

geobulletin

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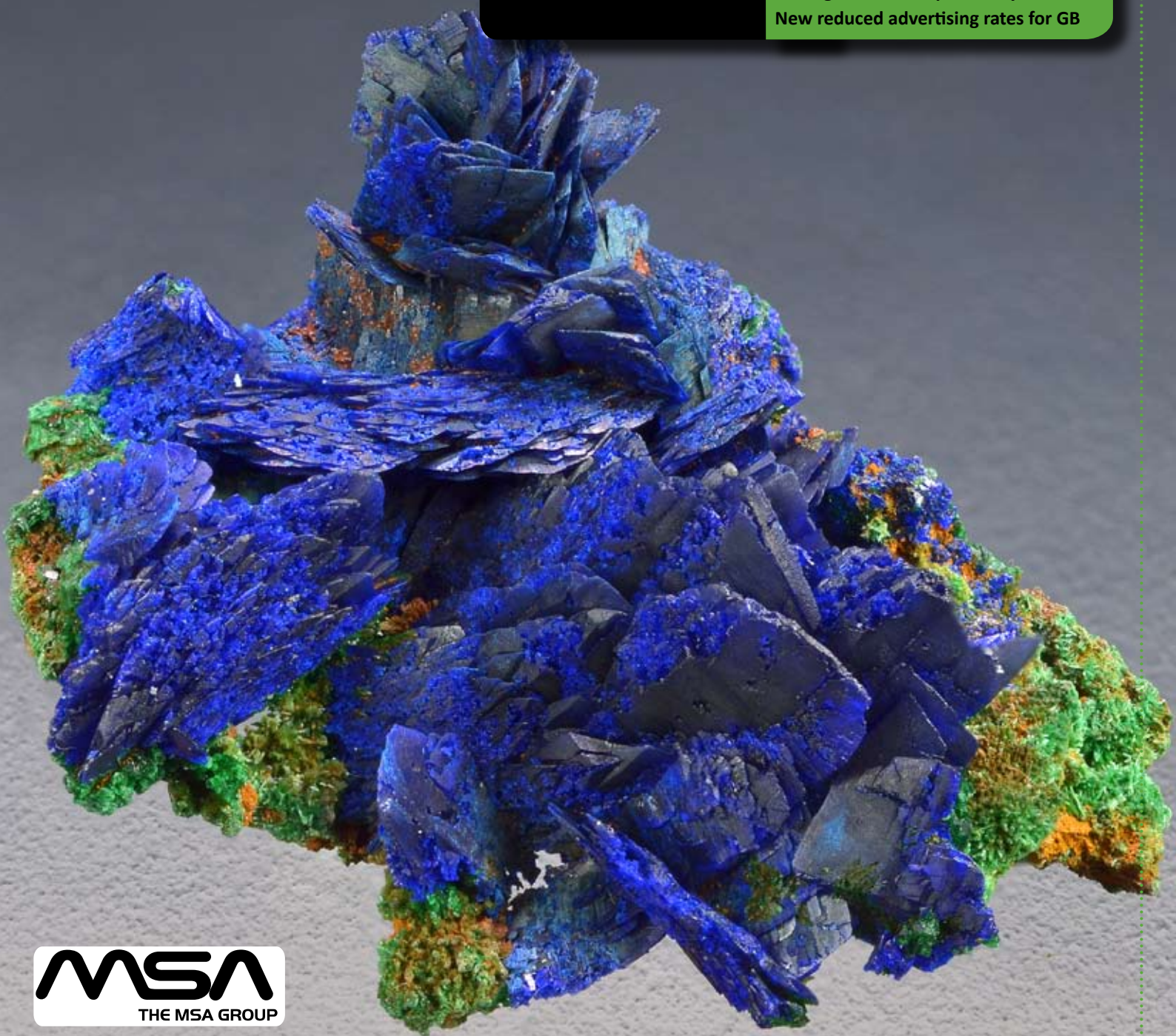
news

Critical raw materials/minerals (CRM)

The Geological Hot Pot

Geological workshops in Kenya

New reduced advertising rates for GB





12TH INTERNATIONAL **KIMBERLITE** CONFERENCE

30 YEARS OF DIAMONDS IN CANADA

8-12 July 2024 • Yellowknife



Ekati, Canada's first diamond mine, Northwest Territories. Copyright © Arctic Canadian Diamond Company

SCIENTIFIC THEMES

1. Diamonds
2. Emplacement and Economic Geology of Kimberlites and Related Magmas
3. The Origin and Evolution of Kimberlites and Related Magmas
4. Diamond Deposits – Exploration and Mining
5. Cratonic Mantle – Petrology, Geochemistry and Geophysics

FIELD TRIPS

1. Northwest Territories Diamond Mines
2. Kimberlites from Across Canada
3. Slave Craton Geology
4. Northwest Territories Kimberlite Drill Core Collection
5. Advances in Drift Prospecting for Kimberlite in Canada

SEMINARS





Invited speakers present a state-of-science summary covering emergent topics followed by moderated questions and extended discussion.

1. Kimberlitic Olivine: Tracking Mantle Cargo and Kimberlite Melt Evolution
Dr. Geoffrey Howarth, University of Cape Town, South Africa

2. Large Type-II Diamonds: Genesis and Transport to Surface
Dr. Evan Smith, Gemological Institute of America

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Front cover photo:

Bladed azurite crystals with green malachite. 3.6 cm, Tschudi mine, Namibia.
See article on pg. 46. (Specimen and photo: Bruce Cairncross)

guest editorial

Critical Raw Materials/Minerals (CRM)



Paul Nex

As I write this, I am currently in a country where it has just been reported that in the first quarter of 2023, the majority of the energy used to produce electricity was produced by wind-power. This has been trumpeted as a major milestone and certainly not something that would have been predicted in 2010 when Critical Minerals / Materials was just starting to become a phrase in common use.

Conversely, yesterday I noted a local headline that stated that “charging anxiety” has replaced “range anxiety” for potential electric vehicle (EV) drivers/owners and that targets for conversion from internal combustion engine (ICE) use to EVs may need to be modified. This includes the ban on new ICE vehicles at some point. Notwithstanding the media’s need to capture our attention with eye-catching headlines of “1st world problems”, I suspect that the combination of energy issues, global anthropogenic climate change, and conversion to a low-carbon economy will be a bumpy ride for the foreseeable future. It also highlights the disparity between places where the supply of energy is taken as a given, whereas the majority of the reading audience for this article are probably suffering from severe load-shedding with no end in sight and no obvious complete solution.

In the last 18 months I have been to three geological conferences on three continents (SEG, Denver; MDSG, Leicester; Geocongress, Stellenbosch, plus Mining Indaba, Cape Town) and it is notable how lithium resources and production have become a major feature of presentations and keynote addresses at these events, which was probably unthinkable 10 years ago. It was only in 2020 that lithium was included in the EU critical raw

materials list; it was absent in 2017 and before. Despite the recent exploration boom and price increases, frequent academic talks and research, the somewhat cynical perspective would ask about the similar boom in rare earth elements from 2010. How many new rare earth element mines are operational since the identification of the REE “crisis”? Will lithium go the same way, as new battery technology improves and is adopted so that the current boom in lithium is more hype than supported by strong economic factors? The “hype cycle” concept would appear to be a reality in the adoption of new technology; however, how applicable is it to the extractive industries? It is pertinent to note an observation from 2017 that in the period 2011–2015 defined mineral resources of REE outside China doubled (Paulick, H. & Machacek, E., 2017, “The global rare earth element boom: An analysis of resources outside of China and discussion of development perspectives”. *Resources Policy* 52, 134–153). Similarly, during the period 2017–2019 the hard-rock lithium resources in Africa increased by a factor of 8. This uplift is typically generated by revisiting known projects and undertaking work to generate code-compliant resources and does not really equate to “new” deposits. As an aside, it calls into question what is meant by a “discovery”.

Critical Raw Materials are nothing new; it is the need for a greater variety of elements concomitant with technological developments that has changed. The transition from stone, to copper, to bronze, to iron, to nuclear with increased technology and development is well-known to all of us. In each of these periods different materials were critical. CRM are regarded as critical due to two main factors:

- 1) the availability of a commodity-supply risk, and
- 2) the impact of supply restriction. It therefore follows that there is no single list of CRM, as the specific criticality of an element / mineral / material will be dependent on the country, the industry

and future perspectives that are involved in the exploitation of those raw materials and the specific manufacturing industry that is being considered. The commonality of many CRM across international borders is largely due to the international drive towards a low-carbon economy. The lists of CRM produced by geological surveys and governments in different jurisdictions are, however, different in detail.

One aspect of the recent plethora of CRM is that there has been an increase in the literature available on deposit genesis, supply chains, and sustainability. This includes books hot off the press in 2023, such as:

- Smelror, M., *et al.*, 2023, *The Green Stone Age: Exploration and Exploitation of Minerals for Green Technologies*. Geological Society of London, Special Publication 526.
- Kalantzakos, S., 2023, *Critical Minerals, the Climate Crisis and the Tech Imperium*. Archimedes, New Studies in the History and Philosophy of Science and Technology 65, Springer, pp. 180.

I haven't read either of these (yet). However, they are certainly eye-catching, full of buzzwords and provide a very detailed current perspective. In addition, new journals are being created, including *Geoenergy*, which was launched at the beginning of 2023 and whose first issue will be a thematic collection on energy-critical metals for a low-carbon transition.

Apart from the headline-makers, I think it is also useful to consider what has happened to other CRM that provided headlines in the last decade that are now of seemingly less interest. This would include PGEs vanadium, nickel, indium, graphite, tantalum, antimony, tungsten, germanium, and cobalt. Those that are used as a component, or regarded as a future component, in batteries do get some airtime (underlined above); however, certainly not as much as lithium. The realisation that copper demand and usage is going to increase with the adoption of EV

technology is filtering down, but perhaps is still not generally appreciated in the public domain. I am reminded of the Rio Tinto booth at the Resourcing Future Generations conference in Vancouver (2018) where it was highlighted that EVs used 3–5 times more copper than ICEs and so copper exploration was a focus for the company.

The increased use of CRM, particularly those that are used only in small amounts, provides the need for traceability and a greater understanding of the supply chains. The Finnish Geological Survey has a program called BATTRACE, which aims to create new technologies that enable mining operations to be made more sustainable. This, therefore, is likely to provide an opportunity for research on the fingerprinting of ores of elements such as lithium, nickel, vanadium and even copper. It has also been suggested that ores and concentrates from certified, more sustainable, and more environmentally friendly extractive operations could command a premium price and provide a competitive advantage to those companies that adopt these practices. This is akin to the SEC Conflict Minerals Law, which covers minerals and metals including gold, tin, tungsten and tantalum, and also the similar regulations regarding the movement of diamonds. An example of potential research would be future studies on the fingerprinting of vanadium, including the deposits of the Bushveld Complex and also Berg Aukas, Namibia, which really should be driven by southern African researchers.

A paper that caught my eye recently was one that highlights the lack of appreciation of the metals, minerals and extractive industry in the wider world (Franks, D.M., *et al.*, 2022, "Mineral Security essential to achieving the Sustainable Development Goals". *Nature Sustainability* 6, 21–27). It noted that the United Nations Sustainable Development Goals (SDG) did not include explicit references to minerals in terms of the goals and targets of SDG, possibly due to an under-appreciation of the necessity of minerals in our daily life. This seems to be an oft-recurring theme in geology. In 1999, just before I came to South Africa, there was a



conference in London organised by the IMM that had as its main theme the relevance of mining and minerals to society. This seems to be a topic that is a focus of one conference or another on a yearly basis.

As a final thought, I am consistently reminded that, in spite of government policies, activists, protestors, NGOs and others, we need to bear in mind that mining is ultimately carried out by mining companies, typically funded by banks and other investors. This emphasises the need for communication between geologists, mining engineers, investors, and the public at large. This does seem to be improving, especially with the current focus on ESG issues and the recognition

over the last 20 years or so of the need for a social license to operate. There are positive signs that communication is improving, as terms such as “critical raw materials”, “rare earth elements” and “supply chain” become part of everyday conversation. This year there are two more international conferences organised by the two main economic geology societies, the SEG 2023 Conference: Resourcing the Green Transition (London) and SGA 2023: Mineral Resources in a Changing World (Zürich). Although these are both in two of the most expensive cities in Europe, it will be particularly interesting to consider their impact.

Paul Nex

executive manager's



The electricity supply shortage in South Africa looks set to continue for some time to come, and we see the blame game being played on an almost daily basis. Building new capacity is seemingly not getting out of the starting blocks. The jury is still out on whether yet another new minister will help or hinder the political process.

Is there anything Eskom customers can do in the short to medium time horizon? Maybe it's time we viewed electrical power as a resource rather than a service. For too long the average domestic consumer has switched on the lights or the stove without regard for availability of the service, unless it's not there. If power is regarded as a resource that needs close management, from the individual consumer to the national scale, we might just reduce the scale and frequency of load-shedding.

Installation of solar capacity in the Smith household has been enlightening (excuse the pun...). There are basically four components



corner

Craig Smith

needed to go solar. First are the photovoltaic panels that collect the solar energy—and which are becoming ever more efficient. Second is the storage medium that you have to have to turn night into day as well as insulating you from Eskom down time. Rapid advances are being made in battery technology, but South African customers basically have to choose between Pb-acid or Li batteries. Buy Li. Third, you need an inverter to convert direct current from the solar panels to the alternating current your house needs. There

are different kinds suitable for different purposes; get advice before you buy. Finally, you have to put it all together and stay connected to Eskom (unless you want to be completely off grid). This is perhaps the most critical aspect to get right, and most of us cannot even find the mains board when a circuit breaker trips, much less wire in a solar add-on. Because this is one of the biggest business opportunities in a generation, all manner of folk are entering the space. And many if not most are not really up to the task. Select a reputable contractor, and make sure the system is certified after installation.

Once installed and working, you will suddenly find that you have a lot more control over your electricity consumption than “service” providers Eskom or the municipalities ever bargained for. You will be “managing” a “resource” that is not necessarily performing optimally at all times due to weather conditions, but nevertheless will reduce your electricity costs significantly, as well as keeping the lights on. Further, electricity will become a resource that is saleable. In the long term, this is a threat to the revenue lines of the major power producers and distributors, including the municipalities. We will still need them to supply base load, but the business models are going to have to change. As are some of the laws and regulations. The trend is clear; it is just a matter of time before home or small enterprise generated electricity is standard operating procedure.

It is premature to conclude that South Africa might be a leader in this space, but the failure of

political will, corruption and the generally dismal operating efficiencies of Eskom—not to mention the lack of strategic planning—combined with the development of specialised finance for homeowners, may force South Africa into a leadership role. It seems the switch to renewable energy in many parts of the world is focused on large-scale national or regional service providers. The business models regarding power production need to change to incentivise domestic capacity increases. This is unlikely to come from government or the power generation industries.

However we move forward, humanity needs significantly higher energy requirements in coming decades, in part to sustain the development of the third world. At the same time, we must cut back the use of fossil fuels.

In late March, the UN Intergovernmental Panel on Climate Change published a five-year summary of panel output. The [executive summary](#) is a document all earth scientists should read. The conclusions are stark and are likely going to create controversy given the amount of societal change needed across the globe to partially mitigate climate change. And it is needed now. It is unequivocal that CO₂ increases in the atmosphere, along with other greenhouse gases, since the start of the Industrial Revolution are real, and are the main drivers of global warming. Harvesting and managing our domestic power resources is a small step in the right direction in our quest for more energy that is climate friendly.

Craig Smith



president's column



Tania
Marshall

There is an ancient Chinese curse “*May you live in a time of change*”, often misquoted as “*May you live in interesting times*”. Both of these two phrases could have been written with our day in mind—“days of danger and uncertainty, but also more open to the creative energy of men than any other time in history” (Robert Kennedy, 1966).

For me, the last two years have very definitely been both “interesting times” and “times of change”. There have been changes within the GSSA itself, with the promotion of the Branches and Divisions portfolio, managed by a new VP and promoted through the establishment of webpages for some of the Branches and re-establishment of relations with some of the “lost” Branches/Divisions; changes in the Meetings VP; a new Chair for the Geoheritage Committee, which changed its name to Geoscience and Society; the initiation of the ESG Division; and the creation of the Chartered Status, which allows GSSA members/fellows to sign off on Public Documents.

Then there have been changes, or rather a lack of changes, in regulations. The promised new cadastral system at the DMRE has not materialised as promised; the controversial new SACNASP Bill has been in the system for over five years; and the ASM Policy document, the Exploration Strategy and Implementation Plan, and the Geoscience Regulations have not delivered to expectations,

and some have even resulted in more confusion than clarity.

The world itself is in a state of flux. We are coming out (maybe) of a global pandemic, where the way in which we do so many things is different from what it was pre- and even during the worst of the pandemic; national and local conflicts are resulting in changes in global economies; the push for a green economy has resulted in different exploration and mining priorities and AI is changing the way in which we do many things—to name but a few...

I would like to think that the GSSA has risen to the occasion with *creative energy*. We have been able to adapt to many of these changes as identified above. I am the first to admit, however, that there are still so many things that the GSSA has yet to accomplish—some of which may never really be possible due to circumstances beyond our control. All of the things that we have accomplished and are in the process of progressing are due to the support of the membership. I would like to thank everyone at the GSSA—the membership, Council, Manco, the Executive and the office staff—for all the support and encouragement during my tenure as President. I would also like to take this opportunity to wish Prof Steve McCourt all the best as he takes the GSSA into the next phase—I know I leave the GSSA in very capable hands.

Tania Marshall





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professional affairs

THE PROFESSIONAL (AFFAIRS) CORNER

What qualities are required to become a leading geoscientist?

I'm sure that I'm not the only one who has had conversations with friends and colleagues about how different our young geologists are to when we were young. There have even been comments that what young geologists want is to just sit in the office and play with software and never experience the adventures of the field.

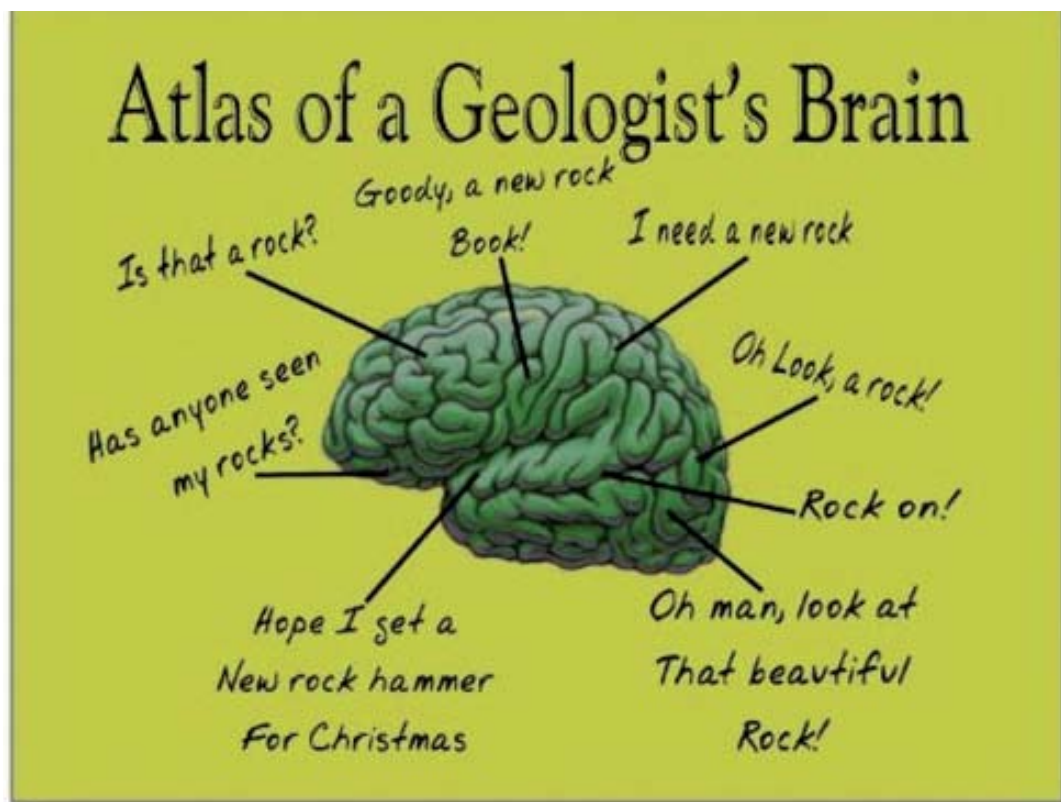
Is there a gulf between young and old geologists (and I do use this term tongue-in-cheek)? And can

it be traced to the basic concept of what makes a good geologist?

To put this to the test, I asked the SACNASP/GSSA mentors and mentees (and a few others) what qualities are required to become a leading geoscientist.

From the oldies

The most successful exploration geologists tend to be those who have seen the most ore deposit settings. I was extremely privileged in my career, which took me to about 70 countries in four continents, to work on or visit more than 700 exploration prospects, projects or mining operations at various stages of development, accompanied by many of the finest geoscientists in the mining industry. To learn from experts, by "osmosis at the coal face", is the best learning experience anybody can wish for. – Roy Corrans, *A geologist and a gentleman*. Extracted from the article 'What do geologists need to be productive and successful?'



Source: www.zazzle.com

Passion for what you do, insatiable curiosity, see as many tricks as possible, read and keep up with current research but don't ignore or reject historical thoughts and concepts. Be willing to share and learn, be flexible; however, know what you stand for and don't backtrack on moral and ethical issues. Be prepared to travel and get out of your comfort zone, learn about other technical disciplines, learn enough about running a business to understand your actions have economic consequences. – *Mark Burnett, Principal Geologist, AMC Consultants*

Firstly, physical fitness, stamina, and self-determination. Secondly, an ability to make observations, not only seeing what is there, but more importantly, what is not there, and identifying anomalies of potential significance. Third, the ability to operate within a team, be flexible about leadership roles, but be respectful towards people when they have a point to make that could be worth listening to. Fourth, keeping your tools sharp! In my case, although I have undertaken many management roles over the years, I have always tried my utmost to be a geologist first, and everything else second. Finally, a thirst for knowledge is critical. This means personal growth, undertaking higher degrees, particularly if they can fit into a work-related topic. Attending management training courses to develop project management skills and theory, field excursions, and focused conferences and seminars. Using the various digital platforms available to download and listen to technical presentations. Reading, and critically appraising academic papers, bearing in mind that not all that is written is cast in stone! – *Richard Hornsey, Consulting Geologist. Extracted from the article 'What makes a geologist?' in Coring magazine, 11 February 2023.*

From the newbies

I think the qualities required to become a leading geologist include having knowledge in 4IR subjects such as Python programming, machine learning and artificial intelligence and being able to use various geological software for fieldwork and

data analysis. It further includes knowledge of government policies related to geoscience and mineral resources such as the Geoscience Act and MPRDA. – *Gift Stephen Mmako, Intern at the Council for Geoscience*

To be a leading geoscientist you need to have an interest in the natural world. You need the traditional skills such as having good scientific and technical skills, problem-solving skills, and good observation skills including being able to articulate your work. To be a cut above the rest you need to have an integrated approach, always being inquisitive and continually learning and upskilling yourself with the latest and new working methods. – *Tshiamo Moleele, Intern at the Council for Geoscience*

Firstly, I believe that a strong foundation in geology and earth sciences is essential. This includes knowledge of mineralogy, petrology, and structural geology, among other areas. Additionally, it's important to have a good understanding of geophysical techniques and their applications. Secondly, communication skills are a must. Being able to clearly articulate complex ideas and data is crucial when presenting findings to colleagues, stakeholders, and clients. This includes both written and verbal communication. Thirdly, the ability to think critically and solve problems creatively is key. Geoscientists often encounter unique challenges that require innovative solutions. Being able to think outside the box is therefore a valuable skill. Lastly, a passion for the field is vital. Geoscience is an ever-evolving area of study, and keeping up with new developments and technologies is important for staying ahead of the curve. – *Mashudu Lucky Baloyi, Intern at the Council for Geoscience*

And in the words of Dr Tania Marshall, President of the GSSA "Passion, lots of hard work and a little bit of luck."

I leave you to draw your own conclusions.

Noleen Pauls

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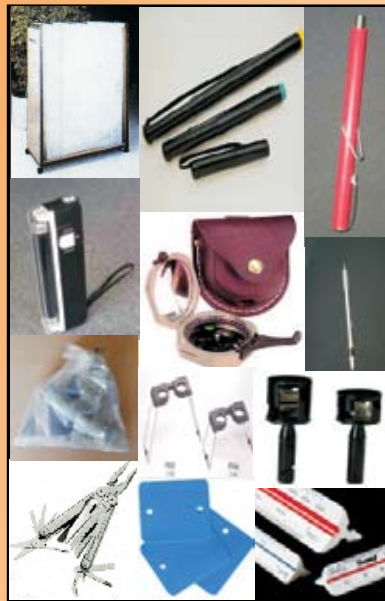
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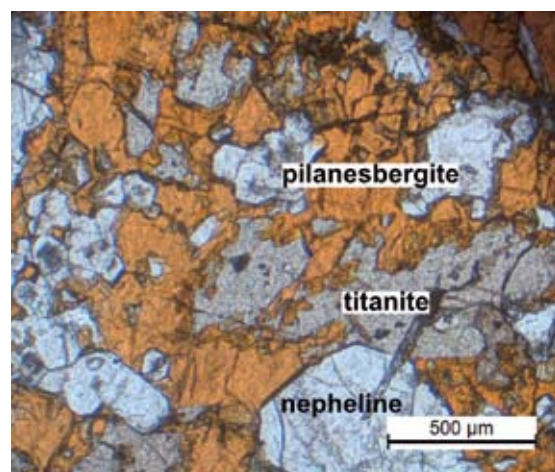
all the news fit to print

University of Johannesburg (including CIMERA and PPM)

Staff and Student News

In April 2023, the International Mineralogical Association (IMA) Commission on New Minerals, Nomenclature and Classification recognised *pilanesbergite* as a new mineral. Prof. **Marlina Elburg** found this mineral in a sample of green foyaite of the Pilanesberg Complex. Old-fashioned microscopy, followed by microprobe analyses at UJ gave the first indication that this was indeed a new mineral, but collaboration with colleagues in Norway and Belgium was needed to obtain the full description that is necessary to get it recognised as such by the IMA. Its ideal mineral formula is $\text{Na}_2\text{Ca}_2\text{Fe}_2\text{Ti}_2(\text{Si}_2\text{O}_7)_2\text{O}_2\text{F}_2$, and it is part of the wöhlerite group, with its closest cousin being normandite, in which manganese dominates over iron. Although not of rock-forming proportion, nor prettily euhedral, the mineral is reasonably abundant in the sample studied, and forms late-magmatic overgrowths on earlier titanite. It is brown in hand specimen and yellow to orange-red pleochroic in thin section, with high birefringence of 0.052.

It has been long known that the Pilanesberg Complex has great potential for new mineral species to be



Yellow-orange *pilanesbergite* in thin section, plane polarised light.

discovered, as similar alkaline complexes like Mont Saint-Hilaire in Canada have yielded dozens of new minerals. It is pleasing that finally the Pilanesberg also has a mineral that bears its name.

Emeritus Professor **Bruce Cairncross** was honoured in January 2023 by the Mineralogical Association of Canada (MAC). He was awarded the Pinch Medal for major and sustained contributions to the advancement of mineralogy through his numerous publications and dissemination of information on southern African minerals and gemstones. Bruce was also one of the co-authors on the paper titled “Malachite pseudomorphs after azurite—Part 2: Milpillias, Mexico, and other worldwide localities” by Peter K. M. Megaw, Evan A. Jones, Bruce Cairncross, and Malcolm Southwood, which was chosen by Friends of Mineralogy as Best Article in *Rocks & Minerals* in 2022 (November/December issue, pages 534–553).

Prof **Bertus Smith** took members of the Korean Broadcasting Service (KBS) to the Northern Cape



The Korean crew filming close-ups of a dropstone in the Makganyene Formation just outside Griquatown.



The film crew shooting the Ongeluk pillow lavas. Bertus Smith is second from the left and the film director on the extreme left.



Province for four days during February 2023 to act as a field guide for a documentary they are filming. The documentary is about glaciers, and the crew wanted footage and interview snippets on the Palaeoproterozoic Snowball Earth preserved in the Makganyene Formation in the Griqualand West region. The documentary is being directed and produced by Ko Junghun and is still in production and likely to be released during 2024.

Dr **Tebogo Makhubela** attended and presented two talks at the new Generation of Academics

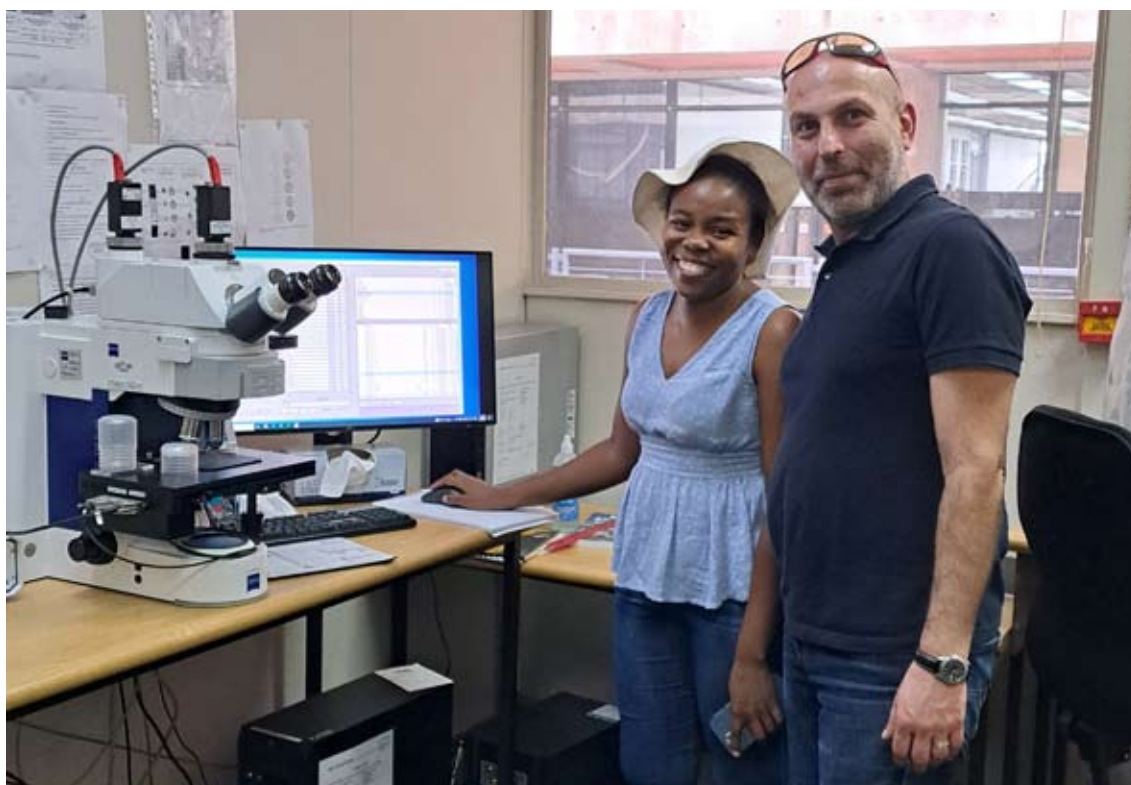
Programme (nGAP) Colloquium on 12 and 13 April 2023. The nGAP Colloquium was an event for Dr Blade Ndzimande, Minister of Higher Education, Science and Innovation, to congratulate and award the first and second cohort of lecturers who successfully completed the six-year programme with a PhD and aim to stay in academia.

Prof **Michiel de Kock** was invited as one of 28 scientists from 14 countries—and the only participant from Africa—to take part in the Nordic Palaeomagnetism Workshop held from 31 July 2022 to 6 August 2022, hosted by the Center of Earth Evolution and Dynamics (CEED) at Kringlen Gjestegård, Oslo, Norway. The Nordic Workshop, which takes place every five years, was initiated in 1986 to tackle problems at the forefront of palaeomagnetic research. Michiel was involved in three working groups concentrating on Rodinia, Nuna/Columbia, and the Archaean to Palaeoproterozoic palaeomagnetic database.

Tebogo Makhubela presenting his talk at the nGAP Colloquium.



Dr **Tebogo Makhubela** and Dr Robyn Pickering (UCT Geosciences) will co-organise and co-host the Climate Change, The Karst Record X (KR10) Conference in March 2025. This conference focuses on using karst systems (speleothems, clastic deposits, tufa deposits, etc.) to understand climate change of the past, present and projected future. The SA team won the bid by 2% against Morocco, who also wanted to be the first to host this conference in Africa.



Dr Stavros Kalatzidis conducting petrographic analysis with UJ PhD student Itumeleng Matlala.

During 2022, **Itumeleng Matlala**, a PhD student in coal petrography and geochemistry at the University of Johannesburg spent two months at the University of Patras (Greece), under the auspices of the Erasmus Programme of the European Union. While there, she was hosted by Dr Stavros Kalatzidis. During her stay, Itumeleng, later joined by her supervisors, Dr **Marvin Moroeng** and Prof. **Nikki Wagner**, attended the 14th annual course of the International Committee for Coal and Organic Petrology (ICCP) at the University of Patras. In a reciprocal visit, Dr Kalatzidis visited the Department of Geology at UJ between the 28th of February and

9th of March 2023. Dr Kalatzidis presented lectures on coal depositional systems over two days to postgraduate students from UJ, NWU, and Wits. He, along with Dr Margo Wojtaszek-Kalaitzidi (Poland), and Prof Wagner also presented a one-day Coal Petrology Workshop at UJ, co-organised by the DSI-NRF CIMERA and the Mineralogical Society of South Africa.

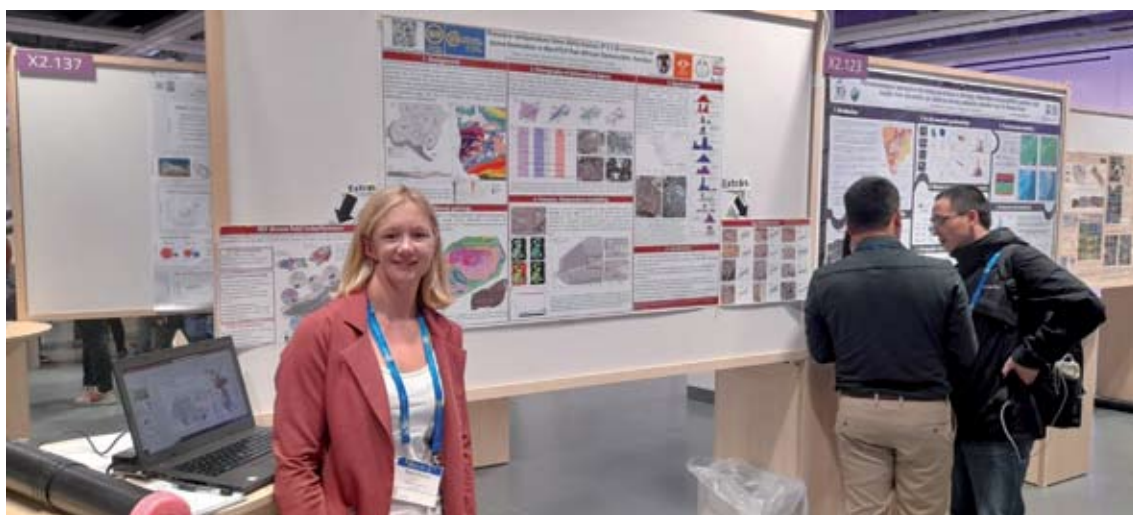
In April, final-year PhD candidate **Robyn Ormond** and Prof. **Jérémie Lehmann** travelled to Vienna, Austria to represent the University of Johannesburg at the annual European Geosciences



From left: Dr Stavros Kalatzidis (University of Patras, Greece), Dr Marvin Moroeng (UJ), Dr Margo Wojtaszek-Kalaitzidi (Poland), Prof Nikki Wagner (UJ), Petra Dinham (MINSa) and Sabine Verryn (MINSa).



Robyn Ormond at her poster during the EGU meeting in Vienna.



Union (EGU) conference. Jérémie gave an oral presentation titled “Modes of crustal growth and construction for the southwestern Congo Craton in the Mesoproterozoic” with data from the Kunene Anorthosite Complex in Angola and Namibia. Robyn gave a poster presentation featuring the main findings from her PhD project. The poster was titled “Pressure–Temperature–time–deformation (P–T–t–d) constraints on dome formation in the HTLP Pan-African Damara Belt, Namibia”. Overall, it was a fantastic opportunity to network, showcase UJ’s ongoing research, and talk some serious geology over good beer!

Ms **Sabine Danala Danga**, a PhD student at the University of Ngaoundere, Cameroon, is visiting the Department for the third time from February to June 2023 under the supervision of Dr Tebogo Makhubela. She previously visited for six and nine months under the supervision of Prof Wlady Altermann and Dr Clarisa Vorster, respectively. Ms Danala Danga’s visits are sponsored by the UNESCO Organisation for Women in Science for the Developing World (OWSD), who are supporting her exposure and access to laboratories outside Cameroon. In April 2023, Ms Danala Danga attended the EGU 2023 Conference, where she

Honours students practicing the art of navigation and direction finding.





Group photo on the last afternoon of the course.

presented a talk titled “An assessment of soil pollution from artisanal gold mining in Wantia Area (Meiganga, Cameroon).”

The Geology Honours class of the University of Johannesburg is typically quite a diverse group of students that have completed their undergraduate qualifications at many different universities across South Africa. To ensure that all the students start at the same level of knowledge regarding field-based geology, and that they will make a success of the various field trips and mapping modules that they will have to complete during their Honours year at UJ, the department has started to spend an additional week with the students in the field, referred to as the “Boot Camp”. During this week, the students are brought up to speed with various geological field and mapping techniques.

This year, the Boot Camp was presented as a separate field course independent of any Honours module, from the 1st to the 9th of April. The course encompassed seven days in the field, with lectures on field techniques followed by practical sessions making up the first 3 days (covering many different aspects from basic compass and map work, navigation techniques, to obtaining structural data from deformed strata, and mapping techniques). This was followed by two days of staff-assisted geological mapping, and culminated in another 2-day mapping project where each student had to

construct a geological map and geological cross-section of structurally deformed geology on his or her own.

This year the course was presented by Prof. **Jérémie Lehmann**, Prof. **Axel Hoffman**, Dr **George Henry** and Dr **Herman van Niekerk** (as well as postgraduate students Megan Sauer and Casper Karadzandima) in the Tswalu Kalahari Reserve in the Koranna Mountains of the Northern Cape Province. The group resided in the Dedebe Research Camp of the reserve, hosted by Dylan Smith, the Head of Dedebe Research Centre. The Tswalu Kalahari Reserve makes an excellent location for teaching geological field skills and methods as it is situated along the eastern edge of the Kheis Terrane in the rocks of the Olifantshoek Group. Apart from the interesting geology, the reserve is also inhabited by all the members of the famous “Big 5”, except for elephants, which makes for a noteworthy field experience for the students. Not only do the students develop their geological field skills, but they are also exposed to the natural world in this setting, and producing a geological map in an area where Kalahari lions roam, and under the watchful eyes of armed game rangers, is life changing.



The top students for 2022. From left to right:

Mr T. Bopalamo (1st year);
Mr K. Fynn (Honours);
Ms L. Zuma (2nd year);
Ms T. Blom (Rand Pioneers Yule Crosby Memorial prize);
Mr T. Sibanyoni (3rd year).



The UJ Geology Department has an annual prize-giving for the top undergraduate and Honours students. This is done retrospectively, and the accompanying photo shows these top achievers for 2022.

Since UJ Geology / CIMERA / PPM's last *Geobulletin* news, the department has also graduated a number

of MSc and PhD students. The various project topics covered broad areas of research interest including geomettallurgy, economic geology, early Earth history and medical geology. The accompanying table lists these, together with the respective supervisors and co-supervisors.

UJ Postgraduate Degrees awarded		
Student Name	Title	Supervisors / Co-supervisors
2022		
Matlala , Itumeleng Vanessa (with distinction)	MSc: The effect of a dolerite intrusion on coal structure: insights from NMR, XRD, and Raman Spectroscopy	Supervisor: Dr OM Moroeng Co-Supervisor: Prof NJ Wagner
Mashiane , Neithel	MSc: Rare Earth Element prospectivity of the Upper Zone of the Rustenburg Layered Suite, eastern Bushveld	Supervisor: Prof MA Elburg Co-Supervisor: Dr AY Billay (Council for Geoscience)
Mouton , Carene	MSc: The effect of host rock on platinum group and base metal sulphide mineralization and their mineral processing characteristics in the Merensky Reef, Western Limb of the Bushveld Complex, South Africa	Supervisor: Prof AJB Smith Co-Supervisor: Prof KS Viljoen

UJ Postgraduate Degrees awarded		
Student Name	Title	Supervisors / Co-supervisors
2022		
Richards , Patrick Kyle	MSc: Petrographical, Mineralogical and Geochemical characterisation of the Leinster Deposit, Kalahari Manganese Field, South Africa	Supervisor: Dr C Vorster Co-Supervisor: Prof AJB Smith Co-Supervisor: Dr L Blignaut Co-Supervisor: Dr NA Vafeas (University College Dublin, Ireland)
Mahooana , Papali Evelyn (with distinction)	MSc: Assessment of the possible occurrence of Torbanite in the Ermelo Coalfield, South Africa	Supervisor: Dr OM Moroeng Co-Supervisor: Prof NJ Wagner
Malatji , Ingrid (with distinction)	MSc: The Late Proterozoic Evolution of the Cuddapah Basin (India)	Supervisor: Prof MO de Kock Co-Supervisor: Dr GA Belyanin
Malepe , Retshepile Evelyn (with distinction)	MSc: Geophagic Materials and their Potential Impacts on Human Health in South Africa: A Case Study from Fetakgomo Tubatse Local Municipality (FTLM) Area in Limpopo Province	Supervisor: Prof H Mouri Co-Supervisor: Prof C Candeias (University of Aveiro, Portugal) Co-Supervisor: Dr M Kwata (Council for Geoscience)
Moila , Amogelang (Geology)	MSc: A process mineralogical investigation of the UG2 and structural geology of the subvertical veins associated with the UG2 at the Bathopele Platinum mine, Bushveld Complex	Supervisor: Dr DH Rose Co-Supervisor: Prof J Lehmann Co-Supervisor: Prof KS Viljoen
Sangweni , Bandile Ndumiso (with distinction)	Dissertation: A Process Mineralogical Investigation of UG2 Flotation Tailings at the Eland and Crocodile River Mines of the Bushveld Complex in South Africa	Supervisor: Prof KS Viljoen Co-Supervisor: Dr DH Rose
Simelane , Carol Xolile	Dissertation: Recovery of Au from mine tailing dumps of the Witwatersrand goldfields using cyanide-free reagents	Supervisor: Dr DH Rose Co-Supervisor: Prof GT Nwaila (University of the Witwatersrand) Co-Supervisor: Prof KS Viljoen
Paprika , Dora Edit	PhD: Mesoarchaeon volcanism and associated hydrothermal activity of the Dominion Group in the Ottosdal area, South Africa - implications for Witwatersrand Basin gold	Supervisor: Prof A Hofmann Co-Supervisor: Prof A Agangi (Akita University, Japan)



UJ Postgraduate Degrees awarded		
Student Name	Title	Supervisors / Co-supervisors
2022		
Gevera, Patrick Kirita	PhD: Naturally occurring potentially harmful elements in the Makueni County environment, South-Eastern Kenya: health implications and community awareness	Supervisor: Prof H Mouri Co-Supervisor: Dr P Gikuma-Njuru (South Eastern Kenya University, Kenya) Co-Supervisor: Prof K Dowling (Royale Melbourne Institute of Technology, Australia) Co-Supervisor: Dr M Cave (British Geological Survey, UK)
Mkhatshwa, Sindile Francisca	PhD: A geometallurgical characterization of uranium mineralization in the A1, A5, E9EC and UE1A reefs at Sibanye-Stillwater's Cooke operations, Randfontein Estates, South Africa	Supervisor: Prof KS Viljoen Co-Supervisor: Prof AJB Smith Co-Supervisor: Dr BM Guy
Nunoo, Samuel	PhD: Origin and age of gold mineralization in NW Ghana - a case study of selected gold deposits from the Julie and Wa-Lawra belts	Supervisor: Prof A Hofmann
Chabalala, Vongani Prince	PhD: The Application of Organic Petrology, Raman Spectroscopy, and Geochemistry to Karoo Basin (South Africa) Shale Gas samples	Supervisor: Prof NJ Wagner Co-Supervisor: Dr N Malumbazo (University of the Witwatersrand)
Student Name	Title	Supervisors / Co-supervisors
2023		
Bussin, Daniel Roland (with distinction)	MSc: A characterization and process mineralogical assessment of the karst-hosted manganese ore deposits at Paling exploration camp in the Postmasburg Manganese Field, Northern Cape Province, South Africa	Supervisor: Dr C Vorster Co-Supervisor: Prof B Smith Co-Supervisor: Dr B Kennedy (4 Arrows Mining and Exploration)
Mapingere, Brian (with distinction)	MSc: Structural and geochronological constraints on the evolution of the south-eastern Mwanesi Greenstone Belt, Zimbabwe Craton: implications for gold mineralisation	Supervisor: Prof J Lehmann Co-Supervisor: Prof KS Viljoen

UJ Postgraduate Degrees awarded		
Student Name	Title	Supervisors / Co-supervisors
2023		
Chitlango , Fatima Zonke (with distinction)	MSc: Rare Earth Elements in South African Coals: Concentration and mode of occurrence in density fractionated samples from the Waterberg Coalfield	Supervisor: Prof NJ Wagner
Fitton , Dillan (with distinction)	MSc: A detailed stratigraphic, mineralogical and geochemical assessment of the Hotazel Formation at Middelplaats, Kalahari Manganese Field, Northern Cape Province, South Africa	Supervisor: Prof AJB Smith Co-Supervisor: Prof R Schoenberg (University of Tuebingen, Germany) Co-Supervisor: Dr C Vorster
Rammela , Tshifhiwa (Geology)	MSc: Geology of the Malmani Subgroup in the Vaal area south of Johannesburg: Implications for the future development of the Glen Douglas Dolomite Mine	Supervisor: Prof MO de Kock Co-Supervisor: Mr FED Senzani
Bowden , Laura Leigh	PhD: Source terrains of Southern African Karoo-aged basins as determined from detrital zircon age studies and a comparison with correlative units in Brazil and India in context of Gondwana reconstruction	Supervisor: Prof NJ Beukes Co-Supervisor: Dr C Vorster
Agra , Naa Afi	PhD: Petrogenesis and geochemistry of the Paleoproterozoic Birimian metavolcanic, metasedimentary and intrusive rocks in the Bui belt of Ghana	Supervisor: Prof MA Elburg Co-Supervisor: Dr C Vorster
Chagondah , Godfrey Shoriwa	PhD: Petrogenesis & metallogenesis of granitic rare-metal pegmatites along the southern margin of the Zimbabwe craton: Implications to exploration	Supervisor: Prof A Hofmann



Finally, it is with great sadness that we report the passing of our trusted technical staff member **Herbert Mhle Gugwana**, on Sunday 23rd April. Herbert was a valuable asset to our department and will be greatly missed.



CIMERA

Since the last *Geobulletin* news from CIMERA, a number of events have taken place.



In July 2022, CIMERA held the Plate Tectonics and Metallogeny Symposium at the University of the Witwatersrand from the 20th to the 22nd of July, facilitated by Professor Laurence Robb (visiting Professor at the University of Johannesburg). In September 2022, CIMERA hosted its first online Science Communication Workshop. The interactive workshop, facilitated by Professor Gijsbert Hoogendoorn from the University of Johannesburg, imparted helpful tips on modifying one's message for optimal communication and techniques to engage an audience effectively. In tandem, the CoE opened its annual Science Communication Competition, aimed at translating economic geology research for a non-geology audience. A month later in October 2022, the CoE exhibited at the Council for Geoscience Summit in Durban from the 25th to the 27th of October.

CIMERA held its annual research colloquium at the University of Johannesburg on the 21st and 22nd



Herbert Gugwana.

of November. The two-day hybrid event brought together 60+ students and academics from across the 12 university partners in South Africa. Three winners of the 2022 Science Communication Competition were announced here.

The multinational Barberton Archaean Surface Environments (BASE) Moodies Drilling Project was awarded the 2022 Kruger Lowveld Chamber of Business and Tourism (KLCBT)/Tshwane University of Technology Innovation Award. The late Prof. Nic Beukes, BASE Project Manager under the DSI-NRF CIMERA, and Ms Phumelele Mashele, BASE Outreach Coordinator, were among the team that accepted the award.

Merrily Tau, winner of the CIMERA 2022 Science Communication award, flanked by Judith Kinnaird on the left and Nikki Wagner on the right.





Attendees at the 2022 annual CIMERA research colloquium.

During the current year, in January 2023, DSI-NRF CIMERA was a Gold Sponsor of the 2023 Geocongress in Stellenbosch. Several CIMERA-funded students presented their work in either oral or poster format. CIMERA held parallel sessions on its nine focus areas at the conference. Here, researchers and students met to discuss the challenges faced and opportunities available under each focus area. The CoE held a short-course symposium on Earth Observation Tools at the University of Johannesburg in collaboration with research partner Helmholtz Institute Freiberg for Resource Technology (HIF), Germany.

In February 2023, CIMERA attended the 2023 “Investing in African Mining Indaba” in Cape Town. The CoE co-exhibited with HIF in their capacity as transcontinental research partners in the minerals and energy sector. CIMERA sponsored twelve MSc and PhD students and a postdoctoral candidate from seven partner universities in South Africa to attend the Young Leaders Programme as part of the Mining Indaba. Here, the economic geology students received first-hand insight into current and future trends in the mining and energy sectors from industry and academia experts. The CoE participated in a panel discussion alongside industry experts titled “Geoscience Research for Future Commodity Demand”, where the panellists discussed the role of geoscience research in

meeting the demands of a mineral-intense energy transition.

In March 2023, CIMERA hosted Professor Stavros Kalaitzidis from the University of Patras in Greece, one of CIMERA’s international partners. Prof. Kalaitzidis facilitated a workshop at the University of Johannesburg on coal deposition environments and organic petrology under the CoE Focus Research Area #7: Energy Resources. Students from North-West University, UJ and the University of the Witwatersrand attended the workshop.

Finally, in April 2023 in an interview with *Mining Weekly*, CIMERA Co-Director, Professor Judith Kinnaird, explained how the research of the CoE positively influences the full mining value chain and expounded the relevance of the CoE in meeting the demands of the green economy.

Looking forward to later this year, CIMERA announced that it would host the 8th Metallogeny Short Course from the 9th to the 13th of October 2023 in Johannesburg, under the theme: “The Role of Mineral Wealth in the Energy Transition – Southern Africa”. The course is a partnership between the Society for Geology Applied to Mineral Deposits (SGA), the International Union of Geological Sciences (IUGS), the Society of Economic Geologists (SEG) and UNESCO, and will include



CIMERA-sponsored students at the 2023 Mining Indaba in Cape Town. CIMERA Director Nikki Wagner is on the left and CIMERA Manager Lizzie Tau on the right.



lectures and field excursions. Registrations for the course are open. Please refer to the flyer for more details: <https://lnkd.in/dPVdfcn6>.

Compiled by **Bruce Cairncross** from various departmental contributors.



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University of the Witwatersrand

The School of Geosciences would like to congratulate Dr **Linda Iaccheri** and Dr **Ben Hayes** on both being promoted to the post of senior lecturer; as well as extend a warm welcome to Dr **Suman Mondal** (a new postdoctoral fellow), Mr **Magcina Nyoni** (as CIMERA administrator) and Ms **Nozipho Khambule**, who also joins us in an administrative capacity. Prof. **Glen Nwaila** (director of the Wits Mining Institute) also did us proud when he was invited by the President's Office to moderate the panel discussion "Mining: A new partnership for growth" at the 5th annual South Africa Investment Conference, held on the 13th of April.

On the 12th of April, the South African Student Chapter of the Society of Economic Geology (SAS-SEG) committee and production geologist Brendan McNally organised a field trip down Harmony Gold's Doornkop Mine, a single-shaft deep-level mine west of Soweto. Under the supervision of Wits Lecturer Dr Scott MacLennan and the geology

H.O.D. Ndumiso Nxumalo, a total of 20 students, including three SAS-SEG committee members, began their decent nearly 2 km into the Earth, where they were treated to an explanation on how an underground drill rig operates, as well as how the South Reef will be mined. After returning to the surface, the geology team prepared a slideshow for attendees explaining the history, geology, and workings of the mine in more detail, followed by a trip to the core yard.

As part of ongoing outreach in the Vredefort Dome World Heritage Site, Prof. **Roger Gibson** delivered a public lecture on the geology of the Dome and the impact event to approximately 70 landowners in March, and followed this up with a 1-day excursion in the Dome in April that was also attended by participants of the SACNASP/GSSA mentorship programme. Both events were very well received and new interest and developments by the local community will hopefully pay dividends in



Student Members of SAS-SEG (orange vests) and Harmony Gold's geologists (yellow hard hats) nearly 2 km underground at Doornkop Gold Mine.

enhancing the Dome as a premier geotourism site. Still in the spirit of outreach, we bid farewell and good luck to Fletcher, our guide dog puppy as he left to begin his training, in the best way we know how: with a fundraiser tea for the 70th birthday of the South African Guide-Dogs Association. If you are able to, please consider donating to this worthy cause too via this link: <https://guidedog.org.za/donate/>.

Compiled by Sarah Glynn from various contributors within the School.



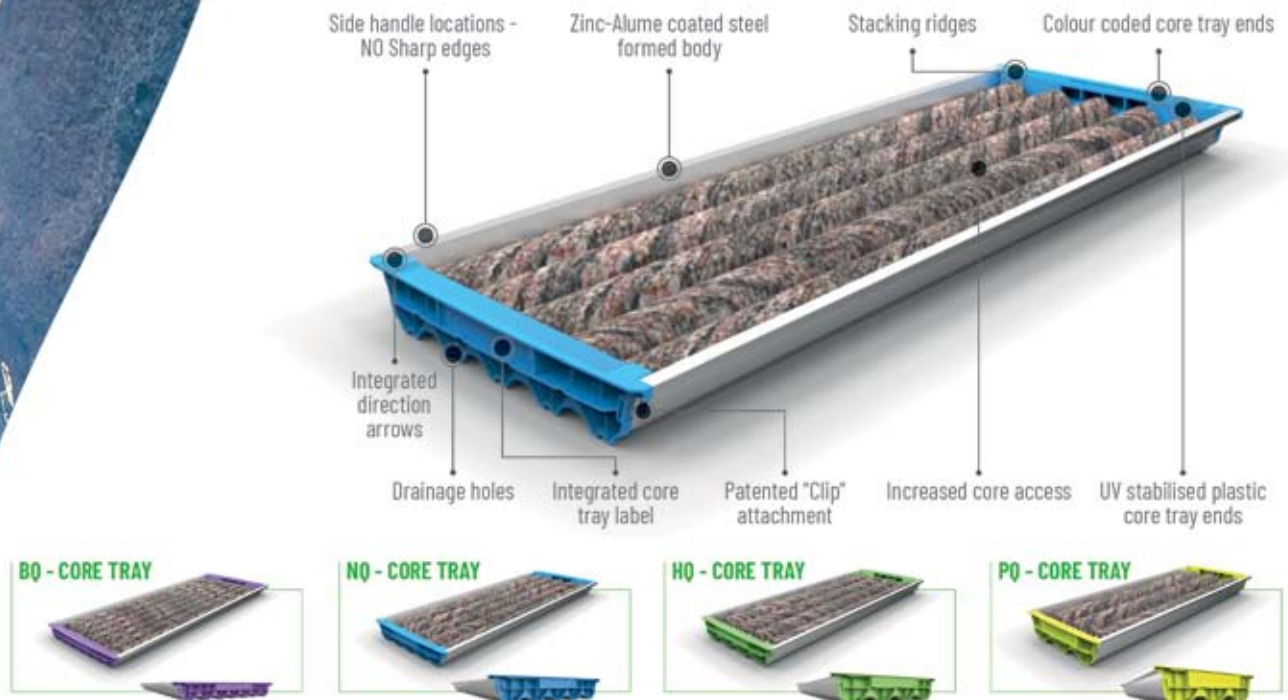
SA Guide-Dogs Association fundraiser tea as a send-off for Fletcher.



Prof. Roger Gibson with participants of the 1-day Dome excursion.

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branch news

Northern Cape Branch

The Northern Cape Branch of the Geological Society of South Africa strives to create awareness and opportunity in a province that has amazing potential and diversity. I am honoured to have been nominated once again to continue carrying the mantle for this vibrant branch.

The year started off with members of the Exco meeting up for an online strategy session whereby goals were set for the year and necessary structures put in place, including the formation of clusters and activities to better administrate our vast province. Thereafter, we successfully hosted our West Coast Diamonds Event and Excursion at Port Nolloth and

Alexander Bay, which was organised in part by what we intend to become our western cluster, the "Namaqua cluster". Online talks were hosted on behalf of the branch in the first quarter of the year. We would like to thank our members, sponsors and interested parties for their continued support. We look forward to hosting future events for all stakeholders as we fulfil our mandate to promote awareness of geology and foster interest in the earth sciences within the region.

Loni Gallant

NC Branch Chairperson

The Northern Cape Branch of the Geological Society of South Africa

"West Coast Diamonds Event & Excursion"

Port Nolloth & Alexander Bay

5th & 6th May 2023





















"Diamonds are forever and so are the memories of yet another successful West Coast Diamonds Event.

Informative talks all round from our presenters Dr. Asriël (Assie) Van Der Westhuizen, Baxter Brown, Dr. Tania Marshall and Deon Bowers, comprising aspects including alluvial diamonds discovery from the West Coast and diamond deposits within Africa, which was followed by an exciting field trip hosted by Alexkor, Kabelo Mongalo.

We would like to once again thank all the event delegates, speakers, NC branch Exco and sponsors for an amazing event."

Loni Gallant – NC Branch Chairperson.



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the geological hot pot

This issue's hot pot is more mixed than usual, and I hope that you don't end up with indigestion after reading it!

We start off deep below the surface of the Earth where things are hot and highly bothered, not to mention squashed. We are now familiar with large igneous provinces (LIPs) such as our local southern African Karoo LIP, as well as komatiites, first identified in the Barberton area. LIPs are composed of the more common mafic to felsic rocks, while komatiites are relatively rare and limited in their global distribution as well as in time. What brings these rocks together are the experimental studies by a group of geoscientists working in France on the melting of pyrolite (representing the bulk composition of the mantle). Their results have been published in *Science Advances*. They determined that the mantle source for the oldest komatiites

decreases from 700 km to 600 km in depth, and from 300 km to 100 km for the picrites and basalts in LIPs, with the extent of mantle melting between 10% and 50%. These findings are important for igneous petrology and go a long way to explain the origin of the rocks in LIPs, and especially how komatiites formed.

From the depths of the Earth to the Etosha Pan in Namibia. Have you ever wondered where baby giraffes come from? Neither did I until I came across [this fascinating article in *Animals*](#) (at least I think so!). Two veterinary scientists from the University of California–Davis studied the mating behaviour of giraffes at the Etosha Pan. They discovered that the male giraffe slurps some urine from the female to determine if she is ready for mating. Umm... Aren't you glad you're not a male giraffe?

Komatiite with its characteristic spinifex texture at the type-section along the Komati River in Mpumalanga Province.





Two posing giraffes in the Etosha Pan. Photo taken in 1977.

Speaking of which, these animals are more intelligent than we suspect. Three animal scientists from Spain conducted some research on giraffe feeding behaviour and found that they probably use statistical reasoning to choose carrots (that giraffes prefer) over zucchinis when presented with a mixture of the two vegetables. A short summary of their report is presented in [The Conversation](#). The full article is on Open Access.

To round off the animal theme, new research from Australia has provided evidence that snakes can hear better than we think. For those of us who have encountered puffadders and other snakes while innocently doing our work in the bush, this is probably very good news indeed! The snakes will hear us long before we see them, and scarper off (except the puffadder, of course!). You can read more in [this summary](#) of the original article from *PloS ONE*.

As we slither down the slippery slope to total darkness courtesy of Eskom, any novel ideas on



Photograph of a baby cobra taken in Sutherland in the 1970s. I had a colleague whose hobby was snakes, and this little chappie was in his collection.

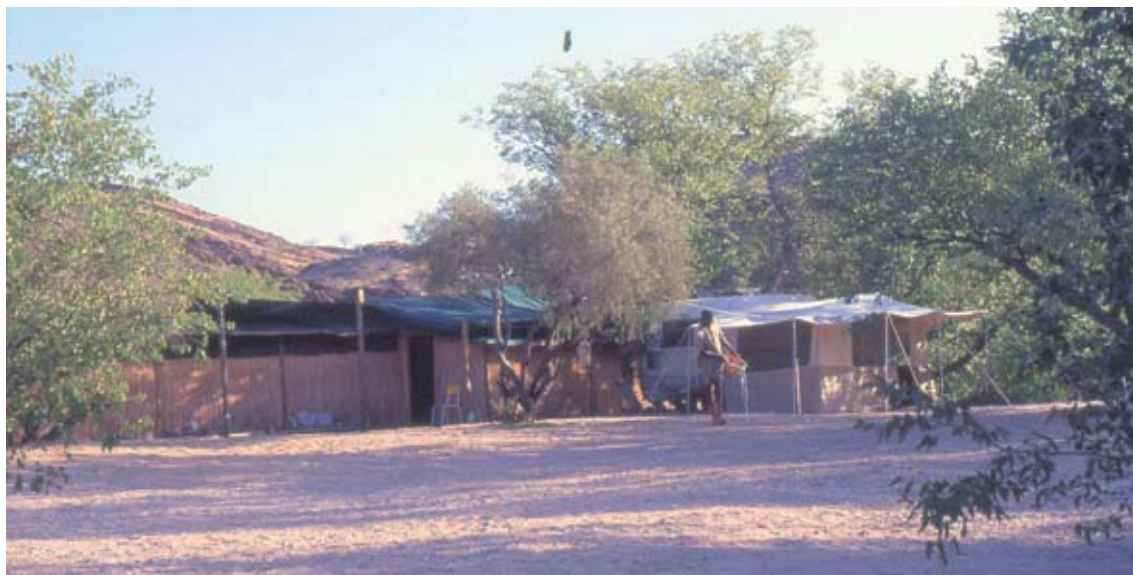


Shaft on Driefontein Gold Mine, close to the Tau Tona Gold Mine, in the Carltonville area in 1980.

how we can prevent this, or at least mitigate it, are surely welcome. An international team of scientists are busy researching new ways to repurpose old underground mines, and have proposed the Underground Gravity Energy Storage (UGES) idea, as explained in [this article in Big Think](#). The basic idea is to lower material, in this case sand, slowly down a disused vertical mine shaft. As the sand containers are lowered, the cables to which the containers are attached spin rotors that generate electricity. The power is fed into the grid and used as normal. In the study, the sand is stored underground until there is excess electricity available to enable it to be hoisted back up to the surface (stored energy). And so the cycle repeats. It



*Rand Mines
exploration camp at
Tsongoari in 1993.*



is notable that the researchers, besides advocating defunct coal mines, suggest that such a system could be set up at the Tau Tona gold mine near Carltonville as a proof-of-concept.

To complement my short archive article elsewhere in this issue, I would like to add a few more notes about exploration in Kaokoland, northwestern Namibia, in the early 1990s. Rand Mines had a base camp at the Tsongoari lead–zinc deposit from where we conducted our regional exploration activities. The remote area where we enlisted the help of the local donkeys was about 60 km to the north-northwest of

base camp. Rand Mines recruited several Geology Honours students from Leeds University in the UK in 1993 to conduct field mapping as part of their independent projects. Austin Osborne and I were doing the field supervision, and the late Jan van der Merwe from Walvis Bay was our camp manager who took care of the logistics. The mapping area was along the Hoarusib River with difficult vehicle access, and hence the donkeys.

Rand Mines were targeting potential extensions of the Tsongoari deposits along stratigraphic strike. The lead–zinc deposits, with some copper and barite,

*Two Leeds University
Geology Honours
students in the Hoarusib
River mapping area
with some local help.*





Mapping and sampling Damara rocks.

are stratiform and stratabound and hosted in meta-sedimentary rock in the lower part of the Damara Sequence. They probably belong to the sedimentary exhalative class of base metal deposits. The rocks have been metamorphosed to amphibolite facies, and complexly deformed during the Damaran orogeny around 530 million years ago. Although the reconnaissance mapping indicated that the host rock sequence does extend in the student

mapping area, no further mineralisation was found. It must be borne in mind, however, that systematic modern exploration, including detailed geophysics and geochemistry, has not been conducted in this very remote area, and so the possibility of future significant base metal discoveries is not ruled out.

George Henry



Deformed Damaran biotite schist with boudinage structures.

CALL FOR ABSTRACTS: <https://cag29gsaf.org/abstracts/>



29th Colloquium of African Geology

“The earth sciences and Africa’s development: current realities, future projections”

26 – 29 September 2023 | Windhoek, Namibia

CALL FOR ABSTRACTS



The Lion’s Claw, a distinctive rock formation at the World Heritage site of /Ui-//aes, also known as Twyfelfontein in the Kunene Region, Namibia

“Namibia the World’s Geological Paradise”

Spearheaded by the Geological Survey of Namibia

from the archives....

DONKEY WORK

A matter of perception



There was a time when a packhorse, pick and pan were the means, and time was plenty for panning streams or searching for the "eisen hüte".

Civilization might have allowed the ease of a well worn track, even the luxury of space for two wheels but what would once have taken months can now be viewed by a glance at a screen without the discomfort of boot-weary feet.

A simplistic mineral-supported existence is still to be found in third world (and some not-so-third world) countries — gold in central Africa and in better times, tin in Namibia). In more developed countries, however, the prospector and subsistence level small miner have been largely replaced by the exploration geologist using advanced technology to assist in finding a deposit of company proportions. Whether evaluating areas around operating or defunct mines, or exploring from grass-roots in remote areas, no amount of technology can replace (yet) hands-on geology.

Some aspects of exploration in Namibia's northwest Kaoko Province can be efficiently effected from a helicopter. Relatively unknown and undocumented geology however requires careful examination and correlation and the most cost-effective means of completing geological mapping and following up geochemical sampling, is on foot — a tall order in an area with poor access and scarce drinking water.

The solution was four-legged. Three donkeys and a good pair of boots between flycamps — a tent, stretcher and sleeping bag, three pots and 2 x 25 litre jerrycans of water. Low on maintenance and no problem with mechanical failure — they could be watered once a day within a day's walk and refuelled en route. Their pace allowed "mobile-mapping" and control required a subtle combination of clicks and vowel sounds (multilingual).

A tent beside a dolomite-sourced spring provided a base camp and a 10-metre tall specimen of *Ficus sycamores* supported an H.F. radio aerial.

Excerpt from GSSA Geobulletin March 1993 issue, pp. 9–10.

I came across this 30-year-old article and it brought back memories of an interesting exploration episode just after I graduated with my doctorate degree. Dr Mark Bristow, Chief Geologist at Randgold and Exploration, hired me to do some work with Austin Osborne in Kaokoland in northwestern Namibia. It was during one fly-camping trip in a very remote area that we had to use donkey power to facilitate our work, as reported by Austin in his article.

Kaokoland is a really remote part of Namibia. If I remember correctly, one of the 1:50 000 topographic map sheets we used did not have a name. This means that there is no human habitation in that area at all, because even a few Himba or Damara folk in a small "village" would give it a name, and this would appear on the map.

George Henry

A day's walk from the base camp, flycamps were set up as and where required, within a few hours walk of known springs. Navigation and positioning was easily facilitated by aerial photographs and topo sheets.

For periods of up to 5 days geochemical sample positions were relocated, anomalies placed into a geological framework and in turn a stratigraphic framework. While perhaps allowing less comfort than a permanent base camp, such a basic method of transport and camping on site does allow the luxury of time — necessary in such an area but not so readily afforded by a helicopter.

Over a period of 6 weeks, geochemical follow-up of most of 1735 samples collected by Tsongoari Exploration in 1991 was completed in conjunction with geological mapping and correlation over an area of some 40 000 hectares.

Reconnaissance geological mapping is planned for more remote areas using the same methodology in 1993. Better focused and more cost-effective geochemical sampling and geological mapping will then be completed by helicopter. With only dry river bed access and an unknown but probably non-existent water supply, 1993 promises to be interesting.

AUSTIN OSBORNE
Randgold and Exploration



*Austin with our
Damara assistants
preparing for
fly-camping.*



*Our Kaokoland 4X4
SUVs.*



A bit further along.



*Away we go, with me bringing up
the rear.*



*A different field trip in the
same area a year later. Note
the hammer for scale.*



‘geoscience corner’

Geoscience, the bedrock of modern-day life—Outreach for geoscience awareness “Geoscience Corner” radio talk shows on NBC (Namibian Broadcasting Corporation) Radio 2022

Geoscience Advocacy and Promotion is one of the strategic themes of the Geoscience Council of Namibia (GSCN) for the period 2020–2023. For this reason, the GSCN in collaboration with the Namibian Broadcasting Corporation (NBC), initiated the “Geoscience Corner” Talk Show to advance geoscience awareness nation-wide throughout 2022.

The objectives of the outreach for geoscience awareness were to:

- Increase public awareness of the vital role that geosciences play in society’s use of resources, resilience to natural hazards, interaction with the environment and in the socio-economic development of Namibia;

- Provide opportunities to expose the youth to geoscience career opportunities;
- Enhance knowledge of the Namibia Broadcasting Corporation (NBC) media practitioners on geoscience and geoscientists’ issues.

The expected outcomes were:

- Improved understanding of the role of geoscience in daily life;
- Improved public science literacy that could influence national decisions;
- Enhanced knowledge and understanding of NBC media practitioners on geosciences;
- Enhanced awareness and access to the geoscience knowledge base and expertise.

The topics that were covered were identical to the eight aspects of Geological Science Application identified as essential in achieving the 17 Sustainable Development Goals of the 2030 Global Sustainable Development Agenda (Gill, 2017). The “Geoscience Corner” talk shows were broadcast on



all 11 NBC FM stations, in 10 different Namibian languages.

The eight geoscientific themes that were discussed were:

- Hydrogeology and contaminant geology
- Rocks and minerals
- Agro-geology (rock to crop) and Medical Geology
- Engineering geology
- Geohazards
- Geo-heritage and geo-tourism
- Geo-energy
- Climate change

In preparation for the radio shows, the Geoscience Council of Namibia held an introductory training week for the media personnel from the NBC, themed “Bringing Media Practitioners to the World of Geoscience”. The training covered various topics introducing the media to the world of geosciences and included an excursion to the QKR Namibia Navachab Gold Mine on the outskirts of Karibib town.

The radio shows proved to be a great success, with various geoscientists from across the country, some even from outside of the country, supporting



Namibian Broadcasting Corporation's media personnel at the QKR Namibia Navachab Gold Mine on the outskirts of Karibib town.

the programme by writing up the scripts and being interviewed for the shows. Great feedback was received from the listeners who called into some of the shows that were broadcast live, or inquired about the pre-recorded shows. The NBC also expressed interest to take the initiative further by producing documentaries that could be broadcast on television.

Geoscience Council of Namibia (GSCN)



Field visit to one of the injection and discharge wells of the Windhoek Aquifer, an aquifer artificially recharged using surface water from dams.



GSAF activities 2022

Summary of activities by the Geological Society of Africa for the year 2022

The Secretariat for the Geological Society of Africa (GSAf), whose website is <http://www.geologicalsocietyofafrica.org>, is located at the Faculty of Science, Department of Geology, College of Natural and Computational Sciences, Addis Ababa University, Ethiopia.

The main objectives of the GSAf are to:

- 1) Promote the understanding of the Earth Sciences;
- 2) Improve standards of Earth Science education and research in Africa;
- 3) Provide a forum for discussion and dissemination of information across national boundaries between scientists, associations and institutions engaged in African geology and Earth resources;
- 4) Promote the development and sustainable management of the continent's Earth resources, to advance its socio-economic development; and
- 5) Improve natural hazard assessment and disaster mitigation.

The objectives of the GSAf are in common agreement with those of other geoscience bodies like the IUGS and geological societies throughout the world. GSAf endeavours to foster the aims of Earth Sciences globally. It advertises and disseminates information about Earth Science in its monthly online newsletter and on its official website. GSAf activities are continent wide and involve the collaboration, association, holding of meetings, workshops and conferences to enhance Earth Science research, education and cooperation.

GSAf membership, as of 2022

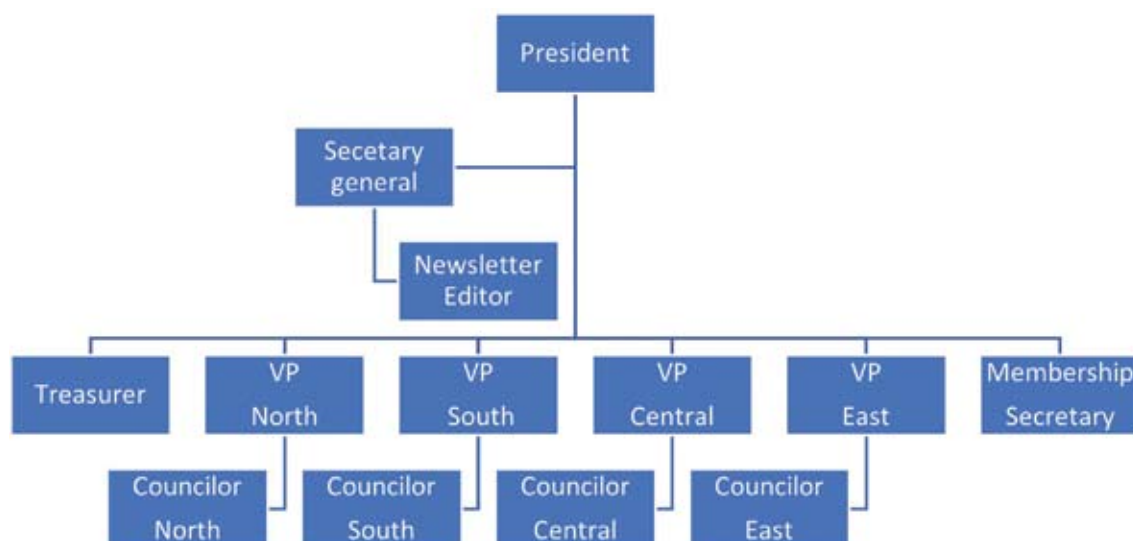
a) GSAf membership statistics

- Total membership: 1010
- Fellows: 6
- Institutional members: 15
- Life members: 155
- Ordinary members: 834
- Membership countries: 84

b) Membership benefits

- Platform for actively participating in geosciences.
- Up-to-date information related to geoscience activities on the continent; research funding; scholarship possibilities;

GSAf structure



information on national, regional and international scientific cooperation partners.

- Attending conferences in which the Society is involved at a reduced fee.
- Opportunity for publication of scientific results on African geology in the *Journal of African Earth Sciences* – JAES (Elsevier).

GSAf activities in 2022

a) The Society produces and distributes a GSAf newsletter every quarter, thereby availing geoscience information. Some of the shared information was on:

- UNESCO Lecture Series: Earth Materials for a Sustainable and Thriving Society
- Big science: harmonising 'deep time' digital geological data
- Geoheritage: heritage sites, collections, geosites, geoparks
- Resourcing Future Generations (RFG)
- Deep-Time Digital Earth (DDE)

b) Society members participated in Geoheritage events, which include:

- GSSA Geoheritage Conference 3–7 April 2022
- Africa Geoparks project under Prof. Wladyslaw Altermann

c) In 2022, GSAf participated and will continue to participate in the following activities:

- United Nations Economic Commission for Africa (UNECA) and United Nations Framework Classification (UNFC) for energy and mineral management systems programmes
- International Seabed Authority activities
- African Mineral Resources Classification / Pan-African Reporting Code (AMREC/ PARC) initiative
- Organisation of African Geological Surveys (OAGS) pan-African geoscience initiative
- IUGS COGE-GEO-ERA
- UNESCO Initiative on Earth Science Education in Africa
- UNESCO African Network of Earth Science Institutes (ANESI)

d) Interaction with other international organisations and projects through their MOUs with the following organisations:

- International Association for Geoethics
- The Geological Society of America
- International Association of Sedimentologists (IAS)
- European Federation of Geologists (EFG)
- The Organisation of African Geological Surveys (OAGS)

Chief accomplishments for 2022

- Organising and bringing to fruition the 28th Colloquium of African Geology
- GSAf seminar series hosted monthly online
- Survey of African experience with virtual education of geology to measure the effect of Covid-19 on the teaching of geology is currently ongoing as an initiative of the GSAf
- Creation of an automatic system that deals with our member database and assigning of IDs.
- Co-sponsored the American Geosciences webinar

Maideyi Meck

GSAf Secretary General



geological workshops

Geological workshops in Kenya

With 23 national parks and 28 national reserves, many of them household names, Kenya is one of the premier wildlife destinations in the world. Following on from publication of the book “Geological Highlights of East Africa’s National Parks” (Struik Nature, South Africa), the author was invited by the Kenya Professional Safari Guides Association (KPSGA) to present educational workshops in April 2023. The association has a membership of more than one thousand, which reflects the importance of professional guides in the country. Rangers of the Kenya Wildlife Services (KWS) also attended the workshops.

The first workshop was held at the Educational Centre of the Nairobi National Park, which is also the location of the headquarters of the KWS. The national park is unique in being located on the fringes of a major city. The second workshop was in the Ol Pejeta Conservancy, located in the southern part of the Laikipia Plateau, near Nanyuki, approximately 200 km north of Nairobi. The conservancy occurs at

an elevation of approximately 2,000 m and nights were remarkably chilly. The conservancy enjoys spectacular morning views of Mount Kenya (east) and the Aberdare Hills (west). The setting in a bush-style conference room located in the “Rhino Sanctuary”—the conservancy is world-famous for protection of the last two remaining Northern White Rhinoceros, together with Southern White Rhinoceros (introduced from South Africa) and Black Rhinoceros—was enhanced by torrential rainfall and thunderstorms. April is the primary rainy season and was chosen for the workshops as few guides are on safari. The plateau is covered by black cotton soils on the Miocene-age volcanic lavas (part of the early or pre-rift activity), which are extremely difficult to negotiate when saturated.

The PowerPoint presentations were developed by the author based on maps and photographs from the book. Judging by the enthusiastic audience—approximately 150 delegates attended the two workshops—and interesting discussion sessions, the content was well received. Local knowledge of many of the parks and reserves resulted in

Entrance to the “Nairobi Safari Walk”, the venue of the first workshop, Nairobi NP.





The author presenting to Kenyan guides and rangers at the Ol Pejeta Conservancy.



Early morning view of Mount Kenya with the Laikipia Plateau in the foreground, Ol Pejeta Conservancy. Mount Kenya is one of the largest shield volcanoes on Earth. The iconic central peaks (5,199 m) are confined to a central plug of syenite that terminated eruption of the mostly phonolite lavas at 2.64 Ma.



Elephant in the Ol Pejeta Conservancy are more disciplined than South African drivers.



View of the Ewaso Ng'iro River from the Buffalo Springs NR with rounded hills (Pleistocene-Holocene-age Nyambeni Volcanics) and rugged inselbergs (Proterozoic-age Mozambique Belt) in the Samburu NP.



stimulating debate and a suggestion that additional geosites could be garnered in collaboration with the guides and rangers was well supported. In addition, there is a possibility that geoparks may be created in Kenya, which will be a joint effort between the KWS and Kenyan geologists. The guides were supportive of both this and the possibility of creating specialised geotourism safaris in the future. A safari to some of the parks and reserves north and west of Mount Kenya, where the author was fortunate to hike on some of the koppies and river sections in the company of KWS ranger Mohammed Garaad,

presented opportunities to photograph some additional geosites.

The support of Edwin Selempo (Association Chairman) and Janette Kerubo (Business Manager) of the KPSGA for initiating the workshops and ensuring transport and accommodation arrangements for myself and my wife went smoothly is appreciated. The support of professional guides Washington Wachira, Simon Mwanza and Stephen Saipan-Duma is acknowledged, as is John Addison (Wild Frontiers) for organising our safari and Cai

Mount Ololokwe is a distinctive landmark located north of Archers Post. The inselberg comprises ancient gneiss and quartzite (Proterozoic-age Mozambique Belt).

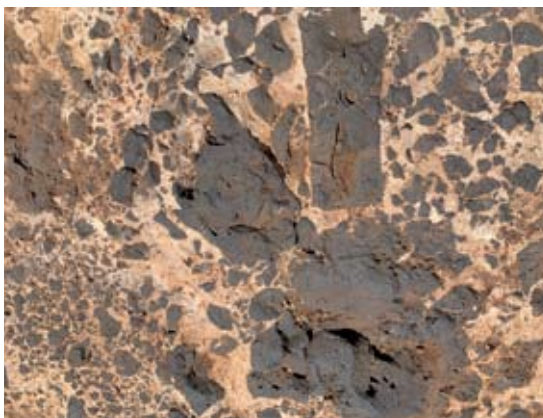




Outcrop of banded quartz-feldspar gneiss (Proterozoic-age Mozambique Belt) next to a river bed, Buffalo Springs NR.

Tjeenk Willink (Asilia Africa) for providing a free night's accommodation at the luxury Ol Pejeta Bush Camp. Each delegate to the workshops received a free copy of the book (Adeel Haq at "Books R Us", Nairobi, arranged deliveries). The writer is particularly grateful to Frederick Moulton Alger III (of Grosse Pointe, Michigan) for sponsoring the cost of the books.

Roger N Scoon



Blocks of volcanic lava (Pleistocene–Holocene-age Nyambeni Volcanics) enclosed in a calcrete deposit, river at Elsa's Camp (discussed), Shaba NR.



Whale-back outcrop of granitic gneiss (Proterozoic-age Mozambique Belt) with xenoliths and well-developed banding, Meru NP.

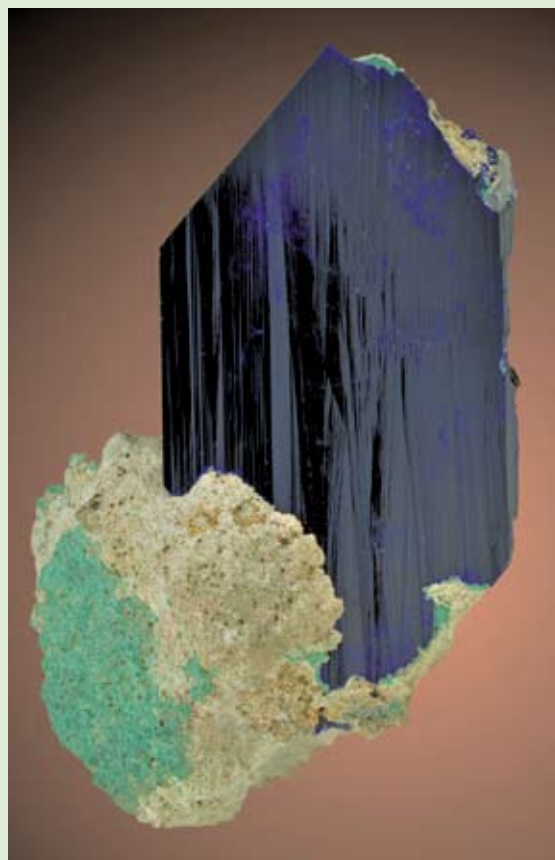
mineral scene

Azurite

This Mineral Scene is partly extracted from Cairncross (2022)¹, with permission from Struik Nature.

If mineral museum curators and amateur collectors were asked to name what their favourite glamorous mineral is, azurite would feature high on the list. Ink-blue, highly lustrous crystals several centimetres long, often associated with bright green malachite are highly desired. Southern Africa, and Namibia in particular, has one particular mine that has set the benchmark for the world's finest azurite crystals—Tsumeb. However, a few other local deposits have yielded interesting crystals.¹

Azurite $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$ crystallises in the monoclinic system, has a hardness of 3.5 to 4, specific gravity of 3.77, a characteristic blue streak and a vitreous lustre. Azurite varies from shades of pale blue to blue-black, but is characteristically a vivid blue. It can be chemically unstable and, in time, converts



A sharply terminated azurite crystal, 7 cm. Tsumeb mine, Namibia. (Specimen and photo: Bruce Cairncross)

A vug lined on the outside by massive light blue azurite, while the open space inside is lined with dark blue azurite crystals. 7.2 cm, Tsumeb mine, Namibia. (Specimen and photo: Bruce Cairncross)





A group of azurite crystals together with a twinned, reticulated cerussite, and minor green malachite. 3.1 cm, Tsumeb mine, Namibia. (Specimen and photo: Bruce Cairncross)

or alters to form green malachite. Pseudomorphs of green malachite after azurite are common. Historically, azurite was crushed and the powder used as blue paint by artists, causing peculiar situations where the sky and ocean in old paintings now appear green. Although it is a relatively soft

mineral, lumps of massive azurite can be cut and polished for lapidary purposes. Azurite can, and does, form spectacular and beautiful crystals that are highly prized by collectors and museums. Thin crystals are usually transparent. Azurite is a common secondary mineral associated with many



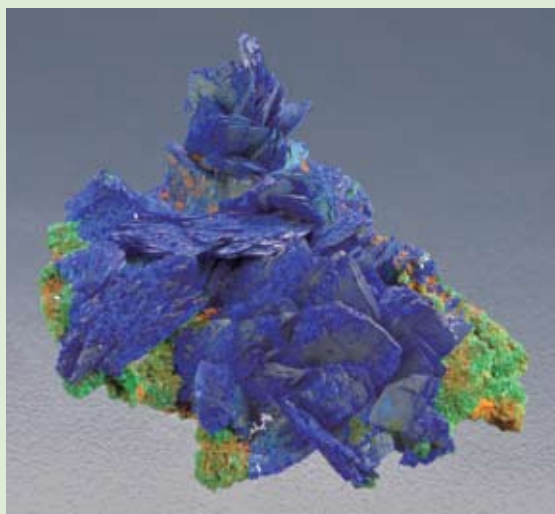
A mass of small azurite crystals associated with several yellow wulfenites and green malachite. 4.4 cm, Tsumeb mine, Namibia. (Specimen and photo: Bruce Cairncross)



A historic azurite specimen, with green arsentsumebite, collected in 1911 at the Tsumeb mine, Namibia. The crystal is 2.4 cm. (Specimen and photo: Bruce Cairncross)



Bladed azurite crystals with green malachite. 3.6 cm, Tschudi mine, Namibia. (Specimen and photo: Bruce Cairncross)



copper deposits. When the primary copper sulphide ore is oxidised, it breaks down chemically to form azurite, which appears as blue smears or smudges on weathered rock surfaces. It is often associated with malachite, also a green copper carbonate.

Some of the finest azurite crystals in the world—intensely blue and up to tens of centimetres—have come from the Tsumeb mine in the Otavi mountainland, Namibia. Top-quality azurites from Tsumeb are among the specimens most sought after by collectors. The azurite exists in many

different forms and habits, and can occur on its own or associated with other attractive species like cerussite, smithsonite, calcite and wulfenite. Beautiful crystals were rarely found at the Onganja copper mine in the Windhoek district, which was also world-famous for huge cuprite crystals. Some excellent drusy azurite crystals, small finger-like stalactites and platelets of an intense azure blue colour came from the Tschudi deposit, about 20 km west of Tsumeb, and appeared on the market in the early 1990s. Not many collectable minerals have surfaced from this deposit, which has copper–silver mineralisation in sandstones. Apart from azurite in the oxidised zone, malachite is the main common mineral and occurs with cuprite.

In South Africa, large, centimetre-long crystals of azurite were found in the 19th Century at the defunct Willows mine east of Pretoria.² At the Vergenoeg mine north of Pretoria, small vivid blue azurite crystals occur in association with fluorite and goethite.³ Rare, small (several millimetres in length) azurite crystals occurred in copper ores in the Limpopo Province's Messina mines, while the Stavoren tin mines of the Bushveld Complex have



A 4.8 cm drusy azurite specimen from Tschudi mine, Namibia. (Specimen and photo: Bruce Cairncross)

produced some small azurite crystals that line cavities and are associated with fluorite and quartz. Several, now abandoned, mines in the Pilgrim's Rest region of Mpumalanga have also recorded crystalline azurite alongside other copper minerals. Azurite has been reported from dolerite intrusions in the Eastern Cape district, near Cradock. It is a rare accessory mineral in the copper mines in the Springbok/Okiep district.

Bruce Cairncross

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A mass of bladed azurite crystals clustered together in semi-parallel arrangements. The field of view is 3.8 cm. Vergenoeg fluorite mine, South Africa. (Specimen and photo: Bruce Cairncross)

GSSA events 2023

GSSA Events from June 2023 – November 2023 (Preliminary Programme)

Date	Event	Location
6 June	Remote Sensing for Explorationists	Cancelled
4 July	Map Making (MINROM)	Cape Town (Minrom Offices)
11 July	ESG Inquisition Feedback	Online
1 August	Intro to Drilling workshop	Online
15 August	Professionalism & Ethics	Online
27 August	Dedicated Commodity Day (BASE METALS)	Springbok / Aggeneys
September (TBC)	Data Analytics / Machine Learning	Hybrid (Jhb)
September 4 x Drilling ½ days (TBC)	Methods and Techniques (Colin Rice)	Online
October 2 days (TBC)	3D Geological Modelling (TECT)	Online
October 2 days (TBC)	Mineral Economics (MR classification, financial valuation, sustainability)	Online
15 & 16 November	African Exploration Showcase	Hybrid (Jhb)



new reduced rates

New reduced advertising rates for *Geobulletin*

Geobulletin is an open source, online, news publication that is accessible via the GSSA website, aimed at the broad earth science community in Southern Africa, and those further afield with an interest in African geology. The magazine is published quarterly in digital format, with a print option available at extra cost. With every issue, the demand for print—with its additional cost—decreases, and further, the postage cost has increased markedly. Digital is clearly the future format. Assessing the circulation and impact of a digital publication is subjective, but at a minimum the link to every new issue is circulated to the full membership of the GSSA and a significant number of those download content.

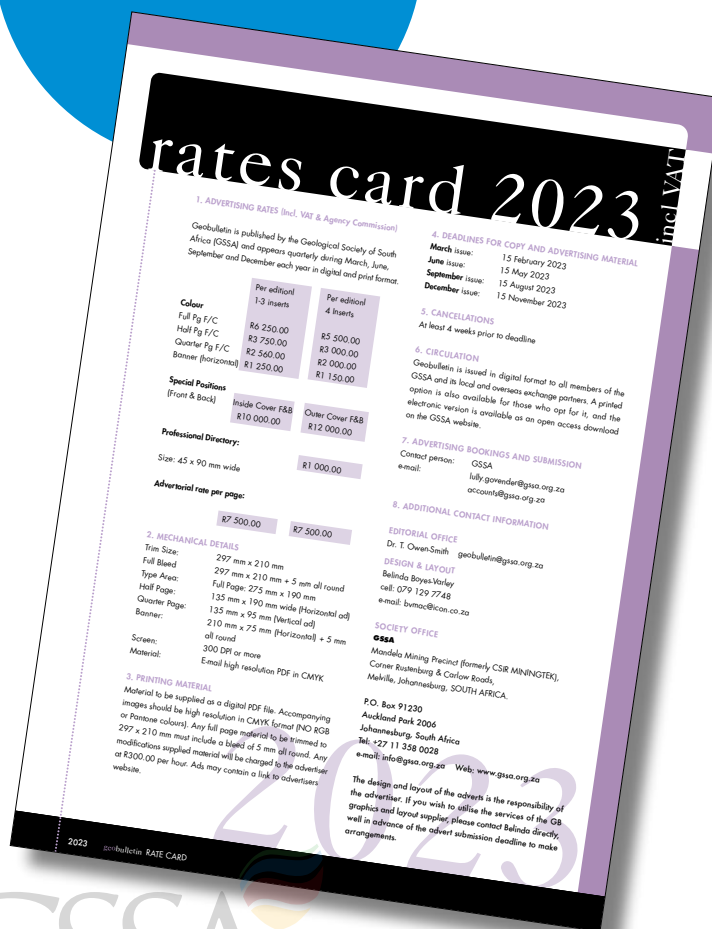
Geobulletin is a good medium for advertisers to reach the earth science community in southern Africa, but advertising costs need to be competitive with other journals. A review of the rates benchmarked against other journals and magazines showed that advertising in full page to partial page format is relatively expensive, in contrast to the professional directory in the back pages (business cards). Maximising advertising revenue has never been a key *Geobulletin* objective, whereas connecting service and equipment providers with potential customers and stakeholders has been. In recent years, advertisers have avoided communicating in *Geobulletin*, and high cost is likely to be a key reason.

Consequently, starting with the September issue of *Geobulletin*, the cost of full page or partial page advertising is being dramatically reduced, and the new rates card is published on the inside back cover. As an example, the cost of a half page ad (single insertion) is reduced from R14,500 to R3,750, close

to a four-fold reduction, and aligned with other similar technical magazines with a digital format. Additionally, we can offer the option of embedding links to advertisers' websites at no extra cost. We hope that advertisers will see the reduction as a significant incentive to market their services and products, as well as assisting in building their brands.

For further information, please contact info@gssa.org.za.

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With Stencil build-in indicators for easy core scanning technology, which work perfectly with geological photography.

Clearly indicating detailed information of the physical tray.

The bold indicators give clarity to drillers and reduce potential errors



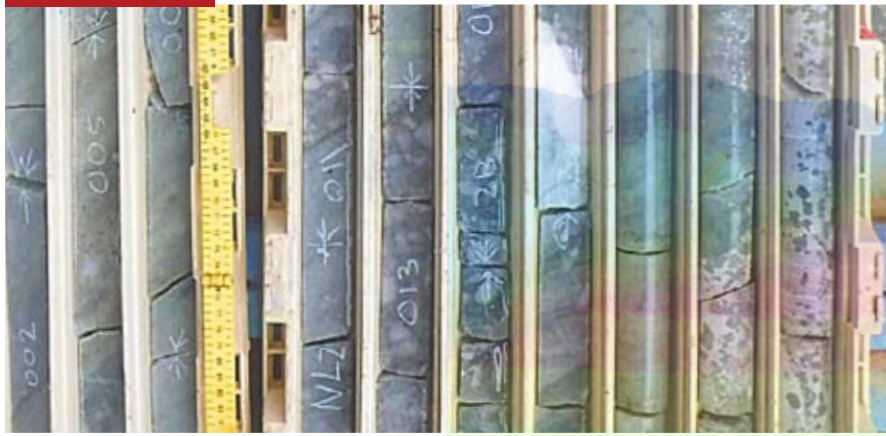
Pro Tray - New End Indicators

With Stencil-build in Core Tray End Tag, which same details as top of tray indicating – Bore Hole No – Tray No – From Depth and To depth



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Geometallurgy Conference 2023

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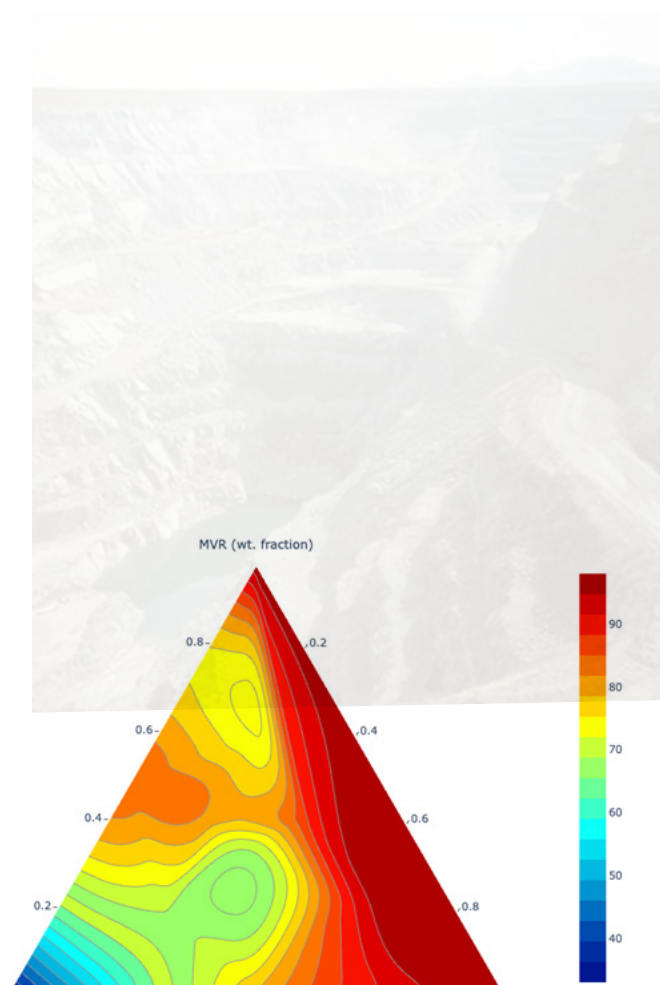
5-6 September 2023 Conference

7 September 2023 Technical Visit

**Hazendal Wine Estate,
Stellenbosch, Western Cape**

BACKGROUND

The theme of this second geometallurgy conference 'Geomet meets Big Data' is inspired by the growing interest and focus on big datasets, machine learning, novel sensors, digital twins and 4IR in the mining industry. The concept of Geometallurgy goes back to some of the earliest mining activities when mineral recognition, mining, separation, and concentration were undertaken simultaneously. Over time, changes in operational structures, product expansion and specialisation ultimately led to the diminishment and breakdown of this holistic approach. In the last two decades, Geometallurgy has become a sophisticated yet entirely logical return to this integrated approach to mine planning. In a world of exponentially increasing ore heterogeneity and metallurgical complexity coupled with a demand for improved sustainability, Geometallurgy is effectively a highly structured, integrated multi-disciplinary collaboration for optimizing the value of an ore deposit. This conference provides a platform for the discussion of some of the newest developments in the field of geometallurgy and a celebration of the success of Geometallurgy integration and value-add.



FOR FURTHER INFORMATION CONTACT:

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Conference Co-ordinator

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NEWS

ONLINE REGISTRATION NOW OPEN

IAH WORLDWIDE GROUNDWATER CONGRESS

"Groundwater: A Matter of Scale"

Online, **early bird registration** is now open at <https://iah2023.org.za/registration/>. Please take advantage of the opportunity to become a member of IAH and benefit from the discounted Congress registration fee to attend the IAH2023 Congress.

IAH Membership: <https://iah.org/join-us>

We are excited to announce that one of our keynote speakers is Professor Seifu Kebede Gurmessa. Seifu is the IAH Vice-President for Africa and has published extensively on global groundwater issues and African Hydrogeology. Dr John Cherry intends to host a special session on the groundwater project showcasing African contributions. The Socio-Hydrogeology Network will hold a special session on "THE CONNECTEDNESS OF GROUNDWATER AND HUMAN SYSTEMS". This session aims at discussing

approaches, techniques and case studies focused on inter- and transdisciplinary assessments of the connections between humans and groundwater at different scales. The Socio-Hydrogeology Network invites abstracts in support of the topic.

This year's congress programme includes 5 Field Excursion options for delegates to select from.

IAH2023 has adapted the traditional format of the congress slightly and the Congress will commence with the Field excursion on Monday, 18 September 2023. The excursion will provide delegates the opportunity to meet new colleagues and catch up with old friends during the excursion before the official congress programme commences on Tuesday, 19 September 2023.

Information on the Congress programme, Field excursions and on becoming a sponsor or booking an exhibition stand, please visit:



Programme at a glance



Excursions



Sponsorship & Exhibit

5 CPD POINTS
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IMPORTANT DEADLINES

Online Registration	Now open	Abstract Acceptance confirmed	20 April 2023
Call for Abstracts	Now open	Early Bird Registration deadline	31 May 2023
Abstract submission deadline	31 March 2023	Registration closes	21 August 2023

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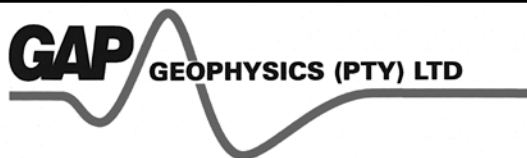
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