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Geological Society of South Africa

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GSSA
Geological Society of South Africa

contents

Front cover photo:
Close-up of the Geology of Cape Town sign with John Rogers listening to queries from the Scouts in Green Point Urban Park on a chilly day.
See article on pg. 33. (Photo: Puvendiran Govender)

GSSA
Geological Society of South Africa

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guest editorial

Andrew Green

"Oh, a marine geologist! So you study whales and dolphins?"

This is the most common response from people, layperson or specialist alike, when I tell them I am a marine geologist. To explain what a marine geologist does is somewhat difficult. Ultimately, they are a scientist who specialises in the geology of the seabed, however, this may merge or overlap with other broader topics such as climate change and sea level science, coastal engineering, energy and mineral exploration and many other fields. In the southern African context, the discipline of marine geoscience underpins several thousand jobs in the coastal and offshore mining and construction sector. Yet, the field of marine geology is a somewhat vague and overlooked one in the broader context of other mining-related geosciences, or other marine sciences in general. For Africa, which, like the rest of the World, will increasingly rely on the contribution of the blue economy to sustain itself, the muddy waters of marine geology are for now seemingly impenetrable. This stands in stark contrast to the global increase in marine geoscience specialisation, primarily linked to offshore windfarm development, ocean engineering schemes, and marine and spatial planning within the Exclusive Economic Zones (EEZ) of developed coastal nations.

The history of coastal and marine geology (herewith marine geology) in South Africa is long and pedigreed. The discipline emerged in the 1960s under the guidance of the late Prof. E.S.W. Simpson, Professor of Oceanography and later Director of the Institute of Oceanography at the University of Cape Town. He established the South African National Committee for Oceanographic Research (SANCOR) Marine Geology Programme, which was in turn led by Prof. R.V. Dingle, later as the Joint UCT/Geological Survey Marine Geoscience Unit. Prof. Dingle was one of the earliest A-rated scientists of the FRD, now NRF, in recognition of his international leadership in Mesozoic marine basin analysis, together with his unparalleled research on Ostracoda. He was later to receive the GSSA's Draper Memorial Medal, the highest scientific honour bestowed by the society.

By the mid 1970s, South African marine geology was a force to be reckoned with. With support from Soekor (now PetroSA), the CSIR and the Geological Survey (now Council for Geoscience), the regional-scale mapping of the nation's seabed commenced, which, despite improved technology and capability, has not been revisited systematically since. In 1986, a second Marine Geoscience Unit was established at the University of Natal, under the directorship of Prof. T.R. Mason, and a number of coastal and marine geologists were similarly produced at the University of Port Elizabeth (now Nelson Mandela University) under SANCOR's coastal processes and estuaries sub-programmes. Many of the graduates from these programmes and institutions have since been recognised as world leaders in coastal and marine geology, working in offshore commodities, environmental, and academic spaces.

So why has marine geology's status been misunderstood as "studying dolphins and whales"? To some extent, it reflects a poor understanding of what the discipline entails among the general public. It also reflects a general decline in funding by the various parastatal organisations in southern Africa, and the dwindling of marine geology and geophysics in university syllabi across the country. Dedicated courses and research programmes in marine geology and geophysics been reduced to offerings at a single university, suitably qualified academic staff are few, and many other disciplines,

in both traditional geology and marine science, have lost connection with marine geoscience and its importance. Marine geology is expensive, requiring geophysical equipment and specialised research vessels, and data collection is often limited to calm weather windows in an otherwise aggressive wave climate. Due to the typical mining-focused curricula of most university geology departments, grappling with the intricacies of marine geoscience often requires an MSc degree where much of the essence of marine geology is learned. These factors all contribute to the general "watering down" of marine geology's status as a critical skill that is needed to further our engagement with the blue economy.

The same can be said for Africa at large. A recent survey of African institutions with coastal and marine-connected research institutes paints a grim picture for marine geosciences. Almost all former programmes are defunct, or subsumed by other marine science disciplines such as fisheries sciences. This is juxtaposed by the mineral and biological wealth that rests offshore of Africa, a wealth that requires careful exploration, seafloor mapping and a commensurate balanced management with conservation and planning concerns.

One more alarming aspect to rise out of the dearth of marine geologists in South Africa is the lack of inclusion of such voices in the great debate focussed on the offshore exploration of areas such as the Wild Coast. Comments made in a recent issue of the *South African Journal of Science*, by non-marine scientists affiliated with the Academy of Science of South Africa (ASSAf), lacked balance in the canvassing of opinion of people specialised in such a field. Such bias indicates a lack of awareness of the key role of marine geology in 1) the ASSAf and 2) among the greater scientific community of South Africa. The ensuing rebuttal from the Council for Geoscience provided an appropriate answer, where the need for better consultation with a more geology-focused literature and marine geoscientists was outlined. Unfortunately, the example above illustrates how little is known or considered of marine geology and its broad sphere of operation in our country.

Despite being confused with our more illustrious biological colleagues, and being looked down upon by fellow land-based geo-colleagues (not hard to do from the vantage point of a continent!), things are slowly improving in the discipline. Operation Phakisa is a government initiative targeted at unlocking the economic potential of South Africa's oceans, which could contribute up to R177 billion to the GDP by 2033 and between 800 000 and 1 million direct jobs. In this context, a slow renaissance in marine geoscience is taking place. Government has instituted a comprehensive continental shelf mapping programme via the Council for Geoscience, and the NRF has provided a significant financial investment in the form of marine geophysical survey equipment to our universities. The Upstream Training Trust, a division of the Petroleum Agency of South Africa, has similarly provided several million rands for a five-year marine geophysics and geology training school, the first of its kind in Africa. There are now key internships available with the main offshore mining houses and graduates are finding employment at healthy levels both in the research/academic space, together with environmental, exploration and mining industries. In the last 10 years, marine geologists have been awarded the GSSA's Jubilee medal, together with the Haughton and John Handley awards, the SANCOR/NRF Emerging Scientist Award, the American Geophysical Union's Africa award for Ocean Sciences, and three finalists and a winner in the National Science and Technology Forum awards (otherwise known as South Africa's science Oscars!). Several key marine geologists sit on international editorial boards and committees, so it's not all doom and gloom. In our local context, the soon to be established Marine Geology Division of the GSSA will further provide support and impetus for growth in our field.

However, the thread of marine geology in the grand aims of Operation Phakisa is still ambiguous. Oil and gas is the main geoscience thrust within the scheme, whereas the important role that geology plays in these plus the other components of aquaculture, marine protection and governance, small harbour and coastal state land development, and coastal and marine tourism is not fully appreciated. Part of this is almost certainly due to the flexible and dynamic role that marine geoscientists have had to assume, hence the difficulties that lie in explaining the role of a marine geologist. We have become hydrographers, surveying the ocean floors depths and morphologies. We have become geophysicists, operating seismic, hydro-electric and magnetic survey systems to unlock bedrock horizons and mineral targets. We have become spatial planners, providing layers of information for conservation strategists and scientists. We have morphed into modelers, who have attempted to understand sediment fluxes along coastlines. We play Jekyll and Hyde, wearing our miner's hat on one occasion, and on the other wearing the hat of a marine habitat mapper. Be it beaches, shelves or the deeps, we have to cover all these bases with few personnel. Jacks of many trades, and masters of many more. With further dedicated investment by the government, industry and academia, we can certainly expect to narrow these fields into a variety of refined experts, satisfying the NRF's expectations of niche specialisation. It may well be at this point that the integrity and uniqueness of marine geoscience can be truly recognised and valued, with the establishing of SARChI chairs, dedicated university programmes at all major geoscience centres, and industry-based research, allowing us to once more be seen as leaders in marine geoscience. We have taken the first big steps towards this goal, and I am sure that soon the day will come when we are no longer mistaken for disciples of the "dolphins and whales".

Andrew Green

Professor of Marine Geology and Sedimentology, University of KwaZulu-Natal

executive manager's corner

Craig Smith

The GSSA has a new President as of the July AGM! Tania Marshall has stepped down after her two-year term of office as President, but will certainly stay active on the Management Committee (MANCO) in her role as Immediate Past President. Steve McCourt (formerly Vice President Academic Affairs on MANCO) takes over as President. Bertus Smith moves from Council to VP Academic Affairs. A big thank you and well done goes out to Tania, and a warm welcome to Steve and Bertus.

While Council is the overarching governing body of the GSSA, MANCO has operational and strategic responsibility for GSSA affairs. MANCO members sit on Council, and generally have at least two years on Council before being asked to serve on MANCO. MANCO meets every month, and MANCO members are commonly in communication with the Executive Manager or other staff on a daily basis. The current MANCO is:

- Prof Steve McCourt (President)
- Dr Tania Marshall (Immediate Past President)
- Mr Thomas Molelengoane (VP Admin and Finance)
- Mr Masibulele (Masi) Zintwana (VP Branches and Divisions)
- Dr George Henry (VP Networking and Communications)
- Mr Dumisani (Dumi) Sibiya (VP Membership)
- Ms Noleen Pauls (VP Professional Affairs)
- Prof Bertus Smith (VP Academic Affairs)
- Prof Judith Kinnaird (Chair Fellows Committee)
- Dr Craig Smith (Executive Manager)

MANCO duties can be quite time consuming, and we thank serving members on both Council and Manco for their effort and dedication.

The Annual General Meeting was held as an online event on July 20, and was reasonably well attended by close to 70 members. The Annual Report is available on the website, behind the login, and includes reports from the President, the VPs, and the Executive Manager. Branch and Division reports, and the financial audit report are appended.

This year's awards were also announced at the AGM, with the senior scientific awards to be presented at the Fellows Dinner in November. Student award winners are Joshua Munro (UCT, John Handley and Corstorphine awards, supervised by Chris Harris), Angela Welham (SU, Haughton award, supervised by Reynold Chow and Jared van Rooyen), and Anele Matsebula (UCT, SACNASP Best 4th Year award, supervised by Alistair Sloan). Responses were given by the three recipients.

Chris Harris of UCT was awarded the Draper Medal, the Society's senior scientific achievement award, and Hielke Jelsma of Anglo American won the Des Pretorius award for contributions in economic geology. The Jubilee award for the best paper published in the *SAJG* went to LC Vonopartis, R Booysen, P Nex, J Kinnaird and L Robb for their paper entitled 'Combined Satellite and Portable XRF Exploration Mapping of the Zaaiplats Tin Field, South Africa' (2022, *SAJG* 125.1, p. 45–60).

Congratulations to all the award winners. It is not too early to submit motivations for this years' Draper and Des Pretorius awards, to be announced in 2024!

The GSSA runs a strong and varied events program, in a mix of online, in-person and hybrid formats, all of which attract Continuous Professional Development points. Members are reminded that the Monday mailers you receive have what you need to know about upcoming GSSA and partnered events. There are two important meetings scheduled to celebrate centenary events. The 100th anniversary of the discovery of the Merensky Reef in the Bushveld Complex will be celebrated in '100 Years of the Merensky Reef: Minerals, Metals and Mining', which will be staged from 15–23 August 2024, at a venue near Rustenburg. This will be of interest to anyone involved in the Bushveld Complex, in both industry and academia. Significant international participation is expected.

2025 marks the 100th anniversary of the discovery of diamonds on the Namaqualand coast—the first diamond being found by Jack Carstens of Port Nolloth. To mark this event, the GSSA will stage '100 Years of the Discovery of the Namaqualand Diamonds' from 13–20 March 2025 at a West Coast venue.

These two significant meetings will be held in addition to the general meeting program. Watch this space!

Craig Smith

president's column

Steve McCourt

As geoscientists, we are very familiar with the concept of geological time and the difference between "deep time" and human history. Many of us still recall being taught, as part of the Introduction to Geology course, that while human history is measured in centuries, decades and years, Earth History is measured in millions and/or billions of years and is recorded on the Geological Time Scale. On this "calendar for Earth History", geological time is subdivided into units of decreasing length called Eons, Eras, Periods, Epochs and Ages.

In my career as a geologist, I have worked primarily with rocks representing processes operating during the Archaean and Proterozoic Eons (a.k.a. the Precambrian). It was therefore rather novel to find out that, as a result of when I was born, I have a direct relationship with the start of the youngest part of Earth History, the Anthropocene.

The Anthropocene Epoch is, currently, an unofficial unit of geologic time, used to describe the interval in Earth's history when human activity started to have a significant impact on the planet's climate and ecosystems. Literature on the Anthropocene is diverse in both scope and focus but from a geological perspective there are a number of important papers by Jan Zalasiewicz from the University of Leicester and Colin Waters from the Institute of Geological Sciences, both stratigraphers from the UK, as referenced below.

The term Anthropocene was introduced to the scientific community by chemist and Nobelist Paul Crutzen,[1] and since then has been used informally to encompass different geological, ecological, sociological, and anthropological changes in recent Earth history.[2] It first received attention from the geological community through the work of the Stratigraphy Commission of the Geological Society of London,[3] who concluded there was sufficient geological evidence to support formalisation of the term, and in 2009 the Anthropocene Working Group (AWG) was established.

The AWG is a task group of the Subcommission on Quaternary Stratigraphy (SQS), within the International Commission on Stratigraphy (ICS). This body is responsible for maintaining and refining the International Chronostratigraphic Chart (ICC), and thus the Geological Time Scale (GTS). As noted by Zalasiewicz *et al*.,[4] a fundamental requirement of all chronostratigraphic units incorporated within the ICC is that each is defined by an **isochronous** base, representing a conceptual surface of *identical time* around the globe. This surface is recognised ("correlated") by stratigraphic signals within sedimentary deposits and other geological materials, and its location indicated by a designated marker at a unique reference section known as a Global Boundary Stratotype Section and Point (GSSP), commonly referred to as a "golden spike". Members of the AWG have been responsible for a number of insightful papers dealing with the concept and in 2016 chose the 35th IGC in Cape Town to adopt a recommendation that the Anthropocene be recognised as a formal geologic epoch. This was followed by a formal, binding, vote in 2019 (see Waters *et al*.[5] for details). If the recommendation of the AWG is successful, the Anthropocene will become the 3rd and youngest Epoch (after

☞

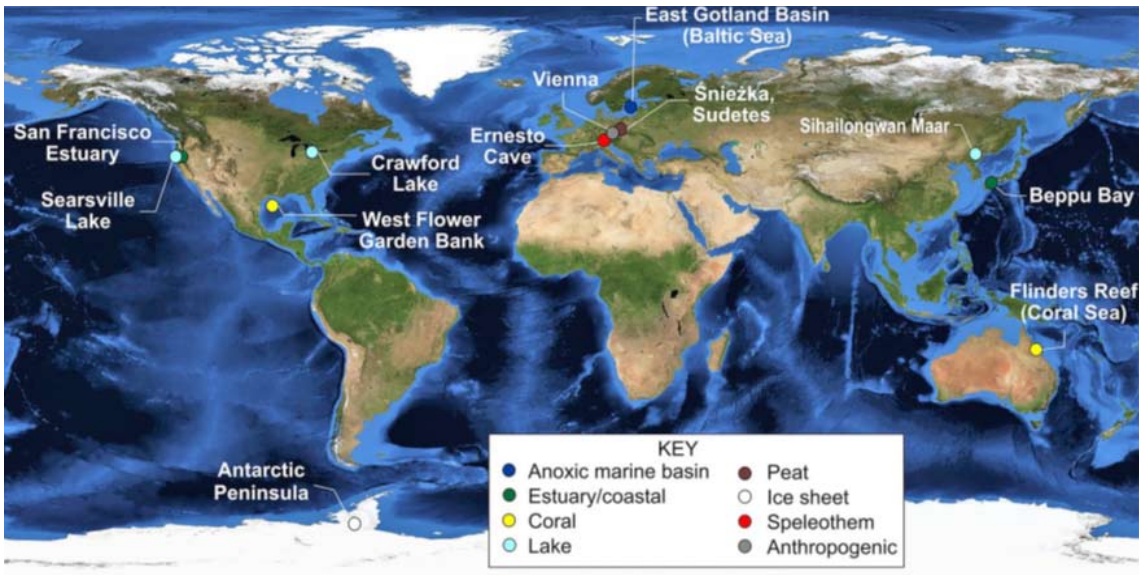
Pleistocene and Holocene) of the Quaternary Period that began 2.588 million years ago.

The case for recognising the Anthropocene as a new unit of geologic time is well documented by Waters *et al*.[2] who note the following:

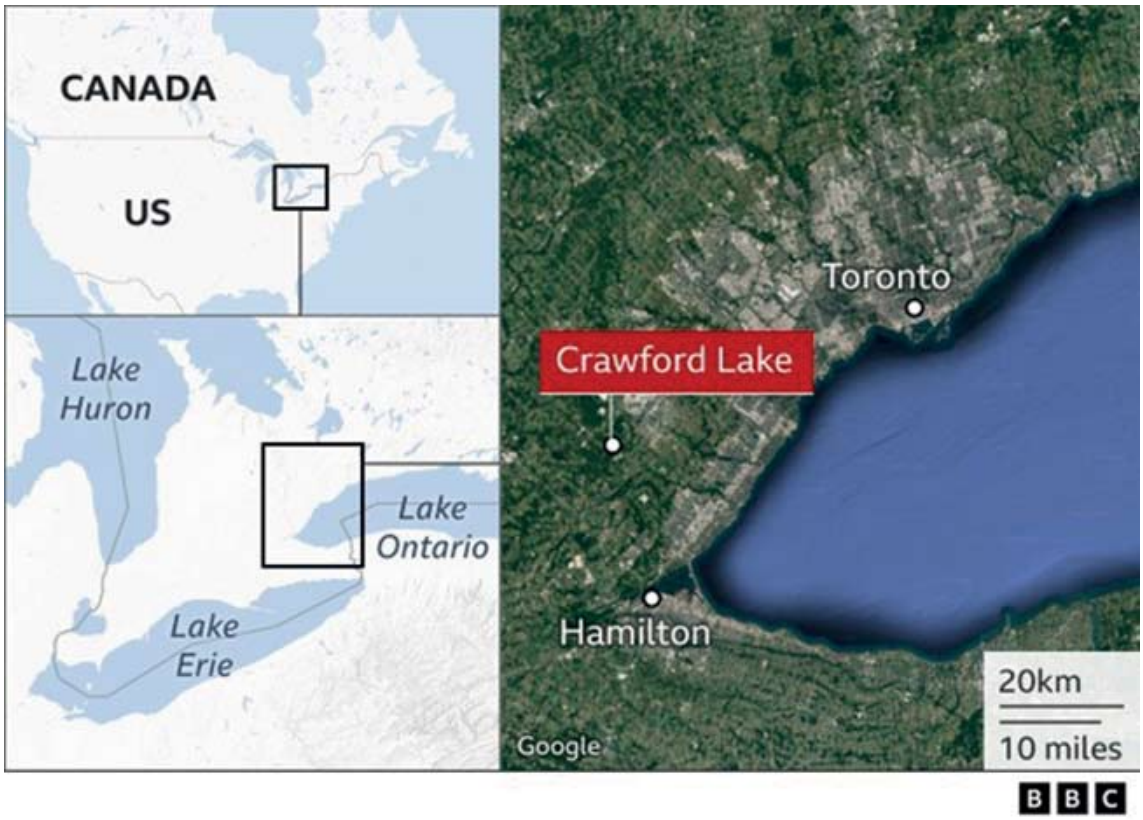
- Fossil fuel combustion has disseminated black carbon, inorganic ash spheres, and spherical carbonaceous particles worldwide, with a near-synchronous global increase around 1950.
- Geochemical signatures include elevated levels of polyaromatic hydrocarbons,
- polychlorinated biphenyls, and pesticide residues, as well as increased $^{207/206}$Pb ratios from leaded gasoline, starting between ~1945 and 1950.
- Soil nitrogen and phosphorus inventories have doubled in the past century because of increased fertiliser use, generating widespread signatures in lake strata and nitrate levels in Greenland ice that are higher than at any time during the previous 100,000 years.
- Detonation of the Trinity atomic device at Alamogordo, New Mexico, on 16 July 1945 initiated local nuclear fallout from 1945 to 1951, whereas thermonuclear weapons tests generated a clear global signal from 1952 to 1980, the so-called "bomb spike" of excess ^{14}C, ^{239}Pu, and other artificial radionuclides that peaks in 1964.
- Atmospheric CO_2 and CH_4 concentrations depart from Holocene and even Quaternary patterns starting at ~1850, and more markedly at ~1950, with an associated steep fall in δ^{13}C that is captured by tree rings and calcareous fossils.

Waters *et al*.[2] conclude that these combined signals render the Anthropocene stratigraphically distinct from the Holocene and earlier epochs and thus support its formalisation at the epoch level with a lower boundary in the mid-20th century and probably around 1950. This position is supported by Zalasiewicz *et al*.,[4] who note that although the start of the Anthropocene was first associated with the onset of the Industrial Revolution, it is best linked with the "Great Acceleration" coincident with, and driven by, unprecedented increases in population, energy consumption, industrialisation and globalisation from the 1950s that fundamentally modified physical, chemical, and biological signals in geological archives.

Although evidence of humanity's impact on the planet is overwhelming, the resultant changes are very recent in geological terms, where an epoch usually spans tens of millions of years. Referring to this, Zalasiewicz *et al*.[4] note that, while the brevity of the Anthropocene compared with other geological time intervals, the novel nature of many of the human-generated stratigraphic signals (e.g. technofossils), and the linking of geological



Location of the 12 candidate and other reference localities indicating the depositional environment.[5] (Satellite image: NASA Visible Earth. Reproduced with amendments from Head et al.[8]).



Google image from a BBC online report showing the position of Crawford Lake relative to Toronto, Canada.

consequences to societal actions (thereby involving a political dimension) have been used as criticism of the Anthropocene as a potential, formal, unit of geological time,[6] the currently short duration of the proposed Anthropocene does not, in itself, contravene requirements for inclusion as a unit in the Geological Time Scale. Indeed, it follows a trend; the most recent intervals of geological time—the Cenozoic Era (66 Ma), the Quaternary Period (2.6 Ma), and the Holocene Epoch (11,700 years), along with its constituent stages (of 3,465–4,270 years), all have the briefest durations within their rank in the GTS.

Where is the GSSP for the Anthropocene?

The process of recognising a potential GSSP for the Anthropocene is discussed by Waters *et al.*[7] and an assessment of 12 sites across the planet in diverse environments of sedimentary deposition has been published by Waters *et al.*[5] Although unofficial, based on an online report from Jonathan Amos of the BBC, cored sediment from Crawford Lake in Ontario, Canada, collected in 2019, is the preferred site. If the site is confirmed, then the GSSP will be a brass plaque next to a frozen section of the cored sediments in a museum in Ottawa.

The final step

Zalasiewicz *et al.*[4] note that once a particular site has been recommended by the AWG to serve as the GSSP, it must still pass three additional levels of international scrutiny, by a supermajority vote (60% or more) successively within the SQS, the ICS, and the IUGS Executive Committee. Only after this can the unit it defines be incorporated officially into the Geological Time Scale and added to the ICC.

Steve McCourt

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professional affairs

THE PROFESSIONAL (AFFAIRS) CORNER

Following on from the last edition of the *Geobulletin*, Roy Corrans expands on…

What geologists need to be productive and successful

"I cannot teach anybody anything,
I can only make them think."

Socrates
470–399 BC

The perception of a 'successful outcome' can sometimes be quite different in the opinion of an observer when compared to that of the subject undertaking a task for the first time.

Samuel Langhorne Clemens (1835–1910), better known by his pen name 'Mark Twain', the author of 'Huckleberry Finn', was attributed in 1853 with the statement: *"A mine is a hole in the ground, owned by an optimist, operated by a fool, and generally followed by a lawsuit".*

We all need to ensure that we are properly motivated, fully understand what is required to be achieved, and then check that we are optimally equipped with the necessary equipment and skills to achieve the required task in the safest, most cost-effective way with minimal environmental disruption and maximum benefit for the project owners.

Des Horscroft, one of my first bosses during regional base-metals exploration programmes in remote areas of Central Africa during the 1960s, was only

half-joking when he generally explained to the novice field geologists and others working under his direction: *"A successful prospector is one with big eyes, big ears, and a small mouth. An unsuccessful prospector is one with small eyes, small ears, and a big mouth".* The principles contained within Des' definition of success requirements are essentially the same today, whether the geologist is working alone or in a team active in exploration, evaluation and mining in the minerals, metals or fuels industries, or in fundamental research, all of which are highly competitive fields of employment.

Exploration success requires optimism and curiosity tempered with reality, focus, tenacity, sustained financial plus technical support in the good times as well as through the bad economic times ('counter-cyclic funding'), and a good deal of luck. Personal 'attitude', common sense and instinctive gut feel play an important role in making the luck happen!
When searching for new mineral resources, the integration of all relevant datasets into realistic synoptic working models is valuable for new target identification. The exploration and mining geologist should be well-versed in current ore deposit models.

Models at various scales…

A powerful personal asset of the successful geologist is the possession of 'helicopter vision', which is the ability to be able to stand back, analyse and integrate the data or the problem under consideration from the broadest overview down to the minute detail, and then to construct realistic working models to define solutions to problems or to locate new targets.

Required attributes for success

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.

There are many different views of the attributes required by geologists to be productive and successful. Listed below, in no order of priority, are some of those that I think play an important role in discovery.

- Successful geologists *'lead from the front'* and use the best technical advisers.
- Possession of *'helicopter vision'* is a powerful personal asset.
- They have a broad range of relevant job skills and working experience with relevant industry professionals such as analysts, metallurgists and mining engineers to have some knowledge of the latter's likely response to situations encountered. Try to see things through the eyes of other disciplines as well as through your own 'geologist's eyes'.
- Use appropriate mineral exploration techniques in the most prospective terrains.
- Only spend the available exploration funds in the most enabling investment jurisdictions.
- Well-balanced work programmes and expenditure should sustain exploration through lean economic times to ensure the completion of exploration programmes started in the good times (consider the merits of 'counter-cyclic' exploration and new mine discovery).

It also helps to be in the right place at the right time! The future of mining has been challenged vociferously in recent years by various environmental groups, some well-meaning and others who are more militant and with unclear agendas.

There is a solid future and growing demand for geologists and related professionals in the worldwide mineral exploration and mining industry. Young geologists now entering the profession should hone their skills and broaden their experience to prepare for the future demand. They should, however, ensure that they maintain a balance between their career requirements in parallel with those of their colleagues and close family in striving for their own

success. Get a life! Success should be a shared experience!

Finally, when it is time to hang up your boots and move on, let it be said of you by the next generation of geologists who follow in your footsteps to visit your mines or discoveries, when they read your epitaph:
"Here lie the remains of a geologist and a gentleman"

And let them not be referring to the remains of two bodies in the same grave! They should remember you for your success in terms of your ethical and social, as well as your professional or technical, life achievements…

Roy Corrans

all the news fit to print

Stellenbosch University

After missing the deadline for a contribution to the March edition of the *Geobulletin*, there is now a lot of news that we can share with the esteemed readership of this fantastic publication. Overall, the department is weathering the load shedding and biting cold fronts with its ubiquitous positive attitude, and the first half of the year has proceeded without any major hiccups. Indeed, several field excursions were packed into the first few months of teaching in order to capitalise on the fair weather and longer days before winter struck.

Big news items date back to the 2023 Geocongress event that was held between 11–13 January and was deemed a great success. We have also wished our 2022 graduates the best for their future careers, and welcomed the new intakes into our undergraduate and postgraduate programs. Our science remains at an exceedingly high standard, with many of the recent publications being presented at international conferences and being picked up by popular media.

Geocongress 2023 *(originally appeared in the MINSA Geode)*
The Geocongress event ran successfully between 11 and 13 January 2023 in a sunny Stellenbosch. Over 400 delegates attended the in-person component of the event, with a smaller contingent taking part from remote settings, using the hybrid functionality that allowed remote speakers and remote audiences to partake. From an informal census of the in-person delegates, the response was overwhelmingly positive, with delegates really enjoying the opportunity to get together and have interpersonal interactions after the two years of pandemic-induced lock-downs and forced virtual interaction.

Geocongress 2023: "The next 125 years of the Earth Sciences" belatedly celebrating the mutual age of the Geological Society of South Africa and Stellenbosch University's Department of Earth Sciences.

The poster sessions were lively and interactive. Conversation, food, and drink all flowed in a decidedly non-viscous manner.

The event really hit its target of appealing to a diverse array of delegates, encompassing industry professionals, academic researchers, and a large number of students (who we believe to represent the future of our science). The talks were mostly of a very high calibre and it was great to see local researchers, and indeed the students, stand up and present at a standard that was comparable to the talks given by the high-level internationally acclaimed scientists who attended. This bodes well for continued southern African Earth Science excellence and competitiveness when taken in a context of the international scientific arena.

The event would not have been possible without the efforts of the local organising committee, the GSSA, the various conference organising entities and service providers, the excursion and workshop organisers, the session chairs, and importantly, the delegates. You are all too many to thank individually, however, you know who you are, and you can be proud of what we achieved in making this event a success. Thank you.

For those interested in re-reading some of the conference abstracts, the abstract volume can now be found on the GSSA website. Inasmuch as we are sure to see each other again at a yet-to-be-confirmed Geocongress 2025, please, if you are in the Stellenbosch area before then, do pop past the Earth Sciences Department for a visit. If you're lucky and we're feeling nostalgic about the Geocongress evening activities, we'll even take you for a drink at one of the now-infamous bars down the street.

The Honours cohort of 2022 at a great farewell lunch hosted at the Volkskombuis in Stellenbosch late last year.

As part of the Geocongress 2023, a one-day workshop was hosted at Stellenbosch University on pressure-temperature constraints, phase equilibria and open system modelling of geological processes. This included applications in the SU software Rcrust (www.tinyurl.com/rcrust) and a special presentation by **Sean Hoffman**, a recent SU MSc graduate who added a trace element and accessory phase saturation routine to Rcrust that now allows the modelling of apatite and monazite in melt-bearing systems. The workshop was a resounding success, with delegates attending from 10 institutions from across the country.

Out with the old and in with the new

As the Lion King teaches us, it's all about the circle of life. At the end of 2022, we bid farewell to all of our graduating students, undergraduate and postgraduate students alike. After successfully defending their research projects, the Honours cohort of 2022 was treated to a lovely farewell function and lunch at a local restaurant called the Volkskombuis. Several of these students have stayed on to pursue further studies, whereas others have moved on to where they will contribute to the local earth sciences sector and to the local economy. We wish all of these students best of luck with their future endeavours. In the most recent March graduations, two PhDs graduated from our department. Dr **Johan Viljoen** worked on the role various essential trace metals have on phytoplankton community dynamics in the Southern Ocean. Johan has now joined the University of Exeter, UK, as a postdoctoral research associate. Dr **Lebogang Babedi** completed his studies on the impacts of trace element incorporation on the beneficiation behaviour of gold-bearing pyrite. He has gone on to undertake a postdoctoral researcher position in Ni-Cu ore flotation in Canada. A last farewell was extended to our Hydrogeology lecturer Dr **Reynold Chow**. After an impactful tenure in our department, he has left to further his career in the Netherlands. His methodical approach and enthusiasm for his work will be sorely missed.

To continue the flow of talent into the local earth sciences sector, we continue to enrol some of the brightest young minds. The year kicked off with a welcome function for the new first years, focused on the theme "Why should I study BSc Earth Science?" with Rene Heyn, Ryan Tucker, Reynold Chow and Susanne Fietz. The session was used to present to the new first years what we do in the classroom, what we research, and to give them an idea of why to study Earth Science. We also welcomed the 2023 Honours cohort, whose program started on 23 January 2023 with a week-long Writing Skills workshop. A total of 22 students signed up for the BSc Earth Sciences Honours Programme, 11 in the Applied Geology stream and 9 in the Environmental Geochemistry stream. We have also enrolled a record number of MSc and PhD students, whose research promises a future flow of exciting scientific results.

Outreach and community engagement

The SU Department of Earth Sciences has partaken in a number of societal outreach initiatives in the first half of 2023. For example, **Susanne Fietz** and

Dr Rene Heyn introduces the new 2023 first years to the department during their orientation week.

First-year students collect litter and data as part of the excursion to Strand beachfront.

team continued the work on dust characteristics and air quality in collaboration with Saldanha Bay Municipality and UCT (Env. & Geogr. Science). A first meeting took place to discuss emerging concerns in the Saldanha Bay area and a site inspection follows. Three SU Earth Sciences young investigators are involved in this project: postdoctoral fellow **Heleen Vos**, MSc student **Kereemang Gaoaaga** and Honours student **Isabella Braithwaite**.

Another example is that of the first-year students who took part in a beach field trip to learn about plastic pollution in our oceans. They assessed plastic debris by number, size, volume and weight, identified sources of litter, and discussed realistic solutions to reduce plastic pollution. The activity included a beach clean-up and debris survey, which was based on a community science approach. Such approaches illustrate how creating data together can aid marine debris policy development.

Thembelihle High School students engage with earth science samples during an outreach event held in Khayelitsha.

Bjorn von der Heyden and **Melita Dlelana** participated in a visit to Thembelihle High School, where they showcased to students the potential careers available in Earth Science. Two of our students, Simanga Mweli and Miranda Sitofile, also attended and shared their own journeys as science students in our department.

If anyone outside our Earth Sciences Department at Stellenbosch University would like to be included in the e-mailing list for a rejuvenated hybrid Wednesday Lunch Seminar Series, hosted in our Geology Building, please contact Martin Klausen (klausen@sun.ac.za). The series may also include an additional Friday afternoon time slot, followed by less formal discussions and networking—just not hybrid—among speaker and attendees. Anyone interested in scheduling their oral presentation within this seminar series is also very welcome to contact Martin.

We retain a strong focus on field school teaching and learning interactions

To take advantage of the nice weather before the Cape of Storms' imminent winter approach, several field schools were successfully run for students across all academic levels. For example, the first-year students had a fieldtrip to Simonsberg Mountain in Stellenbosch, where they learnt about fluids moving through rocks. They learnt about how

Students visit a silicified portion of the Colenzo Fault on Simonsberg mountain outside of Stellenbosch.

fluids alter fresh granites to silicified granites in the Colenzo fault zone, and they saw how fluids have formed manganese occurrences in the overlying Peninsula sandstones. It was a great opportunity to learn and bond with classmates.

The Honours cohort took a two-week tour around southern Africa (2–13 May). Given the modern drive towards critical metals, the tour focussed heavily on some of these commodities—e.g., Rare Earth Elements at the Steenkampskraal monazite mine; Cu and other base metals in Springbok, Aggeneys and Rosh Pinah; graphite at the Aukam mine in Namibia; and Li and Ta in the various pegmatites (e.g., Tantalite Valley Complex). The students were also very fortunate to be afforded the opportunity to attend the West Coast diamond excursion, where they could experience the fascinating geology of the alluvial diamonds and interact with a range of professional geologists—enhancing their networks

The Honours class of 2023 dressed and ready to go underground at the Rosh Pinah lead–zinc mine.

Angela Welham, recent recipient of the 2022 Haughton Award from the Geological Society of South Africa.

for their future careers. Thanks are extended to all the mines and exploration operations that graciously hosted the large student group, and to the Northern Cape GSSA branch and all sponsors for the diamond excursion opportunity.

Student and postdoc achievements

We are very proud of current MSc student **Angie Welham** who won the Haughton Award for the year 2022 from the GSSA. She adds her name to a long list of Stellenbosch alumni who have received this coveted award (2009, 2015, 2017, 2022 and now 2023). Her Honours thesis was entitled '*Spatial characteristics of the Verlorenvlei Estuarine Lake Water Sources Using Stable Isotopes and Hydrochemistry*' and was recognised as a thesis of exceptional merit produced at a South African university. She worked under the guidance of supervisor Dr Reynold Chow.

At the recent 11th International Conference on Aeolian Research (ICAR) held in Las Cruces (USA), postdoctoral research fellow Dr **Heleen Vos** was awarded the ISAR Best Presentation Award for her work on dust sources and characteristics and their impacts on human health and the environment.

Alumni engagement

Several social events have recently been organised to help us foster a sense of community, both among the current students and staff, and with our recent and more distant alumni. In July, Extraordinary Professor Glenn Brown arranged an alumni get-together for the 45 Maties living abroad in Toronto and other parts of Canada. This exciting event included a guest appearance by Vice-Chancellor Wim de Villiers. In August, the Earth Science Student Committee organised a fantastic evening function for past students and current students and staff. The event was the first ever Earth Science Formal and was a smashing success!

Bjorn von der Heyden

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Yebo Gogga exhibition space before visitors arrived to find out how to "beat the heat" according to this year's theme.

Various members of the School of Geosciences were involved in outreach events over the past few months. One such event was the annual Yebo Gogga exhibition held in May, where we once again had on display rock and mineral specimens that would appeal to both learners as well as the general public who visited. Later in June, staff once again represented the Faculty of Science in the Wits Integrated Experience, which this year explored what would happen if a meteorite hit South Africa. 295 Grade 11 learners from 58 different feeder schools either played a computer game simulating the impact; carried out impact experiments considering differences in meteorite composition, meteorite size and speed of impact; covered the potential of water contamination; or were taught how to do geophysics on the Library Lawns.

It hasn't all been outreach though, as there was the International Platinum Conference from 4–7 July at Cardiff University that saw many staff in attendance. A little closer to home however, **Roger Gibson** joined academic and industry partners from Botswana, Zambia, and Nigeria for the inaugural meeting of the EU-funded Erasmus + FAST4Future (Focus on Africa Space Science and Technology for Future Development) Project at the SA National Space Agency in Hermanus, 21–25 May. This 3-year project involves a series of initiatives to foster STEM training and research development across the partner countries through involvement of staff and students in physics, astronomy, data science and computing, electrical engineering, and geoscience disciplines, including visits between the partners, an analysis of the state of training in space-related disciplines and development of a virtual African Centre of Excellence for Space Science and Technology.

Lastly, congratulations go to Prof. **Musa Manzi** whose talk "Tunnel Seismics for Mineral Exploration – Is it Worth the Effort?" given at the European Association of Geoscientists and Engineers (EAGE) Near Surface Geoscience 2022 in Belgrade has been selected to feature in a new E-Lecture Series, as well as in the Distinguished Lecturer Programme 2023.

*Compiled by **Sarah Glynn** from various contributors within the School.*

Learners looking at meteorite samples as part of the Wits Integrated Experience.

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the geological hot pot

By now most readers will have tweaked onto how I get my articles to write about. There are many magazines and online publications that cater to the informed layman about the natural sciences and the latest research discoveries in the different fields. The better-known ones include *Scientific American* and *New Scientist* that are more scholastic than *Popular Science*, for example, that is more down-to-earth. *SciTechDaily* and *ScienceAlert* are two of the many websites that keep tabs on both the news updates posted mainly by universities and other institutions on their latest research discoveries and the technical articles published in the academic journals. What is nice about this is that they make complicated concepts more understandable and also give the links to the original articles. So I have to thank these sources, amongst a few others, for providing me with the ingredients to put into my hot pot.

The first article in the previous Geological Hot Pot took us deep down into the Earth, and this is where I propose to start again because of three papers dealing with the origin of kimberlites. The first one will be published in *Nature* by Thomas Gernon of the University of Southampton and his co-workers, and his succinct account is present here. The main controversy is about whether kimberlites are the direct result of mantle plume activity, or due to continental rifting and its related tectonic consequences. Gernon's group used kimberlite data gathered from Africa and North and South America, and subjected them to machine learning, a branch of artificial intelligence, to discover any important relationships regarding the rocks. The exciting finding is that kimberlite magmas tend to be erupted 20–30 million years after continents start to rift apart. In addition, they found that the magmatism tended to migrate from near the continental edges towards the interiors at a uniform rate. These findings, indeed, will have a profound impact on the search for new kimberlites and, hopefully, associated diamond deposits.

In support of the mantle plume hypothesis for the origin of kimberlite, Omer Bodur and Nicolas Flament of the University of Wollongong in Australia enlisted the help of supercomputers to create three-dimensional geodynamic models of the Earth's mantle. They found that broad mantle upwellings, informally named "pillars of heat", connect the very deep Earth to the surface. In addition, their modelling also explains the movement of tectonic plates across the surface of the Earth over the past billion years. Their paper is published in *Nature Geoscience*, and they provide a summary here.

A much closer look at where diamonds come from and the conditions under which they form is provided by another article in *Nature Geoscience,* as reported here. Tingting Gu of the Gemological Institute of New Yark and Purdue University studied the inclusions in a diamond from Botswana, and found ringwoodite, ferropericlase and enstatite, among others, that suggest that the diamond formed at least 660 km below the Earth's surface. The depth is at the boundary between the upper and the lower mantle. Moreover, the mineral assemblage, especially ringwoodite that forms in a hydrous environment, suggests that the transition zone between the upper and lower mantle is relatively water rich. This finding has implications for the research reported above. Don't you just love the name Tingting?

The flavour of the day for the past decade or so (to stretch a phrase) has been critical metals. We have been swamped with the issues around global warming/climate change, and the need to de-carbonise our energy generation. The alternative ways to supply us with electricity require these

The Big Hole in Kimberley, type locality for kimberlite.

critical metals, and in abundance. From the rare earth elements (REE), nickel, cobalt and now copper (just deemed by America to be a critical metal) among several others, it is essential that we continue to mine and use them well into the future. This article in *Science News* gives an in-depth look at the only REE mine in the USA, Mountain Pass. If you, as a geologist, have been living in a cave or in the jungle out of contact with civilisation for the past ten years, this is a good catch-up article about what the REE fuss is about.

The gossan developed on the outcrop of the Matchless copper deposit in Namibia.

Which segues nicely into the topic of, just how do the REE deposits form? Researchers at Trinity College in Dublin, Ireland, have come up with an innovative way to do just that. They subjected common limestone to REE-bearing fluids under various environmental conditions and found that chemical reactions took place whereby the REEs replaced the calcium ions in the limestone. Of importance is the finding that some of these complex reactions are extremely fast, and can occur at ambient, not extreme temperatures. You can read more about this at *SciTechDaily*.

Almost hot off the press as I write this article is the good news contained here in *SciTechDaily*. The critical metals as a group have become extremely expensive, but society has to carry the current high prices because we have no choice but to do so. But high commodity prices lead to research into finding alternative replacement commodities that do the same functions for less cost. And this is where chemists at the University of Basel in Switzerland come into the picture. Their research indicates that chromium can replace the noble metals osmium and ruthenium in luminescent materials and catalysts. Osmium and ruthenium are in the platinum group of elements (PGEs) and are currently much more expensive than platinum itself. South Africa is fortunate in possessing some of the world's largest resources of both chromium and the PGEs but will lose significant revenue from the latter if the chromium substitution is successful and widely applied in industry.

At the end of a long day in the field looking at rocks (preferably) or in the office writing project proposals, there is nothing better than downing a nice cold beer (says your pet teetotaller—me). If your preference is a lager beer, you may wish to dig into the origin of the yeast that is used to produce it in this article. It is Open Access and written with German thoroughness. There is no doubt that the science is solid, but I found the timeline of brewing history interesting in their Table 6. I do recommend a peek at the article. Cheers!

What better way to wind down than to throw in some tasty shellfish into our hot pot? Researchers at the Smithsonian Institute report on the good news that human harvesting of edible shellfish is, on the whole, sustainable. There is no danger of the most popular species going extinct due to over-exploitation, as reported in *SciTechDaily*. The scholarly article is in *Nature Communications*, an Open Access journal.

UG1 chromitite seams at Dwars River in the eastern limb of the Bushveld Complex.

A few recent and fossil bivalve shells.

We have to thank our scientific colleagues at the Max Planck Institute for giving us a more than a valid reason to indulge in chocolates and other sweet treats. No more lame excuses when we can just roll out this concise explanation in *SciTechDaily*. It turns out that when we pursue a high fat or high sugar diet, our brain is actually rewired to prefer these types of foods, i.e. we end up craving them. But, as we are all aware, such a diet is not particularly healthy, so again, moderation and a balanced diet is the way to go.

After a nice dessert, one can settle back and enjoy a few moments of restful contemplation while the sun goes down. This is very good for you, as attested in this article in *BigThink*. Good night!

George Henry

Sunset over the hippo pool at Diggers Retreat, Noordkaap, near Barberton.

symposium 2023

ARTICLES

Goldschmidt and the International Platinum Symposium 2023

Walking the corridors of Stellenbosch University's Earth Science Department, an impressive sight graces the walls—a collection of conference posters spanning the years. Amid this visual chronicle, one finds a recurring emblem: The yearly logos of the esteemed Goldschmidt Conference. A gathering that beckons geochemists worldwide and a focal point of intellectual exchange, Goldschmidt has earned its status as a formative, yearly event in the realm of geochemistry. The conference offers a wide spectrum of themes and sessions, nurturing an optimal social environment for the interplay of ideas and the exploration of pioneering research across diverse geochemistry-related domains, all alongside the chance to establish connections with renowned and early-career scientists. As a postdoctoral fellow embarking on the inaugural first year of research post-PhD, the opportunity to attend Goldschmidt 2023 offered an invaluable stage to present my doctoral work pertaining to the enigmatic genesis of chromitite layers in the Bushveld Complex. Beyond the chance to disseminate our research, Goldschmidt was an occasion to connect with global researchers, many of whom were pivotal in the work forming part of my PhD, and who continue to shape the fields of economic, experimental and igneous petrology.

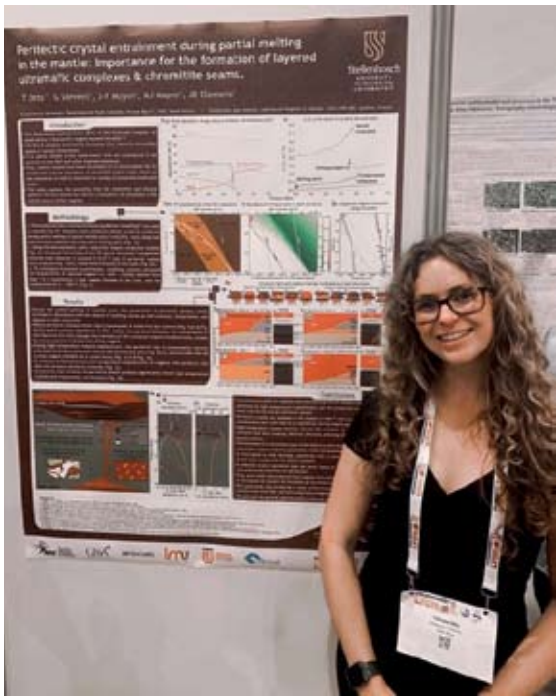
The Goldschmidt Conference shifts its locale annually, and this year, the city of Lyon, France embraced the role of host from 9—14 July. A captivating ambiance can be found the southern heart of France in July. European summers have

Stellenbosch University geoscientists meet up at Goldschmidt 2023, outside the exhibition hall. From left: Dr Ryan Cloete, Ms (almost Dr) Deyanira Cisneros-Lazaro, Dr Tahnee Otto, Dr Matthew Mayne.

a distinct charm, with bustling streets along the Rhône river in Lyon lined with residents and visitors alike embracing the never-ending days that come with the warm weather. This backdrop set an idyllic scene for an amazing conference experience. In the company of other early-career scientists, I attended the Icebreaker event on the 9th of July, an evening that inaugurated the meeting of fellow researchers and ceremoniously kicked-off the start of the conference with informal discussions about science, conversations about academia in general, as well as talks of research opportunities, funding, and possible collaborations.

The week commenced with soaring temperatures, cresting at 38 °C—perhaps mirroring the heat generated by ground-breaking scientific discourse within the Centre de Congrès de Lyon, which is located right across the city's inner sanctum, the picturesque Parc de la Tête d'Or. Each day was filled with interesting sessions to attend, followed by dialogue that extended beyond the confines of the conference rooms, often accompanied by the great food offered by Lyon's vibrant culinary scene. Goldschmidt's acclaimed early-career program enriched the week's itinerary, featuring lunchtime workshops. I took the opportunity to attended two of these: an enlightening session on scientific paper review by Professors Rajdeep Dasgupta and Georg Zellmer before the icebreaker, and on the 11th of July, a workshop titled 'From Student to Teacher', complemented by a lunchtime talk on analytical technique advancements. Engaging conversations concerning effective teaching strategies within academia, led by Prof Emma Tomlinson and Dr Kate Kiseeva, mirrored insights into the revolutionary MS/MS MC-ICP-MS technology pioneered by ThermoFisher Scientific.

Navigating the diverse array of themes at the conference, my journey led me to Theme 05, 'Volcanism in the Earth System', which was of great interest and benefit to me. Within this theme, my poster presentation took place on the 13th of July as part of Session 5f, titled "Large Igneous Provinces (LIPs): Their plumbing systems, and links with plumes, supercontinent breakup, ore deposits, and environmental change through Earth history". During my presentation, I delved into our novel research, spotlighting how peritectic crystal entrainment in the mantle source plays a pivotal role in transporting chromium—much more than melt could—to the crustal magma chamber, thus allowing the formation of chromitite layers as well as the ferromagnesian layers as observed in the Rustenburg Layered Suite of the Bushveld Complex. The insights offered by other scientists sparked fascinating discussions, constructive feedback,



Dr Tahnee Otto during her poster presentation at Goldschmidt 2023 in Lyon, France.

and promising avenues for future research and collaboration. I also had the honour of connecting with Prof Richard Palin, one of my PhD examiners who I couldn't meet during my doctoral defence, during the poster session.

The knowledge and experience gained from the conference and poster sessions underscored the significance of attending such events during a researcher's career journey. Immense gratitude is extended to the Research, Education, and Innovation (REI) Fund of the Geological Society of South Africa (GSSA) for awarding me with the Andrew Geddes Bain grant that enabled not only attendance at the Goldschmidt Conference, but also participation in the International Platinum Symposium (IPS) 2023 held in Cardiff, Wales, ahead of Goldschmidt. IPS2023, a more intimate meeting, included a dynamic succession of sessions. I had the privilege—and the trepidation—of being the second presenter on the first day! In addition, I partook in the Wager and Brown (Layered Intrusions) field trip and workshop, a chromite-focussed workshop, and an array of sessions that bolstered my insights. The imprint of IPS2023 and Goldschmidt 2023 continue to resonate within my academic journey and amplify my growth as a young scientist. I would like to express my appreciation towards the GSSA REI Fund for contributing towards this twofold experience that symbolises growth, learning, and a chance to spotlight South African research and innovation.

Tahnee Otto

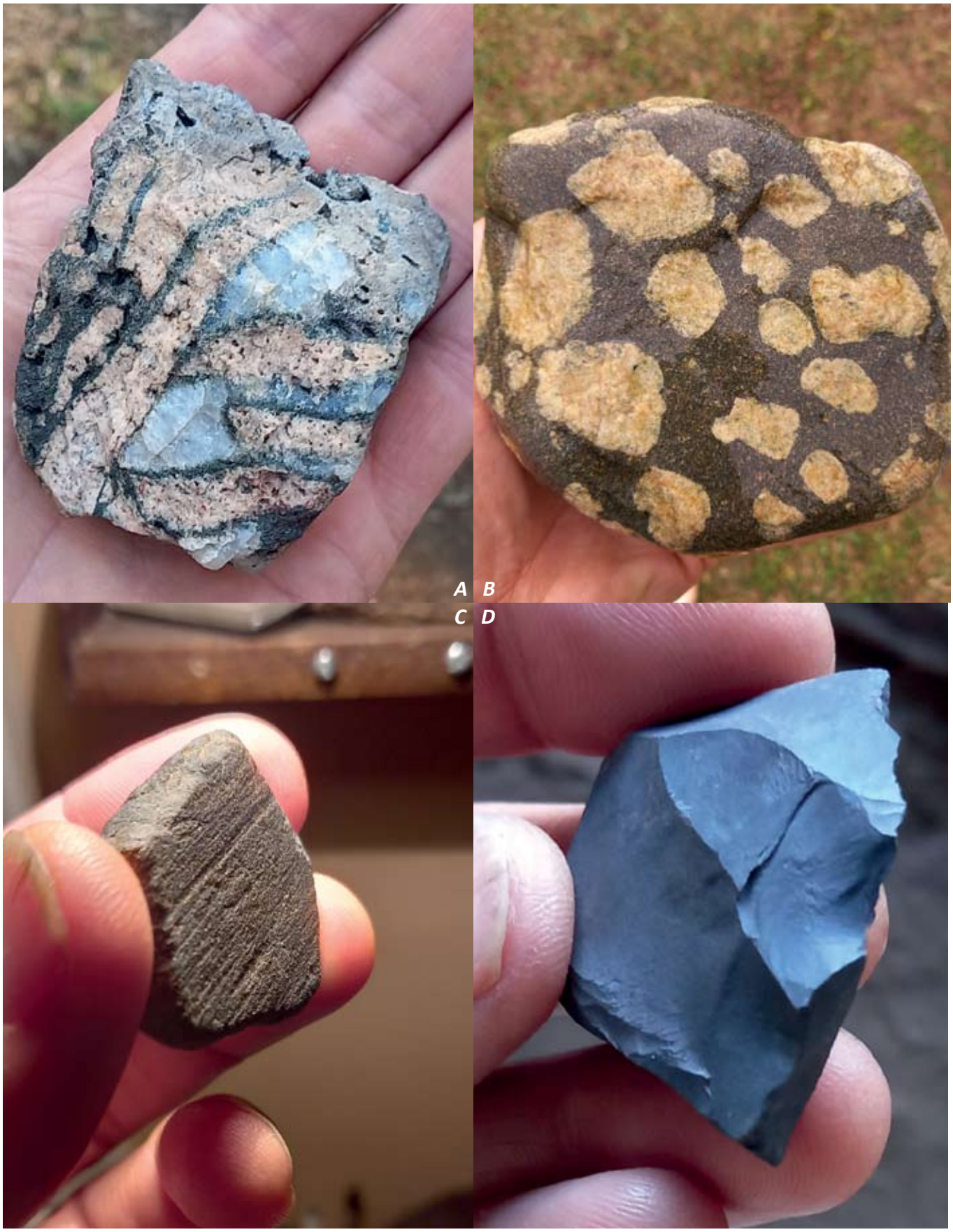
story of the earth

Telling the story of the Earth—brief notes on geological nature guiding

I'm a professional nature guide, and have the privilege of sharing South Africa's remarkable biodiversity with people of all ages and interest levels. In the last few years, I've increasingly included more geology in my guiding, and have offered several geology-focused walks and tours. These have been very popular, and I have started offering geological learning adventures for travellers intent on discovering the wonder of the rocks and landscapes of South Africa.

Here are some brief notes on this journey so far:

- Most people have very little idea of what geology is about.
- The stories of the rocks and landscapes need to be shared in ways that everyday people can relate to.
- Most people are unable to relate to geological time scales.
- Beautiful rocks grab people's attention.
- Formation process stories are appealing.
- Technical language intimidates most people.
- There is no substitute for first-hand experience. If you can stand on or hold what you are talking about, people make the connections.



A: Syenite breccia,
Kgopolwe Koppie, Phalaborwa.

B: Porphyritic Dolerite,
White uMfolozi River, Babanango Game Reserve, KZN.

C: Glacially striated pebble,
Cumberland Nature Reserve, KZN.

D: Hornfels artefact,
Middle Stone Age, Holley Shelter, Wartburg, KZN.

- Stone tools, and other rocks with a human story, are easier for people to relate to.
- Many geologists are specialists, and appreciate learning about particular areas or fields in which they have never worked.
- Asking for help is my secret weapon. I have received fantastic guidance and support from many geologists, including Nick Norman, Nigel Hicks, Chris Harris, Andy Green, John Bristow, Gerald Davie, Gillian Drennan, Grant Bybee, Megan Sauer, Jens Jacobsen and several others. Many thanks to you all.
- I've realised that geological communication is an emerging field, and may be a viable career path for some students.

Geological guiding is proving to be a fascinating way of sharing geology, and I'm open to chatting further with anyone interested in this work.

John Roff
Geology and Nature Guide

Glacially faceted chert pebble, Cumberland Nature Reserve, KZN.

Agglomerate, White uMfolozi River, Babanango Game Reserve, KZN.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geoheritage

Geo-Outreach in Cape Town

28 January 2023: GeoHike for 1st Camps Bay Scouts from Green Point Urban Park to Camps Bay

On a rain-threatened Saturday morning, I rendezvoused with 23 people, mainly 1st Camps Bay Scouts (boys and girls over 11), their Scout Master, a working civil engineer, Puvendiran Govender, Bernard Fourie, an international oilfield technician and a sprinkling of parents, in the Green Point Urban Park. I made our new Geology of Cape Town sign my starting point and it worked very well, beside the Labyrinth and near the Lighthouse entrance to the park.

We then hiked to Three Anchor Bay to see the best turbidites in the Peninsula in the Cambrian deep-marine siltstones and claystones of the Malmesbury Group's Tygerberg Formation, with good outcrops of the near-vertical NE limb of the major Signal Hill Syncline and also good examples of minor sinistral faults.

Dodging the other users of the Promenade, we made our way to the contact-metamorphosed spotted hornfels, just south of Sea Point Pavilion and then onward to the Sea Point Contact itself, via the sharp contact between the baked margin (spotted hornfels of the Tygerberg Formation; 560 Ma) and the chilled margin (Cape Granite; 540 Ma), beside the major carpark and public toilets there. Making our way to the complex part of the contact,

Close-up of the Geology of Cape Town sign with John Rogers listening to queries from the Scouts in Green Point Urban Park on a chilly day. (Photo: Puvendiran Govender)

John Rogers (JR), in the hat and the puffer jacket, explaining to 1st Camps Bay Scouts (led by Scoutmaster civil engineer Puvendiran Govender) and some parents, about the Geology of Cape Town signage in the Green Point Urban Park, beside the Labyrinth. Bernard Fourie, an oilfield technician, is on JR's left. Lion's Head, in the background, has outcrops of metamorphic rock (hornfels of the Tygerberg Formation; 560 million years old), igneous rock (Cape Granite; 540 million years old) and sedimentary rock (Table Mountain Group; 490 million years at its base). Finer detail via www.gssawc.org.za. The sign was designed and erected at the expense of the City of Cape Town with GeoInformation supplied by the GeoHeritage Subcommittee of the Western Cape Branch of the Geological Society of South Africa. (Photo: Puvendiran Govender)

Scouts and their parents scrambling over the Cambrian Cape Granite (540 million years old) at the north end of First Beach Clifton, where Early Cretacous (130 million years old) dolerite dykes of various thicknesses can be found, dating to the breakup of supercontinent Gondwana. (Photo: John Rogers)

we viewed Lion's Head with its *metamorphic* NE flank (Tygerberg Formation spotted hornfels) its *igneous* SW flank (Cape Granite) and the overlying outlier of the *sedimentary* Table Mountain Group sandstones.

A determined hike, with scouts half my height and about one-eighth of my age, took us down hundreds of steps, nearly 700, to Clifton First Beach to study Early Cretaceous (130 Ma) dolerite dykes, with a variety of widths, intruding Cape Granite. There are good examples of very narrow chilled margins, but no baked margin of the granite. Avoiding an ascent of 700 steps, the young people scattered and ran along the four beaches of Clifton to Fourth Beach for a gentler ascent to the road.

As the weather started to deteriorate, we reached

Lion's Head

by John Rogers (Retired Geology Lecturer)

The mountains surrounding Cape Town are so close to the city that we sometimes forget they are there. However, if you pause to observe them, you can discover their varied and lengthy geological past.

For today's shallow dive into Cape geology, I request that you look at (or imagine looking at) Lion's Head.

Naturally, the first thing you see is the iconic conical hill, the Lion's Head itself. Many of us have hiked it. Most of us have photographed it. But is there more to it than meets the eye?

When unlocking an area's geological secrets, I find it helpful to think of the three principles of the Danish anatomist-geologist priest Nicolas Steno (1638 to 1686).

1. His *Principle of Superposition* states that the thin-bedded sandstones seen near the top of Lions Head (Graafwater Formation) are about 510 million years old. The thick-bedded sandstones above (Peninsula Formation) are slightly younger. Because of this, we can assume that the mountain's beds are still the right way up, not upside down, as seen in other parts of the Western Cape.

2. His *Principle of Original Horizontality* relies on the fact that most sediments deposit in mostly-horizontal layers at the bottom of large bodies of water, such as giant lakes or under the sea. The river sandstones on the summit of Lion's Head are still visibly horizontal. Can you figure out what that means?

3. His *Principle of Lateral Continuity* is particularly important. It draws attention to the fact that the top of Lion's Head used to connect to Table Mountain itself. Even more impressive, the top of Lion's Head used to connect to the caps of the Tygerberg Hills, the Hoteiaatsto Hollanc Mountains above Somerset West and Stellenbosch, and the sandstones of Argentina (yes, Argentina-Argentina).

Only 130 million years ago, the South Atlantic Ocean (now 7000 km wide) was as narrow as the Red Sea between Egypt and Saudi Arabia. From Lion's Head, the *Sierra de la Ventana* (The Mountain of the Window) was within hiking distance. These days, in 2023, I would need to fly for 12 hours at 800 km/h to get there! If planes didn't exist, I would need to sail across the ocean. If my ship departed from Queen's Beach in Sea Point (visited by Charles Darwin in 1836), I'd be able to see the Cape Granite at the water's edge. When it was busy forming (540 million years ago), the Cape Granite mixed with the older mudstones (560 million years old), baking them and metamorphosing (changing) them to spotted *hornfels*, a rock still used for road aggregate all over our city to this day.

So, while looking at our mountain (that is indeed the right way up), please take a moment to think about how long it has existed, the things it has seen, and the things it may see in the future.

Read more at geoses.org.za or in John's richly illustrated book, Geological Adventures in the Fairest Cape: Unlocking the Secrets of its Scenery. DM @lencarfin for details.

Younger

Older

Queen's Beach, Sea Point

Geoheritage

the northern edge of Camps Bay, where the black southeaster suddenly strengthened and threatened to blow us back to Green Point!

1 February 2023

I met Mike Wright (PPE, Stellenbosch) for the first time in Newlands, just perchance, in the Hazz Café and this led to my contributing an A5 page to his "Le Scarf", a free publication that he distributes in the coffee shops of Cape Town. See previous page.

10 to 11 March 2023: Annual Overnight Walking Tour of Robben Island with the Friends of Iziko Museum

On Friday, 10 March 2023, a group of 40 Friends of Iziko Museum set off across Table Bay from the Nelson Mandela Gateway in the Waterfront. This was the 8th overnight field trip that I had led, but the first post-Covid. In many ways it was the best, partly because we were invited by the Robben Island Museum via Yolanda Mdutyana, whereas normally we make the first approach—"we" being Charlotte Honiball, Munro Bloch and myself. We used my 35IGC booklet on the geology of the island. I sold two copies during the tour, sending the proceeds to the Geological Society of South Africa on my return home.

After a visit, on foot, to the Political Prison, the Leper Graveyard, the exterior of the Leper Church (Church of the Good Shepherd) and the Lime Quarry, we enjoyed an evening braai in our accommodation, the former Convict Prison, and a stroll, in the dark, to the Lighthouse on Minto Hill. Cape Town at night, across the 12 km of Table Bay, is a sight to be savoured.

Next morning, we were accompanied by a Robben Island Guide, Sabelo Madlala, and Environmental Officer, Asisipho Tsako, who forbade one or two stops as it was the breeding-season for African Black Oystercatchers, Swift Terns and Hartlaub's Gulls. Being a member of the Cape Bird Club, I had to acquiesce.

After self-supplied breakfast, we set out on foot again through the village, for the first time equipping each participant with hired headphones. I had a head-microphone. This was a real breakthrough, as those at the very back of the large group could hear every word I said.

After the "comfort stop" at the tuck shop and toilets on the SE corner of the island, we had a group photograph, Table Mountain across Table Bay behind us, before exploring the sedimentological highlights of the deep-marine, turbiditic siltstones of the Cambrian Tygerberg Formation in the nearby Van Riebeeck Quarry.

Hiking around the SW corner of the island along the tarred perimeter road, we studied the younger of two "raised beaches"—vegetated but uncemented cobbles of siltstone—before waving at the

Forty Friends of Iziko Museum on the SE corner of Robben Island during the 8th Annual Overnight Geological Hike on Robben Island. (Photo: Charlotte Honiball)

differentially weathered Early Cretaceous dolerite dyke at Langbaai. No lunch-stop due to breeding African Black Oystercatchers.

Heading East, inland and up and over Minto Hill, we visited the low cliff of the older "raised beach", this time cemented and capped with the soil, calcrete (a duricrust). Both beaches are Late Pleistocene in age.

Built atop the highest point (30 m) of Minto Hill, the lighthouse was revisited as our lunch-stop. At noon we timed the difference between *seeing* white smoke from the Noon Gun on Signal Hill and *hearing* the sound, after crossing the 12 km of Table Bay, 34 seconds later. Memorable proof of the difference between the velocity of light and that of sound. As a great privilege we were, for the first time, allowed entry to the lighthouse, built in 1864, to see fine views of Table Bay and our beloved City of Cape Town.

After preparing our luggage for transport from the Convict Prison to the harbour, we walked back via the Church of the Good Shepherd which, for the first time, was open to us. It is owned and well maintained by the Anglican Church of South Africa, with top-quality information banners along the western wall.

We then boarded the ferry and sailed along the sheltered east coast of the island to the SW swells in Table Bay and back to the sheltered waters in the lee of Signal Hill to the Waterfront. All were good sailors. No *mal de mer*!

17 April 2023: Geology for Grandchildren

We have known Pete and Shirley Smith for decades, Pete now being a newly retired UCT Pharmacology professor. Shirley has long been a marine-geological mapmaker. They brought three of their grandchildren for a GeoHike around our home and garden in Newlands. This involved my GeoTimeline in the back garden from Archaean Banded Iron Formation (Malelane) to Cape Peninsula rocks, Karoo rocks, offshore Pebble Phosphorite, Limestones, Calcrete, Ferricrete and Pleistocene Beach Cobbles.

Within the house I showed my GeoGuests an assortment of minerals and rocks, along with Nick Norman's book "A Box of Rocks", which is aimed at children.

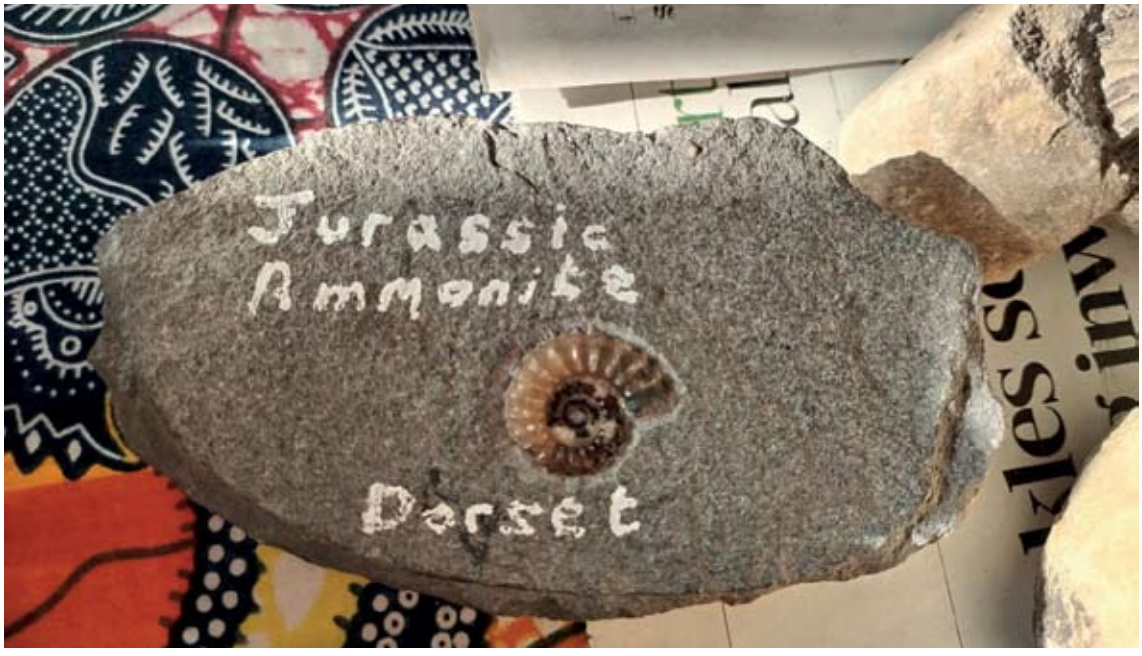
GeoTimeline in the back garden of the home of John and Phil Rogers in Dean Street in Newlands. (Photo: John Rogers)

John Rogers showing rocks, minerals and fossils to the grandchildren of good friends in his home in Newlands. (Photo: Phil Rogers)

24 April 2023: Earthquakes in the Western Cape (September 1969) and in Turkiye/Syria (February 2023)

The talk, commissioned by John van der Linde for Constantia Place this year, opened with a discussion of the terminology used in studying earthquakes, as well as how a knowledge of plate tectonics teaches one which countries are less (South Africa) or more (Turkiye) likely to suffer from earthquake activity.

The 1969 Ceres-Tulbagh Earthquake was then described, including eye-witness and ear-witness accounts, recorded, mainly in vivid Afrikaans, in two commemorative books, one by Ceres survivors and the other by Tulbagh survivors, published in 2019, fifty years later. The most earthquake-proof building in Cape Town, the Koeberg Nuclear Power Station, was discussed in fine detail.



Jurassic ammonite bought in Lyme Regis in Dorset during a field trip for the 13th International Sedimentological Congress (Nottingham) in 1990. (Photo: John Rogers)

The talk finally spotlighted the swiftly documented, devastating pair of earthquakes (6 February 2023) in East Turkiye and Northern Syria, where at least 50 000 inhabitants died in seconds. This was due to political corruption and the blatant disregard of recently updated building codes. A bitter lesson to learn.

17 May 2023: Cogmans Kloof Inspection

Len Gardner and I visited Cogmans Kloof between Ashton and Montagu, only to discover that our GeoInformation was already on a well-produced plaque beside a new parking layby on the Montagu side of the short tunnel, which is capped by *Die Engelse Fort* (Fort Sidney).

Cogmans Kloof just north of Fort Sidney (Die Engelse Fort) with a new layby and a new sign explaining the geology of the area. (Photo: John Rogers)

20 May 2023: GeoTrip for the Indigenous Bulbs Society and the Cape Horticultural Club

I led a convoy of 7 cars, transporting a party of 17, converging at our rendezvous outside the entrance to the Cape of Good Hope Nature Reserve, from homes in the Cape Peninsula, Stellenbosch and Somerset West.

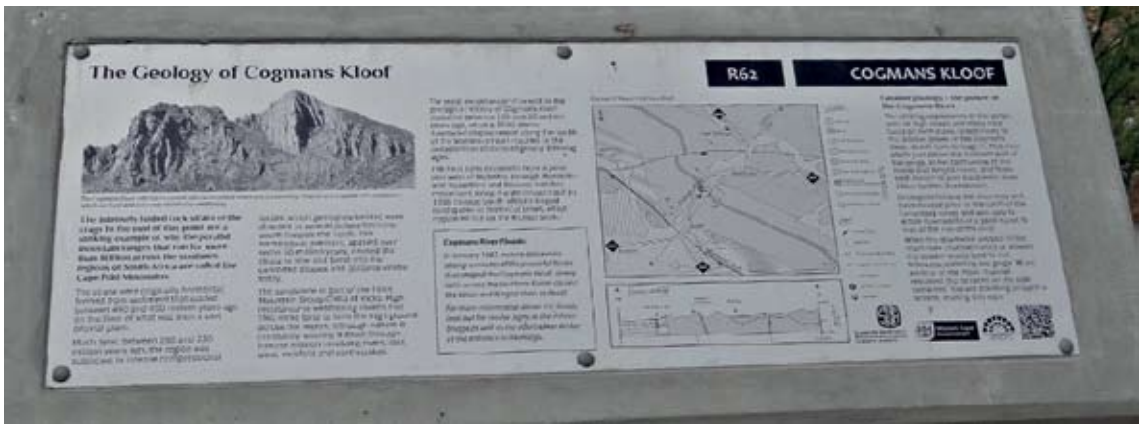
After explaining, in a bitingly cold wind, a small suite of hand-specimens in geochronological order, we viewed the biggest fault in the Peninsula at Smitswinkel Bay, with upthrown Cape Granite to the north and downthrown Table Mountain Group sandstone to the south. North of the beach we could spot the second-widest dolerite dyke in the Peninsula, but not its granite xenoliths.

The Froggy Pond stop, on the southern edge of Simon's Town was a very satisfactory teaching locality with narrow dolerite dykes intruding Cape Granite, well below the nonconformity in the upthrown block, high above the houses. We were blessed with early morning light, a spring low tide and a calm sea.

We then headed for the view-site over Noordhoek Beach to discuss the wave-regime and the Fish Hoek Valley's scissor fault, before moving to the layby just north of the half-tunnel on Chapman's Peak Drive. The marine geology and coastal geology of Hout Bay was then pointed out from the view-site opposite the Sentinel before stopping for a packed lunch at one of the picnic spots.

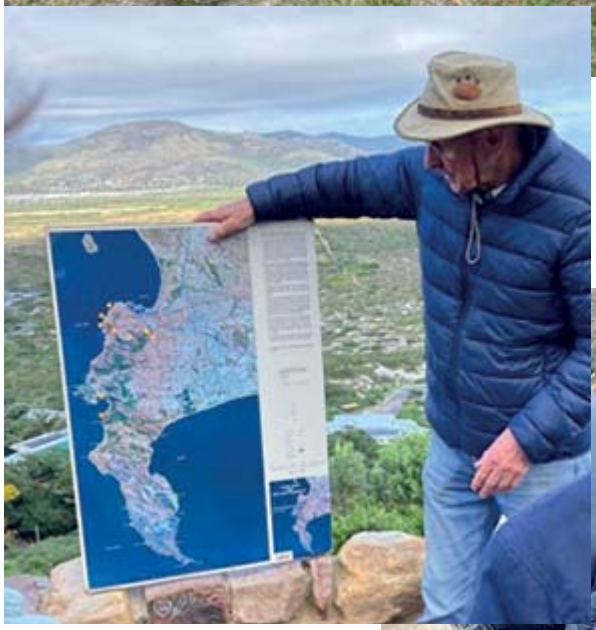
Then, just north of East Fort, I showed them the normal fault there and then led the way to the Sea Point Contact, Three Anchor Bay and the Green Point Urban Park.

John Rogers



Close-up of the new sign 'The Geology of Cogmans Kloof', installed by the civil engineers who revamped the road to raise it above the floodline, using GeoInformation provide by the GeoHeritage Subcommittee of the Western Cape Branch of the Geological Society of South Africa. (Photo: John Rogers)

GeoTimeline on display outside the Cape of Good Hope Nature Reserve. (Photo: Ruth Prescott)



John Rogers using a French (SPOT-1) satellite image of the Cape Peninsula above the northern edge of Noordhoek Beach, uphill from Monkey Valley Resort. (Photo: Ruth Prescott)

Geoheritage

John Rogers pointing out a NW–SE-striking, vertical, dark, deep-ocean mudstone of the Malmesbury Group's Tygerberg Formation, deposited in the Adamastor Ocean about 560 million years ago, overlain by a sandy turbidite. Three Anchor Bay in Sea Point. (Photo: Ruth Prescott)

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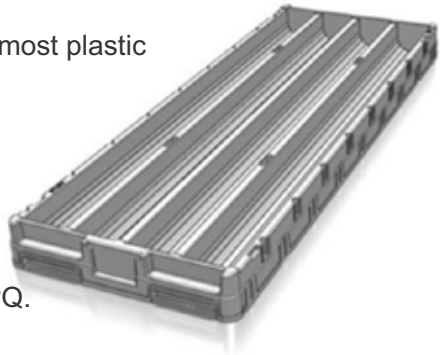

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mineral scene

Rhodochrosite

This Mineral Scene is partly extracted from Cairncross and Beukes (2013)[1]

Rhodochrosite ($Mn^{2+}CO_3$) is one of the most highly desired mineral species amongst collectors and museum curators. Its blood red colour is striking and few localities are as well-known as the Kalahari manganese field for producing world-class rhodochrosite crystals.

The mineral that made the Kalahari Manganese Field world famous was rhodochrosite. This mineral was originally discovered in the Hotazel opencast mine in 1963 and the first specimens were generally not spectacular and consisted mainly of drusy rhodochrosite associated with gypsum. Then, 10 years later, the major discovery of rhodochrosite was made while N'Chwaning I mine was being opened, when a wide variety of the different colours and habits of spectacular specimens was encountered. Apart from its colour variations, which range from wine-red to pale-pink, the rhodochrosite occurs in a variety of shapes and sizes, from 'dog-tooth' (scalenohedral) varieties to smooth spheres and 'wheat-sheaf' bundles of crystals. The tales of these specimens being discovered in the mine are legendary, and many fortunes were made (and lost) from dealing in this particular mineral. The shaft of N'Chwaning I mine penetrated directly into vugs containing crystals, and hundreds of loose crystals were swept away off the floor at that time.

Truly exceptional, undamaged rhodochrosites are not that common, particularly the scalenohedral form, whose terminations cleave off very easily. Some gem-quality material has been faceted. Most of the high-quality rhodochrosite came from N'Chwaning I mine. Specimens from Hotazel and N'Chwaning I mines typically occur with manganite,

A group of transparent, bright red rhodochrosite crystals. 9.5 cm, N'Chwaning I mine, Kalahari manganese field. (Specimen: Sacco collection, photo: Bruce Cairncross ©)

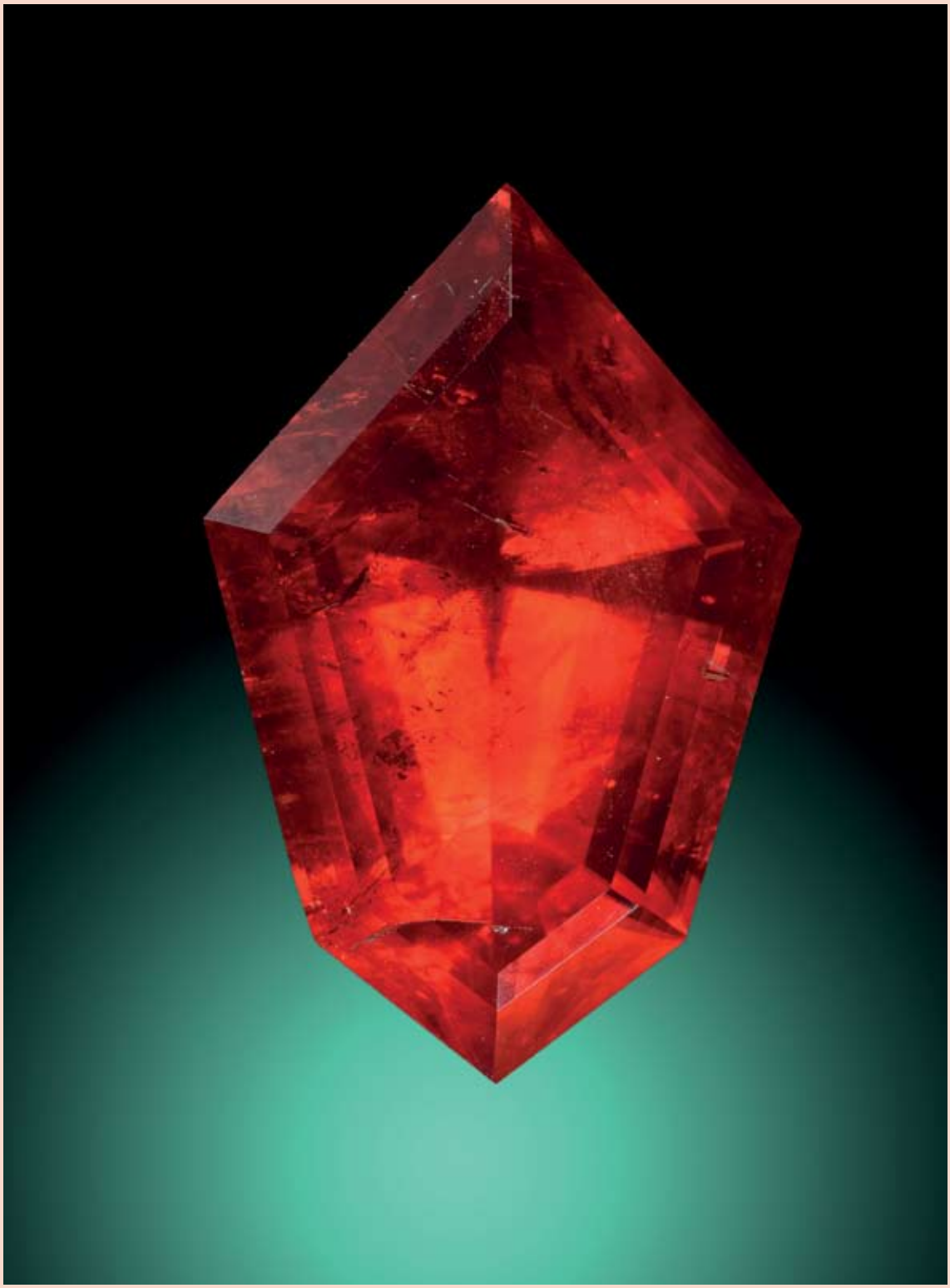
Three scalenohedral ('dog's tooth') rhodochrosite crystals, back-lit to show the gem quality of the crystals. 4 cm, N'Chwaning I mine, Kalahari manganese field. (Specimen: Sacco collection, photo: Bruce Cairncross ©)

Rare, pink spherical rhodochrosite on black manganite. 10 cm, N'Chwaning I mine, Kalahari manganese field. (Specimen: Sacco collection, photo: Bruce Cairncross ©)

Unusual vermiform crystals on manganite. Field of view is 5 cm. (Specimen and photo: Bruce Cairncross ©)

gypsum, todorokite, chalcedony and drusy quartz. Drusy pink rhodochrosite was the most common mineral associated with specimens found in 2006 at N'Chwaning I mine, together with shigaite. Most have drusy, pale-pink to pink interlocking rhodochrosite crystals, one to three millimetres long. Some specimens have translucent pink crystals up to one centimetre or slightly longer, but these tend to be isolated on the drusy matrix. One variation of the pink rhodochrosite is thin, prismatic needle-like crystals up to two centimetres, which are intergrown with each

A radiating cluster of rhodochrosite with flat, pinacoidal terminations, overgrown on earlier-formed scalenohedral crystals. 9.1 cm, N'Chwaning I mine, Kalahari manganese field. (Specimen: Sacco collection, photo: Bruce Cairncross ©)



A 24.24 carat faceted rhodochrosite. (Specimen and photo: Bruce Cairncross ©)

other. These crystals are transparent, pale-red and bicoloured, almost always with a darker, red-brown colour at the termination of the crystals.

Bruce Cairncross
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brucec@uj.ac.za

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1. Cairncross, B. and Beukes, N.J. (2013). The Kalahari Manganese Field: the adventure continues. Random House Struik Publishers, Cape Town, 384 pages.

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obituary

Ian K. McMillan †

Ian K. McMillan
8 March 1951 to 30 May 2023

Ian McMillan was born in 1951 in Kingston-upon-Thames near London and attended Surbiton County Grammar School. He first studied foraminifera in 1972, while at the Portsmouth Polytechnic, and he completed an MSc Thesis entitled 'Recent and Relict Foraminifera from the Agulhas Bank, South African Continental Margin' at the University College of Wales (Aberystwyth) in 1974. In 1987, he was awarded a PhD, also from the University College of Wales (Aberystwyth), entitled 'Late Quaternary Foraminifera from the southern part of offshore South-West Africa/Namibia'.

He worked at Soekor (now PetroSA) as a foraminiferal biostratigrapher from 1972 to 1992 and then at De Beers Marine from 1993 to 2003, subsequently working as a consultant. He advised on 10 micropalaeontological theses at Honours, MSc and PhD levels. Geographically, he worked on micropalaeontological projects in Sierra Leone, Angola, Namibia, South Africa, Cameroon, Argentina and Tanzania. Over the years he studied the microfossils of about 250 boreholes, most being thousands of metres long, as well as 4000 seafloor samples, mostly off South Africa.

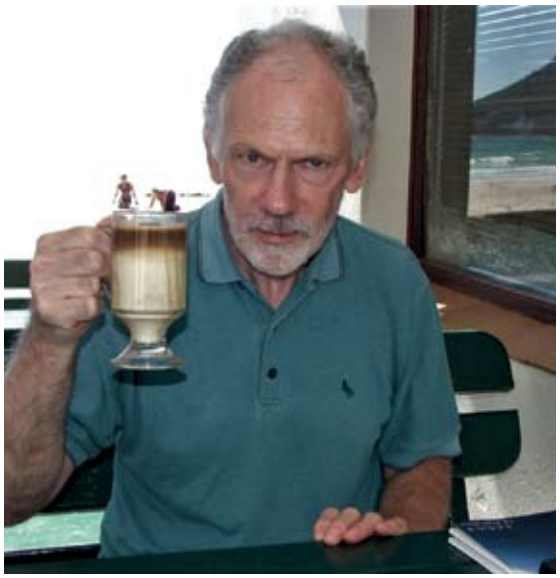
He published about 50 articles and papers on foraminifera, also mostly off South Africa. For most of his career, Ian McMillan was the only micropalaeontologist working and publishing in South Africa on foraminifera, especially benthic (bottom-dwelling) foraminifera, and he thus made a major contribution to the understanding of the geological history of South Africa's Jurassic, Cretaceous, Tertiary and Quaternary marine sediments, mainly deeply buried under the continental margin and therefore inaccessible, except to the very expensive drilling platforms

Ian delighted with his Draper Medal in his home in Fish Hoek. (Photo: John Rogers)

of the petroleum industry, particularly those contracted by Soekor.

At Soekor, all the computerised basin modelling evaluation for prospects relied on Ian McMillan's meticulous stratigraphic scrolls, in particular the near-surface geology that comprised more than half the critical time-period for oil generation and migration. That work showed that most of the oil was generated long before the structures were formed as at present because of intervening basin tilting. His detailed correlations from the borehole data enhanced and confirmed the existing seismic sequences and stratigraphic correlations between these boreholes interpreted from seismic reflection sections. This was vital for, *inter alia*, successful appraisal drilling after the discovery borehole.

A Soekor colleague: "*Ons sal vir Ian lank onthou, veral sy mooi saggeaarde persoonlikheid en sy diepgaande kennis wat soveel respek by ons almal afgedwing het. Dit was n'voorreg om hom te ken en*



Ian enjoying a smoothie at the Galley Restaurant beside Fish Hoek Beach. In the background is a personal trainer on the beach. His booklet, On the Beach, on the micropalaeontology of sediments in the Saldanha Bay region, lies beside his left hand. (Photo: John Rogers)

saam met hom te werk. Ons eer sy nagedagtenis." (*We shall long remember Ian, both for his lovely gentle-natured personality and his profound knowledge which commanded so much respect from us all. It was a privilege to know him and to work with him. We honour his memory.)*

De Beers Marine was extremely fortunate when Ian McMillan joined the Cape Town-based team to establish the "Rock Lab". Ian proved to be a brilliant educator and mentor who delighted in sharing his knowledge and expertise. Some 4400 micropalaeontological samples were processed by the lab team prior to its closure in ca. 2002—a phenomenal contribution, not only to the company but to science as well. His work laid the foundation for the lithostratigraphic framework which, to this day, underpins the geological model for diamonds offshore of southern Africa.

Supported by his encyclopaedic knowledge of foraminifera and African basins, Ian's micropalaeontological insights led to many fascinating conversations which, sadly, will be sorely missed. Aware that the impact of Parkinson's was growing, Ian set about compiling a monograph on Eocene Foraminifera of the South Atlantic, much of which was based on his work at De Beers Marine. He considered it to be one of his most important contributions to his science.

Ian worked at the Iziko South African Museum on their foraminifera collection and database. From his work on the Mesozoic basins and Cenozoic deposits, he contributed ~2,000 foraminifera specimens to the micropalaeontology collection. He was listed as one of the Honorary Associates of the Museum during that time.

Ian worked at Cardiff University, UK, for several years in the 2000s. At that time, he joined a team researching the Cretaceous and Cenozoic marine rocks in southern Tanzania and participated in several extended field seasons in the Ruvuma and Mandawa Basins. The succession there is remarkable for its superb microfossil and biomarker preservation, making it a first-class place to study the climate history of the tropics. It is, however, quite poorly exposed in most places and rather weathered at the surface. The work involved geological mapping of large areas of bush and targeted coring of sediments to extract palaeoclimate records.

Ian's unparalleled expertise in micropalaeontology, especially of benthic foraminifera, was crucial for deciphering the stratigraphy and structure. The trick was to distinguish one type of weathered greenish-grey clay from another, as most of what passes for outcrop there consists of anonymous roadside ruts in which the Cretaceous, Palaeogene and Neogene clays are almost indistinguishable to look at. Ian also took his turn supervising field operations at the drill sites and was directing the rig when he first recovered the Palaeocene—Eocene transition near the village of Mkazambo in the Kilwa District. This site proved hugely important for subsequent research and resulted in many publications. The site remains the key record through the Paleocene—Eocene Thermal maximum in the tropics, with climate proxies recording sea surface temperatures of about 40 °C. The Turonian nannofossil *Truncatoscaphus macmillanii* was named in his honour for this work.

Prof. Kevin Burke referred to Dr Ian McMillan as "the unsung hero of South African geology".

This situation was addressed in 2014, when he was awarded the Draper Memorial Medal of the Geological Society of South Africa.

The geological community of South Africa and the world is enriched by his monumental body of detailed work on foraminifera and what they tell us.

Ian died in Fish Hoek on 30 May 2023, at the age of 72, after a long struggle with Parkinson's Disease. Ian leaves a brother, John, a retired astrophysicist, living in the Lake District of England.

Compiled by ***John McMillan, George Smith, Chris Davies, Malcolm Wood, De Ville Wickens, Ian Corbett, Eugene Bergh, Paul Pearson*** *and* ***John Rogers***

obituary

Johannes Leopold Bosch †

Johannes Leopold Bosch
12 April 1939 to 20 February 2023

It is with great sorrow that we have to notify members of the GSSA of the passing of Leopold Bosch on 20 February 20 2023. Leopold was the first professional manager of the GSSA, serving in that capacity from 2003 to 2009. Up to that point, the day-to-day operation of the Society was handled by volunteers, but this had become too onerous as the membership numbers grew and the range of activities expanded. Leopold took on the challenge, and defined the executive manager role that has not changed significantly since then. The senior GSSA employee needs to be a professional geologist—preferably highly regarded and networked in the southern African region. Leopold filled this role very successfully and became the face of the Society during his time as manager. The officers of the Society under which Leopold served are grateful for his assistance and guidance.

Leopold graduated from Florida Hoërskool in 1956 and attended Potchefstroom University until 1963. During his time there he completed a BSc in geology and chemistry, a BSc Honours, and an MSc thesis on the petrology of various kimberlite occurrences in the Barkly West area. On graduation he took employment as a geologist with the Federale Volksbeleggings Beperk, working on a number of projects, including Northern Cape kimberlites, kaolin in the Western Cape, refractory minerals in the Northwest Province and Botswana, the Bushveld Complex and Klein Aub, Namibia. In 1965 he joined Corner House Laboratories, a division of Rand Mines. The work was focused on mineralogy, including Wits gold, PGMs in the Bushveld, and REE in northern Mozambique. From 1968 to 1983, he was employed by the Industrial Development Corporation in a number of roles, including Manager Minerals Development, Senior Manager Information Systems and Deputy General

☞

Manager responsible for information systems and internal accounts. His work at the IDC exposed him to Richards Bay heavy minerals, Cu deposits in Natal, and coal projects in Mpumalanga. He took early retirement from the IDC in 1995. From 1997 he consulted for Thabex Exploration, focused on alluvial diamonds and base metals. He was a director on several Thabex subsidiaries. Leopold joined the GSSA in 2003 as the executive manager, retiring from that post in 2009.

Leopold's career path is instructive, in covering a wide range of commodities across a number of organisational structures, and in a variety of roles. This is the type of wide-ranging experience that a young professional today should strive to attain. The days of joining a company on graduation in the expectation of employment for life are long gone. As a geologist, you will change career directions many times, as Leopold has done.

Leopold leaves a solid legacy at the GSSA, having developed a number of practices and processes for governing the Society. He was also the 'corporate memory' of the GSSA; his recollections were usually more realistic than any set of minutes—and we relied on that many times after his retirement. He was an early proponent of Geoheritage and South Africa's mining history. His aid in the development of the Directorate of Professional Programs was instrumental in the establishment of the now extensive GSSA meetings calendar.

He was a well-liked manager of the staff. He had an engaging personality, kind disposition, and a great sense of humour.

Leopold Bosch will be missed. He is survived by his wife Hettie, son Christian, daughters Annalie (Roux) and Helène (Toerien), and six grandchildren. The GSSA sends condolences to the family.

Craig Smith

obituary

Robert Victor (Bobby) Danchin †

Robert Victor (Bobby) Danchin
6 January 1942 to 28 May 2023

Bobby Danchin, a renowned member of the South African and Australian Geological communities, has died at his home in Melbourne, Australia on 28 May 2023. Bobby's career covered a wide spectrum of geological achievements. He started as an academic, progressed into industry research, moved on to diamond exploration, and ended up in the boardroom of a major mining company.

Bobby was born in Johannesburg in 1942 and matriculated from Parktown Boys High in 1958. He earned a BSc in Geology and Chemistry from the University of Witwatersrand in 1963 and then moved to the University of Cape Town to complete an Honours degree (1964), MSc degree (1967) and PhD (1970). He remained at UCT in research and teaching roles under the auspices of Louis Ahrens and Tony Erlank until 1970, working in the

Sedimentary Geochemistry Research unit and the Lunar Sample Research Group.

In 1971 he moved to industry, joining Anglo American Research Laboratories (AARL) in Johannesburg as a Research Geochemist, where he developed his interests in kimberlite geology. In 1976, he spent a year at the Carnegie Institute in Washington and was exposed to the then relatively new analytical tool, the electron microprobe. In the following year, he returned to Johannesburg where he was appointed head of the Geology Laboratory in AARL. Bobby was a dedicated scientist, often at the cutting edge, including the use of electron microprobes to assess chemical signatures of mantle-derived minerals and the development of ilmenite and spinel chemistry as diamond indicators. His achievements include 28 publications in scientific journals, mostly on kimberlite and upper mantle geochemistry.

By the late 1980s, the kimberlite and diamond unit that he initiated was the largest and most productive support laboratory in the world.

Bobby maintained strong working connections with academia and industry research throughout his career, often bringing rewarding outcomes. His long-time friend, Professor Stephen Haggerty of the University of Massachusetts, cites one memorable collaboration period in mid- to late 1977, where sample collections led to 12 advanced student degrees, 42 papers and the description of two new minerals (*lindsleyite* and *mathaisite*).

In 1981, he was appointed Chief Geologist of the Research and Technical Services Division of Stockdale Prospecting Ltd, the Australian exploration arm of De Beers, and moved to Melbourne. In 1988, he became Exploration Manager of Stockdale Prospecting, overseeing exploration throughout Australia and Asia for the De Beers Group.

In 1996, Bobby returned to Johannesburg to replace his mentor, Barry Hawthorne, as Deputy Technical Director (Geology). In addition, he was appointed as Chairman, New Mining Business, for Anglo American. In 1997 he was appointed CEO of the Exploration and Acquisitions Division for Anglo American plc and an executive director of Anglo-American Corporation of South Africa.

During this time (1996–2002) Bobby established an international team and led the diversification of Anglo's exploration and acquisition activities into geographies as varied as the Arctic tundra of Finland and Canada, the jungles of central Africa and Brazil, and the challenging extremes of Patagonia, Namibia, Iran and the Andes. Along with these environments, he established skilled multidisciplinary teams in ore deposit types as varied as nickel sulphides, porphyry coppers and epithermal gold, IOCGs, and oxide and sulphide zinc. His teams were instrumental in several major discoveries, project expansions and new acquisitions. His greatest legacy was leaving in place a diverse active and dedicated exploration and geosciences community.

Bobby retired on 31 December 2002, and returned to live in Australia. In retirement, he remained active as a senior advisor to Anglo, as well as holding numerous directorships of mining and exploration companies in Australia, the UK, and Africa including Cluff Gold, Cluff Natural Resources, GMA Resources, Diamond Mines Australia, Gravity Diamonds and Mineral Deposits Ltd. He also sat on several committees of professional organisations and government advisory bodies.

Bobby was well liked and respected by colleagues and formed strong friendships throughout his career. He was extremely supportive of his staff, and they have commented on the mentoring and development roles he played in their careers. He had a special ability to lead, inspire and develop teams. Wherever he worked he created a work culture that empowered and encouraged people. He directed and guided and then wholeheartedly supported the decisions they made. He was outgoing and sociable and had a well-honed sense

of humour that endeared him to many. This was a great asset in his management of and collaboration with people. With his brilliant analytical skills, ability to get to the point of the issue and constructively move forward, this made him a pleasure to work with.

He was an inspiration to many.

He is survived by his wife Gayle, his three children and six grandchildren.

The GSSA sends its condolences to the family.

*Compiled by **Craig Smith** and **Joe Joyce** (with input from Steve Haggerty, Dave Apter, Bruce Wyatt, Owen Garvey, Barbara Scott-Smith, Paddy Lawless, John Bristow, Owen Bavinton and Bobby!)*

REQUEST FOR APPLICATIONS TO THE RESEARCH, EDUCATION AND INVESTMENT (REI) FUND OF THE GSSA CLOSURE DATE FOR APPLICATIONS: 31 JANUARY 2024

The GSSA Research, Education and Investment Fund (REI Fund) is inviting applications from GSSA paid up-members (including post-graduate student members) for grants from the Fund, to be received at the GSSA office not later than 31 January 2024. Applications can be made using the prescribed application form available under Publications/GSSA Documentation on the GSSA website (www.gssa.org.za) or see the link below for the online form. Supporting information required with each application includes a short description of the project, brief motivation for research and funding requested, a budget describing how funds will be used, and a letter of support from research supervisor (in cases where the applicants are post-graduate students at South African universities). Post-graduate student members applying for financial support must have been a member of the Society for at least one year. Applications from current student members with a PhD qualification are not accepted unless the applicant has applied for transfer to or is registered as a full paid-up member of the Society.

https://www.cognitoforms.com/GeologicalSocietyOfSouthAfrica/researcheducationandinvestmentfund

Grants are intended to support a variety of earth science research costs, including analytical and field costs, conference attendance, and publication costs. Projects that promote and support earth science awareness such as geoheritage, geotourism and geo-education may also be supported. Expenses related to (annual) registration and tuition fees, text books, accommodation, etc. required at Higher Education Institutions are not covered. Members enrolled at non-South African universities are not eligible to apply for financial support.

In particular we welcome applications from post-graduate student members and would appreciate it if Heads of Departments at Higher Education Institutions and their staff would inform their students of this opportunity. Grants are usually limited to R25 000 per application, but well-motivated applications for larger amounts are also welcome. All applications will be judged on merit and/or the importance to the Society in promoting its image. Note that grants are only awarded to members/student members in good standing.

Applications are screened by the REI Fund Committee during February/March with input and ratification by the GSSA Management Committee and Council, respectively. In evaluating the applications and recommendations, the Committee considers the merit of each application, and depending on the amount of money available for that year, makes a final decision on the allocation of grants for that year. The decision of the Committee is final and no further correspondence on the matter will be entertained. By following this procedure it is anticipated that applicants will be informed during March 2024 whether or not their applications are successful. Recommendations made by the Committee require Council approval, which may delay notifications.

The current members of the REI Fund Committee are: Reinie Meyer (Chairman), Frank Gregory, Bertus Smith, Rob Ingram, Derek Kyle, Steve McCourt, Richard Viljoen, Mike Wilson, Grant Bybee and two office bearers of the Society who have ex officio status, namely the President (Dr Steve McCourt) and the Executive Manager (Craig Smith).

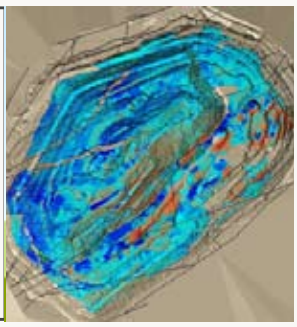
GSSA events 2023

26 & 27 SEPTEMBER 2023
ONLINE
DATA ANALYTICS & MACHINE LEARNING
SPEAKER - GLEN NWAILA

https://www.gssa.org.za/uploads/newsletters/Events/Data_Analytics_26_&_27_September_2023.pdf

3 OCTOBER 2023
ONLINE
3D GEOLOGICAL MODELLING
SPEAKER - IAN BASSON

https://www.gssa.org.za/uploads/newsletters/Events/3D_GEOMODELLING_3_October_2023.pdf



24 & 25 OCTOBER 2023
ONLINE
MINERALS RESOURCES & MINERAL ECONOMICS

https://www.gssa.org.za/uploads/newsletters/Events/Mineral_Resources_and_Mineral_Economics_.pdf

15 & 16 NOVEMBER 2023
JHB COUNTRY CLUB - AUCKLAND PARK
AFRICAN EXPLORATION SHOWCASE

https://www.gssa.org.za/uploads/newsletters/Events/African_Exploration_&_Technology_Showcase.pdf

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Down Hole Survey cc

The John J. Gurney Postgraduate Research Scholarship at the University of Cape Town

A competitively awarded scholarship, in honour of the late Prof. John J. Gurney, is being offered to support postgraduate research on some aspect of the geology of kimberlites, diamonds or the deep lithosphere (mantle and/or lower crust) at the University of Cape Town. The scholarship provides ZAR150 000 (South African Rand) to cover living expenses, plus an additional ZAR50 000 toward research-related expenses (this can include tuition fees, which range from ZAR30 000-40 000 per year) for a total of ZAR 200 000 per year. The maximum terms of the scholarship are two years for the MSc or three years for the PhD. Continuation of funding after the first year is contingent upon satisfactory progress. The recipient must have a primary supervisor who is a UCT academic staff member, but co-supervision by academic or industry scientists from other institutions is possible, as are joint degrees with other universities. Postgraduate study in the Department of Geological Sciences is by dissertation only, although the recipient will have the option to undertake coursework if deemed necessary. The primary supervisor need not necessarily be in the Department of Geological Sciences.

Applicants of any nationality are eligible. Candidates must provide: (1) a short CV providing the applicant's educational and relevant professional background and list of publications (if any), (2) transcripts of undergraduate and any postgraduate coursework/degrees (electronic copies must be provided, they need not be certified at this stage), (3) names and contact details of two appropriate referees familiar with the applicant's work and ability, and (4) a short proposal (two pages maximum) outlining the candidate's chosen research problem, the approach s/he intends to use to address it, and the names of the supervisor(s) with whom s/he intends to work. Applicants will be ranked on the basis of academic excellence, strength of recommendation letters and the feasibility and quality of the research proposal. In the case of multiple similarly ranked top candidates, residents of SADC countries will have preference.
Awardees who are non-South African residents will need to obtain a study permit from the South African Department of Home Affairs.

The University of Cape Town has a world-famous collection of upper mantle research specimens (mantle and lower crustal xenoliths, kimberlites, megacrysts, etc.), as well as a wide range of analytical instrumentation (electron microscopy and EPMA instruments, XRF, XRD, solution and laser ablation quadrupole and multicollector ICP-MS and a stable isotope laboratory with laser fluorination). Academic staff members in Geological Sciences cover a wide range of relevant fields (geophysics, sedimentology, lithospheric dynamics, isotope geochemistry, kimberlite and mantle geology, petrology and geochemistry, metamorphic petrology and mineralogy, please see the department website: http://www.geology.uct.ac.za). It is recommended that, prior to applying, prospective applicants contact UCT academic staff member(s) with whom they would be interested in working.

The application deadline is October 31, 2023, with notification of the outcome by early December. Please send all application materials as a single PDF document to Prof. Phil Janney (phil.janney@uct.ac.za). Evaluation of applications will be performed by a panel including UCT and international academics and industry scientists. The start date is flexible, but should be sometime in 2024 and no earlier than the start of the first semester at UCT in February.

Igneous and Metamorphic Studies Group Conference 2024

22-24 January - southern KwaZulu-Natal

Circular 1 - Call for expression of interest

IMSG 2024 will be held as a field conference in southern KZN. The conference venue is the Lake Eland Game Reserve near the spectacular Oribi Gorge. For more detailed information on the location please visit **www.lakeeland.co.za**.

IMSG presents a platform for postgraduate students at all levels as well as established researchers to present their work in an informal setting that emphasizes discussion and networking. In addition to our traditional topics on petrology and geochemistry we welcome contributions on structural and tectonic aspects of igneous and metamorphic rocks. The conference will also present an opportunity to visit igneous and high-grade metamorphic rocks of the Mesoproterozoic Natal Belt.

Since our last IMSG conference in 2019 a new generation of students and new staff have joined our community. **Please pass on this advert to all interested colleagues and students who might not have participated in previous IMSG meetings.**

IMSG does not charge conference fees, but accommodation, food and drinks are for the participants' own accounts (more on that in the second circular later this year). We do hope, though, to attract sufficient sponsorship to fund specific events such as the conference dinner and the icebreaker.

The accommodation at Lake Eland Game Reserve offers choices ranging from camping to fully equipped self-catering chalets sleeping between 2 and 5 people. In order to set aside enough space for IMSG participants we require some information about the approximate number of participants and their most likely accommodation requirements. Please **follow this LINK** and submit your **expression of interest before the 31 July 2023.**

AT THIS POINT THIS IS NOT A BINDING RESERVATION.

Further circulars for registration, with more information on accommodation and catering, and for abstract submission will follow later this year.

Enquiries: Saumitra Misra: email: misras@ukzn.ac.za

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rates card 2023 incl VAT

1. ADVERTISING RATES (Incl. VAT & Agency Commission)

Geobulletin is published by the Geological Society of South Africa (GSSA) and appears quarterly during March, June, September and December each year in digital and print format.

	Per editionl 1-3 inserts	Per editionl 4 Inserts
Colour		
Full Pg F/C	R6 250.00	R5 500.00
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March issue:	15 February 2023
June issue:	15 May 2023
September issue:	15 August 2023
December issue:	15 November 2023

5. CANCELLATIONS

At least 4 weeks prior to deadline

6. CIRCULATION

Geobulletin is issued in digital format to all members of the GSSA and its local and overseas exchange partners. A printed option is also available for those who opt for it, and the electronic version is available as an open access download on the GSSA website.

7. ADVERTISING BOOKINGS AND SUBMISSION

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8. ADDITIONAL CONTACT INFORMATION

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2023

12TH INTERNATIONAL KIMBERLITE CONFERENCE

12 IKC

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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