the Geode
the Geode

MINSA
Mineralogical Association of South Africa
A division of the GSSA

Is Mineralogy Dying?
(as a taught subject in geosciences?)

What is efflorescence?

Scientist for a day @Wits!

SADiLaR geoscience in African languages

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The GEODE

Minsa Newsletter
Volume 12
No. 2
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2025

MINSA
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website: www.gssa.org.za/Minsa
e-mail: Minsa@gssa.org.za

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NEWSLETTER
Volume 12 No. 2
June 2025

Contents

Next issue theme: GeoCongress 2025. **See also advert pg. 8.**

The Editor's Site

Greetings from Minsa from the not-quite-literal-eve of Geocongress, writing this in June from Makhanda, where the vibrations from Bloemfontein, the host city of Geocongress 2025, are almost palpable. So much to do; exams to mark, talks to prepare, authors to inform, and I'm not even on the organisational committee (just a lowly session convenor). Looking forward to it, though, and mineralogically-themed and Minsa-connected sessions are duly highlighted again in this issue.

The Editor answers the call of the motherland. After a cheap preflight haircut.

Elsewhere in this issue, we Meet a Mineralogist, Dr Elizaveta Kovaleva of UKZN, and her zircons. We also see some of what Minsa committee members have been up to this past quarter, including participating in an Open Day at University of Pretoria, and a national conference in Canada, whilst socialising with retired mineralogists and petrologists for leisure, as well. Our feature articles in this issue examine the state of mineralogy teaching in universities, mainly in the form of a broad contextual overview, and an account of revised current practice from the University of Pretoria. Is mineralogy dying as a taught subject, and should we be looking in new directions? (Maybe, and yes, are my answers; see inside for more). We will likely revisit this theme of "what is a mineralogist" later this year, and your opinions are also invited. We wrap up with a note on efflorescence, and Bruce Cairncross takes us further in that direction with a short article and photo essay on ettringites from the Kalahari Manganese Field, South Africa.

On that note, bye for now!

Steve Prevec

Chair's Column

Welcome to our second issue of Volume 12 of the Geode, "Is Mineralogy Dying?", with several articles speaking to this title in this issue.

I believe that it's more of a transformation than an extinction. There is no doubt that mineralogy remains a foundational science.

The key challenge will be to make sure that as we adapt to new technologies and broader interests, the fundamental, indispensable knowledge of mineralogy isn't lost. For more perspectives on the topic, read on, and please do send us your viewpoints for sharing in a future issue of the Geode.

To those of you who have paid their annual subscriptions, THANK YOU. We will be circulating another round of invoices and urge members who have not yet paid to step up and do so. Consider this: Your R230 annual subscription delivers incredible value, giving you the priceless Geodes at less than R60 an issue, plus all the other advantages of being a Minsa member (see our new sign up form in this issue). Perhaps as a small token of your appreciation, you might consider volunteering as a mentor? The simple steps to do so are outlined later.

Coincidentally, this issue of the Geode appears in Youth Month. Minsa places a strong emphasis on seeking to recruit youth graduates and young professional members, as well as cultivating an appreciation of science, and mineralogy in particular, amongst families with school age children. Currently, many of your committee are busy coordinating activities for our inaugural event "Day as a Scientist@Wits"; check out our Youth & Development portfolio manager Bavisha's ad in this issue. The year ends with another family event, the Xth (yes! 10th !) iteration of the ever-popular "Night at the Museum".

In between, we have Geocongress 2025 and a panel discussion in October. It's not too late to register and catch the super-exciting presentations of the Applied Mineralogy Session on Wednesday 25th June 2025, or you could catch talks in either of the other sessions also involving Minserains as conveners:

- Petrogenesis and Metallogenesis of Layered Intrusions
- Bolides, Impacts and Shock Phenomena

On a personal note, my recent trip to Denmark did not favour my ambition to collect amber. Instead of storms needed to stir up the bottom sediments and dump the seaweed and entrained amber on the beach we targeted, the seas remained disappointingly and unusually flat and calm. I did however tick off another of my 'dividing line' tourist spots*. This was to stand between the waters of Skagerrak (extension of the North (Atlantic) Sea and the Kattegat (leading into the Baltic Sea). In the pic, taken at the northern tip of the Jutland peninsula outside the town of Skagen, the saline North Atlantic is to the left and less dense surface water from the Baltic is on the right. The dividing line between the two is clearly visible from this vantage point.

I send all our readers warm wishes for the remaining 6 months of 2025.

Remember, our AGM takes place in August; nomination forms will be sent out shortly and I urge all of you to consider participating in this procedure; in fact, in all our Minsa activities.

A collective engagement by all of us is the bedrock on which Minsa can continue to thrive, fostering a vibrant community and ensuring that mineralogy remains a dynamic and relevant discipline for generations to come.

Regards,
Petra Dinham

**A previous one was the Mid-Atlantic Ridge between the Eurasian Plate and the North American Plate near Keflavik International Airport, Reykjavik Iceland.*

Minsa News

GSSA Geocongress 2025

Sessions of Mineralogical Interest:

The following sessions have been proposed by Minsa Council members, and those of you with mineralogical research of relevance are invited to contribute.

Applied Mineralogy: Providing Practical Solutions to Research and Industry (Wednesday morning June 25)

Session convenor: Bertus Smith (University of Johannesburg)

This session aims to highlight the role applied mineralogy plays in solving problems in research and industry. These can include challenges related to geology, ore modelling, mineral processing, and environmental matters. In addition to case studies, submissions focusing on advanced methodologies in applied mineralogy are also welcome.

Petrogenesis and Metallogenesis of Layered Intrusions (Wednesday June 25)

Session convenors: Freddie Roelofse (Univ. of the Free State), Rais Latypov (Wits University) & Steve Prevec (Rhodes University)

This session will focus on advances in the field of layered intrusion research, looking not only at the petrogenesis of layered intrusions, but also the processes responsible for the formation of world-class ore deposits hosted within layered intrusions. The session chairs hope to receive a good mix of contributions from academics, students and practicing geologists and envisage a strong focus on the Bushveld Complex.

Bolides, Impacts and Shock Phenomena (Thursday morning, June 26)

Session convenor: Steve Prevec (Rhodes University)

Relevant topics to include (but not restricted to): Impact structures and their evolution (could include impact processes themselves, or post-impact geological histories) Solar system materials; meteorites, asteroids, nearby planets (sources of meteorites, among other things); what can they tell us about early Earth evolution? Catastrophism or punctuated uniformitarianism: impact structures and their global influences, including extinctions, climate change, ash distributions, etc. Shocked minerals: what do they prove, and how are they useful? Other impact phenomena: pseudotachylites, breccias, suevites, impact melts, shattercones, and what they can and cannot tell us about impacts. Primitive igneous materials associated with impact structures: evidence of mantle melts, crustal melts or meteorites, and what are the implications for impact processes? Impact structures as potential hosts or influences for economic mineralisation.

There are other sessions available, including for the mineralogically-inclined; More information is available on the conference website at https://geocongress2025.org.za/.

Minsa upcoming activities

- **A Day as a Scientist @ Wits!**, Wits Campus/ Origins Centre – 19 July 2025 (see also insert in this issue)
- **GSSA GeoCongress**: 24-27 June 2025, University of the Free State, Bloemfontein. See below for more.
- **SAIMM Geomet Conference**; 13-16 October 2025, Glenburn Lodge, Muldersdrift.
- **Panel discussion "The Future of Mineralogical Analysis using Automated Scanning Electron Microscopy in South Africa"**, SRK Head Office – 13 October 2025.

Minsa presents "A Day as a Scientist @Wits!"

Dear Members

Minsa is excited to invite you to "A Day as a Scientist @Wits", a hands-on science adventure for kids, families, and curious minds!

Date: Saturday, 19 July 2025

Time: 10:00–15:00

Venue: Starting at Origins Centre, Wits University

Cost: R100 per person (Digital Dome: R40 for kids / R70 for adults)

The event includes a day of interactive activities across the Origins Centre and several Wits departments. To attend, please visit the Webtickets link provided in the attached PDF poster. That link will allow you to purchase your general ticket for the full day's activities.

If you'd also like to attend one of the Digital Dome shows (space-themed experiences for kids, teens and adults), you'll need to purchase those separately on Webtickets, as they are not included in the general ticket price.

We hope to see you and your young scientists there!

Minsa on the move

Minsa on the move: UP Open Day

On Saturday 8th March, the Natural and Agricultural Sciences of the University of Pretoria had an open day for prospective students (grades 8 to 11) and their parents. Minsa participated to help draw attention to geology as a career but more specifically mineralogy.

The setup was very informal with questions being lobbied and answered. Of course, our banners were on display and stickers, pens and postcards were given away freely. Minsa caps and coasters were awarded as

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

origins centre

MINSA

Mineralogical Association of South Africa

A division of the GSSA

presents

A Day as a Scientist @Wits

A science adventure for the whole family!

Curious minds can learn about minerals and metals, explore fossils, get fired up about chemistry and journey through space and time - all in one day.

Activities are aimed at kids of primary school age, but there is something for everyone.

Date: Saturday, 19 July 2025

Time: 10:00 – 15:00

Venue: Start at Origins Centre, Wits University

Cost: R100 per person (Discounted family rate)

(Digital Dome tickets: R40 kids / R70 adults)

Queries: minsa@gssa.org.za

Space is limited. Click here to book now!

Activities include:

- Archaeology fun, ochre painting, scavenger hunts
- Neuroplasticity in Art & Science (11:00-12:00)
- Chemistry Demos
- Glow-in-the-dark rocks
- Digital Dome (separate ticket required). Book here
- ...AND MORE EXCITING ACTIVITIES TO BE ANNOUNCED!!

Announcement 1. Full programme to follow

prizes to students who could answer mineralogical questions posed by myself. About 65 students passed through the display.

The author would like to thank his rover scouts Ethan Rens and Bianca Nienabar for helping to setup the base. Bianca additionally provided photography.

Contributed by Igor Željko Tonžetić

Bjorn climbs the ladder

We at Minsa are pleased to announce that our committee member, Bjorn von der Heyden, PhD, should now be properly addressed at Professor von der Heyden, having been promoted (as of 2025) from Senior lecturer to Associate Professor at the university of Stellenbosch. Congratulations Bjorn! No longer do you have to respond to calls of "Is there a doctor in the house?" (Nobody ever calls for a professor).

Steve goes to GAC-MAC (Canada)

In May 2025, Steve Prevec journeyed to Ottawa, Canada, for the annual meeting of the Geological Association of Canada and Mineralogical Association of Canada (GAC-MAC), this year's meeting paired up with the IAH-CNC (International Association of Hydrogeologists - Canadian National Chapter), creating a phonetically unmanageable acronym of GAC-MAC-IAH-CNC. Steve is a long-standing member of GAC (since about 1984) and a more recent member of MAC, since he commenced service as coeditor of its flagship journal, the Canadian Mineralogist, now restyled as the Canadian Journal of Mineralogy and Petrology. In promotion of this latter service, it was deemed useful that the journal editors be a presence at the national meeting whenever possible, particularly given their physical absence from that continent otherwise (based as I am in South Africa, with my coeditorial colleague based in Taiwan). Accordingly, we (Greg Shellnutt, of the Taiwan Normal University, Taiwan, Steve Denyszyn of the Memorial University of Newfoundland, Canada, and Steve Prevec of Rhodes University, South Africa) co-convened a session at the conference entitled "**Layered mafic intrusions, associated magmatism and metallogenesis in anorogenic settings**".

Our proposal blurb read as follows: The emplacement of mafic and ultramafic magmas into the crust at anorogenic settings throughout geologic time has contributed to crustal growth, crustal recycling, and continental breakup. Anorogenic mafic rocks, such as those comprising layered mafic intrusions, also host most of the world's magmatic sulphide-hosted ore deposits of Ni, Cu, PGE, Cr and related metals, while associated granitoids host small but economically significant ore deposits (including critical metals). Large Igneous Provinces are also sites of significant ore-bearing intrusive suites, including layered intrusions and ferroan (A-type) granitoids. The roles of magma mixing and contamination, decompression, oxygen fugacity and immiscibility have all been critically re-examined in recent decades in these contexts. This session will focus on constraining the tectonomagmatic processes that contribute to the formation of intraplate rock suites, including but not limited to continental flood basalt provinces, related subvolcanic intrusions, A-type granites, and giant radiating mafic dyke swarms and their related metal ores. It is aimed at geochemists, petrologists, geologists, tectono-physicists and numerical modelers interested in the relationship between geodynamics, magma genesis and mineralization.

The session ran for a half day and featured a keynote presentation by James Mungall, Zhuo-sen Yao, Richard Ernst and Nico Kastek (given by James) entitled **Structural controls on chonolith formation**. Chonoliths, a theme which featured prominently in the Mungall-Ernst presentations at this meeting, are irregularly-shaped intrusions (i.e., not dykes, sills, stocks or laccoliths), and usually feature tube-shaped components (as seen in the Uitkomst intrusion in South Africa) as a prominent feature. It transpires that many mineralized mafic intrusions are associated with this geometry, which has newly recognized noteworthy implications.

Your correspondent presented a talk in this session entitled **Constraints on Fe-Ti-oxide ore formation in mafic-ultramafic intrusions**, by Prevec and Geoff Howarth, looking at the evidence for magnetitite layers from south west China and from the Bushveld. He also presented another talk, **Evidence for post-emplacement hydrochromatographic PGE mobility in the Merensky Reef, Bushveld Complex, South Africa,**

as a primary PGE concentration mechanism by Prevec, Savvas Largatzis, Will Brownscombe and Tobias Salge, in a thematic session commemorating the career of Mike Lesher (who was present). Mike was particularly instrumental in a lot of the work in the 1990s on komatiite-hosted sulphide ore deposits, among other things. Both of Steve's talks can be accurately described as "finishing on time'. Steve also participated in a day-long meeting of MAC Council preceding the scientific conference.

On the social-professional side, my visit also included a pre-conference dinner with famed mineralogist (and Minsa member) Louis Cabri. Louis, whose c.v. features a strong South African and Canadian pedigree and a plethora of PGE mineralogical research, among other things, is now retired from paid work, but still has lots to say on matters mineralogical (in print).

Dr Cabri enjoying retirement.

Post-conference, I met up at Eddie's Restaurant in Sudbury (Ontario) with mineral collectors and purveyors Ed and Ruth Debicki, who took up the calling after retirement from full and successful careers with Inco and the Ontario Ministry of Mines and Development, respectively. I also met up (also for purely social purposes) with retired petrologists Richard James (Laurentian University and Palaeoproterozoic layered intrusions) and Ed Pattison (Inco, and the ore-hosting Sudbury impact offset dykes). On a non-mineralogical note, I also made a short pilgrimage to the birthplace of the late Rick Danko, best known as principal bass player for "The Band", following on from "Ronnie and the Hawks" (with Ronnie Hawkins), and as Bob Dylan's backup band in the 1960's, around the time Bob famously and controversially went electric (just after the time depicted in the recent Dylan biopic, "A Complete Unknown", which I then saw on a plane on the way back to South Africa). I had recently discovered that Rick (as well as his bandmate Robbie Robertson) was born and raised less than an hour from my home in southern Ontario.

For the record (and not the LP kind), the trip involved 40 hours of actual flying, eight actual travel days (out of 16), 20 hours of driving (17 on the other side of the road), and 5 days of antibiotics. All for mineralogy.

Contributed by S. Prevec

The SADiLaR initiative

Amagama ayasichaza, ayasicacisa, kwaye, ngamanye amaxesha, asebenzela ukusilawula okanye ukusahlula.

Words define us, they explain us, and, on occasion, they serve to control or isolate us.

From "The dictionary of lost words" by Pip Williams (translation into isiXhosa courtesy of Sinelethu Hashibi)

In many parts of the world, undergraduate enrolments into the Earth sciences, especially for the hard rock sub-discipline, is on the decline. To some extent, this decline may be attributed negative sentiments surrounding mining, with societal paradigms subscribing to the *NIMBY* (Not In My Backyard) and *BANANA* (Build Absolutely Nothing Anywhere Near Anyone) movements, often fuelled by social media narratives and influencers. Another possible reason for this decline is because we, as a community of practice, fail to adequately market ourselves and the importance of our discipline.

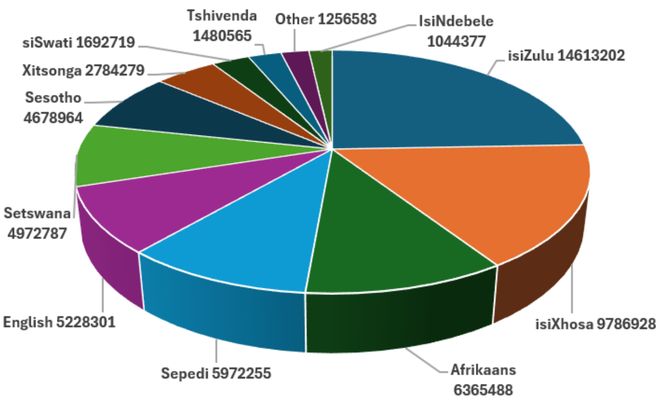


Figure 1: *The prevalence of South Africa's home languages (Data from Statistics South Africa's Cultural Dynamics in South Africa (2025), based on Census 2022 and accessed from https://southafrica-info.com/.*

Towards rectifying the latter, earth science outreach and education is starting to receive its much needed, and well-deserved attention. Most of these initiatives are currently pitched in English, a global language that enjoys some dominance in the local and international earth sciences. However, in a context of the relative prevalence of South Africa's twelve national languages, English is only the fifth most commonly spoken home language (after isiZulu, isiXhosa, Afrikaans and Sepedi; Figure 1). This begs the question; *"How effective can our outreach initiatives be if they are not being pitched to the youth of our country in their primary spoken language?"*

Towards enhancing future earth science outreach initiatives, specifically with a view towards attracting new and eager young talent into the discipline, it is imperative that the discipline make itself as accessible as possible to as wide a variety of people as possible. This accessibility and inclusivity will only be optimised by drawing on the power of language.

The **Mineralogical Association of South Africa (Minsa)** was successful in obtaining a grant from the **35th International Geology Congress (IGC) Legacy Fund**, which has enabled it to pursue a lexicography exercise aimed at collating geological, mineralogical and geomorphological terms in South Africa's eleven spoken national languages. The initiative started out as a grass-roots community engagement exercise in which the general geological community was encouraged to submit translations of common geological terminology (Figure 2). The effort rendered mixed results with a total of 161 translations submitted, though some of these translations conflicted between sources.

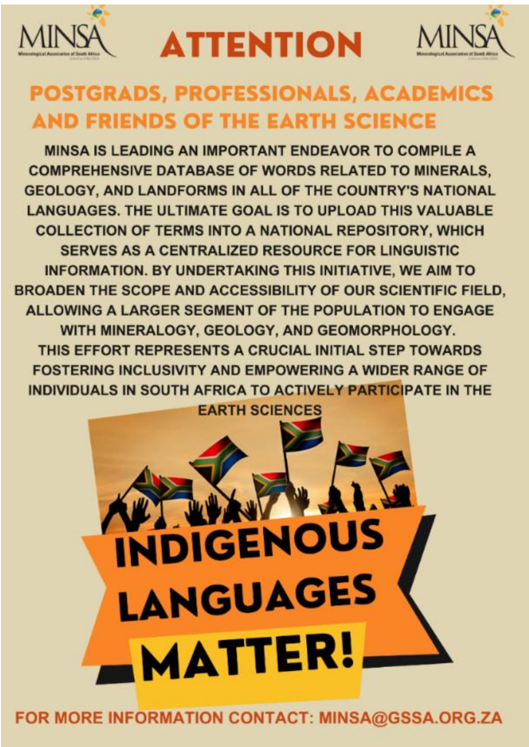


Figure 2: *A 2024 advert calling for community involvement in the lexicography initiative.*

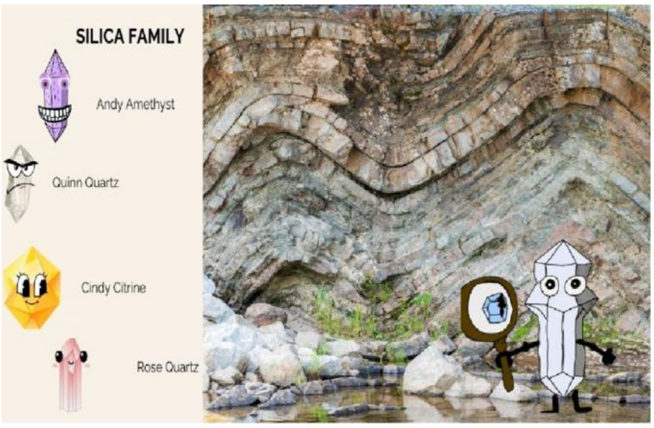


Figure 3: *Some rough ideas of where the collated word list may be useful in teaching and enthusing the next generation of South African earth scientists (image credit: J. Dykstra).*

To fast-track the process, Minsa enrolled professional help from the **Stellenbosch University Language Centre**. Currently we have a list of 182 geological terms that will be, as far as possible, translated into ten other languages. If fully successful, the result will be a list of >1800 geological terms collated into a repository that will be made publicly available for future outreach activities, teaching and learning interventions and general advertisement of the earth sciences (Figure 3).

Should you be interested in more details about the initiative, you are welcome to contact minsa@gssa.org.za.

Contributed by B. von der Heyden

Articles

Meet a Mineralogist

Elizaveta Kovaleva
Senior Lecturer
Department of Geological Sciences
University of KwaZulu-Natal
Durban, South Africa

Dr Elizaveta Kovaleva is a senior lecturer at the Department of Geological Sciences, University of KwaZulu-Natal, South Africa, an Alexander von Humboldt scholar (Germany), Russian Science Foundation scholar (Russia), National Research Foundation scholar (South Africa), holding a Y scientific rating from the National Research Foundation of South Africa.

She completed an MSc with distinction at the Department of Petrology, Lomonosov Moscow State University, Russia, and a Ph.D. at the Department of Lithospheric Research, University of Vienna, Austria. She was a Postdoctoral Fellow at the Department of Geology at the University of the Free State (UFS), South Africa, and later served as a Senior Lecturer in the same department before moving to the lecturing position at the University of the Western Cape (UWC) in Cape Town, which she combined with the Alexander von Humboldt scholarship in GFZ-Potsdam. From 2025, she has been a Senior Lecturer at UKZN.

What is your favourite mineral and why?

My absolute favourite mineral is zircon – zirconium silicate, $ZrSiO_4$. Not only is it very common on Earth in all types of crustal and mantle rocks, but we also find it in rocks from the Moon, Mars, and even some meteorites. So this simple mineral is truly a citizen of our Solar System.

Zircon is so valuable for geoscientists because it is able to record a whole bunch of crucial geological information: the time of its crystallization, the geochemical environment of crystallization (e.g., MINSA

Mineralogical Association of South Africa

A division of the GSSA

Scan the QR code to become a member

Who We Are

The Mineralogical Association of South Africa (MINSA) was founded in 1979 to foster collaboration and knowledge exchange within South Africa's mineralogical community.

MINSA is a specialist division of the Geological Society of South Africa (GSSA) and an affiliate of the International Mineralogical Association (IMA).

We organise a range of events and initiatives, from informal topical talks to major international conferences to promote cutting-edge science, practical engagement, and a vibrant community spirit.

Why Join MINSA?

- Connect with professionals in mineralogy, geochemistry & petrology
- Attend expert talks and field trips, often free
- Enjoy discounted rates for MINSA events
- Receive a quarterly newsletter, The Geode
- Join family-friendly activities that inspire future scientists
- Be part of shaping the mineralogical community

Join us and help advance mineral sciences in South Africa.

For more information please contact: minsa@gssa.org.za.

Minsa Mentors Wanted!

Hey Minsa members,

Ever had someone give you a helpful nudge in your career? (or wish you had?) Now's you chance to be helpful – without the heavy lifting!

We're looking for friendly, experienced professionals to share insights, answer questions, and offer guidance to the next generation of geologists and mineralogists. No formal commitment, no rigid structure – just a chance to pass on some wisdom when it suits you.

Think of it as career chats over coffee, a quick email now and then, or a LinkedIn connection that makes a difference.

Interested?

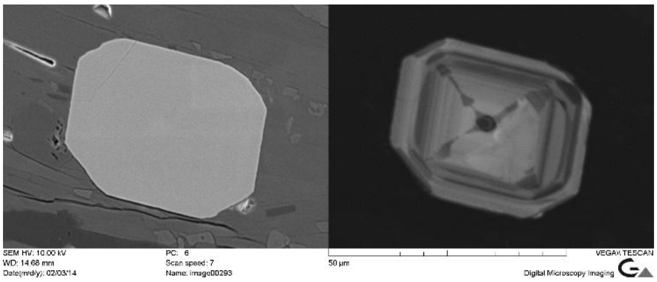
Let us know at minsa@gssa.org.za and we'll add you to our informal mentor pool.

- No long-term commitment
- Flexible & casual mentoring
- Help shape the future of our industry

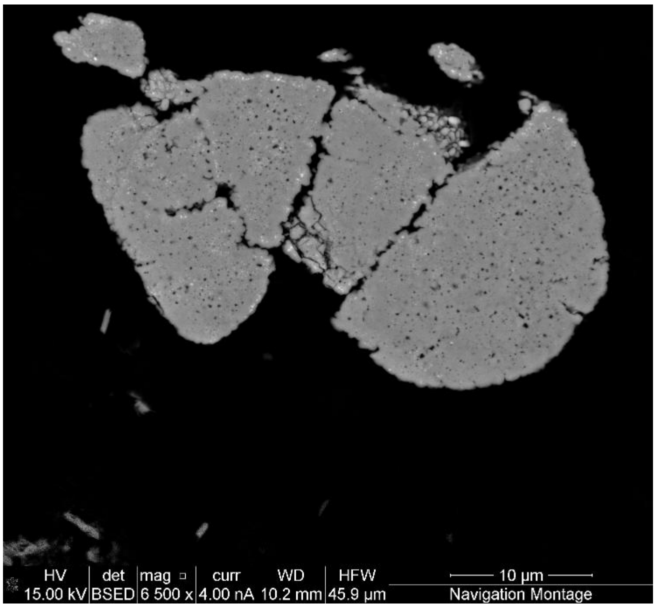
Because sometimes, all it takes is a bit of guidance from someone who's been there.

composition of the parent melt), the temperature of formation. These can be determined by measuring trace elements, isotopic ratios, minerals inclusions, and crystal shapes.

But this is not all. With the help of internal microstructures in zircon, we can determine time, temperature, and pressure of deformation events that affected the host rock, for example, meteorite impacts, lightning strikes, earthquakes, and high-grade metamorphism.



Some SEM images of zoned (unshocked) zircons.



A zircon shocked, if not appalled, by a large terrestrial impact.

What is your most funny or memorable fieldwork or lab experience?

While I have many such experiences, I can say that the most memorable are connected to interactions with wildlife. We must remember that we are not alone on this planet – we share it with many other species that we must give space to!

Once working at Vredefort, I was charged at by a warthog. This is when I discovered I can very effectively climb trees. On another occasion, also at Vredefort, a large camel spider crawled into the room at night. As you might know, this animal is not easily scared away, so I spent a good portion of the night trying to catch it. I only succeeded when he found a large dead cockroach and started to munch on it, thus being distracted from a fight. He was released in the morning to the field.

Another time I was at Kara, in a polar region, which is characterized by tundra. I was awakened in the middle of one night by loud breathing and chewing noises. When I peeked out of the tent, I discovered that we were completely surrounded by reindeer, because we carelessly set up a camp on their path.

What is the most exciting aspect of mineralogy for you?

It fascinates me how minerals can record entire stories within their bodies, and share valuable information with us when we learn to read them.

Indicator minerals from kimberlite pipes help us find treasures such as diamonds. Others keep secrets of metamorphism, working as geo-thermo-barometers of the deep crust. Some count time with their isotopic systems, working as clocks. Others are messengers from outer space and bring us clues about the universe, arriving on our planet in meteorites. Minerals fill the bodies of ancient animals, allowing them to fossilize and teach us about the history of life and evolution. Without minerals, we won't know even 10% of what we know about the world around us.

There are also minerals that we subject to different experiments in the laboratory, to torture out valuable information. Good thing one does not need an ethical clearance to do that!

What motivates you to go to work every day?

A desire to learn the secrets of the planet, and share those secrets with others. A sense of personal achievement. I also feel that I must repay humanity for the wonderful education that I've received – generations of researchers worked hard to fill my head with knowledge and to equip me with unbelievable tools, so it is only logical for me to continue their mission.

What is the most exciting project you have worked on?

I find excitement in every project I work on. When you start a new project on a topic that you know nothing about, it seems boring, because your brain is frightened with the unfamiliar and complex information. But as you educate yourself more and more, you discover a growing interest and passion about the subject. This is how it works.

Once I was making analogue experiments, trying to reproduce metasomatic reactions observed in the Sand River gneisses from Limpopo. I added brines to a stub of the regular gneiss and "cooked" it in a platinum capsule, heating it and loading with pressure. I was excited to see a perfect two-pyroxene charnockite as a product of my experiment. It reproduced the assemblage we saw in nature.

At another time, I was looking at "fossil earthquakes" – veins of friction melt from Ivrea-Verbano Zone. Very carefully, I looked at zircons and unexpectedly discovered planar deformations, which previously were only known to appear in zircon from meteorite craters.

My project that I realized in the framework of the Alexander Von Humboldt scholarship was the most exciting. I got to learn transmission electron microscopy (TEM) techniques, and the new worlds that TEM reveals. With TEM, one can observe mineral grains as large as 5 nanometers in diameter (1 nanometer = 1/1 000 000th of a millimeter), with their defined shape, composition and crystal structure.

What advice would you give your younger self, when you were just starting out in the industry?

I don't think a younger version of me would have listened, because this is hard advice, which comes in conflict with my core values and common sense. But if I could, this is what I would say:

Take it easy and don't put all your eggs in one basket. Good working ethics and professional achievements are not what is valued at the workplace. If I learned that 10 years ago, I would have avoided a lot of disappointment and a major burnout.

What route did you take to become a mineralogist?

Start studying early and learn from the best in the field. Diversify your education, don't stay in one organization. Go to the field, work in labs, talk to people, seek out opportunities – especially when you are young.

Thematic Articles: Is Mineralogy Dying?

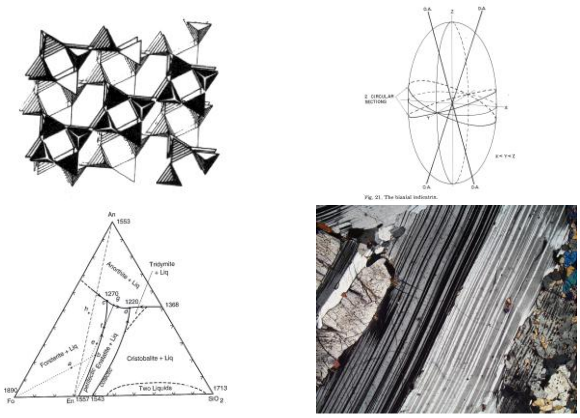
It has come to our attention that the formal teaching of mineralogy as a discrete course offering in university geoscience undergraduate programmes has been suffering, for various reasons, and more recently has been dropped altogether in some cases. This has obvious implications for the discipline of mineralogy *sensu lato*, and for the application of mineralogical science by geologists. In this series, we will examine some fundamental concepts, including what is meant by "mineralogy" from a geological disciplinary perspective, why and how it is taught, and what has changed over time to shift the goalposts in this context. We then feature a contribution from Prof. Roberts of the Geosciences at the University of Pretoria, where the teaching of a discrete mineralogy course module has been abandoned. We finish the theme with a Minsa perspective on marketing mineralogy to students.

Why teach mineralogy?

S.A. Prevec
Rhodes University, Dept of Geology

To begin with, what do we actually mean by 'teaching mineralogy'? Probably as with all things you could solicit 50 geoscientists and get 50 somewhat different perspectives on this, but probably the majority would include fundamentally similar elements, I would like to think. Certainly some would no doubt discard some of my basic elements as being outdated or irrelevant, and others would add on elements that I have omitted by choice or by ignorance.

I have divided Mineralogy here into three basic thematic elements, consisting of an introduction to crystalline solids, optical properties under the petrographic microscope, and lastly phase relationships. A more detailed breakdown of what I would consider essential contents of each section is provided below.



Above, the image from the front over of the mineralogy course handbook I created for the 2nd year geology course I used to teach (ca. 2004-2012); it graphically encapsulates these basic elements described below. (I didn't stop in 2012 because we decided the content was redundant; we had a retirement and some trading of chairs ensued).

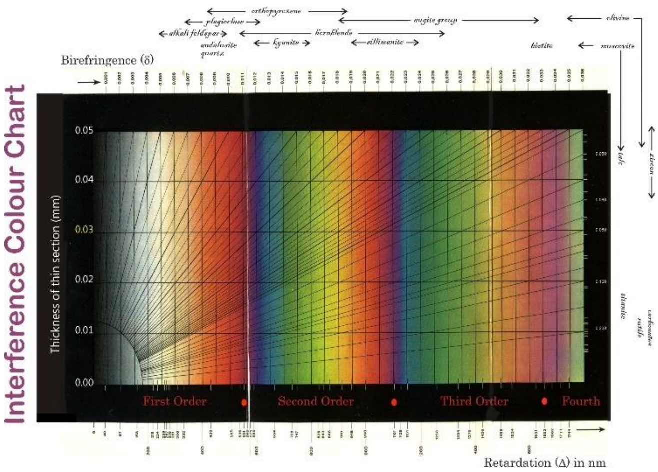
Introduction to crystalline solids

- Atomic level crystal lattices
- Crystal symmetry elements
- Miller Indices, 2-D representation of crystal faces (Wulff Net)

Why are these concepts important?

- They provide a root for geochemical understanding of ionic behaviour, substitution controls;
- They provide the basis for interpretation of XRD, EDS, EPMA data on mineral compositions and identification;
- They provide the basis for identification of minerals in hand section and thin section.

BUT one must consider how crucial is it to understand minerals at a crystal-chemical level in order to apply them; for example, how essential is it to understand the principles of compatibility & incompatibility to understanding rock and mineral chemistry? (i.e., a geochemist can be told that a certain spike in a spidergram (a normalized trace element histogram) means a certain tectonic or igneous process; actually understanding the underlying principles (which are in fact not always agreed upon anyway) might be superfluous to its application. Similarly, linking crystal symmetry element theory to petrographic application (properties such as uniaxial versus biaxial indicatrices, 2V, extinction angles) might be overkill. If I know that orthorhombic minerals will show parallel extinction in thin section, so I can tell them apart from monoclinic variants, do I need to actually know the symmetry elements of those two groups? (No.)).



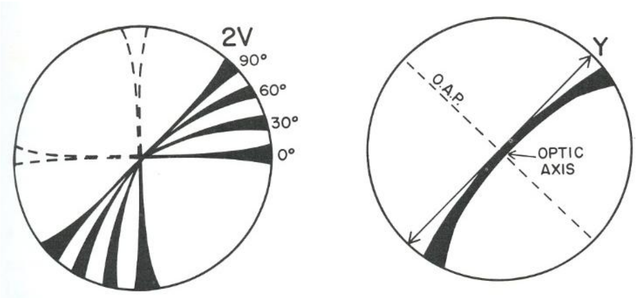
From back when "first order" meant something other than the baddies in the last few Star Wars movies…

Introductory petrography

Basic principles of mineral identification

- Optical properties under petrographic microscope
    - Basic: mineral colour, pleochroism, birefringence, relief (± chagrin), optic sign

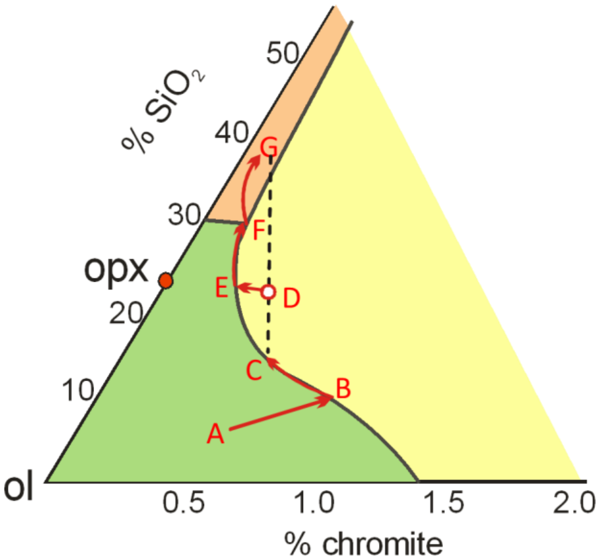
determinations, 2V assessment, crystal axis orientation, extinction angles
- ‘Advanced’: Use of refractive index oils, universal stage;



- Hand specimen examination
  - Mineral and rock identification
- Textural analysis
  - Primary vs secondary mineralogy, mineral assemblages, alteration, reactions, inheritance, cumulus processes, melt migration, etc.
    - Provides basis for rock identification, contextualization
      - Identification of prospective mineral deposits

Mineral phase relationships

Introduction to 1-, 2-, 3-component chemical systems:



- These provide the basis for understanding equilibrium, disequilibrium melting and crystallization processes (igneous & metamorphic rocks, sulphide and oxide ores; metallurgical principles)
- It also provides the basis for experimental petrology studies

Why did we ever teach mineralogy in the first place?

Originally (in the 1950s to 70s?), optical mineralogy was the fundamental tool for mineral identification in thin section and hand specimen, particularly in the absence of easily accessible quantitative tools.

What’s changed that might diminish the need for these skills?

In recent years it has become progressively easier to access progressively more accurate quantitative tools for mineral identification. This began with increasing availability and reliability of electron microprobes in the late 1960s and 1970s, and these were complemented by Scanning Electron Microscopes and X-ray diffraction (XRD) spectrometers. In the much more recent past, and the present, access to micro-X-ray and SEM-scanning of cut sections and even drill core provides nearly routine high spatial resolution compositional analysis of rocks.

However, all of these methods involve time- and labour- and money-consuming sample preparation, and a lot of this information could already be obtained, along with a lot of other data, by a competent petrographer.

- Image analysis
  - Can provide basic statistical analysis in terms of grain size, aspect ratios, grain orientation
  - In high contrast mineralogically simple systems, can provide modal analysis
- X-ray-based quantitative chemical scanning analysis (SEM, QEMSCAN, other)
  - Mineral ID based on composition
  - Precise modal abundance estimates

Demand: Who is still employing “mineralogists” *sensu stricto*?

University geoscience departments remain the main employer of mineralogists as research and teaching staff. This appears to represent an ever-diminishing pool of human resources. When was the last time you saw a university geology department advertise for a "mineralogist"?

Other employers include:

- Research institutions & industry:
  - Applied mineralogy
    - Clays, for example, as sinks for fluids, waste (mining, radioactive byproducts, etc.)
    - Carbon sinks
- Mining and exploration industry?
  - Not so much, seemingly; lots of data collected on mineral compositions (ore element content in ore-hosting minerals, etc.), but outsourced to external consulting and analytical services?
- Groundwater? Petroleum?
  - Use of geophysics, conductivity logs, etc. as lithological equivalencies.

From an applied mineralogical perspective, the pool of mineralogists as analysts (both in the sense of collecting data from analysis of materials, and interpreting and analysing those data) remains robust, and in fields ranging well beyond geological research, and even well beyond minerals in mining exploitation, as described below.

There is a perception (particularly from an applied, or industry perspective) that "petrography" consists of mineralogy (perhaps extending to mineral compositions) and mineral proportions. These can now be acquired quickly and reliably using X-ray scanning applications, obviating the need for more subjective, more time-intensive (therefore expensive) interventions by 'mineralogists'.

Drawbacks? Why isn't a detailed account of the mineralogy and mineralogical proportions sufficient?

The problem here is the absence of any contextual analysis. For example, in metamorphic and igneous rocks, it is important to distinguish between alteration assemblages (grain rims, fractures) and primary assemblages. This is critical when the ore-forming process is often associated with secondary alteration or metasomatic processes, and the primary assemblage may be acting solely as a passive host substrate that has been accessed via mechanical fracturing, or dissolution (carbonates), or permeable lithological horizons (or bedding planes, or unconformities). This would be relevant to hydrothermal ores (Au, Ag, Cu, Pb, Zn, etc.), for example.

In clastic sedimentary rocks, textural analysis is needed to distinguish between primary clasts and cements, which may have variable solubilities, and relate to various primary and secondary porosities, and permeabilities. For example, orthoquartzites (a sandstone with primarily quartz cement) are relatively insoluble as a host rock, requiring fracturing to enhance permeability, in contrast to carbonate, clay, hematite cements (variably chemically soluble). This could be relevant to extraction and identification of viable hydrocarbon resources.

Top left: strained undulose quartz, indicating deformation; to an SEM or an XRD, still just quartz. Top right: exsolution of albite from K-feldspar (microcline); can the scanner interpret this (if not, I imagine it will be able to, soon enough)? Lower left: plagioclase within olivine, reacting to form a double corona (of opx + amphibole-spinel symplectite) = disequilibrium and possibly uplift from deep crust. Lower right: olivine, opx and plagioclase, but all the opx here is a peritectic reaction phase, and not primary crystals. Let's see the SEM tell you that!

A final example involves the identification of cumulate textures in plutonic igneous rocks. Silicate-sulphide and silicate-silicate textural relationships linked to modal proportions tell us about magmatic processes. For example, disseminated vs net-veined, stockwork sulphide textures indicate vectors for gravity-concentration of sulphide ores, and non-cotectic mineral proportions combined with textural evidence (primocryst vs clast-supported vs interstitial silicate) provide evidence for crystal settling, and/or for conduit-type magmatic processes. These are associated with magmatic Ni, Cu, Cr, V, PGE ores.

The bottom line here is that two rocks can have similar modal mineralogies but very different textures, with dramatic implications for their evolution. Similarly, rocks with mineral assemblages that are clearly not in equilibrium require geological interpretation to be meaningful.

How are we teaching mineralogy?

Here it seems pertinent to share a few thoughts on actually how mineralogy and petrography are taught. For example, how much do we need to make students memorize these days? Probably a lot less than 30 years ago (pre-internet, and pre-smart phone), and much much less than 60 years ago.

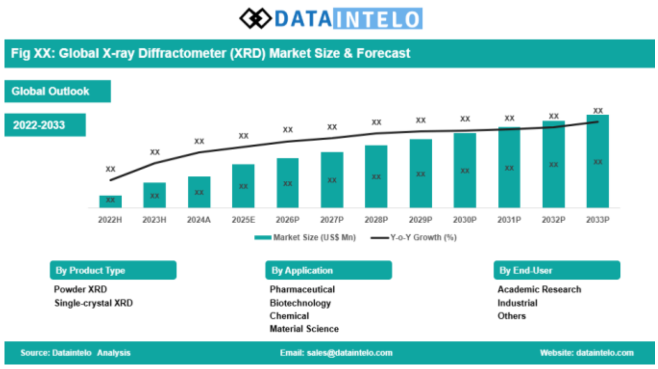
Do undergraduates need to know about crystal lattice space groups, Miller Indices, and memorize mineral stoichiometries? Arguably not. In South Africa we do have the limitation that we can't save 'advanced' content that we might want a mineralogist to know for postgraduate (MSc or PhD) courses, since we don't, typically, get to offer those.

Optical microscopy in particular cannot usefully be taught 'casually', in small sessions to large classes, or with students sharing microscopes. These methods will never make petrologists. My 'joy' in petrography, and the ability to recognize most common minerals in about 20 seconds down the microscope, or often from a photo of the slide, comes from spending hours and hours looking down the microscope for under-graduate practicals, arguing with my classmates about mineral diagnostics. How many hours that we'll never get back did we spend distinguishing quartz from the dreaded nepheline (both low relief, low birefringence, uniaxial minerals), not grasping that a) if you have one in the rock, you cannot have the other, and b) nepheline is really, really uncommon? However, the then-unappreciated pearl of wisdom from our mineralogy lecturer (Doug Grundy) that "you know it's quartz coz it looks like quartz" became a reality, given enough experience. There is no short-cut to this, really. Practical work need to be spread out over time and conducted in the student's own time, so if you have several classes a week sharing microscopes, and three hours per student per week, you won't get far, in my experience. That time might be better spent teaching them how to plot and interpret geochemistry, or isotopes, or interpret mineral textures, and let the SEM identify the minerals, after all.

What is the future of Mineralogy?

I had the bright idea of attempting to correlate XRD sales with the trends in mineralogy, on the premise that mineralogists would be the primary users. As it turns out, this was unexpectedly enlightening.

The AI summary of my search said this: "The XRD (X-ray Diffraction) analyzers market has shown a significant growth trajectory, valued at USD 1.2 billion in 2024 and projected to reach USD 2.5 billion by 2033. This represents a compound annual growth rate (CAGR) of 9.6% from 2026 to 2033. The X-ray Diffractometer Market, which includes XRD analyzers, also exhibits strong growth, with a value of USD 778.59 million in 2023 and a projected value of USD 1061.14 million by 2032, according to Zion Market Research. This represents a CAGR of 3.5% between 2024 and 2032."



Upwards trend in XRD market forecast between 2024 and 2033. (https://dataintelo.com/report/x-ray-diffractometer-xrd-market.)

So the XRD market is stable, robust, and growing; is this encouraging? As it turns out, this sector increase is driven by material science, nanotechnology + pharmaceuticals (identification of polymorphs), biotechnology (protein crystallography), and the chemical industry (metals, ceramics, polymers, nanomaterials). This indicates a growing market demand for non-geological applications for basic mineralogical principles, but not, especially, traditional geoscience-based mineralogy. A question arises which is are geology departments providing service learning to other science departments who appear to be at the forefront of mineralogical study? And if not, why not?

Mineralogy and the University of Pretoria Department of Geosciences

James Roberts
Prof., Head of Dept, UP Geological Sciences

The recent decision by the Geology department at the University of Pretoria (UP) to remove a course in mineralogy from the prescribed curriculum has ruffled a few feathers. Is UP going the same way as some European universities and stopping petrography at undergraduate level? Is UP moving too far from its roots? Therefore I've been asked to say a few words and put the geological community more at ease.

Setting any curriculum for an undergraduate degree is a fraught process. What needs to be there for those students going into industry? What needs to be there for those taking a more academic route? What do we need to add to "future-proof" our degree? And what do we take out if we add something in? Within the South African context, many of our students are overloaded with course material, which leads to high failure and dropout rates- how do we maximise student throughput while maintaining standards?

At UP, the GLY255 Mineralogy course at the beginning of 2nd year was infamously hard. At times in the 2000s and 2010s, it was the course with the highest failure rate. As the lecturer in charge during this period, I tried everything to improve the pass rates, including winter schools and special classes. In the end, after an exhaustive analysis, we implemented a set of draconian prerequisites for students to meet before they were allowed to do the course. This in turn had knock-on effects, as students couldn't proceed through their geology degree unless they passed 1st semester Mathematics. Thus, to improve throughput rates and give students a better chance of finishing their degree in minimum time, a new approach was taken in the curriculum review of 2022.

The core of the issue with Mineralogy as taught at UP and other places is twofold: the course requires the student to integrate their pre-existing chemistry, physics and maths into understanding minerals, and the course is relatively devoid of geological context. The first issue is what university lecturers call "the silo effect", where students keep the content of each course strictly locked away from other areas. How does the wave theory of light (physics) inter-relate with the chemical bonding within a crystal (chemistry)? How do you work out the Fe^{2+}/Fe^{3+} ratio from a chemical analysis (a mix of maths and chemistry)? The second issue relates to "why". Why do we care about the crystallographic group of a mineral? Why do we care about the specific type of plagioclase present? Why do we need to memorise the chemical formulae for biotite? These are the types of questions raised by students when we asked them why they did so badly in GLY255 Mineralogy.

As I moved from teaching mineralogy to teaching igneous and metamorphic petrology in the 2nd half of 2nd year, many of these issues persisted. I constantly had to reteach concepts and ideas the students learnt in GLY255 Mineralogy, as once again the students siloed the information from proceeding courses and failed to apply these concepts in the next stage of their education. It's easy enough to blame the students for this problem from a distance, but it's much harder to actually change the bad habits inherited from a poor school system and a challenging 1st year university experience.

Therefore, during the curriculum review in 2022, it was decided to teach mineralogy implicitly within our courses rather than explicitly. Petrography and an introduction to the theory of light is taught during an extended sedimentology course in 1st semester, and mineral calculations, reactivity and phase diagrams are taught during igneous and metamorphic petrology in 2nd semester of 2nd year. Ore microscopy is taught in 3rd year, and Honours teaches analytical methods and advanced mineralogy. Some content has necessarily been lost, but all the knowledge and skills we consider critical to student success moving forward has been retained.

Will this approach work? We won't know for a few years. However, within the South African context, UP Geology has an obligation to try improve student throughput and the previous curriculum was not in the students' favour. We don't believe we have compromised quality, and hopefully the implicit approach will actually allow students to master the work better, as we strive to make mineralogy relevant for students, rather than a hated course to pass.

(As a personal aside, I didn't get very much mineralogy in my own undergraduate training in the 90s at Rhodes. Our mineralogy consisted of 4 weeks as part of 2nd year, and I was shocked when I arrived at Wits later on for my MSc, where whole grains were immersed in toxic aloe oils to illustrate refractive index in messy practicals, and where Mineralogy was a semester long course. When I moved to UP and took on teaching Mineralogy myself, I had to learn a lot. However, I'd already finished a PhD and had extensive experience in petrography, which Rhodes did teach me, so learning the science behind my view down the microscope came easily. I can only hope that the undergraduate students at UP will similarly be able to learn the science once they understand why it might be useful.)

Is Anyone Still Interested in Mineralogy? A Personal Reflection

By Bavisha Koovarjee
Executive Committee Member, Minsa
Manager, Minsa Youth & Development portfolio

I've been thinking a lot lately about something that's hard to ignore: the growing disinterest in mineralogy among university students. As someone who came to this association with a sense of curiosity and respect for its relevance, it's disheartening to see how little engagement there is from students, especially when it comes to professional spaces like Minsa that are designed, in part, to support them.

This is not a criticism. It's an honest observation, and I say it with concern, not judgement.

Over the past year, we at Minsa have made a conscious effort to reach out to students. We've invited them to join our committee as student representatives. We've created space for their voices and opinions. We've offered opportunities to influence what Minsa does, whether that's events, outreach, or resources. We even waived the membership fee for students to make participation completely barrier-free.

And yet, very few take up the offer.

The reasons may be complex. Perhaps mineralogy just doesn't seem "relevant" anymore. Maybe students don't see a clear career path tied to it, or they associate it with something old-fashioned or overly technical, disconnected from urgent issues like climate change, sustainable development, or community impact. It could be that, in the face of job market pressure and course overload, students are opting for what feels more practical, more 'employable,' or more widely recognised. It might also be that mineralogy isn't being taught in a way that connects to the bigger picture. Many students might not realise how foundational mineralogy is to some of the most pressing issues of our time: resource security, critical minerals for green technologies, the legacy of mining on communities, and even planetary science. Or, maybe we haven't been loud enough or clear enough in communicating that message.

We don't have all the answers. This is my perspective, and I'm still figuring it out myself. Personally, I don't come from a strong mineralogical background. But I joined Minsa because I saw value in its work and in its potential to create a platform for meaningful dialogue. That includes students - especially students.

So if you're a student reading this, here's our open invitation: tell us what would make mineralogy meaningful for you. What would help you see a future in this field? What role should Minsa play in that?

We're listening. We really are. Email us at [minsa@gssa.org.za].

Got any thoughts on how we should be teaching and/or promoting mineralogy as a subject? What should and should not be taught? Who should we be teaching; maybe mineralogy isn't just for Earth scientists any more? Please share those thoughts! (minsa@gssa.org.za).

Other Gems

Efflorescence

We take this opportunity to introduce our readership to what might be a relatively unfamiliar mineralogical term as our "Word of the month". Efflorescence "generally refers to a powdery, whitish deposit of salts that forms on the surface of porous materials like bricks, concrete, or stone, due to the evaporation of water that has dissolved salts within the material."

Efflorescence typically appears as a white or grayish powdery or crusty coating. The salts are often soluble compounds like calcium carbonate, gypsum, or other salts that are present within the material. Efflorescence can also refer to the spontaneous loss of water of crystallization by a hydrated salt, resulting in a powder or crust. According to Wikipedia, efflorescence (which roughly means "the flowering" in French) is the migration of a salt to the surface of a porous material, where it forms a coating.

I thought this was sufficiently interesting that I suggested it as a possible mineral photo essay theme to Bruce Cairncross, and the results are a lot more interesting than I expected (see below), which was, admittedly something more along the lines of hard water precipitate in the kettle.

Contributed by S. Prevec

Bruce's Beauties: Efflorescent Minerals

The Editor-in-Chief informed me that the theme of this Geode is the decrease in university teaching of minerals, and that did not bode well for mineral photos! However, he then informed me that he had written a short note about efflorescence in minerals and that helped, although, as will be seen, efflorescence is not a property the construction industry appreciates, and is in fact a subject of much research. In support of this claim, I will quote verbatim (liberally) from a recent article I wrote on the mineral ettringite, one of the culprits (Cairncross 2024, pages 464-465):

"**Ettringite and Portland Cement**

For many years the construction industry has been engaged in research focused on the deterioration of concrete, one of the causes of which is 'sulfate attack' (Santhanam et al. 2001), and in particular, the role ettringite plays in this deterioration (Barger *et al.* 2001).

In Portand cement, ettringite originates in two stages, firstly by the reaction of tricalcium aluminate, gypsum and water to form ettringite. Certain calcium sulfates, like gypsum, are deliberately added to Portland cement to reduce shrinkage during drying and to control initial hydration reactions. Ettringite forms by the above reaction within a few hours after mixing the components with water, and much of the sulfate is used up at the outset. This first stage primary ettringite is uniformly dispersed throughout the mixture as microscopic crystals less than 1 µm in cross-section, and it controls stiffening of the mixture, and is therefore beneficial (Barger *et al.* 2001). Secondary ettringite forms in concrete exposed to water over extended periods by dissolving of the primary ettringite and its recrystallization in any available crack or voids. These secondary crystals are acicular 20 to 30 µm long and masses can completely fill voids over long time periods and under extreme wet and dry conditions. However, experiments conducted over time by Barger *et al.* (2001) demonstrated that neither the primary nor the secondary ettringite were detrimental to concrete performance, particularly with regard to causing expansion and failure in hardened concrete. While Barger *et al*.'s (2001) results are not universally accepted, *i.e.*, that ettringite does not cause problems in concrete; it is important to note that at low pH, ettringite can alter to gypsum (Santhanam *et al.* 2001). This ramification introduces gypsum into the equation of causes of softening and expansion (failure) of concrete over time. Therefore, indirectly ettringite does appear to play a role, as does thaumasite, which also forms during sulfate attack of concrete.

Some of the factors affecting ettringite stability in concrete are dehydration and decomposition to form other phases (Zhou and Glasser 2001; Zhou *et al.* 2004). These processes were investigated to determine the role ettringite plays in concrete and the subsequent changes it undergoes thereafter. The formation of AFm – a series of hydrated calcium aluminates $4CaO{\cdot}Al_2O_3{\cdot}13\text{-}19H_2O$ in which the hydroxyl anion can be replaced either by sulfate or carbonate anions - is part of these processes (Appelo 2021). Matschei *et al.* (2007, p. 118) note that "in the presence of portlandite, and as carbonate displaces sulfate in AFm, the reaction results in changes in the amount of both portlandite and ettringite". Interestingly in the Kalahari

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manganese field naturally formed portlandite is one of the minerals found associated with ettringite. The dehydration of naturally formed ettringite crystals over time is known to occur and this causes the discoloration from yellow to white and colorless transparent to opaque milky white. However, this change is not ubiquitous and some ettringite remains pristine and unaltered" (unquote).

The morphology / habit / colour of ettringite in concrete is unattractive. However, the ettringite crystals from the mines of the Kalahari manganese field are attractive and photogenic, and come in a range of colour from bright yellow to colourless. There is one proviso though. Visually distinguishing ettringite from allied species such as thaumasite, sturmanite, jouravskite and even despujolsite requires quantitative analyses.

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Zhou, Q. and F. P. Glasser. 2001. Thermal stability and decomposition mechanisms of ettringite at <120 °C. Cement and Concrete Research 31:1333–39.

Zhou, Q., E. E. Lachowski and F. P. Glasser. 2004. Meta-ettringite, a decomposition product of ettringite. Cement and Concrete Research 34:703–10.

Do you have an analytical service relating to sample preparation, mineral analysis, mineral extraction, or mineral identification?

Do you have capacity to conduct additional services and to get paid for it?

If your answer to any of these questions is "yes, I guess so", then you could be advertising in this space at very reasonable rates, making some revenue, and contributing to the geoscience economy of the nation.

So get busy, what are you waiting for? Advertise here!

Bruce's Beauties: Efflorescent Minerals

Ettringite: $Ca_6Al_2(SO_4)_3(OH)_{12}\cdot 26H_2O$, from the N'Chwaning II mine, Kalahari manganese field, South Africa. (All samples and photos property of Bruce Cairncross).

Above, a cluster of ettringite crystals on matrix. Field of view is 4 cm.

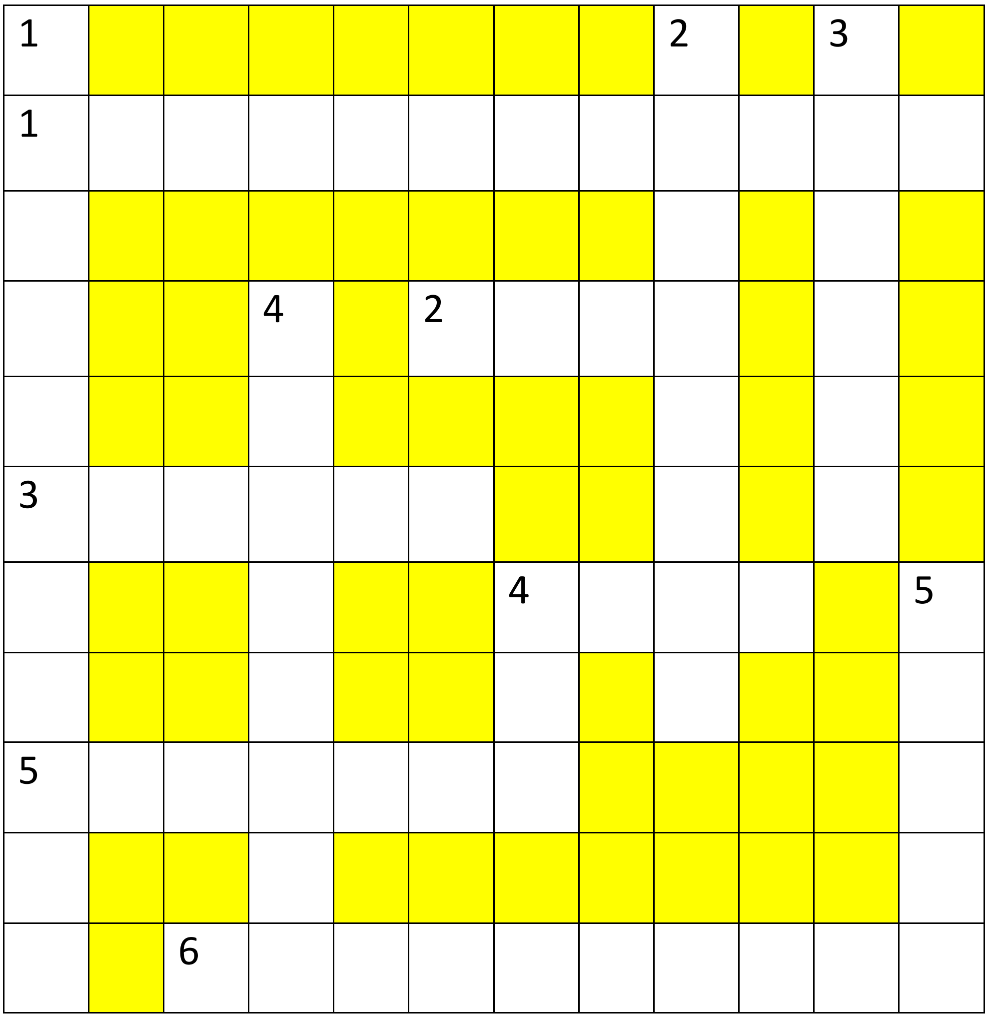
Above, colourless calcite on bright yellow ettringite, 5 cm.

A cluster of white ettringite, presumed to have undergone complete dehydration. Some of the crystals are broken and the crystals are entirely white, indicating complete transformation.

A 3.4-cm ettringite crystal displaying horizontal layering perpendicular to the c-axis. The different bands probably represent layering of different species, or that some are partially dehydrated.

Minsa Crossword for June 2025

The theme for this crossword is optical petrography. Because we can. An even more 'fun' way to do this that I only thought of after would be to give the optical properties as the clues to minerals as the answers! Another time…



DOWN:

1. A mineral that has different refractive indices in different directions in the crystal lattice, resulting in the type of colours in 1-Across, can be described as this.
2. A specific accessory lens that when engaged produces a conoscopic image, essential for optic sign determination.
3. The technical name for the microscope eyepiece lens (producing 10x magnification).
4. The optical indicatrix for quartz and apatite, but not for the feldspars.
5. The mineral symmetry group that has three mutually perpendicular axes, and produces isotropic minerals in thin section.

ACROSS:

1. The type of colour produced by minerals that are 1-Down when both analyser and polariser are engaged.
2. The general adjective for the accessory plates inserted to increase the refractive index to help determine optic sign.
3. The visual effect of contrast between two adjacent minerals of differing refractive index.
4. The general name for the curved glass part of the magnifying objectives on a microscope.
5. When the refracted light passing through a mineral is exactly aligned with the crossed nicols of the analyser and polariser, thus blocking all light from reaching the eye, that mineral is said to be this.

Minsa Crossword solutions for March 2025

The theme for this crossword was Cu ore minerals, and their friends, since some of them have quantum aspects.

1 F			2 1 C	O	V	E	L	L	I	3 T	E
A			H							S	
2 M	A	L	A	C	H	I	T	E		U	
A			L							M	
T			C				4 P			E	
I		3 I	O	C	G		Y		4 S	B	
N							R				
I		5 L	I	N	A	R	I	T	E		
T							T				
6 E	N	5 A	R	G	I	T	E				
		S									

ACROSS:

1. A rare indigo blue secondary (supergene) Cu compound which in spite of its apparently simple stoichiometry of CuS actually contains Cu- and S- and is more properly represented as something like $Cu^{+}_{3}S^{2-}S^{2-}$.
2. An attractive green botryoidal Cu carbonate ore, mined since 4000 BCE in Sinai and Suez, and favoured as an ornamental stone in Biblical accounts of The New Jerusalem (and in HG Wells' description of the idyllic future encountered in the Time Machine).
3. The acronym for a particular class of copper and gold ore deposit, famous examples of which include Olympic Dam (Australia). Significant U ores are also often associated, although not part of the name.
4. The chemical symbol for this element, a common bonding partner to Cu (see 1 Down) and to the PGE, its name (may) derive from the Greek and French for "monk-killer", as early 'chemists' were typically monks, and some of the compounds of this element are toxic.
5. A rare deep blue Cu hydroxide (see p. 28) with the formula $PbCu[(OH)_2|SO_4]$, it forms from the oxidation of assemblages of galena and chalcopyrite.
6. This the primary Cu arsenide ore of east Asia's formerly richest precious metal deposit (see p. 6), as well as several Rocky Mountain-hosted copper deposits in the western USA. It is of hydrothermal origin.

DOWN:

1. This rare Cu ore occurs with and pseudomorphing after its arsenide equivalent, and is found in vein-hosted hydrothermal ore deposits, and mentioned on p. 6.
2. This prefix applies to copper-bearing minerals, from the Greek word for it, and whose pronunciation is discussed above (p. 27).
3. This mining town in northern Namibia was a significant local Cu producer, but is more notable as a geological heritage site for the variety and rarity of the minerals found there (p. 29).
4. This mineral is not Cu-bearing, but is a common associate of Cu-sulphide ores, as well as of iron sulphide ores in general. Only a Fool would miss it.
5. The chemical symbol for this element, which is a common associate in Cu and Au sulphide ores. Like gold, it features only one naturally occurring isotope (75).

Cover images: Upper right: XRF powder pellets. Lower left background: spinel rods exsolved from plagioclase feldspar in coronitic gabbros, Labrador, Canada. All images c/o S. Prevec.

Contributions for the next issue of the Minsa Geode invited for submission before 31 August, 2025.