MINSA
Mineralogical Association of South Africa
A division of the GSSA

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the Geode
the Geode
NEWSLETTER
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Contents:

From the Chair

As the new MINSA cycle is upon us, welcome to this newest edition of the Geode. It has been a momentous past year for the Association, with a number of milestones having been reached, not least of which is the regular appearance of the newsletter (and the new crossword puzzle addition!) – Thanks very much to Dr Steve Prevec for taking this on. I must further thank Igor Tonžetić and Dr Robert Schouwstra for their stellar work in improving compliance of the Association over the past year, given its requirements towards fulfilling GSSA objectives. Part of this process has involved amending the MINSA constitution, for which comment is currently sought from the membership. Continuing concerted efforts over the last three years, the membership database has also grown, and for the first time, fees have been systematically collected with the help of the GSSA, thus contributing to MINSA's ability to pay its annual IMA membership dues. Thanks to all for your participation in this exercise, and please keep it up, as your fees contribute to the benefits of being a MINSA member, which I am sure has been evident over the last year.

Dr Deshenthree Chetty (MINSA Chair)

The new MINSA Executive Committee was announced at the recent AGM held on 23 August 2017 at the GSSA's new offices in Carlow Road, Johannesburg:

- Chair: Dr Desh Chetty (Mintek)
- Vice Chair: Mr Igor Tonžetić (Sci-Ba)
- Treasurer: Prof. Robert Shouwstra (Independent, UCT)
- Secretary: Ms Petra Dinham (Anglo American)
- Dr Bertus Smith (UJ)
- Dr Roger Dixon (UP)

I look forward to working with the Executive, as well as the co-opted committee, to improve on MINSA's offerings and benefits to its membership. We remain a volunteer organisation, and working with committed individuals in a demanding work environment is always appreciated, so thank you to the Executive team who agreed to be nominated for the task.

Besides our series of evening talks (hosted courtesy of Dr Bertus Smith at UJ), we organise field and laboratory trips, and for 2018, will participate in large conferences, one of which is IMA2018 in Melbourne, the other of which is a Geometallurgy conference, which will be the first of its kind in Southern Africa. In keeping with skills development initiatives, we'd furthermore like to host another Mineralogists' Toolbox event in 2018. Student attendance is a key focus, so as to tap into available facilities to help in achieving their research project aims.

Another aspect I wish to pick up on is the MINSA Student Book Prize – it has been rather disappointing that no names were put forward for the award last year. I am sure there are deserving students practising mineralogy who could be considered for these awards, and would strongly encourage their supervisors (Hons and MSc) to nominate their (completed) work for the prize this year.

We look forward to another exciting year of MINSA activities. Please do let us know if there is anything MINSA should be considering of interest to the membership, or if you have any ideas regarding activities – particularly outside the Gauteng region.

Until next time, enjoy Spring and the activities planned for the rest of the year!

Desh Chetty

MINSA talk: Illegal mining

The most recent talk by MINSA for this year was presented from a current executive member of the association, Adjunct Professor Robert Schouwstra titled "Strengthening the Security and Integrity of the Precious Metals Supply Chain". The presentation is based on a technical report compiled by Professor Schouwstra for the United Nations Interregional Crime and Justice Research Institute (UNICRI) published in 2016. The attendance of the talk was low, and represented what one of attendees described as "the current hotbed of mineralogists in South Africa".

The report and talk focused on the illicit trafficking of precious metals, such as gold and platinum-group metals, as well as precious and semi-precious gemstones. Illicit trafficking starts at a point along the supply chain where material is stolen by organised crime syndicates and sold upwards through various levels within the organisation, often across international borders. In South Africa, criminal activities are investigated by the forensic crime laboratory in conjunction with industry. Industry participation is usually facilitated via the Chamber of Mines, whose members are required to report theft incidents. The UNICRI report is available from the Chamber of Mines website, along with a summary of the action plan, available from: Illegal mining - Chamber of Mines South Africa.

Contributed by Darren Tiddy

Forthcoming Events & Attractions

- 20-22 October: Barberton field trip, covering the Golden Quarry/Eureka City; Barberton Geotrail; komatiites and oldest rocks
- 14 November: MINSA talk by Roger Dixon; "Combining innovative technologies for enhanced mineralogical characterisation."
- 24 November: Night at the Museum III

MINSA visit to the SelFrag and Micro-XRF Facility, University of Pretoria

With the advent of new and exciting techniques on the market, it was with anticipation that a small group of avid MINSA members made the trip to the University of Pretoria's Stoneman Laboratory on Sunday 30 July 2017, to visit two facilities there: the Selfrag Lab system and the Bruker M4 Tornado micro-XRF system. The visit was hosted by Dr Roger Dixon, who showed the group around the facilities, and demonstrated the capabilities of the instrumentation.

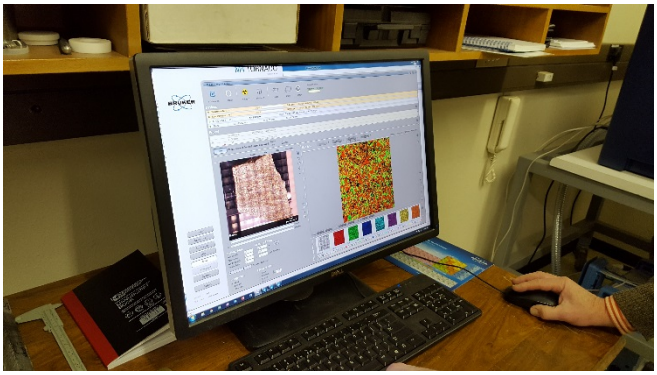
Dr Roger Dixon at the SelFrag instrument.

First up was the SelFrag system, which has garnered attention over the last decade or so for its ability to fragment rocks and other materials into clean components. It does this through use of ultra-short (<500 ns) electric pulses underwater to selectively break up composite materials, along phase boundaries, into their respective components. The effect of the electric pulse is a spark discharge that travels through the solid, with a pressure wave generated by electrical breakdown causing the solid to disaggregate. Or – according to Dr Dixon – Thor's Hammer at work. Indeed, a hand sample of magnetite-rich quartered drill core was inserted into the nylon vessel, and with the touch of a button, came away separated into the constituent grains. Perusal of the products under a stereomicroscope showed clean liberated magnetite crystal surfaces. As a laboratory system, the SelFrag Lab can take samples of 250-300 ml in volume, ideally at 2 cm particle sizes. Typically, 200 pulses are sent through the sample, and a run would take 30 seconds to 1 minute to perform on this volume.

An important use of the system is in the production of clean mineral separates for geochronological studies. At industrial level, it has been used in the liberation of such soft minerals as graphite and lithium minerals from harder rock matrices, as well as in the crushing of high-purity silicon for silicon wafer and solar cell manufacturing. Upgrading and refining of quartz, and the removal of coatings on zircon are other achievements in industry, made possible through key advantages like the lack of overgrinding and abrasion, which reduce fines and contamination.

Second to elicit excitement for the morning was the Bruker M4 Tornado micro-XRF system, for which specimens were duly brought to take advantage of the free demonstration in elemental mapping, to be followed by mineral classification on the system. As a desktop system, the stage can hold up to a couple of kg of sample, to the dimensions of a Ferrero Rocher large chocolate box, according to Igor Tonžetić, who helped with setting up the system at UP.

Sample block placed in the chamber of the micro-XRF instrument.



Element map of a granitic specimen being imaged by micro-XRF.

A few of our drill core pieces were easily mounted so as to have a flat parallel side facing the detector inside the instrument. X-rays are excited from a Rh tube, and provide an energy-dispersive X-ray spectrum, not unlike that generated by an e-beam system on a scanning electron microscope. However, because X-rays are dealt with directly, counts on the lighter elements (typically Si and lower) are rather less than on the heavier elements, so that peak ratios for elements in typical minerals will be different to how one would normally identify them with an e-beam. Additionally, Bragg diffraction has an effect on the spectral peaks, all of which require a slightly different way in interpreting mineral spectra obtained from X-rays. The Bruker software easily provides elemental maps from the imaging, which can be done with X-ray spot sizes down to 25 µm, and resolution to 25 µm step size. Textures were already well evident based on the elemental maps of the samples examined, and element correlations were soon being pointed out from the maps.

A slightly more in-depth process is required for mineral identification, done through the AMICS software – Advanced Mineral Identification and Classification System – with the setting up of a mineral list against which the spectral data can be processed to produce a mineral map. A few lively discussions ensued regarding the genesis of the Bushveld Complex – a giant step forward from interpretation of a rock texture! Improvements to the software continue to see the technique making strides in mineral mapping, with momentum gained in petrographic studies, where it is replacing traditional thin section work to understand mineral textures at a larger scale, and has provided numerous insights on ore genesis.

The group was thoroughly fascinated by the demonstrations, with promises made for follow-up sample analysis using these systems. Thanks very much to Dr Roger Dixon for hosting us.

Contributed by Desh Chetty

If you have any news that would be of interest to the MINSA community, contributions can be sent to
Steve Prevec
(s.prevec@ru.ac.za).

The deadline for submissions for the next issue of the Geode is November 30, 2017.

Other gems

Geode art

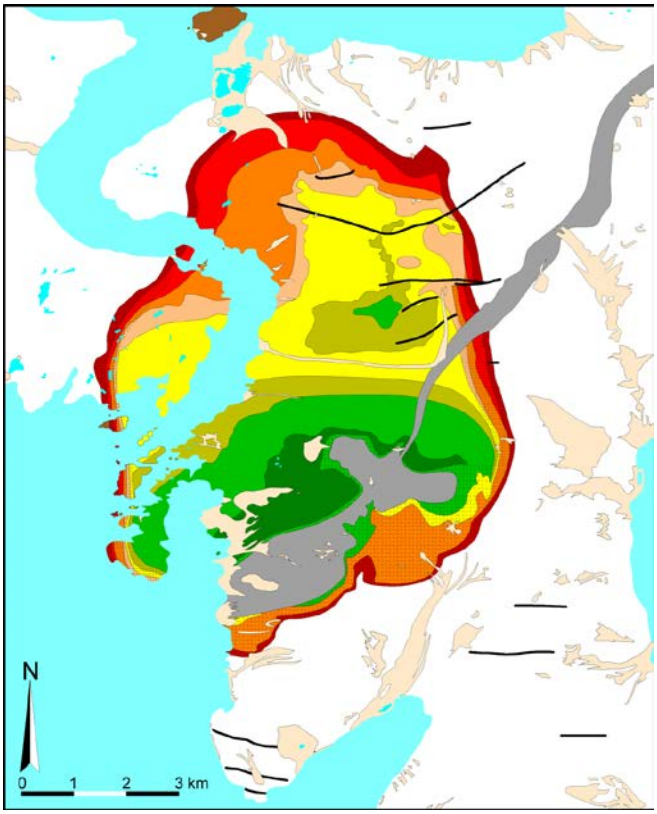
Dear Steve,

Good on you for becoming our first editor of Geode!

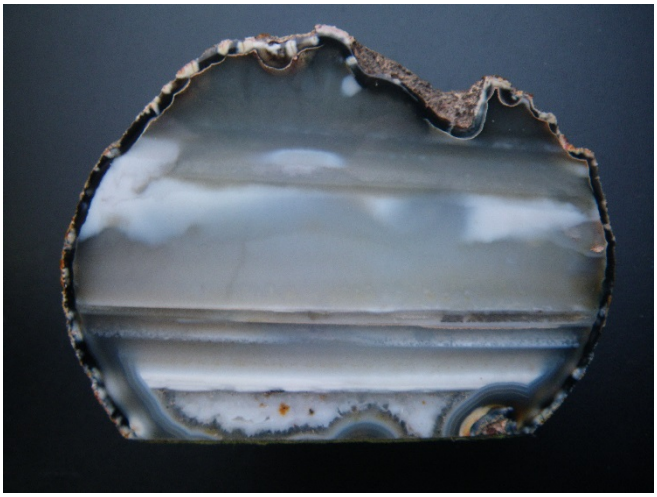
May I share two with you?

The first two are the two sides of a geode from South America that is a perfect replica of what we think the Skaergaard intrusion would look like in a vertical section.

Editor: For reference, here following is a modelled section of the Skaergaard Intrusion (Greenland), taken from the website of Kurt Hollocher of Union College, Schenectady, New York, at (http://minerva.union.edu/hollochk/skaergaard/basistoppen.html).



The second is what I think is the most beautiful geode ever – a seascape of the most remarkable intricacy. I bought that one in Montana.

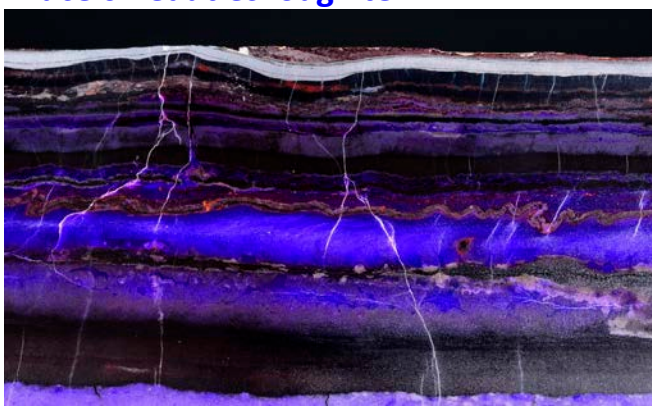


Good luck

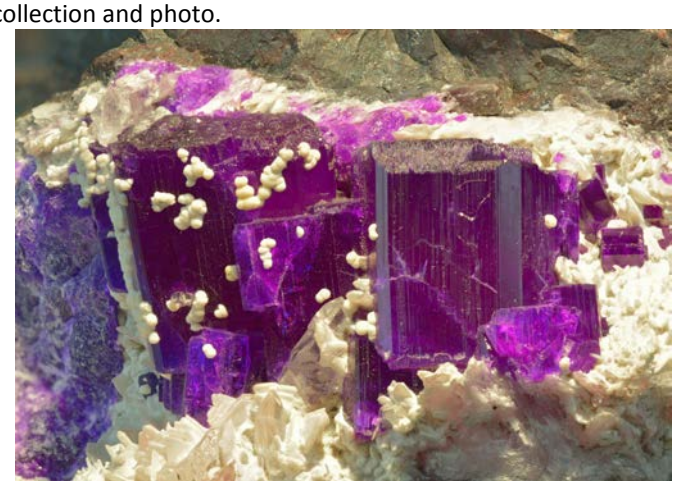
Contributed by Grant Cawthorn

In a new section, we feature a selected mineral for each issue, contributed by our unofficial national mineralogical treasure, Prof. Bruce Cairncross. Prof. Cairncross is a coal sedimentologist and has a passion for southern African minerals and mineral localities. He was the Head of Department of Geology at the University of Johannesburg (2003-2015), and has authored a number of books on minerals (10), with more in progress, and over 100 other publications. He also contributes a regular column to the GSSA Geobulletin, the "Mineral Scene". He proposed calling this contribution "Photo Essay of Southern African Minerals", but I've gone with "Bruce's Beauties", for brevity, at the risk of sounding overly Australian.

Bruce's Beauties: Sugilite



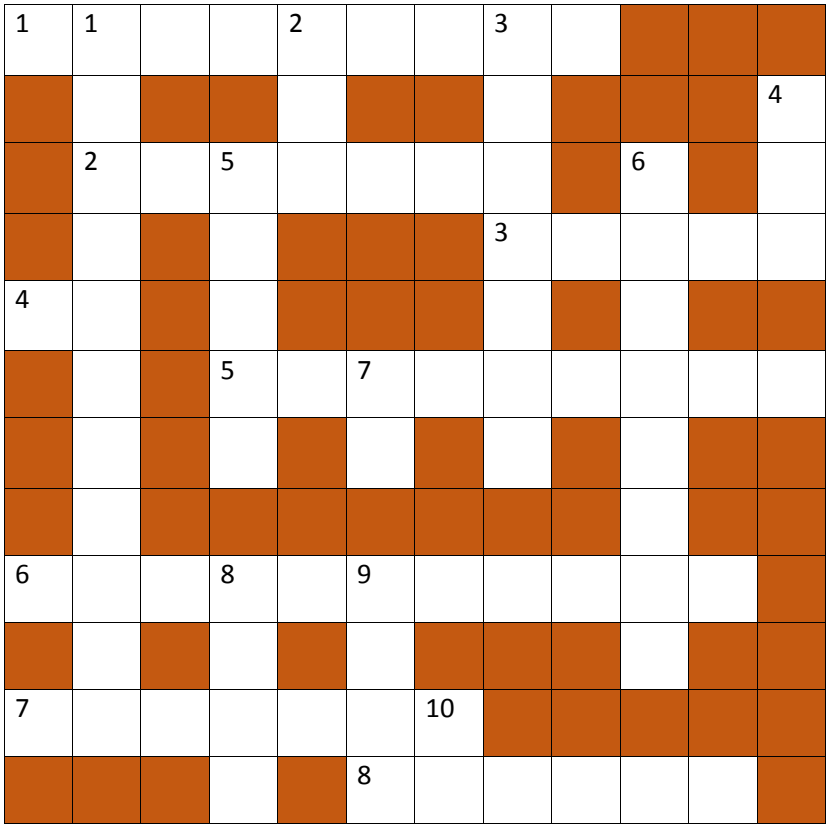
At left, a 9 cm polished slab of sugilite ($K(Na,\square)_2Li_3(Fe,Mn,Al,Zr)_2[Si_{12}O_{30}]$) associated with high grade manganese ore from Wessels mine in the Kalahari manganese field. Sugilite was first described in 1976 from Japan where it occurs in scattered grains in syenite. It was named in honour of Professor Ken-ichi Sugi, petrologist at the Imperial Niigata Prefecture, Japan, who first discovered the mineral. The Kalahari manganese field sugilite is, to date, unrivalled in quality and quantity. Originally found during exploration drilling at the Wessels mine in 1975 and since then, tons of this massive purple mineral have entered the market where it is used as lapidary and jewelry material. This specimen is associated with andradite, hematite and calcite. Bruce Cairncross collection and photo.



At right, sugilite crystals associated with cream-white pectolite and minor calcite, from the Wessels mine, Kalahari manganese field. The field of view is 2.8 cm and the right hand crystal is 8 mm. Sugilite is well known in its massive form and is highly sought after by the gem trade and hobbyists as a lapidary item. Crystals are extremely rare and gem quality crystals even more so. This specimen together with a handful of others, came from a once-off discovery. Although some crystalline material has been sporadically found over the years, the size and quality have never matched these world-class specimens. Bruce Cairncross photo, private collection.

At left, a somewhat recent find of unusual fibrous sugilite crystals from N'Chwaning III mine in the Kalahari manganese field, 3.9 cm. Interestingly, two new type-species have been discovered associated with this variety of sugilite. Lipuite ($KNa_8Mn^{3+}{}_5Mg_{0.5}(Si_{12}O_{30}(OH)_4)(PO_4)O_2(OH)_2\cdot 4H_2O$) named in honour of Professor Pu Li (1911-1968) who was the pioneer of isotope geochemistry in China. The second new type species is taniajacoite ($SrCaMn^{3+}{}_2Si_4O_{11}(OH)_4\cdot 2H_2O$) named after Tania and Jaco Janse van Nieuwenhuizen, mineral dealers from Kakamas who provided the type-material for study. Both these species occur as microminerals in the matrix of the fibrous sugilite. An associated mineral is potassic-ferri-leakite that forms matted aggregates of microscopic bronze crystals. Furthermore, there is a third type-species identified with the fibrous sugilite, pending IMA approval. The specimen is 3.9 cm. Bruce Cairncross collection and photo.

MINSA Crossword: September 2017



Across:

1. Garnet mineral found associated with metamorphosed chromite ore deposits (such as at Kemi, Finland).
2. Hydrothermal arsenic sulphide ore mineral, formerly used as red pigment in artworks.
3. Element which occupies the trigonal B site in tourmaline, for which it is a characteristic element, and is mined most extensively as an evaporitic oxide ore in Turkey.
4. The diagnostic element in lepidolite mica.
5. A hydrated copper aluminium phosphate mineral, best known as and for its distinctive colour. It is reportedly named from the French for "stone of Turkey", through which Persian exports passed into Europe historically.
6. The polymorph of Al_2SiO_5 found in high grade regionally metamorphosed rocks. It was first described in Connecticut, U.S.A..
7. Feldspathoidal tectosilicate found associated with potassic mafic lavas, which are associated with continental rift and arc volcanism, such as in Italy, as well as the East African Rift.
8. The most common variety of igneous calcic clinopyroxene, typical of basaltic and gabbroic rocks.

Down:

1. Hydrated mica-like clay mineral formed from biotite and/or phlogopite through weathering or hydrothermal alteration.
2. Although not a mineral, this important hydrocarbon ore is normally found as a liquid trapped in porous sandstone.
3. A rare earth element named after the village of Ytterby (Sweden), and mostly used commercially to make green fluorescent lighting.
4. The element which, when combined with copper, makes bronze, and has been mined extensively from the Bushveld granites as its oxide ore.
5. A variety of cryptocrystalline silica associated with precipitation from volcanically-heated groundwater into void spaces, and named for its occurrence by the river Achates, in Sicily.
6. Asteroidal pyrrhotite, in effect, and historically the chemical standard for sulphur isotopic measurements.
7. The parent element for radiogenic osmium (187Os), which decay scheme is used to date and fingerprint sulphide ores in PGE-bearing systems.
8. U.S.-based (Michigan) company commonly associated with producing disc-grinding and polishing equipment for rocks and minerals. No money was received by the editor for this clue…
9. The prefix for rocks which have undergone solid-state transformation.
10. Abbreviation of the rare earth element essentially unique amongst the lanthanides for exhibiting both +2 and +3 valence states in relatively reducing (igneous) systems, allowing it to mimic calcium much more effectively than its relations.

Crossword solution can be found on the MINSA webpage, at www.gssa.org.za/minsa.