

### Dear members...

Welcome to this edition of the MINSA newsletter. The year is almost at an end as we gear up (or wind down) towards the Festive Season. MINSA has been active with events this year, with more planned since the AGM took place in August, at the Ditsong Museum of Natural History, Pretoria. I'd like to thank Sabine Verryn, as outgoing Chair, for her tireless efforts in promoting the goals of MINSA. As I've been away for two months since the AGM (a piece on my exploits over this period is elsewhere in this newsletter...), I'd also like to thank Igor Tonžetić, the MINSA Vice-Chair, for standing in as Chair during this period, as well as the elected committee members for handling the affairs of MINSA. More on hosted and planned events can be found in this edition, and your participation is strongly encouraged – please see especially the information on the IGC conference ([www.35igc.org](http://www.35igc.org)) in Cape Town next year, where mineralogical themes focus strongly in a comprehensive scientific programme.



You are always welcome to suggest any initiatives that help to bring together the mineralogical community and address topics relevant to our profession – we look forward to your inputs.

MINSA is also on a drive to update and grow its membership database. Please spread the word so that members who have not heard from MINSA can get in touch with us to update their contact details.

As this is the last edition for this year, I'd like to wish all of our membership a safe and happy Festive Season, and a prosperous 2016 ahead.

Enjoy!

– *Desh Chetty, MINSA Chairman 2015-16*

### “The Earth Scientist’s Toolbox”: MINSA’s analytical techniques workshop

A successful workshop on analytical techniques in the earth sciences was hosted by MINSA from 27-28 October 2015 at Mintek in Randburg. Experts from industry and academia were invited to present talks on the theory and applications of various techniques, including petrography, scanning and transmission electron microscopy, automated SEM, XRD, XRF, electron and nuclear microprobe analysis, LA-ICP-MS, infrared spectral imaging, Raman spectroscopy, SIMS, ToF-SIMS, Mössbauer spectroscopy, as well as neutron and X-ray computed tomography. Application talks by users were also given.



***Dr Sabine Verryn giving an introduction to X-ray diffraction on day 1 of the workshop***

The workshop was an ideal opportunity for experienced mineralogists to refresh their basic theory and learn about new applications, as well as excellent exposure for students to available analytical techniques. A highlight for many was the networking opportunity, learning which instruments are available at which institutions and getting to know the people involved, and also the interaction with suppliers of instrumentation. – *Keshree Pillay*

# The aspects of coloured precious metal intermetallic compounds

- Invited talk by Prof. Elma van der Lingen

How many coloured metals can you name? Apart from the ones that are grey ('cause then that's over a hundred – duh)? Most would probably say about two – gold and copper...some might get cheeky and include alloys – brass, electrum and rose gold. The guys who really know their periodic table might mention the bluish tinges of cadmium and especially osmium or the subjective greenish-brownish tinge of nickel – but regardless, not many coloured metals exist. It was with this in mind that MINSAs invited Prof. Elma van der Lingen from the University of Pretoria to give a talk on coloured metals (17th



**The “Lycurgus Cup” (290-325 AD). Left - light shone from front resulting in green reflectance. Right – light shone through back resulting in red transmission. [<http://www.smithsonianmag.com/history/this-1600-year-old-goblet-shows-that-the-romans-were-nanotechnology-pioneers-787224/?no->**

September 2015, Wits) or rather coloured intermetallic compounds, which are technically not so much metals as they behave in an incredibly brittle manner and are more akin to minerals like taenite and kamacite with distinct stoichiometries. Spectacular purple gold ( $\text{AuAl}_2$ ) was discussed with applications in jewellery, specifically as a faceted stone because of its inherent brittleness. However, mention was made of how some of these coloured compounds have also found use as barrier coatings on turbine blades for jet engines, catalysts (by de-alloying Al from Au for instance, creating a mesoporous structure) and decorative coatings such as the glass coatings seen so ubiquitously on skyscrapers nowadays. An ancient

example of the use of metals for colour effect was presented as the “Lycurgus Cup” – a cup where nano-particles of gold and silver render a dichroic effect to the glass when lit from behind (viewer sees red transmitted light) or when lit from in front (viewer sees green reflected light). Brief mention was also made of how anodising (oxidising minute layers of metals) can change their colour attributes, as seen in the many colours of aluminium metal carabiners.

Further reading: Van der Lingen, E. (2014): Aspects of coloured precious metal intermetallic compounds, The Journal of the Southern African Institute of Mining and Metallurgy Vol. 114, pp137-144. For a video on the “Lycurgus Cup”: [https://www.youtube.com/watch?v=\\_lweX0IT-uQ](https://www.youtube.com/watch?v=_lweX0IT-uQ).

Any ideas concerning topics or guest speakers are welcomed and may be forwarded to Igor Tonžetić at: [igor.zeljko@gmail.com](mailto:igor.zeljko@gmail.com) – Igor Tonžetić



## MINSAs AGM 2015

MINSAs held its Annual General Meeting (AGM) on the evening of 27 August 2015. This year's event was hosted at the Ditsong National Museum for Natural History (the old Transvaal Museum) in Pretoria, where members and visitors had the opportunity to browse through the mineral exhibits over snacks and drinks. The highlight of the AGM was the awarding of two honorary memberships. The recipients were Prof. Johan de Villiers (University of Pretoria) and Prof. Grant Cawthorn (Emeritus professor, University of the Witwatersrand) in recognition of their long association with, and commitment to, MINSAs. Outgoing Chair, Dr Sabine Verryn (XRD Analytical and Consulting), read the citations and presented Johan with a specimen of exotic sulphides from Tsumeb Mine, and Grant with a specimen of syenite from the Pilanesberg. Both specimens were provided courtesy of Dr Paul Nex of the University of the Witwatersrand, recognising the research passions of both recipients.

Sabine further reported on the activities and events of the previous year, the most significant of which was the highly successful IMA2014 conference held in September 2014, and welcomed the new executive committee members: Dr Desh Chetty (Chair, Mintek); Igor Tonžetić (Vice Chair, Indigo Laboratories); Darren Tiddy (Anglo American) and Keshree Pillay (Mintek). Sabine remains on the executive committee, as does Dr Jill Richards, the MINSAs secretary/treasurer. Planned and upcoming events were announced, and new membership encouraged.

The evening's formalities ended with a presentation by Ellen de Kock (Council for Geoscience) on the curation of the museum's mineral collection, which elicited lively discussion from the audience. MINSAs wishes to thank the museum head, Kholisile Nzolo, for kindly making the museum facilities available for the AGM. – Desh Chetty



*Prof. Grant Cawthorn (left) and Prof. Johan de Villiers (right) being awarded their honorary memberships by Dr Sabine Verryn at this year's AGM (photos courtesy Roger Dixon)*

## Desh's visit to Scandinavia

A day after the MINSAs AGM, I was on my way to Luleå, northern Sweden, where I would be based for two months at the Luleå University of Technology (LTU). I was there as a visiting scholar on the geometalurgy course as part of the EMerald Masters Programme in Georesources Engineering (<http://www.emerald.ulg.ac.be/>). The programme is run as a joint collaboration among four European institutions: Université de Liège, Université de Lorraine, Nancy, Bergakademie Freiberg, and LTU. Fourteen students from 13 countries arrived in Luleå for the third leg of their studies under the programme. The geometalurgy course was run by Prof. Pertti Lamberg, who has extensive experience and knowledge in the field, and Dr Cecilia Lund, senior researcher in the Minerals and Metallurgical Engineering Department at LTU. Other members of staff and postgraduate students in the department also contributed to different aspects of the course.



*EMerald students and teachers at the historic Outokumpu mine in Finland*

A highlight of the course was a fieldtrip to Finland, where we visited three mines, the Geological Survey of Finland, and the University of Oulu. I was most impressed with the effective communication between geologists and process engineers on the plant in implementing geometalurgical principles for successful operation at the three mine sites visited. Mines at different stages of their lives were covered, which was also a good choice for learning about different challenges at different stages of the mine life cycle.

Back in Luleå, the students were exposed to different 'games' to emphasise the importance of a mineralogical approach to geometalurgy – excellent teaching tools that would certainly find merit in the South African context. These included the "Adventures of a Process Mineralogist" game for troubleshooting problems in minerals processing circuits, and the "Challenge Geometallurgy!" game, where the aim was to establish and use a

geometallurgical model to mine and process an iron ore body in the shortest payback time.

I was also fortunate to visit the Kiruna and Malmberget iron ore mines of Swedish company LKAB, both located north of the Arctic Circle. Kiruna, the world's largest underground iron ore mine, together with the Malmberget mine, accounts for the majority of Europe's iron ore production. Magnetic and gravity separation are used for upgrading the ore, with additional flotation in the case of Kiruna ore to remove fine-grained apatite. Iron concentrates are then pelletised and transported by rail to Narvik (in Norway) and Luleå. Living next to the railway line and seeing the loaded trains every day, brought home to me the importance of this industry to the region.

Adding crisp autumn weather, the rapid change in the length of daylight, beautiful forests, the awesome Aurora Borealis, wonderful Sami culture, lilting Swedish language and the many people I met from all over the world, has made this an inspiring professional and personal experience. To this end, I would like to thank LTU for kindly hosting me, and Mintek and the EMerald programme consortium for funding the visit. – *Desh Chetty*



*View of the Kiruna iron ore mine, from the bus station. The town is in the process of moving, owing to mining expansion plans.*



**Specialists in Thin Section Preparation of Rocks & Minerals**

- Fastest, most reliable & cost effective services
- Easy collection & dispatch of rock samples globally
- State-of-the-art facilities
- Dedicated team

*Also available: Mortar & Pestles made of AGATE*

**Contact:** [www.labcryystals.com](http://www.labcryystals.com)  
**Email:** [cigeology@gmail.com](mailto:cigeology@gmail.com)

**Would you like to place an advertisement in the MINSAs newsletter?**

***Our advertising rates for 2016 are:***

- 1/8 Page: R 100
- 1/4 Page: R 200
- 1/2 page: R 400

**Please contact Jill Richards ([jillrichards.za@gmail.com](mailto:jillrichards.za@gmail.com)) for payment details.**

***If you have any news that would be of interest to the MINSAs community, contributions can be sent to Keshree Pillay ([KeshreeP@mintek.co.za](mailto:KeshreeP@mintek.co.za))***