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the Geode the Geode

NEWSLETTER
Volume 7 No. 1
March 2020

“the magazine you can share, virus-free”

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From the Chair

From the Chair – March 2020

Hello to all current (and future) Minsa members reading this chair’s column for the first Geode of 2020! Although up to now the year has been quiet, at least mineralogically speaking, some interesting things lie ahead!

Future Themed Geodes

There are also other interesting developments for Minsa. From now on, the Geode, Minsa’s quarterly

newsletter, will have special scientific themes. These themes will be announced in the preceding Geode and we invite anyone with an interesting short article related to these themes to submit them to Geode for possible publication in the next issue. The theme for the second Geode of 2020 will be novel, interesting, and under-utilized techniques for applications in process mineralogy (e.g. computed tomography, synchrotron-based techniques, etc.). This can be related to the techniques themselves or brief case studies where the techniques were applied.



*Bertus Smith
Minsa Chair*

Minsa Book Prize

Another new development concerns the Minsa book prize, which is awarded to Masters

dissertations of high quality completed at southern African universities. The criteria are that the dissertation comprise at least 50% mineralogy. This book prize will now be advertised and administered through the Geological Society of South Africa's annual post-graduate student awards. This means the Minsa book prize will join the likes of the Best Fourth Year Geology Student Prize, the John Handley Award and the Corstorphine Medal, and be awarded at the GSSA's annual general meeting. The call for nominations for the Minsa book prize will therefore go out with the other GSSA awards and nominations can be submitted to the GSSA. The prize will still be adjudicated by Minsa. If you believe there is a completed dissertation that fits the criteria and is of merit, please submit a nomination.

This year will be challenging in many ways, with a few curveballs already coming our way such as Covid 19, and US elections always providing interesting times. Please be safe out there and wash those hands regularly! As always, please keep an eye on the Geode and our Minsa mailing list for further activities coming this year and thank you again to Steve Prevec for his hard work in preparing the Geode every quarter. See you for the next column!

Kind regards,

Bertus Smith

Chair – Minsa Executive Committee 2019/20

Forthcoming Events & Attractions

- Due to the advent of the COVID-19 coronavirus global pandemic into South Africa, all of the scheduled interactive social-professional events in the first half of 2020 have been postponed, cancelled, or gone virtual.

This includes the June-July GSSA Geocongress (Stellenbosch) and all

scheduled Minsa talks in March-April. The talks will be rescheduled as it becomes appropriate to do so, hopefully sooner rather than later. A teaser for the March talk follows.

And still on the cards if 'isolation' restrictions are lifted in time:

- Combined MINSAs/Micromount Symposium – November 2020
- Joint weekend visit of MINSAs and the S. A. Micromount Society to Rooiberg Tin Mine.

A Minsa Talk: Coming soon to a venue or virtual setting near you...

Modern beneficiation techniques for bulk ore processing: Iron ore and coal as case studies

by Carl Bergman

When: To Be Announced (originally scheduled for March 17, postponed for the time being);

Where: University of Johannesburg, Geology Department Reading Room (to be confirmed)

The talk will focus on the development of *new processing methods* that have recently entered the space of bulk ore processing. Dry bulk commodities are usually divided into two categories: major bulks and minor bulks. Some examples of major dry bulk commodities include iron ore, coal, and grain. The talk will highlight special requirements in terms of logistics and processes to treat ores at over 1000 t/hr.

Topics covered will include:

- Resources in South Africa
- Mineralogical drivers for processing options

- General themes specific to bulk ore processing
- Use coal and hematite to showcase the logistic and processing headaches
- Economic sensitivities

Carl Bergmann graduated from Wits in 1988 with a B.Sc. Eng. (Chem). He joined Mintek in December 1988 in the Minerals Processing Division, where he worked in the Physical Separation Group. He was Head of the Group from 1995 to 2002. He obtained a Master's degree in project management in 2003 from the University of Pretoria and was seconded as General Manager of Tollsort, a Mintek JV company looking at optical sorting of minerals, from 2003 to 2004. Currently, Carl is employed at Mintek as Specialist in Research, focussing on new technologies and modelling of mineral processing processes.

The Year of the Plant

The United Nations General Assembly has declared 2020 as the ***International Year of Plant Health (IYPH)***. The objective is to raise global awareness on how protecting plant health can help end hunger, reduce poverty, protect the environment, and boost economic development.

Last year the Minsa quarterly talk on the 'Year of the Periodic Table' was presented by Professor Reinout Meijboom, HoD of Chemistry at UJ. This year Minsa is looking at organising a virtual (?) talk with a mineralogical take related to plants, such as bioremediation of mined waste land, or biomining.

If you have any brilliant ideas on topics and/or speakers, please send your suggestions to our Communications Officer:

sara.sjt.turnbull@gmail.com .

Thematic Minsa geodes

As noted in the Minsa Chair's column earlier in this issue, it has been proposed by the Minsa illuminati late last year that we attempt to use this space as

a venue for more stimulating interactive professional discourse. One way of doing this, apart from my riveting crossword puzzles (see last page), is to have specific themes for each quarterly issue, which can stimulate responses or comment to be published in subsequent Geodes. It has been noted that apparently, for mineralogists, it can be debated as to whether there is in fact such as thing as "mineralogical techniques", or not. Got an opinion? Let us know! Personally, in my experience running mass spectrometry labs, and using external TIMS and EPMA facilities, my impression is that analytical techniques in general may not in fact exist as permanent entities in this space-time dimension, but in fact are only temporary manifestations whose existence is controlled by the vagaries of quantum instabilities. But that might just be me.

The June issue is designated for submissions on **novel, interesting, and under-utilized techniques for applications in process mineralogy**. Got a method that is under-appreciated? We want to know!

Contributed by S. Prevec

MINSAs membership news

Our membership currently stands at 152 and we are growing steadily. We welcome all new members and urge them to become active participants of our Association – even if only virtually?

During 2019, several members resigned, probably one of the most well-known being Professor Louis Cabri who closed his company in November 2019 and retired - after 35 years with Canmet followed by 20 years consultancy.

Our 15 Honorary members now include Dr Desh Chetty and Dr Sabine Verryyn who were awarded this recognition at our 40th Anniversary Dinner held in October 2019.

Two members are deceased, Professor Dee Bradshaw passed away in 2018 and Dr Jay Barton

in early 2019. We also said farewell to a good friend of Minsas's, Dr James Brink, who died in 2019.

Minsas events: A Night at the Museum

We did a group sleepover at the national museum on Saturday December 7th, 2019. The group consisted of 6 adults and 7 kids, the latter ranging from 8 years old to a 5 month old. The weather was rainy outside, but the museum was warm and a comfortable temperature.

Upon arrival we all met on location and the facilities were shown to us. (This process was delayed a bit which resulted in all activities being a bit delayed - so this could be improved on). We then started with a tour of the bird room, which was really cool. There was break and then the dinosaur room was done followed by the mammal room. There was also a scavenger hunt which was enjoyed by both adults and kids and finally movie time (by then it was late and the kids exhausted), followed by sleep time. We were given the option of sleeping literally anywhere in museum, which was cool. We chose the bird room, as the temperature was the most comfortable.

The next morning after a quick breakfast, we spent some time at the play area and then did minerals and rocks, followed by viewings of the huge dinosaurs outside. The tour guide was very knowledgeable, patient and friendly. The kids enjoyed the activities and just the general sleepover. The facilities are fairly well kept. The kitchen provided with microwave and fridge was good. Bathrooms were accessible and neat.

It was an awesome experience and I would definitely repeat it in a year or two. I was impressed with the tour and activity provided and would highly recommend this fun activity.

Contributed by Nadia Dawood

Other gems

Goldschmidtite

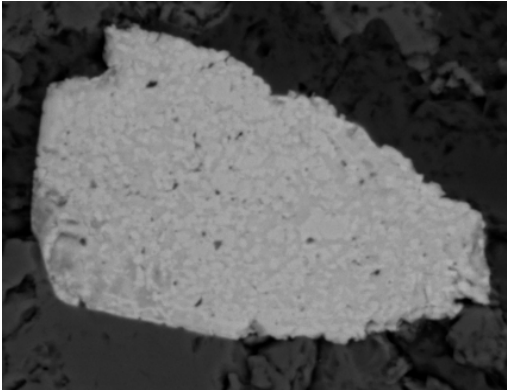
Nicole Meyer, a Ph.D. student at the University of Alberta, Canada (my doctoral alma mater, incidentally), has recently identified a chemically-distinctive variant of perovskite as an inclusion in a South African-derived diamond, from the Koffiefontein kimberlite pipe, in the southwestern Free State. The mineral, with stoichiometry $(K,REE,Sr)(Nb,Cr)O_3$, is noteworthy for the predominance of K and Nb and light rare earth elements in a phase originating in a mantle setting. Fluid metasomatic processes in continental roots are implicated in its origins, wherein normal perovskite ($CaTiO_3$) might become a home for normally incompatible high field strength elements in the environment of kimberlite magmagenesis in which those elements are locally enriched.

For more information, see an article [here](#) (there are several to choose from), or the recent (Sept. 2019) publication in the *American Mineralogist* (vol. 104, p. 1345-1350), entitled "Goldschmidtite, $(K,REE,Sr)(Nb,Cr)O_3$: A new perovskite supergroup mineral found in diamond from Koffiefontein, South Africa" by Meyer, Wenz, Walsh, Jacobsen, Locock, and Harris.

Reidite

A mineral I just became aware of through my own research interests, reidite, is the high-pressure, high-temperature polymorph of zircon ($ZrSiO_4$), and occurs exclusively in association with meteorite impact craters. Although the mineral structure was recognized experimentally in 1969 by Alan F. Reid (hence the name), it was recognised in nature only relatively recently, since 2015, in association with, to date, less than ten impact structures. The main difficulty in identifying it in nature is that, well, it does not actually exist there, since it forms as a transient high pressure form during extreme shock

metamorphism (requiring pressures in excess of 30 GPa, and temperatures in excess of 1673°C, that of zircon decomposition, and possibly >2000°C), and then reverts back to zircon shortly thereafter, in the absence of the shock-induced extreme conditions.



A possible FRIGN zircon?; SEM image of an 80 μ -long, granular-textured zircon grain from the footwall rocks adjacent to the Proterozoic Sudbury impact structure, Canada. Is this the product of shock, cataclasis, and/or thermal metamorphism? From Prevec, de Bruyn and Nxesi (2019) Large Meteorite Impacts VI, Brasilia, Brazil, conference abstract.

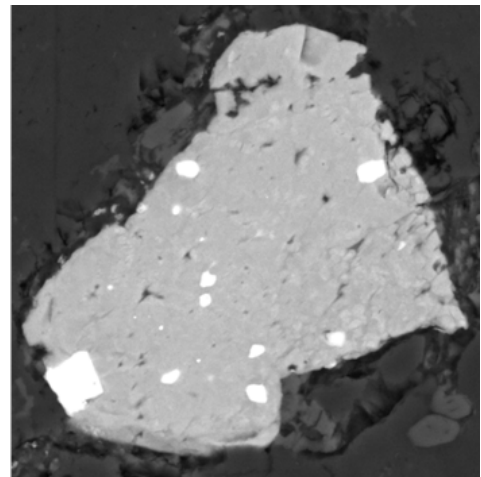
It was discovered in 2015 that the inversion process produced characteristic clustering or domains of crystallographic axis alignment in the resultant decompressed zircons, recognizable (so far most reliably) using the relatively novel analytical technique of electron back-scatter diffraction (EBSD). The sample must also first be prepared beyond normal polished section requirements by additional mechanical and chemical pre-treatment.

A significant amount of work has already been achieved by the few specialist laboratories in the world, building up the database on occurrence, habit and significance of these inverted reidites, known colloquially as FRIGN zircons (“former reidite in granular neoblastic”), particularly that of Dr Aaron Cavosie of Curtin University (Perth, Australia) and his research team. For more information, see also their article in *Geology*, vol.,

46, p. 891-894, entitled “FRIGN zircon—The only terrestrial mineral diagnostic of high-pressure and high-temperature shock deformation”, by Cavosie, Timms, Ferrière and Rochette.

Thorite?

On a related note, the mineral thorite, discovered in 1828 and with the kind of chemistry that makes you not want to keep it in your front pants’ pockets, with stoichiometry (Th,U)SiO₄, is known to occur in association with zircon in pegmatites and volcanic extrusives, as well as in contact metamorphic rocks, has also been found as subdomains within the same baked, sheared and shocked rocks as was the zircon featuring in the previous image.



Above, a granular-textured zircon containing subhedral grains of thorite (bright / white), identified and photographed using SEM-EDS. Field of view is around 60 μ wide.

The occurrence of the mineral thorite in the specific context of apparently shock-deformed zircons in an impact melt sheet aureole has not been previously reported, and this author is keen to hear from anyone with insights into its petrogenesis, whilst working towards publishing this meantime!

Contributed by S. Prevec (your editor).



MINSA – Bridge the Gap Geoscience Guidance Program partnership announcement and call for participation

The Mineralogical Association of South Africa (Minsa) would like to announce their partnership with Bridge the Gap Geosciences Guidance Program (BTG). Bridge the Gap is a student run organisation at the University of the Witwatersrand, that focuses on mentorship between undergraduate and postgraduate students, as well as between students and industry professionals.

In addition to the mentorship program, BTG hosts a number of informative talks, workshops and field trips to expose students to opportunities as well as the expectations of a working environment. To further these goals MINSA has partnered with BTG and asks their membership base to consider collaborating in any of the following capacities:

- Mentorship
- Speaking at a lunch-time talk (topics covered range from geoscience related to skills based)
- Leading an excursion to a field site or laboratory
- Offering to host students for vac work experience
- Providing sponsorship

BTG invites all interested individuals/ companies to “bridge the gap” between students and industry by joining the BTG program. Your influence can go a long way in encouraging and shaping aspiring geologists by acting as positive role models.

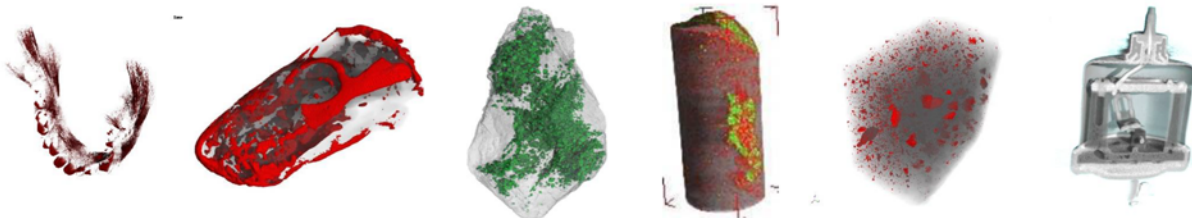
To get involved please complete the Google form by clicking on the following link: <https://forms.gle/Sf5tMciuSStAQuFL8>, or email bridgethegap.wits@gmail.com for more information.



2nd ANNOUNCEMENT

IMGRAD-2020 Conference

4th South African Biennial Conference on
Imaging with Radiation: Radiography & Tomography



21 and 22 Sept 2020

Necsa Visitor Centre, Pelindaba, Pretoria

The Radiation Science Department of the South African Nuclear Energy Corporation SOC Ltd. is proud to host the 4th National IMGRAD conference in the series of bi-annual conferences. The conference aims to bring together researchers in the field of neutron and X-ray imaging techniques, such as Computed Tomography (non medical) in the various research fields to discuss their work and share ideas.

You are invited to submit abstracts from the following fields:

- Geosciences
- Biosciences
- Material Sciences
- Palaeosciences
- Engineering
- Cultural Heritage

Maximum length of abstracts must be 250 words. Do not include tables, figures, equations, formulae or references in the abstract.

Registration, costs, information as well as abstracts for oral and poster presentations can be submitted on the following site:

<http://events.saip.org.za/event/IMGRAD-4>

1 March 2020	Abstracts submission & Registration open
15 Aug 2020	Abstract Submission deadline
15 Aug 2020	Notification of acceptance Preliminary program
1 Sept 2020	Registration close Final program
21&22 Sept 2020	Conference (2 days)

Organisers contacts:

Dr Frikkie de Beer

012 305 5258

imgrad4@saip.org.za

For more info minsa@gssa.org.za

INVITATION FOR SUBMISSIONS FOR THEMED GEODE



Closing Date

End of May 2020

Quarterly newsletters now have scientific themes. We invite anyone with an interesting short article related to these themes to submit them to Geode for possible publication in the next issue.

The theme for the second Geode of 2020 is novel, interesting, and under-utilized techniques for applications in process mineralogy (e.g. computed tomography, synchrotron-based techniques, etc.). This can be related to the techniques themselves or brief case studies where the techniques were applied.

Bruce’s Beauties: Aegirine

In the world of mineral collecting and aesthetic specimens, aegirine ($\text{NaFeSi}_2\text{O}_6$) is not one that readily springs to mind, being a somewhat mundane (for collectors, at least!) rock-forming pyroxene found in alkali igneous rocks and carbonatites.

An exception are the specimens shown here, that come from the Zomba Mountains in Malawi. These are being collected from pegmatites in the syenite by local artisanal diggers and some individual crystals are up to 20 cm in length.

The 8.1 cm piece below has a prime aegirine crystal standing vertically in its matrix, and as with many from this locality, is associated with K-feldspar and tan-coloured zircon.

Bruce Cairncross specimen and photo ©.



At right, a large (10.2 cm) aegirine crystal with large tetragonal tan-coloured zircons attached.

Bruce Cairncross specimen and photo ©.



This specimen (above) consists of clusters of black aegirine together with creamy K-feldspar and tiny, granular zircon crystals, 9.8 cm.

Bruce Cairncross specimen and photo ©.



Minsa Crossword for March 2020

1		1			2							
									3			
4												5
				2								
3												
							6					
		4	7									
		5										
	6											

DOWN:

1. A variant of cryptocrystalline silica consisting of a mixture of chalcedony and microgranular quartz, associated with precipitation from volcanogenically-heated fluids.
2. A pyroxene found in alkaline igneous rocks, or high pressure metamorphic rocks, in which sodic minerals feature prominently. This mineral also features elsewhere in this issue of the Geode.
3. A cobalt arsenic sulphide mineral, found in high temperature hydrothermal deposits. The primary element is named from the German, Kobold, meaning “underground spirit”, with reference to its refusal to smelt as expected.
4. An arsenic sulphide mineral found in low-temperature hydrothermal deposits and in hot springs and volcanic fumaroles. Its name derives from its golden colour.
5. The Ca-Al garnet subgroup also found in skarns, the unintended theme of this crossword. A green gem variety, Tsavorite, named for the Tsavo region of Kenya, occurs in Kenya and Tanzania.
6. This hydrated carbonate mineral is the primary source for sodium carbonate in the U.S.A. (but not elsewhere), and forms in non-marine evaporates. It also occurs in salt pans in Namibia and the Kenyan rift valley.
7. This mineral is the recently recognized high-pressure polymorph of zircon, diagnostic of the conditions unique to large impact craters. It also features elsewhere in this issue of the Geode.

ACROSS:

1. An arsenic sulphide mineral also known as “ruby sulphur”, on the street. Also, when I was an undergraduate, we thought this would be an excellent name for a child. Now, as a parent, not so much.
2. A hydrothermal mercury sulphide mineral, HgS, constituting the only important mercury ore. Its bright red colour made it attractive as a colouring pigment for thousands of years, mined from volcanic precipitates, although its toxicity to humans has been recognised as early as ancient Roman times.
3. The three letter acronym for the six elements chemically associated with rhodium, for which the Critical Zone of the Bushveld Complex hosts much of the global economic reserves to date.
4. The plural form (yes, it’s a bit of a cheat) of the Ca-Fe garnet subgroup found in contact metamorphosed skarns associated with heating of impure limestones.
5. Another mineral found in impure limestone-hosted skarns, this Ca-Mg-Fe sorosilicate is also known as vesuvianite, but the gem version is often known as this.
6. The high pressure polymorph of quartz first synthesized in 1953 by Loring Coes Jr, a chemist at an American commercial abrasives-making company, it is associated in nature with meteorite impact craters.

Note: The recommended deadline for submissions for the next issue of the Geode is May 31, 2020.