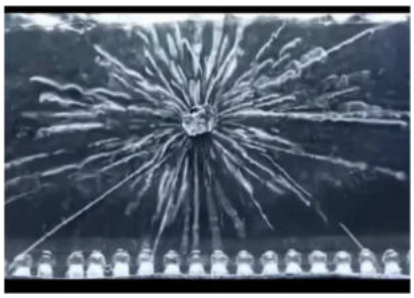
Mineralogical Society of Western Australia Inc.

To encourage mineralogical study by amateur and professional alike and, in so doing, discover, document and preserve the Earth's, and in particular Western Australia's, natural history.

NEWSLETTER 109 December 2024



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EDITORIAL

Welcome to the 109th issue newsletter for the last quarter 2024.

We hope you enjoy reading this edition of our recent activities. With a small Christmasy flavour and articles on our interesting November talk about collecting and displaying radioactive minerals and our latest field trip to Mukinbudin. As well as some more specific studies on minerals – of a different sort this time.

Merry Christmas to you all and best wishes for the New year and beyond.

Wendy H
Newsletter Editor

NOVEMBER 2024 TALK

Some Aspects of Radioactive Minerals Found in WA

Compiled by Grant Boxer

Introduction

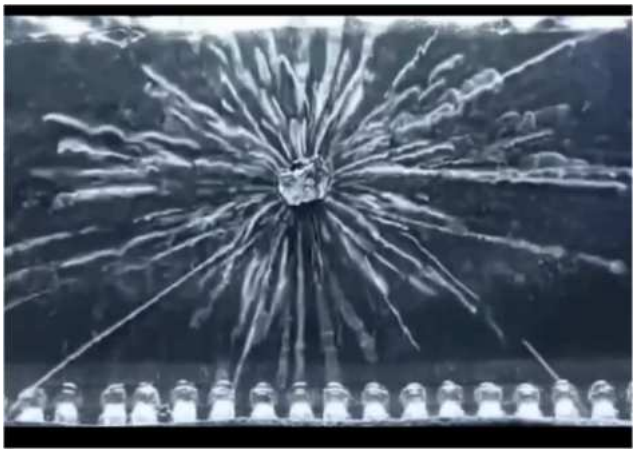
The talk on November 13th was given by Stuart Jeffries, a retired hydrogeologist and an Accredited Contaminated Sites Auditor in WA. Stuart has been concerned about the storage of radioactive minerals in people's collections and this talk highlighted the issues surrounding radioactive minerals. Stuart's talk was really interesting as I have been a geologist for many decades and never really considered the health risks associated with my mineral collecting!

What is radioactivity

Radioactivity is the release of energy from the decay of the nuclei of certain kinds of atoms and their isotopes. There are three types of radiation: alpha, beta and gamma.

Alpha radiation comprises the nuclei of helium atoms (2 protons and 2 neutrons) and have a positive electric charge. Alpha particles are very limited in their travel distance and cannot penetrate intact skin. Beta radiation consist of rays of electrons and has a negative electric charge. Beta radiation can penetrate 3 mm of aluminium and can penetrate human skin. Gamma radiation is the most dangerous, comprising high energy photons, and these have the highest penetrating power. Gamma radiation can pass through several centimetres of lead. This radiation can pass through the human body and cause damage to tissues and DNA, leading to cancer.

The problem with radioactivity is that we cannot see, feel or touch it. Stuart showed a great video of the radiation detected using a cloud chamber (see image below) and the blue "Cherenkov glow" in a nuclear reactor.



Naturally-occurring background radiation is the main source of exposure for most people, with levels ranging from about 1.5 to 3.5 millisievert (mSv) per year. The WA effective dose limit for the public is 1 mSv/yr.

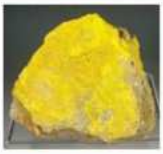
Dangers of exposure

Low levels of radiation exposure can cause various cancers whereas large doses lead to death. The minerals in our rock collections pose potential radiation exposure risks. Stuart discussed some of the famous nuclear reactor disasters like Chernobyl, where the temperatures reached over 1200°C and melted through concrete. The Manhattan Project was discussed along with the "Oppenheimer" and "Fat Man and Little Boy" movies.

Radioactive mineral occurrences

A radioactive mineral is a naturally occurring inorganic solid with a defined chemical composition and a crystalline structure. Man-made radioactive substances like the highly radioactive products of a meltdown, highly enriched uranium or plutonium and spent nuclear fuel are not encountered in nature.

Radioactive uranium minerals found in Australia include uraninite (pitchblende), uranophane, davidite, coffinite, brannerite and carnotite.

Uraninite (Pitchblende), (UO_2)		Davidite: (La/,Ce,Ca) $(Y,U)(Ti,Fe^{3+})_{20}O_{38}$		Brannerite UTi_2O_6	
Uranophane: $(Ca(UO_2)_2(SiO_3OH)_2 \cdot 5H_2O)$		Coffinite $U(SiO_4)_{1-x}(OH)_{4x}$		Carnotite: $K_2(UO_2)_2(VO_4)_2 \cdot 3H_2O$	

Radioactive thorium minerals include thorite, thorianite, and monazite.

Thorium (Th)		Thorite: Th,U)SiO4		Carbonatite:	
Thorianite: ThO_2		Monazite: (Ce,La,Nd,Th) $(PO4,SiO_4)$			

Concentrations of uranium and thorium are found in a variety of deposits, including roll-front deposits, surficial calcrete, metamorphic and granitic rocks, carbonatite intrusive rocks and beach sand deposits (monazite).

Monazite-(Ce), (Ce,La,Nd,Th)PO_4 (the most common member)		Rutile:TiO_2		Zircon: $ZrSiO_4$	

WA occurrences

Uranium mineralisation is widespread in WA, with 28 known uranium deposits hosting at least 200 000t of U_3O_8. Examples of WA deposits include Kintyre (Rudall Complex), Yeelirrie (Yilgarn), Mulga Rock, and the numerous beach sand deposits around WA's coastline hosting large amounts of monazite.

Hazards

There are three risks associated with radioactive minerals — radiation, toxicity and the inhalation of radon gas.

Uranium is a heavy metal and, if ingested, has a chemical toxicity similar to lead oxide. Irradiation of alpha, beta and gamma are all a serious risk with radioactive minerals.

Radon gas is produced by natural radioactive decay. Radon is colourless, odourless and tasteless, and emits alpha particles during its decay. If radon is ingested, then this alpha radiation can cause lung cancer. Radon has a short half-life of 3.8 days. Radon gas can collect in a display case containing radioactive minerals and these should either be sealed or well ventilated.

Safety precautions for mineral collectors

Minerals generally have low levels of radioactivity and are not harmful to people if handled properly. The major concern in handling these minerals is their inherent toxicity and they should always be handled with gloves. Radioactive samples should be clearly identified in your collections to remind yourself, and others, that this is a potentially hazardous mineral sample.

The important things to consider when storing radioactive minerals is that they should be in a display case and that Pb containing glass can act as an extra shield from radiation. Due to the production of radon gas, it is recommended that the minerals be in a well-ventilated space. Samples should not be stored close to commonly frequented areas like living rooms or bedrooms.

Use a vacuum cleaner or wash the samples to remove dust to prevent inhalation of radioactive particles or radon. Wear gloves and always wash your hands after handling radioactive minerals.

An audit was undertaken of the Lapidary Club collection and, although radioactive minerals are present, the health risks are very low due to the limited exposure time to the collection by onlookers.

NOVEMBER 2024 FIELD TRIP

Mukinbudin Field Trip – 15-17 November 2024
Compiled by Peter Pring
Pictures by the author unless noted otherwise

A group of 13 MinSocWA members assembled in Mukinbudin (250 km east-northeast from Perth) to enjoy beautiful spring weather while looking for minerals. Most field trip participants opted to stay at the Mukinbudin caravan park, rather quiet at this time of year but clean and tidy with good facilities (nobody took the opportunity to use the pool). The only complaint would be that the ground was rather hard for knocking in tent pegs. The group assembled at the Mukinbudin pub on the evening of the 15th,

Mukinbudin Main Street – Looking towards the pub (picture by Mark Richards)

some sampled the product from the local Dandanning Microbrewery, before dining in the attached restaurant.

The participants assembled on the morning of the 16th in the café attached to the pub, where we were treated to an impromptu lesson on grain quality and pricing from the landowner of the Mukinbudin quarry (Gary Shadbolt), with the grain harvest in full swing across the region ahead of forecast rains during the week ahead. The participants travelled in convoy out to the Mukinbudin quarry site but scattered across the three quarries and associated outcrops for a morning of fossicking.

Field trip participants in the Mukinbudin quarry

The Mukinbudin quarry has been developed in a pegmatite dominated by quartz and microcline (feldspar) with accessory biotite and minor muscovite.

Twinning in Microcline – Mukinbudin quarry

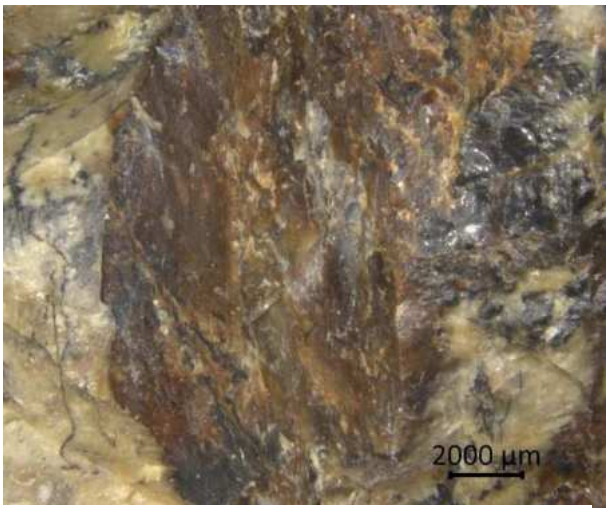
Fergusonite and Cyrtolite – Mukinbudin Quarry – squares are 1cm x 1cm (Picture by Rob Walker)

There are also trace amounts of zircon (cyrtolite), fergusonite, allanite and euxenite, all with varying levels of rare earth elements and associated uranium/thorium.

The risk from radioactive materials was the topic of much discussion during the trip, Stuart came armed with a Geiger counter with which he confirmed some of it was quite 'hot'.

Metamict thorite up to 42.76 µSv/hr – "Quite Hot" – Mukinbudin Quarry (Picture by Stuart Jeffries)

Crytolite under microscope – Mukinbudin Quarry (Picture by Rob Walker)



Fergusonite under microscope – Mukinbudin Quarry (Picture by Rob Walker)

Damage fractures radiating out from Cyrtolite in quartz – Mukinbudin Quarry

Biotite book – Mukinbudin Quarry – squares are 1cm x 1cm (Picture by Rob Walker)

Some neat mineral textures were on display in the pegmatite minerals. The white to pale pink microcline showed good cleavage, twinning and perthitic textures, the quartz varied between grey-white, crystal clear or smoky; some small miarolitic cavities provided decent crystal points. The biotite formed good sized books to 30 cm across or occasional “rosettes”, in one instance radiation damage could be observed around coarse zircons embedded within biotite. Zircon not contained in biotite but rather in quartz and feldspar, were typically surrounded by a damage zone of radiating fractures.

Biotite rosette in microcline groundmass – Mukinbudin quarry

Biotite with zircon (showing damage and weathering around the zircons) – Mukinbudin quarry

Looking east from the Mukinbudin quarry over the conveyor belts of the screening plant (Picture by Stuart Jeffries)

A late addition to the field trip was a visit to the Lake Brown gypsum project southeast of Mukinbudin. There was plenty of gypsum to be seen with some well-formed swallow-tail twinning but most crystals were on the small side. A key learning for some was that it's unwise to venture too far out on salt lakes which may be soft under the salt crust!

Lake Brown (Picture by Mark Richards)

The group moved to the Calcaling Quarry in the afternoon — both are inactive but Calcaling is much smaller than the Mukinbudin operation. The two pits have a similar mineralogy and textures, with the addition of ilmenorutile at Calcaling. Possibly the best smoky quartz point of the trip was found at Calcaling on a pile of quartz product. Calcaling also features a small cave at the base of the pit that hosted some decent smoky quartz crystals, with a little excavation it was accessible to the smaller members of the group, but it was too confined to allow much chance of getting the quartz crystals out intact, so we didn't try.

Gypsum crystals – Lake Brown

Lake Brown Gypsum – squares are 1cm x 1cm (Picture by Rob Walker)

Ilmenorutile in Albite – Calcaling Quarry– squares are 1cm x 1cm (Picture by Rob Walker)

Pick of the quartz points from Calcaling quarry (not found in the cave shown below)

Smoky quartz crystals in microcline groundmass in the cave – Calcaling Quarry

Suzie in the cave – Calcaling quarry

Half the group departed for Perth on the afternoon of the 16th, the other half had a second night in Mukinbudin (the beer was just as good the second night). The remaining participants returned the

Mukinbudin quarry on the morning of the 17th for a final fossick before returning to Perth in the afternoon.

The field visit was only possible with the permission of the landowners and the companies who hold the exploration licenses over the respective quarries. Mukinbudin quarry is on land owned by Gary Shadbolt, the license is currently held by Industrial Minerals Ltd. Calcaling quarry is on land owned by John Nicoletti and the license is currently held by MTM Critical Minerals. The 2016 UWA Honours thesis by Thomas Pilote *Mineralogy and Geochemistry of Rare-Element Bearing Minerals in the Mukinbudin NYF Pegmatite Field, Western Australia*, provides a much more detailed discussion of the minerals present in both quarries and the regional context of the Mukinbudin pegmatite field. You can also read about some finds from a much earlier MinSocWA trip here.

It was not possible on this trip to visit the Karlonning and Cosh's North pegmatite quarries; both are operated by Whitestone quarries and on exploration licenses currently held by Codrus Minerals and Caprice Resources respectively. Both companies were agreeable to a Mineralogical Society visit, as was Whitestone quarries, however the quarries are active work sites but there were no personnel on site over this weekend.

It is hoped we could repeat the trip next year, once the summer weather cools down.

Most of the participants – Calcaling Quarry (Picture by Ida Newton)

2024 INTRODUCTION TO MINERALOGY

Session One of the Introduction to Mineralogy course – 13 July.
We talked about definitions of mineralogy, minerals and rocks, and the physical properties of minerals with some examples of their utilisation.

Session Two of the Introduction to Mineralogy course – 10 August at WAM Boola Bardip.
We talked about the periodical system of elements, chemical composition of minerals and their classification, and touched on crystallography. Thanks to Susan Stocklmayer (MinSocWA) and Erin Gray (GSWA) for their help with these difficult topics. Also, we visited the WAM Origins exhibition and saw beautiful minerals and rocks of WA. The display of mineral fluorescence attracted the most attention.

Session Three – 14 September at Toodyay.
The group had a splendid day looking at granites in the Perth Hills. Thanks to Tim Ivanic (GSWA) for help explaining the geology of Archean rocks and their mineralogy.

Session Four – 12 October – a browse and study of PGMS specimens and gems worth collecting.

Session Five – 9 November – A visit to the Perth Core yard.
DEMIRS / GSWA staff showing and discussing drillcore, mineral and fossil collections with some analyses using GSWA portable instruments.

CHRISTMAS 'MINERALS'

A traditional Christmas nativity scene often includes the visitation by those described as the "three wise men from the east.

The gifts they brought were selected as worthy and listed as gold, frankincense and myrrh. As a seasonal thought - each of these gifts has some connexion to minerals and revered materials: gold is an elemental mineral, a symbol of wealth and has a deep history as a mineral appreciated for its many virtues. Both myrrh and frankincense are botanically fragrant gum resins that are used in perfumery, medicines and as incense.

They are derived from a long-established culture of exploitation in some countries of the Middle East and northern Africa. Both resin products continue on and are commercially available; incense can be sensed in the rituals of many cultures and in different places of worship.

OTHER INTERSTING ARTICLES, SNIPPETS, INFO

How does fossicking impact the endangered booroolong frog

An intriguing discussion with Dr Sophie Collins and our member Rodney Berrell. See AJM Issue 25.2 for more details.

MICROSCOPE CORNER

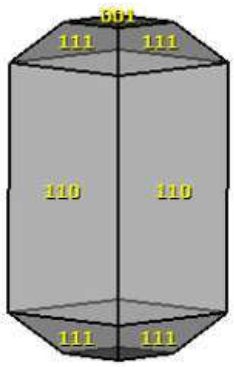
Weddellite – both a mineral and an organically generated compound

Submitted by Susan Stocklmayer

The recent AJM journal included an article (Colchester and Pogson, 2024) that introduced the reader to thoughts about the strict definition of a mineral as well as some simple home-based mineralogical investigations that produce results seen under the microscope.

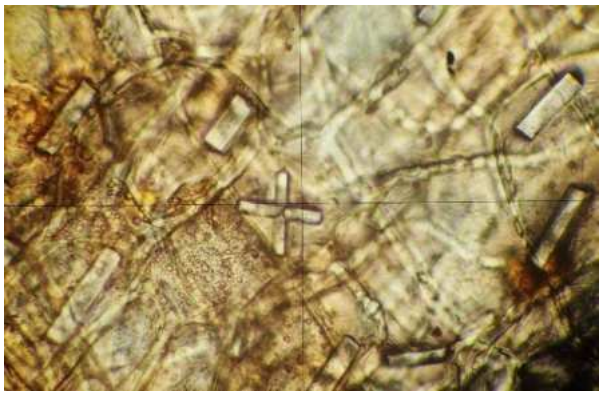
The mineral under discussion is weddellite (a calcium oxalate; Ca (C_20_4) 2 H_20), first described from samples dredged from seafloor sediment of the Weddell Sea in Antarctica in the 1930s (Bannister and Hey, 1936). It was later named and International Mineralogical Association (IMA) approved in 1942. These tiny tetragonal system crystals, all under 1mm in length, white to pale yellow in colour are described as "envelope"- shaped with prismatic forms, bi-pyramidal terminations and some with basal faces. They were formed by authigenic processes in the seabed sediment.

The general construction of a crystal is shown on the right (www.smorf.nl/draw.php).



Weddellite is also fairly commonly found as an organically formed mineral and the recent AJM article is illustrated with images of weddellite crystals which have developed within the dry skins of onions. These occur as one crystal to one cell through the cellular texture of the skin specimen.

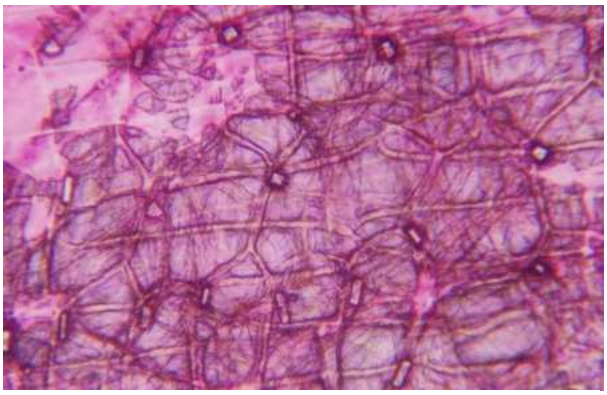
Weddellite is documented as occurring in many different plants, where it crystallizes from a combination of calcium and oxalic acid in the natural metabolic processes of the plant – the sour taste of sorrel and rhubarb are examples of plants that process oxalic acid. Weddellite is also found in fungi, lichens and in animals in some urinary and renal deposits.



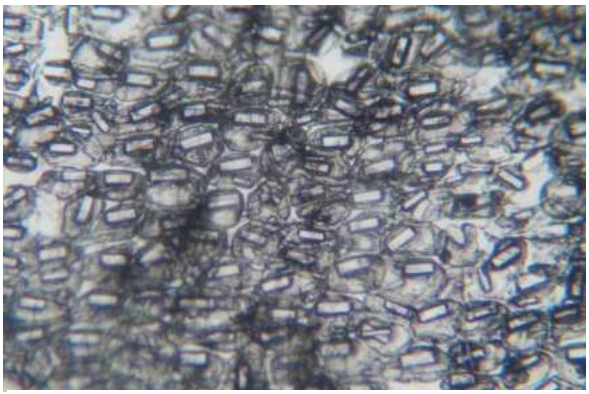
Prismatic crystals with one central twinned crystal of weddellite in onion skin (maximum crystal length 0.2mm)

Following the example of the onion skin, the author also investigated other varieties of the *Allium* genus including dry skins from red onions, garlic and shallots. By removing a small piece of dry skin from the outer layers from each of these bulbs, mounting the specimens on a glass slide with a drop of mineral oil and examining these under high magnification, the images below show the occurrence of the weddellite crystals in each of these host examples.

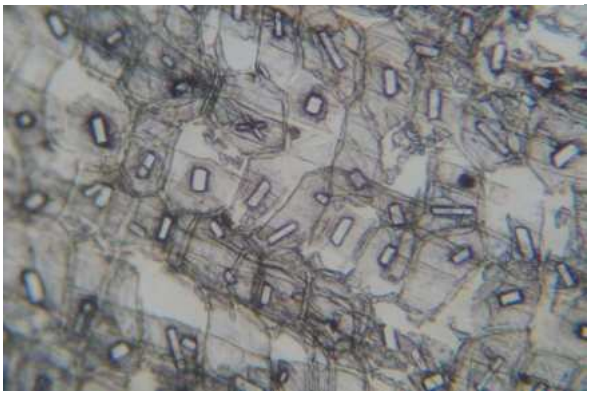
The arrangement of the single crystals and some examples of its cross pattern of twinning is also shown. The longest crystal prism faces measured from these examples is about 0.2mm and from the common brown onion skin; the garlic and shallots produced crystals that were noticeably smaller and in more obvious linear trails and, the red onion produced a colourful display by virtue of its natural red pigment together with its mineral content of tiny crystals. Because of the regular alignment and orientation of the crystals it was only feasible to view the prismatic faces and part of the pyramidal faces; a spindle stage would be required to reorient crystals.



Small crystals of weddellite in red onion skin. FOV 1mm



Crystals of weddellite in garlic skin, generally aligned and some crystals twinned. PPL.FOV 1mm



Crystals of weddellite in shallot skin. PPL view FOV 1mm

So, weddellite as found in plants and animals, is a bio mineral, generated by the metabolic processes of living organisms and by definition is not accepted as a mineral *sensu stricto*, with many botanical references describing the crystals simply as calcium oxalates. Whereas, weddellite as a fairly widespread mineral derived naturally by inorganic processes are those occurrences described in mineralogy references. Weddellite is noted in cave deposits in WA (Bridge, 1977).

Bannister, F.A, and Hey, M.H. 1936. Report on some crystalline components of the Weddell Sea deposits. *Discovery Reports*, *13. p. 60-69*

Bridge P J, 1977. Archerite, (KNH4) HPO4, a new mineral from Madura, Western Australia. *Mineralogical Magazine, v.41 p.31-35*

Colchester DM, and Pogson RE, 2024. Weddellite in onion skin, *Australian Journal of Mineralogy. Volume 25 number 2 p.63-64.*

https://www.mindat.org/min-4254.html

CRYSTAL PROBLEMS

Cornelius S. Hurlbut, Jr.

When first I studied crystals
I didn't have the knack
Of three-dimensional thinking:
This skill I seemed to lack.
I'd turn and twist the crystal round
In hope that I could see
At least one axis or a plane
Of crystal symmetry.
The prism, pinacoid and dome,
The rhombic pyramid
All looked the same to me,
No matter what I did.
But now I've studied long and hard,
And think I'm somewhat wise,
For in no length of time at all
The cube I recognize.

VALE TED FOWLER

Edward (Ted) Fowler, a founding member of MinSocWA, passed away on 1 November 2024.

FOWLER Edward TED Passed away 1 Nov 2024. Devoted husband to Maureen, Dad to Rod, Sally, Cameron and Sussan, Pop to Daniel, Jason, Zach, Asha and Eric. Forever now with Gran, looking for rocks in undiscovered terrain.

Always in our hearts Love you Pop

Ted spent most of his life in WA working as a Bank Manager, travelling and visiting the spread of our State from Bassendean to Broome, from Meekatharra to many Wheatbelt towns. With Alan Longbottom and Clive Daw, he carried the torch of micromounting in the Society for many years.

Putnisite on millerite, photo Ted Fowler

He was a keen-eye mineralogist and a good outsider in the bush, as clearly outlined in these photos. He also had a quirky sense of humour, as outlined by an item from the MinSocWA Newsletter of December 2001 (below).

Ted enjoying the carvings near Angaston

Ted's Drying Tray

"*Ted Fowler was an enthusiast fossicker with a great knowledge of WA mineral localities. He was enjoyable company to be with on our Mineralogical post-conference excursions. His enthusiastic presence and enjoyable company will be missed by many, especially those who were involved with Ted and his fossicking exploits*" - George Stacey, MinSocNSW member

A MINERAL BY ANY OTHER NAME WOULD SMELL THE SAME - OR WOULD IT?

The potential discovery of a new species is the dream of most collectors. Some time ago my very good friend and fellow Society member, Ted Fowler, a knowledgeable and fine practitioner of the art of micromounting, was delighted to find a possible new species in this backyard. More precisely, the locality was the underside of the concrete lid of the household septic tank.

Not one to ignore the potential scientific value of this interesting cluster of white acicular crystals, Ted duly collected and mounted the specimen. Once mounted, the important labelling requirements became a priority. Notwithstanding the international conventions on naming minerals, my friend was inclined to be a little self-indulgent and proposed "fowlerite" as an appropriate name. This hope for immortality was immediately shattered when it was realized that fowlerite had already be applied to a zincian rhodonite. Undaunted by this setback and mindful of the origin of the specimen, a name was selected that maintained the family connection and provided a subtle clue to the type locality.

Over the years, many collectors have admired Ted's collection and not infrequently visitors have been invited to make a visual identification of a particularly fine cluster of white acicular crystals. To date no one has successfully identified the species, although many learned suggestions have been offered. Each time this play has been performed, Ted proudly turns the mount to reveal its name - **FOULERITE**

John Reeve – extracted from MinSocWA Newsletter, December 2001

MinSocWA – 25 YEARS OLD in 2025

Next year is our 25th anniversary. Niels Dahl (currently travelling) has taken on the task of compiling an historical record of the past quarter century.

If you hold early records, photographs or ephemera, please make it known and available to Niels or anyone on the committee (or better yet, send to the Newsletter@minsocwa.org.au) so that it can be included in our history.

MEMBERSHIP

The Mineralogical Society of WA has over 100 members. We have welcomed the following new members since September 2024:

Christin Schulz	Daniel McQuiggin
Meagan Gardiner	Suzie Soh

All members are asked to ensure that their contact details are up to date with the Membership Secretary/Secretary. If you change your email address or phone number, please let us know so that you continue to receive all MinSocWA communications – membership@minsocwa.org.au

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ADVERTISING

Put your advert here.

UPCOMING EVENTS

Next evening talk is on 22 January 2025. See December Bulletin for details.

COMMITTEE MEMBERS FOR 2023/2024

President	Peter Willems	president@minsocwa.org.au
Vice President	James Sherborne	jamessherborne@hotmail.com
Secretary	Angela Riganti	secretary@minsocwa.org.au
Treasurer	John Mill	treasurer@minsocwa.org.au
Treasurer Apprentice	Vino Vigneswaran	vvinodaarshini@yahoo.com
Field Trip Leader		fieldtrips@minsocwa.org.au
Newsletter Editor	Wendy Hampton	newsletter@minsocwa.org.au
Committee Member	Niels Dahl (Travelling)	stormpfan@gmail.com
Committee Member	Susan Stocklmayer	baobab46@dodo.com.au
Committee Member	Nicolas Hébert	aminenh3@gmail.com
PGMS Secretary	Peter Willems	pgms_secretary@minsocwa.org.au

Patron - *Mark Creasy*

Meetings

Meetings of the Mineralogical Society of Western Australia Incorporated are usually held at **7.30 pm on the second Wednesday of every odd month** at:

WA Lapidary & Rockhunting Club rooms 31 Gladstone Road,
Rivervale (corner of Newey Street)

The venue will be open from 6.30 pm for refreshments and socialising.

MinSoc WA LINKS

Web	http://www.minsocwa.org.au
Facebook Group	https://www.facebook.com/groups/minsocwa
Facebook Page	https://www.facebook.com/MINSOCWA
Instagram	https://www.instagram.com/MINSOCWA
YouTube Channel	https://www.youtube.com/channel/UC0S2TFVFIBLU-2zlEzE5VNA

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