Mineralogical Society of Western Australia Inc January 2012 Newsletter

Editorial

A reminder, our meetings are now held on the third Wednesday of odd months, often with other activities on the intervening months. While we are having either meetings or activities most months, the newsletter will still only come out once every 2 months. Many thanks to those members supplying articles for this newsletter. Please can members submit articles for the newsletter, as the committee are currently busy planning for this year's seminar. Articles to be included in the next newsletter are due by Wednesday 7th March. Late articles may be held over to the following newsletter. If insufficient articles are received by this deadline then the newsletter may be cancelled.

Until the end of the seminar committee members will be under a lot of pressure. Please make their task easier by helping out whenever you can.

Members may submit short adverts free of charge.

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February informal Meeting - Wednesday 15th February 2012

Topic: Minitalks on Rare Earth Minerals Part 2

Speaker	Topic
Susan Stocklmayer	**A rare earth mineral containing Scandium**
Stewart Cole	**A rare earth mineral containing Cerium**
Vernon Stocklmayer	**A rare earth mineral containing Praseodymium**
Ted Fowler	**A mineral containing Promethium**
Sue Koepke	**A rare earth mineral containing Gadolinium**
Tony Davies	**A rare earth mineral containing Dysprosium**

Visitors Welcome.

Light refreshments provided after the meeting.

2012 Future Meetings and other Activity Dates

Please note these dates are the third Wednesday of the month.

Wednesday 21st March 2012 Speaker: Francine Payette Topic "Mont Saint-Hilaire"
Wednesday 18th April 2012 (informal meeting) Rare Earth Mineral talks part 3
Wednesday 16th May 2012 Speaker(s): To be Announced Topic: To be Announced
June – Joint Seminar Saturday 9th June to Monday 11th June
Wednesday 19th September 2012 Speaker: Melvyn J. Lintern , CESRE , Topic: "The gold and calcrete story 25 years on - what have we learnt?"

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Joint Mineralogical Societies of Australasia 35th Annual Seminar

Please note early registration closes on the 31st of January.
The next Joint Mineralogical Societies of Australasia 35th Annual Seminar will be held in Perth at the State Library (Alexander Building) from 9th to 10th June 2011. The theme will be "Rare Earth Minerals". Additionally a micromounters symposium will be held at Gemmological House in Claremont on the 8th June. The theme for the micromounters symposium is "Nickel Minerals of Western Australia" with particular emphasis on 132 North Mine, Widgiemooltha. A mineral trading morning will be held at The Philatelic Council Rooms in Wellington Fair Perth on Monday 11th June. A 10 day field trip is being planned with an exit point at Kalgoorlie (possibly between days 3 and 5) for people who need to leave early. Members are encouraged to download the registration form from the website (www.minsocwa.org.au) and to register early.
More details in future Newsletters, and on the website.

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New Members

Welcome to new members Ken Ireland, Peter Simmonds and Yvonne Regge..

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Tranquillityite found in Western Australia

The Apollo 11 mission in 1969 brought back 21.5Kg of rocks. Geologists were excited about seeing the first rocks from our closest neighbour. Every speck of these rocks were examined in minute detail – nothing was overlooked. As a consequence three new minerals not previously discovered on earth were discovered. These were armalcolite $(Mg,Fe)Ti_2O_5$, pyroxferroite $(Fe,Mg,Ca)SiO_3$, and tranquillityite $Fe_8Zr_{15}Y_{0.5}Ti_3Si_3O_{24}$. Microprobe analysis of 4 samples of tranquillityite from the Apollo 11 and Apollo 12 missions show that the lunar material also contains small amounts of Cr(0.11% Cr2O3), Hf(0.17% HfO2), Nd(0.24% Nd2O3), Pr and Gd(trace amounts) and uranium(72ppm). These minerals were originally thought to be unique to the moon, however, within three years the geologist Danielle Velde found armalcolite in samples of lamproite dikes and plugs taken in Smoky Butte, Garfield County, Montana, USA. Mindat now lists armalcolite as occuring in 12 countries (including Russia, USA, European countries and Zimbabwe) as well as the landing sites on the moon for Apollo 11, Apollo 16 and Apollo 17. Similarly pyxoxferroite was found within a few years on earth and Mindat now lists it as being found at USA, Europe, and Japan. Tranquillityite has been found in Martian and Lunar meteorites in India and Oman, but until 2011 has not been found in terrestrial rocks, making it the last mineral from the Apollo missions unique to the moon. Curtin University's Professor Birger Rasmussen tentatively identified a Pilbara mineral as tranquillyite after studying it in a scanning electron microscope.This has been confirmed by researchers from The University of Western Australia's Centre for Microscopy , Characterisation and Analysis, by showing that the composition and crystal structure is the same as the lunar tranquillityite. Tranquillityite does not have a lot of uses, however it is useful for radiometric dating of the rocks in which it was found. The Pilbara rocks in which it was found were previously thought to be 820 million years old but have now been found to be 1040 million years old.
In the Apollo 11 mission tranqillityite was found in basalts at the Sea of Tranquillity whereas in Western Australia they are found in dolerite dikes and sills, associated with baddeleyite and zirconolite.

References
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Last mineral thought to be unique to the Moon found in Australia by Darren Quick Jan 17 2012
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‘Moon rocks’ made here: tranquillityite discovered in Western Australia

Birger Rasmussen
ARC Australian Professorial Fellow at Curtin University

The Apollo missions yielded more than just great views of our home planet. NASA

By the time the Apollo Program ended in 1972 it had cost NASA roughly US$170 billion dollars (in today’s terms). It was seen as a waste of money by some, but almost 40 years since the launch of Apollo 17, we are still seeing significant returns on the investment. Among the most significant of those returns is the valuable information the lunar landings provided about our moon and, in turn, the planet we call home.

Have you seen my rock collection?

Prior to the Apollo missions, knowledge about the moon was limited to remote sensing, modelling and speculation. It was unclear what the moon was composed of, whether it was young or old, whether it harboured life, and whether it contained water. There were many theories but few facts.

On July 20, 1969, the Apollo 11 Lunar Module touched down in the Sea of Tranquillity. Soon after landing, Neil Armstrong and "Buzz" Aldrin became the first humans to walk on the moon. During their two-and-a-half hours outside the spacecraft, they collected 58 samples, weighing a total of 21.6 kilograms.

Five days later, the first box of samples was opened before a global audience. Although the first dusty samples looked like overcooked potatoes, they soon started answering some fundamental questions, and raising new ones.

A microscope image of a thin slice of coarsegrained basalt collected from the Sea of Tranquillity by the Apollo 11 astronauts. Birger Rasmussen

Among the samples were coarse-grained basalts that were found to contain minerals not known on Earth: pyroxferroite, armalcolite and tranquillityite. Within a decade the first two of these were identified on Earth but tranquillityite was not, and it came to be regarded as the "moon's own mineral".

Tranquillityite is a silicate mineral containing zirconium, titanium and iron that crystallises from a magma with other late-forming minerals.

Australian-made

Rocks of broadly similar composition to the coarse-grained "lunar basalts" also occur here on Earth. These rocks are referred to as dolerite, and contain many of the same minerals. My colleagues and I recently collected samples of Western Australian dolerite while searching for minerals to use for dating. Our research involved detailed examination of thin slices of dolerite using optical and scanning electron microscopes.

In a sample from the Pilbara region, small, foxy red crystals were identified that had the same X-ray element spectra – a kind-of compositional fingerprint – as tranquillityite from the moon.

Examination of thin slices of the mineral using a high-resolution transmission electron microscope revealed it had the same structure as annealed (slowly cooled) lunar

tranquillityite.
Since the first discovery, we've now identified tranquillityite in dolerite from six new localities in Western Australia. This suggests tranquillityite may be a widely distributed trace mineral in these types of rocks.

A sample of dolerite from the Pilbara region of Western Australia containing tranquillityite. Birger Rasmussen

Dating rocks

Tranquillityite contains trace amounts of uranium and so attempts were made to date it by ion microprobe – an instrument that fires a focused beam of charged particles at the sample. We now know that tranquillityite is particularly good for dating and we can deduce the age of the mineral quite accurately.
By analysing basalt collected during the Apollo 11 mission we can deduce that the Sea of Tranquillity was a vast lava field 3.7 billion years ago. Rocks this old are rare on Earth and are typically highly deformed and metamorphosed, having experienced a complex geological history.
On the moon, by contrast, the absence of tectonic processes, water and microbial life has left most lunar rocks virtually unaltered since they formed. Indeed, the 3.7 billion-year-old lunar basalts appear "fresher" than lavas that erupt today in Hawaii or Iceland.
Because of its ideal properties for dating, tranquillityite could also be used to date the dolerite in Western Australia. It turns out that the dolerite is more than a billion years old – much older than expected – necessitating a re-evaluation of the geological history of this region of Australia.

In our own backyard …

Two questions immediately arise from our discovery of tranquillityite on Earth: why was it first found on the moon, and why did it then take 40 years to identify on Earth?
It was probably first identified on the moon for a couple of reasons.
Firstly, scientific interest in lunar material was intense and within five years of the first returned lunar samples, nearly 1,000 scientists from 200 research groups across the world had closely scrutinised the samples.
In 1970, six independent groups had already identified a mysterious new mineral in Apollo 11 basalts variously referred to as "phase A", "an iron, titanium, zirconium silicate" and "an unnamed yttrium-zirconium silicate".
In 1971, Australian geologist John Lovering and co-authors jointly published a paper describing the new mineral and naming it "tranquillityite" after the Sea of Tranquillity.

An optical microscope image showing a crystal of tranquillityite (red-brown) in a sample of dolerite from Western Australia.
Birger Rasmussen

Secondly, at that time, new technology was emerging in the form of scanning electron microscopes and electron microprobes, which allowed scientists to extract every bit of information possible from these priceless samples.
Although tranquillityite also formed on Earth, it was probably not discovered earlier because these rocks were not as intensely studied. Tranquillityite is small and rare, and can be mistaken for other minerals. Also, dolerite is mostly examined today using techniques that require crushing of entire samples to determine chemical composition or to extract minerals for dating. These approaches do not favour the discovery of small, rare minerals.
The identification of tranquillityite on Earth 40 years after its discovery on the moon is a reminder of the many achievements of the Apollo mission, including countless scientific discoveries, revolutionary advances in technology and, perhaps most importantly, the inspiration of a generation of scientists and engineers.

From the vantage point of 2012, the estimated US$170 billion cost (in today's terms) of the Apollo mission seems increasingly modest, and is surpassed many times over by the long-term economic, societal and scientific returns.

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Extraordinary Stories from the British Museum reported by Sue Koepke

"Extraordinary Stories from the British Museum", a collection of some of the most important objects representing many of the 54 Commonwealth countries, is exhibited at the Western Australian Museum - Perth until 5 February 2011. The exhibit includes priceless works of ancient art, and most objects have never been shown outside of Britain before. A visit (entry is by donation) is highly recommended.
For further informations see http://museum.wa.gov.au/extraordinary-stories/extraordinary-stories
This is the first initiative of a five-year partnership between the WA Museum and the British Museum to collaborate in research and exhibition development.
http://www.museum.wa.gov.au/extraordinary-stories/extraordinary-stories-from-british-museum

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Report on the talk on fluorescence given by Tom Bateman on Wednesday 18th January 2012

Report submitted by Susan Stocklmayer, photos by A. Hart and S. Koepke.

Our speaker for the meeting was retired geologist Tom Bateman who gave us a talk on fluorescence and its application in mineral detection. Throughout his talk were demonstrations showing fluorescence in various minerals that showed the usefulness of the portable fluorescent lamp for fossickers and prospectors.

As an introduction, various luminescence terms were described; these included triboluminescence (light stimulation by friction), fluorescence (light emission during ultraviolet light stimulation) and phosphorescence (after-glow following the cessation of ultraviolet light stimulation). Fluorescent responses and some phosphorescent responses are the most pertinent to mineral detection.

We were informed that fluorescence, caused by sunlight stimulation was familiar to our ancestors in the Roman period.

Fluorescence occurs when an electron relaxes to its ground state by emitting a photon of light after being excited to a higher level by some type of energy. The most striking examples shown by a mineral or other fluorescent substance occur when the absorbed radiation is in the ultraviolet range and thus invisible to the human eye and the emitted light is in the visible region. Visible light is that perceived by the human eye and that is in the range 310nm to 700nm, most of us can generally see light of wave lengths greater than 400nm and to 700nm.

Many materials in the home will fluorescence: in the kitchen various edible oils include olive-, peanut- and macadamia oils as well as substances such as tonic water (with its quinine content) and plastics.

Ultraviolet (UV) light is commonly termed 'black light' as it is invisible to us. Ultraviolet light, especially short wave, can be damaging to us and it is advisable to wear spectacles and protect the skin from exposure when using UV lamps.

The UV light is most commonly generated by mercury vapour tubes that emit UV together with some visible light- most of the unwanted visible light wavelengths are then removed by filters. Lamps are available that produce UV in specific ranges utilising a combination of filters, long wave (LWUV) has a principal wavelength of 365nm and short wave (SWUV) has a principal wavelength of 254nm. Fluorescent responses are generally stronger using lamps with a mains electric supply compared to portable prospecting types.

The causes of fluorescence are complex and include atomic defects and ions in abnormal positions within the atomic structure of minerals (examples include diamonds, sphalerite and fluorite) as well as the presence of particular elements in minerals. Pure minerals do not fluoresce.

Self- activator elements (as compounds) that cause fluorescence include amongst others: uranyl group and minerals that contain trace amounts of uranium- in opaline silica producing green and yellow fluorescence, tungstates in scheelite, molybdates in powellite and lead in anglesite and cerussite. Chromium (as Cr+3) results in red fluorescence in both natural and synthetic ruby.

A large group of minerals also will fluoresce when activated by the presence of certain trace elements such as manganese and lead and examples include: apatite, axinite, halite, pectolite, tremolite, chiastolite, eosphorite, and willemite.

Conversely, the presence of some elements quench fluorescent response, particularly iron (Fe^{2+}) and nickel (1ppm causes a marked decrease in UV response in sphalerite).

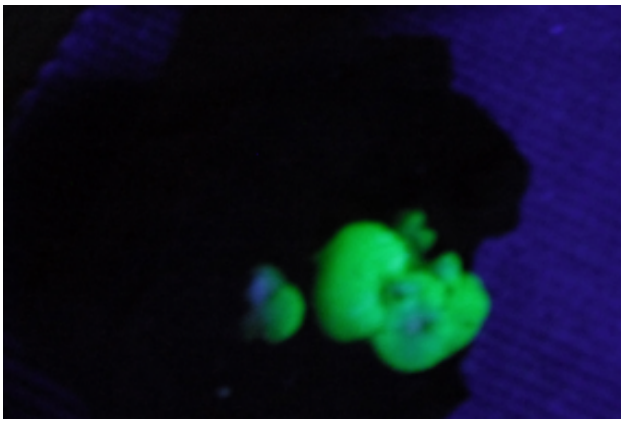
From a total of about 4200 known minerals approximately 520 regularly show fluorescence.

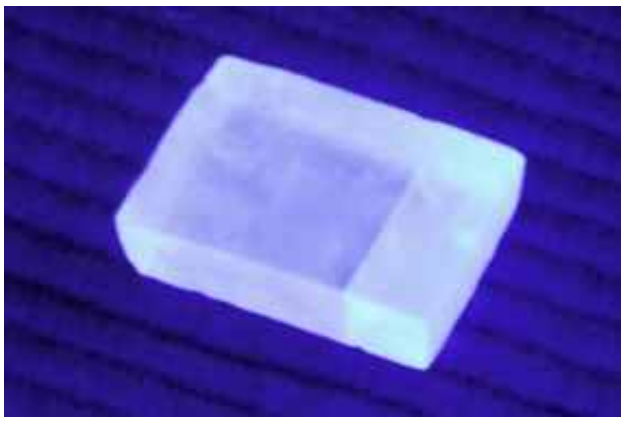
This was an interactive meeting with discussion and questions during and after the session and viewing of many minerals that were brought along to show their fluorescent responses. Of special note amongst gemstones were natural and synthetic rubies, spinels and amber with minerals commonly encountered in the field including: monazite (as sands), magnesite and opalised magnesite, aragonite, calcite and gypsum, kunzite and gaspeite.

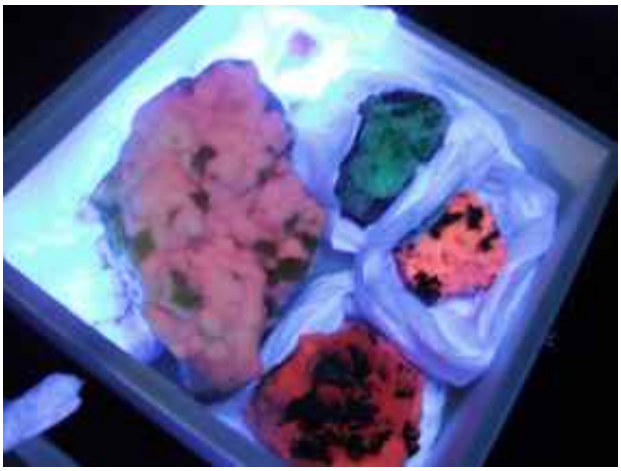
Tom's years of experience as a teacher were demonstrated by his relaxed, clear communication and delivery of a session promoting discussion and participation that was appreciated by all.

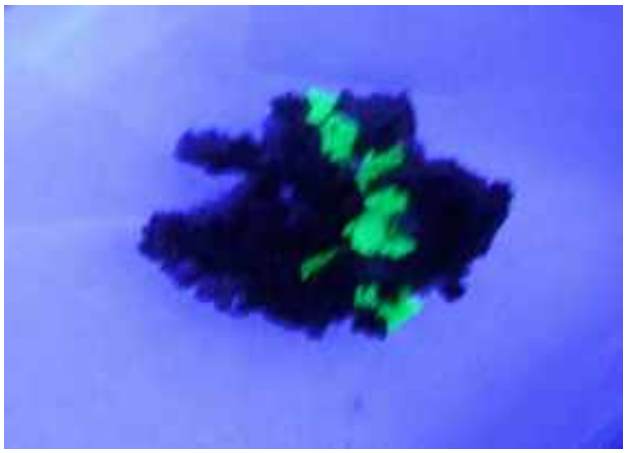
Tom lecturing to the meeting

Tom demonstrating the UV lamp









Examples of minerals under fluorescent light shown on the night

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Vale Dennis Kelsall

Members are advised of the sad passing of Dennis after a long illness.
No further details are available.

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Field Trips 2012

By arrangement members of the mineralogical society are able to go on field trips organized by the Western Australia Lapidary and Rockhunting Club inc.
If you are interested in attending these field trips please put your name on the notice board at the Lapidary and Rockhunting Club for the relevant field trip.
Please register with MINSOC Field Trip organizers prior to attending any of the following events, but only if you are a current (financial) MINSOCWA member to confirm event details.

THE WESTERN AUSTRALIAN LAPIDARY AND ROCKHUNTING CLUB INC. 31-35 Gladstone Road, Rivervale, 6103. Rivervale W.A.
PROPOSED 2012 ACTIVITIES & EVENTS
February 19th Around the houses
March 3rd, 4th & 5th Hobbs Farm & Beverley
April 6th-9th Mingenew area
May 13th Lake Clifton & Abington Village
June Exhibition – no trips
July 14th-28th long Rockhunt to Muckinbudin, Golden Valley, Lake Seabrook, Condamin Rock, Mt Palmer
August 19th Rockingham Eco Centre
Sept 16th Toodyay for crystals
Sept 29th, 30th & Oct 1st Moora & Bindi for chert & anthophyllite
Nov 18th Club Auction
Further 2012 activities and events will be published during the year

OS&H – Yes, occupational, safety and health applies on field trips
Please make sure you have the normal safety gear – field boots and hard hat Plus carry extra drinking water. Take sun screen and fly repellant. Drive safely

Particularly important for group field trips:-
Please register your details with excursion organizer – name, car rego, mobile telephone
Please follow instructions by excursion organizer and if you need to leave a field trip early, advise organizer.

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Committee Members	
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