



**THE
MINERALOGICAL SOCIETY
OF
NEW SOUTH WALES INC**

C/o School of Natural Science
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NEWSLETTER

JULY 2014

The July Meeting will be held on Friday the 4th of July at 7.30 p.m. in the LZG14 lecture theatre on the ground floor of Building LZ in the Science campus of the University of Western Sydney on the corner of Victoria Road and James Ruse Drive in North Parramatta.

The program will comprise lectures to be given by Gary Sutherland and John Rankin speaking on : -

Some British Mines & Minerals: Part II.

FORTHCOMING MEETINGS

Friday 1st of August 2014 The ANNUAL GENERAL MEETING

Members are hereby duly notified that the Meeting on Friday the 1st of August 2014 will be the Society Annual General Meeting which will commence at 7.30 p.m. in the LZG14 lecture room.

The A.G.M. will commence at 7.30 p.m. with the President's report for 2013/2014, the Treasurer's report and presentation of the annual financial accounts for 2013/2014 and the election of the Society Committee and office-bearers for 2014/2015. In accordance with the Society Constitution the entire current Committee retires at the commencement of the A.G.M. and all positions are open for nomination and election. Any other business may also be raised and discussed. The minutes of the previous 2013 A.G.M. were circulated in the September 2013 Newsletter. Copies of this will be available at the 2014 A.G.M. or may be obtained from the Secretary.

Nomination forms for election to the 2014/2015 Committee are being circulated with this Newsletter. Further copies may be obtained from the Secretary if required. According to the Society Constitution nominations should be received seven days before the commencement of the A.G.M. Only financial and Honorary Life members of the Society are eligible for nomination or allowed to participate in any voting.

Any members who feel able to serve on the Committee are urged to discuss this with any of the current Committee members and to make known their availability for nomination at the A.G.M. A member can be nominated for but cannot hold more than one position.

After the A.G.M. has been concluded the Betty Mayne Memorial Lecture will be given this year by Lin Sutherland on : -

**“Zeolites from India and other Delectable, (Collectable),
Flood Plain Basalt Mineral Suites”**

FORTHCOMING MEETINGS

Meetings will be held on the first Friday of each month throughout the year except before the long weekend of October and before Easter next April when it will be held on the second Friday. Some of the following programs and speakers are still to be confirmed and subject to circumstances some changes may have to be made.

September 5th: The previous scheduled program for September has had to be put back until early in 2015. Instead it is intended that there should be an **Interactive Member’s Forum** with members invited to present short, or long, talks on their favourite minerals, favourite collecting sites, most enjoyable field trips etc or any stories which reflect their interest in mineralogy.

October 10th,: Lecture by Graham Ogle on : - ‘**Långban, Sweden – Rarity and Fluorescence**’.
(Second Friday)

November 7th: Lecture by Brian England on : - ‘**Kulnura Zeolites**’.

December 5th: **Christmas Social.**

Some Society Meeting programs have been tentatively established for the first months of 2015.

February 6th 2015: Lecture by Vera Munro-Smith on ‘**Cobalt Mines of the Cloncurry District**’

March 6th 2015: Report on the **2015 Tucson Show**, speaker to be confirmed, and a lecture by Paul Carr on ‘**Wingen – Fire Mountain**’

April 10th 2015: (The Meeting will be held on the second Friday. April 3rd is Good Friday).
Lecture by Rob Barnes on ‘**Mineral Deposits in NSW**’

WELCOME

Welcome to new member Hayley Bambridge of Merrylands

LIFE MEMBERSHIP: PETER A.WILLIAMS

At the commencement of the June General Meeting the Society President, Dieter Mylius announced that at the May Committee meeting a proposal was made that in view of his very long and valuable service to the Mineralogical Society Peter A. Williams should be granted Life Membership. The proposal was considered at the Committee meeting and was carried unanimously.

The relevant clause in the Society's Constitution states: -

8. MEMBERSHIP OF THE SOCIETY

b). Honorary Life Membership may be bestowed by the Society upon individuals who by their voluntary and sustained efforts have furthered the Society, its aims and objectives. Such membership to be proposed as a resolution by the Committee and confirmed by the membership.

In accordance with the Society Constitution the President formally presented the proposal to the Meeting. The proposal was seconded by Lin Sutherland and carried unanimously by the members present.

At the June meeting there were over forty members comprising a quorum, the Constitution stating:- The quorum at a General Meeting shall be fifteen (15) members or one fifth of the financial membership, whichever is the smaller.

Congratulations were offered by the President to Peter Williams and applauded by the membership.

The SOCIETY COMMITTEE

PRESIDENT:	Dieter Mylius	Tel: (02) 9477 1060
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COMMITTEE MEMBERS:	David Colchester	Tel: (02) 9449 3862
	John Rankin	Tel: (02) 9482 7474
	Gary Sutherland	Tel: (02) 9871 1379
	Jim Sharpe	Tel: (02) 9871 2502
	Edward Zbik	Tel: (02) 9638 6586

The JUNE MEETING

The President, Dieter Mylius, described aspects of the May 24th/25th **Field Trip to Mt Tennyson** and the **Essington Cash mine** when twenty-five cars 'invaded someone's property', as he put it, and thirty-six yellow and orange-vested members emerged from their cars to spend some four -hours breaking

and raking rocks on the Mammoth tungsten and molybdenite mine site looking for garnets, diopside, molybdenite, scheelite and whatever else they could find.

Peter Williams also reported on the **Field Trip** and thanked members for looking out, as he had asked them to, for specimens of 'crummy yellow things', - rarer or more unusual minerals. Apparently none of these were found on this one visit but this did not mean that the minerals were not at the site and Professor Williams hoped that now that permission had been obtained once to access the property possibly other visits might be made.

Ed Zbik advised that two **more field trips were being planned** for later this year, probably in November, to other sites in the Oberon area and then sometime next year to the old Southern Cross quarry near Narellan. He was also considering the Cow Flat area for another trip. Another possibility was to look at Wingen and other sites in that area such as Ardglen. Ed was also looking for four to six people willing to accompany him on a weekend reccéing trip to look for and examine ten to fifteen sites in the Wisemans Creek area. This would involve a certain amount of bush-bashing but Ed had received local information that there were mineral sites in a particular area but which would require up to a two-kilometer hike to access.

The next **Micro-Mineral group** would be meeting on the following day at Noel and Anne Kennon's house at Kanahooka south of Wollongong. The Group would be specifically looking at some zeolites recovered on a field trip two years ago from road cuttings at Bunnan near Scone.

'Polymorphs. A Mineral Enigma'

Professor Peter A. Williams

Professor Williams introduced his lecture by describing mineral polymorphs as those minerals with exactly the same chemical composition but different crystal structures. As an example he showed images of the monoclinic mineral cornwallite and the triclinic cornubite which are copper arsenate hydroxides, both with the composition $\text{Cu}^{2+}_5(\text{AsO}_4)_2(\text{OH})_4$. As a further example the speaker drew attention to a specimen which had been brought in for display by Jim Sharpe, collected from one of the mines in the Cloncurry area, which had the two phosphate analogues, reichenbachite and pseudomalachite, $\text{Cu}^{2+}_5(\text{PO}_4)_2(\text{OH})_4$ of the pictured arsenate minerals. Other very familiar examples of polymorphs were the minerals calcite which is rhombohedral and aragonite which is orthorhombic, both being composed of calcium carbonate, CaCO_3 .

In suggesting that the description of what is a polymorph was very simple Professor Williams then posed the question of why these minerals exist. This unfortunately was extraordinarily complicated and was to be the main theme of his lecture this evening.

Taking the example of calcite and aragonite it was known to mineralogists that calcite was the more stable form of the carbonate which should have meant that it would form predominantly. There was no condition of temperature or pressure under which aragonite would be stable with respect to calcite. In disregard of this there are millions of tons of aragonite around the World. The presence of other ions may serve to interrupt a crystallization process and geochemical systems are dirty; there are usually many minor constituents present. Accordingly the presence of a small amount of magnesium in a medium containing calcium carbonate would cause the formation of impure calcite which would be less stable in respect to pure aragonite. This would go some way towards explaining how the normally less stable form of a mineral might form in quantity in certain circumstances.

Professor Williams referred to a very able chemist, Wilhelm Ostwald, who was awarded the first Nobel prize for physico-chemistry in 1909. He first started publishing in the 1880s and amongst other work established the Ostwald Step Rule. He had recognized that compounds of the same composition may form polymorphs and that if so the one that forms first is the least stable. No-one since has got to the bottom of this phenomenon or can explain why it happens but there are many examples in chemistry.

Professor Williams then referred to currently ongoing U.W.S. research into polymorphic minerals and displayed a list of atacamite polymorphs and the dates when they were recognized and described. All are copper hydroxy-chlorides with the composition $\text{Cu}^{2+}_2(\text{OH})_3\text{Cl}$ but with different crystal structures.

Atacamite	1788	orthorhombic	Clinoatacamite	1996	monoclinic
Botallackite	1865	monoclinic	Anatacamite	2009	triclinic
Paratacamite	1906	rhombohedral			

The presence and amount of chloride or other minor constituents in a medium where atacamite would form can influence which of several polymorphs would actually form or predominate. It has only been over the last two years that the relative stabilities of polymorphs of various mineral groups under different conditions have been established and research at the University is continuing.

With the aid of images of mineral specimens and lists the speaker referred to other mineral groups related to the paratacamite group and which also included several polymorphs such as the herbertsmithite group of composition $\text{ZnCu}_3(\text{OH})_6\text{Cl}_2$ and a few analogues of that mineral where the zinc has been replaced with nickel making gillardite, by magnesium forming haydeelite or by cobalt forming leverettite.

At the end of his lecture Professor Williams posed the question asking how many members would have specimens of paratacamite in their collections. If so they were advised that in fact it would be almost certain that their specimens would also possess at least a small amount of one or more of the polymorphs, clinoatacamite and anatacamite. There would be no easy way to verify this which could only be done by single crystal structure x-ray analysis.

‘Ultra-Small Minerals and How We Can See Them’

Noel Kennon

Noel Kennon commenced his lecture by showing a series of images initially of quite large mineral specimens but gradually of smaller and smaller specimens eventually to specimens with crystals visible only under a powerful microscope. He also showed a short series of diagrams of dots on paper at diminishing distances apart, establishing that 0.11 millimeters was the limit of separation or resolution of the unaided human eye. He then moved on to describe how the eye can be aided with instruments.

Small hand lenses that can magnify up to 20x can provide resolution down to about 0.005 mm or five millionths of a millimeter, also written as 5μ , ($m\mu$). For greater magnifications the observer has to use a microscope of which there are many different types and the speaker proceeded to describe microscopes in some detail. A feature of any microscope was that as the magnification of any microscopic system is increased three problems arise. These are that the depth of field diminishes, meaning that the specimen being viewed must be as flat as possible or much of it will be out of focus at any one time. Then there is a problem with how the lenses actually produce an image and there is even a problem with the nature of light. It was these three problems that the speaker wished to address in turn.

With the aid of diagrams showing an inclined scale and then of the lenses in a microscope Noel Kennon explained the significance of focal length to the depth of field and how some of this problem can be improved although not eliminated by more elaborate lenses. However with constantly advancing microscope technology, systems such as Digital Combinational Photography can provide sharply focused images at higher and higher magnifications. A DCP system works by taking a photograph of a specimen focusing initially on the very top of an uneven specimen surface. Then a series of other photographs are taken at intervals as the focus is moved down through the specimen. Possibly ten or more images may be taken of a specimen and then the instrument computer combines all the images, selecting out only the parts in focus and combines them all together to present a fully focused complete image.

The second problem referred to by the speaker was the feature produced by all lenses to greater or lesser degree of a circular brighter area in the centre of the field of view called an Airy disc. A number of images were shown of the disc viewed by better and then better lenses showing the improving resolution. Ideally the feature will be reduced as much as possible by a very good lens.

Thirdly the nature of light was discussed by the speaker noting that for some purposes specimens might be examined routinely with a microscope using light adjusted to specific wavelengths or colours. This was because the resolving power of a lens system would be influenced by the wavelength of the light being used, green and red light being slightly better than blue. Another consideration is that the human eye is more sensitive to green light than other colours and so a worker might use green illumination for an amount of his microscopic work. Noel Kennon mentioned that in his career he had done much work as a metallurgist, examining under microscopes the structure of metals and alloys, and for about 99% of that time was using green light.

In order to be able to magnify and see ever smaller objects possibly utilizing other forms of light such as ultra-violet or x-rays the speaker advised that in 45 years he had never seen a UV microscope although he believed that some had been made. X-rays presented difficulties to incorporate into any microscopic system since no-one had yet found out how to focus them to produce an image or had invented an x-ray lens. Conversely x-rays have been very useful in identifying minerals since the rays will be diffracted in specific patterns by the regular geometric arrangement of the atoms in a crystal. X-ray diffraction became a very useful tool in mineralogy for analyzing crystal structures.

Noel Kennon moved on to describe electron microscopy initially providing a history of the discovery of the electron and the developments from that discovery. The electron was first described by Joseph John Thomson in 1897 who was Cavendish Professor of Physics at Cambridge University. In recognition of this work he was awarded the Nobel Prize in Physics in 1906 and knighted in 1908.

The date of 1897 was rather significant because it was in the late 1890s that Fellows of the Royal Society in England firmly believed that by then there was nothing new to discover in science, all major discoveries of any importance having been made! They had clearly spoken much too soon. In 1896 a German physicist W.C. Roentgen discovered x-rays and the following year Thomson described electrons.

A few other early scientists who were instrumental in developing and expanding the knowledge and properties of electrons were mentioned. Louis-Victor-Pierre-Raymond, Prince de Broglie, was a French physicist who in 1924 postulated that any particle in motion had associated with it a wave energy structure. There was a duality between wave and particles. The theory was proved a year later by workers in America, Clinton Davisson and Lester Germer, and then in England by George Paget Thomson, son of J.J. Thomson and by these developments the new physics of wave mechanics was born.

Development proceeded briskly with electron microscopes being envisaged by 1928 and production machines being manufactured by Siemens in the 1930s. Two main types were built, transmission instruments where the electron beam passes through a thin specimen and scanning instruments where the beam bounces back to the detector. Images of some of the earliest electron microscopes and of modern instruments were shown and the speaker described aspects of the design and mode of operation of the instruments.

A number of electron microscope images of various materials were shown. Some were at a resolution near to atomic size, others of minerals and some of everyday objects at much lower magnifications which the speaker suggested members might care to try and identify. Finally a series of images of mineral specimens were projected commencing with ones at a low magnification with small crystals large enough to be seen with the naked eye or a small lens at about 10–15 times magnification progressing in increasing levels of magnification up to ones at 5,260.

Noel Kennon completed his lecture by showing a few images of electron microscope images of varieties of potch and precious opal at 75,000 times magnification. Investigations on the reasons for the colour of opal probably go back some fifty years and various workers have managed to demonstrate with the aid of some special techniques the regular arrangement of the silica spheres in precious coloured opal compared to the same spheres but of irregular sizes and stacking in potch. The work showed that the colour in precious opal came from the diffraction of visible light, not by the spheres themselves but from the gaps in between the spheres.

FORTHCOMING EVENTS

THE BLAXLAND GEM & MINERAL CLUB GEM SHOW

Saturday & Sunday August 16th and 17th 2014

Displays of lapidary work and gem, mineral and crystal sales. Refreshments available.

Glenbrook Community Hall, Great Western Highway, Glenbrook, NSW
(Next to Glenbrook Theatre) Just west of Information Centre.

<http://www.freewebs.com/blaxlandgemmineralclub/BGMCshow.htm>

8 am to 4 pm Daily Entry: Adults: \$3 Children \$1

CUMBERLAND GEM & MINERAL SHOW

Over Saturday and Sunday the 23rd and 24th of August
in the Roselea Community Centre, Pennant Hills Road, Carlingford.

SALES of jewellery, gemstones, beads, opals, mineral specimens from all over the world,
tools and equipment for lapidary and beading work, metaphysical and healing crystals.

Displays of mineral specimens, cut & polished stones, carvings & gemstones.

A WORLD OF GEMS GEMKHANA 2014

The Annual Gem & Mineral Show and Competition of Lapidaries from all over NSW,
presented by the Gem & Lapidary Council of NSW Inc

To be held in the Goulburn Showground-Recreation Area, Braidwood Road, Goulburn, NSW 2580
over the Labour Day Weekend of Saturday to Monday, October 4th to 6th.
From 10.00 am to 5.00 pm Saturday & Sunday, 9.00 am to 12 noon on Monday.

Displays and Demonstrations of Jewellery, Gem Faceting, Gemstones and Gem Identification.

Sales by local and interstate gem, jewellery, mineral dealers and tailgate vendors of minerals,
crystals, fossils, gold, silver, mountings, faceted gems, beads, finished jewellery,
jade, gift items, tools, supplies and equipment.

Raffle, Children's Activities, Attractions for everyone of all ages, Refreshments, Plenty of parking
Admission: Adults \$3.00, Children \$1, Families \$8.

Contacts for inquiries: - Marilyn or John Behrens on (02) 9635 8218 or Arthur Roffey on 02 4572 5812.

NORTHERN DISTRICTS LAPIDARY CLUB GEM SHOW

From Friday the 24th to Sunday the 26th of October 2014

A Gems, Jewellery and Minerals Exhibition at the Beecroft Community Centre, Beecroft Road, Beecroft.

From Friday 24th, 9am – 9pm, Saturday 25th 9am – 5pm and Sunday 26th, 10am – 4pm.
Admission: Adults \$4, Children \$1 Family \$8 - Free tea coffee and refreshments

THE PARRAMATTA and HOLROYD LAPIDARY CLUB

Presents their

ANNUAL EXHIBITION

To be held over Friday, Saturday & Sunday the 7th to 9th of November 2014.
From 9.00 a.m. to 4.00 p.m. each day. At the Clubrooms at 73 Fullagar Road, Wentworthville.

Competition, demonstrations of Club activities, rocks & mineral for sale, member's work for sale,
demonstrations, children's activities, sand sieving, fossicking heap, refreshments.

Wheelchair access and plenty of parking

Contacts: Ray 02 9863 1273, John 02 9635 8218
