



## THE MINERALOGICAL SOCIETY OF NEW SOUTH WALES INC

Website: [www.minsocnsw.org.au](http://www.minsocnsw.org.au)

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### NEWSLETTER      SEPTEMBER 2019

**The September Meeting will be held on Friday the 6<sup>th</sup> of September at 7.30 pm in the clubrooms of the Parramatta and Holroyd Lapidary Club at 73 Fullagar Road, Wentworthville.**

The program at the September meeting will comprise a talk to be given by Mark Walters on : -

#### **Demonstration of UV Fluorescence in Minerals**

Mark Walters will be bringing a number of fluorescent samples to demonstrate his lecture but it is suggested that other members may also care to bring in fluorescent specimens to display to the Meeting.

The talk will be followed by a lecture to be given by Lee Spencer on -

#### **Arsenates: Examples from the Ojuela Mine, Mexico.**

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### FORTHCOMING MEETINGS AND PROGRAMS

The October meeting will be held on the second Friday of the month, after the long weekend.

October 11<sup>th</sup>: There will be a series of lectures on **Mineral Museums in Australia and Overseas** by several speakers. These will include Dieter Mylius, Graham Ogle and Geoff Parsons.

November 1st: Lecture by David French on **Minerals in Coal** and a talk by Brian Holden on **'Collecting at Torrington'** the titles of both talks are to be confirmed.

December 6<sup>th</sup>: **Christmas Swap and Sell**

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### The AUSTRALIAN JOURNAL OF MINERALOGY

AJM Publications Inc. of 46 Gemmell Way, Hillarys, WA, 6025, have established a Website and Facebook page for the Journal. The Website lists all the issues of the Journal with copies of the covers and contents pages with full details and also that whilst some are out of print most back issues are still available for sale for prices from \$12.50 to \$17.50 each, (plus postage).

The Facebook page is : - <https://www.facebook.com/AJMPublications>

And the Website is : - <https://www.ajmin.org.au/>

## WELCOME

Welcome to new members Eileen and Peter Keith of Goulburn

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## Minutes of the ANNUAL GENERAL MEETING AUGUST 2<sup>nd</sup> 2019

The 2019 A.G.M. was held in the clubrooms of the Parramatta and Holroyd Lapidary Club and attended by over thirty members comprising a quorum. The Meeting was opened by the Society Vice President, John Chapman in the absence of the President, Dieter Mylius, who was travelling to West Australia. .

Initially John Chapman asked if there were any announcements to be made and Graham Ogle reported that the next meeting of the **Micro-mineral Group** would be next Saturday at Noel and Ann Kennon's house in Dapto. The Kennons were down-sizing their collection of micros and accordingly would be giving away a lot of 'freebies' to members who turned up for the meeting. The following month's meeting would be on Vesuvius and there should be an amount of free specimens also to be given away at that meeting.

John Chapman and Graham Ogle also complimented the visit that a number of members had made the previous month to the WB Clarke Geoscience Centre at Londonderry, hosted by the curator, Paul Meszaros. The party members were shown a large number of specimens with Graham Ogle remarking that of some forty specimens which he asked to be shown after selecting them from the catalogue, all were readily provided to him.

With no further announcements John Chapman asked that the minutes of the previous A.G.M. in August 2018 had been circulated in the September 2018 Newsletter and asked if there were any queries.

John Chapman then read out the President's Report for 2018/2019

### President's Report 2019

This is the President's Report of the Mineralogical Society of NSW Inc for 2019. Unfortunately, I cannot be here to deliver it personally so I leave it to our Vice President, John Chapman to present. Sue and I will be somewhere in WA on part 2 of our big loop.

The past year has been an enjoyable and informative one, with great talks, interactive evenings, auctions and a wonderful (if somewhat cosy) Christmas celebration. Thank you to everyone who has contributed to the Friday meetings, whether by presenting a talk or mini talk, participating in a forum, bringing in specimens for us to admire, or being part of the discussion.

Both total membership and Friday night attendances are fairly steady, and if you are a member who has joined or rejoined recently, welcome.

This is a time when I can acknowledge and thank those that keep the Society going. A big thank you to the 2018-19 Committee for their dedication and work during the last year. It's always good to have a committee that works together harmoniously and has the best interests of the Society at heart, and remember, any member can nominate to serve on the committee.

This past year's committee consisted of John Chapman as Vice President and organiser of the Friday night programs, Graham Ogle as Treasurer who so ably looks after our finances and Peter Beddow, who with help from other committee members and others, looked after Friday night refreshments. Ed Zbik has been working tirelessly to organise field trips and Safe Work Methods Certificates, as well as organising the library. The other members jumping in and helping where needed were David Colchester, Geoff Parsons and Simon Tanner.

As most of you know, I always single out George Laking, our Secretary, for special thanks. He is the person that does most of the work, and is our go-to person. Most of it he does quietly behind the scenes, but you can all see the results – the newsletter, transcripts of talks, minutes at committee meetings, the attendance book, membership lists, dealing with correspondence, name tags, and mail. He's the one that can fill in historical details of the Society, and what's in the constitution. George, we are in awe of what you do. Thank you.

There are many other helpers as well including those who help set up and clean up, Jim Sharpe who keeps the \$1 box going and still provides input to committee meetings. Jim also organises the highly successful May auction and the February Kids with Cancer Sales. I'd also like to thank Marion who regularly keeps us in goodies, ably assisted, I understand, by her chooks. Toby Ogle looks after our website and uploads the newsletters and other information on which we rely.

Financially we are in great shape, and the details of this will be given in the Treasurer's Report which will follow. Again, I'd like to thank Graham Ogle for so ably keeping track of, and managing, our money, which includes two bequests in term deposits.

Organising field trips is a tough gig, with difficulties in gaining access to properties and finding worthwhile places to go. Being hosted at Manuka recently was undoubtedly the highlight of the year, as it was last time the Society visited the site. Ed Zbik has done a great and complex job, getting us to localities by chasing up contacts, arguing our case and door knocking in country areas.

The micromineral group, convened each month by Graham Ogle, has grown and in some months is larger than the average lounge room can handle, so now meets here when the room is available. Everyone is welcome.

As usual, pizza and minerals were a winning combination, with the Christmas event again well attended. Yes it was a little cramped, but the committee has decided not to hold it at a larger venue at this stage. Thank you to the many who contributed to this event whether providing food, drink, minerals, helped in setting up and cleaning up. It was a combined effort - thank you all.

Into the future, we have the ongoing challenge of encouraging new (especially younger) members to join, finding interesting topics for the program and places to go for field trips.

2020 will also be the year that the Combined Mineralogical Societies of Australasia Seminar will be hosted by NSW, even though it will likely be held after the 2020 Annual General Meeting, so it's over a year away. The last time Minsoc NSW hosted it was in 2013. Hosting the seminar involves quite an amount of planning and work, which you will be pleased to hear, has already been started by the current committee. Decisions about dates, topic, speakers, program, field trip/s, and seminar dinner need to be made. We also need to settle on a suitable venue and book it well in advance.

Finally, thank you to you all, for being here each month, for being part of Mineralogical Society of NSW and for sharing your interest, passion and knowledge of minerals with each other. It's a great Society to be part of.

I wish the incoming committee a successful year ahead.

Dieter Mylius  
August 2019

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The President then called upon the Society Treasurer, Graham Ogle, to deliver the Annual Report for the previous financial year and copies of the report were circulated among the members. The Treasurer then described the report in some detail, the more significant figures having been highlighted.

Total Society funds at the 30<sup>th</sup> of June 2019 were \$106,489.74, showing an increase over the previous year of \$1,281.92. The Society still maintained three accounts, a cheque account to provide general running

expenses and the two term deposits. All contained similar sums to the same time the previous year. As before, the interest from the Betty Mayne bequest term deposit was added to the cheque account and accordingly the figure of \$31,966.32 showed the same balance as the previous year whilst the interest from the Walker bequest term deposit was allowed to accumulate in the fund which showed a corresponding increase.

The Treasurer noted that there had been the usual income during the year including \$1,425 donated for the Kids with Cancer Foundation with other figures for membership subscriptions, refreshment donations and sales of George Smith books being similar to the previous year. Expenses had been larger due to the purchase of some items of equipment throughout the year. These had included a new microscope, a public address system, and a Geiger counter. Otherwise expenses were similar to the previous year and included payments for the Society insurance cover, rent for the use of the Lapidary club meeting room, maintenance of the Society Website, meeting refreshment expenses, some stationery and postage and a few other items.

Graham Ogle noted that the Society was in good financial shape and was maintaining a substantial financial reserve some of which could be used if members were to come up with ideas for spending some of the money to benefit the Society. He had a few suggestions himself, a company in New Zealand was marketing a microscope which could be used to examine small specimens and immediately project their image on to a large screen. In addition he suggested that a portable, robust bench-top XRD instrument would be very interesting to obtain although unfortunately versions overseas were still too expensive to consider buying at the present time but eventually with constantly advancing technology, prices were likely to come down.

Since he was speaking about Society finances Graham Ogle allowed himself one small gripe, specifically about the monies being placed in the refreshment collection box which he suggested should ideally not include any silver coins. He did not think that the collection box should be used by 'certain' members, - (described as 'miscreants'), to divest themselves of spare silver coinage. \$1 or \$2 gold coins or notes were preferred. *(This last was delivered humorously but the Treasurer obviously does not like having to collect up and deal with an amount of silver coinage).*

## MINERALOGICAL SOCIETY OF NEW SOUTH WALES

### FINANCIAL STATEMENT 2018-2019

		2018-19	2017-18
<b>Funds in hand:</b>	Balance in Operating Account CBA # 06 2016 28023647 @ 30th June 2018	\$ 7,720.74	\$ 7,754.85
	Funds in CBA Term Deposit 1 - Betty Mayne Bequest	\$ 31,966.32	\$ 31,966.32
	Funds in CBA Term Deposit 2 - Walker Bequest	\$ 67,256.68	\$ 65,440.65
	Cash in Hand	\$ 46.00	\$ 46.00
<b>Total Funds at 30th June</b>		<b>\$106,489.74</b>	<b>\$105,207.82</b>
<b>Liabilities:</b>		\$	\$
<b>Increase in funds</b>		<b>\$ 1,281.92</b>	<b>\$ 653.01</b>
<b>Income:</b>	Membership subscriptions	\$ 2,805.00	\$ 2,650.00
	Supper donations and mineral sales	\$ 1,277.40	\$ 1,116.00
	Sale for Kids with Cancer	\$ 1,425.00	\$ 1,005.00
	George Smith book sales	\$ 270.00	\$ 227.00
	Interest on operating account	\$ 33.38	\$ 33.20

Interest on term deposit (into operating account)	\$ 783.17	\$ 783.17
Interest on term deposit (reinvested into term deposit)	\$ 1,816.03	\$ 813.42
<b>Total</b>	<b>\$ 8,409.98</b>	<b>\$ 6,627.79</b>

<b>Expenditure:</b>	Supper items	\$ 1,262.69	\$ 1,627.83
	Rent - hall hire	\$ 330.00	\$ 330.00
	Transfer of money raised for Kids for Cancer	\$ 1425.00	\$ 1,005.00
	Printing, postage, stationery, Subs, PL ins., Dept Fair Trading, PAI, Speaker, Website, Library etc.	\$ 4,110.37	\$ 3,011.95
	<b>Total</b>	<b>\$ 7,128.06</b>	<b>\$ 5,974.78</b>

<b>Income – Expenditure:</b>		<b>\$ 1,281.92</b>	<b>\$ 653.01</b>
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Other Assets: Mineral trimmer      UV lamp, Geiger counter  
 Display cabinets      Library and shelving  
 George Smith books      Microscopes - 2  
 Urn  
 UHF radios (2)      Projector, PA system

The above statement indicates that the Society is in a sound financial position

The accounts have been examined and confirmed by Jim Sharpe.

Graham Ogle  
 Treasurer  
 2nd August 2019

The Treasurer answered a few questions about the financial report, mainly about the cost of some of the equipment he had suggested could be considered for purchase in the future. The microscope with screen projection capability he thought was about \$5,000 at the present time. He finally offered thanks to Jim Sharpe for examining and confirming the accounts.

After asking if there were any further queries about the Annual Financial Report the Vice-President asked that the Report could be formally accepted. A statement about the Report had to be sent to the Department of Fair Trading within a month of the A.G.M.

Gary Sutherland formally proposed that the Financial Report be accepted. The proposal was seconded by Peter Beddow with all in favour.

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## **ELECTION OF THE SOCIETY COMMITTEE FOR 2019 / 2020**

John Chapman asked Gary Sutherland to assume the task of Returning Officer and to take the chair of the Meeting for the election of the 2019/2020 Society Office-Bearers and Committee members.

Before Gary Sutherland dealt with the Election he addressed the Meeting to extend on behalf of all the members of the Society a warmest vote of thanks to the 2018/2019 Committee for all their work throughout the year. There had been a very good calendar of events and the standard of the lectures had been very good. He then turned to conduct the election of the Society Committee for 2019/2020.

The Returning Officer reported that only single nominations had been put forward for the Committee positions and was therefore able to dispense with a ballot. He read out the names and positions of the nominated Committee members and declared them elected unopposed.

PRESIDENT:	Dieter Mylius
VICE-PRESIDENT:	John Chapman
SECRETARY:	George Laking
TREASURER:	Graham Ogle
COMMITTEE MEMBERS:	Peter Beddow
	David Colchester
	Geoff Parsons
	Simon Tanner
	Edward Zbik

The elected Vice-President re-assumed the chair of the meeting and thanked Gary Sutherland for his help with the election.

The 2019 Society Annual General Meeting proceedings were concluded.

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In continuing the post-AGM evening program and as has become customary the Vice-President described the background to the Mayne-Walker Memorial Lecture.

### **'The Mayne Walker Memorial Lecture**

'For those that have not heard the story before, the Mayne and Walker name comes from three extraordinary people, Betty Mayne and siblings Harold and Edna Walker. All had been Society members for many years and the Society was provided with substantial financial bequests after they passed away, Betty Mayne in 1991 and the Walkers within a year of each other in 2011 and 2012.

As a commemoration of their generosity the Society established the Betty Mayne Memorial Lecture as the premier keynote presentation of the year to be held after the A.G.M. on a subject of mineralogical or geological interest. Betty Mayne had become Secretary of the Society and then President and brought considerable organising skills to both positions sadly passing away after presiding over the 1991 Seminar held that year in Sydney. She had built up a substantial mineral and gemstone collection and her will stipulated that it should be auctioned with the proceeds split between the Society and the then Friends of the Geological and Mining Museum, (FOGAMM, now disbanded).

Harold and Edna Walker were quite different people compared with Betty Mayne but were very loyal Society members not missing virtually any meeting, including field trips and at least once attending a Seminar when it was held away from Sydney in Melbourne, in spite of Harold having a degree of walking disability. After they sadly also passed away within about a year of each other a bequest was received from their estate and their names were added to the title of the Memorial Lecture'.

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John Chapman finally introduced the Memorial Lecture speaker for the evening, Society Life Member and ex-President, Professor Peter Williams. The speaker is a World-renowned mineralogist and chemist and has had a long and distinguished academic career. He has contributed articles to over 400 journal publications, has written a book on Oxide Zone Geochemistry and in collaboration with Jim Sharpe has conducted extensive research into the copper minerals of the Cloncurry district. He was Dean of the Faculty of Science and Technology at the Western Sydney University in the 1990s, is chairman of the International Mineralogical Association, (I.M.A.) Commission on New Minerals, Nomenclature and Classification (CNMNC), and has even had a mineral named after him.

## Secondary Copper Minerals of the Mt Isa District

Professor Peter A. Williams

Professor Williams acknowledged that he and Jim Sharpe had conducted extensive studies into the copper minerals of the Mt Isa Block and advised that there were two of the more common and important minerals there that he would not be speaking about, namely azurite and malachite. There are undoubtedly some absolutely spectacular examples of those minerals which have come from this part of the World and he drew attention to an example of an azurite 'rose' which he had brought in to display. However they are common to nearly all the copper mines of the Mt Isa Region and what Professor Williams wanted to do was to refer to the other copper minerals present, not specifically to list all of them since he expected that a list might well be incomplete with more species to be discovered in the future. What he wanted to do was to describe how the other minerals got there since he felt that this would be much more interesting and it would place the minerals in context and would not just be an alphabetical exercise. He would be taking into account some of the processes that he had spoken about in previous lectures to the Society about how certain minerals form.

The Mt Isa Block is in north-west Queensland about 100km from east to west bounded more or less by Cloncurry on the eastern side and by Mt Isa on the western side. North and south the area is a bit bigger to include all the deposits counted as part of the Block. The speaker then briefly outlined the geology of the region noting that ore deposits had arisen due to intrusions by magmatic rock most of which are fault-hosted. He would be speaking mainly about deposits which have been derived from intrusions into sediments of hot fluids working their way up through faults and depositing primary minerals. As the tops of intrusions wore down and the primary minerals were exposed to the air they would react to form a completely different suite named the secondary minerals.

As an example of the variety of copper minerals formed and the problems of distinguishing between samples of very similar species Professor Williams displayed images of the two minerals connellite,  $\text{Cu}_{19}\text{Cl}_4(\text{SO}_4)(\text{OH})_{32}\cdot 3\text{H}_2\text{O}$ , and buttgenbachite,  $\text{Cu}_{19}\text{Cl}_4(\text{NO}_3)_2(\text{OH})_{32}\cdot 2\text{H}_2\text{O}$ , from the Great Australia mine, Cloncurry. Invariably in all the studies conducted by the speaker and Jim Sharpe the two minerals form a continuous series. Whilst the one mineral is a sulphate and the other a nitrate the two researchers have never found an example of the mineral which was completely free of either the sulphate or nitrate ions. Accordingly in order to name the mineral the decision would depend on which was the more predominant ion in any specimen. There is a complex solid solution series between the two minerals with buttgenbachite being found in the majority of specimens examined by the researchers.

Moving on the speaker pointed out all the various factors, mostly chemical, but also temperature and pH which may prevail in an ore deposit and give rise to a variety of minerals species. As another example of minerals forming slightly differently due to the local availability of anions and cations he referred to the similar species barlowite,  $\text{Cu}_4\text{BrF}(\text{OH})_6$  and claringbullite,  $\text{Cu}_4\text{Cl}_2(\text{OH})_6$  also from the Great Australia mine. These otherwise almost identical minerals formed differently due to the presence of traces of bromine and fluorine in one area of a deposit and the presence of chloride in another area.

A number of factors will influence the particular mineral or suite of minerals formed in a deposit and these are the structure, available ions, pH, redox potential, temperature, kinetic phenomena (and combinations of all these factors). As an example of how the prevailing pH in a deposit will affect the minerals formed Professor Williams referred to the two minerals antlerite  $\text{Cu}_3\text{SO}_4(\text{OH})_4$  and brochantite  $\text{Cu}_4\text{SO}_4(\text{OH})_6$ . Examples of these minerals are found in a number of places throughout the Block. If brochantite has formed but the environment is made more acidic the brochantite would become unstable and reacts to form antlerite and releases a copper ion. Conversely if the concentration of copper ions in the environment is increased it will push the reaction the other way turning antlerite into brochantite.

Fine specimens of acicular cuprite (*chalcotrichite*),  $\text{Cu}^+_2\text{O}$  are known from the Black Rock open cut, Mt Isa, Great Australia, and the Starra mine, Selwyn, where it was abundant. Cuprite occurs in most of the Cu deposits of the Mt Isa Block. On one occasion the researchers were collecting specimens at the Great Australia

Mine of what appeared to be cuprite on quartz and accumulated a number of boxes of material. In returning to Sydney and upon opening their boxes, there was not a sign of any quartz, all the samples had all become covered with a green 'fur'. The colourless material in the samples had been nantokite,  $\text{CuCl}$ , which over the period of travelling from collecting sites in Queensland had commenced to break down and convert to atacamite,  $-\text{Cu}^{2+}_2\text{Cl}(\text{OH})_3$ . Under continuing oxidation cuprite will convert to tenorite,  $\text{Cu}^{2+}\text{O}$  and, in the presence of  $\text{CO}_2$  will start producing malachite and an image of a specimen under conversion was displayed.

Secondary minerals may also be affected by temperature and kinetic phenomena and examples were shown of pseudomalachite,  $\text{Cu}_5(\text{PO}_4)_2(\text{OH})_4$  and reichenbachite  $\text{Cu}_5(\text{PO}_4)_2(\text{OH})_4$  which have exactly the same formula. The stability of these minerals is temperature-influenced, pseudomalachite being the more stable at ambient temperatures down to about 15 Celsius when reichenbachite would be the more stable.

Professor Williams quoted the Ostwald Step Rule in regard to the influence of temperature and kinetic factors in mineral formation. Friedrich Wilhelm Ostwald, (1853 to 1932), was a German chemist who was awarded a Nobel Prize in 1909. He formulated the Step Rule which basically states that if something is synthesized and when more than one product can be formed it is the least stable substance which forms first. After a time the next most stable product is formed and possibly after still more time the most stable. This is the kinetic phenomenon. This feature has affected other minerals. Rare cornetite ( $\text{Cu}_3\text{PO}_4(\text{OH})_3$ ) and much libethenite ( $\text{Cu}_2\text{PO}_4\text{OH}$ ) are associated with pseudomalachite and reichenbachite at the Great Australia Mine, but their formation depends on varying amounts of  $\text{Cu}^{2+}$  in solution and the pH. Cornetite is also known from the Desolation and Crusader mines together with pseudomalachite and libethenite.

Arsenate analogues of copper phosphates include clinoclase,  $\text{Cu}_3\text{AsO}_4(\text{OH})_3$ , from Poseiden, Lorena, Desolation and Mt Cobalt mines and olivenite,  $\text{Cu}_2\text{AsO}_4\text{OH}$ , reported from the Lorena and Desolation mines, Mt Oxide and Mt Cobalt. Professor Williams expressed some disappointment over news he had heard about the Lorena mine which was being re-opened as a gold mine. This would mean the mine taking out the whole of the oxide zone which apparently contained about 100,000 ounces of gold. Initial profits from the gold extraction would be used to fund deep drilling over the site to ascertain the extent of the orebody.



Cloncurryite,  $\text{Cu}_{0.5}(\text{VO})_{0.5}\text{Al}_2(\text{PO}_4)_2\text{F}_2 \cdot 5\text{H}_2\text{O}$ ,  
Great Australia mine, Cloncurry



Metatorbernite, Monokoff mine,

A few copper nitrates are known such as gerhardtite,  $\text{Cu}_2\text{NO}_3(\text{OH})_3$ , from the Monakoff and Great Australia mines and likasite,  $\text{Cu}_3\text{NO}_3(\text{OH})_5 \cdot 5\text{H}_2\text{O}$ , from the Great Australia (single specimen). Interestingly the researchers asked themselves where the nitrate had come from to appear in these minerals and were able to trace the source which turned out to be due to termite activity in the ore body!, a conspicuous feature of the landscape in the Mt Isa area being termite mounds. The researchers managed to track the nitrate ions in the minerals to termite activity by measuring the stable isotope ratios of nitrogen and oxygen in the copper mineral ions compared to water extracts of termite mounds.

There are a number of other multi-metal copper minerals. Agardite,  $(\text{REE},\text{Ca})\text{Cu}_5(\text{AsO}_4)_3(\text{OH})_6 \cdot 3\text{H}_2\text{O}$ , is known from Mt Oxide; Lavendulan,  $\text{NaCaCu}_5(\text{AsO}_4)_4\text{Cl} \cdot 5\text{H}_2\text{O}$ , is a rare phase at Mt Cobalt; Chenevixite,



$\text{Cu}_2\text{Fe}_2(\text{AsO}_4)_2(\text{OH})_4 \cdot \text{H}_2\text{O}$ , occurs in the Desolation mine; Conichalcite,  $\text{CaCuAsO}_4\text{OH}$ , is the most common secondary copper arsenate in mines of the Mt Isa Block; Notable occurrences are at Mt Cobalt, the Desolation mine and the Lorena gold mine; Chalcosiderite,  $\text{CuFe}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4\text{H}_2\text{O}$ , was found at Mt Oxide.

The speaker finally dealt with the minerals found in the supergene enriched zone which included the copper sulphides, chalcocite,  $\text{Cu}_2\text{S}$ ; digenite,  $\text{Cu}_9\text{S}_5$ ; and anilite,  $\text{Cu}_7\text{S}_4$ . These minerals displayed variable ratios of copper  $^{+1}$  or copper  $^{+2}$  ions associated with the sulphide ions. Anilite is sufficiently reactive to start burning once it had been exposed to the air.

In conclusion Professor Williams noted that secondary copper minerals was a large and interesting subject which had long fascinated him from his very early years and were his favourite group of minerals.

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## JULY MEETING

At the July Meeting the second lecture of the evening was given by David Colchester on : -

### **Homemade Minerals, or ‘How to Grow Your Own Minerals’**

**David Colchester**

Minerals are by definition naturally-occurring crystals, with the exception of mercury, and extending that definition, ice is a mineral whilst water is not. Many crystals can be grown artificially from natural substances although they should be referred to as artificial crystals even though they are real minerals with the same composition and structure as their natural counterparts. Fake minerals are crystals of chemicals not found in nature. David Colchester proceeded to describe some methods and techniques of making artificial crystals at home especially water soluble ones since they are easy to grow and can make spectacular specimens.

Initially the speaker referred to a useful book, **Crystals and Crystal Growing** by Alan Holden & Phyllis Singer. It was first published in 1961 and he bought his copy in 1964 for ten shillings and six pence! Later editions are still available. He then listed the methods used to grow artificial minerals

#### **Growing large crystals**

1. Crystallization from super-saturated, usually aqueous, solutions: (e.g. chalcantite, potassium alum, lopezite)
2. Crystals grown in a silica gel medium, (e.g. crocoite, wulfenite)

#### **Growing small crystals**

3. Crystals formed by the precipitation of ions in solution.
  - (a) Crystallization by evaporation from a drop of solution
  - (b) Crystal formation by metathetical reactions
  - (c) Formation of dendritic crystals by electromotive redox reactions  
(e.g. Ag Cu, Pb, Sn, Sb, Bi, As)
  - (d) “The Tree of Diana”
4. Crystallization from a melt. (e.g.  $\beta$  sulphur, bismuth, ice)
5. Boiling “hard” water (e.g. aragonite)
6. Biomineralization (e.g. brushite, apatite,).

The method for growing crystals from an aqueous solution was described.

- (i) Use two beakers or jars. The first beaker is used to generate a saturated solution while the second is used to grow your crystals.

(ii) In the first beaker dissolve the salt to be crystallized in distilled water and let it stand. There should always be undissolved salt lying on the bottom of the solution. The solution should be left to reach saturation during the day.

(iii) In the evening (about 6 pm) pour the saturated solution into the second beaker and drop into it one or two seed crystals. As the solution cools down over night it will supersaturate causing the seed crystals to grow.

(iv) In the morning remove the crystals, blot them dry, and rub off any parasitic crystals. Return the solution to the first beaker and wash out the second beaker.

(v) Repeat the process over two, three or more days.

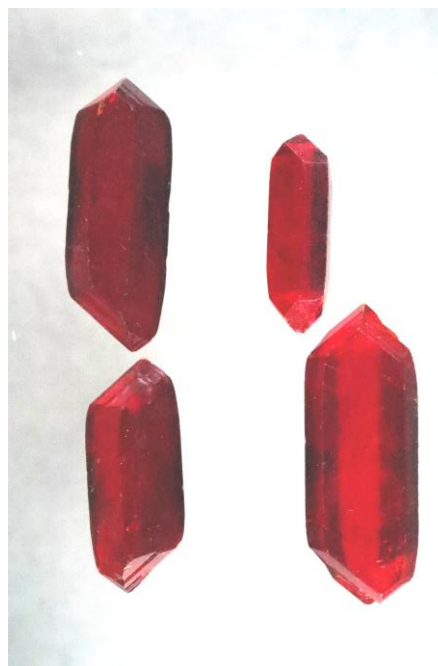
(iv) A daytime/night time temperature difference of about 8 – 10 degrees seems to work well.

All my large crystals have been grown this way.'

As an extra feature to growing crystals David Colchester recommended that the 'grower' should examine his crystals and describe the morphology including making crystallographic drawing of them and provided some pointers towards achieving this. There are crystallographic drawing programs freely available on the internet and he showed several images of crystal diagrams which could be downloaded and checked against a manufactured crystal. Grown crystals can have quite variable morphologies with each specimen having a different shape caused by the various crystal faces forming at different rates of growth.



Chalcanthite, Copper Sulphate.  
A favourite among crystal growers

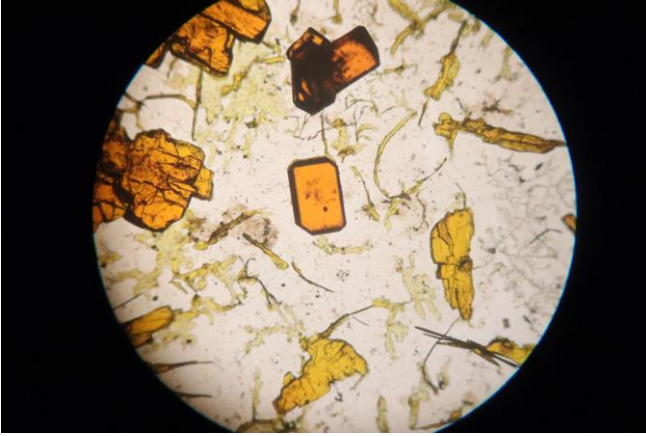


Potassium ferricyanide forms  
spectacular cherry red prismatic  
monoclinic crystals.

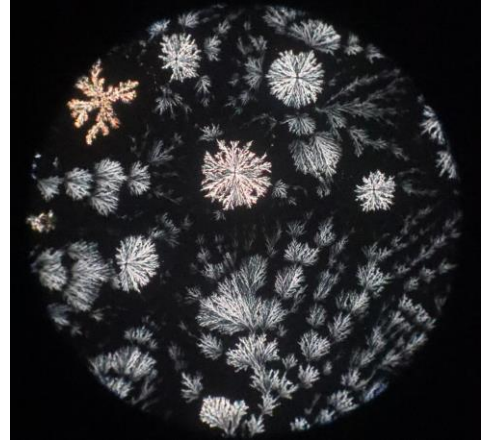
**Making Small Crystals:** Micromineral collectors appreciate small crystals and small crystals are easy to grow! Growing small crystals uses the methods and techniques of chemical microscopy in which the experiments are performed on microscope slides and the reactions and products examined through a microscope. It is a simple, quick and cheap way of doing practical chemistry and making qualitative chemical assays.

A drop of water is placed on a glass slide, about 6mm in diameter. A few grains of the mineral to be grown is nudged into the drop and allowed to dissolve. The resulting solution is left to evaporate. To get good crystals the solution should reach supersaturation while the drop is still about 1mm deep.

**Making metal dendrites:** When a metal grain such as zinc is placed in contact with a solution of the salt of an element such as Pb, Sn, Cu, Ag, Bi, dendritic crystals of these elements will sprout from its edges. The chemical reaction is a simple redox reaction e.g  $\text{Zn} + 2\text{AgNO}_3 = 2\text{Ag} + \text{Zn}(\text{NO}_3)_2$ . The dendrites can be seen to grow in real time over about half an hour.



Well formed triclinic stable lopezite, potassium chromate, crystals formed towards the interior of an evaporating drop of solution.

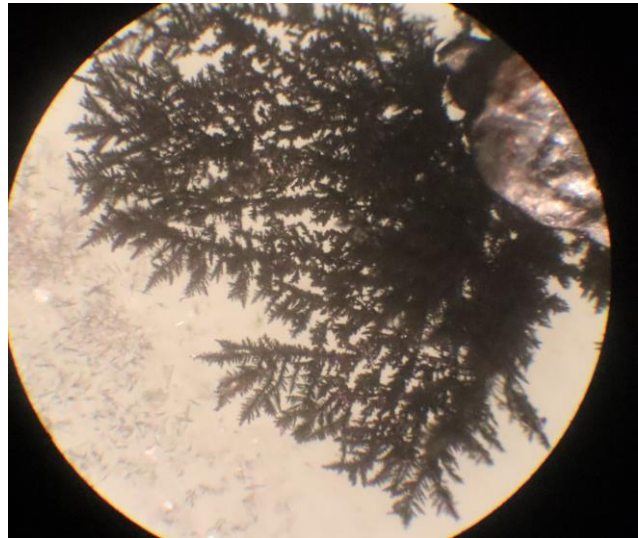


Trona, - Sodium bicarbonate.  
Under the microscope

Mediaeval alchemists used to perform an experiment in which a small puddle of mercury was covered in a solution of silver nitrate. A feather like tree of silver amalgam would sprout from the mercury. This was called a 'Tree of Diana' or the Philosopher's Tree. ('Diana' stood for silver among mediaeval alchemists).



Tree of Diana



Dendrites of bismuth

At the end of his lecture during which had been very thorough David Colchester invited members to come forward to examine examples of artificial crystals which he had grown and brought in to display.

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## FORTHCOMING EVENTS

### The PARRAMATTA & HOLROYD LAPIDARY CLUB'S 57<sup>th</sup> GEM, JEWELLERY & MINERAL SHOW EXHIBITION & SALE

From Friday to Sunday 14th, 15th & 16th September 2018 in the clubrooms at  
73 Fullagar Rd, Wentworthville from 9am to 4pm each day.

**FEATURING :** Gem Faceting, Cabochon Cutting, Silvercrafts, Copper enamelling, Jewellery making, Rock and Mineral Specimens and Slabs, Club and Fossicking Information, BBQ & Refreshments, Raffle, Plants, Kids' Craft. Free Entry

Inquiries :- Website <http://www.parramattaholroydlapidaryclub.weebly.com>

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## **The CENTRAL COAST LAPIDARY CLUB INC. ANNUAL GEM FESTIVAL**

will be held in the Mingara Recreational Club, Mingara Drive, off Wyong Road, Tumbi Umbi, Central Coast over Saturday & Sunday the 13th and 14th of October, on Sat from 9am-5pm and Sunday from 9am to 4pm.

'Dealers from across the state will be attending selling everything from jewellery, gemstones, fossils, specimen stones and stones polished and rough. There will be displays of the club members' work and our own club tables selling Minerals and also a large table of beading.'

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## **GEMKHANA 2019**

The Annual Gem & Mineral Show and Competition of lapidaries from all over NSW will be presented by the Gem and Lapidary Council of NSW Inc, in the Howard Pavilion at the Hawkesbury District Agricultural Showground, 40 Racecourse Road at Clarendon outside Richmond over the weekend of the 28<sup>th</sup> and 29<sup>th</sup> of September from 9am to 5pm each day. Entry \$5.

**Visitors please note:** The above dates are before the long weekend of the 5<sup>th</sup> to 7<sup>th</sup> of October.  
Featuring: The largest emerald found in NSW; hand-crafted jewellery; polished stones; (cabochons); stone carvings; minerals and fossils. Demonstrations of Silver Work and Gem Cutting  
For further details email [gemkhana@gemlapidarycouncilnsw.org.au](mailto:gemkhana@gemlapidarycouncilnsw.org.au)

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## **The Illawarra Lapidary Club Inc presents the 2019 Jewellery Gems and Minerals Festival**

To be held in the Heininger Hall, Ribbonwood Centre, 109 Princes Hwy, Dapto. From 9.00am to 4pm on Saturday 2<sup>nd</sup> November and from 9.00am to 2.30pm on Sunday the 3<sup>rd</sup> of November.

Entry: Adults \$3, children under 12 years free.

Featuring: Gemstone Faceting, Cabochon Cutting, Silvercrafts, Jewellery Making and Valuations, Mineral Group displays, Club and Fossicking Information, Refreshments, Raffle, Lucky Door Prizes and Kids' Games.

Dealers Selling: Lapidary Supplies, Minerals, Jewellery, Crystals, Findings, Fossils, Beads and Opals

Enquiries: John (02) 42675618 [www.illawarralapidaryclub.com](http://www.illawarralapidaryclub.com).

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