Mineralogical Society of Western Australia Inc. November 2013 Newsletter

Editorial

There were three door prizes this month; a fabulous polished rock donated by Kim MacDonald and two mineral specimen boxes supplied by an anonymous donor. Thank you, whoever you are.

The lucky winners were John Mill (polished rock specimen), James Sherborne (specimen box) and Jason Bennett (specimen box).

The policy that members may submit short adverts free of charge will remain. Additionally, it was agreed that other commercial advertisements would be accepted for a nominal charge.

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Recent Activities

Annual General Meeting held on 18th September 2013.

The 13th Annual General Meeting of the Mineralogical Society of Western Australia Incorporated was on Wednesday 18th September 2013 at the WA Lapidary Club rooms located at 31, Gladstone Road, Rivervale (corner of Newey St).

The Annual General Meeting was followed by a talk by Francine Payette entitled **"Fascinating Tourmaline".** Francine supplied the following summary of her detailed presentation.

Our journey

Chemical composition & Structure / Geological setting / Crystallography / Growth features / Other things of interest.

Tourmaline simplified ideal mineral formula.

$XY_3Z_6(BO_3)_3(T_6O_{18})V_3W$, where:

X = Na, K, Ca, and/or is vacant (large cations)

Y = Li, Al, Mg, Fe^{2+}, Fe^{3+}, accessory (Mn, Cu, Zn, Ti) (intermediate to small cations – in valence balancing combinations when the X site is vacant)

Z = Al, Mg, Fe^{3+}, Cr, accessory (Si, V) (small cations)

T = Si (accessory Al, B)

V = O and/or OH

W = F, O and/or OH

The tourmaline group currently consists of 14 valid mineral species.

		X site				Y site									Z site			
	Species	Na	K	Ca	vac	Li	Al	Mg	Fe^{2+}	Fe^{3+}	Mn	Cu	Zn	Ti	Al	Mg	Fe^{3+}	Cr/V
alkali	Elbaite	1				1.5	1.5				x	x	x		6			
	Olenite	1					3								6			
	Dravite	1						3							6			
	Cr-dravite	1						3										6 CR
	V-dravite	1						3										6 V
	Schorl	1							3					x	6			
	Buergerite	1								3				x	6			
	Povondraite	1	x							3				x		2	4	
calcic	Liddicoatite			1		2	1								6			
	Uvite			1				3							5	1		
	Feruvite			1					3					x	5	1		
vacancy	Rossmanite				1	1	2								6			
	Magnesiofoitite				1		1	2							6			
	Foitite				1		1		2					x	6			

Tourmaline structure.

Tetrahedral rings (T site) with apical oxygen pointing towards the (-) c-pole. T sites occupied by O and minor of Al and B.

Alternating over the T sites, triangular BO_3 groups that lie parallel to the (0001) plane.

Planar rings linked by 2 types of octahedra, the Z octahedron is relatively small and somewhat distorted, the Y octahedron is relatively regular.

X-site is a 9-coordinated trigonal prism, located along the 3-fold axis of symmetry.

The 31 anions are located in 8 distinct sites. Six of these sites contain only O.

The single W site, located along the 3-fold axis, can contain OH^{1-}, O^{2-} or F^{1-}.

The three V sites contain OH^{1-} and O^{2-}.

Colour in tourmaline.

Chromophores and colour-causing mechanism

Pink, red Mn^{2+} & irradiation (Mn^{3+}, low Fe)

Red (dravite)	Fe^{3+} pairs
Red to red-brown	Fe^{3+}
Green (schorl-elbaite)	Fe^{2+} and Fe^{2+} <—> Ti^{4+}
Green	Cr^{3+} or V^{3+}
Blue (indicolite)	Fe^{2+} <—> Ti^{4+}
Brilliant blue (Paraíba)	Cu^{2+} in Y-site
Black	Fe^{2+} , Fe^{3+}, Fe^{2+} <—> Ti^{4+}
Brown	Fe^{2+} <—> Ti^{4+}, with high Fe
Yellow	Fe^{2+} <—> Ti^{4+}, with low Fe
Yellow-green	Mn^{2+} <—> Ti

Geological settings.

Tourmaline occurs in a variety of geological environments and is common in:

- Granitic pegmatites
- Low- to high-grade metamorphic rocks
- Clastic sedimentary rocks
- Few others

In pegmatites

Alkali tourmalines: elbaite, schorl, dravite, olenite

Calcic tourmaline: liddicoatite

X-site vacant tourmaline: rossmanite, foitite

Most found in rare-element pegmatites (low T & P) such as LCT pegmatites (Li, Cs, Ta).

The B and Al enrichment characteristic of LCT pegmatites promotes the crystallization of tourmaline.

Tourmaline crystallization.

Early stage: If sufficient Fe, B, Al, schorl first species to form.

Then: Crystallization proceeds, Fe is depleted; if enough B, Al and Li in the melt, elbaite forms (in pockets).

Thus: In typical LCT pegmatite, from wall to late stage pocket: schorl to elbaite.

Sometimes, in late stages: If insufficient Na or Ca available to fill X-site, then X-site-deficient (vacancy group) tourmaline such as rossmanite or foitite forms. If there is enrichments of Ca, liddicoatite forms instead of elbaite.

If exceptionally, there is slight enrichment in Fe in pockets where pink elbaite formed, then the pink elbaite is overgrown by green elbaite (watermelon).

Crystals with green or blue caps are also examples of late stage increase in Fe.

Tourmaline crystallography.

Trigonal, class *3m* (ditrigonal pyramidal, hemimorphic)

3 vertical planes of symmetry

1 vertical triad axis which is uniterminal

There is no centre of symmetry, no axes or planes perpendicular to the c-axis, and the c-axis is polar.

Crystals grow faster along the c-axis. Less material is deposited along the prism faces while more is deposited at the pyramid.

Crystals have different forms on opposite ends.

Tourmaline Forms.

Pedion / Trigonal prisms / Hexagonal prism / Ditrigonal prism / Trigonal pyramids / Ditrigonal pyramids

The famous liddicoatite with "mercedes" colour zoning.

Intense pink trigonal *star* that radiates from the center of the c-axis with arms at 120° to each other.

Trapiche Tourmaline.

Pattern formed by the presence of liquid and solid inclusions located at the boundaries between pyramidal and prismatic growth sectors. Can be a fixed six-rayed or three-rayed star.

The formation of the complex pattern is a two-step process, with the skeletal growth in a first step (Na-rich dravite) followed by the growth of a second tourmaline generation (Ca-rich fluor-uvite followed by Na-rich dravite). Green colour: Cr and V.

Locality: Zambia

Pleochroism: Dichroism, usually seen with the help of a dichroscope. Strong in some dravite and seen without help.

Tourmaline with "Usambara effect".

The Usambara effect describes a colour change dependant on a change of path length of light *through* the gem material in a single orientation (with different thickness of material). Associated with presence of Cr and V.

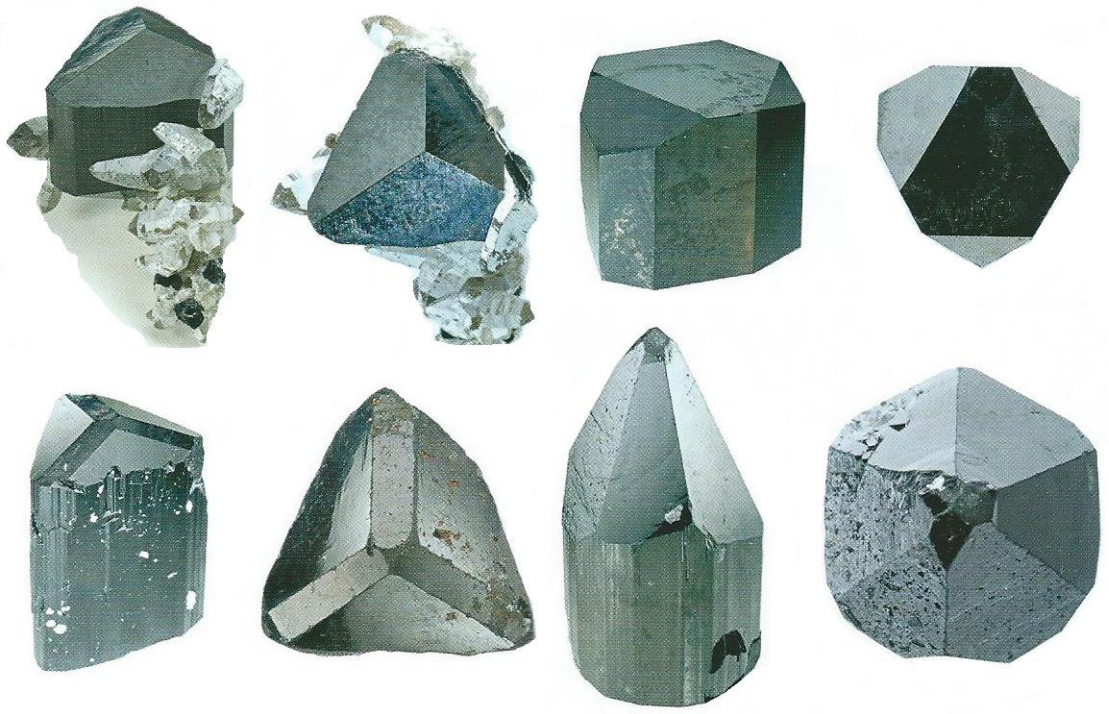
This is a different type of colour change than the Alexandrite effect, where the colour changes in different types of illumination.

Dravite from the Umba Valley, Tanzania.

Two examples of trapiche tourmaline.

Photographs by F. Payette.

Tourmaline pyramids



Taken from the book Faszination Turmalin by P. Rustemeyer.

A collection of tourmalines showing the great range of colours.

Photo by Sue Koepke.

Act

As an experiment, Ken organized a "mystery minerals identification contest" whereby members had to identify the diverse range of minerals, crystals and elements on display. Despite the fairly sparse attendance everybody had an enjoyable evening and it is proposed to hold a similar night in the future.

Sue Koepke identified the most specimens and won a bottle of wine; she also won the door prize which was a soft-cover copy of "Mineral Collections of Arizona" presented by an anonymous donor

The minerals/crystals/elements viewed were as follows.

ID	Location	Country	Year	Appearance	Mineral
1	Gunpowder, Nth Queensland	AU	1974	Dark brown hex xl, with blue surface stain	Tourmaline, Dravite, Shorl
2	Mt Frosty, North Queensland	AU	1974	Slab of metallic copper with white matrix	Native Cu, on Qz
3 A	Harts Range, Nth Territory	AU	1973	Twinned xl, olive colour	Epidote twins
3 B	"	AU	1973	Flat blue xl	Kyanite
4	Wave Hill Station, NT	AU	1972	Cut solid geode, olive colour	Prehnite
5	Broken Hill South, #2 level	AU	1958	Pale yellow xl (3mm) on dark brown matrix	Anglesite on goethite
6	Kambalda, WA	AU	1967	Slab of green blobs (30mm) in browny conglom	Garnierite
7	Yinnietharra, WA	AU	1979	Brown trigonal xl, double term'd	Tourmaline, Dravite, Shorl
8	Elizabeth, Sth Hedland, WA	AU	2010	Silver balls (1mm) in white matrix	Native Ag
9	Zinc Corp, Broken Hill, NSW	AU	1958	Cluster of clear, colorless xls	Quartz
10	Challenger Mine, SA	AU	2009	Massive broken xline, burgundy colour	Garnet (almandine)
11	Old Agnew (Emu) Mine, WA	AU	1972	Large cluster of dull grey dodecahedron xls, on matrix	Native lead
12	Triple Chance Mine, NSW	AU	1958	Dull yellow hexagonal prism xls	Beryl
13	No specimen, the dog must have ate it				
14	Barkly Highway, Mary Kathleen, QLD	AU	1972	Small (5mm) 90 deg twin	Staurolite
15	near Inverell, NSW	AU	1960	8mm tapered hex xl, dark blue, slight waterworn	Sapphire
16	Majors Creek, NSW	AU	1961	Cluster of grey dendrites (7mm), matrix chiselled off	Native zinc
17 A	May Downs Station, Mt Isa, QLD	AU	1966	Dark brown trigonal xls, double term'd	Tourmaline
17 B	"	AU	1966	Dark brown dodecahedrons (6mm)	Garnet (pyrope)
18	MarsupaRia, Kalimantan (BP Minerals)	Indo	1988	Deep mauve spotty matrix	Cu Iodide (no name)
19	Longarone (Dolomites)	Italy	1986	Shiny silver wedge	Silicon metal (smelter)
20	God Only Knows (from hotel lobby shop)	Ceylon	1986	Cut gemstone, orange colour, 6mm oval	Citrine
21	Bou Azzer	Morroco	?	Cluster of dodecahedra silver xls	Smaltite
22	Panasqueira Mines, Beira Baixa	Portugal	2000	Quartz cluster with ferberite/wolframite xls	Ferberite/Wolframite
23	Western Australia	AU	1990	Small xls of Mimetite (probably) on gossan matrix	Mimetite
24	Panasqueira Mines, Beira Baixa	Portugal	2000	Small crystals of fluorite and apatite on matrix	Fluorite / apatite
25	Panasqueira Mines, Beira Baixa	Portugal	2000	Siderite cluster with minor sphalerite and quartz	Siderite
26	Panasqueira Mines, Beira Baixa	Portugal	2000	Green apatite on matrix	Apatite
27	Panasqueira Mines, Beira Baixa	Portugal	2000	Arsenopyrite cluster with small xls of fluorite/quartz	Arsenopyrite
28	Panasqueira Mines, Beira Baixa	Portugal	2000	Sphalerite with small xls of siderite	Sphalerite
29	Panasqueira Mines, Beira Baixa	Portugal	2000	Greenish quartz with dogthooth calcite xls	Quartz

Members busy at the "mystery minerals identification contest".

Photo by Sue Koepke

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Future Meetings and Other Activities

General Meeting on November 20th 2013.

This will be followed by a talk by Kevin Morgan on **"Early Exploration and Mineral Collecting"**. An outline of this talk is as follows:

Incentive to explore can be driven by curiosity of the unknown 'out there' as much as for potential reward that may follow, either through wealth or notoriety. Exploring for minerals can satisfy all needs.

Exploration can take you to remote and fascinating places, see different cultures, find new expressions of nature and, at times, provide financial rewards.

I have been fortunate in my career to have experienced six exploration 'booms' and these have been the catalyst for my opportunities as an exploration geologist to see many aspects of the 'out there'.

I have seen the transition from the 'old ways' to the so called modern ways of doing things and the vastly different attitudes people now take to treating 'out there' as a temporary experience, travelling the easy way and mostly missing a full understanding of what the outback is really about.

My talk attempts to present a few 'snapshots' of the changes I have observed and experienced over the past sixty years of my travels.

Kevin Morgan graduated with double major in geology from University of Western Australia also with a diploma in gemmology.

Since that time, he has been engaged in exploration geology, hydrogeology, mining and engineering geology in many parts of the world, often in the remotest and unexplored locations. He is still an active field geologist, interested in a wide range of activities including an honorary associate-ship with the Western Australian Museum

General Meeting on 15th January 2014.

Murray Thompson and Peter Downes will give an "Update on DeGrussa Minerals".

General Meeting on 19th March 2014.

Mikael Siversson will discuss "Fossil Sharks".

General Meeting on 21st May 2014.

Marcus Sweetapple will talk on "Triplite, Triphylite, Triplodite; to Trip the Phosphate 'Lite' Fantastic".

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New Members

We welcome Lee Hassan as a new member to the Society.

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Committee Meeting

The next Committee Meeting will be held at 15 Colin Grove, West Perth on Saturday 23d November.

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Field Trips

Western Australia Lapidary and Rockhunting Club Inc.

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 MinSocwa Field Trip organizers prior to attending any of the field trips to confirm event details.

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Committee Members

The following committee members were elected at the Annual General Meeting.

Committee Members	
Stewart Cole - President ph 0414 904 169	Nimal Perera - Social Officer/Field Trips Leader
Sue Koepke - Secretary ph 0417 990 688	Vernon Stocklmayer-Newsletter Editor ph 92919043
Ken Ireland - Treasurer	Ida Newton
Geert Buters - Vice President	
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