THE MINERALOGICAL SOCIETY OF NEW SOUTH WALES INC.

C/o School of Natural Science
B.C.R.I. Parramatta Campus University of Western Sydney
Locked Bag 1797 Penrith South DC N.S.W. 179
Website: **www.minsocnsw.org.au**

NEWSLETTER

NOVEMBER 2010

The November Meeting will be held on Friday the 5th of November 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 commence with a talk to be given by Gary Sutherland on : -

'Bollywood Beauties'
(Indian zeolites)

The talk will be followed by a lecture to be given by Glen Diemar on : -

'The Roxby Downs Copper-Uranium Mine'.

****

FORTHCOMING MEETINGS

Subject to circumstances some changes to the following schedule of program subjects and speakers may have to be made in due course.

December 3rd 2010: Christmas Social

February 4th 2011: 'New Minerals Update' talk by Peter Williams and a lecture by Peter Leverett on 'Mines in the Mist – Mt Lyell'.

March 4th 2011: Tucson 2011 Update and a lecture by John Rankin on 'Collectors of the New England'.

April 1st 2011: Talk by John Smedley on 'Labels for Minerals' and a lecture by Gary Sutherland on 'A Photographic Tour of the British Museum of Natural History'.

May 6th 2011: Member's Mini Auction.

June 3rd 2011: 'The Prospect Intrusion. Brief History, Geology & Member's Experiences.

THE SOCIETY COMMITTEE

PRESIDENT:	Dieter Mylius	Tel: (02) 9477 1060
VICE-PRESIDENT:	John Chapman	Tel (02) 9808 3481
	E-mail:	*chapmanjr@optusnet.com.au*
SECRETARY:	George Laking	Tel: (02) 9636 7145
	E-mail:	*bglaking@tech2u.com.au*
TREASURER:	Graham Ogle	Tel: (02) 9876 5224
COMMITTEE MEMBERS:	David Colchester	Tel: (02) 9449 3862
	Arthur Roffey	Tel: (02) 4572 5812
	John Smedley	Tel: (02) 9688 1284
	Gary Sutherland	Tel: (02) 9871 1379
	Peter Williams	Tel: (02) 9685 9914

****

OCTOBER MEETING

The October Meeting was opened by Gary Sutherland in the absence of the President and Vice-President, Dieter Mylius and John Chapman, who were respectively in Melbourne and Broken Hill.

Initially there were a number of announcements about forthcoming lapidary club shows at the end of October and in November and Gary Sutherland also urged members to start thinking about the **2011 Gemboree** being held over Easter next year, Friday to Monday, April 22nd to 25th, at Bathurst. The Committee had decided to provide a Society display table at the Gemboree and would need display material to be loaned and a number of volunteers to man the stand for the duration of the event. Any members who were expecting to be visiting the Gemboree over the period were urged to consider offering a few hours of their services to help man the Society stand and to make this known to the Committee so that a roster could be compiled.

The Chairperson further advised the meeting that the projected tour of the **Newcrest Company** workings at the **Cadia mine** near Orange was being held on Sunday the 14th of November. The Company was holding an Open Day for the general public of its facilities at Cadia and was arranging for school groups and any other interested people to be picked up by buses from Orange, Millthorpe and Blayney and taken to the mine for guided tours. The tours would last approximately two hours and buses would depart every ten minutes starting at 8.30 a.m. through to about 3.00 p.m. The tours would be strictly sightseeing and there would be no collecting of specimens. Any members interested in going were urged to contact John Chapman by e-mail or telephone and advise him that they wished to attend and how many others they might be taking with them.

****

The Chairperson then introduced the first speaker for the evening. Society member John Rankin had by now established himself as a well-researched historian of mines, miners, minerals and mining history as well as a notable mineral collector.

'Mineral Catalogues'
John Rankin

John Rankin commenced his talk by advising that over the years in pursuing his mineralogical and historical interests he had accumulated a number of old mineral catalogues. The reason for his talk this evening was that he had felt that it was time for him to share with others some of the contents of these catalogues which were almost certainly not available in libraries or through other avenues such as E-bay and the catalogues provided a window into the past of mineral collecting and prices.

Referring to his research work at the Australian Museum the speaker had found that prior to 1890 most of the mineral specimens obtained by the Museum were acquired from dealers. Specimens predominantly came from Europe, Asia and North America. Referring to a slide of a report in an edition of the Sydney Morning Herald from 1878 the speaker had noted that Archibald Liversidge, then a professor of geology and mineralogy at the University of Sydney, was leaving for a trip to England and Europe and whilst travelling having been given £1,000 by the NSW government to acquire minerals. He apparently spent all of the money during visits to a number of dealers in England and in Germany, one of which was the company A.Krantz which was one of the most significant dealers in the world at that time. The company of A.Krantz was established in 1833 by Dr. August Krantz, (1809 - 1879). It is said to be the oldest geological supplier in the World and is still operating today.

A number of views were shown of minerals purchased by Prof Liversidge with the Krantz labels visible. Prices on the labels were given in German marks which were of similar value to an Australian shilling at that time. A list of Krantz minerals sent to Sydney University on approval in 1882 was also examined. Some of the 1880's prices were impressively different to those in this century with the speaker pointing out a specimen of hessite which had a price of 120 marks but by his estimation would be worth at least $2,000 today. Catalogues in those days tended to list minerals generically rather than individually and a buyer might request a representative specimen of a particular species from a particular location and also specify how much they wished to pay, such as five shillings etc.

Another dealer referred to was the Foote company which was established in Philadelphia in 1876 by Dr Albert E. Foote, (1846 to 1895), and which is also still operating today. A few views were shown of pages from a Foote catalogue from the 1880s and of a few specimens bought from the Foote company by the Australian Museum including a specimen of azurite with malachite about ten inches across bought for £5 in 1888. Another impressive Foote specimen was of a large rubellite-tourmaline bought for US$25 in 1912.

From 1897 onwards U.S. dealers were very active in Australia and a number of Australian minerals started to appear in U.S. catalogues. In 1900 the Foote Company only had two mineralogists field collecting specimens world-wide, one in the States and one in Australia. Images displayed by the speaker of advertisements in the American Mineral Collector Magazine from 1897 showed Broken Hill minerals being mentioned for the first time. In 1898 George L. English, (1864 to 1944), another American dealer, bought a collection from an Australian miner then in London which included superb reticulated groups of Broken Hill cerussites priced at 50 cents! By 1899 the Foote Company had accumulated so much Broken Hill material that they had to put out a special supplement to their mineral catalogue. They had brought back to the U.S. over 1,100 lbs of Broken Hill specimens collected for them over a five-week period by a special collector, Stan Mitchell from Victoria, who also went to Tasmania for another eight weeks acquiring more specimens.

By 1901 George English had also acquired a lot more Australian minerals and put out an advertisement. The list of specimens was impressive and included lots such as 'Atacamites, - 240 good cabinet and museum-sized specimens; cuprites from Moonta, 25 matrix groups and 300 small groups; cobaltites; embolites, - 60 specimens, stolzite, - six crystallized specimens; marshite - 'one large group'; etc. Kalgoorlie specimens had also started to be acquired by the American dealers and listed in their catalogues by 1904. Another big American dealer noted was Ward's Natural Science Establishment which has provided teaching and science material for institutions as well as specimens for collectors. Ward's is also still operating today having been founded in 1862 by Henry Ward, who was pictured, and is based in Rochester, New York State. In 1905 Ward's

Natural Science Establishment purchased George English's business and stock of minerals.

Ward's first mineral catalogues listed minerals generically like those by Krantz but occasionally the company brought out special issues and the speaker was able to show an image of a special Ward's catalogue from 1930. They had unfortunately suffered a big fire two years earlier which had burnt most of their stock but were able to list in the catalogue a number of items acquired since including a large range of specimens from Tsumeb, some hundreds of azurites, large crystals - 'from (US)$2 -$20', Bisbee azurites for $3.50; crocoites from Tasmania - 'museum groups up to $100'; pyargyrites, - 'choice one-inch crystals on rocks - $6'; etc.

A 1938 catalogue referred to by the speaker indicated that from 1908 to 1938 both Foote and Ward's were conducting substantial specimen exchanges with various institutions including the Australian Museum. These years covered the period of the Depression which would have affected the prices of minerals and a number of comparisons were made with minerals and prices in the catalogue with what value the specimens might attain today. A Broken Hill cerussite was featured in the catalogue with a price of US$15 in 1938 which when taking inflation into account could be converted to about AU$250 today. However in reality such a specimen would probably command a price of at least $1,000 in 2010.

Finally John Rankin referred to a catalogue he had found which had been published in 1956 by Specimen Minerals of South Australia and which presented a range of Australia minerals also still with low prices compared with current ones. In answer to a question about the value of the older catalogues themselves the speaker advised that since these were so rare and very seldom changed hands no standard prices had been established. Possibly a 1909 Foote catalogue might sell for $80. There were however certainly a few very keen collectors in America who would latch on to any such items as they became available.

****

'Plate Tectonics to Mineral Deposits'

Paul Carr

The concept of plate tectonics presents a really big picture and is a framework or a model for understanding very large-scale Earth structures. It explains important features of the Earth's dynamics such as volcanoes, their distribution, why they occur in belts around the Earth and why some are more active than others. Similarly tectonics explains the occurrence of earthquakes and their distribution and severity, and generally explains mountain chains and the overall structure of the Earth's surface. The speaker referred to the term 'terra firma' which literally means 'solid earth' and which is actually quite a misnomer because the Earth is not solid at all. It is also not homogenous and its structure is quite layered in the form of a series of concentric spheres. The total distance from the surface to the centre of the Earth is about 6,400 kilometers. There is an inner core of solid iron-nickel alloy similar to that found in iron meteorites, and about 1,200 kilometres deep. Outside or above that is the outer core, also composed of an iron-nickel alloy, but which is fluid. This is important because it determines a number of features about the Earth such as maintaining a magnetic field. Above the outer core is the mantle which is also fluid, effectively behaving as a hot plastic, and on top of that is the solid crust.

Referring back to the year 1620 it was the English mariner Sir Francis Bacon who pointed out that the coast-lines of Africa and South America were quite similar as if they had once been joined. Over the next two hundred years whilst a number of further observations were made no explanations were provided until 1929 when a German geologist Alfred L. Wegener put forward a whole series of ideas about continental drift. Wegener expanded the observation that the continents of Africa and South America could be fitted together but also in taking into account geological similarities of other continental borders proposed that most of these had all been joined together in one super-continent and then had drifted apart and in fact were probably still drifting. Wegener's evidence for this movement also took into account the distribution of fossils in the various

continents showing that over such periods as the late Paleozoic to early Mesozoic fossils in the southern continents were very similar, showing that the land masses must have been connected at that time.

A number of images were shown of some of the types of fossils found from that period and from different areas. Evidence was also derived from the observation of glaciated surfaces in various parts of the world, some now in tropical zones where glaciation should not have occurred at all but which were similar in age to one another, showing that they were formed at the same time and in high latitudes. The directions of the glaciations also provided clues since the directions today made no sense unless the areas of land on which they are found had been moved and were in a different orientation when the glaciation occurred.

Wegener's theories started coming together after the war period of the 1940s when military concerns led to extensive mapping of the ocean's floors and the discovery of the central ocean rifts which were found to total about 84,000 kilometres. The most spectacular of these is the Mid-Atlantic Ridge. The mapping also revealed the presence of the deep ocean trenches, particularly in the Pacific, such as the Marianas Trench. Military concerns also led to looking at the magnetic properties of the sea in regard to applying any knowledge gained to tracking the movement of submarines. In the 1920s a researcher looking at the magnetic properties of basalts of Permian age in the Kiama area realized that the rocks indicated that the Earth's magnetic field at the time the basalts were laid down must have been the opposite of today. Further research by a number of workers looking at the distribution of rocks and their magnetic signatures in the ocean basins established that there were bands where the rocks had 'normal' polarity and bands where the polarity was reversed. The bands of normal and reversed polarity were found to be symmetrical on either side of the mid-ocean ridges.

Researchers also dated rocks that they sampled from the ocean floors and found that these were much younger than rocks on the land surface, less than 200 million years for the ocean rocks compared to up to four billion years for the land rocks. A diagram was shown illustrating the dates established for rocks sampled across the Mid-Atlantic Ridge showing dates ranging from zero age in the centre of the Ridge and becoming progressively older in samples the further away from the centre and symmetrically so on either side of the Ridge. The explanation became clear that this was due to the sea-floor spreading outwards from the central rifts. In referring to a diagram of the Earth the speaker pointed out that the crust and the uppermost part of the mantle, called the Lithosphere, behaved as a solid block immediately above the next layer of the mantle, called the Asthenosphere, which was plastic. Looking at the whole of the Earth's surface the Lithosphere comprises some fourteen rigid blocks of varying sizes and these are the tectonic plates. Since they are situated on top of a plastic layer they can move, very approximately at a rate of about ten centimetres per year.

Referring to another diagram of the Earth's surface and the various tectonic plates Paul Carr pointed out the Australia plate noting that the Australia land mass is sitting more or less in the middle of its plate compared to New Zealand and much of Indonesia which are on the edge, not a good place to be since the plate boundaries were the location of much of the volcanism and earthquakes around the world.

Tectonic movements occur due to extremely slow convection movements within the Earth's mantle. The Earth's solid core is hotter than the mantle. Heat is transferred from its boundary into the mantle fluid in contact with it and the mantle fluid rises upwards, setting up massive convective cells. The tops of these cells then affect the crustal blocks above them inducing very slow movement. With fourteen major tectonic plates around the planet being moved in various directions the plates obviously will either butt into one another, move apart or grind alongside. This produces three types of boundaries, what geologists call 'divergent or constructive' boundaries; 'convergent or destructive' boundaries and 'transform or conservative' boundaries. This process which is occurring today around the world will produce various surface features, such as the formation of a deep ocean trench or pushing up of a mountain chain due to the subduction of one plate under the edge of another The boundary where any plates are moving towards, away, or grinding past each other is likely to be very seismically active with substantial earthquake and volcanic activity. Maps of the World were referred to, indicating the volcanic areas which tend to occur in chains effectively for the most part marking the various plate boundaries. The boundaries also tended to form island arcs due to the geometry of a dipping plane or plate intersecting a sphere, the surface of the Earth, forming a curved boundary.

Describing the tectonic situation of plates neither colliding or subducting but grinding past one another and demonstrating a transform boundary the speaker referred to the most well-known example, that of the San Andreas Fault in California. Over time pressure builds up along the boundary until at some point it snaps and the Pacific plate in effect lurches forward causing earthquakes.

The speaker moved on to discus how the tectonic processes and forces have influenced surface features and mineralogy. As the edge of a tectonic plate is subducted under another the lower edge of the plate heats up and minerals which are unstable at high temperatures melt and break down releasing volatiles such as water, fluorine, boron, etc and in effect act as a flux lowering the melting point of the surrounding rocks. This may lead to volcanism at the surface due to the melted rocks forcing their way upwards, although not all plumes of melted rock may reach the surface. Melted rock being squeezed upwards may pond at some depth beneath the surface and cool slowly, releasing some of the volatiles into the surrounding rocks and forming a suite of minerals in the process.

Under the various circumstances existing in any sub-crust melting and movement of melted material towards the surface and the prevailing temperatures and pressures a variety of mineral deposits may form at depth or along hydro-thermal vents. With illustrations the speaker referred to a few examples of the minerals which will form in hydro-thermal systems showing images of the spectacular hematite after magnetite crystals from the Payun Volcano in Argentina. In that situation hydro-thermal fluids are moving through an iron-rich system precipitating initially magnetite which is oxidised to hematite with the influx of more iron and oxygen. Granites formed at depth and moving upwards when gradually cooling down will allow the higher-temperature minerals to form first and the remaining material will retain progressively more of the more volatile components of the original rock. Accordingly the granite may contain pegmatites which in turn may contain beryls and tourmalines.

Another mineralogical feature of tectonic plates colliding and parts of boundaries being subducted is that rocks that had been near or at the surface in being pushed down and becoming subjected to considerable pressure and heat may undergo metamorphic processes. As an example of metamorphic minerals so formed the speaker referred to the dravite crystals from May Downs in Queensland which occur in a talc matrix and the fine almandine garnets from Broken Hill. Fine rhodonite crystals have also been recovered at Broken Hill. These were possibly formed originally on a deep ocean floor around a ‘black smoker’ vent where a lot of minerals were being ejected from under the floor. Over a very long period the rhodonite deposit had been subjected to probably several periods of metamorphism and along with other heavy metal minerals such as galena also originally deposited on the ocean floor had produced the crystals which have been found.

Another feature of tectonic plate movement was the existence around the world of a few ‘hot spots’, places where volcanic activity has been occurring for a long time but which are situated in the middle of a plate rather than at the edge of the plate where volcanism would be expected. The best example is the Hawaiian island chain which is situated in the middle of the Pacific plate but where there is active volcanism due to the Islands being situated over a mantle convection plume. However since the Pacific plate is moving slowly to the north-north-west the ‘hot-spot’ has been moving under the Islands and has gradually formed a chain of islands stretching to the north-west to Midway Island which is the oldest in the archipelago. The movement of the Pacific plate has actually changed slightly over the time that the Hawaiian archipelago has been forming. For the last 50 to 60 million years the plate has been moving towards the northwest but before that it was moving in a more northerly direction and the chain of islands accordingly form a slight ‘dog-leg’.

Other ‘hot-spots’ around the world include the country and island of Iceland which is also situated over the Mid-Atlantic Ridge as well as being over a hot-spot. Hence it is very volcanically active. Another hot-spot is the Yellowstone area in the western U.S.A. which geologist are concerned about in that it may become a lot

more active than it is today. Dr Lin Sutherland did a lot of work a few years ago tracing a number of hot-spots in eastern Australia. These are not active now but were in the past.

If basalts erupt to the Earth's surface they may cool very quickly and trap volatiles such as water and carbon dioxide in vesicles. These cavities in basalt are a source of interesting minerals such as zeolites, cavansite, stilbite, prehnite, calcite and quartz etc and all are minerals of relatively low-temperature formation. Another event that can happen in a mid-plate a long way from a plate boundary is that there may be an eruption of a diatreme which is a very highly gas-charged magma. The structure of a diatreme is usually cone-shaped starting off narrow at depth and expanding as it rises to the surface and the pressure is reduced. Diatremes may be the source of minerals formed originally at very high temperatures and pressures such as diamonds.

The speaker stressed that the minerals he had spoken about so far had been primary minerals formed in association with tectonic processes. The larger suite of minerals more familiar to collectors, cerussite, azurite malachite etc etc and including important minerals such as gold are not formed due to tectonics. Secondary minerals depend on the right chemistry being available and on weathering and oxidation.

In winding up his lecture Paul Carr referred to a few interesting specimens that he had found out about recently. One was of a nice calcite specimen from Appin Colliery near Wollongong. Collectors would not normally regard a coal mine as a source of minerals but occasionally specimens are found. In this particular case the colliery had mined through a fault zone where there had been fluid movement depositing the mineral.

Finally in mentioning gold the speaker related an item of news from the Denver Show two weeks previously where a 750 ounce West Australian gold nugget which had been found earlier this year had been placed on display. The gold alone would have been worth over one million dollars and as a specimen possibly two to three times that !. The nugget was rumoured to be one of three found and was not the largest of them. Any one of these would be a nice specimen to find on a field trip!

At the end of the lecture there were quite a few questions posed including where the Earth's internal heat came from. Paul Carr advised that this was partly derived from the original heat of formation but also from the continuous decay of radio-active elements.

Peter Williams also added some information about the work, and fate, of Alfred Wegner (1880- 1930) who had first seriously proposed the theory of continental drift in 1929. Wegener who was professionally an entirely competent meteorologist and astronomer was effectively vilified and shunned by the supposed experts of the day and his theories thoroughly rejected by almost everyone. Since he had no definitive proof for his proposals at the time he had to accept this. Wegener died in 1930 aged 50 being frozen to death during the last of several official expeditions he had taken part in to Greenland to study Arctic weather patterns. By the 1950s and subsequently Wegener's theories about continental drift have been completely vindicated.

****

MEMBERS FORUM

A question raised by member John Smedley was "what is a solid solution series?". The following answer has been provided by Noel Kennon.

WHAT IS A SOLID SOLUTION SERIES ?

Two pure substances which are soluble in each other in all proportions are said to form a solution series. This series is a single homogeneous mixture (a phase) that exists from one pure substance through all compositions to the other pure substance.

All gases are mutually soluble and form a single gaseous phase. Our atmosphere is an example. In the liquid state, there are fewer instances, but one is water and alcohol which mix together in all proportions to form a single liquid phase from pure water through to pure alcohol.

In the solid state, complete mutual solubility of two pure solids is severely restricted by several conditions including the necessity that they are isomorphous, that is, have the same crystal structure so that the composition can change continuously from one pure solid to the other. This cannot occur if the two crystal structures are different. The metals copper and nickel are both face centred cubic and are mutually soluble to form a continuous phase (sometimes called a continuous series of solid solutions) from pure copper to pure nickel. This single phase is usually called the alpha phase. Likewise, the triclinic mineral species albite ($NaAlSi_3O_8$) and anorthite ($CaAl_2Si_2O_8$) are soluble in each other in all proportions forming a continuous phase that is called the 'plagioclase feldspar'. It is worth noting that plagioclase feldspars with compositions between albite and anorthite are simply part of that continuous phase. They do not have composition or other special significance and were named oligoclase, andesine, labradorite and bytownite for convenience. Other pairs of minerals which are mutually soluble, include members of the cubic garnet group, monoclinic members of the pyroxene group as well as siderite-rhodochrosite and siderite-magnesite, each of which is rhombohedral.

Noel Kennon
October 2010

Please forward any items for the Members Forum to John Chapman at chapmanjr@optusnet.com.au

****

FORTHCOMING EVENTS

FIELD TRIP 13-14 November

Saturday 13 November: Location still to be finalized (possibly Cow Flat limestone operations)
Saturday night accommodation: Bathurst-Orange area, probably farm house accommodation at Newhaven Park House near Cow Flat (still to be finalized) - see http://www.newhavenparkhouse.com.au/.
Sunday 14 November: Cadia Valley Operations (gold & copper mine) near Orange. This is NSW's biggest metaliferous mining operation. There will be a bus tour of the mine site from 10am to midday. This is being run as part of their open day and we won't have collecting access. However, after the bus tour, the geologist will take us back to the exploration office to view and possibly collect ore samples. This is a rare opportunity to visit a mining operation of this size.

When finalized a detailed itinery will be sent to those who have registered.

There still a few places available so let John Chapman know asap if you wish to go (Ph 98083481, email chapmanjr@optusnet.com.au)

****

The 50TH ANNUAL GEMSTONE & MINERAL SHOW

Presented by members of the **Parramatta-Holroyd Lapidary Club**
over Friday, Saturday & Sunday, the 12th, 13th & 14th of November 2010
at the Clubrooms at 73 Fullagar Road, Wentworthville.

Competition, displays, demonstrations, sales. Sand sieve and fossicking heap.
Refreshments. Plenty of parking. Wheelchair access.

****

ILLAWARRA LAPIDARY CLUB 2010 ROCK AND MINERAL FAIR

Sunday 27th February 2011, 8.30 am - 2.00 pm. In Stuart Park, by the beach, North Wollongong

Members of the Lapidary Club sell minerals, fossils, lapidary work, jewellery, books, equipment and other wares. "Rock Scramble" around mid-day for children and young people.

****

GEMBOREE 2011

Easter 2011. Friday to Monday, April 22nd to 25th, at Bathurst, N.S.W.

****