macarthur astronomical society

prime focus

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Presidents Report

A very warm welcome, to our August edition of "*Prime Focus"*

Last month, Assoc Prof Peter Tuthill presented a talk on "**The "Deathstar" Wolf-Rayet 104: Exotic curiosity or harbinger of doom?**

It was a very informative and entertaining insight in to these huge stars and their possible effect on Earth, if one was to Supernova near us.

I would also like to thank Peter for being a good sport and understanding, when we first had projector problems and then we had to move to another room.

2010 Speakers

We have a "who's who" list of speakers for the rest of the year, please make sure of the dates and tell your friends!!

magnitude][continues to sell strongly since its release, and what can I say but……..WOW, a truly professional production with great content provided by you, the members.

Also a BIG THANK YOU to Chris Malikoff for his expertise in putting this production together.

A.A.O. Coonabarabran, MAS will be visiting the 3.9 metre Telescope facility on August 13th, 14th & 15th.

Paul Cass (Sec, Coona Society) and Donna Burton (Outreach Officer, AAO) will be our guides of the facility, with a tour "behind" the scenes.

I'm sure there will be many stories to tell on the return of the 26 members from The AAO.

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MAS Dates 2010

August 2010

07/8/10	The Forest
13-15/8/10	AAO visit
14/8/10	Stargard
16/8/10	General Meeting
21/8/10	The Forest: Students Observing night

September 2010

04/9/10	Stargard
11/9/10	The Forest
20/9/10	General Meeting

October 2010

02/10/10	Stargard
4-9/10/10	Magnitude: C'town Art Gallery
09/10/10	The Forest
18/10/10	General Meeting
30/10/10	Stargard

November 2010

06/11/10	The Forest
15/11/10	General Meeting

December 2010

04/12/10	The Forest
11/12/10	Stargard

President's Report: John Rombi

Art Gallery, Campbelltown.

On Saturday October 9th from 4.30pm, we will have renowned Astronomer & Public Speaker, David Reneke. His topic will be ***"Secrets of the universe + 50 things you didn't know about the Moon landings*** "followed by Dr David Malin, ***"The invisible universe, making sense of the unseen"*** as our keynote speaker; this will be open to the public and will be held in the main 185 seat auditorium.

Seating will be a first come, first served.

Our exhibition will be open Monday to Friday from 10.00am to 4.00pm. Saturday 10.00am to 8pm.

We need volunteers to man our telescope display for these times.

We will also need telescopes to place in our display, please consider this very important part of the event.

As always "many hands make light work" We have lone access to the "Green Room" this area has all the facilities need for this week long event. Toilets, showers, kitchen, TV etc. everything needed to make it as comfortable as possible.

Without volunteers, this event WILL NOT succeed.

Please complete the poll that Chris Malikoff has assembled on the Forum.

As always check our website for ANY information concerning MAS activities.

Observing Nights

Have at last cooperated with us, with both Stargard and The Forest showing clean, clear skies.

I was unable to attend The Forest, but Stargard had over 12 members attending with great skies, but very cold temperatures, down to -3*C we had ice from 9.30pm until sunrise the next day.

It took most of Sunday to dry out the equipment!!

At least all the dew heaters worked beautifully and kept all the optics dry.

This Month

We have Dr Max Spolaor (AAO) his presentation will be on **"The Chemical Evolution of Galaxies."**

Due to a conflict of dates, our scheduled speaker Dr Andrew Hopkins will not be available this month.

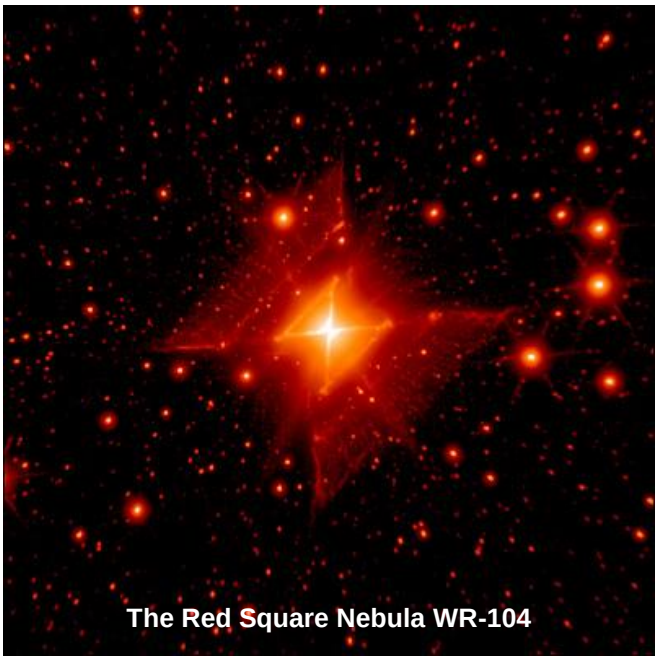
I would like to thank Andrew for arranging with Max to take his place.

Until next month,

Clear Skies, John Rombi.

Secretary's Column: Roger Powell

Our Guest Speaker in July may have opened up a new area of interest for many members. Wolf-Rayet stars were objects that I had certainly heard of but never took much interest in - until Dr. Peter Tuthill (Sydney University), a leading expert on these objects, began his talk with a stunning image of WR-104 that showed us rectangles of debris that had emanated from a central star. The structure was so symetrical and square in appearance that it looked intriguingly unnatural, almost as though there was an intelligent design involved, which of course there was not. Circles and ellipses are the most common regular geometrical shapes of the Universe but straight lines are manifested when those shapes are seen edge on. It seems we are looking down squarely at bi-polar cones, turning circular structures into apparent edge on straight lines – a bit like our view of Saturn's rings at the moment. The following image is reproduced courtesy of Dr Peter Tuthill and the Keck Observatory.



The Red Square Nebula WR-104

Peter told us that Wolf-Rayet stars are the last known phase of stellar stability before a supernova explosion kicks in. The most important feature of WR-104, from our point of view, he said, is that our Solar System appears to be aligned very closely with the the orientation of the spin-axis of WR-104. What this means is that in a relatively short time, when the inevitable supernova occurs, a concentrated polar jet of destructively powerful gamma rays could be beaming it's way directly at us. That's not a nice thought to contemplate and hopefully when it does happen we will all be long gone anyway.

Peter's fascinating presentation was very well received. I

Secretary's Column: Roger Powell

hope he will come back at some future date to keep us updated on his research, which involves the use of the twin ten metre diameter Keck telescopes. located above the clouds at the summit of the dormant Mauna Kea volcano on Hawaii Island.

I find it very exciting that one of the users of the world's largest optical and infra-red observatory, located in the USA, would happily spend an evening of his time to explain his research to a bunch of amateur astronomers living here in SW Sydney. Thanks, Peter.

It's time for another reminder to members that laser pointers are classed as dangerous implements and by law need to be registered with the Police Firearms Registry. Members of registered astronomical societies hold an exemption to this legal requirement, provided the device is strictly used for astronomical purposes. If you wish to use your laser pointer for any other purpose, you are not covered by the Society's registration and you must register it with the Police. If you use your laser pointer in pursuit of astronomy, I recommend you download an MAS registration form from the website and send it to me, if you have not already done so. Then your legitimate use of it will be recorded by the Society.

Finally, just another reminder that we would welcome any comments or suggestions on our current constitution, which is now under review. Please let Trevor, Tony or myself know as soon as possible if you have any ideas on improving this important MAS document.

Prime Focus
Article Submission

Deadline for article submissions for the next edition of Prime Focus is

Monday 13th September 2010

All Articles can be submitted via email editor@macastro.org.au
Or via snail mail to the MAS Postal address

PLEASE NOTE THE CHANGE OF EMAIL ADDRESS FOR SUBMISSIONS!!!

It Is Amazing Who You Meet on the Moon Pt 7
Crater Kamerlingh Onnes

David M Jones

Every day learns from that which preceded it.
Publilius Syrus 50BC

Lunar crater, Kamerlingh Onnes, is located on the far side of the moon; it has a diameter of 66 km. Kamerlingh Onnes is a worn and eroded structure, slightly elongated along the east-west direction, creating an oval shape. A scattering of smaller craters lie along its rim, particularly on the northern edge. Kamerlingh's interior floor has only a few craterlets and some ray ejecta material from crater Ohm, which lies to its north-west. (Encyclopedia, 2009)


Heike Kamerlingh Onnes

The Dutch physicist, Heike Kamerlingh Onnes was born on September 21st, 1853 at Groningen in the Netherlands. His father was a businessman; the owner of a brick and tile works, his mother, the daughter of an architect. After an unremarkable 'secondary education', Onnes entered the University of Groningen in 1870. He obtained his "candidaats" degree – equivalent to perhaps the B.Sc. - the following year and then went on to Heidelberg where he became a student of Bunsen and Kirchhoff from October 1871 until April 1873. Bunsen, a chemist – was "*the Bunsen*" after whom the (gas) *Bunsen burner* is so named. Kirchhoff, a physicist – is yet another significant historical personage. Both of these aforementioned gentlemen also have lunar craters named in their honour. (Nobelprize.org, 2010)

In one of several biographies available on-line, it is noted that Kamerlingh Onnes' aptitude for unravelling scientific problems was already obvious in 1871, when, then aged eighteen, he was awarded a Gold Medal for a competition backed by the Natural Sciences Faculty of the University of Utrecht – followed subsequently by a Silver Medal for a parallel event at the University of Groningen. Furthermore, whilst working with Kirchhoff he also won the "Seminarpreis" ('seminar prize'), enabling him to occupy one of the two existing assistantships under Gustav Kirchhoff. (People, 2010) On returning to Groningen, Onnes passed his doctoral examination (M.Sc.) in 1878, and gained his doctorate in 1879. His thesis, entitled, *Nieuwe bewijzen voor de aswenteling der aarde* (New proofs of the rotation of the earth) is still considered to be an outstanding paper to this day.

In 1881, Onnes published a paper entitled – *Algemeene theorie der vloeistoffen* – (General theory of liquids), which dealt with the kinetic theory of the liquid state – approaching *Van der Waals* law of corresponding states from a *mechanistic point of view*. Van der Waals work was concerned with the existence of 'critical temperatures in gases, and is an extremely complex area outside the scope of this article. However, it was the writing of this paper by Onnes that led him to his life-long quest into the properties of matter at low temperatures. (Nobelprize.org, 2010)

It was against this background that Onnes was eventually appointed to the Physics Chair at Leiden, where he set about reorganising the Physical Laboratory (now named the Kamerlingh Onnes Laboratory) to suit his own program. Following through on the work of Johannes Van der Waals and Hendrik Lorentz, Onnes, established a cryogenic laboratory that would eventually lead him to verifying Van der Waals law of corresponding states over a large range of temperatures. It was these labours that brought about the liquefaction of helium in 1908. (Liquefaction = the change from a gas to a liquid through condensation). He actually reduced the temperature of the helium to 0.9K – reaching the nearest approach to absolute zero thus far achieved. It was famously remarked at the time that his laboratory in Leiden was ***the coldest spot on earth***! He was awarded a Nobel Prize for this accomplishment.

At the laboratory, Onnes studied *thermodynamics*, the *radioactivity law*, and *observations on optical, magnetic and electrical phenomena* – such as the study of *fluorescence* and *phosphorescence*, the *magnetic rotation of the polarization plane*, *absorption spectra of crystals in the magnetic field*; also the *Hall Effect*, *dielectric constants*, and particularly *the resistance of metals*. (*See Edwin Hall – 1855-1938*). It was this work that led him to the significant breakthrough in 1911 (that Onnes is especially remembered for today) – that of the ***superconductivity*** of pure metals such as mercury, tin and lead at very low temperatures; and following on from this, the study of *persisting currents.* (Org, 2010)

It was at this point, your humble author himself had to do even more digging (not being a physicist), and I quite happily own up to the fact that I hadn't a clue what superconductivity actually was. It turns out, as the old saying goes – *every day learns from that which preceded it* – and apart from being a long word – superconductivity is a fascinating subject in itself.

To begin to understand the properties of a superconductor, it is necessary to move into the world of quantum mechanics. Quantum mechanics is described as being a body of scientific principles describing the behavior of matter and its interactions on atomic and sub-atomic scales. (Wikipedia, 2008) Richard Feynman (US physicist 1919-1988) is quoted as saying quantum mechanics deals with "Nature as She is – absurd!" As a personal

It Is Amazing Who You Meet on the Moon Pt 7
Crater Kamerlingh Onnes

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thought, I would have said that given what we know (or don't know) of the universe – and how *insignificant* Classical Mechanics (physics) is when applied to much of the cosmos – that quantum mechanics, rather than being – absurd – is in fact more 'normal' than our understanding of Classical Physics as such! Whilst quantum mechanics may be counterintuitive to the human brain, physicists and scientists alike, have relied more and more on creating 'off Earth environments', such as those produced in cryogenic equipment – or the LHC particle accelerator – to gain insight into otherwise unexplainable phenomena. The changed state of matter at temperatures higher or lower than those we live with, or experience, on Earth obviously falls into this category.

Superconductivity itself has a 'human history' going back to the end of the 19th century – circa 1864 – when characters such as – Z.F. Wróblewski and Karol Olszewski – first documented predictions of electrical phenomena in ultra-cold states, dropping electrical resistance levels. Other names would be added to the long list of those exploring this area as time moved on. James Dewar and John A Fleming predicted that at absolute zero, pure metals would become perfect electromagnetic conductors. Later, Walther Nerst – a German physicist, developed the Third Law of Thermodynamics' – which stated that absolute zero was unobtainable! In *his* efforts to discover more, Kamerlingh Onnes purchased a Linde machine (refrigeration unit – *see* Carl von Linde) for his research; even our old friend, Nikola Tesla got in on the act, when he researched the same area around 1900. Such was the fascination of this burgeoning technology.

So – in simple terms – what are the properties of a superconductor? I'm sorry to say there are no 'simple terms'. There is nevertheless a class of elementary properties that are independent of the underlying material(s). All superconductors have ***exactly*** zero resistivity to low applied currents when there is no magnetic field present, or if the applied field does not exceed a critical value. The existence of these 'universal' properties suggests that superconductivity is a thermodynamic phase. Perhaps one of the most intriguing properties of a superconductor is its ability to preserve a current with no applied voltage whatsoever. Research has demonstrated that currents in superconducting coils can endure for years without any measurable attenuation. Experimental proof points to a current lifetime of at least one-hundred-thousand years! Hypothetical estimates for the lifetime of a continual current can EXCEED the ESTIMATED LIFETIME of the UNIVERSE – depending on the wire geometry and the temperature. (Wikipedia, 2010)

A note at this point about 'absolute zero' and why it cannot be attained; the state of absolute zero is simply a state where there is complete cessation of movement by all atoms or molecules. Because of background microwave radiation - a left over echo from the 'Big Bang' – absolute zero simply cannot be attained. Whilst those who stare into the 'bitter empty void' of space through a variety of implements – imagining perhaps they are peering through a cold vacuum – nothing could be further from the truth. Whilst there is much 'empty space' out there – there still remain atoms of this, that or the other, drifting in eternity. These atoms effectively have so much 'room to themselves' they never get to exchange energy or reach a desired state of equilibrium by passing on energy to other atoms. While the apparent temperature in space may average about 3K (-270°C or 3°C above absolute zero) if it were possible to take a random sample temperature of a molecule in space – one that is perhaps part of the solar winds, and record its temperature – that temperature may well prove to be around a million or more degrees Kelvin! (McGuigan, 2010)

To conclude, outside of his scientific work – which he considered to be a hobby – Onnes favourite recreations were his family life and philanthropic activities. He is described as a man of great personal charm and a humanitarian. Heike Kamerlingh Onnes was always a man of delicate health. After a short illness he died at Leiden on February 21st, 1926 – aged 72 years. As always, it is impossible to record but a small fraction of all the achievements of yet another great man in such a short article except to say without those achievements the world would be a poorer place indeed.

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