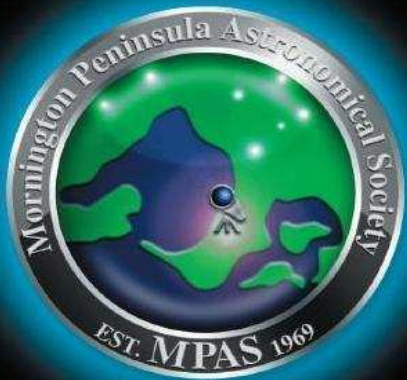


Cover images - Twilight Planets with Reflections
Mercury (top), Jupiter (middle) & Venus (bottom)
Taken at Pink Lake Victoria - 24th August, By Alex Cherney



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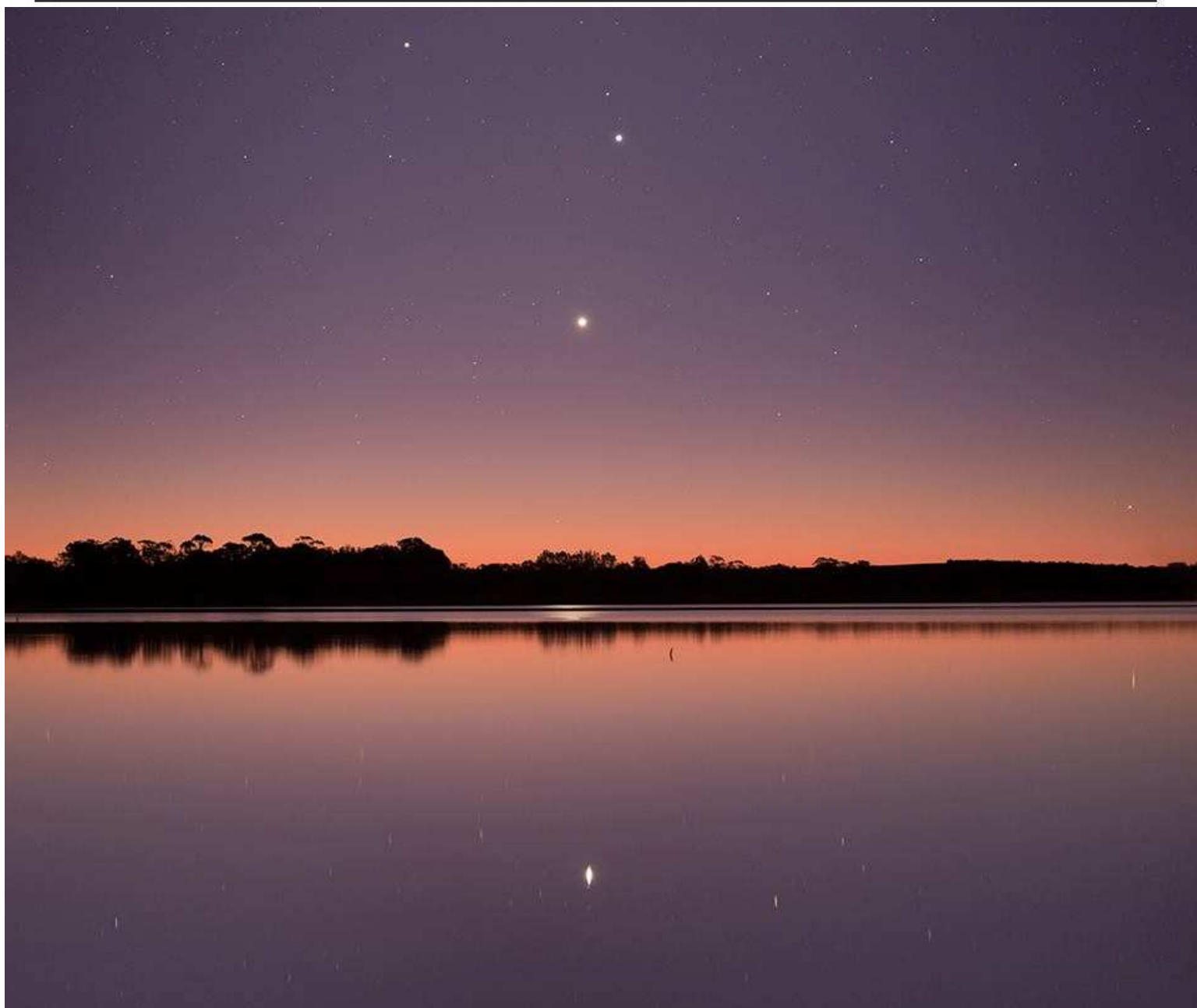
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Volume XXV, No 6 (November / December) 2016

The Mornington Peninsula Astronomical Society (formerly the Astronomical Society of Frankston) was founded in 1969 with the aim of fostering the study and understanding of Astronomy by amateurs and promoting the hobby of amateurs Astronomy to the general community at all levels.

The Society holds a focused general meeting each month for the exchange of ideas and information. Regular public and private observing nights are arranged to observe currently available celestial objects and phenomena. In addition, the society encourages the service of its members for education presentations and observing nights for schools and community groups.

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SOCIETY NEWS

By Greg Walton

Scout viewing night - Approximately 60 scouts & parents in attendance. Peter Lowe gave a talk on the solar system. The scout leaders said, they had never seen the scouts so well behaved while Peter gave the talk; after which the scouts got to see a street light through Peter Skilton's telescope, as the clouds did not clear. Also helping out was Heinz Rummel, Simon Birch & myself, *Greg Walton*

September public night - Approximately 25 in attendance - 20 members and 5 members of the public. Peter Lowe opened the night, then Trevor Hand gave one of his amazing talks & gave away some meteorite fragments to the public, while other members did a few small jobs in the observatory. The clouds did not clear, so everyone got an early night, all leaving around 10 pm.

Astrophotography work shop - Well last night went better than we could have hoped for. The sky cleared just after dark and all our guests had a good experience. When I say guests, a lot of them are new members now as I recall about 10 membership applications being taken during the day. This event, from a society fund raising point of view, would have to be up there amongst the best of them. I would like to thank all of the presenters – Jamie, Greg, Alex & Steve for their outstanding presentations. Also thanks to Paul for his event management and for the volunteers on the day. A big shout out and thanks to Pia Pedersen, who managed the catering department. I overheard many comments about how well organized and delicious the meal service was. Well done everyone. Regards, *Dave Rolfe*

Also thanks to Dave for his presentation. A few stayed on and got some nice images of the moon, Saturn & M22 globular cluster, through the MPAS telescopes in the observatory. Amazingly, it stayed clear. I got home just before midnight to find it had been raining in Chelsea.

Group photo of MPAS-APW 2016



Photos above - John Cleverdon, Rohan, Alex Cherney & Pia Pedersen

September Society Meeting - saw about 30 members in attendance. We almost had to do the meeting in the car park as the Peninsula school had changed the locks on the building. Jamie Pole came to the rescue & found the person in control's phone number & Dave was able to get somebody to open the door for us. The meeting got under way 30 minutes late. Dave Rolfe (President) chaired the meeting & talked about up & coming events at MPAS. Greg Walton, did "sky for the month" & Rod, showed a video of the MPAS Briars site taken with his Drone. Then MPAS member Greg Gibbons, talked on the Danish astronomer Tyco Brahe & showed many interesting images, after which members chatted over coffee.

See more about Tyco Brahe, by *Greg Gibbons*

https://drive.google.com/file/d/0ByvkxzZGI9g_Vm1LSXZVYUpmdGs/view?usp=sharing



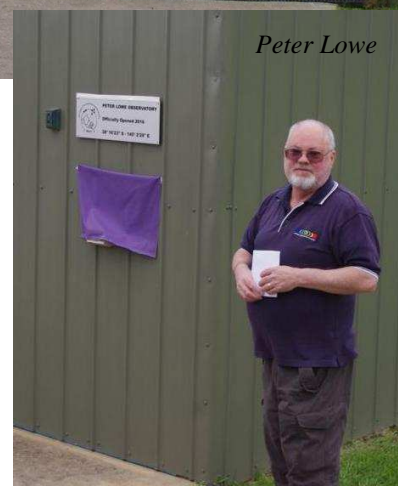


PETER LOWE OBSERVATORY
Officially Opened 2016
38° 16'23" S - 145° 2'29" E



Photo, by Pia Pedersen

September 24th Solar Day, Grand Opening Peter Lowe observatory & members Pizza night - about 40 members in attendance, the day started at 1 pm with about 10 solar telescopes being set up. Then at 3 pm Peter Lowe did a talk on the sun in the big shed, which I found very interesting. Next at 4 pm was the Grand Opening of the Peter Lowe Observatory. Dave Rolfe (President) made a speech, thanking all who helped out with the planning, construction & setting up of the new telescopes. Also mention was made of about 10 members, who put in more than 2 days each on the project. With a special mention to Mark Hillen, Pia Pedersen & Greg Walton for putting in more than 10 days each on the construction & driving the project forward. Each was given a jacket with the MPAS logo on them. Peter Lowe also made a speech & mentioned the past ASF/MPAS observatories & their fate. We all hope this new observatory has a long & useful life. Peter Lowe then removed the purple paper coving the plaque & opened the observatory. Then the clouds rolled in on queue & stopped everyone from using the new observatory. The solar telescopes were then all packed away before it rained. Members looked over the observatory. All were very happy with what they saw & asking many questions about how the new telescopes worked. Next, at 5 pm, Dave Rolfe did a presentation on how the new MPAS web site forum worked & urged us to test it out. Then at 6 pm the pizza man arrived with a fine selection of pizzas. Many members also brought along many different cakes & deserts. We then thanked Dave Rolfe for all the work he has done as new President in the past 12 months. It was an early night with most leaving around 9 pm as the rain started.



Peter Lowe



Photo By Greg Walton



Photo By Greg Walton

The Peter Lowe Observatory opening on Saturday the 24th Sept. was very entertaining. Thankyou to all who made the event happen by being there and to those who provided the delicious edible creations :). Special thanks to the committee for the surprise presentation of an MPAS jacket. I enjoyed helping construct the observatory with Greg and Pia, resident electrical expert David Rolfe, computer tech Jamie Poole and a dozen or so other hands on members. The roll off roof designed by Greg is a magnificent thing and will make for very convenient telescope use for public nights, and members wishing to partake in visual or astrophotography. Happy viewing, Mark Hillen

Hi All, Hope every one had a good night tonight at the members dinner. Thanks Peter for your presentation, always informative. As demonstrated tonight, feel free to have a look around our new member forum trial on the website. The link is located below. Please use your 'real name' as aliases are not welcoming when registering. You can create your own account at this stage, it will be automatically approved during the trial. There is a forum for feedback there, let us know if it works. If all else fails, post your comments back here and I will see what I can do. Regards, *Dave Rolfe* - MPAS forum http://www.mpas.asn.au/members_forum.html

October public night - Approximately 70 in attendance - 15 members and 55 members of the public. Peter Lowe opened the night, then Trevor Hand gave one of his talks. The clouds only cleared long enough for a small group, who got to see Saturn & the Moon, another early night, with everyone leaving around 10 pm.

Overnewton Viewing Nights @ Camp Manyung - on the 10th & 13th October we had 170 year 4 students plus teachers on camp from Overnewton Anglican Community College at Camp Manyung. This was the first time we've done a viewing night for this school and they are really looking forward to us coming. Luckily both nights were clear & everyone got too see Saturn, Mars, Venus, NGC 104 & the Moon. Peter Lowe did the talk while Peter Skilton, Phil Holt, Dave Rolfe, Sky Murphy, Fiona Murray, Pia Pedersen & Greg Walton were manning the telescopes.

All went very well. Returned fulfilled like in the past. Had real fun with PS and DR looking through a spectroscope grating. It was wowwww... we were all quite blown back how bright and intense the spectra were. Then PH too; he was awesome with several tricks eg wire loop carrier and roller loader. The kids and teachers all had a woww time with my Moonbeam, seeing where the astronauts first landed and all those sharp craters at the other edge. And brilliant Venus! It needed pointing to. One exclaimed... you mean we can see Venus as a star???! Regards, *Sky*

Viewing Night for Guide Jamboree - on the 15th October at Guides Hall in Carrum. We had 60 Girl Guides plus parents. The Guides asked lots of question about the Moon & Planets. Luckily the sky stayed clear long enough for everyone too see Saturn, Mars, Venus & the Moon. Peter Lowe did the talk while Peter Skilton, Mark Stephen, Heinz Rummel, Dave Rolfe, Fiona Murray, Greg Walton, Josh & Jamie Pole were manning the telescopes.

October Society Meeting - seen about 28 members in attendance. Dave Rolfe (President) chaired the meeting & talked about up & coming events at MPAS. Then MPAS member Paul Albers (Vice President), talked on meteor showers & how they can be heard & used by the ham radio operators. Greg Walton, did "sky for the month" after which members chatted over coffee.

October Members BBQ - seen about 20 members in attendance - including Anders Hamilton, Dave Rolfe, Paul Albers, Peter Lowe, Ian Sullivan, Fiona Murray, Phil Holt, John & Marj Cleverdon, Helmuth, Nic Baker, Bruce Renowden, Roland Knabe, Kevin Rossiter & Charlotte Swart. Sorry to anyone I have missed. It rained on & off all night, the observatory didn't get opened up, so no real viewing done. We did gaze longingly into some sucker holes that opened up later in the night. We did manage to sing a few rounds of happy birthday too Kevin Rossiter (21st) & Charlotte Swart (23rd) who both had there 50th Birthday. From *Jamie Pole*



Overnewton Viewing Nights



We now have the ASTRONOMY 2017 books in stock. Members can purchase their copies at \$24.50 each at the General Meeting in November. We have only ordered a few this year because we seem to always end up with an over supply.



PUBLIC NIGHT THANK-YOU

Recent public viewing nights and school viewing nights have continued to be very well received by the attendees. It is no coincidence that this is due to the efforts put in by the members that help out at these events. To everyone that has helped out over the past months, a very big thank-you goes to you all. Your efforts are very much appreciated, and are being very well received.

Please note we have 3 public viewing night in January 6th, 13th, 20th

MPAS SUBSCRIPTIONS 2016

The ticking over of the New Year also means that society fees are now due to be paid. The society has worked hard to ensure that 2016 fees are still the same as last year's prices. So to assist the society in maintaining the facilities and service we provide, we appreciate your prompt payment for the 2016-year ahead.

As a reminder, the following structure of the fees are:

SOCIETY FEES

Subscriptions can be paid in a number of ways:

- Direct Cash payments to a committee member
- Send a cheque or mail order to the society mail box MPAS, P O Box 596, Frankston 3199
- Make a direct electronic payment into the society working bank account.

The account details are BSB 033-272 Account 162207. Remember to add your name and details to the transfer so we can identify the payment in the bank records. If you have any concerns please talk to a committee member.

Click on the link for farther information - https://drive.google.com/file/d/0BYvkxzZG19g_NXZ4cWxHbERTdEE/view?usp=sharing

- \$50 - Full Member
- \$45 - Pensioner Member
- \$65 - Family Membership
- \$60 - Family Pensioner Membership

A word from the Scorpius editing team.

Members please write a story about your astronomy experiences and add some pictures.

Send them to:

Greg Walton

gwmipas@gmail.com

Brett Bajada

Peter Lowe

Bruce Renowden

CALENDAR		November / 2016				
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Vic-south 1 Cup Day	2	3 Venus & Saturn left of the Moon	Public Night 4 8pm	5
6 Mars left of the Moon	7	8 First Quarter	9 ASV Meeting	10	11	12
13 Venus near M8	14 Full Moon	15	16 Society Meeting 8pm	17 Venus near M28	18 Venus near M22 & lid of the tea pot	19 Members Night BBQ 6pm
20 Neptune Stationary	21 Last Quarter	22 Mercury & Saturn right of the Antares	23 Committee 8pm Venus near Comet 45P Honda-Mrkos	24	25 Jupiter right of the Moon Morning	26
27	28	29 New Moon	30			

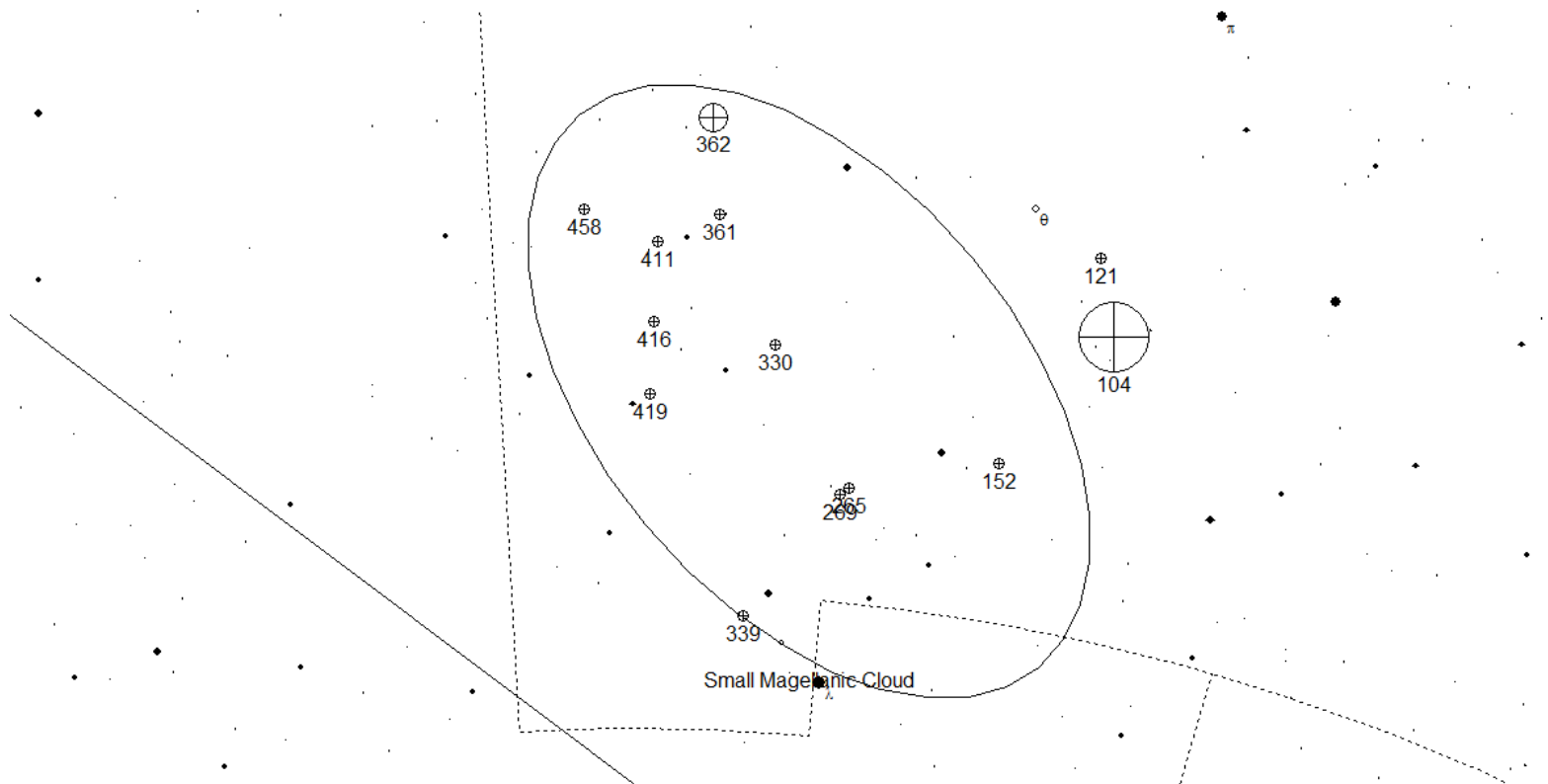
Monthly Events & High Lights.**Public nights** 4th, 8pm start - **Society Meeting** at 8pm on 16th @ the Peninsula School**Members Night BBQ** 6pm @ the Briars 19th**Evening** - Venus & Saturn left of the Moon on the 3rd - Venus near M22 on the 18th**Dawn** - Jupiter has now moved to the morning sky

CALENDAR		December / 2016				
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Mercury left of the Moon	Public Night 2 8pm	3 Venus left of the Moon
4 Mars left of the Moon	5	6	7 ASV Meeting First Quarter	8 Mercury close to ngc6638	9	10 Members Night Xmas BBQ 6pm
11	12	13 Aldebaran 0.5 deg from Moon	14 Full Moon	15	16	17
18	19 Mercury stationary	20	21 Last Quarter Solstice	22	23 Jupiter right of the Moon morning	24
25 Xmas	26 Boxing Day	27 Xmas Holiday	28	29 New Moon	30	31

Monthly Events & High Lights. Red Days indicates School Holidays**Public nights** 4th 8pm start - **NO Society Meeting in December****Members Night Xmas BBQ** 6pm @ the Briars 10th**Evening** - Venus left of the Moon on the 3rd**Dawn** - Jupiter right of the Moon morning on the 23rd**Please note we have 3 public viewing night in January 6th, 13th, 20th****Note** this years the Members night BBQ's will be the first Saturday after the Society Meeting.

Also General Meetings will be called Society Meetings under the new regulations.

Sky for November/December as the planets are now past there best its time to get back to deep sky objects. In the evening you will see that the southern cross is now low in the southern sky & the LMC & SMC are riding high above. So I thought I should set a challenge for you all, I have always had an interest in globular clusters & there are 13 globular clusters brighter than 12 magnitude in & around the SMC... So see how many you can find! Use the chart below. NGC104 (47 Tuc) is the second brightest globular clusters in the sky & can by seen with the naked eye from a dark sky location. For the rest you will need a telescope & the societies new 14 inch would by the best one for this job.



Produced on Sky Map by Greg Walton

Below an image I took of the SMC with a 300mm camera lens

SMC NGC104 Briars Pentax ist 300Lens 5x30sec
ISO3200 By Greg Walton No editing



ASTRO NEWS

By Peter Lowe

Largest Single Aperture Radio Telescope Completed

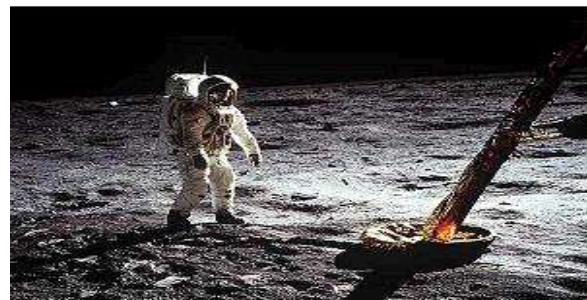
Boasting half a kilometer in diameter, China's 500-meter Aperture Spherical Radio Telescope (FAST), has been completed in the Guizhou Province, southwest China. Started in 2011 the enormous dish antenna was completed on July 3 when the final panel was lowered into position. FAST is bigger than the Arecibo telescope in Puerto Rico with its 305-meter diameter dish. The two giant telescopes are similar using natural geological depressions in the landscape known as "karst, giant sinkholes created by nature that fit the rough outline of the



telescope dish. Both are static structures in the sense that the dish only looks straight up, staring at the zenith. They both therefore depend on the rotation of the Earth allowing different parts of the sky to drift into view over the course of the day. To follow an object for a few hours at a time, the detector, which is suspended above the center of the dish, can be shifted. An additional feature uses an advanced system of cables and actuators that deform the spherical mirror, much like a rubber sheet, to create a parabolic shape allowing the instrument to track an object over a larger part of the sky. Even though construction is completed, Chinese scientists and engineers still have a huge task to make the system reach the design specifications and ultimately deliver new and exciting scientific results. As the name already suggests, this is a radio telescope, picking up radiation from the cosmos at wavelengths of between 0.1 meter and 4 meters. This is light with a wavelength a million times or so longer than our eyes can detect. Not surprisingly, the sky at these long wavelengths looks vastly different which is exactly why observations at radio wavelengths reveal information that is not accessible with optical telescopes. While the instrument still has a long commissioning period before it can start work, it is expected to become a vital component in the world's radio telescope global network.

Apollo Astronauts May be Dying Young

It has been suggested that Apollo mission astronauts are experiencing higher rates of cardiovascular problems that are thought to be caused by their exposure to deep space radiation. 43 percent of the deceased Apollo astronauts died from a cardiovascular problem, which is four to five times higher than non-flight astronauts, or astronauts who only travelled in low Earth orbit below the Earth's radiation belts. Of the 24 men who flew lunar missions, eight have died and seven others are included in a study. Mice radiation studies demonstrate an impairment of arteries that is known to lead to the development of atherosclerotic cardiovascular disease in humans.



Galactic Virgin Fly Again

Two years after Virgin Galactic's deadly crash, the Federal Aviation Administration has issued an operating license for their space tourism rocket to recommence commercial operations. The crash was determined by the National Transportation Safety Board to have been a combination of human error and inadequate safety procedures requiring the company to build a redesigned vehicle. In 2014, their first spacecraft - the SpaceShipTwo - was destroyed when a co-pilot unlocked the braking system too early. The co-pilot was killed, and the pilot was severely injured but survived. The company hopes to begin using the latest spacecraft to send satellites (and perhaps even human customers) into space next year.

Juno Orbits Jupiter

Past missions to Jupiter have either been flyby glimpses or have had to maintain their distance from the planet to stay away from Jupiter's deadly ionization belts. Probes can't last long inside these belts but to study Jupiter you need to get up close. The Juno mission is designed to undertake this suicidal mission. Launched in 2011 it has been cruising toward the Jovian system and arrived into orbit this July. Its orbit is highly elliptical which allows it to plunge deeply through the radiation belts to get a close up view of the planet. All up the mission is planned to last 37 orbits (20 months) after which it will be sacrificed to a fiery death in Jupiter atmosphere.



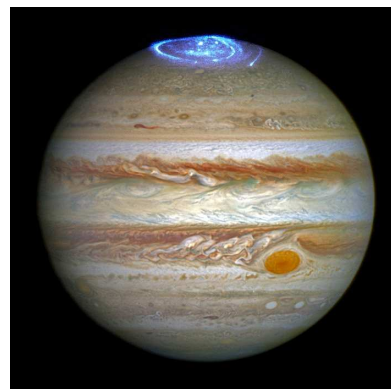
In Greek and Roman mythology, Jupiter drew a veil of clouds around himself to hide his mischief. It was Jupiter's wife, the goddess Juno, who was able to peer through the clouds and reveal Jupiter's true nature. The Juno spacecraft will also look beneath the clouds to see what the planet is up to, not seeking signs of misbehaviour, but helping us to understand the planet's structure and history. Juno's principal goal is to understand the origin and evolution of the planet. Underneath its dense cloud cover, Jupiter safeguards secrets to the fundamental processes and conditions that governed our solar system during its formation. As our primary example of a giant planet, Jupiter can also provide critical knowledge for understanding the planetary systems being discovered around other stars. With its suite of science instruments, Juno will investigate the existence of a solid planetary core, map Jupiter's intense magnetic field, measure the amount of water and ammonia in the deep atmosphere, and observe the planet's auroras.

Specifically, Juno will:

- 1) **Determine how much water is in Jupiter's atmosphere, which helps determine which planet formation theory is correct (or if new theories are needed)**
- 2) **Look deep into Jupiter's atmosphere to measure composition, temperature, cloud motions and other properties**
- 3) **Map Jupiter's magnetic and gravity fields, revealing the planet's deep structure**
- 4) **Explore and study Jupiter's magnetosphere near the planet's poles, especially the auroras – Jupiter's northern and southern lights – providing new insights about how the planet's enormous magnetic force field affects its atmosphere.**

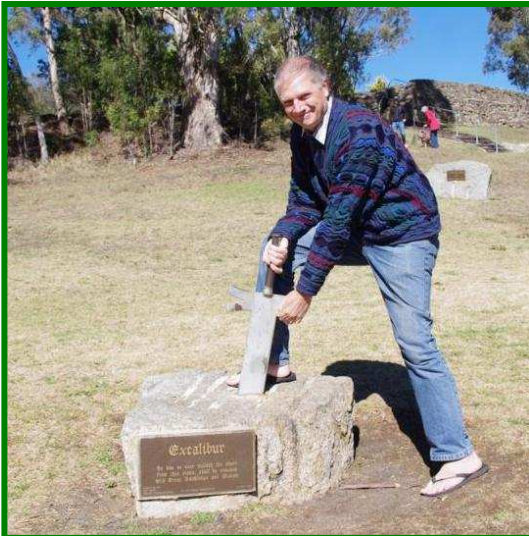
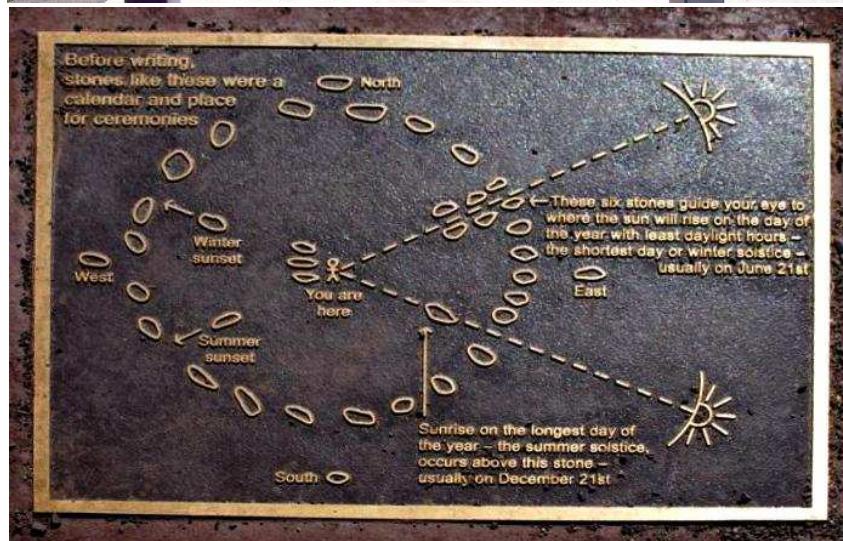
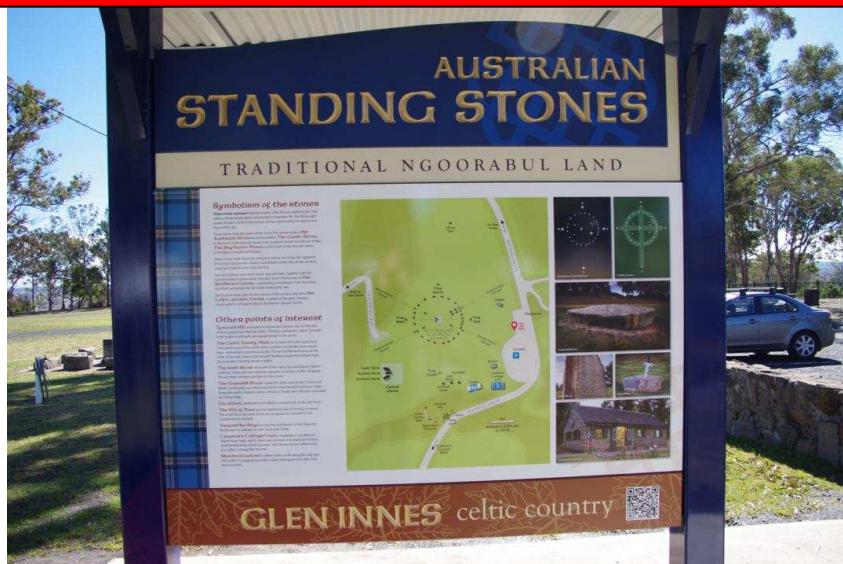
Theories about solar system formation all begin with the collapse of a giant nebula of gas and dust forming the infant sun. Like the sun, Jupiter is mostly hydrogen and helium, so it must have formed early, capturing most of the material left after our star came to be. Precisely how this happened is still unclear. Did a massive planetary core form first and gravitationally capture all that gas, or did an unstable region collapse inside the nebula, triggering the planet's formation? Differences between these scenarios are profound. The materials that formed the Earth and other rocky planets have long been modified however unlike Earth, Jupiter's giant mass allowed it to hold onto its original composition, providing us with a way of tracing our solar system's history. Juno will measure the amount of water and ammonia in Jupiter's atmosphere and determine if the planet actually has a solid core, directly resolving the origin of this giant planet and thereby the solar system. By mapping Jupiter's gravitational and magnetic fields, Juno will reveal the planet's interior structure and measure the mass of the core. How deep Jupiter's colourful zones, belts, and other features penetrate into its atmosphere is one of the most outstanding fundamental questions about the giant planet. Juno will determine the global structure and motions of the planet's atmosphere below the cloud tops for the first time, mapping variations in the atmosphere's composition, temperature, clouds and patterns of movement down to unprecedented depths.

Finally Juno will map Jupiter's enormous magnetosphere. Deep within Jupiter's atmosphere, under great pressure, hydrogen gas is squeezed into a fluid known as metallic hydrogen. At these great depths, the hydrogen acts like an electrically conducting metal, which is believed to be the source of the planet's intense magnetic field. This powerful magnetic environment creates the brightest auroras in our solar system, as charged particles precipitate down into the planet's atmosphere. Juno will directly sample the charged particles and magnetic fields near Jupiter's poles for the first time, while simultaneously observing the auroras in ultraviolet light produced by the extraordinary amounts of energy crashing into the polar regions. These investigations will greatly improve our understanding of this remarkable phenomenon, and also of similar magnetic objects, like young stars with their own planetary systems.



Australian Standing Stones

Travelling through NSW we stopped at Glen Innes, a country town with a Celtic heritage. Many of the town's buildings are built in stone in the Celtic style. Outback towns are looking for ways to attract visitors to stay & spend their money so I guess this is just another one of these ideas! "Let's put some rocks on a hill, with a coffee shop & we will see if anyone will turn up".... Yes, there was a steady stream of people stopping for a look. You can find the standing stones on a hill overlooking the town. They don't resemble Stonehenge, but have an astronomical theme, with stones lining up in winter & summer solstice. The stones each more than 3 metres high, were cut from a quarry. The money was donated by locals with each business paying for one stone. Maybe we can do the same at the Briars? *By Greg Walton*

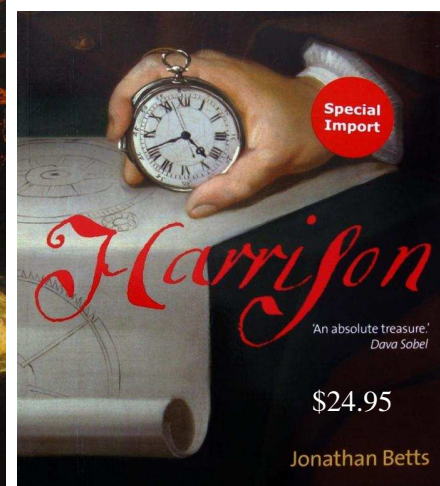
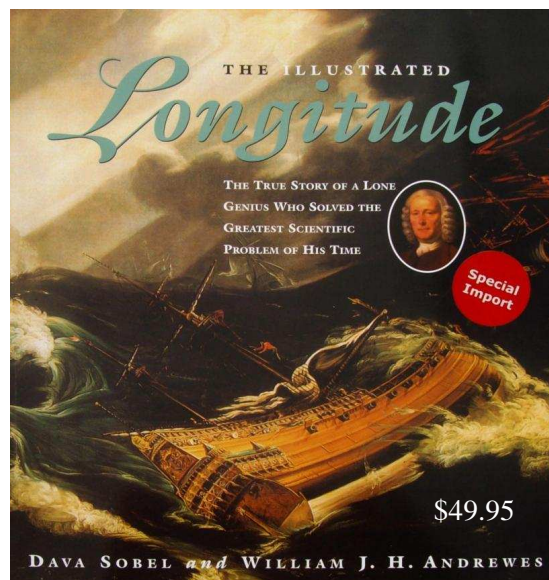
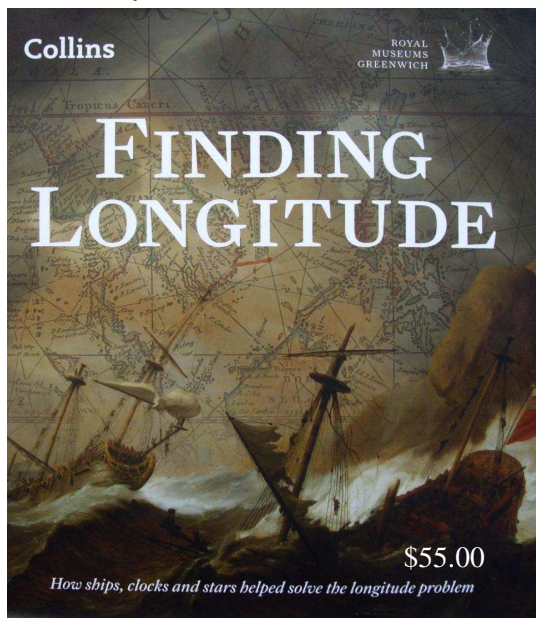
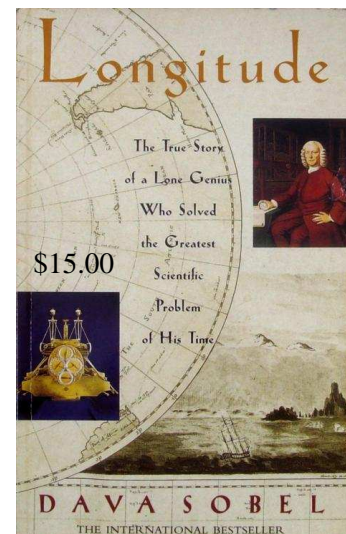
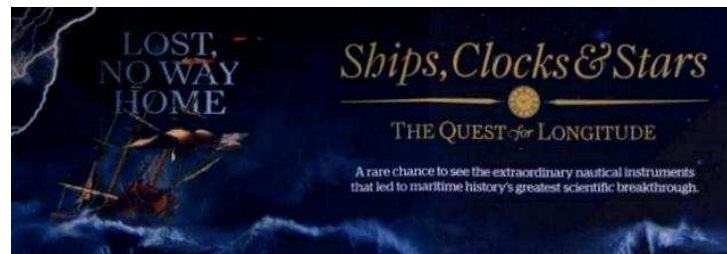


More photos https://drive.google.com/drive/folders/0ByvKxZGI9g_QjUxWUJ1SWhoMEU
 Standing Stone Time Lapse <https://vimeo.com/46402888>

John Harrison & his timekeepers

I bought the book *Longitude* by *Dava Sobel*, almost 20 years ago. When I saw on TV that the John Harrison's timekeepers are now in Sydney at the maritime museum, till 30th October 2016, I thought I will need to go & see them. You may think this has not much to do with astronomy, but in the 1600th century there were two main ways to find longitude. The first used the measurement of time & the other used the position of the Moon against the stars. Both had there advantages & disadvantages. The astronomy method was difficult to do on a rolling ship, also needing large tables of moon & star positions to be made years in advance. The measurement of time system needed an accurate clock, none of which had been made, until John Harrison came along & spent most of his life working on such a clock; finally achieving this in the latter years of his long life. This all happened before the discovery of Australia, in a time when many ships were being lost at sea, with a massive loss of life & valuable cargo. The English government had offered a prize of 20,000 pounds to anyone who could come up with a way of determining (measuring) longitude.

We stayed at Marina Court Hotel, a ½ hour's walk from the maritime museum. On arrival at the maritime museum we found no cameras were allowed into the timekeepers exhibition. Also, these were not the original clocks, but very good copies made in England. Even still, all very interesting. We spent all day at the maritime museum, looking at ships, boats, sub's & the Harrison timekeepers. I will not write about the clocks: too much to write for here. You can get the whole story by buying one of the excellent books on sale, or you can watch on YouTube. See below



Longitude (2000) TV 3 hours <https://www.youtube.com/watch?v=ecrf8KhVcyo>

Ships, Clocks & Stars: Assembling the H3 replica time-lapse trailer <https://www.youtube.com/watch?v=YsCguJfR7A0>

The Clock That Changed the World (BBC History of the World) <https://www.youtube.com/watch?v=T-g27KS0yiY>

John Harrison's first timekeeper <https://www.youtube.com/watch?v=0cc0KObkDBs>

John Harrison Clocks for Longitude from June 1998 in Greenwich, London, UK <https://www.youtube.com/watch?v=bcABUUIE-Zo>

The Longitude Problem <https://www.youtube.com/watch?v=t61ZJuKPUoI>

TimeLine - A Brief Introduction To The History Of Timekeeping Devices <https://www.youtube.com/watch?v=At5atF4mKiU>

John Harrison's wooden clocks - part 1 <https://www.youtube.com/watch?v=bUxZISVEAk0>

John Harrison's wooden clocks - part 2 <https://www.youtube.com/watch?v=sBKMTKl0wkY>

John Harrison's H1 Clock 1735 <https://www.youtube.com/watch?v=reSA75dMr0k>

John Harrison's H2 Clock 1737 <https://www.youtube.com/watch?v=hCCuLE3KuPs>

Harrison H1 clock <https://www.youtube.com/watch?v=y-v4VqCd7IQ>

A Detailed Study of H4 - John Harrison's Longitude Timekeeper Reconstruction <https://www.youtube.com/watch?v=UeEba55S7MI>

Determine Longitude <https://www.youtube.com/watch?v=b7yoXhbOQ3Y>

HARRISON'S CLOCKS - GREENWICH, UK <https://www.youtube.com/watch?v=jGpxlcBinkc>

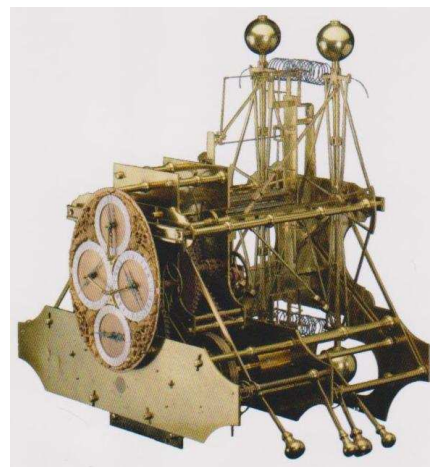
Google "Harrison timekeepers" & I got an over whelming amount of images & video

Find out more @ <http://www.anmm.gov.au/longitude>



The Harrison timekeepers came to Australia in pieces & then were assembled. Above is H1.

Being someone who has worked with metal most of my life, the timekeepers with all there problems interested me greatly. As I watched each one of them ticking, I got an insight into their workings. Every few minutes a flat blade of brass spins around, winding a secondary spring, from the larger main spring, to keep a constant load on the drive system. This also meant the clock kept running while being wound. These timekeepers don't need lubrication as it would have changed the speed of the timekeeper with changing temperature. I could see that every moving part was finely balanced, but still after 20 years Harrison realized that H1, H2 & H3 were still affected by a ship making a turn. That's when he realized he had to make the timekeeper smaller. Smaller parts are less affected by the ships movement & gravity. All the timekeepers had temperature compensation which changed the length of the pendulum & secondary drive spring, which took many years to adjust. The timekeepers needed to be accurate to within one second a month. Each night Harrison would look at a chimney across the road from his home & his window frame, when the same star past behind them each night. He used this to set the timekeepers. Harrison spent much of his time dealing with government officials, most of the time giving him more money so he could keep working at perfecting the timekeepers. He had a long life for these times & it was most likely the timekeepers & solving the longitude problem kept him going. A remarkable achievement for those times.



Talking to all the volunteers at the maritime museum was very interesting. They had so many stories to tell.... Life on a tall ship or a Oberon submarine; I took this photo at right of the centre point tower through the periscope on a submarine, which surprised the tour guide greatly. The door way on the submarine would get smaller by as much as 4mm in diameter when the submarine was at a depth of 100 meters. They showed us an imprint of a coin in a door way, were a sailor placed a coin between a strengthening bar & the door way.

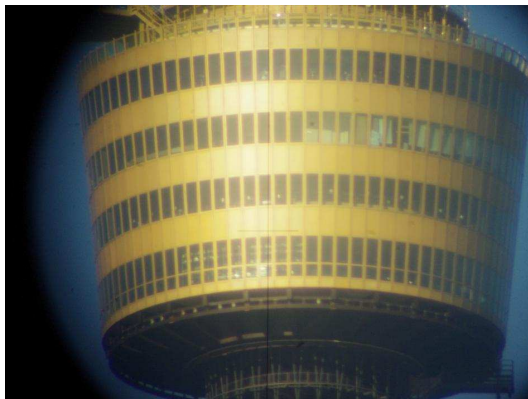


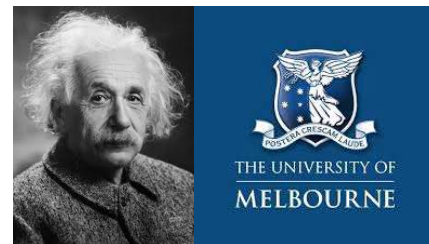
Photo at right is a Planisphere clock at Darling harbour, opposite the maritime museum. It's about 2 metres across.

Link to more photos from maritime museum, Flickr <https://www.flickr.com/gp/141552671@N02/1a6HMm>

By Greg Walton

2016 July Lectures in Physics, by Dave Rolfe

I attended the series of lectures this year and found them very interesting and worthwhile. Although from our side of the city, the 6.30pm start in Parkdale was a traffic challenge it was still worth the effort. Melbourne Uni has run these lectures each year over July for about 40 years. This year there are 5 Fridays in July so it was a big commitment after work.

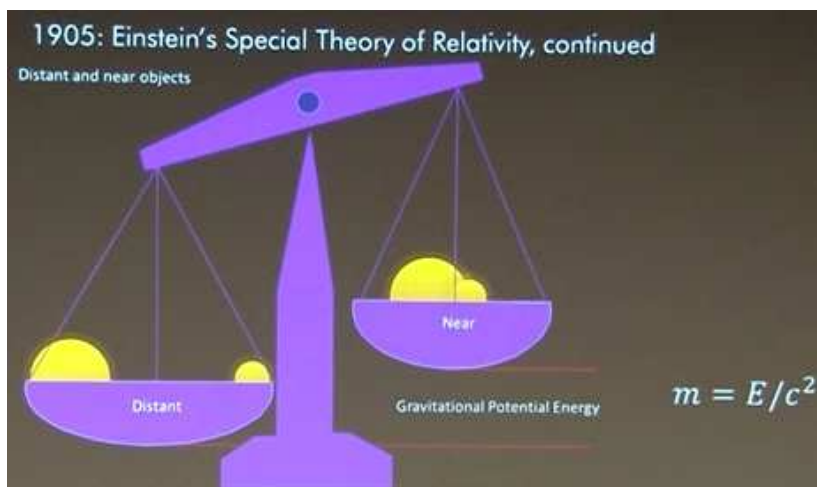
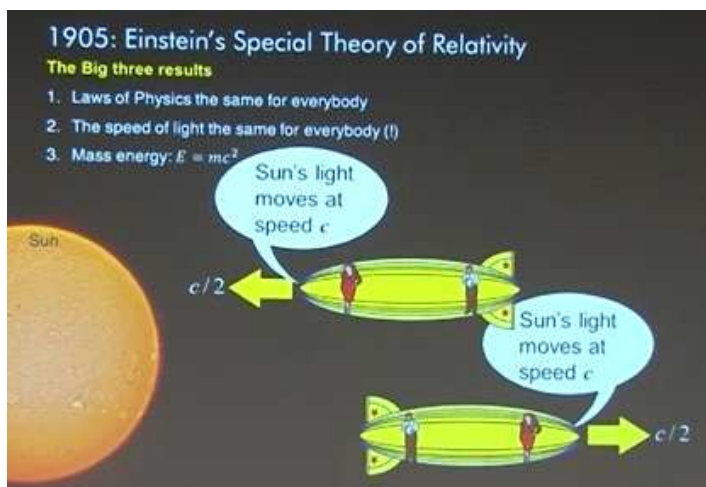


Friday 1st of July

After wagging the public viewing night I found my way to the basement lecture theatre and got a prime seat. The theatre is large and I would say about 90% full. Being the 100 years of Einstein's General Theory of Relativity anniversary this is a bit of a focus for each of the lectures.

Professor David Jamieson presented the first lecture, from Melbourne Uni School of Physics and he provided a very good definition of the General Theory with several prepared experiments. The talk was labelled 'Lost Planets, Australian Eclipses and warped space'.

The lecture started with the history of Galilean, Special and General Relativity with examples. We then moved onto gravity, touched on Gravity waves and worked out why we don't go flying off the Earth as it is spins due to centrifugal forces. We then tied in Gravity and Acceleration into the mix before time run out. David did take a few questions from the floor and explained that most people will struggle with the fact that the speed of light is referenced from the observer and cannot be broken.



Formulas used:

$$c = 10^8 \text{ m/s or } \approx 1,000,000,000 \text{ km/h}$$

$$E = mc^2$$

$$\mathbf{F} = m \frac{d\mathbf{v}}{dt} = m\mathbf{a}$$

$$\frac{P^2}{a^3} = \frac{4\pi^2}{G(M+m)} \approx \frac{4\pi^2}{GM}$$

- (celerity or speed of light)

- *Einstein's Mass/Energy Equivalence*

- *Newton's Law of Motion (and variations)*

- *Keplers 3rd Law*

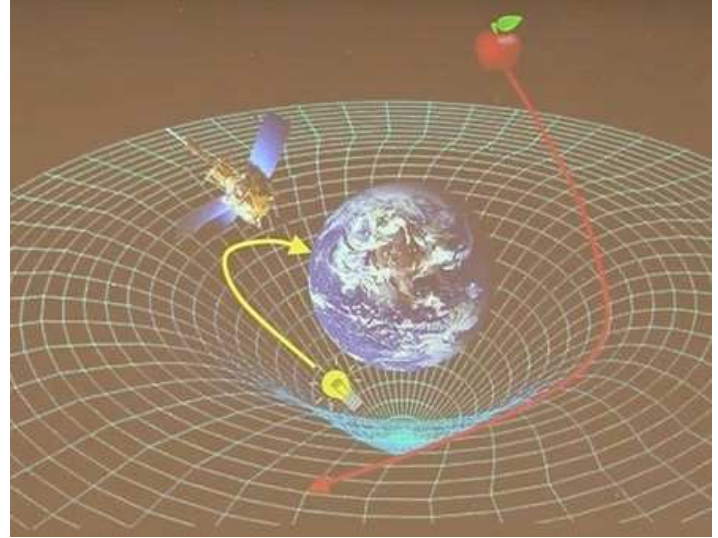
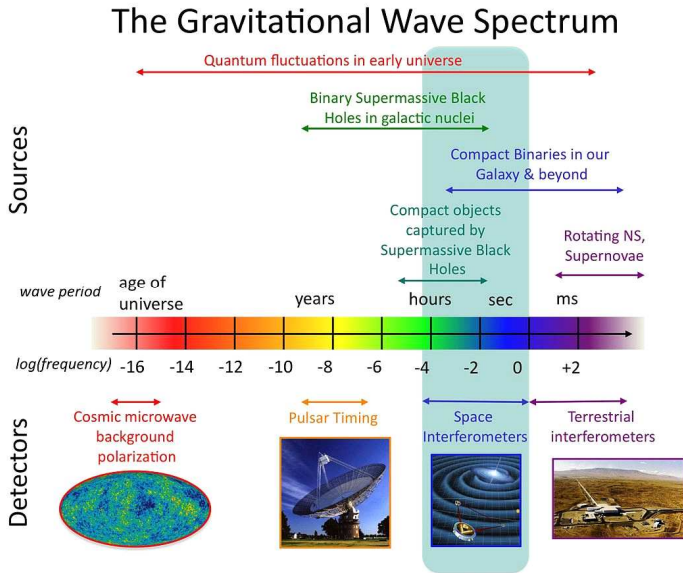
I must say I was grinding cogs in my mind thinking back to my year 12 physics schooling!

This lecture was recorded and is available on YouTube here: <https://youtu.be/3zgQDYhed1I>



Friday 8th of July

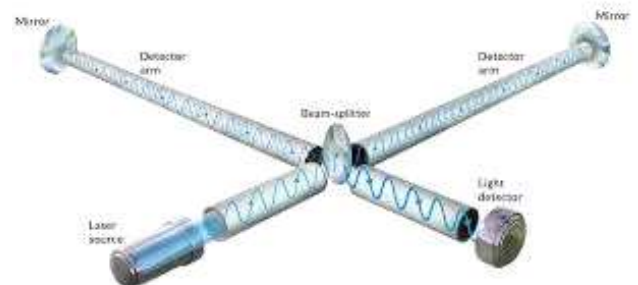
Jamie Pole and I went to see Professor Andrew Melatos host this lecture. Again Andrew works at Melbourne Uni and is also involved and collaborates with the LIGO Gravity Wave interferometer research team. The talk started with a definition of gravity waves and how they are created. This involved explaining space/ time, gravitational lensing and what events can cause major gravitational energy emissions. The talk was officially named 'The Discovery of Gravity Waves: The Breakthrough by LIGO'.



Then we moved to LIGO and went over the first two detections with an interpretation of the 'chirps' and how we derive the source. In summary;

- The gravity wave on the 14th of September was by 2 black holes of 29 and 36 solar masses. The detection lasted 0.2 seconds and occurred 1.4 billion years ago emitting $3M_{\text{sun}}c^2$ of gravitational wave energy leaving a $62M_{\text{sun}}$ Black Hole.
- The second event on 26th of December was also a merger of two black holes of 14 and 8 solar masses. The detection lasted about 1 second (more orbits before merge) and also occurred 1.4 billion years ago emitting $1M_{\text{sun}}c^2$ of gravitational wave energy, leaving a $21M_{\text{sun}}$ Black Hole.

Part 3 was titled, 'Astronomy without light'. This covered what they expect to see in the future with a space based detector, what a neutron star merge would look like, super nova burst and the holy grail peering back to the inflation period. Andrew finished with why Einstein was right (as this is the first time his theory had been tested with 'strong field regime'), reinforcing in the 100 years of GR flavour. Again he took questions at the end.



Andrew also highlighted that Australia was involved with the discovery with so many of the components for LIGO being designed and manufactured in Australia.

This lecture was also recorded and is available on YouTube here: <https://youtu.be/UnrYUrw1tJg>

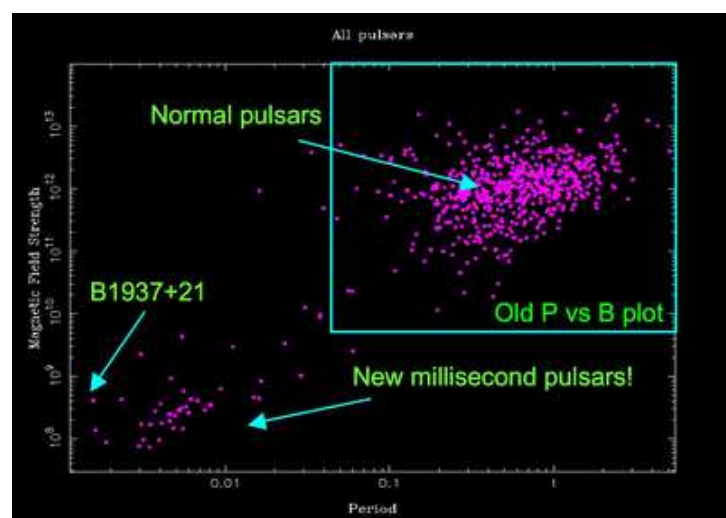
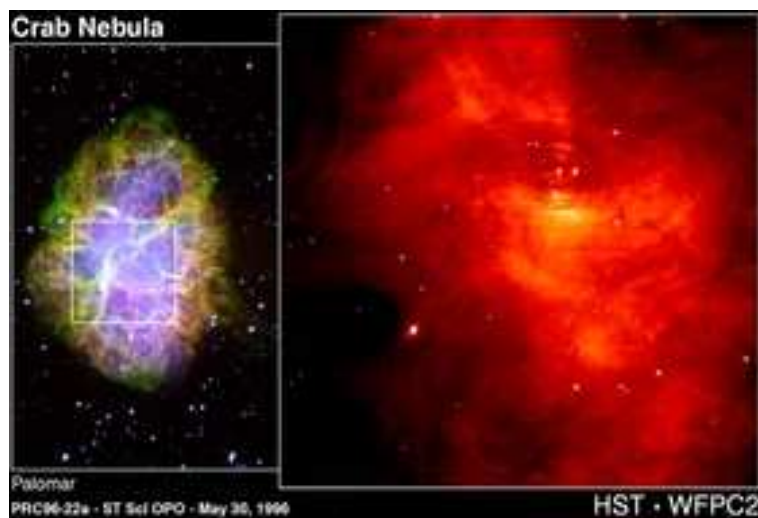


Friday 15th of July

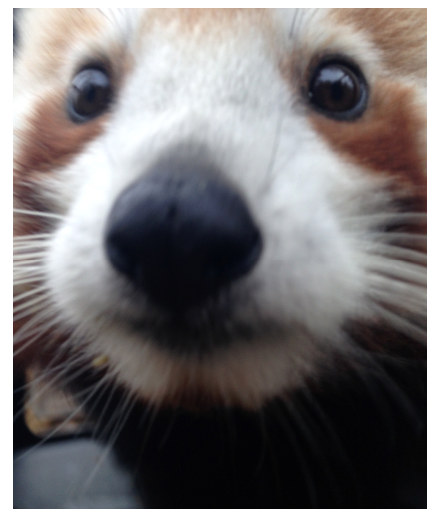
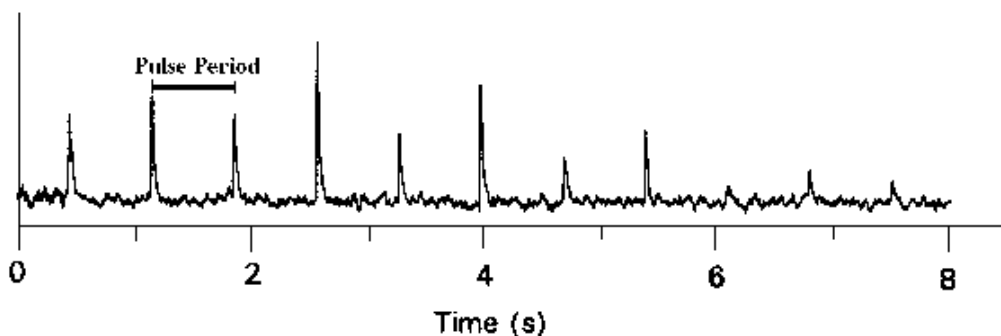
Professor Matthew Bailes delivered this lecture from Swinburne University of Technology's Centre of Astrophysics and Supercomputing. The talk was titled 'Pulsars: Nature's naturally-occurring gravitational laboratories'.

He explained his latest work with pulsars and performed a live cross (via VNC) to a radio telescope in Parkes to see a pulsar and explain how fast pulsars can discover gravitational waves from super-massive black hole binaries. The visuals from Matthews talk were superb; the team in the Supercomputing division really did well with the simulations from both a scientific accuracy point of view as well as visually pleasing aspect.

Pulsars are spinning dead stars that have long since consumed all their nuclear fuel and collapsed into super-dense remnants. Pulses of radiation from the spin can be used as extremely precise clocks with which to study extreme gravity. He explained that Astronomers have discovered over 2,000 of these bizarre objects to date.



Matthew also highlighted his team's work (including his PhD students) and explained how lucky we are in the southern hemisphere with lots of pulsars and less research competition. His students also had a breakthrough in finding some longer duration pulsars of over 10 seconds. Most pulsars are fast from 1.4ms to 8 seconds.



Side Note: I was early this for this lecture, so I stopped at the zoo and caught a nice pic of my favorite animal, the Red Panda. They are normally sleeping up their tree about 50 feet in the air. I guess it was feeding time!

This lecture was also recorded and is available on YouTube here: <https://www.youtube.com/watch?v=HeMqi0ihmVQ>

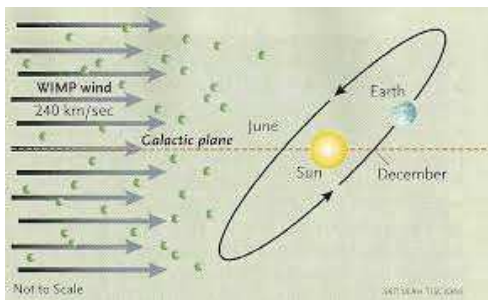


Friday 22nd of July

This lecture was given by Professor Barberio and was titled 'Dark Matter and Gravity: Searching for missing mass at Stawell gold mine'.

Synopsis: Einstein's General Theory of relativity provides an exceptionally accurate theory for gravity and matter at the largest scales. But observations of the way stars move subject to gravity in the galaxies show there is more gravity that can be accounted for by the visible stars. Gravity from invisible dark matter is proposed to explain the discrepancies. Despite concerted searches, no other trace of this dark matter has yet been found.

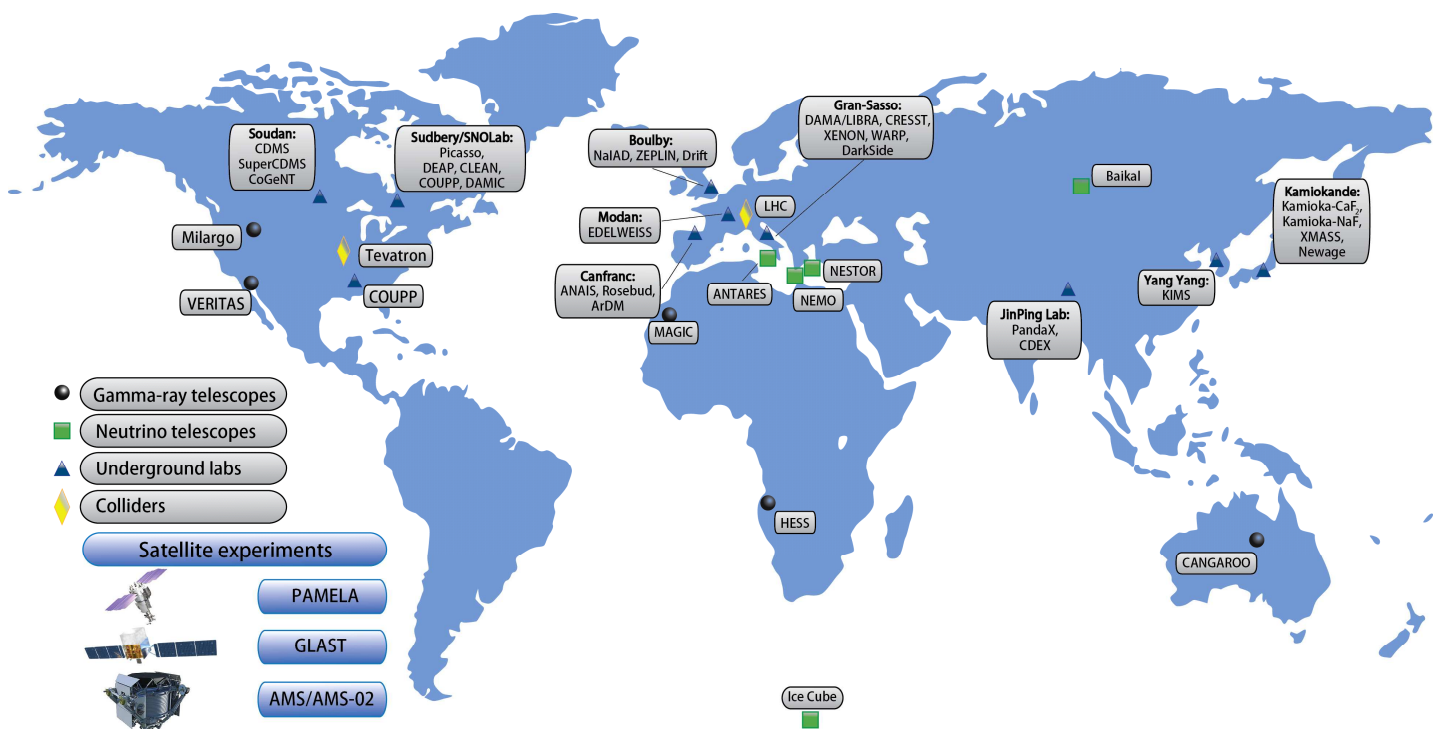
Dark matter was described as a WIMP (Weakly-Interacting Massive Particle) and the thoughts so far on detecting it are directly, indirectly or via production in a collider. We also looked at how to classify dark matter as it does not emit or interact with electromagnetic radiation, such as light, and is invisible to the entire electromagnetic spectrum. As this matter accounts for more than 5 times the ordinary matter we know of in the universe we need to have an understanding of it to improve the modeling of cosmic structure and galaxy formation.



Melbourne Uni, together with other institutes and government funding are building a detection lab in the old Stawell gold mine (near the Grampians). This is a mirror image of the Gran Sasso facility in Italy where they have some promising data but need record inverse data to corroborate the results from the Southern Hemisphere. The facility is expected to be operational at the end of 2017 with the SABRE (Sodium-iodide with Active Background REjection) experiment.

The lab will be about 1km underground and used materials of low natural radiation, especially potassium so as she explained, no bananas allowed down there!

This experiment is anticipated to have the best chances of success as many other expensive 'Dark Matter Detector' experiments have come up empty in the past.



This lecture was also recorded and is available on YouTube here: <https://www.youtube.com/watch?v=B2tf7GIXBaA>



Friday 29th of July

This lecture was given by Stuart Wythe and titled 'Einstein's Gravity: Black Holes, Dark Matter and Gravitational Lensing'. Jamie Pole and myself attended this final session.

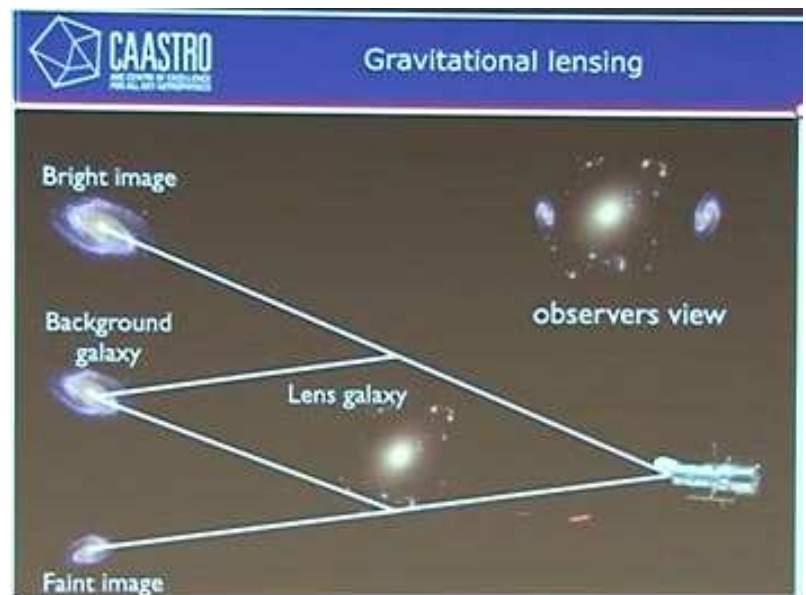
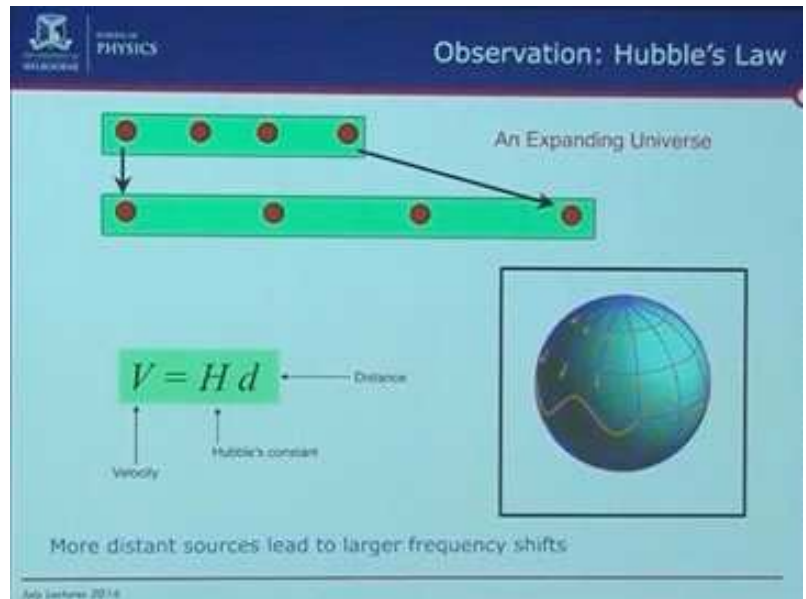
Stuart started by showing the realistic size of things from our planet, our solar systems, our galaxy, our local galaxy cluster and beyond and explained Hubble's Constant of the expanding universe.

It was then explained that Dark matter has mass, but does not interact except by gravity. We then can infer its existence only through its gravitational effects.

There is then a very good example and definition of gravitational lensing and how it is used to detect unseen matter and why it makes up most of the mass of clusters.

Stuart has a good example of how a black hole works with some good examples of shrinking the size of an object while keeping the same mass and calculating escape velocities. He also made a note that the mass of the black hole in the centre of a galaxy is predicted to be 1/1000 of the overall mass of the galaxy, hence the bigger the galaxy the bigger the black hole.

It is wrapped up by covering a bit more on the LIGO discovery, pulsars and how all this conforms to the theory of General relativity.



This lecture was also recorded and is available on YouTube here: <https://www.youtube.com/watch?v=xge8RE9ilRo>

Colour Codes from the Stars, Part 2 Visible Colours

Let us start with the fascinating magnet. We readily sense its field of influence, ‘magnetic field’; farther is weaker. This strong-weak is a measure of magnitude. Incredible inventions use moving magnets to make electricity (ie a generator), whilst changing electricity moves magnets (ie a motor). This association is ‘*electro-magnetic*’; one change causes the other. A fluctuating field is a ‘wave’. This doesn’t mean it’s jumping up and down in space; the strength just keeps changing strong-weak repeatedly.

As a different kind of waves to sound, water, string, or seismic, an electromagnetic (EM) wave is a changing electric field with its associated magnetic field. Its strength/magnitude fluctuates cyclically with time –eg 50 times per second or 50 Hz (Hertz) for household electricity.

Just like a hi-fi equipment display of sound ‘frequency’ components, from *Bass (low frequency) through to Treble (high frequency)*, EM waves are commonly shown in Hz, plotted 1 interval = 10 times higher:

10, 100, 1k, 10k, 100k, 1M, 10M, 100M, 1G, 10, 100G, 1T
(50 Hz, AM-FM radio, HF, VHF, microwave, infrared, red---violet, ultraviolet, x-ray, gamma ray,...)

‘Light’ is just a small part of this range. Some lights are not visible to humans: *ultra*-violet is of higher frequency than violet and *infra*-red is of lower frequency than red.

Along a path that the field strength/magnitude fluctuates, a measurement can be made from one point of maximum strength to the next. This is a measure of length, therefore ‘*wavelength*’, in Angstrom, nm, cm, etc. The same information above can be shown as wavelengths (higher frequency = shorter wavelength). See <http://imagine.gsfc.nasa.gov/science/toolbox/spectral1.html>

A dewdrop on a blade of grass, especially a *round* drop, shows with sparkling clarity all colours of the rainbow, ROYGBIV (VIBGYOR). If you cannot see bright violet and deep red, try a more peripheral angle.

The sunlight’s spectrum can tell us what happened at the sun about 8 minutes earlier, as light took that long to get here. The sun is a star. Another star’s light shows similar colours and can tell us what was going on there. Remember... what is seen of an object x light-years distance away happened x years ago.

Basic equipment

Just like a dewdrop that shows sunlight’s component colours, a prism can be used, or a (glass) *transmission* grating that is mounted with threads just like for a filter.

Examples are shown in Pictures 1a – 1d (*A mention does not necessarily imply endorsement. Please research*). Rainbow Optics (2 versions: a two-piece Visual/Photo/CCD and a one-piece Visual) has a cylindrical lens that stretches the thin-line star spectrum wider for visual viewing.



The two-piece Visual / Photo / CCD Star Spectroscope



The one-piece Visual Star Spectroscope

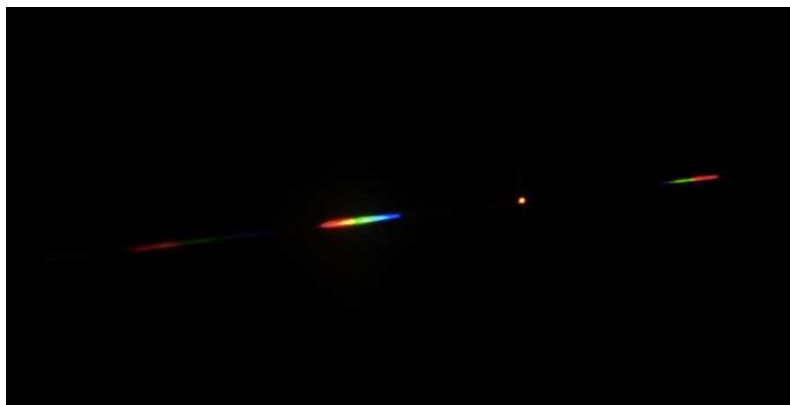


Pictures 1a-b. Two versions of the Rainbow Optics grating [Ref 1]

Pictures 1c-d. SA100 and SA200 gratings [Ref 2]. Local enquiry [Ref 3]

Observing an astronomical spectrum is as basic as general observing with a filter, with a camera or a telescope.

Sometimes we see double rainbows. Similarly, but by a different process, transmission gratings (see-through) and reflection gratings (angled arrays of mirror surface show a light source’s multiple-order spectra), Picture 2.



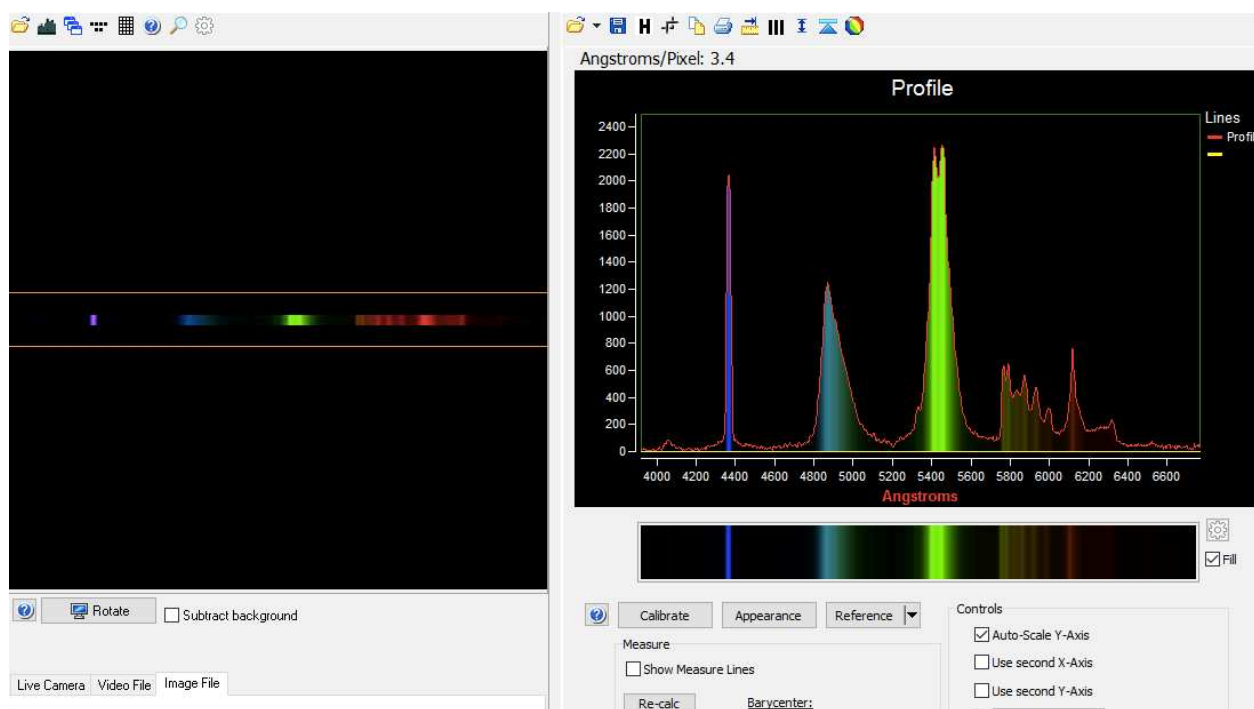
Picture 2. At the eyepiece, Betelgeuse, SA100, Credit: Malcolm Locke, NZ, with permission

A point-light star gives a (very) thin band of spectrum. Broader band are often seen displayed, because:

- If a cylindrical lens is used, it stretches the image broader (but fainter!), similarly to a lens ruler that magnifies a line of text.
- If without tracking, by setting the grating for the spectrum to lie perpendicular to the drift, imaging the star drift smears a narrow spectrum into a band.
- For imaging with tracking, the resultant bright narrow spectrum (repeatedly exposed at the sensor) can be regenerated by software to show a wide band.

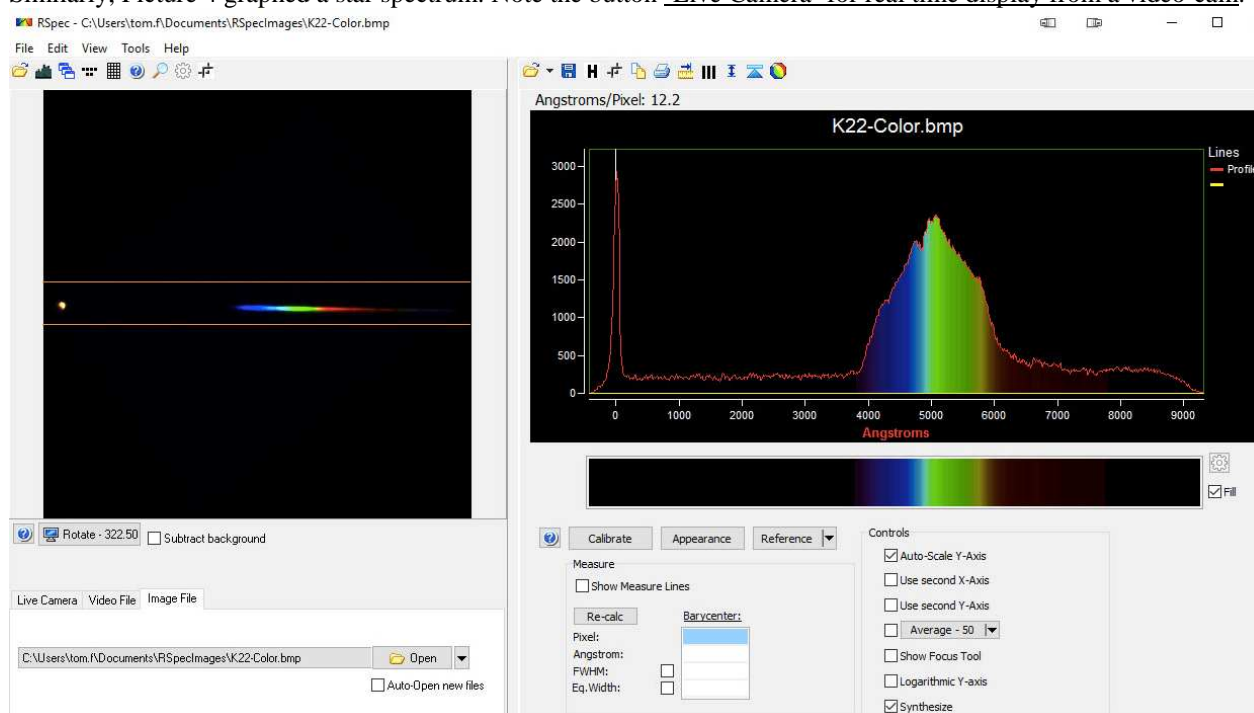
From image to graph Such an image can be further processed. Black-and-white imaging is generally preferred, to maximise resolution (colours can be later synthesised). There is freeware (VSpec, ISIS, BASS), and the low-cost RSpec with free-trial.

In Part 1 of this series, a plastic grating showed CFL lamps' spectra. A cropped image from the 'Warm' CFL is graphed using RSpec in Picture 3.



Picture 3. Illustrative only, display on RSpec by the author. CFL original by Mark Justice.

Similarly, Picture 4 graphed a star spectrum. Note the button 'Live Camera' for real time display from a video-cam.

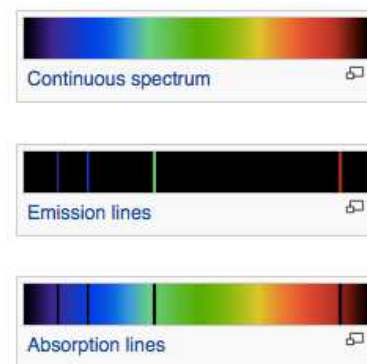


Picture 4. Vega spectrum using RSpec. Supplied by Tom Field [Ref 4]

A celestial object's spectrum may show:

a band of colours (continuum) from a hot solid object,
bright lines (emission), a hot gas emits light at specific wavelengths,
dark vertical lines (absorption), a cooler gas absorbs light at specific wavelengths,
broadening interpreted as a Doppler shift effect,
changes with time eg from binary stars, comets, novae.

See https://en.wikipedia.org/wiki/Astronomical_spectroscopy

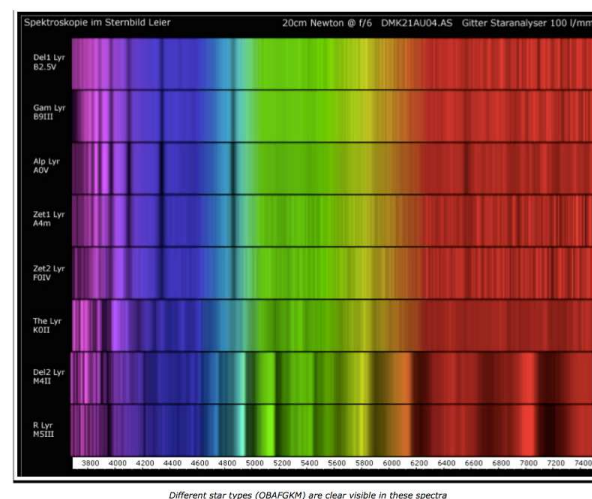
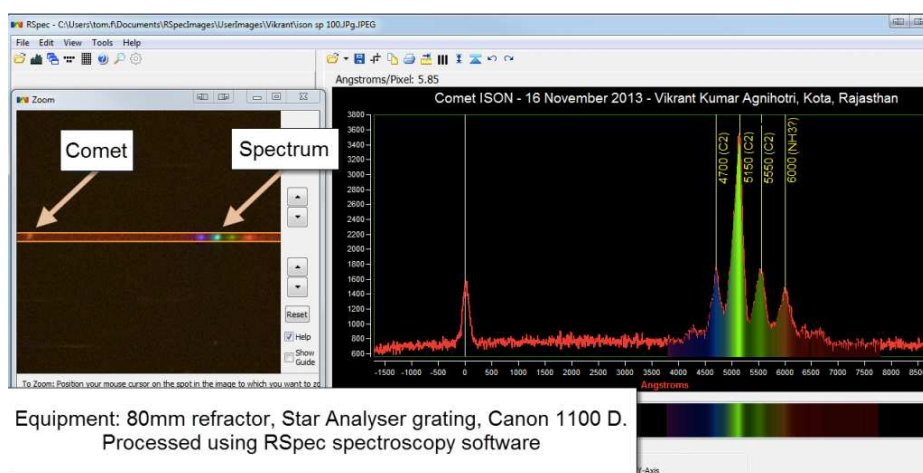


Pictures 5a-c Continuum, Emission, Absorption. Credit: Stkl Public Domain,
<https://commons.wikimedia.org/w/index.php?curid=42405328> (and -29 and -27)

Introductory Observing List. Stars are classified based on features of their spectra, examples in Picture 6. Special southern-sky objects are: *Gamma Velorum* 'Spectral Gem', *Theta Muscae*, *Eta Carinae*. See also <http://www.atlasoftheuniverse.com/stars.html> The Brightest Stars, Spectral Types.

Picture 6. Stellar classification examples. [Ref 5, details in original image] with permission

With proper calibration, analysis can yield much information. See Picture 7, and examples in [Ref 5]: Albireo, a nova, a Wolf Rayet star, carbon stars.



Picture 7 Comet ISON [Ref 5] with permission.

With a small outlay of a transmission grating and simple equipment, one can see all these vivid colours and explore scientific data.

Pro-Am Spectroscopist Malcolm Locke, NZ, relates:

- Amateur spectroscopy 'top heavy' globally. Need more Southerners!
- Opportunity for real scientific contribution.

References

[1] <http://www.starspectroscope.com/index.html> and <http://www.optcorp.com/manufacture/rainbow-optics-spectroscope>

[2] http://www.patonhawsley.co.uk/resources/Star_Analyser_100_Instructions_v1-6.pdf and

http://www.patonhawsley.co.uk/resources/STAR_ANALYSER_200_INSTRUCTIONS_v1-2.pdf

[3] <http://www.bintel.com.au/Accessories/Spectroscopy/154/catmenu.aspx>

[4] <http://www.rspec-astro.com/setupdownload/> currently with a workshop video

[5] www.rspec-astro.com/sample-projects

Resources

<https://youtu.be/Fv5fFSacVO8> How to capture star spectra in your backyard, 7.5 mins Tom Field, 2016

<https://www.youtube.com/watch?v=6IMJglnz2Uw> Different Types of Spectra, 5 mins, P E Robinson, 2013

<http://www.spectro-aras.com/forum/viewtopic.php?p=6816> Workshop 2016

A version of this has been submitted for newsletters of Astronomical Societies in Australia and New Zealand

by Sky C Murphy and Team at Southskyscience

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Dave Rolfe



Paul Albers



Peter Skilton



Jamie Pole



Trevor Hand



Peter Lowe



Fred Crump



Greg Walton

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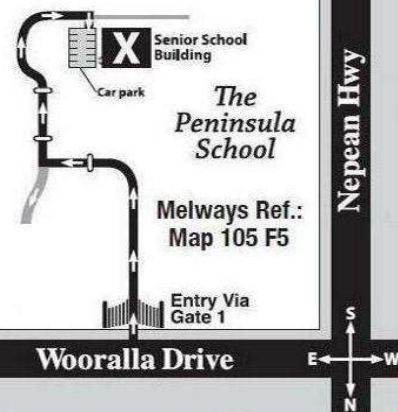
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SOCIETY MEETINGS

Meeting Venue: The Peninsula School,
 Wooralla Drive, Mt Eliza, (Melways ref. 105/F5)
 in the Senior School at 8pm
 on the third Wednesday of the month
 (except December).
 Entry is via the main gate, off Wooralla Drive.
 (See map).

For addition details:
Internet: www.mpas.asn.au
email: welcome@mpas.asn.au

Phone: 0419 253 252
Mail: PO Box 596, Frankston 3199, Victoria, Australia



Fiona Murray

The Society also has books & videos for loan from it's library, made available on most public & members nights at The Briars site, contact Fiona Murray.

LIBRARY

E-SCORPIUS NEWSGROUP

M.P.A.S. main line of communication is the online newsgroup called E-Scorpius. Here you will be kept up to date with the latest M.P.A.S. news & events information as well as being able to join in discussions & ask questions with other members.

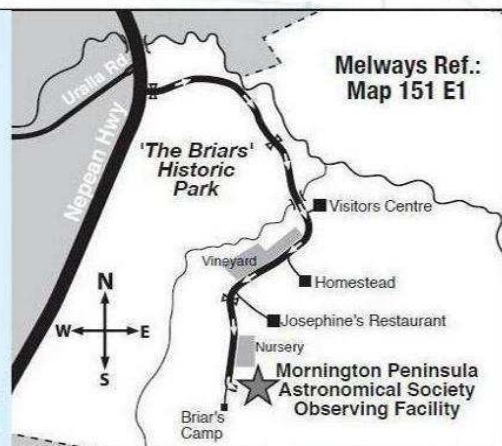
To join, to go: www.groups.yahoo.com/e-scorpius and sign up to Yahoo groups - you are required to sign up to Yahoo groups to join E-Scorpius. Once you have signed up at Yahoo groups, email welcome@mpas.asn.au say that you want to join E-Scorpius & you will be added to the E-Scorpius list.

VIEWING NIGHTS - MEMBERS ONLY

Any night, at The Briars, Nepean Hwy, Mt Martha, starting at dusk.
 Members visiting The Briars for the first time
 Must contact Greg Walton on 9776 2074 or 0415172503 if they need help getting to The Briars site. Upon arrived at the site, remember to sign the attendance book in the observatory building.

For addition details:
Internet: www.mpas.asn.au
email: welcome@mpas.asn.au

Phone: 0419 253 252
Mail: PO Box 596, Frankston 3199, Victoria, Australia



Members please write a story about your astronomy experiences and add some pictures.
 Send them to: Greg Walton gwpas@gmail.com

SCORPIUS The journal of the Mornington Peninsula Astronomical Society

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