# SCORPIUS

THE JOURNAL OF THE
MORNINGTON PENINSULA ASTRONOMICAL SOCIETY INC.

Volume XXIII, No 2 (March / April)

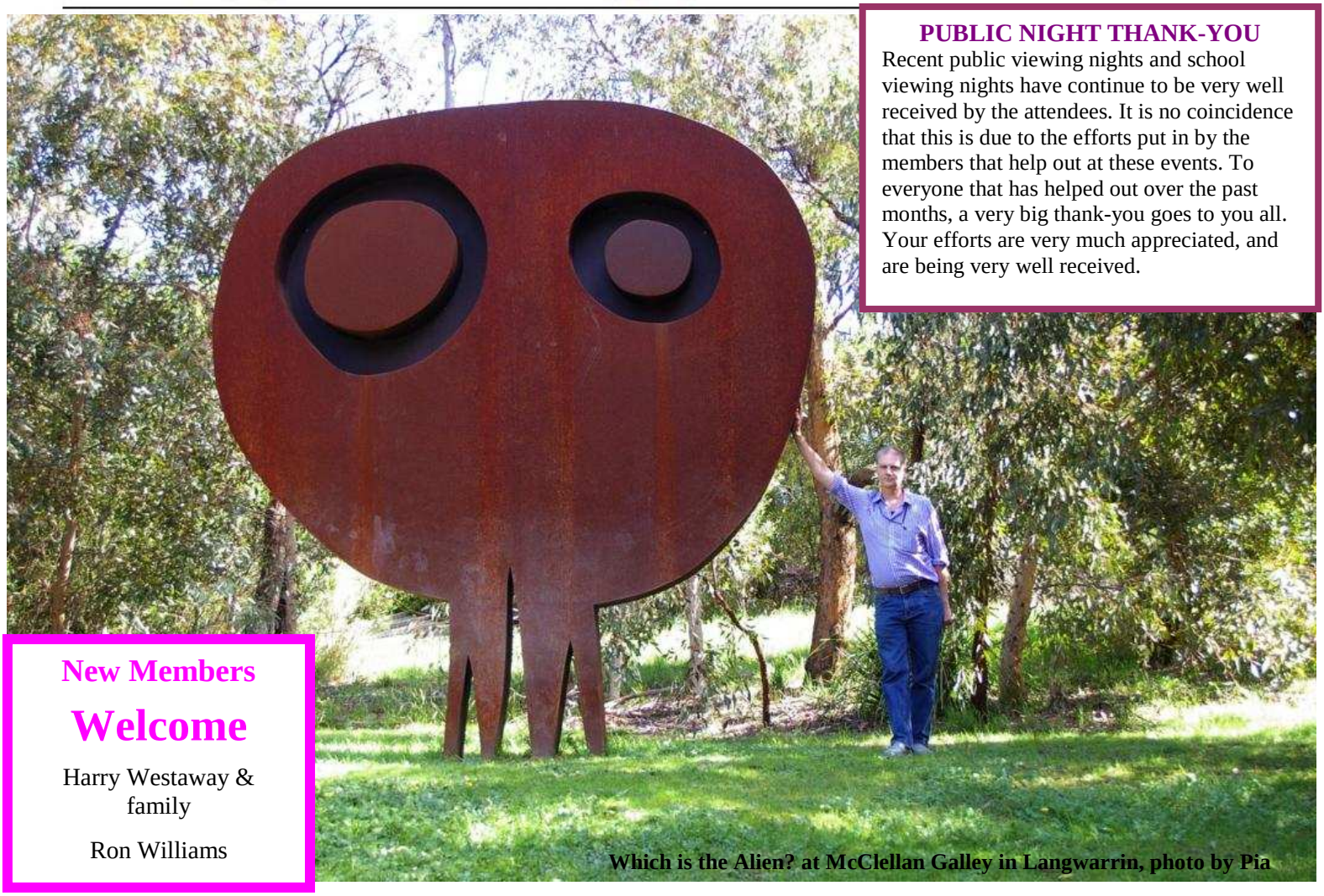
The Mornington Peninsula Astronomical Society (formerly the Astronomical Society of Frankston) was founded in 1969 with the aim of fostering the study and understanding of Astronomy by amateurs and promoting the hobby of amateur Astronomy to the general community at all levels.

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 services of its members for educational presentations and observing nights for schools and community groups.

Reg No: A268 ABN: 34569548751 ISSN: 1445-7032

## PUBLIC NIGHT THANK-YOU

Recent public viewing nights and school viewing nights have continue 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.



Which is the Alien? at McClellan Galley in Langwarrin, photo by Pia

## New Members

## Welcome

Harry Westaway & family

Ron Williams

**SCORPIUS The journal of the Mornington Peninsula Astronomical Society**

**Newsletter Disclaimer**

The Scorpius Newsletter is published online, once every two months for its membership, by the Mornington Peninsula Astronomical Society, for Educational Purposes Only. As a newsletter, this publication presents news spanning a spectrum of activities, reports, and publications in order to keep society members abreast of a variety of events and views pertaining to astronomy. While prudent, reasonable effort has been utilized to verify factual statements made by authors, inclusion in this newsletter does not constitute or imply official MPAS endorsement. 

# Society News

*By Greg Walton*

**January public nights** seen a good turn out of members of the public all 3 nights. Peter Lowe (president) did the talks while the clouds hampered the viewing. The public saw Jupiter and some deep sky objects. Thanks to all those members who helped with the telescopes.

**January Meeting** seen 24 members in attendance Peter Lowe (president) chaired the meeting. Peter Lowe also talked on the solar cycle and sun spot activity. Greg Walton did sky for the month and played time lapse video. Then Member chatted over coffee.

**January members BBQ** seen about 20 member. Thankyou Peter Lowe (President) for buying in all the food. Thanks Guys for help with the cooking and thanks Girls for setting up the food and the cleaning up after wards.

**Viewing Night at Camp Manyung for Muscular Dystrophy Group**, Wednesday January 22, 2014, 8:00 pm - 9:30 pm
It was an excellent night at Camp Manyung last night with the group of 70 from Muscular Dystrophy Australia.
We had dozens of electric wheelchairs (with inbuilt headlights) whirring around the oval looking through the assembled telescopes. Eyepieces were lowered or raised as necessary to match the particular chair height, though some chairs were able to adjust their own height instead. A really great turnout of members, with cloudless, clear, moon-free and surprisingly steady skies considering it was windy and quite cool. Views of Jupiter were remarkably good, with the Great Red Spot even visible in my 15cm Newtonian and all 4 moons on display. The Orion Nebula rode high in the sky. There were literally dozens of satellites seen during the evening and many sporadic meteors. We had scopes set up from Alex Cherney and his daughter, Dave Rolfe, David Stock, Phil Holt, Greg Walton and Peter Skilton. Inside with a meteorite talk were Clem Unger, Peter Lowe and Fiona Murray and Pearl. The carers present were also very impressed, with the last of them reluctantly leaving just before 11pm. It demonstrated clearly that a disability doesn't have to be an impediment to night sky viewing even with the standard telescope types we had present on the oval. Regards, *Peter Skilton*

**February public night** seen a good turn out of members of the public. Trevor Hand did the talks while the clouds hampered the viewing. The public saw Jupiter and some deep sky objects. Thanks to all those members who helped with the telescopes.

**February Meeting** seen 24 members in attendance Peter Lowe (president) chaired the meeting. Peter Lowe also talked on the different ways to power a space craft and robotic landers. Greg Walton did sky for the month and played time lapse video. Also play a John Dobson documentary. Then Member chatted over coffee.

**February 21st school viewing**. It was a good evening last night at McClelland College in Karingal, adjacent to Ballam Park. Inside with the 27 middle year pupils and teachers was Pearl, with Peter Lowe grappling with projector technology and new Apple Macs, before launching into the solar system talk. Clear skies gave way to quickly approaching cloud around 9:15pm, so everyone was hauled outside to the carpark to see Jupiter with it's 4 satellites readily apparent, and clear bandings with a white spot near the meridian of the northern one. The cloud cleared about half an hour later, enabling fairly steady views of Jupiter and the Orion Nebula even though it was only a few degrees away from a floodlight that couldn't be extinguished. The evening was quite mild and ended about 10:30pm after the last teachers left. In the field with telescopes were Fiona Murray (Schmidt Cassegrain and Newtonian), Sean Blake with freshly laser-collimated Newtonian telescope, Greg Walton (Dobsonian) and Peter Skilton (Newtonian). Some attendees were so keen they were wearing face-painted stars, and during the viewing Peter Lowe passed the meteorite around outside. Regards, *Peter Skilton*

**February members BBQ and astrophotography workshop** seen about 20 member and about 60 from 2 camera clubs.
Thanks to everyone who helped out yesterday for the astrophotography workshop. It was a great day and I got a lot of positive feedback during the BBQ. We had the Frankston Camera Club in the afternoon and the Dandenong Rotary Camera club a little later. The timing was prefect because the two clubs came together just as the food was being served and we all enjoyed a lovely sit down meal outside under the 100% cloudy skies. As usual also thanks to all our chefs and other helpers at the BBQ's. (I might add that Kevin and I managed to get sun burnt even under the clouds!!) Even the weather played ball and the skies cleared just as darkness fell. A special thanks to Greg and Alex who really made the day. Based on the verbal feedback the presentations have really stimulated some new thinking for photographic projects and I'm sure we'll get a few new members and public viewing night visitors out of this. Unfortunately my stamina faded later in the day and I couldn't stay into the evening but I'm sure there was lots of astro-clicking late into the night. Below is an email from Peter Carty of the Frankston Camera Club. Cheers *Peter Lowe*

Congratulations to your club on presenting such an enjoyable and educational day for the camera clubs. Greg and Alex's talks were first class and the eventual clearing of the cloud (which I believe you organized) was very timely. Please pass on our thanks to all of the astronomical people for their work in setting up, cooking up and clearing up. I'm sure you will be seeing more of many of the attendees again. Regards, Peter J C

**A word from the Scorpius editing team.**

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

Send them to:
Brett Bajada
Peter Lowe
Greg Walton
gwmpas@gmail.com

## 2013 SUBSCRIPTIONS

**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 2013 fees are still the same as last years prices.**
**So to assist the society in maintaining the facilities and service we provide, we appreciate your prompt payment for the 2013-year ahead.**
**As a reminder, the following structure of the fees are:**

## SOCIETY FEES

**$50 – Full Member**
**$45 – Pensioner Member**
**$65 – Family Membership**
**$60 – Family Pensioner Membership**

**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.**

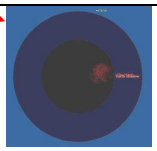
**Under the new government regulations, a list of financial member is required for insurance purposes, so please make certain your membership renewals are on time.**

# March / 2014

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 30 | 31<br>**New Moon** | | | | | 1<br>**New Moon**<br>**Messier star party** |
| 2 | 3 | 4 | 5 | 6 | 7<br>**Public Night 8pm** | 8<br>**First Quarter** |
| 9<br>Jupiter Moon all on the left | 10<br>Jupiter below the Moon | 11 | 12<br>ASV Meeting | 13<br>Jupiter 9:30pm Io shadow transit | 14 | 15 |
| 16 | 17<br>**Full Moon**<br>St Patrick's day | 18<br>Mars below the Moon | 19<br>Society Meeting 8pm | 20<br>Jupiter 10:00pm Io shadow transit | 21 | **Solar Day** 22<br>Members Night BBQ 6pm |
| 23<br>Jupiter Moon all on the left | 24<br>**Last Quarter** | 25 | 26<br>Committee Meeting 8pm | 27 | 28<br>Venus, Mercury & Moon in dawn sky | 29 |

**Monthly Events & High Lights.** **Watch out for Auroras** - 2 New Moons this month???? Yippee
**Public nights** 7th, 8pm start - **Society Meeting** at 8pm on 19th @ the Peninsula School
**Solar Day** 1am at the Briars 22nd also **Members Night BBQ** 6pm at the Briars 22nd
**Evening -** Jupiter 9:30pm Io shadow transit on the 13th also Jupiter 10:00pm Io shadow transit on the 20th
ASV Messier star party at LMDSS Heathcote on the 1st. Call me if you wish to attend, Greg 0415172503

# April / 2014

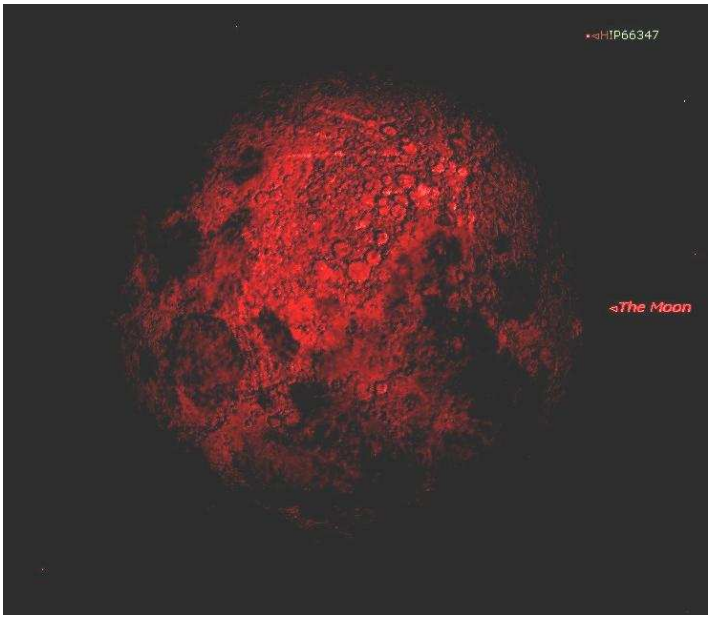
| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4<br>**Public Night 8pm** | **5** |
| **6**<br>Day Light savings ends | **7**<br>**First Quarter**<br>Jupiter below the Moon | **8** | **9**<br>ASV Meeting<br>Mars at opposition | **10** | **11** | **12** |
| **13** | **14**<br>Mars below the Moon | **15**<br>**Full Moon**<br>**Total Lunar eclipse at sunset** | **16**<br>Society Meeting 8pm Saturn moons in a line | **17**<br>Saturn 2 degrees above the Moon | **18**<br>Good Friday | **19**<br>Members Night BBQ 6pm<br>Easter Saturday |
| **20**<br>Easter Sunday | **21**<br>Easter Monday | 22<br>**Last Quarter** | 23<br>Committee Meeting 8pm | 24 | 25 | 26<br>Venus right of the Moon |
| 27 | 28 | 29<br>**New Moon**<br>**Partial solar eclipse** | 30 |  |  | |

**Monthly Events & High Lights.** - **Watch out for Auroras - Red Days** indicates School Holidays
**Public nights** 4th 8pm start - **Society Meeting** at 8pm on 16th @ the Peninsula School
**Members Night BBQ** 6pm at the Briars 19th - **Partial solar eclipse on the 29th at 5:07pm**
**Total Lunar eclipse at sunset on the 15th low on eastern horizon**
**Evening -** Saturn moons in a line on the 16th at 11pm - Saturn 2 degrees above the Moon on the 17th at 9pm
**Evening -** Mars at opposition on the 9th (closest point to Earth) **Dawn -** Venus right of the Moon on the 26th

**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 April we have 2 events

15th April - Total eclipse of the Moon
From the Briars in the evening as the moon rises just before 7pm in the east, the eclipse will already be in progress. As the sky darkens the Moon will look red, with Mars just off to the left.



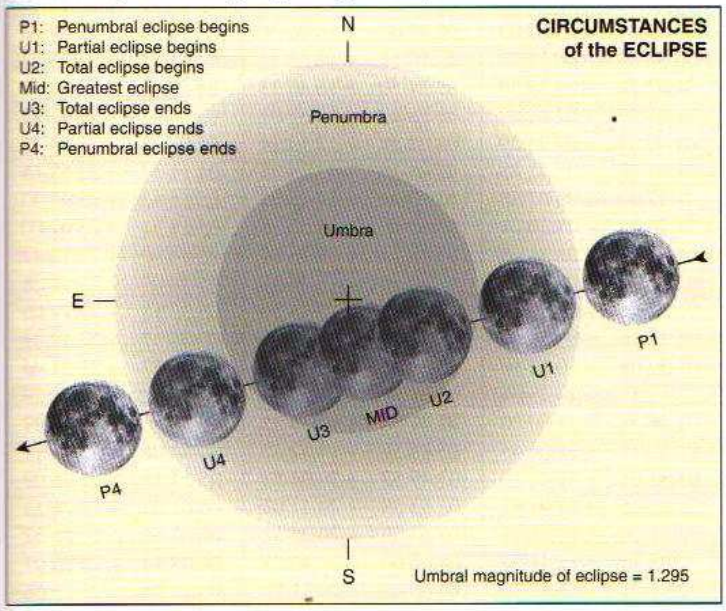

29th April - Partial solar eclipse.
Starts at just before 4pm.
From Oliver's Hill looking NW across the bay with maximum coverage at 5:07 pm and going below the horizon at 5:34pm

Warning - Please Note, you must not look at the sun. Unless you have the correct solar filter.

**Inserts from Astronomy 2014**

**15 April — Total eclipse of the Moon**

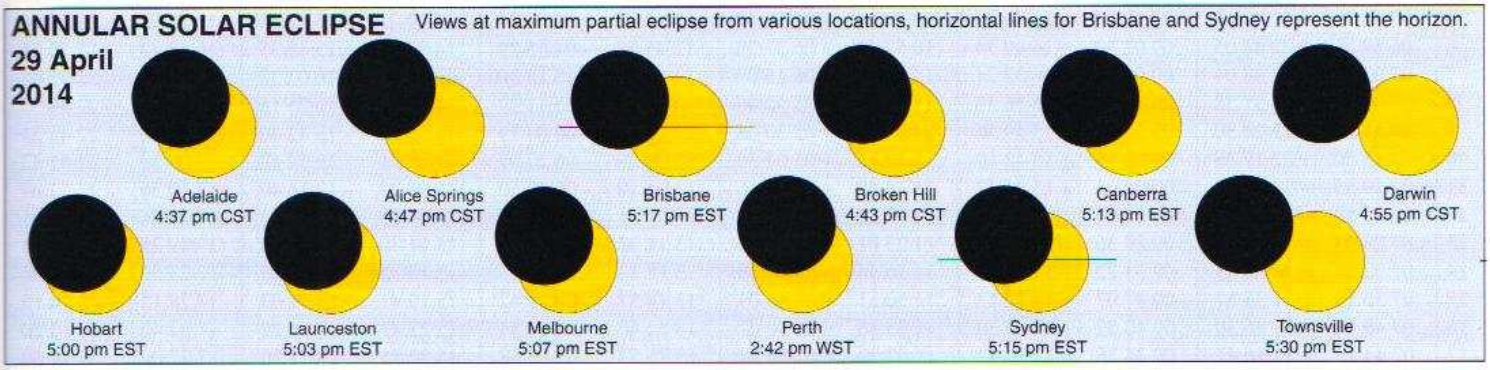
The first lunar eclipse of the year is total and visible in western Africa, western Europe, the Americas, eastern Asia and Australasia. Seen under less than favourable circumstances, this is the first total lunar eclipse for us since 2012. From eastern states of Australia mid-eclipse occurs around moonrise in the bright evening twilight sky, with totality ending just prior to the end of astronomical twilight. From central Australia totality is all but over by the time the sky is dark; observers will only see a small chunk out of the Moon's limb as it slips further into the Earth's penumbra. WA misses out entirely with the Moon leaving the umbra before it rises and departing the penumbra in twilight. The eastern view will be pleasant after the eclipse, with the Full Moon just below 1st magnitude star Spica with the brighter Mars (just past opposition) to the north.




| | UT | EST | WST |
|---|---|---|---|
| Penumbral eclipse begins (P1) | 04:52.0 | 2:52 pm | 12:52 pm |
| Partial eclipse begins (U1) | 05:58.0 | 3:58 pm | 1:58 pm |
| Total eclipse begins (U2) | 07:06.4 | 5:06 pm | 3:06 pm |
| Greatest eclipse | 07:45.7 | 5:46 pm | 3:46 pm |
| Total eclipse ends (U3) | 08:25.0 | 6:25 pm | 4:25 pm |
| Partial eclipse ends (U4) | 09:33.4 | 7:33 pm | 5:33 pm |
| Penumbral eclipse ends (P4) | 10:39.2 | 8:39 pm | 6:39 pm |

**ANNULAR SOLAR ECLIPSE**
**29 April 2014**

Views at maximum partial eclipse from various locations, horizontal lines for Brisbane and Sydney represent the horizon.



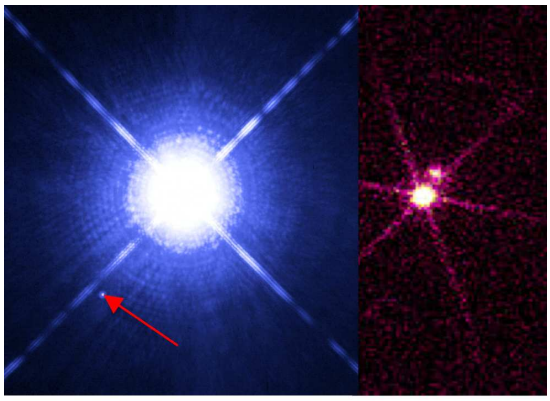

| LOCATION | TIME ZONE | ECLIPSE BEGINS | MAXIMUM ECLIPSE | ECLIPSE ENDS | SUN ALTITUDE | SUN AZIMUTH | ECLIPSE MAGNITUDE | ECLIPSE OBSURATION |
|---|---|---|---|---|---|---|---|---|
| Adelaide | CST | 03:25 pm | 04:37 pm | (set) | 10° | 296° | 0.61 | 0.51 |
| Alice Springs | CST | 03:44 pm | 04:47 pm | 05:44 pm | 17° | 295° | 0.38 | 0.26 |
| Brisbane | EST | 04:31 pm | 05:17 pm | (set) | 0° | 286° | 0.36 | 0.24 |
| Broken Hill | CST | 03:36 pm | 04:43 pm | (set) | 8° | 293° | 0.53 | 0.43 |
| Canberra | EST | 04:08 pm | 05:12 pm | (set) | 2° | 289° | 0.57 | 0.46 |
| Darwin | CST | 04:21 pm | 04:55 pm | 05:28 pm | 22° | 292° | 0.10 | 0.04 |
| Hobart | EST | 03:51 pm | 05:00 pm | (set) | 2° | 292° | 0.72 | 0.64 |
| Launceston | EST | 03:53 pm | 03:03 pm | (set) | 3° | 292° | 0.70 | 0.61 |
| Melbourne | EST | 03:58 pm | 05:07 pm | (set) | 5° | 292° | 0.64 | 0.55 |
| Perth | WST | 01:17 pm | 02:42 pm | 03:59 pm | 32° | 317° | 0.59 | 0.49 |
| Sydney | EST | 04:14 pm | 05:15 pm | (set) | 0° | 287° | 0.52 | 0.41 |
| Townsville | EST | 04:49 pm | 05:30 pm | (set) | 5° | 287° | 0.19 | 0.10 |

# Talking Astronomy White Dwarfs & Novae

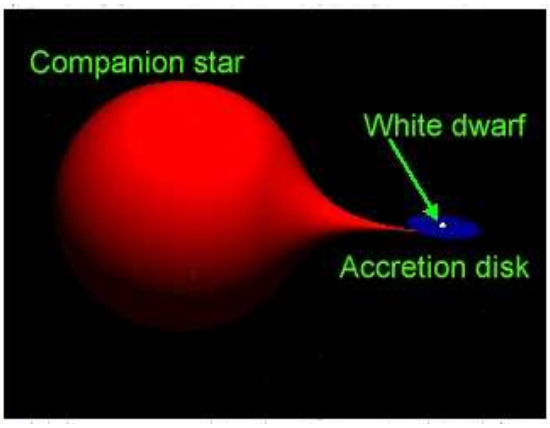
By Peter Lowe

Image by Alex Cheney

The terms nova and supernova are commonly confused almost as often as the terms astronomy and astrology. They're different but similar. On Dec 2nd last year a new star appeared near the pointers of the Southern Cross. Designated Nova Centaurus 2013, it quickly brightened to about 3rd magnitude, bright enough to be seen naked eye. Over the next year or so, it is expected to slowly fade below telescopic visibility. Novae and supernovae belong to a class of stars known as cataclysmic variables; a diverse group of stellar objects that exhibit sudden eruptions in brightness. Amongst the group are supernova, nova, dwarf nova, flare stars of various types, shell stars and some X-ray objects. Most of these eruptions are the result of explosions inside, on or near the surface of a star. A nova is caused by the runaway nuclear ignition of hydrogen that has accreted onto the surface of a dense star known as a white dwarf. Novae are believed to occur when the white dwarf is part of a binary system. If the two stars are close enough, material can be pulled from the companion star's surface onto the white dwarf.



Sirius B (arrowed) is faint in this Hubble picture (left) but is much brighter in X-rays




To understand these objects you need to understand white dwarf stars. White dwarfs were the enigma of the 19th century in much the same way that quasars and gamma ray bursters were the enigma of the 20th. White dwarfs play a role in astronomy that is all out of proportion to their tiny sizes. Our closest white dwarf is the companion to our current visually brightest star Sirius. By carefully measuring its position from 1834 to 1844 Friedrich Bessel found irregularities in its motion across the sky. He attributed this to the presence of an unseen companion, which despite numerous searches proved completely elusive. In 1862 the telescope maker Alvan Clark (the second) was testing the objective lens of a new refracting telescope and unexpectedly spotted the elusive companion, now know as Sirius B or the Pup. Sirius B proved to be some 10,000 times fainter than Sirius itself yet its colour indicated a surface temperature of about 30,000K. Pup's low luminosity and high surface temperature was a major problem because it suggested Sirius B had to be smaller than the Earth. Over the next 40 years the situation became even more bizarre when the orbital dynamics were determined and it showed the mass of Pup was slightly greater than that of the Sun. How do you pack that much mass into such a small volume? In the 1920's this was totally paradoxical and could not be explained by the physics of the day. It became known as the "Impossible Star". The physical structure of the white dwarf remained a mystery until the 1930's leading to a Nobel Prize for S. Chandrasekhar.

White dwarf stars mark the evolutionary endpoint of low to intermediate mass stars like our Sun. Nuclear fusion in the cores of these stars ceases once the helium has been converted to carbon and the contracting carbon core cannot reach a high enough temperature to ignite. Instead, it just contracts until it squeezes all of its electrons into the smallest possible space they can occupy. The core material becomes what is known as degenerate. The constitute core atoms are forced by the enormous pressures and temperatures into a soup of atomic nuclei randomly bouncing off each other like a high energy gas infused by an ocean of free electrons. Electrons cannot be forced together so they strongly repel each other. The resulting electron pressure arises due to quantum mechanical effects, and stops gravity from compressing the core any further. Thus the pressure of electrons rather than thermal pressure generated in its core supports a white dwarf.

Once the core has stopped contracting, the white dwarf has a temperature of over 100 million degrees Kelvin and shines through residual heat. Young white dwarfs typically illuminate the outer layers of the original star ejected during the red giant phase creating a planetary nebula. The continued radiation from the white dwarf, coupled with the lack of any internal energy source, means that the white dwarf begins to cool.

Eventually, after hundreds of billions of years, the white dwarf will cool to temperatures at which it is no longer visible and it will become a black dwarf. With such long timescales for cooling due mostly to their small surface area even the oldest white dwarfs still radiate at temperatures of a few thousand Kelvin, and black dwarfs remain hypothetical entities.

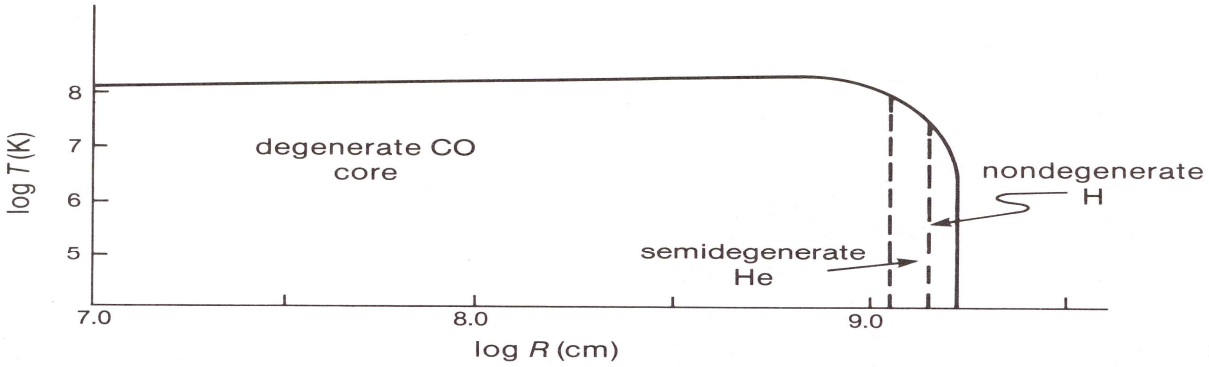



**Figure 17.19.** Structure of a 0.75 $M_\odot$ hot white dwarf accreting H from its companion, showing a H-burning shell (outer dashed ), and a semidegenerate He layer beneath it. The core is degenerate, containing C and O. Note the gradual increase in $T$ with increasing radius in the CO core.

The temperature gradient across a white dwarf shows the core is essentially at a constant temperature of 100 million degrees. At the surface there is a layer of non-degenerate hydrogen & helium. The star's cooling is determined by the conditions on the surface. Near the star's surface the pressure is low enough that electrons are no longer degenerate leaving an approximately 30km thick layer of non-degenerate matter. Depending on the past evolution of the star this layer contains hydrogen, helium and may also contain carbon, oxygen and other more complex nuclei. Very large thermal gradients occur across this thin layer where the temperature drops precipitously from 100 million degrees at the outer edge of the core to around 10,000K at the surface. This layer acts as an insulating blanket limiting the rate at which energy can radiated into space. The surface gravity of a white dwarf is enormous, roughly 200,000g. This intense gravity draws the surface into a layered arrangement of material much like the skin layers of an onion. Light atoms such as hydrogen float to the surface while the heavy constituents helium, carbon and oxygen sink to the lower layers. Being non-degenerate material this surface layer is highly convective. At the core interface atomic nuclei diffuse from the lower surface layer into the degenerate core. If the white dwarf is a part of a contact binary, hydrogen is streaming from the red giant onto the white dwarf's surface layer via an accretion disc. This surface layer is an ideal place for fusion reactions. Hydrogen slowly fuses into helium at the hydrogen/helium boundary interface and helium slowly fuses at the carbon/oxygen boundary. So we have a series of processes, material is streaming from the companion star into an accretion disc around the white dwarf and then transfers from the accretion disc onto the white dwarf surface. Once on the surface the hydrogen slowly fuses into helium which sinks to the bottom of the surface layer and then diffuses into the white dwarf core. The white dwarfs total mass of course is slowly rising.

The composition of the surface layer varies depending upon how fast material streams from the companion star, how fast material falls from the accretion disc onto the surface and how fast material can diffuse into the degenerate core. We can see there are many variable at play in all of this. For instance the evolution of the companion star can change the rate of supply of fresh hydrogen, the accretion disc is somewhat turbulent and can dump material onto the white dwarf surface. Normally these material flows are in rough balance but like a flash flood a sudden dump of hydrogen onto the surface can lead to a catastrophic fusion reaction at the hydrogen/helium interface. The resulting explosion blows the surface layer into space and we see this explosion as a nova. The explosion steadily expands into space before the original flow of material from the companion re-establishes itself. The explosion does not disrupt the white dwarf or affect the binary system and the whole process can repeat itself. Repeated novas are called recurrent. Recurrent novas can occur over decades as with the 2013 T-Pyxidis nova which has been observed over six outbursts. You never know Nova Centauri 2013 may rise again.

Astronomically, novae provide an opportunity to directly view a star's core. We can never directly see the Sun's core however in a nova the core is briefly exposed to space and observation. While Nova Centauri 2013 has now faded below naked eye visibility take the opportunity to bring out the binoculars and look directly into the core of a star.

# Astro Class

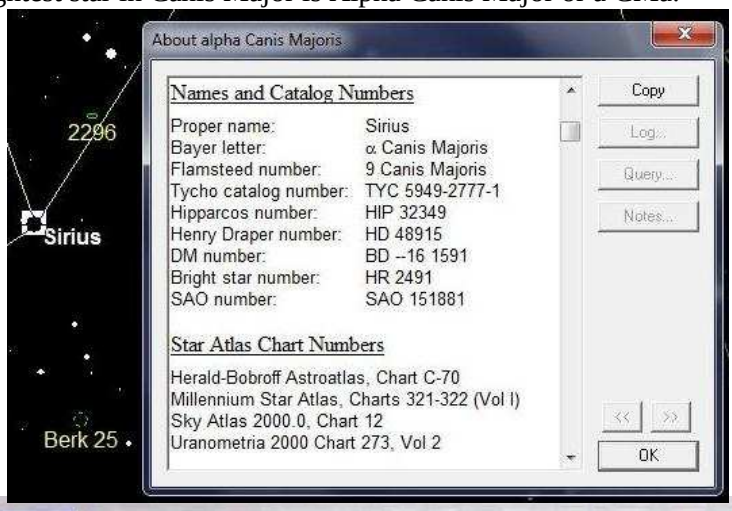
By Greg Walton

## How stars got there names.

The popular names of the brightest stars we use today, have there origins from the Arabic and Greek astronomers from as far back as 2,000 year ago, long before the invention of the telescope, then man could only see about 6,5000 naked eye stars in the entire sky. e.g. Canopus, Sirius & Achernar. Tycho Brahe born in Denmark (1546-1601) was the first astronomy to produce accurate charts of the position of the popular names stars without the aid of a telescope. John Bayer a Bavarian lawyer (1572-1605) published in 1603 a star atlas the Uranometria, which used the now known Bayer Lettering system, which uses the Greek alphabet and constellation as a stars name, which is still used today. How this works is the brightest star in a constellation is given the name Alpha then add the name of the constellation, for example Acrux is Alpha Crux the brightest star in southern cross, Mimosa is Beta Crux the second brightest star in the south cross and Gacrux is Gamma Crux the third brightest star in the south cross and so on working down in order on the Greek alphabet. The star Sirius the brightest star in Canis Major is Alpha Canis Major or a CMa.

Galileo Galilei (1564-1642) the age of the telescope meant there were more stars to catalogue.

John Flamsteed (1646-1719) the first Astronomer Royal used the telescope to accurately measure the position of about 2,800 stars. The Flamsteed numbers system allocated a number to the stars in each constellation, for example Sirius is 9 Canis Majoris. Nowadays there are more than a dozen star catalogue's, you can see some here listed in the Sky map Software. Centre image




| | |
|---|---|
| α | Alpha |
| β | Beta |
| γ | Gamma |
| δ | Delta |
| ε | Epsilon |
| ζ | Zeta |
| η | Eta |
| θ | Theta |
| ι | Iota |
| κ | Kappa |
| λ | Lambda |
| μ | Mu |
| ν | Nu |
| ξ | Xi |
| ο | Omicron |
| π | Pi |
| ρ | Rho |
| σ | Sigma |
| τ | Tau |
| υ | Upsilon |
| φ | Phi |
| χ | Chi |
| ψ | Psi |
| ω | Omega |

## THE BRIGHTEST STARS

From Astronomy 2014 AUSTRALIA

| | Designation | Name | Constellation | RA (2000.0) | Dec (2000.0) | Magnitude App | Magnitude Abs | Spectral Type | Parallax | Distance pc | Distance ly | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | α CMa | Sirius | Canis Major | 06 45.1 | –16 43 | –1.44 | 1.5 | A1 V | 0.3800 | 2.63 | 8.58 | d |
| 2 | α Car | Canopus | Carina | 06 23.9 | –52 42 | –0.74 | –5.6 | F0 Ib | 0.0104 | 96 | 310 | |
| 3 | α Cen | Rigil Kent | Centaurus | 14 39.6 | –60 50 | –0.28 | 4.1 | G2V + K0V | 0.7472 | 1.34 | 4.37 | d |
| 4 | α Boo | Arcturus | Bootes | 14 15.7 | +19 11 | –0.05 | –0.3 | K2 III | 0.0889 | 11.3 | 36.7 | |
| 5 | α Lyr | Vega | Lyra | 18 36.9 | +38 47 | 0.03 | 0.6 | A0 V | 0.1289 | 7.76 | 25.3 | v |
| 6 | α Aur | Capella | Auriga | 05 16.7 | +46 00 | 0.08 | –0.5 | G8III + G0III | 0.0773 | 12.9 | 42.2 | sb, v |
| 7 | β Ori | Rigel | Orion | 05 14.5 | –08 12 | 0.15 | –6.8 | B8 Ia | 0.0042 | 240 | 780 | d, v |
| 8 | α CMi | Procyon | Canis Minor | 07 39.3 | +05 14 | 0.38 | 2.7 | F5 IV–V | 0.2861 | 3.50 | 11.4 | d |
| 9 | α Eri | Achernar | Eridanus | 01 37.7 | –57 14 | 0.45 | –2.8 | B5 IV | 0.0227 | 44.1 | 144 | v |
| 10 | α Ori | Betelgeuse | Orion | 05 55.2 | +07 24 | 0.50 | –5.2 | M2 Iab | 0.0076 | 131 | 430 | v |
| 11 | β Cen | Hadar | Centaurus | 14 03.8 | –60 22 | 0.61 | –5.4 | B1 II + B | 0.0062 | 161 | 525 | d, v |
| 12 | α Cru | Acrux | Crux | 12 26.6 | –63 06 | 0.74 | –4.2 | B0.5IV + B0.5V | 0.0102 | 98 | 320 | d |
| 13 | α Aql | Altair | Aquila | 19 50.8 | +08 52 | 0.76 | 2.2 | A7 IV–V | 0.1950 | 5.13 | 16.7 | |
| 14 | α Tau | Aldebaran | Taurus | 04 35.9 | +16 31 | 0.87 | –0.6 | K5 III | 0.0501 | 20.0 | 65 | v |
| 15 | α Sco | Antares | Scorpius | 16 29.4 | –26 26 | 0.96 | –5.1 | M1.5Iab + B4V | 0.0067 | 150 | 490 | d, v |
| 16 | α Vir | Spica | Virgo | 13 25.2 | –11 10 | 0.98 | –3.5 | B1III–IV + B2V | 0.0124 | 80 | 262 | sb, v |
| 17 | β Gem | Pollux | Gemini | 07 45.3 | +28 02 | 1.15 | 1.1 | K0 III | 0.0967 | 10.3 | 33.7 | |
| 18 | α PsA | Fomalhaut | Piscis Austrinus | 22 57.7 | –29 37 | 1.16 | 1.7 | A3 V | 0.1301 | 7.69 | 25.1 | |
| 19 | α Cyg | Deneb | Cygnus | 20 41.4 | +45 17 | 1.25 | –7.2 | A2 Ia | 0.0020 | 500 | 1600 | v |
| 20 | β Cru | Mimosa | Crux | 12 47.7 | –59 41 | 1.26 | –3.9 | B0.5 III | 0.0093 | 108 | 353 | v |
| 21 | α Leo | Regulus | Leo | 10 08.4 | +11 58 | 1.36 | –0.5 | B7 V | 0.0421 | 23.8 | 78 | d |
| 22 | ε CMa | Adhara | Canis Major | 06 58.6 | –28 58 | 1.50 | –4.1 | B2 II | 0.0076 | 132 | 430 | d |
| 23 | α Gem | Castor | Gemini | 07 34.6 | +31 53 | 1.58 | 0.6 | A1V + Am | 0.0633 | 15.8 | 52 | d, sb |
| 24 | λ Sco | Shaula | Scorpius | 17 33.6 | –37 06 | 1.62 | –5.0 | B1.5 III | 0.0046 | 215 | 700 | sb, v |
| 25 | γ Cru | Gacrux | Crux | 12 31.2 | –57 07 | 1.63 | –0.5 | M3 III | 0.0371 | 27.0 | 88 | v |
| 26 | γ Ori | Bellatrix | Orion | 05 25.1 | +06 21 | 1.64 | –2.7 | B2 III | 0.0134 | 75 | 243 | |
| 27 | β Tau | El Nath | Taurus | 05 26.3 | +28 36 | 1.65 | –1.4 | B7 III | 0.0249 | 40.2 | 131 | |
| 28 | β Car | Miaplacidus | Carina | 09 13.2 | –69 43 | 1.67 | –1.0 | A0 III | 0.0293 | 34.1 | 111 | |
| 29 | ε Ori | Alnilam | Orion | 05 36.2 | –01 12 | 1.69 | –6.4 | B0 Ia | 0.0024 | 410 | 1340 | |
| 30 | γ Vel | Regor | Vela | 08 09.5 | –47 20 | 1.70 | –5.4 | O9Ib + WC8 | 0.0039 | 258 | 840 | sb, v |

# Pentax K30, *by Greg Walton*

My 4 year old Pentax Kx is getting a bit dated, so it was time for an upgrade. So I purchased the Pentax K30 which can be bought for around $650, as a new model is on its way the K50. The K30 has had a major upgrade from its predecessor the Kr, its more complex with fetchers you would find on a more professional camera. Like more rubber seals for better weather proofing, 16 megapixels sensor, up to 25600iso, cable release port, built in interval timer up to 999 shoots, electronic level, 2 user settings on the mode dial which you can program, 2 e-dials instead of one on the Kx & Kr when in manual mode the front e-dial changes the exposure time & the back e-dial changes the F ratio, also has a C (continuous focus) setting as well as the usual MF (manual focus) & AF.S (auto focus single) switch, at last the B (bulb setting) has been move back to the mode dial like on the Pentax ist which will be of great use for astrophotographer's, the built in pop up flash is about 20mm higher than the Kx or Kr to help stop a shadow being cast when using a bigger lens, the K30 is about 25% heaver than the Kx or Kr, the rear screen on the K30 & Kr is 15% larger than the Kx, the K30 & Kr have Night Scene HDR which generates a single image from 3 images, K30 also has Astro tracker the same as the Pentax K5 which uses the moving sensor to track the stars with the aid of a GPS unit available from Pentax which attaches to the cameras hot shoe.



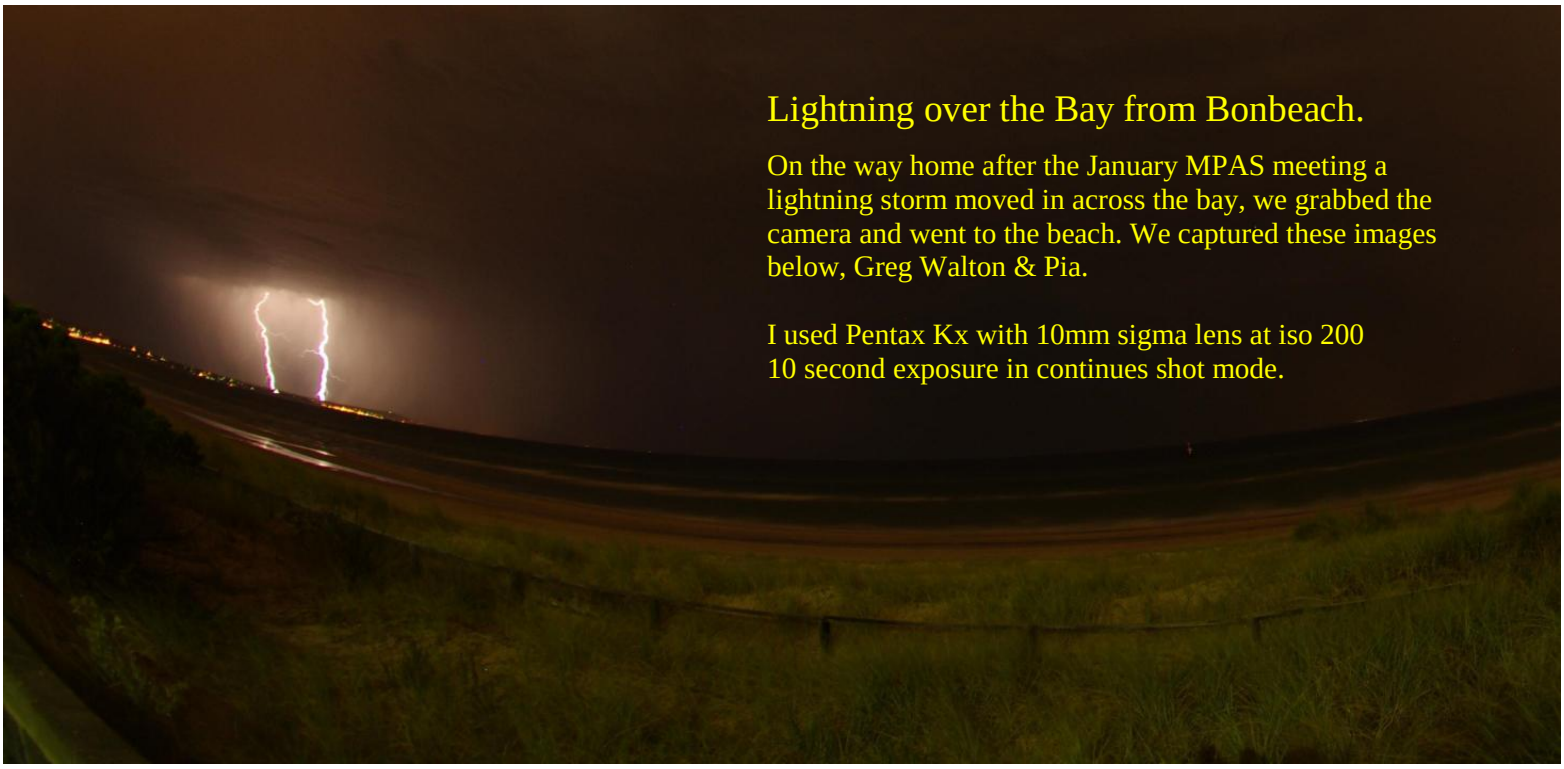
The K30 uses the same 240v power supply and AA battery adaptor as the Kr (neither are included with the camera), which is very useful if you wish to use AA batteries for those time were you have no 240v power and wish to run the camera all night in very cool conditions, I have found one set of disposable lithium batteries will keep the camera going all night. Bunning's sell a packet of 4xAA Varta disposable lithium's for $10, which I have used with no problem. The energizer disposable lithium's are slightly better but cost $20. The Kr & K30 come with the same match box size rechargeable battery and 240v changer, but this battery will only have enough power for about 3 hours continues use, which I have found to be very reliable even after many rechargers. For all night time lapse work & lengthy videos, you will need a 16 gig Ultra High speed SD card.

Down sides are the position of the buttons have move around and in the night it's a bit confusing jumping between the Kx, Kr & K30 cameras, also in live view you can only zoom in 6 times were as the Kr & Kx had 10 times zoom which is better for focusing on star when using the camera for astrophotography, also unfortunately the Pentax K30's built in interval timer is limited to 999 shoots, which is annoying if you want to make a time lapse for an extended time, but by using my programmable cable release, I can shot until the SD card is full. Interval timer does not work in B mode. Hopefully Pentax will fix this in the K50.

I can see it would be very daunting for a newcomer to learn all the feature on the K30. I still find out new things about the K30 & Kr all the time, the 290 page paper back size operating manual that comes with the camera is excellent, but has to much information to take in all at once, so I try to understanding one page each day and then go back over want I have already learn from time to time. Luckily the Pentax on screen menu has not changed radically as each new model is released, so what you learn can be carried forward as you upgrade.

I talked to Pentax at the camera show and they said the K50 will be the same specifications as the K30, the only changes are the appearance and a software upgrade also it will have better power management for longer battery life, the K50 cost is about $850.00au


Front e-dial



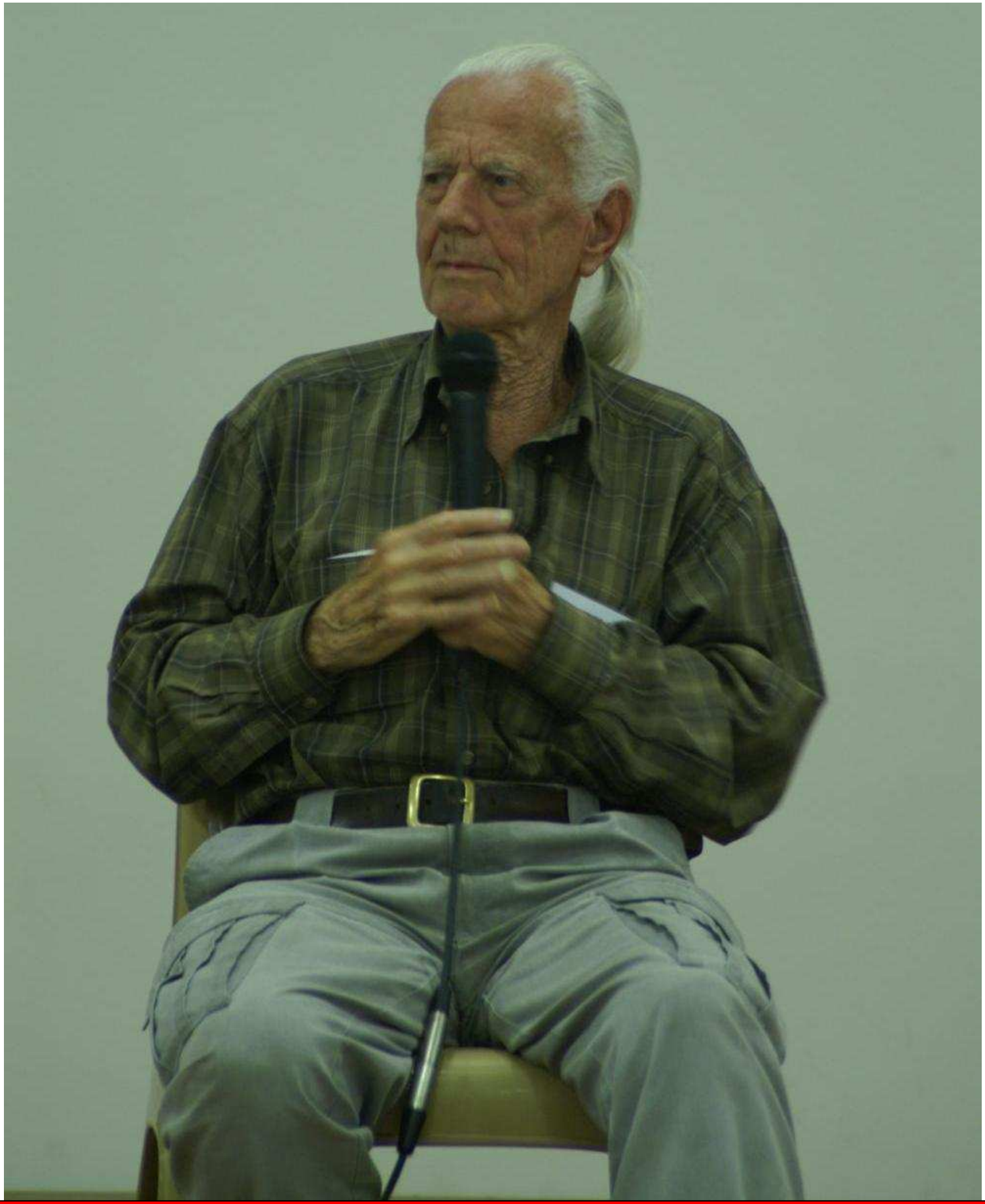
## Lightning over the Bay from Bonbeach.

On the way home after the January MPAS meeting a lightning storm moved in across the bay, we grabbed the camera and went to the beach. We captured these images below, Greg Walton & Pia.

I used Pentax Kx with 10mm sigma lens at iso 200
10 second exposure in continues shot mode.

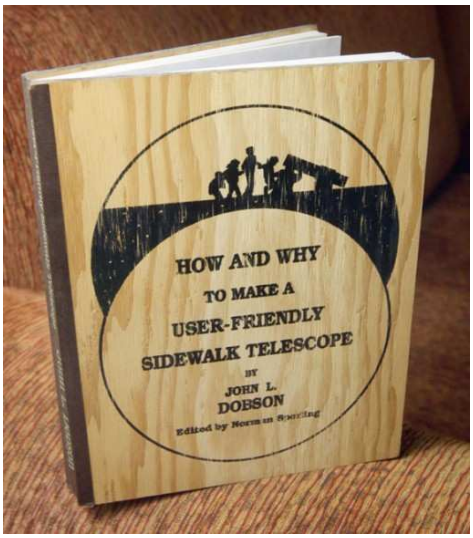
# The pasting of John Dobson aged 98, 14 September 1915 - 15 January 2014, *By Greg Walton*

I was very happy to have meet John Dobson at Heathcote in 2005 at Vastroc hosted by the ASV. I think of him as more of a story teller than an amateur astronomy and telescope builder. Most know him as the inventor of the Dobsonian telescope, which is a Newton telescope setup in a card board tube on a simple plywood box mount. But John Dobson said he only built and popularized the type of telescope that bears his name. John Dobson was also the co-founder of the amateur astronomical group, the San Francisco Sidewalk Astronomers, who set up there telescopes on city streets, then coaxed people to look through there telescopes and usually providing a story about what ever they were looking at. Pretty much like what we do at the Briars on a public night. Photo below from Vastroc 2005



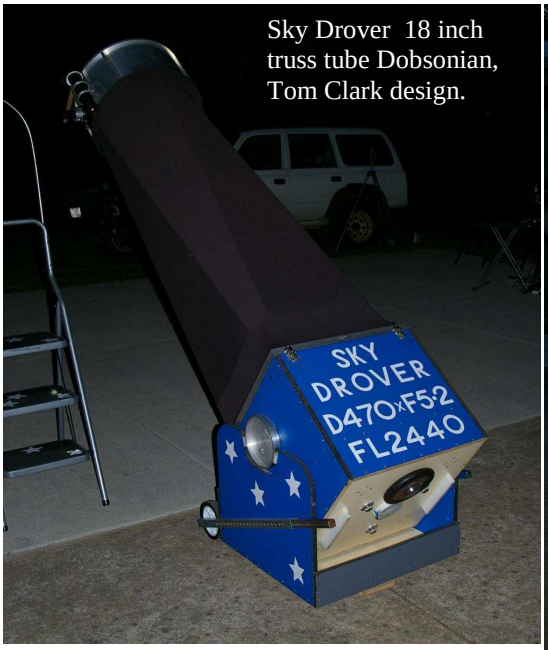
For many years John Dobson lived in a monastery as a Vedantan monk (1944 to 1967) grinding his mirror under water so as not to make many noise and scrounging what ever he could find to make his telescopes out of. The glass for the mirrors were from discarded port hole windows which came from a local ship yard. Eventually he was asked to leave the monastery because he was found to be on the out side of the wall too many times and also talking to people walking passed the monastery. He said, I was doing some weeding, with a telescope by his side. But being a monk and an amateur astronomy were starting to conflict. Also because of his religious connection, he end up on the TV series Compass, were he talked about his life time experiences. One such story was, when he was asked to go on the TV and show how he builds his telescopes, he said OK. That night he was out on the street in front of his house with his telescope, when a young teenage girl asked what he was doing. John show her what he was looking at with his telescope and asked her if she would come on the TV with him, to show how he builds his telescopes. The young teenage girl said yes I can do that, which she did. On the way back from the TV studio the young teenage girl said, I always wounded what you were doing with that telescope each night, I thought you were a dirty old man, now you are my favourite dirty old man.

So John Dobson spent the later years of his life, travelling the world talking about his life and astronomy. Even writing a book, see below.

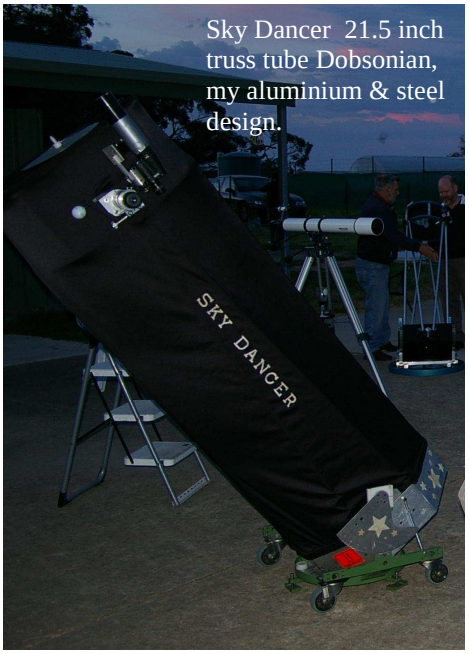



When listening to John Dobson you soon realized he know a lot about all aspects of astronomy, which got him into a lot of heated discussions. Most of the time he won over the audience.

He certainly inspired a lot of people into building a telescope. I being one of them, who has now built 3 Dobsonian's and repaired and restored countless others. See below



Sky Drover 18 inch truss tube Dobsonian, Tom Clark design.



Sky Dancer 21.5 inch truss tube Dobsonian, my aluminium & steel design.


Sky Transformer 12 inch brief case Dobsonian, the whole telescope fits into one case with Argo Navis.

# How close am I getting to producing Hubble quality images? *By Greg Walton*

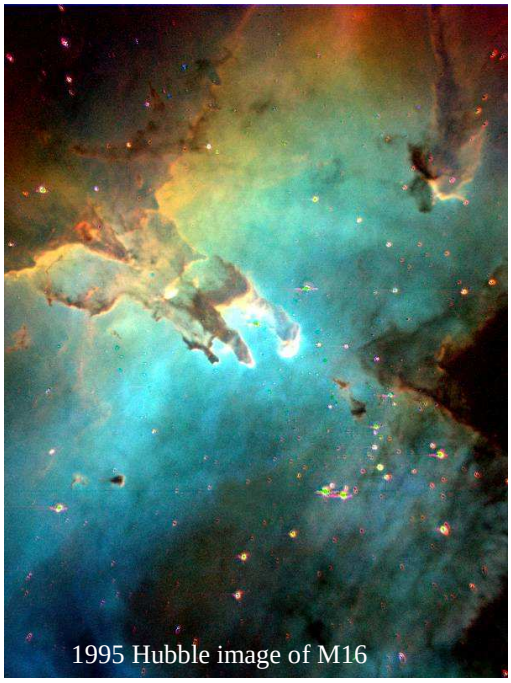

I still have away to go when I compare the Hubble image of NGC7293 at right with my image left.

My equipment cost $5,000

Hubble cost about $5,000,000,000 to date.

Is the Hubble image 1,000,000 times better?


Hubble image of NGC7293

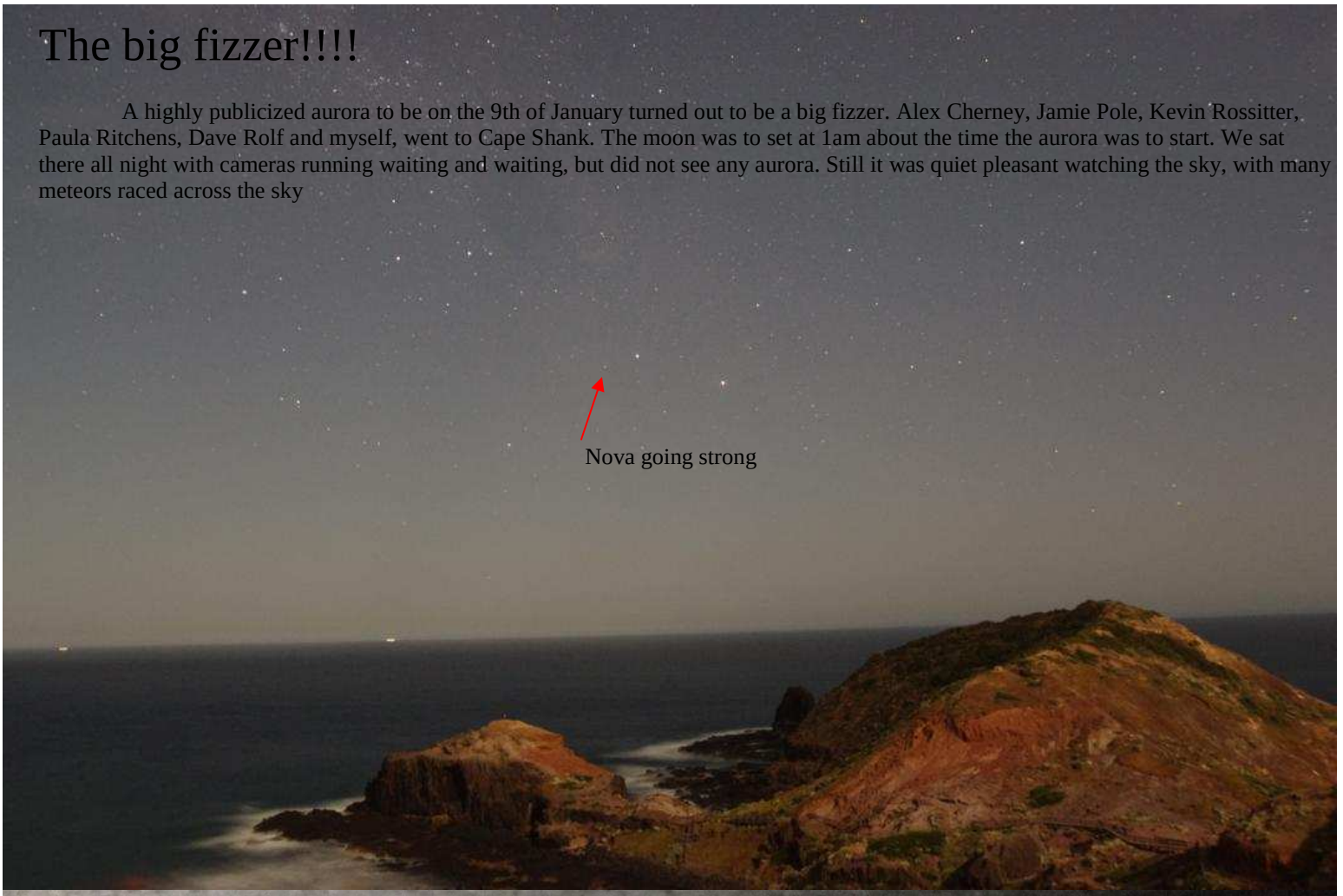


1995 Hubble image of M16


Left M8 imaged with my 12" Newton
I high lighted the same part of the sky in the Hubble image

Below Hubble Image from Sky & Telescope

# The big fizzer!!!!

A highly publicized aurora to be on the 9th of January turned out to be a big fizzer. Alex Cherney, Jamie Pole, Kevin Rossitter, Paula Ritchens, Dave Rolf and myself, went to Cape Shank. The moon was to set at 1am about the time the aurora was to start. We sat there all night with cameras running waiting and waiting, but did not see any aurora. Still it was quiet pleasant watching the sky, with many meteors raced across the sky



Nova going strong

The excitement of not seeing an aurora was all to much for Big Dave.

Thanks Paula for sending in this great image.

# The truth behind the expanding universe

**by Carl Joseph**

We've all seen the incredible photographs from the Hubble Space Telescope. Edwin Hubble himself was a highly regarded astronomer in his day. He was responsible for resolving one of the Great Debates of astronomy – is everything a part of our own Galaxy, or are the other spiral nebulae we observe "Island Universes" of their own?

Hubble is also recognised as being the person who discovered the expansion of the Universe. Our Universe is growing, and the further away you look, the faster it is expanding. This concept is referred to as the Hubble Law, and the speed at which galaxies are moving away from us is called the Hubble Constant. Except, it wasn't Hubble at all who first discovered this. What if, history was played back, and we now had the Lemâitre telescope, instead of the Hubble telescope? Perhaps the Lemâitre-Hubble would be more appropriate?

The discovery of the expanding universe is a topic which has fascinated me for some time. It's a story of conspiracy, editorial interference, rivalries, and murder. Well okay, not so much the murder. So who is this Lemâitre guy and why should he get the credit?

## The sequence of events

At the time of Hubble's 1929 paper, very few people knew of a non-static solution to Einstein's field equations, i.e. solutions which told us that the universe is changing in size.

- The earliest was Alexander Friedman who had already passed away in 1925. Friedman mathematically showed that Einstein's solution was unstable, and that they behaved much like a giant explosion.
- Georges Lemâitre was unaware of Friedman's work; however he was the first to combine the mathematical solutions of the field equations to observations of galaxy redshifts. He discovered a *linear-velocity distance relation.* This is the relation which shows that the further away an object is, the faster it is moving away from us. In 1927, he published his findings in French in the obscure Belgian journal *Annales de la Société Scientifique de Bruxelles*.
- Two years later, we see Hubble publish his own paper on the same relation.

Looking simply at the timeline, it would be easy to argue the Lemâitre discovered the expanding Universe, was the first to derive the expansion-coefficient and should be credited as such. Hubble and Humason should then be credited with helping to confirm the discovery in 1931 with more accurate observations and measurements.

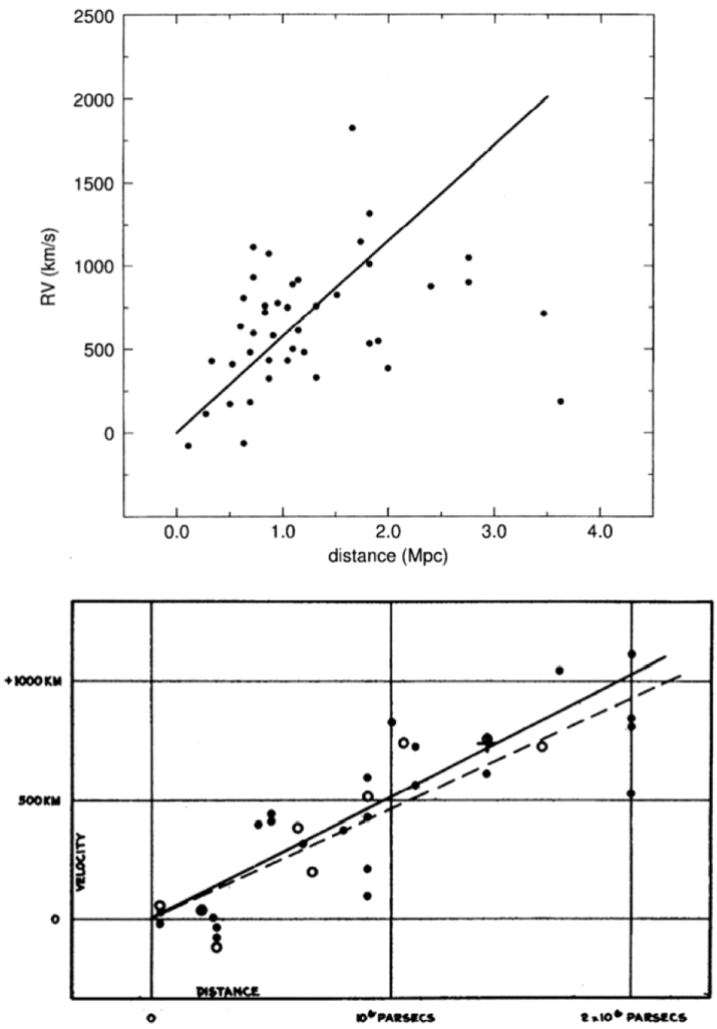



**Figure 1: Top:** Graph of the data used by Lemâitre in 1927 to discover the value of the rate of expansion of the Universe. **Bottom:** The radial velocity–distance diagram published by Hubble in 1929.

As always, science isn't that simple, and here is where the real mystery begins …

Eddington was working on the problem of Einstein's field equations when he was reminded of Lemâitre's 1927 paper, a paper Lemâitre himself had sent to him earlier. Instead of publishing his own work, Eddington wrote a kind of review paper on Lemâitre's article in 1930. In it he states:

> *"my original hope of contributing some definitely new results has been forestalled by Lemâitre's brilliant solution."*

He goes on to explain Lemâitre's discovery and the importance of it.

This brought Lemâitre's work to the attention of the Monthly Notices journal who in 1931 published an English translation of it. However there was one historically detrimental omission. His discovery of the expansion-coefficient was not present in the translated version. **Queue dramatic music: Dah Dah Daaaaaaaaaah**

## The omission

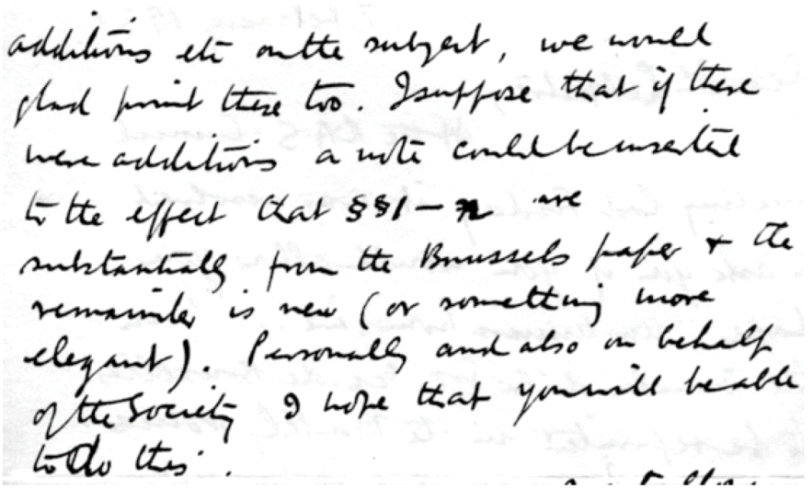
Sidney van den Bergh, who knew Lemâitre personally, believes the omission to have been a deliberate act by the translator, perhaps in order to not undermine Hubble's claim. David Block, a researcher who was elected a Fellow of the Royal Astronomical Society of London at age 19, suggests that Hubble himself was involved in the conspiracy, as a way to ensure that he alone would receive the credit for the discovery.

**It is therefore worth tracing how the translation itself came about.**

The Editor in Chief of the Monthly Notices told van den Bergh that they held no records regarding the translation of Lemâitre's paper. However, another researcher, Livio recently looked to Brussels and found a letter to Lemâitre, where Dr. Smart (then editor of the Monthly Notices journal) asks if he would be willing to have his paper translated and published in English:

> *"Briefly — if the Soc. Scientifique de Bruxells is also willing to give its permission — we should prefer the paper translated into English. Also, if you have any further additions etc on the subject, we would glad[ly] print these too. I suppose that if there were additions a note could be inserted to the effect that §§1–n are substantially from the Brussels paper + the remainder is new (or something more elegant). Personally and also on behalf of the Society I hope that you will be able to do this."*

David Block and astronomers Nussbaumer & Bieri interpret the "§§1–n" to read "§§1–72". Paragraph 73 interestingly is where Lemâitre begins to describe his derivation of the expansion co- efficient (the Hubble Constant). They also argue that Dr. Smart is attempting to convince Lemâitre to write *"something more elegant"* after that paragraph. I don't see it quite this way. *"n"* is a common place-holder for an unknown number. In this case it would make more sense *"as a simple place-holder for the end of Lemâitre's article"*. Secondly, the *"something more elegant"* refers more to finding a better way of explaining any additions Lemâitre would make to a new, translated version, rather than a more elegant re-writing of paragraphs 73 onwards.


additions etc on the subject, we would
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were additions a note could be inserted
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substantially from the Brussels paper + the
remainder is new (or something more
elegant). Personally and also on behalf
of the Society I hope that you will be able
to do this.

**Figure 2:** Letter from Dr. Smart to Lemâitre, dd. February 1931.

Either way, equation No. 24 and the associated text from paragraph 73 onwards was omitted, so we must ask how and why.

## The competitor

Hubble himself was described as a competitive, guarded man, who didn't get along well with others, and had a low opinion of theorists. Even after Lemâitre's work became known, Hubble rarely cited him or mentioned any outside support for the expansion model of the universe. Hubble also did not cite Vesto Slipher in his landmark paper of 1929, even though the majority of the data Hubble used were from Slipher. Block is highly critical of Hubble's practices. He suggests that Hubble was also very territorial. He attributes this to part of a letter from Hubble to de Sitter dd. 21 August 1930:

> *"I consider the velocity-distance relation, its formulation, testing and confirmation, as a Mount Wilson contribution and I am deeply concerned in its recognition as such."*

He goes on to argue that whoever translated or oversaw the translation of the article knew about Hubble's personality and the influence he held and reasons that the censors would have been sensitive to this. Personally, I find this difficult to believe. Whilst large personalities would have some impact, to censor a previous discovery like this would be a huge ask.

## The translator

The fact *still* remains though, the section was omitted. Perhaps finding the translator might help? In his research, Livio finds Lemâitre's response to Dr. Smart's letter, which I have included below:

> *"Dear Dr. Smart.*
>
> *I highly appreciate the honour for me and for our society to have my 1927 paper reprinted by the Royal Astronomical Society. I send you a translation of the paper. I did not find advisable to reprint the provisional discussion of radial velocities which is clearly of no actual interest, and also the geometrical note, which could be replaced by a small bibliography of ancient and new papers on the subject. I join a french text with indication of the passages omitted in the translation. I made this translation as exact as I can, but I would be very glad if some of yours would be kind enough to read it and correct my english which I am afraid is rather rough. No formula is changed, and even the final suggestion which is not confirmed by recent work of mine has not be modified. I did not write again the table which may be printed from the french text.*
>
> *As regards to addition on the subject, I just obtained the equations of the expanding universe by a new method which makes clear the influence of the condensations and the possible causes of the expansion. I would be very glad to have them presented to your society as a separate paper.*
>
> *I would like very much to become a fellow of your society and would appreciate to be presented by Prof. Eddington and you.*
>
> *If Prof. Eddington has yet a reprint of his May paper in M.N. I would be very glad to receive it.*
>
> *Will you be kind enough to present my best regards to professor Eddington."*

It is clear from this letter that Lemâitre translated his own paper into English. He believed his discussion on radial velocities was *"clearly of no actual interest"* so did not include it in the paper. Perhaps because of the more recent and subsequent work of Hubble? Perhaps he was working on a new paper regarding the cause of universal expansion? Perhaps he simply thought that it was not worth repeating as it was already published (although obscurely).

It is unknown why he made this decision, but its omission has had a huge impact on the story we tell about the discovery of the expanding universe.

## The mistake?

In reading these letters, I feel that Lemâitre may not have been aware of the significance of his discovery at the time. He did however write briefly about it in 1950 (emphasis is my own):

> *"About my contribution of 1927, I do not want to discuss if I was a professional astronomer. I was, in any event, an IAU member (Cambridge, 1925), and I had studied astronomy for two years, a year with Eddington and another year in the U.S. observatories. I visited Slipher and Hubble and heard him in Washington, in 1925, making his memorable communication about the distance [to] the Andromeda nebula.*
>
> *While my Mathematics bibliography was seriously in default since I did not know the work of Friedmann, it is perfectly up to date from the astronomical point of view; **I calculate [in my contribution] the coefficient of expansion** (575 km per sec per megaparsecs, 625 with a questionable statistical correction). Of course, before the discovery and study of clusters of nebulae, there was no point to establish the Hubble law, but only to calculate its coefficient.* ***The title of my note leaves no doubt on my intentions: A Universe with a constant mass and increasing radius as an explanation of the radial velocity of extra-galactic nebulae.***
>
> *I apologize that all of this is too personal. But, as noted by the author (p. 161)* ***"the history of this science competition is not irrelevant"*** *and it is useful to highlight the details to enable an exact understanding of the scope of the argument that can be drawn from this."*

We see here that Lemâitre obviously wanted to set the record straight. He was the one who calculated the expansion co-efficient and the first to combine the mathematical predictions with observational evidence. *"The history of this science competition is not irrelevant"*. Unfortunately his claim did not make much difference. By this time, people were already beginning to call the discovery "Hubble's Law" and referred to the "Hubble Constant."

## Who gets the credit?

This raises the interesting question on how we credit people for scientific discoveries.

Is it the person who predicted it? Is it the person who proves it? Or is it some other more nuanced process? Or is Stigler's law of Eponymy true, that *"No scientific discovery is named after its original discoverer"*?

Hubble was already becoming immensely popular. He was credited for his classification scheme, and distance measurement to the Andromeda Galaxy. This in turn helped him to clear the debate around the Island Universe hypothesis. Block suggests conspiracy, although a simpler reason can be found. Credit for multiple, closely related discoveries, often goes to the more popular scientist rather than lesser known ones.

Scientific discoveries are complex. As writers of history, our behaviour is often to put things into a linear form, where one discovery leads to another. It makes it simpler to explain related discoveries. After perpetuating this time after time in articles and textbooks, the short-hand becomes the myth, and then the fact.

As a consequence of his own omission, and the simplification we adopt when writing, Lemâitre, whilst recognised as a great scientist, was largely forgotten until the 1980s. Part of our responsibility as students of science, and writers of science is to look beyond the popular myths and narratives. To scratch underneath the surface and engage with the often complicated, messy, aspects of real people undertaking real science. Very rarely do we line up to stand on the shoulders of previous giants. It's just not that simple.

### Further reading:

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Hubble, E. in 1929, in Proc. NAS of USA, 15, 168–173
Hubble, E. & Humason, M. L. 1931, ApJ, 74, 43
Lemaître, G. 1927, Ann. Soc. Sci. de Bruxelles, 47, 49.
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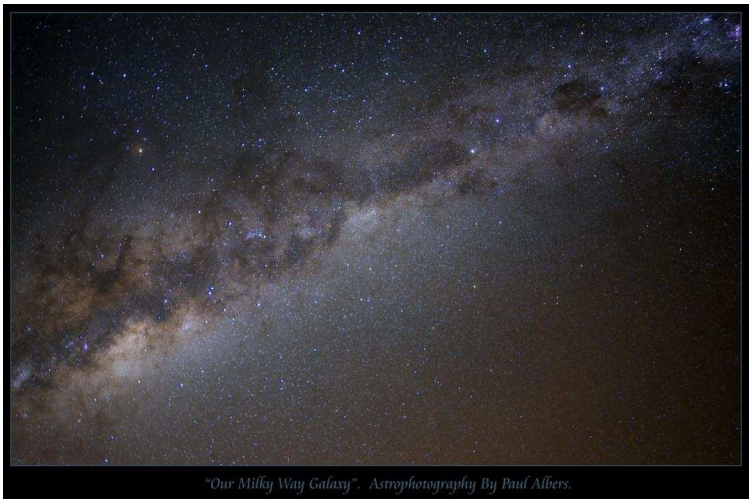
Nussbaumer, H. & Bieri, L. 2011, The Observatory, 131, 394–398
van den Bergh, S. 2011, JRASC, 105, 151

# *Paula Ritchens Gallery*


# *Paul Albers Gallery*



*"Our Milky Way Galaxy". Astrophotography By Paul Albers.*

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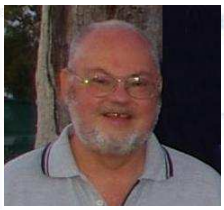

Peter Lowe


Dave Rolfe


Peter Skilton

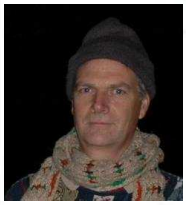

Jamie Pole


Trevor Hand


Fiona Murray


Paula Ritchens


Clemems Unger



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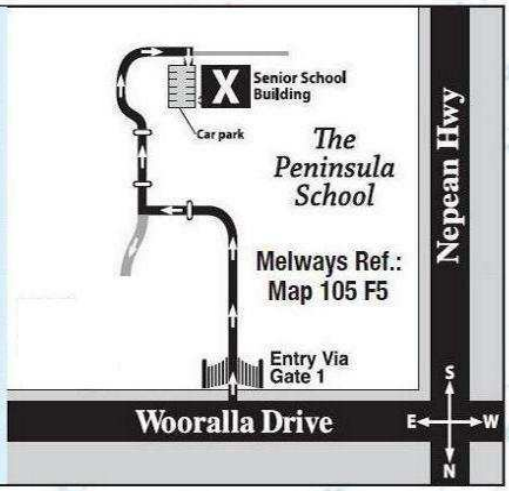
**Library:** Fiona Murray

## SOCIETY MEETINGS

Meeting Venue: **The Peninsula School**, Wooralla Drive, Mt. Eliza, (Melways ref. 105/F5) in the Senior School at 8pm, on the 3rd Wednesday of each month (*except December*). Entry is via the main gate, off Wooralla Drive. (*see map*).

**For additional details:**

Internet: http://www.mpas.asn.au
email: welcome@mpas.asn.au
Phone: 0419 253 252
Mail: P.O. Box 596, Frankston 3199, Victoria, Australia.




## LIBRARY

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

## 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 and event information as well as being able to join in discussions and ask questions with other members.

To join, go to: http://groups.com/group/e-scorpius and sign up to Yahoo groups - *You require to sign up to Yahoo groups to join E-Scorpius.* Once you have signed up at Yahoo groups, email welcome@mpas.asn.au saying that you want to join E-Scorpius and 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 either **9776 2074** or 0415 172 503 if they need help in getting to the site. Upon arrival at the site, remember to sign the attendance book in the observatory building.

**For additional details:**

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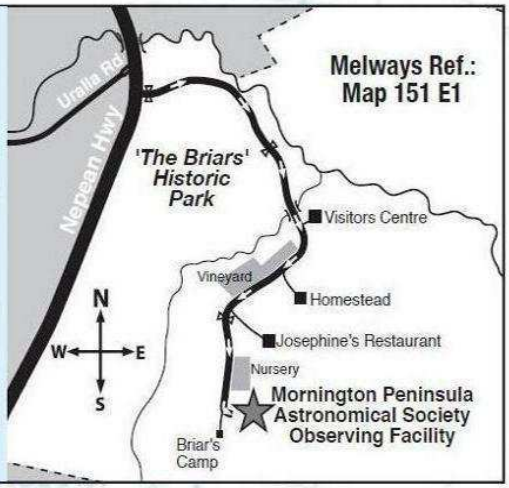


Greg Walton - Please send your articles & photos to gwmpas@gmail.com