

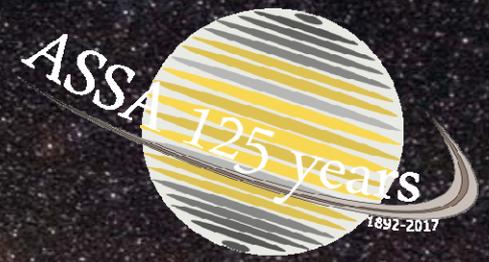
The

Volume 126 No. 5

May 2017

# Bulletin

*Monthly newsletter of the  
Astronomical Society of South Australia Inc*



## In this issue:

- ◆ **Astronomical discoveries during ASSA's third decade**
- ◆ **Terry Lovejoy discovers his 6<sup>th</sup> comet**
- ◆ **Using standard stars for variable star photometry**
- ◆ **The flattest galaxy - NGC 4762 in Virgo**



Don't miss this month's General Meeting! Learn about  
**Astronomical Sketching**  
from Martin Lewicki



**ASTRONOMICAL SOCIETY of  
SOUTH AUSTRALIA Inc**  
GPO Box 199, Adelaide SA 5001

The Society (ASSA) can be contacted by post to the address above, or by e-mail to [info@assa.org.au](mailto:info@assa.org.au). Membership of the Society is open to all, with the only prerequisite being an interest in Astronomy.

**Membership fees are:**

Full Member	\$75
Concessional Member	\$60
Subscribe e-Bulletin only; discount	\$20

Concession information and membership brochures can be obtained from the ASSA web site at:

<http://www.assa.org.au>

or by contacting The Secretary (see contacts page).

**Member Submissions**

Submissions for inclusion in The Bulletin are welcome from all members; submissions may be held over for later editions.

Wherever possible, text submissions should be sent via e-mail or posted on CD-ROM in almost any word processing format and may still be submitted handwritten or typed. Your name may be withheld only if requested at the time of submitting. Images should be high resolution and uncompressed, e.g. TIFF file formats, although high resolution JPEGs are acceptable. Your full name and object designation must be provided with each image and will be published. Equipment/exposure etc details are welcome but optional.

**Advertising & Classifieds**

Small adverts and classifieds are free for members (space permitting). Commercial advertising is available at a cost of \$50.00 per quarter page per issue.

All enquiries and submissions should be addressed to The Editor and preferably sent by e-mail to: [editor@assa.org.au](mailto:editor@assa.org.au)

For large files (e.g. on CD) or hardcopy items, post to:

**Joe Grida**  
**Editor, The Bulletin**  
**PO Box 682,**  
**Mylor SA 5153**



**Contributions should reach the Editor no later than the 7th of each month, for publication in the following month's issue of The Bulletin**

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**Sister Society relationships with:**

**Orange County Astronomers**

[www.ocastronomers.org](http://www.ocastronomers.org)

**Colorado Springs Astronomical Society**

[www.csastro.org](http://www.csastro.org)

**Central Arkansas Astronomical Society**

[www.caasastro.org](http://www.caasastro.org)

**Arkansas-Oklohoma Astronomical Society**

[www.aogas.org](http://www.aogas.org)

**Gruppo Astrofilii di Piacenza (Italy)**

[www.astrofilipc.it](http://www.astrofilipc.it)

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**Cover photo:** The Southern Cross, imaged by **Trevor Green**, during the Astrolmaging Camp at The Springs, Bendleby Ranges in March 2017. Taken with a Canon 80d DSLR, 50 mm lens@ F2.8, 1600 ISO on a standard tripod. 40 x 8 sec exposures. Processed and stacked with Photoshop CC.



# Activities

April 2017 - the month at a glance



## Happy Birthday, ASSA Celebrating 125 years in 2017!



### General Meeting

Wednesday, 3 May, 2017  
@ 8:00pm

Kerr Grant Lecture Theatre  
2nd Floor, Physics Bldg  
University of Adelaide  
North Terrace, Adelaide

**Guest Speaker:**

**Martin Lewicki**

**ASSA Light Pollution Officer &  
Adelaide Planetarium presenter**

### Astronomical Sketching

Today's amateur astronomers are immersed in a luxury of telescope and imaging technology. Cameras and sensors capture planets and deep sky objects with phantasmagorical detail and colour. Indeed, many star parties are increasingly populated with amateur telescopes piping images of selected astro objects to computer screens on site. On the other hand, astronomical sketching at the telescope has long been relegated to a quaint pre-photographic past. Why would anyone bother to sketch what is seen with a telescope these days? A small but growing cadre of observers are however returning to this old art and are reclaiming a lost satisfaction in carefully peering through the eyepiece and with pencils, smudge stubs and brushes translating what they see on to cartridge paper. While the result is not necessarily scientifically "accurate", the astronomical sketcher gains in another way during the process.

### Planning on going observing?

Save yourself unnecessary travel and time. If the weather looks doubtful where you are, check with the following people to see if the event is still on (or see [www.assa.org.au](http://www.assa.org.au) after 5pm).

#### Stockport Observatory (DO 3-13)

Observatory 8528 2284

Lyn Grida 8391 5377

Tony Beresford 8338 1231

#### Heights Observatory (DO 3-34)

Robert Bronca 8266 7504

#### Whyalla

Peter Mayfield 0405 410 895

#### Tooperang

Jeff Lowrey 0429 690 610

#### Northern Yorke Peninsula

Tony "Hendy" Henderson 0429 352 382

#### Riverland

Tim Vivian 0407 800 225

### May 2017 Calendar



Day	Time	Activity
Wed 3	7:00pm	Beginners' Meeting, Adelaide
Wed 3	8:00pm	General Meeting, Adelaide
Thu 4	7:30pm	Whyalla Members' Meeting
Fri 5	8:00pm	Public Viewing Night, The Heights
<b>Sat 6</b>	<b>7:00pm</b>	<b>Autumn Star Party, Stockport</b>
Fri 19	7:30pm	Astro-imaging Group, Modbury
Fri 26	8:00pm	Public & Members' Viewing, NYP
Sat 27	8:00pm	Members' Viewing Night, Tooperang
Sat 27	8:00pm	Members' Viewing Night, Stockport
Tue 30	7:30pm	ASSA Council Meeting

**Note: Times shown above and throughout this document are:**

2 Oct 2016 to 1 Apr 2017 : South Australia Summer Time (UTC+10:30)

2 Apr 2017 to 1 Oct 2017 : South Australia Standard Time (UTC+ 9:30)

### Astronomy Education

Wednesday, 3 May 2017 @ 7:00pm

Kerr Grant Lecture Theatre



### Collapsars

Collapsars are literally Collapsed Stars which have gravitationally contracted at the end of their long lives into incredibly dense objects. Tonight we explore White Dwarfs, Neutron Stars and Black Holes.





## Reports and Notices

Reports on recent ASSA activities, and notices of upcoming events

### Guest Speaker Biography

#### Martin Lewicki

Martin Lewicki is a member of the ASSA, and is the serving Light Pollution Officer leading the Dark Sky activity group with the aim of abating excessive light pollution and preserving our starry skies. Martin began his interest in astronomy as a high school student in 1963 and joined the ASSA in 1989. In his time at ASSA he has delivered lectures at meetings and published in The Bulletin, the Society's newsletter. His speciality is the workings of the celestial coordinate systems and how they are used for positional astronomy. He has given talks on astronomy as far away as the Planetario de Bogota in Colombia. He also follows developments in astrophysics and optics.



He still uses his home-made 6-inch reflecting telescope he made in 1974 to observe the night sky and uses his camera to capture starry sky scapes at night. Martin began lecturing sessions at the Planetarium in 2005 and presents most of the planetarium sessions to schools, clubs and community groups and runs a number of popular short courses at the planetarium.

### Astro-Imaging Group Meeting

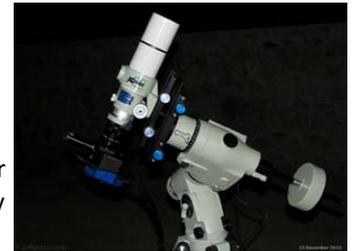
Friday 19 May @ 7:30PM

University Of The Third Age,

22 Golden Grove Rd, Modbury North

Enter via Gold Court to access Car Park 1

As the availability of affordable and more precise imaging equipment has increased, considering the option of a permanent home for your imaging gear may be on the cards. It may be a permanent pier in your backyard, a slide-off roof shed, or as elaborate as a traditional rotating dome observatory.



This month **Colin Hill** will share with us his experience in setting up and imaging from his own home observatory.

*Please bring any images that you would like to share with the group on a USB memory stick.*

## ASSA 125th Celebration Dinner 1892 – 2017

*To celebrate the 125<sup>th</sup> year of the Astronomical Society of South Australia the pleasure of your company is requested at the Anniversary Dinner & Awards night.*

### Guest of Honour Dr David Malin

*The evening deliberations will include*

- ◆ *Announcement of 2017 recipients of selected ASSA awards*
- ◆ *A rare viewing of the antique Orrery accompanied by a talk*
- ◆ *A Historic photographic presentation*
- ◆ *door prizes*
- ◆ *complimentary glass of commemorative vintage port for each guest*

*7 o'clock on Saturday 8th July, 2017*

*Belair Park Country Club,*

*Upper Sturt Road, Belair (adjacent to Belair National Park)*

*Cost: \$60 per head / Early birds: \$55 (full payment received by 30 May 2017)*

*Cost includes delectable three course meal (beverages not included)*



**Bookings open 1 May 2017.** Pay online <https://www.assa.org.au/dinner> or send cheque/ money order (payable to ASSA) to ASSA Dinner PO Box 682 Mylor 5153 Enquiries Lyn Grida 08 8391 5377 email: [observatories@assa.org.au](mailto:observatories@assa.org.au)



## Reports and Notices

Reports on recent ASSA activities, and notices of upcoming events

### The Heights Public Night 7<sup>th</sup> April, 2017 breaks attendance record

by Corrie Carnie

We were fortunate enough to hold our monthly Public Night the day after the Stargazing Live program aired and over 170 people attended, keen to observe some of the objects they had seen on TV. This was the largest crowd we have entertained at The Heights for many years.

Both of the school observatories were in operation and we managed to get everyone through for a quick session. Outside we only had 3 telescopes setup, so the lines waiting to observe grew quite long. Luckily we had clear skies so we didn't disappoint them when it was their turn to view.

Favourites of the night were close ups of the moon, a magnificent Jupiter, Great Orion Nebula, Omega Centauri, Jewel Box and Betelgeuse. Only a few people remained when Saturn appeared above the trees but it was quite hazy.

In addition we ran laser pointer sky tours and had a computer setup with a slide show of various photos including a couple that appeared on the

Stargazing Live program.

A big thanks to our ASSA volunteers who set up telescopes on the night and willingly shared your knowledge of all things astronomical to the appreciative crowd.

People were impressed with what they saw, many looking through a telescope for the very first time. Hopefully they will all return for a future event.

The next public night at The Heights will be held on May 5<sup>th</sup>.



### A report from the ASSA Riverland Group by Tim Vivian

For the first time in a few years, the Riverland ASSA group have started to meet again. Friday 24<sup>th</sup> and Saturday 25<sup>th</sup> March marked our get together and was attended by only a few. Initially this will be 3 - 4 times a year to generate a spark in the members and to try and invite new people to come along as our member base is very small with only 9 interested people.

I would like to personally thank Alan Brinkworth and Phil Fitzpatrick for committing to our night and making the trip to Loxton. It was wonderful to make new friends and swap experiences and look forward to visiting them at Tooperang. Friday night saw a partially cloudy night but were still able to see some sights and show some visitors so wonderful globular clusters and nebular formations. Jupiter with its moons was also a popular sight for them. The downside of the night was that Alan's 18" Dob decided that it wasn't going to get going and he (Alan) spent the night looking for the reasons why.

Saturday night was a completely different sky with a total blanket of cloud cover (unusual for The Riverland). I think this kept a few people away!! We made the most of it with a BBQ tea, fellowship and was then treated to a fire poi demonstration from my brother. I would like to encourage all members of ASSA, it is what we make of it together. Just to sit and talk and get to know each other more, ask questions and swap experiences was just as important as viewing the sky. I had a great night and I trust Alan and Phil enjoyed their weekend in Loxton.





# History of Astronomy

Andrew Collings reviews some of the astronomical discoveries since ASSA was formed.

**In this instalment, Andrew reviews the discoveries made during ASSA's 3rd decade.**

## 1912-1921:

*"Mathematics, physics, chemistry, astronomy, march in one front. Whichever lags behind is drawn after. Whichever hastens ahead helps on the others. The closest solidarity between astronomy and the whole circle of exact science." – Karl Schwarzschild, 1913 (pictured at right)*

And march they did. With advances in the understanding from atomic structure through to the rules that govern the universe many of the ideas developed and explored are still relevant today. It was busy and hectic but between quantum theory and the theory of general relativity, between moving continents, a fifth dimension and the horror of a world war we still had time to develop the zipper and the pop-up toaster.

## 1912:

The solidarity in science mentioned above was not universal. With identical plant fossils on opposite sides of the ocean on coastlines that fit together almost like a jigsaw, German geophysicist and meteorologist Alfred Wegener proposes the theory of continental drift.

Met with little support and much hostility Wegener later wrote, *"Scientists still do not appear to understand sufficiently that all earth sciences must contribute evidence toward unveiling the state of our planet in earlier times, and that the truth of the matter can only be reached by combing all this evidence. . ."*

Looking somewhat further afield Vesto Slipher observes the spectrum of the Andromeda Nebula and discovers it is moving toward us at 300 kilometres a second.

## 1913:

Approaching from a different direction, the American astronomer Henry Norris Russell produces a diagram that is in agreement with Hertzsprung's; the relationship between temperature and luminosity of a star is not random.

Published the following year its variations will become known as the Hertzsprung-Russell diagram and astronomers begin to speculate that it represents stellar evolution, though in which direction is not certain. With no understanding of the composition of stars or the mechanisms that fuel them the predominant thought is stars progress from giants to dwarf by converting gravitational energy into radiation.

Niels Bohr takes Rutherford's concept of a very small positively charged atomic nucleus, mixes in a bit of Planck's quantum theory and presents his quantum model of the atom where the electrons occupy stable orbits and can move

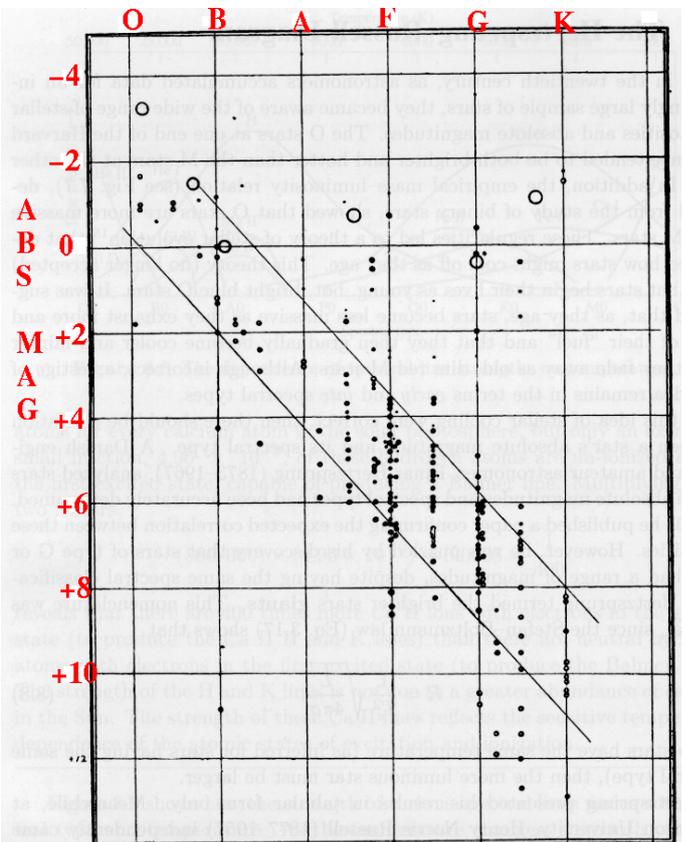
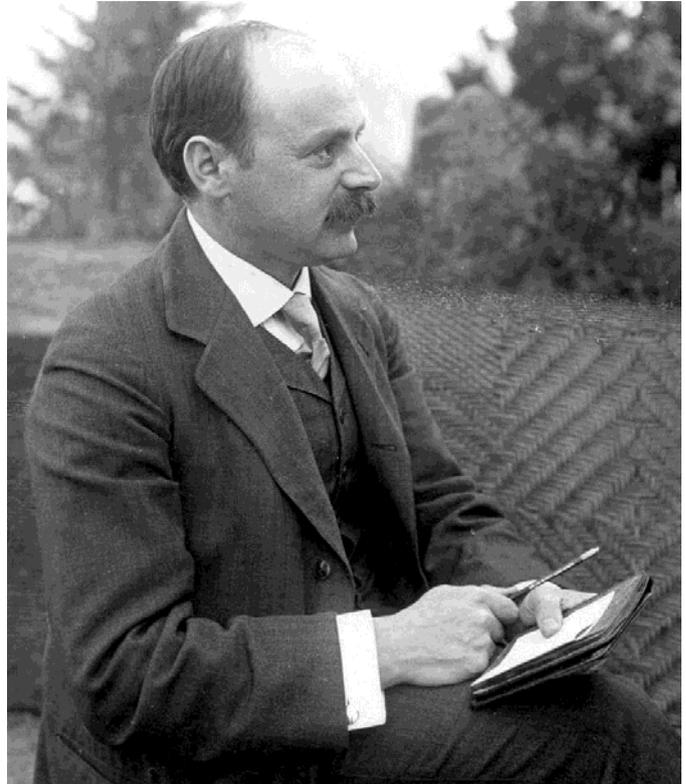


Figure 8.10 Henry Norris Russell's first diagram, with spectral types listed along the top and absolute magnitudes on the left-hand side. (Figure from Russell, *Nature*, 93, 252, 1914.)



# History of Astronomy

Andrew Collings reviews some of the astronomical discoveries since ASSA was formed.

between them only by absorbing or emitting specific amounts of energy.

### 1914:

One of the founding fathers of rocketry, Robert Goddard patents a liquid fuelled rocket and a multi stage solid fuel rocket.

The Swedish American engineer Gideon Sundback files a patent for the all-purpose zipper.

Vesto Slipher reports the Virgo Nebula is rotating and that its redshift shows it is moving away from us at the enormous velocity of a thousand kilometres per second.

Firing electrons into mercury vapour, James Franck and Gustav Hertz show the electrons only lose a specific amount of energy in collisions. This supports Einstein's photoelectric effect and Planck's relation. It also supports Bohr's model of the atom but they failed to notice that. A second paper shows that after the collision, the mercury atom emits light at a frequency corresponding to the energy lost by the electron. This also supports Bohr who had predicted the relationship but again no mention was

made of this. Eventually, in 1918, they get around to writing a paper that acknowledges him.

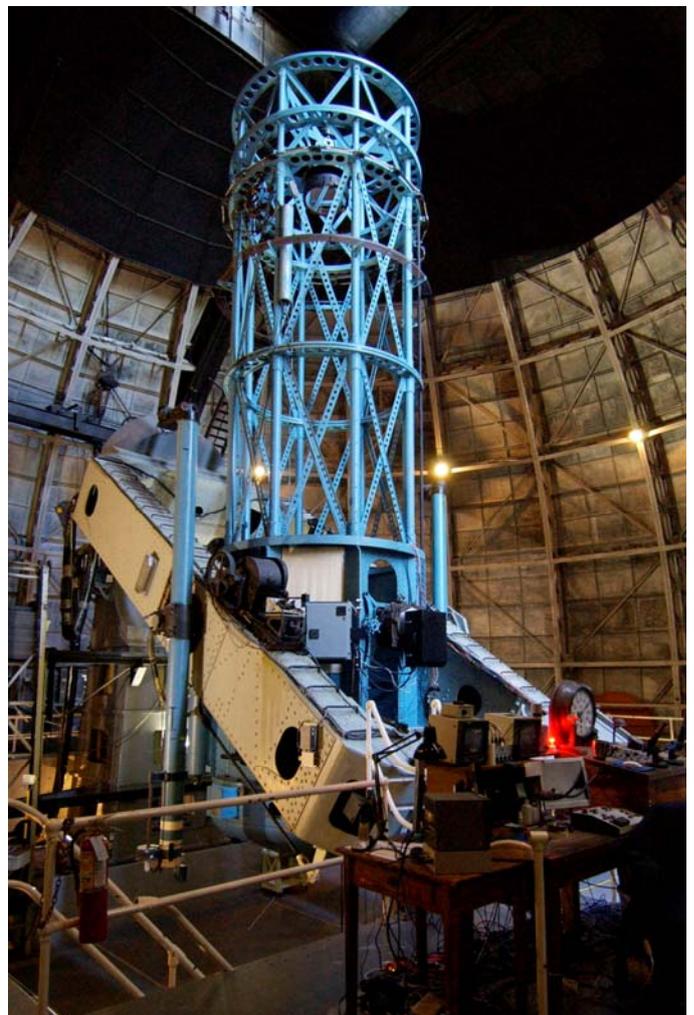
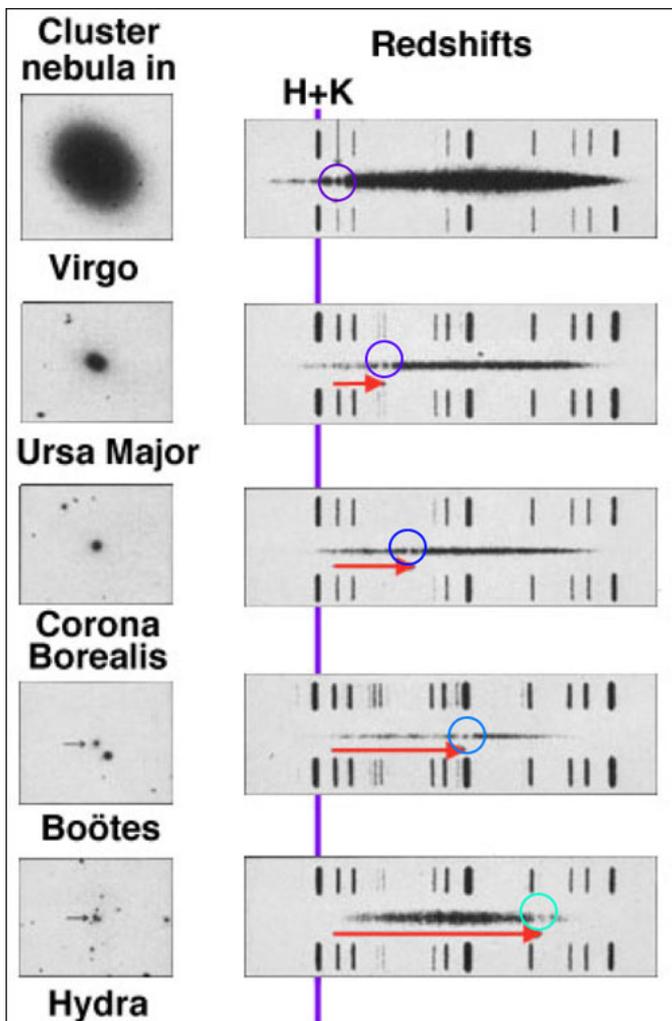
### 1915:

Vesto Slipher presents the results of his continuing research into nebulae. He reports four are moving towards us, eleven are moving away and almost all are moving at fantastic velocities.

After a decade of thinking and doing math, Albert Einstein is honing his theory of general relativity in which gravity is the result of curved space-time. He presents a paper showing how the anomalous perihelion precession of Mercury is predicted by his theory.

While serving on the Russian Front, German physicist Karl Schwarzschild (pictured at right) writes Einstein a letter. In it he details the first exact solution to Einstein's field equations and in doing so sets the groundwork for black hole theory. His paper, 'On the Field of Gravity of a Point Mass in the Theory of Einstein' is published the following year.

Robert Innes discovers Proxima Centauri, the closest star to Earth after the Sun.





# History of Astronomy

*Andrew Collings reviews some of the astronomical discoveries since ASSA was formed.*

## 1916:

Barnard's Star is discovered by Edward Emerson Barnard to have the largest proper motion of any star relative to the solar system.

The spectrum of S Sagittae and other Cepheid variables is found by Harlow Shapley to vary in step with their brightness.

Gilbert N. Lewis, a physical chemist who published in various fields including thermodynamics and relativity, formulates a shared electron (covalent bond) model of chemical bonding.

Albert Einstein publishes his general theory of relativity and shows there is a wavelike solution to the field equations though he feels gravity waves would be too small to be detected.

## 1917:

Vesto Slipher is back with his nebulae. The count is now twenty one moving away from us and four toward and an average velocity thirty fold the average velocity of stars. In light of this he says his observations lend weight to the "Island Universe" theory where nebulae are stellar systems seen at great distance and our stellar system and the Milky Way are a spiral nebula seen from within.

After considerable trouble the Hooker 100 inch telescope sees first light on November the 2<sup>nd</sup>, 1917.

Robert Goddard receives a grant from the Smithsonian to continue his experiments in rocketry.

## 1918:

In the third century BC Aristarchus of Samos calculated the sun was hundreds of times more voluminous than the earth and therefore perhaps it, rather than the Earth, should be the centre of the galaxy. After only two millennia of discussion, and just a little Inquisitional investigation, the rest of the world agreed he might be onto something. Two hundred and fifty years or so after that, in 1918, Harlow Shapely discovers that even the solar system is not at the centre of the Milky Way and it is accepted without anyone having to be tortured, imprisoned or executed. Now that's progress.

Heber Curtis discovers a jet of matter emerging from the elliptical galaxy M87; it is the first cosmic jet observed. Charles Strite invents the pop-up toaster. Unfortunately the only automated bread slicer was destroyed in a fire six years prior.

## 1919:

Ernest Rutherford is credited with the discovery of the proton when in the first reported artificial nuclear reaction he fires alpha particles into nitrogen gas producing oxygen and hydrogen nuclei.

Arthur Eddington takes a trip to the island of Principe off the west coast of Africa and conducts the first experimental test of the general theory of relativity. By photographing and measuring star positions behind the sun during the total eclipse the predicted bending of light in a gravitational field is confirmed.

## 1920:

Having equipped the Hooker telescope with an astronomical interferometer of his own devising Albert A. Michelson determines the precise diameter of Betelgeuse. Other than our sun this is the first time the size of a star has been measured.

Due to the disparity between atomic weight and atomic number Ernest Rutherford suggests the existence of a neutral particle in the nucleus.

The first domestic radio sets are sold in the United States. The word 'Robot' is introduced to the world when Karel Čapek's drama 'R.U.R' (Rossum's Universal Robots) is published in Prague.

## 1921:

Attempting to unify gravitation and electromagnetism Theodor Kaluza publishes a paper concerning a five-dimensional version of Einstein's equations. It is not the first attempt to unify gravity with electromagnetism and it will not be the last.

James Chadwick and E. S. Bieler publish a paper 'The Collisions of Alpha Particles with Hydrogen Nuclei' containing the first indications of the Strong nuclear force.

### Image references:

- *1913 russells h-r diagram.gif* - image from: <http://burro.astr.cwru.edu/Academics/Astr221/StarProp/hr.html> (original source from 'Nature, 93, 252, 1914')
- *1915 Schwarzschild.jpg* - image from: [https://en.wikipedia.org/wiki/Karl\\_Schwarzschild#/media/File:Schwarzschild.jpg](https://en.wikipedia.org/wiki/Karl_Schwarzschild#/media/File:Schwarzschild.jpg)
- *1917 100\_inch\_Hooker\_Telescope.jpg* - image from: [https://upload.wikimedia.org/wikipedia/commons/7/7f/100\\_inch\\_Hooker\\_Telescope\\_900\\_px.jpg](https://upload.wikimedia.org/wikipedia/commons/7/7f/100_inch_Hooker_Telescope_900_px.jpg)
- *slipher nebula redshift .jpg* - image from: <http://faculty.humanities.uci.edu/bjbecker/ExploringtheCosmos/redshiftnebb.jpg>



## Amateur discovery

*Queenslander Terry Lovejoy discovers his 6th comet*

**Terry Lovejoy discovered his 6th comet on March 10. Here are Terry's comments on his new discovery.**

The latest comet, C/2017 E4, was found on a set of 3 images made on the morning of March 10 (Local time) in the constellation of Sagittarius.

Although my 6th discovery, this was the first discovery with the Hyperstar 14" Celestron Schmidt Cassegrain telescope. However, because the field of view is now smaller I must now make shorter exposures, and more of them, to cover similar amounts of sky as possible. However, I felt the extra aperture have has more than compensated especially since my location experiences quite bad light pollution being just 18 km from the centre of Brisbane, a city of more than 2 million people.

Back to the comet, it was found using MOD (Moving Object Detection) a computer program I wrote that searches sets of images for moving objects like comets of asteroids. I tend to run MOD with very high sensitivity, which means it will identify anything remotely resembling a moving object, resulting in mostly false positive detection's. In fact in crowded star-fields this can be as high as 90% false positives and so I must examine each detection manually.

Nevertheless, this is huge time saver compared to examining the entire image manually. That morning a lot of the fields were in the milky way I had a large number of false detection's I had to examine, and there were also at least a dozen asteroids, but finally there was one object that had a definite coma and I knew almost certainly a comet. I then did some checks against known asteroids/comets plus some checks to eliminate internal optical reflections as a cause for the detection. This all checked out so I was certain of a new comet at this point.

I then sought independent confirmation from another observer, and looking at Messenger I could see Cristavao Jacques in Brazil was online, so I contacted him, but unfortunately dawn had started and he had closed up the observatory so there was no luck there. I then contacted Michael Mattiazzo and he was able to get a confirmation image not long after from a remote telescope in New Mexico.

This was all well within the 24 hours of the actual discovery images, which is probably a record for me! The comet was then posted on the Possible Comet Confirmation Page and astrometry started to stream in over the next few days and within 3 days the orbit was known with enough certainty for it to be designated as C/2017 E4.

The orbit indicates - unfortunately - this is an intrinsically small comet that will probably stay quite faint (and it could even disappear altogether) but we can always hope for a better display.



Above: A faint ion tail extends for more than  $1^\circ$  in this photo taken on March 30. Note the comet's flattened coma shape. North is up and east left. C/2017 E4 passes closest to Earth on March 31 (0.6 a.u.) and closest to the Sun on April 23 (0.5 a.u.) Photo by Gerald Rhemann

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## Neural networks promise sharpest ever images

**Telescopes, the workhorse instruments of astronomy, are limited by the size of the mirror or lens they use. Using 'neural nets', a form of artificial intelligence, a group of Swiss researchers now have a way to push past that limit, offering scientists the prospect of the sharpest ever images in optical astronomy.**

The diameter of its lens or mirror, the so-called aperture, fundamentally limits any telescope. In simple terms, the bigger the mirror or lens, the more light it gathers, allowing astronomers to detect fainter objects, and to observe them more clearly. A statistical concept known as 'Nyquist sampling theorem' describes the resolution limit, and hence how much detail can be seen.

The Swiss study, led by Prof Kevin Schawinski of ETH Zurich, uses the latest in machine learning technology to challenge this limit. They teach a neural network, a computational approach that simulates the neurons in a brain, what galaxies look like, and then ask it to automatically recover a blurred image and turn it into a sharp one.

Just like a human, the neural net needs examples - in this case a blurred and a sharp image of the same galaxy - to learn the technique.

Their system uses two neural nets competing with each other, an emerging approach popular with the machine learning research community called a "generative adversarial network", or GAN. The whole teaching programme took just a few hours on a high performance computer.

The trained neural nets were able to recognise and reconstruct features that the telescope could not resolve - such as star-forming regions, bars and dust lanes in galaxies. The scientists checked it against the original high-resolution image to test its performance, finding it better able to recover features than anything used to date, including the 'deconvolution' approach used to improve the images made

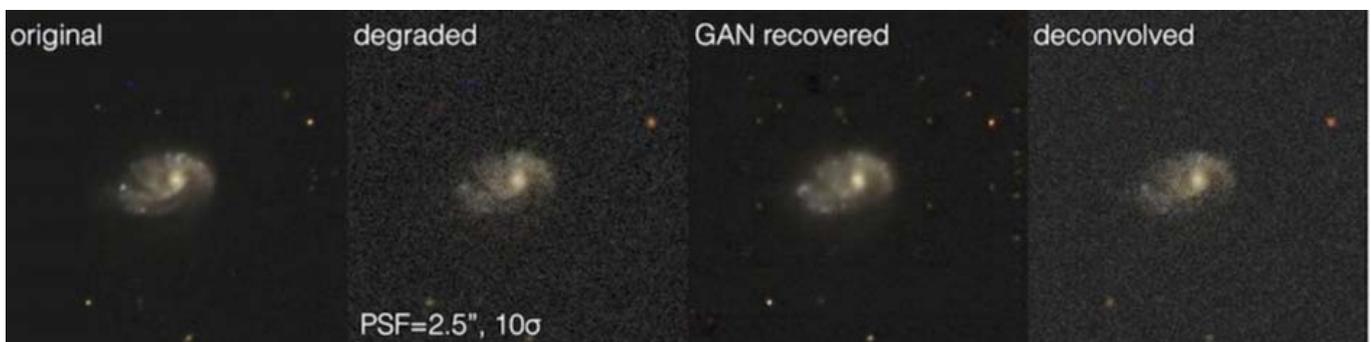
in the early years of the Hubble Space Telescope.

Schawinski sees this as a big step forward: "We can start by going back to sky surveys made with telescopes over many years, see more detail than ever before, and for example learn more about the structure of galaxies. There is no reason why we can't then apply this technique to the deepest images from Hubble, and the coming James Webb Space Telescope, to learn more about the earliest structures in the Universe."

Professor Ce Zhang, the collaborator from computer science, also sees great potential: "The massive amount of astronomical data is always fascinating to computer scientists. But, when techniques such as machine learning emerge, astrophysics also provides a great test bed for tackling a fundamental computational question - how do we integrate and take advantage of the knowledge that humans have accumulated over thousands of years, using a machine learning system? We hope our collaboration with Kevin can also shed light on this question."

The success of the project points to a more "data-driven" future for astrophysics in which information is learned automatically from data, instead of manually crafted physics models.

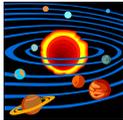
ETH Zurich is hosting this work on the space.ml cross-disciplinary astrophysics/computer-science initiative, where the code is available to the general public.



**Above:** The frames here show an example of an original galaxy image (left), the same image deliberately degraded (second from left), the image after recovery with the neural net (second from right), and the image processed with deconvolution, the best existing technique (right). Credit: K. Schawinski / C. Zhang / ETH Zurich

### Story Source:

Royal Astronomical Society. "Neural networks promise sharpest ever images." *ScienceDaily*, 23 February 2017. [www.sciencedaily.com/releases/2017/02/170223092406.htm](http://www.sciencedaily.com/releases/2017/02/170223092406.htm)



# Solar System Highlights

## The major planets during May 2017

by John Newell

The **Sun** will rise at 6:56am and set at 5:28pm on the first of the month. On the 31st it will rise at 7:18am and set at 5:08pm. (Please subtract 4 minutes per degree East of Adelaide and add 4 minutes for each degree West.)

First quarter of the **Moon** will be on the 3rd, it will be full on the 11th at 7:14am, last quarter on the 19th. New Moon will be on the 26th at 5:16am, the same day as the closest Lunar Perigee of the Year.

**Mercury** rises at 5:37am on the first, reaches aphelion on the 6th and will be at greatest western elongation of 25.8 degrees in the pre-dawn sky on the 18th. It will rise with the Moon on the 24th. On the 31st it will rise at 5:30am.

**Venus** will rise at 3:47am on the first, it will rise with the Moon on the 23rd, on the 31st it will rise at 3:34am.

**Mars** now distant, sets at 6:50pm on the first, passes Aldebaran on the 5th, sets with the Moon on the 27th and sets at 6:12pm on the 31st.

**Ceres** magnitude 8.6 in Taurus, sets at 6:38pm on the first and

sets

### Diary of phenomena

#### May 2017

d	h(UT)	phenomenon	Occn
2	14	Mercury stationary	
3	2	FIRST QUARTER	
4	9	Regulus 0.5°N of Moon	Occn
7	23	Jupiter 2.0°S of Moon	
9	23	Mercury 2.3°S of Uranus	
10	21	FULL MOON	
12	19	Moon at apogee	
13	22	Saturn 3.1°S of Moon	
14	20	Moon furthest South (-19.3°)	
15	20	Pluto 2.4°S of Moon	
18	1	Mercury greatest elong W(26°)	
19	0	LAST QUARTER	
20	5	Neptune 0.4°N of Moon	Occn
22	14	Venus 2.2°N of Moon	
23	6	Uranus 3.7°N of Moon	
24	2	Mercury 1.6°N of Moon	
25	19	NEW MOON	
26	1	Moon at perigee	
26	3	Aldebaran 0.6°S of Moon	Occn
27	2	Mars 5.3°N of Moon	
27	23	Moon furthest North (19.4°)	
31	16	Regulus 0.2°N of Moon	Occn

close to the sun at 5:22pm on the 31st.

**Jupiter** in Virgo, sets at 4:51am on the first, sets with the moon on the 8th and sets at 2:43am on the 31st.

**Saturn** in Sagittarius, rises at 8:21pm on the first, rises with the Moon on the 13th and rises at 6:16pm on the 31st. On the 24th Saturn will reach solstice allowing a spectacular view of the rings. Below is an image of Saturn captured by Damian Peach on 18 March, 2017.

**Uranus** magnitude 6.2 in Pisces, rises at 5:52am on the first, rises with Mercury for the first half of the month, and rises with Venus at 3:52am on the 31st.

**Neptune** magnitude 7.7 in Aquarius, rises at 2:23am on the first, rises with the Moon on the 20th and rises at 12:28am on the 31st.

**Pluto** magnitude 14.2 in Sagittarius, rises at 10pm on the first, rises with the moon on the 15th and rises at 8pm on the 31st.

The **Eta Aquarid** meteors, from Comet 1/P Halley, travelling at 66 km/s, are expected to peak on the 6th at about one per minute. The Moon will obscure them so it may be best to look for them earlier in the month or after the Moon sets.



### Moon Phases - May 2017

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1  Age: 5.7 days	2  Age: 6.8 days	3  Age: 7.8 days	4  Age: 8.8 days	5  Age: 9.8 days	6  Age: 10.7 days
7  Age: 11.7 days	8  Age: 12.6 days	9  Age: 13.5 days	10  Age: 14.4 days	11  Age: 15.3 days	12  Age: 16.2 days	13  Age: 17.1 days
14  Age: 18.0 days	15  Age: 18.9 days	16  Age: 19.8 days	17  Age: 20.7 days	18  Age: 21.7 days	19  Age: 22.7 days	20  Age: 23.6 days
21  Age: 24.7 days	22  Age: 25.6 days	23  Age: 26.5 days	24  Age: 26.0 days	25  Age: 29.2 days	26  Age: 0.8 days	27  Age: 2.0 days
28  Age: 3.2 days	29  Age: 4.3 days	30  Age: 5.3 days	31  Age: 6.4 days			



## **May 2017 continues to be a busy period for the comet observer, with 4 objects expected to be brighter than magnitude 10.**

### **C/2017 E4 Lovejoy**

Terry Lovejoy discovers his 6th comet! Read about the discovery in Terry's own words on page 9 of this issue.

Since discovery, Terry's comet did an amazing thing and brightened rapidly towards perihelion, reaching 6th magnitude by early April. My final observation of the comet was on the morning of April 4th when I estimated magnitude 6.7 through 8x40mm binoculars.

The comet is now too far north for viewing and reached perihelion on 2017 April 23 at 0.49AU.

### **41P Tuttle-Giacobini-Kresak**

Closest to Earth on 2017 April 1 at 0.142AU.  
Closest to Sun on 2017 Apr 12 at 1.045AU.  
Maximum magnitude 5 in April 2017 but prone to outbursts!  
Orbital period: 5.41 years

41P TGK has a history of frequent outbursts, particularly in 1973 when the comet brightened some 10 orders of magnitude! (14 to 4) on May 27. The comet was expected to reach magnitude 6 during April 2017. A similar event at closest approach could briefly bring the comet within easy naked eye visibility. As of writing in early April, no outbursts were detected.

On the morning of May 1, the comet transits at about 4am local time and attains an altitude of 14 degrees, about 5 degrees west of Vega, in the northern sky. It may appear at magnitude 6, with a very large coma >15' in diameter. The comet's visibility improves during the month as it treks southwards through Lyra.

Moonlight interferes from the morning of May 10. Towards the latter half of May, 41P will become visible in the late evening hours. On May 18, the now magnitude 8 comet, can be seen before midnight, situated low in the northeastern sky in Hercules, prior to moonrise. By the end of May the comet may have faded to magnitude 9. Note that comet Johnson will also be visible in Bootes.

### **C/2015 V2 Johnson**

Closest to Earth on 2017 June 5 at 0.81AU.  
Closest to Sun on 2017 June 12 at 1.63AU.  
Maximum magnitude 6-7 in June 2017.  
Orbital period: N/A (parabolic.)

It will be well situated for viewing in southern hemisphere evening skies after June as it treks southwards overhead. At the start of May 2017, the comet will be located low in the northern morning sky, near the vicinity of Phi Herculi, shining at magnitude 8. It transits at 130am local time, 10 degrees above the northern horizon.

Moonlight interferes from May 6. By May 16, it rises at 8pm local time, prior to moonrise. It continues to trek southwards at 1 degree per day, becoming more visible for southerners.

Comet Johnson's morphology will be very different to 41P, much more condensed, with a bright dust tail through telescopes or photographically. 41P will appear very large and diffuse. By the end of May, the comet will be situated 8 degrees Northeast of Arcturus in Bootes and will have brightened to magnitude 7

### **C/2015 ER61 PANSTARRS**

Closest to Earth on 2017 April 19 at 1.18AU.  
Closest to Sun on 2017 May 9 at 1.042AU.  
Maximum magnitude ?6 in May 2017.  
Orbital period: 7,500 years  
**ALERT** - potential naked eye comet.

This comet experienced a 2 magnitude outburst on 2017 April 4, when the comet was seen to brighten from magnitude 8 to 6 in a 24 hour period. (see photo attached) At the time of writing, it faded slightly since outburst but future magnitude predictions will be guesswork as anything is possible.

At the start of May 2017, the magnitude ?6 comet will be situated in Pisces, high in the East before dawn and trekking north easterly at over a degree per day. Moonlight interferes from the morning of May 10 until May 24 when the comet can be found about 10 degrees to the west of Venus. The comet remains in Pisces throughout May, and fades slightly by the end of the month.

Latest information, images and finder charts (including night mode versions) can be found on my website at:  
<http://members.westnet.com.au/mmatti/sc.htm>



**Above:** C/2015 ER61 PANSTARRS 2017 April 5 @ 11:30UT. I-Tel New Mexico T20 0.1m F/5 Astrograph + CCD 5 mins. FOV 1 degree. North at lower left. Credi: M Mattiazzo



# Variable Vagaries

This regular column will cover happenings in the ever-changing world of variable stars.

by David Benn



Since late 2014 I've been doing wide-field DSLR photometry. I talked about this at an ASSA Imaging Group meeting in 2015 (see *Links* for slides). My modest equipment is accompanied by free software running on a 7 year old MacBook Pro to match my modest budget. I run the Windows program IRIS on an emulator (WINE) to calibrate images and perform photometry.

The calibration part is semi-automatic but the photometry is quite manual. Several reference stars and target stars must be manually matched against a finder chart, local coordinates captured and entered, and instrumental magnitudes (IMs) extracted for each filter, V and B in my case. I am not inclined toward selecting multiple targets due to the time required and the need to select an appropriate ensemble of reference stars to suit multiple targets.

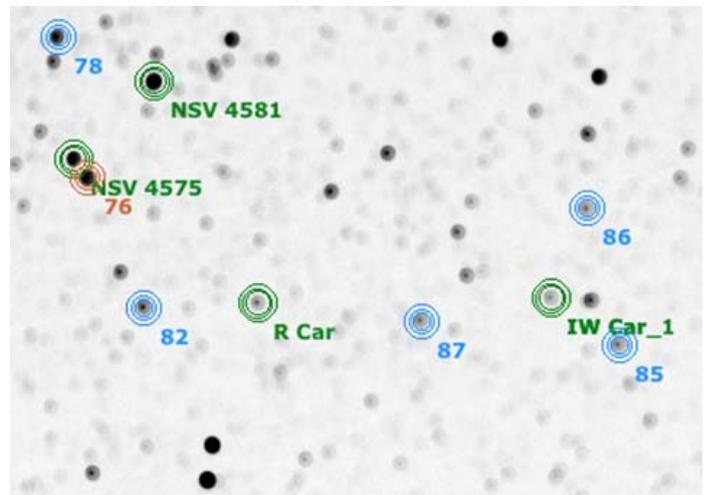
IMs are then entered into a spreadsheet developed by the Citizen Sky project and improved by Mark Blackford and others (see *Links*) to yield magnitudes that are transformed to the standard Johnson filter system.

AAVSO has been raising the profile of the need for standardized transformation by determining the transformation coefficients (TCs) of your system with respect to so-called standard stars within a cluster or otherwise nearby in the sky (see *Links*) instead of, for example, using ensemble photometry to do so. I recall that Robert Jenkins has talked about this here as well, in particular the use of Landolt Standard stars. Note also the paper by Terry Moon: *Southern Clusters for Standardising CCD Photometry*.

So, I've been imaging one of these standard clusters (NGC 3532) using IRIS for calibration and the free web-based tool VPHOT (see *image top right*) to automatically identify the standard stars and then extract IMs. I first use AstrolmageJ to plate solve the images before submission to VPHOT. Another free tool, Transform Generator (TG) developed by AAVSO member Gordon Myers takes VPHOT output and computes transformation coefficients after a suitable dataset is selected. I need to spend time refining the TCs, probably with multiple imaging runs.

With TCs computed, IRIS, AstrolmageJ, and VPHOT can be used to carry out photometry on one or more targets of interest. After the AAVSO WebObs upload format file is generated by VPHOT, yet another free (Windows, so under WINE in my case) tool, Transform Applier (TA), by AAVSO

volunteer George Silvis takes this output and the TCs generated with TG along with airmass information from VPHOT, to transform a single observation or a time series, ready for submission to the AAVSO International Database (AID) or inspection with VStar.



Seem complex? Too many acronyms? It's not as bad as it seems. I'll show concrete examples in future installments.

The key thing for me is that I want to move toward a more advanced set of tools so that I can make better use of my time and images. It's akin to moving from pushing a telescope around manually to having a GOTO; it will allow me to do more of what I want to do: make and submit observations. VPHOT also makes doing multiple target photometry easier, not to mention variable star search, given a long enough time sequence.

So that's where I'm heading. We'll see how long it takes to get there.

In other news, delta Cephei (del Cep), the prototype of the pulsating variable star class that bears its name, has recently been observed to have X-Ray pulsations with the same 5.4 day period as its visible light pulsations. As the author of the article I read (see *Links*) said: "Given the astrophysical and cosmological importance of Cepheids, and the high precisions required to test cosmological models, these new discoveries should be better understood. X-ray observations of other bright Cepheids are planned to unravel their X-ray behavior."

## LINKS

DSLR photometry slides: <http://goo.gl/a05Y53>

del Cep in X-Ray: [https://www.astromart.com/news/news.asp?news\\_id=1563](https://www.astromart.com/news/news.asp?news_id=1563)

AAVSO finder chart creator: <https://www.aavso.org/apps/vsp>

AAVSO DSLR manual and spreadsheet: <https://www.aavso.org/dslr-observing-manual>

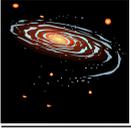
AAVSO Transform Campaign: <https://www.aavso.org/transform> & <https://www.aavso.org/aavso-transform-campaign>

AAVSO photometry tool, VPHOT: <https://www.aavso.org/vphot>

AstrolmageJ: <http://www.astro.louisville.edu/software/astroimagej>

Southern Clusters for Standardising CCD Photometry: <http://goo.gl/kn3fhk>

Landolt Standard stars: <http://www.cfht.hawaii.edu/ObsInfo/Standards/Landolt>



## Alone in the dark

*A guide to observing faint fuzzies in our night sky*

*by Joe Grida*



### The flattest galaxy - NGC 4762 in Virgo

- **NGC 4762**, UGC 8016, MCG +02-33-033, Edge-on Lenticular Galaxy, distance 58 million light years  
RA: 12h 52m 56s Dec: +11° 13' 49", Size: 8.7' x 1.7', Mag: 10.0v
- **NGC 4754**, UGC 8010, MCG +02-33-030, Lenticular Barred Galaxy, distance 39 million light years  
RA: 12h 52m 18s Dec: +11° 18' 50", Size: 4.6' x 2.5', Mag: 10.3v

The galaxy pair NGC 4762 and NGC 4754 is easy to find for scopes of almost all sizes under reasonably dark skies, even though they are part of the Virgo galaxy cluster. Start at 3rd magnitude  $\epsilon$  Virginis (Vindemiatrix), and move about 2° west and slightly north.

In the field, just look for an extremely thin, yet reasonably bright, edge-on galaxy – this is NGC 4762. In the same field about 11' northwest you'll find NGC 4754, a face-on galaxy. This pair is an example of two similar galaxies at a much different orientation. Though these galaxies appear to be interacting they are considered non-interacting pairs due to their significant redshift difference.

In my 16" Dob, under dark skies, I find this pair to be a stunningly beautiful view. They were also a favourite when I observed with the 8" Meade SCT.

Previously thought to be a barred spiral galaxy, NGC 4762 has since been found to be a lenticular galaxy, a kind of intermediate step between an elliptical and a spiral.

The edge-on view that we have of this particular galaxy makes it difficult to determine its true shape, but astronomers have found the galaxy to consist of four main components — a central bulge, a bar, a thick disc and an outer ring.



**Above:** NGC 4762 & NGC 4574, imaged by **Josef Popsel & Beate Behle**, using a Ganymed 60cm Hypergraph at Skinakas Observatory in Crete, Greece. The image was taken on 17 June 2009, by remote control from Germany. North is up. Exposures L:20x900sec, RGB: 3 x 900sec. SBIG STL-11000M CCD Camera.



## Contact information

Here's how to contact various members of Council, Regional Co-ordinators and SIG's

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#### Whyalla

The group meets on the first Thursday of the month.

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#### Northern Yorke Peninsula

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The Riverland group hold combined members' and public viewing nights monthly.

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## Members' Gallery

*Highlighting members' astrophotos*



**Above:** Comet C/2015 ER61 Panstarrs imaged by **Trevor Green** at 4:00 am on 08/04/2017. SkyWatcher AZ-EQ Mount, SkyWatcher 10 inch CF Quatro Newtonian telescope. Canon 80D DSLR, ISO 6400 ,10x45 secs subs. Stacked in Photoshop CC.

**Below:** Vela Supernova remnant, imaged by **Paul Haese**, at Clayton Bay, SA. Takahashi FSQ106ED refractor and QSI683-8 CCD Camera. Exposures: Ha OIII 900 1470 (30 minute subs narrow band). Processed in CCD stack and Photoshop CS6. This image received the Highly Commended Award at the 2015 Eureka Prize.

