

The

Volume 126 No. 3

March 2017

Bulletin

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



Don't miss Dr Russell Cockman
at the General Meeting, on
March 1:
How we dodged a
doomsday event in 2012

In this issue:

- ◆ ASSA 125th Birthday Celebrations & Awards
- ◆ Review - GSO RC12 truss Ritchie-Chretien astrograph
- ◆ Amateur astronomer helps uncover secrets of unique pulsar binary system
- ◆ Planetary Nebulae in Puppis



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. 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

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

Colorado Springs Astronomical Society

www.csastro.org

Central Arkansas Astronomical Society

www.caasastro.org

Arkansas-Oklohoma Astronomical Society

www.aogas.org

Gruppo Astrofilii di Piacenza (Italy)

www.astrofilipc.it

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Cover photo: M1, Crab Nebula, a supernova remnant in Taurus imaged by **Paul Montague**. 10 x 20 minute subs with a QHY8 one shot colour camera, 8" carbon fibre Ritchey Chretien scope on a Skywatcher NEQ6 Pro mount. Processed with PixInsight and Photoshop.



Activities

February 2017 - the month at a glance



Happy Birthday, ASSA Celebrating 125 years in 2017!



General Meeting

Wednesday, 1 March 2017
@ 8:00pm

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

ASV Speaker Exchange:

Dr Russell Cockman
Vice-President

Astronomical Society of Victoria

How we dodged a doomsday event in 2012

In September 1859 the most powerful solar storm in recorded history wreaked havoc on our, then, fledgling technology. Known as the Carrington Event, it is inevitable that a storm of similar ferocity will happen again, but the consequences for our more advanced and more vulnerable technologies could be far worse. In July 2012 a Carrington-type event, that went largely unreported in the media, fortunately missed the Earth, but slammed into an orbiting solar observatory. In his talk Dr Russell Cockman will review the circumstances of the Carrington event, the potential cost of a similar event to our present way of life, what was learned from the observations collected in July 2012 and how the damaging impacts can be mitigated.

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 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

March 2017 Calendar



Day	Time	Activity
Wed 1	7:00pm	Beginners' Meeting, Adelaide
Wed 1	8:00pm	General Meeting, Adelaide
Thu 2	7:30pm	Whyalla Members' Meeting
Fri 3	8:00pm	Public Viewing Night, The Heights
Fri 17	7:30pm	Astro-imaging Group, Modbury
Sat 18	8:00pm	Members' Viewing Night, Stockport
Fri 24	8:00pm	Public & Members' Viewing, NYP
Sat 25	8:00pm	Members' Viewing Night, Tooperang
Sat 25	8:00pm	Members' Viewing Night, Stockport
Tue 28	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, 1 March 2017 @ 7:00pm

Kerr Grant Lecture Theatre



Jovian Planets

Out past the main asteroid belt lies the realm of the giant planets. Find out how the four gas planets formed and become so large. We will also look at their internal structure and explore the different ring systems circling each of these worlds.





Reports and Notices

Reports on recent ASSA activities, and notices of upcoming events



Have you got your National Police Check?

- New legislation applies from 11 April 2015
- Impacts on all ASSA members who volunteer at ASSA sanctioned **public** events
- i.e. public viewing nights, school visits, National Science Week, private booked nights

From the 11th April 2015, all members who attend ASSA sanctioned public events **MUST** have a current NPC clearance certificate, or equivalent clearance letter from their employer, and **MUST** have provided ASSA with these details. Non-compliance is a \$10,000 fine to ASSA.

Full details available here:

<https://www.assa.org.au/members/policies>



Please note: Meeting DVD's will no longer be available, however members will still be able to view the meeting recordings via the ASSA website.

Guest Speaker Biography Dr Russell Cockman

Dr Russell Cockman, an Aussie by birth, has a PhD in Chemistry and has had a life-long interest in Astronomy.

He enjoys all things astronomical, particularly astrophotography, cosmology and the Sun.

He has travelled widely to view the Universe under dark skies and to photograph astronomical events as varied as solar eclipses, meteor storms and aurorae.

He is currently Vice President of the Astronomical Society of Victoria, and Director of the Solar Section.



Now available!

The ASSA 125th Anniversary 2017 Calendar is now available for purchase - \$20 + \$5 postage

Order now from secretary@assa.org.au

For free delivery from Gawler - Murray Bridge - Goolwa, contact Trish Ellin at tellin@txc.net.au or (08)82613354



Astro-Imaging Group Meeting

Friday 17th March @ 7:30PM

University Of The Third Age,

22 Golden Grove Rd, Modbury North

Enter via Gold Court to access Car Park 1

Monochromatic (Black & White) imaging sensors have the advantage of greater sensitivity and more control than their OSC (One Shot Colour) counterparts, allowing the operator greater flexibility in how the image is captured by using Narrowband or RGB colour filters.



This month **Tom Valencic** will present his experiences with LRGB Astro Imaging.

Please bring any images that you would like to share with the group on a USB memory stick. Any questions, contact the Group Coordinator, Jeff Lusher: imaging@assa.org.au



ASSA 125th Birthday Celebration & Awards Presentations

Members were recognised for their achievements, as we also remembered our birth 125 years ago

Numerous presentations of awards were made at the February 2017 General Meeting.

Colin Hill reports: "At the Astronomy Education session, I was proud to present awards for the 2016 Basic Beginner's Course in Astronomy. The award is given to those who attend nine or more sessions throughout the year". See photo at top right.

At the General Meeting, the following **Service Awards** were presented:



Dean Davidson - For his service to ASSA over many years, namely as President (a few times), Editor (a few times), and as Project Manager of the Turret Replacement Project



Robert Jenkins - For his service to ASSA over many years, namely as President, Assistant Secretary, and fundraising for the Turret Replacement Project



Paul Curnow - For his service to ASSA over many years, namely as Publicity Officer, and organising the guest speakers each month

The **NetCraft Australia Astrophotography Award** was presented to **Paul Montague**. He submitted 6 very high quality images. The members of the ASSA Council chose the winning entry - The Corona Australis Field. President Joe Grida presented Paul with his award, a 2TB USB External Hard Drive on behalf of NetCraft's David Bennett, who couldn't be there on the night.

The **Craig Richardson Memorial Image Award** is presented by the Richardson family to the ASSA member who, in the opinion of the family, enters the best wide-field image (incorporating foreground land or sea-scapes) of an astronomical phenomenon such as an aurora, lunar or planetary conjunction, comet, constellation or the Milky Way taken in the preceding 12 months.

This year's winning entry, titled **A Trio of Planets**, submitted by **Werner Kutsche**, showed a widefield view of Scorpius and Sagittarius, including the planets Venus, Mars & Saturn. Craig's mother, Barbara presented Werner with a \$100 prize.

Another highlight of the evening was the re-enactment of the announcement of the intention to form an astronomical society, in December of 1891 by C.C. Farr.

The idea and script were created by **Andrew Collings**, and it also meshed together the advances in astronomical imaging we have seen in the intervening 125 years. Members are



Above: The recipients of the award were (left to right) Robert Becker, Craig Robinson, Chris Whittall and Craig Withers (not present). Colin Hill at far right.



Above - President Joe Grida presented the NetCraft Australia Astrophotography Award to Paul Montague on behalf of David Bennett

Below: Barbara Richardson presented the Craig Richardson Memorial Image Award to Werner Kutsche





ASSA 125th Birthday Celebration & Awards Presentations

Members were recognised for their achievements, as we also remembered our birth 125 years ago

encouraged to view a copy of the proceedings once the video of the meeting becomes available online. The players were:

*John Hisco as C.C. Farr
John Newell as Mr Sells
Paul Haese, as himself.*

The scene opened as C.C. Farr reads the notice placed in *The Register* newspaper. In walks Paul Haese, a visitor from 2017, who highlights the progress in imaging. He introduces our guests from 1892 to the amazing coloured images we now all take for granted.

Congratulations to all our players. Great job!

We also thanks Alex Wood for organising the purchase of the magnificent birthday cake. Every member who came to supper at the end of the meeting was able to have a piece of cake. Some even had two!

Images - clockwise from top right.

- *The birthday cake*
- *C.C. Farr (played by John Hisco) marvels at our colour pictures*
- *C.C. Farr (John Hisco) and Mr Sells (played by John Newell) strike a very thoughtful pose*
- *Our 3 players - John Newell, Paul Haese, and John Hisco.*





Equipment Review

Paul Haese reviews a stalwart imaging telescope

Review of the GSO RC12 Truss Ritchey Chretien Astrograph

Guan Sheng Optical (GSO) is telescope manufacturing company. They are based in Taiwan. They make affording telescopes for the consumer market and also mirror sets for some of the other more expensive Ritchie Chretien (RC) manufacturers.

All their mirrors are CNC manufactured and of a very high quality. Mirrors test well with good Stehl ratios and infragrams. Though none of this information is freely available or included in purchase, you can request the information.

I first bought a GSO RC when they were introduced to Australia in 2008/09. The optical surfaces were very good as was the optical tube which was carbon fibre. I used that telescope to image quite a few objects in the night sky after I made a few modifications to the primary baffle tube and the purchase of a quality focuser.

In early 2011 I decided to upgrade to the GSO RC12. At the time it had a steel tube (still available I believe) with tube rings and dove tails top and bottom. It also came with a large focuser made by GSO. After some early trialling I found that the steel tube would not hold focus long enough in the early part of the evening to do any useful imaging. Nor was the focuser any good despite its size. It had a fair

bit of flop in it and this affected the collimation of the telescope. I was disappointed by these faults but I did know the optics were going to be useful in the long term. I had several conversations with Jim Sheng about the issues and he had indicated that a carbon truss was under development. It took several years for this truss system to be realised and available to the market. When it became available I ordered just the truss from GSO and installed the mirror set into the OTA.

Upon testing I found that the carbon system was very stable. It would hold focus for many hours before focusing would need to be conducted again. However some other problems arose. The first was that the secondary would dew up badly. To solve this issue I installed a Kendrick dew heater into the secondary assembly. This involved drilling a hole into the rear plate of the secondary and then taping the cables of the heater along one of the spider veins. It worked perfectly and dewing of the secondary has not been a problem since. It is also on my nag list to Jim Sheng for



Above: *The author's 12" GSO RC telescope installed in his remote observatory.*



Equipment Review

Paul Haese reviews a stalwart imaging telescope

future development and incorporation of his scopes. It would be good if GSO installed secondary dew heaters in manufacture.

The next problem was that of imaging payload was being supported by the mirror assembly. Whilst, smaller payloads would not cause a problem, I found that putting about 12kgs of imaging equipment on to the OTA would cause distortions to star shapes and collimation would be affected by elevation. Gravity was working against the design. Working closely with GSO and Bintel, we came up with a design which would support heavy imaging trains and not affect collimation. The imaging assembly is now supported by a camera adjusting ring/imaging train support ring, which is supported by the rear OTA plate. The primary is unaffected by the imaging assembly as a result. Since installation of the new mirror assembly and rear plate I have had not issues with star shapes or collimation at all.

Future developments are likely to incorporate a flattener/corrector for these scopes. Currently, there is not a corrector available from GSO. This can mean for larger sensors you need to either purchase a dedicated flattener from other RC manufacturers (which are very expensive) or you simply have to crop. I have tried a couple of cheaper flatteners and they do not work, so I have opted to wait out a dedicated

flattener from GSO. There is one in development and have seen the prototype. At this stage it is only 2", but a 3" version is in planning.

What I like most about these scopes is that bang for buck they can and do compete well with the more expensive RC's. The OTA's are developed enough now that great results can be obtained with them. My images would seem to attest to that. Instead of paying twenty to thirty thousand dollars you can get a scope for under ten thousand dollars which has great optics, can hold collimation well and holds focus for long periods of time.

You will need still need to do some tinkering to get the scope working at peak performance but not nearly as much tinkering that I have had to do in the past. A new focosor is a must and a dew heater for the secondary if you have lots of dew in your imaging site. You will need to learn about collimation of an RC too. Collimation of these scopes is demanding and requires careful adjustments to get things near perfect. Having the right tools for collimation will help to obtain perfect collimation.

Overall these are very good telescopes now and I will be buying a bigger one in the near future.

2017 Flinders Ranges AstroCamps

There are 5 astrocamps planned for 2017:

Alpana Station - May 25-29, August 17-21
The Springs - April 21-25, September 15-18

Please be aware that places for these camps fill very quickly, so if you are considering attending, book ASAP!

Please note that a dedicated **Astro Imaging workshop** will be held at The Springs over the weekend of March 24-26, 2017. A full program will be available in mid-January.

If you would like to know more about these camps, please contact:

Joe Grida
(president@assa.org.au)
phone 08 8391 5377
for a detail sheet.

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Amateur astronomer helps uncover secrets of unique pulsar binary system

A professional astrophysicist and an amateur astronomer have teamed up to reveal surprising details about an unusual millisecond pulsar (MSP) binary system comprising one of the fastest-spinning pulsars in our Galaxy and its unique companion star.

Their observations are the first to identify "star spots" on an MSP's companion star. Plus, the observations show that the companion has a strong magnetic field, and provide clues into why pulsars in some MSP binaries switch on and off. John Antoniadis, a Dunlap Fellow with the Dunlap Institute for Astronomy & Astrophysics, University of Toronto, and André van Staden, an amateur astronomer from South Africa, analyzed observations of the brightness of the companion star made by van Staden over a 15-month period, with his 30cm reflector telescope and CCD camera in his backyard observatory in Western Cape.

The analysis revealed an unexpected rise and fall in the star's brightness. In a typical MSP binary, the gravity of the pulsar distorts the shape of the companion star, pulling it into a teardrop-shape. As it circles the pulsar, we see a cyclical rise and fall in the companion's brightness. The companion is brightest at two points in its orbit, when we see its broad, tear-shaped profile; it is dimmest midway between those two points, when we see its smallest, circular profile. Naturally, the light curve measuring the brightness rises and falls in step with the companion's orbital period. But Antoniadis and van Staden's observations revealed that the brightness of the companion wasn't in sync with its 15-hour orbital period; instead the star's peaks in brightness

occur progressively later relative to the companion's orbital position.

Antoniadis and van Staden concluded that this was caused by "starspots," the equivalent of our Sun's sunspots, and that the spots were lowering the brightness of the star. What's more, the spots were much larger relative to the companion star's diameter than our Sun's sunspots.

They also realized that the companion star is not tidally locked to the pulsar -- as the moon is to Earth. Instead, they concluded that the companion's rotational period is slightly shorter than its orbital period, resulting in the unexpected light curve.

The presence of starspots also led the collaborators to infer that the star has a strong magnetic field, a prerequisite of such spots.

A dedicated non-professional astronomer for many years, van Staden has a particular interest in pulsars and in 2014 came across Antoniadis' research website listing MSP binaries with optical companions.

"I noted that the binary system MSP J1723-2837 is well suited for observing from South Africa," van Staden says,



Above: Artist's rendition of a typical millisecond pulsar binary system in which the shape of the companion star (l.) is deformed by the gravitational pull of the pulsar (r.) seen emitting beams of radiation. Credit: NASA



Above: André van Staden in his home observatory with his 30cm reflector telescope. Credit: André van Staden

"and that a light curve had not yet been determined for this particular system." The pulsar, in Ophiuchus, was discovered during the Parkes Multibeam Pulsar Survey in 2004.

"I also realized that observations were scarce because professionals do not have the luxury of using professional instruments for continuous observations. On the other hand, non-professionals can make these long-term observations." "The dataset was unlike anything I had ever seen," says Antoniadis on receiving van Staden's data, "both in terms of quality and timespan. And I urged André to continue observing for as long as possible."

Observations such as van Staden's are critical in answering questions about the evolution and complex relationship between the MSP and its companion in "black widow" and "redback" binaries -- pairs of stars in which the pulsar, like its arachnid namesake, devours its companion.

In a typical scenario, a newly formed neutron star feeds off of gas gravitationally pulled from the companion. As the pulsar gains mass, it also gains angular momentum and spins faster.

Eventually, the neutron star is rotating hundreds of times a second. At this point, it enters the next phase of its evolution. The neutron star begins to emit beams of intense radiation that we see as a rapidly pulsating signal: a pulsar is born. At this point, the pulsar also begins to give off intense

gamma-ray radiation and a strong stellar wind that staunch the flow of material from its neighbour. The companion is no longer being cannibalized by the pulsar, but it has only traded the means by which it is being consumed. Now the radiation and wind from the pulsar are so intense they begin to erode the doomed star.

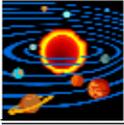
As complex as these MSP binary systems are, they have only gotten more perplexing in recent years with observations that pulsars turn off and return to a state in which they are feeding off material from their companion -- and that they can make this transition multiple times.

It has been suggested that the pulsar's stellar wind and radiation may be behind the transition. But an additional result from Antoniadis and van Staden's observations is that the stellar wind from the pulsar is not affecting the companion.

Typically, a pulsar's strong stellar wind and intense radiation output create a "hotspot" on the pulsar-side of the companion. It is as if the star has a "day" and "night" side. But the presence of the hotspot was not detectable in the data. This could mean that the wind is either absent entirely or is blowing in a direction other than toward the star.

Either way, this suggests that the companion's magnetic field -- and not the pulsar's stellar wind and radiation -- may be the mechanism that turns off pulsars.

Story Source: Dunlap Institute for Astronomy & Astrophysics. "Amateur astronomer helps uncover secrets of unique pulsar binary system: Observations are the first to identify 'star spot' on an MSP's companion star." ScienceDaily, 8 December 2016. www.sciencedaily.com/releases/2016/12/161208143343.htm



Solar System Highlights

The major planets during March 2017

by John Newell

On the 1st the **Sun** will rise at 7:07am and set at 7:48pm. On the 31st it will rise at 7:33am and set at 7:07pm. The autumnal **equinox** is on the 20th at 8:59pm.

The **Moon** will reach perigee on the 3rd, first quarter will be on the 5th as it passes Aldebaran. Full Moon on the 13th at 1:24am, last quarter on the 21st and new Moon will be on the 28th at 1:27pm.

Mercury rises at 6:40am on the first, reaches superior conjunction on the 7th, perihelion on the 23rd and sets at 7:46pm on the 31st, forty minutes after the Sun. It reaches greatest eastern elongation of 19 degrees on April first.

Venus sets at 8:44pm on the first, almost an hour before Mars. She will be at inferior conjunction on the 25th and on the 31st she will rise at 6:58am, a half hour before the Sun.

Mars will set at 9:38pm on the first, with the Moon. It will set with the Moon again on the 30th and on the 31st it will set at 8:40pm.

Ceres, magnitude 8.5 in Aires, sets at 10:34pm on the first and

sets with the Moon and Mars at 9:03pm on the 31st.

Jupiter, near to Spica in Virgo, rises at 9:44pm on the first, rises with a gibbous Moon on the 14th and rises at 7:37pm on the 31st. Prayers for the Juno probe which may have thruster issues.

Saturn now in Sagittarius, rises at 1:23am on the first and at 11:25pm on the 31st. The Cassini probe is in its final few months of life and is orbiting through the rings to return excellent pictures of the minor moons.

Uranus in Pisces magnitude 6.2, sets with the Moon and Mars at 9:36pm on the first. It sets with Mercury at 7:43pm on the 31st and is approaching solar conjunction.

Neptune, magnitude 7.8 in Aquarius, begins the month at solar Conjunction. On the 28th it will rise with the moon and on the 31st it will rise at 5:19am.

Pluto, magnitude 14.2 in Sagittarius, rises at 3am on the first, with the Moon on the 22nd and rises at 1:05am on the 31st.

Comet 2P Encke, 3.3 year period, may reach 6th magnitude in March and reaches solar conjunction on the 11th.

Diary of phenomena

March 2017

d h (UT)

- 1 18 Uranus 3.4°N of Moon
- 1 21 Mars 4.1°N of Moon
- 2 2 Neptune at conjunction
- 2 13 Venus stationary
- 3 8 Moon at perigee
- 4 10 Mercury 1.0°S of Neptune
- 5 3 Aldebaran 0.3°S of Moon
- 5 11 FIRST QUARTER**
- 6 23 Mercury superior conjunction
- 7 0 Moon furthest North (18.9°)
- 10 22 Regulus 0.8°N of Moon
- 12 14 FULL MOON**
- 14 21 Jupiter 2.3°S of Moon
- 18 17 Moon at apogee
- 20 10 Equinox
- 20 10 Saturn 3.4°S of Moon
- 20 15 LAST QUARTER**
- 21 5 Moon furthest South (-18.9°)
- 22 5 Pluto 2.7°S of Moon
- 25 10 Venus inferior conjunction
- 26 8 Neptune 0.0°N of Moon
- 26 16 Mercury 2.1°N of Uranus
- 28 2 NEW MOON**
- 29 5 Uranus 3.4°N of Moon
- 30 12 Moon at perigee

Moon Phases - March 2017





March 2017 comets

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

In 2017, the short period comet 41P Tuttle-Giacobini-Kresak will be having an exceptional apparition, at least for northerners. Perihelion is due on 2017 April 12 at 1.045 AU. The comet is closest to the Earth on April 1 at 0.142AU and remains within 0.20AU from us between March 5 and May 3, a period of nearly 2 months.

41P TKG has a history of frequent outbursts. In 1973, the comet brightened some 10 orders of magnitude! (14 to 4) on May 27, followed up by a second outburst (14 to 6) on July 8 of that year.

The comet is expected to reach magnitude 5 ordinarily during April 2017. A similar event at closest approach could briefly bring the comet within easy naked eye visibility. Unfortunately for southern hemisphere observers, the comet will be at high northern declination during April, thus restricted to viewers north of 20S latitude.

A good profile of past light curves to 1995 has been posted by Seichi Yoshida at his website:

<http://www.aerith.net/comet/catalog/0041P/index.html>

You can see that the 2006 apparition passed rather uneventfully, with no reported outbursts, but in 2001, there were 2 observed outbursts pre perihelion some 3 and 4 orders of magnitude.

In 1995, the comet was some 3 orders of magnitude brighter post perihelion.

The observed outbursts were of short duration, lasting only several days to weeks, slowly declining in brightness. The coma morphology photographed in 1973 appears quite similar to the 15P Finlay outbursts in 2015. The comet displayed a bow shock (parabolic hood) as well as an ion tail spine.

See my images of comet Finlay at <http://members.westnet.com.au/mmatti/webpage/15P%20Finlay.htm>

At the start of March 2017, 41P will be situated in Leo, to the north west of Mu Leonis. It rises at sunset but is better viewed at midnight local time. The comet may appear magnitude 10, or considerably brighter.

Trekking northwards, it enters Leo Minor on March 6, and Ursa Major on March 13. Moonlight interferes from March 8. For Adelaide observers, the comet will drop below the northern horizon by about March 20, when it has brightened to magnitude 8 or more.

It will remain unobservable until about April 20. Hopefully it saves its best performance until after this date.

2P Encke

- Closest to Sun on 2017 March 10 at 0.33AU
- Closest to Earth on 2017 March 12 at 0.65AU
- Maximum magnitude 3 in March 2017
- Orbital period: 3.3 years

"Old faithful" was discovered by Mechain in 1786. This is one of the shortest period comets, with a period of 3.3 years, and the most observed (63rd apparition to date).

It arrives at perihelion on 2017 March 10 at 0.33AU and is closest to Earth on March 12 at 0.65AU. It will peak at 3rd magnitude but unfortunately situated too close to the Sun for observation.

However, it will make a southern hemisphere appearance in late March morning skies, fading from magnitude 6. From 35°S latitude, the comet may be first glimpsed low in the east from March 20 at 6am local daylight time, when the magnitude 5 comet will be situated adjacent to Tau1 Aquarii. (mag 5.6 for good comparison).

Visibility rapidly improves over the next weeks as the comet heads south-westwards through Aquarius.

The Moon will be 8 degrees to the north of comet Encke on the morning of March 26.

By March 27, the now magnitude 7 comet lies 13 degrees above the local horizon at 6am daylight time.

By April 1, the comet has faded to magnitude 8 and is situated 3 degrees to the north of the Helix Nebula NGC 7293 in Aquarius.

Latest information can be found on my website at: <http://members.westnet.com.au/mmatti/sc.htm>

I encourage any members to submit photos to *The Bulletin* and I'll hopefully be posting outburst alerts on ASSA chat.



Variable Vagaries

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

by David Benn



KIC 9832227 is a close eclipsing binary pair in Cygnus that is attracting some attention due to a prediction made by Larry Molnar and colleagues. Its orbital period is slightly less than 11 hours.

In this contact binary system, gas from both stars is shared to form a lopsided peanut shape. By looking at different data sources (e.g. NSVS, Kepler, Super-WASP) and their own more recent observations, Molnar et al found the period of the system to have decreased by about a second over a decade. The researchers predict that the pair will spiral closer, merge and explode somewhere between late 2021 and mid 2022, leading to a rapid brightening such that it could become visible to the unaided eye for a short time.

Such an event favours northern hemisphere observers of course since from our latitude, KIC 9832227 would have a maximum elevation above the horizon of only 10 degrees or so.

Another eclipsing binary, V1309 Sco, went through a similar transition in 2008. Along with V838 Mon and V1309 Sco, KIC 9832227 is thought to belong to the class of so-called *red novae*.

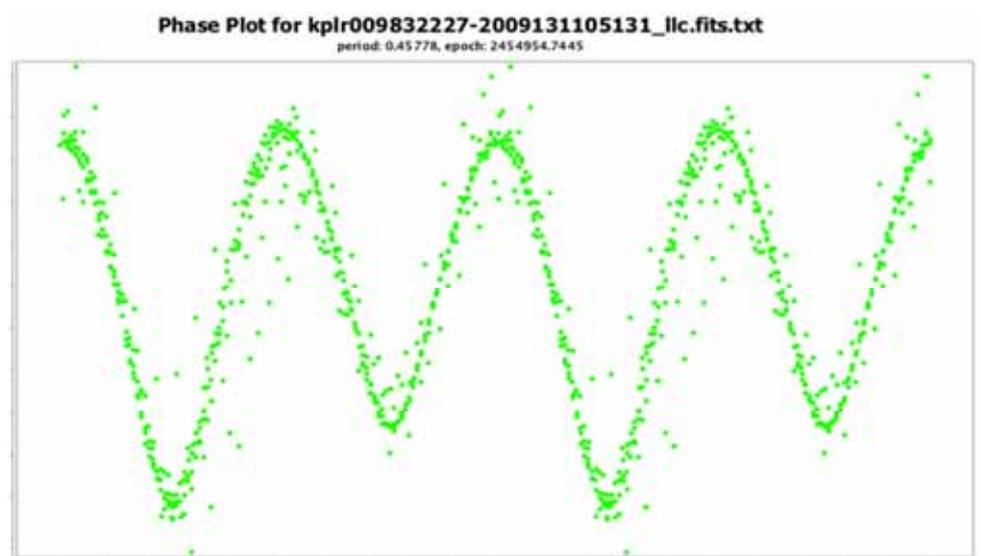
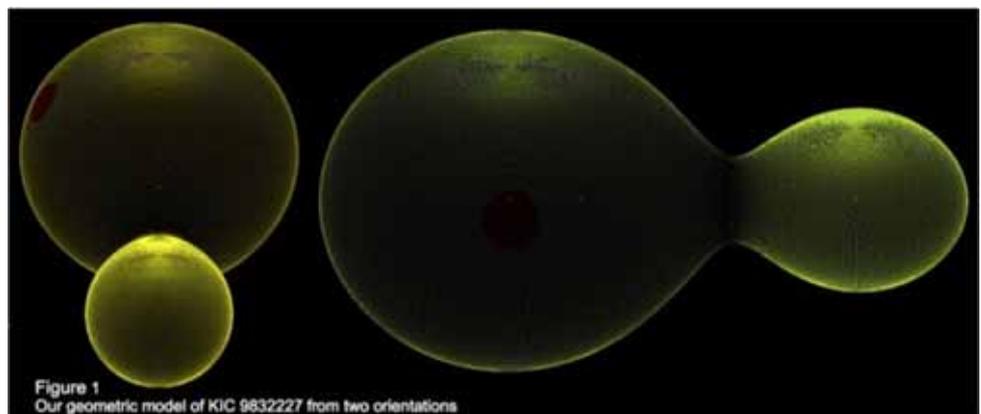
Reading the ApJ paper (see Links) shows that there are subtle aspects that the authors account for. However, it seems worth pointing out that the period change over a similar time span for V1309 Sco was a little less than 30 minutes as opposed to 1 second for KIC 9832227. I wonder what implications this has for the merger prediction, given that there are only two other red novae known? Will the rate of change of orbital decay increase substantially over the next 5 years?

Numerous instruments will be pointed at KIC 9832227 to monitor its evolution so that if it does merge and explode, plenty of data

will be available to understand the mechanism. Amateur astronomers are also encouraged to make observations between now and the predicted event. I can see that this is already occurring by looking at the AAVSO International Database (AID).

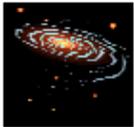
As an aside, Sky & Telescope News says that “Molnar is currently working on a website where amateurs will be able to upload their observations and which will calculate how well those data match the team’s predictions.” As mentioned above, there’s already a place to record such observations, the AID; there are also ways of accessing this programmatically (via a web service) for use in such a web site that the authors may not be aware of. I may ask whether they’ve considered that.

In any case, it will be interesting to revisit the state of KIC 9832227 in 2022.



Links

- <http://earthsky.org/space/star-predicted-to-explode-in-2022>
- <http://www.skyandtelescope.com/astronomy-news/stars-en-route-to-merger>
- KIC 9832227 ApJ paper: <http://www.calvin.edu/academic/phys/observatory/MergingStar/MolnarEtAl2017.pdf>
- VSX entry: <https://www.aavso.org/vsx/index.php?view=detail.top&oid=169823>
- KIC 9832227 Kepler data: <http://keplerebs.villanova.edu/overview/?k=9832227>
- V1309 Sco paper: <https://arxiv.org/pdf/1012.0163.pdf>



A couple of planetary nebulae in Puppis

I always enjoy looking at planetary nebulae. Imagining the raw power released during their formation, and how with some you can bring them in from invisibility to sharp view by adding an OIII filter to the eyepiece.

There's a few interesting ones in Puppis; but we'll concentrate on just 2 this month. A relatively easy target, and a challenging one.

Let's get over the hard stuff first. **Sanduleak 2-21** is about the size of Jupiter at opposition, so relatively large, and because of its dim magnitude, makes it difficult to see. Of course, being only 4 arc-minutes west of naked eye 16 Puppis (V=4.4) doesn't help either. The one saving grace is that it is very high in the sky at this time of the year. Located at RA 08:08:44 Dec -19:14:02.

It's incredible that such a large (42" x 36") and bright (?) mag 13.7 object as this was not recognised as a planetary until 1975, when Nicholas Sanduleak discovered it on plates taken on a telescope at Cerro Tololo in Chile.

Up until 1998, it was still being listed as a galaxy in the Morphological Catalog of Galaxies as MCG-03-21-004! This is one of Sanduleak's bigger and brighter objects in his catalog, as many others are much smaller and fainter. Observing this challenging object will require a dark sky and largish telescope. At least a 12". Use the star 16 Puppis to locate the field. Then, add an OIII filter. This will cause the

bright star to dim, and increase the contrast to allow you to see the planetary.

Using a magnification of 150x, the planetary looks quite striking as a crisply defined oval. There is a hint of darkening in the centre, so that it appears annular. Studies of this planetary in the early 2000's reported a number of faint OIII rings; not that I would expect any of us to see those.

Our other target is the planetary nebula **NGC 2452**, discovered during sweep 769 in 1837 by John Herschel from Cape of Good Hope using his 18.7" refractor.

Located at RA 07:47:26 Dec -27:20:06, the mag 12.6 nebula is fairly large (31" x 24") and contains a lot of detail. At the centre of this blue cloud lies what remains of the nebula's progenitor star. This cool, dim, and extremely dense star is actually a pulsating white dwarf, meaning that its brightness varies over time as gravity causes waves that pulse throughout the small star's body.

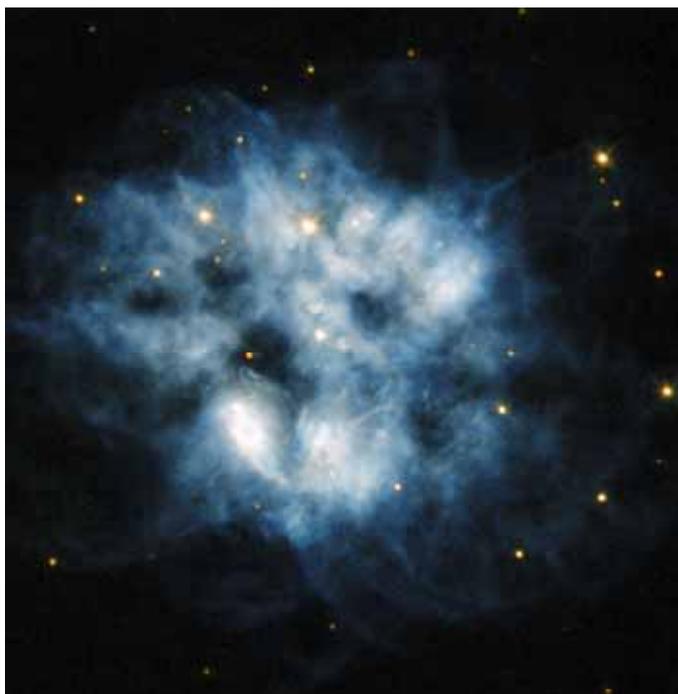
It's smaller and brighter than Sanduleak 2-21, so it stands magnification well. Use about 300x magnification. It appears as a mottled oval, with brighter patches at the southern and northern end. Again, make use of the OIII filter.

The small open cluster NGC 2453 lies 7' to the north.

Happy observing!



Above: Sanduleak 2-21 planetary nebula imaged by the 1.8m Pan-STARRS telescope from Haleakala (Maui).



Above: Hubble Space Telescope image of NGC 2452



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

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The group meets on the first Thursday of the month.

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Northern Yorke Peninsula

The NYP'pers hold combined members' and public viewing nights monthly.

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Riverland

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

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Members' Gallery

Highlighting members' astrophotos



Above: Two panel mosaic of the Chameleon Cloud Complex by **Justin Tilbrook**. 8" F/4 astrograph , Baader type III coma corrector, SDkywatcher HEQ Pro 5 mount, Orion mini guider, Unmodded Canon 1100D DSLR with Cooler box. 33 x 8 minute subs ISO 800 , flats and bias frames applied. Stacked in Deep Sky Stacker . Stitched in ICE, Processed in Photoshop CS2.

Below: Orion's Belt and the Horsehead Nebula by **Bob Ferrige**, imaged with a Nikon 180mm FL F2.8 ED lens (at F5.6) on a Nikon D3300. Skywatcher NEQ6 mount with a ASI120MC on a finder for guiding. 5 min subs - about 40 at ISO1600. Flats, darks and bias shots added. Processed in DeepSkyStacker and PhotoShop

