

Astro Flyer



OCTOBER 2023

Club News

A big welcome goes out to new members Jean-Louis Sagliocco and Xavier Brooks. May your term with the club be educational and entertaining.

Please note that if you wish to pay your club subscription by direct bank debit please include your name (first, last) in the reference line.

The official opening of the Shoalhaven Observatory on September 6th was a great success with speeches being given by MP Gareth Ward and the Uni manager Chris Hadley. Approximately 100 people attended and were given tours of the Observatory. Club members John Gould and Stephen Jones wowed the audience with their great astrophotography. Well done to all those who helped make this the great success it was!

The yearly Christmas dinner will be held on December 15th at the Bomaderry Hotel on Meroo Street, Bomaderry. The venue has been booked and I hear the food is delicious. Stay tuned for more details.

The next monthly meeting will be held at our meeting room at the Uni in West Nowra on Friday October 20th starting 7:30 PM. Please note the time change due to daylight saving.

President Frank Gross

Contents

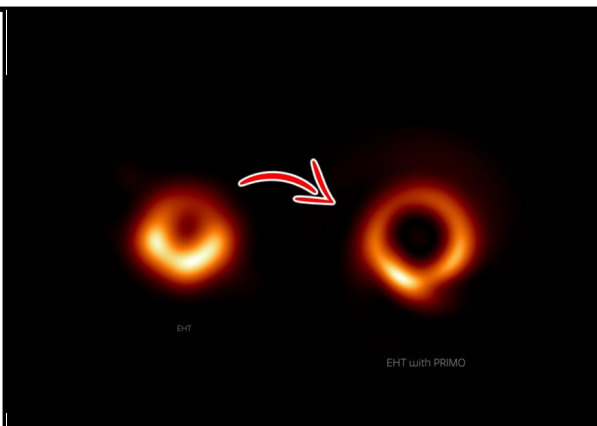
Observation Report
 Andrew Wood
 Pages 2-3

Astro Events
 Frank Gross
 Pages 4-6

30 Doradus Nebula
 Harry Roberts
 Pages 7-8

Observatory Report
 Mark Town
 Page 9

More Information and Club News
 Page 10



Viewing Nights

We are aiming, once daylight saving is over, to make observing at Friday meetings a priority if the weather permits.

MOON PHASES

New and Last Quarter moon phases are good times for Dark Sky Observing.



New Moon Nov 13th First Quarter Oct 22nd Full Moon Oct 29th Last Quarter Nov 5th

Observation Report Andrew Wood

What's on in the Cosmos – October/November 2023

Our October 20 meeting occurs five days after New Moon, with First Quarter on the 22nd. The club's viewing night at the Shoalhaven Observatory on October 21 will accompany a large waxing crescent Moon which will not set until 2am on the 22nd.

Moon Phases

New Moon	15 th October	Dark all night
First Quarter	22 nd October	Dark after midnight
Full Moon	29 th October	Enjoy the Moon – a Super Moon
Last Quarter	5 th November	Dark before midnight
New Moon	13 th November	Dark all night

Planets

Mercury is not visible during October. It will become visible near the evening western horizon from mid-November.

Venus shines brilliantly in the east before sunrise, being furthest from the Sun on Oct 24. Telescopically it will change from being half-illuminated to slightly gibbous.

Mars is hidden from view until Jan 2024.

Jupiter is at opposition Nov 3 and nearly 50 arcseconds in diameter. Prime viewing time. At magnitude -2.9, nothing apart from the Moon will be nearly as bright in the night sky.

Saturn is still prominent at about magnitude 1 in the north-western evening sky. Always a great telescopic object.

Uranus is at opposition Nov 14. At 4 arcseconds in diameter and magnitude 5.6 it will show as a blue-green planetary disc through a telescope.

Neptune at magnitude 8, a telescope is required to see the outermost of the planets. It has a disc of 2.3 arcseconds in diameter and is visible from evening until the early hours of the morning.

Comets

A plethora of faint comets are currently visible, as reported in *Astronomy 2023*. An interesting one is **Comet 62P/Tsuchinshan 1**, which is visible in the morning sky and may brighten to magnitude 8, making it an easy telescopic object. On the morning of Nov 15 it will be 1 degree north of the famous Beehive Cluster (M44).

Meteor Showers

Orionids are active from October 2 to November 7. Maximum is from late evening on October 22. After midnight when the Moon has set and into the morning of October 23 will be the best time to see the maximum of around 20 meteors per hour.

Northern Taurids are active from October 20 to Dec 10. Maximum on Nov 13, coinciding with New Moon. About 5 meteors per hour.

Leonids are active from Nov 6 to Nov 30. Maximum on Nov 18-19. From the southern hemisphere expect about 5-6 meteors per hour around the maximum after midnight.

Observation Report Andrew Wood

Cont...2

Beyond the Solar System

As darkness sets in at this time of year, with the Southern Cross now low on the southern horizon, the Magellanic Clouds take prominence. Both of these galaxies, companions to our Milky Way, have bright and famous deep sky objects as well as numerous fainter objects for anyone with a good telescope and atlas.

The most famous object associated with the Small Magellanic Cloud, the huge bright globular cluster 47 Tucanae (NGC 104), is actually part of the Milky Way's globular cluster halo, at 15,000 light years from our Sun. the SMC itself is 197,000 light years away.

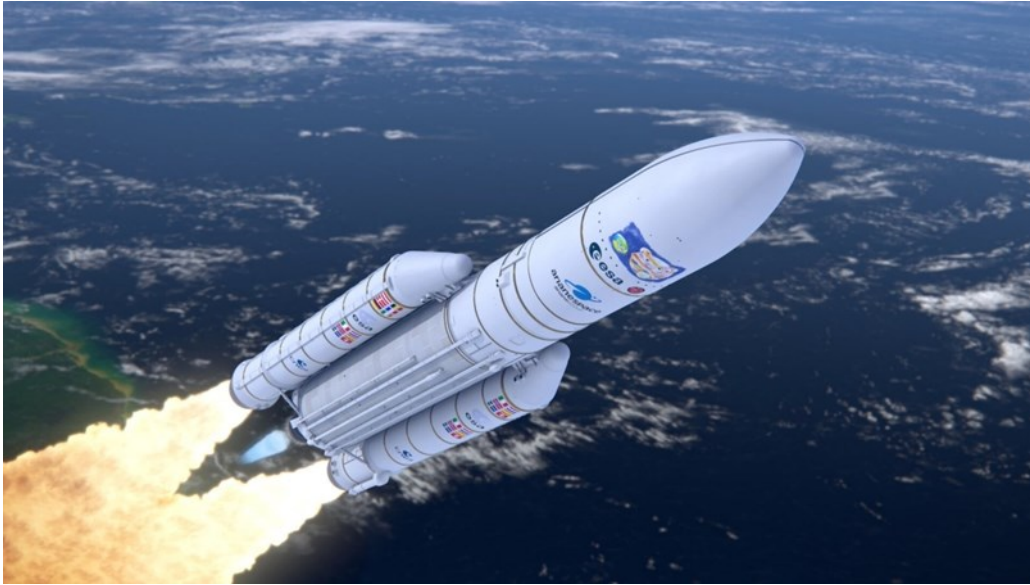
The famous Tarantula Nebula (NGC 2070) is very much a part of the Large Magellanic Cloud, 150,000 light years distant. The Tarantula is part of a complex system of nebulae and star clusters. Both 47 Tucanae and the Tarantula Nebula are visible to the naked eye under dark skies and make great telescopic and imaging objects.



The fuzzy shapes of the Large and Small Magellanic Clouds seen rising from a dark location.

Always great to read and hear reports of observations of Solar System and Deep Sky Objects made by members, either visual descriptions or via images. Write a report of your observations for the *Astroflyer* or request a spot to speak at meetings

Astro Events from Frank Gross



ESA's JUICE Mission Begins Historic Journey to Jupiter and Its Oceanic Moons

The European Space Agency's (ESA) Jupiter Icy Moons Explorer (JUICE) mission has officially set off on its historic journey to Jupiter and its oceanic moons.

Ivan Petricevic Posted on April 15, 2023

A Groundbreaking Voyage to Explore the Gas Giant's Complex Environment and the Long-Awaited Launch of JUICE

ESA's JUICE mission finally embarked on its journey to Jupiter on April 14 from the European spaceport in Kourou, French Guiana. Despite a 24-hour delay due to poor weather, the van-sized spacecraft took to the skies aboard an Ariane 5 rocket at 12:14 UTC.

The Ascent: A Step-by-Step Liftoff

Within two minutes of flight, the rocket's side boosters detached, followed by the spacecraft's protective bonnet a minute later. At the eight-minute mark, the rocket's main stage separated, and the third stage propelled JUICE into its transfer orbit.

Solar Panel Deployment and Ground Control Communication

After entering its transfer orbit, the spacecraft deployed its solar panels and established contact with ground control. JUICE (Jupiter Icy Moons Explorer) is set to embark on an eight-year voyage to study Jupiter and its three large oceanic moons (Ganymede, Callisto, and Europa). The JUICE mission goal is to study these celestial bodies using a variety of remote sensing, geophysical, and in situ instruments.

A Quest for Habitats on Icy Moons

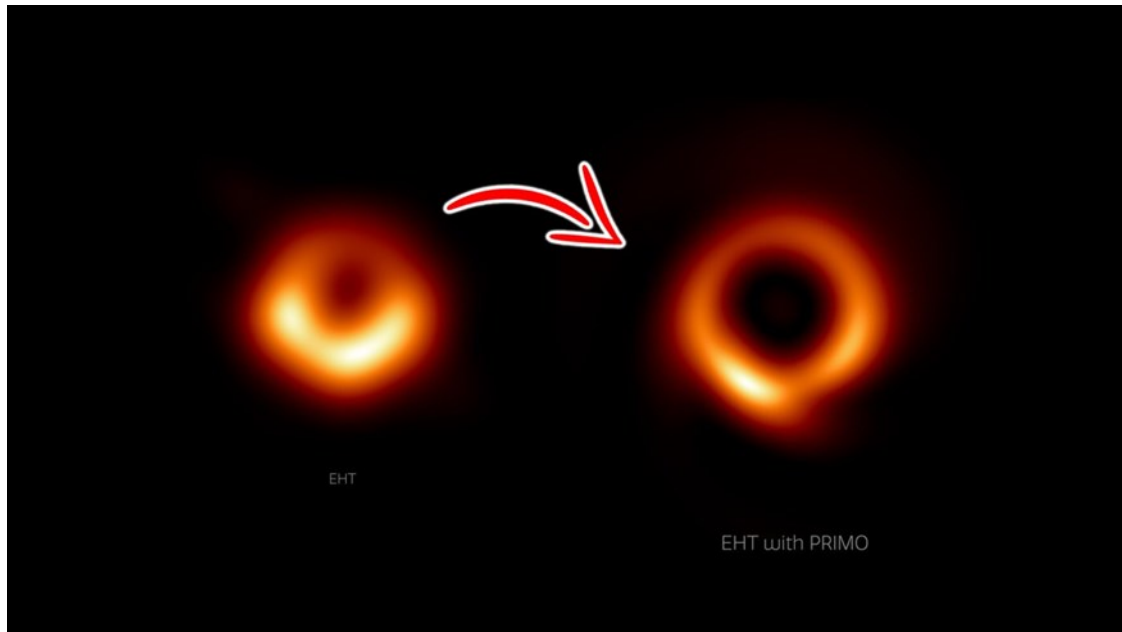
Additionally, the JUICE mission goal is to investigate these moons, which harbor oceans beneath their icy crusts, as potential habitats for life. JUICE will also delve into Jupiter's intricate environment and examine the broader Jupiter system as a model for gas giants throughout the universe.

Groundbreaking Firsts for the JUICE Mission

JUICE boasts several firsts in the solar system. The mission will mark the first time a probe orbits a moon other than Earth's, specifically Jupiter's largest satellite, Ganymede. During its journey, JUICE will perform an Earth-Moon gravity assist maneuver to conserve fuel, a first for ESA. Additionally, the mission represents the last ESA mission to launch aboard an Ariane 5 from Kourou, before the Ariane 6 takes over at the European Spaceport.

Astro Events from Frank Gross

Cont...2



Machine Learning Enhances Iconic Black Hole Image

This is the sharpest image yet of a Black Hole.

Ivan Petricevic Posted on April 15, 2023

Machine-Learning Method Sharpens Messier 87 Black Hole Imaging

A New Look at the First Black Hole Image

Researchers, including an astronomer from NSF's NOIRLab, have developed a machine-learning technique called PRIMO to improve the clarity and precision of radio interferometry images. This new approach has been utilized to create a high-fidelity version of the famous Event Horizon Telescope (EHT) image of the supermassive black hole at the heart of Messier 87.

A Makeover for the Iconic Black Hole Image

The iconic image of the supermassive black hole in Messier 87 has undergone its first official update, thanks to the PRIMO machine-learning technique. This enhanced image more accurately depicts the black hole's dark core and the unexpectedly narrow outer ring. The researchers generated the new image using the original 2017 data from the EHT collaboration and, for the first time, achieved the full resolution of the EHT.

Developing PRIMO: A Machine-Learning Breakthrough

EHT members Lia Medeiros (Institute for Advanced Study), Dimitrios Psaltis (Georgia Tech), Tod Lauer (NSF's NOIRLab), and Feryal Ozel (Georgia Tech) developed PRIMO, which stands for principal-component interferometric modeling. Their work is detailed in *The Astrophysical Journal Letters*.

Filling the Gaps in Radio Telescope Data

In 2017, the EHT collaboration utilized a global network of seven radio telescopes to form an Earth-sized virtual telescope capable of observing the "shadow" of a black hole's event horizon. While this technique enabled astronomers to capture incredibly detailed images, it lacked the data-collecting power of a real Earth-sized telescope, leaving gaps in the information. The new PRIMO technique addresses these gaps.

Achieving Maximum Resolution with PRIMO

Lia Medeiros, the study's lead author, explains that PRIMO helped the team reach the maximum resolution of the current array. The narrower ring width in the image will provide powerful constraints for theoretical models and gravity tests. PRIMO uses a branch of machine learning called dictionary learning, which trains computers on specific rules using thousands of examples.

Applying PRIMO to EHT Data

Astro Events from Frank Gross

Cont...3

When PRIMO was applied to the EHT image of Messier 87, computers examined over 30,000 high-fidelity simulated images of gas accreting onto a black hole, searching for common patterns. These results were then combined to create a highly accurate representation of the EHT observations, while also providing a high-fidelity estimate of the missing image structure. A paper on the PRIMO algorithm was published in *The Astrophysical Journal* on February 3, 2023.

PRIMO's Potential for Future Observations

The updated image is consistent with both EHT data and theoretical expectations, including the bright emission ring produced by hot gas falling into the black hole. This new image should lead to more precise determinations of Messier 87's black hole mass and the physical parameters shaping its appearance. PRIMO can also be applied to other EHT observations, such as those of Sagittarius A*, the central black hole in the Milky Way.

Continuing to Unlock the Secrets of Black Holes Lia Medeiros affirms that the 2019 image was just the beginning and that PRIMO will be a crucial tool in extracting further insights from the data underlying the image.

30 Doradus Nebula by Harry Roberts

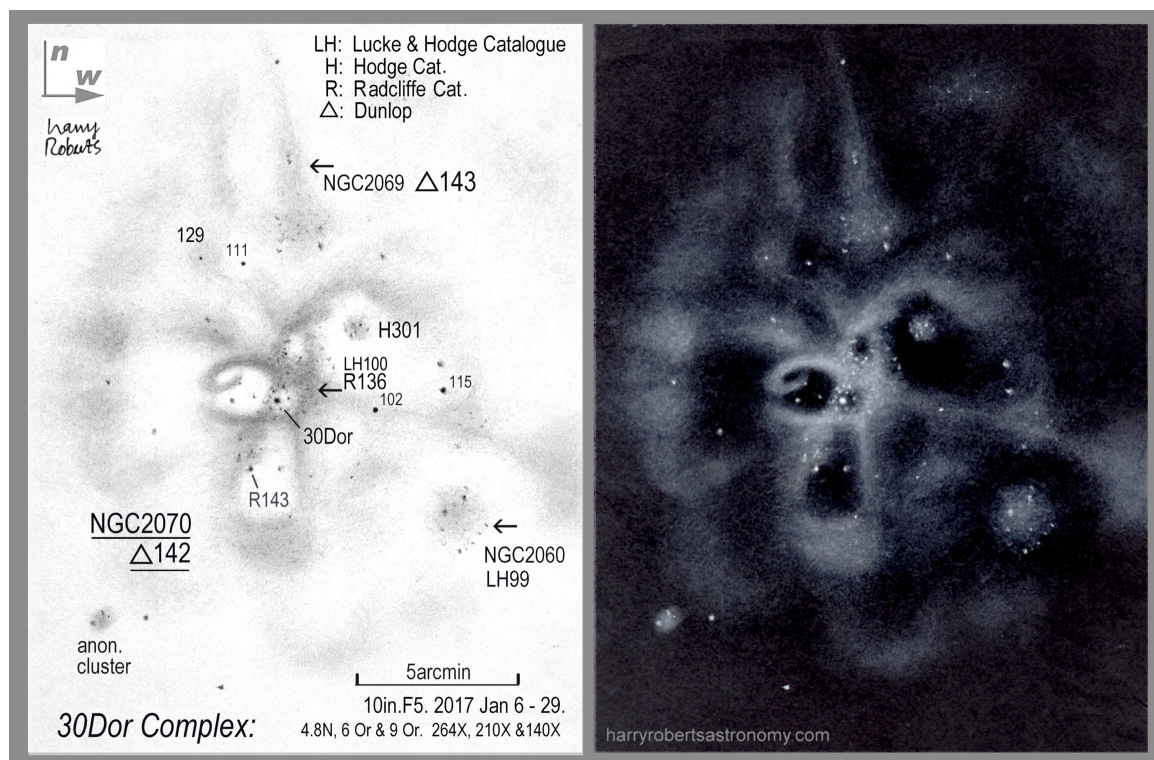
30 Doradus Nebula: Going Deeper!

The writer first viewed this nebula in the Large Magellanic Cloud in 1963: a tantalising glimpse in a four-inch 'scope - then better views with an eight-inch in 1965. It was a bewildering object! A first try at photography was made in Sep 1967; all the while hoping to soon sketch its multi-foil contortions. And fifty years later, a sketch was begun on Jan. 6th, 2017. This initial pastel was reworked over several nights until, on the 29th, it was done!

Is the 30 Dorado Nebula, or 'Tarantula', the most complex object in the whole sky? Nothing with more detail packed into the one field-of-view comes to mind. Why is this so? 30 Dor. is an enormous object, some 1000ly in diameter (160Kly distant), comprising multiple looping nebulous 'clouds', twined around four or five star clusters or stellar associations. Here and there are compact dark voids, darker even than the surrounding LMC background. At its centre, bright 'trunk-like' structures writhe, as if tied in knots. This is the largest known HII region and nothing in our Galaxy approaches its size.

Compare familiar Milky Way HII regions, like Orion's M42 for example, and we see just one O-type star (Theta1Orionis) illuminating the whole nebula; or M8, the 'Lagoon', where 5 or 6 O-types light-up that nebula. In 30 Doradus hundreds of O-types are involved (along with myriad B supergiants and WR types).

The LMC galaxy is much smaller than our Galaxy: why then does it contain such a huge HII assembly? Clearly, something happened 'recently' to remodel the two Magellanic Clouds - and it triggered a burst of HII and 'blue-knot' star formation, in a dynamic process involving both clouds. By 'recent' we mean between 1 to 10Myr.



Sketch. The 'old-era' ten-inch f5 was used, with a dark head cover and observing seat. During the six sessions a variety of eyepieces were needed; old narrow-field orthoscopes gave the best contrast for the faintest nebulae and the faintest stars: most star clusters or associations were partly resolved. At least fifty stars pepper the fov (Fig) with maybe 100 resolvable.

30 Doradus Nebula by Harry Roberts

Cont...2

As usual, the sketch got bigger as outer loops or streamers were seen, until it overflowed the A4 page; attractive features often 'swam' into view beyond the fov! Clearly the 'Tarantula' is only the brightest part of a fainter field, very much larger than the sketch. Some star positions are approximate only. At completion, about ten hours had been spent at the scope.

Catalogues. The 'Tarantula' is so large and complex that historic attempts at labels give some confusion. The 'whole' central nebula is NGC2070, while the stellar association and nebula streamers 5arcmin to the north is NGC2069. A large cluster with nebulosity 8mins to the SW is NGC2060, yet it lies within the outer 'clouds' of 2070, as does 2069! 'Jamie' Dunlop has two 'objects' attributed to him: NGC2069 is D143 and 2070 is D142, it seems. More recently smaller features, particularly clusters, have gained 'tags'. The cluster that holds 30Dor is R136 (Radcliffe) but also LH100 (Lucke and Hodge) as well as SL633! Which 'tag' has primacy? As 'scopes get better at recording details the need for catalogue numbers increases. Clusters are important for work on stellar spectral types and luminosity classes that yield ages and masses etc. for their members.

A negative of the sketch (Fig) has been captioned with (I hope) the correct labels. Current papers show, for example, that tiny cluster H301 (Hodge) is ten times older (10Myr) than the dense OB swarm of supergiants that comprise R136, including 30Dor, due mainly to a burst of 'second-generation' giant stars therein. Despite this, a tiny but 'pretty' cluster with 2 or 3 stars resolved, 9arcmin SE of 30Dor is, it seems, anonymous. Some star magnitudes are shown (Fig) for reference purposes. The fov centre is ~05h39m, -69°07'.

NGC2060. Most of the 'Tarantula's' components are intriguing objects in their own right, albeit distant. For example, the NGC2060 cluster of supergiant stars (LH99) has within it a supernova remnant including a compact X-ray source and a pulsar much like the 'Crab Nebula' M1.

Dark voids. Some parts of the 'Tarantula' appear darker even than the surrounding LMC background. Why? Most notable is the one on the E side of star 30 Dor. It is surrounded by twisted bright 'trunks' and may be, in part, a contrast effect. Yet Hubble images show it is an 'empty' void – presumably blown by extreme stellar winds from 30 Dor and its 'friends'. Two or three others are also not dark dusty regions, but true voids blown by supergiants – as seen elsewhere in the LMC, such as in the N11 Nebula (i.e. NGC1760, 61, 63 and 69).

Filters. These were little used on this object – but an H-beta filter strongly enhanced the nebula, as well as many others outside the fov – including the curious 'blue-filaments' 1.5 to 2deg N of the 'Tarantula', that maybe the subject for a future sketch. H-beta response is not often strong on Milky Way objects, but may be better with LMC objects.

Sketching the unique 'Tarantula' was a rewarding, if challenging, project – too long delayed. But it was made easier by the somewhat darker skies of the writer's backyard.

Clear skies!

Observatory Report Mark Town

The RC-14A , the Esprit 100 and the Evostar 72 are now all mounted on the CEM120 mount (see picture). And the observatory can now be used for some basic operations.

Training in the use of the observatory is now available and will be delivered to interested SA members on a demand basis. To use the observatory you need to do at least the first 3 training modules:

- Work Health & Safety
- Observatory Overview, and Manual Visual Observing.

The training is easy to do and done in the observatory in small groups so each person gets some practical experience of using the systems. I encourage all of you to get the training so you can start to enjoy the observatory and what it can offer SA members.

Time on the observatory can be booked via the Members Area / Observatory Activities page on our website. You will need a username and password to login so message or email myself for that information.

**Best Regards,
Mark Town**

Club News

The AGM was held at the July 2023 monthly meeting. Elected officials for 2023- 2024

Executive

President: Frank Gross
Vice President: Laurence Wakelin
Secretary : Andrew Wood
Treasurer: Frank Gross
Public Officer; Frank Gross

Andrew Wood
Mark Town
John Gould
Ian Scott

Operation Positions

Website Manager: Steve Holloway
Observation Officers: Andrew Wood, Mark Town and John Gould
Editor: Kaye Johnston
Librarian: Chris O'Hanlon
Equipment Officer: Andrew Wood

Committee General Members:

Laurence Wakelin
Frank Gross
Andrew Wood
Mark Town
John Gould
Ian Scott

Club Notices

Astronomy yearbook and calendar

This year, we will not be ordering these publications to sell to members. For anyone wanting to purchase them, the details are as follows:

Astronomy 2024 can be purchased through Quasar Publishing <https://quasarastronomy.com.au/> . This publication, once it becomes available, can also be found in bookshops and newsagents.

Astronomy Calendar 2024 can be purchased through Astrovisuals <https://astrovisuals.com/> .

National Australian Convention of Amateur Astronomers (NACAA)

NACAA will be held in Parkes over the Easter weekend of 2024. See <https://nacaa.org.au/2024/programme> .

Dear Members of Shoalhaven Astronomers

This is a reminder to members who paid last year, and have not yet paid membership for 2023-4, that fees are due. My apologies if there has been a mistake. If you have paid let me know and I will check with our treasurer Frank Gross. I know that in some cases illness may be a factor at the present time.

Payment (\$30) can be made at club meetings. The next is Fri Sep 15 at 7PM

Or Pay by direct deposit into the club IMB account – Please ensure your name is in the reference section. BSB 641800 Account 009135475

Hoping for your continuing membership – the Shoalhaven Observatory is now open and functional!

Kind Regards Andrew Wood Secretary

Check out the Astro Flyer on the web site: www.shoalhavenastronomers.asn.au

Shoalhaven
Astronomers
PO BOX 1053
Nowra NSW 2541

**The deadline for Articles for the Astro Flyer is
The First Friday of the Month.**

Editor Kaye Johnston