Shoalhaven Astronomers Inc.
www.shoalhavenastronomers.asn.au

Volume 22
Issue 7

Astro Flyer

JULY 2022

Club News

From The President

Your new management Committee met for the first time prior to last month's meeting and resolved some longstanding issues and started action on some needed changes. The highlights were:

- Fees have increased slightly – our secretary Andrew Wood has written to you all with information about the fee structure and the payment schedule.
- Observing nights will be reinstated – Freya Bates and Andrew woods are coordinating that issue and will have some information for you soon.
- Outreach activities – John Bambury is managing the Jervis Bay Brewing Co. outreach event now on the 13th July **NOT** 12th! Frank Gross has agreed to manage an outreach event with the Maritime Museum on 20th August.

Observatory – initial discussions with the council regarding development approval have started with John Gould and Mark Town jointly managing that activity.

We need to expand our line-up of speakers for our meetings and again I call on the members to step up if you are able. The committee will be looking into the availability of guest speakers to increase our range of content. We will keep you posted as that activity progresses.

Keep on watching Cheers Mark Town

Next Meeting July 15th 6.30 for 7pm winter time.

Contents

MOON PHASES

New Moon	First Quarter	Full Moon	Last Quarter
July 29	Aug 5	start→July14	July 20

Viewing Nights

VIEWING NIGHTS
Starting again

Club viewing nights are selected to provide viewers with the best possible conditions for good viewing. They are held on specific Saturdays at different locations around Nowra.

Dates & Locations

Sat July 30th Woncur Rd
Sat Aug 27th Uni
Sat Sept 24 Woncur Rd
Sat Oct 22 Uni
Sat Nov 26 WoncurRd

More Club Information Including viewing site Directions Page 15

OUT THERE BY BOB TURNBULL
OBSERVATION OFFICER

June - July 2022

Hello once again! Well I'm not sure how to give you a firm-viewing program because of the poor visibility of our night sky, however I'll attempt to do my best.

Highlights – June

Venus and Uranus close
Mars and Jupiter close
Mars and Moon close
Moon and Uranus close (but occulation from Western Australia)

Constellations

Winter solstice on 21st gives longer darker periods to gain clear skies for at least 4 months, so if we continue to persist with our viewing it's more than likely to get at least some good sky conditions.

Looking at the three asterisms (dippers) which are visible on winter maps on 4 & 5 (pages 90 & 91) in your Astronomy Australia 2022. Pages 50 & 51 give the detailed directions.

Planets

Mercury traversing Taurus in the Eastern morning sky. It reaches its greatest elongation of 23° West of the Sun on the 17th, which is an excellent time to see this small world before dawn.

Venus and Uranus are 2 degrees off each other from the 11th – 13th.

Mars rises at 2am in the Eastern sky in Pisces,

Jupiter: remains a morning object during June. Close to Mars on the 1st then splits to widen away from each other.

Saturn rises late in the Eastern sky but goes into regression.

July

Refer to pages 54 & 55 for the June and July variations of the Planets changes in apparent sizes.
Page 59 gives 4 maps of the positions of the planets and later Venus in the dawn sky.
Check out the half page of the Moon and read about the *Messier Twins.*

Good viewing of the longer, darker sky.

Bob Turnbull

Astro Events from Frank Gross

Astronomers Spot a Cosmic Object Speeding Through the Milky Way at 2.5 Million Mph


Ivan Petricevic

It is traveling at a speed of 2.5 million miles per hour, or nearly four million kilometers an hour, or if you prefer, 700 miles per second (1,127 km/sec).

There's a strange *star* speeding through our galaxy at an unfathomable speed. **PSR J0002+6216** was spotted by astronomers traveling through our galaxy like a lone runner at a speed of 2.5 million miles per hour, nearly four million kilometers an hour, or if you prefer, **700 miles per second (1,127 km/sec)**

PSR J0002+6216 is traveling at **1,1,127 kilometers per second** which means that if it were traveling from Earth to the moon, it could get to its destination in less than 6 minutes.

The star was seen as it zoomed away from an expanding cloud of a recent supernova explosion. As it makes its way through the galaxy, it leaves behind a massive cosmic trail after punching through the explosion's outer shell of debris. Astronomers have revealed that the tail extends around 13 light-years and is seen pointing back to the supernova center.

PSR J0002+6216 is a type of neutron star called a pulsar. A pulsar is a highly magnetized rotating neutron star that emits a beam of electromagnetic radiation. These types of stars have a mind-bending fast spin rate, which causes them to emit jets of electromagnetic radiation as they spin. This pulsar spins 8.7 times a second. As the star spins on its axis traveling through space, if the jets of electromagnetic radiation line up with Earth, we see them as a kind of cosmic lighthouse.

A cannonball pulsar

Cont...2

"Thanks to its narrow dart-like tail and a fortuitous viewing angle, we can trace this pulsar straight back to its birth-place," explained Frank Schinzel, a scientist at the National Radio Astronomy Observatory (NRAO).
"Further study of this object will help us better understand how these explosions can 'kick' neutron stars to such high speed," Schinzel added.

PSR J0002+6216 is located some 6,500 light-years away from Earth in the constellation Cassiopeia.
According to astronomers, the pulsar is located around light-years from the center of a supernova remnant called **CTB 1**.
PSR J0002+6216 was found to be traveling through the galaxy five times faster than the average speed of a pulsar.
Astronomers say that PSR J0002+6216 is faster than 99 percent of Pulsars with measured speeds.

Scientists grow plants in lunar soil – and find bad news

Scientists grow plants in lunar soil – and find bad news
Jon Kelvey
Fri, 13 May 2022

The good news for proponents of space colonization is that scientists have shown you can grow plants in Moon dirt. But the bad news for anyone envisioning a lushly verdant lunar astronaut salad bar is that plants grown in lunar regolith don't grow very well and are generally stressed out by the experience.

In a new study published Thursday in the journal Communications Biology, researchers at the University of Florida grew plants in lunar regolith from Nasa's Apollo missions for the first time, comparing their growth to that of plants seeded in terrestrial volcanic ash.

The lackluster performance of the plants grown in the Apollo samples presents a challenge for proponents of in "situ resources utilization," the term for astronauts creating their water, oxygen, fuel, or in this case, food, from resources found on an extraplanetary body rather than pack them from home.

The researchers seeded Arabidopsis thaliana, a small flowering plant more commonly known as thale cress, either in samples of lunar regolith brought back to Earth by the Apollo 11, 12, and 17 missions, or in a volcanic ash-based control soil designed to mimic lunar regolith. The plants seeded into the Moon samples grew slower, smaller, and showed more signs of stress such as pigmentation and the expression of stress-related genes, than those grown in the volcanic ash.

And while the plants grown in volcanic ash developed more or less uniformly, the plants grown in the Apollo 11 samples fared worse than the plants in the Apollo 12 and 17 samples, suggesting variability in the samples. The Apollo 11 sample, for instance, was exposed to solar and cosmic radiation the longest, and the researchers theorize the effects of that long-term energetic bombardment could have left the lunar regolith particularly reactive to biology.

The study is the first to attempt growing plants in lunar regolith as the primary growth medium, and the results contrast with those of experiments conducted in the 1970s.

During the Apollo program, researchers crumbled lunar regolith, giving plants growing in terrestrial soil a veneer of Moon dust, and found the plants actually thrived compared to controls. The experiments were mainly focused on ensuring no unknown pathogens or toxins lurked in the Moon samples astronauts brought back, and researchers believed the additional nutrients were responsible for the plants' growth.

Seeds taken to the Moon by Apollo astronauts and returned to Earth were then planted, with many successfully growing into mature "Moon trees," but the experiment addressed the viability of seeds taken to space, not seeds in soil from space.

More recently, in 2019, an experiment on China's Chang'e 4 lunar lander successfully germinated seeds on the Moon for the first time, but did so in a sealed container using Earthly soil.

The current study's takeaway is that growing crops on the Moon will not be as easy as simply putting up a pressurized greenhouse and planting seeds. As with other experiments with in situ resource utilization, more research is needed.

Astro Events from Frank Gross

Cont...3

Space agencies like Nasa and the European Space Agency are currently researching many different technologies for utilizing resources found in space so that astronauts do not have to pack everything they need with them from Earth. Esa scientists are studying how to extract oxygen from molten lunar regolith, for instance, while an experimental device on Nasa's Perseverance Mars rover is extracting oxygen from the Red Planet's thin atmosphere.

Nasa plans to return to the Moon in 2025 as part of the space agency's Artemis program, which aims to use the Moon as a practice zone before a mission to Mars in the early 2040s. Astronauts spending weeks or months on the Moon will have ample opportunity to experiment with in situ resource utilization, including ways of modifying lunar regolith to be more friendly to plants.

And it could take a lot of experimentation, according to the present study's authors.
"Further characterization and optimization would be required before regolith can be considered a routine in situ resource, particularly in locations where the regolith is highly mature," they wrote in the paper.

NGC5189: Planetary Nebula in Musca by Harry Roberts

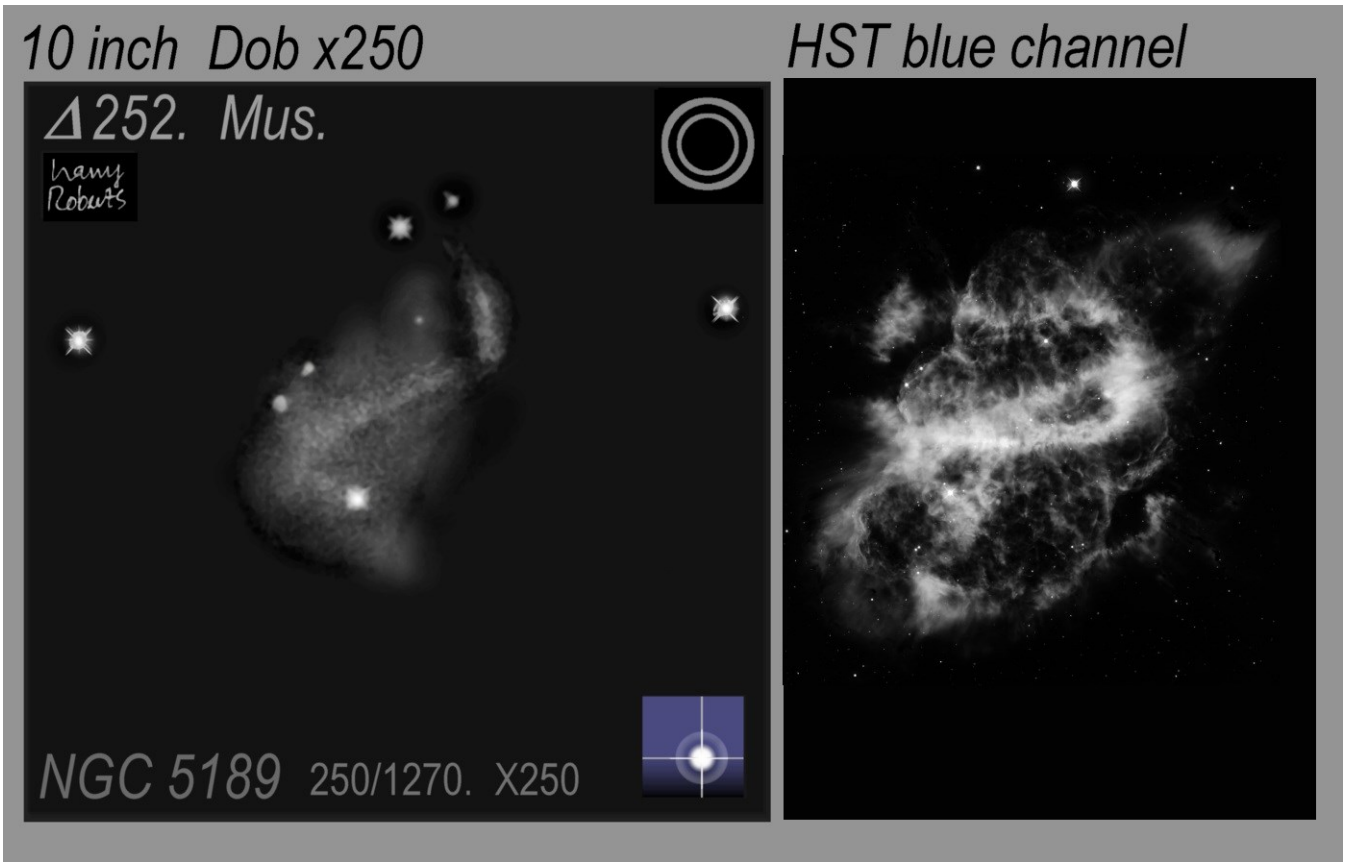
NGC5189

History. NGC5189 is a strange object, first logged in 1826 by 'Aussie'[1] James Dunlop at his Parramatta home 'observatory' with a 9 inch reflector; he was in a big hurry! His 'boss', Rumker, having clashed with Gov. Brisbane, had quit to live in Camden and Brisbane was busy governing. So Dunlop set out to record the entire southern deep sky from his own backyard and had about a year in which to do it! His Catalogue is a remarkable feat.

He viewed Dunlop object 252, NGC5189, only twice and wrote: "A very faint nebula about 25" (arc sec) diameter" noting some nearby stars. Clearly, he thought it a nebula of some sort, but not a planetary nebula (PN). It is now recognized as a type of planetary, gaining the Perek Kohoutek designation PK 307 -3.1. His position for D252 (when precessed) is very close to the modern site.

What do we see? In an 8 or 10 inch scope we see an irregular 'branched' object that is fairly bright for a PN, with a wide central bar and 'arms' at each end –like a barred spiral galaxy (Fig, left). I've not been able to see any colour, just a neutral grey. OIII filters help a little. Several stars are involved though the central star, the source of the nebula, is invisible. While 'Jamie' had it 25 arc sec in size, the modern value is 150 arc sec.

Modern images (Hubble etc.) show the object's size is about twice what we can see, mainly due to its outer 'streamers' being red H-alpha emitters. Our eyes don't see H-alpha unless the source is very bright, so our view is mostly of the inner blue-green OIII and H-beta parts. If we take the blue channel of a Hubble image (Fig, right) and compare it with what we see in a ten inch 'scope we find the major parts of the planetary are visible in our 'scopes – but the outer red 'bits' are not.



NGC5189: Planetary Nebula in Musca by Harry Roberts

Cont...2

While at first 5189 was classed as an emission nebula, it is now confirmed to be a planetary nebula PN (Wiki) with streamers or 'jets' of ejecta from a central star that has recurrent outbursts and is "a rare low mass WR primary with a white dwarf companion". As the main star rotates the jets form an abstract shape rather than the familiar spherical shell of most planetaries. N5189 is sited just 2600ly away, presumably in the Carina arm of our Galaxy.

Yet N5189 can be hard to find. It is just SE of the "Coal Sack" dark nebula (see "Astronomy 2021" Map1). It is well worth finding as this type of PN is rare. While at times called the "Spiral Planetary" it is not a widely known object despite its central location in our sky. were it a northern hemisphere object it would have a common name and be very well known. With high magnification the "Spiral Planetary" is an impressive sight – take a look. Clear skies!

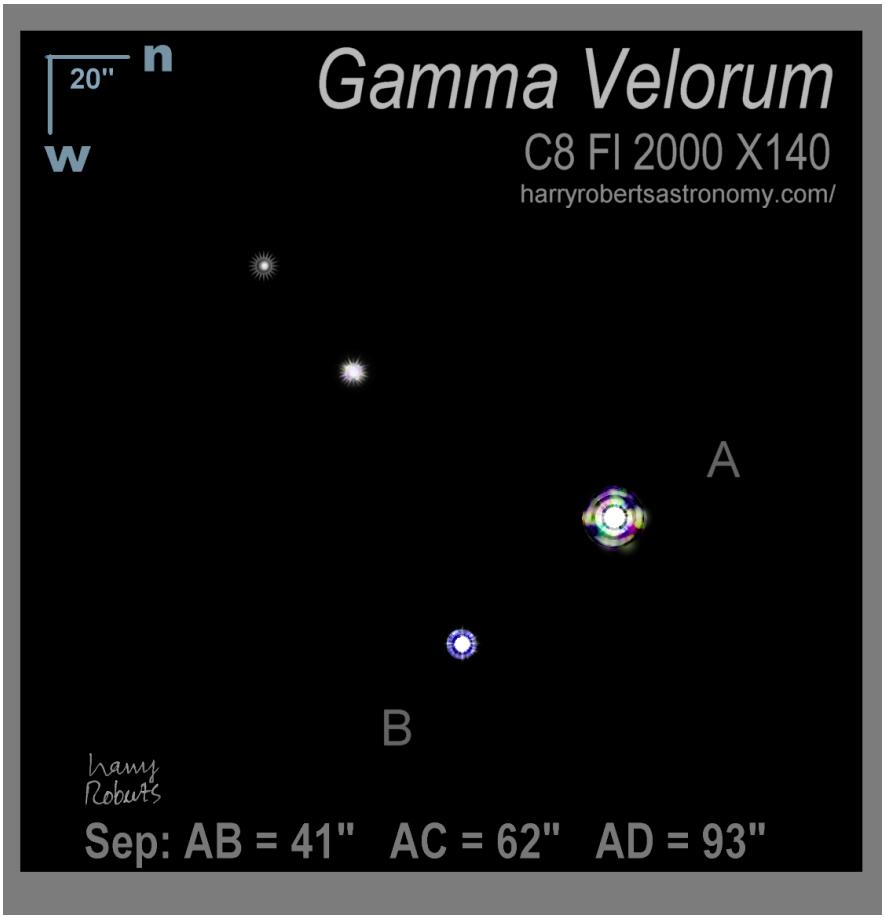
1 Ive dubbed Dunlop an 'Aussie' since, like some early arrivals, he returned to live in Australia after his 'stint' and is buried at Kincumber on the central coast, where his lathe and parts of the 9inch 'scope are held in a small museum.

Exotic Spectra: Gamma Velorum by Harry Roberts

In the southern sky, in ancient Argo Navis, is the brightest Wolf-Rayet star in the sky: **Gamma Velorum**. A bright naked eye star –it's remarkable for many reasons, particularly its rare spectral type.

Gamma Vel. is a multiple star with four components visible in a small 'scope, and the primary Gamma^2 is itself an unresolved double, a pairing of type **O9** with a **Wolf-Rayet WC8** – making it both the brightest O type in the sky as well as the brightest WR star, with a combined magnitude of 1.8. The next brightest type O is nearby Zeta Puppis at 2.2mv.

In a small 'scope Gamma is a stunning sight (Fig) – with a distinct dash of pale yellow and violet in its Airy rings – hinting at the extreme temperatures of the primary. R. H. Allen described the star colours as *"white, greenish-white and purple",* and while such terms can be fatuous, the bright bands in the WR spectrum do, maybe, give it a green tint, and violet is also strong.

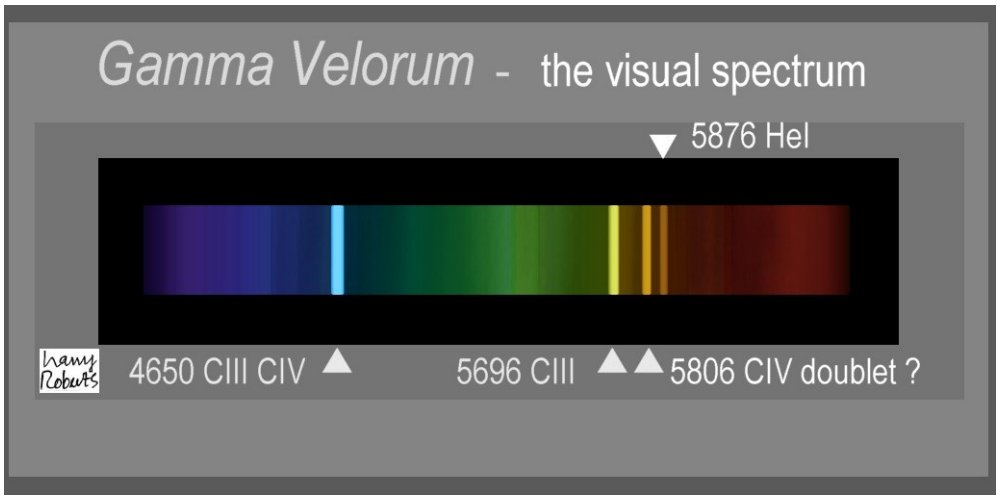


Kaler tells us that O types are rare among the naked eye stars, paradoxically so, as they are the brightest of all stars. Yet none are close - just as well for us, as we wouldn't want one for a near neighbour – and Gamma Vel is 1200L.y. away. Type O stars are hot and massive, and the WR stars are even hotter, ~70,000K, with violent mass-loss winds. Gamma^2 is also a prime supernova candidate - but what of its spectrum?

Exotic Spectra: Gamma Velorum by Harry Roberts

Cont...2

Gamma[2] , the spectrum. My first view was with a small prism, and some detail was seen that way - but a stellar spectroscope, such as the Baader does a much better job, showing a stunning spectrum for the star (Fig).



Gamma Velorum's spectrum is bright in an 8-inch scope, with vivid emission bands, as the figure shows. What do we see? We'll let Scottish Astronomer Royal, Ralph Copeland (1883), answer:

"Its intensely bright line in the blue, and the gorgeous group of three bright lines in the yellow and orange, render the spectrum…incomparably the most brilliant and striking in the whole heavens. A vivid continuous spectrum extends into the violet as far as the eye has power to follow it, and accounts for the brilliant whiteness of the star."

This classic description captures the sense of wonder that every viewer must feel when seeing the spectrum for the first (or fiftieth) time! Why the gaudy bright bands?

Kaler again: Wolf-Rayet's are 'windy' stars that have shed their hydrogen envelopes, *"exposing deep helium-rich layers, heavily contaminated with by-products of nuclear fusion".* And *"Relative to helium, carbon is typically enriched by a factor of 100, the product of the fusion of helium."*

Hence the bright blue line is carbon, the 'C' in Gamma's spectral type **WC8**. It is, in fact, a blend of two emission bands, CIII and CIV, sited at 4650Å.

Of the "gorgeous" lines, the brightest lemon yellow one is CIII at 5696 Å; and the strongest orange line is, probably, HeI at 5876 Å. So the emission lines reveal the chemical abundances in this highly evolved and active star. There are two kinds of WR stars, Gamma is the carbon kind, WC8, and there are some where nitrogen dominates, the WN type.

The spectrum shows what the eye sees – and the human eye does not see far beyond 6500Å in the red, or beyond 4000 Å in the violet.

It is no accident that Gamma Velorum and Zeta Puppis are close, within the envelope of the vast Gum Nebula, a supernova remnant, sited about RA 09h, Dec 45ºS in Vela –part of an active region of star formation in a nearby arm of our galaxy.

If Gamma is the brightest Wolf-Rayet star listed, the next six are much fainter, from magnitudes 5.9 down to 6.9, all far southern stars – and tougher prospects for a visual observer.

Exotic Spectra: Gamma Velorum by Harry Roberts

Cont...3

Astrophysicist Cecilia Payne-Gaposchkin once listed her moments of "*revelation"* in astronomy – her *"white stone"* days. It was a short list – and number one was? - *her first view of the spectrum of Gamma Velorum!*

For some reason spectroscopes are uncommon gear - yet gratings have never been cheaper. Beg, borrow or buy one – and enjoy a moment of *revelation:* view the most amazing spectrum in the entire night sky.

1 Kaler, J. "Stars and Their Spectra" Cambridge Uni Press. P203 -
2 The quote is often attributed to Agnes Clerke, but other material suggests the words are those of Copeland himself.

Southern Gems: Jewel Box by Andrew Wood

I think it was September last year I submitted an article about 47 Tucanae, the second entry from Stephen O'Meara's *Southern Gems*, which details 120 deep southern sky objects. Since then, we've experienced some quite wild and unusual weather. Finally, June 22 found me free and in my Wollongong backyard under a clear moonless sky.

Southern Gem number 58 in O'Meara's book is the open cluster NGC 4755, better known as the Jewel Box or Kappa Crucis. This bright, well-known cluster is a suitable target for a decent suburban sky.

Well known as it is, I was in for a surprise when I consulted my own records. I've kept notes of the deep sky objects I've observed for more than 20 years, yet found that, despite having observed the Jewel Box many times, I have never made a written record. Perhaps on numerous viewings I'd just assumed I'd made a note. This night, then, was an opportunity to record more detailed notes than I usually make.

Located in the Southern Cross near Mimosa (Beta Crucis) – see Figure 1 – the cluster appears as a star to the naked eye. Hence its Bayer designation Kappa Crucis.

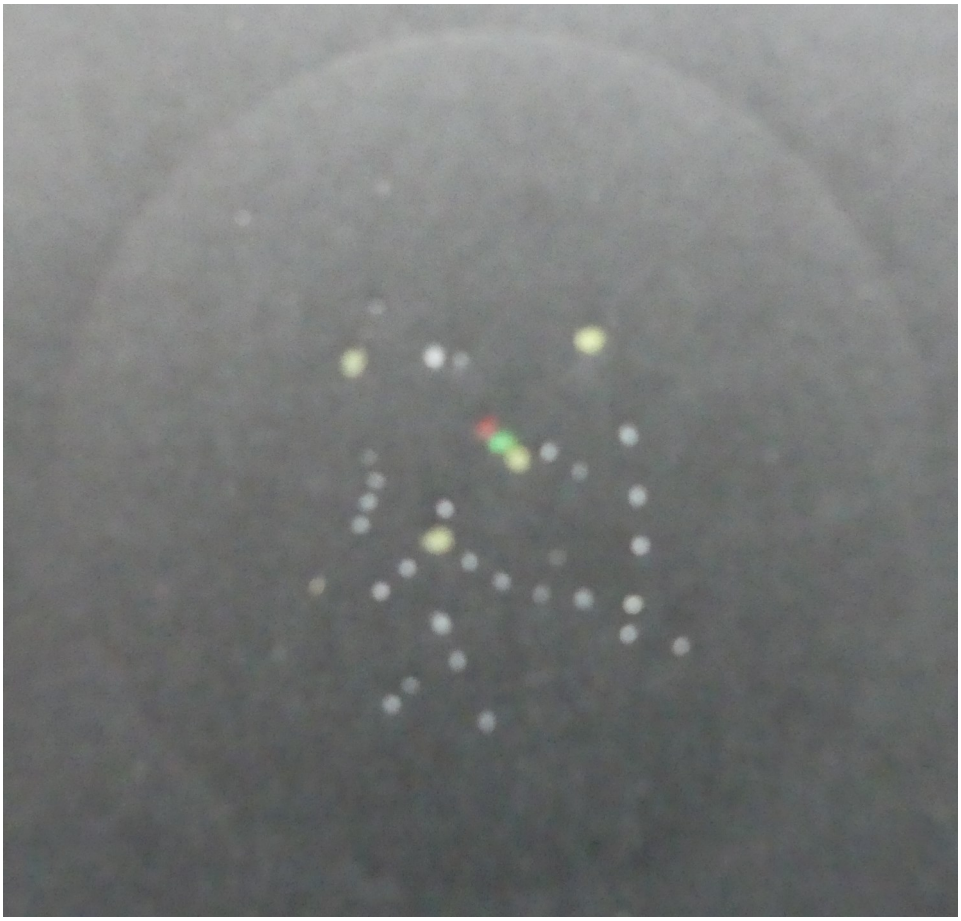
Using 10x42 binoculars, Kappa becomes a tight triangular knot of stars, the brightest point being at the SE corner of the triangle.

Through a 120mm achromatic refractor using an 8-24mm zoom eyepiece, at low power it really does appear like a bunch of jewels in an otherwise not very rich field. The three brightest stars make up the corners of an isosceles triangle. About halfway along the south side of the triangle are three stars myself and other observers I've been with have termed the 'traffic lights'. The innermost of these is distinctly red in colour while the outermost is yellow. The star in the middle is fainter and duller in colour. I think of it as the 'green' traffic light. Along with a star about a third the way between the stars of the opposite side of the triangle (this star has a much fainter companion), the cluster has seven prominent stars. the 0.8-degree field.

Southern Gems: Jewel Box by Andrew Wood

Cont...2

Around the bright SE star is a smattering of fainter stars. There are also many stars off the E side. With the eyepiece at 8mm (75 times magnification), there were about 20 individual stars visible that looked to be part of the cluster. The cluster took up a small part of the 0.8-degree field.



Moving the zoom eyepiece to a 250mm Newtonian, the brightness of the cluster of course increases as do the number of stars to 40 or so. At 175x, the cluster takes up about 20% of the 0.4-degree field.

The Jewel Box is a bright, rich, compact cluster with some distinct colour in its members. I have a long way to go to reach Harry Robert's quality, but Figure 2 is a sketch I composed from my observations.

According to O'Meara, there are 281 known members of the cluster in an area 10 minutes of arc across. Obviously, getting to a fully dark sky away from light pollution and with larger aperture will reveal an even richer cluster than on this night in a suburban backyard.

NGC 4755 is 4,900 light years from the Sun and its stars inhabit an area 1114 light years across. As O'Meara says in *Southern Gems*, the inhabitants of any stars in the cluster would have a glorious night sky.

Wide-field Digital Astrophotography by Andrew Wood

In the last two issues of the *Astroflyer* I've described using a Panasonic FZ300, a non-DSLR digital camera not designed for astrophotography, to take images of the Moon and Sun. The FZ300 zooms from 25 to 600mm in focal length. The longest focal length was used for lunar and solar images.

Recently I was at a sight between Wollongong and Sutherland to do some observing. This site has of course skyglow to the north and south but at high altitudes the limiting magnitude of stars is 6.5. Using the camera at its shortest focal length, I placed it on a tripod and aimed at the area around Scorpius, which had risen high in the east.

The photo is a 30 second exposure at 25mm focal length, f2.8, ISO 400. It took a few attempts. Looking through the electronic viewfinder of the camera, the stars weren't visible. Using manual focus and setting the focus to infinity, however, gave decent star images. Still, getting the right area of sky took a few adjustments of the tripod head after each image. Even using shutter time delay resulted in star tailing due to the opening and closing of the shutter. Putting a black object – I used my mobile phone cover – in front of the lens until after the shutter opened then when it was due to close gave a much better result.

A pleasing feature of the FZ300 that I didn't know about until I tried long exposure was that it automatically carries out a blank exposure, a "dark", for the length of time of the actual exposure.

The resulting image is a wide field showing the prominent constellation Scorpius. Also visible are Sagittarius, Corona Australis, a good portion of Ophiuchus and other smaller constellations. Checking a star atlas, the image appears to show stars to magnitude 6. Turning up the ISO would show fainter stars. It's something I could experiment with, but this image gives a realistic view of the stars visible at a dark location. What is exaggerated is the star colours. Hues that are subtle to the naked eye are brought out prominently with the long exposure. The concentrated stars and dark lanes of the Milky Way are also prominent, as are a few deep sky objects if you use an atlas and look closely.

Wide-field Digital Astrophotography by Andrew Wood

Using film cameras, wide field shots of constellations was the easiest way to try a bit of astrophotography – but you had to wait for the film to be processed to see how they turned out. The number of exposures was also limited. Even the basic digital cameras available now can be used for some basic astro-imaging, and you can check the image immediately, adjust, and try again. Then use a computer to enhance the collected data. I should mention that the raw image was imported into Adobe Lightroom and some adjustments were made to produce the image above.

More Club News continued from page 1

Club/Social Viewing Nights

Club/Social Viewing Nights are on Saturday evenings "just" Before Sunset. Viewing nights are for members and invited guests. The contingency plan for poor weather on the proposed viewing night is to meet the next night (a Sunday night) .

Woncur Road, South Nowra (Head South down The Princes Highway, turn right at BTU Road, Woncur Road is the street first on the left).

University Viewing site. On the way to the university on George Evans Road go straight ahead through the second turning circle to the new viewing site.

Bring your scopes and or binoculars and a small folding chair, a decision on the day planned, depending on viewing conditions, by the club president and his deputy.

Email information if details are changed, to all, or contact Frank for changes.

Solar viewing BBQ lunches (BYO) may be held and these will be advised ahead of these events. Special events such as Comets, eclipses etc. may also warrant members night viewings.

The AGM was held at the May 2022 monthly meeting. Elected officials for 2022- 2023

The 2021 AGM has been postponed due to Covid.

Executive
President: Mark Town
Vice President: John Gould
Secretary : Andrew Wood
Treasurer: Frank Gross
Public Officer; Frank Gross

Operation Positions
Website Manager: Mark Town
Observation Officer: Robert Turnbull
Editor: Kaye Johnston
Librarian: Chris O'Hanlon
Equipment Officer:Vacant

Committee General Members:
Freya Bates,
Larry Wakelin,
Chris O'Hanlon,

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