Shoalhaven Astronomers Inc.
www.shoalhavenastronomers.asn.au

Volume 23
Issue 2

# Astro Flyer

## February 2023

## Club News

From The President

we have had 2 successful working session @ the UOW campus to progress the refurbishment of our observatory prior to its assembly. Thanks to all who have attended! We will also have had another working session on Sunday 04 Feb23 by the time you read this. So far the wall sections have been refurbished and prepared for assembly with the dome sections planned to be done on 04 Feb. Assembly day(s) is getting closer!

In the coming year we are going to try and refocus on practical astronomy and see if we can do some observing at our monthly meetings – weather gods permitting! To help with that over the next few months we will be assembling our observatory and fitting it out with necessary equipment. The mount and telescope for the observatory have been selected and ordered from our supplier.

In the meantime keep on watching!

**Next Meeting Febtuary 17th 7 for 7.30pm**

Best Regards,
Mark Town

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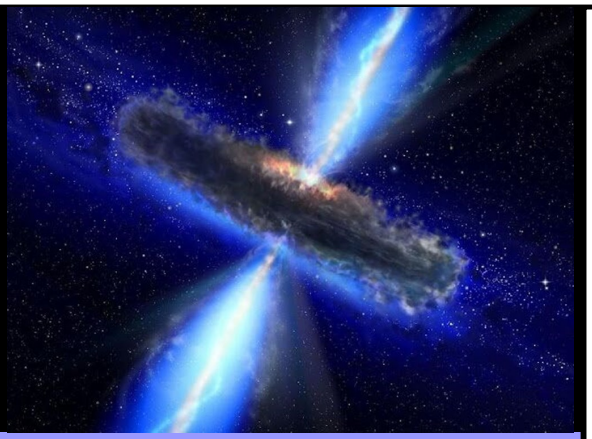


**MOON PHASES**

| New Moon | First Quarter | Full Moon | Last Quarter |
|---|---|---|---|
| Feb 20 | Feb 27th | Mar 7th | Mar 15th |

### Viewing Nights

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

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

## OUT THERE BY BOB TURNBULL
## OBSERVATION OFFICER

### January February

Hi all you enthusiastic astronomers! Apart from an improvement in the night sky with at least better breaks with clear skies, temperatures have continued to be erratic.

**Moon** mid January 15th 10pm will be maximum libration (Map 116 & 117 page)
22nd 7am Moon at perigee (closest to earth, 356,569 kms**.** The Moon will be increasing in size into February.

**Mercury** wait for January 18 – 21 in the dawn for close to M25 low in the eastern sky near to the Tea Pot.

**Venus** appears in evening twilight in the low west with the Moon and Saturn in Capricornus

**Jupiter** will be in the low west near a dark Moon and Venus.

Appearance of the planets is on p22 for January and p28 for February of your copy of the Astronomy 2023.

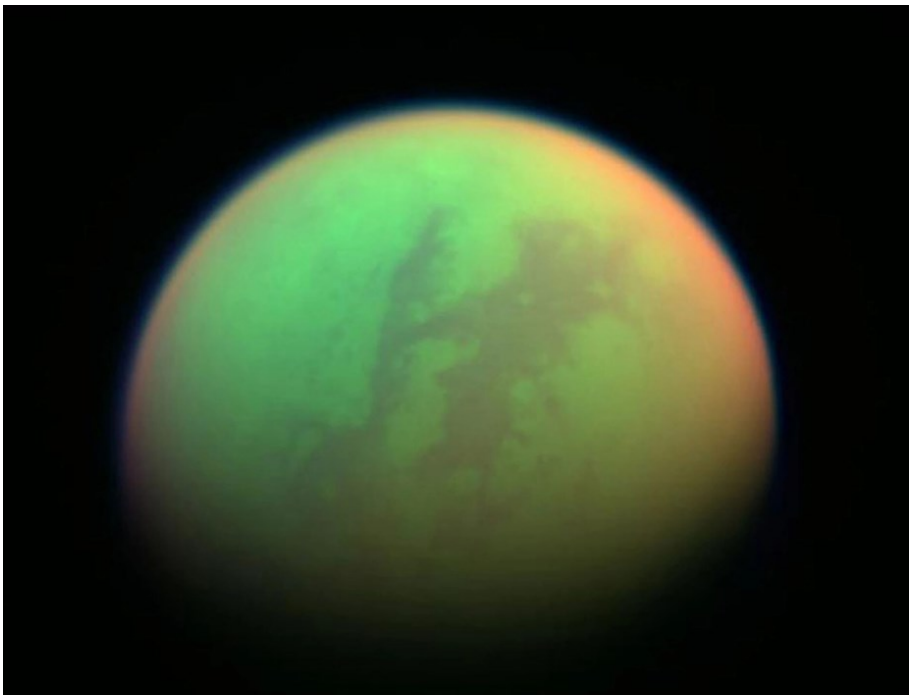
Keep in touch with major pages on the iNet for NASA website. In particular read all about the Artemis 1 moon missions attempt to return astronauts to the lunar surface.

Good viewing.

Bob Turnbull

## Life on Titan Could Have Huge Implications For Life in the Cosmos


Ivan Petricevic
Posted on December 29, 2022



The surface temperature of Titan equals 94 degrees Kelvin above absolute zero. This is around a third of Earth's. Interestingly, 94 degrees above absolute zero happened to be the temperate of the cosmic microwave background, some hundred million years after the big bang.

There are a few places in the solar system other than Earth where life could have sprung into existence. This must not necessarily be intelligent life. If there is life elsewhere in the solar system, it is likely in the form of bacteria or simple life. Other than our world, life could have thrived on Mars. Some scientists believe that life may have sprung into existence on Mars billion of years sooner than on Earth. But in addition to worlds such as the red planet, life could have sprung into existence on distant moons such as Enceladus, Europa, and Titan. This later is the largest moon circling around the planet of the rings, Saturn. And if there is life on Titan, whatever its form or shape, it could have huge implications for life elsewhere in the universe.

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## Life on Titan


Annotated view of James Webb's observation of Titan. Image Credit: SCIENCE: NASA, ESA, CSA, Webb Titan GTO Team. IMAGE PROCESSING: Alyssa Pagan (STScI).

Professor Avi Loeb revealed in an essay that the surface temperature of Titan equals 94 degrees Kelvin above absolute zero. This is around a third of our world's. Interestingly, 94 degrees above absolute zero happened to be the temperate of the cosmic microwave background, some hundred million years after the Big Bang. Astronomers think this was when some of the first generations of stars were born. And if there is life on Titan, and we could soon find out, it can help astronomers test the possibility of life emerging in the universe billions of years ago, when some of the first stars and worlds formed.

## Titan, a unique world

Titan is a unique world in our solar system. Besides Earth, this Saturnian moon is the only celestial object with rivers, lakes, and oceans on and beneath its surface. It has a cycle similar to the water cycle on Earth, which means there is rain on Titan too. However, unlike on Earth, it rains methane and ethane on Titan. Curiously the atmosphere of Titan is somewhat similar to Earth. It is primarily made of nitrogen but has an additional 5% methane. The Cassini spacecraft spent years studying Saturn and its moons. Gravity measurements of Titan revealed this moon is home to a subsurface ocean of liquid water. This ocean is fixed with salts and ammonia. This means that there are good chances some forms of life could have developed both on and beneath its surface.

## Implications of Life on Titan

Whether there is life on Titan remains to be seen, and future space missions will likely find out. But if there is life on Titan, it would have huge implications. Not only because we would finally answer whether we are alone in the universe but also because it would mean life could have sprung into existence billions of years ago, and the cosmos has been teeming with life since the very first stars formed, some 100 million years after the Big Bang. Because as the very first stars formed, distant Titan-like bodies could have also formed, home to the very characteristics our own solar system's Titan is home to.

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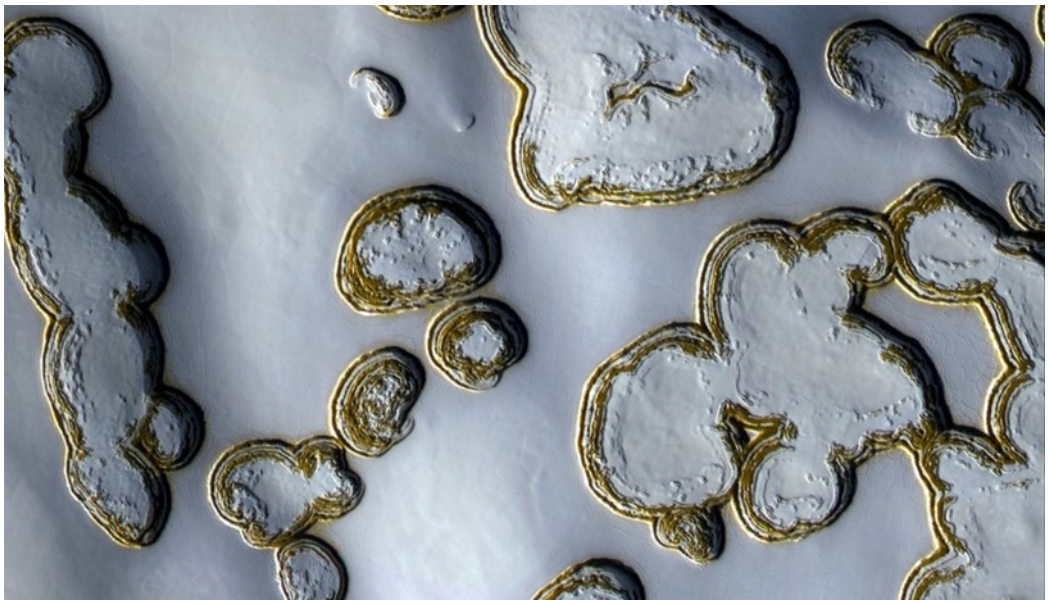
## This is What Winter on Mars Looks Like




Ivan Petricevic
Posted on December 29, 2022

Have you ever wondered about what winter is like on the surface of Mars? Is there snow? And if there is, how much of it is there?

Have you ever wondered about what winter is like on Mars? NASA has a series of photographs taken from orbit that show the Martian winter wonderland. Frozen landscapes with cube-shaped snow are just one of the characteristics of a Martian winter. The coldest temperature on the red planet is around Mars' poles, where it can get as freezing as minus 123 degrees Celsius. But despite the extreme cold, Mars doesn't get as much snow as Earth does. In fact, according to NASA, each Martian year (a Martian year equals two Earth years) has no more than a few centimeters of snow. Furthermore, most of this snow falls on flat surfaces, making it difficult to accumulate. But even though there isn't abundant snow on Mars, winter on the red planet is magical and offers a play of colors.

## Winter on Mars: Two types of snow

On Mars, we can find two forms of snow. Mars has snow in the form of water ice and carbon dioxide, also known as dry ice. And because there are two types of snow on Mars, little of it accumulates. This is because the air on Mars is very thin compared to air on Earth. Since the air is thin and temperatures so cold, water-ice snow turns into a gas long before it lands on the surface. Dry ice on the other hand does make it to the Martian surface. But even though there isn't much of it, some dry ice accumulates. Sylvain Piqueux, a NASA scientist explains that there's is enough of it for someone to snowshoe across it. Snow accumulates more on craters or cliffsides thanks to the sloped surface.

## How do we know there is snow on Mars?

Despite the fact that we have never actually photographed snow falling on Mars, we know it exists thanks to a few instruments on the orbiters circling the red planet. For example, the Mars Reconnaissance Orbiter can peer through cloud cover on Mars thanks to the so-called Mars Climate Sounder Instrument. It detects light in wavelengths the human eye cannot. This allows experts to spot carbon dioxide snowing on the surface. Back in 2008, NASA used the Phoenix lander to spot water-ice snow falling on Mars. The Phoenix lander was sent some 1,600 kilometers from Mars' North Pole.
How do we know there is snow on Mars?

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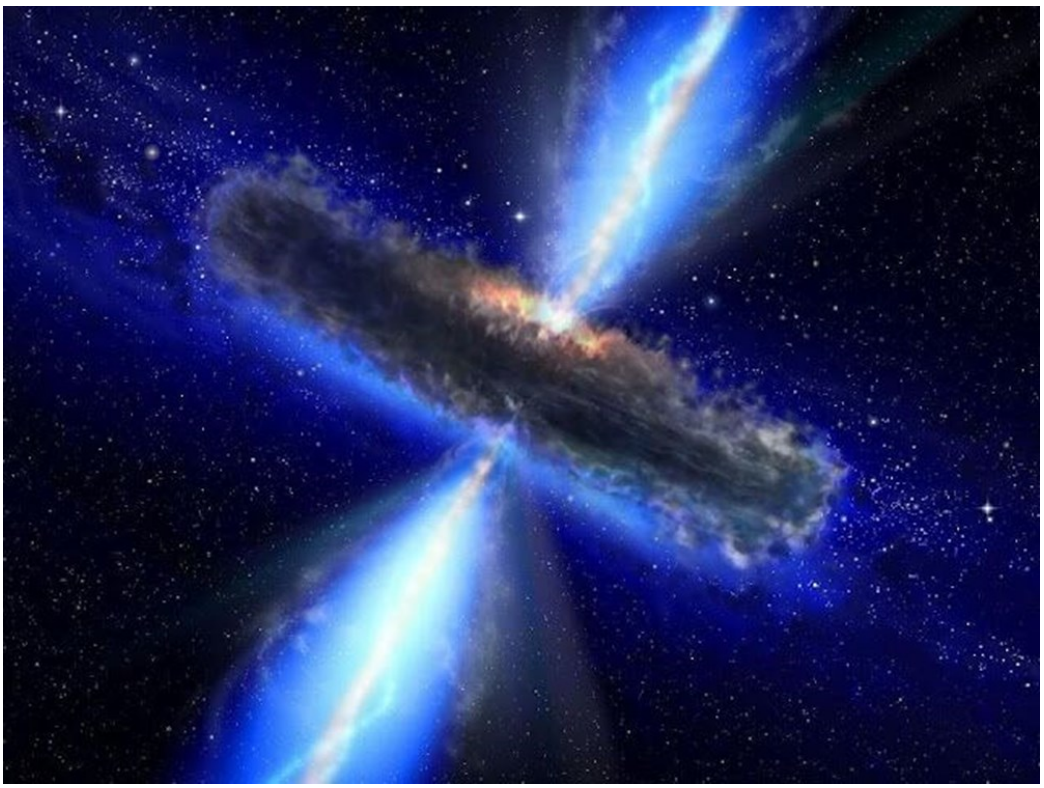
## Astronomers discover a floating water reservoir in space that is equivalent to 140 trillion times the amount of water in the world's oceans



A water reserve the size of 140 trillion oceans lurks in a distant supermassive black hole, the universe's greatest deposit of water and 4,000 times the quantity contained in the Milky Way.

September 20 2022

Two teams of astronomers discovered this amount of water 12 billion light-years away, where it appears as vapor spread across hundreds of light-years.

The reservoir was discovered in the gaseous area of a quasar, which is a dazzling compact region at the center of a galaxy fueled by a black hole. This discovery shows that water may have been throughout the universe from the beginning. While specialists are not surprised, water has never been spotted this far out. The light from the quasar took 12 billion years to reach Earth (particularly, the APM 08279+5255 quasar in the constellation Lynx), meaning that this mass of water existed when the universe was only 1.6 billion years old.

The Z-Spec equipment at the Caltech Submillimeter Observatory in Hawaii was utilized by one group, while the Plateau de Bure Interferometer in the French Alps was employed by the other.

These sensors detect millimeter and submillimeter wavelengths, which allows them to detect trace gases (or large reserves of water vapor) in the early universe.

The discovery of numerous spectral fingerprints of water in the quasar gave researchers with the information they needed to establish the reservoir's massive size.

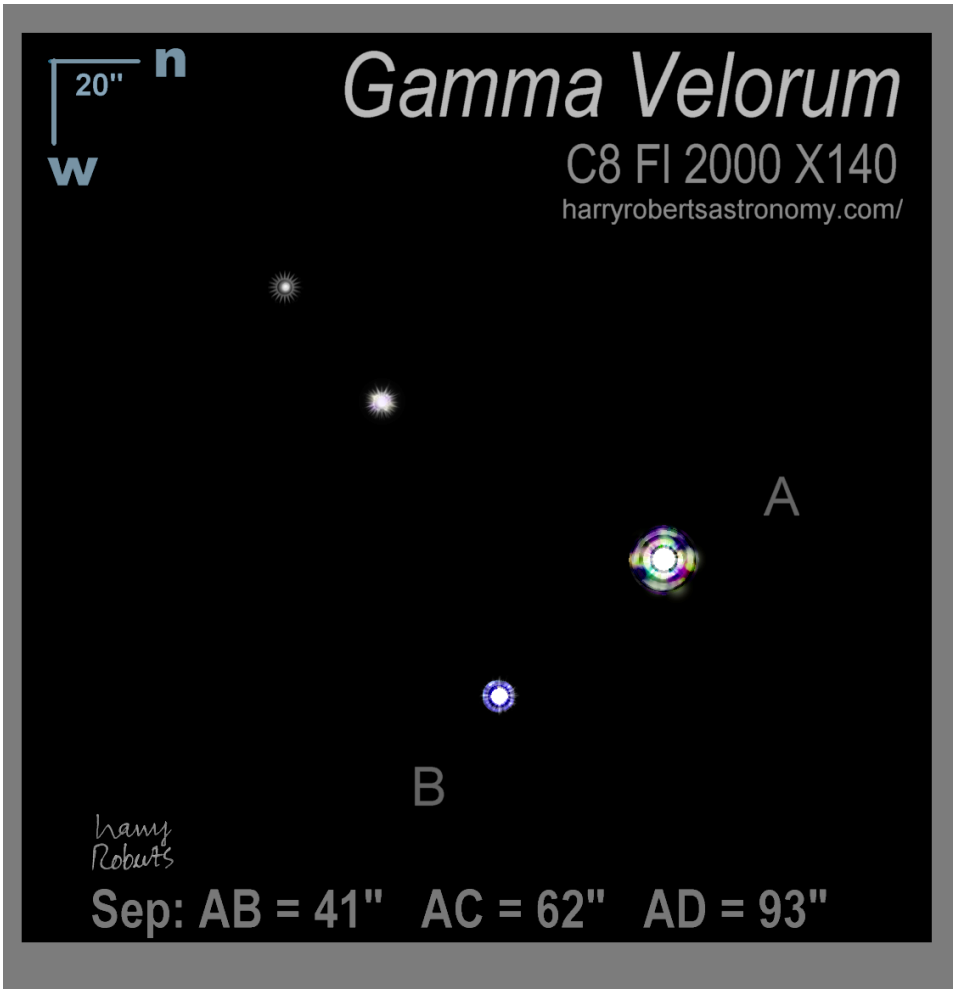
## Exotic Spectra: Gamma Velorum by Harry Roberts

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

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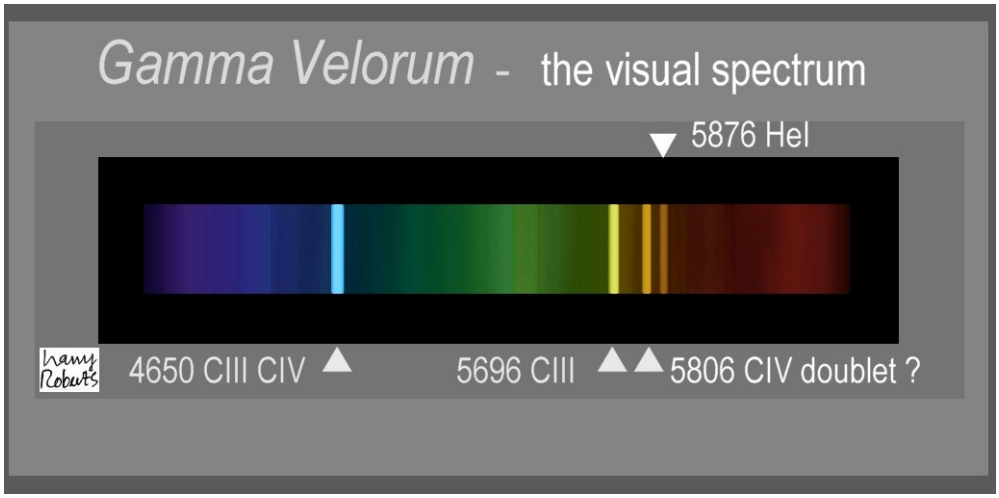
**Gamma[2] , the spectrum.** My first view was with a small prism, and some detail was seen that way - but a stellar spectroscope, such as the Baader does a much better job, showing a stunning spectrum for the star (Fig).




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

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!*

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## Exotic Spectra: Gamma Velorum by Harry Roberts

Cont...3

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.

## COMET 2022 E3 (ZTF) by John Gould & Andrew Wood

The so-called “Green Comet”, the green colour caused by diatomic carbon in the nucleus, C/2022 E3 has been gracing northern skies. It is now becoming prominent to the south, in an easy to locate region near Mars and the constellation Orion, as shown in the diagram below reproduced from the website of QUASAR PUBLISHING (the producers of the yearly ASTRONOMY books). Currently reported at magnitude 6.2 and fading, with the lack of a bright Moon it should still be locatable in binoculars and telescopes.

Photo reference Adler Planetarium

## COMET 2022 E3 (ZTF) by John Gould & Andrew Wood

Cont...2

This will be a good opportunity as well to photograph the comet. Contrary to the belief that you need $15,000 worth of equipment to do astrophotography, here is a real chance to dip the toe into the fascinating world of astrophotography with very little effort, experience or expenditure.

If you have a DSLR or Mirrorless Camera, a 135/200mm lens & a tripod (& preferably a remote shutter release - or use a 2 Sec delay to avoid shake), you'll get the comet OK with a high ISO - try 1600 or 3200 and a 2 sec exposure. You can try 5-10 seconds but you'll get star trailing but should bring up the comet better.

If you want to be serious about it.... take 20 or 30 x 2 second exposures and stack them in "Sequator" (free easy photo stacker); or if a bit more advanced you can use Deep Sky Stacker (DSS) and its Comet Stacking Function.

If it is all looking pretty faint, you'll need to do a Histogram Stretch to bring out the detail in a photo manipulation program.

It may even be possible to capture an image on a simpler non-dSLR digital camera, especially if it has a manual focus. Below is a JPEG image of Comet 2021 A1 Leonard, taken with a Panasonic Lumix FZ300 camera on a tripod. The exposure was f2.8, ISO 6400 and 8 seconds.

Photo Andrew Wood

With thanks to the **Tamworth Astronomy Club** for sending John Gould details regarding photographing the comet

# Our New Observatory Comes to Life


## More Club News

**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

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| Shoalhaven<br>Astronomers<br>PO BOX 1053<br>Nowra NSW 2541 | **The deadline for Articles for the Astro Flyer is The First Friday of the Month.**<br><br>**Editor Kaye Johnston** |