

Cover image - Some of the comics on Facebook from these uncertain times.



SCORPIUS

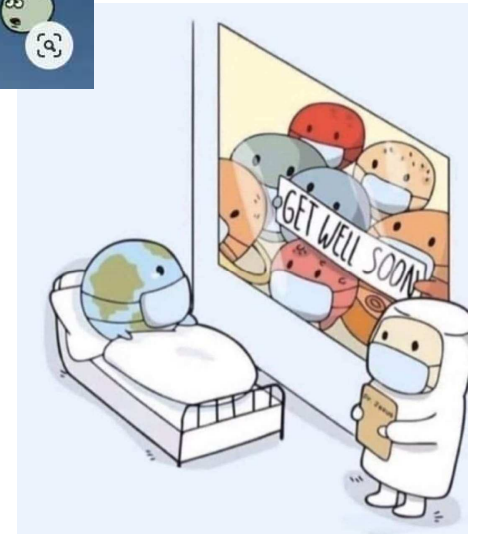
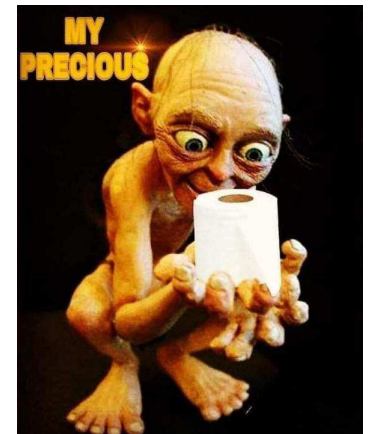
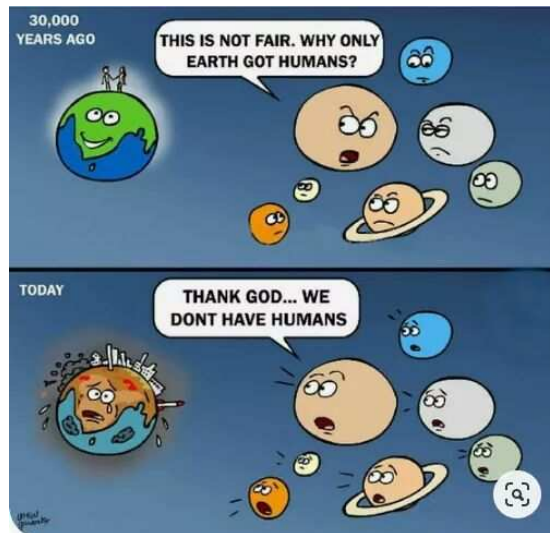
THE JOURNAL OF THE
MORNINGTON PENINSULA ASTRONOMICAL SOCIETY INC.

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The Mornington Peninsula Astronomical Society (formerly the Astronomical Society of Frankston) was founded in 1969 with the aim of fostering the study and understanding of astronomy by amateurs and promoting the hobby of amateur astronomy to the general community at all levels.

The Society holds a focused general meeting each month for the exchange of ideas and information. Regular public and private observing nights are arranged to observe currently available celestial objects and phenomena. In addition, the Society encourages the service of its members for on-site or off-site educational presentations and observing nights for schools and community groups.



MPAS - <https://www.facebook.com/mpas0/>

MPAS Members - <https://www.facebook.com/groups/MPAS1/>

Scorpius MPAS - <https://www.facebook.com/Scorpius-MPAS-1694951307446763/>



Mornington Peninsula Astronomical Society

SOCIETY NEWS



Scout Night February 28th - The quarterly Friday Scouts, Cubs and Guides night at the Briars saw 16 in attendance from the Sorrento Scout group. Although the evening started with almost total cloud cover, by the time the talk inside by Peter Skilton had finished, all clouds had disappeared, allowing unhindered views of the heavens with the observatory instruments. Unfortunately the cloud didn't clear early enough to see the passage of over 100 Starlink satellites in a line over the southwestern paddocks of the Briars. Helping in the field were Fred Crump, Robin Broberg, Christine Johnson, Ben Claringbold, Mark Stephens, Simon Hamm and Mike Smith. Thank you!

Regards, Peter Skilton

Public Night March 6th - The stargazing evening for the public for March went ahead with the metropolitan area being under nearly complete cloud cover. Upon arrival at the Briars, the skies were almost clear, with cloud visible in most directions low on the horizon only, especially to the north. We ended up with 57 visitors, plus many members in addition. Quite a few of the public were clearly deterred by the cloud cover where they live, as they were no-shows. Yet another example of the elevation probably creating a hole in the clouds above the observatory, while nearby regions languished under cloud. By the end of the evening, however, the clouds had moved in and a pass-over of the International Space Station was not generally visible due to poor cloud placement at that time. Nevertheless, most visitors were able to see the Moon and other objects, with 47 Tucanae giving a great view in the 14 inch. The talk indoors by Trevor Hand was about naked-eye phenomena. Simultaneously, the more bizarre talk outdoors was mostly about toilet roll supply and demand in the face of the corona virus. Those helping outside included Fred Crump with a boxed, massive 1:72 scale Saturn V rocket from the 50th anniversary that he's gluing together, Ian Argent, Mark Stephens, John Cleverdon, Ben Claringbold, Alan Predjak, Jason Heath, John Goodall, Jamie Pole, Guido Tack, Kathryn Hand, Dave Rolfe, Greg Walton, Simon Hamm aka <<insert name here>> on his name tag, Paul Albers, Nerida Langcake, and Piper Grierson wielding power as the gatekeeper of the inner sanctum of the auditorium. Members are reminded please to sign the logbook by the glass cabinet when visiting, and to wear their name tags. *Regards, Peter Skilton*

Parkdale High School viewing night March 11th - 'Twas a packed night at Parkdale Secondary College last night, with 219 in attendance. The talk indoors in the Seniors hall was given by Peter Skilton, with the school's new wireless data projector connected successfully to Windows after some cajoling. The meteorite was passed around the room and from the front could be heard dropping on the floor 2 or 3 times with a thud as some kids misjudged the density. It wasn't accompanied by a scream, so all was well. So there would now be some further dents of extraterrestrial origin in the floor of the Seniors hall. Following the talk, everyone moved out to the adjacent public park to be shown the night sky. The skies remained very clear throughout, with warm and mozzie-free conditions. Operating the telescopes were Philip Rea, Nerida Langcake, Fred Crump (with his new poster indoors), Jamie and Josh Pole, Guido Tack, Greg Walton, Simon Birch, Ben Claringbold and Ian Sullivan and friend (whose name I missed). So 11 telescopes overall. The orangey, nearly Full Moon rose in time, with plenty of light aircraft passing near it during the evening but we didn't see any transit in front of the lunar disc. The Jewel Box and Orion Nebula were both very popular. Unfortunately, Venus was the only planet readily visible and that was barely above the nearby houses in the west. The school's co-ordinator of the evening fed back the next day that "It was such a fantastic night. The presentation was fantastic, so much new & interesting information. Thank you so much and please pass on our grateful thanks to all the members of MPAS who came along". One parent also sent in "What a fantastic evening! The talk was great, and my 7yr old daughter was totally captivated by all his information! We all learnt a great deal from him. Please pass on our sincere thanks for coming out this evening to present." So the evening was a hit, with everyone leaving intact before 9:30pm. *Regards, Peter Skilton*

Society meeting March 18th - Cancelled due to Covid-19

Member night working bee and BBQ March 21st - Cancelled due to Covid-19

Public Night April 3rd - Cancelled due to Covid-19

Society meeting April 15th - Cancelled due to Covid-19

Member night working bee and BBQ April 18th - Cancelled due to Covid-19

Cancelled

Due to the rapidly escalating measures being mandated by governments to try to slow the virus spread, the Briars MPAS facilities are now CLOSED for observing or gathering, even if you were contemplating being there alone for observing with your own equipment.

Please do NOT go to The Briars.

The previous suspension of all MPAS in-person member, school and public activities will now continue until further notice.

Committee will review the situation monthly in light of subsequent government announcements.

- * Stay at home if you're not performing duties deemed essential by authorities.
- * Follow the directions from authorities closely for your safety and that of the wider community. Err on the side of caution.
- * Keep your personal distance from others.
- * Wash your hands at every opportunity, especially if you need to venture away from home.

The ABC reported research that Corona viruses in general can stay viable on porous and hard surfaces for days, not just minutes or hours after being touched. They are harder than common flu and cold viruses, but can be washed away by normal household chemical means. So handles, knobs, taps, switches, cables, keyboards, telephones, steering wheels, petrol pumps, keypads, credit cards, coins & notes etc. Some businesses are now discouraging cash transactions for this reason.

It only takes one slip up at the wrong moment to become potentially infected.

Committee is investigating the practicality of putting pre-recorded monthly meetings in some form on our YouTube channel, so stay tuned.

In coming days, it's very probable that we'll each intimately understand what it's like to be an astronaut confined inside a spaceship heading for Mars. But we will reach the destination eventually.

Life has changed and will continue to change rapidly for the public good. Peter Skilton, President MPAS

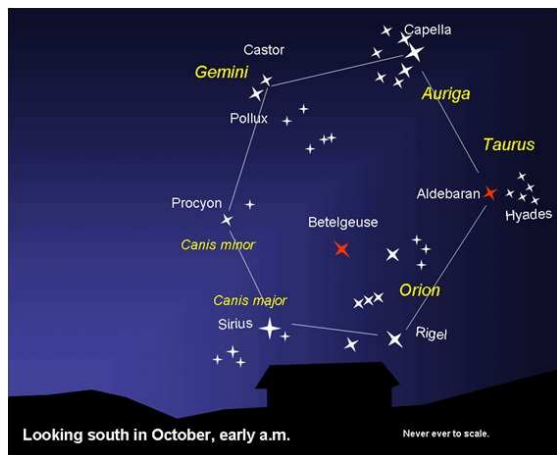
Fire in the Sky *by Sky Murphy*

(An extract from my presentation at the 15/01/2020 Society meeting)

Aboriginal Stories of Stars

Battle Fire Betelgeuse vs Aldebaran*

*Image credit Pinterest * Hamacher, 2012: p17-18*



Campfires by the great river of the Milky Way **

Image credit NASA

** *Wikipedia Australian_Aboriginal_astronomy, quoting Ref TBC [10]*

Meteor Aboriginal Stories of the Meteor

Henbury Crater “A fiery devil ran down from the Sun and made his home in the Earth.”

https://en.wikipedia.org/wiki/Henbury_Meteorites_Conservation_Reserve

“The Wardaman people: The falling star... will cause the earth to shudder, the hills and trees to topple and turn, and everything going black with night descending.” www.aboriginalastronomy.com.au > uploads > 2018/05 > Hamacher-Thesis, p 223 (p 253 pdf) quoting Harney & Elkin, 1949: 29–31.

Comet Example: The Great Comet of 1882

Aboriginal Stories of the Comet

“another possibility, the Great Southern Comet of 1880... an Aboriginal community saw a comet as the smoke of a campfire”. *Hamacher Thesis p 158 (188 pdf) quoting (Roth, 1984: 8)*

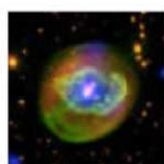
Aurora Borealis and Australis Maori Stories of the Aurora

The Maori see aurorae as a reflection of the fires cast by these ancestors, which signal their presence.” *Hamacher, D.W. (2014) Aurorae in Australian Aboriginal Traditions J. Astronomical History & Heritage, Vol. 17(1), preprint p17/20 pdf pages*

The SUN Aboriginal Stories of the Sun

“The Yolngu say that Walu, the Sun-woman... the Sun-woman, lights a small fire each morning, which we see as the dawn. She paints herself with **red ochre**, some of which spills onto the clouds, creating the sunrise. She then lights a torch and carries it across the sky from east to west, creating daylight.” *Wikipedia Australian_Aboriginal_astronomy, quoting Ref TBC [10].*

Nebula



Planetary nebula



Emission nebula



Reflection nebula



Dark nebula



Supernova remnant

Supernova


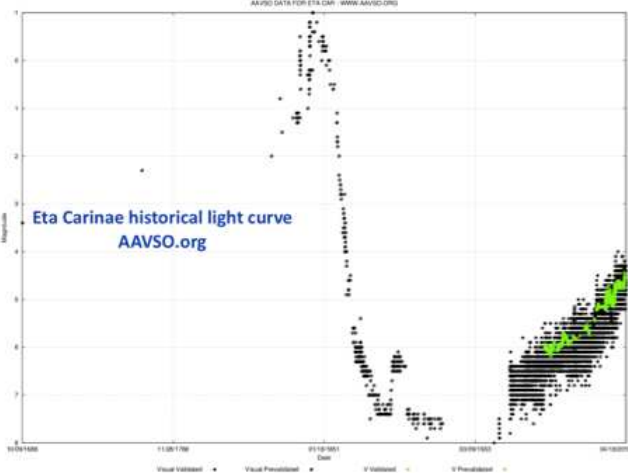


Top*, Carina Nebula, a complex mix of emission, reflection and dark nebulosity. Eta Carinae is the bright star at left.

Left, SN1987A, the bright star near the Tarantula Nebula. *Image credit ESO - <https://www.eso.org/public/images/eso0708a/>, CC BY-SA 4.0*

The overwhelming probability is that the next supernova... will originate from an unknown white dwarf or anonymous red supergiant, very likely not even visible to the naked eye.

Nevertheless, the prospect of a supernova originating from an object such as Eta Carinae arouses great interest. * *Image and text credit Wikipedia Eta Carinae*

<p>One of the two main stars of the Eta Carinae system is expected to explode as a supernova in the astronomically near future.....</p>	<p>Why?</p> <p>Partly because</p> <p>-----></p> <p>+</p>  <p>spectroscopy</p>	 <p>Eta Carinae historical light curve AAVSO.org</p>
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Eta Carinae. How can we help?

An example call from 2019 “Eta Carinae V observations needed” an active “Eta Car” researcher called for help, on AAVSO.org <https://www.aavso.org/eta-carinae-v-observations-needed>

“Eta Car underwent a 0.15 mag. rapid brightening. High precision is required... about 0.1 variation”

Southern Sky Stargazers and Citizen Science



Images ©Ethansaurus

Eta Carinae (supernova predicted) AND a lot of other southern objects are not visible from the NH.
It's our watch!

OBSERVATORY UPDATE



Even though we can't use the MPAS site at the moment, things are still happening.

MPAS now has a pie warmer, thanks to Jamie Pole.

Telescopes in the observatory have been removed for some maintenance and safe keeping.

Committee are staying in touch with one another using video conferencing over the internet.

Dave Rolfe has installed 4 security cameras, and a weather station on the front of the meeting hall. Also Dave has mowed the lawns. *See security camera view below.*



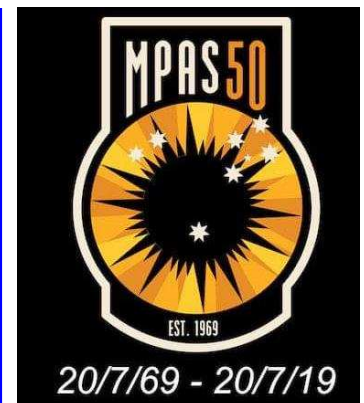
★ New Members Welcome ★

Grant Lewis and family (Chris, Jeff, Lisa, Hayley & Kate)

Chris Kostokanellis

Sarah Cottrill and family (Simon, India, Acacia & Felix)

Marina Miles and Paula Wilson



MPAS SUBSCRIPTIONS 2020

Each ticking over of the New Year also means that Society fees are due to be paid. The committee has worked hard to ensure that 2020 fees are still the same as the previous many years' prices. So to assist the society in maintaining the facilities and services we provide and share, we appreciate your prompt payment for each and every year ahead. As a reminder, the following structure of the 2020 fees is:

Subscriptions can be paid in a number of ways:

- On-line (preferred, see at right)
- Cash payments to a committee member
- Send a cheque, made out to "Mornington Peninsula Astronomical Society", to MPAS. P O Box 596, Frankston 3199
- Make a direct electronic payment into the society working bank account (state your name clearly).

The account details are BSB 033-272 Account 162207. Remember to add your name and details to the transfer so we can identify the payment in the bank records. If you have any concerns please talk to a committee member.

Click on the link for further information - https://drive.google.com/file/d/0ByvkvzZG19g_NXZ4cWxHbERTdEE/view?usp=sharing

SOCIETY FEES

- \$50 – Full Member
- \$45 – Pensioner Member
- \$65 – Family Membership
- \$60 – Family Pensioner Membership

See more options on-line



Full Member	\$50
Pensioner	\$45
Family	\$65
Family Pensioner	\$60

You can now renew your membership online. See link below. Click on Members then JOIN NOW at the bottom of the page. Then just fill in your detail on Try-booking. <http://www.mpas.asn.au/members.html>

CALENDAR		May / 2020					Red Days indicate School Holidays
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
31		12th Notes Io shadow 12:26am S Io transit 1:36am S Io shadow 2:38am F Io transit 3:49am F			First Quarter 1 Public Night 8pm Cancelled	2	
3 Io shadow 4:04am S Io transit 5:16am S	4 Eu transit 12:18am S Eu shadow 12:33am F Io transit 11:45pm S	5 Io shadow 12:45am F	6	7 Full Moon Moon at 361,183km	8	9	
10 Mothers Day	11 Eu transit 2:45am S Eu shadow 3:07am F	12 See Notes above Jupiter and Saturn left of the Moon Midnight	13	14	15 Last Quarter	16 Mars above the Moon morning Dinosaur/geology Cancelled	
17	18 Moon at 405,583km Eu shadow 3:02am S Eu transit 5:11am S	19 Io shadow 2:19am S Io transit 3:25am S	20 Cancelled Society Meeting 8pm Io transit 9:53pm S Io shadow 11:01pm F	21 SPSP starts Cancelled	22 Mercury and Venus 1 degree apart Just after Sunset	23 New Moon Members night Working Bee 4pm BBQ 6pm Cancelled	
24 Venus below a thin Moon Mercury right Just after Sunset	25	26	27 Io shadow 10:42pm S Io transit 11:42pm S	28 Io shadow 12:54am F Io transit 1:53am F	29 SCA 8pm Cancelled	30 First Quarter	

Monthly Events

Public Nights - 8pm start on the 1st @ the Briars
Society Meeting - 8pm to 10pm on the 20th @ the Briars
Members Night BBQ - 6pm on the 23rd @ the Briars - Working Bee 4pm start
 Dinosaur/geology outing to Pt Ledge on Saturday 16th May
 Notes - SPSP South Pacific Star Party, 21st to 24th **cancelled due to Covid-19**.

Jupiter moon code
 Io = Io
 Eu = Europa
 Ga = Ganymede
 Ca = Callisto
 S = start
 F = finish

CALENDAR		June / 2020					Red Days indicate School Holidays
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
	1	2	3 Moon at 364,366km	4 See Notes below Io shadow 12:36am S Io transit 1:27am S Io shadow 2:40am F	5 Cancelled Public Night 8pm Eu shadow 12:05am F Ga transit 12:07am S	6 Full Moon	
7	8 Queens Birthday Jupiter and Saturn below the Moon 10pm	9	10	11 Io shadow 2:30am S Io transit 3:15am S	12 See Notes below Io shadow 8:58pm S Io transit 9:42pm S Io shadow 11:11pm F	13 Mars below the Moon morning	
14 Last Quarter	15 Moon at 404,595km	16	17 Society Meeting 8pm Cancelled	18	19 Venus below a thin Moon Moon dawn M45 at left Eu & Ga shadow 5am	20 Cancelled Members night 4pm Io shadow 10:51pm S Io transit 11:27pm S	
21 New Moon Solstice	22 Mercury above a thin Moon just after Sunset	23	24 M44 left of thin Moon	25 Scorpius Deadline	26	27 Io shadow 12:46am S Io transit 1:10am S Io shadow 3am F	
28 First Quarter Io shadow 7:15pm S Io transit 7:36pm S	29 Eu shadow 6:20pm S Eu transit 7:01pm S Eu shadow 9:02pm F	30 Moon at 368,958km		4th Notes Ga shadow 8:38pm S Eu shadow 9:23pm S Eu transit 11:04pm S Ga shadow 11:49pm F	12th Notes Eu shadow 12am S Ga shadow 12:38am S Eu transit 1:23am S Eu shadow 2:40am F	12th Notes Ga transit 3:35am S Ga shadow 3:50am F Eu transit 4:09am F Ga transit 6:55am F	

Monthly Events

Public Nights - 8pm start on the 5th @ the Briars
Society Meeting - 8pm to 10pm on the 17th @ the Briars
Members Night BBQ - 6pm on the 20th @ the Briars - Working Bee 4pm start
 Note - Comets 2P/Encke, 88P/Howell & C/2017 T2 Panstarrs are brightening this month.

Southern Comets website - <http://members.westnet.com.au/mmatti/sc.htm>

Please... we need helpers to keep the MPAS Observatory open to members on all Saturday nights.
 If you can help, contact Greg Walton on 0415172503 or email - gwmpas@gmail.com

THE BRIARS SKY

By Greg Walton



Now is the best time to start viewing Jupiter's moons and shadows crossing the face of Jupiter.

I have noted the best of then on the MPAS calendar page 7.

On 4th June 2020 at 10:30pm you will see Ganymede and Europa shadows cross the face of Jupiter together.

Then soon after, Ganymede and Europa will cross the face of Jupiter. *See image below*

4th June 2020
 Ganymede shadow 8:38pm start
 Europa shadow 9:23pm start
 Europa transit 11:04pm start
 Ganymede shadow 11:49pm finish

5th June 2020
 Europa shadow 12:05am finish
 Ganymede transit 12:07am start
 Europa transit 1:50am finish
 Ganymede transit 3:29am finish

This view 10:27pm - 4th June 2020
 Produced on Software Starry Night

There is a repeat performance on the morning of the 12th June 2020. *See image below*

12th June 2020
 Europa shadow 12am start
 Ganymede shadow 12:38am start
 Europa transit 1:23am start
 Europa shadow 2:40am finish
 Ganymede transit 3:35am start
 Ganymede shadow 3:50am finish
 Europa transit 4:09am finish
 Ganymede transit 6:55am finish

This view 1:22am - 12th June 2020
 Produced on Software Starry Night

Queensland and the local space industry *by Tony Nightingale*

Gilmour Space Technologies

Gilmour Space Technologies is a venture capital-backed rocket company based in Queensland, Australia that is making significant progress in its goal to launch the next-generation small satellites into Low Earth Orbits.

Gilmour Space

Technologies (also known as Gilmour Space, Gilmour Space Tech or GSpaceTech) is a leading venture-funded Australian space company headquartered

in Queensland, Australia that is developing new hybrid-engine rockets and associated technology to support the development of a low-cost space launch vehicle. Its stated mission is to provide affordable space launch services to the world's fast-growing small satellite



industry. The maiden launch of its first commercial orbital vehicle, called Eris, is planned for 2022. Eventually, the company is also looking to provide low-cost space access for human spaceflight and exploration. Gilmour Space was founded in 2012 in Singapore by former banker, Adam Gilmour. In 2013, the Australian CEO & Founder set up similar operations in Queensland, Australia with his brother James Gilmour. The company's first project in 2013 was to design and manufacture high-fidelity spaceflight simulators and replicas for a number of space-related exhibits, and education centres, including Spaceflight Academy Gold Coast, Australia's first astronaut training centre. It began its rocket development program in 2015; and within 18 months, successfully launched Australia and Singapore's first privately developed hybrid test rocket using proprietary 3D printed fuel. The Gilmour brothers have also met with NASA officials at the [Kennedy Space Center](#) to discuss launch opportunities. Gilmour Space employs a proprietary hybrid rocket motor technology that it believes overcomes many of the traditional challenges of hybrid rockets. A [hybrid-propellant rocket](#) utilises a mixture of solid and liquid fuel. Advantages of hybrid rockets include acceptably high [specific impulse](#) values with relatively very low complexity and associated risks. In general, hybrid rocket engines are the safest of the three major rocket engines e.g. as compared to a solid-propellant rocket which cannot be throttled or deactivated once ignited; and a liquid-propellant rocket which typically requires [cryogenic](#) fuel storage and complex turbine systems to provide sufficient combustion chamber pressure both for the fuel and the oxidiser (hybrid-propellant rocket only requires pressurising the oxidiser). Gilmour Space was the first private rocket company in Australia to launch a proprietary hybrid rocket in June 2016. The Rasta launch vehicle is reported to have flown to an altitude of 5 km and is said to be one of the world's first flight demonstrations of 3D printed rocket fuel. Since then, the Queensland-based company has conducted a series of large hybrid engine test fires, including a 17-second test in August 2018 that recorded 80kN (80,000 lbs) of thrust. A second test launch was attempted in June 2019, which failed in the final seconds on the launch pad due to an anomaly in the pressure system affecting the oxidiser tank. According to the company, a detailed investigation into the anomaly resulted in 15 key recommendations that have since been implemented in the new orbital rocket design, and the company is now actively sourcing partners to test and manufacture its orbital launch vehicles in Australia. Gilmour Space has also supported a number of proof-of-concept technology projects related to the development of a long-term space habitat. An example is the M.A.R.S (Mars Aqua Retrieval System) rover project, a collaborative educational project at [SUTD](#) which received an award at the 2016 ASME international student competition, and was featured in National Geographic's Exploring Mars exhibit in Singapore. The company is also working on an in-space CubeSat propulsion system, which could potentially be used to send a 1U CubeSat from Earth's orbit to that of other moons or planets in the solar system. In Feb 2018, it signed a reimbursable Space Act Agreement with NASA to collaborate on various research, technology development and educational initiatives, including the testing of its MARS rover at Kennedy Space Center. The company has earlier developed a number of unique high-fidelity spaceflight simulators and replicas, including a 6 degree-of-freedom space plane simulator, space capsule simulator, fighter cockpit trainers, low gravity climb, mission control simulators, and others. In February 2017, the Design Business Chamber of Singapore awarded Gilmour Space with the Singapore Good Design Mark (SG Mark 2017) for excellence in design and quality of its simulators.

Sources: Wikipedia, Gilmour Space Technologies.

Black Sky Aerospace

Black Sky Aerospace (also known as BSA) is an Australian private aerospace company, headquartered in Jimboomba, Queensland, Australia. BSA specialises in payload delivery systems through proprietary propulsion systems, componentry and vehicles. Additionally, BSA provides access to calibration and simulation systems that redefines the way traditional data is acquired. On November 21, 2018, Black Sky Aerospace successfully conducted Australia's first commercial payload rocket launch from the nation's only sub-orbital launch facility west of Goondiwindi, Queensland, Australia. This sub-orbital mission utilised a Sighter190 research rocket to carry experimental payloads and instruments to an altitude of approximately 20,000ft.

The minister for state development, manufacturing, infrastructure and planning, [Cameron Dick](#) was present to press the launch button. In September 2019, Black Sky Aerospace was granted approval by regulators to begin manufacturing solid rocket motors. Solid rocket motors (SRM's) are the fuel (propellant) that boosts rockets into space, such as the boosters on the space shuttle and is the preferred fuel to use by many space launch companies due to its simplicity and cost-effectiveness. The company will be the first manufacturer of its kind in Australia and will be able to provide access to solid fuels for orbital and sub-orbital launch vehicles.

In October 2019, Black Sky Aerospace gained priority access to the new [Equatorial Launch Australia \(ELA\) Arnhem Space Centre](#) in the Northern Territory. Black Sky Aerospace Director Blake Nikolic said priority access to the Arnhem Space Centre would provide his customers with the benefits of launching close to the equator. Equatorial Launch Australia operates the Arnhem Space Centre, near Nhulunbuy, and plans to host NASA's first rocket launch from a non-government owned site.

Queensland-based launch provider, Black Sky Aerospace, is facilitating UK company Raptor Aerospace's rocket motor test and sounding rocket launch campaign, to be conducted in Australia's Beyond the Blue sub-orbital launch facility. This will be Australia's first privately operated, international rocket motor test and sounding rocket launch campaign.

The Raptor Aerospace team intends to undertake a campaign where they can first test and space qualify their own launch vehicles and systems. The Beyond the Blue Aerospace facility they will use is located just outside of Goondiwindi in Queensland's outback.

According to Black Sky's press release, Raptor has chosen to conduct their tests in Australia, rather than in the UK, due to practical reasons – the UK has a dense population and a busy European airspace, making land-based rocket launches and systems recovery very difficult. Raptor CEO, Ben Jarvis, said "Whilst the development of the new space-ports in the UK will ultimately allow some of our commercial activity to occur on 'home soil', many customer payloads and test flights, where recovery of sensitive electronics after flight is critical, will need a land range to fly from."

Jarvis continued, "Black Sky Aerospace have been a great partner in our development so far in offering us access to a suitable inland site and invaluable expertise that we hope will lead to an ongoing commercial collaboration that forwards space access in both countries."

CEO and founder of Black Sky aerospace, Blake Nikolic said, "Australia is playing an increasing role in the world's space ambitions and we are playing a significant role in enabling access to an efficient, cost-effective service".

"...This campaign with Raptor Aerospace will drive additional export opportunities of Black Sky Aerospace's technology, whilst solidifying Australia's position as the place to conduct research and testing, before undertaking expensive orbital launches," continued Nikolic.

Sources: Wikipedia, Black Sky Aerospace.



Hypersonic

Hypersonic is bringing increased efficiency and flexibility to space launch through the use of cutting-edge aerodynamic technology. Have you ever wondered why getting to space is so expensive? It's because almost all space systems are thrown away after every launch!

Have you ever thought space launch should be more like flying an aircraft, where the launch vehicle returns to base after each mission? Introducing Spartan, the world's first space launch system build around scramjets.

Scramjets are airbreathing engines, just like the jet engines on tens of thousands of aircraft that fly each day. But scramjets work at hypersonic speed; that's faster than Mach 5.

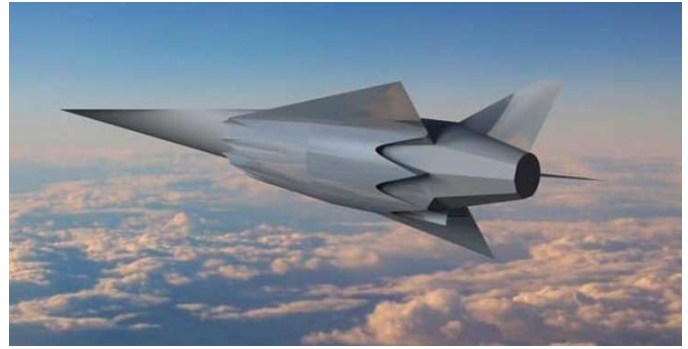
[Spartan](#) is a rocket-scramjet-rocket system that can supply dedicated launch to Sun Synchronous Orbit for satellites up to 150 kg. It involves:

A [1st stage](#) "Boomerang" rocket booster that flies back to the launch site by deploying wings and a propeller motor.

A hypersonic [2nd stage](#) that is powered by scramjets and flies back to the launch site like a plane.

With both 1st and 2nd stages returning to base, Spartan is more than 80% reusable. This means that Hypersonix can launch small satellites with much less expense than single-use rockets. It also means no dumping of debris or expended rocket motors into the ocean.

Spartan is the space launch system for the 21st century. Hypersonix will fly a small fleet of vehicles that can launch within a week's notice, provides flexible orbit inclination and timing through aircraft-like operation of the scramjet powered 2nd stage and is more like an airline than solely rocket based launch systems.



Boomerang

The Boomerang is a conventional rocket with an important upgrade.

Thanks to innovative use of cutting-edge aerodynamic technology, the Boomerang can fly back to base after accelerating the scramjet to Mach 5. Spartan combines the Boomerang with a scramjet to make a space launch system that is more than 80% reusable.

Scramjet

Australia is a world leader in scramjet technology.

A scramjet is an air-breathing engine, similar to the turbojet engine on a commercial aircraft. However, unlike a turbojet, scramjets do not have rotating blades on the air intake.

Importantly, a scramjet can go a lot faster than a turbojet, without carrying oxygen like most rockets need to do. A scramjet's oxidiser comes free from the air!

Turbojets get too hot to go faster than Mach 3. A turbojet engine sucks in air and generates 'thrust' (forward push) by burning fuel with the air which then shoots out the back, propelling the aircraft forward. However, in order to take off, a turbojet needs rotating blades to compress the air, limiting its speed to about three times the speed of sound (Mach 3) since the blades get too hot to go any faster. Scramjets are Hypersonic air breathing engines.

Speeding along faster than Mach 5 (hypersonic speed!), a scramjet doesn't need any blades or other moving parts to produce thrust. The speed of the air "ramming" into the engine is enough to get the scramjet engine working, so it doesn't have trouble with blades overheating. The "sc" in scramjet stands for "supersonic combustion", as the air keeps moving faster than the speed of sound through the whole engine. Travelling at its design speed, a scramjet is way more efficient than a rocket, because a rocket must carry oxygen as well as fuel. The picture shows NASA's Space Shuttle blasting into orbit. The massive orange tank that the Space Shuttle sits on contains 630000 kilograms of liquid oxygen, as well as 106000 kg of liquid hydrogen fuel.

A scramjet needs fuel, but it doesn't need to carry oxygen. It gets all its oxygen from the air that it flies through. At Hypersonix, we are developing the hydrogen fuelled 'Spartan' scramjet. It is designed to be the second stage of a satellite launch system, accelerating from Mach 5 to 10 and then releasing the final stage. Our scramjet launch system only uses a rocket for the first and final part of the trip up to orbit, meaning we can carry more payload such as satellites and in the future, maybe even people! Another benefit of our scramjet system is that the exhaust from the hydrogen fuelled scramjet is just steam (superheated water), making our space access systems more environmentally sustainable.

Sources: Hypersonix, NASA.



Conquering the Challenge of Isolation in Space *by Tony Nightingale*

On a recent afternoon at the Johnson Space Center, Bill Paloski, Ph.D., Director of NASA's [Human Research Program](#) (HRP), commented on HRP's mission to protect the health and safety of astronauts. He reflected on some of the human [hazards](#) of space, including radiation, isolation and confinement, distance from Earth, altered gravity, and hostile/closed environments.

"We still have a lot to learn about these hazards," says Paloski. "For instance, how long does it take for space radiation to damage the human body? When you're isolated, and can't get home or talk to your family, how long can you stay positive? NASA's Human Research Program exists to ensure the safety of brave people who are navigating unfamiliar territory in very stressful conditions. We need this program and its research teams to develop strategies to protect our explorers and pioneers who represent the front line of our nation's space program."

Paloski's dedication to improving the lives of this "front line" has provided benefit to other sectors of the federal government, including those who serve the nation in high-risk missions and those in our military services. In recognition of these benefits, Paloski recently received the prestigious [Robert M. Yerkes Award](#) for significant contributions to military psychology by a non-psychologist.

Isolation and Confinement: Being Alone and Cramped in the Infinity of Space

According to Paloski, much of NASA's human research in the past was focused on understanding and overcoming the effects of long-term exposure to microgravity. Scientists set guidelines for engineers to maintain a pressurized cabin for crewmembers to be able to work in the unforgiving conditions of space. Of engineering necessity, the design of crew living quarters on any space vehicle has resulted in a very small, very crowded, and

often very uncomfortable habitat compared to what we are accustomed to on Earth. As we begin to venture into deep space, new stressors – including extreme isolation and unimaginable distances from Earth – offer the potential to diminish the adaptability and resiliency of someone living in such close quarters. These stressors impact the human body and mind in several ways.

"Isolation and confinement are like being alone in a cramped space," says Paloski. "And that feeling worsens over time. It's an occupational hazard similar to working on a submarine. The longer and longer a person spends in that kind of environment, there is a potential for bigger and bigger problems."

As a result, HRP has been investing significantly in studies related to individual resilience, crew composition and selection, and tools to help astronauts cope with the loneliness, helplessness, and anxiety that affect all humans separated from friends and families for long periods. This work is highly relevant to the military, especially to special operations forces, submariners, and soldiers deployed in high-risk environments, facing hostile actions halfway around the world. NASA's research on mitigating the effects of [isolation and confinement](#) is also relevant to increasing our understanding of issues facing our aging population here on Earth. Examples of similar stressors: some elderly find themselves isolated and confined, living alone with mobility issues; others feel isolated while living in senior facilities without regular access to family and friends. NASA can both learn from, and potentially contribute insight with regard to, mitigating the stress experienced by these members of our population as well.

As a respected NASA scientist who has conducted numerous studies on how spaceflight affects the inner ear, as well as how artificial gravity might be used to offset those effects, Paloski appreciates the challenges of carrying out complex human spaceflight investigations. His years of organizational leadership at the branch and division levels within NASA also provide Paloski with insight into the management aspects of research. With an undergraduate degree in mechanical engineering, and advanced degrees in biomedical engineering, Paloski spent several years as a junior faculty member at the Boston University College of Engineering before joining NASA and, more recently, several more as a senior faculty member and founding Director of the University of Houston's Center for Neuromotor and Biomechanics Research. He was drawn back to NASA to direct HRP because of the opportunity to contribute in a significant way to the success of the most challenging expedition ever planned: a human mission to Mars. He likens his current role to that of an executive producer, particularly as NASA wrestles with the challenge of astronauts living in space for months or years on end.

"My job is to work for all these people around me," Paloski said.

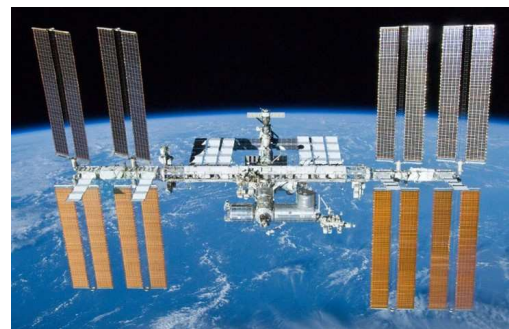
"Working not only with the HRP leadership team, but also for them – securing access to funds, facilities, and partnerships necessary for scientists to carry out the critical research required to ensure that astronauts will be able to stay healthy and perform their jobs in space throughout missions to destinations as distant as Mars."

Integrating Human Research

Paloski has witnessed how investigations in one area of human research often lead to breakthroughs in other areas of science. According to Tom Williams, Element Scientist for the [Human Factors and HYPERLINK](#) "<https://www.nasa.gov/hrp/elements/hfbp>" [BehaviouralHYPERLINK](#) "<https://www.nasa.gov/hrp/elements/hfbp>" [Performance Element](#) at the Johnson Space Center, Paloski's support of "crossover research" has advanced the field of psychology.



Williams notes that astronauts currently working on the [International Space Station](#) spend a large part of their days connecting with people on Earth. They consult with Mission Control in Houston. They talk with scientists, doctors, reporters, students, family, and friends. That luxury won't be available to humans traveling to Mars, where the distance makes real-time interactive communication impossible. He says astronauts like Scott Kelly who spent [one year in space](#) miss the people they know best. They often compare the experience to service members on long deployments. Astronauts also miss home in a sensory way (the smell of grass, the sight of a sunny day, the feel of their feet on the ground). When those familiar experiences are taken away, it impacts a person's motivation. Over extended periods of time, it can even affect the ability to make decisions. Scientists are concerned that altered gravity and radiation, combined with isolation and confinement, could pose real psychological hardships, leading to further danger for the crew in space.



"The spaceflight hazards are menacingly synergistic, creating cumulative effects," says Williams. "These combined effects are likely to pose an even graver risk to the mind and body as humans travel farther from Earth."

To manage that risk, NASA is looking at hazards in combination as well as separately. Paloski has contributed to an integrated approach to the study of physical and mental health in space.

Impacting the Future of Health on Earth, as Well as in Space

The Yerkes awards committee recognized the significance of Paloski's contributions as a non-psychologist in advancing research of wide relevance. According to Williams, Paloski has championed research plans that incorporate behavioural health – acknowledging potential risks to sensorimotor functions, nutritional impacts on morale, and the ability to perform under demanding conditions, especially over long periods of time. Paloski has advocated for partnerships between military, health and medical institutes, and NASA research programs. These partnerships promote human resiliency in the face of adversity.

While the Yerkes award is being presented to Paloski, he feels that the award recognizes a vast team of people.

"This recognition is a tribute to the great work that the people supporting the [HRP Elements](#) have done. Characterizing and mitigating the risks posed by psychological factors to individuals engaged in expeditionary operations in high-demand, extreme environments, as well as those experiencing isolation or confinement for long periods of time, allows us to support safe, productive human space travel," says Paloski.

For both Paloski and Yerkes, results have demonstrated the value of psychology in support of a national level mission that includes members of our astronaut corps as well as our military service members and their families. Paloski's advocacy for integrated research is reducing the risk posed by psychological vulnerabilities, with a goal to increase human adaptability and resiliency. Previous recipients of the Yerkes award have included Senator Kay Bailey Hutchison, Senator Daniel Inouye, and Senator Elizabeth Dole.

Like Yerkes, Paloski's award recognizes his promotion of psychology as a science of relevance to promoting the well-being of our society. Paloski's vision has helped establish the value of psychological support to health on Earth, as well as in space.

NASA's [Human Research Program](#) (HRP) is dedicated to discovering the best methods and technologies to support safe, productive human space travel. HRP enables space exploration by reducing the risks to astronaut health and performance using ground research facilities, the International Space Station, and analogue environments. This leads to the development and delivery of an exploration biomedical program focused on: informing human health, performance, and habitability standards; the development of countermeasures and risk mitigation solutions; and advanced habitability and medical support technologies. HRP supports innovative, scientific human research by funding more than 300 research grants to respected universities, hospitals, and NASA centres to over 200 researchers in more than 30 states.



Former Astronauts Share Ways to Cope with Social Distancing & Isolation

If anyone knows about how to deal with being far from family and friends, and working in close quarters, it's astronauts. From the earliest space missions with capsules barely bigger than astronauts and their equipment to record-setting durations aboard the International Space Station (ISS), astronauts have pushed the physical, psychological, and emotional limits of spending time in space and conducting research there.

In the past few decades, NASA has become increasingly concerned with the toll of spending time on space missions. From extended ISS missions to the prospect of weeks- or months-long lunar or Mars missions – and even colonization –, there's a lot to try and understand when it comes to sending humans into space for any length of time.

"Isolation and confinement are like being alone in a cramped space, and that feeling worsens over time," says Bill Paloski, Ph.D., Director of NASA's Human Research Program (HRP). "The longer and longer a person spends in that kind of environment, there is a potential for bigger and bigger problems."

As part of the attempt to understand these potential problems and prepare astronauts, NASA funded the HI-SEAS mission on the slopes of Hawaii's Mauna Kea. The Martian-like environment offers participants a realistic simulation of what life will be like for astronauts on Mars someday. During each of six missions between 2013 and 2018, four- to six-person crews operated in isolated independence and attempted to maintain self-reliance and sanity for up to a year.

NASA is not alone in this endeavour: between 2007 and 2011, three crews of volunteers participated in a simulated Mars isolation study, called Mars-500, supported by Russia, China, and ESA; in March 2019, international participants in the Scientific International Research in a Unique terrestrial Station (SIRIUS)-18/19 project spent four months in isolation; and China has run a series of small-crew isolation experiments at their simulated Lunar Palace 1 facility.

All this to say: astronauts know a lot about isolation, social distancing, and life in small spaces with limited resources. Who better to provide us all advice on the current social conditions – which range from border closings and self-quarantine to total lockdown depending on where you live – than these experts?

Forbes sat down with two astronauts and asked their advice on how we can all keep from going stir-crazy over the next few months.

“Take stock of your situation, make an honest assessment of where you are,” advises Dr. Chiao, who spent more than 229 days in space over the course of several missions. “What resources do you have and how long you might be in this situation? That helps you prepare mentally.”

NASA astronauts generally know how long each mission will last and what resources they will have. That’s a great advantage over us here on earth facing uncertain timelines for when we can stop following “shelter-in-place” orders and social distancing.

Dr. Chiao shared a story of preparing mentally for a six-and-a-half-month mission, only to receive late notice that mission might extend to 12 months. He knows the feeling of uncertainty too: “That was kind of a shock to us because we’d been training for three and a half years having this expectation of six months [mission duration]. So that shows you how the uncertainty can get in there and kind of mess with your expectations.”

At the end of the day, seeing the bigger picture can help keep it all in perspective.

Astronauts get to look down on earth and remember what their missions are for; we on earth have to remember that all of these measures help save lives – an equally worthy mission.

John Grunsfeld PhD, retired NASA astronaut and Hubble Space Telescope repairman spent over 59 days in space. He notes that one advantage of astronaut missions over our current social distancing and remote work policies are that NASA keeps astronauts very busy.

“Nearly every minute of the day is scripted with tasks,” shares Dr. Grunsfeld. “While we were isolated, we had regular contact with the ground. At sometimes, so much contact that we wished the ground would leave us alone and let us get our work done.”

As for those of us on earth, Dr. Grunsfeld recommends the following: “Start a new project or challenge that you’ve wanted to do but didn’t have the time. Trade your commute time for learning a new skill.”

“On the International Space Station, the other key activity to maintain good health – mind and body – is regular exercise,” says Dr. Grunsfeld. Astronauts are required to spend several hours each day exercising; this helps maintain their physical wellbeing and also taps into the psychological benefit of exercise to fight depression and other mental health issues.

Even as parts of the world enter various states of lockdown, most of the ‘shelter-in-place’ orders within the U.S. allow citizens to leave their home for exercise (hiking, walking, running, or cycling) as long as we maintain social distance (6 feet or more). “Try to get some exercise every day – outside if possible, while keeping social distance,” advises Dr. Grunsfeld.

In space, astronauts rely on their spacecraft to keep them alive; there are some riveting tales about the risk and reality of life in space in Commander Chris Hadfield’s book *An Astronaut’s Guide to Life on Earth*. While these seem abstract or far-fetched, it’s important to keep our earthly abodes operational too – especially as we’re spending a lot more time in them.

“In your own home, make sure that as much as possible things, you’re in a state of good repair, and you’re making your surroundings as comfortable as possible,” advises Dr. Chiao. “Make sure the systems are working. Keep on top of malfunctions.”

Translating this from astronaut language back to earth, this means you should make sure your boiler or washing machine isn’t about to call it quits, your roof won’t be leaking in on the next rainy day, and you’ve got a few extra comforts to keep your home feeling homey. (In my house, that’s fresh daffodils and candles!)

Another tip is to make sure each person in your home has their own space to escape the rest of the ‘crew:’ “On the ISS one thing we’ve learned is to make sure each crew member has their personal space that they can decorate with family photos and be alone when they want to,” shares Dr. Grunsfeld. “For folks confined to their homes or apartments with other people, my recommendation is to try to spend some ‘away’ time each day to give your brain a ‘socialization’ rest.”

You’ve heard it before: stop buying all the toilet paper, eggs, and other groceries.

“Please try to avoid the urge to go in panic buy because you’re going to help create artificial shortages that hurt everyone,” advises Dr. Chiao. “It’s important to keep up your supplies, but if everyone goes out and just buys normally what you need, then we should all be OK with that.”

And when it comes to consuming your entire Coronavirus stock of snacks, the best way to prevent that is by not buying them in the first place: “It’s human nature that if you have a lot of something, then you tend to eat more of it.” Put the candy bars, goldfish crackers, and bottles of wine back on the shelf and slowly back away.

In earlier missions, astronauts had intermittent communications – email syncing every eight hours and voice-over-internet calls with family and friends whenever the satellites were aligned. (Wouldn’t we all like to only receive work emails every eight hours?!)

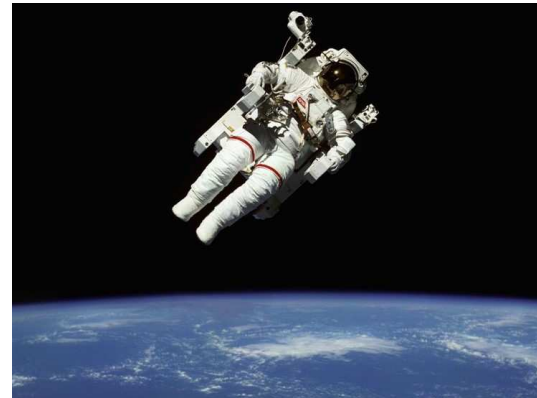
Today, astronauts aboard the International Space Station are in constant contact with earth, which helps reduce the sense of isolation and loneliness they experience: “For the last several years aboard ISS, you do have real time e-mail,” says Dr. Chiao. “We do have real time Internet access. And so, the isolation is not as much as it was before.”

Dr. Grunsfeld recommends the same policy for us on earth: “connect with family and friends frequently – virtually, of course.”

Humour (all those memes we keep sending each other), small pleasant surprises, and little notes to say ‘I’m thinking of you and hope you’re well’ can go a long way to combat the distance we feel as part of social distancing.

“I would take pictures of different places on the earth that meant something special to a family member or a relative or a friend. And I would email the picture to those of those peoples and they would really appreciate it,” shares Dr. Chiao. “And they in turn, would send me photographs or short video clips. It kind of kept my spirits going as well.”

So yes, those cat pics and text messages help. As do unexpected Amazon Prime gifts or Facetiming with friends and family you can’t travel to see in person.



Credits: NASA.

Comet Atlas is coming! *By Tony Nightingale*

Comet Atlas is racing toward the inner solar system, and it could become the brightest comet seen in the night sky in over two decades. The comet, discovered by an observatory designed to protect Earth from asteroids, may even be visible during the day just two months from now. Also known as C/2019 Y4, this comet was discovered by astronomers at the Asteroid Terrestrial-impact Last Alert System (ATLAS) in Hawaii in December 2019. At the time, the comet was exceedingly dim — but the comet became 4,000 times brighter in just a month. This increase is far greater than astronomers predicted and could potentially signal the comet may soon be exceptionally bright.

Comets are, essentially, dirty snowballs. As the comet approaches the Sun, the heat will drive off some of the ice which makes up the nucleus (main body) of the object. If the comet holds its shape as it continues to heat, then Comet Atlas could grow as bright as the planet Venus (the brightest object in the night sky other than the Moon). The comet, currently near the orbit of [Mars](#), is closely following the path taken by one of the great comets in history — the Great Comet of 1844.

At its current rate of brightening, Comet Atlas could be visible to the naked eye, under dark skies, during the first weeks of April. For skywatchers in the northern hemisphere, this would be a sight unseen since the dual shows of Comets Hyakutake in 1996 and Hale-Bopp the following year. When Hyakutake was at its peak, the tail of the comet stretched halfway across the sky. In May, the comet could shine with a green hue, providing a unique view for viewers in the northern hemisphere. The brightest predictions for the comet suggest it could become bright enough to be seen during the day. The peak brightness of Comet Atlas would depend, largely, on how much material is encased within its nucleus. If the comet is sizable, and it does not fall apart as it is heated by the [Sun](#), it could put on an amazing show in May.

The ATLAS observatory which first spotted the comet consists of a pair of 0.5-meter (19") telescopes, placed 160 kilometres (100 miles) apart. The system, operating since 2017, is designed to detect near-Earth objects — [asteroids and other](#)[HYPERLINK "https://medium.com/the-cosmic-companion/welcome-our-new-mini-moon-2020-cd3-d7e1aa8e027d?source=friends_link&sk=87a28b2026c954df0a9e7ecfc0af8f07"](https://medium.com/the-cosmic-companion/welcome-our-new-mini-moon-2020-cd3-d7e1aa8e027d?source=friends_link&sk=87a28b2026c954df0a9e7ecfc0af8f07) [HYPERLINK "https://medium.com/the-cosmic-companion/welcome-our-new-mini-moon-2020-cd3-d7e1aa8e027d?source=friends_link&sk=87a28b2026c954df0a9e7ecfc0af8f07"](https://medium.com/the-cosmic-companion/welcome-our-new-mini-moon-2020-cd3-d7e1aa8e027d?source=friends_link&sk=87a28b2026c954df0a9e7ecfc0af8f07) [bodies](#) which could potentially impact Earth. In addition to finding roughly 100 space rocks measuring 30 meters (100 feet) in diameter or larger every year, the observatory also occasionally discovers comets.

When it was first spotted on December 28, the comet was 439 million kilometres (273 million miles) from the [Sun](#). At its closest approach, Comet Atlas will come within 37.8 million kilometres (23.5 million miles) of our parent star. The comet is brightening at nearly an unprecedented rate and by March 17, the comet was already 600 times brighter than predicted. The [comet](#) is currently in the constellation of Ursa Major (which includes the Big Dipper) and it will remain visible all night (as seen from the northern hemisphere) all night during it pass through the inner solar system.

Several [comets](#) astronomers thought were destined for greatness failed to achieve their potential. In 2013, Comet PANSTARRS became as bright as Sirius (the brightest star in the sky), but it was positioned low on the horizon as seen from the northern hemisphere, making it difficult to see. The last two bright [comets](#) — McNaught in 2007 and Lovejoy in 2011 — were only visible from the southern hemisphere.

The path travelled by Comet Atlas — the same as that take by the Great Comet of 1844 — suggests that each of these bodies (and potentially others) may have broken off an ancient mega-comet long ago. The Great Comet of 1844 was first seen by observers at the Cape of Good Hope on December 18 of that year and was visible without the aid of a telescope through January 1845.

"During the latter part of December and the first week in January, it was a brilliant object in the southern hemisphere, equalling, it is said, in brightness the celebrated comet of Halley in its last appearance," [The Astronomical Journal](#) reported in 1850.

Comets are one of the most beautiful sights to see in the night sky, and they make perfect targets for families to view together, creating a lifetime of memories. Of course, the behaviour of comets is notoriously difficult to predict, and some comets once thought to be destined for greatness fizzled. In 1974, many astronomers believed Comet Kohoutek would light up the night sky, but it failed to deliver. Similar expectations were dashed by Comets Austin in 1990 and ISON in 2013. If this comet fails to live up to its potential, it will be a long time before we see it again — once it heads out to the outer [solar system](#), it will not return for another 6,000 years.



Not since [Comet 46P/Wirtanen](#) passed near the Pleiades star cluster in December 2018 has a naked-eye comet graced the night sky. That may soon change. On December 28, 2019, astronomers with the automated [Asteroid Terrestrial-impact Last Alert System](#) (ATLAS) survey discovered a 20th-magnitude comet in Ursa Major that was subsequently named Comet ATLAS (C/2019 Y4). Once a reasonable orbit was determined, Comet ATLAS proved a close match to the [Great Comet of 1844 \(C/1844 Y1\)](#). Both have periods around 4,000 years, approach within 0.25 astronomical unit (a.u.), or 37.4 million kilometres, of the Sun at perihelion, and are inclined 45° to the ecliptic. These and other orbital similarities were strong enough to conclude that both objects were fragments of a single, much larger comet that broke apart about 5,000 years ago. For all we know there may be additional fragments en route for future appearances. Because the Great Comet reached 2nd magnitude and grew a 10° tail in January 1845 many of us wondered if its sibling might be capable of doing the same. The answer is a qualified "yes." But one thing is certain — the comet is brightening exponentially. Back on February 16th, Comet Atlas was a 14th-magnitude wisp 30" across and barely brighter than the sky background through my 15-inch telescope. Three weeks later March 6th the coma had grown to about 5' and become more compact with a magnitude of 11. By mid-March I snared it with a pair of 10×50 binoculars at magnitude 9 from a dark-sky site. Other observers have reported a similar rapid uptick.

While a hundredfold increase in brightness in a month makes a comet lover's heart palpitate, it could also mean that the comet's volatile ices are rapidly vaporizing as it nears the Sun. Once those materials are depleted some astronomers expect Comet ATLAS's brightness curve to flatten out, a common occurrence in comets that have rarely or never come close to the Sun before. Long-period comets that approach within 1 a.u. of our star have been known to split apart, disintegrate, and disappear. [Comet ISON \(C/2012 S1\)](#) offers a classic example. Shortly before its November 2013 perihelion, the comet crumbled into a cloud of dust and ice, dashing hopes for the spectacle so many of us had anticipated. According to [NASA's JPL Horizons](#) the comet could reach magnitude -5, exceeding Venus in brightness at perihelion on May 31st. Because it will lie 13° southwest of the Sun at that time, it might be possible to see the object in broad daylight with a properly shielded telescope. That prediction may be overly optimistic, however. In a March 19th notice from the [Central Bureau for Astronomical Telegrams](#) (CBAT), Director Daniel Green applied a formula based on the behaviour of previous long-period, Sun-hugging comets and derived a more conservative peak magnitude of -0.3. It's good news either way. In both predictions Comet ATLAS will reach naked-eye brightness in mid-May before it's lost in the solar glare. The JPL Horizons formula predicts a peak magnitude between 1 and 2, while Green anticipates that number to be between 2 and 3. During the first half of May the comet will appear low in the evening sky at dusk and early nightfall as it tracks through Perseus. Binoculars should reveal a bright, strongly condensed coma followed by dust and gas tails pointing away from the Sun. With a little luck we might even see the tail without optical aid.

After rounding the Sun, Comet ATLAS returns to view around June 15th at dawn in Orion for Southern Hemisphere skywatchers. Initially glowing at magnitude 3 or 4, the comet will fade quickly — assuming it survives a sizzling perihelic encounter!

The only thing left to do is to track Comet ATLAS in the days and weeks ahead. Fortunately, its path in March and April will be very favourable for Northern Hemisphere observers, as it will be circumpolar and always remain above the horizon. As darkness falls, it will be positioned more than halfway up in the north-northwest sky. Right now, the comet is in western [Ursa Major](#), and it will shift into the boundaries of Camelopardalis the Giraffe — a rather dim, shapeless star pattern — by March 29. There it will stay, right on through the month of April.

As to how bright Comet ATLAS will get, that's anybody's guess. It might become faintly visible to the naked eye under dark sky conditions by mid- or late April. By mid-May, when it disappears into the bright evening twilight, perhaps it will have brightened to second magnitude — about as bright as [Polaris](#), the North Star.

Whether ATLAS continues to overperform and shines even brighter, develops a significant tail or suddenly stops brightening altogether and remains very faint and ghostly are all unknown right now. We'll just have to wait and see.

Southern hemisphere observers get their first opportunity to observe a bright twilight comet from June 1, about 1 hour prior to Sunrise. The first week of June will be primetime as the comet will rapidly fade by month's end, and the viewing circumstances don't get much better.

Your location in the southern hemisphere will also affect your viewing circumstances.

Viewers at 25 South latitude will see the comet a few days earlier than June 1 but the comet will become more difficult to observe as it travels southwards.

Viewers at 45 South latitude are better suited as they see the comet at a higher elevation in a darker sky, as the month of June progresses.

You will require an unobstructed Eastern Horizon. Optical aid such as a pair of binoculars is also recommended.

Start observing 1.5hrs prior to Sunrise as you may see the comets tail rise well before the head.

Use Alpha Ceti (magnitude 2.7) as a guide to locating the comet, which will appear 15 degrees below the star.

The ion tail will appear perpendicular to the horizon, rising for maybe several degrees (but better seen photographically)

The dust tail will appear much brighter, and show curvature towards the north.

Ion tails appear faint because they shine by fluorescent light. Dust tails appear bright because they shine by reflected sunlight.

May 26-Crosses into the constellation of Taurus the Bull.

May 28-Passes 11 degrees from the Sun as seen from Earth.

May 29-Passes near the Pleiades open star cluster Messier 45.

June 1-Crosses the ecliptic southward.

June 14-Crosses into the constellation of Orion the Hunter.

June 15-Drops below +6th magnitude.

June 16-Passes near the +3.7 magnitude star Pi Orionis.

July 1-Drops below +10 magnitude.

By June 7, the comet has faded to 1st magnitude, 4th magnitude by June 16, 6th magnitude by June 26. This is due to the comet rapidly receding from the Sun and Earth.

However, the comet is likely to fade more slowly post-perihelion. $n=3$ (typical of Halley type comets) which will extend our viewing circumstances but the comet will continue to remain near the Sun.

Viewers should also be on the lookout for outbursts or fragmentation. 00:10 04:52

MPAS @ the ASV's Messier Star Party LMDSS near Heathcote, by Greg Walton

There was some thought that this event might not go ahead. The day before, the ASV sent out a message that the event was still on but if you had any flu-like symptoms please stay away. I arrived at 2pm to find the viewing field empty, 50 percent cloud and a strong cold south wind blowing dust everywhere. So it was a quiet start to the day and I was wondering if anyone else would turn up. I slowly started to set up Sky Dancer, my F3.8 21.5 inch Dobsonian which I built 20 years ago. I had not used this scope for a year and I was glad that I didn't forget anything. I sat back in my chair and watched the wind blow the telescope around in circles like a weathervane. I kept the mirror cover on, to keep out the dust. Next I set up my bed in the back of the ute and opened a bottle of port; very important!



I went for a walk around the site to check out what was new. First I headed to the radio section to see if the 8-metre dish is working, as I helped to build it. Yes, the receiver had been fitted with an aerial above which I think must be there as a lightning conductor to protect the receiver. Someone had fitted a set of cricket stumps to the centre of the dish to pay homage to the movie *The Dish* where they were playing cricket inside the dish at Parkes. Also dust covers had been fitted around the central gear and the tower had been painted white. The dish was moving back and forth, but when I looked inside the control room there was no one home, just a whole lot of electric meters and computer screens running. Wish I knew what it all meant; I believe they're mapping the sky at the hydrogen wavelength.



I walked up to the club room and was surprised to see the room had been insulated and lined with some kind of white board, definitely felt cooler and looked nice... Saw a new fridge the same as we have at MPAS; also a lounge area in the corner with TV. All felt very homely. Outside some members were selling off their unwanted astronomy gear, while others were setting up chairs.



Also 3 local vineyards had set up tables outside, all to help sterilize the minds of the astronomers.

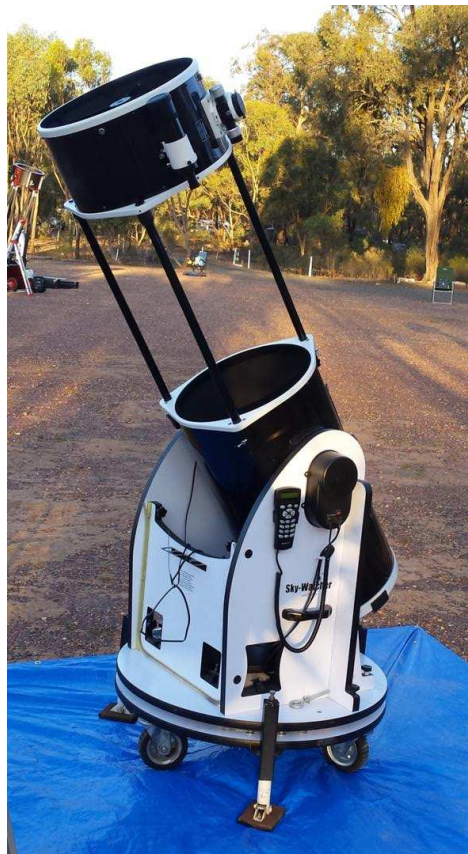
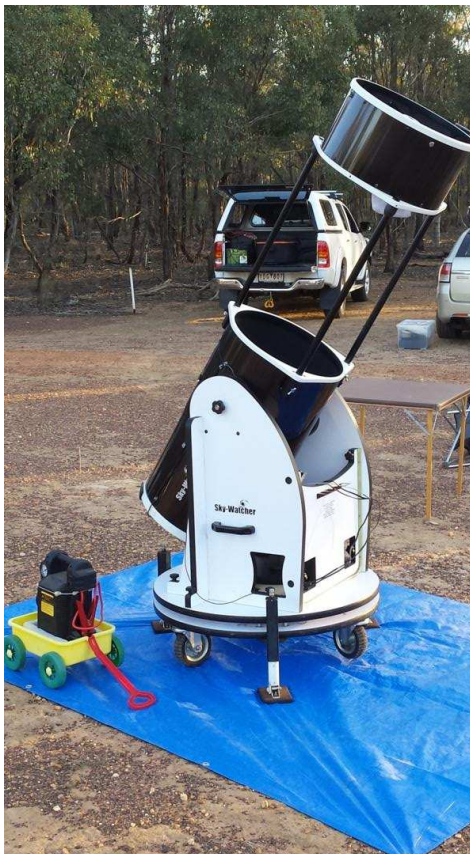
The local Lions Club arrived, and started cooking sausages and hamburgers. I got in first and ordered a hamburger as every other year they sold out early. Maybe I'll come back for seconds?



I went back to my bottle of port and saw that the large roll-off observatory was still closed. Some other members were starting to set up telescopes, so I wouldn't be on my own.

Far right a fine looking 18 inch STM with GoTo motors and a long focal length.

Below a 16 inch GoTo Dobsonian has had wheels fitted plus 3 adjustable jacks. I can see a lot of thought had gone into the battery trolley! ☺

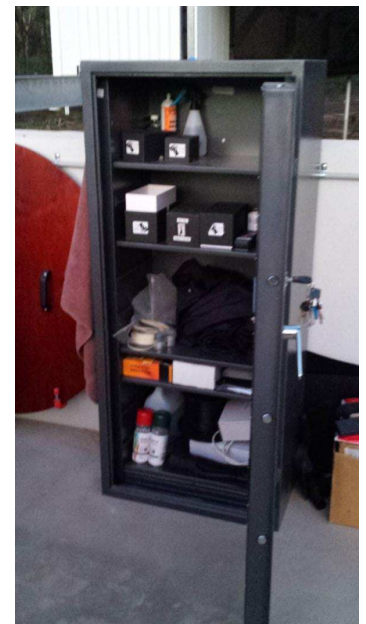




Above - Well designed and very nice woodwork in this binocular stand. In the centre of the field was the ASV's 25-inch Obsession which has had ServoCAT fitted so you can just dial in your object, push the Go button and the telescope will move to your target.



Below - The large roll-off roof opens and the 40-inch Dobsonian is cooling off, said to be the largest amateur telescope in Australia. Right - Lockable eyepiece cabinet.



Next I set up my Bino-chair, which I must say is my favourite out of all my viewing instruments. The bino. are 100mm by 25 times magnification which I bought from Andrews communication 10 years ago for the bargain price of \$430. Once they're adjusted the stars are pin sharp and the view is something you can never achieve with a camera on any telescope. The globular cluster Omega Centauri shines brightly against the inky background, with a mass of tiny pins of light all saying look at me. Swinging left you can easily spot galaxy NGC5128 the Hamburger with its dark lane running through its centre. Then moving up and to the right you can easily see edge-on galaxy NGC4945. Just below the Southern Cross, the Jewel Box NGC4755 jumps out at you with a yellow star embedded in a perfect triangle of stars. Just to the right an ink black patch called the Coal Sack. Then leaning back in the chair you move up to the Carina Nebula NGC5139 with a brightly shining yellow star at its centre. This nebula occupies a large area so you need to swing from side to side to take it all in. It has a 3-dimensional look with dark patches in front blocking the starlight from behind. One dark patch looks as if someone has placed a piece of electrical tape over the nebula. I swung the chair around 180 degrees to compare it with the Great Orion Nebula M42 and found it was much smaller in size easily fitting in the field of view of the binoculars though M42 is much brighter. Moving down a bit I could see the Running Man Nebula within its patch of bright stars. Swing down to the right the Flame Nebula NGC2024 hangs on to the stars Alnitak. I tried but couldn't see the Horse Head Nebula. Then a quick look at Pleiades M45 which perfectly fits in the field of view; nice but I'm still not going to buy a Subaru. Throughout the night many members and public sat in the chair, it was interesting in listen to their comments. The sky was so full of stars. Wow! What's that big ball of stars, I can see so much, makes me feel very small. This is a very comfortable chair. Even 3 young men from Taiwan all sounded very excited talking in their own language, also asking if they could get plans for the chair. I was able to send them the link for a story on the chair.



Sky Dancer also got a workout as a steady stream asked if they could look through the telescope. Due to Covid-19 I always stood well back from everyone as I talked about the various objects in the eyepiece, trying not to make it too obvious. The Moon climbed over the tree tops around 11pm stopping all viewing. I covered the telescope and went to bed.

Sunday morning everyone was up early packing their car and leaving. By noon there were just 3 members left on site. I decided to stay and have this night to myself. I rested all day with a headache and swore never to drink port ever again. Yeah! like that's going to happen!

Sunday night first object was M1 the Crab Nebula which is easily spotted but very hard to see at the Briars. Then M83 a face-on galaxy. I had forgotten how bright it is from a dark sky, as it's hardly visible from the Briars. Then on to a close group of galaxies M66, M65 & NGC3628 where I could see their dust lanes. On to M104 the Sombrero Galaxy, also very bright and looked much larger than what is seen at the Briars. Next, galaxies M95, M96, M105. Then a quick look at the Great Orion Nebula M42 & Horse Head which I could just make out with my Ha filter. Galaxies NGC3166 & NGC2903 looked very interesting and would be good photograph objects. Went to many other Messier objects until my legs got sore, I finished the night off sitting in my Bino-chair, I never get tired of the views. Again the Moon started stealing the stars around 11:30pm; time for bed. The following day the ASV council closed LMDSS and cancelled all meetings.



Making the Bino-chair link - https://drive.google.com/file/d/0ByvkvzZGI9g_WTJUNUdmYVFXdkk/view?usp=drivesdk



M17 | Swan or Omega Nebula by *Steve Mohr*

I have the M17, Swan Nebula processed, with LRGB filters, no Ha. I was lucky enough to have really nice Luminance data with the Ha not adding anything to the image quality. Strange, normally it will give something.

The nice thing about not having Ha is that the processing is much easier. Ha adds complexities and needs to be gently added, but when it's just LRGB, it all just matches BAM!

Hi resolution link: https://live.staticflickr.com/65535/49556080057_86314ae4f5_o.jpg

Information regarding this image:

Centre (RA, Dec): (275.232, -16.073)

Centre (RA, hms): 18h 20m 55.675s

Centre (Dec, dms): -16° 04' 23.874"

Size: 48.2 x 31.8 arcmin

Radius: 0.481 deg

Pixel scale: 0.733 arcsec/pixel

Orientation: Up is 117 degrees E of N

Instrument: Planewave CDK 12.5 | Focal Ratio: F8

Camera: STXL-11000 + AOX | Mount: AP900GTO

Camera Sensitivity: Lum: BIN 1x1, RGB: BIN 2x2

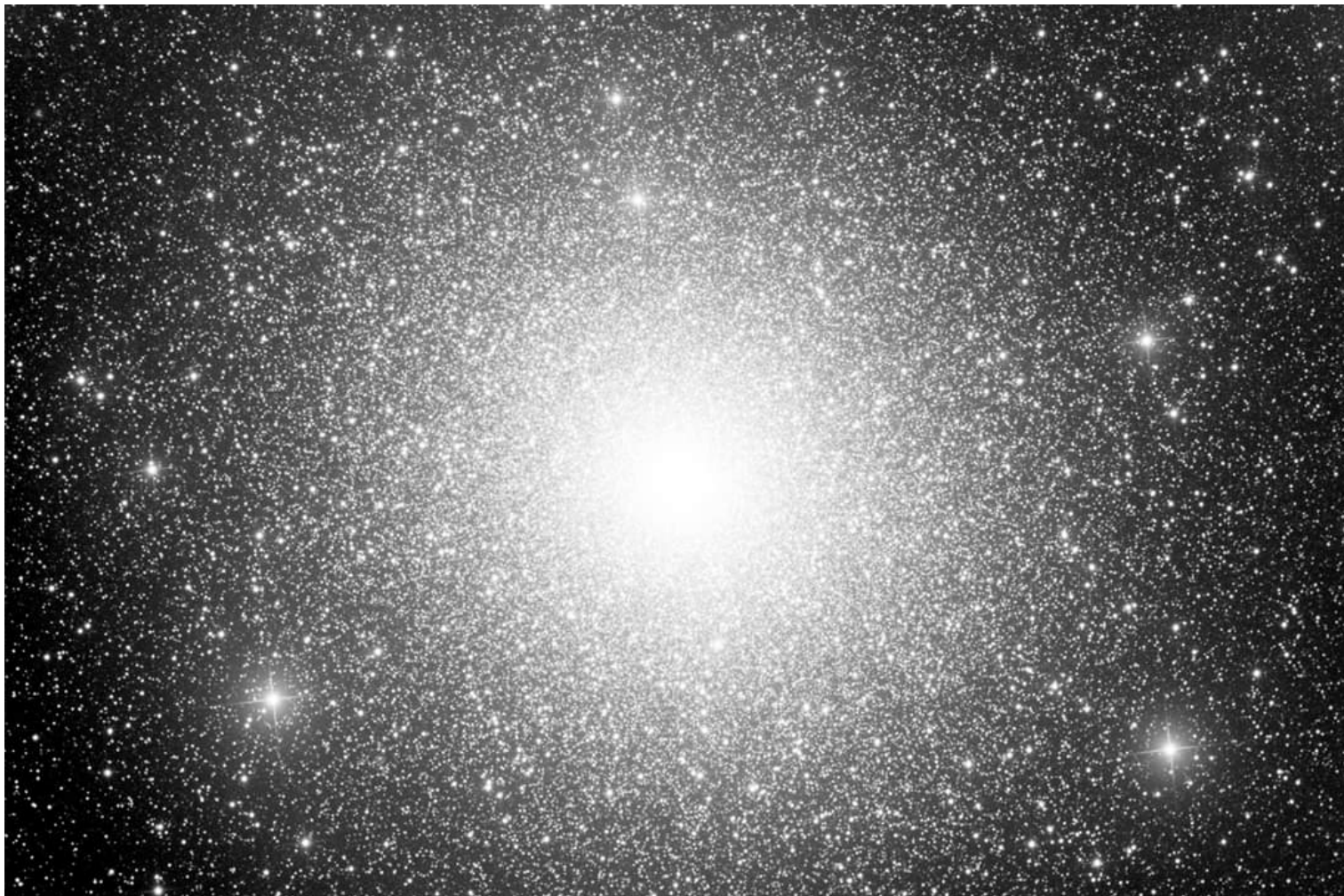
Exposure Details: Total: 18.25 hours | Lum: 37 x 900 sec [9.25hr], RGB 450sec x 24 each [9.0hrs]

Viewing Location: Central Victoria, Australia.

Observatory: ScopeDome 3m

Date: April-July 2019

Software Enhancements: CCDStack2, CCDBand-Aid, PS, Pixinsight



47 Tucanae | NGC104 | Globular Cluster *by Steve Mohr*

High resolution link: https://live.staticflickr.com/65535/49568536448_6b4f1a6220_o.jpg

This one is a HDR effort, with 600sec, 300sec, 180sec, 60sec, 30sec, and 10sec sub exposures. Probably didn't need that many steps. I have been avoiding these targets, globulars, as they are a tough target, especially tough on your optics performance. I'm surprised with the colour, a clear yellow hue, with all photos calibrated in Pix.

47 Tucanae is the second largest globular cluster in the night sky, and appears roughly that of a full moon in size. Southern hemisphere observers can find this object directly adjacent to the Small Magellanic Cloud, not far from the south celestial pole. Having an exquisite symmetry, containing approximately a million Sun-like stars, all tied together gravitationally, these objects are often referred to as "astronomical fossils" because they retain chemical compositions that were found in the time of the origin of their neighbouring galaxies. But how did these form? Some studies reveal that the answer may in fact lie in their unique chemical properties that are not found in any other stellar environment. In time, studies will help us to understand how these clusters originally formed, and answer the more confusing question of: How did successive generations of new stars evolve within environments apparently barren of the normal elements necessary to create new stars?

Information about the image:

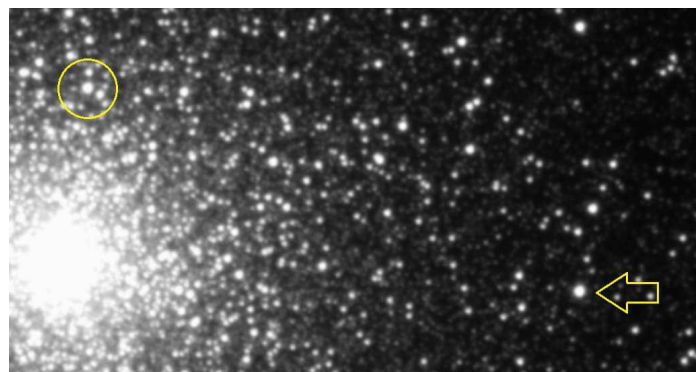
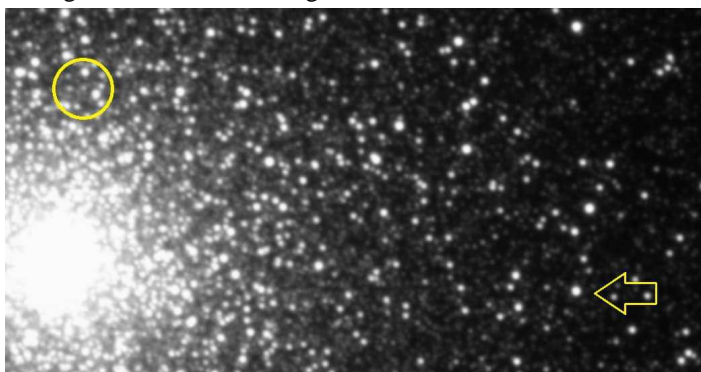
Centre (RA, Dec): (6.027, -72.102) Centre (RA, hms): 00h 24m 06.561s Centre (Dec, dms): -72° 06' 06.704"

Size: 48.6 x 32.2 arcmin Radius: 0.486 deg Pixel scale: 0.732 arcsec/pixel Orientation: Up is 187 degrees E of N

Instrument: Planewave CDK 12.5 | Focal Ratio: F8 Camera: STXL-11000 + AOX | Mount: AP900GTO

Viewing Location: Central Victoria, Australia. Observatory: ScopeDome 3m Date: June-September 2019

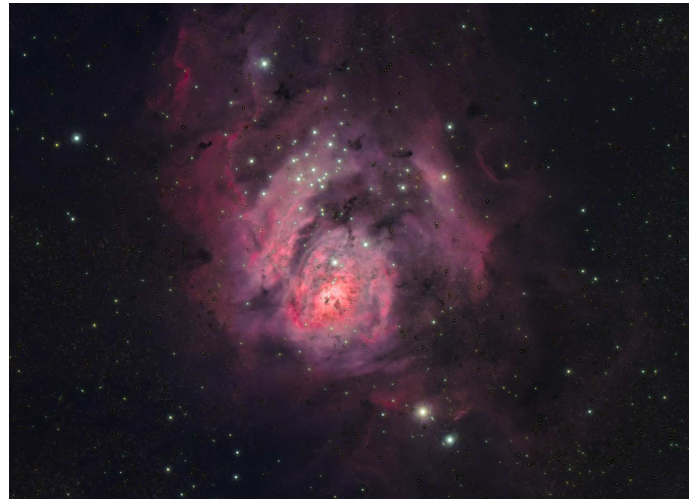
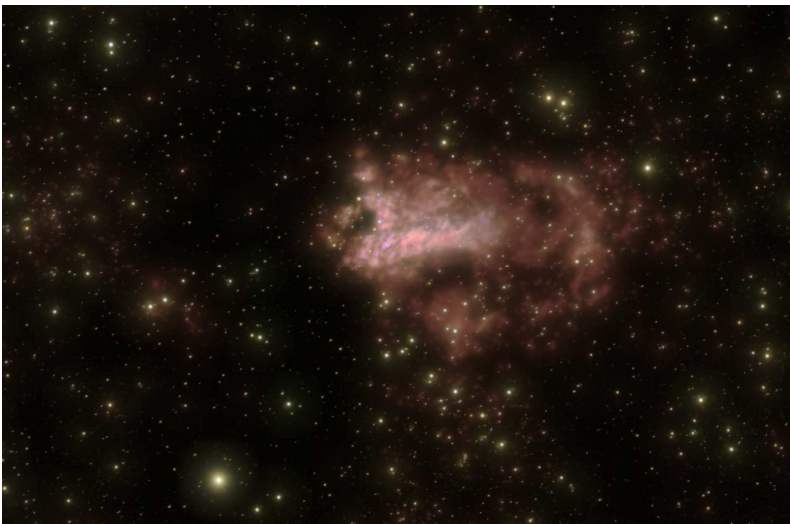
Image below taken on 2 nights show some differences in the stars.





Here's a gas cloud called Carina Nebula that I took last month at Heathcote. It's a collection of 90 mins of light using 4 minute long exposures. Taken with a WO110 triplet and ASI07i Camera tracked to follow the sky. I like the overall colour and all the tiny dark clouds. Thanks for looking, *Domenic Lucarelli*

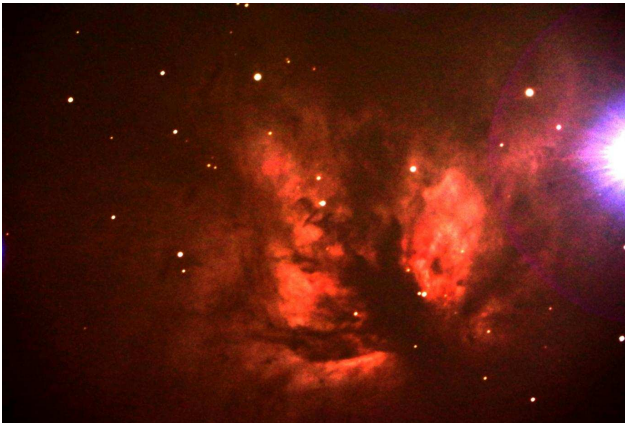
Clear skies and a day off work on a Friday rarely occur for me! I was therefore motivated to attempt some astrophotography from the Briars for my first time as I usually travel out further into the countryside. After receiving some very well communicated information from Greg, I arrived at the Briars, before anyone else was there and managed to set up and switch the power on, just in time for sunset! The Moon was set to rise after 1am, so I had a deadline to get accurately aligned, and up and photographing. I used my f/6 Orion Apo refractor and my newish cooled ZWO camera ASI071, which I'm still learning to use. Once drift aligned I took 40 x 2 minute exposures of M8, the Lagoon Nebula, and approx. 20 x 3 minutes exposures of M17, The Swan. I think my



images turned out ok considering it was windy all night, and I collected a lot of skyglow which is very rare (green stars, Yuk!). Lucky I do the processing with Deep Sky Stacker and a program called StarTools which works like magic! I've attached my two images, which I hope you like. I'm a visual astronomer mainly and the best part was hanging out with Greg in the dome (in between checking on the gear outside) while we explored deep sky objects east of Sagittarius with the C11. We visited many favourite deep sky objects of mine! *Domenic Lucarelli*



Carina Nebula from my backyard last night. Taken with a Hydrogen Alpha filter using a William Optics Star 71 f/4.9 Astrograph and SBIG STL11k Camera. This is just a single 5-minute exposure (best shot from a night of 'bouncy' seeing). *By Dave Rolfe*



Above left - Flame Nebula NGC2024, taken with the 350mm Meade with 0.7 reducer on EQ8 in the MPAS observatory. The bright star at right is Alnitak which is one of the 3 stars on Orion's belt. Camera - Pentax K30 23x30sec ISO 12800 stacked on (Deep Sky Stacker)

Left right - Image straight out of the camera, as you can see it's fairly faint and I had to enhance the contrast and colour. Also cropped the blue circle in the left part of the image which has been caused by some internal reflection in the telescope. *By Greg Walton*



Above left - M78 taken with the Meade 350mm 0.7 reducer EQ8 Pentax K30 21x30sec ISO 12800 stacked on (Deep Sky Stacker)

Above right - Image straight out of the camera. You can see it's faint and I had to enhance the contrast and colour. *By Greg Walton*

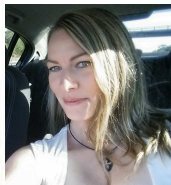
SOCIETY INFORMATION



Peter Skilton



Mark Stephens



Nerida Langcake



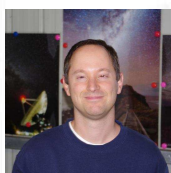
Jamie Pole



Anders Hamilton



Trevor Hand



Simon Hamm



Peter Lowe



Dave Rolfe



Greg Walton

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SOCIETY MEETINGS

Meeting Venue: MPAS Astronomy Centre
 The Briars, Nepean Hwy, Mt Martha
 (Melways ref. 151/E1)

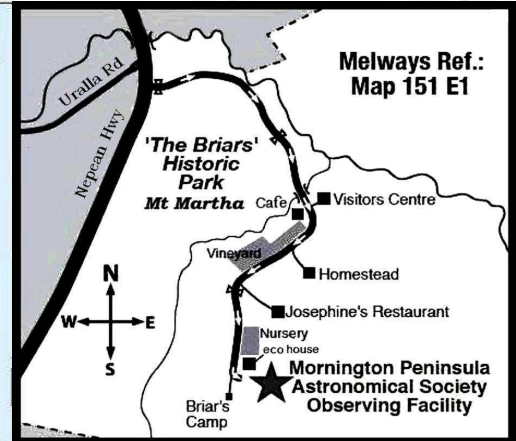
Society meetings: Don Leggett Astronomy Centre
 8pm on the third Wednesday of the month
 (except December)
 (See map at right & Below)



For addition details:
 Internet: www.mpas.asn.au
 email: welcome@mpas.asn.au

Phone: 0419 253 252

Mail: PO Box 596, Frankston 3199, Victoria, Australia



LIBRARY

The Society also has books & videos for loan from its library, made available on most public & members nights at The Briars site. Contact Fred Crump



Rohan Baumann



Fred Crump

E-SCORPIUS NEWSGROUP

M.P.A.S. main line of communication is the online newsgroup called E-Scorpius. Here you will be kept up to date with the latest M.P.A.S. news & events information as well as being able to join in discussions & ask questions with other members. To join, email welcome@mpas.asn.au say that you want to join E-Scorpius & you will be added to the E-Scorpius list.

facebook MPAS members - <https://www.facebook.com/groups/MPAS1/>
 MPAS - <https://www.facebook.com/mpas0/>

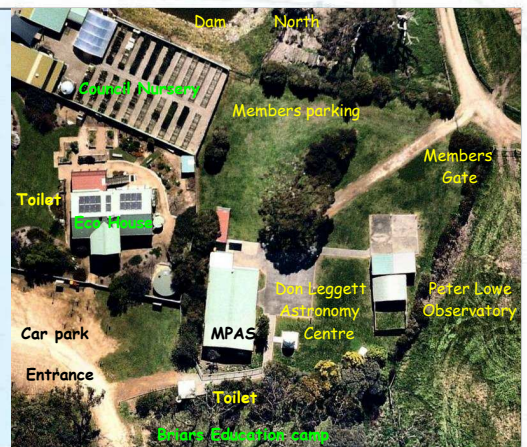
VIEWING NIGHTS - MEMBERS ONLY

Viewing Night - Members only
 Any night, at The Briars, Nepean Hwy, Mt Martha, starting at dusk.
 Members visiting The Briars for the first time must contact Greg Walton on 0415172503 if they need help getting to The Briars site.
 Upon arrival at the site, remember to sign the attendance book in the observatory building.

For additional details:
 Internet: www.mpas.asn.au
 email: welcome@mpas.asn.au

Phone: 0419 253 252

Mail: PO Box 596, Frankston 3199, Victoria, Australia



Members please write a story about your astronomy experiences and add some pictures. Send them to the editor: Greg Walton gwpas@gmail.com

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