



Cover image: NGC 1999 By Logan Nicholson

16 hours X 7 minutes Hydrogen alpha from home, and 1.5 hours X R,G, and B at 2 minutes for a total of over 20 hours integration. ASI1600mm-c, ZWO filters, CGEM mount, Takahashi MT-160 scope.

# 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.



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# SOCIETY NEWS

By Greg Walton



**Public Night January 4th** - saw 130 members of the public in attendance plus about 20 members. Was a sunny day until late afternoon when heavy clouds rolled in stopping any viewing through the telescopes. Peter Lowe extended his talk to keep the public entertained. Many walked through the observatory while members explained how the telescopes worked. Some had come from as far away as England, hoping to see the 2 brightest globule clusters in the sky, NGC5139 & NGC104, which can't be seen from the northern hemisphere at higher latitudes. I could only show them the 2 objects on my phone as I had imaged these objects with the telescopes in the observatory.



Photos John Cleverdon

**Public Night January 11th** - Under a waxing crescent Moon, there were 125 in attendance at the public night on January 11th at The Briars, plus members, including some visitors who came back after the January 4th night was completely clouded out with about 105 present then. It was pleasantly warm with no wind but with some intrusion of mosquitoes around dusk. We even had two ladies visiting from the Netherlands who had booked and paid while still home in somewhat cooler conditions, including a volunteer from Rotterdam Planetarium. Peter Lowe gave the talk inside, and outside the gathered members were greeted all evening with the music of Grease, the movie, which was playing as part of the Barefoot Cinema event projected down the hill at the visitors centre for the public who attended that instead. There was some noticed light pollution effect from the cinema, about 1.5 magnitudes, as suggested by the observatory photometer trace, darkening around 10:30pm at the end of the show. You can see the real time measurements yourself anytime at <http://www.mpas.asn.au/photometer.html>



Outside helping with proceedings (and who mostly remembered as members to sign the log book at the entranceway when they attend) were Simon Hamm, Peter Skilton, Nerida Langcake, Piper Grierson, Catrina & Maria Dumitru, Jamie Pole, Pia Pedersen, Greg Walton, Fred Crump & Bonnie, John & Marj Cleverdon, Bob Heale, Mark Stephens, Kevin Rossiter, Dave and Jamie Rolfe, Mike Smith, Rohan Baumann, Simon Birch, Eden White, Jasmine Si and family, Peter & Finn Cracknell and Ian Sullivan with his Questar.

*Regards, Peter Skilton*

**Society Meeting January 16th** - saw 20 members in attendance. Peter Lowe chaired the meeting and talked on "The History of Vastroc and NACAA". Members chatted over coffee. Greg Walton did Sky of the Month. No viewing due to clouds.

**Public Night January 18th** - We had 53 visitors at the public night at the Briars, with about a half of that more who didn't show on the night probably due to the total cloud cover. Although the Moon could just be made out through the clouds, it was an amorphous blob of light. There was a clear sky around the start of twilight, but it was just too bright to spot any objects in the sky before the clouds rolled in. Trevor Hand gave an exoplanet talk indoors, while outdoors in the field were many other members including Peter Lowe, Greg Walton, Pia Pedersen, Simon Bacon, Nerida Langcake, Peter Skilton, Fred Crump & Bonnie, Mark, Amy and Jiny Bendall, Eden White (up from Phillip Island), Mike Smith, Gavin Curnow, Peter & Coleen Conboy and Haydn, Lachlan, Kaitlyn and Jessynta Blake. There was even a suggestion that Mr Pole and Mr Hamilton and some of the Sioukas family were there as well, and possibly other shadowy members lurking around who forgot to sign the members' logbook by the glass cabinet in all the excitement. Do please remember to wear your lovely nametags. Some members keep them in their car's glovebox, or opt to leave them by the glass counter at the end of the evening. They help with social interaction and to put a name to a face. If you've lost yours or are after another, such as if you have a family membership, then don't hesitate to ask. *Regards, Peter Skilton*





**Members BBQ January 19th** - saw about 40 members in attendance, which is a large turnout then normal. Big thanks to all who brought food and helped with the clean up. Many had came to do the observatory and telescope training which started at 8pm with Greg Walton and David Rolf doing a brief intro before members were let loose on the telescopes. Instructors on the 4 telescopes in the observatory were Jamie Pole, Anthony Nightingale, Anders Hamilton and myself. Members doing the training were shown how to open the observatory and operate the telescopes, by handing them the controls and getting them to do everything, this makes is very hands-on as we made sure each member could run the telescopes. A bonus was that nobody failed.



### Public Night January 25th -

The fourth public night in January at The Briars was held in warm conditions and under almost complete cloud cover all evening, after the cool change relief from 42 degrees blew through late afternoon. There was also the odd mozzie or two buzzing around, and the outdoors cinema was still in progress near the Visitors' Centre causing some throttling of traffic-flow up to the observatory. Nevertheless, 95 visitors attended to hear Trevor Hand give his favourite 12 moons talk, with quite a few families travelling from Melbourne and beyond for the evening before the school holidays ended. In parallel, Peter Lowe set up on the outdoors screen a video of 50 years of NASA produced by the agency, and Fred Crump had on show an informative poster board he'd prepared celebrating the 1969 Moon landing - those astronauts sure look young now! Outside helping with the evening were members Anders Hamilton, Greg Walton, Pia Pedersen, Simon Hamm, Fred Crump & Bonnie Cass, Ashley Grierson & Nerida Langcake, Mark Stephens, Peter Skilton, Lachlan & Haydn Blake, Kathryn Hand, Logan Nicholson, Gavin Curnow, David, Landon & Jamie Rolfe and possibly some other members who forgot to sign the log book at the counter. This wrapped up the successful January set of public nights, to be followed by the regular February monthly public night so no rest just yet. *Peter Skilton*



Hand did the talk while members set up telescopes under a perfectly clear sky. We just had some smoke haze which made it hard to spot the SMC Small Magellenic Cloud. Mars was very disappointing looking more like a star than a planet. Other objects on show were Orion nebula, 47 Tucana NGC104, Jewel Box NGC4755, Tarantula Nebula NGC2070 and Alpha Centauri - a close double star. The public enjoyed listening to the members talking about the different objects. Last visitors leaving about 11:30 pm. *Greg Walton*

MPAS viewing last night. Perfect night, no Moon, no clouds and warm. We were full to capacity with 100 people. The president Peter Lowe gave a safety briefing and short talk on polar vortexes followed by my talk "Robots in Space", from Sputnik to the Mars Curiosity rover and everything in between. The last time I gave this talk I was on an around-Australia cruise, one of the passengers introduced themselves after my talk, they worked for NASA and one of their jobs was calculating the orbital paths for Pioneer and Voyager! *Trevor Hand*



**Society Meeting February 20th** - saw 30 members in attendance. Peter Lowe chaired the meeting. Dave Rolfe spoke about the pricing for Vastroc and items for sale relating to MPAS 50 year anniversary, then Roland Knabe talked on astronomy in outback South Australia. I did Sky for the Month and showed photos from Mt Burnett. Later, members talked over coffee. No viewing due to cloud cover. *Greg Walton*

Yes, an engaging talk last night at The Briars, Roland. Looked like you and Anna had a lot of crater and hill hiking and a lot of fun, despite all the mishaps. I captured it somewhat amateurishly on my iphone and now just have to figure out how to shrink it, and boost the audio a little for uploading to YouTube. Will post the link when I solve that if others wish to see the talk. It's audible but I think I missed the right hand half of the screen so as to keep you in the frame at the lectern. And a great effort with the poster board, Fred. All being done by hand without computer assistance would have taken a long time. I can see it potentially being the basis of a big rectangular iced anniversary cake if any member has any skills in that area. *Regards, Peter Skilton*

Thanks Roland for doing the talk tonight, I enjoyed it. I bet next time you pack the red dot finder first! Also well done to Fred for his Apollo 11 info board. Hopefully we will continue to see it at Public nights, Vastroc, National Science week, etc... and eventually join the MPAS gallery. *Regards, Dave Rolfe*



**Members BBQ February 23rd** - saw about 40 members in attendance. Many came to do the observatory and telescope training which started at 8pm with Greg Walton and David Rolf doing a brief intro before members were let loose on the telescopes. Instructors on the 4 telescopes in the observatory were Paul Albers, Jamie Pole, Anders Hamilton, Simon Hamm and myself. A big turnout at the MPAS members BBQ. It was good to see so many new members joining in and helping out. Thank you to everyone who brought along desserts, salads and nibbles. Special thanks to Bonny and Marg for washing a mountain of dishes and cutlery, both not long out of hospital. Mark, Heath and Bruce did an excellent job running the BBQ. Also a Big thanks to the telescope trainers in the observatory who passed on their knowledge. Good to hear many new members asking about how to get started with astrophotography. *VP Greg Walton*

Below is the link to my website where you can see my notes on astrophotography and more.

<http://gwmpas.wixsite.com/astroimagerplus>

Thanks again to everybody who contributes to these nights. Unfortunately events don't run themselves, and it was really fantastic to see the number of people there last night, and to see everybody roll up their sleeves and contribute/help when required – really encouraging. To those who completed observatory training last night – congratulations! To those who partially completed the training – please don't be discouraged; please keep attending events, asking questions, get in and have a play with the telescopes in the observatory when someone is around to supervise. This coming Friday night is a Public Viewing Night – I'd encourage all those who have recently qualified to come down to MPAS and drive a telescope for the night to show the public some stars, and gain some confidence operating the equipment. There will be experienced members on hand to help and assist you. Many thanks to all for last night.

*Jamie Pole*



*By Fred Crump*



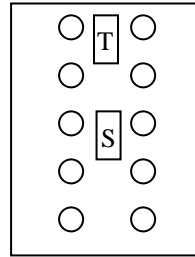
*Photo John Cleverdon*

### **The following events are confirmed and in need of member help with telescopes/speakers where shown.**

Tuesday 26th February, 8pm for Sirius College at Camp Manyung, Mt Eliza. 85 Year 5/6 girls. Speaker Peter Lowe.  
 Friday 1st March, 8pm Briars. Public & Balnarring Probus stargazing night. Speaker TBD.  
 Wednesday 13th March, 7:30pm at Parkdale Secondary College, Warren Rd, Mordialloc East. 200 Year 7 pupils. Speaker TBD.  
 Sunday 17th March, 7:30pm for Baden Powell Scouts at the Briars. 65 11-14yo anticipated. Speaker Peter Skilton.  
 Monday 1st April, 6:30pm for Strathcona Girls Grammar at Grantville camp. 50 Year 5 girls anticipated. No assistance is needed.  
 Friday 5th April, 8pm Briars. Public stargazing night. Speaker Trevor Hand.  
 Friday 3rd May, 8pm Briars. Public stargazing night. Speaker Trevor Hand.  
 Friday 17th May, 8pm Briars. Scout/Guides/Cubs night. No packs booked as yet. Speaker Peter Skilton.  
 Friday 7th June, 8pm Briars. Public stargazing night. Speaker Trevor Hand.  
 Friday 5th July, 8pm Briars. Public stargazing night. Speaker Trevor Hand.  
 Friday 2nd August, 8pm Briars. Public stargazing night. Speaker Trevor Hand.  
 Sunday 11th August, 10am Coolart homestead, Somers. Public Science In The Park with NASA visitor. TBD.  
 Tuesday 13th August, 6:30pm at Mornington Library, Main St, Mornington. Public talk. Speaker Peter Lowe. No assistance is needed.  
 Wednesday 14th August, 6:30pm at Frankston Library, Playne St, Frankston. Public talk. Speaker Peter Skilton. No assistance is needed.  
 Friday 16th August, 8pm Briars. Public stargazing night for Science Week. Speaker Trevor Hand.  
 Saturday 17th August, 7:30pm Briars. Space Concert and Public stargazing night. Speakers TBD.  
 Sunday 1st September, 6:30pm for Strathcona Girls Grammar at Merricks camp. 50 Year 5 girls anticipated. No assistance is needed.  
 Friday 6th September, 8pm Briars. Public stargazing night. Speaker Trevor Hand.  
 Friday 13th September, 8pm Briars. Scout/Guides/Cubs night. No packs booked as yet. Speaker Peter Skilton.  
 Friday 4th October, 8pm Briars. Public stargazing night. Speaker Trevor Hand.  
 Friday 1st November, 8pm Briars. Public stargazing night. Speaker Trevor Hand.  
 Friday 8th November, 8pm Briars. Scout/Guides/Cubs night. No packs booked as yet. Speaker Peter Skilton.  
 Friday 6th December, 8pm Briars. Public stargazing night. Speaker Trevor Hand.

## MPAS Observatory check list

- 1 Open 2 gates ( Members track )
- 2 Open key safe ( Get code from committee member )
- 3 Open lower shed (the warm room)
- 4 Switch red light on
- 5 Sign in book and add date
- 6 Switch on power to outside power points if needed  
( Middle black switch to up position see below )
- 7 Toilet key next to light switch
- 8 Note position of fire extinguishers and first aid kit.
- 9 Open large door if needed (latches top & bottom at left side)
- 11 Open Observatory door using electronic tag, wedge door open
- 12 Switch on lights.
- 13 Open observatory roof using crank hand.
- 14 PLEASE OPERATE TELESCOPES IN A SAFE MANNER
- 15 Switch power on, remove covers and place on table near door



**To open Key safe** 10  
**Slide centre button down S** ↓  
**Press 6 digit code**  
**Slide top button down T and pull lock out**  
**Use key to unlock both locks**

**To lock key safe**  
**Slide centre button down S** ↓  
**Press 6 digit code**  
**Slide top button down T while placing lock back in its housing**  
**Release top button T**  
**Check lock is secure**

**NOTE** - Electronic tags are only given to members after one year and have completed the training session.

Electronic tags are cancelled if memberships lapse.

### At the end of the night

- 16 Send each telescope to Park position, turn off power at wall, refit all covers & switch off red dot finders!!
- 17 Close observatory roof, switch off lights & close internal observatory door
- 18 Pack up everything outside & put away ( Telescopes, ladders, chairs, etc )
- 19 Close large door (latches top & bottom at left side)
- 20 Lock toilet door replace key in warm room
- 21 Switch off power to outside power points, switch off lights in warm room & lock outside door
- 22 Shut 2 gates ( Members track )

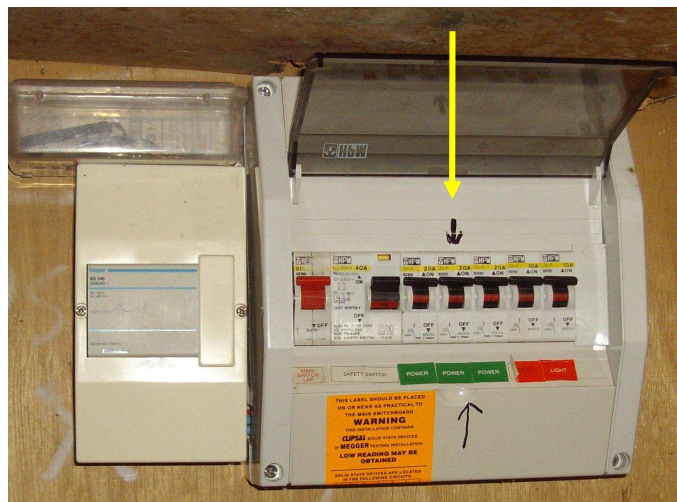
**Main, leave ON = UP**

#### Power to outside power points

In the past we always switched **OFF** the main power switch in the observatory when not in use.

But now since we have installed an electronic lock on the observatory door, we now leave the Main power switch **ON** & only switch **OFF** the power to the outside power points, using the middle black switch.

Note - DOWN IS OFF





**Horsehead and Flame Nebulas.** From Aspendale Gardens - 2 hours with Ha filter.  
Taken with a Takahashi FSQ106N, SBIG STL11k, Skywatcher Az-EQ6 mount, *By Jamie Pole*



## New Members Welcome

- \* Sophie, Alex, Patricia, Evie and Alasdair MacLeod
- \* Jessica Peters
- \* Haydn, Belinda, Lachlan, Kaitlyn and Jessynta Blake
- \* Shelley & Paul Mitchell
- \* Aamir, Sadaf, Amaan and Zara Mirza
- \* Jasmine, Michael & Min Si, and David and Xiaodong Wang.
- \* Coleen and Peter Conboy
- \* Ben Claringbold
- \* Pam Collins
- \* Tony Coventry (returning after years overseas)
- \* Sue Stoner, Nigel Rue and Heath Stoner-Geraghty (returning after several years)
- \* Katherine McCoy
- \* Ed Wright
- \* Rebecca, Guy, Bella and Ebony Lucas
- \* Isabel Melhem



### Scorpius editing team.

Members please write a story about your astronomy experiences and add some pictures.

Send them to: **Greg Walton**  
gwpas@gmail.com

### MPAS SUBSCRIPTIONS 2019

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 2018 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 2019 fees is:

### SOCIETY FEES

Subscriptions can be paid in a number of ways:

- 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.

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/0ByvkvxzZGI9g\\_NXZ4cWxHbERTdEE/view?usp=sharing](https://drive.google.com/file/d/0ByvkvxzZGI9g_NXZ4cWxHbERTdEE/view?usp=sharing)

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



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		March / 2019					Red Days indicate School Holidays
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
31					1 <b>Public Night 8pm</b>	2 Saturn 0.5 deg from the Moon dawn	
3 Venus below thin crescent Moon dawn	4	5	6	7 <b>New Moon</b>	8 Europa shadow 12:47am S Europa shadow 3am F Europa transit 3:12am S Europa transit 5:30am F	9 Io shadow centre & Io transit at 1:05am S	
10	11 Mars right of the Moon	12	13 ASV Meeting Moon below Aldebaran	14 <b>First Quarter</b>	15 Europa shadow 3:20am S Europa shadow 5:37am F Europa transit 5:45am S	16 Io shadow 1:45am S Io transit at 2:57am S Io shadow 3:55am F Io transit at 5:05am F	
17 St Patricks day	18	19	20 <b>Society Meeting 8pm</b>	21 <b>Full Moon</b> Autumn Equinox	22	23 <b>TLD - 4pm</b> <b>Members Night BBQ 6pm</b> Io shadow 2:40am S	
24	25	26	27 Jupiter right of the Moon dawn	28 <b>Last Quarter</b>	29 Saturn right of the Moon dawn	30 Mars near M45 Io shadow 5:30am S	

### Monthly Events

MPAS calendar [http://www.mpas.asn.au/Calendar\\_2019.pdf](http://www.mpas.asn.au/Calendar_2019.pdf)

**Public nights** - 8pm start on the 1st @ the Briars

**Society Meeting** - 8pm to 10pm on the 20th @ the Briars

**Telescope Learning Day** - 4pm on the 23rd @ the Briars - (Public event)

**Members Night BBQ** - 6pm on the 23rd @ the Briars

**Time to start watching Jupiter's Moons and shadows transit across Jupiter's face.** ( S = start & F = finish )

CALENDAR		April / 2019					Red Days indicate School Holidays
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
<b>Jupiter's Moons Morning 1st April</b> Io Shadow 12:01am S Io transit 1:10am S Io Shadow 2:05am F Io transit 3:15am F	1 Moon at 405,577km <b>Europa shadow centre and Ganymede shadow 11:00pm S</b>	2	3	4	5 <b>Public Night 8pm</b> <b>New Moon</b>	6	
7 <b>Day light savings ends</b>	8 Io shadow 12:53am S Io transit 2am S Io shadow 3am F Io transit 4am F Europa shadow 11:15pm S	9 Europa transit at 1:30am S Europa shadow 1:35am F Ganymede shadow 2am S Ganymede shadow 4am F	10 ASV Meeting	11	12	13 <b>First Quarter</b>	
14	15 Io shadow 2:43am S Io transit 3:50am S Io shadow 4:55am F	16 Europa shadow at 1:45am S Europa transit at 3:50am S Europa shadow 4:05am F	17 <b>Society Meeting 8pm</b> Io shadow 9:15pm S	18	19 <b>Good Friday</b> <b>Full Moon</b>	20 <b>Members Night BBQ 6pm</b>	
21 Easter	22 Easter Io shadow 4:40am S	23 Europa shadow at 4:20am S Io shadow 11:07pm S Io transit 12 midnight S	24 Io shadow 1:17am F Io transit 2:15am F	25 <b>ANZAC Day</b> <b>Saturn Moon</b>	26 Europa emerge 9:49pm	27 <b>Last Quarter</b> <b>Scorpius Deadline</b>	
28	29 Moon at 404,583km	30					

### Monthly Events

**Jupiter - Double shadow transit on the 1st >**

**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

**Saturn moves behind the Moon** - 25th 11:40pm and reappears at 12:30am



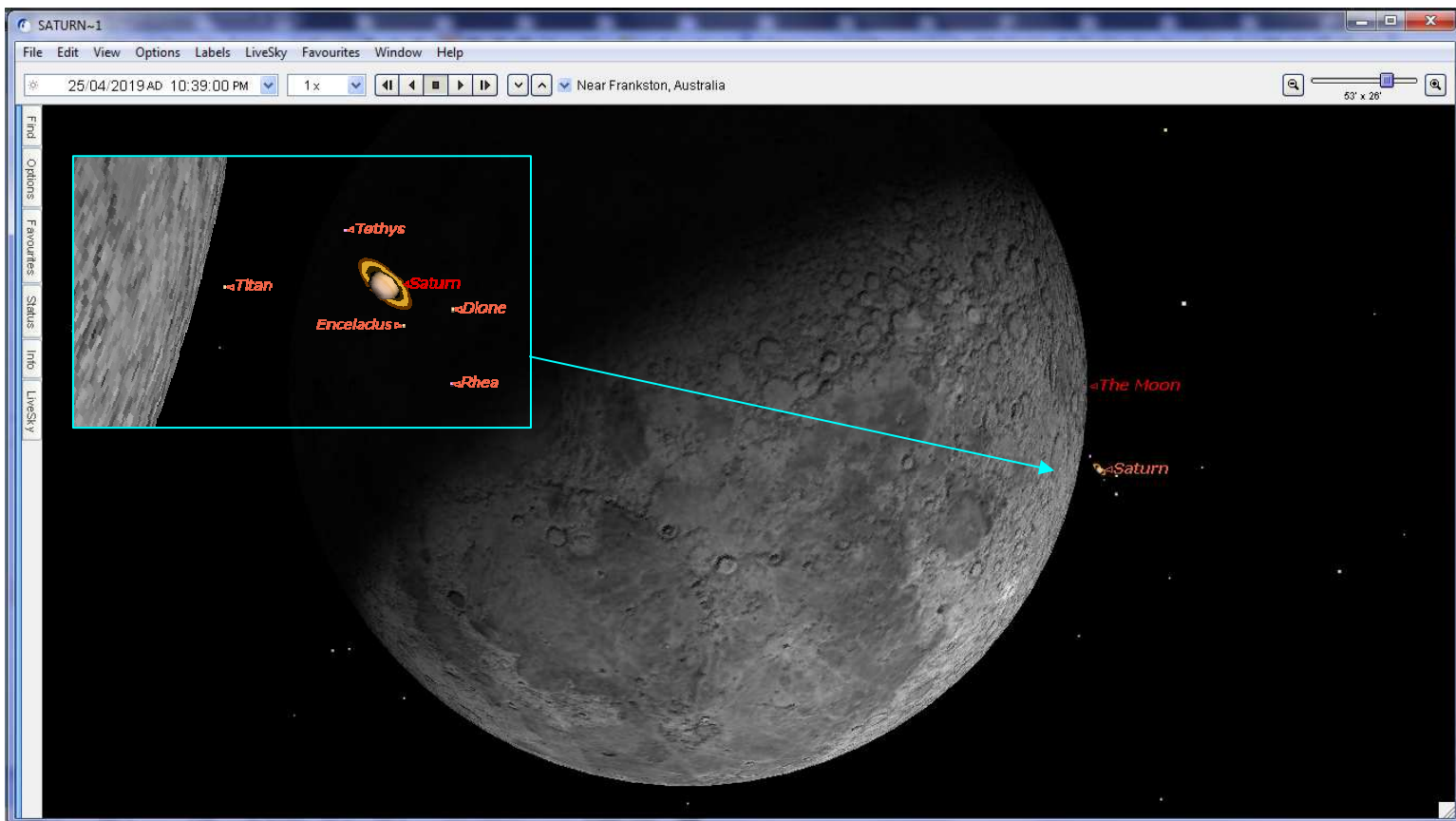
Please... we need helpers to keep the MPAS Observatory open to members on all Saturday nights.  
If you can help, contact Greg Walton on 0415172503 or email - gwmpas@gmail.com

# THE BRIARS SKY

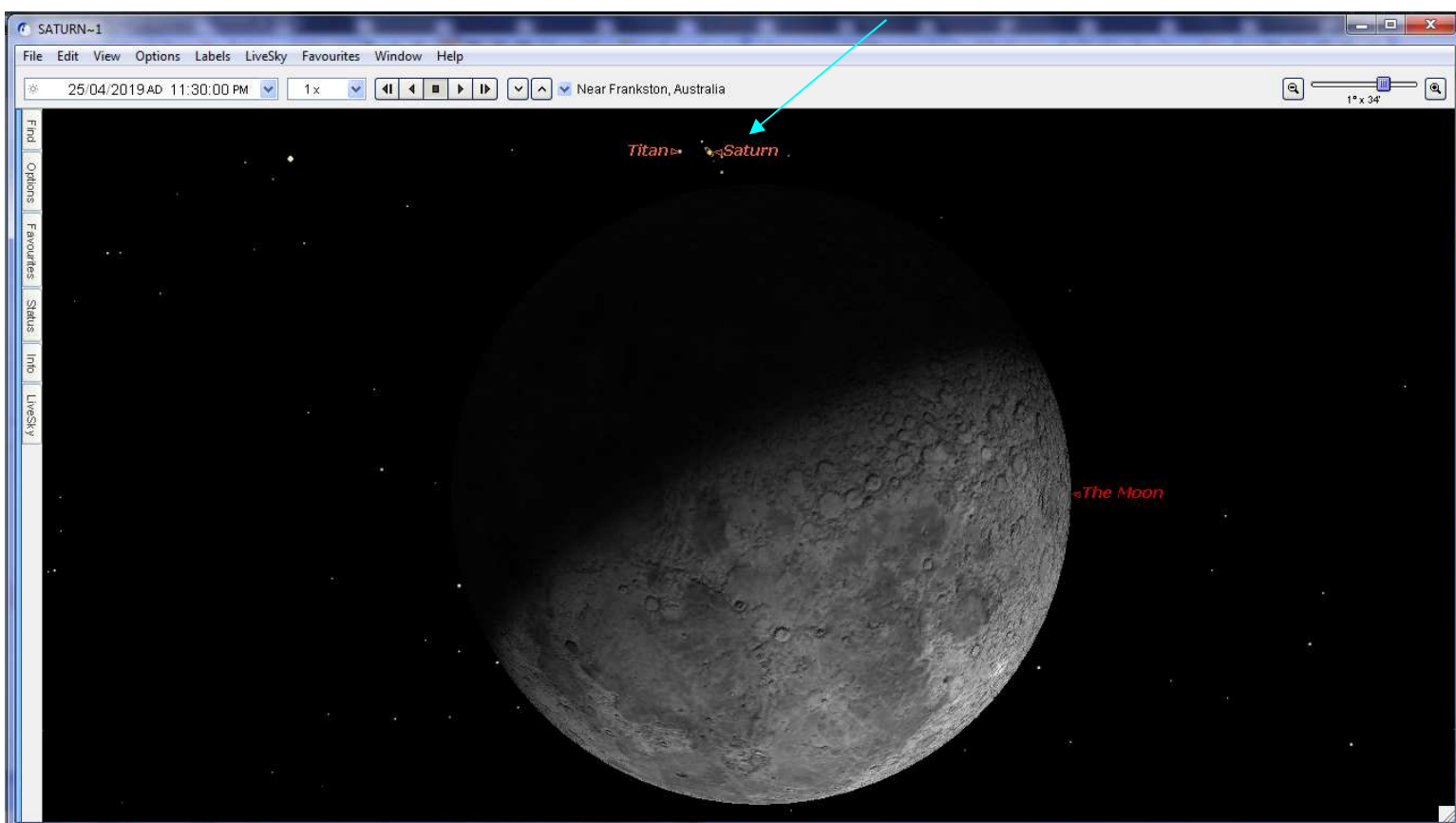
By Greg Walton



Rare event not to be missed!!!! - Saturn moves behind the Moon on the 25th April at 10:39 pm.  
It will be low on the eastern horizon, so the MPAS Briars site will be well suited as it has a clear easterly view.  
Also Jupiter will rise above the horizon an hour before the Moon.



Saturn and its moons will start reappearing before at 11:30 am. See map below



Images Produced on Starry Night



## China's Chang'e-4 lands on the Moon's far side

China's Chang'e-4 spacecraft set down on the moon's far side on January 3, 2019. It's the first time a spacecraft has landed on the far side of the moon. The spacecraft is a combination lander-rover and will explore both above and below the lunar surface.

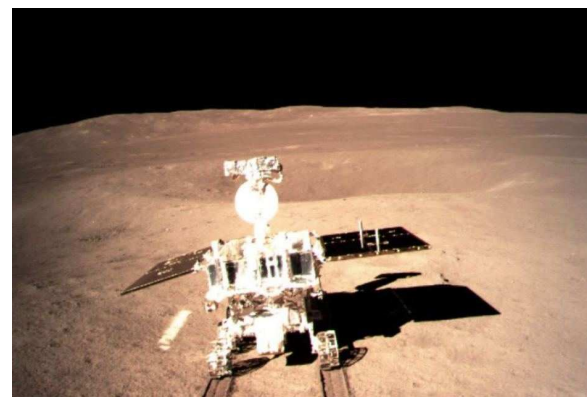
Chang'e-4 itself launched on December 8, 2018. It entered lunar orbit four days later, where mission controllers spent 22 days testing the spacecraft's systems, waiting for the sun to rise at the landing site. On January 2-3, 2019 Chang'e-4 successfully de-orbited and landed.

The spacecraft landed in the Von Kármán crater (186 km wide) located on the lunar far side within the South Pole-Aitken basin, which is an impact crater at roughly 2,500 km in diameter and 13 km deep. It is one of the largest known impact craters in the Solar System, and is the largest, oldest, and deepest basin recognized on the Moon.

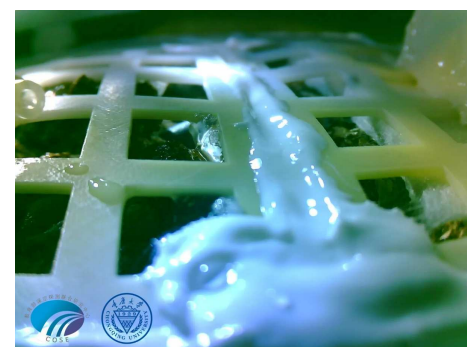
Scientists say Chang'e-4's landing site is an area where an ancient impact by space debris pounded the moon long ago, possibly exposing some of the lunar mantle, the layer beneath its crust. So it's an interesting region geologically. Chinese scientists hope to learn more about the early history of our moon (and by extension the Earth and rest of the solar system) by studying this region via Chang'e-4.

The lander has succeeded in its first task of deploying its rover - named Yutu-2 - which has started exploring the Moon's Von Karman crater. China's space agency shared an image of the rover being deployed, along with a picture taken from the south side of the landing site which was relayed back via a relay satellite.

One early biological experiment began just hours after the historic touchdown, which aimed to assess how plants and animals grow and develop in the alien lunar environment. The experiment included seeds of cotton plants, potato, rapeseed and Arabidopsis plants, as well as fruit-fly eggs and yeast, and these organisms were encased in a 2.6 kilogram canister. The cotton seeds were able to handle the harsh conditions, at least initially, becoming the first plants ever to sprout on the surface of another world. (Chinese space officials haven't said how the other organisms did). But the canister did not have a battery-powered heater, so the onset of the lengthy lunar night spelled doom for the cotton sprouts when the temperature inside the 1-litre capacity canister reached minus 52 degrees Celsius, so the moon is a lifeless world once again.



*China's Yutu-2 rover has started exploring the far side of the Moon. (Supplied: CNSA/CLEP)*

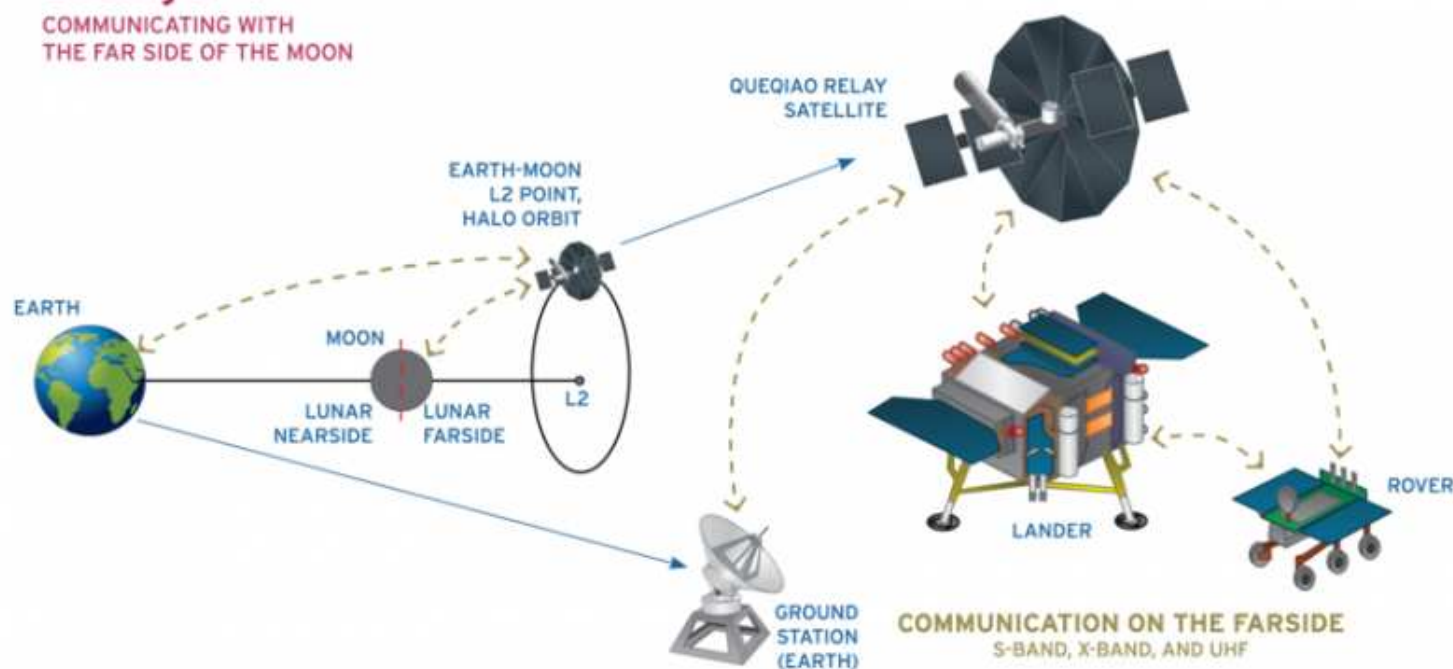


*Chinese scientists released this image of a cotton plant germinating in its tank on the moon's far side aboard the Chang'e 4 lander.*

*Credit: Chongqing University*

### Chang'e-4

COMMUNICATING WITH  
THE FAR SIDE OF THE MOON



*Since the far side of the moon never faces Earth, missions there require a relay satellite. To solve that problem, China launched the Queqiao relay satellite in May 2018. The Queqiao relay satellite also brought along two SmallSats named Longjiang-1 and 2 bound for lunar orbit. Only Longjiang-2 was successful. Image via The Planetary Society.*



## Museum of the Moon: Scienceworks

My daughters Piper, Jamie and Ashley, plus myself and Stuart, finally visited the giant moon on display at Scienceworks, and it's very impressive!

On display until 28<sup>th</sup> April 2019 you will find this amazing piece of touring artwork by UK artist Luke Jerram to the left of the entrance, just past the ticket counter.

Measuring seven metres in diameter, the moon features 120dpi detailed NASA imagery of the lunar surface.

At an approximate scale of 1:500,000, each centimetre of the internally lit spherical sculpture represents 5 kilometres of the moon's surface. This installation fuses lunar imagery, moonlight and music created by BAFTA and Ivor Novello Award winning composer, Dan Jones.

There are lounge chairs, beanbags and cushions setup around the base, so you can make yourself comfy while you lay back and admire the amazing piece of artwork hanging above you.



While the Museum of the Moon is included in the Scienceworks general admission cost, there are also other Moon activities available (for additional cost) such as an engaging virtual reality experience where you, the astronaut, explore a lunar space station, walk on the Moon and experience the most breathtaking views of Earth. *By Nerida Langcake*

## MUSEUM OF THE MOON

Over its lifetime, the Museum of the Moon will be presented in a number of different ways both indoors and outdoors, so altering the experience and interpretation of the artwork. As it travels from place to place, it will gather new musical compositions and an ongoing collection of personal responses, stories and mythologies, as well as highlighting the latest moon science.

The installation is a fusion of lunar imagery, moonlight and surround sound composition created by BAFTA and Ivor Novello award winning composer Dan Jones. Each venue also programmes their own series lunar inspired events beneath the moon.

Luke Jerram's multidisciplinary practice involves the creation of sculptures, installations and live arts projects. Living in the UK but working internationally for 19 years, Jerram has created a number of extraordinary art projects which have excited and inspired people around the globe. Jerram has a set of different narratives that make up his practice which are developing in parallel with one another. He is known worldwide for his large scale public artworks.

<http://my-moon.org/>



# Apollo missions - 50 years ago when man went to the Moon.



Rover



Lander

I took this image of the Moon below, then I overlaid all 6 places where people landed and walked on the Moon. See if you can find these sites next time you're at the telescope. The dark patches mark the outline of a rabbit, Apollo 11 at base of right ear.

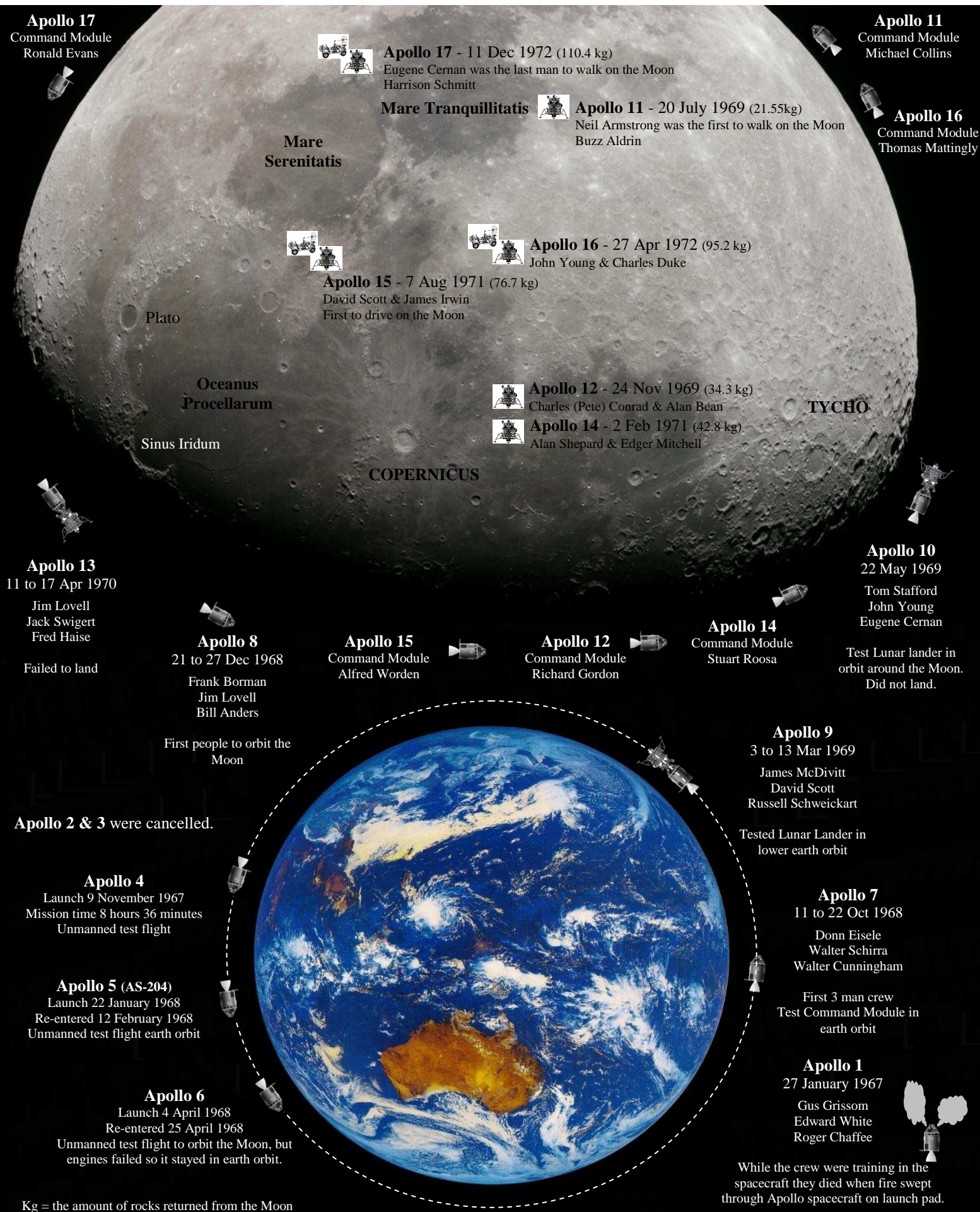


Image of the Earth taken by Japanese satellite in the 1990's

Data from Wikipedia and NASA website

Image of the Moon and story by Greg Walton

## The day a man walked on the Moon. *By Greg Walton*

Neil Armstrong stepped on to the surface of the Moon on July 21st at 2:56:15 UTC, being July 20<sup>th</sup> in the USA, but in Melbourne it was Monday July 21st at 12:56 pm EST.

I was 8 years old at Parkdale Primary School. We all sat in a hall and watched Neil Armstrong climb down a ladder to the surface of the Moon, on a small television. I remember that the whole thing took far too long. We waited and waited for something to happen, it felt like hours, the picture just stayed the same, nothing changing, nothing happening. Every now and again the NASA staff would say something, like "preparing to come out". The picture was black and white and very poor quality. When Neil Armstrong finally came out, he moved very slowly. For weeks after it was replayed over and over, each time it was cut shorter and shorter, till it final disappeared for good.



### I asked other members if they could remember that day, see their comments below

I was 14 and in high school. Our school had one television in the science laboratory. We were in the science lab for most of the morning waiting for the first step but there were delays and lunchtime came; the teachers came in and told all junior students to leave to make room for senior students to watch the only TV in the school. This was so important to me and although I was a compliant student who followed instructions, not this time! Junior students had a different uniform to senior students so with stealth I moved to the back and slunk down in my chair hoping the desk would provide some degree of coverage so my junior uniform would not betray me. My strategy worked and I saw Neil Armstrong take that one small step live on a small black and white television in our science laboratory. This was a significant event for me and to this day I always question blind compliance to instructions. I will always remember this day. Man walked on the moon but a 14-year old school girl saw it live on television. The wonders of science continue to amaze and enthrall. *Louise Turnbull*

I was 22 at the time and working as a wharfie at Darwin, saving money to travel overseas. When the news came through that man had landed on the moon, some bright spark remarked that they had found it crawling with cockroaches! *Tony Nightingale*

I was 9 and recall pleading with my Mother to let me stay home and watch man walking on the moon. Unfortunately, my pleas failed and I was sent to school, fully expecting to miss the event. But to my surprise my school actually possessed a new black and white telly and had it set up in an audio-visual room for those interested in watching whilst those that didn't care enjoyed an extended recess. Those of us who wanted to watch were taken to the room and seated on a hard wooden floor. I seem to recall that there was a delay and that we sat watching the Lunar Module's legs for what seemed like an eternity and then finally Neil Armstrong appeared and the rest is now history. I was happy that I got to see the event "live" although my backside was sore for a week. At the time having watched man walk on the moon, I fully expected to be Star Trekking by now Unfortunately, I may have to wait for my next life or the one after that. *Cheers Mark Stephens*

I was in Grade 2 and everybody that had an older brother or sister in Primary School (we were in Infants) could come and have them collect their siblings and take them home. As I was the oldest in our family of my brother and myself. I was praying that the Luck boys who just lived up the road would come and take us home. This never eventuated. Then what seemed ages they let the grade 2 kids take home their grade 1 siblings home. It was a 20 minute walk or so and they were innocent days in Camp Hill Brisbane. My brother and I walked home and saw Neil Armstrong place his foot print on the moon and go for a walk. Or as best as I can recollect. I was 6 at the time. I remember years later that NASA actually brought a crew capsule around to display. We could easily see the re-entry burns on the bottom of the capsule. By this time we had moved to Surfers Paradise and saw it at the top of Cavil Avenue on the beach front. I do not remember if it was a Mercury, Gemini or Apollo capsule. It was only small. A little off track here but as the Vietnam War was going on and not that we knew, there were two Phantom F-4 jets stationed at Coolangatta airport for ages under covers. It was easy to make out what they were. Just a bit of added history. *Warm regards, Paul Mitchell*

I'll never forget that day. We were all watching it on TV in the science theatre. I was eating one of those round toffees they used to sell in cup-cake paper. My tooth filling came out. Neil Armstrong sure took his time taking that first step. Pretty boring watching that lunar-lander leg for ages. *Regards, Renato Alessio*

I remember this occurring many many moons ago. Mum, Dad, and 4 children living in Napier, New Zealand, watched this in real time on a kit set black and white television that Dad had put together. It had no cabinet so this TV was really bare bones, and on its screen we could just make out the live stream from moon, it may have been relayed perhaps from Australia's big dish and satellites. The picture wavered in a background snow storm of noise with periods of clarity. Seeing the figure of a human on the moon was surreal, almost unbelievable, but there it was on the big glass tube that was the screen of our TV. It was really happening. I also recall thinking of lots of things that might go wrong. Seemingly carefree people playing on the moon and one man orbiting. Would the Lander make its escape and join with the return module, or might they end up dehydrated to be preserved on that barren landscape. I remember the relief when the Lander successfully left the moon and met with the orbiter to return those brave men to earth, their home. Thinking about this lunar landing now, it's strange that perhaps the three most momentous historic events to me have been the assassination of John F Kennedy, man on the moon, and the 9-11 twin towers collapse. All three being USA related. *Mark Hillen*

I was walking with my friends on one hot summer afternoon via Mariahilferstrasse in Vienna in Austria to get to the swimming pool and talking about how Neil Armstrong landed his foot on the moon and changed the astronomical history... many talks followed for months... *Good thing for mankind... Valda Walton*

I was 2 weeks away from my 21st birthday, and home from work sick, listening to the news on my transistor radio. Goodness me, how the world has changed, and it's really not all that long ago, considering we can remember it so well. *Regards, Jan Shaw*

The night man landed on the moon, I was playing darts in a pub called Hungry Horse in the UK. The next week the pub boss changed it to The Man on the Moon. *Yours faithfully, Fred Crump*





### On the 21st of July 1969, failure to attend school on the landing day was not an option.

I was 9 years old in Grade 3 (Year 3) at Belvedere Park Primary school in Seaford, in the innocent days when kids used to walk or bike their way to and from school by themselves. The school still exists and has arguably weathered better than I have since then. The entire school was squished into an emptied double classroom where the dividing wall had been folded back. Younger years were at the front, and older taller pupils were at the back. At the western end was a small black and white valve television, with rabbit ear and coil antenna on top, sitting on a trolley such that it was about eye height. It was about the size of screen that we enjoy on a laptop today in full colour. But what a technological marvel it was for the time, and you only had to get a technician in to fix it every couple of months or replace a blown valve. I can vividly remember the Bakelite smell of the inside of the televisions then, once their back was removed for servicing.

Everyone was standing in the classroom because room was limited. I remember it as being just after lunchtime and everyone was extremely excited, but a quiet hush came over the large room at the critical moment.

I remember the B&W image from the adjacent LEM leg camera of Armstrong standing on the side of the Lunar Eagle Module before eventually jumping onto the lunar surface. The TV picture was ill-defined and over-exposed and no doubt what we see of it today has been tweaked considerably. But it was unmistakable and extremely exciting to be part of witnessing major positive history in the making. I was so transfixed on what was unfolding that I don't recall hearing the transmission glitch in Armstrong's famous proclamation of "That's one small step for (a) man".



I remember it was a time of Cornflakes for breakfast, lunch and dinner and anytime in-between, because from inside Cornflake packets at the time, you were given a small blue plastic Saturn V rocket, Lunar Module, Service Module or the like in bits, then you clipped the pieces together to build a set. They were only an inch or two in size, and not of correct relative sizes, but clearly had an impact and helped in understanding how the craft all fitted together into the mission plan.

There were lots of space projects at school in the lead-up to the Moon landing, and afterwards; and without a shadow of doubt it inspired and germinated a whole new generation of budding engineers and scientists around the world. If only humanity had the fortitude to do something of similar magnitude and outwardly-directed vision today.

I recall no mention of astronomy societies or any special activities like public events at the time locally from watching TV, listening to radio or reading The Age and local newspapers. Perhaps some were held but just not publicised where I noticed them or could even get to them. The internet, of course, was still a long way off and we didn't even have a landline phone at home. Our Society formed as a direct result of the Apollo 11

landing and so didn't exist earlier in 1969, but some other societies were around in various guises. Can you imagine what frenetic public events we'd be doing today if mankind was stepping onto Mars in the coming weeks?

For those too young to have experienced the heady times, the excitement and buzz of 1969, go and watch the excellent Australian film called "The Dish". It never fails to transport me back to simpler times when achievements seemed greater, the world was larger and full of promise of great things to come, and the police were older. *Regards, Peter Skilton*

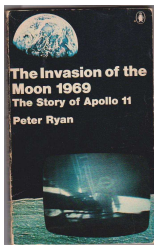
## Why did we forget about going back to the Moon?

Only 12 people have walked on the Moon, the last person was in 1972. At the time the USA was looking for something to take its people's minds off the Vietnam War. Also it needed to show the world how great it was. Most of the people working on getting a man to the Moon were working 16-hour days but only being paid for 8 hours. The staff just did not want to go home at the end of the day, they felt very fortunate just to be there. But after 10 years for some, the novelty wore off and the cost of putting people on the Moon was just too much. First footprint cost US \$24,000,000,000. In today's money, add another zero.

**To get to the Moon** the Saturn 5 rocket lifted the spacecraft up into Earth's orbit. As the spacecraft orbited the earth the astronauts prepared the craft for its journey to the Moon and waited for the exact moment to fire the rockets which would shoot the spacecraft on a trajectory to the Moon faster than a bullet out of a gun, accelerating to 25,000 miles per hour. The rocket engine only burned for a few minutes, then they coasted the rest of the way to the Moon. As space is almost empty, there is little to slow the spacecraft down, only the earth's gravity will slow the craft. As the craft approached the Moon, Earth's gravity would have slowed the craft by as much as 90 percent to about 2,000 miles per hour. Then the Moon's gravity kicked in dragging the craft faster and faster. Once the craft arrived at the Moon the craft needed to be swung around pointing the rocket engine in the direction they were going. At an exact moment the engine fired, slowing the craft to a speed which kept the craft in orbit around the Moon. Then 2 astronauts climbed into the lunar Lander and fired a rocket engine to slow the craft as it fell to the lunar surface. The rocket engine fired to slow the Lander's fall.

The rocket engine fires again to slow the Landers from falling to fast. Once on the surface the astronauts prepare the craft to leave straight away if needed. If everything is OK, the air is released out of the Lander, so the astronauts can open the door and climb down to the surface. Apollo 11 only spent about 8 hours on the surface before they were order to leave. Once back in the Lander the ignition button was pushed and then only the up section of the Lander launched upwards to meet the command module which was orbiting the Moon. Once docked and the 2 astronaut are back inside the command module, the Lander is release to fall back to the moon. Then at the exact moment the command module fires it engine sending it back to Earth, where it fell in to the sea for retrieval by the USA navy.





## You can get the feeling for what it was like on that day Neil Armstrong stepped on the Moon.

Below are a few pages from the book shown at right.

### The \$24,000,000,000 Footprint

Avoiding the boulder-filled crater he had sighted, Armstrong had landed Eagle some four miles down range from the originally selected landing site. It was some time before Mission Control could figure out exactly where they were. Armstrong's cool had given way to excitement as he put Eagle down on the rocky lunar surface; his heart rate had risen to 156 beats per minute, but now it was back down to 99 as he and Aldrin went through a rapid check of the spacecraft and a simulated countdown in readiness for an emergency take-off should this be necessary. Even as Armstrong and Aldrin were preparing to land, Russia's Luna 15 was adding to the drama. It too had swung into a low orbit, skimming ten miles or so above the moon on its nearest approach. It is almost certain that it was intended to make a soft landing, but the mystery came to an abrupt end when Sir Bernard Lovell reported from Jodrell Bank that the craft had plunged into the Sea of Crises (rather fittingly) at some 300 miles an hour, and later Tass added that its mission 'had been completed'.

For a few minutes, while Collins was still overhead in the command module, Armstrong could choose to fire the ascent engine and rejoin him in orbit. In the excitement of the landing, Collins had almost been forgotten, and it was in an almost plaintive voice that he called up Mission Control:

*'Houston, do you read Columbia on the high gain?'*

MCC: *'Roger, we read you, Columbia. He has landed Tranquillity base. Eagle is at Tranquillity, over.'*

Collins: *'Yeah, I heard the whole thing ... fantastic.'*

Eagle had now been down for seven minutes and the time was approaching for the last stay or no-stay decision before they would commit themselves to remaining on the surface while Collins made at least one orbit of the moon.

MCC: *'Eagle, Houston, you are stay for T2, over.'*

Armstrong: *'Have your stay for T2, we thank you.'* This gave Armstrong another few minutes to change his mind. He now found time to report on his final approach to the landing site: *'Houston, that may have seemed like a very long final phase. The auto-targeting was taking us right into a football-field-sized crater, with a large number of big boulders and rocks for about one or two craters' diameters around us, and it required flying manually over the rock field to find a reasonably good area.'*

MCC: *'Roger, we copy, it was beautiful from here, Tranquillity, over.'*

Armstrong: *'We'll get the details of what's around here, but it looks like a collection of just about every variety of shapes, angularities, granularities, every variety of rock you could find. The colours vary pretty much depending on how you're looking. [Sunlight on the lunar surface is very stark and everything appears in sharp contrast, making it difficult to see any tone ranges or colour.] There doesn't appear to be too much of a general colour at all, however it looks as though some of the rocks are boulders, of which there are quite a few in the near area, it looks as though they're going to have some interesting colours to them, over.'*

MCC: *'Roger, copy. Sounds good to us, Tranquillity. We'll let you press on through the simulated countdown, and we'll talk to you later, over.'*

Armstrong: *'OK. This one-sixth G is just like the airplane.'* (On training flights in planes flying a certain parabolic path it was possible to simulate weightlessness and varying degrees of gravity for short periods.)

MCC: *'Be advised that there's lots of smiling faces in this room, and all over the world.'*

Armstrong: *'There's two of them up here.'*

Collins: *'And don't forget one in the command module ... and thanks for putting me on [communication] relay, Houston, I was missing all the action.'*

Armstrong: *'Just keep that orbiting base ready for us up there now.'*

Collins: *'Will do.'*

PAO: We've just got a report that the LM systems looked good after landing. We're about twenty-six minutes now from loss of signal from the command module.

Armstrong and Aldrin, now committed to staying for at least two hours, had removed their helmets and gloves.

Armstrong: *'[Out of] the window is a relative plain cratered with a fairly large number of craters of five- to fifty-foot radius and [there are] ridges twenty, thirty feet high I would guess, and literally thousands of little one- and two-foot craters around the area. We see some angular blocks out several hundred feet in front of us that are probably two feet in size and have angular edges. There is a hill in view, just about on the ground track ahead of us, difficult to estimate [the distance] but might be half a mile or a mile. ... It was really rough over the targeted landing area ... extremely rough, cratered and large numbers of rocks that were probably larger than five or ten feet in size. ... I'd say the colour of the local surface is very comparable to what we observed from orbit at this sun angle [it was sunrise]. It's pretty much without colour. It's grey and it's a very white chalk-grey as you look into the zero phase line [directly opposite the sun], and it's considerably darker grey, more like ashen grey as you look up ninety degrees to the sun. Some of the surface rocks in close here that have been fractured or disturbed by the rocket engine are coated with this light grey on the outside, but when they've been broken they display a dark, very dark grey interior and it looks like it could be country basalt [an earthly volcanic rock].'*

PAO: This is Apollo control. We've had loss of signal now from the command module.

At Tranquillity base Armstrong and Aldrin continued their work on the lunar module, preparing to power down the descent stage and readying the ascent stage for flight.

PAO: This is Apollo control at 103 hours, 44 minutes [10.16 p.m. BST, 20 July]. We have some updated information on the landing point. It appears that the spacecraft Eagle touched down just about on the lunar equator at 23.46 degrees longitude, which would put it about four miles from the targeted landing point down range. At this point all LM systems seem to look very good.

Tranquillity base: *'Houston, Tranquillity base is ready to go through the power down and terminate the simulated countdown.'*

MCC: *'Roger, stand by. ... Hello, Tranquillity base, you can start your power down now, over.'*

Tranquillity base: *'Roger, it has been started.'*

MCC: *'At Tranquillity base the white team [referring to the 'white team' at Cape Kennedy which launches the Saturns] is going off now and let the maroon team take over. We appreciate the great show. It was a beautiful job, you guys.'*

Tranquillity base: *'A recommendation at this point, [we are] planning an EVA [extravehicular activity on the lunar surface] with your concurrence starting about three hours from now.'*

MCC: *'We will support it [your plan]. We are go at this time. You guys are getting prime time TV there.'*

Tranquillity base: *'Hope that little TV set works.'* A small television camera attached to a panel in the descent stage of the lunar module was to relay the first step on the moon to an audience estimated to be 600 million, about one-fifth of the world's population.

**GET 105:00** (11.32 p.m. BST) Armstrong and Aldrin were eating man's first meal on the moon prior to starting their preparations for the moon walk. In the original plan for the Apollo 11 flight, this meal was to have been followed by a four-hour rest period. How anyone had imagined that the astronauts would be able to sleep with the most exciting moment of their lives just the other side of a spacecraft hatch remains something of a mystery.



Armstrong: 'Houston, this is Tranquillity, we're standing by for a go for cabin depress, over.'

MCC: 'Tranquillity base, this is Houston, you are go for cabin depressurize, over.'

GET 109:04 (3.36 a.m. BST, 21 July) Armstrong: 'Everything is go here. We're just waiting for the cabin pressure to bleed, to blow enough pressure to open the hatch.'

MCC: 'Roger, we're showing a real low static pressure on your cabin. Do you think you can open the hatch at this pressure?'

Armstrong: 'We're going to try it . . . hatch coming open.' Aldrin now guided Armstrong as he made his ungainly exit, on his knees and backwards through the narrow hatch, into an alien world.

Aldrin: 'Neil, you're lined up nicely. . . . Toward me a little bit. . . . OK, down . . . roll to the left . . . put your left foot to the right a little bit . . . you're doing fine.'

Armstrong: 'OK, Houston, I'm on the porch.' Unlike all the moon landing heroes of science fiction, Armstrong was crouching with his back to the moonscape on a platform just outside the hatch. Now he gingerly felt with his feet for the first rungs of the ladder.

PAO: Neil Armstrong on the porch at 109 hours, 19 minutes, 16 seconds [3.51 BST] . . . twenty-five minutes of PLSS time expended now.

The life support systems Armstrong and Aldrin were now living on had enough oxygen and water for up to four hours.

Aldrin: 'OK, everything's nice and sunny in here.'

Armstrong: 'OK, can you pull the door open a little more?'

Aldrin: 'Did you get the MESA out?' The MESA (modularized equipment stowage assembly) was a panel on the descent stage to the left of the foot of the ladder which Armstrong opened by pulling a cord. As the flap came down, it revealed the television camera and some of the equipment which would be used by the astronauts to collect moon samples.

Armstrong: 'I'm going to pull it now. Houston, the MESA came down all right.'

MCC: 'Houston, roger, we copy and we're standing by for your TV. . . . Man, we're getting a picture on the TV.' On the giant screen at Mission Control an obscure jumble of black and white images flickered into place. MCC: 'There's a great deal of contrast in it and currently it's upside down on our monitor, but we can make out a fair amount of detail. . . . OK Neil, we can see you coming down the ladder now.'

On the television screen the picture had now turned the right way up. The surface of the moon appeared as a sheet of white paper while the 'sky' was inky black. In the foreground the ladder could be made out, a grey form descending from top left of the screen. A shadowy grey figure could be seen coming down it.

Armstrong: 'I'm at the foot of the ladder. The LM foot pads are only depressed in the surface about one or two inches. Although the surface appears to be very fine, fine grained, as you get close to it, it's almost like a powder. Now and then it's very fine.' Armstrong was now standing with both feet on the three-foot diameter pad at the base of the landing leg.

Armstrong: 'I'm going to step off the LM now.' He lifted his left foot and, pushing it out a little, planted history's most witnessed footprint. 'That's one small step for man, one giant leap for mankind.'

#### Abbreviations

MCC = Mission Control Centre at Houston

PAO = Public Affairs Officer

BTS = British standard time

GET - Ground elapsed time

Armstrong: 'The surface is fine and powdery. I can pick it up loosely with my toe. It adheres in fine layers like powdered charcoal to the sole and sides of my boots. I only go in a small fraction of an inch, maybe one-eighth of an inch, but I can see the footprints of my boots and the treads in the fine, sandy particles. There seems to be no difficulty in moving around, as we suspected. It's even perhaps easier than the simulations at one-sixth G that we performed in the simulations on the ground. It's actually no trouble to walk around. The descent engine did not leave a crater of any size. There's about one foot clearance on the ground [from the bottom of the descent engine nozzle]. We're essentially on a very level place here. I can see some evidence of rays emanating from the descent engine, but [a] very insignificant amount. OK, Buzz, we're ready to bring down the camera.' Aldrin now lowered the still camera on a pulley attached to a rope.

Armstrong: 'It's quite dark here in the shadow [of the LM]

and a little hard for me to see if I have a good footing. I'll work my way over into the sunlight here without looking directly into the sun.' Armstrong had now stepped a few feet away from the LM opposite the ladder.

PAO: Time of the first step: 109:24:20 [3.56 a.m. BST].

Armstrong moved back into the shadow of the LM. 'Looking up at the LM, I'm standing directly in the shadow now looking up at Buzz in the window [Aldrin was operating the sixteen-millimetre camera]. I can see everything quite clearly. The light is sufficiently bright, backlighting into the front of the LM, that everything is very clearly visible.'

PAO: The [flight] surgeon says that the crew is doing well. Data is good.

Armstrong had now secured the camera on a bracket mounted on his chest. 'I'll step out and take some of my first pictures here.'

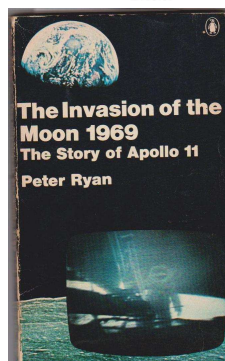
MCC: 'Roger, Neil, we're reading you loud and clear. We see you getting some pictures and the contingency sample. . . . Neil, this is Houston, did you copy about the contingency sample? Over.'

Armstrong: 'Rog, I'm going to get that just as soon as I finish these pictures.' Mission Control were obviously more concerned about the sample. If for any reason Armstrong had had to climb back into the LM in a hurry, he might not have had time to collect a sample of moon rock.

MCC: 'OK, going to get the contingency sample now, Neil?'

Armstrong: 'Right.' He reached down to a pocket just below the knee of his left leg and fished out a telescoped rod with a scoop attached to one end. He pulled out the rod and began to scrape up the first sample of the lunar surface. 'This is very interesting. It's a very soft surface but here and there where I plug with the contingency sample collector, I run into very hard surface, but it appears to be very cohesive material of the same sort. I'll try to get a rock in here. Here's a couple.'

Aldrin: 'That looks beautiful from here, Neil.'



#### The Invasion of the Moon 1969

The Story of Apollo 11 by Peter Ryan

Penguin Books Ltd - ISBN10: 0140522785

*I enjoyed this account of the lead up to Neil Armstrong stepping on to the moon and the safe return of the crew back to Earth. I also learnt many interesting facts and seen the difficulties that had to be overcome. One of these things were, that the space craft were never finished in time for the launch, but the astronauts still when. "We will have that fixed on the next launch". Greg Walton*



## Australia in 1969

Australia's population in 1969 was 12,008,635 - today its 25,000,000



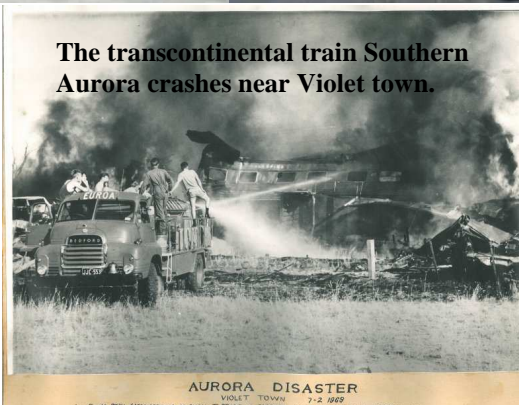
Murchison meteorite falls in Victoria



Australian cars in production



Work starts on the west gate bridge.



The transcontinental train Southern Aurora crashes near Violet town.



Woops.

Australian aircraft carrier Melbourne sliced the destroyer USS Frank E Evens in half killing 74 crew.

## World events in 1969

The worlds population in 1969 was 3,600,000,000 - today its 7,600,000,000

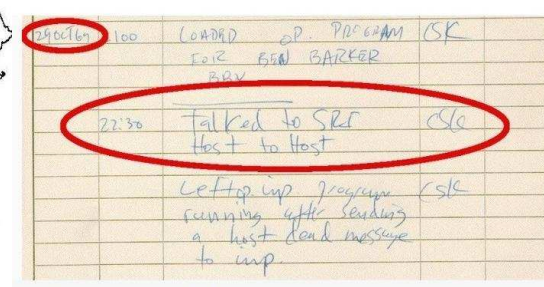
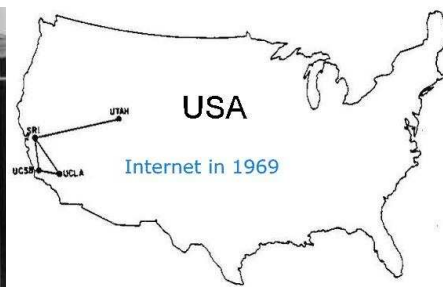


The first flight of the British-built Concorde prototype, piloted by Brian Trubshaw, lasted 22 minutes and was made from Filton airfield near Bristol to RAF Fairford in Gloucestershire.



Boeing 747 jumbo jet takes the skies.

The start of the internet when 4 computers were able to communicate over a telephone line in America.



1969 saw 125 rocket launches with only 1 in Australia at Woomera.



**What's on TV** - Braddy Bunch, Get Smart, I Dream of Genie, Green Acres, Hawaii Five-0, Here's Lucy, Mission Impossible, Bewitched, Hogan's Heroes, Beverly Hillbillies, Gomer Pyle, Thunderbirds.

**And we are still watching them 50 years on.**

**At the Movies** - Butch Cassidy and the Sundance Kid, The Italian Job, Paint Your Wagon, True Grit & On Her Majesty's Service (James Bond)

**Space movies** - Journey to the far side of the sun.

**Music released** - The Who "Tommy", Beatles "Get Back", David Bowie "Space Oddity"  
Also - John Lennon returned his MBE.



**Black Arrow**  
1st June 1969



# Mt Burnett Open Day

By Greg Walton

27th January 2019

Pia and I had never been to Mt Burnett Observatory, and when we saw advertised an open day on Facebook we thought let's go for a drive.



It's located at 420 Paternoster Road Mt Burnett, just behind a farmer's house. We were greeted by an enthusiastic group of members demonstrating the telescopes and observatories. The observatory was built by Monash University in 1972, but fell into neglect and in 2011 was handed over to The Mt Burnett Society who lovingly cleaned and restored the main observatory and surrounding buildings. They also installed a new Sirius dome with a 14 inch GoTo Celestron telescope. See left and below





### The Monash University Observatory.

A very steep ladder leads up to the telescope; in the night this could be a bit of a challenge for some, although it was lit with red LED lights. The 40 cm Jeffree telescope has been modified many times. The original wooden tube has been replaced with a steel tube because the wood was not stable enough for precise spectroscopy work. I liked the design of the secondary mirror holder, the whole spider assembly can be rotated 180 degrees by just pulling out a pin. This gives the telescope 2 focal lengths depending on which of the 2 secondary mirrors is selected. The 45-degree flat operates as a Newtonian while the 100mm spherical mirror operates like a Cassegrain which gives a much longer focal length, sending the light path through a hole in the primary mirror out the rear of the telescope. There are also 2 focusers on the side of the telescope tube, one for the Newtonian and the other for when the telescope is set up in spectroscopy mode. Many of the original instruments and optical trains were still in the observatory stored on the ground floor. The telescope sat on a large concrete structure which extended from the ground up into the second floor, but not touching the floor, to keep the telescope from any vibrations made by people walking around. The complicated clock drive gave 2 hours of tracking.







On the wall of the observatory was a nice large Planisphere; this would be very handy to work out what's in the sky at what time. See above

Also on the wall was a pair of astronomical clocks, one shows normal time and the other shows sidereal time. The clocks were once owned by Ernst Hartung, author of "Astronomical Objects for Southern telescopes" published 1968 and donated by Keith Thompson. The clocks have recently been restored and mounted by ASV member Ken Beard. See right

The site also has a small old roll off roof observatory which is used to store a new 18 inch Dobsonian telescope. MBO are hoping to set up a more permanent telescope there which is currently under repair. See below







Other things on display were a solar telescope viewing with 2 PST telescopes showing the surface of the sun and a folding telescope which projects a white light image of the sun. This telescope is designed to show sun spots, but as we are at solar minimum there was not much to see. See above & right

A beautifully crafted wooden F12 5-inch refractor was also on display. Built by Donald Abbes in 1996. I could see that a lot of time went into making this telescope and a nice touch was the brass edge strips. The mount folded up for transport. See below and right





# THE JEFFREE TELESCOPE

JOHN L. PERDRIX

Situated approximately 65km from Melbourne in the Dandenong Ranges near Gembrook stands the Monash Observatory which houses the Jeffree Telescope. It is hoped that Figure 1 (Monash Observatory) is not indicative of its future with the typical Melbourne sky in the background. The name Jeffree should not be unfamiliar to members as it was he who constructed the Society's 30-cm reflector, which is known as the Mercer Telescope after D. J. Mercer, an Honorary Life Member of the Society. Figures 3 and 4 show the observatory in the course of construction and the dome being lifted into position.

Figure 1. Monash Observatory in the Dandenong Ranges near Gembrook.

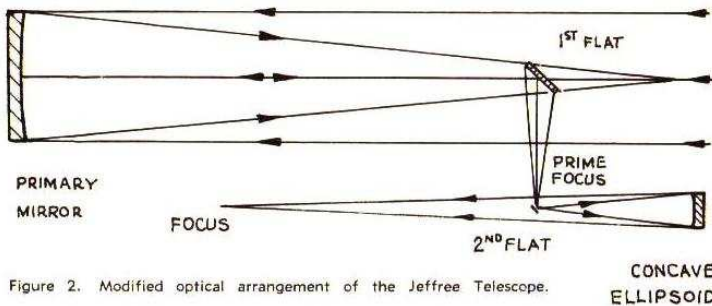
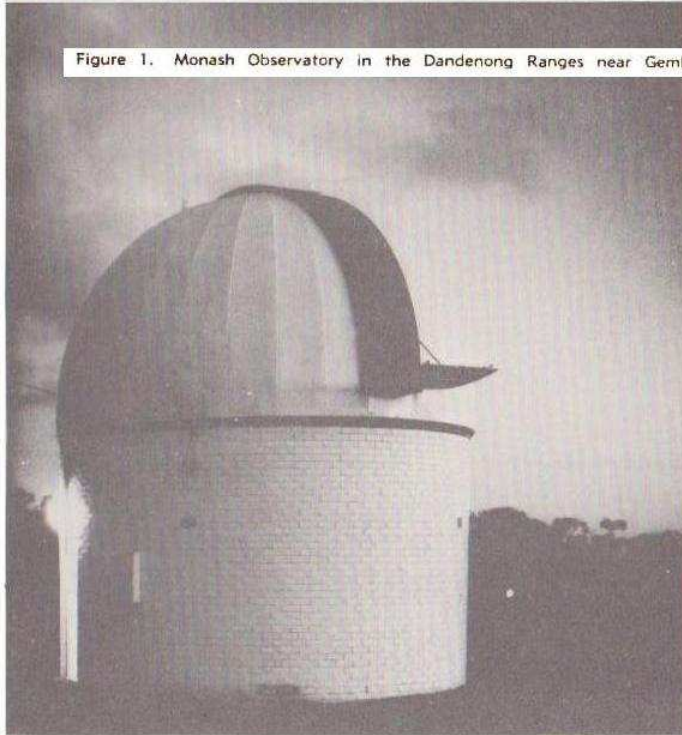


Figure 2. Modified optical arrangement of the Jeffree Telescope.

The 40-cm Jeffree Telescope was originally constructed by L. Jeffree, an amateur astronomer of Bendigo, but he never finished it. Monash University purchased the instrument from his estate in 1968 and it was modified and completed by the staff and students of the Physics and Mechanical Engineering Departments of the University. The basic design is similar to the Society's telescope with a solid wooden tube supporting a rotating turret which holds the diagonal flat, eyepiece tube and guide-telescope.

Figure 3. Observatory wall in course of construction.

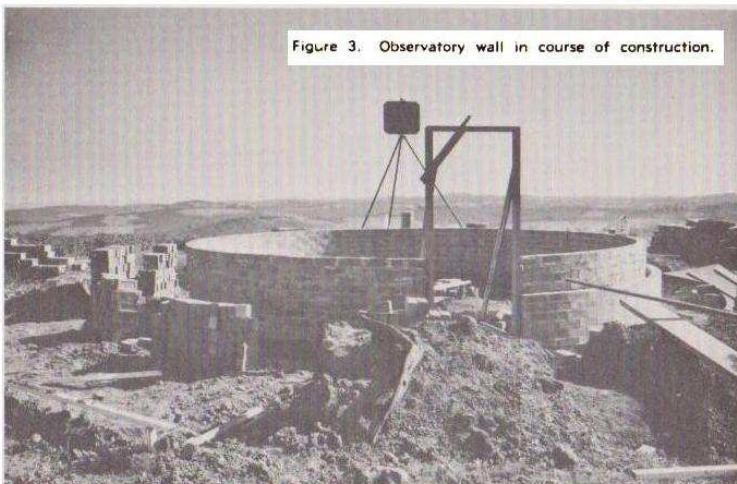


Figure 4. Dome being lifted into position by mobile crane.

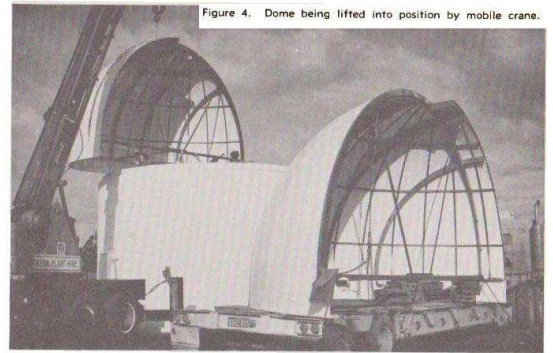
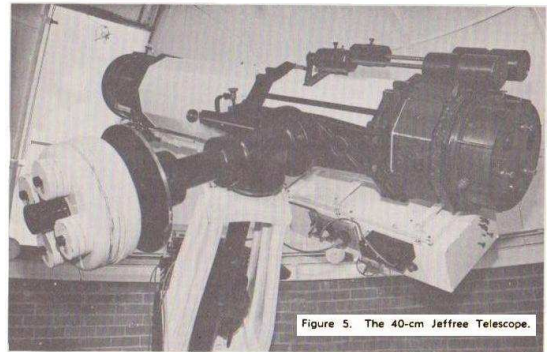


Figure 5. The 40-cm Jeffree Telescope.



It was realized that with the original design the eyepiece could be about 3.6m above floor level, and it was decided to modify the optical arrangement to lower the position of the eyepiece. It was also felt that the modified optical arrangement (Figure 2) would be better for future spectrographic work. The second (flat) mirror, which is placed accurately at the prime focus, has a projected diameter of 19mm on to the 100mm diameter concave ellipsoid. This size was chosen as it will almost accommodate the entire field of view from the primary mirror, whilst, at the same time, it will have the same blocking ratio on the ellipsoid as the first flat has on the primary mirror. The 100mm diameter ellipsoid is completely filled by the diverging  $f/7.55$  light beam, and with an eccentricity of approximately 0.4, the second focus is 965mm down the side of the tube. The primary mirror was refigured by W. E. James, a member of the Society, who also made the two flats and the ellipsoid.

spectrograph is to be used in conjunction with the telescope and the total length then becomes 4m, that is,  $f/40$ . A 100mm grating of 159 440 grooves mm finally gives a linear dispersion of 2nm/mm with the camera attachment. spectrograph was designed by J. Robinson, a part-time Masters student.

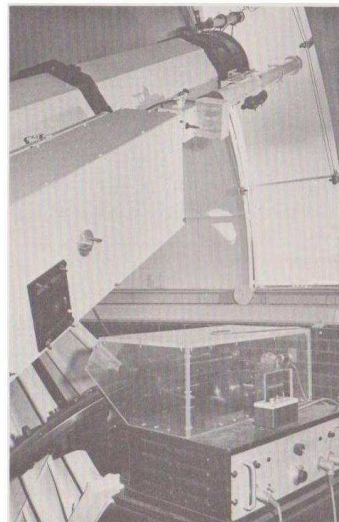
A photometer is also to be attached for UVB determinations. This was designed by an Honours student, D. R. Herald, and made in the university workshops. Four apertures have been made to give field diameters of 60, 30, 9 and approximately 1 second of arc. The light beam on leaving the aperture then passes through a 100mm focal length lens on its way to the photometer which is cooled by a commercial refrigerator unit. Focusing is achieved by a retractable mirror which deflects the beam on to an illuminated graticule and an eyepiece — the distances from the mirror surface to the graticule and to the aperture being the same. The filters used for the spectral regions are listed below:

Spectral region	Filter Combination
U	Corning 9863 — less (Corning 9863 Wratten 21) — to remove the red leak of the Corning 9863;
B	Corning 5433;
V	Corning 3384 Corning 9788 Wratten 4;
R	Corning 3480;
I	Wratten 88A

It is hoped that some useful work will be forthcoming from this instrument, and that Victoria will again have a name in astronomical fields.

The author is indebted to R. L. Bryant, Physics Department, Monash University, who supplied the photographs which accompany this article.

Figure 6. Instruments attached to the telescope.



Early history on this page is from the ASV News letter Journey December 1972.

When the observatory was built, there was no trees blocking the view towards to the south.

The marker on 3 posts is still there today, but its surrounded by trees.





**Image above By Steve Mohr** - "Messier 78 or M 78, also known as NGC 2068, is a reflection nebula in the constellation Orion. It was discovered by Pierre Méchain in 1780 and included by Charles Messier in his catalogue of comet-like objects that same year. M78 is the brightest diffuse reflection nebula of a group of nebulae that includes NGC 2064, NGC 2067 and NGC 2071. This group belongs to the Orion B molecular cloud complex and is about 1,350 light-years distant from Earth. M78 is easily found in small telescopes as a hazy patch and involves two stars of 10th and 11th magnitude. These two B-type stars, HD 38563 A and HD 38563 B, are responsible for making the cloud of dust in M78 visible by reflecting their light.

The M78 cloud contains a cluster of stars that is visible in the infrared. Due to gravity, the molecular gas in the nebula has fragmented into a hierarchy of clumps, the denser cores of which about to form stars with masses of up to  $5 M_{\odot}$ . About 45 variable stars of the T Tauri type, young stars still in the process of formation as well as some 17 Herbig–Haro objects are known in M78." [From the Wiki]

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

Viewing Location: Central Victoria, Australia. Observatory: ScopeDome 3m / Date: January 2018 November to February 2018, and November 2018 to January 2019



**Image left By Steve Mohr** - "NGC1977 [minor objects NGC1975 & NGC1973] This nebula is commonly called "The Running Man Nebula" due to the somewhat identifiable outline of a man striding through the sky. The object's catalogue number is mostly known as NGC1977, but two other NGC catalogue members lay in the field – NGC1973 and 1975. In a dark sky site, this nebula is easy to see in a small telescope, but the "running man" dark lane area can be difficult to see. The Running Man nebula lies south of the famous and substantial stellar nursery called the Orion Nebula, being some 1,500 light years away in the constellation of Orion. NGC1977 was first discovered in 1786 by William Herschel, with Heinrich Louis d'Arrest first identifying the two smaller regions of NGC 1973 [1862] and NGC 1975 [1864]. [From the Wiki]

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NGC3169, NGC3166 & NGC3165 This beautiful to behold set of interacting galaxies lays some 70 million light years away in the constellation of Sextans; depicting the gravitational affects between NGC3169 [bottom left] and its neighbour NGC3166. Smallest of the trio is NGC3165, which can be seen top right of NGC3166.

"Interacting" refers to the initial stages of galaxies colliding, and in this scene, the two larger galaxies are beginning their cosmic dance, gravitationally tugging and pulling on one another. Already the delicate arms of NGC3169 are pluming in response to its close proximity to NGC3166, and eventually in many millions of years to come, these two will eventually combine to form a much larger single galaxy.

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

Viewing Location: Central Victoria, Australia. Observatory: ScopeDome 3m - Date: April 2018 to February 2019



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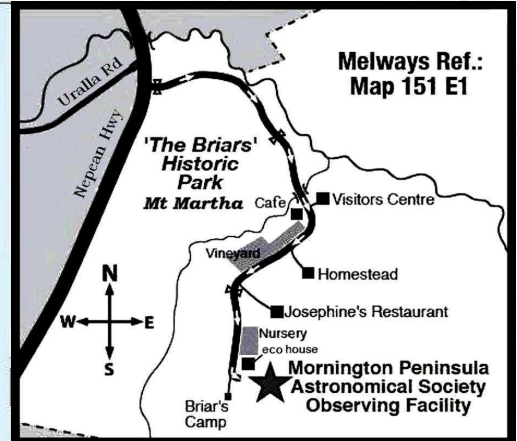
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 (See map at right & Below)



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