Cover image - NGC1365 *by Steve Mohr*
See details on page 18.

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

Public Night January 3rd - There were 67 visitors in attendance at the first Friday public night at The Briars this year to hear Trevor Hand speak about galaxies. Very probably numbers were down a lot this year due to the smoky conditions. It was a warm evening with plenty of flies and smoke haze from the extensive bushfires in eastern Victoria. Fortunately the amount of smoke started clearing a bit overhead during the evening as a change started to arrive. And it was noted that the bright star Betelgeuse in Orion was dimmer than usual, more so than from just the smoke. Perhaps a precursor to an impending nova outburst or bigger. The first quarter Moon was easily visible, as were Venus, Uranus, the International Space Station and other brighter objects in the dusk and beyond. Members also present and helping included Anders Hamilton, Jamie Pole, Dave & Jamie Rolfe, Phil Holt, Mark Stephens, Peter Skilton, Nerida Langcake and Piper Grierson, John Goodall, John Cleverdon, Bob Heale, Louise Edgoose and Jess Peters, Sky Murphy, Ben Claringbold, Ross Berner, Jason Heath, Alan Predjak and Greg Walton. *Regards, Peter Skilton*

Public Night Saturday January 4th - Under cool and smoke free conditions, there were 71 visitors at the second public night of the year at The Briars. Trevor Hand gave the talk indoors. Clouds became more problematic as the evening progressed, but nevertheless most of the visitors were able to see several objects during the evening before they went home. There was also a pass-over of the International Space Station towards the north. Helping during the evening were Sky Murphy, Fred Crump & Bonnie Cass, Nerida Langcake, Ben Claringbold, Peter Skilton, Mark Stephens, Jamie Pole, Dave, Jamie and Landon Rolfe, Phil Holt, Anders Hamilton, Ian Sullivan and apricots, Greg Walton, Kit Penfold, the Sioukas brothers, musician Alan Predjak and TV actor Jason Heath. *Regards, Peter Skilton*

Public Night January 10th - Saw 31 members of the public in attendance. The numbers were down due to 100% cloud cover and a lot of smoke hanging in the air. So no viewing through the telescopes, but everyone seemed to enjoy the talk. Heavy rain afterwards made a slow trip home for most.

Society Meeting January 15th - The main topic was Australian Aboriginal Astronomy. This wasn't a live presentation (holiday period) but rather we have been given approval by the Royal Society of Victoria to screen their recording of Assoc. Prof. Duane Hamacher on the topic in the CBD a little while back. *See right.* There was a possibility that we might have visitors attending from one or more local indigenous organisations in the region, but no known attendance. Following the talk and tea break were: Fire in the Sky by Sky Murphy, Sky for the Month by Mark Stephens. Then we played 3 short movie clips: Animals and the Space Race by Lance Geiger, The truth about Water down the Plughole by Dr. Derek Muller, Can you stand on Liquid Mercury? by Cody Reeder. *Regards, Peter Skilton*

Public Night January 17th - The final public night for January was held last Friday at The Briars, and saw only 41 visitors in attendance. The bushfire smoke this year may have scared half the people away it seems, compared with previous years. While heavy cloud cover prevented viewing during the evening it, of course, cleared up nicely just after the public had left for the evening! The talk indoors was given by Peter Skilton, and ably helping with the many tasks outdoors were Piper Grierson, Nerida Langcake, Bob Heale, Greg Walton, Simon Hamm, Ian Argent, John Cleverdon, Anders Hamilton, Sky Murphy, Peter & Coleen Conboy, Robin Broberg and Ben Claringbold. *Regards, Peter Skilton*

Members' night working bee and BBQ January 18th - We had a good turnout at the working bee with most of the jobs on the list completed. Lawns mowed and trimmed; cut back trees on eastern fence line; removed 2 trees - one dead and one that had fallen over on the last public viewing night and we cut back trees around the TV aerial. Small dome observatory was washed and polished; we also got the roof hatch moving freely. We assembled and cleaned the 120mn refractor. Cleaned the plastic chairs; removed cobwebs; tidied up the library... Then it was time to fire up the BBQ. Big thanks to Jamie for buying supplies and also a big thank you to members who brought along salads and desserts. As the sky was clear 4 members were trained to open the observatory and use the telescopes. Big thanks to all who helped out on the day. Many hands make light work. *Regards Greg Walton*

Photo by John Cleverdon

Members viewing night Saturday 25th January - One of the best nights I have seen in a long while. Clear skies, no Moon and no wind, with the Milky Way shining brightly overhead. About 10 members at the Briars that night. Could be a first with all 4 telescopes in the observatory being used for astrophotography at the same time. Noah set up his Dobsonian outside and was happy to see all the improvements we had made over the last 2 years. Was almost 2 a.m. when I packed up. *Regards Greg Walton*

Public Night February 7th - Saw 80 visitors in attendance, plus a dozen or more members. A show of hands in the audience showed that half hadn't been to the Briars previously. The talk was given by Trevor Hand, deftly avoiding the corona virus while cruising the seas last month. The skies cleared of clouds by mid-evening, but the smoke haze remained omnipresent throughout, causing a noticeable brightening of the sky due to scattered light from the 95% full Moon. Outside helping were Simon Hamm, Fred Crump and Bonnie Cass, Anders Hamilton, Nerida Langcake, Bob Heale, Peter Skilton, Ross Berner, Ian Argent, Anne Dunne, Mark Stephens, Mike Smith, Ben Claringbold, Jason Heath, Greg Walton, Katherine McCoy, John Cleverdon, Rohan Baumann, Jamie Pole and Alan Predjak.
Regards Peter Skilton

Before I started my talk on Friday, I asked for a quick show of hands of people who had never been to the Briars before. I estimate at least 50% put their hands up, I was expecting a bit of a smattering of hands rather than a sea of hands. So I thought that was very interesting and would pass on my "survey results". *Trevor Hand*

Society meeting February 19th - After the President's summary of the Society's activities -past, present, and upcoming, Professor Ilya Mandel from Monash University and Chief Investigator at the ARC Centre for Excellence in Gravitational Wave Discovery (OzGrav) spoke on 'Gravitational Wave Astronomy'. This was followed by 'Waves Light and Blue' by Sky Murphy, Sky for the Month by Mark Stephens, and 3 selected video clips. Mark also brought a brand spanking shiny new orrery -set in motion, shown and told to the gaping audience. For those who might have missed this MPAS meeting, the video is now available on YouTube. https://youtu.be/KY4JduZC4UQ *Regards, Peter Skilton*

Telescope Learning Day and BBQ February 22nd - Some photos below from the first Telescope Learning Day event at the Briars (two this year). Perfect weather and approximately 65 in attendance - with lots of enthusiastic active participation. A big thank-you to all that attended and helped out today - Congrats to Mark Stephens on delivering a great presentation - the group really seemed to get something out of it. *Jamie Pole*

Camp Manyung February 24th - The Camp Manyung stargazing evening for 80 year 6 students from Sirius College went ahead last night with Peter Skilton giving the talk and handing around a meteorite. The evening started with some technical issues getting connection to the data projector, but this was eventually worked around. Unfortunately the evening had light rain for most of the time, precluding any possibility of use of telescopes outdoors, and so the indoors talk went until the teachers deemed it was bed time for the students. Thanks go to Philip Rea, Phil Holt, Guido Tack, Simon Hamm, Ben Claringbold, Robin Broberg and Fred Crump (together with a new, glittery Apollo 11 poster) for attending with telescopes, just in case they could be used. *Regards, Peter Skilton*

Here's an update of confirmed outreach events for your 2020 diary.

MARCH 2020 Friday 6th, 8pm Briars. Public stargazing night. Speaker Trevor Hand.
Wednesday 11th, 7:30pm at Parkdale Secondary College. About 170 Year 7 pupils anticipated. Speaker Peter Skilton.

APRIL 2020 Friday 3rd, 8pm Briars. Public stargazing night. Speaker Trevor Hand.

MAY 2020 Friday 1st, 8pm Briars. Public stargazing night. Speaker Trevor Hand.
Friday 29th, 8pm Briars. Scout/Guides/Cubs night. No bookings as yet. Speaker Peter Skilton.

JUNE 2020 Friday 5th, 8pm Briars. Public stargazing night. Speaker Trevor Hand.

JULY 2020 Friday 3rd, 8pm Briars. Public stargazing night. Speaker Trevor Hand.
Friday 31st, 8pm Briars. Scout/Guides/Cubs night. No bookings as yet. Speaker Peter Skilton.

AUGUST 2020 Friday 7th, 8pm Briars. Public stargazing night. Speaker Trevor Hand.
Friday 21st, 8pm Briars. Public stargazing night for National Science Week. Speaker Trevor Hand.

SEPTEMBER 2020 Friday 4th, 8pm Briars. Public stargazing night. Speaker Trevor Hand.

OCTOBER 2020 Friday 2nd, 8pm Briars. Public stargazing night. Speaker Trevor Hand.
Friday 30th, 8pm Briars. Scout/Guides/Cubs night. No bookings as yet. Speaker Peter Skilton.

NOVEMBER 2020 Friday 6th, 8pm Briars. Public stargazing night. Speaker Trevor Hand.

DECEMBER 2020 Friday 4th, 8pm Briars. Public stargazing night. Speaker Trevor Hand.

We made a mistake with the Scout night dates in the MPAS 2020 calendar.
Correct dates below. Combined Scout, Cubs & Guides @ the Briars 8pm to 10pm (Help required)
February 28th, May 29th, July 31st, October 30th

Also we have corrected the last newsletter, mpas update and calendar on the mpas Google drive.

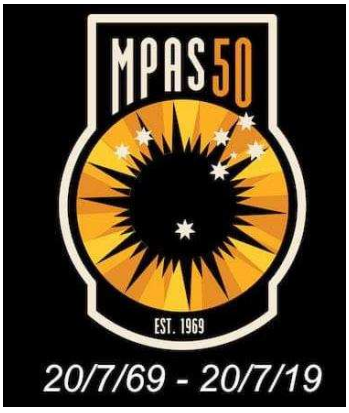
Link to correct 2020 calendar below.
https://drive.google.com/file/d/1fP3Udo0wXX4tU_LJMdaertfF8zTeo--J/view?usp=drivesdk

Link to all Scorpius newsletters.
https://drive.google.com/folderview?id=0ByvkxzZGI9g_SUNmZVhkZTFGWTA

Regards Greg Walton

New Members Welcome

Adam & Natasha Langton and family
Jennifer Jobling
Guido & Monika Tack
Alexandra Sefertzis
Burkhard Schulz & family
Michael & Ana Kostidis and family
Allan & Gwen Tregea
Denis Meadows
Spase Dimitov
Piyush Madhamshettiwar & family
Leah Walsh
Simon & Erin Patterson and family
Michael Dever & family
Cecily Whitford & Denys Avery



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:

SOCIETY FEES

$50 – Full Member
$45 – Pensioner Member
$65 – Family Membership
$60 – Family Pensioner Membership
See more options on-line

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/0ByvkxzZGI9g_NXZ4cWxHbERTdEE/view?usp=sharing

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 / 2020

Red Days indicate School Holidays

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3 **First Quarter**	4	5	6 **Public Night 8pm**	7
8 Venus & Uranus 2 degrees apart	9 **Labour Day** Venus & Uranus 2 degrees apart	10 **Full Moon** Moon at 357,122km	11 ASV Meeting	12	13	14
15 **St Patricks day**	16 **Last Quarter**	17	18 **Society Meeting 8pm**	19 Mars, Jupiter, Saturn & the Moon all together in morning.	20 **Equinox** Mars & Jupiter close	21 **Members night** **Working bee 4pm** **BBQ 6pm**
22 Mercury left of a thin Moon, dawn.	23	24 **New Moon**	25	26	27	28 Venus below the Moon, evening.
29	30	31 Mars & Saturn close east morning sky				

Monthly Events

Public Nights - 8pm start on the 6th @ the Briars
Society Meeting - 8pm to 10pm on the 18th @ the Briars
Members Night BBQ - 6pm on the 21st @ the Briars - Working Bee 4pm start
NOTE - Mars, Jupiter, Saturn & the Moon all together in morning of the 19th

CALENDAR — April / 2020

Red Days indicate School Holidays

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1 **First Quarter** Mars & Saturn close east morning sky	2 Venus in Pleiades **M45** 8pm west	3 **Public Night 8pm**	4
5 **Daylight Saving Ends**	6	7	8 **Full Moon** ASV Meeting Moon at 356,907km	9	10 **Good Friday** **NACAA**	11 **Easter** **NACAA**
12 **Easter** **NACAA**	13 **Easter**	14	15 **Society Meeting 8pm** **Last Quarter**	16 Jupiter, Saturn above the Moon with Mars below, morning.	17	18 **Members night** **Working bee 4pm** **BBQ 6pm**
19	20	21 Moon at 406,462km	22 Mercury left of a thin Moon, dawn.	23 **New Moon**	24 **Scorpius Deadline**	25 **ANZAC Day**
26 Venus right of a thin Moon, evening.	27 Venus below the Moon, evening.	28	29	30		

Monthly Events

Public Nights - 8pm start on the 3rd @ the Briars
Society Meeting - 8pm to 10pm on the 15th @ the Briars
Members Night BBQ - 6pm on the 18th @ the Briars - Working Bee 4pm start
NACCA - National Australian Convention of Amateur Astronomers @ Parkes over Easter.

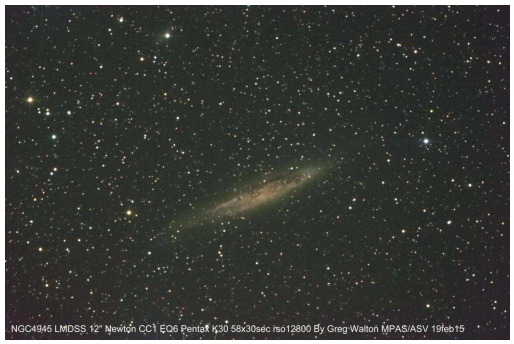
Please… we need helpers to keep the MPAS Observatory open to members on all Saturday nights.
If you can help, contact Greg Walton on 0415172503 or email - gwmpas@gmail.com

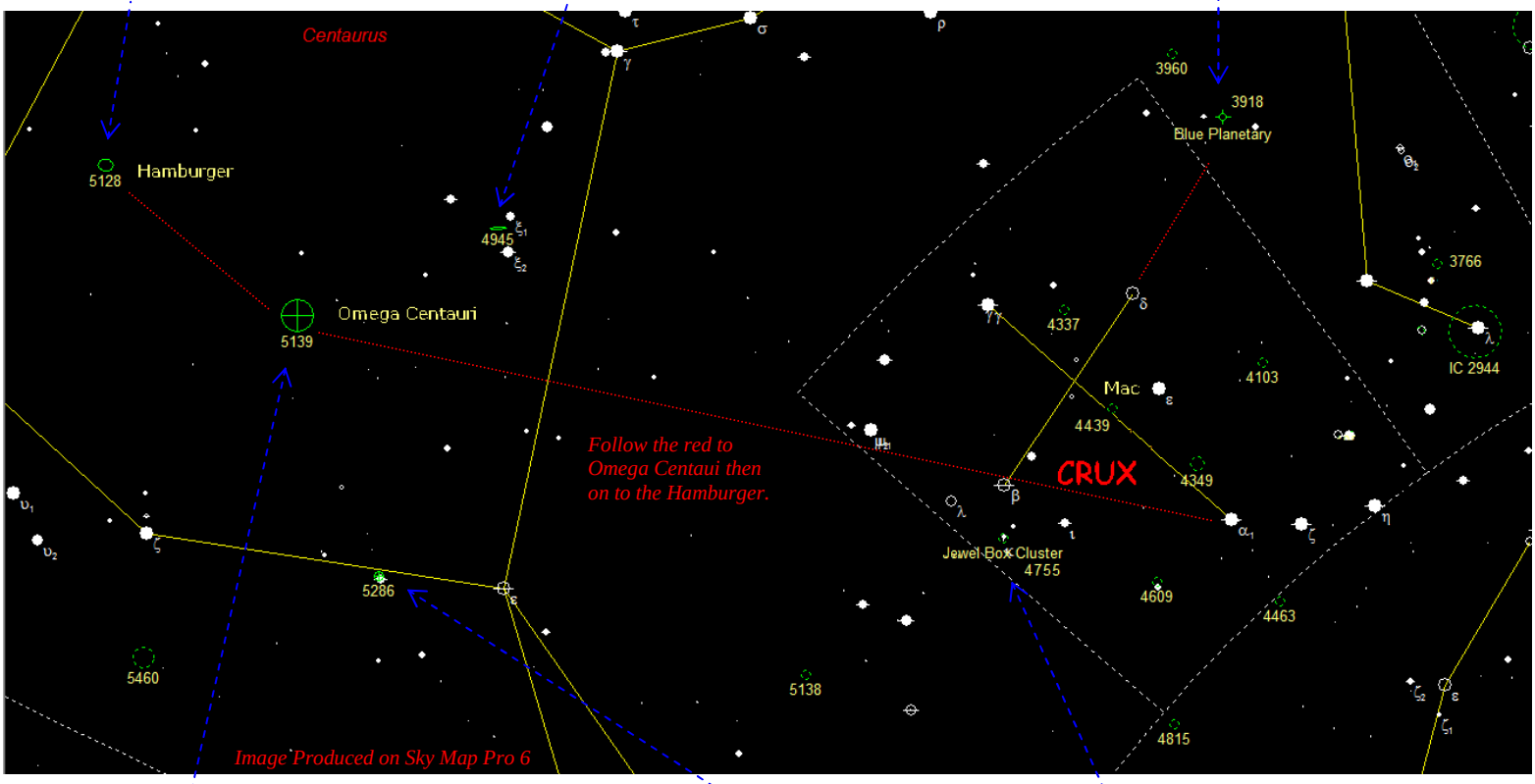
THE BRIARS SKY

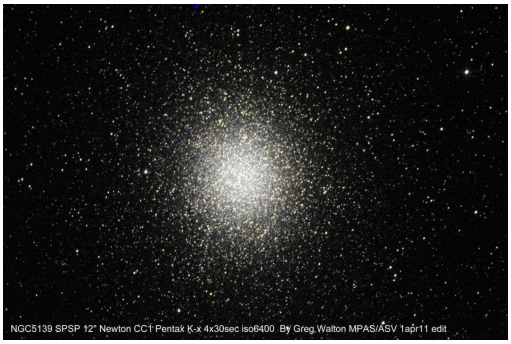
by Greg Walton

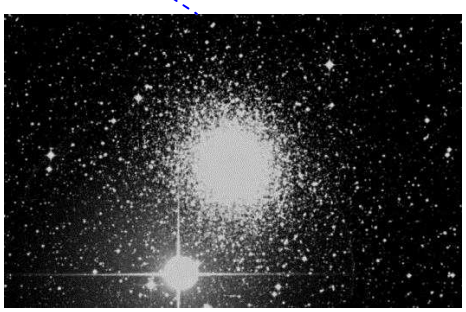
Mornington Peninsula Astronomical Society

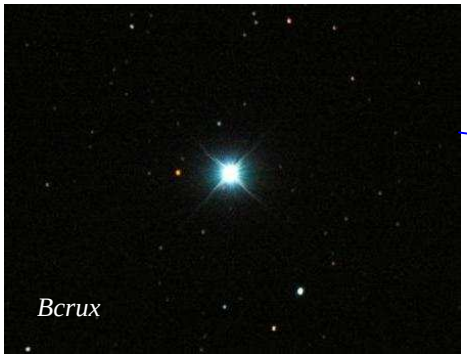
Autumn sees the Southern Cross climbing in the south east along with many of our favourite objects.
Hamburger, NGC4945, Blue planetary, Omega Centauri, NGC5286, Jewel Box NGC4755 and the reddest star in the sky.



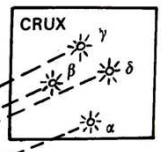




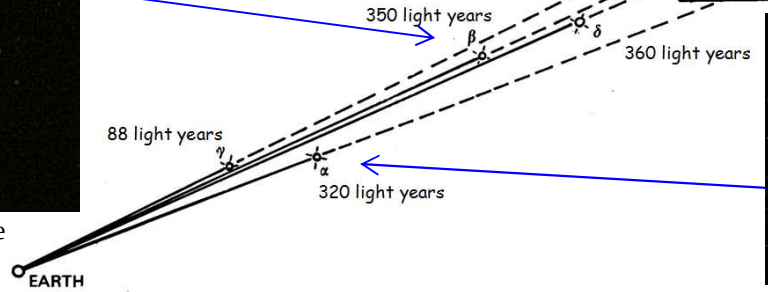


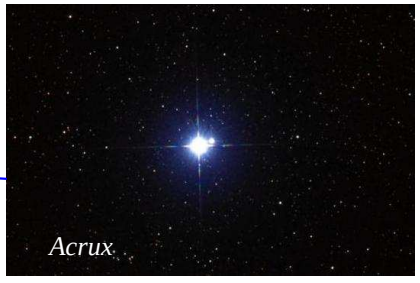


You might think the stars in the Southern Cross are all close to one another, but their distances from Earth are very different.



Acrux is a double star making it easy to recognize.





You can find the reddest star in the southern sky next to Bcrux

ASTRO NEWS

by Nerida Langcake

Mornington Peninsula Astronomical Society

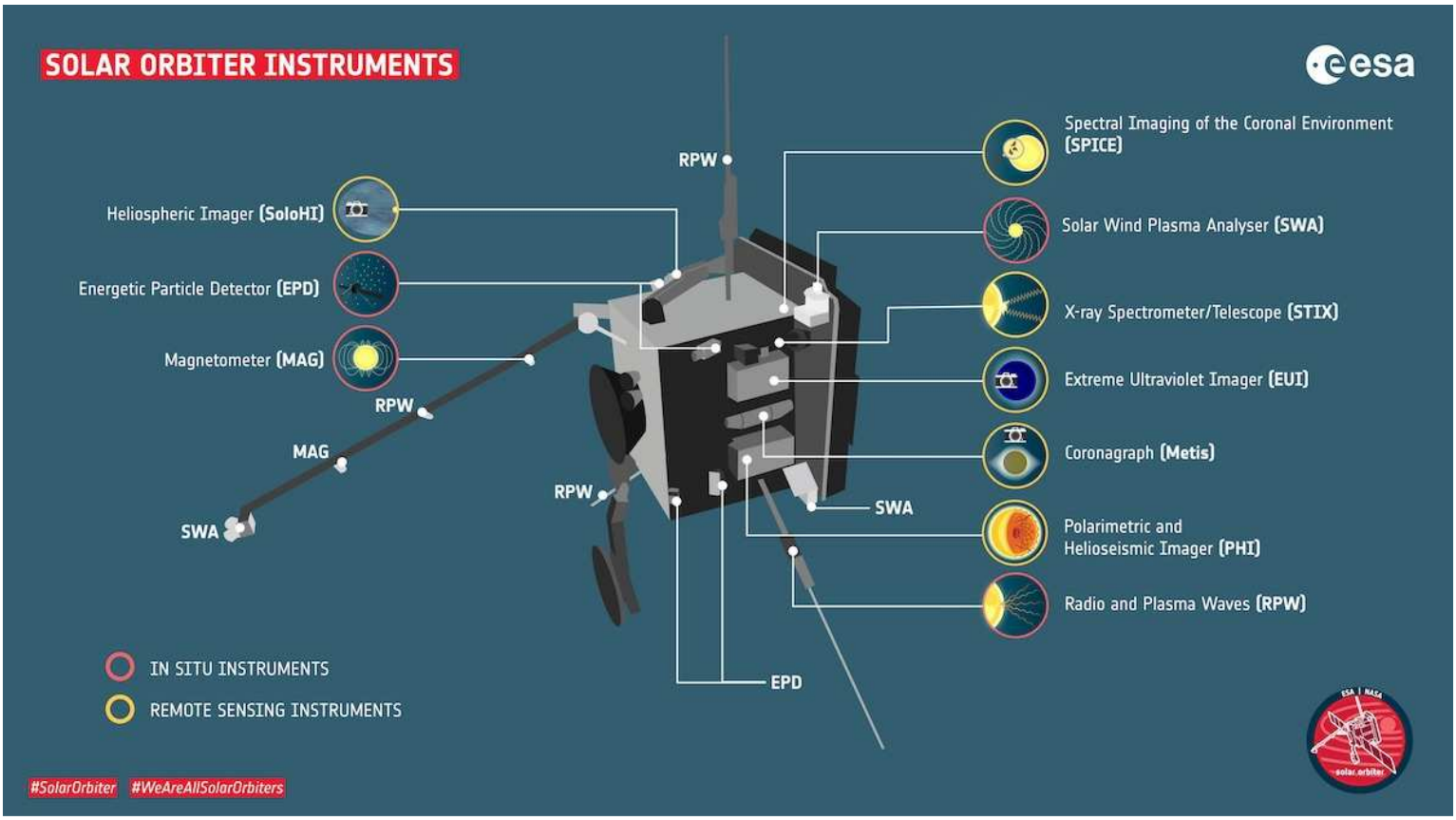
Lift-off! Solar Orbiter launches successfully

ESA's sun-exploring Solar Orbiter will be the first spacecraft ever to fly over the sun's poles. It will study the origin of the solar wind, which has the potential to affect earthly technologies. The Solar Orbiter blasted to space aboard a U.S. Atlas V 411 rocket from NASA's spaceport in Cape Canaveral, Florida, on 9th February.

Solar Orbiter carries a set of 10 instruments for imaging the surface of the sun and studying its environment. It'll get as close to the sun as 42 million km; that's about a quarter of the distance between the sun and Earth. Solar Orbiter will be the first spacecraft to fly over the sun's poles. It's expected to shed new light on what gives rise to solar wind, which can affect earthly technologies including electric grids and communications satellites.

NASA said, "Solar Orbiter will provide the first-ever images of the sun's poles and the never-before-observed magnetic environment there, which helps drive the sun's 11-year solar cycle and its periodic outpouring of solar storms".

ESA describing Solar Orbiter's path through space says Solar Orbiter will take the first direct images of the sun's poles, but getting into the right orbit to do this means taking a loopy path through the inner solar system, borrowing thrust from the powerful gravitational fields of Earth and Venus.

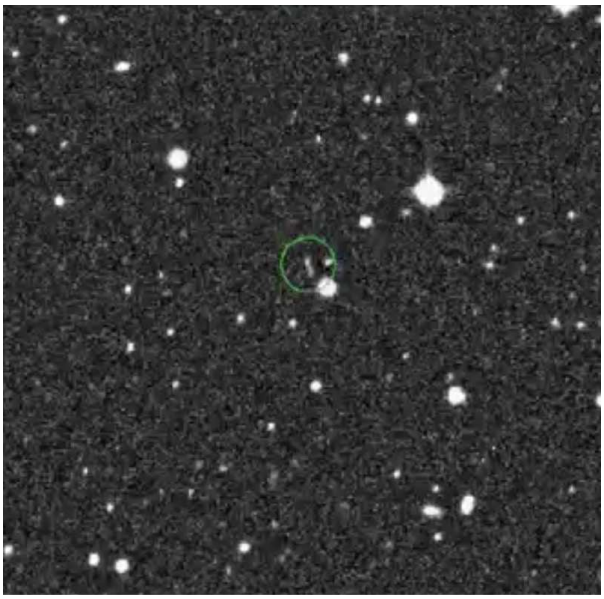


Solar Orbiter carries a set of 10 instruments for imaging the surface of the sun and studying its environment. Image credit: ESA

Looks like Earth has a new natural (albeit temporary) moon

Astronomers have announced that Earth has a new mini-moon, a small asteroid apparently captured into Earth orbit 3 years ago. It's been designated 2020 CD3. The IAU's Minor Planet Center (MPC) announced that Earth has a new "temporary" captured object.

2020 CD3 was discovered on February 15 by astronomers at the Catalina Sky Survey, based in Tucson, Arizona. More than 30 observations were made of the object by February 17. Those observations were needed to refine an orbit for the object, and to confirm it does appear to be orbiting Earth. The object is very small and faint. Sunlight reflected from it helps provide an estimate of its diameter. The estimate is 1.9-3.5 meters at this time, but that could easily change. Still … it's small! It's amazing astronomers can identify something so small orbiting Earth. Expect more info as the days pass!



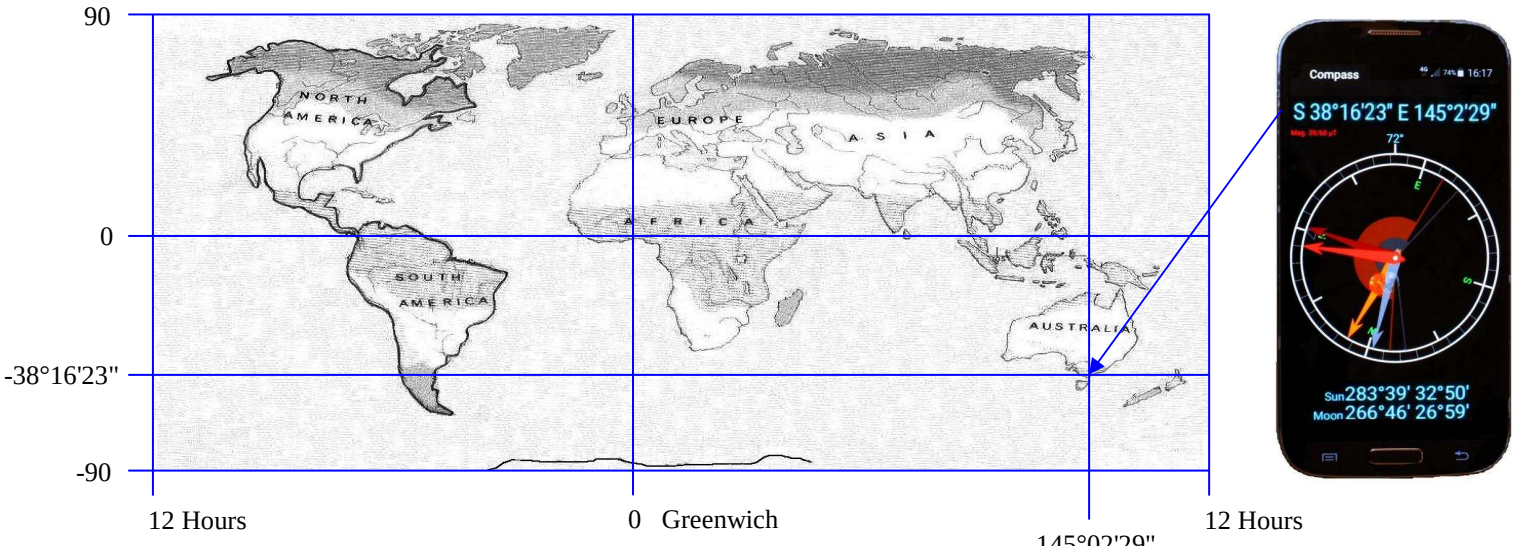
One of the discovery images of the object designated 2020 CD3. Image via @WierzchosKacper.

Setting circles. They help us find things in the sky when using an equatorial mount.

We know that the Earth is divided up into time zones which circle the Earth around its equator.
Greenwich Mean Time, England, being zero and Melbourne being +10 hours.
This can be converted into degrees as one hour equals 15 degrees, making Melbourne 10 hours x 15 = 150 degrees from Greenwich.

360 degrees in a circle, divided by 24 hours, equals 15 degrees per hour.

We also have measurements in degrees from the equator, equator being zero, the north pole being 90 degrees and south pole -90 degrees.
So we can find our location on Earth and record it as just 2 numbers.
For example the MPAS Briars site is 145°02'29" distance in degrees from Greenwich -38°16'23" distance in degrees from equator.
These are the same numbers your smart phone uses to work out where you are on Earth. **(Known as GPS coordinates)**



We use the same system of numbers to record the position of objects in the sky.
So every star in the sky has its own pair of numbers or 2 dimensional coordinates.

Like on Earth, zero in the sky is directly overhead if you were standing at the equator, the north celestial pole being 90 degrees and south celestial pole being -90 degrees. The number for a position in this direction is the declination angle, Dec.

Making a full circle around the sky from east to west, can be divided up into 360 degrees or 24 hours. This is the Right Ascension, RA.
All star measurements are taken from a line drawn through both poles. This line we call zero and a point to measure from.
Note that stars slowly change their positions over time and star charts are renewed every 50 years.

So we have 2 maps sliding over one another at 2 different angles depending on where you are on Earth.

The setting circles on most modern telescope mounts are very small, making them hard to read or get any accuracy.
But it's still possible to get close enough so you can see the brighter objects in the finder scope.

The trick is to get your telescope mount accurately polar aligned. **See link below**
Polar alignment https://drive.google.com/file/d/19Kd4WJw3bYqoC3zhZ6QZw5QBFM-8stNr/view?usp=drivesdk

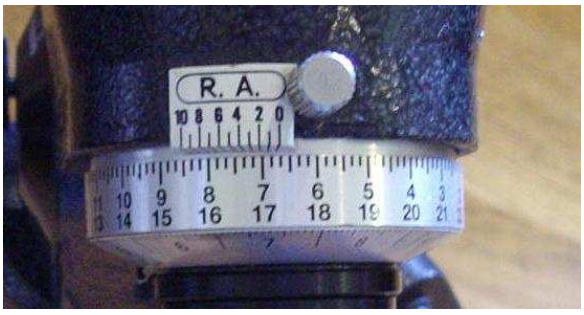
Now point your telescope at a star, best to use either one of these below as most of the time either one of these is in the sky.

Summer alignment star Sirius - RA 6 hours 45 minutes - Dec -16.7 degrees

Winter alignment star Antares - RA 16 hours 30 minutes - Dec -26.5 degrees

While Sirius is in the eyepiece turn the RA setting circle to 6 hours 45 minutes and lock. Just use the zero on the top scale.
If you have a RA tracking motor, you should be good for a few hours. If not, you will need to reset the RA every 4 minutes.

Then check the Dec setting circle it should be on -16.7 degrees. Only need to use the zero on the top scale.
You only need to adjust this once then it should be good for the night. Now we unlock both axes.



Alignment setting for Sirius

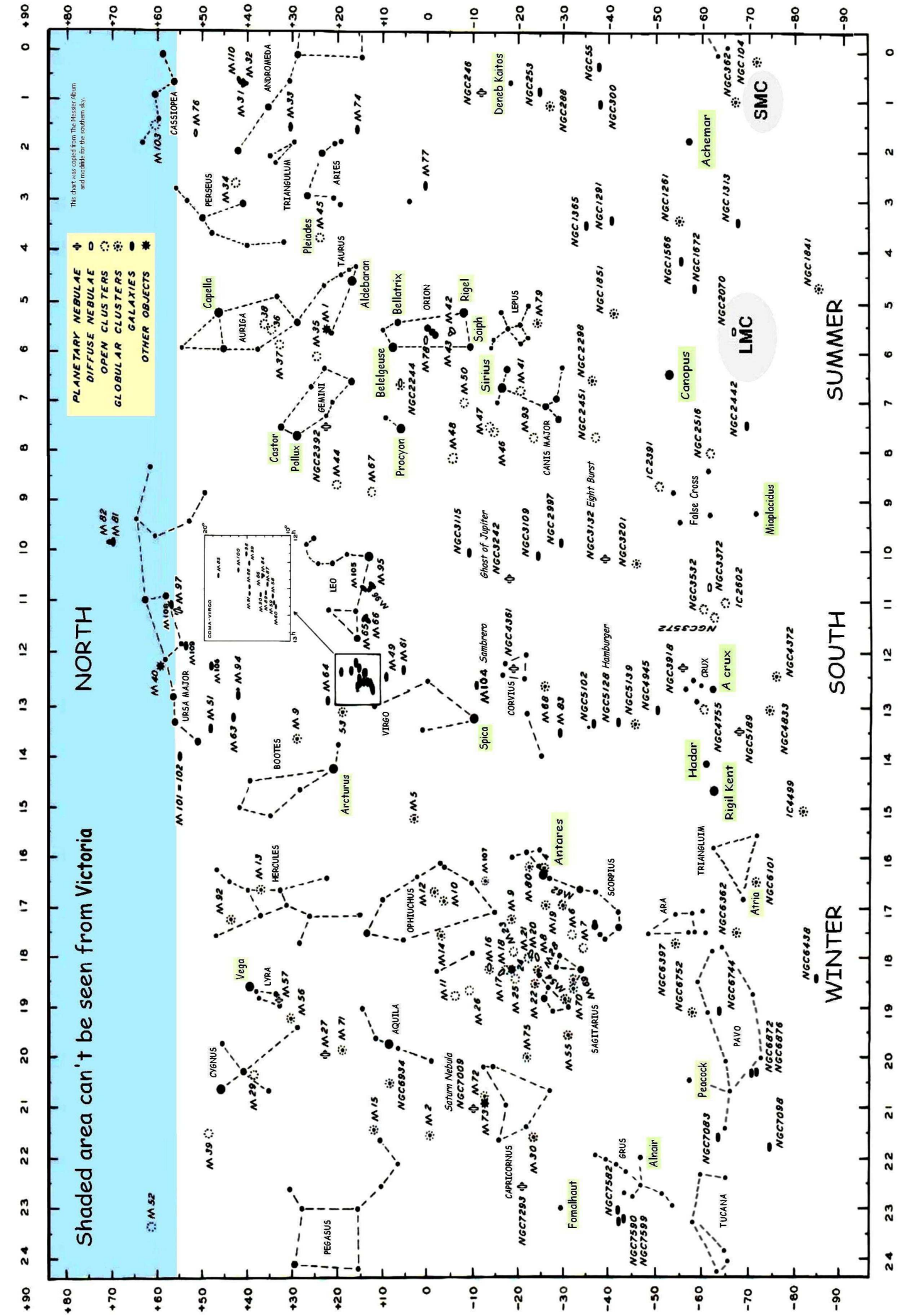
Now select an object on the list on the next page, say M42.
Now move the telescope so the setting circles read RA 5h 35.4m Dec -5d 27m
The Orion nebula M42 should be in the finder scope. Centre M42 and you should be able to see it in the eyepiece.

You can also find an all sky map on page 9.

Summer Stars		RA		Dec		LY	Mag
Sirius	a Canis Major	6h	45m	-16d	42m	8.6	-1.5
Betelgeuse	a Orion	5h	55m	7d	24m	310	0.5
Rigel	b Orion	5h	15m	- 8d	12m	910	0.1
Aldebaran	a Taurius	4h	36m	16d	30m	68	0.9
Castor	a Gemini	7h	35m	31d	53m	46	1.6
Canopus	a Carina	6h	24m	-52d	41m	1170	-0.7
Achernar	a Eridanus	1h	38m	-57d	8m	144	0.45
Winter Stars							
Antares	a Scorpius	16h	30m	-26d	28m	330	1.0
Alpha Crux		12h	27m	-63d	5m	360	0.9
Alpha Centauri		14h	40m	-60d	50m	4.3	-0.3
Beta Centauri		14h	4m	-60d	22m	460	0.6
Al Nair	a Grus	22h	9m	-46d	52m	100	1.7

KEY	
RA	Right Ascension
Dec	Declination
h	Hours
m	Minutes
d	Degrees
N	Nebula
O	Open cluster
G	Globular cluster
Gx	Galaxy
P	Planetary Nebula
Mag	Brightness
LY	Light Years
Not seen in finder scope.	

OBJECT			RA		Dec		Size Deg	Mag	LY
LMC	Gx		5h	23.6m	-69d	45m	11 x 9	0.1	180,000
SMC	Gx		0h	52.7m	-72d	50m	4.6 x 2.7	2.3	190,000
Coal Sack	Dark nebula near Crux		12h	53m	-63d		6.7 x 5	none	500
M4	G		16h	23.6m	-26d	32m	0.57	5.9	10,000
M7	O		17h	53.9m	-34d	49m	1.33	3.3	800
M6	O	Butterfly	17h	40.1m	-32d	13m	0.5	4.2	1,300
M8	N	Lagoon	18h	3.8m	-24d	23m	1.5 x 0.65	5.8	5,000
M16	N	Eagle	18h	18.8m	-13d	47m	0.55 x 0.45	6	5,900
M17	N	Omega or Swan	18h	20.8m	-16d	11m	0.75 x 0.6	7	5,900
M20	N	Trifid	18h	2.6m	-23d	2m	0.46	6.3	5,000
M22	G	large, in Sagittarius	18h	36.4m	-23d	54m	0.55	5.1	7,800
M31	Gx	Andromeda	0h	42.7m	41d	16m	3.2 x 1	3.4	2,500,000
M33	Gx	Pinwheel	1h	33.9m	30d	39m	1.2 x 0.6	5.7	2,400,000
M42	N	Great Orion Nebula	5h	35.4m	-5d	27m	1.17 x 1	4	1,500
M44	O	Praesepe or Beehive	8h	40m	19d	59m	1.7	3.1	580
M45	O	Pleiades	3h	47m	24d	7m	1.8	1.2	380
M46	O	NGC2437 (and -8 P)	7h	41.8m	-14d	49m	0.43	6.1	3,200
M57	P	Ring Nebula	18h	53.6m	33d	2m	0.02	8.8	1,600
M83	Gx	Southern Pinwheel	13h	37m	-29d	52m	0.15	7.5	15,000,000
M104	Gx	Sombrero	12h	40m	-11d	37m	0.22 x 0.07	8.3	41,000,000
NGC 55	Gx		0h	15.1m	-39d	13m	0.5 x 0.1	8.1	4,000,000
NGC 104	G	47 Tucanae	0h	24.1m	-72d	5m	0.83	4	15,000
NGC 253	Gx	Silver Coin	0h	47.6m	-25d	17m	0.43 x 0.1	7.6	11,000,000
NGC 2070	N	Tarantula	5h	38.6m	-69d	5m	0.8	8.3	180,000
NGC 3201	G	in Vela	10h	18m	-46d	30m	0.5	6.8	16,000
NGC 3372	N	Eta Carinae	10h	43.8m	-59d	52m	2	6	6,000
NGC 3532	O	Pin cushion	11h	6.4m	-58d	40m	0.83	3	1,300
NGC 3766	O		11h	37m	-61d	43m	0.15	5.3	
NGC 3621	Gx		11h	18.3m	-32d	49m	0.15 x 0.1	9.2	20,000,000
NGC 4755	O	Jewel Box	12h	53.6m	-60d	20m	0.17	4.2	7,600
NGC 4945	Gx		13h	5.4m	-49d	28m	0.3 x 0.08	8.8	16,000,000
NGC 5128	Gx	Hamburger	13h	25.5m	-43d	1m	0.45 x 0.3	6.7	14,000,000
NGC 5139	G	Omega Centauri	13h	26.8m	-47d	29m	0.83	3.9	16,000
NGC 6362	G		17h	33m	-67d	3m	0.4	8.3	
NGC 6752	G	Pavo	19h	10.9m	-59d	59m	0.3	5.3	13,700
NGC 7582	Gx	Grus Quartet	23h	18.4m	-42d	22m	0.5	10	62,000,000


Shaded area can't be seen from Victoria
NORTH
SUMMER
SOUTH
WINTER
This chart was copied from The Messier Album and modified for the southern sky.
PLANETARY NEBULAE
DIFFUSE NEBULAE
OPEN CLUSTERS
GLOBULAR CLUSTERS
GALAXIES
OTHER OBJECTS
LMC
SMC
Capella
Aldebaran
Rigel
Betelgeuse
Bellatrix
Saiph
Procyon
Sirius
Pollux
Castor
Deneb Kaitos
Achernar
Canopus
Miaplacidus
False Cross
Ghost of Jupiter
Sombrero
Spica
Arcturus
Vega
Antares
Hadar
Rigil Kent
A crux
Atria
Fomalhaut
Alnair
Peacock
Saturn Nebula
Eight Burst
Hamburger
CASSIOPEA
ANDROMEDA
PERSEUS
TRIANGULUM
ARIES
TAURUS
AURIGA
GEMINI
ORION
LEPUS
CANIS MAJOR
URSA MAJOR
BOOTES
CORONA-VIRGO
LEO
VIRGO
CORVUS
CRUX
HERCULES
LYRA
CYGNUS
AQUILA
OPHIUCHUS
SCORPIUS
SAGITTARIUS
CAPRICORNUS
PEGASUS
GRUS
TUCANA
PAVO
TRIANGLUM
ARA

NASA @ LEGOLAND, *by Pia Pedersen*

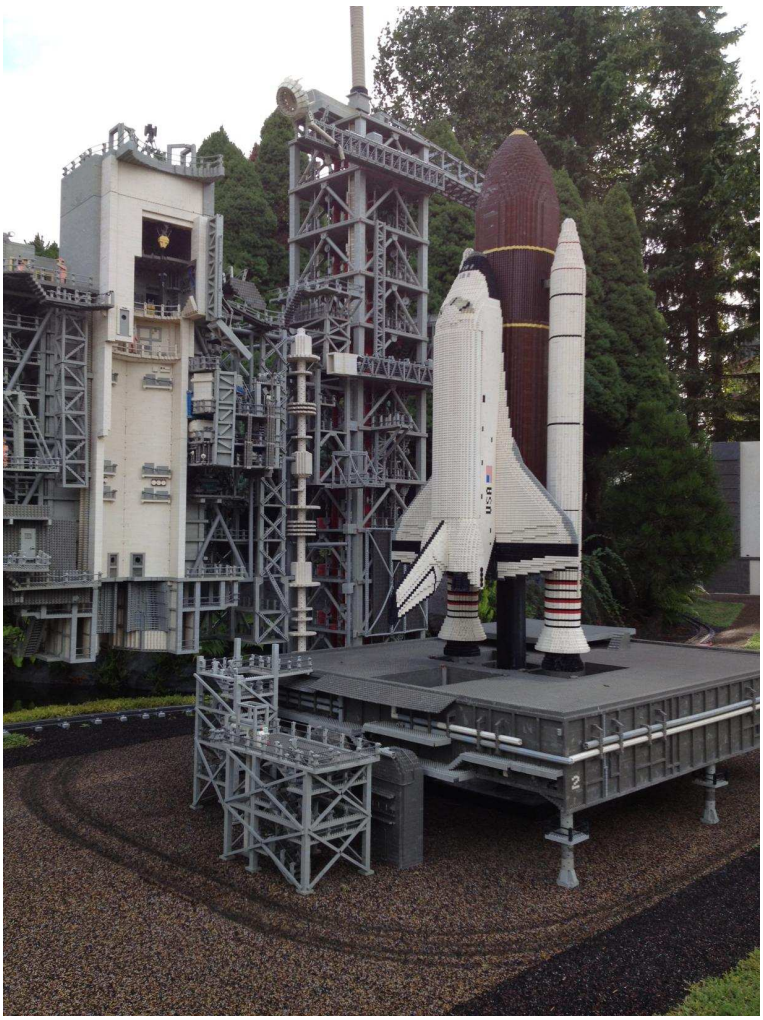
On my last trip to Denmark I visited Lego Land. One of the most popular exhibitions is the NASA display along with a Star Wars exhibition. I photographed it all for Greg as he would not get on the plane and come to Denmark with me.

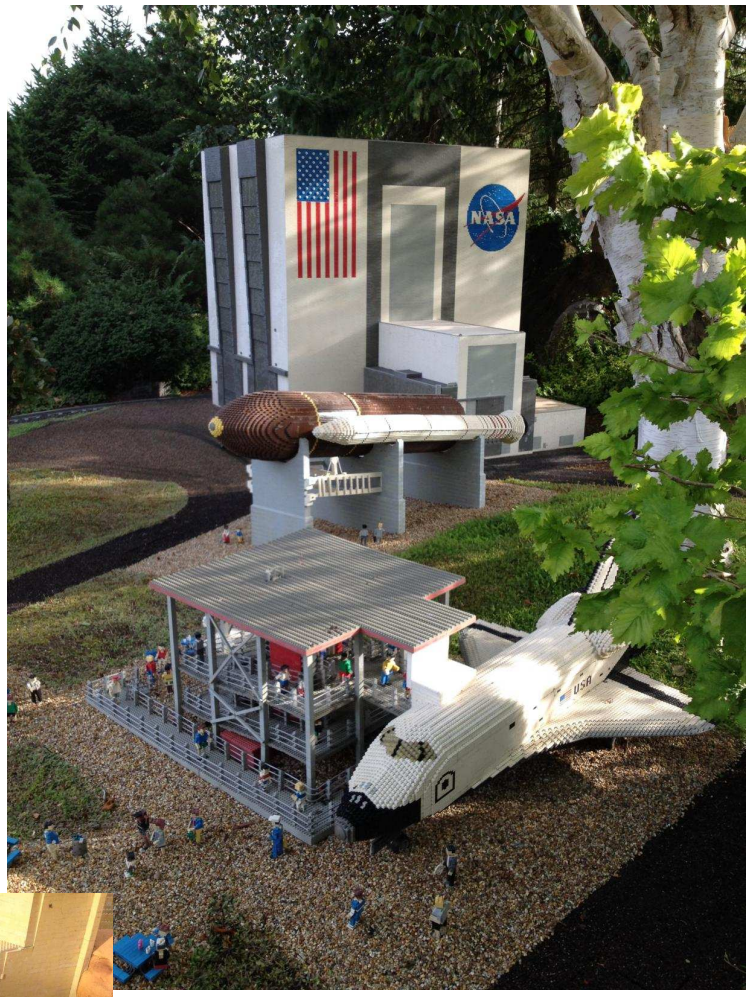
Shuttle Launch https://youtu.be/cEFULV4Pe6I

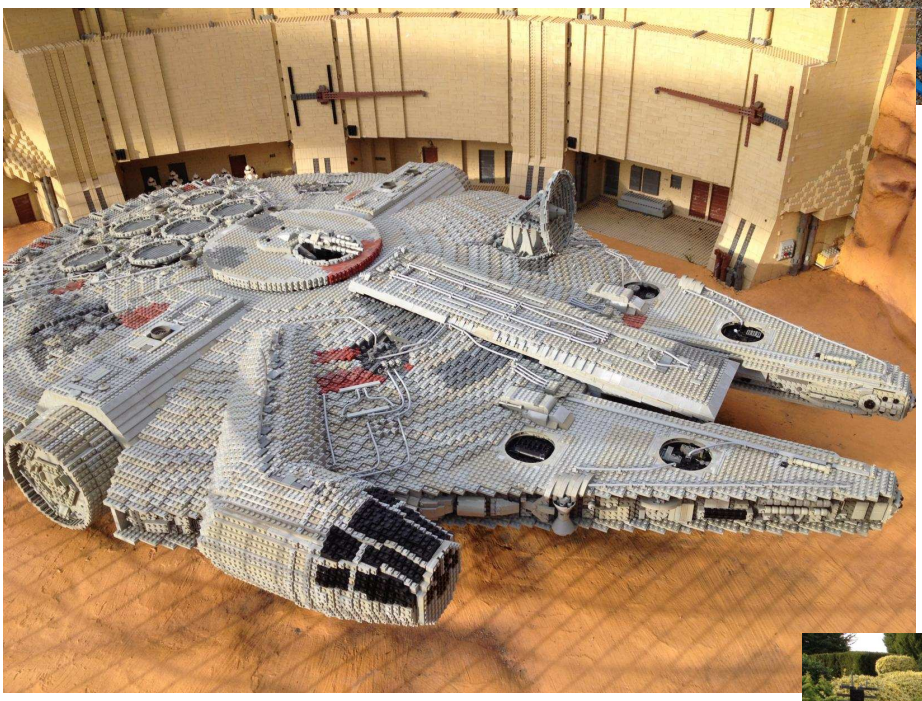
Lego Land NASA https://youtu.be/ZxtkAc77D-I

Lego Land 23min video https://youtu.be/VNX27BQe9yI

Florida NASA Lego Land https://youtu.be/6NIUQs5QZvM

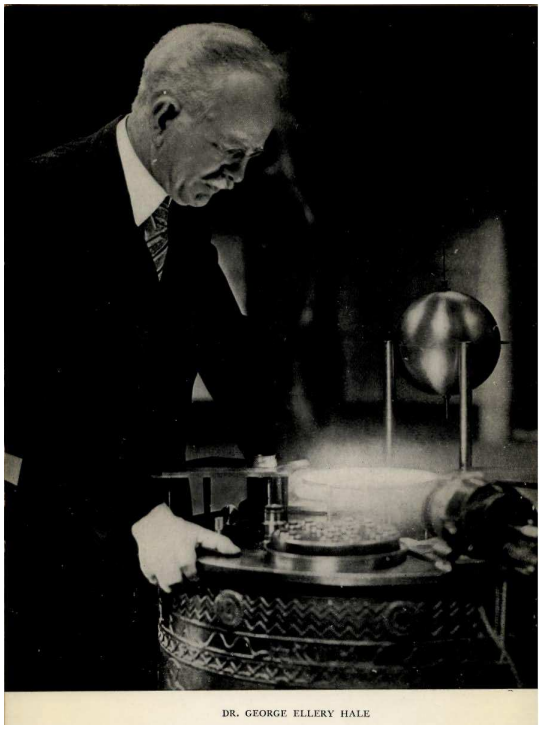






The full size X wing fighter below used 5,335,200 bricks and weighed 20,857 Kilograms. 32 builders took 17,000 hours to construct it in 4 months. It's 13.4 metres long with a 13.4 metre wing span and 3.4 metres high. *All Photos by Pia Pedersen*

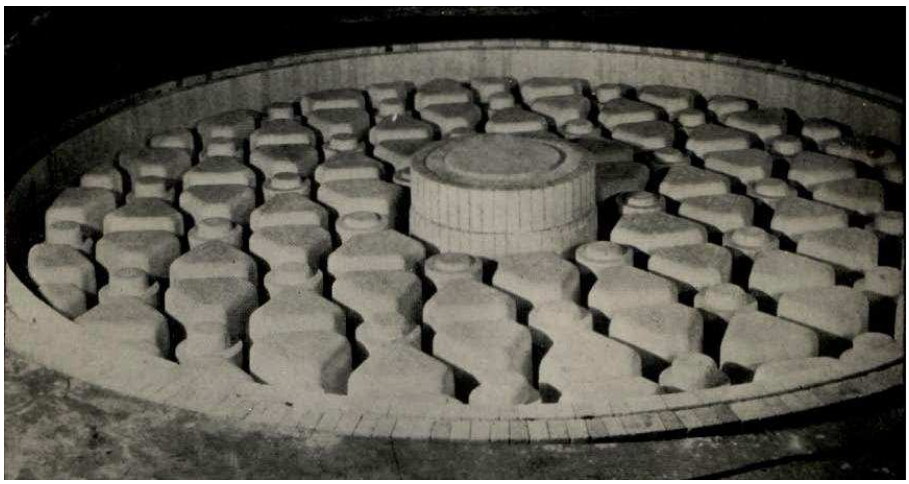
200-inch Telescope @ Palomar, *by Greg Walton*


DR. GEORGE ELLERY HALE

The first really big telescope was the Hale 200-inch telescope at Palomar in America completed in the 1940s. The biggest challenge with such a large mirror is that it may never get to a stable operating temperature. Also where will the money come from? George Hale spent much of his time knocking on many doors asking for money.

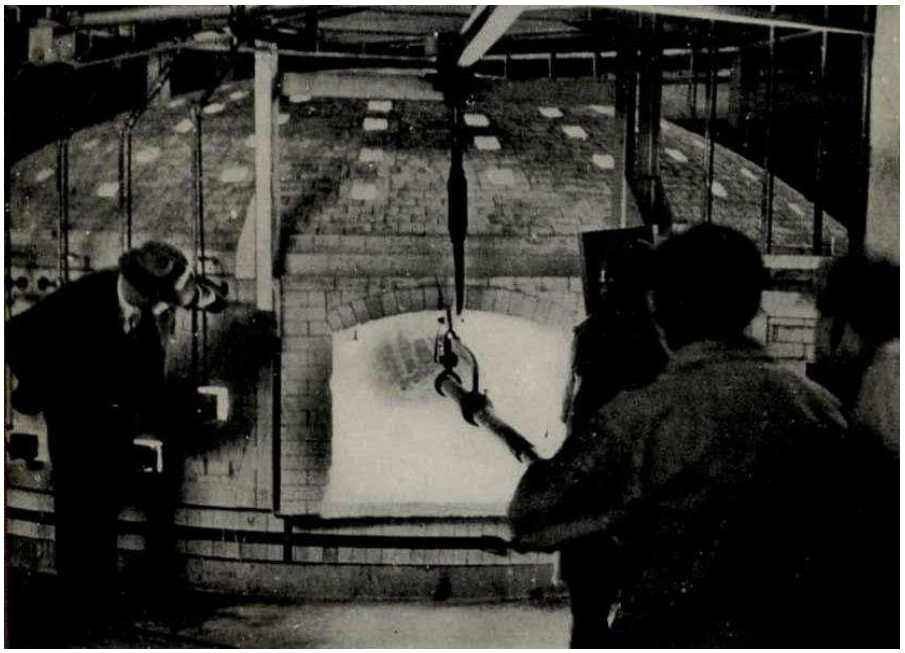
Rockefeller was one of the richest people in the world owning most of the oil companies, also a strongly religious man and in his later years decided to set up a foundation to give away his money. Rockefeller built hundreds of libraries, hospitals and schools around the world and put up the money for the 200-inch telescope.

No one had ever cast a glass mirror this big before and it was thought that the mirror should be made of quartz which conducts heat very well. So a lot of time and money was wasted trying to fuse quartz into a disk and in the end this idea was scrapped. The Corning glass works decided they would attempt a Pyrex glass mirror. Pyrex is a mixture of glass and quartz which melts at a much higher temperature than ordinary glass and also transfers heat better, so making a mirror that would cool down much faster. The Corning Glass Works made cookware and thought making mirrors would be no different, but soon found there were many problems to be solved. The mould had to be made of ceramic and heated in an enclosed oven which gave time for any bubbles to rise to the surface. They started with a small mirror which shattered when cooling. The mirrors would need to be left in the annealing oven longer. As the mirrors got larger the moulds started to melt and only luck saved many mirrors.

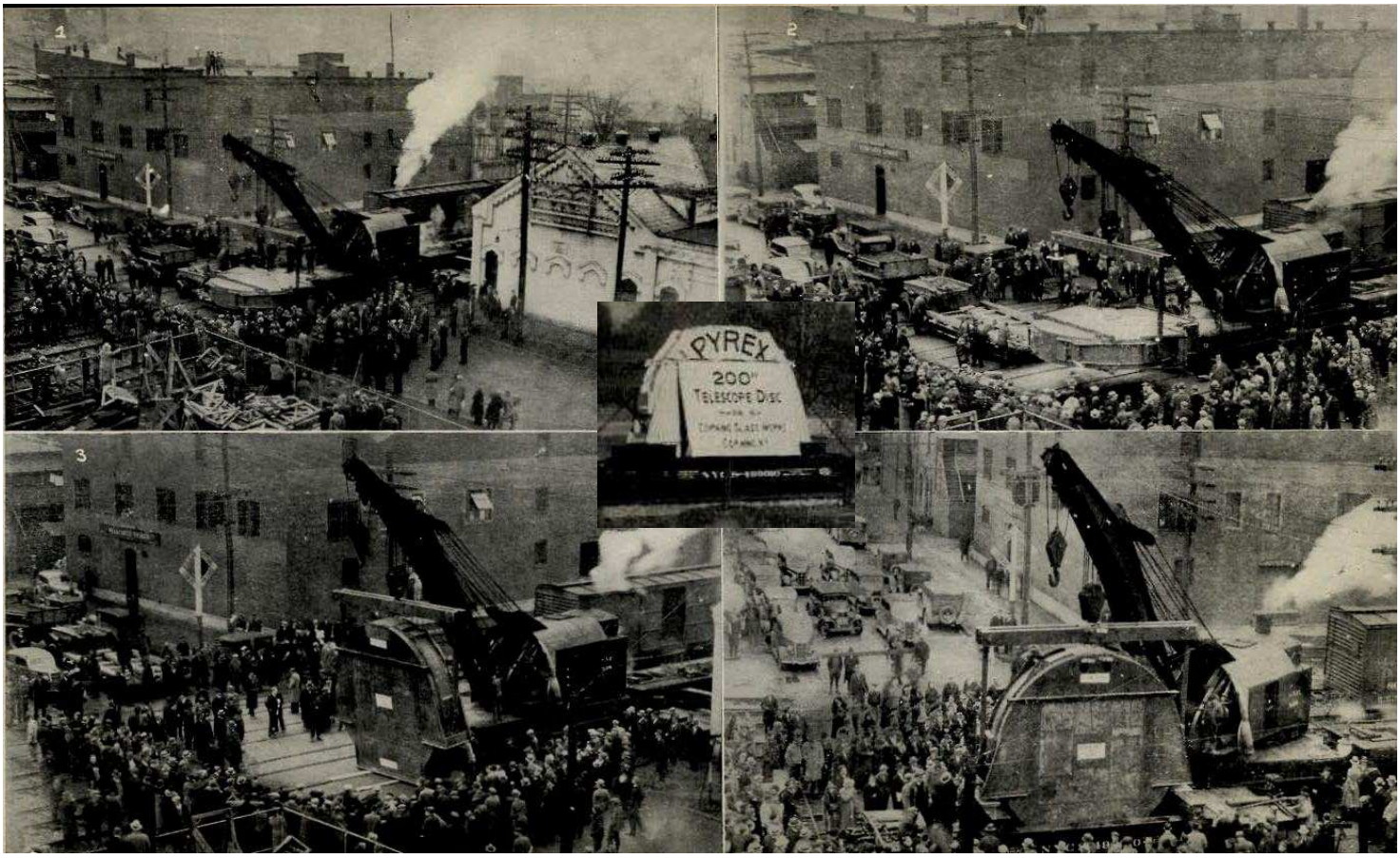


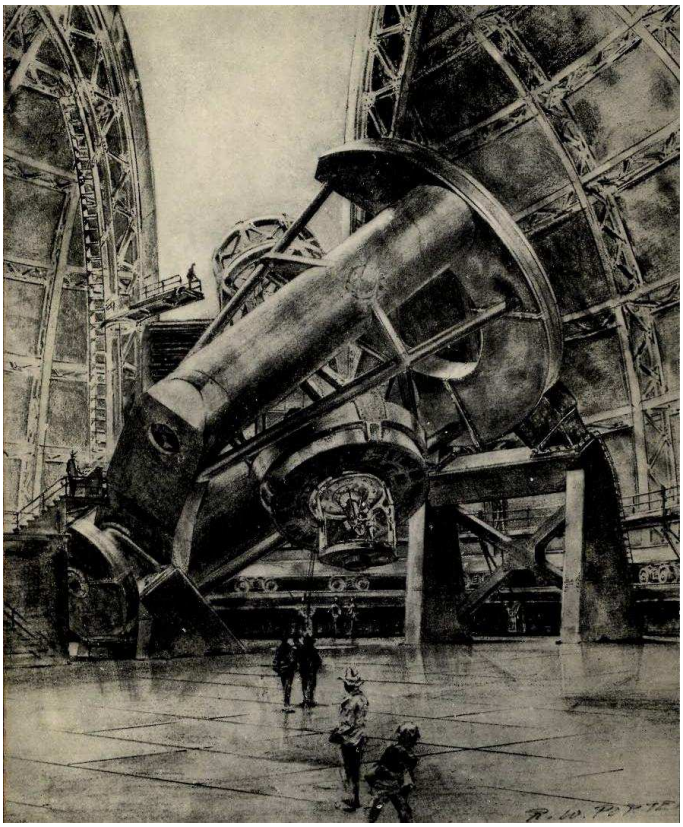
When it came time to cast the 200-inch mirror, it was decided to do this on a Sunday morning with paying spectators shuffling past on a catwalk. But the mould failed with some of the ceramic cores breaking loose and floating around on the surface. The bolts which held the cores down had melted. The whole mould and furnace had to be dismantled and rebuilt; but this time the bolts which held the cores down would be cooled with fans blowing air in around them. Also the workers were sent off to church before they came to work on Sunday and there would be no spectators. The 20 tons of 1,200 degree Celsius molten Pyrex was ladled by hand into the mould from a row of furnaces. After, the temperature was slowly reduced till the Pyrex had set hard, then the furnace was quickly dismantled and the 200 inch mirror moved to an electrically heated annealing chamber, where it sat for one year as the temperature was reduced by about 2 degrees every day. During the cooling process the electricity must not be switch off and the thermostats must not fail. But during the cooling the factory flooded when a nearby river burst its banks. The works used chain blocks to winch the mirror in its chamber and electrical transformer to safety above the water.

Then talking about bad luck the nearby river again burst its banks, but luckily the mirror had finished its cooling process and was ready for shipping with one small problem. Once the mirror was loaded on the truck they found the mirror could not leave because the corner of the factory was in the way. The factory manager ordered the works to quickly demolish the wall so the truck could pass.



The mirror was taken to a nearby rail crossing and tipped on its edge then placed on a specially modified rail cart. Large steel plates were put on all sides to protect the mirror as it was thought that some hillbillies might take pot shots at the mirror as it travelled across America from the east coast to the west coast, where it would then be polished into the most accurate surface ever made by man. There was lots of publicity about this telescope, so people lined the railway tracks as it made its journey.



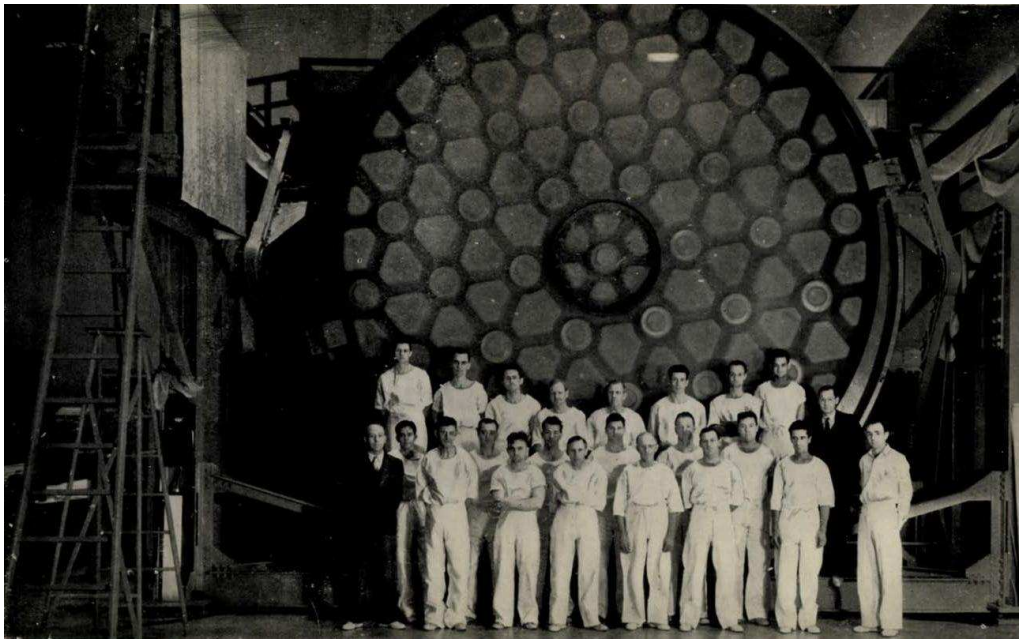


Of course the mirror would need a telescope, observatory and a mountain to put it on. Many telescope designs were considered, the best was from an amateur astronomer named Russell Porter who proposed the horse shoe mount. Its main advantage was its compact design which meant the observatory can be small for such a large telescope therefore reducing the cost, also the telescope could view the north celestial pole. A drawing office was set up at Caltech employing the best designers and draftsmen. Also someone with experience in building large complicated metal structures would be needed to oversee the project. This man was loaned from the naval shipyards and could build a warship in 3 months. He told his superiors that he would get this telescope built and be back in a month. The telescope ended up taking 10 years to build and he never returned to the shipyard.

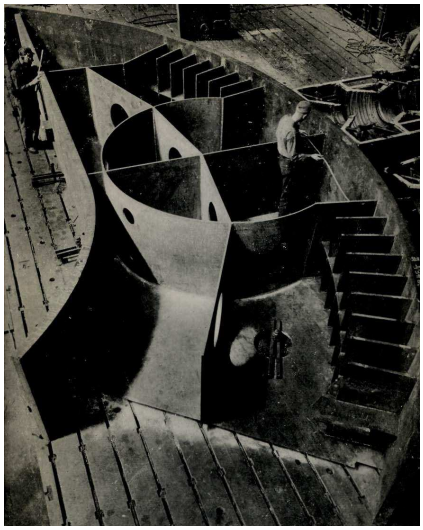
While the telescope was being designed, astronomers tested the sky quality at many sites and eventually decided on Palomar Mountain State Park. First thing was to get permission to use the site and build a road big enough to get all the parts of the telescope to the top. Palomar was also covered in large trees which were a fire hazard so a fire station on the mountain was one of the first things built.

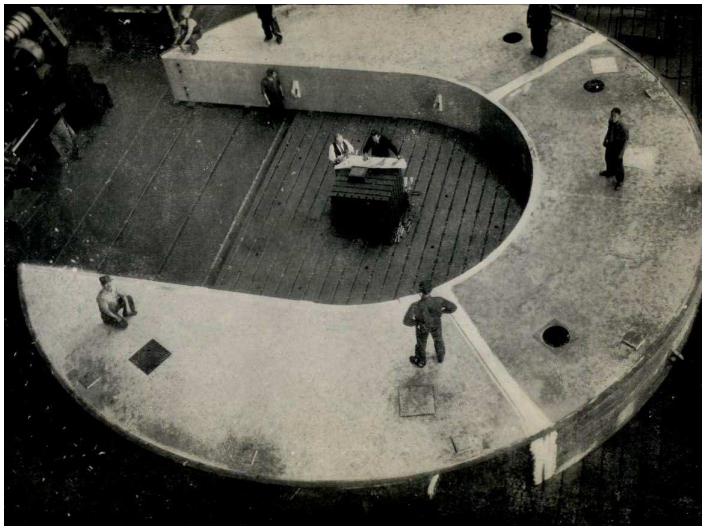
If we are building the most accurate telescope, it will need to be able to find and track the stars very precisely. So we will need the most accurate gears ever made. The Westinghouse engineering works had the biggest gear-cutting machine able to make gears 8 metres in diameter, mostly used to make gears for battleships gun turrets. But a gear produced on this machine would not be good enough due to inaccuracies in the machine. So the gears would be made in 2 halves, then rotated 180 degrees and the teeth would be polished by hand, then rotated 90 degrees and polished again, then rotated tooth by tooth and polished again and again, till it did not matter where you turned the gear to, the teeth would always align perfectly.

Of course while the telescope was being built, the mirror had made its way to Pasadena and the polishing process began. Starting with coarse grinding powder then working with finer and finer powders till a perfect spherical mirror was produced. Before every new powder was used, everything was cleaned many time and all the workers' cloths disposed of. But this perfect spherical mirror would not bring the star light to a focal point. The mirror needed to be parabolic in shape. They needed a polishing tool that was flexible so more pressure can be applied to its centre thus making the mirror slightly deeper in the centre. It took about 10 years of testing and repolishing to finish the mirror. There were also many other smaller mirrors that had to be polished for the telescope.



The horseshoe was one of the largest and heaviest parts to be dragged up the mountain. Built like a ship with access holes for workers to climb inside so it could be welded on the inside as well as the outside. Fans blew air though the horseshoe the same way fans blow air though a mine. Once the telescope was assembled hydraulic oil was pumped into pads which the horseshoe sat on. This oil stopped the metal parts from touching and the telescope moved very freely.





Further reading.
Many years ago long before I owned a telescope I picked up a book called The Glass Giant of Palomar by David O. Woodbury. It's one of my all time favourite books with many interesting facts, stories and problems which had to be solved. Recently I found it could be downloaded, see link below.
https://archive.org/details/TheGlassGiantOfPalomar

Palomar YouTube channel
https://www.youtube.com/channel/UC9YssB4C-EIWZ6yXH_uuytw

Videos

Inside Palomar https://youtu.be/UAsjgKeWCxw

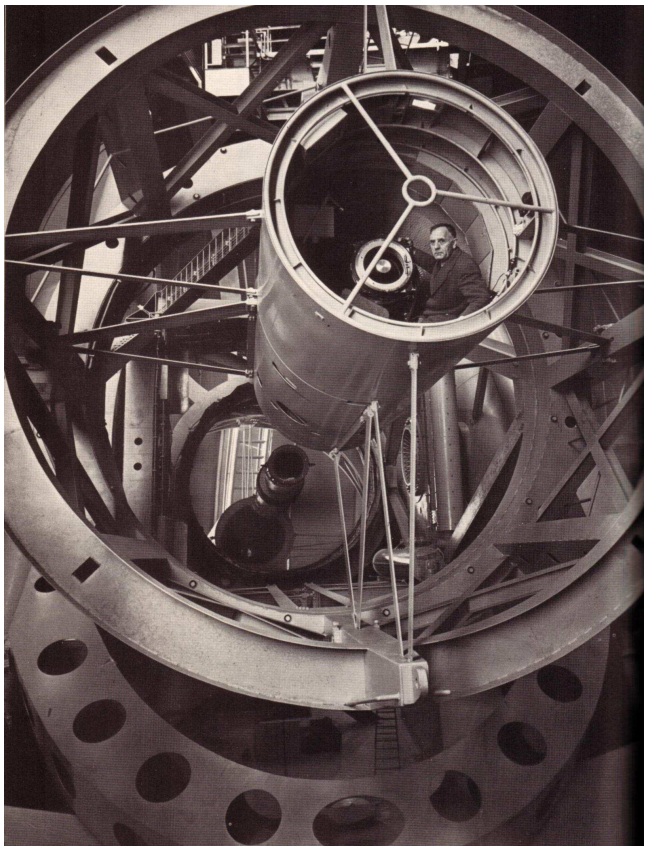
History https://youtu.be/npuaDOtEQco

Then and now https://youtu.be/uWDgrUDQSQ8

Old documentary https://youtu.be/4miVqgNSRVY

Mt Palomar telescope https://youtu.be/ghdDeRAEC8I

Photo at right - Edwin Hubble in the upper cage.
All other photos are from the book mentioned above.



MPAS GALLERY

NGC7582, 7590,7599 | Grus Trio of Galaxies

I'm not sure if I am a fan of this galaxy group? But I love the huge volume of background tiny galaxies in Grus, and it's amazing to look back in time at all these tiny distant galaxies.

Formulated with help from S&T: The Grus Trio of galaxies (Grus Triplet) is located in the Constellation of Grus, some 60 million light years distant from Earth. Whilst the group are often referred to as The Grus Quartet, this rendition only shows the three group members that are in close proximity, with NGC7552 lying far out of this field of view.

The smallest of the three is NGC7590 [right top], with its visibly close companion NGC7599 [top left]. NGC 7582 is a type 2 Seyfert galaxy; such a classification is due to the fact that the galaxy has an extremely bright supermassive central black hole very similar to a quasar (most energetic objects in the universe). The black hole of NGC7582 is about 10 million times the mass of our sun.

Information regarding this image: Center (RA, Dec): (349.576, -42.178) Center (RA, hms): 23h 18m 18.336s Center (Dec, dms): -42° 10' 40.248" Size: 39.6 x 29.7 arcmin Radius: 0.413 deg Pixel scale: 0.733 arcsec/pixel Orientation: Up is 326 degrees E of N Instrument: Planewave CDK 12.5 | Focal Ratio: F8 Camera: STXL-11000 + AOX | Mount: AP900GTO Camera Sensitivity: Lum/Ha: BIN 1x1, RGB: BIN 2x2 Exposure Details: Total: 17.6 hours | Lum: 48 x 900 sec [12.0hr], RGB 450sec x 16 each [5.6hrs] Viewing Location: Central Victoria, Australia. Observatory: ScopeDome 3m Date: August-October 2019 Software Enhancements: CCDStack2, CCDBand-Aid, PS, Pixinsight

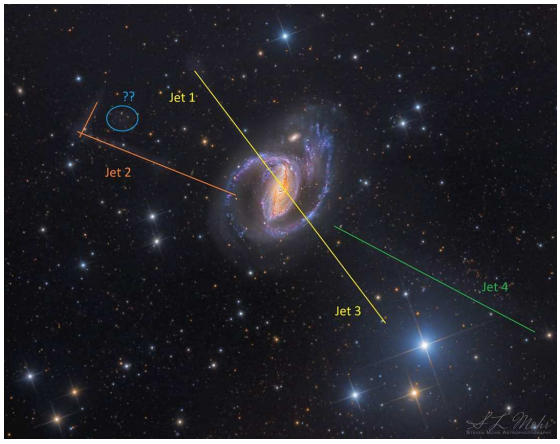
By Steve Mohr

NGC1097 | Barred Spiral Galaxy | Mysterious Tidal Remnants. I thought to try NGC1097, and it nearly killed me. Tough little galaxy to process with crazy bright stars and foreground dust to the upper area of the image. Oih!

According to the Wikipedia, NGC 1097 is a barred spiral galaxy about 45 million light years away in the constellation Fornax. It was discovered by William Herschel on 9 October 1790. It is a severely interacting galaxy with obvious tidal debris and distortions caused by interaction with the companion galaxy NGC 1097A. NGC 1097 is also a Seyfert galaxy. Deep photographs revealed four narrow optical jets that appear to emanate from the nucleus. These have been interpreted as manifestations of the (currently weak) active nucleus. Subsequent analyses of the brightest jet's radio-to-X-ray spectral energy distribution were able to rule out synchrotron and thermal free-free emission. The optical jets are in fact composed of stars. The failure to detect atomic hydrogen gas in the jets (under the assumption that they were an example of tidal tails) using deep 21 cm HI imaging with the Very Large Array radio telescope and numerical simulations led to the current interpretation that the jets are actually the shattered remains of a cannibalized dwarf galaxy. Thank you Wiki!

My hope was to try and identify the fourth tidal remnant. What I found was that this remnant appeared to be very dispersed or plumed over a large area, making it greatly diffused relative to the first, second and third remnants. The bright star group in this picture at approximately 5 o'clock from NGC1097, led by the star HD17321, really make detection of the fourth remnant very difficult, as their glow is simply overwhelming. Separate to these items is a round faint glow appearing in the inside portion of the dog-leg shaped remnant. Looking at other authors' inverted images, a number hint to the presence of this faint area. Interesting…

Lastly, the nature of this galaxy being a Seyfert means the centre core is super bright. Well, I'm not going to "respect the light" ever(!), when I can reveal what otherwise cannot be seen without HDR. Hope you like the faint structures of what my data reveals. I am happy considering this is a 12.5" instrument. Accompanying the main image is an exaggerated view of the remnants, and a third image that paints lines of roughly where they lay.



Information: (RA, Dec): (41.592, -30.306) Size: 34.9 x 27.5 arcmin Radius: 0.370 deg
Instrument: Planewave CDK 12.5 F Ratio: F8 Camera: STXL-11000 + AOX & Mount: AP900GTO
Exposure: Total: 30hours Location: Central Victoria Observatory: ScopeDome 3m

By Steve Mohr Date: October-December 2019

The Great Barred Spiral Galaxy | NGC1365 | cover image.

It's been two years since I had a go at this object. And since then, I have put in a huge effort modifying and maintaining this setup to try and squeeze everything I can out of it. I know this image is over the top, being heavily processed, but the data was consistently better than previous, and helped me to make it a little improved. I have a comparison image following which I did when I was nearly done comparing to my old image, and I can see a difference.

As a matter of interest: To the right of NGC1365, and between what seems to be a distant elliptical galaxy, are a number of very faint and possibly fine galaxy arm extensions, or tidal tails that may be associated to NGC1365. A second image is included that show their positions which extend out far and wide of that of the main structure. My eyes may be playing tricks on me, but I think these are associated.

Here is some information on NGC1365…

The beautiful and majestic barred spiral galaxy, NGC1365, lays in the depth of space some 56 million light-years away in the constellation of Fornax. But NGC1365 is not alone, as it forms part of the enormous Fornax galaxy cluster which is said to be the second most richest galaxy cluster within 100 million light years from earth [with the Virgo cluster of galaxies being largest].

This galaxy shows intense star forming regions, defined by the pinkish, magenta tones surrounding the galaxy core and out into and along its arms. The nature of this barred typed spiral galaxy resides in the shape of its core, and how it extends to its arms. With highly defined dust lanes that etch across this bar section, the barred shape is easily confirmed. Astronomical studies reveal the gravitational nature of this bar structure serves as a perfect funnelling mechanism, channelling stellar material, such as stars, dust and gas, towards the centre that ultimately feed a discrete, super-massive black hole.

This image was captured over the months of October to November 2020, with the top 23 hours of sub-exposures taken with Luminance, Red, Green and Blue filters. These sub-exposures were individually calibrated and then medium combined to create a master filter set. This master set was then combined and edited to create this final image.

Hi resolution version:

https://live.staticflickr.com/65535/49524185918_fdb66a3aeb_o.jpg

Position | Size | Orientation:

Center (RA, Dec): (53.400, -36.140)

Center (RA, hms): 03h 33m 35.968s

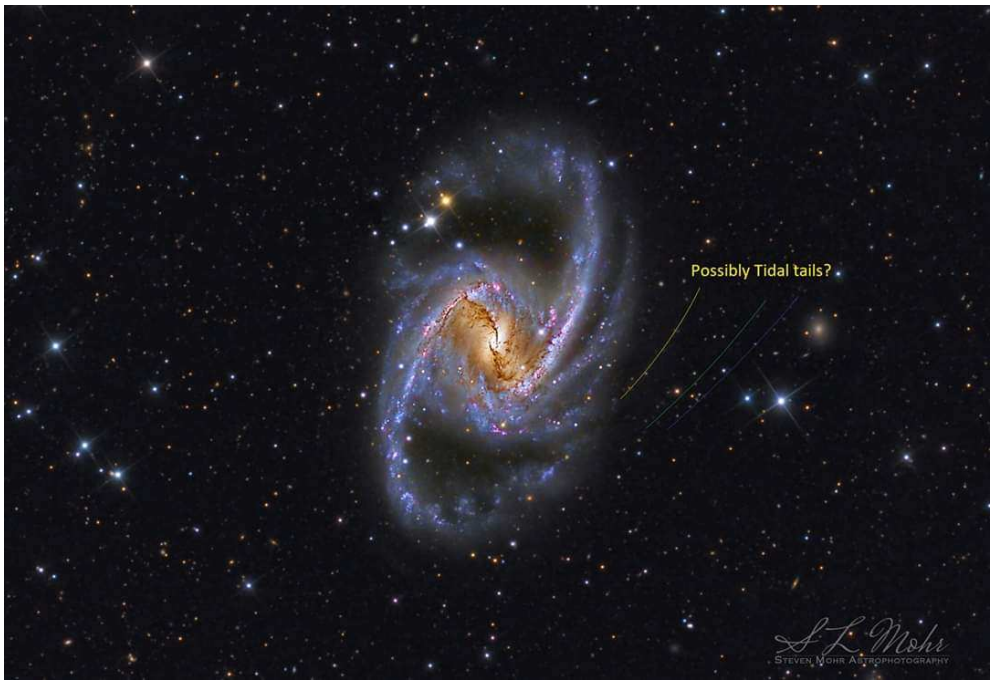
Center (Dec, dms): -36° 08' 23.127"

Size: 26.7 x 18.3 arcmin

Radius: 0.270 deg

Pixel scale: 0.733 arcsec/pixel

Orientation: Up is 305 degrees E of N



Information about the image:

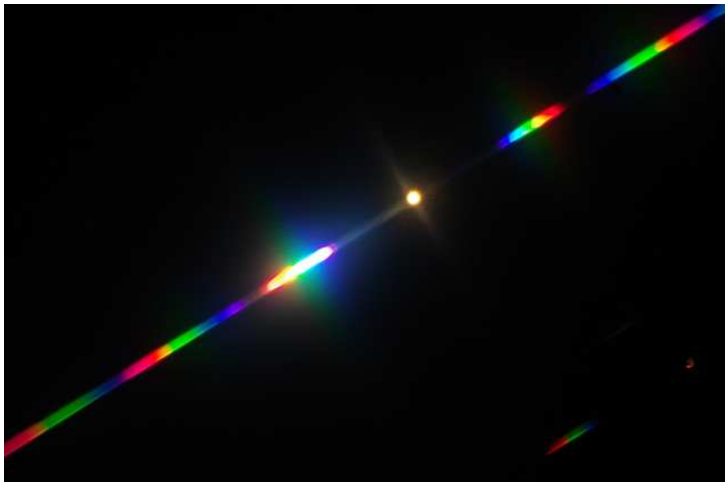
Instrument: Planewave CDK 12.5 | Focal Ratio: F8 Camera: STXL-11002 + AOX | Mount: AP900GTO Camera Sensitivity: Lum: Bin 1x1, RGB: Bin 2x2 Exposure Details: Total Hours: 23, Lum: 68 x 900 sec [17hrs], RGB 450sec x 16 each [6.0hrs] Viewing Location: Central Victoria, Australia. Observatory: ScopeDome 3m Date: October - November 2019 Software Enhancements: CCDStack2, CCDBand-Aid, PS, Pixinsight

By Steve Mohr

Open cluster M46 with the planetary nebula NGC2438 to the lower left of centre. Taken at the Briars 22/12/19 on the 127mm refractor with Canon 5D III. 29 images stacked with DSS and edited in PS. Thanks again Greg Walton for helping me locate the object.
(Seems I wandered off into M47- it's easy to get lost out there!)

By Tony Nightingale

Hi all, A magnificent night, in the sky and of camaraderie, Sat 25-Jan. Thank you, Greg, for the use of your camera and for the how-to.
Attached some practice run images of spectra, to improve on: eta Car in its star field left, and Sirius right.
MPAS SA100 spectroscopic grating. *Regards Sky*



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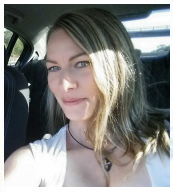
Peter Skilton


Mark Stephens


Nerida Langcake


Jamie Pole


Anders Hamilton


Trevor Hand


Simon Hamm


Peter Lowe


Dave Rolfe


Greg Walton

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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:
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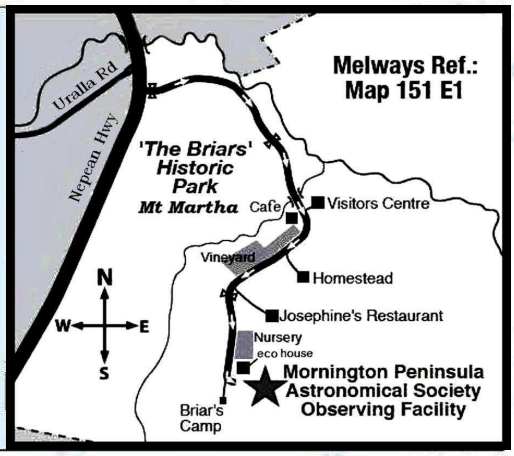
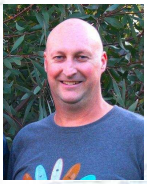


LIBRARY


Rohan Baumann


Fred Crump

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

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.

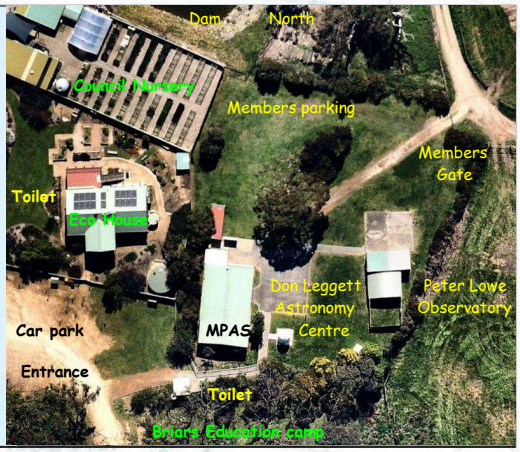
facebook
MPAS members - https://www.facebook.com/groups/MPAS1/
MPAS - https://www.facebook.com/mpas0/

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 gwmpas@gmail.com
MPAS Scorpius on facebook - https://www.facebook.com/Scorpius-MPAS-1694951307446763/

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