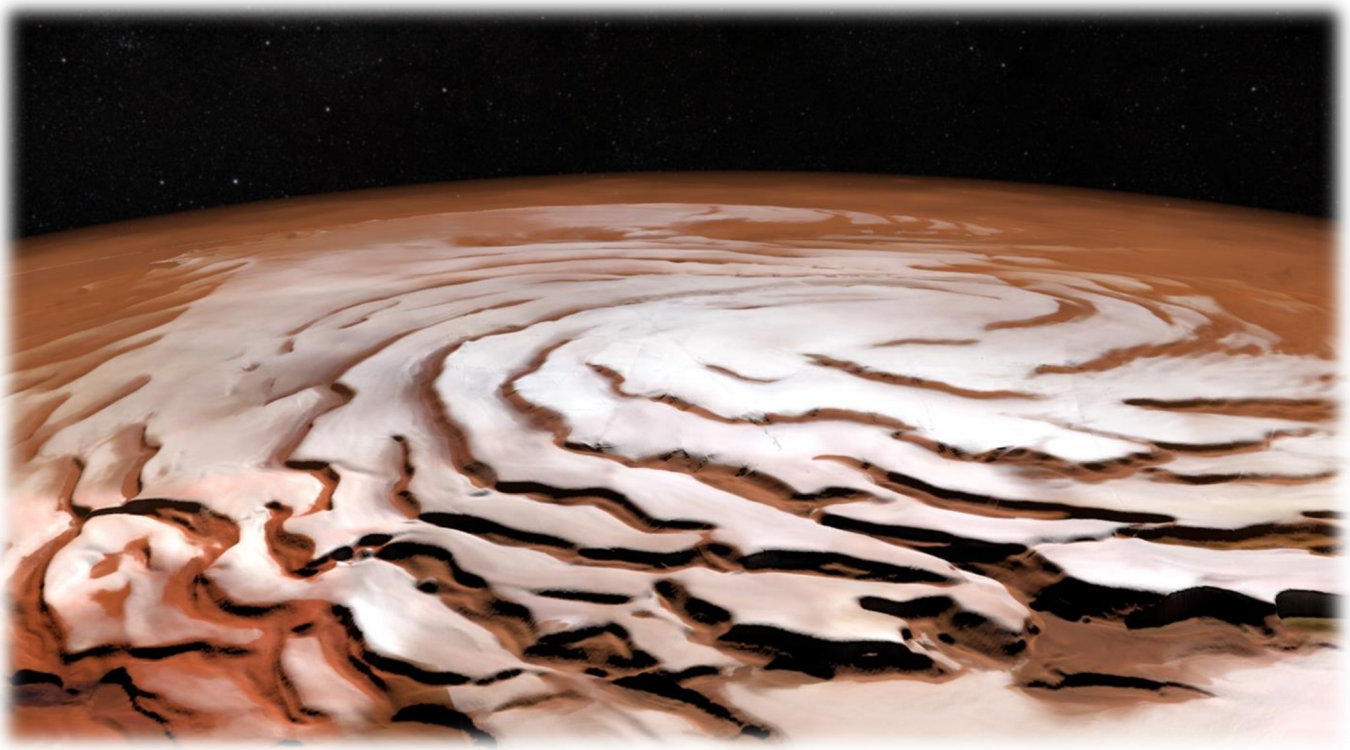
Wellington Astronomical Society October 2017 Volume 47 Issue 9
WWW.WAS.ORG.NZ, ISSN 01147706 - PRINT, ISSN 2230-5912 ONLINE

The next WAS meeting will be held on Tuesday 10th of October 2017 at 6:00 pm at Te Wāhanga Atawhai Mercy Conference Centre, 15 Guildford Terrace Thorndon, Wellington (Note the change of time and venue)

Exploring Mars with 150,000 Earthlings - Dr. Meg Schwamb



Mars is a dynamic world. Its' south pole is sculpted by the never-ending cycle of freezing and thawing of exposed carbon dioxide ice. In the summer, carbon dioxide jets loft dust and dirt through cracks in the thawing carbon dioxide ice sheet to the surface where winds blow the material into the hundreds of thousands of dark fans observed from orbit. This process is completely alien, with no Earthly counterpart. Understanding the direction, frequency, and appearance of these fans (a proxy for the jets) and how varying factors impact these properties, we can better understand the Martian climate and how it differs from Earth.

(continued on the next page)

Inside this issue:

Wellington Astronomical Society October 2017 Events	4
Call for Volunteers	5
Aoraki Mackenzie Starlight Festival	6
Astronomy News	7
Astronomical Events in 2018	9
Notification for the AGM 2017	10
Occultations for October 2017	10
The Night Sky in October	12

Exploring Mars with 150,000 Earthlings *(continued)*

Dr. Meg Schwamb

It is difficult if not impossible for computer algorithms to accurately identify individual fans. Computers just aren't good enough to do the required task, but the fans spotted for orbit are easily spotted by the human eye. Meg will talk about the Planet Four and Planet Four: Terrains projects and its ongoing effort collaborating with over 150,000 people around the world through power of the Internet. Volunteers map the dark seasonal fans and other surface features carved during by the carbon dioxide gas jets. Meg will present the discoveries made by these citizen scientists and discuss how you can get involved in exploring Mars from the comfort of home.

Meg Schwamb is a planetary scientist and astronomer studying the bodies in our Solar System and beyond. She currently is an assistant scientist at the Gemini Observatory based in Hilo, Hawaii. Megs research focuses on how planets and their building blocks form and evolve, applying ground-based surveys to probe our Solar System's small body reservoirs. In collaboration with the Zooniverse, Meg uses crowdsourcing or citizen science to tackle large astronomical and planetary datasets, engaging people worldwide directly in scientific research. She has collaborated with hundreds of thousands of people to search for new planets outside our Solar System and study the climate of Mars. Meg is a member of the science team for the Zooniverse's Planet Four projects using human pattern recognition to map wind-blown seasonal fans appearing on Mars' South Pole, identify seasonal features on the Martian South pole, and search for polygonal ridges in the Arabia Terra region on Mars. She also currently serves as project scientist for the Comet Hunters citizen science project enlisting the public to search for cometary activity in the Solar Systems asteroid belt. Later on this year, Meg will receive the Carl Sagan Medal for Excellence in Public Communication in Planetary Science from the American Astronomical Society's Division for Planetary Science.

We gratefully thank

ASTRONZ

and Andrew Buckingham for their support in bringing Meg to Wellington and New Zealand.

www.astronz.nz

World Space Week

Since its United Nations declaration in 1999, World Space Week has grown into the largest public space event on Earth. More than 2,700 events in 86 countries celebrated the benefits of space and excitement about space exploration in 2016. With our new Theme "Exploring New Worlds In Space" we aim to inspire even more events around the world in October 2017.

"The General Assembly declares 4 to 10 October World Space Week to celebrate each year at the international level the contributions of space science and technology to the betterment of the human condition"

UN General Assembly resolution, 6 December 1999

Meg Schwamb's presentation in Wellington on the 10th Oct will be part of World Space Week.

www.worldspaceweek.org

2017 — 2018 SUBSCRIPTIONS DUE

The new subscription year begins in September, so WAS looks forward to receiving your subscription renewal.

Renewal forms can be found on the website, but a summary follows:

Subscription for Newsletter by Email 2017-2018

Adult/Waged: $ 50.00

Student/Unwaged: $ 30.00

Family: $ 70.00

Payment methods:

Cheque - make out to Wellington Astronomical Society Inc, and mail to PO Box 3181, Wellington 6140

Direct Deposit or Internet Banking - use Acc No: 03-0502-0508656-00, please include reference so WAS knows who is making the payment

Cash - please bring exact amount to meeting

It appears that quite a few members from last year have not yet renewed their subscriptions. If this is an oversight, can you please remedy it as soon as possible.

WAS COUNCIL MEMBERS AND CONTACTS

Council Members

The following members were elected to Council at the Nov 2016 AGM

President: Antony Gomez
president@was.org.nz / 021_253_4979

Vice President: Duncan Hall
vice-president@was.org.nz

Secretary/Telescope custodian: Chris Monigatti
secretary@was.org.nz / 021_890_222

Treasurer: John Homes

Newsletter Editor: Gerard Coyle
editor@was.org.nz

Membership Secretary: Janine Bidmead
membership@was.org.nz

Website : John Homes & Peter Woods
webmaster@was.org.nz

Council

Andrew Fuller

Edward Wilcock

Frank Andrews

Janine Bidmead

Murray Forbes

Peter Woods

Sarah Taylor

Postal Address: Wellington Astronomical Society, PO Box 3181, Wellington 6140, New Zealand

WAS ON FACEBOOK

Our Facebook page "Wellington Astronomical Society" is now operational. You can search for it on Facebook or click on this link https://www.facebook.com/WellingtonAstronomicalSociety/.

If you are a Facebook user, please use the page to receive up-to-date notifications of our Society's events and news. This is the easiest way to keep informed as to what is going on in the Society, as well as keeping up with astronomical news.

Remember you will need to interact occasionally with the page by liking or commenting on postings, or indicating whether you are coming to an event. Otherwise Facebook will, after a time, stop sending you new postings. So keep visiting the page as there are a number of Society events coming up in the next few months.

We also have Facebook group "WAS – Wellington Astronomical Society" https://www.facebook.com/groups/96304353012/ which is open for anyone to join by request. The public group is open for discussion or postings on astronomical news. The WAS Astrophotography Group https://www.facebook.com/groups/1684738758511214/ is for those interested in astrophotography. It serves as a place to notify others of astrophotography gatherings at short notice and to display images captured by members.

Wellington Astronomical Society October 2017 Events

WAS October Meeting: Exploring Mars with 150,000 Earthlings - Dr. Meg Schwamb

As detailed on out front page, our October talk is going to be given by Dr. Meg Schwamb, assistant scientist at the Gemini Observatory based in Hilo, Hawaii. She will detail how she uses crowd sourcing in her research, particularly her investigations of the planer Mars.

PLEASE NOTE THE CHANGE TO OUR USUAL TIME, DATE AND VENUE.

Date: Tuesday 10th October

Time: 6:00pm,

Venue: Te Wāhanga Atawhai Mercy Conference Centre, 15 Guildford Terrace, Thorndon

Astronomy Night - So, Our Universe Is a Hologram?

Some scientists believe we're living in a very complex hologram. That life as we know it might be just an illusion. Antony Gomez, President of the Wellington Astronomical Society, will explore the theories and provide a glimpse into some of the more recent developments in this field.

If the sky is clear, we'll go outside after the talk and look through telescopes provided by the Wellington Astronomical Society.

This event is part of Sci-Fi Month at Hutt City Libraries.

Date: Friday 13th October

Time: 6:30pm,

Venue: Lower Hutt War Memorial Library

WAS Astrophotography group / Dark Sky Observing

We are again planning to get special access to this site again both for astrophotography and dark sky observing. Please be at the gates by 8:15pm. The gates will be opened for cars to drive in and closed again at 8:30pm. There won't be anyone there to let you in if you are late. Any updates will be posted on the WAS Astrophotography Group Facebook page closer to the time. For further details or cancellations contact Edward 021_08304802 or Chris 021_ 890222.

Date: Saturday 21st October

Time: 8:30pm,

Venue (to be confirmed): Brooklyn Hill Turbine

WAS Observing Evening

See many wonderful objects, star clusters, galaxies, dying stars and nebulae. We will be focusing on objects around the galactic centre like the Lagoon, Trifid, Swan, and Eagle nebulae as well as a number of other Messier objects prominent in this part of the night sky. Saturn and the Moon will be visible from early evening. Come and learn how to star-hop through the night sky to find many of the various astronomical objects using the Society's Dobsonian telescopes.

Chris is often there on Friday evenings too so feel free to come along though it would be best to give him a ring on 021_ 890222 to check on conditions.

Dates: Saturday 28th October

Time: 8:00pm,

Venue: Tawa College

Call for Volunteers - Painting out Graffiti

WAS members and supporters are invited to help the Cretney Bequest Committee paint over graffiti at the Gifford Observatory. All materials and tools will be supplied, courtesy of the Wellington City Council. The job will involve painting over graffiti on the corrugated iron fence, and on the observatory building itself – and the lower 2 metres of the fibreglass dome. No prior painting experience is required.

The following map shows how to get to the Gifford Observatory through Wellington College. Wellington College entrance is to the left of the entrance to Government House on the south-east corner of the Basin Reserve.

If October 7 weather is unsuitable, Saturday October 14 will be the back-up day for painting.

To register your interest and be advised of postponements, contact Duncan Hall at dun-can.hall@computer.org

Date: Saturday 7th October or Saturday 14th October

Time: 10 :00 am to 2:00 pm

Venue: Gifford Observatory.

Aoraki Mackenzie Starlight Festival

To celebrate New Zealand's International Dark Sky Reserve, the third Aoraki Mackenzie Starlight Festival will be held at the Hermitage, Aoraki, Mount Cook from 13th to 15th October,

Three international keynote speakers will be at the festival:

- Dr Natalie Batalha from NASA Ames, who will be talking on 'A planet for Goldilocks'. Natalie was a principal scientist on the highly successful Kepler mission to find Earth-like planets, and was named by Time Magazine as one of the 100 most influential people on Earth for 2017.
- Kevin Govender from the IAU Office of Astronomy for Development in Cape Town, who will be talking about Astronomy for Humankind
- Sze-leung Cheung from the IAU Office for Astronomy Outreach in Tokyo, who will be talking about light pollution and the dangers of LEDs for dark skies.

In addition:

- The renowned astro-photographer Mark Gee from Wellington will conduct an astrophotography workshop to tell you about his techniques for perfect astro-photographs.
- Mark Gee, Steve Chadwick and Fraser Gunn, will be showing their latest astronomy night-sky time-lapse animations
- There will be an astrophotography exhibition featuring nine of New Zealand's top astro-photographers.
- The digital planetarium at the Hillary Alpine Centre at Mt Cook will be the venue for two special planetarium shows for the Festival.
- For school students (or in fact for people of all ages) there will be a Galileoscope workshop hosted by a team from _Science Alive!_ from Christchurch.
- There will be videos, exhibitions and stargazing at the new Mt Cook Observatory.
- Finally, Mt John Observatory will host an open day on the afternoon of Sunday October 15th.

For further details please visit their web-site at

http://www.starlightfestival.org.nz,

or their Facebook page at

http://www.facebook.com/AorakiMackenzieStarlightFestival/ .

Dates: Friday 13th to Sunday 15th October

Venue: The Hermitage, Aoraki, Mount Cook

NASA Astronomy Picture of the Day Archive

For anyone interested in viewing the current and past NASA Astronomy Pictures of the day, the link is https://apod.nasa.gov/apod/archivepix.html.

Astronomy News

WAS meets the Skopje Astronomical Society

On my recent trip to Skopje, Macedonia, I met up with some of the key members of the Skopje Astronomical Society. I left a message on their website and within an hour the got back to me. We arranged to meet the next evening where they took me to the main square in the city. One of their members had a telescope set up for the public to view Saturn and other bright astronomical objects. He is there every clear night and Skopje has over 200 clear nights a year.

Their Society is similar in size and they run similar events as we do, however they meet weekly at a local university lecture room which is provided free to them. They also run a number of adult and children astronomy courses during the year which provides an income to the Society.

They are also planning to be a remote observatory at a dark sky site which there are many options for as most of the population of Macedonia live in Skopje and the rest of the country is relatively dark. However they do have different issues than we do in Wellington. Land and setting up the infrastructure is very cheap but there are no astronomy shops as such to purchase equipment and they have to import gear from countries like Germany and with the added freight costs, it makes it expansive.

They kindly took me out to dinner where I tasted some of the local liquor and had delicious local meal. We talked and shared our experiences throughout the evening. It was amazing how much we shared in common through our mutual passion for astronomy. Here was bunch of strangers I had met for the first time that evening and they were kind, generous and enthusiastic in having me there.

However they did express some jealousy when I told them about some of the amazing astronomical objects visible in our southern night skies like the Magellanic Clouds, Tarantula Nebula, Jewel Box, 47 Tucanae and Omega Centauri. They seemed to know about all these objects and seen images of them. I added insult to injury when I mentioned I had seen auroras in Wellington. But I did put out an invite to any of them that if they ever made it to NZ, we would host them and show them our magnificent southern night skies.

I had a lovely evening with them and look forward to meeting again another time. I would like to thank the Skopje Astronomical Society for their wonderful hospitality in taking me out and sharing time with them.

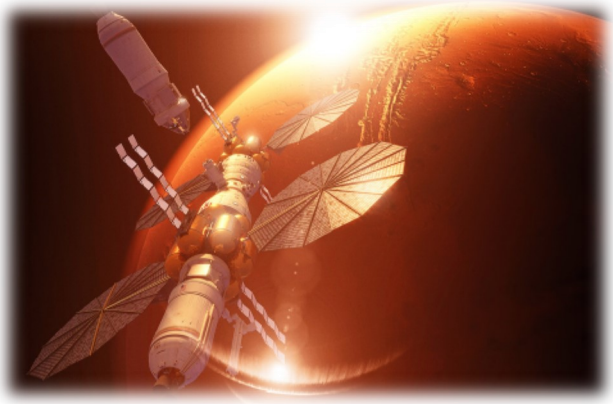
- Antony

It's Official: Russia And The US Will Work Together on The First-Ever Moon Station

In Spring of 2017, NASA revealed their plans for what the massive Space Launch System (SLS) rocket would be used for: to build the Deep Space Gateway, a space station in cis-lunar orbit that'll serve as a stepping stone to the exploration of the Solar System.

Read more

Mars Base Camp: Lockheed Martin's Red Planet Plan in Pictures

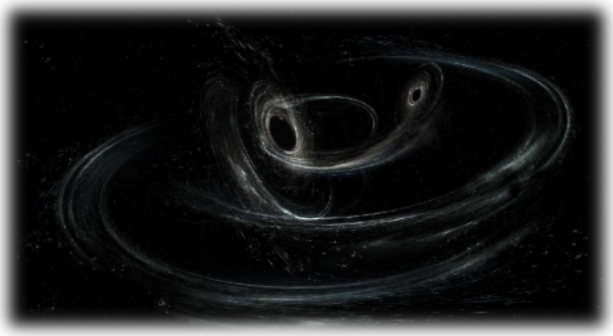


The aerospace company Lockheed Martin has an ambitious vision for Mars exploration by astronauts. Called Mars Base Camp, the plan includes sleek landers and huge interplanetary ships to carry humans to Mars. See Lockheed Martin's Mars exploration vision in images here.

In this image, an Orion spacecraft and propulsion stage are arriving near the orbital Mars Base Camp, which serves as a staging ground for Martian exploration.

Read more

Gravitational Waves Have Officially Been Detected Again



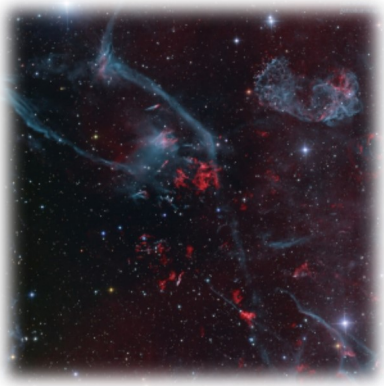
VIRGO collaboration have announced in a press conference the detection of gravitational waves from merging black holes for the fourth time. However, this time it was seen by three observatories.

The two black holes that merged are located 1.7 billion light-years away, with a mass of 30.5 and 25.3 times the mass of the Sun, respectively. This discovery has been reported in the journal Physical Review Letters.

Read more

Scientists from the LIGO Scientific Collaboration and the

Astronomy Picture of the Day (APOD)



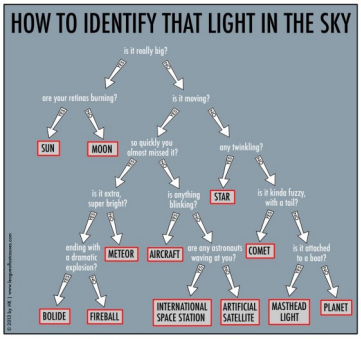
APOD: Puppis A Supernova Remnant (2017 Sep 29)
Image Credit & Copyright: Don Goldman

Driven by the explosion of a massive star, supernova remnant Puppis A is blasting into the surrounding interstellar medium about 7,000 light-years away. At that distance, this colorful telescopic field based on broadband and narrowband optical image data is about 60 light-years across. As the supernova remnant (upper right) expands into its clumpy, non-uniform surroundings, shocked filaments of oxygen atoms glow in green-blue hues.

Read more

To see daily APOD go to https://apod.nasa.gov/apod/astropix.html

How to Identify that Light in the Sky



APOD: How to Identify that Light in the Sky (2017 Sep 24)
Image Credit & Copyright: HK (The League of Lost Causes)

What is that light in the sky? Perhaps one of humanity's more common questions, an answer may result from a few quick observations. For example -- is it moving or blinking? If so, and if you live near a city, the answer is typically an airplane, since planes are so numerous and so few stars and satellites are bright enough to be seen over the din of artificial city lights.

Read more

Astronomical Events in 2018

Thanks to Duncan Hall, here is a list of the main astronomical events in 2018:

Date in 2018	Event
Jan-03 ~ 04	Quadrantid Shower: ZHR = 120
Jan-07	Mars-Jupiter: 0.2° N
Jan-13T19:58	Mercury-Saturn: 0.7° N
Jan-31 ~ Feb-01	Total Lunar Eclipse
Feb-07	WAS meeting?
Mar-07	WAS meeting?
Mar-21	Autumnal Equinox
Apr-02	Easter Monday, https://www.govt.nz/browse/work/public-holidays-and-work/public-holidays-and-anniversary-dates
Apr-04	WAS meeting?
Apr-22 ~ 23	Lyrid Shower: ZHR = 20
May-02	WAS meeting?
May-05	Eta Aquarid Shower: ZHR = 60
May-05	InSight launch: 12th mission of the Discovery programme, a Mars lander mission dedicated to geological and seismological studies
Jun-06	WAS meeting?
Jun-15 (est.)	Matariki: https://kiwikidsnews.co.nz/what-date-is-matariki-on/ also at https://www.whatdate.co.nz/matariki/2018/
Jun-16 (est.)	Eid-ul-Fitr: end of Islamic month of Ramadan, https://www.islamicfinder.org/special-islamic-days/eid-ul-fitr/
Jun-21	Winter Solstice
Jul-04	WAS meeting?
Jul-13T16:01	Partial Solar Eclipse (only really visible south of Stewart Island, https://eclipse.gsfc.nasa.gov/SEplot/SEplot2001/SE2018Jul13P.GIF
Jul-TBD	Hayabusa 2: arrives at asteroid Ryugu
Jul-28	Total Lunar Eclipse (becomes visible as Moon sets)
Jul-28	Delta Aquarid Shower: ZHR = 20
Jul-31	Parker Solar Probe launch: Heliophysics observation mission planned to make in situ studies of the Sun's outer corona at a perihelion distance of 8.5 solar radii (5.9 million kilometres)
Aug-01	WAS meeting?
Aug-TBD	OSIRIS-Rex: arrives at asteroid Bennu
Aug-13	Perseid Shower: ZHR = 90
Sep-05	WAS meeting?
Sep-09 ~ 11	Rosh Hashanah: Jewish New Year
Sep-23	Vernal Equinox
Oct-03	WAS meeting?
Oct-TBD	James Webb Space Telescope launch: International space observatory, long-wavelength visible and infrared telescope, launching to L_2
Oct-21 ~ 22	Orionid Shower: ZHR = 20
Nov-05 ~ 06	South Taurid Shower: ZHR = 10
Nov-07	WAS meeting?
Nov-12 ~ 13	North Taurid Shower: ZHR = 15
Nov-18	Leonid Shower: ZHR = 15
Dec-05	WAS meeting?
Dec-TBD	CST-100 Starliner: First operational crewed mission of CST-100 Starliner to the ISS, to restore American manned space-flight capabilities
Dec-TBD	Chang'e 4 launch: China's third lunar lander (back-up to Chang'e 3), the first spacecraft to attempt a soft landing on far side of the Moon
mid Dec	Comet 46P/Wirtanen predicted to reach magnitude 3 in Taurus, http://www.cometwatch.co.uk/bright-comets-of-2018/
Dec-14 ~ 15	Geminid Shower: ZHR = 120
Dec-22	Summer Solstice
Dec-22 ~ 23	Ursid Shower: ZHR = 10

Notification for the Annual General Meeting 2017

The 2017 Annual General Meeting will be held on the **Wednesday 1st November** at Space Place, Carter Observatory.

If you have any resolutions for the AGM or nominations for Council that you would like to forward, please email the secretary@was.org.nz. We need to have any resolutions and nominations submitted before Monday 8th October so it can be printed in the November newsletter. If you need help with submitting a resolution please contact Chris 021_890_222 or Antony 021_253_4979.

Occultations for October 2017

Total Lunar Occultations

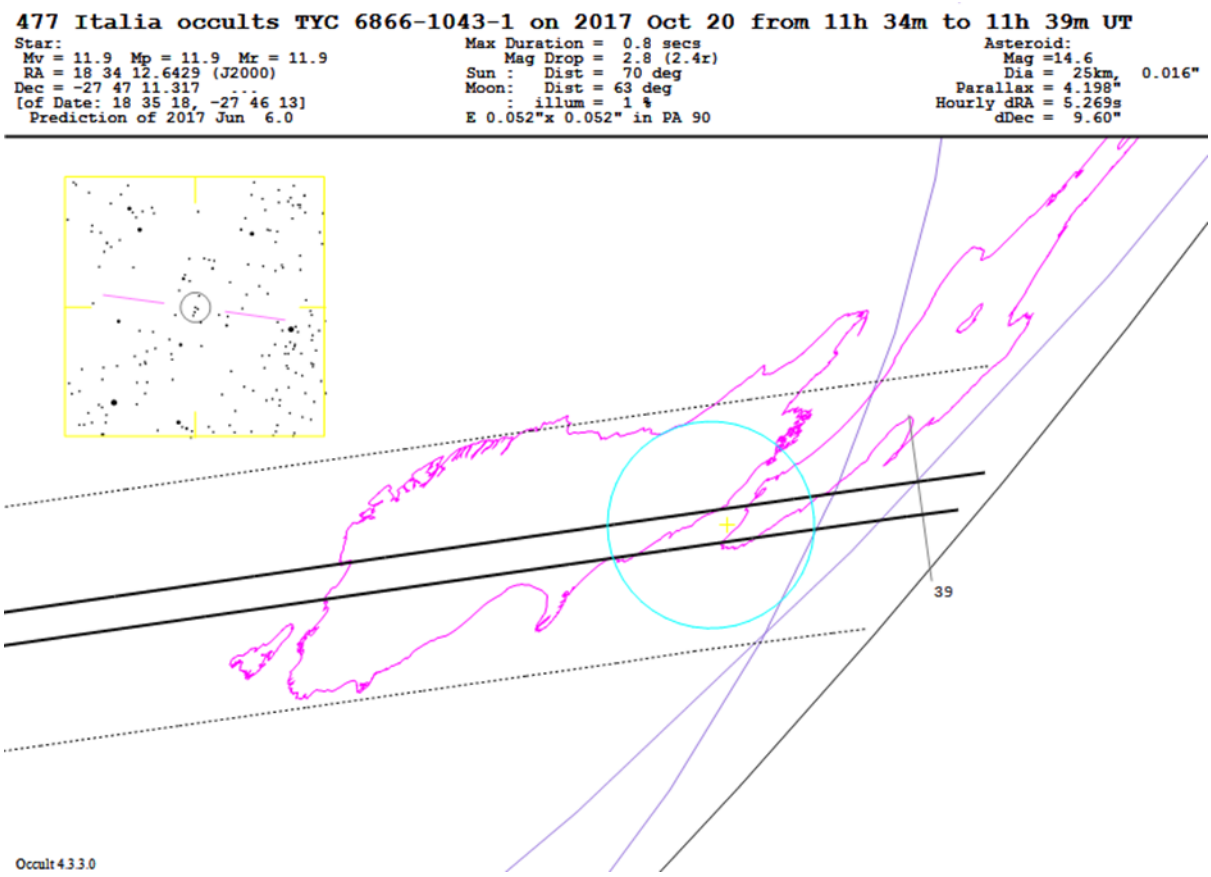
- All of this month's lunar occultations occur near the end of the month. The first event is on Tuesday 24th October at 08:32 UT (09:32pm). It has everything going for it – the star is reasonably bright (magnitude 6.3), disappearing behind the dark limb of an 18% illuminated moon that will be 23° above the horizon AND the star is in the Kepler2 program!
- The next lunar occultation is a few days later, on Thursday 26th October at 10:27 UT (11:27pm). While somewhat later in the evening, and with a brighter moon (35% illumination), it is well worth attempting as the star is a suspected double. The star is also a variable, so don't be surprised if it appears fainter than the reported value (magnitude 6.6).
- The last lunar occultation for the month is on Saturday 28th October at 09:52 UT (10:52pm). As the moon is now 54% illuminated, if there is any cloud nearby this may cause problems with glare from moon light scattering off these clouds.

day			Time			P	Star		Sp	Mag	Mag		%	Elon	Sun	Moon	
y	m	d	h	m	s		No	D		v	r	V	ill		Alt	Alt	Az
17	Oct	24	08	32	47.2	D	2508	k	B8	6.3	6.3		18+	051		23	265
2508 is in the Kepler2 program {ID=234585678}																	
17	Oct	26	10	27	57.3	D	2794	c	K3	6.6	5.7	v	35+	073		20	262
Double 7.5 7.5 0.10" 90.0, dT = +0.2																	
17	Oct	28	09	52	02.2	D	3036		F5	7.0	6.8		54+	095		42	286

Minor Planet Occultations

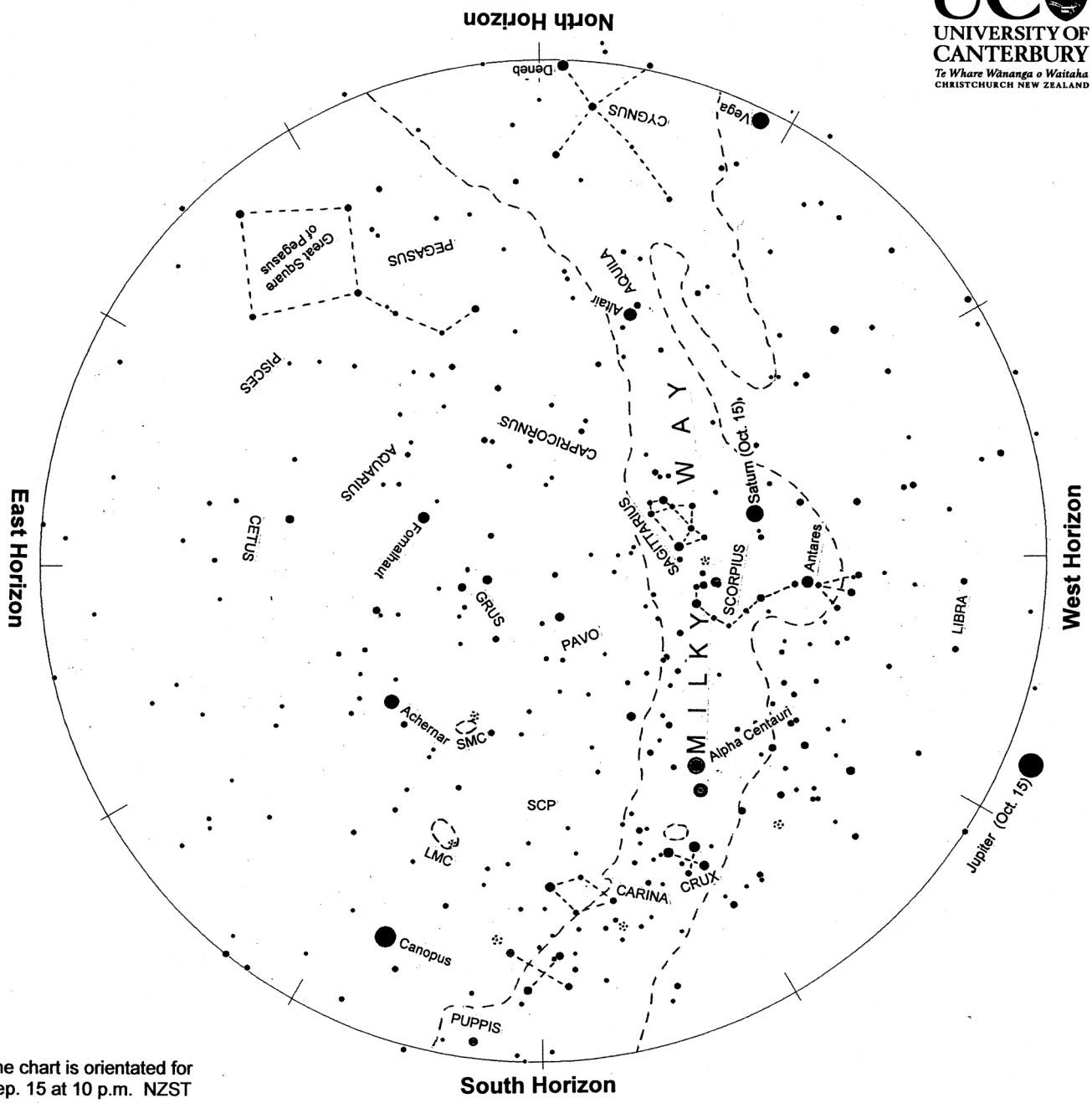
There's only one minor planet occultation predicted for the month, on Friday 20th October at 11h 38m 54s UT. While somewhat late in the evening at 12:39pm, at least you don't have to get up early the following morning to go to work. The star is quite faint (magnitude 11.9) so you'll need to use an integrating video camera and/or have a 10" (or larger) telescope. The occultation will only last for at most 0.8 seconds, so don't integrate for more than 0.2 seconds. Fortunately it's a new moon so that won't cause any problems. The difficulty with this event, especially if you live in a valley as I do, will be the star's low altitude (11° above the horizon). The shadow is predicted to travel across most of the Wairarapa, but Wellington observers still have a high probability of seeing an occultation. Don't forget that the point time listed below is always in UT;

Point Time	Star	J2000 RA	J2000 Dec	Dec Offset	SAO
h m s	mag	h m	o '	ArcMin	
10 52 23	4.5	17 47.6	-27 50	3.9	185755
09 40 53	2.8	16 35.9	-28 13	28.8	184481
08 42 10	3.6	15 37.0	-28 8	25.3	183619
Previous evening					
17 19 03	5.4	00 11.6	-27 48	-4.2	166103
17 16 51	5.4	00 9.4	-27 59	7.0	166083
15 22 13	5.5	22 14.3	-27 46	-5.6	190985
13 11 01	4.4	20 2.7	-27 43	-6.7	188844
12 15 28	3.3	19 6.9	-27 40	-7.8	
11 54 14	3.2	18 45.7	-26 59	-48.0	187239



VOLUME 47 ISSUE 9

UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND



The chart is orientated for
Sep. 15 at 10 p.m. NZST
Oct. 1 at 10 p.m. NZDT
Oct. 15 at 9 p.m. "

Evening sky in October 2017

To use the chart, hold it up to the sky. Turn the chart so the direction you are looking is at the bottom of the chart. If you are looking to the south then have 'South horizon' at the lower edge. As the earth turns the sky appears to rotate clockwise around the south celestial pole (SCP on the chart). Stars rise in the east and set in the west, just like the sun. The sky makes a small extra clockwise rotation each night as we orbit the sun.

Jupiter is the 'evening star' at the beginning of the month, appearing near the western horizon soon after sunset. By mid-month it is fading into the twilight. Saturn is mid-way down the western sky, looking like a cream-coloured bright star. Orange Antares is well below and left of it. Canopus is low in the southeast, twinkling colourfully. Vega sets on the north horizon. Crux, the Southern Cross, and the Pointers are in the south-west. The Milky Way spans the sky from north through west and into the south. The Magellanic Clouds, nearby galaxies marked as LMC and SMC on the chart, are misty glows above Canopus.

Chart produced by Guide 8 software; www.projectpluto.com. Labels and text added by Alan Gilmore,
Mt John Observatory of the University of Canterbury, P.O. Box 56, Lake Tekapo 7945, New Zealand. www.canterbury.ac.nz

The Night Sky in October

Jupiter is the 'evening star' at the beginning of the month when it appears on the west horizon in the early twilight and sets around 8 p.m. It falls lower in the twilight night to night, disappearing around the middle of the month. Jupiter is on the far side of the Sun from us, 960 million km away.

Saturn is midway down the western sky at dusk, the brightest 'star' in that region. Well below and left of it is the orange star Antares. Saturn sets in the southwest after midnight at the beginning of October; before 11 pm by the end. It is 1570 million km away mid-month. Saturn appears oval-shaped in binoculars and small telescopes as the planet and the rings blend together. Larger telescopes show the rings, currently at their most 'open' or most tilted to our view. Saturn's biggest moon, Titan, looks like a star four ring-diameters from the planet. Smaller, fainter moons are closer in. The crescent moon will be below Saturn on the 24th.

Antares marks the body of the Scorpion. The Scorpion's tail loops up the sky in the evening, making a back-to-front question mark with Antares being the dot. The curved tail is the 'fish-hook of Maui' in Maori star lore. Antares is a red giant star: 600 light years* away and 19 000 times brighter than the sun. Red giants are dying stars, wringing the last of the thermo-nuclear energy from their cores. Massive ones like Antares end in a spectacular supernova explosion. Antares is about 20 times heavier than the sun. Above and right of the Scorpion's tail is 'the teapot' made by the brightest stars of Sagittarius. It is upside down in our southern hemisphere view.

Canopus is low in the southeast at dusk often twinkling colourfully. It swings up into the eastern sky during the night. Canopus is 13 000 times the sun's brightness and 300 light years* away. On the north skyline is Vega, setting in the early evening. It is 50 times brighter than the sun, 25 light years away and the 5th brightest star in the sky. From northern New Zealand the star Deneb is on the north skyline.

In the southwest are 'The Pointers ', Beta and Alpha Centauri, making a vertical pair. They point down to Crux the Southern Cross. Alpha Centauri, the top Pointer, is the closest naked eye star at 4.3 light years away. Beta Centauri is a blue-giant star, very hot and very luminous, hundreds of light years away.

The Milky Way is brightest and broadest in Scorpius and Sagittarius. In a dark sky it can be traced down to the south. In the north it meets the skyline right of Vega. From northern New Zealand the star Deneb can be seen near the north skyline in the Milky Way. It is the brightest star in Cygnus the Swan. The Milky Way is

our edgewise view of the galaxy, the pancake of billions of stars of which the sun is just one. The thick hub

of the galaxy, 30 000 light years away, is in Sagittarius. The actual centre, with a black hole four million times the sun's mass, is hidden by dust clouds in space. Its direction is a little outside the Teapot's spout. The nearer 'interstellar' clouds appear as gaps and slots in the Milky Way. The dust and gas has come from old stars that have thrown much of their material back into space as they faded or blew up. New stars eventually condense from this stuff. A scan along the Milky Way with binoculars shows many clusters of new stars and some glowing clouds of left-over gas. There are many in Scorpius and Sagittarius and in the Carina region.

The Large and Small Clouds of Magellan, LMC and SMC, look like two misty patches of light in the southeast sky. They are easily seen by eye on a dark moonless night. They are galaxies like our Milky Way but much smaller. The Large Cloud is about 5% the mass of our Galaxy and the small one 3%. That is still many billions of stars in each. The LMC is around 160 000 light years away; the SMC around 200 000 l.y.

On moonless evenings in a dark rural sky the Zodiacal Light is visible in the west. It looks like late twilight: a faint broad column of light tilted toward Antares, fading out at the Milky Way. It is sunlight reflecting off meteoric dust in the plane of the solar system. The dust may have come from a big comet, centuries ago.

Brilliant Venus (not shown) might be seen on the eastern horizon at dawn. At the beginning of the month it rises 50 minutes before the Sun. It sinks lower in the twilight as it moves to the far side of the Sun from us.

*A light year (l.y.) is the distance that light travels in one year: nearly 10 million million km or 1013 km. Sunlight takes eight minutes to get here; moonlight about one second. Sunlight reaches Neptune, the outermost major planet, in four hours. It takes four years to reach the nearest star, Alpha Centauri.

Notes by Alan Gilmore, University of Canterbury's Mt John Observatory, P.O. Box 56, Lake Tekapo 7945, New Zealand.

www.canterbury.ac.nz