

The

Volume 126 No. 12
December 2017

Bulletin

*Monthly newsletter of the
Astronomical Society of South Australia Inc*



In this issue:

- ◆ **Osiris-REx mission does a fly-by of Earth**
- ◆ **The Great American Solar Eclipse**
- ◆ **The Ancient Moon Had Atmosphere Made of Volcano Smoke**
- ◆ **The spiral galaxy NGC 1637 in Eridanus**



ASTRONOMICAL SOCIETY of SOUTH AUSTRALIA Inc

GPO Box 199, Adelaide SA 5001

The Society (ASSA) can be contacted by post to the address above, or by e-mail to info@assa.org.au. Membership of the Society is open to all, with the only prerequisite being an interest in Astronomy.

Membership fees are:

Full Member	\$75
Concessional Member	\$60
Subscribe e-Bulletin only; discount	\$20

Concession information and membership brochures can be obtained from the ASSA web site at:

<http://www.assa.org.au>

or by contacting The Secretary (see contacts page).

Member Submissions

Submissions for inclusion in The Bulletin are welcome from all members; submissions may be held over for later editions.

Wherever possible, text submissions should be sent via e-mail or posted on CD-ROM in almost any word processing format and may still be submitted handwritten or typed. Your name may be withheld only if requested at the time of submitting. Images should be high resolution and uncompressed, e.g. TIFF file formats, although high resolution JPEGs are acceptable. Your full name and object designation must be provided with each image and will be published. Equipment/exposure etc details are welcome but optional.

Advertising & Classifieds

Small adverts and classifieds are free for members (space permitting). Commercial advertising is available at a cost of \$50.00 per quarter page per issue.

All enquiries and submissions should be addressed to The Editor and preferably sent by e-mail to: editor@assa.org.au

For large files (e.g. on CD) or hardcopy items, post to:

Joe Grida
Editor, The Bulletin
PO Box 682,
Mylor SA 5153



Contributions should reach the Editor no later than the 7th of each month, for publication in the following month's issue of The Bulletin

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Sister Society relationships with:

Orange County Astronomers

www.ocastronomers.org

Colorado Springs Astronomical Society

www.csastro.org

Central Arkansas Astronomical Society

www.caasastro.org

Arkansas-Oklohoma Astronomical Society

www.aos.org

Gruppo Astrofili di Piacenza (Italy)

www.astrofilipc.it

HAVE YOU GOT YOUR 2018 COPY YET?



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Email:

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Cover photo: IC5332, is a face-on spiral galaxy in Sculptor, at a distance of 39 million light years. Image taken at Clayton Bay, South Australia by **Paul Haese**. Equipment - 302mm GSO f4 Truss Newtonian, QSI WSG-8, Software Bisque PME mount. Guiding - SBIG STi. Software - MaximDL 6, Focusmax V4, SkyX, CCDautopilot 5. LRGB 9.7 hours. Processed in CCD stack and Photoshop CS6



Activities

November 2017 - the month at a glance



Happy Birthday, ASSA Celebrating 125 years in 2017!



Annual General Meeting

Wednesday, 6 December, 2017
@ 8:00pm

Kerr Grant Lecture Theatre
2nd Floor, Physics Bldg
University of Adelaide
North Terrace, Adelaide

Guest Speaker:
Prof Fred Watson
**Australian Astronomical
Observatory**

Moon Mysteries

**A celebration of our nearest
neighbour**



No celestial object is more assured of a place in the hearts of humans than the Moon, but the sentiment ought to extend beyond mere romantic fervour. Undying gratitude is perhaps more appropriate, since it's entirely possible that without the Moon, intelligent life might never have evolved on our planet. This is just one of the intriguing insights that current scientific research has uncovered. In this entertaining and fully-illustrated talk, Fred Watson explores the history of our understanding of the Moon from the earliest times through to the space age, and highlights some of the questions that today's investigations into our natural satellite are addressing.

Planning on going observing?

Save yourself unnecessary travel and time. If the weather looks doubtful where you are, check with the following people to see if the event is still on (or see www.assa.org.au after 5pm).

Stockport Observatory (DO 3-13)

Observatory 8528 2284

Lyn Grida 8391 5377

Tony Beresford 8338 1231

Heights Observatory (DO 3-34)

Robert Bronca 8266 7504

Whyalla

Peter Mayfield 0405 410 895

Tooperang

Jeff Lowrey 0429 690 610

Northern Yorke Peninsula

Tony "Hendy" Henderson 0429 352 382

Riverland

Tim Vivian 0407 800 225

December 2017 Calendar



Day	Time	Activity
Wed 6	8:00pm	Annual General Meeting, Adelaide
Thu 7	7:30pm	Whyalla Members' Meeting
Tue 12	7:30pm	ASSA Council Meeting
Fri 15	8:00pm	Public & Members' Viewing, NYP
Sat 16	8:00pm	Members' Viewing Night, Stockport
Sat 16	8:00pm	Members' Viewing Night, Tooperang
Fri 22	8:00pm	Public Viewing Night, The Heights
Sat 23	8:00pm	Members' Viewing Night, Stockport

Note: Times shown above and throughout this document are:

1 Oct 2017 to 1 Apr 2018 : South Australia Summer Time (UTC+10:30)

1 Apr 2018 to 7 Oct 2018 : South Australia Standard Time (UTC+ 9:30)

Astronomy Education

Wednesday, 6 December 2017 @ 7:00pm

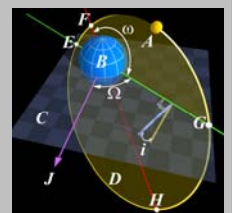
Kerr Grant Lecture Theatre



Astrophysics

You don't need a degree in Astrophysics to attend this one. Find out how the planets stay in orbit around the Sun.

Discover the mysteries of General Relativity and the inner workings of the Universe.





Reports and Notices

Reports on recent ASSA activities, and notices of upcoming events

Guest Speaker Biography

Professor Fred Watson



Fred Watson comes from a long line of Fred's, but was the first in his family to become a scientist. He has been an astronomer at the Australian Astronomical

Observatory since 1995, and is best known for his radio and TV broadcasts, talks, and other outreach programs, which earned him the 2006 Eureka Prize for Promoting Understanding of Science.

He has written a number of popular astronomy books, and has both a science-themed CD and an award-winning symphony libretto to his name. Fred was made a Member of the Order of Australia in 2010. He has an asteroid named after him (5691 Fredwatson), but says that if it hits the Earth, it won't be his fault.

The ASSA 125th Anniversary

Port for Sale

375ml bottles - \$26 ea (only 110 bottles)

750ml bottles - \$46 ea (only 50 bottles)

Order from the ASSA website



Sun shines brightly on Solar BBQ

It was a perfect Spring day at Ridge Park for the Annual Solar BBQ/Picnic on Sunday, 5th November. It began with a magnificent serenade by a local magpie. It had your Editor entranced for quite a while. The melodic warble always brings tingles. About 20 members attended a very pleasant afternoon.

Many thanks to Blair Lade for setting up side-by-side Solar telescopes for safe sun viewing.





Osiris-REx

Terry Wardle tried to photograph it during an Earth fly-by in September.

The OSIRIS-REx spacecraft is travelling to Bennu, an asteroid whose composition may record the earliest history of our solar system. Bennu is also a 'hazardous' asteroid, it has a probability of impacting the Earth. OSIRIS-REx will determine Bennu's physical and chemical properties.

The spacecraft was launched in September 2016 and after a year of travelling performed an Earth flyby slingshot manoeuvre to send it on its way to the asteroid. During this manoeuvre, the spacecraft passed directly over Rockhampton and across to Adelaide placing us in a prime position to record the event.

The Desert Fireball Network (DFN) based at Curtin University sent teams into the field to capture images of the flyby to provide a baseline so NASA can compare its telemetry from the spacecraft with our ground observations, and to test our equipment and orbital analysis calculations. About two months before the event, the DFN invited amateur astronomers to participate and submit their photo's to be included in the Australia OSIRIS EGA observation campaign. Several of us in Adelaide are involved with the DFN and we were asked if we would participate in imaging the flyby.

The DFN approach was to send multiple teams into the field with full frame DSLRs, fast lens', GPS tracking and a good deal of experience in night sky imaging. The DFN was particularly interested in acquiring images from telescopes. My plan was to use my DSLR with a 70mm lens on a tripod as well as my telescope.

Other members of our group went out to dark sky sites to image the flyby. I had concerns that the weather may interfere with our plan and decided on a backup and booked two remotely controlled telescopes at the iTelescope observatory at Siding Spring. I chose the T12 and T13 telescopes because they both had a wide Field of View. Apart from the scientific value of the images I also wanted a bit of artistic flair. I recall that impressive pictures of comets are photographed when they appear near a deep sky object.

Looking at the spacecraft's predicted coordinates for Siding Spring I noticed that it will come to within about 20 arcmins of 47 Tucanae. I programmed T12 to take a series of sixteen, 30 second exposures either side of the predicted time. I programmed T13 to take thirty-four, 30 second exposures at the spacecraft's closest approach, which was low on the horizon.

You wouldn't believe it. Friday was overcast. I stood outside most of the night willing the clouds to part, but I didn't have enough brownie points with the cloud Gods. I went inside and looked at the all-sky cam at Siding Spring and there was a little cloud near the horizon but otherwise, all clear.

In the early hours of Saturday morning (23 Sep 2017), in front of my PC, I watched the imaging sequence complete at Siding Spring and I downloaded the images. After all the



planning to capture this flyby, when I looked at the images I couldn't find the spacecraft. Imagine my disappointment. I looked at them again after a sleep and, no spacecraft.

On the following Sunday, I gave them one last desperate look before writing the whole thing off and there it was. Hooray! I got the picture of the Osiris-REx spacecraft as it sailed past 47 Tucanae. The spacecraft is a very faint thin line to the right of 47 Tuc. So faint that I missed it on the first two looks. In the picture, I have 'over' stretched the levels so you can see the spacecraft trail. I have submitted it to NASA and to the 'Australia OSIRIS EGA observation campaign'!

I thought that maybe I captured a faint meteor but: it's in the right place to an arcmin or two, the right time to less than a second of the prediction, and it's going in the right direction.

What happened with the T13 images? I never found the spacecraft. It was very low on the horizon, some frames had cloud and the spacecraft was too faint.





The great American Solar Eclipse

ASSA member Stephen Duplock and his family travelled to the US to watch the spectacle

Emailing our sister astronomy club, The Colorado Springs Astronomical Society (CSAS) on 7th February 2016 about the 2017 total solar eclipse turned out to be a great decision and one that shaped our holiday and road trip through the USA.

With my two children, Tobi and Sofi being 8 and 10 years old, it seemed like a perfect alignment of visiting some of the USA's best national parks, seeing a total solar eclipse and a finale in Disneyland Anaheim.

About 5 months after that initial email I received an extensive Powerpoint presentation from Scott Donnell (President of CSAS) and Jim Uram detailing where the club had chosen to set up for this spectacular event.

Glendo State Park is located in the US state of Wyoming approximately 350 miles north of Denver and 100 miles east of Casper, right on the centre of the line of totality with a duration of 2 minutes 28 seconds. Most members would get there 2 or 3 days prior, set up camp and leave the day after thus avoiding the predicted huge crowds. So with the added bonus of some star parties with the club, we confirmed our attendance.

We picked up our RV in Las Vegas and headed for the eclipse location over the next 2 weeks taking in some of the USA's best national parks including the Grand Canyon, Arches, Canyonlands and Dinosaur National Monument.

We arrived at Glendo State Park on Saturday 19th August and met up Scott and his family, Jim Uram, Andrew Hradesky and family as well as many other members of CSAS (a total of 25 RVs, 30 tents and 132 people). The location was wide open grassland with clear views of all horizons and most importantly clear skies!

The Saturday star party was excellent, with many shooting stars crossing the heavens that night much to the delight of my daughter Sofi and my wife Susan. It was a very clear sky to learn the northern sky.

The Big Dipper was most prominent, Cassiopeia and Andromeda all high in the sky while Scorpius and Saggiarius were low on the horizon (not to mention being upside down J). There was a plethora of scopes out and it was great to view some different objects.

M81 and M82 and the Andromeda galaxy were my favourites while Tobi bagged Pluto as well as Neptune/Triton in a 20" scope. Sunday's star party saw some patchy cloud move in, but the forecast for eclipse day was to be cloud free.

The morning of 21st August dawned clear and bright. All anxiety left me when I first went outside. We were going to see nature's greatest spectacle without a doubt. Thousands of vehicles had arrived overnight and were parked in neighbouring fields. Scott and family had driven up from Wheaton and arrived around 5am to avoid traffic. It wasn't long before a myriad of scopes were pointed at the sun.

A large beautiful string of sunspots was visible across the centre of the disk of the sun and I walked around the campsite looking through a multitude of filters on scopes and projections onto various surfaces. First contact occurred at 10:24 am at our location and was announced for all to hear. The build-up to totality would take more than an hour. It was great to see those sunspots disappear during the moons ingress.

Fox21 Colorado Springs meteorologist Justin Chambers had come up for the event, following the astronomy club, and



Above: The author and family with approximately 10 minutes to totality.

Below: CSAS Glendo State Park Campsite





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has a short news story available on the internet for viewing. Being the only Australians around he made sure he got to interview us. I think he did a really good job of it and you can view his news story and some good video footage on the link <http://fox21news.com/2017/08/21/local-astronomy-group-witnesses-rare-eclipse-at-point-of-totality-in-wyoming/>.

My previous 2 eclipses (2002 and 2012) were evening and early morning events and were quite different from this one. With totality at 11:45 (local time) the day had time to fully blossom and brighten as well as warm up. When the moon had covered approximately half the solar disk it was distinctly discernible that the bright light of midday was no longer.

With 5 minutes to go there was such a buzz in the crowd. Light levels were dropping fast and the temperature also. I took a fleeting glance with my eyes but the remaining sun's crescent was overpoweringly bright and made it impossible to really see what was happening.

I had a quick look to see if I could see the shadow coming but only a broad darkness and an orange horizon was visible. With 15 seconds to go until second contact the initial diamond ring began to blaze and Venus immediately became

visible just a few degrees away. The final rays from the sun's edge vanished and then totality was upon us.

The large crowd cheered and oohed and ahed but I have to say they were much quieter than I thought. Most people were simply lost for sounds or words. The pure beauty of this event was astounding. Bathed in the sun's coronal light, for me it had a supernatural feel about it. Of course this event is fully explained by science but still you cannot help but wonder at the amazing coincidence of the sun and moon being the same apparent size and us being in just the right spot for 2 minutes and 28 seconds.

With such a clear sky the coronal rays streaked far from the moon's disk, something more observable than my previous 2 eclipses. Some other stars were also visible (particularly Regulus). The horizon looked like a 360 degree sunset with orange all around. My gaze was always drawn back to the moon's disk, like a black hole covering the sun. Tobi and I stood together just looking at it, amazed, overwhelmed with its magnificence. It was the fastest two and a half minutes in my life. The sun emerged and a stunning diamond ring held my gaze for more than 10 seconds before having to look away. Totality was over, wow! Light levels increased incredibly quickly. I estimated the temperature drop was at least 10-12°C. People started to talk about the experience



Above: *Yellowstone NP: Crystal clear hot spring with extremophile bacteria (orange).*



The great American Solar Eclipse

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and just how good it was. An experience shared together, one of emotion, beauty, and unexplainable brilliance.

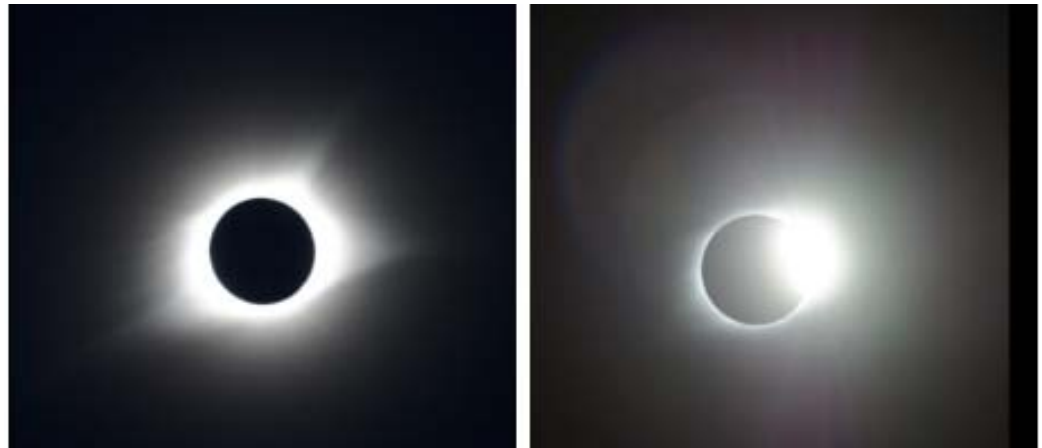
Of course the show was not over, but the moons recession, light and temperature returning, seem to gradually bring you back to the normal world, back to a normal day. For those who travelled up for the day primarily from the city of Denver, the day was going to get very normal indeed. A traffic jam the likes we have not ever seen in Australia was about to happen and last till well into the night.

I talked to a lot of people throughout the afternoon, all of whom were in awe, some were emotional and all said it had surpassed their expectations as a celestial event. Conversation always turned toward the next total solar eclipse in the USA (in 2024 a mere seven year wait!). The previous eclipse in the USA was in 1979 and only a fraction of CSAS members had seen it. I received many invitations to come back and stay in 2024, but we'll have to see.

The next day we said our farewells and headed off early to Yellowstone National park. This is an incredible part of the world and definitely worth a mention in this article. In some parts of Yellowstone you can truly imagine that you are walking on another planet. Extremophiles rule here in the steaming ponds and bubbling mudpots. You feel like you are walking around on some very unstable ground and I guess you are in geological timescales, yet there are geysers that have erupted here on a predictable timetable for centuries.

It was an incredible holiday and even though we saw the cream of America's national parks, the solar eclipse was still the cherry on top. Can't wait to observe the next one!

I would like to thank CSAS members for their help and hospitality while we were with them in Glendo State Park. Special thanks to Scott Donnell and Jim Uram for all their great planning to secure the site in the park and for all their help and correspondence prior to this event.



Above: Coronal rays during totality and the final diamond ring. Photos courtesy of Bob Dixie (CSAS)

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Ancient Moon Had Atmosphere Made of Volcano Smoke

Roughly 3.5 billion years ago huge volcanoes released enough gas to cover the Moon with a thin atmosphere that was visible from Earth.

We are used to picturing the Moon as a quiet place of “magnificent desolation,” its otherworldly peace disturbed only by the occasional meteorite impact or rare terrestrial spacecraft landing. But 3 or 4 billion years ago, it might have looked very different.

After forming around 4.5 billion years ago, the ancient Moon was still cooling and geologically active. Large-scale volcanic eruptions spewed lava, filling huge basins to form *maria* (Latin for seas), the darker regions we can see with the naked eye.

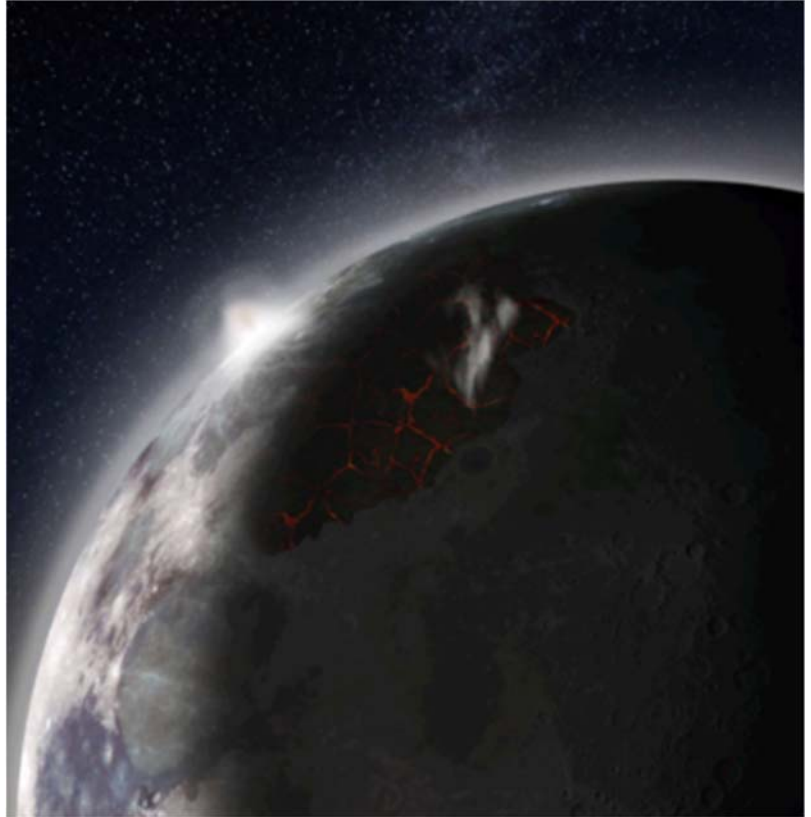
A new study reveals that the Moon’s intense volcanism might have released large amounts of gas at fast pace, enough to shroud the satellite with a thin atmosphere that survived millions of years before being lost to space.

“The terrain would have looked like a sea of glowing molten rock, with patches of darker, cooling rocks forming a fractured crust on top of lava exposed to the developing atmosphere,” says Debra Needham (NASA Marshall Space Flight Centre), author of the new study. “The atmosphere would most likely have been a brownish yellowish haze, due to the sulphur concentration, that would have been visible from the Earth.”

The researchers used updated measurements of the extension and depth of Moon’s maria, obtained by lunar missions such as GRAIL, LRO (*see pic next page*), and the Moon Mineralogy Mapper, to determine the volume of lava released during the eruptions. They combined that information with laboratory analyses of lunar rocks collected during the Apollo missions.

By measuring the amount of volatiles — substances susceptible to escape in the form of gas — still trapped in those rocks, the researchers estimated how much gas had leaked into the atmosphere.

Needham found that during the maria-forming eruptions, a huge mass of gas should have been released as well. She estimates that during the peak of volcanic activity, roughly 3.5 billion years ago, the lunar atmosphere could have been up to 1.5 times as thick as that of present-day Mars, reaching a surface pressure of 0.01 atmospheres, or 1% of Earth’s atmospheric pressure at sea level.



Above: *This illustration shows the Moon, looking over the Imbrium Basin, as volcanoes spew lava and gases, producing a visible atmosphere. Credit: NASA MSFC*

Such conditions may have lasted up to 70 million years. As the Moon’s interior cooled down and its volcanic activity decreased, it stopped churning out gases. The low gravity wasn’t able to hold on to the newly created atmosphere, and it was lost to space.

A Wet Atmosphere?

Needham and colleague David Kring (USRA) also estimate that a good fraction of the Moon’s transient atmosphere might have been water. Volcanoes could have released up to twice the water volume of Lake Tahoe and, although most of it was probably lost to space, some deposits might have survived on the lunar surface, particularly in shadowed areas towards the poles.

However, the new results don’t mean there is more water on the Moon’s surface than previously thought. Scientists already know there are some hydrogen-rich deposits — presumably water — in the shadowed regions near the lunar poles. But most researchers thought it was brought onto the



surface by external sources, such as asteroids, comets, or the solar wind. The new findings suggest that at least some of the polar water might have been locally sourced, with volcanic eruptions pumping it out from the depths of the Moon itself.

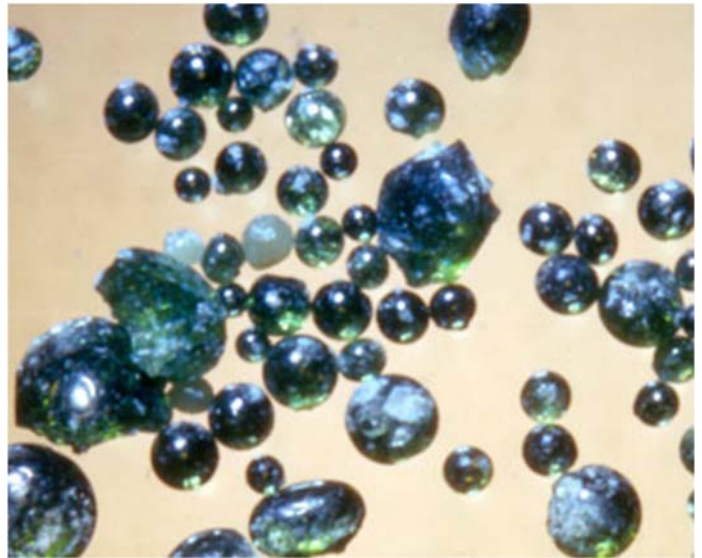
This research paints a different picture of our only satellite, usually seen as a rock inactive since the beginning of the solar system. It might also have some practical implications for future crewed missions.

Rock samples like these glassy granules, *pictured right*, were collected from the lunar surface in the early 1970s by the Apollo Mission. Looking into the volatiles trapped in them, researchers can determine how much gas escaped to the atmosphere during volcanic eruptions.

“By understanding their origin, we may gain insight into how these volatile materials are distributed in the ground, whether they’re at the surface in a cohesive, pure layer or at depth in patches of dirty ice,” Needham says.

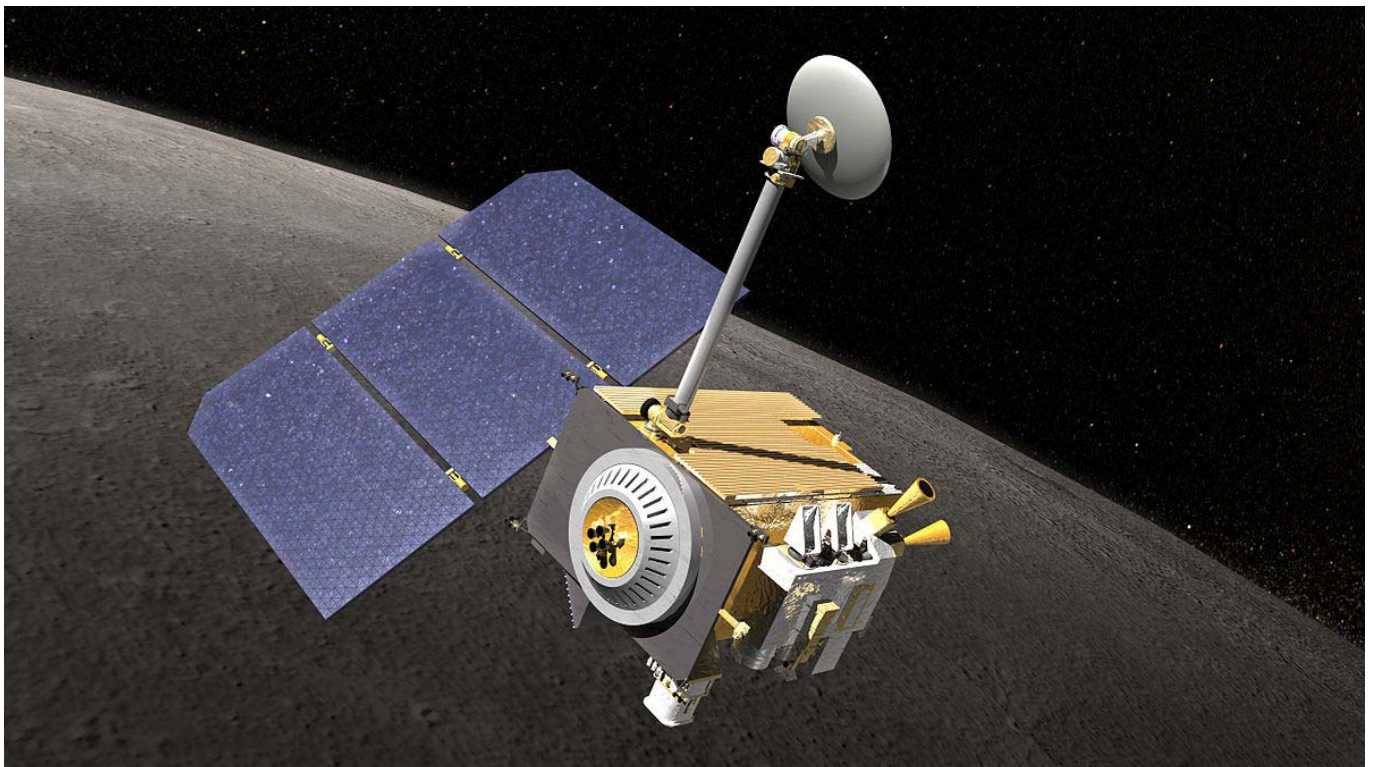
According to Saxena Prabal (NASA Goddard Space Flight Centre), who wasn’t involved in this study, there’s a growing realization that the ancient lunar surface and atmosphere were more dynamic than once thought.

Prabal cites recent research showing that the Moon was once magnetically active, and its magnetic field may have

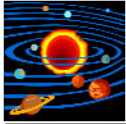


affected the transient atmosphere as well. It could have impacted how volatiles were transported, lost, or deposited throughout the lunar geography.

Looking for layers of atmospheric material in lunar rocks helps paint a picture of how the Moon’s atmosphere evolved, Prabal says. After all, many insights regarding the lunar past might still lie buried in the rocks brought back to Earth by the Apollo missions, which took off for the last time almost 45 years ago, in December 1972.



Story Source: Needham et al. “Lunar Volcanism Produced a Transient Atmosphere Around the Ancient Moon.” *Earth and Planetary Science Letter*. September 25, 2017.



Solar System Highlights

The major planets during December 2017

by John Newell

On the first of the month the **Sun** will rise at 6:01am and set at 8:10pm, on the 31st it will rise at 6:10am and set at 8:28pm (Subtract 4 minutes per degree East of Adelaide and add 4 minutes for each degree West.) The summer solstice occurs at 2:58am on the 22nd.

Full **Moon** is on the 4th at 2:18am, last quarter is on the 10th, new Moon is on the 18th at 5:02pm and first quarter is on the 26th.

Mercury will set with Saturn at 9:43pm on the first, will reach inferior solar conjunction on the 13th, will rise with the Moon and Venus on the 17th and will rise at 4:42am on the 31st.

Venus will rise at 5:30am on the first, will pass Mercury on the 16th, will pass Saturn on the 26th and will rise close to the sun at the end of the month.

Mars will rise at 3:46am on the first, will rise with the Moon on the 14th, will move from Virgo to Libra on the 22nd and will rise near Jupiter at 2:41am on the 31st.

Ceres in Leo, increasing in magnitude from 7.3 to 6.9 through the month, will rise at 1:19am on the first, will rise with the Moon on the 9th and will rise at 11:33pm on the 31st.

Jupiter in Libra, will rise at 4:32am on the first, will rise with the Moon on the 14th and will rise with Mars at 2:52am on the 31st.

Saturn in Sagittarius, will set with Mercury at 9:30pm on the first, will reach solar conjunction on the 22nd and will rise at 5:38am on the 31st.

Uranus magnitude 6.1 in Pisces, will set with the Moon at 3:42am on the first, will set with the Moon again on the 28th and will set at 1:44am on the 31st.

Neptune magnitude 7.7 in Aquarius, will set at 1:51am on the first, will set with the moon on the 24th and will set at 11:51pm on the 31st.

Pluto magnitude 14.3 in Sagittarius, will set at 10:53pm on the first, will set with the Moon on the 20th and will set close to the Sun at 8:59pm on the 31st.

Diary of phenomena December 2017

d h (UT)

- 3 15 FULL MOON
- 4 9 Moon at perigee
- 5 11 Moon furthest North (20.0°)
- 6 2 Mercury 1.4°S of Saturn
- 8 23 Regulus 0.7°S of Moon
- 10 7 LAST QUARTER
- 13 1 Mercury inferior conjunction
- 13 19 Mars 3.9°S of Moon
- 14 16 Jupiter 4.0°S of Moon
- 15 15 Mercury 2.2°N of Venus
- 17 9 Mercury 1.8°S of Moon
- 17 18 Venus 4.1°S of Moon
- 18 6 NEW MOON
- 18 13 Saturn 2.7°S of Moon
- 19 1 Moon at apogee
- 19 9 Moon furthest South (-20.1°)
- 21 16 Solstice
- 21 21 Saturn at conjunction
- 24 13 Neptune 1.4°N of Moon
- 25 17 Venus 1.1°S of Saturn
- 26 9 FIRST QUARTER
- 27 20 Uranus 4.2°N of Moon

The **Geminid Meteor Shower**, active for two weeks from December 4th to December 17th, will peak at December 14th near the new Moon. From the 18th to the 23rd the **International Space Station** will do multiple visible passes each night.

Moon Phases - December 2017

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1  Age: 12.3 days	2  Age: 13.4 days
3  Age: 14.6 days	4  Age: 15.7 days	5  Age: 16.9 days	6  Age: 18.0 days	7  Age: 19.2 days	8  Age: 20.2 days	9  Age: 21.3 days
10  Age: 22.3 days	11  Age: 23.3 days	12  Age: 24.3 days	13  Age: 25.2 days	14  Age: 26.1 days	15  Age: 27.0 days	16  Age: 27.9 days
17  Age: 28.8 days	18  Age: 0.2 days	19  Age: 1.1 days	20  Age: 2.0 days	21  Age: 2.9 days	22  Age: 3.8 days	23  Age: 4.7 days
24  Age: 5.6 days	25  Age: 6.5 days	26  Age: 7.5 days	27  Age: 8.5 days	28  Age: 9.6 days	29  Age: 10.6 days	30  Age: 11.7 days
31  Age: 12.9 days						



Our regular columnist, Michael, advises that there are no bright comets visible in southern skies during December. So, we bring you another comet story this month.

Small asteroid or comet 'visits' from beyond the solar system

A small, recently discovered asteroid -- or perhaps a comet -- appears to have originated from outside the solar system, coming from somewhere else in our galaxy. If so, it would be the first "interstellar object" to be observed and confirmed by astronomers.

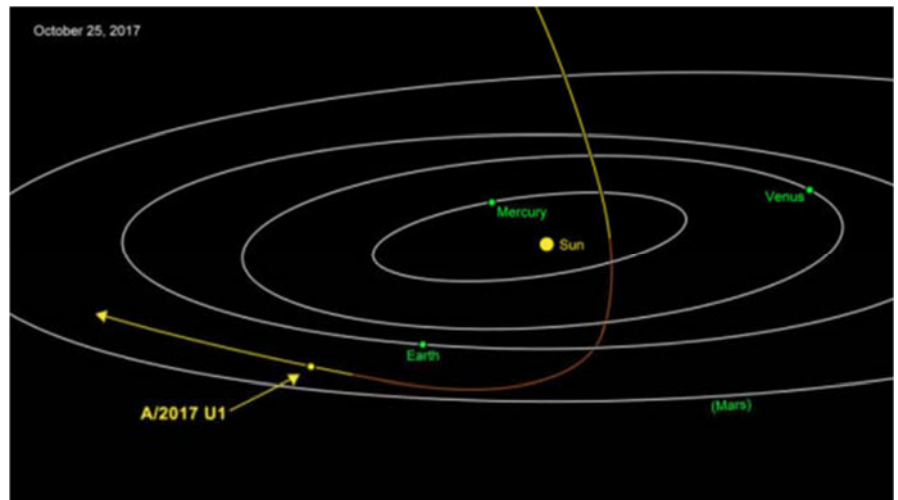
A small, recently discovered asteroid -- or perhaps a comet -- appears to have originated from outside the solar system, coming from somewhere else in our galaxy. If so, it would be the first "interstellar object" to be observed and confirmed by astronomers.

This unusual object -- for now designated A/2017 U1 -- is less than 400 metres in diameter and is moving remarkably fast. Astronomers are urgently working to point telescopes around the world and in space at this notable object. Once these data are obtained and analyzed, astronomers may know more about the origin and possibly composition of the object.

A/2017 U1 was discovered Oct. 19 by the University of Hawaii's Pan-STARRS 1 telescope on Haleakala, Hawaii, during the course of its nightly search for near-Earth objects for NASA. Rob Weryk, a postdoctoral researcher at the University of Hawaii Institute for Astronomy (IfA), was first to identify the moving object and submit it to the Minor Planet Center. Weryk subsequently searched the Pan-STARRS image archive and found it also was in images taken the previous night, but was not initially identified by the moving object processing. Weryk immediately realized this was an unusual object. "Its motion could not be explained using either a normal solar system asteroid or comet orbit," he said. Weryk contacted IfA graduate Marco Micheli, who had the same realization using his own follow-up images taken at the European Space Agency's telescope on Tenerife in the Canary Islands. But with the combined data, everything made sense. Said Weryk, "This object came from outside our solar system."

"This is the most extreme orbit I have ever seen," said Davide Farnocchia, a scientist at NASA's Center for Near-Earth Object Studies (CNEOS) at the agency's Jet Propulsion Laboratory in Pasadena, California. "It is going extremely fast and on such a trajectory that we can say with confidence that this object is on its way out of the solar system and not coming back."

The CNEOS team plotted the object's current trajectory and even looked into its future. A/2017 U1 came from the



Above: A/2017 U1 is most likely of interstellar origin. Approaching from above, it was closest to the Sun on Sept. 9. Credit: NASA/JPL-Caltech

direction of the constellation Lyra, cruising through interstellar space at a brisk clip of 25.5 kilometers per second or 93,000 kms per hour!.

The object approached our solar system from almost directly "above" the ecliptic, the approximate plane in space where the planets and most asteroids orbit the Sun, so it did not have any close encounters with the eight major planets during its plunge toward the Sun. On Sept. 2, the small body crossed under the ecliptic plane just inside of Mercury's orbit and then made its closest approach to the Sun on Sept. 9. Pulled by the Sun's gravity, the object made a hairpin turn under our solar system, passing under Earth's orbit on Oct. 14 at a distance of about 24 million kilometers -- about 60 times the distance to the Moon. It has now shot back up above the plane of the planets and, travelling at 44 kilometers per second with respect to the Sun, the object is speeding toward the constellation Pegasus.

"We have long suspected that these objects should exist, because during the process of planet formation a lot of material should be ejected from planetary systems. What's most surprising is that we've never seen interstellar objects pass through before," said Karen Meech, an astronomer at the IfA specializing in small bodies and their connection to solar system formation.

Story source: NASA. "Small asteroid or comet 'visits' from beyond the solar system." *ScienceDaily*, 27 October 2017. www.sciencedaily.com/releases/2017/10/171027104523.htm



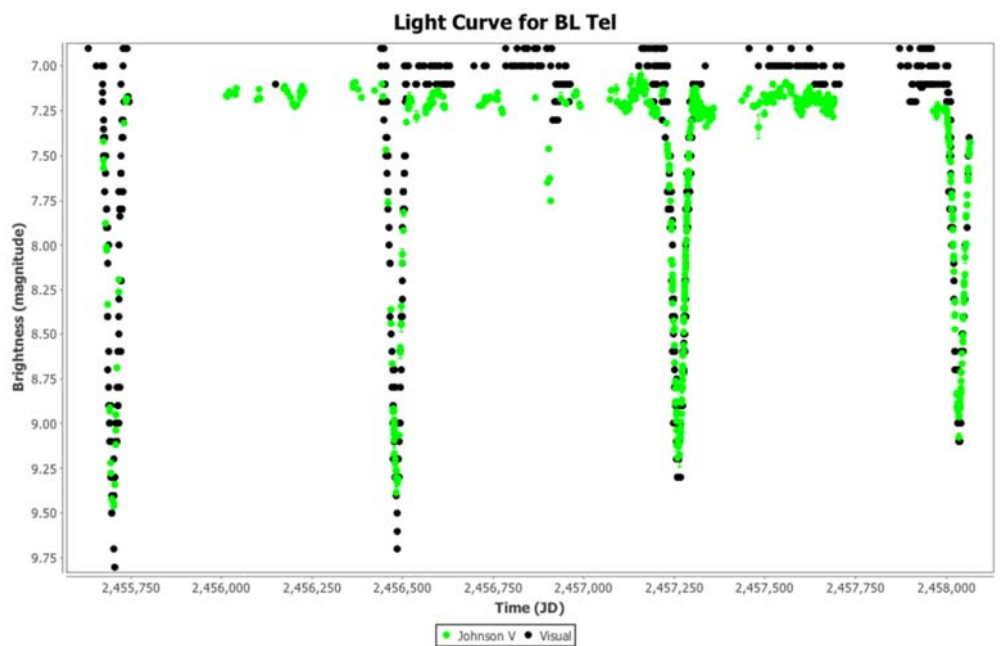
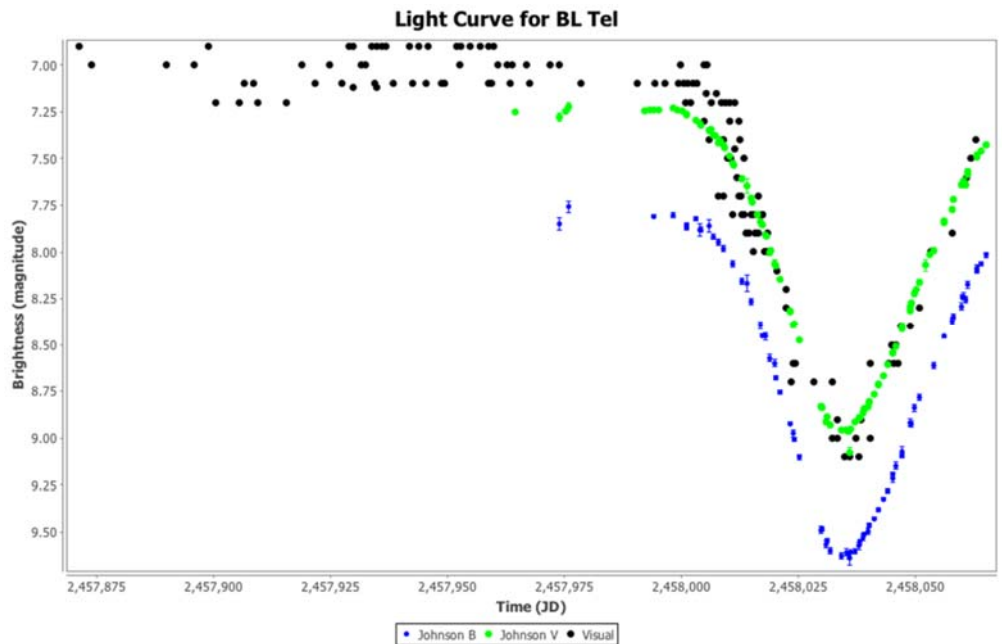
I recently finished an enjoyable online Data Driven Astronomy course of six weeks duration run by the University of Sydney (via Coursera). The astronomy content included pulsars, black holes, galactic redshift, and galaxy classification with liberal use of scientific Python and SQL. I seem to have been bitten by the short course bug since first taking an AAVSO CHOICE course in 2013.

My first DSLR observation since the middle of this year was of BL Tel near minimum eclipse on Oct 8th. BL Tel is an Algol-type eclipsing binary system with a long period of around 778 days. Below is the current primary eclipse event, showing Johnson B, V, and visual observations.

It's interesting to look at previous eclipses. The following light curve shows the last 4 eclipses, dating back to 2011 with eclipse minimum magnitudes ranging from 9.5 to 9. To add some interest, the more massive primary component is a yellow supergiant semi-regular variable star of spectral type F4, while the other is a redder star of spectral type M. As someone remarked in a Variable Stars South email recently, the eclipse depths becoming shallower suggests some interesting astrophysics.

In other news:

- in early November, a transient in Taurus was identified as a micro-lensing event;



- a neutron star merger of recent gravitational wave fame created oodles of gold;
- spots on the supergiant Zeta Puppis drives large stellar wind spiral structures.

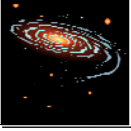
USEFUL LINKS

BL Tel

- <https://www.aavso.org/vsx/index.php?view=detail.top&oid=36332>
- https://en.wikipedia.org/wiki/BL_Telecopii

Other News

- <https://www.aavso.org/tcp-j050742642447555-new-transient-108-mag-taurus-microlensing-event>
- <https://www.aavso.org/neutron-star-merger-connected-gravitational-wave-detection-new-era-begins>
- <https://www.aavso.org/how-universe-creates-gold-and-other-elements>
- <https://www.aavso.org/spots-supergiant-star-drive-spirals-stellar-wind>



Alone in the dark

A guide to observing faint fuzzies in our night sky

by Joe Grida



NGC 1637 - spiral galaxy in Eridanus

The constellation of Eridanus, the river, boasts a booty of deep sky objects. Galaxies like NGC 1232, NGC 1300, NGC 1531 are regularly visited by observers. There's also a couple of Hickson Compact Groups of Galaxies as well (21,22). My observation planning software list over 200 galaxies visible in the 16" telescope!

But, this month we'll go a little away off the beaten track to NGC 1637, a beautiful spiral galaxy halfway between mu Eridani and nu Eridani, not far from Rigel, in Orion.

In 1999, astronomers at the Lick Observatory reported the discovery of a new supernova, SN 1999em. The star that became SN 1999em was very massive, more than eight times the mass of the Sun, before its death.

The spiral structure of NGC 1637 shows up, in the image below, as a very distinct pattern of bluish trails of young stars, glowing gas clouds and obscuring dust lanes.

Although at first glance NGC 1637 appears to be a fairly symmetrical object it has some interesting features. It is

what astronomers classify as a lopsided spiral galaxy: the relatively loosely wound spiral arm at the top left of the nucleus stretches around it much further than the more compact and shorter arm at the bottom right.

At a distance of about 35 million light years, this spiral shines at magnitude 10.8, and displays an almost face-on aspect of 2.7' x 3.3'. Visually in the telescope it displays a bright stellar core, a bright middle and then a fainter halo. I suspected the spiral arm so prominent in the photo below.

Whilst you are in this area, head over to mag 3.9 nu Eridani, and clustered around it is a trio of galaxies. The brightest is 12.3 mag SA spiral NGC 1625, only 12 minutes to the east. An elongated galaxy, 1.7' x 0.5' size.

NGC 1622 is located 11' to the NNE of nu Eridani. At a size of 3.5 x 0.8', it is the largest of the trio, but slightly fainter at 12.5 mag. It too is an SA spiral.

NGC 1618, at mag 12.7 is 13' to the north and the faintest.



Above: This image from ESO's Very Large Telescope at the Paranal Observatory in Chile shows NGC 1637, a spiral galaxy located about 35 million light-years away in the constellation of Eridanus (The River). In 1999 scientists discovered a Type II supernova in this galaxy and followed its slow fading over the following years. **Credit:** ESO



Contact information

Here's how to contact various members of Council, Regional Co-ordinators and SIG's

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The group meets on the first Thursday of the month.

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Northern Yorke Peninsula

The NYP'pers hold combined members' and public viewing nights monthly.

Coordinator: Tony Henderson

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Email: nyp@assa.org.au

Riverland

The Riverland group hold combined members' and public viewing nights monthly.

Co-ordinator: Tim Vivian

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Email: riverland@assa.org.au

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Light Pollution Martin Lewicki 0413 494 366

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Planetarium Paul Curnow 0402 079 578

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Schools Viewing Nights Coordinator TBA

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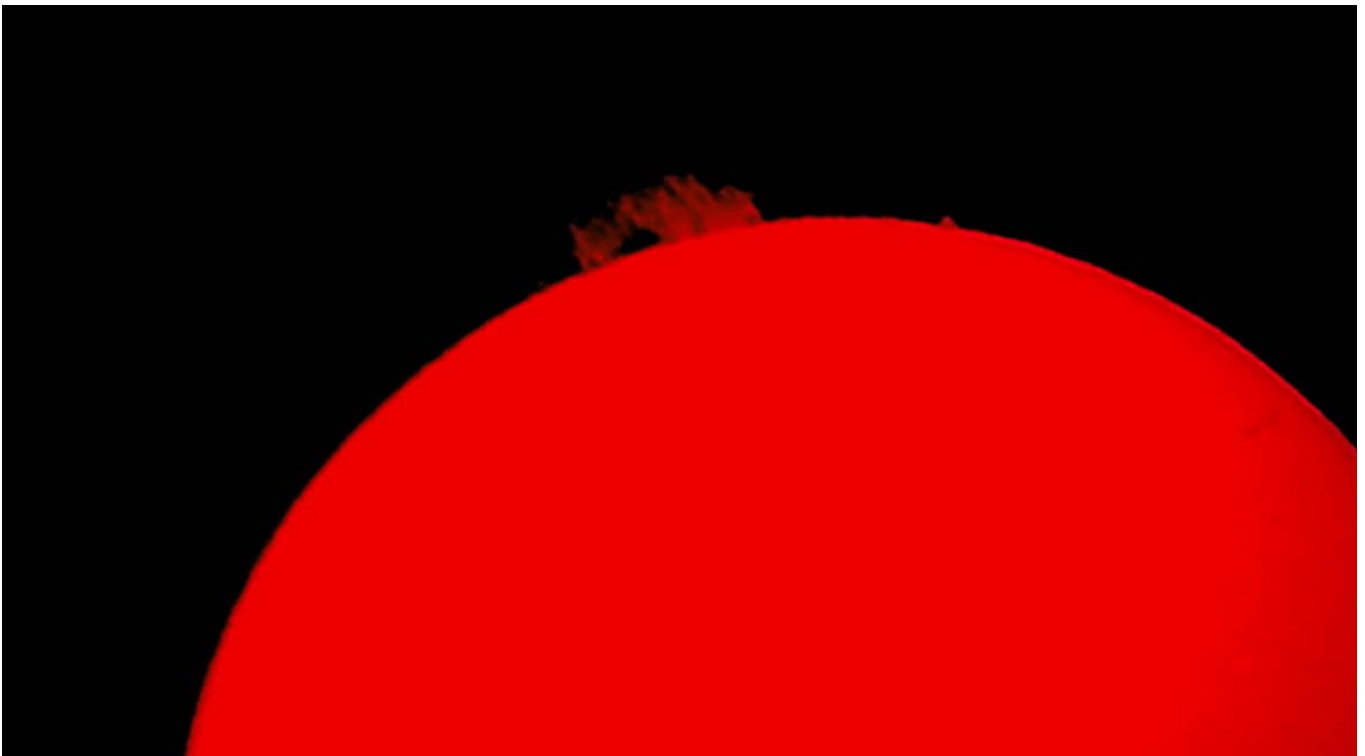
Awards Committee awards@assa.org.au

National Police Check Coordinator Paul Rogers 08 8263 7666
ozymandias@senet.com.au



Members' Gallery

Highlighting members' astrophotos



Above: A large solar prominence, imaged by **Ian Anderson** on 20 October 2017 @ 15:36 CSST. Overexposed out of focus handheld image, red channel only, using the ASSA's 60mm Coronado Solar Scope.

Below: The International Space Station (ISS), imaged by **John King**, as it passes in front of the Moon at 1:39:55 am local time on 2 November 2017 from Glenunga in Adelaide. The transit was captured as a video (resolution 1920x1080 @ 30 fps) with a Nikon D800 DSLR at prime focus on a Meade LX200GPS 8" Schmidt-Cassegrain telescope (2000mm focal length, f/10), unguided. The exposure was at ISO 6400, shutter speed 1/8000 s, with daylight white balance. The still image is a composite of 22 consecutive video frames, stacked in Photoshop, cropped and sharpened.

The transit lasted 0.81 seconds. The distance from observer to satellite was 644 km. Orbital calculations by CalSky.com. The ISS was in the Earth's shadow and apparently had four spacecraft docked: two Soyuz and two Progress vehicles.

