



Hello All,

I want to warn everyone coming and going from our meeting place at the University to be wary of Kangaroos. One of our members had his car run into by one after as he was exiting. Damage was caused by the collision. Reduce your speed and keep an eye out. I used to travel at 50 on George Evans Road. Now, I am going to drive at 30. Just saying.

Wow, the Atkins, Martin and Robbie are opening their house and telescopes to members one night later in May. There will be BBQ facilities available. I for one will be going to this. Have a careful read of the promotion found in this Astroflyer. (page 3) RSVP to the Atkins.

See you at the meeting,

Frank Gross, President, Shoalhaven Astronomers, Inc.

Next monthly meeting will be held at the Shoalhaven Campus of the Uni of W'Gong, George Evans Road off Yawal Road, West Nowra, May 17th, 6.30 pm for 7pm start.

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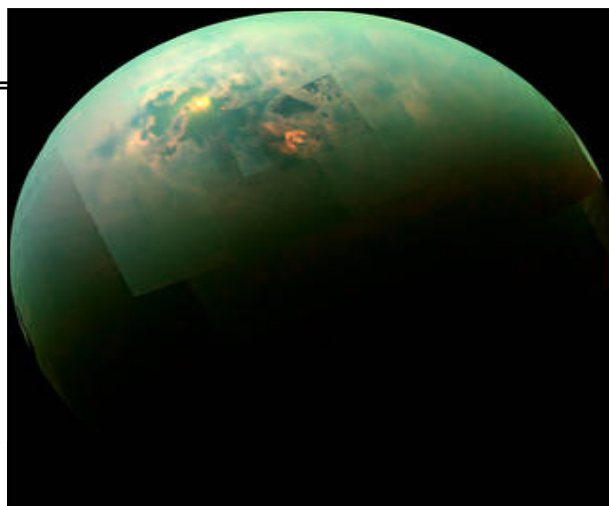
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MOON PHASES



**New Moon
June 3**



**First Quarter
May 12**



**Full Moon
May 19**



**Last Quarter
May 27**

Viewing Nights

Club viewing nights are selected to provide viewers with the best possible conditions for good viewing. They are held on specific Saturdays at different locations around Nowra.

The next club viewing night will be on **Saturday 25 May (back-up night Sun 26 May)** at **Robbie and Martin's place, 439 Jervis Bay Road, Woollamia** (see page 3 for directions)

*More Club Information
Page 15*

OUT THERE

Bob Turnbull OBSERVATION OFFICER

JUNE-JULY 2019

Now are the clear days and nights which are ideal for viewing, so I look forward to some interesting feedback about what you club members are actually viewing – Sky wise !

I hope you have seen plenty to study in the night sky and caught some of the program for viewing in last month's "OUT THERE".

Telescopes: These need to be acclimatised by setting up about 30 minutes before viewing so reducing fogging of mirrors and eye pieces!

PLANETS

JUPITER Should be the biggest and best of the planets, coming to opposition on the 11th of June at -2.6 magnitude, then dropping to 2.5 magnitude in July. It is bright in the Eastern morning sky in Ophiuchus and on the 16th it is near (to our eye) to the Full Moon in a triangle with Antares, in Scorpio.

So at 46 arcminutes it is easy to see with almost any sized telescope and the bigger the telescope the better the detail (provided you look after the Moon is waning) So refer to page 120 for rising times, and satellites at EST, with visible events. For those "sleepy heads" viewing, like me, the evening viewing around 19:43 EST is more rewarding and comfortable from the 1st of June.

SATURN This major planet (to our eyes) rises in the East at 7pm mid month, in June and exhibits its amazing ring system, at 24 degrees, plenty to see with this planet as a favourite to most members, so see page 125 in Astronomy 2019 for future viewing times.

VENUS Blasts into the dawn sky in the East and on the 2nd of June it will be 3 degrees north of a sliver waning Moon. You will not see this planet until September.

METEOR SHOWERS

The theta-Ophiuchids, were seen in 2010 and listed in 2011 and they could be very interesting bright and slow with long trains and the best reached -5 magnitude with a 30 degree train. So watch for these on the 21st of May until June the 16th, with a peak around the 10th and 11th, best seen after midnight.

Clear skies and good viewing!
BOB TURNBULL

VIEWING NIGHTS

Club/Social Viewing Nights are on Saturday evenings "just" Before Sunset. Viewing nights are for members and invited guests. The contingency plan for poor weather on the proposed viewing night is to meet the next night (a Sunday night) .

Woncur Road, South Nowra (Head South down The Princes Highway, turn right at BTU Road, Woncur Road is the street first on the left).

University Viewing site. On the way to the university on George Evans Road go straight ahead through the second turning circle to the new viewing site.

SHOALHAVEN ASTRONOMERS SUGGESTED VIEWING NIGHTS

FEBRUARY-JUNE 2019

Viewing night at Robbie and Martin's place 439 Jervis Bay Road, Woollamia.

Date, 25 th May or 26 th depending on sky conditions. Time from 5pm onwards.

439 Jervis bay road is 4.39 kilometers from the intersection with the princes hwy. towards Huskisson. The last cross street is Seasongood road. The driveway is on the left exactly on the apex of a left hand bend around 400 meters past Seasongood road.

I will have a 10inch lx200, a 12inch lx200 and a 14inch lx200 set up on the side of Robbie's swimming pool. There is ample room for more scopes.

There will be bbq facilities so bring meat and salads if you wish plus Robbie is making a big pot of soup.

To confirm on the afternoon of 25th text me on 0419426333. If the weather looks bad I'll text back saying to try for the next day.

Month	Saturday or Sunday	Place	Time
JUNE	22 nd or 23 rd	NEW SITE ??	1 hour after sunset

Bring your scopes and or binoculars and a small folding chair, a decision on the day planned, depending on viewing conditions, by the club president and his deputy.

Email information if details are changed, to all, or contact Frank for changes.

Solar viewing BBQ lunches (BYO) may be held and these will be advised ahead of these events. Special events such as Comets, eclipses etc. may also warrant members night viewings.

Bob Turnbull
OBSERVATION OFFICER

The Visual Astronomer

Part 6

Eugene O'Connor

Transits, Occultations and Eclipses

A rare treat for the visual astronomer is watching one heavenly body pass in front of another. Some of these events are of massive significance, for example the arrival of Captain Cook in Australia to observe the transit of Venus. Some are of lifetime significance for the observer, such as the observation of a total solar eclipse. While total lunar eclipses are less rare than those above, the sheer beauty of the event can be moving for young and old alike.

Some visual astronomers can develop an interest in scientifically recording the occultation of stars from night to night by the moving Moon. A more common observation is the occultation by the outer planets by the moon, as the observation and timing of these event can be easily observed, and the sheer closeness of the heavenly bodies can have all the impact of the dramatic conjunctions of stars and planets from month to month. While the occultation of Saturn by the moon was unfavorable for Australian observers last month, a much more favorable one occurs in the early evening of August 12th this year, weather permitting.

(Below: All eyes on a Mercury transit)



(I recorded the following transit of Mercury sixteen years ago, but I can still recall the excitement of that day.)

Dare to drift Upon a Star: A Rare Transit of Mercury. May 7th 2003

Our group of seven Shoalhaven Astronomers saw the first hour of transit from 3.14 p.m. Eastern Aussie Standard Time.

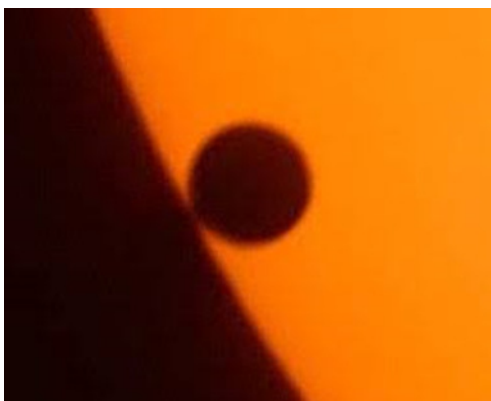
It had been a hazy day, but the Sun looked locked in for the day as the afternoon approached. We met at Jack's property which has a good view of the western horizon. Six telescopes of various denominations were on the field and I had a filtered pair of 25X100 Binox. The largest aperture was 6" and the highest power was X60. Jack's small Russian Two Inch was equipped with a H Alpha filter. I spotted first contact in the big binox at 3.14.10. The cries soon went up on the other machines.

Sky Objects By Eugene O'Connor

Cont...2

The intruder was a tiny dent NW on the great disc. I moved to the 60X filtered 2" about five minutes after first contact and clearly saw a rather unusual 'tear-drop' effect. It looked as if the tiny disc was enlarged or ovoid as it dragged itself away from the sharp edge. More a full diameter stretch than a drop effect. Then the tiny Mercury was inside with a sliver of sun separating the outer edge of the planet.

(*Below: two different shots of a transit.*)



First impressions from everybody were that the planet was so large and so perfectly round and black. It did not resemble any sunspot I have ever seen. Hard to believe that the same Mercury – even at its largest in crescent stage-- is so tiny by comparison.

As the hour progressed and we became more relaxed and the tea and cakes appeared, we began to try 12X60 binoculars, which revealed the tiny disc and finally with well propped 7X50s several of us could just spot the tiny dark dot, now several diameters inside the solar face. We were all surprised it took so little power to see the event – when you knew where to look.

The sun was heading for low sunset clouds and becoming quite veiled. We took our last look, with Mercury, still well-off mid-journey across the sun, and packed up. Darkness came soon after I reached home, and I thought of the many eyes trained to dawn skies half way round the curving world as this insignificant but dramatic and strangely awesome event continued for some hours to come. The sunset was a vivid rose-coloured blaze with dark birds passing rapidly across the western sky. Next transit of Mercury visible in Australia will be in November 2032.

(While you wait for a spectacular transit of Venus or Mercury, during the coming months Jupiter and its Galilean moons can show all the fun of eclipses, occultations and shadow transits in small telescopes while studying this impressive planet.)

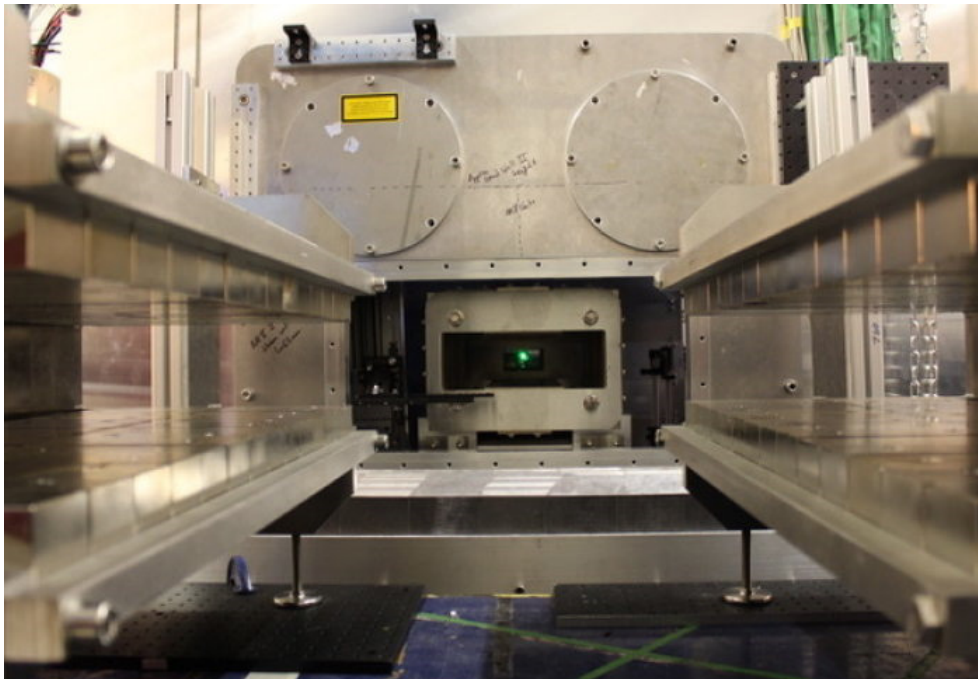
PHYSICISTS ARE TRYING TO TURN LIGHT INTO MATTER TO PROVE THE 'IMPOSSIBLE'

BY ARISTOS GEORGIOU

Eight-four years ago, scientists Gregory Breit and John Wheeler theorized that it would be possible to turn light into matter. However, it was long thought that proving this would be beyond the capabilities of scientists. Now physicists from Imperial College London (ICL) in the U.K. are attempting to prove the impossible in a potentially groundbreaking experiment.

The theory, known as the Breit-Wheeler process, states that smashing together two particles of light, or photons, would create matter in the form of a negatively charged electron and its antiparticle, a positron. Both electrons and positrons have a small mass unlike photons, which have no mass.

So far, experiments attempting to prove the Breit-Wheeler process have not been successful as they have required the use of massive high-energy particles. But in 2014, physicists Steven Rose, Stuart Mangle and their colleagues from ICL proposed plans for an experiment that did not rely on these additional particles. Now, this experiment is underway.



The target chamber, where the laser beams are focused

Creating matter from light would be "a pure demonstration of Einstein's famous equation that relates energy and mass: $E=mc^2$, which tells us how much energy is produced when matter is turned to energy," Rose said in a statement. "What we are doing is the same but backwards: turning photon energy into mass, i.e., $m=E/c^2$."

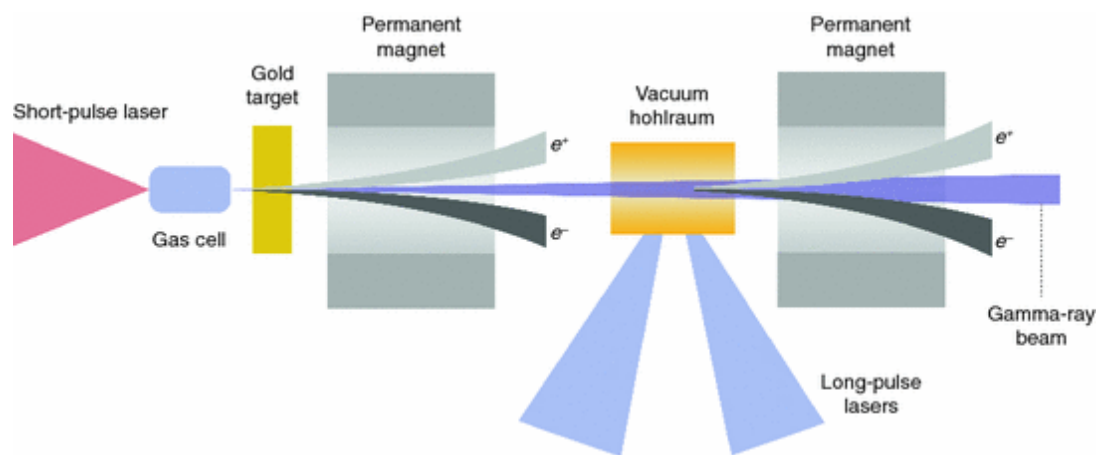
The team's setup involves two high-power laser beams that contain the photons. The lasers are pointed at two separate targets inside a chamber consisting of a complex system of optics and magnets that will deflect the photons from both sources in such a way that they will collide.

The scientists will then look for the creation of positrons as a result of the collision, which, if detected, would be a sign that the experiment was a success (though they will have to conduct careful checks to make sure that particles were not being created by any background process).

Astro Events from Frank Gross

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"When Gregory Breit and John Wheeler first proposed the mechanism in 1934, they used the then new theory of the interaction between light and matter known as quantum electrodynamics (QED)," Mangle said. "Whereas every other fundamental prediction of QED has since been demonstrated experimentally, the 'two-photon Breit-Wheeler process' has never been seen."



"If we can demonstrate it now, we would be re-creating a process that was important in the first 100 seconds of the universe and that is also seen in gamma ray bursts, which are the biggest explosions in the universe and one of physics' greatest unsolved mysteries"

Cont...3

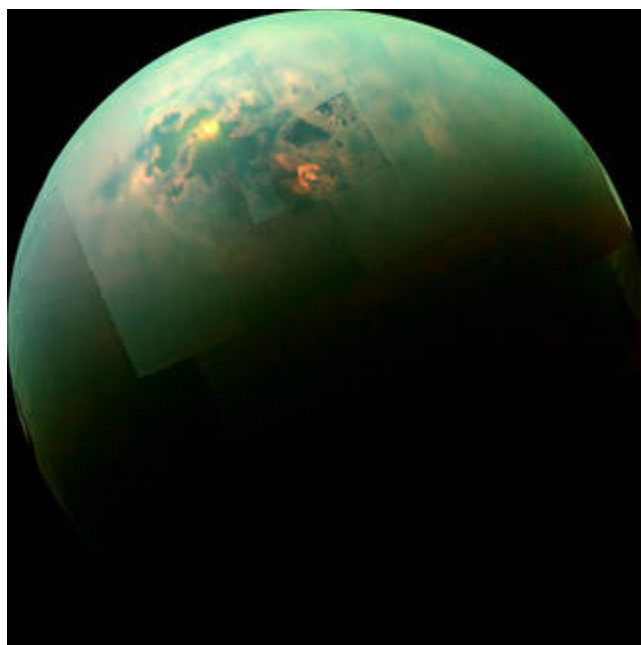
NASA's Cassini Reveals Surprises with Titan's Lakes

On its final flyby of Saturn's largest moon in 2017, NASA's Cassini spacecraft gathered [radar](#) data revealing that the small liquid lakes in Titan's northern hemisphere are surprisingly deep, perched atop hills and filled with methane.

The new findings, published April 15 in *Nature Astronomy*, are the first confirmation of just how deep some of Titan's lakes are (more than 300 feet, or 100 meters) and of their composition. They provide new information about the way liquid methane rains on, evaporates from and seeps into Titan — the only planetary body in our solar system other than Earth known to have stable liquid on its surface.

Scientists have known that Titan's hydrologic cycle works similarly to Earth's — with one major difference. Instead of water evaporating from seas, forming clouds and rain, Titan does it all with methane and ethane. We tend to think of these hydrocarbons as a gas on Earth, unless they're pressurized in a tank. But Titan is so cold that they behave as liquids, like gasoline at room temperature on our planet.

Scientists have known that the much larger northern seas are filled with methane, but finding the smaller northern lakes filled mostly with methane was a surprise. Previously, Cassini data measured Ontario Lacus, the only major lake in Titan's southern hemisphere. There they found a roughly equal mix of methane and ethane. Ethane is slightly heavier than methane, with more carbon and hydrogen atoms in its makeup.



This near-infrared, colour view from Cassini shows the sun glinting off of Titan's north polar seas.

Credits: NASA/JPL-Caltech/Univ. Arizona/Univ. Idaho

"Every time we make discoveries on Titan, Titan becomes more and more mysterious," said lead author Marco Mastrogioseppe, Cassini radar scientist at Caltech in Pasadena, California. "But these new measurements help give an answer to a few key questions. We can actually now better understand the hydrology of Titan."

Adding to the oddities of Titan, with its Earth-like features carved by exotic materials, is the fact that the hydrology on one side of the northern hemisphere is completely different than the that of other side, said Cassini scientist and co-author Jonathan Lunine of Cornell University in Ithaca, New York.

"It is as if you looked down on the Earth's North Pole and could see that North America had completely different geologic setting for bodies of liquid than Asia does," Lunine said.

Astro Events from Frank Gross

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On the eastern side of Titan, there are big seas with low elevation, canyons and islands. On the western side: small lakes. And the new measurements show the lakes perched atop big hills and plateaus. The new radar measurements confirm earlier findings that the lakes are far [above sea level](#), but they conjure a new image of landforms — like mesas or buttes — sticking hundreds of feet above the surrounding landscape, with deep liquid lakes on top.

The fact that these western lakes are small — just tens of miles across — but very deep also tells scientists something new about their geology: It's the best evidence yet that they likely formed when the surrounding bedrock of ice and solid organics chemically dissolved and collapsed. On Earth, similar water lakes are known as karstic lakes. Occurring in areas like Germany, Croatia and the United States, they form when water dissolves limestone bedrock.

Alongside the investigation of deep lakes, a second paper in *Nature Astronomy* helps unravel more of the mystery of Titan's hydrologic cycle. Researchers used Cassini data to reveal what they call transient lakes. Different sets of observations — from radar and infrared data — seem to show liquid levels significantly changed.

The best explanation is that there was some seasonally driven change in the surface liquids, said lead author Shannon MacKenzie, planetary scientist at the Johns Hopkins Applied Physics Laboratory in Laurel, Maryland. "One possibility is that these transient features could have been shallower bodies of liquid that over the course of the season evaporated and infiltrated into the subsurface," she said.

These results and the findings from the *Nature Astronomy* paper on Titan's deep lakes support the idea that hydrocarbon rain feeds the lakes, which then can evaporate back into the atmosphere or drain into the subsurface, leaving reservoirs of liquid stored below.

Cassini, which arrived in the Saturn system in 2004 and ended its mission in 2017 by deliberately plunging into Saturn's atmosphere, mapped more than 620,000 square miles (1.6 million square kilometers) of liquid lakes and seas on Titan's surface. It did the work with the radar instrument, which sent out radio waves and collected a return signal (or echo) that provided information about the terrain and the liquid bodies' depth and composition, along with two imaging systems that could penetrate the moon's thick atmospheric haze.

The crucial data for the new research were gathered on Cassini's final close flyby of Titan, on April 22, 2017. It was the mission's last look at the moon's smaller lakes, and the team made the most of it. Collecting echoes from the surfaces of small lakes while Cassini zipped by Titan was a unique challenge.

"This was Cassini's last hurrah at Titan, and it really was a feat," Lunine said

The Cassini-Huygens mission is a cooperative project of NASA, ESA (European Space Agency) and the Italian Space Agency. NASA's Jet Propulsion Laboratory, a division of Caltech in Pasadena, California, manages the mission for NASA's Science Mission Directorate, Washington. JPL designed, developed and assembled the Cassini orbiter. The radar instrument was built by JPL and the Italian Space Agency, working with team members from the U.S. and several European countries.

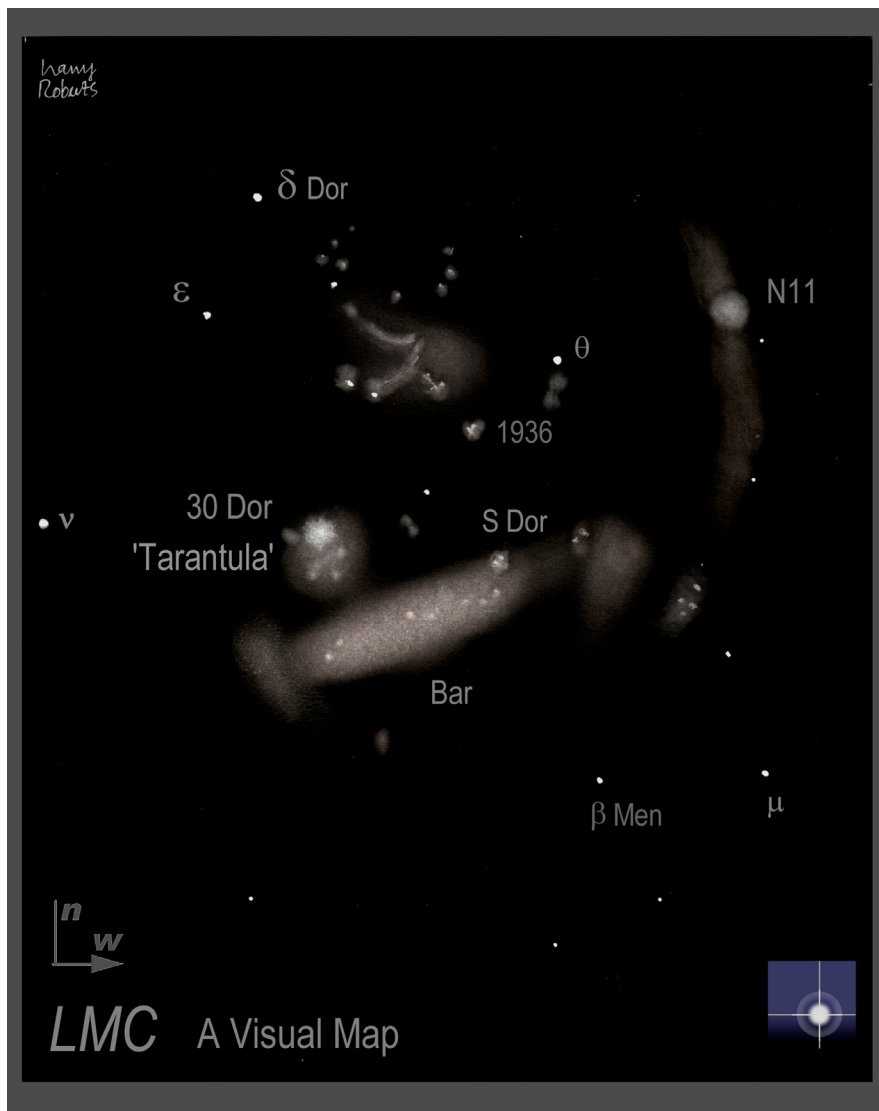
Large Magellanic Cloud by Harry Roberts

The LMC: 'A Mud Map' Part 1

The writer has often gazed at the Large Magellanic Cloud (LMC)- only to be discouraged by the mass of details seen, even in binoculars. Recently, an outline sketch of the Cloud's main parts, a 'mud-map', say, was made hoping to clarify some of its baffling detail. The map (Fig.) is as simple as possible – showing just the LMC's main 'bits' visible in small 'binos'. The idea is to name the Cloud's main regions and show its full extent in the night sky: and it's bigger than it looks!

The two Magellanic Clouds are visible only in the Southern Hemisphere, the Large Cloud is highest in mid-December, the Small, in mid-October. And for a 'first impression' let's assume we are at a dark site, seated comfortably, with a pair of 8X30 binos, it's summer, and the sky is clear. What can we see?

Central Bar. With the naked eye we will see at least two LMC features: the long central 'Bar' and the faint 'blob' above its east end called 30 Doradus, the 'Tarantula' Nebula. In the 'binos' mottled detail will appear in both the Bar and the Tarantula.



Now look well west of the 'bar' (another Bar-length) and upwards (north) and you will see a large round nebula about 1/3 size of the Moon!

What's it called?

A good question! While it is a single object comprising multiple clusters and nebulae (all with NGC/IC numbers), it has NO common name. Yet a familiar object in the MWG, like the "Rosette" Nebula say, has a useful name as well as four NGC numbers.

Large Magellanic Cloud by Harry Roberts

Cont...2

LMC names. LMC objects have NGC/IC and other catalog numbers, but they lack common names - a big problem when we view the Clouds. The NGC system assigns numbers by Right Ascension (RA), but for objects with some RA 'width' the numbers are not consecutive: e.g. our 'un-named' object has four: NGC1760, 1761, 1763 and 1769. Yet it does have several Henize Catalog (1956) numbers: N11A to N11F. So, in the Map it is named **N11**: a useful tag often used in science papers.

And N11 is one very "Hot Topic"! There is much published on it: as it is a "Super Bubble" – for which the LMC is noted – and they are not easily seen in our MW Galaxy (thankfully).

N11, in the bino's, is a large faint object with some stars– but, in a scope, a vast complex of bright nebulae and star clusters is seen; a very impressive sight! And now we can easily find N11 we will point a big 'scope at it (in a future piece) and discuss its incredible X-ray emitting nebulae and WR stars. After the Tarantula Nebula, N11 is the Cloud's biggest 'Super-Star'. Now we know where to find it!

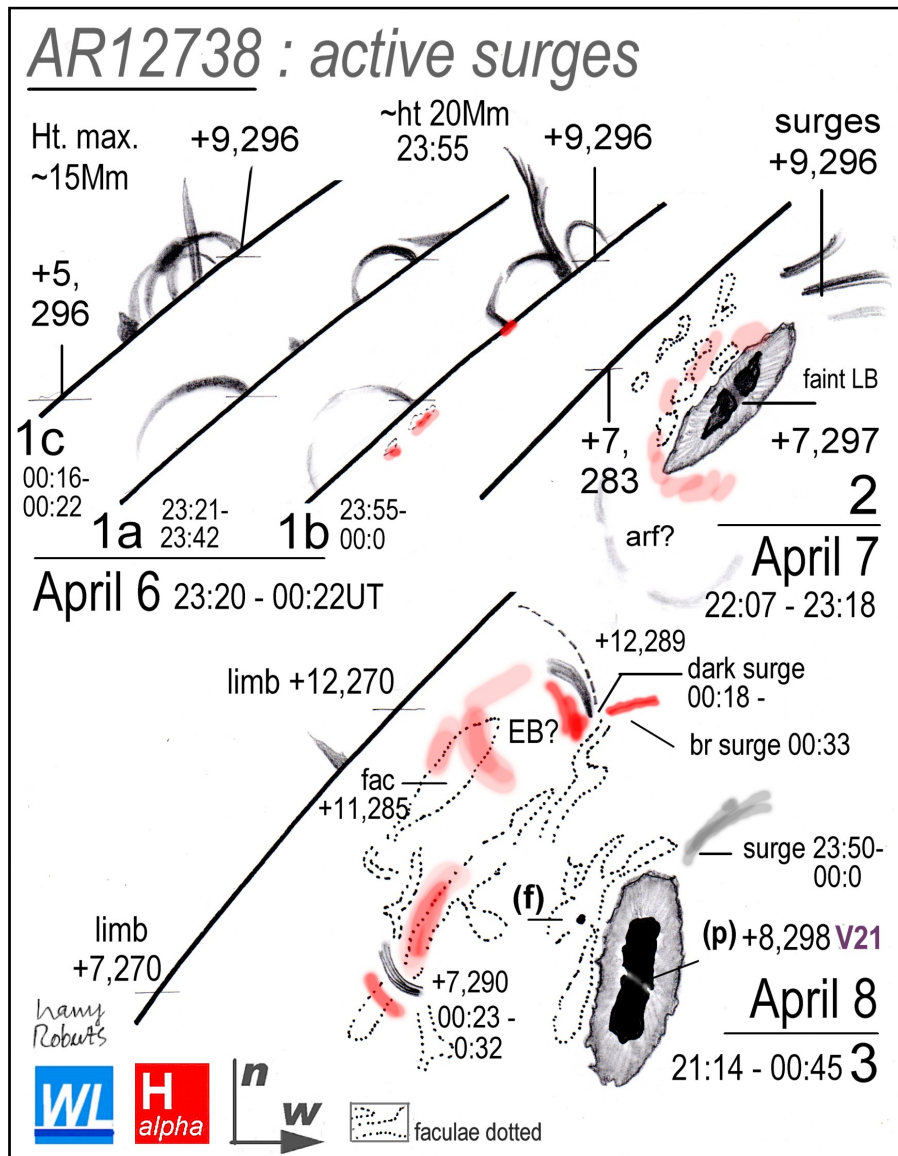
This, then, covers three LMC objects that are visible to the unaided eye or in small bino's (The Bar, the Tarantula and N11). In Part II of 'LMC Mud-Map' we will name and unveil more of the LMC's remarkable 'bits'.

Clear skies!

AR12738 and 12740: 'Salvoes of Surges'

While levels of solar activity are at cyclic lows, the Sun always has a trick or two up its sleeve! On 2019, Apr. 6, 23:06 (UT), a blank disc in white light came as no surprise. After a few minutes for routine chord transits, at 23:20, H-alpha was opened. Some minor prominences were logged around the disc, as well as two fairly bright loops low in the NE. It was soon clear these were active arches – and three detail logs were made (Figs 1a, b and c). They reached ~20Mm high and implied that a large simple spot lay just behind the limb at ~+7,296.

Next morning, April 7, as expected, a large round spot now lay 14 deg from the limb (Fig2).

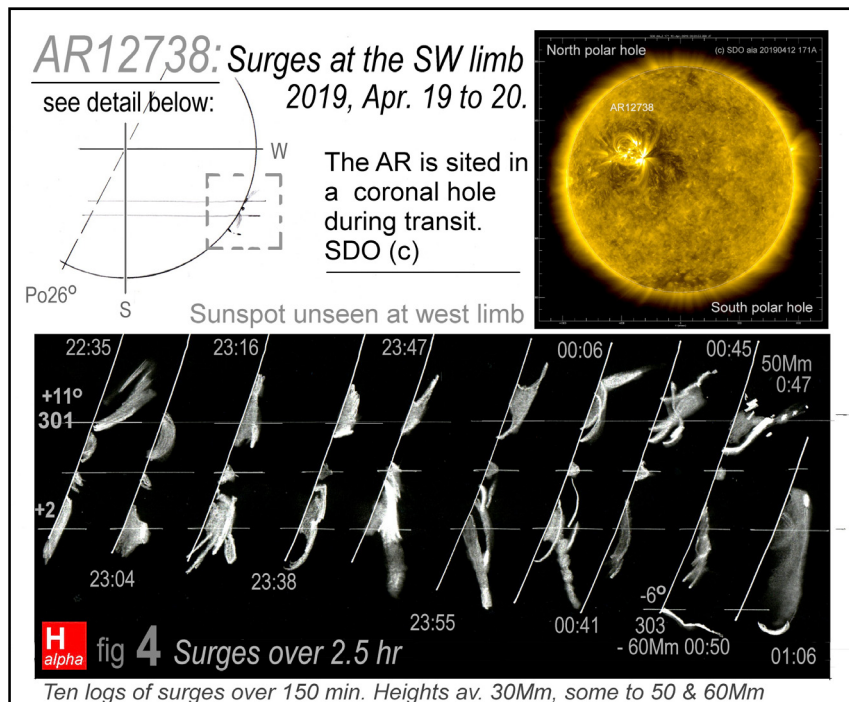


Solar News by Harry Roberts

Cont....2

It had an area ~400units, with some dark surges on its N side and a surprisingly large area of very bright faculae and plage on its following (f) side – that seemed to stretch to the limb. This was an unusual feature for a Hale alpha-class spot – unless that spot was sole-survivor of an earlier large beta group. No limb surges were recorded this session.

April 8 (Fig3) revealed a much more complex scene; one not typical of current spot activity. A small (f) spot lay just E of the (now) (p) big spot, still with a faint light bridge (LB) from the day before. But bright faculae were sited at +11,285 some 13deg behind the big (p) spot – with plage at the same site. Surges, both bright and dark, were erupting at +12,289, some 9deg behind the (p) spot! Another site 8deg behind the (p) was also active.



This intense activity covered a very large area – indeed would continue throughout the big spot’s disc transit. Yet no large flares occurred, but a GOES B4.5 ‘lit up’ the whole ‘following’ region of the big spot on Apr 11 at 12:34UT (outside my time zone) though the region of bright plage and some surges were logged 23:00UT.

April 19 (Fig 4) shows the remarkable display of surges when the spot lay on the Sun’s west limb. Now unseen, the big spot is sited centrally at lat.+7deg –while the “crown” of surges erupt both north and southward! The spot will return for more surging two weeks later. The April 12 SDO(c) 171A image shows the spot and its coronal loops nearing central meridian transit.

What are surges? Zirin (1986, P290-) tells us: in H-alpha “...surges are collimated eruptions normally produced by small flares at their base. Helen Dodson-Prince always felt the surge had to retrace its steps in order to qualify as a surge but nowadays we are not always so strict. When a surge does fall back we see a splash in the chromosphere”. (Helen’s Wiki page is worth a look: she is not so well known.)

So, surges arise near big round spots where flare ejecta shoots out as a narrow ‘jet’ collimated by the big spot’s magnetic fields; as Helen said, they mostly pause at the end of their trajectory before returning the way they came. They can be funny to watch! Our big spot, AR12738, was to host dozens of surges both bright and dark during its two weeks on the Sun and – on its return as AR12740 – dozens more.

Solar News by Harry Roberts

Cont....3

Mostly surges move at $\sim 100\text{km/sec.}$, so fast it causes strong Doppler-shifts in their wavelength; we need a filter with a good tuning range to see them. Remember, on the Sun, nothing is static; even 'stable' things are moving at $\sim \pm 5\text{km/sec!}$ Quickly tuning through the filter's full range will often show surges in action that are not seen in H-alpha centreline. The beauty of our Fabry-Perrot filters is that they are tuned by tilting, something we can do in real time.

Note that SDO EUV images (171A) show that our big spot (now on its second disc transit) is sited inside a large coronal hole; something we don't often see – and that might account for the spot's longevity and its strong surging. Enjoy H-alpha.

Sunny skies!

More Club News continued from page 1

The AGM was held at the July 2018 monthly meeting. Elected officials for 2018 - 2019

President: Frank Gross
Vice President: John Gould
Secretary/Treasurer: Tracey Newcombe
Public Officer; Frank Gross
Observation Officer: Robert Turnbull
Editor: Kaye Johnston
Librarian: Chris O'Hanlon

The Committee: Robert Turnbull, Rudolf Henssen, Robert Spruyt, Jack Apfelbaum, Chris O'Hanlon, John Gould

Check out the Astro Flyer on the web site: www.shoalhavenastronomers.asn.au

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The deadline for Articles for the Astro Flyer is The
First Friday of the Month.

Editor Kaye Johnston

Club Video Projector Rental

The Video Projector is available for club members for a small rental fee. If a club member would like to project a football game, cricket game onto a wall for a party this is the way to go. You will get up to a 100 inch diagonal picture on a light coloured wall with the Epson video projector. The projector has an inbuilt speaker but you can add your own speaker units if necessary. The unit s very easy to use and instruction would be given before the borrowing (2 days) occurs. The rental price is set at present at \$15 for two days.