Shoalhaven Astronomers Inc.
www.shoalhavenastronomers.asn.au
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AstrO Flyer

FEBRUARY 2019

Club News

Hello Everybody,

Lecture time again at the next meeting. Alan Plummer will be giving a talk on interesting astronomical items in our regular meeting room. Hope we can get a big turnout for him. The summary of Alan's talk appears page 2 in this issue. Yummy refreshments will be available.

The January 26th Club Viewing Night at the new viewing area just North of the Uni at West Nowra turned out to be a flop. Overcast clouds seemed to be lifting around 7:30 or so so I packed my binocs, camera, tripod and director's chair and drove to the Uni. Alas, the overcast became worse. I was going to try to take some time lapse of certain starry regions of the night sky but ended up returning home.

Frank Gross, President

Next monthly meeting will be held at the Shoalhaven Campus of the Uni of W'Gong, George Evans Road off Yawal Road, West Nowra, February 15th, 7pm for 7.30 start.

Contents

MOON PHASES

New Moon	First Quarter	Full Moon	Last Quarter
Mar 7	Feb 13	Feb 20	Feb 26

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 9 Mar (back-up night Sun 10 Mar) at the new viewing site. Go to the university on George Evans Road and go straight ahead through the second turning circle to the new viewing site.

More viewing nights Page 3

Summary of Alan Plummers talk on the 15th February:

"S Doradus is the class proto-type of the S Dor stars, also called Luminous Blue Variables, which class famously includes ETA Carinae and the Pistol Star here in our Milky Way. S Dor itself is a star that has captured the imagination of both science and science fiction writers for over a century. Remarkable, since the star is not even in our own Galaxy.

Known since Herschel's 1830s Cape of Good Hope survey, S Dor was first recognised as unusual by Williamina Fleming in 1897, and the star came to the attention of Sci-Fi writers soon after. In 1943 the light curve was interpreted to show a massive eclipsing binary with a 40 year period. However, the true nature of S Dor, and the class it represents, is still both elusive and hotly debated. And still, it features is popular fiction. Many of the S Dor stars are bright enough to observe with small telescopes, and anyone that chooses to do so can make a significant contribution to astronomy".

Regards

John Gould

OUT THERE
Bob Turnbull OBSERVATION OFFICER

FEBRUARY to MARCH

I Hope you are looking forward to some cooler nights and clearer skies to see what's on offer from that FEATURE PROGRAM up in the early sky!

PLANETS
VENUS
In February, it's in Sagittarius during the early morning eastern sky and from the 17th to the 21st it is seen 2 degrees from Saturn, like two bright "headlights"
This view will change in March when it is a bright 4th magnitude object in the eastern sky in the vicinity of the waning crescent Moon at 1 degree apart, in Capricornus (see Sky view).

MARS
Is near the waxing Moon on the 10th in Pisces and 1 degree from Uranus, which is visible with 8" to 12"inch mirror telescopes with ease on a clear night.
On the 21st of March it is at its autumnal equinox, when the Sun rises due east and sets due west, with equal hours of day and night. This planet will be in Aries, before moving into Taurus, near M45 in the Pleiades star cluster.

SATURN
Is rising in Sagittarius at 1am in March mid month, and on the 2nd morning viewers should see it when the waning Moon appears less than 1 degree away.

URANUS
Not much to see as in March it comes too close to Sun.

NEPTUNE:
Is near the brighter star Phi Aquarii, but do not confuse these two.

Good viewing to you all.
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.

Dates for Club/Social Viewing Nights for 2019 On Saturday Nights As Follows:

SHOALHAVEN ASTRONOMERS SUGGESTED VIEWING NIGHTS

FEBRUARY-JUNE 2019

Month	Saturday or Sunday	Place	Time
FEBRUARY	9th or 10th	Shoalhaven Campus	1 hr after s/set
MARCH	9th or 10th	"	"
APRIL	27th or 28th	"	"
MAY	11th	" or Woncur Rd.	"
JUNE	22nd or 23rd	" NEW SITE ??	"

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 3.

Eugene O'Connor

How often does the regular viewer face the frustration of waiting though the long lunar cycle for a clear, dark night only to be frustrated with a glorious clear sky that suddenly coincides with that of a Full Moon. The following article written many years ago offers another take on this dilemma.

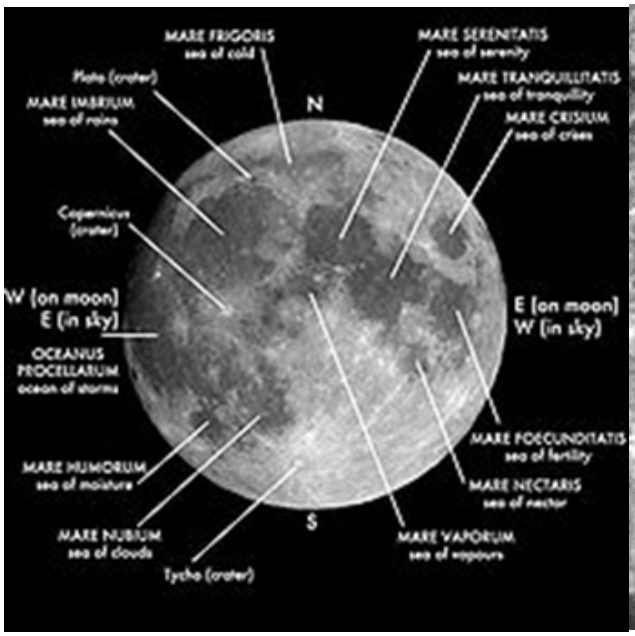
Dipping into The Sea Of Crises

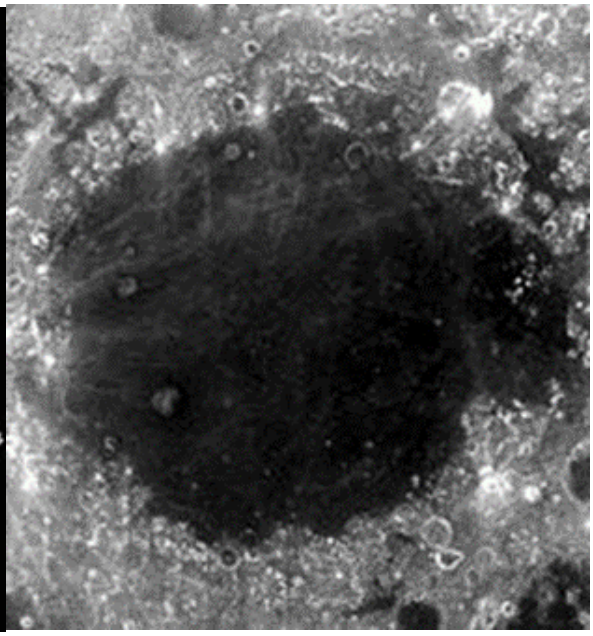
I wrote these general observations following a brief study of the full moon in 2005. They demonstrate that there is much to observe when we feel that the night sky is too bright, or cold and windy, wintry conditions make long periods of viewing unpleasant. The arrival of the full moon is also a great time to get familiar with some of the more obscure and seldom studied areas near the moon's edge when libration or tilting of the moon brings remote craters, mountain or seas, normally on the other side into view.

"I spent an intriguing half hour this evening gazing at the 15 day old Moon in the 25X100 binox. I think the comfortable viewing position (looking downwards) using both eyes and with such a wide field the sheer enormity and mystery of the Moon grows on me yet again. The radiating craters look like a deliberate piece of splash art work and tonight a white ray stretched like a straight line across the Sea of Tranquility.

Because of extended libation beyond the Sea of Crises, I was able to study two very unusual craters close to the shadow line that I had never viewed before. They were the very large walled plain Gauss with two well-defined interior craters and closer to Mare Crisium the delightful crater Hahn whose interior was just going into shadow giving it a strange key-hole effect.

Page 16 of the famous moon atlas by Antonin Rukl barely does this area a service. In fact, I was disappointed at how little Rukl shows of this seldom reached area.
However, such is the way with all astronomical guides, maps and pictures: when you experience the real thing all the viewing aids fade into insignificance."





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Other activities for full moon viewing include: planning and watching the occultation of the brighter stars in the moon's path through the heavens; making a study of and calculating the lengths of light rays which can radiate for hundreds of kilometers from some popular craters on full moon and calculating the smallest crater your telescope or binoculars can reveal.

The greatest pleasure of Moon viewing, apart from its mystery and vivid detail, is the fact that it is always full of surprises and never fails to present features that grab the eyes and the imagination. And the best part of this great viewing gift on our doorstep is the fact that even simple, cheap telescopes show ample rewarding features that change from night to night. In fact, if you can hold your binoculars steady and use a power of 10X or greater, the view of this massive, pitted heavenly ball leaves the best imaging in the shade.

Ever so often a Lunar Eclipse captures the attention of the media and the public. Names such as Blue Moon, Red Moon, Wolf Moon etc. all conjure mystery and intrigue. For the regular lunar observer little can touch the sudden surprise of the glowing yellow ball that suddenly appears after dark on the eastern horizon or hanging over the crepuscular predawn sky. There is nothing like the moon to recapture that early awakening of our lifelong interest in astronomy.

ISS Views the Moon

Astro Events from Frank Gross

Astronomers Are Tracking Four Potential Interstellar Objects Now In Our Outer Solar System

Bruce Dorminey

At any given time, there are a few thousand trapped objects within the solar systemWe do not know if they are comets, asteroids, or artifacts

Using detailed computer models of asteroidal-type objects between the Sun and Jupiter, two Harvard University researchers find that at least four known objects are likely to have origins from outside our solar system.

This artist's impression shows the first interstellar object discovered in the Solar System, Oumuamua. CREDIT: ESA/ HUBBLE, NASA, ESO, M. KORNMESSER

After becoming gravitationally-trapped, the four potentially interstellar objects --- 2011 SP25, 2017 RR2, 2017 SV13, and 2018 TL6 --- are thought to spend most of their time between the orbits of Jupiter and Neptune. However, during their closest approaches to the Sun, they do pass through Earth's neighborhood.

In a paper submitted to the Monthly Notices of the Royal Astronomical Society, Harvard co-authors Amir Siraj and Abraham Loeb, compare the orbital characteristics of theoretical high-inclination objects to those of the centaurs, the most similar population of known asteroids.

"We find that there should be hundreds of Oumuamua-size interstellar objects identifiable by Centaur-like orbits," write the authors. 1I/2017 U1 Oumuamua, the first bona fide interstellar object, was discovered Oct. 19, 2017 by the University of Hawaii's Pan-Starrs telescope. But the authors note that there should be at least 66 possible other interstellar objects in their calculations, ranging in diameter from roughly 100 meters to 10 kilometers in size.
And all of these potential interstellar interlopers should be detectable by the LSST (Large Synoptic Survey Telescope), currently under construction in Chile.

"The Sun-Jupiter system acts as a fishing net that collects interstellar objects," Harvard University astrophysicist Abraham Loeb told me. " At any given time, there are a few thousand trapped objects within the solar system ."
Our paper, says Loeb, shows that by focusing on objects at high inclinations to the plane of the solar system and on counter-rotating orbits to the planets, we can isolate interstellar objects. As for the four that the authors have thus far identified as potential interstellar objects -

" We do not know if they are comets, asteroids, or artifacts ," Amir Siraj, a Harvard University undergraduate in astrophysics, told me. Until these objects pass close to earth again, he says we won't be able to know. Siraj notes that of the four, object 2018 TL6 will make a close Earth approach in another twenty years.

Could they be artificial in origin?
"We do not have any evidence that these [four] objects are unnatural at this point," said Siraj.
They pass near Earth on timescales of some 20 to 120 years so it will be another 20 years until we can photograph one of them, he says. That is, unless someone designs a flyby mission that will visit one or more of them. The most likely source of interstellar objects is planetary systems that eject them during formation and development processes.
And as for Oumuamua which NASA classifies as a highly-elongated, rocky, cigar-shaped object with a somewhat reddish hue?

NASA's Spitzer infrared telescope data rules out typical cometary activity, says Loeb. And he says it also sets an upper limit on Oumuamua's size, which in turn implies a shiny surface, which is at least ten times more reflective than a typical asteroid.

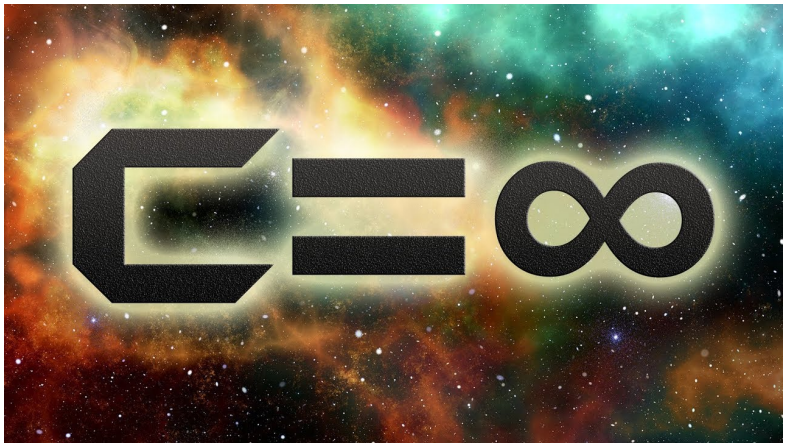
"These results are at odds with the properties of comets and asteroids in the solar system are fully consistent with an artificial origin," said Loeb.

Theory challenging Einstein's view on speed of light could soon be tested
New paper describes for first time how scientists can test controversial idea that speed of light is not a constant

By Ian Sample

Was Einstein wrong? Physicists challenge speed of light theory.

The newborn universe may have glowed with light beams moving much faster than they do today, according to a theory that overturns Einstein's century-old claim that the speed of light is a constant.



João Magueijo, of Imperial College London, and Niayesh Afshordi, of the University of Waterloo in Canada, propose that light tore along at infinite speed at the birth of the universe when the temperature of the cosmos was a staggering ten thousand trillion trillion celsius.

It is a theory Magueijo has being developing since the late 1990s, but in a paper published on Monday he and Afshordi describe for the first time how scientists can finally test the controversial idea. If right, the theory would leave a signature on the ancient radiation left over from the big bang, the so-called cosmic microwave background that cosmologists have observed with satellites.

"We can say what the fluctuations in the early universe would have looked like, and these are the fluctuations that grow to form planets, stars and galaxies," Afshordi told the Guardian.

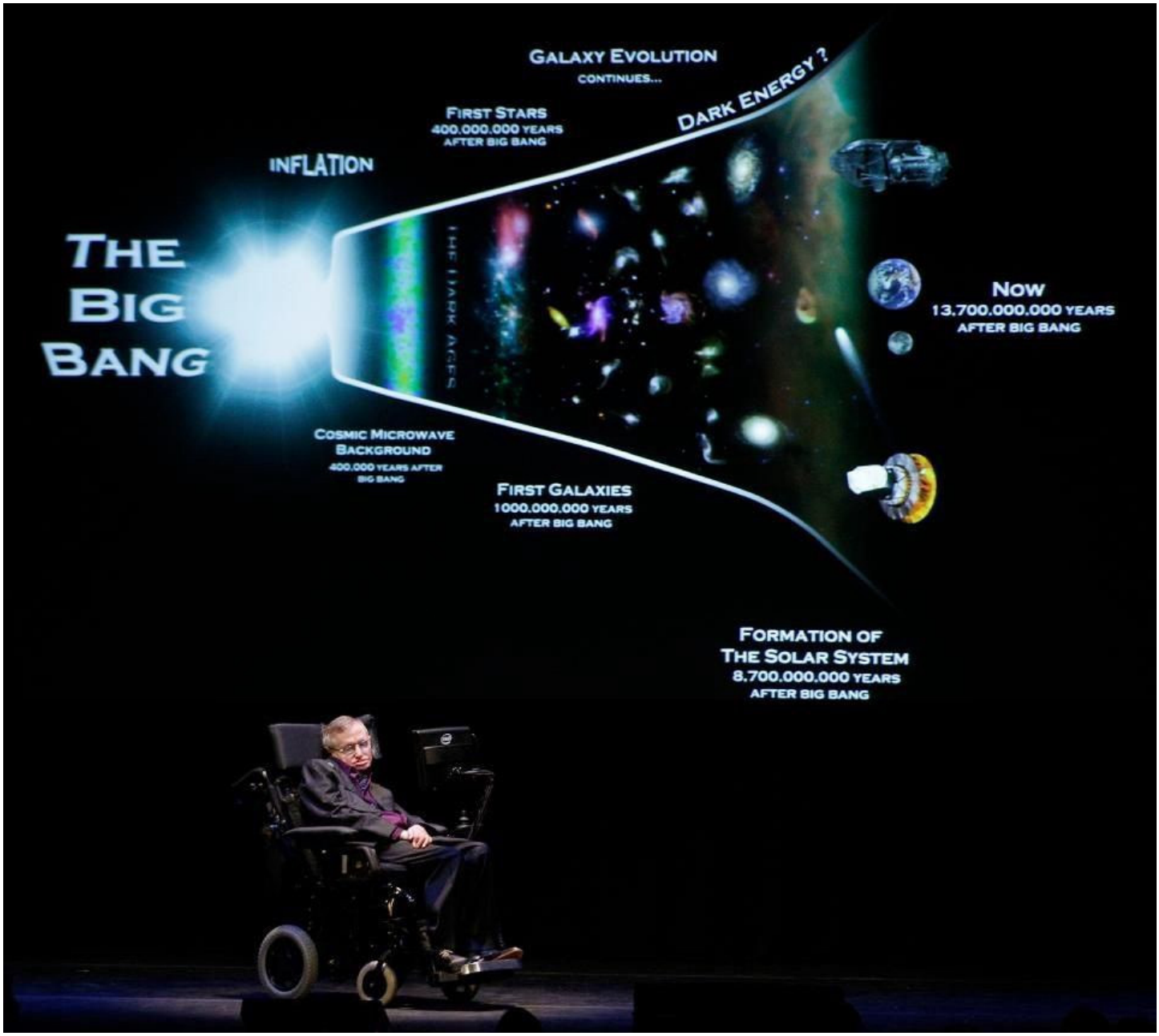
The speed of light in a vacuum is considered to be one of the fundamental constants of nature. Thanks to Einstein's theory of general relativity, it was stamped in the annals of physics more than a century ago at about 1bn km/h. But while general relativity is one of the cornerstones of modern physics, scientists know that the rules of today did not hold at the birth of the universe.

Cont...3

Albert Einstein

Thanks to Einstein's theory of general relativity, the speed of light in a vacuum is considered to be one of the fundamental constants of nature. Photograph: Hulton Archive/Getty Images

Magueijo and Afshordi came up with their theory to explain why the cosmos looks much the same over vast distances. To be so uniform, light rays must have reached every corner of the cosmos, otherwise some regions would be cooler and more dense than others. But even moving at 1bn km/h, light was not travelling fast enough to spread so far and even out the universe's temperature differences.



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To overcome the conundrum, cosmologists including Stephen Hawking have proposed a theory called inflation, in which the fledgling universe underwent the briefest spell of the most tremendous expansion. According to inflation, the temperature of the cosmos evened out before it exploded to an enormous size. But there is no solid proof that inflation is right, and if so, what sparked such a massive period of expansion, and what brought it to an end.

Magueijo and Afshordi's theory does away with inflation and replaces it with a variable speed of light. According to their calculations, the heat of universe in its first moments was so intense that light and other particles moved at infinite speed. Under these conditions, light reached the most distant pockets of the universe and made it look as uniform as we see it today. "In our theory, if you go back to the early universe, there's a temperature when everything becomes faster. The speed of light goes to infinity and propagates much faster than gravity," Afshordi said. "It's a phase transition in the same way that water turns into steam."

New simulation could shed light on dark energy and expansion of the universe

Scientists could soon find out whether light really did outpace gravity in the early universe. The theory predicts a clear pattern in the density variations of the early universe, a feature measured by what is called the "spectral index". Writing in the journal Physical Review, the scientists predict a very precise spectral index of 0.96478, which is close to the latest, though somewhat rough, measurement of 0.968.

Science can never prove the theory right. But Afshordi said that if measurements over the next five years shifted the spectral index away from their prediction, it would rule out their own theory. "If we are right then inflation is wrong. But the problem with inflation is that you can always fine tune it to fit anything you want," he said.

David Marsh, of the Centre for Theoretical Cosmology at Cambridge University, is not giving up on inflation yet. "The predictions of inflation developed by Stephen Hawking and others more than 30 years ago have been tested by cosmological observations and faced those tests remarkably well. Many scientists regard inflation as a simple and elegant explanation of the origin of galaxies in the universe," he said.

And while other theories might also look promising, Marsh said there were elements of Afshordi and Magueijo's that were not well understood. "It remains to be seen how robust the predictions are when all the theoretical issues have been addressed," he said.

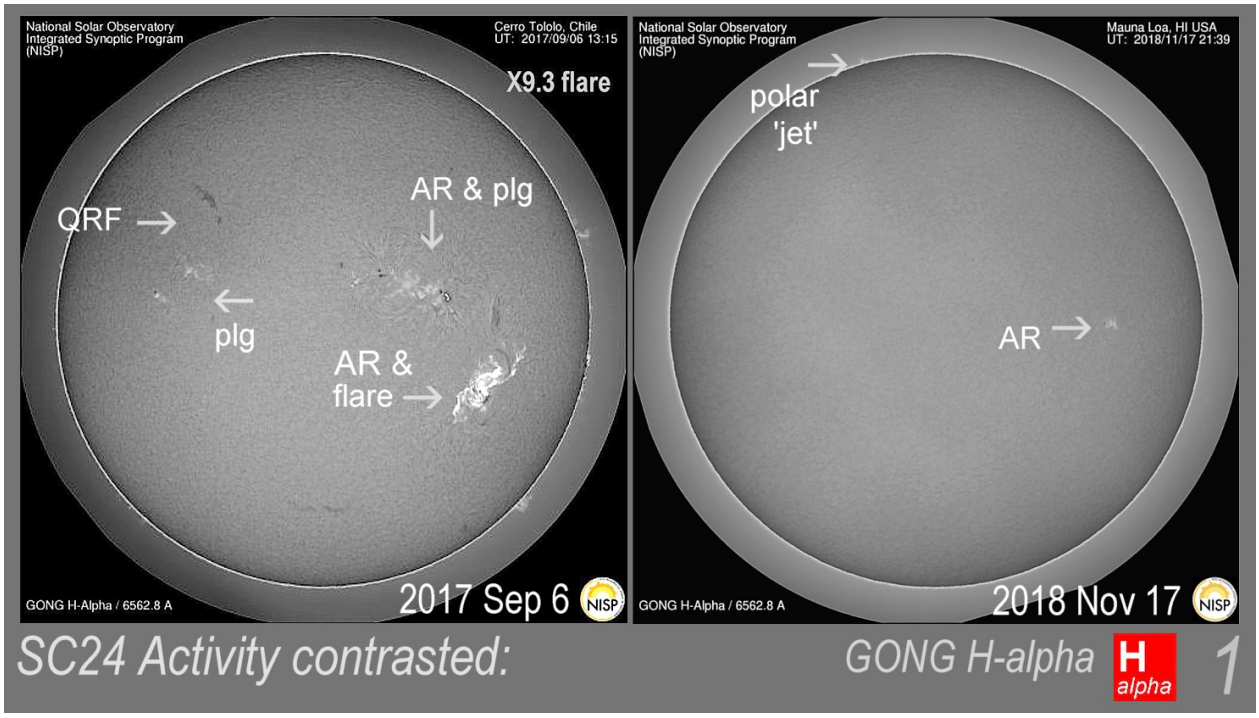
SC24 Solar Minimum: Puzzling Times? by Harry Roberts

Sunspot Cycle

Luckily for us, the Sun's energy output does not vary much, or Earth might be lifeless! But its magnetic activity varies greatly; it's a kind of 'variable star'. This was first noticed in the 17thC when the number of sunspots was seen to change from 'a lot' - to 'next to none' –over a decade or so.
300 years of study has shown that sunspots arise at high solar latitudes (~± 40°) as a new spot cycle begins and steadily migrate towards the equator over time; and the number of spots rises and falls over an eleven year period: the Sunspot Cycle. As the spots are magnetic and cooler than their surroundings, they look dark in a solar telescope.

Narrow band activity

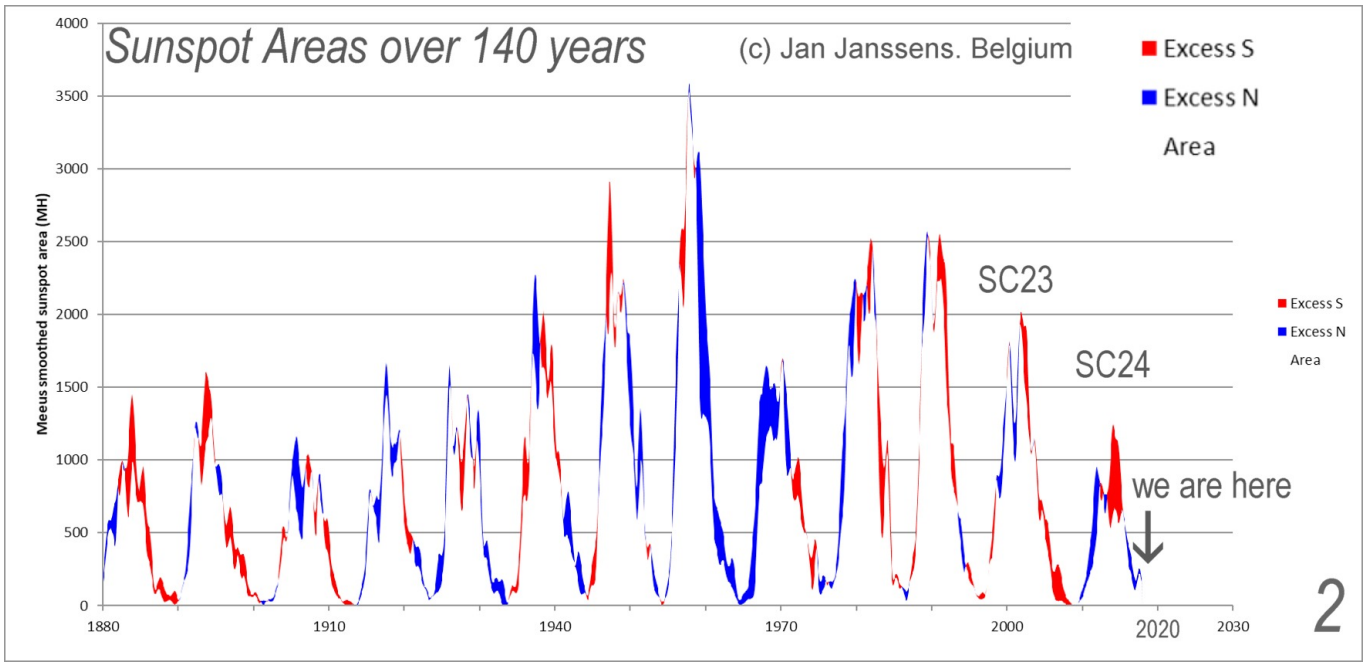
With the invention of monochromators and magnetographs (~1920's – 1950's) amazing transient activity was revealed in those sunspot zones: flares, surges, sprays etc; much more exciting than the spots themselves (!) but closely related. This narrowband/magnetic activity also rose and fell with the Sunspot Cycle. (Fig1 H-alpha 2yrs)



As well, they showed that magnetic fields in the 'migrating' activity zones varied from a 'mild' ± 50Gauss to a remarkable >4000G in big sunspots! How are solar fields so amplified? Most workers agreed that differential rotation within solar convection zones was the cause; but how? And what is driving the Sunspot Cycle?
200 years of records also show that the solar activity Cycle is far from a regular sine wave. Indeed, it may be a blend of several cycles with periods from a few years to a century or so – with a big variation between peak sunspot counts, areas and related activity over that time (Fig2 Spot Areas 140yr) (see over page).

SC24 Solar Minimum: Puzzling Times? by Harry Roberts

Con't...



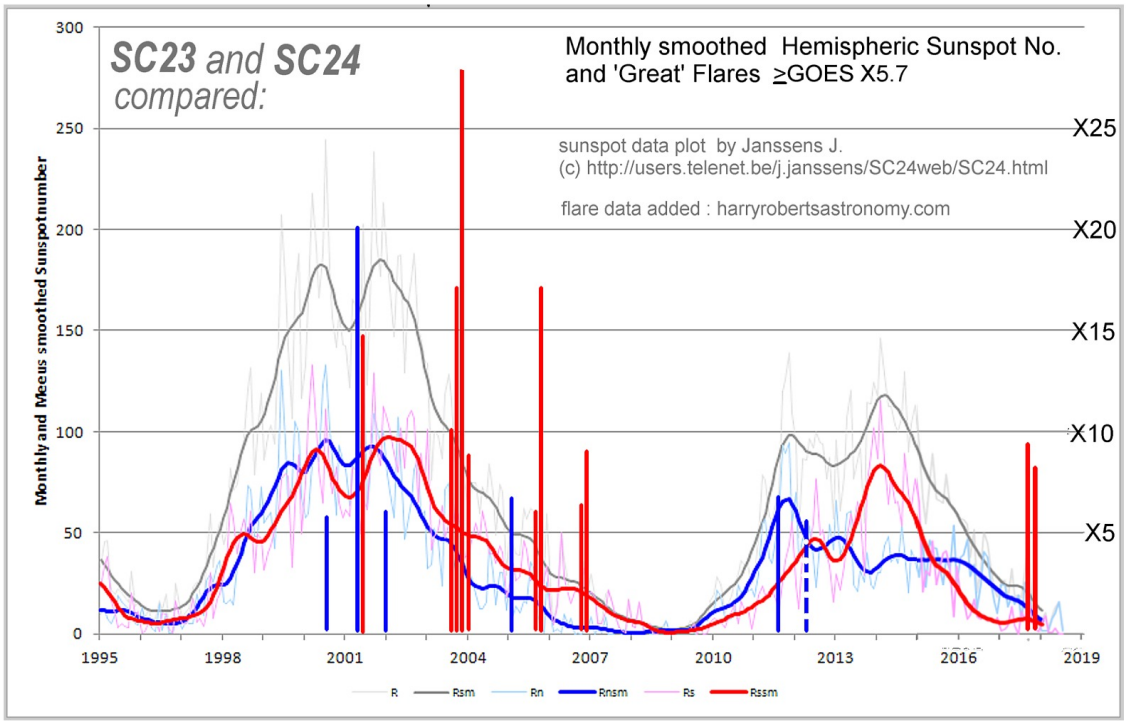
(Fig2 Spot Areas 140yr). A mathematical model that could predict future cycles would be a huge achievement! Many have tried - and failed! Let's compare the last two cycles.

Cycle 23 (1997 – 2008) had a strong spot Maximum (Relative Sunspot Number, RSN 180). As it ended, debate began over the expected maximum of Solar Cycle 24. Between 2002 and 2007 forty or so research teams offered their predictions (i.e. before SC24 started). Most predicted strong activity, like SC23: RSN~120 -180; but a small minority predicted much weaker activity: RSN~60-80.

SC24 Solar Minimum: Puzzling Times? by Harry Roberts

Con't...3

Cycle 24 (2009 to now). These latter teams were proved correct. The SC24 Maximum was to be ~RSN80 (Fig3); *just half* the previous Cycle number and now seen to be the weakest Sunspot Cycle since about 1880, i.e. for ~140yrs! And in late 2018 (a year before the expected Minimum) the SC24 RSN and related activity is, it seems, already near Solar Minimum levels! But is it?



(Fig3)

Those teams that predicted a very weak SC24 also made grim warnings about 'weakening fields' and the possible non-appearance of SC25! Warnings by now mostly forgotten.

Current Activity: **Spotless Days.** One way to assess solar activity is to count days without visible spots. In 2018 there were 221 'spotless' days, while in 2008, the last Minimum year, there were 268 such days: 47 days more! This shows (we think) that 2018 cannot yet be the SC24 Minimum; and that the Sun in 2019 will be a lot *less active* than the past year! Oh dear!

Caution. Checking, we find that 38 sunspots appeared in 2018 compared to 29 spots in 2008 – and that half the 2008 spots were 'new cycle' (SC24) ones! That is, the new cycle was by then active. In 2018 NO new cycle (SC25) spots or other activity has yet occurred! Recall those grave warnings about 'weakening fields' (cited above)! *New SC25 activity may not occur at all- we are warned!*

SC24 Solar Minimum: Puzzling Times? by Harry Roberts

Con't...4

2018 H-alpha Activity. Filaments (QRF) were rarely seen on the disc during the year, while prominences had grown very faint– yet both were conspicuous features throughout the 2008 Minimum (writer's logs). Since faint prominences are still logged the QRF must exist – but are undetectable (even by GONG network 0.4Å Hα cameras)! This also is likely due to weakening solar fields – in this case the 'quiet region' (filament) fields. Though faint, the 2018 prominences grew more numerous in the second half of the year. Why?

Flaring. Over SC24 flaring (writer's main interest) was starkly different to that of previous cycles for which we have data. Modern flare data covers only 42y from 1976: it's barely an archive! Yet SC24 flaring was extremely weak compared to previous cycles (Fig3).
The steady decline of sunspot (umbral) fields was cited by the few that rightly predicted a weak SC24 – and that the weakening would make visible spots in SC25 unlikely. Current logs suggest that both spots and filaments are, indeed, thus affected.

Signs of New Cycle Activity. What SC25 things might we expect? The last Minimum was a good guide. New cycle activity starts at high latitudes, at least ±30- 40deg. Patches of faculae or plage (plg in Fig1) may arise there before any visible spots. Spots, when they appear, will have REVERSED polarity. We can't see that, but the SDO HMI assembly can; they will tell us!

Quiet Upside? As we bemoan the lack of eruptive H-alpha features on the now almost blank solar disc (when a tiny spot makes 'headlines'.Fig1) there is an 'upside'! In any complex system that has activity-variation, the most important questions are: 'how active' can the system be - and 'how quiet' can it get? Over what period? This is essential for an understanding of variable stars, supernovae *and* the Sun.

Skipped Cycles? The last 'skipped' cycle was, apparently, before 1780, some 240y ago. Yet evidence of 'missing' cycles is debatable. Such 'Deep History' of the Sun relies on patchy records, tree rings, ice cores and other such proxies; so the 2010 prediction for SC25 is surely 'provocative'!

Provocative? Yet easily tested! For those interested, the current project is to monitor the disc for new-cycle spots. These SC25 spots will have reversed polarity from those of SC24 and arise at higher latitudes - while current cycle spots are near the equator and SDO magnetograms will show 'reversed' spot fields. Watching for 'reversed spots' is the current project and in the last weeks of 2018 none had yet appeared!

Excitement! This is an exciting time; the Sun *may* be doing something very different from the uniformly strong activity that marked the 20th century. You may like to join the few who closely study our star and its amazing activity: in 2019 the excitement will be high! Is a Skipped Cycle possible? *Is it already happening?*

NEBULAS IN ORION

Halpha photograph taken by Fabian Neyer and used with his permission. Harry showed this image at the last meeting and it is fantastic. It looks as if someone has laid out crushed red velvet to place the stars on. Look up his website.

http://www.starpointing.com/ccd/orion.html

http://www.starpointing.com

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.