New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 26 Issue 8 — September 2018 *When Printed, this Newsletter costs VAS at least £1*

Society News

Garlic Festival

Well the weather wasn't as bad as the last couple of years but, it was still windy and not exactly rain free.

Anyhow, the VAS volunteers did their bit, collected a good few pounds for our raffle and answered the questions of the many visitors to our display tent. The lucky winner of the telescope raffle was Caz, an Island resident.

Thanks to all those who helped over the weekend, I'm pleased to announce that we made a small profit over the event although, I'm sure if the weather had been a little better, we could have done rather better.

It was encouraging to have many people keen on visiting the observatory and maybe joining us. We should have some extra visitors in the next few weeks.

This time of year sees an increase in requests for group visits to the observatory so please keep an eye on page 2 for reservations. The funds raised from these special visits really do keep VAS in credit. Of course, Thursday "club nights" are not available to visiting groups.

Brian Curd
Editor New Zenith

VAS Website: wightastronomy.org

Submissions or letters to New Zenith are always welcome and should be sent to:

The Editor, New Zenith
Carpenter's Cottage
Dennett Road
Bembridge
Isle of Wight PO35 5XF
Tel: **01983 872875** or email: **editor@wightastronomy.org**

Material for the next issue by the 6th of the month please.

Registered Charity No 1046091

Observatory Diary

Monday, 19.30hrs	Members Only and by arrangement Telescope and night sky training. Please contact Martyn Weaver 07855 116490
Thursday	Members (19.30hrs) and Public (20.00hrs). Informal meeting and observing

VAS Website: wightastronomy.org

Contents this Month

Monthly meetings are held at the Newchurch Pavilion next to the Observatory and start at 19.30 unless stated.

2018 Monthly Meetings

Date	Subject	Speaker
Check *http://www.wightastronomy.org/meetings/* for the latest information		
24 Aug	**AGM from 19.00hrs** Members' Social Evening	
28 Sep	How Old is the Universe?	Stephen Tonkin
26 Oct	Dark Skies Stargazing Night	VAS/AONB
23 Nov	Noise Effects in Astronomical Processes	Dudley Johnson

2019 Monthly Meetings

Date	Subject	Speaker
Check *http://www.wightastronomy.org/meetings/* for the latest information		
25 Jan	TBA	TBA
22 Feb	Imaging the Sun	John Slinn
22 Mar	TBA	TBA
26 Apr	The Rise and fall of the Herstmonceux Observatory	Keith Brackenborough
24 May	Can we Live on Mars?	Greg Smye-Rumsby
28 June	Nuclear Physics - Life, the Universe and Everything!	Dr Elizabeth Cunnigham
26 July	Young Astronomers' Event	
23 Aug	AGM and Social Evening	
27 Sept	A transportable/deployable radio telescope for hydrogen line observation	Alan and Martin Thompson
25 Oct	Dark Skies Event	
22 Nov	TBA	TBA

Observatory Visits Booked

Oct 17	Carisbrook Brownies
Please phone me for the current situation (number on the front page)	
It would be appreciated if members could avoid using the observatory at these times.	

VAS Contacts 2017/18

President	Barry Bates president@wightastronomy.org
Chairman	Bryn Davis chairman@wightastronomy.org
Secretary	Richard Flux secretary@wightastronomy.org
Treasurer	Simon Plumley treasurer@wightastronomy.org
Observatory Director	Brian Curd director@wightastronomy.org
Programme Organisers	Elaine Spear progorg@wightastronomy.org
Astro Photography	Simon Plumley ap@wightastronomy.org
NZ Editor	Brian Curd editor@wightastronomy.org
Membership Secretary	Norman Osborn members@wightastronomy.org
NZ Distribution	Graham Osborne
Others	Mark Williams, Nigel Lee & Stewart Chambers

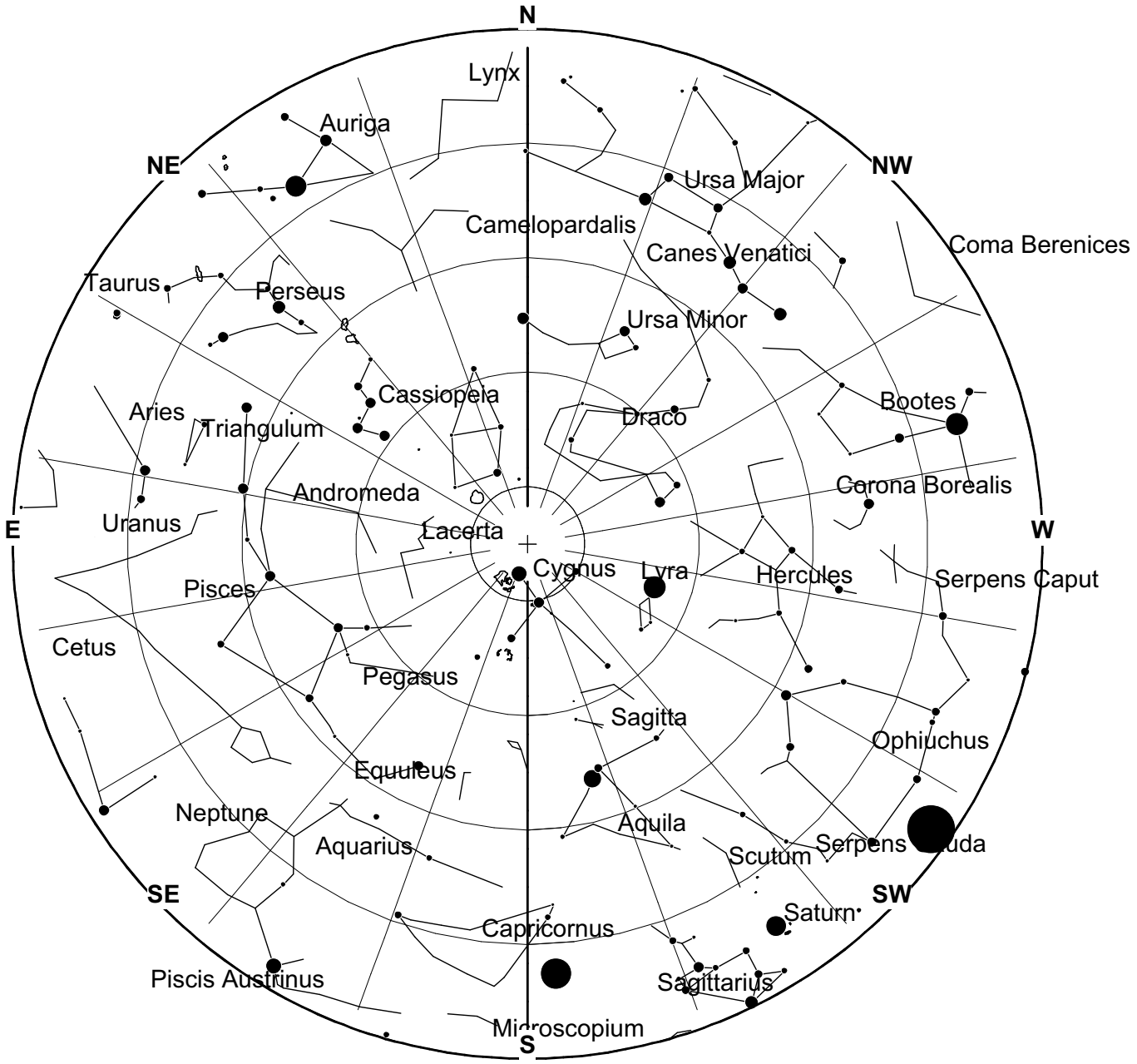
Important

Members using the observatory MUST enter a line or two in the Observatory Log Book.

On several occasions, lights, heaters and the Meade LX200 have been left on!

When leaving, please ensure all is secure and all lights, heaters and telescopes are TURNED OFF.

September 2018 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 September 2018

Collinder 399 (Cr 399) is a random grouping of stars located in the constellation Vulpecula near the border with Sagitta. Collinder 399 is known as Al Sufi's Cluster or Brocchi's Cluster. The brighter members of this star cluster form an asterism also known as the Coathanger.

It was first described by the Persian astronomer Al Sufi in his Book of Fixed Stars in 964.

In the 17th century, it was independently rediscovered by the Italian astronomer Hodierna.

In the 1920s, Dalmero Francis Brocchi, an amateur astronomer and chart maker for the American Association of Variable Star Observers (AAVSO), created a map of this object for use in calibrating photometers.

In 1931, Swedish astronomer Per Collinder listed it in his catalogue of open clusters

September 2018 Night Sky

Autumnal Equinox

The autumnal equinox, the moment at which the Sun crosses the equator on its way south and day and night are equal occurs on September 23rd at 02:53 UT.

Moon Phases

New	First Qtr	Full	Last Qtr
			
9th	17th	25th	3rd

Planets

Mercury

There are two apparitions of Mercury this month, a good show in the morning early in the month and the start of a very poor appearance in the evening sky at the end of the month. It will not be possible to see Mercury in the evening as very close to the horizon and sets just a few minutes after the Sun.

Azimuth & Altitude Of Mercury September 2018 at 06:00					
Date	**Az**	**Alt**	**Date**	**Az**	**Alt**
1	80	11	7	79	6
3	80	10	9	78	4
5	79	8	11	76	2

Venus

During the first weeks of the month Venus can be seen hanging low in the southwest at sunset, but by the end of the month it will have become lost to view, setting just 15 minutes after sunset. It will re-appear again in November as the Morning Star.

Mars

Mars is well placed for observation throughout the evening hours. Mid evening finds it in the south. It is brighter than any star in that part of the sky, but is now noticeably fainter than when at opposition, and through a telescope appears much smaller. Don't let this put you off observing with a telescope, there is still plenty to see. Make the most of it before it is too late and the surface features shrink away to invisibility.

Jupiter

Jupiter is currently unfavourably placed very low in the southwest as the sky darkens. It bright enough to be easily seen from a location with a good western horizon, but is too low for serious observation.

Saturn

After sunset Saturn can be found low in the south-southwest amongst the stars of Sagittarius.

Uranus

Uranus can be found in amongst the 'un-named' stars in the border country between Pisces and Aries. All the close by stars are faint and known only by their catalogue numbers. Use the finder chart in last month's New Zenith or a planetarium program to locate this outer planet. It is relatively bright not difficult to see with a pair of binoculars if you know exactly where to point them.

Neptune

Look a little below mid way between Phi and Lambda aquarii for Neptune. It forms an almost equilateral triangle with stars 81 & 82 Aquarii with Neptune being at the south-eastern point.

Deep Sky

M72 Globular Cluster
RA 20h 54m Dec -12° 31' mag 10.0

Visually a rather small globular but it can be forgiven its apparent size when you consider that it is on the other side of the galaxy from us. It can be just seen in binoculars and a small to medium sized telescope with some magnification is needed to resolve any of the stars. It is not as tightly packed in the core as many globulars.

M39 Open Cluster
RA 21h 32m Dec 48° 32' mag 4.5

The Milky Way is full of star clusters, many are dimmed by intervening dusts or are so surrounded by other stars that it can be difficult to identify them. M39 can be spotted with the naked eye under good conditions, it is large, about the size of the full moon, so binoculars or a rich field telescope are the best instruments to use to observe this triangular shaped cluster.

Collinder 399 The Coat Hanger Cluster
RA 19h 26m Dec 20°12' mag 3.6

The universe really does have a sense of humour; this is a coat hanger, floating above the starry background out there in the Milky Way. It can be seen with the naked eye as a brighter knot in the Milky Way just on the Vulpecula side of the border with Sagitta. Any optical aid shows the coat hanger with it's rather over sized hook. A telescope may be too much for this cluster unless the magnification can be kept very low. If a telescope is available try to spot NGC6802, this rather small magnitude 8.8 cluster would make the seventh and most eastward star in the bar of the hanger.

Peter Burgess

New Kind of Aurora is Not an Aurora at All

Alberta Aurora Chasers Capture Steve, The New-to-science Upper Atmospheric Phenomenon, on the evening of April 10, 2018 In Prince George, British Columbia, Canada.

Credit: Ryan Sault

Thin ribbons of purple and white light that sometimes appear in the night sky were dubbed a new type of aurora when brought to scientists' attention in 2016. But new research suggests these mysterious streams of light are not an aurora at all but an entirely new celestial phenomenon.

Amateur photographers had captured the new phenomenon, called STEVE, on film for decades. But the scientific community only got wind of STEVE in 2016. When scientists first looked at images of STEVE, they realized the lights were slightly different than light from typical auroras but were not sure what underlying mechanism was causing them.

In a new study, researchers analyzed a STEVE event in March 2008 to see whether it was produced in a similar manner as the aurora, which happens when showers of charged rain down into Earth's upper atmosphere. The study's results suggest STEVE is produced by a different atmospheric

Thin ribbons of purple and white light that sometimes appear in the night sky were dubbed a new type of aurora when brought to scientists' attention in 2016. But new research suggests these mysterious streams of light are not an aurora at all but an entirely new celestial phenomenon.

Amateur photographers had captured the new phenomenon, called STEVE, on film for decades. But the scientific community only got wind of STEVE in 2016. When scientists first looked at images of STEVE, they realized the lights were slightly different than light from typical auroras but were not sure what underlying mechanism was causing them.

In a new study, researchers analyzed a STEVE event in March 2008 to see whether it was produced in a similar manner as the aurora, which happens when showers of charged rain down into Earth's upper atmosphere. The study's results suggest STEVE is produced by a different atmospheric process than the aurora, making it an entirely new type of optical phenomenon.

"Our main conclusion is that STEVE is not an aurora," said Bea Gallardo-Lacourt, a space physicist at the University of Calgary in Canada and lead author of the new study in Geophysical Research Letters, a journal of the American Geophysical Union. "So right now, we know very little about it. And that's the cool thing, because this has been known by photographers for decades. But for the scientists, it's completely unknown."

The study authors have dubbed STEVE a kind of "skyglow," or glowing light in the night sky, that is distinct from the aurora.

Studying STEVE can help scientists better understand the upper atmosphere and the processes generating light in the sky, according to the authors.

"This is really interesting because we haven't figured it out and when you get a new problem, it's always exciting," said Joe Borovsky, a space physicist at the Space Science Institute in Los Alamos, New Mexico who was not connected to the new study. "It's like you think you know everything and it turns out you don't."

A different kind of light show

Auroras are produced when electrons and protons from Earth's magnetosphere, the region around Earth dominated by its magnetic field, rain down into the ionosphere, a region of charged particles in the upper atmosphere. When these electrons and protons become excited, they emit light of varying colors, most often green, red and blue.

A group of amateur auroral photographers brought STEVE to scientists' attention in 2016. A Facebook ground called the Alberta Aurora Chasers had occasionally noticed bright, thin streams of white and purple light running east to west in the Canadian night sky when they photographed the aurora.

More at: https://www.eurekalert.org/

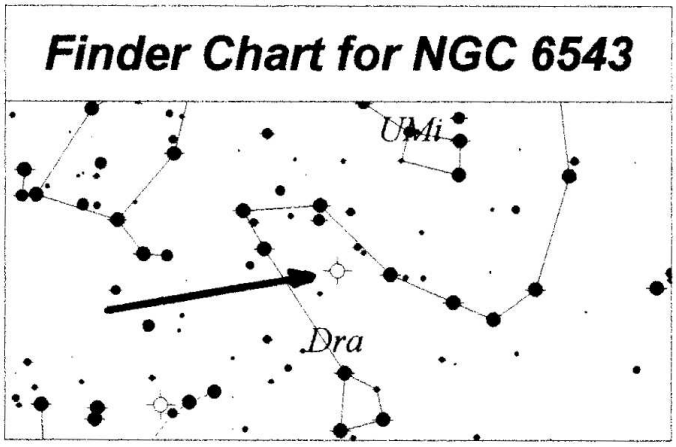
My 100 Best Night Sky Sights

Planetary Nebula

Coordinates: RA 17h 58m 24s, Dec +66' 38"

WARNING: Those of a nervous disposition should not observe this object alone.

On any clear night from May to September aim your telescope high in the northern sky to the constellation of Draco. Here, in the middle of the dragon's 'neck' is what is deemed by many to be one of the finest of all planetary nebulae – ***NGC6543***.



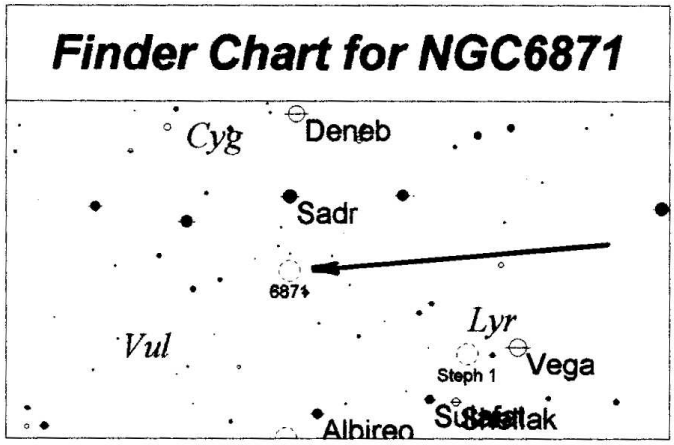
Depending on how you make your first acquaintance with this planetary you may or may not subscribe to this view. My first observation came whilst testing the accuracy of the Meade LX200 in locating small objects and placing them first time in a high power field. When the telescope indicated it had located NGC6543 I looked through the eyepiece and was taken aback by the strong impression that it was ***I*** who was being observed and not the other way around, for there staring at me from out of an inky black sky was this baleful green eye. Whoever gave this object its nickname must have had a similar experience for he (she?) called it '***the Cat's Eye Nebula'***.

The planetary is small, only 18″ arc minutes across (compare that with the Ring Nebula at around 70″) and at low magnifications looks like a blue-green, out-of-focus star, but crank up the power and it really does look like a cat's eye – quite uncanny.

Galactic Cluster

Coordinates: RA 20h 05m 54s, Dec +35' 47"

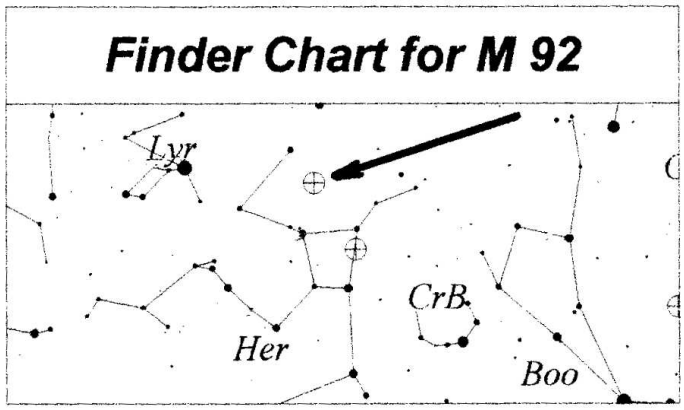
Talking of eyes, the next time you're wandering around the Cygnus neighbourhood from July to September, seek out the fine open cluster ***NGC6871*** and you'll discover some more. I'm frequently puzzled by the exclusion from many star atlases of some of the night sky's finest sights. NGC6871 is a case in point - of four such tomes readily available to me only one gives it a mention, describing it as inhabiting the 'downtown' area of the constellation



which may indicate to you the brilliance of the neighbourhood. Despite its position in one of the brightest areas of the Milky Way the cluster's 60 or so stars clearly stand out against the backdrop as a 'foreground' object. Embedded within the cluster which consists mainly of stars of 9th magnitude and less are two bright double stars looking just like two pairs of eyes. The cluster is best viewed with very low powers through any telescope when the 'eyes' stare at you out of a speckled 'face' – these night-time vigils can be quite scary at times.

Globular Cluster

Coordinates: RA 17h 17m 06s, Dec +43' 08"



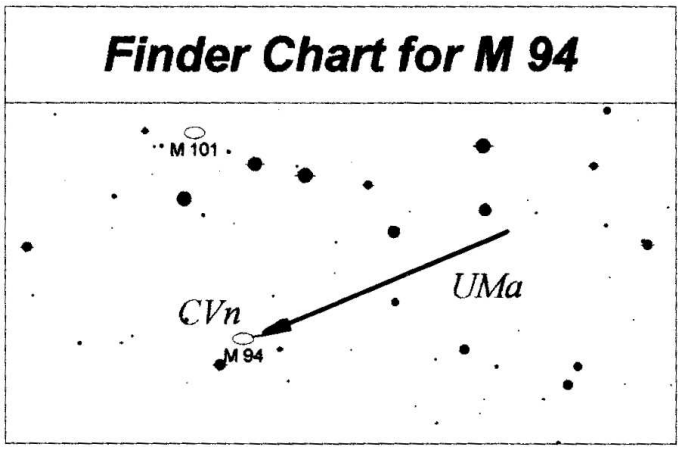
Among the finest sights in the sky are the great globular clusters, those seemingly impossible congregations of hundreds of thousands of stars huddled together in their gravitational grasp. Although at our latitude we are less well endowed with these glorious objects than our southern brethren we are still fortunate to have a couple of very fine examples well positioned for observation in the summer. One of these is ***M92*** whose only disadvantage is to inhabit the same constellation as the Northern Hemisphere's most illustrious globular, M13. So for once eschew the delights of M13 and visit M92 first – you won't be disappointed.

Situated some 6° due north of π Herculis, the top left star of the Keystone, M92 is just below naked eye visibility but, at magnitude 6.5 is easily recognised in any telescope. When first located in a 6″ it will show as a fuzzy blob, but change to a high power eyepiece and a sprinkling of minute stars will appear around the periphery as the increasing magnification darkens the sky. A 10″ at any power will provide a feast for the eyes, with pinpricks of light sparkling across the face of the cluster; the VAS Observatory instrument will invoke the "**wow**" factor. Almost directly overhead at the end of June, M92 is well placed for viewing for six weeks or so either side.

Spiral Galaxy

Coordinates: RA 12h 50m 54s, Dec +41° 07"

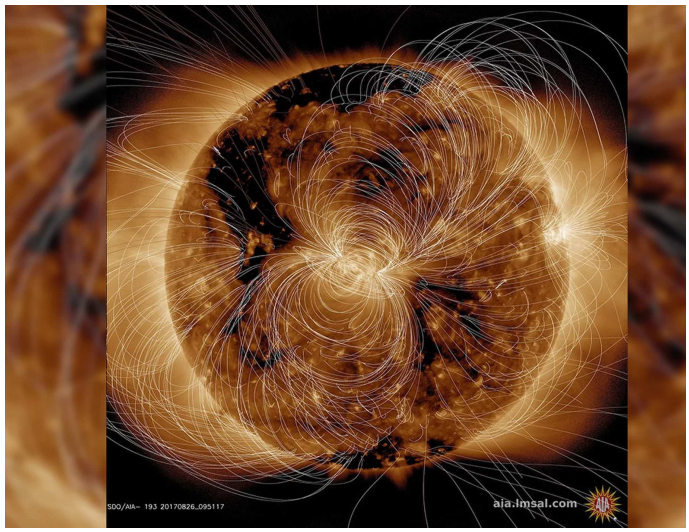
Mention 'Spiral Galaxy' and 'Canes Venatici' in the same breath and its Jupiter to Pluto that your auditor/reader will assume you're discussing the Whirlpool Galaxy (I did last month) and deservedly so for it is undoubtedly the most celebrated of all face-on spirals. For those of us with modest telescopes however, M51 has a rival in ***M94*** that is also face-on and probably easier to view.



Forming an flattened isosceles triangle with α and β CVn (the only significant stars in the constellation) M94 displays one of the brightest of all galactic nuclei to telescopes as small as 6″ which see it as a pinpoint of light shining through a faint haze. An 8″ brightens the 'haze' and a 10″ shows it as a ring of nebulous material surrounding the bright stellar core with dark sky between – as close as we come to seeing spiral structure with telescopes of this size. As with M13 and M92 don't be mesmerised by M51 to the exclusion of M94 –very worth while some of your viewing time in spring.

Bert Paice
Originally published in NZ - April 1999

Stunning NASA Image Lets You Watch the Sun Explode in Real Time



The sun is a ball of invisible, electromagnetic explosions. This stunning ultraviolet image taken by NASA's Solar Dynamics Observatory models what those swirling electric field lines actually look like.

Credit: Solar Dynamics Observatory, NASA

Don't be alarmed, but the sun is constantly exploding. While violent nuclear fusion reactions power the sun's 27-million-degree-Fahrenheit (15 million degrees Celsius) core, towers of molten plasma, crackling radiation and electromagnetic energy rise and fall from the star's blazing surface in a constant tangle of heat and light.

It's pretty cool — and almost completely invisible to human eyes. Thankfully, researchers at NASA's Solar Dynamics Observatory have used computer models to capture snapshots of this unseen solar energy every day. Yesterday (Aug. 16), they shared one of those snapshots, which you can see above. [Sun Storms: Incredible Photos of Solar Flares]

In the computer-enhanced ultraviolet photo, you can see a model of the sun's magnetic-field lines swirling out of the star's surface the way they appeared on Aug. 10, 2018. Each white line represents a powerful electromagnetic eruption resulting from high-energy interactions between the ultrahot, supercharged particles that make up both the sun's magnetic field and the plasma writhing around the star's surface.

As you can see from the image, some of those streams of energy blast far into space, creating solar winds and other space weather, while others rise from the sun's surface, spin around and fall back down again in closed loops. These returning loops of magnetic energy can further stir the pot of charged particles on the sun's surface,

resulting in more and greater explosions of solar weather, including solar flares and big belches of radiation known as coronal mass ejections.

It may look like there's a lot going on, but historically speaking, the sun is actually experiencing a bit of a slow season right now. Scientists don't know exactly why, but the sun's magnetic field seems to follow a pretty reliable 11-year cycle of activity in which these loops of solar energy grow progressively larger and more complicated before resetting to a relatively stable state. Toward the end of each cycle, the sun radiates more, sunspots become more frequent, and powerful solar storms are more likely to blaze off of the sun's surface and deep into space.

Once the magnetic field reaches a point of maximum activity — or its solar maximum — the star's magnetic poles flip, and a new period of relative inactivity begins again. (This new beginning, as you might deduce, is called the "solar minimum.")

The last solar maximum occurred in April 2014 and, according to NASA, was pretty weak by the sun's historical standards. One of the largest solar storms on record, the so-called Carrington event, for example, occurred near a solar maximum in 1859. When the massive wave of solar energy slammed into Earth, telegraph wires shorted out and burst into flame, and a beautiful aurora — usually visible only from polar latitudes — shimmered in the sky as far south as Cuba and Hawaii. Fortunately, 2014 was much less eventful.

Full Article with Links: https://www.space.com/

35% of all known exoplanets are 'water worlds', researchers find

Do atmospheres of steam, with oceans of liquid water, and ice-encrusted rocks sound like the kind of planet you'd expect anywhere but here?

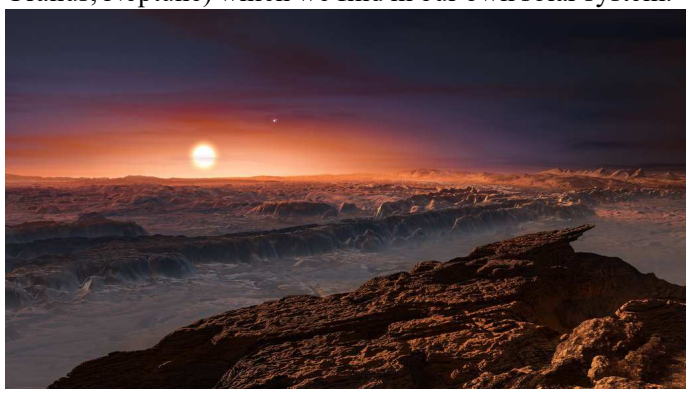
Turns out, after scientists studied 4,000 known exoplanets (a planet surrounding a star outside of our solar system), fully one-third of them—or 1,400 of those 4,000—were found to be water-rich worlds. In some cases, as much as 50% of the weight of the planets is water. (By comparison, the Earth is only 0.02 per cent water weight.)

"It was a huge surprise to realize that there must be so many water-worlds," said lead researcher Dr Li Zeng of Harvard University.

Water of some kind means they could have life on them... but perhaps not anything we've conceived of before.

"This is water, but not as commonly found here on Earth," said Li Zeng. "Their surface temperature is expected to be in the 200 to 500 degree Celsius range. Their surface may be shrouded in a water-vapor-dominated atmosphere, with a liquid water layer underneath.

Li Zeng continued, "Our data indicate that about 35% of all known exoplanets which are bigger than Earth should be water-rich. These water worlds likely formed in similar ways to the giant planet cores (Jupiter, Saturn, Uranus, Neptune) which we find in our own solar system."



In this NASA digital illustration handout released on February 22, 2017, an artist's concept allows us to imagine what it would be like to stand on the surface of the exoplanet TRAPPIST-1f, located in the TRAPPIST-1 system in the constellation Aquarius.

Interestingly, all of the planets studied ended up being 1.5 to 2.5 times the size of Earth. And there's a correlation between the sizes; using their models, it turns out that planets 1.5 times the size of the Earth are very likely to be rocky, and 2.5 times our size, water worlds.

The paper and research, presented at the Goldschmidt Conference in Boston this week, confirms what has long been suspected: We're not the only water-rich world out there.

Scientists used the Kepler Space Telescope, specifically designed to hunt for exoplanets, and the Gaia mission to find these planets, but two new tools will soon be available to dig much deeper.

Li Zeng continued. "The newly-launched TESS mission will find many more of them, with the help of ground-based spectroscopic follow-up. The next generation space telescope, the James Webb Space Telescope, will hopefully characterize the atmosphere of some of them. This is an exciting time for those interested in these remote worlds."

TESS (Transiting Exoplanet Survey Satellite) was launched in April, 2018, and the James Webb Space Telescope is due to be launched in 2021.

Full Article with Links: https://bigthink.com/

Light From Ancient Quasars Helps Confirm Quantum Entanglement

Last year, physicists at MIT, the University of Vienna, and elsewhere provided strong support for quantum entanglement, the seemingly far-out idea that two particles, no matter how distant from each other in space and time, can be inextricably linked, in a way that defies the rules of classical physics.

Take, for instance, two particles sitting on opposite edges of the universe. If they are truly entangled, then according to the theory of quantum mechanics their physical properties should be related in such a way that any measurement made on one particle should instantly convey information about any future measurement outcome of the other particle -- correlations that Einstein skeptically saw as “spooky action at a distance.”

In the 1960s, the physicist John Bell calculated a theoretical limit beyond which such correlations must have a quantum, rather than a classical, explanation.

But what if such correlations were the result not of quantum entanglement, but of some other hidden, classical explanation? Such “what-ifs” are known to physicists as loopholes to tests of Bell's inequality, the most stubborn of which is the “freedom-of-choice” loophole: the possibility that some hidden, classical variable may influence the measurement that an experimenter chooses to perform on an entangled particle, making the outcome look quantumly correlated when in fact it isn't.

Last February, the MIT team and their colleagues significantly constrained the freedom-of-choice loophole, by using 600-year-old starlight to decide what properties of two entangled photons to measure. Their experiment proved that, if a classical mechanism caused the correlations they observed, it would have to have been set in motion more than 600 years ago, before the stars' light was first emitted and long before the actual experiment was even conceived.

Now, in a paper published today in Physical Review Letters, the same team has vastly extended the case for quantum entanglement and further restricted the options for the freedom-of-choice loophole. The researchers used distant quasars, one of which emitted its light 7.8 billion years ago and the other 12.2 billion years ago, to determine the measurements to be made on pairs of entangled photons. They found correlations among more than 30,000 pairs of photons, to a degree that far exceeded the limit that Bell originally calculated for a classically based mechanism.

“If some conspiracy is happening to simulate quantum mechanics by a mechanism that is actually classical, that mechanism would have had to begin its operations -- somehow knowing exactly when, where, and how this experiment was going to be done -- at least 7.8 billion years ago. That seems incredibly implausible, so we have very strong evidence that quantum mechanics is the right explanation,” says co-author Alan Guth, the Victor F. Weisskopf Professor of Physics at MIT.

“The Earth is about 4.5 billion years old, so any alternative mechanism -- different from quantum mechanics -- that might have produced our results by exploiting this loophole would've had to be in place long before even there was a planet Earth, let alone an MIT,” adds David Kaiser, the Germeshausen Professor of the History of Science and professor of physics at MIT. “So we've pushed any alternative explanations back to very early in cosmic history.”

Guth and Kaiser's co-authors include Anton Zeilinger and members of his group at the Austrian Academy of Sciences and the University of Vienna, as well as physicists at Harvey Mudd College and the University of California at San Diego.

A decision, made billions of years ago

In 2014, Kaiser and two members of the current team, Jason Gallicchio and Andrew Friedman, proposed an experiment to produce entangled photons on Earth - a process that is fairly standard in studies of quantum mechanics. They planned to shoot each member of the entangled pair in opposite directions, toward light detectors that would also make a measurement of each photon using a polarizer. Researchers would measure the polarization, or orientation, of each incoming photon's electric field, by setting the polarizer at various angles and observing whether the photons passed through -- an outcome for each photon that researchers could compare to determine whether the particles showed the hallmark correlations predicted by quantum mechanics.

The team added a unique step to the proposed experiment, which was to use light from ancient, distant astronomical sources, such as stars and quasars, to determine the angle at which to set each respective polarizer. As each entangled photon was in flight, heading toward its detector at the speed of light, researchers would use a telescope located at each detector site to measure the wavelength of a quasar's incoming light. If that light was redder than some reference wavelength, the polarizer would tilt at a certain angle to make a specific measurement of the incoming entangled photon -- a measurement choice that was determined by the quasar. If the quasar's light was bluer than the reference wavelength, the polarizer would tilt at a different angle, performing a different measurement of the entangled photon.

In their previous experiment, the team used small backyard telescopes to measure the light from stars as close as 600 light years away. In their new study, the researchers used much larger, more powerful telescopes to catch the incoming light from even more ancient, distant astrophysical sources: quasars whose light has been traveling toward the Earth for at least 7.8 billion years -- objects that are incredibly far away and yet are so luminous that their light can be observed from Earth.

Tricky timing

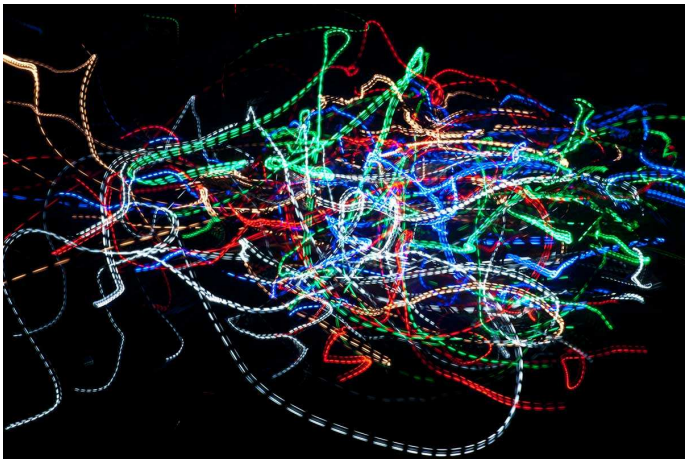
On Jan. 11, 2018, "the clock had just ticked past midnight local time," as Kaiser recalls, when about a dozen members of the team gathered on a mountaintop in the Canary Islands and began collecting data from two large, 4-meter-wide telescopes: the William Herschel Telescope and the Telescopio Nazionale Galileo, both situated on the same mountain and separated by about a kilometer.

One telescope focused on a particular quasar, while the other telescope looked at another quasar in a different patch of the night sky. Meanwhile, researchers at a station located between the two telescopes created pairs of entangled photons and beamed particles from each pair in opposite directions toward each telescope.

In the fraction of a second before each entangled photon reached its detector, the instrumentation determined whether a single photon arriving from the quasar was more red or blue, a measurement that then automatically adjusted the angle of a polarizer that ultimately received and detected the incoming entangled photon.

"The timing is very tricky," Kaiser says. "Everything has to happen within very tight windows, updating every microsecond or so."

More at: https://www.eurekalert.org/



The latest in a new generation of giant telescopes broke ground this week

Space is hot.

Thanks to new rockets built by the private sector and the remarkable discovery of evidence of water on Mars, space flight and exploration are receiving more attention now than they have in decades. Soon, it won't just be Earth's immediate neighborhood in the news, either.

Construction began this week on the Giant Magellan Telescope in Chile, a mammoth, $1 billion project designed to see to the very edge of the universe. The telescope, scheduled to begin operation in 2024, will have an array of seven enormous mirrors totaling 80 feet in diameter, giving it 10 times the precision of the Hubble telescope. Among its advances is technology to help it correct for the distorting effect of Earth's atmosphere by using software to make hundreds of adjustments per second to its array of secondary mirrors.

The project's architects, a consortium of universities and institutions in the US, Korea, and Australia, chose to build in Chile's Atacama desert for its clear, dry skies. Astronomers will use the Magellan Telescope to study the origins of elements and the birth of stars and galaxies, and to examine planets that have been identified as potentially harboring life.

The Giant Magellan Telescope is but one of several gigantic new telescopes expected to begin operation in the next decade. Also in Chile, the aptly-named European Extremely Large Telescope—a project funded by 15 European countries—will search the sky with a mirror 40 meters in diameter. In Hawaii, a team of American, Canadian, Japanese, Chinese, and Indian institutions are planning the very literally named Thirty Meter Telescope (it has, of course, a 30-meter diameter) for atop Mauna Kea, although local objections to its placement have stalled its progress.

And in 2021, NASA's James Webb Space Telescope will launch. Intended to succeed the Hubble, the Webb won't orbit Earth liked its predecessor. Instead, it will orbit the Sun, at a distance 1.5 million kilometers from Earth, 2,500 times farther from us than Hubble. In deep space, it will have the conditions necessary to find the universe's most distant galaxies yet to be seen.

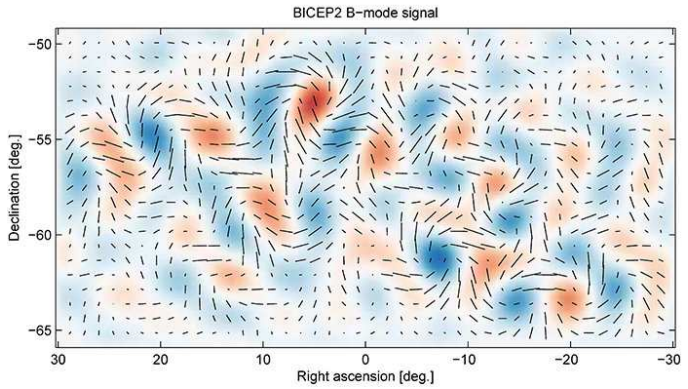
Links and more at: https://qz.com/

Radioactive Swirls in the Cosmos May Rewrite the Origin Story of the Universe

Swirls of radiation in the cosmos may mean another universe has come this way before. (pixabay)

The idea is called “conformal cyclic cosmology” (CCC), and what it asserts is that, rather than starting from a big bang, the universe continually expands and contracts, each time leaving behind tiny bits of electromagnetic radiation that remain as the process occurs over and over. The late Stephen Hawking predicted tiny dots of radiation, which others call 'Hawking points', left over from this cycle. Now, the scientists behind CCC theory say they can see possible examples of 'Hawking radiation' in a map created by a radio telescope at the South Pole. They’ve dubbed them 'Hawking holes'. “I think,” says team leader, Oxford’s Roger Penrose, “he would have been delighted to see the actual effect he predicted in an observation.”

In 2014, the BICEP2 South Pole telescope captured images in which there were swirls of polarized light in the cosmic microwave background (CMB). The BICEP2 team interpreted these swirls as artifacts of gravitational waves from the expansion occurring after the Big Bang, and say that subsequent data from the Planck observatory suggests that these 'B-modes' are interstellar dust.



B-mode polarisation patterns. Credit: BICEP2.

The idea is called “conformal cyclic cosmology” (CCC), and what it asserts is that, rather than starting from a big bang, the universe continually expands and contracts, each time leaving behind tiny bits of electromagnetic radiation that remain as the process occurs over and over. The late Stephen Hawking predicted tiny dots of radiation, which others call 'Hawking points', left over from this cycle. Now, the scientists behind CCC theory say they can see possible examples of 'Hawking radiation' in a map created by a radio telescope at the South Pole. They’ve dubbed them 'Hawking holes'. “I think,” says team leader, Oxford’s Roger Penrose, “he would have been delighted to see the actual effect he predicted in an observation.”

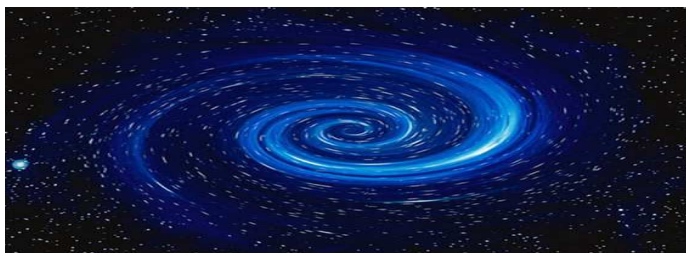
In 2014, the BICEP2 South Pole telescope captured images in which there were swirls of polarized light in the cosmic microwave background (CMB). The BICEP2 team interpreted these swirls as artifacts of gravitational waves from the expansion occurring after the Big Bang, and say that subsequent data from the Planck observatory suggests that these 'B-modes' are interstellar dust.

Some say the map on which Penrose is basing his conclusions isn’t really accurate enough to take so seriously. The BICEP2 team hasn’t yet released that data from which the map was generated, and there’s a certain amount of rounding-off in the map Penrose is working from. Huge areas of space are represented by single pixels in the image, so there’s insufficient detail present in any one pixel to make it that useful for serious analysis. The raw data, when released, will be more granular in the information it presents.

Even so, Penrose’s faith in the image he has is based on his teams' models that predict what the map seems to show. His colleague Daniel An says, “That means they were probably caused not by chance, but by some physical phenomenon.” The team’s analysis of the corresponding Planck data verifies that the swirls aren’t just visual artifacts, but that there is really at least something there. Something consistent with their 4,000 CCC simulations.

If conformal cyclic cosmology is correct, the Big Bang theory isn’t. Of course, before such an extraordinary shift in perspective occurs, equally strong evidence for CCC will be necessary. Still, Penrose’s idea—though preliminary, pending receipt of the BICEP2 data—is tantalizing. “What we claim we’re seeing,” he says, “is the final remnant after a black hole has evaporated away in the previous eon.” Make that the previous universe.

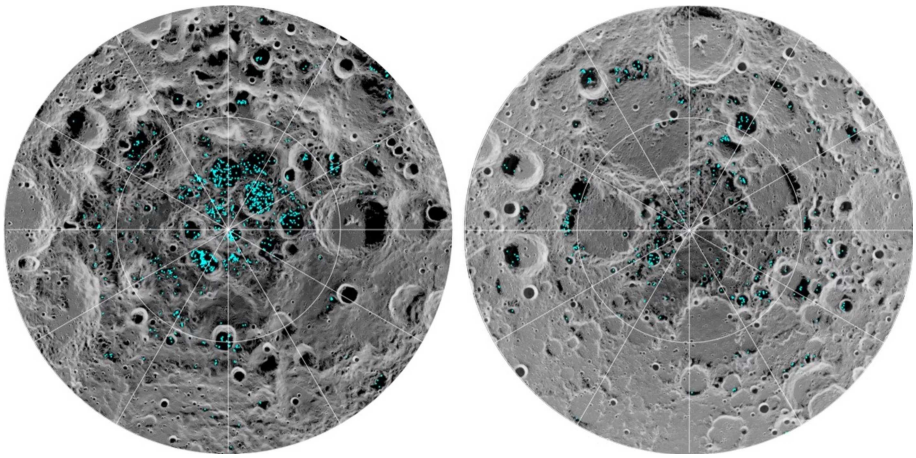
More at: https://bigthink.com/



THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

Discovery of Water Ice on the Moon Thrills Lunar Scientists



This image shows the distribution of surface ice at the moon's south pole (left) and north pole (right), as detected by NASA's Moon Mineralogy Mapper instrument, which flew aboard India's Chandrayaan-1 spacecraft. Credit: NASA

Scientists who study the moon are beaming about the new discovery of exposed water ice in lunar polar regions.

Using data from NASA's Moon Mineralogy Mapper (M3) spectrometer experiment, a team of researchers — led by Shuai Li iof the University of Hawaii and Brown University — found direct evidence of water ice on the lunar surface, in permanently shadowed areas in polar craters.

M3 flew aboard the Indian Space Research Organization's Chandrayaan-1 spacecraft, which studied the moon from orbit in 2008 and 2009. [The Search for Water on the Moon in Pictures]

Previous data could not confirm the existence of water ice on the moon's surface, but Li et al. provide solid evidence for its presence in their study, which was published online this week in the journal Proceedings of the National Academy of Sciences.

More at: https://www.space.com/

Observatory

For your own safety, please bring a torch. Also, please make sure you close and lock the car park gate if you are the last to leave - if you need the combination to the lock, please contact a member of the committee.

Articles Needed

NZ needs letters, articles, reviews or pictures related to astronomy. Contact details on page 1.

"Physics isn't a religion. If it were, we'd have a much easier time raising money"
Leon M. Lederman

"I do not fix problems. I fix my thinking. Then problems fix themselves"
Louise Hay

"If all of mathematics disappeared, physics would be set back by exactly one week"
Richard Feynman

"Fist Law of Cartoon Physics. Gravity doesn't work until you look down"
Wile E. Coyote

"A physicist is just an atom's way of looking at itself"
Niels Bohr