New Zenith

The Monthly Newsletter of the Vectis Astronomical Society

Vol 25 Issue 10 — November 2017 *When Printed, this Newsletter costs VAS at least £1*

Society News

Financial News

1. Please see the note on page 6 for a reminder about the 2017/18 subscription deadline.

2. If you shop online you can help VAS, at no cost to you, by using website: **easyfundraising.org.uk**. Find out how to get started on page 9.

Monthly Meetings

I am sure everyone realises that our monthly meetings cost VAS quite a lot each year. How much? well monthly, it can be £100 for a mainland speaker and then the cost of the hall on top of that. Add on the time taken to organise and collect the speakers, the donated time of VAS members, setting up, serving refreshments, Peter's talk etc etc and you can see it is a big investment.

It is disappointing then that attendances on a Friday seem to be in decline. We're hoping that most of this can be put down to the Summer and people being on holiday - if can suggest another reason, please let the Committee know.

Anyhow, can I please ask for an extra effort to attend the monthly meeting as we have some great speakers lined up for next month and for 2018. (*see page 2*).

Possible Changes to Meade LX200 Operation

We are currently conducting some experiments with the dome telescope. These involve connecting a computer and using that, with appropriate software, to easily set up and control the telescope.

Hopefully this will avoid the need to align the telescope each time it is used and make its operation much more reliable. No physical changes are being made.

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.

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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

PLEASE NOTE:

Monthly meetings are now held at the Newchurch Pavilion next to the Observatory

2017 Monthly Meetings

Date	Subject	Speaker
Please check **wightastronomy.org/meetings/** for the latest information		
27 Oct	VAS - AONB -CPRE Public Open Evening	
24 Nov	Mapping orbits around black holes and neutron stars	Dr Diego Altamirano

2018 Monthly Meetings

Date	Subject	Speaker
Please check **wightastronomy.org/meetings/** for the latest information		
26 Jan		
23 Feb	Astronomical Observations on the Isle of Wight	Paul Bingham
23 Mar		
27 Apr	An Overview of the Development of the Universe to date	John Currigan
25 May	The Rise and Fall of the Herstmonceux Observatory	Keith Brakenborough
22 Jun	TBA	Alan Chapman
27 Jul		
24 Aug	**AGM** The European Extremely Large Telescope	Dr Aprajita Verma
28 Sep		
26 Oct		
23 Nov		

Observatory Visits Booked

19.00 Wed 22nd Nov	Newport Scouts
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
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Secretary	Richard Flux secretary@wightastronomy.org
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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

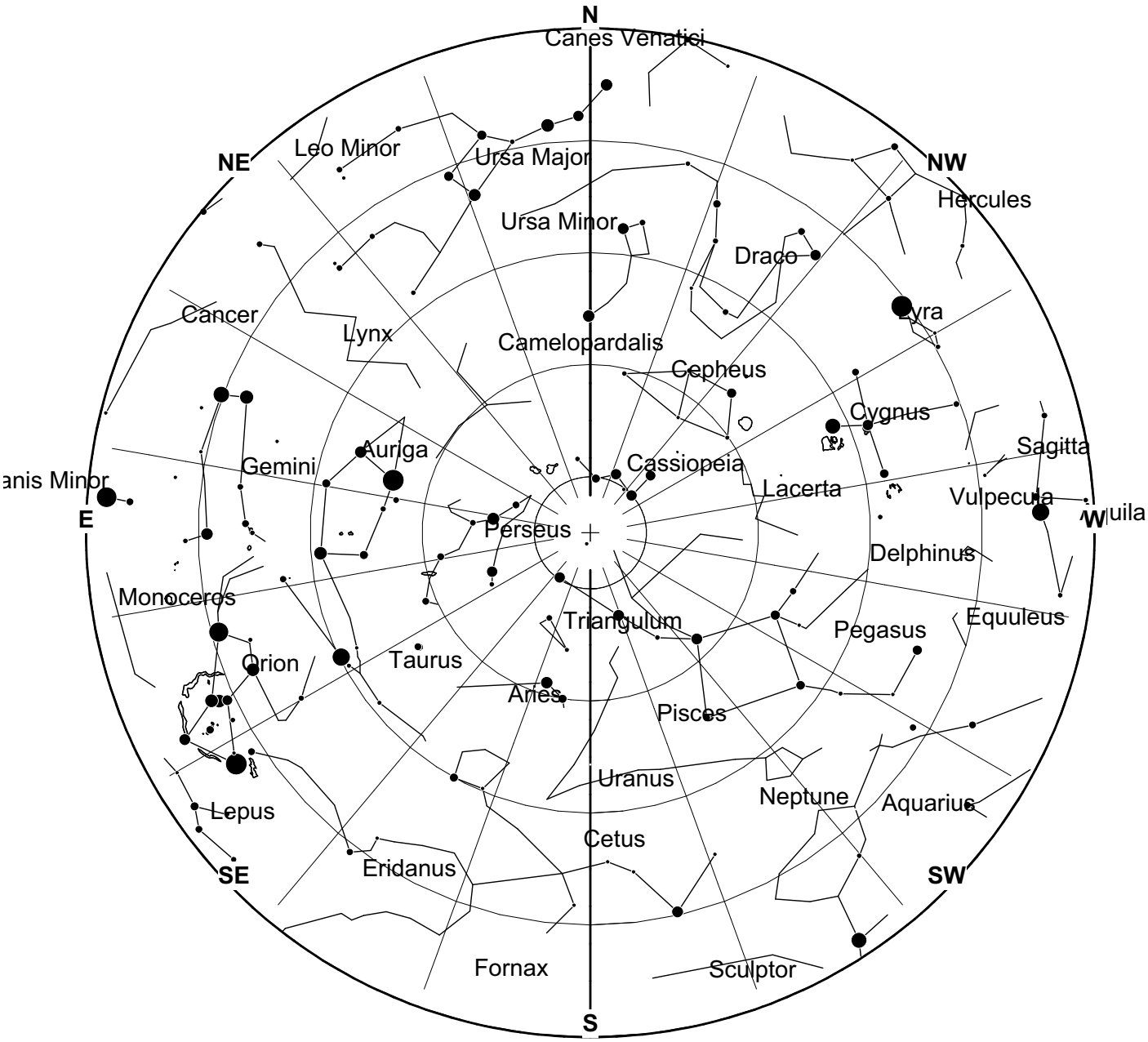
Important

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.

November 2017 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 November 2017

Orion is a prominent constellation located on the celestial equator and visible throughout the world. It is one of the most conspicuous and recognizable constellations in the night sky. It was named after Orion, a hunter in Greek mythology. Its brightest stars are Rigel and Betelgeuse, a blue-white and a red supergiant, respectively.

The earliest depiction that has been linked to the constellation of Orion is a prehistoric (Aurignacian) mammoth ivory carving found in a cave in the Ach valley in West Germany in 1979. Archaeologists have estimated it to have been fashioned approximately 32,000 to 38,000 years ago. The distinctive pattern of Orion has been recognized in numerous cultures around the world, and many myths have been associated with it. Orion has also been used as a symbol in the modern world.

November 2017 Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
			
18th	26th	4th	10th

Planets

Mercury

Mercury continues its poor evening apparition. From our latitude it is too close to the horizon at sunset to be visible.

Venus

Continuing its plunge towards the rising sun, Venus will be lost against the bright pre-dawn sky before the end of the month. It will re-appear in the evening sky early next year.

Mars

Mars rises about 3 hours before the Sun and can be seen in the eastern sky amongst the stars of Virgo. It is easily identified, being brighter than any nearby star and having a distinctly ruddy hue.

Jupiter

Jupiter is making its reappearance from conjunction behind the Sun. On the 13th is in very close conjunction with Venus with a separation of only 16 arc minutes, half the diameter of the full moon.

Saturn

This year's apparition of Saturn can now be considered to be over. It is heading for conjunction with the Sun and is lost against the bright sunset sky.

Uranus

During the mid to late evening Uranus can be found well placed in the southern sky. Along with the stars Omicron, Nu and Mu Piscium it almost forms a square, with Uranus the top right hand point.

Neptune

Neptune can be found well placed in the southern sky in the early evening. Look for it in the rather dim constellation of Aquarius a little over a full moon diameter below the star Lambda Aquarii.

Deep Sky

NGC869 & 884
The Double Cluster
RA 2h 19m Dec 57° 19'
Mag 5.3

Either one of these clusters would be high in the list of sights in the winter sky yet here we have two in the same field of view. They can be seen as a pair of diffuse glows with the naked eye, and were recorded by the ancient Greeks. A small pair of binoculars shows them to be a pair of rich star clusters and will resolve a few of the stars. A telescope at low magnification gives the best view, careful use of magnification is needed as too much will spoil the view.

Stock 2 Open Cluster
RA 2h 15m Dec 59° 20'
Mag 4.4

From the double cluster follow the curved chain of stars toward Cassiopeia; for about 2.5°, about half a 10x50 binocular field. To the left is a group of stars making a rather crooked H shape, sometimes called the strongman cluster. This is Stock 2, another open cluster that needs low magnification, this is a rather sparse cluster about 1 degree in diameter. A telescope shows chains of stars and dark areas in the cluster.

NGC1499 California Nebula
RA 4h 1m Dec 36° 21'
Mag 5.0

This very large nebula can be found just to the north of Menkib, Xi Persei. Although it may have a magnitude of 5 this light is spread out over an area of some 2 x 1 degrees making the surface brightness very low. It can be seen in large aperture binoculars and rich field telescopes but when using a telescope the magnification must be kept to the minimum available to stand any chance of seeing it. A hydrogen beta nebula filter will help to increase the contrast of the nebula. This is a good target for long exposure photography.

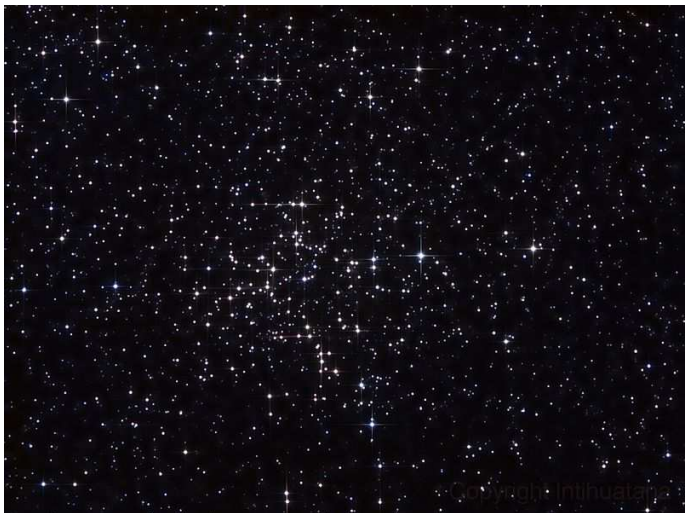
Peter Burgess

My 100 Best Night Sky Sights

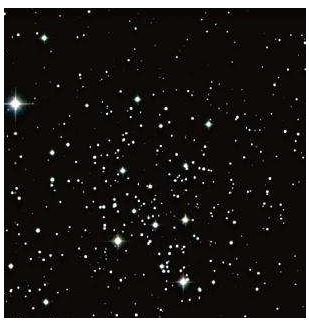
Galactic Clusters

Last month I discussed the M36 cluster in Auriga, now it's the turn of its very near neighbour M38. While hard to decide which is the more impressive sight, they have very different characteristics.

M38 is much the larger of the two and despite having fewer stars is just as bright and as easily seen in binoculars. Some consider its stars form a rough cross, others that they resemble an inverted Greek letter Pi. I find either requires a lot of imagination but what is clear is the significant concentration towards the centre. In my 10" at x63 the whole group is just contained within the 44° field of view, but increasing to x96 and so reducing the field to 35° cuts out the more scattered outer members and transforms the view into one packed with a myriad of stars bright and dim - a quite magnificent sight. Do try it and see if you agree (smaller apertures may need higher powers for the same effect). To locate it, refer to last month's New Zenith M36 article and finder chart.



Cancer, like many other constellations, hides one of its lights under a bushel. Too many observers make the American Tour of this diminutive Zodiacal member, only viewing the renowned Beehive Cluster which lies at its heart. That's like saying 'been to Paris, seen France' for, nestling in the southern outer region of the constellation is the uniquely beautiful cluster - M67.

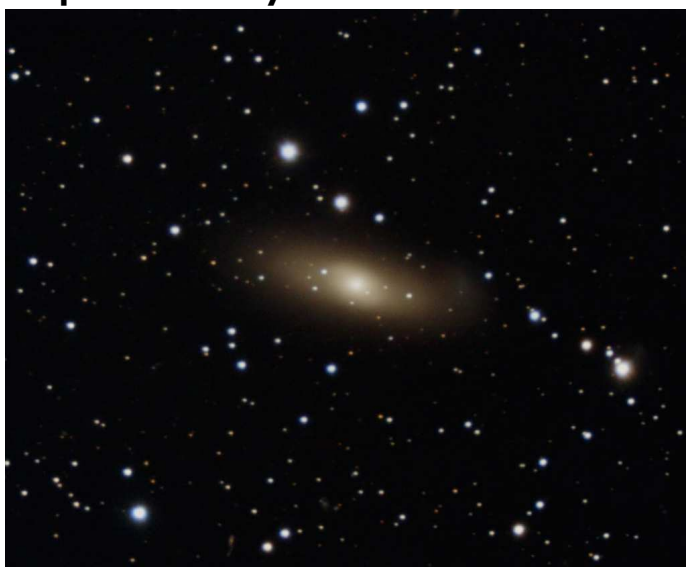


As with many clusters the binocular view is of a small, misty patch. In 3" or 4" telescopes a few stars reveal their presence against a hazy background. With increasing aperture more and more stars switch on and the haze recedes until at 10" the full spectacle is revealed. I use the term unique because to me it takes on the appearance of a catherine wheel frozen motionless in space - with the addition of some dust and gas it would mimic the face-on spiral galaxy M74 in Pisces! Towards its NE edge lies a star significantly brighter than the 200 or so others which crowd the field. Find M67 in late winter/early spring exactly half way and slightly above a line joining the mag 1 stars Regulus in Leo and Procyon in Canis Minor.

Globular Cluster

South east of Pegasus is the ill-defined constellation Aquarius which has a variety of deep sky objects for telescope owners including the fine globular M2. Located in its NW extremity it can be seen in binoculars but only as a fuzzy 'star'. The smallest telescopes do little more than expand the fuzz but at apertures of around 8" it reveals its true nature with the edges of the fuzz ball translated into the tiniest of stars. On the best nights it should be possible to achieve this with a 6" at high power. In the 10" at x96 it resembles a bright, grainy ball but with the wick turned up to x250 what a transformation. I now gaze at a large, bright globe consisting entirely of pin point stars in countless number - yet another object we must observe in autumn with the VAS 18" - with three times the light gathering power it must be a truly magnificent sight. For the less experienced M2 is not so easy to find so use a star atlas to identify the constellation and the finder chart to locate the cluster.

Elliptical Galaxy

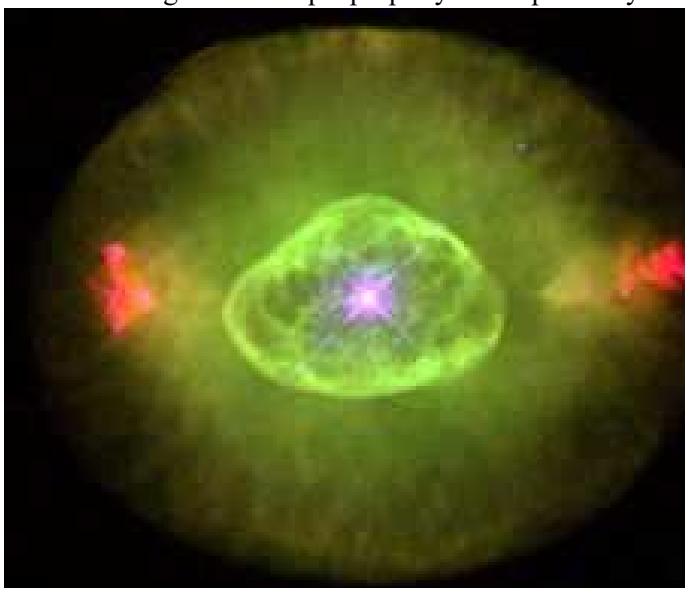


NGC1023 Perseus. In Astronomy Now March edition study the 11 Messier Elliptical Galaxies shown from page 45 (M32, 49, 59, 60, 84-87, 89, 105 and 110) and what do you notice? Yes, identical elevenuplets (sorry, but my Latin doesn't extend beyond sextuplets), the sole differences being the shape of the ellipses, only M110 showing slight deviation from the common form. That's why EGs don't rank in my top 100 deep sky splendours - for the most part it's a case of 'see one, seen them all'.

Except for NGC1023 that is. Right on the border of Perseus and Andromeda this little fellow mimics an edge-on spiral galaxy. It's very elongated - 4.5° x 1.3° - and although only mag 11, is well seen in my 10" displaying a bright nucleus with the outer regions rapidly diminishing in brightness either side. It also has another visual ace up its sleeve - it's juxtaposition with nearby stars. Just as a picture is enhanced by its frame so NGC1023 is rendered a more delightful sight by its position adjacent to a shallow 'V' of five brightish stars with the galaxy at the apex of this stellar triangle. An 8" will provide a similar view and a 6" will pick up the galaxy although it will be small and dim with two of the stars missing. Best months are October to January.

Planetary Nebula

NGC 6826 Cygnus. Way up among the flight feathers of the Swan's left wing sits this tiny, peculiar object. Although less than half an arc minute across it should be easy to find as it's a bright mag 8.7 but it's shy and unless you know exactly where to look you can miss it. It's visible in a 6" telescope but the mag 11 central star will be difficult which will negate the unique property of the planetary.



Through a 10" or smaller instrument averted vision is needed to see the surrounding gaseous envelope so looking directly at it, it disappears leaving only the central star. Look to one side and the fuzzy ring reappears with its stellar bull's eye, hence it's nickname - the Blinking Planetary. With the 6" it still blinks on and off but the 'hoopla' effect is lost. I suspect that in 12" or larger instruments the additional light gathering power may permit the nebula to be seen with direct vision which would also spoil the show. Mid summer is the best time to see this curious effect but if you must retire before midnight you can still witness it up to October.

Bert Paice
Originally published in NZ - June 1998

VAS Subscriptions were due 1 October The rates for 2017/18 are unchanged at:	
Ordinary membership	**£30.00 pa**
Senior (60+)	**£24.00 pa**
Student (under 18 or in full time education)	**£12.00 pa**
Family (2 Adults and 2 children) This is new this year	**£50.00 pa**

Payment may be made by Cash, or Cheque payable to Vectis Astronomical Society, at the Observatory or at Friday's Dark Sky event.

Cheques may be sent to:

The Membership Secretary,
Butterflies,
Woodside Avenue,
Alverstone Garden Village,
PO36 0JD.

If you have a Standing Order please check the amount as some members did not change their Standing Orders when the rates were changed in 2015.

To pay by Bank Transfer, the Account details are:

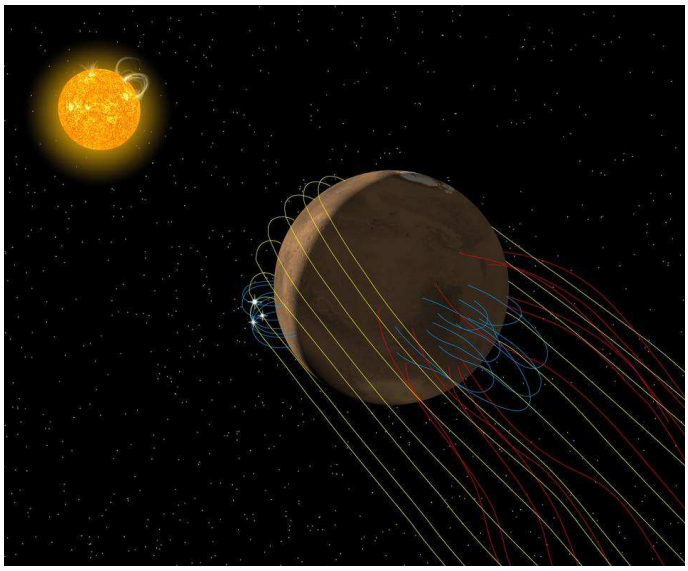
Vectis Astronomical Society,
Sort Code 30 95 99
Account No 00037505

If you are not renewing your subscription please let the Membership Secretary know.

Failure to renew by mid November will result in your membership being terminated.

Norman Osborn
Membership Secretary

NASA's MAVEN Mission Finds Mars Has a Twisted Tail



Artist's conception of the complex magnetic field environment at Mars. Yellow lines represent magnetic field lines from the Sun carried by the solar wind, blue lines represent Martian surface magnetic fields, white sparks are reconnection activity, and red lines are reconnected magnetic fields that link the surface to space via the Martian magnetotail.

Credits: Anil Rao/Univ. of Colorado/MAVEN/NASA GSFC

Mars has an invisible magnetic "tail" that is twisted by interaction with the solar wind, according to new research using data from NASA's MAVEN spacecraft.

NASA's Mars Atmosphere and Volatile Evolution Mission (MAVEN) spacecraft is in orbit around Mars gathering data on how the Red Planet lost much of its atmosphere and water, transforming from a world that could have supported life billions of years ago into a cold and inhospitable place today. The process that creates the twisted tail could also allow some of Mars' already thin atmosphere to escape to space, according to the research team.

"We found that Mars' magnetic tail, or magnetotail, is unique in the solar system," said Gina DiBraccio of NASA's Goddard Space Flight Center in Greenbelt, Maryland. "It's not like the magnetotail found at Venus, a planet with no magnetic field of its own, nor is it like Earth's, which is surrounded by its own internally generated magnetic field. Instead, it is a hybrid between the two." DiBraccio is project scientist for MAVEN and is presenting this research at a press briefing Thursday, Oct. 19 at 12:15pm MDT during the 49th annual meeting of the American Astronomical Society's Division for Planetary Sciences in Provo, Utah.

The team found that a process called "magnetic reconnection" must have a big role in creating the Martian magnetotail because, if reconnection were occurring, it would put the twist in the tail.

"Our model predicted that magnetic reconnection will cause the Martian magnetotail to twist 45 degrees from what's expected based on the direction of the magnetic field carried by the solar wind," said DiBraccio. "When we compared those predictions to MAVEN data on the directions of the Martian and solar wind magnetic fields, they were in very good agreement."

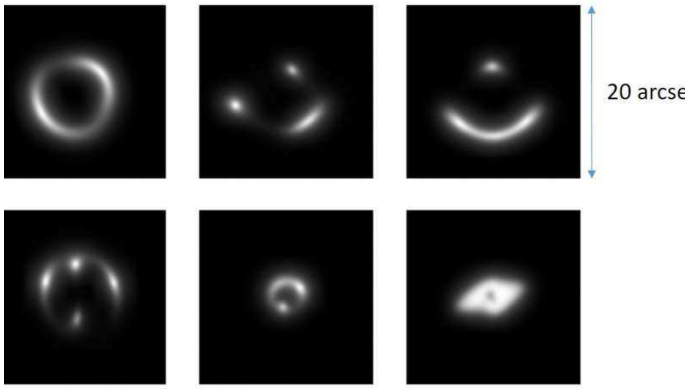
Mars lost its global magnetic field billions of years ago and now just has remnant "fossil" magnetic fields embedded in certain regions of its surface. According to the new work, Mars' magnetotail is formed when magnetic fields carried by the solar wind join with the magnetic fields embedded in the Martian surface in a process called magnetic reconnection. The solar wind is a stream of electrically conducting gas continuously blowing from the Sun's surface into space at about one million miles (1.6 million kilometers) per hour. It carries magnetic fields from the Sun with it. If the solar wind field happens to be oriented in the opposite direction to a field in the Martian surface, the two fields join together in magnetic reconnection.

The magnetic reconnection process also might propel some of Mars' atmosphere into space. Mars' upper atmosphere has electrically charged particles (ions). Ions respond to electric and magnetic forces and flow along magnetic field lines. Since the Martian magnetotail is formed by linking surface magnetic fields to solar wind fields, ions in the Martian upper atmosphere have a pathway to space if they flow down the magnetotail. Like a stretched rubber band suddenly snapping to a new shape, magnetic reconnection also releases energy, which could actively propel ions in the Martian atmosphere down the magnetotail into space.

Since Mars has a patchwork of surface magnetic fields, scientists had suspected that the Martian magnetotail would be a complex hybrid between that of a planet with no magnetic field at all and that found behind a planet with a global magnetic field. Extensive MAVEN data on the Martian magnetic field allowed the team to be the first to confirm this. MAVEN's orbit continually changes its orientation with respect to the Sun, allowing measurements to be made covering all of the regions surrounding Mars and building up a map of the magnetotail and its interaction with the solar wind.

More at: ***https://www.nasa.gov/***

Artificial Intelligence Finds New Gravitational Lens Candidates



This picture shows a sample of the handmade photos of gravitational lenses that the astronomers used to train their neural network.
Credit: Enrico Petrillo, University of Groningen

A group of astronomers from the universities of Groningen, Naples and Bonn has developed a method that finds gravitational lenses in enormous piles of observations. The method is based on the same artificial intelligence algorithm that Google, Facebook and Tesla have been using in the last years. The researchers published their method and 56 new gravitational lens candidates in the November issue of Monthly Notices of the Royal Astronomical Society.

When a galaxy is hidden behind another galaxy, we can sometimes see the hidden one around the front system. This phenomenon is called a gravitational lens, because it emerges from Einstein's general relativity theory which says that mass can bend light. Astronomers search for gravitational lenses because they help in the research of dark matter.

The hunt for gravitational lenses is painstaking. Astronomers have to sort thousands of images. They are assisted by enthusiastic volunteers around the world. So far, the search was more or less in line with the availability of new images. But thanks to new observations with special telescopes that reflect large sections of the sky, millions of images are added. Humans cannot keep up with that pace.

Google, Facebook, Tesla

To tackle the growing amount of images, the astronomers have used so-called 'convolutional neural networks'. Google employed such neural networks to win a match of Go against the world champion. Facebook uses them to recognize what is in the images of your timeline. And Tesla has been developing self-driving cars thanks to neural networks.

The astronomers trained the neural network using millions of homemade images of gravitational lenses. Then they confronted the network with millions of images from a small patch of the sky. That patch had a surface area of 255 square degrees. That's just over half a percent of the sky.

With the help of artificial intelligence, astronomers discovered 56 new gravity lens candidates. At this picture are three of those candidates.
Credit: Carlo Enrico Petrillo, University of Groningen

Gravitational Lens Candidates

Initially, the neural network found 761 gravitational lens candidates. After a visual inspection by the astronomers the sample was downsized to 56. The 56 new lenses still need to be confirmed by telescopes as the Hubble space telescope.

In addition, the neural network rediscovered two known lenses. Unfortunately, it did not see a third known lens. That is a small lens and the neural network was not trained for that size yet.

In the future, the researchers want to train their neural network even better so that it notices smaller lenses and rejects false ones. The final goal is to completely remove any visual inspection.

Kilo-Degree Survey

Carlo Enrico Petrillo (University of Groningen, The Netherlands), first author of the scientific publication: “This is the first time a convolutional neural network has been used to find peculiar objects in an astronomical survey. I think it will become the norm since future astronomical surveys will produce an enormous quantity of data which will be necessary to inspect. We don't have enough astronomers to cope with this.”

The data that the neuronal network processed, came from the Kilo-Degree Survey. The project uses the VLT Survey Telescope of the European Southern Observatory (ESO) on Mount Paranal (Chile). The accompanying panoramic camera, OmegaCAM, was developed under Dutch leadership.

More at: ***https://phys.org/news/***

Jodrell Bank Bids for Unesco World Heritage Status

The 76m (250ft) Mark I telescope was the largest steerable dish in the world when it was completed in 1957

Jodrell Bank Observatory has been selected as the latest UK candidate for World Heritage status.

The site, in Cheshire, is home to the famous Lovell Telescope, which was complete in 1957.

If the bid is successful, it would join the likes of Stonehenge and the Taj Mahal on the Unesco list of "globally important" landmarks.

Prof Teresa Anderson, director of the observatory's Discovery Centre, said it has a "rich scientific heritage".

She described the telescope, which was the largest of its kind when it was built, as "an icon for science".

More than 1,000 places around the world have been granted Unesco World Heritage status.

Currently, 31 sites in the UK and its overseas territories have been awarded the accolade.

The site was first used for radio astronomy in 1945 by Sir Bernard Lovell and his team and since then, its astronomers have tracked Sputnik and discovered quasars.

Prof Anderson said her team have been preparing the case for years, "so it's absolutely fantastic to reach this milestone".

Director of the Centre for Astrophysics, Prof Michael Garrett, said: "Jodrell Bank has played a leading role in radio astronomy for over seventy years, work which is reflected in the landscape of the site."

More at: ***http://www.bbc.com/***

and

http://www.jodrellbank.net/

EasyFundRaising?

Did you know that whenever you buy anything online - from your weekly shop to your annual holiday - you could be collecting free donations for Vectis Astronomical Society?

There are over 3,000 shops and sites on board ready to make a donation, including Amazon, John Lewis, Aviva, thetrainline and Sainsbury's - and it doesn't cost you a penny extra!

It's as easy as 1, 2, 3...

1. Head to ***https://www.easyfundraising.org.uk/causes/vectisastronomicalsociety/*** and join for free.

2. Every time you shop online, go to easyfundraising first to find the site you want and start shopping.

3. After you've checked out, that retailer will make a donation to your good cause for no extra cost whatsoever!

There are no catches or hidden charges and Vectis Astronomical Society will be really grateful for your donations.

Here are a few of the companies that will donate to VAS when you make a purchase (no cost to you).

As well as those mentioned above, here are just a few of the companies involved:

John Lewis	**Argos**	**Amazon.co.uk**
Apple	**ebay**	**Next**
Boots	**Currys/PC World**	**House of Fraser**
Sky	**AO**	**Dyson**
M&S	**Debenhams**	**Asos**
Gap	**Clarks**	**Cotton Traders**
Booking.com	**Expedia**	**Thomas Cook**
Wightlink	**Trainline**	**Aviva**

Please give this a try if you are shopping online and let the Editor know if you have problems.

Thank you for your support.

New Hubble Gallery Features Objects from Popular Not-a-Comet Messier Catalog

In a nod to the global amateur astronomy community, as well as to any space enthusiast who enjoys the beauty of the cosmos, the Hubble Space Telescope mission is releasing its version of the popular Messier catalog, featuring some of Hubble's best images of these celestial objects that were once noted for looking like comets but turned out not to be. This release coincides with the Orionid meteor shower — a spectacle that occurs each year when Earth flies through a debris field left behind by Halley's Comet when it last visited the inner solar system in 1986. The shower will peak during the pre-dawn hours this Saturday, Oct. 21.

Spotting comets was all the rage in the middle of the 18th century, and at the forefront of the comet hunt was a young French astronomer named Charles Messier. In 1774, in an effort to help fellow comet seekers steer clear of astronomical objects that were not comets (something that frustrated his own search for these elusive entities), Messier published the first version of his "Catalog of Nebulae and Star Clusters," a collection of celestial objects that weren't comets and should be avoided. Today, rather than avoiding these objects, many amateur astronomers actively seek them out as interesting targets to observe with backyard telescopes, binoculars or sometimes even with the naked eye.

Hubble's version of the Messier catalog includes eight newly processed images never before released by NASA. The images were extracted from more than 1.3 million observations that now reside in the Hubble data archive. Some of these images represent the first Hubble views of the objects, while others include newer, higher resolution images taken with Hubble's latest cameras.

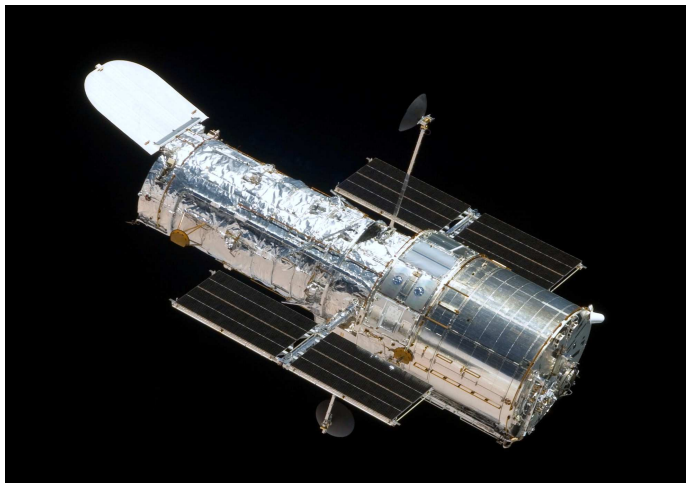
While the Hubble Space Telescope has not captured images of all 110 objects in the Messier catalog, it has targeted 93 of them as of September 2017. Some Messier objects have not earned enough scientific interest to warrant Hubble's time, which is in extremely high demand, or can be studied nearly as well with ground-based research telescopes. Others appear too large in the sky to be observed completely by Hubble, which provides high-resolution views that cover tiny portions of the sky. So while a number of Hubble's photographs capture a given object in its entirety, many images focus on smaller, more specific areas of interest.

In some cases, Hubble observed a Messier object but didn't take a picture. Rather, it obtained spectra, which break up an object's light into its component wavelengths to reveal characteristics such as the object's chemical composition, velocity and temperature. Hubble's spectral observations are not included in this photographic catalog.

The gallery currently includes 63 Messier objects and will be updated as more of Hubble's images are processed. For those objects already in the catalog, amateur astronomers can compare their own sightings with those of Hubble. For skywatchers looking for meteors left by the debris of Comet Halley, they might take some time to search for objects determined not to be comets yet still quite fascinating, as demonstrated by the breathtaking details of Hubble's pictures.

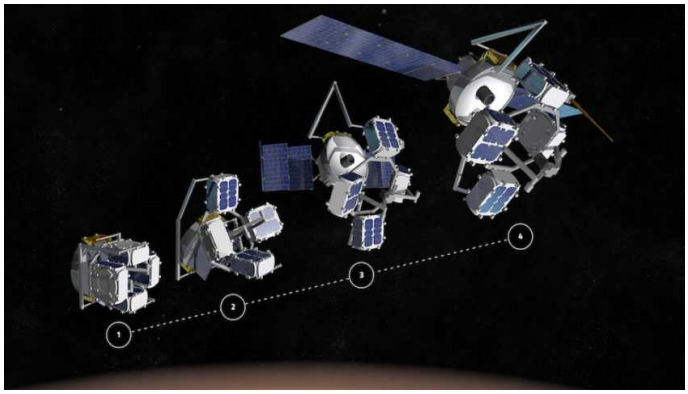
Hubble's Messier catalog can be found online at ***https://www.nasa.gov/*** and on Flickr at ***https://www.flickr.com/***.

Article from ***https://www.nasa.gov/***



Satlets: Crazy Idea or Ingenious Concept?

This week's test on ISS will offer clues



A NovaWorks's illustration of its modular "Satlet" design.

SAN FRANCISCO – On Oct. 25, astronauts onboard the International Space Station plan to link NovaWurks' spacecraft building blocks in the first on-orbit test of a radically new approach to satellite design and manufacturing.

Instead of fitting spacecraft components into a rectangular bus as companies have for decades, NovaWurks invented Hyper-Integrated Satlets (HISats), identical seven-kilogram modules with everything a satellite needs to function, including communications, pointing, power, data processing and propulsion. Satellite builders can mate any number of HISats, which measure 20 by 20 by 10 centimeters and snap together like Lego, to their payloads on Earth or in orbit. Software determines the role each HISat should play. If one HISat subsystem begins to fail, for example, the same subsystem on other HISats can help.

It's an approach Talbot Jaeger, founder and chief technologist of Los Alamitos, California-based Novawurks, came up with while contemplating the wonders of biological stem cells. "The architecture comes alive as it starts to grow, Jaeger told SpaceNews. "It creates an organism you can't defeat."

After years of development and ground testing plus two years of storage on ISS, NovaWurks engineers and their partners are waiting for the first on-orbit demonstration of their technology. If all goes as planned, on Oct. 25 astronauts will assemble a small satellite by snapping together six HISats and two deployable solar arrays built by Pumpkin with an electro-optical imager in a NASA-sponsored mission called Satlet Initial Proofs and Lessons (SIMPL).

Then astronauts plan to launch the newly assembled small satellite from ISS on Oct. 27 using the NanoRacks Kaber Microsatellite Deployer, providing a key test of how well the HISats function as a single unit.

"Can they detect each other, recognize they've been put together and think as a group to get power and maintain altitude?" Jaeger asked.

Dave Barnhart, director of the University of Southern California's Space Technology and Systems Group, is eager to see. Like everyone who has been watching NovaWurks' efforts to transform the way satellites are built, Barnhart, who awarded NovaWurks a contract in 2012 to build HISats for the U.S. Defense Advanced Research Projects Agency's Phoenix program, which he managed, wants to see HISats work in space.

"For 50 to 60 years, we've built satellites as monolithic entities," Barnhart said. "If we can now build something that is held together by cells that can actually function like a satellite, that's a huge deal."

Andrew Kalman, founder, president, CTO of cubesat manufacturer Pumpkin and a longtime NovaWurks partner, said engineers tend to devote a lot of time and effort to designing satellites that are slightly different. "Talbot is looking at it from the ground up and saying, 'If we could have something that could handle all these things with a minimum of further engineering, what would it look like?' He has made a very good case that his architecture is one way to do that," Kalman said.

The ISS experiment will provide the first evidence of how well HISats work in orbit, but additional tests are coming.

DARPA is "evaluating several launch options" to fly HISats to low Earth orbit in 2018, said Bill Crandall, NovaWurks advanced projects chief. As part of the Phoenix program aimed at demonstrating innovative, lower-cost satellite architectures, DARPA wants to launch 14 HISats linked with Raytheon's Space Enabled Effects for Military Engagements (SeeMe) imaging satellite as part of the eXperiment for Cellular Integration Technologies. The experiment is designed to show whether HISats remain linked when exposed to launch forces and, once in orbit, whether they can separate from SeeMe and adjust to the change by immediately reconfiguring their software.

Because NovaWurks sees HISats as all-purpose satellite tools, the company is eager to show that the modules can be assembled to form spacecraft of various shapes and sizes on the ground or in orbit. For example, a customer might want to assemble core elements of a spacecraft on the ground, launch it and then add HISats robotically.

More at: ***http://spacenews.com/***

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LINKS, COMMENTS AND OBSERVATIONS

What IS Red Shift?

'Red shift' is a key concept for astronomers. The term can be understood literally - the wavelength of the light is stretched, so the light is seen as 'shifted' towards the red part of the spectrum.

Something similar happens to sound waves when a source of sound moves relative to an observer. This effect is called the 'Doppler effect' after Christian Andreas Doppler, an Austrian mathematician who discovered that the frequency of sound waves changes if the source of sound and the observer are moving relative to each other.

If the two are approaching, then the frequency heard by the observer is higher; if they move away from each other, the frequency heard is lower.

There are many everyday examples of the Doppler effect - the changing pitch of police and ambulance sirens, or train whistles and racing car engines as they pass by. In every case, there is an audible change in pitch as the source approaches and then passes an observer.

Everyone has heard the increased pitch of an approaching police siren and the sharp decrease in pitch as the siren passes by and recedes. The effect arises because the sound waves arrive at the listener's ear closer together as the source approaches, and further apart as it recedes.

Light behaves like a wave, so light from a luminous object undergoes a Doppler-like shift if the source is moving relative to us. Ever since 1929, when Edwin Hubble discovered that the Universe is expanding, we have known that most other galaxies are moving away from us. Light from these galaxies is shifted to longer (and this means redder) wavelengths - in other words, it is 'red-shifted'.

Since light travels at such a great speed relative to everyday phenomena (a million times faster than sound) we do not experience this red shift in our daily lives.

The red shift of a distant galaxy or quasar is easily measured by comparing its spectrum with a reference laboratory spectrum. Atomic emission and absorption lines occur at well-known wavelengths. By measuring the location of these lines in astronomical spectra, astronomers can determine the red shift of the receding sources.

However, to be accurate, the red shifts observed in distant objects are not exactly due to the Doppler phenomenon, but are rather a result of the expansion of the Universe.

Doppler shifts arise from the relative motion of source and observer through space, whereas astronomical redshifts are 'expansion redshifts' due to the expansion of space itself.

Two objects can actually be stationary in space and still experience a red shift if the intervening space itself is expanding.

A convenient analogy for the expansion of the Universe is a loaf of unbaked raisin bread. The raisins are at rest relative to one another in the dough before it is placed in the oven. As the bread rises, it also expands, making the space between the raisins increase.

If the raisins could see, they would observe that all the other raisins were moving away from them although they themselves were stationary within the loaf. Only the dough - their 'Universe' - is expanding.

Source: ***http://www.esa.int/***

Observatory

When visiting the VAS 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.
Send to the Editor, contact details on the front page.

"It took less than an hour to make the atoms, a few hundred million years to make the stars and planets, but five billion years to make man!"
George Gamow

"We have at any rate one advantage over Time and Space. We think them whereas it is extremely doubtful whether they think us!"
John Cowper Powys

"It requires a very unusual mind to undertake the analysis of the obvious"
Alfred North Whitehead