# New Zenith

*The Monthly Newsletter of the Vectis Astronomical Society*

Vol 24 Issue 10 — November 2016 *When Printed, this Newsletter costs VAS at least £1*

## Society News

### Final Reminder

Subscriptions were due 1 October.

Subscriptions were not increased for 2016/17 and remain amazing value at £30:00 for Full Membership, £24:00 for Senior Members (over 60) and £20 for Students.

Cash or cheques may be delivered to the observatory or the Newport Meeting. They may also be sent to:

**Membership Secretary,**
**Butterflies**
**Alverstone Garden Village**
**PO360JD.**

A transfer via your bank either online or over the counter is also very acceptable. Our account details are:

Lloyds TSB, Newport IOW. Sort Code 30-95-99, Account Name VECTIS ASTRONOMICAL SOCIETY (1046091), Number 00037505.

Please use your membership number for the reference. (email members@wightastronomy.org for your number)

Members failing to renew by 10 November will not receive further editions of NZ.

*Norman Osborn*

## Work at the Observatory

Well it's taken a lot longer than any of us had hoped but we are nearing the end of the work at the observatory.

The walls have been painted, the worktop installed and the electrics made safe. Just a few little bits to tidy up and a floor to level and we'll be there. Oh, I forgot there's a new projector screen to erect, some cupboards to clean up and a doorway to cover over. Otherwise it's all finished ;)

Thanks to everyone who has helped, particularly John Gaudion, without his expertise and wry sense of humour we would never have made it this far.

I hope to have some photographs for inclusion in NZ next month.

*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<br>Telescope and night sky training.<br>Please contact Martyn Weaver 07855 116490 |
| Thursday, 19.30hrs | Members and Public.<br>Informal meeting and observing |

## Contents this Month

## 2016 Monthly Meetings

| Date | Subject | Speaker |
|---|---|---|
| Please check **wightastronomy.org/meetings/** for the latest information | | |
| 28 Oct | Simulations of Dwarf Galaxies | Dr David Williamson |
| 25 Nov | Stellar population Modelling | Dr Claudia Maraston |

## Observatory Visits Booked

***November***

| | | |
|---|---|---|
| 8th | Sandown Townswomen's Guild | 18.30-20.00 |
| 14th | 1st Northwood Scouts | 19.00-21.00 |
| 15th | Sandown Townswomen's Guild | 18.30-20.00 |

It would be appreciated if members could avoid using the observatory at these times.

## 40th Anniversary Event

***The Breeze***
***Island Harbour***

*Saturday 12 November 2016*
*18:30 for 19:00*

Booking forms have been sent to all members by email or by post

***Please complete your order and return it, along with your payment, to any committee member***

***Only those who have booked meals will be able to attend***

## VAS Contacts 2014/15

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

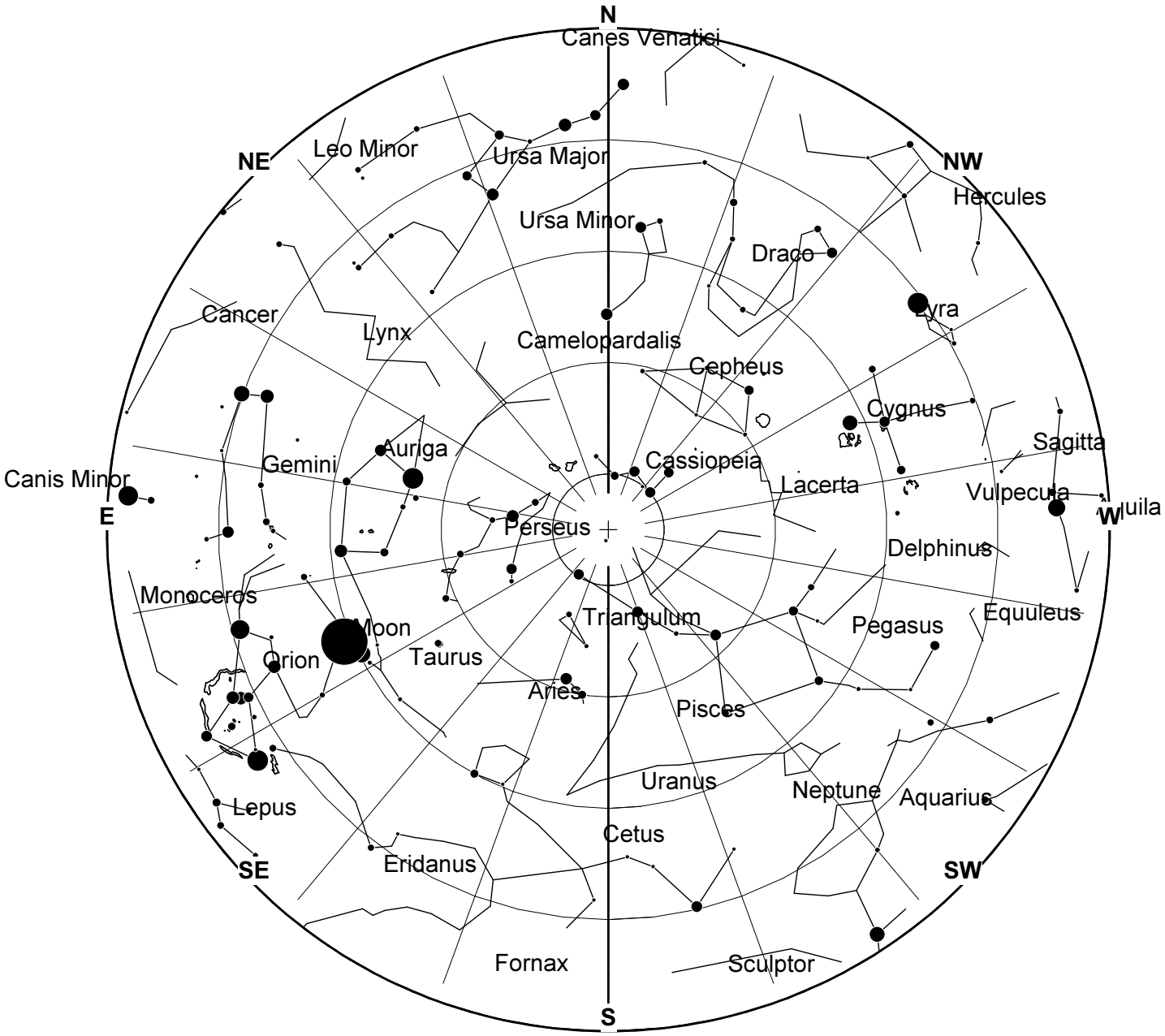
# Important

Members using the observatory outside normal Thursday meetings MUST enter a line or two in the Observatory Log Book.

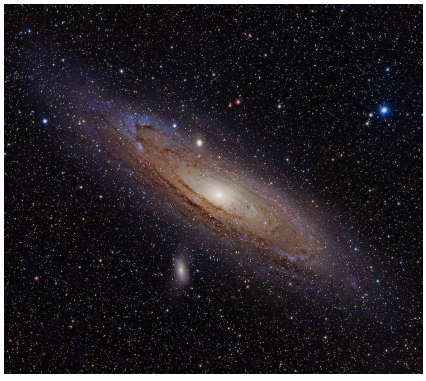
On several occasions,
lights, heaters and the Meade LX200 have been left on!

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

# November 2016 Sky Map




*View from Newchurch Isle of Wight UK - 2200hrs - 15 November 2016*



The **Andromeda Galaxy**, also known as M31, or NGC 224, is a spiral galaxy approximately 2.5 million light-years from Earth. It is the nearest major galaxy to the Milky Way.

Andromeda is approximately 220,000 light years across, and it is the largest galaxy of the Local Group, which also contains the Milky Way, the Triangulum Galaxy, and other smaller galaxies. Despite earlier findings that suggested that the Milky Way contains more dark matter and could be the largest in the grouping, the 2006 observations by the Spitzer Space Telescope revealed that Andromeda contains one trillion ($10^{12}$) stars: at least twice the number of stars in the Milky Way, which is estimated to be 200–400 billion.

# November 2016 Night Sky

## Moon Phases

| New | First Qtr | Full | Last Qtr |
|---|---|---|---|
|  |  |  |  |
| 29th | 7th | 14th | 21st |

## Planets

### *Mercury*

This month sees Mercury make a very poor apparition in our evening sky. It sets just after the Sun so the only opportunity for observation will be during the day, when the Sun is still in the sky. To do this will need a telescope, If you do try this, ensure that there is no possibility of accidentally pointing the telescope at he Sun. The simplest way of doing this is to make sure that the telescope is always in the shade.

### *Venus*

Venus is found low in the south west for an hour or so after sunset. Towards the end of the month the length of time it remains visible increases slightly as it starts to slowly move clear of the horizon. On the 2nd there is a grouping with Saturn and the Moon, being so low down it will not be a particularly spectacular show at our latitude.

### *Mars*

Mars is stubbornly refusing to move from its southerly position at sunset. It is the brightest object in that part of the sky making it easy to identify. Once you have found it, just look in the same direction at the same time every night and it will be there, clouds permitting.

### *Jupiter*

Look to the south east before sunrise and the brightest point in the sky is the king of the planets, Jupiter.

### *Saturn*

Saturn is too close to the sun for any serious observation this month. It will be a few months before it starts to make a reappearance in the morning sky.

### *Uranus*

As the month progresses Uranus closes in on the magnitude 5 star Zeta Pisciium, starting almost 2° to the south east and ending at just under a degree away. It does not get much closer than this and spends next moth almost stationary.

### *Neptune*

Neptune can be found about 2.5° south west of Lambda Aquarius towards Sigma Aquarius. A planetarium program makes finding the outer planet easier as there are no obvious nearby guide stars.

## Deep Sky

### *M74 The Phantom Galaxy RA 1h 37m Dec 15° 50' mag 9.1*

This low surface brightness face on spiral galaxy is probably the most challenging of all the Messier objects. With a large aperture telescope and dark skies detail can be glimpsed in the spiral arms.

### *M31 Galaxy RA 0h 43m Dec 41° 54' mag 4.5*

Easily visible to the naked eye this galaxy is at least twice the width of the full moon and the largest member of the local group. It is seen as an oval smudge in the central northern part of Andromeda. Viewed from this galaxy our own Milky Way would look very similar if somewhat smaller.

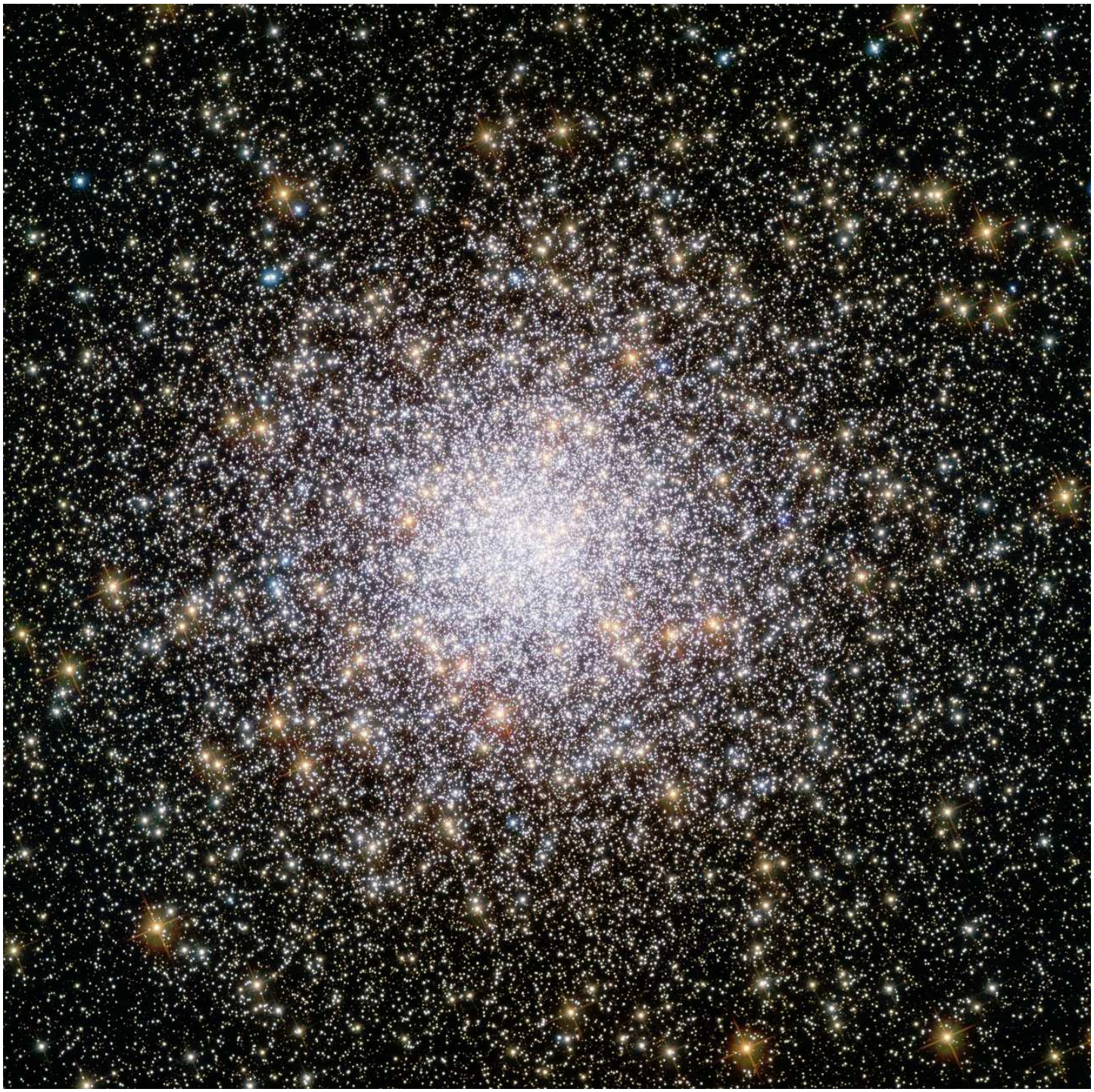
In dark skies binoculars just show Andromeda's two companion galaxies, but a telescope is really needed to appreciate them. Through a small telescope the view of Andromeda is not that much better than binoculars, it is such a large object that it completely fills the field of view with anything other than very low magnification. A larger telescope will show the dust lanes and allow tracing out of the spiral arms.

### *M33 Galaxy RA 1h 34m Dec 45° 8' mag 7*

M33 in Triangulum is one of a number of galaxies that shares the common name Pin Wheel. It is another member of our local group of galaxies, but somewhat smaller than the Milky Way being only 1/7 its size. This galaxy despite its relatively bright apparent magnitude, its large size, about that of the full moon makes it very difficult to see. It can be glimpsed in our skies with a pair of 10x50 binoculars as a slight brightening of the background sky. A telescope of at least 8 inches diameter is needed to see any structure in the spiral arms, and then it can be difficult. Don't be put off by the difficulties it is a worthwhile object for observation.

*Peter Burgess*

# Youthful NGC 362



***Globular clusters*** offer some of the most spectacular sights in the night sky. These ornate spheres contain hundreds of thousands of stars, and reside in the outskirts of galaxies. The Milky Way contains over 150 such clusters — and the one shown in this ***NASA/ESA Hubble Space Telescope*** image, named NGC 362, is one of the more unusual ones.

As stars make their way through life they fuse elements together in their cores, creating heavier and heavier elements — known in astronomy as ***metals*** — in the process. When these stars die, they flood their surroundings with the material they have formed during their lifetimes, enriching the ***interstellar medium*** with metals. Stars that form later therefore contain higher proportions of metals than their older relatives.

By studying the different elements present within individual stars in NGC 362, astronomers discovered that the cluster boasts a surprisingly high metal content, indicating that it is younger than expected. Although most globular clusters are much older than the majority of stars in their host galaxy, NGC 362 bucks the trend, with an age lying between 10 and 11 billion years old. For reference, the age of the Milky Way is estimated to be above 13 billion years.

This image, in which you can view NGC 362's individual stars, was taken by ***Hubble's Advanced Camera for Surveys (ACS)***.

*Credit: ESA/Hubble & NASA*

# Monitoring Climate from Space Part 3

## Monitoring Climate Missions - Observing our planet for a safer world.

Earth observation technology has developed immensely over the past 15years since the first satellite, Sputnik 1, was launched into low earth orbit in 1957 carrying a simple radio transmitter.

ESA's Environmental Satellite (Envisat), launched in 2002, carried a multitude of different sensors and was tasked to provide observations related to many elements of the Earth's oceans, land, atmosphere and cryosphere, providing a vast array of key information and data products. The mission delivered thousands images and a wealth of data used to study the workings of the earth, including insights into factors contributing to climate change.

Contact with Envisat was suddenly lost in April 2012, but the 10yrs of data retrieved continues to be used for studying our planet. The development of new techniques has allowed satellite missions to be tailored to a much wider range of applications.

ESA is now ambitiously developing and deploying the Sentinel range of EO satellites in the Copernicus programme.

### *Copernicus*

The European Commission in partnership with ESA has launched a new project know as Copernicus. This is the new name for the Global Monitoring for Environment and Security programme, previously known as GMES.

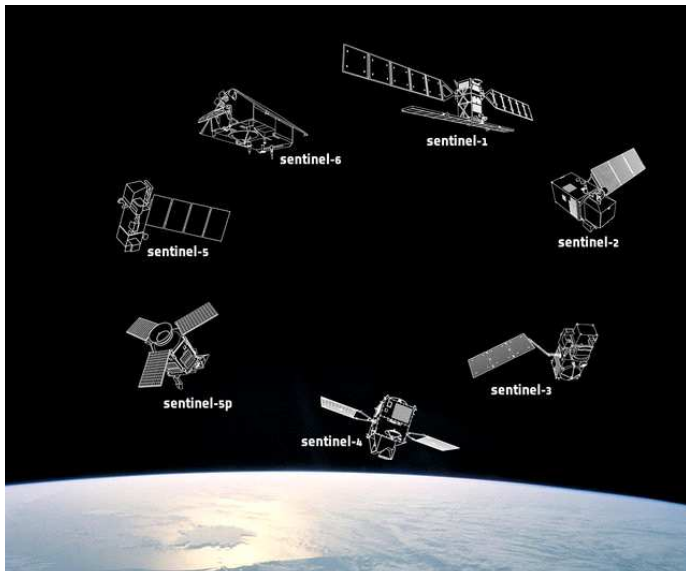
It will provide accurate, timely and easily accessible information to improve the management of the environment, understand and mitigate the effects of climate change and ensure civil security.

ESA is developing a new family of satellites, called Sentinels, specifically for the operational needs of the Copernicus programme.

Copernicus provides a unified system through which vast amounts of data are fed into a range of thematic information services designed to benefit the environment, the way we live, humanitarian needs and support effective policy-making for a more sustainable future.

These services fall into six main categories: land management, the marine environment, atmosphere, emergency response, security and climate change.

### *Sentinels*




Sentinel-1 carries an advanced radar instrument to provide an all-weather, day-and-night supply of imagery of Earth's surface. Launched on 3 April 2014 on a Soyuz rocket from Europe's Spaceport in French Guiana. It is a polar-orbiting, all-weather, day-and-night radar imaging mission for land and ocean services.

Sentinel-2, launched in June 2015, carries a wide sweeping high-resolution imager with 13 spectral bands. It is polar-orbiting, and the multispectral high-resolution images monitor the land, by providing high resolution optical images of vegetation, soil and water cover, inland waterways and coastal areas. Sentinel-2 will also deliver information for emergency services.

Sentinel-3 launched Feb 2016, will provide data for services relevant to the ocean and land. It is a multi-instrument mission to measure sea-surface topography, sea- and land-surface temperature, ocean colour and land colour with high-end accuracy and reliability.

Sentinel-4 will provide data for atmospheric composition monitoring from geostationary and polar orbits, respectively. It is a payload that will be embarked

upon a Meteosat Third Generation-Sounder (MTG-S) satellite in geostationary orbit.

Sentinel-5 is a precursor satellite mission being developed to reduce data gaps between Envisat, and the launch of Sentinel-5. This mission will be dedicated to atmospheric monitoring and is a payload that will monitor the atmosphere from polar orbit aboard a MetOp Second Generation satellite.

Sentinel-6 will carry a radar altimeter. This generates pulses of microwave radiation which are bounced off the surface of the earth and re measured at the satellite. The primary mission of this instrument is to measure sea surface height.

### *Instruments*

There are new techniques such as multispectral and hyperspectral passive remote sensing instruments, along with Lidar and Synthetic Aperture Radar (SAR) active sensors.

Satellite observation has transitioned from the experimental to the more continuous phase of deployment. The Copernicus system is going to provide continuous data streams to many parameters of our planet. It's the first time we have had that continuity of data available from space from anything other that meteorological platforms in the past.

These days earth observation missions come in a wide variety of sizes, from cubesats which are basically 10x10x10 cm, to large missions like Sentinel-3. They have a range of structures, from solar panels to generate electricity, to antennae to communicate with the earth and transmit the data.

The Sea and Land Surface Temperature Radiometer (SLSTR), is passive remote sensing instrument which is designed to measure long-wave radiation emitted from the earth. This measures sea surface temperature to high levels of accuracy. It can also measure land surface temperature, detect fires, measure distribution of vegetation and improved cloud detection.

### *Active and passive instruments*

Active instruments actually generate electromagnetic radiation of particular wavelengths. For example in the case of radar, this would be microwave radiation, whereas in the case if Lidar, it would be laser radiation, typically at visible or infrared wavelengths.

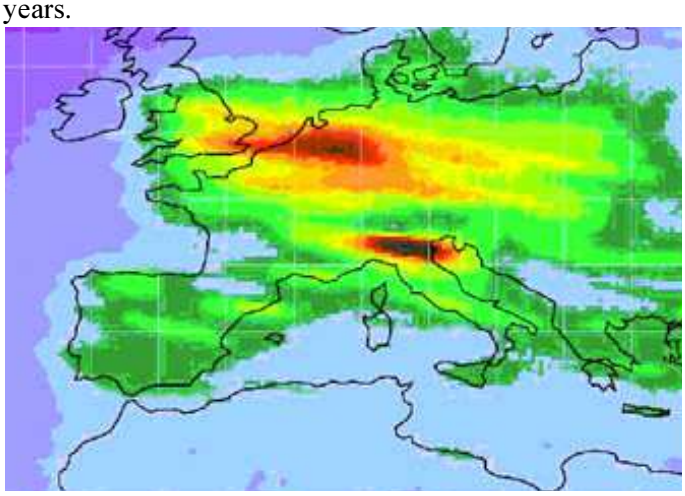
They are used for particular tasks, for example, measuring vegetation canopy height and the height of ice sheets.

Passive remote sensing instrumentation, by contrast uses just sunlight or thermal emitted radiation from the earth. Most remote sensing instruments are passive.

### *The Atmosphere*

The atmosphere plays a vital role in making the Earth habitable, including shielding us from harmful UV electromagnetic radiation, holding the air we breathe, and helping keep Earth at the necessary temperature for maintaining a good supply of liquid water - thus making life possible on our planet. In order to assess the condition of the atmosphere, and to study its evolving complexity, it is important to monitor the status of, and changes in, atmospheric properties - such as chemical composition, temperature, pressure, wind speed and wind direction. Earth observation techniques provide the opportunity to collect global measurements of such parameters, and is therefore essential to monitoring and forecasting our weather, and to improving our understanding of atmospheric science, especially climate change.

Increasing atmospheric concentrations of carbon dioxide (CO2) are the most prominent and well-known driver behind our changing climate. Through heavy industrialisation, humans have released huge amounts of CO2 and other greenhouse gases into the atmosphere, and have also removed some of the areas of forest that help absorb atmospheric CO2 and store it as carbon in vegetation. Over time, these human activities have caused changes in our climate, and whilst these changes may perhaps be almost imperceptible to us personally, measurements with EO sensors and other types of measurement device show significant impacts at both the regional and global scales. By combining these types of data within numerical modelling, we can also make forecasts of what climate changes we might see in future years.



### *Aerosols*

'Atmospheric aerosols', (minute particles suspended in Earth's atmosphere), can interact with incoming and outgoing electromagnetic radiation, and thus can have an

important effect on the Earth's 'radiation budget'. Particular types of aerosol particle serve to scatter and absorb shortwave and longwave radiation more severely, causing increased impacts on the radiation budget, weather and climate. Certain types of aerosol also have other effects - for example changing precipitation. It is therefore important to both quantify the total amount of aerosol present in the atmosphere at a particular location, but also to try to identify its type.

Earth observation allows us to study atmospheric aerosols in much greater detail and over a much wider area of the planet than ever before, helping to improve our understanding of their role in the climate system and in climate change. By using observations from EO satellites, we can assess the amount and type of aerosol present, and can achieve a global view of their spatial and temporal variability. We can also use the data to try to deduce the origin of the aerosol in a particular region, along with the size range and abundance of the particles.

Satellites provide us with the detailed information necessary to assess the changing concentrations of CO2, other trace gases, and aerosols in our atmosphere. This might be forecasts a few days ahead for early warning of periods of reduced air quality, or decades ahead in relation to what the changing concentrations of atmospheric greenhouse gases might mean for Earth's climate.

### *Glossary of terms*

A geostationary orbit is a circular orbit 35,786 kilometres (22,236 mi) above the Earth's equator and following the direction of the Earth's rotation.

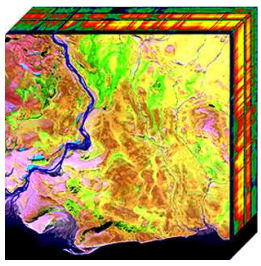
A polar orbit is one in which a satellite passes above or nearly above both poles on each revolution. It therefore has an inclination of (or very close to) 90 degrees to the equator.

The higher the orbit of a satellite, the longer its 'period' (time to make one orbit). Satellites in low polar orbit pass over the poles. They orbit between 100 km and 200 km above the Earth's surface, taking around 90 minutes to make each orbit.

The cryosphere is the places where water is in its solid form, frozen into ice or snow, including ice that is found in water. This includes frozen parts of the ocean, such as waters surrounding Antarctica and the Arctic.

The Meteosat series of satellites are geostationary meteorological satellites operated by EUMETSAT under the Meteosat Transition Programme (MTP) and the Meteosat Second Generation (MSG) programme.

A multispectral image is one that captures image data at specific frequencies across the electromagnetic spectrum. The wavelengths may be separated by filters or by the use of instruments that are sensitive to particular wavelengths, including light from frequencies beyond the visible light range, such as infrared.



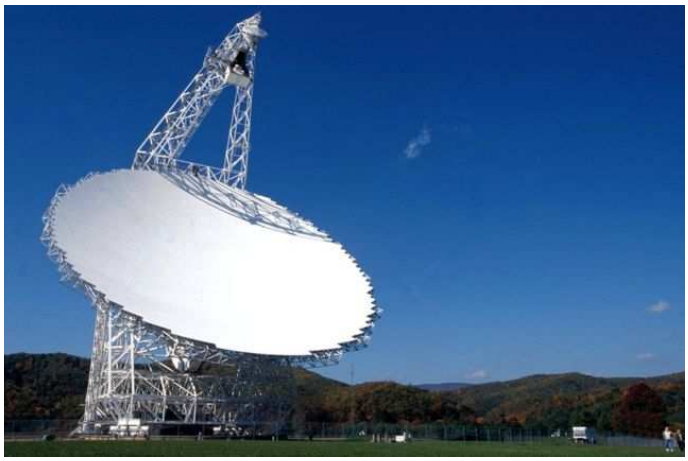
Hyperspectral imaging, like other spectral imaging, collects and processes information from across the electromagnetic spectrum. The goal of hyperspectral imaging is to obtain the spectrum for each pixel in the image of a scene, with the purpose of finding objects, identifying materials, or detecting processes.

Lidar is an acronym for Light Detection And Ranging, and is a surveying method that measures distance to a target by illuminating that target with a laser light. From an aircraft this includes objects such as the ground, buildings and vegetation.

A Synthetic Aperture Radar (SAR), is a coherent airborne or spaceborne sidelooking radar system which utilizes the flight path of the platform to simulate an extremely large antenna or aperture electronically, and that generates high-resolution remote sensing imagery.

*Elaine Spear*

# Dish to listen for ET around strange star



*The Green Bank Telescope is located in a rural area of West Virginia*

A $100m initiative to listen for signals from alien life is targeting a star with an unusual dimming pattern.

The Breakthrough Listen project, backed by Prof Stephen Hawking, will train a US radio telescope on a target called Tabby's Star.

Tabby's Star has been a subject of attention and controversy over its irregular dimming pattern.

Some scientists have been puzzled by large dips in the star's brightness.

One of the most favoured explanations for this behaviour is that a swarm of comet fragments is periodically blocking light from the star, which also known by its official designation - KIC 8462852.

One very remote and speculative idea - yet one that has attracted much attention in the media - is that the pattern is caused by some kind of artificial structure, or a collection of structures, around the star.

The co-director of the Breakthrough Listen programme, Dr Andrew Siemion, said he was sceptical of explanations that involved intelligent life.

He added: "The Breakthrough Listen programme has the most powerful SETI equipment on the planet, and access to the largest telescopes on the planet."

"We can look at it with greater sensitivity and for a wider range of signal types than any other experiment in the world."

The team plans to use the 100m Green Bank Telescope in West Virginia, US, to observe the star, which is named after the leader of the team that discovered it - Tabetha Boyajian, assistant professor at Louisiana State University.

Previous searches, using the Hubble Space Telescope and the Keck Observatory, have failed to find any unusual signals around the star.

But Dr Siemion explained: "The Green Bank Telescope is the largest fully steerable radio telescope on the planet, and it's the largest, most sensitive telescope that's capable of looking at Tabby's star given its position in the sky."

The unusual behaviour around Tabby's star was first reported in September 2015 by Dr Boyajian, who was then a postdoctoral student at Yale University. The findings were published in the Monthly Notices of the Royal Astronomical Society.

The team was actually looking for evidence of planets orbiting stars other than our own.

While most such dimming by transiting planets is brief, regular and blocks just 1 or 2% of the light of the star, Tabby's star dims for days at a time, by as much as 22%, and at irregular intervals.

Speculation that the phenomenon could be caused by a "megastructure" built by an intelligent civilisation, has been dismissed by most scientists. But it has propelled the stellar object to prominence in the popular media.

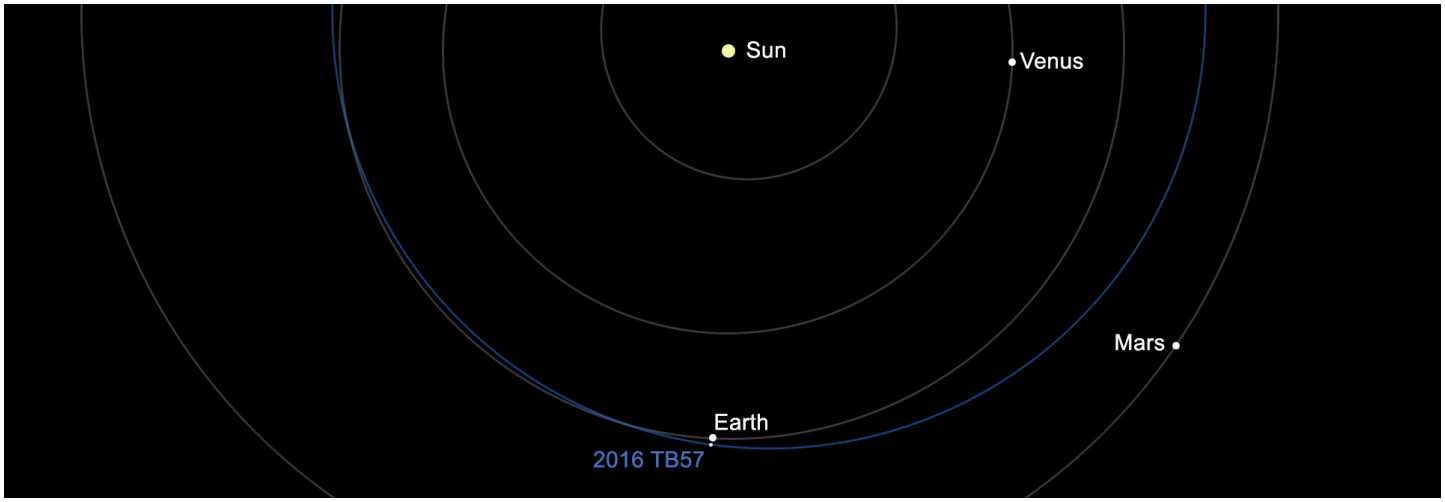
"I don't think it's very likely - a one in a billion chance or something like that - but nevertheless, we're going to check it out," said Dan Werthimer, chief scientist at Berkeley SETI, based at the University of California, Berkeley.

Yet Tabby's Star remains a fascinating conundrum for astronomers. Some observations show that the dips in brightness are more irregular than a comet swarm would produce. And another study suggested that it had been dimming at a steady rate for the past century.

The Breakthrough Listen initiative was launched in 2015 at an event in London. It is largely funded by Russian entrepreneur Yuri Milner - who also supports the Breakthrough Prizes for science and maths.

*More at:* ***http://www.bbc.co.uk***

# Catalog of Known Near-Earth Asteroids Tops 15,000




*The 15,000th near-Earth asteroid discovered is designated 2016 TB57. It was discovered on Oct. 13, 2016, by observers at the Mount Lemmon Survey, an element of the NASA-funded Catalina Sky Survey in Tucson, Arizona. Credits: NASA/JPL-Caltech*

The number of discovered near-Earth asteroids (NEAs) now tops 15,000, with an average of 30 new discoveries added each week. This milestone marks a 50% increase in the number of known NEAs since 2013, when discoveries reached 10,000 in August of that year.

Surveys funded by NASA's Near Earth Object (NEO) Observations Program (NEOs include both asteroids and comets) account for more than 95% of discoveries so far.

The 15,000th near-Earth asteroid is designated 2016 TB57. It was discovered on Oct 13 by observers at the Mount Lemmon Survey, an element of the NASA-funded Catalina Sky Survey in Tucson, Arizona. 2016 TB57 is a rather small asteroid - about 50 to 115ft (16 to 36m) in size - that will come closest to Earth on Oct 31 at just beyond 5x the distance of the moon. It will safely pass Earth.

A near-Earth asteroid is defined as one whose orbit periodically brings it within approximately 1.3x Earth's average distance to the sun - that is within 121 million miles (195 million km) - of the sun (Earth's average distance to the sun is about 93 million miles, or 150 million km). This distance also then brings the asteroid within roughly 30 million miles (50 million km) of Earth's orbit. Observers have already discovered more than 90% of the estimated population of the large NEOs - those larger than 0.6 miles (one km).

"The rising rate of discovery is due to dedicated NEO surveys and upgraded telescopes coming online in recent years," said NASA's NEO Observations Program Manager Kelly Fast. "But while we're making great progress, we still have a long way to go." It is estimated by astronomers that only about 27% of the NEAs that are 460ft (140m) and larger have been found to date. Congress directed NASA to find over 90% of objects this size and larger by the end of 2020.

Currently, two NASA-funded NEO surveys - the Catalina Sky Survey and the Panoramic Survey Telescope & Rapid Response System (Pan-STARRS) in Hawaii - account for about 90% of new NEO discoveries. Both projects upgraded their telescopes in 2015, improving their discovery rates.

A recent upgrade to one of the Catalina Sky Survey's telescopes resulted in a tripling of its average monthly NEO discovery rate. When the Pan-STARRS system increased the observing time it devoted to NEO searching to 90%, it increased its rate of discovery by a factor of three. Pan-STARRS also will add a second telescope to the hunt this fall. As more capable telescopes are deployed, the overall NEO survey effort will be able to find more objects as small as and smaller than 140m (460ft).

The NEO Observations Program is a primary element of NASA's Planetary Defense Coordination Office, which is responsible for finding, tracking and characterizing potentially hazardous NEOs, issuing warnings about possible impacts, and coordinating U.S. government planning for response to an actual impact threat.

"While no known NEO currently poses a risk of impact with Earth over the next 100 years," says NASA Planetary Defense Officer Lindley Johnson, "we've found mostly the larger asteroids, and we have a lot more of the smaller but still potentially hazardous ones to find."

For asteroid news and updates, follow AsteroidWatch on Twitter:

*http://www.twitter.com/AsteroidWatch*

I know there are quite a few members interested in electronics and how things work so I thought I'd remind them about a pair of very interesting websites: hackaday.com and hackaday.io.

Hackaday.com describes itself:

*Hackaday serves up Fresh Hacks Every Day from around the Internet. Our playful posts are the gold-standard in entertainment for engineers and engineering enthusiasts.*

*We are taking back the term "Hacking" which has been soured in the public mind. Hacking is an art form that uses something in a way in which it was not originally intended. This highly creative activity can be highly technical, simply clever, or both. Hackers bask in the glory of building it instead of buying it, repairing it rather than trashing it, and raiding their junk bins for new projects every time they can steal a few moments away.*

*Our front page is a mix of hacks from around the community as well as our own original content. We strive to promote the free and open exchange of ideas and information. We educate those just learning the art of Hack, and provide inspiration for the seasoned veterans. Don't be shy; if you want to show off your project, or have found something cool of someone else's that deserves sharing, send us a link!*

*But don't just read Hackaday — you should delve deeper into the community. Document your work on our hosting site at Hackaday.io. Tell the world about your interests and show off the stuff you've already built. Start a build log for that project you've been dreaming of recently. Make some friends and collaborate with them on a project. Get lost digging through mountains of gnarly hacks.*

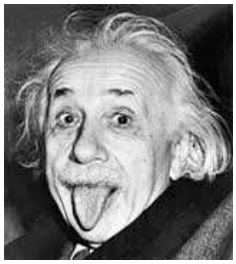
Very usefully the homepage on hackaday.com has a Search facility so it's very easy to home in on projects you may be interested in. I tried "Astronomy" and got the following results:

1. Citizen Scientist Radio Astronomy (And More): No Hardware Required
2. Star Track: A Lesson In Positional Astronomy With Lasers
3. Thp Entry: Making Amateur Astronomy Easy
4. 3d Universe Theater
5. A Compact Star Tracking Tripod
6. and plenty more.....

There really is a ton of stuff to read on the website, from people using space blankets to make mirrors through telescope mount controls using Raspberry Pi computers and on to using software defined radios to make radio telescopes.


Of course there's a lot more here than just astronomy so, whether you need an automatic system to control your homebrew beer or fancy making a human crossbow (!) have a look around, I'm sure you'll enjoy it, you could even make a Tea-Pi (A voice controlled automatic loose-leaf tea-brewer for fine teas).

***http://www.hackaday.com***
***http://www.hackaday.io***



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LINKS, COMMENTS AND OBSERVATIONS

## Latest dark matter searches leave scientists empty-handed

***Physicists ponder possibilities for bulk of universe's mass***

Scientists have lost their latest round of hide-and-seek with dark matter, but they're not out of the game.

Despite overwhelming evidence that an exotic form of matter lurks unseen in the cosmos, decades of searches have failed to definitively detect a single particle of dark matter. While some scientists continue down the road of increasingly larger detectors designed to catch the particles, others are beginning to consider a broader landscape of possibilities for what dark matter might be.

"We've been looking where our best guess told us to look for all these years, and we're starting to wonder if we maybe guessed wrong," says theoretical astrophysicist Dan Hooper of Fermilab in Batavia, Ill. "People are just opening their minds to a wider range of options."

Dark matter permeates the cosmos: The material keeps galaxies from flying apart and has left its imprints in the oldest light in the universe, the cosmic microwave background, which dates back to just 380,000 years after the Big Bang. Indirect evidence from dark matter's gravitational influences shows that it makes up the bulk of the mass in the universe. But scientists can't pin down what dark matter is without detecting it directly.

***https://www.sciencenews.org/***

## Juno's First Slice of Jupiter

This composite image depicts Jupiter's cloud formations as seen through the eyes of Juno's Microwave Radiometer (MWR) instrument as compared to the top layer, a Cassini Imaging Science Subsystem image of the planet. The MWR can see a couple of hundred miles (kilometers) into Jupiter's atmosphere with its largest antenna. The belts and bands visible on the surface are also visible in modified form in each layer below.

JPL manages the Juno mission for the principal investigator, Scott Bolton, of Southwest Research Institute in San Antonio. Juno is part of NASA's New Frontiers Program, which is managed at NASA's Marshall Space Flight Center in Huntsville, Alabama, for NASA's Science Mission Directorate. Lockheed Martin Space Systems, Denver, built the spacecraft. Caltech in Pasadena, California, manages JPL for NASA.

Image credit: NASA/JPL-Caltech/SwRI/GSFC

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

### 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

**New Zenith needs letters, articles, reviews or pictures related to astronomy. Contributions to the Editor at the email or postal address on the front page.**

*"Facts do not cease to exist because they are ignored"*
***Aldous Huxley***

*"The opposite of a fact is falsehood, but the opposite of one profound truth may very well be another profound truth"*
***Niels Boor***

*"There is a profound difference between information and meaning"*
***Warren Bennis***

*"My Father had a profound influence on me. He was a lunatic"*
***Spike Milligan***