

## Society News

### Transit of Mercury

As members will almost certainly know, on Monday May 9 there will be a transit of Mercury across the Sun's disk. This relatively rare phenomenon is always an interesting spectacle to watch and we are intending to be at the observatory with equipment to witness the event. The actual transit lasts from 12:12 BST till 19:41 BST.

If we can attract enough members (minimum 8) to attend we will open things to the public and advertise it. Using the VAS solarscope and a Coronado (kindly offered by John Langley) we should, weather permitting, get a good view.

If you can help, even for a couple of hours, please contact Elaine Spear (elainespear1@gmail.com).

### Physics Event

VAS have been invited to Cowes Enterprise College for a Physics Day on Tuesday 5th July. They are expecting visits from most of the Island's schools and hope we can provide an insight to astronomy.

We would have an exhibition stand and need some volunteers to help for the day. If you can help for an hour or two please drop me an email.

### Treasurer

Our Treasurer, David Kitching, is leaving us! David has decided to stand down this year as he is moving off the Island to be closer to his (growing!) family.

Firstly, on behalf of the members and Committee, thank you David for your help over the last few years, you've done a great job, we'll miss you and hope that it wasn't us that drove you away ;)

If anyone fancies a go at being treasurer, now would be a good time to volunteer, you'll at least get a chance to pick David's brain before he leaves!

*Brian Curd*  
*Editor New Zenith.*

## VAS Website: [wightastronomy.org](http://wightastronomy.org)

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

**The Editor New Zenith**  
**75 Hefford Road**  
**East Cowes**  
**Isle of Wight PO32 6QU**

Tel: **01983 296128** or email: [editor@wightastronomy.org](mailto:editor@wightastronomy.org)

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

## VAS Registered Office

75 Hefford Road, East Cowes, Isle of Wight, PO32 6QU  
The Vectis Astronomical Society and the Editor of the New Zenith accept no responsibility for advice, information or opinion expressed by contributors.

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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, 19.30hrs	Members and Public. Informal meeting and observing

## Contents this Month

<i>Society News</i> .....	1
<i>April Sky Map</i> .....	3
<i>April Night Sky</i> .....	4
<i>Silly Questions?</i> .....	5
<i>Monstrous 'Super Spirals'</i> .....	5
<i>All we are is Dust in the Interstellar Wind</i> .....	6
<i>Haze on Ceres</i> .....	7
<i>NASA Sends Fire to International Space Station</i> ..	8
<i>Dr Tom Kitching - A Date for Your Diary</i> .....	9
<i>NASA's Asteroid Redirect Mission</i> .....	10
<i>Astronomers 10 Commandments</i> .....	10
<i>VLA Shows Earliest Stages of Planet Formation</i> ..	11
<i>The Back Page</i> .....	12

## 2016 Monthly Meetings

Date	Subject	Speaker
Please check <a href="http://wightastronomy.org/meetings/">wightastronomy.org/meetings/</a> for the latest information		
25 Mar	Death From Space	Ninian Boyle
22 Apr	Astronomy on the Tablet	Dr Lilian Hobbs
27 May	Meteors	Richard Kacerek
24 Jun	<b>TBA</b>	<b>TBA</b>
22 Jul	ESA EUCLID Mission Latest Update	Dr Tom Kitching
26 Aug	AGM Starts at 7pm sharp William Herschel and the Rings of Uranus	Dr Stuart Eves
23 Sep	Galaxy Formation	Prof Chris Lintott
28 Oct	Radiation protection in space (for manned missions)	Dr Elizabeth Cunningham
25 Nov	Stellar population modelling	Dr Claudia Maraston

## Observatory Visits Booked

None booked this month

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

## Electrical Saga

The alterations to the observatory have been delayed somewhat following the discovery of a few electrical wiring “inconsistencies”.

An electrician has been contacted and should be sorting things out very soon.

*Everything in the observatory is safe to use as the affected circuit has been isolated but please ask if you are unsure of anything.*

## VAS Contacts 2014/15

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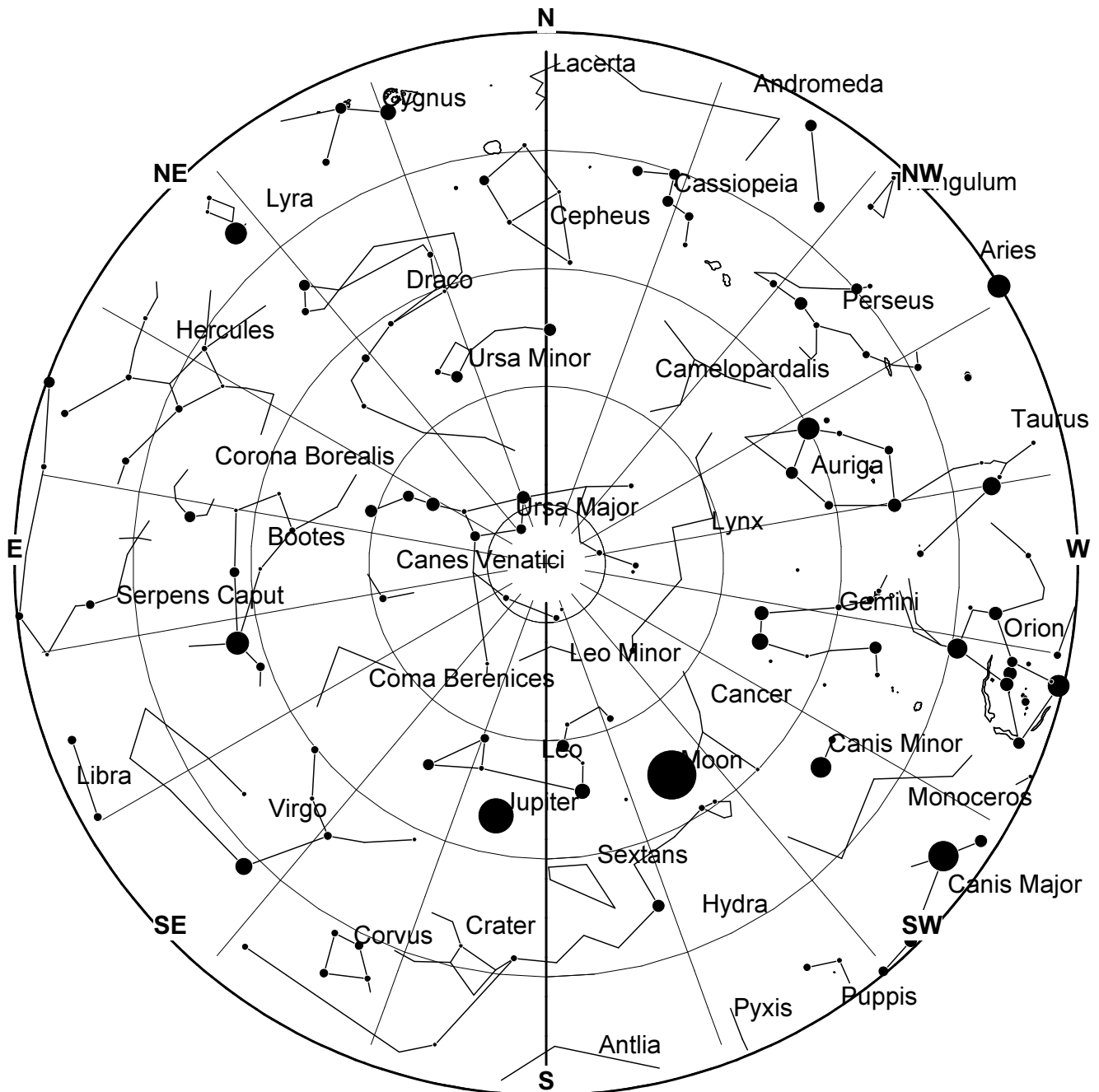
## Important

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

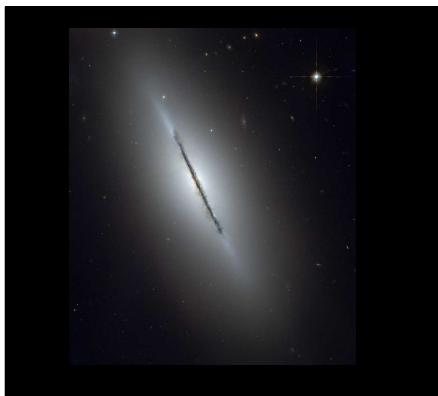
On several occasions, lights, heaters and the Meade LX200 have been left on!

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

# April 2016 Sky Map



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







**NGC 5866 (also called the Spindle Galaxy or Messier 102)** is a relatively bright lenticular or spiral galaxy in the constellation Draco. NGC 5866 was probably discovered by Pierre Méchain or Charles Messier in 1781, and independently found by William Herschel in 1788.

One of the most outstanding features of NGC 5866 is the extended dust disk, which is seen almost exactly edge-on. This dust disk is highly unusual for a lenticular galaxy. The dust in most lenticular galaxies is generally found only near the nucleus and generally follows the light profile of the galaxies' bulges

*This article is licensed under the [GNU Free Documentation License](#).  
It uses material from the Wikipedia article "NGC 5866".*

## April 2016 Night Sky

### Moon Phases

New	First Qtr	Full	Last Qtr
			
7th	14th	22nd	30th

### Mini-moon

There is often a great deal of publicity for a Super-moon, a full moon that occurs when the Moon is close to the Earth and appears slightly larger and brighter in the sky. This month's full moon is the smallest of the year, it occurs when the moon is 404,350km from the Earth.

### Planets

**Mercury** - Mercury makes a good apparition in the evening sky, spring time is good for observing the Moon and planets in the evening sky. There is a nice grouping with the crescent moon to the left of Mercury on the 8th.

The table shows the altitude and azimuth of Mercury at 20:00 and 20:30. It will be visible both before and after the times given in the table, but it will be a challenge to spot easily in the bright evening sky.

Date 20:00	Az	Alt	Date 20:30	Az	Alt
1	279	4	13	284	11
3	279	6	15	285	12
5	279	9	17	285	13
7	279	11	19	285	13
9	279	13	21	286	13
11	279	14	23	287	13

**Venus:** - Venus is in the morning sky rising at about the same time as the Sun. It may be glimpsed with the naked eye at the start of the month, but will be challenging to spot in the brightening sky. There is a lunar occultation where Venus disappears behind the Moon on the 6th at 08:29, reappearing again at 09:00. The Moon will be a very thin crescent at this time and the Sun will be in the sky. If it is clear this may be visible using binoculars, though it will be much easier to observe with a telescope. **Take great care if attempting to observe this because the Sun will not be far away.** To be safe ensure that you and your instruments are in the shade and can not see the Sun.

**Mars** - Mars is still an early morning object being found low in the south at around 4AM. This will change with

next month's opposition when it will be brighter and visible all night. It is a few degrees above its opposite Antares, a red super giant star of very similar colour.

**Jupiter** - We are now just passed opposition making Jupiter well placed for observation from mid evening onwards. As the sky darkens is the brightest object in the south-south-east below the body of Leo.

**Saturn** - The rings of Saturn are for the early risers or those who can stay up all night. Saturn can be found low in the south at around 4AM. There are only two other bright objects in that part of the sky, Mars and the star Antares. Both are noticeably red in colour and are easily distinguished from Saturn which has yellow hue.

**Uranus & Neptune** - Both outer planets are lost in the glare of the sun and will not return to our skies until later in the year.

### Deep Sky

#### **NGC5866 / M102 Spindle Galaxy** **RA 15h 7m Dec 55° 44' mag 10.5**

Is this really M102? Did Messier ever see this galaxy or was it all a great mistake, and just a duplicate observation of M101, perhaps we will never know. An almost perfectly edge on galaxy, visually it lives up to its name, small telescopes show it as a silvery spindle of light against a hopefully dark background. Larger 'scopes may, if the seeing is good enough show a thin dust lane cutting through the central bulge.

#### **M101 The Pin Wheel Galaxy** **RA 14h 3m Dec 54° 18' mag 8.5**

In contrast to M102 this is a large, almost perfectly face on galaxy. Covering an area of sky about a quarter of that of the full moon this galaxy is visually not as bright as its magnitude might suggest, but as galaxies go it is still quite easy to find and is visible as a dim smudge on the sky in a pair of binoculars.

#### **Leo Triplet M65, M66, NGC3628** **RA 11h 20m Dec 13° 14'**

Just under the lion's hind legs in an area not much larger than the full moon are three spiral galaxies. Using a low power all three can be seen in the same field of view. Each is about half way between edge on and face on so appear as an oval smudge with a bright core. Why NGC3628 is the largest of the three and the faintest, just (mag 9.5), why it does not have its own place in the Messier catalogue we will never know, perhaps it says something for the quality of 18th century optical equipment.

*Peter Burgess*

# SILLY QUESTIONS?

WE ALL KNOW THAT THERE'S NO SUCH THING AS A SILLY QUESTION BUT.....

## What's the Difference Between a Star and a Shooting Star?

### Stars

A star is a luminous sphere of plasma held together by its own gravity. The nearest star to Earth is the Sun. Other stars are visible to the naked eye from Earth during the night, appearing as a multitude of fixed luminous points in the sky due to their immense distance from Earth.

For at least a portion of its life, a star shines due to thermonuclear fusion of hydrogen into helium in its core, releasing energy that traverses the star's interior and then radiates into outer space. When the hydrogen in the core of a star is nearly exhausted, almost all naturally occurring elements heavier than helium are created by stellar nucleosynthesis during the star's lifetime and, for some stars, by supernova nucleosynthesis when it explodes.

### Shooting Stars or Meteors

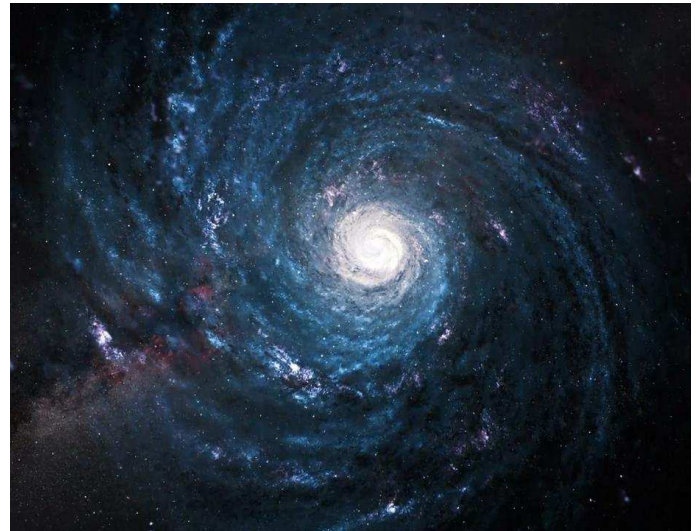
Meteors, or shooting stars as they are more commonly known, are the streaks of light produced when a meteoroid burns up in the Earth's atmosphere. It looks like a star falling towards Earth as it momentarily flashes above us. The meteoroids, which produce the meteors, are dust and rocks in space.

Comets and asteroids are the two main sources. Upon coming close to the Sun, comets lose dust and fragments while asteroids lose fragments if they collide together. As the Earth moves along its orbit around the Sun, meteoroids hit the upper atmosphere and hurtle towards Earth's surface. Once in the atmosphere, friction between the meteoroid and air molecules often produces the brief trail of light that we call a meteor or shooting star.

To produce a meteor, a meteoroid needs only a mass of one millionth of a gram, but needs to be travelling at a tremendous speed: anywhere between 11 and 74km/sec (that is up to 100 times faster than a rifle bullet). The factors that determine the luminosity of a meteor are the size, speed, mass and structure of the meteoroid's material.

Large meteoroids, which produce longer meteors reaching a magnitude of -10, are called fireballs. Tens of thousands of them fall to Earth each year, around five thousand of which break up and explode. Such explosive meteors are called bolides.

## Astronomers Discover Monstrous 'Super Spirals'



*A team of scientists led by Dr. Patrick Ogle from the California Institute of Technology has discovered a new type of galaxy called a super spiral.*

According to the team, super spirals are very luminous — they can shine with anywhere from 8 to 14 times the brightness of our Milky Way Galaxy.

They are also giant and massive, with diameter 186,000-437,000 light-years and stellar mass between 30 and 340 billion solar masses.

These galaxies give off copious UV and mid-IR light, signifying a breakneck pace of churning out new stars. Their star formation rate is as high as 30 times that of our own Galaxy.

Dr. Ogle and co-authors chanced upon super spirals as they searched for extremely luminous, massive galaxies in the NASA/IPAC Extragalactic Database (NED).

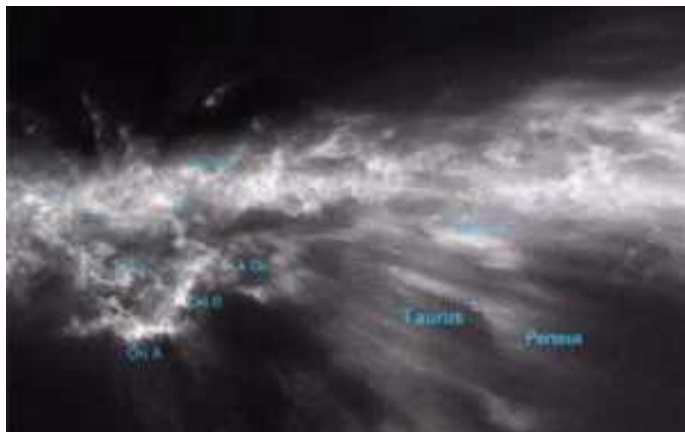
“Remarkably, the finding of super spiral galaxies came out of purely analyzing the contents of the NED database, thus reaping the benefits of the careful, systematic merging of data from many sources on the same galaxies,” said team member Dr. George Helou, also from the California Institute of Technology.

The astronomers expected that humongous, mature galaxies called ellipticals would dominate their search within NED for the most luminous galaxies. But a tremendous surprise lay in store for the team.

In a sample of about 800,000 galaxies no more than 3.5 billion light-years from Earth, 53 of the brightest galaxies intriguingly had a spiral, rather than elliptical, shape.

More at: <http://www.sci-news.com/>

## All we are is Dust in the Interstellar Wind



Cosmic dust is not simply something to sweep under the rug and forget about.

Instead, National Science Foundation (NSF)-funded astronomers are studying and even mapping it to learn more about what it might be hiding from us, where it comes from and what it's turning into.

Some researchers are delving deep down to see how dust comes together at the atomic level, while others are looking at the big picture to see where stars and planets might be forming in dusty stellar nurseries. Recent discoveries, such as that of a very young galaxy containing much more dust than expected, have shown us that we still have much to learn about where exactly all this dust comes from.

### A little bit of dust makes a very large problem

Although dust only makes up about 1 percent of the interstellar medium (the stuff between the stars), it can have big effects on astronomical observations. Dust has a bad reputation because it gets in the way by absorbing and scattering the visible light from objects such as far-off galaxies and stars, making them difficult or impossible to observe with optical telescopes.

The scattering effect dust has is known as “reddening” - dust scatters the blue light coming from an object, making it appear redder. This occurs because dust has a greater effect on light with short wavelengths, such as blue. A similar effect is what causes sunsets to appear red.

Astronomers can tell a lot about a star simply by its colour, so this reddening effect can trick us into thinking a star is cooler and dimmer than it actually is. However, thanks to NSF-funded astronomers like Doug Finkbeiner of the Harvard-Smithsonian Center for Astrophysics, we

can now correct for dust reddening and recover a star's intrinsic colour.

Finkbeiner first began studying cosmic dust as a graduate student at the University of California, Berkeley in the late 1990s. Dust may seem like an odd thing to dedicate an astronomical career to but “dust is not as obscure as it sounds,” Finkbeiner said. “Objects like the Orion Nebula, the Horsehead Nebula, and the Pillars of Creation are dense, dusty clouds intermingled with bright stars, making a beautiful scene. But every part of the sky has at least some dust, and even a tiny amount of dust can interfere with astronomical measurements, so we need a way to correct for it.”

### A necessary nuisance

Knowing where dust is, and where it isn't, gives us a better understanding of what's happening in our galaxy. For example, an area saturated with dust may indicate a hotbed of star formation activity, while holes in an otherwise dusty area tell us that a supernova may have occurred and blown a pocket of dust away.

“Dust is not a very glamorous name for something this important,” said Glen Langston, an NSF astronomy program director. “It represents both sides of star life — star birth and star death.”

These dusty areas are also factories of cosmic chemistry — chemistry that creates molecules such as graphite (otherwise known as the stuff inside your pencil).

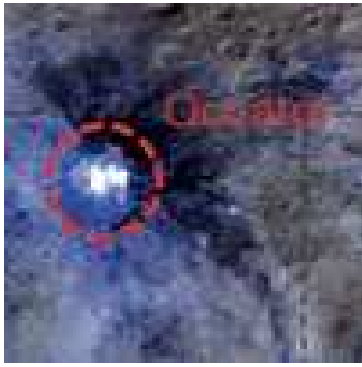
When dying stars explode, they expel dust out into space that can be recycled to make something new. In fact, everything in the universe — stars, comets, asteroids, planets, even humans, started out as grains of dust floating around in space. As the late astronomer Carl Sagan famously said, “The nitrogen in our DNA, the calcium in our teeth, the iron in our blood, the carbon in our apple pies were made in the interiors of collapsing stars. We are made of starstuff.”

Astronomers can peer into the galaxy and tell that some stars are making dust right now, but other dust might be billions of years old with a long, complicated history of growing, shrinking, freezing and burning as it travelled through space.

“It's not a bad analogy to think of dust like grains of sand on the beach,” Finkbeiner said. “You might have sand that looks the same because it's coming from a coral reef 100 meters away, but in other places you might have sand that came from very far away which has been through a lot over thousands or millions of years.”

*Read More: [ScienceBlog.com](http://ScienceBlog.com)*

## Haze on Ceres



Independent observations of Ceres by Dawn spacecraft and by HARPS spectrograph at La Silla, Chile, reveal the extremely variable behaviour of the mysterious bright spots on the surface of the dwarf planet, which were discovered by the spacecraft in February 2015. Variability measured with HARPS and recent closer images reveal a mysterious haze in the Occator crater (92 km), which disappears within a few hours.

It is assumed that something comes out from inside the planet where a huge amount of water is present. Water could possibly evaporate and fill the crater and then disappear under the effect of solar radiation. The team of the space mission showed great interest for the results of ground-based observations, and joint coordinated observations are being planned to continue research also after the space mission is completed.

Ceres is the largest object in the asteroid belt located between Mars and Jupiter and is also the dwarf planet closer to Earth. Unlike the other celestial bodies around it, it seems to have traces of activity on its surface. This is suggested by the beautiful high resolution images collected by Dawn spacecraft published in Nature last December, and presently by recent observation with ground based telescopes by a team of INAF astronomers including Paolo Molaro and Marco Fulle of OATs.

Searching for further clues about the nature of the spots, Molaro and co-authors measured the radial velocity distortions produced in the spectrum of the solar light reflected by Ceres by the bright spots which rotate like a headlight. Using HARPS spectrograph at ESO 3.6 telescope, the authors could reach the limit of about one meter per second necessary to reveal the extremely small distortions. The results of observations confirm the variations of the solar spectrum with a period slightly higher than nine hours, which corresponds to the rotation period of Ceres. However, observations also reveal marked and unexpected variations in radial velocity in different nights. Data analysis brings to conclude that the observed effect could be due to the presence of volatile substances which evaporate due to solar radiation. When the rotation of Ceres takes them on the side illuminated by the Sun they

sublimate and form spots which reflect the solar light very effectively. Since they evaporate very quickly, they lose their reflecting power and generate the observed variation in radial velocity. This effect changes every night and generates a non-reproducible trend.

In accordance with ground based spectroscopic data, Nathues and co-authors by analyzing data from Dawn spacecraft in an article published in Nature assumed that the appearance of the bright areas in Occator crater would be consistent with the presence of hydrated magnesium sulphates. On the floor of the crater there seems to be something that pours out from inside and probably sublimates, thus generating a periodical haze that appears and disappears within a few hours.

If this interpretation were confirmed, the nature of Ceres would be quite different from the nature of Vesta and the other asteroids in the main belt. Ceres is a celestial body which, despite being so isolated and unaffected by the direct action of other planets, could have an internal activity on its own.

We know that Ceres hides huge amounts of water inside it, but we do not know either if the material reaching the surface is water, or the nature of the energy source that allows its continuous discharge. In the next few months, the Dawn mission will probably shed light on these mysteries and on the nature of the reflecting material, while the technique to measure radial velocity will allow to monitor this cycle of activity also after the space mission will be completed.

*More at: [Astronomical; Observatory of Trieste](#)*

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## NASA Sends Fire, Meteor Experiments to International Space Station on Commercial Cargo Spacecraft



*An Atlas V launch vehicle lifts off from Cape Canaveral Air Force Station carrying a Cygnus resupply spacecraft on the Orbital ATK CRS-6 mission to the International Space Station. Liftoff was at 11:05 p.m. EDT. The spacecraft will deliver 7,500 pounds of supplies, science payloads and experiments. Credits: NASA*

Scientific investigations of fire in microgravity and grippers inspired by geckos are among the nearly 7,500 pounds of cargo headed to the International Space Station aboard an Orbital ATK Cygnus spacecraft, along with equipment to support some 250 other experiments and studies aboard the world's only orbital laboratory.

Orbital ATK's fifth cargo delivery flight under its Commercial Resupply Services contract with NASA launched at 11:05 p.m. EDT Tuesday on a United Launch Alliance Atlas V rocket from Space Launch Complex 41 on Cape Canaveral Air Force Station in Florida. The Cygnus is scheduled to arrive at the orbiting laboratory Saturday, March 26.

The station's Expeditions 47 and 48 crews will employ these science payloads to support experiments in biology, biotechnology, physical science and Earth science – research that improves life on Earth -- including:

- **Saffire-I** provides a new way to study a large fire on an exploration craft, which has not been possible

in the past because the risks for performing such studies on spacecraft with astronauts aboard are too high.

- **Meteor** will enable the first space-based observations of meteors entering Earth's atmosphere from space.
- **Strata-I** could give us answers about how regolith behaves and moves in microgravity, how easy or difficult it is to anchor a spacecraft in regolith, how it interacts with spacecraft and spacesuit materials, and other important properties.
- **The Gecko Gripper** study tests a gecko-inspired adhesive gripping device that can stick on command in the harsh environment of space.
- **The Additive Manufacturing Facility** will add an upgraded 3-D printing capability to the station.

NASA astronaut and Expedition 46 Commander Tim Kopra will capture Cygnus at about 6:40 a.m. Saturday, March 26, using the space station's Canadarm2 robotic arm to take hold of the spacecraft. Astronaut Tim Peake of ESA (European Space Agency) will support Kopra in a backup position. NASA TV coverage of capture will begin at 5:30 a.m.

Saffire-1 will remain on the spacecraft once all the other supplies are unloaded, and the vehicle will be attached to the space station for about two months. Once it departs and the spacecraft is a safe distance from the space station, engineers will remotely conduct the first Saffire experiment before the Cygnus' destructive reentry into Earth's atmosphere. Before detaching from the station, Cygnus will also be filled with about 3,000 pounds of trash, which will be burned up over the Pacific Ocean.

This is the second flight of an enhanced Cygnus spacecraft, and the second using the Atlas V launch system. The cargo freighter features a greater payload capacity, supported by new fuel tanks and solar arrays, and an extended pressurized cargo module that increases the spacecraft's interior volume by 25 percent, enabling more cargo to be delivered with each launch.

The space station is a convergence of science, technology and human innovation that demonstrates new technologies and makes research breakthroughs not possible on Earth. The space station has been continuously occupied since November 2000. In that time, it has been visited by more than 200 people and a variety of international and commercial spacecraft. The space station remains the springboard to NASA's next great leap in exploration, including future missions to an asteroid and Mars.

Links to more info: <https://www.nasa.gov/>



## Dr Tom Kitching - A Date for Your Diary

*An Island scientist, Dr Tom Kitching, is about to appear on a BBC2 Horizon programme.*

Tom went to Shanklin CE Primary, Lake middle and Sandown High Schools. He was interested in Astronomy from a very early age - encouraged by his father Dave Kitching, and together they joined Vectis Astronomical Society, when Tom was just 8.

Tom had an aptitude for mathematics and his father, who taught maths at primary school, could not keep up with him after he reached the age of 8 when he discovered calculus - after that he was on his own in the mathematical universe.

Tom left Sandown High School in July 1999, where he was an A\* pupil in Physics, Maths and Chemistry, and went on to Imperial College and got a MSc in Physics.

Tom's Ph.D came from his research in Cosmology at Edinburgh University - in just 3 years. He was a research assistant in the Astro Physics department at Oxford University, and then went back to Edinburgh University as a researcher into Cosmology at the Royal Observatory, Edinburgh.

Tom became a fellow of the Royal Astronomical Society (RAS), and was awarded a prodigious University Research Fellowship with the Royal Society. he is currently a University Lecturer and Researcher into Cosmology (in the field of Dark Energy) at UCL in London and is based at the Mullard Space Science Centre in Surrey (part of UCL).

Lead scientist on the European Space Agency Project called EUCLID (<http://sci.esa.int/euclid/>), Tom has written numerous scientific papers, and is highly regarded in his field and travels the world for his research.



***Dr Tom's programme will be on TV very soon.....***

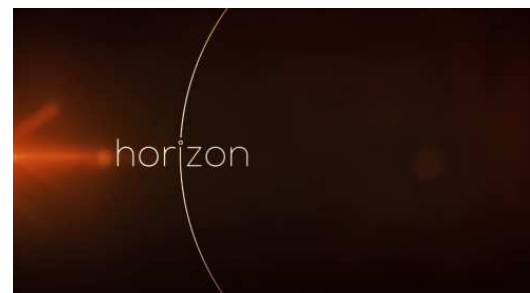
***30th March 2016 8.00 pm***

***BBC2 Horizon - "The Mystery Of Dark Energy"***

***so put that in your diary***

### From the BBC Website - The Mystery Of Dark Energy

Horizon meets the scientists on the hunt for Dark Energy, and questions whether Einstein was right or wrong. Dark Energy is causing the expansion of the universe to accelerate at an astonishing rate. When Einstein first conceived his theory of gravity the universe he predicted was constant, not expanding or contracting, but now that concept is a thing of the past. In the future, everything we can see in the sky at the moment will expand so far away from us that we will be unable to see it. The challenge for scientists now is to work out why.



Is Dark Energy a new force? Is it the result of quantum fluctuations or the first evidence that Einstein really was wrong - that gravity isn't an attractive force, but on cosmic scales is repulsive. And the scientist who solves the Dark Energy problem may well take Einstein's crown as the greatest genius in history.

## NASA's Asteroid Redirect Mission



NASA is developing a first-ever robotic mission to visit a large near-Earth asteroid, collect a multi-ton boulder from its surface, and redirect it into a stable orbit around the moon. Once it's there, astronauts will explore it and return with samples in the 2020s. This Asteroid Redirect Mission (ARM) is part of NASA's plan to advance the new technologies and spaceflight experience needed for a human mission to the Martian system in the 2030s.

NASA has identified multiple candidate asteroids and continues the search for one that could be redirected to near the moon in the 2020s. Since the announcement of the Asteroid Initiative in 2013, NASA's Near-Earth Object Observation Program has catalogued more than 1,000 new near-Earth asteroids discovered by various search teams. Of those identified so far, four could be good candidates for ARM. Scientists anticipate many more will be discovered over the next few years, and NASA will study their velocity, orbit, size and spin before deciding on the target asteroid for the ARM mission.

The Asteroid Redirect Mission is one part of NASA's Asteroid Initiative. The initiative also includes an Asteroid Grand Challenge, designed to accelerate NASA's efforts to locate potentially hazardous asteroids through non-traditional collaborations and partnerships. The challenge could also help identify viable candidates for ARM.

NASA plans to launch the ARM robotic spacecraft at the end of this decade. The spacecraft will capture a boulder off of a large asteroid using a robotic arm. After an asteroid mass is collected, the spacecraft will redirect it to a stable orbit around the moon called a "Distant Retrograde Orbit." Astronauts aboard NASA's *Orion spacecraft*, launched from a *Space Launch System (SLS)* rocket, will explore the asteroid in the mid-2020s.

The robotic mission also will demonstrate planetary defense techniques to deflect dangerous asteroids and protect Earth if needed in the future. NASA will choose an asteroid mass for capture with a size and mass that cannot harm the Earth, because it would burn up in the atmosphere. In addition to ensuring a stable orbit, redirecting the asteroid mass to a distant retrograde orbit around the moon also will ensure it will not hit Earth.

Perhaps most importantly, NASA's Asteroid Redirect Mission will greatly advance NASA's human path to Mars, testing the capabilities needed for a crewed mission to the Red Planet in the 2030s. For more information, read "[How NASA's Asteroid Redirect Mission Will Help Humans Reach Mars.](#)"

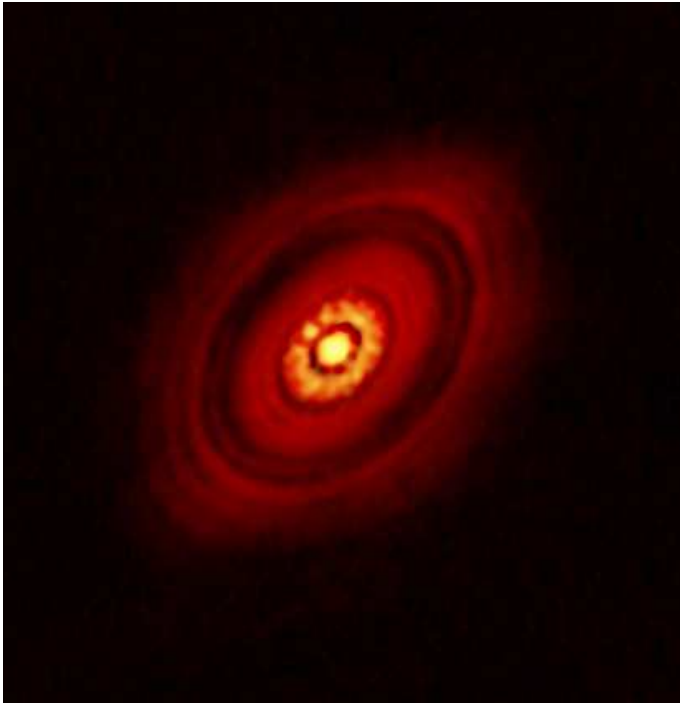
Links and Videos: <https://www.nasa.gov/>

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## Astronomers 10 Commandments

1. Thou shalt have no white light before, behind, or to the side of thee whilst sharing the night sky with thy fellow stargazers.
2. Thou shalt not love thy telescope more than thy spouse or thy children; as much as, maybe, but not more.
3. Thou shalt not covet thy neighbor's telescope, unless it exceeds in aperture or electronics twice that of thy wildest dreams.
4. Thou shalt not read "Astronomy" or "Sky & Telescope" on company time, for thine employer makes it possible to continue thine astronomical hobby.
5. Thou shalt have at least two telescopes so as to keep thy spouse interested when the same accompanies thee under the night sky or on eclipse expeditions to strange lands where exotic wild animals doth roam freely.
6. Thou shalt not allow either thy sons or thy daughters to get married during the Holy Days of Starfest.
7. Thou shalt not reveal to thy spouse the true cost of thy telescope collection; only the individual components and that shall be done with great infrequency.
8. Thou shalt not buy thy spouse any lenses, filters, dew shields, maps, charts, or any other necessities for Christmas, anniversaries, or birthdays unless thy spouse needs them for their own telescope.
9. Thou shalt not deceive thy spouse into thinking that ye are taking them for a romantic Saturday night drive when indeed thou art heading for a dark sky site.
10. Thou shalt not store thy telescope in thy living room, dining room, or bedroom, lest thou be sleeping with it full time.

## VLA Shows Earliest Stages of Planet Formation



*Combined ALMA/VLA image of HL Tau.*

*CREDIT: Carrasco-Gonzalez, et al.; Bill Saxton, NRAO/AUI/NSF.*

New images of a young star made with the Karl G. Jansky Very Large Array (VLA) reveal what scientists think may be the very earliest stages in the formation of planets. The scientists used the VLA to see unprecedented detail of the inner portion of a dusty disk surrounding the star, some 450 light-years from Earth.

The star and its disk were studied in 2014 with the Atacama Large Millimeter/submillimeter Array (ALMA), which produced what astronomers then called the best image ever of planet formation in progress. The ALMA image showed gaps in the disk, presumably caused by planet-like bodies sweeping out the dust along their orbits. This image, showing in real life what theorists had proposed for years, was surprising, however, because the star, called HL Tau, is only about a million years old -- very young by stellar standards.

The ALMA image showed details of the system in the outer portions of the disk, but in the inner portions of the disk, nearest to the young star, the thicker dust is opaque to the short radio wavelengths received by ALMA. To study this region, astronomers turned to the VLA, which receives longer wavelengths. Their VLA images show that region better than any previous studies.

The new VLA images revealed a distinct clump of dust in the inner region of the disk. The clump, the scientists said, contains roughly 3 to 8 times the mass of the Earth.

“We believe this clump of dust represents the earliest stage in the formation of protoplanets, and this is the first time we've seen that stage,” said Thomas Henning, of the Max Planck Institute for Astronomy (MPIA).

“This is an important discovery, because we have not yet been able to observe most stages in the process of planet formation,” said Carlos Carrasco-Gonzalez from the Institute of Radio Astronomy and Astrophysics (IRyA) of the National Autonomous University of Mexico (UNAM). “This is quite different from the case of star formation, where, in different objects, we have seen stars in different stages of their life cycle. With planets, we haven't been so fortunate, so getting a look at this very early stage in planet formation is extremely valuable,” he added.

Analysis of the VLA data indicates that the inner region of the disk contains grains as large as one centimetre in diameter. This region, the scientists said, is presumably where Earth-like planets would form, as clumps of dust grow by pulling in material from their surroundings. Eventually, the clumps would gather enough mass to form solid bodies that would continue to grow into planets.

The VLA observations, made in 2014 and 2015, received radio waves with a wavelength of 7 millimetres. The earlier ALMA observations of HL Tau were made at a wavelength of 1 millimeter. The VLA images showed a similar level of detail as the ALMA images.

“These VLA observations are the most sensitive and show the most detail of any yet made of HL Tau's disk at these longer wavelengths,” said Claire Chandler, of the National Radio Astronomy Observatory (NRAO). “The VLA's ability to produce such high-quality images in this region is very important to advancing our understanding of these initial stages of planet formation,” Chandler added.

The VLA study of HL Tau was an international collaboration, involving the UNAM, the MPIA, the NRAO, and the Spanish Consejo Superior de Investigaciones Científicas (CSIC). The project leaders were Carlos Carrasco Gonzalez (UNAM) and Thomas Henning (MPIA). The scientists are reporting their findings in the *Astrophysical Journal Letters*.

*The National Radio Astronomy Observatory is a facility of the National Science Foundation, operated under cooperative agreement by Associated Universities, Inc.*

*More info: [National Radio Astronomy Observatory](#)*

## THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

### Pavilion Building Work

Work has started on an access ramp at the Pavilion next to the observatory.

**It is essential that anyone visiting the observatory brings a torch to ensure their own safety.**

The paths are supposed to be kept clear and the works clearly marked but the area is open to the public and cannot be monitored 24/7.

**Please be very careful when visiting the observatory in the dark!**

### How Far Can a Laser Pen's Beam Travel?



All light, laser or not, travels at the speed of light and will never stop unless absorbed by something else. The laser light just gets dimmer and dimmer (fewer and fewer photons per second) the further you go.

How far away you could see it depends on the quality of the laser. A cheap laser pen will have a beam that is less coherent and diverges much more rapidly over distance than a more expensive laser.

If you take your laser pen and hold a piece of paper an inch in front of it, the beam will look very narrow there, but if you go even 10 or 20 feet away, it will look much wider.



The reason you would eventually not be able to see the laser beam is because the energy would be spread out into a large diverging beam and be undetectable by your eye.

A person can think their laser beam can't reach an aircraft, since the beam looks "short". However, light from a laser does not stop in mid-air, it just keeps going. A pilot at the other end can clearly see the light from even a relatively low powered 5mW green laser, at a distance well over 2 miles. For a more powerful 50mW green laser, the green "dot" is visible at well over 7 miles - even though to the user, the beam appears only a few hundred metres long.

***A bright visible laser light can cause distraction or temporary flash blindness to a pilot.***

***The beam CAN reach an aircraft!***

***NEVER aim a laser pointer at or near an aeroplane or helicopter:***

***It is not safe,  
You may be arrested, and  
You may help get laser pointers banned***

### 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.

*"It is a pity, in an age of rockets and space telescopes, that so few people have a direct acquaintance with the stars. Learning the stars and following their nightly courses across the sky brings a deep satisfaction born of familiarity with something both ancient and ageless"*  
**Richard Berry**

*"A man is the best computer available to place in a spacecraft ... It is also the only one that can be mass produced with unskilled labour"*  
**Werner von Braun**