NWASNEWS

Volume21, Issue 1

September 2015

Newsletter for the Wiltshire, Swindon, Beckington Astronomical Societies and Salisbury Plain

SUMMER MEMORIES

It is funny how looking back over a 3 month period it becomes very difficult to get a balanced perception of what was seen over the period, particularly if it is coloured by, an observationally, difficult week or so.

It even colours the what was happening in space elsewhere.

This is the undoubted advantage of good log books and image filing techniques. It enabled me to search back and slowly build enough images and news to make the magazine… despite few input logs or images from members.

Out in Space we got the superb images from the Dawn mission to the asteroids and the views of the other side of the dwarf planets, Pluto. Undoubtedly a great mission that over came technical issues just at the wrong time, it provided great views of the icy out world. Despite the claims that it was bigger and more detailed in features than expected (now at 2170km from 2140km), the features on the much smaller Ceres showed recently exposed ice and mountains present. Nothing to move it from dwarf planet status I'm afraid to say.

But meanwhile Cassini has just had its final pass of Dione, the moon of Saturn. Again very similar smaller body geophysics of the solar system.

The Indian probe MOM has returned some incredible images from its low budget mission, viewing the curiosity landing crater with new clarity.

So exciting from the the space missions.

Closer to home I had the disappointment of being on the wrong side of Scotland for cloud while two nights of Aurora kicked off. This is the moment that coloured my look back.

Going further back, camera troubles (dropping my main DSLR high resolution camera returning from the June meeting) and breaking the D300 cleaning to act as replacement meant I took the plunge a got the astro ready Nikon D810. It is providing stunning images. Can't wait to get to Spain and try it out from dark skies.

The picture below shows how it works from here in Wiltshire.

Our Perseid meteor watch was successful in the end (cloud did try to put us off), and the close pass of Venus and Jupiter was also blessed with skies clearing at the right time.

Here's to exceptional seeing on the 27th and 28th September for the lunar eclipse.

Andy Burns

The Milky Way from the side of the A4 road at Silbury Hill.

OK some sky glow, but with simple processing from the RAW image I was able to pick out the Milky Way with ease.

BUT this is using the astronomically adjusted Nikon D810, full frame digital SLR with a 20mm Nikkor lens.

However, balance this with the exposure details of f3.5 and 60 seconds shows the potential for sky viewing and imaging from our county.

The leaves and horizon are a little blurred because I am using a Vixen polaris tracker to allow star to be tracked but the foreground images will blur slightly.

Andy Burns

Wiltshire Society Page

Wiltshire Astronomical Society

Web site: www.wasnet.org.uk

Meetings 2007/2008 Season.

NEW VENUE the Pavilion, Rusty Lane, Seend

Meet 7.30 for 8.00pm start

2015

Sept *Patterns in the Sky - Exploring & Observing Asterisms Jonathan Gale*
Oct *Binocular Astronomy : Steve Tonkin*
Nov *Images of the Universe : Paul Money*
Dec *Neptune - A Calculated Guess : Andrew Lound*

2016

Jan *Rosetta - An Update : Dr Andrew Morse*
Feb *10 Years at the Helm of the European Space Science: Professor David Southwood*
Mar *Life on Mars : Professor Mark Sims*
Apr *The Story of Star Names : Mark Hurn*
May *Oddities of the Solar System : Bob Mizon*
June *The Current State of SETI : Martin Griffiths*

Membership Changes in fees to be discussed. Could be lowered!

Meeting nights £1.00 for members £3 for none members

Wiltshire AS Contacts

Andy Burns (Chairman, and Editor) Tel: 01249 654541, email: anglesburns@hotmail.com

Vice chair: Keith Bruton

Bob Johnston (Treasurer)

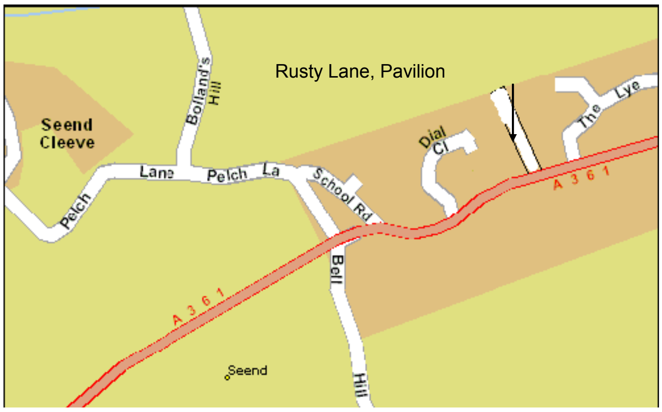
Philip Proven (Hall coordinator)

Peter Chappell (Speaker secretary)

Nick Howes (Technical Guru)

Observing Sessions coordinators: Jon Gale, Tony Vale

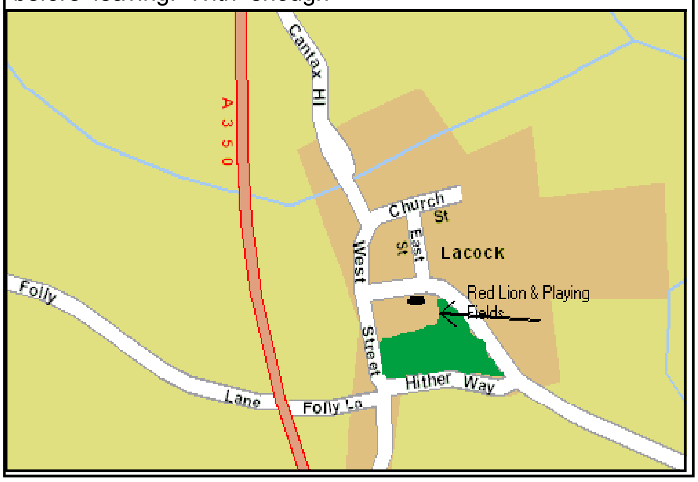
Contact via the web site details. This is to protect individuals from unsolicited mailings.



Observing Sessions

The Wiltshire Astronomical Society's observing sessions are open, and we welcome visitors from other societies as well as members of the public to join us.
We will help you set up equipment (as often as you need this help), and let you test anything we have to help you in your choice of future astronomy purchases.
Please treat the lights and return to full working order before leaving. With enough care shown we may get the National Trust to do something with them!

PLEASE see our proposed changes to the observing sessions, contacting and other details. Back Page



Our speaker for tonight in Jonathan Gale, a very keen eye to the telescope practical observer.

His search for patters in the sky to aid his search for objects through binoculars or Dobsonian non-guided scopes puts him aside as one the foremost sky workings in the country.

He also organises our observing sessions with Tony Vale, and here he is set up at the Redhorn viewing site on the 31st July when Jupiter and Venus were within half a degree of each other. Note the cloud and lightening lit storm behind him…

It did clear to see the planets.

Swindon's own astronomy group

The club meets once a month at Liddington Hall, Church Road, Liddington, Swindon, SN4 0HB at 7pm. See programme below.

The Winter Season Begins…Brrrrr

We are looking forward to our first meeting of the winter season along with the viewing opportunities that autumn and winter allow.

Our next meeting is our popular 'Telescope Evening' where those with new telescopes can bring them along for help in setting them up. We will also be holding an astronomy 'bring and buy' sale.

Ad-hoc viewing sessions near Uffcott and National Astronomy Week

Regular stargazing evenings are being organised near Swindon. To join these events please visit our website for further information.

We meet regularly at a lay-by just outside the village of Uffcott, near Wroughton. Directions are also shown on the website link below.

When we use East Kennett, we meet at the public car park just below The Red Lion pub at Avebury; we usually hang on for 10 minutes and then move on to our viewing spot at East Kennett. Information about our evenings and viewing spots can be found here:

http://www.swindonstargazers.com/noticeboard/noticeboard06.ht

If you think you might be interested email the organiser Robin Wilkey (see website). With this you will then be emailed regarding the event, whether it is going ahead or whether it will be cancelled because of cloud etc.

We are a small keen group and I would ask you to note that you DO NOT have to own a telescope to take part, just turn up and have a great evening looking through other people's scopes. We are out there to share an interest and the hobby. There's nothing better than practical astronomy in the great cold British winter! And hot drinks are often available, you can also bring your own.

Enjoy astronomy at it's best!

Members of the Wiltshire Astronomical Society always welcome!

Meetings for 2015
At Liddington Village Hall, Church Road, Liddington, SN4 0HB – 7pm onwards

The hall has easy access from Junction 15 of the M4, a map and directions can be found on our website at:

http://www.swindonstargazers.com/clubdiary/directions01.ht

Friday 18 Sept 2015

Telescope Evening & Astro Bring & Buy Sale

Friday 16 Oct 2015

Paul Roche: X-Ray Binaries

Friday 20 Nov 2015

Programme: Trevor Pitt – Weather Forecasting for Astronomy

Friday 18 Dec 2015

Christmas Social plus a presentation

Website:

http://www.swindonstargazers.co

Chairman: Peter Struve

Tel No: 01793 481547
Email: peter.struve@sky.com
Address: 3 Monkton Close, Park South, Swindon, SN3 2EU

Secretary: Dr Bob Gatten (PhD)
Tel Number: 07913 335475

Email: bob.gatten@ntlworld.co.uk.
Address: 17, Euclid Street,

Swindon, SN1 2JW

BECKINGTON ASTRONOMICAL SOCIETY

We also have a new website www.beckingtonas.org where details of our programme and other useful information can be found. General enquiries about the society can be emailed to chairman@beckingtonas.org

So our committee is now:

Steve Hill, Chairman/Imaging 01761 435663
John Ball, Vice Chairman 01373 830419
Alan Aked, Treasurer 01373 830232
Rosie Wilks, Secretary 01225445814
Mike Witt, Membership 01373 303784
John Dolton, Telescope Hardware 01225335832

Meetings take place in Beckington Baptist Church Hall (see the location page for details of how to get to us) and start at 7:30pm.

2015

19th June AGM & Member Talks

The programme and details of how to contact the society are at www.beckingtonas.org

SALISBURY PLAIN OBSERVING GROUP

Where do you meet?

We meet at a variety of sites, including Pewsey Downs, Everleigh, Bratton Camp, Redhorn Hill and Whitesheet Hill. The sites are cold in winter so you will need warm clothing and a flask. We are always looking for good sites around the edge of the Plain.

Do I join?

No. We are not a club. We meet informally, so aside from contacting our friends to give a yes or no to meeting up, that's it.

I am a beginner—am I welcome?

Of course you are — whether you have a telescope, binoculars or just your eyes, there will be someone to observe with. We have a variety of equipment and are always happy for newcomers to look through.

So I just turn up?

Essentially yes, but please drop us an email as parking can be an issue at some of the meeting areas or at the pubs.

I am more experienced—what's in it for me?

If you have observing experience we prepare a monthly observing list chosen in rotation by the group. We pick some easy objects, some moderate and some tough ones. If you are experienced, why not share what you know?

SPOG OBSERVING SITES

Any ground rules for a session?

Common sense applies in the group; red light is essential to preserve night vision; we park cars so you can leave when you wish and not disturb others with your headlights.

Contact Details

Our Website

www.spogastro.co.uk

Our Email

spogastro@googlemail.com

Twitter

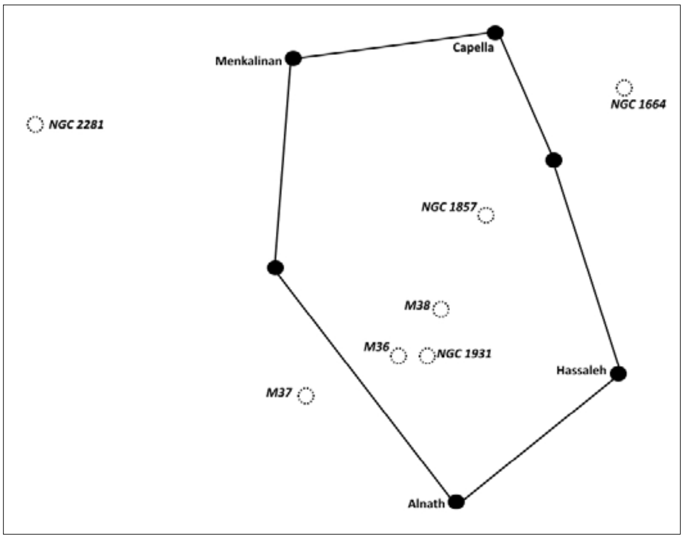
http://twitter.com/SPOGAstro

Facebook

http://www.facebook.com/group.php?gid=119305144780224

The Magnificent Seven – Touring Open Clusters in Auriga

To open the autumn observing season, I thought it would be interesting to have a tour around Auriga. Although at its best in the winter months, Auriga rises at around 00:30 in the middle of September, so night owls may enjoy hunting for some of the many deep sky objects contained within. Auriga is one of the easiest constellations to locate in the night sky due to the presence of Capella, the sixth brightest star in the sky (as well as being circumpolar) and the constellation's distinctive distorted 50 pence piece shape.



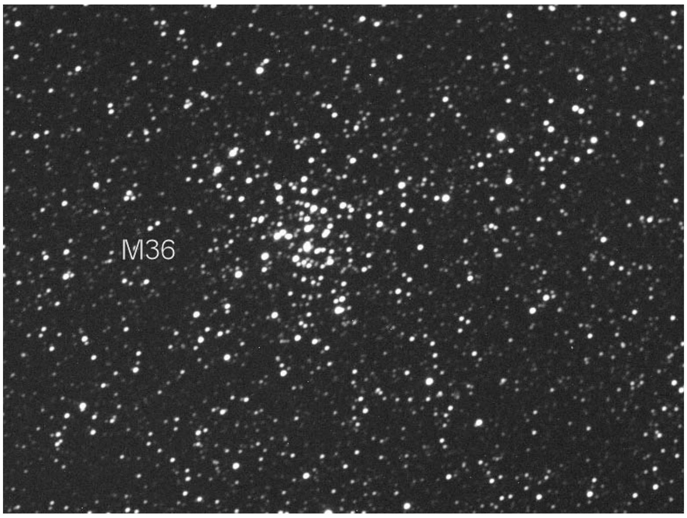
For the "Magnificent Seven" we have three easy to find Messier open clusters, along with 4 NGC (New General Catalogue) selections. The Messier clusters are easily spotted in 10x50 binoculars, with some of the NGC ones requiring a telescope of moderate aperture of say 6" to 8".

M38

Messier logged this lovely cluster in September 1764, describing it as "… a cluster of faint stars …of a square shape and does not contain nebulosity"; the first observation though was by Giovanni Hodierna, an Italian astronomer who compiled a precursor to Messier's catalogue of some 40 objects which could be confused with comets. He observed M38 before 1654 and described it as a "nebulous patch". The cluster lies around 3,500 light years distant and some 15 light years across. Its age has been estimated at 150 to 200 million years old.

From a *very* dark site it may be spotted with the naked eye, but 7 x 50 or 10 x 50 binoculars show it easily. There a couple of ways to locate the cluster; the easiest I find is to draw an imaginary line from Hassaleh to Alnath and half way down is a fairly obvious line of stars leading into the constellation. Follow this line and you arrive at M38. Alternatively draw another imaginary line from Capella to Alnath and M38 is just over halfway down. Close by M38 is the "Cheshire Cat" asterism so you know you are at the right cluster.

M36



Logged by Messier along with M38 in 1764 he observed cluster of stars in the Charioteer…the stars are barely discerned." John Herschel described it as a "… very pretty object which fills the field." Hodierna had, unsurprisingly, logged it earlier along with M38. M36 is the least rich of the 3 Messier clusters and is a lot younger - estimated to be 20 to 40 million years old, and some 4300 light years away.

To locate the cluster, use M38 as your starting point, and gently follow a line which skirts the eastern end of the mouth of the "Cheshire Cat", and M36 comes into view. Small binoculars show the cluster as a faint patch, but a small telescope of say 5" aperture resolves over 60 stars.

M37

Hodierna had bagged this one as well, with Messier finding it in his September observations, describing it thus "...a faint cluster of stars, at a little distance from the previous [M 36]; the stars are very faint, close and contain some nebulosity." Leo Brenner, one of history's more colourful astronomical characters if you care to look up his biography, described it as "A splendid object for small scopes … the larger the scope the more splendid the view."

M37 is one of the richest clusters in the Messier catalogue; over 2,000 member stars, of which 150 are brighter than magnitude 12 and 500 brighter than magnitude 15. The cluster is some 33 light years across and lies at least 4,500 light years away.

To locate M37, I draw the usual imaginary line from Alnath to Theta (θ) Aurigae, follow it half way across and then lower my binoculars a little. Small binoculars show it as a nebulous patch, larger binoculars (say 70mm) start to resolve the cluster.

So now onto the NGC objects. Many people think that all NGC objects are small and faint, which is not always the case - the Double Cluster in Perseus was overlooked by Messier so it has NGC numbers 869 and 884. However the open clusters in Auriga below can be challenging if you do not have GOTO facilities, but are well worth observing.

NGC 1664

A lovely open cluster known as the Kite Cluster, although when I first saw it, it reminded me of an oddly shaped keystone. I detected it using 40x magnification in the 8", but 80x really brought it out. From memory I star hopped from Al Anz across to the cluster. Once you have the body of the Kite picked out, then trace the tail stars.

NGC 1857

I first saw NGC 1857 in October 2013 as part of my Herschel 400 project. I located it by using Hadeus, then dropping down to Lambda Aurigae to find a "Cassiopeia like" asterism, then star hopping to the cluster. It is a pretty, fairly compressed cluster of faint stars which I observed at 75x magnification to resolve, and 37x to find.

NGC 1931

Now this may well be a tricky little one! This little cluster is embedded within a nebula, and is known as the "Fly Cluster" or the "Mini Orion" nebula. It contains five or 6 obvious stars I have observed this twice: my first observation in October 2013 yielded little in my 8" reflector, but by the end of November with the 12" I had got it as a small fuzzy blob at 50x, but easily seen at 100x. Herschel had more luck in February 1793 observing it as a "… very bright, irregularly round, very gradually brighter towards the middle. Seems to have one or two stars in the middle." Try a UHC or OIII filter to bring out the nebulosity. NGC 1931 is a relatively young cluster, being some 10 to 13 million years old.

NGC 2281

Image Courtesy of Courtney Seligman

This was a fairly easy, bright open cluster, but perhaps seldom observed because it lies outside the main constellation. It is a bright grouping of about 25-30 stars and can be seen with binoculars, but rewards a power of 60x to 90x. Herschel observed it in March 1788 and noted "A cluster of coarsely scattered pretty [bright] stars, pretty rich". I first saw it in October 2013 and found it easily in my 9 x 50 finderscope, star hopping from Menkalinan. My observation log states "It has a lovely curved shape, reminiscent of the Euro symbol or a curved S". It has been christened the "Broken Heart Cluster", as you could argue it resembles a heart shape cut vertically.

As autumn moves into winter, why not seek out these seven clusters; finder charts will be found in the "Observing Now" section of the Society forum. For better results try a simple sketch of the main stars and then compare to an image of the cluster – how close can you get?

Jonathan Gale

Editors note: The Messier objects by Andy Burns, other object images from Wikipedia page due to low aspect of Auriga through august and cloud.

Lacock Observing Evenings – the new season …

As we reach the end of the Society's observing season, it seems appropriate to reflect on the sessions we have offered since September; of the 9 sessions we planned, only 3 have run due to the weather. This reflects the pattern of the last few years and by sticking to a set day we are always going to limit our success, so maybe now is the time to re-evaluate the sessions and try alternative approaches. Below we present some options for the next season:

Option 1 – Adopt a "First clear night" approach.

We choose a suitable week, either remaining with the last week of the month, or choosing the week in the month when the moon is absent. In that week, the *first clear night* becomes the observing session. We can fine tune this and narrow down to saying that it will be the Monday, Tuesday or Wednesday, or from Wednesday, Thursday, or Friday. The plus side is that hopefully we have more chance of getting a decent night; on the down side, midweek may not be the best time if you have to be up early the next day, or it may clash with our other events such as outreach. If we go down this route, then we will have to have more forward planning. Societies such as Abingdon use this approach with the several sites they meet at.

Option 2 – The *first clear* Friday is the observing night

We nominate Friday as the observing day, but the first Friday in the month that is scheduled to be clear is the observing day! Again, the positive side is that we have more chance of success, planning is easier as little outreach takes place on a Friday night, but it may well be short notice.

Option 3 – the Friday *closest to New Moon* is the observing night

Whilst the moon is always lovely to look at, the purpose of a dark site is for deep sky observing. Another possibility is always to make the Friday session as close to new moon as possible to make the best use of the dark sky.

Option 4 – Abandon planned sessions on Fridays, and have ad hoc sessions.

Many groups do not have planned sessions – when it is clear they meet up. Whilst this is good in theory, it needs a team of people to draw upon, as with a limited number of organisers there may well be limitations on availability. To do this we will need more members who are prepared to come on board to help.

Option 5 – Retain Fridays and have an ad hoc list.

The latter Friday of the month can still be the main day, but we also operate an ad hoc system for short notice observing, on *any* day of the week. This would most likely not be run at Lacock, but at a darker site, maybe Redhorn Hill, maybe near the Alton Barnes White Horse, for deep sky observing.

Option 6 – Retain Fridays and roll over to Saturday if cloudy

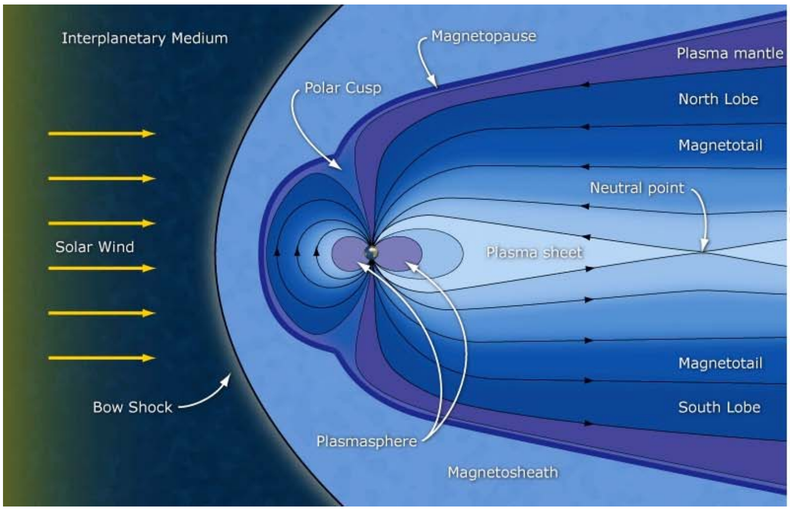
This was the way it used to be done, and we could return to this, although again there may be availability issues for the organisers. There may well be clashes with other observing sessions.

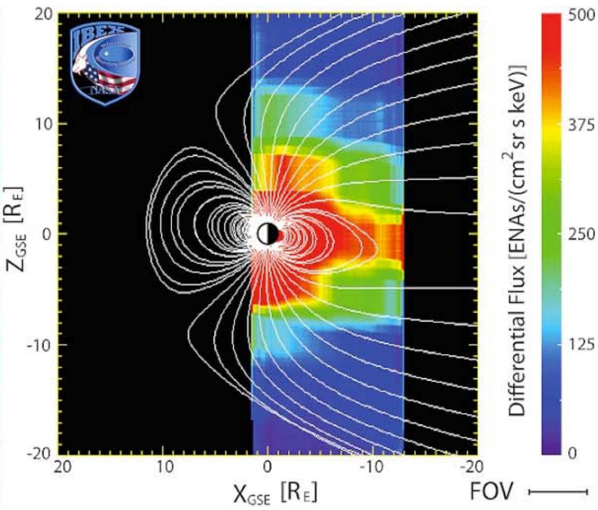
See back page for sessions.

Solar Wind Creates—and Whips—a Magnetic Tail Around Earth

By Ethan Siegel

As Earth spins on its axis, our planet's interior spins as well. Deep inside our world, Earth's metal-rich core produces a magnetic field that spans the entire globe, with the magnetic poles offset only slightly from our rotational axis. If you fly up to great distances, well above Earth's surface, you'll find that this magnetic web, called the magnetosphere, is no longer spherical. It not only bends away from the direction of the sun at high altitudes, but it exhibits some very strange features, all thanks to the effects of our parent star.





The sun isn't just the primary source of light and heat for our world; it also emits an intense stream of charged particles, the solar wind, and has its own intense magnetic field that extends much farther into space than our own planet's does. The solar wind travels fast, making the 150 million km (93 million mile) journey to our world in around three days, and is greatly affected by Earth. Under normal circumstances, our world's magnetic field acts like a shield for these particles, bending them out of the way of our planet and protecting plant and animal life from this harmful radiation.

But for every action, there's an equal and opposite reaction: as our magnetosphere bends the solar wind's ions, these particles also distort our magnetosphere, creating a long magnetotail that not only flattens and narrows, but whips back-and-forth in the onrushing solar wind. The particles are so diffuse that collisions between them practically never occur, but the electromagnetic interactions create waves in Earth's magnetosphere, which grow in magnitude and then transfer energy to other particles. The charged particles travel within the magnetic field toward both poles, and when they hit the ionosphere region of Earth's upper atmosphere, they collide with ions of oxygen and nitrogen causing aurora. Missions such as the European Space Agency and NASA Cluster mission have just led to the first accurate model and understanding of equatorial magnetosonic waves, one such example of the interactions that cause Earth's magnetotail to whip around in the wind like so.

The shape of Earth's magnetic field not only affects aurorae, but can also impact satellite electronics. Understanding its shape and how the magnetosphere interacts with the solar wind can also lead to more accurate predictions of energetic electrons in near-Earth space that can disrupt our technological infrastructure. As our knowledge increases, we may someday be able to reach one of the holy grails of connecting heliophysics to Earth: forecasting and accurately predicting space weather and its effects. Thanks to the Cluster Inner Magnetosphere Campaign, Van Allen Probes, Mars Odyssey Thermal Emission Imaging System, Magnetospheric Multiscale, and Heliophysics System Observatory missions, we're closer to this than ever before.

Kids can learn about how solar wind defines the edges of our solar system at NASA Space Place. http://spaceplace.nasa.gov/interstellar

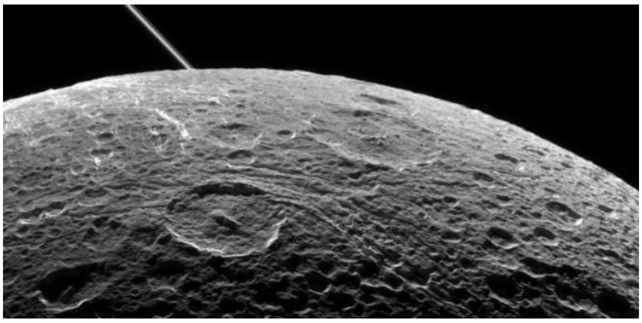
Image credit: ESA / C. T. Russell (L), of Earth's magnetic tail and its cause: the solar wind; Southwest Research Institute / IBEX Science Team (R), of the first image of the plasma sheet and plasmasphere created around Earth by the solar wind.

SPACE NEWS

The summer has been very full of news from probes sent out into space, with the Rosetta probe Philae reawakening on the comet, through the Indian Mars probe images, the last visit of Cassini to Dione at Saturn, Dawn sending exciting images from Ceres, New Horizons surviving a last weeks glitch to advance on to Pluto.

Cassini's Farewell Look at Dione

by David Dickinson on August 19, 2015

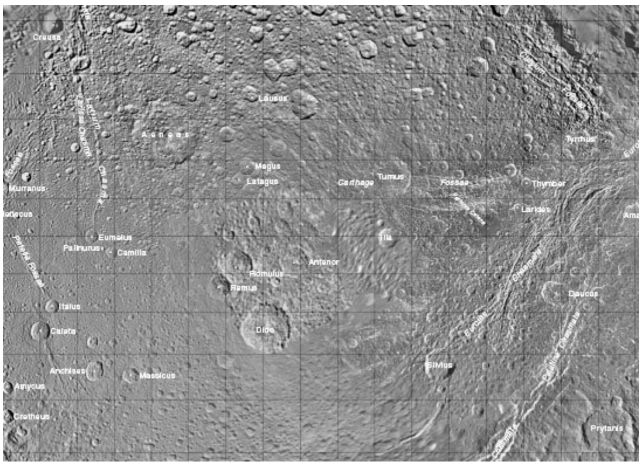


The mottled surface of Dione, with the rings of of Saturn in the background during the June 16th 2015 flyby. Image Credit: NASA/JPL-Caltech/Space Science Institute

NASA's Cassini spacecraft paid a visit to Saturn's moon Dione this week, one final time.

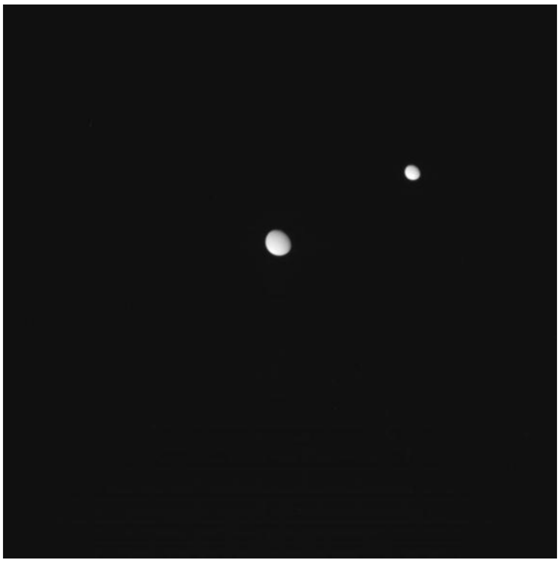
Cassini passed just 474 kilometers (295 miles) above the surface of the icy moon on Monday, August 17th at 2:33 PM EDT/18:33 UT. The flyby is the fifth and final pass of Cassini near Dione (pronounced dahy-OH-nee). The closest passage was 100 kilometers (60 miles) in December 2011. This final flyby of Dione will give researchers a chance to probe the tiny world's internal structure, as Cassini flies through the gravitational influence of the moon. Cassini has only gathered gravity science data on a handful of Saturn's 62 known moons.

"Dione has been an enigma, giving hints of active geologic processes, including a transient atmosphere and evidence of ice volcanoes. But we've never found the smoking gun," said Cassini science team member Bonnie Buratti in a recent press release. "The fifth flyby of Dione will be the last chance."



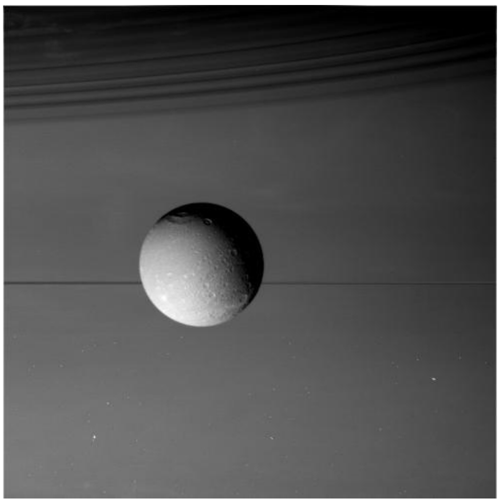
A map of Dione. Click here for a full large .pdf map. Credit: USGS

Voyager 1 gave us our very first look at Dione in 1980, and Cassini has explored the moon in breathtaking detail since its first flyby in 2005. This final pass targeted Dione's north pole at a resolution of only a few meters. Cassini's Infrared Spectrometer was also on the lookout for any thermal anomalies, a good sign that Dione may still be geologically active. The spacecraft's Cosmic Dust Analyzer also carried out a search for any dust particles coming from Dione. The results of these experiments are forthcoming. In a synchronous rotation, Dione famously displays a brighter leading hemisphere, which has been pelted with E Ring deposits.



Dione (center) with Enceladus(smaller and to the upper right) in the distance. Image credit: NASA/JPL-Caltech/Space Science Institute

The raw images from this week's flyby are now available on the NASA Cassini website. You can see the sequence of the approach, complete with a 'photobomb' of Saturn's moon Enceladus early on. Dione then makes a majestic pass in front of Saturn's rings and across the ochre disk of the planet itself, before snapping into dramatic focus. Here we see the enormous shattered Evander impact basin near the pole of Dione, along with Erulus crater with a prominent central peak right along the day/night terminator. Dione has obviously had a battered and troubled past, one that astro-geologists are still working out. Cassini then takes one last shot, giving humanity a fitting final look at Dione as a crescent receding off in the distance.



Dione in profile against Saturn. Image credit: NASA/JPL-Caltech/Space Science Institute

It'll be a long time before we visit Dione again.

"This will be our last chance to see Dione up close for many years to come," said Cassini mission deputy project scientist Scott Edgington. "Cassini has provided insights into this icy moon's mysteries, along with a rich data set and a host of new questions for scientists to ponder."

Cassini also took a distant look at Saturn's tiny moon Hyrrokkin (named after the Norse giantess who launched Baldur's funeral ship) earlier this month. Though not a photogenic pass, looking at the tinier moons of Saturn helps researchers better understand and characterize their orbits. Even after more than a decade at Saturn, there are tiny moons of Saturn that Cassini has yet to see up close.

The limb of Dione on close approach. Image credit: NASA/JPL-Caltech/Space Science Institute

Next up for Cassini is a pass 1,036 kilometers (644 miles) from the surface of Titan on September 28th, 2015.

Launched in 1997, Cassini has given us over a decade's worth of exploration of the Saturnian system, including the delivery of the European Space Agency's Huygens lander to the surface of Titan. The massive moon may be the target of a proposed mission that could one day sail the hazy atmosphere of Titan, complete with a nuclear plutonium powered MMRTG and deployable robotic quadcopters.

Cassini is set to depart the equatorial plane of Saturn late this year, for a series of maneuvers that will feature some dramatic passes through the rings before a final fiery reentry into the atmosphere of Saturn in 2017.

A farewell look at Dione. Image credit: NASA/JPL-Caltech/Space Science Institute

Astronomer Giovanni Cassini discovered Dione on March 21st, 1684 from the Paris observatory using one of his large aerial refracting telescopes. About 1,120 kilometers in diameter, Dione is 1.5% as massive as Earth's Moon. Dione orbits Saturn once every 2.7 days, and is in a 1:2 resonance with Enceladus, meaning Dione completes one orbit for every two orbits of Enceladus.

In a backyard telescope, Dione is easily apparent along with the major moons of Saturn as a +10.4 magnitude 'star.' Saturn is currently a fine telescopic target in the evening low to the south on the Libra-Scorpius border, offering prime time observers a chance to check out the ringed planet and its moons. Fare thee well, Dione… for now.

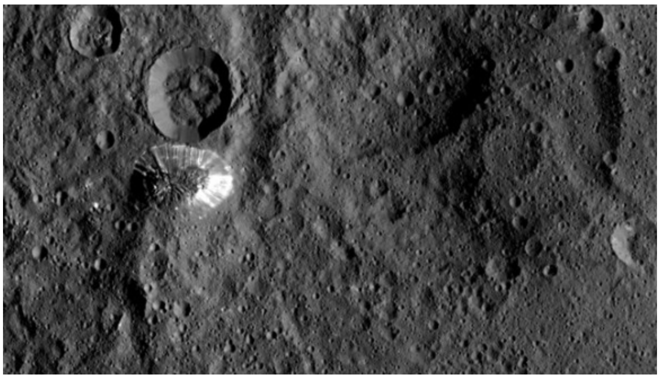
Ceres' "Pyramid" Gets a Closer Look, But Bright Spots Remain a Mystery

by Nancy Atkinson on August 26, 2015

NASA's Dawn spacecraft spotted this tall, conical mountain on Ceres from a distance of 915 miles (1,470 kilometers). The mountain, located in the southern hemisphere, stands 4 miles (6 kilometers) high. Its perimeter is sharply defined, with almost no accumulated debris at the base of the brightly streaked slope. The image was taken on August 19, 2015.Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

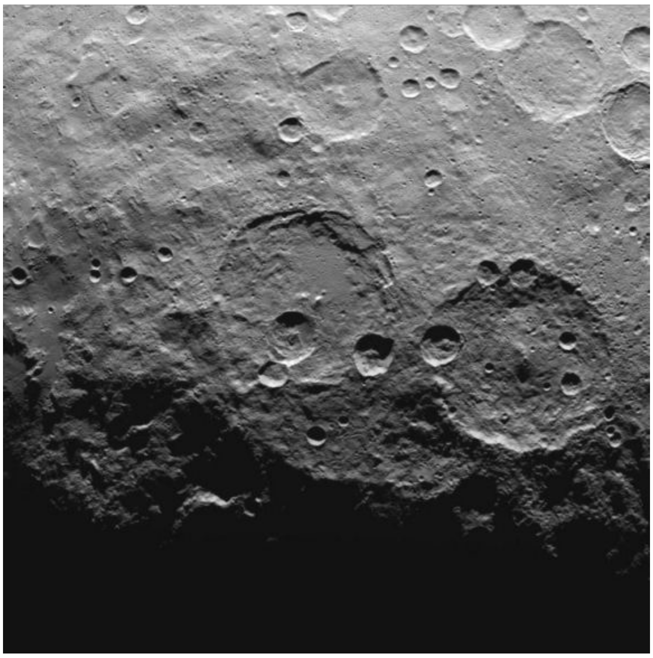
The Dawn spacecraft is now orbiting just 1,470 kilometers (915 miles) above Ceres' surface, and the science team released these latest images. Above is a closest view yet of the so-called 'pyramid' on Ceres, although the closer Dawn gets, the less this feature looks like a pyramid. It's actually more like a conical mountain with a flat top, almost like a butte.

And if you're like me and you see a crater instead of a mountain, just turn the picture over (or stand on your head). Below, we've turned the image upside down for you:



An upside down look at the conical mountain on Ceres (in case you have trouble seeing it as a mountain!). Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

The mountain is located in the southern hemisphere, and stands 6 kilometers (4 miles) high. Visible on the sides of the mountain are narrow braided fractures and an intriguing bright area. Only time will tell if this bright region is similar to the mysterious bright spots seen in previous Dawn images of Ceres. The team released additional images as well.

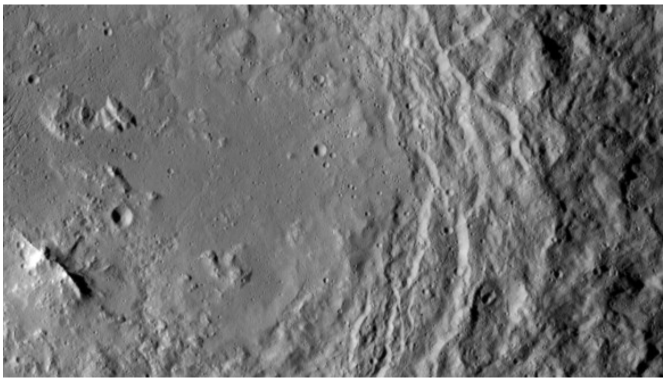


This image, taken by NASA's Dawn spacecraft, shows high southern latitudes on Ceres from an altitude of 2,700 miles (4,400 kilometers). Zadeni crater, measuring about 80 miles (130 kilometers) across, is on the right side of the image. Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

As Dawn slowly moves ever-closer to Ceres surface, the team says the spacecraft is performing well.

"Dawn is performing flawlessly in this new orbit as it conducts its ambitious exploration. The spacecraft's view is now three times as sharp as in its previous mapping orbit, revealing exciting new details of this intriguing dwarf planet," said Marc Rayman, Dawn's chief engineer and mission director, based at NASA's Jet Propulsion Laboratory, Pasadena,

Dawn is currently taking images to try and map the entire surface. This will 11 days at this altitude and each 11-day cycle consists of 14 orbits. Over the next two months, the spacecraft will map the entirety of Ceres six times.



This image, taken by NASA's Dawn spacecraft, shows high southern latitudes on Ceres from an altitude of 2,700 miles (4,400 kilometers). Zadeni crater, measuring about 80 miles (130 kilometers) across, is on the right side of the image. Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Using Dawn's framing camera to map the surface in detail, scientists hope to create a 3-D modeling of Ceres' surface. Every image from this orbit has a resolution of 450 feet (140 meters) per pixel, and covers less than 1 percent of the surface of Ceres.

At the same time, Dawn's visible and infrared mapping spectrometer is collecting data that will give scientists a better understanding of the minerals found on Ceres' surface.

The science and engineering teams are also taking a look at the data coming in from radio signals to help with measurements of Ceres' gravity field. This will help determine the distribution of mass on Ceres interior and might provide clues if the asteroid has any liquid water beneath its surface.

Additionally, the radio data data will help mission planners design the maneuvers for lowering Dawn's orbit even more. In late October, Dawn will begin spiraling toward this final orbit, which will be at an altitude of 375 kilometers (230 miles.)

In the latest entry on the Dawn Journal, Rayman said despite the loss of the reaction wheels (in 2010 and 2012) that help maneuver the spacecraft and keep it stable, engineers have learned how to be very efficient with the precious hydrazine the fuels the small jets of the reaction control system and they now have some to spare. They now expect to exceed the original mission parameters!

"Therefore, mission planners have recently decided to spend a few more in this mapping orbit," Rayman said. "They have added extra turns to allow the robot to communicate with Earth during more of the transits over the nightside than they had previously budgeted. This means Dawn can send the contents of its computer memory to Earth more often and therefore have space to collect and store even more data than originally planned. An 11-day mapping cycle is going to be marvelously productive."

There's still a debate about the unusually bright spots in some of Ceres craters that appear when the asteroid/dwarf planet turns into the sunlight. The team has speculated that they could be frozen pools of water ice, or patches of light-colored, salt-rich material.

The brightest spots are known collectively as Spot 5, and sit inside Occator Crater on Ceres, and hopefully new images of this area will be released soon. In a previous article on Universe Today, Dawn's principal investigator, Chris Russell of the University of California at Los Angeles told us that the debate is continuing among the science team, but he wouldn't harbor a guess as to which way the debate might end or which "side" was in the lead among the scientists.

"I originally was an advocate of ice, because of how bright the spots seemed to be," Russell told writer Alan Boyle, but newer observations revealed the bright material's albedo, or reflectivity factor, is about 50 percent – which is less than Russell originally thought. "This could be salt and is unlikely to be ice. I think the team opinion is now more in line with salt," he said.

Indian Mars Orbiter Shoots Spectacular New Images of Sheer Canyon and Curiosity's Crater

by Ken Kremer on August 17, 2015

This view over the Ophir Chasma canyon on the Martian surface was taken by the Mars Colour Camera aboard India's Mars Orbiter Mission (MOM). Ophir Chasma is a canyon in the Coprates quadrangle located at 4° south latitude and 72.5° west longitude. It is part of the Valles Marineris canyon system. Credit: ISRO

India's space agency has released a spectacular new batch of images taken by everyone's favorite MOM – the Mars Orbiter Mission – the nation's first probe ever dispatched to the Red Planet and which achieved orbit nearly a year ago.

The Indian Space Research Organization (ISRO) has published a beautiful gallery of images featuring a steep and stunning Martian canyon and the landing site of NASA's Curiosity Mars Science Laboratory rover, and more.

What Is A Dwarf Planet?

by Matt Williams on August 17, 2015

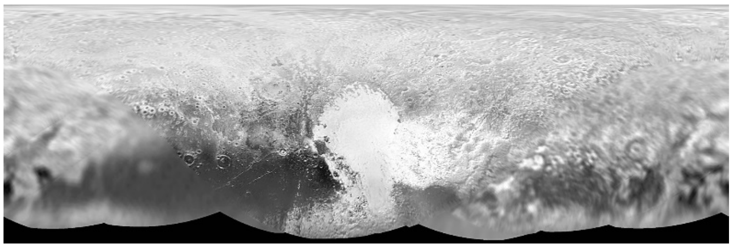
An artist's concept showing the size of the best known dwarf planets compared to Earth and its moon (top). Eris is left center; Ceres is the small body to its right and Pluto and its moon Charon are at the bottom. Credit: NASA

The term dwarf planet has been tossed around a lot in recent years. As part of a three-way categorization of bodies orbiting the Sun, the term was adopted in 2006 due to the discovery of objects beyond the orbit of Neptune that were comparable in size to Pluto. Since then, it has come to be used to describe many objects in our Solar System, upending the old classification system that claimed there were nine planets.

The term has also led to its fair share of confusion and controversy, with many questioning its accuracy and applicability to bodies like Pluto. Nevertheless, the IAU currently recognizes five bodies within our Solar System as dwarf planets, six more could be recognized in the coming years, and as many as 200 or more could exist within the expanse of the Kuiper Belt.

New global map of Pluto

Posted on 29 July 2015 by Astronomy Now



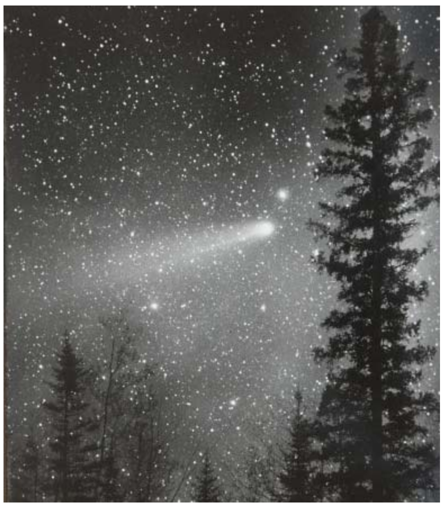
Clicking on the graphic above loads a 1:10 scale version of the full resolution Pluto map just published based on imagery acquired by NASA's New Horizons spacecraft 7-14 July 2015. A link to the full resolution image for high-specification desktop computers with RAM to spare is included in the article below. Image credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute.

The science team of NASA's New Horizons mission has produced an updated global map of the dwarf planet Pluto. The map includes all resolved images of the surface acquired 7-14 July 2015, at pixel resolutions ranging from 40 kilometres (24 miles) on the Charon-facing hemisphere (left and right sides of the map) to 400 metres (1,250 feet) on the anti-Charon facing hemisphere (map center). Many additional images are expected in autumn 2015 and these will be used to complete the global map.

The New Horizons spacecraft flew past Pluto and its moons on July 14. For high-specification desktop computers with RAM to spare, a full resolution (18630 by 9315 pixel, 5.221MB) version of the above image is available

More Evidence That Comets May Have Brought Life to Earth

by Nancy Atkinson on August 18, 2015



Halleys Comet, as seen in May 1986. Credit and copyright: Bob King.

The idea of panspermia — that life on Earth originated from comets or asteroids bombarding our planet — is not new. But new research may have given the theory a boost. Scientists from Japan say their experiments show that early comet impacts could have caused amino acids to change into peptides, becoming the first building blocks of life. Not only would this help explain the genesis of life on Earth, but it could also have implications for life on other worlds.

Dr. Haruna Sugahara, from the Japan Agency for Marine-Earth Science and Technology in Yokahama, and Dr. Koichi Mimura, from Nagoya University said they conducted “shock experiments on frozen mixtures of amino acid, water ice and silicate (forsterite) at cryogenic condition (77 K),” according to their paper. “In the experiments, the frozen amino acid mixture was sealed into a capsule … a vertical propellant gun was used to [simulate] impact shock.”

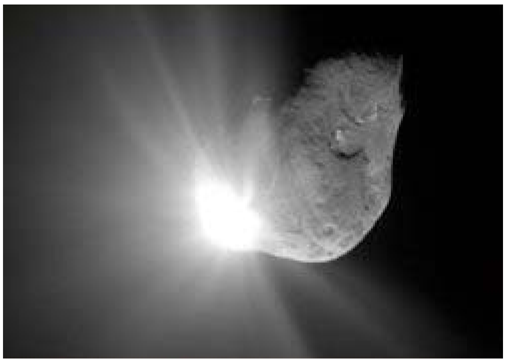
They analyzed the post-impact mixture with gas chromatography, and found that some of the amino acids had joined into short peptides of up to 3 units long (tripeptides).

Based on the experimental data, the researchers were able to estimate that the amount of peptides produced would be around the same as had been thought to be produced by normal terrestrial processes (such as lighting storms or hydration and dehydration cycles).

Artists concept of the stardust spacecraft flying throug the gas and dust from comet Wild 2. Credit: NASA/JPL

“This finding indicates that comet impacts almost certainly played an important role in delivering the seeds of life to the early Earth,” said Sugahara. “It also opens the likelihood that we will have seen similar chemical evolution in other extraterrestrial bodies, starting with cometary-derived peptides.”

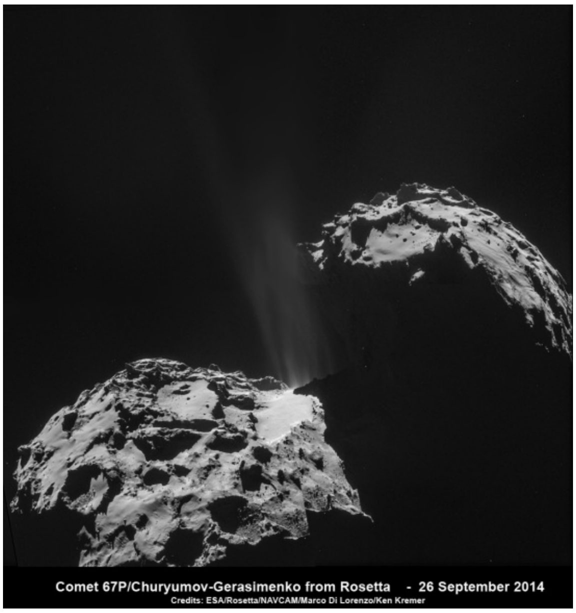
The earliest known fossils on Earth are from about 3.5 billion years ago and there is evidence that biological activity took place even earlier. But there’s evidence that early Earth had little water and carbon-based molecules on the Earth’s surface, so how could these building blocks of life delivered to the Earth’s surface so quickly? This was also about the time of the Late Heavy Bombardment, and so the obvious answer could be the collision of comets and asteroids with the Earth, since these objects contain abundant supplies of both water and carbon-based molecules.



A view of NASA’s Deep Impact probe colliding with comet Tempel 1, captured by the Deep Impact flyby spacecraft’s high-resolution instrument.

Space missions to comets are helping to confirm this possibility. The 2004 Stardust mission found the amino acid when it collected particles from Comet Wild 2. When NASA’s Deep Impact spacecraft crashed into Comet Tempel 1 in 2005, it discovered a mixture of organic and clay particles inside the comet. One theory about the origins of life is that clay particles act as a catalyst, allowing simple organic molecules to get arranged into more and more complex structures.

The news from the current Rosetta mission to comet 67P/Churyumov-Gerasimenko also indicates that comets are a rich source of materials, and more discoveries are likely to be forthcoming from that mission.



Jets of gas and dust are blasting from the active neck of comet 67P/Churyumov-Gerasimenko in this photo mosaic assembled from four images taken on 26 September 2014 by the European Space Agency’s Rosetta spacecraft at a distance of 26.3 kilometers (16 miles) from the center of the comet. Credit: ESA/Rosetta/NAVCAM/Marco Di Lorenzo/Ken Kremer/kenkremer.com

“Two key parts to this story are how complex molecules are initially generated on comets and then how they survive/evolve when the comet hits a planet like the Earth,” said Professor Mark Burchell from the University of Kent in the UK, commenting on the new research from Japan. “Both of these steps can involve shocks which deliver energy to the icy body… building on earlier work, Dr. Sugahara and Dr. Mimura have shown how amino acids on icy bodies can be turned into short peptide sequences, another key step along the path to life.”

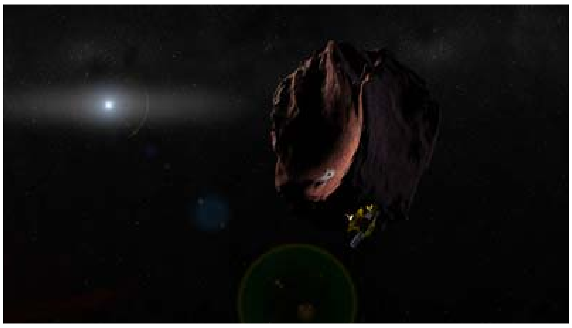
“Comet impacts are normally associated with mass extinction on Earth, but this works shows that they probably helped kick

-start the whole process of life in the first place," said Sugahara. "The production of short peptides is the key step in the chemical evolution of complex molecules. Once the process is kick-started, then much less energy is needed to make longer chain peptides in a terrestrial, aquatic environment."

The scientists also indicated that similar "kickstarting" could have happened in other places in our Solar System, such as on the icy moons Europa and Enceladus, as they likely underwent a similar comet bombardment.

Sugahara and Mimura presented their findings at the Goldschmidt geochemistry conference in Prague, going on this week.

NASA's New Horizons Team Selects Potential Kuiper Belt Flyby Target



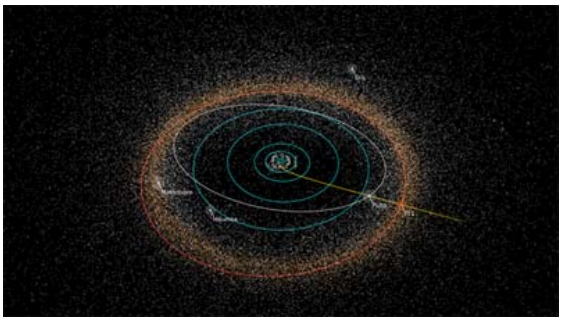
Artist's impression of NASA's New Horizons spacecraft encountering a Pluto-like object in the distant Kuiper Belt. (Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute/Steve Gribben)

NASA has selected the potential next destination for the New Horizons mission to visit after its historic July 14 flyby of the Pluto system. The destination is a small Kuiper Belt object (KBO) known as 2014 MU69 that orbits nearly a billion miles beyond Pluto.

This remote KBO was one of two identified as potential destinations and the one recommended to NASA by the New Horizons team. Although NASA has selected 2014 MU69 as the target, as part of its normal review process the agency will conduct a detailed assessment before officially approving the mission extension to conduct additional science.

"Even as the New Horizon's spacecraft speeds away from Pluto out into the Kuiper Belt, and the data from the exciting encounter with this new world is being streamed back to Earth, we are looking outward to the next destination for this intrepid explorer," said John Grunsfeld, astronaut and chief of the NASA Science Mission Directorate at the agency headquarters in Washington. "While discussions whether to approve this extended mission will take place in the larger context of the planetary science portfolio, we expect it to be much less expensive than the prime mission while still providing new and exciting science."

Like all NASA missions that have finished their main objective but seek to do more exploration, the New Horizons team must write a proposal to the agency to fund a KBO mission. That proposal – due in 2016 – will be evaluated by an independent team of experts before NASA can decide about the go-ahead.



Path of NASA's New Horizons spacecraft toward its next potential target, the Kuiper Belt object 2014 MU69, nicknamed "PT1" (for "Potential Target 1") by the New Horizons team. Although NASA has selected 2014 MU69 as the target, as part of its normal review process the agency will conduct a detailed assessment before officially approving the mission extension to conduct additional science. (Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute/Alex Parker)

Early target selection was important; the team needs to direct New Horizons toward the object this year in order to perform any extended mission with healthy fuel margins. New Horizons will perform a series of four maneuvers in late October and early November to set its course toward 2014 MU69 – nicknamed "PT1" (for "Potential Target 1") – which it expects to reach on January 1, 2019. Any delays from those dates would cost precious fuel and add mission risk.

"2014 MU69 is a great choice because it is just the kind of ancient KBO, formed where it orbits now, that the Decadal Survey desired us to fly by," said New Horizons Principal Investigator Alan Stern, of the Southwest Research Institute (SwRI) in Boulder, Colorado. "Moreover, this KBO costs less fuel to reach [than other candidate targets], leaving more fuel for the flyby, for ancillary science, and greater fuel reserves to protect against the unforeseen."

New Horizons was originally designed to fly beyond the Pluto system and explore additional Kuiper Belt objects. The spacecraft carries extra hydrazine fuel for a KBO flyby; its communications system is designed to work from far beyond Pluto; its power system is designed to operate for many more years; and its scientific instruments were designed to operate in light levels much lower than it will experience during the 2014 MU69 flyby.

The 2003 National Academy of Sciences' Planetary Decadal Survey ("New Frontiers in the Solar System") strongly recommended that the first mission to the Kuiper Belt include flybys of Pluto and small KBOs, in order to sample the diversity of objects in that previously unexplored region of the solar system. The identification of PT1, which is in a completely different class of KBO than Pluto, potentially allows New Horizons to satisfy those goals.

But finding a suitable KBO flyby target was no easy task. Starting a search in 2011 using some of the largest ground-based telescopes on Earth, the New Horizons team found several dozen KBOs, but none were reachable within the fuel supply aboard the spacecraft.

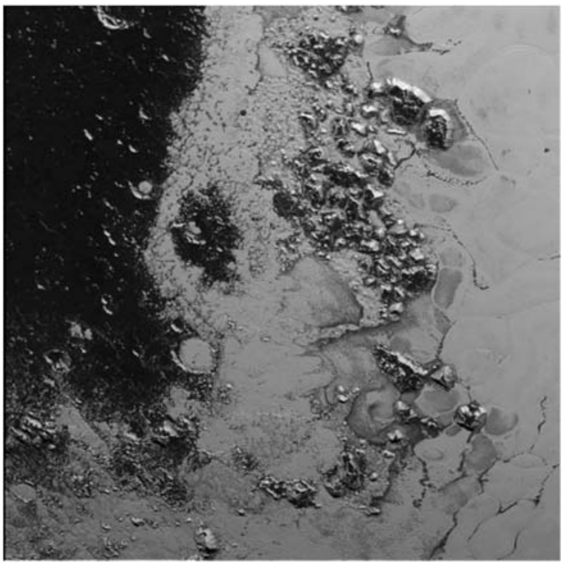
The powerful Hubble Space Telescope came to the rescue in summer 2014, discovering five objects, since narrowed to two, within New Horizons' flight path. Scientists estimate that PT1 is just under 30 miles (about 45 kilometers) across; that's more than 10 times larger and 1,000 times more massive than typical comets, like the one the Rosetta mission is now orbiting, but only about 0.5 to 1 percent of the size (and about 1/10,000th the mass) of Pluto. As such, PT1 is thought to be like the building blocks of Kuiper Belt planets such as Pluto.

Unlike asteroids, KBOs have been heated only slightly by the Sun, and are thought to represent a well preserved, deep-freeze sample of what the outer solar system was like following its birth 4.6 billion years ago.

“There’s so much that we can learn from close-up spacecraft observations that we’ll never learn from Earth, as the Pluto flyby demonstrated so spectacularly,” said New Horizons science team member John Spencer, also of SwRI. “The detailed images and other data that New Horizons could obtain from a KBO flyby will revolutionize our understanding of the Kuiper Belt and KBOs.” The New Horizons spacecraft – currently 3 billion miles [4.9 billion kilometers] from Earth – is just starting to transmit the bulk of the images and other data, stored on its digital recorders, from its historic July encounter with the Pluto system. The spacecraft is healthy and operating normally.

New Horizons is part of NASA’s New Frontiers Program, managed by the agency’s Marshall Space Flight Center in Huntsville, Ala. The Johns Hopkins University Applied Physics Laboratory in Laurel, Md., designed, built, and operates the New Horizons spacecraft and manages the mission for NASA’s Science Mission Directorate. SwRI leads the science mission, payload operations, and encounter science planning.

New Horizons Finds Second Mountain Range in Pluto’s ‘Heart’



A newly discovered mountain range lies near the southwestern margin of Pluto’s heart-shaped Tombaugh Regio (Tombaugh Region), situated between bright, icy plains and dark, heavily-cratered terrain.

This image was acquired by New Horizons’ Long Range Reconnaissance Imager (LORRI) on July 14, 2015, from a distance of 48,000 miles (77,000 kilometers) and sent back to Earth on July 20. Feature as small as a half-mile (1 kilometer) across are visible.

These frozen peaks are estimated to be one-half mile to one mile (1-1.5 kilometers) high, about the same height as the United States’ Appalachian Mountains. The Norgay Montes (Norgay Mountains) discovered by New Horizons on July 15 more closely approximate the height of the taller Rocky Mountains.

The names of features on Pluto have all been given on an informal basis by the New Horizons team.

Image Credit: NASA/JHUAPL/SWRI

Pluto’s icy mountains have company. NASA’s New Horizons mission has discovered a new, apparently less lofty mountain range on the lower-left edge of Pluto’s best known feature, the bright, heart-shaped region named Tombaugh Regio (Tombaugh Region).

These newly-discovered frozen peaks are estimated to be one-half mile to one mile (1-1.5 kilometers) high, about the same height as the United States’ Appalachian Mountains. The Norgay Montes (Norgay Mountains) discovered by New Horizons on July 15 more closely approximate the height of the taller Rocky Mountains.

The new range is just west of the region within Pluto’s heart called Sputnik Planum (Sputnik Plain). The peaks lie some 68 miles (110 kilometers) northwest of Norgay Montes. This newest image further illustrates the remarkably well-defined topography along the western edge of Tombaugh Regio.

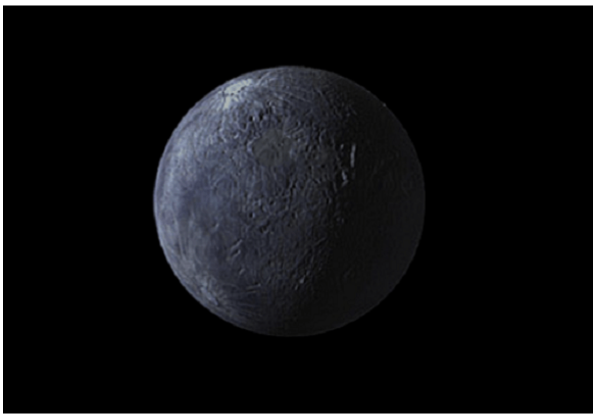
“There is a pronounced difference in texture between the younger, frozen plains to the east and the dark, heavily-cratered terrain to the west,” said Jeff Moore, leader of the New Horizons Geology, Geophysics and Imaging Team (GGI) at NASA’s Ames Research Center in Moffett Field, California. “There’s a complex interaction going on between the bright and the dark materials that we’re still trying to understand.”

While Sputnik Planum is believed to be relatively young in geological terms – perhaps less than 100 million years old — the darker region probably dates back billions of years. Moore notes that the bright, sediment-like material appears to be filling in old craters (for example, the bright circular feature to the lower left of center).

This image was acquired by the Long Range Reconnaissance Imager (LORRI) on July 14 from a distance of 48,000 miles (77,000 kilometers) and sent back to Earth on July 20. Features as small as a half-mile (1 kilometer) across are visible. The names of features on Pluto have all been given on an informal basis by the New Horizons team.

The Dwarf Planet Orcus

by Matt Williams on August 29, 2015



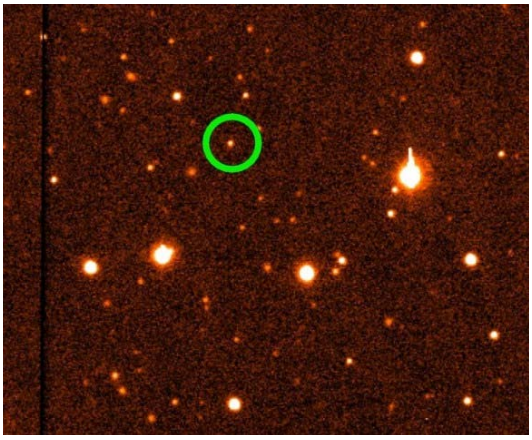
Artist’s impression of the Trans-Neptunian Object (TNO) 90482 Orcus. Credit: NASA

Since the early 2000s, more and more objects have been discovered in the outer Solar System that resemble planets. However, until they are officially classified, the terms Kuiper Belt Object (KBO) and Trans-Neptunian Object (TNO) are commonly used. This is certainly true of Orcus, another large object that was spotted in Pluto’s neighborhood about a decade ago.

Although similar in size and orbital characteristics to Pluto, Orcus is Pluto's opposite in many ways. For this reason, Orcus is often referred to as the "anti-Pluto", a fact that contributed greatly to the selection of its name. Although Orcus has not yet been officially categorized as a dwarf planet by the IAU, many astronomers agree that it meets all the requirements and will be in the future.

Discovery and Naming:
Orcus was discovered on February 17th, 2004, by Michael Brown of Caltech, Chad Trujillo of the Gemini Observatory, and David Rabinowitz of Yale University. Although discovered using images that were taken in 2004, prerecovery images of Orcus have been identified going back as far as November 8th, 1951.

Provisionally known as 90482 2004 DW, by November 22nd, 2004, the name Orcus was assigned. In accordance with the IAU's astronomical conventions, objects with a similar size and orbit to that of Pluto are to be named after underworld deities. Therefore, the discovery team suggested the name Orcus, after the Etruscan god of the underworld and the equivalent of the Roman god Pluto.



90482 Orcus. The location of Orcus is shown in the green circle (top, left). Credit: NASA

Size, Mass and Orbit:
Given its distance, estimates of Orcus' diameter and mass have varied over time. In 2008, observations made using the Spitzer Space Telescope in the far infrared placed its diameter at 958.4 ± 22.9 km. Subsequent observations made in 2013 using the Herschel Space Telescope at submillimeter wavelengths led to similar estimates being made.

In addition, Orcus appears to have an albedo of about 21% to 25%, which may be typical of trans-Neptunian objects approaching the 1000 km diameter range. However, these estimates were based on the assumption that Orcus was a singular object and not part of a system. The discovery of the relatively large satellite Vanth (see below) in 2007 by Brown et al. is likely to change these considerably.

The absolute magnitude of Vanth is estimated to be 4.88, which means that it is about 11 times fainter than Orcus itself. If the albedos of both bodies are the same at 0.23, then the diameter of Orcus would be closer to 892 -942 km, while Vanth would measure about 260 -293 km.

In terms of mass, the Orcus system is estimated to be 6.32 ± 0.05 $\times 10^{20}$ kg, which is about 3.8% the mass of the dwarf planet Eris. How this mass is partitioned between Orcus and Vanth depends of their relative sizes. If Vanth is 1/3rd the diameter Orcus, its mass is likely to be only 3% of the system. However, if it's diameter is about half that of Orcus, then its mass could be as high as 1/12 of the system, or about 8% of the mass of Orcus.

Orcus compared to Earth and the Moon. Credit: Wikipedia Commons

Much like Pluto, Orcus has a very long orbital period, taking 245.18 years (89552 days) to complete a single rotation around the Sun. It also is in a 2:3 orbital resonance with Neptune and is above the ecliptic during perihelion. In addition, it's orbit has a similar inclination and eccentricity as Pluto's – 20.573° to the ecliptic, and 0.227, respectively.

In short, Orcus orbits the Sun at a distance of 30.27 AU (4.53 billion km) at perihelion and 48.07 AU (7.19 billion km) at aphelion. However, Pluto and Orcus are oriented differently. For one, Orcus is at aphelion when Pluto is at perihelion (and vice versa), and the aphelion of Orcus's orbit points in nearly the opposite direction from Pluto's. Hence why Orcus is often referred to as the "anti-Pluto".

Composition:
The density of the primary (and secondary assuming they have the same density) is estimated to be 1.5 g/cm^3. In addition, spectroscopic and near-infrared observations have indicated that the surface is neutral in color and shows signs of water. Further infrared observations in 2004 by the European Southern Observatory and the Gemini Observatory indicated the possible presence of water ice and carbonaceous compounds.

This would indicate that Orcus is most likely differentiated between a rocky core and an icy mantle composed of water and methane ices as well as tholins – though not as much as other KBOs which are more reddish in appearance. The water and methane ices are believed to cover no more than 50% and 30% of the surface, respectively – which would mean the proportion of ice on the surface is less than on Charon, but similar to that on Triton.

Moon:
In 2011, Mike Brown and T.A. Suer detected a satellite in orbit of Orcus, based on images taken by the Hubble Space Telescope on November 13th, 2005. The satellite was given the designation S/2005 (90482) before being renamed Vanth on March 30th, 2005. This name was the result of an opinion poll where Mike Brown asked readers of his weekly column to submit their suggestions.

The name Vanth, after the Etruscan goddess who guided the souls of the dead to the underworld, was eventually chosen from among a large pool of submissions, which Brown then submitted to the IAU. The IAU's Committee for Small Body Nomenclature assessed it and determined it fit with their naming procedures, and officially approved of it in March of 2010.

Vanth orbits Orcus in a nearly face-on circular orbit at a distance of 9030 ± 89 km. It has an eccentricity of about 0.007 and an orbital period of 9.54 days. In terms of how Orcus acquired it, it is not likely that it was the result of a collision with an object, since Vanth's spectrum is very different from that of its primary.

Therefore, it is much more likely that Vanth is a captured KBO that Orcus acquired in the course of its history. However, it is also possible that Vanth could have originated as a result of rotational fission of the primordial Orcus, which would have rotated much faster billions of years ago than it does now.

Much like most other KBOs, there is much that we still don't know about Orcus. There are currently no plans for a mission in the near future. But given the growing interest in the region, it would not be surprising at all if future missions to the outer Solar System were to include a flyby of this world. And as we learn more about Orcus' size, shape and composition, we are likely to see it added to the list of confirmed dwarf planets.

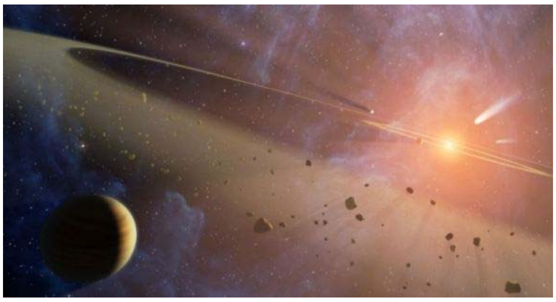
We have many interesting articles on Dwarf Planets, Kuiper Belt Objects, and the Outer Solar System here at Universe Today. Here is What is a Dwarf Planet? and What is the Kuiper Belt?

And be sure to checkout How Many Planets are in the Solar System?, and this article about all the Bright Objects in the Kuiper Belt.

For more information on Orcus, Vanth, check out the Planetary Society's page on Orcus and Vanth. To learn more about how they were discovered, consult Mike Brown's Planets.

What is the Asteroid Belt?

by Matt Williams on August 23, 2015



Artist concept of the asteroid belt. Credit: NASA

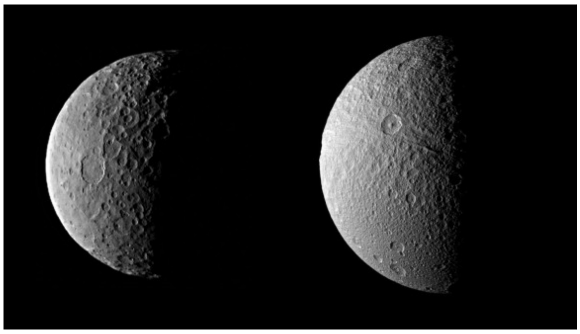
In the 18th century, observations made of all the known planets (Mercury, Venus, Earth, Mars, Jupiter and Saturn) led astronomers to discern a pattern in their orbits. Eventually, this led to the Titius–Bode law, which predicted the amount of space between the planets. In accordance with this law, there appeared to be a discernible gap between the orbits of Mars and Jupiter, and investigation into it led to a major discovery.

In addition to several larger objects being observed, astronomers began to notice countless smaller bodies also orbiting between Mars and Jupiter. This led to the creation of the term "asteroid", as well as "Asteroid Belt" once it became clear just how many there were. Since that time, the term has entered common usage and become a mainstay of our astronomical models.

Discovery:

In 1800, hoping to resolve the issue created by the Titius-Bode Law, astronomer Baron Franz Xaver von Zach recruited 24 of his fellow astronomers into a club known as the "United Astronomical Society" (sometimes referred to the as "Stellar Police"). At the time, its ranks included famed astronomer William Herschel, who had discovered Uranus and its moons in the 1780's.

Ironically, the first astronomer to make a discovery in this regions was Giuseppe Piazzi – the chair of astronomy at the University of Palermo – who had been asked to join the Society but had not yet received the invitation. On January 1st, 1801, Piazzi observed a tiny object in an orbit with the exact radius predicted by the Titius-Bode law.



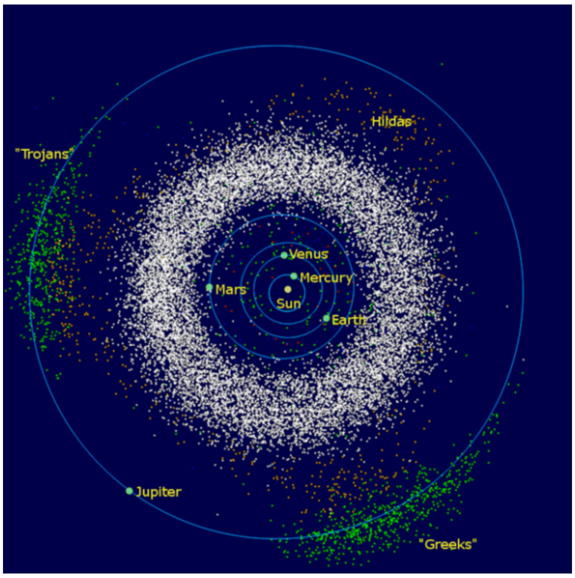
Ceres (left, Dawn image) compared to Tethys (right, Cassini image) at comparative scale sizes. Credits: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA and NASA/JPL-Caltech/SSI. Comparison by J. Major.

Initially he believed it to be a comet, but ongoing observations showed that it had no coma. This led Piazzi to consider that the object he had found – which he named "Ceres" after the Roman goddess of the harvest and patron of Sicily – could in fact be a planet. Fifteen months later, Heinrich Olbers (a member of the Society) discovered a second object in the same region, which was later named 2 Pallas.

In appearance, these objects seemed indistinguishable from stars. Even under the highest telescope magnifications, they did not resolve into discs. However, their rapid movement was indicative of a shared orbit. Hence, William Herschel suggested that they be placed into a separate category called "asteroids" – Greek for "star-like".

By 1807, further investigation revealed two new objects in the region, 3 Juno and 4 Vesta; and by 1845, 5 Astraea was found. Shortly thereafter, new objects were found at an accelerating rate, and by the early 1850s the term "asteroids" gradually came into common use. So too did the term "Asteroid Belt", though it is unclear who coined that particular term. However, the term "Main Belt" is often used to distinguish it from the Kuiper Belt.

One hundred asteroids had been located by mid-1868, and in 1891 the introduction of astrophotography by Max Wolf accelerated the rate of discovery even further. A total of 1,000 asteroids were found by 1921, 10,000 by 1981, and 100,000 by 2000. Modern asteroid survey systems now use automated means to locate new minor planets in ever-increasing quantities.



The asteroids of the inner Solar System and Jupiter: The donut-shaped asteroid belt is located between the orbits of Jupiter and Mars. Credit: Wikipedia Commons

Structure:

Despite common perceptions, the Asteroid Belt is mostly empty space, with the asteroids spread over a large volume of space. Nevertheless, hundreds of thousands of asteroids are currently known, and the total number ranges in the millions or more. Over 200 asteroids are known to be larger than 100 km in diameter, and a survey in the infrared wavelengths has shown that the asteroid belt has 0.7–1.7 million asteroids with a diameter of 1 km or more.

Located between Mars and Jupiter, the belt ranges from 2.2 to 3.2 astronomical units (AU) from the Sun and is 1 AU thick. It's total mass is estimated to be 2.8×10^{21} to 3.2×10^{21} kilograms – which is equivalent to about 4% of the Moon's mass. The four largest objects – Ceres, 4 Vesta, 2 Pallas, and 10 Hygiea – account for half of the belt's total mass, with almost one-third accounted for by Ceres alone.

The main (or core) population of the asteroid belt is sometimes divided into three zones, which are based on what is known as Kirkwood gaps. Named after Daniel Kirkwood, who announced in 1866 the discovery of gaps in the distance of asteroids, these describe the dimensions of an asteroid's orbit based on its semi-major axis.

Zone I lies between the 4:1 resonance and 3:1 resonance Kirkwood gaps, which are 2.06 and 2.5 AU from the Sun respectively. Zone II continues from the end of Zone I out to the 5:2 resonance gap, which is 2.82 AU from the Sun. Zone III extends from the outer edge of Zone II to the 2:1 resonance gap at 3.28 AU.

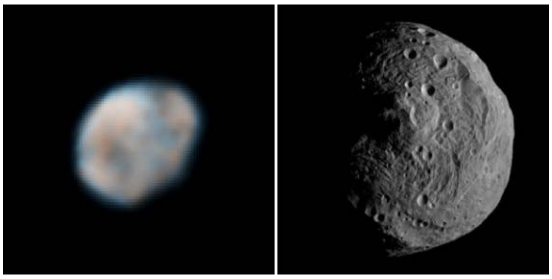
The asteroid belt may also be divided into the inner and outer belts, with the inner belt formed by asteroids orbiting nearer to Mars than the 3:1 Kirkwood gap (2.5 AU), and the outer belt formed by those asteroids closer to Jupiter's orbit.

The asteroids that have a radius of 2.06 AU from the Sun can be considered the inner boundary of the asteroid belt. Perturbations by Jupiter send bodies straying there into unstable orbits. Most bodies formed inside the radius of this gap were swept up by Mars (which has an aphelion at 1.67 AU) or ejected by its gravitational perturbations in the early history of the Solar System.

The temperature of the Asteroid Belt varies with the distance from the Sun. For dust particles within the belt, typical temperatures range from 200 K (-73 °C) at 2.2 AU down to 165 K (-108 °C) at 3.2 AU. However, due to rotation, the surface temperature of an asteroid can vary considerably as the sides are alternately exposed to solar radiation and then to the stellar background.

Composition:

Most asteroids are composed of rock, but a small portion of them contain metals such as iron and nickel. The remaining asteroids are made up of a mix of these, along with carbon-rich materials. Some of the more distant asteroids tend to contain more ices and volatiles, which includes water ice.



Vesta seen from the Earth-orbit based Hubble Space Telescope in 2007 (left) and up close with the Dawn spacecraft in 2011. Hubble Credit: NASA, ESA, and L. McFadden (University of Maryland). Dawn Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA. Photo Combination: Elizabeth Howell

The Belt consists primarily of three categories of asteroids: C-type, or carbonaceous asteroids; S-type, or silicate asteroids; and M-type, or metallic asteroids. Carbonaceous asteroids are carbon-rich, dominate the belt's outer regions, and comprise over 75% of the visible asteroids. Their surface composition is similar to that of carbonaceous chondrite meteorites, and their spectra matches the primordial composition of the early Solar System.

S-type (silicate-rich) asteroids are more common toward the inner region of the belt, within 2.5 AU of the Sun. These are typically composed of silicates and some metals, but not a significant amount of carbonaceous compounds. This indicates that their materials have been modified significantly over time, most likely through melting and reformation.

M-type (metal-rich) asteroids form about 10% of the total population, and are composed of iron-nickel and some silicate compounds. Some are believed to have originated from the metallic cores of differentiated asteroids, which were then fragmented from collisions. Within the asteroid belt, the distribution of these types of asteroids peaks at a semi-major axis of about 2.7 AU from the Sun.

There's also the mysterious and relatively rare V-type (or basaltic) asteroids. This group takes their name from the fact that until 2001, most basaltic bodies in the Asteroid Belt were believed to have originated from the asteroid Vesta. However, the discovery of basaltic asteroids with different chemical compositions suggests a different origin. Current theories of asteroid formation predict that the V-type asteroids should be more plentiful, but 99% of those predicted appear to be missing.

Families and Groups:

Approximately one-third of the asteroids in the asteroid belt are members of an asteroid family. These are based on similarities in orbital elements – such as semi-major axis, eccentricity, orbital inclinations, and similar spectral features, all of which indicate a common origin. Most likely, this is believed to have involve collisions between larger objects (with a mean radius of ~10 km) that then broke up into smaller bodies.

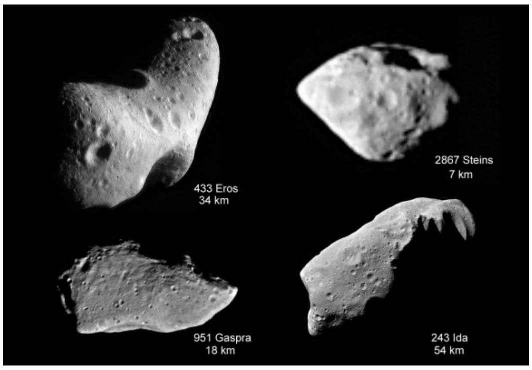
This artist's conception shows how families of asteroids are created. Credit: NASA/JPL-Caltech

Some of the most prominent families in the asteroid belt are the Flora, Eunoma, Koronis, Eos, and Themis families. The Flora family, one of the largest with more than 800 known members, may have formed from a collision less than a billion years ago. Located within the inner region of the Belt, this family is made up of S-type asteroids and accounts for roughly 4-5% of all Belt objects.

The Eunomia family is another large grouping of S-type asteroids, which takes its name from the Greek goddess Eunomia (goddess of law and good order). It is the most prominent family in the intermediate asteroid belt, and accounts for 5% of all asteroids.

The Koronis family consists of 300 known asteroids which are thought to have been formed at least billion years ago by a collision. The largest known, 208 Lacrimosa, is about 41 km (25 mi) in diameter, while an additional 20 more have been found that are larger than 25 km in diameter.

The Eos (or Eoan) family is a prominent family of asteroids that orbit the Sun at distance of 2.96 – 3.03 AUs, and are believed to have formed from a collision 1-2 billion years ago. It consists of 4,400 known members that resemble the S-type asteroid category. However, examination of Eos and other family members in the infrared show some differences with the S-type, thus why they have their own category (K-type asteroids).



Asteroids we've seen up close show cratered surfaces similar to yet different from much of the cratering on comets. Credit: NASA

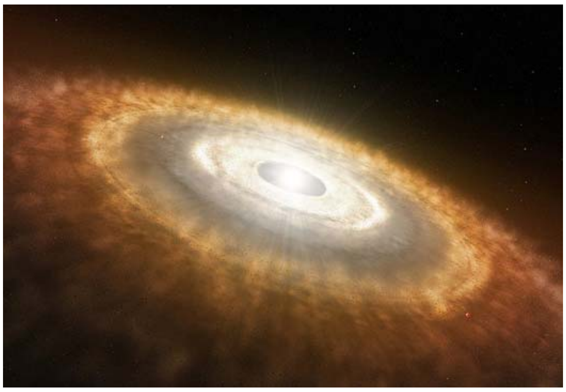
The Themis asteroid family is found in the outer portion of the asteroid belt, at a mean distance of 3.13 AU from the Sun. This core group includes the asteroid 24 Themis (for which it is named), and is one of the more populous asteroid families. It is made up of C-type asteroids with a composition believed to be similar to that of carbonaceous chondrites, and consists of a well-defined core of larger asteroids and a surrounding region of smaller ones.

The largest asteroid to be a true member of a family is 4 Vesta. The Vesta family is believed to have formed as the result of a crater-forming impact on Vesta. Likewise, the HED meteorites may also have originated from Vesta as a result of this collision.

Along with the asteroid bodies, the asteroid belt also contains bands of dust with particle radii of up to a few hundred micrometres. This fine material is produced, at least in part, from collisions between asteroids, and by the impact of micrometeorites upon the asteroids. Three prominent bands of dust have been found within the asteroid belt – which have similar orbital inclinations as the Eos, Koronis, and Themis asteroid families – and so are possibly associated with those groupings.

Origin:

Originally, the Asteroid Belt was thought to be the remnants of a much larger planet that occupied the region between the orbits of Mars and Jupiter. This theory was originally suggested by Heinrich Olbders to William Herschel as a possible explanation for the existence of Ceres and Pallas. However, this hypothesis has since fallen out of favor for a number of reasons.



Artist's impression of the early Solar System, where collision between particles in an accretion disc led to the formation of planetesimals and eventually planets. Credit: NASA/JPL-Caltech

First, there is the amount of energy it would have required to destroy a planet, which would have been staggering. Second, there is the fact that the entire mass of the Belt is only 4% that of the Moon. Third, the significant chemical differences between the asteroids do not point towards them having been once part of a single planet.

Today, the scientific consensus is that, rather than fragmenting from a progenitor planet, the asteroids are remnants from the early Solar System that never formed a planet at all. During the first few million years of the Solar System's history, when gravitational accretion led to the formation of the planets, clumps of matter in an accretion disc coalesced to form planetesimals. These in turn came together to form planets.

However, within the region of the Asteroid Belt, planestesimals were too strongly perturbed by Jupiter's gravity to form a planet. These objects would therefore continue to orbit the Sun as before, occasionally colliding and producing smaller fragments and dust.

During the early history of the Solar System, the asteroids also melted to some degree, allowing elements within them to be partially or completely differentiated by mass. However, this period would have been necessarily brief due to their relatively small size, and likely ended about 4.5 billion years ago, in the first tens of millions of years of the Solar System's formation.

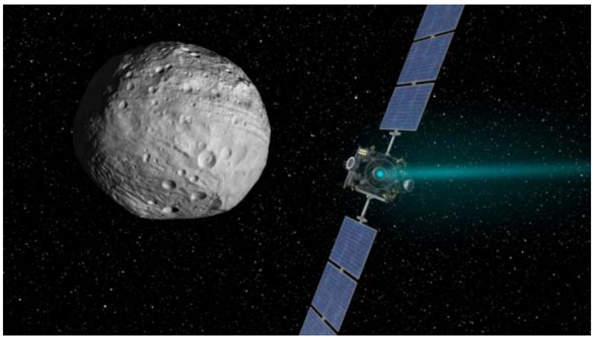
Though they are dated to the early history of the Solar System, the asteroids (as they are today) are not samples of its primordial self. They have undergone considerable evolution since their formation, including internal heating, surface melting from impacts, space weathering from radiation, and bombardment by micrometeorites. Hence, the Asteroid Belt today is believed to contain only a small fraction of the mass of the primordial belt.

Computer simulations suggest that the original asteroid belt may have contained mass equivalent to the Earth. Primarily because of gravitational perturbations, most of the material was ejected from the belt a million years after its formation, leaving behind less than 0.1% of the original mass. Since then, the size distribution of the asteroid belt is believed to have remained relatively stable.

When the asteroid belt was first formed, the temperatures at a distance of 2.7 AU from the Sun formed a “snow line” below the freezing point of water. Essentially, planetesimals formed beyond this radius were able to accumulate ice, some of which may have provided a water source of Earth’s oceans (even more so than comets).

Exploration:

The asteroid belt is so thinly populated that several unmanned spacecraft have been able to move through it; either as part of a long-range mission to the outer Solar System, or (in recent years) as a mission to study larger Asteroid Belt objects. In fact, due to the low density of materials within the Belt, the odds of a probe running into an asteroid are now estimated at less than one in a billion.



Artist’s concept of the Dawn spacecraft arriving at Vesta. Image credit: NASA/JPL-Caltech

The first spacecraft to make a journey through the asteroid belt was the *Pioneer 10* spacecraft, which entered the region on July 16th, 1972. As part of a mission to Jupiter, the craft successfully navigated through the Belt and conducted a flybys of Jupiter (which culminated in December of 1973) before becoming the first spacecraft to achieve escape velocity from the Solar System.

At the time, there were concerns that the debris would pose a hazard to the *Pioneer 10* space probe. But since that mission, 11 additional spacecraft passed through the Asteroid Belt without incident. These included *Pioneer 11, Voyager 1 and 2, Ulysses*, *Galileo*, *NEAR, Cassini, Stardust, New Horizons,* the ESA’s *Rosetta*, and most recently, the *Dawn* spacecraft.

For the most part, these missions were part of missions to the outer Solar System, where opportunities to photograph and study asteroids were brief. Only the *Dawn*, *NEAR* and JAXA’s *Hayabusa* missions have studied asteroids for a protracted period in orbit and at the surface. Dawn explored Vesta from July 2011 to September 2012, and is currently orbiting Ceres (and sending back many interesting pictures of its surface features).

And someday, if all goes well, humanity might even be in a position to begin mining the asteroid belt for resources – such as precious metals, minerals, and volatiles. These resources could mined be from an asteroid and then used in space of in-situ utilization (i.e. turning them into construction materials and rocket propellant), or brought back to Earth.

It is even possible that humanity might one day colonize larger asteroids and establish outposts throughout the Belt. In the meantime, there’s still plenty of exploring left to do, and quite possibly millions more objects out there to study.

We have written many articles about the asteroid belt for Universe Today. Here’s Where Do Asteroids Come From?, Why the Asteroid Belt Doesn’t Threaten Spacecraft, and Why isn’t the Asteroid Belt a Planet?.

Also, be sure to learn which is the Largest Asteroid in the Solar System, and about the asteroid named after Leonard Nimoy. And here’s 10 Interesting Facts about Asteroids.

We also have many interesting articles about the Dawn spacecraft’s mission to Vesta and Ceres, and asteroid mining.

The moon using a simple compact camera with a powerful zoom.

The Nikon S9900, hand held.

Noctilucent clouds. Only one clear showing in July (18h)

E-mails' Observing logs and members images

Hi Andy,

I was thinking about what I would like to see at the monthly meetings and I think some of those new to astronomy would like to see more practical demonstrations on a number of topics.

It is not always possible for to get to the observing evenings and watching youtube videos is no substitute for a hands-on demonstrations when questions can be asked there and then.

Maybe these along with death-by-powerpoint presentation to reiterate processes and subjects would be doable:

Beginners Topics could be:
Setting up a portable mount with scope including Polar alignment and 2/3 star alignment.
Full Collimation of reflectors from scratch.
Solar observing - the various different ways to do this from projection to solar telescopes and what one can expect see using the various methods.
Selecting telescopes and mounts, pros and cons of each type and what can be seen using various sizes.
Eyepieces - different types and uses.
Imaging of DSO and planets with reflectors and refractors including what equipment is needed and various software packages available to aid photography. something on where people go wrong would be useful too.
Image processing using the various software packages.
Recommended dark areas within 20 miles of the club
Comet spotting best way to view
Using binoculars - guide to the interesting objects that can be seen.
Quick guide to the moon and what interesting features can be seen during the various phases.

I imagine these have all been done before but I haven't been lucky enough to be there when they have. I wouldn't expect to have these demonstrations every month and it is probably possible to combine some subjects but maybe one guaranteed indoor practical session a year would be useful to new comers to astronomy. It may also encourage attendance at some of the practical observing sessions later on.

Other subjects I would be interested in seeing would be more talks on the findings of the various space craft that have visited objects and planets in our solar system.

As far as the observing sessions go, I rarely get emails when the planned or ad-hoc sessions are talking place so I am not even sure I am on the email list but some sort of message or email a few days beforehand on Facebook or the Forum would be useful as a reminder.
However, I think having a monthly planned session is a good idea but perhaps if the weather is against it, this is automatically postponed until either the next night or perhaps a weeks time.
Failing that maybe then defaulting to a ad-hoc night with no planned observing i.e. just turn up and see.
I think having it on either a Friday or Saturday night is best for those of us who have to get up a 6am during the week but this shouldn't stop midweek observing for those who don't.

Just my ha' penny's worth but I would like to say I have enjoyed all the meetings to date and am grateful for the time and effort everybody puts in to making them happen.

Cheers
Chris

Hi Andy,

Sorry I could not make it to Seend at the weekend, had too many prior arrangements.

I was out in my garden last night as it was clear and tried to see if I could catch any Persieds. I was also interested to see if

the switching off of the local streetlights at midnight had much effect. All that is left on are some pathway lights, most of the estate ones go off (Cepen Park North). I did not know this darkening was going to happen, I just noticed it when I was looking out from my house in the early hours a couple of weeks ago and noticed the street lights were out.

On the attached picture the left side is 1 min before midnight and the right side is 1 min after. Quite a difference! Together they make up the full frame of that part of the sky I was imaging.

No I did not catch any meteors on camera but did see a lot. The streak on the top left is a satellite.

Cheers

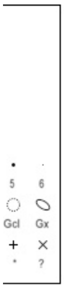
Brian

I hope you don't mind me emailing you; I got your address from the Wiltshire Astronomical Society website. I have a nearly-new Sky-watcher SK1309EQ2 Reflecting telescope in really good condition that I bought a while ago but hardly ever use. It is 130 mm diameter and 900 mm focal length, perhaps ideal for a beginner or junior member. If the Society or anymember would like it, I am happy for you to have it for no charge. I live in Laverstock, Salisbury and could either deliver it (locally) or I would be happy for someone to pick it up from my home.

Regards,

Mike Curnow

07810447340



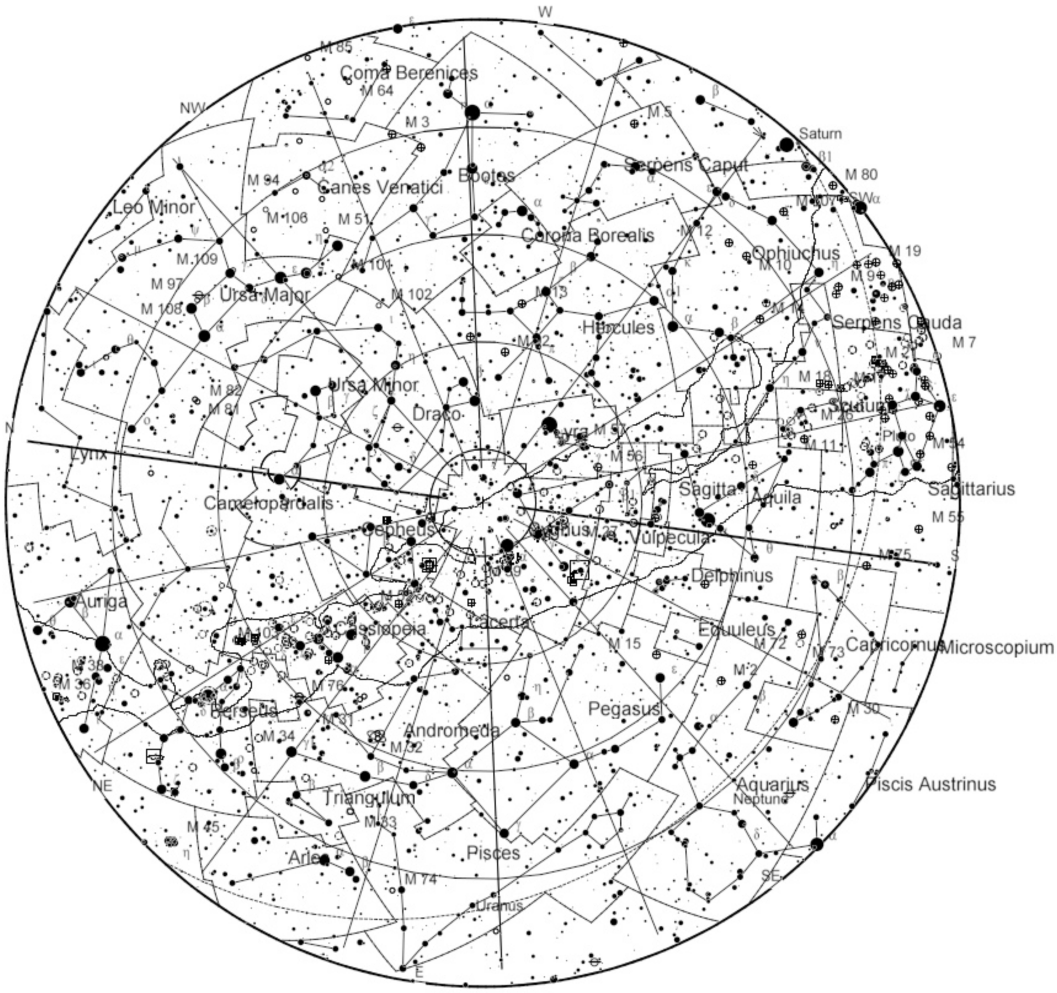


Image is from mid September, 9:30pm, Cartes du Ciel

September 1 - **Neptune at Opposition.** The blue giant planet will be at its closest approach to Earth and its face will be fully illuminated by the Sun. It will be brighter than any other time of the year and will be visible all night long. This is the best time to view and photograph Neptune. Due to its extreme distance from Earth, it will only appear as a tiny blue dot in all but the most powerful telescopes.

September 4 - **Mercury at Greatest Eastern Elongation.** The planet Mercury reaches greatest eastern elongation of 27 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the evening sky. Look for the planet low in the western sky just after sunset.

September 13 - **New Moon.** The Moon will located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 06:41 UTC. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.

September 13 - **Partial Solar Eclipse.** A partial solar eclipse occurs when the Moon covers only a part of the Sun, sometimes resembling a bite taken out of a cookie. A partial solar eclipse can only be safely observed with a special solar filter or by looking at the Sun's reflection. The partial eclipse will only be visible in southern Africa, Madagascar, and Antarctica.

September 23 - **September Equinox.** The September equinox occurs at 08:21 UTC. The Sun will shine directly on the equator and there will be nearly equal amounts of day and night throughout the world. This is also the first day of fall (autumnal equinox) in the Northern Hemisphere and the first day of spring (vernal equinox) in the Southern Hemisphere.

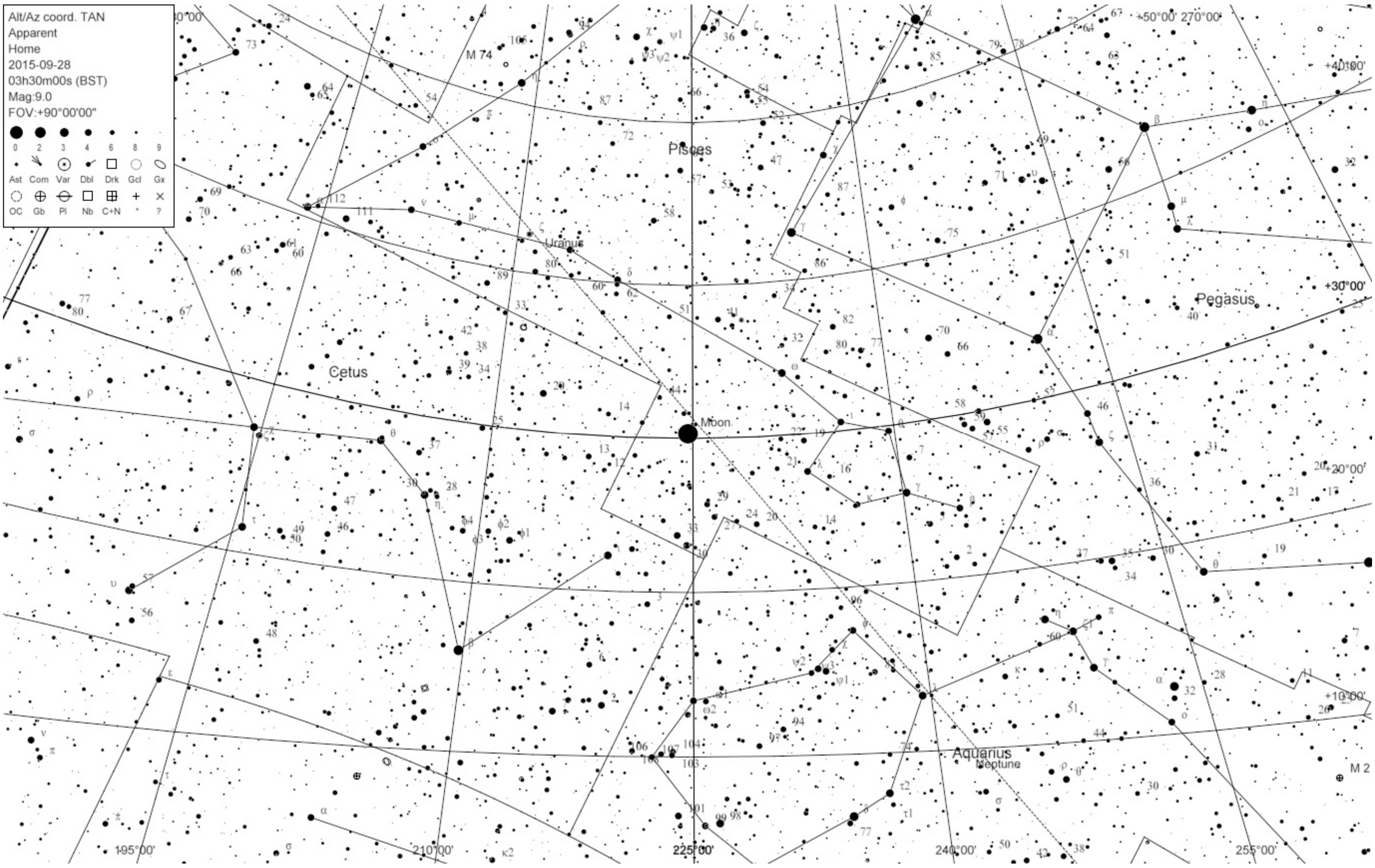
September 28 - **Full Moon.** The Moon will be located on the opposite side of the Earth as the Sun and its face will be will be fully illuminated. This phase occurs at 02:50 UTC. This full moon was known by early Native American tribes as the Full Corn Moon because the corn is harvested around this time of year. This moon is also known as the Harvest Moon. The Harvest Moon is the full moon that occurs closest to the September equinox each year. This is also the second of three close moons for 2015. The Moon will be at its closest approach to the Earth and may look slightly larger and brighter than usual. This will be the closest full moon of the year.

September 28 - **Total Lunar Eclipse.** A total lunar eclipse occurs when the Moon passes completely through the Earth's dark shadow, or umbra. During this type of eclipse, the Moon will gradually get darker and then take on a rusty or blood red colour. The eclipse will be visible throughout most of North and South America, Europe, Africa, and western Asia.

LUNAR ECLIPSE 28th SEPTEMBER 2015

The times displayed might be a minute or two off actual times.

Event	UTC Time	Time in Bristol*	Visible Bristol
Penumbral Eclipse begins	28 Sep, 00:11	28 Sep, 01:11	Yes
Partial Eclipse begins	28 Sep, 01:07	28 Sep, 02:07	Yes
Full Eclipse begins	28 Sep, 02:11	28 Sep, 03:11	Yes
Maximum Eclipse	28 Sep, 02:47	28 Sep, 03:47	Yes
Full Eclipse ends	28 Sep, 03:23	28 Sep, 04:23	Yes
Partial Eclipse ends	28 Sep, 04:27	28 Sep, 05:27	Yes
Penumbral Eclipse ends	28 Sep, 05:22	28 Sep, 06:22	Yes



A lunar eclipse occurs when the Moon passes within Earth's umbra (shadow). As the eclipse begins, the Earth's shadow first darkens the Moon slightly. Then, the shadow begins to "cover" part of the Moon, turning it a dark red-brown color (typically - the color can vary based on atmospheric conditions). The Moon appears to be reddish because of Rayleigh scattering (the same effect that causes sunsets to appear reddish) and the refraction of that light by the Earth's atmosphere into its umbra.[1]

The following simulation shows the approximate appearance of the Moon passing through the earth's shadow. The Moon's brightness is exaggerated within the umbral shadow. The northern portion of the Moon was closest to the center of the shadow, making it darkest, and most red in appearance.

The view of stars is for the mid eclipse time and shows the Moon in Aquarius and the umbra of the Earth surrounding it. The degree of 'redness' wil;l vary with particulates in the Earths atmosphere.

Danjon scale:

The following scale (the Danjon scale) was devised by André Danjon for rating the overall darkness of lunar eclipses:[5]

L=0: Very dark eclipse. Moon almost invisible, especially at mid-totality.

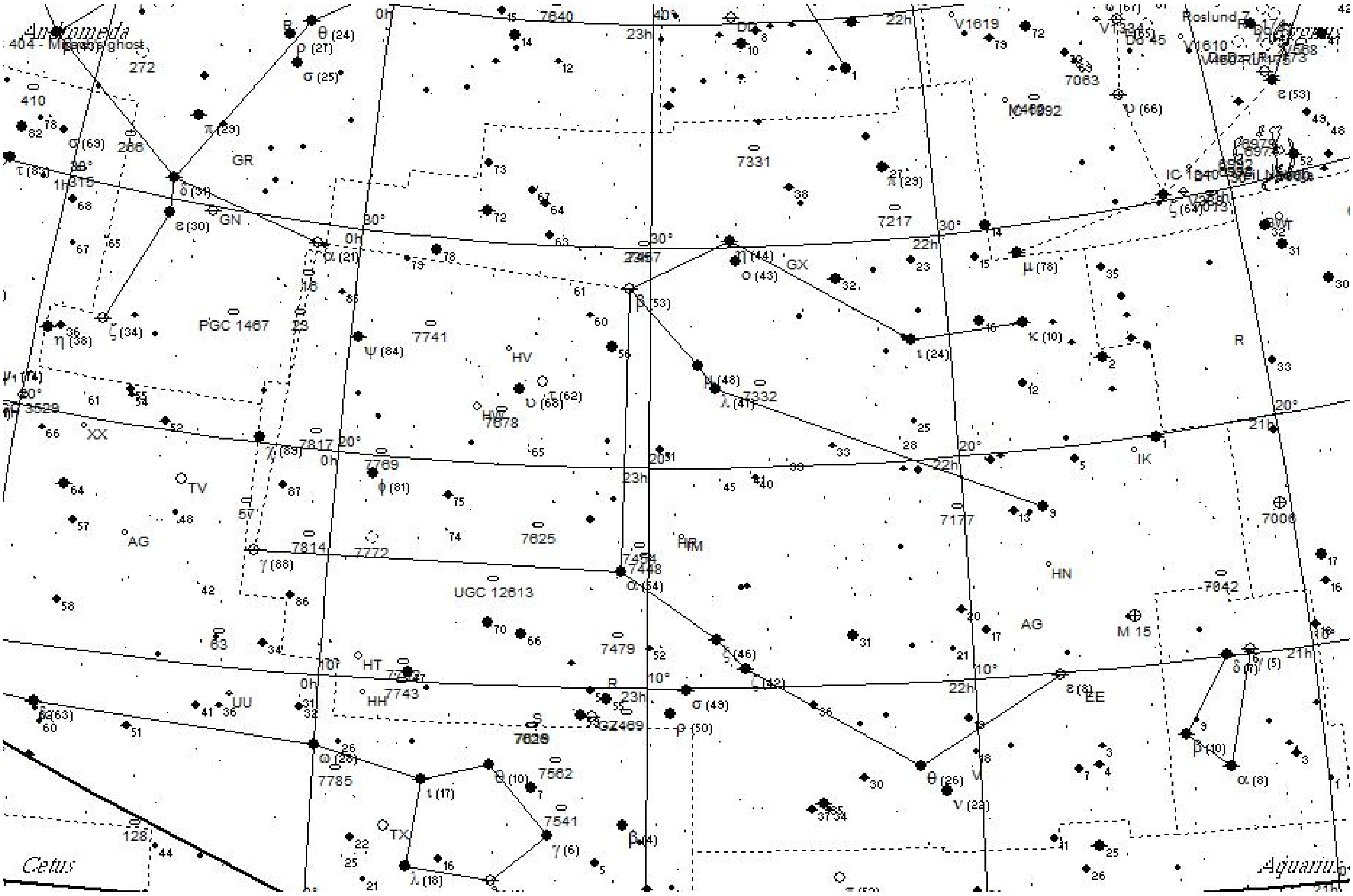
L=1: Dark eclipse, gray or brownish in coloration. Details distinguishable only with difficulty.

L=2: Deep red or rust-colored eclipse. Very dark central shadow, while outer edge of umbra is relatively bright.

L=3: Brick-red eclipse. Umbral shadow usually has a bright or yellow rim.

L=4: Very bright copper-red or orange eclipse. Umbral shadow is bluish and has a very bright rim.

CONSTELLATIONS OF THE MONTH: PEGASUS



Pegasus, the winged horse, flew out of the head of Medusa when Perseus slew her. It was fathered by Poseidon, some time earlier, and waited for the Gorgon's death to appear. (Medusa's story is told under the constellation "Cepheus".)

Athene gave Pegasus to Bellerophon (a grandson of Sisyphus), who used the winged creature in his fight against the Chimaera - a monstrous female with three heads.

Bellerophon shot arrows at the beast as he flew above her on Pegasus, then he stuck between her jaws a huge lump of lead. The monster's own breath melted the lead, which then flowed down her throat and burned her to death.

Now Bellerophon was sent off on another mission, which he accomplished with equal aplomb. Flushed with victory, he flew off for Olympus, home of the gods, as if he too were immortal. Zeus sent a gadfly, which stung Pegasus on the bum, and Bellerophon was kicked off the horse.

Pegasus went alone to Olympus, where he was used by Zeus to carry around his thunderbolts. As for Bellerophon, for his presumption of greatness, he wandered about the earth for the rest of his life, blind, lame, and shunned by man, until dying of old age.

Pegasus is a conspicuous constellation which includes the so-called "Great Square of Pegasus". However it must now share the northeast corner of the square with Andromeda: *delta Pegasus* was given to Andromeda, to provide the lady with a head!

The stars are generally second and third magnitude. There are several interesting binaries here, a curious flare star, and one outstanding deep sky object.

Double stars in Pegasus:

Kappa Pegasi is a very close binary, with an orbit of only 11.52 years: 4.8, 5.3; presently the companion is at PA 132 degrees and separation of only 0.2".

37 Pegasi is another close binary, with an orbit of 140 years: 5.8, 7.1; presently the companion is found at PA 118 degrees and separation of 0.8".

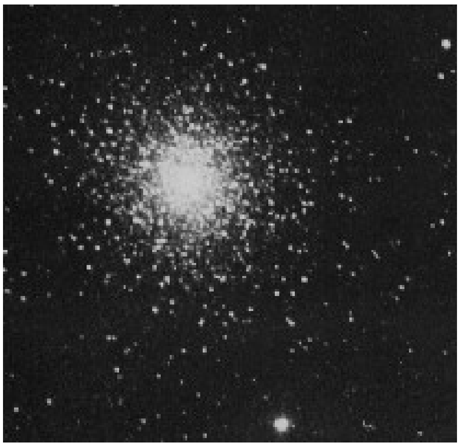
85 Pegasi is a well-known close binary with orbit of 26.27 years: 5.8, 8.9; currently the companion is at PA 149 degrees and separation of 0.8".

Variable stars in Pegasus:

Epsilon Pegasi is an irregular (Lb type) variable, and a flare star with a relatively cool shell. This supergiant can get as bright as 0.7 magnitude, and dimmer than 3.5. Generally it stays around 2.4.

Deep Sky Objects in Pegasus:

Pegasus has many galaxies and an outstanding globular cluster.



M15 (NGC 7078) is one of the finest globular clusters in the heavens, very bright and compact, at 35,000 to 40,000 light years away. It is found four degrees NW of epsilon Pegasi

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NGC 7331 is a spiral galaxy resembling the Milky Way Galaxy; it's as if we were looking at outselves from fifty million light years away.

NGC 7479 is a barred spiral galaxy about three degrees due south of alpha Pegasi

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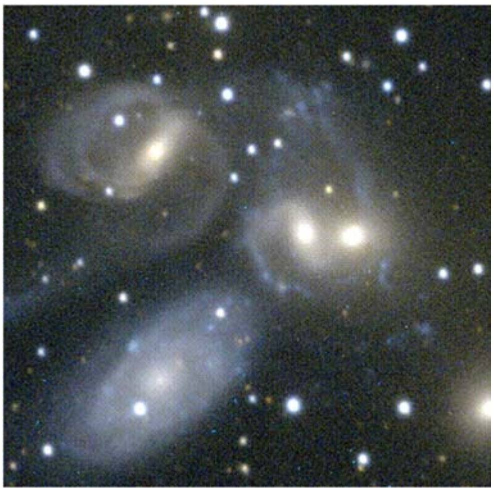
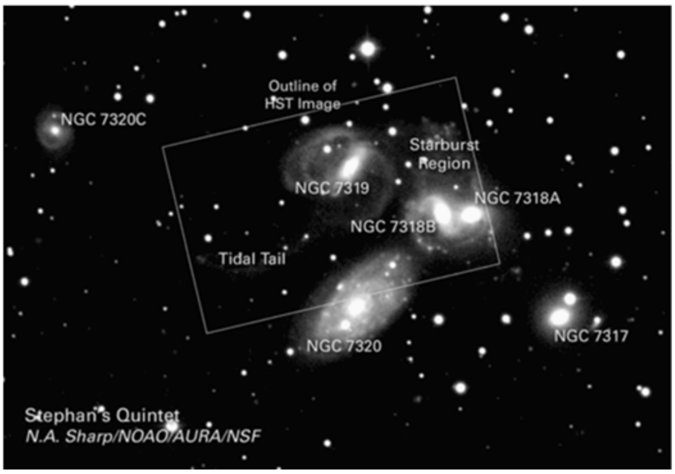


Stephan's Quintet is a noted cluster of galaxies half a degree SSW of NGC 7331. See how many of the five you can spot (three is average, four is good).

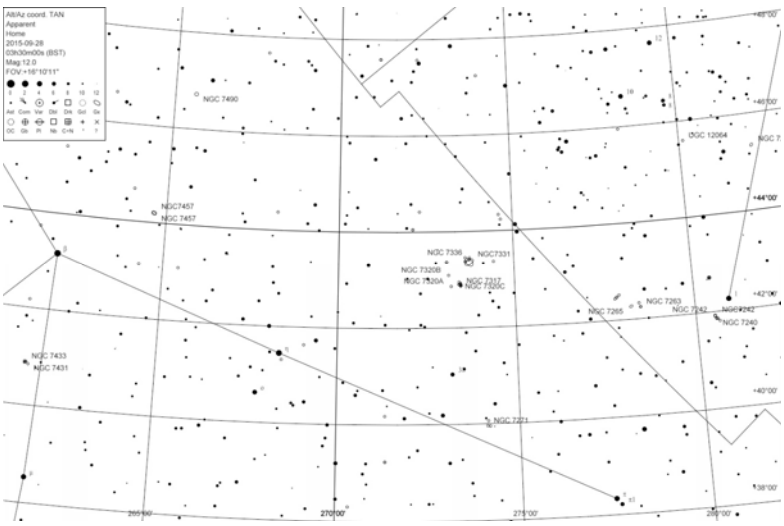
Stephan's Quintet in the constellation Pegasus is a visual grouping of five galaxies of which four form the first compact galaxy group ever discovered. The group was discovered by Édouard Stephan in 1877 at Marseille Observatory. The group is the most studied of all the compact galaxy groups.The brightest member of the visual grouping is NGC 7320 that is shown to have extensive H II regions, identified as red blobs, where active star formation is occurring.

These galaxies are of interest because of their violent collisions. Four of the five galaxies in **Stephan's Quintet** form a physical association, Hickson Compact Group 92, and are involved in a cosmic dance that most likely will end with the galaxies merging. Radio observations in the early 1970s revealed a mysterious filament of emission which lies in inter-galactic space between the galaxies in the group. This same region is also detected in the faint glow of ionized atomic hydrogen seen in the visible part of the spectrum as the magnificent green arc in the picture to the right. Two space telescopes have recently provided new insight into the nature of the strange filament, which is now believed to be a giant intergalactic shock-wave (similar to a sonic boom but traveling in intergalactic gas rather than air) caused by one galaxy (NGC 7318B) falling into the center of the group at several millions of miles per hour.



The galaxies in the vicinity of Stephan's Quintet. The rectangle indicates the area covered by the 1998–99 Hubble Space Telescope image below.

The five visually adjacent galaxies of Stephan's Quintet are NGC 7317–7320. NGC 7320, however, is a foreground object roughly 40 million ly away, significantly closer than the others at about 290 million ly, and not part of the Hickson association. The visual distinction between 7320 and the others in the 2009 HST image below is quite striking. A sixth galaxy, NGC 7320C, probably belongs to the association: it has a redshift similar to the Hickson galaxies, and a tidal tail appears to connect it with NGC 7319.



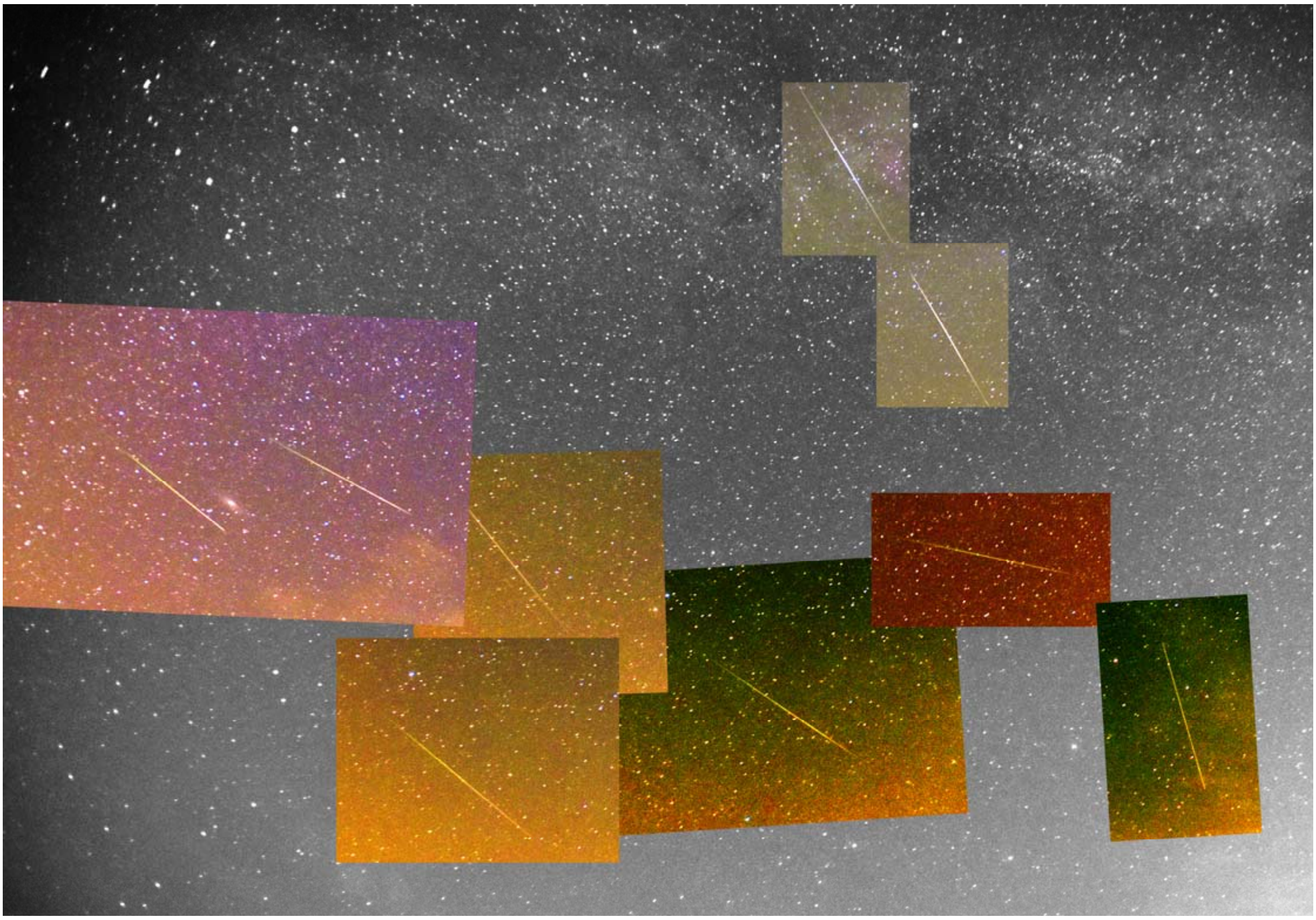
ISS PASSES For September/October 2015

From Heavens Above website maintained by Chris Peat

Date	Brightness	Start			Highest point			End		
	(mag)	Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
11 Sep	-0.8	05:26:59	10°	S	05:28:58	15°	SE	05:31:00	10°	ESE
13 Sep	-1.7	05:16:09	15°	SSW	05:18:07	26°	SSE	05:20:55	10°	E
14 Sep	-1.1	04:24:53	17°	SE	04:24:53	17°	SE	04:27:01	10°	E
14 Sep	-3.0	05:57:32	10°	WSW	06:00:44	59°	SSE	06:03:58	10°	E
15 Sep	-2.6	05:06:07	29°	SSW	05:07:16	42°	SSE	05:10:22	10°	E
16 Sep	-1.5	04:14:43	24°	ESE	04:14:43	24°	ESE	04:16:41	10°	E
16 Sep	-3.3	05:47:17	14°	WSW	05:49:59	81°	SSE	05:53:14	10°	E
17 Sep	-3.2	04:55:50	51°	SSW	04:56:24	63°	SSE	04:59:38	10°	E
18 Sep	-1.3	04:04:22	25°	E	04:04:22	25°	E	04:06:00	10°	E
18 Sep	-3.4	05:36:56	19°	W	05:39:09	86°	N	05:42:25	10°	E
19 Sep	-3.5	04:45:27	83°	SSW	04:45:31	84°	SSE	04:48:47	10°	E
20 Sep	-0.8	03:53:57	20°	E	03:53:57	20°	E	03:55:08	10°	E
20 Sep	-3.4	05:26:31	25°	W	05:28:16	86°	N	05:31:32	10°	E
21 Sep	-3.0	04:35:01	64°	ENE	04:35:01	64°	ENE	04:37:51	10°	E
21 Sep	-3.3	06:07:43	10°	W	06:10:58	66°	SSW	06:14:12	10°	ESE
22 Sep	-0.3	03:43:33	14°	E	03:43:33	14°	E	03:44:09	10°	E
22 Sep	-3.5	05:16:08	37°	W	05:17:17	83°	SSW	05:20:33	10°	ESE
23 Sep	-2.0	04:24:43	37°	E	04:24:43	37°	E	04:26:50	10°	E
23 Sep	-2.9	05:57:17	14°	W	05:59:51	44°	SSW	06:02:58	10°	SE
24 Sep	-3.4	05:05:56	59°	SW	05:06:11	62°	SSW	05:09:24	10°	ESE
25 Sep	-0.9	04:14:40	19°	ESE	04:14:40	19°	ESE	04:15:43	10°	ESE
25 Sep	-2.2	05:47:15	21°	WSW	05:48:35	27°	SSW	05:51:24	10°	SSE
26 Sep	-1.9	04:56:07	28°	SSE	04:56:07	28°	SSE	04:58:01	10°	SE
27 Sep	-1.4	05:37:43	16°	SSW	05:37:43	16°	SSW	05:39:17	10°	S
04 Oct	-1.0	20:47:30	10°	SSW	20:48:21	16°	SSW	20:48:21	16°	SSW
05 Oct	-1.8	19:54:11	10°	SSW	19:56:35	19°	SE	19:56:55	19°	SE
05 Oct	-0.2	21:29:21	10°	WSW	21:29:29	11°	WSW	21:29:29	11°	WSW
06 Oct	-2.4	20:35:30	10°	SW	20:37:53	38°	SSW	20:37:53	38°	SSW
07 Oct	-2.4	19:41:49	10°	SW	19:44:43	32°	SSE	19:46:10	21°	ESE
07 Oct	-0.8	21:17:38	10°	WSW	21:18:44	20°	WSW	21:18:44	20°	WSW
08 Oct	-3.4	20:23:38	10°	WSW	20:26:52	69°	SSE	20:26:55	69°	SSE
09 Oct	-3.0	19:29:43	10°	SW	19:32:52	50°	SSE	19:35:01	18°	E
09 Oct	-1.3	21:05:54	10°	W	21:07:33	27°	W	21:07:33	27°	W
10 Oct	-3.5	20:11:49	10°	W	20:15:05	87°	SSE	20:15:35	60°	E
11 Oct	-3.3	19:17:46	10°	WSW	19:20:59	72°	SSE	19:23:34	15°	E
11 Oct	-1.7	20:54:06	10°	W	20:56:06	34°	W	20:56:06	34°	W
12 Oct	-3.4	19:59:58	10°	W	20:03:13	85°	N	20:04:02	47°	E
12 Oct	0.1	21:36:21	10°	W	21:36:34	11°	W	21:36:34	11°	W
13 Oct	-3.4	19:05:49	10°	W	19:09:04	89°	S	19:11:57	13°	E
13 Oct	-2.1	20:42:12	10°	W	20:44:29	42°	W	20:44:29	42°	W
14 Oct	-3.4	19:48:03	10°	W	19:51:18	88°	N	19:52:23	39°	E
14 Oct	-0.1	21:24:27	10°	W	21:24:55	13°	W	21:24:55	13°	W
15 Oct	-3.3	18:53:51	10°	W	18:57:06	84°	N	19:00:17	10°	E
15 Oct	-2.5	20:30:13	10°	W	20:32:49	47°	WSW	20:32:49	47°	WSW
16 Oct	-3.4	19:36:01	10°	W	19:39:15	78°	SSW	19:40:43	30°	ESE

END IMAGES

Image from the Perseid meteor shower on the night of the 12th/13th August. This is only a fraction of those seen. Andy Burns



Date	Moon Phase	Observing Topic
2015		
Friday September 18th	Waxing crescent	Lunar and deep sky
Monday September 28th		*Lunar eclipse. Viewing from Bratton Camp above Westbury*
Friday October 23rd	Gibbous	Lunar targets
Monday October 26th		*Conjunction of Venus and Jupiter*
Wednesday October 28th		*Conjunction of Venus, Mars and Jupiter*
Friday November 27th	Full	Lunar targets
Sunday 13th / Monday 14th December	Crescent	Geminids meteors
Tuesday December 29th	Waning gibbous	Christmas Early meeting - Lunar targets
2016		
Friday 29th January	Waning gibbous	Lunar targets
Friday 26th February	Waning gibbous	Lunar targets
Friday 25th March	Full	Lunar targets
Friday 29th April	Last quarter	Lunar targets
Monday 9th May		*Transit of Mercury*
Friday 27th May	Waning gibbous	

Wiltshire Astronomical Society Observing Sessions 2015 – 2016

OUTREACH ACTIVITIES

List accumulating, with individual talk events and combined viewing events at others.

October 20th Bowerhill ladies group.

November 4th Sutton Benger brownies.

Lacock cubs tba.