

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

Happy Christmas and New Year

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Seasons greeting to all.

It is good to have Andrew Lounds back to give us his talk in his inimitable style about the discovery of Neptune using mathematics from the orbit of Uranus....

I forgot to mention it was our pre Christmas meeting because last months speaker, Paul Money had to go first. However, as with last year the committee has agreed to the society paying for those nibbles in place of the summer trip and bbqs that have fallen by the wayside due to lack of support. This is not to suggest that they will not be reinstated if we get above 40% of the membership turning up for the events.

Meanwhile we did not have an after meeting photoimaging session, though the observing session at Lacock did go ahead in spite of poor weather up to 8pm.

Again a very low turn out, but we did manage to view star birth nebula, star clusters and galaxies as well as the very bright moon. During an after viewing session discussion it became apparent that we could include some more about the software available and we regularly use when imaging so we can begin to put this into the newsletter as an introduction, and we spin off the beginners sessions a new

piece of readily available software each month. Does anyone want to take this on?

This month I have given a list of 'finder' software, planetarium or sky charts for the Moon, the planets, the stars and deepsky objects.

Even weather prediction tools and aurora alert apps for your phone. Have fun playing with these.

Software for imaging will come later.

The outreach has been very busy this month but mainly in the background from the other members point of view with schools days in schools and two 'guide' groups, though one was very much pre brownies age.

We also have requests to return to do viewing sessions in Melksham and some interesting work/involvement at East Witchell in Swindon.

Don't forget our early evening after Christmas viewing session at Lacock. From 6pm on Tuesday December 29th.

Andy

Messier M35 and NGC2158.

Two open clusters in Gemini, looking out to the next spiral arm of our Milky Way galaxy.

M35 is a comparatively young cluster, 150 million years old and lies around 2800 ly away, and has between 400 and 500 members.

The smaller denser looking ngc2158 is much further away 12630ly, and much much older 3.2Billion years.

Imaged this November from Chippenham. Nikon D810A, 30seconds, 640iso.

Andy Burns



Wiltshire Society Page

Wiltshire Astronomical Society

Web site: www.wasnet.org.uk

Meetings 2015/2016Season.

NEW VENUE the Pavilion, Rusty Lane, Seend

Meet 7.30 for 8.00pm start

2015

Dec 1st *Neptune - A Calculated Guess* : Andrew Lound
2016

Jan 5th *Rosetta - An Update* : Dr Andrew Morse

Feb 2nd *10 Years at the Helm of the European Space Science*: Professor David Southwood

Mar1st *Life on Mars* : Professor Mark Sims

Apr 5th *The Story of Star Names* : Mark Hurn

May 3rd *Oddities of the Solar System* : Bob Mizon

June 7th *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)

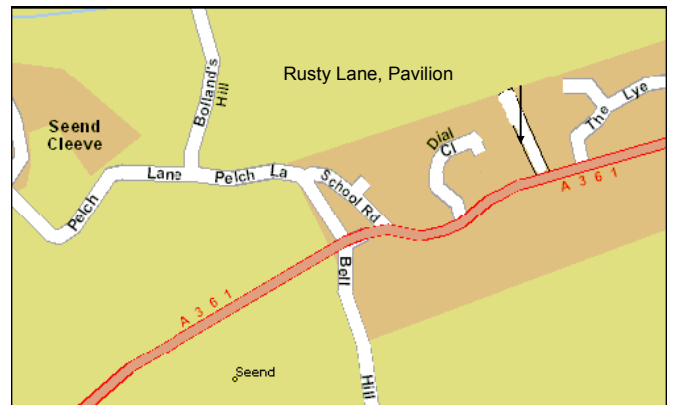
Philip Proven (Hall coordinator)

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

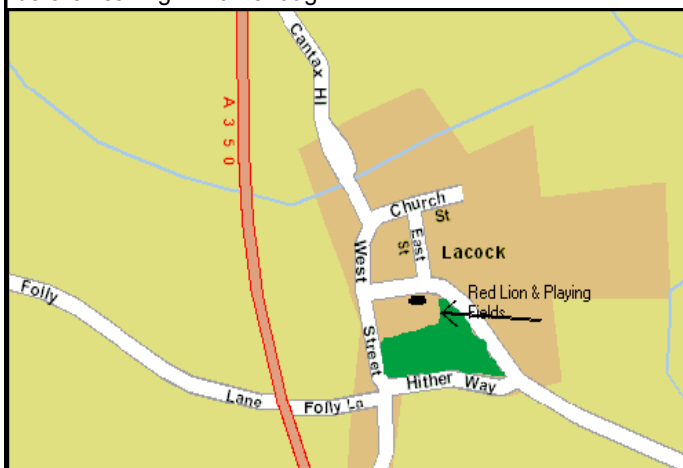
The Wiltshire Astronomical Society's observing sessions are open, and we welcome visitors from other societies as well as members of the public to join us.

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



Andrew Lound. has been presenting public lectures and staging exhibitions for over 30 years and has participated in over 2,300 events.

He regularly tours the UK with his Odyssey Class Dramatic Lectures and is invited back time and again due to popular demand. He has also worked in USA and in 2005 became the first western science speaker to tour Libya following the removal of sanc-

tions.

He can be heard regularly on BBC radio WM where he is known as "The Urban Space man" or "WM's Titanic Expert..." His current projects include working with the California Institute of Technology JPL on promoting the Cassini Mission to Saturn and The Antoniadi Project – a space-probe to the Hellas Region on Mars. He is also developing new computer techniques for use in public lectures. Andrew is a man of many interests who specializes in space science and astronomy from both a current and historical perspective. Another main area of interest for Andrew is the Titanic. After many years of dedicated research he is now recognized as one of the worlds leading authorities on the subject.



Swindon Stargazers

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.

Weather Forecasting For Astronomy

Our speaker for November was Trevor Pitt who gave a very interesting talk on weather forecasting in astronomy, the talk included various ways of predicting the weather by reading the clouds etc.

Our next meeting will be our Christmas meal at a local hostelry called The Village Inn at Liddington, we are, of course, very much looking forward to this.

Ad-hoc viewing sessions near Uffcott

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 Dec 2015

Christmas Social.

Meetings for 2016

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

Friday 15 Jan 2016

Programme: Philip Perkins: Astrophotography

Friday 19 Feb 2016

Programme: Andy Burns: A presentation on John Herschel

Friday 18 Mar 2016

Programme: AGM plus a presentation

Friday 15 Apr 2016

Programme: Mark Radice: Observing the Moon

Friday 20 May 2016

Programme: Owen Brazell: Shrouds of Night - Observing Dark Nebulae

Friday 17 Jun 2016

Programme: James Fradgely: How (on Earth) Did Life Start

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.

Date	Title	Speaker
20 th November	<i>The Magic of Starlight</i>	Dick Cardy
4 th December	Social Evening	
15 th January	<i>Planetary Nebulae</i>	Martin Griffiths
19 th February	<i>Science of the Solar</i>	Steve Hill
18 th March	<i>Ten ways the Universe</i>	Stephen Tonkin
15 th April	<i>Seven Moons</i>	Bob Mizon
20 th May	<i>Tales from the Dark</i>	Mike Witt
17 th June	Annual General Meeting <i>Member Talks</i>	

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>

SOFTWARE AND APPS

Here is my first foray into this for some time. Where possible I choosing readily available and free software for PCs Macs or Apps for phones.

This first list is for YOU to check and report if it is the software you want me to review, otherwise I will run with my own software choice.

Firstly how do find what is up in the sky at any particuly day/ night/time.

There are many sorts of app for the phone (Android or iPhone)

Google Sky Map

Planets

Starmap

Astronomist

Sky Safari Pro (it does have a free version and runs on Macs and iPhones plus Android... not PCs yet.)

How Aurora warnings: Aurora Watch alert works very well this year and gives audible warnings.

Satellite prediction

ProSat

SatelliteAR

ISS Detector

There is even an excellent weather predictor for viewing

Clear Outside for Android showed Fridays viewing window from days in advance.

For Deep Sky Objects, DS Browsers tells you what is up.

And the Moon, Moon HD is OK but for the sky I much prefer the bigger screen versions for the PCs and Macs.

Sky Charts:

Cartes du Ciel

Stellarium both free

Sky Safari Pro

Or the Sky are the expensiveoptions but give you so much more information.

The Moon on PCs and MACs there is one standout programme and it is free. Virtual Moon Atlas.

There are others I know, but these keep me informed and allow viewing session planning. Next month some image processing software.

Andy



Our Solar System Is Almost Normal, But Not Quite

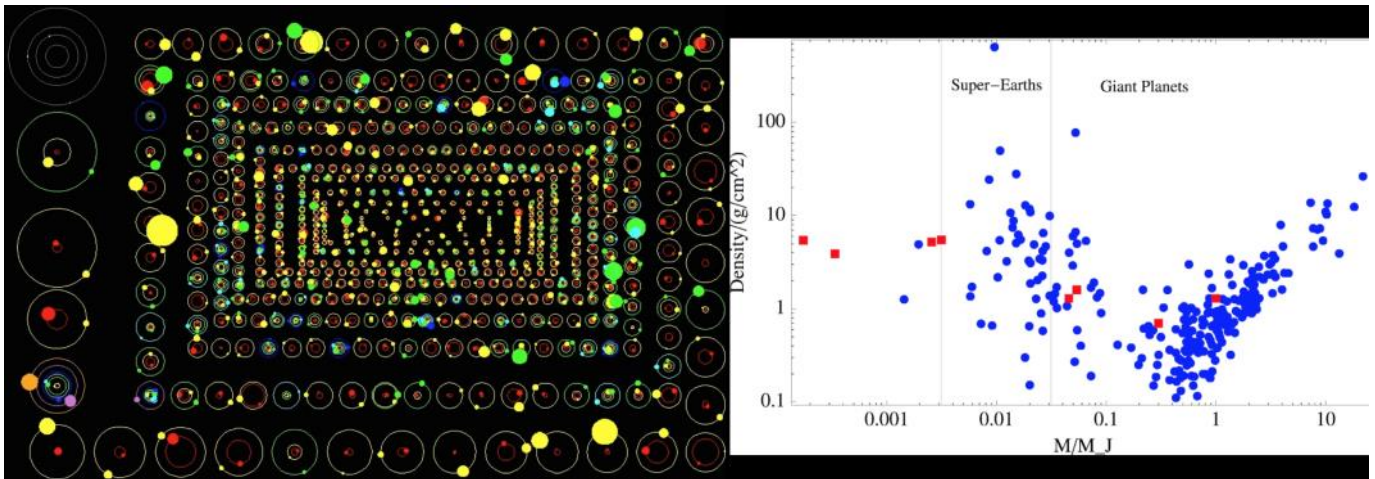
by Ethan Siegel

It was just over 20 years ago that the very first exoplanet was found and confirmed to be orbiting a star not so different from our own sun. Fast forward to the present day, and the stellar wobble method, wherein the gravitational tug of a planet perturbs a star's motion, has been surpassed in success by the transit method, wherein a planet transits across the disk of its parent star, blocking a portion of its light in a periodic fashion. Thanks to these methods and NASA's Kepler spacecraft, we've identified many thousands of candidate planets, with nearly 2,000 of them having been confirmed, and their masses and densities measured.

- All eight of our solar system's planets' orbits are highly circular, with even the eccentric Mars and Mercury only having a few percent deviation from a perfect circle. But most exoplanets have significant eccentricities, which could indicate something unusual about us.

- And finally, one of the most common classes of exoplanet—a super-Earth or mini-Neptune, with 1.5-to-10 times the mass of Earth—is completely missing from our solar system.

Until we develop the technology to probe for lower-mass planets at even greater distances around other star systems, we won't truly know for certain how unusual we really are!



The gas giants found in our solar system actually turn out to be remarkably typical: Jupiter-mass planets are very common, with less-massive and more-massive giants both extremely common. Saturn—the least dense world in our solar system—is actually of a fairly typical density for a gas giant world. It turns out that there are many planets out there with Saturn's density or less. The rocky worlds are a little harder to quantify, because our methods and missions are much better at finding higher-mass planets than low-mass ones. Nevertheless, the lowest mass planets found are comparable to Earth and Venus, and range from just as dense to slightly less dense. We also find that we fall right into the middle of the "bell curve" for how old planetary systems are: we're definitely typical in that regard.

Images credit: NASA / Kepler Dan Fabricky (L), of a selection of the known Kepler exoplanets; Rebecca G. Martin and Mario Livio (2015) ApJ 810, 105 (R), of 287 confirmed exoplanets relative to our eight solar system planets.

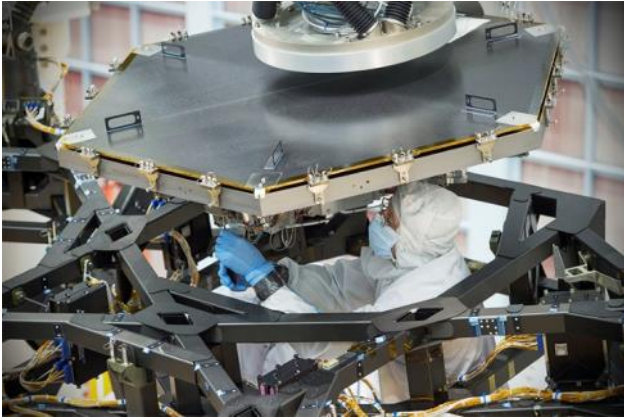
But there are a few big surprises, which is to say there are three major ways our solar system is an outlier among the planets we've observed:

- All our solar system's planets are significantly farther out than the average distance for exoplanets around their stars. More than half of the planets we've discovered are closer to their star than Mercury is to ours, which might be a selection effect (closer planets are easier to find), but it might indicate a way our star is unusual: being devoid of very close-in planets.

SPACE NEWS

NASA installs the first mirror on the Hubble's replacement

by Andrew Tarantola | @terrortola | November 25th 2015 at 12:35pm November 25th 2015 12:35 pm



NASA announced on Wednesday that it had successfully installed the first of 18 mirrors on the new James Webb space telescope. The work took place at NASA's Goddard Space Flight Center in Greenbelt, Maryland earlier this week.



These 4-foot wide hexagonal mirrors will unfold once the telescope reaches orbit and operate like a single 21-foot wide

reflector. Each mirror is comprised of super-lightweight beryllium (though they still tip the scales at 88 pounds apiece). Plus, they will have to withstand negative 400 degree temperatures while shifting less than 38 nanometers over the life of the telescope, otherwise they might throw the delicate optics out of phase.

"After a tremendous amount of work by an incredibly dedicated team across the country, it is very exciting to start the primary mirror segment installation process" Lee Feinberg, James Webb Space Telescope optical telescope element manager at Goddard, said in a statement. "This starts the final assembly phase of the telescope." The Goddard team expects to have the rest of the mirrors installed by the end of next year.

[Image Credit: NASA / Chris Gunn]

Philae Detected Organic Molecules On Comet

November 18, 2014 | by Lisa Winter

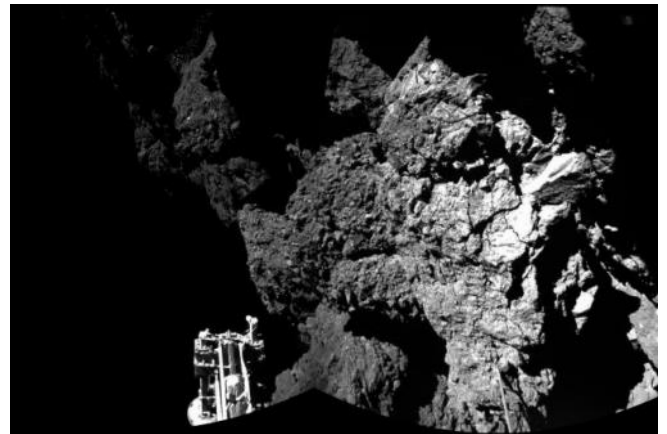


Photo credit: Credit: ESA/Rosetta/Philae/CIVA

Though the Philae lander was short-lived on the surface of Comet 67P/Churyumov-Gerasimenko, it was able to return scientific data back to Earth from the first samples ever obtained directly from a comet's nucleus. During its successful 60-hour-long primary science mission last week, Philae made a very important discovery: the comet contains organic molecules.

Not much has been released about the molecules so far, with the *Wall Street Journal* breaking the news on Monday. The molecules are carbon-based, but no word has been given on what other elements are present, or how complex they may be. Complex organic compounds, like amino acids, are the building blocks to life.

Philae's mission was to determine which, if any, organic compounds existed on comets. This knowledge will allow scientists to determine if comets brought the necessary ingredients for life to early Earth. The conditions on the young Earth were not favorable for making those compounds, and it is most likely that they came from an outside source.

The discovery of the molecules was made with Philae's Cometary Sampling and Composition Experiment (COSAC) instrument. This device analyzes compounds present in the comet's thin atmosphere, seeking out organic and volatile compounds.

As of right now, it is hard to tell when additional information will be provided about the nature of these molecules, and what implications they may have.

The Lost Lunar Crash Site From The Apollo 16 Mission Has Been Found

November 30, 2015 | by Tom Hale



Photo credit: NASA/GSFC/Arizona State University

As part of the Apollo 16 mission in 1972, the rocket's Saturn V third booster SIVB was intentionally crashed into the surface of the Moon after it had propelled the crew into lunar orbit. Somewhere along its descent, NASA scientists lost track of it and its location has remained a mystery ever since.

The 17.7-meter (58-foot) SIVB booster contained liquid hydrogen, liquid oxygen tanks and a J2 engine. While smashing it into the Moon might sound like reckless space littering, the crash was intended to measure seismic activity in the hope of learning more about its surface.

Forty-three years later, the crash site has finally been found by Jeff Plescia, a physicist and geologist from Johns Hopkins University, Baltimore. He found the lunar scar through high-resolution images from the NASA Lunar Reconnaissance Orbiter.

"I did finally find the Apollo 16 SIVB crater," Plescia told *Inside Outer Space*. "It looks like the others, but its position was much more poorly defined since the tracking was lost prior to impact."

Interestingly, this wasn't the only artifact left behind on the Moon by the Apollo 16 mission. Along with other equipment used during the mission, astronaut Charles Duke also left a family photograph of him, his sons and his wife. On the back of the portrait, he wrote, "This is the family of astronaut Charlie Duke from planet Earth who landed on the moon on April 20, 1972."

Star Clusters Combine And May Collapse

November 26, 2015 | by Stephen Luntz

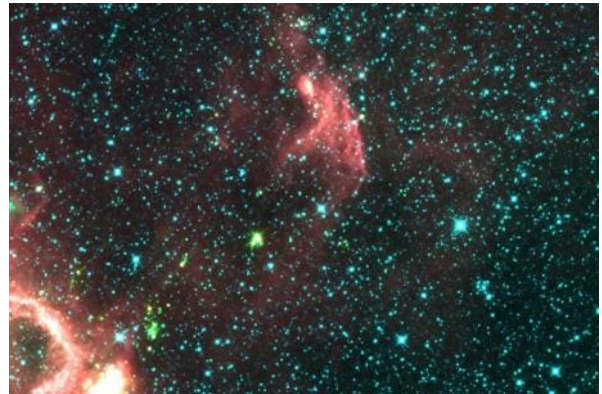


Photo credit: An aggregated cluster, with numerous individual clusters dotted across the bottom left of the image. Credit Camargo et al, MNRAS

A study of more than 1,000 newly discovered star clusters has revealed that these stellar villages have a more complex and diverse process of formation than previously recognized. The findings could change the way we think about our Sun's relationship to the stars with which it was born.

Considering how much time amateur astronomers spend entranced by the beauty of "embedded clusters" (groups of stars surrounded by interstellar gas and dust) it is surprising how little we know about them. While the globular clusters that surround the Milky Way have been the subject of extensive study, clusters that lie within the galaxy itself remain more of a mystery, partly because dust lanes block so many from our view. Yet embedded clusters are thought to be where almost all stars are born; understanding them is essential to knowing where we come from.

Professor Denilso Camargo of Brazil's Colegio Militar de Porto Alegre, has been conducting a search for undiscovered clusters using visual inspection of the images collected with the Wide-field Infrared Survey Explorer. His first 437 revealed that the galaxy probably has four arms, not two as has been proposed. Camargo also identified two clusters whose locations and behavior differ dramatically from any seen before.

Camargo has now more than doubled the number of clusters that bear his name, with a paper to be published in *Monthly Notices of the Royal Astronomical Society* (preprint available on arXiv.org) detailing the clusters named Camargo 447 to Camargo 1098.

These clusters, mostly made up of just 10-20 stars support the previous claims for a four armed galaxy. More significantly, much has been learned in the process about how embedded clusters evolve.

Regions such as the Orion Nebula are giving birth to stars before our eyes. The Trapezium Cluster at the nebula's heart consists of very young stars with halos of the gas from which they form. Embedded clusters that survive intact until all their gas has turned to stars are known as open clusters. Since stars in clusters like this usually have the same age and formed from chemically similar material, they have been thought to have a fairly simple history, being born in the same nursery before eventually drifting apart.

However, Camargo proposes instead that some clusters are "aggregates" that come from two or more clusters merging. After studying a representative sample of his clusters in detail

he and his coauthors found several examples where clusters appear to be made from stars with slightly different origins, indicating a merger. Others, Camargo told IFLScience, “present signs of ongoing merge events.”

The paper suggests this process may explain why some clusters have previously been found to have a surprisingly wide spread of ages among their stars.

“We find evidence that star formation processes span a wide range of sizes,” Camargo told IFLScience, “From populous dense clusters to small compact embedded ones, sparse stellar groups or in relative isolation.”

The authors propose that many clusters undergo what they call “collect and collapse events” where supernovae explosions, or the powerful stellar winds from very large stars, drive stars apart until the cohesiveness of the cluster is lost.

Planet Earth: Facts About Its Orbit, Atmosphere & Size

by Charles Q. Choi, Space.com Contributor | December 11, 2014 10:49pm ET



Credit: NASA

Earth, our home, is the third planet from the sun. It is the only planet known to have an atmosphere containing free oxygen, oceans of liquid water on its surface, and, of course, life.

Earth is the fifth largest of the planets in the solar system — smaller than the four gas giants, Jupiter, Saturn, Uranus and Neptune, but larger than the three other rocky planets, Mercury, Mars and Venus.

Earth has a diameter of roughly 8,000 miles (13,000 kilometers), and is round because gravity pulls matter into a ball, although it is not perfectly round, instead being more of an “oblate spheroid” whose spin causes it to be squashed at its poles and swollen at the equator.

Roughly 71 percent of Earth’s surface is covered by water, most of it in the oceans. About a fifth of Earth’s atmosphere is made up of oxygen, produced by plants. While scientists have been studying our planet for centuries, much has been learned in recent decades by studying pictures of Earth from space.

Orbital characteristics

Earth spins on an imaginary line called an axis that runs from the North Pole to the South Pole, while also orbiting the sun. It takes Earth 23.439 hours to complete a rotation on its axis, and roughly 365.26 days to complete an orbit around the sun.

Earth’s axis of rotation is tilted in relation to the ecliptic plane, an imaginary surface through Earth’s orbit around the sun. This means the northern and southern hemispheres will sometimes point toward or away from the sun depending on the time of year, varying the amount of light they receive and causing the seasons.

Earth’s orbit is not a perfect circle, but is rather an oval-shaped ellipse, like that of the orbits of all the other planets. Earth is a bit closer to the sun in early January and farther away in July, although this variation has a much smaller effect than the heating and cooling caused by the tilt of Earth’s axis. Earth happens to lie within the so-called “Goldilocks zone” around its star, where temperatures are just right to maintain liquid water on its surface.

Orbit & rotation

Some statistics about Earth, according to NASA:

- Average distance from the sun: 92,956,050 miles (149,598,262 km)
- Perihelion (closest approach to the sun): 91,402,640 miles (147,098,291 km)
- Aphelion (farthest distance from the sun): 94,509,460 miles (152,098,233 km)
- Length of solar day (single rotation on its axis): 23.934 hours
- Length of year (single revolution around the sun): 365.26 days
- Equatorial inclination to orbit: 23.4393 degrees

Earth’s formation and evolution

Scientists think Earth was formed at roughly the same time as the sun and other planets some 4.6 billion years ago, when the solar system coalesced from a giant, rotating cloud of gas and dust known as the solar nebula. As the nebula collapsed because of its gravity, it spun faster and flattened into a disk. Most of the material was pulled toward the center to form the sun.

Other particles within the disk collided and stuck together to form ever-larger bodies, including Earth. The solar wind from the sun was so powerful that it swept away most of the lighter elements, such as hydrogen and helium, from the innermost worlds, rendering Earth and its siblings into small, rocky planets.

Scientists think Earth started off as a waterless mass of rock. Radioactive materials in the rock and increasing pressure deep within the Earth generated enough heat to melt Earth’s interior, causing some chemicals to rise to the surface and form water, while others became the gases of the atmosphere. Recent evidence suggests that Earth’s crust and oceans may have formed within about 200 million years after the planet had taken shape.

The history of Earth is divided into four eons — starting with the earliest, these are the Hadean, Archean, Proterozoic and Phanerozoic. The first three eons, which together lasted nearly 4 billion years, are together known as the Precambrian. Evidence for life has been found in the Archean about 3.8 billion years ago, but life did not become abundant until the Phanerozoic.

The Phanerozoic is divided into three eras — starting with the earliest, these are the Paleozoic, Mesozoic, and Cenozoic. The Paleozoic Era saw the development of many kinds of animals and plants in the seas and on land, the Mesozoic Era was the age of dinosaurs, and the Cenozoic Era we are in currently is the age of mammals.

Most of the fossils seen in Paleozoic rocks are invertebrate animals lacking backbones, such as corals, mollusks and trilobites. Fish are first found about 450 million years ago, while amphibians appear roughly 380 million years ago. By

300 million years ago, large forests and swamps covered the land, and the earliest fossils of reptiles appear during this period as well.

The Mesozoic saw the ascendance of dinosaurs, although mammals also appear in the fossil record about 200 million years ago. During this time, flowering plants became the dominant plant group and continue to be so today.

The Cenozoic began about 65 million years ago with the end of the age of dinosaurs, which many scientists think was caused by a cosmic impact. Mammals survived to become the dominant land animals of today.

Composition & structure

Atmosphere

Earth's atmosphere is roughly 78 percent nitrogen, 21 percent oxygen, with trace amounts of water, argon, carbon dioxide and other gases. Nowhere else in the solar system can one find an atmosphere loaded with free oxygen, which ultimately proved vital to one of the other unique features of Earth — us.

Air surrounds Earth and becomes thinner farther from the surface. Roughly 100 miles (160 km) above Earth, the air is so thin that satellites can zip through with little resistance. Still, traces of atmosphere can be found as high as 370 miles (600 km) above the surface.

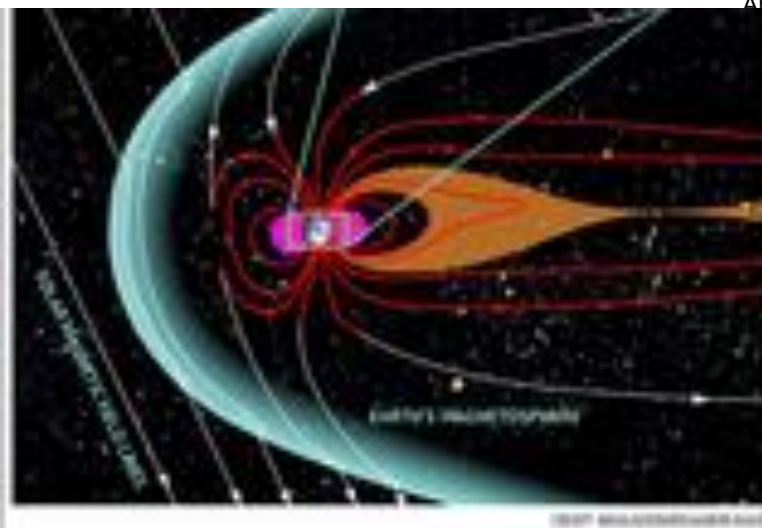
The lowest layer of the atmosphere is known as the troposphere, which is constantly in motion, causing the weather. Sunlight heats the planet's surface, causing warm air to rise. This air ultimately expands and cools as air pressure decreases, and because this cool air is denser than its surroundings, it then sinks, only to get warmed by the Earth once again.

Above the troposphere, some 30 miles (48 km) above the Earth's surface, is the stratosphere. The still air of the stratosphere contains the ozone layer, which was created when ultraviolet light caused trios of oxygen atoms to bind together into ozone molecules. Ozone prevents most of the sun's harmful ultraviolet radiation from reaching Earth's surface.

Water vapor, carbon dioxide and other gases in the atmosphere trap heat from the sun, warming Earth. Without this so-called "greenhouse effect," Earth would probably be too cold for life to exist, although a runaway greenhouse effect led to the hellish conditions now seen on Venus.

Earth-orbiting satellites have shown that the upper atmosphere actually expands during the day and contracts at night due to heating and cooling.

Magnetic field



The northern lights are more formally known as auroras, and are caused by interactions between the solar wind and the Earth's magnetic field. See how the northern lights work in this Space.com infographic.

Credit: Karl Tate, SPACE.com Contributor

[View full size image](#)

Earth's magnetic field is generated by currents flowing in Earth's outer core. The magnetic poles are always on the move, with the magnetic North Pole recently accelerating its northward motion to 24 miles (40 km) annually, likely exiting North America and reaching Siberia in a few decades.

Earth's magnetic field is changing in other ways, too — globally, the magnetic field has weakened 10 percent since the 19th century, according to NASA. These changes are mild compared to what Earth's magnetic field has done in the past — sometimes the field completely flips, with the north and the south poles swapping places.

When charged particles from the sun get trapped in Earth's magnetic field, they smash into air molecules above the magnetic poles, causing them to glow, a phenomenon known as the aurorae, the northern and southern lights.

Chemical composition

Oxygen is the most abundant element in rocks in Earth's crust, composing roughly 47 percent of the weight of all rock. The second most abundant element is silicon at 27 percent, followed by aluminum at 8 percent, iron at 5 percent, calcium at 4 percent, and sodium, potassium, and magnesium at about 2 percent each.

Earth's core consists mostly of iron and nickel and potentially smaller amounts of lighter elements such as sulfur and oxygen. The mantle is made of iron and magnesium-rich silicate rocks. (The combination of silicon and oxygen is known as silica, and minerals that contain silica are known as silicate minerals.)

Internal structure

Earth's core is about 4,400 miles (7,100 km) wide, slightly larger than half the Earth's diameter and roughly the size of Mars. The outermost 1,400 miles (2,250 km) of the core are liquid, while the inner core — about four-fifths as big as Earth's moon at some 1,600 miles (2,600 km) in diameter — is solid.

Above the core is Earth's mantle, which is about 1,800 miles (2,900 km) thick. The mantle is not completely stiff, and can flow slowly. Earth's crust floats on the mantle much like wood floats on water, and the slow motion of rock in the mantle shuffles continents around and causes earthquakes, volcanoes, and the formation of mountain ranges. Above the mantle, Earth has two kinds of crust. The dry land of the continents consists mostly of granite and other silicate minerals, while the ocean floors are made up mostly of a dark, dense volcanic rock called basalt. Continental crust averages some 25 miles (40 km) thick, although it can be thinner or thicker in some areas. Oceanic crust is usually only about 5 miles (8 km) thick. Water fills low areas of the basalt crust to form the world's oceans. Earth has more than enough water to completely fill the ocean basins, and the rest of it spreads onto the edges of the continents, areas known as the continental shelf.

Temperature gets warmer toward its core. At the bottom of the continental crust, temperatures reach about 1,800 degrees Fahrenheit (1,000 degrees Celsius), increasing about 3 degrees Fahrenheit per mile (1 degree Celsius per kilometer) below the crust. Geologists think the temperature of Earth's outer core is about 6,700 to 7,800 degrees Fahrenheit (3,700 to 4,300 degrees Celsius), and the inner core may reach 12,600 degrees Fahrenheit (7,000 degrees Celsius),

hotter than the surface of the sun. Only the enormous pressures found at the super-hot inner core keep it solid. Recent exoplanet surveys such as NASA's Kepler mission suggest that Earth-size planets are common throughout the Milky Way galaxy. Nearly a fourth of sun-like stars observed by Kepler have potentially habitable Earth-size planets.

Earth's moon

Earth's moon is 2,159 miles (3,474 km) wide, about one-fourth of Earth's diameter. Earth has one moon, while Mercury and Venus have none and all the other planets in our solar system have two or more.

The leading explanation for how the moon formed was that a giant impact knocked off the raw ingredients for the moon off the primitive molten Earth and into orbit. Scientists have suggested the impactor was roughly 10 percent the mass of Earth, about the size of Mars.

Species overview

Earth is the only planet in the universe known to possess life. There are several million known species of life, ranging from the bottom of the deepest ocean to a few miles into the atmosphere, and scientists think far more remain to be discovered. Scientists figure there are between 5 million and 100 million species on Earth, but science has only identified about 2 million of them.

Earth is the only body in the solar system known to host life, although scientists suspect that other candidates — such as Saturn's moon Titan or Jupiter's moon Europa — have the potential to house primitive living creatures. Scientists have yet to precisely nail down exactly how complex life rapidly evolved on Earth from more primitive ancestors. One solution suggests that life first evolved on the nearby planet Mars, once a habitable planet, then traveled to Earth on meteorites hurled from the Red Planet.

Additional reporting by Nola Taylor Redd, Space.com Contributor

Moon Phase Mysteries: Some Common Questions Answered

by Joe Rao, SPACE.com Skywatching Columnist | March 04, 2013 04:04pm ET



Astronaut Chris Hadfield snapped this photo of a full moon on Jan. 30 from the International Space Station. "Full Moon rising. So near, and yet..." he wrote. Credit: Chris Hadfield/@Cmdr_Hadfield

The moon has intrigued humanity since we first craned our necks toward the heavens, but many people still have questions about why Earth's nearest neighbor appears as it does in the sky.

The moon's ceaseless celestial dance is indeed a complex one, taking it from dark and "new" to bright and full, then back again, over and over.

Here are answers to a few interesting questions that frequently come up regarding the phases of the moon:

How long does a full moon last?

Probably not as long as you think.

The actual moment of full moon — that time when the moon is opposite to the sun in the sky — can be found in any almanac, and in many newspapers (such as The New York Times). [Amazing 'Supermoon' Photos by Stargazers]

We can therefore say that the moon is officially "full" for only one minute! The full moon of March 27, for instance, occurs at 5:27 a.m. EDT (0927 GMT). In the very strictest sense, one minute before that time, the phase of the moon is a waxing gibbous; one minute after that time, it's a waning gibbous phase.

But is a full moon really "full"?

Surprisingly, the answer is "no." The disk of the moon can only appear 100 percent sunlit from Earth when it is diametrically opposite to the sun in the sky. But that's impossible, because at that moment the moon would be positioned in the middle of the Earth's shadow and in total eclipse!

In fact, in any month where there is no eclipse, there should be an ever-so-slight sliver of darkness visible somewhere on the lunar limb throughout those hours when the moon is passing through "full" phase.

Interestingly, people often refer to a "full" moon one, two or even three days before and/or after the actual full moon date. Yet close inspection will usually reveal that the moon is not fully illuminated at these times but is indeed gibbous, or slightly out of roundness.

Why is the half moon called a "quarter moon"?

The term "quarter moon" sounds a bit incongruous to be sure. But the "quarter" in question does not refer to the amount of the moon's disk that is illuminated by the sun, but rather to how far along the moon has progressed through its cycle of phases. [Top 10 Cool Moon Facts]

The cycle always begins at new moon. The amount of time that it takes to go from one new moon to the next — or the time it takes the moon to circle Earth once, using the sun as the reference point — is 29.53 days on average. This is called a "synodic" month, derived from the word synod, meaning "meeting" (for at new moon, the moon "meets" the sun).

If we were to divide that average period of 29.53 days into quarters, it would take 7.38 days to go from one quarter to the next.

So, using the new moon as the starting point, it would take 7.38 days to complete one quarter of the synodic cycle — the first quarter. At that point, the moon appears to shine roughly half by day and half by night. It rises about six hours later than the sun (one-quarter of a day), at around noon, and climbs the sky during the afternoon about half a sky (90 degrees, or one-quarter of a full circle) away from the sun. The moon reaches its highest point in the sky around sunset and shines for the first half of the night.

After another 7.38 days (or 14.76 days from new moon), the moon has gone through half a synodic month. Now the moon is opposite to the sun in the sky, with its entire disk illuminat-

ed. We could call this the "second quarter" moon, but we've opted for "full moon" instead.

Another 7.38 days after full moon (or 22.14 days from new moon) the moon appears half-illuminated once again, but now it precedes the arrival of the sun by about six hours, rising around midnight and setting around noon.

Some refer to this as the "third quarter" moon, which it indeed is. Most, however, call this the "last quarter," which, strictly speaking, it isn't. The term "last quarter" should really be reserved for when the moon has completed the final quarter of its synodic cycle. But since this moment also coincides with the beginning of a new synodic month (the next new moon), we have come to associate the moon's third quarter with last quarter.

Wrong date?

Sometimes I receive emails asking this question: "My newspaper says full moon will occur on the 8th but my calendar says that full moon falls on the 9th. Why is this so?"

Just about all calendar manufacturers and newspapers base the dates of the lunar phases on the calculations of the U.S. Naval Observatory. Accurate moon phase data is, in fact, available from the Naval Observatory's Astronomical Applications Department here, which covers the years 1700 to 2035.

There is one thing, however, that some manufacturers and newspapers overlook. All the dates and times provided by the Naval Observatory are given in Universal Time (UT), which is sometimes referred to, now colloquially, as Greenwich Mean Time (GMT).

UT and GMT are often used loosely to refer to time kept on the Greenwich meridian (longitude zero). As a result, if the times are not converted to your local time zone, you can sometimes end up being one day off on the date of a particular phase.

A good example of this will come up in August 2013. The Naval Observatory says full moon will occur that month on Aug. 21 at 0145 UT. But for those of us in North America, the moon will actually reach its full phase on Aug. 20 — in the case of Boston, for example, at 9:45 p.m. local time, since UT runs four hours ahead of Eastern Daylight Time.

Joe Rao serves as an instructor and guest lecturer at New York's Hayden Planetarium. He writes about astronomy for The New York Times and other publications, and he is also an on-camera meteorologist for News 12 Westchester, New York. This article was first published on SPACE.com.

Mystery DOME found on Mars: Alien hunters say structure was built by an ancient civilisation on the red planet

(Note: This article is from the Daily Mail and shows the unfettered rubbish to defend with proper science, like scales and sizes).

- **The 'dome' was captured in an image taken by the Opportunity Rover**
- **'It proves that someone built them in the past,' wrote a conspiracy site,**
- **Follows a similar 'discovery' earlier this year in which conspiracy theorists believe they saw a replica of one of Egypt's Great Pyramids on Mars**

By Ellie Zolfagharifard For Dailymail.com

There's a set of UFO hunters who are convinced that Nasa is covering up the remains of an ancient civilisation on Mars.

In the hope of backing up their bizarre theory, they've spotted what they believe to be everything from military bunkers to coffins on the red planet.

Their latest 'sighting' of a rock by the Opportunity rover described as a 'man-made dome' that they say was left behind by an alien race sometime during Mars' watery past.

Scroll down for video



UFO hunters' latest 'sighting' of a rock is described as a 'man-made dome' that they say was left behind by an alien race sometime during Mars' watery past. The image was taken by Nasa's Opportunity rover

They claim a glow or light in the middle of the dome is evidence that it may be metallic and reflecting sunlight.

'The existence of domes on Mars proves that someone or something built them in the past,' wrote conspiracy website, the Unsilent Majority.

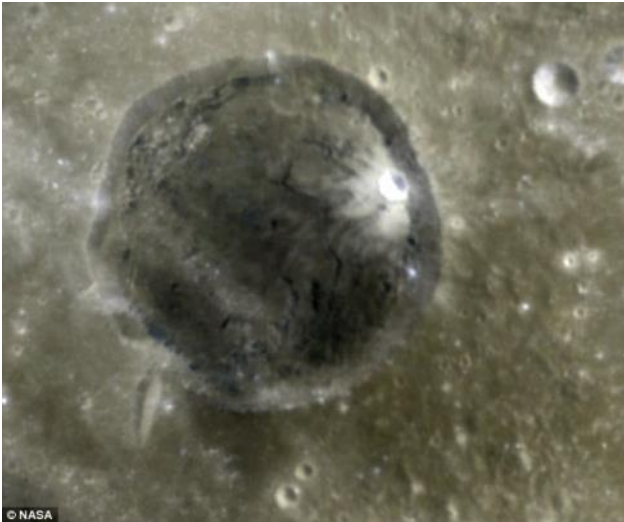
'Is it possible that we are looking at some sort of building left behind by ancient inhabitants on Mars?'

'What if we are looking at the ultimate evidence that proves the red planet was in fact inhabited in the distant past by beings that developed across the red planet just as humans developed across Earth?'

'While it could be some sort of natural rock formation, that would need to be extremely strange, we cannot dismiss the fact that we could be looking at the remains of an alien structure on Mars.'



'The existence of domes on Mars proves that someone or something built them in the past,' wrote conspiracy website, the Unsilent Majority. 'Is it possible that we are looking at some sort of building left behind by ancient inhabitants on Mars?' Pictured is the dome at a distance



While this seems to be the first dome found on Mars, other have been found on the surface of the moon (pictured). These are largely thought to be the result of ancient eruptions that formed flat and wide volcanoes



A glow or light in the middle of the dome suggests it may be metallic and reflecting sunlight, some have said

The site says there may also be a third option to explain the dome's presence.

They say that Nasa has developed a secret space program and flotilla that operates in space.

While this seems to be the first dome found on Mars, other have been found on the surface of the moon.

These are largely thought to be the result of ancient eruptions that formed flat and wide volcanoes.

The latest sighting follows a similar 'discovery' earlier this year in which conspiracy theorists believe they saw a replica of one of Egypt's Great Pyramids on Mars.

Citing the 'near-perfect design and shape', they argued the 'pyramid' is evidence that an ancient civilisation once lived on the red planet.

While the pyramid is believed to be 'car-sized', alien-hunters say it may be just the tip of a much larger structure buried beneath.

YouTube channel, **ParanormalCrucible**, used video footage taken by Nasa's Curiosity Rover on May 7 to back up its claims.

'None of the Curiosity Rover's subsequent photos taken at 20 to 30 sec intervals in the following few minutes and the subsequent photos hours later, included the object,' wrote UFO site **Exopolitics**.

'It appears that the Nasa operators of Curiosity deliberately chose not to take another photo or zoom in on the pyramid.'

'If they however did so, none of these subsequent photos were released to the general public.'

ParanormalCrucible goes further, claiming the 'near perfect design and shape' means the pyramid is: 'the result of intelligent design and certainly not a trick of light and shadow'.



In another bizarre claim, conspiracy theorists say they have found a replica of one of Egypt's Great Pyramids on Mars. Citing the 'near-perfect design and shape', they say the pyramid could be evidence that an ancient civilisation once lived on the red planet



ParanormalCrucible says the 'near perfect design and shape' means the pyramid is: 'the result of intelligent design and certainly not a trick of light and shadow'. Commentators on the the channel, however, were not convinced, with some pointing to similar rock formations on Earth caused by wind. Commentators on the the channel, however, were not convinced, with some pointing to similar rock formations on Earth caused by wind.

But the story strikes a note with conspiracy theorists who believe that civilisations, including our own, have secretly visited Mars and established colonies there.

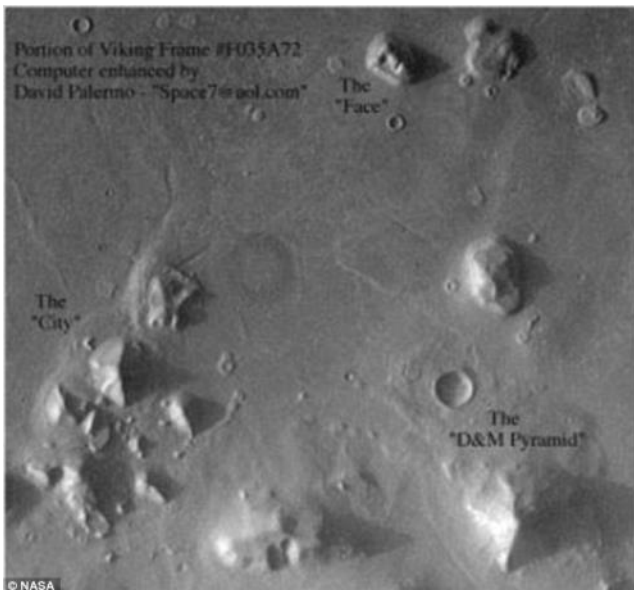
In November last year, a woman named 'Jackie' called into American radio station, Coast to Coast AM, with a 'confession' that she had witnessed suited men running on the red planet in 1979.

Jackie said she was working as part of a 'downstairs' team downloading telemetry from a Viking Lander when she saw the humans via live feed.

'I wonder if you could solve a 27-year-old mystery for me,' she asked the presenter. 'That old Viking rover was running around.'

'Then I saw two men in space suits - not the bulky suits we normally used, but they looked protective. They came over the horizon walking to the Viking Explorer.'

MinimizeExpandClose



The story strikes a note with conspiracy theorists who believe that civilisations, including our own, have secretly visited Mars and established colonies there. Pictured is a wider shot showing 'pyramid'

MARTIAN CIVILISATION WAS WIPED OUT BY ALIENS, CLAIMS PHYSICIST

Last year, physicist Dr John Brandenburg said he believes an ancient civilisation on Mars was wiped out by a nuclear attack from another alien race.

Dr Brandenburg says ancient Martians known as Cydonians and Utopians were massacred in the attack - and evidence of the genocide can still be seen today.

Back in 2011 the scientist first postulated that the red colour on Mars could have been due to a naturally occurring thermonuclear explosion.

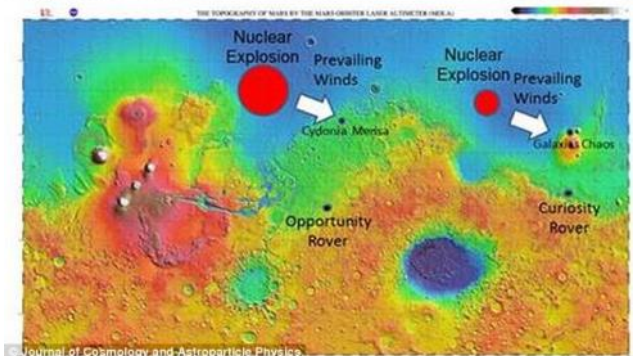
'The Martian surface is covered with a thin layer of radioactive substances including uranium, thorium and radioactive potassium - and this pattern radiates from a hot spot on Mars,' he told Fox News at the time.

'A nuclear explosion could have sent debris all around the planet.'

But since then he has advanced his theory to the level that he now no longer thinks it was a naturally occurring explosion - but rather one planned by an intelligent alien race.

According to **Vice**, the conclusion of his latest paper says that nuclear isotopes in the atmosphere resembling hydrogen bomb tests 'may present an example of civilisation wiped out by a nuclear attack from space.'

Approximate Locations of Centers of Nuclear Explosions



Earlier this week, physicist Dr John Brandenburg said he believes an ancient civilisation on Mars was wiped out by a nuclear attack from another alien race. He says there is evidence for two nuclear explosions on Mars (image from his paper shown)

Nasa did not corroborate the story, but this didn't stop conspiracy theorists from claiming it as evidence for a 'secret space programme.'

According to Jackie, six other Nasa workers saw the two humans walking on the red planet's surface.

Jackie's claim follows a similarly bizarre theory by physicist Dr John Brandenburg who believes an ancient civilisation on Mars was wiped out by a nuclear attack from another alien race.

Dr Brandenburg says ancient Martians known as Cydonians and Utopians were massacred in the attack - and evidence of the genocide can still be seen today.

He claims his theory could explain the Fermi Paradox - namely why, if the universe is abundant with life, we haven't heard anything from anyone else yet.

He warns, though, that we need to be fearful of an attack on our own planet, and should mount a manned mission to Mars to know what we're up against

E-mails'

Hi Andy,

For the last 2 or 3 months the street lights in our road have been turned off between mid-night and 5am. I was looking at the Wiltshire Council website and found maps of the affected areas. I thought other members might like to take a look at maps for their area, and perhaps write or email the council to congratulate them on this new initiative to save council tax-payer's money and reduce sky light-pollution.

<http://www.wiltshire.gov.uk/parkingtransportandstreets/roadshighwaysstreetcare/roadsandtraffic/streetlights.htm>
Dave.

Andy

I'm looking to sell my 9.25" OTA on a NEQ 6 as well as the Skypod.

Do you know of anyone that might be looking for such a set up?

Also have some other accessories too....

Simon

Observing logs and members images

Tony Vale:

Log November 2015

Just 35 variable star observations this month which is an improvement on last month. Among these was SS Cygni, (8.4 on 20th and again on the 22nd. - this is now the third month in a row I have been lucky enough to catch it in outburst) and RV Tauri (9.3 on the 20th and 9.2 on the 23rd). RV Tauri is a new addition to my list. It is the prototype of a class of pulsating variable stars of about the mass of the sun. The pulsations can be a bit chaotic and are not as yet well understood but the stars are believed to be in the post AGB stage of their evolution, with inactive cores, shell burning and extensive material loss taking place. This stage may only last a few thousand years before the core collapses to a white dwarf and the rest of the star explodes forming a planetary nebula.

On the evening of the 20th I also observed the 9 day old moon early in the evening. The terminator passed close to Copernicus and Clavius and both were spectacular. The Montes Carpatus, close to Copernicus, were well beyond the terminator but the rising sun was just catching the peaks of the mountains which made them appear to be hanging in space, detached from the rest of the moon. When I observed the moon again at the end of the session, the terminator had moved enough to illuminate them fully and the effect was gone.

Image of the Moon on the 20th taken by Andy Burns. Copernicus as in the 'empty' Oceanus Procularium, and Clavius the huge crater at the bottom of the terminator.





Some nice halos around the moon this month, here the skudding cloud really helps enhance the look. Nikon



S9900 compact camera. Here and below the full Moon



from last week. The Beaver moon (when Beavers were at their plumpest pre winter hibernation state.

The Moon from Sunday night.

There were sufficient nights clear in the month for me to image test the new mount that arrived 2nd November.

Some bad experiences of tracking problems turned out to be the auto selection by the Synscan system of lunar tracking and it staying on this even when you swapped object



data base to stellar/nebula listings. At magnifications a big problem. All taken from Chippenham.

Nikon D810A and exposures of 30 and 60 seconds.

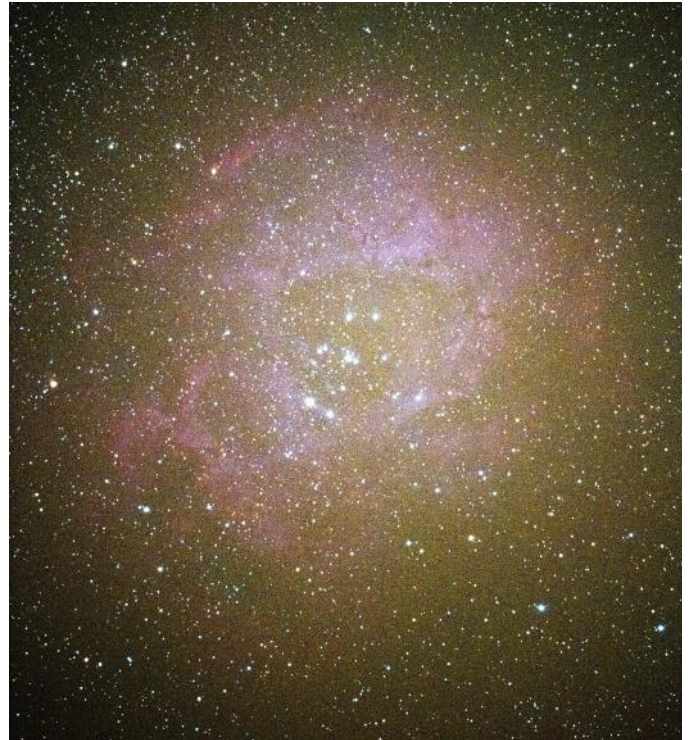
NGC 2024 the flame nebula and the horsehead just showing through.



M46 in Puppis with M47. Two open clusters around 5300ly away. M47 is much closer at 1700ly, but both are in the next spiral arm of our galaxy.



The other Messier object is the Messier 67, around 2600ly away. Studies of the stars in this cluster suggest that they have the same age and metallicity (element ratio) as our own star, the Sun.

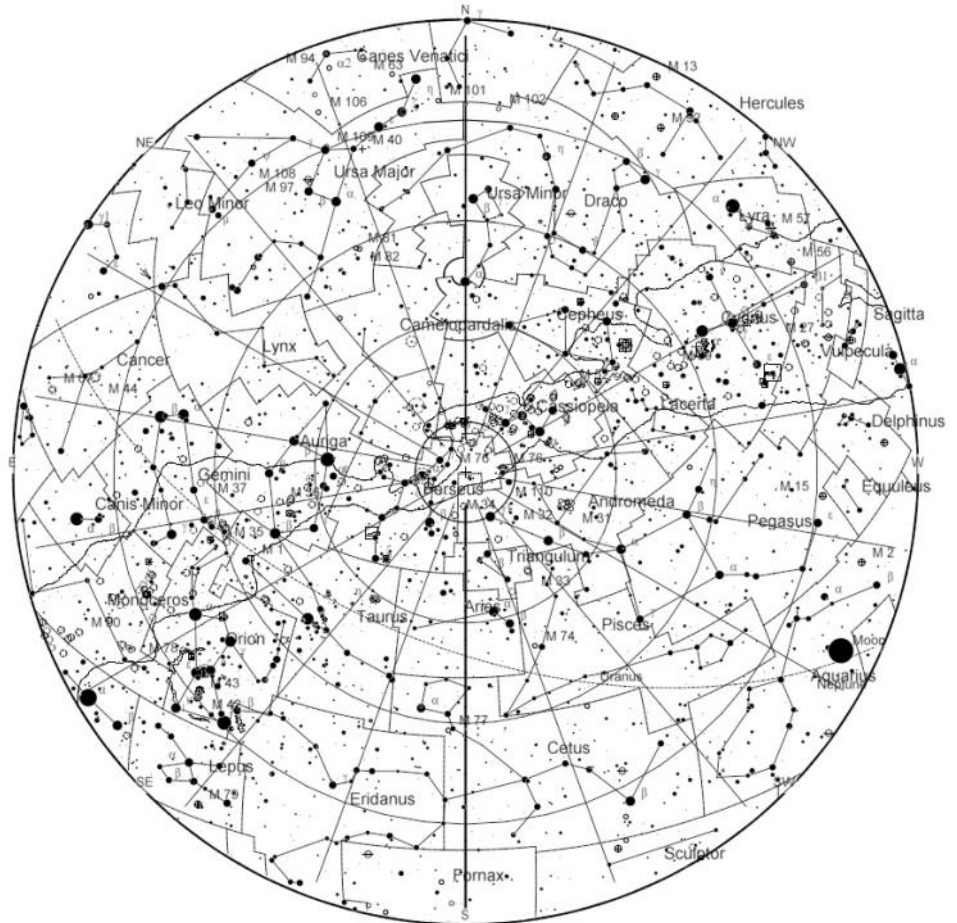
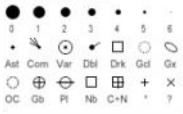


Into cancer now with the beehive open cluster M44. The hive is the pentagram structure on its side in the middle of the picture. Only 515ly away.



The rosette nebula and stars of ngc2244

All/Az coord. ARC
 Apparent
 Home
 2015-12-16
 21h00m00s (UTC)
 Mag 6.1
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December 7 - Conjunction of the Moon and Venus. A conjunction of the Moon and Venus will take place on the morning of December 7. The crescent moon will come within 2 degrees of bright planet Venus in the early morning sky. Look to the east just before sunrise.

December 11 - New Moon. The Moon will be located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 10:29 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.

December 13, 14 - Geminids Meteor Shower. The Geminids is the king of the meteor showers. It is considered by many to be the best shower in the heavens, producing up to 120 multicolored meteors per hour at its peak. It is produced by debris left behind by an asteroid known as 3200 Phaethon, which was discovered in 1982. The shower runs annually from December 7-17. It peaks this year on the night of the 13th and morning of the 14th. The crescent moon will set early in the evening leaving dark skies for what should be an excellent show. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Gemini, but can appear anywhere in the sky.

December 22 - December Solstice. The December solstice occurs at 04:48 UTC. The South Pole of the earth will be tilted toward the Sun, which will have reached its southernmost position in the sky and will be directly over the Tropic of Capricorn at 23.44 degrees south latitude. This is the first day of winter (winter solstice) in the Northern Hemisphere and the first day of summer (summer solstice) in the Southern Hemisphere.

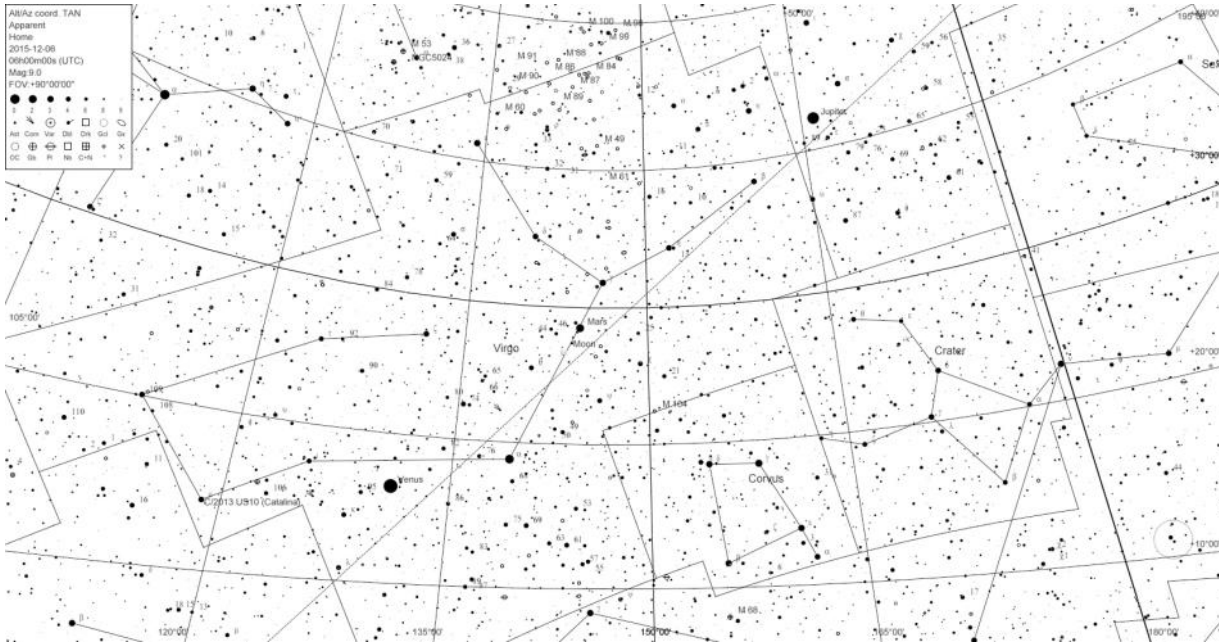
December 21, 22 - Ursids Meteor Shower. The Ursids is a minor meteor shower producing about 5-10 meteors per hour. It is produced by dust grains left behind by comet Tuttle, which was first discovered in 1790. The shower runs annually from December 17-25. It peaks this year on the night of the 21st and morning of the 22nd. This year the waxing gibbous moon will be bright enough to hide most of the fainter meteors. If you are patient, you might still be able to catch some of the brighter ones. Best viewing will be just after midnight from a dark location far away from city lights. Meteors will radiate from the constellation Ursa Minor, but can appear anywhere in the sky.

December 25 - Full Moon. The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This phase occurs at 11:11 UTC. This full moon was known by early Native American tribes as the Full Cold Moon because this is the time of year when the cold winter air settles in and the nights become long and dark. This moon has also been known as the Moon Before Yule and the Full Long Nights Moon.

December 29 - Mercury at Greatest Eastern Elongation. The planet Mercury reaches greatest eastern elongation of 19.7 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.

Clear Skies. Andy

The Morning Planetary Line-up Charts.



Phaethon. The asteroid takes about 1.4 years to orbit around the Sun.

The Geminids are considered to be one of the more spectacular meteor shower during a year, with the possibility of sighting around 120 meteors per hour at its peak.

Where to

6th December

2015 Geminids meteor shower

In 2015, the Geminids will peak between December 13 and 14. A waxing crescent Moon (Moon's phase after a New Moon) will create good conditions for viewing the shower.



A Geminid meteor in 2012.

The Geminids are one of two meteor showers that occur in December.

©iStockphoto.com

Northern Hemisphere observers should try their luck right after sunset, while those in the Southern Hemisphere should try to catch the shower after midnight.

The Geminids can be annually observed between December 4 and December 17, with its peak activity being around December 14. The shower owes its name to the constellation Gemini from where the meteors seem to emerge from in the sky.

Unlike most other meteor showers, the Geminids are associated not with a comet but with an asteroid - the 3200

view the Geminids

The Geminids can be observed from locations all around the world.

While it is not necessary to look in a particular direction to enjoy a meteor shower – just lie down on the ground and look directly above and you are bound to see some meteors – astronomers suggest looking towards the south to view the Geminids.

When to view the Geminids

The best time to view the Geminids between sunset, local time and before sunrise.

Location in the sky

The best date is around 13 Dec 2015, table below is for that date:

How to view the Geminids

There isn't a lot of skill involved in watching a meteor shower. Here are some tips on how to maximize your time looking for the Geminids:

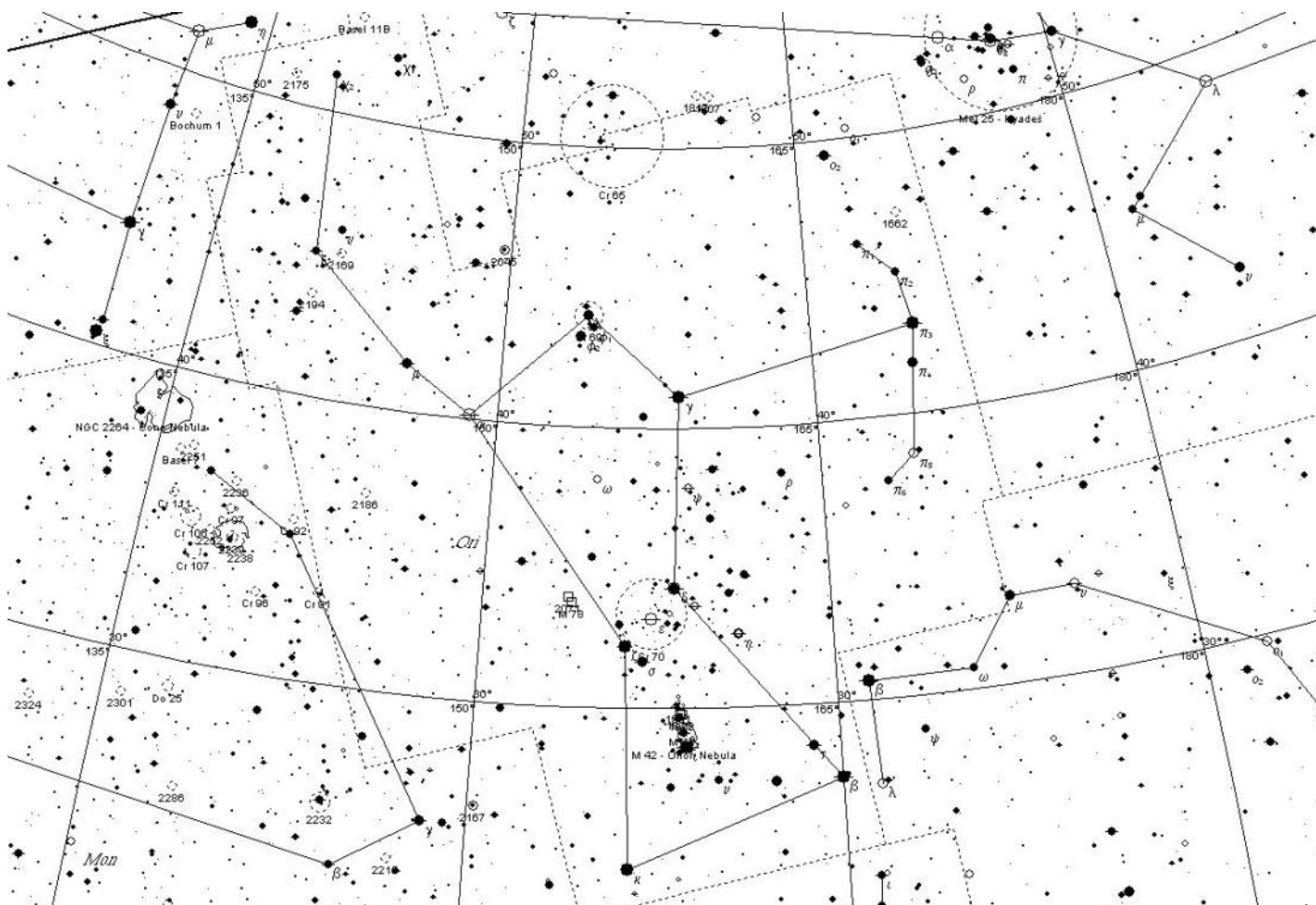
Get out of the city to a place where city and artificial lights do not impede your viewing

If you are out viewing the shower during its peak, you will not need any special equipment. You should be able to see the shower with your naked eyes.

Carry a blanket or a comfortable chair with you - viewing meteors, just like any other kind of star gazing is a waiting game, and you need to be comfortable. Plus, you may not want to leave until you can't see the majestic celestial fireworks anymore.

Check the **weather** and **moonrise** and **moonset** timings for your location before you leave, and plan your viewing around it.

CONSTELLATIONS OF THE MONTH: ORION



Orion is the master of the winter skies. He lords over the heavens from late fall to early spring, with his hunting dog Sirius trailing at his feet.

The mythic tales of Orion go as far back as the Hittites, who flourished from the Second Millennium BC to around 1200 BC.

One story from this culture gives an interesting account of Orion's death. Here he is called Aqhat, and was a handsome and famous hunter. The Battle-Goddess Anat fell in love with Aqhat, but when he refused to lend her his bow, she sent another man to steal it. This chap bungled the job, and wound up killing Aqhat and dropping the bow into the sea. This is said to explain the astronomical fact that Orion and the Bow (an older version of the constellation) drops below the horizon for two months every spring.

Like all myths borrowed from several sources over a great length of time, the Greek stories offer many variations. Generally speaking, Orion was known as the "dweller of the mountain", and was famous for his prowess both as a hunter and as a lover. But when he boasted that he would eventually rid the earth of all the wild animals, his doom may have been sealed.

It might have been the Earth Goddess herself who sent the deadly scorpion to Orion. Or possibly Apollo, concerned that Orion had designs on his sister, Artemis. Thus Apollo may have told the Earth Goddess of Orion's boast. In any case, it seems clear that it was the Earth Goddess who sent the scorpion on its mission.

Some stories have the scorpion killing Orion with its sting. However the general consensus is that he engaged the scorpion in battle but quickly realised its armour was impervious to any mortal's attack. Orion then jumped into the sea and swam toward Delos. But Apollo had witnessed Orion's struggle with the scorpion and would not let him escape so easily. He challenged his sister Artemis, who was an excellent shot, if she

could hit that small black object far away in the sea, the head -- he told her -- of an infamous and treacherous villain. Artemis struck the object with her first shot. She then swam out to retrieve her victim's corpse, and discovered she had killed Orion. Artemis implored the gods to restore his life, but Zeus objected. So she put Orion's image in the heavens.

In his eternal hunting, Orion is careful to keep well ahead of the scorpion. In fact Orion has disappeared over the horizon by the time Scorpio rises in the east, as it becomes his turn to rule the evening sky.

Finding Orion should be no problem. Its stars are some of the most familiar in all the heavens. Question: can you name the three stars that make up Orion's Belt. (Answer below.)

Above the belt, slightly to the left, is *Betelgeuse*, *alpha Orionis*.

Betelgeuse, the right arm of Orion (or "armpit" as the name suggests), glows with a dull red. Although labelled *alpha Orionis*, it is less bright than *beta Orionis* (Rigel), in the opposite corner of the constellation, to the southwest. Yet if slightly less bright, it is much larger, estimated at around 250 Suns. If one were to replace our Sun with Betelgeuse, its size would completely engulf the Earth and extend as far as Mars.

As the brightest star in Orion, *Rigel* ranks as the seventh brightest star in all the heavens, just behind Capella. It is a visual binary; its companion is much fainter, but quite visible if you are persistent enough (PA 202°, 9.4").

The other corners of the constellation are formed by *Bellatrix* (*gamma Orionis*) and *Saiph* (*kappa Orionis*). It was once thought that all women born under the sign of Bellatrix would be fortunate and have the gift of speech. The star's name is

often translated as Female Warrior or Amazon, and another name sometimes seen is "Amazon Star".

The constellation's main feature is of course the three stars which form the "belt" across the middle of Orion: from west to east *Mintaka*, *Alnilam*, and *Alnitak*. Even the Bible makes reference to this famous group. God, while pointing out how all-powerful he was, is purported to have asked Job if he (Job) was able to "loose the bands of Orion" (*Job* 38.31).

The last of these stars is also known as *zeta Orionis*, and is a well known triple star system. The primary is a blue-white star, and its companion (165°, 2.3") is a dull red. Close by, just to the south, is the renowned Horsehead Nebula, a so-called dark nebula that is not visible in scopes but quite spectacular in long-exposure photographs.

Binary stars in Orion:

There are many double stars in this constellation visible in small telescopes. Below are several selected from a wide list.

Beta Orionis (Rigel) has a 10.4 visual magnitude companion at 202° and a wide 9.5" separation. This is a fixed system.

Lambda Orionis (between Betelgeuse and Bellatrix) is another fixed binary, with a 5.5 companion at PA 43° and 4.4" away.

*Theta*¹ is a complex system of fixed stars. The four brightest form The Trapezium, an outstanding multiple system for small telescopes. AB is at a position angle of 32° and separation 8.8", AC: PA 132°, 12.7", and AD: PA 96°, 21.5".

*Theta*² is also a fine binary, a triple system to the southeast of The Trapezium. Component B is a binocular object: 6.4 magnitude at a position angle of 92° and separation 52.5". Component C (8.5) is even wider: PA 98° and separation 128.72".

Sigma Orionis is one of the few orbiting binaries found in Orion. Component B has an orbit of 158 years and is one of the few components that traces a not-quite-perfect circle. That's to say, we see it nearly face on, as a wheel spinning around its hub.

The separation never changes much from its current distance of only 0.2". Its 2000.0 position angle is 132°.

Much easier to resolve is component E, with a visual magnitude of 6.7, this is a binocular object at a position angle of 61° and separation of 42".

Zeta Orionis (1.9, 4.0) has a very slow orbit of 1509 years, and is currently at 165° and 2.3" separation.

Variable stars in Orion:

A dozen stars in this constellation are visible in small scopes, but most of them are of the EA type of eclipsing binaries, which change very little. These include two stars of the Trapezium (theta 1A and 1B).

EA variables are old stars, nearing the end of their evolutionary process. The companion has grown to the size of a subgiant, perhaps equal in size to its primary. But their luminosities are quite different; thus, as the dimmer companion revolves around its primary, variations in the total brightness occur.

The maximum brightness occurs of course when the two are not eclipsed, with each one adding its luminosity to the total output. Two minima also occur: the principal minimum is when the companion blocks out the primary; while a secondary minimum occurs when the companion is eclipsed by the primary.

The only interesting Mira-type regular variable is *U Orionis*, which usually has a brightness of 4.8 but every 368.3 days it drops down to 13. In 2000 the minimum is scheduled to occur on 5 December.

Deep Sky Objects in Orion:



M42, The Orion Nebula is perhaps the most photographed deep sky object in the heavens, a vast nebula of gas and dust exquisitely lit by surrounding stars.

This is a celestial nursery; soon (that's to say, in several hundred million years) young stars will appear from this wealth of cosmic matter.

Inside the nebula is the fascinating four-star system known as *The Trapezium*: theta 1A, 1B, 1C, and 1D - four stars held together by common gravity

(actually at least two other stars are part of this complex system.) They are visible in medium sized telescopes and, with the nebula, form one of the most beautiful binary systems in the heavens.



M43 (NGC 1982) is a detached part of the Orion Nebula, with a ninth magnitude central star. A dark lane of gas separates M43 from M42, although the two are actually part of the same vast cloud.

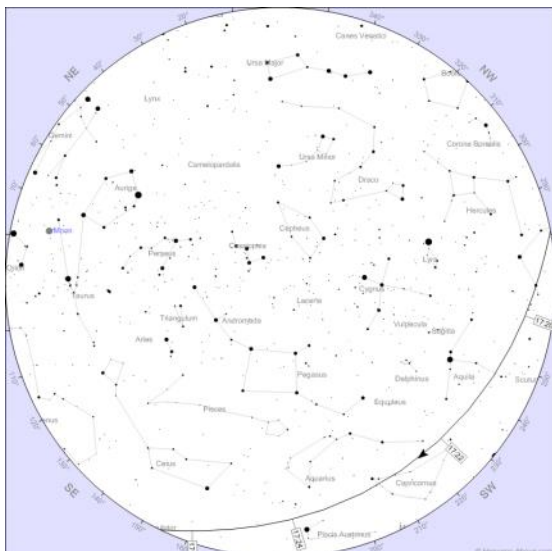
M78 (NGC 2068) is a faint reflection nebula NE of Alnitak (zeta Ori), that looks best in long-exposure photographs.

The Horsehead Nebula is an intriguing and devilishly difficult dark nebula found just between zeta Orionis and sigma Orionis, visible in medium to large telescopes given the right sky conditions. An H-Beta filter is also helpful.

ISS PASSES For September/October 2015

From Heavens Above website maintained by Chris Peat

Date	Brightness	Start	Highest	End							
	(mag)	Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.	
05 Dec	-0.6	18:00:29	10°	SSE	18:00:30	10°	SSE	18:00:30	10°	SSE	
06 Dec	-0.9	18:41:51	10°	SSW	18:42:56	17°	SSW	18:42:56	17°	SSW	
07 Dec	-1.5	17:49:55	10°	SSW	17:52:22	20°	SE	17:52:37	20°	SE	
07 Dec	0.1	19:25:09	10°	WSW	19:25:15	11°	WSW	19:25:15	11°	WSW	
08 Dec	-0.9	16:58:30	10°	SSE	17:00:00	13°	SE	17:01:34	10°	ESE	
08 Dec	-1.9	18:32:43	10°	SW	18:34:52	33°	SSW	18:34:52	33°	SSW	
09 Dec	-2.2	17:40:23	10°	SW	17:43:23	33°	SSE	17:44:25	26°	ESE	
09 Dec	-0.2	19:16:21	10°	W	19:17:03	15°	WSW	19:17:03	15°	WSW	
10 Dec	-1.5	16:48:16	10°	SSW	16:50:54	22°	SE	16:53:34	10°	E	
10 Dec	-2.8	18:23:43	10°	WSW	18:26:32	58°	SW	18:26:32	58°	SW	
11 Dec	-2.9	17:31:10	10°	SW	17:34:24	53°	SSE	17:35:58	26°	E	
11 Dec	-0.5	19:07:29	10°	W	19:08:36	19°	W	19:08:36	19°	W	
12 Dec	-2.2	16:38:44	10°	SW	16:41:48	37°	SSE	16:44:55	10°	E	
12 Dec	-3.4	18:14:47	10°	W	18:18:00	83°	WSW	18:18:00	83°	WSW	
13 Dec	-3.3	17:22:06	10°	WSW	17:25:24	76°	SSE	17:27:23	22°	E	
13 Dec	-0.9	18:58:34	10°	W	19:00:01	24°	W	19:00:01	24°	W	
14 Dec	-3.5	18:05:49	10°	W	18:09:08	84°	N	18:09:22	75°	ENE	
15 Dec	-3.3	17:13:04	10°	W	17:16:22	88°	N	17:18:45	18°	E	
15 Dec	-1.4	18:49:32	10°	W	18:51:22	30°	W	18:51:22	30°	W	
16 Dec	-3.4	17:56:45	10°	W	18:00:05	88°	S	18:00:46	53°	E	
16 Dec	0.3	19:33:17	10°	W	19:33:23	11°	W	19:33:23	11°	W	
17 Dec	-3.3	17:03:57	10°	W	17:07:15	85°	N	17:10:11	13°	E	
17 Dec	-1.9	18:40:25	10°	W	18:42:49	39°	WSW	18:42:49	39°	WSW	
18 Dec	-3.1	17:47:35	10°	W	17:50:53	70°	SSW	17:52:18	31°	ESE	
18 Dec	0.0	19:24:21	10°	W	19:24:56	13°	W	19:24:56	13°	W	
19 Dec	-3.3	16:54:44	10°	W	16:58:03	85°	S	17:01:22	10°	ESE	
19 Dec	-1.8	18:31:18	10°	W	18:34:17	32°	SSW	18:34:32	31°	SSW	
20 Dec	-2.4	17:38:21	10°	W	17:41:32	46°	SSW	17:44:15	13°	SE	
20 Dec	-0.1	19:15:58	10°	WSW	19:16:54	12°	SW	19:16:54	12°	SW	
21 Dec	-2.9	16:45:26	10°	W	16:48:43	64°	SSW	16:51:59	10°	ESE	
21 Dec	-0.7	18:22:19	10°	W	18:24:45	19°	SW	18:26:50	12°	S	
22 Dec	-1.3	17:29:08	10°	W	17:32:02	29°	SSW	17:34:55	10°	SSE	
23 Dec	0.1	18:14:16	10°	WSW	18:15:03	11°	SW	18:15:44	10°	SSW	
24 Dec	-0.3	17:20:06	10°	W	17:22:20	17°	SW	17:24:32	10°	S	
03 Jan	-0.1	06:54:30	10°	S	06:56:16	14°	SE	06:58:06	10°	ESE	
05 Jan	-1.0	06:43:21	10°	SSW	06:46:01	24°	SSE	06:48:45	10°	E	
06 Jan	-0.4	05:50:59	10°	S	05:53:00	16°	SE	05:55:05	10°	ESE	
06 Jan	-2.6	07:25:45	10°	WSW	07:28:57	56°	SSE	07:32:10	10°	E	
07 Jan	-2.1	06:32:45	10°	SW	06:35:47	39°	SSE	06:38:52	10°	E	



Here is the all important pass chart for the 24th December, Christmas Eve.

END IMAGES

Messier 33 in Triangulum, situated between the Andromeda galaxy and the Pleiades the irregular galaxy M33 is part of the local group and a very active galaxy. It can be easier to spot in binoculars rather than a telescope.

Nikon D810A, from Chippenham, televue127, ISO800, 60seconds.



Date	Moon Phase	Observing Topic
2015		
Sunday 13th / Monday 14 th December	Crescent	Geminids meteors
Tuesday December 29th	Waning gibbous	Christmas Early meeting - Lunar targets
2016		
Friday 29 th January	Waning gibbous	Lunar targets
Friday 26 th February	Waning gibbous	Lunar targets
Friday 25 th March	Full	Lunar targets
Friday 29 th April	Last quarter	Lunar targets
Monday 9th May		<i>Transit of Mercury</i>
Friday 27 th May	Waning gibbous	
Wiltshire Astronomical Society Observing Sessions 2015 – 2016		

OUTREACH ACTIVITIES

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

Don't forget the Christmas meeting starts at 6pm

We have 4 other outreach projects on the go with communications now being picked up from our website.