Volume23, Issue 7

February 2018

# NWASNEWS

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



## Moonless February

What's in a name.

We seem to get hyperbole rammed at us from all quarters, is it the only way to interest an attention span reduced public, or should the evidence and facts speak for themselves. It is a big worry.

Take the super blue blood red Moon for example. Much vaunted across the media.

Have seen the perigee (closest pass of the Moon) on the Monday night how could that full Moon be the 'super' variety?

And don't get me started on the 'Blue' moon. An invention in the astrology section of an American Farmers' Almanac. Perpetuated by a self confessed cock up in Sky and Telescope magazine.

The 'blue' moon of lore is actually the third of four blue Moons in an ecclesiastical quarter (solstice to equinox and on). This was the interloper Moon or 'bleuer' Moon.

Yes there is then the blue Moon caused by atmospheric influence, Volcanoes, Forest fires or chemical release subtracting yellow and red wavelengths. I have recorded one of these on film.

Blood Moon? OK where there was the full lunar eclipse but not in Europe. So a lot of people see the Moon rising through the Belt of Venus and thought this was the red Moon bit. And the media perpetuated this hokum.

The one plus, was at least on social media a lot of people were looking at the Moon and photographing it for the first time in their lives.

Even running through the astronomy media for articles in the newsletter I am stumbling through sensationalist headers.

Welll, that got that off my chest (until the 'Bluemoon@ in March).

Astrofest this weekend and I will go for the first time in a couple of years. I am headed there on the Friday. If anyone wants to join me lunch, meet by the entrance doors at 1pm.

Clear Skies

Andy

*The beautiful companion galaxy of ours, Messier 33, just in the Triangulum galaxy.*
*At 2.5 million light years away from us it is a little closer to M31 Andromeda, and so undergoes frequent disruption to its spiral arms, which makes it one of the more active galaxies in our skies. Always worth keeping an eye on for nova, but is so spread out that it can be difficult to spot in a telescope.*
*This was a 120second exposure on the Nikon D810a, using the TMB 102mm refractor.*
*Contrast reduced for printing...*

# 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**

| Date | Speaker | Title |
|---|---|---|
| 6th Feb | Prof. David Southwood | Cassini-Huygens, a Mission to Saturn & Titan. |
| 6th Mar | Andrew Lound | Guardians of the Rings. |
| 3rd Apr | Guy Hurst | George Alcock – The Life & Achievements of this Amazing Observer. |
| 1st May | Paul Money | Triumphs of Voyager: Journey to Jupiter/Splendours of Saturn. |
| 5th Jun | Martin Griffiths | Understanding Stars +AGM. |

Professor David John Southwood is a British space scientist who holds the post of Senior Research Investigator at Imperial College London. He was the President of the Royal Astronomical Society from 2012-2014, and earlier served as the Director of Science and Robotic Exploration at the European Space Agency. Southwood's research interests have been in solar–terrestrial physics and planetary science, particularly magnetospheres. He built the magnetic field instrument for the Cassini Saturn orbiter.

**Membership Meeting nights £1.00 for members £3 for visitors**

**Wiltshire AS Contacts**

Keith Bruton Chair, keisana@tiscali.co.uk

Vice chair: Andy Burns and newsletter editor.
Email anglesburns@hotmail.com

Bob Johnston (Treasurer) Debbie Croker (vice Treasurer)

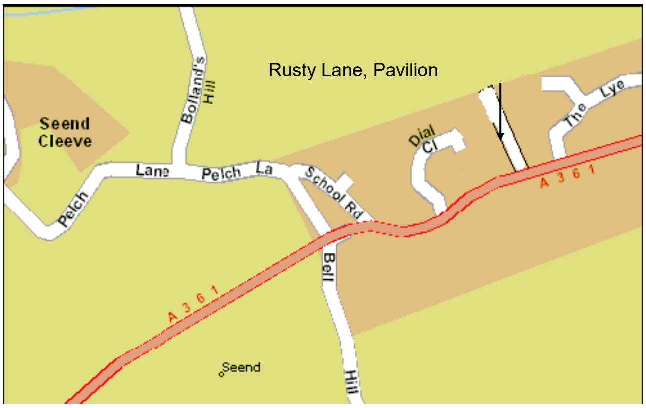
Philip Proven (Hall coordinator) Dave Buckle (Teas)

Peter Chappell (Speaker secretary)

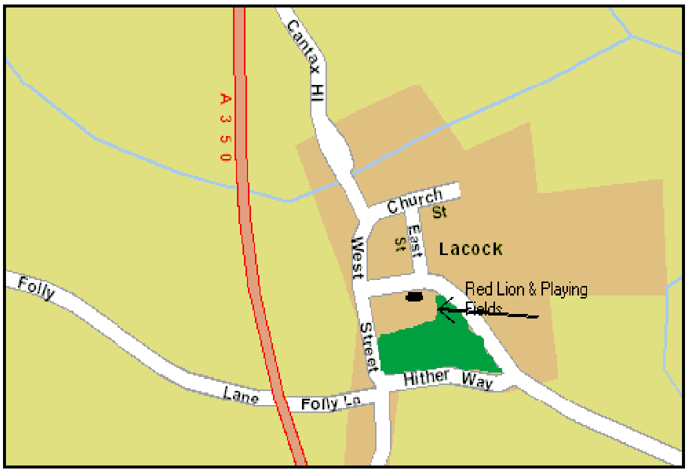
Nick Howes (Technical Guru)

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

Swindon Stargazers

## Swindon's own astronomy group

The club meets once a month at Liddington Hall, Church Road, Liddington, Swindon, SN4 0HB at 7.30pm. See programme below.

**Ad-hoc viewing sessions**

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

Lately we have been stargazing at Blakehill Farm Nature Reserve near Cricklade, a very good spot with no distractions from car headlights.

We often 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.htm

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!

At Liddington Village Hall, Church Road,
Liddington, SN4 0HB – 7.30pm 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.htm

**Meeting Dates for 2018**

**Friday 16 February 2018**
Programme: Prof. Peter Read - Jupiter's Turbulent Atmosphere

**Friday 16 March 2018**
AGM – Mark Ackland - Astrophotography For Beginners

**Friday 20 April 2018**
Programme: Stephen Tonkin - Age of the Universe

**Friday 18 May 2018**

Programme: Prof. Harrison - Space Weather

**Friday 15 June 2018**
Programme: TBA

**Summer Break: No meetings in July and August**

**Friday 21 September 2018**
Programme: Dr. Chris Pearson: Galaxy Formation and Evolution

**Friday 19 October 2018**
Programme: Dr. Michael McEllin - Radio Telescopes: How they work and what they can do

**Friday 16 November 2018**
Programme: Dr. Rhodri Evans - Astronomy from a Boeing 747

**Friday 21 December 2018**
Programme: Christmas Social

**Website:**

**http://www.swindonstargazers.com**

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.com
Address: 17, Euclid Street,

# BECKINGTON ASTRONOMICAL SOCIETY

Society Details & Speakers programme can be found on our Website www.beckingtonas.org

General enquiries about the Society can be emailed to chairman@beckingtonas.org.

**Our Committee for 2016/2017 is**

Steve Hill-----------Chairman- 01761 435663

John Ball-----------Vice Chairman- 01373 830419

………….john@abbeylands1.freeserve.co.uk

Sandy Whitton---- Secretary-07974-841239

…………………..sandy.whitton@blueyonder.co.uk

Jacky Collenette---Treasurer… collenettejacqueline@yahoo.co.uk

Mike Witt---------- Membership-……… mjwitt@blueyonder.co.uk.

John Dolton------ Committee…. member@jdolton.freeserve.co.uk

Meetings take place in Beckington Baptist Church Hall in Beckington Village near Frome.

See the location page for details of how to find us on our website…………

Post Code for Sat Nav is BA11 6TB.

Our start time is 7.30pm.

| | | |
|---|---|---|
| **16th February** | *Voyage to the Dawn of the Solar System* | Chris Starr |
| | | |
| **16th March** | *Pole Stars of other Planets* | Bob Mizon |
| | | |
| **20th April** | *Building the World's Largest FM Radio Receiver to Learn about the First Galaxies* | Jonathan Pritchard |
| | | |
| **18th May** | *The Dichotomy of Mars* | Mike Witt |
| | | |
| **15th June** | Annual General Meeting *Member Talks* | |

## Sixty Years of Observing Our Earth

By Teagan Wall

Satellites are a part of our everyday life. We use global positioning system (GPS) satellites to help us find directions. Satellite television and telephones bring us entertainment, and they connect people all over the world. Weather satellites help us create forecasts, and if there's a disaster—such as a hurricane or a large fire—they can help track what's happening. Then, communication satellites can help us warn people in harm's way.

There are many different types of satellites. Some are smaller than a shoebox, while others are bigger than a school bus. In all, there are more than 1,000 satellites orbiting Earth. With that many always around, it can be easy to take them for granted. However, we haven't always had these helpful eyes in the sky.

The United States launched its first satellite on Jan. 31, 1958. It was called Explorer 1, and it weighed in at only about 30 pounds. This little satellite carried America's first scientific instruments into space: temperature sensors, a microphone, radiation detectors and more.

Explorer 1 sent back data for four months, but remained in orbit for more than 10 years. This small, relatively simple satellite kicked off the American space age. Now, just 60 years later, we depend on satellites every day. Through these satellites, scientists have learned all sorts of things about our planet.

For example, we can now use satellites to measure the height of the land and sea with instruments called altimeters. Altimeters bounce a microwave or laser pulse off Earth and measure how long it takes to come back. Since the speed of light is known very accurately, scientists can use that measurement to calculate the height of a mountain, for example, or the changing levels of Earth's seas.

Satellites also help us to study Earth's atmosphere. The atmosphere is made up of layers of gases that surround Earth. Before satellites, we had very little information about these layers. However, with satellites' view from space, NASA scientists can study how the atmosphere's layers interact with light. This tells us which gases are in the air and how much of each gas can be found in the atmosphere. Satellites also help us learn about the clouds and small particles in the atmosphere, too.

When there's an earthquake, we can use radar in satellites to figure out how much Earth has moved during a quake. In fact, satellites allow NASA scientists to observe all kinds of changes in Earth over months, years or even decades.

Satellites have also allowed us—for the first time in civilization—to have pictures of our home planet from space. Earth is big, so to take a picture of the whole thing, you need to be far away. Apollo 17 astronauts took the first photo of the whole Earth in 1972. Today, we're able to capture new pictures of our planet many times every day.

Today, many satellites are buzzing around Earth, and each one plays an important part in how we understand our planet and live life here. These satellite explorers are possible because of what we learned from our first voyage into space with Explorer 1—and the decades of hard work and scientific advances since then.

To learn more about satellites, including where they go when they die, check out NASA Space Place: https://spaceplace.nasa.gov/spacecraft-graveyard

*This photo shows the launch of Explorer 1 from Cape Canaveral, Fla., on Jan. 31, 1958. Explorer 1 is the small section on top of the large Jupiter-C rocket that blasted it into orbit. With the launch of Explorer 1, the United States officially entered the space age.*
*Image credit: NASA*

# MEMBERS VIEWING LOGS and IMAGES

Hi Andy,

No viewing log for this month due to a power cable failure while slewing to my first target while out one night, the cable got caught around the tripod leg and snapped in two resulting in the telescope not working L. After getting a replacement cable made, I found out it still works on external power (lucky me) but not on internal, probably a power board problem? A company in the States wants over $75 just to ship a $22 circuit board to me, er do not think so at the moment!

Anyway, I managed to get the Blue Super moon for January rising over the estate I live in West Swindon. Tech details: Canon D70 DSLR attached to a Tamron 150 – 600 zoom lens set at 600 mm with an ISO of 160, shutter speed of 1/80th of a second and aperture of f 20 on a Manfrotto tripod.

Clear skies.

Peter

*Peter, sorry about the cable issue, but it is one of my fears when using cabled power supplies and hand controllers, let alone laptop links and CCD cameras. Especially when working with outreach and in schools.*

*Now from Amanda who brought her Dobsonian to the last meeting for advice. Yes, we had a couple of exchanges to get the short focus inherent in these scope sorted, but Amanda is beginning to get results.*

I've managed to transfer phone footage to avi, the created individual images from the avi on pipp.

Then stacked on register, and it did it!

Result was rubbish! Lol. But it did do it, so now I have to figure out what…

I've also found my camera does not allow choices in video footage, it decides what's best hence rubbish footage

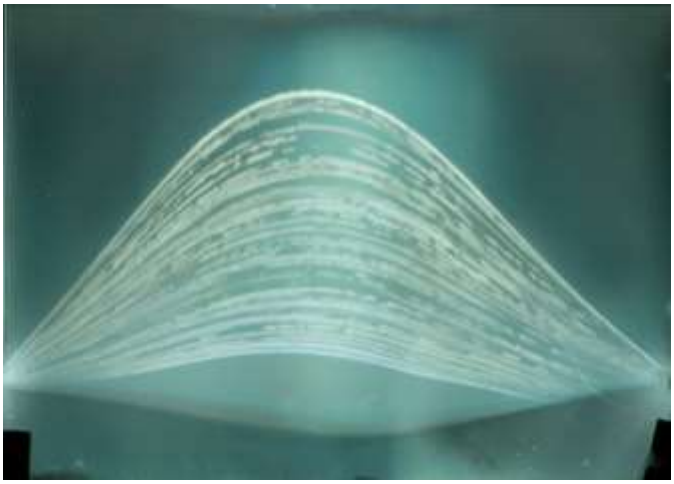
Tried to take images of stars on my phone tonight but I dont think it's up to it.

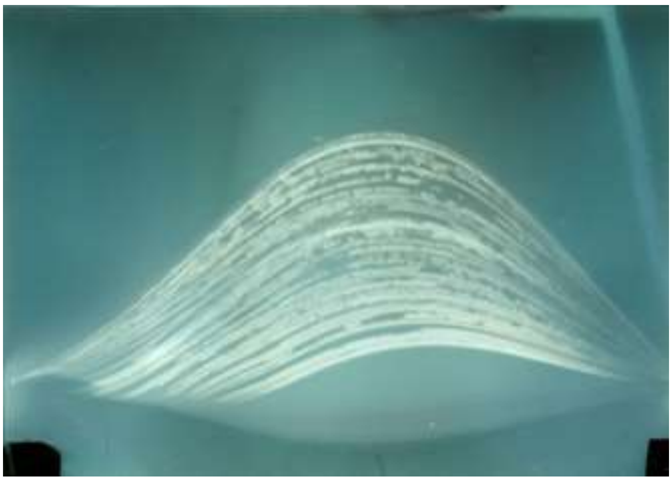
Getting closer though!

Amanda.

Hi Andy,

Attached are images for the February Newsletter.





Beer can pinhole camera Solargraphs from Summer Solstice June 2017 to Winter Solstice December 2017.

An image of the Jupiter and Mars conjunction in the dawn sky on 7th January. Canon G16, F2.2, ISO 1600, 2.5 sec.

Regards,

John Dartnell

From Andy Burns...

Now some from the 19th January (and the Moon from 29th January, when the Moon was at the closest point on its orbit to the Earth, so the much lorded supermoon on the 31st was not the closest point to the Earth (perigee).

The rosette nebular and the clouster of stars within ngc2244

And the Andromeda galaxy with the attendant galaxies of M32 (bright left) and M110 to the right.
Both of these are 60 second exposures, single shot D810a on TMB102mm.

# SPACE NEWS FOR FEBRUARY

Our Facebook page carries a lot of these news items throughout the month.

## FOR THE FIRST TIME, PLANETS HAVE BEEN DISCOVERED IN ANOTHER GALAXY!

Article written: 3 Feb , 2018

by Matt Williams

The first confirmed discovery of a planet beyond our Solar System (aka. an Extrasolar Planet) was a groundbreaking event. And while the initial discoveries were made using only ground-based observatories, and were therefore few and far between, the study of exoplanets has grown considerably with the deployment of space-based telescopes like the *Kepler* space telescope.

As of February 1st, 2018, 3,728 planets have been confirmed in 2,794 systems, with 622 systems having more than one planet. But now, thanks to a new study by a team of astrophysicists from the University of Oklahoma, the first planets beyond our galaxy have been discovered! Using a technique predicting by Einstein's Theory of General Relativity, this team found evidence of planets in a galaxy roughly 3.8 billion light years away.

The study which details their discovery, titled "Probing Planets in Extragalactic Galaxies Using Quasar Microlensing", recently appeared in *The Astrophysical Journal Letters.* The study was conducted by Xinyu Dai and Eduardo Guerras, a postdoctoral researcher and professor from the Homer L. Dodge Department of Physics and Astronomy at the University of Oklahoma, respectively.

For the sake of their study, the pair used the Gravitational Microlensing technique, which relies on the gravitational force of distant objects to bend and focus light coming from a star. As a planet passes in front of the star relative to the observer (i.e. makes a transit), the light dips measurably, which can then be used to determine the presence of a planet.

In this respect, Gravitational Microlensing is a scaled-down version of Gravitational Lensing, where an intervening object (like a galaxy cluster) is used to focus light coming from a galaxy or other large object located beyond it. It also incorporates a key element of the highly-effective Transit Method, where stars are monitored for dips in brightness to indicate the presence of an exoplanet.

In addition to this method, which is the only one capable of detecting extra-solar planets at truly great distances (on the order of billions of light years), the team also used data from NASA's *Chandra X-ray Observatory* to study a distant quasar known as RX J1131–1231. Specifically, the team relied on the microlensing properties of the supermassive black hole (SMBH) located at the center of RX J1131–1231.

They also relied on the OU Supercomputing Center for Education and Research to calculate the microlensing models they employed. From this, they observed line energy shifts that could only be explained by the presence of of about 2000 unbound planets between the quasar's stars – which ranged from being as massive as the Moon to Jupiter – per main-sequence star.

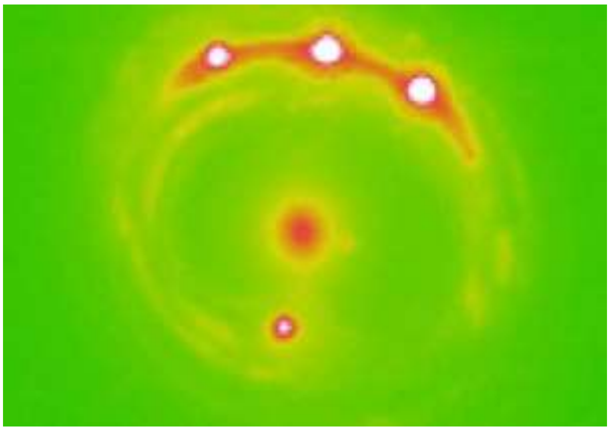


*Image of the gravitational lens RX J1131-1231 galaxy with the lens galaxy at the center and four lensed background quasars. It is estimated that there are trillions of planets in the center elliptical galaxy in this image. Credit: University of Oklahoma*

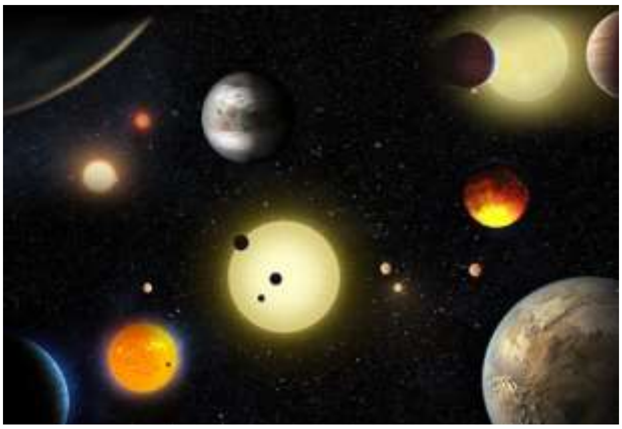
As Xinyu Dai explained in a recent University of Oklahoma press release:

*"We are very excited about this discovery. This is the first time anyone has discovered planets outside our galaxy. These small planets are the best candidate for the signature we observed in this study using the microlensing technique. We analyzed the high frequency of the signature by modeling the data to determine the mass."*

While 53 planets have been discovered within the Milky Way galaxy using the Microlensing technique, this is the first time that planets have been observed in other galaxies. Much like the first confirmed discovery of an extra-solar planet, scientists were not even certain planets existed in other galaxies prior to this study. This discovery has therefore brought the study of planets beyond our Solar System to a whole new level!

And as Eduardo Guerras indicated, the discovery was possible thanks to improvements made in both modelling and instrumentation in recent years:

*"This is an example of how powerful the techniques of analysis of extragalactic microlensing can be. This galaxy is located 3.8 billion light years away, and there is not the slightest chance of observing these planets directly, not even with the best telescope one can imagine in a science fiction scenario. However, we are able to study them, unveil their presence and even have an idea of their masses. This is very cool science."*



*In the future, exoplanet discoveries are likely to be made within and beyond the Milky Way Galaxy. Credit: NASA*

In the coming years, more sophisticated observatories will be available, which will allow for even more in the way of discoveries. These include space-based instruments like the *James Webb Space Telescope* (which is scheduled to launch in Spring of 2019) and ground-based observatories like the ESO's OverWhelmingly Large (OWL) Telescope, the Very Large Telescope (VLT), the Extremely Large Telescope (ELT), and the Colossus Telescope.

At this juncture, the odds are good that some of these discoveries will be in neighboring galaxies. Perhaps then we can begin to determine just how common planets are in our Universe. At present, it is estimated that could be as many as 100 billion planets in the Milky Way Galaxy alone! But with an estimated 1 to 2 trillion galaxies in the Universe… well, you do the math!

*Further Reading: University of Oklahoma*, *The Astrophysical Journal Letters*

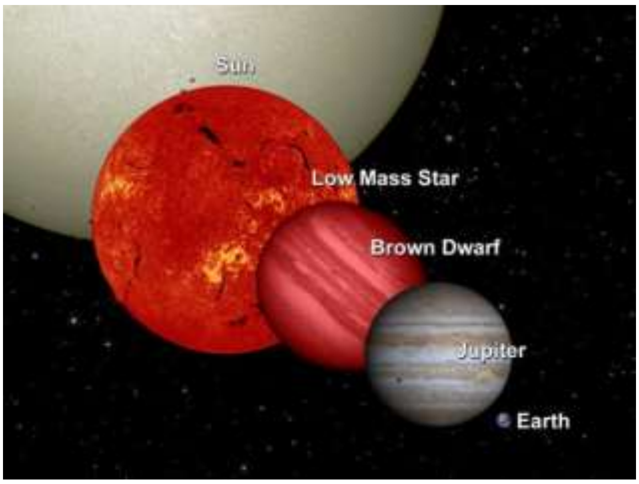
## Where's the Line Between Massive Planet and Brown Dwarf Star?

Article written: 25 Jan , 2018

by Evan Gough

When is a Brown Dwarf star not a star at all, but only a mere Gas Giant? And when is a Gas Giant not a planet, but a celestial object more akin to a Brown Dwarf? These questions have bugged astronomers for years, and they go to the heart of a new definition for the large celestial bodies that populate solar systems.

An astronomer at Johns Hopkins University thinks he has a better way of classifying these objects, and it's not based only on mass, but on the company the objects keep, and how the objects formed. In a paper published in the Astrophysical Journal, Kevin Schlaufman made his case for a new system of classification that could helps us all get past some of the arguments about which object is a gas giant planet or a brown dwarf. Mass is the easy-to-understand part of this new definition, but it's not the only factor. How the object formed is also key.

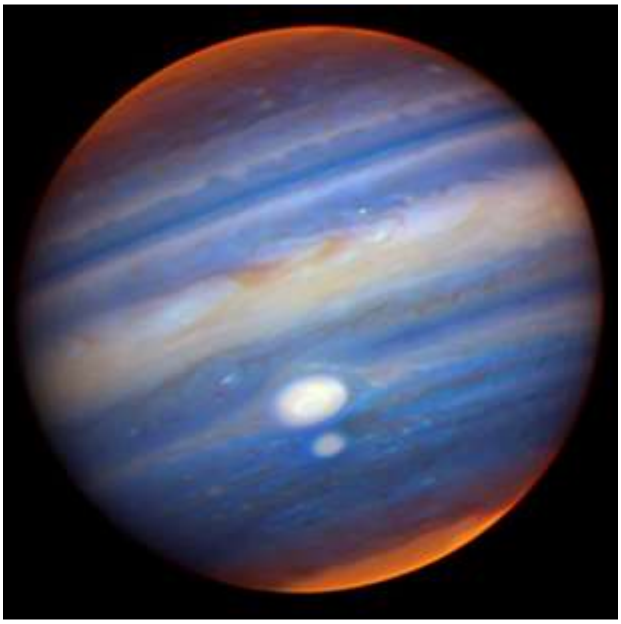



In general, the less massive a star, the cooler it is. Though stars smaller than our Sun can still sustain heat-producing fusion reactions, protostars that are too small cannot. These "failed" stars are commonly known as brown dwarfs, and a new definition puts their range from between 10-75 times the mass of Jupiter. This artist's concept compares the size of a brown dwarf to that of Earth, Jupiter, a low-mass star, and the Sun. (Credit: NASA/JPL-Caltech/UCB).

Schlaufman is an assistant professor in the Johns Hopkins Department of Physics and Astronomy. He has set a limit for what we should call a planet, and that limit is between 4 and 10 times the mass of our Solar System's biggest planet, Jupiter. Above that, you've got yourself a Brown Dwarf star. (Brown Dwarfs are also called sub-stellar objects, or failed stars, because they never grew massive enough to become stars.)

"An upper boundary on the masses of planets is one of the most prominent details that was missing." – Kevin Schlaufman, Johns Hopkins University, Dept. of Physics and Astronomy.

Improvements in observing other solar systems have led to this new definition. Where previously we only had our own Solar System as reference, we now can observe other solar systems with increasing effectiveness. Schlaufman observed 146 solar systems, and that allowed him to fill in some of the blanks in our understanding of brown dwarf and planet formation.



An image of Jupiter showing its storm systems. According to a new definition, Jupiter would be considered a brown dwarf if it had grown to over 10 times its mass when it was formed. Image: Gemini

"While we think we know how planets form in a big picture sense, there's still a lot of detail we need to fill in," Schlaufman said. "An upper boundary on the masses of planets is one of the most prominent details that was missing."

Let's back up a bit and look at how Brown Dwarfs and Gas Giants are related.

Solar systems are formed from clouds of gas and dust. In the early days of a solar system, one or more stars are formed out of this cloud by gravitational collapse. They ignite with fusion and become the stars we see everywhere in the Universe. The leftover gas and dust forms into planets, or brown dwarfs. This is a simplified version of solar system formation, but it serves our purposes.

In our own Solar System, only a single star formed: the Sun. The gas giants Jupiter and Saturn gobbled up most of the rest of the material. Jupiter gobbled up the lion's share, making it the largest planet. But what if conditions had been different and Jupiter had kept growing? According to Schlaufman, if it had kept growing to over 10 times the size it is now, it would have become a brown dwarf. But that's not where the new definition ends.

### Metallicity and Chemical Makeup

Mass is only part of it. What's really behind his new classification is the way in which the object formed. This involves the concept of metallicity in stars.

Stars have a metallicity content. In astrophysics, this means the fraction of a star's mass that is not hydrogen or helium. So any element from lithium on down is considered a metal. These metals are what rocky planets form from. The early Universe had only hydrogen and helium, and almost insignificant amounts of the next two elements, lithium and beryllium. So the first stars had no metallicity, or almost none.

This is an image of M80, an ancient globular cluster of stars. Since these stars formed in the early universe, their metallicity content is very low. This means that gas giants like Jupiter would be rare or non-existent here, while brown dwarfs are likely plentiful. Image: By NASA, The Hubble Heritage Team, STScI, AURA – Great Images in NASA Description, Public Domain, https://commons.wikimedia.org/w/index.php?curid=6449278

But now, 13.5 billion years after the Big Bang, younger stars like our Sun have more metal in them. That's because generations of stars have lived and died, and created the metals taken up in subsequent star formation. Our own Sun was formed about 5 billion years ago, and it has the metallicity we expect from a star with its birthdate. It's still overwhelmingly made of hydrogen and helium, but about 2% of its mass is made of other elements, mostly oxygen, carbon, neon, and iron.

This is where Schlaufman's study comes in. According to him, we can distinguish between gas giants like Jupiter, and brown dwarfs, by the nature of the star they orbit. The types of planets that form around stars mirror the metallicity of the star itself. Gas giants like Jupiter are usually found orbiting stars with metallicity equal to or greater than our Sun. But brown dwarfs aren't picky; they form around almost any star. Why?

### Brown Dwarfs and Planets Form Differently

Planets like Jupiter are formed by accretion. A rocky core forms, then gas collects around it. Once the process is done, you have a gas giant. For this to happen, you need metals. If metals are present for these rocky cores to form, their presence will be reflected in the metallicity of the host star.

But brown dwarfs aren't formed by accretion like planets are. They're formed the same way stars are; by gravitational collapse. They don't form from an initial rocky core, so metallicity isn't a factor.

This brings us back to Kevin Schlaufman's study. He wanted to find out the mass at which point an object doesn't care about the metallicity of the star they orbit. He concluded that objects above 10 times the mass of Jupiter don't care if the star has rocky elements, because they don't form from rocky cores. Hence, they're not planets akin to Jupiter; they're brown dwarfs that formed by gravitational collapse.

### What Does It Matter What We Call Them?

Let's look at the Pluto controversy to understand why names are important.

The struggle to accurately classify all the objects we see out there in space is ongoing. Who can forget the plight of poor Pluto? In 2006, the International Astronomical Union (IAU) demoted Pluto, and stripped it of its long-standing status as a planet. Why?

Because the new definition of what a planet is relied on these three criteria:

- a planet is in orbit around a star.
- a planet must have sufficient mass to assume a hydrostatic equilibrium (a nearly round shape.)
- a planet has cleared the neighbourhood around its orbit

The more we looked at Pluto with better telescopes, the more we realized that it did not meet the third criteria, so it was demoted to Dwarf Planet. Sorry Pluto.

Pluto was re-classified as a dwarf planet based on our growing understanding of its nature. Will Schlaufman's new study help us more accurately classify gas giants and brown dwarfs? NASA's New Horizons spacecraft captured this high-resolution enhanced color view of Pluto on July 14, 2015. Credit: NASA/JHUAPL/SwRI

Our naming conventions for astronomical objects are important, because they help people understand how everything fits together. But sometimes the debate over names can get tiresome. (The Pluto debate is starting to wear out its welcome, which is why some suggest we just call them all “worlds.”)

Though the Pluto debate is getting tiresome, it’s still important. We need some way of understanding what makes objects different, and names that reflect that difference. And the names have to reflect something fundamental about the objects in question. Should Pluto really be considered the same type of object as Jupiter? Are both really planets in the same sense? The IAU says no.

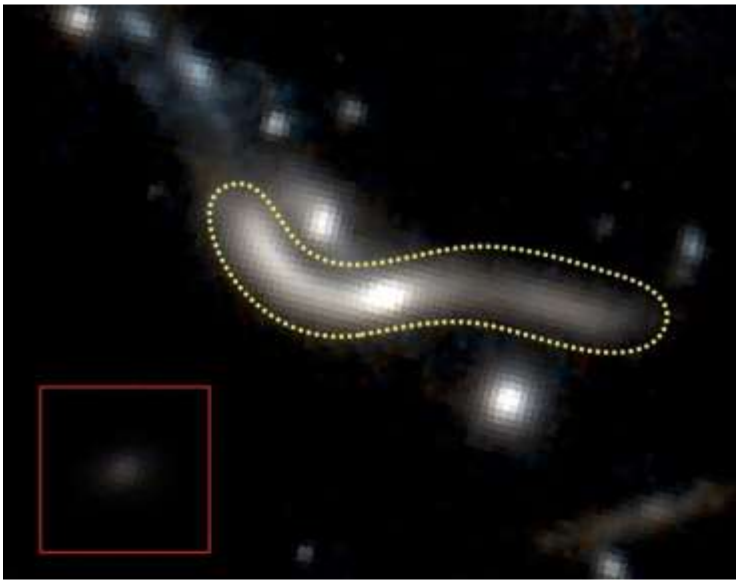
The same principle holds true with brown dwarfs and gas giants. Giving them names based solely on their mass doesn’t really tell us much. Schlaufman aims to change that.

His new definition makes sense because it relies on how and where these objects form, not simply their size. But not everyone will agree, of course.

Let the debate begin.

## Gravitational lensing sets new magnification record

2 February 2018 Astronomy Now



The quiescent galaxy eMACSJ1341-QG-1 as seen by the Hubble Space Telescope. The yellow dotted line traces the boundaries of the galaxy’s gravitationally lensed image. The inset on the upper left shows what eMACSJ1341-QG-1 would look like if we observed it directly, without the cluster lens. The dramatic amplification and distortion caused by the intervening, massive galaxy cluster (of which only a few galaxies are seen in this zoomed-in view) is apparent. Image: Harald Ebeling, UH IfA

Extremely distant galaxies are usually too faint to be seen, even by the largest telescopes. But nature has a solution – gravitational lensing, predicted by Albert Einstein and observed many times by astronomers. Now, an international team of astronomers led by Harald Ebeling from the University of Hawaiʻi has discovered one of the most extreme instances of magnification by gravitational lensing.

Using the Hubble Space Telescope (HST) to survey a sample of huge clusters of galaxies, the team found a distant galaxy, eMACSJ1341-QG-1, that is magnified 30 times thanks to the distortion of space-time created by the massive galaxy cluster dubbed eMACSJ1341.9-2441.

The underlying physical effect of gravitational lensing was first confirmed during the solar eclipse of 1919, and can dramatically magnify images of distant celestial sources, provided a sufficiently massive object lies between the background source and us, the observers.

Galaxy clusters, enormous concentrations of dark matter and hot gas surrounding hundreds or thousands of individual galaxies, all bound by the force of gravity, are valued by astronomers as powerful “gravitational lenses”. By magnifying the galaxies situated behind them, massive clusters act as natural telescopes that allow scientists to study faint and distant sources that would otherwise be beyond the reach of even the most powerful man-made telescopes.

“The very high magnification of this image provides us with a rare opportunity to investigate the stellar populations of this distant object and, ultimately, to reconstruct its undistorted shape and properties”, states team member Johan Richard of the University of Lyon, who performed the lensing calculations.

Although similarly extreme magnifications have been observed before, the discovery sets a new record for the magnification of a rare “quiescent” background galaxy – one that, unlike our Milky Way, does not form new stars in giant clouds of cool gas.

Team leader Harald Ebeling explains, “We specialize in finding extremely massive clusters that act as natural telescopes and have already discovered many exciting cases of gravitational lensing. This discovery stands out though, as the huge magnification provided by eMACSJ1341 allows us to study in detail a very rare type of galaxy.”

Representing the endpoint of galaxy evolution, quiescent galaxies are common in the local Universe. “However, as we look at more distant galaxies, we are also looking back in time, so we are seeing objects that are younger and should not yet have used up their gas supply,” says Mikkel Stockmann, a team member from the University of Copenhagen. and an expert in galaxy evolution. “Understanding why this galaxy has already stopped forming stars may give us critical clues about the processes that govern how galaxies evolve.”

Follow-up observations of eMACSJ1341-QG1 are in progress, using telescopes in Chile and on Maunakea. Details of the discovery are published in the Astrophysical Journal Letters.

## Ingredients for life revealed in meteorites that fell to Earth

16 January 2018 Astronomy Now


A blue crystal recovered from a meteorite that fell near Morocco in 1998. The scale bar represents 200 microns (millionths of a meter). Credit: Queenie Chan/The Open University, U.K.

Two wayward space rocks, which separately crashed to Earth in 1998 after circulating in our solar system’s asteroid belt for billions of years, share something else in common: the ingredients for life. They are the first meteorites found to contain both liquid water and a mix of complex organic compounds such as hydrocarbons and amino acids.

A detailed study of the chemical makeup within tiny blue and purple salt crystals sampled from these meteorites, which included results from X-ray experiments at the Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab), also found evidence for the pair's past intermingling and likely parents. These include Ceres, a brown dwarf planet that is the largest object in the asteroid belt, and the asteroid Hebe, a major source of meteorites that fall on Earth.

The study, published Jan. 10 in the journal Science Advances, provides the first comprehensive chemical exploration of organic matter and liquid water in salt crystals found in Earth-impacting meteorites. The study treads new ground in the narrative of our solar system's early history and asteroid geology while surfacing exciting possibilities for the existence of life elsewhere in Earth's neighborhood.

"It's like a fly in amber," said David Kilcoyne, a scientist at Berkeley Lab's Advanced Light Source (ALS), which provided X-rays that were used to scan the samples' organic chemical components, including carbon, oxygen, and nitrogen. Kilcoyne was part of the international research team that prepared the study.

While the rich deposits of organic remnants recovered from the meteorites don't provide any proof of life outside of Earth, Kilcoyne said the meteorites' encapsulation of rich chemistry is analogous to the preservation of prehistoric insects in solidified sap droplets.

Queenie Chan, a planetary scientist and postdoctoral research associate at The Open University in the U.K. who was the study's lead author, said, "This is really the first time we have found abundant organic matter also associated with liquid water that is really crucial to the origin of life and the origin of complex organic compounds in space."

She added, "We're looking at the organic ingredients that can lead to the origin of life," including the amino acids needed to form proteins.

If life did exist in some form in the early solar system, the study notes that these salt crystal-containing meteorites raise the "possibility of trapping life and/or biomolecules" within their salt crystals. The crystals carried microscopic traces of water that is believed to date back to the infancy of our solar system – about 4.5 billion years ago.

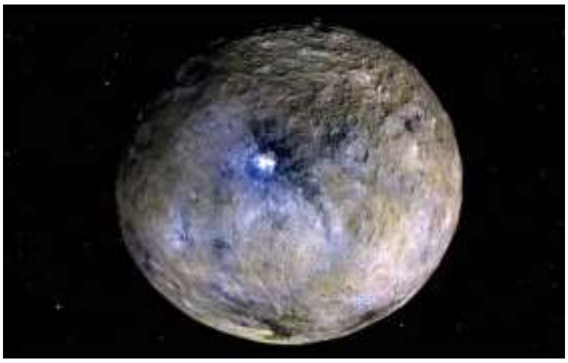
Chan said the similarity of the crystals found in the meteorites – one of which smashed into the ground near a children's basketball game in Texas in March 1998 and the other which hit near Morocco in August 1998 – suggest that their asteroid hosts may have crossed paths and mixed materials.

There are also structural clues of an impact – perhaps by a small asteroid fragment impacting a larger asteroid, Chan said.

This opens up many possibilities for how organic matter may be passed from one host to another in space, and scientists may need to rethink the processes that led to the complex suite of organic compounds on these meteorites.

"Things are not as simple as we thought they were," Chan said.

There are also clues, based on the organic chemistry and space observations, that the crystals may have originally been seeded by ice- or water-spewing volcanic activity on Ceres, she said.



Ceres, a dwarf planet in the asteroid belt pictured here in this false-color image, may be the source of organic matter found in two meteorites that crashed to Earth in 1998. Credit: NASA

"Everything leads to the conclusion that the origin of life is really possible elsewhere," Chan said. "There is a great range of organic compounds within these meteorites, including a very primitive type of organics that likely represent the early solar system's organic composition."

Chan said the two meteorites that yielded the 2-millimeter-sized salt crystals were carefully preserved at NASA's Johnson Space Center in Texas, and the tiny crystals containing organic solids and water traces measure just a fraction of the width of a human hair. Chan meticulously collected these crystals in a dust-controlled room, splitting off tiny sample fragments with metal instruments resembling dental picks.

"What makes our analysis so special is that we combined a lot of different state-of-the-art techniques to comprehensively study the organic components of these tiny salt crystals," Chan said.

Yoko Kebukawa, an associate professor of engineering at Yokohama National University in Japan, carried out experiments for the study at Berkeley Lab's ALS in May 2016 with Aiko Nakato, a postdoctoral researcher at Kyoto University in Japan. Kilcoyne helped to train the researchers to use the ALS X-ray beamline and microscope.

The beamline equipped with this X-ray microscope (a scanning transmission X-ray microscope, or STXM) is used in combination with a technique known as XANES (X-ray absorption near edge structure spectroscopy) to measure the presence of specific elements with a precision of tens of nanometers (tens of billionths of a meter).

"We revealed that the organic matter was somewhat similar to that found in primitive meteorites, but contained more oxygen-bearing chemistry," Kebukawa said. "Combined with other evidence, the results support the idea that the organic matter originated from a water-rich, or previously water-rich parent body – an ocean world in the early solar system, possibly Ceres."

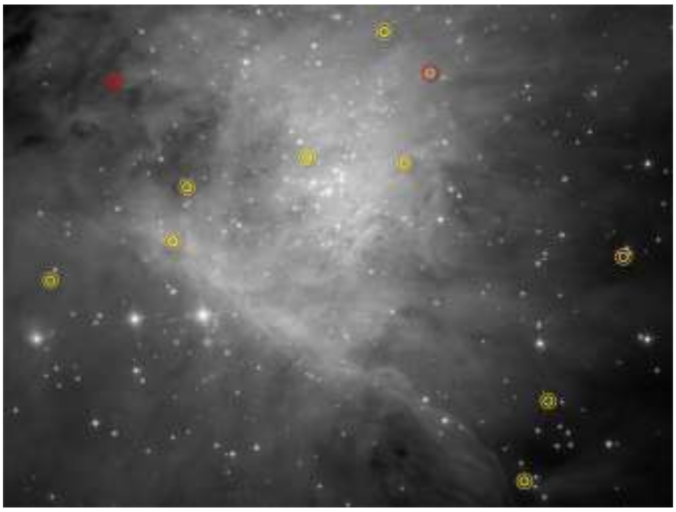
Kebukawa also used the same STXM technique to study samples at the Photon Factory, a research site in Japan. And the research team enlisted a variety of other chemical experimental techniques to explore the samples' makeup in different ways and at different scales.

Chan noted that there are some other well-preserved crystals from the meteorites that haven't yet been studied, and there are plans for follow-up studies to identify if any of those crystals may also contain water and complex organic molecules.

Kebukawa said she looks forward to continuing studies of these samples at the ALS and other sites: "We may find more variations in organic chemistry."

## Hubble finds substellar objects in the Orion Nebula

16 January 2018 Astronomy Now



This image is part of a Hubble Space Telescope survey for low-mass stars, brown dwarfs, and planets in the Orion Nebula. Each symbol identifies a pair of objects, which can be seen in the symbol's center as a single dot of light. Special image processing techniques were used to separate the starlight into a pair of objects. The thicker inner circle represents the primary body, and the thinner outer circle indicates the companion. The circles are color-coded: Red for a planet; orange for a brown dwarf; and yellow for a star. Located in the upper left corner is a planet-planet pair in the absence of a parent star. In the middle of the right side is a pair of brown dwarfs. The portion of the Orion Nebula measures roughly 4 by 3 light-years. Credit: NASA , ESA, and G. Strampelli (STScI)

In an unprecedented deep survey for small, faint objects in the Orion Nebula, astronomers using NASA's Hubble Space Telescope have uncovered the largest known population of brown dwarfs sprinkled among newborn stars. Looking in the vicinity of the survey stars, researchers not only found several very-low-mass brown dwarf companions, but also three giant planets. They even found an example of binary planets where two planets orbit each other in the absence of a parent star.

Brown dwarfs are a strange class of celestial object that have masses so low that their cores never become hot enough to sustain nuclear fusion, which powers stars. Instead, brown dwarfs cool and fade as they age. Despite their low mass, brown dwarfs provide important clues to understanding how stars and planets form, and may be among the most common objects in our Milky Way galaxy.

Located 1,350 light-years away, the Orion Nebula is a relatively nearby laboratory for studying the star formation process across a wide range, from opulent giant stars to diminutive red dwarf stars and elusive, faint brown dwarfs.

This survey could only be done with Hubble's exceptional resolution and infrared sensitivity.

Because brown dwarfs are colder than stars, astronomers used Hubble to identify them by the presence of water in their atmospheres. "These are so cold that water vapor forms," explained team lead Massimo Robberto of the Space Telescope Institute in Baltimore, Maryland. "Water is a signature of substellar objects. It's an amazing and very clear mark. As the masses get smaller, the stars become redder and fainter, and you need to view them in the infrared. And in infrared light, the most prominent feature is water."

But hot water vapor in the atmosphere of brown dwarfs cannot be easily seen from Earth's surface, due to the absorbing effects of water vapor in our own atmosphere. Fortunately, Hubble is up above the atmosphere and has near-infrared vision that can easily spot water on distant worlds.

The Hubble team identified 1,200 candidate reddish stars. They found that the stars split into two distinct populations: those with water, and those without. The bright ones with water were confirmed to be faint red dwarfs. The multitude of fainter water-rich, free-floating brown dwarfs and planets within the Orion nebula are all new discoveries. Many stars without water were also detected, and these are background stars in the Milky Way. Their light was reddened by passing through interstellar dust, and therefore not relevant to the team's study.

The team also looked for fainter, binary companions to these 1,200 reddish stars. Because they are so close to their primary stars, these companions are nearly impossible to discover using standard observing methods. But by using a unique, high-contrast imaging technique developed by Laurent Pueyo at the Space Telescope Science Institute, astronomers were able to resolve faint images of a large number of candidate companions.

This first analysis did not allow Hubble astronomers to determine whether these objects orbit the brighter star or if their proximity in the Hubble image is a result of chance alignment. As a consequence, they are classified as candidates for now. However, the presence of water in their atmospheres indicates that most of them cannot be misaligned stars in the galactic background, and thus must be brown dwarfs or exoplanet companions.

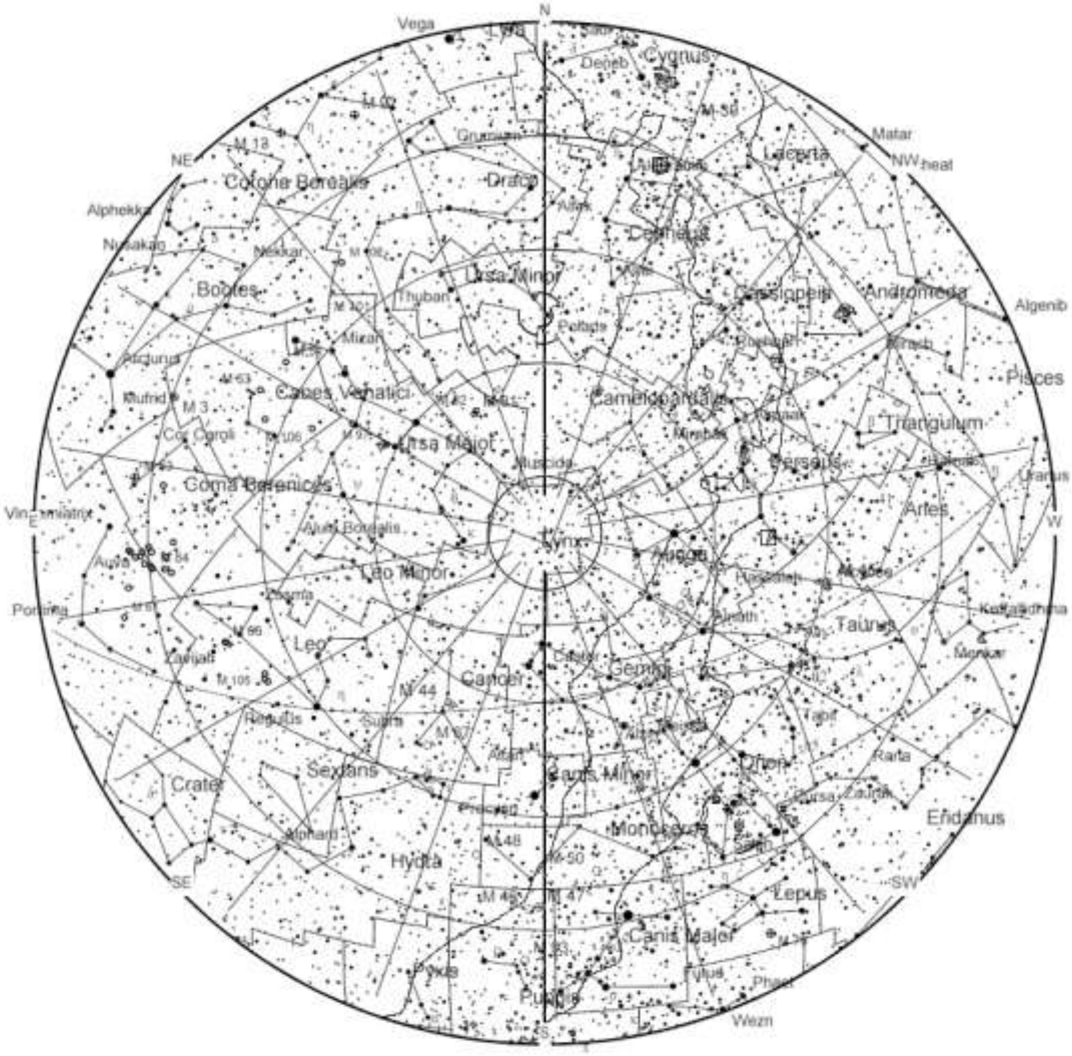
In all, the team found 17 candidate brown dwarf companions to red dwarf stars, one brown dwarf pair, and one brown dwarf with a planetary companion. The study also identified three potential planetary mass companions: one associated to a red dwarf, one to a brown dwarf, and one to another planet.

"We experimented with a method, high-contrast imaging post processing, that astronomers have been relying on for years. We usually use it to look for very faint planets in the close vicinity of nearby stars, by painstakingly observing them one by one," said Pueyo. "This time around, we decided to combine our algorithms with the ultra-stability of Hubble to inspect the vicinity of hundreds of very young stars in every single exposure obtained by the Orion survey. It turns out that even if we do not reach the deepest sensitivity for a single star, the sheer volume of our sample allowed us to obtain an unprecedented statistical snapshot of young exoplanets and brown dwarf companions in Orion."

Combining the two unique techniques, imaging in the water filters and high-contrast image processing, the survey provided an unbiased sample of newly formed low-mass sources, both dispersed in the field and companions of other low-mass objects. "We could reprocess the entire Hubble archive and try to find jewels there," Robberto said.

The team presented their results at the 231st meeting of the American Astronomical Society in Washington, D.C.

Finding the signatures of low-mass stars and their companions will become much more efficient with the launch of NASA's infrared-sensitive James Webb Space Telescope in 2019.

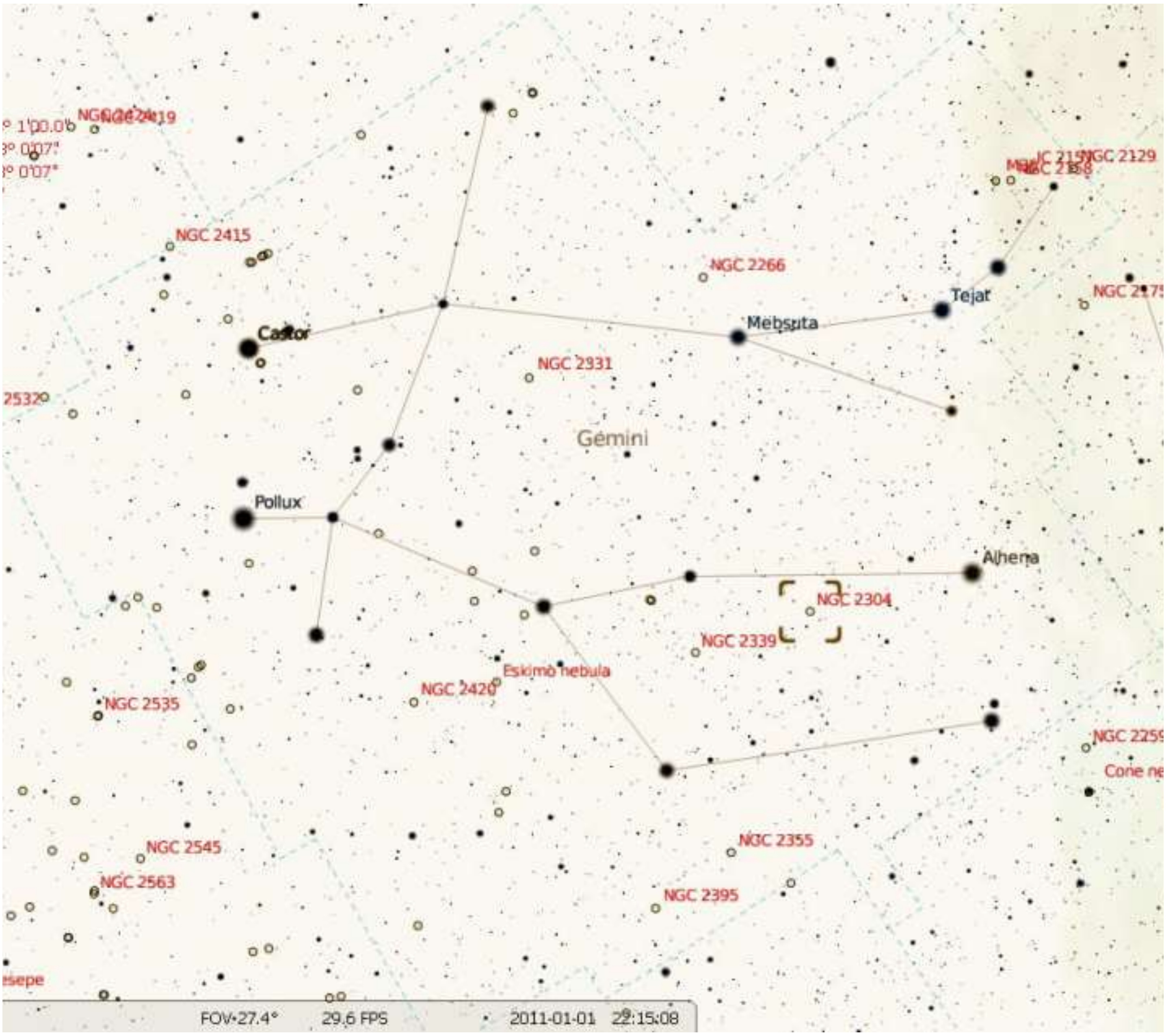



**February 15** - **New Moon.** The Moon will located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 21:05 UTC. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.

**February 15** - **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. This partial eclipse will only be visible in parts of Chile, Argentina, and Antarctica.

**March 2** - **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 00:51 UTC. This full moon was known by early Native American tribes as the Full Worm Moon because this was the time of year when the ground would begin to soften and the earthworms would reappear. This moon has also been known as the Full Crow Moon, the Full Crust Moon, the Full Sap Moon, and the Lenten Moon

# CONSTELLATIONS OF THE MONTH: Gemini




GEMINI

by Tammy Plotner

Gemini is a constellation of the zodiac, positioned on the ecliptic plane between between Taurus to the west and Cancer to the east. Only its Alpha and Beta stars – Castor and Pollux – are easy to recognize. They represent the "Twins". Gemini is one of the original 48 constellations charted by Ptolemy and has endured to become a part of the 88 modern constellations recognized by the International Astronomical Union. It covers approximately 54 square degrees of sky and contains 17 main stars in the asterism, with 80 stars possessing Bayer/ Flamsteed designations. Gemini is bordered by the constellations of Lynx, Auriga, Taurus, Orion, Monoceros, Canis Minor and Cancer. It can be viewed by all observers located at latitudes between +90° and ?60° and is best seen at culmination during the month of February.

There are two annual meteor showers associated with the constellation of Gemini. The first peaks on or around the date of March 22, and are referred to as the March Geminids. This meteor shower was first discovered in 1973 and then confirmed in 1975. The average fall rate is generally about 40 per hour, but the meteoroid stream is unstudied and it may vary. These appear to be very slow meteors, entering our atmosphere unhurriedly and leaving lasting trails.

The second meteor shower associated with Gemini are the Geminids themselves, which peak on or near the date of December 14th, with activity beginning up to two weeks prior and last several days beyond the date. The Geminids are one of the most hauntingly beautiful and mysterious displays of celestial fireworks all year – first noted in 1862 by Robert P. Greg in England, and B. V. Marsh and Prof. Alex C. Twining of the United States in independent studies. The annual appearance of the Geminid stream was weak initially, producing no more than a few per hour, but it has grown in intensity during the last century and a half. By 1877, astronomers had realized this was a new annual shower – producing about 14 meteors per hour. At the turn of the last century, the rate had increased to over 20; and by the 1930s, up to 70 per hour. Only ten years ago observers recorded an outstanding 110 per hour during a moonless night…

So why are the Geminids such a mystery? Most meteor showers are historic – documented and recorded for hundreds of years – and we know them as originating with cometary debris. But when astronomers began looking for the Geminids' parent comet, they found none. It wasn't until October 11, 1983 that Simon Green and John K. Davies, using data from NASA's Infrared Astronomical Satellite, detected an object (confirmed the next night by Charles Kowal) that matched the orbit of the Geminid meteoroid stream. But this was no comet, it was an asteroid – in fact, a 14th magnitude asteroid which is passing Earth tonight from a distance of less than 18 million kilometers! Now considered a Potential Hazardous Asteroid (PHA), 3200 Phaeton comes within 3.2 million kilometers of Earth's orbit about every 17 months. Originally designated as 1983 TB, but later renamed 3200 Phaethon, this apparently rocky solar system member has a highly elliptical orbit that places it within 0.15 AU of the Sun during every solar system tour. But asteroids can't fragment like a comet – or can they? The original hypothesis was that since Phaethon's orbit passes through the asteroid belt, it may have collided with one or more asteroids, creating rocky debris. This sounded good, but the more we studied the more we realized the meteoroid "path" occurred when Phaethon neared the Sun. So now our asteroid is behaving like a comet, yet it doesn't develop a tail.

So what exactly is this "thing?" Well, we do know that 5.1 kilometer diameter Phaethon orbits like a comet, yet has the spectral signature of an asteroid. By studying photographs of the meteor showers, scientists have determined that the meteors are denser than cometary material, yet not as dense as asteroid fragments. This leads them to believe Phaethon is probably an extinct comet which has gathered a thick layer of interplanetary dust during its travels, yet retains the ice-like nucleus. Until we are able to take physical samples of this "mystery," we may never fully understand what Phaethon is, but we can fully appreciate the annual display it produces!

Thanks to the wide path of the stream, folks the world over get an opportunity to enjoy the show of the Geminids. The traditional peak time is the night of the 13th into the morning of the 14th of December – as soon as the constellation of Gemini appears, around mid-evening. The radiant for the shower is near the bright star Castor, but meteors can originate from many points in the sky. From around 2 AM tonight until dawn (when our local sky window is aimed directly into the stream) it is possible to see about one "shooting star" every 30 seconds. The most successful of observing nights are ones where you are comfortable, so be sure to use a reclining chair or pad on the ground while looking up… And dress warmly! Please get away from light sources when possible – it will triple the amount of meteors you see.

In mythology, Gemini is associated with the myth of Castor and Polydeuces. The two brothers Castor and Pollux were twins, of course and no one could tell them apart. According to legend, they joined Jason's expedition aboard the Argo to the Black Sea in search of the Golden Fleece. When the Argo stopped at the entrance to the King Amycus' realm, the king challenged them to a boxing match – mainly because no one ever survived. The brothers were known to be fit and ready, so Pollux was the first Argonaut to take on the challenge. As soon as he got a clear shot, Pollux drove his fist into Amycus' temple, crushing his skull and ended the battle. However, the tale ends rather sadly. Their final adventure took them to lands of Arcadia with two cousins (ex-Argonauts) to raid cattle. When their ill-gotten booty was divided, the cousins took the loot and ran. Of course, Castor and Pollux followed, taking a shortcut to wait. Unfortunately, a cousin discovered Castor first shot him. When Pollux avenged his brother, the other cousin knocked him unconscious with a rock and went in for the kill. Luckily, Zeus was watching and ended the ordeal with a thunderbolt. When Pollux regained consciousness and realized Castor was join, he begged Zeus to remove his immortality. Zeus granted his wish and placed the twins in the sky to remind us of all of brotherly love.

For binocular observers, Gemini has a wealth of treasures. But to find things, you've got to know your way around! Let's start first with Alpha Geminorum – the "a" symbol on our map. This is Castor. Although it might look like just a single star in binoculars, it's really quite an outstanding triple star system in a telescope. Here you will find two similar magnitude stars separated by just a few seconds of arc – and both of these stars are binary stars, too! The faint, distant orange star, Castor C, is also double star, consisting of nearly identical, low-mass M stars – red dwarfs – and either one, or both of these are flare stars. Pretty remarkable, huh?

Now, go look at brighter Beta Geminorum, the "B" symbol on our map. Pollux is the 17th brightest star in the sky, and this orange giant star is unusual, too. Here we have an X-ray emitter. Pollux has a hot, outer, magnetically supported corona perhaps similar to that surrounding our Sun. But that's not all. Beta Geminorum has an orbiting planet! That's right. A planet that's nearly 3 times the size of Jupiter and orbits its sun about the same distance as Mars orbits ours. So, if we were there, how big would orange giant Pollux look in the sky? Try almost 6 times larger, and belting out 16 times more radiation. Sunblock 6000 anyone?

Our next target is Delta Geminorum – the "8" shape on our map. Delta goes by the traditional name of Wasat, which means middle. Thankfully, that's right about where it's positioned! Wasat is positioned very close to the ecliptic plane, so it is an important star to remember since it often gets occulted by the Moon. But that's not all. Wasat is also a terrific double star, too. Take out the telescope and have a look at this soft white star with the disparate orange companion. It's a tasty treat!

Now head further down the line for Gamma Geminorum – the "Y" shape on our map. It's name is Almeisan and it is about 150 light years away from Earth. A binary star? You bet. The major star is a spectroscopic binary, but look for a faint optical companion, too. Hop across the constellation to Theta Geminorum, the "n" shape. Often called Nageba, this 200 light year distant Class A3 star is also a binary that can be split with a telescope. Look for components of magnitudes 3.60 and 5.18, separated by 2.9 arcseconds.

Last on our list of stars is Epsilon Geminorum, the backward "3". It's name is Mebsuta and it is about 900 light years away from our solar system. Mebsuta is a supergiant star of spectral class G5, and compared to our Sun, it's 150 times larger. Like Delta on the other side of Gemini, Epsilon is also very near the ecliptic plane and can also be occulted by the Moon or planets. Be sure to also keep an eye on Zeta Geminorum, too! It is a cepheid variable star, with very nice magnitude changes from 3.62 to 4.18 every 10.15 days. Quite worth following!

Before you put away your binoculars, travel back to Theta and make the starhop to magnificent Messier 35. Also listed as NGC 2168, the awesome open star cluster was discovered by Philippe Loys de Chéseaux in 1745 and independently discovered by John Bevis before 1750. Progressively larger optics will reveal more and more stars… several hundred stars in an area about the size of the full moon. Perhaps 100 million years old, this collection of stellar gems contains several yellow and orange giant stars to delight the eye – but large telescopes will see something else. Located about 15 arc minutes southwest of M35 is another galactic cluster – NGC 2158. At low magnification, it will appear almost like a faint globular cluster – and with good reason. NGC 2158 is over 10 times older and over five times more remote than M35! About 50 arc minutes west from M35, faint, loose open cluster IC 2157 can also be found. For those with ultra-wide field eyepieces, you can often showcase all three objects in the same field of view!

For the telescope, there's no place like NGC 2392 (RA 7:29; Dec 20:55) about 4 degrees east/southeast of Wasat. Better known as the "Eskimo Nebula", this planetary nebula has a bright central region and the surrounding dim ring structure. Be sure to up the magnification in even

a small telescope on this one. This stellar relic was first spied by William Herschel in 1787 and is a bubble of material being blown into space by the central star's intense "wind" of high-speed material. Try adding a nebula filter to bring out different and subtle details!

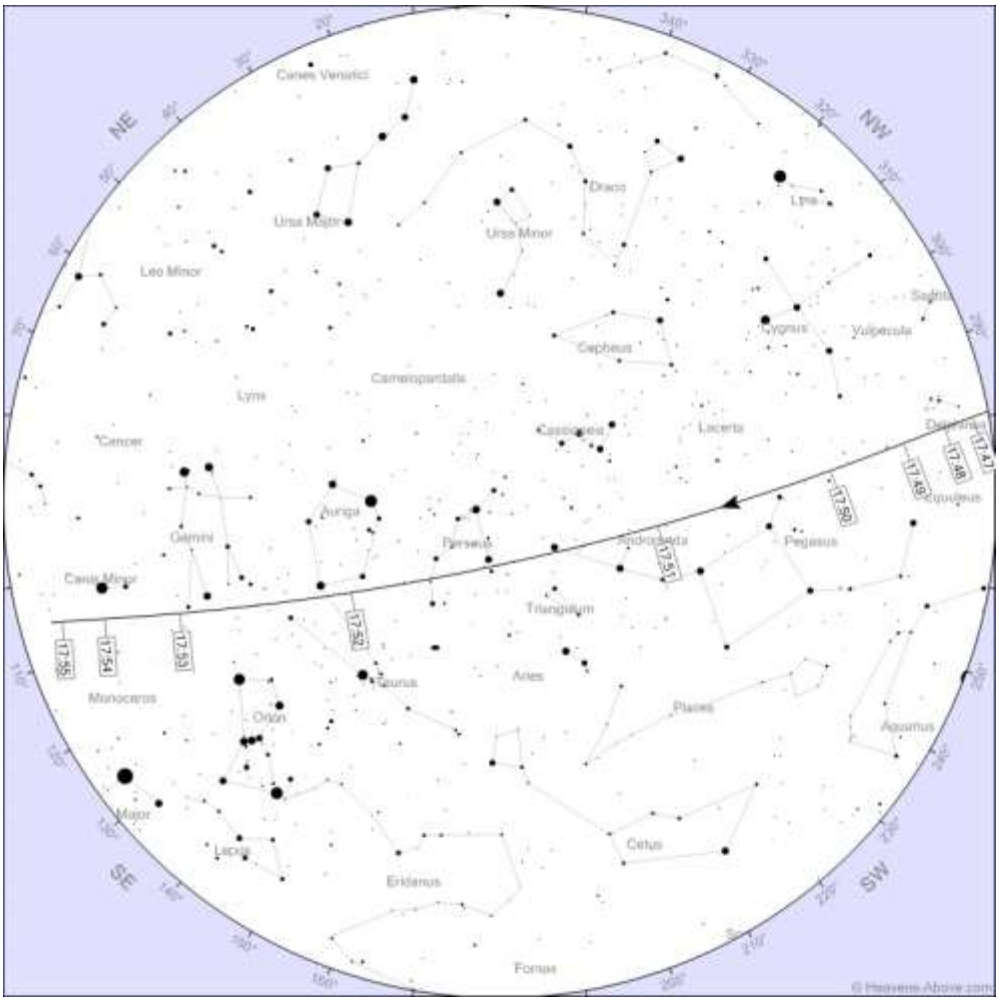
Head now for NGC 2266 (RA 06 43.2 Dec +26 58). This open cluster is probably a billion years old – nearly all of its members evolved to the red giant star phase. From its position high above the galactic plane, low metallicity NGC 2266 has escaped the mixing of dusts and gases contained in the rest of the Milky Way and become the perfect laboratory for studying stellar evolution. Look for a relatively well compressed area of looping faint stars with a combined magnitude of near 10.

Care to try NGC 2420? You'll find it located at RA 07 38.5 Dec +21 34. This near 8th magnitude galactic star cluster is rich in solar type stars – another scientific playground for learning about the origins and evolution of the Milky Way. With nearly 1000 stars packed densely together in a small region, NGC 2420 originally belonged to another small galaxy that was cannibalized by our own. With an estimated age of 1.7 billion years old, it remains a curiosity because it is moving rapidly through space – and because it hasn't been tidally pulled apart by our galactic disc. Enjoy this unique view!

There are other star clusters to enjoy in the constellation of Gemini as well, so get a good star chart and enjoy your time with the "Twins"!

# ISS PASSES For February/March 2018 From Heavens Above website maintained by Chris Peat

| Date | Brightness | Start | | | Highest point | | | End | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (mag) | Time | Alt. | Az. | Time | Alt. | Az. | Time | Alt. | Az. |
| 06 Feb | -3.8 | 17:56:05 | 10° | W | 17:59:22 | 87° | N | 18:02:25 | 12° | E |
| 06 Feb | -2.5 | 19:32:38 | 10° | W | 19:35:05 | 38° | WSW | 19:35:05 | 38° | WSW |
| 07 Feb | -3.5 | 18:40:24 | 10° | W | 18:43:39 | 62° | SSW | 18:45:11 | 27° | SE |
| 07 Feb | -0.5 | 20:17:23 | 10° | W | 20:17:51 | 12° | WSW | 20:17:51 | 12° | WSW |
| 08 Feb | -3.7 | 17:48:11 | 10° | W | 17:51:28 | 79° | SSW | 17:54:45 | 10° | ESE |
| 08 Feb | -2.1 | 19:24:51 | 10° | W | 19:27:40 | 27° | SSW | 19:28:01 | 26° | SSW |
| 09 Feb | -2.6 | 18:32:30 | 10° | W | 18:35:36 | 39° | SSW | 18:38:16 | 13° | SE |
| 10 Feb | -1.1 | 19:17:24 | 10° | WSW | 19:19:25 | 15° | SW | 19:21:21 | 10° | S |
| 11 Feb | -1.5 | 18:24:43 | 10° | W | 18:27:24 | 23° | SSW | 18:30:03 | 10° | SSE |
| 13 Feb | -0.7 | 18:17:26 | 10° | WSW | 18:19:02 | 13° | SW | 18:20:37 | 10° | SSW |
| 27 Feb | -1.0 | 06:05:10 | 10° | S | 06:07:08 | 15° | SE | 06:09:08 | 10° | ESE |
| 01 Mar | -1.9 | 05:55:36 | 10° | SSW | 05:58:24 | 26° | SSE | 06:01:13 | 10° | E |
| 02 Mar | -1.3 | 05:04:10 | 11° | S | 05:06:08 | 17° | SE | 05:08:23 | 10° | E |
| 03 Mar | -0.9 | 04:14:00 | 11° | SE | 04:14:00 | 11° | SE | 04:14:54 | 10° | ESE |
| 03 Mar | -2.9 | 05:46:39 | 10° | SW | 05:49:43 | 43° | SSE | 05:52:52 | 10° | E |
| 04 Mar | -2.3 | 04:56:22 | 25° | S | 04:57:20 | 30° | SSE | 05:00:15 | 10° | E |
| 05 Mar | -1.3 | 04:06:00 | 18° | ESE | 04:06:00 | 18° | ESE | 04:07:29 | 10° | E |
| 05 Mar | -3.6 | 05:38:38 | 16° | WSW | 05:41:04 | 67° | SSE | 05:44:20 | 10° | E |
| 06 Mar | -3.3 | 04:48:11 | 45° | S | 04:48:36 | 49° | SSE | 04:51:47 | 10° | E |



## END IMAGES, OBSERVING AND OUTREACH

Messier 38 left and ngc1907 in Auriga

The larger cluster is 4,600 light years away and the smaller one ngc 1907 is 5900 light years away.

Nikon D810a, 60 seconds on TMB102mm refractor..

| Wiltshire Astronomical Society Observing Sessions 2017 – 2018 | | |
|---|---|---|
| **Date** | **Moon Phase** | **Observing Topic** |
| **2018** | | |
| 23rd February | Half Moon | Lunar targets and brighter deep sky objects |
| 23rd March | Half moon | Lunar targets and brighter deep sky objects |
| 20th April | Waxing Crescent | Deep sky objects in the Great Bear and Leo |
| 18th May | Slim Crescent | Jupiter low in the south east, and the return of the Summer Triangle |

**OUTREACH ACTIVITIES**

Arrangements being made with several schools, but dates tbc.

Feb 16th – is stargazing live week but BBC not doing anything.