



# NEWSLETTER

Dec. 2016 - Feb. 2017 Issue 177



*The CAS outreach team with Tim Peake*

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# Editorial

# John Richards

It's that time of the year again, Christmas parties, mince pies, Santa Claus, and (hopefully) dark, crisp skies. While I can't promise the latter, as we reflect on 2016 and look forward to 2017, I can offer this small gift; - the last CAS newsletter of 2016!

We have our regular update on Society business from Theresa, including news of our newly acquired charity status. We also have a report of Tim Peake's visit to Techniquet by both Theresa AND our new Junior Reporter Team of Sam Sherratt and Owen Cornelius. (*Ed. Great article boys, I'll look forward to the next one*). We have Hugh Lang's regular quarterly review of the night sky. This one though is a bit different, in that its been separated into two sections; one for the planets and the other for deep sky objects. Additionally, some images have been added to aid your navigation around the sky. Finally, in a busy quarter for news, I round up the major events in the spaceflight review.

**Merry Christmas from the CAS Committee**

## Publication Dates

The CAS newsletter is published at the first Society meeting of September, December, March & June. The deadline for submissions is 4 weeks before the publication date, and is 7<sup>th</sup> February for issue 178. **Why not attach your article, to an email and send it to me, the Editor at [Publications.Officer@cardiff-astronomical-society.co.uk](mailto:Publications.Officer@cardiff-astronomical-society.co.uk).**

## Contact Details

Have you changed your email address or other contact details recently? If so, you could be missing out on receiving important Society information. Please keep us up to date with any changes. Send your revised details to either our Membership Secretary ([membership.secretary@cardiff-astronomical-society.co.uk](mailto:membership.secretary@cardiff-astronomical-society.co.uk)) or Secretary ([secretary@cardiff-astronomical-society.co.uk](mailto:secretary@cardiff-astronomical-society.co.uk)).

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Visit CAS on the web at

<http://www.cardiff-astronomical-society.co.uk>

General enquiries can be sent to:

[info@cardiff-astronomical-society.co.uk](mailto:info@cardiff-astronomical-society.co.uk)

As a CAS member you can use the Members Area of the web site to view Society handbooks, committee minutes, newsletters and other Society material of note.



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facebook

CAS on facebook at

<http://www.facebook.com/CardiffAS>

# **BEHIND THE SCENES Theresa Cooper**

## **Charitable Incorporated Organisation (CIO) status**

As you may already be aware, on 31<sup>st</sup> October 2016 the Cardiff Astronomical Society became a Charitable Incorporated Organisation (CIO). You should have already received notification on this, via email or post, but if you have any questions about our CIO status, and what impact it will have on the Society, please feel free to contact anyone on the committee.

## **CAS @ Herschel Museum - Bath Spa - 26<sup>th</sup> November**

The Museum was well worth the visit, set up as an authentic Georgian home which included the carpets, wallpaper, his musical instruments,

furniture and fittings. This is interesting enough in itself, but added to that was the privilege of being able to see the actual prism and thermomete



*CAS members outside Herschel Museum in Bath*

rs he used to discover infrared radiation, some of his telescopes and instruments, his correspondence and workshops, and also being able to sit in the garden from where he discovered Uranus. And not forgetting all the work that Caroline did, an accomplished astronomer in her own right, a renowned singer, and she did all that whilst keeping house as well.

We had a good welcome and spent a few hours there until we set up camp in an Italian restaurant for an excellent leisurely lunch with appropriate beverages. This then set us up to face the hustle and bustle of the Bath Xmas markets and the busy but unique city centre.

# **Cardiff Astronomical Society invited to meet Tim Peake**

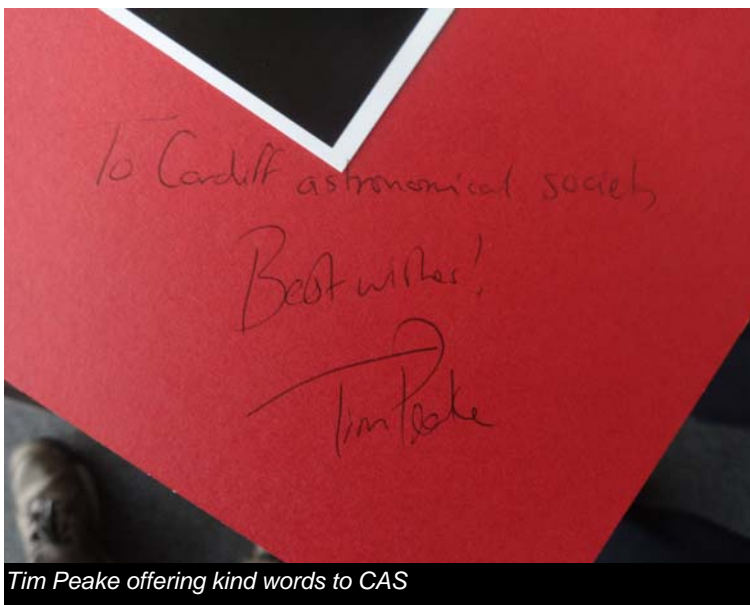
## **Theresa Cooper**

On October 13<sup>th</sup> 2016 the CAS outreach team were among the fortunate to be invited to Wales's version of the Tim Peake tour of the UK. This was held at Techniquet, Cardiff Bay and other attendees included classes of children from several local schools, the First Minister Carwyn Jones, and the Chief Scientific Advisor for Wales, Professor Julie Williams. This was Tim's first venue on the tour and he had flown in from Houston that morning, been driven to Cardiff from the airport and shown into Techniquet. Whenever I've been on a long haul flight overnight I've been shattered for days but he looked absolutely fresh and keen to pass on his enthusiasm and knowledge. But if you can work and sleep on the International Space Station then I suppose you can sleep on an aeroplane.

CAS were asked to bring telescopes, informative displays and activities to engage the junior audience. Mike Foley brought two tables worth of his amazing photographs and kept a crowd of the attendees fully engaged and amazed all afternoon. Kayleigh Churchill (CAS Junior Representative) and her two reliable and helpful assistants Owen Cornelius and Sam Sherratt set out a table of many things of interest for the school children present and she printed, laminated and exhibited information on Tim's Principia Mission. Others such as Rob Jones, Bob Biss, Alan Stephens, Spencer Grennan and Phill Wallace set up telescopes, helped people and children look through them and answered queries from the adults present. Kath Compton inflated the whole solar system with just a small pump and somehow I was volunteered to do an interview with Radio Wales, fortunately that does seem to have disappeared into the ether rather than be broadcast!

Tim received a very warm welcome from the audience and gave an enthralling presentation about his time on the International Space Station from the training involved, the launch and re-entry experiences, and life aboard. Sundays included sometime for relaxation and catching up with events at home, and in common with all our down to Earth lives, Saturday was housekeeping and

cleaning day! He told us about the nicest space food and the menus that weren't so palatable! Because of the nature of the timeline and problems with water leakage into the suit of his fellow astronaut, his spacewalk unusually included ten minutes when he could just look around him towards Earth and into the blackest of black space. He included a beautiful image of Wales in his presentation which he took as close as he could to St. David's Day and enlightened the audience with the statement that space 'smelt' of something burning. Fortunately, this wasn't the case but whenever the airlocks had been open and then closed there was always an aroma of



b u r n i n g  
w h i c h   w a s  
n o t h i n g   t o   d o  
w i t h   t h e  
i n s t r u m e n t s !  
T h e r e   w e r e  
m a n y  
q u e s t i o n s  
a n d   h e   t o o k  
t i m e   t o  
a n s w e r   t h e m  
a l l ,   a n d   a l s o  
t o   o f f e r   m a n y  
p h o t o  
o p p o r t u n i t i e s  
a t   t h e   e n d   o f  
h i s   t a l k .

The CAS team were presented to him and he was very friendly and patient whilst we took selfies, a group photograph and shook his hand. Then he also kindly signed some of Mike's photographs and gave his best wishes to the Society.

He is someone who takes his outreach work very seriously and appears to very much relish these events. ***Thank you very much Tim, for a very enjoyable and unique afternoon!***

# The Night Sky December to March 2017

Hugh Lang

## Part 1 The Planets

In December, **Mercury**, at apparent magnitude -0.5 and angular size 5.5 seconds of arc is an evening planet. Its greatest eastern elongation (21 degrees East) occurs on the 11<sup>th</sup> of the month. 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. Due to the planets rapid orbit around the Sun, January sees the planet's separation from the Sun is at a westerly maximum on January the 19<sup>th</sup> (24 degrees), shining with an apparent magnitude of -0.2. Unfortunately for northern hemisphere observers, the planet's shallow angle to the ecliptic will make it a difficult object to view. At the beginning of February the planet will rise a good hour before the Sun, though the planet will still remain difficult to observe.

At the start of December **Venus**, at apparent magnitude -4.2 and some 17 seconds of arc in angular size is found low in the evening twilight. It's so bright it even in a murky sky it still stands out. By January 2017 Venus will be observed as an even brighter object in the south western evening sky after sunset, now at apparent magnitude -4.4 with an angular size 21.7 seconds of arc.

The planet moves from the constellation of Capricornus into Aquarius at the start of this month, then into Pisces on the 25<sup>th</sup> of the month. At the beginning of February, Venus is now some 39% lit phase, at apparent



Approximate location of Venus at 18:00 GMT on 15th Jan 2017

magnitude -4.8 and apparent angular size of 31 seconds of arc, and will be separated from the Sun by some 46 degrees, meaning it sets nearly four and a half hours later after the Sun. By the end of

February the planet's size will have grown to some 41 seconds, and will be observed through a telescope as a 17% lit crescent. The planet will remain in the evening skies until in the second half of March when it becomes too close to the Sun for observation.

In December **Mars** is located in the constellation of Capricornus, low in the south western sky at twilight (Apparent magnitude +0.9.) Around the start of the New Year the planet moves into the constellation of Aquarius, and on January 1<sup>st</sup>, Mars, now at 5.7 arc second angular size, will be found about half a Moon diameter (15 arc minutes) away from the planet Neptune. By mid-month the planet will have again moved on into the constellation of Pisces having made a very brief encounter, skirting the constellation of Cetus on February 7<sup>th</sup>. For most of this year Mars is fading in magnitude as it moves ever further away from the planet Earth. By the end of this month the planet dims to apparent magnitude +1.3 and through a telescope will be observed as no more than a tiny disk of around 4.6 seconds of arc.

At the start of December, **Jupiter** (apparent magnitude -1.8 and angular size of 32.8 seconds of arc) is rising in the east well after midnight amongst the stars of the constellation Virgo. The Planet, increasing in size and brightness (apparent Magnitude -2.1 and 38 seconds of arc diameter,) moves to within eight Moon diameters (four degrees of Virgo's first magnitude star Spica, on the 21<sup>st</sup> of January. On the 6<sup>th</sup> of February Jupiter having now reached its stationary point starts retrograding amongst Virgo's stars, still increasing in brightness and angular size. It will again pass within four degrees north of Spica on February 23<sup>rd</sup>. By the end of the month of February Jupiter's apparent diameter will about 42 seconds of arc and have an apparent magnitude of -2.4.

At the start of December, **Saturn** is located in the constellation of Ophiuchus, deep within the Sun's glare and to all intents and purposes not observable safely. The planet then makes conjunction with the Sun on the 10<sup>th</sup> of the month. Saturn will reappear as an early morning object late in January rising in the twilight sky at apparent magnitude 5.8, with an apparent globe diameter of 15 seconds of arc and with its rings spanning some 35 seconds of arc. Saturn's northern hemisphere is currently pointing in our direction.

By February 25<sup>th</sup>, Saturn crosses in to the constellation of Ophiuchus; the planet's apparent magnitude and angular size remaining constant.

Throughout the period of this article the apparent magnitude of **Uranus** is a relatively constant 5.8 – 5.9. During December its apparent angular size 3.6 seconds of arc and the planet is visible in Pisces, well positioned for observing. Uranus remains in the constellation of the fish throughout the year. From mid-January it can only be seen in the evening sky until late March when it becomes too close to the Sun for observation.

**Neptune** is nearly always an elusive planet to find, with apparent magnitude of around +7.9 for the duration this article covers. It's apparent angular size is a very small 2.2 seconds of arc and is best observed using binoculars or a small telescope during the early evenings of December in the SW sky. On 31<sup>st</sup> December and 1<sup>st</sup> January, Mars provides a signpost to Neptune, and offers a rare opportunity to see these two worlds in the same binocular field of view when Mars is separated from Neptune by around 20 minutes of arc (approximately 2/3 of the diameter of the Full Moon).

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## Spaceflight Round-Up

In one of his last acts as US President, Barack Obama, bestowed honours on two of the pioneers of computing. Few will have heard of either, but without both it is highly unlikely that men would have landed on the Moon within the time-frame they did. **Margaret Hamilton** and **Grace Hopper** were awarded (posthumously in Grace's case, as she died in 1992) the Presidential Medal of Honour, the highest civilian honour any American can receive. Margaret Hamilton was employed as a computer programmer in the Apollo Programme, and was responsible for writing the on-board flight software for NASA's Apollo command modules and lunar modules. Grace, known as “Amazing Grace” and “the first lady of software,” was at the forefront of computers and programming development from the 1940's through the 1980's. Hopper's work helped make coding languages more practical and accessible, and she created the first compiler. She even appeared as a guest on



Letterman in 1986 explaining the concept of a nano-second to him. Without their diligence, immense hard work and ability to overcome hurdles, the world would be a very different place. I think both women are amazing.



*Margaret Hamilton receiving her Presidential Medal of Honour*

On its latest, and 2<sup>nd</sup> close approach, while still 13 hours from closest approach, NASA's **Juno** probe unexpectedly entered 'safe mode' on 19<sup>th</sup> October. Due to the highly eccentric orbit of the probe (see last newsletter), Juno captures detailed data on Jupiter only during these close flyby events, sending the data back to Earth during its 'coasting phases' (when the probe is further from Jupiter) 'Safe Mode' is the mode where all scientific instruments are turned off, and Juno orientates its solar panels to the Sun to gain maximum power. Scientists are unsure why the probe entered 'safe mode', but don't think it was due to the intense radiation around Jupiter. The craft has since returned to normal flight mode, but the 'planned science data collection for (perijove 2) did not occur'. As Juno is designed for only 36 orbits of the giant planet, losing one flyby, and all its commensurate science data is a blow. Perijove 3 begins on the 11<sup>th</sup> December. This was the 2<sup>nd</sup> recent issue with the probe. Earlier, mission specialists noticed an issue with some of the thrusters on the probe, that prevent it from flying correctly. During its 1<sup>st</sup> flyby (perijove 1), in August, Juno flew closer and faster to Jupiter than any other probe, flying only a few hundred miles above the cloud tops, returning stunning imagery that mission specialists, and scientists generally will be pouring over for years.

Almost as the last issue went to press, **SpaceX**, suffered a highly unusual "static (non-flight) test" explosion, causing the complete loss of the Falcon 9 rocket AND the Amos-6 satellite. An immediate decision was made to ground the entire SpaceX fleet, until the cause could be found. SpaceX were keen to try to return to flight with a scheduled launch in November, but as of now (4<sup>th</sup> December)

no future launch dates have been provided. While sabotage was initially proposed as a reason for the failure, it has been recently suggested that a helium tank carrying the gas at a temperature of  $-269^{\circ}\text{C}$  may have been the cause of the explosion. But helium is non flammable I hear you say. Well, the suggested explanation is that the rupturing of the liquid helium tank, overcooled the liquid oxygen and this was what actually exploded.

On 15<sup>th</sup> September China launched its second Space Station, **Tiangong-2**, followed just over a month later by the launch of 2 taikonauts to test the station on a 30 day mission. Jing Haipeng and Chen Dong tested station capabilities, and conducted experiments involving silkworms and lettuces, while ground control monitored brain activity of the taikonauts. They returned safely to Earth on 16<sup>th</sup> November, shown live on Chinese Television, marking the longest mission in Chinese manned spaceflight history. While Chinese taikonauts were testing out their new space station, the Chinese also successfully launched the Long March 5 rocket on its maiden flight. Designed as a “heavy launch vehicle” the **Long March 5** rocket is destined to carry up to 14 tonnes of payload to Geostationary orbit, and will greatly assist in the building of Chinese components for any future space stations, and possibly a stepping stone to a Chinese attempt to land men on the Moon.

As well as the visit of Tim Peake (see Behind the Scenes and Junior Articles), October saw the visit of Apollo astronaut Al Worden to our shores. Organised by Dark Sky Wales, the evening, at the Parc and Dare Theatre in Treorchy was a huge success, attended by a large number of people, and quite a few Society members.

A ‘croaky’ (he managed to catch a cold during his visit) Al Worden, Command Module Pilot on Apollo 15, regaled us with stories of his early life, his adventures as a test and fighter pilot, and what it feels like to be the ‘most isolated man in the World’, when while orbiting the Moon he was more than 2,000 miles away from the nearest human being. Many stories ensued, including how the Apollo 15 crew hoodwinked NASA on the design of their mission patch. A ‘Question and Answer’ session followed, moderated by self-confessed Apollo ‘nut’ Nick Howes (speaking to the Society on Jan 5<sup>th</sup> 2017 on ‘The Apollo Programme’) when Al further expanded with

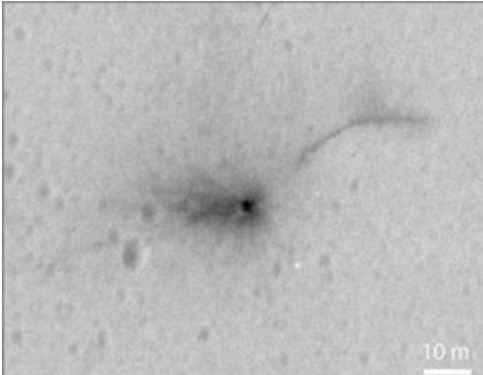
his 'matter of fact' approach to the first deep space EVA, and seeing the Earth and Moon, simply by 'turning my head' and was he ever scared before going to space. His observations were illuminating and very enjoyable, and several members of the Society who attended felt we'd met a very humble legend. At the obligatory book signing afterwards, Al was particularly impressed with Theresa, who showed him her **ORIGINAL** Apollo press clippings. A great evening.

The customary 6 month changing of **ISS** crew continued in October, when first Kate Rubins, Anatoly Ivanishin and Takuya Onishi returned to Earth in a Soyuz craft after a 115 day mission aboard the International Space Station. The ISS crew, then down to 3, was brought up to its full complement of 6, when on 17<sup>th</sup> November, Soyuz MS-03 (the 3<sup>rd</sup> flight of the newly modified, all digital craft) launched from Baikonur carrying Russian Commander Oleg Novitskiy, Flight Engineer Thomas Pesquet from ESA and American astronaut Peggy Whitson, the oldest woman to fly into space. This is her 3<sup>rd</sup> spaceflight. They are scheduled to stay aboard Station until around April 2017.

As I write this article, it has been confirmed the latest Russian resupply mission, Progress MS-04, to the ISS has failed to reach orbit, and burned up in the upper atmosphere. A fault developed, around six minutes into the flight, during the 3<sup>rd</sup> stage burn, only around two minutes from achieving preliminary orbit. Carrying more than 2,000kg of cargo, it isn't thought the loss of the vessel will cause any undue pressure on the consumables already aboard the Station.

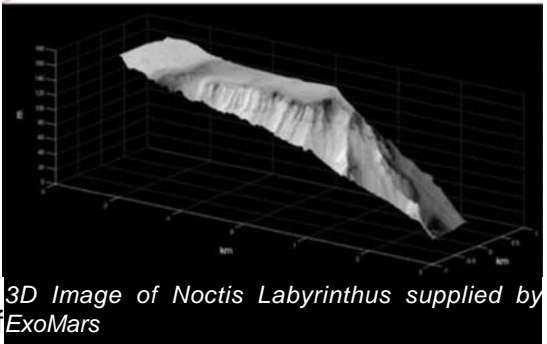
If 2016 was summed up by one event, it had to be the exciting prospect and then crashing disappointment (literally) of **the ExoMars/Schaparelli** lander. The ExoMars probe entered orbit around Mars in October and ESA, and the world, held its breath as the test Schiaparelli probe (a much larger version is due to be launched in 2020/21) was released. While initial telemetry received from the probe suggested all was well, tension began to mount as the scheduled landing time came and went, with no contact from the lander. Over the next few days scientists began to piece together

what had happened. It appears as though contact with the probe was lost around a minute before the landing. It also appears that the probe received conflicting details of its altitude, and jettisoned the parachute and shroud too early, meaning the probe slammed into the Martian surface. A picture taken by NASA's Mars Reconnaissance Orbiter confirmed this a few days later, when they released an image of the crash site. Ejecta can clearly be seen from the site of the proposed impact,



MRO image showing Schiaperelli impact

suggesting that Schiaperelli was travelling far faster than was intended when it hit the Martian surface. On the positive side however, the ExoMars orbiter released its 1<sup>st</sup> images of the Martian surface, including the first stereo reconstruction of Noctis Labyrinthus on Mars.

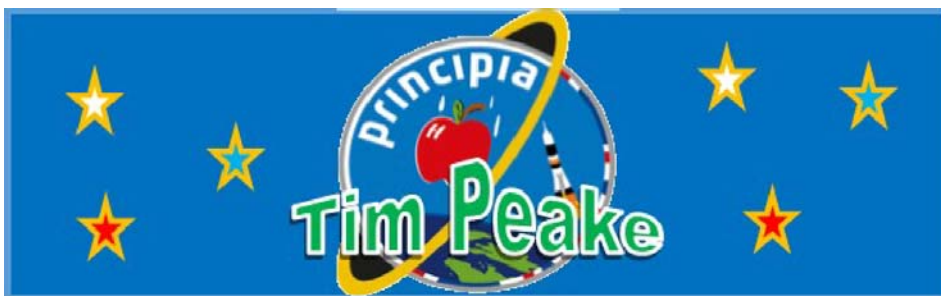


3D Image of Noctis Labyrinthus supplied by ExoMars

Research ministers meeting on 1<sup>st</sup>-2<sup>nd</sup> December, decided to fully fund the next phase of the ExoMars mission, for a larger, UK assembled rover, to be sent to the Red Planet in 2021. Now all they need to do is find the £400 million it will cost to fund.

Goodbye and farewell to **Rosetta**, which landed on Comet 67P Churyumov-Gerasimenko on the 30<sup>th</sup> September.

After such an eventful year, with both Brexit (perhaps effecting Britain's burgeoning multi billion pound space industry) and the election victory of Donald Trump to the Presidency, potentially impacting how spaceflight is funded, and WHAT is funded, these could be interesting subjects to report upon in 2017.



## Tim Inspires the Next Generation

### Sam Sherratt and Owen Cornelius

Recently we (Sam Sherratt and Owen Cornelius) were given the opportunity to attend an invite-only event with the Cardiff Astronomical Society (CAS). We are both active members of CAS, and are on its committee; Owen is the Assistant Junior Representative and I (Sam) am the Junior News Reporter. The event was hosted at Techniquet with some very important guests, including the Chief Scientific Adviser for Wales, Professor Julie Williams, Carwyn Jones and



*Tim mesmerizing the young audience with his adventures*

the one and only Tim Peake! When we heard that we had the opportunity to meet Tim we were beside ourselves and couldn't quite believe it. At the event Owen and I were very busy going round handing out CAS membership forms for those interested. We managed to give a membership form and a CAS mug to Carwyn Jones and the same to Tim and Julie.

At the event there was a big media coverage including BBC, ITV and 'Made in Cardiff'. Theresa Cooper, the CAS event organiser, was interviewed live by BBC Radio Wales. Owen and myself got talking to plenty of news reporters as well but sadly didn't manage to get on TV. Overall the event was brilliant and we had a really good time. Owen and I even made it on to Tim's Instagram page!

# Up-coming CAS Public Events

Date	Time	Event	Venue
28 <sup>th</sup> Jan	10am - 4pm	Astronomy and Space Day	National Museum of Wales

Some of our events are organised at short notice, so for further details of events we are organising, please regularly visit the CAS web site (address is on page 2 of this newsletter)

## CAS Lectures September to November

Date	Title	Lecturer
8 <sup>th</sup> Dec.	Introduction to Practical Astronomy	Marc Delaney / CAS
5 <sup>th</sup> Jan.	The Apollo Programme	Nick Howes
19 <sup>th</sup> Jan.	An introduction to Meteorites and Impactites	Dr Jana Horak / National Museum Wales
3 <sup>rd</sup> Feb.	Project Orion	Phillip Wallace / CAS
16 <sup>th</sup> Feb.	Space Dust	Prof Hayley Gomez
2 <sup>nd</sup> Mar.	The Science of Doctor Who: Time Travel and Alien Worlds	Dr Edward Gomez, Las Cumbres Observatory/Cardiff University

## Observing Sessions

Date	Day	Time	Venue
2 <sup>nd</sup> or 3 <sup>rd</sup> Dec.	Fri or Sat	20:00 - 00:00 GMT	Dyffryn Gardens
30 <sup>th</sup> Dec.	Fri	20:30 - 00:00 GMT	Dyffryn Gardens
20 <sup>th</sup> or 21 <sup>st</sup> Jan.	Fri or Sat	20:00 - 00:00 GMT	Dyffryn Gardens
27 <sup>th</sup> or 28 <sup>th</sup> Jan.	Fri or Sat	20:00 - 00:00 GMT	Dyffryn Gardens
3 <sup>rd</sup> or 4 <sup>th</sup> Feb.	Fri or Sat	20:00 - 00:00 GMT	Dyffryn Gardens
24 <sup>th</sup> or 25 <sup>th</sup> Feb.	Fri or Sat	20:00 - 00:00 GMT	Dyffryn Gardens

**NOTE:-** Where two dates are given we will attempt to hold the session on the first date, weather permitting, otherwise we will try again on the subsequent date. All dates are subject to weather conditions. For confirmation of any session please check on the CAS Web site or the CAS Observing line 07535 718 669 for more information.

## FREE ASTRONOMY MAGAZINE

Our friends at Astro Publishing have provided us a free link to their latest **FREE** bi-monthly astronomy magazine. The link for the magazine is shown below:

<http://www.astropublishing.com/FreeAstronomyMagazine.htm>



# Almanac

Compiled by John Richards

## Sun Rise/Set & Twilight

Date	Astronomical Twilight Begins	Sun Rise	Sun Set	Astronomical Twilight Ends
1 <sup>st</sup> December	05:54	07:55	16:07	18:08
8 <sup>th</sup> December	06:01	08:04	16:04	18:07
15 <sup>th</sup> December	06:07	08:11	16:03	18:07
22 <sup>nd</sup> December	06:12	08:16	16:06	18:10
29 <sup>th</sup> December	06:14	08:18	16:11	18:14
1 <sup>st</sup> January	06:14	08:18	16:13	18:17
8 <sup>th</sup> January	06:14	08:16	16:22	18:24
15 <sup>th</sup> January	06:11	08:11	16:32	18:32
22 <sup>nd</sup> January	06:06	08:04	16:43	18:41
29 <sup>th</sup> January	05:59	07:55	16:55	18:52
1 <sup>st</sup> February	05:55	07:51	17:01	18:56
8 <sup>th</sup> February	05:46	07:39	17:13	19:07
15 <sup>th</sup> February	05:34	07:26	17:26	19:19
22 <sup>nd</sup> February	05:21	07:12	17:39	19:30

## Meteor Showers

Date	Meteor Shower	RA	DEC	ZHR
9 <sup>th</sup> Dec.	Puppis-Velids	9h00m	-48 <sup>o</sup>	15
14 <sup>th</sup> Dec.	Geminids	7h28m	32 <sup>o</sup>	75
23 <sup>rd</sup> Dec.	Ursids	14h28m	78 <sup>o</sup>	5
26 <sup>th</sup> Dec.	Puppis-Velids	9h20m	-65 <sup>o</sup>	15
4 <sup>th</sup> Jan.	Quadrantids	15h28m	50 <sup>o</sup>	80

## Star Party and Observers Club Meetings

Date	Day	Time	Venue
30 <sup>th</sup> Dec.	Friday	19:30 - 21:30 GMT	Dyffryn Gardens
20 <sup>th</sup> Jan	Friday	19:30 - 21:30 GMT	Dyffryn Gardens
24 <sup>th</sup> Feb.	Friday	19:30 - 21:30 GMT	Dyffryn Gardens

We always hope for clear skies, but the Star Party will go ahead as planned, regardless of the weather, and are held at Dyffryn Gardens unless otherwise stated.

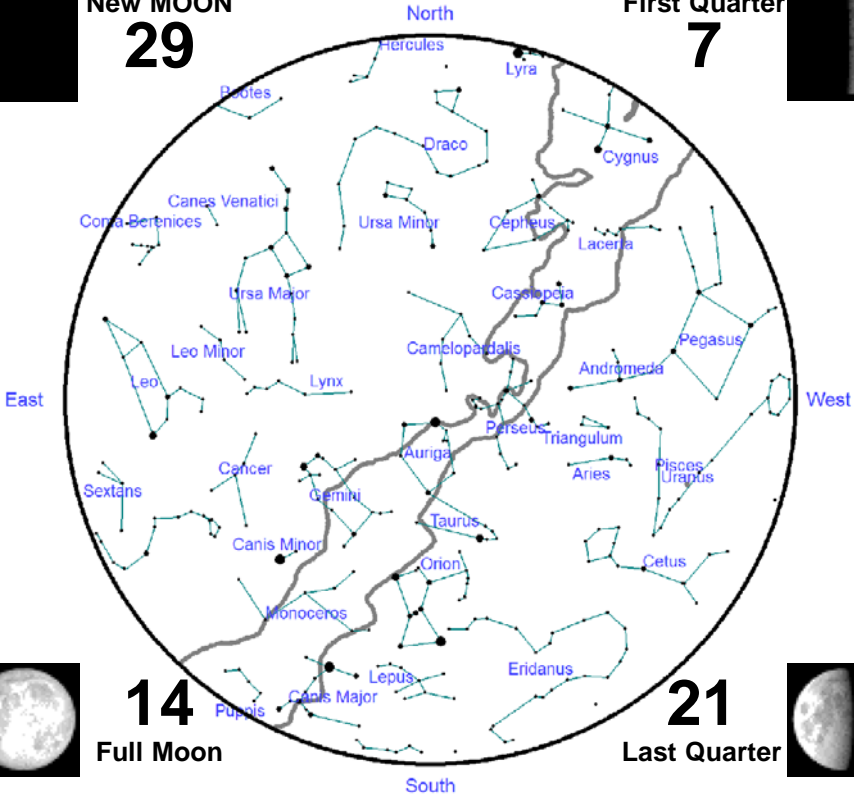
# Almanac December

New MOON

29

First Quarter

7



14

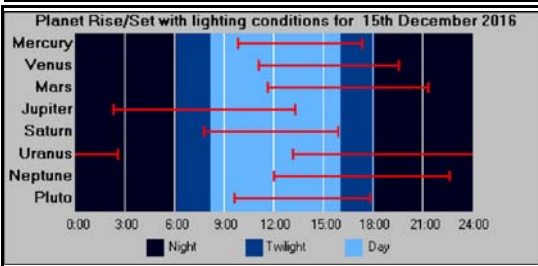
Full Moon



21

Last Quarter

	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Sagittarius	18h59m26s	-24°10'34"	09:46	17:19	-0.2
Venus	Capricornus	20h46m12s	-20°17'17"	11:06	19:32	-4.2
Mars	Capricornus	21h57m17s	-13°43'12"	11:38	21:21	+0.8
Jupiter	Virgo	13h12m04s	-06°18'55"	02:15	13:17	-1.8
Saturn	Ophiuchus	17h14m15s	-21°43'16"	07:44	15:51	+0.6
Uranus	Pisces	01h17m13s	+07°29'33"	13:08	02:34	+5.8
Neptune	Aquarius	22h55m31s	-07°47'06"	12:05	22:51	+8.0
Pluto (Dwarf)	Sagittarius	19h20m18s	-21°12'37"	09:46	18:00	+14.3



## Planet Events

10th Saturn at Conjunction.  
 25th Mercury at Perihelion(0.31 A.U.).  
 28th Mercury at Inferior Conjunction.

The data presented here is for the 15<sup>th</sup> December. Positional data is at 00:00 GMT/UT

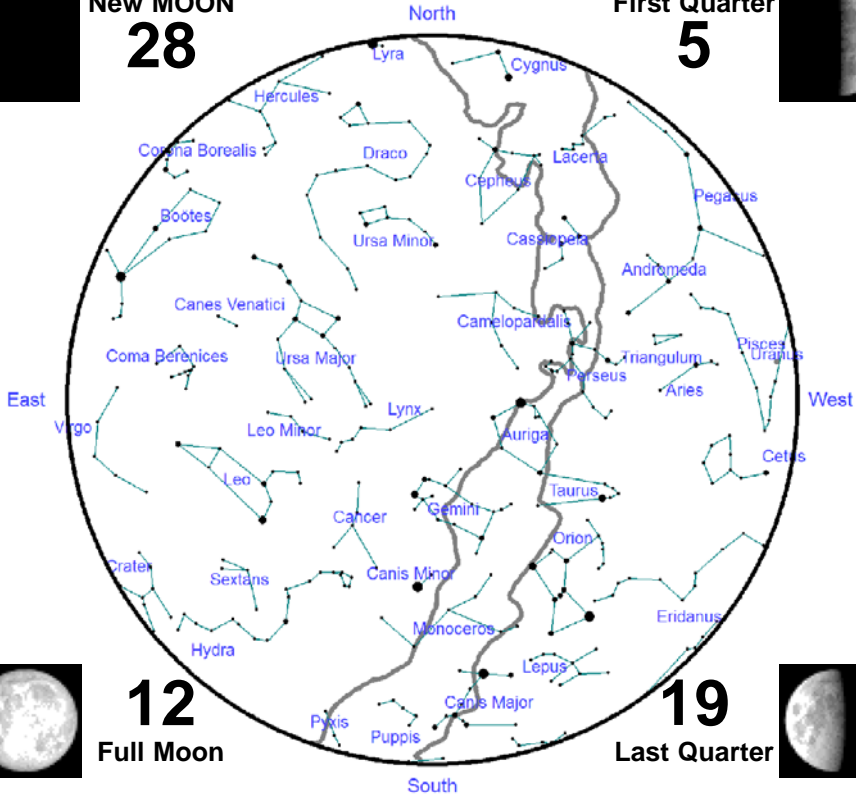


# Almanac January



New MOON  
**28**

First Quarter  
**5**

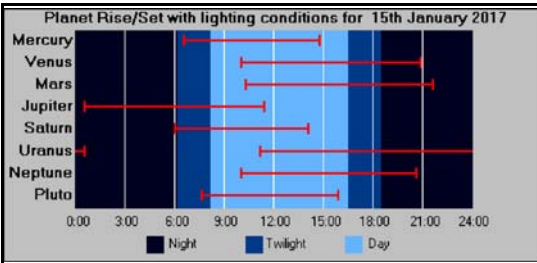


**12**  
Full Moon

**19**  
Last Quarter



	Constellation	R.A	Dec	Rises	Sets	Mag.
<b>Mercury</b>	Sagittarius	18h06m32s	-21°21'31"	06:32	14:44	-0.1
<b>Venus</b>	Aquarius	22h54m35s	-07°15'56"	09:59	20:51	-4.4
<b>Mars</b>	Aquarius	23h24m33s	-04°31'11"	10:15	21:35	+1.0
<b>Jupiter</b>	Virgo	13h24m46s	-07°28'06"	00:32	11:22	-2.0
<b>Saturn</b>	Ophiuchus	17h29m23s	-21°57'55"	05:59	14:03	+0.6
<b>Uranus</b>	Pisces	01h17m18s	+07°31'17"	11:07	00:32	+5.8
<b>Neptune</b>	Aquarius	23h02m00s	-07°10'37"	10:06	20:59	+8.0
<b>Pluto (Dwarf)</b>	Sagittarius	19h27m27s	-21°31'54"	07:54	16:03	+14.3



## Planet Events

3rd Earth at Perihelion (0.98 A.U.)

The data presented here is for the 15<sup>th</sup> January positional data is at 00:00 GMT/UT

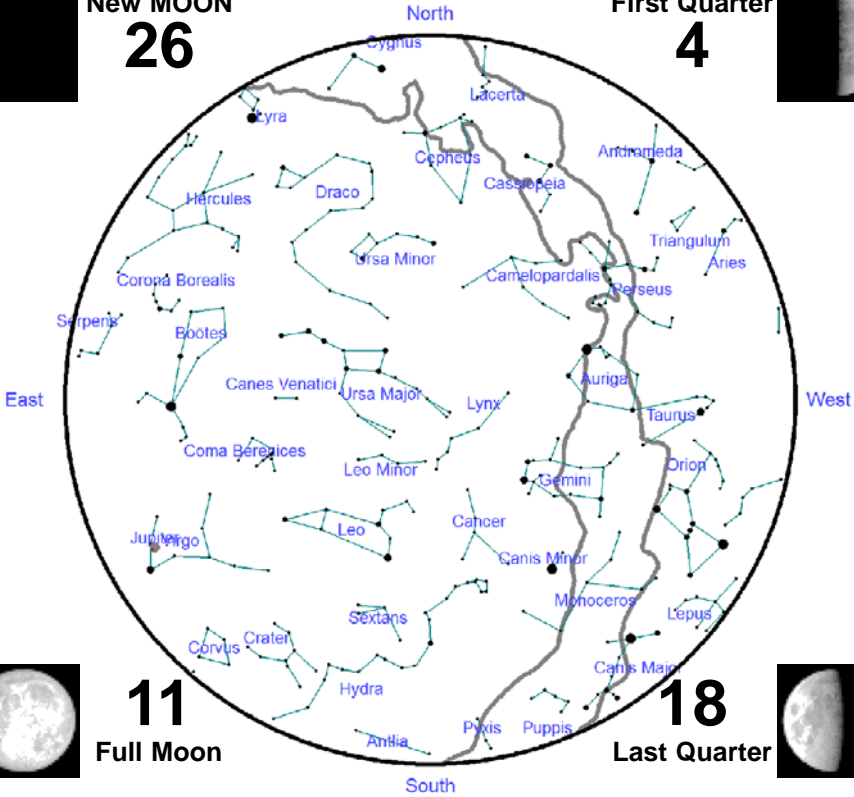
# Almanac February

New MOON

26

First Quarter

4



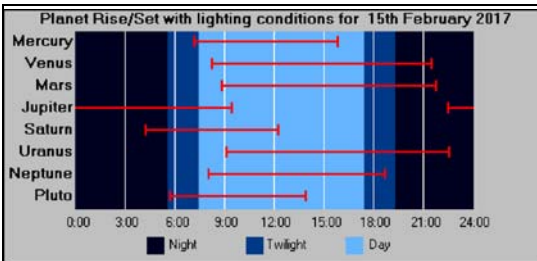
11

Full Moon

18

Last Quarter

	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Capricornus	20h58m39s	-19°02'40"	07:07	15:48	-0.4
Venus	Pisces	00h22m18s	+06°43'02"	08:14	21:27	-4.6
Mars	Pisces	00h48m48s	+05°03'11"	08:49	21:45	+1.2
Jupiter	Virgo	13h27m24s	-07°35'31"	22:29	09:22	-2.2
Saturn	Ophiuchus	17h41m46s	-22°04'26"	04:10	12:12	+0.5
Uranus	Pisces	01h20m22s	+07°50'50"	09:06	22:31	+5.9
Neptune	Aquarius	23h02m08s	-07°09'45"	08:04	18:57	+8.0
Pluto (Dwarf)	Sagittarius	19h27m33s	-21°31'47"	05:52	14:01	+14.3



## Planet Events

- 18th Jupiter at Aphelion (5.46 A.U.).
- 20th Venus at Perihelion (0.72 A.U.).

The data presented here is for the 15<sup>th</sup> February, positional data is at 00:00 GMT/UT

# The Night Sky: The stars

Hugh Lang

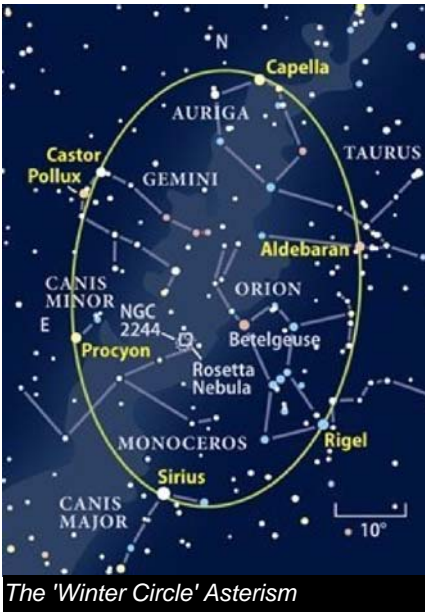
This time of year generally heralds the most miserable of British weather: icy blasts, driving, freezing rain or snow from the north or west, with the worst of the snowy weather generally emanating from the north and east. Having said that, when it is clear, especially after a rain-laden cold front has passed over, we can look forward to the best and longest of the year's clear and stable night skies, that stretch overhead from all points of the compass. The countless numbers of stars, scattered everywhere on the celestial dome, appearing like searing points of light that perforate the inky black canvas to some bright beyond! OK, well enough of that wild rambling for this quarter. What can one really expect to see on the odd clear night that lives up to the above expectation over the next three months? Obviously this will depend on where you are actually observing from; a bright city will only allow you to observe, maybe, 50-60 of the brightest stars. If you're lucky, and it's crystal clear, maybe after a rain storm has cleared the smog from the sky, then maybe a couple of hundred stars, down to magnitude two or three can be observed from a city back garden. That's enough to discern the pattern of constellations, but to get the best out of the night sky you need to be out in the countryside, well away from the light pollution. That's where the sky will present its real vista, so many stars that even regular sky gazers can get confused, as the constellations are completely overwhelmed by the myriads of fainter stars, (coupled with the observers much improved night vision) So, in brief, if the Society announces a public observing session then try to attend. I can assure you that you won't be disappointed; it's well worth the effort.

Now if you ask any member of the general public to name some winter constellations I would suspect that the three most popular answers would likely be Cassiopea, The Plough and Orion. Obviously the Plough is incorrect as it's an asterism (more on that later). Cassiopea, is an easily recognised 'W' pattern in the sky, and Orion actually looks like what it's supposed to represent. However, there is more to the constellation of Orion than meets the eye! It's a constellation with a stellar nursery whose nebulosity, from a very

dark site, can even be glimpsed by the naked eye. The top left hand star is the brilliant red star Betelgeuse (Armpit of Orion), a star coming to the end of its life, and so large that its diameter would encompass a large part of our solar system (though currently it appears to be shrinking in size.) It's predicted to be one of the nearest stars to become a novae, and when it 'blows up' it will be bright enough to be seen in the daytime, likely brighter than the full Moon!. The bottom right star of Orion is Rigel, a star forty thousand times brighter than our Sun, and some 773 light years away. The 'Belt of Orion' comprised of hot young stars no more than 10 million years old. The three brightest are named **Alnitak**, **Alnilam** and **Mintaka**. Hanging down from the belt is the great 'Sword of Orion', part of which is the great Nebulae M42, a large stellar nursery, and one of the few emission nebulae to be seen with the naked eye. To me it looks like a fuzzy gleam in the sword of Orion. A small telescope will show the four Trapezium stars though there actually are actually six, but two are very faint; buried in a greenish grey glow caused by the many forming stars lighting up the gas and dust contained within the nebula. This nebula is one of the nearest star forming regions to the solar system. More than a thousand or so stars are in the process of been created in this stellar nursery. The nebulae are some thirty odd light years in diameter and around one thousand three hundred odd light years distant. The whole thing resembles the shape of an Angel fish, and is easily seen through a small telescope. In mythology Orion was the son of Poseidon and a mortal mother. He thought himself invincible, that is until he came across and decided to kill a puny scorpion. Thinking nothing of it, he trod on this poor creature; the scorpion was not amused about its demise and so fatally stung Orion, on his heel. Both these unfortunate characters were then placed in the sky exactly opposite each other; hence we see Orion as a mid-winter constellation and Scorpius as a mid-summer constellation. Located towards the lower left of Orion when facing south or below, we have Canis Major, one of Orion's hunting dogs. It is home to **Sirius**, the brightest star in the sky. Sirius is around 8.2 light years away, so in galactic terms, is a next door neighbour. Sirius is actually a two (binary) star system. Sirius B, the companion star, is a white dwarf, and was discovered

by Alvin Clark, in 1835. Sirius was one of the more important celestial objects as it was used as a time marker, promoting harvests and celebration in certain early cultures. Its first appearance at dawn led the Egyptians to celebrate a New Year, its return generally preceded the annual flooding of the Nile. The constellation has many deep sky objects, a galactic cluster **M41**, an open cluster visible to the eye from a darkish site, it's located where you would find the dog's heart. Contained within the boundaries of Canis Major you can hunt down **NGC2534**, an open cluster, **2539** The Wild duck Nebulae, **NGC2362**, a small open cluster and **NGC2360**, a large open cluster. All these objects should be easily observed with a small telescope from dark skies. One also easily notices in January's radiant skies, the so-called Winter Triangle consisting of the stars of Sirius, Procyon and Betelgeuse, a roughly equilateral triangle. It's the seasonal opposite of the Summer Triangle which vanished from our skies three months ago. On the other side of the Milky Way, in Canis Minor, is mighty Procyon, seven times brighter than the Sun. Its name in Greek means "before the dog", meaning that it always rises before Sirius, the Dog-Star. The last member of the Triangle, Betelgeuse, is 640 light-years from Earth and is a supergiant. It can be recognised by its reddish colour. It is brighter than more than 10,000 Suns and is so huge that if it replaced the Sun, its diameter would stretch out beyond the orbit of Jupiter! And speaking of size, the largest known star in the Universe is just south of Sirius. The diameter of VY Canis Majoris would stretch out even beyond Saturn if it replaced the Sun. This star is thought likely to explode as a supernova. When this happens its light should be visible on Earth in the daytime, but fortunately for our health it is nearly 5,000 light-years away.

The Winter Triangle is what's known as an asterism, It's not a constellation; just a recognised pattern of stars which can be composed from either one or many constellations. Another more well-known asterism is the Big Dipper or The Plough, part of Ursa Major (The Big Bear). The Winter Triangle is part of a much bigger asterism known as the winter hexagon, or winter circle, made up from the brightest stars of six constellations, Capella in Auriga, Aldebaran in Taurus, Rigel from Orion, Sirius of Canis Major,



Procyon of Canis minor and finally Pollux in Gemini. Memorising the location these stars is an easy way of finding your way around the winter night sky (see image left).

Moving overhead and north of the Winter Triangle, resides Capella, the brightest star in Auriga. Auriga is a conspicuous pentangle shape; found roughly overhead in the late evening in the month of February. We are actually peering through the deeper portions of our galaxy's Orion arm, and observe that the number of stars and galactic clusters increases. This constellation

is home to the star Eta Auriga, a strange variable star. It was recently discovered to be caused by a flat, dark disk of material orbiting and currently passing in front of the star. The constellation of Auriga is home to three fine open star clusters. They all show as glows in binoculars and resolve into a myriad of pin pricks of light in a small telescope. It's just possible to see all three objects at the same time in a pair of wide field binoculars. The first of these three; **M36** is the smallest of the three clusters (1/3 the diameter of the full Moon), and is estimated to be fourteen light years in diameter and is located five degrees southwest of Theta Auriga. The cluster contains some 60 member stars of magnitudes between 9 and 14 and is estimated to 4,100 light years from our solar system. If you look carefully then you will likely notice that several of its brightest stars look as if they are arranged in roughly parallel rows. The open cluster **M37** is spread over roughly eight Moon diameters and found east-southeast of M36, again some 4,000 light years from Earth. This is the richest and brightest of the three clusters with about 500 stars. This cluster has an apparent diameter of just less than that of the full Moon (it's actually about 25 light years in diameter) and an ideal object for a small telescope or medium sized binoculars appearing somewhat like a triangular grouping. Look for a bright

orange star near the centre. Shift almost four Moon diameters northwest of M36 and you will sweep into **M38**. It's a big and bright showpiece of an open cluster presenting itself as a scattered group of stars; this open cluster has a distinctly irregular shape. M38 is composed of some 100 stars about magnitude 10 and fainter. The full apparent diameter of the cluster is slightly less than the diameter



*M36, M37 and M38 in Auriga*

of the full moon. This cluster is about 4,000 light years away from our solar system. It's best seen with a medium magnification, around 30x, in a small telescope. To the west side of Auriga resides the constellation of **Perseus**. Sweeping more or less toward the North West we observe the familiar W shape of Cassiopeia. Midway

between these two constellations you may discern a faint misty patch of light emanating from Caldwell 14, better known as the Double Cluster, a young grouping of stars, some twelve million years old, containing 300 super giant stars. It's a real treat to behold in binoculars or a telescope. As we look away from the Auriga, towards the south-southwest we will observe Taurus the Bull and Orion. To the lower left of Orion is Canis Major. With Gemini the constellation of the twins situated to the eastward side with the constellation of Taurus, Auriga and Perseus. If we now extend a line through Rigel and Betelgeuse, we should observe the two brightest stars of the constellation of Gemini. Castor a multiple system, consisting of three double stars, and Pollux, actually the brighter of the two stars in this constellation, and known to have an extra solar planet (it's not likely to harbor life, well not as we know it, to again coin a well-known phrase.) The constellation is close to the Milky Way and therefore has many optical double and multiple star systems close to and within its boundaries. Objects to look for include a bright planetary 'The Eskimo Nebulae' **NGC2932, IC433**, a large super novae remnant, quite faint; and **M35**, a very nice open

cluster containing many hundreds of stars that can be glimpsed by eye when the sky conditions are good. Between Gemini and Canis Major we arrive at the not very distinct constellation of Monoceros, the Unicorn. Looking through the constellation we are glimpsing along the Orion arm of our galaxy. In actual fact this area is fairly devoid of stars, certainly no real recognisable patterns as such. The constellation however is the location of the Rosette nebulae. The nebula is a difficult object to observe, as it's angular size is quite large, and has a very low surface brightness. It certainly won't be visible in light polluted skies, but it's quite stunning when imaged with a CCD. To the east side of Gemini lies Cancer the crab. It's not a very distinguishable constellation in city skies. In fact, it is the dimmest of all the constellations, but is home to one of the better open clusters, **M44**. The Praesepe or Beehive is one of the nearest clusters to the solar system. The constellation of Leo, is now just peaking above the eastern horizon. Meanwhile the water constellations of Pisces, Cetus and the winding river Eridanus are now sinking below the south western horizon, accompanied by Andromeda and Pegasus setting toward the west and north western horizon. At the start of December the bowl of The Plough facing the north western horizon will continue to slowly rotate to face north and by early March Orion and Canis Major will be sinking below the south and western horizon as will Taurus the Bull in the west, to be replaced by the spring constellations of Leo and Virgo on the ecliptic. The bright star Arcturus will be rising more or less due east, while the southern skies will be bereft of bright stars with only the winding constellations of Hydra Sextant and Crater visible.

## **Meteors**

The **Geminids** meteor shower can be seen from the 8<sup>th</sup> to the 17<sup>th</sup>, each December. The maximum takes place on the 13<sup>th</sup> December. Unfortunately this year, the Moon is full and this will seriously limit the number of meteors you will see. The shower is associated with asteroid 3200, Phaethon. Finally, the **Quadrantids** is the first major meteor shower of 2017, the meteor counts should peak on January 3<sup>rd</sup> (hourly rate around 120) The shower radiant is circumpolar situated in the constellation of northern Bootes. The shower is generally active from December 28<sup>th</sup> to January 12<sup>th</sup>.