

# SKYMATTERS

Blackrock Castle Observatory [www.bco.ie](http://www.bco.ie)  
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**December 2018**

## Things to watch out for

### December 7

The New Moon is one of the best times of the month to observe faint objects such as nebulae and our Milky Way. The Moon will be between the Earth and Sun so its light won't interfere with attempts to view dimmer astronomical targets.

### December 13/14

The Geminids Meteor Shower will run from the 6th to the 16th, but will peak on these nights. Often considered one of the best meteor showers, capable of producing up to 120 meteors at the zenith per hour, and will be visible quite early thanks to an early moonset on these dates this year.

### December 15

Mercury at Greatest Western Elongation. The planet Mercury reaches greatest western elongation of 21.3 degrees from the Sun. This is the best time to view Mercury since it will be

at its highest point above the horizon in the morning sky. Look for the planet low in the eastern sky just before sunrise.

### December 21

December Solstice. The December solstice occurs at 22:23 UTC. The South Pole of the earth will be tilted toward the Sun, which will have reached its southernmost position in the sky and will be directly over the Tropic of Capricorn at 23.44 degrees south latitude. This is the first day of winter (winter solstice) in the Northern Hemisphere and the first day of summer (summer solstice) in the Southern Hemisphere.

### December 22

The Full Moon will fall at the end of December, bringing extra light into the sky. This makes fainter objects harder to see. The Moon is in the sky from sunset to sunrise, so this is one of the best nights for lunar observations given good weather.

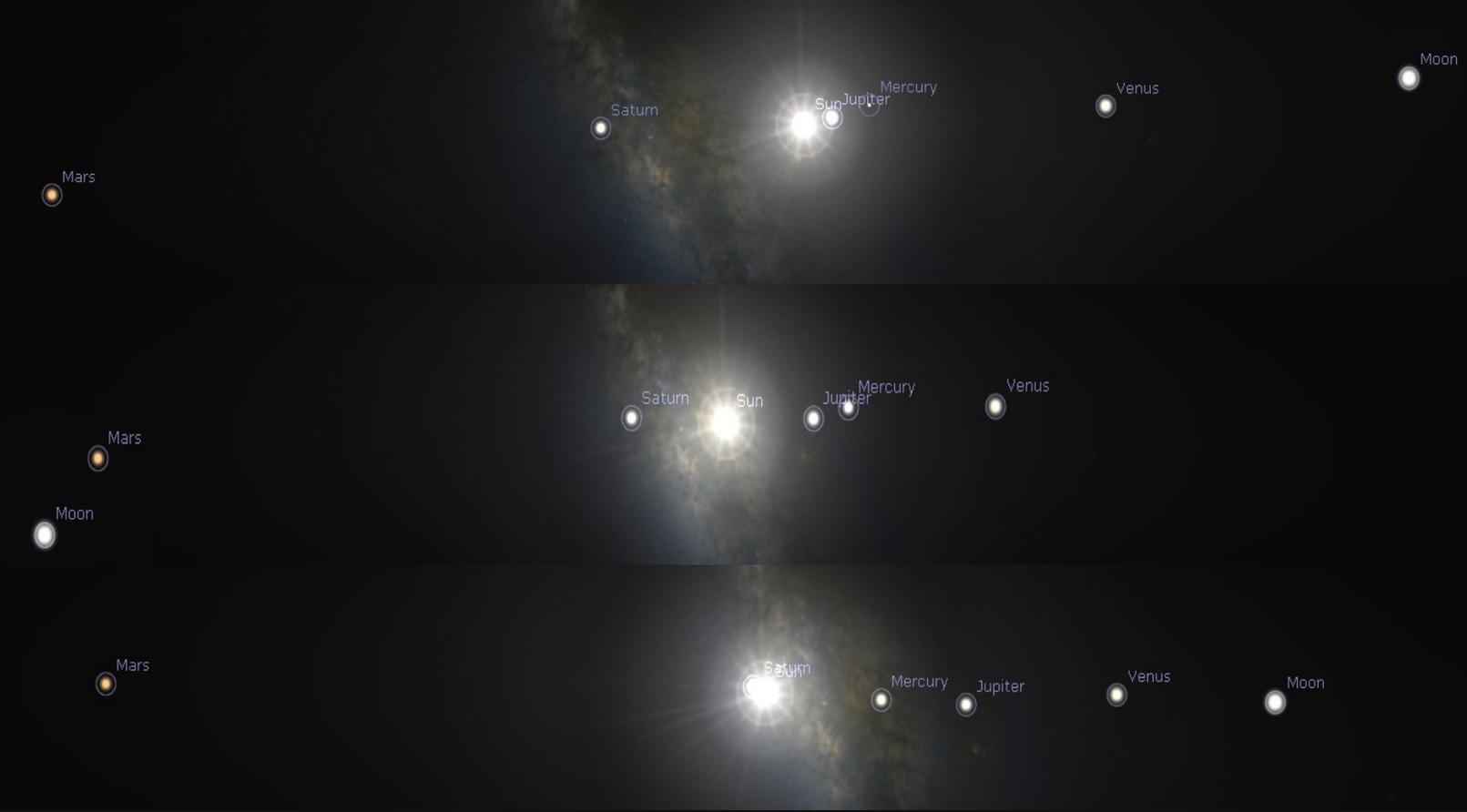
### December 21, 22

The Ursids Meteor Shower runs from the 17th to the 26th, but will peak on these nights. A small shower, usually only producing 5-10 meteors an hour at the zenith. Best seen in the early morning before the glow of dawn obscures them.

**Top Image:** This is a view to the South at 5 o'clock in the evening on the 9th. Saturn becomes increasingly difficult to spot as the month moves on, becoming impossible after the 15th. Mars however stays visible right into the New Year.

**Bottom Image:** This is a view to the south east on the 13th at 8 o'clock in the morning. All three of these planets will be visible in the sky up until Christmas morning, although Mercury is quite difficult to catch later in the month.





The above images are a view of space from the position of the earth, but free from the blue glow of the atmosphere. This allows the sun and planets to be seen together. The images progress from early in the month at the top to later in the month at the end. Without the limits of the atmosphere, we can see that Jupiter emerges from behind the sun at the beginning of the month, while Saturn moves behind it as we approach the end of the year.

## Our View of the Planets

From here on earth, our view of the planets is limited. Of course, we can only see the planets at night and only if they are above the horizon. Viewing the elliptical orbits of the planets edge on also makes it a little more difficult to understand their motion from here on earth. Rising above the atmosphere helps, but even then, the planets may be on the far side of the sun from us and blocked from view.

Shown at the top of the page is such a view, how the planets would appear from above the earth, during the day, over the course of December. By taking a close look at where the planets are, we can ascertain when we will be able to see these planets, if at all. All of these images are centred on the sun. It is a planets position relative to the sun that really decides if it is going to be visible, so the sun will stay centred to highlight the planets movement. Each image has east on the left and west on the right with the Sun due south.

In the top image for the 1st of December, we can see that Mars is on the far left. This means Mars is on the east of the sun and it is far enough to the east to remain in the sky long after the sun has gone down. Moving across the image towards the west we find Saturn. Saturn is still to the east of the sun, but not as much as mars. Although Saturn is visible above the sun at sunset, it isn't as far, so it won't be in the sky for as long as mars in the evening and it will seem much closer to the sunset. Moving past the sun we can see Jupiter and Mercury, both too close to the sun for us to see on the first of December. Although neither of them is directly behind or in front of the sun, the glow of the sunrise will be bright enough to block them out. Continuing on to the west we have Venus, far enough from the sun that it is visible just above the sunrise in the morning. If you compare Venus' distance to the west of the sun with Mars and Saturn's to the east, you might notice that Venus is about as far west as Saturn is east, not quite as much as mars. This means Venus will be quite close to the sunrise and only visible for a shorter amount of time, just like Saturn in the evening.

Moving down through the images, Mars seems to remain in a similar position all month. As we move around the sun, so does Mars, so Mars appears to move quite little in the sky. Saturn on the other hand ends up right behind the sun by the end of the month. Saturn orbits the sun quite slowly, but the earths motion puts the sun between us and it. Jupiter gets further out from the sun and more visible in the mornings, like Saturn this is as much to do with our motion as Jupiter's, the giant planet orbits the sun more slowly than we do. Mercury however is fast, orbiting the sun in 88 days. It becomes visible early in the month, reaching its most visible on the 8th, and then quickly orbits back into the suns glare by the end of the month. Venus, just like Mars, moves at a speed similar to ours and remains with us all month long.

Over longer periods of time, Venus orbits back into the suns glare and Mars eventually ends up on the far side of the sun from us. Saturn will become more visible in the morning, while Mercury ends up on the other side of the sun and becomes an evening viewing object. All of those changes await us in 2019.



On immediate left, we see Mercury heading towards its greatest elongation, moving out away from the sun. On the right is Mercury at its greatest elongation, the furthest from the sunrise it can appear.

Above right, we see Mercury continue its orbit past it's greatest elongation. This causes mercury to appear to move back towards the sun, in retrograde motion. Above left, we see that Mercury has furthered it's orbit, appearing to bring it past Jupiter which is continuing to move away from the sun, in direct motion.

## What is Retrograde?

With planets orbiting the sun, they normally orbit in the same direction as their parent star spins. So, looking at the solar system from above, if the Sun turns clockwise, then the planets will orbit it in a clockwise direction. If a planet goes against this pattern, or seems to, then its orbit is "retrograde". All of the planets in our system orbit the sun the same way, there is no planet in a permanently retrograde orbit. However, due to the way the planets circle the sun, some of the planets can seem to travel back the way they came. If a planet appears to be moving backward, then it is said to be in retrograde. When ever a planet in our solar system is in retrograde, it simply means that it appears to be going the wrong way.

Why would this matter? In astronomy, knowing which way a planet is moving can help you predict where and when you will see it in the sky. For example, if Mercury is in the "normal" part of its orbit, then in the mornings it will appear higher and brighter each day. If Mercury is in retrograde in the morning, then it will appear lower and for less time each day. In the evenings it is the opposite. We seem to see Mercury popping out from the sun, then turning around and heading back in. Of course Mercury is really orbiting the sun in a similar ellipse to us, but looking at that ellipse from the side causes an illusion, it makes Mercury appear to be moving backward. It appears to be in retrograde.

For ancient people, this was considered by many to be a bad sign. Mercury ( or Hermes to the Greeks) was the messenger of the gods. If he was going backwards, how were the gods to communicate? If the gods were confused, then what would happen to us? Similar ideas held for Venus and Mars, both of whom appear to move backwards at some points of their orbit. This apprehension eased as our measurements of the planets motions improved. With Mercury's short year, just 88 earth days, the regularity of its retrograde motion was seen quite early in astronomy. Mercury appears to go backwards every 44 days or so, after its greatest elongations. Mercury's next elongation is on the 8th of December and it is a western elongation, meaning we'll see Mercury in the morning. After this, Mercury will appear to move back towards the sun. #

Mars on the other hand, only appears to move retrograde for a couple of months every couple of years. This meant it took even more measurements and long term observations to notice and predict these loops. Mars is further from the sun than we are, so its retrograde motion isn't the result of Mars going from in front to behind the sun. Instead, Mars appears to loop in the sky because we are orbiting the sun faster than it, we essentially over take it in our orbit, it appears to move backwards simply because we move ahead of it. This is similar to objects in a rear view mirror appearing to speed away, even if they are moving forward, as long as they are slower than your motion.

Soon Mercury will be in retrograde, and some people may lament the effect this has on them. Of course, Mercury in retrograde does mean it is getting harder to see, so some of us may lament that if nothing else.

## Tips for Astronomy on Winter Nights

The sun is setting early, the nights are getting long and dark. Winter might not be everyone's favorite time of year, but it is a great time for astronomy. However, the chill we are all feeling can make standing out with a telescope seem a little uninviting. Here are a few tips to make your winter night excursions as comfortable as possible.

- Firstly, only stay out as late as you have to. With the sun setting early, there are some fantastic objects visible as early as half 5 in the evening. If you want to spend a few hours stargazing, it's often good to reach your location and begin preparing before the sun even sets! This way you will be ready to observe as soon as the sky darkens.
- Secondly, make a good pair of gloves a priority. It's very tricky to align and hold steady a telescope if you are keeping your hands in your pockets. Even if gloves are rarely a concern for you, gripping the cold metal tube of a telescope can be uncomfortable on winter nights. This is especially true for two-handed items like binoculars.

Thirdly, bring something warm to drink and/or hold. A warm flask of tea, coffee or hot chocolate can of course warm you from the inside out, but a warm flask (or even a hot water bottle) under your coat or jacket can add a little of that much needed warmth. If you aren't a fan of sugary or caffeinated drinks, try some diluted and warmed up fruit cordial or even a warm, flat, sugar-free drink. Boiled 7-up was always my drink of choice for winter camping, you might be surprised what's tasty warmed up!

## Website of the month

<https://www.ted.com/>

Ted talks are lectures from leading experts in almost every imaginable field. Whatever your interest, there is certainly a video and accompanying transcript to pique your interest

## Quote of the month

**"We are a part of this Universe, and we need to know what is going on in it. We have strong theories about how common galaxies form and evolve, but, for rare ones, we don't have much information. Those unique objects present the extreme cases, so they really give us a big picture for the Universe's evolution — they stretch our understanding of everything."**

**Dr. Burcin Mutlu-Pakdill, discoverer of a possibly one of a kind galaxy, PGC 1000174, now known as "Burcin's Galaxy"**

## Upcoming Events at CIT Blackrock Castle Observatory

Here at the Castle, we are very excited for the upcoming year. 2019 will be the 50th anniversary of humanity's first moon landing, as well as the 100th anniversary of the International Astronomical Union. We hope that you all will join us in celebrating, educating and inspiring for the future as we reflect on Apollo50, IAU100 and all that's happened since. You can expect some very special events all around the country. So, from all of us at BCO, enjoy the Winter Break and watch this space!

**PUBLIC OPENING Hours: 10am—5pm (Mon-Sun)**

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**Blackrock Castle Observatory is operated by Cork Institute of Technology and is a partnership with Cork City Council.**