

# SKYMATTERS

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100 years of the International  
Astronomical Union

**January 2019**

## Things to watch out for

### January 3/4

The Quadrantids Meteor Shower, which runs from December 28th till January 12th, will peak on these nights. This shower is expected to have a range between 60 and 200 meteors an hour at zenith, roughly 120 on average. It is thought to be produced by dust grains left behind by an extinct comet known as 2003 EH1 and comet 96P/Machholz. The Moon will be a thin crescent and should not interfere with what could be a good show this year. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Boötes, but can appear anywhere in the sky.

### January 6

The Moon will be located on the same side of the Earth as the Sun and will not be visible in the night sky. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere. On this new Moon, the Moon will obscure the Sun causing a partial solar eclipse. This is when the Moon covers only a part of the Sun. The partial eclipse will be visible in parts of eastern Asia and the northern Pacific Ocean. It will be best seen from northeastern Russia. Never look directly at the Sun without protective eyewear!

Venus also reaches its Greatest Western Elongation on this date. Look for the bright planet in the eastern sky before sunrise.

### January 21

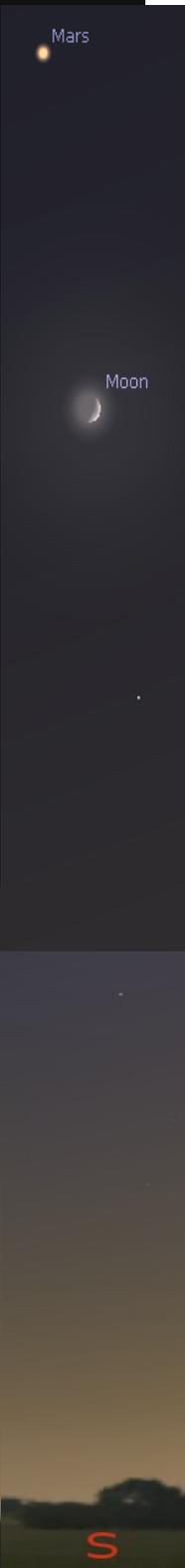
The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This is also the first of three supermoons for 2019. A supermoon is when the Moon is at its closest to the Earth, allowing it to be slightly brighter, although the difference is slight. This full Moon will pass into the Earth's shadow causing a total lunar eclipse. During this type of eclipse, the Moon will gradually get darker and then take on a rusty or blood red color. The eclipse will be visible throughout most of North America, South America, the eastern Pacific Ocean, western Atlantic Ocean, extreme western Europe, and extreme western Africa.

### January 22

A conjunction of Venus and Jupiter will be visible on the morning of January 22. A conjunction is when two planets appear near each other in the sky. The two bright planets will be visible within 2.4 degrees of each other. This is still far enough that they will be visible as two separate points for most observers. Look for this impressive sight in the east just before sunrise.

To the right, stretching from the bottom to nearly the top of the page, we have Mars and the Moon as they appear on the 12th at 5:25 in the evening, just after sunset. Mars will be visible in the evening sky all month and will remain close to due south at the time of sunset.

Bottom Left: Here we see the sunrise on the 1st of January at 8 o'clock. Mercury is getting more difficult to see as we enter the New Year, but Jupiter and Venus remain high.  
Bottom Right: Here we see the sunrise on the 31st of January at 7:45. Mercury will be gone by the end of the month but is replaced by Saturn. Venus and Jupiter have swapped places, having passed close to each other on the 22nd of the month.  
The Moon will be near its last quarter on both of these days. Antares in Scorpio is visible also, a bright red star below and to the right of Jupiter





Clockwise from top left: The first image shows the SpaceX Crew Dragon as it would appear docking with the ISS, with their competitor Boeing's CST-100 Starliner shown in a similar fashion next to it. The next image is the New Horizons probe as it was before launch being worked on by technicians. Below that is a simulation of Hayabusa2 collecting debris from the Ryugu asteroid with a "horn" slung beneath the craft's main body. Lastly we have a comparison between many of the new rockets being used in 2019. From right to left we have the Firefly Alpha, the Falcon 1, the Vector-H, the Electron, the LauncherOne and the Vector-R. All of these rockets are used by private companies to launch small payloads such as satellites.

## The Upcoming Year in Spaceflight

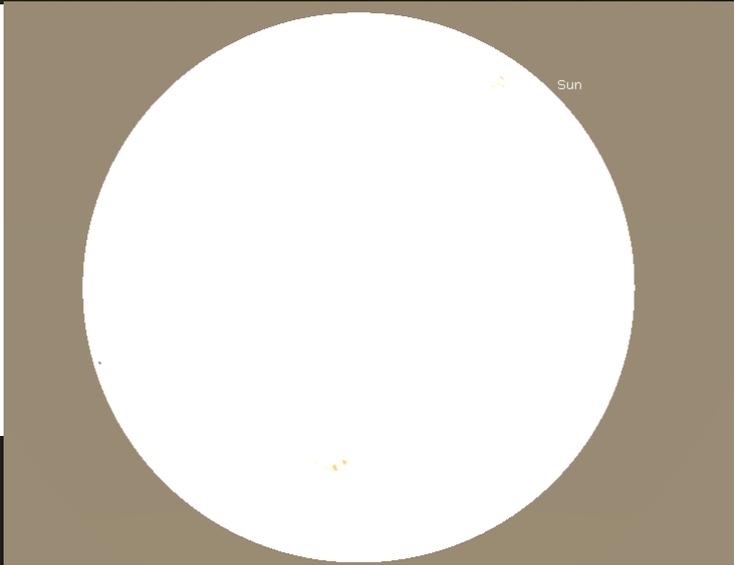
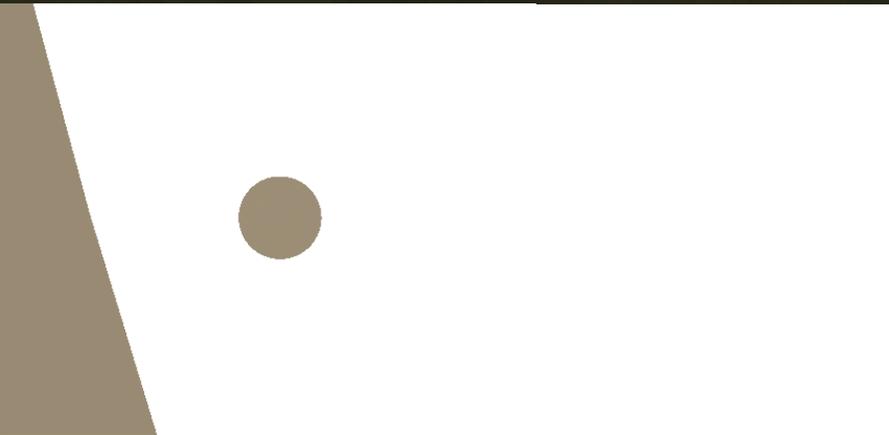
2019 is shaping up to be a fantastic year for humanity's endeavours in space. The New Horizons mission, which previously gave us the clearest photographs of Pluto, will flyby another distant object. The Kuiper belt object, nicknamed Ultima Thule, will become the most distant object from the Sun to have received a flyby from a spacecraft. This is expected to happen on January 1st, so a record-breaking start to what may be a record-breaking year.

January will also see an early test of the Dragon 2 module, a reusable crew module designed to bring astronauts to the International Space Station. If the unmanned test is successful, a manned launch is planned for June. This will be the first American spacecraft to bring astronauts to the ISS since the last Space Shuttle flight in 2011. The Dragon is being designed by Space X, a private commercial venture, and so may become the first commercially produced spacecraft to carry astronauts to the ISS. However, Space X are not the only ones. Boeing is testing their answer to crewed missions, the CST-100 Starliner, in March with a manned launch planned for August. If Space X suffers delays, then Boeing may become the first commercial company to provide transport to ISS astronauts. It has been quite some time since two groups competed to reach space, and in 2019 even more groups will enter the fray.

2019 will see many commercial bodies and countries testing out new rockets. Many private companies are hoping to join Space X and Boeing in the competition to provide affordable launches for research and commercial missions. The Vector-R from Vector Space systems will have its first orbital flight, along with the LauncherOne from Virgin Orbit and Firefly Alpha from Firefly Aerospace. Blue Origin is hoping to bring tourists to space with its New Shepard rocket, which will carry its first passengers in 2019 after several successful tests in 2018. America won't be having all the fun, with a Spanish company PLD Space hoping to test their Arion 1 while the multinational Arianespace aims to test its new Vega-C rocket to replace older Vega models. Russia is aiming to replace the old Soyuz rockets, with Soyuz 2.1a being tested for manned missions, India will launch its Small Satellite Launch Vehicle (SSLV) for the first time and China aims to replace its old Kuaizhou rockets with the new Kuaizhou 11.

This year is also going to see private groups launching rovers and other instruments to the Moon. Some groups that originally competed for the Google Lunar-X prize have launches scheduled for 2019, including the Israeli and German teams. India, China and Japan are also aiming to land equipment on the Moon. At the very end of the year, the Japanese Hayabusa2 mission will leave the asteroid Ryugu and begin returning to the Earth with a sample taken from the asteroid.

Private companies racing to reach space efficiently, satellites and missions from more countries than ever before, renewed exploration of the Moon, some of the first exclusively commercial space ventures and returning samples mined from an asteroid. 2019 seems to have some of the hallmarks from the glory days of Apollo and some from science fiction predictions. We might be catching up with some of our wildest dreams.



**Top of Page:** When Jupiter is at opposition it rises as the Sun sets, as we can see in the upper image. Saturn will rise when the Sun sets once it reaches opposition, as we can see in the image second from the top. Directly above we have a close up of Mercury passing the Sun on the 11th of November. To the right we have a full view of the same transit. Mercury is on the right edge.

## What we can Predict

There is a lot in space that is predictable. For example, the sunrise. As we move around the Sun and rotate, we see the Sun rise and set. You can expect the Sun will rise tomorrow, seeing as it has risen every other morning so far. However, we know the Sun will rise. It's not an expectation, or an assumption, it is a fact. We have, over hundreds of years, developed an understanding of the Earth's motion and the behaviour of our parent star. With this understanding, we know that the Sun will rise.

A similar principle holds true for the Moon. We can expect a Full Moon on the 21st of January because they happen every 29.5 days and the last one was on the 22nd of December. We know that they happen every 29.5 days because we have measured the speed that the Moon moves around us and we understand how the light reflecting from it will behave.

As the Moon orbits us and we orbit the Sun, the path these bodies take across the sky overlap. At certain times this can cause eclipses, and eclipses are a little harder to predict. Where the Sun and the Moon are in the sky, and how both of them move, needs to be understood to predict eclipses. We can predict them now, but just a few hundred years ago eclipses were miraculous events that defied human understanding. The very first page of this supplement asserts the date of a lunar and solar eclipse this year. We know when they will be because we understand the way all of the involved objects move.

This also extends to the planets. We know when certain planets are at their most visible in the same way we know when the Moon will be full. Jupiter will be at opposition on the 10th of June, with Saturn reaching opposition on July 9th. Mercury is going to pass directly in front of the Sun on November 11th, causing the first transit since 2016 and the last till the 2030's. It is harder to predict transits than points of opposition for the same reason that it is harder to predict eclipses compared to Full Moons. Now that we understand how and why these things happen we can predict them with ease and this is helped by the regularity and stability of the solar system.

We can predict when the Earth is about to enter the path of a comet and bring a meteor shower. We can even use the positions of other planets and their effect on dust in space to predict if there will be many meteors or only a few. As our understanding of the solar system grows, our ability to predict it also grows.

The weather is a little trickier, simply because so many factors are involved. We don't know if skies will be cloudy in Ireland for the Mercury transit in November. Granted, it was cloudy last year, and November is rarely a clear month, but we don't KNOW. I would bet my life-savings on Mercury transiting the Sun. I wouldn't bet anything on a weather prediction for months in the future, we simply don't understand it well enough yet. Predicting the planets may take the surprise out of the sunrise, but actually being able to see the Sun in November in Ireland would be enough of a surprise to make up for it.

## Tips for Watching Meteor Showers

This year begins with the Quadrantid meteor shower, but meteor showers run throughout the year. Being able to see a meteor or “shooting star” is often a magical experience. Being able to see many of these bright objects stream across the sky is even more captivating. Whether you’re aiming to catch the Quadrantids or another shower later in the year, here are some tips.

First, keep the same basic principles in mind as you would for planets or stars. A clear sky, a moonless night if possible and a dark sky away from city lights will allow fainter meteors to be seen.

Secondly, give yourself time. Meteor showers can often peak across several nights, so you may want to observe multiple times to get the best effect. Because meteor showers usually radiate from a particular part of the sky, showers may appear to get better as the radiant rises into the sky.

Thirdly, get comfy. Meteors will often be high in the sky, and craning your neck back for any length of time can be painful. Having a place where you can sit or lie at an angle can help reduce this strain. A nice lounge chair or deck chair would be ideal, but a slight hill to lie on or even the roof of a car can help you stare straight up.

Lastly, take some photos! Meteors can shoot past so fast that setting up a video or long exposure photograph can make things easier. The sport setting on many cameras and phones can also be quick enough to catch them. It’s always nice to share the experience, so let us know @blackrockcastle if you get any good snaps!

## Website of the month

<https://www.imo.net/>

The International Meteor Association tracks and predicts meteor showers. Not only do they provide information on when and where meteor showers are visible, they explain how visible they are and why. They also take submissions of observations made by the public to add to their data.

## Quote of the month

**Great is the power of steady misrepresentation - but the history of science shows how, fortunately, this power does not endure long.**

— Charles Darwin

**Origin of Species (1878)**

## Some Upcoming Events at CIT Blackrock Castle Observatory

### Space Explorers: Mission to Mars

This session will have us thinking about what life might need to survive on the Red Planet. Junior astrobiologists and planetary scientists will have to figure out the best possible adaptations for successful life on the hostile alien world of Mars!

This 1.5 hour workshop is for 8-12 year old children.

**Tickets €10**

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

**Phone: +353-21-4326120 / Email: [info@bco.ie](mailto:info@bco.ie)**

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