

# SKYMATTERS

Blackrock Castle Observatory [www.bco.ie](http://www.bco.ie)  
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**April 2020**

## Things to watch out for

### April 8

April 8 - Full Moon, Supermoon. 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 third of four supermoons for 2020. The Moon will be at its closest approach to the Earth and may look slightly larger and brighter than usual.

### April 22/23

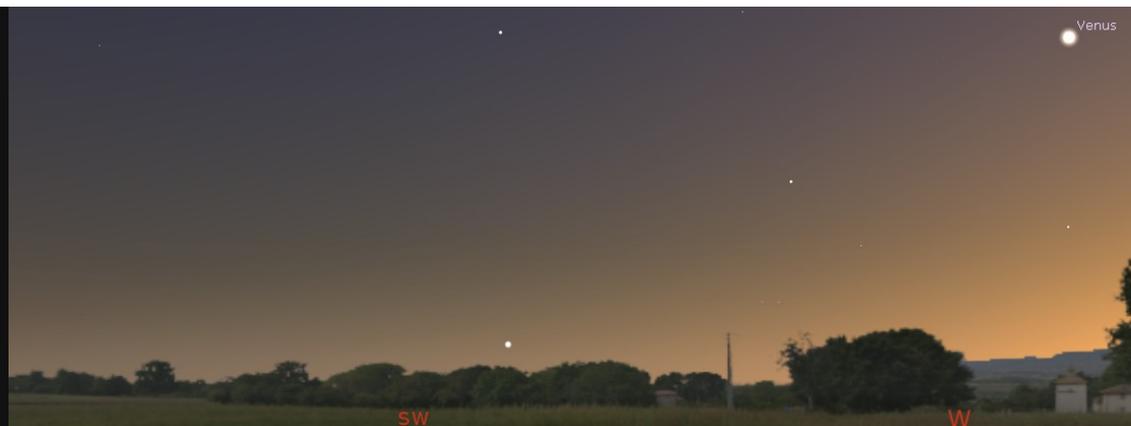
April 22, 23 - Lyrids Meteor Shower. The Lyrids is an average shower, usually producing about 20 meteors per hour at its peak. It is produced by dust particles left behind by comet C/1861 G1 Thatcher, which was discovered in 1861. The shower runs annually from April 16-25. It peaks this year on the night of the night of the 22nd and morning of the 23rd. These meteors can sometimes produce bright dust trails that last for several seconds. The nearly New Moon will ensure dark skies for what should be a good show this year. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Lyra, but can appear anywhere in the sky.

### April 23

April 23 - New Moon. The Moon will be located on the same side of the Earth as the Sun and will not be visible in the night sky. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.

### All of April

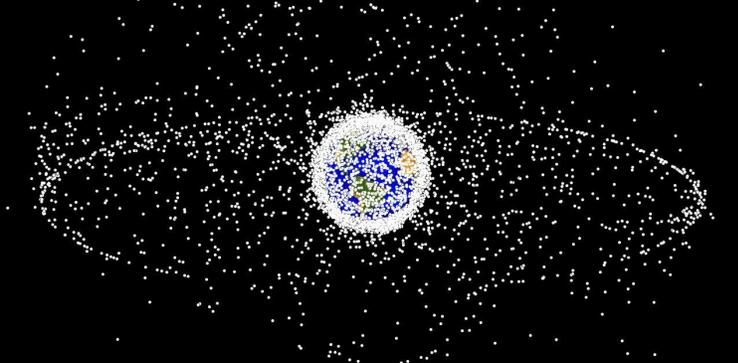
All month long we have four planets visible in the sky. Venus will be our brightest evening object and the first to appear each evening, above the setting Sun to the west. Mars, Saturn and Jupiter will all be visible in the south-east every morning just before sunrise. As our nights are finally getting shorter, Sunset and sunrise are getting later and earlier respectively. Despite this, due to the brightness of the planets, Venus and Jupiter in particular, you don't need to wait for total darkness to see them. All of this month's planets are visible during dusk and dawn, as long as the sun is still below the horizon.



To the right, we see Venus, high above the setting Sun on the 29th of April at 9:30 pm. Venus will appear similar to this at earlier times earlier in the month. This is also the time when Orion and the brightest star Sirius emerge low in the evening and disappear quite early. Here, they are both low between the southwest and west. They will no longer be visible as we push into summer time.

Below, we see Mars, Saturn and Jupiter, low to the southeast at 6:30 am on the 1st of April. They will disappear earlier and earlier as we push later in the month. Also, on the first, Mars and Saturn are in close conjunction, but Mars will appear further and further east from the other planets as we get later in the month as well. The constellation of Sagittarius is faintly visible just south of the planets, and this is where the core of our galaxy would be visible in dark skies that are free from light pollution, though this will also disappear earlier than the planets, closer to 5:30 am on the first and 4:30 am on the thirtieth.





The top left image is an artists interpretation of the ESA Solar Orbiter probe, which will become Europe's closest spacecraft to the Sun, protected from the Sun's intense heat by a coating developed by Irish firm ENBIO. They are also involved with the Eirsat-1 project, whose logo is displayed on the right. The bottom left image is a simulation of the sheer amount of space junk and debris orbiting the Earth.

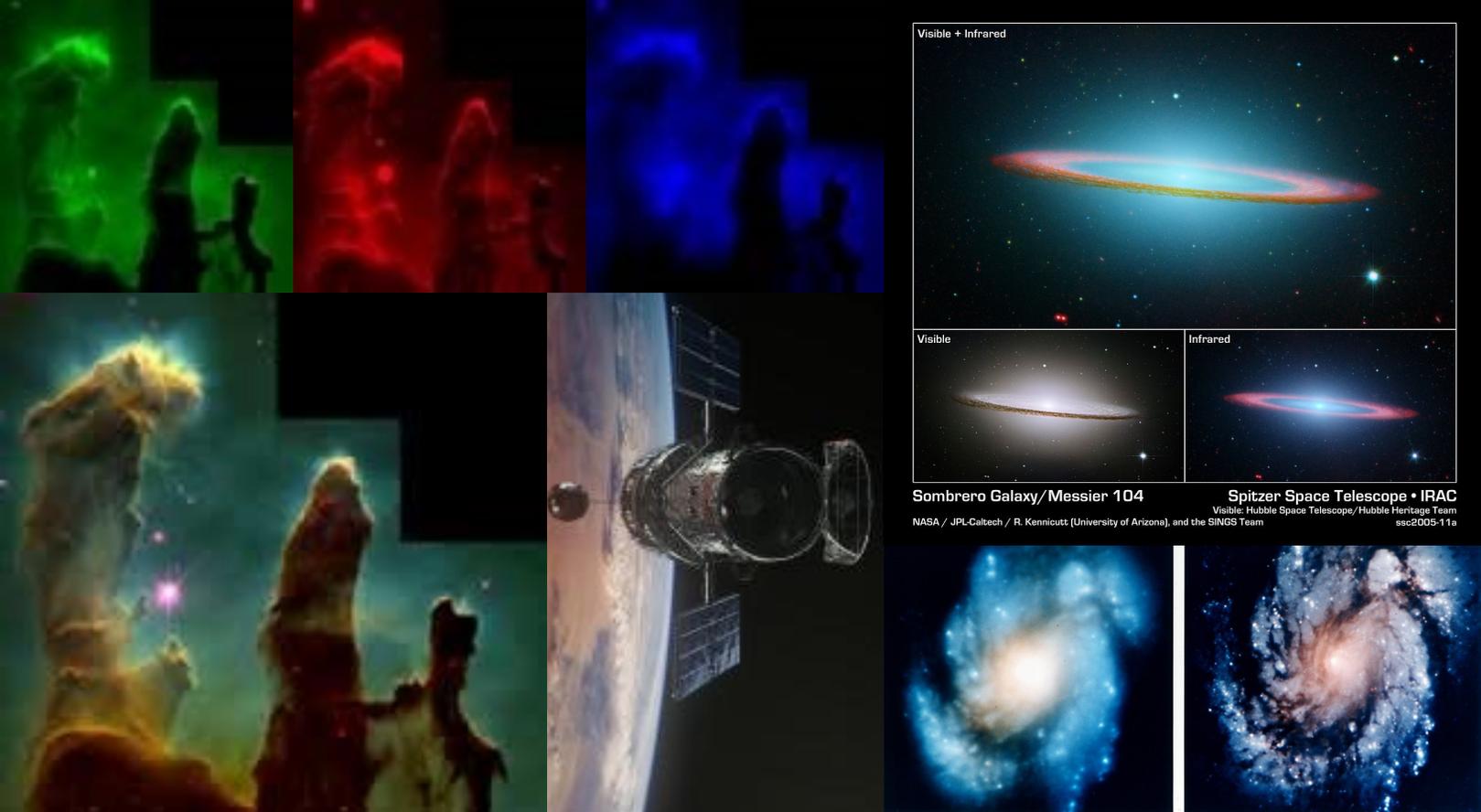
## Space 4.0

Space 4.0 has almost become a buzzword in modern astronomy and space science, but it has a clear and important meaning. However, to truly understand space 4.0, a little familiarity with the other three versions is useful. Firstly, space 1.0 was not called that at the time, but is now used to refer to historical astronomy, really any time before the 1900's, when we could look at space but had yet to visit it. Space 2.0 begins with the first space probes and manned space flight. This is followed by the first long term human residence in space, with space stations such as the ISS leading us into space 3.0. As well as our technical achievements, cooperation can also be used as a distinguishing factor between these phases. In the beginning, individuals often worked alone or collaborated with other individuals. The first manned spaceflights were achieved when whole countries began reaching for the star, and the collaboration of multiple countries has led to the construction of international projects in space. Space 4.0 brings a new player into this game, private companies.

Private launches into space have already begun thanks to an ever growing number of companies such as SpaceX, and private satellites such as those used by telecoms agencies. We are very much in space 4.0 already, but there is far more potential waiting to be unlocked. The collaboration of nations brought us from weeks in space to whole years. Private companies collaborating with each other and nations could increase that measure to multiple years, with many lofty, long-term goals such as the colonization of other planets such as Mars. Even competition between these companies can be beneficial, as they race to create the cheapest launch vehicles, the lightest satellites and most efficient solar-arrays. Private companies are eagerly looking to solve problems that many nations are unwilling to take on, such as the arduous task of clearing out the space around our planet, which has filled with debris and "space-junk" over the early decades of space exploration.

Now more than ever, we individuals are provided the opportunity to engage with space. With so many companies now involved, there are far more employment opportunities in the space sector. It's also a great time to begin researching space technologies, as there are far more interested parties willing to provide funding, and the number of tools and software's available for that research are ever-growing as well. This also brings up whole new areas of research. For example, how do we stop satellites, free floating in space, from lining up with other satellites to spy on them? How do we prevent the interception of communications in a vast, three-dimensional space? This is the newly created area of space cybersecurity, a topic already receiving attention at Cork's Institute of Technology. With so many new satellites going into space, we are coming up with ever more ways to use them. With so many satellites beaming back images of the Earth for us to study and strive to understand, the area of earth Observation has also become a productive area of research at CIT. Ireland's first satellite, being created at UCD, is supported both by Ireland and Europe as well as private companies such as Nokia's Bell Labs and Ireland's own Enbio. Enbio is also the company which developed the protective coating for the European Space Agency's Solar Orbiter. This is a great example of a private company collaborating with an international agency, showing how space 3.0 is growing into space 4.0.

We have stepped over the threshold of a new era of space exploration, into a vast realm of possibilities. Some of us still remember the Apollo Landings, a crowning achievement of Space 2.0, and many remember watching Space Shuttles launch for the ISS, a key part of Space 3.0. Who knows what the children of today will look back on as the height of space 4.0.



Visible + Infrared  
Visible  
Infrared  
Sombrero Galaxy/Messier 104  
Spitzer Space Telescope • IRAC  
Visible: Hubble Space Telescope/Hubble Heritage Team  
NASA / JPL-Caltech / R. Kennicutt (University of Arizona), and the SINGS Team  
ssc2005-11a

The above series of images documents some of the amazing capabilities of the Hubble Space Telescope, which itself is the central image. On the left of the page, there is a series of three mono-color images along the top with their combined, full-color version displayed below them on the left. On the top right we see a visual example of how images from multiple telescopes, even viewing separate parts of the spectrum, can be combined. Down in the bottom left we can see a comparison between the older Wide Field Planetary Camera 1 (second from the edge) and the newer WFPC 2 (furthest left).

## The Hubble Space Telescope

The Hubble Space Telescope is one of the most famous telescopes in existence. It was one of the earliest telescopes placed in orbit around the Earth, and is one of the oldest space telescopes still actively used for research. It has brought us some of the most beautiful views of space and allowed us to look further into our galaxy than ever before. After a long service of 30 whole years, it has survived having its mirrors replaced, having cameras added and removed, even having one of its gyroscopes fail (which are essential for pointing it at the right objects). Even though its service contract has been extended to 2021, with plans to service it and ensure it keeps running hopefully into the 2040's, soon more and more research will be performed by other telescopes, such as the planned James Webb Space Telescope.

We are at a transitional period as we come to Hubble's 30th anniversary. While it is certain that Hubble will still be used in the future, for how long and for what purpose are still active questions. Regardless, as long as Hubble has been used it has provided us with some of the most beautiful and informative images of space. Sometimes it can be tough to grasp the scientific impact due to the sheer aesthetic beauty, and there are always questions as to how "real" a false colour image is, or an image that takes from outside the visible spectrum.

Firstly, as we can see in the set of images on the top and left at the top of this page, Hubble generally takes images through a filter. These filters allow light of a particular frequency (which if visible would be a particular colour) to pass through. Multiple filtered images are then stacked together to provide the final colour image. The example above shows the Pillars of Creation, part of the Eagle Nebula, in three colours and as a final full colour image. Due to this process, many people question whether this is what we would actually see with our eyes. In some cases it is, in others it isn't. In the case of the Eagle nebula, we would need some pretty long duration flights to go and find out.

Hubble can also combine images in different wavelengths, and team here on the earth can even combine images from multiple telescopes. The top-most image on the right hand side shows a visible light image of the Sombrero Galaxy being combined with an infrared image taken by the Spitzer Space Telescope. Even though we can't see in infrared, this image allows us to visualize its prominence, which can help us see what parts of the galaxy are hotter, even though we couldn't see that effect with our own eyes. For this reason, false colour and enhanced colour images may not be true to life, but they can be better, allowing us to see things that are outside of the visible spectrum for us humans.

Hubble may have suffered some setbacks, but many of these have led to improvements, such as an improved Wide Field Planetary Camera (WFPC). The bottom-most right image gives a comparison between WFPC1 (left) and the WFPC2 (right) both taking an image of the same spiral galaxy. Issues with Hubble's gyroscope system allowed astronomers to learn that pressurised oxygen can cause corrosion to wires, pressurised nitrogen is now used in its place. Hubble's long history in space has allowed scientists to investigate how materials perform in a vacuum at extreme temperatures over long periods of time.

Hubble has brought us images that have helped us learn about the wider Universe, but it has also helped us learn what we can accomplish in space and how best to do so. Here's to 30 more years with one of our most famous and useful artificial satellites.

## Tips for Doing Some Citizen Science when You're Stuck Indoors

It's always hard to stay occupied or feel like you're accomplishing something if you are stuck inside. The Globe at Night is an international citizen science campaign aimed at raising awareness of light pollution and gathering data on it.

First, take a look at <https://www.globeatnight.org/webapp/>. This web app gives you a place to submit how many stars you can see and what kind of weather was effecting your view.

The assumed constellations are Gemini and Orion both visible from 7 o'clock in the south, moving towards the west and setting as we come to eleven. Try see if you can spot them through any of the windows in your residence.

Once you find the appropriate constellation, see how many stars are visible! The number of stars visible in the sky has a strong correlation with light pollution. Weather also effects visibility, so the Globe at Night provides a field to enter weather conditions as well.

Feel free to do this from different windows at different times and even across a few days. This makes it easier to ascertain if things are getting brighter or fainter over time.

Lastly, it is a great way to keep people occupied. In a truly dark sky, you can often count up to 2500 stars visible to the eye. And with this data being so valuable, there has never been a better time than to send kids on a mission to count the stars visible from a window. It may be better than video games at least.

## Website of the month

[http://hubble.stsci.edu/gallery/behind\\_the\\_pictures/meaning\\_of\\_color/](http://hubble.stsci.edu/gallery/behind_the_pictures/meaning_of_color/)

The Hubble Website has many fantastic resources for learning about and understanding one of our favourite space telescopes. The link above brings you to an interactive page that helps to explain and demonstrate how Hubble images get their beautiful colour. The website is strewn with images, information and even live views of what Hubble is looking at currently.

## Quote of the month

About ten months ago [1609] a report reached my ears that a certain Fleming [Hans Lipperhey] had constructed a spy-glass, by means of which visible objects, though very distant from the eye of the observer, were distinctly seen as if near-by...

Galileo Galilei, *The Starry Messenger* (1610), trans. Stillman Drake, *Discoveries and Opinions of Galileo* (1957), 28-9.

## Some Upcoming Events at CIT Blackrock Castle Observatory

We may be stuck inside for now, but take a look at our twitter [@blackrockcastle](#) and our YouTube channel [Blackrock Castle Observatory](#), for videos to keep you up to date on what's in our sky.

Don't forget to keep an eye on our website to see when we reopen.

**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.**

All Screenshots courtesy of Stellarium

Images Related to Hubble courtesy of NASA  
Collated by Caoimhín de Bhailís and the  
Blackrock Castle Observatory team