

SKYMATTERS

Blackrock Castle Observatory www.bco.ie
Download monthly *skymatters* newsletters from www.bco.ie/sky-matters

January 2021

Things to watch out for

January 2/3

The Quadrantids Meteor Shower will peak on the night of the 2nd and morning of the 3rd this month. It is a brief shower which runs annually from January 1st to 5th. The close-to-full Moon will block out most of the faintest meteors this year, and it usually produces about 40 an hour an zenith. The radiant, or origin in the sky, of this meteor shower is the constellation Bootes, but they can appear anywhere in the sky.

January 13

The New Moon falls on this date this month. 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.

January 24

Mercury will reach its Greatest Eastern Elongation on this date. This is one of the best times 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.

January 28

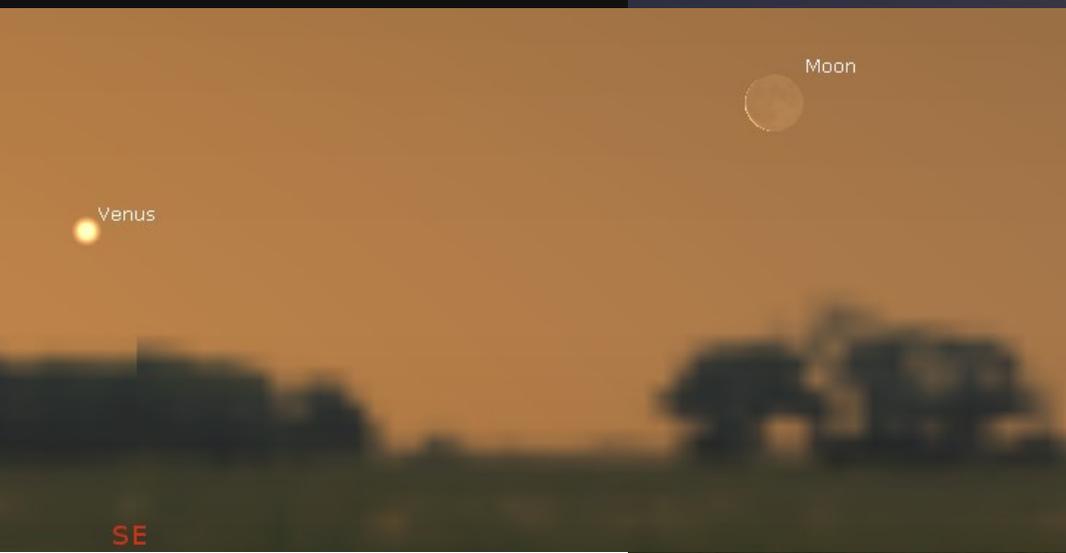
The Full Moon will fall on this date this month. The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. The light from the Moon will make fainter objects more difficult to see.

In the below image we see sunset on the 24th this month at 5:50pm. In the very top left we see Mars, which will be high in the early evening sky all month. In the bottom left we see Mercury at its greatest eastern elongation. Mercury will only be visible for a few days, low in the southwest above sunset.

Mars



In the below image, we see sunrise on the 11th this month at 8am. Venus will become impossible to see as we reach the end of this month and is already quite low here. Shown next to it is the waning crescent Moon, which will be close to Venus on this date.



Venus

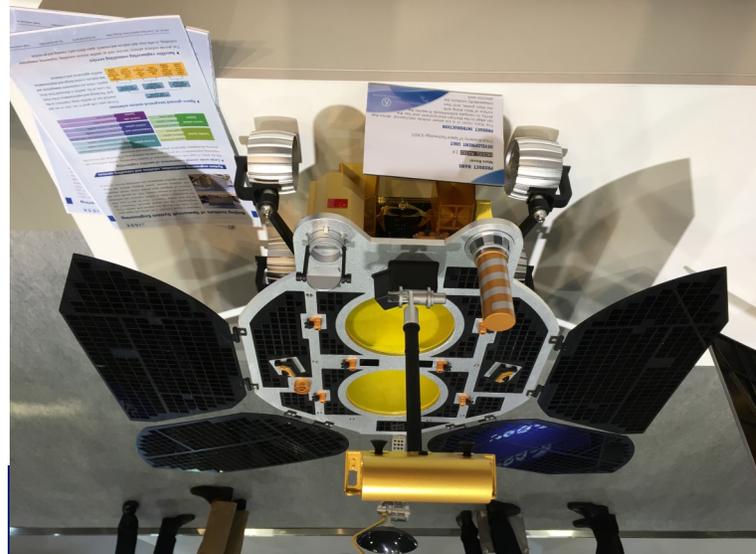
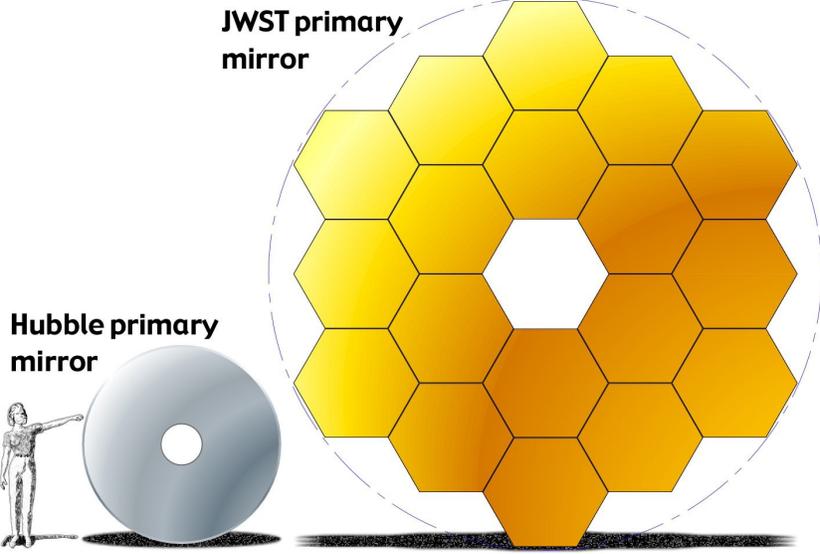
Moon



Mercury

SE

SW



Clockwise from bottom right: Here we see the SpaceX Starship during one of its test flights, showing its fins. Next we see a plane designed to carry vehicles for launch into space. This is the Virgin Galactic launcher for their small, passenger spacecraft. Next is a visual comparison between the main mirror of the Hubble space telescope, already in use, and the main mirror of the JWST, which has been built and is scheduled for launch this year. Last we have a model Mars rover, intended to be part of the upcoming Chinese mission to Mars, Tianwen 1.

The Upcoming Year in Space

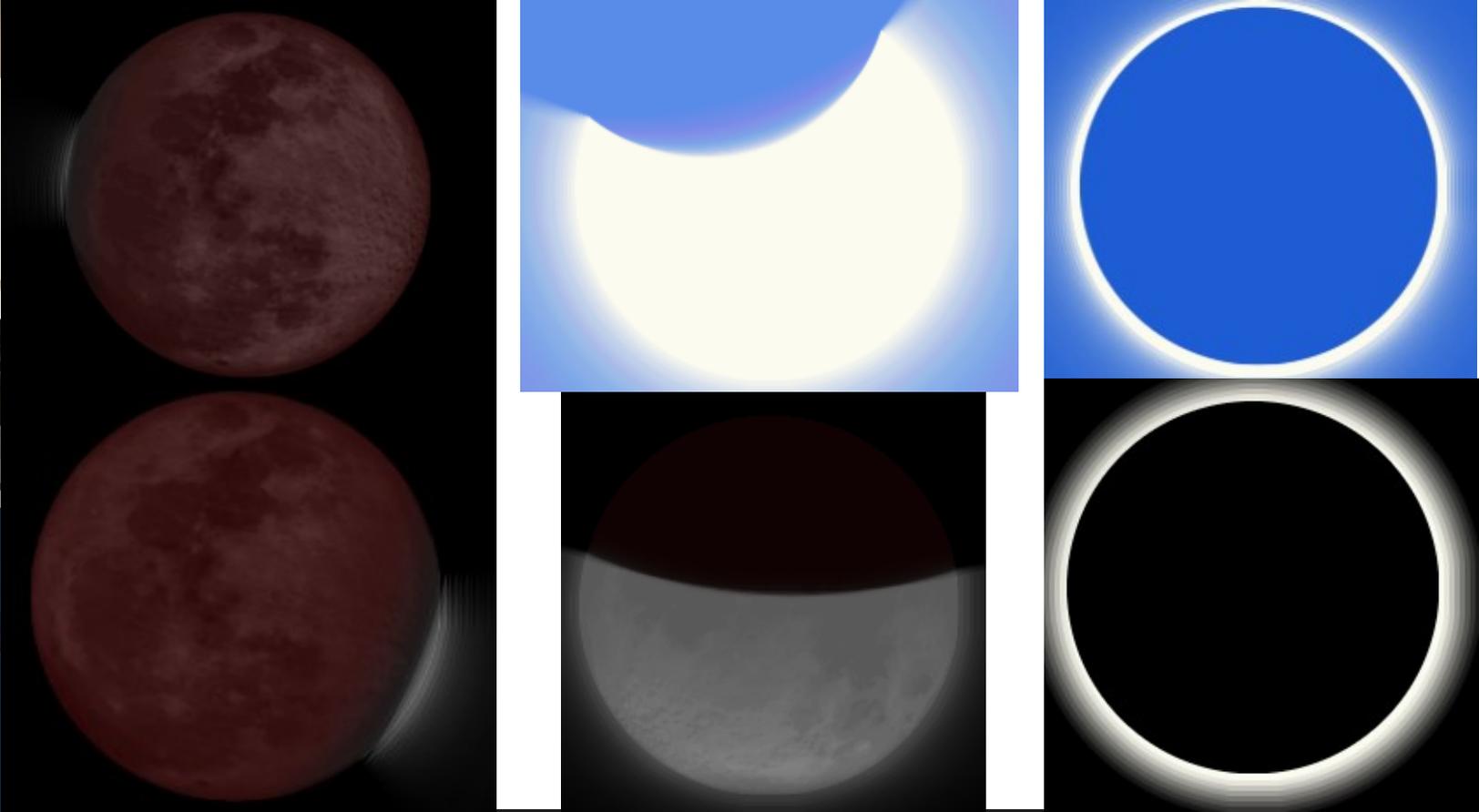
2020 has certainly been a tumultuous year, but luckily 2021 gives us plenty to look forward to in the realm of space. From the continued tests of the SpaceX Starship to the prospective launch of the James Webb Space Telescope, there are many milestones awaiting us in the year ahead.

The SpaceX Starship has already had some successful test flight, but this year will hopefully see its first orbital flight, an important stepping stone towards using the rocket to transport people to Mars, which is SpaceX's intended purpose for this launch vehicle. It takes a very large rocket to travel to another planet, and the Starship (at 150 metres tall) will be about 10 meters taller than the massive Saturn V that brought astronauts to the Moon. Such large rockets aren't always necessary, especially when the target location is Low Earth Orbit. For example, the Vector-R measures just 12 meters, and even smaller rockets may be possible if we give them a little help getting into the sky. More and more companies are pursuing the idea of air-launched rockets, carried to the edge of the atmosphere by large planes before igniting and powering themselves the rest of the way. With increasingly diversified options for launching satellites, particularly smaller ones, we can expect to see more countries establishing a presence in space.

Beyond simply getting off the Earth, many countries are also continuing extra-planetary exploration this year. As well as a NASA rover already on its way to Mars, there is a U.A.E. Mars orbiter called Hope and a Chinese lander/rover mission, all scheduled to land in February. 2021 could be the first year where 4 different nations have a presence on and around Mars, with the above three joining the long running ESA Mars Express orbiter. We may also see a record breaking number of nations present on the Moon. Russia is planning to finally send another lunar rover to the Moon after quite a long break. America will continue its robotic presence around and on the Moon, with the UK, India, Germany and Mexico all planning to land a robotic presence on the Moon as well, and these are just the plans that have been announced!

Of course, many of us are still reeling from the past 12 months, and many of these plans are subject to delays and setbacks, as much as any space mission. One particular mission which has hopefully seen the last of its delays is the James Webb Space Telescope. Now scheduled to launch in October this year, the JWST has already seen some delays, and regular readers of this newsletter may remember some excited mentions of the JWST over the past few years (in 1997, the intended launch year was 2007!). The JWST will be the largest space telescope ever launched, and has the potential to revolutionise our understanding of the cooler parts of the Universe, which are tough for the Hubble space telescope to study. This includes the formation and characteristics of exo-planets, which is still quite poorly understood.

Lastly, we should soon learn more about the makeup of asteroids in our solar system. The Japanese asteroid sampling mission, Hayabusa2 returned samples for study in late 2020, while the NASA OSIRIS-Rex mission has successfully collected a sample from the asteroid Bennu. Although it isn't expected home until late 2023, it should be departing the asteroid in March of this year, starting its long journey home. Many other long-term missions such as Juno, the Parker Solar Probe, the Solar Orbiter and BepiColumbo will pass important milestones this year, making sure that we have plenty of small success ahead to celebrate.



Top row from left First is the total lunar eclipse in May, as seen from a perfect location, Suva, Fiji. Next is the annular solar eclipse in June, as seen from Cork, followed by the same eclipse from an ideal location, Alert, Canada. Bottom row from left: First is the partial lunar eclipse in November, from an ideal location, Honolulu, Hawai'i, followed by the same eclipse as seen from Cork. Lastly is the total solar eclipse in December as seen from a perfect location, Berkner Ice Rise, Antarctica.

Celestial Certainties

It is hard to predict exactly how things will go in the coming year. As we have seen this year, even long running events are subject to change. Even the Olympics were deferred by a year, though hopefully with all we have learned over the past 12 months, they will go ahead in 2021. Many of us have put off plans, from holidays to weddings, and circumstances may dictate that they be pushed back again. Luckily, some things are more regular and do not change their schedule, particularly in the world of astronomy. No matter how bad things get, the Earth is still turning and orbiting the Sun, the Moon continues to orbit us. These things can be relied on, and the spectacular events they produce as well. This year, that includes 4 eclipses, 2 solar and 2 lunar. Although 2 of these eclipses are totally invisible from Ireland, 2 will be partially visible at least.

On the 19th of November there will be a partial solar eclipse visible from Ireland. It will begin at 6 o'clock in the morning and continue until the Moon sets at 8 o'clock. Its maximum occurs at just 5 minutes to 8, so here in Ireland we will hopefully be able to see from the beginning to just past the maximum. This eclipse is a partial lunar eclipse, but a large swath of North America will see the Moon become almost entirely shadowed over the course of about 6 hours. Of course, this is weather dependant, as all astronomical events are, and it will occur very early in the morning, but it is something we can look forward to no matter what else happens.

The other lunar eclipse of 2021, on May 26th, will mainly be visible across the Pacific Ocean. It is a total eclipse, with the whole process taking over five hours, but the majority of the eclipse will occur over the ocean, though part of Australia, New Zealand, Papua New Guinea and Antarctica should see the whole thing. Antarctica also gets a fantastic solar eclipse. The total solar eclipse on the 4th of December is almost exclusively visible from Antarctica. Some populated areas, such as the coast of South Africa and part of the Falklands, should see the Moon graze the Sun briefly, but won't see a total eclipse.

The Arctic receives the other solar eclipse next year. An annular solar eclipse will cross the Arctic on the 10th of June next year. This will be an annular eclipse, which will leave a ring of light around the Moon, more so than a total eclipse. Areas in the path of totality will see almost 90% of the Sun covered by the Moon over the course of 2 hours. Although much of these areas are the sparsely populated northern reaches of Canada, Greenland and Russia, the path of the eclipses reaches as low as Ontario in Canada. Outside of totality, the amount of the Sun blocked drops, but for most areas it will still take place over the course of 2 hours. Here in Ireland, we should see the eclipse from its beginning at around 10 o'clock, through its peak at 11 until it finishes at midday. However, for us only about 30% of the Sun will be covered, with as high as 31% coverage at maximum at the northwest coast, down to about 27% in the southeast.

The weather, as always, continues to be unpredictable, as many things are. However, whether the clouds block our view or not, these celestial events will occur anyway. In that way they are some of the most reliable events that occur, regardless of anything down here on Earth. Then again, we can always hope that clouds won't block our view of all these eclipses, and even if they do, there will certainly be more eclipses in the future. Hopefully, very soon, we can get back to planning trips to go and see them, even if they aren't visible here.

Tips for Keeping Resolutions

Every year, many of us make resolutions. These promises to ourselves, promises to make a change for the better, are notoriously hard to keep. Here are some reasons why and some tips to keep them.

Firstly, be specific. Resolutions are often hard to quantify. If you resolve to exercise more, how much more? If it's eat better, then how and how much better? Having specific, measurable target makes it easier to strive for, as there is a specific goal that has a definite end.

Secondly, don't just promise yourself! We often forgive ourselves quickly for breaking internal promises, having external accountability can help. Whether this is finding someone to exercise with, or just someone willing to remind you and check in on your progress, a little can go a long way.

Thirdly, start small. It can be tempting to set lofty goals, for example, training for a marathon. However, if you've never run before, even managing 5km is impressive, so start there. Even if you have a bigger target, make sure to aim for and celebrate each milestone along the way. The feeling of success and achievement can make it easier to keep going.

Lastly, don't bite off more than you can chew. We have all had a hard year, and almost all of us have much that we missed out on or need to make up for. It can be good to resolve not to do something, to take some quiet time. With so much to do as we enter a New Year, and with many of us eager to get back to normal and back to our friends and pastimes, it is important to remember not to try to do too much.

Website of the month

mtu.ie

After years of work and planning, The Munster Technological University has finally been birthed from the fusion of CIT and ITT. Well done to everyone involved!

Quote of the month

We spend January 1st walking through our lives, room by room, drawing up a list of work to be done, cracks to be patched. Maybe this year, to balance the list, we ought to walk through the rooms of our lives...not looking for flaws, but for potential.

Ellen Goodman, *The Time Wall* (2 January 2017)

Some Upcoming Events at CIT Blackrock Castle Observatory

For updates on our opening schedule during this time, please check our website, BCO.ie, and to see the space and science-related gifts and goodies we stock, go to blackrock-castle-gift-shop.myshopify.com.

You can also check us out on our YouTube channels (Blackrock Castle Observatory and BCO Education), Instagram (@blackrockcastleobservatory) and Twitter (@blackrockcastle).

Alternatively, you can contact us using the contact details below.

Phone: +353-21-4326120 / Email: info@bco.ie

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