

SKYMATTERS

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December 2020

Things to watch out for

December 13/14

The Geminids Meteor Shower will peak on these dates. The Geminids are considered by many to be one of the best showers. It can produce up to 120 multicolored meteors per hour at its peak. The shower runs annually from December 7-17. The nearly new Moon will ensure dark skies for what should be an excellent show. Best viewing will be from a dark location after midnight.

December 14

The New Moon falls on this date. 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 New Moon will block out the Sun, causing a Total Solar Eclipse. A total solar eclipse occurs when the Moon completely blocks the Sun, revealing the Sun's beautiful outer atmosphere known as the corona. Unfortunately, this eclipse is best seen from the South Pacific and is not visible in Ireland.

December 21

The December Solstice falls on this date. The South Pole of the Earth will be tilted toward the Sun, which will have reached its southernmost position in the sky. This is the winter solstice in the Northern Hemisphere and the summer solstice in the Southern Hemisphere.

Great Conjunction of Jupiter and Saturn. This rare conjunction of these two planets is known as a great conjunction. The two bright planets will be so close together that they will appear to make a bright double planet. Look to the southwest just after sunset for this impressive planetary pair.

The Ursids Meteor Shower will peak on this night and the morning of the 22nd. The Ursids is a minor meteor shower producing about 5-10 meteors per hour. The shower runs annually from December 17-25. The first quarter Moon should set just after midnight leaving dark skies to aid viewing.

December 30

The Full Moon falls on this date. The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This will be the last Full Moon of 2020.



To the left we see Venus, low to the southwest at 8.15am on the Morning of the 21st. Venus is visible all month, but lower in the sky than in previous months.

Directly below we have sunset at 5pm on the 21st. Mars is visible high to the southeast all month. Jupiter and Saturn are in close conjunction towards the southwest. Although they are also visible all month, on this night they may appear as one object to the naked eye.



Directly below we see a close up of Saturn and Jupiter, roughly as they would appear through a 14in/35.5cm aperture telescope (in this case, based off of a Schmidt-Cassegrain). This shows how close they appear in the sky, and lets us see Saturn's Ring, Jupiter's Stripes and various moons.





Top Left: The ESA Cluster satellites are some of the many being shutdown and suspended during the pandemic.

Top Right: One of the few upsides of the pandemic is the reduction in pollution, as shown with this comparison with 2005 from Beijing.

Bottom Left: Here we see the historic IAU conference that voted on Pluto's planet status. Many such meetings have had to have been suspended.

Bottom Right: The Pan-Starrs telescope in Hawai'i is one of many telescopes that can operate remotely. However, many of them are now lacking essential maintenance.

The Impact of COVID-19

The COVID-19 pandemic has had an unprecedented effect on the world. It has been devastating for many and has impacted almost everyone in some way. COVID-19 seems to have affected every aspect of our lives, and its effects reach into every business and industry. Of course, astronomy and space science are no exception.

Firstly, as with most groups, various conferences and meetings have had to be cancelled or moved on-line. The American Astronomical Association, the Irish Astronomical Society, the International Astronomical Union, all have had to move various meetings and conferences online, while postponing and cancelling various other activities. Even at a smaller scale, various hobby groups have had to put their meetings and events on hold. While meetings and conferences can be done remotely, actual stargazing activities are much harder to migrate, with most being postponed till restrictions ease.

Luckily, astronomy has long been using and advocating remotely operated technology, particularly robotic observatories. This means that robotic observatories, like PAN-STARRS in Hawai'i, can continue to receive instructions and make observations. Space based telescopes like Hubble still receive commands and instructions remotely. However, both ground-based observatories and the antennae used to communicate with space-based telescopes require maintenance. Without this maintenance, observatories on the ground and in space may have to suspend their activities. Many telescopes and communication antennae are located in remote environments, which further complicates repair attempts.

Some missions are more complicated than others. Many probes in distant parts of the solar system require teams of engineers and researchers to control and understand the suites of sensors and instruments they carry. Specially designed systems are often built to translate the huge amounts of data returning from these craft. When that unique computer system is built into a command centre, it can be difficult to create a remote alternative, and in some cases, simply impossible. Some distant missions have been put into hibernation, their research and investigations placed on hold until the teams in charge can safely come back to work together.

Astronomy is also one of the places where we can get some positive news. The European Space Agency's Sentinel satellites observe the Earth from space, some observing ground-level phenomena, some observing the atmosphere, including pollution. Pollution may be one of the biggest losers during this pandemic, with various pollutants showing record-breaking low concentrations. Even big industrial cities, like Beijing, Paris, and Milan have shown improvements in air quality. Besides the air, even rivers seem to be getting clearer, particularly the canals of Venice, with the reduction in tourism to the city. With fewer flights between countries, there are fewer contrails (the little white cloud-trails that planes leave behind) and fewer active factories and cars means less smog. All of this gives us better conditions to see the stars. We may not be able to gather together physically, but even from our own homes, we can all enjoy a better view of the sky above us all.



Left: This is an example of a medical ventilator, similar ones are being made by telescope engineers to increase the numbers available to hospitals.
Top Right: This rare, cloud-free image of Ireland, the UK and northern France was taken by an ESA Sentinel satellite. They can help us to see the effect of COVID-19 on cities and the environment.
Bottom Right: This shows part of NASA's Pleiades Supercomputer, one of many now being used to perform calculations related to case tracking, transfer rates and modeling the effects of COVID-19.

Astronomy and fighting COVID-19

The astronomical community, as all communities, was hit hard by COVID-19. Luckily, we have tools to help us hit back. One of the most direct ways that astronomy is helping in the fight is with Earth Observation. As well as monitoring how well different areas are following “stay-at-home” orders, various satellites continue to track land usage, crop growth, traffic and weather. This helps to keep government organizations up-to-date with possible future hotspots, areas that may see food production decreases, and areas that may have more difficulty accessing medical aid due to storms or poor infrastructure. These early warnings are essential in order to help governments prepare accordingly and inform any members of the public to prepare as well.

Satellites are of course essentially to worldwide communication in the modern day. Being able to quickly gather and share data on new cases and infection rates is paramount in helping all of us stay ahead of the disease’s spread. Astronomy communities have not only leveraged the various satellites above us to aid in this task, but also computational power to crunch the numbers and display the information. Earth observation specialists have been working on how to accurately display large scale information on maps for decades, making them invaluable assets in the creation of hot-spot maps and graphical displays of infection rates around the world.

Of course, not every contribution is so direct. Many of the people working in astronomy are not just astronomers. It takes diverse teams of engineers, computer scientists, instrumentation specialists and designers to build and run observatories. With these skills all working together, there are even more ways to help. The pumps that cool telescopes aren’t too different to the ventilators that bring oxygen to damaged lungs. Observatories around the world have turned their hands to making these essential pieces of medical equipment and have made thousands already. This is besides the visors, goggles, valves and other small essential pieces of equipment being printed by the same 3D printers that were printing parts for telescopes and satellites just a few months ago.

Many observatories are optical, they specialize in taking pictures. The expertise built up by instrumental specialists means the skills used in imaging stars can be used in imaging the droplets people spray out when they sneeze and cough. What’s more, they can compare how many droplets escape from the various different masks and visors that have made their way on to the market. This gives us a far better idea of which masks are better at preventing the spread of the disease (and why it’s so important to cover your nose and mouth tightly!).

One of the most important roles that scientists all over the world are filling is the role of translating the technical specifications of masks and the statistical details of COVID-19’s spread, into simple, clear and understandable instructions. Terms such as “incubation period” and “R0/R-Naught” are getting more familiar too us all, but just a few months ago those terms were specialist medical jargon, it’s tough to just look at the words and understand what they mean. Translating that kind of jargon into easy to consume explanations is the foremost job of every science educator, and big hobby for many science enthusiasts. Explaining a black hole and explaining how infection rates work are certainly different topics, but the skill of explanation is the same, and astronomers all over the world are using all the skills they have to help us.

Tips for Connecting Online

This year, many of us will not be able to visit the people that we would normally visit. Whatever reason you have, most of us would like to at least see our loved ones over the coming weeks. We may not be able to meet in person, but technology can at least help us to see familiar faces.

Firstly, it is worth checking if your phone and network support video calls and their cost. Some plans allow for the receipt of video calls at a lower cost than making them. With a little arrangement, it may be possible to find someone with a good plan who can host the video call, in order to make it more affordable.

Secondly, most social media sites now allow for group video calls, usually regardless of whether the users are using phones or computers. This can help keep gatherings more flexible, allowing as many people as possible to join. It may take some arrangement to all agree on a particular platform to use, but with so many apps there are plenty of choices.

There are more and more dedicated web conferencing platforms emerging. As well as the ever present Skype, Microsoft now has Microsoft Teams, as well as more general offerings such as Zoom, OpenMeetings and Google Hangouts.

As long as you have an internet connection and a camera, there is almost always some way of transferring voice and video. However, with poor internet connection, it can be hard to do so with any sort of reliability or quality. One option, which may seem antiquated today, is the video postcard. It may not be live, but getting the chance to see and hear your loved ones clearly may be better than a distorted, choppy attempt at something live.

Website of the month

www.blackrock-castle-gift-shop.myshopify.com

Winter is here, and who doesn't appreciate a good gift at this time of year. The BCO Gift Shop has you covered, with all types of science gifts, from ESA merchandise to DIY science kits!

Quote of the month

Despite the growing interest in the field of ultracold chemistry, experimental progress has been hampered by a lack of appropriate methods to trap and cool molecules.

Edvardas Narevicius, Adam Libson, Christian G. Parthey, Isaac Chavez, Julia Narevicius, Uzi Even, and Mark G. Raizen; "Stopping supersonic oxygen with a series of pulsed electromagnetic coils: A molecular coilgun" in *Physical Review A* 77(5)

Some Upcoming Events at CIT Blackrock Castle Observatory

We are delighted to announce that the BCO gift shop is now operating online! Visit the link below to see our stock and place orders for Click-and-Collect:

www.blackrock-castle-gift-shop.myshopify.com

We look forward to seeing more of you all in the New Year.

PUBLIC OPENING Hours: 10am—5pm (Mon-Sun) - see website for latest opening details

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