10~ spectacular stargazing events to watch in 2021~

Despite a year filled with lockdowns and social isolation, the starry skies of 2020~ gave us solace and enthralled us with a parade of eye-catching celestial events. The astronomical calendar this past year was packed full of memorable sights, including the surprise appearance of the , the decade’s best views of , a Halloween blue moon, and a much-anticipated .

Scores of amazing astronomical phenomena are also in the offing throughout 2021~. Here are our picks for the predicted celestial events worth circling on your calendar in the new year.

February11~: Venus~Jupiter~ conjunction

Early risers will be rewarded with a close encounter between two of the brightest planets in our skies: and . Both planets will appear as brilliant dots to the naked eye, and the pair will seem to be so close in the sky that they will be visible at the same time through a backyard telescope. As an added bonus, the planet Saturn~ will be drifting to the pair’s upper right.

Be prepared to scout out a good observing spot with an unobstructed view of the southeast horizon, as this celestial pairing will occur near the rising sun, and spotting it will be all about timing. The trick is to allow the planets to rise high enough in the morning sky to observe them just before the light of dawn drowns out your view. The best time to see them will be about20to30minutes~ before sunrise. People in the SouthernHemisphere~ will have the best opportunity to see the event because the planets will be positioned farther from the sun and therefore higher in the sky.

March9~ and 10~: Quadruple formation

An impressive cosmic huddle will greet sky-watchers around the globe as four worlds cluster in the southeast morning sky. , Jupiter~, and will all appear in near-perfect alignment, while the nearby crescent moon will frame the trio of planets. Each planet will appear as a brilliant dot, with Mercury~ being the faintest and Jupiter~ the brightest—all easily visible to the naked eye.

Through binoculars, stargazers will be able to spot Jupiter~’s four largest moons, while a small telescope will reveal Saturn~’s rings. Because of Earth~’s position relative to Mercury~ and the sun, only half of the innermost planet's disk will appear illuminated to us. As a result, Mercury~ will look like a miniature version of the through the telescope.

May26~: “Blood moon” total lunar eclipse

Across western NorthAmerica~, western SouthAmerica~, Australia~, and southeast Asia~, people will be able to witness the moon blush red as it undergoes a . This dramatic astronomical event happens when the sun, Earth~, and moon are precisely aligned so that our planet's shadow completely blankets the moon’s face.

During the total part of the eclipse, sunlight shining through the ring of Earth~'s dusty atmosphere is bent, or refracted, toward the red part of the spectrum and cast onto the moon's surface. As a result, the moon will transform from a dark gray color during the partial phase of the eclipse to a reddish-orange color during totality. The moon's exact color can vary depending on the amount of dust in Earth~'s atmosphere.

This total lunar eclipse coincides with the moon being at its closest point to Earth~ in its egg-shaped orbit—sometimes called a —so the lunar disk will also be bigger and brighter than an average full moon. The partial eclipse begins at 144am~ Pacific~ time, when the first hint of Earth~’s shadow will start to cover the moon. The total eclipse, when the moon appears to turn red, will begin at 311am~ and end at 325am~

June10~: “Ring of fire” solar eclipse

Any people along a narrow path running north from Canada~, into part of Greenland~, and into Russia~ will get to see a “ring of fire” eclipse just as the sun rises. Also known as an annular , this stunning event occurs when the moon, sun, and Earth~ are aligned so that the lunar disk is too small to cover the entire sun, leaving a ring of light around the dark lunar silhouette. The full eclipse path starts at 9:49 UT~ over northern Canada~ and ends in Russia~ at 11:33 UT~.

While it may be difficult for most people to make it into the ring of fire’s remote path, millions will be well placed to witness the related partial solar eclipse, when large parts of Asia~, Europe~, and NorthAmerica~ will see part of the sun blocked by the moon. If you are viewing either the annular or partial eclipse, remember to never look at the sun directly without proper eye protection, such as solar filter glasses.

July12~: Venus~Mars~Conjunction~

After local sunset, these two bright planets will appear to touch in the sky. The pair will be joined by a crescent moon, making for an eye-catching photo opportunity.

Similar to the , Mars~ and Venus~ will be so close they will be visible through a backyard telescope at the same time. Venus~ will be the easiest to spot as an unmistakably bright star-like object. RuddyMars~ will appear much fainter, so you may not notice it at first due to Venus~’s glare. After your eyes adjust, however, the two should be easy to see with the unaided eye, separated by space equal to the width of a full moon.

August12and13~: Perseid meteor shower~ peaks

Every mid-August, Earth~ travels through a cloud of debris shed by the comet Swift–Tuttle, producing a flurry of shooting stars in the skies as small meteors burn up in the upper atmosphere. This is the Perseid , and it can produce up to 60~ shooting stars an hour in a typical year.

This year promises to be particularly good for the Perseids~, since the shower~’s peak will coincide with a dark, moonless sky. A thin crescent moon will set during the early evening, ushering in excellent viewing conditions later in the night. TheNorthernHemisphere~ is favored since the meteors always appear to radiate from their namesake constellation Perseus, which lies close to the horizon this time of year for those in far southern latitudes.

To get the best view of this celestial fireworks show, scout out a viewing spot with as little light pollution as possible. Even from a suburban backyard or park, dozens of shooting stars should be visible each hour under clear skies.

August18~: Mars~-Mercury~ conjunction

A close encounter will transpire between the innermost planet of the solar system, little Mercury~, and the fourth planet from the sun, ruddy Mars~. This dramatic conjunction will be a bit tricky to catch because of its close proximity to the setting sun, so you’ll need a clear line of sight toward the western horizon. Mercury~ will appear brighter than Mars~, since it will be illuminated more by the sun. If you can spot the conjunction through a telescope, these two planets will appear squeezed together so closely that they can both be viewed at high magnification, providing detailed views of the two worlds together.

October8~: Draco~nid meteor shower~

The Draco~nids~ will sparkle in the high northwest skies after nightfall with about 10~ to 15 shooting stars an hour. This flurry of meteors comes from a stream of sand grain-size particles spread along the orbit of comet 21P~/GiacobiniZinner~. With only a small sliver of moon to compete, the relatively dark skies will help sky-watchers enjoy these flashes of cometary debris.

Like most other meteor shower~s, the Draco~nids~ are named after the constellation from which they appear to radiate—in this case, Draco~, the dragon. The Draco~nids~ are best viewed from nightfall to midnight, when the shooting stars will appear highest in the sky. At the shower~'s peak, Draco~ will be nearly overhead around local midnight throughout the NorthernHemisphere~. The dragon's shooting stars are fairly easy to spot since they are some of the slowest moving of any annual shower~.

November19Partial~ lunar eclipse

The last lunar eclipse of the year will greet sky watchers across North and SouthAmerica~, Australia~, and parts of Europe~ and Asia~. While it is technically a partial eclipse, upto95percent~ of the full moon will be cast within Earth~’s dark shadow. During the maximum phase, it should briefly appear as a total eclipse, which means the lunar disk may show hints of orange or red. The eclipse will start at 218amEST~, and Earth~’s shadow will envelop most of the moon’s visible surface by 402amEST~.

December4~: Total solar eclipse

Intrepid travelers looking for the ultimate eclipse-chasing adventure will have their chance at the endof2021~, when a total solar eclipse will unfold across Antarctica~. Meanwhile, a partial eclipse of the sun will be visible across parts of Chile~, Argentina~, SouthAfrica~, Namibia~, and Australia~. Viewers using solar-filtered glasses in these regions will get to see a bite taken out of the sun as the moon partially obscures the solar disk.

Some cruise ships and airlines will head straight into the path of totality, where the entire disk of the sun will be covered by the moon, dramatically darkening the surrounding environment for a few precious minutes. Those who make the trek to the southernmost part of the world will have an opportunity to capture the eclipsed sun near the horizon in the early morning hours, with icebergs and icy tundra in the foreground—a terrific way to round out the year.