

The Night Sky

Once in a Blue Moon

The month of May will have two full Moons, the first on the beginning of the month, May 1st, and the second on the last day of the month, May 31st. Traditionally when such an occurrence happens, the second full Moon of the month is called a “Blue Moon.” Usually, it has nothing to do with the actual or apparent color of the Moon.

There is a remarkable history of the phrase “Blue Moon.” Before it meant an extra moon in a month, the term was used in the *Maine Farmers' Almanac* to track seasonal cycles. A tropical year has 12 full moons, but occasionally has 13, meaning one season gets four full moons instead of three. The almanac called the third full moon in a season with four full moons a "Blue Moon" to keep the naming of seasonal moons (such as “Harvest Moon”) consistent from year to year. The definition we use today stems from a mistake made by amateur astronomer James Hugh Pruett in a 1946 *Sky & Telescope* magazine article. Pruett misinterpreted the older *Maine Farmers' Almanac* rule and incorrectly described a Blue Moon as the second full moon in a single calendar month. The incorrect 1946 definition took on a life of its own. It was even used as an answer in the 1986 board game *Trivial Pursuit*, and became cemented in mainstream pop culture during the late 1990s.

The term "*lunation*" (also known as a synodic month or lunar month) is the average period of time of approximately 29.53 days elapsing between two successive new moons. It encompasses the complete cycle of the Moon's phases. One lunation is 29.53 days. There are about 365.24 days in a tropical year, where a "tropical year" is the time, it takes the Sun to return to the same position in the sky relative to Earth, completing one full cycle of seasons. It is measured as the interval between one vernal equinox (marking the first day of spring) and the next.

Therefore, about 12.37 lunations (365.24 days divided by 29.53 days) occur in a tropical year. So, the date of the full moon falls back by nearly one day every calendar month on average. Each calendar year contains roughly 11 days more than the number of days in 12 lunar cycles, so every two or three years (more precisely, seven times in a 19-year interval), there is an extra full moon in the year. The extra full moon necessarily falls in one of the four seasons, giving that season four full moons instead of the usual three.

Given that a year is approximately 365.2425 days and a synodic orbit of the Moon is 29.5309 days, there are about 12.368 synodic months in a year. For this to add up to another full month would take $1/0.368$ years. Thus, it would take about 2.716 years, or 2 years, 8 months, and 18 days in between blue moons to occur -- approximately once in 32.5 months on an average.

Now let's ask the question, can the Moon actually appear blue in color? The Moon can appear blue under certain **rare** atmospheric conditions – for instance, if volcanic eruptions or large-scale fires release

particles into the atmosphere of just the right size to preferentially scatter red light, though this phenomenon is rare and unpredictable (hence the saying "once in a blue moon"). The key to a blue moon in actual color is having many particles slightly wider than the wavelength of red light (0.7 micrometer) -- and no other sizes present. Ash and dust clouds thrown into the atmosphere by fires and storms usually contain a mixture of particles with a wide range of sizes, with smaller than 1 micrometer, and they tend to scatter blue light through a process known as Mie scattering. This kind of cloud makes the Moon turn red; thus, red moons are far more common than blue moons.

Venus continues to dominate the evening sky, shining brightly at the feet of the Gemini constellation. On May 18th, a thin waxing crescent Moon will appear just to the right of Venus. Throughout the month, watch Jupiter, the second brightest planet in the night sky, behind the brightest, Venus, get closer and closer to Venus, as these two planets approach their close conjunction in June.

Mars returns to the morning sky after its superior conjunction with the Sun. You should first be able to spot it above the eastern horizon in the bright morning twilight on May 14th. Looking just to the upper right of Mars, you should easily be able to spot Saturn. On May 13th and 14th, the waning crescent Moon will pass just above Saturn on the 13th, then Mars on the following day.

The ETSU Powell Observatory open houses are on hiatus until September. Later this summer, the 2026-2027 schedule for our Astronomy open houses can be found on the web at <https://www.etsu.edu/cas/physics/observatory/starparty.php>.

The last planetarium show of the season occurs on May 14th at 7:00 p.m. at the ETSU Planetarium in Hutcheson Hall. A location map of the Planetarium on the ETSU campus can be found on the web at <https://www.etsu.edu/cas/physics/outreach/planetarium.php> for further information.

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