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## Upstate NY Stargazing in December: Geminid meteor shower, another Supermoon

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By Special to nyup.com

By Damian Allis, Contributing Writer



The author, adequately layered for an exceptionally cold observing session earlier this year.

It is not common knowledge, but the late-autumn and winter holidays were strategically placed to allow amateur astronomers in New York to bulk up on high calorie foods for the many long nights of observing to be had before pre-dawn snow turns back into light drizzles. While advocates for some outdoor avocations go into hibernation mode near the first snow, celestial observers prepare for crisp and clear nighttime skies by stocking up on batteries and hand-warmers.

# Roma Tile & Marble



New and unprepared observers come face-to-frozen-face with the harsh reality of cold temperatures the first time they strike out for nighttime viewing in winter. Observing through binoculars or telescopes is a very stationery activity, where the goal is to move as little as possible to not disturb your view through the eyepiece. Your lack of motion has a tendency of making you feel very cold very quickly. Furthermore, when the temperature outside drops below that of your skin or your last good layer of clothing, you become the heat source for your surroundings and not vice versa - this can make for some very short observing sessions.

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If you're thinking about attending any observing session in New York this winter, stop thinking and start planning. The winter skies are beautiful and filled with some amazing objects at any magnification provided you're dressed for the occasion. You need only be adequately prepared for the session, which means having on hand at least one more layer than you *\*think\** you will need. Back in the day, many an observer would even have a telephone book ready to stand on to provide an additional layer of



insulation between toes and ground. You may have trouble finding an adequately thick stack of cheap paper nowadays, but that first encounter with numb toes can coax you into some quality recycling bin search time.

### Your First Steps Outside:

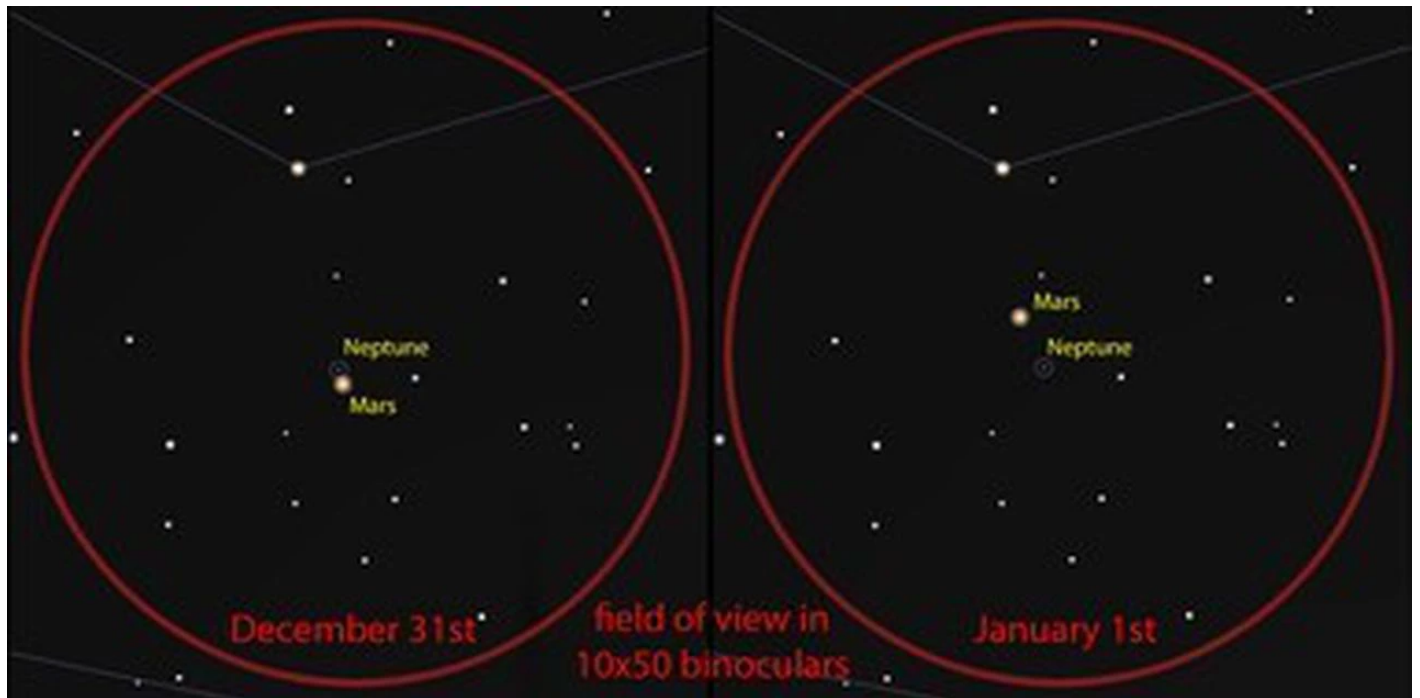


The view looking south at 8 p.m. on Dec. 15 (except for the changing Moon position, this mid-month view is accurate for all of December). Click for a larger view.

Items and events listed below assume you're outside and observing most anywhere in New York state. The longer you're outside and away from indoor or bright lights, the better your dark adaption will be. If you have to use your smartphone, find a red light app or piece of red acetate, else set your brightness as low as possible.

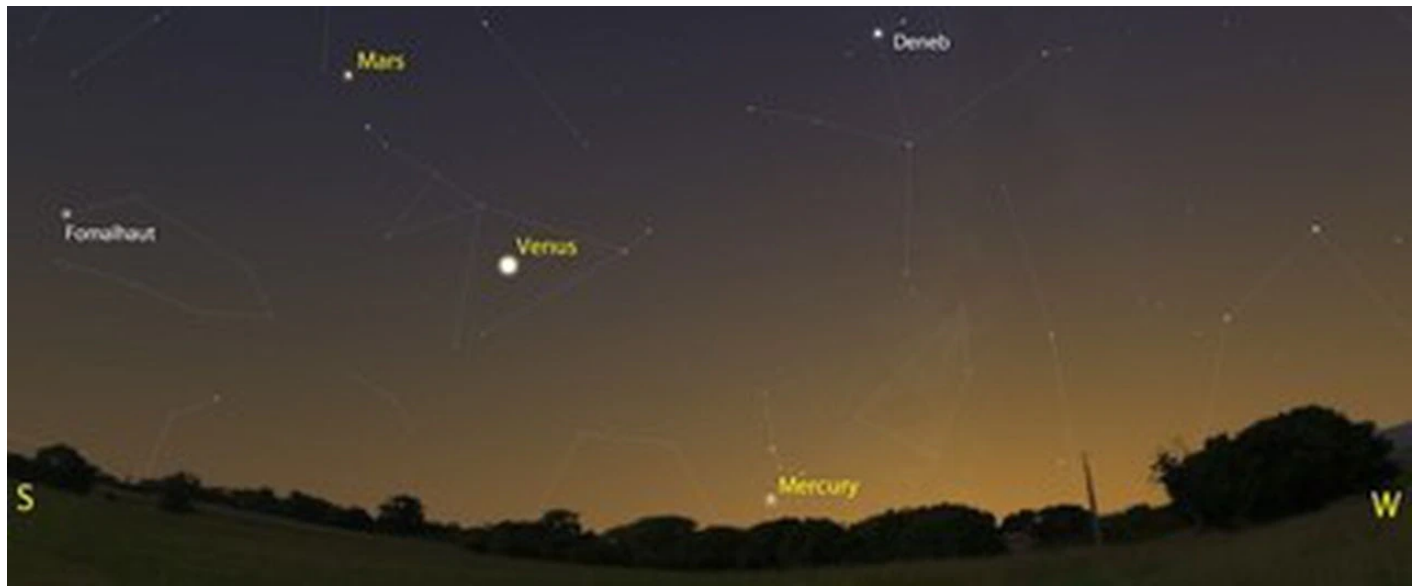
**Mars:** Mars continues its slow migration along the horizon from southwest to west this month, setting at around 9:00 p.m. each night in the process. Those keeping track of zodiacal constellations will note that Mars begins near the eastern-most corner of Capricorn before sliding into Aquarius on December 15th, trailed closely by bright Venus, which spends nearly the entire month in Capricorn. While Mars will not have

close encounters with any deep sky objects this month, scope owners will be treated to very close pairing of Mars and Neptune on Dec. 31, as well as a close pairing to ring in the New Year on Jan. 1.



An ideal opportunity to find a distant planet using a nearby one. On Dec. 31, Mars and Neptune will be at their closest. To get a feel for how much the planets move each night, try observing on Jan. 1 to see Mars' new location. Click for a larger view.

**Venus:** We gain about two additional minutes of Venus viewing each night this month, setting close to 7:05 p.m. on the 1st and 8:20 p.m. on the 31st. After the Moon, Venus is the brightest object in the sky after sunset and should jump right out at you to the southwest. You'll have plenty of time to work on training your eyes to see first sight of Venus in the sky, as it remains with us near sunset until well into March 2017. Mars will hand off its close approach duties to Venus in January, when Venus and Neptune appear very close in the sky on Jan. 12.



Mercury, Venus, and Mars just after sunset on Dec. 15. Click for a larger view.

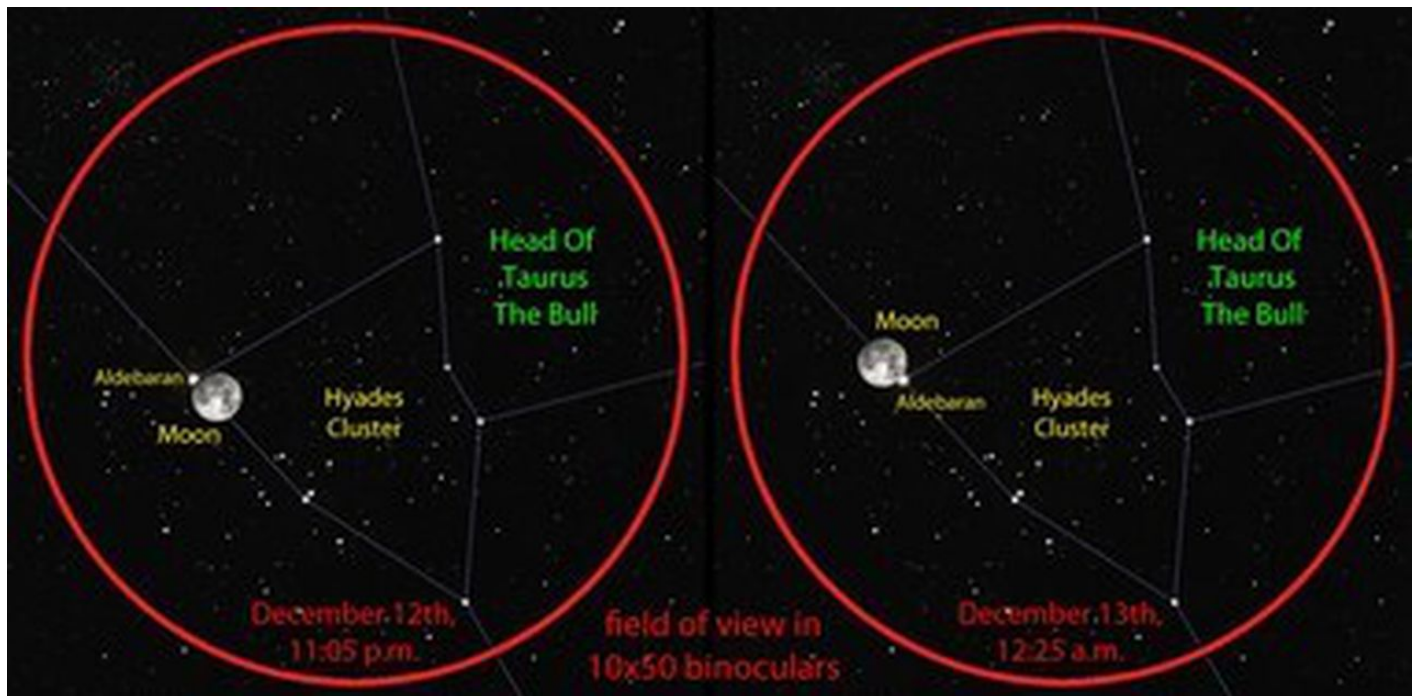
**Mercury:** Mercury will be a tough catch this month, as it is not particularly bright and is very close to the horizon at sunset. Your best chance to see it will be on Dec. 15, when it will be nearly perfectly southwest after sunset and all but gone before 6 p.m. That said, Mercury will be in roughly the same position and early-setting until around the 20th. If you can find Mercury, Venus and Mars will be much easier catches as you swing your sights higher and to the south.

### **Lunar occultation of Aldebaran on Dec. 12/13**

If you go outside at, say, 9 p.m. over several consecutive nights and compare the position of the Moon to the stars and constellations in the sky, it will be obvious to you that the Moon makes a significant leap east each night. This is, of course, the motion of the Moon around the Earth that you are noticing. The Moon is, in fact, constantly in motion around the Earth, just as the Earth-Moon pair moves in our orbit around the Sun. The clearest indicator of this constant lunar motion comes from watching a star disappear behind the eastern side of the Moon, only to reappear on the western side up to 80 minutes later (depending on if the star is grazing the Moon's edge or if you have to wait a full Moon diameter's worth to see the star pop back out). Such an event, referred to as an occultation, is going to occur this month when the Moon occults the bright star Aldebaran, bright red-orange eye of the constellation Taurus the Bull.

Observers should see the occultation begin close to 11:09 p.m. on December 12th, lasting about 75 minutes when Aldebaran reappears on the western edge of the Moon at 12:23 a.m. on the 13th. These lunar occultations are common events - the Moon is always blocking some piece of the sky each night. This particular occultation is special because a very bright star is involved, making the whole disappearing-reappearing act all the more pronounced with or without magnification.

When an occultation involving a distant star and, for instance, a gas giant like Jupiter or Saturn occurs, we get more than a disappearing act. As the star begins to slip behind the planet, it does not disappear all at once, instead trailing off quickly behind the planet's upper atmosphere. By measuring the light of the star without the planet and then measuring the change in the star's light because of the planet, scientists and amateur astronomers alike are able to identify the gases in these planetary atmospheres from the comfort of their own telescopes and spectrometers. Keen observers this night will learn what the Apollo astronauts experienced firsthand - Aldebaran will fizzle out immediately due to the lack of any measurable lunar atmosphere.



Just before and after the lunar occultation of Aldebaran. Click for a larger view.

## Early Riser Alert

**Jupiter:** Jupiter rises above the eastern horizon near 3:00 a.m. on December 1st and by 1:30 a.m. at month's end. Its four Galilean Moons - Callisto, Io, Europa, and Ganymede - are all visible in low-power binoculars when Jupiter rises, but are washed out early by sunlight even before sunrise approaches. Jupiter and the very waning crescent moon will make a very nice pairing after 2:00 a.m. on Dec. 22.

**Saturn:** Those who want one last easy view of Saturn in 2016 will have to wait until just before sunrise at the very end of December, when it rises just after Antares, the heart of the summer constellation Scorpius.

**December observing opportunities In Upstate/Central New York:**

New York has a number of evenly-spaced astronomers, astronomy clubs, and observatories that host sessions throughout the year. Many of these sessions are free and open to the public, often close to the New Moon when skies are darkest and the chance for seeing deep, distant objects is greatest. These observers and facilities are the very best places to see the month's best objects using some of the best equipment, all while having very knowledgeable observers at your side to answer questions and guide discussion. Many of these organizations also hold monthly meetings, where seasoned amateurs can learn about recent news and discoveries from guest lecturers, and brand new observers are encouraged to join and begin the path towards seasoned amateur status.

Announced public sessions from several respondent NY astronomy organizations are provided below for December. As wind and cloud cover are always factors when observing, please check the website links or email the groups for directions and to find out about an event a day-or-so before the announced session. Also note that some groups will include weather-alternate dates for scheduled sessions.

## Astronomy Events Calendar

Organizer	Location	Event	Date	Time	Contact Info
Adirondack Public Observatory	Tupper Lake	Public Star Gazing	Dec. 2	6:00 PM	<a href="#">email</a> , <a href="#">website</a>
Adirondack Public Observatory	Tupper Lake	Public Star Gazing	Dec. 16	6:00 PM	<a href="#">email</a> , <a href="#">website</a>
Albany Area Amateur Astronomers & Dudley Observatory	Schenectady	Public Lecture	Dec. 15	7:30 - 9:00 PM	<a href="#">email</a> , <a href="#">website</a>
Albany Area Amateur Astronomers & Dudley Observatory	Schenectady	Night Sky Adventure	Dec. 20	7:00 - 8:30 PM	<a href="#">email</a> , <a href="#">website</a>
Baltimore Woods	Marcellus	Geminids With Bob Piekiet	Dec. 13	7:00 - 10:00 PM	<a href="#">email</a> , <a href="#">website</a>
Kopernik Observatory & Science Center	Vestal	Nanomaterials Lecture And Public Viewing	Dec. 2	7:00 PM	<a href="#">email</a> , <a href="#">website</a>
Kopernik Observatory & Science Center	Vestal	"Star Of Bethlehem" Movie And Public Viewing	Dec. 9	7:00 PM	<a href="#">email</a> , <a href="#">website</a>
Kopernik Observatory & Science Center	Vestal	"Star Of Bethlehem" Movie And Public Viewing	Dec. 16	7:00 PM	<a href="#">email</a> , <a href="#">website</a>
Mohawk Valley Astronomical Society	Waterville	Public Star Gazing	Dec. 3	7:30 PM - 10:00 AM	<a href="#">email</a> , <a href="#">website</a>

## ISS And Other Bright Flyovers:

Satellite flyovers are commonplace, with several bright passes per hour, yet a thrill to new observers of all ages. Few flyovers compare in brightness or interest to the International Space Station. The flyovers of the football-sized craft with its massive



solar panel arrays can be predicted to within several seconds and take several minutes to complete.

December is full of early-evening ISS flyovers, including nine days when observers will be treated to two passes separated by about 90 minutes - the time it takes for the ISS to go once around the Earth. Early birds will have three chances to see flyovers during the last three days of the month. Simply go out a few minutes before the start time, orient yourself, and look for what will at first seem like a distant plane.

## ISS fly-bys

Date	Brightness	Approx. Start	Start Direction	Approx. End	End Direction
12/1	extremely	5:51 PM	S/SW	5:55 PM	E
12/1	somewhat	7:28 PM	W	7:28 PM	W
12/2	very	5:00 PM	S	5:05 PM	E
12/2	very	6:36 PM	W/SW	6:38 PM	W/NW
12/3	extremely	5:44 PM	SW	5:49 PM	E/NE
12/3	somewhat	7:21 PM	W/NW	7:21 PM	W/NW
12/4	very	6:29 PM	W	6:31 PM	N/NW
12/5	extremely	5:36 PM	W	5:42 PM	NE
12/5	somewhat	7:14 PM	NW	7:14 PM	NW
12/6	moderately	6:22 PM	W/NW	6:24 PM	N/NW
12/7	very	5:29 PM	W	5:34 PM	NE
12/8	moderately	6:15 PM	NW	6:17 PM	N
12/9	very	5:22 PM	W/NW	5:27 PM	NE
12/9	somewhat	7:00 PM	NW	7:00 PM	NW
12/10	moderately	6:08 PM	NW	6:10 PM	N
12/11	moderately	5:15 PM	NW	5:20 PM	NE
12/11	somewhat	6:52 PM	NW	6:53 PM	NW
12/12	very	6:00 PM	NW	6:03 PM	N/NE
12/13	very	5:08 PM	NW	5:13 PM	NE
12/13	moderately	6:44 PM	NW	6:45 PM	NW
12/14	very	5:52 PM	NW	5:56 PM	NE
12/15	very	5:00 PM	NW	5:06 PM	E/NE
12/15	very	6:36 PM	W/NW	6:39 PM	NW
12/16	extremely	5:44 PM	NW	5:49 PM	E
12/16	somewhat	7:21 PM	W	7:22 PM	W
12/17	very	6:29 PM	W/NW	6:33 PM	S
12/18	extremely	5:37 PM	W/NW	5:43 PM	SE
12/19	somewhat	6:22 PM	W	6:26 PM	S
12/20	moderately	5:29 PM	W/NW	5:35 PM	S/SE

12/22	somewhat	5:22 PM	W	5:26 PM	S/SW
12/29	moderately	6:25 AM	S	6:30 AM	E
12/30	somewhat	5:34 AM	S/SE	5:36 AM	E/SE
12/31	very	6:16 AM	SW	6:22 AM	E/NE

Predictions courtesy of [heavens-above.com](http://heavens-above.com).

## Moon:

### Lunar Phases

New:	First Quarter:	Full:	Third Quarter:	New:
Nov. 29, 7:18 AM	Dec. 7, 4:03 AM	Dec. 13, 7:05 PM	Dec. 20, 8:55 PM	Dec. 29, 1:53 AM

The moon's increasing brightness as full moon approaches washes out fainter stars, random meteors, and other celestial objects - this is bad for most observing, but excellent for new observers, as only the brightest stars (those that mark the major constellations) and planets remain visible for your easy identification. If you've never tried it, the moon is a wonderful binocular object.

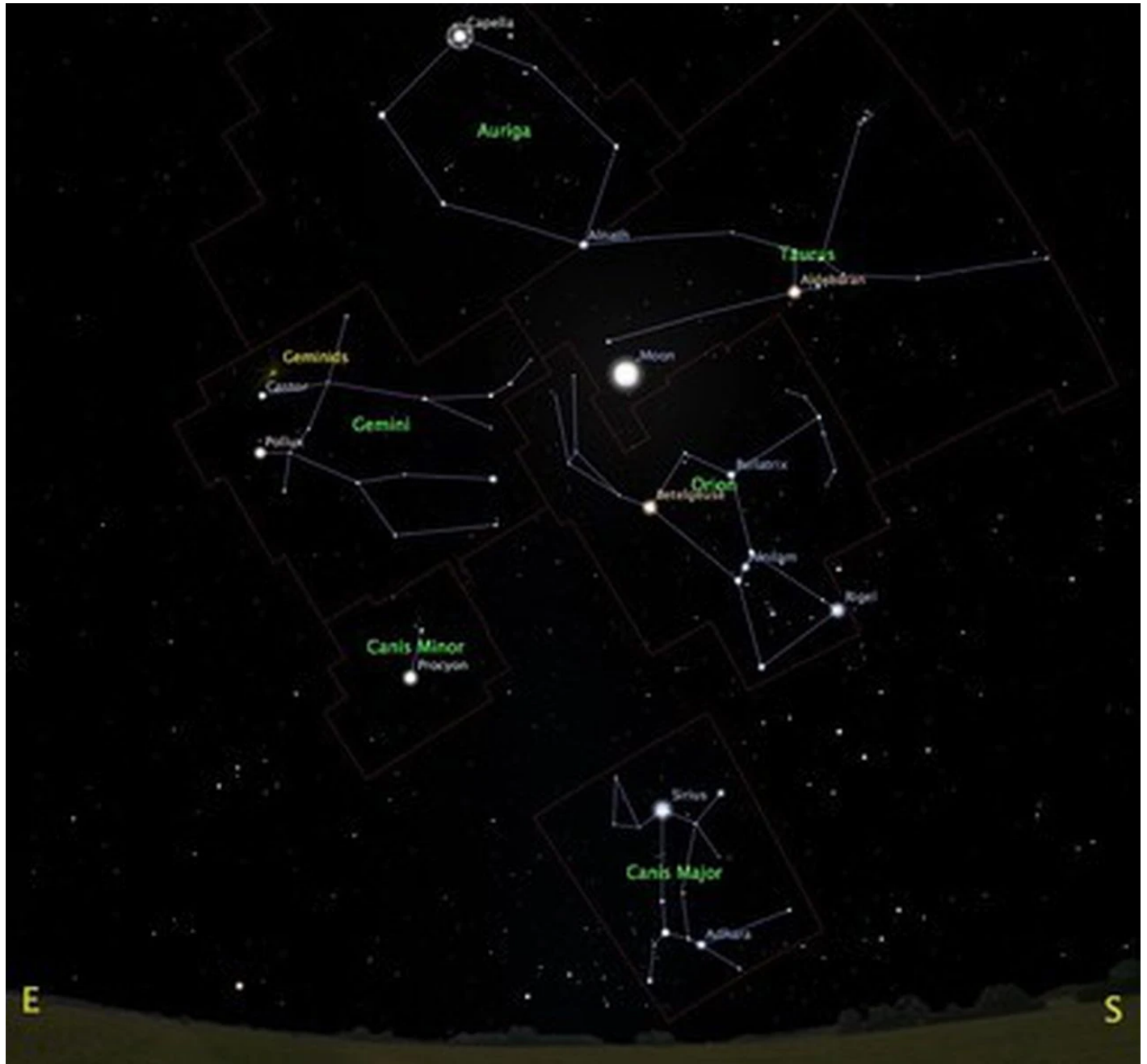
In the interest of completeness, we note that the last supermoon of 2016 will occur on December 14th. The term "supermoon" is not an astronomical description of any significant event, but instead owes its origin to modern astrologer Richard Nolle (and don't get an astronomer started with *that* debate). For those interested in technical jargon, astronomers refer to these closest approaches of the Moon to the Earth as perigee-syzygy. Perigee describes when the Moon is closest to the Earth in its orbit; Syzygy occurs when the Sun, Earth, and Moon are aligned, which happens at either New Moon (Sun-Moon-Earth) or Full Moon (Sun-Earth-Moon). For those counting double-letter/double-word scores, syzygy also only occurs when someone combines the tiles from two or more Scrabble boxes.

Sadly, the December supermoon has only one superpower - it will wash out the shooting stars from the Geminids, greatly diminishing this otherwise decent meteor shower.

### Meteor Showers: Geminids, Peaking Dec. 12-14

Meteor showers are the result of the Earth passing through the debris field of a comet or asteroid. As these objects approach the warming sun in their long orbits, they leave tiny bits behind - imagine pebbles popping out the back of a large gravel truck on an increasingly bumpy road. In the case of meteor showers, the brilliant streaks you see are due to particles no larger than grains of sand. The Earth plows through the swarm

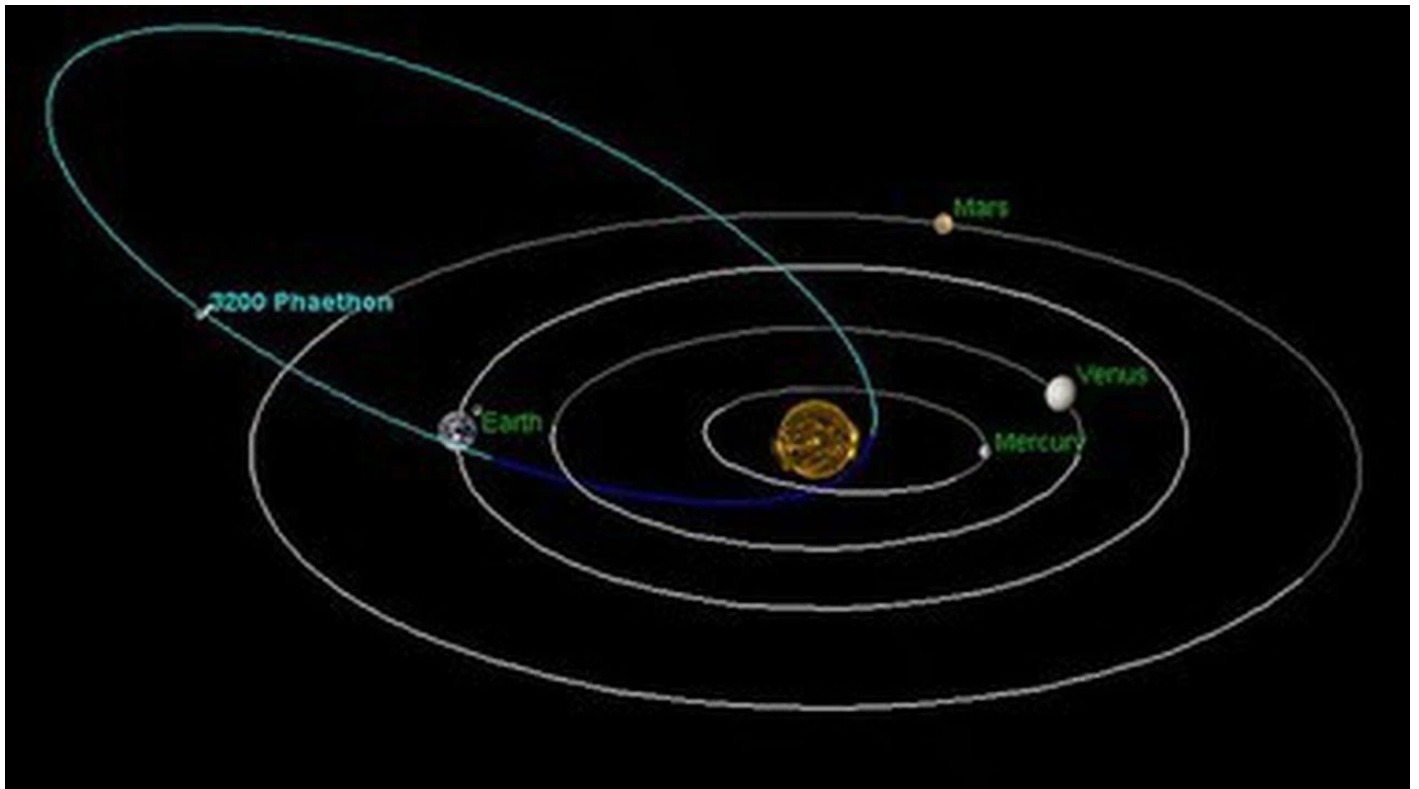
of these tiny particles at up-to 12 miles-per-second. High in the upper atmosphere, these particles burn up due to friction and ionize the air around them, producing the long light trails we see. We can predict the peak observing nights for a meteor shower because we know when and where in Earth's orbit we'll pass through the same part of the Solar System - this yearly periodicity in meteor activity is what let us identify and name meteor showers well before we ever had evidence of what caused them.



Gemini rises soon after Orion, with Orion's three belt stars being a very easy find for most people. [Click for a larger view.](#)

The name of each meteor shower is based on the constellation from which the shooting stars appear to radiate - a position in the sky we call the radiant. In the case of the Geminids, the meteor shower radiant appears to be next to Castor, both the name of one of the twins and the name of his head star. Unlike most of the meteor

showers, the Geminids are not produced by a comet - asteroid 3200 Phaethon, an unassuming object not discovered until 1983, has an eccentric 1.4 year orbit that places it near the path of Earth's orbit. Because of its proximity and quick orbit, 3200 Phaethon has great opportunity to repopulate its orbit with small particulates, meaning the Geminids are often a stand-out meteor shower for the year.



The eccentric orbit of 3200 Phaethon in the inner solar system.

**How to observe:** The Geminids can be impressive and impressively bright, with up-to 120 meteors per hour possible. Sadly, the Moon will be prominent in the late-night/early-morning sky during the days around the Geminid peak, making for a far less impressive display. Those observing the Aldebaran occultation on the night of December 12th might even be able to catch a few of the brightest meteors that night.

To optimize your experience, lie flat on the ground with your feet pointed towards Gemini and your head elevated - meteors will then appear to fly right over and around you. Counts and brightness tend to increase the later you stay out, with peak observing times usually between 1 a.m. and 5 a.m. The swarm of tiny particles is distributed broadly in orbit, meaning some people may see shooting stars associated with the Geminids throughout the middle of the month.

**Learn A Constellation: Taurus The Bull**





Taurus the Bull and nearest neighbors. Click for a larger view.

Once upon a time in our distant ancestral past, someone broke an excellent spear tip trying to take down a jagged rock that just happened to look like dinner under the fading light of sunset. More recently, it's a fair bet that everyone has looked up at the clouds or into just the right thicket of bushes to see some kind of animal-like feature jump out. This phenomenon, known as pareidolia, is the result of some kind of stimulus, be it a sound or a sight, that you then interpret as something very different.

Many of the oldest constellations are textbook pareidolia. The stars of Orion the Hunter are perfectly placed now to look like a human being, just as the constellation Scorpius has been recorded as a scorpion in every civilization that knew what a real scorpion looked like. These and other characters have been with Western cultures for thousands of years.

This all leads to a great question in astronomy and human history - just how old is the oldest recognized constellation? At what point in our history could we travel back to and have a distant ancestor and ourselves agree on what a shape in the sky looks like?

One answer was uncovered in the Lascaux caves in France, when an archeologist with some astronomical inkling noticed that one image of a bull had black spots at strategic points along the horns and around the head, including one notably larger black spot for one of the two eyes. To the right of this cluster of marks lay a tightly-packed cluster of black dots, while to the left lay a line of three (actually, four) stars. If we take this arrangement at rock-face value, the placement of the three-dot line to the left and tight cluster to the right line up very well with the placement of Orion's Belt (to the left) and the Pleiades star cluster (to the right) on either side of the head of what we today call Taurus the Bull. If this arrangement and overlaid image of a bull are what the original artist intended, and we take the carbon dating at face value, then we've compelling evidence that Taurus the Bull, in some form, might date back over 17,500 years.



No bull - a Lascaux painting marking the location of an ancient Taurus, c.a. 15,500 B.C. Click for a larger view.

While it is wondrous to think that this celestial meme was passed down by ancestral astronomers throughout southern Europe into the Middle East and North Africa, it is likely that the meaning of the representation at Lascaux died with its painter, and our modern Taurus is instead a result of someone else seeing the same shape on a winter night long ago.

Taurus is featured several times in this month's article, including its close proximity to Gemini and, of course, the Aldebaran occultation on December 12th. [In last month's article](#), we described how Taurus contains the two closest prominent open star clusters in our neighborhood - the Pleiades and the Hyades. The head of Taurus the Bull is the closest star cluster to Earth - the Hyades. While the bright Aldebaran is perfectly placed to make the whole object look like a prominent "V," this is only because we see the sky as flat. Aldebaran, at 65 light years away, is not a member of the Hyades cluster, which lies roughly 150 light years from us.

The Pleiades are the most famous of these open clusters due to their proximity - in binoculars, the famed Seven Sisters increase in number to the mid-30's. The actual count of stars in this collective is measured as being close to 1000. On cloudy nights, observers need only find their nearest parking lot to see a rough map of the Pleiades in the form of a logo - in Japanese, the Pleiades are known as "Subaru," meaning "united."

[Dr. Damian Allis](#) is the director of [CNY Observers](#) and a NASA Solar System Ambassador.

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