the Skyscraper

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AMATEUR ASTRONOMICAL SOCIETY OF RHODE ISLAND ⋆ 47 PEEPTOAD ROAD ⋆ NORTH SCITUATE, RHODE ISLAND 02857 ⋆ WWW.THESKYSCRAPERS.ORG

In This Issue:

December Meeting & Holiday Celebration

Saturday, December 16
at North Scituate Community House, 546 W Greenville Rd (Rt. 116)

In-person and on Zoom (Contact Linda Bergemann (lbergemann@aol.com) for the Zoom link.

Topic: Astronomy in 3-D!
Speaker: Steve Nathan, Eastern Connecticut State University

Steve will share with you another facet of his interest in astronomy: Astronomy in 3-D! For over 150 years, 3-D photography has been a key part of astronomy, both from aesthetic and scientific viewpoints. So, grab your 3-D glasses (provided by Skyscrapers) and we will gaze at the heavens through the third dimension.

Steve Nathan is an Associate Professor of Energy Geoscience and Chair of the Environmental Earth Science Department at Eastern Connecticut State University. Outside of the day job, Steve shares his life-long interest in amateur astronomy by working as a planetarium lecturer for the Seymour Planetarium in Springfield, Massachusetts. He also created and coordinated for 22 years the Astronomical League's Lunar Observing Program. Steve has taught countless astronomy classes and workshops for many naturalist, school and science groups (e.g., the Appalachian Mountain Club, the Springfield Science Museum, the Tin Mountain Conservation Center).

Seagrave Memorial Observatory Open Nights
December 2, 9, 23 & 30
@ 7pm

President's Message

by Linda Bergemann

Greetings and Happy Holidays!

Time seems to fly by faster and faster, and my to-do list gets longer and longer. With this message, I hope to check off a few items.

First, I am passing along an invitation from the Kalamazoo Astronomical Society (KAS) to participate in their "Introduction to Amateur Astronomy" lecture series beginning in early 2024. This five-part series was last offered in 2022, and many Skyscrapers, including me, attended and earned a Certificate of Completion. The series will be offered exclusively on Zoom and admission is FREE. But, you must register through the KAS website https://www.kasonline.org/amastro.html. More details and scheduled dates are available on their website. One check.

Next up. Sometime in the last year, I, on behalf of Skyscrapers, completed a survey regarding collaboration with professional astronomers from the International Astronomical Union (IAU). I was recently notified that the IAU has launched a Pro-Am Research Collaboration (PARC) initiative to promote and facilitate research between amateur and professional astronomers. Amateur astronomers from around the world are invited to visit the PARC web portal, explore the "Active Projects", and sign up to participate in those that are of interest. If you have an interest, or just want to browse, the PARC Web Portal link is: https://www.iau.org/science/scientific_bodies/working_groups/professional-amateur/. Check two.

Lastly, I would like to extend my congratulations to Skyscrapers member, Mark Munkacsy, upon his election to the Board of the American Association of Variable Star Observers (AAVSO). Mark is also a member of the Data Quality Task Force which received the AAVSO Director's Award. We are fortunate to have Mark as a member of Skyscrapers. Mark joined Skyscrapers in 2021 and immediately took on forming an astronomy club at the Woonsocket Harris Public Library which met biweekly for well over a year. His latest project for Skyscrapers (in conjunction with Michael Corvese) is prototyping "Sky Puppies", a youth astronomy program currently ongoing at the Portsmouth Free Public Library. Congratulations to Mark on his accomplishments, and my thanks to Mark and Michael for bringing astronomy to the youth of Portsmouth. Check three.

I will end by reminding you that Skyscrapers will celebrate the upcoming holidays with a Potluck Dinner before our speaker on December 16th. This event will not take place at the observatory, but at the nearby North Scituate Community House. More information is available on our website. I hope to see you there!

Warmest wishes, Linda

New Members

Welcome to Skyscrapers

Paul White
of South Kingstown

Paul Bissonnette
of Cranston

Skyscrapers Presentations on YouTube

Many of our recent monthly presentations on Zoom have been recorded and published, with permission, on the Skyscrapers YouTube channel. Go to the URL below to view recent presentations.

https://www.youtube.com/c/SeagraveObservatorySkyscrapersInc

The Skyscraper is published monthly by Skyscrapers, Inc. Meetings are held monthly, usually on the first or second Friday or Saturday of the month. Seagrave Memorial Observatory is open every Saturday night, weather permitting.

Directions
Directions to Seagrave Memorial Observatory are located on the back page of this newsletter.

Submissions
Submissions to The Skyscraper are always welcome. Please submit items for the newsletter no later than **December 15** to Jim Hendrickson at hendrickson.jim@gmail.com.

E-mail subscriptions
To receive The Skyscraper by e-mail, send e-mail with your name and address to jim@distantgalaxy.com. Note that you will no longer receive the newsletter by postal mail.

Skylights: December 2023

by Jim Hendrickson

The **Sun** spends December moving along the most southerly section of the ecliptic, bringing the longest nights to the northern hemisphere. If you're familiar with the twelve zodiacal constellations, you may be surprised to learn that the Sun lies within a constellation that is not a member of this set, Ophiuchus, the Doctor, through December 18, when it enters into Sagittarius.

On the 1st, the Sun is at the same right ascension as, and 4.4° north of Antares at noon.

The earliest sunset of the year occurs at 4:14pm EST on the 8th.

Solstice occurs at 10:27pm EST on the 21st, marking the start of winter for the northern hemisphere, and summer in the southern hemisphere. At a declination of -23.4°, the Sun will now appear to move slowly north.

Although it appears to coincide with solstice, the Sun's crossing of the galactic equator at about 7:00am on the 22nd is owed to the unrelated orientation of our planet and solar system at this point in cosmic history.

Look 3.0° south of the waxing gibbous **Moon** about an hour after it rises on the 1st to find the open cluster M44, the Beehive, in Cancer. Two nights later, it rises in a position 3.2° north of Regulus, in Leo.

Last quarter Moon occurs on the 5th, in Leo.

When it is going through its waning crescent phase, it passes 2.7° northwest of Spica, in Virgo, on the 8th, then 3.6° south-southwest of brilliant Venus on the 9th.

New Moon occurs just after noon on the 12th, marking the beginning of Lunation 1249.

The Moon is well south of the ecliptic as it passes through its waxing crescent phases, and as such, you'll notice the position of the young Moon unusually far to the southwest.

On the 17th, the 5-day crescent Moon joins Saturn, 2.5° to its north. First quarter occurs on the 19th.

On its way to full, the waxing gibbous Moon is 5.0° west of Jupiter on the 22nd, and just 2.0° southwest of the Pleiades cluster just before moonset on the morning of the 24th.

The Full Cold Moon occurs at 7:33pm EST on the 26th. It rises in the east-northeast at 3:45pm EST, when the Sun is still above the horizon in the west-southwest. This makes for a photogenic moonrise as the foreground subjects are still in sunlight while the Moon is visible low over the horizon.

The Moon transits the meridian at three minutes before midnight on the 26th-27th at an elevation of 76°, the most northerly Full Moon of 2023. It is notable also that about half of the Moon's disk lies in the constellation Auriga, with a slightly larger proportion of its lower disk lying within Gemini.

The Moon sets the following morning at 8:07am.

Following 2023's final full Moon, the waning gibbous passes 2.2° southwest of Pollux in the morning hours of the 28th, then 2.3° north of Regulus on the last morning of the year.

Mercury is an evening planet in December, but remains rather low, and sets no later than 75 minutes after sunset, which occurs on the 7th, four days after its greatest elongation of 21° east of the Sun.

Mercury passes two of the more prominent globular clusters in Sagittarius in December, although you'll need a clear southwestern horizon and medium-high magnification in a telescope in order to see them through diminishing twilight. On the 7th, M28 is just 0.5° to the right of Mercury, and on the 12th, M22 is 0.2° above the planet, and 0.2° to the left of it the following night.

While watching Mercury pass these objects, even if you are unable to see the clusters, you should notice the planet's changing phase. On the 8th, it exhibits a quarter Moon phase, just over 7 arcseconds in size. On the 12th and 13th, you'll see Mercury as a slightly larger crescent.

The nights of the 18th and 19th may be the last time before inferior conjunction on the 22nd that you'll be able to see Mercury 30 minutes after sunset. If you're able to see it, you'll notice that it has become a very thin crescent, nearly 10 arcseconds across.

During the last week of December, Mercury returns to the morning sky, and quickly gains elevation needed to easily track it going through its widening crescent phases. By the 28th, Mercury is rising at least an hour before the Sun, and this morning may be your first opportunity to see Mars since it was in conjunction last month, as the Red Planet lies 3.7° south of Mercury, although it is still very low and dimly shining through twilight at a distance of 2.434 AU.

At the beginning of December, **Venus** rises at 3:11am EST, nearly four hours before the Sun, and lies just a few degrees to the northeast of Spica, in Virgo. At just under 1 AU from Earth, Venus is moving away from us and is steadily closing its apparent elongation angle from the Sun. A view through a telescope reveals a 68% gibbous phase just over 17 arcseconds large.

The 26-day crescent Moon joins Venus on the 9th, rising nearly simultaneously with the brilliant planet, the two objects being just 2.7° apart over the eastern horizon.

As the month progresses, Venus rises about two minutes later each morning, crossing from Virgo into Libra on the 11th.

At the end of the month, Venus still rises three hours before sunrise, and shows a 78% gibbous phase that will have shrunk to 14 arcseconds as the planet increases its distance to 1.178 AU.

Mars, having passed superior conjunction last month, spends much of December closely trailing the Sun through Ophi-

Events in December

1	Moon 3.0° N of M44
3	Moon 3.2° NE of Regulus
4	Mercury Greatest Elongation E21
5	**Last Quarter Moon**
6	Neptune Stationary
8	Moon 2.7° NW of Spica
8	Earliest Sunset 4:15pm
9	Moon 3.6° SSW of Venus
12	**New Moon (1249)**
12	Mercury Stationary
13	Mercury 0.2° NW of M22
16	Neptune Quadrature E90
17	Moon 2.5° S of Saturn
19	**First Quarter Moon**
21	**Solstice (10:27pm EST)**
21	4 Vesta Opposition (6.4)
22	Moon 5.0° W of Jupiter
22	Mercury Inferior Conjunction
22	9 Metis Opposition (8.4)
24	Moon 2.0° SW of M45
25	Equation of Time = 0
26	**Full Cold Moon**
28	Moon 2.2° SW of Pollux
28	Mars 3.7° S of Mercury
31	Moon 2.9° N of Regulus
31	Jupiter Stationary

Ephemeris times are EST (UTC-5) for Seagrave Observatory (41.845N, 71.590W) uchus. By month's end, it will have crossed into Virgo, and rises only 50 minutes before sunrise.

December is the best time to take a telescopic tour of our outer solar system. If you haven't taken the opportunity to view all four outer planets during one night, give it a try sometime this month, as Jupiter, Saturn, Uranus, and Neptune are all high in the sky and easy to view, lying within an 80° arc across the ecliptic from southwest to southeast.

The December night sky is dominated by **Jupiter**, the king of planets, which is the brightest starlike object visible. Only Venus, which is rising when Jupiter sets, is brighter.

Jupiter remains high in the sky on December evenings. It ends its westward retrograde motion, in Aries, on the 31st.

Keep watching Jupiter's moons throughout December for some interesting arrangements.

On the 14th, from 5:52pm until 7:22pm EST, Jupiter appears to have only two moons, as Io and Europa are both behind the planet and its shadow. A similar arrangement occurs on the 21st, from 7:42pm until 10:00pm EST, and on the 28th, from 9:30pm to 10:13pm. However, on this occasion, Europa goes into Jupiter's shadow within four minutes of emerging behind the planet's globe. Jupiter then retains its "two moon" appearance for another two hours and 22 minutes. Watch closely beginning at 12:39am on the 29th, as Europa and Io both emerge from shadow within nine minutes of each other.

In the early evening of the 24th, all four Galilean moons are visible, in close arrangement and in order of orbital distance, extending to the west of Jupiter.

On the 26th, the moons are arranged in close pairs on both sides of Jupiter, from west to east, Io, Ganymede, Europa, and Callisto.

Saturn is still in our evening sky during December, but it is now setting by 10:30pm in early December, and just 8:45pm by the end of the month.

The 5.2-day crescent Moon is just 2.5° south of Saturn on on the 17th.

Uranus, residing in Aries, is high in the southeast and ready for viewing immediately following evening twilight.

By now you're probably familiar with finding Uranus by starting with Botein (delta Arietis), and the trapezoidal asterism it is the western point of, and noticing the blue-green planet about 2.5° to the south-southwest.

Since Uranus is on the more northerly portion of the ecliptic, it culminates quite high in the sky when it crosses the meridian, meaning that its light passes through a minimum amount of our atmosphere to reach us. And with the Moon out of view during the first half of the month, this is an ideal time to try spotting Uranus without binoculars or a telescope.

Neptune is ideally positioned high in the south during the early evening hours through the first half of December, and can be easily observed without interference from bright moonlight.

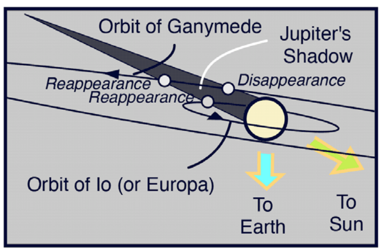
Located 5° south of lambda Piscium, in the Circlet asterism of Pisces, Neptune spends the first ten days of December in Aquarius, during which it ends its retrograde motion, becoming stationary on the 6th, and resuming its eastward, prograde motion. On the 16th, Neptune reaches its point of eastern quadrature.

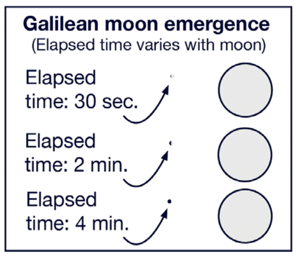
Ceres passed superior conjunction in November, and has entered the morning sky, though it is best to wait until the latter third of December, when it rises before twilight begins. Looking at the magnitude 8.9 dwarf planet through a thicker slice of Earth's atmosphere will require a telescope. On the 30th, Ceres lies in Ophiuchus, 8° northeast of Antares.

Ceres is 3.633 AU away.

Pluto remains visible low in the southwest in early December, but by the 21th, it sets before the end of astronomical twilight. If you're up for the challenge of locating it, it can be found 1.3° south-southwest of the globular cluster M75, in Sagittarius.

Asteroid **2 Pallas**, at magnitude 9.6, is





An "Oh! Wow!" moment through your telescope

Imagine seeing a world emerge in the darkness, taking several minutes to fully appear. Such a body is Io, Europa, or Ganymede on multiple occasions this December.

Aim a telescope at Jupiter shining in the south a few minutes before the event is predicted to take place. Look away from the planet's bright disk, about one planet diameter from its eastern edge. At the designated time, a faint speck can be discerned. As the seconds pass, that speck grows brighter and brighter.

This is one of the large Galilean moons, slowly leaving Jupiter's shadow while orbiting the giant planet. December is a good month this year to witness an event like this in the evening sky, because Jupiter's shadow angles to the east of the planet, putting the emerging moon relatively far from the planet's glare. Each moon takes a different time to fully emerge, because of its diameter and of its orbital velocity around the planet.

Note: December 12 and 19 have Ganymede disappearing into the shadow and reappearing.
December 21 and 28 have Io and Europa both disappearing near the same time.

Make sure that Jupiter is sufficiently above the horizon at your location and that the evening twilight has sufficiently darkened. Begin viewing a few minutes before the listed times.

Event commencement: (all times CST)

Io	Dec 5, 11:34 pm
Io	Dec 7, 6:04 pm
Ganymede	Dec 12, disappearance 5:41 pm, reappearance 7:48 pm
Io	Dec 13, 1:30 am
Europa	Dec 14, 6:24 pm
Io	Dec 14, 7:58 pm
Ganymede	Dec 19, disappearance 9:45 pm, reappearance 11:49 pm
Europa	Dec 21, 9:03 pm
Io	Dec 21, 9:53 pm
Europa	Dec 28, 11:42 pm
Io	Dec 28, 11:48 pm
Io	Dec 30, 6:18 pm

Use a "high" magnification!

moving eastward through Virgo, crossing into Serpens on the 27th. On the 31st, when the large asteroid is 3.075 from Earth, it passes just 1.1° south of globular cluster M5.

The brightest asteroid, **4 Vesta**, reaches opposition in Orion on the 21st. At a distance of 1.583 AU, Vesta shines at magnitude 6.4, placing it within reach of 50mm binoculars. Vesta is fairly easy to locate: It passes just a few arcminutes south of NGC 2175, a cluster in nebulosity. It then passes 8’ north of χ2 Orionis on the 14th, and 20’ north of χ1 Orionis on the 23rd.

Asteroid **9 Metis** reaches opposition at a distance of 2.101 AU in Gemini on December 22. At magnitude 8.4, it is within the same binocular field of view, about 3° to the north of open cluster M35 throughout most of December.

The final month of the year gives us the longest nights and earliest sunsets. One of the benefits of this is that one can be under the stars at 6pm, spend a few hours observing, and still be in bed well before midnight.

The pointer stars of the Big Dipper are at their lower culmination in the north during early December evenings, a conspicuous indicator that we’re about to roll into a new year as the northern sky’s most familiar asterism continues to rotate into position east of the meridian.

The Summer Triangle, which has hovered high overhead for the past few months, is now moving lower in the west, with Altair, and then Vega, dropping out of view during the mid-evening hours, leaving only Deneb, with its host constellation Cygnus, the swan, pointed nose-down, over the northwestern horizon.

Still in the early evening, the Great Square of Pegasus is high in the south, and Cassiopeia nearly overhead. The Great Andromeda Galaxy, the most distant object that can be viewed without optical aid at 2.5 million light years, crosses the zenith at about 7:30pm in early December, before bright moonlight washes out its distant glow.

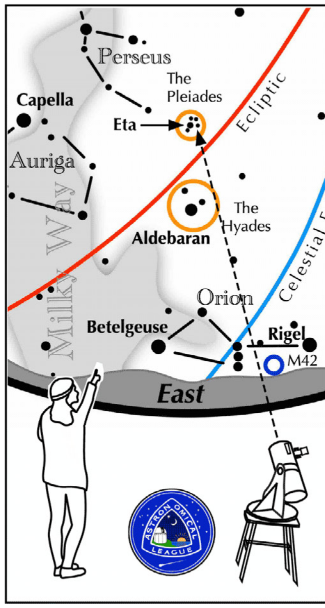
In the east, the entire Winter Hexagon is within view by 9:00pm, giving indication that the change of season is upon us.

Another way to tell that we’re about to enter a new year is the transit of Sirius at about midnight at the end of December.

Lastly, one of the year’s most reliable meteor showers, the **Geminids**, appears mid-month. Conditions for this shower are favorable for several reasons: The radiant, the point from which the meteors appear to originate near Castor, is above the horizon soon after twilight ends. Also, because this shower is. Also, the peak nights of December 13 and 14, host a young waxing crescent Moon low in the southwest, which will not be a factor in brightening the sky.

The Geminids originate from 3200 Phaethon, a roughly 6-kilometer asteroid whose perihelion brings it to within 0.140 AU of the Sun, during which it actively sheds meteoric material. Phaethon completes an orbit every 1.43 years, guaranteeing a frequently replenished supply of Geminids.

ASTRONOMICAL LEAGUE Double Star Activity



Other Suns: Eta Tauri (Alcyone)

How to find Eta Tauri on a December evening

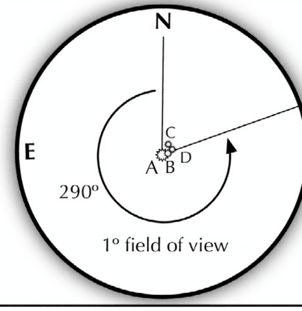
Face east. Look for the Pleiades star cluster. Eta Tauri is the cluster's brightest member. It is a quadruple star.

Eta Tauri
A-B separation: 118 sec
A magnitude: 2.8
B magnitude: 6.3
Position Angle: 290º

A-C separation: 182 sec
C magnitude: 8.2
Position Angle: 313º

A-D separation: 192 sec
D magnitude: 8.7
Position Angle: 296º

Suggested magnification: >20x
Suggested aperture: >3 inches



Searching for the Star of Bethlehem

by Francine Jackson

It’s been a while, but the “Star of Bethlehem” still comes up when the holiday season comes around. This is the sign in the sky that is said to have led the Magi to the stable where the Christ Child was born. But, what it was has been a question for thousands of years.

First, it’s only mentioned in one of the four gospels: Matthew, Chapter 2, where the Wise Men apparently ask King Herod of Judea where He is, as, “We have seen His star in the East, and have come to worship Him.” If it were that meaningful, why isn’t it listed in all the gospels? But, if it did happen, the question remains, What was it?

We first need to know exactly who the Magi were. Apparently, the name Magi is often considered short for Magician, which 2,000 years ago was a synonym for Astrologer. As such, they would have been very aware of the sky. If so, what was it they could have seen?

First of all, was the “star” they saw in the east, or were they in the east and saw it? And, then, what could it have been? And, did anyone else see it? Apparently not, as there would have been a flock of travelers racing to the King’s door.

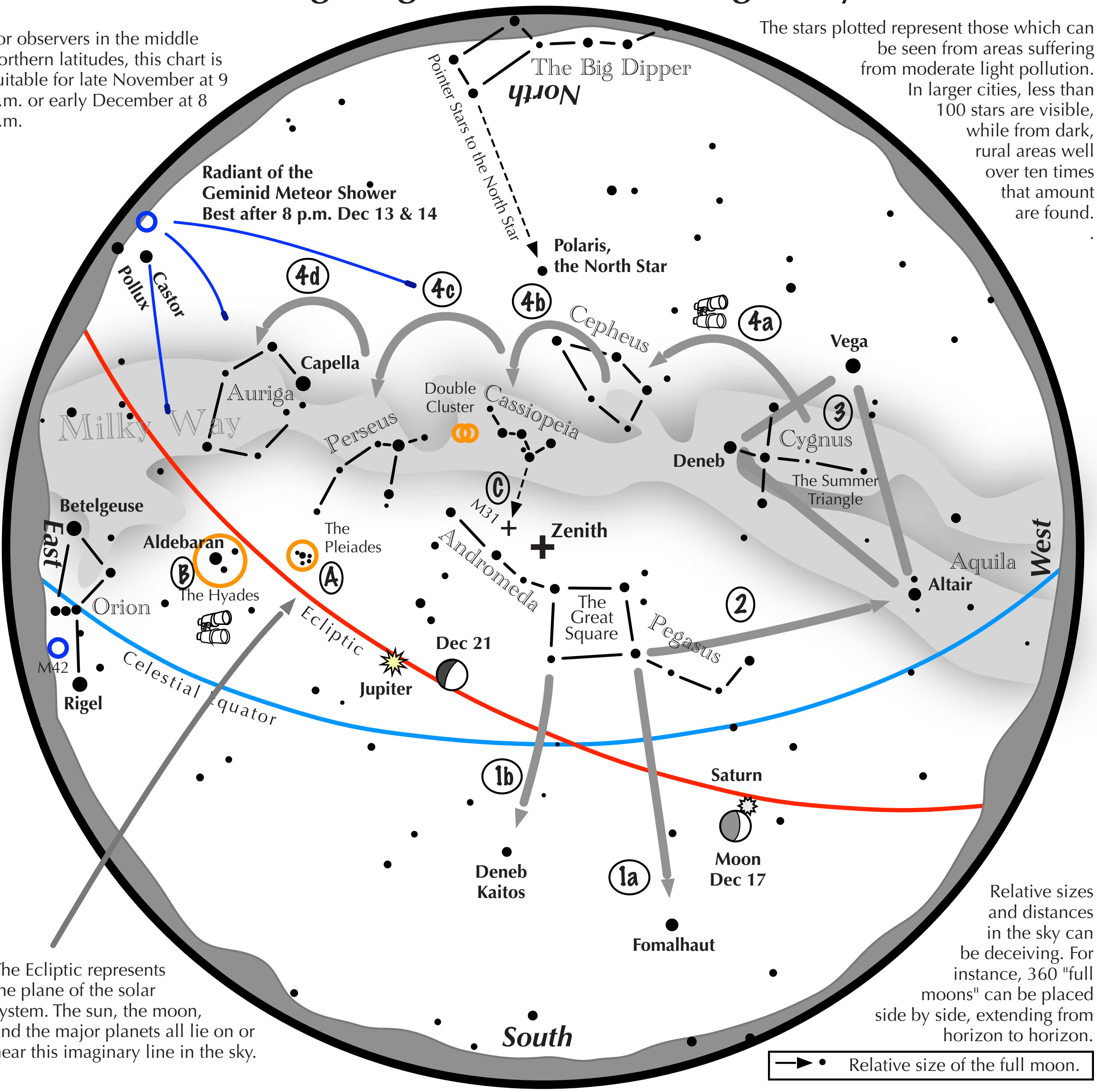
We can dismiss many celestial events: A meteor is too fast; an exploding star, a supernova, could have been seen by many, and then slowly disappear; a comet, which was the popular idea, as painted by Giotto centuries ago.

It appears the most logical explanation was the motions of planets. For the time frame when this happened, there are two apparent possibilities, in two separate dates. In approximately 6-4 B.C. there were motions of Jupiter and Saturn, joined at the late date by Mars, or in 2-1 B.C. when our two brightest planets, Venus and Jupiter, came together. Could either of these possibilities be correct? Or, did this scenario not happen at all? Whatever you believe, we would like to wish you all a very happy holiday season.

Navigating the December Night Sky

For observers in the middle northern latitudes, this chart is suitable for late November at 9 p.m. or early December at 8 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

Navigating the December night sky: Simply start with what you know or with what you can easily find.

1 Face south. Almost overhead is the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend an imaginary line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the southwest. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second bright star in the south.

2 Draw another line, this time westward following the southern edge of the Square. It strikes Altair, part of the "Summer Triangle."

3 Locate Vega and Deneb, the other two stars of the "Summer Triangle. Vega is its brightest member while Deneb sits in the middle of the Milky Way.

4 Jump along the Milky Way from Deneb to Cepheus, which resembles the outline of a house. Continue jumping to the "W" of Cassiopeia, to Perseus, and finally to Auriga with its bright star Capella.

Binocular Highlights

A and B: Examine the stars of the Pleiades and Hyades, two naked eye star clusters.
C: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.
D: Sweep along the Milky Way from Altair, past Deneb, through Cepheus, Cassiopeia and Perseus, then to Auriga for many intriguing star clusters and nebulous areas.

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The Sun, Moon & Planets in December

This table contains the ephemeris of the objects in the Solar System for each Saturday night in December 2023. Times in Eastern Standard Time (UTC-5) for Seagrave Observatory (41.845N, 71.590W).

Object	Date	RA	Dec	Const	Mag	Size	Elong	Phase(%)	Dist(S)	Dist(E)	Rise	Transit	Set
Sun	**2**	16 31.4	-21 52.7	Oph	-26.8	1946.4	-	-	-	0.986	06:54	11:35	16:16
	9	17 01.9	-22 46.1	Oph	-26.8	1948.3	-	-	-	0.985	07:01	11:38	16:15
	16	17 32.7	-23 17.5	Oph	-26.8	1949.9	-	-	-	0.984	07:07	11:41	16:16
	23	18 03.8	-23 26.2	Sgr	-26.8	1951.1	-	-	-	0.984	07:11	11:45	16:19
	30	18 34.8	-23 11.9	Sgr	-26.8	1951.7	-	-	-	0.983	07:13	11:48	16:24
Moon	**2**	8 33.1	23 25.0	Cnc	-12.3	1791.7	125° W	79	-	-	20:03	03:52	11:30
	9	13 43.0	-11 39.3	Vir	-10.7	1799.8	49° W	17	-	-	03:23	08:44	13:56
	16	20 25.9	-24 53.8	Cap	-10.4	1949.6	40° E	12	-	-	10:37	15:24	20:21
	23	2 37.0	16 36.8	Ari	-12.5	1923.3	131° E	83	-	-	13:36	21:11	04:58
	30	9 06.4	21 02.3	Cnc	-12.4	1789.1	146° W	91	-	-	19:58	03:15	10:20
Mercury	**2**	18 02.1	-25 49.0	Sgr	-0.3	6.3	21° E	69	0.385	1.070	08:45	13:06	17:28
	9	18 31.1	-24 56.0	Sgr	0.0	7.4	20° E	48	0.345	0.909	08:40	13:06	17:32
	16	18 34.0	-23 13.6	Sgr	1.6	9.0	14° E	18	0.314	0.751	08:05	12:38	17:11
	23	18 01.5	-21 14.2	Sgr	5.9	10.0	2° W	0	0.309	0.676	06:55	11:35	16:17
	30	17 30.1	-20 08.2	Oph	1.6	9.1	15° W	19	0.332	0.742	05:54	10:39	15:25
Venus	**2**	13 42.4	-8 17.1	Vir	-4.0	17.2	43° W	68	0.718	0.982	03:14	08:46	14:18
	9	14 13.8	-11 03.3	Vir	-4.0	16.4	42° W	71	0.719	1.030	03:28	08:50	14:12
	16	14 46.2	-13 41.2	Lib	-4.0	15.7	40° W	73	0.719	1.078	03:43	08:55	14:07
	23	15 19.5	-16 06.2	Lib	-4.0	15.0	39° W	75	0.720	1.124	03:58	09:01	14:03
	30	15 53.8	-18 13.6	Lib	-3.9	14.5	38° W	77	0.720	1.169	04:13	09:08	14:02
Mars	**2**	16 13.8	-21 27.2	Sco	1.5	3.7	4° W	100	1.520	2.501	06:36	11:17	15:57
	9	16 35.2	-22 20.1	Oph	1.5	3.8	6° W	100	1.510	2.486	06:34	11:11	15:47
	16	16 57.0	-23 02.7	Oph	1.4	3.8	8° W	100	1.501	2.469	06:31	11:05	15:38
	23	17 19.2	-23 34.3	Oph	1.4	3.8	10° W	100	1.492	2.450	06:28	10:59	15:31
	30	17 41.7	-23 54.2	Oph	1.4	3.9	12° W	100	1.483	2.430	06:25	10:54	15:24
1 Ceres	**2**	16 05.0	-18 01.0	Sco	8.7	0.3	7° W	100	2.740	3.715	06:12	11:07	16:02
	9	16 17.1	-18 44.1	Sco	8.8	0.3	11° W	100	2.745	3.705	06:00	10:52	15:43
	16	16 29.3	-19 23.6	Sco	8.8	0.3	15° W	100	2.751	3.688	05:47	10:36	15:25
	23	16 41.4	-19 59.4	Oph	8.9	0.3	19° W	100	2.756	3.665	05:34	10:21	15:07
	30	16 53.5	-20 31.6	Oph	8.9	0.3	24° W	99	2.762	3.635	05:21	10:05	14:50
Jupiter	**2**	2 20.5	12 35.8	Ari	-2.7	47.8	147° E	100	4.979	4.120	14:31	21:19	04:07
	9	2 18.1	12 25.9	Ari	-2.6	47.0	140° E	100	4.981	4.188	14:02	20:50	03:37
	16	2 16.4	12 19.0	Ari	-2.6	46.1	132° E	99	4.982	4.267	13:33	20:20	03:07
	23	2 15.2	12 15.5	Ari	-2.5	45.2	125° E	99	4.983	4.356	13:05	19:52	02:39
	30	2 14.8	12 15.3	Ari	-2.5	44.2	118° E	99	4.985	4.453	12:37	19:24	02:11
Saturn	**2**	22 15.3	-12 37.7	Aqr	0.9	16.8	82° E	100	9.746	9.840	11:59	17:15	22:31
	9	22 16.7	-12 29.1	Aqr	0.9	16.6	75° E	100	9.744	9.954	11:33	16:49	22:06
	16	22 18.3	-12 18.9	Aqr	0.9	16.5	68° E	100	9.742	10.064	11:06	16:23	21:41
	23	22 20.3	-12 07.3	Aqr	0.9	16.3	62° E	100	9.740	10.169	10:40	15:58	21:16
	30	22 22.5	-11 54.3	Aqr	0.9	16.1	55° E	100	9.738	10.268	10:14	15:32	20:51
Uranus	**2**	3 11.9	17 31.3	Ari	5.6	3.8	161° E	100	19.618	18.684	15:03	22:11	05:18
	9	3 10.8	17 27.3	Ari	5.6	3.8	153° E	100	19.617	18.731	14:35	21:42	04:50
	16	3 09.8	17 23.5	Ari	5.7	3.8	146° E	100	19.616	18.792	14:07	21:14	04:21
	23	3 09.0	17 20.2	Ari	5.7	3.7	139° E	100	19.615	18.865	13:38	20:45	03:52
	30	3 08.3	17 17.4	Ari	5.7	3.7	131° E	100	19.614	18.949	13:10	20:17	03:24
Neptune	**2**	23 43.2	-3 10.8	Aqr	7.9	2.3	105° E	100	29.904	29.628	12:52	18:43	00:34
	9	23 43.2	-3 10.7	Aqr	7.9	2.3	98° E	100	29.904	29.747	12:25	18:15	00:06
	16	23 43.3	-3 09.9	Psc	7.9	2.3	91° E	100	29.904	29.868	11:57	17:48	23:39
	23	23 43.5	-3 08.4	Psc	7.9	2.3	84° E	100	29.904	29.989	11:30	17:21	23:11
	30	23 43.8	-3 06.3	Psc	7.9	2.3	77° E	100	29.904	30.109	11:02	16:53	22:44
Pluto	**2**	20 05.0	-23 08.7	Sgr	14.5	0.2	49° E	100	34.903	35.541	10:33	15:05	19:38
	9	20 05.7	-23 06.7	Sgr	14.5	0.2	42° E	100	34.908	35.632	10:06	14:39	19:11
	16	20 06.5	-23 04.6	Sgr	14.5	0.2	35° E	100	34.913	35.712	09:39	14:12	18:45
	23	20 07.4	-23 02.4	Sgr	14.5	0.2	28° E	100	34.917	35.780	09:12	13:45	18:18
	30	20 08.3	-23 00.1	Sgr	14.5	0.2	21° E	100	34.922	35.835	08:45	13:19	17:52

Halley's Comet at Aphelion

by Jim Hendrickson

When we talk about comets, we often think about relatively dim, fuzzy visitors from the outer solar system that, if we're lucky, appear high enough in a darkened sky to show in our telescopes, or maybe even binoculars.

Any specific comets whose names are remembered long after their appearances are the ones that blaze in the sky, bright enough to see without optical aid, and leave lasting impressions, even decades after they fade into obscurity. Names like Hale-Bopp and Hyakutake instantly come to mind. Sure, there have been bigger and brighter comets, but for Earth's northern hemisphere, there are few that get the recognition of local skywatchers.

Other recent comets that may be remembered, may not have appeared very bright, or remained in our sky for long, include names like NEOWISE, PanSTARRS, and 17P/Holmes.

With the exception of Holmes, which underwent an outburst several months post-perihelion, we usually watch the comets that are nearest to the point of their orbits closest to the Sun–perihelion–and pay little attention to them when they fade from view as they move farther away, toward their farthest point from the Sun, aphelion.

The most familiar comet in history, 1P/Halley, is no exception. The excitement around Halley was sky-high in the mid-1980s, when it made its last appearance in the inner solar system.Sales of telescopes spiked dramatically, an international armada of five space probes were sent to study the comet, and a dedicated "Halley Night" at Seagrave Observatory attracted over 2,000 visitors.

But it has been many years since Halley's Comet has been talked about, but there is a milestone occurring in late 2023 that is worthy of mention.

Halley's Comet reaches aphelion, the farthest point in its orbit around the Sun, at about 8:00pm EST on December 8, 2023. Beyond the orbit of Neptune, this point is 35.143 AU from the Sun. It is notable that this is even more distant than Pluto, when it was still classified as a major planet at the time, during the comet's 1986 perihelion.

At the slowest point in its orbit, the comet is moving at 0.910 km/s relative to the Sun, which has been the acknowledged top speed of the Lockheed SR-71 Blackbird. This occurs on March 19, 2024, notably about three months past perihelion, since the comet orbits the solar system's barycenter rather than the Sun itself.

A Look Back: Halley's Last Aphelion

Perhaps the most intriguing property of Comet Helley, besides being the first known periodic comet, is that its orbital period spans an average human lifetime. Because of this, it is an interesting exercise to use the comet's period as a measure of history.

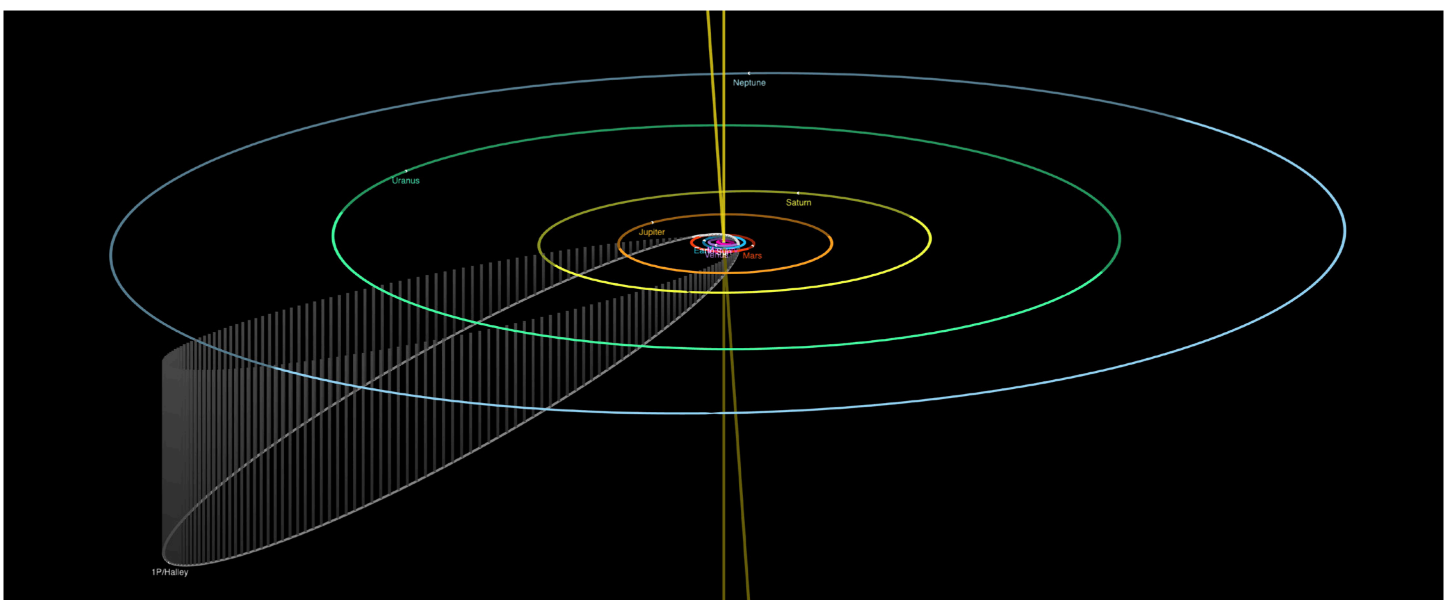
Looking back to Comet Halley's last aphelion, we find ourselves in a different era, one before large survey telescopes, digital imaging, and interplanetary space probes significantly advanced our knowledge of the universe. The date was February 22, 1948.

Our solar system seemed a bit more sparse than it does today. While we knew of nine planets, the number of known moons for all the planets totaled 29, just one-tenth of the number of known moons today. Notably, Jupiter had only eleven moons, and Saturn had just nine. Uranus' fifth moon, Miranda, was discovered just six days before by Gerard Kuiper, and Neptune's second, Nereid, was not known until the following year. Pluto's largest moon, Charon, would not be found for another three decades.

In early 1948, the number of known asteroids stood at just 1,600, and only a few dozen comets had been cataloged. Today, we know of over 1.3 million asteroids (more collectively known as minor planets), and nearly 4,000 comets.

In February 1948, science and aerospace technology was just beginning to take off at a rapid pace. The first supersonic airplane flight, piloted by Chuck Yeager, had taken place 4 months prior, and although this preceded the period of orbital spaceflight by nearly a decade, test flights of captured German V-2 rockets were routinely reaching the Karman line, many of them carrying atmospheric and heliophysics instruments on board.

The largest optical telescope in the world, the 200-inch Hale Telescope on Palomar Mountain in California, would be dedicated a few months after Comet Halley's 1948 aphelion. Palomar Observatory would become significant in Halley history,



as it was the first telescope to recover the comet on its inbound approach to its 1986 perihelion, on October 16, 1982, when the comet was still 11.04 AU from the Sun.

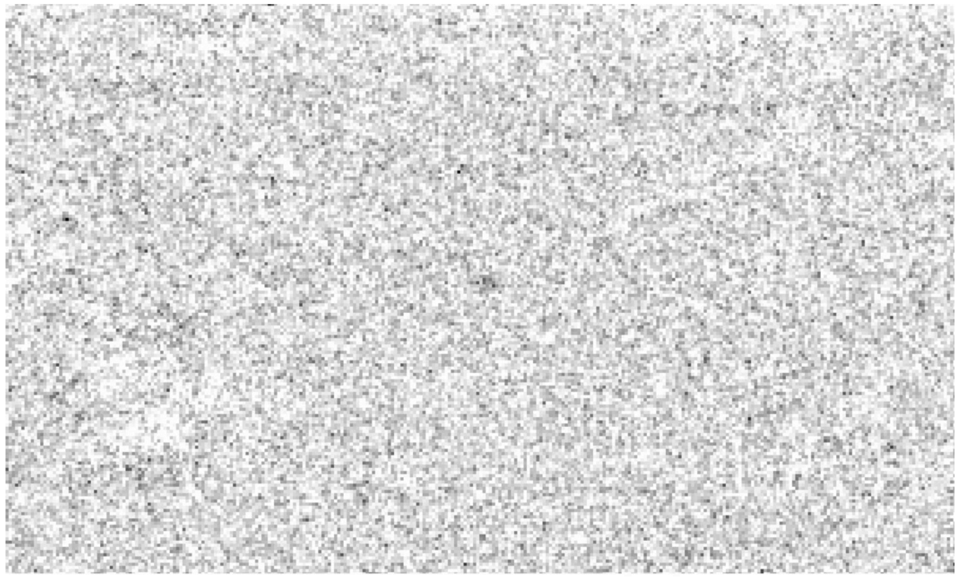
In early 1948, Skyscrapers had been in existence for just over 15 years, and had been running Seagrave Memorial Observatory for just over 11 years. The Alvan Clark telescope was 70 years old, and occupied the only building on the observatory grounds, as the Crawford dome (whose concrete pad is the only remaining element today) would be completed later that year, and the meeting hall would not be built for another four years.

A Look Ahead to the Return of Comet Halley

As we move past aphelion, we can look forward to Halley's next perihelion, in 2061, which will now be closer in time to us than its previous one in 1986. The comet will be closest to the Sun on July 28 of that year, and closest to Earth the following day.

Prospects for observing the comet in the northeastern United States are fairly good, considerably more so than its previous apparition in 1985-1986, when it reached perihelion while on the opposite side of the Sun from Earth, and its closest pass to Earth had it very low on the southern horizon two months later.

While its 2061 closest passage to Earth is about 15% more distant as it was in 1986, it nearly coincides with perihelion, and is in a better position in the sky for the mid-northern latitudes. Halley will be in the northern constellation Lynx, only a few degrees south of circumpolar for us in Rhode Island, so it will be visible in both the morning and evening skies.



Comet Halley at 28 AU Heliocentric Distance
(VLT ANTU/FORS1 + MELIPAL/VIMOS + YEPUN/FORS2)

ESO PR Photo 27a/03 (1 September 2003) © European Southern Observatory

Halley's Comet has been known to exhibit both an ion tail, and a substantial dust tail during its many previous visits to the inner solar system, so we expect its next appearance will be no different. Since the comet will be between Earth and the Sun, but about 20 degrees north of the ecliptic, we'll be looking into the tail, and the extended tails would be closer to us than the coma. They will likely spread a good distance into the northern sky and be visible despite the light of a waxing gibbous Moon.

But before we get there, here are some milestones to note along the way.

A Look Beyond: Aphelion 2097

A complete orbit of Halley from now, it will be near its next aphelion, on November 21, 2097.

What will be the state of backyard astronomy in 2097? Will we be able to detect Halley's faint, dormant nucleus at the icy fringe of the solar system, using readily available equipment? What "Great" comets will we have seen since Halley made its last appearance in 2061?

Will Voyager 1, likely decades beyond its last contact with Earth, still be the farthest human-made object (424 AU) from home?

By the time we come upon the next aphelion of Comet Halley, Rhode Island will have experienced its first total solar eclipse (May 1, 2079) since 1925, and the next transit of Venus (December 21, 2117) will be just 20 years away.

Back to the present: If you want to start looking for Halley's Comet in late 2023, turn your telescope to RA 08h 22m 16.85s, Declination +02° 11m 42.7s, a point in northwestern Hydra, about 4° west of Minchir (σ Hydrae). From there, the comet slowly migrates about 1/4° west-northwestward each year, upon cycling through its retrograde loop.

Although it likely will not be visible through our backyard telescopes, or picked up on our most sensitive imaging cameras for a few more years, it is worth noting that in December 2003, at a distance of 28.06 AU, Halley's Comet was detected by European Southern Observatory's Very Large Telescope (VLT) at Paranal, Chile. This is the farthest that any comet has ever been seen. Even though the comet is now 25% more distant today than it was 20 years ago, it will still be within reach of the instrument that captured it in 2003. Halley's Comet will never again be beyond our gaze.

Milestone	Date	Distance (Sun)	Velocity (Sun)
Orbit of Neptune	July 5, 2041	30.0699 AU	3.072 km/s
Orbit of Uranus	May 12, 2053	19.1891 AU	6.555 km/s
Orbit of Saturn	December 3, 2058	9.5366 AU	11.669 km/s
Orbit of Jupiter	June 26, 2060	5.2028 AU	17.063 km/s
Velocity of Voyager 1	August 18, 2060	4.7081 AU	16.774 km/s
Orbit of Mars	May 16, 2061	1.5237 AU	33.307 km/s
Orbit of Earth	June 19, 2061	1.0000 AU	52.608 km/s
Perihelion	July 28, 2061	0.5928 AU	54.250 km/s
Closest to Earth	July 29, 2061	0.4774 AU*	

* Distance from Earth

Observer's Challenge:

IC 10: Irregular Galaxy in Cassiopeia

by Glenn Chaple

I enjoyed getting this galaxy, it is one of the closest galaxies to earth, about the same distance as Andromeda, 2-3 MLY away. It is partially "hidden" by the winter milky way of Cassiopeia .It is a small irregular galaxy that happens to be going through a starburst phase, as evidenced by the red HA regions. It is also surrounded by a very large neutral hydrogen gas halo.
This image was obtained by my 32 inch telescope, with my ZWO ASI 6200 camera. Taken with 1 hour lum, 45 min each of RGB, and 50 min of Ha imaging (to highlight Ha regions) for a total integration time of about 4 hours. Fascinating object Mario Motta, MD. (ATMoB)

Magnitude 10.4, Size 6.3' x 5.1'

Any deep-sky object not included in the Messier or Herschel catalogs will likely prove to be a serious challenge for the visual observer. Such is the case with the irregular galaxy IC 10 in Cassiopeia. It eluded detection until 1887 when it was spotted by American astronomer Lewis Swift with a 16-inch Clark refractor. Its elusiveness is attested to by the fact that IC 10 isn't mentioned in the extensive deep-sky lists found in either Burnham's Celestial Handbook or Kepple and Sanner's The Night Sky Observer's Guide. IC 10 is also absent from Stephen O"Meara's Hidden Treasures and The Secret Deep – both guides dedicated to little-known deep-sky objects.

Christian Luginbuhl and Brian Skiff mention IC 10 in their Observing Handbook and Catalogue of Deep-sky Objects, noting that it's faintly visible in a 6-inch scope as a "diffuse unconcentrated patch elongated SE-NW." In Deep-sky Wonders, author Sue French describes seeing the brightest part of IC 10 (in her words, "a little patch of fuzz about 1' across") with a 4-inch refractor. It fittingly appears in Phil Harrington's Cosmic Challenge and is included in a section devoted to medium-scope challenges (apertures between 6 and 9.25 inches). Harrington warns that unless you can see M33 with the unaided eye, you may need to work with larger apertures. Its elusiveness is obvious when you consider that IC 10 is similar in size to M27, the Dumbbell Nebula (8.0' X 5.6" vs. 6.3' X 5.1'), but a full 3 magnitudes fainter (7.4 vs. 10.4). IC 10 is a visual challenge that will mandate large aperture under skies of average transparency or optimally dark skies if you wish to capture it with a small-aperture instrument. In either case, work with a medium magnification (75-100X).

IC 10 is a member of the Local Group of galaxies that includes our Milky Way, M31 (the Andromeda Galaxy), and M33. It is located about 2.2 million light years away – close as galaxies go. Its faintness arises from its location in Cassiopeia about 1½ degrees east of Caph (beta [β] Cassiopeiae) at 2000.0 coordinates RA 0h 20m 17.3s and Dec +59o 18' 14". This puts it near the plane of the Milky Way where it is dimmed by interstellar gas and dust.

The purpose of the Observer's Challenge is to encourage the pursuit of visual observing. It is open to anyone who is interested. If you'd like to contribute notes, drawings, or photographs, we'd be happy to include them in our monthly summary. Submit your observing notes, sketches, and/or images to Roger Ivester (rogerivester@me.com). To find out more about the Observer's Challenge, log on to rogerivester.com/category/observers-challenge-reports-complete.

NASA Night Sky Notes:

A Flame in the Sky – the Orion Nebula

by Kat Troche

It's that time of year again: winter! Here in the Northern Hemisphere, the cold, crisp sky offers spectacular views of various objects, the most famous of all being Orion the Hunter.

As we've previously mentioned, Orion is a great way to test your sky darkness. With your naked eye, you can easily spot this hourglass-shaped constellation. Known as an epic hunter in Greco-Roman, Orion and all its parts have had many names and meanings across many cultures. In Egyptian mythology, this constellation represented the god Sah. The Babylonians referred to it as The Heavenly Shepard. In most cultures, it is Orion's Belt that has many stories: Shen in Chinese folklore, or Tayamnicankhu in Lakota storytelling. But the Maya of Mesoamerica believed that part of Orion contained *The Cosmic Hearth* – the fire of creation.

1,500 light years away from Earth sits the star-forming region and crown jewel of Orion – Messier 42 (M42), the Orion Nebula. Part of the "sword" of Orion, this cloud of dust and gas sits below the first star in Orion's Belt, Alnitak, and can easily be spotted with the naked eye under moderate dark skies. You may also use binoculars or a telescope to resolve even more details, like the Trapezium: four stars in the shape of a baseball diamond. These young stars make up the core of this magnificent object.

Credit: Stellarium Web

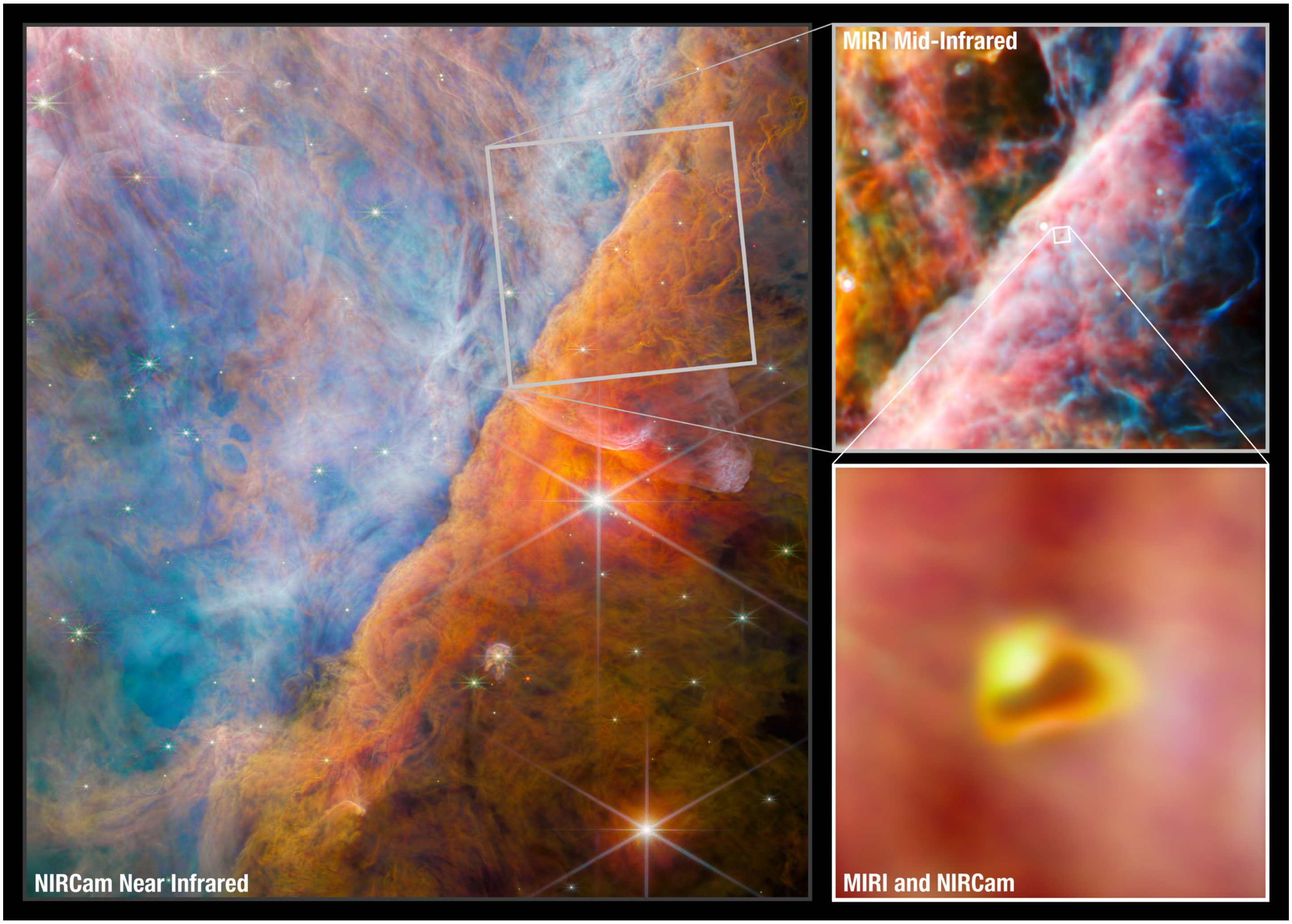
Of course, it's not just for looking at! M42 is easily one of the most photographed nebulae around, by astrophotographers here on the ground, large ground-based observatories, and space telescopes alike. It has long been a place of interest for the Hubble, Spitzer, and Chandra X-ray Space Telescopes, with James Webb Space Telescope joining the list in February 2023. Earlier this year, NASA and the European Space Agency released a new photo of the Orion Nebula taken from JWST's NIRCam (Near-Infrared Camera), allowing scientists to image this early star forming region in both short and long wavelengths.

But stars aren't the only items photographed here. In June 2023, JWST's NIRCam and MIRI (mid-infrared instrument) imaged a developing star system with a planetary disk forming around it. That's right – a solar system happening in real time – located within the edges of a section called the Orion Bar. Scientists have named this planet-forming disk d203-506, and you can learn more about the chemistry found here. By capturing these objects in multiple wavelengths of light, we now have even greater insight into what other objects may be hiding within these hazy hydrogen regions of our night sky.

In addition to our Dark Sky Wheel, a fun presentation you can share with your astronomy club would be our Universe Discovery Guide: Orion Nebula, Nursery of Newborn Stars activity. This will allow you to explain to audiences how infrared astronomy, like JWST, helps to reveal the secrets of nebulae. Or, you can use public projects like the NASA-funded MicroObservatory to capture M42 and other objects.

Learn more about what to spy in the winter sky with our upcoming mid-month article on the Night Sky Network page through NASA's website!

This article is distributed by NASA's Night Sky Network (NSN). The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!



ESA/Webb, NASA, CSA, M. Zamani (ESA/Webb), PDRs4ALL ERS Team

Star Party Reports

Night Sky at River Bend, Uxbridge MA
Friday, November 24, 2023
by Francine Jackson

Friday's November 24th star party was one of the coldest and windiest of the season at River Bend, Uxbridge. Bob Janus, John Kicur, Jim Hendrickson and Francine Jackson set up their telescopes at the top of the hill at 6:00 P.M., and began with Saturn, Jupiter and the Moon, then continued to Vega and the double-double, Uranus, the Pleiades, M92, Alcor and Mizar, and the Coathanger. Sherine, the new ranger in charge, stayed for over an hour to keep the building open for those who needed to warm themselves up.

Over a dozen hardy guests came, including Mike, a frequent local visitor, who, with Bob, located M31, the Milky Way, and Albireo, before we decided to break down at 7:45.

Already we're looking forward to another set of observing nights for 2024, and will announce the dates soon.

ANNULAR ECLIPSE from UTAH

by **Gregory T. Shanos**

Just returned from Arizona/Utah where I was able to successfully video the entire Annular Eclipse of Oct. 14, 2023 from Goulding, Utah right next to Monument Valley. The skies were perfectly clear- zero clouds with excellent transparency and seeing. I used a SONY FDR-AX100 4K camcorder with a Sony 1.5× teleconverter. Tripod mounted on a Star Adventurer motorized equatorial tracker with a Thousand Oaks solar filter. Photo stills (8MP) from the video were taken to make this collage of second and third contact.

I took temperature and humidity readings every minute during the entire eclipse. First contact: 55.7°F (13.2°C) at 38% humidity. Second contact: 52.0°F (11.1°C) at 41% humidity. Third contact: 51.2°F (10.7°C) at 41% humidity. Fourth contact: 65.1°F (18.4°C) at 29% humidity

The video of annularity was uploaded to YouTube at: https://youtu.be/r3v_zt5slSo

December 2023 Volume 45

STARRY SCOOP

Editor: Kaitlynn Goulette

WHAT'S UP

The December solstice occurs on the 22nd this month. It marks the start of winter for those of us in the Northern Hemisphere and it's also the shortest day of the year. On this day, the sun shines from directly overhead on the Tropic of Capricorn.

As the new year is approaching, our fall constellations are moving westward, making way for the winter stars. Pegasus can be seen diving headfirst into the horizon, with Andromeda following close behind, along with the other fall constellations. Moving into center stage is the asterism known as the Winter Hexagon, which is comprised of many bright stars in this region, making it easily recognizable. They consist of Sirius, Rigel, Aldebaran, Capella, Pollux, and Procyon.

The hours after sunset offer a perfect opportunity to observe the planets. Throughout the month, Saturn moves from the southern to the southwestern sky and is joined by the crescent moon on the 17th. This gas giant and its rings are a beautiful telescopic object. Jupiter is positioned in the southeastern sky and is visited by the moon on the 21st and 22nd. Its detailed atmospheric bands always make for fantastic telescopic observations, and observing the Great Red Spot only adds to the excitement.

December brings us the peaks of two meteor showers. The Geminids peaks on the evening of the 13th and morning of the 14th and is considered one of the best meteor showers of the year, producing up to 120 meteors an hour. Yearly, it runs from December 7th to the 17th. The Ursid meteor shower runs annually from December 17th to the 25th and peaks on the 21st. This shower produces about a dozen meteors per hour at its peak. To best observe these showers, find yourself in a dark place after midnight.

On December 17th, 120 years ago, the Wright brothers soared aloft in their Wright Flyer and completed the first successful airplane flight. This was only the beginning of humanity overcoming Earth's gravity; just 58 years later, the first human reached outer space and orbited Earth. Many generations have passed since these accomplishments, and we're waiting to see what mankind will do next.

DECEMBER'S SKY

4: Mercury at Greatest Eastern Elongation

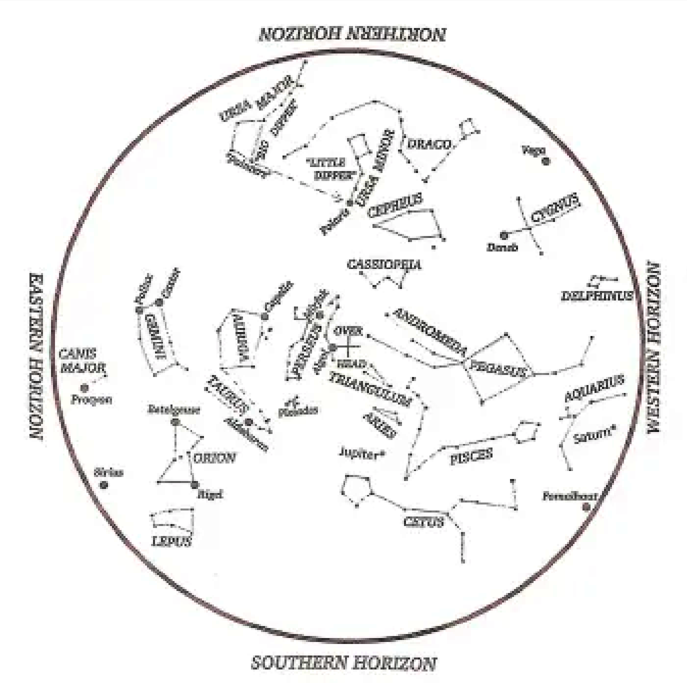
12: New Moon

13-14: Geminid Meteor Shower Peak

21-22: Ursid Meteor Shower Peak

22: December Solstice

27: Full Moon



Credit: Roger B. Culver

Hold star map above your head and align with compass points.

OBSERVATIONS

Since the clocks have been set back and the recent pattern of rain has cut us some slack, my sister and I have taken advantage of quite a few clear nights to observe. With Saturn at its highest point in the sky following sunset, the ringed planet has been my first nightly target.

A notable recent night under the stars had us bundled up and braving the cold as we focused on the planets and the moon. On this particular evening the atmosphere allowed us to observe Saturn at 250 magnification and the Cassini division was very well defined. This year, Saturn's rings are positioned at an angle that offer breathtaking views.

After Saturn, we slewed the telescope to Jupiter. Along with observing its atmospheric bands, I enjoyed studying its moons and their orbital progressions. Io's orbit in particular is very short and on this evening, I was lucky enough to spot its shadow traversing the planet's surface.

After having our fill of the planets, we decided to focus on other objects located throughout the night sky. My personal favorites consisted of Bode's Galaxy and the Cigar Galaxy, designated M81 and M82. This pair is located in the northern sky and holds a special place in my heart as I used them to win a bet against my father a few months ago while visiting Lowell Observatory.

The purpose of the Starry Scoop is to communicate current astronomy and space events. If you want to share your observations or get digital copies of the Starry Scoop, contact starryscoop@gmail.com. The Starry Scoop is now on Facebook. Clear skies!

OBJECT OF THE MONTH

The featured object for the month of December is M33, commonly known as the Triangulum Galaxy. Located 2.73 million light-years away, this spiral galaxy is one of the closest to the Milky Way. It is viewed almost directly face-on with its spiral arms very loosely wound around the central core. The Triangulum Galaxy is a popular target for astrophotographers.

Find this object in the constellation Triangulum, about 8 degrees southeast of the star Mirach in Andromeda. It's been said to be visible to the unaided eye, but from my experience, binoculars or a telescope are needed. Good luck!

Triangulum Galaxy
Photo Credit: Warren Carrington

Triangulum Galaxy Map

Directions to Seagrave Memorial Observatory

From the Providence area:
Take Rt. 6 West to Interstate 295 in Johnston and proceed west on Rt. 6 to Scituate. In Scituate bear right off Rt. 6 onto Rt. 101. Turn right onto Rt. 116 North. Peeptoad Road is the first left off Rt. 116.

From Coventry/West Warwick area:
Take Rt. 116 North. Peeptoad Road is the first left after crossing Rt. 101.

From Southern Rhode Island:
Take Interstate 95 North. Exit onto Interstate 295 North in Warwick (left exit.) Exit to Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt. 101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.

From Northern Rhode Island:
Take Rt. 116 South. Follow Rt. 116 thru Greenville. Turn left at Knight's Farm intersection (Rt. 116 turns left) and follow Rt. 116. Watch for Peeptoad Road on the right.

From Connecticut:
• Take Rt. 44 East to Greenville and turn right on Rt. 116 South. Turn left at Knight's Farm intersection (Rt. 116 turn left) and follow Rt. 116. Watch for Peeptoad Road on the right.
• or • Take Rt. 6 East toward Rhode Island; bear left on Rt. 101 East and continue to intersection with Rt. 116. Turn left; Peeptoad Road is the first left off Rt. 116.

From Massachusetts:
Take Interstate 295 South (off Interstate 95 in Attleboro). Exit onto Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt. 101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.

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SKYSCRAPERS INC.

47 Peeptoad Road
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