the Skyscraper

vol. 46 no. 11
November 2019

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

In This Issue:

Seagrave Memorial Observatory Open Nights

Saturdays st 7:00 pm
weather & conditions permitting

Phases of the Moon

First Quarter Moon
November 4 10:25

Full Beaver Moon
November 12 13:34

Last Quarter Moon
November 19 21:11

New Moon
November 26 15:06

Friday, November 1, 7:00pm
at Seagrave Observatory

20 Years of Chandra X-Ray Observatory by Kim Arcand

In the past 20 years, NASA's Chandra X-ray Observatory has made profound discoveries and contributed invaluable information about objects in our Universe. Chandra is part of a rich legacy of telescopes with its X-ray lineage stretching back to the Space Age when scientists and engineers pioneered instruments that were sent above the Earth's atmosphere. Each decade has brought new innovations and new capabilities, culminating in Chandra's launch aboard the Space Shuttle Columbia in 1999.

Chandra has strong astronomical family ties across the electromagnetic spectrum. As part of NASA's "Great Observatories" program, Chandra was designed and built to observe X-rays alongside the Hubble Space Telescope, the Spitzer Space Telescope, and the Compton Gamma-ray Observatory. The quest to explore the Universe is both multiwavelength and multimessenger in nature, with many significant discoveries requiring information from different types of light as well as gravitational waves and more. Learn more about Chandra, and the pivotal role it has played in understanding our Universe.

Kimberly Kowal Arcand is the Visualization Lead for NASA's Chandra X-ray Observatory, which has its headquarters

at the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts. Arcand is an award-winning producer and director. She is a leading expert in studying the perception and comprehension of high-energy data visualization across the novice-expert spectrum. As a science data storyteller she combines her background in molecular biology and computer science with her current work in the fields of astronomy and physics. She was a nominated "Changemaker" for the White House State of Women Summit in 2016 and selected as a speaker for the U.S. Department of State Speaker Program in 2019.

Kim will have some copies of her newest book "Light from the Void" for sale (cash or check only).

Iceland 2020 Trip Overview by Melissa Mennella

Recently, Skyscrapers, Inc., received an opportunity for its members, families and friends to be a part of a trip to Iceland in October, 2020, to try to observe the aurora borealis. It would be planned by the AAA, the Automobile Club of America. At this meeting, Melissa Mennella will introduce her plans for this trip.

Melissa has created a trip to this land for all to enjoy. The cost is quite reasonable, and a portion of each ticket will be donated to the organization. Of course, there will be questions, but Melissa will be able to answer any you may have.

Come and hear what could be a memorable time.

President's Message

by Steve Hubbard

Welcome to Fall!

Hopefully the danger of mosquito born EEE virus infections will be past soon and we can all get back to some to what we love to do best. Getting out under a clear night sky and enjoying the show!

There's lots to see and the nights are cool, but not cold and usually bug-free. It's one of the best times of the year for observing before the bitter cold of winter curbs our efforts.

This Fall, there is a special treat in store on Monday, November 11. If the skies are clear, there will be a bunch of us at Seagrave Observatory to watch the progress of Mercury as it crosses in front of the Sun. While not as rare an event as a transit of Venus, Mercury transits are uncommon with only about 13 or 14 happening each century. Mercury in general is not easy to see and there's no better or easier time to see the small planet than during a transit. This will be primarily a member focused event and will be ongoing for a large portion of the day. The 11th is Veterans Day so it should be easy for many of you to come by and join the fun.

Our annual AstroAssembly this year was another smashing success. We had some of the best weather for this that I can remember and the speakers, friends that joined us and food were all fantastic. Thanks SO much to everyone who helped out and especially our point people on this, Bob Horton and Kathy Siok. This is always an event that takes a lot of time and planning to put together and it was great to see so many of our members help out. I'm already looking forward to next year's AstroAssembly.

See you at our next meeting on Friday November 1.

Solar Activity Update

As of October 27 the Sun has been spotless for 223 days, or 74% of the year.

This surpasses 2018, which for the entire year was 221 spotless days, or 61%.

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 **November 15** to Jim Hendrickson, 1 Sunflower Circle, North Providence, RI 02911 or e-mail to jim@distantgalaxy.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.

Transit of Mercury: Past, Present & Future

by Francine Jackson

One of our not-too-common celestial events, a transit of Mercury, will be taking place this month, on November 11th. Fortunately, for some of us, it is a holiday, and both Seagrave and Ladd observatories are planning observing sessions, although Ladd's observations will be on the campus Green.

Although not as relevant, and as rare, as a transit of Venus, Mercury transits also do not happen each time the planet comes into inferior conjunction – traveling directly between the Sun and the Earth - but they occur at least a few times per century, instead of 4 times every approximately 2½ centuries as Venus transits do. However, the next one won't be until 2032, and, you'll have to travel across the world to see it, as it will not be visible from here.

It was a transit of Mercury observed by Edmund Halley in 1677 that led him to understand that such phenomena could actually assist in the determination of the astronomical unit, the elusive distance between the Sun and the Earth, which is the basis for the size of the solar system. Halley realized that Mercury was quite small, and that trying to take observations of it in such detail would be very difficult, but Venus, twice as close to Earth, and over twice the diameter of Mercury, would be a better fit in trying to determine this measurement. Unfortunately, Halley was unable to test his theory directly, as he died in 1842 at age 84, 19 years before the next Venus transit, in 1761, would occur.

On November 9-10, 1769, after successfully observing the June 5th transit of Venus in Tahiti, Captain James Cook and Charles Green sailed the ship Endeavour to the Coromandel Peninsula on New Zealand's North Island to watch the transit of Mercury. They noted that the planet seemed to have no atmosphere (a correct statement). Cook, after this successful observation, renamed the peninsula Mercury Bay.

Logic would tell us that both forms of planetary transit should occur with a fair regularity, but Nature has other plans. If November 11th is a good, clear day, please come join us, as the next transit of Mercury we can view from here won't be until 2049.

Francine Jackson is a NASA Solar System Ambassador, writes the weekly newsletter for Ladd Observatory and teaches astronomy at the Community College of Rhode Island. See more at http://theskyscrapers.org/francine-jackson

Granite monument at Mercury Bay, New Zealand commemorating James Cook's observation of the transit of Mercury. From Wikimedia Commons.

November Meteor Showers

by Dave Huestis

First up for November is my reminder to be sure to set your clocks back one hour on Sunday, the 2nd. That's when most of the United States will switch back to Eastern Standard Time from Daylight Saving Time. The mnemonic is "spring ahead and fall back/behind." Thank goodness for most of us it occurs on a weekend!

Whereas the premiere astronomical event during November will be the transit of Mercury between the Earth and the Sun (which I will preview in a separate column), there will be two meteor showers as well.

From November 4th thru the 6th watch the sky for no more than a half dozen or so Taurid meteors. These often very bright yellow fireballs (meteors that explode and fragment into multiple pieces) are fairly slow and enter our atmosphere at approximately 17-miles per second. Observe after midnight to increase your chances of seeing one. Look in the general direction of the constellation Taurus. To locate Taurus find the V-shaped pattern that defines the bull's face, or locate the Pleiades — the Seven Sisters star cluster. A waxing gibbous Moon will overshadow all but the brightest of the meteors this year.

Another more productive meteor shower will occur on the night of November 17-18, with the peak of the annual Leonids between midnight and dawn on the 18th. Unfortunately a bright waning gibbous Moon in neighboring constellation Cancer will also overshadow all but the brightest of the shooting stars. An observer well away from man-made light pollution may see about 10-15 green or blue shooting stars per hour, but the interfering moonlight may reduce that optimistic forecast. Please note a cluster of stars above the Moon. It is the Beehive Cluster. Check it out with binoculars.

The Leonids blaze across the sky at around 44-miles per second as they hit the Earth's atmosphere nearly head-on. The resulting display produces many fireballs, with about half of them leaving trains of dust that can persist for minutes. The area of sky from where the meteors appear to radiate is in the Sickle (backwards question mark) asterism in Leo. Clear skies and some luck will favor seeing as many shooting stars as possible.

Finally, just after sunset on the 24th look towards the southwestern sky to see a conjunction (close proximity of two celestial bodies) of Venus and Jupiter ten degrees above the horizon. They will be about 1.4 degrees apart—three full moon diameters Venus will be the brighter of the two planets.

Keep your eyes to the skies.

Transit of Mercury
A Unique Astronomical Event

by Dave Huestis

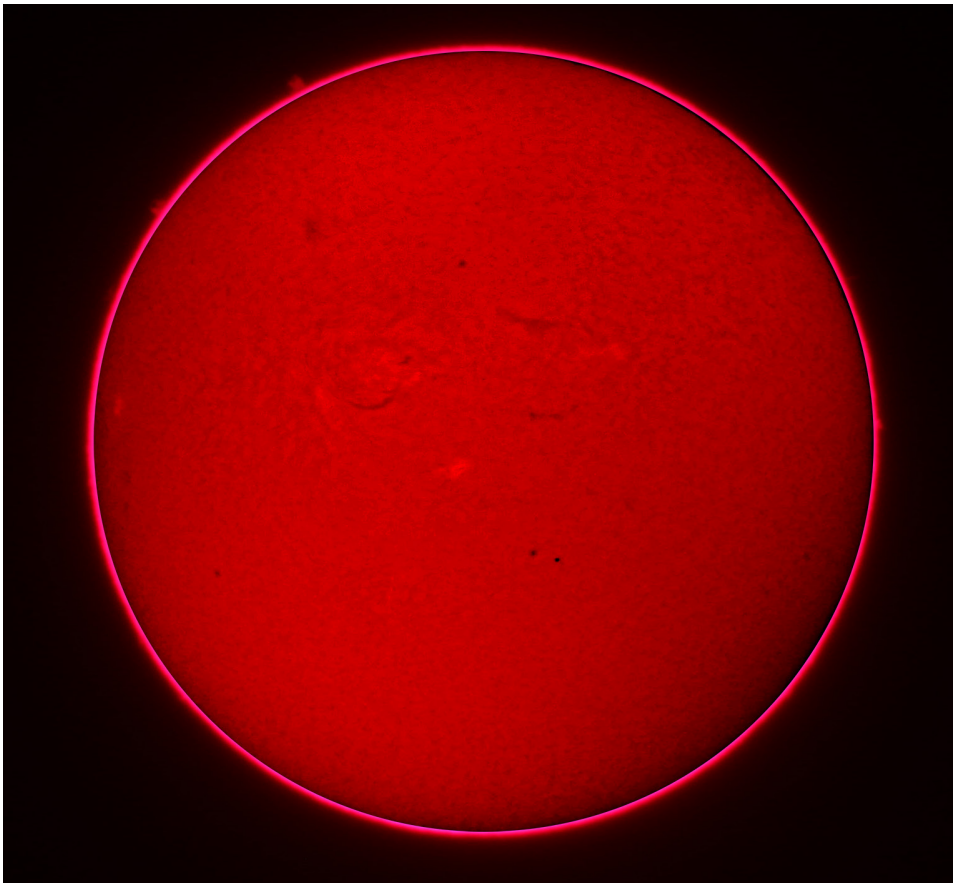
Venus and Mercury transits occur when these worlds, which orbit between the Earth and the Sun, can be seen to pass directly in front of the solar disk and transit across the face of our star. Why don't we experience a transit of Venus or Mercury every time they pass between the Earth and the Sun (called inferior conjunction)? It all has to do with the orbits of these planets and our ever-changing viewing angle. Most of the time Venus and Mercury pass above or below the solar disk as seen from the Earth. This concept is simply stated here, but it took the greatest astronomical minds of the past to solve this great mystery. The process took much observation, dedication and deduction to determine the solar system design and the celestial mechanics that govern its motion.

Venus transits are rare astronomical events. They always occur in pairs, eight years apart. We last experienced transits of Venus in 2004 and 2012. Their immediate predecessors occurred back in 1884 and 1882. And the next pair won't be until 2117 and 2125!

However, another planet can transit the Sun—Mercury. Though not as rare as Venus transits, transits of Mercury occur 12-13 times per century. The last one occurred on May 9, 2016 and it was observed in its entirety locally. The Mercury transit prior to that occurred on November 8, 2006, but in Southern New England we were clouded out. Unfortunately, the next one visible here after the upcoming November 11 event won't be until May 7, 2049.

I encourage the reader to examine the brief article at this website http://www.theskyscrapers.org/historical-perspective-transits-of-venus-and-mercury to understand why transits were once so important that expeditions were sent around the world to observe them.

First and foremost I must express several very important words of caution. My mantra is: when observing the Sun, observe caution as well. Do not attempt to observe this event unless you are an experienced solar observer. Mercury is so tiny that you won't be able to detect it in transit with the naked eye anyway, so don't be tempted to try. Number 14 welders' glass will not show Mercury either. DO NOT use exposed film of any kind. This method is not safe under any circumstance. In past columns I have instructed folks on how to build a solar eclipse viewer using a shoe box. This observing method also won't work in this circumstance because the projected solar disk is so tiny that Mercury's even smaller silhouette won't be detectable. Furthermore, unfortunately those solar eclipse glasses practically everyone obtained for the August 21, 2017 solar eclipse will not reveal tiny Mercury's disk either.



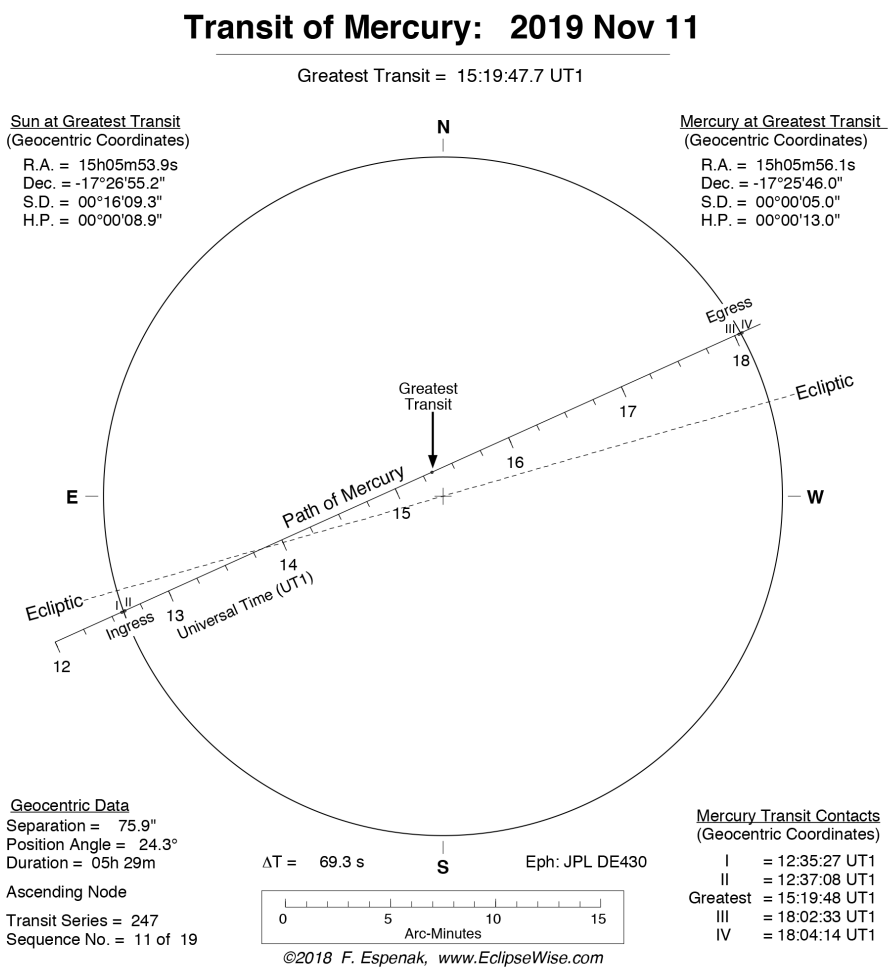
If you have never observed the Sun before this event, don't start now! Don't risk your eyesight due to an oversight or an outright mistake. Even if you have one of those department store refractors that often come with small glass or plastic filters, do not be tempted to use them. They have been known to shatter when exposed to the Sun's concentrated image. (Many years ago, when I first started out in astronomy, I had one of those glass/plastic filters shatter during a partial solar eclipse. Luckily, I wasn't looking through the eyepiece at the time. But it was a very close call.)

If you use an unfiltered telescope to project the Sun's image on a white screen, remember to be very cautious if other folks, especially children, are nearby. You don't want anyone accidentally stepping up to an unguarded eyepiece to take a look. And regarding eyepieces, do not use cemented eyepieces. Use only those that are airspaced. Eyepieces have been ruined when the cement has melted due to the concentrated sunlight collected by a telescope.

Otherwise, experienced astronomers use special solar filters that prevent more than 99.99% of the light from even entering the telescope. That includes the dangerous infrared wavelength as well.

Regardless of which telescope method you use, please remember to block off your telescope's finder scope. I have seen observers singe their hair or clothes by failing to do so!!

Our location here in Southern New England will allow us to observe the 2019 transit in its entirety. From start to finish the transit will last five and a half hours. That's a long duration event to allow interested individuals to be able to view even a few minutes of Mercury's passage across



the solar disk.

Please note that all times with this article are provided in Eastern Standard Time and have been specifically calculated for Providence. (Times do vary slightly by geographic location, so if you are going to be outside of the area, you may want to check online for specifics.)

Locally the transit begins bright and early at 7:34:43 a.m. with the Sun about ten degrees above the southeast horizon. This is the moment of 1st contact when the tiny silhouette of Mercury will begin to appear along the lower left (east) edge of the Sun approximately at the eight o'clock position. Because the Sun arcs across the sky depending upon geographic location, and because we live on the surface of a sphere, the beginning and ending positions will differ greatly from the accompanying graphic. It's all a matter of perspective. It will take two minutes for Mercury to emerge fully onto the solar disk.

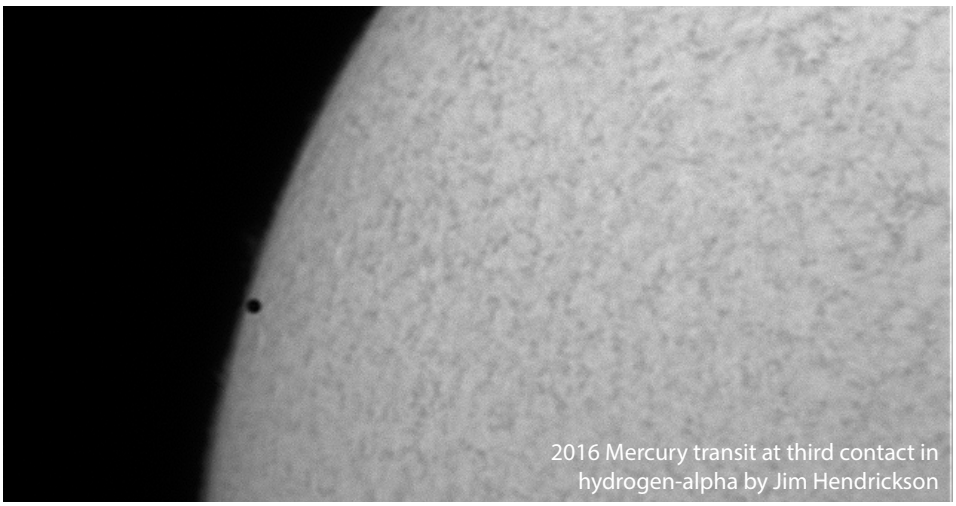
Just before it does so, a keen-eyed observer should notice the "black drop" effect. Many members of Skyscrapers observed this "black drop" during Venus' transit in 2004. High magnification will be necessary to see this effect due to Mercury's small size. When Mercury is seen fully in front of the solar disk is the time of 2nd contact at 7:36:24 a.m. The image of Mercury will be quite small and much darker and rounder than any sunspot. (With the Sun currently at solar minimum there will be few if any sunspots to use for comparison.)

Mercury's motion will continue to carry it across the face of the Sun from east (left) to west (right). The mid-transit point will occur at 10:19:46 a.m. with the Sun 28.6 degrees above the south-southeast horizon. At 1:03:13 p.m. Mercury will reach the right edge of the Sun. This is 3rd contact. Just prior to this time an observer will once again have another opportunity to observe the "back drop" effect. Then at 1:04:54 p.m. Mercury will exit the solar disk completely. This event is called 4th contact. The Sun will then be about 26.8 degrees above the south-southwest horizon.

If you are not an experienced solar observer and wish to experience this transit, you may be able to do so at some of the local observatories. At the time of this writing in early October, only Frosty Drew Observatory at Ninigret Park in Charlestown has an observing program scheduled (https://frostydrew.org/events.dc/show/event-800/. If and when any of the other facilities offer Mercury transit observing opportunities, I will email the media with the details.

And heavens forbid the skies are cloudy here on November 11. I'm sure there will be many websites streaming the event live. I agree that watching online sites is not the same as experiencing the transit firsthand, but if the weather doesn't cooperate, you may have no choice but to pull up a chair in front of your computer screen and watch the progress of the event. This course of action is also an option if you can't observe it safely yourself or can't travel to an organized observing program. Should the opportunity pass you by for any reason, you won't have another chance locally until May 7, 2049.

Good luck in observing this interesting astronomical phenomenon, and remember to keep your eyes safe.


2016 Mercury transit at third contact in hydrogen-alpha by Jim Hendrickson

Dave Huestis is Skyscrapers Historian and has been contributing monthly columns to local newspapers for nearly 40 years. See more at http://theskyscrapers.org/dave-huestis

Left: Photo of the May 9, 2016 transit of Mercury. Mercury is the small dot on the center right. Note how tiny it is, even compared to the small sunspot on the center left. Credit: Dave Huntz. Above: This photo from the same 2016 transit event shows Mercury a bit larger, as it should; it was taken at a higher magnification through a large 16 inch telescope! Credit: J. A. Blackwell

NASA Night Sky Notes:
The Messenger Crosses the Sun: Mercury Transit 2019

By David Prosper

Did you know that there are two other objects in our skies that have phases like the Moon? They're the inner planets, found between Earth and the Sun: Mercury and Venus. You can see their phases if you observe them through a telescope. Like our Moon, you can't see the planets in their "new" phase, unless they are lined up perfectly between us Earthlings and the Sun. In the case of the Moon, this alignment results in a **solar eclipse**; in the case of Mercury and Venus, this results in a **transit**, where the small disc of the planet travels across the face of the Sun. Skywatchers are in for a treat this month, as Mercury transits the Sun the morning of **November 11**!

You may have seen the transit of Venus in 2012; you may have even watched it through eclipse glasses! However, this time you'll need a solar telescope to see anything, since eclipse glasses will only reveal the Sun's blank face. Why is that? Mercury is the smallest planet in our solar system, and closer to the Sun (and further away from Earth) during its transit than Venus was in its 2012 transit. This makes Mercury's disc too small to see without the extra power of a telescope. Make absolutely certain that you view the transit via a telescope equipped with a safe solar filter or projection setup. Do NOT combine binoculars with your eclipse glasses; this will instantly burn a hole through the glasses – and your eyes! While most people don't have solar telescopes handy, many astronomy clubs do! Look for clubs hosting Mercury transit observing events near you at bit.ly/findnsn (USA) or at bit.ly/awbtransit (worldwide).

What a fun opportunity to see another planet during the day! This transit is expected to last over five hours. Folks on the East Coast will be able to watch the entire transit, weather permitting, from approximately 7:35 am EST until around approximately 1:04 pm EST. Folks located in the middle of North America to the west coast will see the transit already in progress at sunrise. The transit takes hours, so if your weather is cloudy, don't despair; there will be plenty of time for skies to clear! You can find timing details and charts via eclipse guru Fred Espenak's website: bit.ly/mercurytransit2019

Mercury's orbit is small and swift, and so its position in our skies quickly changes; that's why it was named after the fleet-footed messenger god of Roman mythology. In fact, if you have a clear view of the eastern horizon, you'll be able to catch Mercury again this month! Look for it before dawn during the last week of November, just above the eastern horizon and below red Mars. Wake up early the morning of November 24th to see Mars, the Moon, and Mercury form a loose triangle right before sunrise.

Discover more about Mercury and the rest of our solar system at nasa.gov

This article is distributed by the NASA Night Sky Network, a coalition of hundreds of astronomy clubs across the US dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, stargazing info and more.

Finding Uranus

by Jim Hendrickson

As the Sun sinks lower, and the autumn and winter constellations begin to fill our evening skies, the Northern Hemisphere turns towards the section of the ecliptic that rides high in our sky, providing the most optimum viewing of anything that resides on this side of our solar system.

Uranus has spent most of the past ten years in Pisces (with a brief foray into Cetus in mid-2012) and this past February it crossed into the constellation Aries, where it will remain until mid-2024, when it passes into Taurus.

Devoid of any bright deep-sky objects, but containing two notable double stars, Aries rarely draws our gaze for much other than it being a transitional star pattern, pointing the way to what lies just beyond to the east--the Pleiades, Taurus, and Orion. This year, however, our seventh planet gives us reason to visit this oft-neglected constellation.

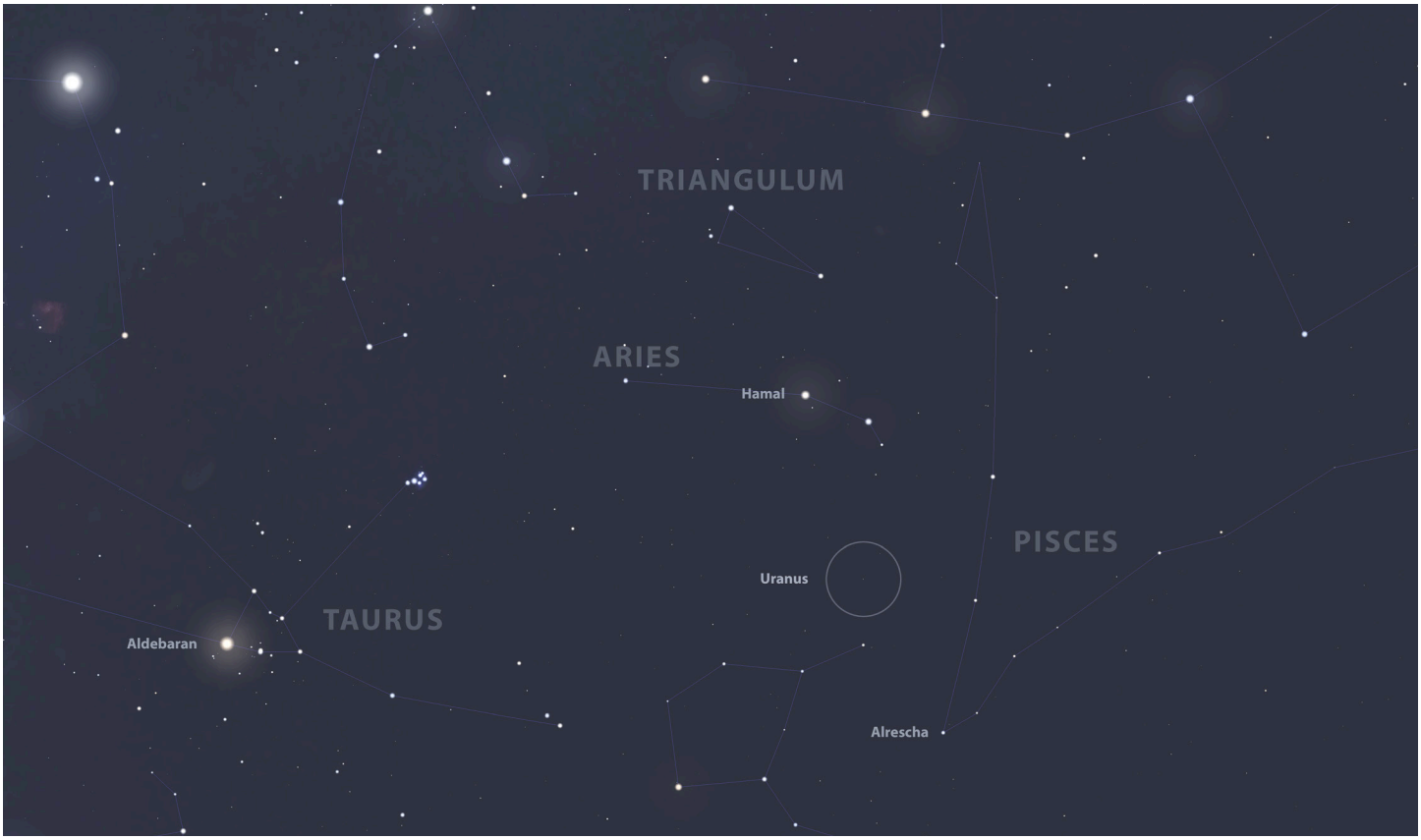
A recent question on the TV game show Jeopardy! asked contestants to identify our solar system's only planet that requires a telescope to see (the answer is Neptune). It isn't often that we think of Uranus as being visible to the unaided eye, but it does reach magnitude 5.67 in the days nearest its opposition, and under ideal viewing conditions, someone with terrific vision could spot it. Traveling through a more northerly declination brings Uranus higher in our sky than it has been in decades. This allows it to shine above more of the atmospheric haze and skyglow than it has been in decades. This fact, combined with the relatively sparse background far from the dense star fields of the Milky Way, make the next several years an ideal opportunity to attempt naked-eye sightings of Uranus. If you don't have great vision, or must observe where light pollution blots out much of the fainter objects, Uranus will make for an easy journey with binoculars.

Reaching opposition on October 28 at a distance of 18.8 AU from Earth, Uranus will spend the next several weeks lying approximately equidistant from Hamal (Alpha Arietis - mag. 2.01) and Alrescha (Alpha Piscium - mag. 3.82). If you have trouble spotting Alrescha, another way to find the area is to look at the short base segment of the isosceles triangle of the constellation Triangulum, above Aries, travel through Hamal, and keep going the same direction and distance. Uranus will be the brightest star-like object around.

Through binoculars or a small telescope, Uranus exhibits an unmistakable bluish-green color, but don't expect to see very much detail on its sub-4 arcsecond disk. Even in large telescopes, the enigmatic planet appears as a rather featureless ball. If you have 10 inches or more aperture, however, you can try for the larger moons of Uranus. Titania and Oberon, each about 14th magnitude, circle within 30-40 arcseconds of the planet. Sky & Telescope has a handy online tool to help locate the moons of Uranus: https://www.skyandtelescope.com/observing/interactive-sky-watching-tools/the-elusive-moons-ofuranus/

Look for Uranus every clear night and note its position amongst the background stars. Try taking wide-field photos (use a tripod and a 10-second exposure) and "blink" them to demonstrate the motion of the planet. Happy hunting, and be sure to share your observations and photos.

Jim Hendrickson is newsletter and web editor and has been a member for 20 years. See more at http://theskyscrapers.org/jim-hendrickson



Planetary Nebula in Cetus: NGC 246

by Glenn Chaple for LVAS

Mag: 10.9; Size: 4.6′ X 4.1′

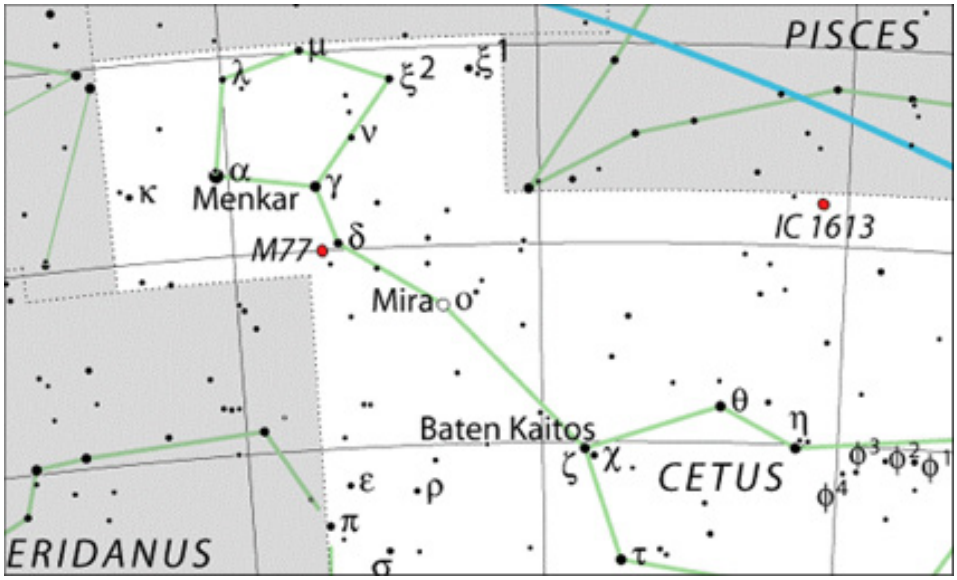
Our November Observer's Challenge, the planetary nebula NGC 246 in Cetus, challenges us in two ways. First, it's in a remote part of the constellation Cetus. You can log in its coordinates (RA 00h47m, dec -11°28′) on a GoTo scope or star-hop 5½ degrees from 3rd magnitude eta (η) Ceti. Second, it's faint! Some guides list its magnitude as 8.0, but that's its photographic magnitude. Visually, it's an 11th magnitude object – two magnitudes fainter than the Ring Nebula (M57). Worse yet, it's 3 times larger than the Ring, making it a low surface brightness target.

My recent (mis)adventures attempting to view NGC 246 with a 10-inch f/5 reflector attest to its elusiveness. The first time, I could make out what looked like a wide multiple star comprised of a handful of 11th magnitude components. Even with averted vision, I was unable to detect any nebulosity. It was a moonless night, but skies were slightly hazy. I was unsuccessful on the next clear night. No haze this time, but lens fogging foiled my effort. As of this writing, I'm waiting for a clear, moonless, low humidity evening for a third attempt. I'll heed Boston ATMs Vice President Rich Nugent's advice to enhance NGC 246's visibility with an OIII filter. Because of the planetary's rather large size, I'll work with a medium magnification – perhaps 75-90X.

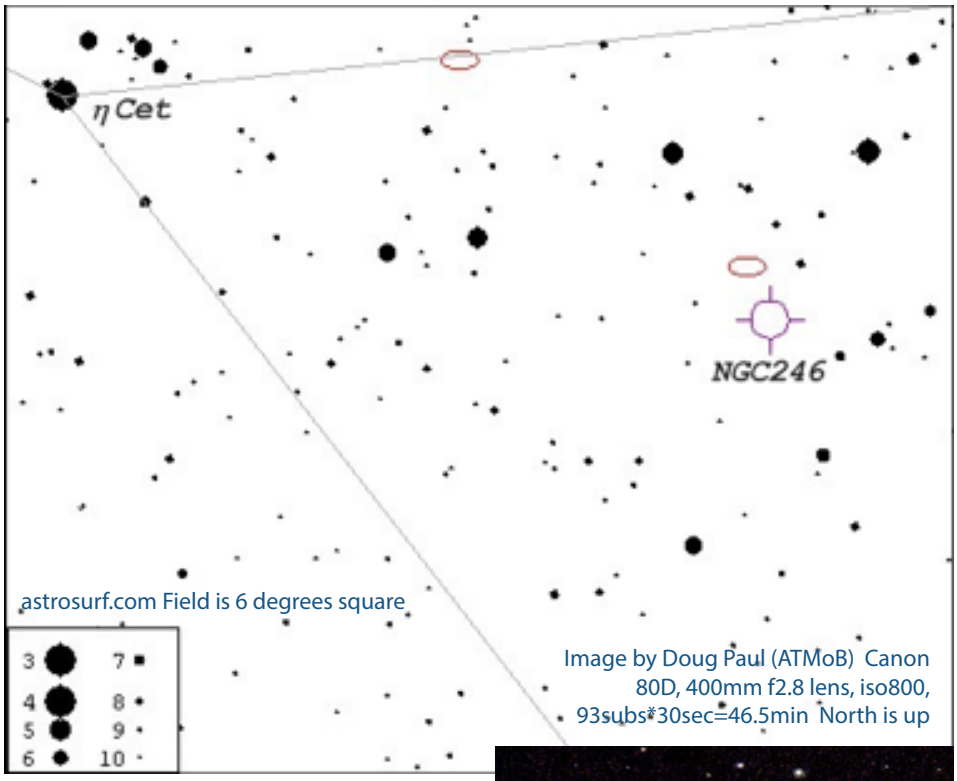
Due to its visual appearance, NGC 246 has been nick-named the "Pac-Man Nebula" or the "Skull Nebula". "Pac-Man" is obvious in the accompanying image made by ATMoB member Doug Paul, while fellow ATMoB member Mario Motta's image shows the "Skull".

While you have NGC 246 in the eyepiece field, look a half degree NNE for the 12th magnitude galaxy NGC 255. William Herschel discovered this barred spiral on November 27, 1785 - the same evening he found NGC 246. It's plotted on the finder chart and appears in Doug Paul's wide-field image.

NGC 246 lies about 1600 light years away and spans an estimated 2.5 light years. NGC 255 is about 60 million light years distant.



constellation-guide.com (IAU and Sky and Telescope)



astrosurf.com Field is 6 degrees square

Image by Doug Paul (ATMoB) Canon 80D, 400mm f2.8 lens, iso800, 93subs*30sec=46.5min North is up

The purpose of the LVAS Observer's Challenge is to encourage the pursuit of visual observing. It is open to everyone that is interested, and if you are able to contribute notes, drawings, or photographs, the LVAS will be happy to include them in our monthly summary. If you would like to contribute material, submit your observing notes, sketches, and/or images to either Roger Ivester (rogerivester@me.com) or Fred Rayworth (queex@embarqmail.com). To find out more about the LVAS Observer's Challenge or access past reports, log on to rogerivester.com/category/observers-challenge-reports-complete.

The Sun, Moon & Planets in November

This table contains the ephemeris of the objects in the Solar System for each Saturday night in November 2019. Times in Eastern Standard Time (UTC-5), except for November 2, which is EDT (UTC-4). Ephemeris times are 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**	14 27.5	-14 34.8	Lib	-26.8	1933.8	-	-	-	0.99	07:19	12:29	17:39
	9	14 55.2	-16 42.4	Lib	-26.8	1937.3	-	-	-	0.99	06:27	11:30	16:31
	16	15 23.7	-18 36.1	Lib	-26.8	1940.5	-	-	-	0.99	06:36	11:31	16:25
	23	15 52.9	-20 13.7	Lib	-26.8	1943.3	-	-	-	0.99	06:44	11:32	16:20
	30	16 22.7	-21 33.2	Sco	-26.8	1945.8	-	-	-	0.99	06:52	11:34	16:16
Moon	**2**	18 48.0	-23 48.6	Sgr	-11.2	1854.5	62° E	27	-	-	12:57	17:38	22:21
	9	0 31.8	-2 52.8	Cet	-12.4	1795.5	140° E	88	-	-	15:33	21:50	04:16
	16	6 21.4	22 14.5	Gem	-12.5	1876.3	139° W	88	-	-	19:53	03:39	11:23
	23	12 50.6	-0 35.7	Vir	-10.8	1933.9	49° W	17	-	-	02:54	09:00	14:55
	30	19 21.5	-23 41.3	Sgr	-10.4	1846.3	42° E	13	-	-	10:36	15:19	20:05
Mercury	**2**	15 38.4	-22 06.1	Lib	1.0	8.8	18° E	26	0.36	0.77	08:59	13:37	18:15
	9	15 18.8	-19 12.3	Lib	4.8	9.9	6° E	3	0.32	0.68	06:57	11:47	16:38
	16	14 47.0	-14 38.9	Lib	3.0	9.4	10° W	8	0.31	0.72	05:41	10:49	15:58
	23	14 41.4	-13 06.6	Lib	0.2	7.8	19° W	39	0.32	0.87	05:05	10:19	15:33
	30	15 03.3	-14 54.1	Lib	-0.4	6.5	20° W	66	0.36	1.04	05:08	10:15	15:22
Venus	**2**	15 51.7	-20 31.4	Sco	-3.8	10.8	21° E	94	0.73	1.56	09:10	13:55	18:39
	9	16 28.2	-22 25.0	Oph	-3.8	11.0	23° E	93	0.73	1.53	08:27	13:04	17:40
	16	17 05.6	-23 47.2	Oph	-3.8	11.2	24° E	91	0.73	1.51	08:43	13:13	17:44
	23	17 43.5	-24 35.1	Oph	-3.8	11.5	26° E	90	0.73	1.47	08:57	13:24	17:51
	30	18 21.7	-24 46.7	Sgr	-3.8	11.7	28° E	89	0.73	1.44	09:08	13:34	18:01
Mars	**2**	13 10.1	-6 33.1	Vir	1.8	3.7	21° W	99	1.64	2.53	05:32	11:11	16:49
	9	13 27.2	-8 18.1	Vir	1.8	3.7	23° W	99	1.64	2.50	04:28	10:01	15:32
	16	13 44.4	-10 00.6	Vir	1.8	3.8	26° W	98	1.63	2.47	04:24	09:50	15:16
	23	14 01.9	-11 40.0	Vir	1.7	3.8	28° W	98	1.63	2.43	04:20	09:40	15:00
	30	14 19.7	-13 15.6	Vir	1.7	3.9	30° W	98	1.62	2.39	04:17	09:30	14:44
1 Ceres	**2**	17 36.8	-26 07.9	Oph	9.2	0.4	46° E	98	2.88	3.49	11:18	15:37	19:56
	9	17 48.1	-26 21.1	Sgr	9.2	0.3	41° E	99	2.89	3.56	10:03	14:21	18:38
	16	17 59.7	-26 31.2	Sgr	9.2	0.3	37° E	99	2.89	3.62	09:48	14:05	18:22
	23	18 11.6	-26 37.9	Sgr	9.2	0.3	32° E	99	2.89	3.68	09:32	13:49	18:06
	30	18 23.6	-26 41.3	Sgr	9.2	0.3	28° E	99	2.90	3.73	09:17	13:33	17:50
Jupiter	**2**	17 31.9	-23 05.3	Oph	-1.8	33.3	44° E	100	5.25	5.91	10:58	15:31	20:04
	9	17 37.9	-23 09.7	Oph	-1.7	32.9	39° E	100	5.25	5.98	09:37	14:10	18:43
	16	17 44.2	-23 13.3	Sgr	-1.7	32.5	33° E	100	5.24	6.05	09:16	13:49	18:21
	23	17 50.7	-23 16.0	Sgr	-1.7	32.3	27° E	100	5.24	6.10	08:55	13:28	18:00
	30	17 57.3	-23 17.7	Sgr	-1.7	32.0	22° E	100	5.24	6.14	08:34	13:07	17:39
Saturn	**2**	19 07.2	-22 24.4	Sgr	0.6	15.9	66° E	100	10.04	10.4	12:30	17:06	21:42
	9	19 09.4	-22 21.4	Sgr	0.6	15.8	60° E	100	10.04	10.5	11:04	15:41	20:17
	16	19 11.9	-22 17.8	Sgr	0.6	15.6	53° E	100	10.04	10.6	10:39	15:16	19:52
	23	19 14.6	-22 13.7	Sgr	0.6	15.5	47° E	100	10.04	10.69	10:14	14:51	19:28
	30	19 17.4	-22 09.0	Sgr	0.6	15.4	40° E	100	10.04	10.77	09:49	14:26	19:03
Uranus	**2**	2 09.3	12 30.3	Ari	5.7	3.7	175° E	100	19.83	18.84	17:19	00:06	05:54
	9	2 08.2	12 24.7	Ari	5.7	3.7	168° E	100	19.83	18.86	15:50	22:38	05:25
	16	2 07.2	12 19.2	Ari	5.7	3.7	161° E	100	19.82	18.89	15:22	22:09	04:56
	23	2 06.2	12 14.1	Ari	5.7	3.7	153° E	100	19.82	18.94	14:54	21:41	04:28
	30	2 05.3	12 09.5	Ari	5.7	3.7	146° E	100	19.82	19	14:26	21:12	03:59
Neptune	**2**	23 10.5	-6 26.9	Aqr	7.8	2.3	127° E	100	29.93	29.33	15:29	21:08	01:47
	9	23 10.2	-6 28.8	Aqr	7.8	2.3	120° E	100	29.93	29.43	14:02	19:40	01:19
	16	23 10.0	-6 30.0	Aqr	7.9	2.3	113° E	100	29.93	29.54	13:34	19:13	00:51
	23	23 09.8	-6 30.6	Aqr	7.9	2.3	106° E	100	29.93	29.65	13:06	18:45	00:24
	30	23 09.8	-6 30.5	Aqr	7.9	2.3	98° E	100	29.93	29.77	12:39	18:18	23:56
Pluto	**2**	19 30.5	-22 23.2	Sgr	14.4	0.2	72° E	100	33.91	34.21	12:53	17:29	22:05
	9	19 31.0	-22 22.7	Sgr	14.4	0.2	65° E	100	33.92	34.33	11:26	16:02	20:38
	16	19 31.6	-22 21.9	Sgr	14.4	0.2	58° E	100	33.92	34.44	10:59	15:35	20:11
	23	19 32.3	-22 21.0	Sgr	14.4	0.2	51° E	100	33.93	34.54	10:32	15:08	19:45
	30	19 33.0	-22 19.9	Sgr	14.4	0.2	44° E	100	33.93	34.63	10:05	14:41	19:18

AstroAssembly 2019

Thanks to Steve Hubbard, Tracy Prell and Jim Hendrickson for submitting photos from our 2019 AstroAssembly

AstroAssembly 2019 was dedicated in memory of long-time member Gerry Dyck, with a display of his memories and accomplishments set up in the antiroom and members and guests sharing tributes and memories before the evening presentation.

Morning & afternoon presentations included Zane Landers, Roger Fu, Ed Ting and Steve Hubbard. Standing in as emcee for a long AstroAssembly tradition is Scott Tracy.

Sue, Linda and Steve at the registration table.

Our on-site vendor Jeff Norwood from Camera Concepts & Telescope Solutions.

Clear skies permitted observation after the evening presentation. The Alvan Clark telescope showed views of the Moon, Jupiter and Saturn, while guests observed with telescopes on the front lawn.

Our catered dinner by Quik-Stop Deli was our last from them, as they're retiring at the end of the year. Astro-Bakeoff entries included a black hole and meteor crater, and for lunch Steve Hubbard and Bob Horton served up hot dogs and hamburgers.

Members and guests gather for dinner at North Scituate Baptist Church before the raffle and evening presentation by Dr. John Mustard.

Cameras for Sale

Contact Conrad Cardano
cardanoc@verizon.net

ZWO ASI120MC Color CMOS Camera
Sensor: 1/3" CMOS
Resolution: 1.2Mega Pixels 1280×960
Pixel Size: 3.75μm
Focus Distance to Sensor: 8.5mm
Interface: USB2.0
Bit rate: 12bit output
It's yours for $75.

SKYRIS 445M

A 12 bit monochrome CCD (Sony ICS445ALA chip) camera. Pixel size 3.75 microns. Chip size: 1280 x 960 pixels. USB 3.0. I paid $650 for the camera and I will sell it for $200 (I no longer use it)

ZWO ASI178MM Monochrome CMOS Camera
· Sensor: Sony 1/1.8" CMOS IMX178 · Resolution: 6.4M · Image Array: 3096 x 2080 · Pixel Size: 2.4um · Low Read Noise: · Interface: USB3.0/USB2.0 · Bit Rate: 14bit output
I paid $370 for this camera and will sell it for $225. I thought I would do lots of planetary photography; but I switched to spectroscopy instead. Hardly used.

Directions to Seagrave Memorial Observatory

www.theSkyscrapers.org

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.

SKYSCRAPERS INC.

47 Peeptoad Road
North Scituate, Rhode Island 02857