

Highlights of the October Sky...

- - - 5th - - -

DUSK: A waxing gibbous Moon is nearly 2½° to upper left of Saturn when they rise in the east-southeast.

- - - 6th - - -

Full Moon @ 11:48 pm EDT

- - - 9th - - -

PM: A waning gibbous Moon and the Pleiades are 2° apart when they rise in the east-northeast. Binoculars will be needed to see the cluster.

- - - 13th - - -

Last Quarter Moon @ 2:13 pm EDT.

- - - 14th - - -

AM: A last quarter Moon, Jupiter, and Pollux form an equilateral triangle with sides 6½° in the eastern sky.

- - - 16th - - -

AM: A waning crescent Moon leads Regulus by 4½° when they rise in the eastern sky.

- - - 19th - - -

DAWN: A thin waning crescent Moon is 4° to the upper right of Venus low in the east.

- - - 20th - - -

PM: Comet C/2025 R2 (SWAN) makes its closest approach to Earth at a distance of 0.26 AU (24 million miles).

- - - 20th → 21st - - -

ALL NIGHT: The Orionid meteor shower is predicted to peak. Expect a maximum hourly rate of 18 meteors per hour.

- - - 21st - - -

New Moon @ 8:25 am EDT

PM: Comet C/2025 A6 (Lemmon) comes closest to Earth at a distance of 0.60 AU (56 million miles). It is predicted to reach an apparent magnitude of 2.5 to 4.

- - - 24th - - -

DUSK: A waxing crescent Moon is 1¾° to the lower right of Antares in Scorpius.

- - - 29th - - -

First Quarter Moon @ 12:21 pm EDT

Prime Focus

A Publication of the Kalamazoo Astronomical Society

★ ★ ★ October 2025 ★ ★ ★

This Month's Events

General Meeting: Friday, October 3 @ 7:00 pm

Kalamazoo Area Math & Science Center • See Page 12 for Details

Observing Session: Saturday, October 11 @ 7:00 pm

Kalamazoo Nature Center • [Visit Observing Page for Details](#)

Observing Session: Saturday, October 25 @ 7:00 pm

Kalamazoo Nature Center • [Visit Observing Page for Details](#)

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First off, please attend the general meeting on Friday, October 3rd. The meeting's theme is *Astrophotography Night*, a KAS tradition dating back over 50 years. This is a chance for the sky shooters of the club to share (and show off) their best and latest images. Everyone in this group should enjoy looking at pretty pictures of the night sky, and it's a great way for you to appreciate the work of your fellow members. As I type this, there are at least nine members that plan to share images. And please keep in mind, there will be apple cider and donuts!

Now indulge me as I get something off my chest. Did you see clips from the hearing of the House Oversight Committee's Task Force on the Declassification of Federal Secrets from September 9th? If you're not sure what I'm referring to, please view [this clip](#) from CBS News on YouTube. The topic was Unidentified Anomalous Phenomena (UAP), formerly known as UFOs. The hearing featured the release of video footage purportedly captured by an MQ-9 Reaper drone in October 2024 off the coast of Yemen. The video captured an orb-like object that allegedly withstood a Hellfire missile strike. They say the missile "bounced right off" the object and "kept on going." Uh-huh, sure it did.

As soon as I saw the footage, I knew immediately what it was. IT WAS A FREAKING BALLOON!!! Hellfire missiles are equipped with something called a

"crush sensor." When they strike a target on the ground, as they are designed to do, they detonate. The missile would have exploded even if it "bounced" off this object. It's clear from the video that the missile passes through the object. The object even briefly oscillates when the missile passes through it, as a balloon would do.

What really irked me is when one of the committee members asked the panel if this video scared them. They all responded yes. Ugh!

We could spend a lot of time

debating if they really believe what they're saying or if they have an ulterior motive. All I know is that if they are truly concerned, then they're not qualified for their positions. It's obviously some sort of high-altitude balloon.

Now, let's talk about something more fun. This time last year, we were getting ready to enjoy Comet C/2023 A3 (Tsuchinshan-ATLAS). This month, there may be not one but two decent comets to enjoy. [Pictured above](#) is Comet C/2025 A6 (Lemmon), discovered by the Mount Lemmon Survey this past January. On October 21st, Comet Lemmon will reach its closest approach to Earth, precisely in the center of the constellation Boötes. According to current predictions, Comet Lemmon is expected to reach an apparent magnitude of 2.5 to 4, making it visible from dark sites with the unaided eye. It will likely be a good binocular target.

Vladimir Bezugly, an amateur astronomer in Ukraine, discovered Comet C/2025 R2 (SWAN) on September 11th. He spotted it in images from the SWAN instrument on SOHO. The day after its discovery, it reached perihelion with the Sun. It comes within 0.26 AU of Earth on October 20th and could reach magnitude 4 to 6. Before that, around October 5th, Earth will pass near the comet's meteoroid stream, possibly producing a meteor shower. Perhaps we'll hold an impromptu comet watch in addition to our planned public sessions this month. Stay tuned!



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September Meeting Minutes



KAS President Richard Bell opened the society's general meeting on September 5, 2025, at 7:11 pm EDT. About 36 members and guests were in attendance at the Kalamazoo Area Mathematics & Science Center (KAMSC), while at least 39 people joined us virtually on Zoom.

Richard also delivered the meeting's featured presentation, *Moon Shot: A Brief History of Lunar Exploration*. He said he planned to give this talk about a year ago when NASA planned to launch the *Artemis 2* mission to orbit the Moon in October. That mission is now scheduled to launch no earlier than February 2026 and no later than April 2026.

However, due to proposed cuts to NASA's budget and around 4,000 NASA employees (at least 20% of its workforce) leaving through a deferred resignation program, many of them being senior employees, Richard doubted it would happen at all.

Continuing with his presentation, Richard noted that it has now been over 50 years since humans first set foot upon the Moon, but we've ventured there in our minds for millennia. The earliest known written story about people traveling to the Moon is by the Syrian-Greek writer Lucian of Samosata in 125 CE. A powerful waterspout blasts a boat to the

Moon in this tale. A race of three-headed vultures greeted the travelers, and soon they found themselves embroiled in a war with another species.

Johannes Kepler completed *Somnium* (*The Dream*), a novel about landing on the Moon, in 1608. Kepler began writing *Somnium* when he was a teenager. It took him two decades to complete it. It was published by his son in 1634—four years after Kepler's death.

The story is framed as Kepler's dream (hence the title). The main character is a young Icelandic boy fascinated by astronomy and whose mother might be a witch.

Kepler's mother, Katharina Kepler, was accused of witchcraft in 1615. Her trial lasted for several years, resulting in her imprisonment before her release in 1621.

Jules Verne published *From the Earth to the Moon* in 1865, followed by *Around the Moon* in 1870. Members of a post-Civil War Baltimore Gun Club use a giant cannon to shoot their travelers around the Moon. They don't land. Instead, they experience a series of misadventures while in orbit around the Moon before eventually making their way back to Earth.

The First Men in the Moon was

written by H.G. Wells and published in hardcover in 1901. Two protagonists use a "hand-waving science" method of travel. They actually land on the Moon, explore it, and return (at least one of them does).

In 1902, French filmmaker Georges Méliès released *Le Voyage dans la Lune* (*A Trip to the Moon*). It was inspired by the works of Jules Verne. The moment when the capsule lands in the Moon's eye remains one of the most iconic and frequently referenced images in the history of cinema.

Robert Heinlein published his sci-fi novella *The Man Who Sold the Moon* in 1950. This is a tale about a wealthy American businessman named D.D. Harriman who is obsessed with being the first man on the Moon. For the ending, Harriman's billionaire buddy backers won't let him in the spaceship to become the first man to set foot on the Moon; he's too valuable as the frontman selling the dream of spaceflight-for-all back on Earth.

Finally, Heinlein co-wrote the 1950 film, *Destination Moon*. It drew in part on the plot of his juvenile novel *Rocket Ship Galileo*, but he also incorporated plot lines from *The Man Who Sold the Moon*. It is a story of corporations rather than governments providing the money and know-how to put a man on the Moon.

Galileo Galilei is often credited with being the first person to observe the Moon through a telescope. He famously first observed craters and mountains on the Moon on November 30, 1609. He quickly published his results in *Sidereus Nuncius* (*Starry Messenger*) on March 13, 1610.

We now know that it was the English astronomer, mathematician, ethnographer, and translator Thomas Harriot who was the first person to observe and sketch the Moon through a telescope (or "perspective tube," as he called it) on August 5, 1609.

Harriot used a 6× Dutch telescope for his lunar survey. He continued his observations of the Moon until 1612. By 1613, he had created two maps of the entire Moon. However, his observations



were not published until 1784, with some not coming to light until 1965.

Belgian cosmographer and astronomer Michael Florent van Langren (Langrenus) created the first detailed map of the Moon in 1645. He believed he could improve the accuracy of longitude determination, particularly at sea, by observing peaks and craters of the Moon as they appear and disappear, not only during eclipses but also in the course of the entire lunation.

He named the crater Langrenus on the Moon after himself, and the name has been preserved to this day. van Langren planned to produce maps of the Moon at 30 different phases but never realized this plan.

Polish astronomer Johannes Hevelius published *Selenographia*, the first treatise entirely devoted to the Moon, in 1647. Hevelius devoted 4 years to charting the lunar surface and discovered the Moon's libration in longitude. His work entitles him to be called "the founder of lunar topography."

Jesuit astronomer Giovanni Battista Riccioli devised the nomenclature for the large naked-eye spots and craters (then known as telescopic spots) in Book 4 of *Almagestum Novum* (*New Almagest*), published in 1651. Despite rejecting the Copernican (heliocentric) theory, he named a prominent lunar crater "Copernicus." Riccioli explicitly stated in his map that the Moon is uninhabited!

German astronomer Johann Friedrich Julius Schmidt spent more than three decades observing, measuring, and mapping the Moon. His chart, *Charte de Gebirge de Mondes*, published in 1878, is the pinnacle of 19th-century selenography.

Using more powerful telescopes than his predecessors, Schmidt mapped much finer detail. Previous lunar charts impressed astronomers by showing more than 7,000 craters; this map depicts nearly 33,000! It was published in 25 separate sheets. Richard noted that many of Schmidt's maps were on display at Adler Planetarium during the last [KAS field trip](#) there in 2007.

Richard moved on to the Space Race between the United States and the Soviet Union, which famously began on October 4, 1957, with the launch of *Sputnik 1* from the Baikonur Cosmodrome. The probe functioned for 21 days. Before burning up in Earth's atmosphere on January 4, 1958, it com-

pleted 1,440 orbits.

The United States responded with *Explorer 1*, launched in a Juno I RS-29 rocket from Cape Canaveral on January 31, 1958. It functioned for 111 days but didn't burn up in Earth's atmosphere until March 31, 1970, after completing over 58,000. It discovered Earth's Van Allen Radiation Belts, which are caused by Earth's magnetic field trapping energetic charged particles (protons and electrons) from the solar wind and cosmic rays.

President Eisenhower signed the National Aeronautics and Space Act, establishing the National Aeronautics and Space Administration (NASA) on July 29, 1958.

NASA succeeded the National Advisory Committee for Aeronautics, which was established as an emergency measure during World War I to promote industry, academic, and government coordination on war-related projects. It began on March 3, 1915, and continued until NASA began operating on October 1, 1958.

Yuri Gagarin became the first human being in space and to orbit Earth on April 12, 1961. Launched from the Baikonur Cosmodrome, he completed a single orbit in 1 hour and 48 minutes in the *Vostok 1* capsule.

In response, NASA created Project Mercury. Its goal was to put a man into Earth orbit and return him safely. It first accomplished that goal on May 5, 1961, with *Freedom 7*. Alan Shepard became the first American in space. His flight was suborbital, reaching an altitude of 101.2 nautical miles. John Glenn became the first American to orbit Earth aboard *Friendship 7* on February 20, 1962. He completed 3 orbits in 4 hours, 55 minutes, and 23 seconds. Project Mercury concluded on May 15, 1963.

Valentina Tereshkova became the first woman in space aboard *Vostok 6* on June 16, 1963. To date, she is the only woman to have a solo space mission. Nobody may ever duplicate this accomplishment. Tereshkova completed 48 orbits in 2 days, 22 hours, and 50 minutes. She is still the youngest woman to have flown in space under the international definition of 100 km altitude and the youngest woman to fly in Earth orbit. The United States wouldn't send a woman into space until 1983, with Sally Ride on the space shuttle *Challenger*.

NASA conducted Project Gemini from March 23, 1965, to November 15,

1966. Its objective was the development of space travel techniques such as rendezvous and docking of spacecraft.

Meanwhile, the Soviet Union launched *Voskhod 2* into orbit on March 18, 1965. Alexei Leonov (with Pavel Belyayev) became the first person to conduct a spacewalk.

Ed White, aboard *Gemini 4*, became the first American to conduct an extravehicular activity (EVA) on June 3, 1965. *Gemini 6A* and *Gemini 7* accomplished the first space rendezvous on December 15, 1965, with *Gemini 7* setting a 14-day endurance record.

Neil Armstrong and David Scott, as part of *Gemini 8*, successfully completed the first docking of two spacecraft in orbit. This mission also saw the first critical in-space system failure of a U.S. spacecraft when the capsule briefly spun out of control.

On January 27, 1967, NASA experienced its first catastrophic event when Virgil "Gus" Grissom, Ed White, and Roger Chaffee lost their lives. A spark ignited the pure oxygen environment in their capsule during a routine test. The mission was originally designated AS-204 but was changed to *Apollo 1* after the accident.

The Apollo Program itself ran from October 11, 1968, to December 19, 1972. *Apollo 8* became the first manned lunar orbital mission. James Lovell, William Anders, and Frank Borman completed 10 orbits around the Moon on December 24, 1968. *Apollo 8* was originally an unpiloted, Earth-orbiting mission, but NASA feared the Russians would send people to the Moon first. *Apollo 8* was also the first use of the Saturn V rocket. The crew was named *Time* magazine's Men of the Year (1968).

Apollo 10 conducted the first manned command and service module (CSM) and lunar module (LM) operations in lunar orbit. Eugene Cernan, John W. Young, and Thomas Stafford completed 31 lunar orbits in May 1969. Stafford and Cernan flew the lunar module for 8 hours, coming within 10 miles of the lunar surface.

During *Apollo 11*, on July 20, 1969, humans walked on another world for the first time in history, achieving the goal that President John F. Kennedy had set in 1961. After a landing that included dodging a lunar crater and boulder field just before touchdown, Neil Armstrong and Buzz Aldrin ex-

plored the area around their lunar landing site in the Sea of Tranquility for 2 hours, 31 minutes, and 40 seconds. They collected soil and rock samples, set up experiments, planted an American flag, and left behind medallions honoring the Apollo 1 crew and a plaque saying, “We came in peace for all mankind.”

Among the many mission objectives for *Apollo 12* in November 1969 was to recover pieces of *Surveyor III*, a robotic lander that had been on the Moon for more than two years. Scientists wanted to study the effects of the lunar environment on the spacecraft.

After a pinpoint landing that gave the crew quick access to *Surveyor*, Pete Conrad and Alan Bean also deployed an experiments package that included a seismometer. Before leaving lunar orbit, they jettisoned the lunar module’s ascent stage so it crashed onto the surface, providing a controlled experiment to assess the seismometers.

Apollo 13, in April 1970, has been called a “successful failure,” because the crew never landed on the Moon, but they made it home safely after an explosion crippled their ship. A switch and insulation were damaged during a test of one oxygen tank, which should have been modified during an upgrade in construction. When the associated heater was turned on during flight, the tank exploded, depleting almost all of the power from the command module and forcing the crew to use the lunar module as a lifeboat.

Jim Lovell, Fred Haise, and Jack Swigert came home safely thanks to the mission control team’s improvised procedures and their ability to implement them.

Notable for the return of America’s first astronaut, Alan Shepard, to space, *Apollo 14* also was probably the smoothest lunar landing to that point. The crew spent 9 hours, 22 minutes, and 31 seconds outside the lunar module and set up several experiments. Shepard set a new distance record by walking more than 9,000 feet on the lunar surface, pulling a handcart to carry their tools and samples.

For the first time, humans drove a car on the Moon. The first of the Apollo “J” missions—designed for longer stays on the Moon—*Apollo 15* carried a lunar rover, which Commander David Scott and Lunar Module Pilot James Irwin used while they were on the surface for more than 18 hours. They traveled more

than 17 miles in the rover, setting up experiments and collecting 170 pounds of samples. Before leaving the lunar surface, Scott conducted an experiment to test Galileo’s theory that objects in a vacuum, without air resistance, would fall at the same rate. He released a geological hammer and a feather, both of which struck the ground simultaneously, thereby validating Galileo’s theory.

Apollo 16 also took advantage of having a lunar rover, as Commander John Young and Lunar Module Pilot Charles Duke drove more than 16 miles over three moonwalks, collecting 209 pounds of samples. Problems forced mission controllers to cut the flight short by a day, but the return trip included a spacewalk by Command Module Pilot Ken Mattingly to retrieve film from a camera in the service module.

Apollo 17, in December 1972, featured the most extensive lunar exploration of the program, with three moonwalks that lasted a total of 22 hours, 3 minutes, and 57 seconds while the crew stayed on the Moon for more than three days. Commander Gene Cernan and Lunar Module Pilot Harrison Schmitt—the first scientist-astronaut to reach the Moon—collected 243 lbs. of material.

Additional Apollo missions were canceled. *Apollo 18*’s target could have been Copernicus crater. *Apollo 19* may have explored Hadley Rille. *Apollo 20* could have visited Tycho crater.

As noted earlier, NASA’s *Artemis 2* mission could return humans to lunar orbit no earlier than February 2026 and no later than April 2026. *Artemis 3* is planned to land humans on the Moon for the first time in 58 years in mid-2027. Richard doubted this timeline due to the aforementioned budget cuts. For now, he encouraged everyone to explore the Moon during Public Observing Sessions at the Nature Center.

Special thanks to Joe Comiskey for providing snacks during the break. Mike Dupuis has offered to bring the traditional snacks of apple cider and donuts to the October meeting.

At the top of his President’s Report, Richard once again thanked Brian Bachert, Matt Borton, Jim Bradshaw, Mike Dupuis, Chip Johnson, Eric Klein, Paul McKinley, Pete Mumbower, Jack Price, Gordon Scott, Don Stilwell, Philip Wareham, Dave Woolf, and Mark Woolf for dismantling the late Fred Dutton’s observatory on August 9th. It was unbearably hot and humid, but we got

the job done quicker than expected.

PlaneWave recently offered a “trade-in” discount for the donated CDK20 telescope. We replied that we would be interested in swapping for an L-500 mount. They only offered a 20% discount (\$5,200), which we obviously turned down.

Despite aurora being seen as far south as Virginia, several members, including Mike Dupuis, Tim Kurtz, Pete Mumbower, and Jack Price, reported negative sightings in West Michigan. However, Brody Wesner successfully captured images of the aurora low on the horizon.

Eric Klein was vacationing with family in Green Bay, Wisconsin, on August 12th and saw the rocket spiral visible across much of the United States and Canada. It was caused by an Ariane 6 rocket from French Guiana venting excess fuel into space after deploying the MetOp-SG A1 weather satellite.

The fuel expanded and froze into ice crystals at high altitude, and the spinning of the rocket created the distinctive spiral pattern as the crystals reflected sunlight, making the event a “twilight phenomenon.”

Jack Price was camping south of Athens, Michigan, on August 23rd. He reported excellent conditions, with both the Milky Way and Andromeda Galaxy easy to spot with the unaided eye. We enjoyed the prime conditions that night as well during a heavily attended Public Observing Session. That will likely be the best session of the season.

Paul Asmus pointed out the recent article in the “News Notes” section of the October 2025 *Sky & Telescope* (pages 10 to 11). To quote: “With total spending set at \$18.8 billion, NASA spending would reach its lowest level since 1961, adjusted for inflation—despite making up less than half a percent of the government’s spending.”

Jack noted that today is the 48th anniversary of *Voyager 1*’s launch. It is now 1 light-day away!

After reviewing upcoming events, the meeting concluded at 9:11 pm.



The featured talk can be viewed in its entirety on our YouTube Channel.

Board Meeting Minutes



The KAS Board met for its summer meeting on Sunday, September 14th, at Sunnyside Church. Society President Richard Bell brought the meeting to order at 5:06 pm. Other board members in attendance were Matt Borton (via Zoom), Scott MacFarlane, Pete Mumbower, Jack Price, Don Stilwell, and Philip Wareham. Also attending for the first time was member Zach Argo.

Don proceeded to give the Treasurer's Report. He stated that June is the first month that the value for tax purposes of the assets that the Society received from the estate of member Fred Dutton is listed in the account balance reports. Then there was some discussion about the tax reporting requirements for the Society.

The total account balance for June was \$44,539.39, July totaled \$43,928.05, and for August it was \$43,560.76. The totals for the following accounts were at the end of last month. The Advia 7-month CD matured in July. Don and Jack had Advia Bank roll it over into a new 7-month CD, which stands at \$10,284.29. The Advia 14-month CD is at \$10,323.53. The savings account is at \$13,004.95, followed by the checking account at \$3,000.44.

The Owl Observatory Maintenance Fund is at \$2,903.36, while the Remote Telescope Fund is at \$1,114.33 and the PayPal account is at \$2,193.42. The cash flow for June was -\$611.34, for July it was -\$367.29, and for August it was -\$377.94.

The board then previewed activities between now and the next board meeting in November. Our next Public Observing Session at the Nature Center will be on September 27th, at 8:00 pm. The next general meeting will be held at KAMSC on October 3rd, at 7:00 pm. Our feature will be *Astrophotography Night* with the traditional cider and donuts during the break!

The last public sessions of the season will be held at the Nature Center on Saturday, October 11th and 25th, with gates opening at 7:00 pm on both nights (weather permitting). We will be playing the classic PBS documentary *The Creation of the Universe* by Timothy

Ferris for the 40th anniversary of its release during our general meeting on November 7th. This film was the first program the Society ran for Full Moon Theater in February 1997. This meeting will be formatted differently. We'll begin with a brief President's Report followed by opening nominations for 2026 board members.

We then moved on to follow-up items from the last board meeting. The Remote Telescope still has some issues autoguiding at zenith, and that cable drag inside the mount was the likely culprit. Pete suggested that we purchase a Pegasus Astro Ultimate Powerbox v3 for \$693.00 to consolidate the cable connections. Pete also stated that the Powerbox would allow us to power cycle individual components on the imaging rig for troubleshooting purposes. Pete motioned to purchase the Powerbox, Don seconded the motion, and the board unanimously voted in favor of the motion to purchase it. The Remote Telescope is still shut down for the monsoon season and should be back online in early October.

The rubber gasket on the corrector plate for the 16-inch Leonard James Ashby Telescope at Owl Observatory is starting to fail, and there was discussion on how to replace the gasket down the road.

A discussion was had for planning this year's Winter Solstice Party. Phyllis Lubbert had graciously offered to organize this year's celebration again. She has already reserved Westwood United Methodist Church for Saturday, December 6th, with a start time of 6:00 pm.

Richard stated that we are still waiting on PlaneWave to recoat the primary mirror of the CDK20 that was donated by Fred Dutton. We also discussed selling the CDK20 telescope, the Paramount ME mount, the observatory, and the accessories that we inherited from Fred Dutton's estate. Richard created an item-by-item list with his best idea of valuations for each individual item. A handful of items will be kept, but most will be sold.

In new business, the next outreach event is CraneFest on Saturday, October

11th, and Sunday, October 12th. Volunteers are needed on both days to hand out KAS literature and share views of the Sun from 11 am to 5 pm.

Another season of [Online Viewing Sessions](#) featuring the KAS Remote Telescope will begin November 15th. Dates for next year's general meetings were reviewed. The Perseid Potluck Picnic will be held on August 1st, while the Winter Solstice Party is tentatively planned for December 19th. An Online Viewing Session is scheduled on the first Saturday of December 2026.

Our world-famous *Introduction to Amateur Astronomy* lecture series will return in early 2026! The following dates are planned: January 17th, February 3rd, February 14th, February 21st, and March 7th. Registration will likely be open in mid-November. Dates for the 2026 Public Observing Sessions were quickly reviewed, but time was running short. We'll take a closer look at it during the November board meeting.

Additional 2026 activities were then discussed. Pete Mumbower is planning to host an updated PixInsight Tutorial. It will be scheduled during the amateur astronomy series to maximize attendance. The February Freeze Out will be held at the Kalamazoo Nature Center on February 20th, while the Messier Marathon will be held at Richland Township Park on March 21st, weather permitting, of course.

In other business, Richard is working on special guest speakers for next year's general meetings as part of our 90th anniversary. Pete brought up taking a big field trip next year and suggested Adler Planetarium in Chicago. Sometime in June was suggested. Our last visit to Adler was in 2007. Richard said he is planning to attend the [Northeast Astronomy Forum](#) (NEAF) in Suffern, New York, on April 11th and 12th. He's encouraging other members to attend as well. It is the world's largest astronomy and space expo.

The meeting adjourned at 7:10 pm. The fall board meeting will be held on Sunday, November 9th, at Sunnyside Church at 5:00 pm. All members are welcome to attend.

Let's Go, LIGO!

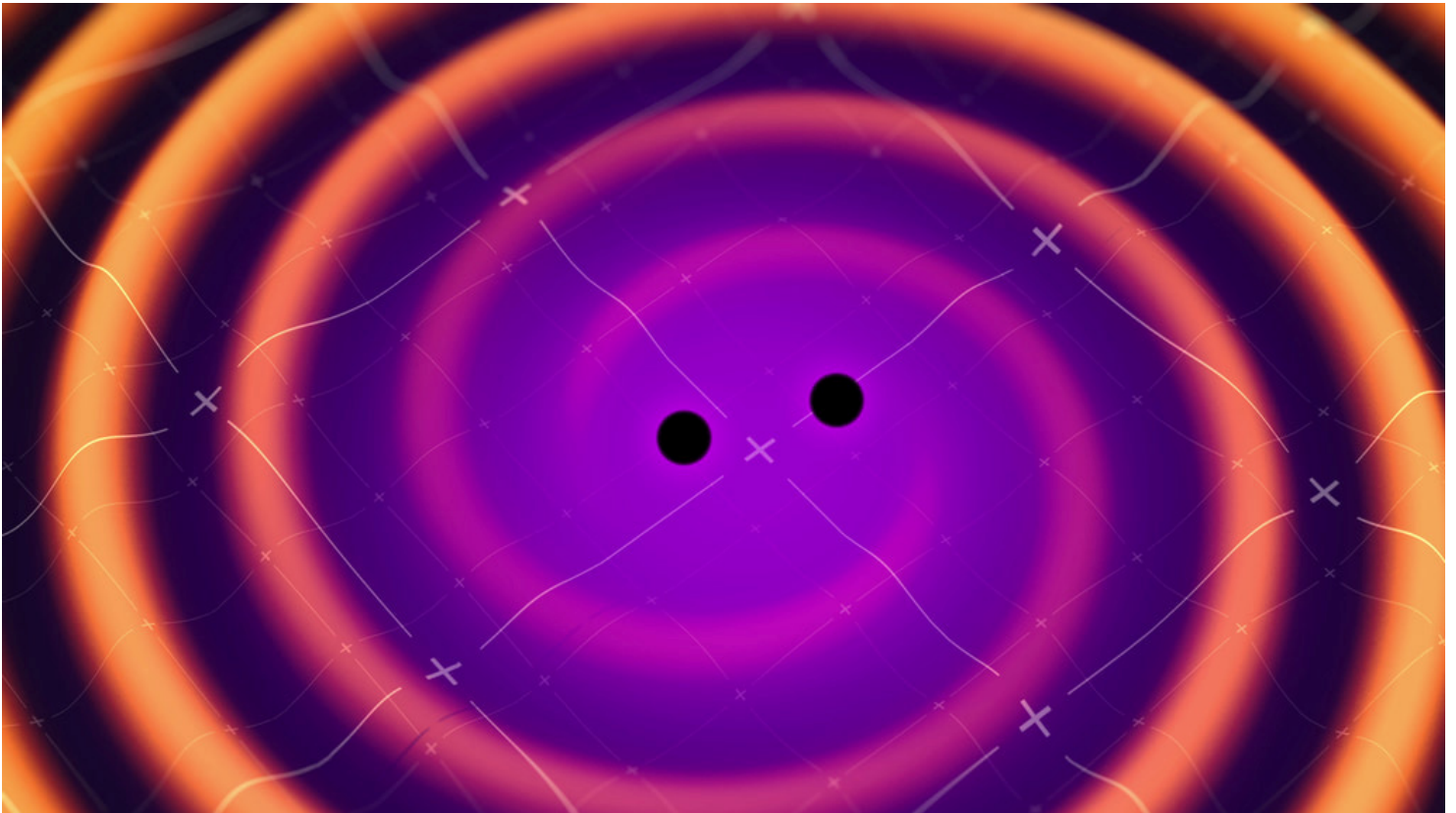
by Kat Troche

September 2025 marks ten years since the first direct detection of gravitational waves as predicted by Albert Einstein's 1916 theory of General Relativity. These invisible ripples in space were first directly detected by the Laser Interferometer Gravitational-Wave Observatory (LIGO). Traveling at the speed of light (~186,000 miles per second), these waves stretch and squeeze the fabric of space itself, changing the distance between objects as they pass.

[animation](#) from NASA's Science Visualization Studio shows the merger of two black holes and the waves they create in the process.

How It Works

A gravitational wave observatory, like LIGO, is built with two tunnels, each approximately 2.5 miles long, arranged in an "L" shape. At the end of each tunnel, a highly polished

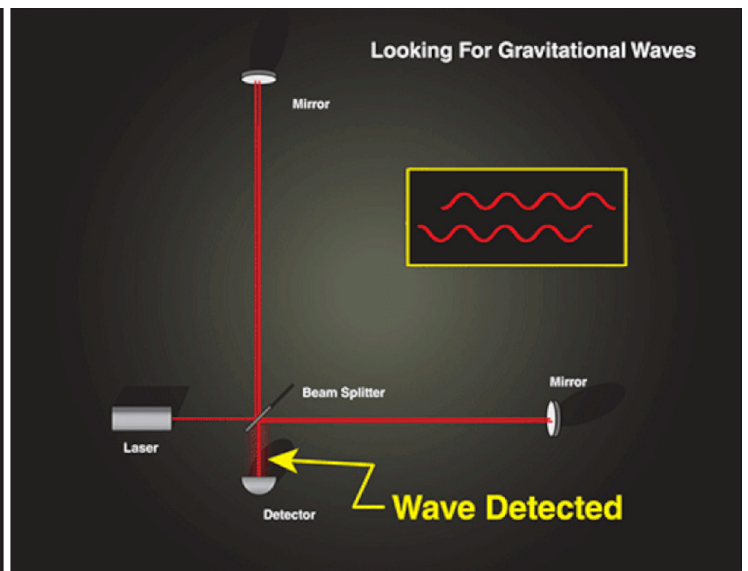
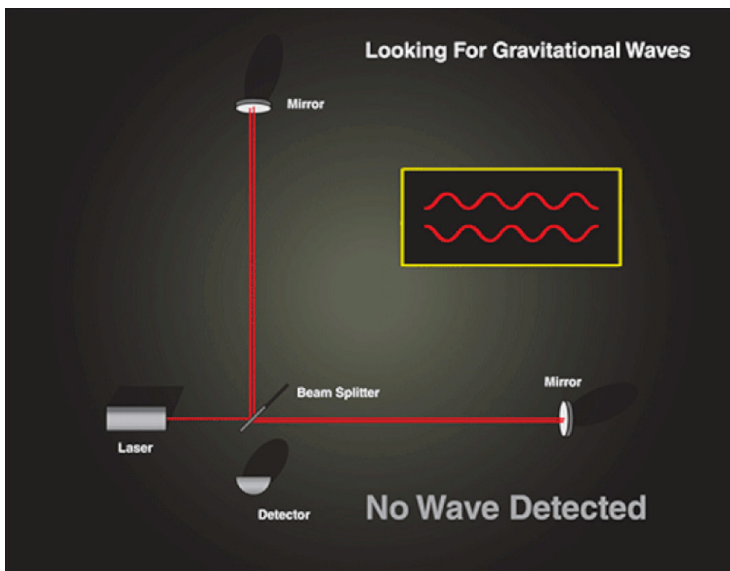


Two black holes orbit around each other and generate space-time ripples called gravitational waves in this image. Credit: NASA's Goddard Space Flight Center Conceptual Image Lab

Waves In Space

Gravitational waves are created when massive objects accelerate in space, especially in violent events. LIGO detected the [first gravitational waves](#) when two black holes, orbiting one another, finally merged, creating ripples in space-time. But these waves are [not exclusive to black holes](#). If a star were to go supernova, it could produce the same effect. Neutron stars can also create these waves for various reasons. While these waves are invisible to the human eye, this

40 kg mirror (about 16 inches across) is mounted; this will reflect the laser beam that is sent from the observatory. A laser beam is sent from the observatory room and split into two, with equal parts traveling down each tunnel, bouncing off the mirrors at the end. When the beams return, they are recombined. If the arm lengths are perfectly equal, the light waves cancel out in just the right way, producing darkness at the detector. But if a gravitational wave passes, it slightly stretches one arm while squeezing the other, so the return-



Still images of how LIGO (Laser Interferometer Gravitational-Wave Observatory) detects gravitational waves using a laser, mirrors, and a detector. You can find the animated version [here](#). Image Credit: NASA

ing beams no longer cancel perfectly, creating a flicker of light that reveals the wave's presence.

The actual detection happens at the point of recombination, when even a minuscule stretching of one arm and squeezing of the other changes how long it takes the laser beams to return. This difference produces a measurable shift in the interference pattern. To be certain that the signal is real and not local noise, both LIGO observatories — one in Washington State (LIGO Hanford) and the other in Louisiana (LIGO Livingston) — must record the same pattern within milliseconds. When they do, it's confirmation of a gravitational wave rippling through Earth. We don't feel these waves as they pass through our planet, but we now have a method of detecting them!

Get Involved

With the help of two additional gravitational-wave observatories, [VIRGO](#) and [KAGRA](#), there have been 300 black hole mergers [detected in the past decade](#); some of which are confirmed, while others await further study.



Black holes collide: The LIGO experiment has made several detections of colliding black holes. Future gravitational wave experiments might detect such events much further back in time, which could shed light on how black holes form. Credit: The SXS (Simulating eXtreme Spacetimes) Project

While the average person may not have a laser interferometer lying around in the backyard, you can help with two projects geared toward detecting gravitational waves and the black holes that contribute to them:

Black Hole Hunters: Using data from the [TESS satellite](#), you would study graphs of how the brightness of stars changes over time, looking for an effect called gravitational microlensing. This lensing effect can indicate that a massive object has passed in front of a star, such as a black hole.



The 4km long arms of the LIGO experiment at Hanford.

Gravity Spy: You can help LIGO scientists with their gravitational wave research by looking for glitches that may mimic gravitational waves. By sorting out the mimics, we can train algorithms on how to detect the real thing. You can also use gelatin, magnetic marbles, and a small mirror for a more hands-on demonstration on how gravitational waves move through space-time with JPL's [Dropping In With Gravitational Waves](#) activity!

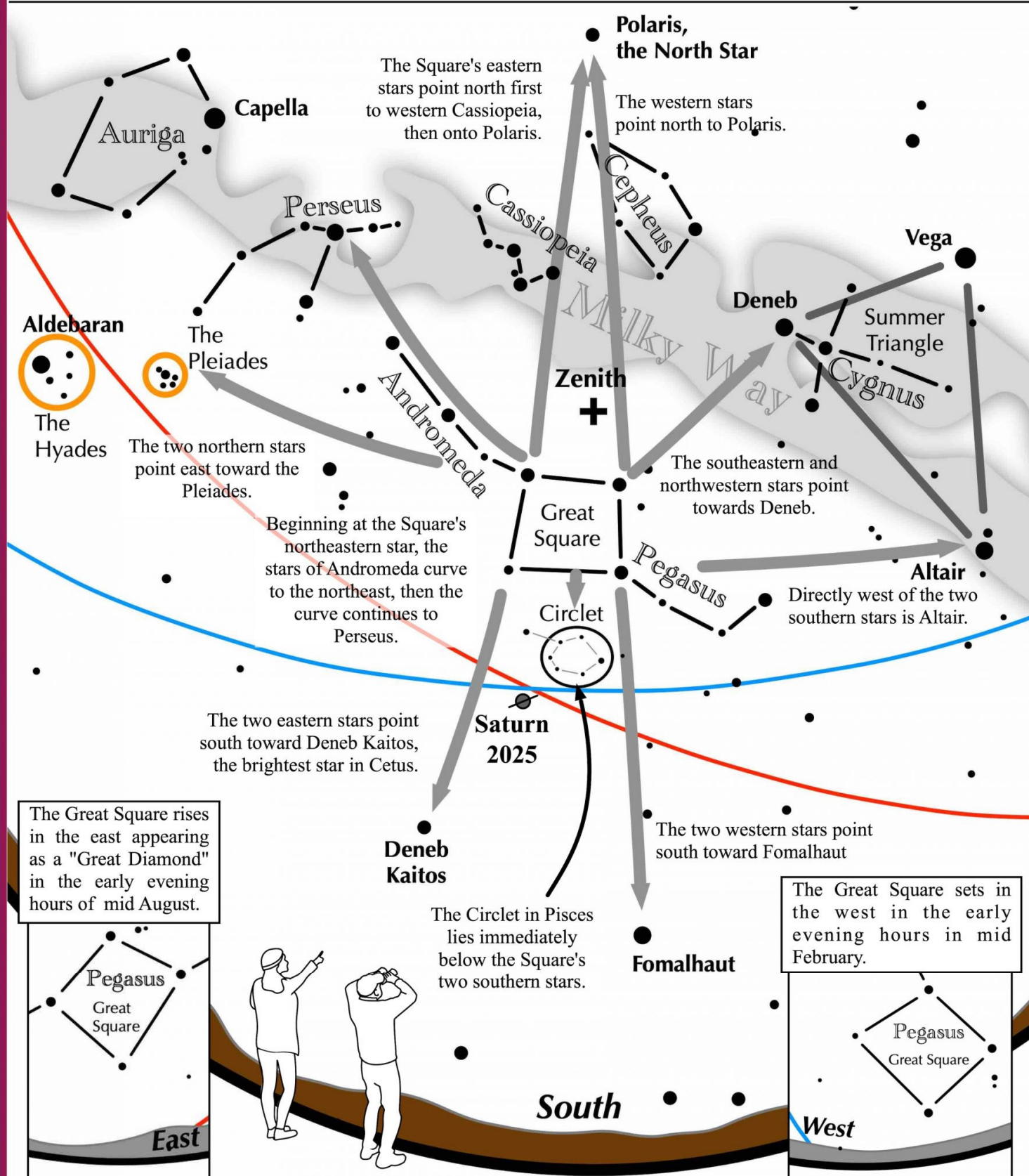
This article is distributed by NASA's Night Sky Network (NSN). The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!



Navigating the mid Autumn Night Sky: Great Square Guide



Befriend these four stars, slightly dimmer than those of the more famous Big Dipper, and they'll guide you on a tour of the Autumn sky.





October Night Sky

This star map is property of the Kalamazoo Astronomical Society. However, you may make as many copies as needed free-of-charge, so long as it is for non-profit educational purposes and full credit is given to the KAS.

www.kasonline.org

This map represents the sky at the following local standard times:

- Early September 11 pm
- Late September 10 pm
- Early October 9 pm
- Late October Dusk

NORTH

EAST

WEST

SOUTH

This Month's Moon Phases

- 6: Full
- 13: Last Quarter
- 21: New
- 29: First Quarter

Deep Sky Object Key

- Galaxy
- Open Cluster
- Globular Cluster
- Diffuse Nebula
- Planetary Nebula

Facing east-southeast at dusk on October 5th will reveal a waxing gibbous Moon about 2½° to the upper left of Saturn. The view grows more dramatic as twilight deepens.

A waning gibbous Moon and the Pleiades rise in tandem in the east-northeast on the evening of October 9th. About 2° will separate the pair. Binoculars will be needed

to see the cluster's stars through the Moon's overpowering glare.

A thin waning crescent Moon, just two days shy of new, appears 4° to the upper right of Venus low in the east at dawn on October 19th. This photogenic scene will easily fit in the field of 7×50 or 10×50 binoculars.

The Orion meteor shower is predicted to

peak at 8am EDT on October 21st. Therefore, the best viewing will be in the hours before dawn. A maximum local hourly rate of 18 meteors per hour is predicted. These meteors are tiny fragments of Halley's Comet itself!

A waxing crescent Moon hangs some 1½° below red-orange Antares, the heart of Scorpius, at dusk on October 24th.

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**Public
Observing Sessions**
at the Kalamazoo Nature Center

October 11th
Saturn & Double Stars

October 25th
Galaxies of Autumn

Gates Open: **7:00 pm** | Observing Begins: **7:30 pm**

KAS NIGHT LIGHT



ONLY \$25.00



Volunteers Needed
Bring Astronomy to the People

Crane Fest

Kiwanis Conservation Area
22300 15 Mile Rd. • Bellevue, MI

Members with white light and H-alpha filtered telescopes are needed to share views of the Sun and hand out KAS literature.

October 11th & 12th
11:00 am - 5:00 pm

Contact Us to Learn More or Sign-Up

ASTROPHOTOGRAPHY *Night*

KAS shutterbugs show off their wares.



The tradition continues! The Kalamazoo Astronomical Society dedicates its general meeting every October to astrophotography, the art of photographing the night sky. Over the years, KAS shutterbugs have traveled to exotic places, ascended to dizzying heights, or just hung out in their backyards and other locations across southwest Michigan, working the graveyard shift with their impressive array of camera gear. Now they are ready to show their artistic wares. Don't miss one of our most enjoyable meetings of the year!

Friday, October 3rd @ 7:00 pm EDT

Kalamazoo Area Math & Science Center

Use Dutton St. Entrance • Locked by 7:10 pm

Also held on Zoom • [Click to Register](#)