

Highlights of the March Sky...

- - - 1st - - -

DUSK: A waxing crescent Moon is 7° to the lower left of Venus. Mercury is about 11° straight below the pair.

- - - 5th - - -

PM: The Moon forms a very shallow triangle with Jupiter and the Pleiades.

- - - 6th - - -

First Quarter Moon @ 11:32 am EST

- - - 8th - - -

DUSK: A waxing gibbous Moon is 1½° to the upper left of Mars.

- - - 11th → 12th - - -

ALL NIGHT: The Moon and Regulus, in Leo, are 3½° apart when they rise in the east and shrink to about 1° when they set before dawn.

- - - 14th - - -

Full Moon @ 2:55 am EDT

AM: **TOTAL LUNAR ECLIPSE.**
Maximum eclipse is at 2:59 am EDT.

- - - 16th - - -

AM: A waning gibbous Moon is about 4½° right of Spica in Virgo.

- - - 20th - - -

EQUINOX: Spring begins in the Northern Hemisphere at 5:01 am EDT.

AM: The Moon is about 3° to the right of Antares in Scorpius.

- - - 22nd - - -

Last Quarter Moon @ 7:29 am EDT

- - - 29th - - -

New Moon @ 6:58 am EDT

AM: A partial solar eclipse is visible across northeastern North America, Greenland, Iceland, most of Europe, and northwestern Russia.

- - - 30th - - -

PM: Mars is less than ½° to the lower right of Pollux in Gemini.

Prime Focus

A Publication of the Kalamazoo Astronomical Society

★ ★ ★ March 2025 ★ ★ ★

This Month's KAS Events

Eclipse Watch: Thursday, March 13 @ 11:00 pm

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

General Meeting: Friday, March 14 @ 7:00 pm

Kalamazoo Area Math & Science Center • See Page 10 for Details

Messier Marathon: Saturday, March 29 @ 7:00 pm

Richland Township Park • [Visit Schedule Page for Details](#)

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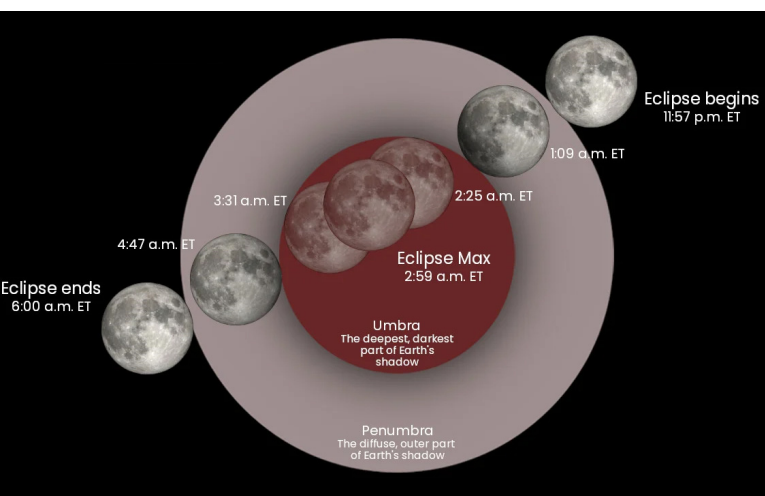
★ ★ ★ www.kasonline.org ★ ★ ★

On the night of March 13th-14th, Earth's ethereal shadow will steal across the Full Moon, providing our first total lunar eclipse since 2022. We actually had two lunar eclipses that year, and they were both clouded out! You have to go back to January 2019 for the last time we enjoyed clear skies on the night of a lunar eclipse.

A total eclipse of the Moon occurs when the Full Moon moves into Earth's shadow. Because the Moon shines through reflected sunlight, we'll see it slowly darken as it enters the shadow. However, the Moon shouldn't disappear entirely. All the sunrises and sunsets around the world filter through our atmosphere, casting either a coppery-orange or dark blood-black color across our nearest celestial neighbor.

Just how dark the Moon will appear during totality on March 14th depends on several factors. These include the amount of dust, dirt, and pollution in the atmosphere. Lunar eclipses that occurred after the eruption of Mount Pinatubo in the Philippines in 1991 were very dark. No major volcanic eruptions have occurred recently, and the devastating fires that ravaged California shouldn't affect the eclipse significantly. All signs point to this eclipse being very bright and colorful.

The eclipse officially begins at 11:57:24 pm EDT on March 13th when the Moon enters Earth's outer, lighter shadow called the penumbra. You're unlikely to notice any change in the Moon's appearance at this point. Things really start going



at 1:09:33 am when the Moon begins to move into the umbra—the darkest part of Earth's shadow. Minute by minute, the dark "bite" on the left side of the Moon grows larger and larger. Totality, when the Moon has moved completely inside the umbra, occurs at 2:25:59 am.

At this point, the sky will have darkened noticeably, and more stars

will be visible. Furthermore, during totality, the Moon has a wonderful three-dimensional look to it. Totality lasts for 65 minutes, ending at 3:31:23 am. The umbral phase of the eclipse ends at 4:47:48 am. As the eclipse ends at 6:00:01 am, even the most ardent astronomers will have packed up by then!

You won't need any special equipment to enjoy the eclipse, but grab a pair of binoculars or a telescope. Close-up views of the Moon will reveal Earth's shadow gracefully crossing lunar craters and mountains. You can enjoy the eclipse right from your own backyard, but the enjoyment is amplified when it is shared with others.

That's why we'll be hosting a special Lunar Eclipse Watch at the Kalamazoo Nature Center. Hopefully, KAS members like *you* will share views through binoculars and telescopes as this sensational celestial syzygy unfolds. Owl Observatory, featuring its 16-inch and 4-inch telescopes, will also be open and available for use. Gates officially open at 11pm, but I hope to arrive at least an hour before that to set up my telescope for astrophotography. Don't forget to bring your chairs, blankets, and snacks for a cozy night of stargazing and exploration!

If the skies are overcast, then we'll have to cancel the event. However, we'll be out there even if the skies are partly cloudy. The next total lunar eclipse is on March 3, 2026, but its times of visibility are even more inconvenient!

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February Meeting Minutes



KAS President Richard Bell initiated the Society's general meeting on February 7, 2025, at 7:14 pm EST. At least 30 members and guests were in attendance at the Kalamazoo Area Mathematics & Science Center, while at least 67 people joined us virtually on Zoom.

Our guest speaker (via Zoom) for the evening was Dr. Samantha Lawler, an Associate Professor of Astronomy at Campion College and in the Department of Physics at the University of Regina in Saskatchewan, Canada. The title of her presentation was *Astronomy and the Billionaire Space Race*.

Dr. Lawler began by reminding us that astronomy is an ancient science. People have been looking up at the sky, noticing patterns, and making predictions for thousands of years—this is part of what makes us human.

Light pollution, the elimination of the nighttime environment by artificial light sources, has spread like a virulent disease over the past 75 years. Many groups, such as the International Dark-Sky Association, have been fighting back to reduce the spread of light pollution, but the sudden leap in technology access caused by LEDs has taken these groups by surprise. LEDs are good; they use less energy for more light but are massively overused because they are so cheap.

Now, a new source of globally visible light or sky pollution has been dramatically increasing recently. SpaceX has been launching batches of 60 satellites into low-Earth orbit every few days.

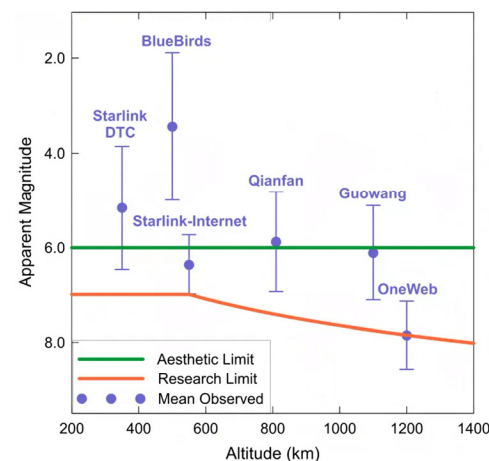
These Starlink satellites are used for global internet and mobile phone coverage. The first batch was placed into orbit in May 2019. To date, over 7,000 of them, out of nearly 11,000 satellites, orbit our planet. *A private company owned by a single billionaire owns more than two-thirds of all active artificial satellites.*

The problem for astronomy is that these satellites reflect well and are visible long after sunset. We have passed a transition point. It used to be fascinating and exciting to see a satellite pass overhead. Now the night sky has become a mundane highway crawling with light pollution. Currently, there are no rules about satellite brightnesses (or orbits, launches, or really much of anything), so engineers have made almost no effort into making them fainter.

As both an amateur and professional astronomer, Dr. Lawler routinely sees these satellites from the dark skies of her prairie home and in her research data. Hundreds of naked-eye satellites are visible all night long at mid-latitudes around the summer solstice, and dozens

are visible close to sunrise and sunset near the equinoxes. Dr. Lawler noted that winter is the best time of year for satellite-free skies.

Sadly, Starlink is the first of many planned “megaconstellations” of Earth-orbiting artificial satellites, and they are all too bright for astronomy:



Dr. Lawler noted that these megaconstellations greatly affect her type of astronomy research, using wide-field imaging to try to discover new Kuiper Belt objects and learn about how the solar system formed. The typical KBOs she searches for are generally magnitude 25 or 15 million times fainter than an average Starlink satellite.

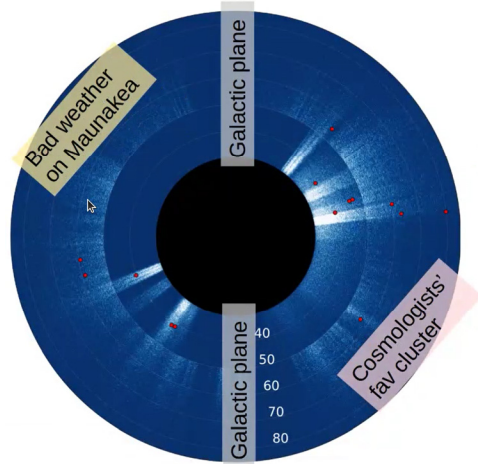
Much of Dr. Lawler's research revolves around trying to understand the observation biases in trans-Neptunian object (TNO) surveys. Most TNOs' elongated orbits are all on the same side of the solar system. One possible explanation for this is Planet Nine, a missing planet about 10 times the mass of Earth with a semi-major axis of 700 AU (see the [June 2017](#) issue of *Prime Focus* to learn more).

Dr. Lawler diagrammed the direction of TNO discovery in the solar system, showing that many areas remain unexplored. There are many reasons why. One is along the galactic plane of the Milky Way. Those areas are very dense with stars and thus extremely difficult to search. Poor winter weather atop Mauna Kea is responsible for another large gap (Dr. Lawler depends on



Samantha Lawler

data from the Canada-France-Hawaii Telescope for her research). Moreover, there's competition with cosmologists. Much of the limited telescope time goes toward exploring galaxy clusters like the one in Coma Berenices.



To effectively test theories of undiscovered distant planets, we need many detections of distant TNOs at various ecliptic longitudes with known detection biases. However, the observation biases are changing fast due to megaconstellations. Starlink satellite interference now affects the upper right section of the illustration above.

Last year, Dr. Lawler was practically confronted at her doorstep with the issue of low-Earth orbiting satellites and the dangers of space debris. Hundreds of pounds of potentially lethal debris fell on farmland less than 100 km from her home in Regina, Saskatchewan, originating from a SpaceX Crew Dragon cargo trunk used in a private mission.

Axiom Mission 3 (Ax-3) was the name of the private mission that sent four Europeans to the International Space Station on January 18, 2024. They safely returned on February 9, 2024.

Before the crew returns home, they discard the Ax-3 cargo trunk, which sits below the Dragon capsule. The trunk's orbit gradually decayed due to atmospheric drag, and despite claims from SpaceX that it would totally disintegrate during reentry, it crashed in a farmer's field on February 26, 2024. It wasn't discovered until the end of April.

The farmer contacted the media (after Googling part numbers on the debris), and the media contacted Dr. Lawler since she was the only research astronomer in the province! Despite her

early skepticism, it was definitely from the SpaceX Crew Dragon cargo trunk.

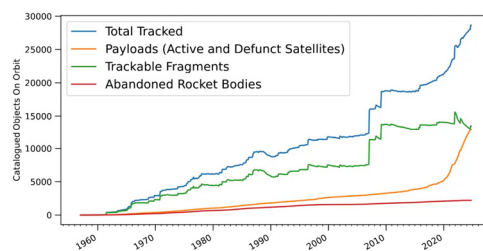
The only possible applicable laws are the 1968 Outer Space Treaty and the 1972 Space Liability Convention. On January 24, 1978, a Soviet Union Cosmos-954 exploded nuclear waste across Canada's Northwest Territories, testing these laws for the first time. The only consequence was a small fine. If the SpaceX trunk caused any damage anywhere in the world, the U.S. government would be liable.

SpaceX employees, driving a rented U-Haul truck, eventually arrived to collect all the debris. Dr. Lawler and a dozen of Saskatchewan's finest local journalists greeted them but did not answer any questions. Dr. Lawler even tried offering them donuts!

Uncontrolled reentries are supposed to have a 1/10,000 casualty list, but other incidents like this are becoming fairly common: China dropped debris in Côte d'Ivoire (in West Africa) in 2020, SpaceX dropped debris in Washington state in 2021, SpaceX dropped debris in Australia in 2022, China dropped debris in Myanmar in 2022, China dropped debris in India in 2022, and NASA dropped debris in Florida in 2024.

Starlink plans to deorbit up to 10,000 satellites per year after five years. Starlink Gen2 satellites measure 7 x 3 meters and have a mass of 1,250 kg (the size of a Ford F-150 pickup truck). (Witnesses in West Michigan reported a Starlink satellite being deorbited on January 28th.)

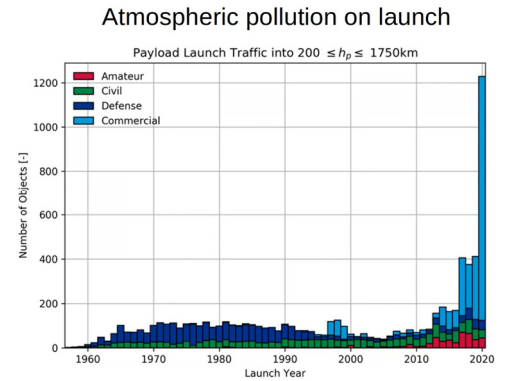
Dr. Lawler pointed out that low-Earth orbit is getting very crowded:



Close approaches would happen on average every 30 seconds at the orbital altitude of Starlink satellites, assuming uniform density (which it is not)! Starlink does collision avoidance maneuvers many times per day, so that terrifyingly low average isn't far off given the weekly increase in the megaconstellation population. Starlink also lost control of their satellites due to Earth's atmosphere

expanding during the solar storm in May 2024. Solar maximum still has a couple of years to go!

Atmospheric pollution due to rocket launches has also dramatically increased recently:



Emission products from the four principal rocket propellants can deplete ozone and add greenhouse gases to the atmosphere. Rocket launches create red ionosphere holes (fake auroras). Noctilucent clouds are becoming more prevalent as rocket launches are seeding high-altitude clouds and much lower latitudes than ever before. It is not fully known how this phenomenon is changing atmospheric chemistry.

Starlink reentries will also deposit an estimated 8 tons of aluminum per day into the atmosphere. This estimate assumes each satellite's mass is 50% aluminum, though SpaceX hasn't disclosed the exact composition. With 30,000 Starlinks at peak operation, each weighing 1000 kg and having a 5-year life span, it works out to 16 tons of material dumped into the upper atmosphere every day. For comparison, meteorites only deposit 0.3 tons of aluminum into the atmosphere per day.

Reentry pollution is already measurable. About 10% of stratospheric aerosols already come from satellite and rocket reentry pollution.

The list of future megaconstellations from other companies is staggering. The list Dr. Lawler shared consists of 586,600 satellites. She also described another company's plan to launch up to a million! There is no possible way to be safe. We need to update and enforce the Outer Space Treaty and Space Liability Convention.

Giant companies like SpaceX will only respond to legislation and consumer pressure. If you have alternatives, avoid using satellite internet. Spread the

word! Most people have no idea about the scale of unregulated commercialization. Ask your local, state, provincial, or federal government to support alternative ways of accessing the internet. Show people the beauty of the night sky. Write your representatives. Comment submission instructions are periodically updated at [Kessler Rebellion](#).

Special thanks to Mike Sinclair for providing snacks during the break. Mike Dupuis offered to bring snacks to the March meeting.

In his President's Report, Richard noted that he recently updated the KAS Gallery section of *KAS Online*. Both the 2024 [General Meeting](#) and [Observing Session](#) pages have been added.

March 8th is the deadline to renew your KAS membership. Anyone failing to renew by that time will be removed from the roster and the email list.

Richard also went through upcoming community outreach events. There's Family Science Night at Bloomingdale Public Schools on March 25th from 5 to 7 pm, STEAM Night at St. Michael Lutheran School on April 11th from 6 to 8 pm, and the Kalamazoo Rock & Mineral Show on May 3rd (10am-6pm) and May 4th (10am-5pm). [Contact us](#) to volunteer.

In astronomical news, for the first time in history, the [sound of a meteorite](#) striking the surface of Earth has been captured. A Ring Doorbell at a home in Marshfield, Prince Edward Island, Canada, captured the impact and resulting sound of a chondrite (stony) meteorite on July 25, 2024.

Asteroid 2024 YR4 has a 1.2% chance of impacting Earth on December 22, 2032 (the odds have dropped considerably since then). Samples collected from the [asteroid Bennu](#) by OSIRIS-REx contain life's key building blocks.

The [world's first smart eyepiece](#) for telescopes has been announced, and Tele Vue will release [Type 7 Nagler](#) eyepieces this summer.

Observing reports were still few and far between thanks to cloudy weather, so, after previewing upcoming events, the meeting concluded at 9:05 pm.

Board Meeting Minutes



The KAS Board met on Sunday, February 9th, at Sunnyside Church. President Richard Bell brought the meeting to order at 5:03 pm EST. Other board members in attendance were Matt Borton, Pete Mumbower, Jack Price, Don Stilwell (via Zoom), Philip Wareham, and Dave Woolf. Once the board approved the meeting agenda, Don proceeded to present the Treasurer's Report.

The Advia Bank 7-month CD is currently at \$10,056.06, and the Advia Bank 14-month CD is currently at \$10,062.92. The total account balance for November was \$45,954.27, December was \$46,899.38, and January 2025 was \$47,645.85.

There was \$2,946.46 in the Owl Observatory Maintenance Fund and \$1,178.36 in the Remote Telescope Fund as of January 31st of this year.

For the cash flow report, November was +\$2,124.18, December +\$945.11, and for January it was +\$746.47. The savings account balance was at \$12,493.42, and the PayPal account stood at \$8,767.44 as of the end of January. Richard and Don agreed to keep \$2,000 in the PayPal account.

The club's storage unit rent has been increased to \$128.00 per month. Matt suggested adding Venmo and Zelle payment options to the club's online membership form.

We then reviewed the KAS activities from February to May. The final Online Viewing Session of the season will be on February 22nd. A Total Lunar Eclipse Watch will be held at the Kalamazoo Nature Center on March 13th with gates opening at 11pm.

For the general meeting on March 14th, Dr. Kirk Korista of WMU will give another presentation. The KAS Messier Marathon will be held at Richland Township Park on Saturday, March 29th, at 7:00 pm. Dr. Nicolle Zellner of Albion College will return in April and give the feature presentation.

The first Public Observing Sessions of the year will be at the Kalamazoo Nature Center on April 5th and 19th, with gates opening at 8:00 pm. Dr. Chris Howk, from the University of Notre Dame, will be the featured speaker at

the May meeting. May's public sessions will be held on Saturday, May 3rd, and the 24th at the Kalamazoo Nature Center.

The new guide scope for the KAS Remote Telescope has been installed and is working quite well. We also recently purchased FocusMax V5 and are currently in the process of setting it up. We have not yet purchased the newest version of MaxIm DL. We plan to try Voyager automation software as an alternative to ACP. The initial cost is high (about \$900), but the annual renewal is much lower than ACP. We won't need MaxIm if we pursue this route.

New spacers are needed for the Remote Telescope's imaging train once the on-axis guider is removed. The cost of this from PlaneWave is \$400.00. Richard made the motion to purchase the spacer with Philip seconding it. The board unanimously approved the expense.

We have purchased a replacement dew heater for the Tele Vue NP101 in Owl Observatory. We just need to install it. Before the observing season begins, we must also clean the observatory.

The club has received cases for the mount, tripod, and accessories used with the 4-inch Stellarvue refractor. The telescope is now [ready for loan](#).

Richard conducted a member poll about the club's interest in purchasing a ZWO SeeStar S50 smart telescope for our loan program. Jack seconded Richard's motion to purchase the SeeStar and accessories. The board unanimously approved the purchase for up to \$560.

We also discussed the telescopes we have on loan that aren't getting much use. Chief among them is the Orion ShortTube 80, purchased back in the late 1990s. Don motioned to sell it, with Matt seconding the motion. The board unanimously decided to sell the Orion ShortTube 80 for \$200.

Richland Township Park is the lead spot for the 31st annual Perseid Potluck Picnic on August 2nd. Backup locations include Van Buren State Park and Flesher Field on 9th Street.

The next board meeting will be on Sunday, May 18th, at 5:00 pm on Zoom. The meeting adjourned at 5:55 pm.



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



Messier Madness

by Kat Troche

March is the start of spring in the Northern Hemisphere; with that, the hunt for Messier objects can begin!

What Are Messier Objects?

During the 18th century, astronomer and comet hunter [Charles Messier](#) wanted to distinguish the ‘faint fuzzies’ he observed from any potential new comets. As a result, Messier cataloged 110 objects in the night sky, ranging from star clusters to galaxies to nebulae. These items are designated by the letter ‘M’ and a number. For example, the Orion Nebula is [Messier 42](#) or [M42](#), and the Pleiades are [Messier 45](#) or [M45](#). These are among the brightest

‘faint fuzzies’ we can see with modest backyard telescopes and some even with our eyes.

Stargazers can catalog these items on evenings closest to the new moon. Some even go as far as having “Messier Marathons,” setting up their telescopes and binoculars in the darkest skies available to them, from sundown to sunrise, to catch as many as possible. Here are some items to look for this season:



Showing a large portion of M66, this Hubble photo is a composite of images obtained at visible and infrared wavelengths. The images have been combined to represent the real colors of the galaxy. Credit: NASA, ESA and the Hubble Heritage (STScI/AURA)-ESA/Hubble Collaboration; Acknowledgment: Davide De Martin and Robert Gendler



M44 in Cancer and M65 and 66 in Leo can be seen high in the evening sky 60 minutes after sunset. Credit: Stellarium Web

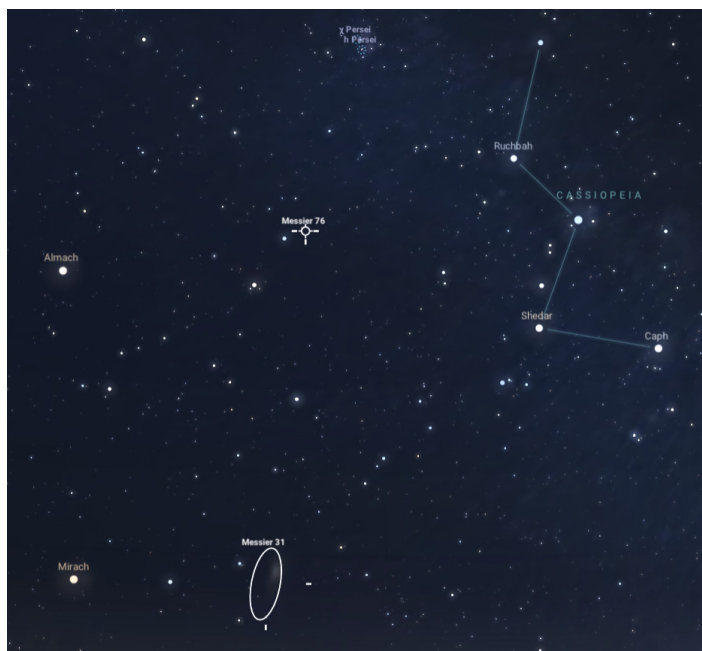
Messier 44 in Cancer: The Beehive Cluster, also known as Praesepe, is an open star cluster in the heart of the Cancer constellation. Use Pollux in Gemini and Regulus in Leo as guide stars. A pair of binoculars is enough to view this and other open star clusters. If you have a telescope handy, pay a visit two of the three galaxies that form the Leo Triplet - **M65** and **M66**. These items can be seen one hour after sunset in dark skies.



Locate M3 and M87 rising in the east after midnight. Credit: Stellarium Web

Messier 3 Canes Venatici: M3 is a globular cluster of 500,000 stars. Through a telescope, this object looks like a fuzzy sparkly ball. You can resolve this cluster in an 8-inch telescope in moderate dark skies. You can find this star cluster by using the star Arcturus in the Boötes constellation as a guide.

Messier 87 in Virgo: Located just outside of Markarian's Chain, M87 is an elliptical galaxy that can be spotted during the late evening hours. While it is not possible to view the [supermassive black hole](#) at the core of this galaxy, you can see M87 and several other Messier-labeled galaxies in the Virgo Cluster using a medium-sized telescope.



Locate M76 and M31 setting in the west, 60 minutes after sunset.

Messier 76 in Perseus: For a challenge, spot the Little Dumbbell Nebula, a planetary nebula between the Perseus and Cassiopeia constellations. With an apparent magnitude of 12.0, you will need a large telescope and dark skies. You can find both M76 and the famous [Andromeda Galaxy \(M31\)](#) one hour after sunset, but only for a limited time, as these objects disappear after April. They will reappear in the late-night sky by September.

Plan Ahead

When gearing up for a long stargazing session, there are several things to remember, such as equipment, location, and provisions:

- **Do you have enough layers to be outdoors for several hours?** You would be surprised how cold it can get when sitting or standing still behind a telescope!
- **Are your batteries fully charged?** If your telescope runs on power, be sure to charge everything before you leave home and pack any additional batteries for your cell phone. Most people use their mobile devices for astronomy apps, so their batteries may deplete faster. Cold weather can also impact battery life.
- Determine the **apparent magnitude** of what you are trying to see and the **limiting magnitude** of your night sky. You can learn more about apparent and limiting magnitudes with our [Check Your Sky Quality with Orion](#) article.
- When choosing a location to observe from, select an area you are familiar with and bring some friends! You can also [connect with your local astronomy club](#) to see if they are hosting any Messier Marathons. It's always great to share the stars!

You can see all 110 items and their locations with NASA's [Explore the Night Sky interactive map](#) and the [Hubble Messier Catalog](#), objects that have been imaged by the Hubble Space Telescope.



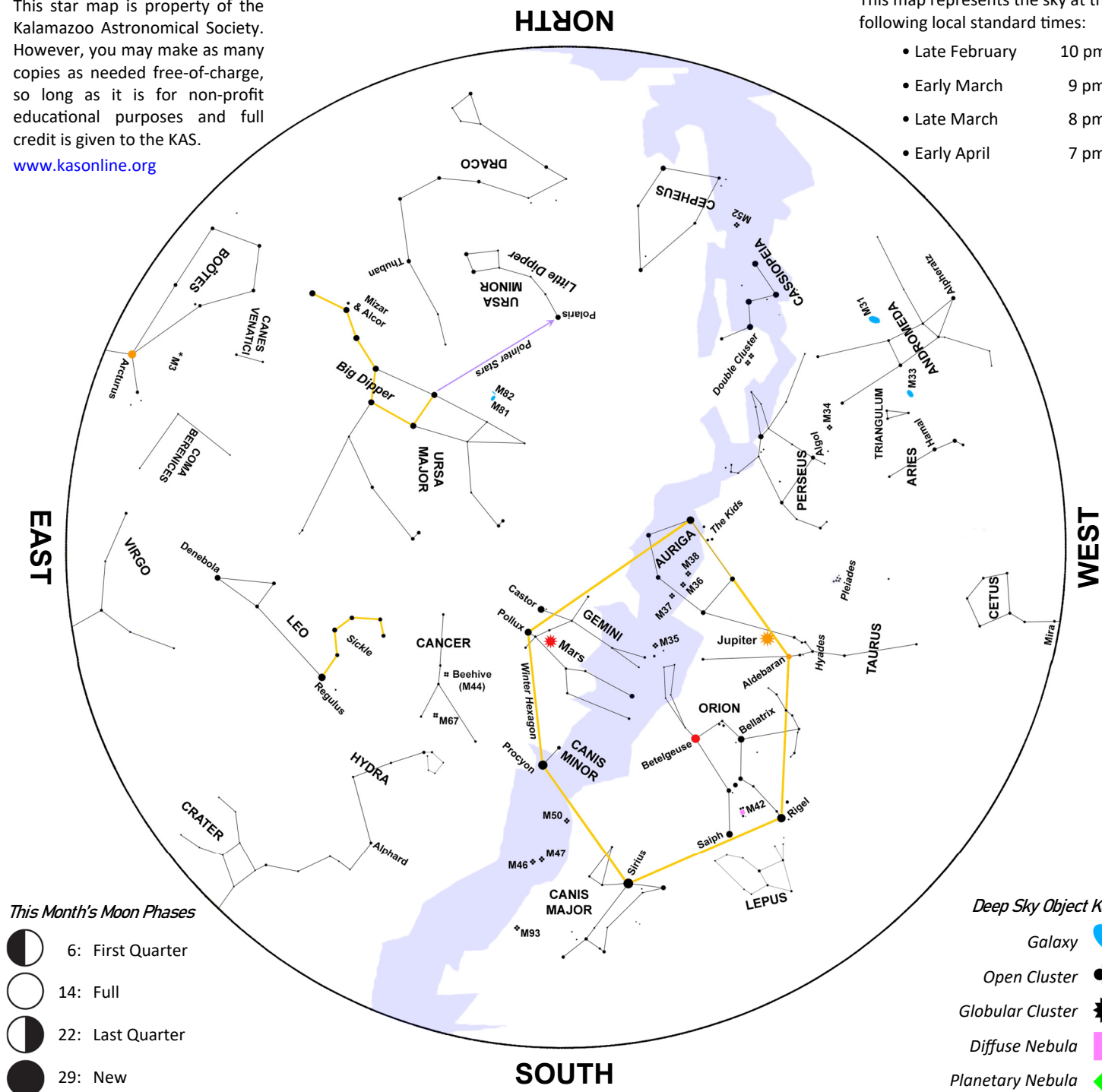
March Night Sky

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:

- Late February 10 pm
- Early March 9 pm
- Late March 8 pm
- Early April 7 pm



A waxing crescent Moon will hang just over $6\frac{1}{2}^\circ$ to the lower left of Venus at dusk on March 1st. If your western horizon is clear, look for Mercury about a dozen degrees below the pairing.

A waxing gibbous Moon and Regulus rise with about $3\frac{1}{2}^\circ$ of sky between them on March 11th. They close to within 1° by the time they set together in the east on the 12th.

A total lunar eclipse will be visible in its entirety across the continental United States on the night of March 13th-14th. The Moon enters Earth's penumbra, the outer part of its shadow, at 11:57 pm EDT. This stage of the eclipse is quite subtle and unremarkable.

The partial phases of the eclipse start at 1:09 am when the Moon begins to enter Earth's umbra. Totality begins at 2:26 am, and the

entire face of the Moon will be tinted a coppery red. Unlike last year's total solar eclipse, no special protection is required.

Totality lasts 65 minutes, ending at 3:31 am. The partial phases return but in reverse, ending at 4:47 am. The eclipse concludes at 6:00 am. The next total lunar eclipse will not be until March 3, 2026, and those times are even more inconvenient!

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Deadline for submissions is **15th of EVERY MONTH.**
The quality of this newsletter depends on **YOU!**

KAS Gallery Updated

New Pages...

- 2024 General Meetings
- 2024 Observing Sessions

The largest astronomy club gallery online!

Tote Bag



Available in a variety of styles and colors



Sky-Watcher
Flextube 200P Collapsible Dobsonian

NEW
Available for Loan!

Earth's ethereal shadow steals across the Full Moon

TOTAL LUNAR ECLIPSE
Watch

Thursday, March 13th @ 11:00 pm
Kalamazoo Nature Center

KAS Clothing
on **Zazzle**

Multiple Sizes,
Colors & Styles
Available

[Explore](#) & [Order](#)



Messier Marathon

*Bring binoculars or a telescope and participate
in this one-night race across the sky.*

Saturday, March 29th @ 7:00 pm
Richland Township Park • 6996 N 32nd St.



Stars Without Nuclear Fusion

Much of the Physics Without All of the Confusion

presented by

Dr. Kirk Korista



The phenomenon of nuclear fusion influences the structure and evolution of stars in many ways, but several key physical processes in and behaviors of stars are ubiquitously misattributed to nuclear fusion. These serve as major misconceptions that lead to widespread confusion about how stars work: (1) Nuclear fusion does not support stars against the force of gravity and gravitational collapse, nor does it generate significant radiation pressure to do so. In fact, radiation pressure rarely contributes significantly to supporting stars at all. (2) Nuclear fusion is not the reason stars are hot. (3) Nuclear fusion is not the reason stars are luminous, nor does it control directly the star's luminosity.

None of this is new physics. We do not have a problem with our models; we have a major problem in how we translate them into the English language and communicate them to humans. Worse, some of the misconceptions are spreading into the peer-reviewed literature. In point of fact, stars do not require nuclear fusion in order to exist as hot, luminous objects that are in force balance against gravity. In order to illuminate their fundamental natures, we explore stars without nuclear processes and compare their evolutionary behavior to stars with nuclear fusion.

— About the Speaker —

Dr. Kirk Korista is a professor of astronomy at Western Michigan University. He received a bachelor's degree in astronomy from the University of Illinois in 1985 and a PhD in astronomy from The Ohio State University in 1990. Kirk performed doctoral work at the Carnegie Observatories (1990-1992), Space Telescope Science Institute (1992-1994), and the University of Kentucky (1994-1997). Kirk's primary research interests are the spectroscopic analysis of active galaxies and quasars and the interpretation of these spectra through numerical (computer) simulations.

Friday, March 14th @ 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](#)