

Highlights of the July Sky...

1st
Last Quarter Moon
5:12 pm EDT

2nd
DUSK: Venus is near the Beehive Cluster low in the west-northwest.

6th
DAWN: A waning crescent Moon is between the Pleiades and Hyadras.

8th
DAWN: The Moon is $4\frac{1}{2}^\circ$ left of Mercury.

9th
New Moon
9:17 pm EDT

11th
DUSK: A waxing crescent Moon forms a 6° long line with Venus and Mars.

12th
DUSK: Venus and Mars are only $\frac{1}{2}^\circ$ apart.

16th
PM: The Moon is $6\frac{1}{2}^\circ$ to the upper right of Spica.

17th
First Quarter Moon
6:11 am EDT

21st
DUSK: Venus and Regulus are 1° apart.

24th
DAWN: The Moon is about $7\frac{1}{2}^\circ$ below Saturn.

26th
DAWN: A waning gibbous Moon is 5° to the lower left of Jupiter.

31st
Last Quarter Moon
9:18 am EDT

Prime Focus

A Publication of the Kalamazoo Astronomical Society

★ ★ ★ July 2021 ★ ★ ★

This Months Events

General Meeting: Friday, July 9 @ 7:00 pm
Kalamazoo Nature Center • See Page 10 for Details

Astrophoto Workshop: Saturday, July 10 @ 9:30 pm
Kalamazoo Nature Center • See Page 6 for Details and to Register

Observing Session: Saturday, July 17 @ 9:30 pm
Venus & First Quarter Moon • Kalamazoo Nature Center

Training Session: Friday, July 23 @ 9:00 pm
Owl Observatory • See Page 9 for Details and to Register

Observing Session: Saturday, July 31 @ 9:30 pm
Jupiter, Saturn & Summer Triangle • Kalamazoo Nature Center

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June Meeting Minutes

President Richard Bell brought the general meeting of the Kalamazoo Astronomical Society to order on Friday, June 4, 2021 at 7:05 pm EDT. At least 77 members and guests attended via Zoom and YouTube. (With any luck this will be our last Zoom meeting of the pandemic!)

Our very special guest speaker was Dr. John C. Mather, a Senior Astrophysicist and the Senior Project Scientist for the James Webb Space Telescope at NASA's Goddard Space Flight Center. His research centers on infrared astronomy, cosmology, and the development of new instruments for exploring the universe. He was the Project Scientist and a Principal Investigator for the Cosmic Background Explorer Satellite — with which the left-over radiation from the Big Bang was measured precisely for the first time. He has received numerous awards, including the Nobel Prize in Physics (2006), and three honorary doctorates.

Dr. Mather began his presentation by reminding us that every award he received was the result of an entire team behind each project. He started by showing an image of the James Webb Space Telescope (JWST) with its 18 hexagonal gold-plated beryllium mirrors measuring 6.5 meters. This is about 2 and a half times larger than the Hubble Space Telescope. It is also designed to detect infrared light instead of the visible spectrum. He then noted that astronomers could submit proposals to the JWST team for review if they have a project that they think would benefit from using the telescope.

One of the biggest questions astronomers are asking is “how did we get here?” If we look at a timeline starting 14 billion years ago and ending with life as we know it today, many dynamic changes need to occur to make it all possible. The expanding universe starts smooth and hot. But then as the gasses formed into complex systems, energy is released. We know that the universe is inherently unstable because it has been reorganizing itself continuously since the Big Bang. We know that a possible infinite universe has allowed time and



Nobel Prize winning physicist and James Webb Space Telescope Senior Project Scientist, Dr. John C. Mather, was our very special guest speaker for the general meeting on June 4th.

space for a great deal of diversity to form. We have also discovered that information in reality is stored (in the form of DNA, decoders, language etc.) which enables complexity, life and evolution. Our bodies may be composed of trillions of individual programs (individual DNA strands), but those individual programs act together in a complex system. That complex system is always changing. As we discovered, every atom in our bodies have been replaced many times over during our life. Despite this constant turnover, the system as a whole remains stable in homeostasis. In other words, we are not the same atoms as when we were born but we continue to look like the same person. To put it simply, we are a system of stabilizing control laws in a series of nested feedback loops. Of course, when we die, those molecules are released showing that the balance of nature is temporary.

There are four forces that act on the universe. These are the strong, weak, electromagnetism, and gravity. Protons, electrons and neutrons all combine and decouple, bound by laws of physics, so that each action results in a finite amount of energy transferred. When these forces are coupled with thermodynamics, we see the fundamental actions of our universe play out. Entropy is always increasing. Entropy is the amount of disorder in a system or the amount of thermal energy that cannot be converted to mechanical work. Structure in the universe begins to organize as equilibrium thermodynamics allows order to form from increasing disorder elsewhere. When nature finds a way to increase entropy with spontaneous heat engines in non-equilibrium thermodynamic action, then life emerges.

So how does instability work? Dr. Mather showed us an image of the Eagle Nebula and described the formula developed by James Jeans in 1902. As the gas cloud clumps together due to gravitational forces, it also tends to push outward as the gas pressure increases. These forces balance each other. A cloud will begin to condense into stars only when the sound traveling across the cloud is greater than the freefall time of the gas. This ratio of the temperature and density of a cloud versus its size is called Jeans' length. A cloud that is smaller than its Jeans' length will not have sufficient gravity to overcome the repulsive gas pressure forces and condense to form a star, whereas a cloud that is larger than its Jeans' length will collapse. One interesting aspect of this process is that gravitational energy is converted to thermal energy. This results in the cloud spontaneously self-heating.

Everything from humans to hurricanes to stellar gas is subject to instability. Looking back in time we should be able to see a reversing trend in entropy. Ultimately, if we follow the trend back and look far enough away, we should be able to observe the beginning. In 1929, Edwin Hubble first plotted galaxy distance vs. recession velocity. He observed Cepheid variables in distant galaxies and discovered that the further away a galaxy is from ours the faster that it is moving away from us. By dividing the outward motion by the distance, it becomes apparent that the

THE JAMES WEBB SPACE TELESCOPE

Constructing the successor to the Hubble Space Telescope has taken more than two decades and involved more than 1,000 people in 7 countries. The James Webb Space Telescope (JWST) can detect ancient light that its predecessors can't and will reveal more information about the origins of the universe than ever before.

The JWST will be tasked with:

- Searching for light from the first stars and galaxies to form after the Big Bang.
- Studying galaxy formation and evolution.
- Studying planetary systems and the origins of life.

Telescope origami

Webb is too big to be launched in its operational configuration, so it will unfold in space.

Launch configuration.

Solar array is deployed and sunshield unfolds.

Sunshield extends.

Sunshield's layers are raised and separated.

Secondary mirror is deployed and folded sections of primary mirror move into position.

Gathering light

1 Although it can operate in optical wavelengths like Hubble, Webb's talent will be capturing infrared light. The enormous primary mirror captures the light from distant galaxies, stars and planets and concentrates it onto the secondary mirror. This focuses the light into the telescope's science instruments.

Science instruments

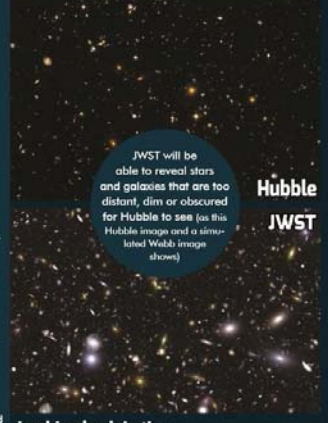
Primary mirror
Secondary mirror

The universe in infrared

All of the JWST's instruments will observe infrared light. One advantage of that is that infrared can pass through the interstellar dust that blocks visible light.

Another advantage is that visible light travelling from a distant star is stretched on its way to us. The light's wavelength gets longer and shifts into the infrared part of the spectrum (known as redshift).

Three of the JWST's detectors are tuned to the near infrared. One of JWST's most important detectors, the Mid InfraRed Instrument (MIRI), has been designed and built by a UK-led consortium including STFC.



Looking back in time

Light travels very fast, but its speed is finite and can take a long time to reach us. As a result, the more distant an object is, the further back in time we're looking. Hubble can see back to the 'toddlers' stage of the universe when it was barely 1 billion years old. Webb will be able to capture light from universe's 'baby' stage when the first stars were born after the Big Bang.

To the Sun

2 Unlike Hubble, which orbits the Earth, Webb will sit at area in space called a Lagrange point. Webb will occupy Lagrange 2, which is a region about 1.5 million km from Earth, where the Sun's gravity and Earth's gravity cancel each other out – allowing the craft to remain relatively stationary.

3 This means that Webb isn't subjected to the same extreme heating and cooling cycles as an Earth-orbiting craft.

JWST will not be exactly at the L2 point, but circle around it in a halo orbit.

Hubble orbit 570km
Moon's orbit 384,400km
JWST 1.5million km

The mirror

The mirror has about seven times the light-collecting area of Hubble and has a field of view more than 15 times larger.

Hubble

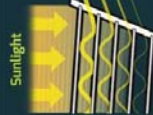


JWST

Keeping everything cool

Webb is primarily an infrared telescope and, since infrared radiation is heat, it has to be shielded from the Sun's radiation.

The tennis court-size sunshield is made of five layers of metallised plastic about as thick as a human hair.



Each layer blocks and deflects some heat, which is then vented away from the telescope.

universe has an age. The theory that the early universe was very hot emerged and that the heat should still be present was clear. In 1965, we accidentally discovered this background heat. And in 1989 the COBE orbiter was launched to measure that radiation. Dr. Mather was on the proposal team for the COBE mission.

The theoretical blackbody radiation curve was proven with only 9 minutes of data collection (so this proved that the expanding universe didn't destroy the ideal state). By 1992 the whole sky was mapped showing the background temperature/density of the universe. Steven Hawking declared this map as the most important discovery of the 20th century. As it defines the clumped gravity regions formed by dark matter and ultimately where matter can condense, it has unlocked an entire invisible universe to us.

The early universe is very hot and compressed. It does not have a center and there is no edge. There is no definable starting point or first moment and probably has no end. But it expands. It is an infinite universe expanding into itself.

Hubble (now 31 years old!) has brought us images of galaxies being pulled together by gravity. The expansion of the universe must surely be slowing down because of gravity. Not so. In 1998, dark energy is shown to be causing a universe that is expanding at an ever-increasing rate! When complex computer simulations are run that include the

expansion with the effects of gravity, we see that the universe can do both. The matter tends to clump and aligns itself into great cosmic strings of galaxies, and leave behind large empty voids. So now what? We have to take pictures of the sky and see if the universe looks like what we are predicting by looking back in time as far as we can see.

The James Webb Space Telescope will hopefully do just that. The instruments on board the telescope include near infrared camera, spectrograph and imaging slit-less spectrograph and mid-infrared instrument. It will be looking for first light in the universe. It will explore assembly of galaxies, birth of stars and birth of planetary systems. It gathers light with an f/1.2 elliptical primary, hyperbolic secondary and elliptical tertiary mirrors. Overall, the image is diffraction limited at 2 microns. How good is this? Well, since a bumblebee is 1 cm² and emits heat, you could see it from a distance of the Moon. JWST will be exploring far beyond and galaxies that the Hubble can't see. It will explore the solar system including Mars, Europa, and Titan. It will observe spectroscopically observe exoplanetary transits on all but the brightest stars.

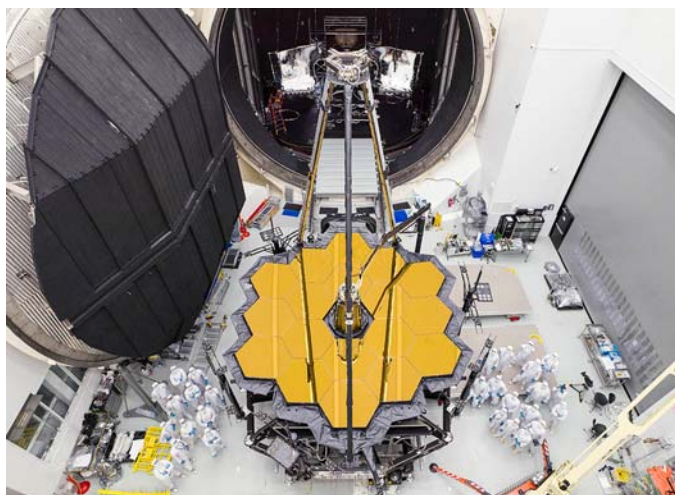
Dr. Mather then shared where the JWST is in production. He shared images of its construction at the Goddard Space Flight Center. He showed the testing facility at Johnson Spaces Center and final assembly at Northrop-Grumman. After a transit through the Panama Canal, it will be launched

from the ESA Kourou site in French Guiana on October 31, 2021. Once in orbit at Lagrange L2 point, the telescope will unfold over the course of several weeks like a giant origami puzzle. Six months of focusing and setup will leave the telescope ready to capture its first images!

Dr. Mather concluded his presentation by showing some of the truly large ground-based telescopes. These are being designed with the best adaptive optics. The latest theoretical project he is working on would utilize one of these telescopes in combination with a large space based “star screen.” The idea would be to mask stars to directly observe the planetary systems surrounding them. After sharing this latest idea, he then took questions.

There were many good questions by attendees. One question was by a member who asked what the biggest uncertainty in the JWST project. Dr. Mather said that the unfolding process was a big concern. Mike Sinclair asked what the greatest discovery this telescope could make. He said that planets will be our biggest surprises. What are the challenges to correct issues at such a great distance? Command programs and redundancy. Joe Comiskey asked what cooled the telescope. Ambient losses are sufficient to cool all but one component which will be cooled by helium refrigerant down to 7 Kelvin.

Richard sincerely thanked our speaker and moved on to the President’s Report. He began by sharing some of the KAS equipment available for loan [on our website](#). Some of these include 25×100 binoculars on a parallelogram mount, Coronado PST and tripod for H-alpha solar viewing, and an 8-inch Schmidt-Cassegrain telescope. New to our loan program is a ZWO ASI294MC camera, donated by Mike Melwiki. Owl Observatory needs cleaning and repairs. Richard has asked for volunteers to help. The observatory now has a calendar and form on the website to reserve the space for personal use (password required). If you want to be trained in using the observatory, contact Richard. While we have one member that has offered to record and post general meetings online, Richard asked for a backup volunteer to help record and post meetings. It would be a team effort! If you are interested, please contact him.



Engineers posed by the James Webb Space Telescope shortly after it emerged from Chamber A at NASA's Johnson Space Center in Houston on Dec. 1, 2017.



Aaron Roman successfully completed the Astronomical League's Urban Observing Program.

Aaron Roman shared his latest Astronomical League Observing Award. He completed the Urban Observing Program and shared the pin and certificate to the group. He was able to express that, though the program was based on making observations in high light polluted areas, it was an excellent list for any visual observer at any site. The list includes 100 very thoughtfully compiled items with high surface brightness. These are some of the best visual targets in the northern hemisphere night sky. It is compiled from many catalogues including the Messier, NGC, IC (supplement to the NGC), Collinder, Mellotte, Stock and Trumpler. If you are looking to share new targets with friends and family, take a look at the A.L. Urban Program.

Aaron and Don have decided to start an Astronomical League Observing Program Special Interest Group (SIG). They took the time to share their idea to collaborate on working on observing programs. The Astrophotography SIG met for the first time on May 21st. Pete Mumbower and Richard were happy to share that turnout was much better than anticipated with 35+ people and announced future activities of the SIG. Our first successful Member-Only Observing Session brought out more than 20 participants. Some double stars, deep sky objects, and the Moon were observed. Richard [shared an image](#) of 4 small robin eggs in a nest on the observatory. Starlink satellites made an appearance in force with 40+ satellites in a row. Joe and Aaron discussed the 40-hour crescent Moon in conjunction with Venus and Mercury.

In astronomical news, Jack Price shared that he enjoyed watching a SpaceX re-landing of one of their rockets. He also shared that Meade Telescopes was recently bought by Orion Telescopes. Richard shared that it was due to a lawsuit with Orion that drove Meade into financial distress. The press release stated that Meade would get to continue to develop and produce its line.

Richard wrapped up the meeting by reminding members that the last Member-Only Observing Session would be on June 5th and that the first Public Observing Session of the season was scheduled for June 19th. One of the first activities by the Astrophotography SIG would be an Astrophotography Workshop at the KNC. Lastly, the annual tradition of holding Gadget Night would continue at the July 9th meeting. It will be held in KNC's amphitheater (located adjacent to Owl Observatory). The meeting concluded at 8:45 pm.

Board Meeting Minutes

The officers and at-large members assembled for a board meeting on Sunday, June 13, 2021. President Richard Bell brought the meeting to order at 5:07 pm EDT on Zoom. Other board members in attendance included Joe Comiskey, Kevin Jung, Scott Macfarlane, Pete Mumbower, Aaron Roman, and Don Stilwell. With no recommended changes to the agenda, Don presented the Treasurer's Report.

Don provided reports detailing our spending and income through the end of May. Owl Observatory and Remote Telescope maintenance were the significant changes this month. PayPal donated \$2.00. Hats and planispheres were the other income items. Expenditures were typical storage rental and registration fees.

The next business item was to renew Astronomical League (A.L.) membership. Secretary/ALCOR Aaron Roman presented the dues statement for the A.L. membership requirements. He broke down the difference in partial club participation rate (defined as <95% of members participating) is \$7.50/membership. Full club participation rate (defined as ≥95% of members participating) is \$5.00/membership. Astronomical League dues for 222 members (which is 100% of members) will be \$5.00 per member and a flat rate fee of \$10.00 per application. It was asked if the Board would like to donate an additional amount to the A.L. above the dues rate. It was decided that this was not in our interest at this time. Don made a motion to renew our A.L. membership. Voted on and opposed by Richard. He feels too few members participate in A.L. Observing Programs to make the expensive membership worthwhile. Also, they don't deliver on some benefits (e.g., club insurance). The motion passed and we will renew for this year.

Next, Richard presented upcoming events for June – September. The Kalamazoo Nature Center would be playing host to most of the following: Astrophotography Workshop, Public Observing Sessions and July General Meeting (featuring Gadget Night) in the amphitheater. Lastly, the for Perseid Potluck Picnic, the Board decided that no additional social precautions would be taken and that the event would look the same as normal. Aaron recommended that part of the announcement include that members were free to bring their own picnic if they were not comfortable sharing. As part of the evening's events, it was decided that the Ashby Telescope Dedication would finally occur!

For the first returning general meeting at the Kalamazoo Area Math & Science Center, it was noted that mask wearing may need to be enforced (due to Kalamazoo Public School policy, all events and classes will be masked on KPS property). No topic or speaker is confirmed yet. Rick Hedrick from PlaneWave will be invited to give a talk and Richard has volunteered to be the backup with a "History of KAS" presentation.

The meeting then moved on to follow-up items from previous board meetings. Richard noted that Jim Kurtz will be traveling to Arizona Sky Village on June 24th, partly to

perform maintenance on the Remote Telescope. Members unanimously approved the purchase of 7×50 and 10×50 binoculars to be kept in Owl Observatory. (Having binoculars in the observatory would have been handy last summer during Comet NEOWISE's peak.) Don agreed to order them. Also, the Board has authorized the purchase of a dehumidifier to keep conditions in the observatory dry, hopefully protecting our investment for years to come. Pete Mumbower will handle this purchase.

A few community outreach items were then discussed by the Board. The KNC Summer Camp has asked us to show campers the Moon and stars during their overnight stay. We will be helping on June 24th (with 6-8 graders) and July 22nd (4-5 graders). We hope to have Owl open if weather permits. If not, there will be a presentation given indoors. The Kindleberger Festival at Kindleberger Park in Parchment has invited us back on July 10th. Richard will need to contact NASA for more swag for that and other future events. Air Zoo Space Camp has requested a Zoom presentation on Tuesday, July 13th at 1pm.

The final follow-up item that the Board discussed was the Winter Solstice Dinner Party. While not much else was determined, the date agreed upon was Saturday, December 4th at 6pm. Martell's was recommended by KAS member Robyn Levene. However, it appears that their private dining area is too small.

Moving on to New Business: Equipment needed to record and post general meetings online will need to be purchased. The Board has authorized Kellie Kloosterman to purchase the Rode microphone set. Owl Observatory maintenance will be required for repairing damaged sections. Dave Garten has already volunteered. Cleaning was needed by volunteers and we also needed to hang the new KAS metal logo.

Richard asked Aaron and Don if any decisions had been made toward picking dates, times and locations for the planned Astronomical League Observing SIG. While most of the gatherings would be at Richland Township Park, the first one is planned at the KNC. Since the observer group had already picked a date overlapping with KNC Camper night, we decided to hold the events in concert with each other. Richard laid out the 2021/2022 Astrophotography SIG schedule. They will all be third Fridays at 8pm. He also laid out the 2021/2022 season of Online Viewing Sessions. These will continue to be held on Zoom. Since the lunar cycle will be problematic (along with holiday interference), there will be a Saturday/Sunday cloud date schedule this season.

The Board decided that July and August board meetings were not necessary. The next board meeting was agreed for Sunday, September 12th at 5:00 pm EDT. For the first time this year the meeting may be held in-person at Sunnyside Church on Gull Rd. Richard closed the meeting 6:20 pm EDT.

All minutes submitted by Aaron Roman



Observations

by **Richard S. Bell**

Members often tell me how appreciative they are of all that I've done for the Kalamazoo Astronomical Society. That is always gratifying to hear, but what matters more to me is that members take advantage of all that I've helped accomplish. More members could use the Remote Telescope and Ashby Telescope in Owl Observatory, for starters. General meeting attendance has always been pretty good (with room for improvement), but the area we really come up short in is turn-out for observing sessions (either for the public or members-only). You may have often heard me say that the KAS is NOT an observing club. I've made many efforts to improve participation during observing activities, but none have succeeded. I consider it my biggest failure.

There's a way you can help change that...at least for one night. Of the two Public Observing Sessions planned this month, the one on Saturday, July 31st takes place on a special day for yours truly. **IT'S MY 50TH BIRTHDAY!**

So - for at least one night only - I'm inviting, encouraging, pleading with all KAS members to attend the Public Observing Session on July 31st. Let's hope skies are clear and, who knows, you may enjoy yourself so much you may even want to attend other sessions in the future. Stranger things have happened, right?

For some time, I planned on inviting everyone to a little birthday party before the session, but have decided against it. Honestly, all I want is your presence under the stars on July 31st. Bring a telescope, bring binoculars, bring a friend, or just bring yourself. That's all I've ever wanted. Think of it as a bright comet. Sure, Hale-Bopp will return in ~2,500 years, but I only turn 50 once! I absolutely do not want any kind of presents, birthday cards, or even birthday wishes. Just a big event or star party feel at a Public Observing Session.

If you absolutely cannot attend the session, then please consider [making a donation](#) to the KAS instead.

Hopefully Mother Nature will stabilize the weather by the time we reach July 31st. We were experiencing a drought through much of the spring, but now we've had a deluge of rain! Current long range forecasts call for even more rain. Those predictions can and will change, but our plans for July 9th and 10th may be in jeopardy. Our first in-person general meeting since March 2020 is scheduled for the 9th. Currently, we have no in-door contingency plan.

I was also looking forward to doing some imaging in Owl Observatory after the meeting and even an Astrophotography Workshop on the 10th. Details on the workshop appear to your right. Not too many members participated in the workshop that featured the Moon last month, but even fewer will participant this month if skies are cloudy! Oh well, if we lose clear skies around New Moon time in July, we can always hope for improved conditions in August.

Astrophotography WORKSHOP



Saturday, July 10th @ 9:30 pm

Kalamazoo Nature Center • Registration Required

Do you want to learn how to take images of the night sky? Well now is your chance! The KAS will hold another astrophotography workshop at the Nature Center on **July 10th beginning at 9:30 pm**. We'll take full advantage of the new Leonard James Ashby Telescope in Owl Observatory (mainly the Tele Vue NP101is refractor, but perhaps the Meade 16-inch SCT as well). Members are encouraged to bring their own equipment for demonstration and knowledge sharing purposes or if you need a helping hand.

This time our subject will be deep sky objects. We'll choose one specific target to image and gather at least a couple hours of subframes using the ZWO ASI071MC Pro Cooled Color CMOS Camera in the observatory. Members will be shown how to set everything up for a night of imaging. The basic operation of Sequence Generator Pro and PHD2 Guiding will also be covered.

What YOU need to bring...

- USB Flash Drive or Portable Hard Drive

All members interested in astrophotography are encouraged to participate in the workshop, but please register ahead of time. Registration can be done through the [contact form](#) on the KAS website. Please be sure to indicate that you are registering for the workshop. We'll inform registrants of any cancellation, either due to the weather or lack of interest. Members wanting to just doing a little observing are also welcome to attend. In fact, there will be little to do while the telescope is taking images. Why not bring binoculars or a telescope to work on an Astronomical League Observing Program as well? Here's hoping for some clear, transparent, and steady skies on **July 10th!**





NASA Night Sky Notes...

Observe the Milky Way and Great Rift

by David Prosper

Summer skies bring glorious views of our own Milky Way Galaxy to observers blessed with dark skies. For many city dwellers, their first sight of the Milky Way comes during trips to rural areas - so if you are traveling away from city lights, do yourself a favor and look up!

To observe the Milky Way, you need clear, dark skies, and enough time to adapt your eyes to the dark. Photos of the Milky Way are breathtaking, but they usually show far more detail and color than the human eye can see – that’s the beauty and quietly deceptive nature of long exposure photography. For Northern Hemisphere observers, the most prominent portion of the Milky Way rises in the southeast as marked by the constellations Scorpius and Sagittarius. Take note that, even in dark skies, the Milky Way isn’t easily visible until it rises a bit above the horizon and the thick, turbulent air which obscures the view. The Milky Way is huge, but is also rather faint, and our eyes need time to truly adjust to the dark and see it in any detail. Try not to check your phone while you wait, as its light will reset your night vision. It’s best to attempt to view the Milky Way when the Moon is at a new or crescent phase; you don’t want the Moon’s brilliant light washing out any potential views, especially since a full Moon is up all night.

Keeping your eyes dark adapted is especially important if you want to not only see the haze of the Milky Way, but also the dark lane cutting into that haze, stretching from the Summer Triangle to Sagittarius. This dark detail is known as the Great Rift, and is seen more readily in very dark skies, especially dark, dry skies found in high desert regions. What exactly is the Great Rift? You are looking at massive clouds of galactic dust lying between Earth and the interior of the Milky Way. Other “dark nebulae” of cosmic clouds pepper the Milky Way, including the famed Coalsack, found in the Southern Hemisphere constellation of Crux. Many cultures



If the Milky Way was shrunk down to the size of North America, our entire solar system would be about the size of a quarter. At that scale, the North Star, Polaris - which is about 433 light years distant from us - would be 11 miles away! Find more ways to visualize these immense sizes with the [Our Place in Our Galaxy](#) activity.

celebrate these dark clouds in their traditional stories along with the constellations and Milky Way.

Where exactly is our solar system within the Milky Way? Is there a way to get a sense of scale? The “Our Place in Our Galaxy” [activity](#) can help you do just that, with only birdseed, a coin, and your imagination. You can also discover the amazing science NASA is doing to understand our galaxy – and our place in it - at [nasa.gov](https://www.nasa.gov).

The Great Rift is shown in more detail in this photo of a portion of the Milky Way along with the bright stars of the Summer Triangle. You can see why it is also called the “Dark Rift.” Crédit: NASA / Akira Fujii



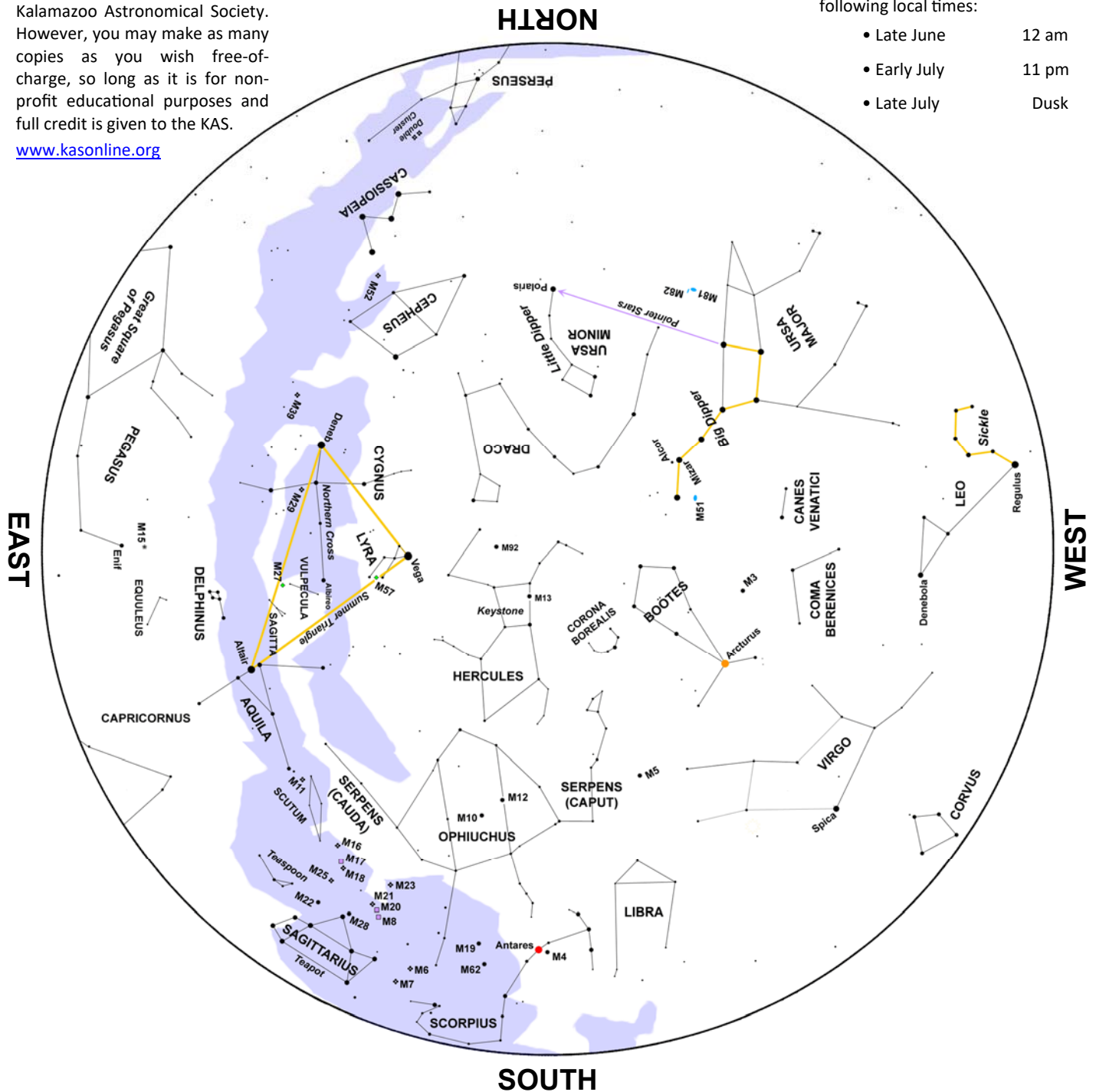
— July Night Sky —

This star map is property of the Kalamazoo Astronomical Society. However, you may make as many copies as you wish 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 times:

- Late June 12 am
- Early July 11 pm
- Late July Dusk



The evening of July 2nd brings a binocular challenge. Venus poses on the northern (right) edge of the Beehive Cluster in Cancer, the Crab. Find a spot with a clear west-northwestern horizon. Binoculars will be needed to spot the cluster's members.

The one-day old Moon pays a visit to the

innermost planet, Mercury, on the evening of July 8th. The pair will be 4½° apart. Binoculars will greatly enhance the Moon's earthshine. The Moon then forms a 6° long line with the close pairing of Venus and Mars on July 11th. Those two terrestrial planets have a very close conjunction on July 12th. Only ½° of sky separate the two.

Venus closes to within 1° of Regulus, in Leo, on the evening of July 21st.

A waning gibbous Moon appears 7½° above Saturn before sunrise on July 24th. The Moon then forms a shallow arc with Jupiter and Saturn on July 25th. Jupiter and the Moon will appear 5° apart on July 26th.

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July 2021

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OWL OBSERVATORY TRAINING

Learn to use the *new* Leonard James Ashby Telescope housed within Owl Observatory at the Kalamazoo Nature Center! Accessing the Nature Center after hours, opening/closing the observatory, and using the Ashby Telescope will all be covered. Registration will be limited so each participant has a chance to practice using the telescope. Please use our [contact form](#) to sign-up.



Friday, July 23rd @ 9:00 pm

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Public Observing Sessions



Saturday, July 17th

Highlights: Venus & First Quarter Moon

Saturday, July 31st

Highlights: Jupiter, Saturn & Summer Triangle

Gates Open: 9:30 pm Observing Begins: 10:00 pm

Kalamazoo Nature Center

— 7000 N. Westnedge Ave. —

General Meeting Preview



Gadget Night

Today's astronomical marketplace is flooded with telescopes and accessories of all shapes, sizes, and price ranges. However, even with the wealth of goods now available, there are some gadgets that can only be hand crafted. It just goes to show that necessity really is the mother of invention and thankfully amateur astronomers are an ingenious lot.

For our next meeting we invite KAS members to trot out the results of their latest brainstorming. Please feel free to bring along any interesting astronomically themed doodads, doohickeys, and devices you've purchased as well. You won't want to miss this fun and entertaining evening.

NOTE: We will meet in KNC's amphitheater, located directly south of Owl Observatory. Bug spray is advised.

Friday, July 9 @ 7:00 pm

Kalamazoo Nature Center

7000 North Westnedge Ave.

Kalamazoo Astronomical Society
c/o KAMSC
600 West Vine, Suite 400
Kalamazoo, MI 49008

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