Highlights of the June Sky. . .

- - - 1st - - -

DAWN: Jupiter is 5° above the Moon, with Saturn about 18° to their right.

- - - 2nd - - -

Last Quarter Moon
3:26 am EDT

DAWN: The Moon, Jupiter, and Saturn form a shallow arc about 30° long.

- - - 10th - - -

DAWN: Partial solar eclipse in progress at sunrise. Ends at ~6:39 am EDT.

New Moon
6:54 am EDT

- - - 13th - - -

DUSK: A narrow waxing crescent Moon is almost 3° above Mars.

- - - 15th - - -

DUSK: The Moon is 4° above Regulus in Leo.

- - - 17th - - -

First Quarter Moon
11:54 pm EDT

- - - 19th - - -

PM: A waxing gibbous Moon is 5° above Spica in Virgo.

- - - 22nd - - -

PM: A nearly full Moon is about 4° above Antares.

- - - 23rd - - -

DUSK: Mars is embedded within the Beehive Cluster.

- - - 24th - - -

Full Moon
2:40 pm EDT

- - - 27th - - -

AM: The Moon and Saturn are separated by 5°.

- - - 28th - - -

AM: The Moon is between Jupiter and Saturn, forming a triangle.

Prime Focus

A Publication of the Kalamazoo Astronomical Society

★ ★ ★ June 2021 ★ ★ ★

This Months KAS Events

General Meeting: Friday, June 4 @ 7:00 pm

Held on Zoom • Click to Register • See Page 6 for Details

Member Observing: Saturday, June 5 @ 9:30 pm

Galaxies of Ursa Major • Kalamazoo Nature Center

Board Meeting: Sunday, June 13 @ 5:00 pm

Held on Zoom • All Members Welcome to Attend

Astrophoto Workshop: Friday, June 18 @ 9:30 pm

Kalamazoo Nature Center • See Page 5 for Details

Observing Session: Saturday, June 19 @ 9:30 pm

Moon & Double Stars of Spring • Kalamazoo Nature Center

Inside the Newsletter. . .

May Meeting Minutes

The general meeting of the Kalamazoo Astronomical Society was brought to order by President Richard Bell on Friday, May 7, 2021 at 7:07 pm EDT. Over 76 members and guests attended via Zoom and YouTube.

Our guest speaker was Eric Bell, the Arthur F. Thurnau Professor of Astronomy at the University of Michigan. Dr. Bell studies the physics of galaxy formation and evolution using large survey datasets. (As Richard noted, they are not related.) The title of his presentation was *When Worlds Collide - Galaxy Collisions and Their Aftermath*.

Dr. Bell began his talk with a definition of galaxies. They are a gravitationally bound group of stars, stellar remnants, gas, dust, and dark matter. Galaxies are really diverse, spanning a factor of a billion in magnitude! He went on to show images of barely visible Willman 1 (one of the faintest known galaxies in the universe), Fornax Dwarf Spheroidal, NGC 2683 (with vast spiral arms), and giant elliptical galaxy M87. The one aspect in common with all of these objects is dark matter. A relatively new discovery, dark matter was first suspected when studying the rotational speed of galaxies. They had gravitational velocity beyond what would be possible with just the visible stars and gas. Later, observing gravitationally lensed objects in systems that have unbalanced distribution of visible and dark matter, it became clear that dark matter was the only currently viable option to explain the off-set rings of background galaxies.

So how do we know that dark matter has mass and isn't just the gravity law being wrong? There is evidence of large "blobs" of dark matter that have collided together and passed through each other only to emerge on the other side without the typical pancaking in the middle that would occur if two gas clouds collided. When galaxy collisions are mapped, there is evidence of this occurring, where the gas and stars are left pancaked in the middle but with the gravitational effects of the dark matter bulging far beyond that of the visible matter. Since dark matter is not visible, it can be inferred by looking at gravitationally lensed objects behind the dark matter.

When you consider the evidence of these events it becomes clear that dark matter makes up 80% of the mass of the universe. Dr. Bell went on to share video models that shows the clumping and massing of dark matter into "halos". He explained that very small visible-mass formations occur in the center of these dark matter halos. Those are the galaxies that we see through our telescopes. Visible matter is affected by not only gravity, but strong and weak forces and is influenced by the electromagnetic fields. This allows visible matter to condense into much more dense formations than dark matter is able. Going one step further, he explained because visible matter interacts to generate heat, and that heat can radiate away from the mass, visible matter behaves completely differently than dark matter. Because of this, it is theorized that galaxies can only be located in the center of the densest dark matter rich areas in the center of the dark matter halos.

Looking at computer generated models of galactic collisions that have taken into consideration the large mass of dark mater we get results that look very similar to our known universe. Elliptical galaxies may be the end-result of two massive disc-shaped galaxies merging. As they collapse and collide into the large random formations, disc galaxies lose their form and the elliptical shape seems to be a common result. Similar models used to show the collision of many very small galaxies collapsing into something the size of our galaxy looks very similar to what our galaxy looks like as well.

What Dr. Bell has been trying to do for the past 15 years is to try and see the evidence of these small contributions to the Milky Way and other nearby galaxies. The galactic stellar halo that surrounds our galaxy has much of the evidence he is looking for. He shared an image taken with an amateur size telescope in New Mexico of NGC 5907. It shows these massive stellar "loops" spanning well beyond the galaxy and into the stellar halo. These loops are exactly the type of evidence needed to prove that past collisions occurred.

The problem with trying to observe stellar halos around galaxies is that they are really faint. So, Dr. Bell has to take images that have a resolution to individual stars in galaxies that are 10s of millions of light-years away. Using the Subaru and Hubble telescopes, he is able to get images that are resolved to individual star points. Looking well beyond the galactic disc we initially don't see much. But if those images are analyzed for red giant-sized stars and brightness (at the know distance) we see evidence of many stars in these empty spaces and if we consider the fainter stars that we can't see, it is clear that these regions are rich in visible matter.

Looking at the Andromeda Galaxy (M31) and its stellar halo, we see massive structures that have sweeping and dynamic features. This shows evidence of a variety of collisions of many different types. By looking at diagrams of old and new galaxies, we see that older galaxies are metal poor while newer galaxies are much more metal rich. Keeping this in mind as we look at M31 we see stars with high metallicity in some regions and low metallicity in others. The Andromeda Galaxy had a massive collision with a metal rich (newer) galaxy and many smaller collisions with older galaxies. The evidence suggests that there were probably three large-sized galaxies in our Local Group. One was destroyed and absorbed by M31.

M31 merged with a galaxy about ⅓ the size of the Milky Way. Called M32p, this galaxy was the progenitor of M32, which is the remnant of its galactic core. The rest of the galactic mass is distributed throughout the Andromeda Galaxy and its stellar halo. The giant stellar stream that loops away from Andromeda is all that is left. The evidence that we see from this merger is disc-wide star formation occurring 2 million years ago. The disc of M31 was obviously left intact after this collision. So, this shows that not every massive collision results in an elliptical galaxy being formed. But M31 does have an unusually thick disc (3× thicker than the Milky Way and 3× the velocity spread).

With the universe's mass being comprised of 80% dark matter, it is not surprising that it drives galaxy formation. Being that dark matter is completely invisible, we therefore have to look at the remnants of galactic collisions to observe what may be going on in the dark matter halo. We may never be able to see dark matter, but the evidence of its existence is everywhere. Dr. Bell closed his presentation by taking a series of interesting questions from the group.

Upon completion of the presentation, Richard moved on to the President's Report. He was very proud to share that he is fully vaccinated. He expressed a feeling (probably shared by all of us) that he looks forwards to observing without a mask. The *Owl Observatory User's Guide* continues to be a work in progress, but the new equipment is available for use. With newly vaccinated members and better equipment, Richard hopes to start some astrophotography workshops. With updated CDC guidelines, see the website for observing sessions as it applies to the public.

Richard guesses that KAS memberships have us at the largest astronomy group in the state. But with that large membership comes needed help. While Kellie Kloosterman has volunteered to record meetings (when we are no longer virtual), additional back-up volunteers are still needed. The club is maintaining the equipment so you only need to bring yourself and a willingness to learn. Richard continues to ask members to update their KAS Member Profiles on the website. To close out the President's Report, he is asking members to make restaurant recommendations for the new Winter Solstice Dinner.

Moving on to Observing & Imaging Reports: Aaron Roman reported observing 12 galaxies in Ursa Major and expressed that he will continue to make more observations in that region over the next couple of months. Richard shared that he has been acquiring images of the Sombrero Galaxy with the Remote Telescope.

Arya Jayatilaka shared news of the Chinese rocket due to crash during the weekend. Mike Sinclair was able to explain the reason that it is falling. When the Chinese separated their booster, it was not pushed far enough away from the main payload. As a consequence, it began to tumble and subsequently the Chinese lost control of the decent. In contrast, Sara Farkas shared in the chat that SpaceX #15 landed safely. Richard wanted to share that Ingenuity, the remote drone deployed with the Perseverance rover, has had its first flight on Mars. It is the first-ever controlled flight on another planet! It has made 5 small flights at this time and audio of one of the flights is available. Additionally, NASA has reported that the rover has successfully made oxygen, a key ingredient for rocket fuel.

Richard concluded the May General Meeting by reminding members of upcoming 2021 events including being hopeful for this season's first observing sessions and the first Astrophotography SIG (Special Interest Group) Meeting. He announced next month's presentation: *Cosmic Instability: How a Smooth Early Universe Grew into Everyone You Know* to be presented by Nobel prize winner Dr. John C. Mather. The meeting adjourned at 8:48pm EDT.

BOARD Meeting Minutes

The KAS Board gathered on Zoom for a business meeting on Sunday, May 2, 2021. The following were in attendance: Richard Bell, Jack Price, Don Stilwell, Joe Comiskey, Dave Garten, Kevin Jung, Scott Macfarlane and Pete Mumbower. Unfortunately, Aaron Roman was not able to attend. Richard brought the meeting to order at 5:05 pm EDT.

With no recommended changes to the agenda, Don presented the Treasurer's Report including Accounts Balance Report and Cash Flow Report. Don provided reports for the details of account balances through April. There was a brief discussion about keeping some value in the PayPal account

on a regular basis, but Richard said he would clear it out and the Board agreed in general. There were many donations made by *Introduction to Amateur Astronomy* participants and that total amount is still growing due to outstanding mailed donations.

Next, Richard presented upcoming events for May through June, with a brief summary for each. General meetings would continue to be held online, so members can continue to expect to register through the emailed link. Presenters include Eric Bell from the University of Michigan and Dr. John C. Mather of James Webb Space Telescope team. Richard expressed optimism that the June General Meeting will be the final one on Zoom, and that in-person meetings resume at KAMSC in September.

Other events discussed were the first Astrophotography SIG Meeting on May 21st and observing sessions at the Kalamazoo Nature Center on May 8th and 22nd, plus June 5th and 19th. There was some good discussion on the 2021 Public Observing Session season. The focus was primarily about when would be an appropriate time to welcome the public back. It was decided that sessions will continue to be member-only until June 5th. Public sessions will resume with a "soft start" on June 19th, meaning publicizing on the website and social media only. The Board will follow all current Michigan Health Department and CDC COVID-19 guidelines.

The Board then moved on to follow-up items from previous board meetings. First on the agenda was an *Owl Observatory User's Guide* update. Richard opened a discussion about establishing reservation times for Owl Observatory. While no formal time schedule was decided, it was discussed that the Remote Telescope and Owl reservation forms should not be combined, as that could be confusing for users. Kevin suggested that Owl users should be able to sign up as much as 30 days in advance. No calendar is used online at this time. The general rules from the previous Owl manual will remain in place with minor updates.

Summer activities at Kalamazoo Nature Center will include the Ashby Telescope Dedication (date TBD) and Gadget Night in July. We are still planning on having the Perseid Potluck Picnic in August. KNC's Summer Camp has asked the KAS to help them out on June 24th and July 22nd with observing for the campers. Fourth through eighth graders in groups of 8 could use the Owl Observatory and any other available telescopes (with a backup weather plan for an indoor presentation). An additional volunteer (or two) is required.

Regarding the new KAS Astrophotography SIG, Richard wanted to know whether this event should be open to public or members only. Pete gave an excellent argument that the event should be used for outreach. Kevin noted that any activity with club equipment would be limited to members. In the end it was decided unanimously that the SIG should be open to the public, while astrophotography workshops will be or members only.

New accessories for Owl Observatory were unanimously approved. These include a new Optec Lepus 0.62× Reducer, Optolong 2" L-Pro Light Pollution filter, and 2" Baader IR-Pass filter (for planetary imaging). Also, four new red LED light fixtures will be installed in the storage cabinet. Still under consideration by the Board are a pair of 7×50 and 10×50 binoculars. Don will search for nitrogen-filled models.

In other news, Kellie Kloosterman volunteered to record and edit general meetings as we transition into a hybrid of in-person and online meeting attendance. The following equipment may need to be purchased: digital recorder, tripod, lavalier, and editing software. For the latter, Pete recommended Open Broadcaster Software (OBS).

And last on the agenda the Board discussed the Winter Solstice Dinner. This will be a reimagined version of the Holiday Party with possibly a new day and time. A new location, such as a local restaurant, is planned as several members have grown fatigued with setting up tables and chairs at KAMSC. While nothing has been decided as of yet, many good ideas for a location have been proposed. Jack volunteered to look into a couple of locations and get back to the Board with recommendations. Richard said that he would mention it to members at the next meeting and ask for suggestions.

The next board meeting was agreed for Sunday, June 13th at 5:00 pm EDT on Zoom. Richard closed the meeting at 6:42 pm EDT.

All minutes submitted by Aaron Roman.

The Dog Star

by Ellen Comiskey

We have all heard of pets doing amazing things, but have you ever heard of a "Stargazing Yorkie?" Our dog Sophia runs to the door wagging her tail with excitement whenever Joe sets up his 10-inch reflector. All she has to hear is the word "telescope" and she is ready for some scientific time with Joe and Ellen!

Observations

by Richard S. Bell

My guess is that no KAS member will be traveling to the path of the June 10th annular eclipse. From what I've read, the Canadian border will remain closed until at least June 21st and that will likely be extended. Traveling to the Arctic seems a little extreme and do you really want to head to northeastern Russia? I didn't think so. So, I imagine most of us will settle with the view from southwest Michigan or sit this one out altogether. If skies are clear that morning, I recommend Richland Township Park. It's a pretty open site with low horizons. Perhaps you could head to Lake Huron and view the eclipse in progress at sunrise, but we get to see so little of it. It ends about 34 minutes after sunrise.

The first-ever meeting of the KAS Astrophotography Special Interest Group met on Zoom at 7pm on Friday, May 21st. About 37 members and guests attended, which is more than I anticipated. We started off with introductions, which took about half of the allotted time. Several members then shared their latest images and they were all quite impressive. I think Josh Taylor-Lehman stole with show with his mosaic of southern-half of the Orion region. He said it consisted of about 1,200 individual images! Hopefully he'll share it again during Astrophotography Night in October.

We then got down to business and discussed the future of the new SIG itself. The AP-SIG will meet on the third Friday of every month at 8pm from September - May. Informal gatherings could be held during the summer months, but we'll mostly focus on group imaging and workshops. The consensus was to meet in-person, but we'll plan to live-stream the meetings on Zoom and/or YouTube. Suggested meeting locations included the Nature Center or WMU's Rood Hall. Special guest speakers will be scheduled from time to time, but some meetings will focus on members sharing their knowledge and skills with one another. The first meeting of the AP-SIG has been posted on YouTube.

As seen to the right, the first Astrophotography Workshop under the AP-SIG is scheduled for June 18th. Our focus (pun intended) will be on the Moon. One additional item to mention is that you don't need a camera to participate. We'll also be using the ZWO camera in the observatory to image the Moon. The video files will be at least a gigabyte, so bring a portable hard drive with plenty of storage space. Let's just hope skies are clear! I'm planning to do a deep sky imaging workshop in July and maybe even August.

Please be sure to "Zoom in" to the meeting on June 4th. I'll expect nothing short of a full house. I've been hyping our very special guest speaker, Dr. John C. Mather, for the past few months. After all, we've never had a Nobel Prize winning physicist speak at a KAS event before. This likely makes Dr. Mather one of our highest profile guest speakers ever! Full details on his presentation can be found on page 6. I'm also excited for the return of Public Observing Sessions on June 19th. I am *incredibly* anxious to share the new Leonard James Ashby Telescope with the public!

Astrophotography WORKSHOP

Friday, June 18th @ 9:30 pm

Kalamazoo Nature Center

Do you want to learn how to take images of the night sky? Well now is your chance! The KAS will hold an astrophotography workshop at the Nature Center on **June 18th beginning at 9:30 pm**. We'll take full advantage of the new Leonard James Ashby Telescope in Owl Observatory (both the 16-inch SCT and 4-inch refractor). You are also welcome to bring your own telescope, mount, etc.

Our subject will be the Moon, which is perhaps the easiest celestial object to photograph. Techniques such as prime focus photography and eyepiece projection will be covered. We will also do some lunar imaging with the ZWO ASI071MC Pro Camera in the observatory. Video file sizes of the Moon taken with the ZWO will be large, so that's why a portable hard drive is listed along with the other needed equipment below.

What YOU need to bring...

- DSLR or Mirrorless Camera
- Intervalometer or Remote Switch
- T-ring
- 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 at the general meeting on June 4th or 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. Here's hoping for some clear skies on **June 18th**!

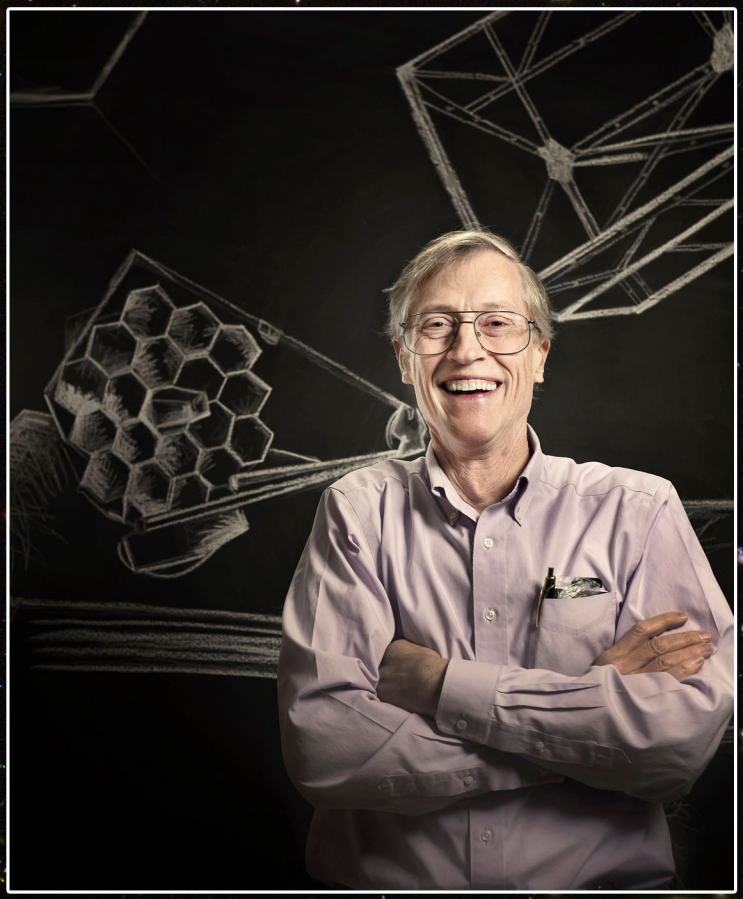
85th ANNIVERSARY CELEBRATION

Cosmic Instability

How a Smooth Early Universe Grew into Everyone You Know

presented by **Dr. John C. Mather**

Senior Project Scientist, James Webb Space Telescope
& Winner of the 2006 Nobel Prize in Physics



Gravity made stars, stars made heavy elements, gravity and chemistry made planets, geology and biology made people, and people made telescopes. What we would like to know is how hard it all was, and could it happen elsewhere.

The James Webb Space Telescope, planned for launch in October 2021, will extend the discoveries of Hubble with a much bigger mirror, cooled to low temperatures so it can observe infrared radiation. It will have detectors capable of observing a bumblebee at the distance of the Moon!

Dr. Mather will show the telescope, describe its capabilities, and discuss what it might find. We expect to see the history of the universe laid out before us, from the first luminous objects to our local neighborhood, and to answer questions like: How did the galaxies and black holes first form and grow? Are there Earth-like planets out there? How can we tell if they harbor life?

Friday, June 4th @ 7:00 pm

Click Here to Register on Zoom • Streamed LIVE on YouTube

Kalamazoo Astronomical Society

— www.kasonline.org —

NASA Night Sky Notes...

Astrophotography with your Smartphone

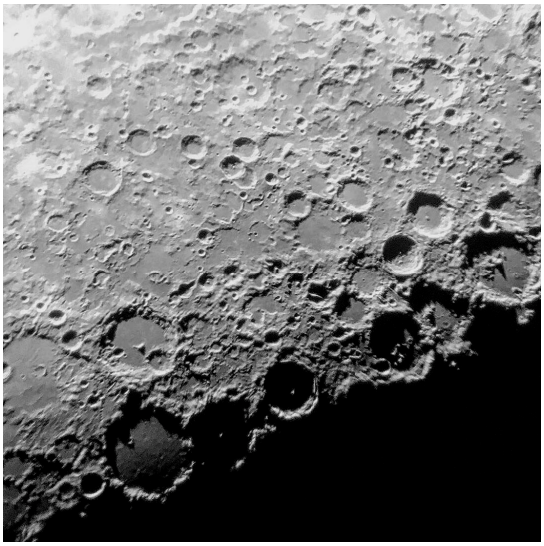
by **David Prosper**

Have you ever wanted to take night time photos like you've seen online, with the Milky Way stretched across the sky, a coppery-red Moon during a total eclipse, or a colorful nebula? Many astrophotos take hours of time, expensive equipment, and travel, which can intimidate beginners to astrophotography. However, anyone with a camera can take astrophotos; even if you have a just smartphone, you can do astrophotography. Seriously!

Don't expect Hubble-level images starting out! However, you can take surprisingly impressive shots by practicing several basic techniques: steadiness, locked focus, long exposure, and processing. First, steady your smartphone to keep your subjects sharp. This is especially important in low light conditions. A small tripod is ideal, but an improvised stand, like a rock or block of wood, works in a pinch. Most camera apps offer timer options to delay taking a photo by a few seconds, which reduces the vibration of your fingers when taking a shot. Next, lock your focus. Smartphones use autofocus, which is not ideal for low-light photos, especially if the camera readjusts focus mid-session. Tap the phone's screen to focus on a distant bright star or streetlight, then check for options to fine-tune and lock it. Adjusting your camera's exposure time is also essential. The longer your camera is open, the more light it gathers - essential for low-light astrophotography. Start by setting your exposure time to a few seconds. With those options set, take a test photo of your target! If your phone's camera app doesn't offer these options, you can download apps that do. While some phones offer an "astrophotography" setting, this is still rare as of 2021. Finally, process your photos using an app on your phone or computer to bring out additional detail! Post-processing is the secret of all astrophotography.

You now have your own first astrophotos! Wondering what you can do next? Practice: take lots of photos using different settings, especially before deciding on any equipment upgrades. Luckily, there are many amazing resources for budding astrophotographers. NASA has a free eBook with extensive tips for smartphone astrophotography, and you can also join the Smartphone Astrophotography project. Members of astronomy clubs often offer tips or even lessons on astrophotography; you can find a club near you by searching the "Clubs and Events" map on the Night Sky Network's website. May you have clear skies!

A small tripod for a smartphone. They are relatively inexpensive – the author found this at a local dollar store!



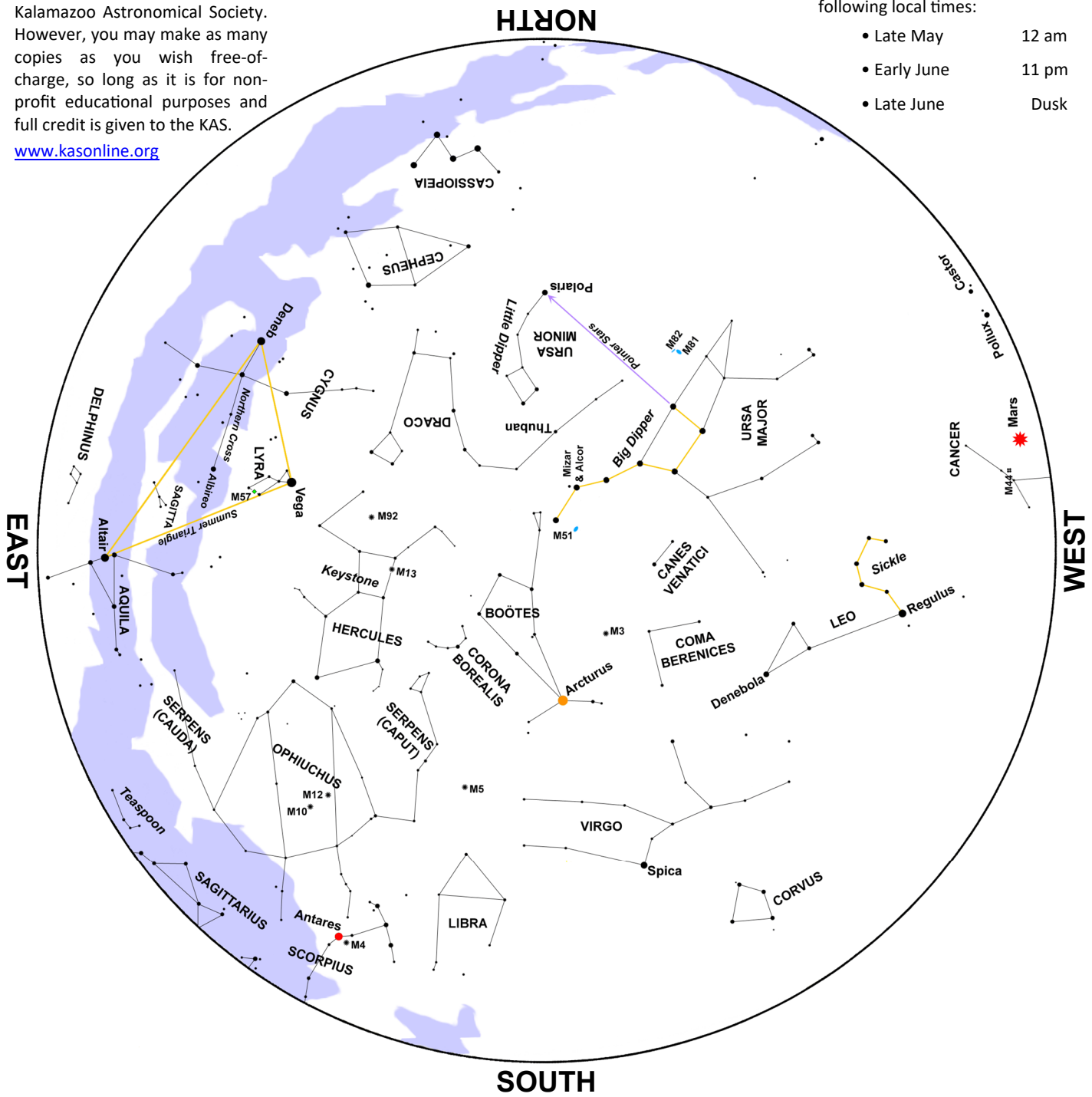
The Moon is large and bright, making it a great target for beginners. The author took both of these photos using an iPhone 6s.

The crescent Moon at sunset (left) was taken with a phone propped on the roof rack of a car; the closeup shot of lunar craters (right) was taken through the eyepiece of a friend's Celestron C8 telescope.

— June Night Sky —

This map represents the sky at the following local times:

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



Early risers in West Michigan can enjoy a partial solar eclipse in progress at sunrise on June 10th if skies are clear. Sunrise occurs at 6:05 am EDT. Maximum coverage (~38%) is at 6:08 am, but the Sun might not be high enough for viewing for at least 10 more minutes - assuming you have a clear view of the northeastern horizon. The eclipse ends at 6:39 am. Use approved Eclipse Shades if you plan to view the eclipse with just your eyes. Binocular or telescope viewers should utilize the projection method or use approved solar filters.

A thin waxing crescent Moon moves to within 3° of Mars on the evening of June 13th. The Beehive Cluster (M44) will be about 4° left of the Moon. All three should just fit in 7×50 binoculars. Mars will move closer to the Beehive and appear *within* the cluster on June 23rd.

A waning gibbous Moon will be between Jupiter and Saturn during the early morning hours of June 28th - forming a triangle with the gas giants.

ZWO ASI294MC Available for Loan

Thanks to a donation by Mike Melwiki, KAS members now have the opportunity to borrow one of the most popular imaging cameras available today. The ZWO ASI294MC Pro Cooled Color CMOS Camera has a resolution of 10.7 Megapixels (4144 × 2822). It is an excellent deep sky imaging camera, but can also shoot 4K video at 24 FPS and 320 × 240 at 179.3 FPS - making it an great planetary camera as well. All original accessories are included, plus an AC Adapter for cooled deep sky imaging. This camera sells for $999, but you can use it for a month for free! You can download the driver and control software for free from ZWO's website. Learn more at:

https://www.kasonline.org/loanscopes.html

OBSERVING AT THE NATURE CENTER

Member-Only: Saturday, June 5th
Highlights: Galaxies of Ursa Major

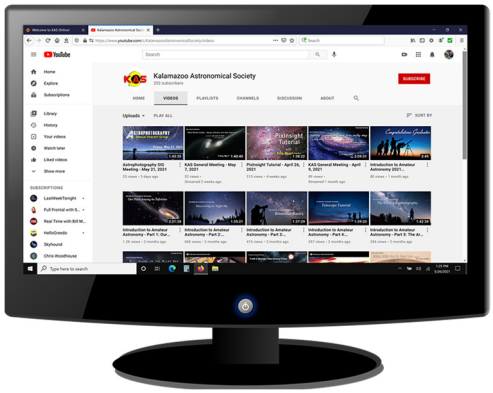
Public Session: Saturday, June 19th
Highlights: The Moon & Double Stars

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

NOTE: Unvaccinated attendees MUST wear a mask.

7000 North Westnedge Ave.

KAS Channel on YouTube



Did you miss or want to re-watch a general meeting guest speaker's talk, Astrophotography SIG meeting, or Online Viewing Session? This and much more is on the KAS YouTube Channel. Members are even welcome (and encouraged) to create astronomically-themed content for the channel. Become a star (or just talk about them)!

CLICK HERE TO VIEW the CHANNEL

MILLER PLANISPHERE

A planisphere is a "computerized" star map that doesn't require batteries! Just dial in the date and time and you'll see what's in the sky for that moment. The Miller Planisphere is made with heavy duty plastic and includes a durable plastic case, so it'll easily survive Michigan's dewy nights. All planispheres sold by the KAS are 10.5-inches in diameter and set at 40° latitude. Amateur astronomers of all levels should have one of these in their observing bag!

They are available for purchase at most meetings and observing sessions. Also available online at:

skyshop.kasonline.org

Only $13.00

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