

## Highlights of the April Sky . .

- - - 4<sup>th</sup> - - -

Last Quarter Moon  
6:04 am EDT

- - - 5<sup>th</sup> - - -

DAWN: A waning crescent Moon, Saturn, and Jupiter form a shallow arc.

- - - 6<sup>th</sup> - - -

DAWN: The Moon is 4½° below Saturn with Jupiter to their left, forming a triangle.

- - - 7<sup>th</sup> - - -

DAWN: The Moon is now 5° below Jupiter with Saturn to their upper right.

- - - 11<sup>th</sup> - - -

New Moon  
10:32 pm EDT

- - - 15<sup>th</sup> - - -

DUSK: A waxing crescent Moon is 5° to the right of Aldebaran in Taurus.

- - - 16<sup>th</sup> - - -

DUSK: The Moon is between the horns of Taurus with Mars 5½° above.

- - - 19<sup>th</sup> - - -

DUSK: The Moon and the twins, Castor and Pollux, form a straight line.

- - - 20<sup>th</sup> - - -

First Quarter Moon  
3:00 am EDT

DUSK: The Moon is 4° to the upper left of the Beehive Cluster (M44).

- - - 26<sup>th</sup> - - -

DAWN: The Moon and Spica are 5° apart.

Full Moon  
11:33 pm EDT

- - - 29<sup>th</sup> - - -

DAWN: A waning gibbous Moon is 4° above Antares in Scorpius.

# Prime Focus

A Publication of the Kalamazoo Astronomical Society

★ ★ ★ April 2021 ★ ★ ★

## This Months Events

**General Meeting: Friday, April 9 @ 7:00 pm**

*Held on Zoom • [Click to Register](#) • See Page 14 for Details*

**Member Observing: Saturday, April 10 @ 8:00 pm**

*Great Nebula in Orion - Kalamazoo Nature Center*

**Member Observing: Saturday, April 24 @ 8:00 pm**

*Moon & Double Stars of Spring - Kalamazoo Nature Center*

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★ ★ ★ [www.kasonline.org](http://www.kasonline.org) ★ ★ ★

# March Meeting Minutes

Over 116 KAS members and guests attended the general meeting on Friday, March 5<sup>th</sup> via Zoom (which hit the 100-attendee limit) and live on YouTube virtually from not only southwest Michigan but as far as New Brunswick, Canada, Florida, Arizona, and Wisconsin.

Before the start of the meeting, Richard [played a video](#) of how the pandemic is making amateur astronomy a more wide-reaching hobby. It highlighted the increase in telescope business during the past year. It also showed hobbyists taking the time to build, observe, and share their experiences. Amateur astronomy is booming!

At 7:08 pm EST, President Richard Bell opened the March General Meeting by introducing the night's speaker. Dr. Pascal Lee joined us from San Jose, California. He is the Chairman of the Mars Institute and Senior Planetary Scientist at SETI (Search for Extraterrestrial Intelligence) and Director of the NASA Haughton Mars Project at the NASA Ames Research Center.

Dr. Pascal opened his presentation by acknowledging the popular notion that there are many advanced civilizations in the cosmos. We celebrate these notions in films and pop culture. Last month's general meeting helped us explore many of these fictional planets and their possible real-life counterparts. This month we looked a little closer to the possibility of there being credibility to this imagined universe.

In the early 1960's, Frank Drake started to compile a group of variables that could help us estimate the number of intelligent civilizations in our galaxy. Later this group of variables became known as the Drake Equation ( $N = R_* \times f_p \times N_e \times f_i \times f_c \times L$ ), where  $N$  = Number of "Advanced" Civilizations (those capable of interstellar communication) in our galaxy. SETI uses the different terms of this equation to discuss the probability of successfully detecting another civilization in our galaxy or beyond.

$N \sim 1$  is a reference to the number of advanced civilizations in our galaxy. With a Universe of over 100 billion galaxies,



**Dr. Pascal Lee, from the SETI Institute, was our special guest speaker for the March 5<sup>th</sup> general meeting.**

each with 100 billion stars, and each star having ten or so planets it seems likely that many of them contain intelligent life and therefore the factor 'N' must be large. Science fiction has certainly encouraged us to think of a Universe of intermingling societies. It is somewhat surprising therefore that anyone would make the claim that we are alone. N is more likely a small number rather than a large one. Exploring each of the factors a little closer will help to show how the universe may not be as busy as we like to imagine.

The most optimized application of the equation puts the nearest civilization 10 light-years from Earth ( $N \sim 50$  million). This number is ideal and not realistic. It assumes every star has a planet with an advanced civilization that has interstellar communication abilities lasting over a million years. A more conservative "standard" model constrains this argument slightly by presenting a rate of star formation more consistent with what we know, and civilizations limited to a 5,000-year lifespan. It still optimizes every star having an advanced civilization. This puts our average closest neighbor to around 1,000 l-y ( $N \sim 10,000$ ). Unfortunately, neither of these ideal models seems possible.

Enrico Fermi posed a question. If N is large, then where is everyone? There are many postulations as to how we could be missing out on a busy galaxy. One is that the distances of interstellar communication is too vast to allow meaningful communication. Some say other advanced civilizations avoid communicating with Earth for various reasons. There is also the notion that SETI itself is conspiratorially covering up the communications. Whatever the explanation, the evidence is that we have not yet had contact with another planet's civilization.

$R_*$  = The factor of the rate of star formation in our galaxy is a relatively constrained. There is not much debate that  $20 < R_* < 50$  stars/year.

$f_p$  = Fraction of stars with planets (or rate of planetary formation). We see data by Kepler, TESS and other ongoing exoplanetary discovery missions that planets are common around stars. While this number was once thought to possibly be small, it is now understood that stars that have planets forming around them is one in twenty to 100%.

$N_e$  = Average number of planet environments suitable for life with those planetary systems. So, if we just look at the "habitable zone" in our own solar system we see potential evidence of life supporting environments on many of our bodies. Mars has had a watery past and still has deep sinkholes that could harbor life safe from radiation. But Venus may have signatures of life in the high atmosphere but is completely uninhabitable on the surface. Other bodies outside the habitable zone certainly show potential for life as well, in the form of subsurface oceans of icy moons to high atmospheric life on gas giants.

Something else to consider is that while our solar system (and other stellar systems) has a habitable zone, our galaxy



also has a habitable zone. Due to gamma-ray bursts that are very prevalent in our galactic center, the probability of life existing only goes down the closer to the center. Even at Earth distances from the center we only see 50% chance of life surviving these gamma bombardments. This all adds up to  $0.01 < N_e < 10$ .

So, what is the chance that life may actually appear?  $f_i$  = Fraction of planets on which life emerges. Experiments show that organic compounds are formed relatively easily. Amino acids have been formed in the lab, but we have not been running experiments long enough to synthesize RNA. Of course, our oceans allowed a much larger, much longer experiment that successfully produced life. And we see that the oldest known rocks on Earth have signs of life. If we generalize this to other planets and other star systems, the implication is that starting life is easy.  $f_i$  is going to be much closer to 1 than 0.

$f_i$  = Fraction of planets on which life becomes intelligent.

$f_c$  = Fraction of those planets on which intelligent life becomes an advanced civilization.

These two factors act in tandem to each other. If you define intelligent life loosely (as in beavers are intelligent), then advanced civilizations then must be defined as extremely rare. Of course, if you define intelligent life as specific to homo-erectus, then those intelligent life forms readily form intelligent civilizations. Other things to consider is that even when intelligent life forms complex social groups, such as dolphins and whales, that does not mean that they have the physiology or environmental incentive to explore space or try to communicate with other planets. We can also assume that the time it takes civilizations to build radio telescopes may be like the time it took humans to developed them, 5,000 years after we first began our civilization.

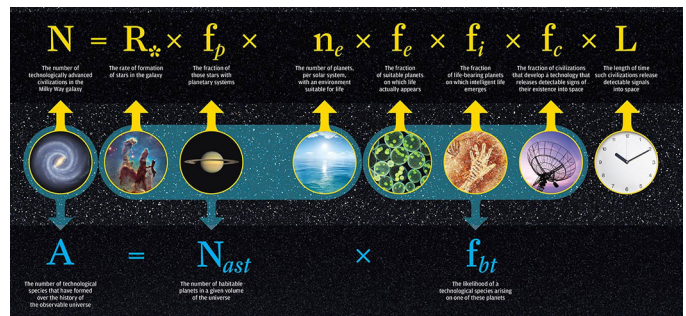
The last factor in the Drake Equation is L. There are many factors that can define the average longevity of an advanced civilization. Impact events on our planet has limited the most favorable time frames to less than that between mass extinction events. We have been around 5,000 years but how long could a civilization last? With pandemics and overpopulation, we could be limited to shorter period, especially if warfare is taken into account. So, estimates range from  $100 < L < 1,000,000$ .

$$N = R_* \times f_p \times N_e \times f_i \times f_c \times L$$

$$N = 20 \times 0.5 \times 1 \times 0.5 \times 0.0002 \times 0.1 \times 10,000$$

$$N = 1$$

Throughout the presentation Dr. Pascal shared many of his own oil paintings that he had completed. The paintings were interesting and beautiful, and complimented the themes he was discussing. One image was of a Martian sink hole with astronauts exploring strange life in its base. Another simply showed our time on Earth in a single sedimentary rock layer. Dr. Pascal also took some questions. He explained the time required to communicate over great distances probably shows that we could never have two-way conversation. The best we can hope to accomplish is to detect a techno-signature. He then shared an interesting theory about Roswell... The simple explanation may be that the Air Force



probably used monkeys to simulate high altitude balloon flights. Look it up if you are interested.

Dr. Pascal made a pitch that everyone should try to make a trip to Devon Island sometime during their life. He shared that he has spent every summer on the island for the past 25 years, helping to study Mars-like conditions.

Richard Bell thanked our guest and gave a brief President’s Report. Good news: 214 KAS memberships! The Remote Telescope flat field screen arrived on March 4<sup>th</sup>. Mike Patton gave us an update on the situation with a grow house threatening our Remote Telescope’s pristine skies. Richard then shared that he thinks that we could have an “in person” meeting as early as July (with *Gadget Night* in the Nature Center’s amphitheater). September has a lot of promise for KAMSC being open. And finally, Richard’s 11-week *Introduction to Astronomy* course will start its next semester on April 6<sup>th</sup> (learn more on page 13).

In Observing Reports: Richard observed Mars near Pleiades and Pete Mumbower shared an impressive image of M81 (see page 6). In *Astronomical News & Events*, the new rover on Mars, Perseverance, landed and made its first move. And finally, in future events, *Introduction to Amateur Astronomy* wraps up this month. The Messier Marathon at Richland Township Park was scheduled for March 13<sup>th</sup>. The close of meeting was at 9:18 pm.

## BOARD Meeting Minutes

The KAS Board met on March 14, 2021. It was held virtually via Zoom and was brought to order by Richard Bell at 5:07 pm EDT. Other attending members include: Jack Price, Don Stilwell, Aaron Roman, Joe Comiskey, Dave Garten, Kevin Jung, Scott Macfarlane and Pete Mumbower. With no recommended changes to the agenda, Don presented the Treasurer’s Report including the Account Balance Report and Cash Flow Report.

Don provided reports for the details of account balances since our last meeting. He took a question by Jack about the Remote Telescope access fee. Donations made by *Introduction Amateur Astronomy* lecture series (IAA) has created a good revenue for the KAS. This has been

reinforced in increased SkyShop sales. The majority of SkyShop sales have been planispheres. Jack mentioned that with the extra available funds we could set aside more for insurance in the Owl Observatory maintenance fund, and a majority of the Board accepted his recommendation (Richard and Aaron objected).

Richard shared that IAA series has had many international attendants and that the series has contributed to an increase in membership. It was noted that the series has 880 registrants and that there were 350 attendees for the last session. He speculated that general meetings and Online Viewing Session attendance were greatly improved by IAA. Richard shared that the attendance-taking during the first session was very time consuming, but that by changing the sign-in process, he was able to make a very quick and usable Excel spreadsheet. Richard commented that Lloyd Simmons has been a great help during IAA. Kevin has agreed to help answer questions for the last session. Richard improved format of IAA content and updated content in notes. Aaron Roman agreed to look into developing a children's version of IAA, with Jack and Don also showing support for expanding the children's program. To close out the discussion about the IAA, it was decided to send hard copy of certificates to all participants that completed the program.

Next Richard presented upcoming events for March – May, with a brief summary for each. The IAA will conclude on March 20<sup>th</sup>. General meeting speakers are set for April and May. Concerning 2021 Public Observing Session season status: After thoughtful consideration and discussion on potential KAS policy, the policy published by Grand Rapids Amateur Astronomical Association, and the potential risk by the KAS, the Board voted as follows: April/May Public sessions are CANCELED to the public. This will be re-addressed on a meeting-by-meeting basis with the next vote to be taken in May for the June sessions. There was also discussion by board members that the Public Observing Session will continue to be scheduled and published like normal with an additional note that the sessions were canceled due to COVID considerations.

Follow-up Items from Previous Meeting: Richard and Jack are still discussing an online vendor for new line of KAS clothing. In July, *Gadget Night* may be held in the amphitheater at the Kalamazoo Nature Center. It was discussed that any events held at the Nature Center would be subject to best guidance by KNC Policy and that provided by the state. It was also discussed that KAS would also have to develop its own policy and guidelines for attendees. It is hoped that we can return to KAMSC for meetings in September.

In new business, Richard reported that Mike Melwiki donated a ZWO ASI294MC Pro Camera. After some discussion it was decided to keep the camera for KAS use for the time being. It will be available for loan to club members. KAS will be renewing Google Drive to increase storage capacity to 2 TB as well as renew TheSkyX Serious Astronomer Edition used in Owl Observatory.

The next board meeting was agreed for Sunday, May 9<sup>th</sup> at 5pm EDT on Zoom. The meeting adjourned at 6:20 pm EDT.

— *Both minutes submitted by Aaron Roman*



Take a look at the KAS membership list that *starts* on page 7. That is the largest membership list to ever be published in *Prime Focus*. I wasn't able to format it as a numbered list, but allow me to tally them up for you. We currently have 223 memberships. I mean, just wow! I knew we'd reach 200 this year after last year's final tally of 191 memberships, but we did it a lot sooner than estimated. Just remember, we never even hit 180 memberships before last year and now were over 220! Just unreal. And it's *only* April!

One reason for the dramatic increase in membership is that we had a higher-than-usual retention rate. Second, is the online version of the *Introduction to Amateur Astronomy* lecture series. That created a surge in membership and most are not even from the southwest Michigan region, but from all across the country. That's why I included their hometown in the listing. Let's just hope they maintain their membership once the lecture series has faded from memory!

To sum it up, the seventh installment of the lecture series is the most successful version in every way measurable. Nearly 900 people registered and 222 people attended all five parts (and signed in as instructed). By comparison, the largest attendance for the in-person version was ~100 with an average of 25 people successfully completing the series. We have also received an unprecedented number of donations and sales as a result of the series. Attendance during KAS online activities has also increased. We reached the Zoom limit of 100 for the last Online Viewing Session in February and during the March General Meeting.

Once this god-awful pandemic ends, I hope things don't go back to normal...at least in regard to KAS activities. We need to develop a new, hybrid way of doing things. The Online Viewing Sessions will continue as is (moving the sessions to an online format had *nothing* to do with the pandemic). However, we need to streamcast most general meetings and future installments of the lecture series online. Not only can this possibly help retain our new members, but bring in many more. ***The hard part is we need a volunteer (or volunteers) to make this happen.*** Perhaps it would be prudent of the KAS is invest in a high-quality camcorder and microphone system. Activities could be streamed live on YouTube and edited afterward.

The KAS is also planning to start an Astrophotography Special Interest Group (SIG). Discussion about this started up several months back, but both Pete Mumbower and I are looking to formally begin in May. Our first goal will be to pick a day and time to meet. Most regular SIG meetings will probably be held on Zoom (even when the pandemic is over), but we could often meet in person when a more hands-on experience is needed. Meeting on Zoom for stuff like processing lessons and demonstrations would be easier, since they could be recorded and kept online. Contact me if you'd like to join the new Astrophoto SIG.

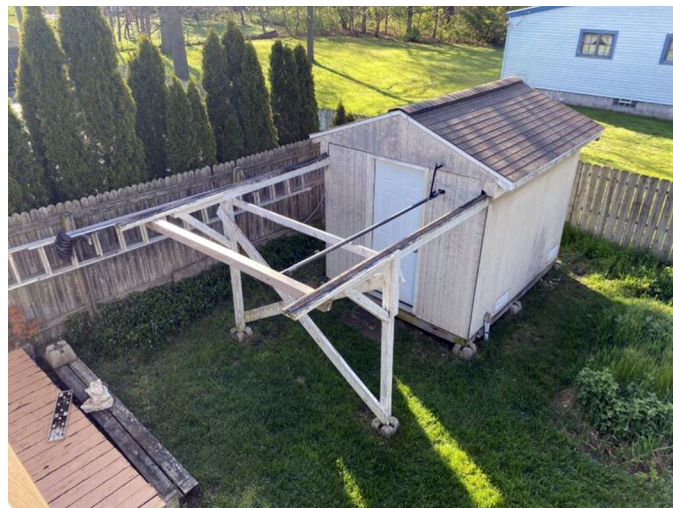


# KAS Member Observatories

## Part 9: Pete Mumbower's Observatory

I have been active in amateur astronomy since the late 80s. By the early 90s I had a passion for capturing the night sky with a camera attached to a tripod or telescope. Over the years I would drag the setup out in the backyard or far away field. Over time doing this diminished the desire to do astrophotography because of the long setup and tear down. So as a result, my "productivity" dropped. After taking some time off from the hobby, I got back into things. With a family and full-time job, I quickly realized having an observatory would be a great benefit since I could be capturing photons or viewing in minutes. So began my journey with two observatories to date.

My first was a roll-off roof that I designed and was influenced by Owl Observatory and from former KAS member David Moore's Astropad back in 90s. It was an 8x10-foot structure with 6-foot walls to block neighbor and streetlights. I poured a massive pier that went 6 feet into the ground, 4 feet above ground and was 12-inches diameter with stainless j-bolts to attach an aluminum plate for an equatorial mount. This setup worked great for 10 years as it went from housing an 8-inch reflector on a Celestron CGEM mount to a 9.25-inch SCT on a CGE-Pro mount.



An opportunity came to move from the heavy light polluted skies of the greater Grand Rapids area to the much darker rural skies of southern Kalamazoo county. Now the fun part of this was selling the house with an observatory that had a sliding roof. So, I decided to dismantle everything and bring along the major pieces so I could build a new observatory eventually. What was left was a giant concrete pier sticking out of the ground embedded with steel rebar. The effort to remove it would be great, so I decided to put a bird bath on top and see how it would go listing the house for sale. Fortunately, the market was hot and only a few prospective buyers asked what it was. In the end the buyer of the house did not even ask about it...so, to my knowledge, it is still a bird bath.



After moving to the new house in the spring of 2020 with the beginning of the pandemic and having a lot of time on my hands, I got back into capturing the night sky. Without an observatory I had the gear setup in the backyard under a Telegizmo 365 cover. This is an amazing product and does a great job keeping rain off the gear. But there was still setup involved of dragging a table, computer, etc. outside each night and then cover it up the next morning. This was somewhat tolerable until I had a clear night forecasted and then out of nowhere at 2am, a popup rainstorm happened while I was imaging. I never moved so fast to get things covered up. After this I was determined to get another observatory built ASAP.

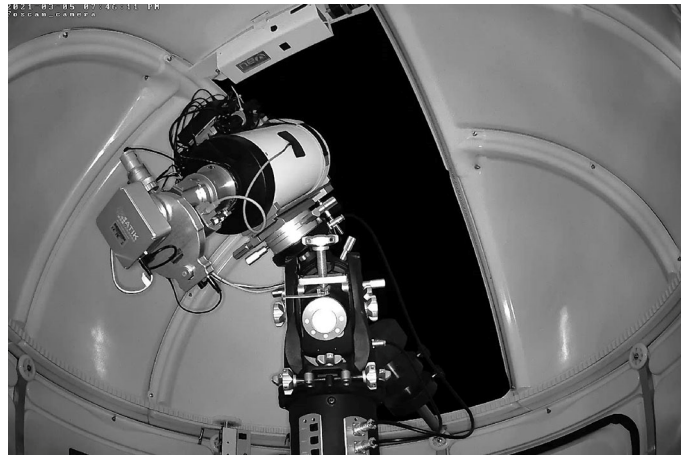
I started designing another roll-off observatory that would be smaller than the last but better fit my needs. With advances in software and hardware, imaging for the amateur can be done from anywhere, including inside the house on a comfy sofa. So, I did not need a really large structure. With a design and build of materials in hand, I was ready to head down to Home Depot to buy everything needed.

Then out of nowhere while looking at some photos of the massive white domed observatories atop of Mauna Kea in

Hawaii, my wife asked if I really wanted a dome instead. Of course I said yes and had already researched the size and cost of one. I put together a presentation and got approval to get a NexDome 8ft observatory. This fit the bill perfectly and came with all the features I needed: wind protection, shielding from the random neighbor lights, dew is practically non-existent, able to handle up a 14-inch SCT/RC/DK sized scope, and it is fully automated.

After placing the order and waiting 9 weeks for it to arrive from Canada, it got delivered on Christmas Eve. Along with some well-timed warm-ish weather, I got it built with the help of my son in 2 days. It took a few clear nights to get everything working well. But now I can sit inside my house and remotely open/close the shutter, image all night long with the dome slit sync'd with where the telescope is pointed. For those middle of the week clear nights, I am able to start an imaging run, go to bed at a reasonable time, and the software handles it all. In the morning I wake up to the scope parked and the dome closed. I recently acquired an observatory weather station that monitors the conditions and if clouds roll in, it starts to rain, or the wind gets insane, the observatory will automatically close to protect the telescope. Finally, there is enough room inside the observatory to have a guest over to do some visual observing. With the benefit of wind and “hopefully” bug protection.

Currently, I have not named the observatory and still am thinking about that. It currently houses an 8-inch f/8 Ritchey-



Chrétien and 8-inch f/4 Newtonian riding on a Celestron CGE-Pro equatorial mount (soon to be replaced with an Astro-Physics 1100GTO). Along with a host of cameras, eyepieces, star charts, and other goodies.

If you ever have the opportunity to build your own personal observatory, I would highly recommend it. You will be observing or photographing the night sky so much more without the hassle of setup and teardown. This by far is the best astronomy related purchase I have ever and will ever make.



## MESSIER 81

by Pete Mumbower

M81 is a spiral galaxy located 12 million light-years away in Ursa Major. Known as Bode's Galaxy, it is 92,000 light-years across and contains ~250 billion stars. It is the largest member of the M81 Group, which contains 34 galaxies. It is the nearest galaxy group to the Local Group.

Pete obtained this image of M81 from his new observatory in Vicksburg between March 3 - 6, 2021. It is a 38-hour total exposure using H-alpha (45 × 20-minute), Luminance (60 × 10 minute), Red, Green, and Blue filters (26 × 10 -minutes each).

Equipment used includes a TPO 8-inch f/8 Ritchey-Chrétien telescope and ATIK 383L+ monochrome CCD camera on a Celestron CGE Pro German EQ mount. Images were acquired with Sequence Generator Pro and processed entirely with PixInsight.

[Click here to see the full image](#)



# Membership of the Kalamazoo Astronomical Society

**Thomas Abraham**  
Kalamazoo, MI  
Senior | 2022

**Amy Alexander**  
New Braunfels, TX  
Regular | 2021

**Jan Andersen**  
Kalamazoo, MI  
Senior | 2021

**Paul Asmus**  
Kalamazoo, MI  
Senior | 2021

**Robert Baldyga**  
Portland, MI  
Senior Family | 2021

**Jeffrey Baldwin**  
Griffin, GA  
Supporting | 2021

**Harold Ballen**  
Kalamazoo, MI  
Senior Family | 2021

**Alton Bates**  
Manchester, MI  
Senior Family | 2022

**Jack Beertema**  
Plainwell, MI  
Senior Family | 2021

**Richard Bell**  
Kalamazoo, MI  
Lifetime | n/a

**Svetla Ben-Itzhak**  
Manhattan, KS  
Supporting | 2021

**Jeff Berson**  
Crawfordville, FL  
Supporting | 2021

**Karen & Peter Berzins**  
Kalamazoo, MI  
Senior Family | 2022

**Luke Bessler**  
Portage, MI  
Student | 2021

**Charles Bibart**  
Vicksburg, MI  
Senior Family | 2022

**Betty Bledsoe**  
Portage, MI  
Senior | 2021

**Jack & Lorrie Bley**  
Paw Paw, MI  
Family | 2021

**Rebecca Bodnar**  
Allegan, MI  
Senior Family | 2021

**Rich Bogdanovich**  
Denver, CO  
Senior | 2022

**Matthew Borton**  
Paw Paw, MI  
Regular | 2021

**Craig Brockmeier**  
Bartlesville, OK  
Senior | 2022

**Betsy Bobb & Tommy Brown**  
Portage, MI  
Family | 2021

**Phyllis Buskirk**  
Kalamazoo, MI  
Lifetime | n/a

**Michael Bussey**  
Kalamazoo, MI  
Senior | 2021

**Beverly Byle**  
Kalamazoo, MI  
Senior | 2022

**Dale A. Campbell**  
Otsego, MI  
Family | 2022

**David Carpenter**  
Kalamazoo, MI  
Family | 2021

**Craig Carrel**  
Marshall, MI  
Regular | 2021

**Bonnie Covert & Mike Chaffee**  
Battle Creek, MI  
Senior Family | 2022

**Cori Charles**  
Buckeye, AZ  
Regular | 2021

**Janine Chesak-Black**  
Kalamazoo, MI  
Senior Family | 2022

**Barry Collins**  
Marshall, MI  
Family | 2021

**Joe & Ellen Comiskey**  
Portage, MI  
Family | 2021

**Roark Consolatti**  
Paw Paw, MI  
Senior Family | 2021

**Michael Cook**  
Kalamazoo, MI  
Family | 2021

**Amiel Cooper**  
Jamaica Plain, MA  
Senior | 2021

**Harry Cotterill**  
Kalamazoo, MI  
Senior Family | 2021

**Steve Crawford**  
Kalamazoo, MI  
Regular | 2021

**John Dillworth & Dorilee Crown**  
Portage, MI  
Family | 2021

**Kalman & Becky Csia**  
Kalamazoo, MI  
Senior Family | 2022

**Simon Dale**  
Battle Creek, MI  
Family | 2021

**Jeff DeHaven**  
Mattawan, MI  
Family | 2022

**Sue DeNise**  
South Haven, MI  
Regular | 2021

**Matthew DePriest**  
Vicksburg, MI  
Family | 2022

**Jeff Dickerman**  
Lowell, MI  
Honorary | 2021

**Richard Dirrenberger**  
Portage, MI  
Senior | 2021

**Dave Doan**  
Kalamazoo, MI  
Senior | 2021

**Lynne Dorsey-Smith**  
Wildwood, GA  
Regular | 2022

**George Drake**  
Edwardsburg, MI  
Senior | 2021

**Kristi & Steve Durbin**  
Kalamazoo, MI  
Family | 2021

**Fred E. Dutton**  
Kalamazoo, MI  
Senior | 2021

**James Dyer**  
Kalamazoo, MI  
Senior Family | 2022

**Janet Dykens**  
Portage, MI  
Regular | 2021

**Fred Espenak**  
Portal, AZ  
Honorary | n/a

**Eric Fischer**  
Kalamazoo, MI  
Regular | 2022

**Thomas Foor**  
Kalamazoo, MI  
Senior | 2022

**Tom Fota**  
San Diego, CA  
Senior | 2021

**Tom Fowle**  
Martin, MI  
Senior Family | 2021

**William Fowler**  
Mattawan, MI  
Family | 2021

**Richard Frantz**  
Battle Creek, MI  
Senior Family | 2021

# Membership of the Kalamazoo Astronomical Society (cont.)

**Justin Freese**  
Three Rivers, MI  
Family | 2021

**Linda & Charlie Grdina**  
Mattawan, MI  
Family | 2021

**Rachel Humphrey**  
Waite Park, MN  
Supporting | 2025

**Srinivasa Kota**  
Saint Joseph, MI  
Family | 2022

**Joseph Frick**  
Portage, MI  
Family | 2021

**Roy & Dana Grubbe**  
Bexley, OH  
Supporting | 2025

**Arya Jayatilaka**  
Kalamazoo, MI  
Family | 2023

**Tyler Krasavage**  
Kalamazoo, MI  
Student | 2021

**Cathy Friday**  
Kalamazoo, MI  
Regular | 2022

**Tony Gurczynski**  
Kalamazoo, MI  
Senior | 2021

**Dean Johnson**  
Kalamazoo, MI  
Senior | 2021

**Zosha Kuiper**  
Okemos, MI  
Student | 2021

**Saul Frommer**  
Murrieta, CA  
Supporting | 2021

**Rick Gustafson**  
Eureka, CA  
Senior Family | 2021

**Phillip Johnson**  
Portage, MI  
Family | 2023

**Jim Kurtz**  
Kalamazoo, MI  
Regular | 2022

**Paul Gallagher**  
Portage, MI  
Family | 2021

**Deb Hamilton**  
Portage, MI  
Regular | 2021

**Stephanie & Levi Johnson**  
Gobles, MI  
Family | 2021

**Tim Kurtz**  
Kalamazoo, MI  
Regular | 2022

**Dave & Bonnie Garten**  
Portage, MI  
Family | 2022

**Alexander Hanchar**  
Portage, MI  
Senior | 2021

**Dorothy Jones**  
Battle Creek, MI  
Family | 2021

**Robert Lando**  
Kalamazoo, MI  
Senior Family | 2022

**Matt Garten**  
Kalamazoo, MI  
Regular | 2022

**Robert & Barbara Havira**  
Portage, MI  
Senior Family | 2022

**Kevin Jung**  
Grand Rapids, MI  
Regular | 2021

**Hayden Lane-Davies**  
Kalamazoo, MI  
Student | 2021

**Brendan & Dee Gauthier**  
Kalamazoo, MI  
Senior Family | 2021

**Daniel Heaton**  
Kalamazoo, MI  
Regular | 2021

**Ahsanuddin & Maliha Ali Khan**  
Kalamazoo, MI  
Senior Family | 2021

**Christopher Larson**  
Jackson, CA  
Supporting | 2021

**Dzintars "Z" Gendrikovs**  
Kalamazoo, MI  
Senior | 2022

**Keegen Henschel**  
Kalamazoo, MI  
Regular | 2022

**Rodney Kinne**  
Battle Creek, MI  
Senior | 2021

**John Lee**  
Kalamazoo, MI  
Senior Family | 2022

**Tom George**  
Kalamazoo, MI  
Regular | 2021

**Geoffrey Hickok**  
Gobles, MI  
Senior | 2022

**Mark Kinsey**  
Kalamazoo, MI  
Regular | 2021

**J. Scott Levene**  
Kalamazoo, MI  
Senior Family | 2022

**Jennifer Gessler**  
Kalamazoo, MI  
Family | 2021

**Lydia Hoff**  
Oshtemo, MI  
Regular | 2021

**Kellie Kloosterman**  
Kalamazoo, MI  
Regular | 2021

**Nancy Wood & Dale Lighthizer**  
Plainwell, MI  
Senior Family | 2022

**Sandra Geyer**  
Sturgis, MI  
Regular | 2021

**Ryan Horak**  
Grand Rapids, MI  
Regular | 2021

**Tanner Klute**  
Kalamazoo, MI  
Student | 2021

**Janice Livesay**  
Portage, MI  
Senior | 2021

**James Gianoulakis**  
Las Vegas, NV  
Senior | 2021

**Dave Horton**  
Springfield, OR  
Regular | 2021

**Bob Koditek**  
Norwell, MA  
Regular | 2021

**Keith Longjohn**  
Kalamazoo, MI  
Senior | 2021

**Dick & Jackie Gillespie**  
Port St. Lucie, FL  
Senior Family | 2022

**Jerry Horton**  
Mount Pleasant, WI  
Regular | 2021

**Katherine Koons**  
Glen Mills, PA  
Senior Family | 2022

**Andrew Loveless**  
Lawton, MI  
Family | 2022

**Tonia Gonzalez**  
Kalamazoo, MI  
Family | 2022

**Brian & Kylie Horvitz**  
Kalamazoo, MI  
Family | 2021

**Kirk & Angela Korista**  
Portage, MI  
Family | 2021

**Gary & Phyllis Lubbert**  
Kalamazoo, MI  
Family | 2021



# Membership of the Kalamazoo Astronomical Society (cont.)

**Chuck Lund**  
Paw Paw, MI  
Senior | 2022

**Cathy & Mike McMinn**  
Delton, MI  
Family | 2022

**Jim & Christene Oorbeck**  
Kalamazoo, MI  
Family | 2022

**Michael Quinn**  
Portage, MI  
Senior Family | 2021

**L. Carlton Lyles**  
Sterling Hts., MI  
Senior | 2022

**Michael J. Melwki**  
Plainwell, MI  
Regular | 2021

**Charles Overberger**  
Kalamazoo, MI  
Regular | 2021

**Jay Raycraft**  
Kalamazoo, MI  
Regular | 2021

**Scott Macfarlane**  
Schoolcraft, MI  
Family | 2021

**Chris Miller**  
Lowell, MI  
Regular | 2022

**David Parks**  
Battle Creek, MI  
Family | 2021

**Jonathan Reck**  
Plainwell, MI  
Senior Family | 2022

**Dale E. Mais**  
Marcellus, MI  
Senior | 2022

**John Miller**  
Plainwell, MI  
Regular | 2021

**Robert Parrish**  
Edwardsburg, MI  
Senior | 2021

**James Reiss**  
Louisville, KY  
Senior | 2021

**Joseph Mallek**  
Evanston, IL  
Senior | 2021

**Mark & Ninah Miller**  
Kalamazoo, MI  
Senior Family | 2022

**Ryan Pate**  
Kalamazoo, MI  
Regular | 2022

**Andrew C. Robins**  
Kalamazoo, MI  
Regular | 2021

**Cary Mannaberg**  
Kalamazoo, MI  
Regular | 2021

**Scott Millin**  
Portage, MI  
Family | 2021

**Sheetal Patel**  
Portage, MI  
Family | 2022

**Florence Roe**  
Kalamazoo, MI  
Senior | 2021

**Phillip & Linda Marshall**  
Lawrence, MI  
Senior Family | 2022

**Dave & Carol Mitchell**  
Portage, MI  
Senior Family | 2021

**Mike Patton**  
Plainwell, MI  
Senior | 2021

**Aaron & McKenzie Roman**  
Kalamazoo, MI  
Family | 2021

**Jennifer Martin**  
Kalamazoo, MI  
Family | 2022

**Gordie Moeller**  
Grand Rapids, MI  
Senior | 2022

**Thom Peters**  
Vicksburg, MI  
Senior | 2021

**Bill Rose**  
Kalamazoo, MI  
Senior Family | 2022

**Jon Towne & Bobbi Martindale**  
Bangor, MI  
Family | 2021

**Michele Momotiuk**  
Kalamazoo, MI  
Family | 2021

**George Piner**  
Brighton, MI  
Senior | 2021

**Brent Sanford**  
Portage, MI  
Regular | 2021

**Richard Mather**  
Richland, MI  
Regular | 2022

**Anne Mount**  
Kalamazoo, MI  
Regular | 2021

**Henry Polderman**  
Mattawan, MI  
Student | 2021

**Jason Schettner**  
Kalamazoo, MI  
Student | 2021

**Randy & Michelle Matson**  
Delton, MI  
Senior Family | 2022

**Pete Mumbower**  
Vicksburg, MI  
Regular | 2022

**Jack & Ruth Price**  
Kalamazoo, MI  
Family | 2021

**Matthew Schie**  
Auburn Hills, MI  
Regular | 2021

**Mark McClure**  
Cooper Twp., MI  
Senior Family | 2022

**Peggy Napier**  
Kalamazoo, MI  
Regular | 2022

**Alison Pruitt**  
Augusta, MI  
Regular | 2021

**Paul Schlegelmann**  
Corvallis, OR  
Regular | 2022

**Sandi McGuire**  
Kalamazoo, MI  
Senior Family | 2022

**Bill Nigg**  
Deming, NM  
Lifetime | n/a

**Dominic Pullo**  
Kalamazoo, MI  
Family | 2021

**Eric Schreur**  
Kalamazoo, MI  
Senior | 2022

**Joe McJilton**  
Battle Creek, MI  
Regular | 2021

**Andrew Northam**  
Portage, MI  
Family | 2022

**David Puzycycki**  
Stevensville, MI  
Regular | 2021

**Frank & Susan Severance**  
Kalamazoo, MI  
Senior Family | 2022

**Paul McKinley**  
Carson City, MI  
Senior | 2021

**Mark Ohrstrom**  
Kalamazoo, MI  
Regular | 2021

**Sam & Tina Qualls**  
Portage, MI  
Family | 2022

**Diane Schear**  
Kalamazoo, MI  
Regular | 2021

# Membership of the Kalamazoo Astronomical Society (cont.)

**Luis Silva**  
Pullman, MI  
Student | 2021

**Josh Taylor-Lehman**  
Portage, MI  
Regular | 2021

**Patricia Villalobos**  
Kalamazoo, MI  
Family | 2022

**Bob White**  
Plainwell, MI  
Senior | 2021

**Lloyd Simons**  
Mattawan, MI  
Family | 2021

**Gary & Karen Theisen**  
Hickory Corners, MI  
Family | 2022

**Alvaro Villamizar**  
Carlsbad, CA  
Supporting | 2021

**Jacob White**  
Kalamazoo, MI  
Regular | 2022

**Michael & Karen Sinclair**  
Kalamazoo, MI  
Senior Family | 2022

**Eric Therkildsen**  
Kalamazoo, MI  
Family | 2021

**Gary & Christina Vincent**  
Portage, MI  
Senior Family | 2022

**Reid Williams**  
Kalamazoo, MI  
Family | 2021

**Greg Sirna**  
Centreville, MI  
Regular | 2021

**Scott Thomas**  
Portage, MI  
Family | 2021

**John Vollmer**  
Lake Linden, MI  
Regular | 2022

**Roger & Molly Williams**  
Kalamazoo, MI  
Senior Family | 2022

**Annie Stephens**  
Riverdale, UT  
Senior | 2021

**Sam Tidwell**  
Dorado, Puerto Rico  
Senior | 2021

**Jim Vukelich**  
Bloomingdale, MI  
Senior | 2021

**John Wing**  
Portage, MI  
Family | 2024

**Mark Stewart**  
Hersey, MI  
Senior | 2021

**Terry Tomlinson**  
Coldwater, MI  
Senior Family | 2021

**Robert Wade**  
Salem, NH  
Supporting | 2021

**Klay & Karen Woodworth**  
Kalamazoo, MI  
Family | 2021

**Don Stilwell**  
Battle Creek, MI  
Senior Family | 2021

**Henry & Martha Upjohn**  
Kalamazoo, MI  
Family | 2021

**Brian Walesh**  
Kalamazoo, MI  
Family | 2021

**David Woolf**  
Kalamazoo, MI  
Family | 2022

**Stephanie Stratton**  
Paw Paw, MI  
Regular | 2022

**Deb Ulmer**  
Chatham, NY  
Supporting | 2021

**Lynn Ward**  
Green Bay, WI  
Supporting | 2022

**Jonathan Young**  
Saline, MI  
Family | 2022

**Brian & Terri Swisher**  
Kalamazoo, MI  
Family | 2022

**Elaine VanBelleghem**  
Kalamazoo, MI  
Senior | 2021

**Philip Wareham**  
Portage, MI  
Regular | 2022

**Mohammed Zafar**  
Kalamazoo, MI  
Regular | 2021

**Renée Szostek**  
Scotts, MI  
Regular | 2021

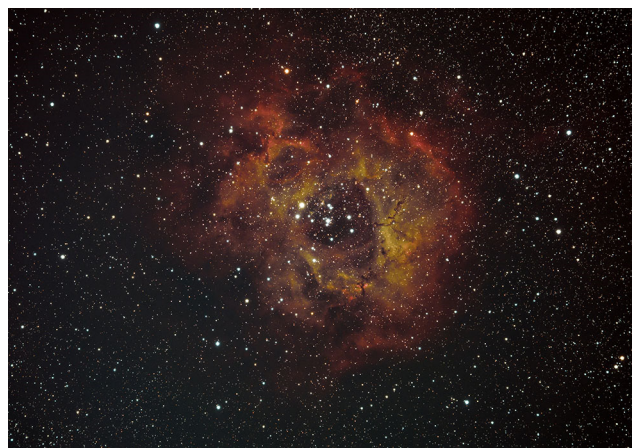
**Michael & Debbie Vandever**  
Lawton, MI  
Senior Family | 2021

**Sharyl Weber**  
Kalamazoo, MI  
Family | 2021

**David Taylor**  
Constantine, MI  
Regular | 2021

**Marie Viglas**  
De Pere, WI  
Regular | 2021

**Katie & Duane Weller**  
Grand Rapids, MI  
Family | 2021



## ***KAS Member Astrophoto Highlight***

KAS member [Mike Melwiki](#) took this image of the Rosette Nebula, an emission nebula located in the constellation Monoceros. It covers 4 times as much sky as the Moon! The nebula region includes the open cluster NGC 2244 (center), which contains ~100 members.

Mike captured this image using a William Optics Zenithstar 73mm refractor and ZWO ASI2600MC Pro CMOS camera (with Optolong L-Pro filter) on a Celestron CGX mount. Total exposure time is 90-minutes with 18 5-minute subframes. The images were stacked and calibrated in DeepSkyStacker and edited with Adobe Photoshop 2021.





NASA Night Sky Notes...

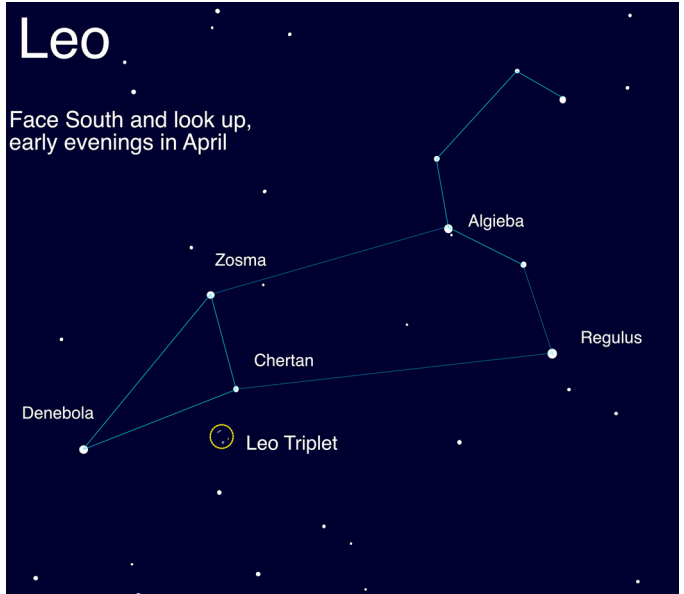
# Watch the Lion: Celestial Wonders in Leo

by **David Prosper**

Leo is a prominent sight for stargazers in April. Its famous sickle, punctuated by the bright star Regulus, draws many a beginning stargazer's eyes, inviting deeper looks into some of Leo's celestial delights, including a great double star and a famous galactic trio.

Leo's distinctive forward sickle, or "reverse question mark," is easy to spot as it climbs the skies in the southeast after sunset. If you are having a difficult time spotting the sickle, look for bright Sirius and Procyon - featured in last month's article - and complete a triangle by drawing two lines to the east, joining at the bright star Regulus, the "period" in the reverse question mark. Trailing them is a trio of bright stars forming an isosceles triangle, the brightest star in that formation named Denebola. Connecting these two patterns together forms the constellation of Leo the Lion, with the forward-facing sickle being the lion's head and mane, and the rear triangle its hindquarters. Can you see this mighty feline? It might help to imagine Leo proudly sitting up and staring straight ahead, like a celestial Sphinx.

If you peer deeper into Leo with a small telescope or binoculars, you'll find a notable double star! Look in the sickle of Leo for its second-brightest star, Algieba - also called Gamma Leonis. This star splits into two bright yellow stars with even a small magnification - you can make this "split" with binoculars, but it's more apparent with a telescope. Compare the color and intensity of these two stars - do you notice any differences? There are other multiple star



**Stars of Leo: note that you may see more or less stars, depending on your sky quality. The brightness of the Leo Triplet has been exaggerated for the purposes of the illustration - you can't see them with your unaided eye.**

systems in Leo - spend a few minutes scanning with your instrument of choice, and see what you discover.

One of the most famous sights in Leo is the "Leo Triplet": three galaxies that appear to be close together. They are indeed gravitationally bound to one another, around 30 million light-years away! You'll need a telescope to spot them, and use an eyepiece with a wide field-of-view to see all three galaxies at once! Look below the star Chertan to find these galaxies. Compare and contrast the appearance of each galaxy - while they are all spiral galaxies, each one is tilted at different angles to our point of view! Do they all look like spiral galaxies to you?

April is Citizen Science Month, and there are some fun Leo-related activities you can participate in! If you enjoy comparing the Triplets, the "[Galaxy Zoo](#)" project could use your eyes to help classify different galaxies from sky survey data! Looking at Leo itself can even help measure light pollution: the [Globe at Night](#) project uses Leo as their target constellation for sky quality observations from the Northern Hemisphere for their April campaign, running from April 3-12. Find and participate in many more NASA community science programs at [Citizen Science](#). Happy observing!

*This article is distributed by NASA Night Sky Network. The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit [nightsky.jpl.nasa.gov](https://nightsky.jpl.nasa.gov) to find local clubs, events, and more!*



**Your view of the three galaxies in the Leo Triplet won't look as amazing as this image taken by the VLT Survey Telescope, unless you have a telescope with a mirror 8 feet or more in diameter! Image Credit: ESO, INAF-VST, OmegaCAM; Acknowledgement: OmegaCen, Astro-WISE, Kapteyn I.**

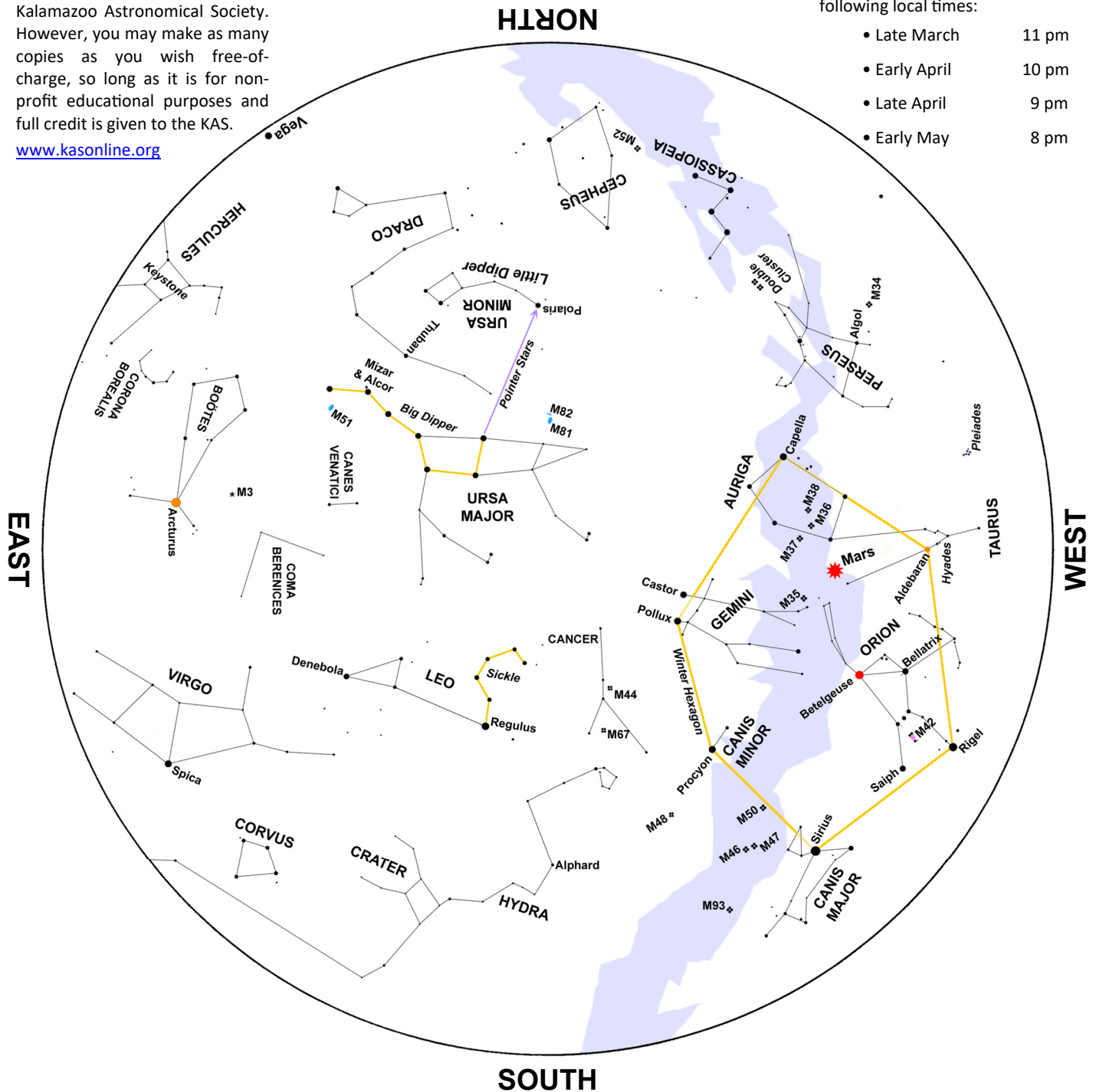
# — April Night Sky —

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](http://www.kasonline.org)

This map represents the sky at the following local times:

- Late March 11 pm
- Early April 10 pm
- Late April 9 pm
- Early May 8 pm



The Moon has a full calendar of conjunctions in April. It begins with a trio of encounters at dawn with the two Jovian planets. On April 5<sup>th</sup>, a waning crescent Moon, Saturn, and Jupiter form a shallow arc. Next, on April 6<sup>th</sup>, the Moon is positioned 4½° below Saturn, with Jupiter to their left forming a triangle. Finally, on April 7<sup>th</sup>, the Moon finds itself

5° below Jupiter with Saturn off to the upper right.

The Moon then encounters the Red Planet. Mars will be 5° above the Moon on the evening of April 16<sup>th</sup> and 5° below the Moon on April 17<sup>th</sup>.

A first quarter Moon visits the Beehive

Cluster (M44) in Cancer, the Crab, on the evening of April 20<sup>th</sup>. Only 4° separate them, making it possible to see them both in binoculars.

A waning gibbous Moon will be 4° above Antares, in Scorpius, at dawn on April 29<sup>th</sup>. It may be spring, but the stars of summer are on their way!



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April 2021

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## 8" SCT Available for Loan

Our Celestron 8" Schmidt-Cassegrain telescope is quick and easy to setup. A dew cap, 3 eyepieces, Tel-Rad finder, and more are included.

This is a serious amateur telescope that will provide dazzling views of the Moon and planets, and is capable of showing you thousands of deep sky objects.

Visit the [Telescopes for Loan](#) webpage for more information and contact KAS Equipment Manager Arya Jayatilaka today if you'd like borrow it.



## Introduction to Astronomy

Astronomy is intimately connected to our most basic need; the quest to know where we fit in the grand scheme of things. To that end, Richard Bell is offering a 11-week online astronomy course. This is a course of personal enrichment. There will be assignments to complete and exams to be taken, but no grades or credits will be given. Challenge and better yourself. [Download the syllabus](#) to learn more and contact Richard to register.

**Tuesdays & Thursdays from 6:00 - 7:40 pm**

**Begins April 6<sup>th</sup> on Zoom**



## Member-Only Observing Sessions



Join your fellow KAS members for a pleasant evening under the stars. To ensure the safety of all that attend, we ask everyone to adhere to the following guidelines:

- All attendees are required to wear a mask or other form of facial covering whenever in close proximity to others.
- Maintain at least 6 feet of physical distancing between other attendees whenever possible.
- Eyepieces and high-touch surfaces (such as focusers) will be sanitized after each use. Members bringing their own equipment are required to provide sanitizing wipes.
- If you have a cough or are feeling ill, please stay at home.

**April 10<sup>th</sup> & 24<sup>th</sup> @ 8:00 pm**

*Kalamazoo Nature Center • 7000 N. Westnedge Ave.*

## General Meeting Preview



**Putting Together the Pieces of the Milky Way**  
*Now with Pictures!*

presented by  
**Dr. Timothy Beers**  
University of Notre Dame

**Friday, April 9<sup>th</sup> @ 7:00 pm**  
*Held on Zoom • [Click here to Register](#)*

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

STAMP

