Prime Focus

A Publication of the Kalamazoo Astronomical Society

☆ ☆ ☆ July 2013 ☆ ☆ ☆

This Months KAS Events

General Meeting: Friday, July 12 @ 7:00 pm

Kalamazoo Nature Center - See Page 3 for Details

Presentation: Saturday, July 13 @ 10:00 am

Portage District Library - See Page 9 for Details

Observing Session: Saturday, July 13 @ 9:00 pm

Super Summer Nebulae - Kalamazoo Nature Center

Observing Session: Saturday, July 27 @ 9:00 pm

The Moon & Planetary Nebulae - Kalamazoo Nature Center

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Highlights of the July Sky. . .

- - - 3rd - - -

DUSK: Binoculars or a wide -field telescope may show that Venus, very low in the WNW, is on the edge of M44, the Beehive Cluster.

- - - 5th - - -

Earth is at aphelion, its farthest from the Sun for the year (3.3% farther than its perihelion in January.

- - - 8th - - -

New Moon
3:14 am EDT

- - - 15th - - -

First Quarter Moon
11:18 pm EDT

PM: Spica is very close to the Moon.

- - - 16th - - -

PM: Saturn is above the Moon, with Spica to their right.

- - - 16th → 17th - - -

DAWN: Jupiter and Mars are just 2.2° apart, very low in ENE an hour before sunrise. Binoculars or a telescope may show that the open cluster M35 is ½° above Mars.

- - - 21st - - -

DUSK: Look 1¼° to lower left of Venus for much fainter Regulus very low in west 45 minutes after sunset. Use binoculars.

- - - 22nd - - -

DAWN: Mars is to upper left of Jupiter low in ENE an hour before sunrise.

Full Moon
2:16 pm EDT

DUSK: Venus is 1¼° above Regulus

- - - 29th - - -

Last Quarter Moon
1:43 pm EDT

June Meeting Minutes

The general meeting of the Kalamazoo Astronomical Society was brought to order by President Richard Bell on Friday, June 7, 2013 at 7:18 pm. Approximately 40 members and guests were in attendance in the Cooper's Glen Auditorium at the Kalamazoo Nature Center.

Richard was also the featured speaker of the evening and the title of his presentation was *Star-Hopping the Summer Milky Way*. This was the second presentation in Richard's seasonal stargazing series; the first being *Orion Always Comes Up Sideways* at the February 2010 meeting.

Richard said clear summer nights were the most wonderful time of the year and the reasons were obvious. The first being the weather. Naturally, the summer months bring the most comfortable night-time temperatures, but also the clearest skies. Using data from the National Weather Service, Richard said that on average 41% of the clear nights in a year occur between July - September.

Additionally, the night-time side of Earth faces the center of the Milky Way Galaxy during the summer. This allows stargazers to enjoy the plethora of deep sky objects along the densest portion of the Milky Way's disk. Richard then listed his favorite observing books and some necessities to conduct a successful observing session (i.e. binoculars, telescopes, eyepieces, deep sky filters, etc.)

Richard then described the nemeses of the night. The first is, of course, light pollution. It is said that two-thirds of the world's pollution can no longer see the Milky Way from their home. The next nemesis was dew and Richard discussed some ways to keep your optics dry.

The last nemesis was none other than the MOSQUITO, described by many as the most dangerous animal on Earth.

It doesn't get much better than this!

Richard gave some background on this great summer pest and ways you can defend yourself. Mosquito spray repellents such as DEET were mentioned, but Richard also discussed the new ThermaCELL repellent devices. They use a butane cartridge to generate a tiny flame that heats up a small blue pad soaked in a nearly odorless repellent derived from chrysanthemum flowers. It is supposed to keep a 15×15 square foot area nearly bug free.

Richard than began the heart of his presentation; a celestial tour of stars, constellations, and deep sky objects along the summer Milky Way between Cygnus and Scorpius. Here is the list of objects Richard highlighted by constellation:

Lyra
- Epsilon Lyra - Double Double
- M57 - Ring Nebulae

Cygnus
- NGC 6992, NGC 6995, NGC 6960 - Cygnus Loop
- NGC 7000 - North America Nebula
- Beta Cygni - Albireo

Vulpecula
- M27 - Dumbbell Nebula
- Collinder 399 - Coathanger

Scutum
- M11 - Wild Duck Cluster

Scorpius
- M7 - Ptolemy Cluster

Sagittarius
- M8 - Lagoon Nebula
- M17 - Swan Nebula
- M20 - Trifid Nebula
- M22 - Great Sagittarius Cluster

Notes from Richard's presentation and star maps to help you track down the objects listed above are available upon request. He'll bring hard copies to the July meeting (since he forgot to bring them to the June meeting).

Richard gave a brief President's Report after the snack break. The KAS Board is planning to create a new line of KAS clothing. We are hoping to have embroidered T-shirts, hats, etc. since printing tends to breakdown over time and patches can peel off. Richard asked members in attendance to solicit clothing designs and desires to the Board. Mark Miller reported observing the recent triple conjunction of Venus, Mars, Jupiter; although clouds prevented us from seeing them in an equilateral triangle on May 26th. The meeting concluded at 9:26 pm EDT. Several members stayed after for observing in Owl Observatory.

General Meeting

Double Feature!

Double your pleasure, double your fun at the next general meeting of the Kalamazoo Astronomical Society. The meeting will be held on **Friday, July 12th at the Kalamazoo Nature Center** and features two special attractions:

On the morning of February 15, 2013, a 7,000-ton asteroid crashed into the Earth's atmosphere, exploded, and fell to the ground across a wide swath near the Ural Mountains in Russia. A blinding flash of light streaked across the sky, followed by a shuddering blast strong enough to damage buildings and send more than 1,000 people to the hospital. According to NASA, the Siberian meteor exploded with the power of 30 Hiroshima bombs and was the largest object to burst in the atmosphere since the Tunguska event of 1908 - another impact in Siberia that left few eyewitnesses or clues. This time, the event was captured by digital dashboard cameras, now common in Russian autos and trucks.

Within days, NOVA crews joined impact scientists in Russia as they hunted for clues about the meteor's origin and makeup. Is our solar system a deadly celestial shooting gallery - with Earth in the crosshairs? And what are the chances that another, more massive asteroid is heading straight for us?

Today the 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.

Observations

by **Richard S. Bell**

The July General Meeting will be delayed one week (as usual) because of the Fourth of July holiday weekend. We will also gather at an alternate meeting site. Therefore, please join us at 7pm on July 12th at the Nature Center. Details on the meeting appear in the column to your left.

Saturday, July 13th could be a very busy day for the KAS if the weather cooperates. Novice members might be interested in a presentation at the Portage District Library starting at 10:00 am. KAS Board Members Mike Cook and Rich Mather will present *Learning the Night Sky & Your Telescope* (see page 9 for details). The KAS will also participate at the Kindleberger Summer Festival in Parchment on July 13th. We'll have tables and solar telescopes setup between 10am - 3pm, but we need to arrive by 9am to setup and beat the parade (which starts at 10am). Some of our regular volunteers are unavailable, so please contact us if you'd like to help out. Finally, we also have a Public Observing Session scheduled for July 13th at the Nature Center (another session is planned for July 27th).

Only five KAS members attended the field trip to Abrams Planetarium and MSU Observatory on June 14th. These include (in addition to myself) Beverly Byle, Scott Macfarlane, Rich Mather, and Don Stilwell. We thought we were going to watch a show called *Gateway to Infinity* in the planetarium, but they just changed over to a new show. The new show was called *Bad Astronomy* featuring our Astronomy Day 2009 guest speaker Phil Plait. It was a fun show, but a little on the corny side.

The weather was excellent for the open house at MSU Observatory, so we got to view several objects through the 24-inch telescope. Attendance was very good and several telescopes were setup outside the observatory by local amateurs. This open house was the last held under the direction of Professor Horace Smith, who just retired after a successful career. It sounds like open houses will continue, but Horace will reduce his roll to just another volunteer.

It disappointing that only 5 members attended the field trip. This continues our recent streak of failed field trips. I've tried to organize trips to Science Central in Fort Wayne and the Armstrong Air & Space Museum in Wapakoneta, Ohio (not to mention multiple attempts to gets members up to Veen Observatory in Lowell) without success. What gives? Why don't you folks like attending field trips anymore? There are ~200 members in the KAS, you'd think at least 10% of you would participate. General meeting attendance and volunteer participation in events like Astronomy Day is great, but we need to find a way to inspire more members to join field trips and attend observing sessions.

Astronomy Day 2013 Report

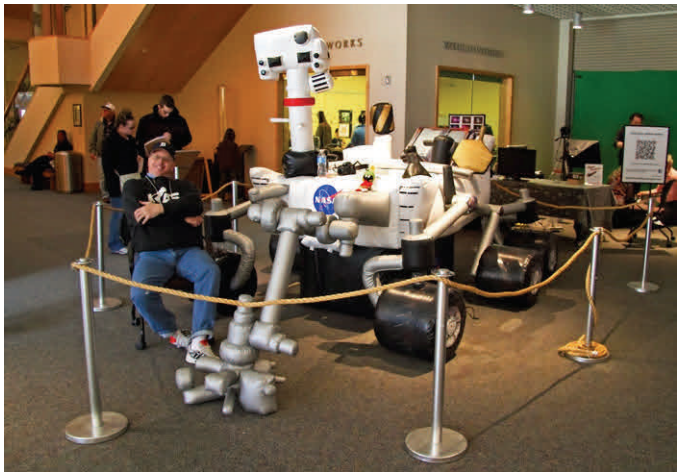
by Richard S. Bell

For thousands of years it was only a blood-red dot amongst a sea of stars. It would eventually be identified as one of five "wanderers" that moved relative to the fixed stars. Mars' usual motion was from east to west, but occasionally it would stop and move backwards. This retrograde motion confused the ancient philosophers. Eventually we realized that retrograde motion was an illusion caused by the planets motion around the Sun.

Mars became a world to explore after the invention of the telescope. The Italian astronomer Giovanni Schiaparelli observed mysterious linear features crisscrossing Mars' surface which he called "canali." The wealthy Bostonian amateur astronomer Percival Lowell was one of many that speculated the canali were a complex system of artificial canals. Mars seemed to be inhabited!

The canals were an illusion, but this would not be definitively proven until the beginning of the Space Age. Since 1965 humans have successfully sent five spacecraft to flyby Mars, nine spacecraft to orbit the planet, three landers and four rovers to explore the rusty surface. They have made some incredible discovers. Mars has a vast canyon, gigantic volcanoes, and dried up river beds. This could only mean that Mars was more Earth-like billions of years ago!

One day we hope to visit the Red Planet in person. Some of the challenges to meet before mounting a manned expedition include advances in propulsion and understanding the effects of prolonged exposure to radiation and weightlessness on the human body. No matter what, Mars will be a big part of our future.



Mike Sinclair keeps watch on Astronomy Day 2013's main attraction — a full-scale inflatable model of the *Curiosity* rover currently exploring the Red Planet.

On Saturday, April 20th the Kalamazoo Astronomical Society honored the past, present, and future of Mars exploration. Astronomy Day 2013 turned out to be our most successful event thus far. Everything about this event was bigger and better than past efforts. This includes the displays, hands-on activities, special presentations, and most importantly the attendance. An estimated 976 people attended this year's event, but the actual attendance was likely over 1,000. Ironically, this year's event was supposed to be simpler but it quickly took on a life of its own!

Daytime activities were held at the Kalamazoo Valley Museum from 9am - 4pm. The first indicator of the great day ahead were the approximately 50 people waiting to get into the museum in morning. They and other morning attendees were greeted by my co-coordinator, **Jean DeMott**, and **Molly Williams**. KAS Vice President **Jack Price** and **Beverly Byle** greeted attendees in the afternoon.

Returning to the Freebie Table in the morning for the third year-in-a-row was **Oxnar Theelien**. He was relieved by **Dennis Stuart** during the afternoon. Freebies were generously supplied by *Astronomy* magazine, Chandra X-Ray Center, Goddard Space Flight Center, Jet Propulsion Laboratory, NASA Space Place, and *Sky & Telescope* magazine. Much of our inventory was depleted by the end of the day.

Our "Meet the Telescopes" display was setup next to the Freebie Table this year (along the wall of names in the museum's lobby), which worked out great since everyone had to pass by them. **Don Stilwell** supplied an example of a refractor and reflector and answered questions during the morning. **Dave Woolf** setup a Schmidt-Cassegrain and volunteered at the display during the afternoon.

The rest of our displays were setup in the back of the museum's first floor. The first one was a little hard to miss. It was a full-scale inflatable model of the Mars Science Laboratory, affectionately named *Curiosity*. I first learned about the inflatable *Curiosity* rover in the summer of 2012 and knew we had to borrow one. Finding the keepers of inflatable *Curiosity* proved to be challenging, but I finally tracked down the proper person at the Jet Propulsion Laboratory. Even better was that the museum offered to pay all the shipping expenses, which freed up our funds for all the other attractions and activities. **Mike Sinclair** kept a watchful eye over inflatable *Curiosity* in the morning and answered lots of questions. **Scott & Scotty Macfarlane** volunteered to watch *Curiosity* in the afternoon. I've got to also thank **Mike Cook** for filling in for Sinclair when he ran home for his Marvin the Martian doll!

Joe Comiskey helps these two young astronomers make a Martian. This was a VERY popular activity.

Two other displays related to Mars were setup next to inflatable *Curiosity*. They were called *The Marvelous Features of Mars* and *Roving the Red Planet*. At first I had no plans to create more displays for this year's Astronomy Day. I thought the inflatable rover was enough, but I'm glad Jean talked me into it. They turned out really well and attracted a lot of attention. In between the two Mars displays was a television playing all the videos from the "Mars in a Minute" series produced by JPL. They were perfect, since most were only a minute long but very informative. Check them out online if you haven't seen them yet. Our last display was the usual, but impressive collection of KAS Member Astrophotography.

Solar observing and hands-on activities began at 10am. Unfortunately, solar observing didn't fare too well this year. Weather conditions on April 20th were cold and cloudy. The high temperature was only 40° F. In fact, we had snow flurries throughout the day. That was an Astronomy Day first! **Dave Garten**, **Bill Nigg**, and **Roger Williams** setup telescopes but did very little solar observing. Other members that brought telescopes but never set them up (so far as I know) were **Jim Kurtz**, **Tim Kurtz**, and **Bill Van Dien**. However, they still stayed outside in the frigid conditions most of the day hoping the Sun would make an appearance. That's dedication!

Our hands-on activities were phenomenally successful this year. The most popular activity was "Make a Martian." It was staffed by **Joe Comiskey** and **Becky Csia** in the morning and then by **Jean DeMott** and **John Miller** in the afternoon. Jean originally wanted to have kids make the Martians out of clay, but it probably would have been cost prohibitive. Plus, we weren't sure how to get them dried out for the trip home. Instead we used pom-poms, wiggly eyes, and glittery pipe cleaners. I saw many creative designs throughout the day, which shows that kids can still use their imaginations. Most of our supplies were used up at days end, so over 150 Martians must have been created on Astronomy Day!

The next activity was 100% Jean's creation. She called it the "Land the Rover on Mars" activity, but I still prefer "Pin the Rover on Mars." As the later name suggests it was a new spin on the classic party game "Pin the Tail on the Donkey." We had a large image of Mars printed with Gale Crater (home to the real *Curiosity*) prominently labeled. Kids would then be blind folded and attempt to pin the rover in the crater. Everyone was a winner and took home a solar system pencil and *Curiosity* sticker. WMU physics student **Mady Higinbotham** and KAS member **Karen Woodworth** volunteered at the rover activity during the first shift. **Susan, Bond**, **Angela Newton**, and **Molly Williams** took over in the afternoon.

Our other Mars-themed activity was called "Coloring the Red Planet." Young astronomers could color one (or more) of several pictures to choose from at the table and/or take some home to color later. The most popular picture to color was the 8.5" × 14" image of *Curiosity* on Mars. **Arthur Woodworth** volunteered his time at the coloring table in the morning, while **Elizabeth Miller** and **Stephanie Stratton** helped out in the afternoon.

The last hands-on activity departed from our Mars theme, but was very popular nonetheless. It was the "Moon Phase Flipbook" activity. I searched the Internet far and wide for a Moon phase flipbook activity, but I didn't like any of them. Therefore, I made one myself and I dare say it's now the greatest one in existence! Volunteers at the activity in the morning were **Scotty Macfarlane** and **Chris Roberts**, followed by **Joe & Patti Borrello** in the afternoon.

The rest of our daytime activities started at 11am. Stargazing shows were held in the planetarium at the top of the hours from 11am - 3pm. *Invaders of Mars* was shown on the half-hour between 11:30 am and 3:30 pm. Total attendance for all the free planetarium shows was 510 (making the average attendance per show 51).

Celestial Portraits returned for the second time at Astronomy Day. **Donovan & Karen Larabel** from Michigan Unlimited

Chris Roberts (on the left) and Scotty Macfarlane had their hands full at the Moon Phase Flipbook table.

Photography were back to take people's portraits in front of a green screen. They choose one of several astronomically-themed images to superimpose in the background. They made $305 total and half that goes toward the Robotic Telescope Project. **Rich Mather** collected money for the Celestial Portraits in the morning, while **Frank Severance** worked the register in the afternoon. Rich and Frank also did a great job selling Mars Bars. We didn't make a lot of money from the sales (~$30), but I got them because it was funny and fit our theme.

The first of our three Mars presentations also began at 11am and was given by **Dr. David Strauss**. Dr. Strauss is an Emeritus Professor of History at Kalamazoo College and the author of *Percival Lowell: The Culture and Science of a Boston Brahmin*. Dr. Strauss gave the "Mars of the Past" lecture, which was entitled *Percival Lowell and the Canals of Mars.* Total attendance for Dr. Strauss' excellent presentation was 74; very impressive considering it started fairly early in the morning. All the presentations were held in the Mary Jane Stryker Theater, which has a seating capacity of 84.

Harvey Elliott, a graduate student in the Department of Atmospheric, Oceanic and Space Sciences at the University of Michigan, gave the "Mars of the Present" lecture at 1pm. Harvey called his presentation *Exploring Mars with the Curiosity Rover* and it was attended by 112 people. It was literally standing room only. Several of my KVCC students were in attendance, writing reports for extra credit, and they all said this presentation was their favorite. I'd have to agree. Harvey gave a very thorough account of the rover's development and it's scientific achievements thus far.

The "Mars of the Future" lecture was given at 3pm by **Dr. Benjamin Longmier**, an assistant professor in the Aerospace Engineering Department at the University of Michigan. The title of Dr. Longmier's presentation was *What Will it Take to Get Humans to Mars? - The Future of Propulsion*. Out of all the presenters he was the hardest to

Don Stilwell talks about the inner-workings of a reflector, while these young astronomers inspect the business end of his telescope.

Harvey Elliott, a graduate student from the University of Michigan, talked about the *Curiosity* rover in front of a packed theater on Astronomy Day.

find. Harvey volunteered to give his talk early on and then I decided to invite Dr. Strauss after coming up with the "Mars: Past, Present, and Future" theme. I made several attempts to invite speakers from NASA. Then I watched a video on YouTube that Jean DeMott sent me. At the end of the video were suggested videos and one of them featured Dr. Longmier. He just the at UofM faculty in September 2012, so it could not have worked out better. Attendance for Dr. Longmier's presentation was 95 - also standing room only. I'd like to invite Dr. Longmier to give his presentation again at a general meeting, because he was running a little long and had to cut it short.

Special thanks to **Kevin Jung** for taking pictures of all our special Mars presenters and other Astronomy Day activities. I tried to record the presentations for the volunteers that could not attend, but it didn't work out. I should have downloaded the video files after each presentation, but I didn't and ran out of room half-way through Harvey's talk!

Daytime activities came to an end at 4pm and some of us enjoyed a leisurely dinner at Old Burdick's. This was a nice change of pace, because we're usually in a terrible rush to get to the Nature Center for the keynote presentation.

Our only evening activity for Astronomy Day 2013 was the first successful Public Observing Session of the year at the Nature Center. Attendance at observing sessions is always difficult to quantify, but I'd guess at least 80 members and guests were in attendance. This was very impressive considering how cold it was that night. Members that setup telescopes and shared views of the Moon, Jupiter, Saturn, and more include **Mike Cook**, **Dave Garten**, **Jim Kurtz**, **Tim Kurtz**, **Bill Nigg**, **Don Stilwell**, and **Roger Williams**.

Thanks again to all our volunteers for making this the best Astronomy Day thus far. For our efforts the Astronomical League awarded us "Quality Event Year After Year" in the 2013 Astronomy Day Award. Please be sure to visit the Astronomy Day 2013 Gallery on *KAS Online*.

High-Energy Spy

by Dr. Martin C. Weisskopf

The idea for the Chandra X-Ray Observatory was born only one year after Riccardo Giacconi discovered the first celestial X-ray source other than the Sun. In 1962, he used a sounding rocket to place the experiment above the atmosphere for a few minutes. The sounding rocket was necessary because the atmosphere blocks X-rays. If you want to look at X-ray emissions from objects like stars, galaxies, and clusters of galaxies, your instrument must get above the atmosphere.

Giacconi's idea was to launch a large diameter (about 1 meter) telescope to bring X-rays to a focus. He wanted to investigate the hazy glow of X-rays that could be seen from all directions throughout the sounding rocket flight. He wanted to find out whether this glow was, in fact, made up of many point-like objects. That is, was the glow actually from millions of X-ray sources in the Universe. Except for the brightest sources from nearby neighbors, the rocket instrument could not distinguish objects within the glow.

Giacconi's vision and the promise and importance of X-ray astronomy was borne out by many sounding rocket flights and, later satellite experiments, all of which provided years-, as opposed to minutes-, worth of data.

Composite image of DEM L50, a so-called superbubble found in the Large Magellanic Cloud. X-ray data from Chandra is pink, while optical data is red, green, and blue. Superbubbles are created by winds from massive stars and the shock waves produced when the stars explode as supernovas.

By 1980, we knew that X-ray sources exist within all classes of astronomical objects. In many cases, this discovery was completely unexpected. For example, that first source turned out to be a very small star in a binary system with a more normal star. The vast amount of energy needed to produce the X-rays was provided by gravity, which, because of the small star's mass (about equal to the Sun's) and compactness (about 10 km in diameter) would accelerate particles transferred from the normal star to X-ray emitting energies. In 1962, who knew such compact stars (in this case a neutron star) even existed, much less this energy transfer mechanism?

X-ray astronomy grew in importance to the fields of astronomy and astrophysics. The National Academy of Sciences, as part of its "Decadal Survey" released in 1981, recommended as its number one priority for large missions an X-ray observatory along the lines that Giacconi outlined in 1963. This observatory was eventually realized as the Chandra X-Ray Observatory, which launched in 1999.

The Chandra Project is built around a high-resolution X-ray telescope capable of sharply focusing X-rays onto two different X-ray-sensitive cameras. The focusing ability is of the caliber such that one could resolve an X-ray emitting dime at a distance of about 5 kilometers! The building of this major scientific observatory has many stories.

Learn more about Chandra at:

http://www.science.nasa.gov/missions/chandra

Take kids on a "Trip to the Land of the Magic Windows" and see the universe in X-rays and other invisible wavelengths of light at:

http://spaceplace.nasa.gov/magic-windows

Dr. Weisskopf is project scientist for NASA's Chandra X-ray Observatory. This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

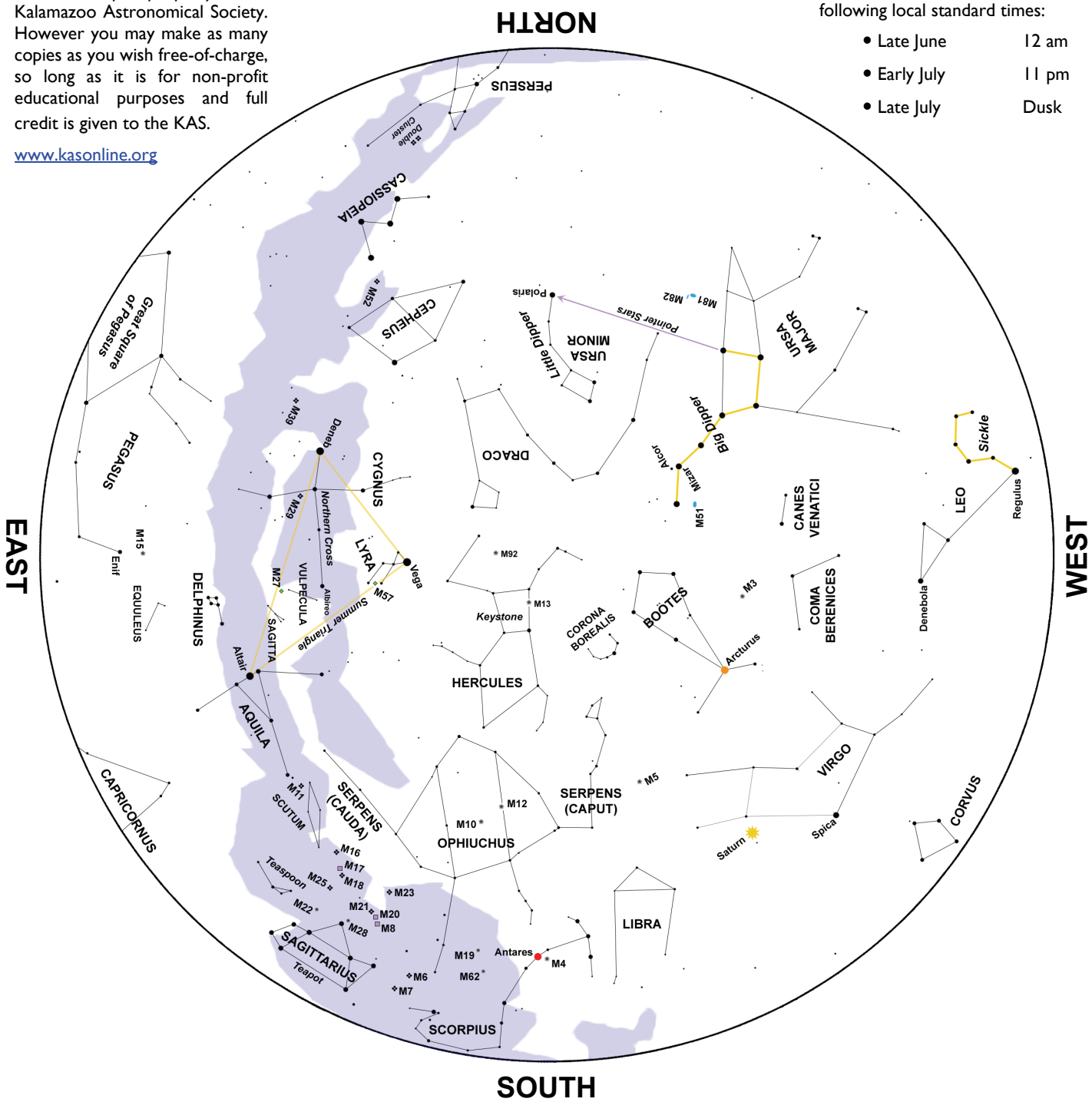
July Night Sky.....

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 standard times:

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



Venus will be less than 1º from the Beehive Cluster (M44) on July 3rd. You'll need binoculars or a wide-field telescope to make the observation. Look low in the west-northwest about an hour after sunset.

The First Quarter Moon will be very close Spica, in Virgo, on the night of July 15th/16th. At its closest, Spica will be less than ½º above the Moon.

Jupiter and Mars will be 2.2º apart before dawn on July 16th & 17th. Look very low in the east-northeast an hour before sunrise. Binoculars or a wide-field telescope might show the open cluster M35 to the lower left of Mars.

Venus will be just over 1º north of Regulus on July 21st. You should be able to spot Regulus in binoculars very low in the western sky about 45 minutes after sunset.

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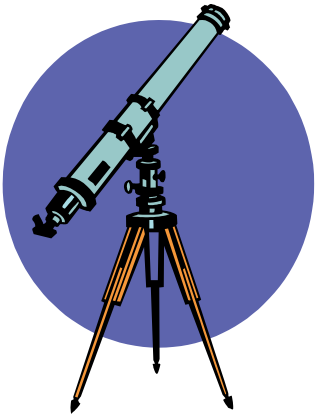
Learning the Night Sky & Your Telescope



Have you ever wanted to look at the night sky through a telescope but found the whole process intimidating? Members of the Kalamazoo Astronomical Society will help you learn how to navigate the night sky and show how to use some of the tools necessary for a successful night under the stars.

Saturday, July 13th, 10am - 12pm

Portage District Library

Kalamazoo Valley Museum

Planetarium Show Schedule

In My Backyard
Weekdays @ 11am; Sat. @ 1pm; Sun. @ 2pm

Treasures of the Great Lakes
Tues. & Thurs. @ 3pm; Sat. @ 2pm

Black Holes: The Other Side of Infinity
Sun., Mon., Wed., Fri. & Sat. @ 3pm

Planetarium admission is $3.00 per person. The Kalamazoo Valley Museum is located at 230 North Rose Street in downtown Kalamazoo. For more information please call (269) 373-7990 or visit us on the web at www.kalamazoomuseum.org

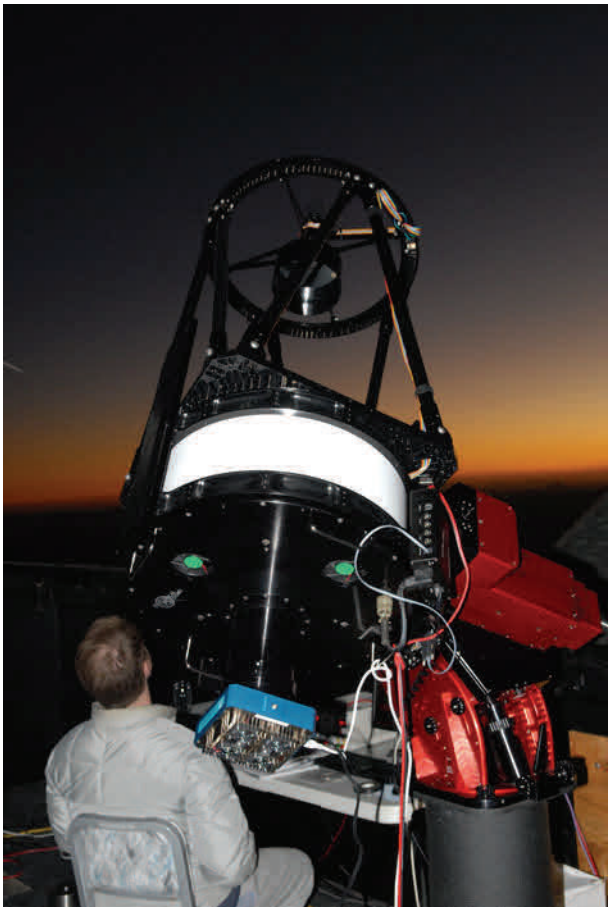
Public Observing Sessions

Saturday, July 13th
Features: Super Summer Nebulae

Saturday, July 27th
Features: Pleasant Planetary Nebulae

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

Kalamazoo Nature Center • 7000 N. Westnedge Ave.



Robotic Telescope
Fundraiser

The time is now! Contribute to the Robotic Telescope Project today.

Learn more about this exciting project on KAS Online.

Donations can be made in one of two ways:

- **Via PayPal (send money to kas@kasonline.org)**
- **Check or Money Order (made payable to the KAS - use return address shown below)**

Please remember that the KAS is a non-profit organization. All contributions are federally recognized as tax deductible per section 501(c)(3) of the IRS code.

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STAMP