

Highlights of the June Sky...

--- 3rd ---

PM: The nearly Full Moon is 4° to the upper left of Antares.

--- 4th ---

Full Moon

--- 5th ---

PM: TRANSIT OF VENUS
Please see the timeline on page 7.

--- 11th ---

Last Quarter Moon

--- 14th → 30th ---

Dusk: Mercury is more than 9° above the WNW horizon a half-hour after sunset.

--- 16th ---

Dawn: Waning Crescent Moon forms a long triangle with Jupiter and the Pleiades to its lower left.

--- 17th ---

Dawn: A very thin Moon is near Jupiter low in the ENE a half-hour before sunrise. Look for Venus to their lower left.

--- 19th ---

New Moon

--- 20th ---

Summer Solstice
7:09 pm EDT

--- 21st ---

Dusk: A Waxing Crescent Moon forms a wavy line with Mercury, Pollux, and Castor to its upper right.

--- 25th → 26th ---

PM: The crescent Moon passes below Mars.

--- 26th ---

First Quarter Moon

--- 27th ---

PM: The Moon is below Spica and Saturn.

Prime Focus

A Publication of the Kalamazoo Astronomical Society

☆ ☆ ☆ June 2012 ☆ ☆ ☆

This Month's KAS Events

Transit of Venus: Tuesday, June 5 @ 4:00 pm

Warren Dunes State Park - See Page 6 for Details

General Meeting: Friday, June 8 @ 7:00 pm

Kalamazoo Area Math & Science Center - See Page 14 for Details

Observing Session: Saturday, June 9 @ 9:00 pm

Grand Globular Clusters - Kalamazoo Nature Center

Kiwanis Star Party: Saturday, June 16 @ 9:00 pm

Kiwanis Youth Conservation Area - See Page 13 for Details

Observing Session: Saturday, June 23 @ 9:00 pm

Super Summer Nebulae - Kalamazoo Nature Center

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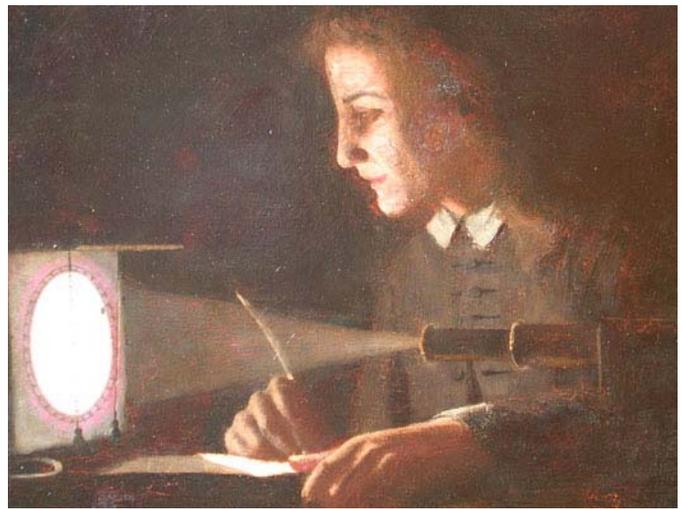
MAY MEETING MINUTES

The general meeting of the Kalamazoo Astronomical Society was brought to order by President Richard Bell on Friday, May 4, 2012 at 7:13 pm EDT. Approximately 39 members and guests were in attendance at the Kalamazoo Area Math & Science Center (KAMSC).

Our special guest speaker was Dr. Eli Maor, Adjunct Professor of Mathematics at Loyola University in Chicago and the author of *Venus in Transit* (and many other fine books). The title of Dr. Maor's presentation was *Venus Across the Sun's Face*.

Dr. Maor began by telling everyone how he got interested in astronomy. At age 5 his mother would take him out at night in Tel Aviv to see the stars. There were very few telescopes in Israel at the time, so he had to make due with his unaided eyes in the early days. He began collecting astronomy books and became interested in eclipses. Some of those books would (almost in passing) mention a Transit of Venus and he made a point of memorizing the first transit on June 8, 2004. Naturally, he would go on to publish his own book on the subject in anticipation of the historic day.

Johannes Kepler published his last major work, the *Rudolphine Tables*, in 1627. It included rules and tables for finding the position of the Sun, Moon, and planets, a catalog of over 1,000 stars begun by his late mentor Tycho Brahe, improved tables of logarithms, and the geographical coordinates of major cities of the world. In it Kepler made two predictions: Mercury would transit the Sun on November 7, 1631 and one month later (December 6th) Venus would do the same. Aware of the potential significance of these events for determining the size of the two planets, Kepler issued an "admonition" to all astronomers to be on the watch. Due to bad weather in



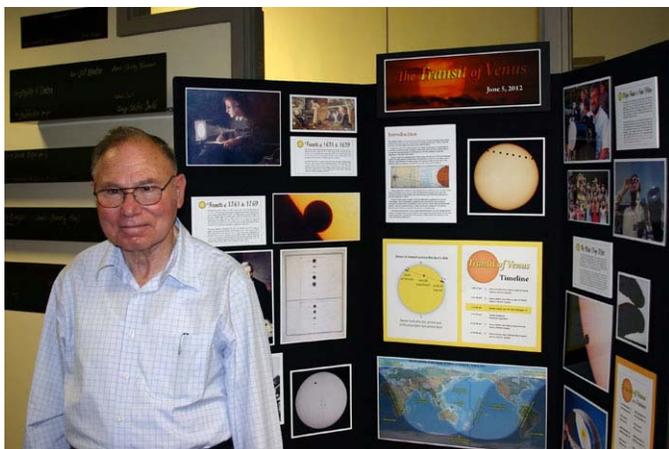
Jeremiah Horrocks predicted and observed the 1639 Transit of Venus, one of the first humans to do so.

Europe, only three people observed the Transit of Mercury and only one of them, Pierre Gassendi, left us with a detailed account. The Transit of Venus was not visible from Europe and no one else in the world was known to have observed it.

The story turns to Jeremiah Horrocks, a young English astronomer living in the small village of Hoole. Horrocks discovered that Kepler failed to predict the 1639 Transit of Venus. He calculated the transit would occur on December 4th, but made sure to start his observations a day early just in case. Horrocks observed the Sun (by projection) throughout the day on December 4th, but had to stop due to "business of the highest importance, which for these ornamental pursuits I could not with propriety neglect." He came back to find the Venus transit had begun! The Sun set while the transit was in progress, so Horrocks was only able to observe it for about 30 minutes!

The 1639 Transit of Venus was also observed by Horrocks' friend William Crabtree, who watched from his home in Manchester. Horrocks and Crabtree were to meet and discuss their observations on January 3, 1641, but Horrocks died the day before of unknown causes. He was only 22 years old. Horrocks and Crabtree are the only known humans to have observed the 1639 transit.

After the November 7, 1677 Transit of Mercury Edmund Halley got the idea of using a transit to determine the Astronomical Unit (AU), the average Earth-Sun distance. This idea would develop in his mind for the next 40 years. In 1716, when he was 60 years old, he submitted his proposal to the Royal Society. The main idea of the plan was to use the passage of Venus in front of the Sun as a means to



Dr. Eli Maor poses next to our Transit of Venus display after his excellent presentation.



Dr. Maor described Guillaume-Joseph-Hyacinthe-Jean-Baptiste Gentil de la Galaisiere (a.k.a. Le Gentil) as his hero because of his extreme dedication in his two attempts to time the Transit of Venus.

measure Venus' parallax, from which its distance from Earth could be computed. Once this distance was known, all the other distances in the solar system – particularly the AU – would easily follow, using Kepler's third law.

The French astronomer Joseph-Nicolas Delisle showed that it was not necessary to record the duration of the entire transit to finish; it would suffice to record the moments of internal contact at ingress or egress at each station. Now, in August 1760, less than a year before the event, he announced his method of observation, known since as "Delisle's Method."

Hundreds of astronomers observed the 1761 transit from 70 locations around the globe. It was the first international scientific effort in history.

Observers of the 1761 transit encountered something for which they were not ready at all. It had been expected that at the moment when Venus' circular image completely entered the Sun's disk, there would be a sudden, instantaneous separation of the planet's trailing edge from the Sun's limb. This was the most crucial moment of the entire transit; its exact timing was the goal of the entire elaborate observation program, and all eyes, telescopes, and clocks were waiting for the instant to happen. But instead of a sudden separation, Venus' trailing edge seemed to linger on for a while, as if it

hesitated before taking the final plunge. A kind of ligament was forming between Venus and the Sun's limb.

The same phenomenon happened again just before egress, when Venus' leading edge was about to leave the Sun. This black drop effect, as it became known, was seen by all those who observed the beginning or end of the transit. It was estimated to last anywhere from a few seconds to a full minute; its duration seemed to depend as much on the observer's subjective impression as on any objective factors.

Various theories were proposed to explain the black drop effect. These include turbulence in the Earth's atmosphere (bad seeing), an optical illusion, imperfections in the telescope, the unreliability of the observer's eyesight, Venus' own atmosphere, and solar limb darkening and broadening due to the instrumental point spread function.

Whatever the cause, the black drop effect frustrated all attempts to record the exact moments of ingress and egress. Even worse, estimates of its duration differed widely even among observers at the same station, making any attempts to correct the timings totally futile. Thus, the great international effort to use the transit of 1761 to determine once and for all the AU ended in disappointment, if not outright failure.

Dr. Maor said there was not enough time to tell every story that came out of the 1761 transit, but did tell the remarkable tale of one of the French expeditions lead by Guillaume-Joseph-Hyacinthe-Jean-Baptiste Gentil de la Galaisiere (or just Le Gentil). Le Gentil left France on March 26, 1760, more than a year in advance. On July 10th his ship stopped at the island of Mauritius – then known as Isle of France – east of Madagascar in the Indian Ocean. There he received bad news: the French plantation near Pondicherry, where he had intended to set up his instruments, had just been taken by the British.

Undaunted, he decided to reach the island of Rodriguez, further to the east, where Alexander-Gui Pingré (leader of another French expedition) was headed. On route to Rodriguez, he learned that a French frigate was about to leave Mauritius for the coast of Coromandel in India, so he changed his plans again. The frigate did not leave port until mid-March 1761 – less than 3 months before the transit. To make things worse, en route they experienced persistent calms, and Le Gentil was on the verge of despair. Finally, on May 24th, their ship reached India. The ships captain received news that Pondicherry itself had just been taken by the English, so he turned his boat around and sailed straight back to Mauritius.

June 6th arrived. It was a beautiful day on the Indian Ocean, and Le Gentil saw the entire transit, but from the deck of his pitching ship he could make no useful observations. Le Gentil decided to make the best out of a bad situation. Having an interest in the wildlife of the island, he decided to stay there, use the time to do some exploration of his own, and wait it out until the next transit eight years hence.

After eight years in the region, Le Gentil decided that Manila, capital of the Philippines, would be the best place to observe. He duly informed the Academy of Sciences in Paris of his intentions, and asked it to get official permission from the Spanish authorities. While his letter was on the way, a Spanish warship bound for Manila called port in Mauritius, and Le Gentil talked to the captain into taking him aboard. He reached Manila on August 10, 1766, and began preparing for the transit.

Then he received word from the Academy, instructing him to proceed to Pondicherry in India, his 1761 site, although only Venus' egress would be visible from there. He did as instructed and reached his old place in March 1768, still more than a year before the transit.

Finally the crucial day arrived. On the night before, the sky was crystal clear, and Le Gentil confidently waited for the morrow. "On June 3, 1769, at the moment when this indefatigable observer was preparing to observe the transit, a vexatious cloud covered the Sun, and caused the unhappy Le Gentil to lose the fruit of his patience and of his efforts." He had missed the planet's egress, the moment when Venus was leaving the Sun, not to return for a 105 years. As if to add to his frustration, he later learned that the skies were perfectly clear in Manila!

Having no chance to witness the next transit in 1874, he stayed in Pondicherry for a while, made some more observations, and slowly wound up his visit.

At last he was ready to leave, having been away for almost 12 years. After being twice shipwrecked, he made it to Cadiz (Spain), and completed the last leg of his journey on foot across the Pyrenees. When he finally arrived in Paris, Le Gentil learned that he had been assumed dead by his heirs, who were busy dividing his estate. The Academy, not quite ready to sign him off yet, nevertheless demoted him to the rank of "veteran" (retiree), being convinced that he had neglected his official duties in order to make some personal gains. He was eventually given back his rank and position at the Paris Observatory, but he had to take legal action to regain his personal property.

Le Gentil then married, and spent the remaining 20 years of his life raising their daughter and writing up his papers. His major work, an account of his exploration of the Indian Ocean, was published in two volumes in 1779-1781. He died in 1792 and the age of 67.

Dr. Maor concluded his wonderful presentation with an overview of Transits of Venus in the distant future. He also talked about the Transit of Earth (and Moon) that'll be visible from Mars on November 10, 2084. For more information please be sure to read Dr. Maor's excellent book *Venus in Transit*.

After discussing Astronomy Day and upcoming events, the meeting concluded at 9:10 pm EDT.



BOARD Meeting Minutes

The KAS Board met on May 11, 2012 at Sunnyside Church, the date being moved from Sunday to the preceding Friday to avoid conflict with Mothers' Day. President Richard Bell called the meeting to order at 7:05 pm. Present were board members Rich Mather, Jack Price, Don Stilwell, and Roger Williams. Also present was KAS member Jean DeMott. Since the meeting was being held prior to the solar filter workshop at 7:30 pm, an abbreviated format was planned.

Rich Mather limited the Treasurer's Report to the current status of eclipse shades sales. Don noted that the Warren Dunes State Park website did not show our eclipse or transit events on their calendar, and asked that we verify especially that the pavilion rental had been accomplished. Rich reported that the rental check had been cashed, so our position should be secure. Don was waiting for contact with the Warren Dunes people to check the status of our events.

Rich reported that the first Library Telescope had been delivered to the Portage District Library, and a display would be set up on Monday, May 21st to acquaint the patrons with the scope (while we also gave away the usual free NASA goodies and transit flip books).

Jean asked for feed-back from the Board on the Astronomy Day event at the Air Zoo this year. Jean had tried to talk to Air Zoo contacts to get their analysis, but unfortunately her calls had not been returned. The unexpected conflict with wedding events had complicated issues regarding available space, and Don estimated that during his time in the hands-on area, about 80% as many young people had been present as were at the Kalamazoo Valley Museum last year. The solar viewing area was seen as nearly ideal by all. Future plans seemed to hinge first on whether the Air Zoo showed any interest in offering their site next year and if so, in working out the problems encountered this time. Alternatively, a meeting with the museum personnel would be necessary to see how some problems like display of our banner could be solved (the requirement for fingerprinting KAS volunteers had already been dropped by the museum). The consensus was that we could see working with either site depending upon how further meetings go.

With the 7:30 pm time having arrived and with KAS members arriving for the solar filter workshop, the meeting was suspended until after the workshop. Discussing after the workshop was limited to preparations for the partial eclipse and Venus transit events. The next board meeting is scheduled for Sunday, June 10th at 5:00 pm. It'll again be held at Sunnyside Church.

Respectfully submitted by Roger Williams



Observations

by Richard S. Bell

We did it...but just barely! On May 20th, KAS members and guests at Warren Dunes State Park got to observe the partial solar eclipse. That was one of the most spectacular viewing experiences I've ever had. Some members that traveled (or now live) out west e-mailed to report (and brag) that they had perfect weather for the annular eclipse. I wouldn't trade our view at Warren Dunes for anything. Honest! It was that amazing. I'm not going to go into details. I and other members in attendance at Warren Dunes will share our stories, images, and video of the eclipse and Venus transit at the next general meeting on June 8th. Images and videos are definitely a plus, but they are not required. Please attend and share your viewing experiences with everyone.

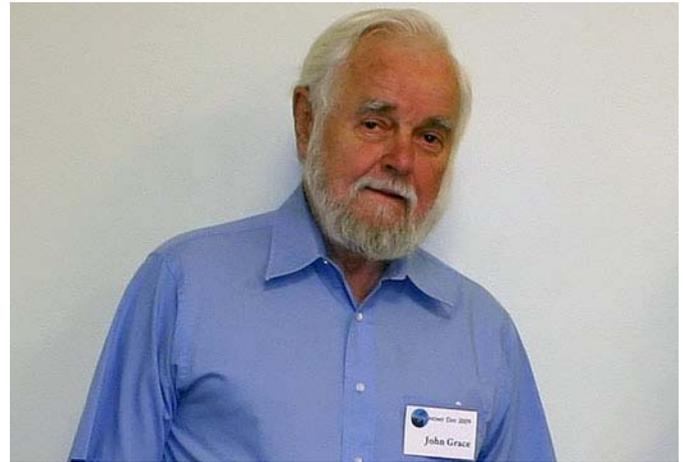
The big event for the month of June is the Transit of Venus. Heck, I dare say this is our biggest event of the year. After all, the Transit of Venus on June 5th will only be the *seventh* one humans have EVER observed. Sure, it won't be as spectacular as a total solar eclipse or a bright comet, but people have witnessed hundreds of those throughout recorded history. What makes a Transit of Venus special is its rarity. As you must know by now, this phenomenon will not occur again for 105.5 years. We are very lucky to live at the time when the transits even occur. Think about how many famous astronomers have come and gone and never witnessed a Transit of Venus.

Have I convinced you to join us at Warren Dunes State Park on June 5th yet? I certainly hope so because I'm hoping for clear skies and a massive crowd. Take the day off work and bring your friends and family. Please be sure to bring a properly filtered telescope with you since we are hoping for a *very* large crowd. Like the historic Mars opposition in 2003, we'll need every telescope we can get.

Our event begins at 4:00 pm with a Solar Star Party. We'll observe the Sun in both white light and hydrogen alpha. This will allow us to view sunspots, filaments, and prominences. We'll also do the Transit of Venus flipbook activity we did at Astronomy Day 2012 for the children in attendance. We need a couple volunteers for this, so expect a call for help fairly soon! The transit itself begins at about 6:04 pm EDT, but hydrogen alpha telescopes should be able to see Venus a few minutes earlier than this.

The KAS has reserved the same picnic area we used for the eclipse, so we have full control of it. Grills are available, so feel free to bring everything you need to have a barbeque. What better excuse to have a party!

If all goes well this will be one for the ages. Please join us and get ready for the last Transit of Venus of our lives!



Dr. John D. Grace

May 6, 1933 - May 21, 2012

KAS member John Grace passed away at the age of 79 surrounded by family on May 21, 2012. John was born in Cincinnati, Ohio on May 6, 1933 to the late Elizabeth (Ahlers) and William Grace. He graduated from Norwood High School, Cincinnati, Ohio in 1951. John received his Bachelor of Arts degree with Honors in Geology in 1955 from Denison University, Master of Science in Mineralogy and Petrology from Penn State, and Doctorate from Leeds University in England. He also was awarded an Honorary Doctorate of Philosophy from Leeds. He was a Professor of Geology at WMU for 30 years until he retired in 1996.

Through the years he did Research at Leeds, UCLA and Cambridge Universities, and Sabbaticals at Argonne National Laboratories, Chicago, Illinois. In retirement, his thirst for knowledge never ended, he enjoyed reading text books (for fun) and taking classes at KVCC. John enjoyed spending the winter months in the Bahamas with his wife and friends where he snorkeled and spent hours walking the beach. He loved spending time with his family and two grandsons. John's interests were varied; he belonged to the Kalamazoo Astronomical Society (since 2008), and the Kalamazoo Rock and Mineral Club. John loved aviation and volunteered as a Docent at Kalamazoo Air Zoo.

Surviving are his wife Harriet "Kelly"; son, Dean (Thea) Lapham; daughters: Diane Lapham and Dale Ann (Steve) Erdman; two grandsons: Adam and Chad Erdman; sister, Lila (Jack) Greer; and mother-in-law, Mary Walter. John was preceded in death by his mother, father, sister and brother-in-law Mary and Jack Reed.

In lieu of flowers, donations can be made to the Kalamazoo Astronomical Society Robotic Telescope Project. Please visit John's personal web page at www.lifestorynet.com where you can archive a favorite memory or photo of him and sign his online guestbook.

Our Last **Transit of Venus**

Venus crosses the Sun's face for the final time of our lives on June 5th. This is only the seventh Transit of Venus witnessed by humanity, so don't miss it. You won't get another opportunity for 105.5 years!

4:00 pm: Hands-on Activity for Children
Solar Star Party

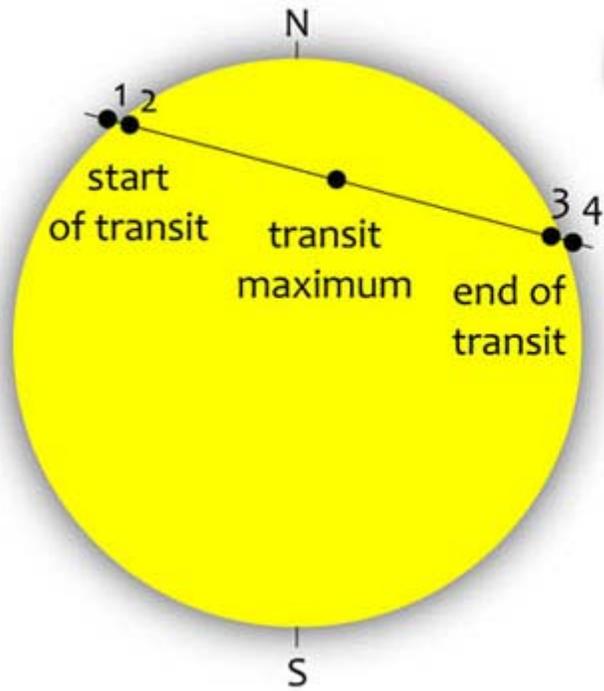
6:04 pm: Transit of Venus begins

9:17 pm: Sunset, Transit ends in progress

Tuesday, June 5 @ 4:00 pm

Warren Dunes State Park

12032 Red Arrow Highway • Sawyer, MI



Transit of Venus

Timeline

6:04:17 pm **1** Venus touches Sun's disk at start of transit
ingress, exterior contact

6:21:46 pm **2** Venus within Sun's disk at start of transit
ingress, interior contact

9:16:41 pm **Sunset, transit over for West Michigan ☹️**

9:27:23 pm Transit maximum
minimum separation

12:32:38 am **3** Venus within Sun's disk at end of transit
egress, interior contact

12:50:30 am **4** Venus touches Sun's disk at end of transit
egress, exterior contact

Astronomy Day 2012 Report

by Richard S. Bell

The great astronomer Johannes Kepler published the last of his three laws of planetary motion in 1619. Called the Harmonic Law, it said that the square of the orbital period of a planet is directly proportional to the cube of the semi-major axis of its orbit ($P^2 \approx a^3$). Therefore, if you know the orbital period of a planet in years you can determine its approximate average distance from the Sun in Astronomical Units. For the first time ever, astronomers had a way to determine the scale of the solar system. The problem was that no one knew the true value of the Astronomical Unit (AU).

Edmund Halley (of comet fame) developed a method for determining the value of the AU that involved observing a rare Transit of Venus. Halley reasoned that if the moments of ingress and egress could be timed to the nearest second, the AU could be found with high accuracy. By positioning observers around the world to make precise measurements and timings, one could calculate the solar parallax. This measurement is an apparent shift in the position of Venus' transit across the Sun's disk due to it being observed from different locations on the Earth's surface. (Visit [THIS](#) website for a complete explanation.)

Astronomers from many nations launched all-out observing campaigns around the globe to observe the 1761/1769 and 1874/1882 Venus transits. There's a misconception that the results of the transit expeditions ended in failure. After the 1882 transit, the Canadian-American astronomer Simon Newcomb combined the data from all four transits and arrived at a value of 149.5 million km. Compare this with the modern value of 149.6 million km. Nevertheless, Transits of Venus have very little modern scientific value, at least in regards of the Astronomical Unit.



The Astronomy Day 2012 Keynote Speaker was Dr. Jill Tarter, Science Working Group member for NASA's Kepler Space Telescope and Director of the Center for SETI Research. Image credit: Daniel Flanagan



This young astronomer came properly dressed for his Celestial Portrait. One small step for a kid, one great photo for Astronomy Day!

Today, astronomers use transits to discover new worlds around other stars...by the thousands!

The Kepler Space Telescope's mission is "specifically designed to survey a portion of our region of the Milky Way Galaxy to discover dozens of Earth-size planets in or near the habitable zone (the region in which liquid water can exist on the surface) and determine how many of the billions of stars in our galaxy have such planets." Kepler monitors the brightness of over 145,000 stars in a fixed field of view. This data is transmitted to Earth, and then analyzed to detect periodic dimming caused by extrasolar planets that transit their host star. Kepler has discovered 61 planets to date, while 2,321 planets await confirmation.

In honor of the last Transit of Venus of our lifetime on June 5th and the Kepler Space Telescope's mission our theme for Astronomy Day 2012 was "transiting worlds.". Daytime activities were held at the Air Zoo from 10am - 4pm on April 21st. Astronomy Days from 2006 - 2008 were held (primarily indoors) at the Kalamazoo Nature Center, while daytime activities for Astronomy Days from 2009 - 2011 were held at the Kalamazoo Valley Museum. Certain circumstances forced us to seek another site for 2012, but my co-coordinator, **Jean DeMott**, and I were thinking about trying a new location anyway. That's one of the advantages to not having a facility of our own. We're free to move where ever our hearts desire!

Like any other location, the Air Zoo had advantages and disadvantages. The first example was with solar observing. The Air Zoo, with its wide-open spaces, had plenty of room for our group of intrepid solar observers. Skies were mostly



Father gives his son a helping hand at one of our hands-on tables.

sunny the entire day and the Sun put on a fabulous show. Plenty of sunspot groupings were visible, as well as a fine assortment of prominences and filaments. However, cool and gusty winds chilled our volunteers to the bone at times!

Jim Kurtz setup his Tele Vue NP101 refractor equipped with a Coronado SolarMax 40 hydrogen-alpha filter. **Bill Nigg** brought his razor-sharp 5" Astro-Physics refractor with a Baader white light filter. **Bill Van Dien** also shared white light views with his Celestron 4.5" Newtonian reflector. **Roger Williams** setup two telescopes; his hand-crafted 4.25" Tri-schiefspiegler and Coronado MaxScope 60 hydrogen-alpha telescope. Thanks again to our solar observers. They all volunteered the entire day.

Once visitors entered the Air Zoo Lobby they were greeted by **Jean DeMott** and **Molly Williams** in the morning and then by **Beverly Byle** and **Jack Price** in the afternoon. Aside from giving information on Astronomy Day activities, they passed out lots of literature on the KAS and its many activities.

Oxnar Thealien had such a great time at the Freebie Table last year he volunteered there again for the entire day this year. **Daniel Woodworth** worked with Oxnar in the morning and **Dheeraj Nosina** replaced him in the afternoon. Boy, did we have a lot of great freebies again this year! Items for the Freebie Table were provided by *Astronomy* magazine, Chandra X-Ray Center, Goddard Space Flight Center, Jet Propulsion Laboratory, NASA Ames Research Center, and NASA Space Place. Meijer supplied plastic shopping bags, so our visitors could carry their free stuff home.

Our Sales Table was also located in the lobby. The morning crew consisted of **Rich Mather** and **Frank Severance**. They were relieved by **Scott Macfarlane** and **Dennis Stuart** in the afternoon. Unlike the past three years we had no books written by our keynote speaker for sale. We did have eclipse shades for the May 20th partial solar eclipse and June 5th Venus transit, in addition to some usual SkyShop merchandise. Sales of the eclipse shades are meant to go to

the Robotic Telescope Fund. However, sales from Astronomy Day just about put us at the break-even point for the initial cost of the eclipse shades. Everything we make after that is pure profit!

Two of our main displays focused on the Kepler Space Telescope and the Transit of Venus and were located in the lobby. We also had a 4-minute video produced by our April guest speaker, **Chuck Bueter**, that covered both subjects. The Air Zoo provided a wonderfully large, flat-screen television that really enhanced the display. We'll be able to use the Kepler display again, but the Venus transit display won't be much use after June 5th. Jean and I are considering donating it to Chuck Bueter for his Transit of Venus Time Keg! What would people think of the display in the year 2117?

The other two displays were located upstairs and are Astronomy Day regulars. They were KAS Member Astrophotography and "Meet the Telescopes" display. Telescopes were provided by **Don Stilwell** (6" refractor), **Mike Dupuis** (12" Dobsonian), and **Rich Mather** (8" Schmidt-Cassegrain). **Mike Dupuis** kept an eye on the telescopes and answered many questions during the morning, while **Don Stilwell** did the same in the afternoon. Many cub scouts were on hand during the day and they were required to thoroughly examine the telescopes as part of their astronomy merit badge. This kept Mike and Don quite busy at times.

A special attraction was located adjacent to our telescope display. After last year's Astronomy Day I attended a *Star Wars* concert performed by the Kalamazoo Symphony Orchestra. Setup amongst the many *Star Wars* fans (several in costume) was a green screen and camera from Michigan Unlimited Photography, owned and operated by **Donavon Larabel**. Mr. Larabel took people's pictures against the green screen and incorporated one of many *Star Wars* backdrops. I thought this would be something new and



The Curious Kids' Starlab Inflatable Planetarium was a big hit and fit right in at the Air Zoo's space museum. Image credit: Daniel Flanagan



different for Astronomy Day. I called it “Celestial Portraits” and people really seemed to enjoy it.

We asked for a suggested donation of \$5 and managed to raise enough funds to at least offset Mr. Larabel’s fee. The best picture taken, without a doubt, is the one of the young boy in the astronaut costume with the Apollo Moon image (seen on page 8). All the pictures taken that day can be seen on the MIUnlimitedPhotography.com website.

The heart and soul of Astronomy Day these past 14 years has been our hands-on activities. We brought back a couple of classic activities again this year. The first was the planisphere activity. Thanks go to **Danielle Dupuis** and **Erin Grace** for volunteering their time in the morning. The afternoon planisphere crew was the dynamic duo of **Joe & Patti Borrello**. The next classic activity was the Big Dipper Clock. That was staffed by **Gary Leadley** and **John Miller** and then **Susan Bond** and **Becky Csia**.

To go with our theme we also offered Transit of Venus flipbooks. I got the idea from **Paul Floyd** at the Night Sky Online [website](#) and adapted his version for our area. Our crew consisted of **Don Stilwell**, **Arthur Woodworth**, and **Karen Woodworth** during the morning shift. **Bob & Barb Havira** took their place during the afternoon. This year the Curious Kids Museum in St. Joseph, Michigan provided the fourth hands-on activity, which were alien hand bands. Curious Kids staff member **Ashley Campbell** worked at the table with assistance from volunteers at Target.

We’ve gotten a little used to having planetarium shows during Astronomy Day the past three years. Therefore, we decided to rent the inflatable Starlab Planetarium from the Curious Kids Museum. There was no room for the planetarium anywhere in the free area (i.e. the lobby), so the Air Zoo decided to have it setup in their new space center wing. In addition to stargazing shows in the planetarium, Astronomy Day attendees got access to the Air Zoo’s main exhibits for free! Shows ran every 30 minutes from 11am - 4pm. **Mike Sinclair** and I took turns giving live stargazing shows every hour, although Mike decided to start early due to popular demand. Oh how we’d love to get our own Starlab Planetarium one day!

The last bit of special programming were three presentations on the upcoming Transit of Venus. These were given by yours truly. I called it *Our Last Transit of Venus* after the name of our special event at Warren Dunes State Park on June 5th. Instead of going into the extensive history behind

Venus transit observations (something our May speaker did very well) I covered the basics of why transits occur and how best to observe them. I also gave a preview of the brief partial solar eclipse on May 20th.

Evening activities were once again held at our home away from home, the Kalamazoo Nature Center. This year’s keynote presentation was given by **Dr. Jill Tarter**. Dr. Tarter is the outgoing Bernard M. Oliver Chair for SETI Research and is Director of the Center for SETI Research at the SETI Institute in Mountain View, California. Dr. Tarter announced her retirement about a month after Astronomy Day. Her presentation to us could very well have been her last as SETI Director. Dr. Tarter is also a Science Working Group member for NASA’s Kepler Space Telescope.

Dr. Tarter is one of the few researchers to have devoted her career to hunting for signs of sentient beings elsewhere, and there are few aspects of this field that have not been affected by her work. Many believe Carl Sagan used Dr. Tarter as the inspiration for the character Eleanor Ann Arroway in his only science fiction novel *Contact*. It was an honor and a privilege having her as our guest.

The title of Dr. Tarter’s keynote presentation was *Searching the Kepler Worlds for an Earth Analog*. Her presentation was a summary of the SETI observations with the Allen Telescope Array and other radio and optical facilities that have been conducted over the past three years that have focused on exoplanets and the initial Kepler list of 1,235 candidate exoplanets.

Her presentation lasted an hour, which gave plenty of time for additional questions. This was as enjoyable as the talk itself. Thanks to **Joe Comiskey** and **Jean DeMott** for greeting visitors and to **Sheila Reuther** for collecting tickets. Finally, I’d like to thank **Daniel Flanagan** for once again taking photos throughout the day.

We enjoyed clear skies at the start of the Public Observing Session, but got clouded out only after a couple of hours. We had plenty of time to observe the Planet Palooza (Venus, Mars, and Saturn) and numerous deep sky objects. Special thanks to **Joe Comiskey**, **Royce Goodchild**, **Jim Kurtz**, **Scott & Scotty Macfarlane**, **Bill Nigg**, **Don Stilwell**, and **Roger Williams** for setting up telescopes. Apologies if I missed any of our excellent volunteers. Astronomy Day would not exist without you.

Thank you all for another fantastic Astronomy Day!



Thank Goodness for Magnetism

by Dr. Tony Phillips

Only 93 million miles from Earth, a certain G-type star is beginning to act up.

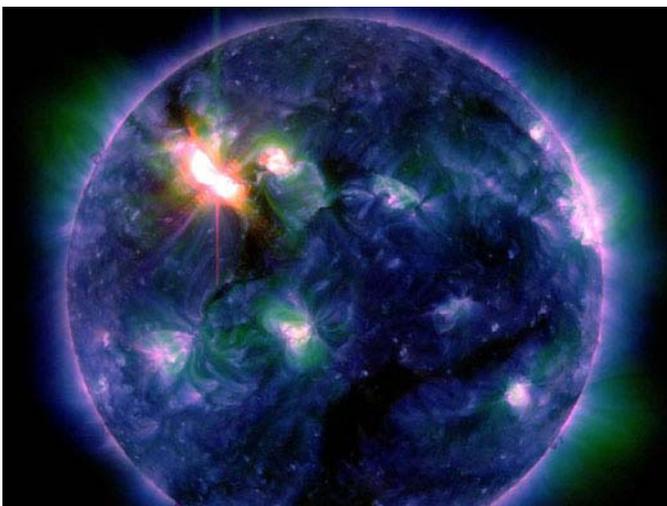
Every 11 years or so, the solar cycle brings a period of high solar activity. Giant islands of magnetism — “sunspots” — break through the stellar surface in increasing numbers. Sometimes they erupt like a billion atomic bombs going off at once, producing intense flares of X-rays and UV radiation, and hurling massive clouds of plasma toward Earth.

This is happening right now. Only a few years ago the Sun was in a state of deep quiet, but as 2012 unfolds, the pendulum is swinging. Strong flares are becoming commonplace as sunspots once again pepper the solar disk. Fortunately, Earth is defended from solar storms by a strong, global magnetic field.

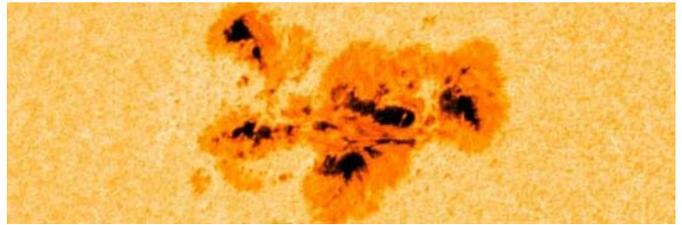
In March 2012, those defenses were tested.

At the very beginning of the month, a remarkable sunspot appeared on the Sun’s eastern limb. AR1429, as experts called it, was an angry-looking region almost as wide as the planet Jupiter. Almost as soon as it appeared, it began to erupt. During the period March 2nd to 15th, it rotated across the solar disk and fired off more than 50 flares. Three of those eruptions were X-class flares, the most powerful kind.

As the eruptions continued almost non-stop, Earth’s magnetic field was buffeted by coronal mass ejections or “CMEs.” One of those clouds hit Earth’s magnetosphere so hard, our planet’s magnetic field was sharply compressed,



Multiple-wavelength view of X5.4 solar flare on March 6, captured by the Solar Dynamics Observatory (SDO) in multiple wavelengths (94, 193, 335 angstroms). Credit: NASA/SDO/AIA



leaving geosynchronous satellites on the outside looking in. For a while, the spacecraft were directly exposed to solar wind plasma.

Charged particles propelled by the blasts swirled around Earth, producing the strongest radiation storm in almost 10 years. When those particles rained down on the upper atmosphere, they dumped enough energy in three days alone (March 7-10) to power every residence in New York City for two years. Bright auroras circled both poles, and Northern Lights spilled across the Canadian border into the lower 48 states. Luminous sheets of red and green were sighted as far south as Nebraska.

When all was said and done, the defenses held — no harm done.

This wasn’t the strongest solar storm in recorded history — not by a long shot. That distinction goes to the Carrington Event of September 1859 when geomagnetic activity set telegraph offices on fire and sparked auroras over Mexico, Florida, and Tahiti. Even with that in mind, however, March 2012 was remarkable.

It makes you wonder, what if? What if Earth didn’t have a magnetic field to fend off CMEs and deflect the most energetic particles from the Sun.

The answer might lie on Mars. The red planet has no global magnetic field and as a result its atmosphere has been stripped away over time by CMEs and other gusts of solar wind. At least that’s what many researchers believe. Today, Mars is a desiccated and apparently lifeless wasteland.

Only 93 million miles from Earth, a G-type star is acting up. Thank goodness for magnetism.

With your inner and outer children, read, watch, and listen in to “Super Star Meets the Plucky Planet,” a rhyming and animated conversation between the Sun and Earth, at:

<http://spaceplace.nasa.gov/story-superstar>

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

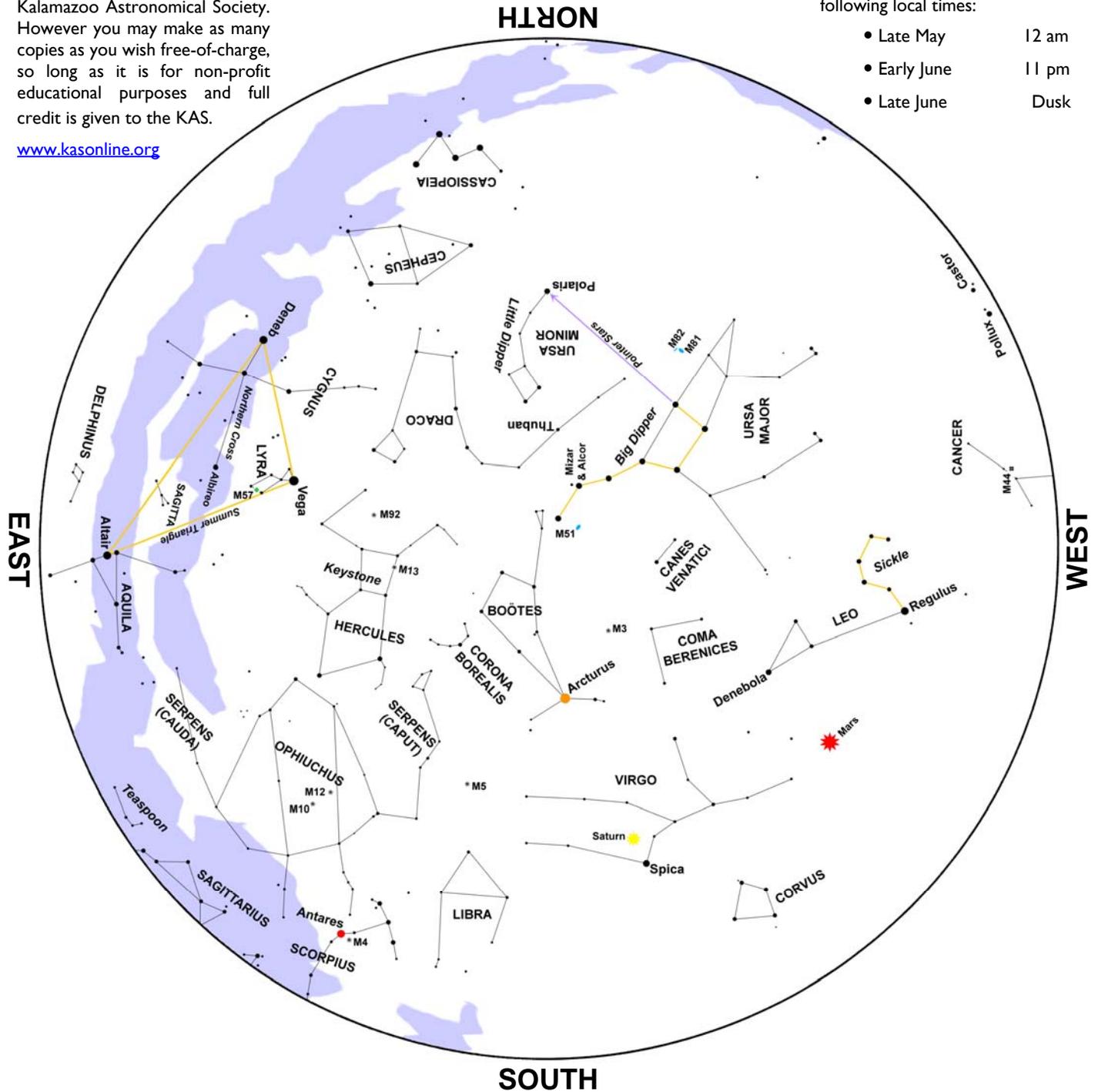
June Night Sky.....

This star map is property of the Kalamazoo Astronomical Society. However you may make as many copies as you wish free-of-charge, so long as it is for non-profit educational purposes and full credit is given to the KAS.

www.kasonline.org

This map represents the sky at the following local times:

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



Venus is at inferior conjunction (between the Sun and Earth) on June 5th. Generally this is a non-event - Venus wouldn't normally be visible. However, on June 5th Venus crosses (or transits) the Sun's face. The next Transit of Venus will not occur for 105.5 years. Make every effort to witness this rare event.

Proper projection is required as Venus will only be visible as a black dot about 3% the size of the Sun. Use a #14 welders glass, eclipse shades, or a properly filtered telescope (where the solar filter fits over the front of the telescope).

Venus begins its passage in front of the

Sun at about 6:04 pm EDT. Using a telescope, look for a hint of Venus' dense atmosphere during this time. Also look for the infamous "black drop effect." This takes place just after Venus' is fully placed on the Sun's disk. Unfortunately, for those of us in Michigan, the transit ends at sunset (9:17 pm).

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June 2012

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Introduction to Your Telescope



Learn how to best view the night sky through the Portage District Library's new Orion StarBlast 4.5" Newtonian reflecting telescope, donated by the Kalamazoo Astronomical Society.

Workshops will be held at 2:00 & 6:30 pm on **Wednesday, June 13th**. Registration is not required.

Portage District Library • 300 Library Lane

Kalamazoo Valley Museum *Planetarium Show Schedule*

Mystery of the Missing Seasons

Saturday @ 1pm; Sunday @ 2pm

The Artists' Sky

Tues. & Thurs. @ 3pm; Sat. @ 2pm

Crossing the Sun

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

Kiwanis Star Party



The KAS & Battle Creek Kiwanis Club will co-host a public star party on **June 16th**. Gates open at 9:00 pm. It'll be held at the Kiwanis Youth Conservation Area on 15th Avenue, 3.6 miles north of Turkeyville in Calhoun County. Admission is FREE.

For cancellation information, please call the Star Party hot line at (269) 223-9118 after 3:00 pm on June 16th for the latest information.

General Meeting Preview



SHARE YOUR STORIES

Partial Solar Eclipse & Transit of Venus

Two spectacular celestial events took place in late May and early June - a partial (or annular) solar eclipse on May 20th and the last Transit of Venus of our life on June 5th. Those events will be a part of history when we meet for a general meeting on June 8th. KAS members and guests are encourage to share their stories, images, and video of these historic events. Please join us and tell your tales!

Friday, June 8 @ 7:00 pm

*Kalamazoo Area Math & Science Center
600 West Vine, Suite 400 • Use Dutton St. Entrance*

- Dutton Entrance Locked by 7:10 pm -

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

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