

## Highlights of the September Sky...

... 1<sup>st</sup> ...

Dusk: Venus, Mercury, & Mars above crescent Moon shortly after sunset. Use binoculars.

... 5<sup>th</sup> ...

PM: Venus, Mercury, & Mars within 4° of each other. Use binoculars. Continues until the 15<sup>th</sup>.

... 7<sup>th</sup> ...

First Quarter Moon

PM: Io & Ganymede cast shadows on Jupiter from 8:12 – 8:38 pm EDT.

... 8<sup>th</sup> ...

First Quarter Moon

... 11<sup>th</sup> ...

Dusk: Venus passes less than 1/3° north (upper right) of Mars.

... 12<sup>th</sup> ...

Uranus at opposition.

... 15<sup>th</sup> ...

Full Moon

... 19<sup>th</sup> ...

Dusk: Venus, Mercury, Mars, & Spica low in WSW after sunset.

... 22<sup>nd</sup> ...

Last Quarter Moon

... 24<sup>th</sup> ...

PM: Jupiter passes 2' or 3' north of 5.9 magnitude star HIP92931.

... 26<sup>th</sup> ...

AM: Thin crescent Moon 2° right of Regulus.

... 27<sup>th</sup> ...

Dawn: Thin crescent Moon 5° right of Saturn.

... 29<sup>th</sup> ...

New Moon

# Prime Focus

A Publication of the Kalamazoo Astronomical Society

☆ ☆ ☆ September 2008 ☆ ☆ ☆

## This Months KAS Events

Observing Session: Saturday, September 6 @ 7:30 pm  
*Uranus & Neptune - Kalamazoo Nature Center*

General Meeting: Friday, September 12 @ 7:00 pm  
*Kalamazoo Math & Science Center - See Page 10 for Details*

Board Meeting: Sunday, September 14 @ 5:00 pm  
*Sunnyside Church - 2800 Gull Road - All Members Welcome*

Observing Session: Saturday, September 27 @ 7:30 pm  
*Galaxies of Autumn - Kalamazoo Nature Center*

## Inside the Newsletter...

Perseid Potluck Picnic Report.....	p. 2
Kiwanis Star Party Report.....	p. 3
Windy Ridge Observatory.....	p. 4
Only Small & Large Black Holes.....	p. 5
NASA Space Place.....	p. 6
Membership of the KAS.....	p. 7
September Night Sky.....	p. 8
KAS Officers & Announcements.....	p. 9
General Meeting Preview.....	p. 10



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# Perseid Potluck Picnic

The fourteenth annual Perseid Potluck Picnic was again held at the Kalamazoo Nature Center on Saturday, August 9<sup>th</sup> with a start time of 6:00 pm. Attendance for this year's picnic was 25 members and guests; down from 2007, but comparable to previous years. At least six of those that attended never RSVP'd. There's nothing wrong with that, but thankfully Richard Bell and Jean DeMott bought a little extra food. For the first time, in fact, there were very few hamburgers and hot dogs left over.

The weather for this year's PPP was fantastic. Forecasts called for scattered thundershowers to take place right around picnic time, but they never materialized. However, the Nature Center did receive a micro-burst of rain earlier in the day. The only consequence were some big mud puddles on the dirt service road leading up to the observatory. The sky was partly to mostly cloudy at 6:00 pm and gradually cleared as time went by. Temperatures started in the upper 70's to low 80's and the humidity was nonexistent, which made for great conditions later in the evening.

Members were able to do solar observing this year with little cloud interference. Richard setup his Tele Vue Pronto (70 mm refractor) equipped with a Coronado SolarMax 40 hydrogen-alpha filter. Dan Morgan brought the Coronado Personal Solar Telescope (PST) owned by the KAS and available for loan to members (*see page 9 for more information*). As has been the norm recently, no sunspots or filaments were visible. However, there were some fairly impressive prominences. The brightest looked like a pair of teepees, while two fainter ones were very large and impressive (just a little hard to spot). Roger Williams expressed regret by not bringing his hydrogen alpha telescope.



**Scott Macfarlane enjoys the prominences visible on the Sun's disk at the 14<sup>th</sup> annual Perseid Potluck Picnic.**

Dinner was served shortly after 7:00 pm. Special thanks again go to Jim Kurtz for bringing his grill and doing all the cooking for the fourth year-in-a-row. The hamburgers were especially juicy and tender this year, so kudos to the chef! We'd also like to thank all the members that brought the many fantastic side dishes and deserts. Several of the tasty morsels can be seen in the photo below. You folks put the "potluck" in Perseid Potluck Picnic!

Several members assisted with clean-up while others got ready for the Public Observing Session at 8:30 pm. Many picnic attendees also brought telescopes for the session. Dan Morgan brought his new (to him) Tele Vue 102 refractor. Don Stilwell setup his Orion 120mm refractor. Bill Van Dien came with his Celestron 114GT reflector. Roger Williams brought his custom-built trischiefspiegler (folded reflector). Jim & Tim Kurtz returned with their 8-inch SCT on the new



Astro-Physics Mach 1 GTO mount and Meade 4-inch apochromatic refractor, respectfully. A few members that were not able to attend the picnic did managed to attend the observing session. Royce Goodchild brought his brand new William Optics refractor. Bill Nigg setup his 5-inch Astro-Physics refractor. Finally, Kerry Robbert brought his 6-inch Celestron refractor on a *REALLY* tall alt-azimuth mount.

Those that attended the Public Observing Session had a great time thanks to the excellent conditions. However, the real fun began after the public and most of the members left and the First Quarter Moon finally set. The transparency was about as good as it gets from the Nature Center. The Sagittarius Star Cloud (in the bulge of the Galaxy) could actually be seen through the sky glow low in the south. Among the many memorable sites that night was the Helix Nebula (NGC 7293) through the 12-inch SCT in Owl Observatory. Another great picnic for the history books!

# KIWANIS STAR PARTY REPORT

by *Dick Gillespie*

Two years ago the Battle Creek Kiwanis Club was given an astronomy presentation by Richard Bell that was well received and last year Dick Gillespie reported to them on a star party. As a result, the Kiwanis Club expressed an interest in having a star party and thought the Kiwanis Youth Area just east of Battle Creek would be ideal. They were right. The Youth Area has some of the darkest skies around Battle Creek. After several discussions, KAS and Kiwanis cosponsored a public star party on August 2<sup>nd</sup> at the Youth Area. Attendance was estimated at somewhere between 60 and 75 participants, ranging in age from 4 to 86. A variety of binoculars and telescopes were used to view the amazing night sky. KAS and Kiwanis attendees, as well as the general public, indicated that the event was a success.

KAS members Richard Bell, Dan Morgan, Jack Roach, Don Stillwell, Jackie and Dick Gillespie brought telescopes and helpful hands to give telescope and viewing assistance to the participants. KAS telescopes present were a Meade 10" LX200, Meade 8" LX90, two 18" Dobs, 12.5" Dob and a 6" equatorial reflector. The public brought two 10" Dobs and 8 to 10 smaller scopes. The youngest person bringing a telescope was a boy (age six) who had received his first telescope from his grandmother that morning. In addition to telescopes, there were numerous binoculars.

Boy Scouts from Augusta and Battle Creek helped with setting up signs, covering flashlights with red cellophane and parking cars. Several Scouts are beginning work to obtain their Astronomy Merit Badge.

The highlight of the event was Richard's unbelievable laser constellation tour. Everyone huddled around Richard with flashlights and a star map for the duration of his tour. If you have never been to one of his constellation tours, don't miss the next Public Observing Session at the Nature Center. You will leave with a greater knowledge of how to quickly maneuver the night sky.



**Jack Roach helps with collimating this Dobsonian.**



**Don Stilwell helps this lady align her red dot finder.**

The weather was perfect. Clear skies, calm air and great views were enjoyed by all until the telescopes started dewing up around 1:30 am. By 2:00 am it was time to pack up. The Milky Way was clearly visible and all Little Dipper stars could be seen. Several guests stated they had never before viewed the Milky Way. M31 was visible with the naked eye. Most participants thought Jupiter, with the red spot, cloud belts and moons, were spectacular. Every time Jackie wanted to look at a deep space object, someone would ask to see Jupiter through her tall scope. One member reported his clearest view ever of the Veil Nebula through Dan's 18" Dob. The Space Station and an iridium flare passed overhead to the amazement of many. There were 10 to 12 meteors during the evening. The best was a bright green streak across the sky ending with a brilliant explosion. Some viewers didn't see the meteor, but most saw the flash from the explosion at the end.

After the telescopes were packed Don and Jack spent another hour trying to outdo each other finding faint fuzzes with binoculars. They reported seeing M6, M7, M8, M11, M16, M17, M18, and M29 and several others. I'm not sure they didn't have little fuzzes glued to their binocular lenses.

Many public attendees had never before looked through a telescope and were amazed by what they were able to view. One lady, looking through a telescope for the first time, commented, "in my 78 years I have never seen anything like that." Another lady asked if there would be another party next week so she could bring neighbors for the constellation tour.

Kiwanis members were excited by the event and look forward to next year having a second annual star party. They would love the opportunity of cosponsoring future astronomical events with KAS, perhaps even more frequently than annual.

Kiwanis expresses gratitude and a special thanks to KAS, Boy Scouts and those who helped make the event a success.



# Windy Ridge Observatory

by *Alan Otterson*

Some of you may remember me from the good old days (1969 - the 90's). I can remember going out to the old club house and doing some all night observing. One time, Eric Schreur and I went out to meet the gang for some observing and I forgot to tell my Mom where I was going. You can guess she was concerned and started to call around and finally got a hold of Eric's Mom. Well, everything worked out okay.

My first observatory was just a store bought tin shed. My Dad, Eric, a couple of other club members and I turned it into a roll-off roof observatory. One year the wind blew the observatory apart and that's how my new facility got the name "Windy Ridge Observatory".

In the meantime, I got married to my wife Cathy (whom some of you know) and, after my Dad died in 2000, we moved in with my Mom in 2001 so she wouldn't be by herself. After all these years, I was finally able to start planning and building a new observatory.

I first made it into a flip top observatory, but being an odd size (9' x 6') it was hard to get the roof to come together and make a good clamping system.

Up to this point I had done all of the work by myself. Along the course of time we met a private contractor. He and his wife became fast family friends and he helped me convert my roof to a roll-off roof observatory.

In order to avoid building permits and inspections I checked with the building codes in my location and found out that my 9' x 6' observatory was too small for permits or inspections.

The frame of the walls are 2x4's with 1/2-inch plywood which made the walls 4' high, now with the 6' x 6' treated rail timbers it is 6-inches taller.



Windy Ridge Observatory near Three Rivers, Michigan.



Alan and his vintage orange tube C8.

The roof is made of white corrugated plastic roofing setting on 2' x 2' timbers. The roof rolls off using six large hard rubber wheels on each rail.

The roof is heavy and having a bad back I bought a 1/2 hp Chamberland garage door opener motor and adapted it to the roof.

Looking through the Cloudy Nights Observatory Forum I found out how to mount the motor outside of the observatory. I took the motor and mounted it upside down on a 4' x 4' treated post and made a cover for it.

The motor has a three prong plug on one end and the wire runs through grey PVC tubing to the motor.

All and all the new observatory has turned out good. Now I have a safe place to keep my new Meade 5" ETX 125PE and my old orange tube Celestron C8. I also got a new Meade LPI imager and a Nikon D40 DSLR camera.

Now if I can get the time and the weather to become one with the universe I can enjoy it.

## --- YOU'RE INVITED! ---

Alan has invited KAS members to a private observing session at Windy Ridge Observatory on September 19<sup>th</sup> starting at 8:00 pm. Here's his address:

12199 Dutch Settlement Rd.  
Three Rivers, MI 49093

Electricity is available around the observatory. For more information please contact Alan Otterson by phone (269-244-8144) or e-mail ([alancath@earthlink.net](mailto:alancath@earthlink.net)).

# Only Small & Large Black Holes?

Black holes are sometimes huge cosmic beasts, billions of times the mass of our Sun, and sometimes petite with just a few times the Sun's mass. But do black holes also come in size medium? A new study suggests that, for the most part, the answer is no.

Astronomers have long suspected that the most likely place to find a medium-mass black hole would be at the core of a miniature galaxy-like object called a globular cluster. Yet nobody has been able to find one conclusively.

Now, a team of astronomers has thoroughly examined a globular cluster called RZ2109 and determined that it cannot possess a medium black hole. The findings suggest that the elusive objects do not lurk in globular clusters, and perhaps are very rare.

"Some theories say that small black holes in globular clusters should sink down to the center and form a medium-sized one, but our discovery suggests this isn't true," said Daniel Stern of NASA's Jet Propulsion Laboratory in Pasadena, Calif. Stern is second author of a study detailing the findings in the Aug. 20 issue of *Astrophysical Journal*. The lead author is **Stephen Zepf** of Michigan State University, East Lansing. (*Dr. Zepf spoke at the May 2006 general meeting of the KAS.*)

Black holes are incredibly dense points of matter, whose gravity prevents even light from escaping. The least massive black holes known are about 10 times the mass of the Sun and form when massive stars blow up in supernova explosions. The heftiest black holes are up to billions of times the mass of the Sun and lie deep in the bellies of almost all galaxies.

That leaves black holes of intermediate mass, which were thought to be buried at the cores of globular clusters. Globular clusters are dense collections of millions of stars, which reside within galaxies containing hundreds of billions of stars. Theorists argue that a globular cluster should have a scaled down version of a galactic black hole. Such objects would be about 1,000 to 10,000 times the mass of the Sun, or medium in size on the universal scale of black holes.

In a previous study, Zepf and his colleagues looked for evi-



dence of a black hole in RZ2109, located 50 million light-years away in a nearby galaxy. Using the European Space Agency's XMM-Newton telescope (which derives its name from X-ray Multi-Mirror design), they discovered the telltale X-ray signature of an active, or "feeding" black hole. But, at that point, they still didn't know its size.

Zepf and Stern then teamed up with others to obtain a chemical fingerprint, called a spectrum, of the globular cluster, using the W.M. Keck Observatory on Mauna Kea in Hawaii. The spectrum revealed that the black hole is petite, with roughly 10 times the mass of our Sun.

According to theory, a cluster with a small black hole cannot have a medium one, too. Medium black holes would be quite hefty with a lot of gravity, so if one did exist in a globular cluster, scientists argue that it would quickly drag any small black holes into its grasp.

"If a medium black hole existed in a cluster, it would either swallow little black holes or kick them out of the cluster," said Stern. In other words, the small black hole in RZ2109 rules out the possibility of a medium one.

How did the scientists figure out that the globular cluster's black hole was small in the first place? Using modeling techniques, Zepf and his colleagues concluded that the spectrum taken by Keck reveals high-velocity flows of matter, or "winds," firing out of the black hole. Only a small black hole could spit out these observed high winds.

Zepf explains, "We knew from X-ray data that this black hole was actively swallowing up, or accreting, material. If an intermediate-sized black hole were accreting this material, it wouldn't be too big of a deal for it. But if a small black hole were accreting this material, it would be a lot for it to take and therefore some material would be ejected in the form of high winds. Thus, the high winds were our smoking gun showing that this black hole is small."

Is this the end of the story for medium black holes? Zepf said it is possible such objects are hiding in the outskirts of galaxies like our Milky Way, either in surrounding so-called dwarf galaxies or in the remnants of dwarf galaxies being swallowed by a bigger galaxy. If so, the black holes would be faint and difficult to find.

Other authors of this paper include: Thomas Maccarone of the University of Southampton, England; **Arunav Kundu** of Michigan State University (*our guest speaker for this month's meeting*); Marc Kamionkowski of the California Institute of Technology, Pasadena; Katherine Rhode and John Salzer of Indiana University, Bloomington; and Robin Ciardullo and Caryl Gronwall of Penn State University, University Park, Pa. Salzer is also with Wesleyan University, Middletown, Conn.



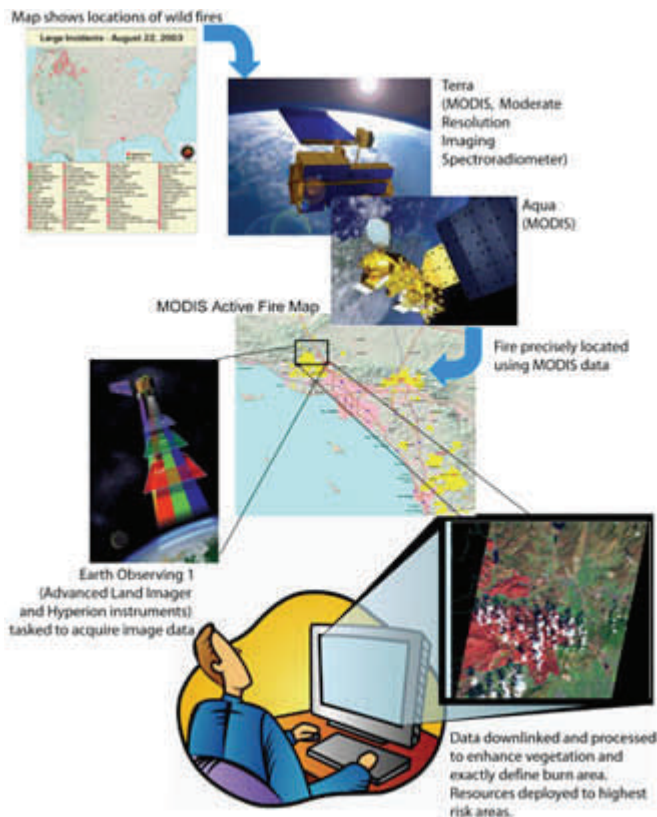
## A Google for Satellites: Sensor Web 2.0

If you could see every satellite passing overhead each day, it would look like a chaotic meteor shower in slow motion.

Hundreds of satellites now swarm over the Earth in a spherical shell of high technology. Many of these satellites gaze at the planet's surface, gathering torrents of scientific data using a dizzying array of advanced sensors — an extraordinary record of our dynamic planet.

To help people tap into this resource, NASA researchers such as Daniel Mandl are developing a “Google for satellites,” a web portal that would make requesting data from Earth-observing satellites almost as easy as typing a search into Google.

“You just click on it and it takes care of all the details for you across many sensors,” Mandl explains.



**A “Google for satellites” type of web portal will allow users to request real-time data from Earth observing satellites.**

Currently, most satellites are each controlled separately from the others, each one dauntingly complex to use. But starting with NASA’s Earth Observing-1 (EO-1) satellite, part of the agency’s New Millennium Program, Mandl and his team are building a prototype that stitches these satellites together into a seamless, easy-to-use network called “Sensor Web 2.0.”

The vision is to simply enter a location anywhere on Earth into the website’s search field along with the desired information types — wildfire maps, vegetation types, floodwater salinity, oil spill extent — and software written by the team goes to work.

“Not only will it find the best sensor, but with proper access rights, you could actually trigger a satellite to take an image in the area of interest,” Mandl says. Within hours, the software will send messages to satellites instructing them to gather the needed data, and then download and crunch that raw data to produce easy-to-read maps.

For example, during the recent crisis in Myanmar (Burma) caused by Cyclone Nargis, an experimental gathering of data was triggered through Sensor Web 2.0 using a variety of NASA satellites including EO-1. “One thing we might wish to map is the salinity of flood waters in order to help rescue workers plan their relief efforts,” Mandl says.

If the floodwater in an area was salty, aid workers would need to bring in bottled water, but if flood water was fresh, water purifiers would suffice. An early and correct decision could save lives.

Thus far, Mandl and his team have expanded Sensor Web 2.0 beyond EO-1 to include three other satellites and an unmanned aircraft. He hopes to double the number of satellites in the network every 18 months, eventually weaving the jumble of satellites circling overhead into a web of sensors with unprecedented power to observe and understand our ever-changing planet.

To learn more about the EO-1 sensor web initiatives, go to:

<http://eo1.gsfc.nasa.gov/new/extended/sensorWeb/sensorWeb.html>

Kids (and grown-ups) can get an idea of the resolution of EO-1’s Hyperion Imager and how it can distinguish among species of trees — from space at:

[http://spaceplace.nasa.gov/en/kids/eo1\\_1.shtml](http://spaceplace.nasa.gov/en/kids/eo1_1.shtml) .

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



# Membership of the KAS

as of August 29, 2008

1. Rick Ainsworth	Regular	2010	55. Michael J. Melwiki	Regular	2008
2. Richard Mehl & Paula Allred	Family	2008	56. Lynn C. Meyer	Regular	2009
3. David & Judith Andrews	Family	2008	57. John Miller	Regular	2008
4. Paul Asmus	Regular	2009	58. Mark & Ninah Miller	Family	2008
5. Richard Bell	Regular	2008	59. Dan Morgan	Student	2008
6. Karen & Peter Berzins	Family	2008	60. Kim & Pat Morgan	Family	2008
7. Susan Bond	Regular	2008	61. Elizabeth Morison	Regular	2008
8. Jacqueline Bonn	Regular	2008	62. Eric Nelson	Regular	2008
9. Joseph & Patti Borrello	Family	2009	63. Bill Nigg	Regular	2008
10. Donald Brezinski	Regular	2008	64. Amy Ohrstrom	Regular	2009
11. Angela Brooks	Regular	2008	65. John & Teri Olbrot	Family	2008
12. Rick Brumbaugh	Family	2009	66. Rick Olsen	Regular	2008
13. Phyllis Buskirk	Lifetime	n/a	67. Alan D. Otterson	Family	2009
14. Beverly Byle	Senior	2008	68. Mike Patton	Regular	2008
15. Bonnie Covert & Mike Chaffee	Family	2008	69. Chris A. Paynich	Family	2008
16. Mike Cook	Family	2008	70. Donald A. Peterson	Senior	2008
17. Harry Cotterill	Regular	2008	71. Daniell Poulsen	Regular	2008
18. Robert & Grace Cox	Family	2008	72. Jack & Ruth Price	Family	2008
19. Kalman & Becky Csia	Family	2008	73. Sam Qualls	Family	2008
20. Jean DeMott	Family	2008	74. Adrian Quint	Regular	2009
21. Gerald & Cynthia Dennany	Family	2008	75. Albert A. Ramudo	Family	2008
22. Mike Durren	Regular	2008	76. Carla & Michael Raphelson	Family	2008
23. Fred E. Dutton	Senior	2009	77. Jack Roach	Family	2008
24. Diana & Brian Evans	Family	2008	78. Kerry Robbert	Regular	2008
25. Niels W. Garlick	Family	2008	79. Andrew C. Robins	Regular	2008
26. Dave & Bonnie Garten	Family	2008	80. Thomas Roland	Regular	2008
27. Tom & Sandra George	Family	2008	81. Eric Schreur	Regular	2009
28. Jackie & Dick Gillespie	Senior Family	2008	82. Frank Severance	Regular	2008
29. Royce Goodchild	Regular	2008	83. Norma J. Simmons	Regular	2008
30. John Grace	Regular	2008	84. Michael & Karen Sinclair	Family	2008
31. Mark Hansen	Regular	2008	85. Greg Sirna	Family	2008
32. Amie Harpe	Regular	2008	86. Robert & Jane Steimle	Family	2008
33. Bill Haug	Regular	2008	87. Don Stilwell	Family	2009
34. Robert & Barbara Havira	Family	2008	88. David & Kathi Stoll	Family	2008
35. Michael James Higgins	Regular	2008	89. Stephanie Stratton	Regular	2009
36. James, Ruth & Joseph Hill	Family	2009	90. Timothy Strunk	Regular	2008
37. Keith Hoekwater	Senior	2008	91. Dennis Stuart	Regular	2008
38. Geoff Howe	Family	2008	92. Eric R. Sullivan	Regular	2008
39. Arya Jayatilaka	Family	2008	93. Craig Swanson	Regular	2008
40. A. Clark Kahn III	Family	2008	94. Norm & Cara Terry	Senior Family	2008
41. Kirk & Angela Korista	Family	2008	95. Gary Theisen	Family	2008
42. Gene & Ginny Kowall	Senior Family	2008	96. Keegan Thompson	Student	2008
43. Connie Kraus	Family	2008	97. W. R. Thomas Tyler	Student	2008
44. Jim Kurtz	Regular	2008	98. Henry L. Upjohn II	Family	2008
45. Tim Kurtz	Regular	2008	99. Michael Vandever	Regular	2009
46. Cal & Jean Lamoreaux	Senior Family	2009	100. Carol & Bill Van Dien	Family	2008
47. David & Sandra Latimer	Family	2008	101. Philip B. Wareham	Regular	2008
48. James & Mary Lilley	Family	2008	102. Bob White	Regular	2008
49. Gary & Phyllis Lubbert	Family	2008	103. Roger & Molly Williams	Family	2008
50. Scott Macfarlane	Regular	2009	104. David Woolf	Family	2009
51. Cary & Sarita Mannaberg	Family	2008	105. Susan Worsnop	Regular	2008
52. Christopher Marttila	Regular	2008	106. Brenda Zielinski	Regular	2009
53. Richard Mather	Regular	2008	107. Sharon Zordan	Regular	2008
54. Dayton Maynard	Senior	2008			

Year in **RED**? Almost time for **YOU** to **RENEW!**

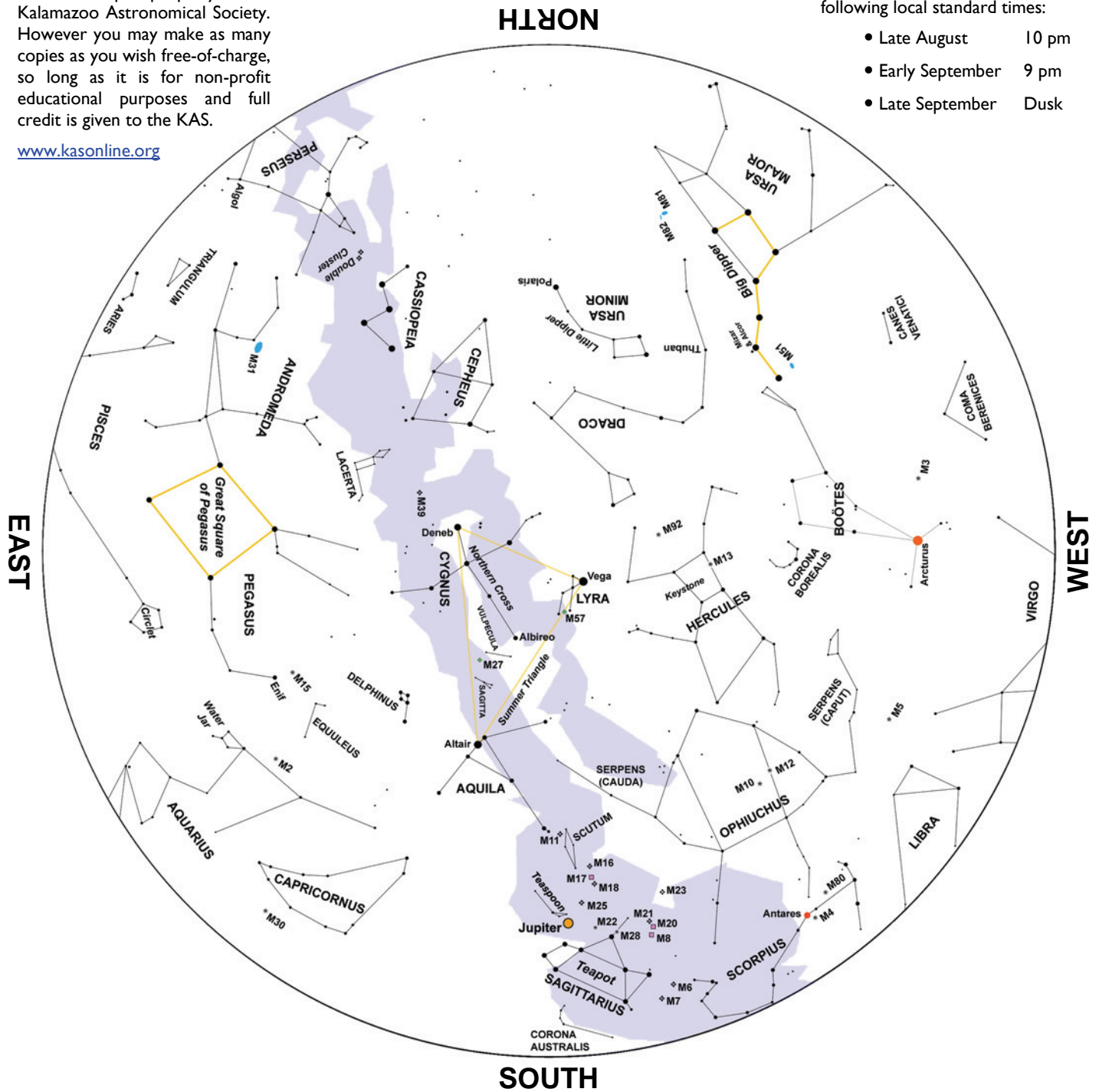
# September Night Sky.....

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 standard times:

- Late August 10 pm
- Early September 9 pm
- Late September Dusk



**V**enus, Mercury, and Mars spend the first three weeks of the month together low in the WSW shortly after sunset. A two day old Waxing Crescent Moon joins the trio on Sept. 1<sup>st</sup>. Binoculars are a must as faint Mars will be tough to spot.

Planet lovers will enjoy a double shadow transit on Jupiter on Sept. 7<sup>th</sup>. Ganymede's shadow will be visible on Jupiter's disk right after sunset, while Io's becomes visible at 8:12 pm EDT. Ganymede's shadow disappears at 8:38 pm and Io's remains visible until about

10:25 pm. You can then enjoy a splendid view of the Great Red Spot!

Observer's may mistake the 5.9 magnitude star HIP92931 for a fifth moon of Jupiter on Sept. 24<sup>th</sup>. It can be found about 2 arcminutes below Jupiter.

## KAS OFFICERS

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### Jean DeMott

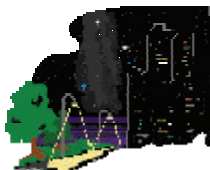
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September 2008

Page 9

## PST Available for Checkout!



The Kalamazoo Astronomical Society's Coronado Personal Solar Telescope (PST), mounted on the light and ultra-portable Tele Vue Tele-Pod, is available for loan.

If you'd like to observe the Sun in hydrogen alpha and see prominences dance along the solar-limb then contact the KAS Equipment Manager, **Dave Woolf**, today:

e-mail: [medalguy@netzero.net](mailto:medalguy@netzero.net)

phone: (269) 762-8269

## Kalamazoo Valley Museum

### Planetarium Show Schedule

#### *Sky Legends of the Three Fires*

Saturdays, 11:00 am; Sundays, 1:30 pm

#### *Constellations Tonight Live!*

Wednesdays 3:00 pm; Saturdays, 2:00 pm

#### *Galaxies*

Saturdays & Sundays, 3:00 pm



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

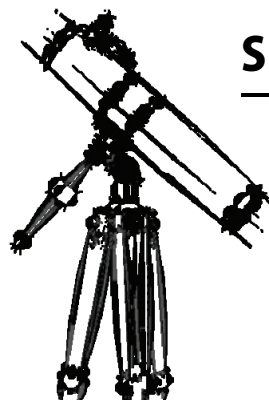
☆☆ **GET OUT & OBSERVE!** ☆☆

## SEPTEMBER STARGAZING DATES

Kalamazoo Nature Center • 7000 N. Westnedge Ave.

Saturday, September 6 @ 7:30 pm  
*Uranus & Neptune*

Saturday, September 27 @ 7:30 pm  
*Galaxies of Autumn*



with the **Kalamazoo Astronomical Society**

## General Meeting Preview

# Tales from the Many Tails of Comets



Presented by **DR. ARUNAV KUNDU**

*Assistant Professor of Astronomy, Michigan State University*

Comets are the wandering minstrels of the sky. Throughout recorded history there have been reports of comets appearing rather suddenly in the night sky, at least in astronomical terms, and fading to obscurity equally promptly. While these unannounced visitors caused much confusion and fear in our ancestors we now know that comets are icy remnants from the formation epoch of our own solar system. Dr. Kundu shall discuss some of the recent observations of comets from both space and ground-based observations that have helped further our understanding of these "dirty snowballs" and their place in the solar system.

**— Friday, September 12 @ 7:00 pm —**

***Kalamazoo Area Math & Science Center • 600 West Vine, Suite 400 • Elevator Access Available***

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