The Prairie Astronomer

June 2017 Volume 58, Issue #6

Photo Credit: NASA/Cassini

Night Sky Network

The Newsletter of the Prairie Astronomy Club

The Prairie Astronomer

NEXT PAC MEETING: June 27, 6:00pm

Solar Star Party

PROGRAM

Solar Star Party and eclipse preparation and education for the public. We'll setup scopes at Hyde Observatory at 6:00 and also run Hyde's eclipse trailer video.

FUTURE PROGRAMS

July: NSP - no club meeting
August: NSP & Eclipse review
September: Hyde's 40th Anniversary
October: Club viewing night at Hyde
November: How to Buy a Telescope
December: Holiday Gathering
January: How to Use Your Telescope

Buy the book! The Prairie Astronomy Club: Fifty Years of Amateur Astronomy.
Order online from Amazon or lulu.com.

CONTENTS

EVENTS

PAC Meeting
Tuesday June 27, 2017, 6:00pm
Solar Star Party
Hyde Observatory

Nebraska Star Party,July 23-28

July PAC Meeting canceled due to overlap with NSP

PAC Meeting
Tuesday August 29, 2017, 7:30pm
NSP and Eclipse Review (send us your photos!)

PAC meeting
Hyde Observatory's 40th Anniversary
Friday, September 29, 2017, 7:30pm

2017 STAR PARTY DATES

Photo by Brian Sivill

	Star Party Date	Star Party Date	Lunar Party Date
January	Jan 20th	**Jan 27th**	
February	Jan 17th	**Feb 24th**	
March	Mar 17th	**Mar 24th**	
April	Apr 21st	**Apr 28th**	
May	May 19th	**May 26th**	May 5th
June	Jun 16th	**Jun 23rd**	Jun 30th
July	Jul 14th	**Jul 21st**	
NSP	**July 23rd - July 28th**		
August	**Aug 18th**	Aug 25th	
September	Sep 15th	**Sep 22nd**	Sep 1st
October	Oct 13th	**Oct 20th**	
November	Nov 10th	**Nov 17th**	
December	Dec 15th	**Dec 22nd**	

Dates in **BOLD** are closest to the New Moon.

PAC E-MAIL:

info@prairieastronomyclub.org

PAC-LIST:

Subscribe through GoogleGroups.
To post messages to the list, send to the address:

pac-list@googlegroups.com

ADDRESS

The Prairie Astronomer
c/o The Prairie Astronomy Club, Inc.
P.O. Box 5585
Lincoln, NE 68505-0585

WEBSITES

www.prairieastronomyclub.org
https://nightsky.jpl.nasa.gov
www.hydeobservatory.info
www.nebraskastarparty.org
www.OmahaAstro.com
Panhandleastronomyclub.com
www.universetoday.com/
www.planetary.org/home/
http://www.darksky.org/

Night Sky Network

Meeting Minutes

This was a short business meeting that was held as part of the annual club dinner. President Jim Kvasnicka called the meeting to order at 6:41 p.m.

Announced coming events:

Next meeting 6/27 will be on solar observing and eclipse preparation, and solar telescopes and scopes equipped with filters will be set up by around 6:00 p.m. It will be well-publicized via social and legacy media to encourage members of the public to attend and learn about the eclipse, and to show them what they can see on the sun looking through a telescope. We will have eclipse glasses to instruct the public on their use. The Hyde Board will be meeting at 6:30 p.m. in the classroom, but after that we will show the Eclipse Trailer to anyone who wants to see it.

The Astronomical League is offering a 2017 Solar Eclipse Observing Award. It requires making observations and calculations that support Einstein's Theory of Relativity. The details are on the Astronomical League's website. And beware: You have only 30 days after the eclipse to submit your data to be eligible for the award.

There have been questions about the future of the club library. Jim asked how many have used it recently, and got no response. It has been noted that most, if not all, of what is in the library can be much more easily accessed online, and that is how most young club members are likely to look for such information, rather than checking out and reading an old book. The board will examine what is in the library and make recommendations about how we want to proceed.

Meeting was adjourned at 6:46 p.m. as members ate dinner, and a short program on solar eclipse photography was presented by John Reinert at the end of dinner.

Standing Room Only for @BeingInTheShadow

Hundreds of people showed up to listen to Dr. Katie Russo's experience covering solar eclipses. The event was held Monday evening at Henzlik Hall on the UNL campus and was sponsored by Hyde Observatory.

Cover Photo: Hail the Hexagon

Saturn's hexagonal polar jet stream is the shining feature of almost every view of the north polar region of Saturn. The region, in shadow for the first part of the Cassini mission, now enjoys full sunlight, which enables Cassini scientists to directly image it in reflected light.

Although the sunlight falling on the north pole of Saturn is enough to allow us to image and study the region, it does not provide much warmth. In addition to being low in the sky (just like summer at Earth's poles), the sun is nearly ten times as distant from Saturn as from Earth. This results in the sunlight being only about 1 percent as intense as at our planet.

This view looks toward Saturn from about 31 degrees above the ring plane. The image was taken with the Cassini spacecraft wide-angle camera on Jan. 22, 2017 using a spectral filter which preferentially admits wavelengths of near-infrared light centered at 939 nanometers.

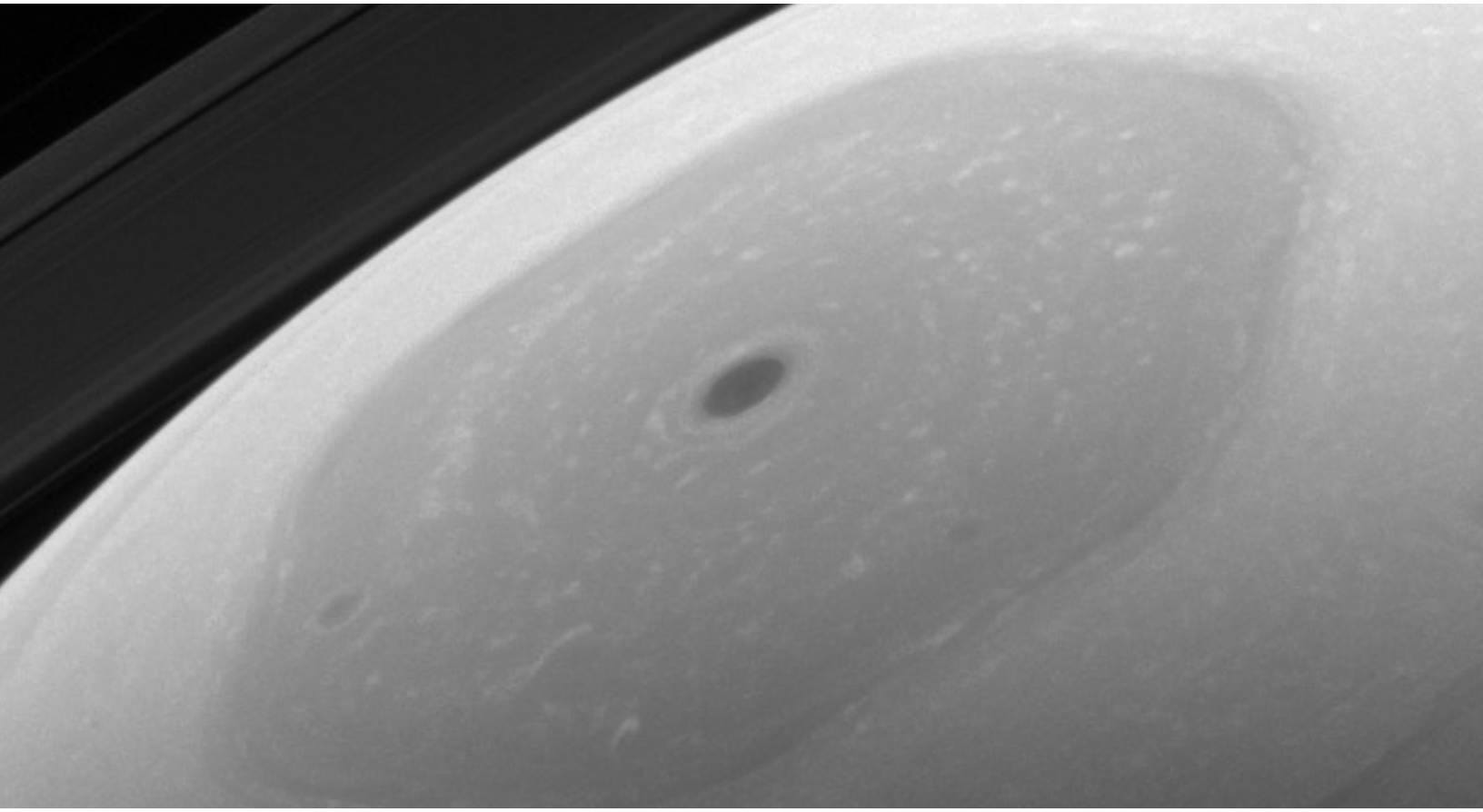
The view was obtained at a distance of approximately 560,000 miles (900,000 kilometers) from Saturn. Image scale is 33 miles (54 kilometers) per pixel.

The Cassini mission is a cooperative project of NASA, ESA (the European Space Agency) and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA's Science Mission Directorate, Washington. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging operations center is based at the Space Science Institute in Boulder, Colorado.

For more information about the Cassini-Huygens mission visit https://saturn.jpl.nasa.gov and https://www.nasa.gov/cassini. The Cassini imaging team homepage is at https://ciclops.org.

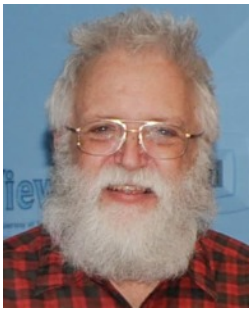
Credit

NASA/JPL-Caltech/Space Science Institute



Observatory Update: NGC4571

Rick Johnson



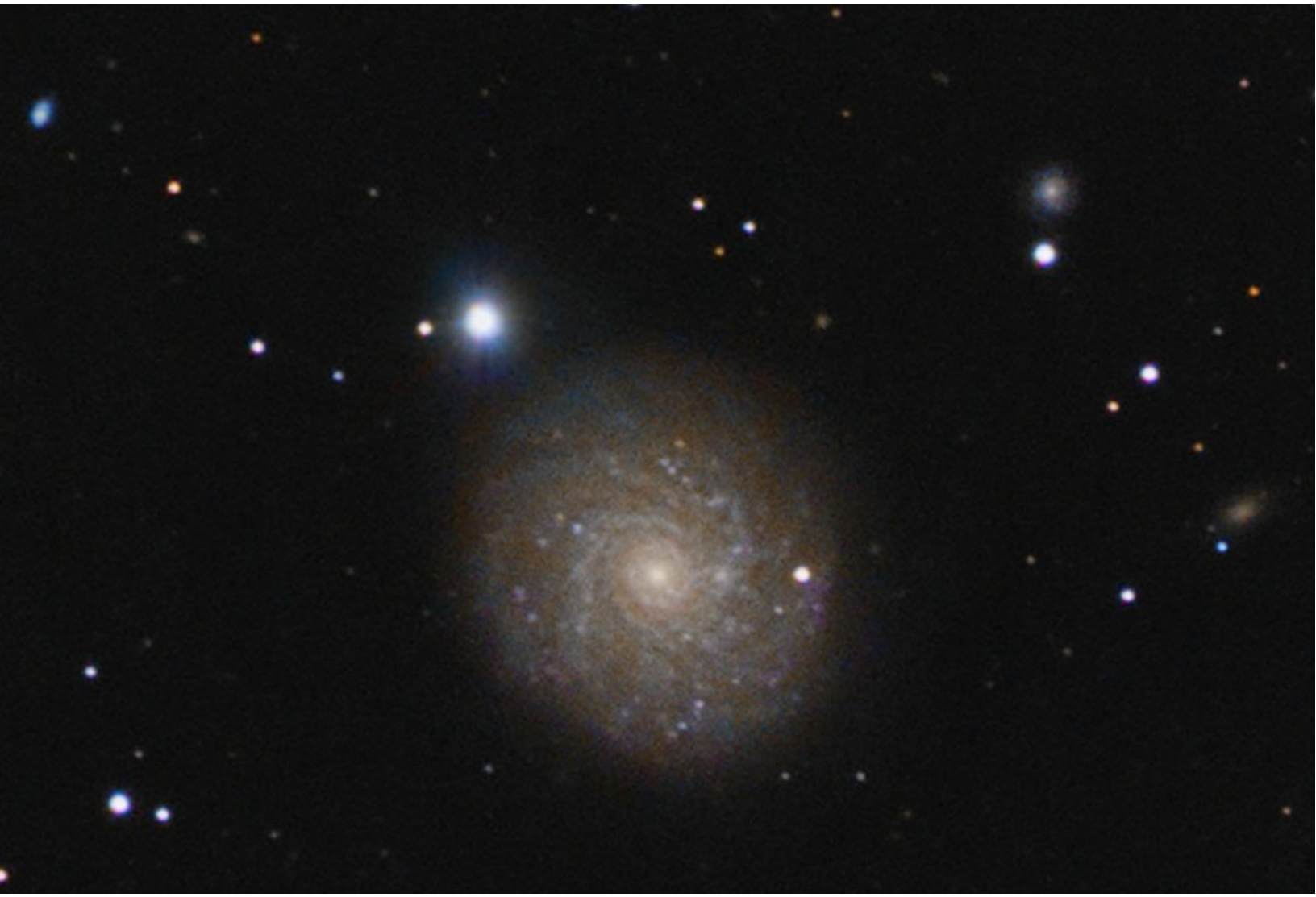
NGC 4571 is a face on low surface brightness galaxy in the Virgo Cluster a half degree southeast of M91. Thus, while a member of the Virgo Cluster it is located in southern Coma Berenices. It has low contrast blue arms on a mostly featureless reddish disk with a small rather bright core. One paper says it has an arm structure similar to M101. I really pushed the contrast and color saturation to bring out these very low contrast arms. Its distance is only 31 million light-years by redshift which is undoubtedly too close. Virgo Cluster galaxies have rather high velocities that make redshift an unreliable distance indicator. Tully-Fisher measurements show a distance of about 50 million light-years which is much more reasonable but likely still too close. I'm finding most current sources are saying about 60 million light-years for its distance which is pretty much the accepted distance to the Virgo cluster itself. Using 60 million light-years for its distance I get a size of 72,000 light-years. It was discovered by William Herschel on 4571. John Herschel thought it might be M91 which led to years of confusion before NGC 4548 was settled on as Messier's M91. On November 23, 1900, Arnold Schwassmann came across the galaxy. For reasons I haven't been able to discover Dreyer treated it as a new object giving it the

designation IC 3588. Was the confusion over M91 to blame? I can't find the answer but tend to doubt it.

To the northeast is Malin 1 and Malin 1B. A note at NED says: "This galaxy (Malin 1B) has previously been given a stellar classification owing to its round shape. The high resolution of WFPC2, however, enabled us to view the galaxy's faint disk and thereby determine its true nature as a galaxy." In my data it doesn't have a PSF of a star though is close. Still, even by eye, I didn't think it a star so find this note rather puzzling. That brings up Malin 1 itself which is listed as being a GLSBG which stands for Giant Low Surface Brightness Galaxy. Its core certainly isn't unusually faint but its disk is in relation to the core. I measure it at about 100,000 light-years in size. I'm not sure how that makes it a giant. Maybe I'm not seeing its full extent though I do see the same size as the SDSS image. Turns out neither I nor SLOAN is seeing it's true size. See this link for the story and a very deep image.

Another puzzle is PGC 042178 to the northeast. It is blue shifted so I list its distance as n/a. It is classified as dE4,N which is a dwarf elliptical with a nucleus. It does have a blue starlike object west of its center. Looking at its PSF in my data it is a star. Sloan image also makes it appear to be a star. If it is a foreground star then where's the nucleus? Another blue shifted dwarf elliptical, PGC 042193 is seen near the eastern edge of my image. It has no nucleus though is a bit brighter if you ignore the star-like object in the former galaxy. Are they related, are they in the Virgo Cluster? I found no answers.

An amateur processed image of NGC 4571 in pseudo color by the HST in green and near IR light can be seen here.



A Little-Known Eclipse Viewing Technique

Rick Brown

There's a well known set of safe methods for viewing the partial phase of a solar eclipse, with which most of us are familiar. These include:

- The "pinhole" method (and its variants, like observing the points of light in the shadow of a leafy tree);
- Direct, unmagnified viewing, using certified filters (like "eclipse glasses");
- Direct magnified viewing (again, with certified filters);
- Optical projection onto a screen, using lenses & prisms.

To these I'd like to add a simple method which I've used a number of times successfully, but which is not widely known: reflection by a small, flat mirror.

The idea is simple (but requires some space). Use a little mirror to reflect the sun onto a shaded surface (e.g. the side of a building) whose distance is at least a few hundred times greater than the mirror's aperture. The result will be a decent image of the eclipsing sun.

It really works. The results aren't of the same quality you get with lenses, but they certainly rival the pinhole technique. Here's an image about 6 inches in diameter, reflected from about 55 feet away. (Sadly, I was unable to arrange for an eclipse to happen on this day, so all you'll see here is the sun's full disk):

And here's the mirror I used. (The mirror is actually about 2.5 inches in diameter, but I masked it down to about 1 square inch. More about that later.)

The principle that makes this work is exactly the same as the pinhole camera. In this case, the mirror itself acts as the "pinhole," because only the light that falls onto that small aperture can end up in the image. The mirror causes the light to switch direction; but that has no effect on what the final image looks like.

All of the principles that apply to the pinhole camera apply to the "mirror camera" too. For example:

You can't resolve anything in the image that's smaller than the size of the pinhole (or smaller than the size of the mirror). Essentially: the smaller the aperture, the sharper the image. That's why I masked the mirror down to about 1 square inch. Notice that the *shape* of the aperture doesn't matter a whole lot, provided it's considerably smaller than the final image.

The larger the pinhole (or the mirror); the brighter the image. This is a tradeoff you have to make with the

previous bullet point: image sharpness vs. brightness.

The more distant the image is from the pinhole (or the mirror), the larger (and sharper) the image appears; but also the dimmer it is.

Because of the tradeoff between brightness and sharpness of the image, the technique works best if you can increase the sharpness as much as possible (by masking the mirror and/or increasing your distance), while reflecting the image onto a well-shaded area for maximum contrast.

Some numbers to consider: At a bare minimum, you will want a reflected image that is at least 5 times the size of your mirror aperture (remember: the mirror's aperture represents the smallest detail you can resolve in the image). A pinhole camera (or the "mirror camera") with a small aperture projects a distant image of the sun whose size will be about 1/108 as large as its distance from the pinhole (or mirror) — this ratio echoes the sun's actual angular size in the sky. What this means is that you should plan on reflecting the image onto a surface that is at least 5 x 108 = 540 times as far away as the size of your mirror aperture — the farther the better, if you can deal with the dimness. If you place the mirror very much closer than that, then the image will look less and less like an eclipsing sun, and will in fact start to take on the size and shape of the mirror itself.

24th Nebraska Star Party - July 23-28, 2017

The early registration deadline is July 1st!

Join us this summer as we gather families from all over the US and around the world in the sparsely populated sand hills of North Central Nebraska to spend a good week under a galaxy of stars.

NSP Schedule of Events

Sunday: registration and check-in, optional dinner.

Monday: registration and check-in, field school, optional dinner.

Tuesday: registration and check-in, swap meet, field school, free “Cattle Country” hamburger dinner.

Wednesday: (All at Valentine High School) field school, registration, swap meet, speaker program, children’s program, dinner on your own.

Thursday: Brewer’s Niobrara Canoe or tube float, optional dinner.

Friday: public star party at 9pm.

For more information see the NSP website.

Register online!

July Observing: What to View

Jim Kvasnicka

This is a partial list of objects visible for the upcoming month.

Planets

Mercury: Low on the WNW no higher than 8° above the horizon.
Jupiter: Sets around 1:00 am as the month begins and by 11:00 pm at the end.
Saturn: In Ophiuchus, its rings are open 26.7°, nearly the maximum tilt.
Neptune: In Aquarius.
Uranus: In Pisces.
Venus: Rises about 2½ hours before the Sun at magnitude -4.0.
Mars: In conjunction with the Sun and not visible.

Messier List

M3: Class VI globular cluster in Canes Venatici.
M4: Class IX globular cluster in Scorpius.
M5: Class V globular cluster in Serpens Caput.
M53: Class V globular cluster in Coma Berenices.
M68: Glass X globular cluster in Hydra.
M80: Class II globular cluster in Scorpius.
M83: Galaxy in Hydra.

Last Month: M58, M59, M60, M84, M86, M87, M88, M89, M90, M91, M98, M99, M10
Next Month: M6, M7, M8, M9, M10, M12, M19, M20, M21, M23, M62, M107

NGC and other Deep Sky Objects

NGC 5907: Edge on galaxy in Draco.
NGC 5921: Galaxy in Serpens Caput.
NGC 6309: The Box Nebula in Ophiuchus.
NGC 6369: The Little Ghost Nebula in Ophiuchus.
NGC 6543: The Cat's Eye Nebula in Draco.

Double Star Program List

Nu Draconis: Equal pair of white stars.
Psi Draconis: Light yellow pair of stars.
40/41 Draconis: Equal pair of light yellow stars.
Xi Scorpii: Yellow primary with a light blue secondary.
Struve 1999: Two yellow-orange stars.
Beta Scorpii: Blue-white primary with a light blue secondary.
Nu Scorpii: Yellow and light blue stars.
Delta Serpentis: Yellow pair.
Theta Serpentis: Light blue pair of stars.

Challenge Object

Abell 2065 Galaxy Cluster: Large aperture is needed to try and glimpse this group of faint galaxies in Corona Borealis.

The Great American Total Eclipse
August 21, 2017

Planning your eclipse trip? Take a look at Fred Espanak's presentation on YouTube:

https://www.youtube.com/watch?v=K4KnxE6yAuI

Focus on Constellations: Scorpius

Jim Kvasnicka

Scorpius

Scorpius, the Scorpion covers 497 square degrees of sky. Scorpius lies in the general direction of the center of our Milky Way Galaxy. Because our Galaxy's family of approximately 200 globular clusters is concentrated toward the center of the Milky Way, Scorpius is rich in globular clusters, two of them M4 and M80 being Messier objects. Scorpius contains two additional Messier objects, M6 and M7, both are open clusters.

Showpiece Objects

Open Clusters: M6, M7, NGC 6231
Globular Clusters: M4, M80
Multiple Stars: Xi Scorpii, Beta Scorpii, 14 Scorpii, 12 Scorpii, Alpha Scorpii

Mythology

Scorpius represents the Scorpion sent to sting Orion in the heel. The constellation is mentioned several times in a group of Mesopotamian tablets dated to 2,500 B.C.; and in Mesopotamian art there are figures of scorpions and scorpion-men.

Number of Objects Magnitude 12.0 and Brighter

Galaxies: 0
Globular Clusters: 10
Open Clusters: 43
Planetary Nebulae: 5
Dark Nebulae: 23
Bright Nebulae: 0
SNREM: 0

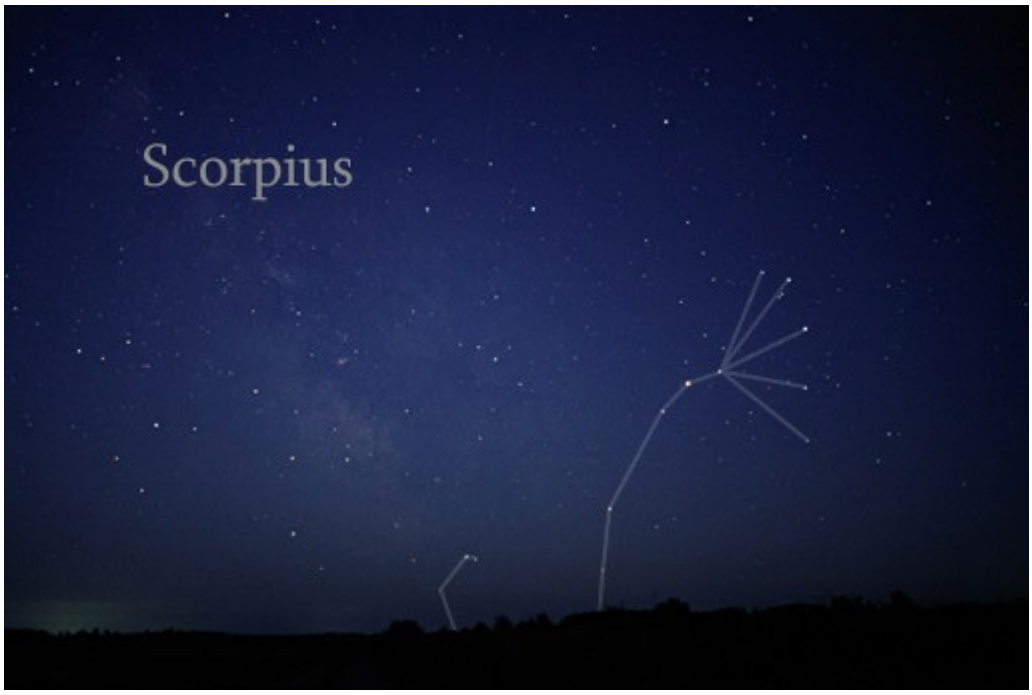


Photo: Till Credner - Own work: AlltheSky.com

The Shape of the Solar System

This article is provided by NASA Space Place.
With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.
Visit spaceplace.nasa.gov to explore space and Earth science!

Marcus Wu

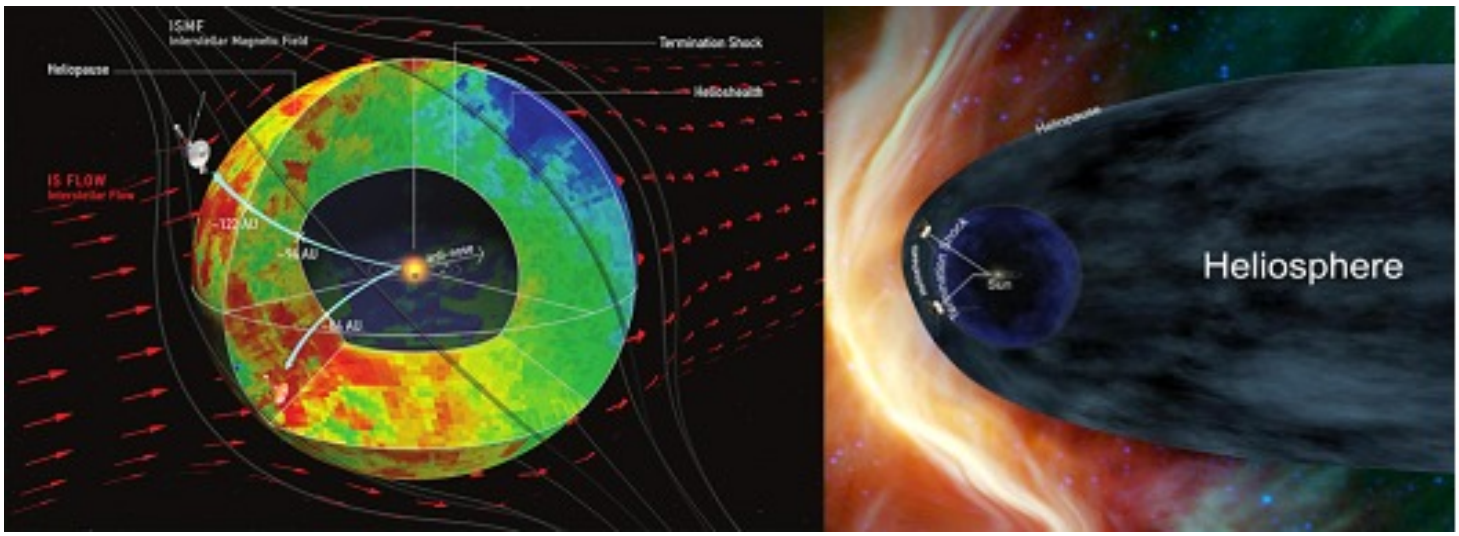
When Stamatios (Tom) Krimigis was selected for the Voyager mission in 1971, he became the team's youngest principal investigator of an instrument, responsible for the Low Energy Charged Particles (LECP) instrument. It would measure the ions coursing around and between the planets, as well as those beyond. Little did he know, though, that more than 40 years later, both Voyager 1 and 2 still would be speeding through space, continuing to literally reshape our view of the solar system.

The solar system is enclosed in a vast bubble, carved out by the solar wind blowing against the gas of the interstellar medium. For more than half a century, scientists thought that as the sun moved through the galaxy, the interstellar medium would push back on the heliosphere, elongating the bubble and giving it a pointy, comet-like tail similar to the magnetospheres—bubbles formed by magnetic fields—surrounding Earth and most of the other planets

"We in the heliophysics community have lived with this picture for 55 years," said Krimigis, of The Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland. "And we did that because we didn't have any data. It was all theory."

But now, he and his colleagues have the data. New measurements from Voyager and the Cassini spacecraft suggest that the bubble isn't pointy after all. It's spherical.

Their analysis relies on measuring high-speed particles from the heliosphere boundary. There, the heated ions from the solar wind can strike neutral atoms coming from the interstellar medium and snatch away an electron. Those ions become neutral atoms, and ricochet back toward the sun and the planets, uninhibited by



Caption: New data from NASA's Cassini and Voyager show that the heliosphere — the bubble of the sun's magnetic influence that surrounds the solar system — may be much more compact and rounded than previously thought. The image on the left shows a compact model of the heliosphere, supported by this latest data, while the image on the right shows an alternate model with an extended tail. The main difference is the new model's lack of a trailing, comet-like tail on one side of the heliosphere. This tail is shown in the old model in light blue.
Image credits: Dialynas, et al. (left); NASA (right)

the interplanetary magnetic field.

Voyager is now at the edge of the heliosphere, where its LECP instrument can detect those solar-wind ions. The researchers found that the number of measured ions rise and fall with increased and decreased solar activity, matching the 11-year solar cycle, showing that the particles are indeed originating from the sun.

Meanwhile, Cassini, which launched 20 years after Voyager in 1997, has been measuring those neutral atoms bouncing back, using another instrument led by Krimigis, the Magnetosphere Imaging Instrument (MIMI). Between 2003 and 2014, the number of measured atoms soared and dropped in the same way as the ions, revealing that the latter begat the former. The neutral atoms must therefore come from the edge of the heliosphere.

If the heliosphere were comet-shaped, atoms from the tail would take longer to arrive at MIMI than those from the head. But the measurements from MIMI, which can detect incoming atoms from all directions, were the same everywhere. This suggests the distance to the heliosphere is the same every which way. The heliosphere, then, must be round, upending most scientists' prior assumptions.

It's a discovery more than four decades in the making. As Cassini ends its mission this year, the Voyager spacecraft will continue blazing through interstellar space, their remarkable longevity having been essential for revealing the heliosphere's shape.

"Without them," Krimigis says, "we wouldn't be able to do any of this."

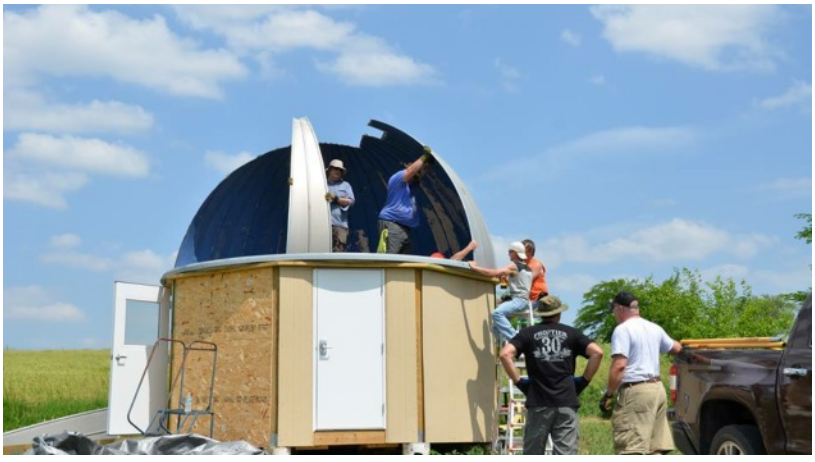
To teach kids about the Voyager mission, visit the NASA Space Place: https://spaceplace.nasa.gov/voyager-to-planets

Dome Assembly Completed at Branched Oak Observatory

We are pleased to announce that the dome for the Everts S. Sibbernsen Memorial Observatory has been assembled! We still have to install the shutter doors, motors, and many other finishing touches, but the major work is done.

We have the following volunteers to thank for today's very HARD work. Rod Witfoth, Jeff W Guettler, Matthew Anderson, Greg Rothman, Brett Boller, Brian Sivill, Bryan Schaaf, Doug Buhrman, Kendra Sibbernsen, Michael Sibbernsen

All photographs by Kendra Sibbernsen



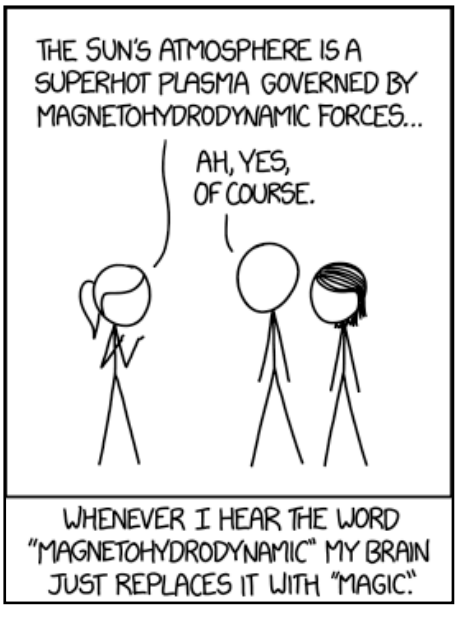
From the Archives: February, 1970

President's Report
February, 1970

The eclipse of March 7th is nearly at hand, and I have been quite busy getting my equipment ready. I plan on taking my 8" f/7.5 and my 2.4" refractor along. I have chosen Valdosta, Georgia as my destination. I had made a sun filter to fit my 6" f/4, but since I decided to take the 8" along I will have to rework the filter to fit the larger scope. As for those who will be in Lincoln on March 7th, I urge you to take part in the public eclipse show at Gateway. Just follow the rules as outlined in the front page story of the latest Reflector Magazine. I will present an open discussion on "The Astronomical Yardstick" at the meeting. See you there. Earl Moser

President's Report March, 1970

The big eclipse of March 7, 1970 has come and gone, and I missed it. Even though I had spent months in preparation and travelled 1500 miles to the path of totality, you can't be sure of anything. The weatherman and mother nature had the final decision. It was cloudy in Valdosta, Georgia on March 7. That's the way it goes. All we can do is hope for better luck next time. It was clear Thursday and Friday, cloudy Saturday, rained Sunday, and clear Monday. I suppose these facts confirm the 50-50 chance of clear skies for Georgia for this time of year. Just the same I don't feel that my efforts were wasted. I took my family along and we considered the trip as our annual vacation. I also had a great time meeting new arrivals at the industrial park site on Friday and spent half the night visiting with the different groups of amateur astronomers from all over the eastern half of the United States. I hear that it was clear in Lincoln on March 7, and the club put on one of its best shows at Gateway. I want to express my thanks for everyone who took part in this eclipse show. I also want to thank those who were responsible for the publicity in the paper. Speaking of publicity! I suppose most of you saw the picture in the Lincoln Journal of my son and me, setting up the telescope at Valdosta. It looks like I really hit the jackpot on publicity. It didn't help the club much though, since the Associated Press photographer failed to mention the club's name after I had written it down for him. Just the same, people from all over the country know that at least there is one person in Nebraska interested in astronomy. We will have detailed reports on the eclipse at our meetinq, from Mexico, Virginia, Georgia, and Lincoln. Some pictures too, I hope. Earl Moser



xkcd.com

CLUB MEMBERSHIP INFO

REGULAR MEMBER - $30.00 per year. Includes club newsletter, and 1 vote at club meetings, plus all other standard club privileges.

FAMILY MEMBER - $35.00 per year. Same as regular member except gets 2 votes at club meetings.

STUDENT MEMBER - $10.00 per year with volunteer requirement.

If you renew your membership prior to your annual renewal date, you will receive a 10% discount.

Club members are also eligible for special subscription discounts on Sky & Telescope Magazine.

CLUB TELESCOPES

To check out one of the club telescopes, please contact a club officer. Scopes can be checked out at a regular club meeting and kept for one month. Checkout can be extended for another month if there are no other requests for the telescope, but you must notify a club officer in advance.

100mm Orion refractor: David Pennington
10 inch Meade Dobsonian: Lee Taylor
13 inch Truss Dobsonian: Available

CLUB APPAREL

Order club apparel from cafepress.com:

Shop through Amazon Smile to automatically donate to PAC:

CLUB OFFICERS

President	Jim Kvasnicka (402) 423-7390 jim.kvasnicka@yahoo.com
Vice President	Brett Boller
2nd VP (Program Chair)	Mark Dahmke
Secretary	Lee Thomas lthomas@allophone.com
Treasurer	John Reinert jr6@aol.com
Club Observing Chair	Jim Kvasnicka jim.kvasnicka@yahoo.com
Outreach Coordinator	Mike Kearns mkearns@neb.rr.com
Website and Newsletter Editor	Mark Dahmke mark@dahmke.com

The Prairie Astronomer is published monthly by the Prairie Astronomy Club, Inc. Membership expiration date is listed on the mailing label. Membership dues are: **Regular $30/yr, Family $35/yr**. Address all new memberships and renewals to: **The Prairie Astronomy Club, Inc., PO Box 5585, Lincoln, NE 68505-0585**. For other club information, please contact one of the club officers listed to the right. Newsletter comments and articles should be submitted to: **Mark Dahmke, P. O. Box 5585, Lincoln, NE 68505 or** mark@dahmke.com**,** no less than ten days prior to the club meeting. The Prairie Astronomy Club meets the last Tuesday of each month at Hyde Memorial Observatory in Lincoln, NE.