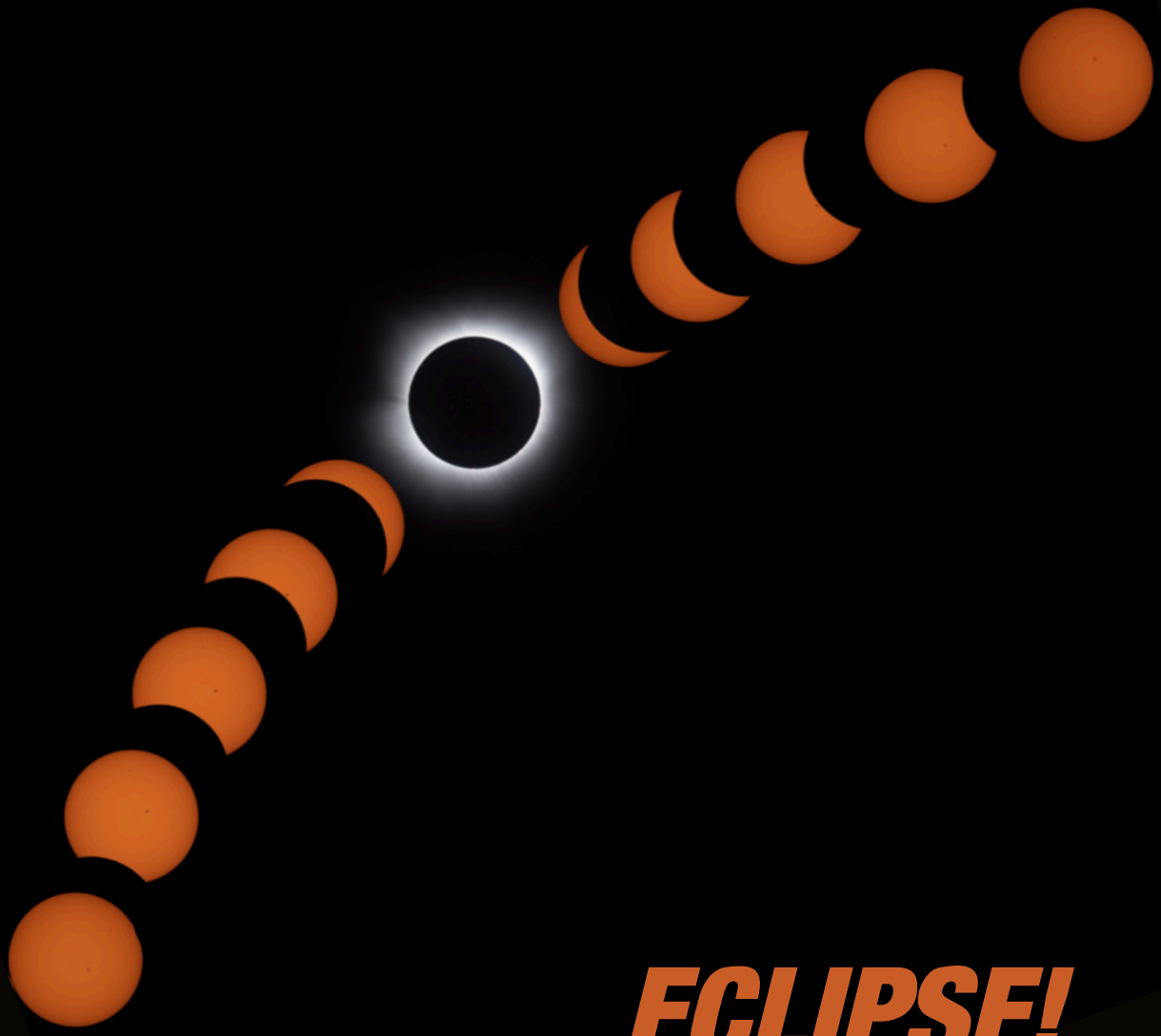
The Prairie Astronomer

April 2024 Volume 65, Issue #4



ECLIPSE!

IN THIS ISSUE:

The Newsletter of the Prairie Astronomy Club

The Prairie Astronomer

The next regular club meeting is April 30th at 7:30pm at Hyde Observatory

NEXT MEETING AND PROGRAM

For our April 30 program we welcome Robert Teeter, founder of Teeterscopes LLC who will talk about optimizing Dobsonian telescopes and some of the interesting builds he's done over the years. Formed in 2002, Teeter's Telescopes has been custom building dobsonian telescopes ranging from 8″ F/6 to 24″ F/3.5 and nearly every aperture and focal length combination between.

UPCOMING PROGRAMS

May: AL Observing Programs (tentative)

June: Nearest Star Party

CONTENTS

Cover: Solar Eclipse Arc by Brett Boller

Background photo: Brett Boller

CALENDAR

Most of our club meetings are held at Hyde Memorial Observatory in Holmes Park.

The Observatory is owned and maintained by the City of Lincoln Parks and Recreation Department, but is operated by volunteers, many of whom are also members of the Prairie Astronomy Club.

PAC Meeting
Tuesday, April 30th, 7:30pm at Hyde Observatory
Program: "Optimizing Dobsonian Telescopes"
presented by Robert Teeter

PAC Meeting
Tuesday, May 28th, 7:30pm at Hyde Observatory

PAC Meeting
Tuesday, June 25th, 6pm at Hyde Observatory
Nearest Star Party

https://www.prairieastronomyclub.org/event-calendar/

Night Sky Network

www.prairieastronomyclub.org

2024 STAR PARTY DATES

	Date	Date
January	5	**12**
February	2	**9**
March	1	**8**
April	3/29	**5**
May	4/26	**3**
June	5/31	**7**
July	6/28	**5**
NSP	**7/28**	**8/2**
August	7/26	**2**
September	8/30	**6**
October	9/26	**4**
November	11/22	**29**
December	20	**27**

Dates in BOLD are closest to the New Moon.

CLUB OFFICERS

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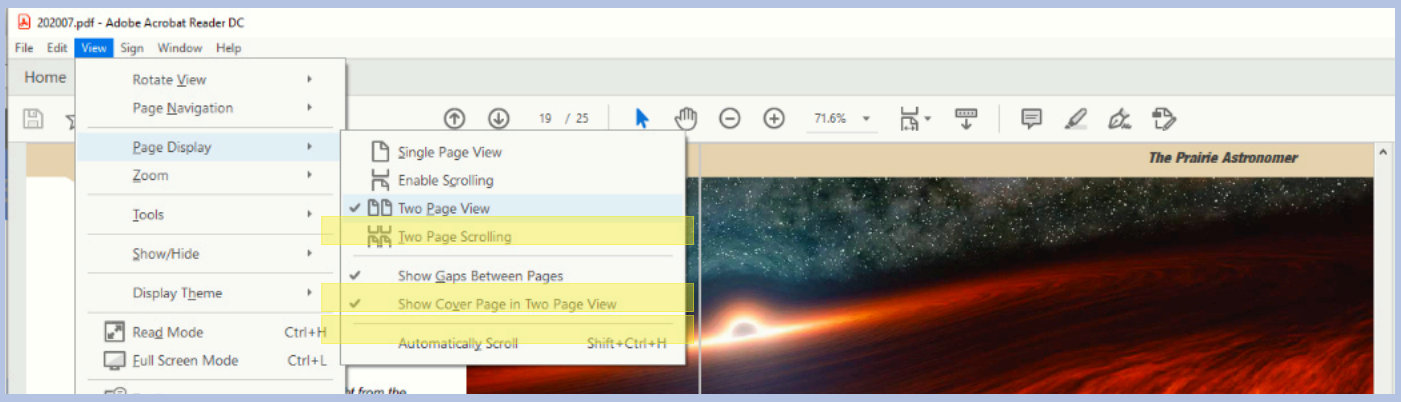
Notices

Newsletter Page View Format

How to Adjust Adobe Acrobat Settings for Two Page View



To view this newsletter in magazine spread format in Acrobat, select View ->Page Display->Two Page View. Acrobat will then show two pages side by side. Also make sure the checkboxes "Show Cover Page in Two Page View" and "Show Gaps Between Pages" are checked. If you have it setup correctly, the cover page will be displayed by itself and subsequent pages will be side by side with the odd numbered pages on the left.

PAC Newsletter Archive

Back issues of the Prairie Astronomer from 1962 to present are available online: https://newsletters.prairieastronomyclub.org/

Pay Dues Online

https://www.prairieastronomyclub.org/pay-dues-online/

If you're already a member and are renewing within 30 days of your anniversary date, select the early renewal option for a discount.

PAC-LIST

Subscribe through GoogleGroups or contact Mark Dahmke to be added to the list. You'll need a Google/gmail account, but if you want to use a different email address, just associate that address with your google account to access Google Groups. Once subscribed, you can view message history through the GoogleGroups website.

To post messages to the list, send to this address: pac-list@googlegroups.com

The President's Message

Jason O'Flaherty

Dear PAC Members,

After looking at the girth of reading material in a preview of this month's newsletter, I've decided to keep this letter short. The 2024 Solar Eclipse captured most of our shared attention this past 30 days. I've enjoyed seeing the posts, photos, and videos from many of you on social media showcasing your experiences. It's amazing when something like this brings so many of us together in spirit and person.

Now that the excitement has ebbed, I'll continue with the yearly tasks of sending out a survey to the club members and meeting with the board to review the results. Look for an email about the 2024 PAC Survey with a link to a Google Form in the coming week. Please take the time to fill it out so we can continue to move forward with everyone's interests in mind.

I look forward to seeing you on April 30th at Hyde for our April Meeting.

We'll be virtually hosting Robert Teeter Jr., who will share the ins and outs of building Dobsonian telescopes.

Wishing you all clear skies,

Jason O'Flaherty

New Members

Welcome to the club!

Scott Spaulding, Lincoln, NE
Russ Genzmer, Lincoln, NE - Welcome back!

Meeting Minutes

Jim White

Jason O'Flarherty started the meeting at 7:33. Tonight's meeting is being held at Branched Oak Observatory and online via Zoom. There was at least one new member at tonight's meeting but I was unable to catch their name as I was attending remotely due to illness and the sound was slightly garbled.

At 7:34 Jason turned the meeting over to the club observing chair, Jim Kvasnicka, for his monthly observing report. This months star parties are this Friday night March 29th and the following Friday night April 5th, both star parties are scheduled to be held at the Clatonia Recreation Area if weather permits. There is a solar eclipse coming up on Monday April 8th, Lincoln will experience a partial eclipse with 79.92 percent of the sun covered. The partial eclipse will begin at 12:31 pm, maximum will be at 1:53 pm and the eclipse will end at 3:10 pm. The Lyrids meteor shower will peak the nights of April 21st – 22nd but the moon will be up and interfere with viewing. There has been a lot of press recently about the comet 12P/ Pons-Brooks which is at 5th magnitude and is very low in the west, northwest to the right of Jupiter. Jim's complete observing report can be found in this newsletter.

At 7:43 Jim turned the meeting over to John Reinert for his treasurers report. John did visit the bank this morning as a club CD is coming due that will mature tomorrow and he will be trying to secure a 4.9 percent rate.

At 7:44 John turned the meeting back over to Jason. Jason went over the benefits of becoming a member of PAC and the cost of membership with the different options for single membership, family membership and student membership. The April club meeting will be back at Hyde Observatory and the program will be Optimizing Dobsonian Telescopes by Robert Teeter Jr. Robert Teeter Jr. is a manufacturer of dobsonian telescopes and is in the process of closing his business, he is going through the remainder of his orders this year and will then close up his shop. Several members of the club own Teeter telescopes.

Star party attendance has been low recently and we want to start a discussion about what we can do to boost attendance and hopefully make it easier for members to know if other club members are planning on attending an upcoming star party. Currently the club has two star parties scheduled per month, the idea being that if the weather is bad for the first then you still have another one to plan for. One idea may be to focus on having one per month and if the weather is bad then fall back to having one the following Friday. Another idea would be to send out an attendance questionnaire. There were some additional suggestions made but

the audio was too garbled for me to understand on Zoom. If you have additional suggestions please bring them up during a meeting or bring it up to one of the club officers. We do have an upcoming board meeting and an annual survey that Jason sends out so if you have any suggestions please include them with the survey.

There is a volunteer opportunity coming up on April 6th, Astronomy Night at Morrill Hall, Don Hain will be there and were sure he would enjoy having some help so if you are interested please get in touch with Don or Christine Parkyn PAC's outreach coordinator. ALCON is coming up July 17th-20th in Kansas City. The 31st annual Nebraska Star Party (NSP) is coming up July 28th-August 2nd at Merritt Reservoir and there will be a beginners field school held in Valentine. The Mid-States Regional Astronomical League is June 7th, 8th and 9th at Mahoney State Park and is being hosted by the Omaha Astronomical Society. Hyde Observatory will be open at noon on April 8th for the solar eclipse and would like anyone that is available to come out and help and if you have a telescope with a proper solar filter you are encouraged to bring it to Hyde and set it up on the lawn and share the view with the public. Branched Oak Observatory will also be open at noon on April 8th for the eclipse and would also appreciate the help from volunteers if you're available.

Tonight's meeting adjourned at 7:58.

Tonight's program is "Beyond the Shadow, Exploring the Great North American Eclipse of 2024" by Michael Sibbernsen from Branched Oak Observatory.

ARP 66

The Mantrap Skies Image Catalog

Arp66/UGC 10396 falls under Arp's category: "Spiral galaxies with small high surface brightness companions on arms." I assume the "companion" Arp is speaking of is the bright object about 21 seconds north of the core of UGC 10396. Problem is that object doesn't appear in NED. Thousands of Sloan survey galaxies are listed in my field. None of which match the position of the bright object. One note at NED says: "Blue condensation 0.12 x 0.10 at 0.35 north center, probably at tip of spiral arm." But it appears completely separate of any arm in my image as well as the Sloan image. Some connection appears possible in Arp's image, however. But to an inner arm, not the one apparently referred to above. Adding to the problems of deciphering this field is the lack of redshift data for anything in the image other than Arp 66's core galaxy. That has a redshift of z=0.020631 which puts it about 280 million light years distant. It is located southern Draco just above its border with Hercules. This one would also fit in Arp's 3 arm spiral category. Seems to have three better-defined arms, one

Rick Johnson

Rick Johnson, a founding member of the Prairie Astronomy Club, passed away in January, 2019. His legacy lives on through his comprehensive catalog of over 1600 images at www.mantrapskies.com.

ARP66, continued.

is just a disconnected arc, than some he included in that category.

One note at NED has this interesting comment: "The system's components rotate in opposite directions. The dynamical and photometric centers of both components somewhat differ in position and radial velocity." If true this would indicate the possibility that this is a merger. Could the mystery object be the remaining core of the merging galaxy? If it was I'd think there'd be a strong difference in the centers of rotation seen which doesn't appear to be the case. Could be most of the parts were stripped long ago and now the core is left to orbit the surviving galaxy. That would give the time needed to give more concentricity to the two. But then the comment goes on to say: "The only determination of the central radial velocity found in the literature appears to come from Arkhipova and Esipov (1979). It is listed, e.g., in the UZC catalog (Falco et al. 2000) and is equal to 6185+/-150 km s^-1^. The causes of such a strong discrepancy between this value and our determination (~2500 km s^-1^) are unclear." NED uses the 6185 figure but with a smaller error bar. Apparently, it considers this group's redshift too unreliable to mention. This then makes me wonder about the first part above. For now, I'm "Lost in Space" over this one.

With no redshift data I didn't prepare an annotated image. North northeast of Arp 66 is the very flat, warped disk galaxy SDSS J162704.39+513650.2. I found nothing on it. Why is it's disk so warped? (Warped disks didn't seem to interest Arp.) Could it be related to Arp 66? Seems unlikely but how else to explain the warp? I haven't explored beyond the bounds of my image so the reason may be "out there." To the northwest of Arp 66 is the very low surface brightness disk galaxy, SDSS J162639.02+513533.8. Again no information on it is available to help decide if it could be related to Arp 66 or not. To the southeast of Arp 66 is what appears to be a trio of interacting galaxies. The western one is SDSS J162715.11+513007.1, the northern one SDSS J162715.79+513009.2 and the southern one ... well it isn't in NED. It might be a arm of the western galaxy ripped off by the interaction with the northern galaxy. Without any redshift data anything I can come up with is a pure guess.


Nebraska Star Party
July 28th - August 2nd, 2024
JUST
IMAGINE
Merritt Reservior • Nebraska • USA • Earth • Sol System • Orion-Cygnus Arm • Milky Way Galaxy

May Observing

Jim Kvasnicka

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

Planets

Mars: Morning planet, best seen at the end of the month.

Saturn: Morning planet but difficult to see.

Mercury, Venus, Uranus, Neptune, and Jupiter: Not visible.

Messier List

M49: Galaxy in Virgo.

M51: The Whirlpool Galaxy in Canes Venatici.

M61: Galaxy in Virgo.

M63: The Sunflower Galaxy in Canes Venatici.

M64: The Black Eye Galaxy in Coma Berenices.

M85: Galaxies in Coma Berenices.

M94: Galaxy in Canes Venatici.

M101: The Pinwheel Galaxy in Ursa Major.

M102: Galaxy in Draco.

M104: The Sombrero Galaxy in Virgo.

Last Month: M40, M65, M66, M95, M96, M105, M106, M108, M109

Next Month: M58, M59, M60, M84, M86, M87, M88, M89, M90, M91, M98, M99, M100

NGC and other Deep Sky Objects

NGC 4244: The Silver Needle Galaxy in Canes Venatici.

NGC 4651/4656: The Whale Galaxy and Hockey Stick galaxies in Canes Venatici.

NGC 4666: Elongated galaxy in Virgo.

NGC 4754/4762: Galaxy pair in Virgo.

NGC 4866: Elongated galaxy in Virgo.

Double Star Program List

Kappa Bootis: Yellow and blue stars.

Iota Bootis: Yellow and dim blue pair.

Pi Bootis: Pair of white stars.

Epsilon Bootis: Yellow and greenish yellow stars.

Xi Bootis: Yellow pair.

Delta Bootis: Yellow primary with a blue-white secondary.

Mu Bootis: Two yellow stars.

Zeta Corona Borealis: Light blue and greenish yellow stars.

Challenge Object

Markarian's Chain: Galaxy group along the Virgo and Coma Berenices border. How many can you fit in your FOV?

Focus on Observing Programs

Jim Kvasnicka

Stellar Evolution Observing Program

Everything that we see in the night sky is visible to us because of light from a star. The stars, nebulae, planets, moons, are all visible because of starlight. We exist because early generations of stars generated the elements that make up our planet and the chemicals required for life.

The Stellar Evolution Observing Program will be of interest to the beginning observer as well as more experienced observers. The purpose of this program is to develop in the observer an appreciation for the most common objects that they see in the night sky – stars. Stars are born, live their lives, and then end their lives. Understanding this "Stellar Evolution" is important to understanding how the Universe works.

Some of the objects in this observing list are on other observing program lists, so you may have already observed some of the objects. After performing the observations you will have enough information to put each object into the context of stellar evolution.

The observing list for this program is divided into several sections, each illustrating a separate phase of stellar evolution. A total of 100 objects must be observed to complete the program. Objects you have already observed must be observed again to complete this program.

Type	Number of Objects
Stellar Nurseries	14
Colorful Stars	34
Young Open Clusters	7
Low Mass Stars	8
Red Giant Stars	6
Carbon Stars	5
Planetary Nebula / White Dwarfs	9
High Mass Main Sequence Stars	6
Red Supergiant Stars	5
Supernova Remnants	2
Variable Stars	4
Total	100

Once you complete the Stellar Evolution Observing Program you will need to submit your observing logs to me for review. I will contact the Stellar Evolution Observing Program chair for approval. Once I receive your certificate and pin I will present them to you at the next PAC meeting.

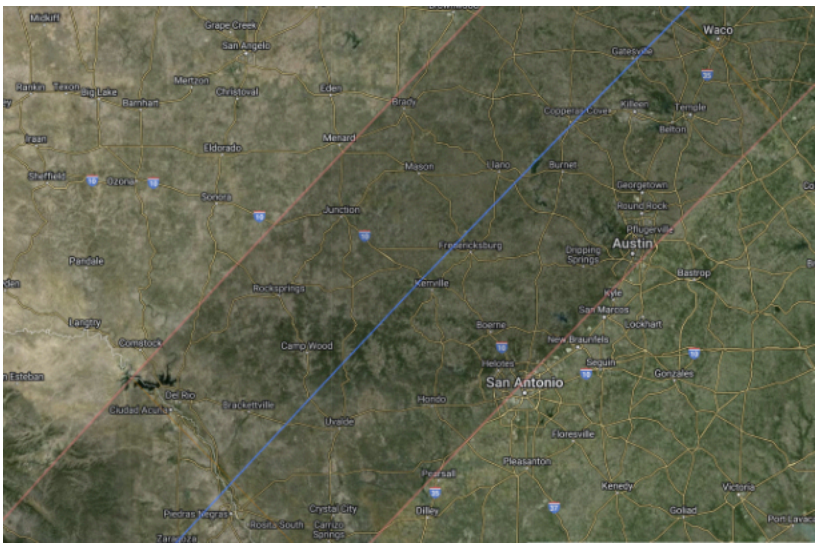
If you have any questions regarding the Stellar Evolution Observing Program or need help getting started in any of the observing programs please ask me and I will be glad to help.

Expedition to the April 8, 2024 Total Solar Eclipse

Larry Stepp

My son Dave and I traveled to Texas from Oro Valley, a suburb of Tucson, AZ, to see the total solar eclipse on Monday, April 8.

We had been planning for the eclipse for most of the past year. The eclipse path ran diagonally across Texas, with the centerline crossing the Rio Grande near Eagle Pass, running northeast through Texas hill country west of San Antonio, Austin and Waco, and then passing the east side of Dallas. Here is a map from the website: http://xjubier.free.fr/en/site_pages/solar_eclipses/TSE_2024_GoogleMapFull.html.



Totality was visible at locations between the red lines, with a maximum of more than 4 minutes and 20 seconds of totality along the centerline, decreasing to only a few seconds of totality near the red lines.

Long-term averages for cloud cover on April 8 showed the best chance of clear skies would be near the Rio Grande, with the probability of clear weather declining as the path moved across Texas and up into Missouri, Illinois, etc. I figured our best chances would be to head to SW Texas, but we wanted to be in a position to reach different areas along the eclipse path, starting just hours before the eclipse.

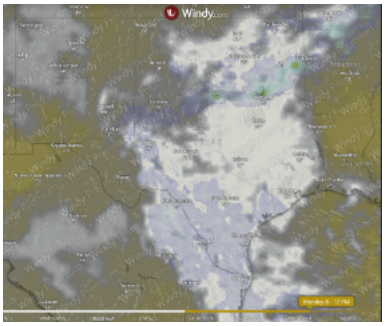
In 2017 my wife Vicki, son Dave, my brothers John and Bob, and I observed the total solar eclipse in Nebraska. We planned to locate in DeWitt, south of Lincoln; however, a heavy bank of clouds moved up from the south, and we had to make last minute changes in our plans. We drove west on Interstate 80 until we got out from under the worst of the clouds, and arrived just in time at the George Clayton Hall County Park in Grand Island, where we got a good view of the eclipse through thin clouds. That experience emphasized the need to have a flexible plan that would allow choosing the viewing location based on last-minute weather forecasts.

In the fall of 2023, when I made hotel reservations, hotels in towns in or near the eclipse zone were asking very high prices for the days around the time of the eclipse, many hundreds of dollars per night. Since we would be coming from Arizona,

Expedition, continued.

I started checking towns back west along Interstate 10 and I found normal prices at the Hampton Inn in Ozona, so I booked a room there for the nights before and after the eclipse, April 7 and 8. Ozona is 680 miles from Oro Valley. I made reservations to watch the eclipse at a ranch just outside of Uvalde, Texas, 159 miles by road south of Ozona, and our Plan A was to drive there early on the morning of the eclipse day.

As the eclipse day approached, weather forecasts for Texas looked awful. For example, here is a cloud forecast map for April 8, from a week earlier:



However, we proceeded with our plans regardless of the forecasts. Driving from Oro Valley we saw lots of motorhomes and camper trailers on the highway heading east. We arrived in Ozona late Sunday afternoon and headed to a well-rated barbecue restaurant, but when we pulled up in front, the restaurant owner came out to our car and told us they were completely sold out; they had run out of food by 2:30, because of all the "eclipsers." So that night we ate some food we brought with us, in our hotel room, and studied the latest forecasts on windy.com.

The weather forecast looked bad for Uvalde and other areas toward the south end of the path; however, further north, four of the five models on windy.com showed a hole in the bank of clouds at eclipse time, just west of Gatesville. So, on Sunday night we changed plans and decided we would head to Evant, Texas (population 456) which was in the middle of the hypothetical hole, 221 miles from Ozona. (On the eclipse map above, Evant is the first highway junction west of Gatesville.) It wasn't on the centerline (Gatesville was) but it still would have 4 minutes and 11 seconds of totality.

We didn't know how hard it would be to find a place to set up, and we knew about 10 million other people in Texas would be watching the weather forecasts, so we decided we needed to get to Evant early. We departed our hotel at 3:30 AM and drove for 3 1/2 hours on 2-lane state highways to get there, and fortunately we didn't hit a deer en route (although unfortunately we did hit a skunk, which made the underside of the car smell funky). When we rolled into Evant, we found a central square with a large parking lot, and there sat a row of port-o-potties and a portable barbeque setup with a nice middle-aged couple cooking breakfast, and preparing smoked brisket, ribs, sausages and side dishes for lunch. They confirmed they were setting up for eclipse viewers, and no, there was no fee,

Expedition, continued.

everyone was welcome. Here is what the area looked like early in the morning, before the crowds arrived.

However, as can be seen in the photo, at 7:00 AM the skies were completely overcast, and it was misting rain. So, we got a great Texas breakfast of coffee, biscuits and gravy, scrambled eggs and bacon, and sat in the car. For the next couple of hours we napped in the car, and then the clouds began to get lighter, and by 10:00 the sun was breaking out, so we started setting up our equipment, including my 4" Televue Renaissance telescope, my Seestar S50 electronic telescope, a shade canopy, a folding table and folding chairs, etc. Here is a photo of our setup, with Dave sitting under the canopy, the 4" telescope on an AVX mount on the left, and the Seestar on a photographic tripod.

By 11:00 we had blue skies overhead and to the north, although we could still see thick clouds to the east, south and west. There really was a hole in the cloud bank, as predicted.

The eclipse started with first contact at 12:18, and by that time there were about a hundred carloads of people there.

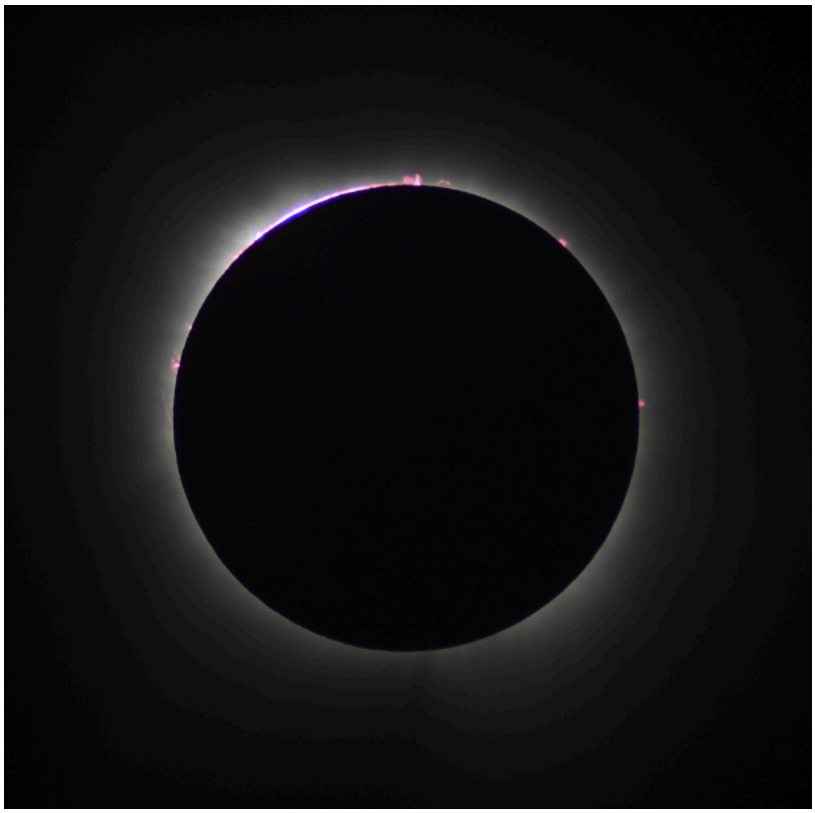
I think the population of Evant more than doubled that day. The barbeque completely sold out before second contact.

Expedition, continued.

Conditions during the eclipse were excellent, with only a light breeze and just a few thin high clouds up until third contact (the end of totality). We could see a couple of sunspots on the sun. The Seestar was equipped with its solar filter, and I set it to take a time-lapse video, shooting a frame every 10 seconds, with a manually set shutter speed of 1 millisecond. Here is one frame from that video:

I also shot several images of the partial eclipse phases with my 4" telescope, solar filter and Nikon camera, and then about 6 minutes before totality I slewed the telescope sideways away from the sun, removed the solar filter and set the camera to photograph totality.

By totality, there were about 250 people in and around the square. I saw one other telescope, an 8" Meade, and 8 or 10 people had tripods set up with cameras with long telephoto lenses. When totality started and the moon completely covered the photosphere, people cheered and clapped. We could easily see Venus and Jupiter flanking the eclipsed sun.



With the 4" telescope I took a wide range of exposures from 1/8 second to 1/2000, to show bright prominences with the short exposures and the extended corona with longer exposures (north is up in the images).

Continued on next page.

Expedition, continued.

At the end of totality, I caught an image (below) just as the photosphere of the sun began to peak out, an effect called a "diamond ring." Note that, with the bright light shining through, you can see the light scattered by the thin high clouds.

After totality I restarted the time-lapse (which had lost tracking when the sun went dark), but within five minutes after totality ended, thick clouds rolled in and completely covered the sky. We were extremely lucky the thick clouds didn't arrive any sooner!

Dave and I drove back to Ozona Monday afternoon, where we found the hotel lobby full of enthusiastic people who had seen the eclipse, some from as far away as Germany.

The next day we drove back to Oro Valley, tired but happy.

An Eclipse Story

Jason O'Flaherty

On April 7th, I party crashed the plans of four other PAC members and journeyed southeast to observe the 2024 Total Solar Eclipse. Jim Kvasnicka, Bob Kacvinsky, Brett Boller, Dave Churilla, and I, Jason O'Flaherty, left Bob's house Sunday morning to stay in Missouri that night before getting an early start on the 8th to travel into the path of totality. The original plan was to stay in Joplin, MO, at a VRBO rental house before continuing to Russellville, AR.

However, Saturday weather reports showed a better chance of clear skies in southern Illinois, so we booked a hotel in Rolla, MO, with new plans to drive to Carbondale, IL, instead.

I had plans to stay south longer, so the four others had to ensure all of their equipment and luggage fit into Brett's dinosaur-themed RAM T-Rex truck, which is as loud and nearly as large as an adolescent king of the lizards. Getting everything packed under the tonneau cover would be a tight fit. Bob was quick to propose a sacrificial piece of luggage and offered to leave his telescope at home, but I was confident in Brett's self-professed Tetris skills, and together, we convinced Bob to take it.

The guys kindly offered to give me company in my truck on the drive down, but I declined since I love driving alone. The first half of the trip went well in our little caravan, with a stop at Arby's for lunch and the Women's National Championship Basketball game playing in the background of both vehicles. All along the drive, road signs warning of possible delays on eclipse day let us know we were headed in the right direction.

The Members of Our Party at 50% Eclipse. Photo Credit: Brett Boller

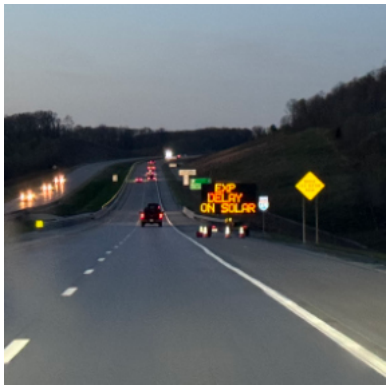


Photo Credit: Jason O'Flaherty

An Eclipse Story, continued.

Shortly after the game's completion, as we passed through the Lake of the Ozarks region, we encountered the low point of our trip. Approaching an overpass bridge, we all saw something on the side of the bridge and directly above our lanes. It looked to be a worker standing on scaffolding off the side, which was a strange sight. As we got closer, however, the image resolved into a possible dummy being hung over the side by a group of people standing on the road above. Unfortunately, it was the sight of someone running across the bridge towards it that said this was not a joke. The speeding police car 30 seconds later and a check of my dashcam showed it was a grimmer situation. A man had tried to jump, but a couple of saviors were heroically holding on to him. I've since learned that they were able to pull him back over the railing to safety.

After another hundred miles or so, the final exit to start the last 90 minutes of driving was in sight. I led the group and pulled into the exit lane when my phone rang. I answered to hear Brett say, 'Don't take the exit' as he sped past me in the left lane. I engaged my dormant storm-chasing skills and made a spectacular maneuver, if I do say so myself, to avoid the now-forbidden route and rejoin the main flow of traffic again.

At the next gas station, I found out that the boys in the other vehicle had been scouring the weather reports. Two of the four models said Russellville now had a 10-15% chance of cloud cover, while the other two said 35%. All four models reported Carbondale to have at least 35% cover. We took a vote as we emptied our bladders and filled our tanks. We decided the 50% chance of better weather to the south was worth it to change course.

The VRBO that was rented for two nights in Joplin didn't have a cancellation option, so we still had the place booked for Sunday night. Staying there would put us closer to Russellville. After a frustrating 15 minutes with Expedia, I was able to cancel our hotel rooms in Rolla. Unfortunately, the four-hour drive back to Joplin meant there would be no time for disc golf before nightfall, a sad fact for some but a sacrifice made for a greater purpose.

The rest of the evening was uneventful for the most part. There was a missed turn that added 20 minutes to our drive, a blanket that smelled of underarms and curry, and "shot" glasses

Photo Credit: Jason O'Flaherty

An Eclipse Story, continued.

Getting Set Up. Photo Credit: Jim Kvasnicka

obtained for a hopeful, celebratory post-eclipse toast large enough to be used as a hat for a small child. Dinner and an early bedtime led us to the morning of the big event.

We got an early start, leaving at 8 a.m. We woke Brett's friend, Mike Ulrich, who had arrived from South Dakota in the middle of the night and slept in his car in the driveway. He joined our caravan as we set off for the solar-promised land of Russellville. Our early start meant that traffic was light. There was even time for a spot of breakfast at McDonald's, though, unfortunately, not enough time for the senior staple, Denny's.

We had a man at ground zero who warned us about $100 parking fees at some of the Russellville parks. He'd found us an alternative site at one of the ballfield rec areas. We claimed some of the last spots that let us back our vehicles in and unload directly from the tailgates to a perfect grass area. The next few hours went by in a hurry-up-and-wait state of mind.

Brett set up a table for his laptop, which he used to automate control of his camera during the eclipse. Bob set up and shared the use of his telescope. Jim and Dave found the best spot to observe from the comfort of their chairs, and I set up my six cameras. The sky above was blue, but some uncomfortably large white clouds were off in the distance. About an hour before showtime, Bob grilled some Johnsonville Brats, which we enjoyed while socializing with our neighbors.

All eyes were on the sky,

waiting for the first glimpse of the moon intruding on the sun's spotlight. Glasses went on, eyes went to telescopes or cameras,

An Eclipse Story, continued.

Watching for the Start. Photo Credit: Jason O'Flaherty

and binoculars raised. If anyone had bothered to look around, the patch of grass would have been awash in glistening chrome solar protection. Those with the most powerful magnification saw it first.

At 12:33:13, the sun's perfect disc was suddenly not so flawless anymore. A blemish had appeared near the 5 o'clock position. Shouts of "It's starting!" rippled through the crowd, followed by whoops and hollers over the sound of dozens of camera shutters, each drumming out its own rhythm. Over the next 77 minutes, we watched an unseen force slowly consume the solar cookie, first in nibbles, then in bites. Those with apps called out the various milestone percentages. Others ticked off the sunspots as they disappeared into the void.

First Nibble. Photo Credit: Jason O'Flaherty

With only minutes until totality, a lone cloud broke away from the flock. Like a child, as if to say, 'Look at me,' it stepped onto the stage and moved front and center, threatening to ruin the show. Fortunately for the audience, it was a whisp of a thing. Thin and short-lived, it only served to enhanced the atmosphere.

As the clock struck 1:50 p.m., the majesty of a total solar eclipse was upon us. Standing in the dim light, we noticed a sudden drop in temperature. As we looked towards the horizon, a shadow rapidly approached us. Planets started to appear in the sky, and the call of "Filters off!" echoed through the air. The sun gave one final flicker as it passed through the diamond ring phase. Everyone lowered their solar glasses, and we gazed in awe at the breathtaking sight of totality.

An Eclipse Story, continued.

Diamond Ring behind a Cloud. Photo Credit: Jason O'Flaherty

The totality of a Solar Eclipse is nearly impossible to describe in words. During this brief celestial miracle, half a dozen things fight for attention. It is a profoundly moving personal experience, but at the same time, you immediately have a bond with everyone around you. When someone cheers, it brings you joy. When you cheer, others respond with delight. It is an event that connects all of humanity since prehistoric times. The scale of the cosmos demands reflection, camaraderie, and elation.

This was my second total eclipse. My experience this time was running around checking the automated cameras and using a handheld camera at 600mm to capture the moment and get a close-up view. This eclipse had several prominences that were visible to the naked eye. This event led to a foolish decision when I ran over to my tailgate and tried to put on a teleconverter in the semi-dark, eating away at precious seconds of observing. To add insult to injury, I forgot to zoom back in after putting it on, so I had even less resolution than if I'd left it off.

I recall hearing cheers and hollering myself. "Wow" was the word of the day as it resounded from mouth to mouth. Bob's giddy joy as he looked through his scope brought a smile to my face. Afterward, he thanked us for not letting him leave it at home as he'd suggested. Many others were able to look through it as well.

The four minutes and nine seconds of totality quickly passed. Too soon, the sky began to lighten. Cries of "Glasses on! Filters on!" cut through the "Wows!" The crowd gave another cheer to thank the

An Eclipse Story, continued.

Solar Prominences. Photo Credit: Jason O'Flaherty

An Eclipse Story, continued.

Sharing the scope. Photo Credit: Jason O'Flaherty

heavens for their performance. The six of us in our group shared high fives, hugs, thank yous, and maybe even a few tears. Brett passed out a round of Coronas, which seemed appropriate for the occasion. We also tried the special edition Eclipse Oreos with Pop Rocks in the cream. In all the excitement, we forgot to break out the celebratory shots.

Brett and I complimented each other on the photos as we flipped through our cameras' memory cards between the continuing shots of the retreating moon. It was about this time that I realized my mistake with the zoom lens and also that I'd forgotten to take the lens cap off of a wide-angle camera that I was using to attempt to photograph comet 12P/Pons-Brooks.

The crowd slowly faded away, leaving only the diehards and camera enthusiasts to watch the conclusion. I was staying in Russellville while the rest of my companions were headed back to Joplin for the night. We said our goodbyes. They headed north to begin the sluggish drive back to Joplin while I headed to the store to buy aloe. Shocking as it may be, even when the moon is photobombing the sun, you still need sunscreen.

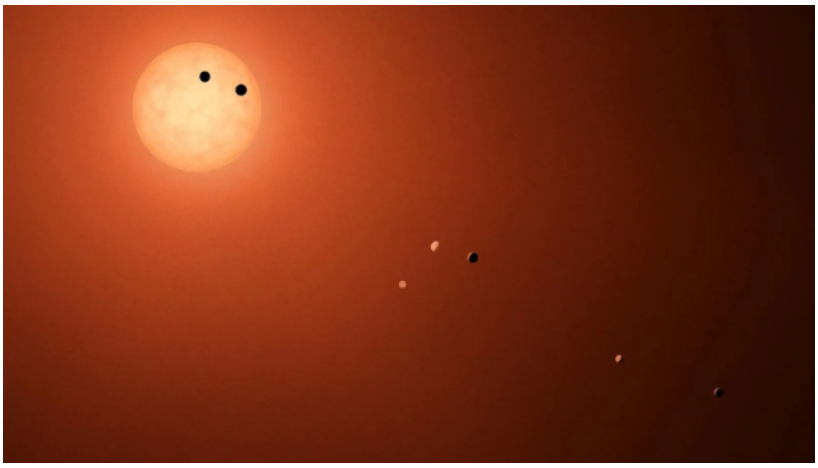
Please visit my website for more photos and videos from our trip. https://www.jasonoflaherty.com/solar-eclipse

Our Group. Photo Credit: Jason O'Flaherty

That Starry Night Sky? It's Full of Eclipses

Our star, the Sun, on occasion joins forces with the Moon to offer us Earthlings a spectacular solar eclipse – like the one that will be visible to parts of the United States, Mexico, and Canada on April 8.

But out there, among the other stars, how often can we see similar eclipses? The answer depends on your point of view. Literally.



An artist's concept shows the TRAPPIST-1 planets as they might be seen from Earth using an extremely powerful – and fictional – telescope. NASA/JPL-Caltech

On Earth, a total solar eclipse occurs when the Moon blocks the Sun's disk as seen from part of Earth's surface. In this case, the "path of totality" will be a strip cutting across the country, from Texas to Maine.

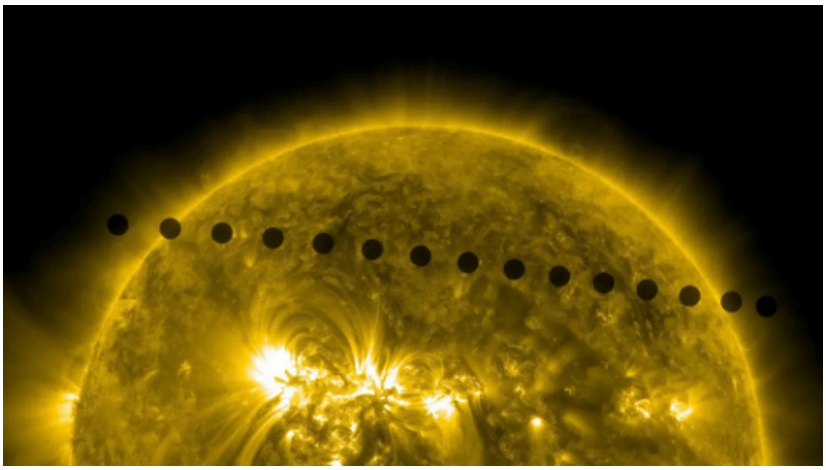
We also can see "eclipses" involving Mercury and Venus, the two planets in our solar system that orbit the Sun more closely than Earth, as they pass between our telescopes and the Sun (though only by using telescopes with protective filters to avoid eye damage). In these rare events, the planets are tiny dots crossing the Sun's much larger disk.

And astronomers can, in a sense, "see" eclipses among other systems of planets orbiting their parent stars. In this case, the eclipse is a tiny drop in starlight as a planet, from our point of view, crosses the face of its star. That crossing, called a transit, can register on sensitive light sensors attached to telescopes on Earth and those in space, such as NASA's Hubble Space Telescope, James Webb Space Telescope, or TESS (the Transiting Exoplanet Survey Satellite). It's how the bulk of the more than 5,500 confirmed exoplanets – planets around other stars – have been detected so far, although other methods also are used to detect exoplanets.

"A solar eclipse is a huge transit," said Allison Youngblood, the deputy project scientist for TESS at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

And both types of "transits" – whether they involve solar eclipses or exoplanets – can yield world-changing science. Solar eclipse observations in 1919 helped prove Einstein's theory of general relativity, when the bending of a star's light

Eclipses, continued.



A composite of images of the Venus transit taken by NASA's Solar Dynamics Observatory on June 5, 2012. The image shows a timelapse of Venus' path across the Sun. NASA/Goddard/SDO

by the Sun's gravity caused the star's apparent position to shift – showing that gravity causes space and time to curve around it.

Exoplanet transits also provide far more than just detections of distant planets, Youngblood said.

"The planet passes in front of the star, and blocks a certain amount of the star's light," she said. "The dip [in starlight] tells us about the size of the planet. It gives us a measurement of the radius of the planet."

Careful measurements of multiple transits also can reveal how long a year is on an exoplanet, and provide insights into its formation and history. Careful measurements of multiple transits also can provide insights into exoplanet formation and history.

And the starlight shining through the exoplanet's atmosphere during its transit, if measured using an instrument called a spectrograph, can reveal deeper characteristics of the planet itself. The light is split into a rainbow-like spectrum, and slices missing from the spectrum can indicate gases in the planet's atmosphere that absorbed that "color" – or wavelength.

"Measuring the planet at many wavelengths tells us what chemicals and what molecules are in that planet's atmosphere," Youngblood said.

Eclipses are such a handy way to capture information about distant worlds that scientists have learned how to create their own. Instead of waiting for eclipses to occur in nature, they can engineer them right inside their telescopes. Instruments called coronagraphs, first used on Earth to study the Sun's outer atmosphere (the corona), are now carried aboard several space telescopes. And when NASA's next flagship space telescope, the Nancy Grace Roman Space Telescope, launches by May 2027, it will demonstrate new coronagraph technologies that have never been flown in space before. Coronagraphs use a

Eclipses, continued.

system of masks and filters to block the light from a central star, revealing the far fainter light of planets in orbit around it.

Of course, that isn't quite as easy as it sounds. Whether searching for transits, or for direct images of exoplanets using a coronagraph, astronomers must contend with the overwhelming light from stars – an immense technological challenge.

"An Earth-like transit in front of stars is equivalent to a mosquito walking in front of a headlight," said David Ciardi, chief scientist at the NASA Exoplanet Science Institute at Caltech. "That's how little light is blocked."

We don't have this problem when viewing solar eclipses – "our very first coronagraphs," Ciardi says. By pure happenstance, the Moon covers the Sun completely during an eclipse.

"A solar eclipse is like a human walking in front of a headlight," he said.

We would have no such luck on other planets in our solar system.

Mars' oddly shaped moons are too small to fully block the Sun during their transits; and while eclipses might be spectacular among the outer planets – for instance, Jupiter and its many moons – they wouldn't match the total coverage of a solar eclipse.

We happen to be living at a fortunate time for eclipse viewing. Billions of years ago, the Moon was far closer to Earth, and would have appeared to dwarf the Sun during an eclipse. And in about 700 million years, the Moon will be so much farther away that it will no longer be able to make total solar eclipses.

"A solar eclipse is the pinnacle of being lucky," Tripathi said. "The Moon's size and distance allow it to completely block out the Sun's light. We're at this perfect time and place in the universe to be able to witness such a perfect phenomenon."

Here's the Total Solar Eclipse, Seen From Space

By Matt Williams, Universe Today

On Monday, April 8th, people across North America witnessed a rare celestial event known as a total solar eclipse. This phenomenon occurs when the Moon passes between the Sun and Earth and blocks the face of the Sun for a short period. The eclipse plunged the sky into darkness for people living in the Canadian Maritimes, the American Eastern Seaboard, parts of the Midwest, and northern Mexico.

Fortunately for all, geostationary satellites orbiting Earth captured images of the Moon's shadow as it moved across North America.

One such satellite was the Geostationary Operational Environmental Satellite-16 (GOES-16), part of the Earth observation network jointly run by NASA and the National Oceanic and Atmospheric Administration (NOAA). The GOES-16 (GOES-East) satellite is the first of the series, regularly monitoring space weather and providing continuous imagery and atmospheric measurements of Earth's western hemisphere. From its orbit at a distance of 36,000 km (~22,370 mi) from Earth, GOES-16 captured the passage of the eclipse across North America from approximately 10:00 A.M. to 05:00 P.M. EST (07:00 A.M. to 02:00

Credit: NASA/Keegan Barber

Eclipse from Space, Continued.

P.M. PST).

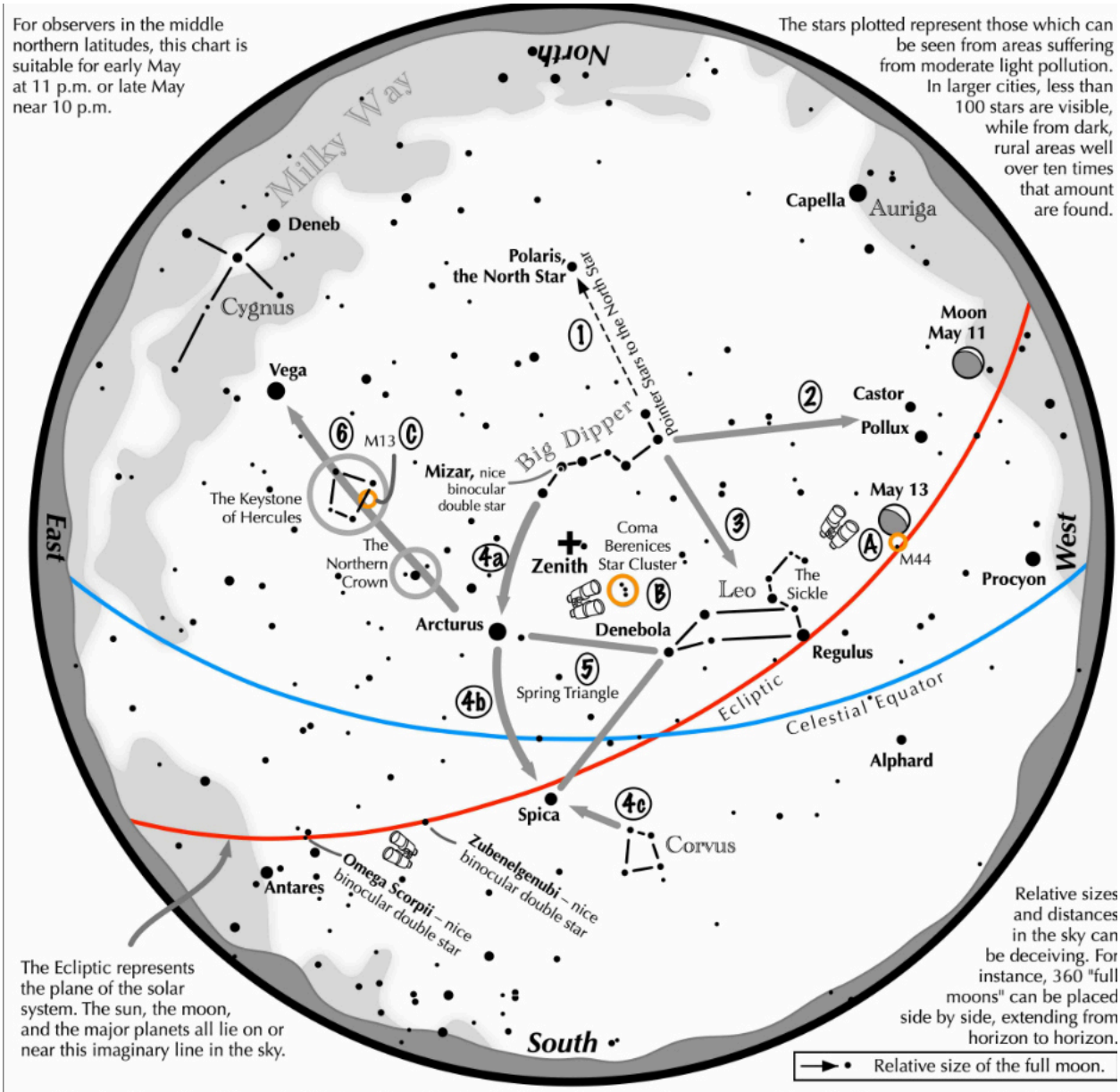
Solar eclipses take several forms, which include what many residents in North America witnessed yesterday (i.e., the Moon completely blocking the face of the Sun). There's also an annual eclipse, which happens when the Moon passes between the Sun and Earth when it is at or near its farthest point from Earth. As a result, the face of the Sun is not completely obscured and is visible as a bright ring in the sky. There's also a partial eclipse, which happens when the Sun, Moon, and Earth are not perfectly lined up, making the Sun appear crescent-shaped.

There's also what is known as a hybrid solar eclipse, which can appear to shift between annular and total (due to Earth's curvature) as the Moon's shadow moves across the globe. A total eclipse, however, is the rarest of these events, where people located directly in the center of the Moon's shadow will see only the Sun's outer atmosphere (the corona). The next total eclipse is not expected to occur until August 12th, 2026, and will be visible to residents in Greenland, Iceland, Spain, Russia, and a small area of Portugal. For people in Europe, Africa, and North America, the same eclipse will appear as a partial one.

The passage of the Moon's shadow across Earth's surface is known as the "path of totality." As the images show, this path spanned across the North American continent from Mexico to the eastern tip of Canada. Aside from GEOS-16, images were also taken by the European Space Agency's (ESA) Copernicus Sentinel-3 mission using its Sea and Land Surface Temperature Radiometer (SLSTR). This satellite monitors Earth's oceans, land, glaciers, and atmosphere to monitor and improve our understanding of global weather dynamics.

In addition to providing a rare glimpse at what a total eclipse looks like from space, the combined images are also an effective tool for researching how an eclipse influences Earth's weather. As the Moon obscures light and heat from the Sun, air temperatures drop in the path of totality and can cause cloud formations to evolve in different ways. Data from GOES-16, Sentinel-3, and other Earth Observation satellites is now being used to explore these effects.

Navigating the May Night Sky



Navigating the May night sky: Simply start with what you know or with what you can easily find.

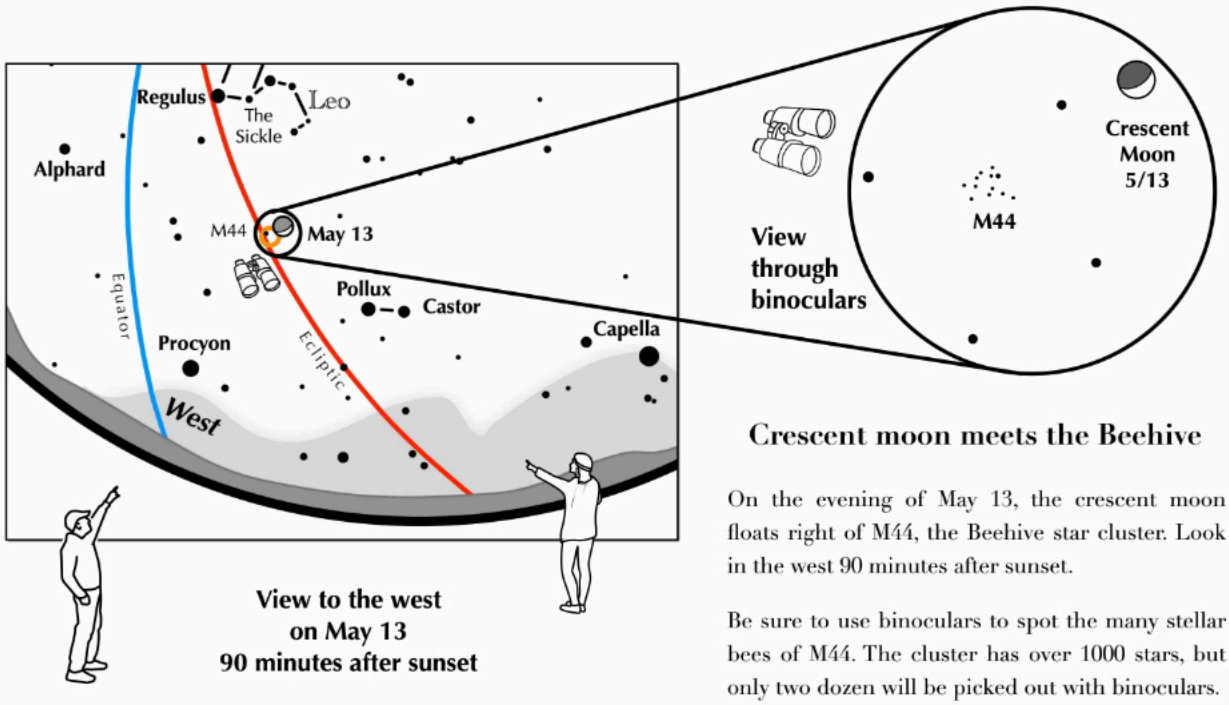
1. Extend a line northward from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
2. Through the two diagonal stars of the Dipper's bowl, draw a line pointing to the twin stars of Castor and Pollux in Gemini.
3. Directly below the Dipper's bowl reclines the constellation Leo with its primary star, Regulus.
4. Follow the arc of the Dipper's handle. It first intersects Arcturus, then continues to Spica.
   Confirm Spica by noting that two moderately bright stars just to its southwest form a straight line with it.
5. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
6. Draw a line from Arcturus to Vega. One-third of the way sits "The Northern Crown." Two-thirds of the way hides the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.

Binocular Highlights

A: M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux. **B:** Look near the zenith for the loose star cluster of Coma Berenices. **C:** M13, a round glow from a cluster of over 500,000 stars.

Astronomical League Outreach

In the early evening on May 13, try this challenge:



View to the west on May 13 90 minutes after sunset

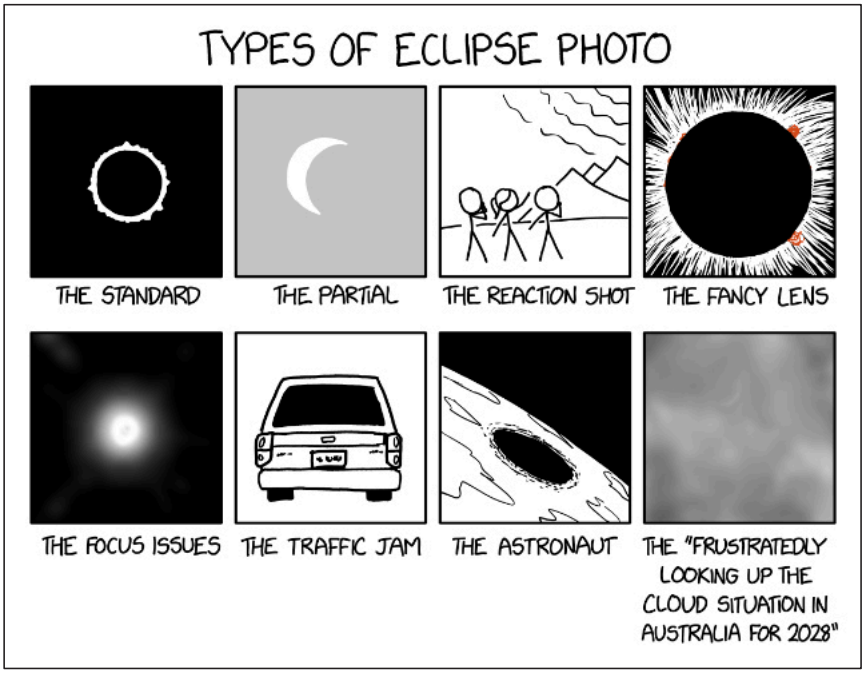
Crescent moon meets the Beehive

On the evening of May 13, the crescent moon floats right of M44, the Beehive star cluster. Look in the west 90 minutes after sunset.

Be sure to use binoculars to spot the many stellar bees of M44. The cluster has over 1000 stars, but only two dozen will be picked out with binoculars.

Even though they lie near each other in binoculars, they are nowhere near each other in three-dimensional space. M44 is 150 million times farther than the moon!

It has taken the light from M44's stars over 600 years to reach your eyes!



Xkcd.com

Binoculars and Double Stars

A rewarding and challenging activity

https://www.astroleague.org/binocular-double-star-observing-program/

Effective Binocular Observing ...

- Binoculars must be precisely focused.
- Binoculars must be held steady. Mounted on a tripod is best.
- Adequate dark adaption is needed. Wait at least 15 minutes in the dark before meaningful observing begins. 30 minutes is better.
- Glare from a bright primary interferes with spotting a dim secondary. The greater the magnitude difference, the greater the difficulty splitting them.
- Steady atmospheric seeing is desired.
- Best observed when the double star has an altitude higher than 30°.

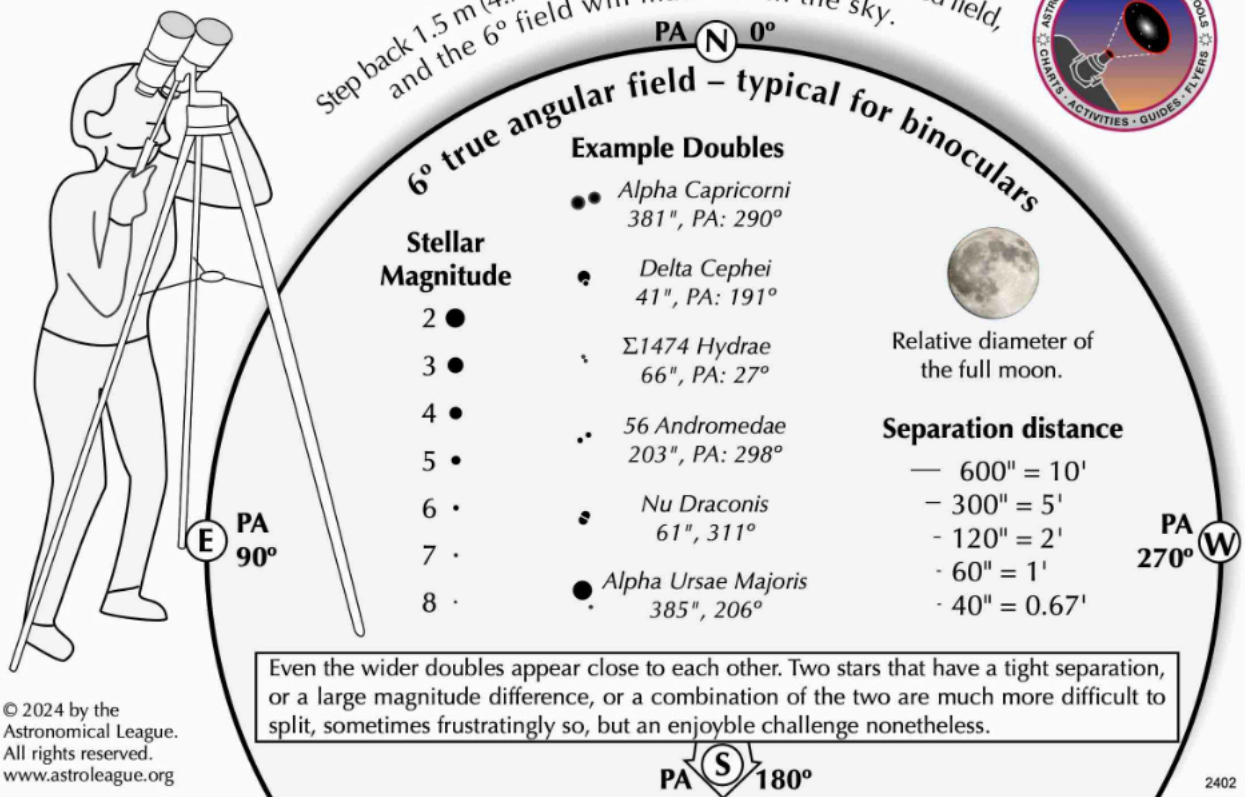
In Your Observing Notes:

- Brightnesses of the components.
- Separation of the components.
- Position Angle (PA).
- Colors of the components.
- Neighboring stars in the field?
- Seeing conditions.
- Atmospheric transparency.
- Altitude.

Rule of Thumb ...

Minimum <u>true</u> separation with 10 x 50 binoculars:

- 24 arc seconds for two stars of 4th magnitude. This equals 4 minutes apparent separation.
- For comparison, the full moon has a true diameter of 1800 arc seconds (=30 minutes).
- **True separation** is the angular space between stars as it appears to the unaided eye. **Apparent separation** is how it appears in binoculars.



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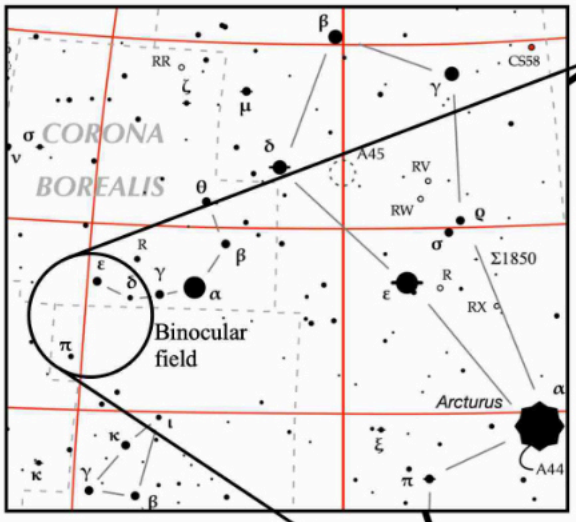
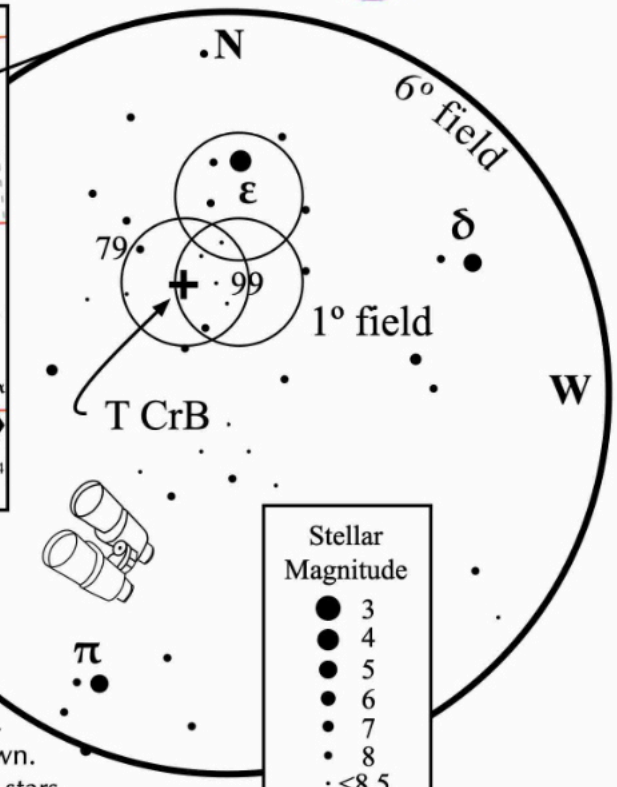
Astronomical League Outreach

T Coronae Borealis

A nova waiting to happen – soon!

also known as HIP 78322 and the "Blaze Star"





How to find T Coronae Borealis

A. Locate bright Arcturus and the kite shaped constellation Boötes.
B. Corona Borealis lies directly east of Boötes.
C. Trace the semi-circle of the stars of the crown.
D. Epsilon and Delta are fourth magnitude stars shining east of Alpha (Gemma), the brightest member of the crown.
E. Place Epsilon in the northern half of the binocular (or finder) field. Fifth magnitude Pi Serpentis lies near the bottom of the field.
F. T Coronae Borealis is about 1/4 the distance between Epsilon and Pi.
G. Move two low power eyepiece fields south of Epsilon.
H. Then move 1/2 low power eyepiece field east.
I. This is the vicinity of 10th magnitude T CBr.

- The star normally is magnitude 10.3.
- Ten years before its outburst, it rises to magnitude 9.8. It did this 10 years ago.
- It then dims to about magnitude 12 one year before outburst. It did this in April 2023.

Between now and September, T CrB is predicted to nova, quickly reaching 2nd magnitude and rivaling the brightness of Alpha CrB (Gemma).

- Its brightness rise will take one day or less.
- It will likely remain near maximum brightness (2nd mag.) for only a few days.

 T CrB: Blaze Star

240

Astrophotography

By John Reinert

Nikon D780, 24.5 MP full-frame CMOS sensor, ISO 100 1/400 second exposure, +0.7 exposure compensation, mated to a Celestron CPC 1100 with f/6.3 focal reducer. Wilson Point on Lake Hamilton, just outside of Hot Springs, Arkansas.

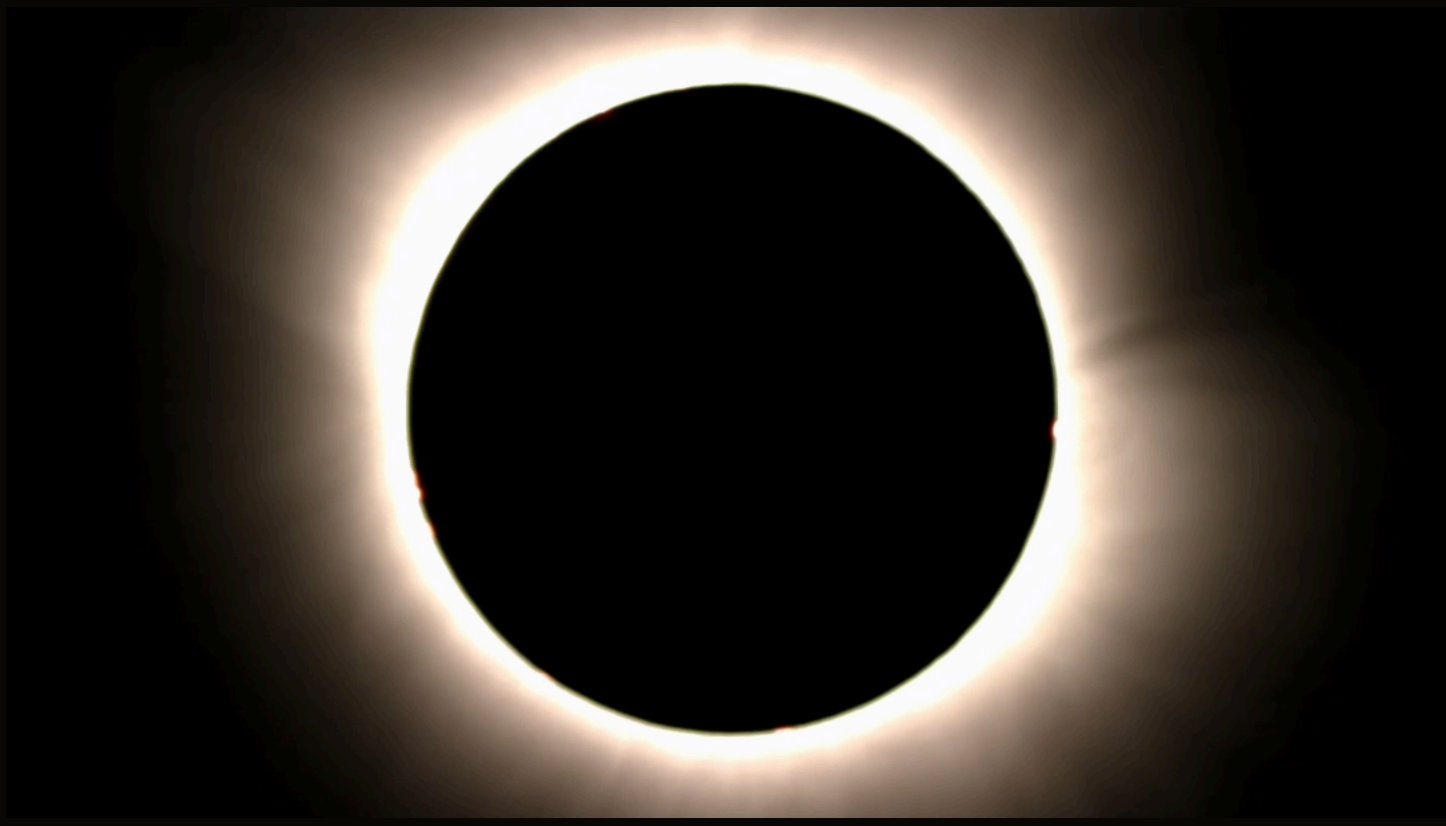
Unprocessed cell phone photo
Paris, Texas

By Dan Delzell

Astrophotography

By Leona Barratt
Greenbrier Arkansas
Nikon P900, approximately 1200mm

Astrophotography



By Kale Strizek

Seestar
Clinton, Arkansas

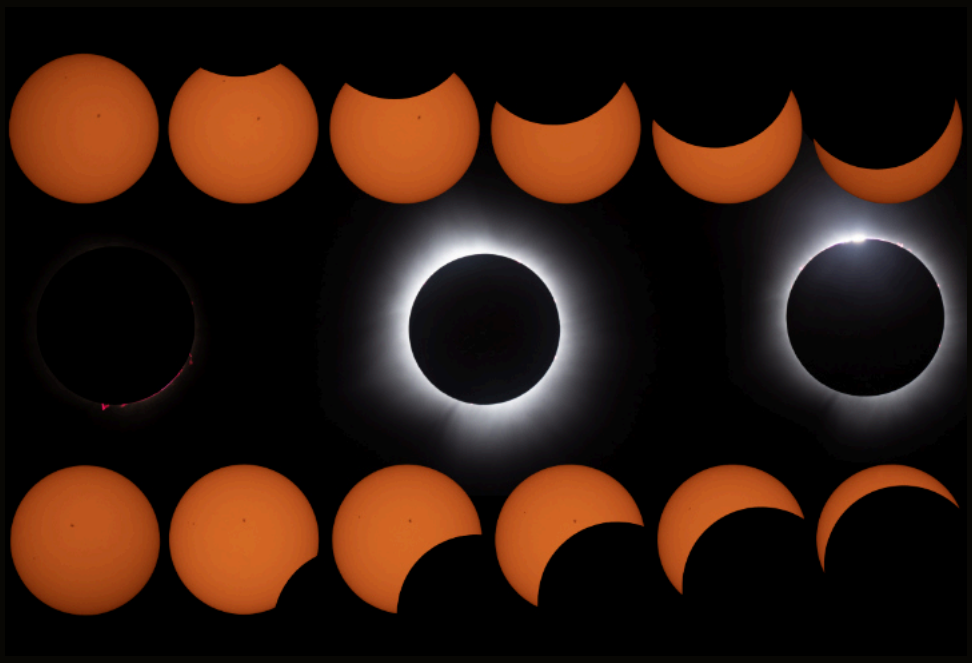
Astrophotography

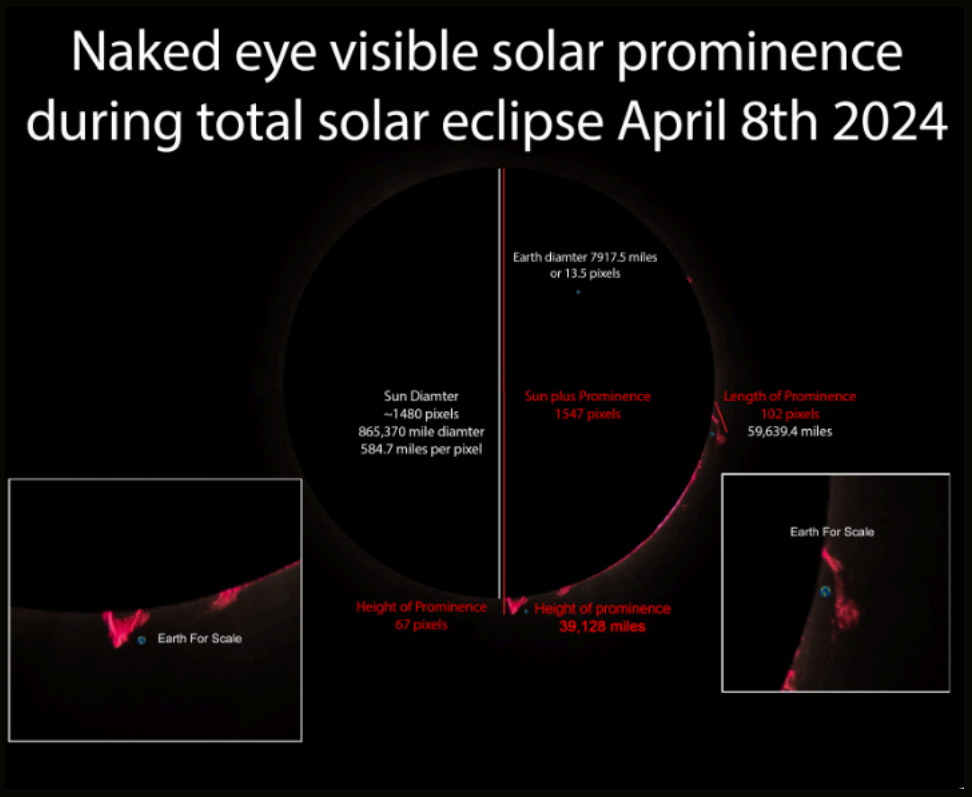
By Kale Strizek
Seestar, 4 minutes
Comet 12P/Pons-Brooks
Lincoln, Nebraska

Astrophotography

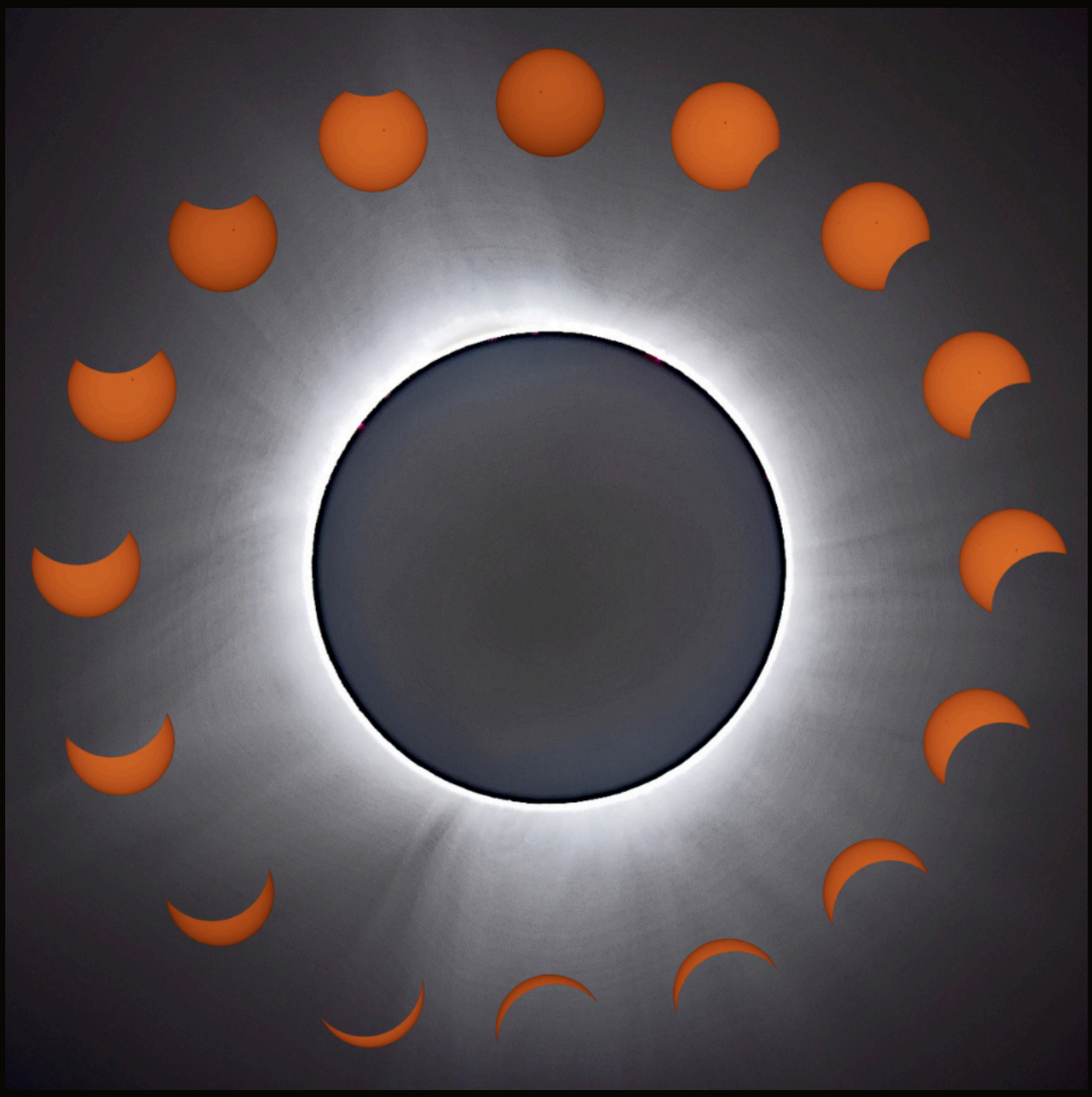
By Brett Boller

Composite images take with Canon t7i and Svbony 80ED F7 scope on Solar Quest





Astrophotography



By Brett Boller

The center is a 3 image HDR composite during totality: Canon t7i and Svbony 80ED F7 scope on Solar Quest tracker.

Partial phases around 3 image HDR composite during totality: Canon t7i and Svbony 80ED F7 scope on Solar Quest tracker.

Astrophotography

By Stephen Luther

Astrophotography

Four Periods of Totality

Clockwise from Upper Left: Baily's Beads, Prominences, Diamond Ring, Corona

By Jason O'Flaherty

Astrophotography

Diamond Ring with Lunar Distortion

1/800 sec at 4/8.0, ISO 125. Fujifilm X-H2S with Fujinon 150-600mmF5.6-8 Lens

By Jason O'Flaherty

May's Sky Notes: Stargazing for Beginners

Kat Troche

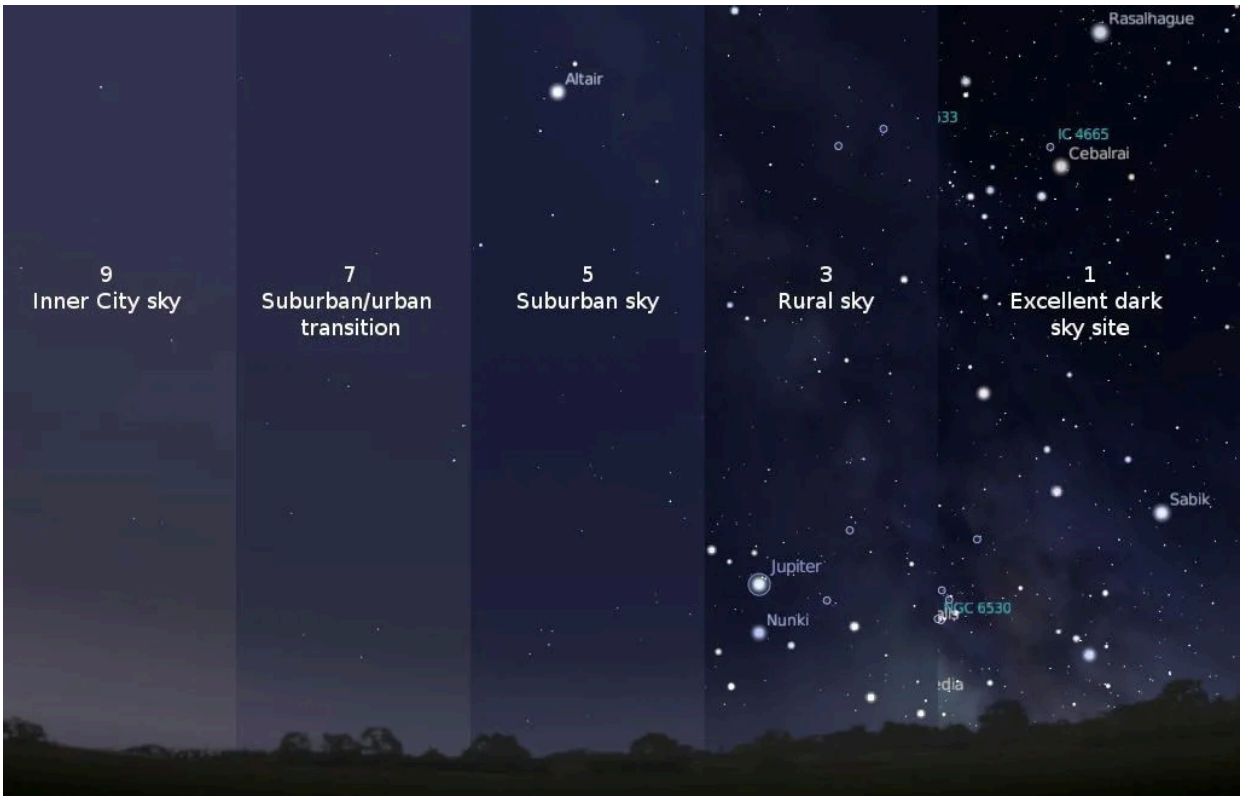
Millions were able to experience the solar eclipse on April 8, 2024, inspiring folks to become amateur astronomers – hooray! Now that you've been 'bitten by the bug', and you've decided to join your local astronomy club, here are some stargazing tips!

This article is distributed by NASA's Night Sky Network (NSN). The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

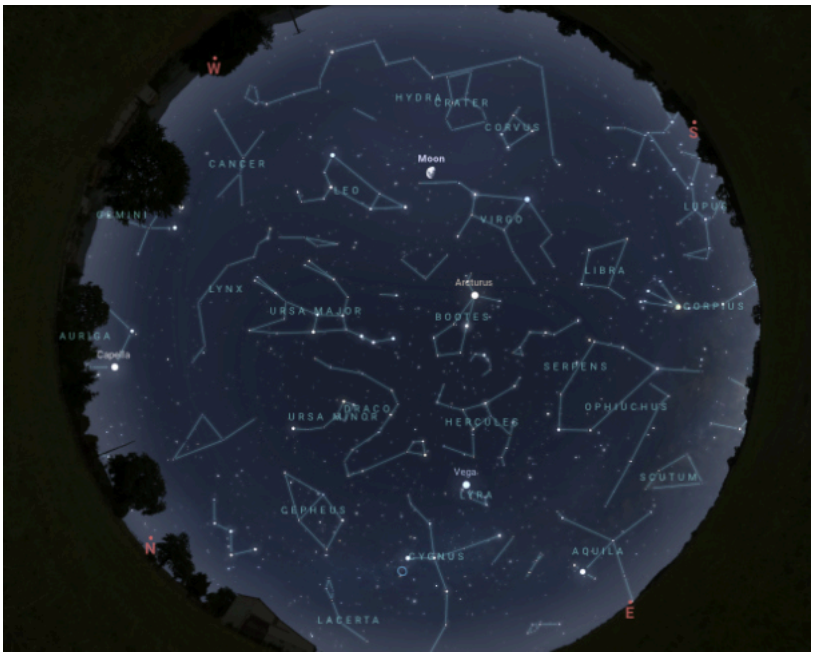
The Bortle Scale

Before you can stargaze, you'll want to find a site with dark skies. It's helpful learn what your Bortle scale is. But what is the Bortle scale? The Bortle scale is a numeric scale from 1-9, with 1 being darkest and 9 being extremely light polluted; that rates your night sky's darkness. For example, New York City would be a Bortle 9, whereas Cherry Springs State Park in Pennsylvania is a Bortle 2.

Determining the Bortle scale of your night sky will help narrow down what you can expect to see after sunset. Of course, other factors such as weather (clouds namely) will impact seeing conditions, so plan ahead. Find Bortle ratings near you here: www.lightpollutionmap.info



The Bortle scale helps amateur astronomers and stargazers to know how much light pollution is in the sky where they observe. Credit: International Dark Sky Association



A full view of the northern hemisphere night sky in mid-May. Credit: Stellarium Web.

No Equipment? No Problem!

There's plenty to see with your eyes alone. Get familiar with the night sky by studying star maps in books, or with a planisphere. These are great to begin identifying the overall shapes of constellations, and what is visible during various months.

Interactive sky maps, such as Stellarium Web, work well with mobile and desktop browsers, and are also great for learning the constellations in your hemisphere. There are also several astronomy apps on the market today that work with the GPS of your smartphone to give an accurate map of the night sky.

Keep track of Moon phases. Both the interactive sky maps and apps will also let you know when planets and our Moon are out! This is especially important because if you are trying to look for bright deep sky objects, like the Andromeda Galaxy or the Perseus Double Cluster, you want to avoid the Moon as much as possible. Moonlight in a dark sky area will be as bright as a streetlight, so plan accordingly! And if the Moon is out, check out this Skywatcher's Guide to the Moon: bit.ly/MoonHandout

Put On That Red Light

If you're looking at your phone, you won't be able to see as much. Our eyes take approximately 30 minutes to get dark sky adapted, and a bright light can ruin our night vision temporarily. The easiest way to stay dark sky adapted is to avoid any bright lights from car headlights or your smartphone. To avoid this, simply use red lights, such as a red flashlight or headlamp. The reason: white light constricts the pupils of your eyes, making it hard to see in the dark, whereas red light allows your pupils to stay dilated for longer. Most smartphones come with adaptability shortcuts that allow you to make your screen red, but if you don't have that feature, use red cellophane on your screen and flashlight.

From the Archives

April, 1977

Last Month's Multiple Moons Circling Uranus Become This Month's Rings

Last month, we reported that photometric measurements made during the occultation of star SAO 158687 by Uranus March 10 indicated the existence of as many as 100 small moons orbiting the seventh planet. A month's further investigation and analysis of data have led to the altered conclusion that, instead of a swarm of discrete bodies circling Uranus there are most probably at least 5 faint rings similar to those circling Saturn.

The rings still have not been seen. Their presence is inferred from the fact that starlight from behind the planet was cut off five times in nine minutes as the planet approached the star, and five times more after the star reappeared from behind the planet.

The position of the rings is consistent with the assumption that a ring belt would circle the planet at its equator.

Uranus' equator is almost exactly perpendicular to the plane of the planet's orbit, and to the orbits of the other major planets except Pluto.

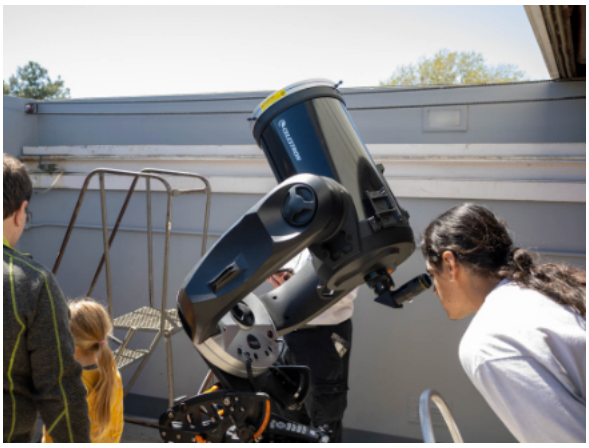
Thus Uranus' poles lie at its orbital plane, and its moons and the newly-discovered rings orbit at right angles to that plane.

The brevity and weak amplitude of the stellar appulses indicate that the rings will probably never be detected either visually or photographically from Earth. However, an effort to observe the rings more closely may be made in 1986, when a spacecraft due to be launched this September could approach Uranus, provided it is still working after nine years and survives scheduled passes of Jupiter and Saturn.

[Editor's Note: The rings were directly imaged when Voyager 2 passed Uranus in 1986. In 2005 the Hubble Space Telescope detected a pair of previously unknown rings. In April 2006, images of the new rings from the Keck Observatory yielded the colors of the outer rings: the outermost is blue and the other one red. Although the Uranian rings are very difficult to directly observe from Earth, advances in digital imaging have allowed several amateur astronomers to successfully photograph the rings with red or infrared filters; telescopes with apertures as small as 36 cm (14 inches) may be able to detect the rings with proper imaging equipment. - Source: Wikipedia]

Eclipse Viewing at Hyde Observatory

Approximately 1200 people viewed the eclipse from Hyde Observatory. Media coverage included KOLN-TV, KLKN, KLIN and the Lincoln Journal Star. Photos by Mark Dahmke



Eclipse Viewing at Hyde Observatory, continued

Left: Dave Knisely doing an interview with UNL students.

Lower left: Kevin Dowd using the solar scope.

Right: Jim Atkins with his Unitron 2.4" f/15 refractor.

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: Available
10 inch Meade Starfinder Dobsonian: Available.
13 inch Truss Dobsonian: Needs repair.
10 inch Zhumell: Needs mount.

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