

San Diego Astronomy Association

Celebrating Over 50 Years of Astronomical Outreach



<https://www.sdaa.org/>
A Non-Profit Educational Association
P.O. Box 23215, San Diego, CA 92193-3215

Next SDAA Business Meeting

November 9th at 7:00pm
10070 Willow Creek Rd
San Diego, CA 92131
Via Zoom

Next Program Meeting

November 17th at 7:00pm
Live Stream

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November 2021, Vol LIX, Issue 11
Published Monthly by the
San Diego Astronomy Association
Incorporated in California in 1963
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Newsletter Deadline

The deadline to submit articles
for publication is the
15th of each month.

SDAA is now actively using online facilities like Zoom and YouTube to provide access to club meetings, events, and outreach programs in keeping with state and local mandates regarding physical distancing requirements during the COVID-19 pandemic. In-person events will start again in 2021 as soon as allowed by state and local mandates. Look for updates on the Lipp telescope.

Since TDS is private space there is no reason to lock down the facility but there are actions you can take to help keep the site safe for all of us. If you plan to visit and use the facility, please bring along some disinfectant wipes or disinfectant spray cleaner. When you finish using the restrooms or the warming room, please wipe down the areas that you touched in order to help prevent the spread of any viruses. As much as we love sharing the views of the night sky, try to maintain the recommended 6-foot physical distance guideline.

November 17, 2021 Program Meeting

Topic: SDAA Elections and Gadget Night

Bring your astronomy-related or imaging garage-built objects, tools, ideas, new hardware, software to share with SDAA on our traditional Gadget Night – only this year via ZOOM. This includes astro-images, views of your home or TDS observatories, videos of telescope equipment, software and neat techniques.



You can register in advance for the meeting at the following link. After registering, you will receive a confirmation email containing information about joining the meeting.

<https://us02web.zoom.us/j/89298162225?pwd=TVZsTTg3dzRXcERDY0tXeHErVXArQT09>

Link to SDAA Merchandise Store <https://sdaa28.wildapricot.org/SDAA-Store>

Link to Outreach Calendar https://calendar.google.com/calendar/embed?src=g-calendar@sdaa.org&ctz=America/Los_Angeles



San Diego Astronomy Association

San Diego Astronomy Association Board of Directors Meeting

October 12, 2021- Unapproved and subject to revision

1. Call to Order

The meeting was held via Zoom and was called to order at 7:08pm with the following board members in attendance: Dave Wood, President; Kin Searcy, Vice President; Melany Biendara, Treasurer; Gene Burch, Recording Secretary; Alicia Linder, Corresponding Secretary; Hiro Hakozaki, Director; Dave Decker, Director; Mike Chasin, Director; member Steve Myers.

2. Approval of Last Meeting Minutes

The September meeting minutes were approved.

3. Treasurers & Membership Report

The treasurers report was approved. Mel reported that a generous donor helped to defer about $\frac{1}{2}$ the cost of repairing the main road to TDS. She's still working with our CPA to finalize last year's tax return. We've generated a lot of money through the sale of donated telescopes. Still working with Dennis Ritz and the insurance company to make sure that we're properly covered. She also worked with Mark Smith to recover a number of underused private pads and we've bought back 4 grandfathered pads which were underused.

4. Standard Reports

a. Site Maintenance Report:

Site maintenance has proposed an electrical grid notification and working procedure that the board will review and move forward with.

The Patio cover has been temporarily repaired but the wood has deteriorated to the point of needing replacement in the next 12 months. The board will move forward with obtaining quotes for a replacement.

b. Observatory/Loaner Scope Report:

Observatory:

Training was held September 4th. Star parties are in full swing again. Encouraging social distancing (chairs outside, etc.) but not requiring masks. Observatory has been running well. We have excellent host participation.

Loaner Scopes:

Program continues to run smoothly with a lot of usage.



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c. Private Pad Report:

It has been a busy 6 weeks or so. The club has cancelled 6 leases for non-usage, purchased 4 previously grandfathered pads that had been unutilized for years, and had one pad returned to the club. This has allowed us to make a big dent in the pads waiting list. Because of the length of the list, the effort to assign pads is still ongoing. In the last two weeks, we have leased 9 pads. There are currently 7 pads left to lease and 8 people on the waiting list (probably 9 within a day or two). I expect to write at least two more leases tomorrow and will continue to work down the waiting list offering the pads we have left (there are still some very nice ones). Kudos to Mark for his hard work!

d. Program Meetings Report:

Cecilia Sanders, California Institute of Technology, speaking on fossil evidence of life on other planets. It is a neat talk. November meeting will report the election slate and attempt to hold the once popular gadget night with something in reserve. Given the banquet on 12 February, do we want to plan a January program meeting?

In-person meetings are unlikely to restart until next year and the meeting structure may not be what the association experienced pre-COVID. The City of San Diego has changed arrangements for evening meetings at the MTRP Visitor Center and they would no longer be free. The meeting fee is being determined but would cover security and possibly clean-up. SDAA is checking with other facilities, including SDSU, as alternatives. Dr. Sandquist, Head of the SDSU Astronomy Department, has no facilities for SDAA meetings at his disposal but is checking with campus management. Community colleges would rent SDAA space for approximately \$300 per meeting.

e. AISIG Report:

The September AISIG Meeting was a live set-up session in a cul-de-sac in Scripps Ranch. Three imagers were able to set-up, align and test their set-ups. We had an additional 4 AISIG members anxious to help out. With everyone's help and advice, all three imagers were successful in working through issues they had previously encountered in other locations.

f. Newsletter Report:

Looks great as always!

g. Website Report:

No issues, except that I would like to get program/speaker info for the website as soon as it is available.

h. Social Media:

No Report.



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i. Outreach Report:

There were no significant changes in our operational schedule for the month of September. We had the same (5) events previously on calendar, with the exception of Sycamore Canyon, which was cancelled due to weather. Below is a summary of outreach event participation with numbers for September and for Year to Date.

2021	September	YTD
Events Completed	4	13
Events Cancelled	5	46
Total Attendance	225	624

Dennis Ammann is working with management at KQ Ranch to resolve a new lighting issue, which could prevent our continued support at that venue. KQ Ranch is on schedule for October and will be reviewed after that.

Kin Searcy has made significant progress with MTRP Kumeyaay Lake CG and West Sycamore. With the aid of the Scripps Ranch Citizens group we have authorization to restart these two events in November. The caveat is the park's requirement for an additional insurance policy to cover our volunteers. Kin has requested and received a quote from our insurance agent, Springbrook, which will be reviewed by the Board.

Major Outreach events for October and November include the Webelos Woods Scouting event at Camp Mataguay, a joint EAA live streaming event with the Tucson Amateur Astronomy Association, and another lunar eclipse, live streaming program with Timeanddate.com.

j. TARO Report:

TARO is operational and is accepting DSO/EXO target imaging requests, weather permitting.

k. Cruzen Report:

Gene is working on the final plans for the Cruzen roll-out and will submit it to the Board for approval.

l. Merchandise Report:

Very slow month.

m. Astronomical League Report:

Nothing new to report.

Currently, we have 58 members who are also listed as Astronomical League Members affiliated with the SDAA.



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n. [JSF Report:](#)

Confirming that we are planning to resume the annual Julian Starfest, starting with August 25-28, 2022, at the Menghini Winery. We will be working to reassemble the JSF committee during October and start preparing for a great return in 2022.

o. [Primary Grid Reconstruction Report](#)

Steve Myers gave a detailed presentation on the state of the electrical grid in the private pad area. He's going to report back to the board with a list of private pads that have severe issues with their electrical system and we'll send out a notice to the pad holders as to what needs to be done to correct the problems. We will be disconnecting pads with dangerous problems from the main grid.

5. **Old Business:**

- a. The annual SDAA Banquet is scheduled for February 12, 2022. Mike C, Dave W and Mel are working on finding a location and Kin is working on finding a speaker.
- b. Other Old Business – none

6. **New Business:**

- a. The patio cover was repaired by Brian McFarland and should last another year or so.
- b. There is a real problem with light trespass from the neighbors across the street and Mike C and Gene B will contact them to see what we can do to mitigate the problem.
- c. Nominating Committee – Gene will be the board member on the committee and will recruit two members to help.
- d. Other new business – none

7. **Adjournment:** The meeting was adjourned at 8:52pm.

2021 TDS Star Party Schedule

Date	Type	Sunset	Astro. Twi.	Moonrise(set)	Illumination
Nov-06	Private	5:53 PM	7:17 PM	(7:34 PM)	6%
Nov-27	Public	4:42 PM	6:09 PM	12:10 AM	50%
Dec-04	Private	4:42 PM	6:09 PM	(5:12 PM)	0%

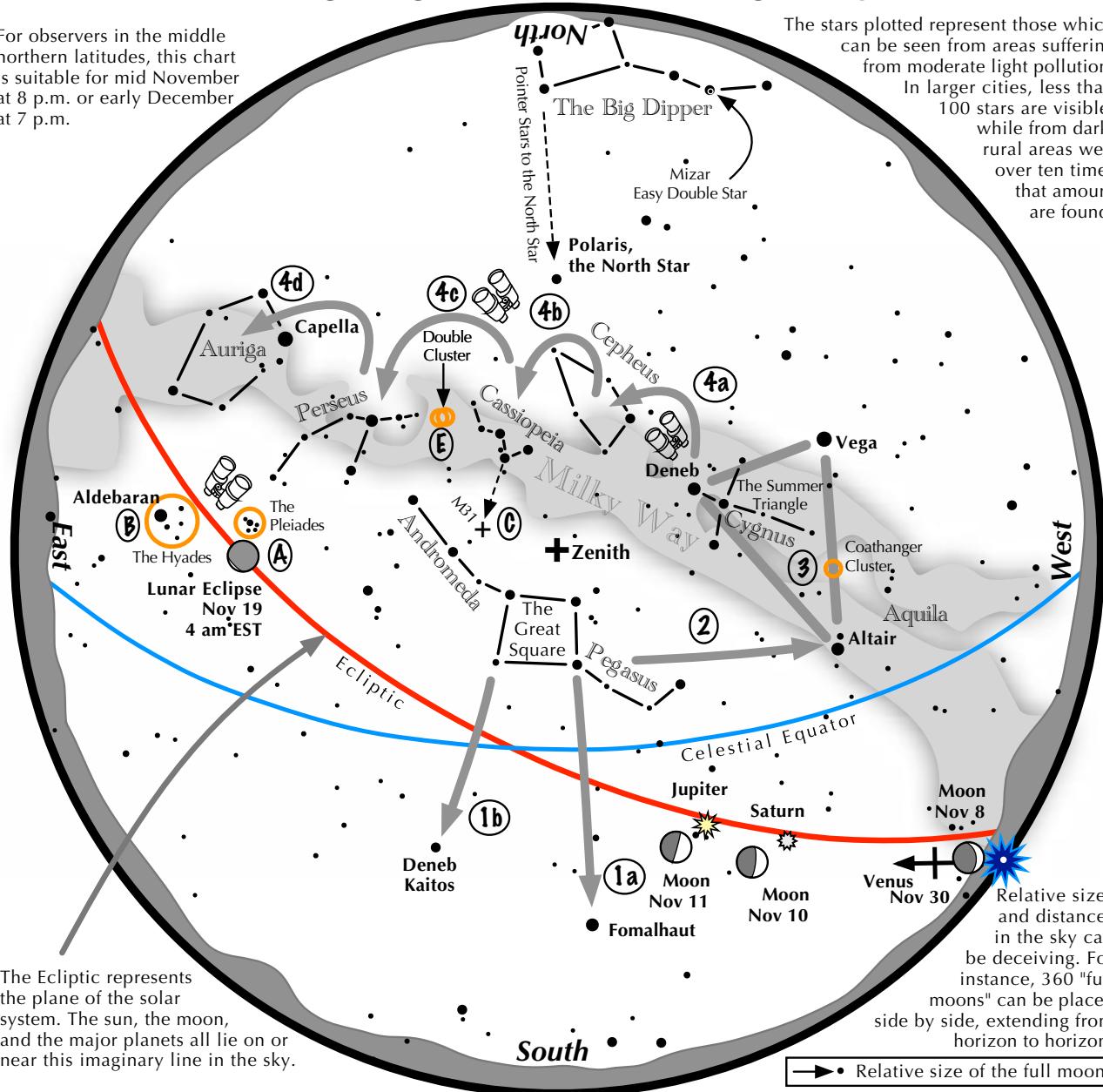


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Navigating the November Night Sky

For observers in the middle northern latitudes, this chart is suitable for mid November at 8 p.m. or early December at 7 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



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

- 1 Face south. Almost overhead lies the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend a line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the south. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second brightest star in the south.
- 2 Draw a line westward following the southern edge of the Square until it strikes Altair, part of the "Summer Triangle."
- 3 Locate Vega and Deneb, the other two stars of the Summer Triangle. Vega is its brightest member, while Deneb sits in the middle of the Milky Way.
- 4 Jump along the Milky Way from Deneb to Cepheus, which resembles the outline of a house. Continue jumping to the "W" of Cassiopeia, then to Perseus, and finally to Auriga with its bright star Capella.

Binocular Highlights

A and B: Examine the stars of the Pleiades and Hyades, two naked eye star clusters. **C:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval. **D:** Sweep along the Milky Way from Altair, past Deneb, through Cepheus, Cassiopeia and Perseus, then to Auriga for many intriguing star clusters and nebulous areas. **E:** The Double Cluster.



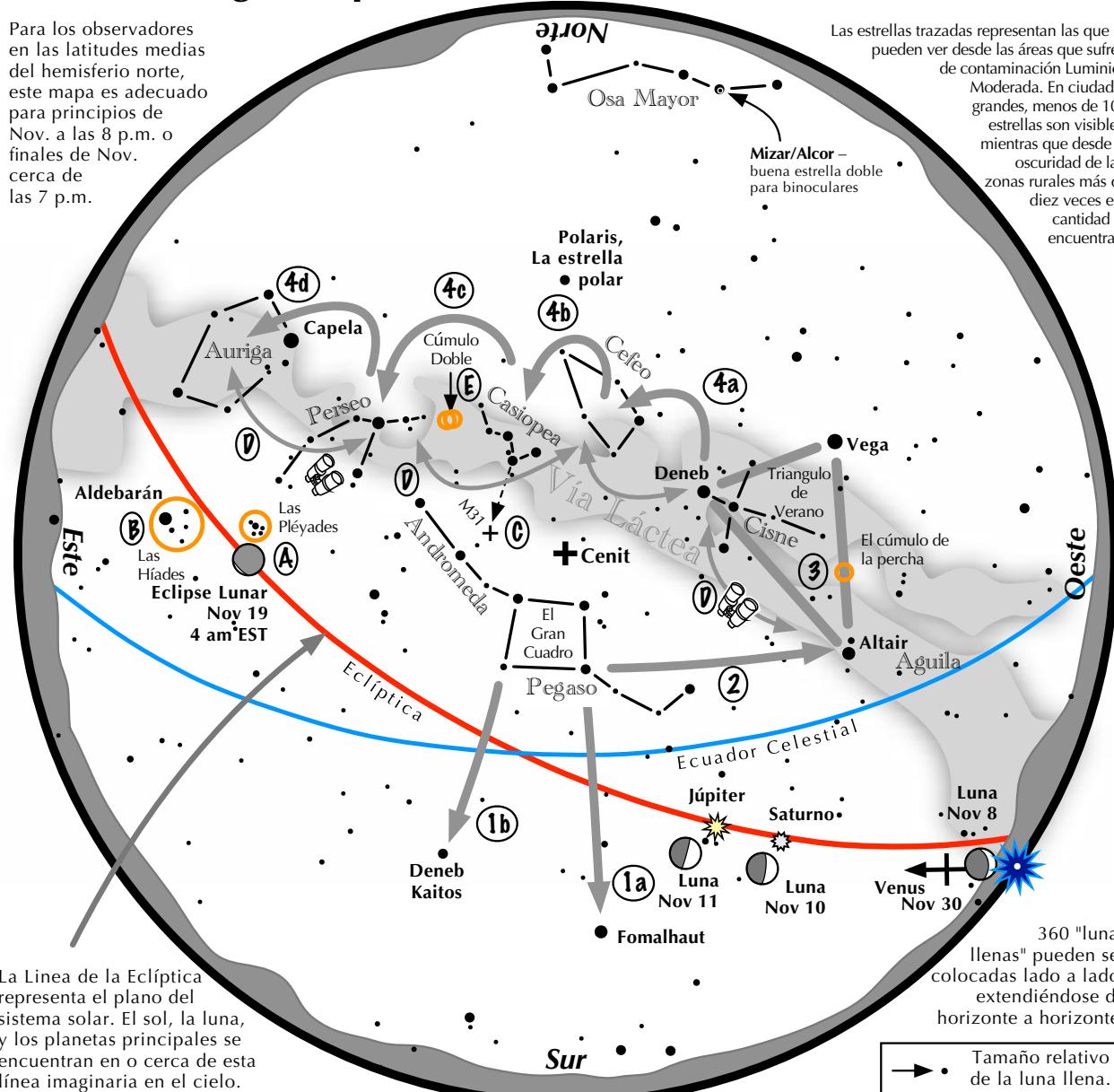


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Navegando por el cielo nocturno de Noviembre

Para los observadores en las latitudes medias del hemisferio norte, este mapa es adecuado para principios de Nov. a las 8 p.m. o finales de Nov. cerca de las 7 p.m.

Las estrellas trazadas representan las que se pueden ver desde las áreas que sufren de contaminación lumínica moderada. En ciudades grandes, menos de 100 estrellas son visibles, mientras que desde la oscuridad de las zonas rurales más de diez veces esa cantidad se encuentran.



Navegando por el cielo nocturno: simplemente comience con lo que sabe o con lo que puede encontrar fácilmente.

- 1 Hacia el sur. Casi arriba está el "Gran Cuadro" con cuatro estrellas con el mismo brillo que las de la Osa Mayor. Extiende una línea imaginaria hacia el sur siguiendo las dos estrellas más occidentales del Gran Cuadro. La línea lleva a Fomalhaut, la estrella más brillante del sur. Una línea que se extiende hacia el sur desde las dos estrellas más orientales, lleva a Deneb Kaitos, la segunda estrella más brillante del sur.
- 2 Dibuja otra línea, esta vez hacia el oeste siguiendo el borde sur del Gran Cuadro. Lleva a la estrella Altair.
- 3 Ubique a Vega y Deneb, las otras dos estrellas del "Triángulo de verano." Vega es su miembro más brillante, mientras que Deneb se localiza en el medio de la Vía Láctea.
- 4 Salta a lo largo de la Vía Láctea desde Deneb hasta Cefeo, que se asemeja al contorno de una casa. Continúa saltando a la "W" de Casiopea, a Perseo y finalmente a Auriga con su brillante estrella Capela.

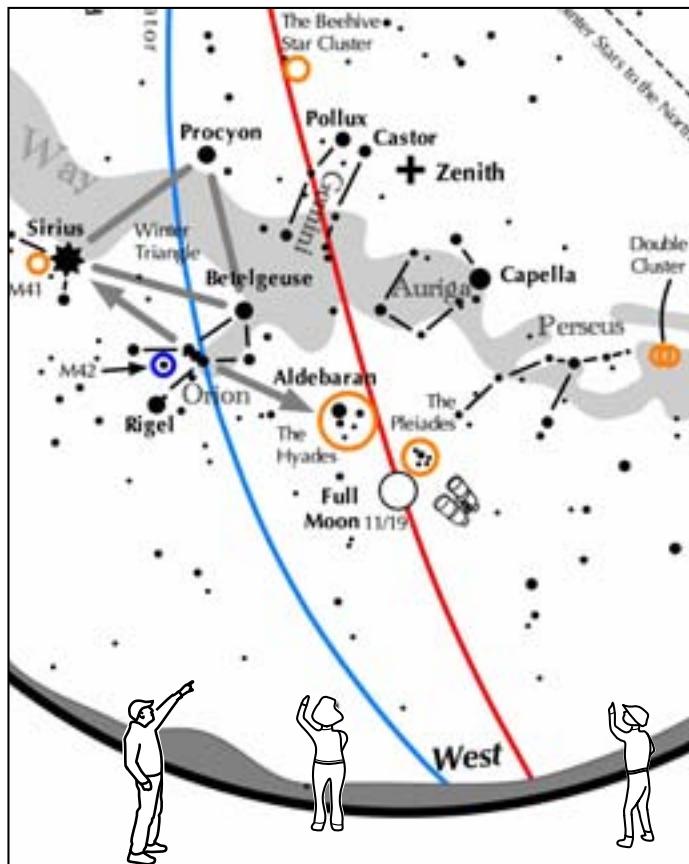
Destacan con Binoculares. A y B: examina las estrellas de las Pléyades y las Híades, dos cúmulos de estrellas a simple vista. C: Las tres estrellas más occidentales de la "W" de Casiopea apuntan hacia el sur hasta M31, la Galaxia de Andrómeda, un óvalo "borroso." D: Barrer a lo largo de la Vía Láctea desde Altair, pasar Deneb, a través de Cefeo, Casiopea y Perseo, y luego a Auriga por muchos intrigantes cúmulos de estrellas y áreas nebulosas. E. Cúmulo Doble de Perseo.



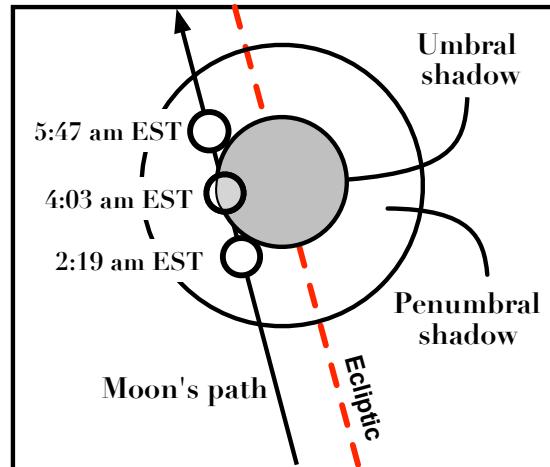


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In the early morning of November 19, try this challenge:



View to the west
on November 19
at 4 am EST,
1 am PST



The Moon slides through an almost total eclipse

In the early morning hours of Nov. 19 for east coasters, and after 11 p.m. on the 18th for west coasters, the brilliant full moon slides into Earth's shadow. But the moon's surface isn't completely covered, just 97% of it at maximum eclipse.

- Even though the partial umbral eclipse begins at 2:19 EST, darkening may not be noticed for another 5 minutes.
- At mid eclipse, can you see that the southern limb of the moon is not in full darkness?
- At mid eclipse, what color is the moon? How red is it?
- Before the eclipse begins, the moon's sky glow blocks viewing the Pleiades star cluster. How close to mid eclipse are the Pleiades still visible?



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2022 TDS Star Party Schedule

Date	Type	Sunset	Astro. Twi.	Moonrise(set)	Illumination [†]	Notes
Jan-1	Member	4:53 PM	6:21 PM	6:59 AM	2%	Quadrantids peak night of Jan 2/3 (ZHR ^{††} 120)
Jan-29	Public	5:18 PM	6:43 PM	5:42 AM	9%	
Feb-5	Public	5:25 PM	6:49 PM	(10:20 PM)	26%	
Feb-26	Member	5:43 PM	7:05 PM	4:27 AM	21%	Mercury Greatest Western Elongation - Feb 16 (AM)
Mar-5	Public	5:49 PM	7:10 PM	(9:04 PM)	12%	
Mar-26	Member	7:04 PM	8:27 PM	4:13 AM	34%	
Apr-2	Public	7:09 PM	8:33 PM	(8:49 PM)	3%	
Apr-30	Member	7:29 PM	9:00 PM	6:32 AM	0%	Mercury Greatest Eastern Elongation - Apr 29 (PM)
May-21	Public	7:44 PM	9:21 PM	1:37 AM	64%	
May-28	Member	7:49 PM	9:28 PM	5:06 AM	3%	Memorial Day Weekend
Jun-18	Public	7:59 PM	9:40 PM	12:11 AM	78%	Mercury Greatest Western Elongation - Jun 16 (AM)
Jun-25	Member	8:00 PM	9:42 PM	3:43 AM	10%	
Jul-23	Public	7:53 PM	9:29 PM	2:22 AM	22%	
Jul-30	Member	7:48 PM	9:22 PM	(9:25 PM)	5%	S. delta Aquariids peak night of Jul 29-30 (ZHR ^{††} 16)
Aug-20	Public	7:27 PM	8:55 PM	1:01 AM	37%	Saturn at Opposition on Aug 14
Aug-27	Member	7:19 PM	8:45 PM	7:30 AM	0%	Mercury Greatest Eastern Elongation - Aug 27 (PM)
Sep-17	Public	6:51 PM	8:14 PM	11:40 PM	54%	Neptune at Opposition on Sep 16
Sep-24	Member	6:42 PM	8:04 PM	6:20 AM	2%	Jupiter at Opposition on Sep 26
Oct-15	Public	6:15 PM	7:37 PM	10:21 PM	71%	Mercury at Greatest Western Elongation - Oct 8 (AM)
Oct-22	Member	6:07 PM	7:29 PM	5:06 AM	8%	Orionids peak night of Oct 20-21 (ZHR ^{††} 20)
Nov-19	Public	4:45 PM	6:11 PM	2:50 AM	21%	Leonids peak night of Nov 17-18 (ZHR ^{††} 15)
Nov-26	Member	4:43 PM	6:09 PM	(7:31 PM)	12%	Thanksgiving Weekend
Dec-17	Public	4:44 PM	6:13 PM	1:34 AM	38%	Geminids peak night of Dec 13-14 (ZHR ^{††} 150)
Dec-24	Member	4:48 PM	6:16 PM	(6:21:PM)	3%	Ursids peak night of Dec 21-22 (ZHR ^{††} 10)

[†] Illumination at meridian crossing.

^{††} Published zenithal hourly rate(s) ZHR vary widely between sources.

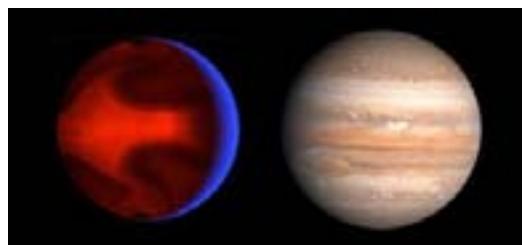


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James Webb Space Telescope needs You!



“We watched the development of one of the fiercest storms in the galaxy,” stated Greg Laughlin of Lick Observatory, University of California at Santa Cruz.



The Exoplanet Watch has tasked us with observing a target to directly aid one of the first JWST observing runs. Discovered back in 2001, HD 80606b is 4.38 times the mass of Jupiter with a closest approach nearly 13 times closer than Mercury. Because of its eccentric 111.4-day orbit and 34-hour rotation, we can measure HD 80606b’s hot spot making it the “first time that we’ve detected weather changes in real time on a planet outside our solar system.” (Laughlin) The transit is ~12 hours long making it impossible for any ground based observer to be able to observe it for James Webb to point to it at the right time. They need all of us to piece it together.

Call to action: Let's get as many SDAAs on it as we can!

HD 80606b’s next transit will be **2021-12-07 17:37-5:37 Pacific Standard Time.**

Equipment Requirements:

- Ideal 8 inch+ telescope with image scale of anything lower than 1"/px and SNR ~250
- Mag 9 host star with Companion Star 21" away
- Transit Duration: ~12 hours
- Transit Depth: ~11.0 ppt
- Observation minimum: 2+ hours of time series images
- Time series images the day before or after also welcome!

Joseph Burch will happily process all your FITS images using JPL’s EXOTIC. **Any contributing data referenced in a published paper will be eligible for co-authorship!**

For more information, please click here [HD80806b](#) to access the Google Drive folder he has made for this or send him an email at JNBpisces@Gmail.com.



San Diego Astronomy Association

Meade Model 622 Cometracker 6" (f/3.60)



Presale price of **250.00** plus fees for Contributing Members only.

Cloudy Nights & Astromart pricing will be **\$300.00** plus fees and shipping.

Here is a blast from the past. Made in the USA. The Meade finishes are beautiful. Optics look clean. Mounted on a foreign tripod/head, and sold as a package. Circa 1986 – Haley Comet craze vintage. ...and did I mention it is beautiful?

These OTAs are sought after by astro-imagers for their f3.60 optics. 6" of light gathering with a 549mm focal length is hard to replicate at a low price. By design, the focal plane is well placed for an SLR camera. A few modifications to the focuser might make this OTA an interesting platform for a one-shot-color CMOS camera.

As a visual instrument, the field of view is stunning. Applying high power is difficult, but the light gathering, combined with fast optics, makes acquiring objects a breeze. The manual mount controls are all smooth and the ring repair is secure – see the first photo. While not rock solid, plenty adequate to return nice images.

As an imaging platform, you would need to modify or replace the stock focuser and add a dovetail. As a visual instrument you might be limited to 1¼" eyepieces or show some chrome getting a 2" to focus. As a museum piece it would have to be turned to hide the ring repair.

We are selling “as-is.” Bottom line, you can have this instrument at a reasonable price.

Dave Decker, for SDAA, Outreach@sdaa.org, 619.972.1003



San Diego Astronomy Association

The History of the San Diego Astronomy Association

For people who are not aware of it, I wrote a book about the history of the SDAA. I published it on August 22, 2021 and, soon thereafter, I informed people about it via the club's online chat group. Since not all club members are involved with the club's online chat group, I've had more than one person suggest that I inform people about the book via the club's newsletter. So, the following is some information about its contents and how to obtain the book.

The reason why I wrote the book is to disclose information about both members who helped form the club plus those who helped make it successful. Most of this information was obtained from newsletters, board meeting minutes, program meeting minutes, etc. dating back to 1963.

Among other things, it contains a history of the different names of the club, the names and positions of nearly all of the club's officers, the names of many volunteers at various public and school star parties, information about observatories and telescopes at the Tierra del Sol property, and stories about astronomy events and conferences related to the SDAA.

Perhaps the most interesting part of the book is the history of the property at Tierra del Sol. I prefer the efforts to find a permanent location for club star parties, the development of the property, and, per the purpose of the book, provide the names of the people who were instrumental in the success of what many members describe TDS as being "the gem of the club."

If you are interested in this book, you can obtain it on Amazon's Web site. The book's title is "The Astronomy Club on the Hill" -- a spinoff of the club's old slogan, the hand-drawn logo on past newsletter letterheads, named 'The Observatory on the Hill'. You can find the book by either searching for the title (of course), searching by my name, or going to the following link --

https://www.amazon.com/Astronomy-Club-Hill-successful-astronomy-ebook/dp/B09DC6C1PP/ref=sr_1_1?dchild=1&keywords=The+Astronomy+Club+On+The+Hill&qid=1634829492&qsid=132-4691158-7369129&sr=8-1&sres=B09DC6C1PP%2CB075WW3JKQ%2CB07PS65RKM%2CB084ZS5KBH%2C0812988701%2CB0787PP19H%2CB003DM3MN4%2CB001T8HCSU%2CB086GC6PN5%2CB084ZS7TQF%2CB076JCR8LG%2CB08P4HKZNL%2CB08772JQB2%2CB07PK5MSVX%2CB071J3YPJ9%2CB08XNP7YZ4&srpt=ABIS_BOOK

The book is electronic and there is no printed version. As such, in order to read it, use either a Kindle device or a free Kindle application on devices such as a desktop computers, laptops, tablets, or smart phones. And you can preview the first five, out of a total of forty, chapters of the book for free. If you purchase the book, as I point out more than once within it, I would like to receive feedback about it. If I receive enough feedback, then I will create the proposed second edition.

Clear, Dark Skies!
Craig Ewing



San Diego Astronomy Association

SDAA Contacts

Club Officers and Directors

President	Dave Wood	President@sdaa.org	(858) 735-8808
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SDAA Editorial Staff

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newsletter@sdaa.org
Assistant Editor: Craig Ewing

Have a great new piece of gear? Read an astronomy-related book that you think others should know about? How about a photograph of an SDAA Member in action? Or are you simply tired of seeing these Boxes in the Newsletter rather than something, well, interesting?

Join the campaign to rid the Newsletter of little boxes by sharing them with the membership. In return for your efforts, you will get your very own byline or photograph credit in addition to the undying gratitude of the Newsletter Editor. Just send your article or picture to Newsletter@SDAA.Org.



San Diego Astronomy Association

NASA Night Sky Notes

November 2021



This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach.

Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Measure the Night Sky

David Prosper

Fall and winter months bring longer nights, and with these earlier evenings, even the youngest astronomers can get stargazing. One of the handiest things you can teach a new astronomer is how to measure the sky – and if you haven't yet learned yourself, it's easier than you think!

Astronomers measure the sky using degrees, minutes, and seconds as units. These may sound more like terms for measuring time - and that's a good catch! – but today we are focused on measuring **angular distance**. **Degrees** are largest, and are each made up of 60 **minutes**, and each minute is made up of 60 **seconds**. To start, go outside and imagine yourself in the center of a massive sphere, with yourself at the center, extending out to the stars: appropriately enough, this is called the **celestial sphere**. A circle contains 360 degrees, so if you have a good view of the horizon all around you, you can slowly spin around exactly once to see what 360 degrees looks like, since you are in effect drawing a circle from inside out, with yourself at the center! Now break up that circle into quarters, starting from due North; each quarter measures 90 degrees, equal to the distance between each cardinal direction! It measures 90 degrees between due North and due East, and a full 180 degrees along the horizon between due North and due South. Now, switch from a horizontal circle to a vertical one, extending above and below your head. Look straight above your head: this point is called the **zenith**, the highest point in the sky. Now look down toward the horizon; it measures 90 degrees from the zenith to the horizon. You now have some basic measurements for your sky.

Use a combination of your fingers held at arm's length, along with notable objects in the night sky, to make smaller measurements. A full Moon measures about half a degree in width - or 1/2 of your pinky finger, since each pinky measures 1 degree. The three stars of Orion's Belt create a line about 3 degrees long. The famed "Dig Dipper" asterism is a great reference for Northern Hemisphere observers, since it's circumpolar and visible all night for many. The Dipper's "Pointer Stars," Dubhe and Merak, have 5.5 degrees between them - roughly three middle fingers wide. The entire asterism stretches 25 degrees from Dubhe to Alkaid - roughly the space between your outstretched thumb and pinky. On the other end of the scale, can you split Mizar and Alcor? They are separated by 12 *arc minutes* - about 1/5 the width of your pinky.

Keep practicing to build advanced star-hopping skills. How far away is Polaris from the pointer stars of the Big Dipper? Between Spica and Arcturus? Missions like Gaia and Hipparcos measure tiny differences in the angular distance between stars, at an extremely fine level. Precise measurement of the heavens is known as **astrometry**. Discover more about how we measure the universe, and the missions that do so, at nasa.gov.



San Diego Astronomy Association

NASA Night Sky Notes

November 2021

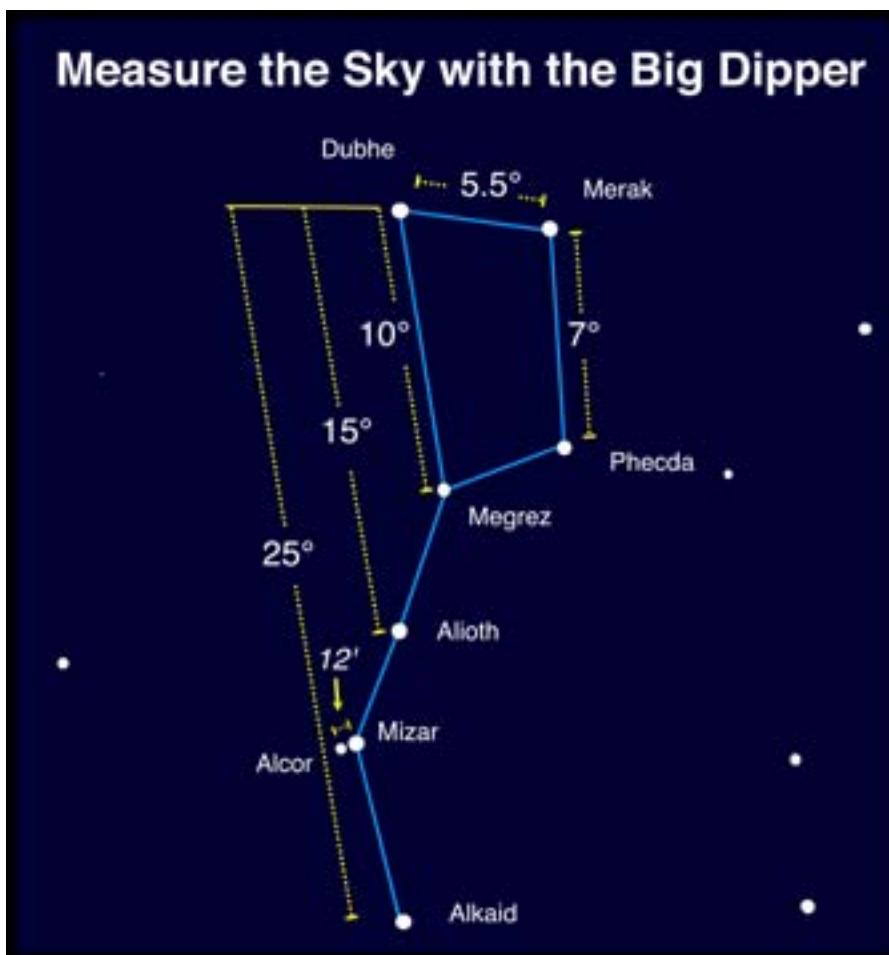
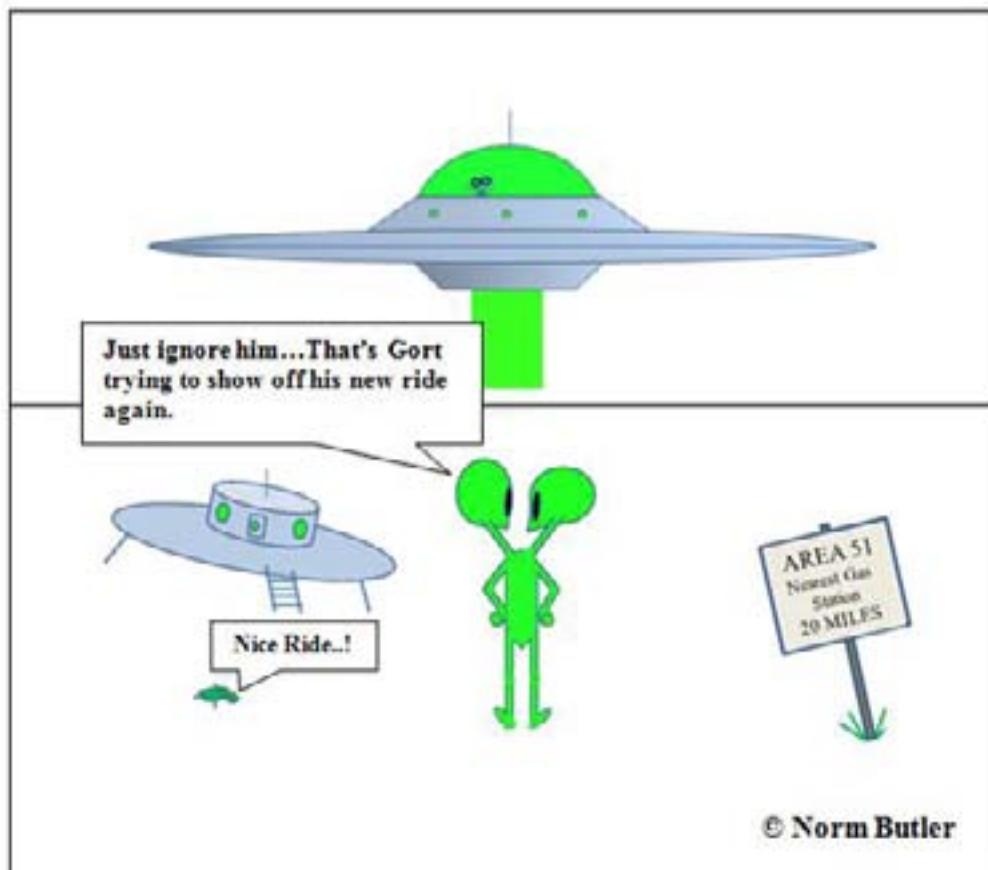


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