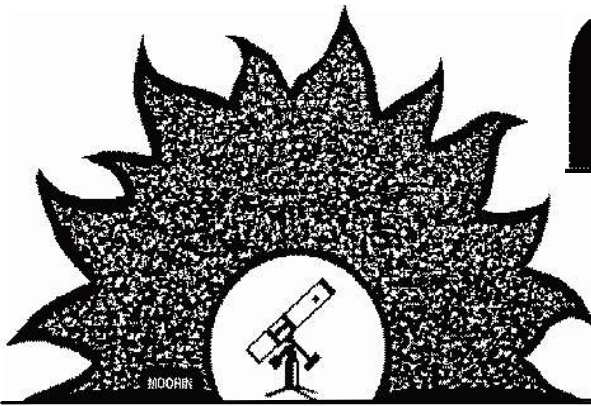




PAStimes

Phoenix Astronomical Society

www.pasaz.org

May 2023

Volume 74 Issue 9

PHOENIX ASTRONOMICAL SOCIETY — ESTABLISHED 1948

TOM SHARP TO TALK METEORITES AT MAY 4TH MEETING

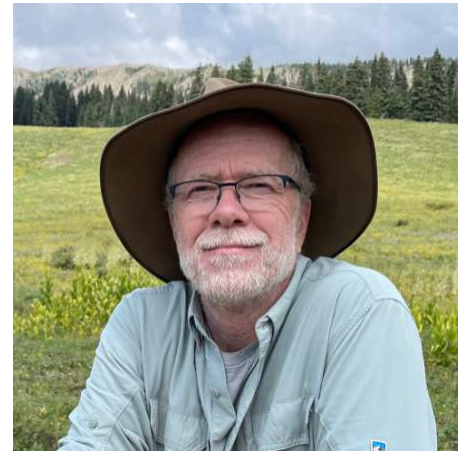
“Shock Effects in Meteorites: The Impact History of the Solar System and a Gift from the Asteroid Belt”

By Tom Sharp

Our understanding of the deep Earth and its mineralogy comes from two fields. Geophysics uses remotely sensed properties to interpret Earth’s physical properties and structure. Mineral physics uses the physical properties of high-pressure minerals to model the mineralogy of Earth’s interior. Although samples of Earth’s upper mantle come to the surface in volcanoes, such as Peridot Mesa in Arizona, few materials from Earth’s lower mantle, other than diamond, survive the transit to the surface. Mineral physicists have synthesized materials under deep-Earth conditions, but these cannot be given mineral names unless they are found in nature and carefully

characterized. Shocked meteorites have provided many of the high-pressure phases thought to occur in the deep Earth, a gift from the asteroid belt that has allowed us to name the most important minerals in the Earth.

Hypervelocity collisions represent an important process in our solar system and much of the impact history is recorded in shocked meteorites. The shock effects in meteorites include local melt veins and melt pockets that form during shock compression and solidify at high-pressure. The resulting assemblages of high-pressure minerals provide a record of shock pressure and temperature in addition to natural examples of deep Earth minerals. The history of impacts is recorded in the resetting of the potassium-argon (K-Ar) isotopic system, providing a detailed record of parent-body impacts. In



TOM SHARP: GUEST SPEAKER FOR MAY 4TH PAS MEETING IN PERSON WITH MEET & EAT DINNER BEFORE THE MEETING.

this talk, you will learn about the high-pressure minerals in meteorites and in the

SEE “METEORITES ON MAY 4TH” ON PAGE 3.

MY JOURNEY IN ASTRONOMY OUTREACH

A Lecture by Mark Johnston

Review by Stu Brackney

How did it begin? What got you interested in astronomy? Questions often asked of astronomers. For Mark Johnston it was when he was eleven years old and first saw Saturn through a telescope. He got the bug and wanted to know and see more.

Mark was our guest speaker at our “hybrid” (in the classroom and via Zoom) meeting on April sixth. No stranger to live audiences, Mark has been presenting lectures worldwide on astronomy and often on the art of astrophotography. His award-winning images have been published by international publications.

Through an entertaining slide and video presentation he took us through the various techniques and equipment he uses

to capture images rarely seen by the naked eye and difficult to see with a standard telescope. Through his live presentations using a special camera attached to his telescopes and then linked to a TV monitor, he can show members of the audience images thousands of light years off in the cosmos in real time. This process is called EAA “Electronically Assisted Astronomy.”

Mark’s inspirational presentation reminded all of us that we too can reach out to members of the public and of course our own organization by sharing these images and the procedures he uses to capture them.

A member of the Astronomical League, Astronomical Society of the Pacific and of course PAS, he is also a NASA Ambassador which enables him to obtain updated space missions from

NASA to share with the public. If you missed this lecture, check it out on our website under PAS Monthly Meetings: Videos of Speaker Presentations.



MARK JOHNSTON IS A PAS MEMBER AND A SOLAR SYSTEM AMBASSADOR.

President	Stu Brackney	480-221-5711	President@pasaz.org
Vice President	Paul Facuna	602-246-1554	VicePresident@pasaz.org
Webmaster	Pete Turner		Webmaster@pasaz.org
Secretary			Secretary@pasaz.org
Treasurer	Richard Sauerbrun		Treasurer@pasaz.org
Event Manager	Terri Finch	602-561-5398	Events@pasaz.org
Membership Manager	Joe Sandy		Membership@pasaz.org
Newsletter Editor	Don K. Boyd		Editor@pasaz.org
Member at Large			
Member at Larger	Bruce Wurst	602-909-8024	mail@pasaz.org

Phoenix Astronomical Society 3241 E Shea Blvd #249 Phoenix AZ 85028-3365

PAST PAS RECORDED PROGRAMS

By Terri Finch, Event Manager

Did you miss a PAS Meeting and wish you could see it? You can get to the link of Past Recorded PAS Meetings with Guest Speakers any time by going to the left hand navigation tool on the PASaz.org website and clicking on "PAS Monthly Meetings." From there a drop down item will appear and please click on "Videos of Speaker Presentations." You will then find recordings of Past PAS Meetings for your viewing pleasure. The collection is in oldest to newest order. Please work your way to the bottom of the collection to find the most recently recorded PAS Guest Speaker Presentation.

As long as PAS can record the PAS Meetings, PAS will continue to add more recordings to this page. Here is the direct link to the recorded PAS Meetings collection: <https://www.pasaz.org/pas-monthly-meetings/videos-of-speaker-presentations>. Enjoy!

TABLE OF CONTENTS

1 "Shock Effects in Meteorites" May 4th	6 Galactic Gavel & Honorary Membership Awarded
1 "My Journey in Astronomy Outreach"	7 Thanks to Paul Facuna
2 PAS Contact Info	7 Thanks to Mike Marron
2 Past PAS Recorded Programs	7 Green Comet C/2022 E3 (ZTF)
2 Table of Contents	8 My First Messier Marathon
2 What's up for May	10 Twin Stars Become Triplets
2 Moon Phases of May	12 Museum of the Moon Feb 7 & 13
3 PVCC Main Campus Map	13 Telescope Workshop Mar 9th
3 Upcoming PAS Guest Speakers	15 ASC Star Party Mar 24
3 May 4th PAS Meeting	15 Satellite Surprise
3 Dinner prior to May 4th Meeting	16 Story Time: The Star Party
4 Stu's Views - May 2023	17 Navigating May Skies
4 PAS Summer Events	18 Observing Flat Galaxies
5 Grand Canyon Star Party June 10-17	19 Iotta & Kappa Bootes
	20 Astrophotography by PAS Members

Bold items Listed in TOC are Upcoming Public & Private Events

WHAT'S UP FOR MAY

Name	Date	Rise	Set
Mercury	05-15-23	06:43	17:44
Venus	05-15-23	08:18	22:51
Mars	05-15-23	09:49	00:62
Jupiter	05-15-23	04:19	17:18
Saturn	05-15-23	01:57	13:04
Uranus	05-15-23	05:14	18:52
Neptune	05-15-23	02:52	14:43
Pluto	05-15-23	12:09	14:08

All Times Arizona Time UT-7

Bold means the object is "visible" in the evening

PAS is incorporated in the state of Arizona as a non-profit, scientific and educational 501(c)(3) organization. Our newsletter PAStimes is published monthly from September to May and distributed via the Internet. All Issues are available for download on our website www.pasaz.org. Ads for astronomy equipment are provided as a courtesy to sellers and buyers, and do not constitute any endorsement by PAS. All Photos by Don Boyd unless otherwise credited. All articles and photos are copyright their authors or PAStimes.

MAY 15, 2023

Sunrise: 5:28

Sunset: 19:3

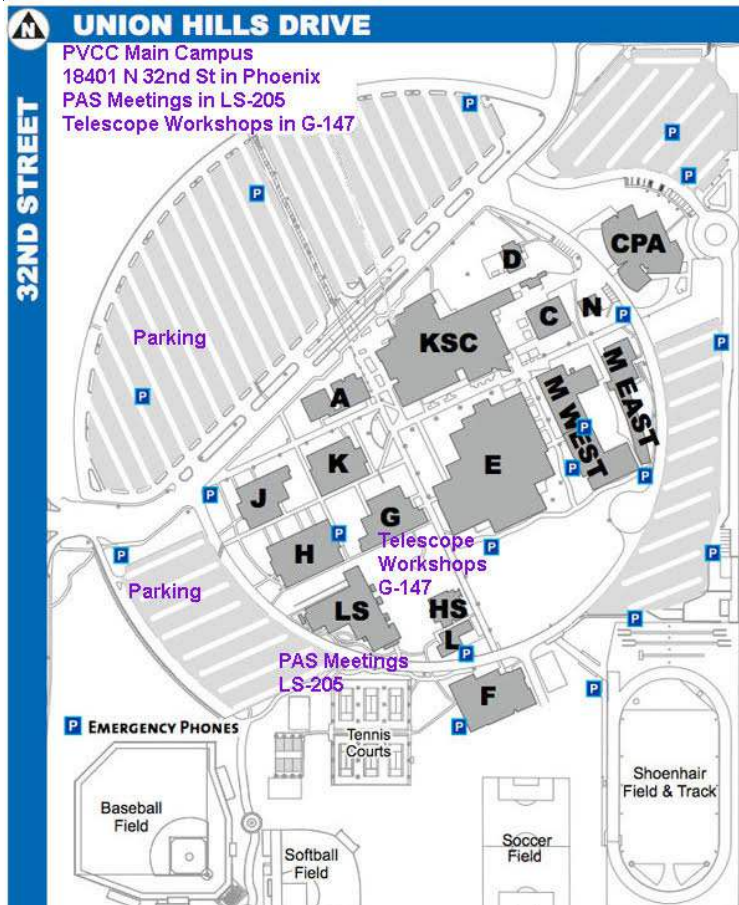
Full: May 5

Q3: May 12

New: May 19

Q1: May 27





2023 PAS GUEST SPEAKERS AT HYBRID MEETINGS

By Terri Finch, Event Manager - Events@pasaz.org

All PAS Meetings with a Guest Speaker held at PVCC can be attended in-person, as well as via Zoom, in a hybrid meeting. Those of you who wish to attend the meeting in person, please meet in LS-205 at PVCC Main Campus (map to the left of this article). If you wish to attend the meeting via Zoom, that option is available. Until further notice, PAS is using the same Zoom Meeting Link for each PAS Meeting: <https://us02web.zoom.us/j/81193628193?pwd=NIBZN2IU204VnVySk5SZXhtZWc2UT09>

Please visit the PAS calendar at www.PASaz.org to find out more about these upcoming meetings and guest speakers. For a complete list of guest speakers visit: <https://docs.google.com/document/d/1LOO-UPaYNvw3p7JCRXCKSjDcbsK60DnvWOoifbqPrNp8/edit?usp=sharing>

Do you have an idea for a guest speaker? Email the details and contact info for the possible guest speaker to Paul Facuna at VicePresident@pasaz.org.

Here are the next scheduled guest speakers at PAS:

Sept 7: Data TBA

Oct 5: Rhonda Stroud - Topic TBA

Nov 2: Kai Staats - Topic TBA

Dec 7: Dr. David Williams - Topic TBA

METEORITES ON MAY 4TH

(CONTINUED FROM PAGE 1)

Earth and how the K-Ar system provides real and impossible impact ages.

Tom Sharp is a professor of geology and planetary science in the School of Earth and Space Exploration at Arizona State University. He is a mineralogist who uses electron microscopy and other analytical tools to study how mineral structures change in response to changes in pressure, temperature, and chemical environment. He is a Fellow of the Mineralogical Society of America. He has studied Earth's surface, its deep interior, the surface of Mars and a variety of meteorites. He is an expert in shock effects in meteorites and high-pressure minerals. He is a principal investigator for the Facility for Open Research in the Compressed Environment (FORCE) and an associate director of the Arizona Space Grant Consortium.

MAY 4TH PAS MEETING

By Terri Finch, Event Manager

Please join PAS at the May 4th PAS Meeting as we welcome Tom Sharp from ASU to PVCC in room LS-205 at 7pm. You can join this meeting in person or pop in from Zoom at this link: <https://us02web.zoom.us/j/81193628193?pwd=NIBZN2IU204VnVySk5SZXhtZWc2UT09>. Everyone is welcome to attend and enjoy this presentation.

MEET & EAT DINNER PRIOR TO PAS MEETING

By Terri, Event Manager

PAS will have a Meet & Eat Dinner prior to the PAS Meeting on May 4th at 4:30-5pm arrival time. When you RSVP, the location near PVCC will be disclosed. RSVP to Events@pasaz.org with the number in your party. We want to be able to get a table or two next to each other that's big enough to accommodate everyone who wishes to join in the fun.

Arrive any time 4:30pm or after. It is highly suggested you get there by 5pm if you plan to eat, as these locations take about 1.5 hours to complete serving a large group. This is a BYO dinner. PAS will accept donations to help pay for the Guest Speaker's dinner. Give your donations to Terri, as William and Terri Finch will pay for the Guest Speaker's meal and then be reimbursed by PAS.

At the end of the meal, we pay for dinner and leave at 6:30pm, getting the Guest Speaker to the meeting by 7pm to set up for his presentation. Only the Guest Speaker and the Finches need to depart at 6:30pm. PAS members in attendance at dinner may stay and chat, if they wish, after the Guest Speaker has departed. Then, come join us at the PAS meeting for a really awesome presentation! Hope you can make dinner! RSVP today! You must RSVP by Tuesday May 2nd end of day if you want to join dinner, so that I have time to call in an RSVP to the dinner location and save enough seats for everyone to be in one location in the restaurant for dinner. Hope to see you there!

STU'S VIEWS



President Stu Brackney

MAY 2023

It's a busy time of year for our organization. Star parties, elections, great weather, fabulous guest lectures and of

By Terri Finch, Event Manager

Many times PAS has had to adjust to our schedule, or plan events around schedules that aren't ours. An example of this is PVCC. When school is out, PAS literally has no rooms to use for various events like Telescope Workshops, Meetings, etc. But PAS is very grateful for its "friendship" with PVCC and the use of the meeting rooms and other activities PAS provides to PAS to promote the sciences.

And every year for quite a while, PAS has not held General Meetings during the summer months for various reasons. One main reason is not having a location to hold a meeting, but another reason is that we have snowbirds who visit Phoenix in the winter and thus come to our meetings and events, and then leave for the summer months.

The same is true with our star parties. Sometimes, holding star parties in the summer is tricky not only because the attendance is low, with the snowbirds gone for the summer, but also the Phoenix monsoons tend to interfere with some events.

Another thing PAS doesn't do during

course telescope workshops.

First off, I am happy to announce we have reached the century mark. Yep, we now have one hundred members! We must be doing something right. Of course, part of the reason for the increase in membership is the new online sign-up system to join or renew membership which has made it so much easier for everyone. Our Membership Manager, Joe Sandy, informs me we have 101 members!

Destiny. I use this word to describe our future. I am hoping all of you have taken the opportunity to design our destiny by voting online for next year's board of directors. Your participation by voting not only tells us who you want to

PAS SUMMER EVENTS

the summer is produce a newsletter for June, July and August. Once in a while, PAS will have a summer edition that comes out at the beginning of July to include any upcoming July and August events, but that only happens when there is enough newsletter fodder to put into an issue and make it worth the time of the Editor to put it out. So, on that note, you now know there will not be a June, July or August newsletter produced (as of mid-March). This doesn't mean it won't happen, it just means that if you are enjoying the newsletter and don't want to miss the next edition, be sure you are a PAS member so you get the notice to go download it when it becomes available.

As far as possible summer events, those are being discussed, and if there are any upcoming summer events to enjoy, PAS will have it on the www.pasaz.org calendar so you will know about it. Follow the Calendar! Let P.A.S. be your Ticket to the Stars!

Also, be sure to RSVP during the summer for every event you wish to attend, so you can be contacted in the event of a cancellation. Phoenix monsoons, usually from mid-May to the end of September, are unpredictable and

lead PAS but also indicates your willingness to be involved with our activities.

Summer is around the corner, and here in Phoenix, need I remind anyone, that means hot days and nights. Normally PAS closes during the summer, no lectures, no star parties and no telescope workshops. We want to change that. Somehow, we are going to see how we can create activities for you during this summer, so keep an eye out my friends, there may be an event you want to join in on.

Finally, your board consists of seven members and two managers. They alone cannot do all that needs to be done to make things happen. For four months I have been asking for volunteers to be secretary and event manager. No volunteers have stepped forward. If we nine are to succeed in giving you what you want, we need your help.

can cancel an event without advance notice. Hope to see you during this summer. It is so nice to get back to "Normal" activities.

One event everyone seems to look forward to - and you can do your own research on this event - is the Flagstaff Festival of Science. Every year, it takes place near the end of September or early October for ten days straight, that's a Friday to a week later on Sunday. This festival has the most interesting and fun activities for kids of all ages (Yes, that includes the adults who just wanna have fun, too). Check out their schedule as it unfolds on their website: <https://scifest.org/>. Then, put in your RSVPs where needed, and go have a great fun day exploring, learning new things. You may enjoy it so much that you add it to your calendar for the following year! Mark your calendar and, if you can, take some time to attend one or all ten days of free science activities, as they are worth your while. Those PAS Members who have attended or volunteered for the Flagstaff Festival of Science previously, will tell you that you don't want to miss those activities that your kids will learn from and love.

GRAND CANYON STAR PARTY (GCSP) JUNE 10-17

by Mark Johnston

Join the world's largest volunteer event, the GCSP! Taking place June 10-17 on both the south and north rims. The South rim event is much larger, often with over 75 telescopes of all makes and models. Skies are dark with little light pollution and both sites are over a mile in elevation, with commensurately better seeing than we experience in the valley. To enjoy it as a guest, you simply pay the park entrance fee (good for 7 days) and arrange your own accommodations. To volunteer, either as a telescope operator or a general volunteer for the south rim, contact the TAAA at <https://tucsonastronomy.org/upcoming-events/grand-canyon-star-party/>. Volunteers get free entry but need to arrange their own camping or lodging.

The North rim is a much smaller and intimate gathering, with higher elevation and darker skies. There may be room for one more telescope operator, if interested contact me and I'll put you in touch with the organizer. I will be doing my 13th

North Rim event, and for the first time will be sharing Electronically Assisted Astronomy on the west side of the lodge veranda. The normal telescopes will be on the east side.

Wherever you choose to go, don't

miss the best skies in Arizona and the camaraderie of many fellow astronomy enthusiasts!

Mr. Johnston may be reached by email at (markj57@gmail.com)



EVENING IMAGE OF A PAST GRAND CANYON STAR PARTY THAT MARK JOHNSTON ATTENDED.
PHOTO BY MARK.



DAYTIME IMAGE: MARK JOHNSTON AT GCSP JUNE 9, 2016. PHOTO PROVIDED BY MARK.

GALACTIC GAVEL & HONORARY MEMBERSHIP AWARDED

By Terri Finch, Event Manager

It is so awesome to share with everyone that Dan Heim was named as an Honorary Member of PAS at the April 6th PAS meeting by a unanimous vote by all attending PAS members. Thank you to everyone who helped Dan achieve this high status in PAS.

Now is the time when we celebrate the Galactic Gavel and its newly created box and plaque. The Galactic Gavel was donated to PAS by Dan Heim. You can read all about this process in the February 2023 Newsletter starting on page 10, then continued in the March 2023 issue of our newsletter on page 7, and the "Rest of the Story" and conclusion to this awesome process is here, in the May 2023 issue of the club's PASTimes Newsletter. It's like a trilogy... but not as violent, character building, or dramatic.

In brief, Dan Heim, a long time member of PAS, created the Galactic Gavel. Then, after his astronomy club (DFAC) disbanded, he decided to donate it to PAS. The Galactic Gavel story began on December 10th with William and me going up to Dan's home to pick it up. After pick up, we decided it needed a safe case or something to carry it in so that the Gavel is protected and so is everything else it comes in contact with because of its sharp edges. If it lay in the PAS President's briefcase, it would surely destroy any papers it came into contact with. William looked around our home and found a case, just the right size, with Foam already

inside to hold the gavel in place and protect it and we made the donation to PAS.

We brought the case and gavel to the next meeting to give it to President Stu. Since it is a gun case, it made walking on the PVCC school campus a bit nerve racking, so Wiliam thought it would be good to get a plaque that said what the contents of this black case were, in case security saw it and felt the carrier of this case was going to do harm on campus. I contacted M&J Trophy who has been doing the PAS Name Badges since I started purchasing them for the club (probably 10-12 or more years ago). I sent them a mock up of what I wanted, they sent me a proof - it wasn't correct, so I sent it back, changed what needed to be changed, and got another proof sent to me before I approved the printing. M&J Trophy on the west side of town is marvelous! All this transfer of data was completed digitally through email. Then, they rushed it through, printed it, I picked it up, I was delighted it was exactly what I requested. A day or so later, William and I worked on centering and adhering it to the case. It came with three super strong strips of double-sided tape, but we added some Gorilla Glue to really make it stay put. It

looks amazing and now it is ready for the President of PAS to open and close meetings using the Galactic Gavel! Thank you M&J Trophy. Thank you Dan Heim. Thank you President Stu Brackney for your patience while we put this awesome case together for your use! And thanks to everyone at the April meeting who approved Dan Heim for Honorary PAS Membership.



DAN HEIM IS NOW AN HONORARY MEMBER OF PAS! PHOTO BY TERRI FINCH AT THE MAY 5, 2016, PAS MEETING.



THIS IS THE NEW PLAQUE ON THE GALACTIC GAVEL CASE. PHOTO BY TERRI.



THIS IS THE GALACTIC GAVEL IN ITS NEW CASE. CASE PROVIDED BY WILLIAM FINCH. PHOTO BY TERRI FINCH APRIL 2023.

MANY THANKS TO VICE PRESIDENT PAUL

By Richard Sauerbrun, Treasurer

Paul, I just wanted to take a minute to say "Thank You" for all your efforts arranging guest speakers for our lecture

series (Monthly PAS Meetings). Quality speakers are the lifeblood of this part of PAS's outreach program. You are the best!

By Stu Brackney, President

I totally agree with Richard, they really make our outreach efforts shine.

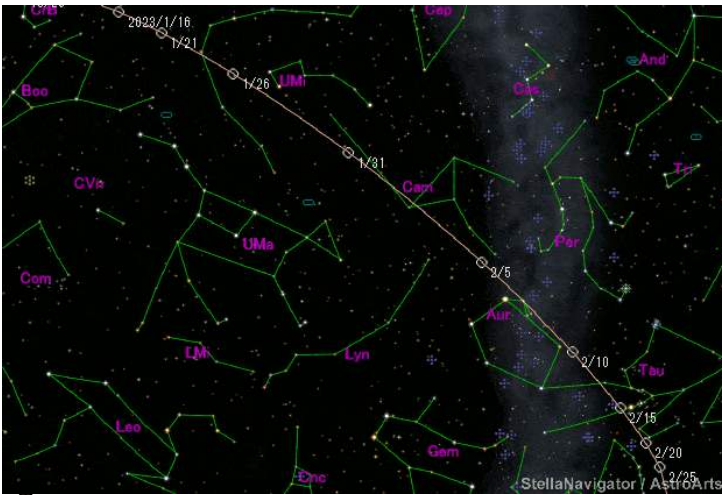
GREEN COMET C/2022 E3 (ZTF)

By Mark Rosen

I was up before 0400. I left the Stellina out all night covered up, so the temperature would be stabilized, saving

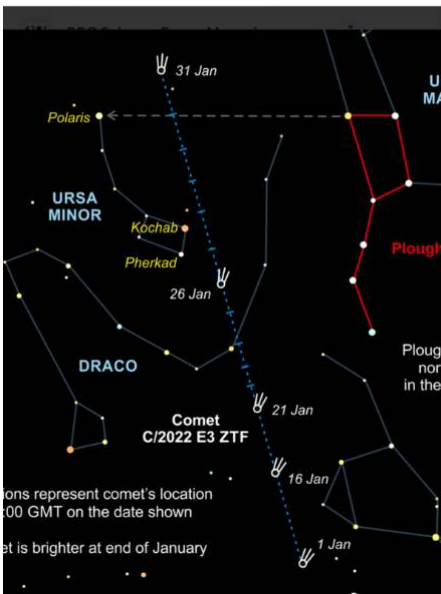
set-up time while still asleep. I live in a densely populated area but my views of Draco and Ursa Minor were perfect, away from Phoenix lights. By 0600 clouds

appeared. It has been rough in Phoenix so far this year....clear skies to all!



THIS STAR CHART SHOWS WHERE YOU WOULD HAVE BEEN ABLE TO SEE IT AS IT MOVED ACROSS THE NIGHT SKY BACK IN JANUARY 2023.

[google.com/search?clier](https://www.google.com/search?clier)



THIS IS THE GREEN COMET TRACKED ON THIS STAR CHART. IT WAS A FAST MOVING, BRIGHT COMET, AND THE GREEN COLOR WAS AMAZING TO SEE. THIS DATA WAS OBTAINED IN A GOOGLE SEARCH.



THIS MARVELOUS PHOTO OF THE GREEN COMET WHICH IS CALLED COMET ZTF IS TAKEN BY MARC ROSEN ON 1/26/2023 AT 0420 FROM PARADISE VALLEY, AZ, USING A STELLINA ELECTRONIC ASSISTED TELESCOPE, 150 JPEG IMAGES STACKED IN STELLINA OVER A 20 MINUTE OBSERVATION, WITH NOISE REDUCTION, SHARPENING, DEHAZE IN ADOBE LIGHTROOM. NO OTHER MODIFICATIONS.



THIS FANTASTIC IMAGE OF THE GREEN COMET WAS TAKEN BY CHRIS MAHAR FROM MORRISTOWN ON JANUARY 24TH USING A SVBONY 80MM ON AN EQ-6R MOUNT AND CANON SL2.

THANKS TO METEORITE MIKE FOR MAR 23

By Troy Marinelli, 6th Grade Science/SS Teacher

Hi Terri,

Yes, Mike was amazing as always! Thanks again and we appreciate you guys (Mike Marron, part of PAS Star Tours). Having your Telescope Team (Mike only)

at our event makes Science Night at Desert Sage Elementary a great experience for the students. I'll reach out next year again. Thanks!

MY FIRST MESSIER MARATHON AT NORTH HOVATTER ROAD

by Mike Cawley, PAS Member,
March 18, 2023

Charles Messier was tired of wasting time sorting through the various false positives he encountered during his comet searches. So he compiled a list of these objects, their positions and a sketch of each. Assisted by his friend Pierre Mechain, he prepared a catalog to serve as a reference guide to help fellow comet hunters avoid these objects. The first version of his catalog was published in 1774 and the last was published in 1781. During that seven years, the catalog grew from 45 objects to 103. We now know that there are galaxies, nebulae, and lots of star cluster entries in this catalog, making for a great variety of celestial targets. The final total in the Messier Marathon catalog is 110.

A few astronomers in the 1970's came up with the idea of trying to see all of these objects in a single night. It is possible, as it turns out, during a new moon in March. And you can actually nab a pretty good chunk of them anytime of the year, but for celestial observers March Madness means "time to get them all." Our latitude of 34 degrees gives a better chance of viewing than latitudes further north. The mild winters and low humidity certainly help too!

For years, the East Valley Astronomy Club and Saguaro Astronomy Clubs have sponsored a marathon at various locations around Phoenix. Lately, the March marathon has been held at the Salome Emergency Airstrip about 90 miles west of downtown Phoenix. Due to the airfield being now unavailable, an alternative site was chosen north of the I-10 freeway at the same Hovatter exit. About 2.5 miles north of the exit is a mining operation with a gravel road access. A large area with desert hardpan served as the base for the night. Signs posted by the clubs made it easy to find. The road is graded, so high clearance vehicles are not required. A nice perk at the site were the Porta-Potties which were ferried in for when Nature calls.

Arriving at the site, I found a good sampling of the various types of telescopes--Dob's, refractors, and a couple big SCT's--scattered around the area. There were lots of spots where a group could gather and other sites more cozy off to the side. A beautiful mix of desert vegetation helped define the various setup spots. The all important Porta-Potties

were about in the middle and were lighted with some red cones.

After unloading and setting up my scope, I enjoyed the final curtain of sundown and enjoyed a view of Mercury, Venus, Mars, Jupiter, and the Moon. I always love the anticipation of a great night of observing while the twilight slowly fades away revealing a sky far better than even my short trips to the outer parks and suburbs surrounding the Valley. An observer had arrived on Friday and used his SQM meter to get a gauge on how dark it was. I think that a 22.00 reading is the darkest for which you can hope. He reported readings of 21.6 after the moon had set. Looking around the horizon, I could see light domes from Phoenix to the east and two domes west and southwest (maybe a truckstop and Yuma?); the north and south vistas were free of any interference. Some of the Messier targets really needed a contrasting dark sky to make it easier to see them, especially the first few targets that were setting in the west.

I had prepared a list in Sky Safari with the order of objects determined by their setting times in the west. A printed list was available from Claude Haynes (our host for the evening from the East Valley club) that I used also. I figured, if my tablet ran out of power in the middle of the run, that the printed sheet would save the night! (Be sure to bring a pencil though!) I decided to use a medium-power eyepiece to give me a fairly wide field to help me find targets but also provide a close enough view so that I could verify acquisition of the object. My 1600mm focal length scope, combined with a 68 degree FOV 27mm eyepiece (60X magnification),

was used throughout the run. I couldn't resist swapping in a 12mm for a closer view of M13 and with a filter for M42, M17 and M8. Dark skies and filtration really help these targets POP visually! All of the objects on the list are, relatively speaking, fairly bright. Remember, Messier's scope of choice was a 4" refractor. Your main enemy is the thick atmosphere near the horizon and any haze. As bad luck would have it, the first six objects are galaxies! Their large, diffused ovals blend in with the murk and are really tough to see. I found three out of the six (I swear M33 was not in the sky that night!). After that? An enjoyable trip through a variety of objects--big, small, beautiful, ghostly, glittery, and just plain otherworldly (M17 with filtration). The key thing about the rest of the 104 objects? Your ability to find them. I was aided by my scope digital setting circles. I heard the distant whirring of robotic scopes throughout the night also. Some objects are near bright stars or at easy triangulation points from marker stars. I spent a fair amount of time "mowing the lawn" briefly to find an object.

The constellation Virgo created a real quandary. Going through the list of Messier galaxy targets and not getting



SETTING UP FOR THE MESSIER MARATHON.



HOVATTER RD EXIT. ALL 5 PHOTOS BY MIKE CAWLEY.

sidetracked was tough. Markarian's Chain contains two Messier targets, M84 and M86. What was surprising to me was how he could have overlooked a few extra. Just in the vicinity are six more! I panned around and picked up lots of wispy bits of fluff among the nearby stars. I will definitely have to revisit Virgo this spring outside the city.

If you are quick about finding objects, you will discover that some of the Messier objects have yet to rise in the east. You can take a nap for an hour or so to recharge. I decided to make the most of the dark sky to check out items that just look washed out or have features that are invisible with light pollution. A couple of springtime southern sky objects that always satisfy are Omega Centauri and Centaurus A. Omega was spectacular! Wandering over to the Hercules globular cluster (M13) and back to Omega proved how big Omega really is! Using higher power, I finally got a look at the dust lane separation in Centaurus A. With the dark sky it was an easy catch. I went back and

took another gander at M16. It is all but invisible from my backyard but was wonderful with filtration and dark skies! M16 is famous for the "pillars of creation" photo taken with the Hubble Telescope.

After my little side trip, it was back to hunting. This being the desert, what better place to see the Scorpion constellation? Many summer globular clusters were coming up and made for some interesting comparisons in terms of size, shape, and loosely or densely packed. By now, the Milky Way had risen along with the "the Teapot" asterism in Sagittarius. The Milky Way crosses over the spout of the teapot. From my dark vantage point, the intersection of them made it appear that the "steam" was coming out of the teapot! Again, this is impossible to see from my city location.

I finally reached the end of the list with just one target remaining. It was a race between the breaking dawn sky and M30, a small globular cluster in the constellation Capricornus. I discovered,

much to my chagrin, that my scope wouldn't swing low enough to see the horizon! So, I had to wait for M30 to rise high enough. I scanned around the brightening sky, to no avail. In the end, dawn won. I tallied up my list and packed away my equipment, telling myself "I'll be back" in my best Terminator impression.

For me, viewing a few Messier objects in an hour is like touring a single country. Spending the night with them all (or almost!) is like taking a world cruise. Everything is represented in glorious detail and contrast. Things that are only hinted at in the city are on full display out in the desert. The next time you hear about some club members making the trip out to dark skies, try to tag along; you will be thrilled!

Oh, I almost forgot. My final score? 105.



AND WE ARE SET FOR A FULL NIGHT OF DOING THE MESSIER MARATHON.



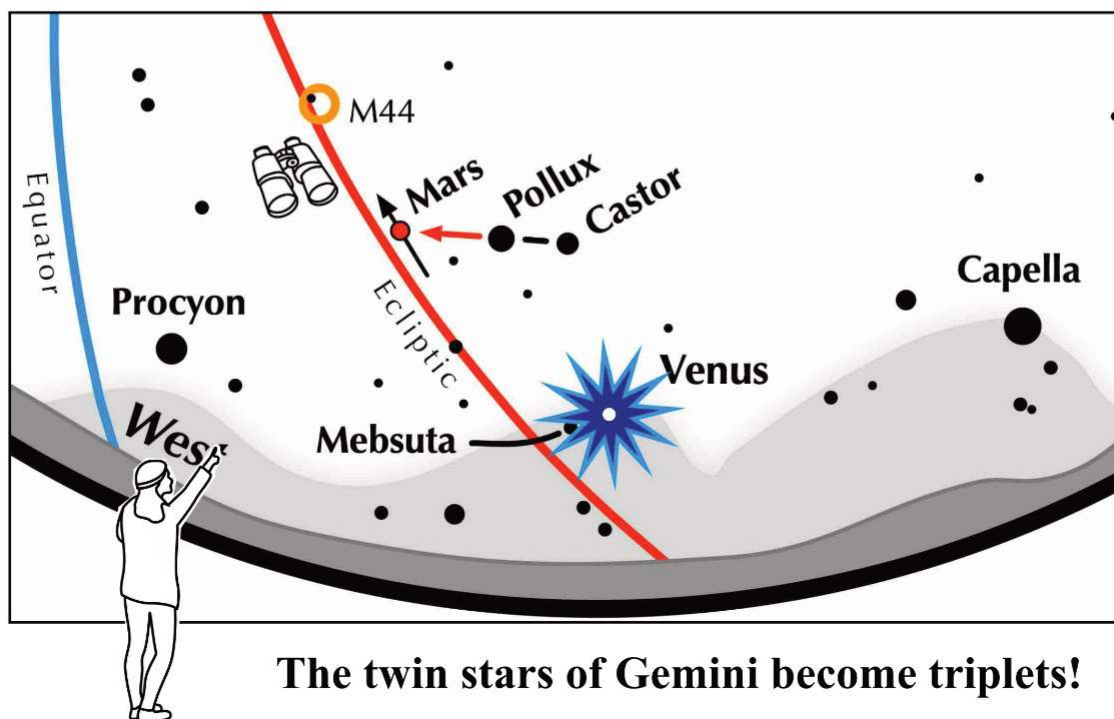
TELESCOPE, CAR... THERE'S NOTHING OUT HERE.



SEVERAL OTHER FOLKS JOIN THE SET UP BEFORE SUNDOWN.



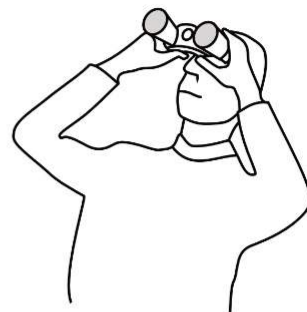
If you can see only one celestial event in the evening this May, see this one.



The twin stars of Gemini become triplets!

Beginning in the second week of May, look to the west-northwest 90 minutes after sunset.

- The twin stars of Gemini, Castor and Pollux, will be found forming a horizontal bar.
- Red Mars, sporting a brightness mid way between those two stars, rises nightly, eventually sliding directly to their left.
- On **May 16**, the three luminaries form a straight line, effectively creating another member of Gemini, the Triplets!
- Look at Venus, brilliantly shining below them. Can you see the moderately bright star Mebsuta in the glare of Venus? Binoculars will certainly help.
- The bright stars Procyon and Capella act like opposing bookends for the scene.
- Over next two weeks, watch Mars approach M44, the Beehive cluster, and Venus move near Castor and Pollux.



MUSEUM OF THE MOON AT DBG FEB 7 & 13

By Terri Finch, Event Manager

What is the Museum of the Moon? The Desert Botanical Garden (DBG) hosted this art display of a huge, internally lit, model of the Moon, suspended above a beanbag seating area. DBG patrons viewed the Moon while enjoying the sounds of a rocket blasting off, President Kennedy's speech about putting a man on the moon and then having that man return safely to Earth, and a little bit of music. This recording repeated about every 15 minutes during the event.

"Museum of the Moon is a touring artwork by UK artist Luke Jerram. Measuring seven meters [23 feet] in diameter, the moon features 120dpi detailed NASA imagery of the lunar surface. At an approximate scale of 1:500,000, each centimeter of the internally lit spherical sculpture represents 5 km [3 miles] of the moon's surface." More about this display can be found at

this link: <https://my-moon.org/>.

Feb 7 2023 Review: The Museum of the Moon display was set up at DBG's Sunset Plaza. The night began with sunset at 6:05pm, reaching total darkness by 7:35pm. Storm Moon and Jake Von Ruhr used Storm's 8" telescope, named Fancy, to show Venus, Jupiter and the E.T. open cluster to the patrons of DBG. This was a three hour event from 6pm to 9pm. Storm was set up in Scope Space 3 with her telescope, Fancy. Terri Finch (that's me) was in Scope Space 2 with her 8" telescope, named Doctor Who. I showed Venus until the Orion Nebula became visible and then I stayed on the Orion Nebula for the rest of the evening. Bruce Wurst set up his 12" telescope (I don't think his telescope has a name) and he showed Venus and Jupiter when the other two telescopes weren't on those

objects. The night from 6pm to 8pm flew by. Hundreds of patrons lined up at the three telescopes, non-stop. I didn't have time to find my beanie and I was very cold. Jake found my beanie and made me put it on. I was much more comfortable after that. Thank you, Jake! Jake attended as a helper at this event.

Around 8pm, the crowd began to thin. It really got cold when all those bodies warming the telescope team left the area. At 9pm, fifteen more patrons visited until the electric carts came to pick us up.

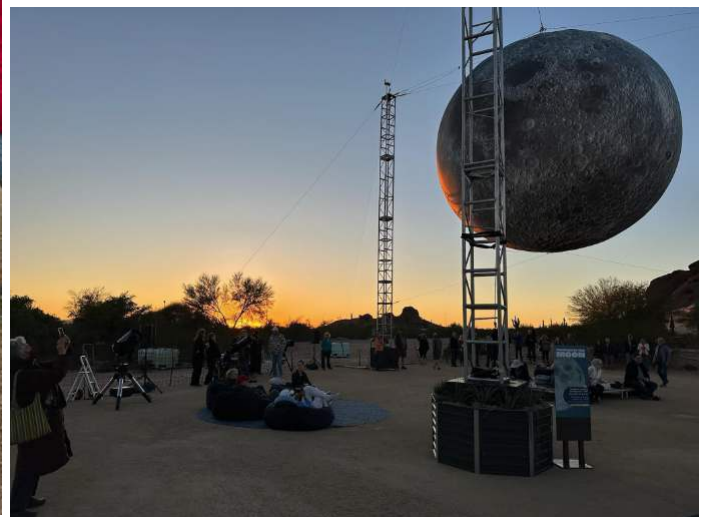
This was a super fun event. It happened so quickly. The Moon on display was lit from the inside, but wasn't so bright that it interfered with the telescopes showing objects away from the Moon. This event was a big success. We



IN THIS IMAGE SUBMITTED BY TED BLANK AT THE FEB 13TH EVENT, YOU SEE TWO OF THE SUPPORT POLES HOLDING UP THIS HUGE MOON. THE ANGLE OF THIS PHOTO IS SPECTACULAR AS THE TELESCOPE POINTS RIGHT AT THE MOON. VERY CREATIVE.



MUSEUM OF THE MOON: THIS IMAGE HAS THE HUGE MOON AND ONE OF THE THREE SUPPORTING POLES HOLDING THE MOON AFLOAT ABOVE THE PEOPLE. THIS WAS TAKEN BY STORM MOON AT THE FEB 7TH EVENT.



TO THE LEFT OF THIS PHOTO, YOU SEE THE STAR TOURS TEAM TELESCOPES SET UP TO SHOW THE ATTENDEES SEVERAL OBJECTS AWAY FROM WHERE THE MOON IS LOCATED. THIS PHOTO BY BRUCE WURST AT FEB 7TH EVENT.

got so many comments and thank you's from the patrons for our attendance. About half of the attendees mentioned that they only came to see through the telescopes because PAS was there. Many of the attendees mentioned they would be back again with their family members when PAS was scheduled to be there again on Monday, Feb 13th, or Tuesday, Feb 14th. It was a very successful and fun event! Many thanks to Amber and Marcia for having PAS at this event!

Feb 13th was an interesting evening. The Team attending was Bruce Wurst with 12" SCT telescope, Mason Klenklen with 11" SCT telescope, and Ted Blank with his 12" Dob and the help of his wife, Peggy. The evening went smoothly. The February 7th team warned the Feb 13th

team of the flood of non-stop people from the start of the event until at least 8pm.

Shortly after the start of the event, Mason texted me with "We got some weather up North that we didn't expect. We'll see what we can see." I was at home monitoring the weather from there and making sure my team was picked up by the electric carts so they could set up and start on time. I also saw the storm clouds to the North in my weather apps.

As the night came to a close, I had sent a text to the team to make sure everyone had gotten back to their vehicles and home safely. I was out running errands by then. When I got home, I took a moment to look through the

photos that my team had sent me.

I wrote back, "Here's something interesting. Last Tuesday, Feb 7th, people were at DBG wearing shorts and jackets." Between Feb 7th and Feb 13th, the temperatures had dropped dramatically, getting much colder. The Feb 14th event got canceled because of the forecasted 40 mph gusts of wind.

I wish to thank everyone involved in this event from DBG as well as my Telescope Team. It's really awesome to have such a successful event go so smoothly. Looking forward to more events at DBG!



JUST BELOW THE MOON, IN THIS IMAGE, TED BLANK'S WIFE PEGGY LOOKS UP AT THE HUGE MOON ABOVE HER. PHOTO PROVIDED BY TED BLANK FROM FEB 13TH EVENT. TED WAS ONE OF THE TELESCOPE TEAM MEMBERS AT THIS EVENT. HIS WIFE CAME AS A HELPER.



AS THE SUN SETS, THE GLOW OF THE SUNSET CASTS UP ON THE MOON'S SURFACE. VERY SPECTACULAR! PHOTO BY TED BLANK AT THE FEB 13TH EVENT. BOTH EVENINGS PAS WAS INVOLVED IN THIS EVENT HAD A CONTINUOUS CROWD OF PEOPLE ENJOYING THE DISPLAY.



I GRABBED A PHOTO OF THE SETTING SUN WITH MY TELESCOPE ON THE LEFT, THEN STORM HAD HER TELESCOPE AND JAKE WAS STANDING NEAR BY (BOTH WITH MASKS). THIS PHOTO WAS TAKEN BY ME, TERRI, ON FEB 7, 2023. WE WERE WAITING FOR THE SUN TO SET AND THE NORTH STAR TO POP OUT, BUT WE DIDN'T KNOW THE HUGE MOON WAS IN THE WAY OF THE NORTH STAR, WHICH WE NEEDED FOR ALIGNMENT.

TELESCOPE WORKSHOP MAR 9

By Debbie Stout

I want to pass on a thank you to you Terri for organizing the telescope

workshop. I would also like to say thanks to Stu for the poster and tips and thank you to Richard for so patiently helping me

with my telescope.

MUSEUM OF THE MOON PHOTOS



MUSEUM OF THE MOON WAS A VERY INTRIGUING DISPLAY AT THE DESERT BOTANICAL GARDEN. THIS IS THE ENTRANCE TO THE SUNSET PLAZA AND FROM THE ENTRANCE, WE CAN SEE THE MOON FOR THIS DISPLAY. PHOTO BY TERRI



MY TELESCOPE, DOCTOR WHO, POSED FOR THIS PHOTO WITH THE MOON IN THE BACKGROUND AT THE FEB 7TH EVENT. IN THE FOUR HOURS WE WERE THERE, THE AREA OF THIS EVENT WAS PACKED WITH PEOPLE FROM START TO FINISH. PHOTO BY TERRI FINCH.



BEAN BAG CHAIRS WERE PLACED ON PALETTES AT VARIOUS LOCATIONS AROUND THE DISPLAY AREA SO THAT PEOPLE COULD SIT ON THEM TO REALLY GET A CLOSE UP VIEW OF THE MOON AND IT'S CRATERS, ENJOY THE MUSIC, STORY WITHIN THE MUSIC, SOUNDS FROM THE BLAST OFF FROM EARTH TO THE MOON, AND THEN THE RETURN HOME FROM THE MOON TO EARTH. THIS PHOTO TAKEN BY MASON KLENKLEN AT THE FEB 13TH EVENT. MASON WAS ONE OF THE TELESCOPES TEAM MEMBERS AT THIS EVENT.



THAT'S THE BIGGEST MOON EVER! LOOK AT THE THREE SUPPORT POLES! THIS EXCITING PHOTO WAS PROVIDED BY TED BLANK AT THE FEB 13TH EVENT .



MASON CAUGHT THIS AMAZING PHOTO THAT LOOKS LIKE THERE'S A LADDER GOING FROM THE SURFACE OF EARTH TO THE MOON! LET'S ALL CLIMB IT AND VISIT THE MOON! PHOTO TAKEN ON FEB 13TH.

HERE WE HAVE MASON KLENKLEN, HIS TELESCOPES, AND THE HUGE MUSEUM OF THE MOON - MOON BEHIND HIM. SELFIE TAKEN BY MASON AT THE FEB 13TH EVENT.

ARIZONA SCIENCE CENTER PUBLIC STAR PARTY MAR 24

By Terri Finch, Event Manager

Astronomy Week (March 20 to 26) offered a whole lot of activities and fun for all ages at the Arizona Science Center. My schedule was too busy to be involved in the daytime activities but March 24th, ASC held a public star party. At this event PAS had Mike Marron with his collection of meteorites, Joe Sandy brought his cute little telescope and showed a few objects, and Stu Brackney brought his 8" scope. William and Terri Finch were doing star charts, stickers, tattoos, and playing Q&A with the kids to give them prizes. Before we left, I was out of prizes. I'd estimate we saw about 300 guests at this event.

So, how was it set up? Evelyn Madden was in charge of the ASC set up. She had Mike and my table next to a table that was demoing Braille on photographs.

That was very intriguing. Next to that table was a physics set up where two ASC Blue Team personnel were demoing how one object can be heavier than another but be smaller in size. They had a very good demo going with "What would happen if..." questions.

Then, down the right side to the Maker Space building they had about eight other tables set up with more demos. One of those tables handed out paper planispheres, so everyone could take one home and enjoy it. They also had music set up and another table down the left side.

In the center of Heritage Square was Joe and Stu with their scopes, with some tables set up with six ASC owned Astroscans. There was a refractor, an 8" Dob, and I believe one other telescope

belonging to ASC. Evelyn came over to our table a few times to ask which eyepiece to use to show Venus, or the Moon. She came to our table because the eyepiece box was hanging out on the table next to our table, so it was convenient for her to ask us, rather than Joe or Stu, what to use in the way of eyepieces in the 8" Dob.

This was a very fun event. I enjoyed it last time I did it in Oct 2022. For Oct 2023, Evelyn wishes to do another week long Astronomy event at ASC that will include the Saturday morning Oct 14 Solar Eclipse. Be on the lookout for that event on the PAS calendar. It will be in Heritage square from 8am to 11am as a public event. Check the PASaz.org calendar for updates.

SATELLITE SURPRISE

by Alex Vrenios

I took Maggie (the dog) out back a little after 8 pm. When I looked up at the stars near Sirius and Procyon, I noticed that one of them was moving slowly and silently across the sky. After a short while I noticed a second one right behind it, then a third, and a fourth, all in a line, heading

northeast! I've seen loads of satellites over the years. It's always a pleasure to watch them pass overhead, but I'd never seen four in a row before.

Inside now, I started Starry Night planetarium software to confirm my sightings. I set the time and hit RUN. There were my four, and a few more, and

even more. There were over a dozen, all labeled STARLINK-xxxx, where xxxx is a seemingly random 4-digit number. Their angle with the Sun probably prevented me from seeing them all.

Woe be unto the dedicated widefield astro photographer, for Elon Musk has really done it this time...

STORY TIME

THE STAR PARTY



ALEX VRENIOS PH.D. AUTHOR

by Alex Vrenios, PhD, PAS Lifetime Member

We headed home after my birthday party. I am 8 years old now, so Mom let me ride “shotgun” up front, instead of strapping me in a car seat in the back. On the way, a drunk driver ran a red light and slammed into the passenger side door – my door. The car was totaled. Mom was okay, but my legs were pinned between the car door and the center console, crushed beyond repair.

The doctors all said I was lucky to be alive; I’m not so sure.

A year or so later, Mom was driving a little too fast and we got pulled over. I was belted in the back seat, but I could hear the cop say to the dispatcher, “It’s a woman and a wheelchair. Looks to be her son, maybe ten years old.”

Is that what people think I am, a wheelchair? “I’ve got a name, you jerk!”

I get driven to school every day and rolled into my classroom to face the stares of all those awful kids. They run and play and shout with glee at the fun they’re having at recess, while all I can do is watch. The teachers even put me back a year because of all the time I’d lost having operations, physical therapy, and just healing.

You think I’m mad? You bet I am.

At my age, artificial legs are too expensive, they said. I would just outgrow them and have to get refitted every few years; no refunds, and no trade-in

allowances. Once I’m eighteen, I can get an adult pair which should last a long time. Until then, I’m stuck in this wheelchair.

All the other kids in school hate me. They even “accidentally” kick my chair in the hall. When I get my prosthetic legs, I’ll show them what a double amputee can do...

Mom thought my day-to-day life needed more variety. She started taking me to museums, the zoo, and to some local sporting events. Half of these places didn’t accommodate wheelchairs. No ramps and no elevators, just long flights of stairs.

One day she brought home a flier from the grocery store, announcing a Star Party. I immediately had visions of meeting Harrison Ford, Denzel Washington, Sandra Bullock, and a host of others. This is one event I really want to see!

We drove up to what appeared to be a local park, not where one might expect to meet Indiana Jones. She parked the car. We got out and I got strapped back into that stupid wheelchair. She pushed me down a walkway for a while to find a large group of people lining up to see the night sky, through any one of a dozen telescopes. Star Party - how clever.

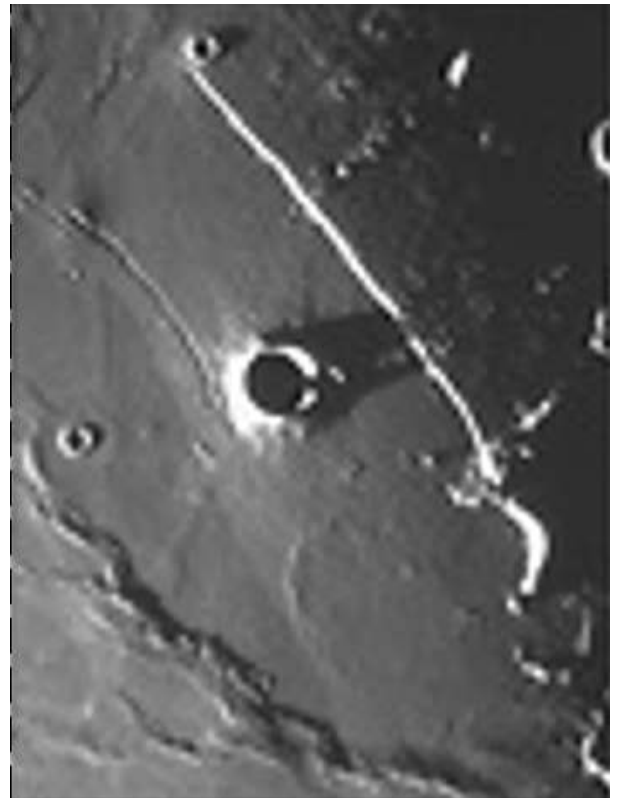
The big Newtonians, as they were called, had their eyepieces too high for me to see through. The straight-through Cassegrain and refractor telescopes offered me only a limited field of view of the sky. There was one setup that did hold some promise for me: a pair of high-powered binoculars, fitted into a cradle that was mounted on a double swing-arm. It was attached to the back of this guy’s camping chair and he saw no reason why it couldn’t be mounted

on a wheelchair. It took only a couple of minutes for him to set it up and adjust it to my height.

Now I could position my chair to see almost any part of the sky. “Wow! Oh Mom, the rings of Saturn.” Next was the Moon. Just over half full, he pointed out the Straight Wall, also called the Sword of Damocles. (It really does look like a sword!) Next, we saw Jupiter, its bands, the Great Red Spot, and three of its many moons. When a fourth moon came into view from behind the planet, the whole night sky suddenly came alive for me; this wasn’t a photo in some coffee table book, this was the real thing!

As we drove home, I realized, and I think Mom did too, that I was smiling – broadly. What a wonderful night this was. When we got home and she put me to bed, I fell asleep immediately. I felt happy, probably for the first time since I could remember...

Months later, on Christmas morning, I opened the largest package first. I ripped off the wrapping paper and shrieked with delight at what I saw. All I could say through my tears was, “Oh, Mom!”

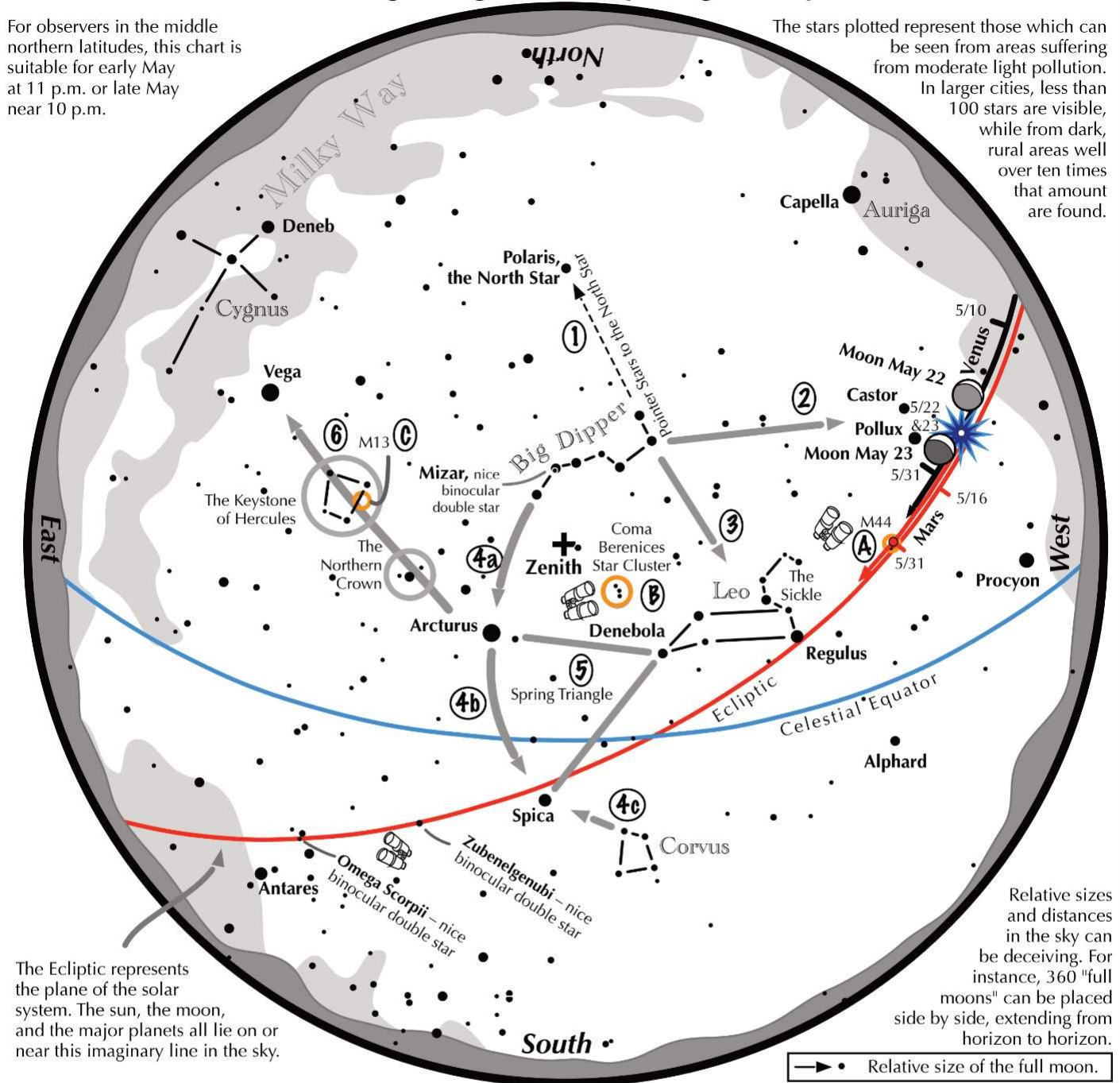


The Sword of Damocles (NASA).

Navigating the May Night Sky

For observers in the middle northern latitudes, this chart is suitable for early May at 11 p.m. or late May near 10 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.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

—•• Relative size of the full moon.

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.





Observing Flat Galaxies

*Eerily fascinating are **Flat Galaxies** with their Cheshire Cat-like qualities of long, thin wisps suspended in the depths of space: Now you see them, now you don't.*



The Silver Needle Galaxy

NGC 4244 (Caldwell 26), lying 14 million light-years distant, is a prime example of a Flat Galaxy, one that is not on the minds of many observers.

Navigate to NGC 4244:

1. Find Cor Caroli (Alpha Canum Venaticorum). It is the moderately bright star 1/3 between Zeta Ursae Majoris and Denebola.
2. Locate Beta CVn to the northwest.
3. Make a right triangle so that one leg is from Alpha to Beta and the other is of the same length but extends to the southwest.
4. It ends near the Silver Needle, NGC 4244.
5. Insert a low power, wide field eyepiece and slowly scan the area.

Recommended Aperture:

Not less than 8 inches. The larger, the better.

Dark skies are a must!

Published Characteristics:

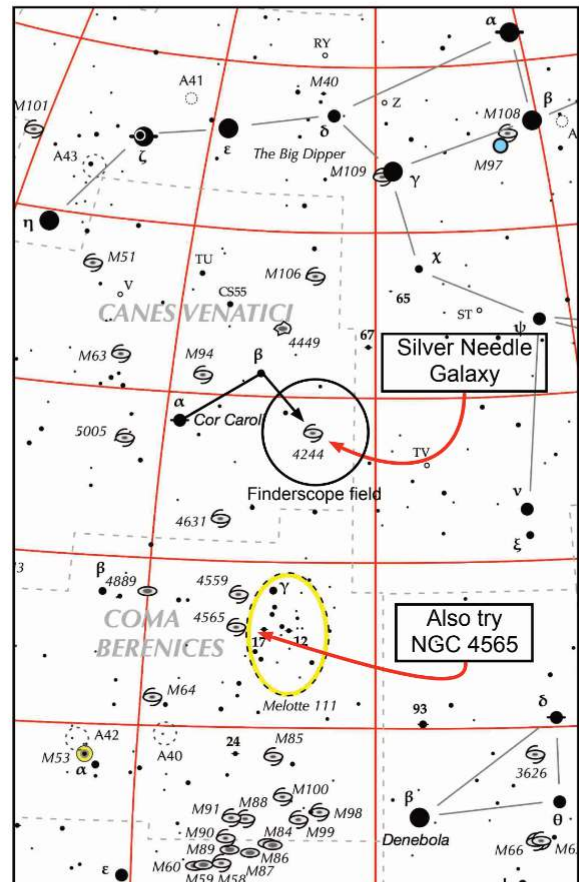
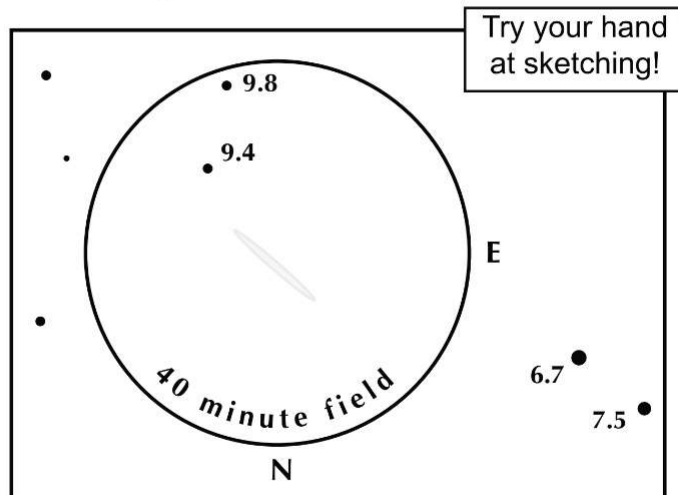
Integrated magnitude: 10.2

Size: 17.0 min x 2.2 min

Surface brightness: 14.2 mag./min², 23.2 mag./sec²

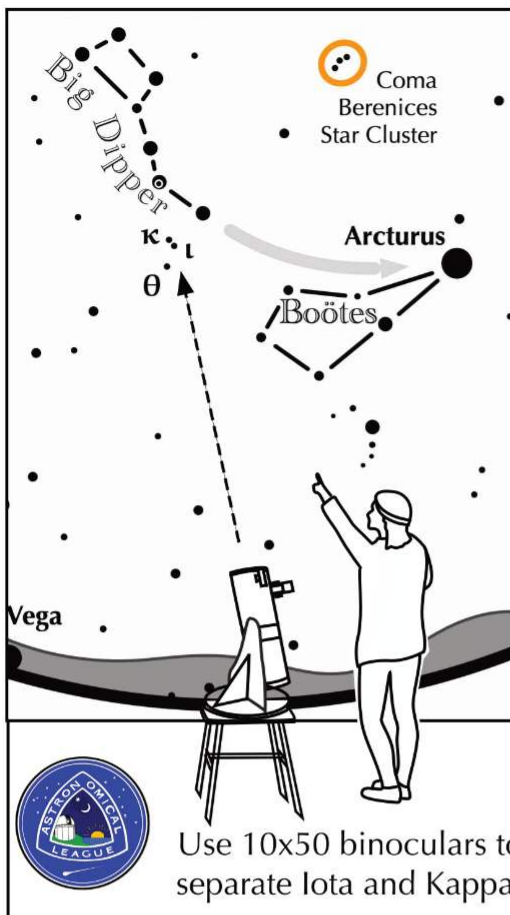
Axis ratio: 7.7

Position Angle: 47°



Eyepiece Impressions:

- 10 inch, f/10, 100x: "SW-NE smudge about 10' x 2'. Center is slightly brighter. Low surface brightness." JG
- 12 inch, f/10, 113x: "Incredible galaxy; most extremely long and narrow; covers more than half a field; moderately bright; brighter small elongated nucleus; faint field star at NE tip." CA
- 13 inch, 70 & 130x: "Long and skinny. Slight bulge. Nice object to observe." AL
- 20 inch, 73 & 313x: "Very easy to see! Can actually measure the PA better when you can see the galaxy! PA: 45-50°. 18' long so it extends some distance." AL



Other Suns: Iota & Kappa Boötis

How to find Iota & Kappa Boötis on a May evening

Look northeast toward the Big Dipper. Follow the curve of the handle until it intersects the bright star Arcturus. The other leg extends 2/3 that length from the end star towards the northeastern horizon. It first intersects Iota and Kappa, then Theta.

Iota Boötis

A-B separation: 39 sec

A magnitude: 4.8

B magnitude: 7.4

Position Angle: 32°

A & B colors: white

Kappa Boötis

A-B separation: 13 sec

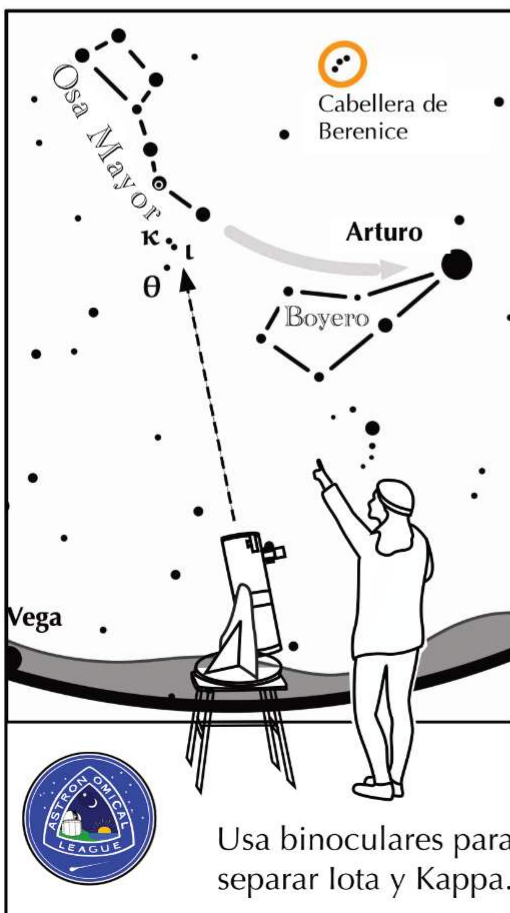
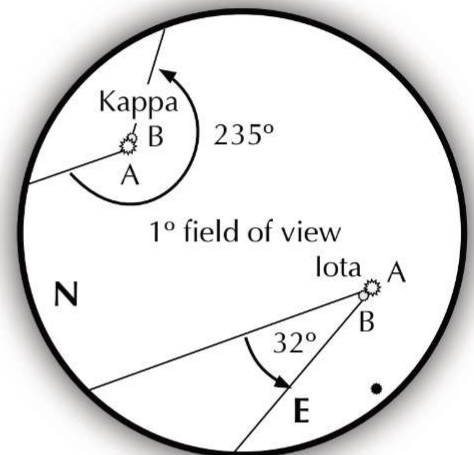
A magnitude: 4.5

B magnitude: 6.6

Position Angle: 235°

A & B colors: white

Suggested magnification: $>30\times$
Suggested aperture: >2 inches



Otros Soles: Iota & Kappa Boyero

Cómo encontrar a Iota y Kappa en una tarde de mayo

Mire hacia Noreste hacia la Osa Mayor. Siga la curva del mango hasta que interseccione con la Estrella brillante Arturo. De la estrella final de Osa Mayor dirija su mirada al Horizonte Noroeste, esta línea pasa por las estrellas Iota, Kappa y Theta Boyero.

Iota Boyero

A-B separación: 39 sec

A magnitud: 4.8

B magnitud: 7.4

PA: 32°

A & B color: blanca

Kappa Boyero

A-B separación: 13 sec

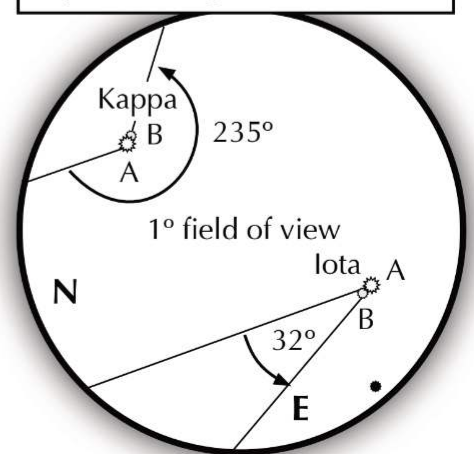
A magnitud: 4.5

B magnitud: 6.6

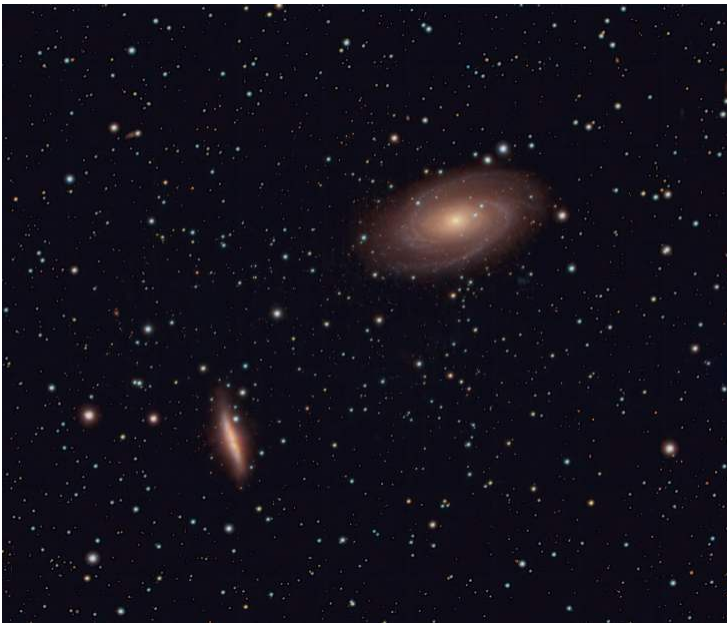
PA: 235°

A & B colores: blanca

Ampliación sugerida: $>30\times$,
Apertura sugerida: >50 mm



ASTROPHOTOGRAPHY BY PAS MEMBERS



M81 AND M82, TAKEN APRIL 9 WITH A RADIAN 75 APO
BY MARK JOHNSTON.



CAT'S EYE NEBULA (NGC 6543) TAKEN APRIL 9 WITH CELESTRON C8
AT F/6.3 BY MARK SAVAN, PAS MEMBER.



COMET ZTF (GREEN COMET) TAKEN FEBRUARY 8 WITH STELLARVUE
SVX130T, CAPTURED BY MARK SAVAN.



THE SUN, TAKEN MARCH 23 WITH A LUNT 100MT BY MARK
JOHNSTON.



THE MOON, TAKEN MARCH 28 WITH A TEC160FL APO BY MARK
JOHNSTON, PAS MEMBER.