



PAStimes

Phoenix Astronomical Society

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PHOENIX ASTRONOMICAL SOCIETY — ESTABLISHED 1948

Virtual PAS Meeting with Dr. David Williams Dec 3

Titan: The Past and Future Exploration of Saturn's Largest Moon

Titan, Saturn's largest moon, is about the size of the planet Mercury. It was briefly studied by the NASA Voyager flybys in the early 1980's, and was quite thoroughly studied by NASA's Cassini orbiter between 2004 and 2017. Titan is a remarkably Earth-like world in terms of its surface geology, with streams, rivers, lakes, and oceans (albeit of liquid hydrocarbon), as well as mountains, dunes, craters, and possibly volcanoes. A global subsurface ocean places Titan in that grouping of 'Ocean Worlds', and it will be explored in the 2030's by NASA's new octocopter drone called Dragonfly. Dr. David Williams from Arizona State University's School of Earth and Space Exploration will discuss what we've learned about Titan from Cassini and what we hope to learn about Titan from the Dragonfly mission.

Dr. David A. Williams is a Research

Professor in the School of Earth and Space Exploration at Arizona State University, Tempe, Arizona. Dr. Williams is the Director of the Ronald Greeley Center for Planetary Studies, the NASA Regional Planetary Information Facility at ASU. He is also the Director of the NASA Planetary Aeolian Laboratory, which administers wind tunnels at the Ames Research Center in California. David is currently performing research in volcanology and planetary geology, with a focus on planetary mapping, geochemical, and remote sensing studies. His current research focuses on planetary geologic mapping of bodies across the Solar System, and computer modeling of the physical and geochemical evolution of lava flows in a variety of planetary environments. He was involved with NASA's Magellan Mission to Venus, Galileo Mission to Jupiter, Dawn Mission to asteroid Vesta and dwarf planet Ceres, and ESA's Mars



This photo was provided by our Wonderful December Guest Speaker: David Williams.

See December 3rd Meeting on page 8.

November 5th PAS Meeting

By Terri Finch, Event Manager

I must thank a few attendees of this meeting before I proceed with the review. Many thanks to Stu Brackney, the PAS Host for being the Zoom meeting host for this evening. Stu used his pro version of Zoom to provide the meeting. Many thanks to Stu.

I wish to also thank everyone who attended the meeting. There were 17 in attendance: 14 were PAS Members and 3 were Guests.

I also want to thank Enzo, the marvel-

ous guest speaker, for his patience while we got him connected to Zoom. Somehow, it wasn't a smooth process. Enzo is a Research Associate at Arizona State University and had a very captive audience at this meeting.

The meeting room opened at 7pm. Many PAS Members were already in the meeting. Stu muted everyone at 7:30pm and then gave the floor to President Mike. Mike opened the meeting with some super short greetings and Enzo took the floor about 7:45pm (would have been earlier



Enzo was a marvelous guest speaker at the Nov 5th PAS Meeting. Photo provided by Enzo.

See November 5th Meeting on page 9.

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Photo Quality in the Newsletter

By Terri Finch

I wish to apologize for the photos taken from TV and Computer screens. PAS tries to provide clear, wonderful photos for your enjoyment in the Newsletter, but since meetings are currently all done virtually through the internet, the quality of the photos Don and I have captured to share and show that we held a meeting, have been

poor and I want to apologize for this. It can't be helped at this time. I feel it is better to provide a photo of lesser quality while we are dealing with the pandemic, than not to have a photo available.

When we do get back to In-Person meetings, I will love to put the photos in the newsletter that are clear, easy to see and fun

to enjoy. But for now, my apologies for the lack of quality photos in order to provide photos that show the things we need to show in the photos to our readers. Thanks also to everyone who provides photos for the Newsletter, no matter what the source or quality, and thanks to everyone for being understanding.

Sky Charts For This Month

By Terri Finch, Event Manager

A new section of the website has been created in which PAS hopes to update each month with that month's Star Chart from various sources. The link to get to that part of the website can be found under "Observing" and then "Sky Charts For This Month"

or use this direct link:
<https://www.pasaz.org/observing/sky-charts-for-this-month>.

The plan is to update the charts in this section as they become available so that everyone can enjoy a view of the night sky

with a map to help you find what you are seeking.

Thanks to Pete Turner, the PAS Webmaster, we are able to provide these wonderful star charts for everyone to use. Enjoy!

What's Up For December?

By Don K. Boyd, PAStimes Editor

Name	Date	Rise	Set
Mercury	12-15-20	7:20	17:06
Venus	12-15-20	05:32	15:52
Mars	12-15-20	13:40	02:34
Jupiter	12-15-20	09:50	19:58
Saturn	12-15-20	09:58	20:02
Uranus	12-15-19	14:29	03:49
Neptune	12-15-20	12:20	23:52
Pluto	11-15-20	09:33	19:31

All Times Arizona Time

Bold means the object is "visible" in the evening

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December 15, 2020

Sunrise: 7:25

Sunset: 17:22

Q3: December 7

New: December 14

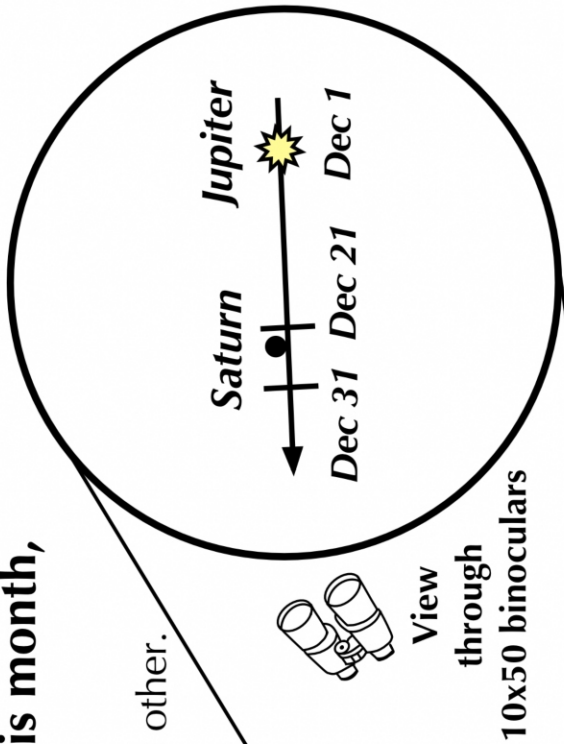
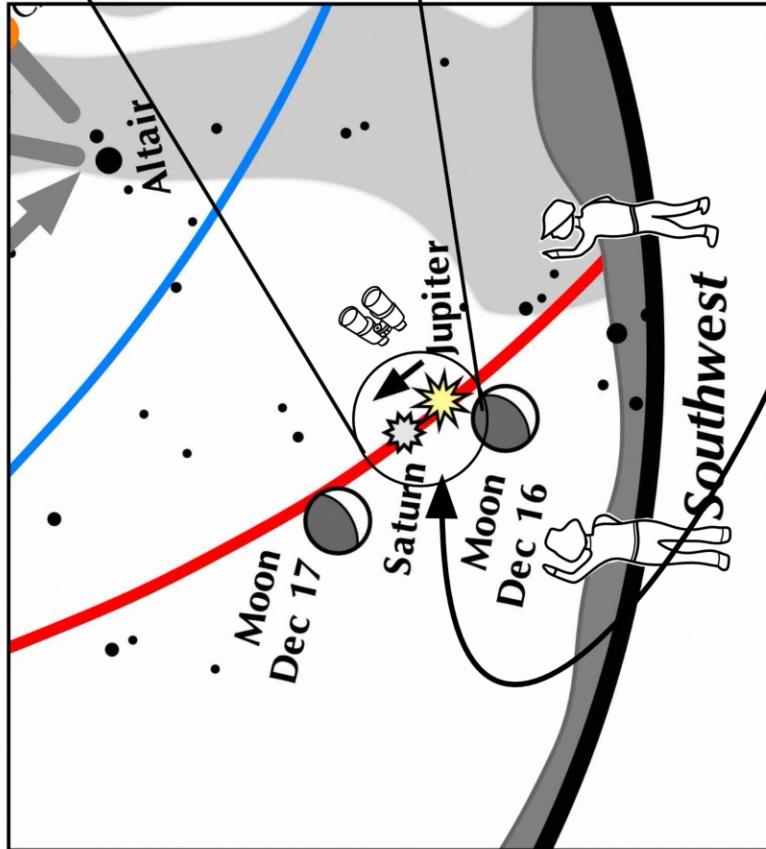
Q1: December 21

Full: December 29



If you can observe only one celestial event this month, consider this one:

Once every 19 3/4 years, Jupiter and Saturn approach each other. This will be their closest in 397 years!



Jupiter approaches Saturn

Look to the southwest 60 minutes after sunset throughout December.

Low in the southwest shine Jupiter and Saturn, the solar system's two largest planets.

Over the next three weeks, Jupiter and Saturn approach each other as they both sink towards the set sun.

Hold up your index finger on your fully outstretched arm. Its angular width is about 2°. As the nights pass, the two planets approach each other within a fraction of an angle.

On December 21, the planets appear to merge into a single bright object. Binoculars will separate them. A telescope will show them in the same field!

Southwest 60 minutes after sunset

Angular width of index finger on an outstretched arm = 2° (1 st-width = 10°)



Date	Separation Degrees	Index Fingers
Nov 30	2 16'	1.1
Dec 5	1 44'	0.9
Dec 10	1 12'	0.6
Dec 15	0 39'	0.3
Dec 21	0 06'	0.0



PAS Occultation Timing Event of Asteroid (441) Bathilde Nov 10th

By Sam Insana, PAS Member
& PAS Past President

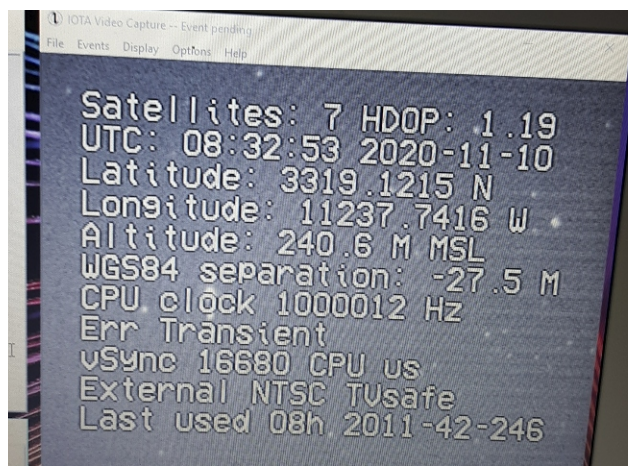
Don Boyd, Paul Facuna, and Sam Insana attempted another occultation timing event in the early morning hours on Tuesday November 10, 2020. Pete Turner was interested in learning how to do this, so he attended also. We met at midnight on Monday November 9th at Robbins Butte Wildlife Viewing Area about 7 miles south of I 10 Fwy and .3 miles west of Hwy 85. This was next to the Gila River. We had Bortle 4.3 dark skies and a clear view to the West where the occultation was to occur in the constellation Aries. It was 39 degrees at midnight when we set up and 37 degrees when we packed up at 2:30 am. It was very cold, and so we had to go inside our cars and turn on the heat for a few minutes to thaw out. We were about 10 miles south of the predicted center line.

At 12:57 am I tried to spot the first prepoint star but my binoculars fogged up from warm air leaking out of my face mask. Pete helped out by shining the 5-inch refractor laser beam to where I was pointing my laser beam, but I do not think I was pointing at the correct star. There was one last chance for success by finding a second prepoint star in Aries near the star Sheratan. This time I removed my mask for a minute to avoid fogging up the lenses. I found the star and pointed my laser and Pete pointed the refractor perfectly. We held the refractor in place at 1:46 am and then let the night sky drift so we could hopefully hit the target star at 2:16 am. I had trouble locking the refractor in place so Don suggested loosening the screw on the telescope and then retightening it. That did the trick and we were locked in place. Then we all watched the laptop screen to see the prepoint star drift. Paul pointed out it wasn't drifting perfectly horizontally, so we made an adjustment to the video camera orientation until the stars drifted perfectly horizontal. We then waited until the 2:16 am time of the expected event where the asteroid (441) Bathilde was supposed to occult the target star. At 2:16:22 the star dimmed for about 2 seconds showing that the asteroid was occulting the star! It was predicted to last longer, but this usually means the asteroid shifted its path. In fact, there was a hit in Payson where PAS member Ted Blank set up a station, which was north of any predicted path, so this shows there probably

was a slight change of trajectory to the north.

There were a total of 12 stations to do this event, however, one person didn't succeed because of cloud interference. I had done a weather check with eight different forecasts, six of which predicted we should have clear skies at occultation time but that clouds would be moving in an hour later. Two forecasts suggested the clouds would come in early and ruin the occultation timing. We were fortunate that it was clear and the clouds did not appear until about an hour later.

Pete said he wanted to do another event to learn even more, and hopefully he will do many more in the future with his own new refractor telescope and some timing equipment from Ted Blank. The photograph shows Paul, Pete, and Don next to all the equipment moments after the successful occultation. Don also photographed a screen showing our altitude, latitude and longitude, all vital information when combined with data from



This is a photo of the information generated by the GPS unit that gives an accurate location for this observation. We also put this chart at the end of the video recording of the event.

Photo by Don.



Photo of Paul, Pete and Don standing by equipment used to detect occultation of (441) Bathilde at 2:16 am. Photo by Sam Insana.



Light curve for the Bathilde 10 Nov 2020 occultation for a location south of I-10 west of SR 85. Our time of occultation was 2.116 seconds. Chart provided by Ted Blank.

the other stations, in calculating the size, shape, rotation, trajectory, etc. of the asteroid.

While Pete, Sam, Don and Paul were at one location, Ted Blank, PAS Member, was at another location doing the same Occultation Timing.

Ted writes: As of Nov 10th, there are now 8 reported positives: this one, at least 2 for me, and 5 others who reported.

Take a look at the light curve chart for the Bathilde 10 Nov 2020 occultation for a location near Payson. The elapsed time of the occultation at this location was 4.14 seconds. Equipment used was an Orion ST120 refractor and a Night Eagle Astro video camera. Timing was provided by an IOTA Video Time Interferer (VTI). The blue curve to the left and right of the central event represents the combined light of the star and the closely approaching asteroid. The lower curve in the center represents the light reflected from the asteroid only, since the star is being occulted behind the asteroid during that interval. For typical small, faint asteroids, the light curve in the center commonly goes to zero but in this case the asteroid was big and bright enough that it was slightly less than half as bright as the star it was occulting. As a result, the asteroid remained faintly visible during the occultation.

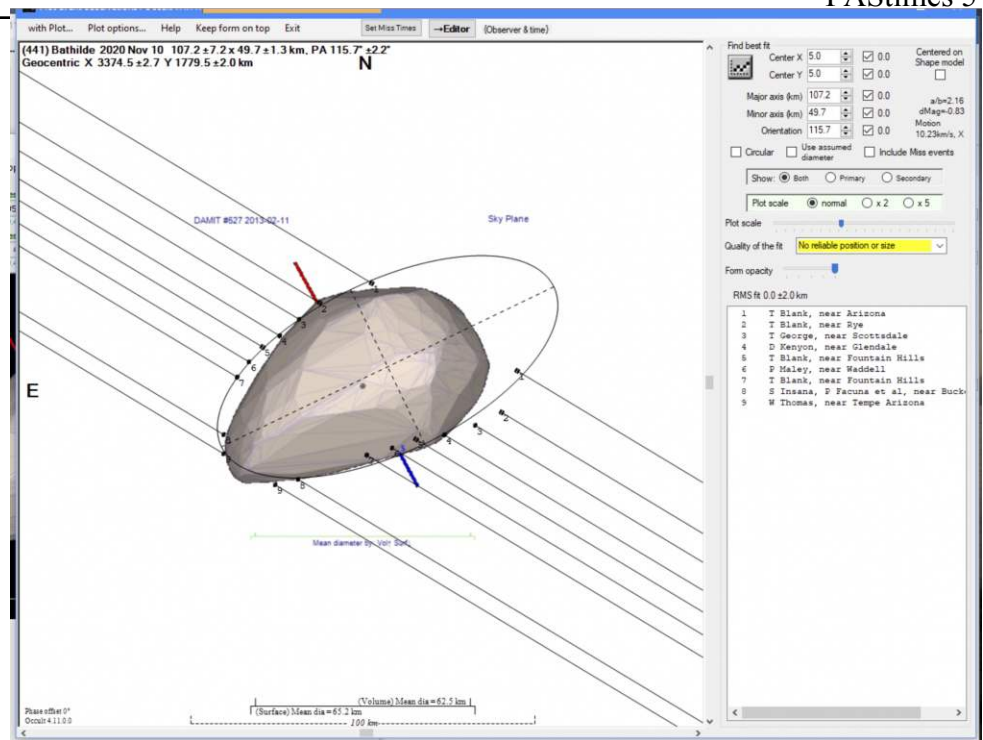
Each observer who is farther north or south from another observer records the star going behind a different part of the asteroid. See picture below. This asteroid was 764 km in diameter (in the n-s direction). So its shadow was the same size here on earth. That means we would have had to cover almost 500 miles of road to get it all. We came close.

Trivia: Moon Facts

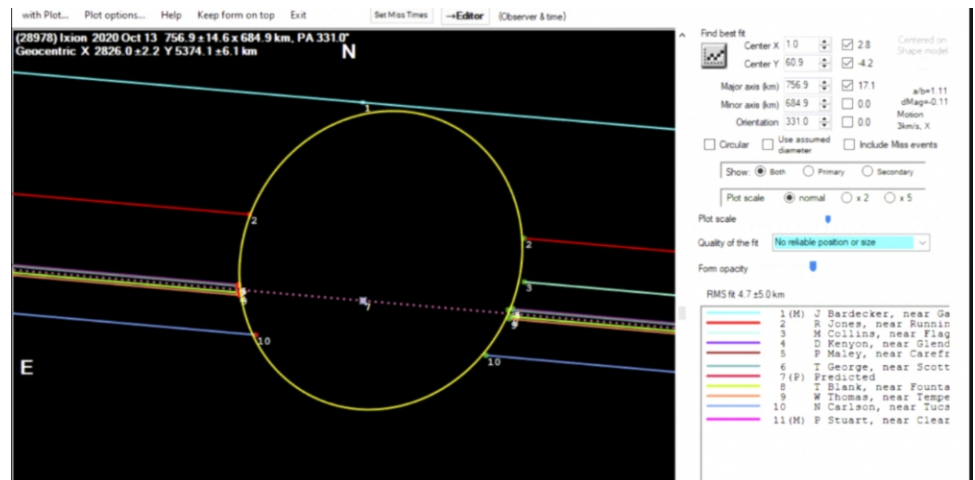
Originally received from Stu Brackney.
Source:

www.moonconnection.com/moon_facts.php
[tml](#)

Dr. Eugene Shoemaker, a Geological Surveyor, who educated the Apollo mission astronauts about craters, never made it into space himself, but it had always been one of his dreams. He was rejected as an astronaut because of medical problems.



This is the shape plotted from the observations. Our chord was second from the bottom, helping with the bottom tip. Graph provided by Ted.



This chart shows the size of the asteroid. Image provided by Ted Blank.

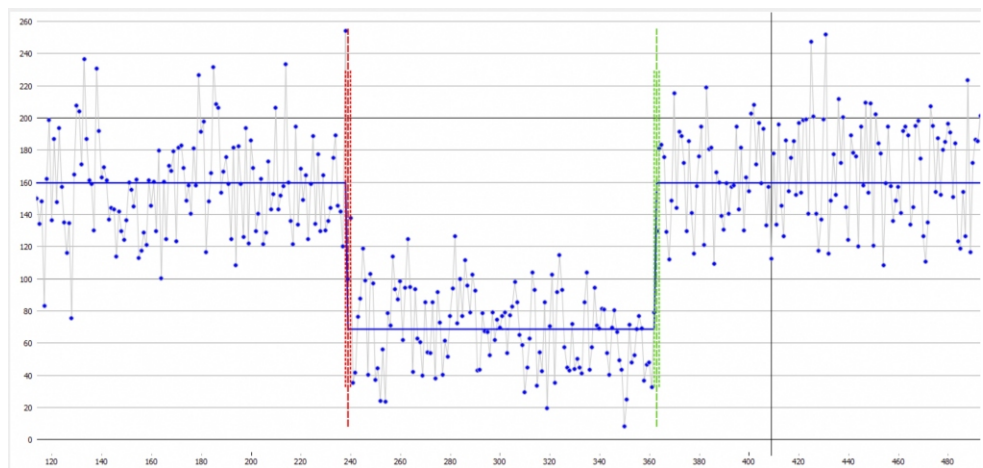


Chart provided by Ted Blank.

Stargazing Trip To Doney Picnic Area Oct 17

By Sam Insana, PAS Member

On October 17th, Mark Johnston, Pete Turner and Sam Insana of PAS ventured northeast of Flagstaff to the Doney Picnic area near Wupatki National Monument for a night of stargazing and astrophotography. Mark's friend Kent from Flagstaff, joined us with this large refractor.

Mark spent the night photographing over 40 celestial objects. His equipment is fantastic, allowing a large, colorful view of the object to appear on his laptop within minutes of slewing his large refractor to the object. He invited the rest of us to look at each spectacular object. Mark observed and photographed galaxies, nebulae, globular clusters, open clusters, etc... His photos

were so good they seemed to be coming from the Hubble Space Telescope.

Pete had his 12-inch Dobsonian and shared some very nice views of the Orion nebula, Andromeda galaxy and other beautiful objects.

Sam, using his 8-inch Newtonian reflector and a DSLR camera, photographed the Andromeda galaxy M31 with its small companion galaxy M32. He also photographed the Ring Nebula M57. Finally, Sam photographed the Milky Way galaxy with his camera on a tripod.

The weather was fine at about 70 degrees during setup and about 50 degrees when Sam and Pete packed up. There was

some wind of about 10 mph during the event with gusts up to about 15 mph making it occasionally difficult observing and photographing.

Pete and Sam took off close to 1 am but Mark kept going for several more hours. This observing site is Bortle 1 and 5300 feet with good sight lines in all directions. The picnic area has paved parking, a restroom and there is plenty of room to spread out.

The next morning, Mark, Pete and Sam all met for breakfast at 10am at the IHOP. Afterwards Pete and Mark took off for the Valley while Sam remained to photograph the colorful fall foliage in Flagstaff and along the Snowbowl road.



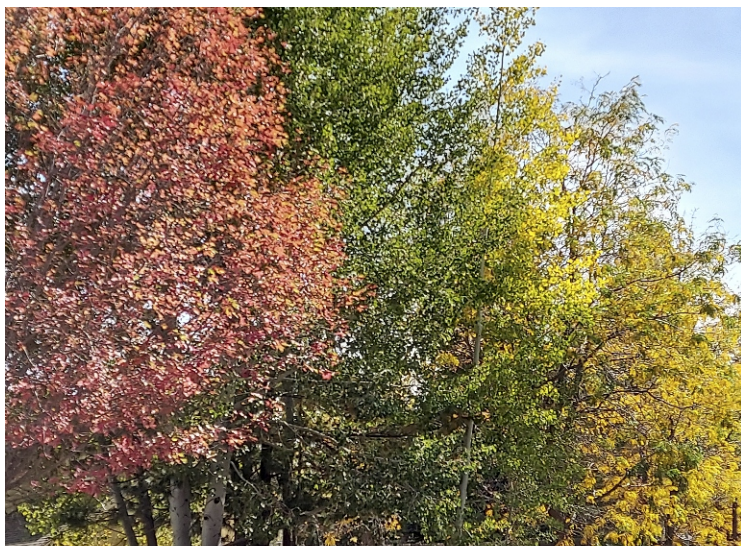
Mark with his equipment at Doney. Photo taken by Sam.



Pete with his 12-inch Dob at Doney. Photo taken by Sam.



Golden aspen along snowbowl road after Doney stargazing. Photo taken by Sam Insana.



Fall foliage in Flagstaff after Doney stargazing. Photo taken by Sam.



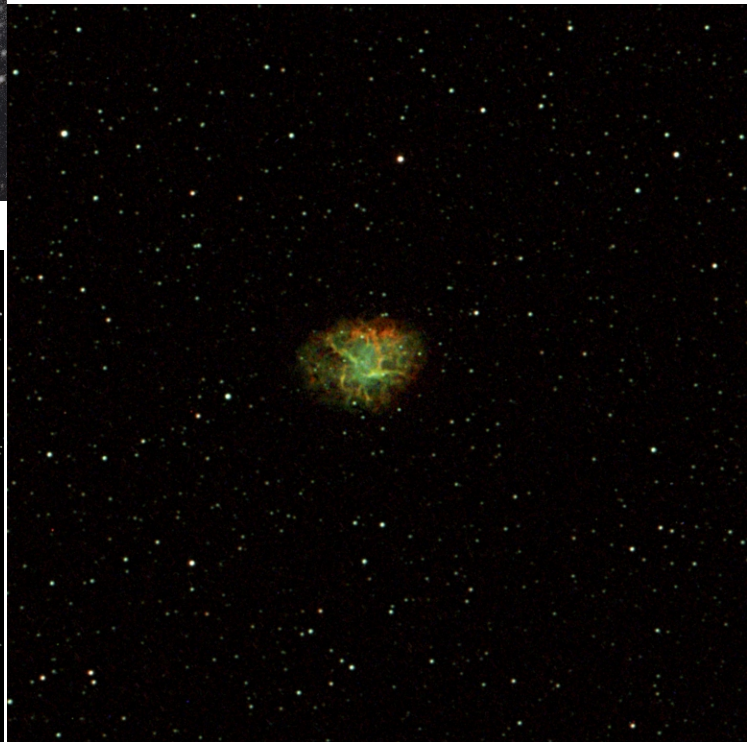
M31 & M32 taken at Doney on Oct 17th by Sam.



Horsehead Nebula IC 434 taken by Mark Johnston.



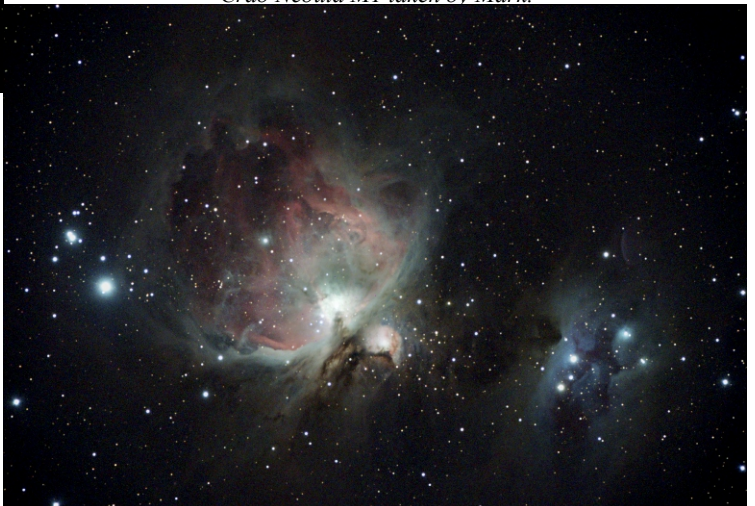
Triangulum Galaxy M33 taken by Mark.



Crab Nebula M1 taken by Mark.



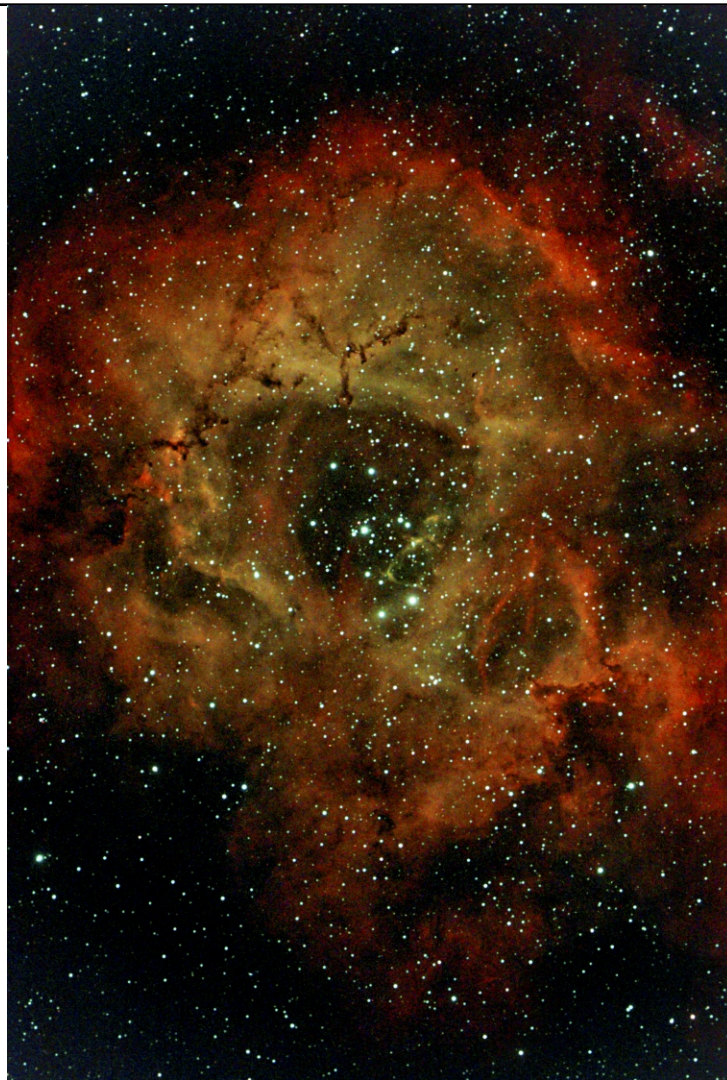
Pleiades M45 taken by Mark.



Orion Nebula M42 taken by Mark.



Pelican Nebula IC 5070 taken by Mark.



Rosette Nebula NGC 2244 taken by Mark.

December 3rd Meeting

Continued from page 1

Express orbiter mission. He is a member of the Janus camera team for the ESA Juice mission, and he is currently Deputy Imager

Lead and a Co-Investigator on NASA's Psyche Mission, scheduled to launch in 2022. In 2014, David was elected a Fellow

of the Geological Society of America, and asteroid 10,461 DAWILLIAMS was named in his honor.

December 3 PAS Meeting

By Terri, Event Manager

Everyone is welcome to attend this virtual meeting with Dr. David Williams. The meeting room will open on Zoom around 7pm. Please visit the PAS online Calendar at pasaz.org on the date of December 3 to find the link to the meeting. This is a public meeting. The meeting will officially begin

at 7:30pm. Please mute your device so that Dr. Williams may have the floor. Questions will be placed through the Meeting Chat. Dr. Williams has returned each year with new, exciting updates of the NASA missions. He is a very enthusiastic guest speaker and PAS welcomes him back! Hope to see you at the Virtual Meeting. Here's the

link you need to log into the Dec 3rd PAS Meeting:

<https://us02web.zoom.us/j/86328081319?pwd=RnNlbnExK2xaMIR2dUprUINZYWpVUT09>

If you can't get this link to work by clicking on it, please copy and paste it into your browser. That sometimes works better.

2020/2021 PAS GUEST SPEAKERS

By Terri Finch, Event Manager
Events@pasaz.org

Due to the Covid-19 pandemic, PAS Meetings are being held via Zoom over the internet. It is planned that a few days before the meeting, the Zoom link will be added to the calendar listing for that night's meeting.

Please visit the PAS calendar to find out more about these upcoming Virtual Meetings and Guest Speakers.

Do you have an idea for a guest speaker? Email Terri Finch, Paul Facuna, or Mike Marron the details (their email addresses are at the top of page 2 of this newsletter).

Here are the next scheduled guest speakers at PAS:

Jan 14: Rogier Windhorst, Subject: JWST - Black Hole Beauties

Feb 4: Tom Field, "You Could Almost Touch the Stars"

Mar 4: TBA

Continued from page 1

November 5th Meeting

except for the technical difficulties).

Enzo's presentation was awesome. It was given at a level that anyone could understand because Enzo took the time to define the terms that the general public might now have known. Enzo's presentation was very informative and enjoyed by all attendees. The presentation ended about 8:25pm and by 8:50pm, Q&A was concluded. President Mike then closed the meeting by 9pm.

It was a very good meeting, lots of great information shared and even though Mike took over the Q&A session with so many questions, Enzo answered all but one. The one question that Enzo did not answer

was due to the answer NOT being part of Enzo's research. But all the other questions by the many attendees were answered very efficiently.

Thanks to all who were present at this meeting. And Thanks to Stu for hosting the meeting and managing the Q&A session. Thanks to everyone who muted their devices and turned off their cameras to allow Enzo to have the total attention of all who tuned in.

The next PAS Meeting on Dec 3rd will have a return Guest Speaker and a favorite of PAS - Dr. David Williams, Research Professor at the School Of Earth and Space Exploration at ASU. Hope to see you there!



It is a challenge to get a good photo of a computer screen. This photo was on Enzo's profile on LinkedIn.

EAA Event at Pinnacle Peak Park Oct 16

By Mark Johnston

I did my first EAA event at Pinnacle Peak Park for the city of Scottsdale last night. It was a big success! Everyone was

socially distanced sitting in their own chairs or on a blanket. Saw quite a few nice objects despite some smoke from local wild-

fires.

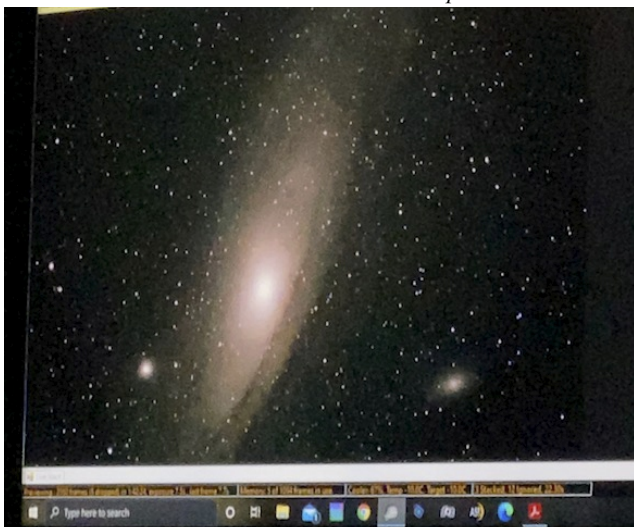
Attached are a few pictures a guest took while at the event.



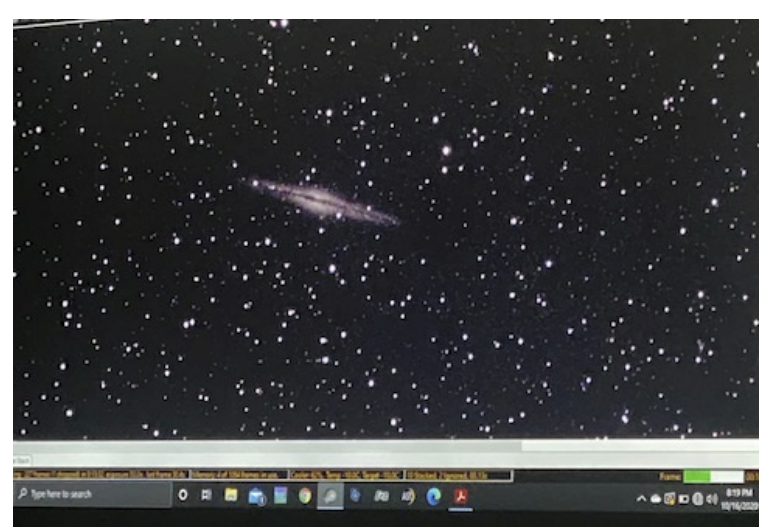
Mark's EAA set up.



NGC 6992 The Veil Nebula



M31 The Andromeda Galaxy

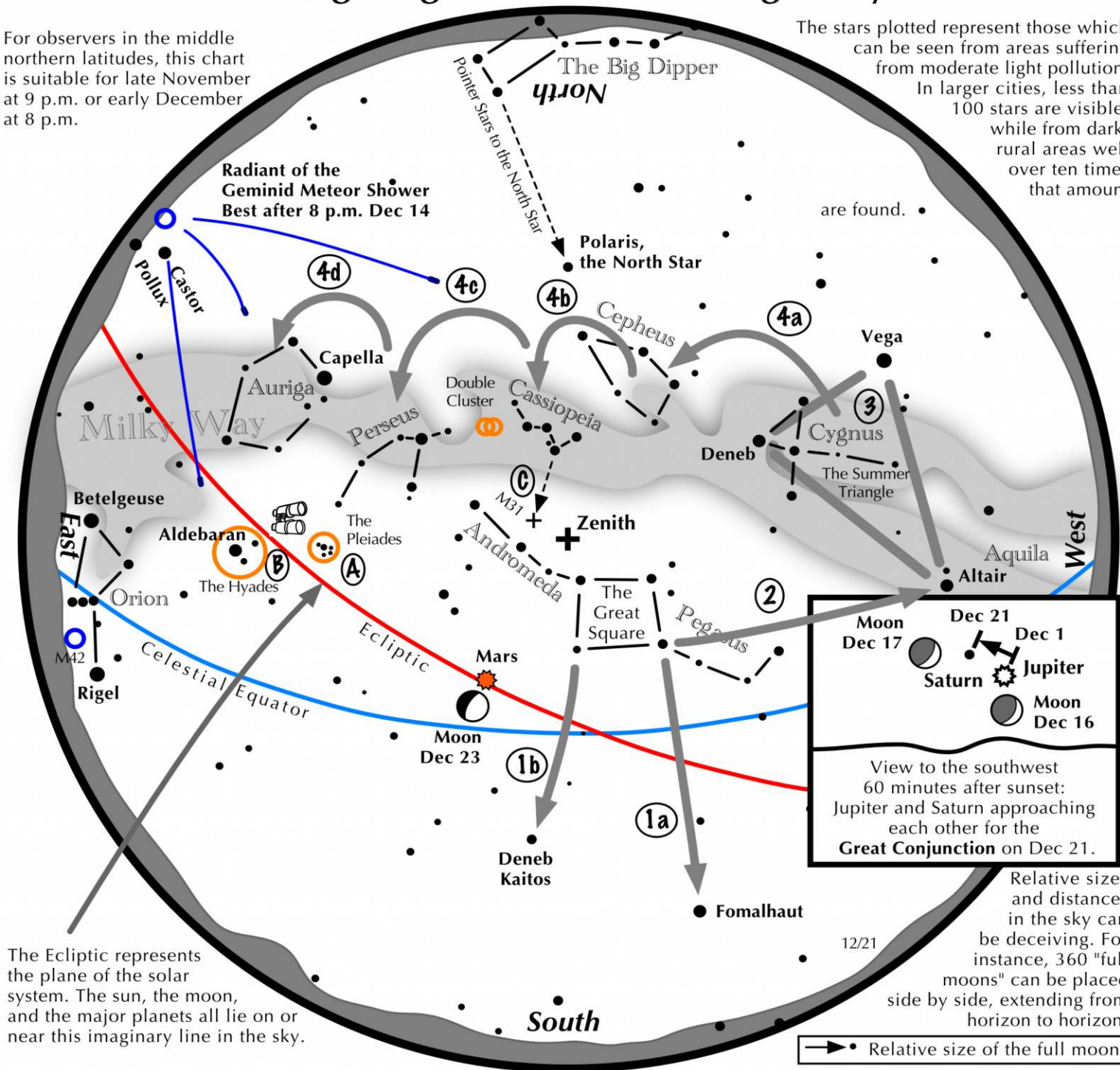


NGC 891 The Silver Sliver Galaxy

Navigating the December Night Sky

For observers in the middle northern latitudes, this chart is suitable for late November at 9 p.m. or early December at 8 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 December night sky: Simply start with what you know or with what you can easily find.

- 1 Face south. Almost overhead is the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend an imaginary line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the southwest. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second bright star in the south.
- 2 Draw another line, this time westward following the southern edge of the Square. 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, 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.

