



PAStimes

Phoenix Astronomical Society

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Volume 72 Issue 6

PHOENIX ASTRONOMICAL SOCIETY — ESTABLISHED 1948

Virtual PAS Meeting Featuring Tom Field Feb 4

“You can almost touch the stars”

Even if you wanted to touch a star, they're all impossibly distant. Despite these great distances, astronomers have learned an enormous amount about stars. How? The most common method used to study the stars is called spectroscopy, which is the science of analyzing the colorful rainbow spectrum produced by a prism-like device.

Until recently, spectroscopy was too expensive and too complicated for all but a handful of amateurs. Today, though, new tools make spectroscopy accessible to almost all of us. You no longer need a PhD, dark skies, long exposures, enormous aperture ... or a big budget! With your current telescope and FITS camera (or a simple web-cam or even a DSLR without a telescope) you can now easily study the stars yourself. Wouldn't you like to detect the

atmosphere on Neptune or the red shift of a quasar right from your own backyard?!

This talk, with lots of interesting examples, will show you what it's all about and help you understand how spectroscopy is used in research. Even if you are an arm-chair astronomer, understanding this field will enhance your understanding of the things you read and the night sky.

Tom Field has been a Contributing Editor at Sky & Telescope Magazine for the past 7 years. He is the author of the RSpec software (www.rspect-astro.com) which received the S&T “Hot Product” award in 2011. Tom is a popular speaker who has spoken to hundreds of clubs via the web and in-person at many conferences, including NEAF, the NEAF Imaging Conference, the Winter Star Party, the Advanced Imaging Conference, and others.

See Feb PAS Meeting on page 9



Please attend the February PAS meeting to welcome Tom Field for a fantastic presentation! Everyone is welcome to attend on Zoom.

Photo provided by Tom Field.

January 14th Meeting Review

By Terri, Event Manager

At the beginning of the meeting, there were 47 in attendance. After the Meeting Host, Stu, made a few brief announcements, President Mike opened the meeting and within a minute, gave the floor to the awesome guest speaker, Dr. Rogier Windhorst.

The information and images shared by this fantastic guest speaker were intriguing, informative, and super interesting. Dr. Windhorst gave a great presentation on the various aspects of the JWST and then about 8pm, he took a brief break from the presentation and opened up the meeting to a Q&A session. At about 8:15pm, he continued his presentation, going over other details of great interest. By 8pm the meeting had 55 in attendance! The presentation ended

about 8:48pm and then there was Q&A for about 20 minutes. The whole meeting concluded about 9:10pm. Everyone enjoyed the presentation!

Dr Windhorst provided a link to the slides that were shown during this presentation at this link: http://www.asu.edu/clas/hst/www/jwst/jwsttalks/phoenixAS21_jwst.pdf. And one of the items he mentioned was at this link: <https://www.esa.int/gsp/ACT/phy/Projects/Blackholes/WebGL/>

I wish to thank Rogier Windhorst for a most spectacular presentation! I wish to thank Stu Brackney, Meeting Host and Zoom Host for managing the meeting so smoothly. And I wish to thank everyone who took the time to pop into this meeting and enjoy what our guest speaker had to

See Jan 14th Meeting Review on page 9



Rogier Windhorst was the January 14th Meeting Guest Speaker. It was a very good meeting with a huge turnout. Photo was captured from his talk by Stu Brackney.

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Geminids Viewing Dec 14

By Mark Johnston, PAS Member

It was a last-minute decision due to patchy clouds, but Dec 14 from 9pm to 11pm, Mark, Mike, Frank and Sam viewed over 200 meteors at Mike's backyard in Cave Creek. We were counting on average about 2 per minute. We also saw about 10 fireballs. The best was a spectacular green fireball with a long yellow tail. It was a beautiful night with only a few high thin clouds. We were able to glimpse M31 and all the stars of the Little Dipper naked eye.

It was 44 degrees when we packed up, but with no wind it was fine. Thanks to Mike for letting us use his backyard, which faced North-East and had nice dark skies.



Geminids Meteor shower in the constellation of Orion. Photo taken by Sam Insana.

What's Up For February?

By Don K. Boyd, PAStimes Editor

Name	Date	Rise	Set
Mercury	02-15-21	06:17	17:06
Venus	02-15-212	06:50	17:24
Mars	02/15/2021	11:00	12:54
Jupiter	02-15-21	06:35	07:04
Saturn	02-15-21	06:13	16:32
Uranus	02-15-21	10:25	23:42
Neptune	02-15-21	08:26	19:57
Pluto	01-15-21	05:37	15:37

All Times Arizona Time

Bold means the object is "visible" in the evening

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February 15, 2020

Sunrise: 7:12

Sunset: 18:14

Q3: February 4



New: February 11



Q1: February 19



Full: February 28





Check Your Sky's Quality with Orion!

David Prosper

Have you ever wondered how many stars you can see at night? From a perfect dark sky location, free from any light pollution, a person with excellent vision may observe a few thousand stars in the sky at one time! Sadly, most people don't enjoy pristine dark skies – and knowing your sky's brightness will help you navigate the night sky.

The brightness of planets and stars is measured in terms of **apparent magnitude**, or how bright they appear from Earth. Most visible stars range in brightness from 1st to 6th magnitude, with the lower number being brighter. A star at magnitude 1 appears 100 times brighter than a star at magnitude 6. A few stars and planets shine even brighter than first magnitude, like brilliant Sirius at -1.46 magnitude, or Venus, which can shine brighter than -4 magnitude! Very bright planets and stars can still be seen from bright cities with lots of light pollution. Given perfect skies, an observer may be able to see stars as dim as 6.5 magnitude, but such fantas-

tic conditions are very rare; in much of the world, human-made light pollution drastically limits what people can see at night.

Your sky's **limiting magnitude** is, simply enough, the measure of the dimmest stars you can see when looking straight up. So, if the dimmest star you can see from your backyard is magnitude 5, then your limiting magnitude is 5. Easy, right? But why would you want to know your limiting magnitude? It can help you plan your observing! For example, if you have a bright sky and your limiting magnitude is at 3, watching a meteor shower or looking for dimmer stars and objects may be a wasted effort. But if your sky is dark and the limit is 5, you should be able to see meteors and the Milky Way. Knowing this figure can help you measure light pollution in your area and determine if it's getting better or worse over time. And regardless of location, be it backyard, balcony, or dark sky park, light pollution is a concern to all stargazers!

How do you figure out the limiting magnitude in your area? While you can use smartphone apps or dedicated devices like a Sky Quality Meter, you can

also use your own eyes and charts of bright constellations! The Night Sky Network offers a free printable Dark Sky Wheel, featuring the stars of Orion on one side and Scorpius on the other, [here:bit.ly/darkskywheel](https://bit.ly/darkskywheel). Each wheel contains six “wedges” showing the stars of the constellation, limited from 1-6 magnitude. Find the wedge containing the faintest stars you can see from your area; you now know your limiting magnitude! For maximum accuracy, use the wheel when the constellation is high in the sky well after sunset. Compare the difference when the Moon is at full phase, versus new. Before you start, let your eyes adjust for twenty minutes to ensure your night vision is at its best. A red light can help preserve your night vision while comparing stars in the printout.

Did you have fun? Contribute to science with monthly observing programs from Globe at Night's website (globeatnight.org), and check out the latest NASA's science on the stars you can - and can't - see, atnasa.gov.



The Dark Sky Wheel, showing the constellation Orion at six different limiting magnitudes (right), and a photo of Orion (left). What is the limiting magnitude of the photo? For most observing locations, the Orion side works best on evenings from January-March, and the Scorpius side from June-August.

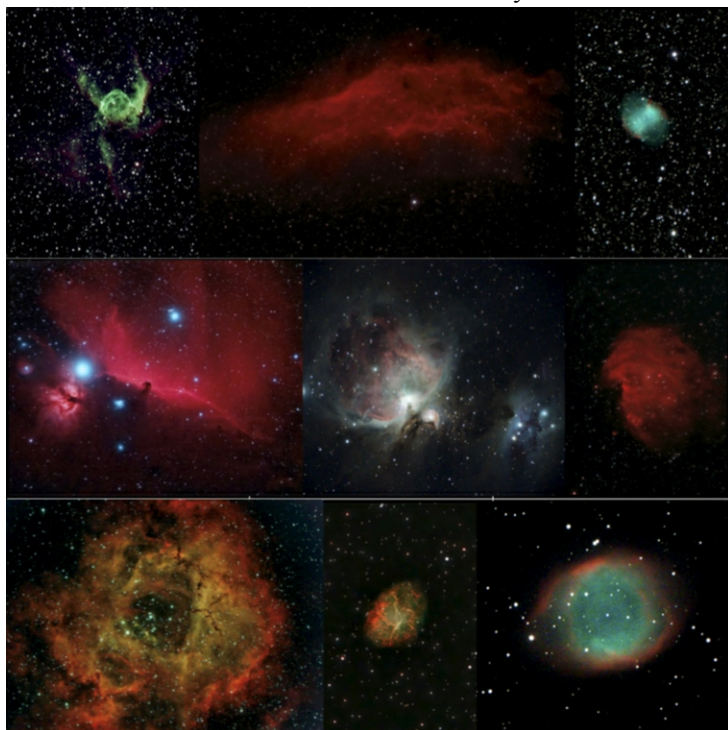
Astrophotography of 2020

By Mark Johnston, PAS Member

As you know, I started astrophotography this year (June) and have been having fun and learning a lot. In fact, I had a major

epiphany as recently as this week! Lots to learn. Anyway, here are my best solar system/milkyway/galactic photos of the year. I look forward to a much better 2021

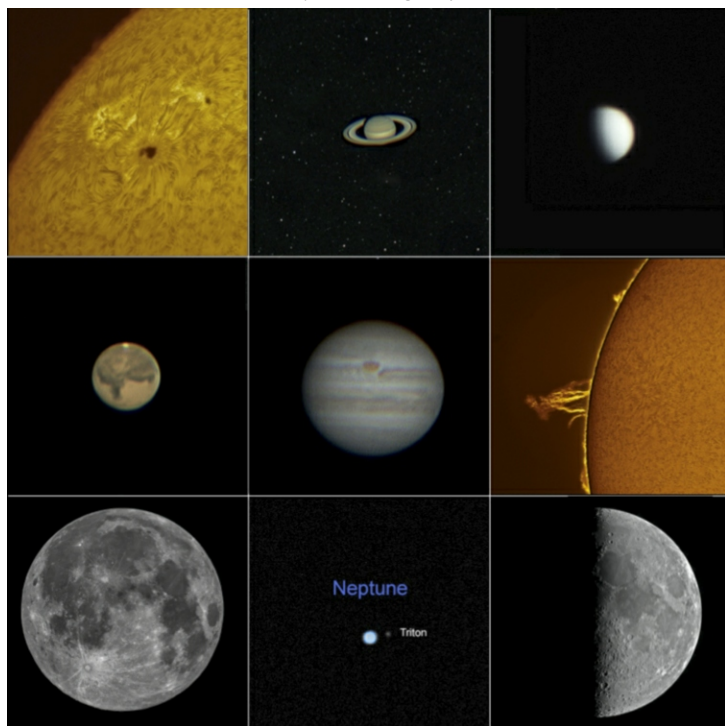
and hope by spring we can resume public outreach events.



Here are my best images of nebulae.



These are my best images of galaxies photographed in 2020. Photo collage by Mark Johnston.



These are the best images I took of the solar system.

Astronomy Equipment for Sale

By Terri, Event Manager & Assistant Newsletter Editor

Do you have some astronomy related items you'd like to sell? Prepare an ad and send it my way so that Don and I can help you sell it through the club newsletter. PAS Members get this service for free. Items you may wish to sell: Books, Star Charts, Telescopes, Eyepieces, Finder Scopes, and more. As long as it is astronomy related, I will happily add it to the newsletter. Please include all items you wish to sell, and what is included with those items. Price them, and provide the contact info for the way you wish to be notified, such as email or phone number. I await your submissions to Events@pasaz.org. Start Today. Your deadline for the next issue is Feb 10th.

Obsession 20-inch f/5 telescope with OMI primary, with enhanced primary. 98% Brilliant Diamond enhanced secondary, including ServoCAT GoTo drive with Argo Navis DSC. 20K upgraded res encoders, Upgrade to Feathertouch focuser. Asking \$6,000 including 10-inch handmade Dob plus 4 Nagler eyepieces. Package deal, Best Offer. Bruce, bmende888@gmail.com

Christmas Star of 2020

The Jupiter & Saturn Conjunction Dec 21, 2020

By Terri Finch, PAS Event Manager

The Christmas Star of 2020 was a very nice conjunction of Jupiter & Saturn with the appearance of two stars next to each other (planets are not stars). Jupiter was the brightest of the two planets as they hung in the evening sky of Dec 21st around 6pm to the SW.

I had gone outside to look for them around 5:30pm and didn't find them in the sky and visible from my location near I-17 and Peoria Ave until about 6pm. I could make out Jupiter & Saturn naked eye. I didn't have my telescope or any binoculars with me.

William and I watched the pair in the night sky for quite some time and then he went indoors. Since we had ordered pizza and we were waiting for the pizza delivery person to come to our home, I got a crowd of people looking at the conjunction. Two of my favorite neighbors, one from either side of my house, joined me along the walkway where we could see the conjunction above the covered parking structure.

Inside my house, on the TV I had brought up the Lowell Observatory Through-the-Telescope view on YouTube. William went inside to watch it, while I talked to the people outside and shared what I knew about the planets and this spectacular view.

Around 7:15pm, the outside crowd left, the pizza guy arrived, and I went indoors to enjoy food and watch what Lowell was showing. It was a perfect, clear evening to view the conjunction and sharing it with the neighbors was also fun.

By Sam Insana member of PAS

Monday night, December 21st, my son Frank and I went to Ron Walker's place in Cave Creek to see the Christmas Star. Although USA today and the Arizona Republic said the conjunction would be so close that it would appear as one large bright star, that never happened. You could see bright Jupiter and dim Saturn separated with the naked eye. When looking through binoculars the separation was even greater. Looking through Ron's 11-inch telescope it was a large separation. It was interesting to see both planets in one field of view along with the 4 Galilean moons and Titan. Jupiter and Saturn looked great 6 months earlier since they were closer to the Earth. During this conjunction they were much farther away

so the rings and cloud bands were not very impressive. There were a dozen people at Ron Walker's, so it was a fun gathering. I also saw Rick Allings ASU Zoom presentation at 5:30 pm which featured Ted Blank and Mark Johnston and their telescopes. With their electronically assisted astrophotography the views were very good. They even showed the Pleiades with nebosity.

By Mark Johnston, PAS Member

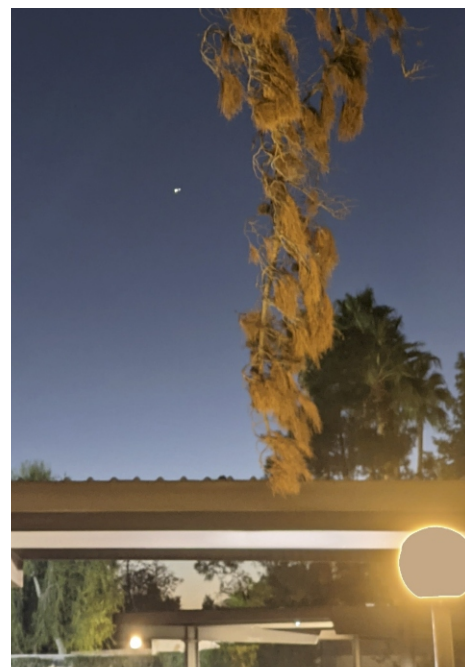
Ted Blank and I participated in the ASU webinar that streamed live to 782 participants. Ted showed Jupiter and Saturn from his observatory in Fountain Hills and I showed the Moon and the Pleiades from my backyard in Scottsdale. I also had a nice personal visual view through my eyepiece which was much nicer than any camera perspective due to the eye's superior dynamic range. It was a good event with lots of questions from participants around the world, and ended after about 75 minutes.

By Roger Anzini, PAS Member

My observation of the Jupiter/Saturn conjunction was a brief viewing session using my 16-inch Dobsonian with a 13mm 2-inch eyepiece. The telescope itself lives in my garage with a south facing door. So, it was a simple matter of sliding the scope about halfway out of the garage. The neighbors were invited with everyone wearing COVID protective masks. At about 6:30 PM we pointed the scope just above the last streak of fading light in the southwest sky. Taking center stage, Jupiter presented three of its large moons with the fourth moon temporarily hidden on the far side of the planet. To the delight of all in attendance, there within the same eyepiece view, Saturn appeared to be a nearby companion hovering very close at hand. In reality, Saturn actually occupied a cold, lonely, sequestered position half a billion miles beyond Jupiter on the far side of our solar system. In my scope Saturn displayed bright Titan at the nine o'clock position. Then, almost touching the rings far, outer edge, two micro-moons dangled in the blackness at what I called a three o'clock position.

Spotting the smaller moons of Saturn has always thrilled me, and this was a view from central Phoenix with a pesky street lamp sixty feet away. Not bad at all.

For some reason the viewing session



William Finch took this photo of Saturn & Jupiter from our Townhouse, over the parking lot, with his Pixel 4 Phone.



And this fantastic photo, taken by Carole who is Mark Savan's Mom, and submitted by Mark shows the Moon at the bottom with Jupiter & Saturn above it. Fantastic photo!

concluded when it was announced that a cozy supper was waiting for me on a warm stovetop. Best Holiday wishes to all.

By Richard Sauerbrun, PAS Member

Due to several obstructions that block my North Scottsdale backyard view of the SW horizon, I moved my rig to a nearby park where I would have an unobstructed

view of Jupiter/Saturn for a good 30 minutes after sunset.

I set up my Celestron 8" SCT, installed an f6.5 focal reducer to widen my FOV, and connected my Canon EOS 70D DSLR with a CLS filter to battle the light pollution. I connected my laptop to the AVX via USB cable for mount control and use of my imaging apps. Using the PlaneWave mount control app (CPWI), I slewed to a point between Jupiter & Saturn and began tracking.

I used the Astro Photography Tool app to begin taking images of the target area with the DSLR. After a few test shots, I was able to center the conjunction in the FOV and begin the focus routine. Using a combination of the APT focus tools and a Bahtinov mask, I was able to achieve reasonable focus considering the atmospheric distortion so near the horizon. Shooting at 1600 ISO, I tried several different expose settings so I could capture both Jupiter and Saturn as well as several of their moons. To also see the moons, both planets were over-exposed which hid the details of Jupiter's cloud bands as well as Saturn's rings. In fact, I could not find a setting that would show all the details of both planets as Jupiter is so much brighter than Saturn. Once I had locked in my settings, I started taking 1s images ... here is a single sub-frame.

The best part of the evening, however, were the people that stopped by to visit. A few dozen people that were walking in the park saw my rig and stopped to ask what I was doing. Once I had the final images of the conjunction appearing on my laptop, a crowd gathered, and everybody took out their phones and started taking pictures of my screen. As is normally the case, many people had questions about what they were seeing, so I did my best to explain why this event was so special as well as a little astronomical data about the two planets. Sharing the experience with others made it even more special. Thanks for the opportunity to share my experience.

By Pete Turner

Andie and I spent the evening of the 21st at the Starbarn (Ron Walker's Planetarium). We viewed the conjunction with binoculars and then through Ron Walker's 11-inch Schmidt-Cassegrain which he had just finished setting up in a small dome in his backyard. I was able to pick out four moons of Jupiter and three more of Saturn. In all, there were about ten of us there socially distancing.

By Mark Savan,
PAS Member

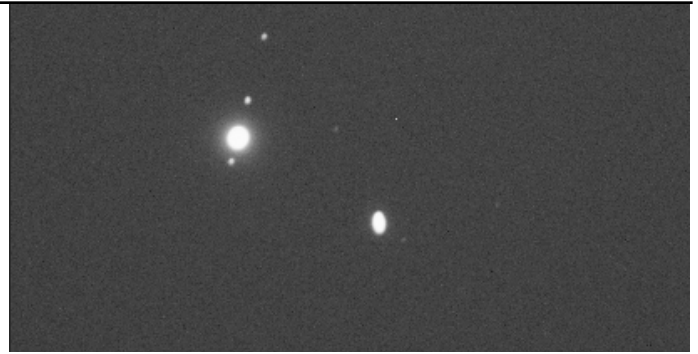
I'm just getting my astrophotography setup going so I managed only some blurry shots of the conjunction via my phone and my 8" Dob. My mom, Carole, won the day (or a few days before) though with this shot she took with her hand-held iPhone.

By Ron Walker,
PAS Member

There are a few things in life that are only offered to us once or twice in a lifetime. A total eclipse of the Sun or perhaps an extremely close conjunction of planets which was offered to us last December 21, 2020. Because it would be the only time my eyes would ever have a chance to see this I worked in earnest to get my little observatory in operational condition. A chore that should have been completed many years ago, but procrastination and just plain laziness took precedence. Every year I keep promising myself that I will see and try and photograph the great nebula in Orion and every year I fail.

But that is another story. Having a chance to see the planets Jupiter and Saturn in one telescopic view with the distinguishing rings of Saturn and the major moons of Jupiter was certainly worth the effort to get things operational. Since the great clockwork in the sky waits for no man, I worked and attained my goal.

Actually, even a day early, as on the 20th I had a planetarium show on "The Christmas Star"



This photo was provided by Richard Sauerbrun..



Image of Jupiter & Saturn as captured by Stu Brackney.



*Here's a fantastic image of the Moon. Not only were Jupiter & Saturn visible, exciting to see on this night, but the Moon was also gorgeous
This photo by Stu Brackney.*



Submitted by Leah Sapir, here is a beautiful image of the Conjunction over Jerusalem. It's really nice to have photos from other locations on the Earth.

and asked the group if they wanted to see the conjunction live and they all said YES. So out to the small dome we went and viewed this most spectacular sight. One of the group even emailed me a note the next day.

“My family and I went to the Star Barn Planetarium on Sunday evening and it was such a fantastic experience! Ron has built an observatory where we viewed the Conjunction and then we watched the Christmas Star presentation. It was beautiful, entertaining, informative, and so compelling. I honestly cannot wait to see another show soon. We are all incredibly lucky to have this beautiful planetarium in our community. Thanks so much for a memorable night Ron!” Adam P.

Bolstered with such a review, the next night December 21, 2020, was set aside for members of the “seven seas” or “7 C’s” or “Cave Creek Carefree Celestial Cosmologically Challenged Curmudgeons”. All in all, everyone had a good time or at least enjoyed some planetarium ale.

Things snowballed and those that read the earlier review demanded equal treatment and a third evening of viewing took place. Once again everyone appeared to really enjoy the view. I for one was mystified seeing both planets in their entire splendor in one field of the scope.

While my experimental pictures are certainly not the best in the world, they are certainly a lasting reminder of this memorable event. Hopefully I will improve at astro-photography but I must admit there was a lot of disturbance in the air, both wind and dust, to make a good excuse as to the poor quality of the images. The two images attached are non-processed (whatever that means) and only differ by the exposure time.

By Leah Sapir, PAS Member

The edge of my neighborhood in a suburb of Jerusalem has a beautiful view of the Mount of Olives. On December 20, 2020, I set up my camera and tripod about an hour after sunset to get a view of the Jupiter-Saturn conjunction over Jerusalem.

I used a Canon Powershot A620 set for ISO 400, F 4.5, and shutter speed 4 seconds. (I tried several different shutter speeds to find the one that came out best.) In a wide-field view, we can see Altair and Tarazed at the right edge of the photo. I used an optical zoom of about 4x to get a close-up view of the planets.

From my patio at home, there are tall buildings hiding the western horizon, but I was able to see both planets in my telescope, in one FOV, in a 25mm eyepiece, if I started looking soon after sunset, before it was completely dark, as the planets were a little higher, then. But I wasn't able to take a picture of them through my scope.

By Terri Finch, Assistant Editor

I wish to thank everyone who submitted these fantastic reviews of their experiences viewing the Christmas Star of December 2020. There are some great photos and even better memories of this experience in this review. I hope everyone got to enjoy the conjunction and this article. Thank you all for your contributions to make this a fantastic, interesting and picture-filled review of a once in a lifetime astronomical event!



This photo has a nice set of 3 moons of Jupiter. Photo by Ron Walker.



Saturn shows its rings in this photo taken by Ron Walker.



In this image, Jupiter & Saturn are above the tree on the right, and Altair & Tarazed are on the left. Photo taken in Jerusalem by Leah Sapir.

A Stargazer's Guide to the Skies at Castle Hot Springs

Reproduction permission by Ellen Burkhardt,
Castle Hot Springs

There's nothing quite like experiencing the night sky from the quiet and dark of the desert. The crystal-clear air and lack of light pollution make for ideal conditions to see an incredible assortment of constellations with the naked eye. This is especially true in January, when the heavens sparkle with the twinkles of deep-sky gems not seen during the rest of the year.

Tucked away in the Sonoran Desert and surrounded by the Bradshaw Mountains, Castle Hot Springs is as idyllic a place as possible to stargaze late into the night. The obsidian skies provide a rich canvas to spot favorite and new constellations alike, with the telescopes on each Sky View Cabin deck aiding even further.

To help you fully enjoy the cosmos' nightly show, here's a guide to the January sky's best finds.

THE BULL AND THE HUNTER

(See the Orion, Taurus and Pleiades photo on the top right of this page.)

The two largest and best-known January constellations are Taurus and Orion. Lighting up the northern sky, these constellations embody a number of recognizable stars and — with a telescope — deep-sky objects.

Taurus is the 17th largest of all 88 constellations and represents the celestial bull. Although it was first catalogued by Greek astronomer Ptolemy in the second century, the famous bovine has been known since the Bronze Age. Taurus is easy to find, largely thanks to the major star cluster it houses: the Pleiades open cluster, also known as the Seven Sisters. The cluster is one of the nearest to earth and easily visible without binoculars or a telescope.

Next up is Orion, the celestial hunter. Another one of the most recognizable constellations, Orion's distinct hourglass shape is formed by seven extremely bright stars, all of which are especially prominent on clear winter nights.

GOING DEEP

(See the Orion Photo third down on the top right of this page.)

Several popular deep-sky objects are best seen in January. The two that are easiest to identify given their location within the aforementioned constellations are the

Orion Nebula and the Hyades star cluster.

The Orion Nebula (also referred to as Messier 42) has been recognized by many civilizations throughout history and is one of the closest large-star-forming regions to Earth at just 1,500 lightyears away. It's here where supergiants (see below) are born, blazing brighter and bluer than their smaller, reddish-toned counterparts. You can spot it immediately below Orion's "belt," its four primary stars brightly blazing in a trapezoidal pattern.

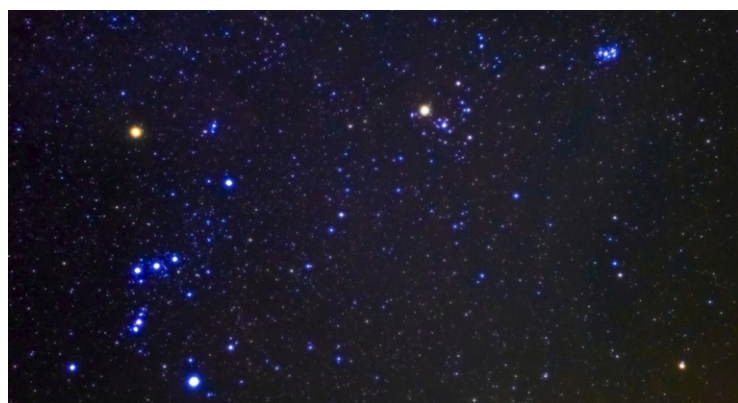
The Hyades star cluster, aka the face of Taurus, consists of five prominent stars in the shape of a V and is notable for being the closest cluster of stars to the sun. While the largest and brightest star forming the bull's face is Aldebaran, it is not technically part of the Hyades cluster. However, as it makes up Taurus' eye, it's worth mentioning and seeking out.

SUPER-STARS (LITERALLY)

There are stars, and then there are supergiants. A supergiant star is



Castle Hot Springs / Photo: Castle Hot Springs

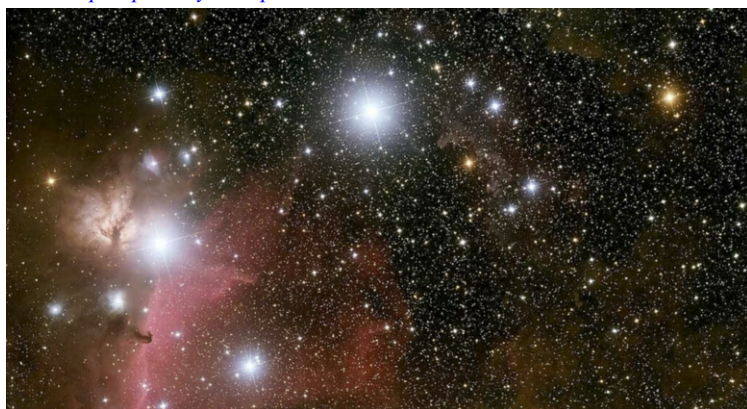


Orion, Taurus, and Pleiades / Photo: Wikimedia Commons by Panda-thwiki



The Orion Nebula - - Photo: Public Domain:

<https://pixabay.com/photos/orion-nebula-emission-nebula-11001/>



Alnitak and Alnilam, two superstars in the Belt of Orion / Photo: Wikimedia Commons by Astrowicht

defined by Britannica as “any star of very great intrinsic luminosity and relatively enormous size.” Stars classified as supergiants often have diameters several hundred times that of the sun and a luminosity nearly 1,000,000 times as powerful — a vibrance that is truly impossible to imagine.

On any given January night, a handful of supergiant stars can be spotted. In Orion’s shoulder, there’s the red beauty Betelgeuse. (the warm-hued star in the upper third of the photo). Estimated to be some 8.5 million years old, the star has reliably been one of the brightest, and is especially easy to identify given its warm hue.

Another supergiant — and Orion’s brightest — is Rigel (the blueish star at the foot of Orion in the bottom third of the top photo on the next page). Approximately 47,000 times brighter than the sun, Rigel is a popular sci-fi touchstone, doubling as the name of planets in Star Trek and garnering a mention in The Hitchhiker’s Guide to the Planet, as well as several other novels. Its name is fitting: Rigel derives from an Arabic term translated in English as “the left leg of the giant,” referring to Orion.

Staying with Orion, in his belt this time, you’ll find Alnilam, better known as Epsilon Orionis. It is the fourth-brightest star in the constellation, the 29th brightest in the sky, and is an incredible 537,000 times more luminous (and more than 30 times larger) than Earth’s sun. The other two stars joining Alnilam in forming the famous Belt of Orion are Alnitak and Mintaka, also supergiants.

Whether you choose to take in the majesty of the January night sky as a whole or opt to seek out these especially notable awe-inspiring star formations, there is no limit to the beauty that awaits. Simply turn your gaze upward, and let the universe do the rest.

More info about Castle Hot Springs can be found at the original article webpage: <https://www.castlehotsprings.com/blog/a-stargazers-guide-to-the-skies-at-castle-hot-springs/>. Enjoy!



Photo: Wikimedia Commons by H. Raab

February PAS Meeting

Continued from page 1

By Terri Finch, Event Manager

Please join PAS in welcoming Tom Field to the Feb 4th PAS meeting. We hope for a huge turnout. The meeting will be held virtually over Zoom. Here’s the link for the meeting: <https://us02web.zoom.us/j/81580512225?pwd=Vkp4ejJyNEN2VVNIQ9jdGl6cmF6QT09>

The meeting will open at 7pm. At 7:30pm we ask that everyone attending please mute your device so no one can hear you, and turn off your camera, so if you make a noise, your image does not pop up over the guest speaker while they are doing their presentation. Once the Guest Speaker finishes their talk and finishes Q&A, you can then turn on your mic & camera.

For Q&A, we will follow the same plan as last month... Stu will lead the Q&A session. If you have a Q, put it in the Zoom Chat for the Guest Speaker to answer. Q&A can go up to a ½ hour in time.

Since everything is virtual, if you need

to leave earlier than the end of the program for this night, please feel free to do so. We understand that some guests and members may not be willing to stay until 10pm, should the meeting run that long.

President Mike will open the meeting with a few brief announcements or teaser announcements of what may be discussed at the end of the meeting after the Guest Speaker concludes their portion of the evening. Stu will take over with a few quick announcements, and then the Guest Speaker can start his presentation as soon as 7:35pm. PAS Plans to record this presentation for those who missed it. You can find the recordings of the meetings on the PASaz.org site. Only the Guest Speaker portion of the Zoom Meeting will be recorded and posted to pasaz.org.

We hope you can join us for this fabulous night of Astronomy with PAS. Bring everyone you know. Share the Zoom link. Let’s give the Guest Speaker a huge crowd at this meeting!

January 14 Meeting Review

Continued from page 1

offer. Three members of Cape Cod Astronomy Club attended this presentation, and several of Dr. Windhorst’s students attended. Looking forward to the next meeting which will be on Feb 4th.

Dec 3 Meeting Thoughts

By Kay Freeman, PAS Member

I just wanted you to know how much I enjoyed the 12/3 PAS meeting presentation by Dr. David Williams. So interesting, and informative!! I look forward to further meetings, and certainly appreciate my association with our wonderful PAS organization. Happy New Year to all of PAS!

Chile's 24" Reflector

By Mark Johnston, PAS Member

As many of you know, there have been some tremendous advances in astrophotography technology in the last few years. And while I've invested in cameras, filters, and other things to advance my personal journey, there are ways to get involved for free.

A number of remote telescope operations are now in place where observers armed with only an internet connection can request images of astronomical objects and then process the resulting raw data to produce beautiful photographs.

Most of these services charge money up front, but Telescope.live offers a free (no credit card needed) 30-day trial. They have telescopes in Spain, Chile and Australia. On Dec 24, I signed up for a free trial of the "bronze" program, and as such was able to request and receive data on two objects so far. I have another couple due soon.

The fun thing about imaging from Chile with a 24" reflector is you can see objects invisible from Arizona. Here are pictures "I took" of the Tarantula Nebula in

the Large Magellanic Cloud, and the Pencil supernova remnant in Vela. In one case I received RGB data and the other Ha/S2/O3 data and had to recombine, sharpen, color, adjust contrast, etc., with software. There are free programs like Deep Space Stacker and GIMP, or you can buy Photoshop or Pixinsight or others. So if you don't mind a learning curve on the software side, you can do this for free for 30 days, then pay just \$4/month for the basic bronze plan. I'm enjoying it so far and will likely continue. Lots to learn!



NGC 2736 (also known as the Pencil Nebula) is a small part of the Vela Supernova Remnant, located near the Vela Pulsar in the constellation Vela. The nebula's linear appearance triggered its popular name. Remnants from a star that exploded thousands of years ago created this nebula. The nebula's luminous appearance comes from dense gas regions that have been struck by the supernova shock wave. As the shock wave travels through space [from right to left in the image], it rams into interstellar material. Initially the gas is heated to millions of degrees, but then subsequently cools down, emitting the optical light visible in the image.



The Tarantula Nebula has an apparent magnitude of 8. Considering its distance of about 49 kpc[2] (160,000 light-years), this is an extremely luminous non-stellar object. Its luminosity is so great that if it were as close to Earth as the Orion Nebula, the Tarantula Nebula would cast visible shadows. The brilliant stars in the Tarantula Nebula are unleashing a torrent of ultraviolet light and stellar winds that are etching away at the hydrogen gas cloud in which the stars were born.

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:

Mar 4: TBA

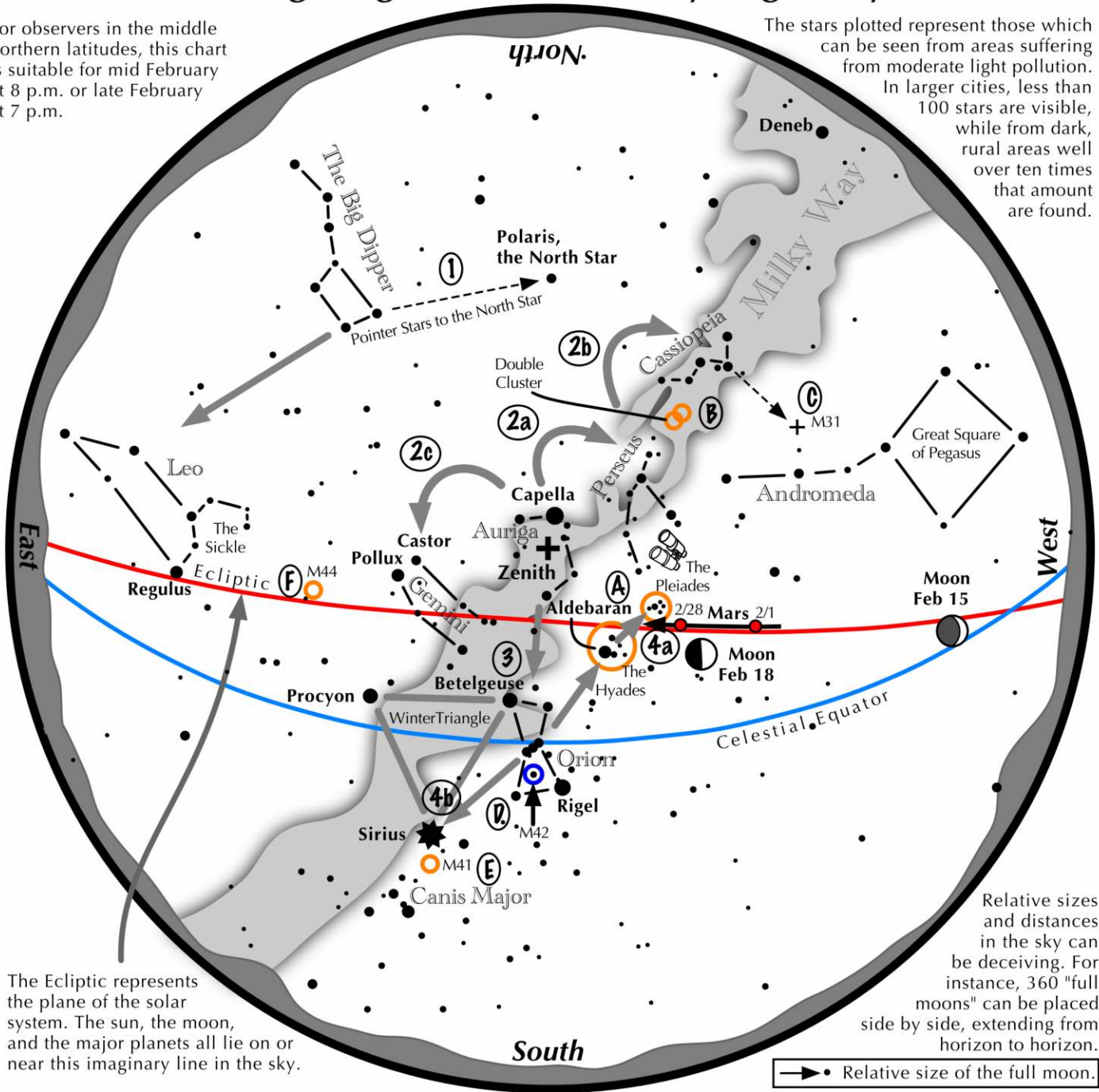
Apr 1: David Jacobs: Cubestats

May 6: Dolores Hill: Osiris-REx Mission

Navigating the mid February Night Sky

For observers in the middle northern latitudes, this chart is suitable for mid February at 8 p.m. or late February 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.



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.

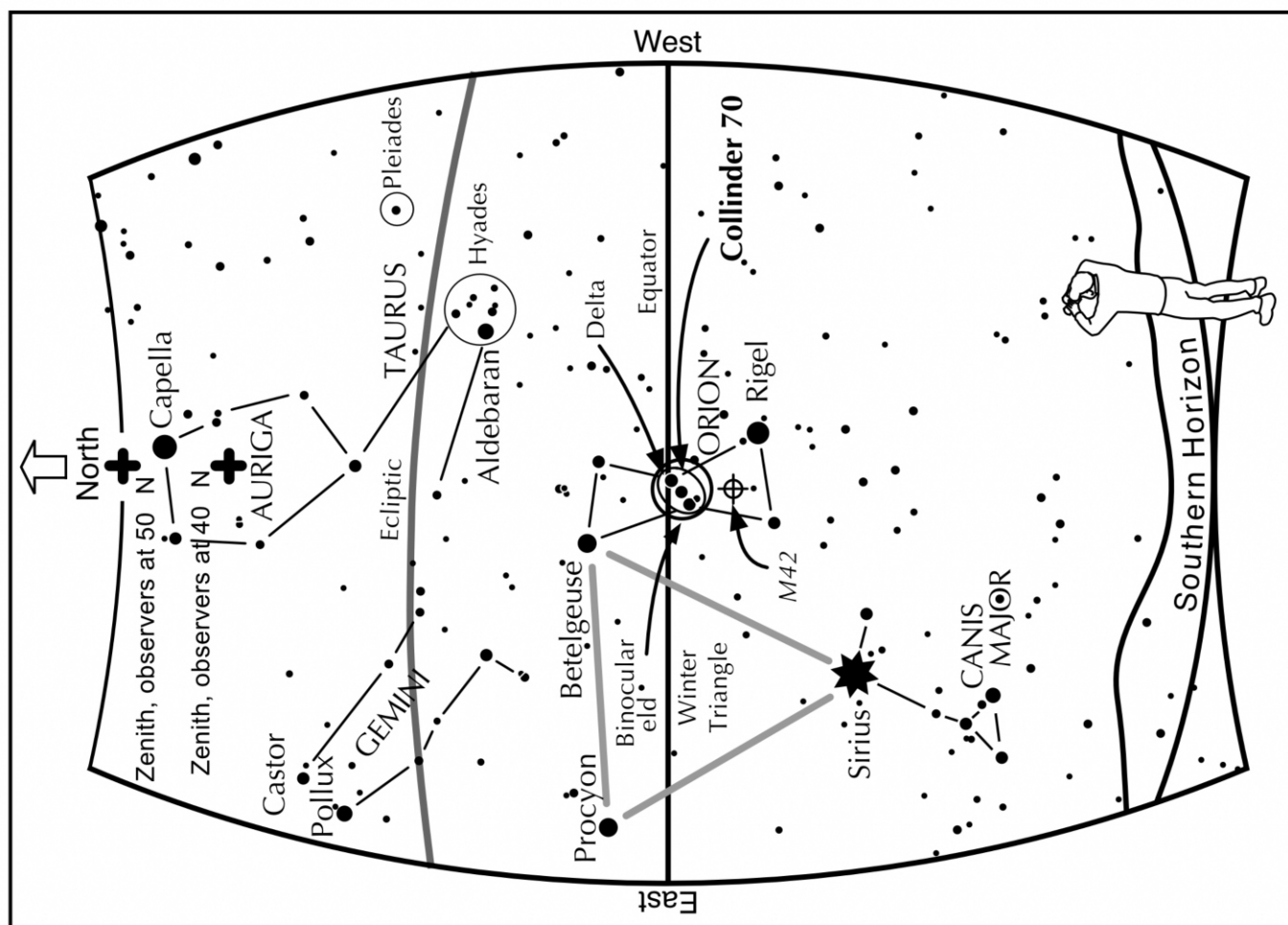
Navigating the February night sky: Simply start with what you know or with what you can easily find.

- 1 Above the northeast horizon rises the Big Dipper. Draw a line from its two end bowl stars upwards to the North Star.
- 2 Face south. Overhead twinkles the bright star Capella in Auriga. Jump northwestward along the Milky Way first to Perseus, then to the "W" of Cassiopeia. Next jump southeastward from Capella to the twin stars of Castor and Pollux in Gemini.
- 3 Directly south of Capella stands the constellation of Orion with its three Belt stars, its bright red star Betelgeuse, and its bright blue-white star Rigel.
- 4 Use Orion's three Belt stars to point northwest to the red star Aldebaran and the Hyades star cluster, then to the Pleiades star cluster. Travel southeast from the Belt stars to the brightest star in the night sky, Sirius, a member of the Winter Triangle.

Binocular Highlights

- A: Examine the stars of two naked eye star clusters, the Pleiades and the Hyades.
 B: Between the "W" of Cassiopeia and Perseus lies the Double Cluster.
 C: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.
 D: M42 in Orion is a star forming nebula. E: Look south of Sirius for the star cluster M41. F: M44, a star cluster barely visible to the naked eye, lies southeast of Pollux.





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

Have you ever seen or even heard of the large open star cluster Collinder 70?

Look high in the south around 8 p.m. for the constellation Orion.

Its three equally bright belt stars shine noticeably between bright Rigel at the southwest corner of the constellation and bright red Betelgeuse at the northeast corner.

Aim a pair of binoculars directly at the three belt stars.

From a dark location, you will discover many dimmer lights in the field. Move the binoculars one field around the belt stars, and you will notice a quick drop in the concentration of dim stars.

You are outlining the cluster of stars known as Collinder 70, lying 1000 light-years from Earth.

Aim binoculars at Delta Orionis (Mintaka). Can you see its 6.8 mag. secondary star just 1 minute north of its 2.4 mag. primary?

