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DECEMBER 2020

Austin Astronomical Society

SIDEREAL TIMES

keeping astronomy weird since 1969

DECEMBER HOLIDAY ZOOM PARTY

Friday, Dec. 11, 2020
7:00 pm - 11:00 pm

You should have received a link via email to join the ZOOM virtual party.

If you have not received the Zoom meeting email, contact president@austinastro.org for access information prior to the meeting
or
call Dawn (512-663-2249) or Tim (512-577-8340) at the start of the meeting for help connecting.

President's Notes

By Terry Phillips

I've been talking for a while about the grand conjunction of Saturn and Jupiter with which we will close out this problematic 2020 astronomically speaking. The conjunction has been garnering a lot of attention lately. Social media is starting to buzz about it, and we are fielding questions on a daily basis about where and when to see it. I'm a little concerned that a lot of questioners seem to assume that you need to find an ideal dark sky spot to observe it. Also, they seem to perceive it as a short-term transitory event like an eclipse that happens at a specific time, lasts a few minutes, and then is gone. So, we are encouraging folks to start observing it now, every clear night for the next three weeks. To fully appreciate it you need to watch the nightly progression as the planets converge and then diverge. I'm pretty sure that in early January we will see a number of stacked multiple exposures, time lapse movies, other artful captures of the multi evening event. You will understand these renderings better if you watch the event unfold in real time. A special location might make an attractive background but is not necessary. These planets are bright, and thirty minutes after sunset can be seen from urban downtown areas. There has been some concern and some media have implied that the event will be very low on the horizon on the 21st. In central Texas, at 6:30 PM when it's plenty dark enough, the pair will still be nearly 15 degrees above the horizon. This is plenty high enough to give a decent view. As of the 9th of December, the two planets are almost 30 degrees above the horizon at 6:30. They are close enough that I've been able to capture both in a 5" f/7 refractor with wide field eyepieces at about 50x. By the end of this week I hope to wrangle both planets in my observatory 25" at 62x or 85x.

Earlier I had alluded to this conjunction as a symbolic coming together at the end of a fraught year that saw so much separation and division in our country. Now I want to talk about how one of the positive emotions often

Banner: Nov. 2020 Image of the Month: Satwant Kumar, Cygnus loop - Face of stellar death

Austin Astronomical Society

Sidereal Times
Vol. 52 Issue 12
http://www.austinastro.org/

Sidereal Times is the official monthly publication of the Austin Astronomical Society.

engendered by astronomical observations might help us to look beyond whatever divides us. That positive emotion is a sense of awe or experience of the sublime. Most of us amateur astronomers have experienced it. My old buddy Mark Johnston who wrote frequently about his observations liked to use the word magnanimous. Not quite the word he thought it was, but when magnificent wouldn't quite cut it, I know exactly what he meant. Think about the things you observe that excite awe for you. Scanning the milky way in big binoculars always does it for me. Observing galaxy clusters containing dozens of visible galaxies really does it for me. Laying on my back on the ground at night, stuck to this large 3rd rock looking down into the cosmos, and trying to feel the earth rotate never fails to invoke awe. What does it for you? Regardless, it turns out that experiencing this emotion can be very beneficial and is an important aspect of a life well lived.

It turns out that a whole science of studying awe has sprung up in the last 15 years or so. Psychological studies have verified the beneficial nature of awe. I don't have the space for details, but a good list of the benefits can be found here: https://greatergood.berkeley.edu/article/item/eight_reasons_why_awe_makes_your_life_better. Some of the key benefits center around the fact that awe fosters an attitude of intellectual humility. It can help you to cultivate what the Japanese call shoshin, a Zen term that translates as 'beginner's mind'. It makes you realize that you don't have all the answers which can help to counteract closed minds, which in turn is one of the reasons awe is seen as helping to bring people together.

Here are some awesome facts to consider while you watch our two largest planets slide past each other in this magnanimous conjunction: You could fit 1300 earths inside of Jupiter and 700 earths inside of Saturn. If you could place a copy of earth in orbit around Jupiter, it would only appear slightly larger than the existing moons of Jupiter. The diameter of Saturn's rings is ¾ of the distance between the Earth and the Moon. Both of these huge planets rotate in just 10 hours. Although they are looking really close together this month, Saturn is twice as far away as Jupiter. It takes Jupiter's reflected light 48 minutes to reach us. Saturn's takes 90 minutes. The first good estimate of the speed of light was derived by timing the eclipses of Jupiter's moons. Enjoy the conjunction1 I'll talk to you in 2021.

Terry

December 11 / 7:00 pm - 11:00 pm

Traditional Austin Astronomical Society Holiday Party.

Austin Astronomical Society
...keeping Astronomy weird since 1969

As close as virtually possible to a social gathering. Any and all attending members are invited to bring their 2-minute video or slide presentation to share with us. After the (short) business meeting, we will set up into Zoom "chat rooms" for small groups. At the end of the night, we will announce the winner of the "Image of the Year" award. Contestants are the 12 "Image of the Month" winners. Members will have voted via the AAS website.

Inside This Issue

AAS Affiliations

ida INTERNATIONAL DARK-SKY ASSOCIATION

http://darksky.org/

Night Sky Network

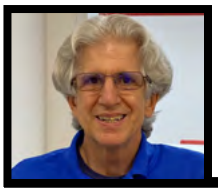
https://nightsky.jpl.nasa.gov

ASTRONOMICAL LEAGUE

https://www.astroleague.org/

TEXAS space grant consortium

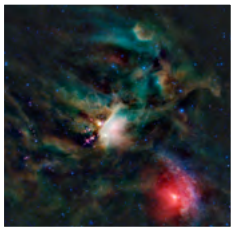
http://www.tsgc.utexas.edu/



On the Horizon: General Assembly Meetings

By **Michael E. Marotta, Vice President**

January 8, 2021 "Spectroscopy" by Tom Field, inventor of spectroscopy tools for educators and hobbyists. It is now possible for amateur astronomers to image, record, and analyze the spectra of our targets. Spectroscopy reveals chemical signatures, red shifts, and blue shifts. Modern equipment screws into your telescope eyepiece or camera objective. Computer software supports your analysis of your images.



February 12, 2021 Young Stars in Our Neighborhood by Ronan M. Kerr, University of Texas. The Sco-Cen (Scorpius-Centaurus) association consists of spectral classes O and B. Kerr's research is identifying some new young stellar groups first the time. His presentation will explain the star formation history and structure found in Sco-Cen, and reveal the larger-scale architecture of star formation in our stellar neighborhood.

March 12, 2021: To be Announced.

April 9, 2021: The Heaven Watcher's Observatory with Rev. Jason Fry and Rob Teeter of Teeter's Telescopes (https://www.teeterstelescopes.com) maker of custom-built ("bespoke") instruments such the one shown here with Jason Fry who views the sky from his "Cielo Vista Observatory" seven miles south of Alpine, between Fort Davis and Big Bend.

May or June: (tentative) – Karl Herzog, (MS ChemE) on the Solar Eclipse of 2024 and where to view it best.

May or June (waiting for date) Dr. Moribah Jah, University of Texas, on non-gravitational orbit plotting.

Redshift—The October 2020 Meeting with Scott Roberts of Explore Scientific and Stuart Parkerson of Astronomical Technology Today. Archived on YouTube here: https://www.youtube.com/watch?v=Ubx-qbMS4-vY
(or Search for Austin Astronomical Society.)

Redshift—Kurt Baty's September 11 presentation, "The Antikythera Device," could not be livestreamed to YouTube because it included copyrighted material from PBS Nova and other sources. However, you can view a short presentation by Kurt for "Brick Fiesta 2017" a Lego convention on "Beyond the Brick" on YouTube here https://www.youtube.com/watch?v=t1I1kdW3wgE

THE **ALCOR**NER

Your Astronomical League Update

By Dawn Davies, AAS Astronomical League Correspondent (ALCOR)

These are trying times we are in for the obvious reasons and because though we may be near our observing gear, constantly, the skies have not been too accommodating. That being said, there are still things you can do with your time indoors.

Take this time to:

- Catch up on reading the Astronomical League's quarterly publication, The Reflector. Current and past issues can also be found on the AL's website.
- Complete those observing program logs you keep saying you are going to finish.
- Submit a proposal for a new observing program, details and instructions here.
- If you are working on your Herschel II, click here to read about upgrades to the list.

As most of you may know, the Astronomical League Convention in Albuquerque has been cancelled. And while we were unable to hold our Messer Marathon last month, rest assured that the first chance for us to meet in person and observe together again at Bad Wolf Ranch will be a night to celebrate.
Until then consider working on one of the AL observing programs that does not need clear and dark skies:

- Analemma
- Astronomy Before the Scope
- Citizen Science
- Constellation Hunter – Northern Skies
- Dark Sky Advocate
- Hydrogen-Alpha Solar
- Lunar and Lunar II
- Radio Astronomy
- Spectroscopy
- Sunspotters

Feel free to reach out if you have any questions about all things AL related, and even those that are not.
Stay healthy, be well, and as always…

Clear Skies,

Dawn

Focus on Simon Plössl

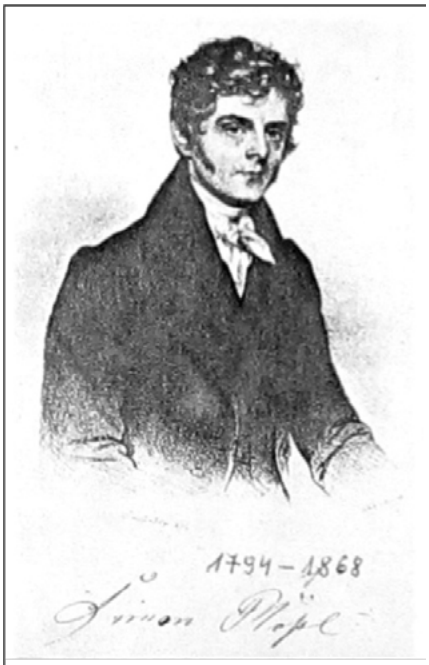
By **Michael E. Marotta**

Focus on Simon Plössl

By Mike Marotta

The Ploessl ocular ("eyepiece") is easily the most popular design in the hobby. Regardless of focal length, from 40 mm to 4 mm, they are common because they are inexpensive and they reasonably support the limits of the largest amateur instruments. Better designs are available, but at a greater cost. A modest instrument under city skies usually will not benefit from the improved optics of better eyepieces such as the orthoscopic and Nagler oculars. Thus, the Ploessl is the first choice, whether for a refractor, reflector, or catadioptric telescope. For all of its ubiquity, its inventor, Viennese optician Simon Georg Ploessl is not widely known among astronomers.

Say it Right



Portrait by Josef Kriehuber (Wikicommons)

First of all, he spelled his name Plößl and that almost rhymes with the English word "vessel." The character that looks like a capital-B ß is a double-s. It is called an "Eszet" or "sharp-ess" (scharfes-Ess) from a time when German orthography spelled words like der Fuss (der Fuß: the foot) as der Fusz to show that it had a hissing-s sound, not the unvoiced fricative that we know in English as "sh" in "shoe" or "push."

The umlaut-o ö is sounded by rounding your lips to say English long-o, but instead, saying English long-a. If you did not grow up speaking German, then "Plessl" is close enough. That is because three consonants follow the vowel. Each one clips some time off the sounding. The word for "height" die Höhe sounds like an American calling their friend from across a room "hey-yeh" not the short laugh "heh."

The double-dots are a medieval shorthand for a little letter e that was placed over the o to show the shifted sound. Thus, the questionably undead cat is not as if in English long-o "Shro-din-jer's" but umlaut-ö as if in English like "Shray-ding-er's." For the signature on his nameplates, Ploessl also used the ligature œ (oe), a less common flourish.

If your typewriter has no umlaut vowels (ä ö ü) or a sharp-s (ß), you can use an e and a double-s. Thus, Plößl (which is how he spelled it) is accepted as Plössl or Ploessl, but spelling the name Plossl or saying it that way is wrong.

From the Microscopic to the Macroscopic

Georg Simon Plößl (1794-1868) was born in Wieden, which had been an independent villa in the Middle Ages but by the 18th century already lay within Vienna's shadow. He was the son of a cabinetmaker. And therefore an apprentice in his father's shop, beginning as a lathe operator (turner). When he was 18, he left for the optical firm Voigtländer, starting on May 9, 1812.[5] Also, he apparently preferred Simon as his given name, but alternated Geog Simon and Simon Georg.

In 1823, he moved back to his father's home and began his own laboratory and workshop for investigations into the production of optical instruments. [1] In 1828 he was open for sales.[2] At first, Ploessl made microscopes, and he soon became famous for them.

His company took off (and took a new direction) when he sold a microscope to Joseph Franz von Jacquin, professor of botany and chemistry at the University of Vienna. Von Jaquin introduced Ploessl to the astronomer Joseph Johann von Littrow for whom he built a telescope in 1830.

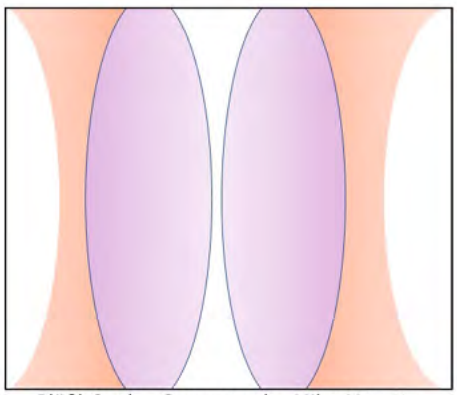
At Viennese industrial fairs in 1835, 1839, and 1845, Ploessl was granted gold medals in recognition of the exemplary products of his workshop. In 1847 another gold medal was bestowed by the Emperor Ferdinand. The emperor also commissioned him to build a telescope which was gifted to the Vizier of the Ottoman Empire. [7] Some sources say that it was for the Sultan.[6]

By 1850, in addition to the microscopes which were the primary production of his firm

Ploessl had delivered refractors to observatories in Romania (Iasi; 6.4 inches), Hungary (Biczke; 8.5 inches) [4], Greece (Athens; 8 inches), and Russia (Pulkovo; 6.4 inches). In 1851 the firm delivered an 11-inch f/11.8 refractor to the Vizier. Yielding 610x magnification, it was said to divide *gamma Coronae Borealis*: 0.6 seconds of arc at 4th and 7th magnitudes. (That was according to 19th century reports. A modern paper identifies the Athens instrument as 162-mm (6.37 inches) [1].) A few other Ploessl telescopes have been located. His firm also built dipleidoscopes for determining the exact time of high noon to within a second of arc, one part in 3600.

All of his telescopes had objectives of crown glass. They followed the Fraunhofer design of a concave and convex lens pair, but did not use flint glass which was rarer in large, high-quality blanks. Consequently, the essential element in the design was the secondary lens system, a flint glass ocular that minimized chromatic aberration. That was Ploessl's stellar achievement.

The Ploessl Ocular Lens System



Plößl Ocular Geometry by Mike Marotta

Two pairs of lenses match convex and concave curves, and the pairs are separated by a gap. The concave lenses are at the extremes, the convex face each other in the center. This design was not a happenstance. The Voigtländer firm was founded in 1763 when Johann Christoph Voigtländer received a monopoly charter ("protection decree") from the Austrian monarchy to produce mathematical instruments. Fifty years later, Ploessl studied mathematics and optical theory at the firm while rising from apprentice to journeyman.

Three factors kept this system from becoming widely accepted. First, telescopes are durable goods. Better ones have been built since 1610, but the old ones still work. The Ploessl refractor in Athens served the university until 1940. Second, astronomy was a private pursuit for intellectuals of independent means. While Britain had its Royal Astronomer, few such public posts existed elsewhere. Ploessl built telescopes for state enterprises in Greece and Russia, but he built more for wealthy patrons in Hungary, Romania, and Italy. Only with the explosion of science in the 20th century was there any broad consumer demand for the instruments of empirical discovery. Third, as prosperous as the Ploessl firm was, it was a sole proprietorship. When Simon Ploessl was killed by a falling sheet of glass in 1868, there was no one to step into leadership. The firm continued until 1905, but there was no visionary to drive the effort.

Enter Al Nagler

In 1977, Al Nagler founded Tele Vue Optics, Inc., of Chester, New York, world class creators of oculars. He gave an extensive interview to *Astronomy* magazine in 2015 and they posted it as a blog. It is archived at *http://cs.astronomy.com/asy/b/astronomy/archive/2015/10/13/the-evolution-of-eyepiece-developments-at-tele-vue.aspx* The story is enjoyable and edifying. Briefly, he said:

"While the Nagler was the first eyepiece I designed for Tele Vue, I feared entering the astronomy market as an unknown "kitchen-table" company with such an expensive eyepiece. This caution led me to produce a Plössl eyepiece first, to gain reputation, experience, and capital."[7]

References and Further Reading

[1] The Hellenic Archives of Scientific Instruments at *http://www.hasi.gr/makers/ploessl-georg-simon*

[2] *https://de.wikipedia.org/wiki/Simon_Plößl*

[3] *Looking at the Skies for 175 Years: The 162-mm Ploessl Refractor and the 400-mm Gautier Refractor of National Observatory of Athens,* Panagiotis, Lazos and Tsimpidas, Dimitrios; XXXVII Scientific Instrument Symposium, 3-7 September 2018, Leiden and Haarlem.

[4] *https://en.wikipedia-on-ipfs.org/wiki/Bicske.html*

[5] "Plössl-Mikroskope - ein Vergleich mit modernen Geräten," by E. Steiner and P. Schulz, ©Naturhistorisches Museum Wien, download from *www.biologiezentrum.at*

[6] "The Achromatic Telescope, Dialytes, and Fluid Lenses--Nebula--Double Stars—Occultations" by the Rev. T. W. Webb, A.M., F.R. A. S., *The Intellectual Observer*, Groombrdige and Sons, London, No. XLIX, February 1866,

[7] "The evolution of eyepiece developments at Tele Vue," Posted by Michael Bakich on Tuesday, October 13, 2015, A guest blog by Al Nagler. *Astronomy*.

Outreach Report **December 2020**

By Joyce Lynch, Outreach Chair

Although in-person star parties are still on hold, we did a virtual event for the City of Bee Cave on November 5. Terry Phillips, Dawn Davies, Jamie Canfield, Jim Lynch and I were on a Zoom call with about 60 visitors at one point. Although Jim had some technical difficulties with his camera and Dawn got booted out of a parking garage at the Domain where she had gone for a better view of the sky, we did manage to do astronomy for over 90 minutes. Terry used Stellarium to talk about the planets in the sky at the moment and the upcoming conjunction of Saturn and Jupiter as well as some winter objects that are starting to be visible. Dawn changed her location and showed Mars and some double stars using her scope and phone. There were a lot of questions and positive feedback from visitors, and we learned some lessons about what to do and what not to do in a virtual event.

Joyce

In case you haven't looked at our website recently, here is the list of astronomy websites that are posted as a (poor, admittedly) substitute for going to actual star parties.

- skymaps.com -- Free monthly sky maps
- heavens-above.com -- Location-specific schedules for flyovers of satellites, Hubble Space Telescope, International Space Station
- earthsky.org -- EarthSky Tonight--articles on what to look for in the sky each night
- https://apod.nasa.gov/apod/archivepix.html -- Astronomy Picture of the Day
- stardate.org -- Current observing information and educational resources produced by UT's McDonald Observatory
- skyandtelescope.com -- Sky and Telescope magazine—interactive star charts, articles on observing, selecting equipment, everything astronomical
- pbase.com/missouri_skies/moon_page -- Moon photos
- hubblesite.org -- Information about and photos from the Hubble Telescope
- twanight.org -- The World At Night photographs and time-lapse videos of the world's landmarks against celestial attractions
- bludja.blogspot.com/2006/06/relative-size-of-planets-stars.html -- See how objects in our solar system compare with distant stars
- astrosociety.org -- Astronomy Society of the Pacific—astronomy education

Calendar of Events

11 Dec 2020
Austin Astronomical Society
Holiday Party
7:00 PM - 11:00 PM
Zoom Video Party
@ Stay at Home

4 Jan. 2021
Executive Committee Meeting
7:00 PM - 8:30 PM
Zoom Video Meeting
@ Stay at Home

8 Jan 2021
General Assembly Meeting
7:30 PM
Zoom Video Meeting
@ Stay at Home

Visitors to Both Jupiter and Saturn

By David Prosper

Have you observed Jupiter and Saturn moving closer to each other over the past few months? On December 21, the two worlds will be at their closest, around 1/5 of a full Moon apart! While the two gas giants may appear close, in reality they are hundreds of millions of miles apart. Despite this vast distance, a select few missions have visited both worlds by using a gravity assist from giant Jupiter to slingshot them towards Saturn, saving time and fuel.

Pioneer 11 was the first mission to visit both worlds! Launched in 1973, the probe flew past Jupiter in late 1974, passing just 26,400 miles above its stormy clouds. In 1979, it became the first spacecraft to encounter Saturn. Pioneer 11 took the first up-close photos of Saturn and its satellites, and made many exciting discoveries, including the detections of its magnetic field and a faint "F" ring, before departing Saturn and eventually, the solar system.

The Voyager missions quickly followed up, taking a "Grand Tour" of the four largest and most distant planets in our solar system. Both probes were launched within two weeks of each other in 1977. Voyager 1 flew past Jupiter in March 1979, discovering Jupiter's faint ring and two new moons, along with active volcanoes on Io's surface! The probe then flew past Saturn in November 1980, discovering five new moons, a new "G" ring, mysterious ring "spokes," and "shepherd moons" shaping the rings. After a brief encounter with Titan revealed evidence of complex organic chemistry and liquid on the moon's frigid surface, Voyager 1 was flung out of the plane of the solar system. Following close behind, Voyager 2 took detailed photos of Jupiter's moons and cloud tops in July 1979. Flying past Saturn in August 1981, Voyager 2 measured the thickness of Saturn's rings and took detailed photos of many of its moons. This second explorer then captured images of Uranus and Neptune before leaving our solar system.

Caption: The difference in technology between generations of space probes can be stunning! The top two photos of Jupiter and Saturn were taken by Pioneer 11 in 1974 (Jupiter) and 1979 (Saturn); the bottom two were taken by Cassini in 2000 (Jupiter) and 2016 (Saturn). What kinds of photos await us from future generations of deep space explorers?

Cassini-Huygens was the last mission to visit both worlds. Launched in 1997, the mission flew past Jupiter in late 2000 and took incredibly detailed photos of its stormy atmosphere and faint rings. Cassini entered into Saturn's orbit on July 1, 2004. The Huygens probe separated from Cassini, landing on Titan to become the first probe in the outer solar system. Cassini discovered geysers on Enceladus, fine details in Saturn's rings, many more moons and "moonlets," the changing oceans of Titan, and seasonal changes on Saturn itself. After revolutionizing our understanding of the Saturnian system, Cassini's mission ended with a fiery plunge into its atmosphere on September 15, 2017.

What's next for the exploration of the outer worlds of our solar system? While Juno is currently in orbit around Jupiter, there are more missions in development to study the moons of Jupiter and Saturn. Discover more about future NASA missions to the outer worlds of our solar system at nasa.gov.

Bad Wolf Ranch – AAS's Dark Sky Site

In this time of Covid-19 danger, the club has cancelled all member star parties until further notice.

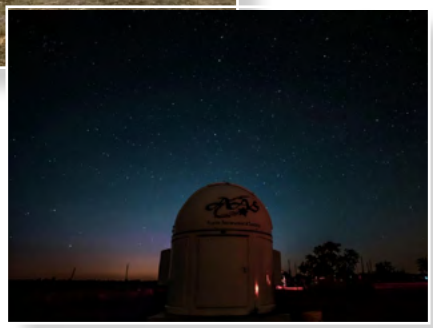
For individual viewing nights the club requires physical distancing or wearing of masks when visiting between unrelated groups. Be safe, we value the well–being of our members and their families.

Bad Wolf Ranch?

Thanks to AAS members, Alan and Carolina Carruth, our club has the use of Bad Wolf Ranch for member-only star parties, special events like the 50th anniversary of the Apollo landing, **AND** private observing any night for every member and her guests.

The ranch is located approximately 15 miles NNW of Lampasas and 60 miles from Austin in an open area with only a few ranch houses within several miles. Most importantly, there is a porta-potty that is serviced on a weekly basis.

Although undeveloped there is a ranch building (off limits to AAS) and a small AAS dome with a 12.5-inch scope available to members. The skies are dark - in the rural/dark sky transition zone



Sample SQM readings at 10:30pm on 4/20/2020:

Zenith – 21.41
North – 21.53
East – 20.95
South – 21.22
West -21.18

Be prepared

- Bring your own power – not available on site
- Bring your own water - not available on site
- Watch out for cow patties and ants

Bad Wolf Ranch Rules at all Events

- No Loud music
- No Tampering with fences or gates
- No Hunting of any sort
- No Activities which materially interfere with owners use and enjoyment of his/her adjacent lands.
- No access to owner's structures
- Don't damage, deface or destroy any property or improvements
- AAS members are responsible for closing and locking all gates when leaving
- No Discharge of firearms or fireworks

Member Individual Observing

To arrange for private observing contact Alan Carruth for permission:
badwolfranch@bobogigio.com

if you do not receive a reply in 24 hours permission is granted

As a reminder, in this time of Covid-19 danger the club requires physical distancing or wearing of masks when visiting between unrelated groups. Be safe, we value the well – being of our members and their families.

Most importantly, enjoy a night under the stars at Bad Wolf Ranch

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I always appreciate comments and suggestions after your visit. Many members are working to improve everyone's experience. Your suggestions are vital.
For directions contact: tbrown@timobrown.com, or feel free to call or text me at: (512) 577-8340.
Tim Brown, Member Services Chair

Observing Targets December 2020

By Brian Cuthbertson

December, especially in 2020, probably isn't the best month for amateur astronomy. Mix in the holidays, a pandemic, and some political pandemonium, and astronomy seems, well, a little far out there. But rest assured, the complete craziness down here this year adds up to all of nothing compared to the sheer totality of what's up above our heads. So keep a sense of humor, a sense of scale, and if you have some spare time, get out and enjoy wandering thru that greater reality up there after dark. Oh, and bring a mask if friends come along.

Zeta Persei & friends rating EASY

II Persei OB association
RA 03h 54.1m Dec +31d 52.9' (2000)
Magnitude 2.9

Zeta Persei, also known as Atik, is located in southern Perseus just north of the Taurus border. It's an easy naked-eye star marking the end of Perseus' eastern leg. At a distance of roughly 1000 light-years, Zeta is one of the most luminous stars in Perseus - a B1 supergiant about 6300 times brighter than the Sun.

Zeta is the brightest member of the "II Persei" OB stellar association, also known as the Zeta Persei group, an expanding group of hot O and B class stars in the direction of the outer (Orion) arm of our galaxy. Association members appear to be moving outward from a common center at a velocity of about 12 km/sec. The group is apparently extremely young on the astronomical time-scale, since outward expansion to its present size would require only about 1 million years. 15 other stars brighter than 6th magnitude are also members of this group. Among them are Omicron Persei (3.8), 40 Persei (5.0), 42 Persei (5.1), and to the north, XI Persei or Menkib (4.0).

Some very conspicuous nebulosity still exists in the group, suggesting that star formation may not be completely done in the region. For example, Omicron Persei is involved in the faint cloud IC 438. And Xi Persei, on the north edge of the group, seems to be the star illuminating NGC 1499, the huge "California" nebula, which lies just to its north and seems to share the outward expansion of the group. Spanning over 2.5 degrees, NGC 1499 has very low surface brightness and is primarily a photographic object. Its main emission line is H-alpha (hydrogen emitting at a wavelength 656.3 of nm) at the red end of the visible light spectrum. However, visually the nebula is best observed with an H-Beta filter (486 nm) in a rich-field telescope under dark skies.

M34 rating MEDIUM

open cluster in Perseus
RA 02h 42.0m Dec +42d 46.9' (2000)
Magnitude 6.0 dia 25'

Discovered by Charles Messier in 1764, M34 is a binocular star cluster that's visible to the naked eye in dark skies. You can find it in Perseus near the Andromeda border, about 5 degrees west and 1 degree north of 2nd-magnitude Beta Persei (Algol). Another route is to move 8 degrees due east from 2nd-magnitude Gamma Andromedae (Almach). In general appearance, brightness and size, M34 resembles cluster M36 in Auriga; both are at their best in fairly low power wide-angle eyepieces. In fact, T.W. Webb called M34 "a very grand low power field; one of the finest objects in its class". However it does not bear magnification well due to a lack of faint stars. Walter Scott Houston noted that 15x65 binoculars give the best impression, but that more magnification merely spreads out the few bright stars that binoculars show perfectly well. Visually, M34's trademark is 4 pairs of stars in its center. One pair, wide and bright, is oriented E-W. To its north, the other three pairs form a parallel row. M34 lies roughly 1500 light-years away, making its central areaa about 4 light-years across,

and its extreme group diameter about 18 light-years. Cluster color-magnitude studies imply it's slightly older than the Pleiades or M36, with an estimated age of just over 100 million years.

NGC 1316 rating HARD

galaxy in Fornax
RA 03h 22.7m Dec -37d 12.3' (2000)
Magnitude 11.0 71.x5.5'

NGC 1316 is a big elliptical on the west edge of the Fornax I galaxy cluster, which straddles the southern Eridanus/Fornax border. There aren't many bright guidepost stars in the area, but you can find the galaxy about 6 degrees NE of the 3rd magnitude double star Acamar (Theta Eridani).

Although visible in scopes as small as a 2.4-inch refractor, NGC 1316 is best observed with a 12-inch class scope or larger. You'll see a 40" core containing a bright nonstellar nucleus in an oval 3' disk.

NGC 1316 is the brightest member of the Fornax cluster, which is a compact group of 18 bright galaxies plus a number of fainter ones. NGC 1316 itself is a peculiar system which appears to be either an elliptical or S0 galaxy, and is coincident the strong radio source "Fornax A". It's similar to peculiar galaxy NGC 1275, which is also the bright member of its galaxy cluster (Perseus I), and is known as radio source "Perseus A".

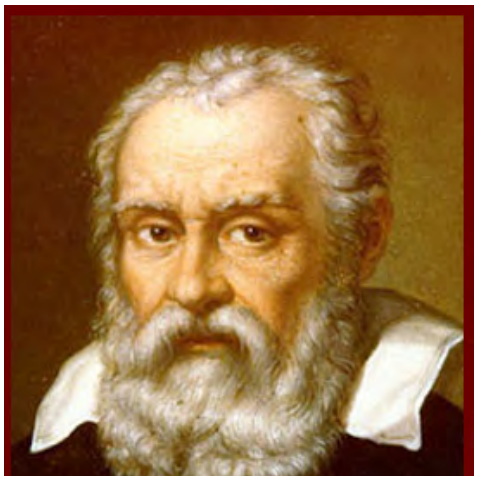
Deep images reveal that NGC 1316 is peppered with lots of dust clouds, and surrounded by a complex envelope of faint material, several loops of which appear to engulf smaller companion galaxy NGC 1317, 6' to the north. Astronomers consider this a case of galactic cannabalism, with larger NGC 1316 devouring its smaller neighbor, a theory supported by several observed features of the system including its strong radio emission.

Composite radio images show radio lobes straddling the galaxy. The filamentary lobes are full of relativistic plasma which probably came from NGC 1316's active nucleus.

As icing on the cake, NGC 1316 was chosen as one of five galaxies whose Hubble Space Telescope images were put on US postage stamps back in 2000. Any celestial philatelists out there? The galaxy's distance is about 55 million light years, so extra postage may be needed.

The Discoveries of Galileo – Part 5: The Milky Way, Orion, and Asterisms

By Ed LaBelle, Psalm 19 Astronomy



This is the final article on the Discoveries of Galileo from 1609 to 1612. His discoveries of Jupiter, sunspots, the Moon, and Venus were covered in parts one through four of this series. This article will cover Galileo's observations of the Milky Way, the constellation Orion and star clusters or what we term today as asterisms.

I have touched on the prevailing European natural philosophy (the precursor to modern science) of the 17th century and the Roman Catholic Church's involvement in censoring any ideas believed to be heretical i.e. counter to the Church's interpretation of scripture. The Greek philosopher Aristotle (384 – 322 BC) had proposed in the 4th century BC that the Earth was the center of the universe and all the celestial objects rotated around the Earth on fixed spheres. The Sun's sphere rotated in 24 hours, the Moon's in 28 days, and the stars in one year. The planets each had their own spheres of differing time period. The other idea from Aristotle was that the heavens and all celestial objects were perfect and unblemished. Claudius Ptolemy (c. AD 100 – c. 170) of Alexandria (a Greek city in what is now Egypt) wrote a treatise of his celestial observations that was published as the Almagest around 150 AD. This was the most influential manual on astronomy that held reign for about 1500 years. In this multi-book tome Ptolemy documented 1022 stars in 48 constellations (Britannica.com).

Figure 1. Galileo's drawing of the three belt stars (top: Alnitak, Alnilam, and Mintaka) and eight sword stars of Orion included another eighty previously unseen stars. The Great Orion Nebula is located in the middle of the four larger middle stars. Image credit: Library Of Congress, Rare Book And Special Collections Division/science Photo Library.

Keying off Aristotle's idea of the heavens being perfect, many natural philosophers believed that all of the stars had been documented by Ptolemy and no new stars existed. The Milky Way was an enigma for the prevailing cosmology up to the discovery of the telescope. It appears to the naked eye as a diffuse irregular band of light high in the heavens. The name comes from the Greek word "'galactos' which literally means 'the milky thing in the sky'"1 For Aristotle, the Milky Way was the point in the universe where the celestial spheres came into contact with the terrestrial spheres.2 Galileo shattered the belief of there being no new stars when he discovered the moons around Jupiter and again when he pointed his spyglass to the Milky Way.

Galileo wrote in the March 1610 pamphlet Sidereus Nuncius (The Starry Messenger) the following, "*…I have observed the nature and the material of the Milky Way. With the aid of the telescope this has been scrutinized so directly and with such ocular certainty that all the disputes which have vexed philosophers through so many ages have been resolved,…The galaxy is, in fact, nothing but a congeries of innumerable stars grouped together in clusters.*" (Discoveries, p.49). And just like that, Galileo shattered the prevailing belief that the number of stars was fixed and unchangeable. Not only are the numbers of stars not fixed but they are a disordered jumble and innumerable. Galileo continued, "*Upon whatever part of it the telescope is directed, vast crowds of stars is immediately presented to view.*"

The band of stars were so numerous that Galileo didn't bother making any detailed drawings of the stars. And one cannot blame him considering the low magnification and narrow field of view of his rudimentary telescope (about 21x magnification and 0.9 degrees). Galileo expressed how daunting the task was to capture stars with such a narrow field of view when observing the constellation Orion.

Galileo wrote, "…*I had intended to depict the entire constellation of Orion, but I was overwhelmed by the vast quantity of stars and by limitations of time, so I have deferred this to another occasion. There are more than five hundred new stars distributed among the old ones within limits of one or two degrees of arc*" (Discoveries, p. 47).

It's interesting to note that Galileo didn't draw or describe the Great Orion Nebula which is one of the winter sky's most interesting naked-eye white fuzzy objects. The large nebula should have been quite noticeable and awe inspiring to look at magnified for the first time. I have an antique refractor telescope with a magnification of about 17x which would have been similar to what Galileo was using when he looked at Orion in February 1610. I took it out in mid-November to look at the nebula

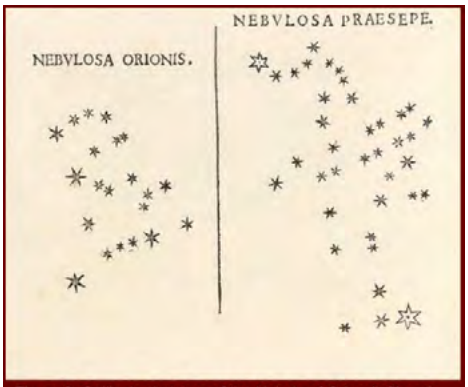


Figure 2. Galileo's sketches of the Nebula of Orion (left) and Praesepe (right). The Nebula of Orion is what Galileo described as the "Head of Orion" and looks to be a sketch of the stars around Meissa. It should not to be confused with the Great Orion Nebula. Image credit: Library Of Congress, Rare Book And Special Collections Division/science Photo Library

and could easily see that the large white fuzzy object was some type of celestial cloud. So, it puzzles me that Galileo didn't sketch or mention the nebulosity. Historians suspect that Galileo may not have trusted what he was seeing when looking at the nebula due to a combination of poor-quality optics and narrow field of view.

However, Galileo does mention other "*nebulas*" when writing about the Milky Way in Starry Messenger. He wrote, "*And what is more remarkable, the stars which have been called "nebulous" by every astronomer up to this time turn out to be groups of very small stars arranged in a wonderful manner.*" (Discoveries, p. 49-50). He then includes a sketch of the nebula he called the Head of Orion which had twenty-one stars (the asterism around Meissa - λ Ori) and the nebula Praesepe "*which is not a single star but a mass of more than forty starlets.*" (Figure 2, Beehive Cluster (M44), Discoveries, p. 50)

Galileo also peered at the Seven Sisters or Pleiades and found numerous stars there visible with his spyglass. He wrote, "… *I have depicted the six stars of Taurus known as the Pleiades (I say six, inasmuch as the seventh is hardly ever visible) which lie within very narrow limits in the sky. Near them are more than forty others, invisible, no one of which is much more than half a degree away from the original six. I have shown thirty six of these in the diagram…*" (Figure 3, Discoveries, p. 48-49).

In summary for this series, Galileo is rightfully considered to be the father of our modern scientific method. In his pursuit of knowledge, he developed an experimental method to test for assumptions such as how bodies fall or float on water. Thus, Galileo used observational astronomy to shed new light on our solar system and helped to dethrone the ancient Greek beliefs about the universe. He showed that celestial objects such as the Moon and Sun were not perfect spheres, that Jupiter had moons,

Figure 3. Galileo's sketch of the Seven Sisters, Pleiades. Image credit: Library Of Congress, Rare Book And Special Collections Division/science Photo Library.

that Venus orbited around the Sun, and that there were innumerably more stars than those visible to the naked eye.

Galileo was arrogant and often condescending in his writings which got him in trouble with peers and the Church. He was unconventional in that he preferred to publish his discoveries in the local Italian vernacular instead of the accepted Latin. This singular action by Galileo brought the field of scientific inquiry from the elite ivory towers down to the common people. In the end, Galileo paved the way for the acceptance of the Copernican heliocentric theory within a few decades after his death in 1642.

1. https://www.livescience.com/56756-milky-way-name-origin.html

2. https://www.loc.gov/collections/finding-our-place-in-the-cosmos-with-carl-sagan/articles-and-essays/modeling-the-cosmos/the-milky-way-one-of-the-many-galaxies

Ed LaBelle has been a member of AAS since 2010. He has worked as an engineer in the semiconductor industry for 30 years and is the founder of the Psalm 19 Astronomy Society based in Austin.

Image of the Month

December 2020

Congratulations to
Robert Van Gulick

The Great Comet Neowise

The Great Comet Neowise taken from the XBar Ranch in Eldorado

Members' Gallery

by Robert Van Gulick

Pelican Nebula in SHO

taken from XBar at the Eldorado Star Party in October

by Eric Dreher

Flaming Skull

NGC7822, the Flaming Skull Nebula, taken during October and November, 2020

Stellarvue SVX102T
Astro-Physics Mach1GTO
ASI1600MM Pro
Baader Ha, SII, and OIII filters
8 hours integration

Members' Gallery

by Nathan Morgan

Elephant Trunk Nebula

This is a Bi-Color processed version of the Elephant Trunk. It has 20 hours of HA and 10 hours of SII.

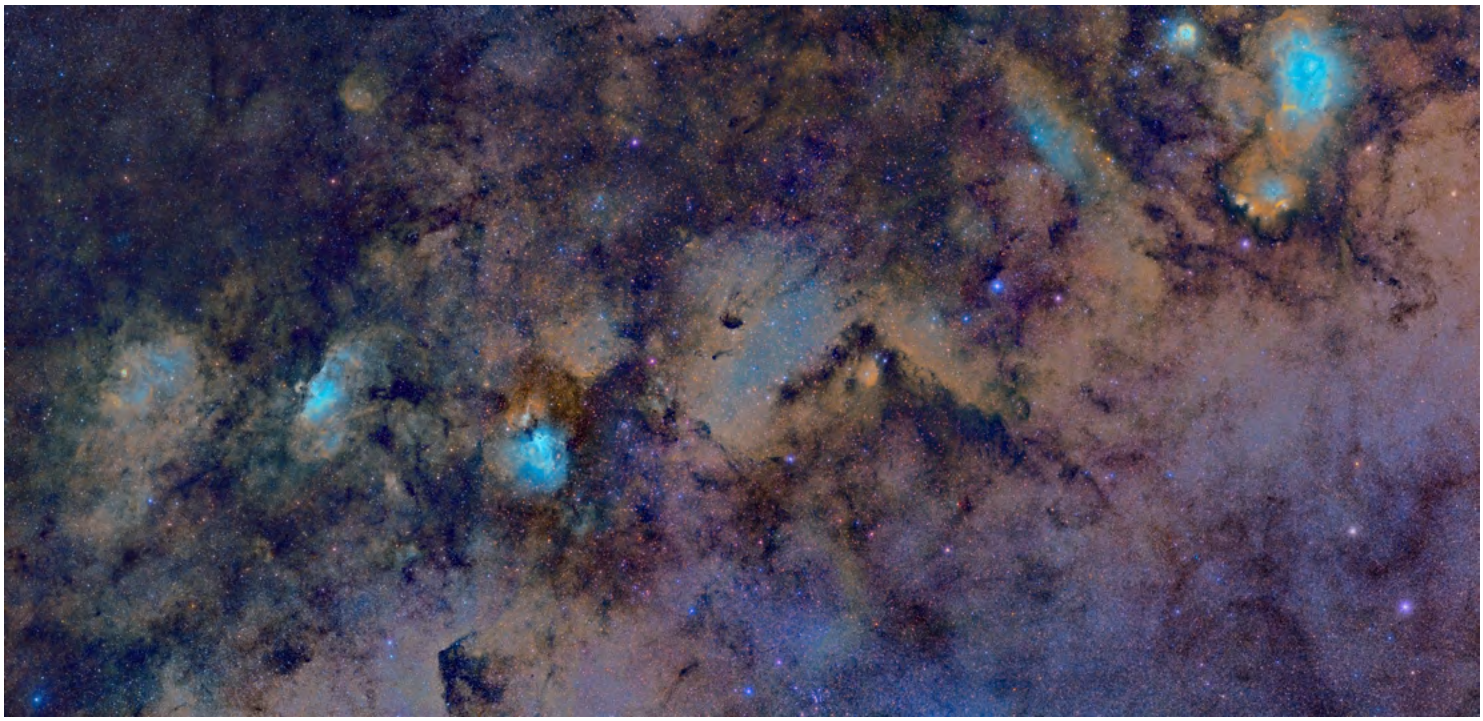
by Tom Richter

Moon

Photo of the deep penumbral eclipse on Nov 30 last month. Photo taken from Cedar Park at 3:42 am CST within a minute of mid eclipse with 83% of the moon in the penumbra (north side of the moon deepest in the shadow) Shot with a Samsung L77 point and shoot camera handheld through a Celestron C5+ with a 32 mm Erfle eyepiece. The camera auto selected ISO 50, F7.0, 1/160 s exposure.

by Chris Foster

Sagittarius Super Wide Field in LSHO



Treasurer's Report November 2020

By Patrick McPhee, Treasurer

Account	January 2020	February 2020	March 2020	April 2020	May 2020	June 2020	July 2020	August 2020	September 2020	October 2020	November 2020
▸ Assets	$18,243.07	$17,936.59	$16,962.97	$16,727.41	$23,636.74	$23,094.22	$21,935.00	$24,635.83	$24,375.11	$24,046.31	$28,534.38
Liabilities	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Net Worth	**$18,243.07**	**$17,936.59**	**$16,962.97**	**$16,727.41**	**$23,636.74**	**$23,094.22**	**$21,935.00**	**$24,635.83**	**$24,375.11**	**$24,046.31**	**$28,534.38**
	January 2020	February 2020	March 2020	April 2020	May 2020	June 2020	July 2020	August 2020	September 2020	October 2020	November 2020

	2019 7/31/19	2019 8/31/19	2019 9/30/19	2019 10/31/19	2019 11/30/19	2019 12/31/19	2020 1/31/20	2020 2/29/20	2020 3/31/20	2020 4/30/20	2020 5/31/20	2020 6/30/20	2020 7/31/20	2020 8/31/20	2020 9/30/20	2020 10/31/20	2020 11/2/20
▾ Assets	$34,510.99	$33,617.21	$31,016.98	$30,713.99	$20,014.01	$19,604.82	$18,243.07	$17,936.59	$16,962.97	$16,727.41	$23,636.74	$23,094.22	$21,935.00	$24,635.83	$24,375.11	$24,046.31	$28,534.38
▾ Cash	$20,659.89	$19,683.74	$17,065.34	$16,724.94	$6,008.08	$5,580.06	$4,170.82	$3,847.95	$2,845.42	$2,592.85	$9,484.58	$8,927.06	$7,756.64	$10,451.13	$10,182.87	$9,847.73	$14,335.79
PayPal	-$281.37	-$281.37	-$281.37	-$4,681.37	-$4,681.37	-$4,681.37	-$5,543.32	-$5,543.32	-$5,543.32	-$6,143.32	$316.38	$316.38	$316.38	$316.38	$316.38	$316.38	$4,804.45
UFCU Checking	$20,941.26	$19,965.11	$17,346.71	$21,406.31	$10,689.45	$10,261.43	$9,714.14	$9,391.27	$8,388.74	$8,736.17	$9,168.20	$8,610.68	$7,440.26	$10,134.75	$9,866.49	$9,531.34	$9,531.34
▾ Savings	$13,851.10	$13,933.47	$13,951.64	$13,989.05	$14,005.93	$14,024.76	$14,072.25	$14,088.64	$14,117.55	$14,134.56	$14,152.16	$14,167.16	$14,178.36	$14,184.70	$14,192.24	$14,198.59	$14,198.59
REGULAR SAVINGS - DONATIONS	$2,062.16	$2,147.16	$2,148.50	$2,168.50	$2,168.50	$2,169.87	$2,199.87	$2,199.87	$2,211.24	$2,211.24	$2,211.24	$2,212.62	$2,212.62	$2,212.62	$2,214.02	$2,214.02	$2,214.02
UFCU CD-1	$5,894.29	$5,904.32	$5,913.94	$5,923.90	$5,933.56	$5,943.55	$5,953.56	$5,962.94	$5,972.98	$5,982.72	$5,992.80	$5,999.13	$6,002.94	$6,006.75	$6,010.44	$6,014.26	$6,014.26
UFCU CD-2	$5,871.95	$5,879.59	$5,886.60	$5,894.05	$5,901.27	$5,908.74	$5,916.22	$5,923.23	$5,930.73	$5,938.00	$5,945.52	$5,952.81	$5,960.20	$5,962.73	$5,965.18	$5,967.71	$5,967.71
UFCU-SCHOLARSHIPS	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60
Liabilities	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Account	Date	Payee	Category	Amount
▾ UFCU CD-1				$3.82
	10/31/20	Apy Earned Apy	Personal Income	$3.82
▾ UFCU CD-2				$2.53
	10/31/20	Apy Earned Apy	Personal Income	$2.53
▾ UFCU Checking				-$335.15
	10/31/20	Apy Earned Apy	Interest Earned	$0.42
	10/26/20	Life Storage #390 0699143651	Storage	-$75.00
	10/20/20	Paypal	Business Expenses	-$341.90
	10/12/20	Mobile Deposit Ref# 660397	Membership Dues	$15.00
	10/12/20	Mobile Deposit Ref# 660473	Membership Dues	$20.00

Contacts database

Contact type	Current	New in last 7 days	New in last 30 days
Total contacts	632	4	10
Members	419	11	18
Donors	96	-	-
Event attendees	18	-	-

Last 5 donations

Date	Name	
09 Jun 2020	James Spigelmire	$300.00 (USD)
02 Aug 2019	Sean Leary	$1.00 (USD)

EC Minutes October 2020

By Jamie Canfield, Secretary

October 5, 2020

Virtual Meeting hosted on Zoom by Terry Phillips, President

Attending: Terry Phillips, Jamie Canfield, Sean Leary, Greg Rhode, Joyce Lynch, Brian Lippincott, Tim Brown, Dawn Davies, Domingo Rochin, Mike Marotta

Call to order at 7:00 PM.

Vice President – Mike Marotta
(Also see VP report) Received approvals from Scott Roberts and Stuart Parkerson for live-streaming & YouTube for this Friday's GA meeting. Recommend handling future permission requests via email. Mike created a message template. An aside- We could not stream Kurt Baty's presentation last month because it contained copyrighted material.
Received confirmation of receipt of thank-you cards from Kurt, Dr. Bagley and Camilla Chiu.

Treasurer – Patrick McPhee
No Report

Member Services – Tim Brown
Discussion about membership form and terms on the website. We need to make payment options clearer on membership page- *Sean handle this. *Also include a disclaimer that you don't need to use Pay Pal.
There is a possibility for a private star party at Pedernales. Dawn took measurements of the henge stones- we have enough space for social distancing. We will have a questionnaire for people attending, require masks, restricted to 24 people, folks will have to RSVP. Need people to check visitors list and direct parking. *Greg volunteered to help send out invitations to see how many people interested. *Tim will handle the paperwork and send out emails.
For Bad Wolf Ranch, we have to get approval from the Lampassas County Judge for more than 10 people to attend. *Greg take the lead on contacting the County Judge with request for star party at BWF, will work with Tim. * Send email to membership to see who would be interested in attending a well-structured star party at BWF.

Communications – Sean Leary
Asking for info on loaner telescope document so he can link to it. *Sean will be getting with Dawn to take care of this *Dawn get him the latest Excel sheet.
Discussion about setting up our own database instead of paying WildApricot $2000/yr, though they provide a lot of extras such as a mechanism to email membership for renewals, and is also where all our files are, like previous Sidereal Times newsletters.
Beta site is live, let's promote people posting to it!

Equipment – Brian Lippincott
Just loaned out another scope. Terry also has one.
The Messier Observer's Planisphere is no longer available from Mike Krzywonski, but he sold the rights and they are still available thru Amazon and other dealers still listed on the messierplanisphere.com site.
Still working on Conex, some lights already installed, not the red ones yet.
*We need to get with Pat about renewing insurance- now have the Conex & associated equipment to consider.

Outreach – Joyce Lynch
The city of Bee Cave is working Int'l Dark Skies Assoc. and they want to have a party Thurs Nov 5th. Joyce is working with them to get an image from a scope and put it out on a Zoom meeting.
For Star Party requests we also need to make sure there's someone there to answer questions & provide content description. *Will work with Dawn to get that going
From Stephen at Pedernales Falls: "if AAS wants to do a party we will work with you." Our next scheduled party is November 7th. Stephen is planning a Christmas Star Party on December 19th, asked if we could help. He has a mallincam. Decision made to cancel Nov date because of ongoing COVID situation. *Joyce- will tell him not November but we will work on participating in December.
Nothing from Inks Lake.

Members At Large
Domingo
Back in town and willing to take on the Telescope Loaner Program on again. Discussion about the value of the equipment and keeping track of the loaners.

ALCOR – Dawn Davies
Topics for Friday:
The current AL committee elections & appointees.
AL's collaboration with Explore Scientific's Explore Alliance Live to create a twice weekly Global Star Party- Tuesday evening (Friday afternoon in the southern hemisphere), with guest speakers and presenters.
Discussion of plans for Alcon 2021.

Webmaster – Byron Miller
No report.

Old Business
Facebook Page- FB members wanting to be AAS members
We have basic questions on our Facebook page for people wanting to join. The protocol is to message people who get added with those questions. If they don't agree, they're removed. (FB doesn't record the answers to the questions.)
*Dawn email list of FB moderators and information.

New Business
Upcoming GA meeting- We have two people who own businesses- Scott runs Explore Scientific, Stuart Astronomy Technology Today magazine.
*Everyone send any questions you might want to add to the panel
Stuart- magazine- process to access content is a little clunky- need to go to site & create their own account & then enter the group code. *Terry get more info about how it works going forward.

EAA- Electronically Assisted Astronomy- astronomy via remote telescopes, videocams, and the world wide web. Anis Abdul, club member & member of Austin Astrophotographers, is going to join us at Stellar Skies, a remote-controlled observatory. Stellar Skies membership- $6000 to $3000 – also a yearly operational fee, ~$750/yr- whole project is cost-sharing – pay taxes for the land on which your building is erected. AAS might want to adopt a site and install our own equipment, a preconfigured automatic observatory. We would need a group of people to form an SIG to build & operate it. Just making us aware there is an opportunity here.
*Terry get us some more info.

Adjourned about 9:00 PM

GA Minutes October 2020

By Jamie Canfield, Secretary

9 October 2020

Call to order: 7:30 pm Location: Zoom video conference. President Terry Phillips presiding.

38 members attended. Quorum does not apply to remote meeting. No items voted on.

Minutes for the September 2020 meeting approved.

Officer Reports:

Mike Marotta (Vice President):
Created an email template for speakers to give permission for live-streaming and YouTube broadcasting of presentations.
Latest GA speaker line-up:
November – Byron Miller, Astrophotography
December – Newtonmas Party
January - Tom Field, Spectroscopy
February – Ronan Kerr, Young Stars in our Neighborhood
Coming up – Dr. Moriba Jah, Non-Gravitational Orbit Plotting
Mike is working on a March presentation on the 2024 eclipse

Patrick McPhee (Treasurer):
No report, but all seems well.

Brian Lippincott (Equipment):
Loaner Scope Program- Recently loaned out another 'scope package. Working on a 10" inch dobsonan donation. Keeping contact with Domingo.
Conex- Dawn, Greg, Brian continuing to go out there every Saturday. Working on insulation soon, white lighting & AC already in. When we paint we will let folks know- will need to have more hands. Needs to be a gray color to blend in with existing stuctures. Greg shared photos.
.

Sean (Communications)
(From EC meeting) The beta site is live, let's promote people posting to it!

Tim Brown (Member Services):
Greg and Dawn have arranged for private Star Parties at Pedernales Falls soon, working on a public events as soon as we can.
Hope to have webinars soon.

Joyce Lynch (Outreach):
Have a Star Party scheduled for Nov 5th at the city of Bee Cave. Working also with Pedernales Falls for possible events soon.

Regular Features:

Dawn (ALCOR):
New Astronomical League Secretary appointed, along with new elections.
Dates have been set for ALCON 2021 for October, in Albuquerque, NM.
AL has teamed up with Explore Scientific for a Global Star Party, live on Tuesday nights. Includes speakers from around the world, astrophotography, space art, poetry, and door prizes! www.explorescientific.org/live

Brian (What's Up in Astronomy):
NASA's Perseverance Rover: Will use ground-penetrating radar to peer beneath Mars surface. Guitar player was asked to help design a mic for the new rover. A helicopter will attempt the first flight on Mars. Robots on Perseverance will extract and save samples.
Astronomy Not In The News- "Venus may have Phosphine, but Mars has lakes of frozen water".

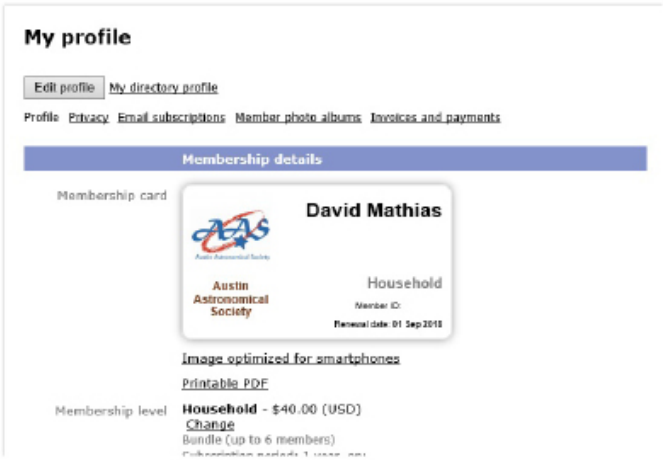
Main Presentation:

Special panel discussion and open Q&A- Stuart Parkerson, founder and publisher of Astronomy Technology Today, with special guest Scott Roberts from Explore Scientific.

Adjourned at approximately 9:15p

Membership Cards Now in Your Profiles

At last, Wild Apricot, our membership database vendor, has made available to its customers membership card templates. Now, under your AAS membership profile you will see a mockup of a card with your name, Membership ID and membership expiration date. You are offered two options for displaying your card: one which is suitable for displaying from a smartphone, and another printable PDF which you can cut and laminate to your heart's delight.



NIGHT SKY NETWORK

The Night Sky Network is a nationwide coalition of amateur astronomy clubs bringing the science, technology, and inspiration of NASA's missions to the general public. AAS members can register with NSN and receive the NSN newsletter and email about upcoming webinars and any additional information or announcements created by the NSN for members. They will be able to search for resources, view all of the toolkits and the files, and access the downloads in each kit.

If you are interested in registering, here is the procedure.

Go to https://nightsky.jpl.nasa.gov/index.cfm
Enter your zip code in the upper right box for CURRENT LOCATION.
Scroll down to CLUBS NEAR YOU and click on AAS.
Click on Register in the toolbar on our page.
Fill out the form and submit.

Your form will be sent to the club for approval.

If you have any questions, email outreach@austinastro.org

Joining AAS or Renewing Membership

To join or renew your membership to AAS, please visit: http://austinastro.org/index.php/why-should-you-be-a-member/ There are six membership levels to choose from:

Household Bundle (up to 6 members) $40.00 (USD)
Renewal: Every one year, starting from join date
No recurring payments. For members of a household living at the same address.

Household With Senior (up to 6 members) $28.00 (USD)
Renewal: Every one year, starting from join date
No recurring payments.
For members of a household living at the same address and at least one member is over 65 years of age.

Junior $15.00 (USD)
Renewal: Every one year, starting from join date
No recurring payments. For members up to age 18.

Students $15.00 (USD)
Renewal: Every one year, starting from join date
No recurring payments. For members age 18 and older.

Regular $25.00 (USD)
Renewal: Every one year, starting from join date
No recurring payments. For individual members.

Seniors $15.00 (USD)
Renewal: Every one year, starting from join date
No recurring payments. For members 65 years of age or older.

Visit Dawn Davies' *Earthbound Astronomer* website at https://www.earthboundastronomer.com/

Amy Jackson's website is http://www.starryskyaustin.com/. Learn more about her children's book about astronomy at http://www.starryskyaustin.com/childrens-book-project/

Rob Pettengill's site can be found at http://astronomy.robpettengill.org/. Rob's material shared per CC BY-NC-SA 4.0 license.

Celestial Teapot's product catalog can be found at http://messierplanisphere.com/

Joseph Macry writes a weekly column for Manor Community News: "This Week in Astronomy". You can read the online edition here: http://manorcommunitynews.com/

Officers of The Society **2020-2021**

President	Terry Phillips	president@austinastro.org
Vice-President	Michael Marotta	vicepresident@austinastro.org
Secretary	Jamie Canfield	secretary@austinastro.org
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