AOH OBSERVER
Fall 2017

The Newsletter of the Astronomers of Humboldt

The Summer of 2017 and Back to Business

The AOH Observer is back after a long summer break, and it is hard to know where to begin. When we left you, members of the AOH were embarking on a busy summer of outreach (we may have set a summer record), traveling to far off places (Ken Yanosko), stargazing (when we could find a place that wasn't foggy), doing astrophotography (Bill Hogoboom), and readying our equipment for the August 21 solar eclipse. The highlight of the summer was the "Great American Eclipse" and several club members traveled out of state to view totality. In this issue of the Observer we cover the members' news of the summer and our upcoming events for the fall.

The "back to business" part of this note refers to the AOH Annual General Membership Meeting. The meeting is scheduled for November 18th at Babe's Pizza and Pasta in Cutten. At this meeting, we will be reviewing the finances of the club and the past year's activities, and setting goals for the upcoming year. If we have a quorum, we will be voting for the slate of nominees for the 2018 Board of Directors (this is assuming that there are no changes to the slate). The AOH Nominating Committee has put together the slate of Board nominees for 2018, and this will be presented to the membership in early November. As per our Bylaws (http://astrohum.org/members_only/bylaws_2013.php), the General Membership is invited to submit nominees for the Board of Directors by November 11th. If you are interested in serving on the Board of Directors, or would like to nominate a member to serve on the Board, please contact Ken Yanosko at secretary@astrohum.org.

Even if you do not want to take a leadership role in the AOH, we are always looking for members who want to be involved in our various club activities such as educational outreach, grant writing, fundraising, maintaining and repairing equipment, working on the newsletter, and organizing social events. No experience is needed and your help would greatly appreciated.

As we come to the end the year, please remember to renew your membership. Both individual and family memberships are $15 (a form can be found here: http://www.astrohum.org/membership.html). When you send in your dues, please consider making a contribution to the our equipment fund. All contributions are tax deductible. Finally, with the holidays coming up, we encourage you to visit our AOH Cafepress store (http://www.astrohum.org/store.html). We have clothing, coffee cups, stationery, and other items bearing our AOH logo. A portion of the sales goes towards supporting our outreach programs and maintenance of the Kneeland Observatory.

Acknowledgement

I am grateful to Ken Yanosko and Donald Wheeler for their proofreading of the newsletter and for their helpful suggestions.

AOH Calendar Fall 2017

Friday October 20. College of the Redwoods Science Night. Please contact Grace at president@astrohum.org if you can help out.

Saturday October 21. Meet at Kneeland Airport or Kneeland School for observing (or possibly elsewhere if the weather is unfavorable). Check the Events page at http://astrohum.org/upcoming.html for updates.

Saturday October 28. International Observe the Moon Night. The moon is 66% illuminated (just past first quarter). This is a great opportunity to go out and observe the moon with your neighbors and friends https://eclipse2017.nasa.gov/international-observe-moon-night. Download a Moon Map activity https://nightsky.jpl.nasa.gov/download-view.cfm?Doc_ID=331.

Saturday November 18. General Membership/Business Meeting. We will be electing the Board of Directors for 2018. Meeting is from 6-8 p.m. at Babe's Pizza in Cutten. Meet at 6 p.m. for dinner and 7 p.m. for the meeting.

Saturday December 2. Public Observing at Arts Alive.

Saturday December 16. Regular Monthly Meeting.

AOH outreach Summer 2017

As I mentioned in the President's note, the AOH might have set a record for the number outreach events that were done over the summer. While the centerpiece of each event was telescope viewing, we were also preparing the public for the August 21 solar eclipse. In all, we distributed over 300 eclipse glasses, gave safety tips on how to view the eclipse, and talked about the science behind solar and lunar eclipses. The AOH is grateful to the NASA Night Sky Network for their gift of eclipse shades, posters, informational flyers, pinhole postcards, and eclipse yardsticks.

This summer we did a total of 10 outreach events: Kneeland Airport Star Parties (4), Brookdale Senior Living, Redwood Boys and Girls Club, Eureka Get Out and Play Day, 4-H Camp at Maple Creek, McKinleyville Kid's Camp, and a Star Party at Humboldt Redwood State Park. It may not seem like a lot of outreach events to do over a 4 month period (June 23 to September 16), but each event requires a bit of planning. So behind the scenes we are coordinating our schedules with the groups requesting the outreach, making sure we have enough volunteers for each event, making sure our telescopes are in good working order, putting together kid-friendly activities, and making posters, demonstrations, props. I want to thank the following volunteers for their hard work over the summer: Ken Yanosko, Mark Mueller, Mark Wilson, Brent Howatt, Russ Owsley, Greg Deja, Dan Eaton, Don Wheeler, Frank Simpson, Eva Laevastu, and Kathy Blume. A special shout-out goes to Frank Simpson who ventured up to the Redwood National Park (RNP) on several occasions to help out with their Friday evening astronomy program. Thank you all for representing the AOH!

The Night Sky Network sent the AOH a box of eclipse-related materials to help our community prepare for the August 21 solar eclipse.

On pages 3-6 are the photos taken from our outreach events.

Kneeland Star Parties: June 23rd to September 16th. Our summer program included viewing Jupiter and Saturn (and their respective moons), and various deep sky objects such as globular and open clusters, galaxies, and nebulae. We also saw Iridium flares and the occasional flyover of the International Space Station. We had a large turnout throughout the summer with our members sharing their telescopes with the many visitors who ventured up to the airport.

Just after the sun went down, we gathered around Austin's refractor trying to find Jupiter in the sky (June 23).

June 23 was the battle of the large Dobsonian telescopes between Don (14 inch) and Frank(13 inch). Visitors were impressed by the view of the planets and deep sky objects in these large telescopes.

We had many visitors at our July 15 meeting. This group drove up to Kneeland Airport to view the Milky Way and were surprised to find telescopes set up on the runway. They were thrilled to be invited to look through our scopes.

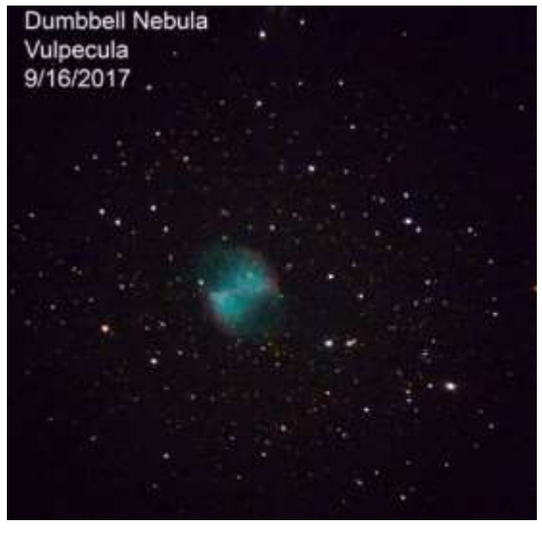
Despite the threat of fog, there was a large turnout for the viewing of the Perseid Meteor shower (August 12). A few of us set up telescopes to view Jupiter and Saturn and some deep sky objects.

Watching the flyover of the ISS (August 12).

Jupiter was often the first planet that we could find in the summer night sky.

The Thomas family joined us for the last star party of the summer (September 16). Stormy was excited to see all of the telescopes. Our newest member Sharon Seagraves is in the background with Grace. (Photo credit: John Carleton Thomas)

Dan Eaton giving his "Oregon Star Party Eclipse Adventure" slide presentation. Dan, Greg, Ken, and John are gathered around Dan's computer tablet.



The Dumbbell Nebula is one of the brightest deep sky object in the night sky.

July 7 Star Party at Brookdale Senior Living. The AOH was contacted in May about doing a telescope viewing with the residents. The coordinator Linda Wakefield was concerned about having the seniors traveling to our Kneeland Observatory. She was relieved when I told her that we would bring telescopes to Fortuna and set up in their courtyard. On the day of the star party, Don and I were greeted to a spirited group of 15 waiting in the courtyard. The sun had just set, but we were still able to find Jupiter and Saturn. We also viewed the gibbous moon, and the residents were wowed by the detailed view of the lunar landscape. Many of the residents are lifelong astronomy enthusiasts and it was interesting to hear their stories on how they became interested in space. We have been invited back and our next adventure will be viewing the constellations of the fall.

Daniel (R) was the first to greet us.
Photo credit: Linda Wakefield.

Viewing Saturn and Jupiter through the telescope.

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July 26 at the Redwood Boys and Girls Club. The theme for the week was “Inventions Big and Small”. Telescopes were used to observe the Moon, Sun, and Venus. We also introduced spectroscopy and how light is used to study planets and stars. At the end, we did an eclipse program using props such as Styrofoam balls (to simulate moon phases) and eclipse yardsticks to show the position of the sun, moon, and earth during a solar (and lunar) eclipse.

Mark Wilson took charge of showing Venus to the campers.

Campers looking at the Moon through Ken Yanosko’s C-8. Photo credit: Lucy Salazar

Using Styrofoam balls to match the illumination of the three-day moon in the sky.

Using eclipse yardsticks to cast the shadow of the new moon onto the Earth.

Ken showing how to use a pinhole projector to view the eclipse.

Using cereal-box spectrometers to look at the wavelengths of light produced by different light sources.

July 29, 2017: Fourth Annual Eureka Get Out and Play Day (GOPD). This year we had a large contingent of volunteers at the GODP event: Russ Owsley, Mark Mueller, Mark Wilson, Dan Eaton, Greg Deja, and Grace Wheeler. We set up several telescopes to view the sun, moon, and planets. We also had our popular "scale model of the solar system" on display. We used this opportunity to talk about the upcoming August 21 solar eclipse. At this event we gave out over 100 eclipse glasses.

Greg Deja supervising the solar observing through the hydrogen-alpha solar scope.

Comparing the size of the Earth to Jupiter.

Observing Jupiter through the C-6 in the daytime.

Mark Wilson answering questions about the August 21 solar eclipse.

August 1, 2017: 4-H Camp at Maple Creek. Despite the heat, mosquitoes, and the late hour, the campers were excited to explore the night sky. The light from the quarter moon made the viewing of any deep sky objects difficult, so we mainly focused on Saturn and the Moon. Saturn (with the moon Titan) made a biggest impression on the campers. They were also amazed by the detail that could be seen in the lunar craters and mountains. Mark brought the Astroscan and everyone had a chance to center the moon in the telescope using the red dot finder. The next morning we held an impromptu viewing of the sun with a hydrogen-alpha solar telescope, and we were fortunate to see a sunspot and a few solar flares.

Mark giving the introductory remarks around the campfire.

Solar flare and a sunspot through the solar telescope.

"Look up in the sky"….two of the camp counselors were nice enough to pose for this picture. Note the quarter moon at the top of the image.

Mark Mueller supervising the line of 4-H campers waiting to view the sun through a hydrogen-alpha solar telescope.

August 4, 2017 McKinleyville Kid's Camp. The volunteers for this event were Ken Yanosko, Greg Deja, Dan Eaton, and Grace Wheeler. This was a group of 60 kids ranging in age from 5 to 12. We set up telescopes and had a daytime viewing of Venus and the sun (with both white and hydrogen-alpha filters). Dan Eaton brought his Sunspotter telescope and pointed out the sunspot on the disk. Other topics that were covered were the scale model of the solar system, and the relative distances between the sun and planets. We ended the program using the eclipse yardsticks (sun, moon, earth orientation) and a talk on safe-viewing of the solar eclipse.

The solar viewing station was made up of the C-8 (with white solar filter), a Coronado PST (hydrogen-alpha filter), and the Sunspotter.

Looking for Venus in a refractor telescope.

The eclipse yardsticks were used to illustrate the orientation of the Sun, Moon, and Earth during eclipses.

August 11, 2017 Perseids at Humboldt Redwood State Park (HRSP). The AOH was invited to do a star party at the Albee Creek Campground (HRSP) for their Perseid meteor shower event. Since it was suppose to be a small crowd, I volunteered to come up by myself and set up two "GoTo" telescopes. The crowd was larger than expected; and, in all, about 50 people came through. Two of the visitors stayed for the entire event and were kind enough to help with crowd control and to make sure that the telescopes weren't jostled. We saw Jupiter and Saturn in the early part of the evening. As the nightfall deepened, we began to see meteors. Before the fog rolled in, most of the visitors had viewed the Hercules Globular Cluster, Lagoon Nebula, and the Owl Cluster. All in all it was a very good experience and I told Mary Kaufman, the HRSP interpretative ranger, that next time we would return with more volunteers.

Setting up in a field at Albee Creek Campground. These two gentlemen helped me set up, and volunteered to do crowd control during the event.

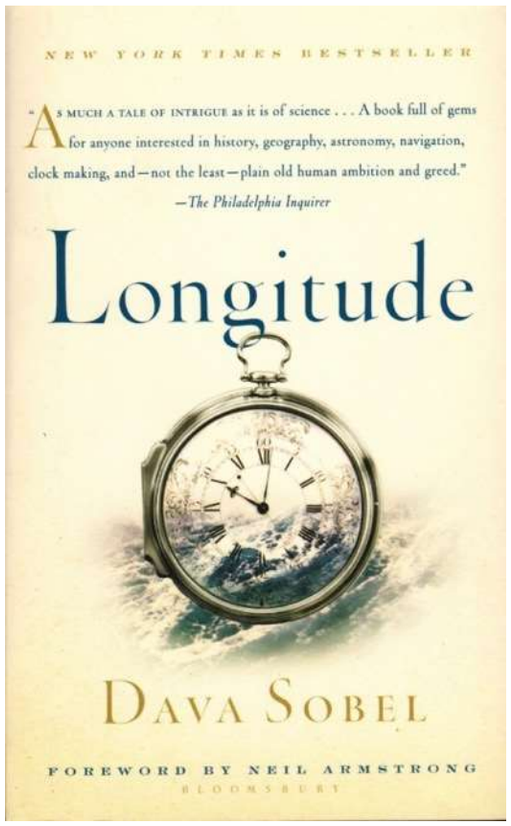
Viewing Jupiter and the Galilean moons through the C-8.

The line of park visitors patiently waiting for their turn at the telescopes.

Longitude and Greenwich: A Book Review and Travel Report
by Ken Yanosko

Users of Go-To telescopes know that if you input the correct time (Universal Time, i.e. the time at Greenwich, England) and the telescope's current location (i.e. latitude and longitude) then the scope's computer is able to calculate the altitude and azimuth of any object in its database, and aim the scope accordingly. But the opposite is also true. If you know the correct time and the observed altitude and azimuth of a familiar heavenly object then it is possible to compute the latitude and longitude of the point from which the observation was made. Before the 18th century, navigators used exactly this method, with varying degrees of success, to determine where in the world they were. The sticking point in this method lay not in the determination of altitude and azimuth--sailors had good sextants and nautical compasses; rather, the problem was time. The best clocks of the day were pendulum clocks, and pendulums behave horribly at sea. And spring-driven clocks were simply not accurate enough. Over a voyage of weeks or months the accumulated error in time would give rise to major errors in location. In 1714 the British parliament passed the Longitude Act, which would award £20,000 for a method to determine longitude to an accuracy of half a degree.

John Harrison, clockmaker.



Enter John Harrison, born in 1693, a woodworker by trade and amateur clockmaker by avocation. Harrison felt that he could make a clock that would work at sea and have the required accuracy. Over a period of years, from 1730 to 1759, Harrison built and tested four such clocks. This story is told in suspenseful fashion by Dava Sobel in her delightful book *Longitude*, published by Walker & Company in 1995 (paperback published in 2007 by Bloomsbury). Sobel, the author of *Galileo's Daughter* and *The Planets*, tells the story of Harrison's dedication and determination, and his drive for perfection. And even after his success with the clocks, the story continues with another long struggle with the Board of Longitude. This Board, which was formed to award the Longitude Prize, was predisposed to favor astronomical solutions to the time problem, such as the timing of the eclipses of the Galilean moons of Jupiter. This is not surprising since the Astronomer Royal, John Flamsteed and later Edmund Halley, was *ex officio* a member of the Board. And later, professional clockmakers with friends on the Board pressed their claims that their clocks were better than Harrison's. So, did Harrison get the prize? I think you'll enjoy reading the book and finding out for yourself.

But wait, there's more. In a final chapter, Sobel tells about her visit to Greenwich Observatory (I'll tell you about mine later) and about the work of Lieutenant Commander Rupert T. Gould of the Royal Navy. It seems that all four of Harrison's clocks had been stored since 1766 in damp conditions at the Observatory. A cleaning had been done in 1866, but the clocks were then put right back in storage. In 1920 Gould, appalled by this neglect, volunteered, without compensation, to clean and repair the four clocks. It is fitting that, like Harrison, Gould had absolutely no training in clockmaking, but he had the patience and determination to spend twelve years restoring the clocks to the museum pieces that they are today.

This past summer Susan and I had the pleasure of revisiting the Royal Observatory in Greenwich. (We had been there before, in 2003.) The guidebooks tell you to get there from Central London either by Docklands Light Rail or by a Thames River boat; either way you get deposited at river level and are faced with a 15 to 20 minute walk up the hill. That's what we did in 2003. Now, older and wiser, we took the #53 bus to Greenwich Park; it lets you off at the top of the hill behind the observatory, and lets you take a flat, shaded stroll to the entrance. Of course observatories are always on hilltops because that's where the seeing is better. But in this case, the Royal Observatory, Britain's official keeper of time, is on a hill because it houses the official "time ball", a big red sphere on a mast, easily visible from seafaring ships docked at Greenwich. Every day since 1833 this ball is raised and then dropped (a la Times Square) at precisely 1 p.m. Thus the ship captains can set their chronometers and take Greenwich time with them and use it to determine their longitude. At least this was the case before radio and LORAN and GPS; now they do it because, well, because they have been doing it since 1833.

The time ball. It is already after 1 pm.

There are several buildings at the Observatory; Flamsteed House was actually Flamsteed's house. The Octagon Room where Flamsteed and his successors worked was designed by famous architect Christopher Wren. As an octagon, it has windows facing in all directions, so observing could be done from indoors but to all parts of the sky.

Another building houses George Airy's Transit Circle, which marks the location of the present Prime Meridian. In 1851 it replaced James Bradley's meridian instrument, which was located approximately 6 meters to the east; Bradley's instrument had replaced Edmond Halley's solar quadrant, which determined local noon by measuring when the sun was at its highest point in the sky. This device, now on display near Bradley's, was previously located some 43 meters away. So the Prime Meridian had moved over the centuries. In fact, although

Six-eighths of the Octagon Room, housing a transit scope, a quadrant, and several clocks.

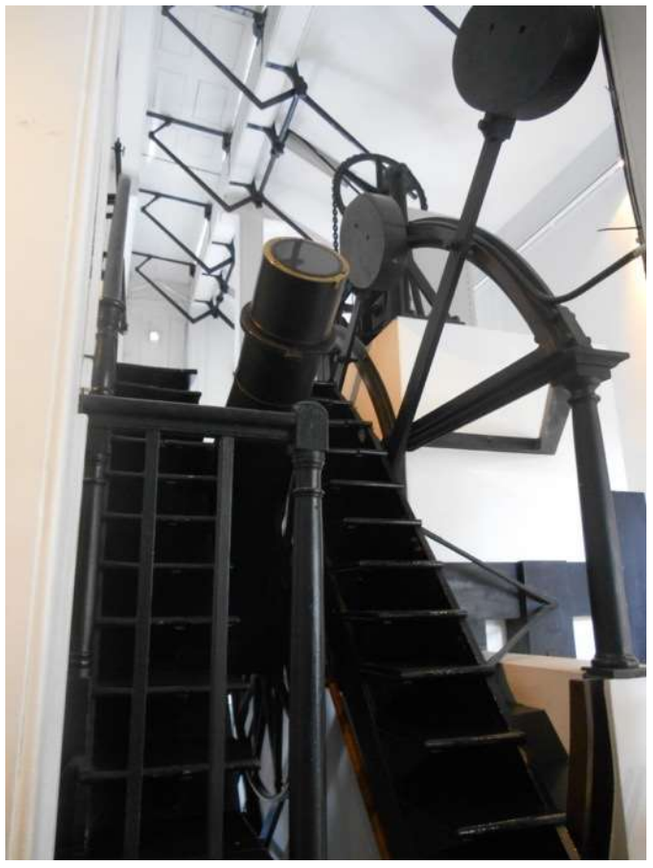
Airy's line is the agreed-upon Prime Meridian by International Treaty, in practice our GPS system uses a different unmarked line 100 meters to the east. This has to do with the fact that the earth isn't a perfect sphere, or even a perfect ellipsoid; GPS uses an idealized ellipsoid which only approximates the earth's surface. Nevertheless, when I took my turn with all the other tourists straddling Airy's line I could *feel* that I was half in the Eastern Hemisphere and half in the West.

There's a planetarium, a dome housing a 28-inch refractor, a camera obscura offering a view of the Docklands, and many other displays of historical interest. But for me, the highlight of the visit is the clock room. You can find dozens of pendulums, carefully crafted with bimetallic rods which don't change their length with changes of temperature. You can see modern atomic clocks, looking like 1960-era computer banks with flashing lights and red-numbered displays. And you can see John Harrison's clocks. Ticking. Showing the time. Looking beautiful.

Harrison's clocks and dates of design and building, from left to right: H1, 1730-1735; H2, 1736-1739; H3, 1740-1757; and H4, designed and built in 1758. (National Maritime Museum, Greenwich. All other photos in this article by KY)

Two meridian lines: Left, running through the peak of the gable, Airy's line, the current (non-GPS) standard; Right, marked by the gap in the tile roof, Bradley's line, the standard from 1750 to 1851.

Edmund Halley's mural quadrant.



Behind-the-scenes view of James Bradley's transit circle, which, for over a century, marked the Prime Meridian.

The 28-inch refracting telescope, the largest in England.

The Great American Eclipse: Part 1

For many of who made it to totality, the sentiment I most commonly hear is that “The trip was long, the eclipse was too short, and it was totally worth it!”. I agree! It is hard to describe totality, but it does evoke an emotional response. From our campground in Madras, there were cheers, gasps, a shedding of tears, and in my case, stunned silence. One of my neighbors at Madras marveled at the “cosmic coincidence” that the disk of the sun and the moon would be the same size from Earth’s perspective.

For Part 1 of “The Great American Solar Eclipse”, we have a montage of solar eclipse photos and thoughts about the eclipse from Humboldt County, the Central Coast, and Oregon and Wyoming. Thank you to all contributed photos and stories to this edition of the newsletter. We hope to collect more photos and stories in time for the winter edition. If you would like to share your eclipse experience contact me at president@astrohum.org.

Totality observed in Salem, Oregon.
Photo credit: Ken Yanosko

The View from Humboldt County

Even though the AOH wasn’t at the Humboldt Redwood State Park (HRSP) eclipse event, we were certainly there in spirit. Our club donated eclipse shades and pinhole projection postcards, and made available various props such as eclipse yardsticks, posters, and a Sunspotter. Mary Kaufman, the ranger in charge of the event, wrote*: “The Eclipse Event here was a complete success. Over 150 people attended! The three days leading up to the 21st were very smoky. Luckily, the 21st was clear. The Sunspotter was very popular. People were using it to take photographs of the eclipse as it progressed. Everyone was very grateful for the glasses.”* (Photo Credit: HRSP, Weott CA)

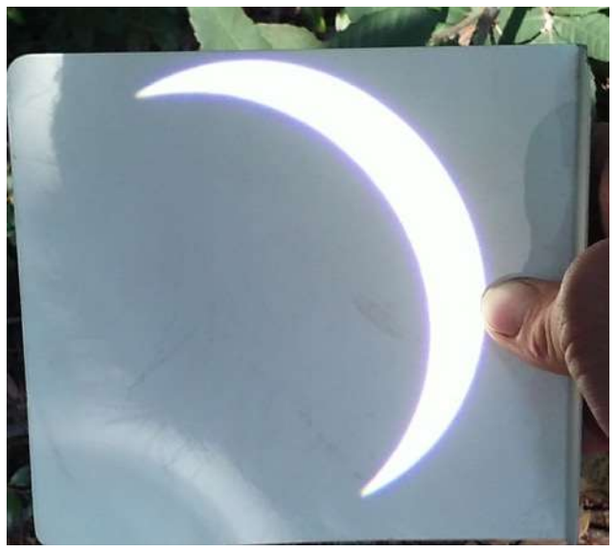
The View from Humboldt County (continued)

Between the thick fog and the smoke from the wildfires, it was it was a challenge finding a place to view the eclipse in Humboldt County. Most people were able to see the eclipse if they went east towards Kneeland and Berry Summit (Hwy 299), north to Bald Hills Road (east of Orick), and south towards Garberville.

Scott Carroll observing from Blue Lake: Eclipse with sunspots [Orion XT8 w/ solar filter].

Bald Hills Road, Orick: "*10:15 am was maximum coverage. This was the view with solar glasses placed over a camera's lens. Photo Credit: Steve Krause NPS* *https://www.facebook.com/RedwoodNPS/*.

Eureka Cub Scouts Pack 28 watching the partial eclipse from Kneeland. Troop leader Megan Tyler wrote: "*Hey there! We just got home from Kneeland from watching the eclipse. We wanted to give a big "THANK YOU" for the glasses! The boys (and siblings) had a great time learning about eclipses and watching the progression of the eclipse."*



David Reilly in Garberville: "Closest I've ever gotten to Totality and I don't mind." (Taken in the Garberville area With a 90mm telescope and 10mm eyepiece).

HSU Astronomy Professor Paola Rodriguez Hidalgo using the eclipse yardstick to explain the orientation of the sun, moon, and Earth during a solar eclipse. Photo Credit: Kevin Hoover

Despite the fog and overcast, a large crowd gathered at HSU's eclipse viewing event. HSU had the NASA broadcast of the eclipse so that attendees were still able to watch the progression of the eclipse on the livestream. https://eclipse2017.nasa.gov/eclipse-live-stream. Photo Credit: Kevin Hoover http://www.madriverunion.com/humboldters-partial-to-viewing-total-eclipse/.

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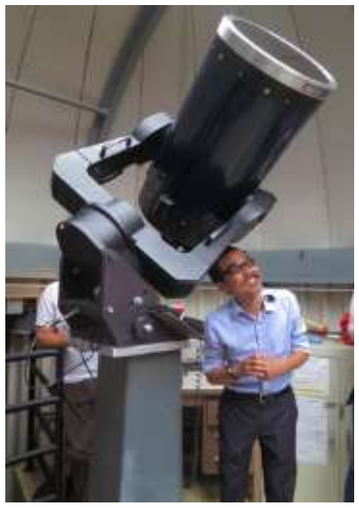
The Bowen Observatory



Dr. Len

Sue Garza, Ayla Garza and Susie Christian modelling our glasses, sent to us by the AOH.

The eclipse through the coastal fog.

Viewing on the Central Coast

AOH member Susie Christian observing from San Luis Obispo: *My daughter and granddaughter arrived from San Antonio, TX., the day before the big event, and because I was sure that neither of them had ever been to an observatory, I decided we'd go to our local community college, Cuesta College where they were having a eclipse viewing party at the Bowen Observatory.*

Sure enough, that Monday morning was shrouded in our typical fogginess. Even if the fog never lifted, at least the girls would see what an observatory was like. We set off for Cuesta College right after 9AM, with high hopes it would be clear there, since it is about seven miles inland. We parked and followed the crowd of people. Entering the Bowen Observatory, we waited our turn to walk up the steep, narrow stairway to the top floor. At the top was Astronomy Professor Patrick Len, who proved to be super friendly, informative and helpful to the many inquisitive folks who fired questions at him. He did say there was no point in us looking through the 14" telescope, unless the sun came out for the eclipse. We lingered as long as we dared in the dome of the observatory, only vacating because others were waiting their turn. We all agreed that getting to hang out in the observatory was the high point of our day.

Making the decision not to gamble on hurriedly driving further inland, we elected to sit in front of the observatory, along with maybe fifty others and wait about fifteen minutes for the event. Besides – it was getting lighter and it looked like the sun might put in an appearance after all.

As luck would have it, the clouds and fog parted partially, just in time for me to get a photo at 10:22AM. Everyone present cheered! Because we were only due to get 74 percent, what we saw didn't darken the sky or hush the birds or drop the temperature by ten degrees. There was very little change, if any and we didn't need the special glasses to see it, even though the glasses made for some creative photos.

On the Path of Totality

Photo and text by David Wilson

The total solar eclipse was truly an awesome sight, in the correct use of the word. Instantly, from something too bright to look at with the naked eye, the sun became a black hole the size of the full moon with a fiery, glowing rim: A black hole in the sky had opened. The size of the full moon. With a fiery rim. There's nothing like it that I've ever seen. It became nearly dark, the brighter stars in sky came out, and the air grew chill. It felt like a dream. It was a mesmerizing, alien sight. It lasted 2:15 minutes. Then suddenly the black hole was too bright to look at again, and I was ripped from my dream. I wanted to go back. It felt as though it were over, though the sun was still 98% eclipsed, and the sight still fantastic. With my goggles I could now see the tiniest crescent sun with the dark mass of the moon hiding the rest, but it wasn't the same, and it wasn't enough. The dream was over... and I wanted to go back. This was at 12485 Parrish Gap Rd., SE, Turner Oregon, August 21, 2017 at 10:19 AM.

Reprinted with kind permission from David Wilson. More of David's work can be found here: https://www.facebook.com/DavidWilsonMFX/media_set?set=a.10214044960347934.1073741843.1529326086&type=3

On the Path of Totality (continued)

Dottie Simmons observing the eclipse in Catfish Junction, OR: "*We viewed the eclipse along the Snake River, Oregon/Idaho border. 2 minutes went like nothing….My cameras and lenses are nothing special, but here are my best shots from Catfish Junction. Totality was with a Lumix all-in-one, the others with a Canon SX160 IS PowerShot with solar filter taped on!"*

Dottie also posted a different version of the corona (lower right): *"An artist in our group gave 16 people each 1/8th of a sun to replicate a section of corona - here are the results."*

Talia Rose in Kimberly, OR: "*Traveled to totality. Three generations made the trek to camp in an organic apple orchard for the experience of a lifetime. Thrilled to capture this moment!"* https://www.facebook.com/countylinewild/.

Bob Zigler at work in Madras, OR.
"(1) 2800mm Celestron C-11 with focal reducer, so about 2000mm, camera connected to laptop for remote operation. (2) Piggy backed 600mm with 2X teleconverter, so about 1200mm, camera connected to the TV on the left. The larger images on the TV and laptop allow me to focus more accurately and keep the images centered. The piggy back lens sits on a 3-way control pan head, so I can adjust it to aim at the same target and track with the telescope and the telescope does the driving to follow the sun. It all worked out fine."

Jeff Schmitt in Crooked River: *"My best untouched images."*

From left to right, a view of totality, Baily's Beads, and the Diamond Ring. Photo Credit: Bob Zigler.

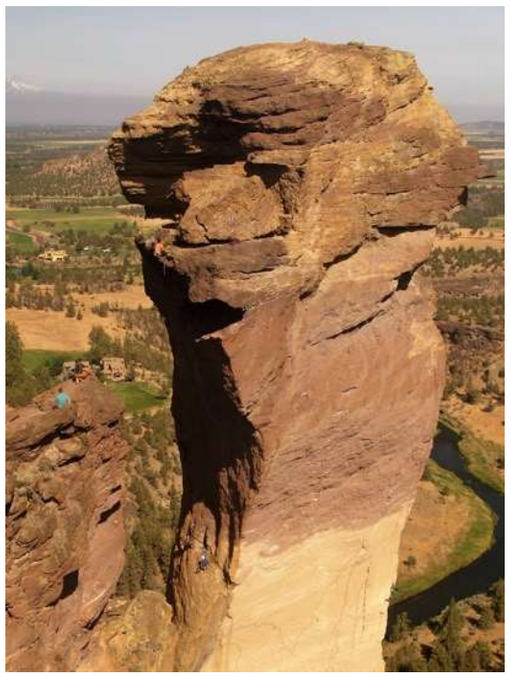
On the path of totality (continued)

The Milli Fire in the Three Sisters Wilderness created smoky conditions in central Oregon (and had a lot of eclipse watchers worried). The view on 8/19/17 from Sisters, OR. (G. Wheeler)

The Exploratorium was contracted to record the eclipse from Madras for the NASA's livestream. They had been setting up for days, and got a little touchy when asked about the smoke and clouds. Madras Airport (OR) on 8/20/2017. (G.Wheeler)

Mt. Jefferson to the west of Madras Airport. On the morning of the eclipse, the smoke stayed mostly to the west and south of the airport. It was clear overhead where it counted the most. (G.Wheeler)

"The Tinfoil Clan": As soon as the eclipse started, our neighbors at the Madras Airport campground donned their tin foil hats. Photo Credit: Rihanna Gelhart, Register-Guard https://twitter.com/rgelhart



Jeff Schmitt at Smith Rock, OR *"I shot these guys on Sunday as they were setting camera angles for the Monday morning eclipse. Little did I know ....."*

Photo credit: Ted Hesser. http://www.oregonlive.com/eclipse/2017/08/the_story_behind_viral_iconic.html

Bill and Sherri Hogoboom at Union Peak, WY. "*We finally settled on this spot about 1/2 mile back from our turn around. This was our view for the eclipse. We ran a little short of water over the weekend so I had to bush whack a path with the machete through this chest high willow thicket and bog for 200 yards to find running water."*

Bill Hogoboom: "*The closest thing to an eclipse photo from the whole trip. Sherri watching the eclipse unfold. I didn't try to get any eclipse images. I wanted to experience the whole thing without obsessing over the camera. I knew other folks would take a few pictures of it."*

Night Sky Report for Fall 2017

Planets

Since late spring and summer, Venus has been moving further away from the earth and towards superior solar conjunction (January 2018). Currently Venus rises in the morning and sets by late afternoon. If viewed in a telescope, the phase is waxing gibbous. From our latitude Venus can be found in the dawn sky until late November. By early December, Venus is no longer visible as it will be lost in the glare of the sun. Venus will be missing in the sky during the first two months of 2018 and reappears in mid-March when it will be setting about an hour after sunset.

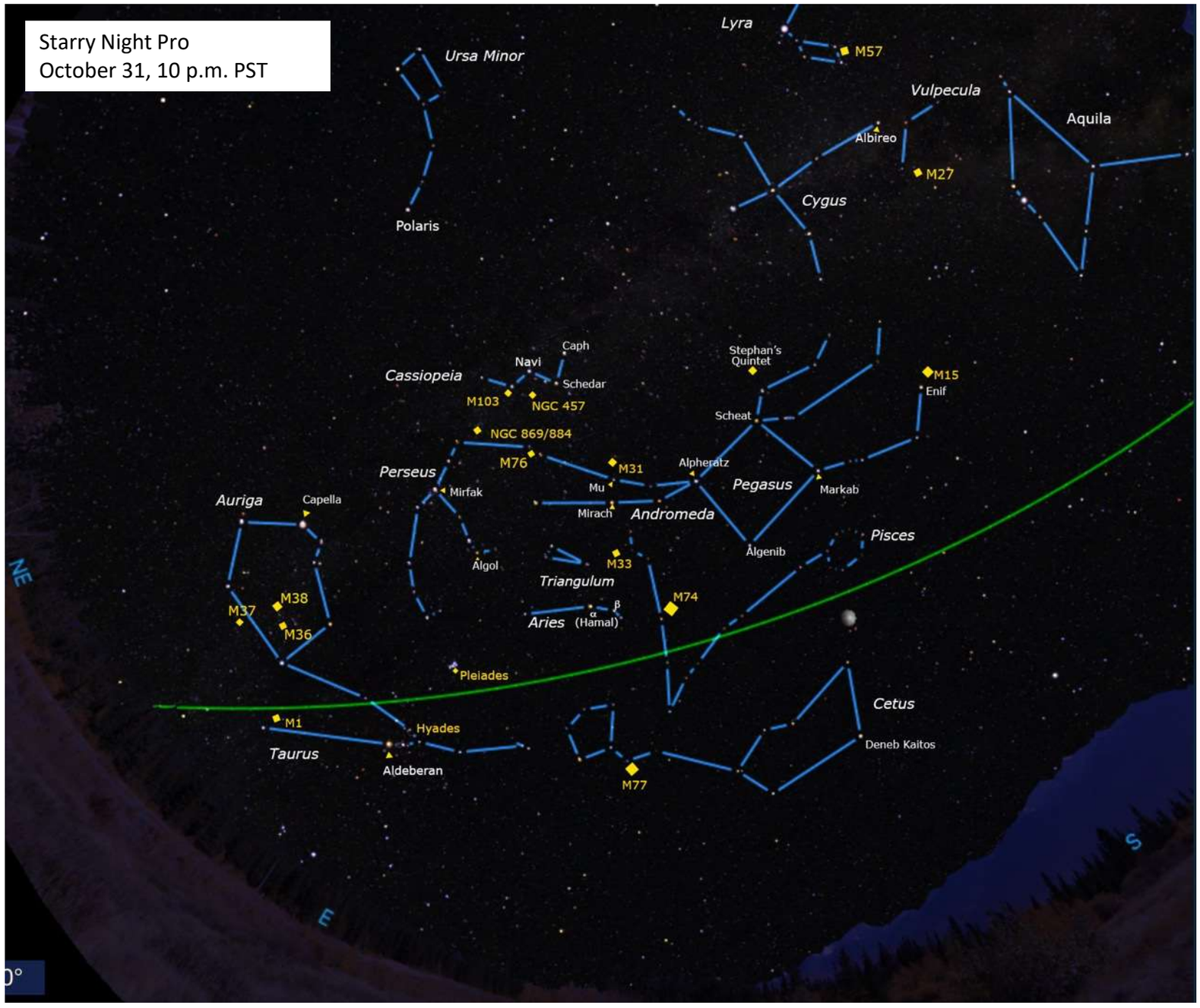
Throughout the summer Jupiter has been moving closer to the Sun, and by early fall, Jupiter could be seen setting shortly after sunset. The planet will not be visible in the sky throughout October and early November; Jupiter does reappear at dawn in mid-November. Visibility of the planet increases as Jupiter rises in the predawn hours in December and January.

Saturn is the last of the visible planets to disappear from the fall night sky. In October, Saturn is still visible at night, and sets about 3 hours after sunset. Saturn continues to set 15 minutes earlier each day and by the end of November, the planet will be too close to the setting sun to view. Saturn reappears in February 2018 in the predawn skies.

To find out the rise and set times for planets visible in Eureka on specific dates go to https://www.timeanddate.com/astronomy/night/ (set the location for your local area).

Fall Constellations and Deep Sky Objects

The constellations of the autumn night sky are Andromeda, Aries, Auriga, Cassiopeia, Cetus, Perseus, Pisces, Taurus, and Triangulum. These constellations can be seen throughout the autumn night. The constellations of the summer such as Hercules, and those of the summer triangle, Aquila, Lyra, and Cygnus, are also well placed for observation in the early part of the fall.



The Perseus Family of Constellations

The Perseus Family is made up of the constellations Cassiopeia (the Queen of Ethiopia), Cepheus, (King of Ethiopia), Andromeda (daughter of Cassiopeia and Cepheus), Perseus (The Hero), Pegasus (the Winged Horse), and Cetus (the Sea Monster). These constellations are characters in the Greek myth of Perseus https://en.wikipedia.org/wiki/Perseus#Marriage_to_Andromeda The nearby constellations Auriga and Triangulum are often including in this grouping.

Cassiopeia is also known at the the "Seated Queen" or the "Lady in the Chair". The five bright stars of Cassiopeia make a "W" or "M" asterism. In Greek mythology, the stars represent Cassiopeia who is tied to a chair and placed in the sky by Poseidon. As punishment she revolves around the night sky spending half of the year upside down.

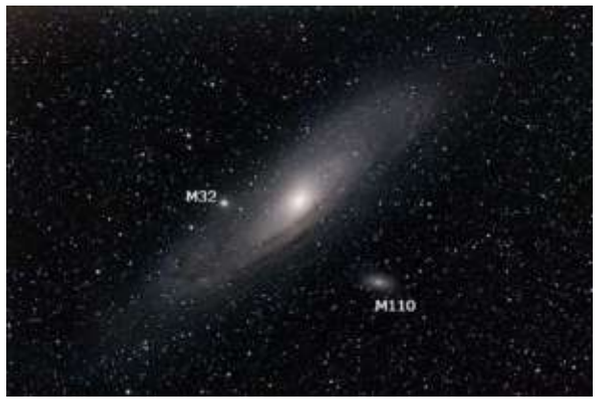
Cassiopeia lies at the northern end of the center of the Milky Way and is rich in open clusters and nebulae. At mid-northern latitudes above 23 degrees N, Cassiopeia is circumpolar and does not set. The constellation is best seen in the fall and winter months when it is well above the horizon. The two brightest stars are Schedar and Caph. Cassiopeia contains two Messier objects that are both open clusters: M103 and M52. M103 can be viewed with binoculars and is located below the star Ruchbach (the bottom left star making up the "W"). The brightest open cluster in Cassiopeia is NGC 457, also known as the Owl Cluster.
http://www.constellation-guide.com/constellation-list/cassiopeia-constellation/

The Owl Cluster NGC 457
Photo credit: Henryk Kowalewski
https://en.wikipedia.org/wiki/NGC_457#/media/File:NGC457.jpg

Andromeda is known as "the Chained Woman". The constellation lies between Cassiopeia and Pegasus. Its brightest star, Alpha Andromedae or Alpharatz, makes up one the 4 corners of the Great Square of Pegasus, and marks the place where Andromeda and Pegasus meet.

The most notable Messier object in Andromeda is the Andromeda Galaxy, M31. At 2.5 million light years from Earth, M31 is the closest spiral galaxy to the Milky Way. It is on collision course with our galaxy (but that won't happen for another 4 billion years) . M31 has an apparent magnitude of 3.4 and can be seen with the unaided eye on very clear dark nights. M31 is six times as wide as the moon and the full size can only be seen with large telescopes. With small telescopes, only the bright central core is seen. The stars Alpharatz, Mirach, and Mu can be used to star hop to M31.

There are 14 dwarf galaxies orbiting M31. The brightest and largest is M32 followed by M110. Both are dwarf elliptical galaxies, and it is possible to find these two galaxies in the same telescope field of view as M31.
http://www.constellation-guide.com/constellation-list/andromeda-constellation/



The Andromeda Galaxy (M31) with the satellite galaxies M32 and M110 (image modified by G. Wheeler)
Photo credit: Torben Hansen
https://en.wikipedia.org/wiki/Messier_110#/media/File:M31_09-01-2011.jpg

Triangulum (the Triangle) is a small constellation that lies between Andromeda and the constellation Aries. As it names implies, the three brightest stars (Alpha, Beta and Gamma Trianguli) form the triangle asterism. Triangulum contains the spiral galaxy M33, also known as the Pinwheel Galaxy.
http://www.constellation-guide.com/constellation-list/triangulum-constellation/

The Pinwheel Galaxy (M33).
Photo credit: Kanwar Singh
https://en.wikipedia.org/wiki/Triangulum_Galaxy#/media/File:Triangulum_Galaxy_(Messier_33).jpg

Perseus (The Hero) lies to the north of Andromeda, and is most famous for the August Perseid meteor shower. The brightest star in Perseus is Mirfak which is Arabic for the "elbow of Pleiades". The Pleiades lie due north of Mirfak. The second brightest, and most notable star is Algol, also known as the Demon Star. Algol is a three star system, which contains an eclipsing binary which dims and brighten with precise regularity. Algol is associated with Gorgon Medusa of the myth of Perseus.

Perseus contains three notable deep sky objects: the open cluster M34, the planetary nebula M76 (Little Dumbbell), and the Double Cluster, NGC 869 and 884. The Double Cluster has a combined magnitude of 4.3, and can be seen with the unaided eye or binoculars under dark skies. A telescope is needed to order to resolve the smudge of light into the two clusters. To find the Double Cluster, use the stars Navi and Ruchbach of Cassiopeia to star hop to the Cluster.
http://www.constellation-guide.com/constellation-list/perseus-constellation/

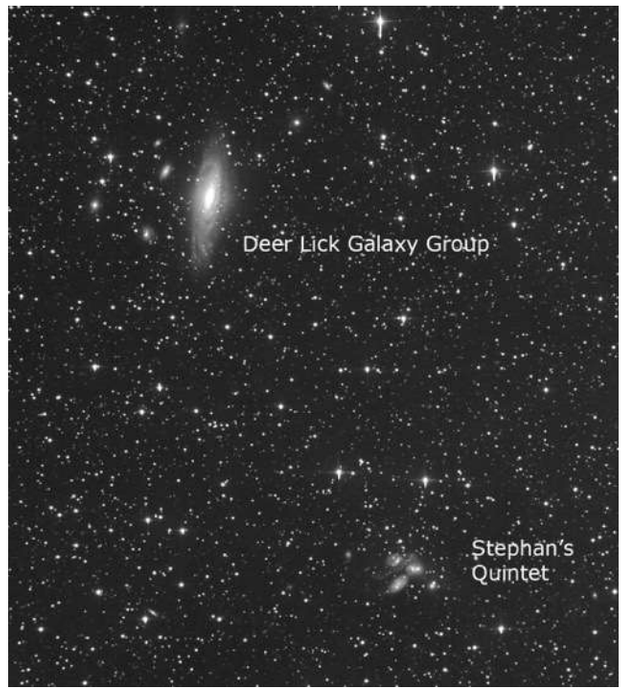
The Little Dumbbell (M27)
Photo credit: Robert Vanderbei,
https://en.wikipedia.org/wiki/Little_Dumbbell_Nebula#/media/File:M76-RL5-DDmin-Gamma-LRGB_883x628.jpg

The Double Cluster of Perseus (NGC 869 and 884).
Photo credit: ItFrightensMe
https://en.wikipedia.org/wiki/Double_Cluster#/media/File:Double_Cluster.jpg

Pegasus (the Winged Horse) is best known for its asterism "the Great Square of Pegasus". It is one of the largest constellations in the northern skies. The stars Alpharatz, Algenib, Markab, and Scheat make up the corners of the square. As noted earlier, Alpharatz actually belongs to the constellation Andromeda and is where the two constellations meet.

Notable objects in Pegasus are M15 and Stephan's Quintet. M15, also known as the Great Pegasus Cluster is one of the densest clusters in the Milky Way Galaxy. Its estimated age is 13.2 billion years making it one of the oldest known globular clusters. A large telescope is needed to view Stephan's Quintet, a visual grouping of five galaxies. Four of the galaxies were the first to be identified as a compact galaxy group and appear to be in the process of merging. Near Stephan's Quintet lies the Deer Lick Galaxy (NGC 7331) with its "fleas" of galaxies.
http://www.constellation-guide.com/constellation-list/pegasus-constellation/

The Great Pegasus Cluster (M15)
Image credit: Hewholooks
https://en.wikipedia.org/wiki/Messier_5#/media/File:M15Hunter.jpg



Stephan's Quintet and the nearby Deer Lick Galaxy Group imaged with a 16 inch telescope.
Image Credit: Gianluca Masi (Virtual Telescope Project and Michael Schwartz (Tenagra Observatories).
https://www.virtualtelescope.eu/2017/07/13/ngc-7331-and-the-stephans-quintet-a-stunning-spot-in-the-sky/

Cetus (the Sea Monster or the Whale) lies in the portion of the sky known as the Water. Constellations in this region include Pisces, Aquarius, and Eridanus (the River). Deneb Kaitos, an orange giant, is the brightest star. Cetus contains M77, a barred-spiral galaxy located just to the south of the 4th magnitude star Delta Ceti. M77 is about 60 million light years away, but it has a bright central core (active galactic nucleus) so it is visible with binoculars or small telescopes under dark sky conditions.
http://www.constellation-guide.com/constellation-list/cetus-constellation/

M77 imaged with an 8 inch telescope.
Image credit: https://www.virtualtelescope.eu/wordpress/wp-content/uploads/2012/10/m77_pw17_17oct2012.jpg

Auriga is Latin for charioteer and its name is derived from the stars forming a polygonal asterism that resembles the pointed helmet of a charioteer. The brightest star in Auriga is Capella which is composed of two pairs of binary stars. Capella is the sixth brightest star in the sky. Notable deep sky objects are the open clusters M36, M37, and M38. The open clusters are bright and large enough to be seen with binoculars.
http://www.constellation-guide.com/constellation-list/auriga-constellation/

M37 is the brightest of the three Messier open clusters in Auriga.
Image credit:
https://en.wikipedia.org/wiki/Messier_37#/media/File:M37a.jpg

Fall Constellations of the Zodiac Family: Aries, Pisces Taurus

The constellation **Aries** is known “the Ram”. Its stars represent the hindquarter, head, horns of the ram. Hamal, an orange giant star, is the the brightest and is the name is derived from the Arabic phrase for “head of the ram”. The other bright star, Sheraton represents the horn. Aries does not contain any Messier objects, but the pointer stars Hamal (α-Arietis) and Sheraton (β-Arietis) can be used as pointer stars to find M74 in the constellation Pisces.
http://www.constellation-guide.com/constellation-list/aries-constellation/

https://en.wikipedia.org/wiki/Aries_(constellation)

M74 in Pisces imaged with the Plavewave 17 unit of the Virtual Telescope Project.
Image Credit:
https://www.virtualtelescope.eu/2012/09/21/m74-psc/

Pisces (the Fish) is one of the largest constellations in the northern sky and lies just west of Aries. The paired fish asterism is thought to represent Venus and Cupid. The spiral galaxy M74 can be found east of Eta Piscium, the brightest star in Pisces.
http://www.constellation-guide.com/constellation-list/pisces-constellation/

Taurus (the Bull) is most commonly associated with the constellations of the winter. In the early fall, Taurus does not rise until well after midnight. The bright stars in Taurus are thought to represent the bull’s head. The brightest star in Taurus is the orange giant star, Aldeberan. Taurus is best known for the open clusters the Pleiades (M45 or Seven Sisters) and the Hyades. These two are the nearest open clusters to Earth and can be seen with the unaided eye. Taurus also contains M1, the Crab Nebula. M1 is the remnant of a supernova explosion that was viewed by Chinese astronomers in 1054 AD.
http://www.constellation-guide.com/constellation-list/taurus-constellation/

The Pleiades (M45) imaged with an 8 inch telescope.
Image Credit: Rawastrodata
https://en.wikipedia.org/wiki/Pleiades#/media/File:The_Pleiades_(M45).jpg

The Crab (M1) imaged with the Plavewave 17 unit of the Virtual Telescope Project.
Image credit:
https://www.virtualtelescope.eu/2012/08/24/m-1-tau/

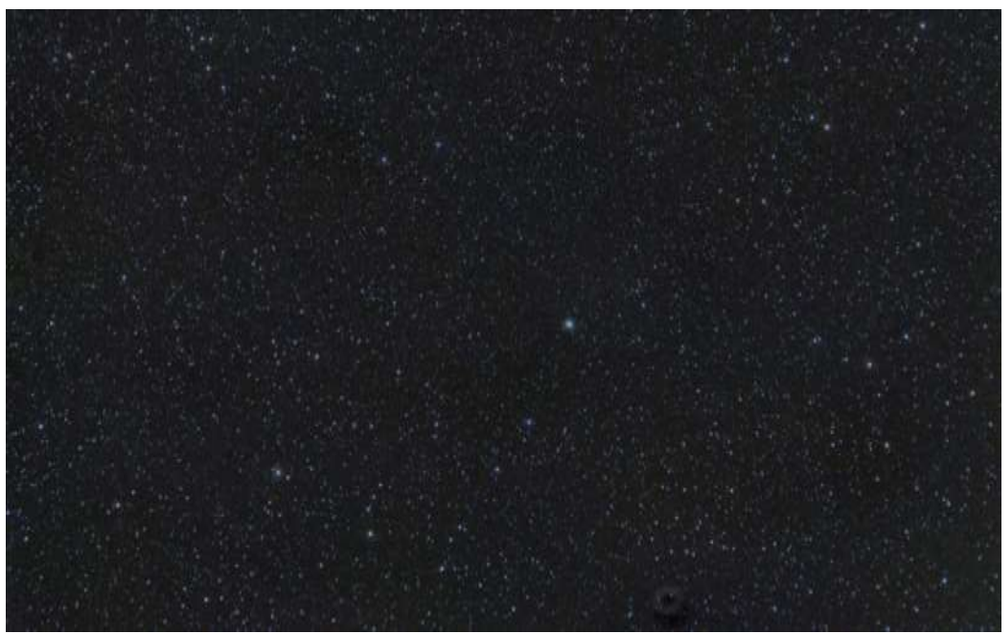
Astrophotography of M5, M2, M81, and M109

Photos and Text by Bill Hogoboom
Introduction by G. Wheeler

I always enjoy getting emails from Bill Hogoboom because it means he'll be telling me about his latest travel adventure and giving me a link to his Imgur photo page where he posts his deep sky images. The photos shown below were actually taken locally in Humboldt County. The M5 one was imaged at the Kneeland Airport during our June 23 star party; M2, M81, and M109 were from his driveway at his house in Arcata. The latter location shows that even in a city, it is possible to get decent deep sky images. Beneath each photo is Bill's description of the settings and conditions of the photo shoot.

If you want to see more of Bill's work, we published several photos in the Winter 2017 issue of the AOH Observer. There is also a photo essay about Bill's excellent adventure to the desert.

M5: "Got my computer running and wanted to share the image of M5 that I got on Sat. night (AOH Star Party at Kneeland). It was nice to see everyone up there, at least in silhouette. I only stayed about an hour after you all left. The M5 image is less than I hoped - but that's always the case. It's badly framed and I didn't get enough 4min shots to get the full HDR effect. I accidentally moved the scope between sets and had to crop quite a bit to find common overlap." (Bill Hogoboom, Kneeland Airport)



M2 Globular Cluster: "This is a wide field with my camera and 85mm lens mounted on top of the scope and using the main scope for guiding. 9x3min exposures. The blob on the bottom right is a dust mote I couldn't get rid of easily because I didn't take any flats." (Bill Hogoboom, Arcata CA)

M81 (Bode's Nebula): "This and all the rest are with my 8"SCT @f6.3 with the Pentax K-3II set to ISO800. 17x3min exposures. Needs a lot more time to get any color out of it." (Bill Hogoboom, Arcata CA)

M109, a barred spiral galaxy: This one's a bit fuzzy but you can make out the central bar. 16x5min exposures with the 8" SCT @ f6.3 with Pentax K-3II set to ISO800. (Bill Hogoboom, Arcata CA).

Cassini Says Goodbye

By Teagan Wall

On September 15th, the Cassini spacecraft will have its final mission. It will dive into the planet Saturn, gathering information and sending it back to Earth for as long as possible. As it dives, it will burn up in the atmosphere, much like a meteor. Cassini's original mission was supposed to last four years, but it has now been orbiting Saturn for more than 13 years!

The spacecraft has seen and discovered so many things in that time. In 2010, Cassini saw a massive storm in Saturn's northern hemisphere. During this storm, scientists learned that Saturn's atmosphere has water vapor, which rose to the surface. Cassini also looked at the giant storm at Saturn's north pole. This storm is shaped like a hexagon. NASA used pictures and other data from Cassini to learn how the storm got its six-sided shape.

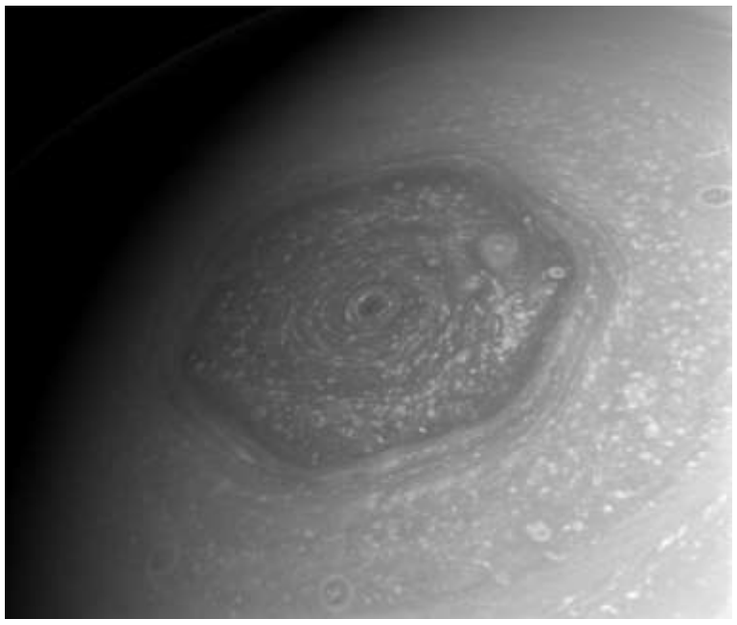
Cassini also looked at some of Saturn's moons, such as Titan and Enceladus. Titan is Saturn's largest moon. Ċassini carried a lander to Titan. The lander, called Huygens, parachuted from Cassini down to the surface of the moon. It turns out, Titan is quite an exciting place! It has seas, rivers, lakes and rain. This means that in some ways, Titan's landscape looks a bit like Earth. However, its seas and rivers aren't made of water—they're made of a chemical called methane.

Cassini also helped us learn that Saturn's moon Enceladus is covered in ice. Underneath the ice is a giant liquid ocean that covers the whole moon. Tall geysers from this ocean spray out of cracks in the ice and into space, like a giant sneeze. Cassini flew through one of these geysers. We learned that the ocean is made of very salty water, along with some of the chemicals that living things need.

If there is life on Enceladus, NASA scientists don't want life from Earth getting mixed in. Tiny living things may have hitched a ride on Cassini when it left Earth. If these germs are still alive, and they land on Enceladus, they could grow and spread. We want to protect Enceladus, so that if we find life, we can be sure it didn't come from Earth. This idea is called planetary protection.

Scientists worry that when Cassini runs out of fuel, it could crash into Titan or Enceladus. So years ago, they came up with a plan to prevent that from happening. Cassini will complete its exploration by diving into Saturn—on purpose. The spacecraft will burn up and become part of the planet it explored. During its final plunge, Cassini will tell us more about Saturn's atmosphere, and protect the moons at the same time. What an exciting way to say goodbye!

To learn more about Saturn, check out NASA Space Place:
https://spaceplace.nasa.gov/all-about-saturn



This image of the hexagonal storm on Saturn's north pole was taken by Cassini in 2013. Image credit: NASA/JPL-Caltech/Space Science Institute

Heavenly Bodies

By Susie Christian