EUGENE ASTRONOMICAL SOCIETY

Io

November, 2022

PO Box 591 Lowell, OR 97452

www.eugeneastro.org

[1] M31, the Andromeda Galaxy Mark Wetzel

Observing Geosynchronous Satellites

by Jerry Oltion

Last month while I was looking at Saturn I noticed a very slow-moving satellite drifting past. It occurred to me that it was moving about the same speed that the stars would move in the other direction if I turned off my tracking motor. So I did, and sure enough, the satellite stayed put and Saturn and the stars slowly drifted westward.

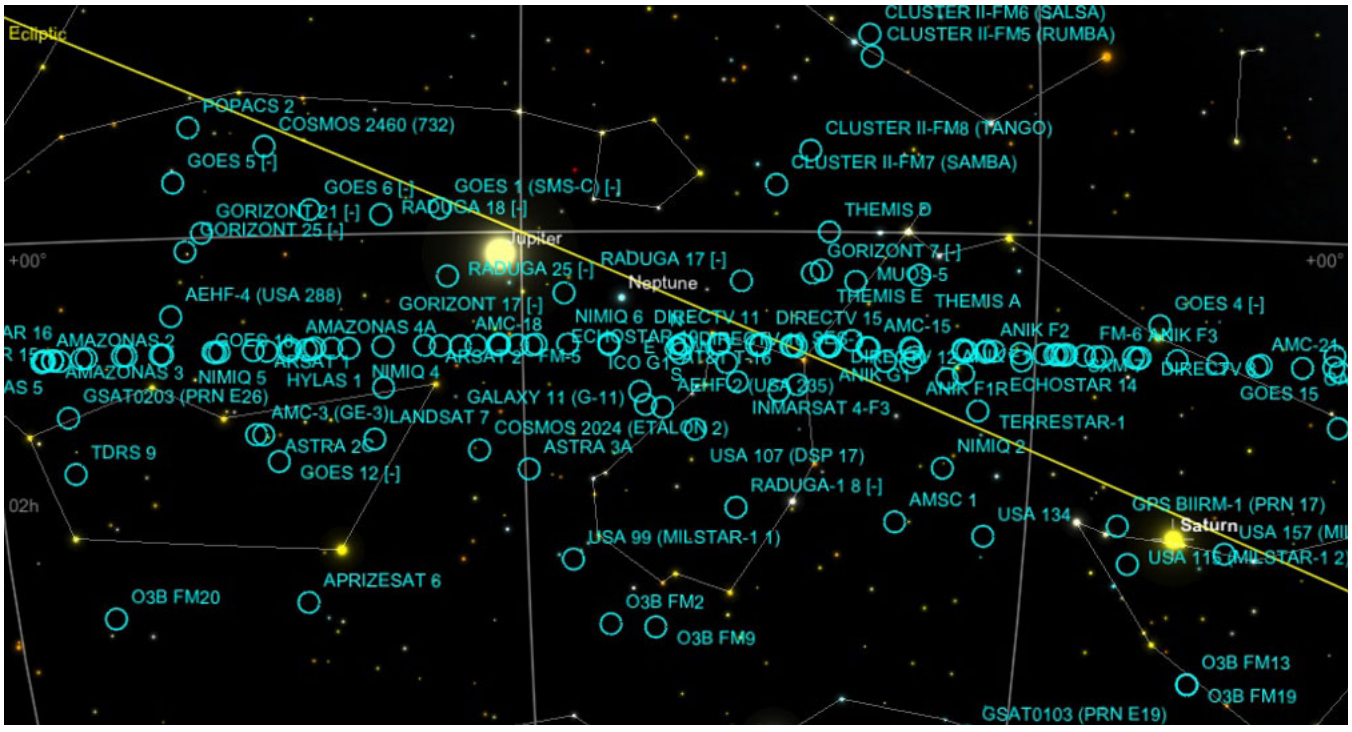
I had stumbled across a geosynchronous satellite! These are the satellites that orbit 22,236 miles out, so their orbits are exactly one day long. That means they stay put over the same spot on Earth, and when you aim your TV dish — or your telescope — at one, it stays there.

I remembered that Frank Szczepanski had made a similar discovery several years ago, also with Saturn. I'm betting that Saturn dips through the plane of the satellites once or twice a year, and this must be that season. It's kind of fun to watch a geosynchronous satellite stay put dead center in your field of view while the stars march slowly past.

About an hour later I was trying to find the constellation Cetus, but I was having a hard time because there were two extra bright stars where there shouldn't have been any. One of them slowly dimmed out while the other one got brighter, and I finally realized I was seeing the glint of sunlight off another couple of satellites. I aimed my scope at them and sure enough: They were geosynchronous, too. And there were four of them in a row, all within a one-degree field. I had apparently seen two of them at the point exactly opposite the Sun, when sunlight reflected off their solar panels right back at the Earth. Way cool!

Geosynchronous satellites are a fun target to hunt down. SkySafari has a lot of them listed in its database, so you can star-hop to them fairly easily. Go into the "Search" menu and highlight "Satellites," then hit "Settings" and "Highlight objects" and you'll see the whole belt of them surrounding the Earth. Pick one near an easy guide star (or planet) and hunt it down. They're relatively dim, probably 10th-11th magnitude, but easy to spot in a 4" scope or larger.

Go for it!



[2] Sh2-114, the Flying Dragon Nebula Andy Nowlen

Constellation of the Month: Andromeda

By Andrew Edelen

Many of the autumn's constellations are dim, delicate filigrees that are hard to trace out from any but the darkest rural sites. Those that aren't are the ones closer to the North Celestial Pole: Cassiopeia, Perseus, Auriga. Farther south, the only bright fall constellations are Pegasus, with its Great Square, and the twin curving chains that make up the familiar part of Andromeda, the Chained Woman.

Andromeda actually owns the northeast corner of the Great Square of Pegasus; Alpha Andromedae, or Alpheratz (Arabic: al-faras, "The Horse") was originally assigned to Pegasus by Ptolemy, but was later reassigned to Andromeda. The star's alternate name, Sirrah (surrat, "The Navel"), also betrays its equine association, representing the belly of the Winged Horse.

Constellation of the Month: Andromeda

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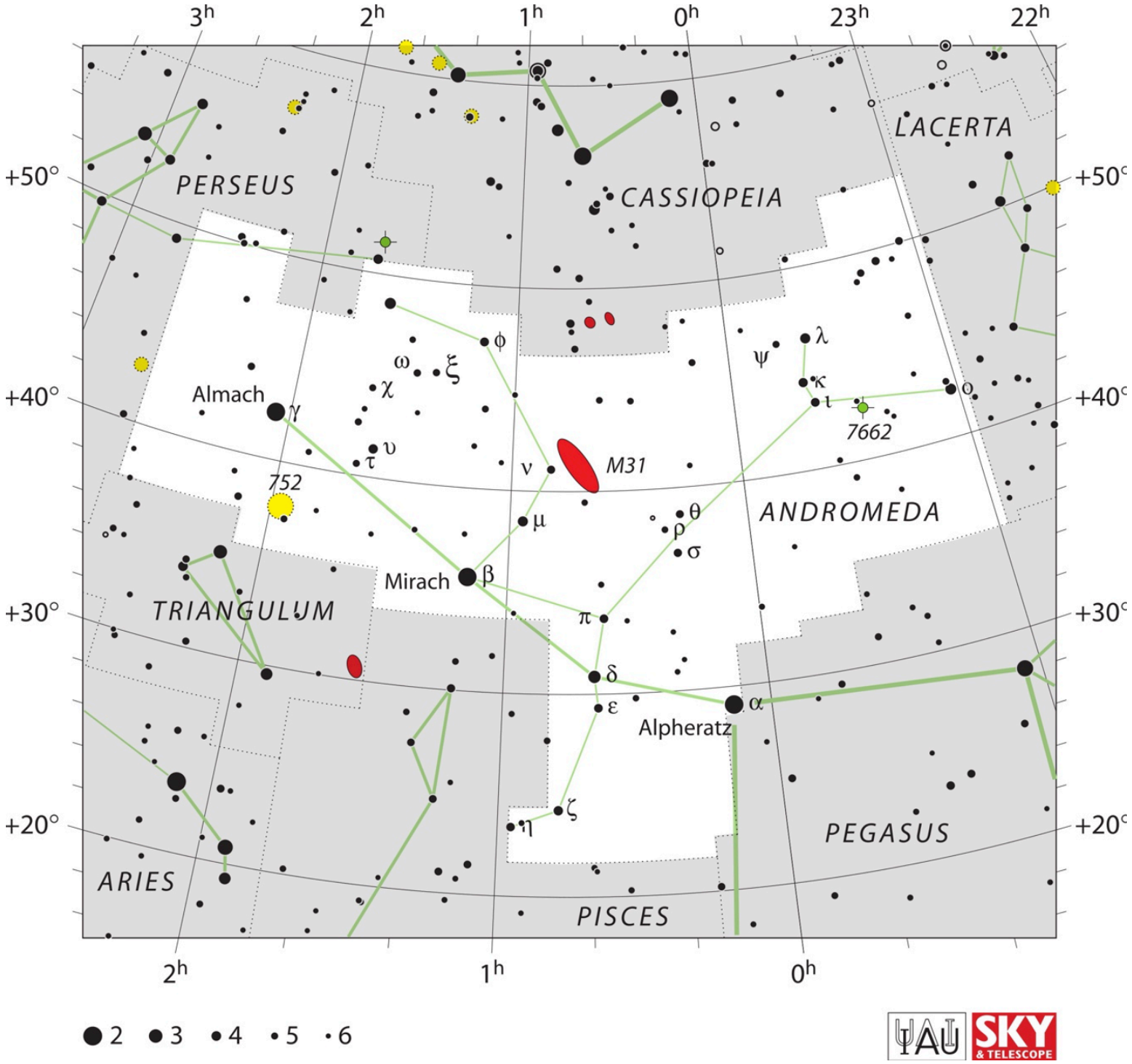


Andromeda, as seen in modern star charts. Courtesy IAU and *Sky & Telescope*.

Constellation of the Month: Andromeda

By Andrew Edelen

The Greek myth about Andromeda is well known, having entered the modern popular consciousness with the two Clash of the Titans films. In short, Queen Cassiopeia boasted of her own beauty so vainly that the gods heard her boasts; either Aphrodite or the Nereids (beautiful sea nymphs who served Poseidon) took great offense at Cassiopeia's vanity and punished the queen by having her daughter Andromeda set to be sacrificed to a sea monster for Cassiopeia's hubris. Andromeda was rescued by the hero Perseus, riding atop the winged horse Pegasus, who turned the sea monster (Cetus) into stone by wielding the severed head of Medusa. Just another day at the office in Olympus, although it's annoying that Bubo the mechanical owl never got his own constellation.

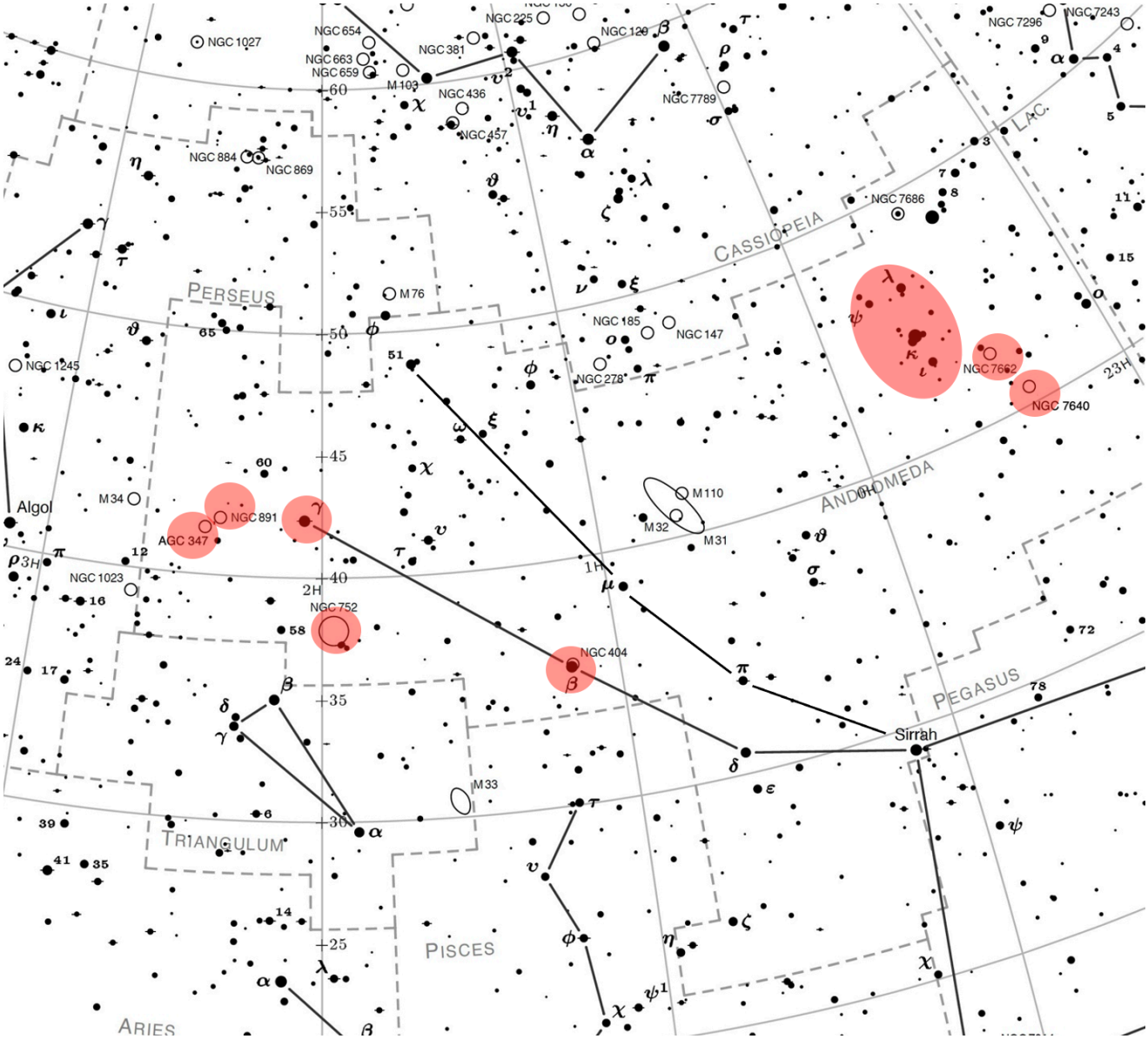
For so prominent a constellation, it's odd that it was cannibalized so severely in the mythologies of other cultures. The Chinese saw the middle section of the constellation as the House of the Sandal, Koui-Siou, which also contained a number of stars in modern Pisces; when Koui-Siou appeared in the evening sky, it was time to make new shoes for the coming year. Gamma Andromedae and ten other nearby stars were used to create Tian-da Jiang-jun, the Great General of the Heavens and his Ten Subordinates, while ten other stars in northern Andromeda were chosen to represent Tian-jiu, a pony express stable. To the Marshall Islanders, Andromeda, Aries, Cassiopeia, and Triangulum were combined to create the constellation of the Porpoise, with Andromeda's stars as the porpoise's body and Aries as its head.

Andromeda is, of course, the home constellation of Messier 31 (M31), the Andromeda Galaxy, the nearest large spiral galaxy to our own Milky Way. M31 and its close companions M32 and M110 are an easy sight in small telescopes and binoculars, and they display greater detail with each increase in optical aperture. (They're also, naturally, visible to the naked eye from a good rural observing site.) Other companions of M31 are either quite distant from the galaxy (NGCs 147 and 185, both satellites of M31, lie across the border in Cassiopeia) or are extremely faint and difficult for amateur equipment (at least a dozen dwarf galaxies scattered across Andromeda, Cassiopeia, and Pisces). Entire books have been written on M31, so I won't expound upon it much here.

It would be easy to have M31 as our naked-eye object for the month, but that would be too obvious a choice. Instead, we turn westward, to an asterism within the constellation that used to be a constellation in and of itself—the Y-shaped pattern known as Frederick's Glory (Frederici Honores), which comprises the stars Psi, Lambda, Kappa, Iota, and (sometimes) Omicron Andromedae. The Frederick referred to here is Frederick the Great, King of Prussia toward the end of the European Enlightenment. The stars of Frederick's Glory range from magnitude 3.62 (Omicron And) to 4.95 (Psi And), making it a suitable test of eyesight and sky conditions from within a minor urban environment. Frederick's Glory was created by the great German astronomer and uranographer Johannes Bode in his 1787 Astronomisches Jahrbuch, but only found favor with a small percentage of astronomers (mostly from the German-speaking realm). Interestingly, the French astronomer Augustin Royer had previously created the constellation Sceptrum

from the same stars in 1679, to commemorate Louis XIV. Obviously, this constellation quickly became as obsolete as its successor would.

Frederick's Glory offers a convenient leaping-off point for NGC 7662, our target this month for 4-inch telescopes. This large, impressive planetary nebula is visible in smaller telescopes and even in large binoculars, but it will take a 4-inch scope to really reveal the pale blue color and "soft" texture that give it the nickname "The Blue Snowball." Larger telescopes are required in order to see the annularity (ring shape) or the central star of this ghostly celestial bubble, but almost every class of optical aid will show something of the nebula. Look for it about a third of the way from Iota And to Omicron And, just southwest of 5.8-magnitude 13 Andromedae.



Andromeda. Chart adapted from https://www.cloudynights.com/articles/cat/articles/observing-skills/free-mag-7-star-charts-r1021

Constellation of the Month: Andromeda

By Andrew Edelen

Just under two degrees SSW of NGC 7662 is the sprawling, highly-inclined (tilted, from our perspective) galaxy NGC 7640, our target for 10-inch telescopes. Often overlooked in favor of other, easier-to-find galaxies in Andromeda, this low surface brightness spiral presents a mottled halo and a slightly-brighter core under good conditions. It's also impressively large, spanning 6′ x 1.5′ in a 10-inch scope in dark skies (remember that 1′ [one arcminute] is 1/60th of a degree, and roughly 1/30th the size of the Full Moon). NGC 7640 is relatively nearby at only 28 million light years, but its spiral arms are full of dust, which makes it fainter than its distance would indicate, and this also gives the galaxy its mottled appearance.

On the opposite end of the constellation from Frederick's Glory, at the SE end of the two chains of stars that comprise the majority of the visible constellation, lies the stunning multiple star Gamma Andromedae, or Almach. (Remember the comment a few columns ago that the Gamma star in most constellations is a striking double star?) Almach---a bowdlerization of Arabic al-'Anaq, "the caracal"—consists of a 2.3-magnitude yellow-orange star and a pair of white stars of magnitudes 5.1 and 6.3; the pair is so close that it takes a considerably-large telescope to separate them. Although white, the two fainter stars appear as a single bluish (or greenish) star in contrast to the brighter yellowish primary star, which is separated from the pair by 10" (ten arcseconds, or 1/6th of an arcminute). To complicate things even further, the brighter of the pair of white stars is itself a visually-inseparable double star, making Gamma And a quadruple system! Almach is a fine sight (and thus our target this month) in 2-inch telescopes.

Almach is a useful signpost for the great edge-on galaxy NGC 891, which lies about ¼ of the way from Almach to Algol, the eclipsing binary star also known as Beta Persei. NGC 891 is our target for 8-inch telescopes, but can be seen in smaller apertures as a long needle of faint light; it'll take at least a 10-inch under dark skies to see the dark, razor-thin dust lane that runs along the galaxy's major axis. Because it's thin and faint, NGC 891 is a good test of the sky conditions—if it's easy to see it, the conditions are excellent. The galaxy covers an area 9′ x 2′ in an 8-inch scope, and larger in greater apertures. It's been dubbed "The Outer Limits Galaxy" for appearing in the opening credits of that TV show, just as Stephan's Quintet appeared as the angels in It's A Wonderful Life.

NGC 891 is a prototype of a class of galaxies known as flat galaxies—spiral galaxies that have at least a 7:1 length-width ratio (I know 9′ x 2′ isn't a 7:1 ratio, but the galaxy is longer in reality than we see it from Earth, certainly longer than we see it in smaller-aperture telescopes.) This is useful because having a consistent shape allows these galaxies to be used to study the perturbations that take place in galaxy interactions (other studies have focused on elliptical galaxies, but those contain more mathematical/physical variables to account for).

Constellation of the Month: Andromeda

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From NGC 891, continue southeast for 22′ to a 6.5-magnitude orange star, then continue another 22′ southeast, where observers with 12-inch or larger telescopes will find a field full of small (less than 1′) faint galaxies. On an average night at a site in the Coastal Range, I counted nine galaxies here with the 20-inch Obsession, and would have added more if I'd used a chart or photo of the region to chase down some of the fainter ones. (Heresy!) This is Abell Galaxy Cluster 347, whose brightest galaxy is NGC 911, and which contains at least 32 members; the 10th-brightest member galaxy shines at only magnitude 13.3. These galaxies require patience and dark skies as much as they do large-aperture telescopes. At "only" 290 million light years' distance, AGC 347 is a part of the vast Perseus-Pisces Filament, one of the largest concentrations of matter in the known universe.

4.5˚ south-southwest of Gamma And is the huge (75′, over twice the size of the Full Moon!) open star cluster NGC 752. Visible to the naked eye under excellent conditions, NGC 752 is our binocular target in Andromeda, and it's a pretty simple one: a cluster of 60 or more stars, many of which are bright enough to see in modest binoculars or the smallest telescopes; there are fifteen 9th-magnitude stars and about thirty of 10th magnitude. The cluster's lucida, or brightest star, is a 6th-magnitude star just south of center, and the bright pair 56 And (magnitudes 5.7 and 6.1, separation 207") lies on the SW edge. Every observer sees something different in the loops and chains of stars in NGC 752—what do you see?

Our final object this month is suitable for nearly all telescopes, but really needs a 6-inch telescope for a good view. This is NGC 404, the Galaxy Not Found, better known as the Ghost of Mirach due to its proximity to the star Mirach (Beta Andromedae; a mis-transliteration from Arabic mizar, "the Girdle"). To find the galaxy, simply center Mirach in your eyepiece and look just northwest of it. Finding the galaxy is easy; seeing it requires persistence. It will help to move 2nd-magnitude Mirach out of the field of view; a higher-power eyepiece will make this easier. The galaxy itself is a small elliptical with a bright central core and a visible, star-like nucleus—it isn't overly impressive, but it's easy to find, and that makes it one of the first NGC objects most new astronomers discover on their own.

As you can see, there's a lot more to Andromeda than just its namesake galaxy (and its companions). Take advantage of any rare clear nights this November and track down some of the constellation's other, less-known gems. Your efforts will be rewarded!

Eugene Astronomical Society
PO Box 591
Lowell, OR 97452

Annual Club Dues $25

EAS is a proud member of The Astronomical League.

Club and Board News

By Randy Beiderwell

I wish to personally thank all of you who attended our October EAS meeting with awesome guest speaker, Bernie Bopp. What a wealth of knowledge Bernie is. I always look forward to a "Bernie talk", as I know I will learn new things. Thank you Bernie! Also thank you Amy Baker for pre taping/editing Bernie's talk for you all to enjoy on YouTube!

I also want to extend my gratitude to all who paid their EAS dues at the meeting! I am starting to process the payments made last night and those that were in our Post Office Box yesterday. You will all receive a payment receipt via email when I process your dues. There are still many outstanding dues to be paid. I will gladly accept your $25.00 check (best bang of $25 I can think of) mailed to:

EAS or Eugene Astronomical Society
P.O. Box 591
Lowell, OR 97452

If you missed the meeting, at our annual Business Meeting, the group said goodbye to Jerry Oltion who has decided to take a long-deserved break from I believe was thirteen years of service on the EAS Board of Directors. He also served at least a decade as your Secretary/Treasurer! Please join me in extending heart felt gratitude for his unwavering service to EAS! Thank you Jerry!! His heart is so into this amazing club, my guess is he won't be gone for long?

During the General Business Meeting, Jerry nominated Robert Asumendi to replace his seat on the Board. Ken Martin and I were also up for re-election. Thank you to the club for being members and voting us all in. Welcome Robert! I look forward to working with you!

Your EAS Board of Directors are:
Ken Martin
Dan Beacham
Randy Beiderwell
Robert Asumendi
Andrew Edelen

Please feel free to reach out to any of us with any questions, ideas for the club or any concerns. Our club is only as strong as our amazing members wish it to be! We are here to serve you!

At our annual Board of Directors meeting, held just after the regular club meeting, the Board unanimously re-elected Andy Edelen as your President and myself, as your continuing Secretary/Treasurer. As club President, Andy is the tie-breaker should the Board have any split voting. Speaking for myself, it is my pleasure to serve! I have gained so much knowledge and fun times from EAS not to mention what I'm guessing most of us are here for, observing our wonderful universe and beyond. Thank you to everyone for making our club one of the best in the U.S.A.!

Member astrophotography in this issue

[1] M31, the Andromeda Galaxy by Mark Wetzel

Casitas de Gila, Gila, New Mexico, October 18 - 20, 2022
Walton, Oregon, September 4, 23-26, 30, 2022

Ever since I started my pursuit of astrophotography, I wanted to produce a good photograph of the Andromeda galaxy. Having purchased a Stellarvue SVX102T refractor in April, I was ready for the autumn skies to put M31 in a good position for imaging. This project included several first attempts: 1) the use of a two-panel mosaic in Sequence Generator Pro, 2) the use of the Photometric Mosaic tools in PixInsight to merge the individual panels, and 3) testing the new Weighted Batch Preprocessing script to calibrate and integrate subframes in PixInsight. In early September, I took a few test shots with the Luminance filter to make sure that the mosaic orientation was correct, and that the 120 second exposure would not blow out the galaxy core. I started the project at dark sky sites in September in Oregon and finished it in October in New Mexico. I also added a camera rotation ruler on the telescope and tested the accuracy in New Mexico, +- 0.5 degrees or better. The image acquisition process went smoothly and almost every subframe was of high quality. Since I imaged during new moon cycles, there were no gradients or sky glow. Only a few subframes were degraded by high, thin clouds. For all nights, seeing varied from average to better than average.

While image acquisition was problem free, post processing was a real challenge, especially when attempting to add hydrogen-alpha filter data to the red and blue channels. The luminance data were easy to denoise, sharpen and stretch. Russ Croman's StarXTerminator and NoiseXTerminator work so well on linear or stretched images that post processing was both easier and flexible. It took me several days to process the Ha+RGB data. While each channel was easy to process, and creating an RGB image from the Red, Green and Blue integrated images, adding the Ha caused many problems with color balance and introduced many artifacts and gradients. I tried almost every approach described on-line and in books without success. To solve this problem, I made a starless RGB image and then stretched it. I then created a new Ha image that accounted for the Ha signal in the Red channel using filter bandwidths and exposure times in a PixelMath expression. I then stretched a starless version of the new Ha image and clone stamped everything that was not an emission region in the arms of the galaxy. The background was made dark, and the new Ha was combined with the RGB image with proportional factors in the Red and Blue channels. By adding some of the Ha to the Blue channel, the emission regions had more of a magenta color. The RGB stars image was denoised, stretched and saturated. I used the GenerlizedHyperbolicStretch script to stretch all the images. The HistogramTransform and CurvesTransform tools were used to fine tune the luminance and color images. The MorphologicalTransform tool was used to reduce the RGB star sizes. The starless luminance image was combined with the slightly blurred HaRGB color image to produce the LHaRGB starless galaxy. The stars and LHaRGB images were combined with PixelMath's combine function using opscreen() (StarXTerminator had the opscreen mode enabled). Several masks were created using the RangeMask tool and GAME script to work on the cores of the galaxies or the arms. The final image was touched up using Photoshop.

M31, the Andromeda galaxy is the nearest spiral to the Milky Way, type SA(s)b. It is one of the very few galaxies that can be seen with the naked eye or binoculars at a dark sky site. The galaxy spans over 3.9 degrees of the sky and its interflux nebula is much larger. M31 is behind a very rich star field in the

[1] M31, the Andromeda Galaxy by Mark Wetzel

constellation Andromeda. M32 and M110 are small elliptical satellite galaxies that have been stripped of much of their mass by M31. M33, the Triangulum galaxy, has also been greatly affected by gravitational interactions with M31. While M31 is a spiral, its disk is distorted from past collisions with other galaxies. Andromeda along with the Milky Way and M33 are a part of the Local Group of gravitationally bound galaxies. M31 is moving towards us, and in about 4 billion years, Andromeda and the Milky Way will merge. In 1923, Edwin Hubble proved that Andromeda was a separate "spiral universe" by identifying a Cepheid variable star in the galaxy to estimate its distance. This was one of the most important discoveries in astronomy and changed cosmology forever. Based on Hubble Space Telescope observations, M31 is about 2.5Mly from Earth with a diameter of about 220 kly (larger than the Milky Way). It is estimated that M31 contains upwards of 1 Trillion stars. Like the Milky Way galaxy, Andromeda is estimated to be about 10 billion years old. There are about 460 globular clusters orbiting the galaxy center. There are also a large number of star forming region as shown by the magenta emission nebulae in the spiral arms. (Wikipedia, NASA and SkySafari Pro).

Imaging details:

Stellarvue SVX102T with SFR0.74 focal reducer (FL = 528mm, f/5.2)
ZWO off-axis guider (OAG-L) with a ZWO ASI 174MM mini guide camera
Losmandy G11 mount with Gemini 2
ZWO ASI 2600MM Pro cooled monochrome camera (-10oC)
Chroma 36mm Hydrogen-alpha, Luminance, Red, Green, and Blue filters
Equatorial camera rotation: 0o

Software: Sequence Generator Pro, ASTAP plate solving, PHD2 guiding,
Losmandy Gemini ASCOM mount control and web client interface,
SharpCap Pro for polar alignment with the Polemaster camera,
PixInsight 1.8.9 with StarXTerminator (AI version 10) and NoiseXTerminator,
Photoshop CC 2022

For each of the two mosaic panels (about 12.5 hours):

Hydrogen-a 10 min x 12 subframes (120 min), Gain 100, Offset 68, 1x1 binning
Luminance 2 min x 135 subframes (270 min), Gain 100, Offset 68, 1x1 binning
Red 4 min x 30 subframes (120 min), Gain 100, Offset 68, 1x1 binning
Green 4 min x 23 subframes (92 min), Gain 100, Offset 68, 1x1 binning
Blue 4 min x 26 subframes (104 min), Gain 100, Offset 68, 1x1 binning

Total integration time for the completed mosaic was about 25 hours.

[2] Sh2-114, the Flying Dragon Nebula by Andy Nowlen

This is my first Optolong L-Ultimate project captured before the October rain set in. I have been practicing the post-processing part of astrophotography for the last few weeks.

Sh2-114 Flying Dragon - located between Cygnus and Lacerta. It is a faint nebula and is 12.0 x 6.0 arc minutes apparent size. It is a less frequently imaged deep sky target. The processing involved creating an HOO version, star removal, and split channels recombined into an SHO(ish) palette derived from the OSC data.

Enjoy!

Scope - ES ED 102mm @ 709mm
Camera - Asi533mc pro
Filter - L-Ultimate
Mount - CEM40EC
AsiAir Pro
Integration ~ 10 hours ~ 135 x 300 seconds
Astropixel Processor
Pixinsight - some aspects of the "Forax" palette were applied. Stars were recombined using a pixel math 'power of inverted' pixels formula. (If interested you can view paulyman astro on Youtube for an introduction.
Photoshop