EUGENE ASTRONOMICAL SOCIETY

Io

December, 2022

PO Box 591 Lowell, OR 97452

www.eugeneastro.org

[1] M45, the Pleiades in Taurus Mark Wetzel

Mars Occultation December 7th

by Jerry Oltion

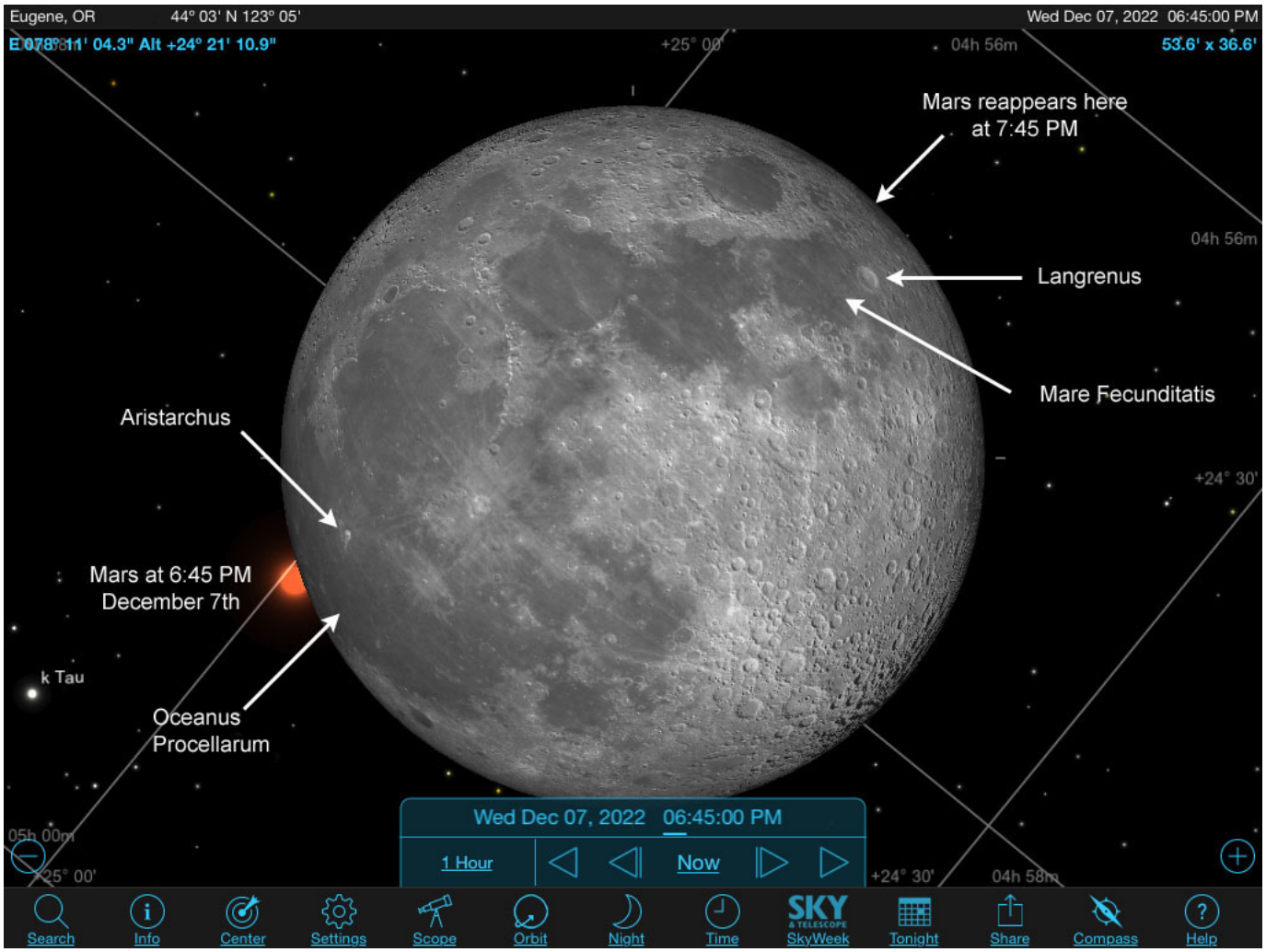
On the evening of Wednesday, December 7th the Moon will cross in front of Mars. The Moon will be full, so both the disappearance and the reappearance will be on bright limbs, but Mars will be shining at its maximum brightness of -1.8 so it should still be easily visible against the lunar glare, even by naked eye. It should be great in binoculars or a telescope.

From our vantage point in the southern Willamette valley, the occultation will happen at 6:45 PM, about two and a half hours after Moonrise. The Moon will be 24° high in the east-northeast (78° azimuth), nestled in the upper horn of Taurus, the bull. Mars will make contact on the edge of Oceanus Procellarum (the Sea of Storms) not far from the bright crater Aristarchus.

Exactly an hour later, at 7:45, Mars will reappear on the opposite side of the Moon, just off Mare Fecunditatis (the Sea of Fertility), near the crater Langrenus. By then the Moon will be 35° high and almost due east (88° azimuth).

Mars will be 17 arc-seconds across, so it will take about 30 seconds for it to disappear and reappear, unlike stars, which wink in and out instantly. Start watching at least a few minutes early.

Lunar occultations of Mars are fairly rare, happening every 14 years on average, and for one to happen when Mars is at opposition is even rarer, so don't miss this one!



SkySafari screenshot of the beginning of the occultation

From the Secretaries Desk

By Randy Beiderwell

EAS welcomes new members:

Rob and Alison Nance, Aphy Mach, Brian Bralley, Robert and Melody Morrell, Ruben Raymos and Stacy Rathbun.

We look forward to meeting you all and helping you with any astronomy related information that we can offer. Always feel free to ask if you have even a simple question or if you have ideas for our club, that would be awesome. You can reach out to any Officer via our website under "contact". Members in good standing who have come to at least 2 club meeting are eligible to borrow a great telescope of your choice from our vast lending library. All telescopes come with eyepieces and everything needed, including instructions. These telescopes can also be found on our club website: eugeneastro.org contact Dan Beacham for a telescope loan.

We have very cool EAS Glow in the Dark (new) logo stickers 3" and Eclipse solar safe glasses for sale. The stickers are $2 each and the Solar Eclipse glasses are $1 for EAS members. Contact me with an order or I will continue to bring a few of each, to live club meetings.

Several new members have expressed ideas for the club that include a "What's Up" in the sky, short presentation for each meeting that will talk about what to look for in our current night sky. This could be a favorite constellation and items therein to observe and how to locate them. It could be a comet or meteor shower. Sky is the limit here! We NEED volunteers to do these short presentations. Please contact our President Andy Edelen or any Board Member if you would be willing to do a presentation. Remember, our club is only as strong as its member are active!

We have also had requests for Dob (reflector) telescope columniation education and practice. This would be a great hands-on topic for a future club meeting. Please let an Officer know if you are willing to help by bringing a Dob and tools to help instruct interested members on how to make the all-important columniation adjustments.

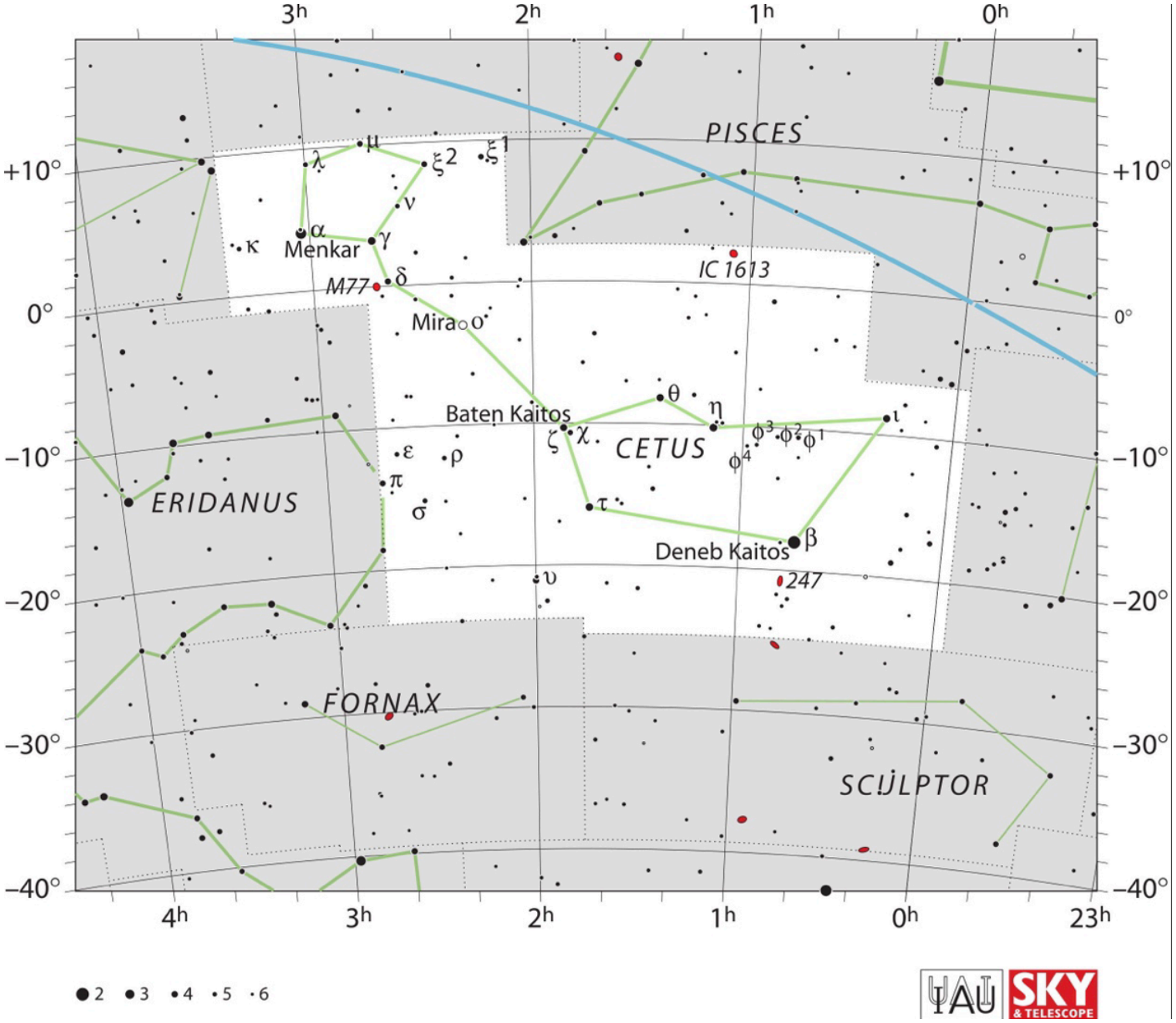
DUES were due on October 1st. to date just a little over 50% of those that paid dues last year, have paid so far. If you are a new member wishing to join, please fill out a Membership Application which can be found on our website under "Join". Renewing members need not fill out the Membership Application. It is important to keep me updated with any change of address or phone number. Please send a check, still only $25, to: EAS, P.O. Box 591, Lowell, OR 97452. I will send you a Dues Receipt via email when I process your dues. You may also pay with cash at any club meeting. Prorated dues are for new members only.

The board voted unanimously to donate $500 to the Science Center and that donation has been given.

Happy Holiday's everyone!

Constellation of the Month: Cetus

By Andrew Edelen



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

Constellation of the Month: Cetus

By Andrew Edelen

Fitting in neatly with both Andromeda and the Cosmic Autumn Ocean mythology-wise, Cetus the Sea Monster (or, in modern atlas and parlance, the Whale) swims deep in the southern reaches of the sky on December nights. The fourth-largest of the 88 constellations, Cetus serves as a bridge between the early-autumn constellations and the rise of gaudy Orion in the east; it takes 3.5 hours for the entire constellation to cross the meridian. It's also perhaps the 13th constellation of the zodiac, as the ecliptic passes just north of the constellation's northeastern border, and planets regularly cross through the region of the Whale's Tail.

Few constellations have undergone such radical makeovers as Cetus. Originally the sea monster sent to ravage the Ethiopian coast and devour Andromeda in sacrifice (in response to her mother's vanity), Cetus was long imagined as some sort of hideous fusion of various giant sea creatures—fish, squid, dragon—with other animals (boar, dog, bear, lion, horse, or even elephant). Renaissance and Enlightenment uranographers let their imaginations run wild while illustrating Cetus for their atlas charts.

Modern atlases depict a more-benign version of Cetus, due in part to the semantic shift of "sea monster" to "whale." Greek kētōs originally meant the former, but with the application of the word to the zoological order Cetacea—the whales, which were not known in the Mediterranean and Aegean Seas—the meaning and depiction of the constellation became less fanciful. What was once the Monster's head, comprising the stars Alpha, Gamma, Nu, Xi2, Mu, and Lambda Ceti, became the Whale's tail. H.A. Rey, whose book The Stars: A New Way to See Them introduced multiple generations to the constellations, even drew Cetus with an endearing smile. (I refuse to see it any other way.) And Beta Ceti, once known as Deneb Kaitos (Arabic: "the Southern Tail of the Sea Monster"), was renamed Diphda ("the Second Frog." No, I don't know either.).

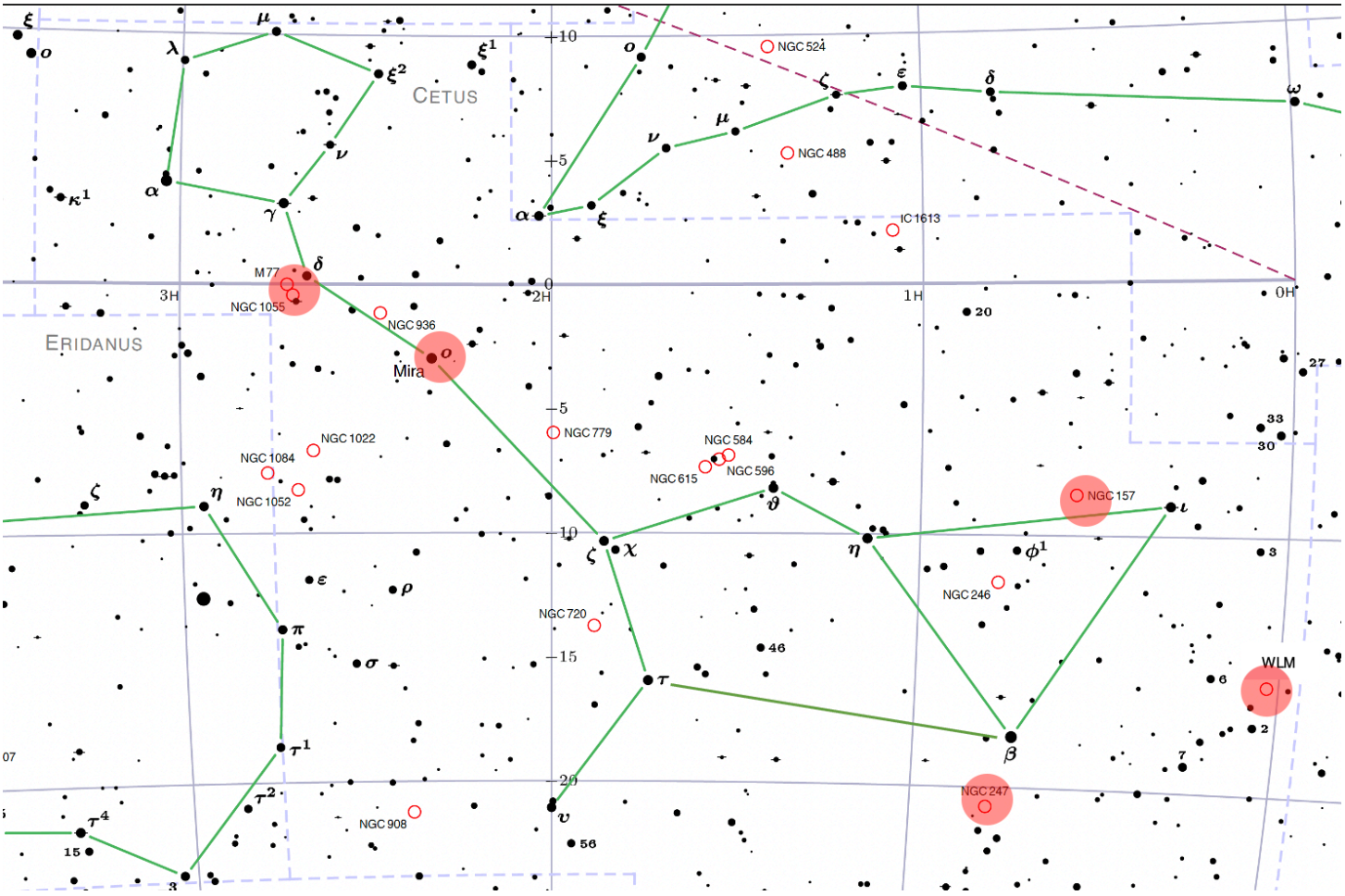
Larger constellations tend to be less represented in the mythologies of other cultures; this is usually because larger star patterns are easier to break up into other (sometimes equally-large) constellations. Delphinus, for example, is usually preserved as one distinct unit from culture to culture. Cetus, on the other hand, gets cannibalized into other constellations by peoples across the globe, which leads to fewer cultures developing specific mythologies for the constellation as we know it. To the world's more-northern peoples, the constellation wasn't even observable, due to its southern declination. The Chinese viewed (modern) Cetus' tail as one of Three Granaries, with many of the Whale's body stars as a second Granary; the third was composed of stars from western Taurus. In Hindu mythology, Cetus was sometimes represented as Ketu, the severed body of a larger monster, while the Tukano and Kobeua peoples of northern Brazil viewed the constellation as Yaí, the great Jaguar, associated with cosmic floods and rising during the flooding of the Amazon basin. (Several sources link Cetus with the Jaguar, but one more authoritative source claims that the Jaguar is actually composed of Cassiopeia and Perseus.)

Constellation of the Month: Cetus

By Andrew Edelen

Cetus' most-famous star is our naked-eye object for this month. Omicron Ceti, better known as Mira, is the prototype of a class of long-period variable stars known simply as Mira-type variables; its variability was discovered in the late 16th Century, and this earned the star its name (Mira, "wonderful"). Mira is an asymptotic red giant, meaning that it is a low-mass star on its way to a possible supernova death, and is currently burning helium around a core of carbon and oxygen.

Mira reaches magnitude 3.5, rising from magnitude 9.5 in approximately 110 days. It then takes about 220 days to slide back down to 9.5 again. These magnitudes can vary depending from cycle to cycle, so it's worth watching when it reaches minimum and maximum. Its next approximate maximum will occur on June 13, 2023; what magnitude is it currently? Compare it to the stars around it; any planetarium app will have the magnitudes of the neighboring stars. However, due to Cetus' position among the fall/winter constellations, it is not visible between March and June, so it is possible to miss its maxima entirely.



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

Constellation of the Month: Cetus

By Andrew Edelen

The majority of notable deep-sky objects in Cetus are galaxies, of which the constellation is host to many fine examples. Foremost of these is the constellation's sole Messier object, M77, which is easily found below the Whale's tail and is our binocular target for this month. M77 is often considered one of the more-difficult Messier objects, but this is nonsense; the galaxy has a very bright core that is visible in even standard (50mm) binoculars. M77's famous spiral arms require dark skies and a medium-aperture (10") telescope for a good view. M77 was the first galaxy known to have an active, emission-radiating nucleus; these active-nucleus galaxies came to be known as Seyfert galaxies, after astronomer Carl Seyfert. By examining its spectrum, Edwin Hubble also found that M77 was an extragalactic object, beyond the boundaries of the Milky Way. This latter discovery—one of the first to use the redshift as a cosmological distance indicator—helped spark the birth of modern cosmology.

M77 lies just under 1˚ southeast of the 4th-magnitude star Delta Ceti. Note that on the detailed chart above, M77 and NGC 1055 are mislabeled—NGC 1055 is actually the more-northern of the two galaxies labeled there. It's also our target for 4-inch telescopes this month and is easily found, lying as it does just ½˚ northwest of M77. NGC 1055 is a nearly edge-on spiral galaxy with a prominent dust lane bisecting it lengthwise; this dust lane requires at least a 12-inch telescope for a good view. In photographs, NGC 1055 resembles a miniature Sombrero Galaxy (M104). Two stars (magnitudes 6.7 and 7.6) to the immediate north form an equilateral triangle with the galaxy; in the eyepiece, these stars resemble the eyes of a cosmic face of which the galaxy is a wide, slightly-lopsided mouth. In a 4-inch telescope, the galaxy is elongated about 3:1 and shows a faint, diffuse core.

Just under 4˚ east of Cetus' "prow" star, Iota Ceti, lies the big, blocky spiral galaxy NGC 157. Our December target for 2-inch scopes, NGC 157 is nearly face-on to us, and shows spiral arm structure in larger telescopes. NGC 157 is by no means an easy catch with small scopes, so anyone finding it in a 2-inch can take pride in having done so. The galaxy 's halo is somewhat rectangular, even in small apertures, but shows little in the way of concentration: no obvious core or nucleus can be seen without larger aperture. The galaxy can be found about 1/5 of the way from Iota Ceti to Theta Ceti (note that our detailed chart uses an obsolete lowercase symbol for Theta).

Our sole non-galaxy target for telescopes this month is the planetary nebula NGC 246, The Skull Nebula. Easily visible in a 6-inch telescope amid the triangle formed by Iota, Beta, and Theta Ceti, NGC 246 is a ghostly, broken circle filled with strands of gossamer nebulosity and a trio of embedded stars; in photographs, the nebula's inner texture and the enmeshed stars give an eerie approximation of a human skull… Yorick, perhaps. In a 6-inch scope, the nebula measures about 3' (3 arcminutes) across; the central star shines dimly at 12th magnitude, while the other stars within the nebula are of 12th and 13th magnitude. The nebula's northern and eastern edges are a little better defined than the southern and western sides.

Constellation of the Month: Cetus

By Andrew Edelen

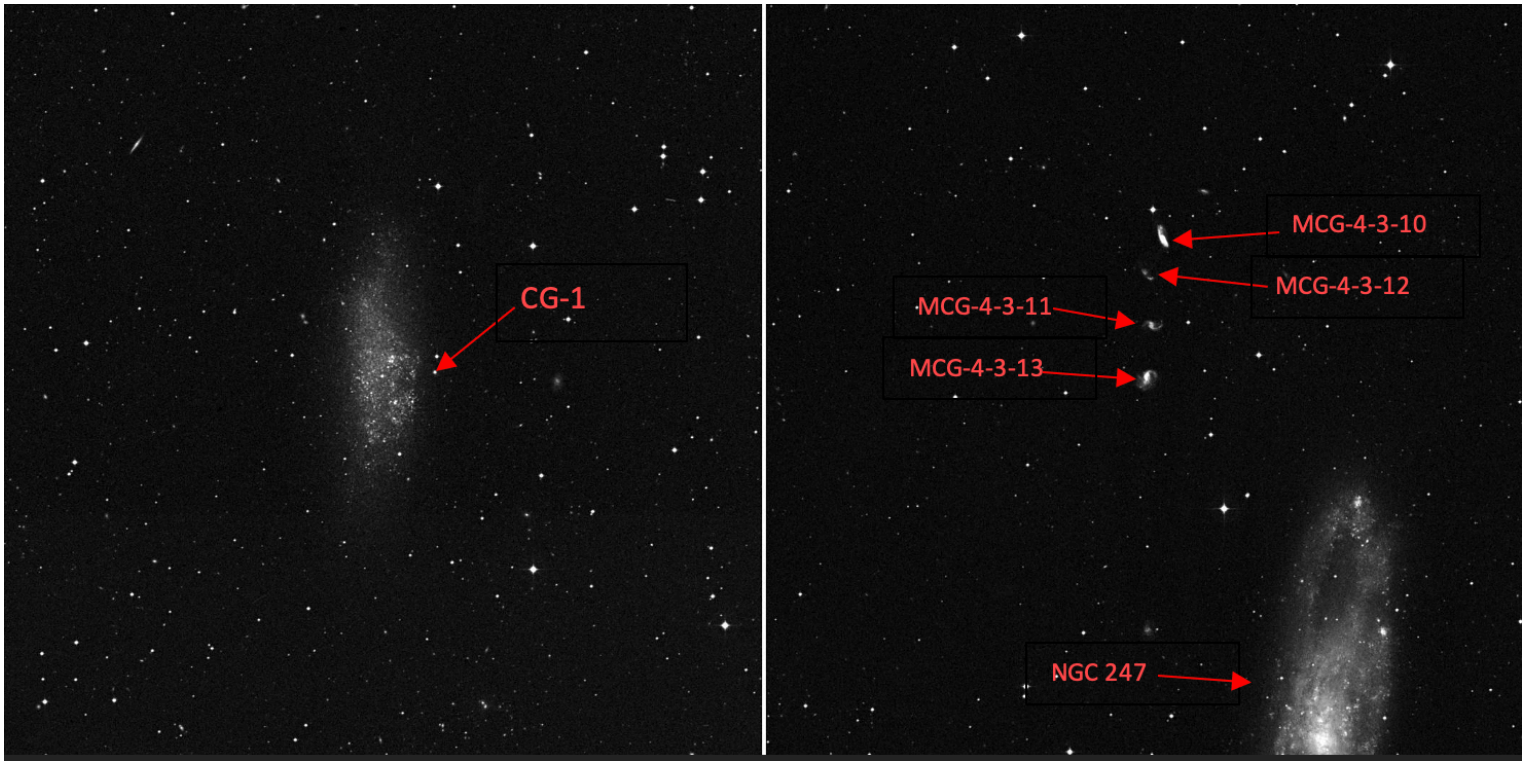
NGC 246 is bounded within an asterism I call "The Jellyfish," which drifts alongside the Whale as it skims the southern horizon. The top of the Jellyfish's bell is marked by 4.8 magnitude Phi1 Ceti, the tentacles—a half-dozen 5th- and 6th-magnitude stars—trailing away to the east and southeast. A well-aligned finderscope will help greatly to find NGC 246 among these stars; it's about 1.5˚ southeast of Phi1. It's also one of the only planetary nebulae whose central star is a triple system, and the interaction of these three stars within the expanding gas shell may account for the nebula's complex internal texture. This triple system is not optically separable, and was only discovered spectroscopically.

Almost nine degrees south of NGC 246 is the sprawling galaxy NGC 247, a challenging object for 8-inch telescopes. NGC 247 is a member of the Sculptor Group of galaxies, whose dominant member is the famous NGC 253; this is the nearest group of galaxies to our own Local Group. NGC 247 is sometimes considered a dwarf galaxy, despite its apparent size—the galaxy is 70,000 light years in diameter but has a relatively low mass. In an 8-inch scope, the galaxy spans about 10′ x 2.5′, and has a 9.5-magnitude star buried in its southern end. Of special interest is a large "void" within the north end of the galaxy; this void (sometimes called "The Needle's Eye") requires a large-aperture telescope to discern amid the galaxy's low surface brightness halo, and is as yet unexplained by astronomers. Due to the galaxy's southern declination from the Eugene/Springfield area, details can be hard to detect in NGC 247, and just seeing the galaxy in an 8-inch telescope is an impressive feat from this latitude. To find the galaxy, look about 3˚ south-southeast of Diphda, Beta Ceti.

NGC 247 is not alone in the field, however, and those with 12" or larger telescopes may note the presence of two (or more, depending on aperture and sky conditions) small galaxies northeast of the galaxy's north end. These are members of the Burbidge Chain, our target for large telescopes this month. From south—closest to NGC 247—to north, these tiny galaxies are MCG-4-3-13, MCG-4-3-11, MCG-4-3-12, and MCG-4-3-10 (MCG stands for Morphological Catalogue of Galaxies). -13 and -10, the S-most and N-most of the chain, are much the easiest to detect of the four, with -10 having a convenient 12th-magnitude star just over 1′ northeast of it. These galaxies were objects of great interest to astronomers Geoffrey and Margaret Burbidge, who hypothesized that the chain formed from a long "tube" of matter that stretched itself apart, each of the broken segments becoming a separate galaxy; maverick astronomer Halton Arp believed the galaxies in the Chain were physically connected to NGC 247, despite the great discrepancy in their respective redshifts (290 million light-years distance to the galaxies in the Burbidge Chain versus only 12 million for NGC 247).

In the eyepiece, the Burbidge Chain (also known as "Burbidge's Chain") spans 5.5′ long; its southernmost member, MCG-4-3-13, lies a full 16′ from the center of NGC 247. The two galaxies in the middle of the Chain, MCGs-4-3-11 and -12, are much more difficult to observe than the two at the ends,

especially at such low declinations. I have spotted -13 and -10 in a 12.5-inch telescope with some difficulty from EAS' Eureka Ridge site, so I know that it can be done; diligence and a good chart or photo of the field are necessary. These are tiny, fleeting galaxies that will challenge an experienced observer in anything less than an 18-inch telescope.



Large-scope targets in Cetus: WLM (left); The Burbidge Chain and NGC 247 (right). North is at top. Courtesy Palomar Observatory/STScI

Three dwarf members of our Local Group of galaxies also inhabit the boundaries of Cetus: IC 1613; the Cetus Dwarf Galaxy (PGC 3097691); and **Wolf-Lundmark-Melotte** (WLM, UGCA 444). The last of these is our target for 10-inch telescopes this month, and is a considerable challenge at that. WLM is a large (9′ x 3′), subtle glow, not much brighter than the background sky on an average night and requiring a wide-field and/or low-power eyepiece to detect. In photographs, the galaxy looks surprisingly Liechtenstein-ish. Don't expect much detail here, although users of larger scopes may be able to spot CG-1/WLM-1, the galaxy's brightest globular cluster; it lies 0.67′ south of a 14.5-magnitude star that's just west of the galaxy's center, and will appear as a slightly-fuzzy star itself. (Older versions of Sky Safari list the globular as the star GSCII 737.)

WLM lies a mere 3 million light years from us, about 50% further than the great Andromeda Galaxy, M31. Its low stellar density is the cause of its feeble surface brightness and irregular morphology.

Constellation of the Month: Cetus

There are dozens of dwarf galaxies like it filling the space between and around the Milky Way and M31 (and M33, too, although few of M33's companions have been identified), with more being discovered every decade; WLM itself was discovered only in 1909. Such discoveries were once the province of amateur astronomers like us, although photographic surveys have since superceded visual discovery in all but a few areas of astronomy. Yet there's still something rewarding about catching photons from these dim, often-ignored neighbors of ours, observed by only a few intrepid explorers wandering among the hinterlands of the great celestial Whale.

Eugene Astronomical Society
PO Box 591
Lowell, OR 97452

Annual Club Dues $25

EAS is a proud member of The Astronomical League.

Member astrophotography in this issue

[1] M45, the Pleiades in Taurus by Mark Wetzel

Casitas de Gila, Gila, New Mexico, October 26-28, 2022

During my trip to New Mexico, I imaged the Pleiades as the second of two targets each night. M45 is a very popular target for widefield imaging. Since I purchased my SVX102T refractor, I have image some of the most photographed deep sky objects. In M45, the hot, blue stars are so bright that I took 30, 60 and 120 second exposures with the Luminance filter in order to construct an HDR composite image for the details while minimizing star bloat. Red, Green and Blue broadband filters were used for color.

I processed the data using a similar workflow in PixInsight as with other nebulae. NoiseXTerminator was used to remove some of the background noise in all integrated and cropped images. A master luminance was created with the HDRComposition tool using the 120, 60 and 30 second Lum integrated images. StarXTerminator was used to create starless and stars luminance images. With a starless image, more faint details emerge during stretching without worrying about star bloat and halos. The same steps were done with the RGB color image combined using the Red, Green and Blue filter integrated masters. The stretched starless luminance image was denoised further with NoiseXTerminator, sharpened and then the contrast was enhanced with the HistogramEqualization tool at three kernel sizes. The RGB starless image was color corrected with the PhotmetricColorCalibration tool. It was denoised with NoiseXTerminator using an aggressive setting, and then it was stretched. Both starless and stars RGB images were combined with luminance images. The colors were adjusted and saturated. The final starless LRGB nebula was combined with the LRGB stars using the PixelMath combine function with the opscreen() parameter.

Member astrophotography in this issue

[1] M45, the Pleiades in Taurus by Mark Wetzel

M45, the Pleiades or Seven Sisters, is an open star cluster that is very close to us. You can see it above the horns of the constellation Taurus in the fall. Galileo was the first to observe the Pleiades through a telescope. M45 contains over a thousand stars that are loosely bound by gravity, but it is visually dominated by a handful of its brightest members. But there is more to M45 than just the bright stars. This image shows extensive clouds of dust lit by the stars and more dark clouds the background. The stars are moving through the dust and are heading in the direction of Earth. The gravity and motions of the stars are causing shock waves in the clouds giving them the striations. M45 is about 444 light years from Earth and has a size of around 17.5 ly (SkySafari Pro, NASA).

Imaging details:

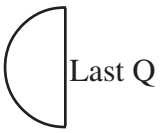
Stellarvue SVX102T with SFR0.74 focal reducer (FL = 528mm, f/5.2)
ZWO off-axis guider (OAG-L) with a ZWO ASI 174MM mini guide camera
Losmandy G11 mount with Gemini 2
ZWO ASI 2600MM Pro cooled monochrome camera (-10C)
Chroma 36mm filters: Luminance, Red, Green, and Blue
Equatorial camera rotation: 270 deg

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

Luminance 30 sec x 59 subframes (29.5 min), Gain 100, Offset 68, 1x1 binning
Luminance 1 min x 90 subframes (90 min), Gain 100, Offset 68, 1x1 binning
Luminance 2 min x 86 subframes (172 min), Gain 100, Offset 68, 1x1 binning
Red 2 min x 40 subframes (80 min), Gain 100, Offset 68, 1x1 binning
Green 2 min x 34 subframes (68 min), Gain 100, Offset 68, 1x1 binning
Blue 2 min x 34 subframes (68 min), Gain 100, Offset 68, 1x1 binning

Total integration time: 8.5 hours

Observing in December 2022



Dec 7, 8:08 PM	Dec 16, 12:56 AM	Dec 23, 2:17 AM	Dec 29, 5:20 PM
Mercury Set: 5:26 PM	Mercury Set: 5:51 PM	Mercury Set: 6:06 PM	Mercury Set: 6:00 PM
Venus Set: 5:15 PM	Venus Set: 5:29 PM	Venus Set: 5:43 PM	Venus Set: 5:57 PM
Mars Set: 7:57 AM	Mars Set: 7:07 AM	Mars Set: 6:29 AM	Mars Set: 5:59 AM
Jupiter Set: 1:04 AM	Jupiter Set: 00:31 AM	Jupiter Set: 00:07 AM	Jupiter Set: 11:43 PM
Saturn Set: 9:37 PM	Saturn Set: 9:05 PM	Saturn Set: 8:41 PM	Saturn Set: 8:20 PM
Uranus Set: 5:10 AM	Uranus Set: 4:33 AM	Uranus Set: 4:04 AM	Uranus Set 3:40 AM
Neptune Set: 00:30 AM	Neptune Set: 11:51 PM	Neptune Set: 11:24 PM	Neptune Set: 11:01 PM
Pluto Set: 7:30 PM	Pluto Set: 6:56 PM	Pluto Set: 6:29 PM	Pluto Set: 6:07 PM

All times Pacific Standard Time (November 6, 2022 – March 11, 2023 = UT -8 hours) or Pacific Daylight Time (March 12 – Nov 4, 2023 = UT -7 hours)

Date	Moon Rise	Moon Set	Twilight Begin	Sun Rise	Sun Set	Twilight End
12/1/2022	13:42	00:22	05:44	07:27	16:35	18:19
12/2/2022	14:02	01:34	05:45	07:28	16:35	18:18
12/3/2022	14:21	02:44	05:46	07:30	16:35	18:18
12/4/2022	14:42	03:53	05:47	07:31	16:35	18:18
12/5/2022	15:06	05:02	05:48	07:32	16:34	18:18
12/6/2022	15:34	06:11	05:49	07:33	16:34	18:18
12/7/2022	16:07	07:19	05:50	07:34	16:34	18:18
12/8/2022	16:48	08:23	05:50	07:35	16:34	18:18
12/9/2022	17:38	09:20	05:51	07:36	16:34	18:18
12/10/2022	18:34	10:09	05:52	07:36	16:34	18:18
12/11/2022	19:35	10:49	05:53	07:37	16:34	18:19
12/12/2022	20:39	11:21	05:54	07:38	16:34	18:19
12/13/2022	21:44	11:48	05:54	07:39	16:34	18:19
12/14/2022	22:49	12:10	05:55	07:40	16:35	18:19
12/15/2022	23:53	12:30	05:56	07:40	16:35	18:20
12/16/2022		12:49	05:56	07:41	16:35	18:20
12/17/2022	00:59	13:08	05:57	07:42	16:35	18:20
12/18/2022	02:07	13:28	05:58	07:42	16:36	18:21
12/19/2022	03:19	13:51	05:58	07:43	16:36	18:21
12/20/2022	04:36	14:19	05:59	07:44	16:37	18:22
12/21/2022	05:56	14:56	05:59	07:44	16:37	18:22
12/22/2022	07:16	15:45	06:00	07:45	16:38	18:23
12/23/2022	08:30	16:49	06:00	07:45	16:38	18:23
12/24/2022	09:31	18:06	06:01	07:45	16:39	18:24
12/25/2022	10:19	19:28	06:01	07:46	16:39	18:24
12/26/2022	10:55	20:51	06:01	07:46	16:40	18:25
12/27/2022	11:23	22:10	06:02	07:46	16:41	18:26
12/28/2022	11:46	23:24	06:02	07:47	16:41	18:26
12/29/2022	12:07		06:02	07:47	16:42	18:27
12/30/2022	12:27	00:36	06:03	07:47	16:43	18:28
12/31/2022	12:48	01:45	06:03	07:47	16:44	18:28

All times are for Eugene, Oregon Latitude 44º 3' Longitude 123º 06'

Items of Interest This Month

Best month to view Mars. Mercury is also visible mid-month.

12/1 Io shadow transit 6:42 – 8:56 PM. Red Spot transits 9:22 PM.

12/7 Mars at opposition, **Moon occults Mars**. Disappearance 6:45 PM, return 7:45 PM.

12/8 Io shadow transit 8:39 – 10:52 PM. Red Spot transits 10:10 PM.

12/13 Geminid meteor shower. Callisto skims Jupiter's south pole 5:00 PM. Red Spot transits 9:19.

12/15 Ganymede shadow transit 4:41 – 7:18 PM. Io shadow transit 10:35 – 00:48. Red Spot transits 10:58 PM.

12/17 Io shadow transit 5:04 – 7:17 PM.

12/18 Europa shadow transit 7:26 – 9:54 PM. Red Spot transits 8:28 PM.

12/21 Winter solstice 1:48 PM. Mercury at greatest eastern elongation (visible after sunset). Ursid meteor shower.

12/22 Ganymede shadow transit 8:44 – 11:20.

12/23 Red Spot transits 7:38 PM.

12/24 Io shadow transit 7:00 – 9:13 PM.

12/25 Red Spot transits 9:17 PM.

12/30 First Quarter Friday. Jupiter within 2° of Moon. Red Spot transits 8:27 PM.