REFLECTIONS

MARCH 2024

THE NEWSLETTER OF THE POPULAR ASTRONOMY CLUB - QUAD CITIES USA

Betelgeuse: About to explode?

Orion's brightest star could put on a spectacular show

Last month, we highlighted the "Winter Football," a group of bright stars visible in the night sky during winter that form a pattern looking somewhat like a football. This month, as winter slowly yields to spring, let's highlight one of the more interesting stars found within the Winter Football – a star which someday may shine so brightly that it will be visible during the day.

That star is Betelgeuse, the brightest star in the familiar constellation Orion, aka "the Hunter." Betelgeuse is a first magnitude star – which means that it is very bright – and rates in the top ten in terms of brightness when it comes to visible stars – though, as we'll see, it has moved down that list, and should eventually move to the top.

Many individual stars have names derived from Arabic, and Betelgeuse is no exception. Found, from our perspective in the Northern Hemisphere, in the upper left portion of Orion, "Betelgeuse" is roughly translated as the "arm of the hunter." It is also often referred to, somewhat indelicately, as the "armpit of Orion."

Betelgeuse is estimated to be 640 light-years from Earth. However, due to its unique characteristics, its distance is difficult to measure, so it may be somewhat closer or further away.

Keep in mind that a light-year is a measure of distance, not time: it's the distance that a beam of light travels in one Earth year. This means that the light we see from Betelgeuse actually departed the star centuries ago.

Betelgeuse is classified as a red supergiant star, and indeed it does appear to have a reddish tint. And it is indeed a giant, certainly in comparison to the star closest to us, our own Sun.

The radius of Betelgeuse is more than 600 times that of our Sun. This means that, if you were to place Betelgeuse in the center of our Solar System, it would engulf Earth; in fact, it would engulf Mars as well, and extend out to the orbit of Jupiter.

Though it's much bigger than our Sun, Betelgeuse isn't nearly as hot. Its surface temperature is about 5,100 degrees Fahrenheit, which is plenty warm but still about half that of the Sun.

Astronomers estimate that Betelgeuse is about 10 million years old. As stars go, that's very young. But

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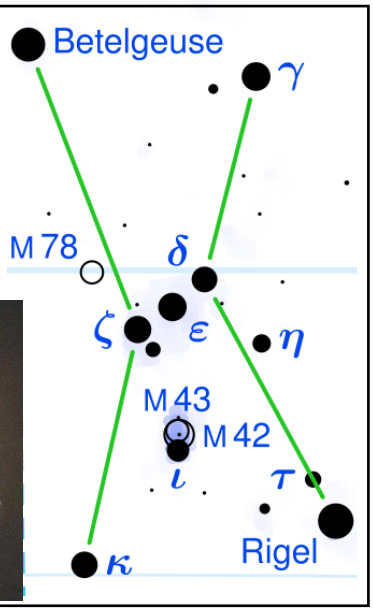
The bright star Betelgeuse can be found in the upper left part of Orion. Al Sheidler took this image of Betelgeuse last April at Paul Observatory.



The Popular Astronomy Club of the Quad Cites – a two-state region comprised of several communities along the Mississippi River in Iowa and Illinois – is a non-profit organization that was founded in 1936. PAC is dedicated to promoting and advancing amateur astronomy, and to informing and educating its members and the general public about astronomy in an engaging, inclusive manner. Because PAC believes that astronomy is for everyone, membership in PAC is open to anyone with an interest in the wonders of the night sky.

To learn more, visit PAC's website, at www.popularastronomyclub.org, or find us on Facebook at www.facebook.com/QCPAC. To contact PAC, send an email to popularastronomyclub@gmail.com.

REFLECTIONS

Reflections *is a free monthly newsletter published by the Popular Astronomy Club. It is intended to serve all members of the club as well as the amateur astronomy community as a whole in the Quad Cities area.*

Reflections *serves as an open forum for PAC members and others with an interest in promoting amateur astronomy. Opinions expressed in* Reflections *are not necessarily those of the club, nor of any individual club officers or members, nor of any other businesses or organizations supporting PAC.*

Submissions to Reflections *are welcome and should be sent via email to* levesque5562@att.net. *Photos which are submitted should be high resolution in .jpeg format when possible. Text submissions need not be formatted and should be sent as Word attachments when possible. Submissions may be edited for spelling, grammar, style, clarity and length. Questions and comments should be sent to Paul Levesque, Reflections editor, at the email address above. Back issues of* Reflections *are available here:* popularastronomyclub.org/news-letters.

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The Popular Astronomy Club is a founding member of the Astronomical League, and is a member of the North Central Region of the Astronomical League (NCRAL). To learn more, visit the Astronomical League's website at www.astroleague.org and the NCRAL website at ncral.wordpress.com


Dale Hachtel

REFLECTIONS FROM THE PRESIDENT

With warmer weather already arriving in February, it seems like spring has already begun this year. The astronomy season is also starting quickly this year, as we jump into programs right away, in anticipation of the solar eclipse on April 8. We will be busy as we provide public programs at libraries and schools, along with our regular monthly observing sessions at Niabi Zoo, which begin this month.

Members should consider helping at any of our public programs to greet and meet the public, and future amateur (and possibly professional) astronomers, as they attend to learn about the eclipse. If you are not traveling to the area of total eclipse, consider coming to the Moline Public Library on April 8. About 90% of the sun will be eclipsed in this area, and we expect a large group of visitors for eclipse observing, just as we did during the last almost-total eclipse in August 2017.

As we interact with the members of the public, we'll help them understand how eclipses happen and show them how to safely observe the solar eclipse. To promote eclipse viewing safety, we are providing certified solar eclipse glasses to any attendee who requests them at any of our programs leading up to the eclipse.

We will hold on to enough to supply attendees on April 8, and other previous programs, but any member who would like to have some to share with family members, friends or neighbors should pick up some at any of our meetings, while supplies last.

Our monthly meeting on March 11 at the Butterworth Center will feature a smorgasbord talks by members. Please consider sharing a brief talk about an astronomy topic that interests you with your fellow members and guests.

Let PAC Vice President Dino Milani know and he will put you on the agenda for the smorgasbord talks. You can reach Dino at dinomilani@qconguard.com.

We usually have guests from nearby astronomy clubs join us via Zoom our meetings. Remember that guests, either online or "live," are always welcome at membership meetings, so if you know of anyone who might be interested in PAC and our activities, bring them along.

While we are focused this month on preparing to view the solar eclipse, it is also a good time to get out to Paul Castle Observatory and observe some of the interesting objects in the night sky, including those on the spring "Messier Marathon" list. No matter the time of year, there are always good reasons to keep looking up!

NCRAL amending its bylaws; your input is welcome

The North Central Region of the Astronomical League, with which PAC is affiliated, is in the process of amending its bylaws. The action is being taken to bring NCRAL into compliance with the Astronomical League's bylaws, which were recently revised.

You can view the proposed draft of the amended bylaws by clicking this link: NCRAL Bylaws. Affiliated members are welcome to review the bylaws and submit any questions and comments. Member input related to the proposed amendments will also be taken at NCRAL's 2024 convention, scheduled for May 17-18 in DePere, Wisconsin.

NCRAL's leadership will vote on the amended bylaws after the convention. After that, a formal vote will be taken on an affiliate-by-affiliate basis.

Questions and comments about the bylaws should be sent to NCRAL Chair (and PAC member) Al Sheidler at adsheidler@gmail.com.

SUMMARY OF PAC FEBRUARY MEETING

The Popular Astronomy Club held a general membership meeting at the Butterworth Center in Moline on February 12 at 7 p.m.

The meeting was attended in person by 21 PAC members and guests, with another 18 joining the meeting via Zoom.

PAC President Dale Hachtel called the meeting to order. He began the meeting by introducing Brother Guy Consolmagno, Director of the Vatican Observatory and President of the Vatican Observatory Foundation, who joined via Zoom.

As Brother Guy Consolmagno showed in his presentation, the term 'high seas' comes from the mistaken belief that sailing took you in an uphill direction.

Brother Guy then gave the feature presentation, titled "Discarded Worlds: Astronomical Ideas That Were Almost Correct."

Brother Guy began by noting that coming up with incorrect ideas was "nothing to be ashamed of," as they can help advance our understanding of the universe even if the ideas fall short of being completely correct.

He began with the example of Arybhata, a 5th century Egyptian astronomer who carefully calculated the periods of the orbits of the visible planets and found the ratios between them. Arybhata's measurements were quite accurate, Brother Guy noted, demonstrating "brilliant astronomy and excellent mathematics." His conclusion that this meant that everything on Earth repeats itself over time periods measured in rational numbers, however, was incorrect.

At Arybhata's time and for centuries later, learned people knew that the world was round, but also believed that it was at the center of the universe. Being at the center wasn't necessarily as prestigious as it might sound, Brother Guy noted, as it was also thought that Hell was within the center of the Earth.

The celestial heaven, in the realm of the stars, was at the top layer of this model of the universe. Earth was at the bottom, where the rocks forming the planet fell to. Water floated atop the earthen layer, with air over that and light (fire) in the sky – accounting for what were believed to be the four basic elements.

Water surrounded what was believed to be a single continent, with the holy city of Jerusalem at its center. Based on this belief, Brother Guy said, God held the waters back, and sailing on the open water took you in an uphill direction – hence the description of the ocean as the "high seas."

Thus, Christopher Columbus set off on his journey knowing the world was round, Brother Guy said, but not knowing that there was another continent blocking the route to Asia.

A century before Columbus, Bishop Nicolas Oresme, a French philosopher and cleric, reasoned that "all motions are relative," meaning that "reason alone cannot rule out the possibility of the Earth spinning and the stars holding still." However, Brother Guy remarked, Oresme concluded that this simply showed the limits of human reasoning, and that "everyone holds that the heavens move and the Earth stands still; so do I."

Moving forward to the 18th century, German astronomer Johann Bode posited a scientific "law" based on a formula showing the relationships of the distances of the known planets from the Sun. The orbit of the recently discovered planet Uranus seemed to fit this law, as did the discovery of

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Ceres, now classified a dwarf planet in the asteroid belt.

When Neptune was discovered, however, its distance did not fit Bode's law, and Brother Guy noted that Saturn also does not actually fit within the distance predicted by the law.

Back in the 1970s, Brother Guy said, he was taught that the Solar System was formed from a disc of gas and matter. Over time, our Sun became a star at the center of a planetary system, with rocky, heavier planets closer to the Sun and planets made up mostly of gas and ice further out.

Astronomers once believed that other planetary systems would fit this model. But modern discoveries of exoplanets orbiting distant stars have shown that this is not the case. "Hot Jupiters" have been discovered close to stars, Brother Guy said, and gas giants and rocky planets seem to be located in random orbits.

"The fact is, our Solar System is not typical," Brother Guy said. "Also, despite what you may have read, we have never found a truly Earth-like planet, at least not yet.

"We have to deal with the fact that the universe is a stranger place that we think," he added.

While you can find eclipse glasses on sale at Hy-Vee and other places, you can get them for free through PAC as noted during the meeting.

Brother Guy then looked at the incorrect ideas proposed by Giovanni Schiaparelli, a late 19th century Italian astronomer best known for finding "canali" – a word meaning "channels" but sometimes mistranslated as "canals" – on the surface of Mars. While this led to speculation about intelligent life of Mars, Brother Guy noted that it was actually "an optical illusion."

Schiaparelli is less known for correctly concluding that annual meteor showers were connected to the Earth's orbital passage through the debris left by comets. However, he incorrectly concluded that comets were formed by accumulating such dust, while we now know that comets originate from regions far outside the Solar System.

Brother Guy then looked at how astronomers analyzed the four Galilean moons of Jupiter, and tried to figure out what they were composed of based on their size, apparent brightness, and density. Many reached incorrect conclusions, often because of incomplete data or misinterpretation of the data.

Brother Guy noted that he himself reached some incorrect conclusions about Jupiter's moon Europa, known then and now to have a liquid ocean covered with a coating of ice. Data collected by space probes launched since Brother Guy wrote his masters thesis on Europa in the 1970s shows that it evolved in a different way than believed back then.

In the conclusion of his thesis, Brother Guy wondered if "simple organic chemistry" leading to the formation of microscopic life could be taking place on Europa. However, noted astronomer Carl Sagan stated that this "was impossible," due to a lack of solar energy that would trigger the formation of life.

A few years after Sagan made this statement, however, hot vents were found deep in the ocean, where sunlight cannot reach, with microorganisms forming near these vents, showing another source of energy that could be present on Europa and similar objects.

In conclusion, Brother Guy stated, "Science makes mistakes, which is why it's a lousy basis for

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February meeting

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religion. But science learns from its mistakes and corrects its mistakes. And often, the mistakes are not in your data, but in your imagination.

"Don't think that the latest and newest ideas are the best ideas," he said. "They often turn out to be 50 percent wrong, though we don't know what 50 percent."

Brother Guy said he found no conflict between science and religion, noting that many famous scientists were and are also devout believers. He contrasted the two this way: "Religion is a love affair with God, while science is a love affair with the universe."

Just as we may never completed understand our own loved ones, Brother Guy said, we will probably never completely understand God nor the universe. But, he added, that shouldn't stop us from trying.

"It's okay to come up with wild, crazy ideas and then put them to the test," he said. "That's how we make progress, and that's why we never tire of looking up at the sky."

In response to a question, Brother Guy said that the Vatican Observatory had scanned in more than 10,000 glass plates dating back to 1891 that were taken at the observatory as part of a project to map the night sky. The images will be made available to the public after they are collated and indexed.

Following the presentation, Dale presented a schedule of upcoming public outreach events and future membership meetings and activities. The March meeting will include a "smorgasbord" of member presentations, and Dino Milani encouraged those interested in making a presentation to contact him so they could be put on the meeting's agenda.

Certified eclipse glasses are being distributed for free to PAC members and to members of the public attending outreach events between now and the April 8 solar eclipse. Ann Bauer and Paul Levesque both said that they had seen eclipse glasses on sale at Hy-Vee for $4.99 (plus tax).

Dale noted that a Skywatch article had been published in both the *Quad City Times* and *Dispatch-Argus* that day, on the "Winter Football," headlined as the "Super Bowl in the Sky." Al Sheidler, who authored the article, credited Paul for his help in editing and organizing his thoughts, and Paul said that he would offer such help to anyone interesting in writing a Skywatch submission.

The meeting concluded with the display of member observations, including images of the Sun showing high sunspot activity taken by Al. He also showed some very nice images he's received in his position as chair of the North Central Region of the Astronomical League.

A recording of the meeting is available on YouTube via the following link: https://youtu.be/vkqKrfaIcB4.

The next membership meeting is scheduled for March 11 at 7 p.m. at the Butterworth Center and via Zoom.

Wind ensemble presents 'Out of this World' concert March 3

The Central Iowa Wind Ensemble will present an "Out of this World" concert on Sunday, March 3. The concert begins at 3 p.m. and will be held at the Franklin Events Center in Des Moines.

The Des Moines Astronomical will provide astrophotos that will be projected onto the screen during this performance of "cosmic music." Numbers that will be performed will include selection from Gustav Holt's orchestral suite "The Planets," and the "Star Wars" theme by John Williams.

Admission to the concert is free but donations are accepted. More information is available at the Central Iowa Wind Ensemble website: www.ciwe.org/out-of-this-world.

Springing forward into the March sky

March will be an interesting month in the sky. Very bright Jupiter will be unmistakable in the western sky, and fast-moving Mercury will make its best evening appearance of the year during the last half of the month.

Look for Mercury in the early evening, low in the western sky to the lower right of Jupiter. The only other planet that will be visible is Mars, and it will be low in the eastern morning sky climbing very slowly up and away from the Sun.

The bright stars of winter will be following Jupiter as they all drift slowly westward and prepare to leave the sky until next fall. Central in this group is Orion (the Hunter) with his unmistakable belt of three bright, evenly-spaced stars.

Orion's two shoulders (or arms) are formed by bright Betelgeuse (see article, page 1) and another moderately bright star, Bellatrix; below his belt, his two knees (or feet) are formed by bright Rigel and another reasonably bright star, Saiph. These stars make this constellation really look like a human figure in the sky.

It is not hard to imagine Orion as a mighty hunter when you include lines of dim stars above Betelgeuse that form his club (or sword); the stars jutting out from his other shoulder that form a shield (or hide); and the three stars below his belt that form a sword.

A statue of Orion can be found in the central square of Messina, an Italian seaport on the island of Sicily.

The stories about Orion are varied and fragmentary, but in one he helped found the seaport of Messina on the northeastern shore of the Italian island of Sicily. Per the legend, Orion smoothed out and flattened the rugged land to shape the harbor, and the city that grew from it.

Orion is still held in high regard in Messina and is the symbol of the city. A statue of him and his hunting dog tops a beautiful fountain in the city's central square.

You can find Orion's hunting dogs by extending a line from his belt down to Sirius, the brightest star in the sky, and the jeweled collar (or nose) of Canis Major (the Great Dog). Once you have found Sirius (the Dog Star), look to its upper left for Procyon, the only bright star in the small, dim constellation Canis Minor (the Little Dog).

Sirius is very bright not only because it is a hot star, but also because it's only 8.6 light-years from Earth. In antiquity, it had its heliacal rising, when it first could be seen rising before the Sun, during the middle of summer.

According to astrology, stars and planets are at their most powerful at their heliacal rising, and it was thought that Sirius added its heat to the Sun and made the summers hot. Although Sirius no longer has its heliacal rising in the summer due to precession, the hottest days of the year are still referred to as the "dog days of summer" after the Dog Star.

Some observing highlights for March:

March 3: The Moon will be very close to Antares, the bright reddish heart of Scorpius (the Scorpion), after they rise together at about 2 a.m. and until sunrise.

March 10: Spring forward: Daylight Saving Time begins at 2 a.m. local time.

March 13: The Moon will be close to the upper right of very bright Jupiter.

March 15: The Moon will be to the upper right of Aldebaran, the bright eye of Taurus (the Bull).

March 18: The Moon will be close to the right of Pollux and farther to the lower right of Castor in Gemini (the Twins).

March 19: Spring arrives in the northern hemisphere with the vernal equinox at 10:06 p.m. Cen-

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Betelgeuse

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Betelgeuse is, in fact, a geriatric star, in the final stages of its life.

As a red supergiant, Betelgeuse is pulsing in and out, making it variable in both size and brightness. For about a year beginning in 2019, Betelgeuse dimmed noticeably before returning to its more familiar magnitude. Astronomers are still not sure what caused this, though some now theorize it may have been due to a sudden burst of dust and gas from the star's surface.

Astronomers are sure that Betelgeuse is rapidly consuming its own fuel and is destined to collapse in on itself. Because it is so massive, it will create a remnant that could turn into a neutron star or even a black hole, neither of which would be visible to the naked eye.

In this process, Betelgeuse will essentially explode. When and if this happens, Betelgeuse will become much brighter from our perspective. It's thought that it will shine at least as bright as a half-moon. The Moon is sometimes visible in the daylight during this phase, and so might be Betelgeuse at the height of its explosion.

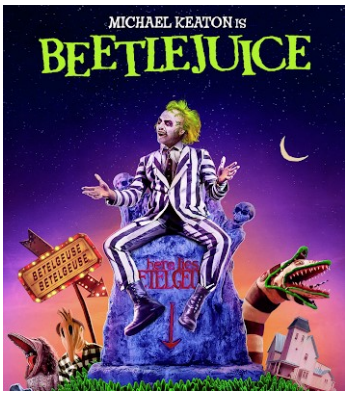
A star that undergoes this sort of transformation is known as a supernova, meaning "big new star." Exploding stars have been observed by ancient astronomers, who saw them as new objects suddenly appearing out of nowhere, and watched them in awe as they shined brightly and then slowly blinked out of sight. One observed supernova of the past evolved into what we now call the Crab Nebula.

The explosion of Betelgeuse will cause some destruction in its celestial neighborhood, but poses no threat to us. From our safe distance, we'd see Betelgeuse put on a spectacular show that would be a wonder to behold.

If you'd like to see this happen – well, don't hold your breath. Given the speed of light and Betelgeuse's proximity to Earth, if the "Armpit of Orion" exploded at about the time Christopher Columbus crossed the Atlantic, we still might not see it in our lifetimes. It's also possible that the explosion is still thousands, or even a few million, years in the future.

Despite that, Betelgeuse remains a fascinating celestial object, one that is worthy of observation and study by both amateur and professional astronomers. This beautiful and interesting star is one more reason we need to keep looking up!

Al Sheidler / Paul Levesque



So how do you pronounce "Betelgeuse"? The most popular pronunciation can be rendered as "Beetlejuice," making the star the namesake of a popular movie released in 1988. While it's more common to pronounce the first syllable in "Betelgeuse" with a long "e," like the word for a root vegetable, it's also acceptable to pronounce it with a short "e," like the word for placing a wager. Some also pronounce the last syllable with a "z" sound – like "jooze" – rather than the more common "s" sound.

March sky

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tral Daylight Time. On this day, everyone on Earth will have about 12 hours of daylight, and the Sun will rise straight in the east and set straight in the west, except at the poles.

March 21: The Moon will be close to Regulus, the bright heart of Leo (the Lion).

March 24: Fast-moving Mercury will be at its highest point for this evening appearance, the best of the year. It will still be low in the western sky. Look for it about 45 minutes after sunset.

March 25: The Moon will be above Spica, the brightest star in Virgo (the Maiden) after they rise at about 9 p.m.

March 30: The Moon will again be near Antares in Scorpius (the Scorpion) after they rise just after midnight. Since the Moon orbits the Earth in approximately 27.3 days, it can pass the same star twice in a month.

David Voigts, Black Hawk Astronomy Club

Circumpolar constellations: The wonders within

As the seasons shift from winter to spring, heralding the promise of warmer weather, the Northern Hemisphere's circumpolar constellations remain the same.

Depending on your latitude, you can see up to nine circumpolar constellations. This month, we'll focus on Lynx, Camelopardalis and Perseus, and on the wonders found within them.

The objects within these constellations can all be spotted with a pair of binoculars or a small- to medium-sized telescope, depending on your Bortle scale – the darkness of your night skies.

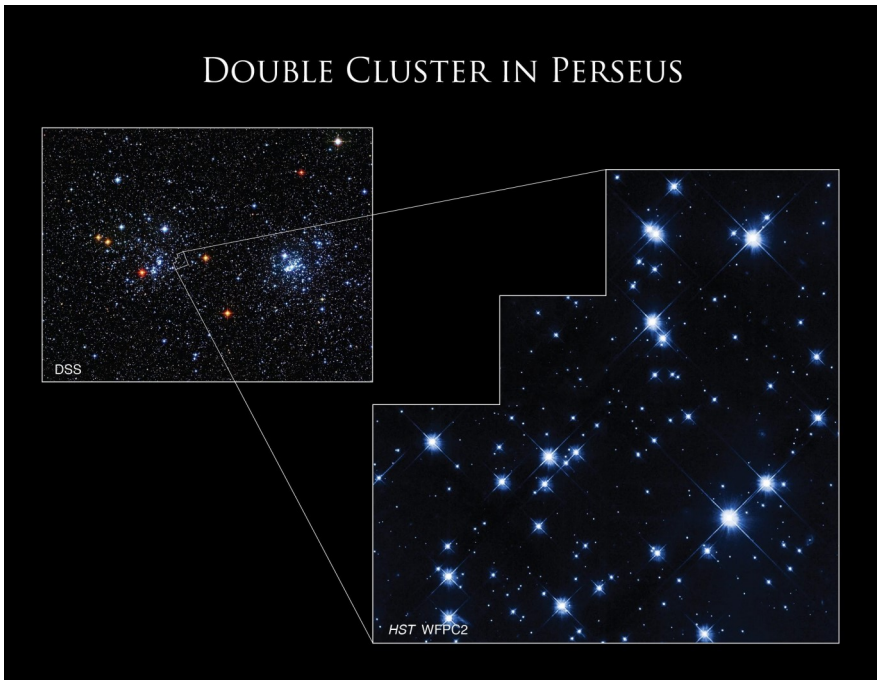
Double Stars: The area that comprises the constellation Lynx is famous for its multiple star systems, all of which can be separated with a telescope under dark skies. Some of the notable stars in Lynx are the following:

- 12 Lyncis: A triple star that can be resolved with a medium-sized telescope.
- 10 Ursae Majoris: A double star that was once a part of Ursa Major.
- 38 Lyncis: A double star that is described as blue-white and lilac.

Kemble's Cascade: This asterism located in Camelopardalis has over 20 stars, ranging in magnitude and temperature. The stars give the appearance of flowing in a straight line leading to the Jolly Roger Cluster (NGC 1502). On the opposite side of this constellation, you find the asterism Kemble's Kite. All three objects can be spotted with a pair of binoculars or a telescope and require moderately dark skies.

Double Cluster: The constellation Perseus contains a beautiful double cluster, made up of two open star clusters (NGC 869 and 884) approximately 7,500 light-years from Earth. The double cluster can be spotted with a small telescope or binoculars and is often imaged by amateur and astronomers. It can even be seen with the naked eye in very dark skies.

Also in Perseus lies Algol, the "Demon Star." Algol is a triple-star system that contains an eclipsing binary, meaning two of its three stars constantly orbit each other. Because of this orbit, you can watch the brightness dim every two days, 20 hours, 49 minutes, during 10-hour long partial eclipses.



Kat Troche

This article is courtesy of NASA's Night Sky Network program, which supports astronomy clubs and is dedicated to outreach. Visit nightsky.jpl.nasa.gov to learn more.

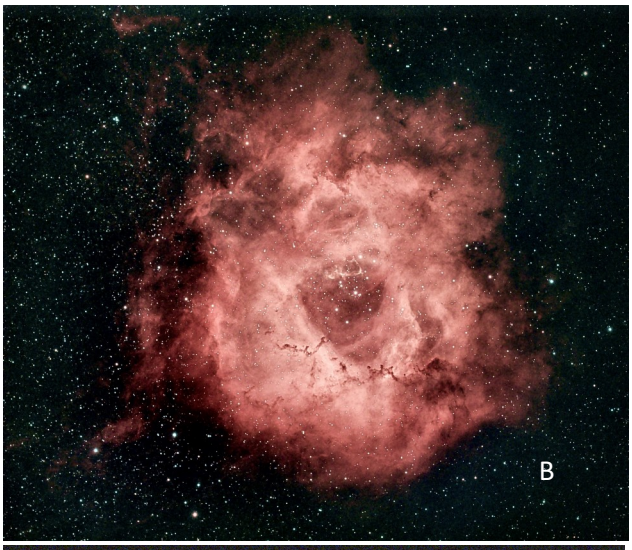
The sky map above shows the locations of the circumpolar constellations Lynx, Camelopardalis and Perseus. Many celestial wonders can be found within these constellations, including the frequently imaged double cluster in Perseus.

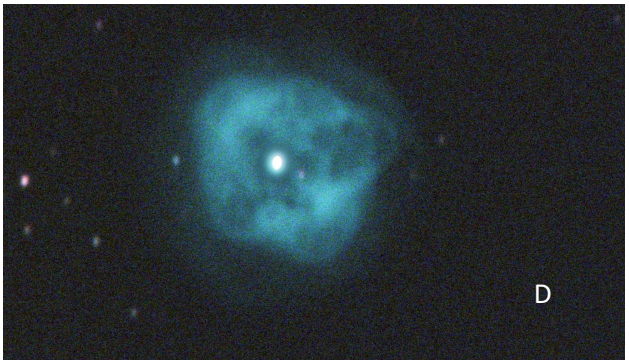
OBSERVATIONS & ACTIVITIES

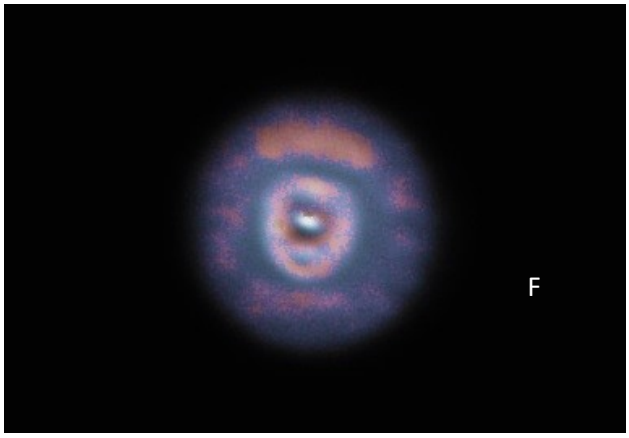
In his role as NCRAL chair, Al Sheidler was sent this image of the dark nebula LBN 762 - the 'Drunken Dragon' - taken by Mark Job of the Minnesota Astronomical Society. Though he lives in Minnesota, Mark has a remote observatory in the Hill Country of Texas, under Bortle 1 (i.e. very dark) skies. Capturing the image required over 19 hours of exposure time, taken through a Stellarvue 103mm refractor telescope with a focal reducer and flattener using a ZWO ASI2600MM Pro camera. The image was processed through PixInsight software.

Here's a collection of photos of the Sun taken by Al Sheidler on clear days in the past month. The photo at lower right is a composite shot taken on January 31 using John Deere Middle School's ZWO ASI 2600MM Pro camera; the large sunspot cluster above was images on February 23. The color photos were taken with an ETX90 telescope using a white light filter.

OBSERVATIONS & ACTIVITIES

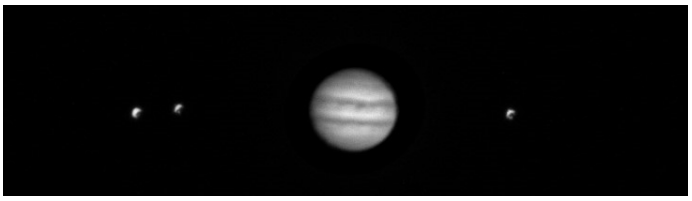


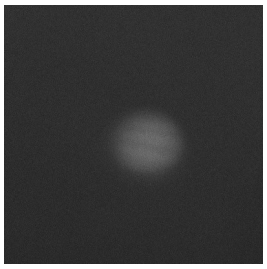




We're proud to present these six images taken by Byron Davies. Shown are (A) NGC2264 (Cone Nebula; other nebulae can be seen); (B) NGC2238 (Rosette Nebula); (C) M45 (the Pleiades); (D) NGC1514 (Crystal Ball Nebula); (E) SH2-274 (Medusa Nebula, in Gemini); (F) NGC2392 (Eskimo Nebula). Multiple frames and long exposures were used to capture these photos.

OBSERVATIONS & ACTIVITIES

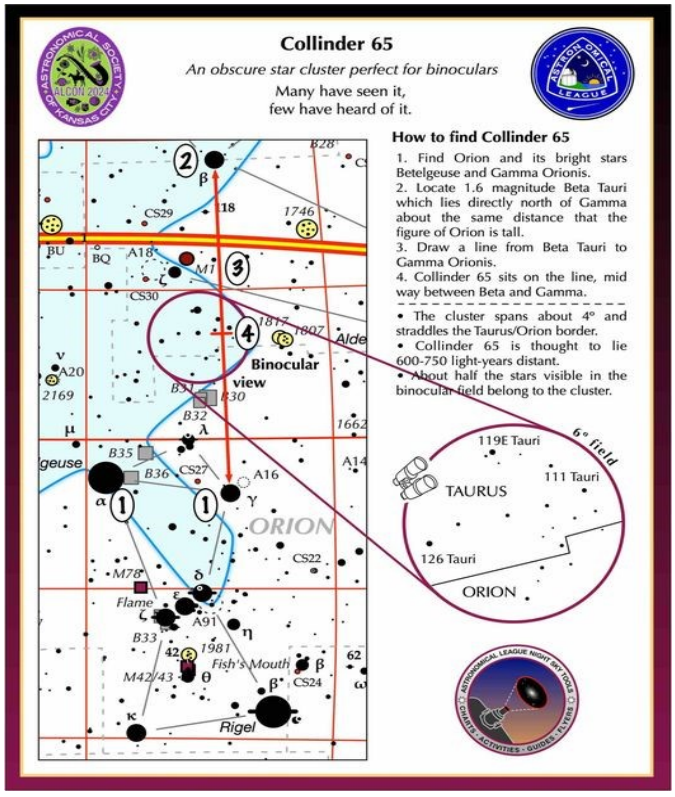




On February 3, Al Sheidler used John Deere Middle School's monochrome camera to capture images of M42 (the Orion Nebula) and Jupiter with its moons. Al used the camera to take the daytime photo of Jupiter at left on February 22.

Dan Cusack used a Celestron 8SE telescope which he purchased from PAC to photograph the moon during its waning gibbous phase. The images were captured in the backyard of Dan's home in Rock Island.

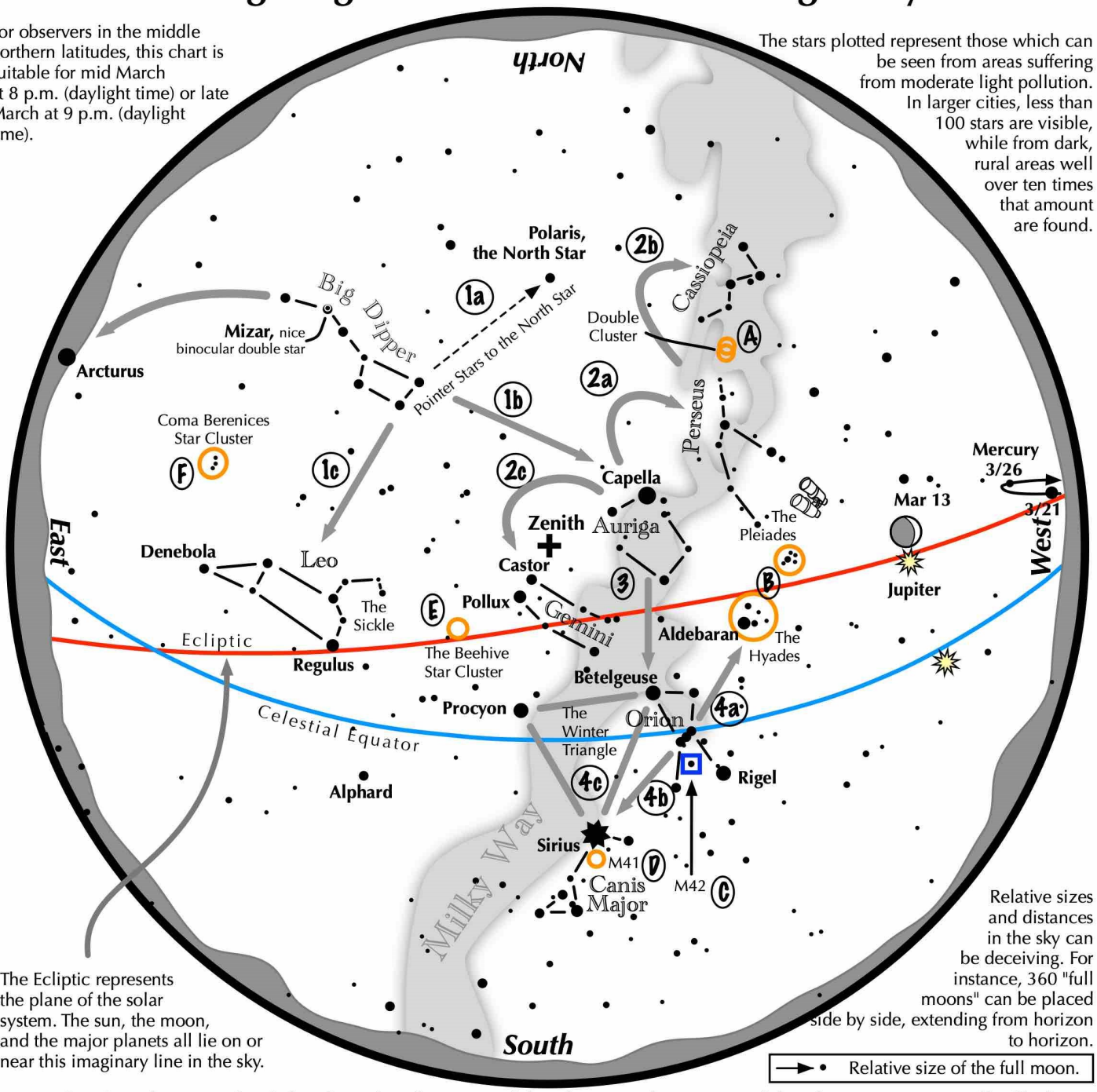
PAC member Dave Smith has a collection of back issues of* Astronomy Magazine *that he's willing to give away for free. The magazines date back to the 1990s (some earlier) and includes some complete years. If you're interested, contact Dave at day4creations@yahoo.com, or (563) 449-6958.



Navigating the mid to late March Night Sky

For observers in the middle northern latitudes, this chart is suitable for mid March at 8 p.m. (daylight time) or late March at 9 p.m. (daylight time).

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

Relative size of the full moon.

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

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

Binocular Highlights

A: Between the "W" of Cassiopeia and Perseus lies the Double Cluster. **B:** Examine the stars of the Pleiades and Hyades, two naked eye star clusters. **C:** M42 in Orion is a star forming nebula. **D:** Look south of Sirius for the star cluster M41. **E:** M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux. **F:** Look high in the east for the loose star cluster of Coma Berenices.

CALENDAR OF CLUB EVENTS

MARCH 11: **Monthly membership meeting at Butterworth Center / via Zoom, 7 p.m. Program: Business meeting / Smorgasbord of member presentations**

MARCH 12: **Solar observing at John Deere Middle School, Moline, 3:20 p.m.**

***MARCH 16*: Public observing at Niabi Zoo (first of the season); sunset at 7:12 p.m.**

MARCH 20: **Moline Public Library; "Project Next Generation" presentation on solar eclipse, 7 p.m.; night sky observing follows**

***APRIL 4*: Eclipse presentation at Rock Island Public Library, Watts Midtown Branch, 7:30 p.m.; night sky observing follows**

MARCH 6: **Peoria Astronomical Society meeting, 7 p.m.; PAC members invited; Program: "Titan's Atmosphere" by Dr. James Dire; Zoom Link**

***APRIL 6*: QCAS Public Night, Menke Observatory**

***APRIL 8*: Eclipse viewing at Moline Public Library; set-up beginning at 11 a.m.; partial eclipse peaks at approximately 2 p.m.**

***APRIL 8*: Monthly membership meeting at Butterworth Center / via Zoom, 7 p.m. Program: "Solar Flares and Neptune's Chemistry" by Robert Gregory, Astronomy Professor, Scott Community College**

***APRIL 20*: Public observing at Niabi Zoo; sunset at 7:49 p.m.**

***MAY 11*: QCAS Public Night, Menke Observatory**

MAY 13: **Monthly membership meeting at Butterworth Center / via Zoom, 7 p.m. Program: "Keep Looking Up - One Sky, One World " by Dave Weinrich, former Director of Minnesota State University-Moorhead Planetarium**

***MAY 18*: Astronomy Day; QCAS public event, site / time TBD**

***MAY 18*: Public observing at Niabi Zoo; sunset at 8:18 p.m.**

***JUNE 1*: Solar observing at Giant Goose Conservation Area, Atkinson**

***JUNE 15*: Public observing at Niabi Zoo; sunset at 8:38 p.m.**

***JUNE 24*: "Stars & S'mores" public observing session at Scott County Public Library, Eldridge, 8:30 p.m.; June 27 rain date**

JUNE 29: **Public observing session at Illiniwek Campground; July 6 rain date**

***JULY 11*: Public observing session at Silvis Public Library; celebrating library's centennial; July 18 rain date**

***AUGUST 10*: Annual PAC Picnic / Perseid meteor shower observing, Paul Castle Observatory**

***SEPTEMBER 28-30*: Eastern Iowa Star Party, Menke Observatory**

***OCTOBER 12*: Annual PAC Banquet, Riverfront Grille, Rock Island, 5:30 p.m.**

Events subject to change; check your email for updates