Reflections

The Newsletter of the Popular Astronomy Club

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Affiliated with

March 2022

REFLECTIONS from the President

Dale Hachtel

Spring is coming soon and warmer weather is on the way, along with the probable resumption of activities we have not seen for the past two years.

To kick off the season we will have our brief business meeting March 14, concurrent with short and informal smorgasbord talks by members who are willing to share their astronomy information and discoveries with the rest of us. If you have something to share, please contact Dino Milani (dinomilani@qconguard.com) and he will add you to the program. Video images or paper handouts are also useful but not required.

The meeting will be at Butterworth Center, and is expected to be open to more in-person attendees, as Illinois COVID mandates are expected to be relaxed by then. Zoom access will also be available for the meeting.

This is also the season to make good use of the Paul Castle Observatory for such observing as the Spring Mini-Messier Marathon. Alternatively, bring your own scope and take advantage of the darker skies, relatively flat ground, and available power at the observatory site.

The spring Messier list is a good time to observe with the observatory scope, with many spring objects that are somewhat dimmer than most objects on the Messier lists for other seasons. Members with observatory training can assist and train those wanting to learn more.

Although most planets are not visible in the evening in this season, there are still many objects to observe. Watch your email for announcements of observing sessions, as they are usually planned only as far ahead as fairly reliable weather predictions can be made, usually three or four days at the most.

We hope to see you at meetings and observing sessions soon.

Keep looking up! DALE

PAC members can use the Paul Castle Observatory to complete the Messier Marathon.

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EXPLORE SPACE VIA CELESTIA

Some of you may have already discovered and used Celestia, a free, open-source software program that enables the real-time, three-dimensional exploration of space and time.

According to its users guide, Celestia enables you to "travel throughout the Solar System and elsewhere in space, at any speed, at any moment of time and in any direction you choose." The guide states that this produces "a meticulously accurate virtual universe rivaling the visual quality seen only in Hollywood films."

Celestia can be used to virtually orbit stars, planets, moons and other space objects; to track spacecraft, asteroids and comets as they fly by; and to display artificial satellites and look out from their perspective. The program also simulates the atmospheres thought to be present on planets and moons, as well as sunrise and sunset as they might appear from these objects.

Catalogues installed as part of Celestia allow the display of the names of celestial objects and satellites, as well as some features on Earth.

The latest version can be downloaded at https://celestia.space.

ANNOUNCEMENTS / INFO

NCRAL Seasonal Messier Marathon Program

NCRAL's Seasonal Messier Marathon observing program is NOT designed to qualify observers for the Astronomical League's Messier Observing program; the two programs are unrelated and observing requirements are quite different. In the NCRAL program, the main requirement is to quickly observe and essentially check off items from one of four seasonal lists of Messier objects as noted in the section to follow.

NCRAL recognition will consist a suitable printed certificate and a 3⁄4-inch enameled star pin (a different color for each season). There will be no direct cost to the membership for participating in the award program; the cost of the program (pins, certificates, mailers, postage) will be borne by the Region as a benefit of affiliation. Relevant program documents are linked below

NCRAL Seasonal Messier Marathon Rules

NCRAL SPRING Seasonal Messier List

NCRAL SUMMER Seasonal Messier List

NCRAL AUTUMN Seasonal Messier List

NCRAL WINTER Seasonal Messier List

H0W'S THE WEATHER?

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weather ☼ close to you

CLEAR OUTSIDE

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The Sun

The ultimate source of light, life and power

Every day, a huge, dazzling ball of fire crosses the sky! In today's modern world, few of us stop to consider this amazing fact. However, in ancient times, this mysterious daily occurrence was astonishing.

This giver of light, life, and power was an object of worship. Of course, today we know the Sun is really just one of countless billions of stars. But, even after we learned basically what the Sun was, it remained an enigma. What makes the Sun shine? How does our star generate such vast amounts of light and heat?

Up until a little over 100 years ago, it was thought that all hot, self-luminous objects were glowing due to the burning of something. If the Sun were made up of coal, for example, and if there were enough oxygen available to support combustion, it was calculated that it would keep burning for maybe a couple thousand years before becoming a cinder. The burning of coal, or another chemical reaction, just did not seem to match the reality of what was happening.

Meanwhile, astronomers had succeeded in fathoming the dimensions of the Earth, Moon, the other planets and the Sun and the distances between these objects.

Most of us do not appreciate how enormous the Sun is. The Sun is actually 109 times the diameter of the Earth and its mass (the tons of matter contained within its bulk) is fully 330,000 times as much. These figures are staggering. The Sun is the largest object by far in our solar system, and contains more than 99% of the solar system's entire mass.

Recently, there has been much discussion about whether solar energy could ever be a suitable replacement for the burning of fossil fuels (coal, oil and natural gas). Let me assure you that there is more than enough solar energy available to power everything many times over.

Alan Sheidler created this illustration using a photo he took of the Sun; the little dot at the upper left is Earth, in scale of its size in relation to the Sun.

The amount of solar radiation received by the Earth is approximately 1,370 watts for every square meter. Not all of this energy reaches the surface, but if it did, it would amount to 3,500 megawatts of solar energy per square mile over the Earth's surface. This is more that the output of a large nuclear- or coal-fired power plant, on just one square mile.

Of course, some of this energy is lost in the atmosphere due to clouds. Obviously, solar energy is unavailable at night, and the solar collectors now in use are far from 100% efficient. So, the amount of solar energy per square mile we can access is far less than what is available in theory – but keep in mind the sunlit side of earth has a lot of square miles!

The Earth has been bathed in this flux of solar energy for billions of years. All life on this planet is powered by the Sun. The fossil

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Astonishing facts about the sun

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fuels we now primarily use are essentially the deposited remains of photosynthesis powered by the Sun.

In 1920, Arthur Eddington proposed the nuclear fusion of hydrogen into helium as the power source of the Sun. Albert Einstein's famous mass/energy equivalence equation (E = mc2) revealed that the fusion process could sustain itself for billions of years by converting 4 million tons of mass every second into energy at the core of the Sun.

To be sure, 4 million tons seems like a lot, but not when you consider that the Sun contains more than 1.99 octillion tons of matter (that's 1.99 followed by 25 zeroes). This is sufficient to sustain the hydrogen to helium fusion process for billions of years. So, we needn't worry about the Sun dying any time soon!

The sun is mostly hydrogen and helium, along with traces of heavier elements such as carbon, oxygen, iron and others. But in the Sun, these elements are in a very unfamiliar state called a plasma.

A plasma results when a gas is raised to such a high temperature that the atoms shed electrons. Hydrogen atoms as we know them here on earth consist of a proton and an electron. In the Sun, the hydrogen is so hot that the electrons are stripped off, forming a sort of a superheated soup of protons and electrons.

At the center of the Sun where the thermonuclear fusion reactions occur, the temperature is measured in the millions of degrees. The pressures at this depth are unimaginable, and combine with the high temperature to push the hydrogen (protons) so close together that they stick together, or fuse, forming helium. This is the source of the Sun's power, and our wellspring of light and warmth here on earth.

The Sun's seething caldron of plasma consists of protons and electrons that are electrically charged particles. The dynamics of the motion of these charged particles generates strong magnetic fields which permeate the Sun.

Where the magnetic field lines penetrate the visible surface, the general area cools slightly, forming dark areas called sunspots. Sunspots can be observed using special telescopes designed to safely view the Sun.

NOTE: **Never** point a telescope at the Sun unless it is designed specifically to view the Sun and that you understand how it works. And **never** look at the Sun directly with the naked eye.

Sunspots are, in essence, magnetic storms on the visible surface of the Sun. They form and dissipate over periods of days or weeks, and often can be the sites of solar flares which can cause auroras (northern lights) on Earth, and also sometimes interfere with radio transmissions.

Astronomers have noted that the number of sunspots wax and wane over an 11-year cycle. The last sunspot minimum was in 2020. Currently, the number of sunspots is increasing, and will peak sometime around 2026. The next few years will be an interesting time for astronomers to observe sunspots.

The Sun we see every day is an interesting, dynamic and vital astronomical object. To observe it, protect your eyes and telescope—and keep looking up!

Alan Sheidler

Al has spent some clear winter days taking photos of the sun through his properly equipped telescope; you can see some of these photos on page 9.

SUMMARY OF PAC FEBRUARY MEETING

The Popular Astronomy Club held its regular monthly meeting on February 14 at the Butterworth Center in Moline. Nine PAC members attended the meeting "live," with another 23 joining via Zoom, including members of other astronomy clubs in the region.

The meeting was called to order by PAC president Dale Hachtel, who made brief remarks and then introduced the evening's guest speaker: Dr. Jennifer "Jen" Owen, associate professor and coordinator of the Corey Marsh Ecological Research Center at Michigan State University

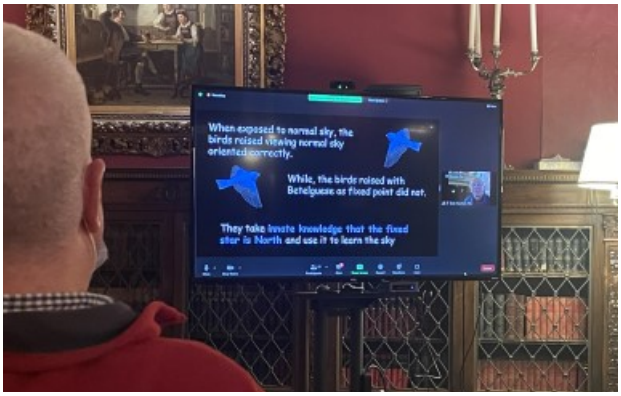
Dr. Owen's virtual presentation was titled "Seeing Stars: How Birds Use the Night Sky During Migration." Dr. Owen began her presentation by stating that more than 4 billion birds of various species migrate to and from North America every year, and that she was "in awe of how far they go and how they do it."

Individual birds will migrate thousands of miles during the spring and fall migration seasons, Dr Owen said, and many of them are recent hatchlings who successfully complete migrations for the first time without following their parents or older birds and without the benefit of previous experience.

Many birds choose to migrate at night, Dr. Owen said, for three main reasons: The temperatures are cooler so they need less water; the atmosphere tends to be more stable and conducive to easier flight; and predators are less active and less able to find birds they might prey upon.

Though we may not be able to see or hear birds migrating in the dark, Dr. Owen suggested pointing binoculars at the full moon on a clear spring or autumn night; if you do, you might see high-flying birds illuminated by the moonlight.

According to Dr. Owen, birds have an innate compass that seems to rely on three



The presentation by Dr. Jennifer Owen explained how birds use stars and other natural phenomena to complete their migrations.

natural phenomena: The position of the sun, the Earth's magnetic field, and the positions of the stars in the night sky.

"Birds are astronomers too," Dr. Owen said, pointing to evidence that migrating birds seem to orient toward and away from Polaris – the star which, from our perspective, is fixed to the north – to find their way as they migrate.

Dr. Owen summarized experiments done with birds who were isolated inside planetariums, and who showed an urge to migrate in the right direction when stars positioned as they would appear at night during the migratory season were projected in the planetarium.

Over the centuries, birds have also been able to allow for precession, a process caused by a slight wobble in the Earth's axis that causes the position of what we see as the north star to shift over a long period of time. For example, the star Thuban in the constellation Draco served as the north star at the time the ancient Egyptians built the pyramids.

In response to questions, Dr. Owen said that artificial light can affect migrating birds, who are often attracted to light, and noted that many birds are killed when the run into tall buildings. Strong winds and storms can

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PAC February meeting

Continued from Page 5

blow migrating birds off course, though they sometime return to their original flight paths. Birds migrating for the second time can recognize landmarks on the ground, Dr. Owen said, and use them to aid in navigation.

The presentation was well received and drew a round of applause and many positive comments.

Following the presentation, Alan Sheidler showed some of the photos of the sun he had taken during January and February. The photos showed sunspots and how they shifted across the sun's surface from day to day.

Dino Milani then reflected on two recent deaths: Dr. Donald Gurnett, an astronomy professor at the University of Iowa who made major contributions to space exploration, and Dino's father, Italo Milani, who died February 6 at the age of 91 and who, while not a PAC member, was a familiar face at events sponsored by the club.

Boy Scout leader Scott Johnson asked for assistance with a STEM event scheduled for Loud Thunder Forest Preserve on May 21; he said that he was unable to attend that day and asked for PAC's assistance in setting up a display on astronomy and possibly staffing the observatory maintained by the Boy Scouts at Loud Thunder. Dale Hachtel stated that a few PAC members would be available to assist, even though the club's regular public viewing session is scheduled for that evening at Niabi Zoo.

Dale then reviewed the calendar of events and urged members to submit input for the monthly articles published in local newspapers before adjourning the meeting at 8:20 p.m. A recording of the meeting can be viewed on YouTube via this link: https://youtu.be/ogUMVClsLFI.

The next PAC membership meeting will take place on March 14 live at the Butterworth Center and via Zoom. The agenda includes a business meeting and a smorgasbord of presentations by PAC members; if you'd like to make a presentation, contact Dino Milani at dinomilani@qconguard.com.

Thank-you note received

This thank-you note comes from Terry Dufek, his sister Pam Kollar, and his friend Eva Davison:

I just wanted once again to send out a great big Thank You to members of the Popular Astronomy Club for helping Terry, Pam and I.

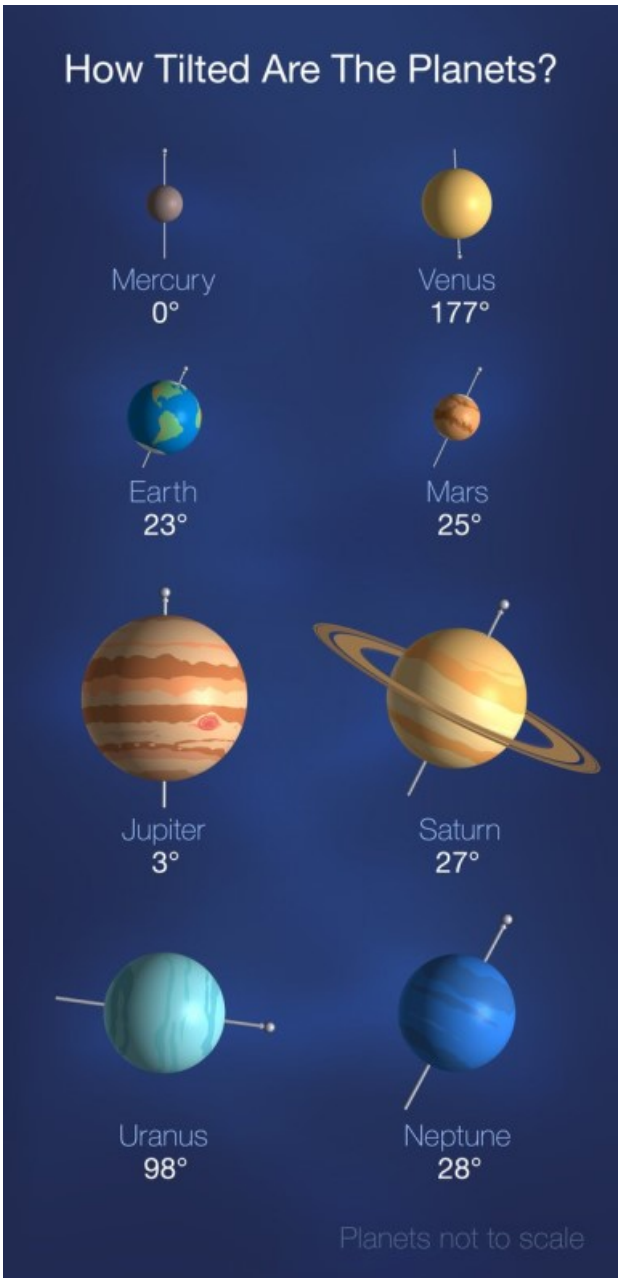
Wednesday (February 23) we needed to take down the bed they helped pick up and assemble so hospice could deliver one with more bells and whistles. Al Sheidler came over on a moment's notice to take out the old bed just as the new one was coming in the door. We will donate the other bed to Habitat Medical Restore.

Rusty Case, our own Mr. Fix-It, came by last week to help figure out a way to raise up Terry's recliner love seat so we could use it with the lift. We got the recliner raised and now Terry has a comfortable place to sit so he isn't always in bed or in his wheelchair.

I'm sorry I forgot to take pictures of my workers this time to share with the group. You have all been a wonderful blessing to Terry with your friendship and help. Pam and I would have been lost without your help and support.

Thanks Again,

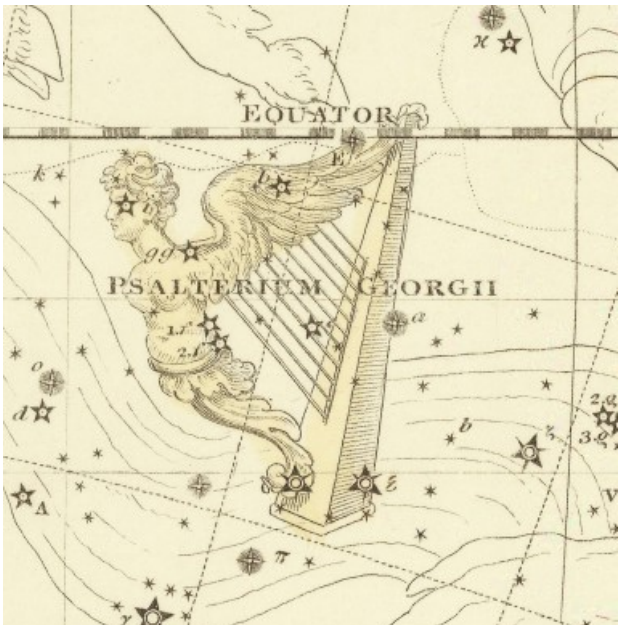
Terry, Pam and Eva



PAC WEBSITE HOT LINKS

- [Past issues of Reflections]
- [Astrophotos by members]
- [Upcoming events]
- [Links to other sites]

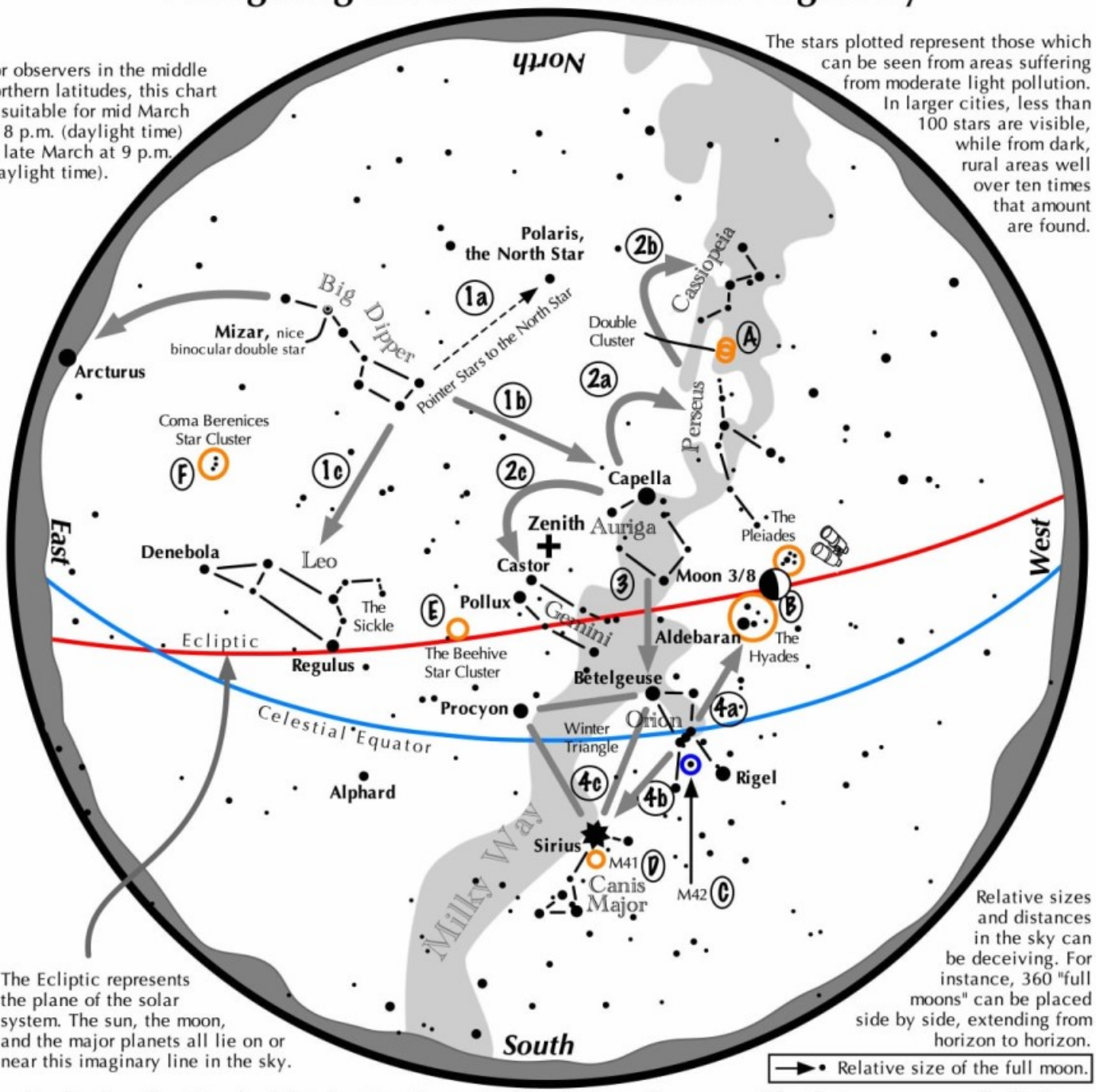
Constellations that didn't make the cut



In 1922, the International Astronomical Union announced the names of 88 constellations that would be used to form the boundaries of sky maps going forward. To mark the centennial of adoption of the modern constellation list, Reflections *is looking back at some constellations that were once found on some sky maps, but didn't make the final cut.*

Psalterium Georgii, which translates as "George's Harp," was a constellation placed in the sky in honor of King George II of England, who reigned from 1727 to 1760 and was succeeded on the throne by his grandson, George III. The now-obsolete constellation was first drawn onto a sky map in 1781 by Austrian astronomer Abbe Maximillian Hell, who located it between Cetus (the Sea Monster) and Eridanus (the River). It is presumed that Hell chose the harp because George II was King of Great Britain and Ireland, and the harp has long been a symbol of Ireland. George's Harp never caught on as a constellation, and the stars which formed it are now within the boundaries of Eridanus.

Navigating the mid to late March Night Sky



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

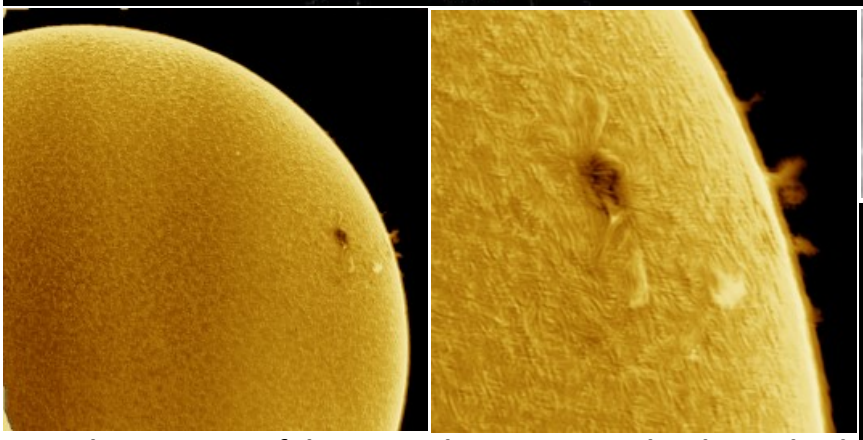
1. Above the northeast horizon rises the Big Dipper. Draw a line from its two end bowl stars upwards to the North Star. Its top bowl stars point west to Capella in Auriga, nearly overhead. Leo reclines below the Dipper's bowl.
2. From Capella jump northwestward along the Milky Way to Perseus, then to 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.

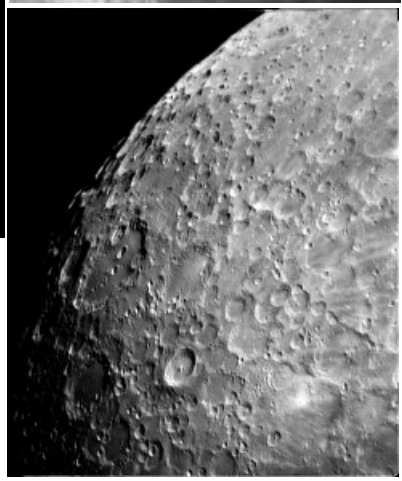
Binocular Highlights

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.

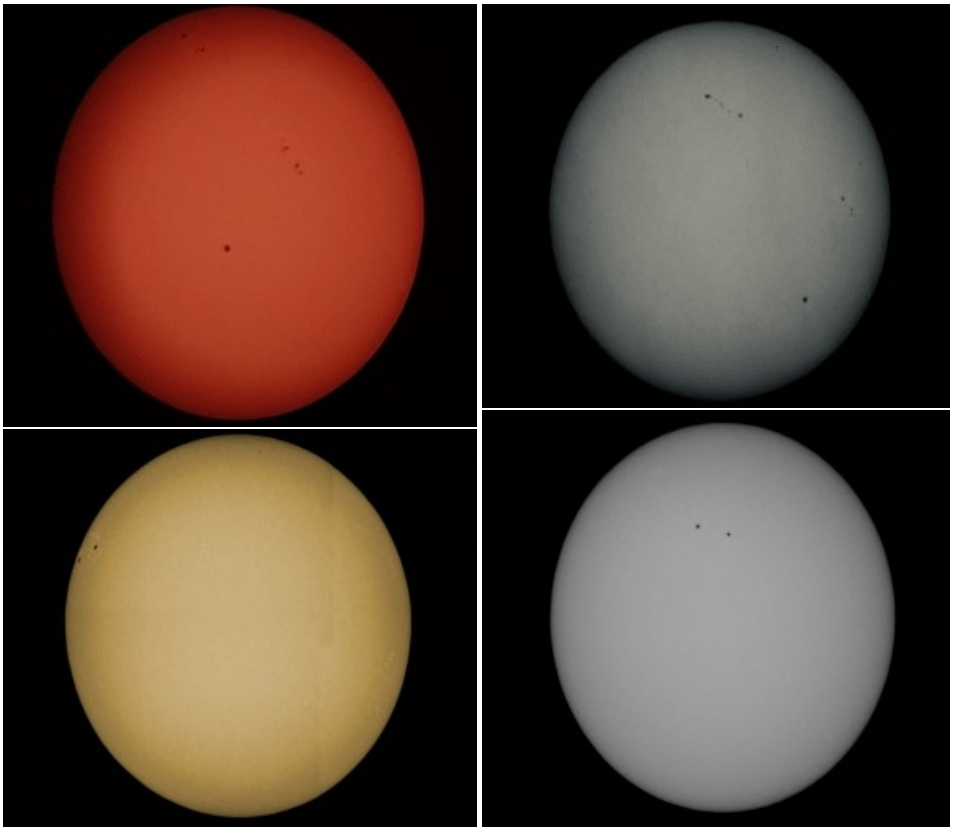
Astronomical League *www.astroleague.org/outreach; duplication is allowed and encouraged for all free distribution.*

MEMBER OBSERVATIONS
& CLUB ACTIVITIES



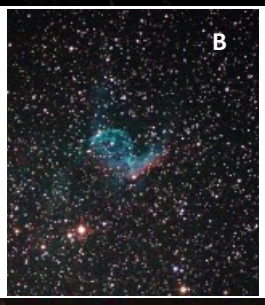


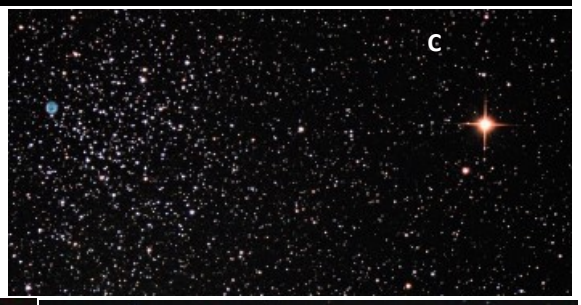
These images of the Sun and Moon were taken by Michael Mack, a PAC member from 2017 to 2019 who has since moved to Wisconsin. Mike took the photos last September from his boathouse on the north shore of Lake Mendota, using his Lunt LS80MT dedicated solar telescope with an H-alpha filter. He reports that the images were captured with SharpCap; analyzed and stacked using Autostakkert; and processed with RegiStax6, followed by final processing with Photoshop.

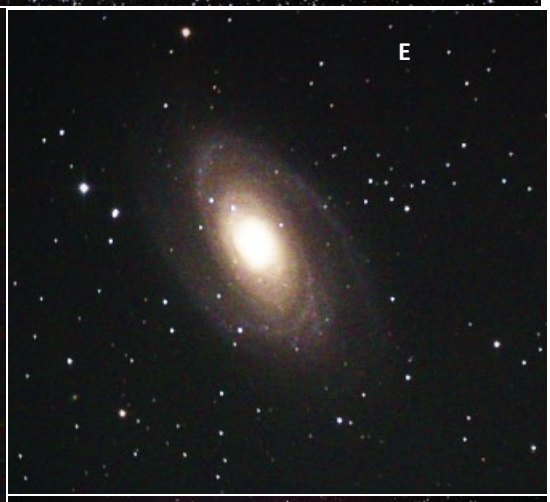


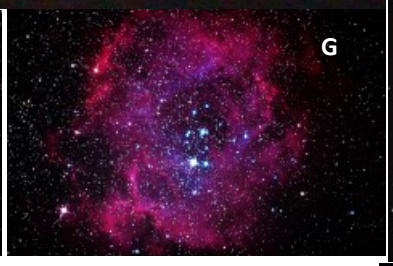
Alan Sheidler has spent the winter months capturing images of the Sun from his home in Moline; he took, processed and enhanced the photos using various filters and enhancing techniques, including finalizing in black and white to make sunspots stand out. The photos in the top row (left to right) were taken on February 5 and 8; the photos in bottom row were taken February 21 and 25. To learn more about our Sun and how sunspots are formed, see Al's article on pages 4-5.

MEMBER OBSERVATIONS
& CLUB ACTIVITIES









Here are some more awe-inspiring astrophotos taken by Byron Davies from his favorite dark sky location in Little York, Illinois, taken with a Canon T4i astro-modified full spectrum camera. Shown are (A) the Orion Nebula; (B) Thor's Helmet, NGC 2359; (C) the Messier 46 open cluster, with the exploded planetary nebula NGC 2438; (D) the Whirlpool Galaxy, Messier 51; (E) Messier 81 galaxy; (F) the Cone Nebula, NGC 2264; (G & I) the Rosette Nebula, set at 1600 ISO and 3200 ISO; (H) the Horsehead Nebula.

March 2022

Star Gazers

What crowd is this? What have we here? We must not pass it by;

A telescope upon its frame, and pointed to the sky

William Wordsworth, 1806

While I was working on my master's degree at Queen's University in Canada some 42 years ago, I came across this poem, loved it, and decided to include it in my thesis. Norman MacKenzie, my thesis advisor, a scholar and a genius, penciled one comment at the bottom of this poem: "Wordsworth wrote some wretched verse." Norman did not have much of a sense of humour, but I am still laughing at his written comment.

In his poem, Wordsworth complains about how many people who look through a telescope are disappointed in what they see. At no point in time is that idea more cogent than now. If a telescope we look through cannot offer us a view as good as a space telescope, then that telescope is a failure.

By the end of the poem, the crowd abandons the telescope:

"One after one they take their turns, nor have I one espied

That doth not slackly go away, as if dissatisfied."

For me, the night sky is far more than our imagined perceptions of what we can see through a telescope. Some of us can look at an internet photograph all day long, but not I.

The beauty of the sky lies in its reality. The planets I see are real worlds. The constellations I point out to young observers contain real stars.

One evening, I asked a group if they had seen the recent eclipse of the Moon. "Yes," answered one, "I saw it online." No, he didn't. Eclipses are real only if you see them in the sky, while they are happening.


Eureka, one of David Levy's telescopes, is probably better than the telescope which 'dissatisfied' those who looked through it in Tennyson's poem.

It is a given that a backyard telescope will never show us Jupiter as detailed or as colorful as a telescope out in space will. What that telescope does show us is the genuine sky, a sky without artificial color enhancement, a sky as it really exists on top of our heads on every clear night.

It shows us a sky untarnished by the trivial events of the day, and unspoiled by petty concerns that are bothering us. Our own telescope truly shows us the Moon as it was a third of a second ago, a star as it appeared 34 years ago, or a galaxy as it appeared 12 million years in the past.

Our backyard telescope shows us what is there, and, unlike the crowd from 1806 that left dissatisfied, the people of today can understand that the sky they see is real.

Embracing the Equinox: March 20

Depending on your locale, equinoxes can be seen as harbingers of longer nights and gloomy weather, or promising beacons of nicer temperatures and more sunlight.

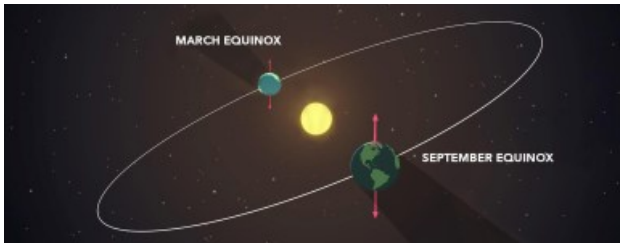
Observing and predicting equinoxes is one of the earliest skills in humanity's astronomical toolkit. Many ancient observatories around the world observed equinoxes along with the more pronounced solstices.

These days, you don't need your own observatory to know when an equinox occurs, since you'll see it marked on your calendar twice a year. The word "equinox" originates from Latin, and translates to equal (equi-) night (-nox). But what, exactly, is an equinox?

An equinox occurs twice every year, in March and September. In 2022, the equinoxes will occur on March 20, at exactly 15:33 UTC *(10:33 a.m. CDT),* and again on September 23, at 01:04 UTC *(September 22 at 8:04 p.m. CDT).*

The equinox marks the exact moment when the center of the Sun crosses the plane of our planet's equator. On the day of an equinox, observers at the equator will see the Sun directly overhead at noon. After the March equinox, observers anywhere on Earth will see the Sun's path in the sky continue its movement further north every day until the June solstice, when it begins traveling south.

The Sun crosses the equatorial plane again during the September equinox, and continues traveling south until the December solstice, when it heads back north again. This move



ment is why some refer to the March equinox as the northward equinox, and the September equinox as the southward equinox.

Our Sun shines equally on both the Northern and Southern Hemispheres during equinoxes, which is why they are the only times of the year when the Earth's North and South Poles are simultaneously lit by sunlight. The length of day and night on the equinox aren't precisely equal; the date for that split depends on your latitude, and may occur a few days earlier or later than the equinox itself.

The complicating factors? Our Sun and atmosphere! The Sun itself is a sphere and not a point light source, so its edge is refracted by our atmosphere as it rises and sets, which adds several minutes of light to every day. The Sun doesn't neatly wink on and off at sunrise and sunset like a light bulb, and so there isn't a perfect split of day and night on the equinox – but it's very close.

Equinoxes are associated with the changing seasons. In March, Northern Hemisphere observers welcome the longer, warmer days heralded by their vernal, or spring, equinox, but Southern Hemisphere observers note the shorter days – and longer, cooler nights – signaled by their autumnal, or fall, equinox. Come September, the reverse is true.

Discover the reasons for the seasons, and much more, with NASA at nasa.gov.

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

The equinoxes and solstices (left), as seen from the EUMESAT satellite; the equinoxes are also depicted in the not-to-scale model above.

UPCOMING EVENTS

Date: March 14, 2022

Event: Regular Meeting @ 7 p.m.

- **Location: Zoom / Butterworth Center**

Program: Business Meeting
Smorgasbord of Member Presentations
Slots available! Contact Dino Milani to sign up

All these events, dates and times are tentative and subject to change! Please check your emails for any updates and changes!

MONTH	NEWSPAPER ARTICLES	MEMBER PRESENTATION	MEETING / PROGRAM
APR 2022	AVAILABLE	AVAILABLE	April 11 - Presentation: "Fantastic Space Discoveries: Theories of Solar System Formation" by Jim Kovac, Chicago Society for Space Studies
MAY 2022	AVAILABLE	AVAILABLE	May 9 - Presentation: "Technology for the Astronomical Community & More" by Matt Dieterich, Technical Services Manager, PlaneWave Instruments, Inc., Adrian, Michigan
JUNE 2022	AVAILABLE	AVAILABLE	June 13 - Presentation: "Sky With Ocean Joined: Scaling the Stars at the U.S. Naval Observatory, 1830 to the Pre-sent" by Geoff Chester, Public Affairs Officer, U.S. Naval Observatory, Washington D.C.
JULY 2022	AVAILABLE	AVAILABLE	July 11 - Presentation: "OSIRIS-REx Mission Update" by Dolores Hill, Senior Research Specialist, Lunar & Planetary Laboratory, University of Arizona, Tucson, Arizona

UPCOMING EVENTS

- **March 2:** Meeting of the Peoria Astronomical Society, via Zoom, 7:30 p.m.
  SUBJECT: Artemis Mission to the Moon; ZOOM LINK: https://us02web.zoom.us/j/84677261713?pwd=aEJmVVhRMEVDVCtvQisvWmIxdTVyZz09
- **NIABI ZOO PUBLIC VIEWING:** March 19, sunset; third Saturday of the month through November
- **April 2:** Messier Marathon
- **May 7:** Astronomy Day: Bettendorf High School / Menke Observatory
- **May 13-14:** NCRAL Convention, Port Washington, Wisconsin
- **May 21**: Boy Scout STEM Event at Loud Thunder Forest Preserve; volunteers needed
- **June 25:** Public viewing at Illiniwek Forest Preserve, sunset
- **July 31:** Perseid meteor show public viewing, Pleasant Valley Middle School (QCAS event)
- **August 13:** Annual PAC Picnic *(no regular meeting)*
- **September 23-24:** Eastern Iowa Star Party
- **October 22:** Annual PAC Banquet *(no regular meeting)*

DATES AND EVENTS ARE TENTATIVE AND SUBJECT TO CHANGE

SUBMISSIONS WELCOME!

This is YOUR newsletter, so we want to hear from you! If you have an article or photos to submit, or other items that might be of interest, send them along to Reflections. Send to: levesque5562@att.net. Thank you!