Longmont Astronomical Society

April 2024

Horsehead Nebula by Paul Kirkpatrick

Volume 40, No 4, 2024
ISSN 2641-8886 (web)
ISSN 2641-8908 (print)

Next LAS Meeting April 18 at 7 pm
Open Forum

The meeting this month is "open forum". LAS members are invited to give a 5 to 10 minute presentation on an astronomy related topic. Tell everyone about:

- Your eclipse adventure
- An observing or imaging project that you are doing
- Good things and bad things about some equipment you have purchased
- Talk about an image you have taken - what is in it, equipment used, how you processed it
- About anything astronomy related that interests you will probably interest others as well

You may present in-person or via Zoom. Not mandatory but it would be helpful if you let Vern know that you are interested in presenting and the topic (email: vern@raben.com) before the meeting.

The meeting will be at the First Evangelical Lutheran Church, 803 Third Avenue, Longmont, CO 80501. The speaker is planning on presenting in person. If you cannot attend the in-person meeting, it will be available on Zoom.

Front Cover: Horsehead Nebula by Paul Kirkpatrick

Back Cover: Rosette Nebula by Rolando Garcia

About LAS

The Longmont Astronomical Society Newsletter ISSN 2641-8886 (web) and ISSN 2641-8908 (print) is published monthly by the Longmont Astronomical Society, P. O. Box 806, Longmont, Colorado. Newsletter Editor is Vern Raben. Our website URL is https://www.longmontastro.org and the webmaster is Sarah Davis. The Longmont Astronomical Society is a 501 c(3), non-profit corporation which was established in 1987.

The Longmont Astronomical Society is affiliated with the Astronomical League (https://www.astroleague.org). The Astronomical League is an umbrella organization of amateur astronomy societies in the United States.

Contents

Planets in April

Mercury

Mercury is not visible this month.

Venus

Venus is not visible this month.

Mars

Mars is visible very low in the ESE. It is +1.2 magnitude in brightness and only 4.6 arc sec across. Mars opposition is January 15, 2025.

Jupiter

Jupiter is visible in the SW after sunset; best time to view would be around 8 pm. It is -2 magnitude in apparent brightness and the disc is 33 arc sec across

Saturn

Saturn becomes visible in the morning sky after the 7th very low in ESE and not far from Mars. Best time to view would be about 40 minutes before sunrise. It is magnitude 1.1 in brightness and the disc is 16 arc sec across. Saturn opposition is on September 8.

Uranus

Best time to view Uranus is around 8:30 pm in April. It is magnitude +5.8 in brightness and the disk is 3.4 arc sec across. It disappears into the bright evening twilight after April 13.

Neptune

Neptune is not visible this month.

Lunar Phases in April

- Third quarter: April 1 at 9:16 pm
- New moon: April 8 at 12:22 pm
- First quarter: April 15 at 1:14 pm
- Full moon: April 23 at 6:18 am

Meteor Showers in April

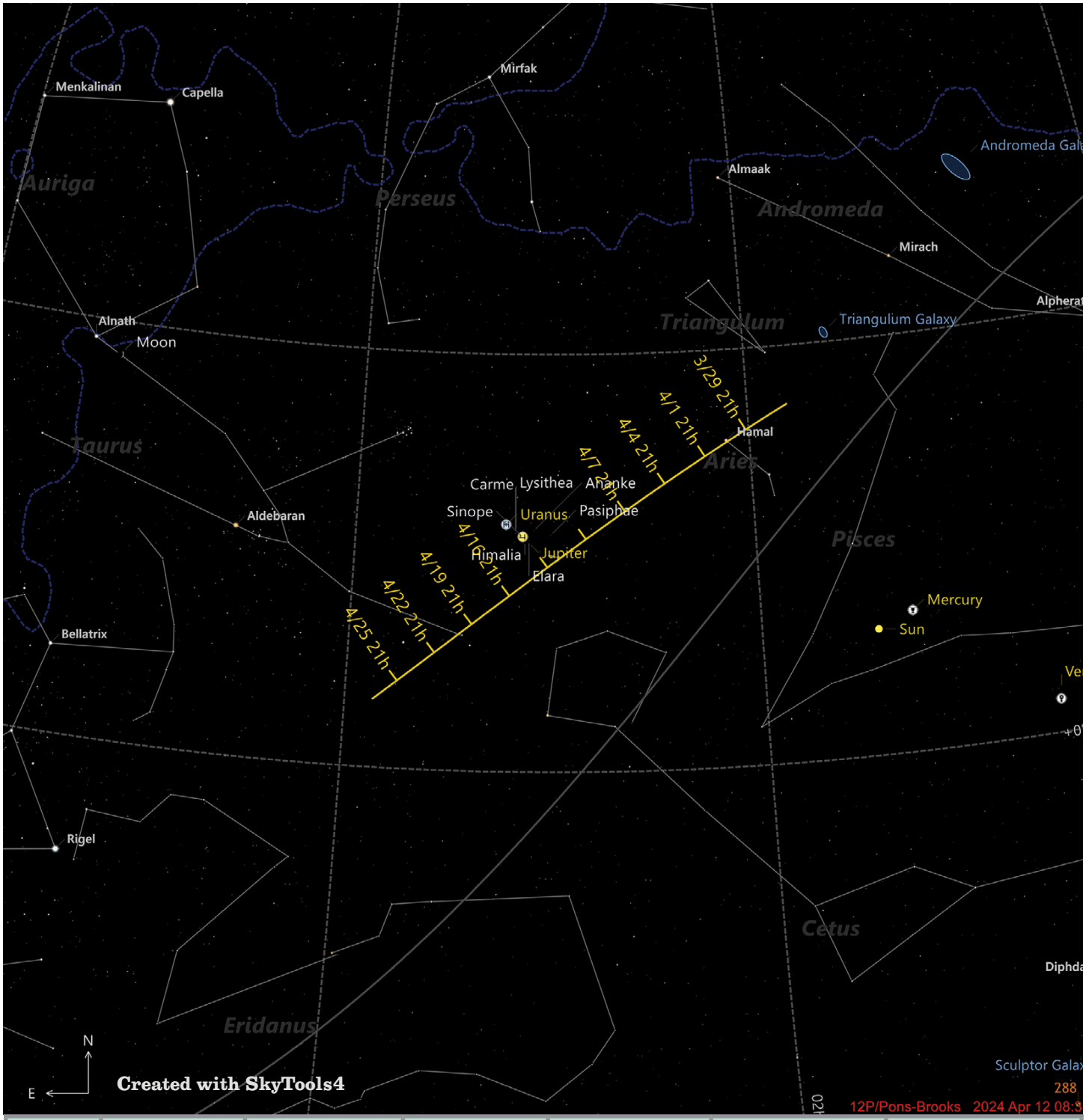
Lyrids peak on evening of April 21. Moon near full unfortunately. If sky were dock about 15 per hour might be seen but not the case this time.

Showpiece Objects in April

Some early evening showpiece objects for mid April:

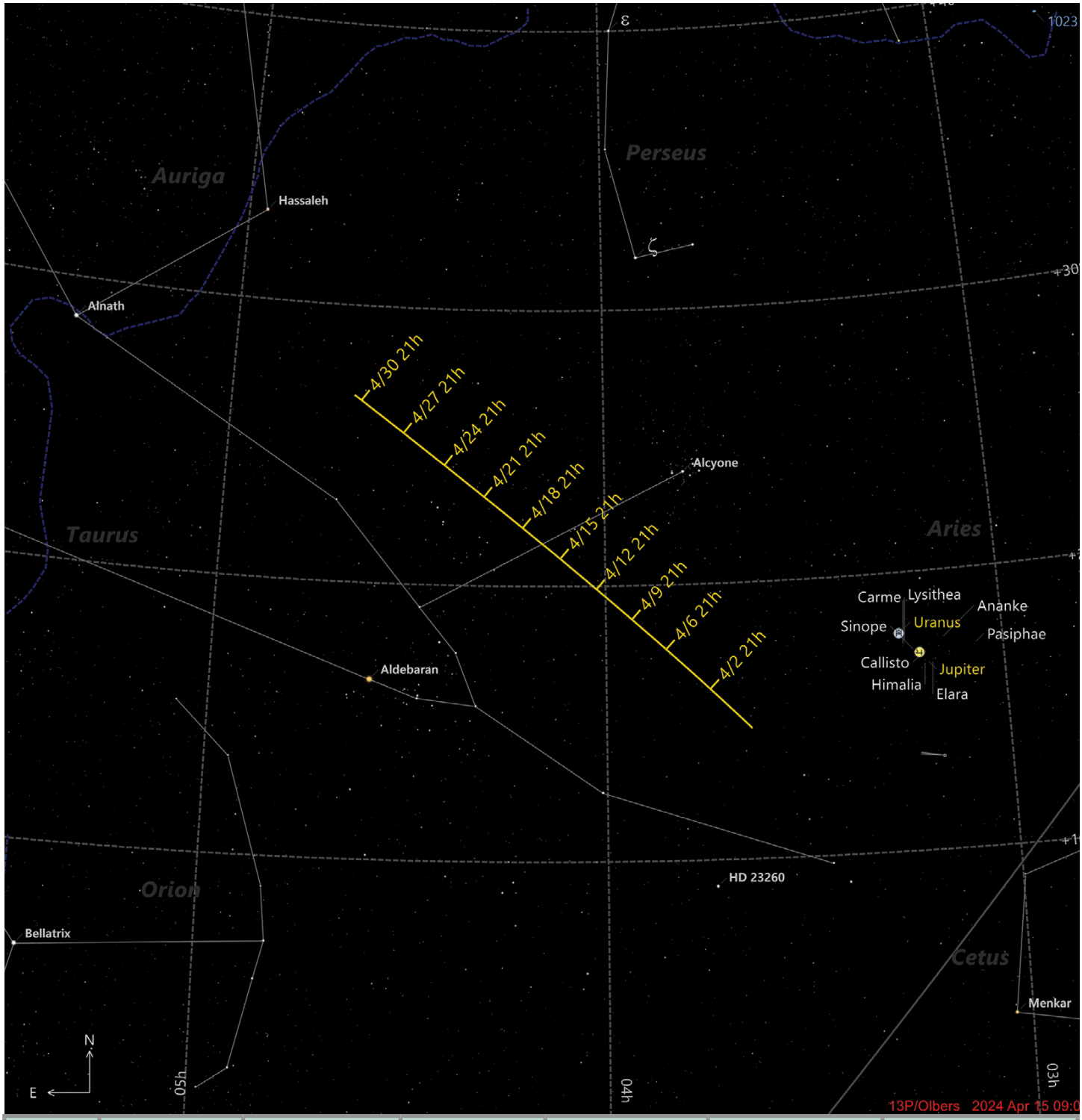
- M 81, spiral galaxy in Ursa Major, mag. 6.8
- M 101, spiral galaxy in Ursa Major, mag. 7.8
- M 51, Whirl pool spiral galaxy in Ursa Major, mag. 7.9
- M 82, Bode's Nebula, spiral galaxy in Ursa Major, mag. 8
- M 106, spiral galaxy in Canes Venatici, mag. 8.3
- M 63, Sunflower galaxy in Canes Venatici, mag. 8.5
- M 64, Black Eye galaxy in Coma Berenices, mag. 8.4
- M 49, elliptical galaxy in Virgo, mag. 8.4
- NGC 4631, Whale galaxy in Canes Venatici, mag. 8.9
- M 97, Owl nebula in Ursa Major, mag. 9.8
- M 66, spiral galaxy in Leo, mag. 8.9
- NGC 4490, Cocoon galaxy in Canes Venatici, mag. 9.3
- M 86, Makarian's chain of galaxies in Virgo, mag. 8.8
- NGC 2683, spiral galaxy in Lynx, mag. 9.1
- NGC 3115, Spindle galaxy in Sextans, mag. 9.1
- NGC 4565, Needle galaxy in Coma Berenices, mag. 9.1
- M 96, spiral galaxy in Leo, mag. 9.1
- M 88, spiral galaxy in Coma Berenices, mag. 9.4
- NGC 4244, Silver Needle galaxy in Canes Venatici, mag. 9,9
- M 109, spiral galaxy in Ursa Major, mag. 9.6
- M 89, elliptical galaxy in Virgo, mag. 9.7
- M 98, spiral galaxy in Coma Berenices, mag. 9.9

Comet 12P/Pons-Brooks in April



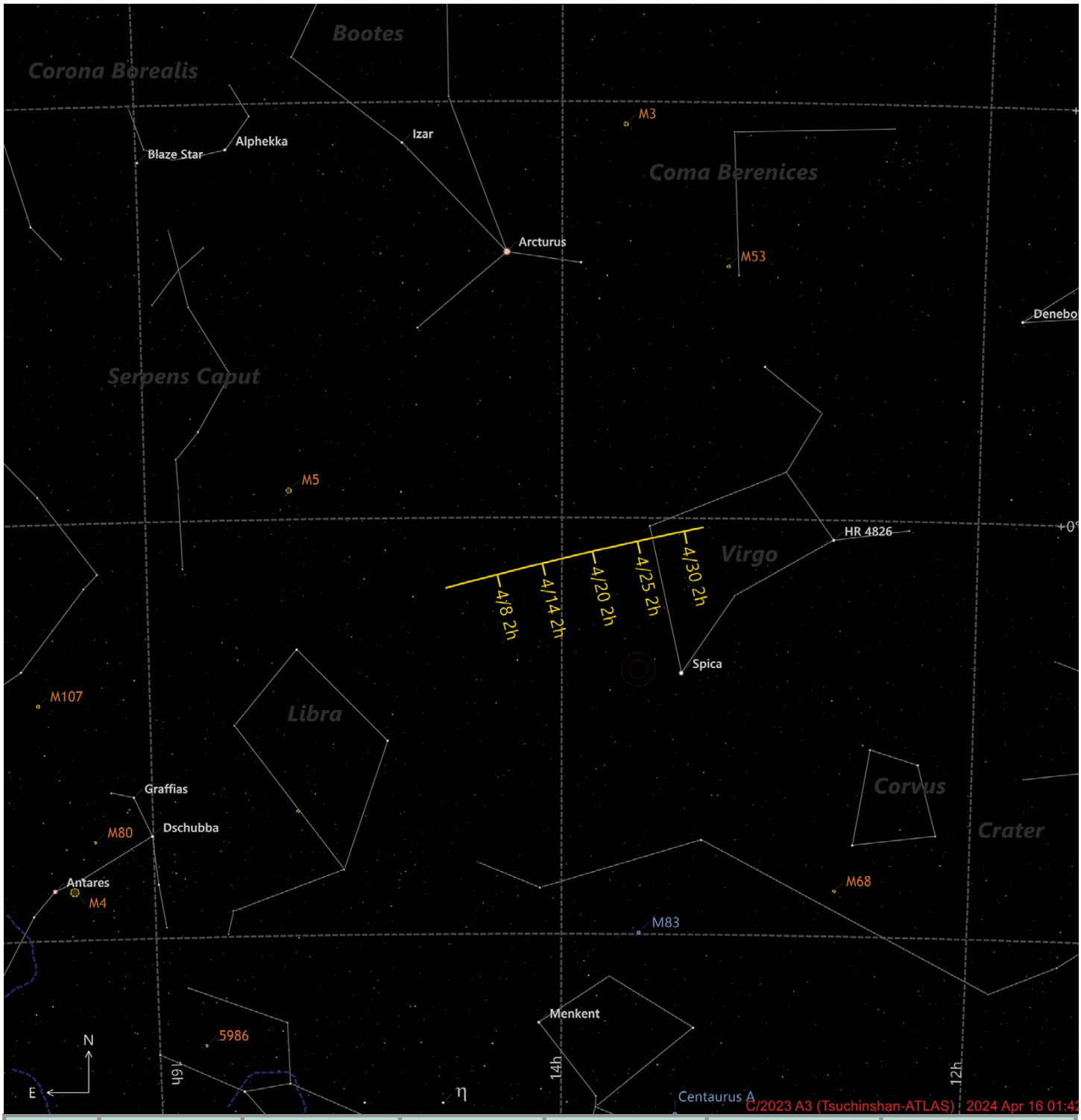
Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Apr 1	8:37pm	02h15m21.6s	+22°31'00"	Aries	4.5	5.8
Apr 8	8:40 pm	02h44m23.1s	+18°07'59"	Aries	4.2	5.9
Apr 13	8:37 pm	03h03m47.5s	+14°47'51"	Aries	4.1	5.9
Apr 19	8:43 pm	03h25m48.5s	+10°38'00"	Taurus	4.0	5.9
Apr 25	8:32 pm	03h46m37.8s	+06°22'46"	Taurus	4.1	5.9
Apr 30	Not visible					

Comet 13P/Olbers in April



Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Apr 1	8:51 pm	03h44m06.8s	+15°53'02"	Taurus	10.3	2.4
Apr 8	8:58 pm	03h55m36.9s	+18°28'11"	Taurus	9.8	2.4
Apr 13	9:03 pm	04h04m36.5s	+20°19'26"	Taurus	9.4	2.4
Apr 19	9:09 pm	04h16m18.5s	+22°33'13"	Taurus	9.0	2.4
Apr 25	9:16 pm	04h29m04.7s	+24°46'58"	Taurus	8.5	2.4
Apr 30	9:20 pm	04h40m36.6s	+26°38'03"	Taurus	8.1	2.5

C/2023 A3 (Tsuchinshan-ATLAS) in April

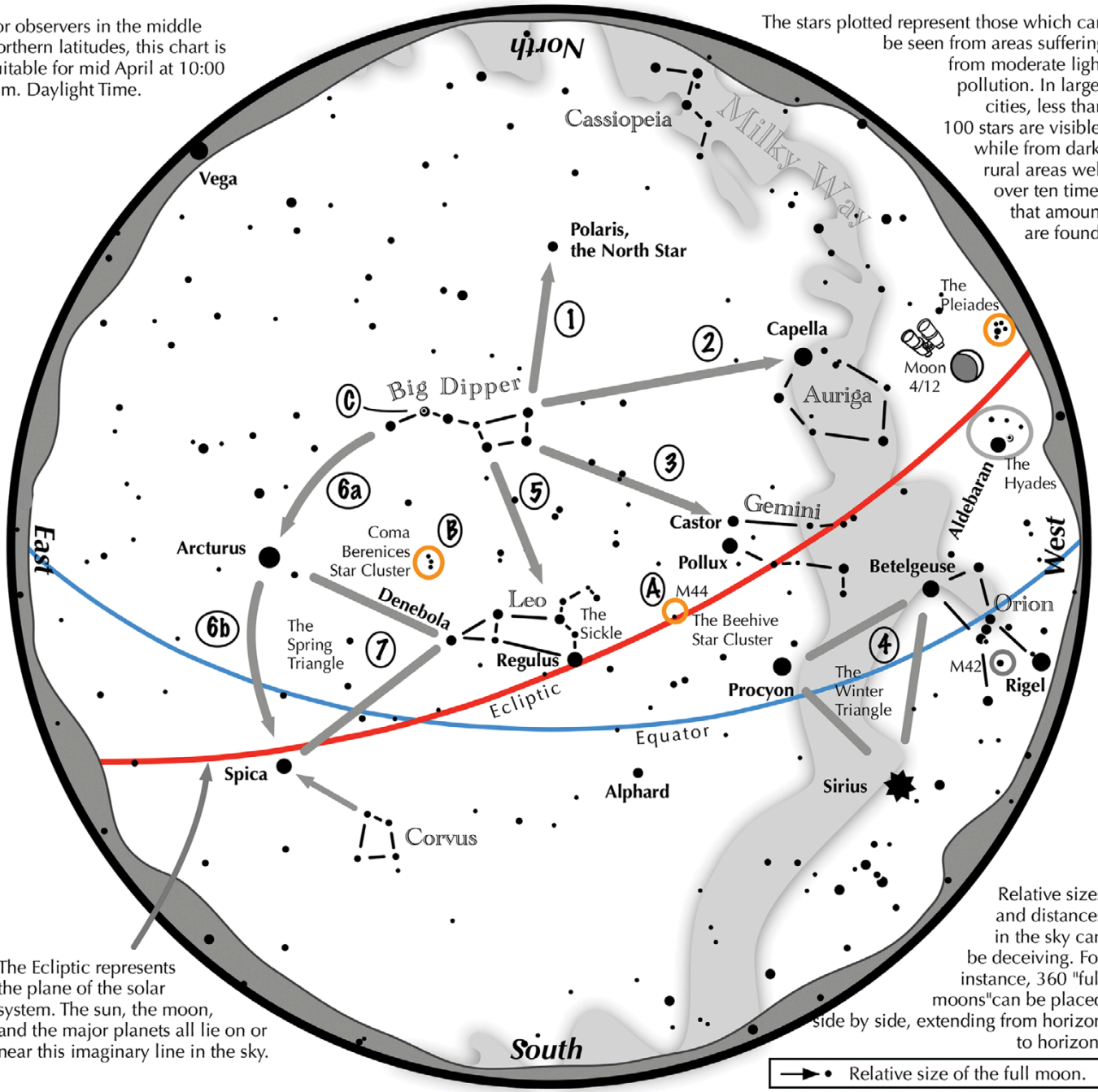


Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Apr 1	2:47 am	14h31m23.7s	-04°56'32"	Virgo	11.6	1.1
Apr 8	2:07 am	14h17m52.9s	-04°05'14"	Virgo	11.3	1.2
Apr 13	1:40 am	14h06m55.5s	-03°24'56"	Virgo	11.2	1.3
Apr 19	1:38 am	13h52m26.7s	-02°33'21"	Virgo	11.0	1.3
Apr 25	10:11 pm	13h37m12.5s	-01°41'11"	Virgo	10.8	1.4
Apr 30	11:46 pm	13h23m24.8s	-00°56'00"	Virgo	10.7	1.4

Navigating the mid April Night Sky by John Goss

For observers in the middle northern latitudes, this chart is suitable for mid April at 10:00 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 April night sky: Simply start with what you know or with what you can easily find.

1. Extend an imaginary line north from the two stars at the tip of the Big Dipper's bowl. It passes Polaris, the North Star.
2. Draw another imaginary line west across the top two stars of the Dipper's bowl. It strikes Capella low in the northwest.
3. Through the two diagonal stars of the Dipper's bowl, draw a line pointing to the twin stars of Castor and Pollux in Gemini.
4. Look in the west-southwest for the bright Winter Triangle stars of Sirius, Procyon, and Betelgeuse.
5. Directly below the Dipper's bowl reclines the constellation Leo with its primary star, Regulus.
6. Follow the arc of the Dipper's handle. It first intersects Arcturus, then continues to Spica.
7. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.

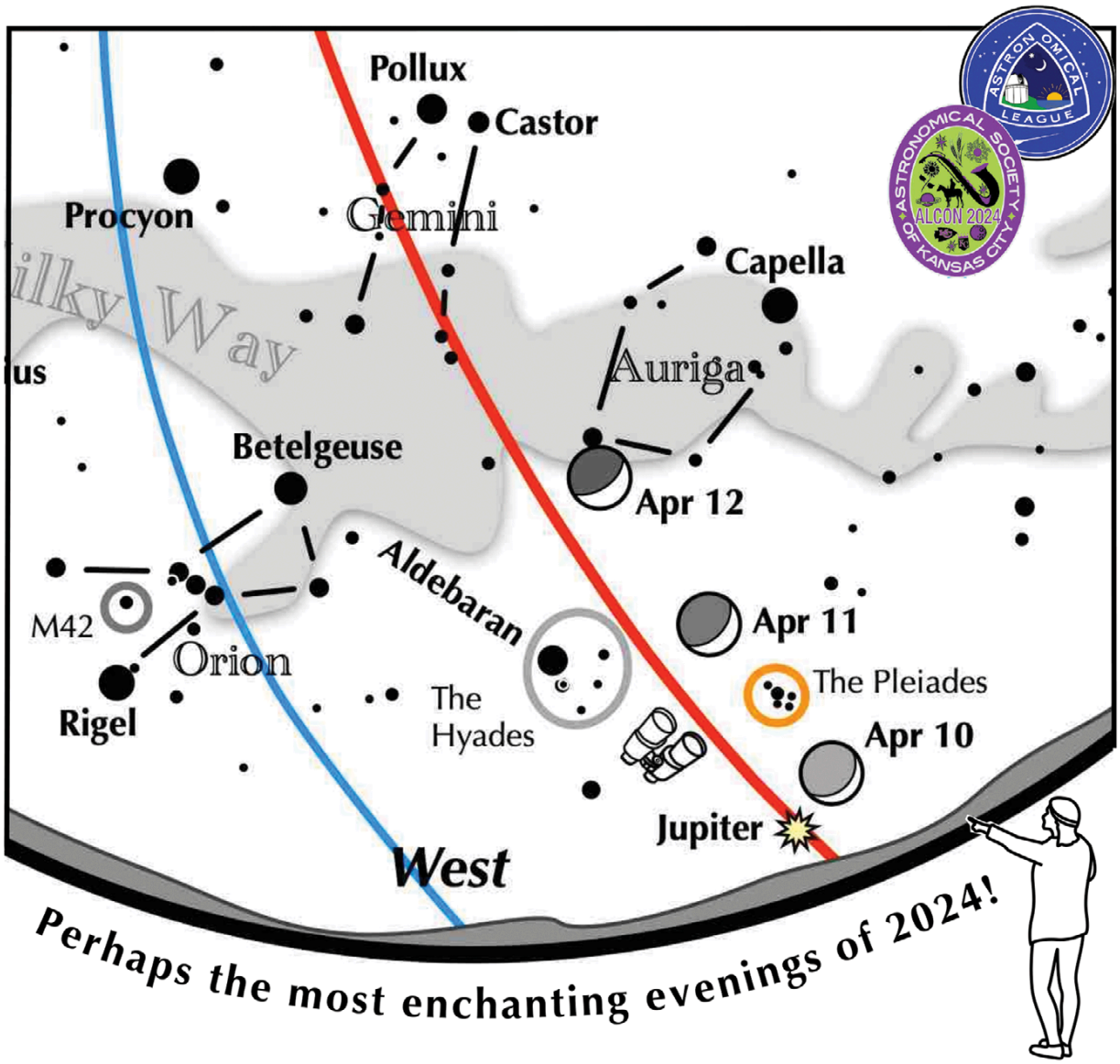
Binocular Highlights

A: M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux.
B: Look nearly overhead for the loose star cluster of Coma Berenices.
C: In the Big Dipper's handle shines Mizar next to a dimmer star, Alcor.

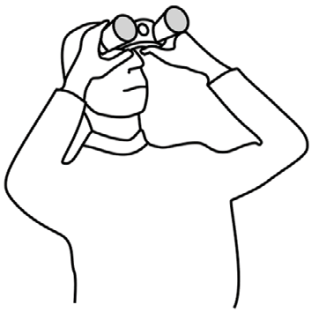
Astronomical League
www.astroleague.org

Duplication allowed and encouraged for all free distribution.

If you can see only one celestial event this April, see this one.



Perhaps the most enchanting evenings of 2024!



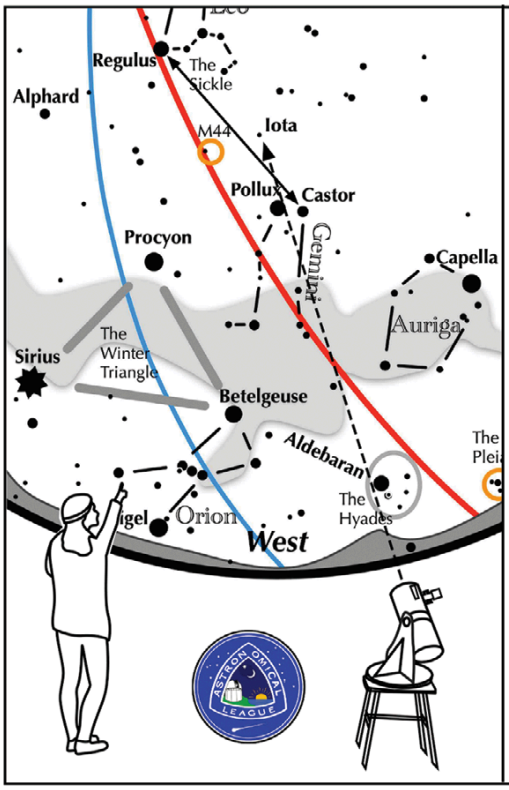
Enhance the scene – use binoculars!

On April 10, 11, and 12, look low in the west-northwest 60 minutes after sunset.

- The crescent moon, glowing full with earthshine, floats just above the horizon in the bright twilight on April 10. Next to it shines Jupiter, and above it lies the pretty Pleiades star cluster.
- On April 11, the slightly thicker, but more pronounced crescent moon moves between the Pleiades and the Hyades star clusters.
- On the third night, the crescent moon stands commandingly above the scene.

www.astroleague.org

ASTRONOMICAL LEAGUE Double Star Activity



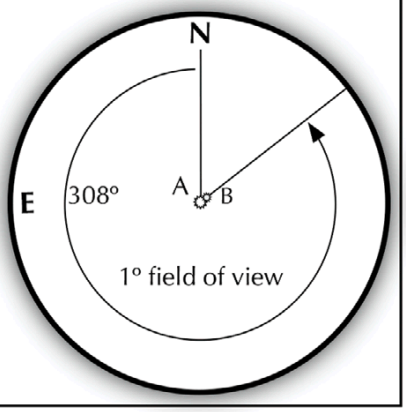
Other Suns: Iota Cancri

How to find Iota Cancri on an April evening

Face west. Look for the twin stars of Gemini, Castor and Pollux. Find Regulus. Iota lies about mid way between Castor and Regulus. It will be a moderately dim star.

Suggested magnification: >20x
Suggested aperture: >3 inches

Iota Cnc
A-B separation: 31 sec
A magnitude: 4.1
B magnitude: 6.0
Position Angle: 308°
Colors:
yellow
blue



Unlock the Universe with Astronomical League Observing Programs!
by Bruce Lamoreaux, Astronomical League Coordinator (ALCOR)

Did you know your membership in LAS also grants you membership in the Astronomical League, a prestigious organization for amateur astronomers? The AL offers a variety of exciting observing programs that can help you explore the wonders of the night sky, regardless of your experience level or equipment.

Even if you're new to astronomy and don't have a telescope, you can participate in many AL observing programs! Some programs only require binoculars, while others can be done with the naked eye. These programs focus on a wide range of astronomical objects, from planets and stars to galaxies and comets. There are even programs that focus on observing techniques, like sketching or astrophotography. Is your telescope neglected? These programs offer a great challenge and reason to blow the dust off of it and get observing again.

By participating in AL observing programs, you'll not only deepen your knowledge of the universe but also earn recognition for your achievements. The AL awards certificates and pins to members who successfully complete observing programs.

To learn more about AL observing programs and choose the ones that interest you, visit the AL Observing Programs web page: https://www.astroleague.org/alphabeticobserving/ or contact Bruce Lamoreaux at bblamo11@gmail.com.

I hope this piques your interest! Astronomy is a fascinating hobby, and the AL observing programs offer a structured and rewarding way to enjoy it.

March 21 LAS Meeting Notes by Eileen Hall-McKim

I. Introduction

The March LAS monthly meeting was held in-person and by Zoom on March 21st at the Longmont Lutheran Church. President Vern Raben began the meeting with self-introductions of members attending. Nineteen members attended in-person, 10 attended by Zoom.

The Reflector is a quarterly publication by the Astronomical League of which Longmont Astronomical Society is a member, and is sent to all members. Members can receive it digitally or by mail. If you are not receiving this go to https://members.longmontastro.org/ open up member profile and sign up for it.

This month, congratulations go out to LAS members receiving observing program awards and selection for publication of image in the Astrophotography Gallery in the March 2024 issue of the Reflector:

- Larry Bloom for completing all the requirements and receiving Astronomical League Observing Awards for three programs:
  - Solar Eclipse Observing Challenge Annual Eclipse, 2023 – Silver
  - Solar Neighborhood Observing Program – Eyes Only
  - Universe Sampler Observing Program
- M.J. Post's Image of LBN 993 - The Angel Nebula - captured from his DSNM observatory in Animas, New Mexico is featured in the Gallery Section

II. Meeting Presentation

For our March meeting we have two presentations: the guest speaker is Dr. Charles Kuehn with his presentation "Cepheid Variable Stars" and LAS Member, David Elmore, presents "Solar Eclipse Public Outreach".

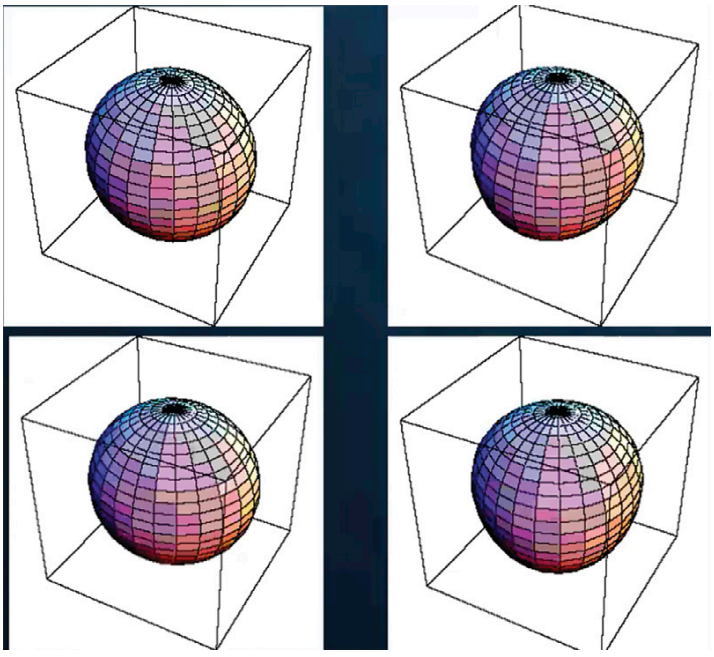
Dr. Charles Kuehn is an Associate Professor of Astronomy at the University of Northern Colorado. He earned his B.S. in Astronomy from the Ohio State University and his PhD in Astronomy and Astrophysics from Michigan State University before completing a postdoc at the University of Sydney in Australia. His research focuses on the study of variable stars in an effort to understand stellar evolution, the formation of the Milky Way, and to determine the physical properties of stars that host exoplanets. He also engages in astronomy education research aimed to increase the accessibility of astronomy labs at the university level. He is passionate about outreach and runs a quarterly series of physics and astronomy talks at Loveland Aleworks.

Cepheid Variable Stars – Why the North Star Isn't Constant After all by Dr. Charles Kuehn

In his play Julius Caesar, Shakespeare had Caesar utter the line "I am as constant as the Northern Star." While poetic, this line isn't remotely accurate by astronomy standards. Not only does the star that happens to be the "North Star" change over time, the star that is currently the North Star, Polaris, is a Cepheid variable star, a class of variable stars that changes in brightness due to the star physically pulsating. Since their discovery in 1784, Cepheid's have become one of the most important tools of astronomers, allowing Edwin Hubble to discover that the Universe is expanding, providing important clues about the internal structure of stars, and allowing a way to study the evolution of stars over short time periods. In this presentation we will look at what causes Cepheid's to pulsate and discuss their important role in modern astronomy.

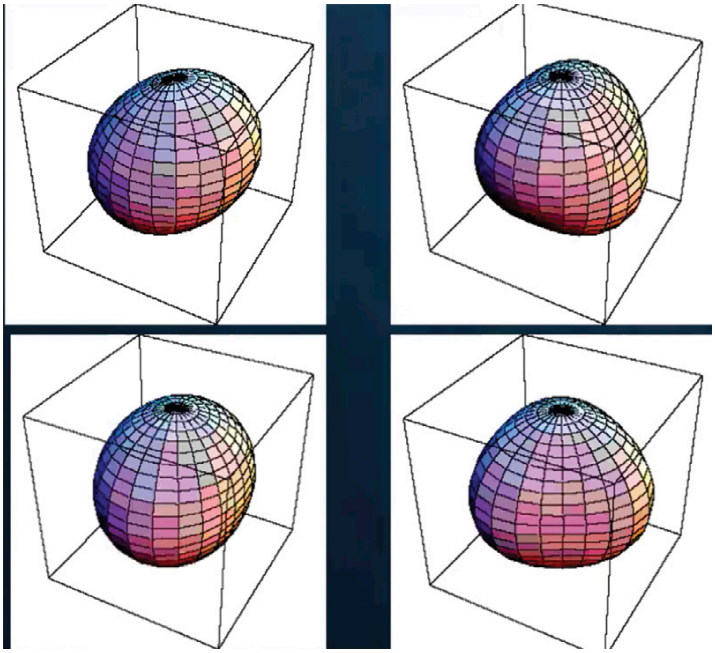
Variable Stars

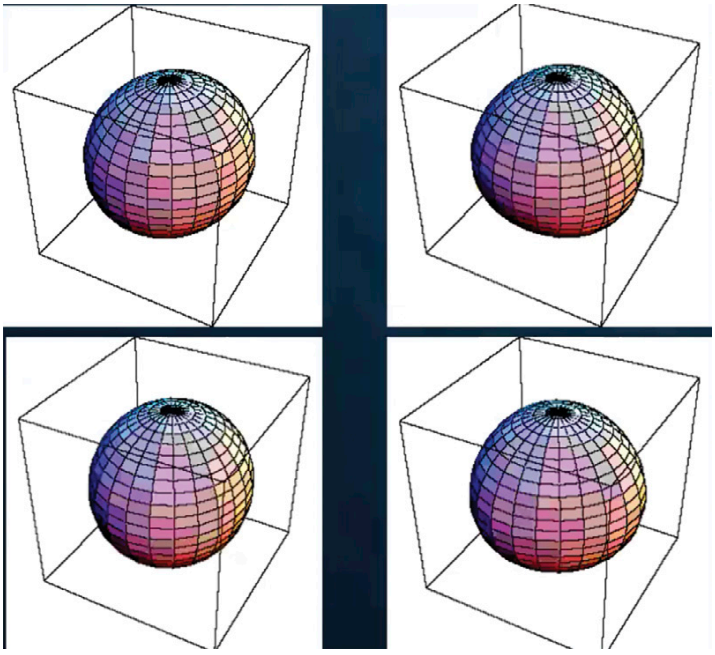
When we go out at night we see the stars twinkling, but of course we know that the twinkling of stars has nothing to do with the stars themselves but has to do with Earth's atmosphere, refracting light from the stars, causing them to appear to twinkle. But that doesn't mean that stars themselves are actually constant. Most stars, including the

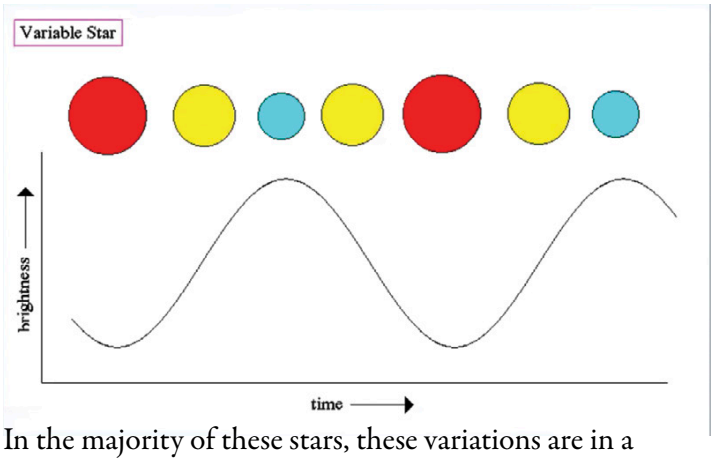


North Star, are not actually constant but most vary over time.

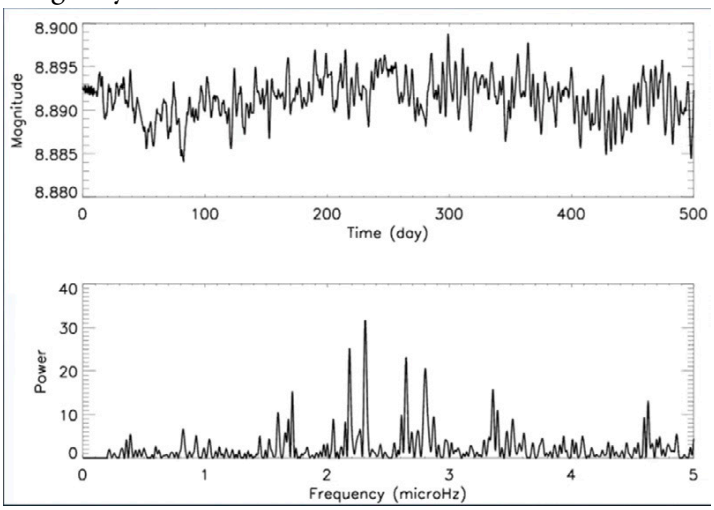
This variations in brightness for the majority of stars is because these stars are actually physically pulsating; they are getting bigger and smaller, expanding and contracting, this combined with temperature changes that happen during that expansion and contraction lead to changes in the luminosity – the amount of light that these stars produce.



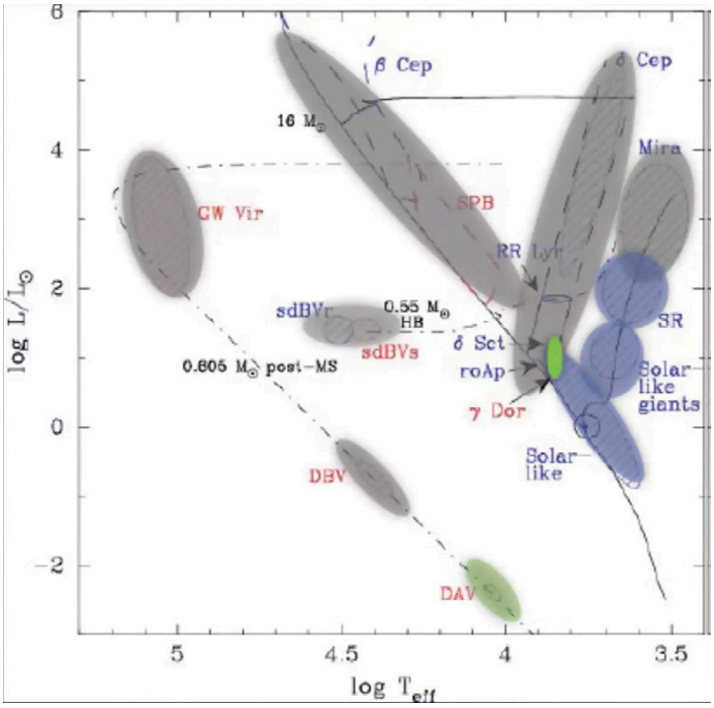




In the majority of these stars, these variations are in a regular periodic pattern or in many cases they have multiple different periods of pulsation happening at once. The variations in the luminosity of these stars provide really important tools to study stars and their evolutionary paths, our galaxy and much more.



Hertzsprung-Russell Diagram (HR)

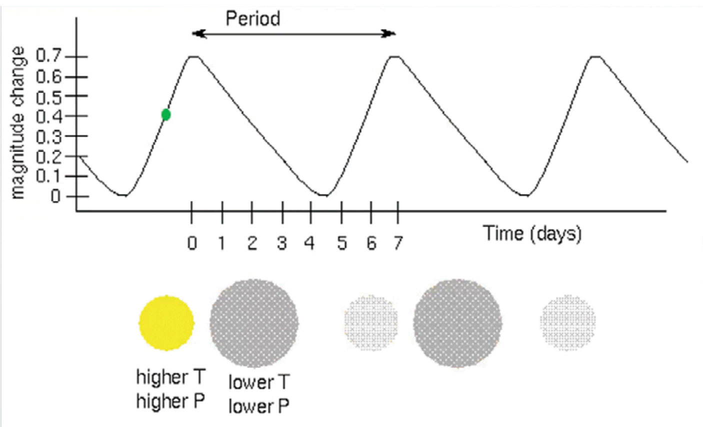


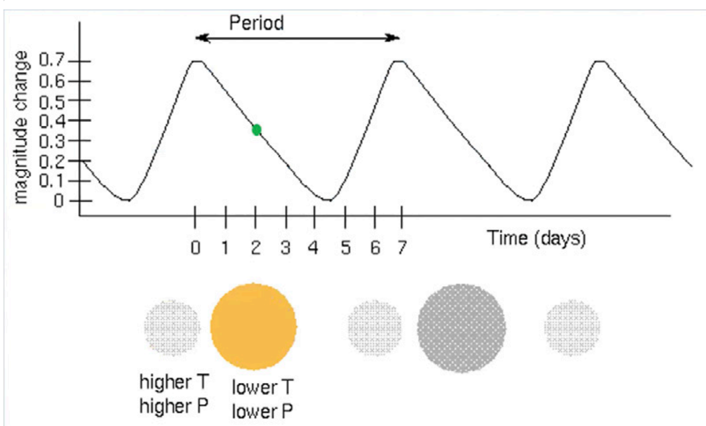
Hertzsprung-Russell Diagram (HR) - one of the most important tools in study of stellar evolution

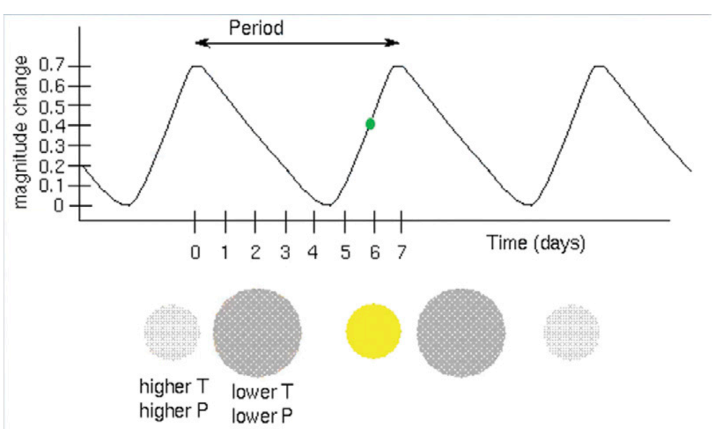
- A graph that plots the temperature of stars against their luminosity
- Most stars lie in the main sequence – the line stretching from the upper left (hot, luminous stars) to the bottom right (cool, faint stars)

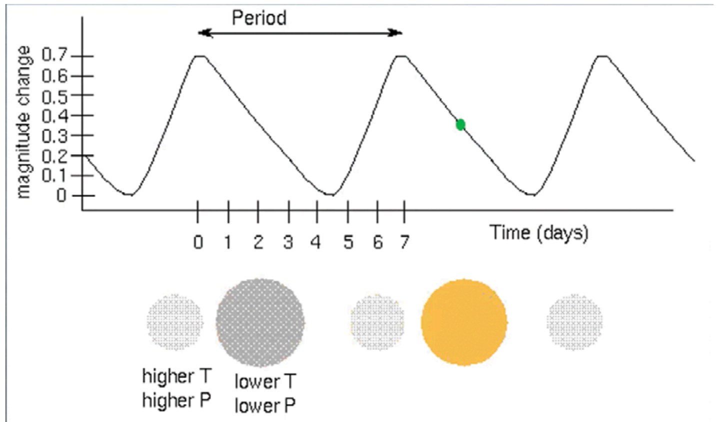
X-Axis = Temperature – (X axis is backwards in that hotter on left, cooler on right)
Y-Axis = Luminosity of the stars

Light Curve plot of luminosity vs time shows variation of luminosity of Cepheid over time because star is expanding and contracting X Axis= Time Y Axis= Luminosity









Cepheid variables: outward pressure (P) and inward gravity compression are out of sync, so star changes size and temperature: it **pulsates**. *RR-Lyrae* variables are smaller and have pulsation periods of less than 24 hours. Also, their light curve looks different from the Cepheid light curve.

Cepheid Variable Stars

Cepheids are some of the oldest known of the periodic variable stars and have been known about for over 100 years. Cepheids luminosity varies in periods of days to weeks in which it can get up to 50 X brighter.

- Stars that are in the process of moving toward or away from the red giant branch
- Pass through region of the HR Diagram known as the instability strip, area of instability
- Cepheid occupy the upper portion of the instability area (gray) in the HR Diagram

Stars in the instability strip, no matter size, how old, what it is made of, will pulsate

When the star is biggest does not correlate to when it give off the most light, but instead this correlates to when it is in the perfect balance of close to hottest and somewhat expanding, as shown in plot.

- The luminosity of a star is proportional to its radius Squared and its temperature to the 4th power $L \propto R^2 T^4$ so as it expands and contracts it also changes in surface temperature; T^4 is going to dominate over any changes in radius, this is why the point of maximum luminosity does not correlate to when the star is the biggest
- Cepheid variables outward pressure (P) and inward gravity compression are out of sync, so star changes size and temperature: it pulsates
- RR-Lyrae variables are smaller and have pulsation periods of less than 24 hrs. Also, their light curve looks different from the Cepheid light curve

What causes this expansion to happen?

Stars are in a constant war between gravity wanting to push it down and crush the whole star and pressure pushing out trying to hold it up. When they are in balance the star is at a happy radius, it doesn't change. When pressure wins it expands, when gravity wins it contracts.

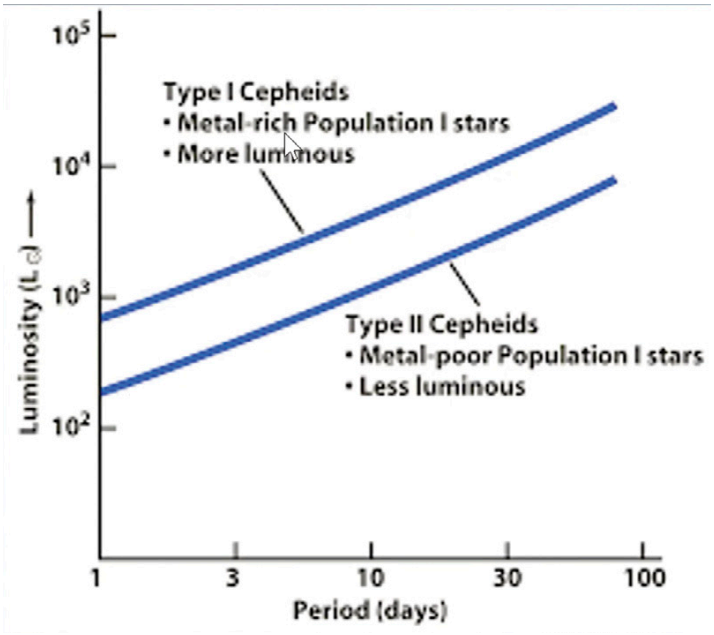
- Near the surface helium is in the process of being ionized for the second time
- Double ionized helium, has gone from one atom to having a positively charged nucleus and two free electrons, three particles; this is issue for photons, trying to avoid this gas, move around and get out, star becomes opaque, light can't get out, starts providing pressure pushing outwards, causes outer part of star to expand
- As star expands gas eventually cools off enough that the electrons can come back and recombine with that helium nucleus. Now less particles again, so photons come back and in time the whole process repeats
- Stars in the instability strip are in the right place for this to happen, right temperature range and near the surface, where helium is being ionized for the second time

Period-Luminosity Relationship

Cepheids were known about well over 100 years, but not really understood until the 1900s-1910s and this came primarily through the work of Henrietta Leavitt. Henrietta was one of a group of Harvard women astronomers knows as "Harvard Computers" – women hired by astronomer Edward Pickering at the Harvard Observatory for very low wages at the time to process astronomical data and calculations. Although he took lead credit for their work, many of the women have gone on to be much more famous in modern astronomy than Pickering.

They wanted to understand what is going on with these changes in luminosity and with the various periods they were observing. Ms. Leavitt suspected there may be a connection between the period (how long it takes that star to pulsate) and how much light it gives off.

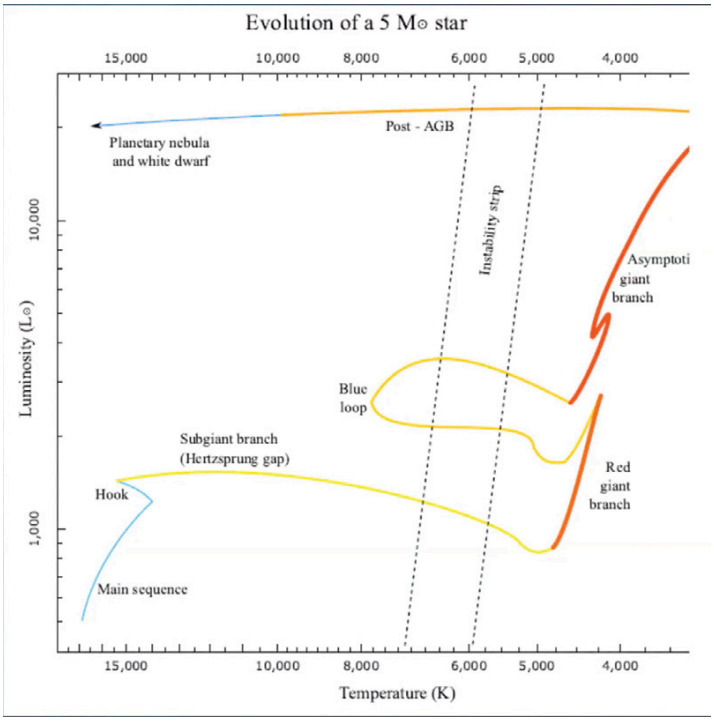
- Many different Cepheids in the sky with all different brightness; didn't know if because stars at different distances or a difference in light being given off or combination
- Needed sample of Cepheids about the same distances away, she found a set in the Large Magellanic Cloud and assumed all roughly same distance from Earth which would mean any difference in brightness must be due to differences in light being given off
- When she does this, she realizes stars with longer pulsation periods are brighter
- Ms. Leavitt publishes the Period – Luminosity Relationship



X Axis= Period (days)
Y Axis= Average Luminosity
Plot show nice relationship curve depending upon whether stars are Type I or II Cepheids

Type 1 Newer Cepheids = more metals in them, more luminous

Type 2 Older Cepheids = less metals, less luminous
Now refer to this relationship as the Leavitt Law



The reason why there is this connection between this pulsation period and the average luminosity comes back to the basic properties of stars and the HR Diagram.

Zoom in on HR Diagram (on bottom right page 14).
X Axis= Temperature
Y Axis= Luminosity
Instability strip–narrow range of temperature all the stars are at roughly the same temperature

- Compare two stars in the instability strip; one at high luminosity and one low luminosity, pretty much the same temperature, only possible difference would be their radius
- High luminosity stars have to have a larger radius than lower luminosity stars
- Why takes longer to pulsate? Pressure waves, acoustic waves in the star, bigger object is going to have slower moving acoustic waves than smaller object, thus a high luminosity larger radius Cepheid will take longer to pulsate than smaller low luminosity Cepheid
- From this Leavitt determined if one can observe and measure how long it takes to pulsate, can calculate how much light it give off – this means that Cepheids can now be used as distance indicators!

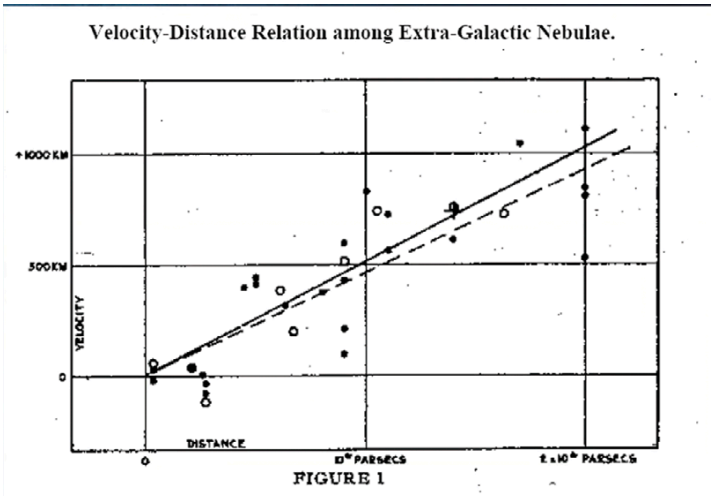
Cepheids as Distance Indicators

Why is it important to be able to calculate how much light a star gives off? Because the amount of light a star gives off, which we call flux, is equal to the luminosity divided by 4 π x the distance of that star squared.

$$F = \frac{L}{4\pi d^2}$$

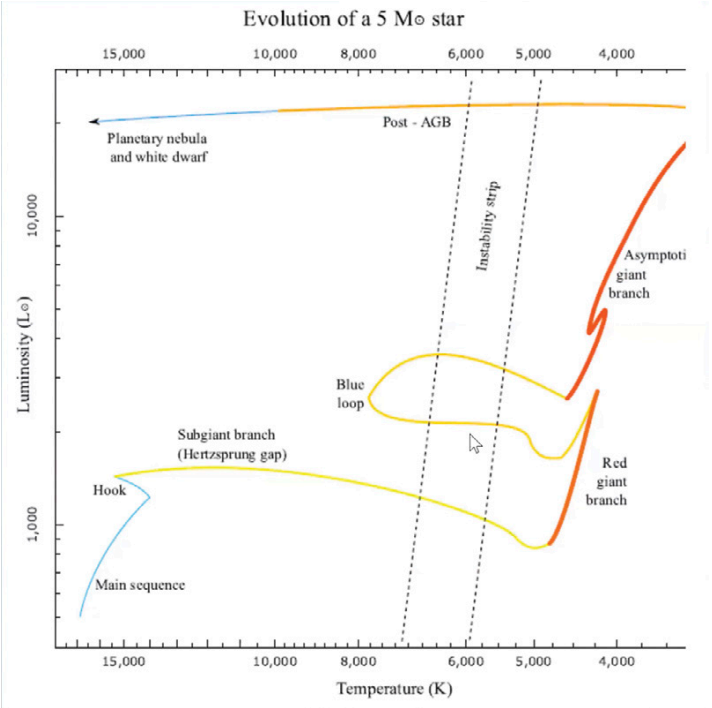
The Leavitt Law allows us to calculate the luminosity from that period we observe and now we can calculate the distance to these Cepheids.

- Soon came to the attention of Astronomer Edwin Hubble
- Hubble uses the Leavitt Law and Cepheids to measure distances to other galaxies, and from there the realization that the Universe is expanding!
- Edwin Hubble becomes very famous for this and acknowledges Henrietta Leavitt's works and how important it was to his work and tried to her credit for her work, although she had already passed away



Above is the famous Hubble diagram showing how he realized the Universe is expanding It shows the velocity-distance relation among Extra-Galactic Nebulae (X Axis = distance and Y Axis = velocity).

Cepheids also provide a way to study star evolution in real time

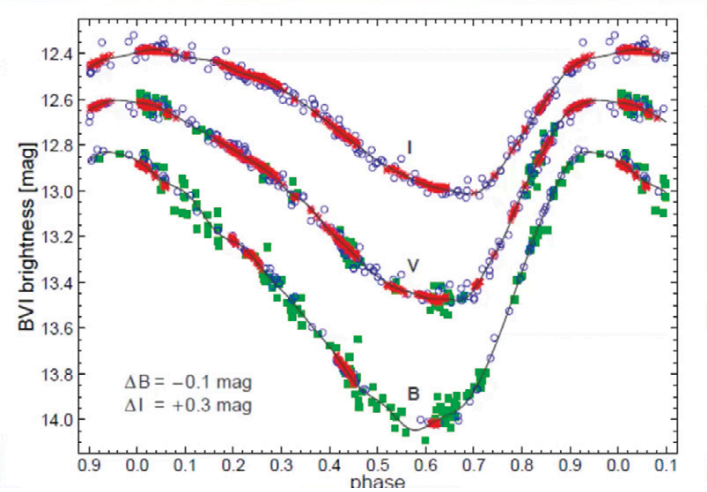


Cepheids quickly became very useful as a way to measure distance and because they are very luminous stars can be seen at very large distances. Looking back at zoomed in HR Diagram, Cepheids also provide a way to study stellar evolution in real time.

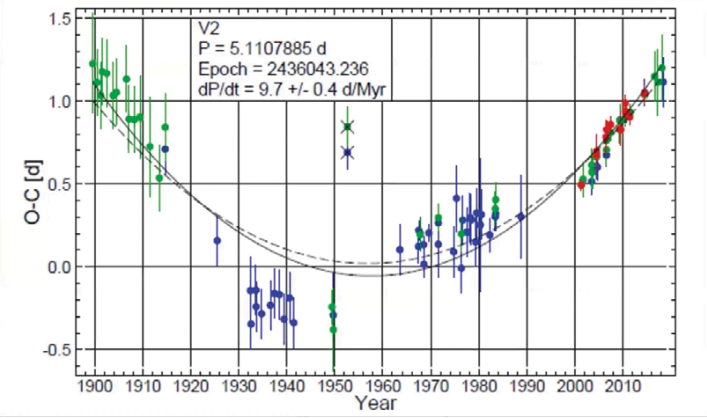
- Stars are not stationary in the instability strip but are slowing moving through it
- Orange curve show path of one star, going away from Red Giant Branch and moving toward it; as moves away, getting hotter, but luminosity stays nearly the same;

means radius must be getting smaller/denser, so pulsation period getting shorter
- Changes in density change the pulsation period
- Cooler to hotter temperatures = periods getting shorter
- Hotter to cooler temperature = period getting longer
- Though these changes are small, they are noticeable over decades and are the result of stellar evolution

We can see these changes that are a result of stellar evolution



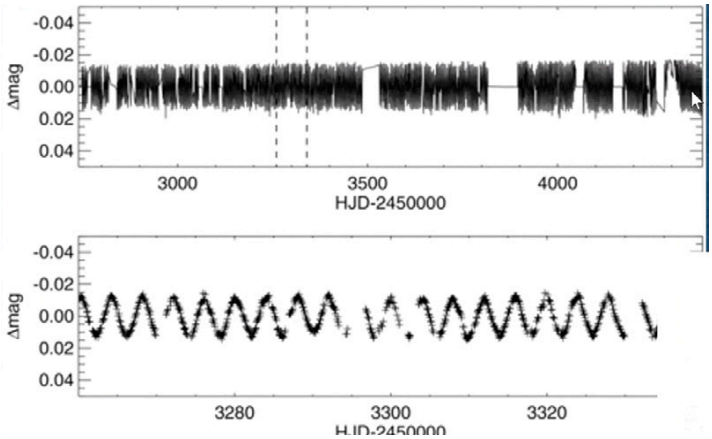
- Looking at set of Cepheids in Globular Cluster M13
- Light Curves of Cepheids in different colors of light (above image)



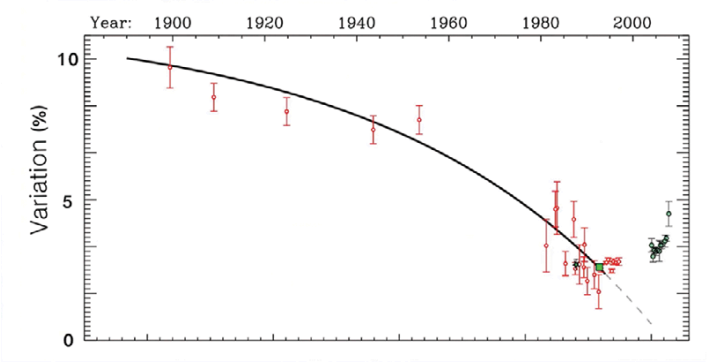
- Diagram shows period change (above image)
- X Axis= Year/Y Axis= Difference between observed period and a constant period
- Shows change between whether period is same or changing
- Positively curved shape indicates star is moving towards Red Giant Branch
- We have observations of this star going back to year 1900 which makes these stars very useful tools for studying stellar evolution in real time

Polaris

Referring back to the phrase as constant as the North Star, we will look again at Polaris. Not only are stars in general not constant, but Polaris is a Cepheid and pulsating and really not constant. In addition to that, Polaris shows some other very interesting behavior.



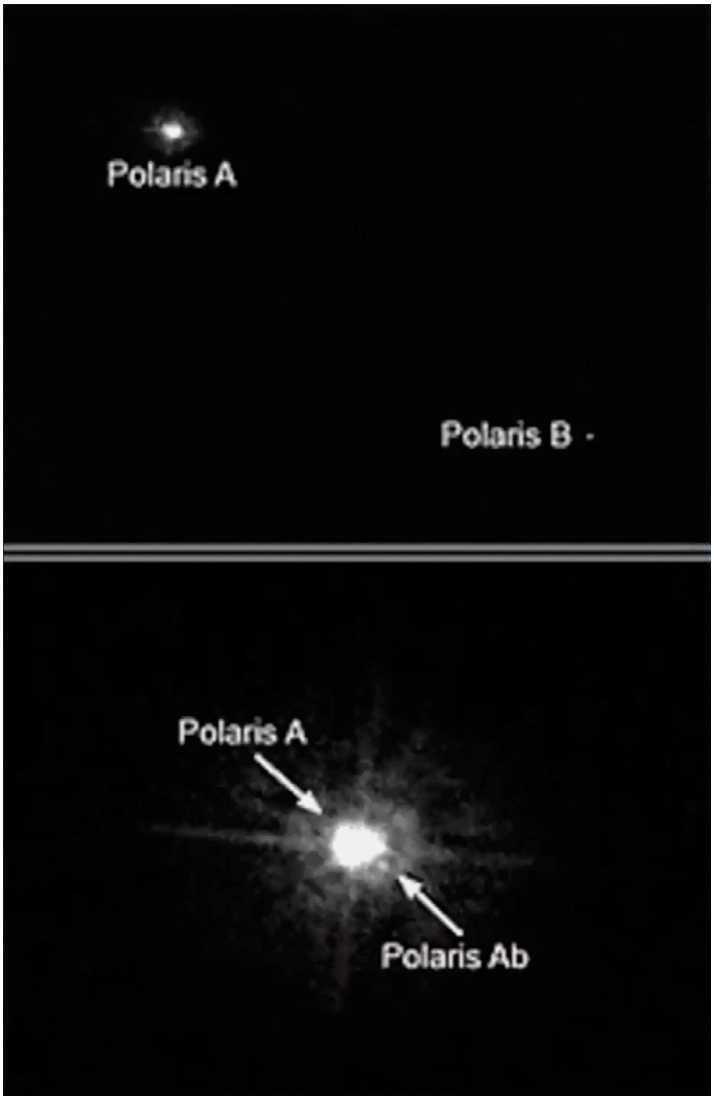
Looking closely at plot above (Spreckley & Stevens 2008) can see a few years of observations, notice that the height of those pulsations is changing from the beginning of observations on the left to the end of them on right. The amplitude of pulsation, the amount of brightness is increasing; this is actually a new phenomenon.

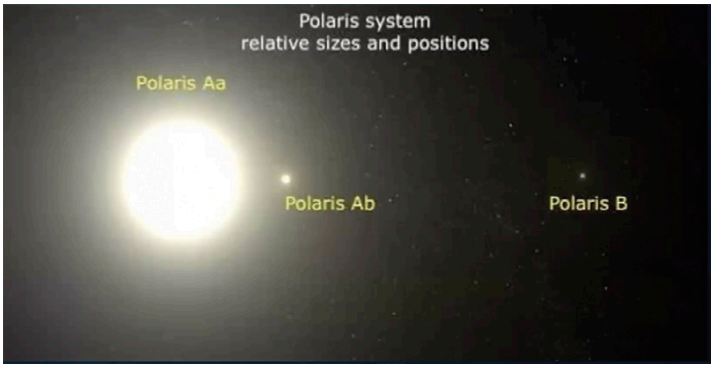


Looking at plot of Variation (H. Bruntt et al, 2008) we see the amplitude of pulsation, the amount of brightness, is increasing. At the beginning of plot in 1900s, for 90 years, it was getting smaller then something happened in the 1990's and it is now getting larger. Not a basic stellar evolution process, that changes the period of pulsation but not that much effect on the amplitude.

- Something we do not yet understand is going on with Polaris
- Polaris is not one star, is part of a triple system
- Polaris Aa, Polaris Ab and Polaris B

- Pulling on each other can introduce tides on each other, and cause ringing, pulsations
- May be some part of complex stellar evolution mixed with effects of triple star system





What is going on with Polaris is one of the big questions in the Variable Star community. Clearly some complicated things going on. We don't know what is going on with Polaris and this has been questioned and talked about at conference for 20 years.

Dr. Kuehn has provided us an intriguing look at Cepheid Variable Stars. Since their discovery in 1784, Cepheids have become one of the most important tools of astronomers. The research done by Harvard astronomer, Henrietta Leavitt, later lead to Edwin Hubble's discovery that the Universe is expanding, and since providing important clues about the internal structure of stars. Cepheids are some of the oldest of the known variable stars; these stars vary in luminosity in a roughly periodic or multi-periodic manner. The brightness variations are caused by physical pulsations/oscillations in outer layer of the star. A very well-known and long studied Cepheid – the 'North Star' Polaris displays unusual changes in amplitude over time, beginning in the 1990s, that is not yet understood. Cepheids are a fascinating type of variable star and present us with a great opportunity to study stellar evolution over short periods of time.

Questions: What was the definition of Flux? There are many types of variables out there, how do you know one is a Cepheid? Is there a specific signature? Are Polaris Aa and B close enough to exchange material? How many types of variable stars are there? What percentage of stars are not variable? Is there a definition as to what makes a star variable? Can you tell if any of the Cepheids variables have magnetic fields? What is the furthest galaxy we can actually see an individual Cepheids in to make these measurements? Questions on resolving distant individual stars as Cepheids, details of photometry. What kind of students take Astronomy classes these days? What are their goals?

See the full meeting recording at https://members.longmontastro.org/

Public Outreach Event for April 8th Solar Eclipse by David Elmore

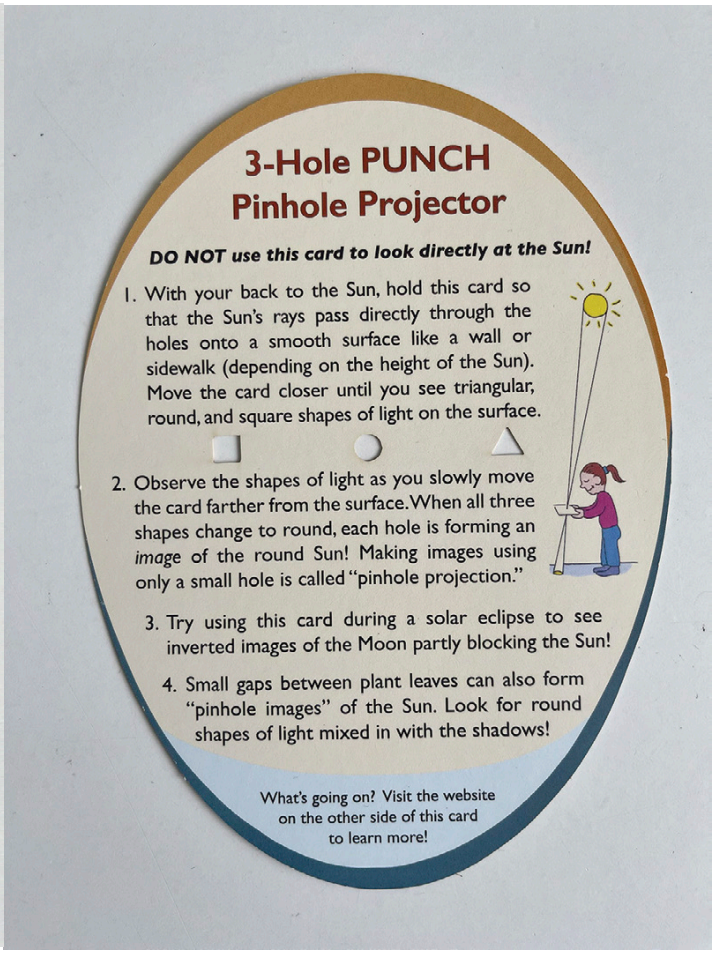
We have had wonderful outreach events, such as the Annual Eclipse Community Viewing in Louisville. With the Total Solar Eclipse coming up in a matter of weeks now, we will talk about some of what you might look for and expect during the event.

- Talk to people about what they are going to see
- Look under the trees, why are there crescents everywhere? Use fingers to make shadow, or a cardboard 3-hole punch viewer, put a mask in front of lamps with shapes
- Viewing solar glasses you can also use any day to look at sunspots, etc.

- Follow fold marks on side to adjust width to glasses
- Turn away from Sun to put on glasses
- Early and late in eclipse you can see sunspots
- In total eclipse, might see shadow of moon coming across a field toward you
- Distant hills may become dark before your area
- What do the animals, birds do?
- At totality it is going to get dark, very fast, and may be cold too
- Looks like sunset all around the horizon
- During totality, we are looking at light around the Sun-electrons
- Iridescent objects sticking out - Prominences
- During totality you may see Venus, Jupiter, maybe a comet!

Very important information on use of solar glasses!!!

If you have solar glasses used for the Total Solar Eclipse of 2017, they may have scratches and wear damage, loss of solar film protection...do not use, they should be disposed of. If you got them new for the Annular Solar Eclipse of October, 2023, they are OK still



III. Business Meeting - Treasurer Report by Bruce Lamoreaux

Longmont
Astronomical Society

P.O. Box 806
Longmont, CO 80502-0806

LAS Treasurer's Report - Bruce Lamoreaux **3/21/2024**

Main Checking Account (xxx-1587)

Begin Balance:	$ 9,500.00	**2/2/2024**	
Deposits:	$ -		
Expenses:	$ (800.00)	Bank Charges, Insurance, Squarespace	
Current Balance:	**$ 8,700.00**	**3/5/2024**	

2-Year Savings Account (xxx-1478) (matures 10/23/23)

Past Balance:	$ 8,200.00	**10/23/2023**
Interest:	$ -	
Balance:	**$ 8,200.00**	**12/29/2023**

Telescope Fund (xxx-0165)

Past Balance:	$ 1,100.00	**1/30/2024**
Deposits:	$ -	
Expenses:	$ -	
Balance	**$ 1,100.00**	**2/28/2024**

Petty Cash

Past Balance:	$ 50.00
Deposits:	$ -
Expenses:	$ -
Balance	**$ 50.00**

Total Assets	**$ 18,050.00**	$ (800.00) Down from February

Active Membership:	**92**
Student Membership:	**0**
Total	**92**

IV. Upcoming Events

Solar Eclipse Viewing Event, Louisville Public Library
Monday, April 8th from 11:30am to 2:00 pm on the Plaza in Front of the Library, 951 Spruce Street, Louisville, CO 80027

Star Party for Boulder County Parks and Recreation
Friday, April 12th starting at 8:30 pm at Ron Steward Preserve at Rabbit Mountain

2024 Rabbit Mountain Star Parties- Star Parties Scheduled by Bill Tschumy, Outreach Coordinator, with Boulder Parks and Open Space (Ranger talk starts about half hour before times noted below)

April 12th @ 8:30 PM – Crescent Moon

May 3rd @ 8:30 PM – No Moon

June 7th @ 9:00 PM – Very thin crescent Moon (one day after new)

July 12th @ 9:00 PM – First Quarter Moon

August 2nd @ 8:30 PM - No Moon (two days before New Moon)

September 6th @ 8:00 PM - Crescent Moon

October 4th @ 7:00 PM – Two day old Crescent Moon

November 1st @6:30 – New Moon

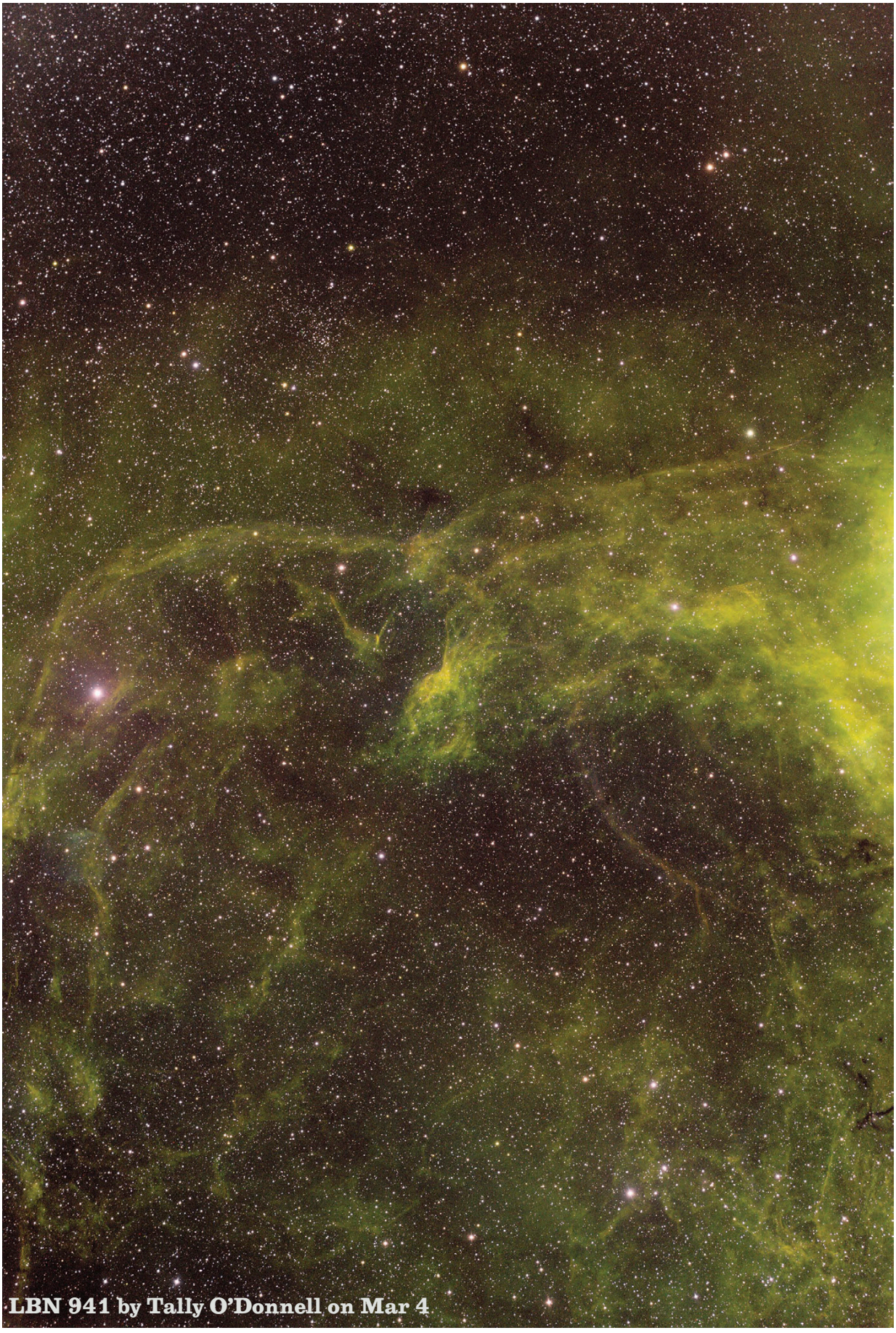
Comet 12P/Pons-Brooks by Gary Garzone on Mar 29

The “Straight Wall” by Tim Brown. Tim has been working on his schiefspiegler lately and it is now working very well evidenced by this image.

The Straight Wall aka Rupes Recta is in the southeastern part of Mare Nubium which is just above the center of this image. The small crater Birt is to the west (left) of the linear Straight Wall. Crater Thebit is to the northeast (upper left).

The Straight Wall is the most easily recognized escarpment on the moon.

Taken with the moon about 9 days old with a 10-in f/18 unobstructed reflector at prime focus. Tims used an ASI 482 MC camera and used the best 60 of 582 exposures at 6 msec each, no filter was used.

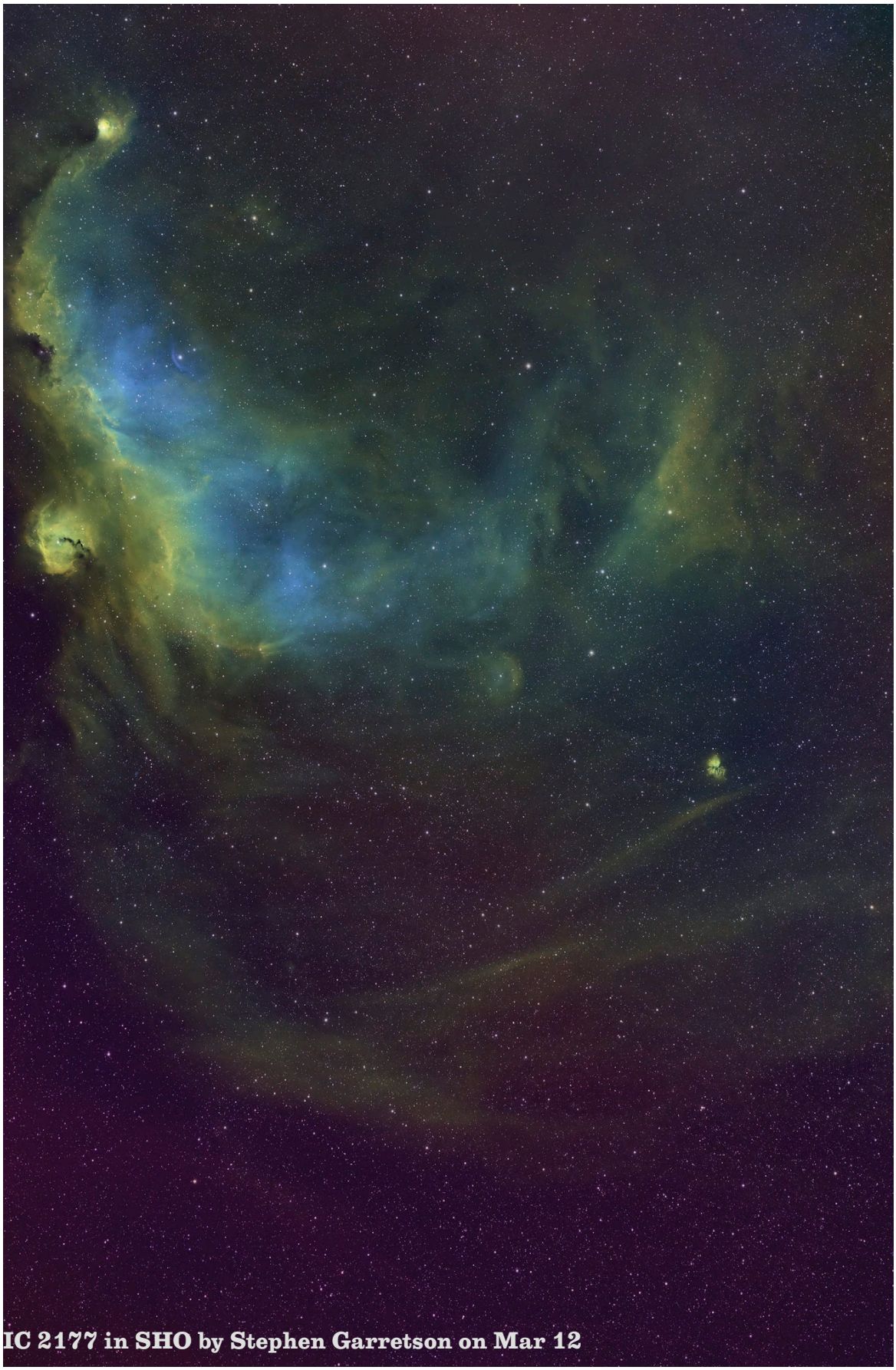


LBN 941 by Tally O'Donnell on Mar 4

This area is just north of the Rosette Nebula which just shows in the right of the frame (image rotated 90 CCW). This is an SHO image with one hour each of Ha, OIII, and SII.

Cone Nebula, Christmas Tree Cluster, Fox Fur Nebula Area, HOO in HOO by Stephen Garretson on Mar 5

[27] guided 600s Ha subs; [27] guided OIII subs; total integration: 9 hours. Borg 55FL f/3.6, 6 element Petzval Astrograph, ASI 2600MM Pro, Gerd Neumann Camera Tilt Adjuster, ZWO EAF, ZWO EFW, Chroma 3nm Ha filter, Chroma 3nm OIII filter, ADM Aimer



IC 2177 in SHO by Stephen Garretson on Mar 12

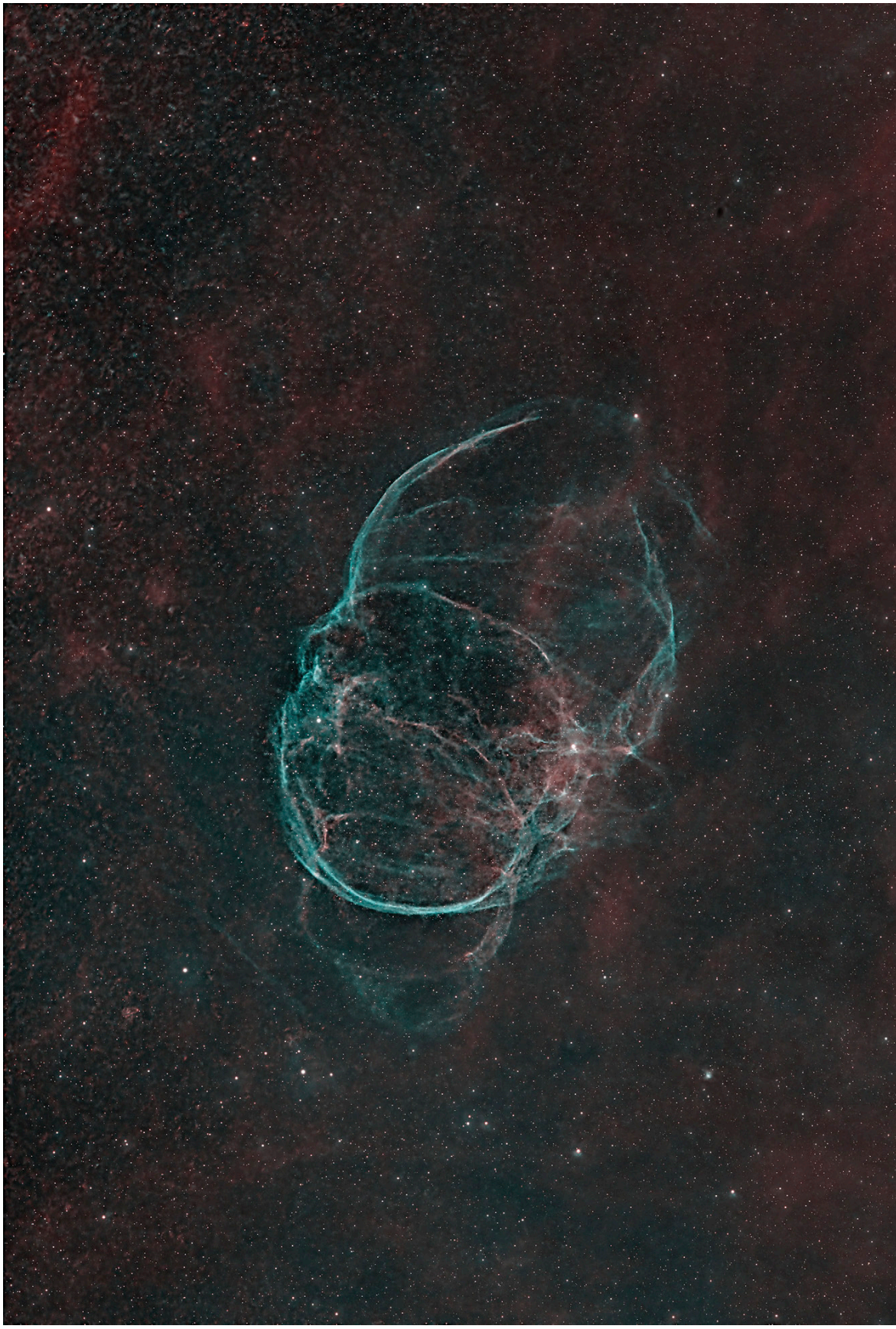
18] guided 600s Ha subs; [18] guided 600s OIII subs; [14] guided 600s SII subs; total integration: 8 hours, 20 minutes For this image each of the three imaging setups is composed of: Borg 55FL f/3.6, 6 element Petzval Astrograph;ASI 2600MM Pro; Gerd Neumann Camera Tilt Adjuster; ZWO EAF; ZWO EFW; Chroma 3nm Ha filter;Chroma 3nm OIII filter; Chroma 3nm SII filter; ADM Aimer

NGC226, "Cone" Nebula by Rolando Garcia on Mar 11

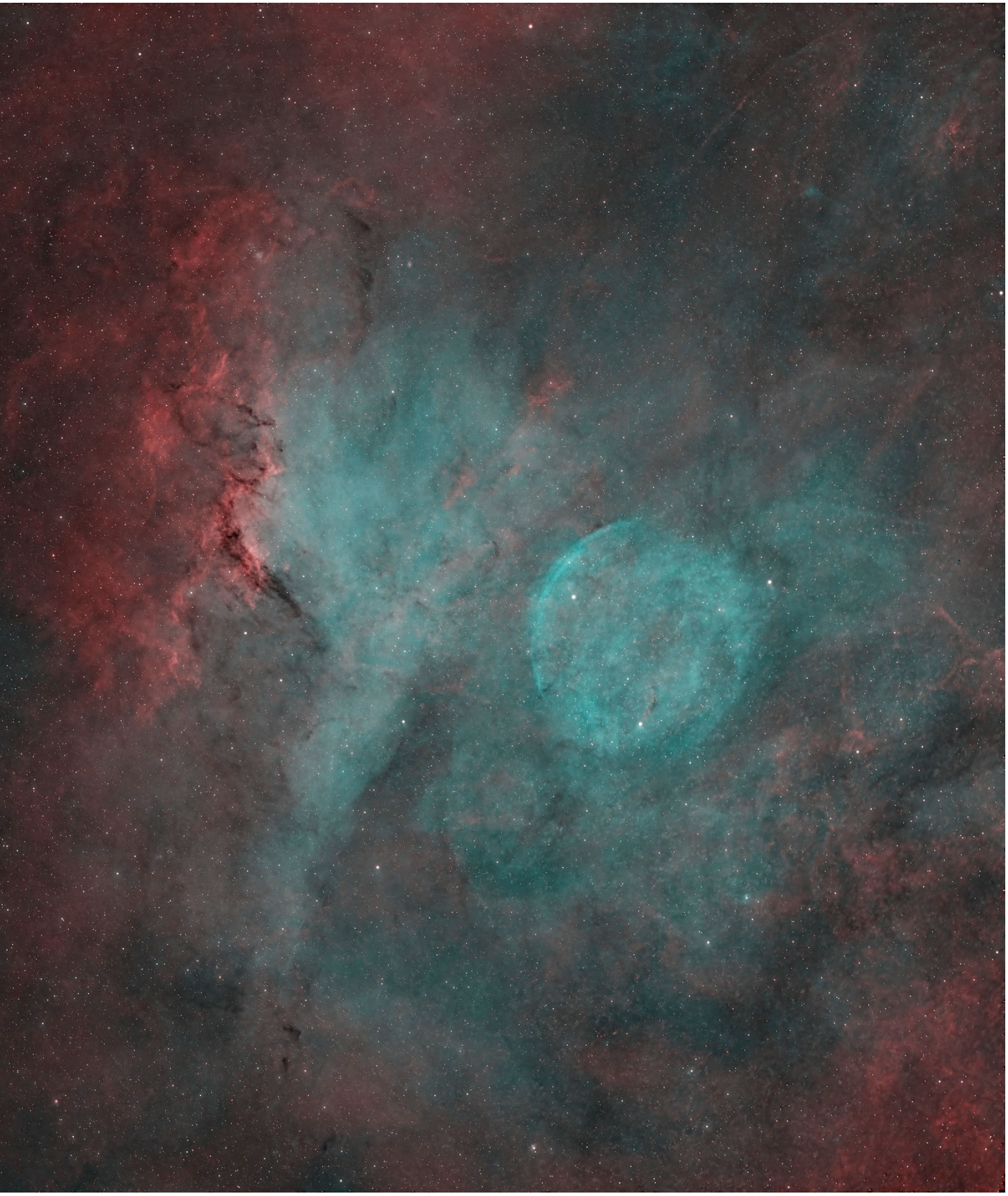
About 2.5 hours exposure at ISO 800, 300 sec subs. IDAS NBZ filter.

These two remnants, G205.5 + 0.5 and G206.9 + 2.3 lie between the Rosette and Cone nebulae. G205 is the larger of the two, image left. Several radio astronomy papers give evidence for its interaction with the Rosette, causing new starburst formations there. There is an amazing amount of structure in G205, but very little in the circular remnant G206 to its right. Strangely, neither remnant was strong in H-alpha, but both were strong in OIII. G205 had a strong SII signature that differed markedly from H-alpha structures, but G206 had no SII signature at all. So these two supernova remnant neighbors display vastly different properties! Why??

This is a false-color narrowband image combining H-alpha, OIII, and SII components. Both H and S were used in the Red channel, and both O and S in the Green and Blue channels in an attempt to render a believable picture of the emissions in the region. Two hours for each of the three narrowband images, so 6 hours total time on target. From DSNM with RASA scope and ASI 6200MM camera. FOV is 3.3 x 2.2 degrees.



Supernova remnant G205.5 +0.5 in HSOS by . J. Post on Mar 30



Supernova remnant G206.9 + 2.3 in HSOS by . J. Post on Mar 30

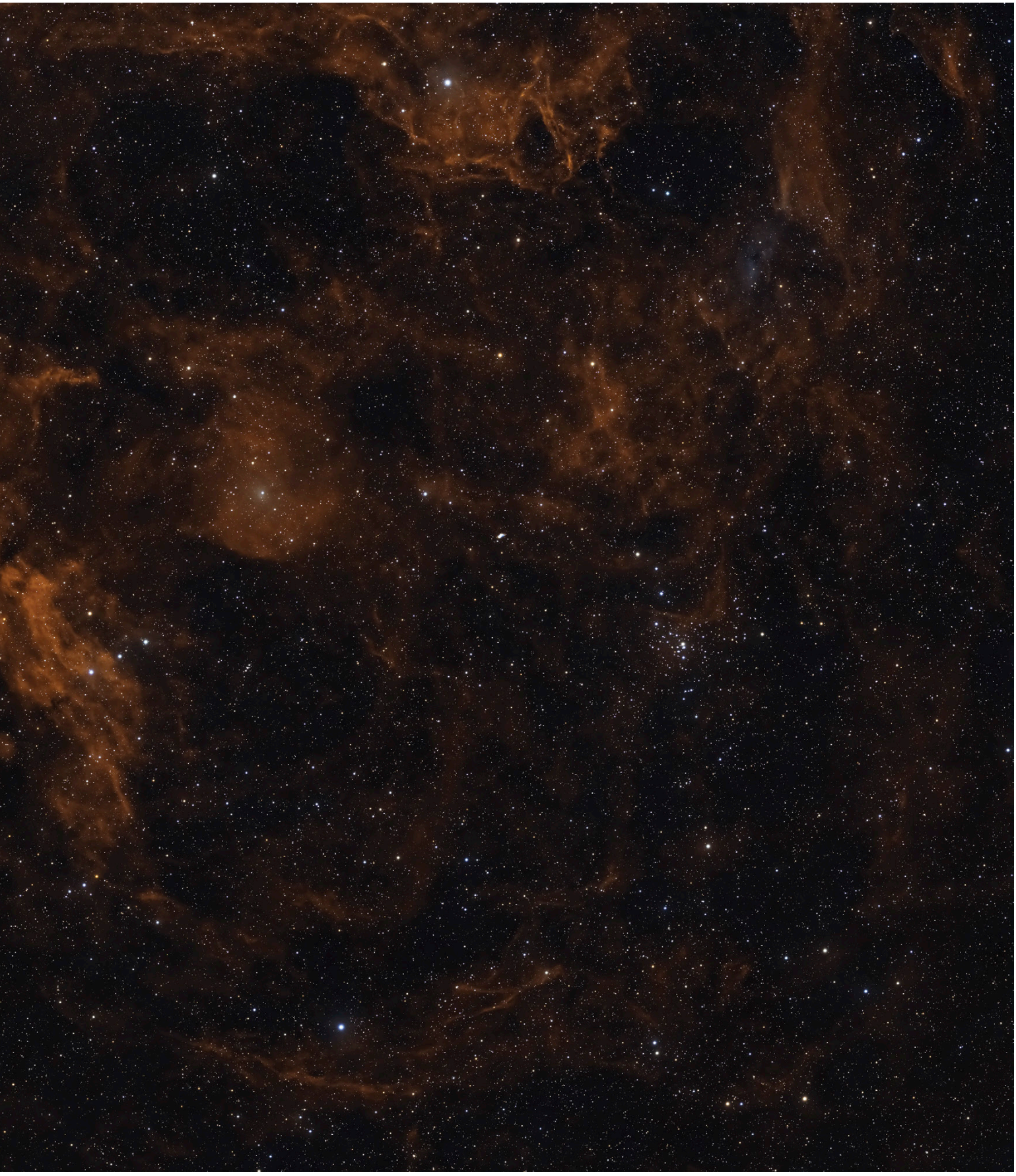
G205_HSOS_PS1.jpg

Taken with a Takahashi FSQ 130 on a Mach2 mount with a ZWO 6200 monochrome camera and Chroma Filters

10 minute subs in Ha, OIII, and SII for a total integration time of 17 hours and 40 minutes.

Ha x 51
OIII x 32
SII x 23

SH 2-284 and G213 in SHO by Marty Butley



NGC 4173, Box Galaxies by Jim Pollock on Mar 11

Sun by Jim Pollock on Mar 24

Cone-Rosette Mosaic in HabSO by David Elmore on Mar 6

This is a wide field view of the Rosette Molecular Cloud in narrowband, 15.4° x 6.2° in extent.
The giant molecular cloud includes the Cone Nebula region, the Rosette Nebula and the Monoceros Loop super nova remnant G205.5+00.5, the circular feature in the center. To the right, south, are Sharpless objects 280, 282, 283, and 284. Just north of 282 is the blue SNR G211.7-0101. Images were recorded using Antlia dual band filters Hydrogen-alpha/Oxygen III and Sulfur II/Hydrogen-beta. The four emission lines were algebraically extracted from overlapping pass bands of the RGB filters on the ASI2400MC pro sensor. These four images were then combined to create a full color image using H-alpha and H-beta as red, SII as yellow, and OIII as blue-green. Numerous PixInsight tools applied. Stars have been greatly reduced to bring out the nebulosity. Borg 55FL F/3.6 refractor. Antlia dual band filters. ZWO ASI2400MC Pro camera. 8 hour 40 minutes total integration recorded 1, 3, 4, April from my little observatory at Dark Sky New Mexico.

Leo Triplet by Eddie Hunnell on Mar 10

Newsletter Archives by Eileen Hall-McKim

30 Years Ago 1994

The meeting was called to order by the Vice President Jim Sharpe. He then informed those in attendance that he had provided a PC to view some super-computer simulations (created by NCSA) of the Shoemaker-Levy 9 collision with Jupiter. Several members took advantage of this opportunity during the break.

Jim then showed a video of an abandoned 31" telescope that was found on Table Mountain. A discussion ensued about its past use, as well as its possible future use. Jim will keep us posted about the status of the telescope.

Member Tim Brown announced that he has finished the club's solar telescope and brought it to the meeting for display (thank you Tim!). This telescope will be available for checkout to club members who want to do some solar observing (the editor would like to report that he has tried this telescope and it gives a fine solar image).

On the topic of club equipment, its usage, maintenance and storage, we decided to designate the 10" Cave as a "star party scope". Due to its size, weight and complexity, we well be bringing it to the star parties and astronomy day booth, but it will not be available for general checkout without special arrangements being made. The 10' dobsonian and the solar scope are a different story though. We strongly encourage anyone to take advantage of a free telescope.

20 Years Ago 2004

Secretary report: Mark Propp mentioned new LAS Internet domain again: http://longmontastro.org Steve Albers has moved our website to our new web server, seems to be working well. The LAS email server and list server seems to be working well.
-Webmaster report: Steve Albers has made several update to the website. Check out space weather links!
-New Business: Boulder Astronomy Society (BAS), next meeting, April 10th at Sommers Bausch Observatory, SBO makes CCD cameras and computers available to the club.

My thoughts on Cactus Flat North (CFN) by Michael Hotka

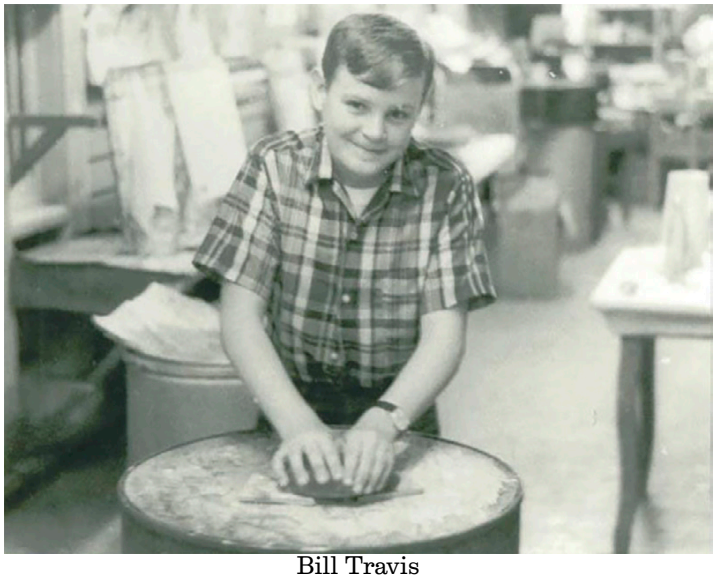
"Yes. It was the largest crowd of people I had ever seen up there. Almost packed. One thing you can always count on is Gary Garzone showing beautiful views through his 30" to all. I have NEVER seen M51 as detailed through any scope as I did through Gary's. Discarding to the views through the 92" WIRO a couple of years ago, this view is at the top of my all time list. I often setup next to Gary to listen to his comments of the sky throughout the night. Saturday night, with Gary's brother Ed visiting, who, in the dark, sounds EXACTLY like Gary, it was hard to determine if Gary was talking or Ed was talking...made an interesting evening for all who "listened".

Cactus Flat North by Gary Garzone

"I think this was the largest crowd to date for CFN new moon event, even Cheyenne club members showed up. Lots of dark sky astronomers showed up, I lost count how many but it was like a summer event almost, except for the cold part, but heck it was about equal to WUTS at Fox park in summer anyway, about 27 degrees maybe? Well trio transit of moons on surface of Jupiter was spectacular. We all caught the double dot spots then witnessed the third one on other side of dark band, easily seen. New 30 mirror coating on edge on galaxies like NGC 4565 and 5907 and spiral M51 were some of the best views to date for scope. We were blessed with clear skies, most of the night, some clouds early to scare off the doubtful, but stayed up till 2 am," bye, Gary

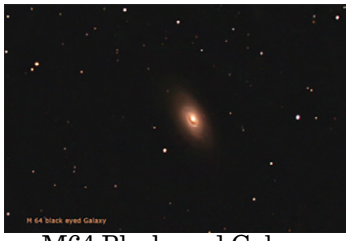
Thank Goodness for Astronomy Clubs by Bill Travis

"Watching the video of David Levy's wonderful banquet speech, I couldn't help but think back to the first astronomy club I belonged to, some forty years ago. The Astro-Gators Astronomy Club was a kids group sponsored by the Children's Museum in Jacksonville, FL, during the 1960s and 1970s. There was a grown-up club in town, too, and I hadn't given much thought to why a junior club was started until I heard Levy talk about his own club, but I'm sure glad it was there. I joined when I was 12. We met every other Friday night in an old mansion that was the Museum's first building. The club thrived because several adults, and some of the more grown up members, put a big effort into keeping it going and teaching us kids the stars. And we members were all expected to provide programs, edit a newsletter, and plan activities. My first public speaking ever was to explain Kepler's laws of planetary motion to the group one Friday night. The Astro-Gators changed many lives, mine included, and offered a bunch of kids not only an excuse to stay out all night, and to travel, but taught us an appreciation of the night sky that has stuck with me all my life."



Bill Travis

Lunar Eclipse
by Brian Kimbal

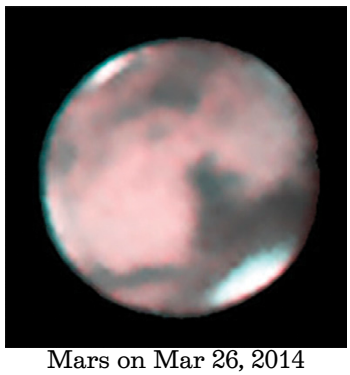


M64 Black-eyed Galaxy
by Gary Gaqrzone

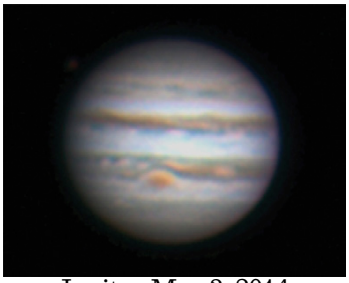
10 Years Ago 2014

There was a very nice turnout of 38 people at the March LAS meeting. Stokes McMillan with the Sierra Nevada Corporation in Louisville gave an entertaining and fascinating talk about the development of their Dreamchaser space plane. Following his talk we had a review of recent images taken by LAS members.

The topic at the April 17th will be "Imaging Mars" presented by Vern Raben. He will discuss some of the equipment and software programs that are available to the amateur astronomer to image the red planet and other solar system objects. He'll give a tutorial on how to configure and use the "Fire Capture" software for capturing planetary images. Alignment, stacking, and enhancement of the images using software tools will be discussed. Techniques to measure and map planetary features will be discussed as well.

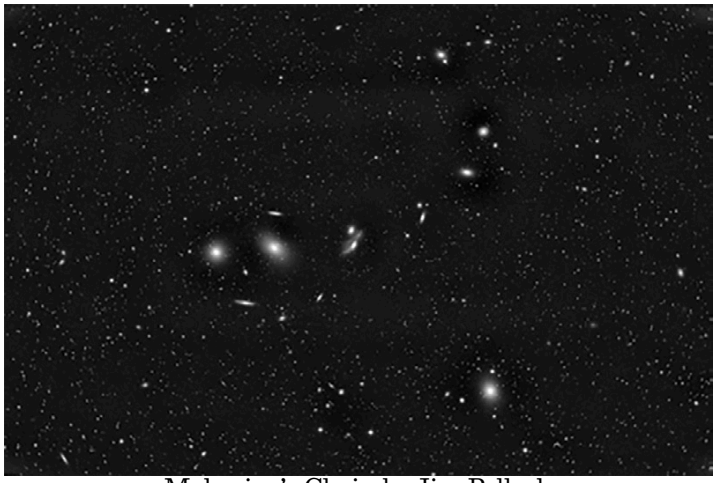


Mars on Mar 26, 2014
by Vern Raben



Jupiter Mar 3, 2014
by Vern Raben

Following the presentation will be observing reports and a slideshow of member images during the past month. Don't forget the total lunar eclipse on the night of April 14 to 15th! Totality begins early morning on April 15th at 1:07 am and ends at 2:25 am MDT.



Makarian's Chain by Jim Pollock

In the 1960's astrophysicist B.E. Markarian found that at least 7 galaxies in this chain shared a common motion in space. The galaxies are located in the northern part of the constellation Virgo near RA 12h 27m Decl + 13° 10'.

M101, Pinwheel Galaxy by Gary Garzone

The Pinwheel galaxy was discovered by Pierre Méchain on March 27, 1781. It was one of the first galaxies to be identified as a spiral "nebula" by William Parsons in 1851. Messier 101 is located in the constellation Ursa Major at RA 14h 03m 12.6s DECL+54°20'57"

Longmont Astronomical Society
P. O. Box 806
Longmont, CO 80506

Rosette Nebula
by Rolando Garcia