



**LONGMONT
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2021**

**“LARGE PROMINENCE”
BY BRIAN KIMBALL**

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LAS Meeting September 16 at 7 pm via Zoom

“SWRI’s Suborbital Research Initiative: First Flights in Next-Gen Suborbital”

by Dr. Dan Durda, SWRI

Abstract:

We are in the midst of a revolution in scientific access to space. This revolution, fueled by billionaire investors like Richard Branson and Jeff Bezos, is fielding human flight sub-orbital systems right now. This new stable of vehicles, originally intended to open up a space tourism market, includes Virgin Galactic’s Spaceship2 and Blue Origin’s New Shepard. Each offers the capability to fly multiple humans and their research payloads to altitudes of 70-140 km on a frequent (daily to weekly) basis for per-seat launch costs much less than ever before. At Southwest Research Institute we have been funded to conduct a multi-flight next-generation suborbital series of research missions.

Bio:

Dr. Daniel D. Durda is with the Southwest Research Institute in Boulder. He has more than twenty-five years of experience researching asteroids, Vulcanoids, Kuiper belt comets, and interplanetary dust, including airborne astronomical observations from high-performance jet aircraft. He is an active pilot with time logged in over a dozen types of aircraft and has more than 110 minutes of time conducting experiments on NASA’s zero-gravity KC-135 aircraft. He has co-authored a book, published numerous articles popularizing planetary science and human exploration of space, and has appeared in more than 70 television science documentaries. Dan is an experienced cave diver and participates in underwater cave rescue and recovery missions.



Upcoming Star Parties

Upcoming public star parties at Rabbit Mountain:

- Friday September 10
- Friday October 15

Masks may be required at telescopes. For members of the public who wish to attend the star party, registration is required through the Boulder County Open Space website at www.BoulderCountyOpenSpace.org/Register

LAS members operating the telescopes do not need to register.

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>. 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.



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LAS Officers and Board Members in 2021



- Stephen Garretson, President
- M. J. Post, Vice President
- Sven Schmidt, Secretary
- Bruce Lamoreaux, Treasurer

Board Members:
David Elmore, Gary Garzone,
Mike Hotka, Brian Kimball,
Vern Raben

Appointed Positions 2021

- Paul Kammermeier, Webmaster
- Bruce Lamoreaux, Library Telescope Coordinator
- Vern Raben, Newsletter Editor

Notes for Thurs. August 19 meeting by Vern Raben

I. Welcome and Introductions

Stephen Garretson, LAS President, opened the meeting via Zoom at 7 pm. He introduced club officers and showed everyone the agenda for the meeting.

II. New Members and Visitors - none

III. August Astronomical History Note by Stephen Garretson



From the 16th century onward maritime trade with India, China, South America, and other European countries was very important to the economies of France, Spain, and Great Britain. The trade routes were long and hazardous; mistakes regarding a ship's location often ended in disaster. In 1674 King Charles II appointed a distinguished commission to look into the problem of navigation at sea. One of the members on the commission was Christopher Wren. Wren was primarily known as an architect but he was interested in any many aspects of science, especially as-

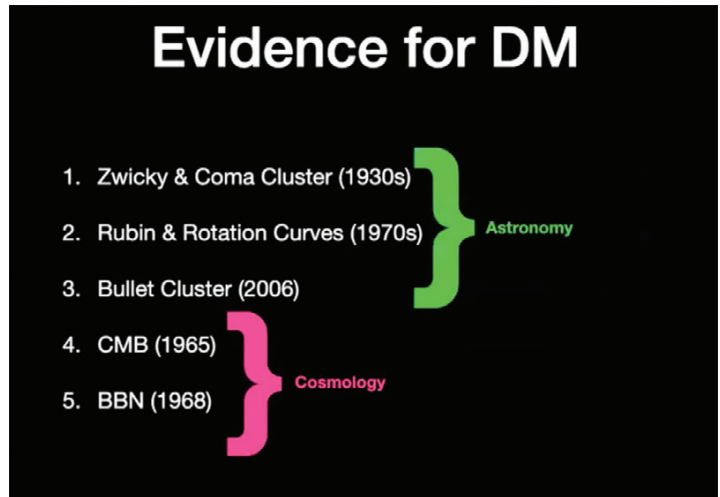


tronomy. He suggested that the ruins of the old Greenwich castle might be a great place to build an observatory to find ways of using astronomy to improve navigation. John Flamsteed was appointed the Astronomer Royal. He laid

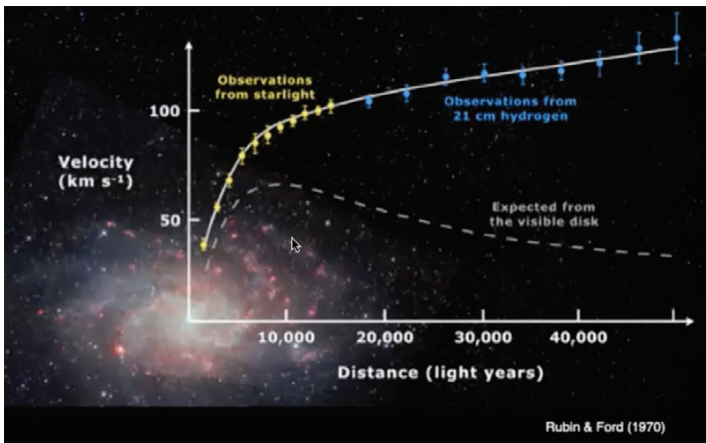
the first stone for the observatory on Aug 10 in 1675. One of the things that can be seen at the Royal Observatory is the line marking the prime Meridian. The prime meridian was established by Sir George Airy in 1851. Bill Tschumy suggests the book "Mask of the Sun" by John Dvorak for those interested in astronomy history.

Presentation by Dr. Angela Collier, "Dark Matter and Why We Need It"

When we look at the night sky all we can see is photons. Yet we know that 86% of all matter is not visible; we can only detect it indirectly. Why do we think there is dark matter? There are 5 main pieces of evidence for dark matter:

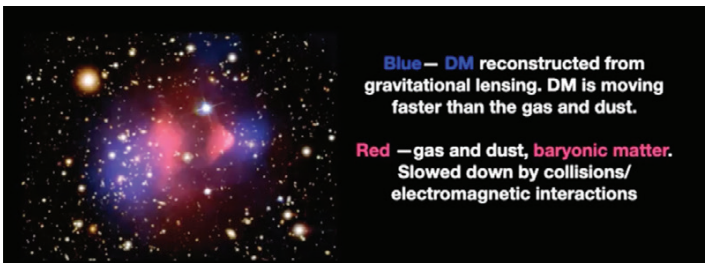


- **Zwicky & Coma Cluster**
In the 1930s Fritz Zwicky studied the Coma Cluster in constellation Coma Berenices. This is a large cluster of galaxies which orbit the same center of mass. Zwicky was interested in measuring the mass of the system. He inferred mass from light from the galaxies and then measured velocity of galaxies on the outskirts of the system. His calculations revealed that there was more than an order of magnitude more mass in those galaxies than light from them indicated.
- **Rubin & Rotation Curves**
In the 1970s Vera Rubin used spectroscopy to accurately measure velocity of stars in 47 galaxies at large radii. Her studies showed that orbital velocities of stars further away from a galaxy did not slow nearly as much expected. This was true for all galaxies that were studied. This then was a multi-scale problem: galaxies clusters had missing mass; galaxies themselves had missing mass.



• **Bullet Cluster**

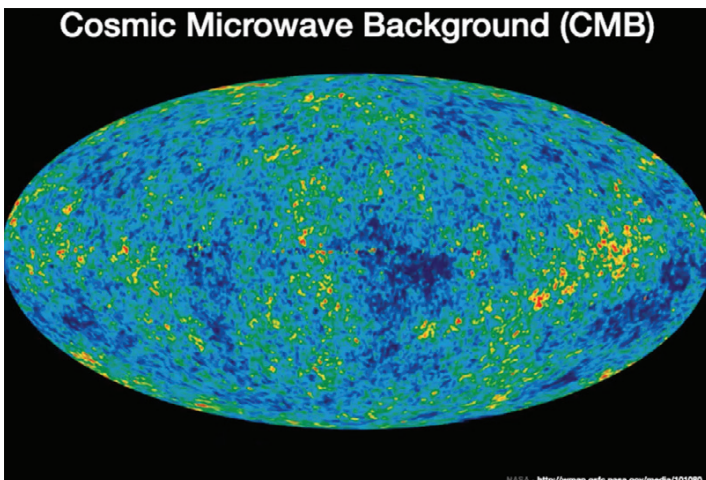
The bullet cluster consists of two colliding clusters of galaxies. Normal (baryonic) matter from one galaxy cluster



has passed through the other and is now at the bullet shape on the right and emits xrays. Studies have shown that majority of the mass, shown in blue, was not slowed and was not affected by the collision. This is not unique; more bullet clusters have been found.

• **Cosmic Microwave Background**

Cosmic background radiation is electromagnetic radiation filling all space and is a remnant of the Big Bag. The CMB has been mapped by various spacecraft. The data shows that there are overdensities and underdensities. If there was no dark matter the baryons would have been



trapped in plasma and would have been uniform. We see that space after the big bang is not isotropic; you have

overdensities and underdensities. The overdensities became galaxies as we moved forward in time. Since all the baryons were trapped in plasma initially what is making the overdensities? What is making the underdensities? What is pulling the baryons into gravity wells is dark matter.

• **Big Bang Nucleosynthesis**

From astronomy and cosmology we know the following dark matter properties: it is massive, it is ubiquitous, it is collisionless, it is electrically neutral, must behave like DM early, and it is cold. When computational physicists like Angela simulate the universe they model a particle with above properties in a n-body simulation through 14 billions years they match all of the expectations. If they simulate galaxy clusters merging they produce a bullet cluster. From this they expect dark matter will be a particle.

• **Modified Gravity** is an alternate explanation. The idea is that at large radii the law of gravity is modified. These models explain observations of Zwicky and Rubin. It does not explain bullet clusters or cosmic background radiation.

V. Treasurer Report by Bruce Lamareaux

Main Checking Account - \$6,600

2-Year Savings Account - \$8,100

Telescope Fund - \$1,100

Petty Cash - \$50

Total Assets - \$15,850

Note: amounts rounded for security purposes.

We currently have 93 regular members and 1 student member.

VI. Old Business

None.

VII. New Business

MJ Post gave a list of upcoming presenters at our monthly meetings: Dan Durda in September, Amanda Hendrix in October, and Delores Knipp in November. All upcoming speakers are local so could present at in-person. There was a short discussion of whether we should do in-person meetings. Some were comfortable doing so; some not. There is a new equipment donation page, see <https://www.longmontastro.org/Equipment-Donation>

VIII. Meeting Adjourned at 8:29 pm

The Planets in September by Vern Raben

Mercury

Mercury is not visible.

Venus

Venus is visible low in the west after sunset in constellation Virgo until the 18th; it is in constellation Libra for the rest of the month. It is magnitude -4 in brightness increases to -4.2 and its disk increases from 15 arc to 16 arc sec across.

Mars

Mars is not visible.

Jupiter

Jupiter is 49 arc sec across as September begins; it decreases to 46 arc sec by the 30th. Its brightness decreases from -2.9 to -2.7 magnitude. Good times to view the Great Red Spot crossing the center of the planet this month are:

Sept 2 at 12:58 am at altitude of 36°

Sept 2 at 8:50 pm at altitude of 21°

Sept 4 at 2:37 am at altitude of 26°

Sept 4 at 10:28 pm at altitude of 34°

Sept 7 at 12:06 am at altitude of 37°

Sept 9 at 1:44 am at altitude of 29°

Sept 9 at 9:35 pm at altitude of 31°

Sept 11 at 11:14 pm at altitude of 37°

Sept 14 at 12:52 am at altitude of 32°

Sept 14 at 8:43 pm at altitude of 27°

Sept 16 at 2:30 am at altitude of 19°

Sept 16 at 10:22 pm at altitude of 36°

Sept 19 at 12:00 am at altitude of 35°

Sept 19 at 7:51 pm at altitude of 23°

Sept 21 at 1:38 am at altitude of 23°

Sept 21 at 9:30 pm at altitude of 34°

Sept 23 at 11:08 pm at altitude of 36°

Sept 26 at 12:47 am at altitude of 27°

Sept 26 at 8:38 pm at altitude of 32°

Sept 28 at 10:17 pm at altitude of 36°

Sept 30 at 11:55 pm at altitude of 30°

Saturn

Saturn is in the constellation Capricornus. It is magnitude $+0.3$ on the 1st; it decreases to 0.5 magnitude in brightness on the 30th. Its disk is 18 arc sec across.

Uranus

Uranus is in the constellation Aries. It is magnitude 5.7 in brightness and the disk is 3.7 arc sec across.

Neptune

Neptune is visible in the constellation Aquarius. It is magnitude 7.8 in brightness and its disk is 2.3 arc sec across.



“Jupiter on Aug 15” by Gary Garzone

Lunar Phases in September



New Moon
Sept 6 at 6:53 pm



First Quarter
Sept 13 at 2:41 pm



Full Moon
Sept 20 at 5:56 pm



Third Quarter
Sept 28 at 7:58 pm

Lunar images by NASA Scientific Visualization Studio

Star Party Targets Sept. 10

On Friday September 10 sunset is at 7:17 pm; it will be fairly dark by 8 pm.

Moon is at Lunation 4.3

Moon on the evening of the tenth is a thin crescent disk. You should be able to spot the following features near the terminator (north to south)

- Messala a walled plain crater 78 miles (125 km) across
- Bernoulli nearly circular crater, triangular bulge on south edge
- Mare Crisium has a very flat floor with wrinkle ridges to the outer boundary; it is 345 miles (556 km) in diameter
- Langrenus is an 82 mi (132 km) wide crater with terraced walls.
- Vendelinus about midway between north and south limbs; it is heavily worn and overlapped by multiple craters
- Petavius - prominent crater; note tonight its central peak is lit by sunlight above the dark floor

Globular Clusters

- M 2 in Aquarius mag 6.5
- M13 in Hercules mag 5.8
- M15 in Pegasus mag 6.2
- M22 in Sagittarius mag 5.1
- M92 in Hercules Mag 6.4

Galaxies

- M32 Elliptical galaxy in Andromeda mag 7.9
- M33 Pinwheel galaxy in Triangulum
- M51 Whirlpool Galaxy in Canes Venatici
- M101 Spiral galaxy in Ursa Major 7.8

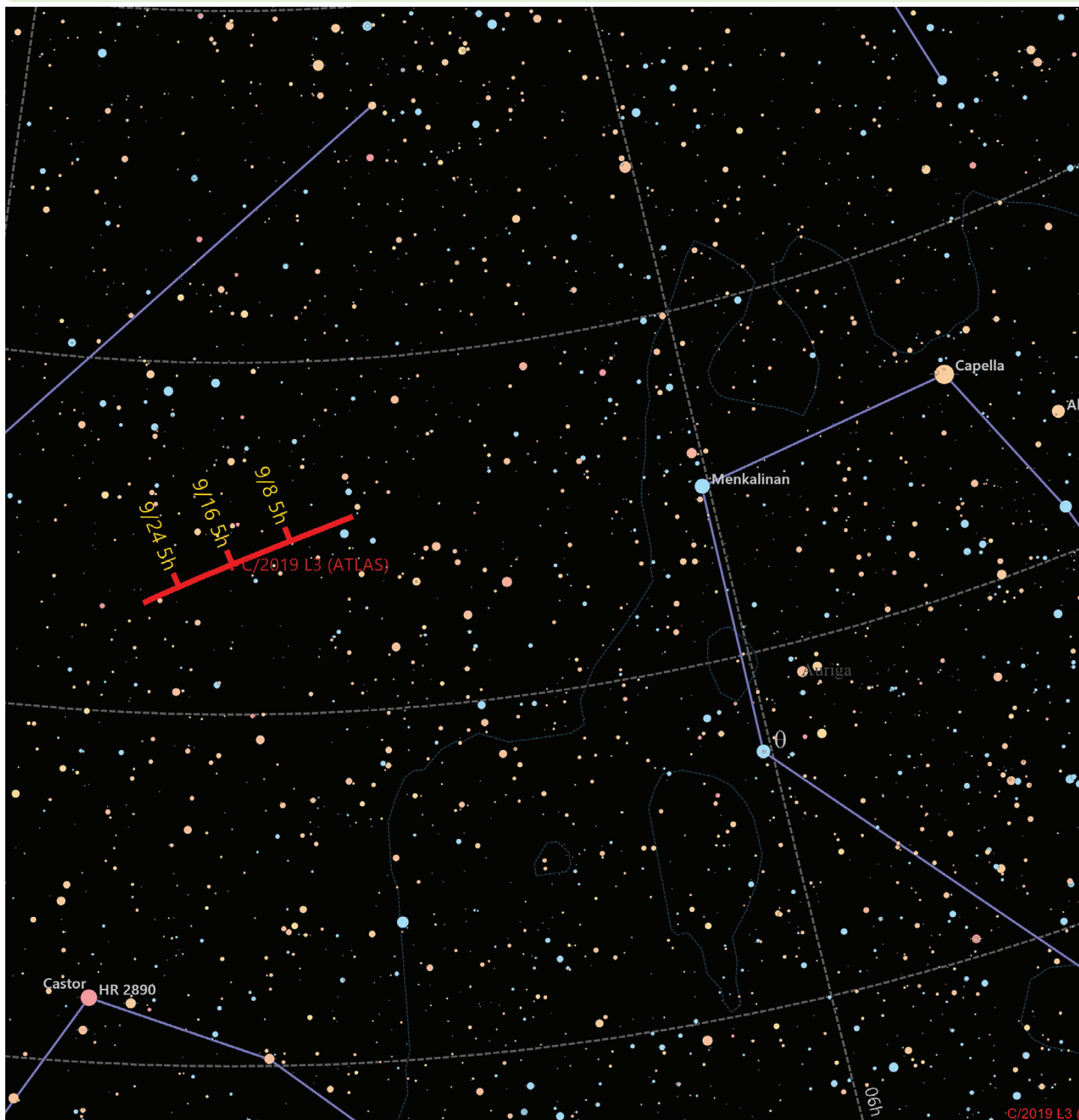
Planetary Nebula

- M27 "Dumbbell Nebula" in Vulpecula mag 7.1
- M57 "Ring Nebula" in Lyra mag 9.8
- M76 "Little Dumbell Nebula" in Perseus mag 10.1

Bright Nebula

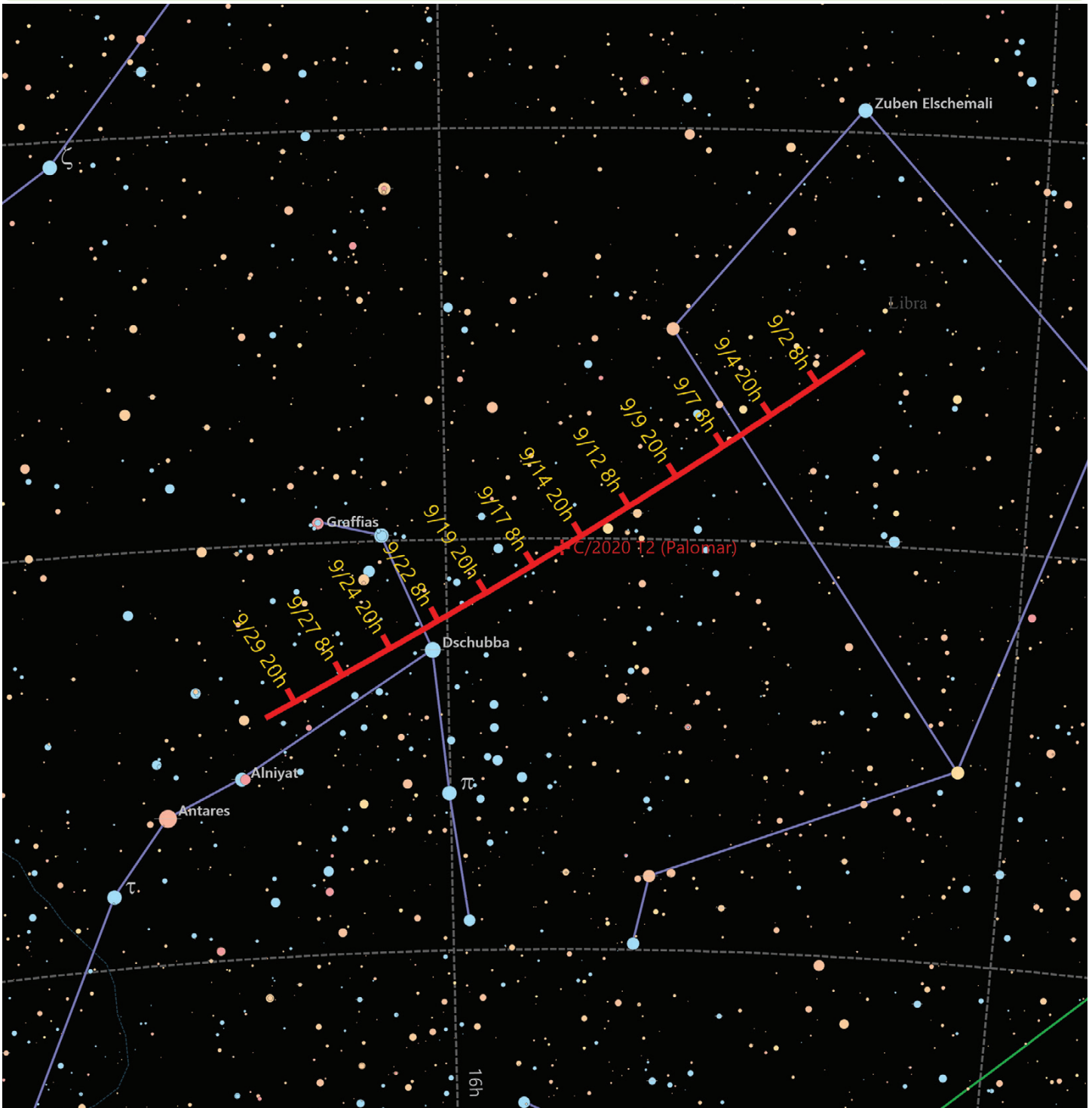
- M8 "Lagoon Nebula" in Sagittarius mag 6.0
- M16 "Eagle Nebula" in Serpens mag 6.4
- M17 "Omega Nebula" in Sagittarius mag 6.0
- M20 "Trifid Nebula" in Sagittarius mag 6.3
- NGC 281 "Pacman Nebula" in Cassiopeia mag 7.4
- NGC 6974 in Cygnus mag 5.0
- NgC 6960 & 6995 "Veil Nebula" in Cygnus mag 5

Comet C/2019 L3 (ATLAS) in September 2021



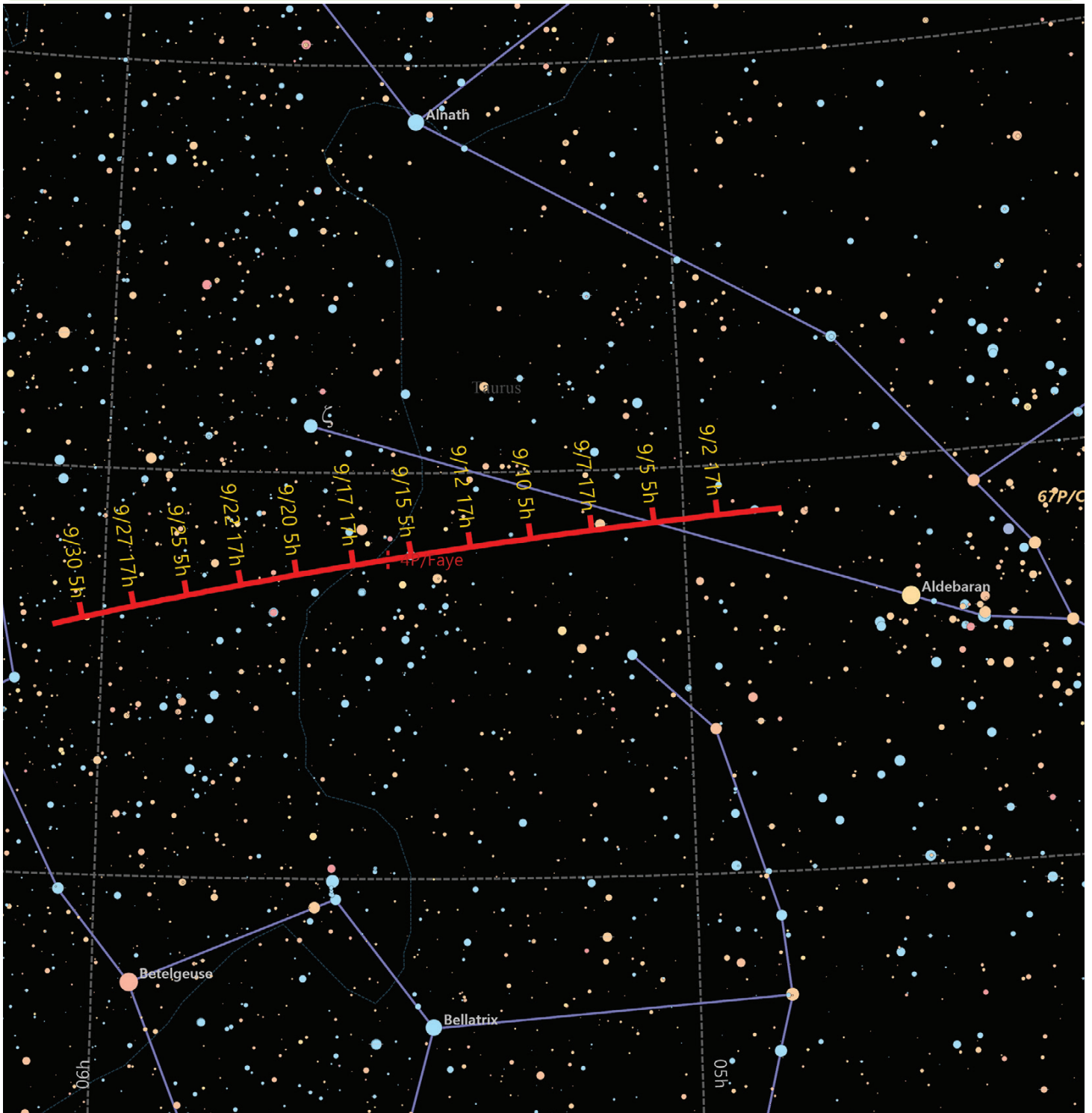
Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Sept 1	5:00 am	07h00m14.2s	+45°22'22"	Lynx	10.0	2.1
Sept 7	5:07 am	07h07m51.8s	+44°54'11"	Lynx	9.9	2.1
Sept 13	5:13 am	07h14m58.2s	+44°25'27"	Lynx	9.8	2.2
Sept 19	5:26 am	07h21m31.3s	+43°56'16"	Auriga	9.8	2.2
Sept 25	5:26 am	07h27m28.3s	+43°26'47"	Auriga	9.7	2.3
Sept 30	5:30 am	07h31m57.0s	+43°02'01"	Auriga	9.6	2.3

Comet C/2020 T2 (Palomar) in September 2021



Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Sep 1	8:51 pm	15h21m05.8s	-15°57'31"	Libra	10.5	3.4
Sep 7	8:39 pm	15h32m20.8s	-17°51'45"	Libra	10.7	3.2
Sep 13	8:28 pm	15h43m57.1s	-19°38'58"	Libra	10.8	3.1
Sep 19	8:17 pm	15h55m52.8s	-21°19'07"	Scorpio	10.9	3.0
Sep 25	8:06 pm	16h08m06.1s	-22°52'08"	Scorpio	11.0	2.9
Sep 30	7:57 pm	16h18m29.6s	-24°04'13"	Scorpio	11.1	2.9

Comet 4P/Faye in September 2021

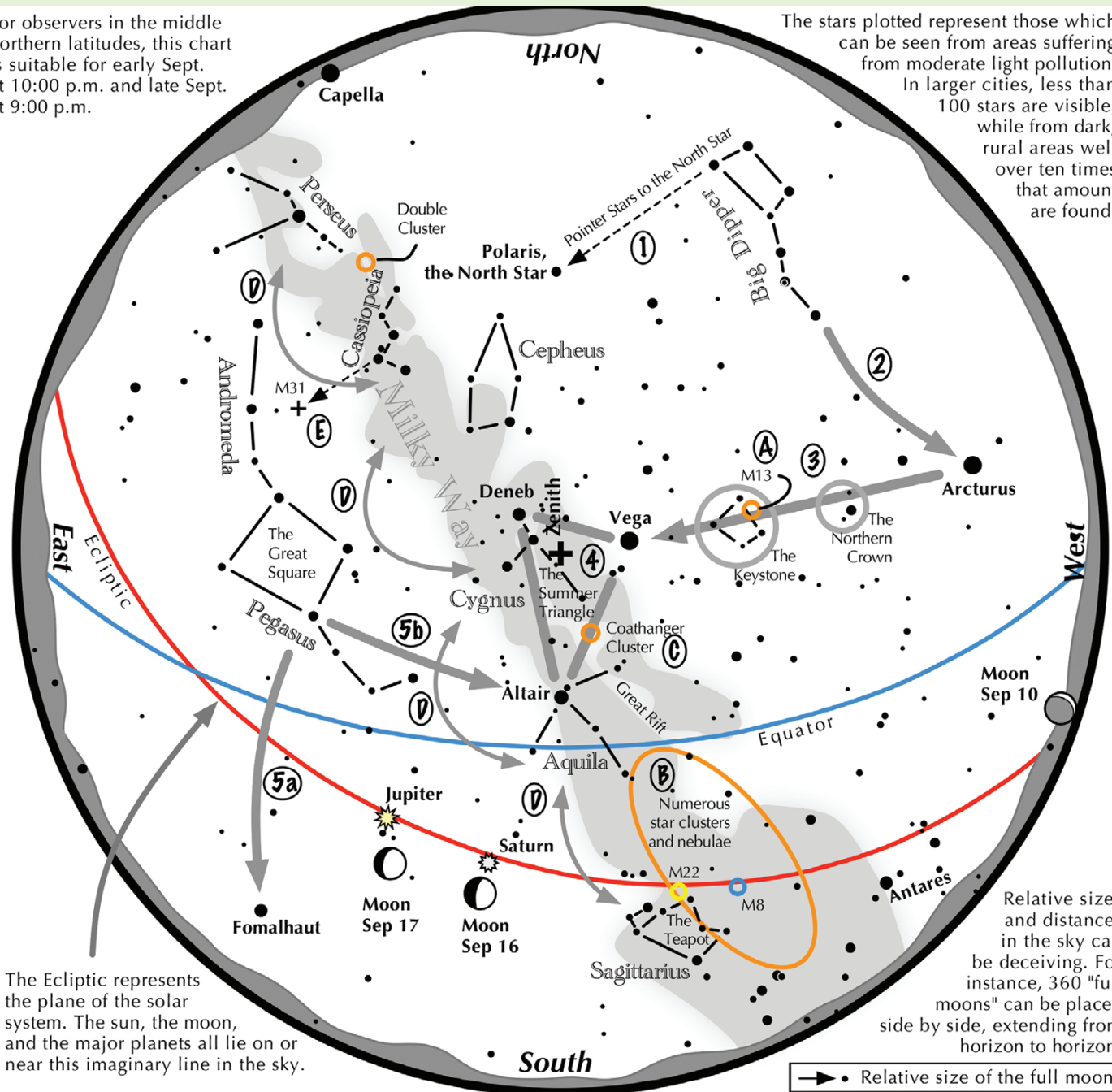


Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Sept 1	4:56 am	04h55m08.8s	+18°48'09"	Taurus	11.7	3.8
Sept 7	5:02 am	05h10m49.8s	+18°29'18"	Taurus	11.6	3.9
Sept 13	5:09 am	05h25m53.3s	+18°02'34"	Taurus	11.6	4.0
Sept 19	5:21 am	05h42m31.6s	+17°22'17"	Taurus	11.5	4.2
Sept 25	5:19 am	05h53m40.8s	+16°48'13"	Taurus	11.5	4.3
Sept 30	5:23 am	06h04m10.3s	+16°10'16"	Orion	11.4	4.4

Navigating the mid September Night Sky by John Goss

For observers in the middle northern latitudes, this chart is suitable for early Sept. at 10:00 p.m. and late Sept. at 9:00 p.m.

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 mid September night sky: Simply start with what you know or with what you can easily find.

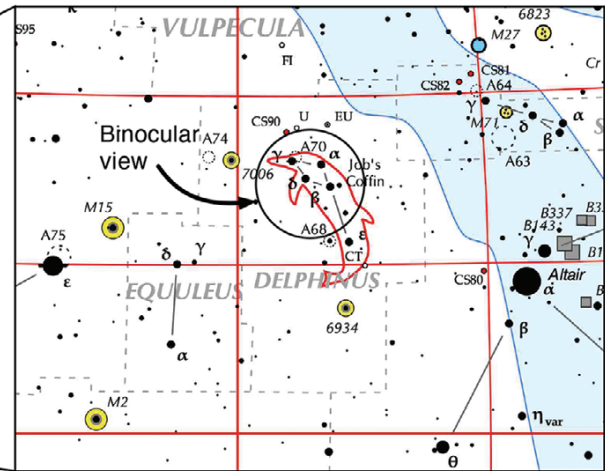
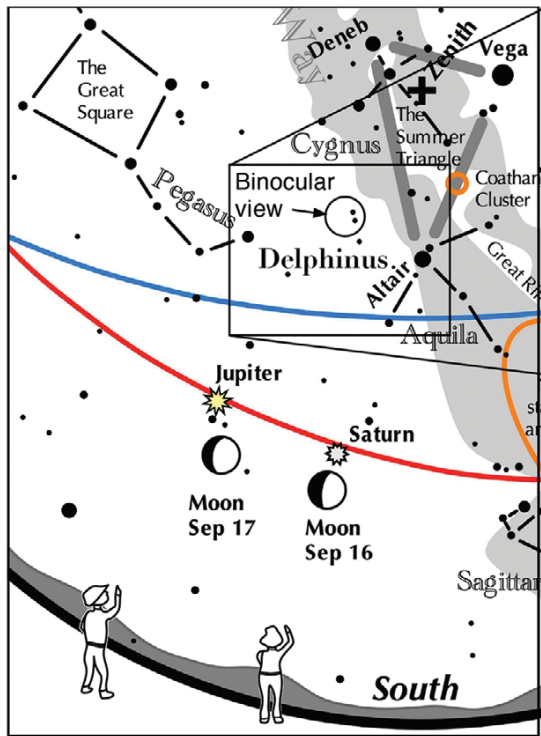
- 1 Extend a line north from the two stars at the tip of the Big Dipper's bowl. It passes by Polaris, the North Star.
- 2 Follow the arc of the Dipper's handle. It intersects Arcturus, the brightest star in the September evening sky.
- 3 Nearly overhead shines a star of similar brightness as Arcturus, Vega. Draw a line from Arcturus to Vega. It first meets "The Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
- 4 The stars of the summer triangle, Vega, Altair, and Deneb, shine overhead.
- 5 The westernmost two stars of the Great Square, which lies high in the east, point south to Fomalhaut. The southernmost two stars point west to Altair.

Binocular Highlights

- A: On the western side of the Keystone glows the Great Hercules Cluster.
- B: Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
- C: 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
- D: Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.
- E: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.

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

If you can observe only one celestial event this month,
view this one:



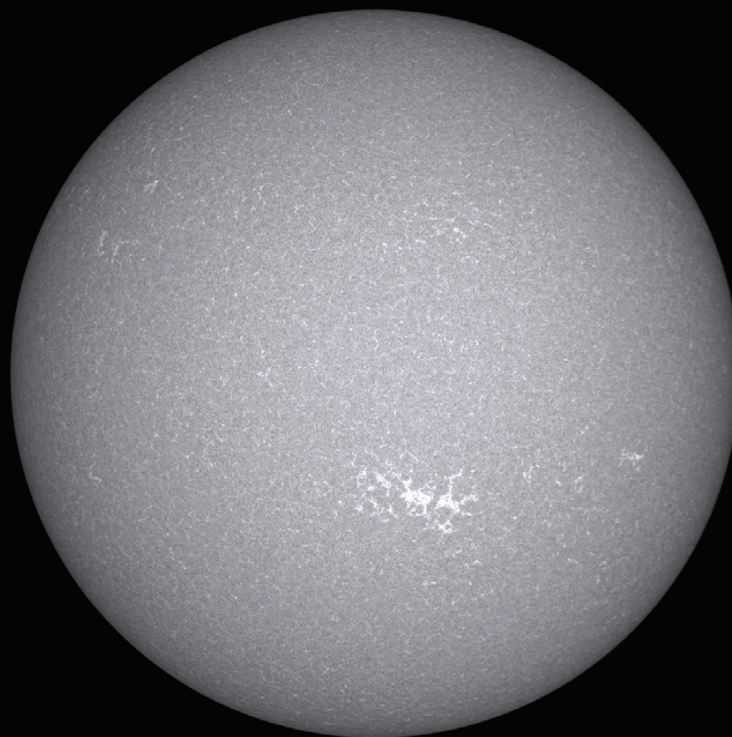
**Meet a new friend,
one that gladly greets you every year**

In the early evening just as darkness settles throughout September, look towards the south for a splash of five or six faint stars.

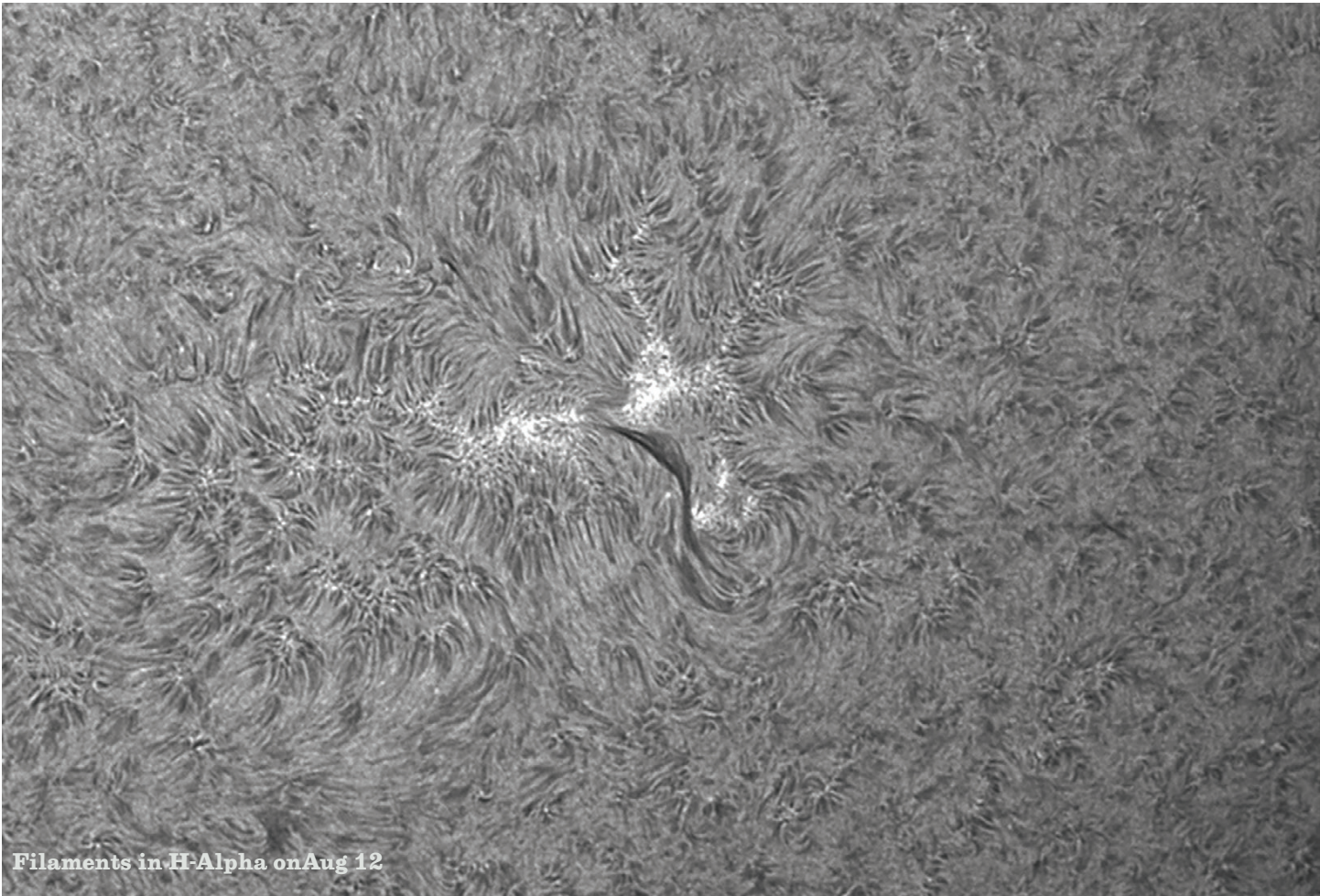
- A dark suburban or darker site will be needed with no bright Moon in the sky.
- The Summer Triangle is near the meridian and the Great Square of Pegasus is rising higher above the eastern horizon.
- Half way between the western side of the Great Square and the southernmost star of the Summer Triangle, Altair, is the pretty grouping of stars known as Delphinus. This small constellation represents a leaping dolphin.
- Once you meet it, you will look for it year after year.



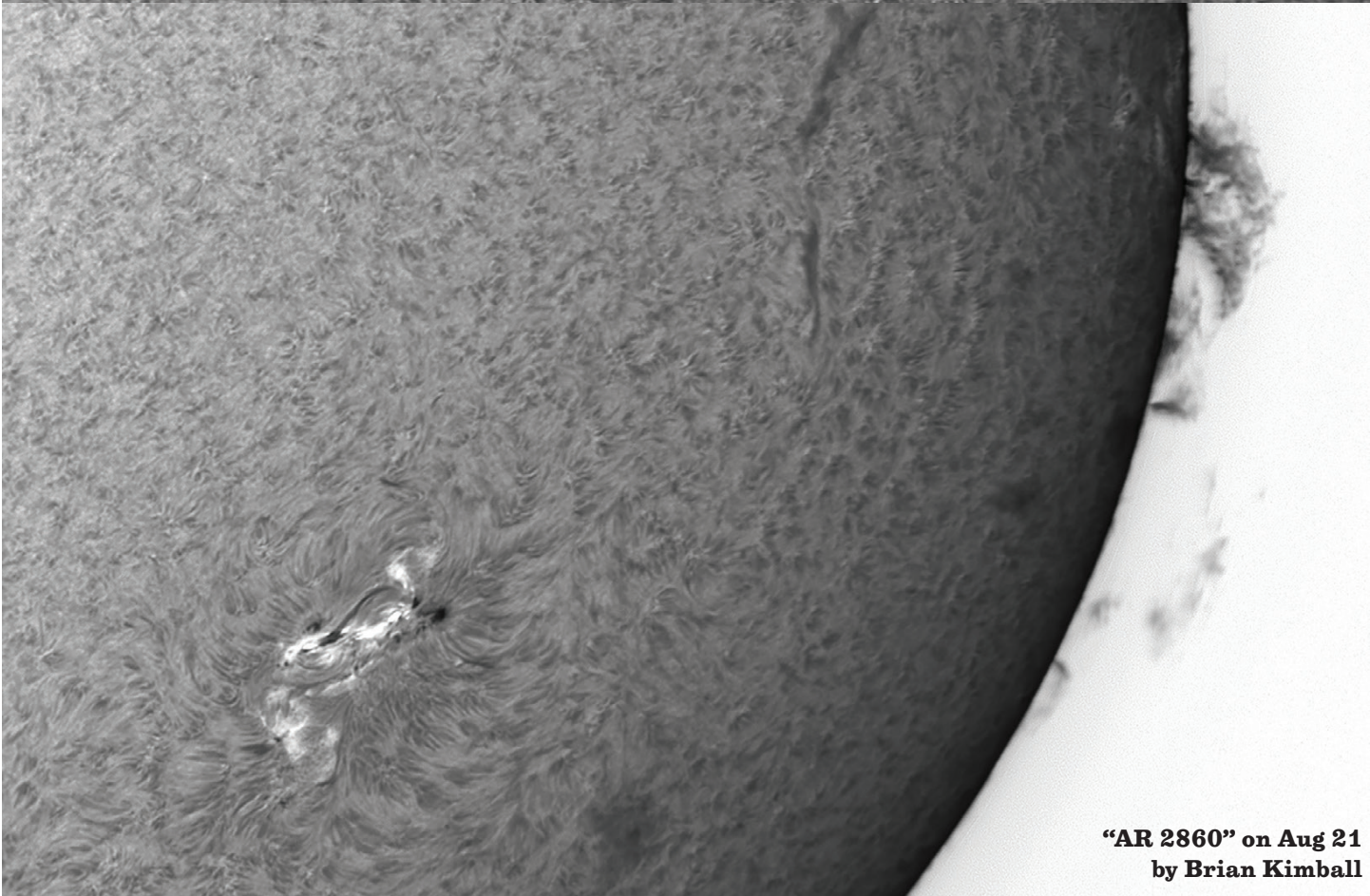
South
90 minutes after sunset
throughout September



Sun in Calcium K on Aug 12 by Brian Kimball



Filaments in H-Alpha on Aug 12



“AR 2860” on Aug 21
by **Brian Kimball**



“Sharpless 2-115 (cropped)” by M. J. Post





"Lobster Claw" by David Elmore



"Bubble Nebula" by Eddie Hunnell



“Saturn on August 15” by Gary Garzone



Above photo by Eddie Hunnel showing his recent upgrades and fixes. He switched back to a 11 in. Celestron RASA telescope and is now using an ASI Air-Pro for control.



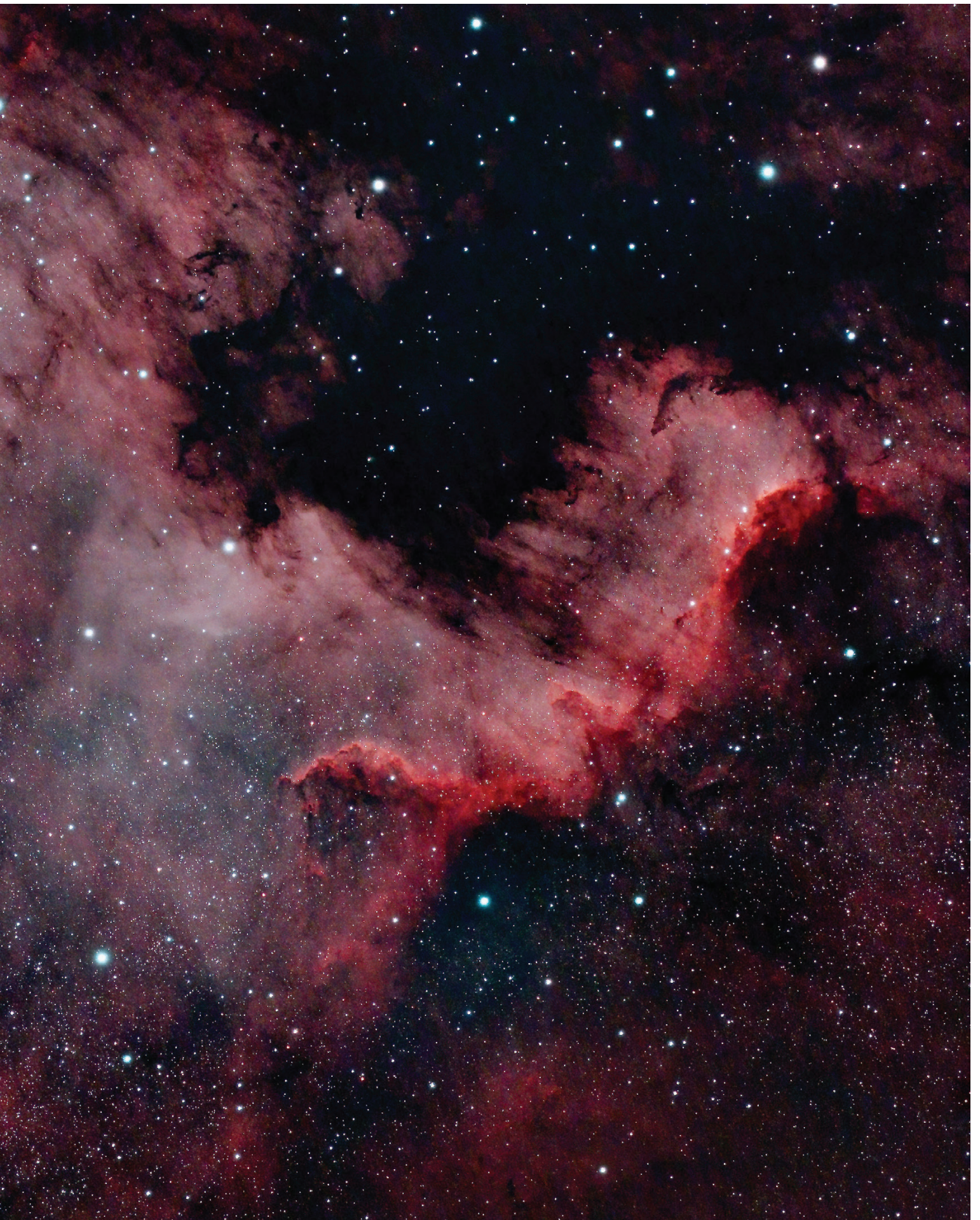
“Soap Bubble” by M. J. Post

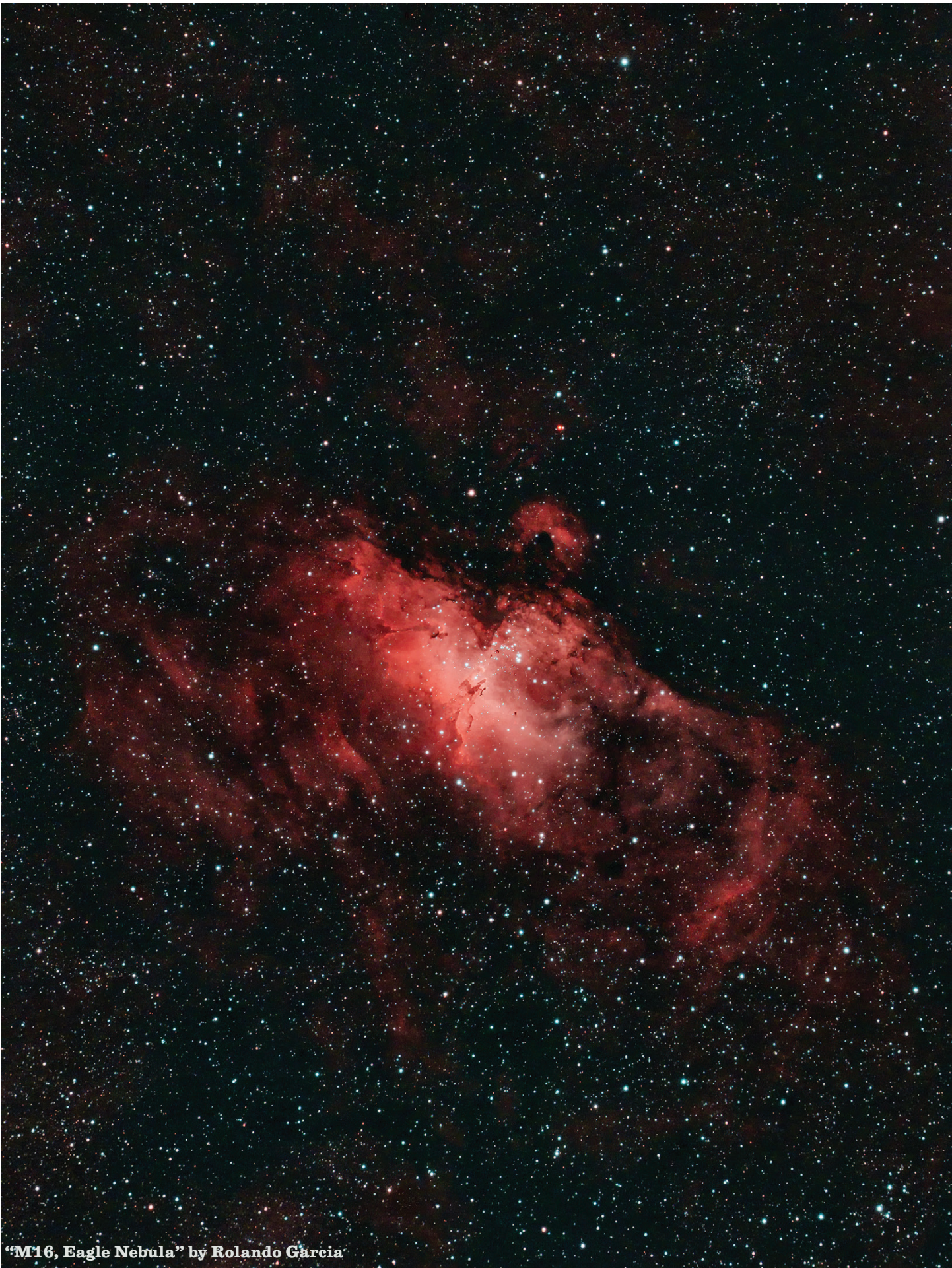


“Sharpless 2-115 and Abel 71” by M. J. Post.



“North America Nebula” by Rolando Garcia





“M16, Eagle Nebula” by Rolando Garcia



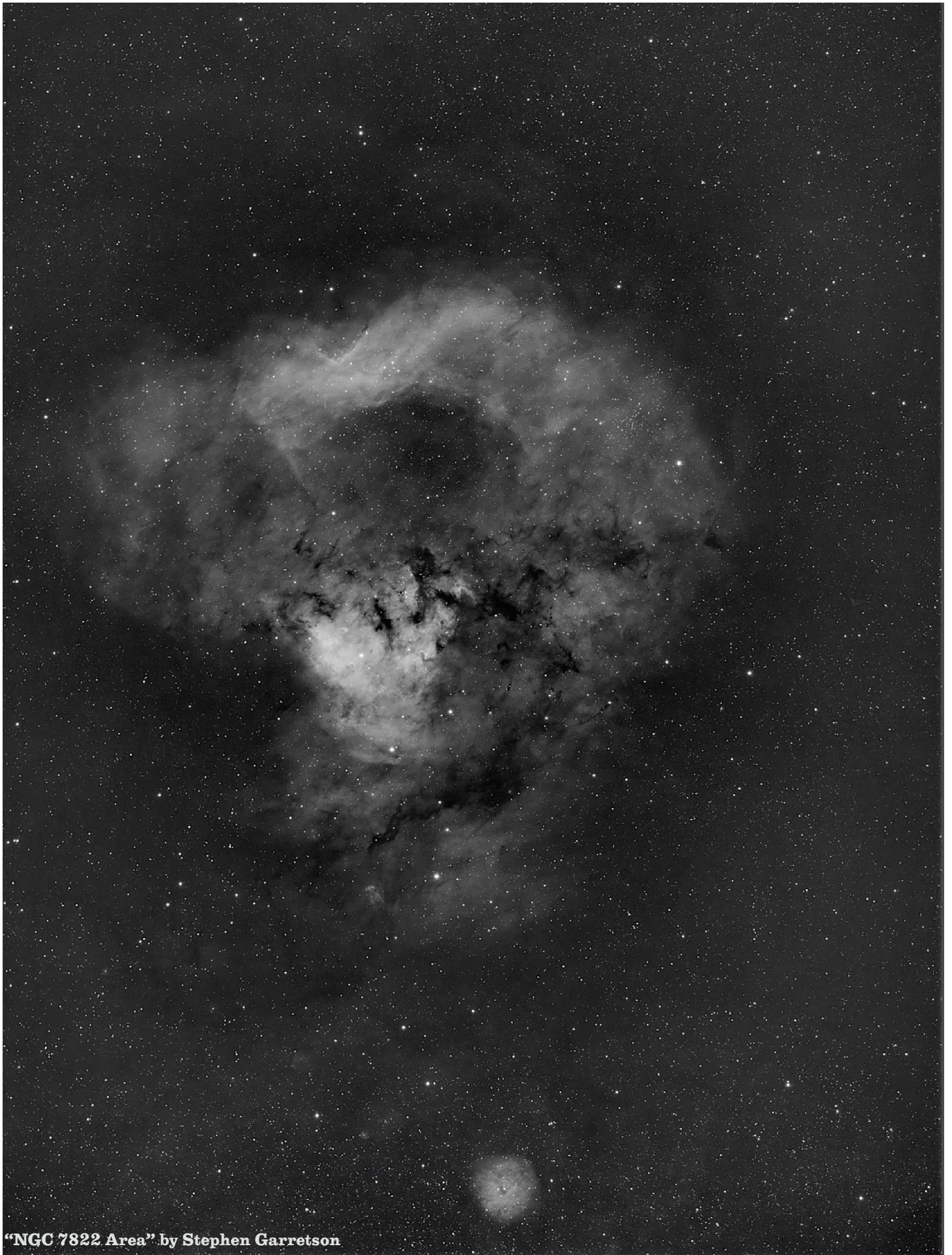
“M10” by Rolando Garcia



“Sharpless 2-115” by Rolando Garcia

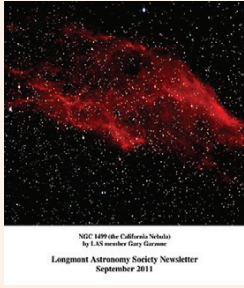


“Sharpless 2-170” by Stephen Garretson



“NGC 7822 Area” by Stephen Garretson

10 Years Ago - Sept. 2011



NGC 1499 (the California Nebula)
by LAS member Gary Garzone
Longmont Astronomy Society Newsletter
September 2011

The Sept. 15th meeting will be at the IHop Restaurant. The speaker is Dr. Doug Biesecker, solar physicist from the

Space Weather Prediction Center in Boulder, CO. Doug will talk about space weather prediction science. Dr. Biesecker started his career at Goddard Space Flight Center as a data grunt on the Solar Maximum Mission. There, he developed his passion for all things solar, and did his PhD on statistical properties and avalanche theories of solar flares at the University of New Hampshire. From there, he researched coronal mass ejections in Birmingham, England, back at GSFC, and finally at NOAA in Boulder. At the Space Weather Prediction Center, he brings in real-time data from SOHO, STEREO, and SDO, validates models, and plans for future.

Over the years we have acquired a number of telescopes. Most are sitting in basements or garages and not being used. We discussed the scopes and what to do with them briefly at the August meeting. There appears to be interest in keeping the scopes and getting them loaned out. We'll schedule an exec meeting in a week or so to discuss completion of some of the scopes and a procedure to get the scopes to those who would like to use them.

Beginning Astronomy Class – Friday evening Sept. 30 to Oct. 21. Telescopes needed for Oct. 7th and 21st star parties at Sandstone for the class.

20 Years Ago - Sept. 2001



The September 2001 newsletter featured reports about a trip to Fox Park (southwest of Laramie, WY). On Wed. there was rain and

hail that left deep puddles. It rained and hailed again a couple hours before sunset on Thurs. It cleared off but dew was very heavy for a while after sunset. David Dunn reported that seeing was very good; he spent the evening chasing planetary nebula. Mike Hotka said the dew removal equipment he recently purchased worked very well; he was able to keep viewing while most everyone else had packed it in.

Friday night Jim Sapp, Michael Hotka, and Gary Garzone joined with 60 people for trip up Jelm mountain to the WIRO Observatory. Gary said that the Jelm trip, especially viewing NGC 7009, the Saturn Nebula, through the eyepiece on the 92" telescope was the highlight of the weekend. Michael Hotka said that Mars was huge in the field of view. The Cat's Eye was layered with expanding shells of gas. the Saturn Nebula was especially breath taking. Jim Sapp said at 10:50 pm he saw a bright meteor streak straight down through Saugartarius which he estimated was 4X as bright as Mars. From inside the Jelm dome Mike Hotka it appeared that someone had turned on the white lights; it was that bright. Gary said that it lit up the ground.

Saturday afternoon there were presentations from Stephanie McLaugh-

lin about NASA's upcoming Deep Impact mission to comet 9P/Tempel1 beginning it 2003. Allyn Smith from the University of Wyoming gave a rundown on the capabilities, goals, and impressive early results of the Sloan Digital Sky Survey. The last speaker was Bruce Bookout who gave a very interesting talk on archeoastronomy with particular emphasis on the astronomical architecture of the Mayan civilization. Once again a big thank you to Cheyenne and Laramie Astronomical Societies and the University of Wyoming for bringing about the 11th great star party at Fox Park.

30 Years Ago - Sept. 1991



LAS is hosting the Oct 4th and 5th FRA-SC Star Party at Crow Valley. Planning meeting will be Aug 22 at Randy

Cunningham's house.

Brian Simpson went to the Battlement Mesa star party and reported 2 clear nights, no bugs and grassy and dust-free site. Lack of signage made finding it difficult even in daylight.

Jenifer Gettson, LAS Treasurer, reported that we have 45 member and \$460 in our account.

Bob Spohn reported that the road to Dead Man has been graded.

Lunar feature of the month was presented by Dave Street. Randy Cunningham gave an overview of "Choice and Use of Eyepieces".



LONGMONT ASTRONOMICAL SOCIETY
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“HIP 99749 AREA”
BY STEPHEN GARRETSON