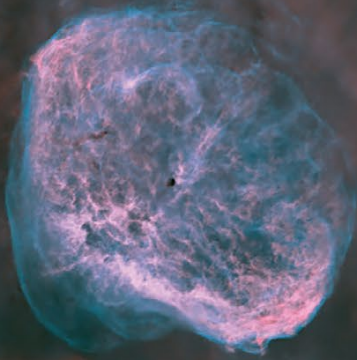


LONGMONT ASTRONOMICAL SOCIETY

AUGUST 2026



CRESCENT AND SOAP BUBBLE NEBULAE
BY STEPHEN GARRETSON

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LAS Meeting on August 20

Opening New Windows to Our Universe

John Bally

Professor Emeritus

**Department of Astrophysical and Planetary Sciences
University of Colorado, Boulder**

We are the first generation to see the Universe in all wavelengths of the spectrum. Within the last decade, we opened new ways to see the Cosmos using waves of gravity. I will show new images taken with our best telescopes such as the Hubble (HST), the James Webb Space Telescope (JWST), and the Atacama Larger Millimeter Array (ALMA). I will discuss how "multi-messenger" astronomy is changing our understanding of cosmic structure and evolution, and the birth of galaxies, stars, and planets.

John Bally is Professor Emeritus in the Department of Astrophysical and Planetary Sciences (APS) at the University of Colorado in Boulder. He earned his PhD from the University of Massachusetts in Amherst on one of the first radio telescopes sensitive to mm-wavelengths. He spent 11 years at AT&T Bell Laboratories in the group that discovered the Cosmic Microwave Background before moving to CU Boulder in 1992 where he continues his research in star and planet formation, the interstellar medium, and cosmic evolution. He continues to use facilities such as the JWST, HST, and ALMA. He operates his own observatory in Breckenridge, Colorado, where he has a PlaneWave CDK20.

Location

The meeting will be at 7pm in the First Evangelical Lutheran Church, 803 Third Avenue, Longmont, CO 80501. It will also be available to LAS members on Zoom and on the members website.

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 Mike Hotka. 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

Front Cover	"Crescent and soap bubble nebula" by Stephen Garretson
2	Next LAS Meeting on August 20: Presentation by Dr. John Bally, APS, University of Colorado
3	Contents
4	Front cover, "Crescent and soap bubble nebula" by Stephen Garretson Back cover: "Most peculiar fiddle galaxy" by Jim Pollock
5	Planets, Lunar Phases, and Meteor Showers in August
6	Comet?
7	Comet
8	Navigating the mid August Night Sky by John Goss, Astronomical League
9	Enhance your view of the crescent of Venus" Astronomical League
10	"Moon slides through deep partial eclipse" by Astronomical League
11	"Authentic Observing Experience: M10" by Astronomical League
12 - 22	LAS meeting notes for July 16 by Eileen Hall-McKim
23	"HII Structures and more in Cygnus" by David Elmore
24	"M10 Globular Cluster" by Gary Garzone
25	"M16 Eagle Nebula" and "M57 from RMSS" by Eddie Hunnell
26	"NGC 6888" by Aref Nammari
27	"Sun in H-Alpha on July 26" by Brian Kimball
28	"AR 4479 in H-Alpha on July 4" and "AR 4492 in H-Alpha on July 25" by Brian Kimball
29	"AR 1482 in H-Alpha on July 26" by Brian Kimball
30	"AR 1478, AR 1479, and AR 1480 in H-Alpha on July 26" by Brian Kimball
31	"Full disk of the sun in H-Alpha" and "AR 4489 in white light on July 18 by Brian Kimball
32	"The Silver Sliver" by Jim Pollock
33	"The little Rosette" by Jim Pollock
34	"Giant rotor 100 million LY away" by Jim Pollock
35	"A Hickson Cluster for the 4th of July" by Jim Pollock
36	"Our Latest Discovery - PaElPos J1503+6555" by M.J. Post
37	"Saturn from early morning July 25 at 4:22 am" by Vern Raben
38 - 39	"LAS Archives for August 1996, 2006, and 2016" by Eileen Hall-McKim
Back Cover	"Most peculiar fiddle galaxy" by Jim Pollock

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 Newsletter: Vern Raben and Eileen Hall-McKim

Front Cover: "Crescent and soap bubble nebula" by Stephen Garretson



The well-known Crescent Nebula, NGC 6888, has an extremely faint planetary nebula neighbor, PN G75.5+1.7, aka the Soap Bubble Nebula. This little guy lies southeast of the Crescent and presents as a nearly perfect circle of OIII. Though I typically share images with stars, because that's the reality, I have selected the starless version here as it shows the Soap Bubble so much better; it gets obscured by the stars.

- [19] 600s guided Ha subs
- [18] 600s guided OIII subs
- Total integration: 6 hours 10 minutes

Capture:

Dual scopes each having the following components:

- William Optics FLT 132 APO Triplet, 0.8x reducer/flattener, running at f/5.6
- ZWO 2600MM Pro
- ZWO EFW
- Chroma 3nm Ha, OIII, & SII filters
- Wanderer Astro Mini V2 Rotator
- Bahtinov mask modified Wanderer Astro Eclipse
- PLL Sesto Senso 3 focus controller

Stephen

Back Cover: "Most peculiar fiddle galaxy" by Jim Pollock



Hi all,

I've been selectively playing with the ARP "Atlas of Peculiar Galaxies" (I mostly just love saying it with a John Cleese accent...so Monty Python!).

This one, NGC772 with a dastardly little NGC770 companion that has been tugging at it for millions of years to form the strong outer arm, is called the Fiddlehead Galaxy.

This is a test shot with only 19 frames of 5-mins (1.5 hours) with my Texas-based 9.25" EdgeHD at f/7 and ZWO 2600mc duo color camera.

Love this Galaxy!!

Always amazed,

Jim Pollock

Planets in August

Mercury

Mercury is visible in the morning sky during the first couple weeks of August. Its brightness increases to +0.2 on the 1st to -1.1 on the 13th. Disk decreases from 7.8 to 5.7 arc sec across.

Venus

Venus is visible after sunset. It increases brightness from -4.2 on the 1st to -4.5 magnitude on the 31st. Its disk increases from 21 to 30 arc sec across.

Mars

Mars is visible in the morning sky; it is +1.3 magnitude in brightness. Its disk increases from 4.8 to 5.1 arc sec across this month.

Jupiter

Jupiter becomes visible low in the morning sky after the 21st. It is magnitude -1.8 in brightness and the disk is 32 arc sec across.

Saturn

Saturn may be seen fairly high up in the SE before sunrise in constellation Pisces. It is magnitude +0.5 in brightness and its disk is 19 arc sec across. Saturn will be at opposition on Oct. 4.



Saturn by Brian Kimball on July 12

Uranus

Uranus may be in the constellation Taurus before sunrise. It is +5.7 magnitude in brightness and its disk is 3.6 arc sec across.

Neptune

Neptune is in the morning also in constellation Pisces. It is magnitude 7.8 in brightness and the disk is 2.3 arc sec across.

Lunar Phases in August

August 5 at 8:23 pm - Third Quarter Moon

August 12 at 11:38 am - New Moon

August 19 at 8:47 pm - First Quarter Moon

August 27 at 10:20 pm - Full Moon

Meteor Showers in August

Perseid meteor shower

Everyone's favorite meteor shower peaks on the night of August 12 - 13. Conditions this year are great as the moon is new on the 12th. Find a nice dark spot somewhere and enjoy about 50 or so meteors per hour. The Perseids are caused by debris particle from comet 109P/Swift-Tuttle



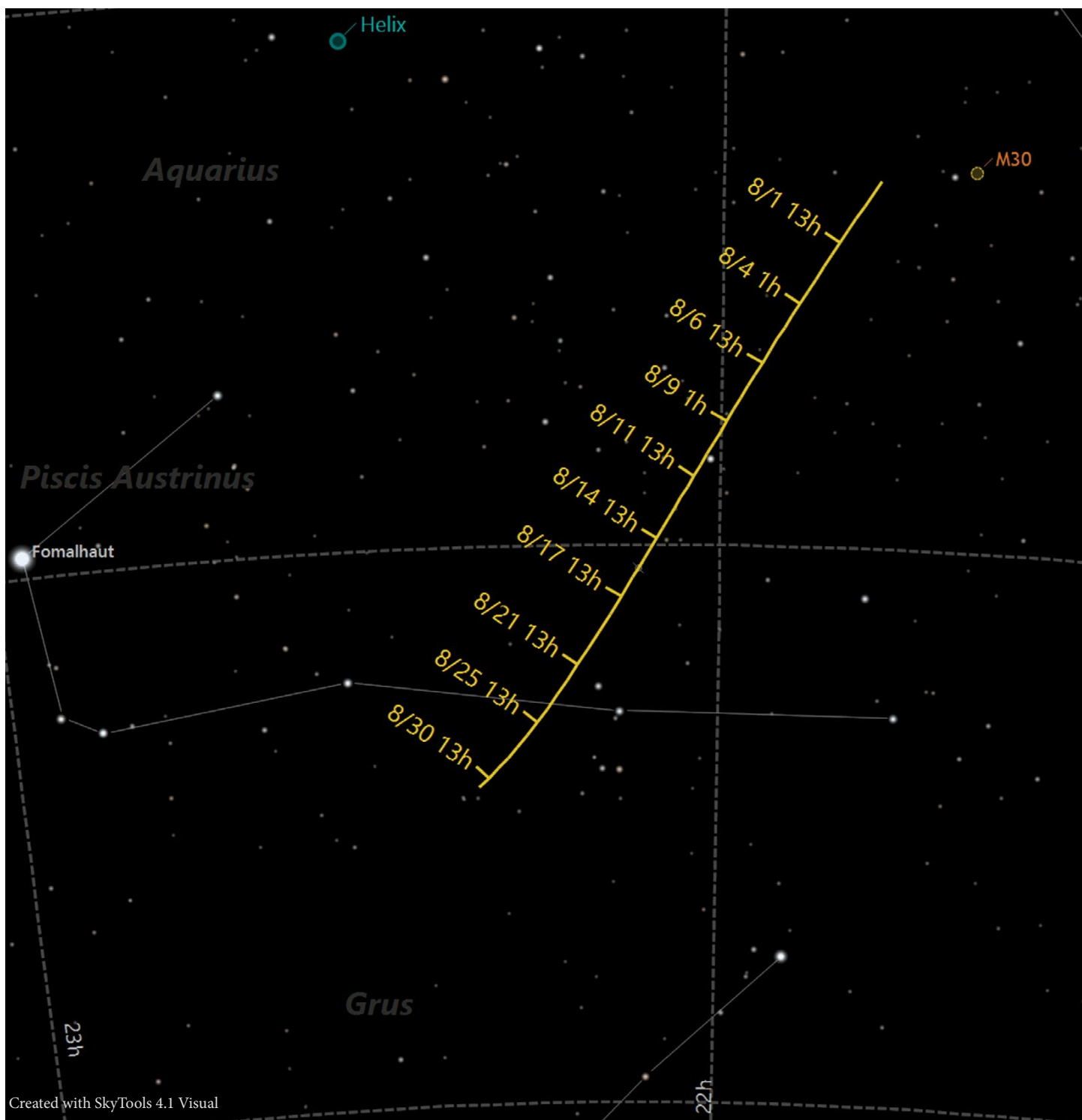
Credit: NASA/Preston Dyche



Credit: NASA Goddard Space Flight Center
Scientific Visualization Studio

The Nancy Grace Roman infrared space telescope is scheduled for launch on August 30th on a SpaceX Falcon-Heavy rocket which will take it to the Sun-Earth L2 Lagrange point.

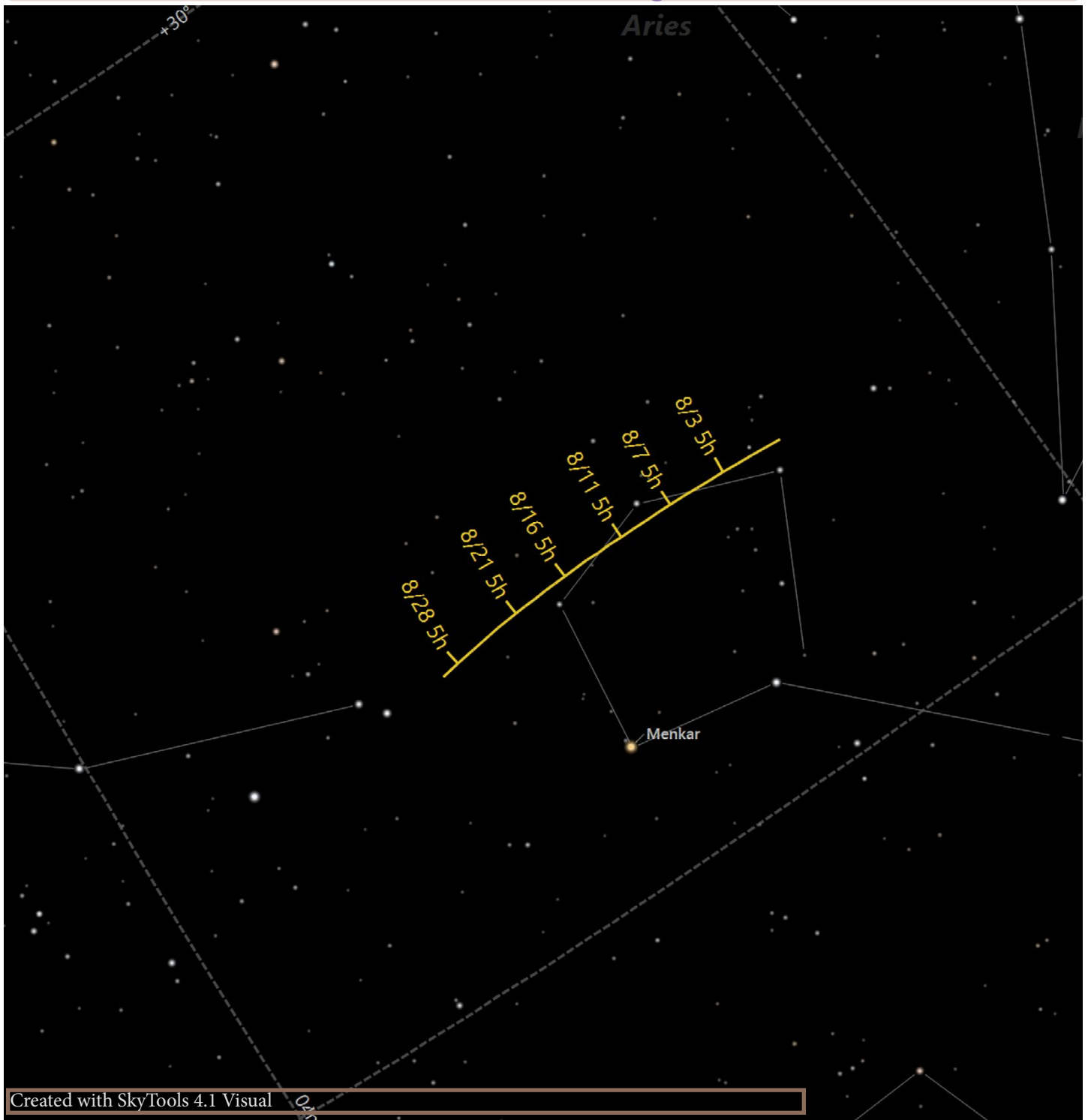
Comet 10P/Tempel



Created with SkyTools 4.1 Visual

Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Aug 1	2:07am	21h53m02.8s	-24°37'40"	Capricornus	8.4	5.5
Aug 7	1:52 am	22h00m01.5s	-27°13'08	Piscis Austrinus	8.4	5.5
Aug 13	1:36 am	22h06m20.5s	-29°34'33"	Piscis Austrinus	8.5	5.4
Aug 19	1:17 am	22h12m06.4s	-31°34'42	Piscis Austrinus	8.6	5.3
Aug 25	1:04 am	22h17m28.5s	-33°09'04"	Piscis Austrinus	8.9	5.1
Aug 31	12:39 am	22h22m34.4s	-34°15'28"	Piscis Austrinus	9.1	4.8

Comet 220P/McNaught



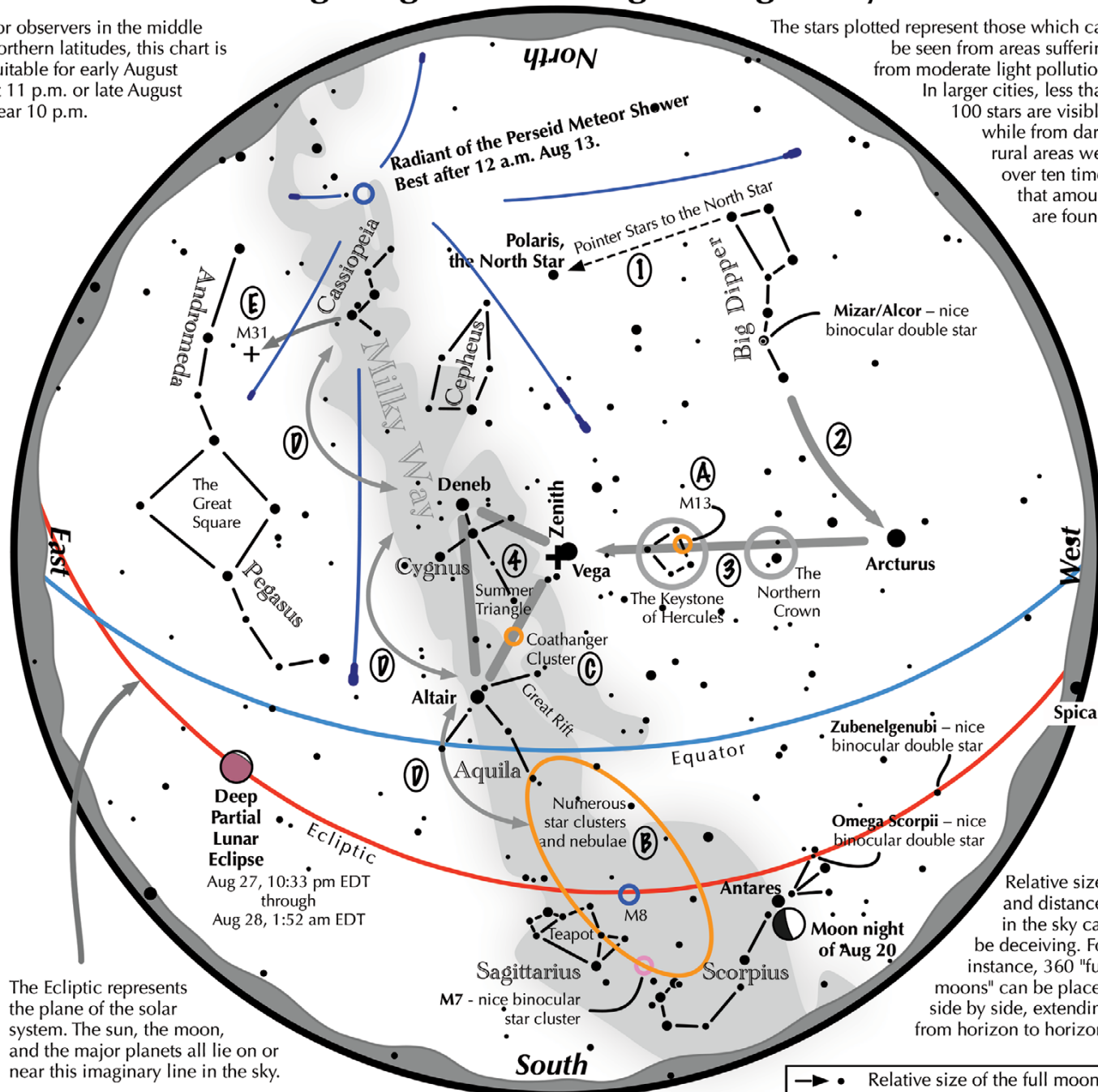
Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
Aug 1	Not visible					
Aug 7	4:21 am	02h44m51.0s	+09°37'58"	Cetus	13.6	1.1
Aug 13	04:28 am	02h55m22.1s	+09°39'27"	Cetus	13.6	1.1
Aug 19	4:35 am	03h04m50.3s	+09°33'25"	Cetus	13.6	1.2
Aug 25	4:44 am	03h13m10.3s	+09°20'11"	Cetus	13.6	1.2
Aug 31	Not visible					

Navigating the mid August Night Sky

2026

For observers in the middle northern latitudes, this chart is suitable for early August at 11 p.m. or late August near 10 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.



Navigating the mid August 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 June evening sky.
- 3 To the northeast of Arcturus shines another star of the same brightness, 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 High in the East lie the summer triangle stars of Vega, Altair, and Deneb.

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; duplication is allowed and encouraged for all free distribution.





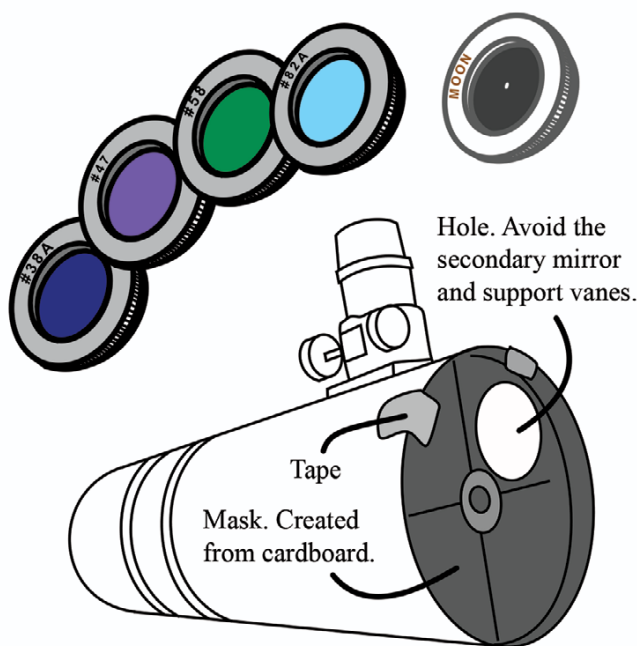
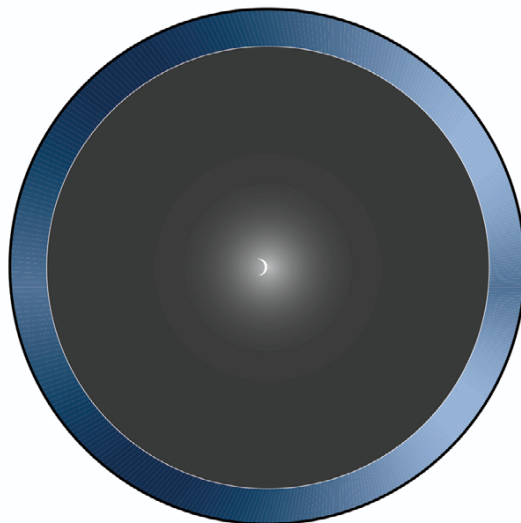
Enhance your view of the thin crescent of Venus



Venus is bright. So bright that its glare becomes interfering, especially when viewed in its beautiful crescent phase. Many people see it as a bright blur.

For a more satisfying view, take one or more of these steps:

1. Place a **moon filter** over the eyepiece.
 2. Depending on telescope aperture, try **colored filters** such as #38A (dark blue), #47 (violet), and #58 (green). #82A (light blue) works well in general. They may bring out very subtle details in that planet's cloudtops.
- Because they transmit little light, the darker filters are better suited for apertures greater than 8-inches.



3a. Use an **aperture mask**. Since Venus is bright – really *too* bright – reducing the effective aperture won't hurt viewing. Doing so will also increase the scope's f ratio.

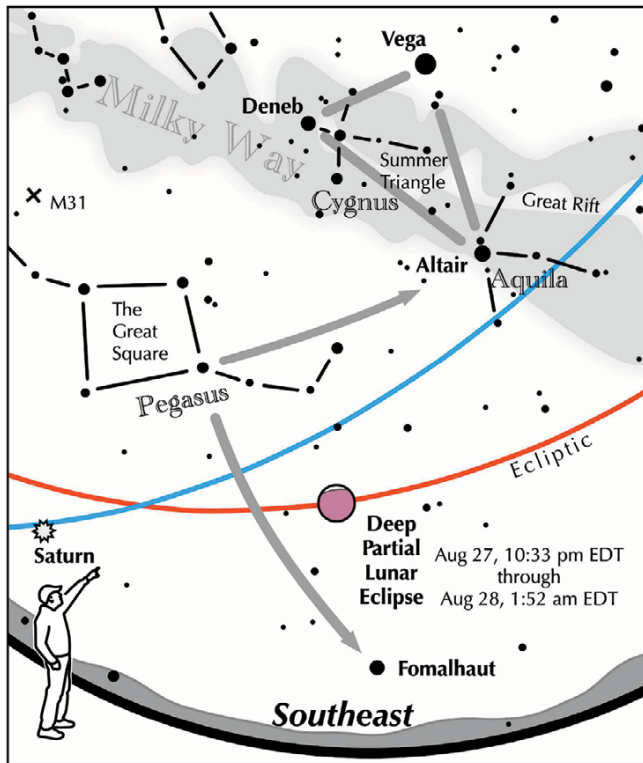
3b. If an SCT or reflector is used that has an aperture of 8-inches or larger, place an **off-axis mask** over the entrance of the optical tube. (Smaller apertures won't have the spacing for large enough holes.) Center the hole in the mask so that light enters the optical tube unobstructed, avoiding the secondary mirror and any vanes. The result – a dimmer, but sharper image.

4. **Daytime viewing.** Being higher above the horizon just might improve viewability!

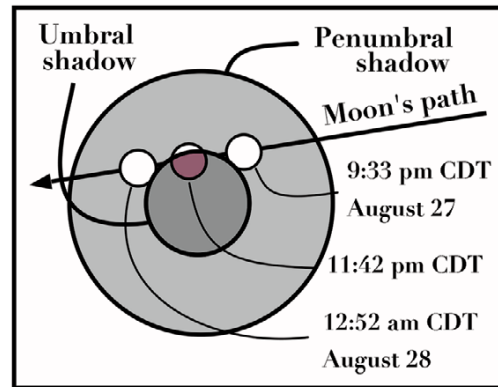
- Place the sun behind a building. Make sure you can't inadvertently view the sun.
- Find the alt-az coordinates of Venus and its elongation from the sun.
- Scan that area of the sky with binoculars. Once you spot it, aim your scope at it.
- Consider using a variable polarizing filter, a Wratten #15 (deep yellow), or a #21 (orange) filter to improve sky contrast.



If you can observe only one celestial event in the evening this August, see this one.



**View to the southeast
on August 27-28
Mid eclipse: Aug 27, 11:42 pm CDT**



The Moon slides through a deep partial eclipse

In the late evening hours on August 27 into the early morning hours on August 28, the brilliant full moon slides into Earth's shadow.

- Even though the partial umbral eclipse begins at 9:33 pm CDT on Aug 27, any dark bite might not be noticed for another 5 minutes.
- At mid eclipse (11:42 pm CDT Aug 27) when 93% of the moon lies in the umbral shadow, what color is the moon? How red is it?
- Do you notice that the shadow's edge is not straight, but curved?



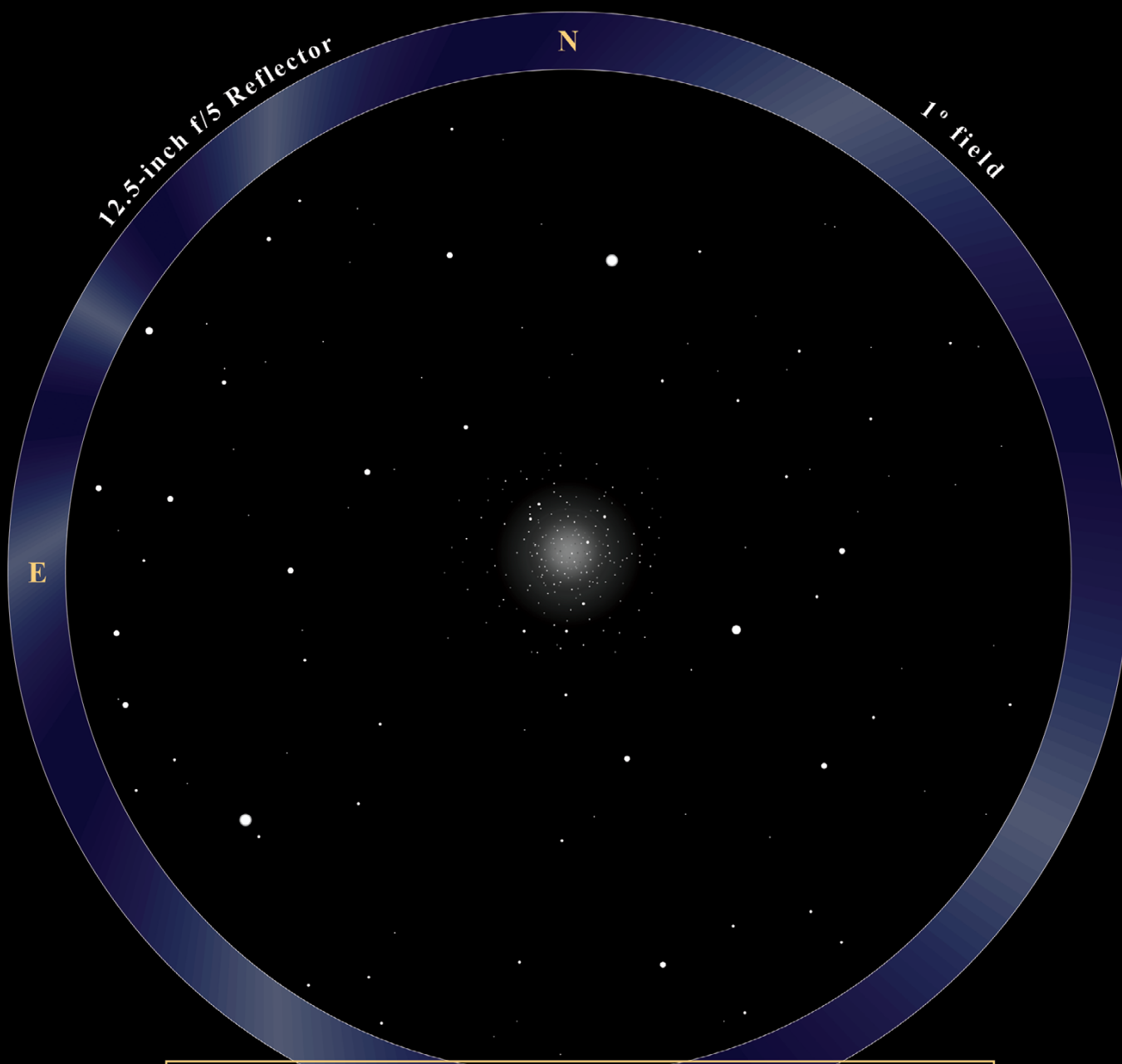
Authentic Observing Experience: M10



Wide field, low power eyepiece view

If you wonder why someone is excited to have a chance at the eyepiece, try visualizing what they will experience and what they will see. After all, an eyepiece view of a celestial wonder is much different than looking at an astro-image. **It is active. It is personal. It is real.**

Hold this screen as close to you as you can while still seeing a focused image.



**Witnessing scenes like this is one reason why we do what we do.
This is one aspect of the Authentic Observing Experience.**

LAS August 16th Meeting Notes by Eileen Hall-McKim

I. Introduction

The LAS July meeting was held in-person and by zoom on July 16th at the Longmont Evangelical Lutheran Church, 803 Third Ave. President, Vern Raben began the meeting with self-introductions of those attending in person. Fifteen attended in-person, 3 by zoom.

II. Main Presentation

Our speaker for this evening is Dr. Vicki Hamilton of the Southwest Research Institute (SwRI). Dr. Hamilton is a geoscientist specializing in infrared spectroscopy of minerals, meteorites, and planetary samples. She has extensive experience with science and instrument operations on numerous NASA planetary science flight missions. She is the Deputy Principal Investigator of the Mars Odyssey THEMIS instrument and the L'TES instrument on the Lucy spacecraft. She was a Participating Scientist with the Mars Science Laboratory Curiosity and is a Co-Investigator and Instrument Scientist for OTES on OSIRIS-REx and OSIRIS-APEX. She led the OSIRIS-REx Spectral Analysis Working Groups during operations and sample analysis was the Mission Sample Spectroscopy Scientist. Hamilton chaired the Panel on Mars for the most recent National Academies Decadal Survey in Planetary Science and just concluded a three-year term as the Chair of the Mars Exploration Program Analysis Group, a community-based, interdisciplinary forum representing the interests of the Mars science community.

The OSIRIS-Apophis Explorer mission is the second life of one of NASA's great success stories in planetary science. The spacecraft, launched in 2016 as OSIRIS-REx, spent two years orbiting the carbon-rich asteroid Bennu before collecting a sample and delivering it safely to Earth in September 2023. After dropping off its cargo, the spacecraft and its instruments remained healthy, so NASA extended the mission and gave it a new target and a new name: asteroid Apophis, named after the ancient Egyptian god of chaos, and OSIRIS-APEX.

On April 13, 2029, the 340-meter-wide Apophis will fly past Earth at ~32,000 kilometers distance, closer than our highest-altitude satellites, making it the largest object to pass this near to Earth in recorded history. Earth's gravitational pull is expected to alter the asteroid's orbit, change how fast it spins, and possibly trigger quakes or landslides on its surface. OSIRIS-APEX will chase Apophis past the Earth and use Earth's gravity to redirect the spacecraft toward a rendezvous with Apophis, beginning an 18-month science campaign in mid-2029. As part of that campaign, Apophis will be the first S-type asteroid to be characterized from orbit in the extended near infrared region (~2.7 – 4 μm) and by thermal infrared spectroscopy (5.7-100 μm). Near the mission's end, the spacecraft will fire its thrusters to excavate surface material, allowing a look at the asteroid's subsurface.

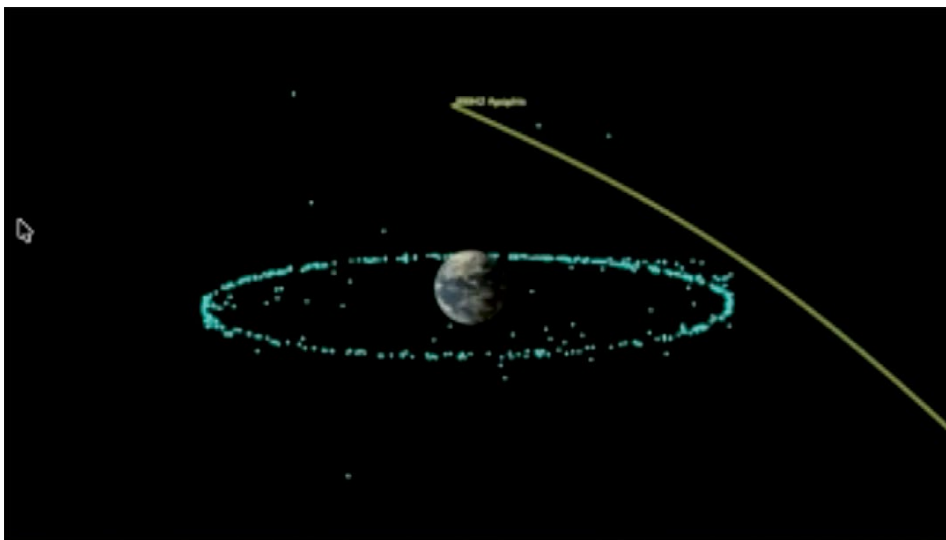
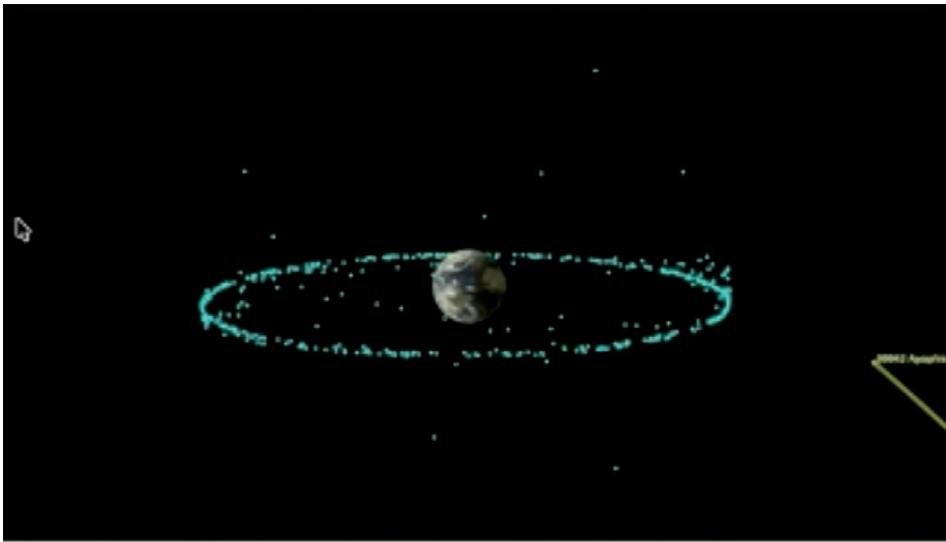
“Beyond Bennu: OSIRIS-APEX and the Exploration of Near-Earth Asteroid Apophis”

By Dr. Vicki Hamilton

Tonight we will talk about how we take spacecraft from NASA that are still working and repurpose them to get the maximum return on investment, so that's what OSIRIS-APEX is.

Where we are headed:

- The Visitor – Once-in-millennia pass of asteroid Apophis by Earth
- Beyond Bennu – A proven spacecraft that we are re-tasking to study a second world
- The Science – The science that we hope to achieve with this mission
- The Mission – The kind of things we want to understand with this mission
- Protecting Earth – Helps us protect Earth going forward, by looking at an asteroid that is not hazardous but it is of a family of asteroids that are potentially hazardous

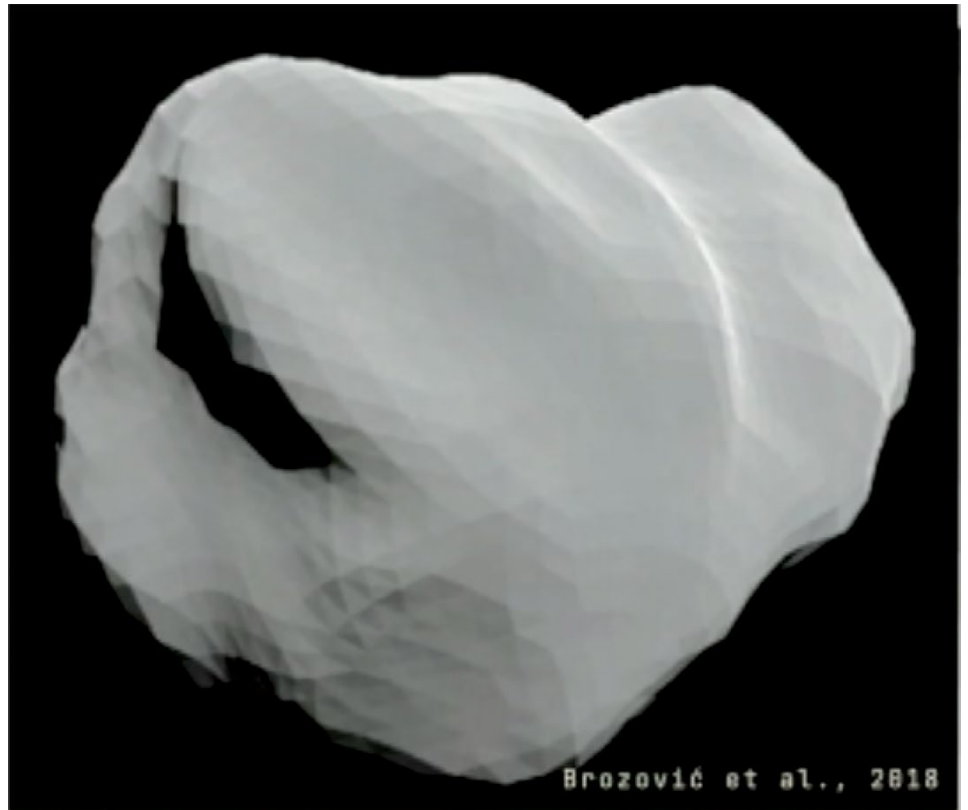


This animation shows the trajectory of Apophis in yellow, it comes very close to Earth and geosynchronous satellites in blue, actually goes inside the orbit of geostationary satellites.

- On Friday, April 13, 2029 Apophis will fly past Earth and 2 billion people could see a new point of light glide across the evening sky with the naked eye

This is our best image of Apophis; it is not actually a photo but a model created from radar data, so we really don't know what it is going to look like. Apophis discovered in 2004 and named for the Egyptian god of chaos, this is a particularly fitting name for an object that briefly looked like a serious threat.

- Diameter = ~340
- Type = Stony (S-complex) Stony, not a lot of metal
- Shape = Bilobate, tumbling – two lobes with a narrower bit in the middle; instead of spinning around an axis, this asteroid tumbles
- Meteorite kin = LL ordinary chondrite 80% of what falls to the Earth – LL lowest amount of iron in them, some have a lot of iron.



What We Know – So Far

Everything we know about Apophis today comes from a distance, from telescopic information of some kind – radar echoes and telescope spectra gathered during past approaches

Measured from Afar:

- Size = ~340m (+/-50m)
- Composition = Stony, Sq-type
- Shape = Two lobes (low-res radar)
- Spin = Tumbling, ~30.6 hr

Still Largely Unknown:

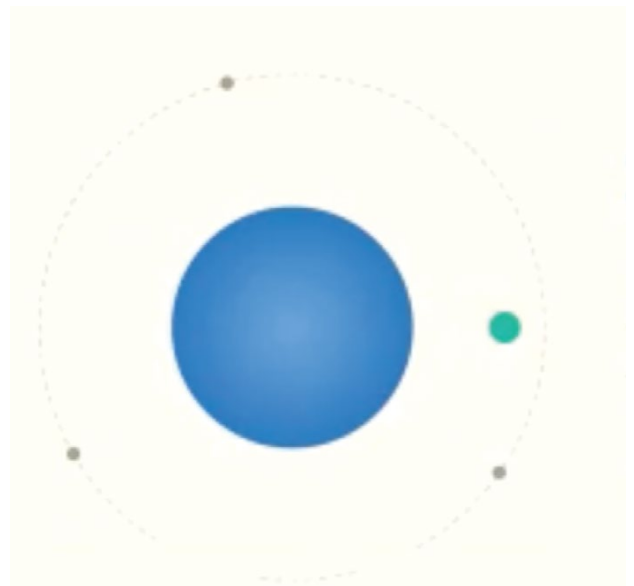
- Mass and Density – only estimated
- Internal structure – a rubble pile?
- Surface strength, texture, and grain size
- Fresh vs weathered material (by space weathering)

How Close Will It Come to us? Closer than our Satellites...

Large blue circle= Earth,
Small green circle= Apophis,
3 Gray circles= orbit of satellites

Will pass within 32,000 km from Earth's surface or about *one-tenth* the distance to the Moon and inside the ring of geostationary satellites. (Earth- satellite ring – *Apophis* – shown to scale)

This occurs with this asteroid once every 7,500 Years, we now have the technology to observe it



How does this compare to other impactors that have hit Earth?

- 340 m across – taller than the Eiffel Tower
- 100X more massive than the 1908 Tunguska impactor (Russia) in early 20th Century
- But what might be more interesting - 5,000X more massive than the 2013 Russian Chelyabinsk meteor, captured on peoples dash cams made a lot of news

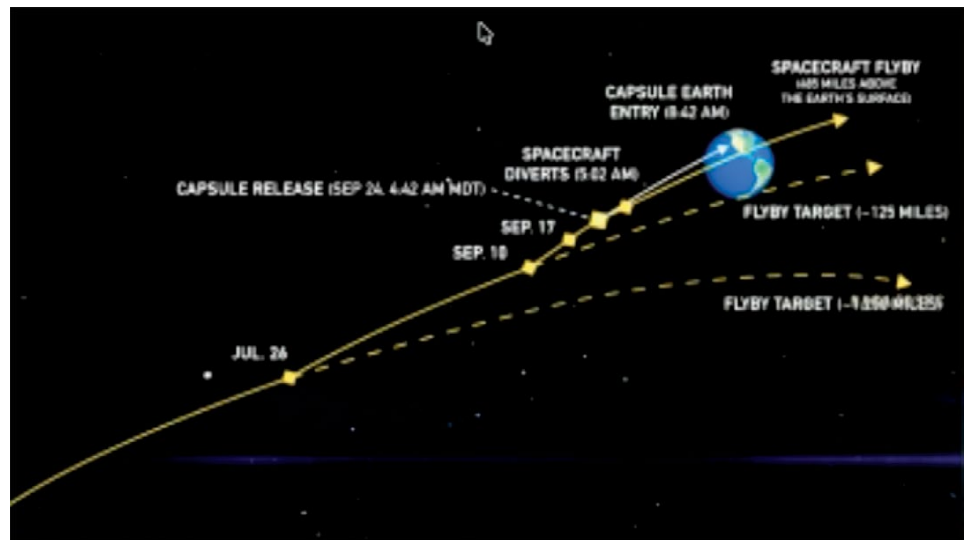
Apophis will NOT strike the Earth in 2029 – and radar tracking has ruled out any impact for at least the next 100 years. When it was discovered in 2004, Apophis briefly held the highest impact odds ever recorded for an asteroid (still less than 1%). Better orbit measurements erased that risk. What remains is a rare, safe chance to study a close encounter as it happens.

Beyond Bennu – A Second Life for a Proven Spacecraft

We launched Bennu in 2016, took two years to get to Bennu, arriving in 2018. Spent 2 more years operating the spacecraft, making observations, collecting photos, spectra, measuring the topography then used all the data collected to identify a place on the asteroid to land.

- In October 2020 our target collection was 60 grams of material from the asteroid

- Took two more years to get the spacecraft back
- Performed a touch-and-go grab of samples, returned 121.6 grams to Earth, arriving back in 2023, far surpassed goal, so now have plenty for research scientists to work with now and into the future
- Diamonds in yellow are changes in trajectory to steer the spacecraft, just few hours out from capsule landing on the Earth, did a burn to point away from Earth into orbit, this is when the spacecraft officially became OSIRIS-APEX (APOPHIS EXPLORER)



What Bennu Taught Us – Partly guiding how we are going to look at Apophis

- We learned Bennu is a rubble pile, not a solid rock but a loose heap of boulders and dust, bound by little more than Bennu's own weak gravity; if hit by something would probably easily just be blown apart
- There is a fair amount of water locked in clay and clay minerals blanket the surface indicating its parent body was soaked in liquid water billions of years ago
- It contains organic molecules – we identified carbon-based compounds, including amino acids, the raw chemical ingredients tied to origin of life
- Veins of carbonate...or phosphate? Bright mineral veins record water that once circulated through cracks in the parent asteroid, but formed at different times; tells us a lot about the history; this is important because we are still trying to figure out how Earth got its water
- A surprisingly active world; Bennu repeatedly flung pebbles off its surface into space, making it an “active asteroid” this was unexpected, and the process is still debated
- Proven capability – mapped Bennu to centimeter scale and stirred its surface with thrusters – the same skills APEX will reuse at Apophis. Important because we are still trying to figure origin of water and this tells us a lot about the history

- From the spectroscopy of the asteroid and return samples have identified a number of carbon based compounds; organic materials including amino acids; trying to understand inventory of organic prebiotic materials– part of initial mix of materials available that led 3.5 billion yrs later to us being here
- These are some reasons why sample returns are so important...gives us ability to know about things unexpected that we did not know existed or to look for

Bennu and Apophis Are Two Very Different Asteroids

Bennu: Carbon-rich & rare

- C-type dark, carbonaceous
- ~ 500 m across
- Hydrous silicates (water) & organics
- Uncommon among near-Earth asteroids

Apophis: Stony & Common

- S-type – rocky, brighter
- ~ 340 m across
- Made of anhydrous (no water) silicate minerals and rock (+metal)
- This tell us never any ice; never had interaction that would produce the clays
- The most common near-Earth type of asteroid

The Science – The natural experiment that we will be able to conduct during the flyby

Why a Stony Asteroid Matters

- Most common – stony asteroids dominate the near-Earth population
- Being most common make them most likely to be a threat to Earth
- We have not seen this asteroid type after an event that is expected to modify things like its orbital trajectory, surface geology, and other effects
- Apophis not a threat to us but we are going to be there to watch it play out so it's a nice test case for how we think about what we call planetary defense

The Meteorite Connection – Castine Ordinary (L6) chondrite - an example of an ordinary chondrite
Ordinary chondrites are the most common meteorites we find – yet they don't quite match the stony asteroids we see in the sky

- The likely culprit is space weathering: eons of solar wind and micrometeorite impacts that redden and dull an asteroid's surface, this is enough to effect the spectra; a freshly disturbed Apophis lets us link the rock in our hands to the asteroid overhead

A Natural Experiment

By coming so close to the Earth, Apophis's orbit is going to change; we know this because we use this same type of sling-shot effect on our spacecraft to change trajectory

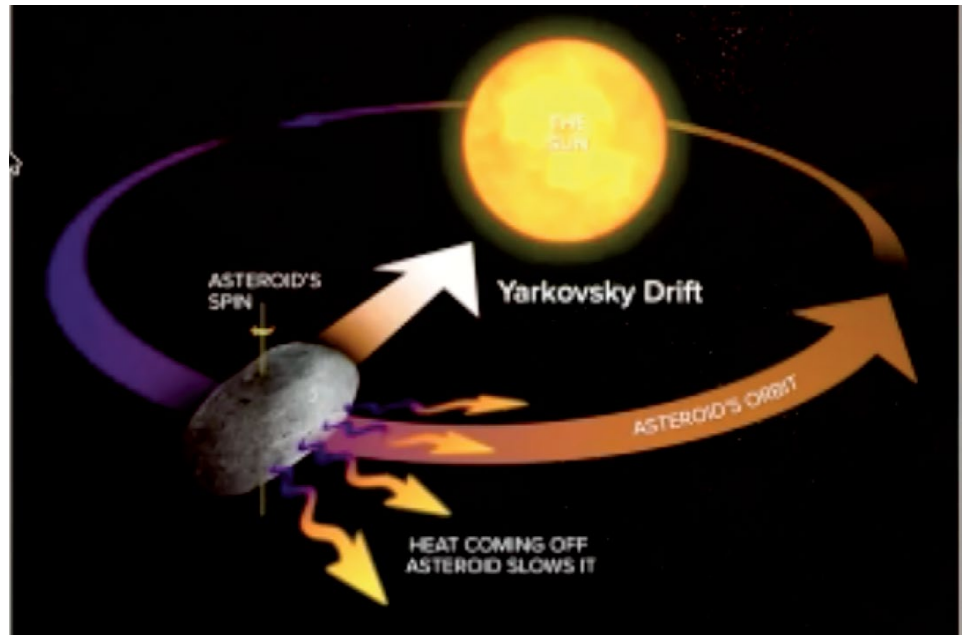


- Its orbit – the path around the Sun is bent – pushed from a tighter to a wider loop
- Its spin rate– the tumble speeds up or shifts as Earth torques the asteroid
- Its surface – Seismic shaking may trigger landslides and release particles out into space

Watching a Force Change – Another change we are expecting to happen

Sunlight does more than illuminate an asteroid – it slowly steers it

- An asteroid soaks up sunlight and re-radiates the heat, producing a faint thrust call the **Yarkovsky Drift**, named after engineer that discovered this
- Over millions of years it can nudge asteroids toward (or away from) Earth; the 2029 encounter with Earth will alter how that push acts on Apophis and APEX will measure this change, over time we see that this changes the orbits of asteroids and this is what make asteroids hazardous or not, what is its orbit? Is it going to intersect orbit of Earth?
- We want to measure the temperature of the asteroid surface all around to be able to determine how much change is from Yarkovsky and how much from sling-shot?



The Instrument Suite

- Cameras – Sharp images and color, down to centimeters
- Laser altimeter – Measures shape, slopes and topography of asteroid
- Visible – IR spectrometer – Identifies/Maps minerals, especially water fingerprints
- Thermal spectrometer – Identifies/Maps minerals and measures temperatures that tell us about the Yarkovsky Effect and thermal inertia

The Long Road to Apophis – how do we get there?

Nearly six years of cruising – three slingshots (gravity assist) past Earth (2025, 2027, and 2029) to bend the spacecraft's path onto Apophis's, riding out solar passes closer to the Sun than it was ever built for.

- Cruise = is the phase we are in whenever we are between two destinations
- EGA = Earth Gravity Assist
- P = perihelion; closest to Sun – pay special attention to the spacecraft after each close pass
- DSM = Deep Space Maneuvers
- Cruise Checkouts = After each perihelion pass perform close inspections
- Apophis Operations = AAM Asteroid Approach Maneuver to help slow down



Arriving After the 2029 Flyby – the orbits do not allow us to beat Apophis to the encounter. APEX watches the flyby, then chases the asteroid down.

- April 2 – APEX first spots Apophis as a distant point of light
- April 13 – Earth flyby for a gravity assist – 1 hour after Apophis's closest approach
- April 21 – First flyby of Apophis, then a slow, careful approach
- June 2029 – Rendezvous – APEX arrives to stay

A Front-Row Seat – APEX captures the encounter as it happens

- Daily brightness measurements reveal how the close pass changes Apophis's tumble, while cameras search the space around it for dust and pebbles shaken loose – the real-time fingerprints of a tidal disturbance.
- Apophis will be too close to the sun for ground-based observers to study until several weeks later
- We will see before the passage, during the passage and after the passage
- Will measure by light curves, by the shape of the light curve you can backout the shape



Going from a Distant Estimate to a Measurement

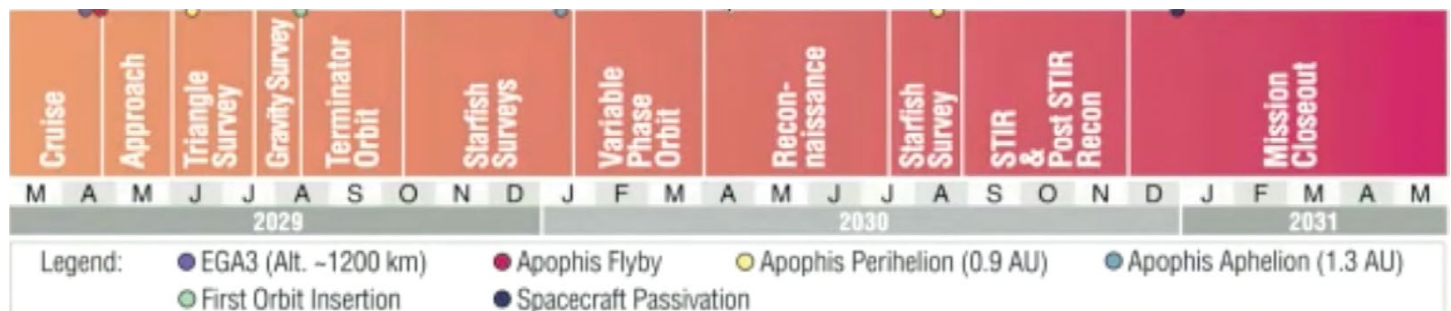
From Earth today:

- Shape: Low-res radar silhouette
- Mass & Density: Rough estimate
- Composition: One average spectrum
- Spin: Approximate tumble
- Subsurface: Invisible

With OSIRIS-APEX

- Shape: Centimeter-scale 3-D model – camera + laser
- Mass & Density: Mass to ~1% - Spacecraft tracking
- Composition: Global mineral maps – spectrometers
- Spin: Tracked continuously – daily light curves
- Subsurface: Exposed & probed – STIR (Spacecraft Thruster Investigation of Regolith)

Proximity-Operations phases at Apophis 2029-2031 DellaGiustina et al., 2023



Proximity-operations phases at Apophis, 2029-2031 - DellaGiustina et al. 2023

Eighteen Months at Apophis

Chart of the full lead-up to that activity, many different phases once we are at the asteroid. After arrival, APEX spends well over a year building a complete picture – surveying its shape, weighing it, dropping into close orbit, mapping its minerals, and zooming in on freshly disturbed ground.

The Spacecraft Collecting Sample

STIR: Kicking Up the Surface- the wings are the solar panels; for its finale, APEX fires its thrusters just above Apophis to blast away loose surface and expose what lies beneath – a trick already proven at Bennu.

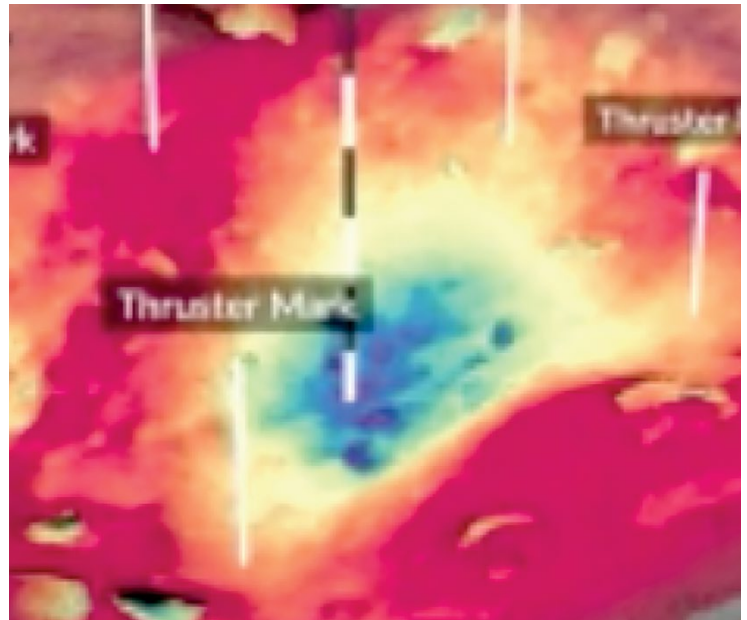
- Approach – Descend to just above a pristine, weathered patch
- Thruster burn – Fire the engines to blast loose regolith aside
- Exposed subsurface – Reveal fresh, unweathered material beneath this gives us a look into the subsurface



An Image From Bennu – actual photograph of rocks, color is indicating topography; red is high; blue is low so this is a hole; blue part is where sample was collected. Can see thruster marks. Can see that certain rocks moved so can start to get a picture of how cohesive is the surface materials. Are these big massive rocks or is it just a pile of rubble that can be easily moved?

What Lies Beneath – disturbing the surface reveals key properties:

- How strong? The cohesion holding the surface together
- How porous? How much empty space is packed inside?
- How layered? Whether grains sort by size with depth
- Is a stony rubble pile loose and compliant like Bennu, or unexpectedly stiff like Itokawa? The answer shapes any future attempt to deflect one
- All this information is really important in understanding what the properties are of these asteroids so if we do need to deflect one in the future coming towards Earth and that can inform us how to go about deflecting it



Practice for Protecting Earth

To deflect a dangerous asteroid, you first have to know how it's built. OSIRIS-APEX tells us.

- Most asteroids that could threaten Earth are stony, but we understand these the least
- Apophis is a more common chondrite, harmless, and arrives at our doorstep, enabling a natural experiment, there may be no better rehearsal for planetary defense when one of its cousins threatens Earth

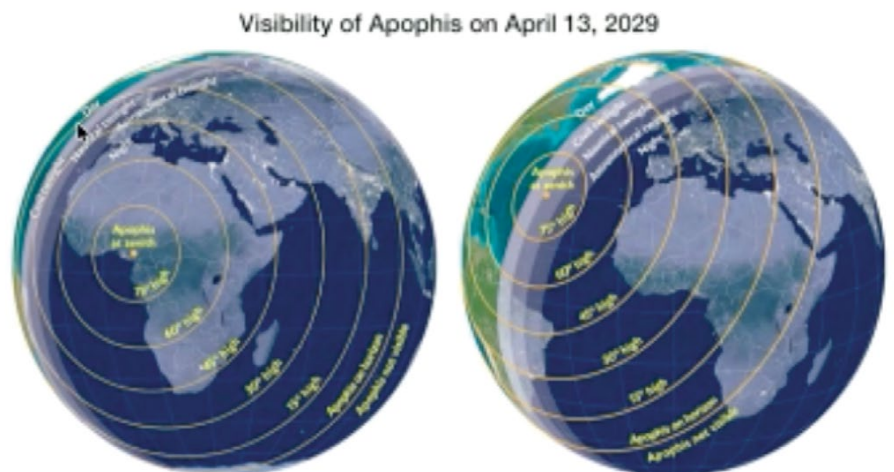


OSIRIS-APEX Will Not Be The Only Observer

- Ground telescopes – A worldwide observing campaign that APEX can verify up close
- DART & Hera (ESA) – Missions that tested actually nudging a stony asteroid's path
- RAMSES (European) – Would rendezvous with Apophis before its 2029 pass by Earth

A Once-in-Civilization Scale Event

- We happen to be alive for an event that recurs only every few thousand years
- On the night of April 13, 2029, Apophis will be bright enough to follow with the naked eye across Europe, Africa, and western Asia
- The peak brightness at 20:35 UT in eastern Africa
- The closest approach position 21:45 UT out in the Atlantic Ocean



Summary

“Apophis is this really interesting opportunity to see one of the most common kinds of asteroids, we are able to do this because we had a healthy spacecraft at the end of the OSIRIS-REX mission; all the instruments are working and we have this asset that otherwise would have just flown off into space. For an incremental increase in money we are able to go do a whole second mission with the spacecraft. and it is going to look at something very different than Bennu. This is the first time we have looked at two different objects with the exact same set of instruments. We will be able to characterize the asteroid after this incredibly rare extraordinary event. And we are doing this through this very carefully planned sequence of observations that ultimately will not only tell us about the asteroid itself but how it represents potentially hazardous asteroids throughout the solar system that are in Earth-crossing orbits.”

Questions:

The Lucy Mission had several asteroid targets and local groups of amateur astronomers used an array of telescopes to watch occultations and make out the shapes of several asteroids that turned out to be pretty accurate, does OSIRIS-APEX have any plans to do anything like that?

If you receive additional information before the close approach will you use that to change your plans any?

You mentioned earlier about Bennu being water and clay and this asteroid being dry what is the theory on the environment these were formed in and do those conditions have difference in composition?

How do you rocks on Bennu or Apophis form without a lot of pressure?

How is there enough gravity or pressure to build sediment?

If you say they are a loosely bound collection of rubble, have there been discussion about whether it might break apart when getting near Earth's gravity?

III. Upcoming Events with Aref Nammari

- July 17 - Star party at Rabbit Mountain with Boulder County Parks from 8:00 to 10:30 pm
- August 14 - We are invited to participate in Lyons lights out at Bohn park from 7:30 to 10:30 pm
- August 15 - Star party at Beech Shelter with City of Boulder Open Space and Mountain Parks from 8:00 to 11:00 pm
- August 20 - LAS Meeting here - speaker will be Dr. John Bally 7:00 to 8:30 pm
- August 28 - Star party at Rabbit Mountain with Boulder County Parks 7:30 to 10:30 pm

IV. Business Report by Treasurer, Bruce Lamoreaux



Longmont Astronomical Society

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

LAS Treasurer's Report - Bruce Lamoreaux

7/16/2026

Main Checking Account (xxx-1587)

Begin Balance:	\$ 4,635.00	6/2/2026
Deposits:	\$ 50.00	Membership
Expenses:	\$ (515.00)	Bank Charges, AL Dues
Current Balance:	\$ 4,170.00	7/2/2026

2-Year Savings Account (xxx-1478) (matures 10/23/25)

Past Balance:	\$ 8,340.00	6/2/2026
Interest:	\$ 15.00	
Balance:	\$ 8,355.00	7/10/2026

Telescope Fund (xxx-0165)

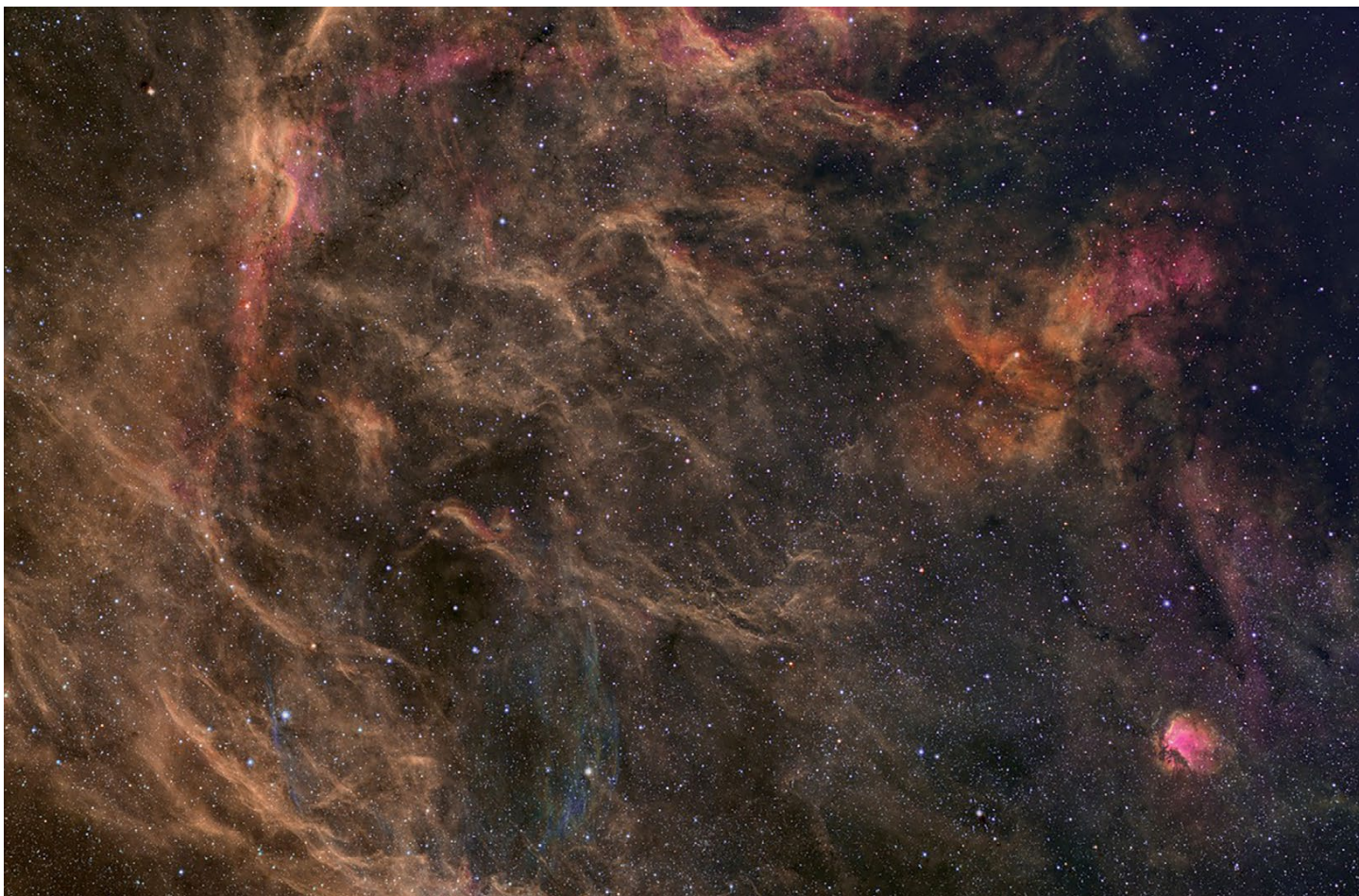
Past Balance:	\$ 1,090.00	5/28/2026
Deposits:	\$ -	
Expenses:	\$ -	
Balance	\$ 1,090.00	6/30/2026

Petty Cash

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

<u>Total Assets</u>	\$ 13,665.00	\$ (629.00) Down from June
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Active Membership:	82	
Student Membership:	2	
Total	84	Active



"HII Structures and more in Cygnus" by David Elmore

Stewart Sharpless surveyed Palomar Schmidt camera images to create a catalogue of 307 HII regions. Sh2-112 (bottom right) is one of these along my path to photograph all of them. This image also shows the 'Propeller Nebula' in the NE and the blue supernova remnant SNR G082.2+053 along the center bottom.

Beverly Lynds similarly ordered a copy of the Palomar Atlas and identified 1125 bright nebula. She estimated brightness on a scale of 1 to 6 and recorded the central coordinates of each object. By tracing the outlines of each using an elegant analogue hand-held measuring device called a planimeter, she could read the area of the nebulae she had traced on a dial indicator. There are 18 Lynds Bright Nebula catalogue objects in this image though identification is difficult when comparing this narrowband digital photograph to what she saw on broadband photographic prints.

The structures come out due to narrowband Hydrogen-alpha rendered as red, Sulfur II as yellow, and Oxygen III as blue. To further enhance the emission RGB images were acquired and used to subtract broadband light from the emission lines.

Borg107 refractor, ASI6200MM camera, Chroma filters, iOptron CEM70 mount from my little observatory at Dark Sky New Mexico. Total exposure 18 hours.

David

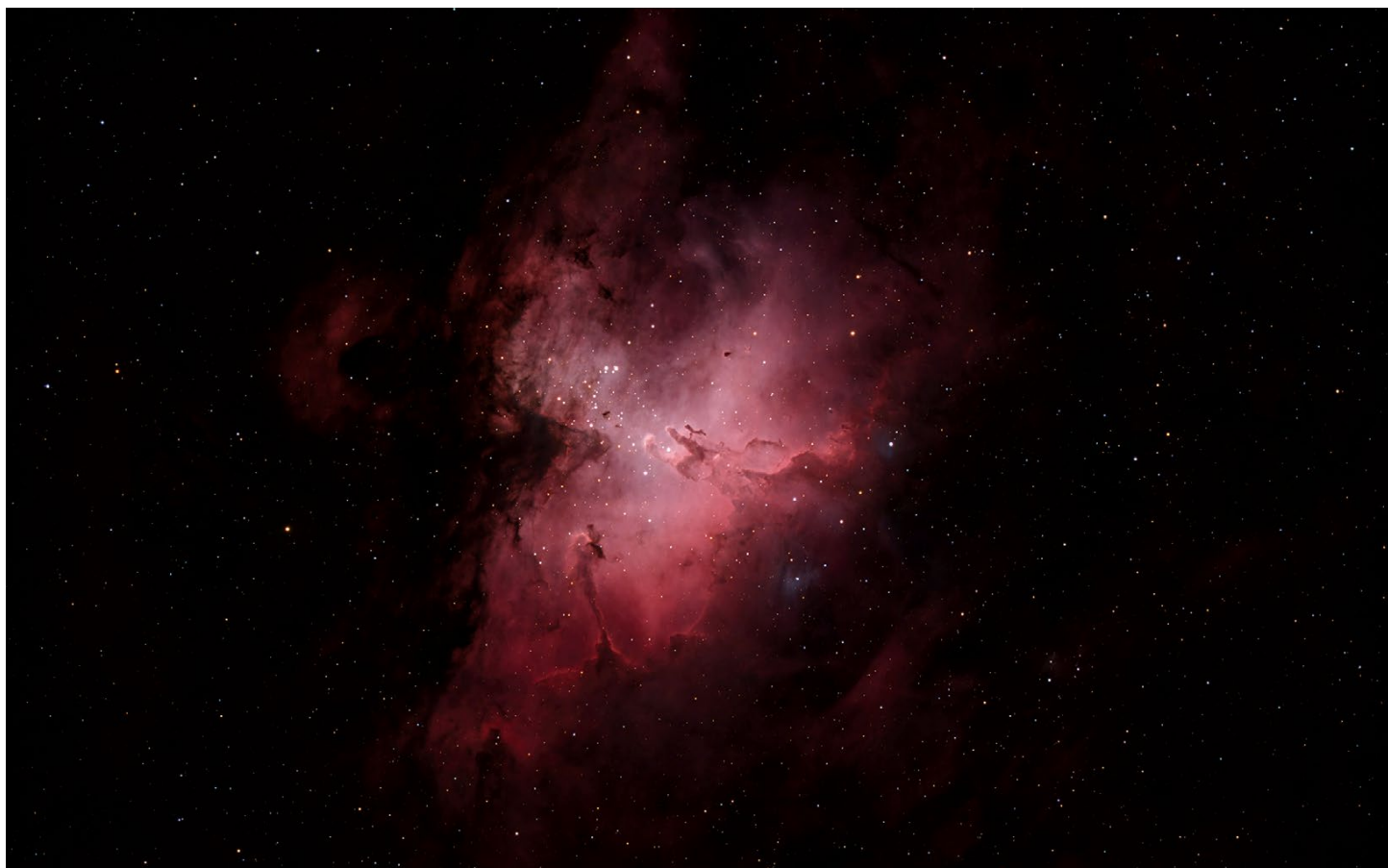


"M10 Globular Cluster" by Gary Garzone

M10, M12, M14, M15 taken last night, up till 4 am. I just could not pass up third straight night of clear skies, no moon up Darkness. Three good nights, got bunch to process yet, do when I get back from my trip. More to process but leaving on trip to Sister's house in N J. Maybe I'll send post card from Wildwood beaches.

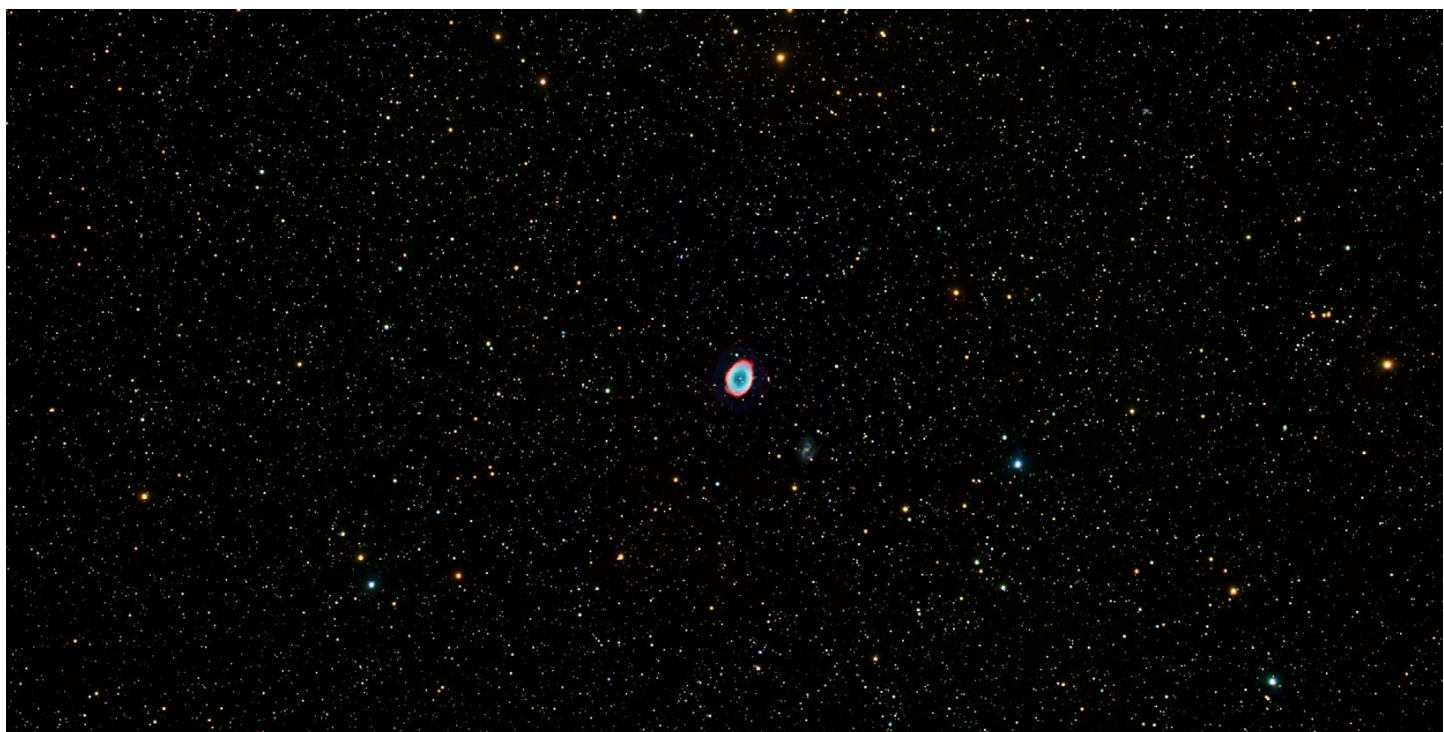
Usual C 14 ZWO 6200 OSC camera 15 five minute frames.

Bye, Gary



"M16 Eagle Nebula" by Eddie Hunnell

My first image from RMSS. Due to the wind I had to discard 5 subs, leaving only 16 subs of 180 seconds each.



"M57 from RMSS" by Eddie Hunnell

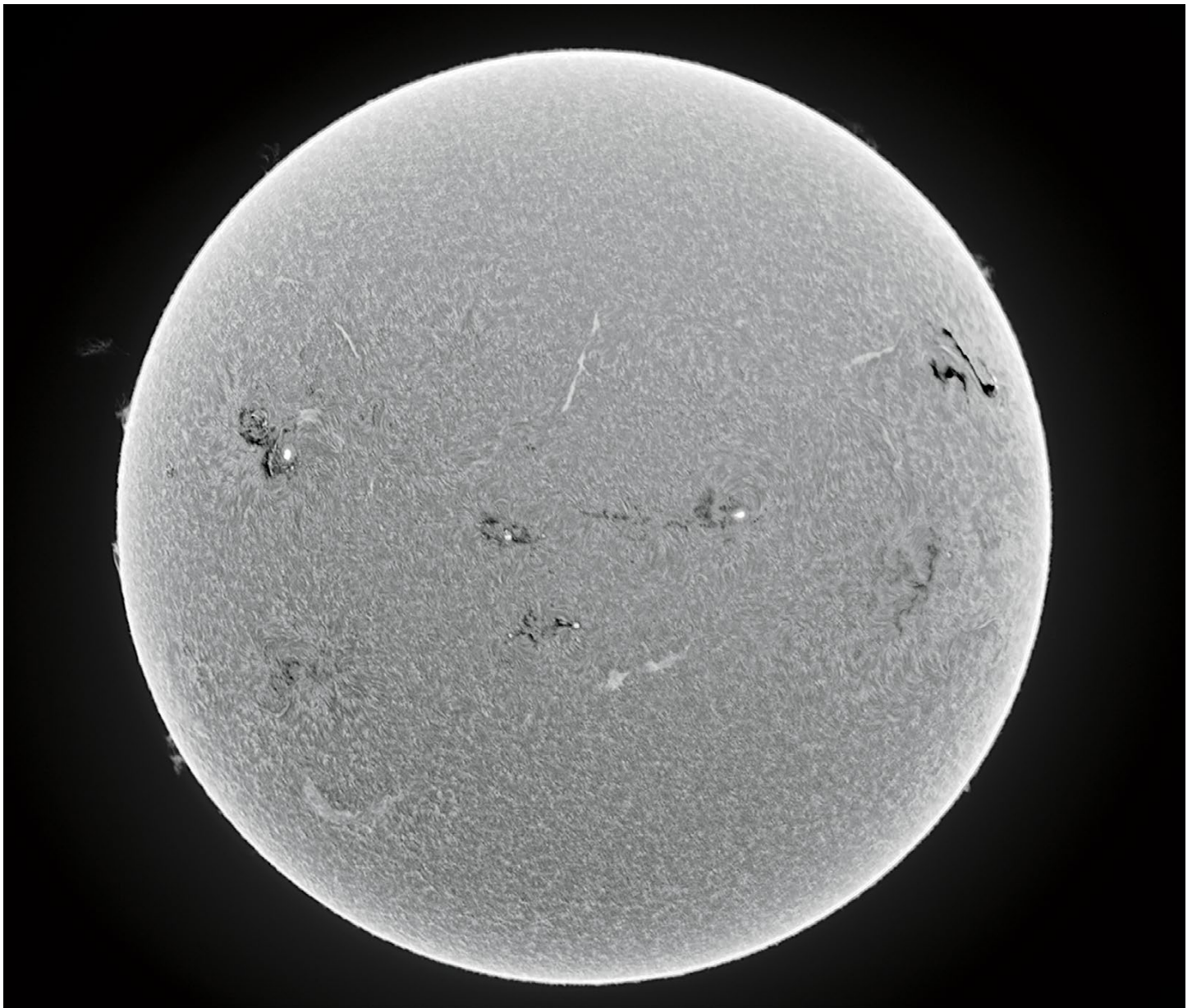
My second and last image from RMSS. I only had 10 subs of 90 seconds each. Masked out M57 so I could stretch the fainter galaxies. Used darks (5 min) and bias images. C11, ASI6200MC Pro, and CGX mount.
Eddie Hunnell



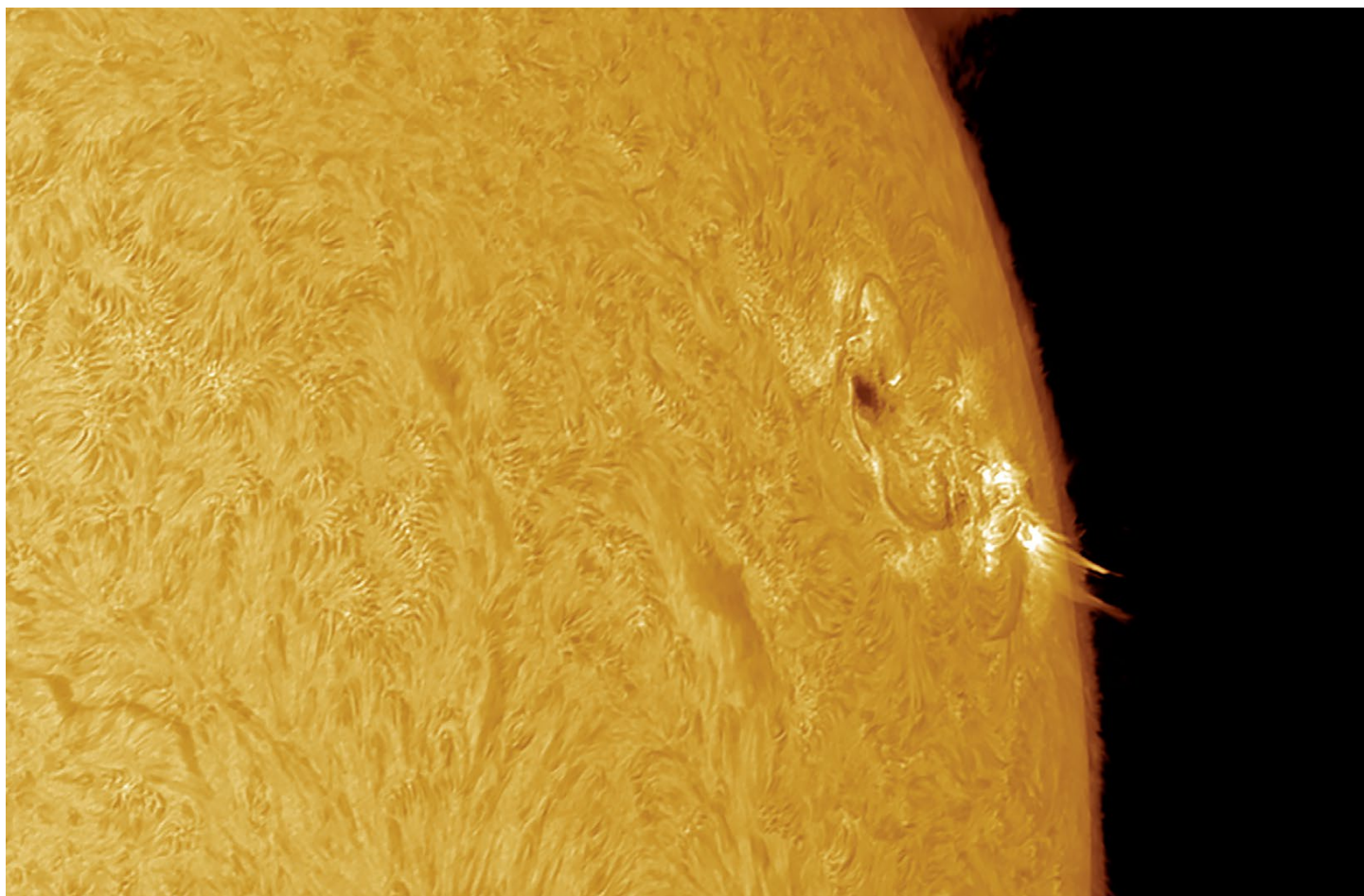
©Aref Nammari

"NGC 6888" by Aref Nammari

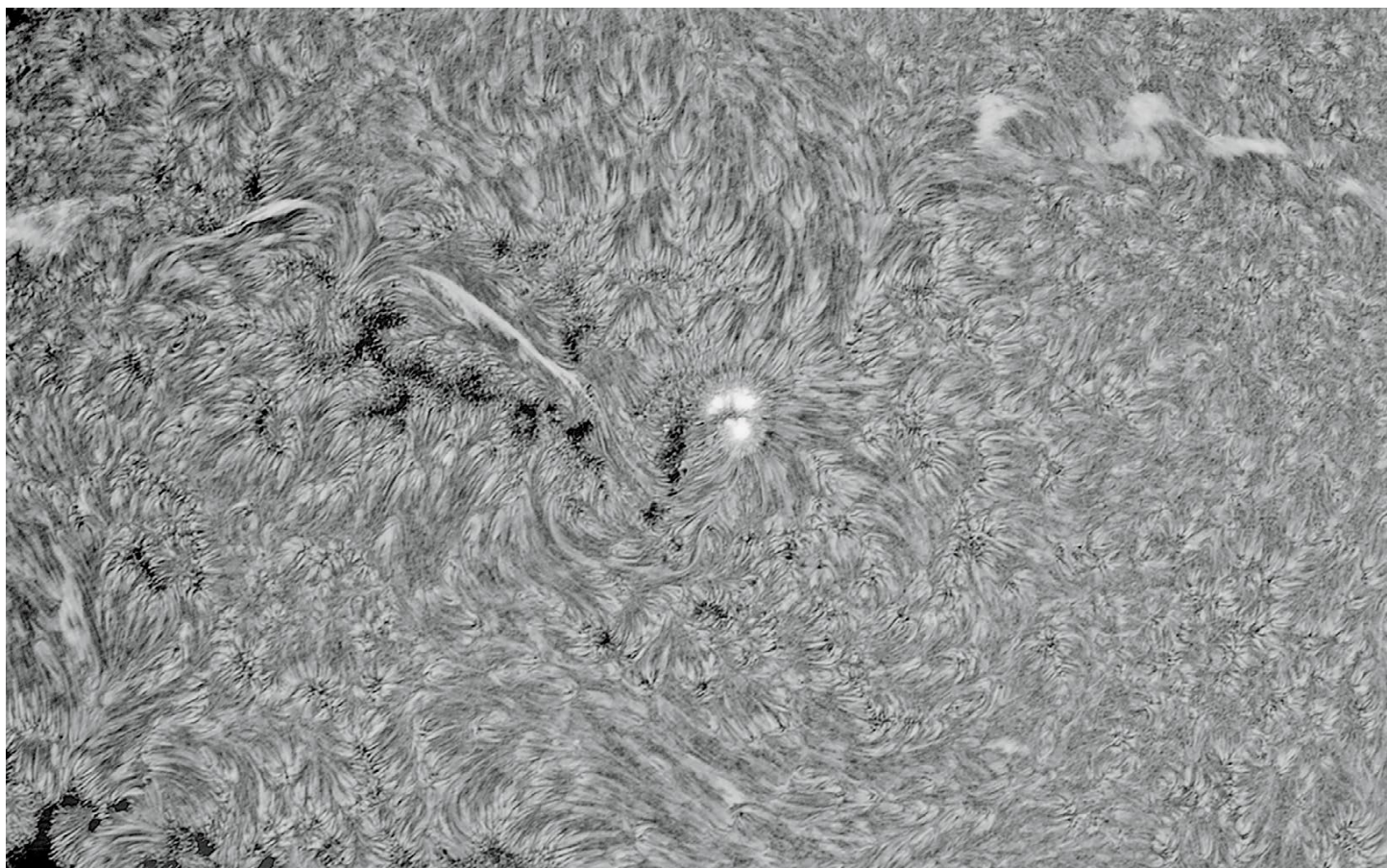
NGC6888 taken Saturday at Kline-Dodge DAS Dark Sky Site. Taken with Sees-
tar S50 433 subs 10 seconds each in alt-az mode.



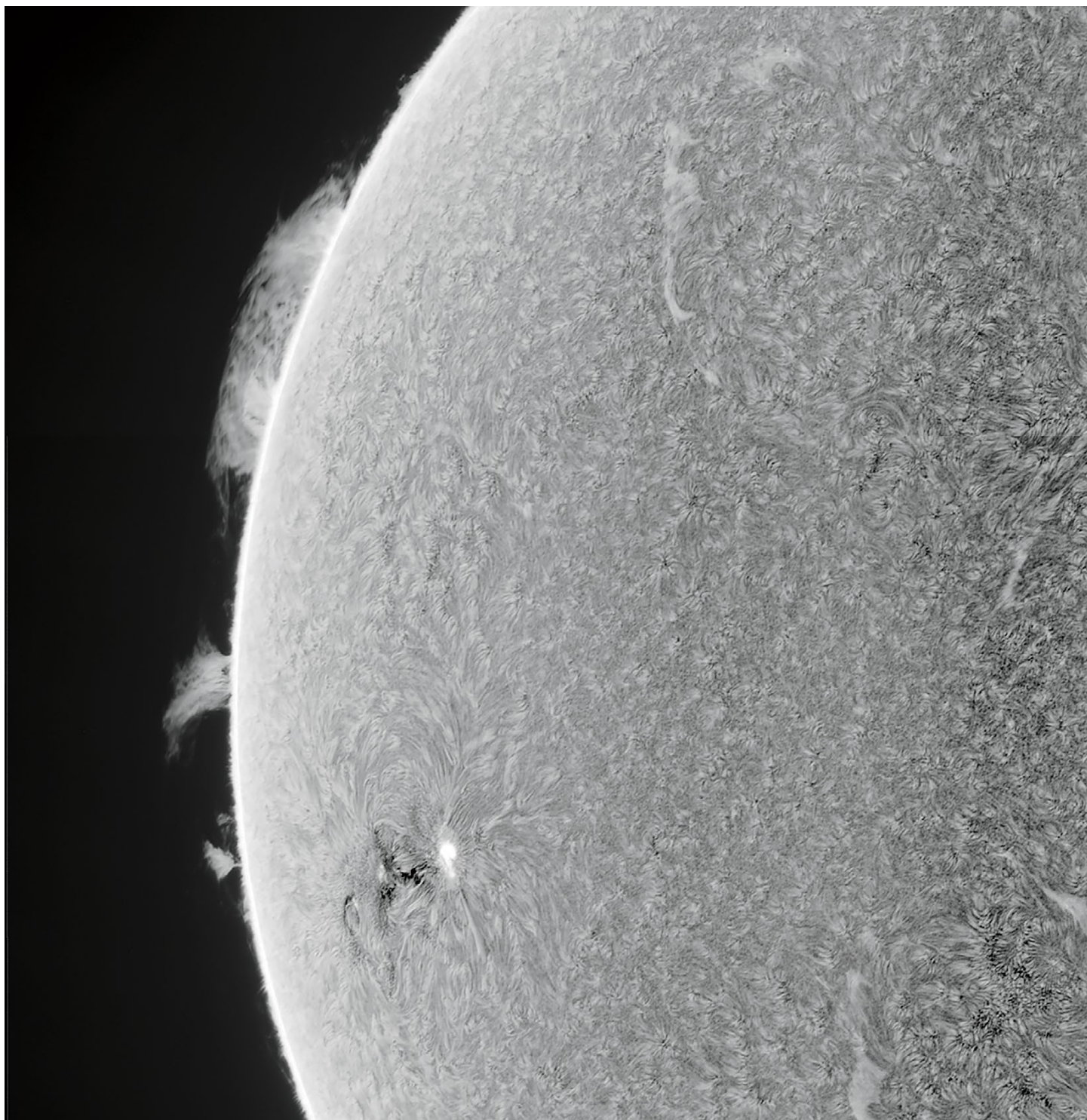
Sun in H-Alpha on July 26 by Brian Kimball



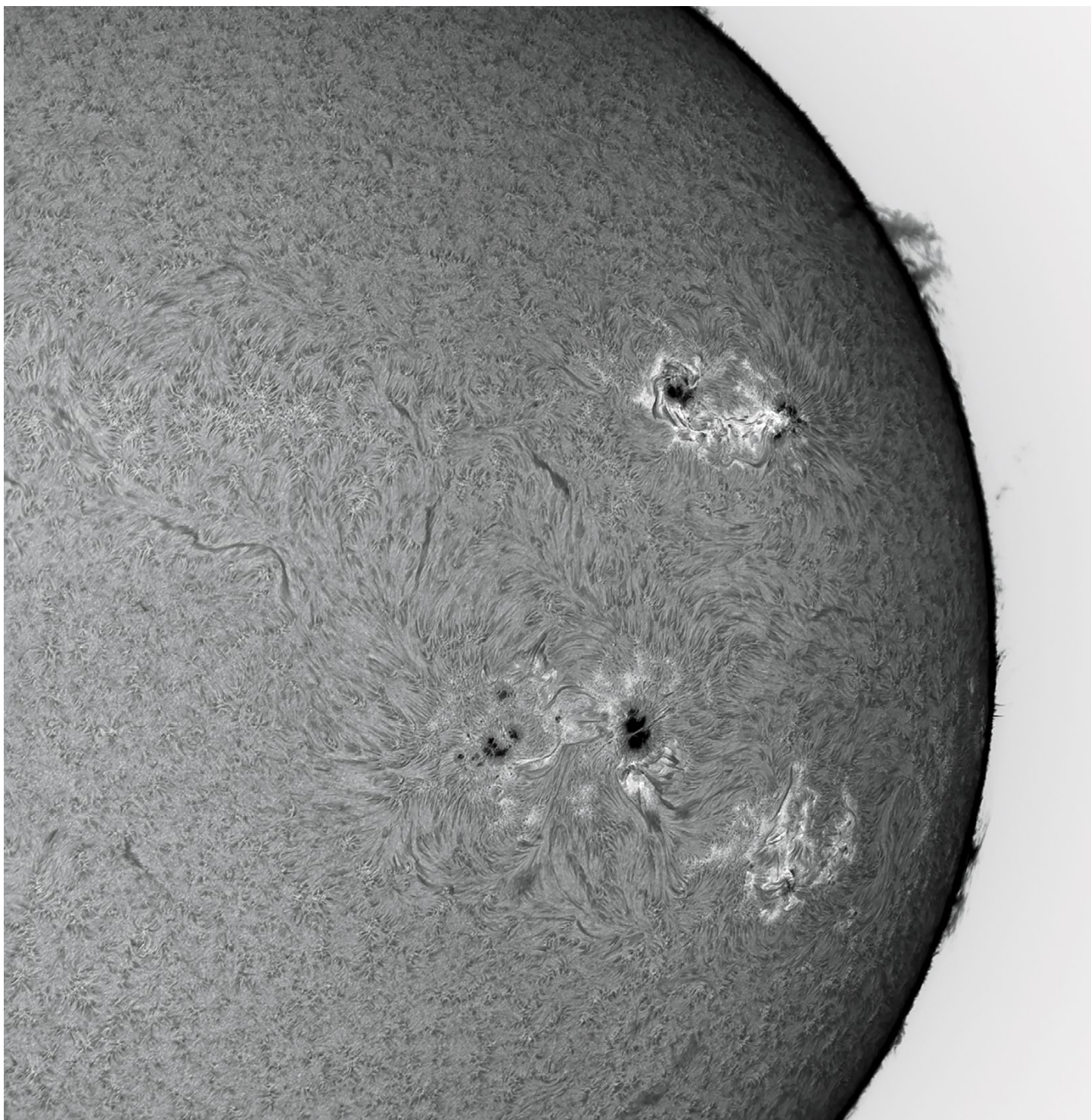
"AR 4479 in H-Alpha on July 4" by Brian Kimball



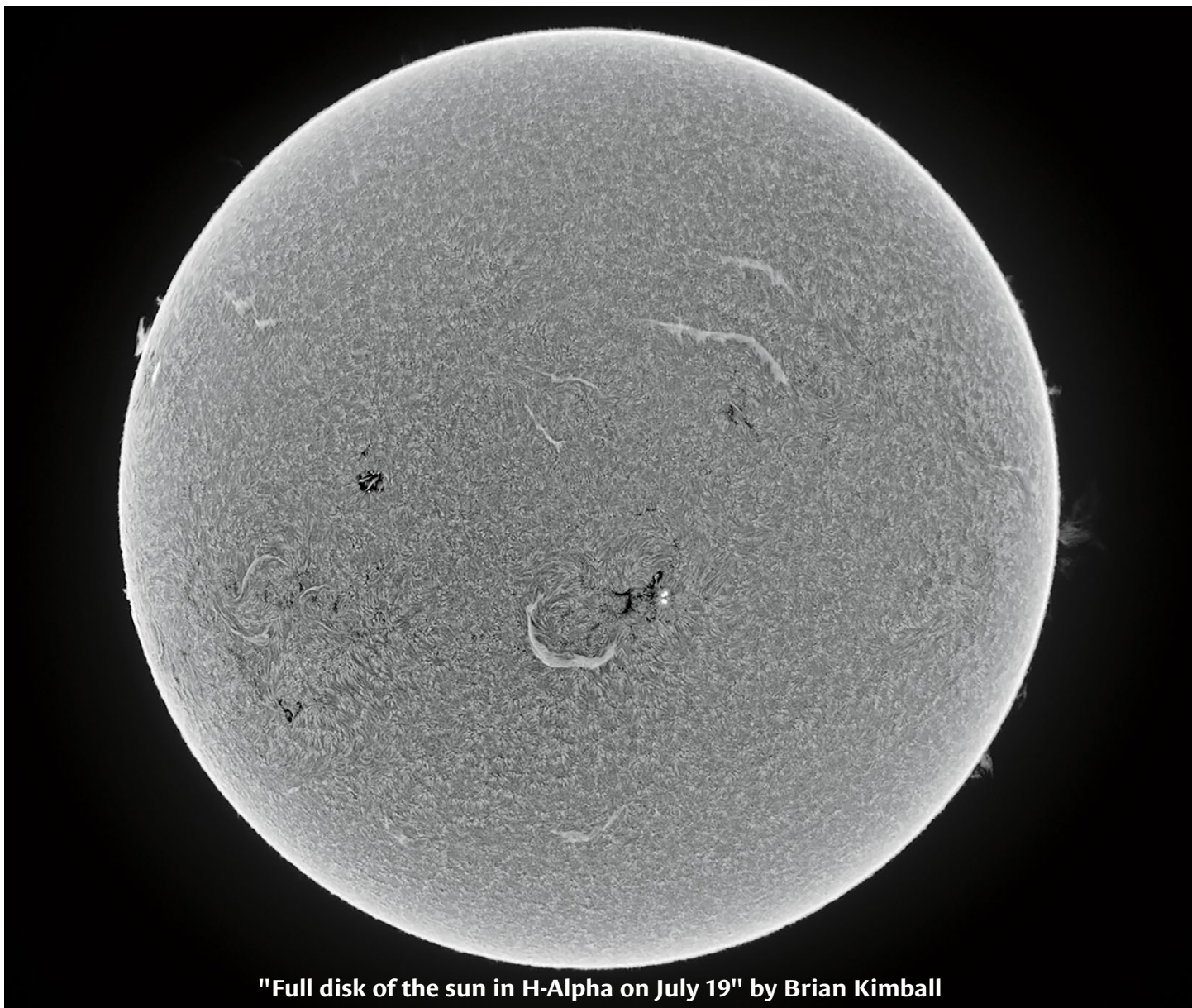
"AR 4492 in H-Alpha on July 25" by Brian Kimball



"AR 4482 in H-Alpha on July 26" by Brian Kimball



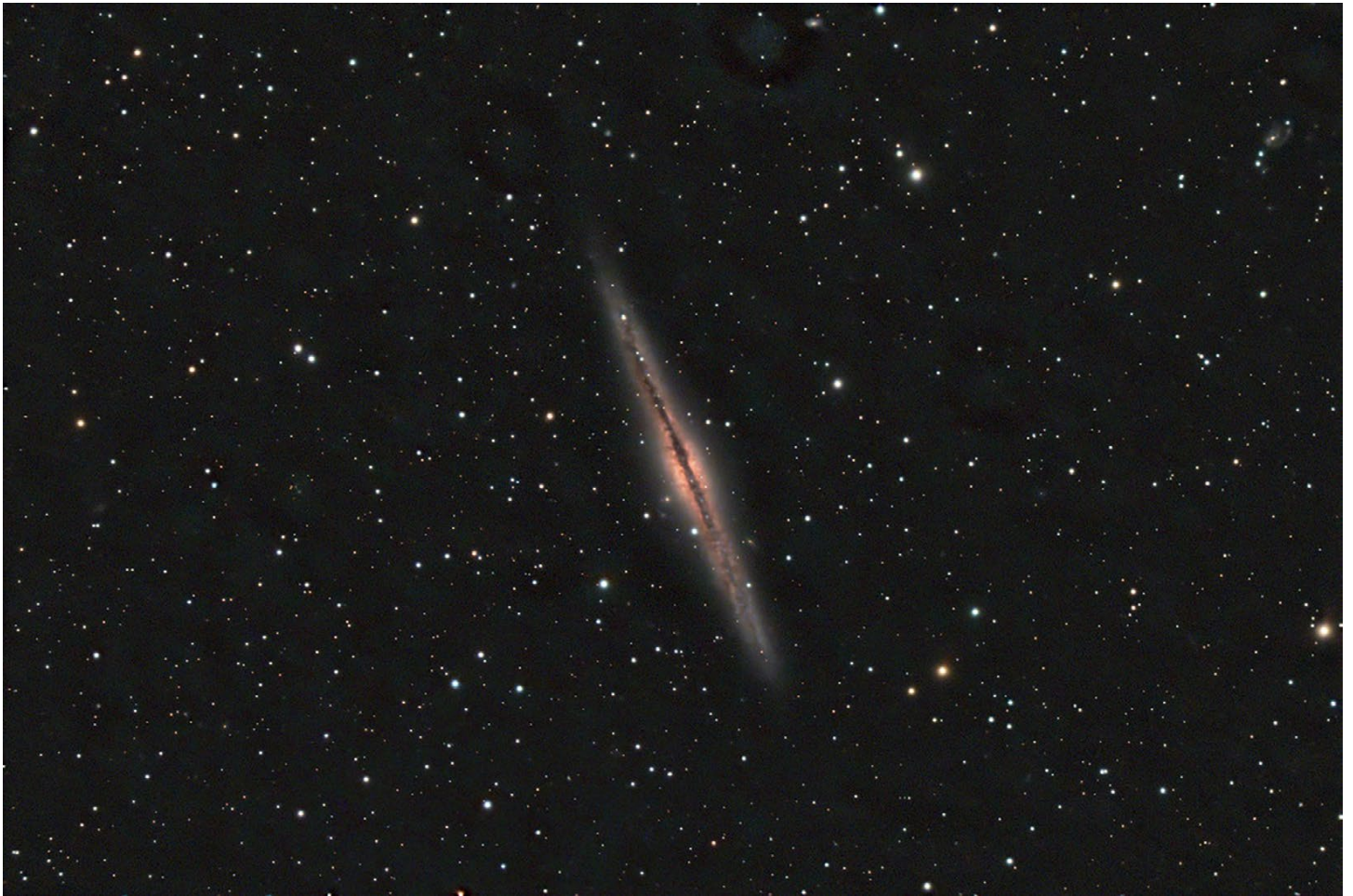
"AR 4478, AR 4479, and AR 4480 in H-Alpha on July 26" by Brian Kimball



"Full disk of the sun in H-Alpha on July 19" by Brian Kimball



"AR 4489 in white light on July 18" by Brian Kimball



"The Silver Sliver" by Jim Pollock

Here's a cool galaxy: The Silver Sliver aka NGC891 aka Caldwell 23 aka "the Outer Limits Galaxy" in the Andromeda constellation. About 30 Million LY from Longmont. So pretty close by!

It has twice been selected as the "first light image" christening two research telescopes: The Large Binocular Telescope (Safford AZ) and the Lowell Discovery Telescope's Large Monolithic Imager (40mi from Flagstaff AZ). This galaxy is very similar in shape, size and luminosity to our Milky Way.

Trivia:

- An image of NGC891 actually did appear in the ending credits of The Outer Limits TV show.
- The soundtrack of the 1974 film "Dark Star" by John Carpenter features an instrumental piece called "When Twilight Falls on NGC 891"
- The first solar album by Edgar Froese (of Tangerine Dream) has a song titled "NGC 891"

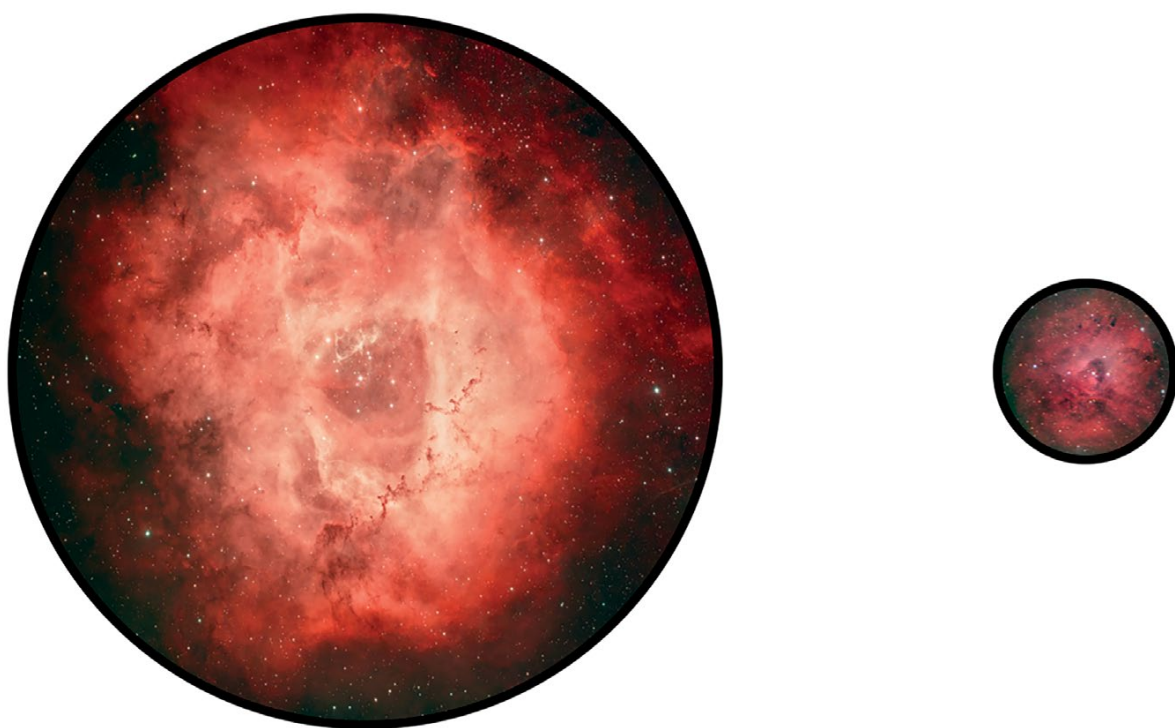
Pretty geeky! But a famous galaxy!!

Always amazed,



"The little Rosette" by Jim Pollock

This is one I've heard of but never took a look at: Sharpless SH2-170, the Little Rosette Nebula. In fact, here's a direct comparison of their relative sizes. I'll let y'all figure out which is the Big Rosette and which is the Little Rosette. Rosette is about 80x80 arc minutes and Little Rosette covers 20x20 arc minutes: 12 times smaller.





"Giant Rotor 100 million LY away" by Jim Pollock

Happy 4th of July!!!!

This is a pretty awesome galaxy, NGC 2336, that I just ran across. It has 8 large spiral arms and a teeny tiny bar across the core for good measure. It has a very small core but a massive black hole within. The 30-45 degree angle of tilt makes it look quite intimidating!!

This image is 38 frames of 5-min each for 3.2 hours of exposure on my 9.25" EdgeHD at f/7 at Starfront Observatories in Texas sending light into my ZWO 2600mc DUO color camera.

As an aside, I've been using the new Pixinsight MultiScaleAdaptiveStretch process since it came out a few months ago. So I now do almost all my processing in Pixinsight with only minor touch ups (if needed) in PhotoShop and reducing size for emailing. The AdaptiveStretch is the first stretching process in Pixinsight that I've been able to get great results from easily without requiring another masters degree.

Happy Safe 4th!

Jim



"A Hickson Cluster for the 4th of July" by Jim Pollock

Happy 4th of July!!!

Attached is an appropriate Hickson Compact Group for a 4th of July Celebration. LOTS of interesting galaxies in a grouping about 125 Million LY away from my house.

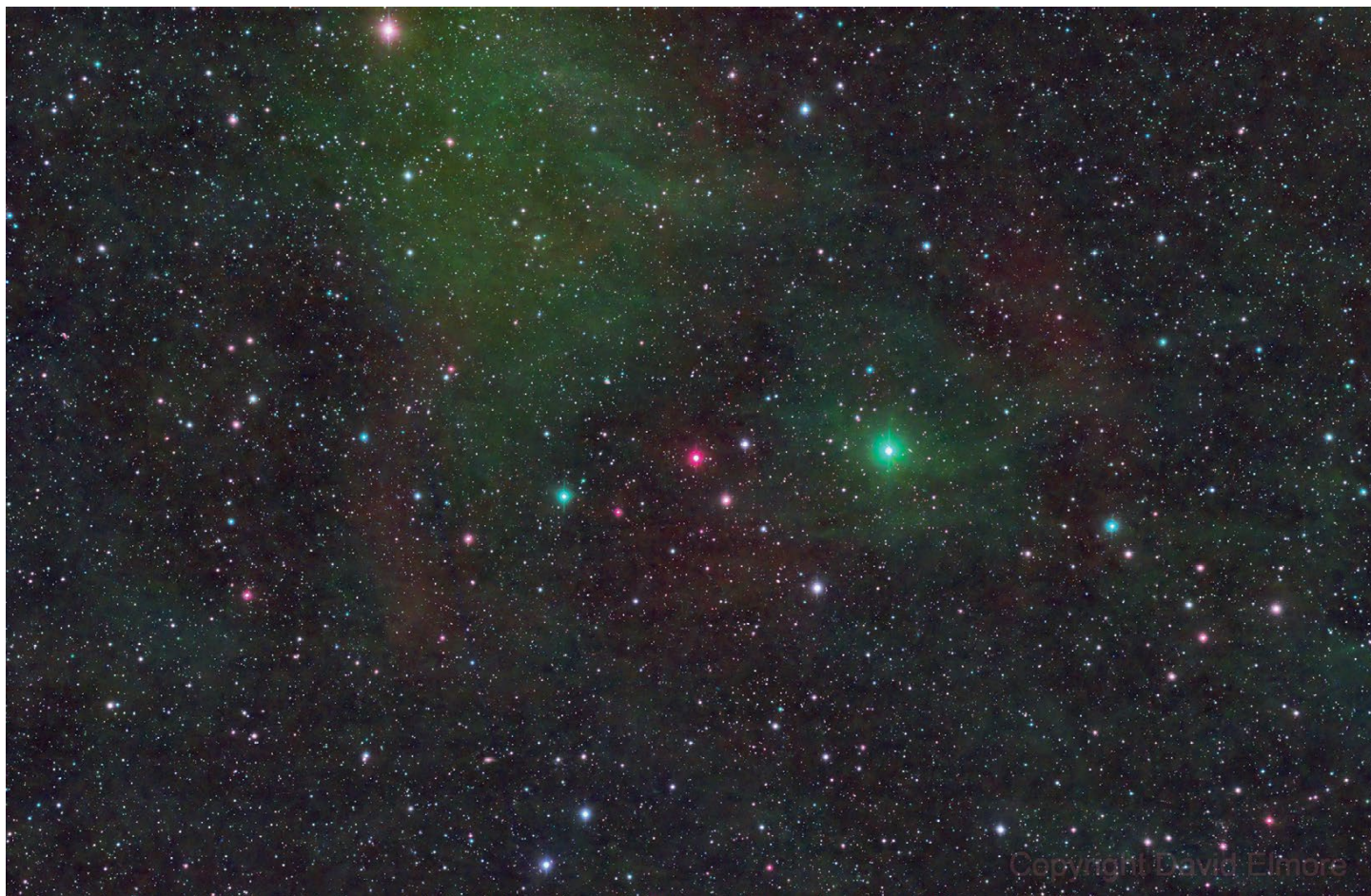
NGC5371 is the big beautiful spiral in the upper left. While separated from the main compact cluster, it is still thought to be a gravitationally involved member.

I particularly like NGC 5360 at the top of the right side... it is a complex multi-tiered spiral with a bar. I love it. Also NGC 5358 at the bottom left of the grouping is small but interesting with its bright and obvious outer ring.

This image was shot last night from my scope at StarFront Observatories in Texas. 39 Frames of 5-min each for 3.3 hours of exposure with the 9.25" EdgeHD at f/7 into my ZWO 2600mc DUO color camera.

Happy 4th!!

Jim



"Our Latest Discovery - PaElPos J1503+6555" by M.J. Post

For several years David Elmore and I have been teaming with Dana Patchick (a California astronomer without a telescope) to search the night skies for uncatalogued objects, primarily faint planetary nebulae.. Here is our latest discovery, posted yesterday on Astrobin. Mine is the monochrome OIII image while David's is the colored image in OHS rendition. FOVs differ slightly (David's FOV is larger). Our Astrobin description reads:

PaElPos J1503+6555 is a large ring-shaped planetary nebula (PN) candidate dominated by Oxygen III emission. Its listing in the HASH PN Database4.6 includes the formal name PNG 104.1+46.0. <http://202.189.117.101:8999/gpne/objectInfoPage.php?id=33914>

Dimensions listed there are 9600 arc seconds x 8800 arc seconds – 2.5 x 2.4 degrees.

A well-positioned possible central star is HD 133994 at 15 03 57.3 +65 55 11.0. <https://simbad.cds.unistra.fr/simbad/sim-id?Ident=Hd+133994&NbIdent=1&Radius=2&Radius.unit=arcmin&submit=submit+id>

This star has a parallax of 6.6941 mas corresponding to a distance of 487 ly. Given that distance, this nebula's inferred diameter is 22.7 light years

Discussion:

A diameter of 22.7 ly is extremely large. For comparison, the confirmed PN often-cited as largest is SH2-216 with a diameter of 12.2 ly at a distance of 420 ly. Another possibility is that this object is a ghost planetary nebula (GPN) as described by Ogle et. al. <https://iopscience.iop.org/article/10.3847/1538-4357/ae733a>. Table 2 in that article lists GPNs and PNs up to 36 pc in diameter (117.4 ly).

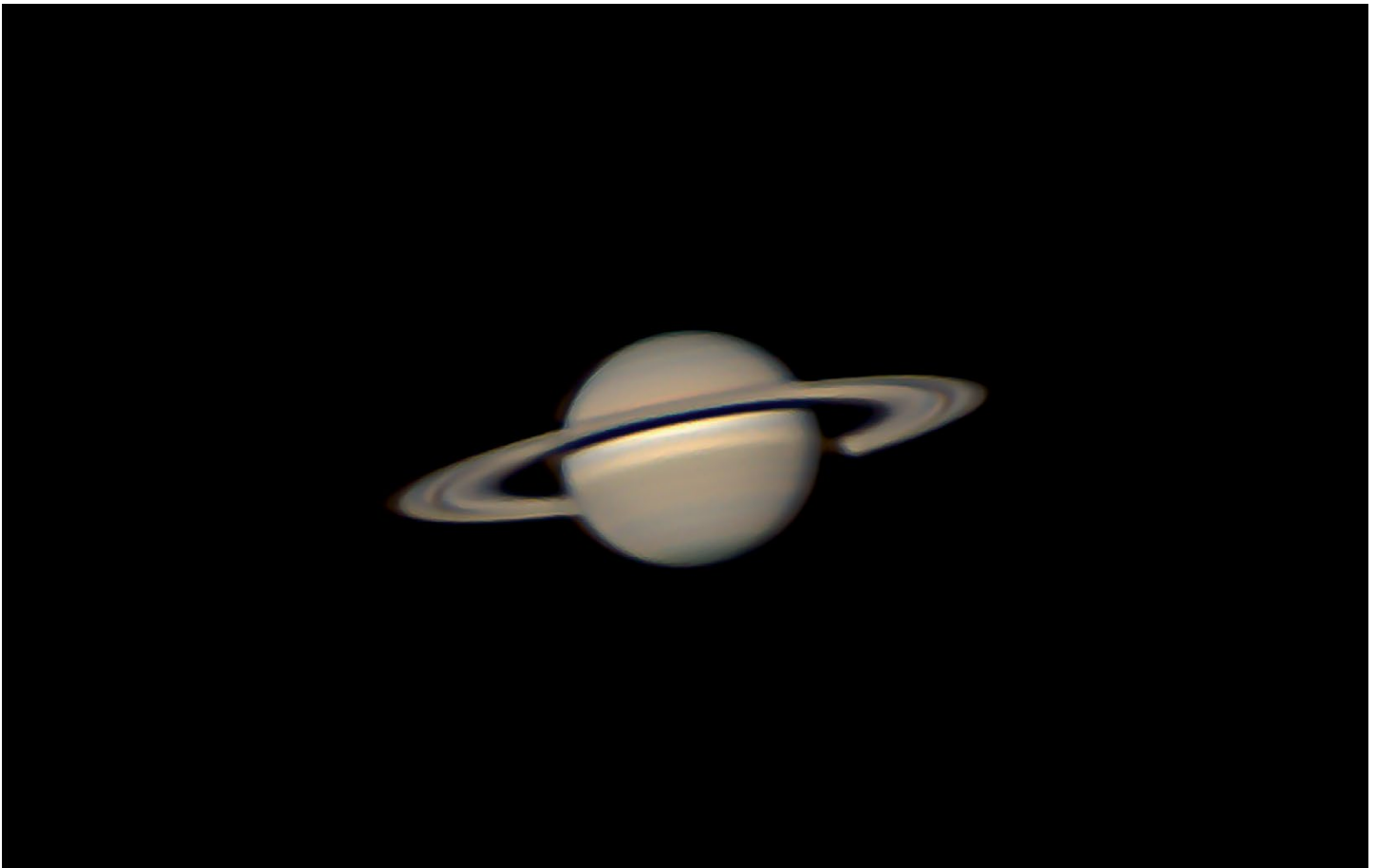
Star HD 133994 is of spectral type A2Vs - a main sequence star with a temperature of approximately 8800K. This temperature is insufficiently hot to doubly ionize oxygen. For HD 133994 to be the central star of this nebula,

a companion white dwarf is required. High resolution spectroscopy is needed to reveal possible emission lines from highly-ionized atomic species in the white dwarf to resolve this possibility.

Another candidate central star for this nebula is H 1504+65 at 15 02 09.6 +66 12 18.6. This star is the second hottest white dwarf in our galaxy with a surface temperature of 200,000K. <https://en.wikipedia.org/wiki/H1504%2B65>. Its distance of 1590 ly means the diameter of this nebula would be 74 ly, well within the range of possibilities for ghost planetary nebulae.

Dana Patchick saw this object in the Northern Sky Narrowband Survey (NSNS) and in August 2025 asked MJ Post and David Elmore to collect narrowband images.

M.J. Post



Saturn from early morning July 25 at 4:22 am by Vern Raben

Saturn from early this morning (July 25) around 4:22 am. Seeing was better than average but not excellent as Astrospheric indicated; it was closer to say 6/10 according to Pickering criteria. Mostly clear but a few thin clouds and gusts now and then.

Equipment used:

Celestron C14HD scope, Televue 2X barlow, and Zwo ASI585MC camera. SharpCap Pro set with ROI of 1280x1024 and acquired series of 2 min video at about 82 fps. Used AutoStakkert!4 to align and stack the videos. BigSky app was used to de-rotate, stack, and enhance the images. I forgot to align the camera to RA axis so image is rotated counter-clockwise 20 or so degrees from where it should be.

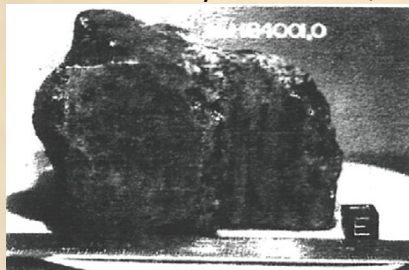
Vern

LAS Archives for Aug. 1996, 2006, and 2016 by Eileen Hall-McKim

30 Years Ago – 1996

A letter from your new editor: "Well, this is my first effort at the newsletter. I hope you enjoy it. I hope it can improve with time and your help. In the future I intend to include more club news, photos and classifieds. Bob, our illustrious president has assured me that he will contribute a letter for all future issues. Watch this space. To make this publication better, I need your help in two areas. First, I would very much appreciate contributions. Write up your observing program results, give me photos, tell us what you have for sale, share any useful information. Second, give me feedback on what you like and don't like. I can take it. I want this to be useful, interesting and fun for you. See you at the meetings or contact me"Doug Little

This 4.5 billion-year-old rock, is believed to have once been part of Mars and to contain fossil evidence that primitive life may have existed on Mars more than 3.6 bya. "We don't claim that we have conclusively proven it. We are putting this evidence out to the scientific community for other investigators to verify, enhance, attack—disprove if they can – as part of the scientific process. Then, within a year or two, we hope to resolve the question one way or another"



ALH84001

Astrophoto of the Month: The dumbbell
Nebula M27 Doug Little (11-inch f/6.3 SCT,
SBIG-6 2-minute exposure



M27 by Doug Little

20 Years Ago – 2006

- Bill Travis announced the MRS Star Party: Last year BASS and LAS had a star party at the CU Research Station up by Nederland during Labor Day weekend. We are doing it again this year Friday 25th and Saturday 26th of August. Vern sent announcement to the LAS email list 3 or 4 days ago with some details. The observing site is located at 9,000 feet, nice and cool in August. There is an observatory up there with a 12" Mead SCT we can use. We can have plenty of scopes in a small area around observatory. There is a new lodge, with bunk rooms, kitchen, meeting rooms, showers, rentable room with 4 bunks, \$50 a room. There will be a BBQ Friday night. The program on Saturday will include an astronomy presentation. We hope for good viewing at high elevation, relatively dark skies, relatively close by. RSVP if you want to participate in pot luck or BBQ, or if you want a room, hopefully sorted out by August 1. Julie Carmen did a great job organizing last year. The potluck dinner was excellent.
- Philippe Bridenne is moving back to France. We will really miss him. He has been an awesome LAS member for years. He has done such a great job with keeping the newsletter going for us, helped with so many star parties I cannot even count all the ways he has helped us. I wish there was a certificate for outstanding employee of the year award for him.
- We need a new newsletter guy so anybody with the desire, please step forward and job can be yours. Philippe and I will help you get started. Nobody ever wants to volunteer but those who serve find it very rewarding to give something back, true sign of success is when you Learn, earn and return to society what you can. Astronomy is a lifelong learning adventure, lets keep it all going .Philippe you're the best, thanks old buddy, we will miss you and you are always welcome to come back and visit when you can.
- Vern Raben and Brian Kimball are still amazing us with their great astronomy pictures, keep them coming you guys. We really do enjoy seeing them, you inspire people to get out and see for themselves the wonders you have showed us.

- Secretary report by Mark Propp: Considering, with webmaster, Steve Albers, adding a calendar of LAS events to web site.
- We are always looking for guest speakers so if anybody has some contacts for club, let me know. Hope to see you in the dark at one of our next star parties. Later, Gary

Weekend Under The Stars report by Gary Garzone Fox Park Weekend Under The Stars was another one of those great views weekend to make it all worthwhile. Sometimes it's hard to endure the bad weekends we get. We have had bad luck viewing last several adventures out with the die-hards, so we were in dire need of a good dark sky viewing weekend. Friday was totally clear all night long. The Milky way was so bright from there and stretched all the way across the skies to trees in the Tea Pot. I would drive all that way just for that view. Saturday it was clear but clouded up by 3 am or so with clouds covering the skies a bit. We stayed up till 4 am Saturday that's how good it was; we pushed it some as usual. We had big crowds but not as big as in past, 200 people maybe. We went to Jelm 92 inch scope for Friday day tour. I will send off some pictures as usual. I love seeing some of the old die-hards who showed up. The Milky Way was casting its shadow, how cool, so bright it was to see it under such good conditions. We are so lucky at times; most people never get the views we do at Fox Park. Have scope will travel, is still my motto. We can maybe do it again next month at Fox park new moon dark sky viewing?? See you in the dark, later, Gary

10 Years Ago – 2016

Cover: Brian Kimball

- Vern put in a request with the Astronomical League for a telescope for Louisville Public Library
- Eclipse update: some Casper area hotel availability but likely to be pricey... check daily if that is your chosen viewing plan.
- Vern volunteered LAS to begin testing of new software and website for the Astronomical League. Site capabilities include create user accounts for all 16 thousand AL members, classified ad submission, display of personal observing awards, forums for participation, upload images. Club officers will be able to maintain their club's information and update / broadcast emails, content submission / articles, etc. Site launch should be around end of July.
- Vern introduced idea of additional telescopes for the Library in Firestone. Gary formally motioned that LAS provide 3 scopes to the library in Firestone, Nancy Ramstall seconds the motion; group voted, all yes with no objections. Motion carried. Vern will contact library and initiate acquisition of scopes.

Open Forum Night:

- Nancy Ramstall introduced herself and told us about her interest in astronomy . She shared Sky and Telescope's Eclipse Road Atlas that includes an eclipse path boundary and centerline map for the path across the United States.
- Tim Brown showed us his home made folded light path telescope scope (an F18 Scheifspiegler). It uses an unobstructed design (no spider or secondary).It must track at this magnification, very nice images but he has design improvements he is considering. The off axis reflections of the design generates astigmatism. His plan is to remove the retention spring that 'warps' the toroidal secondary mirror and introduce a very weak 'cylinder' lens to correct the astigmatism. Tim will keep the group informed as to progress / results.
- Gary Garzone shared a recent Fox Park imaging report. He showed several images taken by him and favorites from other LAS members.
- Tally described his new interest in narrow band imaging, a mechanism that allows excellent imaging results from light polluted areas by rejecting / filtering out the majority of optical wavelengths, leaving only those necessary to image the object of interest (of course, only in the emission wavelengths allowed to 'pass'). Common bandpass filters include: Hydrogen-Alpha - 656.3nm; Hydrogen-Beta - 486.1nm; Oxygen-III - 500.7nm; Sulfur-II - 672.4nm; Nitrogen-II - 658.4nm



Tally O'Donnell at Fox Park 2016

LONGMONT ASTRONOMICAL SOCIETY
P. O. Box 806
LONGMONT, CO 80506



MOST PECULIAR FIDDLE GALAXY
BY JIM POLLOCK