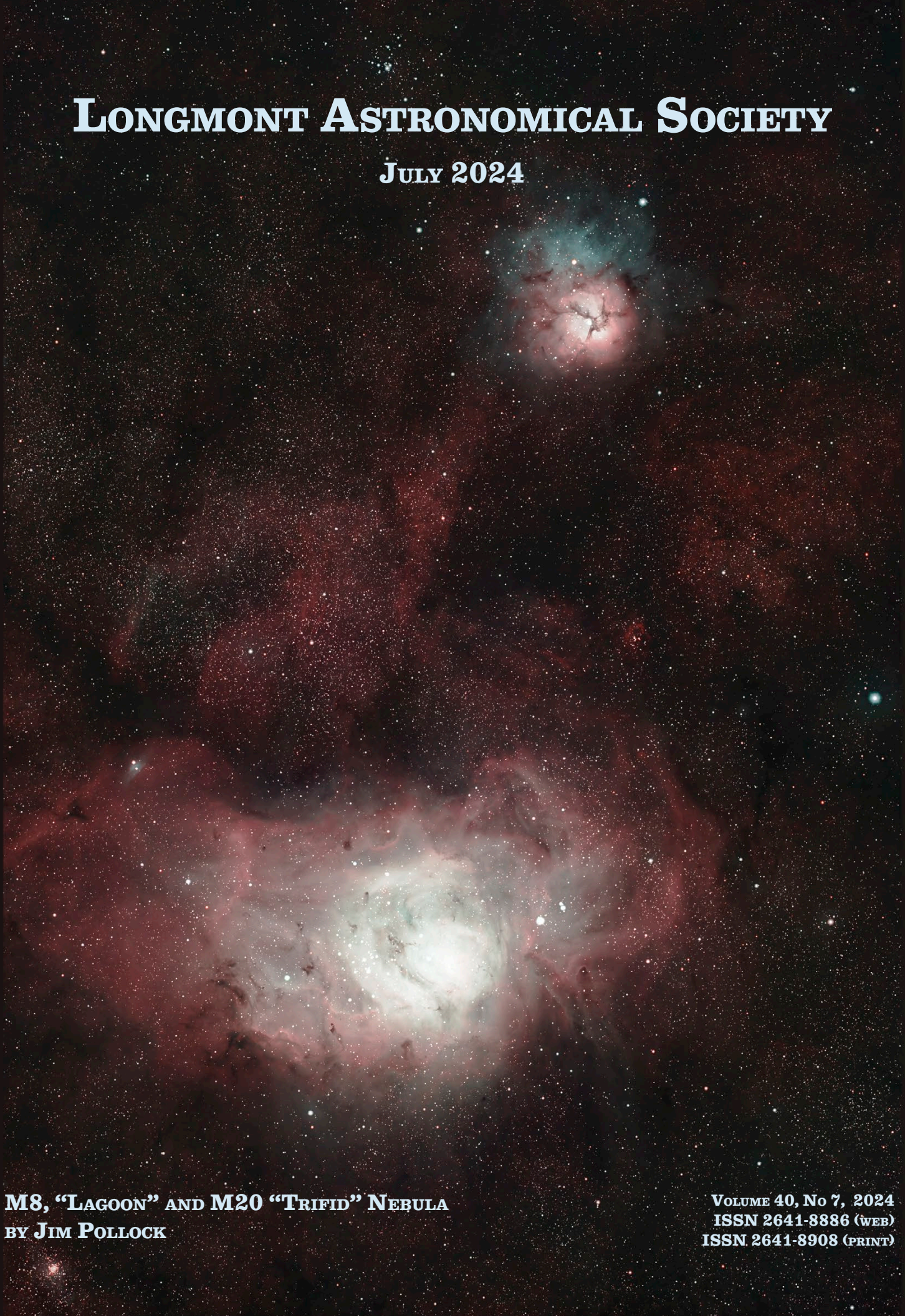
Longmont Astronomical Society

July 2024



M8, "Lagoon" and M20 "Trifid" Nebula
by Jim Pollock

Volume 40, No 7, 2024
ISSN 2641-8886 (web)
ISSN 2641-8908 (print)

Next LAS Meeting July 18 at 7 pm
Lunar science and exploration as part of the Artemis program

Biography

Dr. Paul Hayne is an associate professor of astrophysical and planetary sciences at the University of Colorado Boulder. He directs the Exploration of Planetary Ices and Climates (EPIC) group at CU's Laboratory for Atmospheric and Space Physics (LASP). He earned his B.S. and M.S. degrees from Stanford University, and his Ph.D. from UCLA. Prior to joining LASP, Dr. Hayne was a research scientist at NASA's Jet Propulsion Laboratory, where he served in a variety of mission science roles, including as an Investigation Scientist for Europa Clipper. He is a Co-Investigator on several active NASA missions, and is Principal Investigator for the Lunar Compact Infrared Imaging System (L-CIRiS), a heat-sensing camera planned for deployment near the south pole of the Moon as part of NASA's Commercial Lunar Payload Services program.

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

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 July

Mercury

Mercury is barely visible in binoculars very low in the WNW sky around 9:15 pm from the 6th to 11th this month. It dims from magnitude -0.2 to +0.1 and the apparent disc increases from 5.8 to 7.8 arc sec across.

Venus

Venus is not visible this month, even in binoculars.

Mars

Mars is visible in the eastern morning sky. Its brightness increases from +1.0 to 0.9 magnitude in brightness; the disk increases from 5.4 arc sec across to 5.9 this month. By the end of this month it should be high up enough before sunrise to begin imaging

Jupiter

Jupiter is visible low in the ENE an hour or so before sunrise. It is magnitude -2.1 magnitude in apparent brightness and the disk is 34 arc sec across. The Great Red Spot (GRS) is in position to image at the following times this month:
Jul 3 05:18 am Alt=22°
Jul 15 05:17 am Alt=29°
Jul 20 04:26 am Alt=22°
Jul 27 05:15 am Alt=36°

Saturn

Saturn is now nearly straight south and 40 degrees up an hour before sunrise so its in position for imaging. It is around +0.9 magnitude in brightness and 18 arc sec across.

Uranus

Uranus also returns to view in the morning sky the last week of the month. It is magnitude 5.8 in brightness and disk is 3.4 arc sec across.

Neptune

Neptune is visible in the ESE in constellation Pisces before sunrise. It is magnitude 7.9 magnitude in brightness and the disk is 2.2 arc sec across.

Lunar Phases in July

New Moon:
July 5 at 4:59 pm

First quarter:
July 13 at 4:50 pm

Full Moon:
July 21 at 4:18 am

Third quarter:
July 27 at 8:53 pm

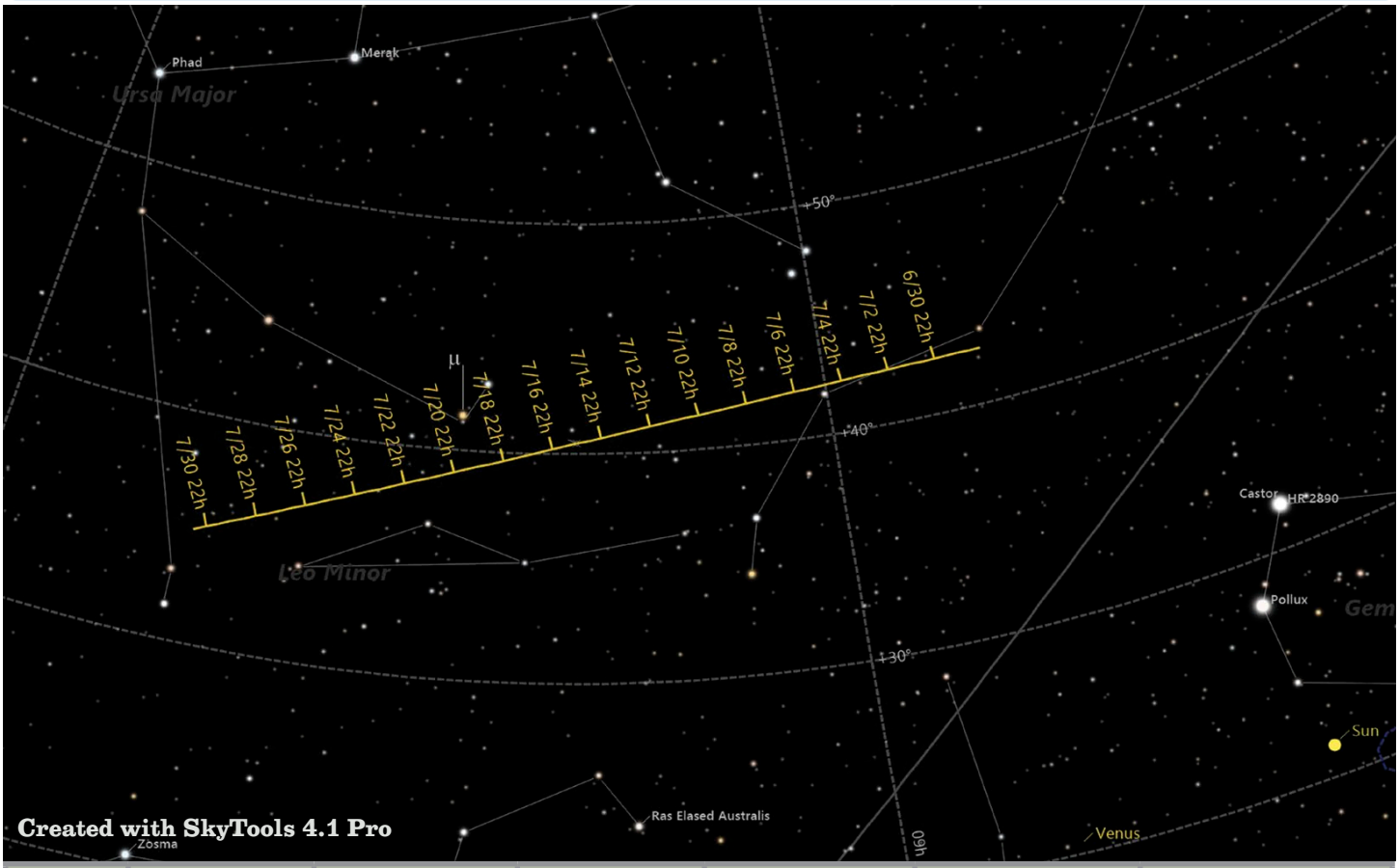
Images created with NASA Scientific Visual Studio's Moon Phase and Libration Tool.
See https://svs.gsfc.nasa.gov/5187/

Showpiece Objects in July

Some early evening objects for mid July:

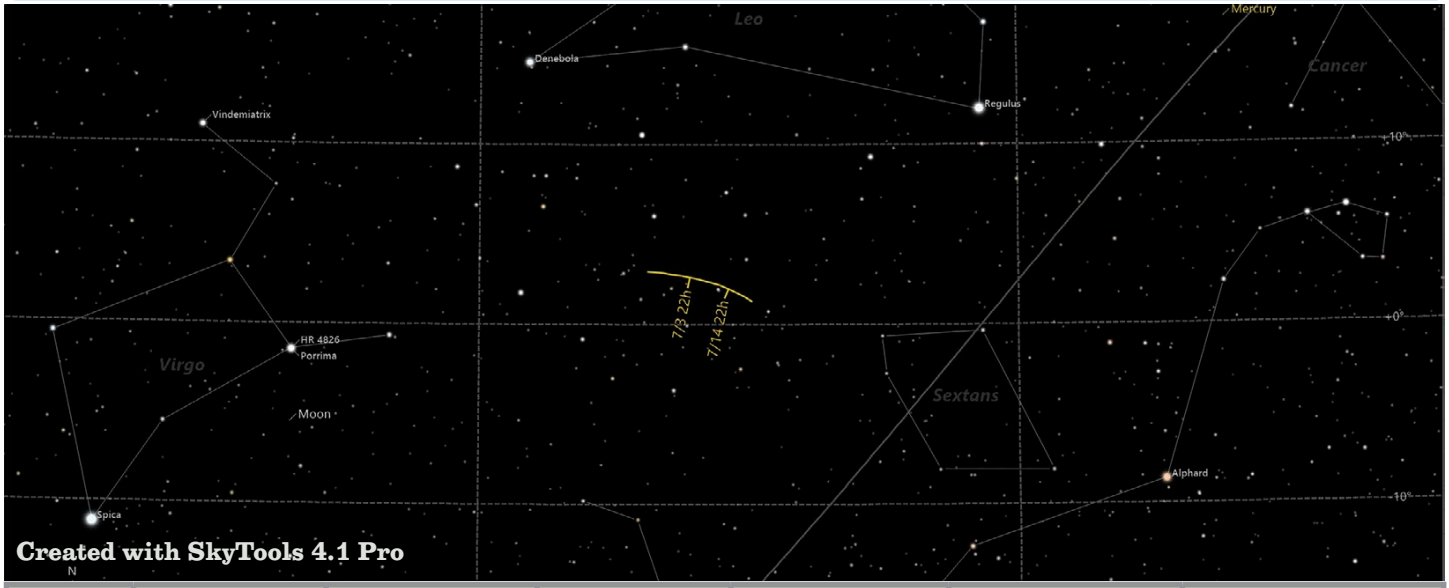
- M 5 globular cluster in Serpens, mag 5.7+
- M 3 globular cluster in Canes Venatici, mag 7.7
- M 81 "Bodes" spiral galaxy in Ursa Major, mag. 7.8+
- M 101 "Pinwheel" spiral galaxy in Ursa Major, mag 8.4+
- M 51 "Whirlpool" spiral galaxy in Ursa Major, mag 8.7
- M 82 "Cigar" irregular galaxy in Ursa Major, mag 9.0
- NGC 5053 globular cluster in Coma Berenices, mag 9.0
- M 106 spiral galaxy in Canes Venatici, mag 9.1
- M 104 "Sombrero" galaxy in Virgo, mag 9.1
- NGC 5466 globular cluster in Bootes mag 9.2
- M 63 "Sunflower" galaxy in Canes Venatici, mag 9.2
- M57 "Ring" Nebula in Lyra, mag 9.4
- NGC 5634 globular cluster in Virgo mag 9.5
- M87elliptical galaxy in Virgo mag 9.6
- M 97 "Owl" nebula in Ursa Major, mag. 9.7
- NGC 4490, "Cocoon" galaxy in Canes Venatici, mag 9.8
- M 86 "Makarian's chain of galaxies" in Virgo, mag 9.8
- NGC 2683 spiral galaxy in Lynx, mag 10
- NGC 3115, "Spindle" galaxy in Sextans, mag 10.0
- NGC 4565, "Hockey stick" galaxy in Coma Berenices, mag 10.1
- M 96 spiral galaxy in Leo, mag 10.1
- M 88 spiral galaxy in Coma Berenices, mag 10.2
- NGC 4244 "Silver Needle" galaxy in Canes Venatici, mag 10.4

Comet 13P/Olbers in July



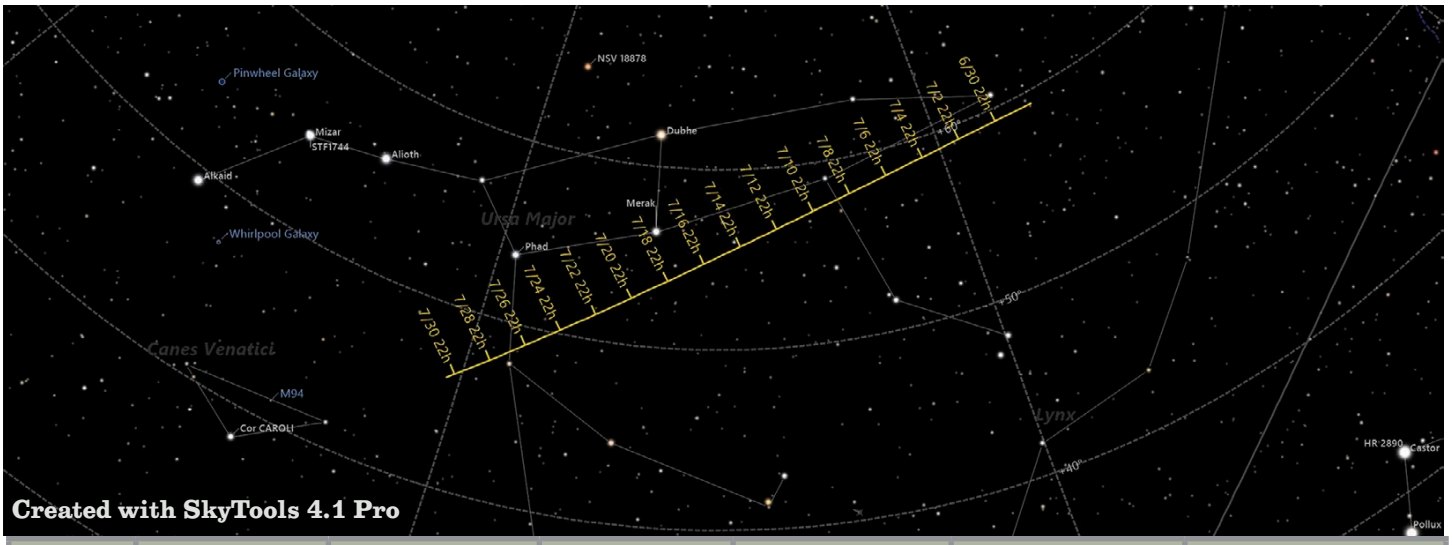
Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
July 1	10:11 pm	08h41m37.8s	+42°17'25"	Lynx	6.8	3.4
July 8	10:09 pm	09h19m55.7s	+41°41'55"	Ursa Major	6.9	3.5
July 13	10:06 pm	09h47m17.3s	+40°48'05"	Leo Minor	7.0	3.5
July 19	10:00 pm	10h19m27.0s	+39°13'07"	Leo Minor	7.1	3.5
July 25	9:55 pm	10h50m18.8s	+37°07'57"	Leo Minor	7.3	3.5
July 31	9:48 pm	11h24m07.2s	+34°10'15"	Ursa Major	7.7	3.5

Comet C/2023 A3 (Tsuchinshan-ATLAS) in July



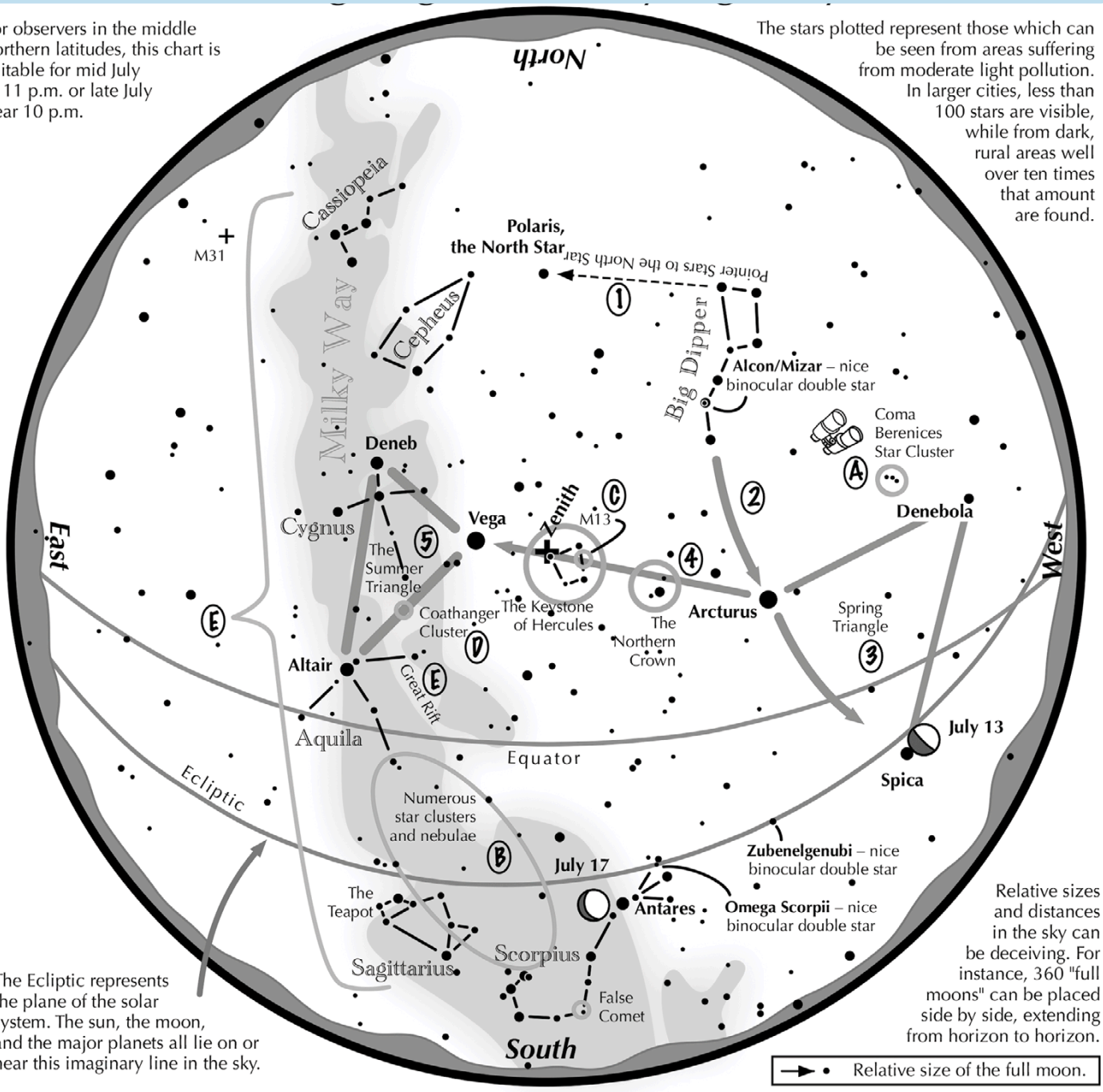
Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
July 1	10:10 pm	11h16m18.9s	+02°35'11"	Leo	9.9	2.1
July 8	10:01 pm	11h10m07.7s	+02°14'26"	Leo	9.6	2.1
July 13	9:52 pm	11h06m26.5s	+01°55'41"	Leo	9.4	2.0
July 19	9:41 pm	11h02m41.1s	+01°29'15"	Leo	9.2	2.0
July 24	9.31 pm	11h01m02.2s	+01°14'33"	Leo	9.0	2.0

Comet C/2023 V4 (Camarasa-Duszanowicz) in July



Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc min)
July 1	10:29 pm	08h44m06.0s	+59°10'48"	Ursa Major	11.3	2.9
July 8	10:27 pm	09h43m43.9s	+57°52'28"	Ursa Major	11.5	2.9
July 13	10:22 pm	10h22m43.0s	+56°01'30"	Ursa Major	11.7	2.9
July 19	10:14 pm	11h03m49.7s	+53°01'52"	Ursa Major	12.0	2.9
July 25	10:09 pm	11h38m38.0s	+49°27'50"	Ursa Major	12.2	2.8
July 31	10:00 pm	12h07m51.4s	+45°35'06"	Ursa Major	12.5	2.7

Navigating the July Night Sky by John Goss



Navigating the mid July 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 first intersects Arcturus, the brightest star in the July evening sky, then continues to Spica. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
3. To the northeast of Arcturus shines another star of similar brightness, Vega. Draw a line from Arcturus to Vega. It first meets "The
4. Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
5. High in the East lies the Summer Triangle stars of Vega, Altair, and Deneb.

Binocular Highlights

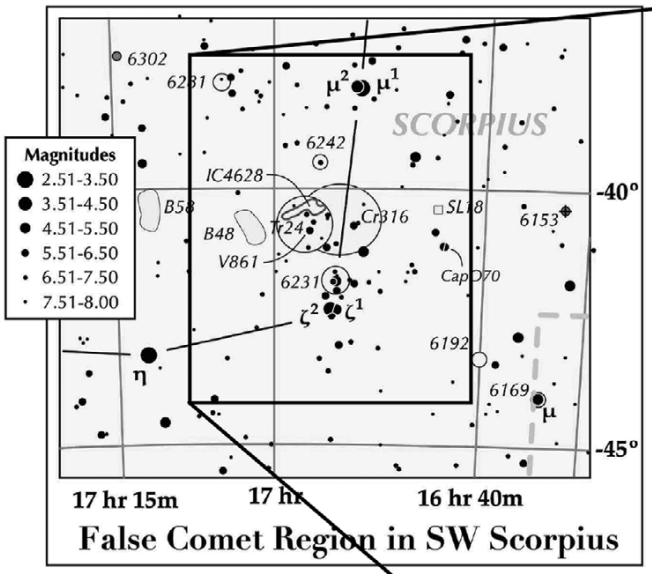
A: Between Denebola and the tip of the Big Dipper's handle, lie the stars of the Coma Berenices Star Cluster.
B: Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
C: On the western side of the Keystone glows the Great Hercules Cluster, containing nearly 1 million stars.
D: 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
E: Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.

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

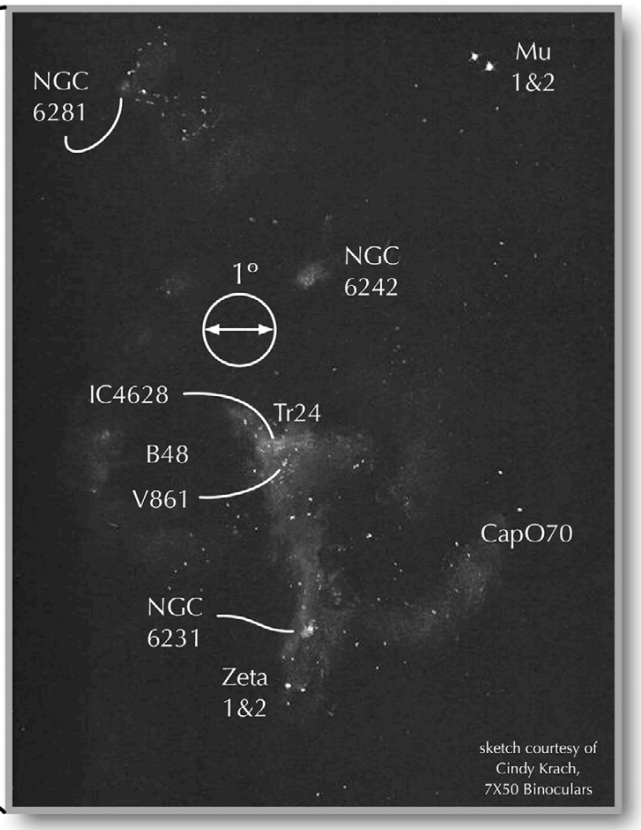
Often ignored because of its southerly declination, this is a great region for binocular observers and telescope users!

False Comet, a closer look

Take your time and explore what this area offers: Open clusters, double stars, variable stars, dark nebulae, emission nebula, & planetary nebulae.



False Comet Region in SW Scorpius



Features to Identify

- Zeta 1 & 2, and Mu 1 & 2, binocular double stars.
- NGC 6231 (Caldwell 76), open cluster.
- Trumpler 24: open cluster, 8.6 mag., 60'
- Collinder 316: Large open cluster.
- B 48 & B 58: dark nebulae
- NGC 6242: open cluster, 6.5 mag., 40'
- NGC 6281: open cluster, 5.4 mag., 8'
- NGC 6302: planetary nebula, "Bug," 9.2 mag., 50".
- V861: eclipsing binary with period of 7.85 days, 6.1 to 6.4 mag.
- IC 4628: emission nebula, the "Prawn."
- CapO70: binocular double star, 6.1 & 6.2 mag., 97" sep.

A great region for binoculars!

- 7x50 and 10x50 work nicely.
- Best when mounted on a tripod for steady viewing.
- Best to have high contrast, dark skies.

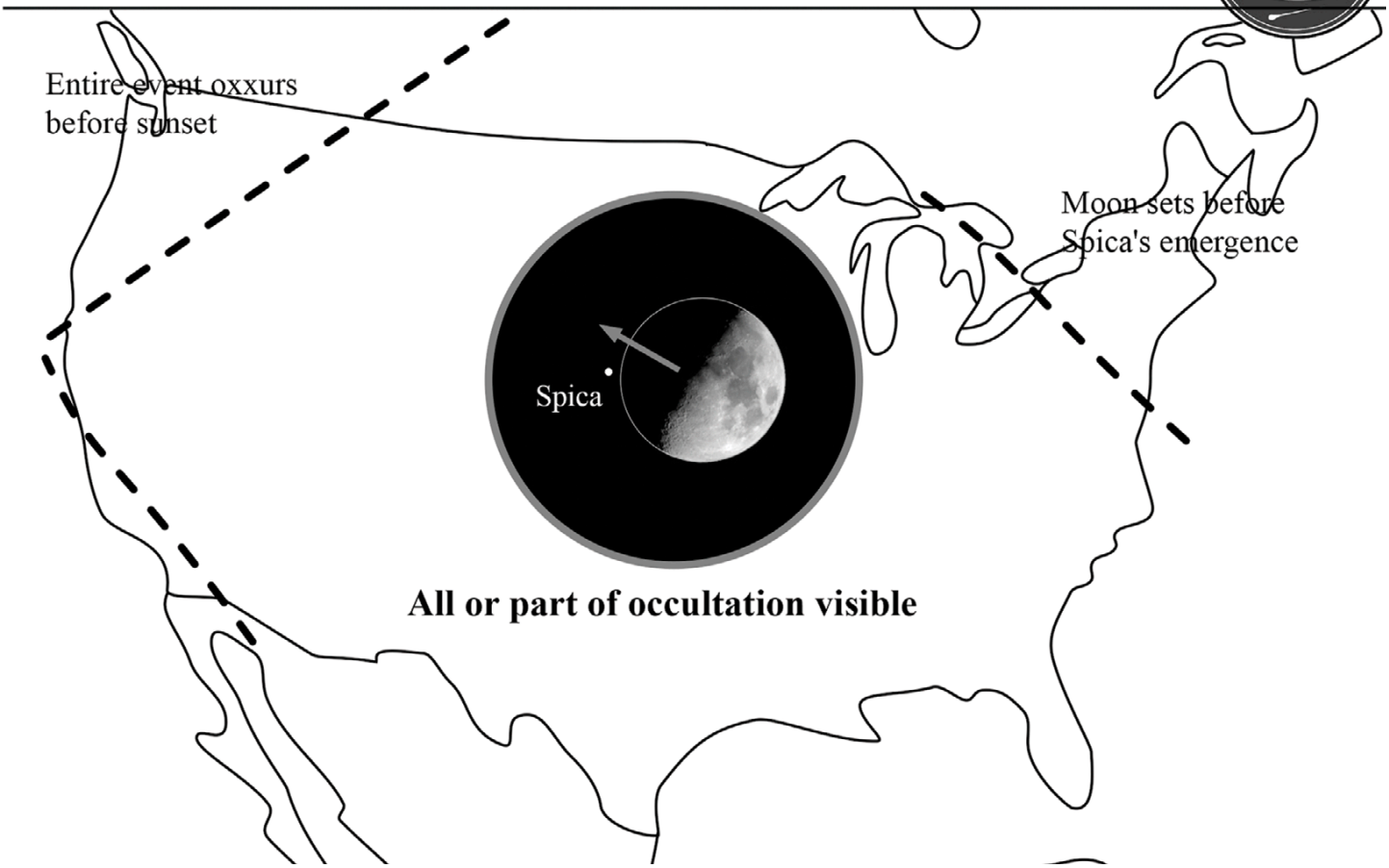
See more detail:

- Use a high contrast or deep sky nebula filter.
- Don't forget to try high magnification, >200.

Try your hand at sketching: Lay down the bright stars first to set relative distances, lightly outline bright nebula next, then fill in cluster stars and dimmer field stars. Add shading. Note dark areas. The more you look, the more you see!

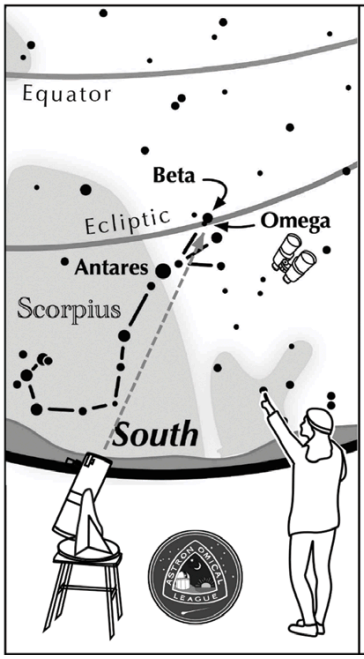
2406

If you can see only one celestial event this month, see this one. The first quarter moon occults Spica on July 13.



Occultation of Spica by the first quarter moon is at 8:48 pm for those us in the Denver area.

ASTRONOMICAL LEAGUE Double Star Challenge

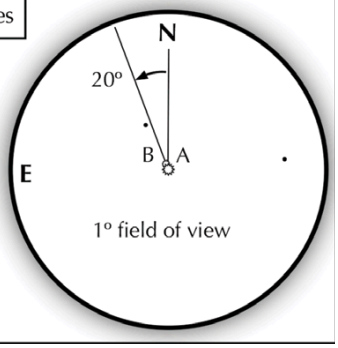


Other Suns: Beta Scorpii

How to find Beta Scorpii on a July evening

Find the bright red star Antares low in the south. To its west shine three stars representing the claws of Scorpius. The northern star is Beta Scorpii. Immediately below Beta lies Omega, a very wide optical double star, easily separated in binoculars.

Suggested magnification: >40x
Suggested aperture: >3 inches



Beta Scorpii
A-B separation: 14 sec
A magnitude: 2.6
B magnitude: 4.5
Position Angle: 20°
A & B colors: white & blue

June 20 LAS Meeting Notes by Eileen Hall-McKim

I. Introduction

The June 2024 LAS monthly meeting was held in-person and by zoom on June 20th at the Longmont Lutheran Church, 803 Third Ave. President Vern Raben began the meeting with self-introductions of members attending in person and those on zoom. Twenty members attended in-person, 13 attended on-line by zoom.

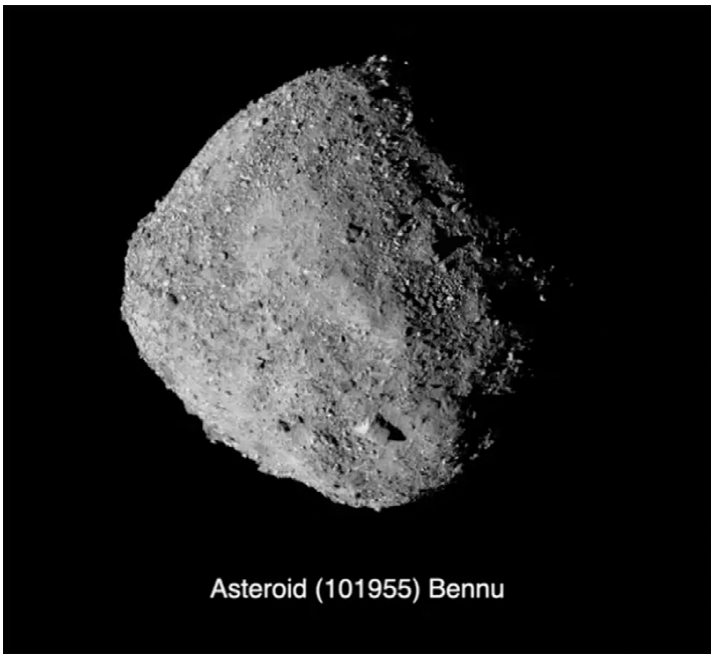
II. Main Presentation

Our guest speaker for the June meeting was Dr. Vicky Hamilton, an Institute Scientist at Southwest Research Institute (SwRI) in Boulder, Colorado. She received her Ph.D. from Arizona State University and her A.B. from Occidental College. She is a geologist specializing in laboratory spectroscopy of minerals, meteorites, and returned samples, and infrared remote sensing of planetary surfaces to determine composition and physical properties. She has been a science team Co-Investigator and Deputy Instrument Scientist/Principal Investigator on five NASA planetary science missions to Mars and asteroids. She is also the Chair of the Mars Exploration Program Analysis Group (MEPAG), a research community-based, interdisciplinary forum providing the science input needed to plan and prioritize NASA's Mars exploration activities.

NASA's OSIRIS REx Mission: Early Results from Asteroid Sample Analysis By Dr. Vicky Hamilton

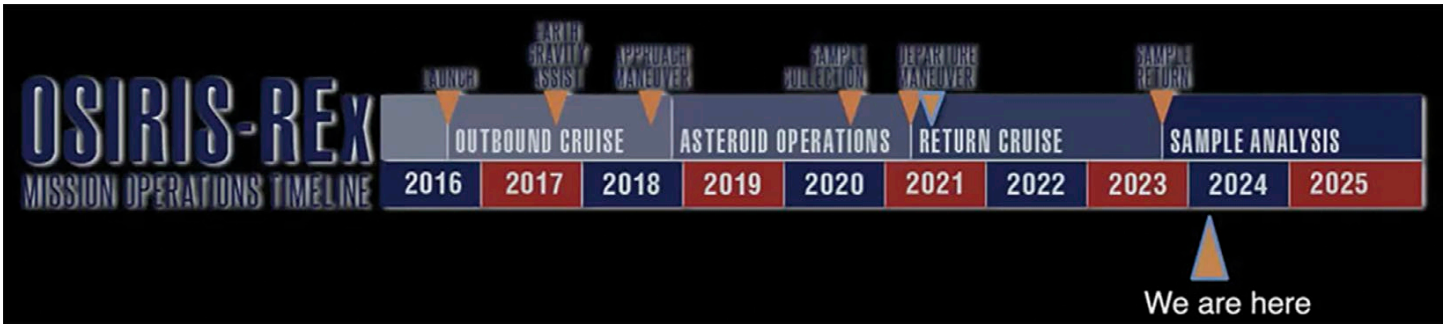
The primary objective of NASA's Origins-Spectral Interpretation-Resource Identification-Security-Regolith Explorer (OSIRIS-REx) mission is to explore and return a pristine sample from the asteroid Bennu to help scientists understand the origin and evolution of our solar system and, ultimately, how life began.

- After arriving at Bennu in 2018, the spacecraft gathered data to understand the asteroid and select a sampling site. A sample was collected successfully in October 2020 and OSIRIS-REx began its return to Earth in May 2021.
- In September 2023, the sample was successfully returned to Earth and the mission science team has begun analyses of this incredible sample and this presentation describes the early results. These early measurements we will talk about were only first presented to the scientific community in March 2024 – so this is hot off the press!



OSIRIS-REx is an acronym for Origins, Spectral Interpretation, Resource Identification, Security – Regolith Explorer

Our origins - how did we get here? What happened in the solar system to produce us? Perhaps we can learn more of this by bringing back a piece of a meteorite to study. Rocks on Earth have been modified since they were formed and the Earth did not form at the early stage of our solar system, but asteroids did. Primitive asteroids are time capsules that contain the best record of what was happening in our Solar System as the Sun was forming 4.567 billion years ago. Spectral interpretation is used to identify what resources they are made of. Security refers to the fact that we are visiting an asteroid that is a NEA (Near Earth Asteroid), PHA (Potentially Hazardous Asteroid) – orbit crosses the path of the Earth for analyses of Regolith (unconsolidated layer of loose rock on surface).



Mission Operations Timeline (2016-2025)

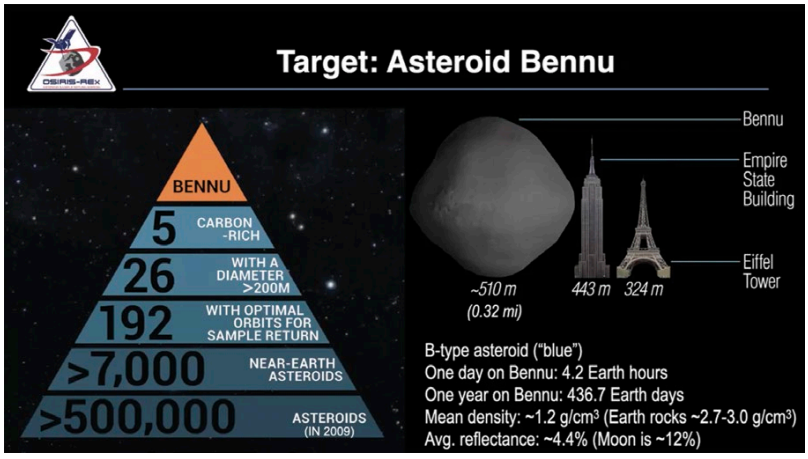
OSIRIS-REx mission key science objectives, over a nearly 10-year mission

- Return and analyze a sample of pristine, carbonaceous, early Solar System material from Bennu's surface – requirement for 60 g (~30 sugar packets), plus collect surface particles on 24 contact pads
- Map the asteroids' composition and geology to contextualize sample brought home
- Measure the factors that change potentially hazardous asteroid orbits over time
- Compare observations at the asteroid to ground-based telescopic observations

Our target Material: A Carbonaceous Chondrite

- A type of carbon-bearing, stony meteorite whose parent body (an asteroid) was never melted, stony meteorites; no metal, not heavy
- Formed in the solar nebula by sedimentary processes and contain chondrules (solidified droplets of silicate magna)
- The most primitive meteorites, although some have been altered by water and/or heat and come from a number of different asteroids
- Variously comprised of silicate (Si-O), oxide (o), carbonate (C-O), and sulfide (S) minerals plus organic compounds (C-, N-, H-bearing chemistry)
- Up to 22% by weight of water in some types, an interesting factor since we are still trying to fully understand where Earth's water came from
- Olivine (Silicate), Serpentine (Silicate), Magnetite (Oxide), Pyrite (Sulfide)

Why aren't meteorites good enough to analyze? Does not supply context of where it came from, can measure water, etc. but do not know what asteroid it came from.



How we chose asteroid Bennu and the OSIRIS-REx Science instruments

Proposed in 2009, at the time 500,000 known asteroids to choose from.

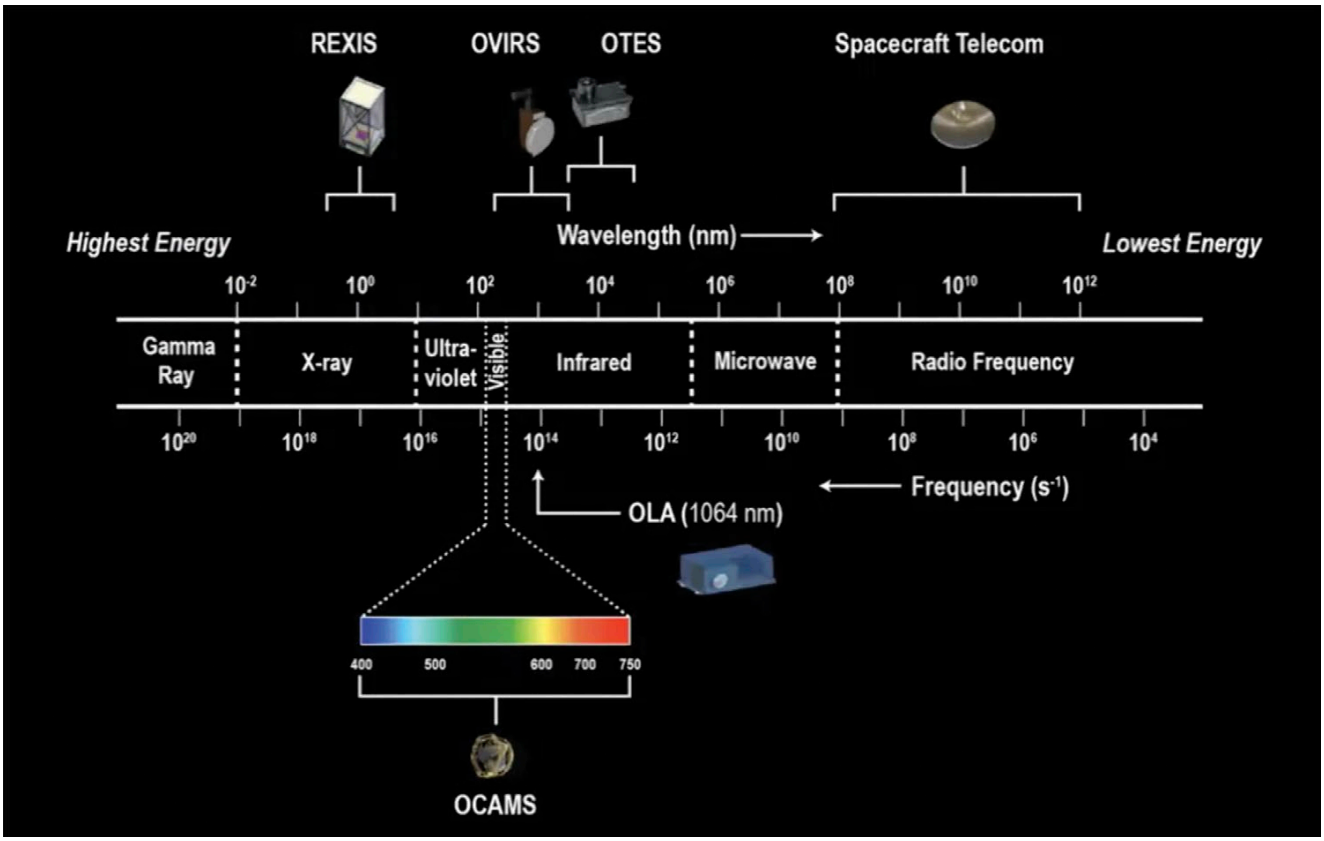
Must be close for transport of fuel, have to be able to retrieve and bring back – 7,000 nearby;

Need optimal orbital trajectory – 192.

Next needed to operate a space craft around the object, need to be >200 meters around – now 26,

Wanted carbonaceous chondrite bodies – only 5, chose Bennu.

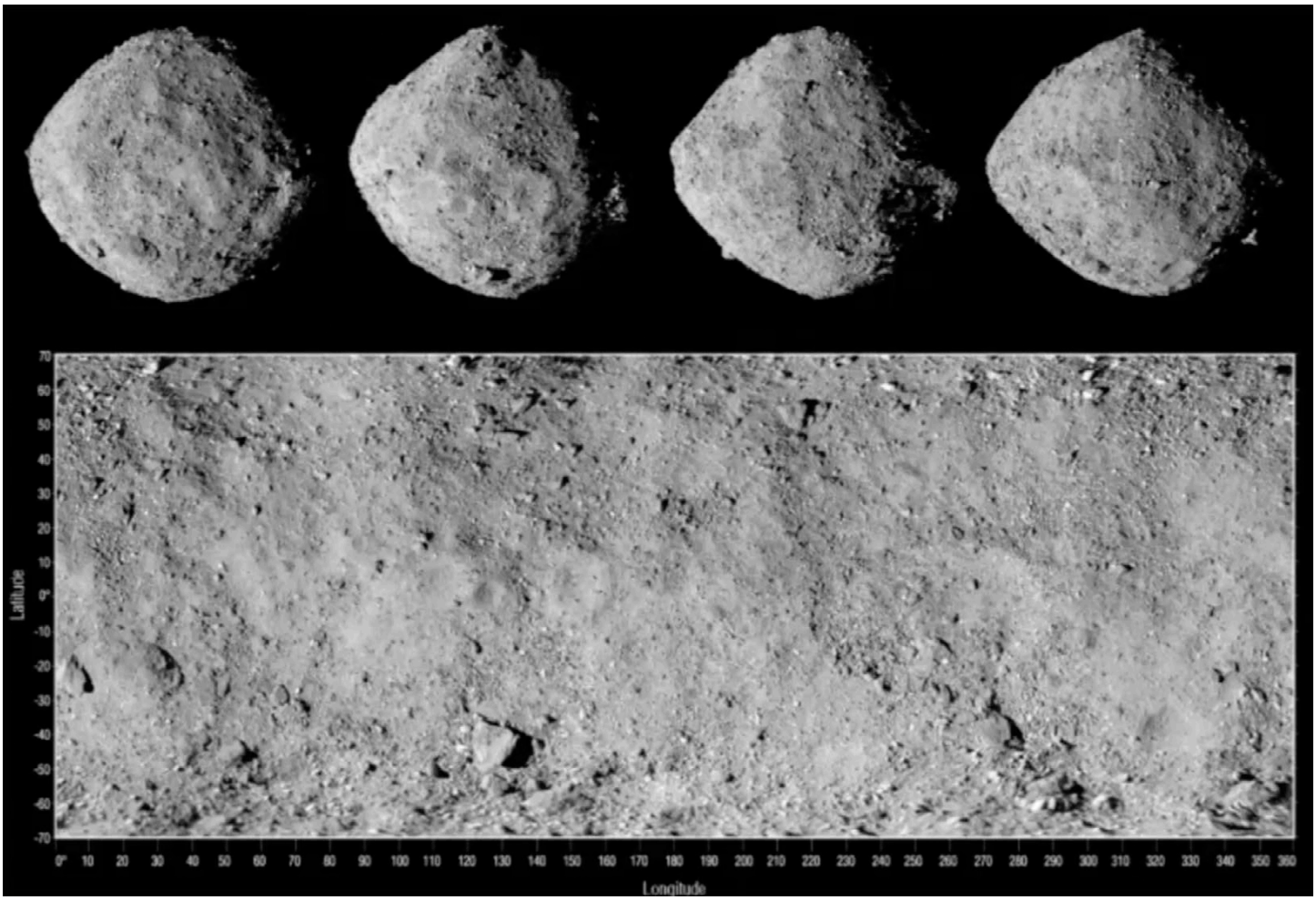
- Japan chose to explore another one of the 5, and also returned samples and turned out to look very similar, an interesting result
- B-type asteroid ("blue") – visible slope is blue
- ~ 510 m (0.32 mi)
- One day on Bennu: 4.2 Earth hours
- One year on Bennu: 436.7 Earth Days
- Mean density: ~1.2g/cm3 (Earth rocks ~2.7-3.0 g/cm3)
- Density of ice: 1 gm/cm3 – mean density more like ice than Earth rocks
- Avg. Reflectance: ~4.4% (Moon is ~12%) this means of all the light that shines on it only 4% is reflected back, so is darker than charcoal briquette, absolutely black



The OSIRIS REx Science Instruments - based on electromagnetic spectrum

Now we have picked out asteroid, we know where it is, we know how big it is, and what we want to do, so what instruments will we carry?

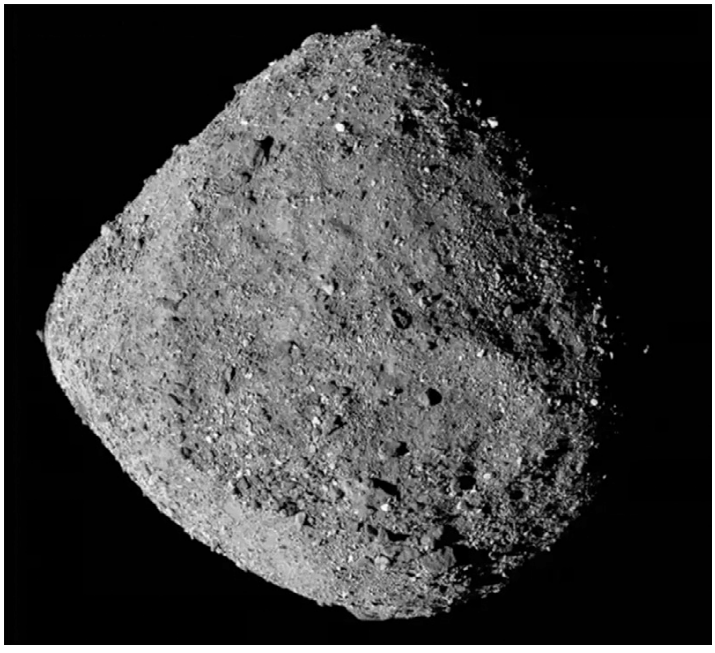
- REXIS – Student investigation uses x-ray spectroscopy of asteroid to look at chemistry
- OCAMS – Visible spectrum – only part our eyes are sensitive too, expands out to rainbow. The reason our eyes have developed to see at these wavelengths is these are peak wavelengths in which our Sun remits energy so our eyes are attuned to see in this color range. Suite of cameras gave us first long distance telescopic views of the asteroid, map geology, look at surface as we were collecting samples
- OVIRS and OTES – Visible/infrared and thermal emission spectrometers for mineralogy, not just the chemistry but the arrangement of chemicals, used for mapping mineralogy
- OLA –Laser Altimeter, first flew to Mars, makes topographic maps of surfaces
- Spacecraft Telecom – Long wavelengths, radio frequencies, doppler shifts in radio signal can detect small gravitational forces and distribution of mass inside the asteroid



Arrival – December 3, 2018

Unusual looking, doesn't look like Mars or Moon. Lots of big boulders, some very large. Faint circular impact crater, degraded – no longer see rim or ejecta, tells us its very old, at least a billion years. Fact that it is a large crater also tells us its very old, as sizes of asteroids have decreased over time, due to multiple collisions. This also tells us this is a second generation asteroid, part of a larger asteroid formed in a collision, but still retains the 4.5 billion yr record.

Very rocky, boulder covered. Bright rocks and dark rocks, not expected to find. Earlier data from space telescope predicted surface covered by 2 cm particles, not what we saw, our entire mission had been based around these size particles to retrieve, had to revise planning entirely.



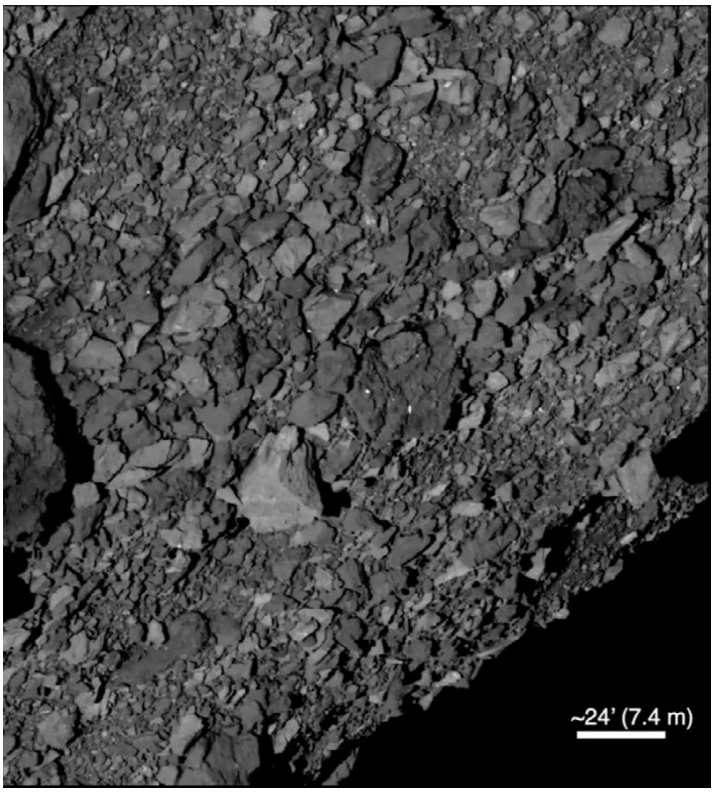
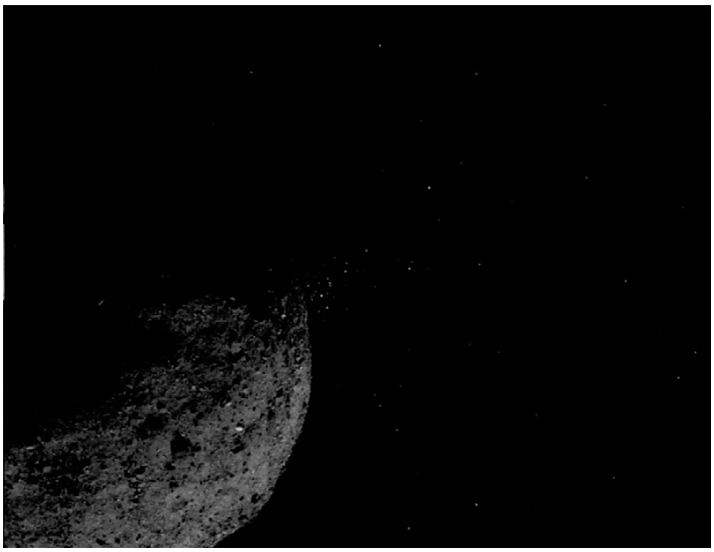
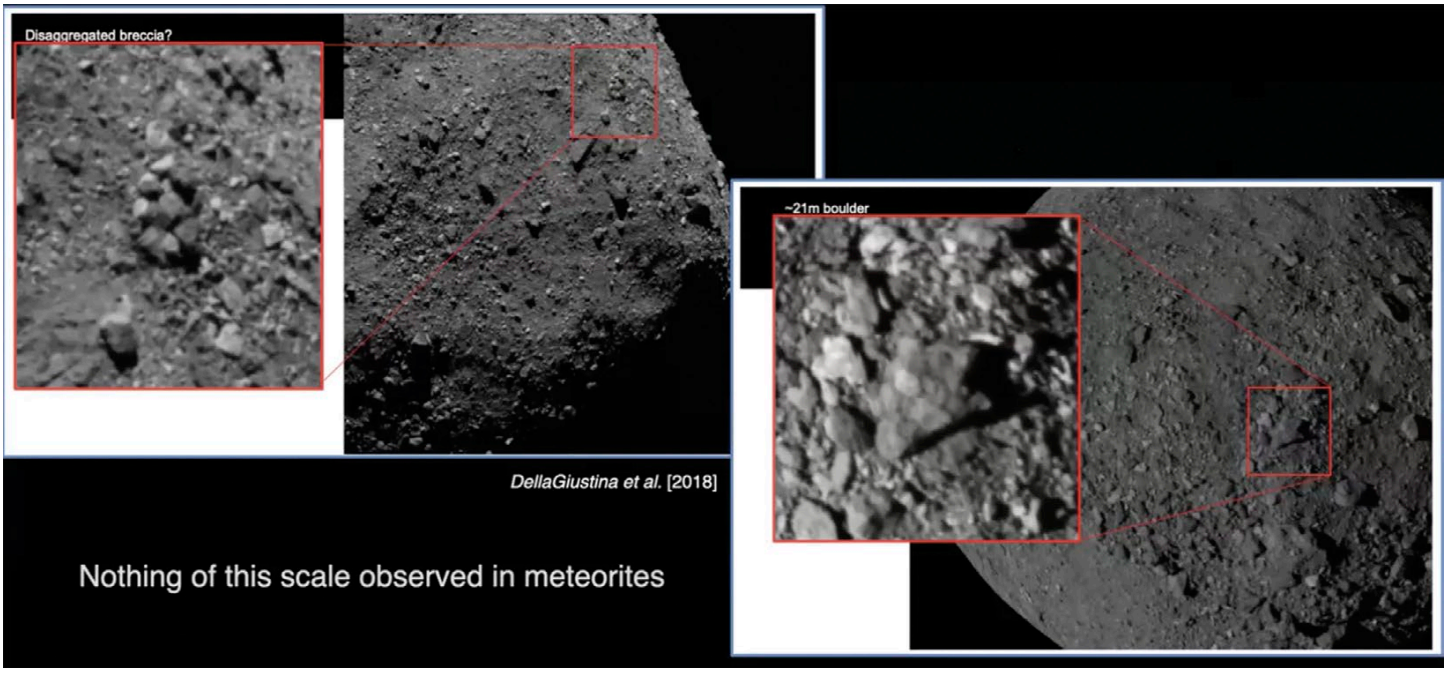


Image of massive amount of very large rocks on surface

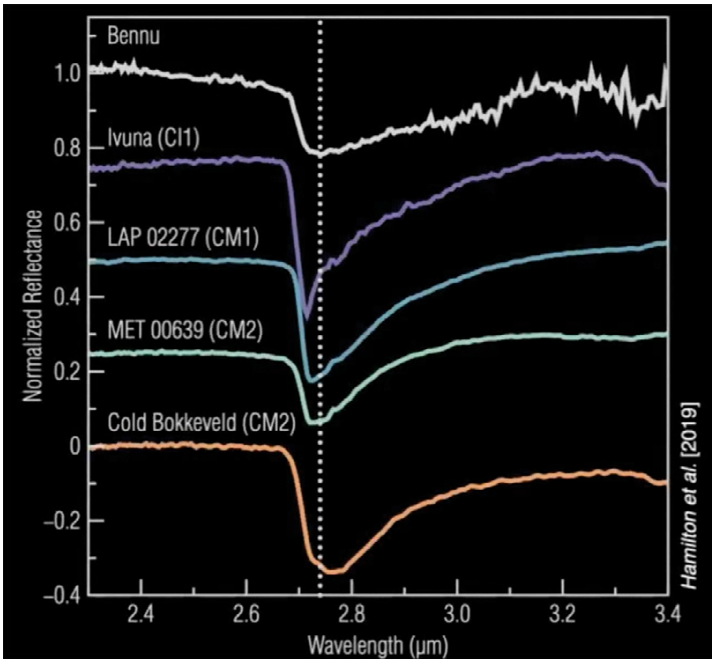


Looking at limb of asteroid, small white specs, first thought to be stars in background later realized minerals from surface, possibly getting hot rotating, then cold, could be a freeze-thaw process, may pop and eject, they then fall back, do not escape, process never seen before



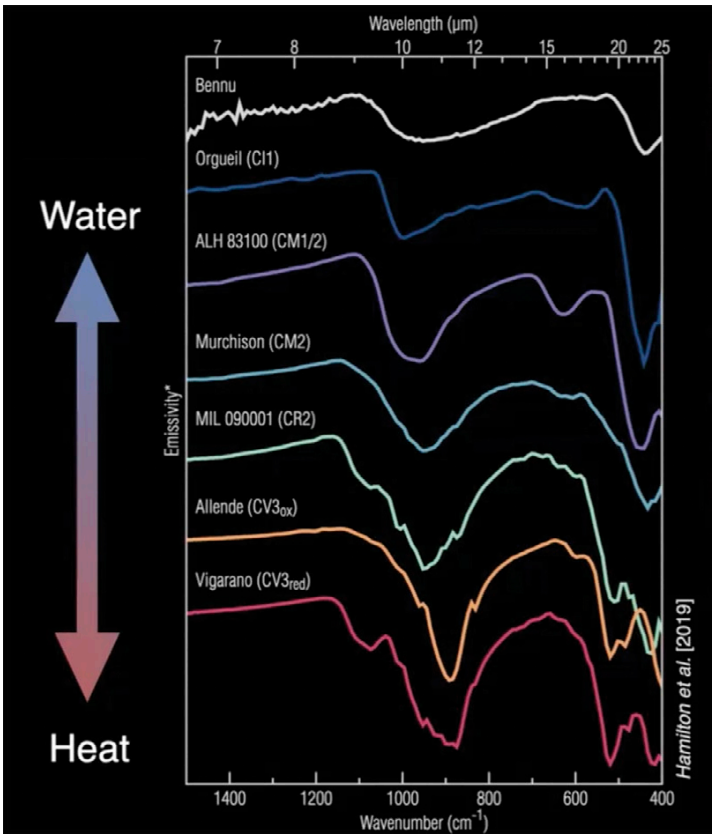
Discoveries: Brecciated Rocks, DellaGiustina et al. (2018)

Brecciated Rocks – broken angular segments of rocks accumulate together, possibly cemented by finer minerals. Images on left shows aggregate together, right images cluster has become disaggregated. Nothing of this scale observed in meteorites.



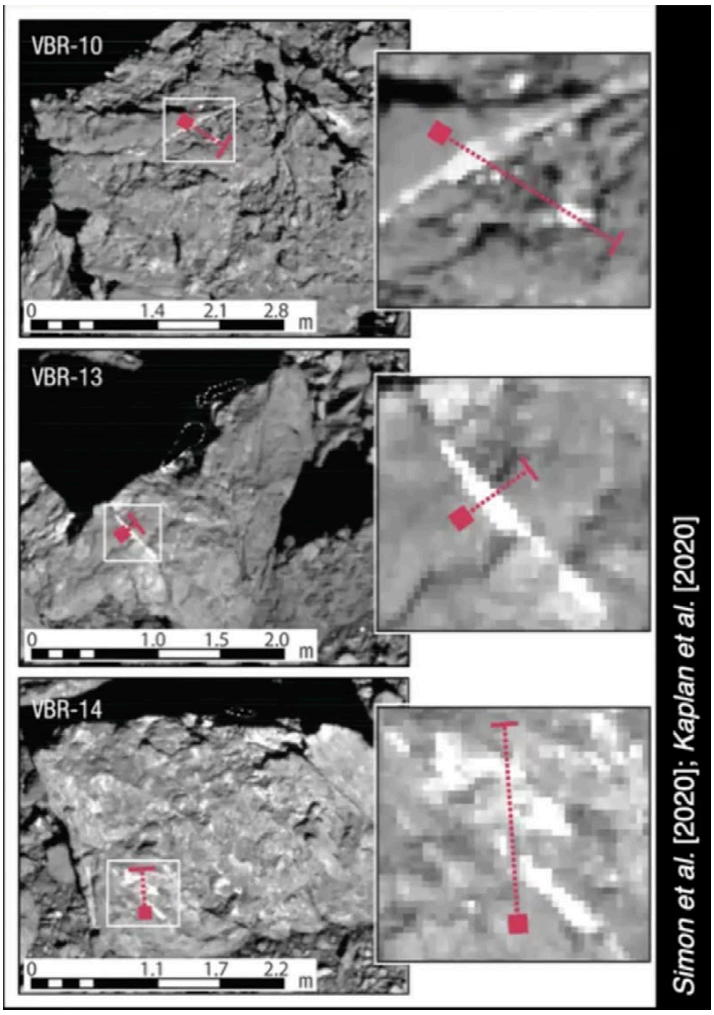
Water-Bearing Minerals I

- Water (H2O) and hydroxyl (OH-) are contained in minerals called phyllosilicates (phyllo=sheet): also called "clay" minerals
- They're identified, in part, by a "3-μm band" in the near infrared, water in minerals creates absorption band (dotted line) tells us were the water is bound in the mineral
- The exact wavelength of the band center tells us about the chemistry of the minerals holding the water



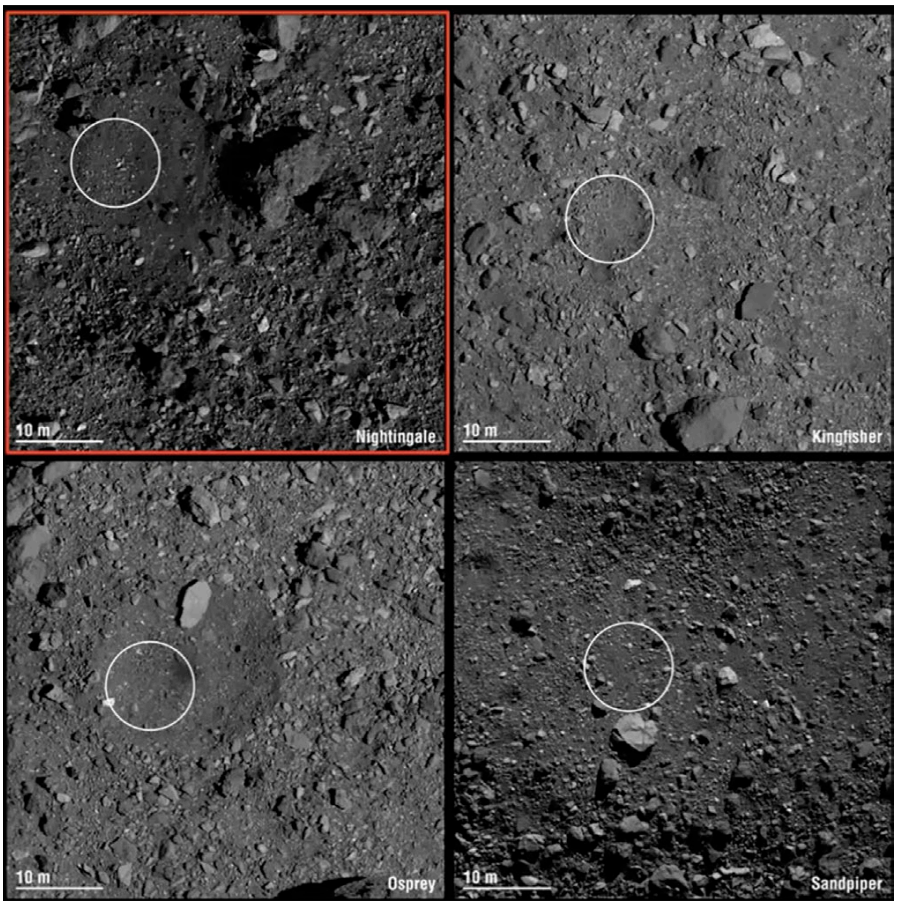
Water-Bearing Minerals II

- The spectrum of Bennu continues into the thermal infrared
- The spectra of meteorites change with the minerals that are present
- Compare Bennu to different kind of meteorites that experienced different geological histories and contain different minerals
- Ones at top of graph have had interactions with water, the ones at bottom heated up, and that changes their mineral composition
- Bennu is most similar to the water-altered meteorites and looks like it is made of >80% water-bearing minerals and <10% anhydrous minerals (no water), this is a prediction made prior to return sample findings



Discoveries: Evidence of Water Circulation

- Carbonate minerals signatures associated with cm-thick, m-long, bright features in boulders, white streaks, interpreted to be veins of carbonate, precipitated after water flowed through cracks/voids in the rocks
- Scale of fluid flow over 10s of meters, maybe even kilometers
- Unlike anything seen in meteorites, entirely unexpected
- Other carbon-bearing compounds found



Sample Site Selection

- How to select site to sample when surface is so rocky?
- Unexpected rugged surface left few options
- Original target ellipse was ~50 m diameter, had to reduce to ~10 meters
- Of four sites, Nightingale (top left) primary site (Hokioi Crater) chosen in spite of scary looking large boulder just to the right, for variety of reasons seemed best site

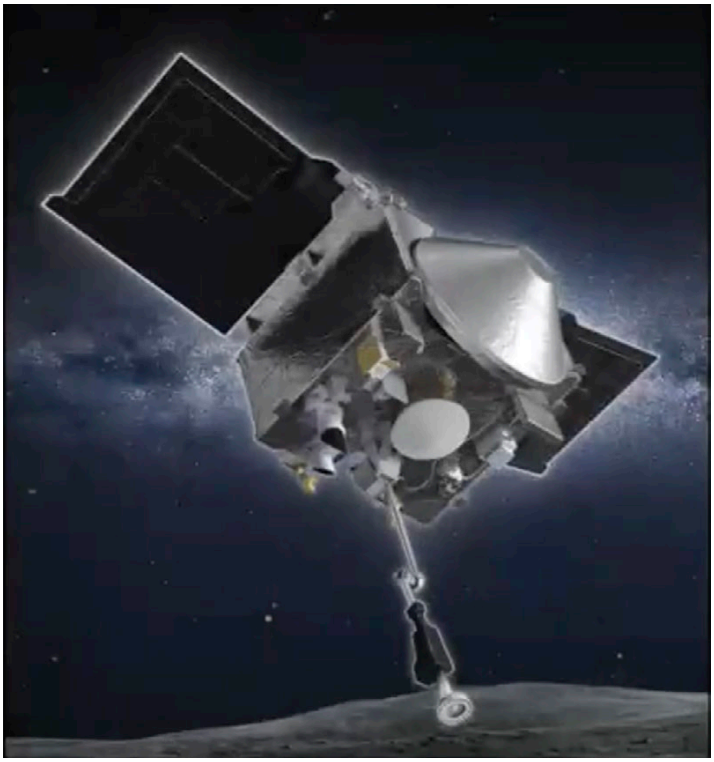
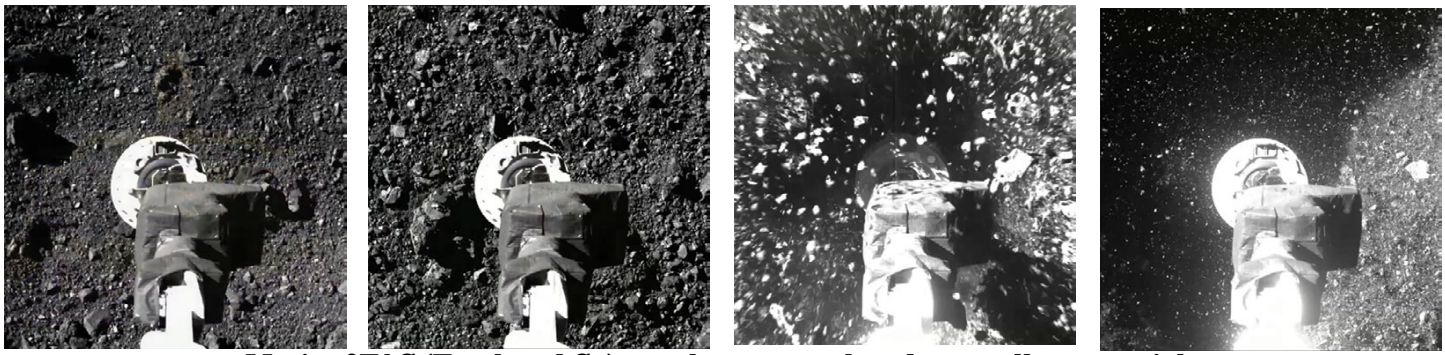


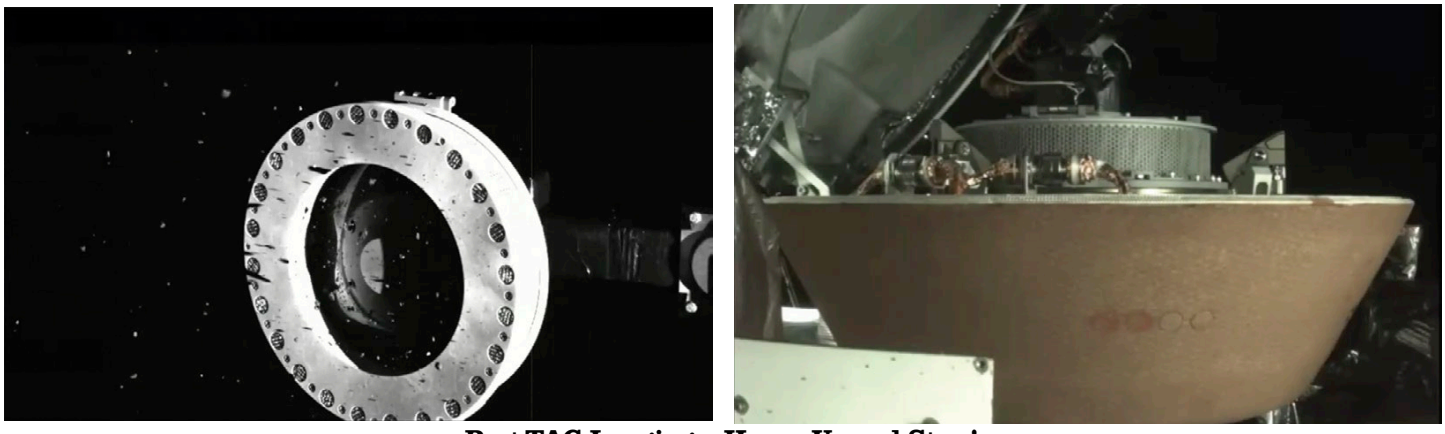
Image of OSIRIS REx Craft

Touch and Go Sample Acquisition Mechanism (TAGSAM)

- Sampling head touching
- Solar panels on ends
- End of arm – sampling head
- Nitrogen gas injected, disrupts surface, causes material to come up into sample head
- Little flaps made of mylar open and close to collect material
- Did not land on asteroid, only needed to "kiss" surface



Movie of TAG (Touch and Go) sampler arm touch and go to collect materials



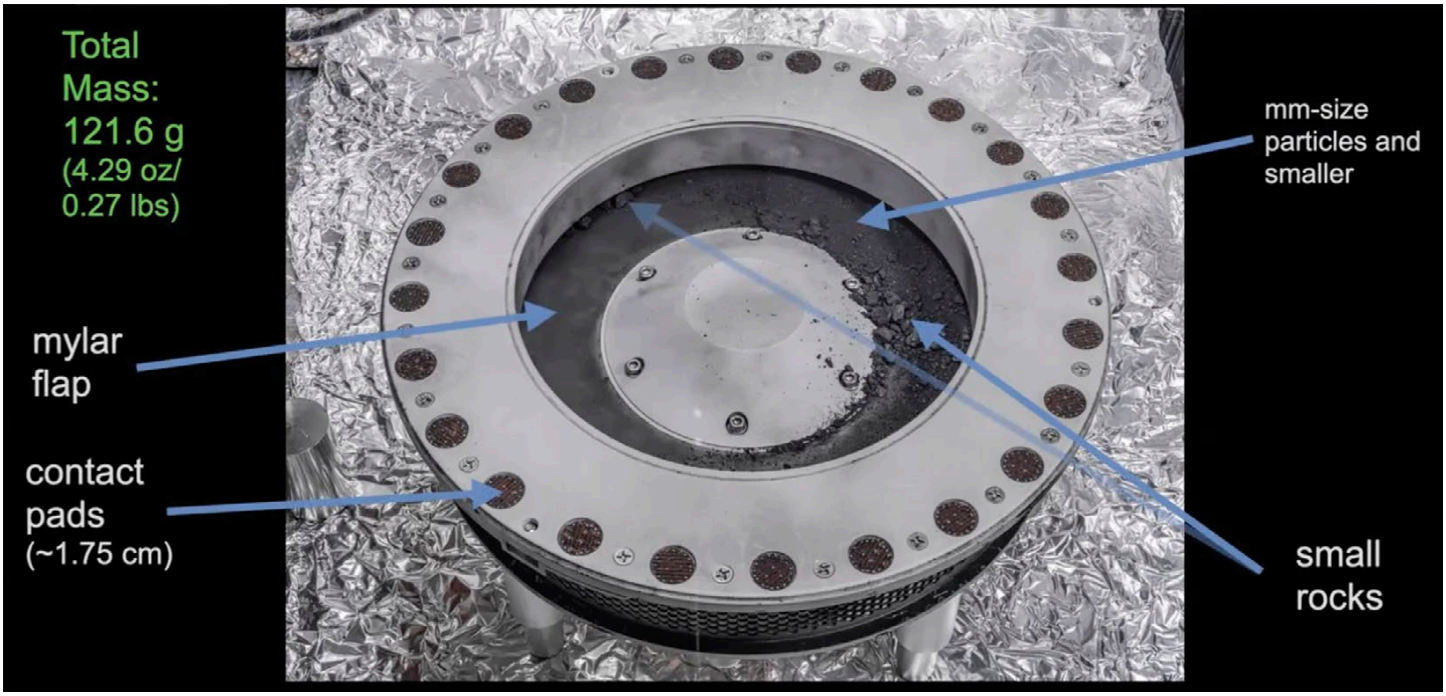
Post-TAG Imaging – Hurry Up and Stow!

- Camera systems allowed us to look at the sampling head afterwards to see if all OK, see large circular pads, designed to collect things, can see something flying away from craft. Realized the mylar flap was being held open by a large stone and we are losing samples!
- Ended up skipping other measurements we were going to make, that could compromise what we had collected. Immediately got permission from NASA to stow head and close up. Arm put sample head into container, arm unfolds and gets out of the way, close lid, prepare to start back on a 2-yr journey home.

Good-bye Bennu – Return Journey

- OSIRIS-REx left Bennu on 10 May 2021
- Sample Return Capsule landed at the Utah Test and Training Range in late September 2023. Series of images of capsule coming in are artists concept. The image with parachute landing was a previous test drop to be sure would work properly, the image on right of black capsule contains actual sample capsule after a perfect landing
- Immediately taken to Johnson Space Center to highly trained curators for opening, examination, allocation of samples to team and international science community, and storage for future generations to study with scientific instruments that we can't even imagine yet

Science highlights from the mission



Hello Sample!

- Had mission requirement to bring back 60 g of material; ended up with total mass return of 121.6 g (4.29 oz/0.27 lbs) – so exceeded expectations
- Arrows show mylar flap, contact pads, mm-size particles and smaller, and small rocks so knew we got a diversity of particles from the surface

Predictions for the Returned Sample Characteristics – Observable Characteristics of Bennu

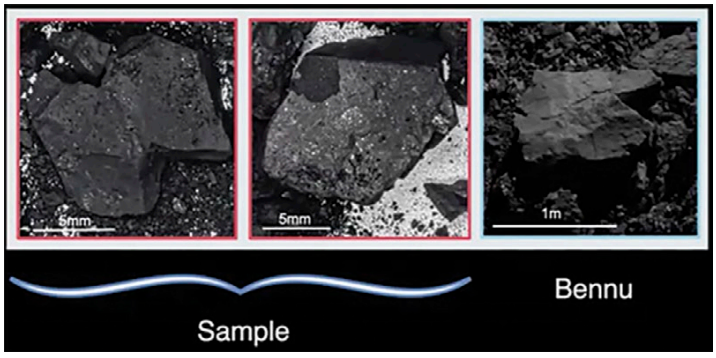
Size range from sub-micron to 3 cm (largest particle is 3.5 cm)

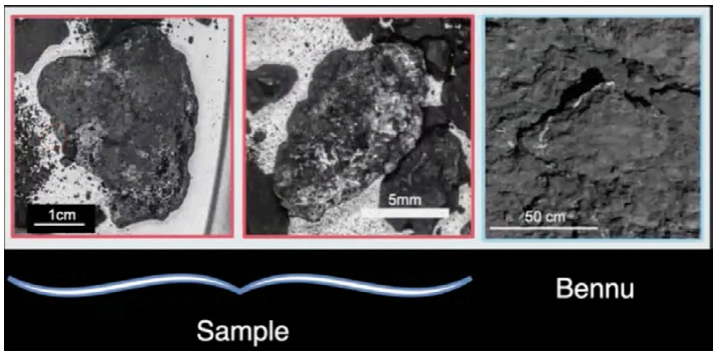
Expected Mineralogy and Chemistry:

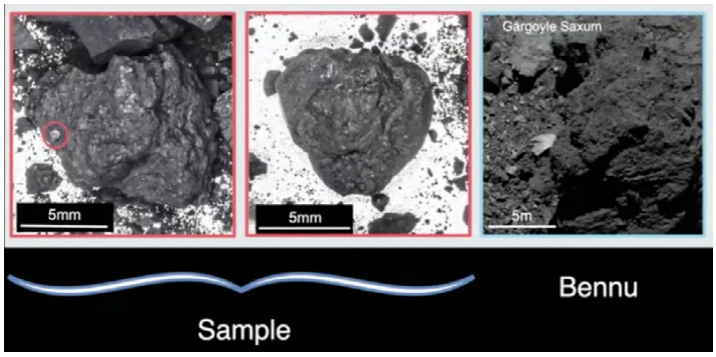
- Abundant hydrated phyllosilicates
- Carbonates
- Magnetite
- Sulfides (not spectrally active- inferred from analog meteorites)
- Organic compounds - Expected rock types ("lithologies")
- Two textures (+) and similar to type-1 Cl and CM chondrites
- Low density and porosity
- Non-chondritic and igneous in nature, like HED meteorites
- Some with properties distinct from known meteorites
- cm-scale carbonates
- Ejected cm-scale platy particles

Observable Characteristic Lead to Hypotheses

Testable Scientific Hypotheses – There were many testable scientific hypotheses that were developed from analyses of data from the OSIRES REx mission, we will look closer at three:

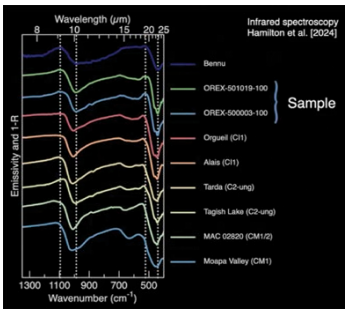


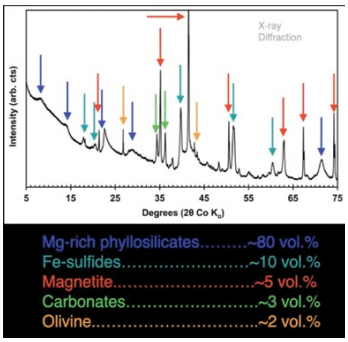




1. Remotes sensing of Bennu accurately characterized its mineral, chemical, & physical properties – using X-ray Diffraction

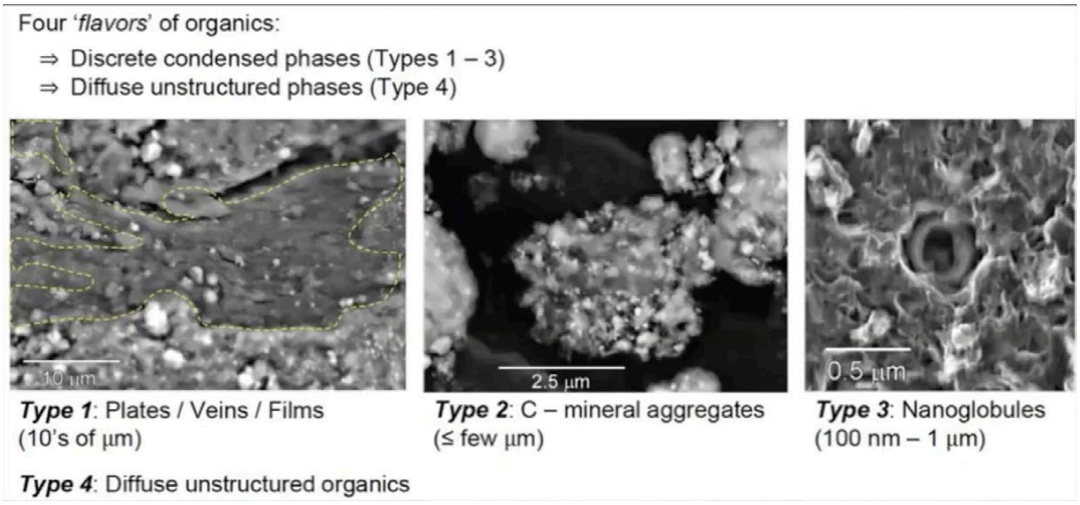
- Two types of rocks based on brightness and textures – may have the same composition…or not
- Rock compositions dominated by hydrous minerals (phyllosilicates) with carbonate, magnetite, less than ~10 vol% anhydrous silicate (olivine)
- Compared to two samples rocks in Houston; on left Bennu boulder, very hard to tell apart; main difference is huge scale differences 5mm – 5m; Again when comparing sample rock with little white patches to that of Bennu, maybe carbonates in veins
- Infrared spectroscopy determined did have >10% anhydrous
- X-Ray diffraction – group of peaks tell what minerals are there and how much – silicates 80% of rock





2. Bennu contains prebiotic organic compounds

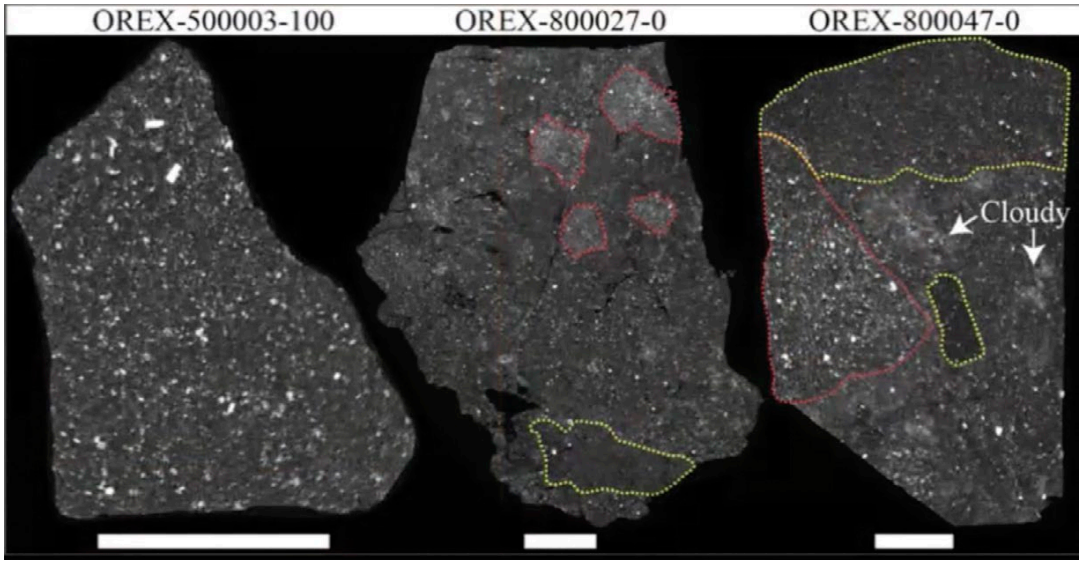
- Spectroscopy at Bennu detected carbon-bearing compounds
- Four types identified
- Very tiny scale – white bar .10μm – 0.5 μm (10's of μm – 1 μm)



Scanning Electron Microscopy Lauretta et al.(2023)

3. Geological activity occurred in the interior of Bennu's parent asteroid early in solar system history

- Using scanning electron microscopy; boulders on Bennu contain "breccias" (rock consisting of angular fragments cemented together)
- Using CT scanner we can look at slices through the rock, can see inside rock without having to break it open; can make a model and see in 3D what inside looks like, can start to see the interior of particle



McCoy et al. (2024)

Full Views CT Model of exterior plus views of layers

What early measurements have revealed – all very current research released March, 2024

How Does Sample Compare to Predictions?

+ Size range from sub-micron to 3 cm (largest particle is 5.5 cm)

Expected Mineralogy and Chemistry:

+ Abundant hydrated phyllosilicates
+ Carbonates
+ Magnetite
+ Sulfides (not spirally active – inferred from analog meteorites)
+ Organic compounds

Expected Rock Types (lithologies)

+ Two textures (+) and similar to type-1 Cl and CM chondrites
+ Low density and porosity
X Non-chondritic and igneous in nature, like HED meteorites Not Identified (yet)
+ Some with properties distinct from known meteorites
X cm-scale carbonates Not Identified (yet)
? Ejected cm-scale platy particles Search ongoing

Summary: Bennu samples are in fact hydrated, organic-rich remnants from our early solar system – we got what we went there to get! NASA's OSIRIS-REx mission successfully collected and delivered the first U.S. sample of a near-Earth asteroid, and much was learned about the asteroid Bennu. The spacecraft still going, can fly for probably another decade, so it will be used for a new mission Apophis Explorer (OSIRIS-APEX) to study Apophis (NEA) (PHA), an asteroid that will have a very close encounter with the Earth in 2029. Invite you all to follow along on social media. We are producing science all the time. We have a new paper coming out, the first scientific paper being published in about a week, and then another wave of papers being published in the weeks following. This is all ongoing research. These samples will continue to get analyzed by our science team and continue to get allocated to scientist around the world, so people will really start digging into these samples and figuring out what they have to tell us.

Members questions and comments followed:

How much fuel was on board, was there any worry of not enough for doing all the operations? Expected and found lots of evidence of hydrated minerals on asteroid, and also evidence of liquid water present in the past, how do you explain that? When the sample arm was going down to the surface of the asteroid, just before it hits it changes orientation, is this how it is planned? If the age of the current asteroid is only about 1 billion yrs. old, when most formed at 4.5 billion yrs. ago, what data lead to that conclusion? For individual particles are you seeing densities like 2.5-3.5 and most of asteroid is just space? Did you see any of those chondrules in your samples you spoke of earlier? Unlike the DART mission that plowed into an asteroid to try to move it, did this arm penetration have any impact on the orbit of the asteroid? Do you see any gravitational effects of interaction between the spacecraft and asteroid? On topic of gravitation, what would be approximate escape velocity and the gravitational acceleration at the surface? How many different research labs have access to these samples? How do you move the samples from one part of the planet to another part for labs to study without Earth effecting the particles that are going to be studied? Did you look at the tag site afterwards and see effects of disruption? Earlier, the European Rosetta probe landed on a comet, were there any major differences in terms of analyses that they did compared to what you were able to do?

IV. Upcoming Events

- Star party for Boulder County Parks and Recreation; Friday, July 12 starting at 9 pm at Ron Steward Preserve at Rabbit Mountain. One day before 1st quarter moon, if you want to help out send message or go to website Events Calendar and register.
- Next LAS Monthly Meeting – Thursday, July 18th at 7:00pm at First Evangelical Lutheran Church, 803 Third Ave., Longmont

Videos of our meeting are available to members only at the LAS portal website https://members.longmontastro.org

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 **6/20/2024**

Main Checking Account (xxx-1587)

Begin Balance:	$ 8,820.00	**5/2/2024**	
Deposits:	$ 50.00	Membership	
Expenses:	$ (5.00)	Bank Charges	
Current Balance:	**$ 8,865.00**	**6/4/2024**	

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

Past Balance:	$ 8,200.00	**12/29/2023**
Interest:	$ 15.00	
Balance:	**$ 8,215.00**	**3/29/2024**

Telescope Fund (xxx-0165)

Past Balance:	$ 1,100.00	**3/28/2024**
Deposits:	$ -	
Expenses:	$ -	
Balance	**$ 1,100.00**	**4/29/2024**

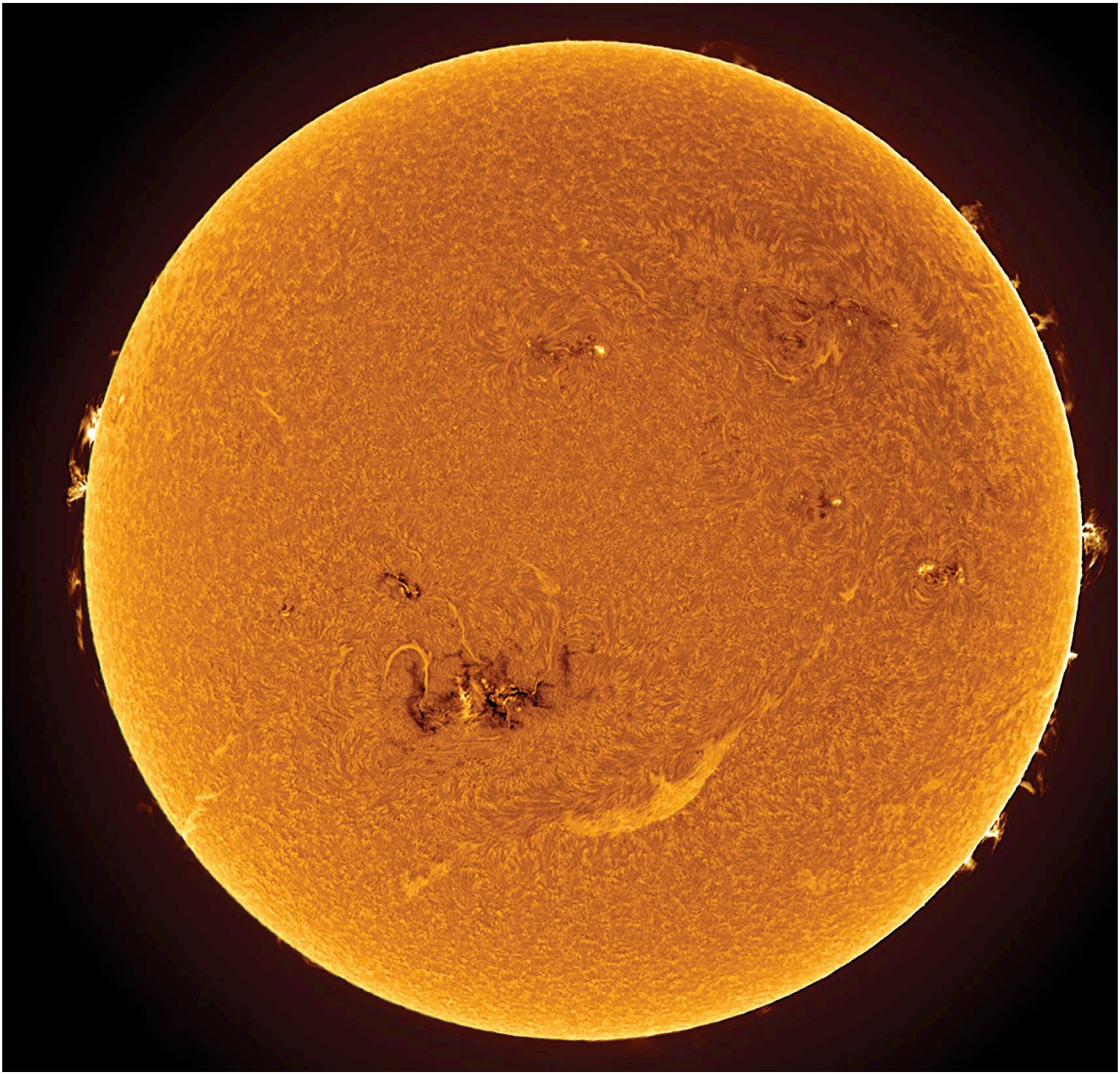
Petty Cash

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

Total Assets	**$ 18,230.00**	$ 45.00	Up from May

Active Membership:	**91**
Student Membership:	**1**
Total	**92**

Moon on June 15 by Brian Kimball



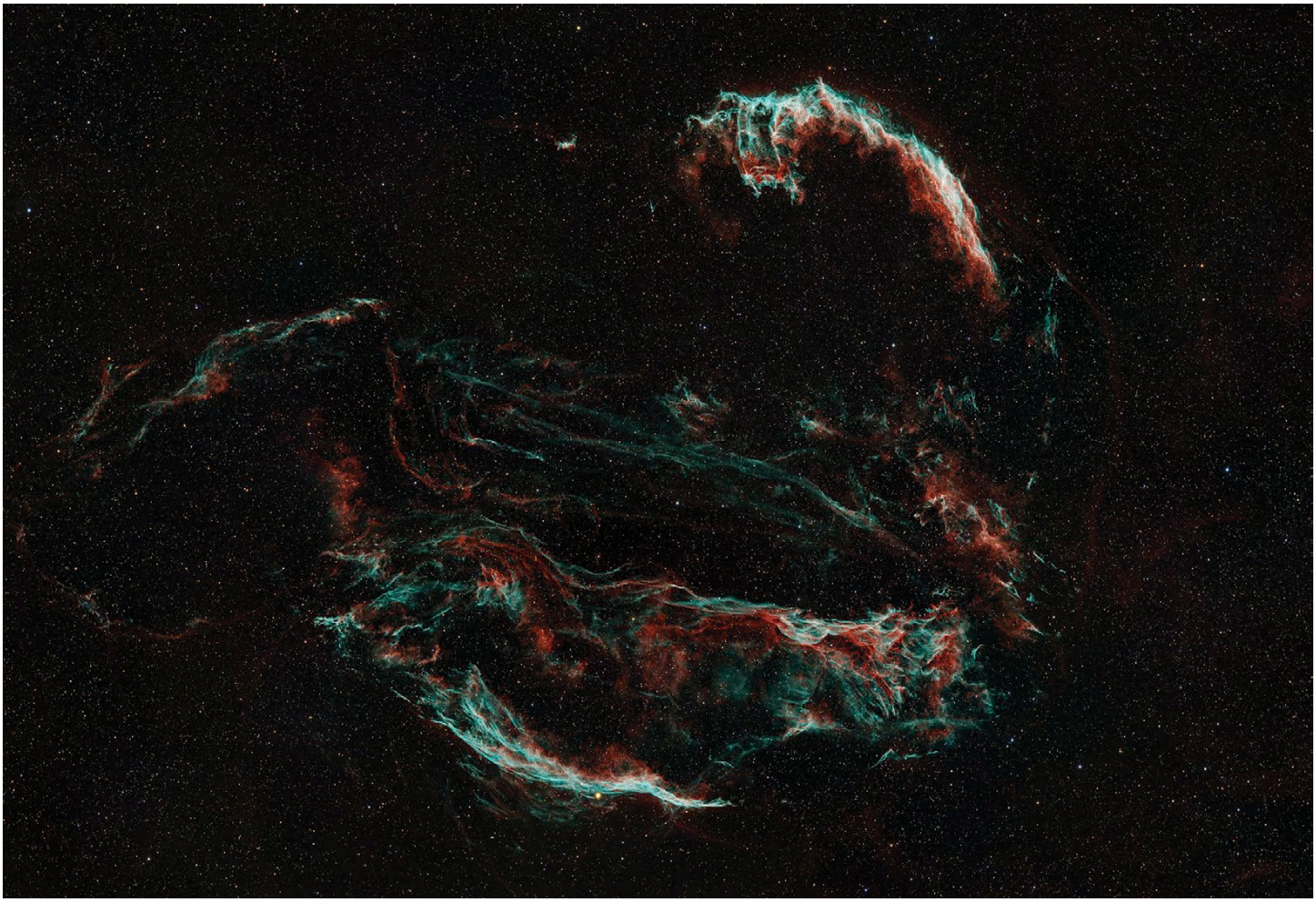
Sun on June 2 in H-Alpha by Brian Kimball

Sh 2-238-9 in HSO by David Elmore on June 17

Planetary Nebula El 2 has just been posted on Planetary Nebulae .net. Recently when reviewing previous images, I saw this object in an image of Sh2-238 (upper right) and Sh2-239 (lower left) recorded 6 December 2023.
The PN is at the right edge half way to the bottom. I used a color table with H-alpha red, Oxygen III blue, and Sulfur II green. PNe very often show up brightly in H-alpha and Oxygen III but not in SII resulting in their appearing red plus blue (magenta) when using this color palette.
The magnitude 19.5 hot white dwarf central star is just detectable in the center of the PN. Research by Dana Patchick uncovered this star that is 3053 light years all the way to 11,582 light years distant within the Milky Way galaxy that is about 100,000 ly across. El 2 is in Taurus in the outer regions of the Hyades cluster.

Borg107FL refractor, ASI6200MM camera and Chroma narrow band filters. Total integration time 4 hours 50 minutes from Cosmos Siding Observatory Dark Sky New Mexico.

The technical name is the galactic coordinates, PN-G:176.9-21.8, whereas the common name is El 2. Yes, there is an El 1, as well as PaEl 1, PaEl 2, and PaElPos 1, making this the fifth PN that has been noticed in one of my images.

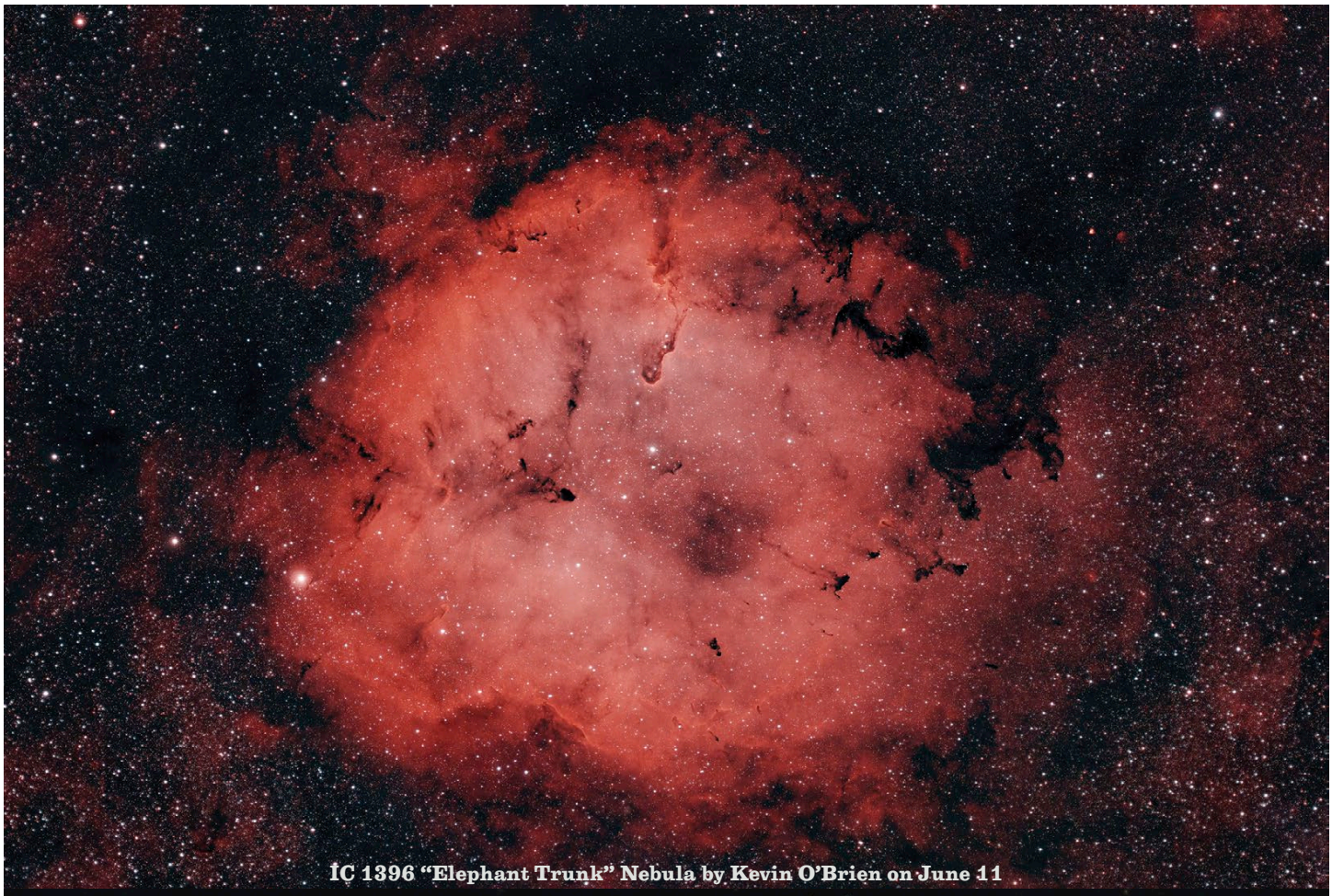


Veil Nebula on June 12 by Eddie Hunnell

Kevin O and I got out last Wednesday night on the Colorado River for a little dark site astrophotography. Weather was perfect. The Milky Way was so bright about 10pm that it looked like there were clouds to the east. As the night went on I realized that was the Milky Way rising. It was incredibly bright (casting a shadow).

I used my Radian Raptor 75 Refractor with the ASI6200MC Pro, ASIAIR, and a ASI120MM guide camera. Guiding was between 0.60" and 0.80" most of the time.

While I was waiting for the Veil to get higher in the sky, I took a bunch of 2 min subs of it without any filter. Then about midnight I started imaging it with the L-Extreme filter for the nebula component. Pic includes: Darks, Bias
13 Two min subs of the stars - no filter
33 Five min subs of the nebula with the L-extreme Processed in pixinsight including GraXpert 3.0.2, The three X tools, and other Pixinsight processing



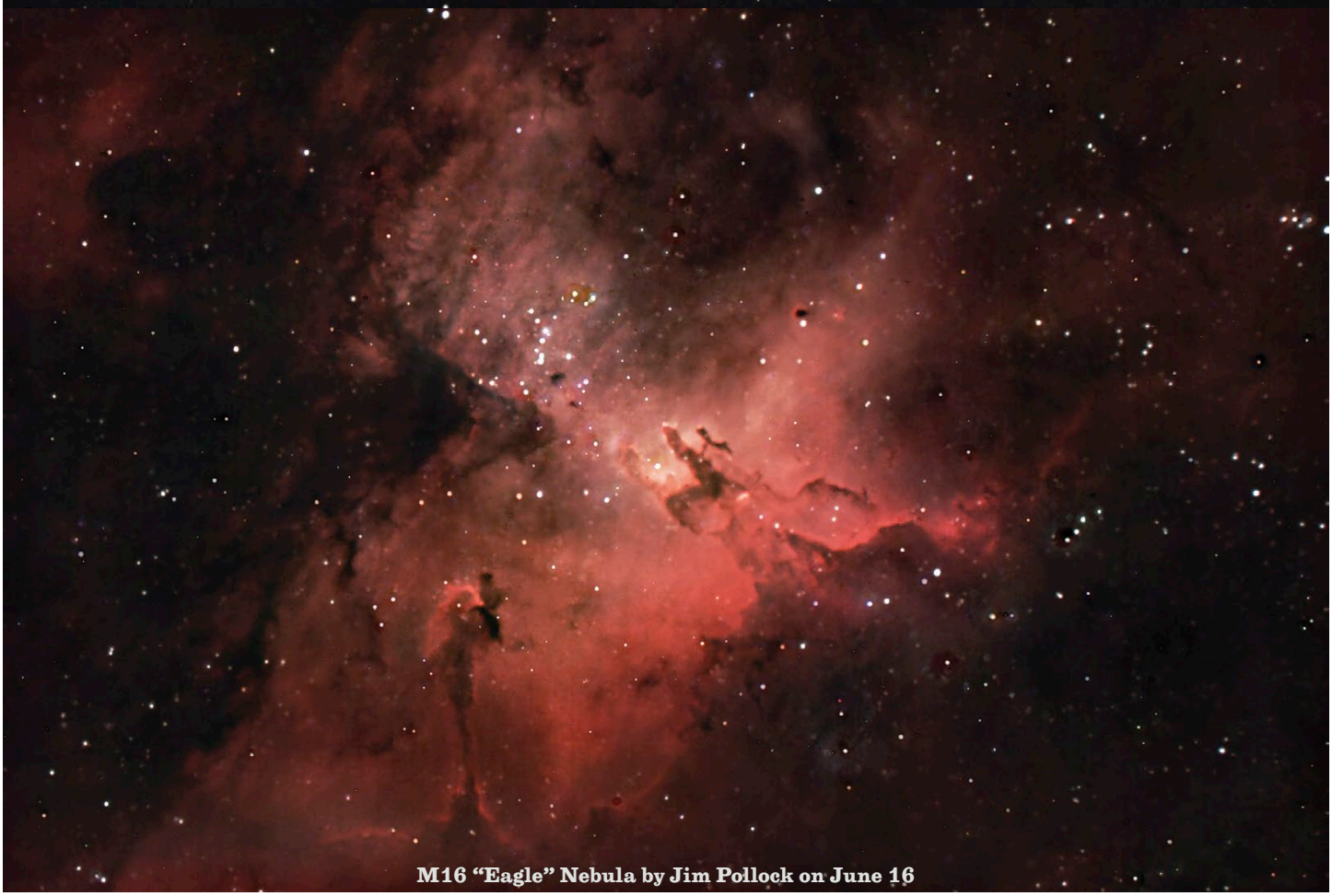
IC 1396 "Elephant Trunk" Nebula by Kevin O'Brien on June 11

M65 Galaxy by Gary Garzone on June 2

M51 Galaxy by Gary Garzone on June 2

M 13 Globular Cluster by Gary Garzone on June 20

M92 Globular Cluster by Jim Pollock on June 17

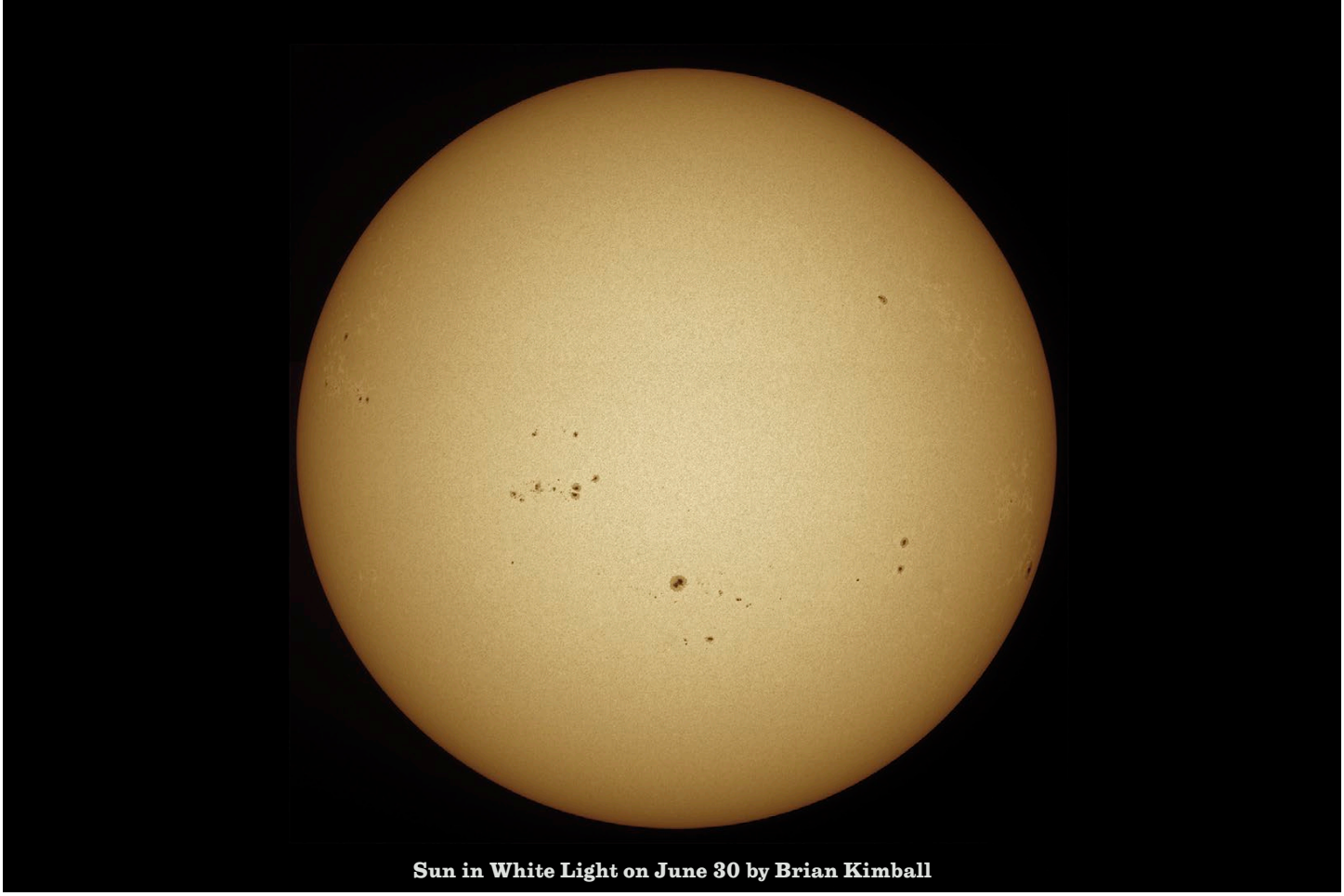


M16 "Eagle" Nebula by Jim Pollock on June 16

SNR G085.9-00.6 Area in SHO by Stephen Garretson on June 14

C/2023 A3 (Tuchinshan-ATLAS) by MJ Post on June 10

M3 by Rolando Garcia on June 30



Sun in White Light on June 30 by Brian Kimball

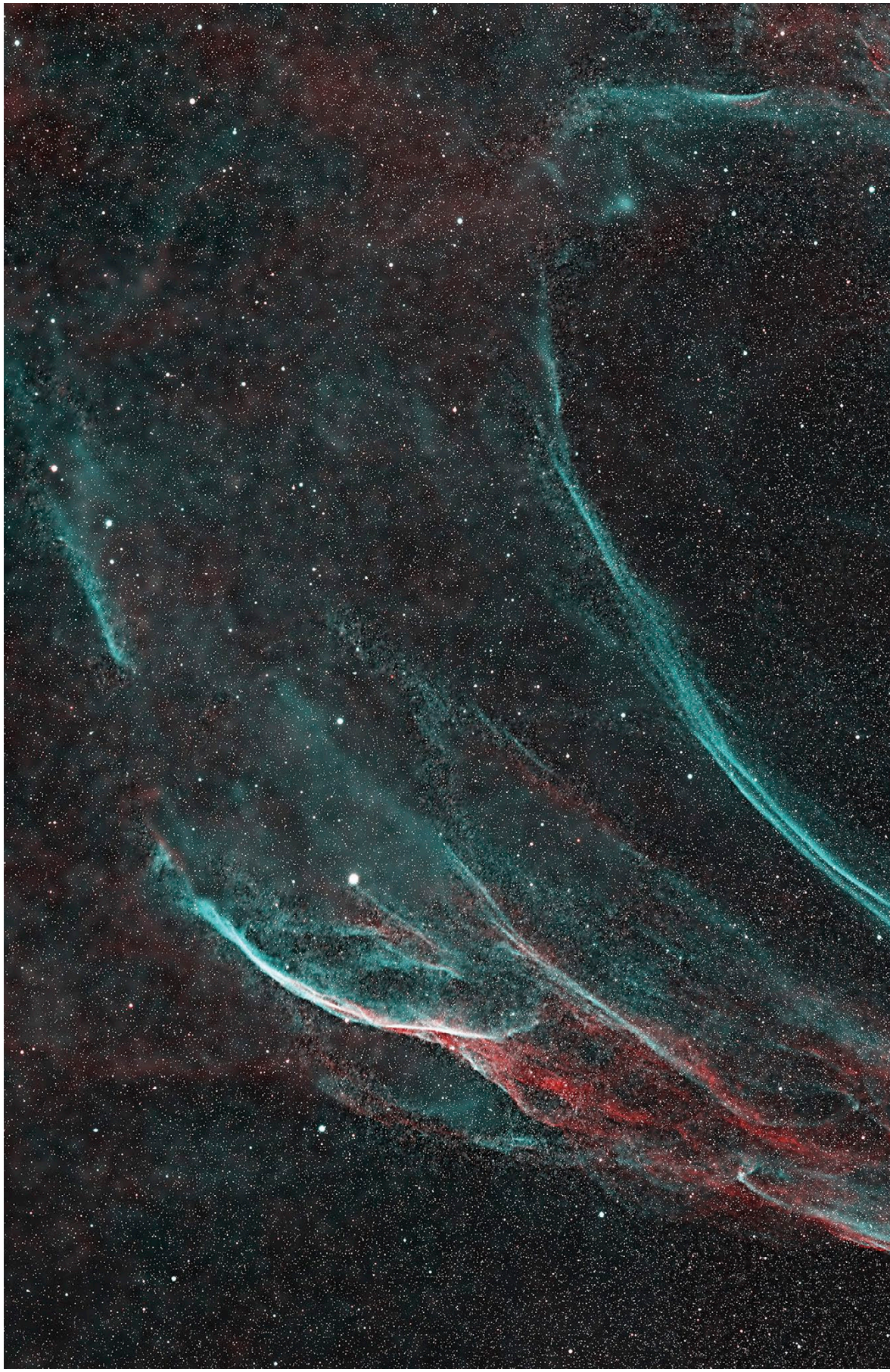
SH 2-91
(half of G65.3_5.7)
by M. J. Post

This is a straight HOO narrowband rendition cropped from a larger mosaic that I'm working on. I'm awaiting the next moon cycle to get SII data before posting the larger result.

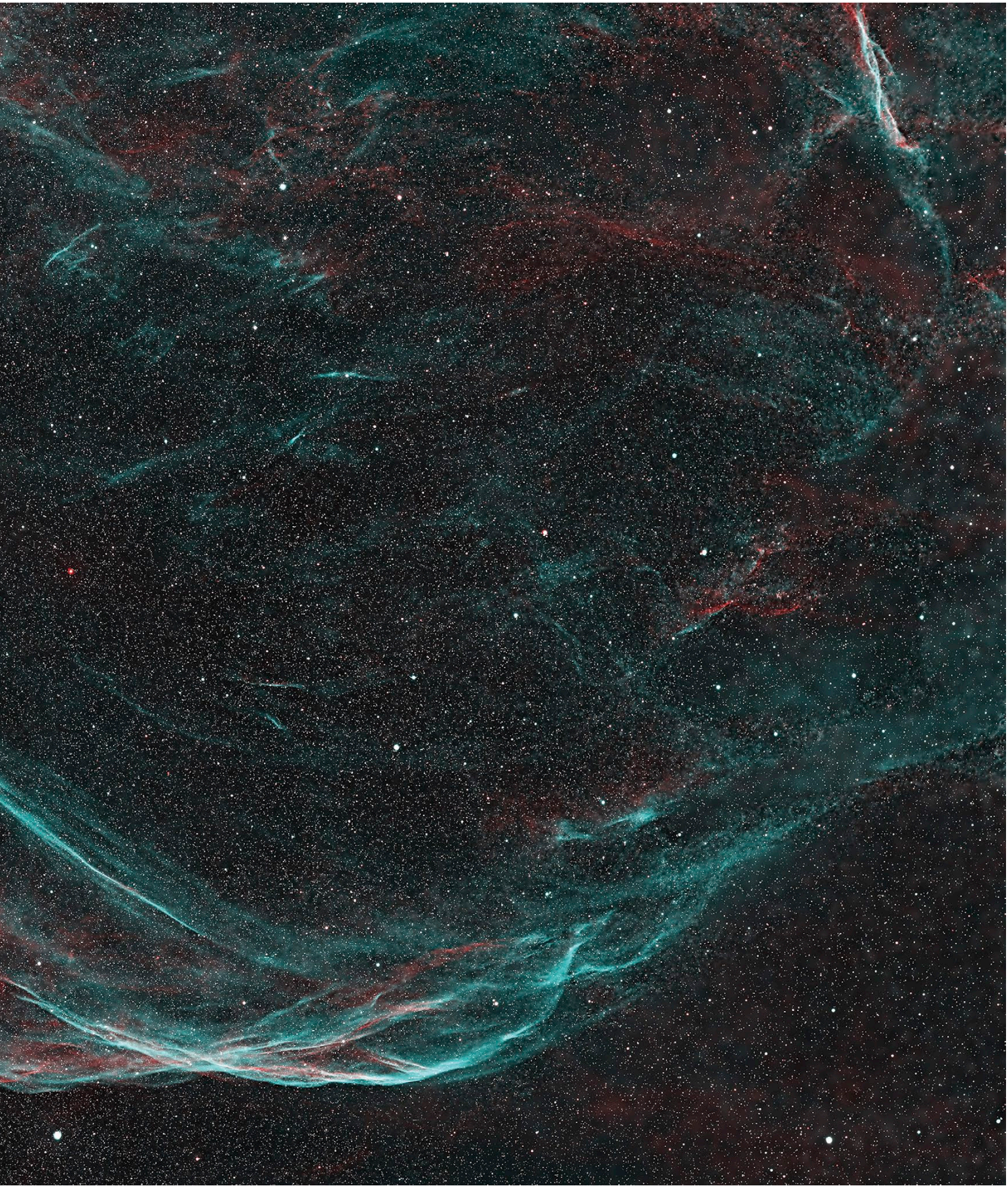
I am particularly intrigued by Campbell's hydrogen star just left of center. It is a very hot, about-to-go supernova star like a Wolf-Rayet, and it has cast off its hydrogen and nitrogen shells that glow bright red. Those shells are also listed (correctly or incorrectly) as a planetary nebula.

But this star is instead a rare type classified as a WC star (not WR) because of its much smaller mass and because its outpouring winds are composed of carbon and oxygen, not nitrogen typical of WR stars.

1.75 hours OIII and 2.0 hours H-alpha data through 11" RASA scope, ASI 6200MM camera, DSNM June 9 and 10 2024.



SH 2-91 by MJ Post on June 18



SH 2-91 by MJ Post on June 18

Newsletter Archives by Eileen Hall-McKim

30 Years Ago July 1994

The main presentation for the meeting was given by a panel of LAS members namely Kevin Brose, Randy Cunningham, Tom Peck, and Jerry Bob Wilkinson. The topic was telescope making, types, mechanics, optics, etc. The presentation was very informative and stirred considerable interest. Future presentations will be given to address questions from this meeting. Thanks guys for sharing your expertise with us.

Impact Information – I would like to pass along the following from Dr. Bob Stencel:
Dear Astronomers: As the impact time nears, we would appreciate reports by observers of any unusual or transient phenomena witnesses during the impact week on Jupiter. Call in reports with TIME of observation or email. These reports will help us evaluate our infrared data taking at our Mr. Evans observatory. Thanks!

New Moon Star Party at Deadman Saturday, July 6 (2004).

20 Years Ago July 2004

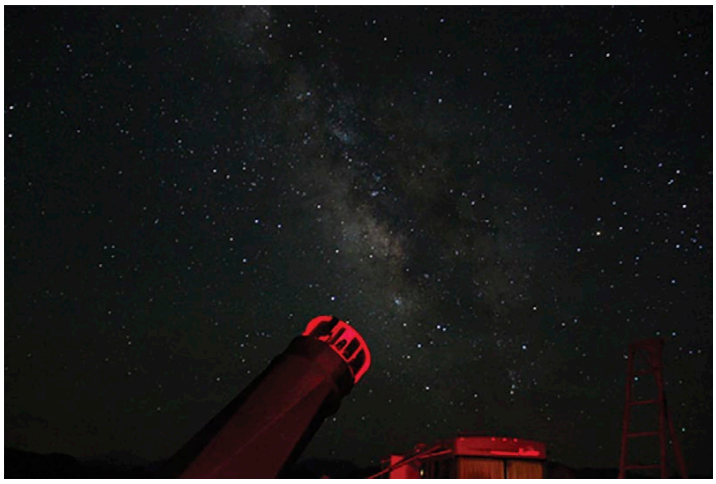
No newsletter was published.

10 Years Ago July 2014

This month's meeting will be "show and tell." Bring in your eyepiece, scope, camera, or gadget you've bought recently and tell us about. If you've built some new gadget or developed an interesting software program then show and describe it to us. If you've had some successes or failures with some astronomy software or imaging processing technique, we'd love to hear about that as well! You could even show us a few pictures of a recent trip to an observatory, astronomy museum or space facility.

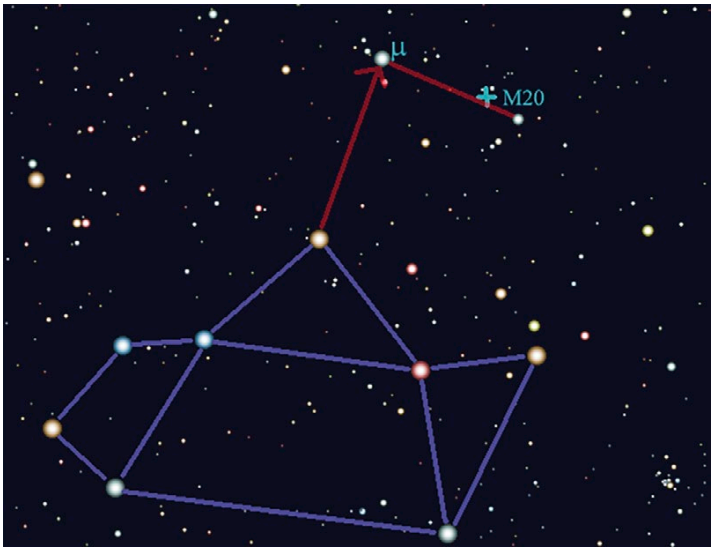
Twenty people were present at the June 19th meeting. Dr. Fran Bagenal, professor in the Department of Astrophysical and Planetary Sciences at the University of Colorado, Boulder, gave an excellent presentation about auroras of different planets and the various processes that cause planetary auroras. Following that we reviewed images Gary, Brian, and Jim have taken since the last meeting

Dark Sky – At the beginning of the month astronomical darkness begins at 10:34pm MDT and ends at 3:48 am MDT. By the end of this month astronomical darkness begins at 10:08 pm and ends at 4:18 am MDT.



Milky Way from RMSS by Gary Garzone

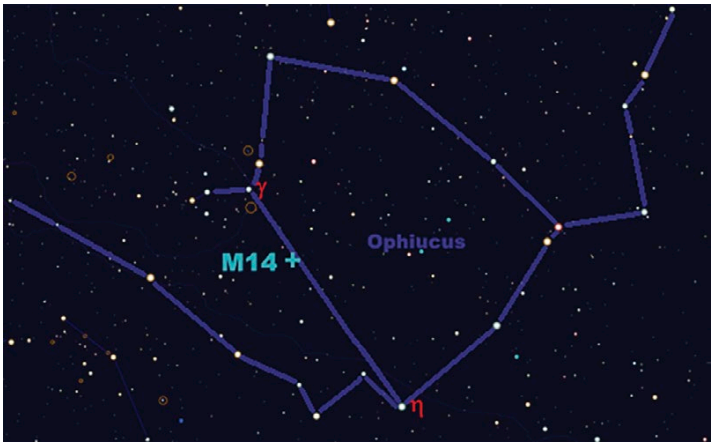
Messier 20, "Trifid Nebula" by Jim Pollack



Trifid Location

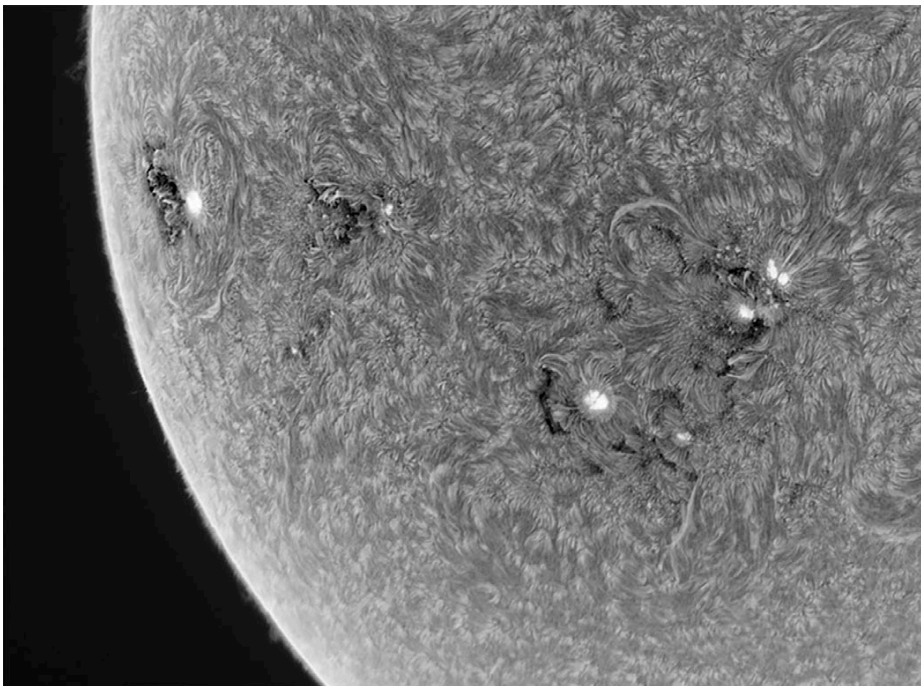
Messier 20 or the "Trifid Nebula" is one of the most beautiful summer objects to view through the eyepiece or image with a camera. The red emission nebula with a star cluster near its center is surrounded by a blue reflection nebula which is particular visible to the north. Dense cloud of dust and gas or dark nebula (Bernard85) divide the object into the trifid shape. The name "trifid" was first used by John Herschel to describe this marvelous object.

M14 Globular Cluster by Gary Garzone



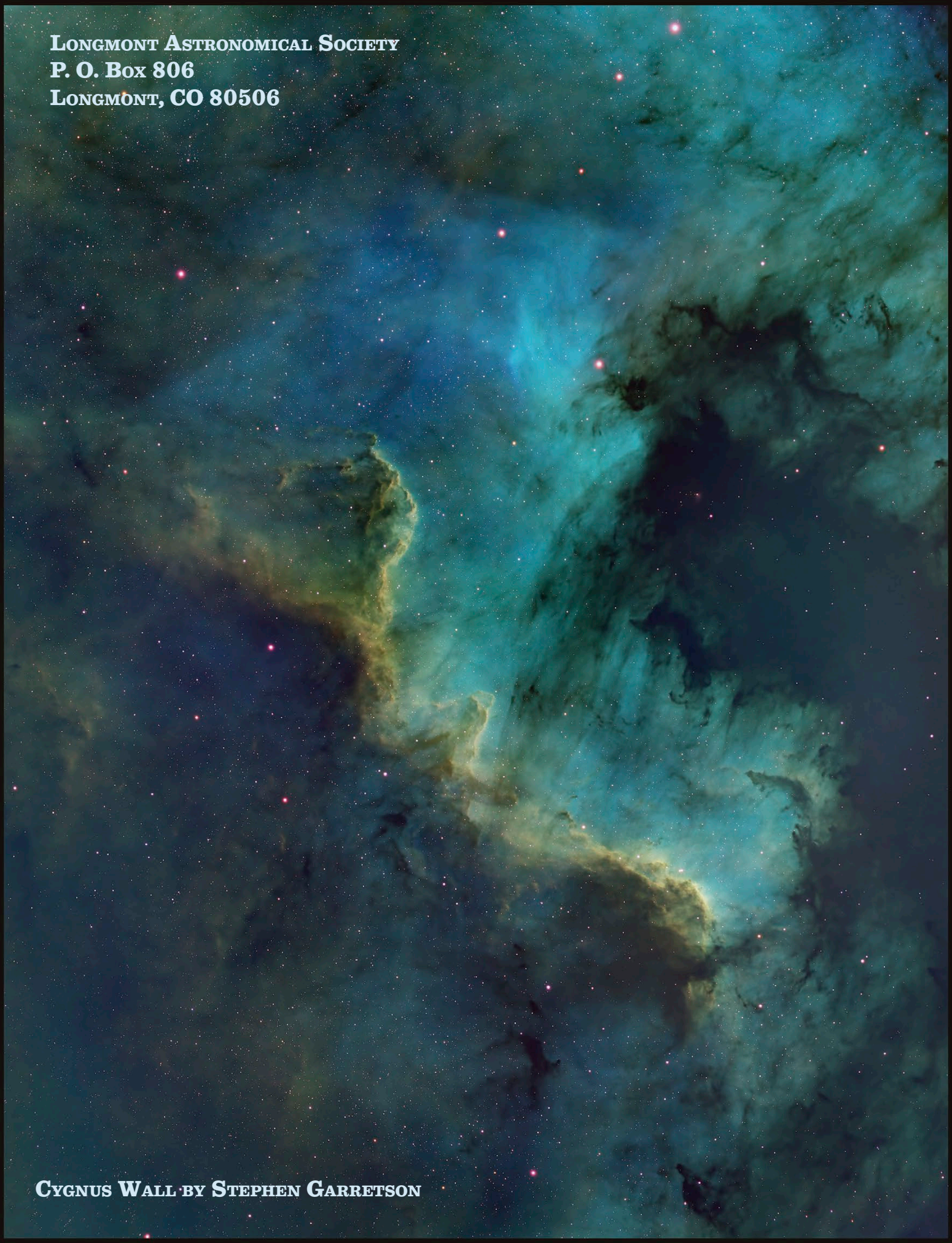
M14 Location

Messier 14 is a class 7 globular cluster which is 11 arc min in diameter and magnitude 7.6 in brightness. It is located in constellation Ophiuchus. To find it manually, first locate Gamma Ophiuchus and then Eta Ophiuchus. M14 is located about ⅓ the distance of the length of the line between those two stars.



Solar region AR 12104 on July 8th, 2014 by Brian Kimball

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



Cygnus Wall by Stephen Garretson