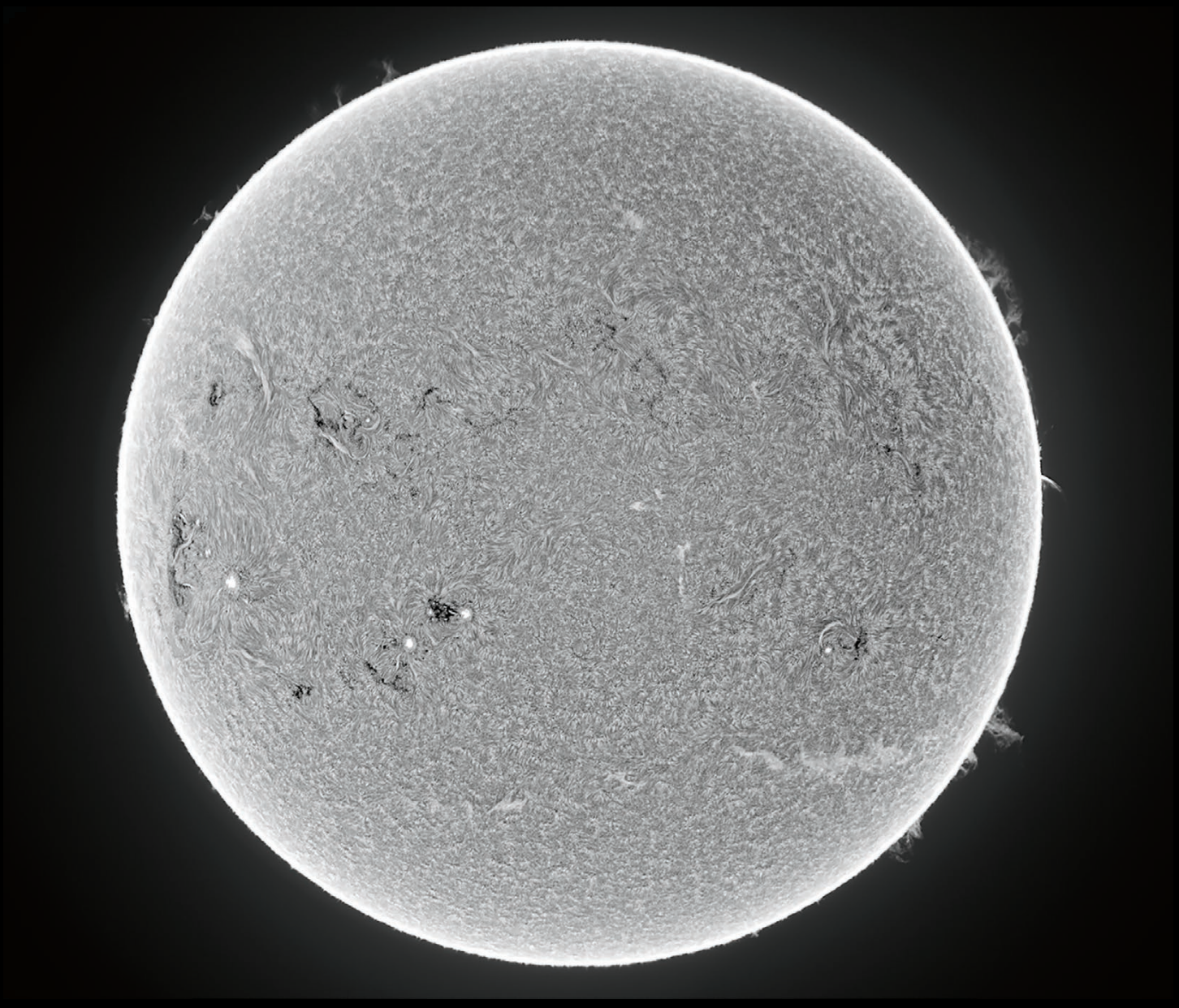
Longmont Astronomical Society

June 2026



Full Disk Image of the Sun in H-Alpha on May 25, 2026
by Brian Kimball

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LAS Meeting on June 18: Presentation by Dr. Tom Woods, LASP

Topic: To be Announced

Bio

Dr. Tom Woods is a Senior Research Scientist at the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado in Boulder.

He earned his B.S. in Physics in 1981 from Southwestern at Memphis (now Rhodes College) and his Ph.D. in Physics in 1985 from Johns Hopkins University. He previously served as LASP's Associate Director of Technical Divisions for 15 years.

Dr. Woods is a leading expert in solar ultraviolet irradiance and its effects on Earth's atmosphere and climate. He has served as Principal Investigator for several major NASA missions and instruments, including TIMED SEE, SDO EVE, SORCE, TSIS-1, and the MinXSS CubeSat missions.

He has received numerous honors for his contributions, including NASA's Outstanding Public Leadership Medal.

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 .

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.

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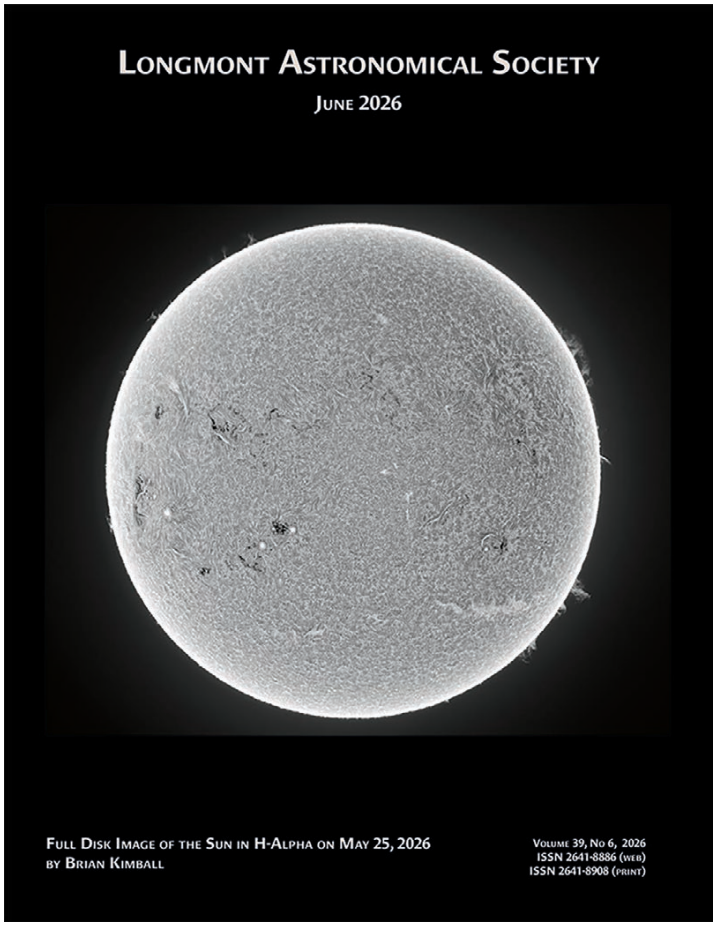


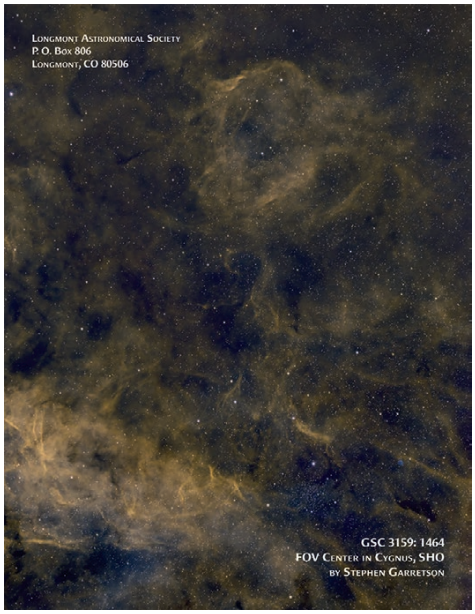
Today's solar images - May 25

Taken this morning with excellent seeing.

Thanks for looking,

Brian Kimball

Back Cover: GSC 3159: 1464 FOV Center in Cygnus, SHO by Stephen Garretson



This FOV is north of the last image I posted and west of LBN 251, to the left just out of the frame. It's the next stop on an exploration of interesting structure in Cygnus. I was struggling with it until I decided to rotate it 90° clockwise from how it was captured. The composition was there, just needing a new orientation. While the Ha and SII signals were strong, OIII was, not surprisingly, pretty weak. I was considering just going with the Ha master until I decided to look at the lower right quadrant in the original orientation. Rotating the image to get ready to rather significantly crop, it became obvious that this was how to present the shot.
[12] 600s guided Ha subs; [13] 600s guided OIII subs
[12] [600s guided SII 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

Guiding:
William Optics WhiteCat f/4.9 Astrograph
ZWO 220 Mini
Paramount MX+ from the Beevo Dome

TheSkyX, SGP, PHD2
PixInsight, MacOS Photo, Preview

...Stephen

Planets in June

Mercury

Mercury becomes visible in binoculars until about the 18th; it dims from -0.5 magnitude on the 1st to +0.8 magnitude on the 18th. The disk increases from 6.2 arc sec across to 8.8 arc sec.

Venus

Venus is visible in the evening sky in the west. It is magnitude -4 in brightness and its full disk is around 13 arc sec to 16 arc sec across this month.

Mars

Mars is a challenging object in small scopes this month. It is in the ENE before dawn and is 1.3 arc sec across; it's disk is 4.4 arc sec across.

Jupiter

Jupiter is getting low in the WNW after sunset. It is about magnitude -1.9 in brightness and disk is about 33 arc sec across. It will disappear into the bright evening twilight early next month.

Saturn

Saturn is getting up fairly high in the ESE morning sky now. It is +0.8 magnitude in brightness and the disk is 17 arc sec across.

Uranus

Uranus is not visible this month. It will re-appear in the morning sky after July 9 if you use binoculars.

Neptune

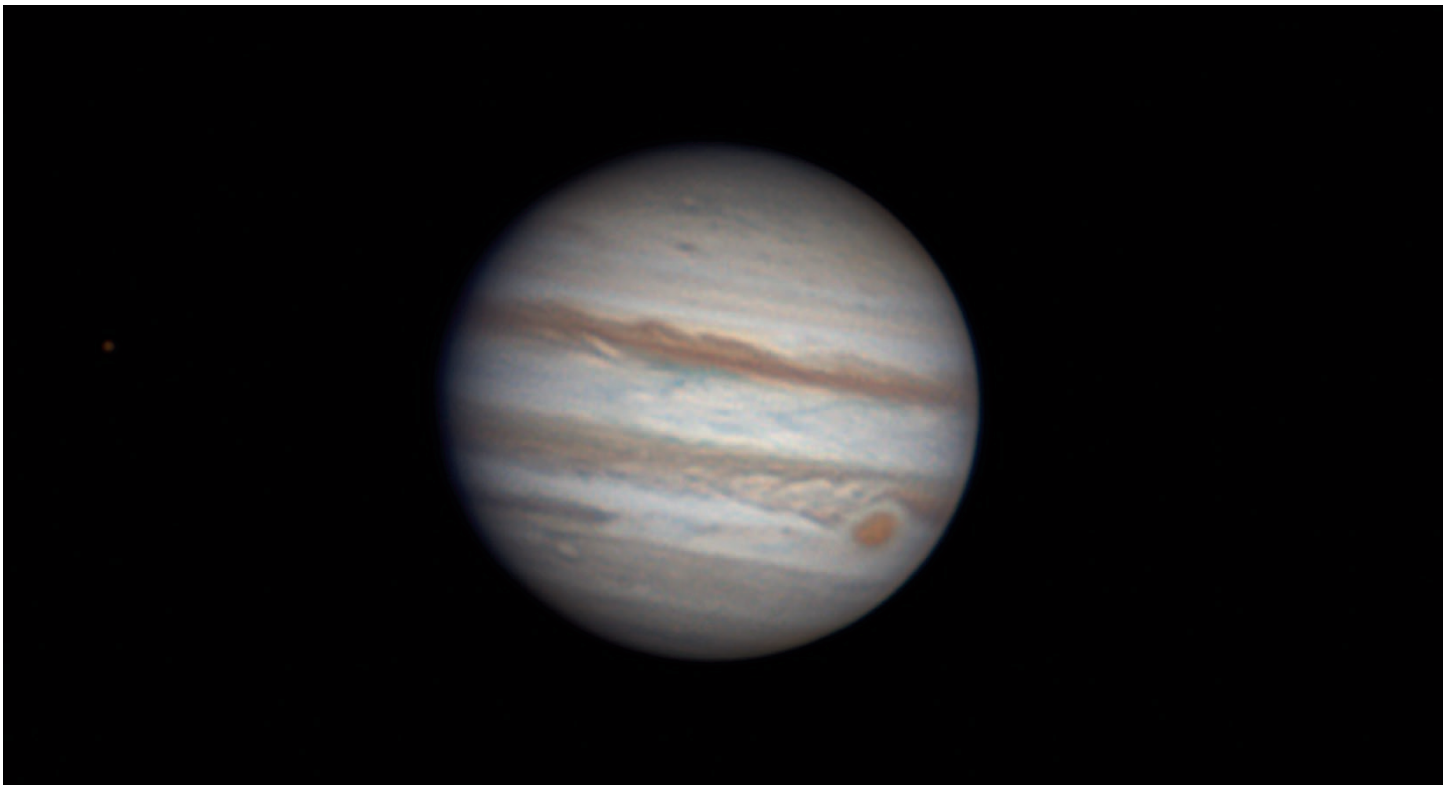
Neptune may be seen in the ENE morning sky after the 5th in small scopes. It is 0.7 magnitude in brightness and the disk is 2.2 arc sec across.

Lunar Phases in June

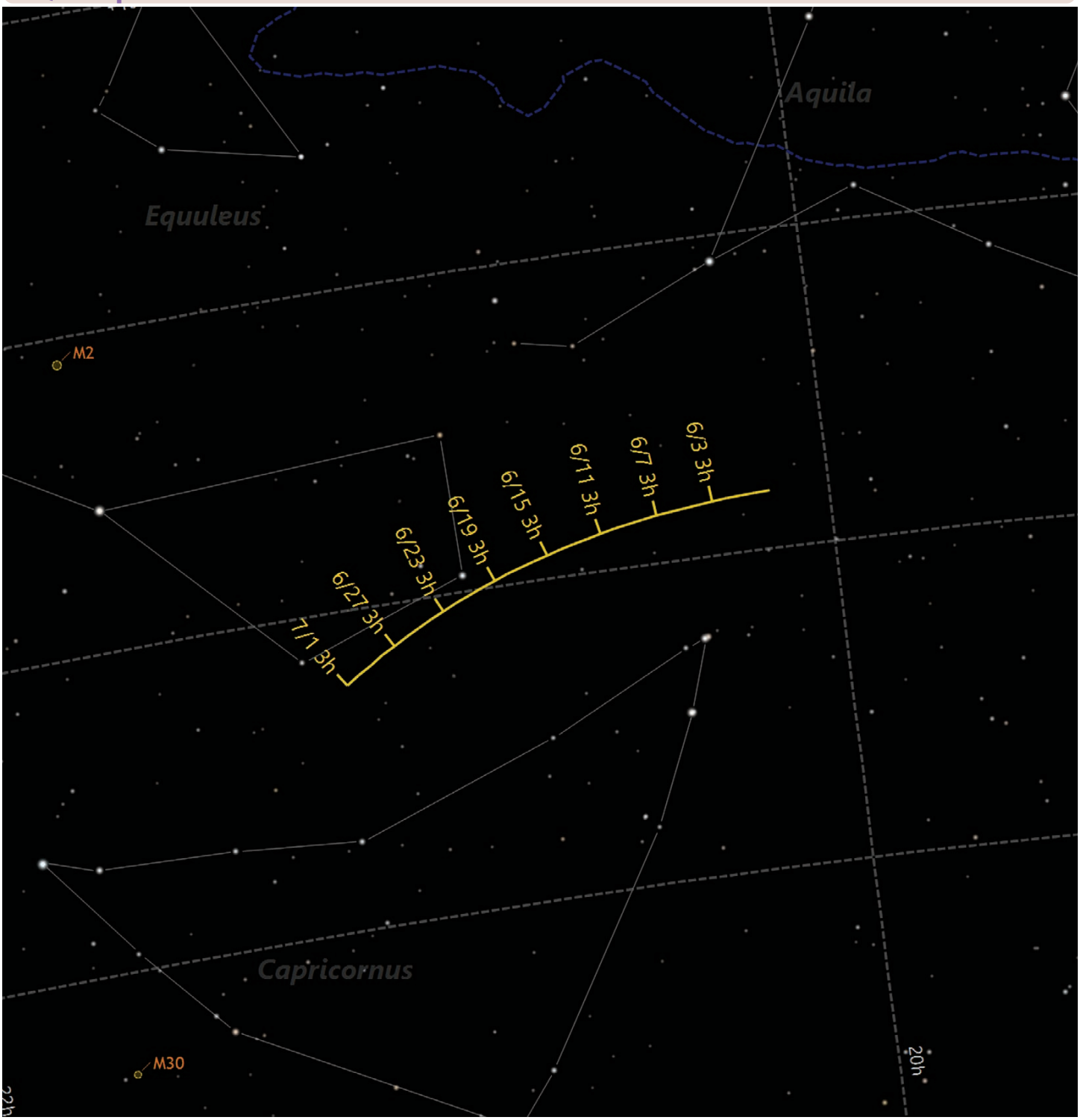
June 7 at 4:02 am - Third Quarter Moon
June 14 at 8:55 pm - New Moon
June 21 at 3:56 pm - First Quarter Moon
June 29 at 5:58 pm - Full Moon

Meteor Showers in June

There are no major (Type 1) meteor showers in June

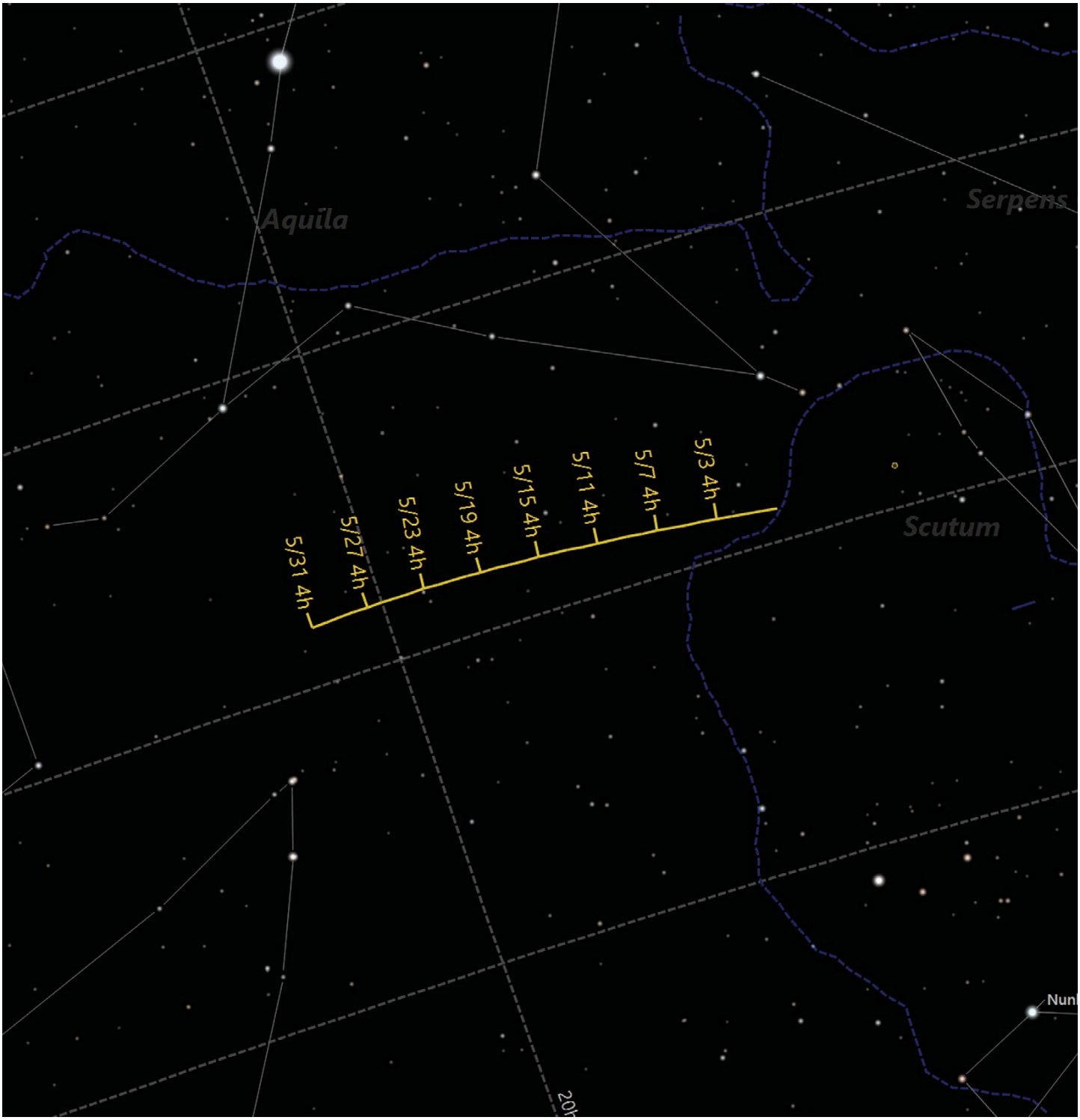


10P/Tempel



Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc sec)
June 1	3:41 am	20h14m29.0s	-08°11'03"	Aquila	13.8	39
June 7	3:28 am	20h25m27.3s	-08°29'56"	Aquila	13.4	42
June 13	3:27 am	20h36m17.0s	-09°02'45"	Capricornus	13.1	45
June 19	3:25 am	20h45m09.8s	-09°42'38"	Aquarius	12.8	48
June 25	3:22 am	20h57m21.1s	-11°00'09"	Aquarius	12.5	52
June 30	3:40 am	21h05m52.7s	-12°12'28"	Aquarius	12.3	54

Comet C/2023 R1 (PANSTARRS)



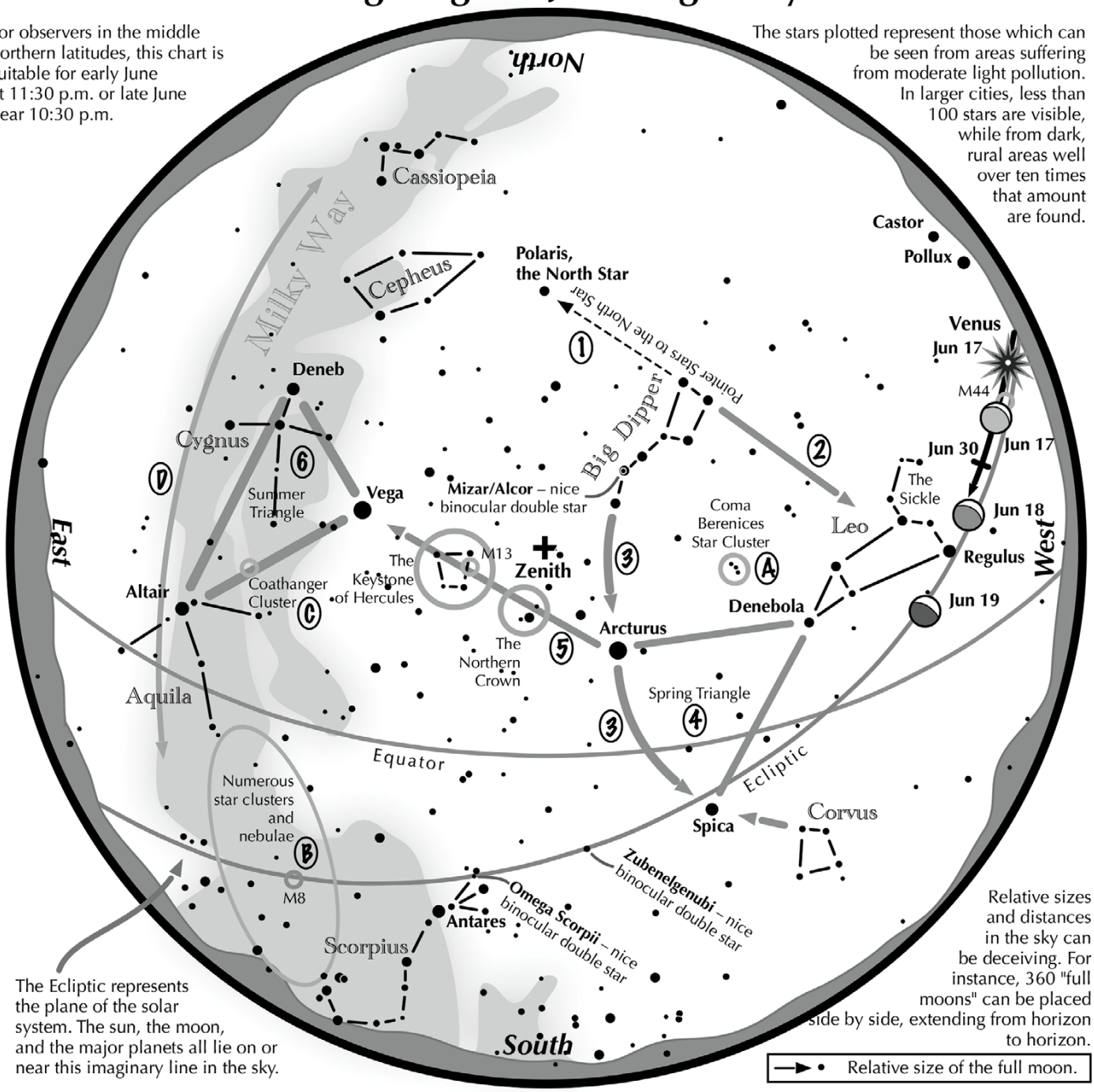
Date	Optimal time	RA	Dec	Constellation	Magnitude	Size (arc sec)
June 1	11:20 pm	18h02m20.1s	-06°07'53"	Ophiuchus	13.7	42
June 7	1:24 am	17h47m33.4s	-06°42'41"	Ophiuchus	13.7	42
June 13	1:09 am	17h35m09.5s	-07°13'06"	Ophiuchus	13.7	42
June 19	12:24 am	17h17m50.1s	-07°57'32"	Ophiuchus	13.7	42
June 25	2:20 am	17h03m06.7s	-08°37'15"	Ophiuchus	13.7	41
June 30	10:16 pm	16h51m55.2s	-09°08'54"	Ophiuchus	13.7	41

Navigating the June Night Sky

2026

For observers in the middle northern latitudes, this chart is suitable for early June at 11:30 p.m. or late June near 10:30 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

Relative size of the full moon.

Navigating the June 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. Draw another line in the opposite direction. It strikes the constellation Leo high in the west.
3. Follow the arc of the Dipper's handle. It first intersects Arcturus, the brightest star in the June evening sky, then Spica.
4. Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.
5. 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.
6. High in the east are the three bright stars of the Summer Triangle: 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 of 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.

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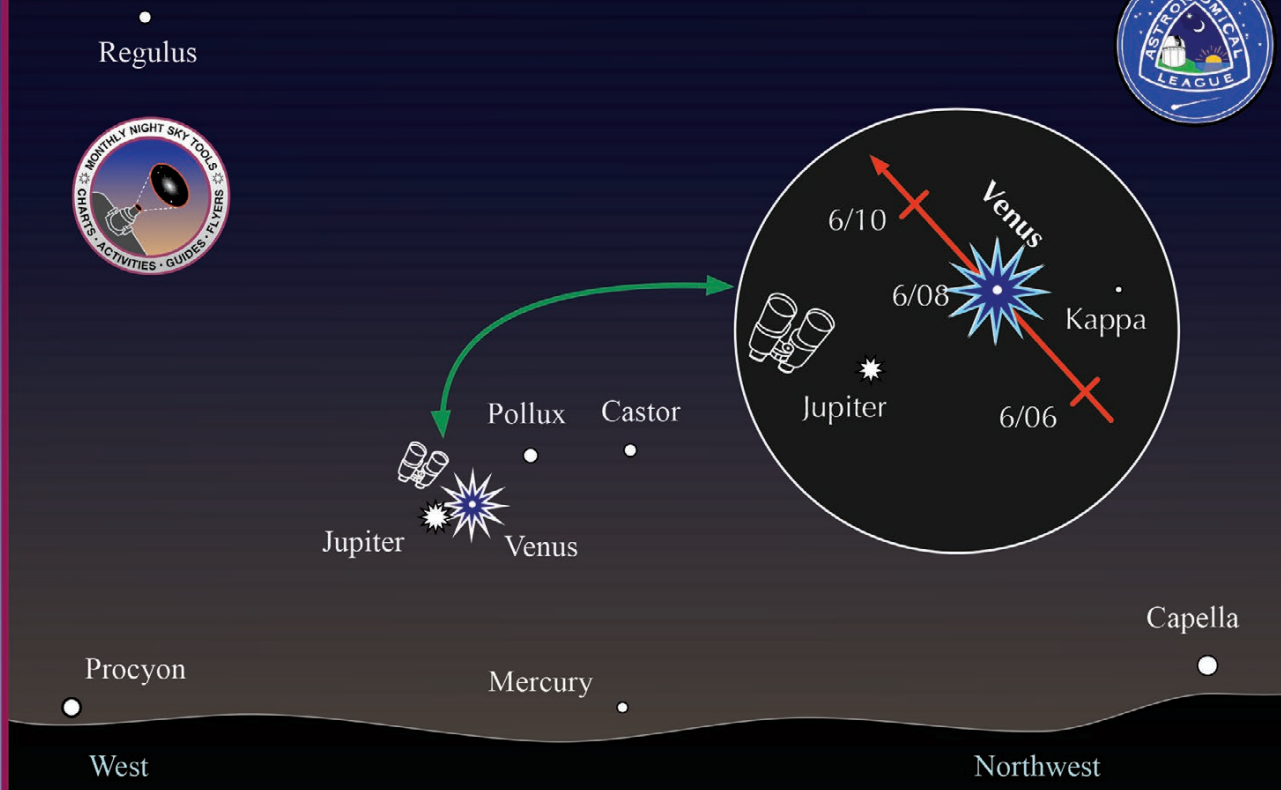


If you can see only one celestial event this June, see this one.

Brilliant Venus passes bright Jupiter

Look to the west-northwest 60 minutes after sunset in early June as the Venus/Jupiter gap narrows.

- On June 8, brilliant, unmistakeable Venus lies slightly below and right of the lesser Jupiter.
- The next evening finds Venus having moved slightly above Jupiter.
- Then on succeeding evenings, Venus pulls above Jupiter, while the mighty planet drops toward the horizon.
- Enhance the view by using binoculars.
- All the while, the much dimmer Mercury lies close to the horizon in the bright twilight.

End your day with this enchanting meet-up!

LAS May 21st Meeting Notes by Eileen Hall-McKim

I. Introduction

Our LAS May meeting was held in-person and by zoom on May 21st at the Longmont Evangelical Lutheran Church, 803 Third Ave. President, Vern Raben began the meeting with self-introductions of those attending in person. Twenty-six attended in person, 10 attended on-line.

II. Main Presentation

Our guest speaker for the evening was Dr. Gregory Wirth of BAE Systems on the remarkable technologies behind NASA's current and future space telescopes. Gregory discusses how the pending Nancy Grace Roman Space Telescope promises to change our ideas about dark matter and dark energy with a camera 100 times more powerful than those on Hubble and Webb. We get a glimpse into the future with NASA's ambitious Habitable Worlds Observatory, designed to identify and study Earth-like exoplanets using cutting-edge optics technology, and we learned what new astronomical discoveries NASA's new James Webb Space Telescope is delivering with its astonishingly sharp infrared images of the universe.

Gregory is an astronomer and Principal Systems Engineer at BAE Systems Space & Mission Systems in Boulder, Colorado. He specializes in space-based astrophysics instrumentation and has contributed to major NASA missions, including helping commission the James Webb Space Telescope (JWST). His work builds on BAE Systems' (formerly Ball Aerospace) legacy in flagship observatories such as Hubble, Spitzer, and Chandra. He earned a Ph.D. in Astronomy & Astrophysics from the University of California, Santa Cruz, with thesis research using early Hubble Space Telescope data. He previously spent 16 years as a support astronomer at the W. M. Keck Observatory in Hawaii. Gregory is also a LAS member.

"Webb, Roman and HabWorlds - Space Telescopes at the Astronomical Frontier" by Dr. Gregory Wirth

Tonight we will talk about the past, present and future of space telescopes that NASA is flying, will introduce the cutting edge technology that goes into the James Webb Space Telescope mirrors, will talk about the Roman Space Telescope which is going to be launching soon, and we will talk about what is on the drawing board, and will finish talking about some of the cool science that we are getting from the Webb Telescope.
Gregory grew up in Michigan, joined an astronomy club, parents bought him his first telescope

- Went on to the home of world's largest telescope (in 1867) at Northwestern University
- Then on to Santa Cruz, home to the world's largest telescope (in 1888) Lick 36" refractor
- Then ended up working at the world's largest pair of telescopes, the twin Keck 10 m. telescopes, at observatory on summit of Mauna Kea, Hawaii, was there for 16 years
- Eventually made his way to Boulder to work at BAE Systems (formally Ball Aerospace), has now been at BAE for 8 year where he has had the opportunity to work on all three of the telescopes that we will talk about tonight

Hubble Space Telescope – the (formally) most famous telescope in the world, launched in 1990. It has now been orbiting above us for 36 years even though only designed to last for a few years; it is still producing groundbreaking science today as it orbits every 90 minutes, 350 miles above us.

- His BAE colleagues are very proud that they were the ones who solved the problem with Hubble's spherical aberration with the mirrors which was a disaster after it was launched. It was great victory to fix that!
- BAE Systems team has built all five of the science cameras that Hubble carries

Hubble's Discoveries – we are all familiar with the beautiful images Hubble has given us of planets, stars, nebulae, of galaxies, but Hubble is doing more than just providing pretty pictures; it is doing ground-breaking work:

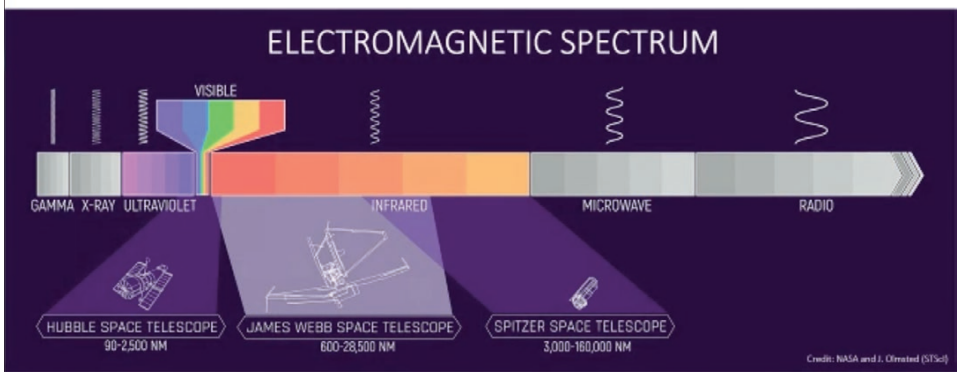
- Hubble deep field rewrote the rules about studying the universe
- Made multiple major discoveries in astrophysics
- Hubble has taught us how galaxies like our own form and evolve; how some merge and consume their neighbors; how others are ripped to shreds in collision; how stars die in titanic explosions.

Electromagnetic Spectrum

Key shortcoming of Hubble is it can't do everything; it is limited in what colors of light it can see

- Our eyes see only a small slice of the full range of light in the visible window
- Hubble was designed to excel in the ultraviolet. Webb was designed to see in the infrared.

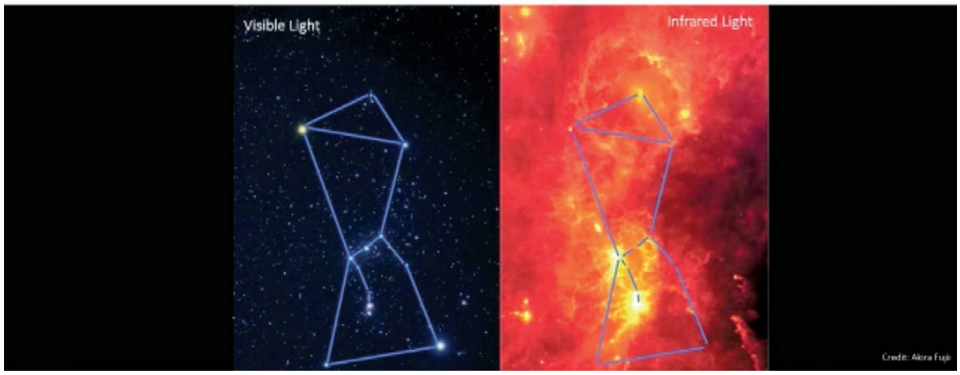
Our eyes see only a small slice of the full range of light



Why would we want to study in the infrared?

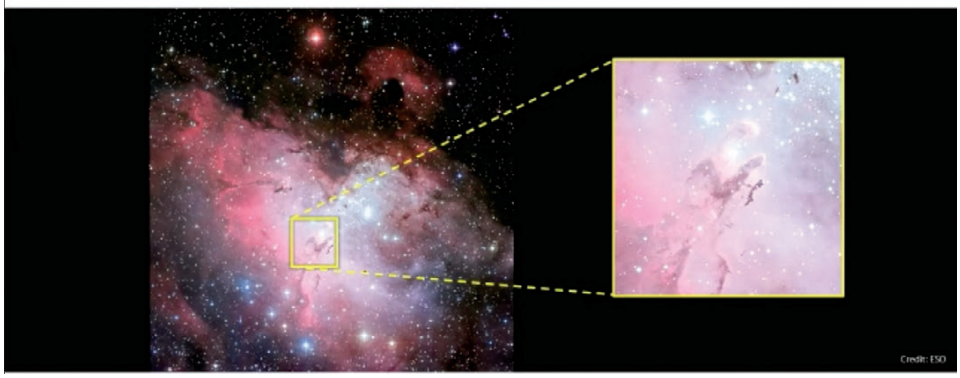
- You would see a very different impression of what is in the sky
- A look at the Orion the Hunter (Left - Visible vs Right - Infrared)
- Infrared allows us to see things we ordinarily could not see with the naked eye
- Infrared light reveals glowing clouds of hydrogen gas coalescing together to form new stars like the ones in Orion's belt
- Infrared can penetrate through gas and dust in a way that visible light cannot

Infrared light reveals clouds of gas in our Galaxy



Eagle Nebula – 7,000 LY away within the Milky Way Galaxy center. Gas clouds (yellow box) are where gas is collapsing to form new stars, these structures are what we call The Elephant Trunks. Hubble took the iconic image "The Pillars of Creation"

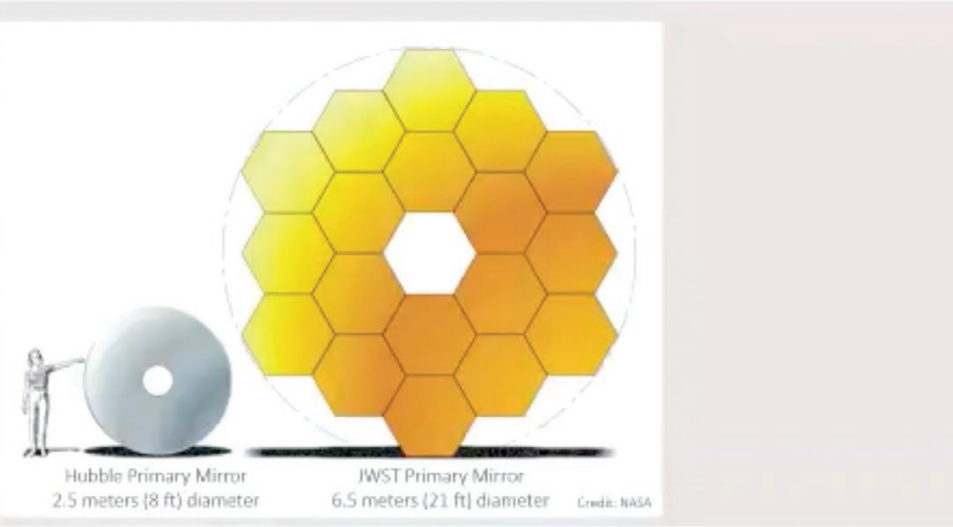
Infrared light reveals stars hidden by dust



Pillars of Creation as seen from Visible Light (Left) and Infrared (Right) Look at all the stars that now jump out at us! Visible light is absorbed by gas and clouds, but with infrared can penetrate through.

Infrared light reveals stars hidden by dust

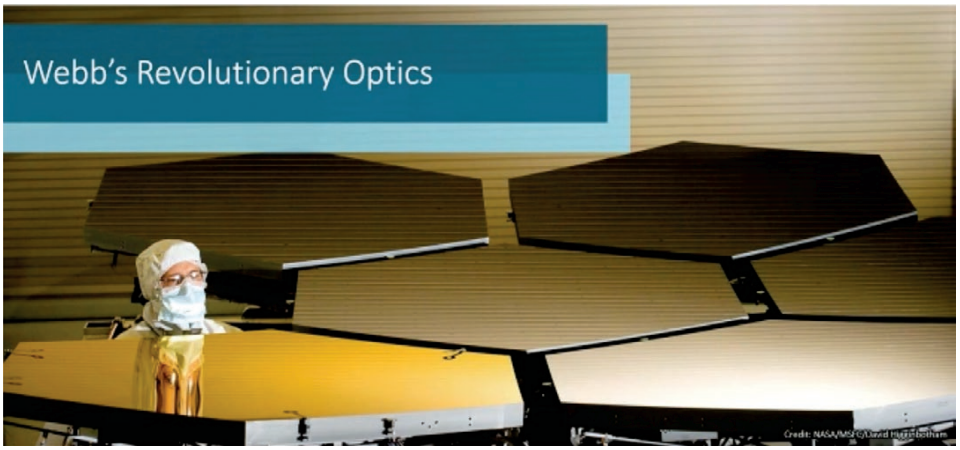
Bigger telescopes show fainter, more distant objects



Hubble Primary Mirror/JWST Primary Mirror

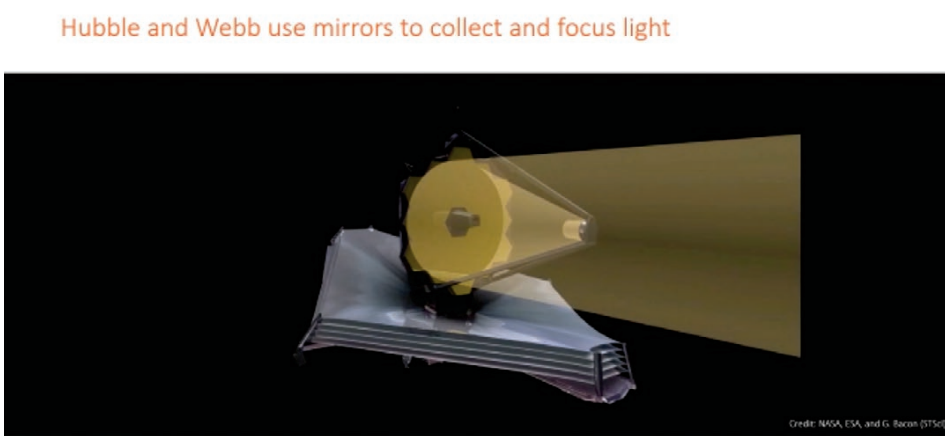
- Most important feature of any telescope is the size of primary mirror. A larger mirror gathers more light and allows us to see things that are fainter so we can study things farther away
- Hubble- 2.5 meters (8 ft) in diameter
- JWST – 6.5 meters (21 ft) diameter

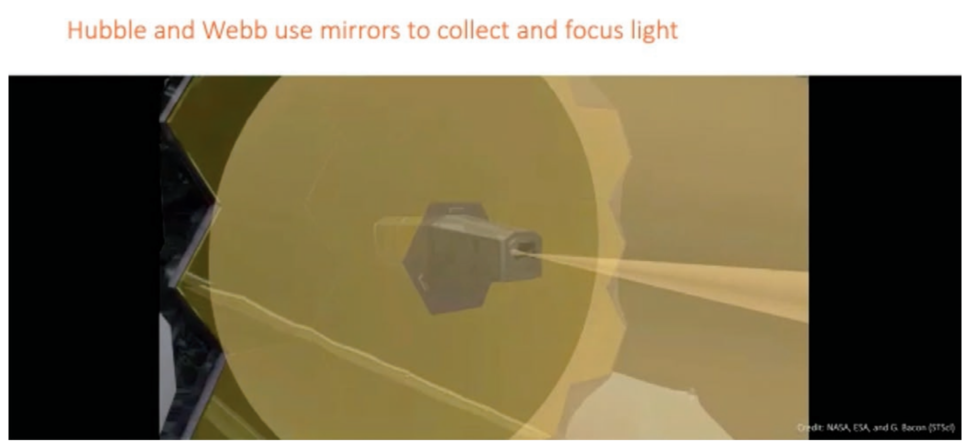
- Full-scale mock-up of the JWST, has 5 layer sun-shields with a Sun Protection Factor (SPF) of 1,000,000

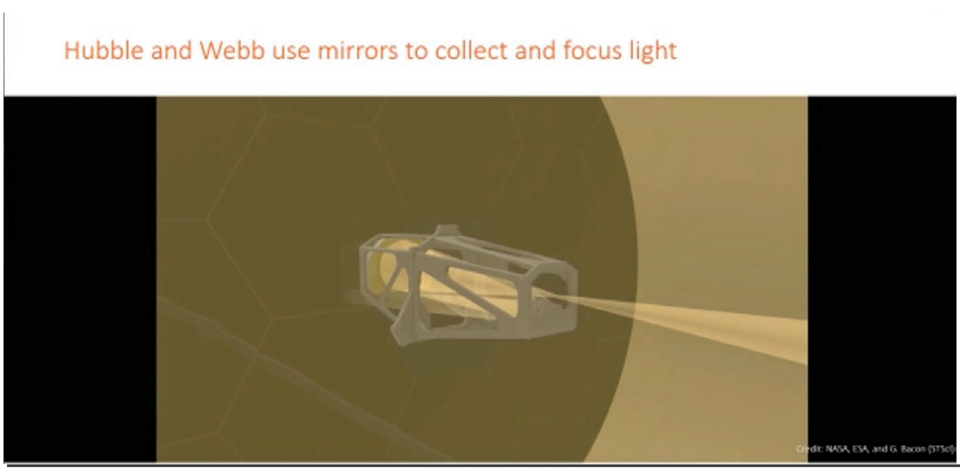


- Revolutionary Optics - Webb is the most complex observatory that has ever been flown
- Primary mirror was designed and built at BAE

Hubble and Webb use mirrors to collect and focus light – Webb is a reflecting telescope



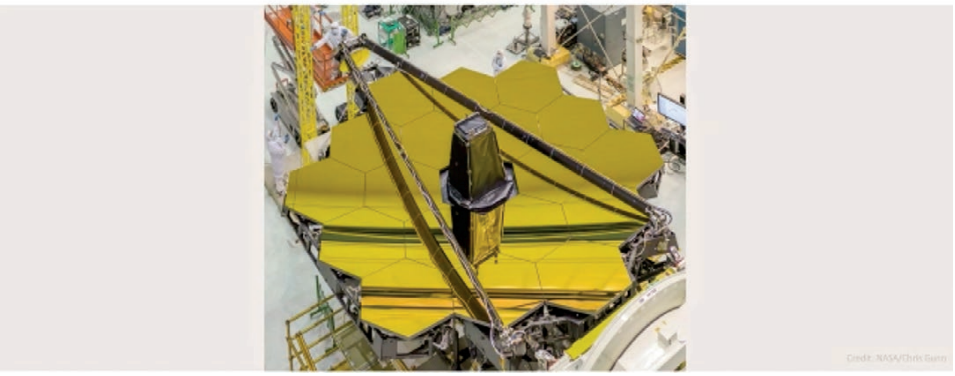




There are three key technological innovations that made JWST mirrors work

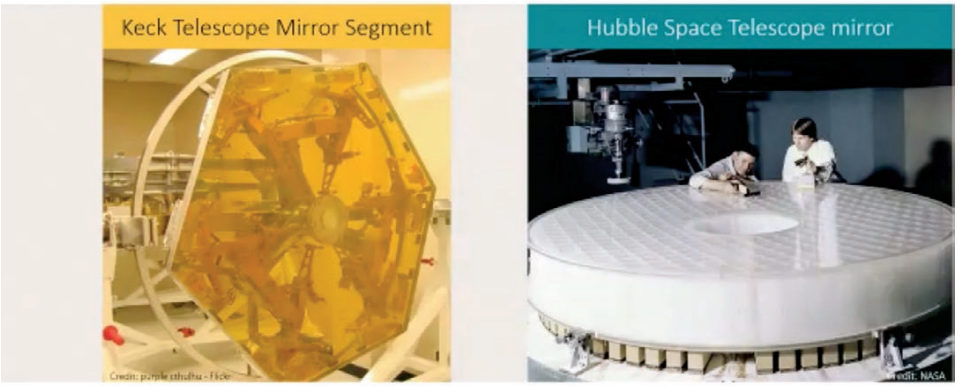
1. Webb's primary mirror is segmented, made up of 18 individual sections, folds up – easier to manufacture and fly, segments need to be aligned carefully to 1/10,000 the width of a hair!

Webb's primary mirror is segmented



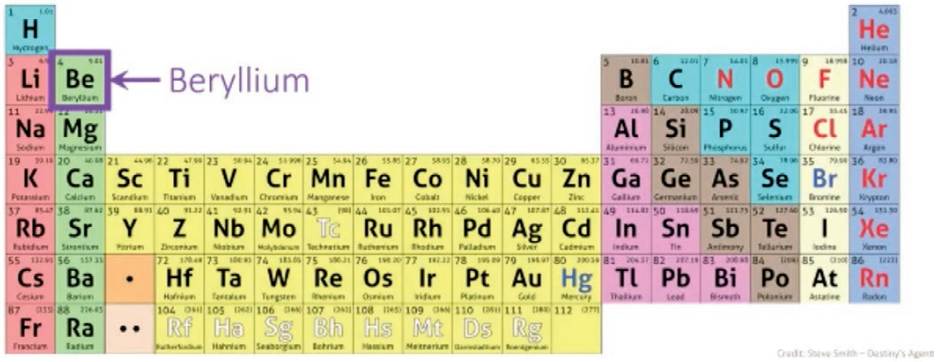
2. Telescope mirrors generally use glass, hold shape in room temperature but when cooled to temperature of deep space, mirrors changes shape, not good, needed different solution

Telescope mirrors generally use glass



- Used Metal #4 on periodic table= Beryllium
- Only one metal Beryllium retains its shape when temperatures change – remains stable

Webb's mirrors are made of metal

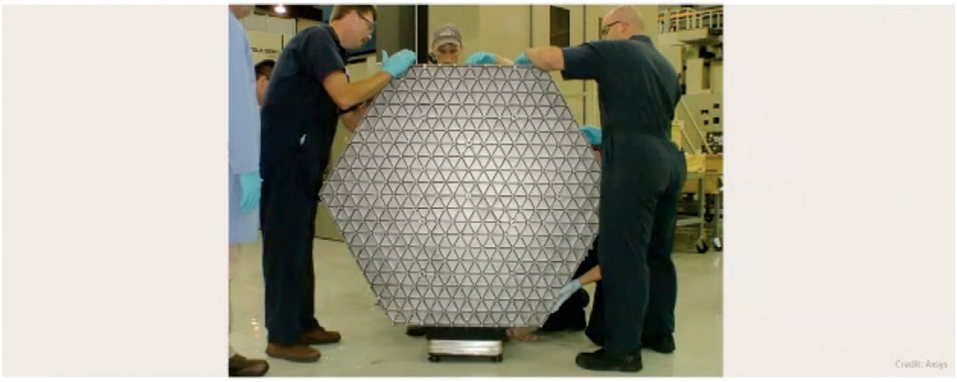


- Each segment starts as a 5" thick solid beryllium slab weighing 550 lbs

Each Webb segment starts as a solid beryllium slab

- To lighten, computerized milling machines hollowed out, leave thin 2mm layer, polished to perfection

Beryllium retains its shape when temperature changes

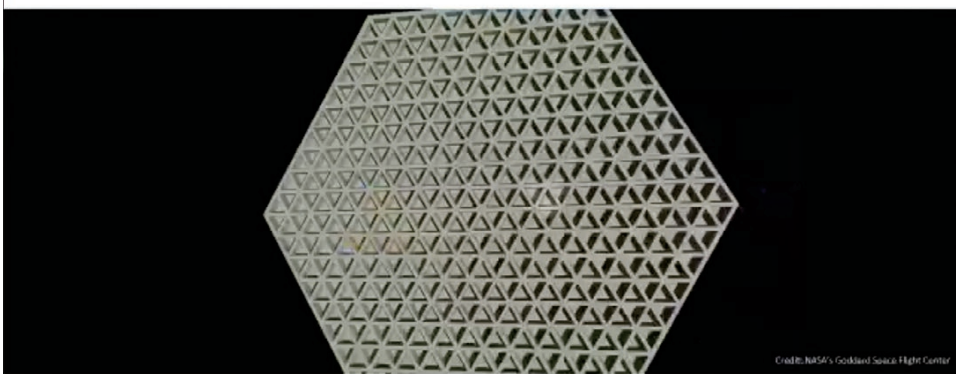


- Webb's mirror segments are gold coated to reflect infrared light
- Polished to perfection, coated with pure gold which reflects 98% of infrared light
- Entire amount to coat all mirrors is only a few atoms thick, would fill a ping pong ball

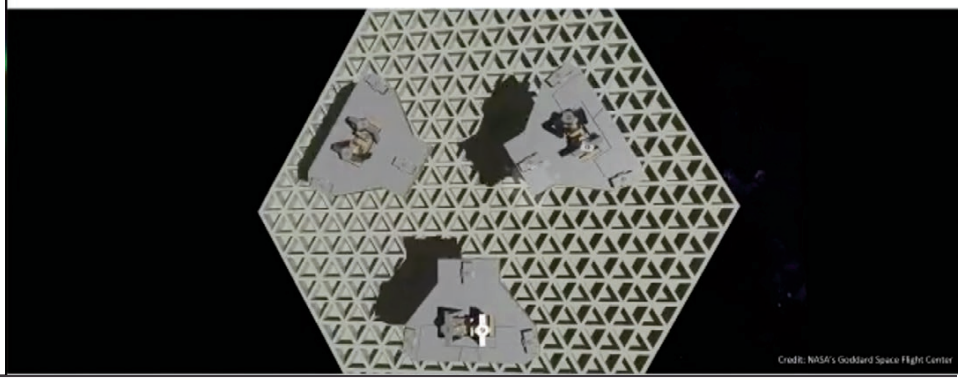
Webb's mirror segments are gold coated to reflect infrared light

3. A third innovation on Webb was making segments that can be moved remotely in space so we can align these mirrors; actuators move the segments multiple ways in the frigid cold of space

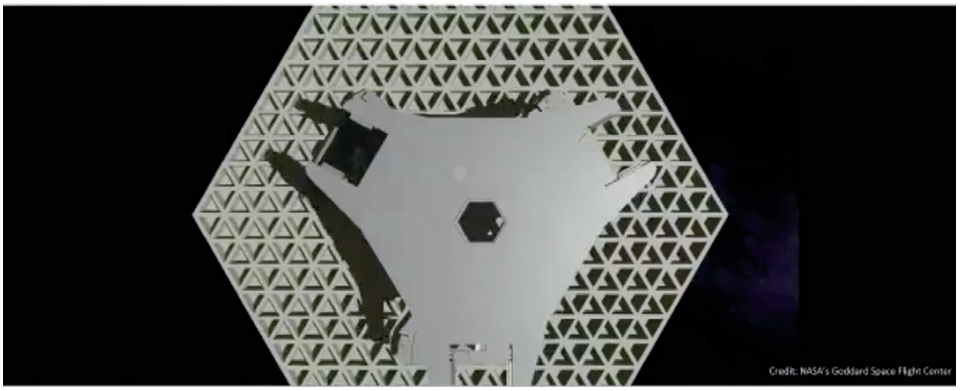
Actuators move the segments multiple ways in the frigid cold of space



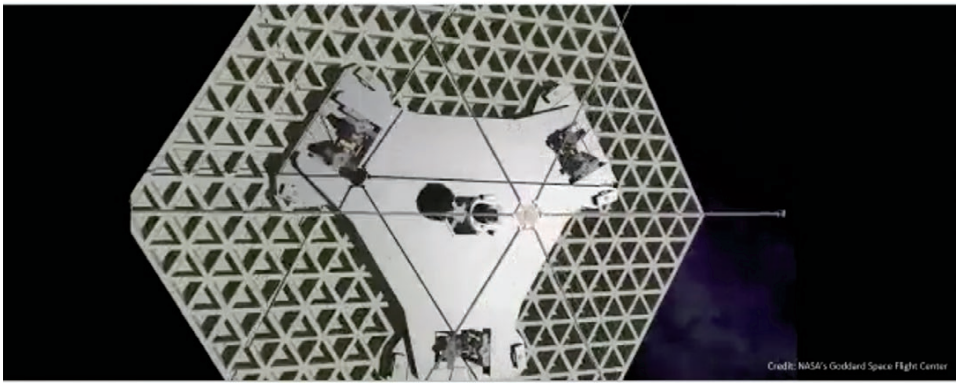
Actuators move the segments multiple ways in the frigid cold of space



Actuators move the segments multiple ways in the frigid cold of space



Actuators move the segments multiple ways in the frigid cold of space



- Have 6 hexapod actuators on back of mirror, 7th in the center connected to the edges
- Need motors to rotate, tilt the mirrors up, down, left, right, can translate up and down. The center actuator can pull on edges to change the shape and the radius of curvature
- Need all this to get a seamless single surface from these 18 segments and need to do in pure vacuum in near absolute zero temperature of in space; a major innovation that allowed the Webb Telescope to work – a mechanical marvel

Image Sharpness Check: Spitzer Space Telescope (2003)

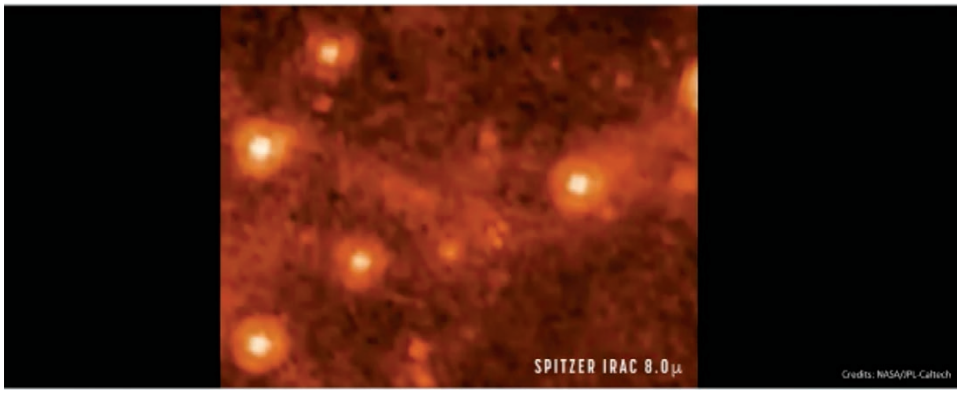
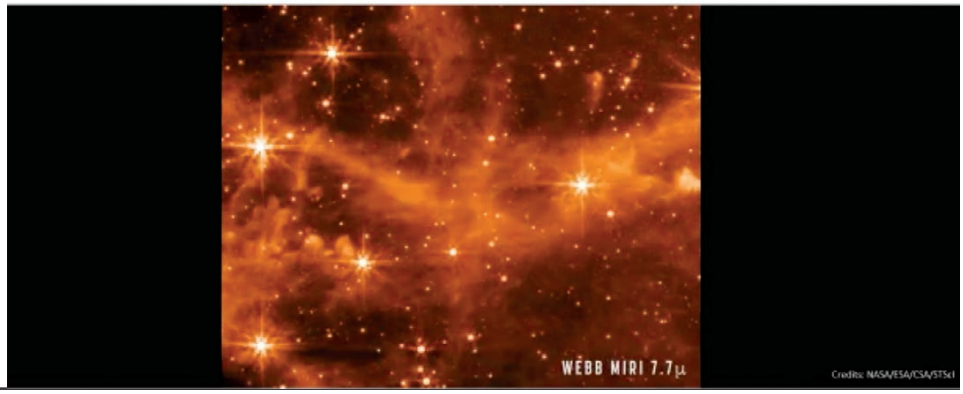


Image Sharpness Check: The power of larger mirrors vs smaller ones: random star field
Top: Spitzer Space Telescope (2003)
Bottom: Webb Space Telescope (2022)

- Things completely invisible to Spitzer, or were merely blobs now pop out as pinpoints of light. This is why astronomers are so thrilled to have this incredible discovery machine

Image Sharpness Check: James Webb Space Telescope (2022)



Nancy Grace Roman Space Telescope

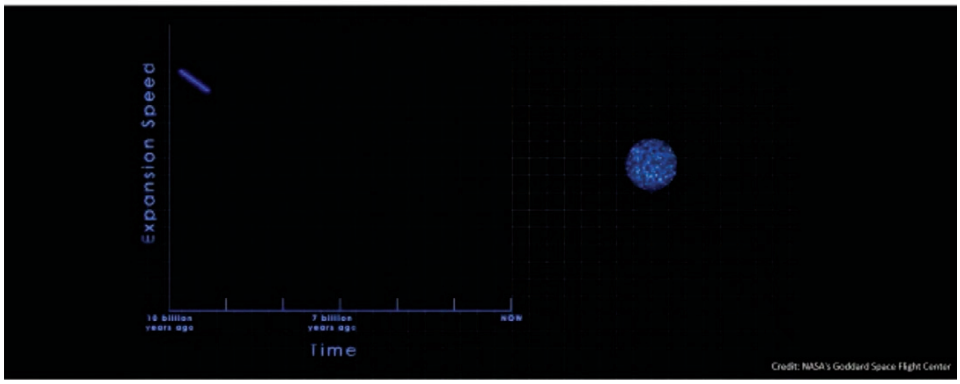
- Why do we need more space telescopes?
- One thing Webb can't do is look at large areas in the sky. In the last 30 years we have discovered interesting things about the Universe that require large surveys of the sky in order to answer - this means we need a different type of space observatory

The Universe is expanding – and accelerating

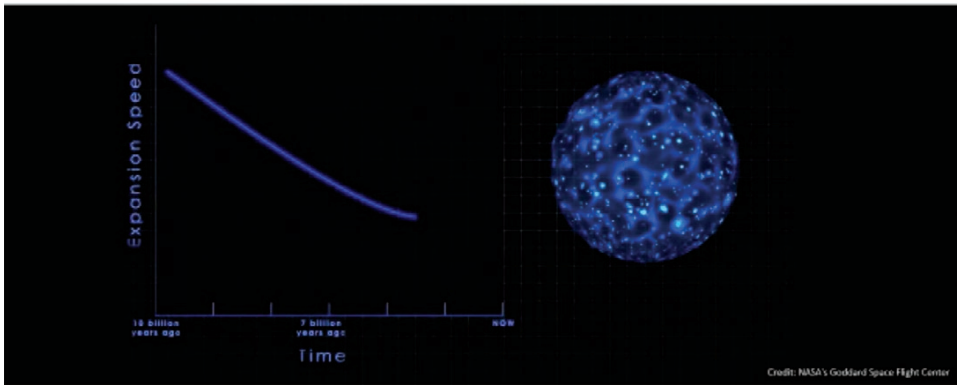
The Universe is expanding – and accelerating.
We have known the Universe is expanding since the Big Bang and assumed that expansion is slowing down. In 1998 scientists used Hubble to make a key discovery; what we found was the expansion is not slowing down; it is in fact accelerating.

- Visible matter (all we observe: stars, planets, neutrino's, us) only 5% of what's out there
- Dark Matter = 27% mysterious substance that interacts with matter gravitationally but does not interact in any other way
- Dark Energy = 68% of mass energy content we know very little about
- We call the mysterious acceleration force "Dark Energy"
- This is quite a mystery to us as it seems to act like "anti-gravity"
- Need new space telescopes to study both Dark Matter and Dark Energy

So how do we study Dark Matter?



The Universe is expanding – and accelerating



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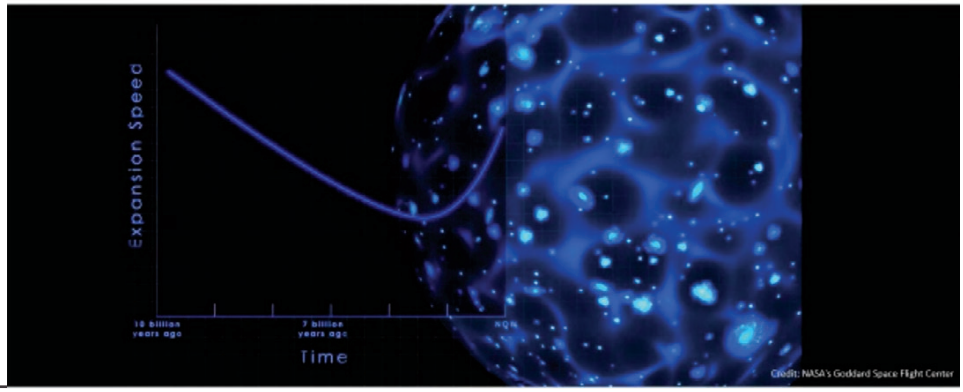
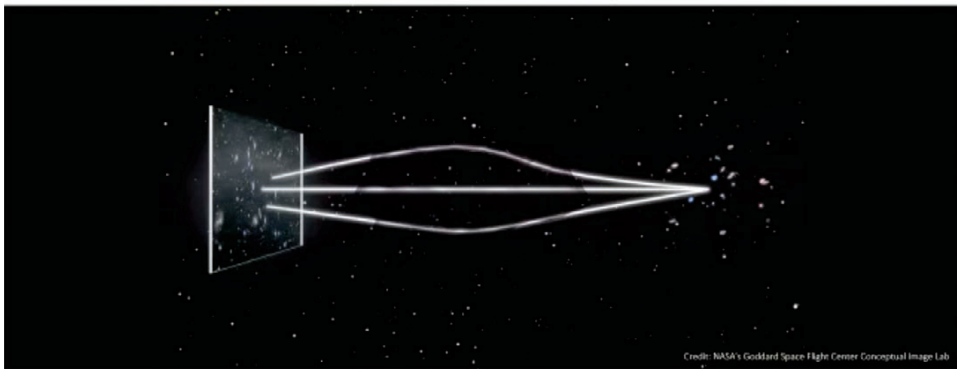
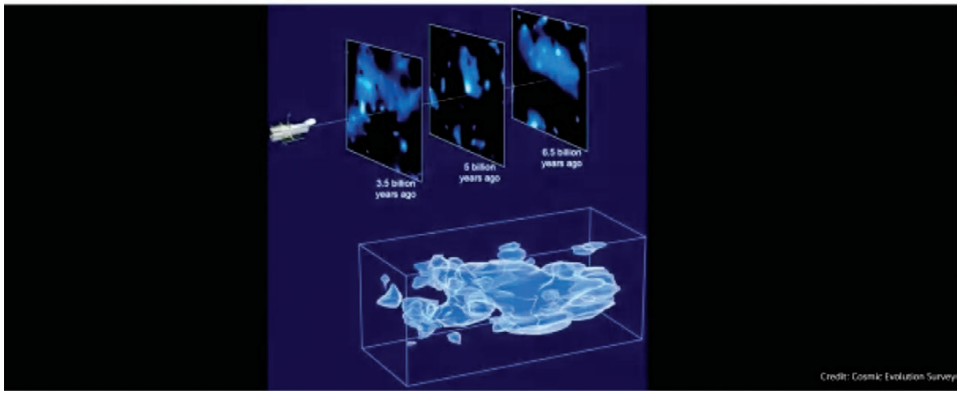


Gravitational lensing reveals the presence of Dark Matter

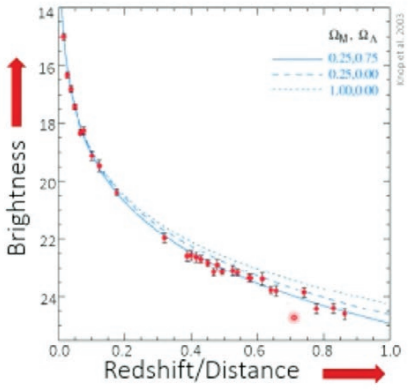


- Gravitational Lensing reveals the presence of Dark Matter
- We can use galaxies and Einstein's General Theory of Relativity. This tells us that anything with mass distorts the space time around it and that affects light passing through it
- We can measure the degree of distortion and working backwards we can figure out how much mass is there and how much dark matter is there
- We can apply this at various points across the sky and map out what the distribution of dark matter is how dark matter changes over time

Measuring how Dark Matter changes over time reveals its nature

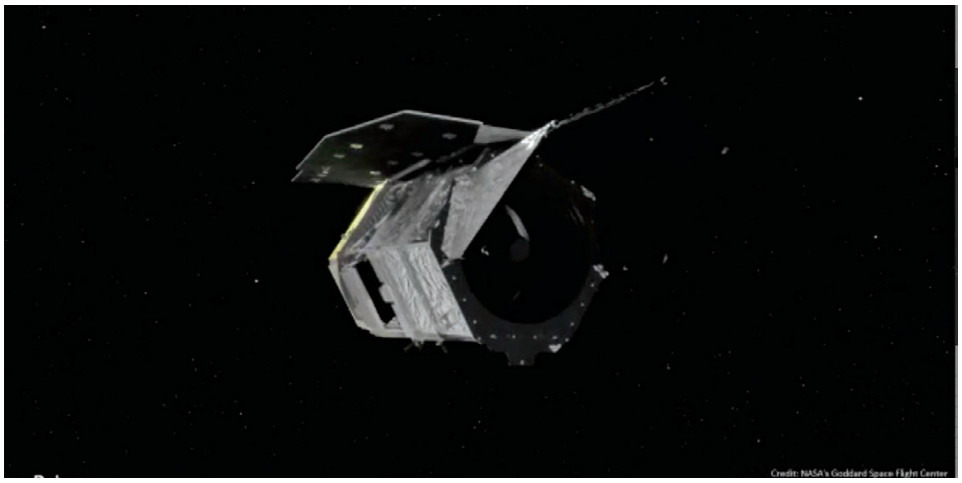


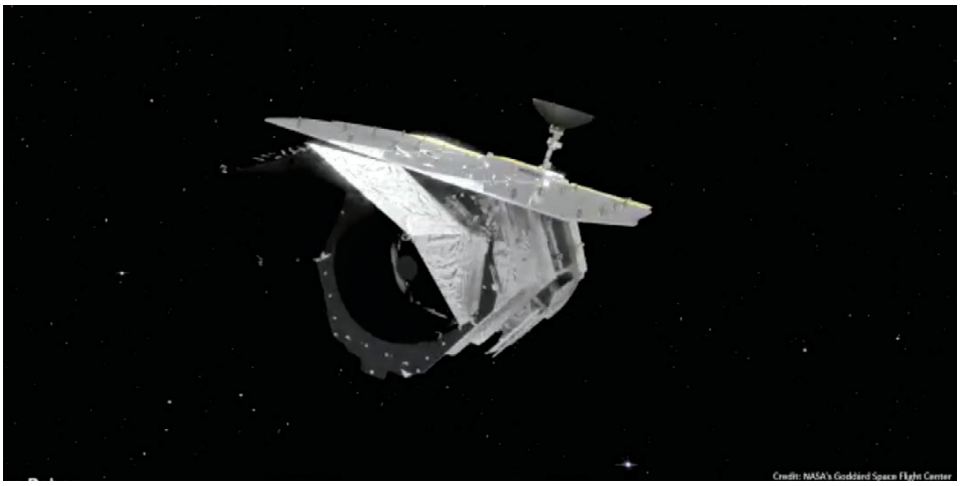
Measuring the expansion rate reveals the presence of Dark Energy



- Looking for super novas which are great tools for studying Universe - Type 1A special to study
- Relationship between how quick brightness changes as function of how far away they are: we can build models to work out amounts of dark energy in dark matter
- In order to do this we need to study many super nova explosions. We need to find them; we don't know where they will occur; we need to look all the time in different parts of the sky
- Need a telescope that is dedicated to do surveys of vast swaths of the sky not only to find the super novas but also the distorted galaxies

That is what the Roman is designed to do, it combines the monolithic mirror type of Hubble with the infrared vision of Webb



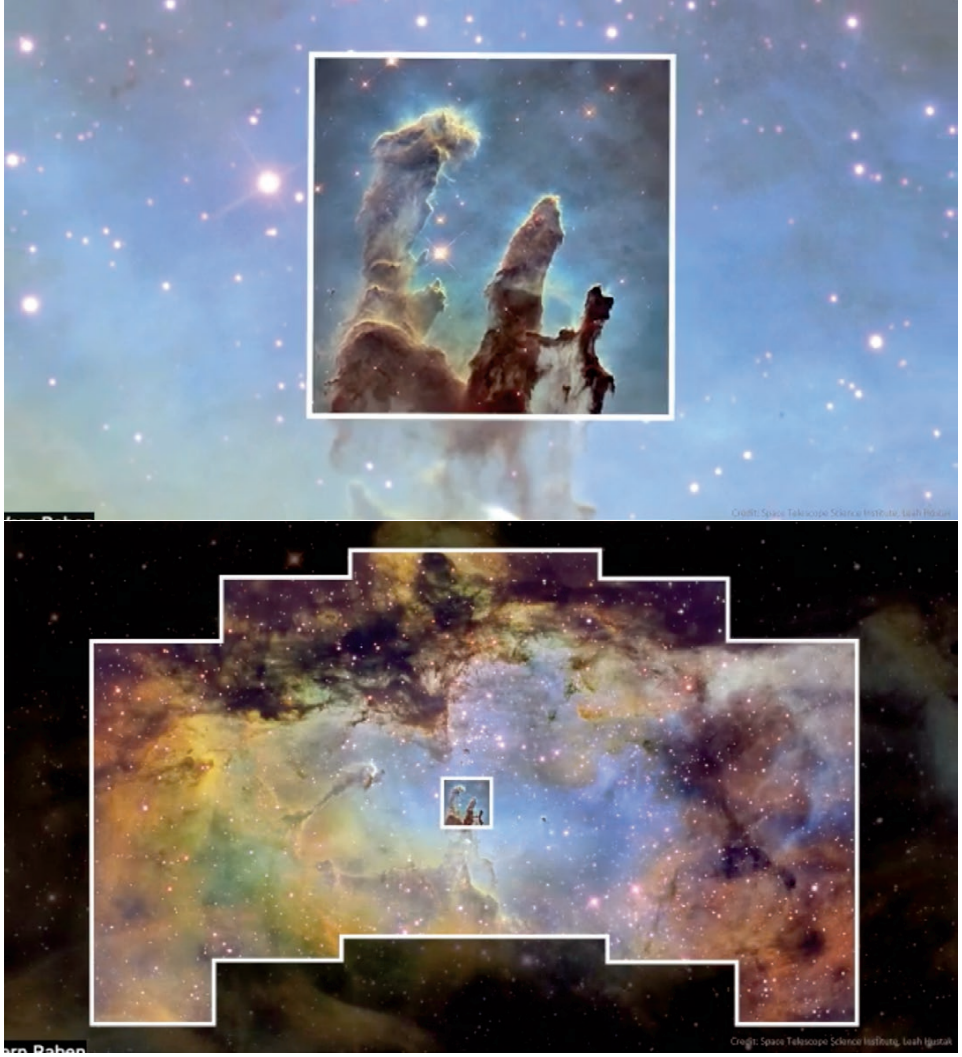


Nancy Grace Roman, NASA's first Chief of Astronomy

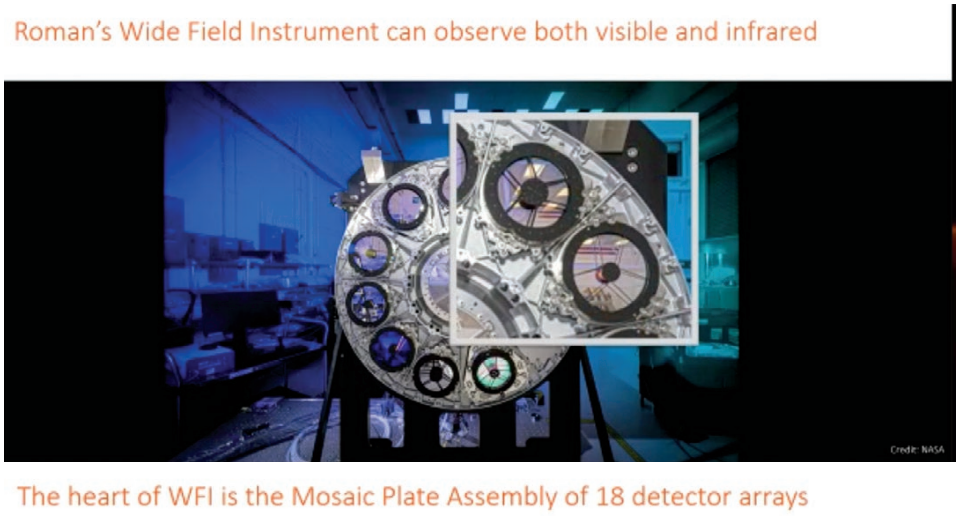
Named for Nancy Grace Roman who in 1960 became NASA's first Chief of Astronomy and advocated for putting a giant telescope in space, earning her the moniker "Mother of Hubble"

- Roman's main camera the WFI (Wide Field Instrument) was built by BAE Systems and delivers the same fantastic images as Hubble but now have large new array detectors that view a much wider area of the sky
- Each Roman will cover 100x as much of the sky as Webb; they can survey the sky 100x faster and can map out dark matter and try to understand the nature of dark energy

Roman's Colossal Cosmic View

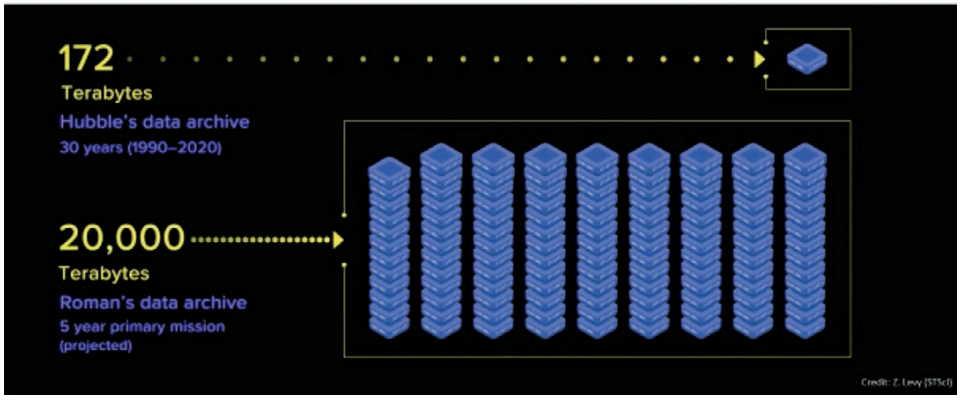


- Roman's WFI different color sensors; can observe both visible and infrared
- Filter wheel built in Boulder and outfitted with little mask precisely shaped and positions to block out infrared light coming off secondary mirror and support structure; this reduces infrared background that enter the telescope and allows the telescope to see fainter things



The key to Roman's wide field view are amazing array detectors. Comparison of large cellphone camera vs Roman sensors, array of 18 sensors together produce image with 300 million pixels

Big Data

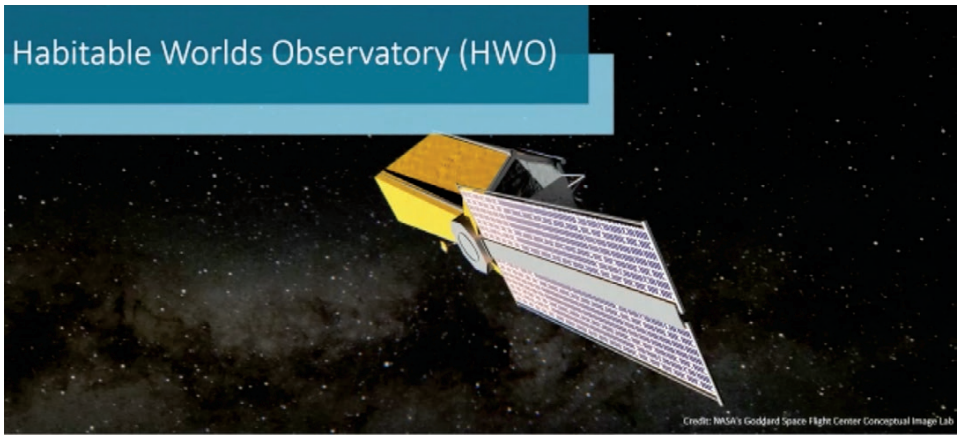


Big Data will be obtained from the Roman Space Telescope

- Hubble's data archive – 30 years (1990 – 2020) = 172 Terabytes
- Roman's data archive – 5 years primary mission (projected) = 20,000 Terabytes

BAE Systems built WFI here in Boulder and delivered it to NASA last year

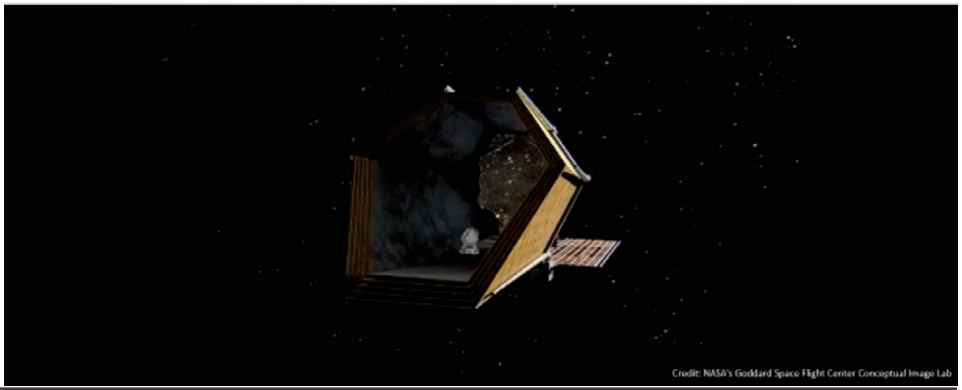
BAE System built Wide Field Instrument (WFI) here in Boulder and delivered it to NASA last year. The camera has been integrated into the telescope; the telescope is fully assembled, fully tested and is now on its way to the launchpad. It is scheduled to launch August 30, 2026



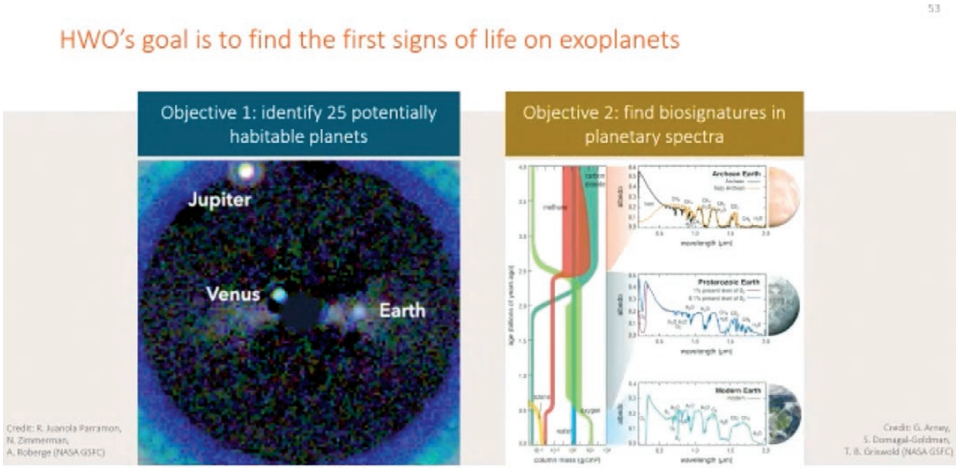
Habitable Worlds Observatory (HWO)

NASA intends HWO as the astronomical flagship for the 2040s

NASA intends HWO as the astronomical flagship for the 2040's – while not yet a formally approved flagship mission, is designed to answer one question; is there life, or signs of life on other planets outside our solar system; HWO will not launch for another twenty years

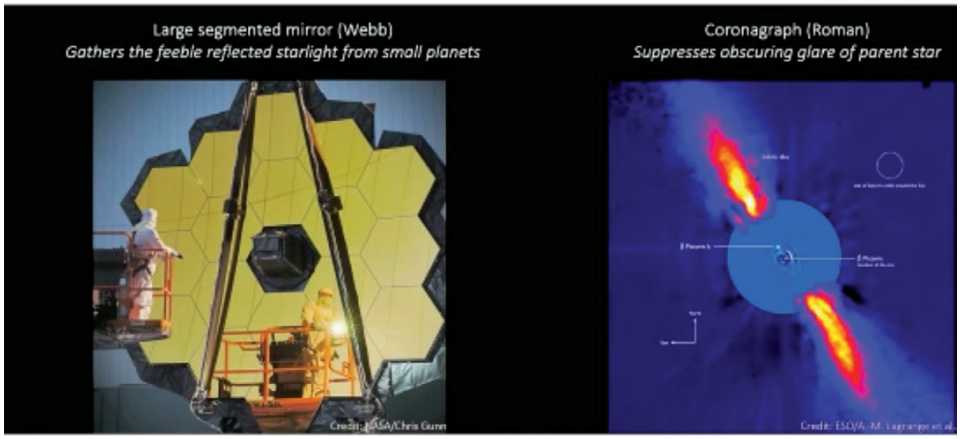


- HWO two main objectives; aims to directly get images of exoplanet orbiting other stars
- Study the atmosphere of those planets to determine whether they contain the materials that indicate the presence of life; oxygen, methane or ozone



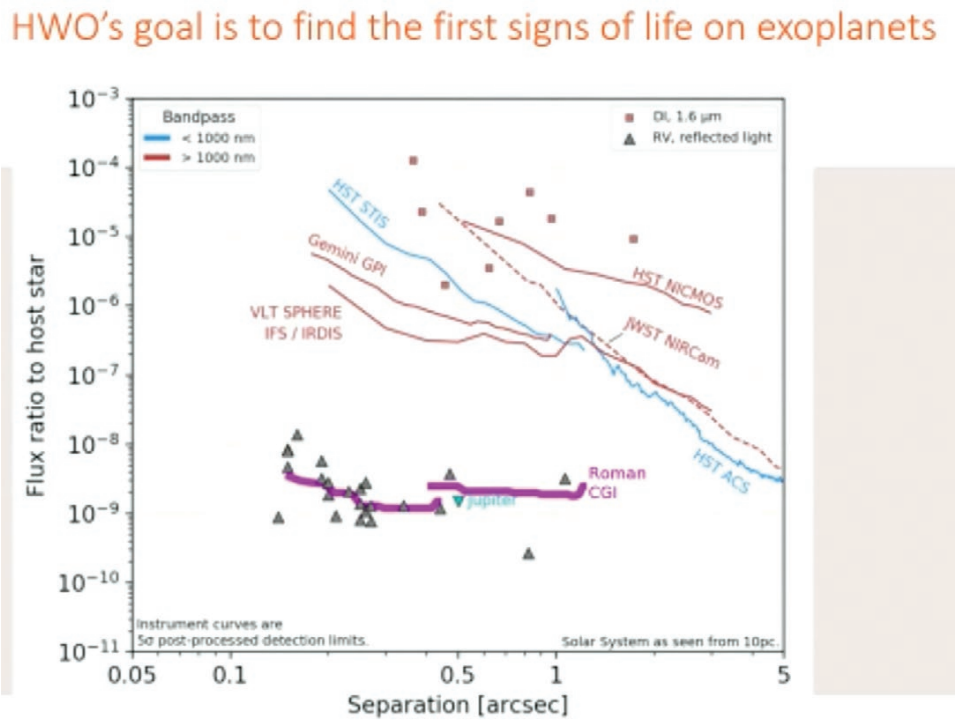
HWO will leverage two technologies developed from Webb and Roman

- Will need a huge segmented mirror like Webb, but will also need a way to block out the light of host star, a coronagraph, similar to the one that has been built for the Roman



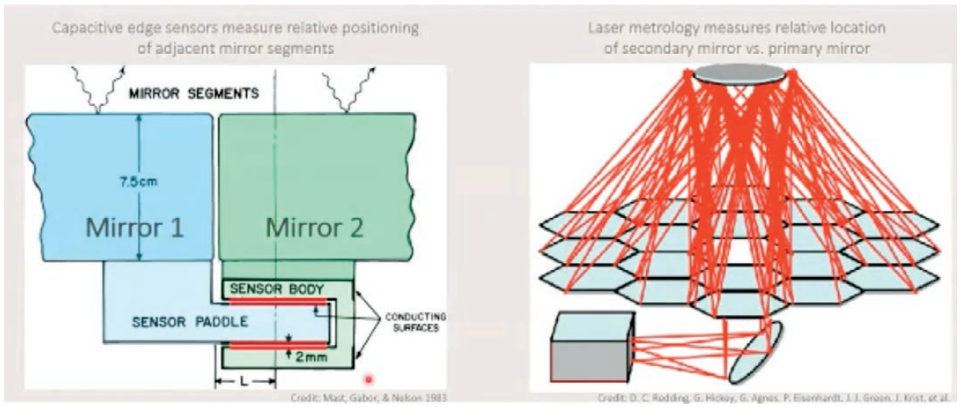
- Coronagraphs suppress starlight to reveal dim planets
- Planets are dim compared to their parent star; will use a coronagraph to suppress starlight to reveal dim planets
- Creates a mini solar eclipse by blocking out the light from the parent star, allowing to see and study the nearby planets

Simulated Solar System Time-lapse observed from 33 light-years away



HWO's goal is to find the first signs of life on exoplanets

- Two factor that make it hard to see
- X Axis = How far away is planet from parent star
- Y Axis = How bright the planet is compared to its parent star
- TOP RIGHT – easier to find BOTTOM LEFT– harder to find
- Lines indicate detection limits: how far down graph can planet still be visible
- To maintain alignment, the system must precisely measure alignment
- To make sensitive measurements need to get measurement down to picometers



- LEFT: Capacitive edge sensors measure relative positioning of adjacent mirror segments
- RIGHT: Laser metrology measures relative location of secondary mirror vs. primary mirror

The mirror segments must remain stable within 10 picometers

The mirror segments must remain stable with 10 picometers – 1/10millionth the width of a stand of hair- will take a few years of R & D to perfect; but they think this telescope can be built

Webb's Discoveries and Images

Movie of Jupiter's Aurora at North Pole – changing patterns of light emitted from trihydrogen atoms that glow in upper atmosphere making an aurora 100x brighter than those on Earth

Ringed planet – Neptune, wonderful detail in cloud structure, 7 moons, Triton much larger moon at top, brighter than Neptune in infrared

Star formation in Pismis 24
Stunning vistas of clouds of gas – group of hot young stars in our galaxy that are emitting incredible energy, vaporing the gas cloud that formed them

Planetary Nebula NGC 1514
Glowing remnant of a dying star forms this beautiful planetary nebula

Einstein Ring in SMACSJ00282-7537
Chance alignment between two galaxies – foreground galaxy acts as a gravitational lens, distorting the image of a redder galaxy in the background

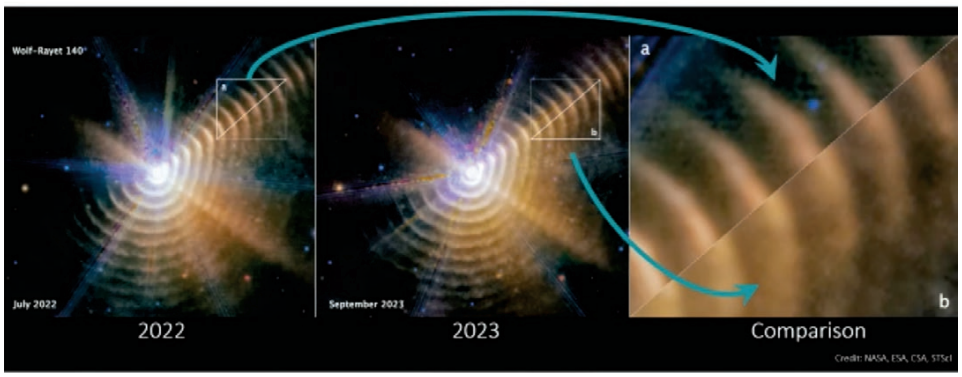
Galaxy Cluster G165 – clusters of galaxies, behind them even more distant galaxies in the early Universe appear red and distorted by the gravitational effects of foreground galaxies

Wolf-Rayet system WR 124 (Hubble)

Wolf-Rayet system WR 124 (Hubble) Giant stars in late stages of life, producing ferocious amounts of energy ejecting matter into space 100X more massive than the sun, 30x hotter 100,000x brighter; new discovery from Webb shows play key role key role in seeding the universe with carbon atoms that form the basis of life on Earth

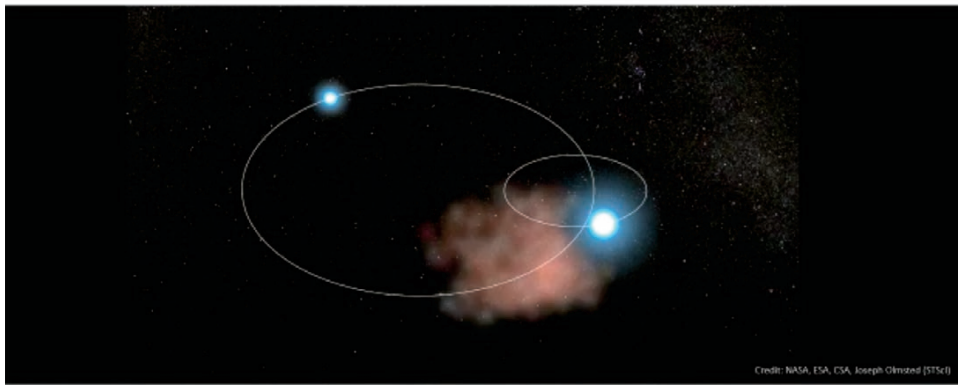
WR 140 (JWST) Dust shells surrounding a star, can watch it change over a period of months,
can work out how quickly they are expanding – 1600 km per second! –
Why are these shells here? Why are they spaced so regularly? Why are they moving so fast?

WR 140



Wolf Rayet
We think there are two stars in this system that orbit each other on a time-scale of 8 yrs
When they get close together winds interact and produces a new shell of carbon dust that is ejected out into space, carbon dust may coalesce into planets like our own and perhaps becoming the stuff we are made of!

Wolf-Rayet binary star animation



Wolf-Rayet system Apep
Three stars surrounded by coiled shells of dust, bubble around ~ 5 LY across

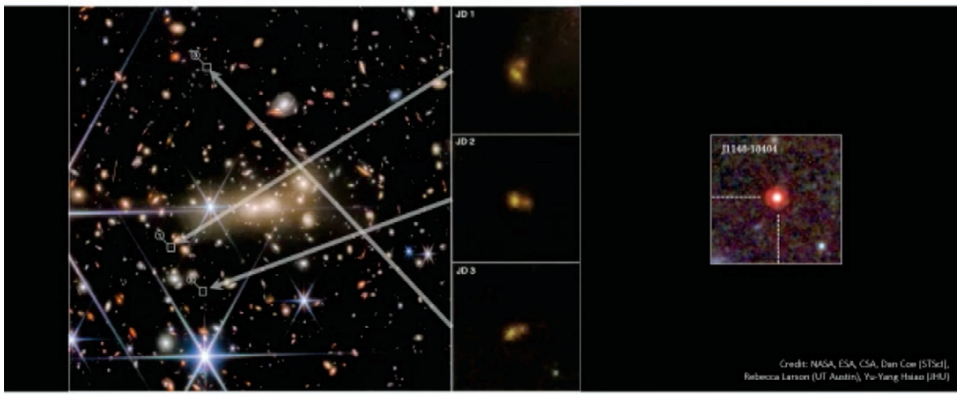
Webb's view of Galaxies

Webb's view of Galaxies
- Anywhere we look in the sky we see galaxies by the thousands
- Many different sizes, shapes, colors, some near, some far

Webb's view of Galaxies

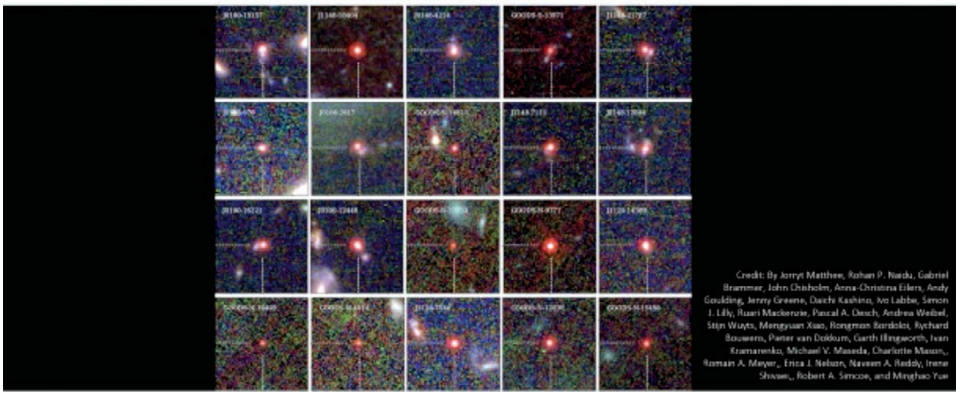
- Leo P faint galaxy close by but not discovered until 2013, looks like star cluster but is actually a draft galaxy, one of smallest ever found just on outskirts of our local group
- Instead of billions of stars, maybe a few million

Infant galaxies in the distant Universe



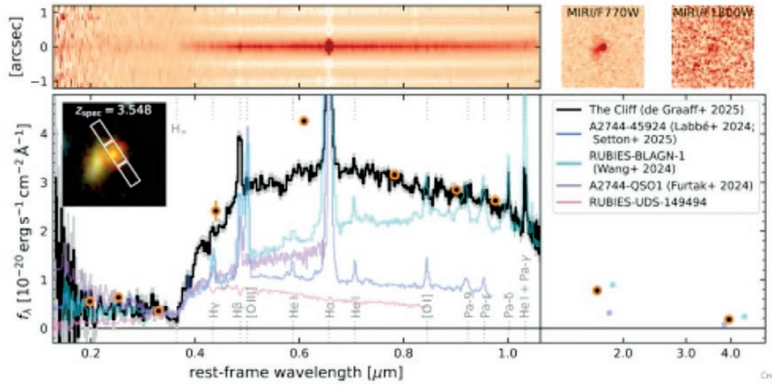
Left: Infant galaxies in the distant Universe
Middle: Looks like three infant galaxies but same one due to gravitational lensing
Right: Galaxy so far away is reduced in size to just "little red dot" so red only visible in infrared

Mysterious "Little Red Dot" galaxies are abundant in the early Universe



Mysterious "Little Red Dot" galaxies are abundant in the early Universe, galaxy so far away are reduced to just a red dot, only seen in the infrared, thought maybe to be starburst galaxies, disproven some should collide and produce x-rays, they do not, no spiral arms, no nebulosity, very compact, seen as they were 12 billion years ago, vanished long ago

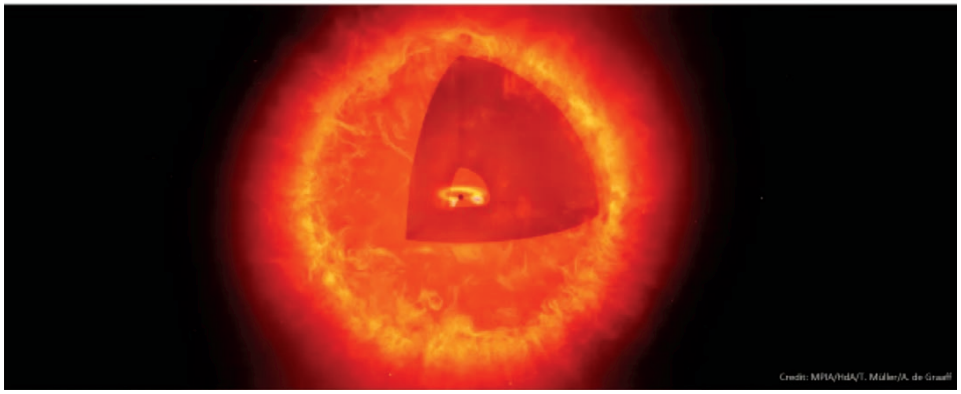
JWST spectrum shows an extreme object



JWST Spectrum very unusual, have way more light in the visible than ultraviolet

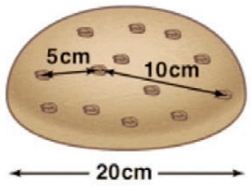
Led to interesting suggestion, been speculated to be “black hole star” active ongoing research

A “black hole star” could explain the observations



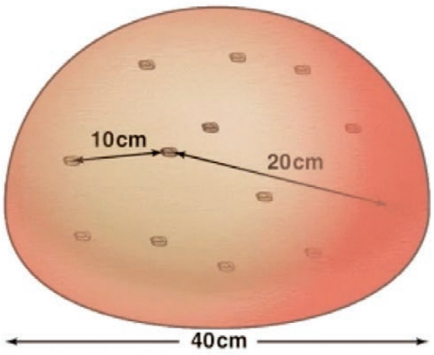
Webb recently confirmed that we may have an incomplete understanding of the physics of expansion of the universe: the “raisin bread” model illustrates how the Universe expands

The “raisin bread” model illustrates how the Universe expands



Edwin Hubble’s famous diagram shows relationship between how far away a galaxy is from us and how fast it is moving – Hubble’s Constant

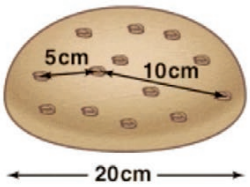
The “raisin bread” model illustrates how the Universe expands

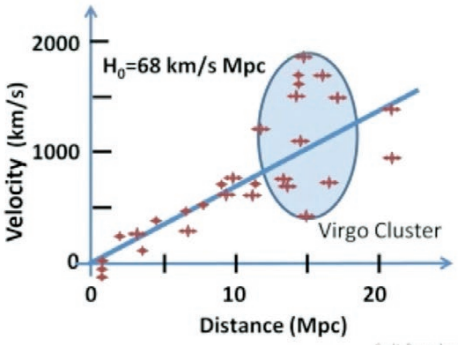


However, to measure how far away the galaxy from us is more difficult. For this we use Cepheid Variables – stars that change in brightness in a very predictable way, been using this method for the last 100 yrs, been using Hubble for the last 35 yrs.

- Has been difficult to pick out Cepheids from others, now with Webb, can see through gas and dust, easier to pinpoint and make measurements are less biased, more accurate

The “raisin bread” model illustrates how the Universe expands

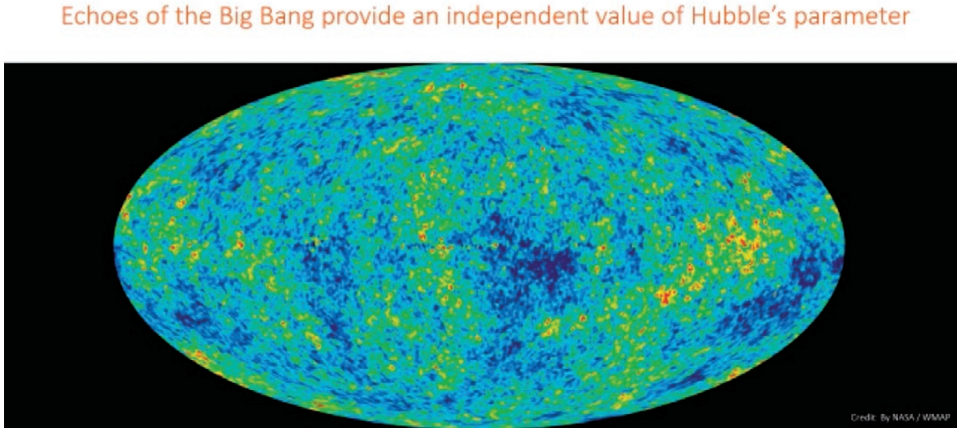




Recent JWST results in galaxy NGC 4258 yield the best measurement yet

- Left: Galaxy NGC 4258 Middle: Visible/Hubble Right: Infrared/Webb
- Not only sharper images but Webb can see through the gas and dust
- Turns out similar to what we saw before, turns out to be a problem

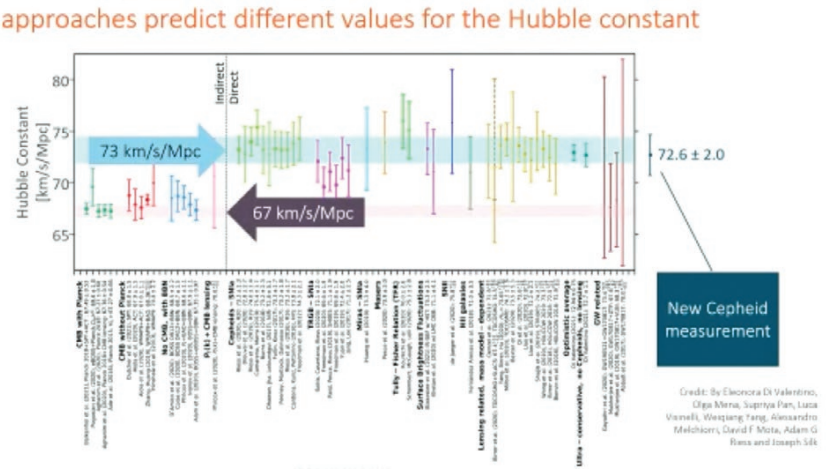
- There is a second way to measure Hubble constant and see how fast the universe is expanding; by observing the microwaves left over from the Big Bang
- Space satellite can map out the microwave sky and detect minute differences between temperature of microwave radiation of different parts of the sky
- Those variations tell us important information about the conditions of Universe in earliest moments of the Big Bang



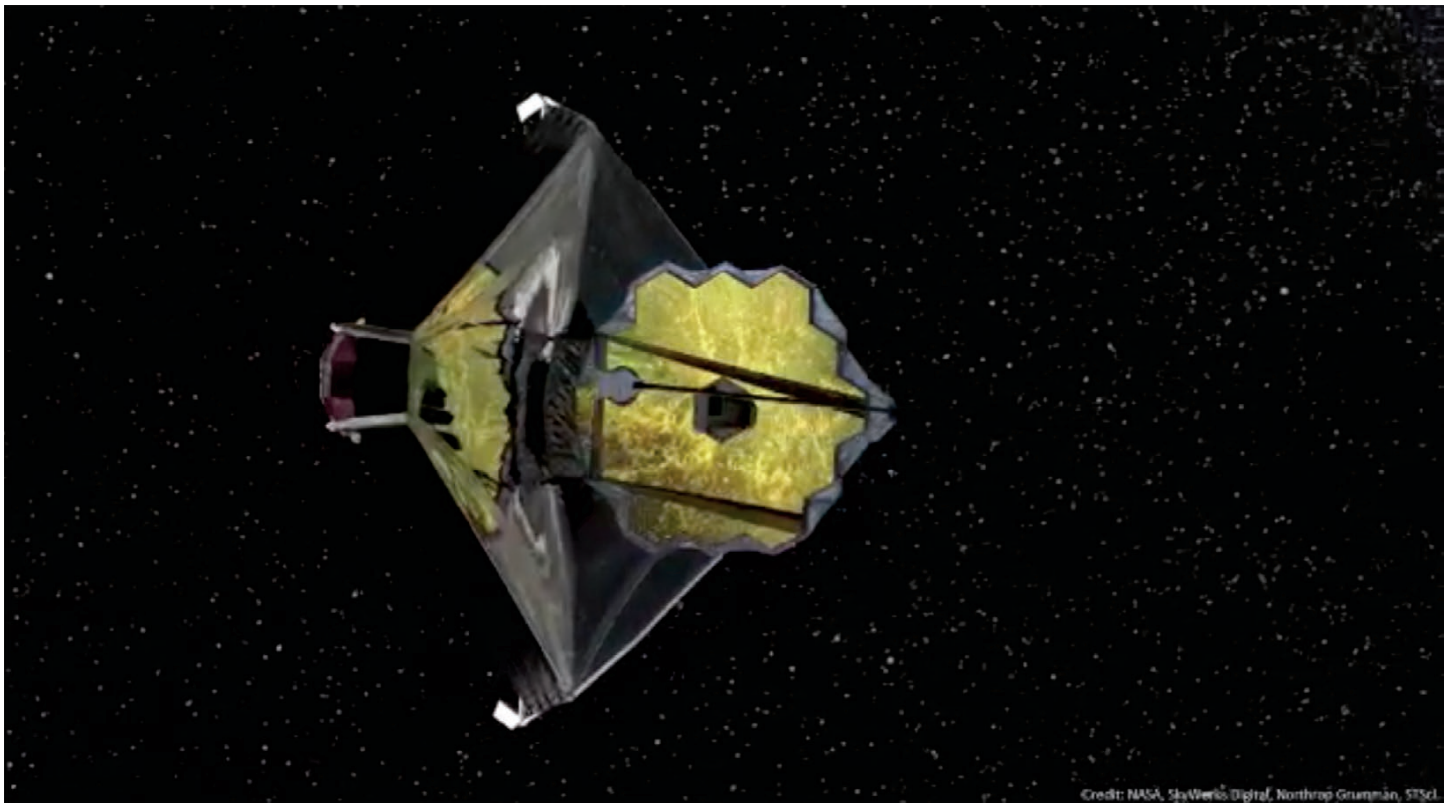
- If we know that we can predict based on laws of physics how fast the Universe is expanding today; echoes of the Big Bang provide an independent value of Hubble's parameter and the two measures should agree, but they don't

The two approaches predict different values for the Hubble constant

- Measurements from microwave background =67km/s/Mpc
- Measurements based on galaxies =73km/s/Mpc
- Uncertainty of the two measurements
- Now we are getting better data and the uncertainties are coming down, but differences remain, most recent from Webb =New Cepheid Variable Measurement = 72.6 +/- 2.0
- That becomes a problem for us but also an opportunity for new discovery
- Tells us either we don't understand how to measure distance to galaxies properly, or there is something physicists do not understand about how the universe operates and that can be an opportunity for discovery too



Every week now JWST is returning to us fascinating images that are helping to make groundbreaking science



happen and when Roman launches later this summer it will join Webb out there and explore vast swaths of the Universe, telling us about dark matter, revealing what dark energy is and casting light on some of our most pressing questions on the fate of the Universe. Eventually HabWorlds will join them out there and be used to determine whether life on Earth is just a happy accident or something that's inevitable. These telescopes are the past, present and future of astronomy for us and will be our legacy to the next generation of astronomers to help them follow in the footsteps of today's astronomers and ask exciting questions about where we came from, and where we are going.

Questions:

Would love to hear how you focus that thing: 18 panels and 4 motors each one. That must be a difficult thing to solve. Did a lot of those techniques come from Keck?

The 10 picometers measurements – curious what kind of advantage does this precision brings?

The Roman telescope is going to bring vast amounts of data, how do you effectively parse that amount of data and pull out the things that are actually interesting for us to look at?

At the beginning stages of building a telescope what are determining factors you would follow for the telescope being in space or on the ground?

Super Novas are standard candles and Roman is going to be looking for 10s of thousands, millions of these, but they are imbedded in galaxies, and there is intervening absorbing media, is not homogeneous. As we look at these standard candles, seems the absorption of the energy that you are measuring is going to be an unknown factor, how do you compensate for that?

What is going to happen when the Milky Way and Andromeda collide?

When you are talking about focusing with no motors, how do you do that focusing mechanically?

III. Business Report by Bruce Lamoreaux

Longmont Astronomical Society

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

LAS Treasurer's Report - Bruce Lamoreaux **5/21/2026**

Main Checking Account (xxx-1587)

Begin Balance:	$ 4,982.00	**4/2/2026**	
Deposits:	$ 75.00	Membership	
Expenses:	$ (87.00)	Bank Charges, Library Telescope, State Fee	
Current Balance:	**$ 4,970.00**	**5/4/2026**	

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

Past Balance:	$ 8,325.00	**12/31/2025**
Interest:	$ 15.00	
Balance:	**$ 8,340.00**	**3/31/2026**

Telescope Fund (xxx-0165)

Past Balance:	$ 1,090.00	**3/30/2026**
Deposits:	$ -	
Expenses:	$ -	
Balance	**$ 1,090.00**	**4/29/2026**

Petty Cash

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

Total Assets	**$ 14,450.00**	$	(13.00) Down from April

Active Membership:	**105**	
Student Membership:	**2**	
Total	**107**	Active

IV. Upcoming Events by Aref Namarri

IV. Upcoming Events

- June 13 – Public star party at Beech Shelter with City of Boulder Open Space from 9:00 to midnight
- June 18 – LAS Meeting from 7 to 8:30 pm
- June 19 – Public star party at Rabbit Mountain with Boulder County Parks from 8:00 to 10:00 pm
- July 15th Beech Shelter
- July 17th Rabbit Mountain
- Also beginning to plan for Longmont Pubic Library observing events, probably starting in the Fall, initially will first be quarterly, will be day solar observing and also night on the library patio

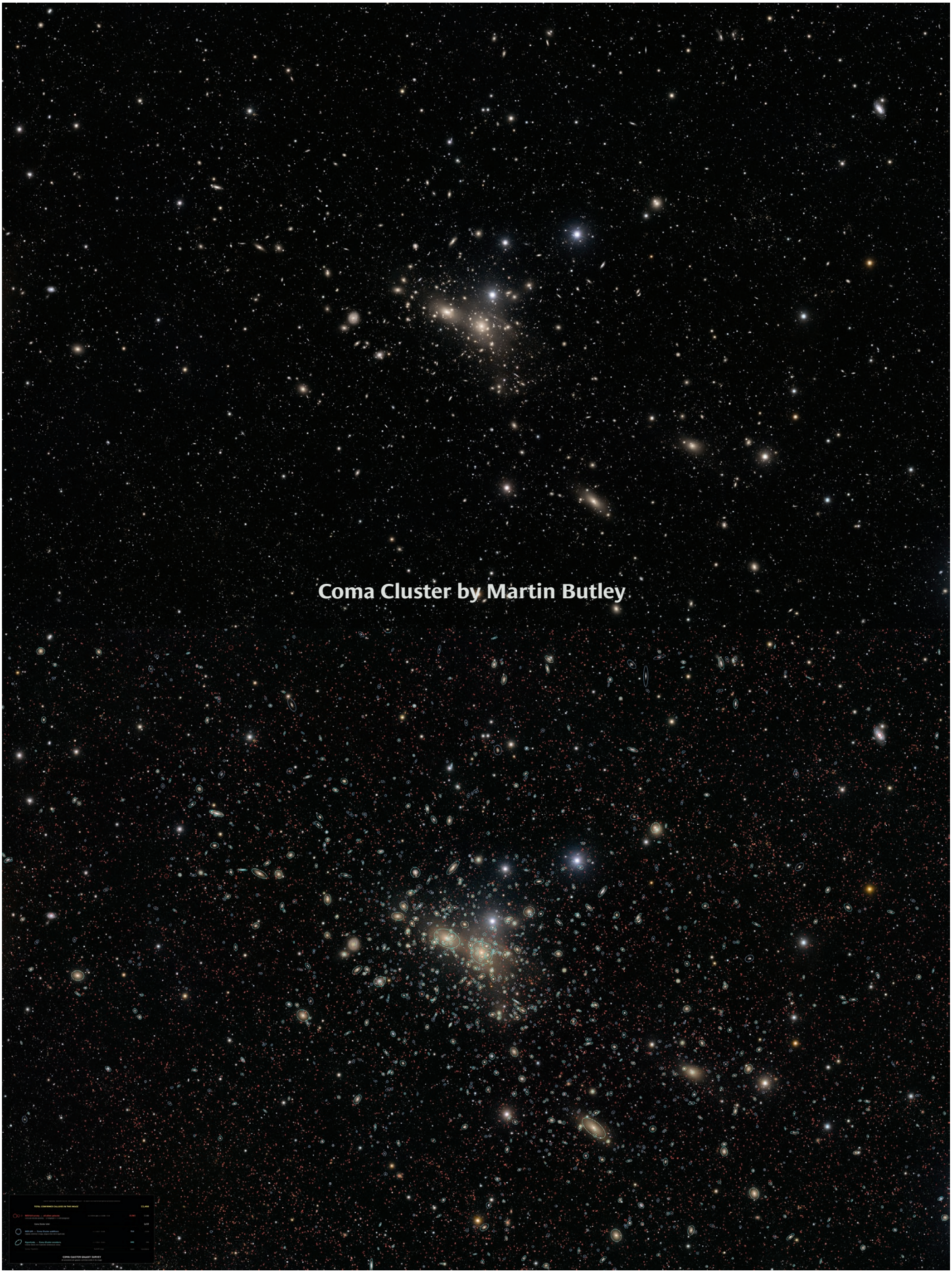
V. Library Telescope Update

Many people may not even know we have a Library Telescope Program, started in 2015. We donated 3 telescopes to the Longmont Public Library, in 2016 we donated 2 more and we applied for a grant from the Jack Horkheimer foundation. ***Note: "Star Hustler" starring Jack Horkheimer was a television program broadcast on PBS from 1985 to 1997 VR.*** These are simple tabletop scopes, 4.25”aperture, optically a very nice scope, small enough but have wide field so make easy for people to find objects, while remaining nicely portable for people to pick up and load in their cars.

We then expanded that:

- We donated 2 telescope kits to Louisville Library with another Horkheimer grant
- We donated 3 telescope kits to High Plains Library District in Jan 2017. We completed an additional 18 kits for them in 2018 and 2019 - High Plains Library District is quite large includes: Firestone, Erie, Greeley and everything all the way to the Kansas Border, covers a population of 400,000 people. They store books and equipment in Greeley, have network of trucks and ship out from there to such places as Alt, it has been a very successful program for them too
- We donated 2 telescope kits to Broomfield Public Library in January 2018
- Gilpin County Library received two scopes in 2023
- Broomfield would like a couple more, we have two spares that with some work can be used and has recently been approved by the board

Bruce Lamoreaux has been working behind the scenes and doing a great job managing this program for many years and preparing, assembling and delivering the kits and is currently working on preparing the Broomfield kits for their library.



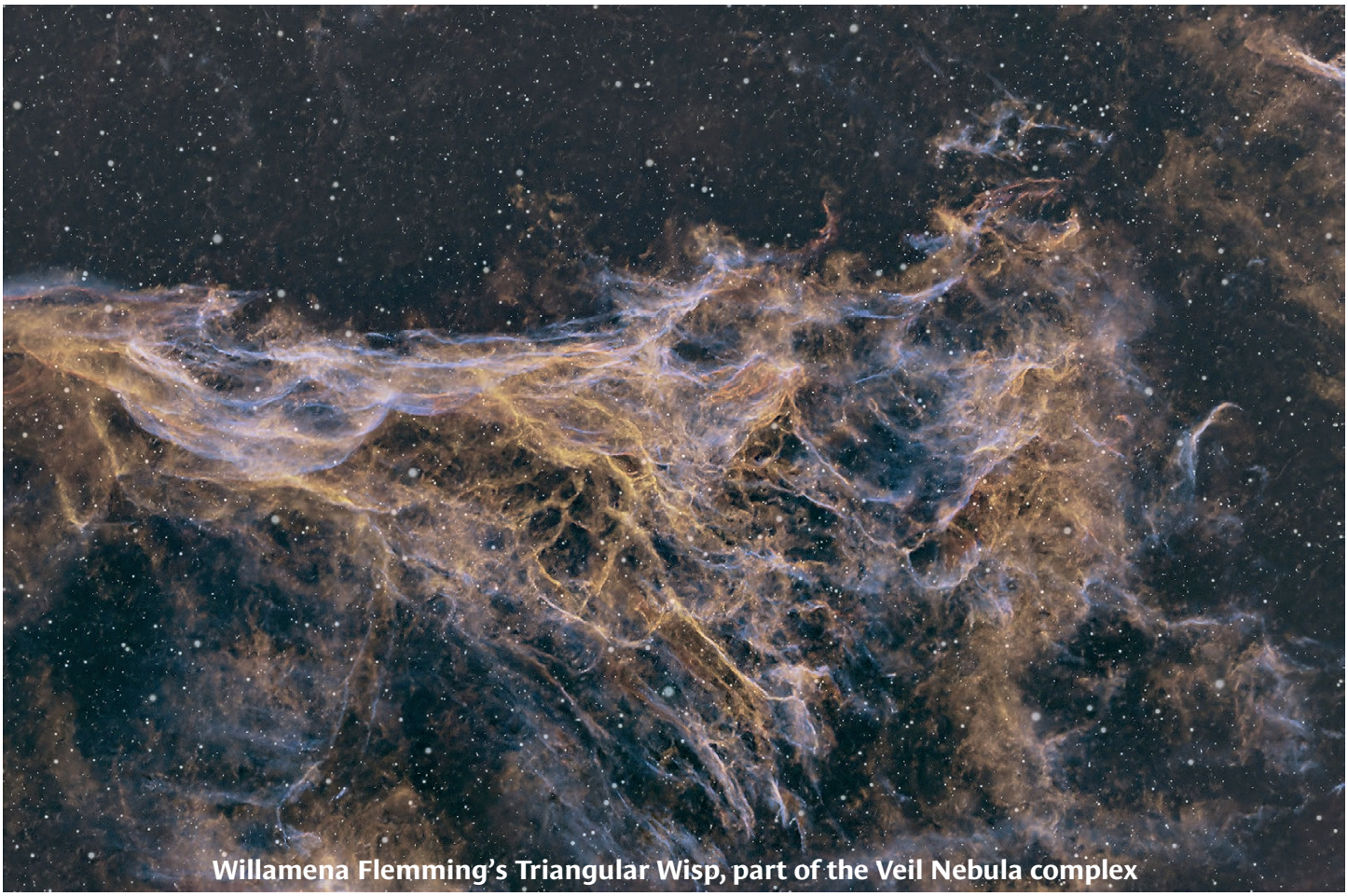
Coma Cluster by Martin Butley

Nebulae Detail by Stephen Garretson

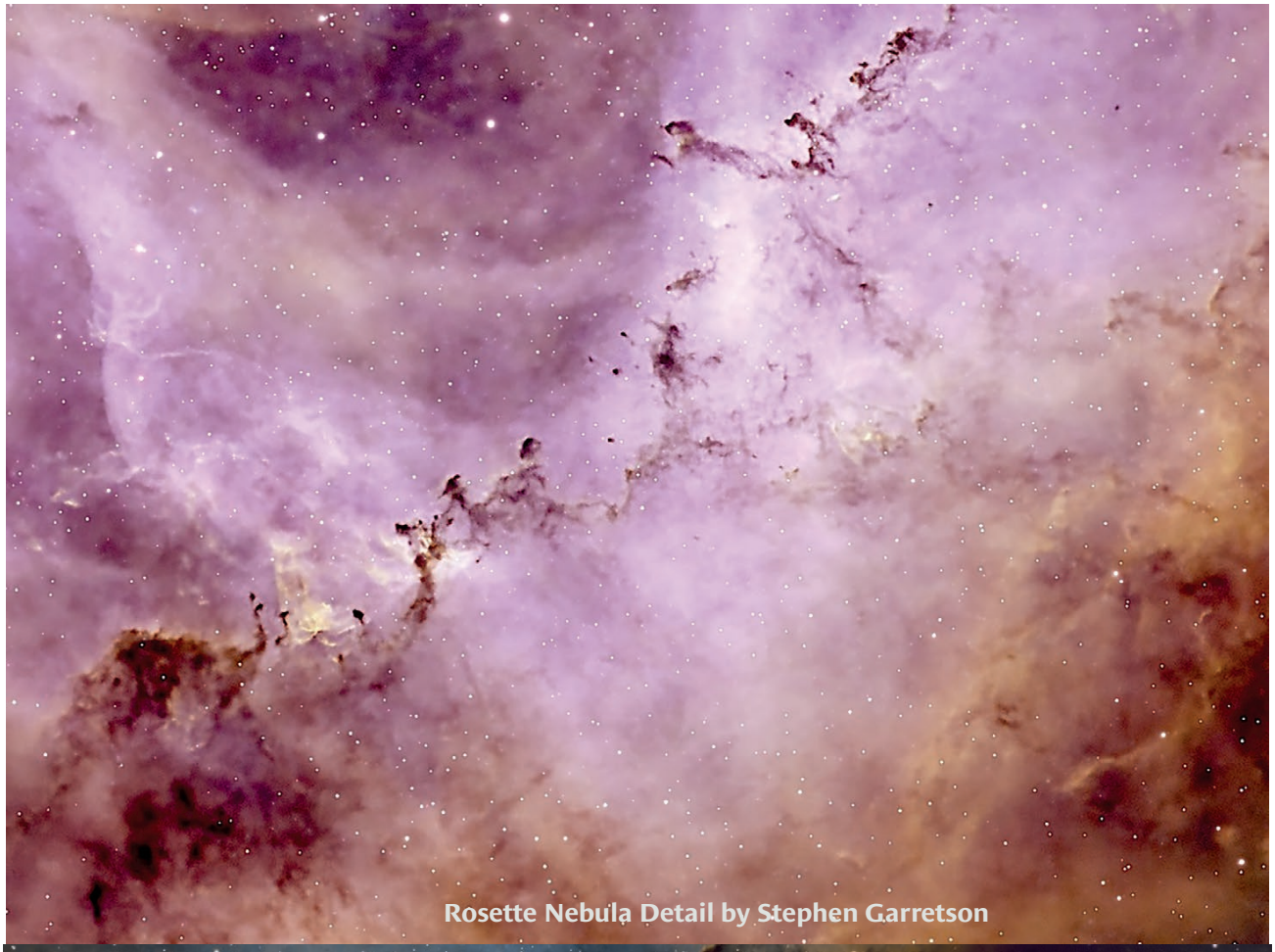
Wanting to get in closer to view structures of interest in various nebulae I pulled these from recent images. The first is ~1/4 of the whole image of Willamena Flemming's Triangular Wisp, part of the Veil Nebula complex. Next is an even smaller section, maybe 1/8 of the whole image, from the Rosette, this treatment containing data from Ha, OIII, SII, and H-Beta. Lastly is ~1/4 section of an image of the eastern part of the Soul Nebula.

All three were captured with the dual William Optics FLT 132 APO setup. I have been working to commission a 10" CDK for these types of FOVs, but having too many issues, so have tabled it for the present and just remounted the dual 132s. The summer Milky Way is starting to appear in the wee hours, so I plan to pursue targets in detail with these scopes.

...Stephen



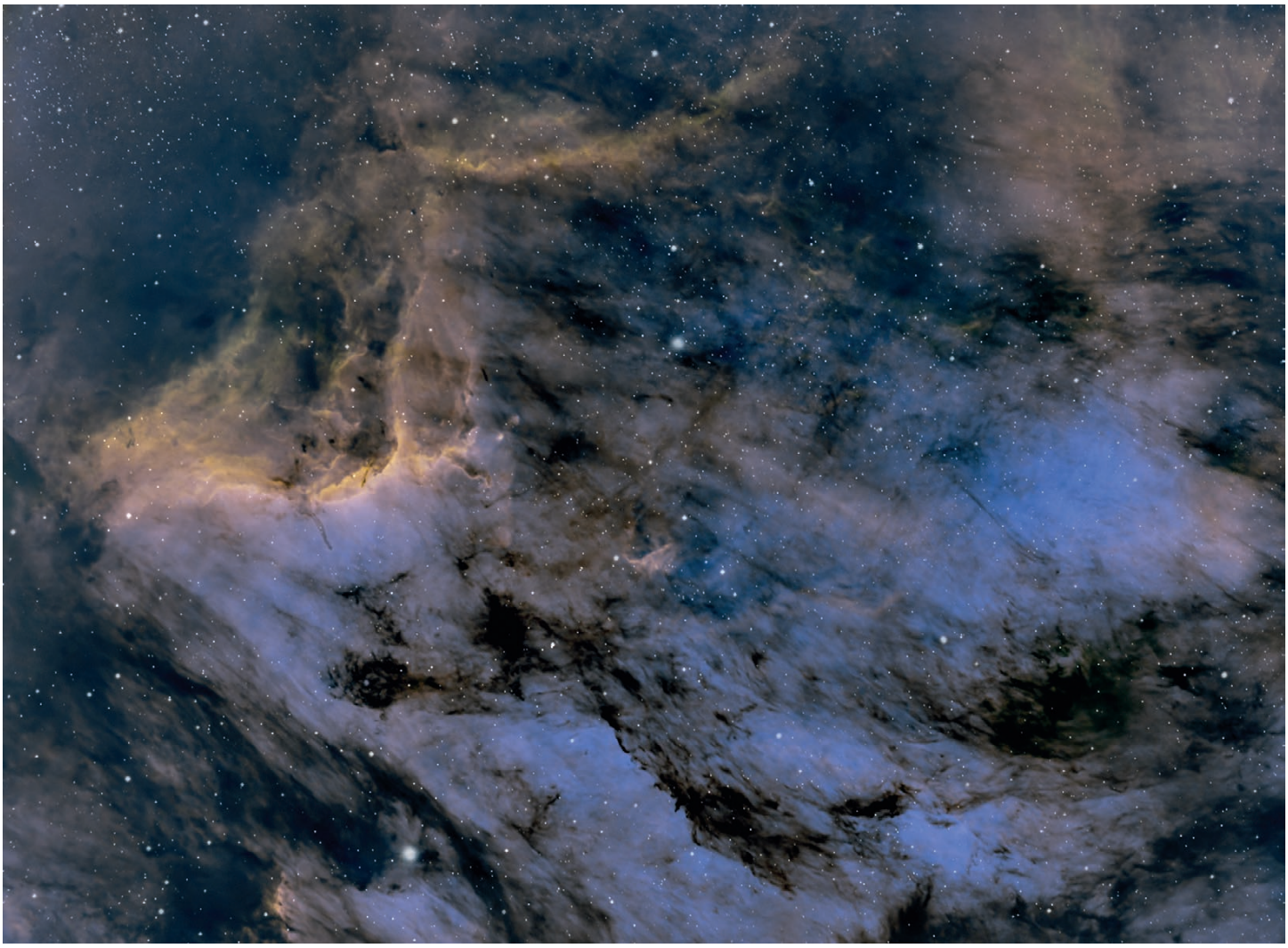
Willamena Flemming's Triangular Wisp, part of the Veil Nebula complex



Rosette Nebula Detail by Stephen Garretson

Detail of Eastern part of Soul Nebula by Stephen Garretson

C 5070, the Pelican Nebula, Modified HOS by Stephen Garretson



Here's the Pelican Nebula, head down and not the typically presented orientation, narrowband modified HOS: Ha-Red, OIII-Blue, SII-Yellow [not the natural color but selected to contrast it from Ha]. The featured attraction here is the Herbig-Haro jets at the top of that long spindly column center left. These are "high-speed jets of gas ejected by newborn stars [the jets] collide with surrounding clouds of interstellar dust and gas." [Wikipedia]. About 2000 lightyears away, the Pelican has a linear diameter of 30 lightyears. Unlike some companion emission nebulae, it is part of the same molecular cloud area as its celestial neighbor to the east, NGC 7000, the North America Nebula. I have also attached a cropped FOV getting in closer to the HH object.

[12] 600s guided Ha subs; [12]
600s guided OIII subs
[12] 600s guided SII subs
Total integration: 6 hours

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

Guiding:
William Optics WhiteCat f/4.9 Astrograph
ZWO 220 Mini
Paramount MX+
From the Beevo Dome

TheSkyX, SGP, PHD2
PixInsight, MacOS Photo, Preview

...Stephen

M65 and M66 by Gary Garzone

M 65 M 66 Leo favorites cropped.

C14 scope F8 ZWO 6200 OSC camera.

Later GG

M100 by Gary Garzone

M51 test image by Eddie Hunnell

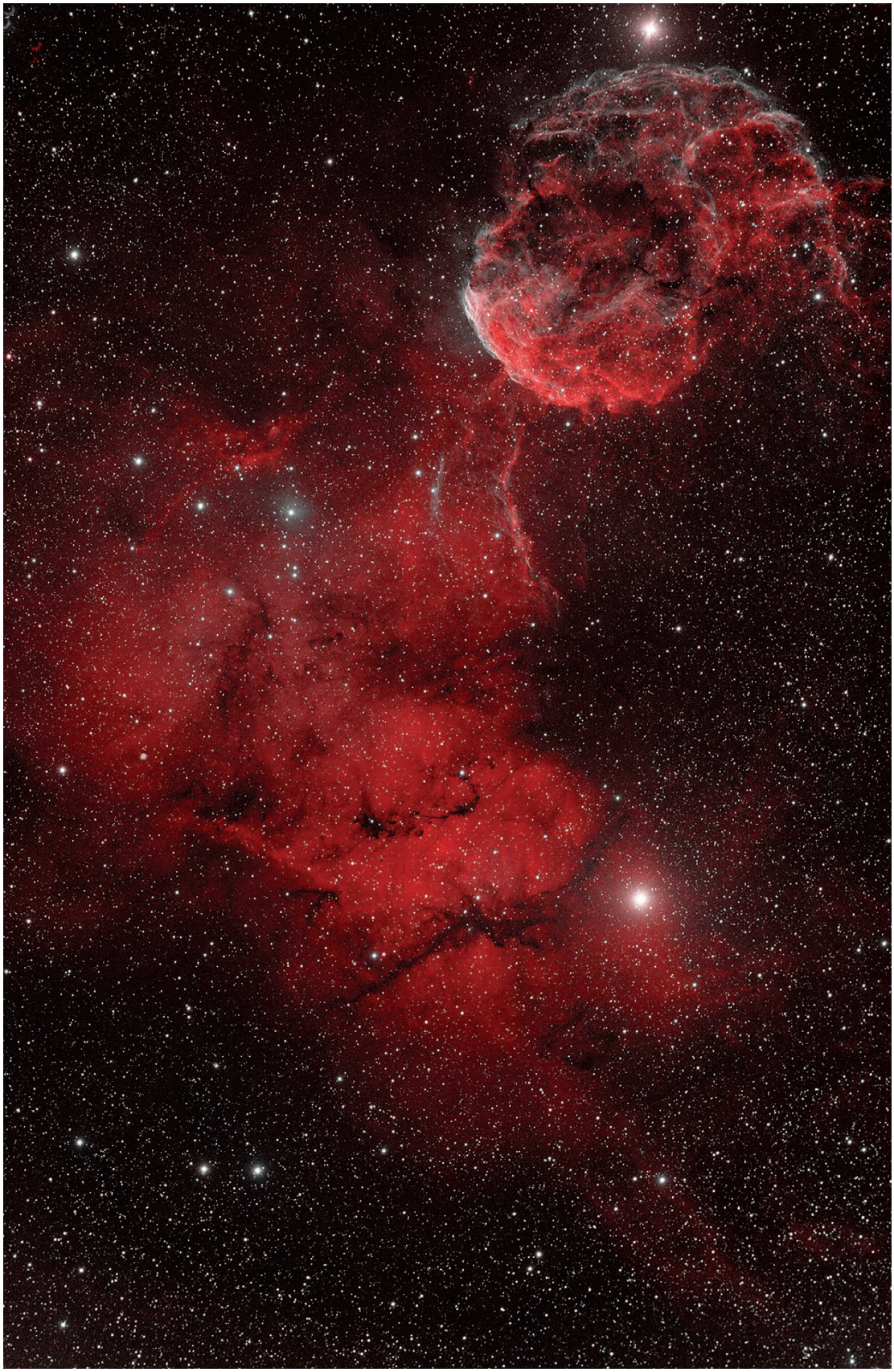
I got out to our local NC site Big Woods Friday night. My main goal was to get my CGX mount and C11 working as I had not used them for 2+ years (since before I moved). I had my older camera on there (ASI128MC Pro) and did not have any recent correction images on it. I had tried my CGX a month ago on my driveway and could not get it to track. So I needed to make sure it is working before I take it out to RMSS next month. The good news is that it tracked and I was able to guide at about 1" error.

I took ten images of M51 before unforecast clouds ended my imaging.

I discarded 2 subs so this image is only 8 subs. No correction images were used. That can be seen by all the hot pixels (those are not background stars), dust bunnies, and the gradient in the bottom right. At least I confirmed this setup (mostly the mount) is still working although making some noise. I will swap to my newer camera and head to Colorado the first weekend in June. Hope a lot of you guys are heading to RMSS. See you in June.

Eddie Hunnell

IC 443 by Tally O'Donnell



This is an HOO image of IC443 [Sh2-248] in the lower right, and Sh2-249 in Gemini that I was able to finish last night just before the Milky Way set in the west. The image is one hour each of Ha and OIII taken in New Mexico that I started last year in December. There are a lot of nice dark nebula in the frame as well. -- Tally

M95 Spirals at the Bar by Jim Pollock

Hey all,

Inspired by Gary's image recently, I shot M95 for the first time ever. Very cool galaxy as it is a face-on barred spiral… with a quite pronounced bar and core. Also, a complex spiral structure.

I've had pretty solid clouds at Starfront in Texas for the last 2 months. Finally a couple of clear nights this week.

This image is 24 frames of 5-mins for a total of 2 hours of exposure. Shot at f/7 with Focal Reducer on the 9.25" EdgeHD telescope with ZWO 2600mc color camera and an L-Quad filter.

Keep looking up!

Jim

Hercules Galaxy Cluster by Jim Pollock

Inspired by MJ (or just plagiarism by me), I took a quick stab at the Hercules Cluster last night from my Texas scope… near full moon and all. Such a target rich area!!! When I did StarXterminator, it took away a load of very distant tiny galaxies. For now, I'm going to leave in full glory. This is just 25 images at 5-min each (2 hours) at f/7 on my 9.25" EdgeHD.

My favorite objects so far are the two propellor galaxies: NGC 6045 near the center. And NGC 6040 (actually a pair of interacting galaxies) near the bottom. In fact, 6045 looks like it has a distant galaxy behind it at the upper tip, adding a spoiler to the propellor!

Also I like the triple galaxy set with some blue nebulosity glowing around it just above 6045.

I'm intrigued by the area of blue nebulosity around the pair of galaxies (and several adjacent) in the upper right. I'm assuming that's local nebulosity lit by the galaxy light passing through. Although seems like there's more to it around the twin owl eyes I the center of it.

Anyway, looking forward to shooting a few nights worth of data (when those pesky clouds move on to Arkansas and stay there!!

Hercules Cluster: 25 frames of 300sec (2 hours total) with my 0.25" EdgeHD at f/7 (focal reducer), with ZWO 2600mc Duo color camera and L-Quad multi-band filter. From Starfront Observatories in Central Texas.

Jim

Dust M106 and Friends by M. J. Post

This group lies in Canes Venatici. The large spiral upper left with massive dust lanes is M 106, oddly discovered by Pierre Mechan in 1781, not William Herschel. It was added to Messier's list posthumously by Helen Sawyer Hogg in 1947, together with M 105 and M 107. It lies 24 M.l.y. distant. Just to its north and west is NGC 4248, while lower right is NGC 4217, an edge-on spiral.

M106 exhibits several water vapor masers, laser-like emissions of coherent microwave radiation from excited water vapor. These enabled the first direct measurements of distance to a galaxy, an independent collaboration of red-shift distance measurements and the Hubble constant.

FOV here is about 48 x 32 arc minutes Three hours total observation time with CDK14 scope at DSNM, ASI 6200MC camera.

M.J. Post

Low Surface Brightness NGC 4395 in Canes Venatici

This nearby galaxy (14 M.l.y.) is unusual in many ways. It is small in extent (only 65 k.l.y), and has very low surface brightness (overall magnitude 10.6). It is considered a dwarf galaxy because it does not have a bulge surrounding its nucleus. It has a relatively low mass supermassive black hole at its center that is highly active, causing this "baby" to be classified as a Seyfert galaxy as well. Dwarf and Seyfert together is very uncommon!

I was surprised and happy to see how sharp the background galaxies appear in this image, takien unguided and with average seeing (4 arc sec FWHM). Three hours total exposure time with CDK14 at DSNM, ASI 6200MC camera. FOV is about 39 x 26 arc min.

M. J. Post

California Nebula in SHO by M. J. Post

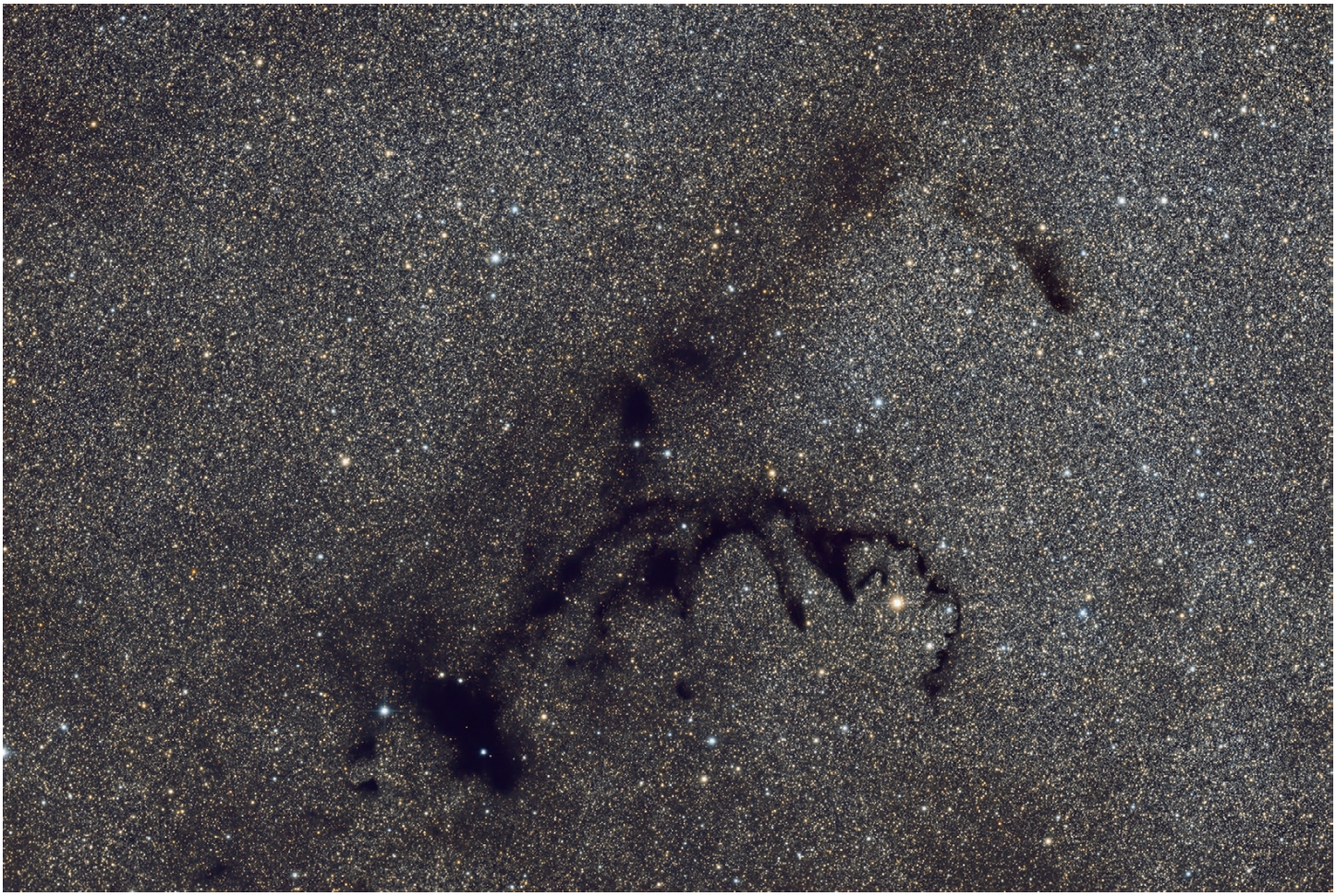
This is NGC 1499, the California Nebula, in the Hubble palette. Surprisingly, OIII emissions are weak compared to H-alpha (dominant) and SII (strong but secondary). The structures in SII and H-alpha are similar in scale but they are distinctly different. The Hubble palette displays these differences nicely.

I had planned to show only RGB stars, but I ran out of time to gather good RGB data at DSNM last year. These SHO stars here are "yucky", so perhaps when this classic rolls around again in 2026 I'll attempt to replace them with better looking RGB stars. If you have the capability, try producing a starless image from this one. I think you will enjoy the result.

3 hours OIII data, 4 hours H-alpha data, 2 hours SII data. 11" RASA scope, ASI 6200MM camera, Chroma 3 nm filters. FOV 3.3 x 2.2 degrees. Sorry I could not fit the entire nebula into a single frame!

M.J. Post

A Dark Nebula with No Name or Listing by M. J. Post



While trolling through Aladin's deep sky images I noticed this interesting dark nebula that cannot be found in Lynd's or Barnard's listings. It is in Sagittarius, just west of the Box planetary nebula (NGC 6445) and globular cluster NGC 6440. Any suggestions for a name? I'm drawing a blank!

Only 1.3 hours exposure time with CDK14 scope and ASI 6200MC camera. FOV is about 48 x 32 arc minutes.

It is mind-boggling for me to see so many Milky Way stars in images like this, and suspect that someone out there must be looking back this way, at us!

M.J. Post

Croc's Eye Galaxy - M94 by M. J. Post

This spiral was discovered by Pierre Mechain in 1781 and added to his partner's (Messier) list two days later. It is close (16 M.l.y) and bright (mag 8.2) and it lies in Canes Venatici. The outer "ring" is actually detached spiral arms, still actively producing stars. The outer ring also displays a considerable amount of dark, dusty material.

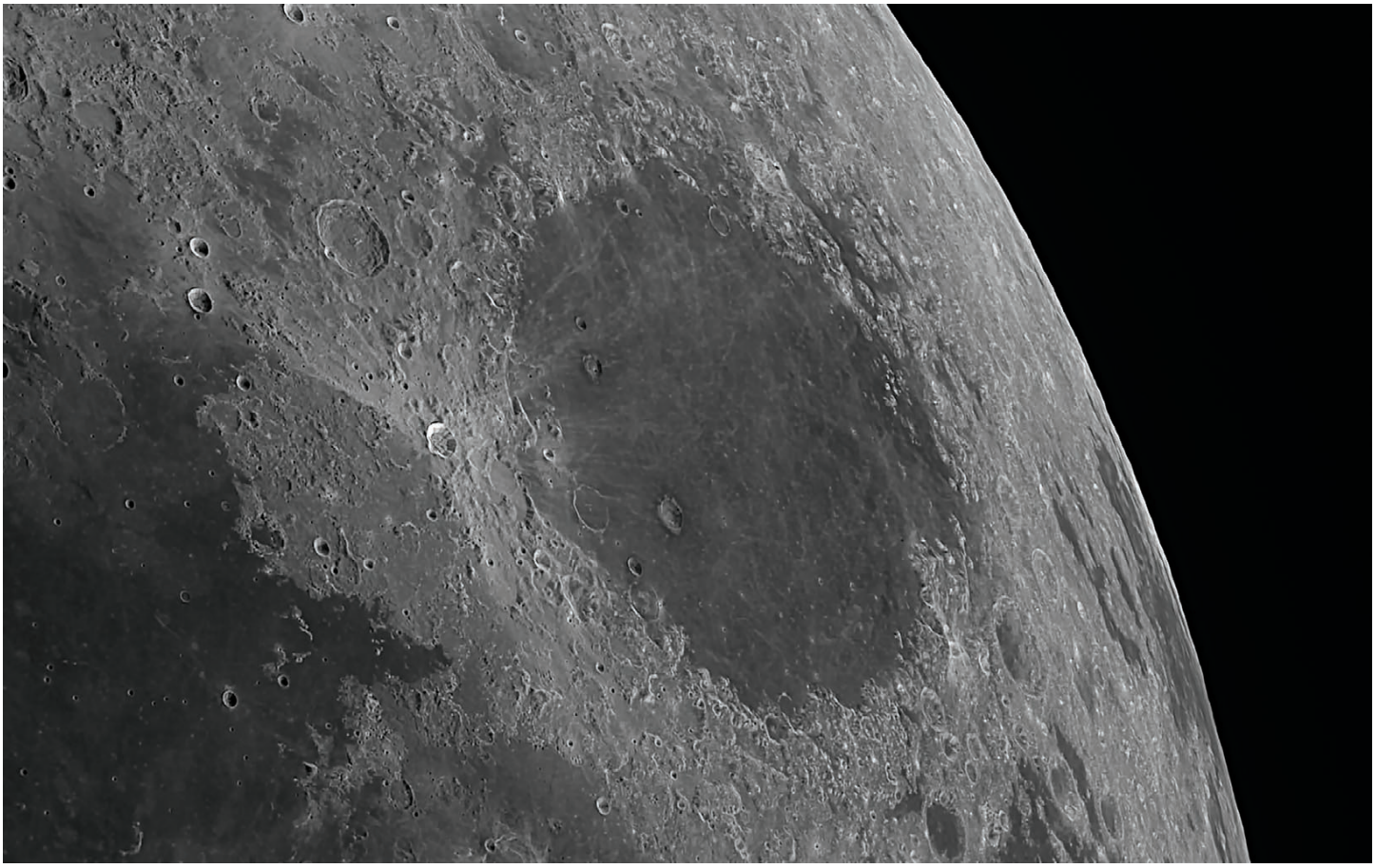
According to a 2008 study of the rotation rates of stars and gas in M94, both in the central core and in the outer ring, little or no dark matter is present. It is highly unusual that all motions can be explained solely by the mass of observed luminous material in this galaxy. In most other galaxies, including the Milky Way, dark matter comprises 80-90% of the gravitational matter.

M94 is also called the Cat's Eye galaxy and NGC 4736.

From DSNM, 3 hours time on target, CDK14 scope, ASI 6200MC camera, 48 x 32 arc minutes field of view.

M.J. Post

Mare Crisium by Brian Kimball



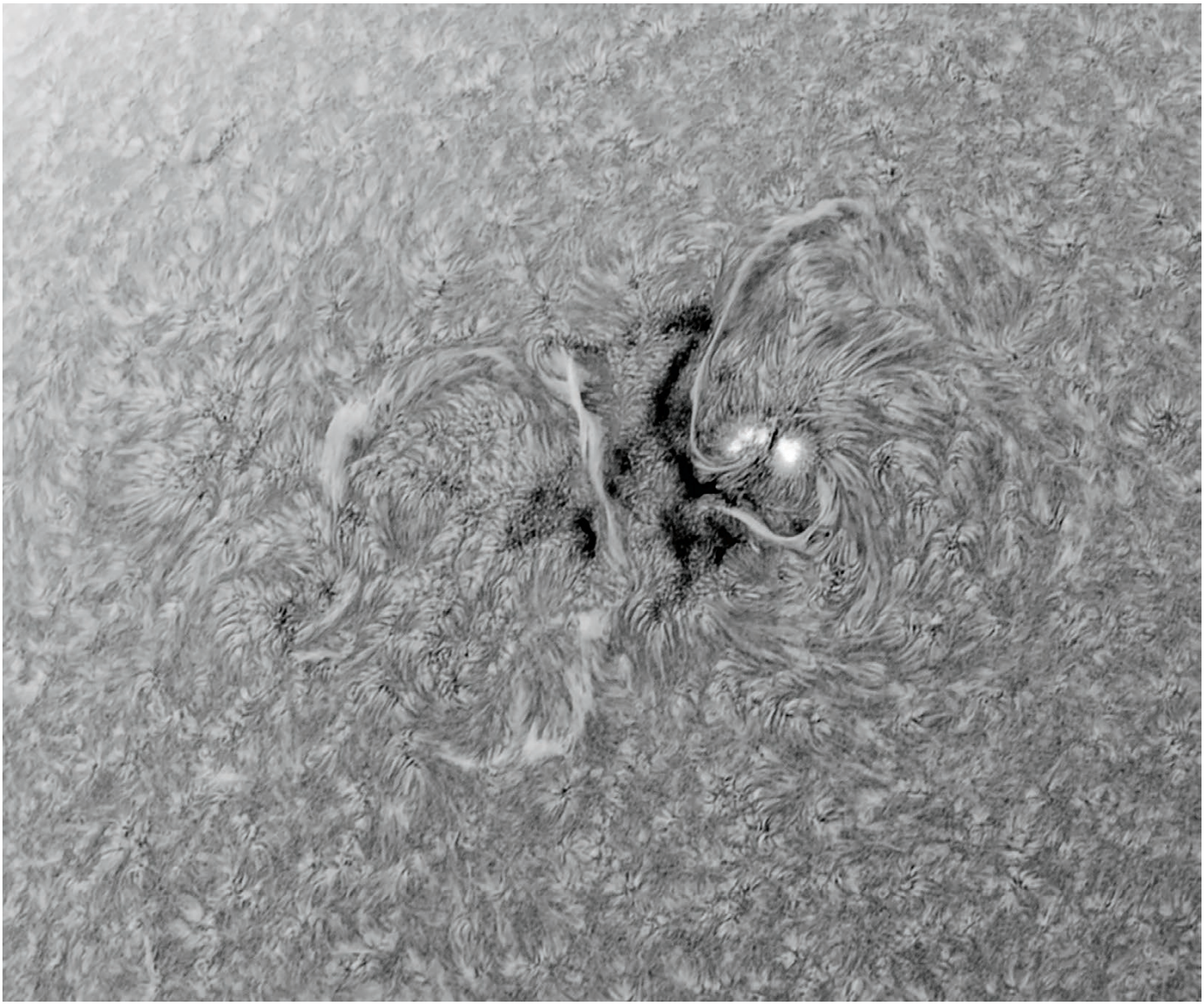
Mare Crisium is easy to find but is often overlooked. Crisium is first seen soon after new moon when long shadows creep across its mare as the Moon grows from a slim crescent.

Just to the left of Crisium is one of the brightest craters on the Moon, Proclus. With its remarkable asymmetrical pattern of bright rays. There is a 140° gap in the rays on the southwest side. In fact, the countryside to the west of Proclus is noticeably grayer that the ray-covered areas and is one of the few highland regions of the Moon given a name, Palus Somni, the Marsh of Sleep.

Thanks for looking,

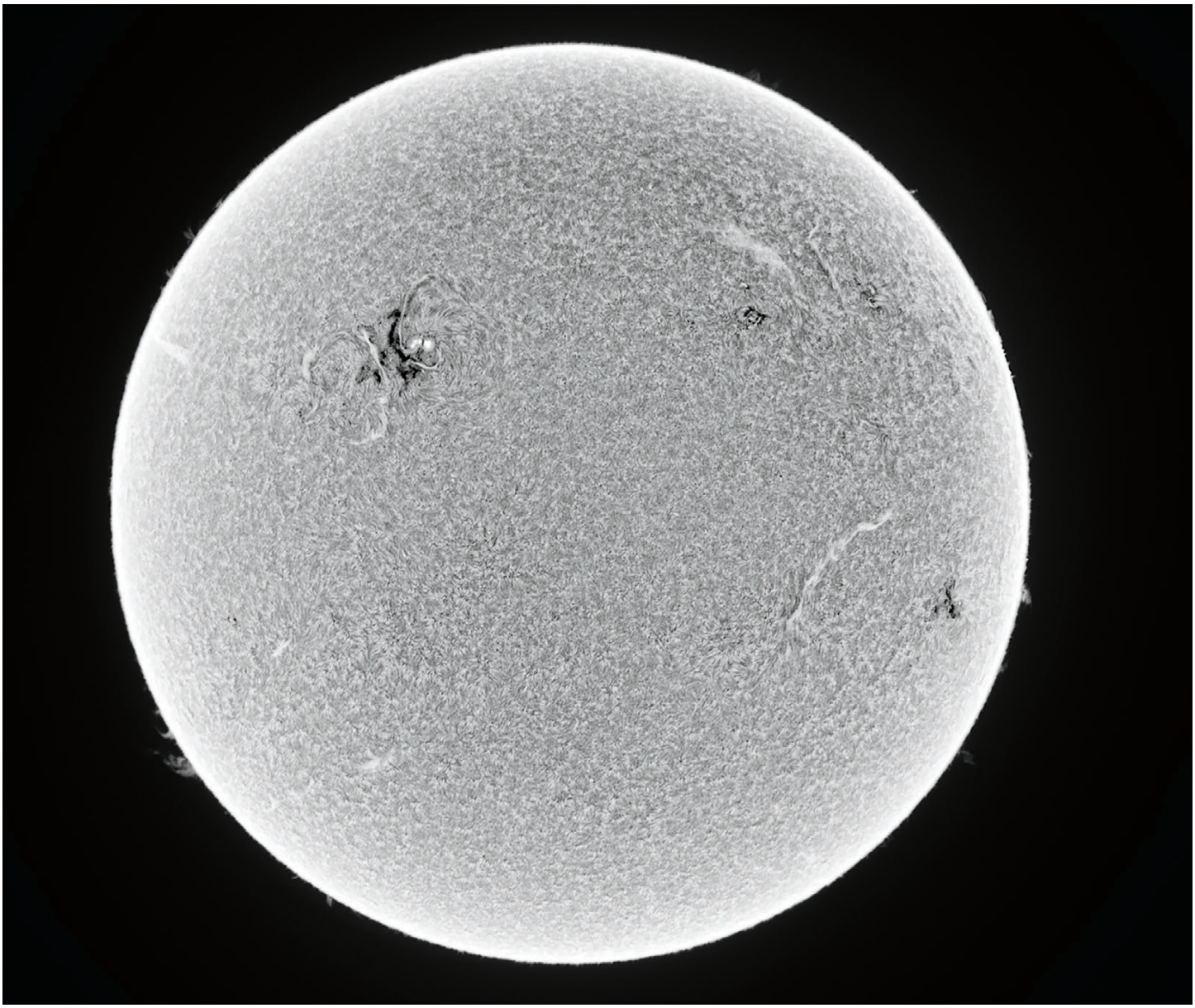
Brian Kimball

Solar Active Region 4436 on May 13 by Brian Kimball



Taken this morning (May 13) with excellent seeing.

Full Disk H-Alpha on May 13 by Brian Kimball



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

30 Years Ago – 1996

This is not your usual newsletter: Misfortune has befallen our Newsletter Editor, Fred Lacy and our President, Dennis Ward and neither will be able to continue as our club officers. For the time being, our Secretary/Treasurer, Harry Albert, will try to pull things together.
Outgoing President – Dennis Ward
Outgoing Editor – Fred Lacy
Vice President – Randy Cunningham
Secretary-Treasurer- Harry Albert
World Wide Web – Steve Albers
At the meeting this coming third Thursday, we can discuss elections and I will hope that our good parliamentarians can help me out with the formalities.
June Meeting: Newcomer Tips, Chatter
Please come with ideas to share about how to approach observing, and how it was for you to begin this hobby, and what folks might have told you to make it more enjoyable. And if you have a new telescope and feel a little wary about how to make the best use of it, now will be the time to ask some old-timers.

20 Years Ago – 2006

Texas Star Party by Dan LaFaive

A few weeks ago I attended the Texas Star Party. This year's Texas Star Party was pretty good. We had 1 night that was a wash due to clouds, 3 nights where we were able to do a lot of observing up until 1-3AM before clouds rolled in, and then 3 nights that were pretty much cloud free. I got to look at a number of neat southern sky asterisms. My favorite was Omega Centauri, which is a globular cluster that spans over 1/2 degree FOV and in fact has the largest FOV of any glob. It is a really incredible object to look at. It comes up about 10 degrees above the southern horizon at TSP at around 1 AM. It was worth going to the party just for that. I also looked at a couple of brighter galaxies that are in the low southern sky at that latitude.

Thanks to those that helped with the Star party for Twin Peaks Charter Academy 3rd graders. We had 50+ kids show up, and another dozen parents and teachers. We had 4 or 5 telescopes, Bob Spohn, Larry Bloom, Jeff Laux and Jessica, and others! Clouds cleared up long enough to give good views of Jupiter, Saturn and the nearly full moon for the kids!

Girl Scouts Star Party - We also did a star party for Girl Scouts in Berthoud estates. Mike Hotka, Philippe, Larry and I lucked out with descent clear skies for the kids and parents. Kids slept in tee pee and tents for several nights outside as group. Mike Hotka gave a nice talk to kids before dark on how scopes work. We talked about differences in scopes. We got awesome views of Mercury early evening, rare chance to see it, along with Saturn, Mars, Jupiter, Moon, M13, globular cluster, few Galaxies even, M81 and M82.
Gary handed an Astronomy League certificate to Mike Hotka, master observer, for observing 100 or more moon features. New Lunar 2 program, good program, some new stuff on the moon.
Ray Warren, Publicity and Fundraising chair: usual commercial, lots of good stuff.
Tim Brown, the planet man: sad announcement, haven't been around much, going to get worse. He accepted a job with new small observatory in Santa Barbara CA. "I've enjoyed hanging around with you, I learned a lot, I made a lot of friends" said Tim. His new email address is tbrown@lcogt.net. Tim added "We want to build network of telescopes around the globe to do continuous surveys with around the clock capability. I'll miss you! Visit me in California if you are there."
Andrew Plank, 2nd part of presentation. Been a LAS member for years, can't remember how long. Recently retired as a French teacher. Developed a fascination with the moon, so presenting on the moon tonight.

M64 by Brian Kimball

10 Years Ago - 2016

Meeting notes from May 19

Vi and Vern were on vacation in the UK, thanks to Tally O'Donnell for chairing the meeting!

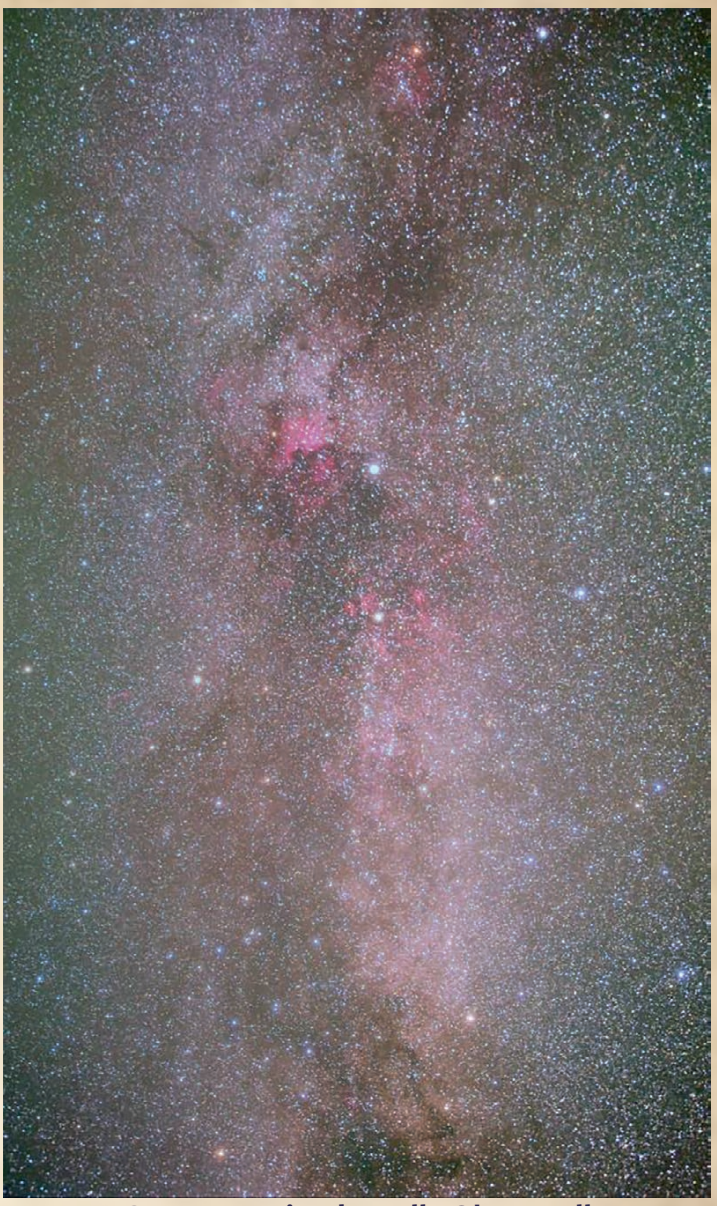
Dr. Dan Davis gave an excellent presentation on "Understanding Particles and Fields throughout the Solar System

Dave Elmore and Tally gave an interesting talk about the trip they made to San Pedro de Atacama Celestial Exploration, a destination for amateur astronomers and site that hosts remote telescopes. They showed everyone some terrific astrophotos they took during the trip

Robert Gossman gave a talk about the dark skies near the town of Norwood, Colorado. The community is in the process of getting certified as a Dark Sky Community by International Dark Sky Association

Next LAS Meeting June 16th Visually and Physically Realistic Ray-tracing Simulations of Earth, Moon and Sky" by Steve Albers, NOAA. The presentation will discuss some ray tracing (image rendering) techniques, with an emphasis on including the physical processes of visible radiation in the Earth's atmosphere and on the surface. Steve Albers received his BS in Physics from the State Univ. of New York at Albany (1978), and MS (1986) in Atmospheric Science from the University of Oklahoma. Between 1976 and 1977 he worked as part of the Viking Intern program connected with the Jet Propulsion Laboratory and Brown University. He did some image processing of Viking Mars Lander Images at JPL's Image Processing Laboratory as part of the Viking Lander Imaging Team. He also performed some data reduction for the Meteorology Team. In 1979 he wrote an article for Sky and Telescope about Mutual Planetary Occultations. This led to the serendipitous discovery in 1980 that Galileo actually saw Neptune in the 1600s. Steve received the R.R. Newton Award from the International Journal of Scientific History in 2009 in recognition of his role.

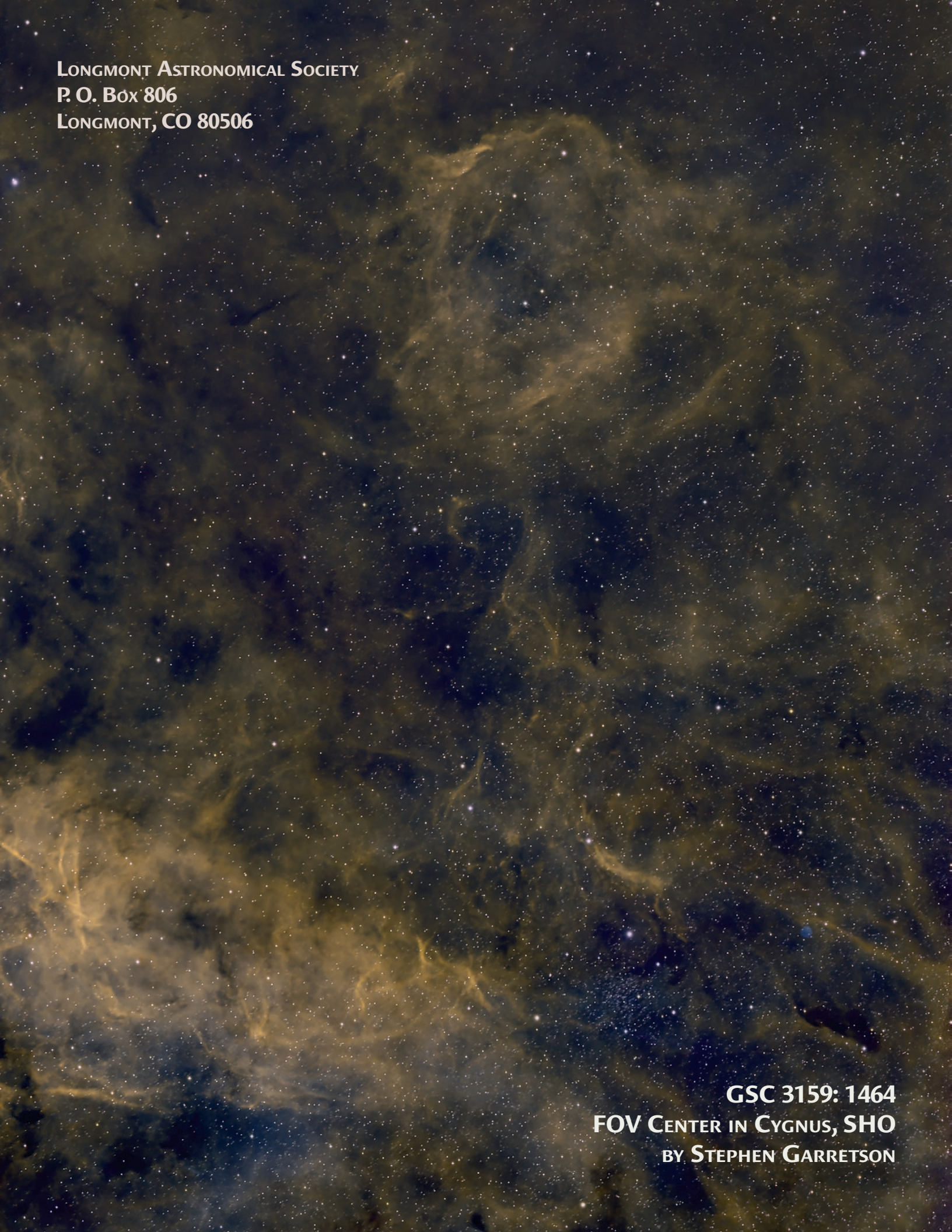
Planetary Imaging Techniques: Luminance Imaging Techniques: Luminance Blending by Vern Raben: Last month I discussed some "wavelet Magic" to sharpen up planetary images. This month the separate red, green and blue monochrome images will be combined and enhanced using "luminance blending" to produce a final image



Cygnus Region by Tally O'Donnell

M84 and Friends by Gary Garzone

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



GSC 3159: 1464
FOV Center in Cygnus, SHO
by Stephen Garretson