Howard Astronomical League Monthly Meeting

April 17th, 2025

Tonight's Agenda, April 17th, 2025

- Introductions
- Announcements
  - 2025 Star Parties & Recent Events
  - Book of the Month – Website Review…
- Featured Speaker – Mike Taylor, Outreach Scientist, SSAI, NASA Goddard
- What's Out in the Sky This Month…
  - Shallow Sky – Jim Tomney
  - What's up In Space – Wayne Baggett
- Members' Astro-Images and Sketches
- Wrap-up & Discussion

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HAL Star Parties…

2025 Schedule of Star Parties

March
- March 8 – Public –
- March 29 - Members

April
- April 5 - Public (Jupiter/Europa shadow transit)
- April 26 – Members - Host: Mike Krauss

May
- May 3 – Public- Hosts: Joel Goodman, Chris Miskiewicz, Chris Todd
- May 24 - Members

June
- June 7 - Public
- June 21 - Members

July
- July 5 - Public (Mercury near greatest eastern elongation)
- July 26 - Members

August
- August 2 - Public
- August 23 - Members

September
- September 13 - Public (No moon)
- September 20 - Members (Saturn at opposition)

October
- October 4 - Public (International Observe the Moon Night, Moon 93.7% full)
- October 18 - Members

November
- November 1 - Public
- November 15 - Members

Regional Star Party info…
https://skyandtelescope.org/astronomy-resources/annual-stargazing-events/

Recent/Upcoming Events

- Public Star Party Held 4/5/2025 Jose Urias, Victor Sanchez, Richard Ren
  - 0 telescopes set up but ≈ 40 visitors, despite cloudy, then rainy weather

- Earth Day at the Clarksville Commons, April 19, 2025, 10am-1pm
- International Dark Sky Week, April 21 - 28, 2025
- Members Star Party Scheduled for 4/24/2025 - Mike Krauss, Host
- New Members' Star Party, date TBD, Stay Tuned

Howard Astronomical League

About HAL | Activities | Observing | Imaging | Membership | Resources

- Join E-Mail List
- Club Equipment
- HAL Library → Book of the Month
- Solar System Walk
- Astronomy Links
- Contact Us / Help

Join HAL

HALO

Howard Astronomical League Observatory

Affiliations

Robinson Nature Center

Astronomical League

Featured Items / News

© James Willinghan

March 2025 Image of The Month, "Blood Moon" Total Lunar Eclipse

26 APR — Members-Only Star Party, Alpha Ridge Park

MAY

03 MAY — Public Star Party, Alpha Ridge Park

15 MAY — HAL General Meeting, May 2025

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Topic: STELLA (Science and Technology Education for Land / Life Assessment): A low-cost open-source remote sensing instruments for education & research

Mike Taylor, Outreach Scientist, SSAI, NASA Goddard

Mike Taylor has been working at NASA Goddard on the Landsat Communications and Public Engagement team as a contractor with SSAI for 17 years. He holds an undergraduate and graduate degree from the University of Maryland College Park is co-lead of the Climate Change Research Initiative Education Ambassadors and board member of Clean Air Partners. For the past 3 years he has been working to help develop and inform others about the STELLA project.

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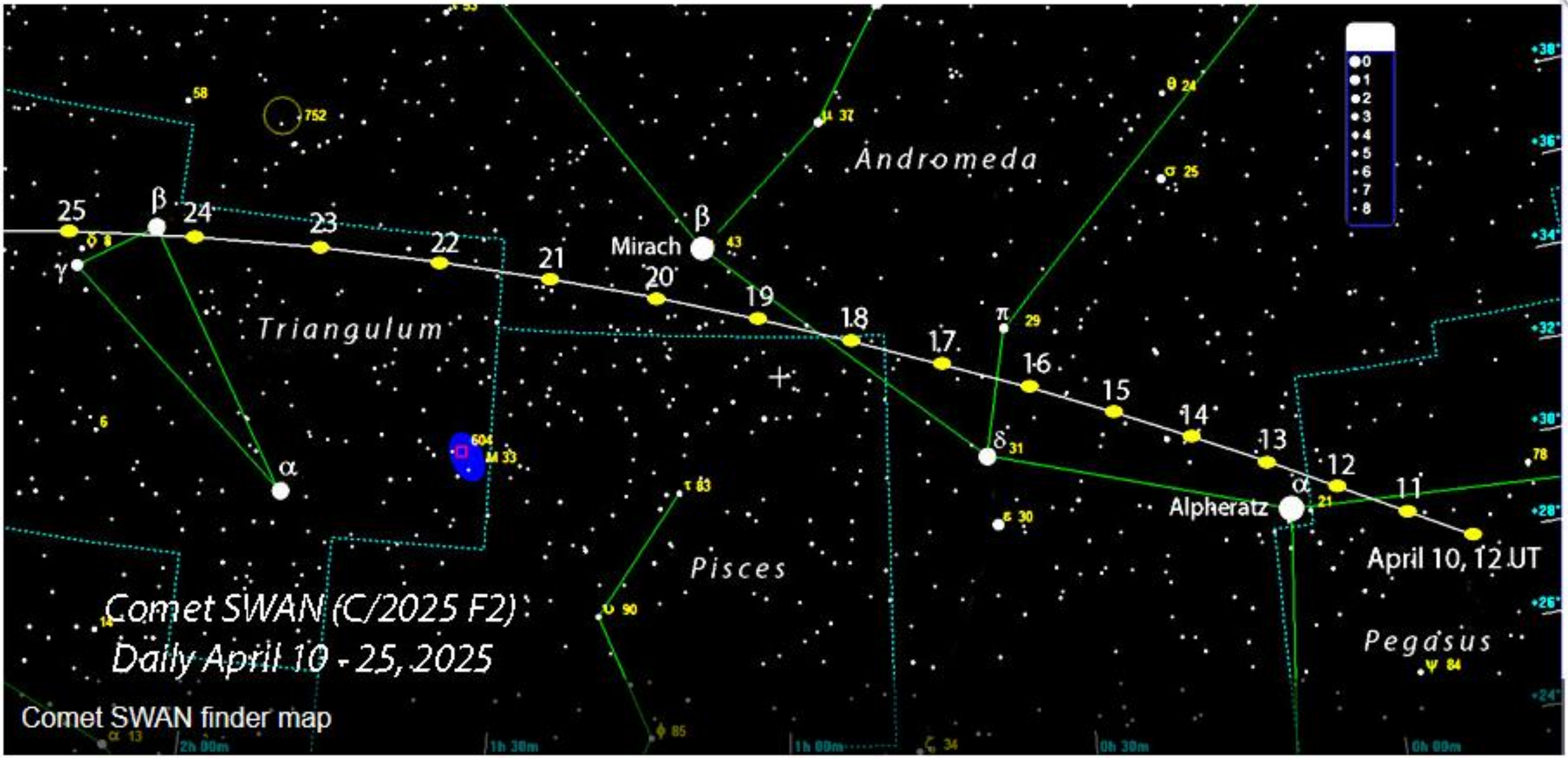
Shallow Sky Highlights for Feb-Mar 2025

- *Mercury Pre-dawn object this weekend, not a great apparition*
- *Venus Ascending in the morning sky, greatest brilliance on April 24th*
- *Mars In the evening sky but a challenging, tiny disk*
- *Jupiter Catch it early in the evening, we only have about 2 months before solar conjunction*
- *Saturn Just beginning to become visible before dawn. No rings!*
- *Lyrid Meteor Shower happens on the night of April 21st but competes with a full Moon. It's known for fireballs, so you might get lucky and catch one if you decide to observe*
- *Stay on alert for the anticipated explosion of T Coronae Borealis [T CrB] at any time.*

Mars Buzzes the Beehive (M44)

- Conjunction on the evening of May 4th
- Mars – much dimmer but still at 1st magnitude
- M44 – the Beehive open cluster
  - One of two naked eye open clusters on the ecliptic – so it can have Solar System visitors.
- Binoculars & small scope are perfect for this
- Camera with telephoto 👍

Comet Swan


Andromeda
Triangulum
Pisces
Pegasus
Mirach
Alpheratz
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April 10, 12 UT
Comet SWAN (C/2025 F2)
Daily April 10 - 25, 2025
Comet SWAN finder map

What's Up in Space: HST's Bullseye Galaxy

- Collisional ring galaxies (CRGs) have been known since 1940s
  - Fritz Zwicky identified the Cartwheel Galaxy in 1941
  - Mid-1970s saw initial theoretical explanations for their structure
    - An impacting small galaxy falls through the center of a more massive disk galaxy
    - Rings of star formation are created as the gas is swept up in the induced density perturbation ("density waves")
  - Studying CRGs helps understand galaxy evolution and structure
    - Probes of gravitational field of the impacted galaxy
    - Density wave physics
    - Production of Giant Low Surface Brightness Galaxies (GLSBGs)

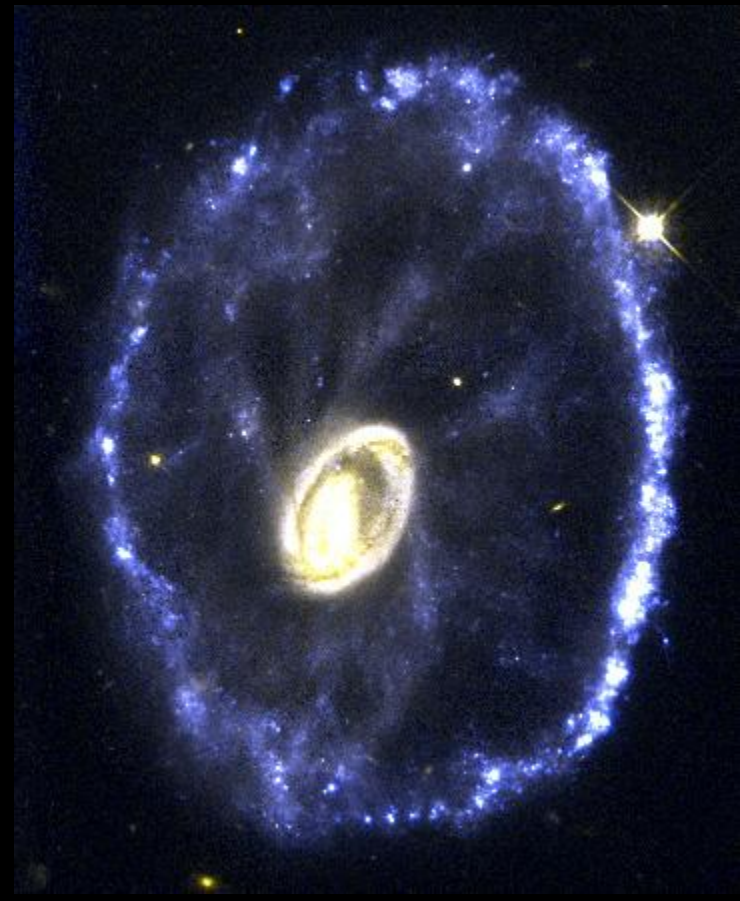

Image credit: Curt Struck and Philip Appleton (Iowa State University), Kirk Borne (Hughes STX Corporation), and Ray Lucas (Space Telescope Science Institute), and NASA/ESA

What's Up in Space: HST's Bullseye Galaxy

- LEDA 1313424 discovered by I. Pasha et al. from Dark Energy Spectroscopic Instrument Legacy Survey (DESI Legacy Survey) imaging
  - Redshift z = 0.039414 (173.9 Mpc, H_0=70km/s/Mpc)
  - Inclined ~42deg to the line of sight
  - Multiple rings seen in initial images
    - Nine rings observed, and a tenth is inferred
  - Likely impactor has been identified
    - Spectroscopy shows it is at the same redshift as the Bullseye
    - Star formation is abnormally high
    - Trail of gas between it and Bullseye
    - ➔ Clumpy blue galaxy just to the left (NE) of Bullseye

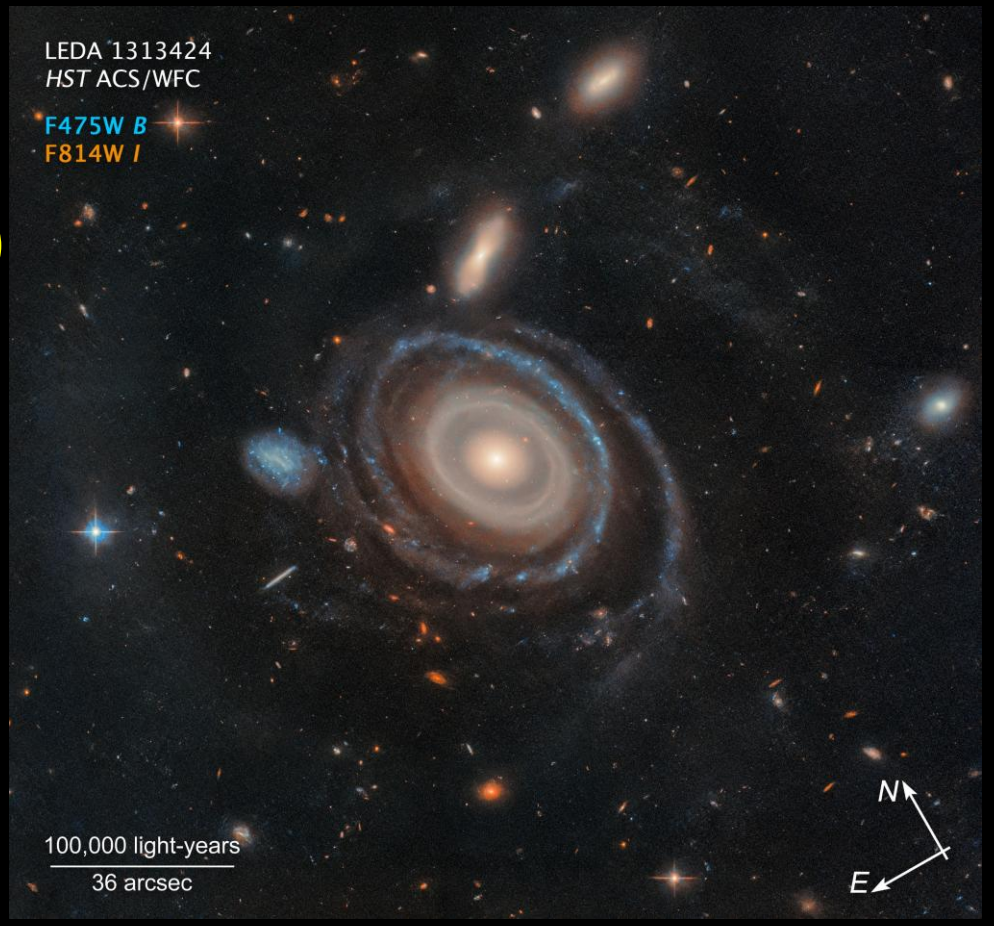

Image credit: NASA, ESA, Imad Pasha (Yale), Pieter van Dokkum (Yale)

What's Up in Space: HST's Bullseye Galaxy

- Ring observations
  - Visually fitted ellipses to the rings seen in an unsharp-mask version of HST image
    - Some ellipses were only fitted to an arc of a ring
    - Eight rings were identified
  - A ninth outer ring identified through deep imaging with ground-based telescopes
  - The rings are separated by larger amounts at larger distances from the center
    - The inner rings are piled together and perhaps merging

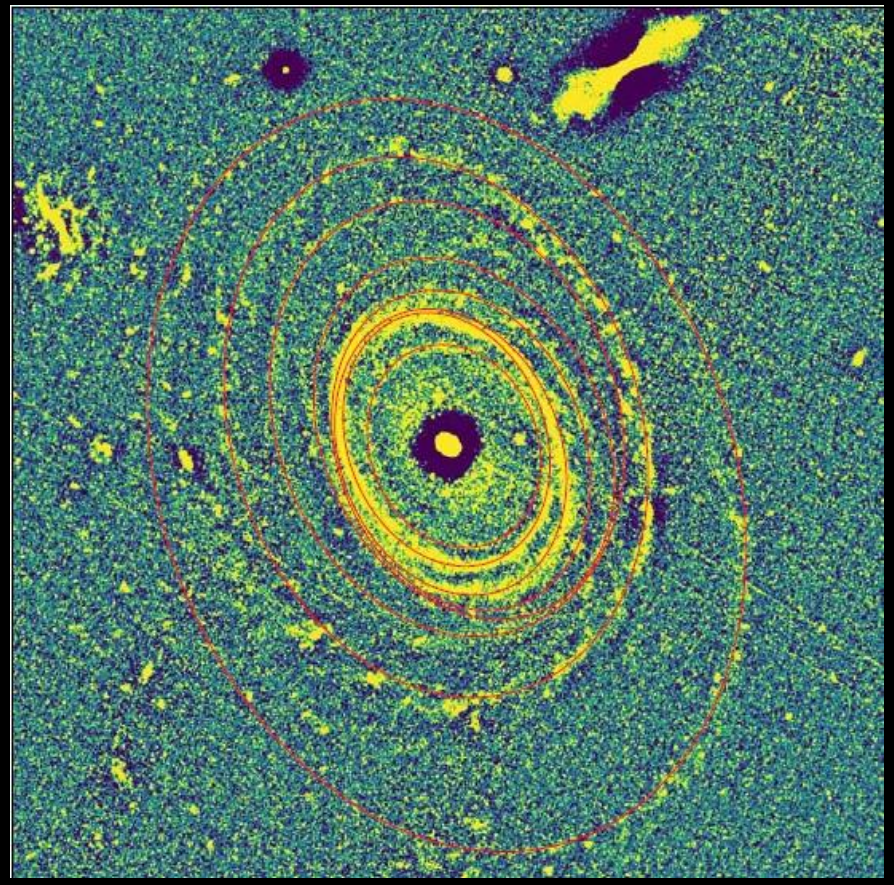

Image credit: I. Pasha et al., ApJLett,980:L3 (16pp), 2025 February 10 (Fig. 2; https://doi.org/10.3847/2041-8213/ad9f5c)

What's Up in Space: HST's Bullseye Galaxy

- Based on a 2010 analytical model by C. Struck
  - The model assumes some things, including
    - The collision is perpendicular to the disk galaxy, through the center of the disk galaxy
    - The impactor is moving quickly so that the disturbance is of short duration relative to the reaction time of the target disk properties (impulsive)
    - The disk galaxy has a flat rotation curve, i.e., a massive halo
    - No gas dynamics in the model
  - Ratio of radii of successively-produced rings is given by

$$r_i / r_{i+1} = (2i + 1) / (2i - 1)$$

    - $r_1/r_2 = 3.0$, $r_2/r_3 = 1.67$, $r_3/r_4 = 1.40$, $r_4/r_5 = 1.29$, $r_5/r_6 = 1.22$, $r_6/r_7 = 1.18$, …
  - The two outermost visible rings in the HST image have a radius ratio of 1.4, suggesting that the outermost ring is the third ring formed in the system

What's Up in Space: HST's Bullseye Galaxy

- Black dashed line shows the unity relation – the measured equals predicted – assuming the outermost HST ring's measured and predicted radii are equal
- Leftmost dashed line (blue color, ends in "Ring 8") shows the predicted ring radii *assuming* the measured values of each ring (y-axis) and that the outermost HST ring is the first (oldest, largest) ring of the system
- Next line (peach color, ends in "Ring 9") represents ring radii *assuming* the outermost HST ring is ring 2
- Open black circles are the measured rings (y-axis values) with their predicted values (x-axis), *assuming* the outermost HST ring is the third ring in the system
- Remaining lines show the ring radii *assuming* the outermost HST ring is the fourth and fifth ring formed

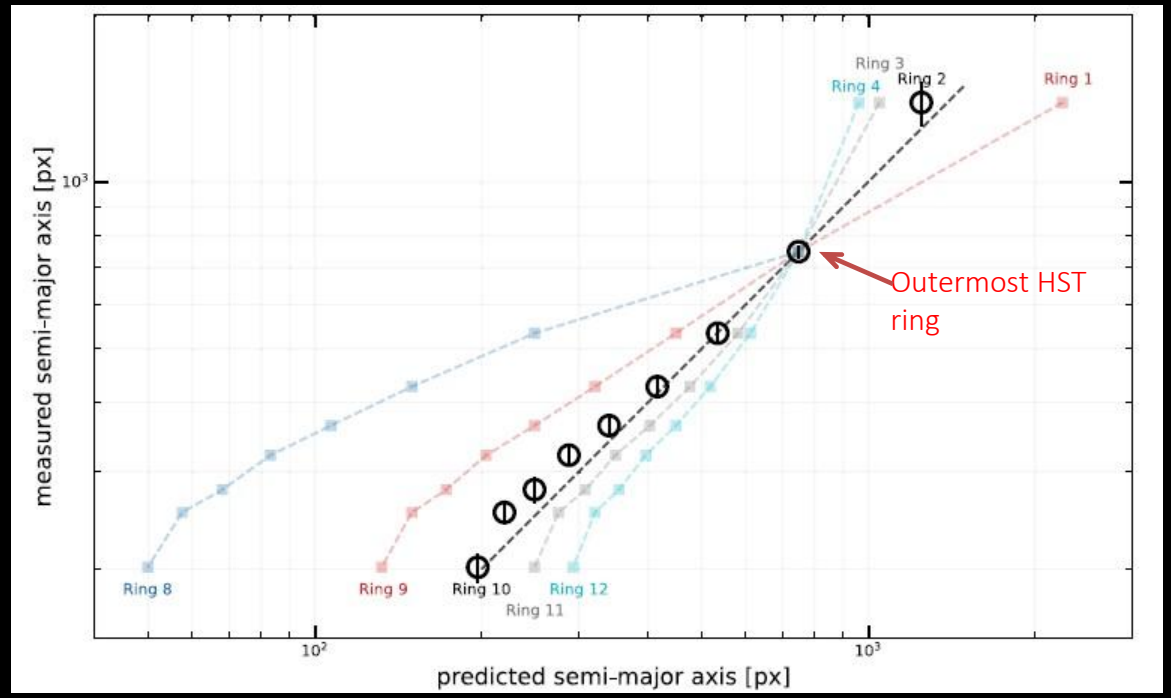

Image credit: I. Pasha et al., ApJLett,980:L3 (16pp), 2025 February 10 (Fig. 4; https://doi.org/10.3847/2041-8213/ad9f5c)

The assignment of the outermost HST ring to be the third ring of the system fits the prediction best

What's Up in Space: HST's Bullseye Galaxy

- Impactor galaxy
  - Spectroscopy with Keck has shown the following
    - The blue galaxy has a velocity of +705 km/s relative to the Bullseye
    - Assuming a perfectly head-on collision:
      - Angular separation of the impactor from the Bullseye is 43.4 arcsec, implying a projected separation of 36.4 kpc
    - Accounting for the inclination of the Bullseye (~42 deg), implies a collision ~56 Myr ago
    - Time is consistent with simulations which show that rings are visible 50 – 150 Myr after the collision

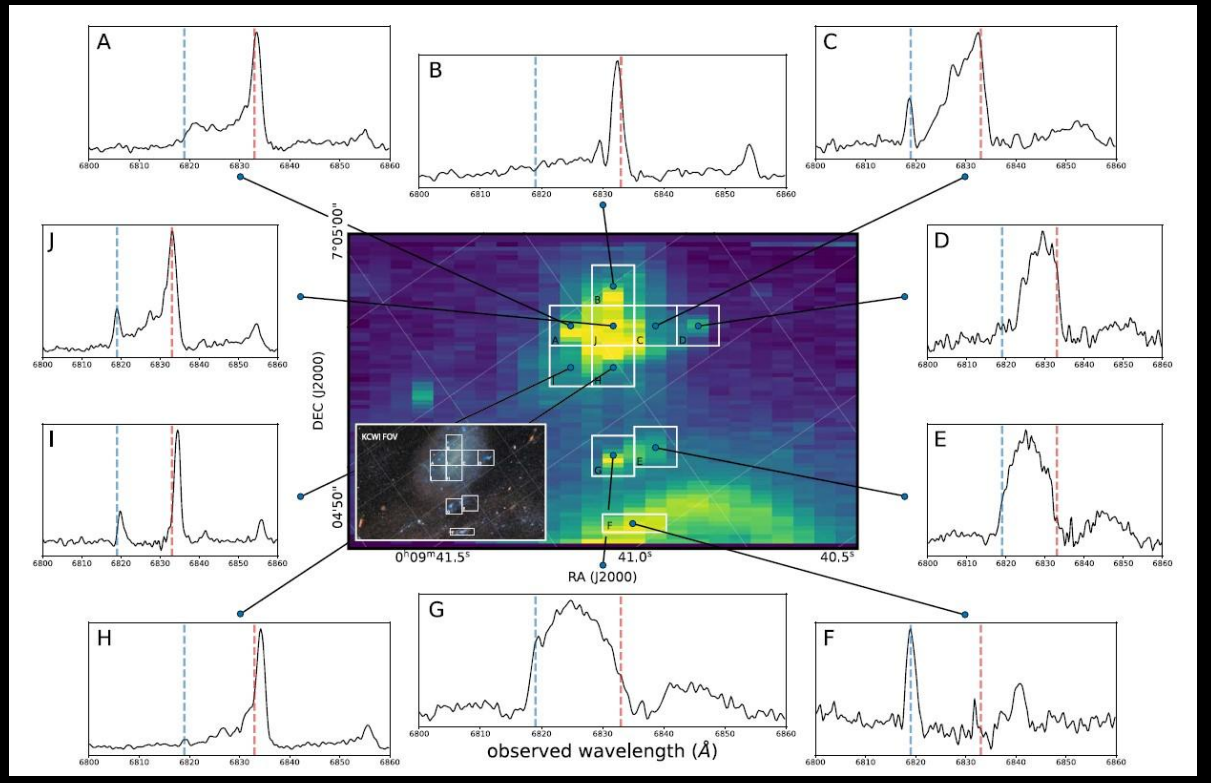

Image credit: I. Pasha et al., ApJLett,980:L3 (16pp), 2025 February 10 (Fig. 8; https://doi.org/10.3847/2041-8213/ad9f5c)

Keck Cosmic Web Imager spectra from different regions of the impactor and the Bullseye near Hα. Vertical blue lines show the Bullseye's Hα wavelength, red lines show the impactor's Hα wavelength.

What's Up in Space: HST's Bullseye Galaxy

- Forming Giant Low Surface Brightness Galaxies
  - The Bullseye may provide the first observational evidence that GLSBGs can be formed by collisions
  - Photometry provides size information as well as stellar mass estimate – 77 kpc in radius, 5.8×10^{10} M_{Sun}
    - The Milky Way is about 15 kpc in radius
    - The Milky Way's stellar mass is about 6.1×10^{10} M_{Sun}
  - HI observations provide an estimate of the gas mass – 3.5×10^{10} M_{Sun}
    - Milky Way has ~ 1×10^{10} M_{Sun} of HI
  - Extended faded rings can lead to low surface brightness features at large galactocentric radii

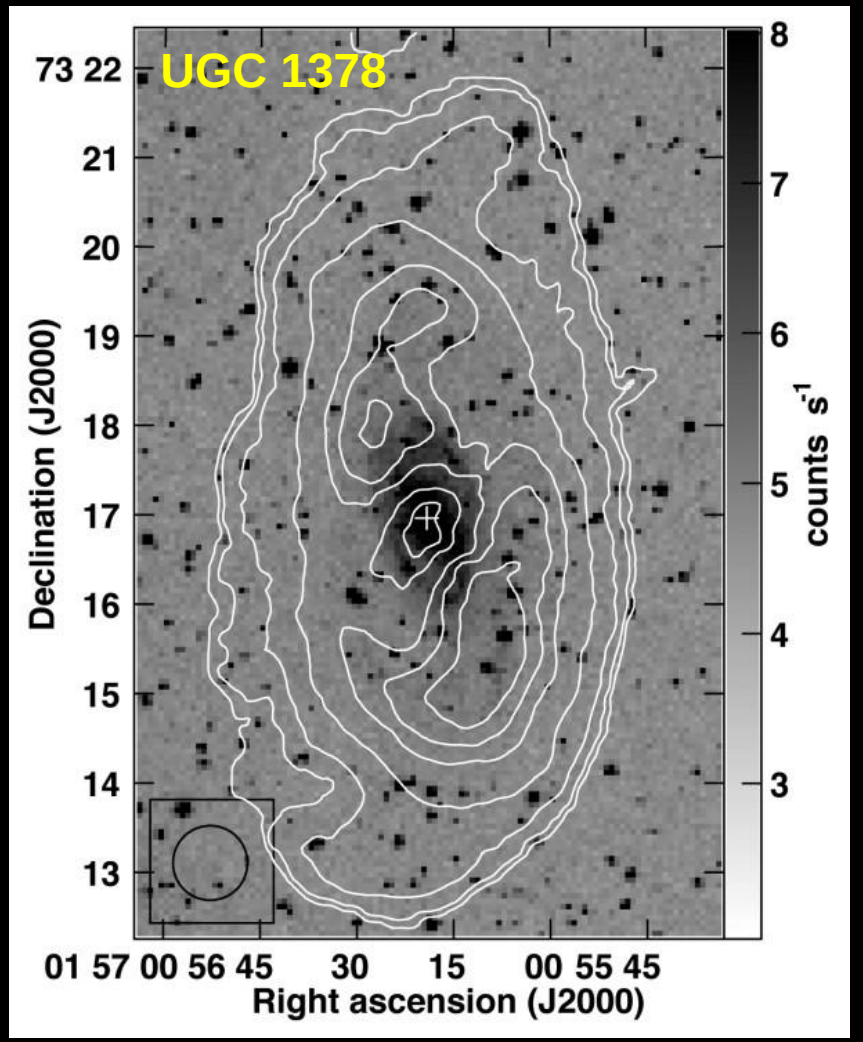

Image credit: A. Mishra, et al., MNRAS 464, 2741–2751 (2017) (Fig. 2; doi:10.1093/mnras/stw2506)

What's Up in Space: HST's Bullseye Galaxy

- Conclusions
  - The Bullseye Galaxy has enough rings to test the simple theory of the characteristics of CRGs
    - The theory seems to work well for the ring sizes
  - The impactor galaxy has been identified through both imaging and spectroscopy
  - Measurements of stellar and gas masses, as well as the size of the galaxy, support the hypothesis that GLSBGs can be formed by these central collisions

Image credit: I. Pasha et al., ApJLett,980:L3 (16pp), 2025 February 10 (Fig. 1; https://doi.org/10.3847/2041-8213/ad9f5c)

What's Up in Space: HST's Bullseye Galaxy

- Resources
  - "The Bullseye: HST, Keck/KCWI, and Dragonfly Characterization of a Giant Nine-ringed Galaxy," I. Pasha et al., **The Astrophysical Journal Letters**, **980**:L3 (16pp), 2025 February 10 https://iopscience.iop.org/article/10.3847/2041-8213/ad9f5c/pdf
  - "Applying the analytic theory of colliding ring galaxies," C. Struck, **Monthly Notices of the Royal Astronomical Society**, Volume 403, Issue 3, pp. 1516-1530 (April 2010) https://ui.adsabs.harvard.edu/abs/2010MNRAS.403.1516S/abstract
  - "GMRT H I study of giant low surface brightness galaxies," A. Mishra et al., **Monthly Notices of the Royal Astronomical Society**, Volume 464, 2741–2751 (2017) https://academic.oup.com/mnras/article/464/3/2741/2447922
  - "Galaxy Collisions," Curtis Struck, **Physics Reports**, **321**, 1, 1999 https://ned.ipac.caltech.edu/level5/Struck/St_contents.html

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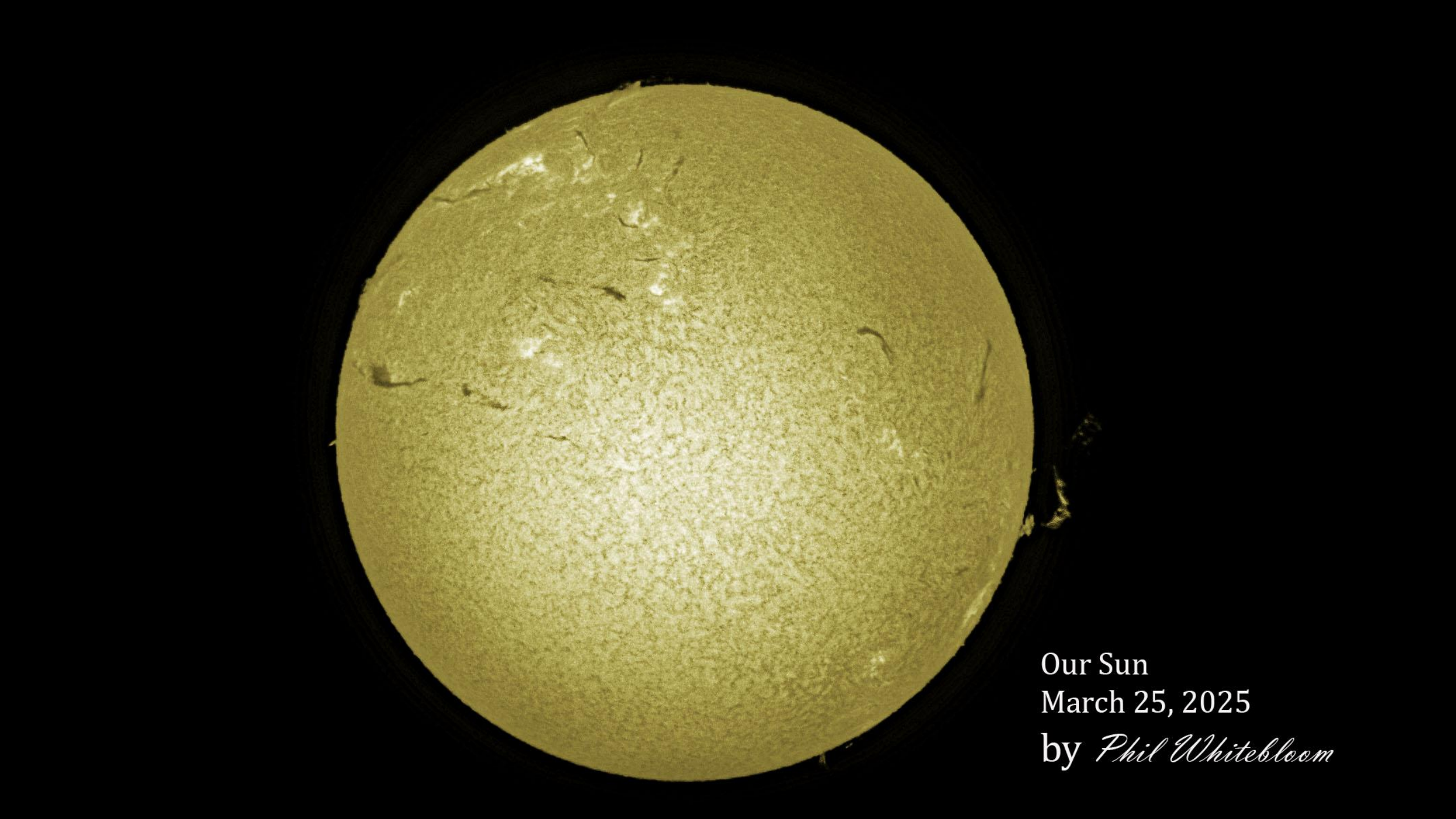
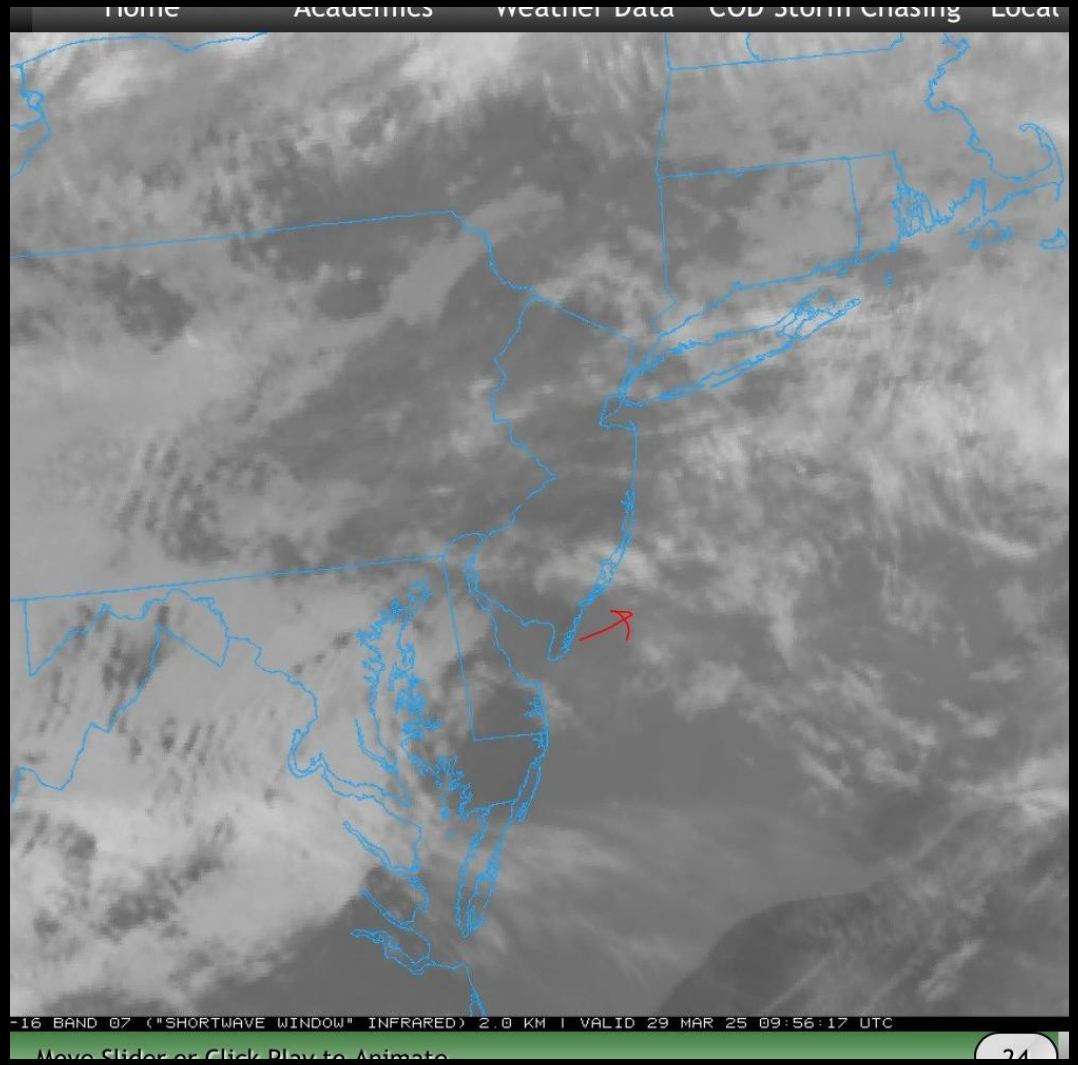


Our Sun
March 25, 2025
by *Phil Whitebloom*

James Willinghan



James Willinghan

Arjun Meenashi Sundar

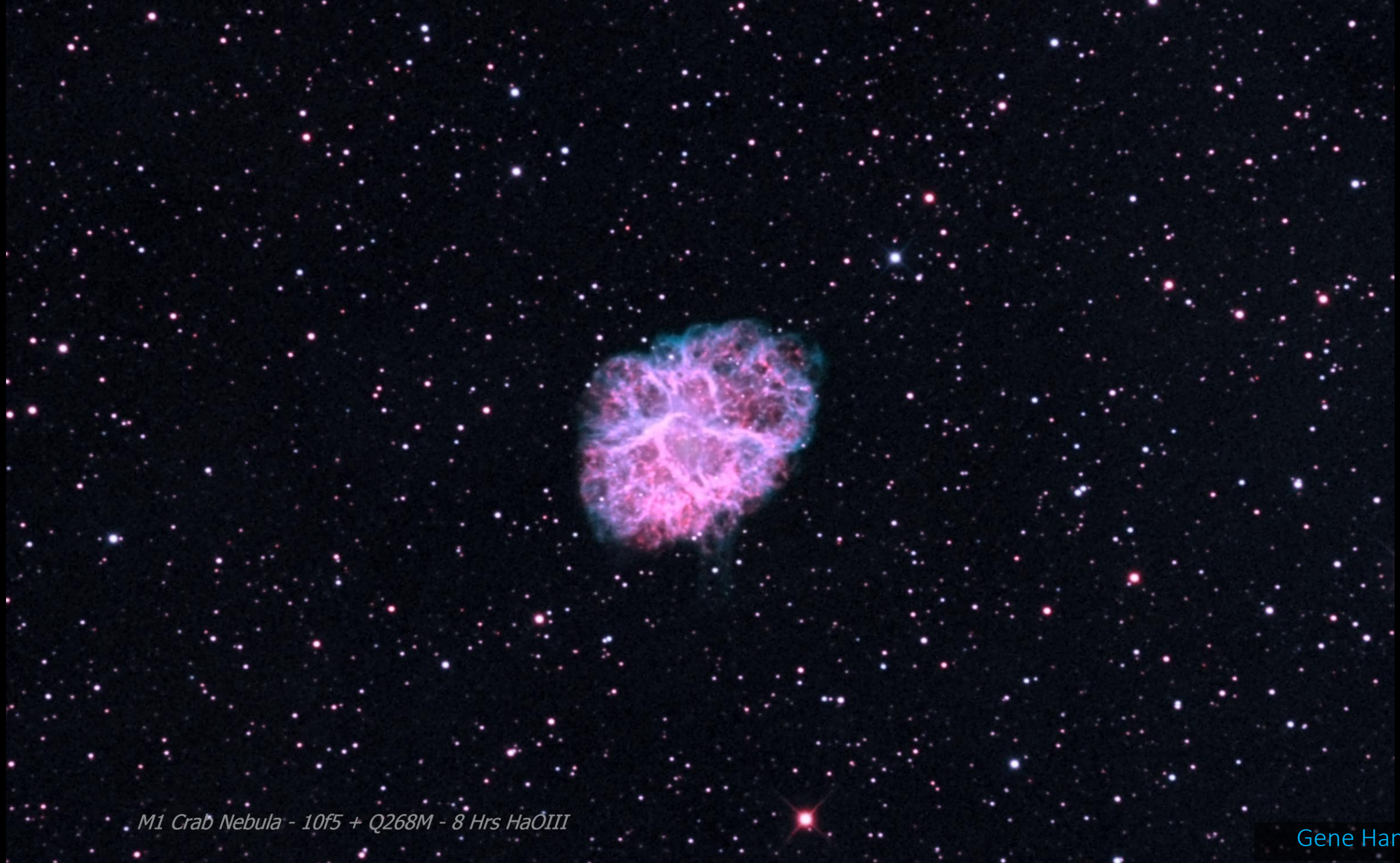
Harrini Ramasamy

Gary Richardson

Gary Richardson

Wayne Baggett


NGC3718 - 10f5 + QHY268M - LRGB - 19.9 Hrs
Gene Handler


M1 Crab Nebula - 10f5 + Q268M - 8 Hrs HaOIII
Gene Handler

Thank you