

Great Observatories

Jonathan F. Ormes

Space Sciences Director, GSFC, Emeritus
University of Denver

Winter, 2019

Wind Crest Learners
Academy for Lifelong Learning

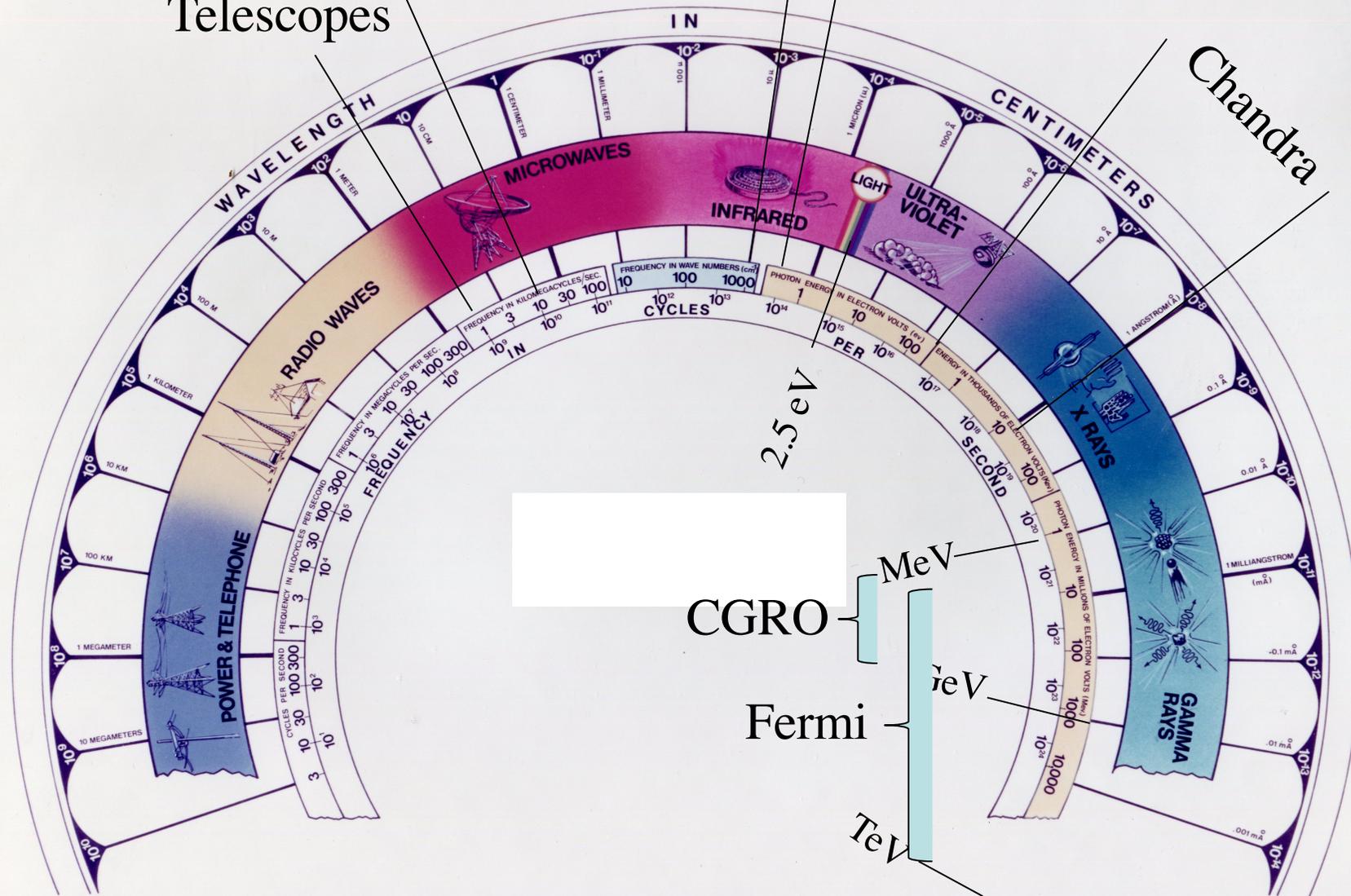
What other eyes do we have?

- The Great Observatories
 - Gamma Ray Observatory
 - Hubble Space Telescope
 - Built at MSFC, transferred to GSFC for operations
 - Optics repaired (Senator Mikulski “Techno-turkey”)
 - Instruments updated spacecraft repairs
 - 1993 (mirror corrected), 1997, 1999, 2002, 2009
 - Chandra X-ray Observatory
 - Spitzer Infrared Observatory

Radio
Telescopes

Spitzer

Chandra

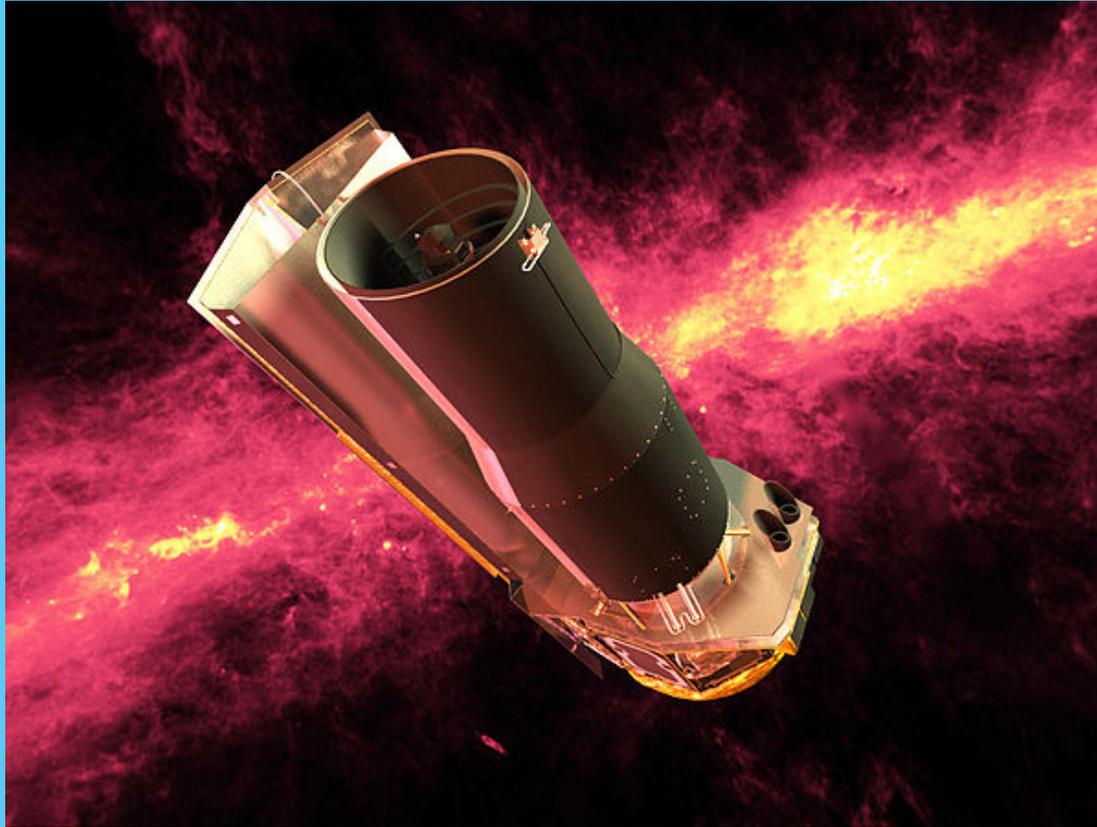


Great Observatories

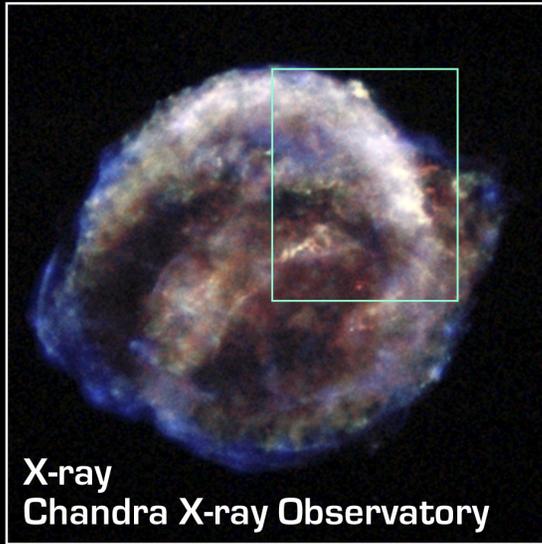
Wavelength ----->



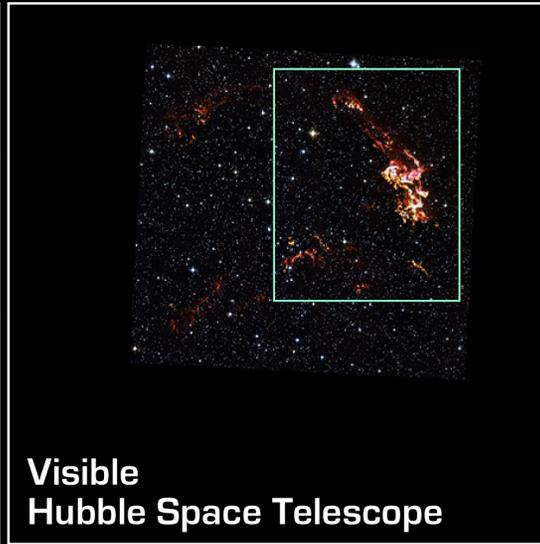
<-----Energy and Temperature



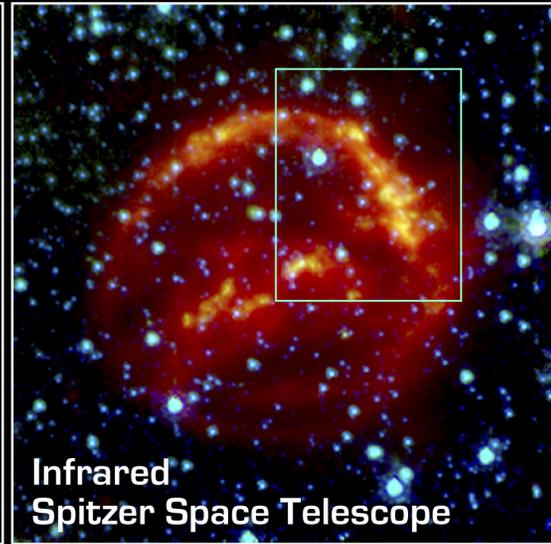
Spitzer Infrared Telescope Facility
Space Infrared Telescope Facility



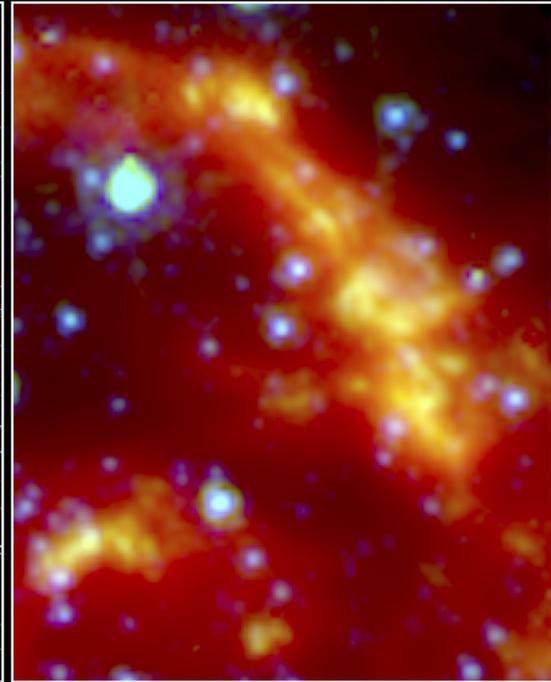
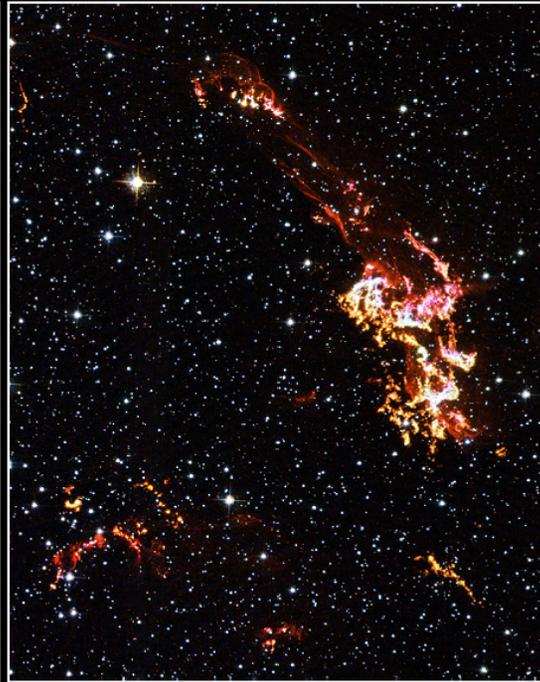
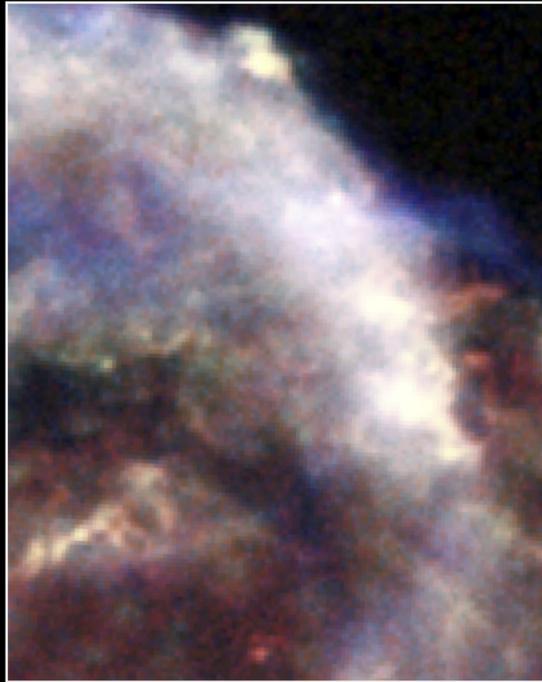
X-ray
Chandra X-ray Observatory



Visible
Hubble Space Telescope



Infrared
Spitzer Space Telescope

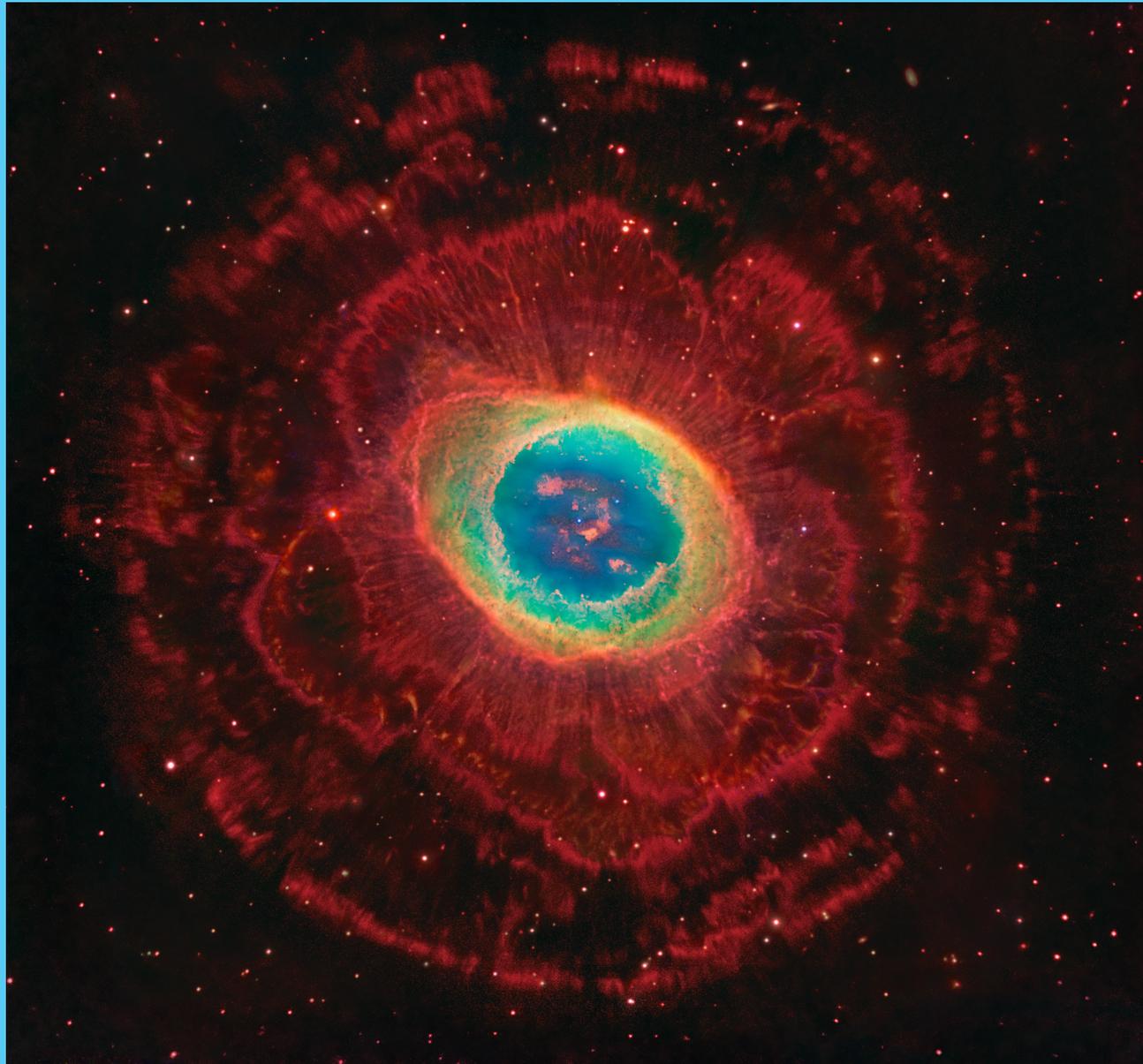


Kepler's Supernova Remnant • SN 1604

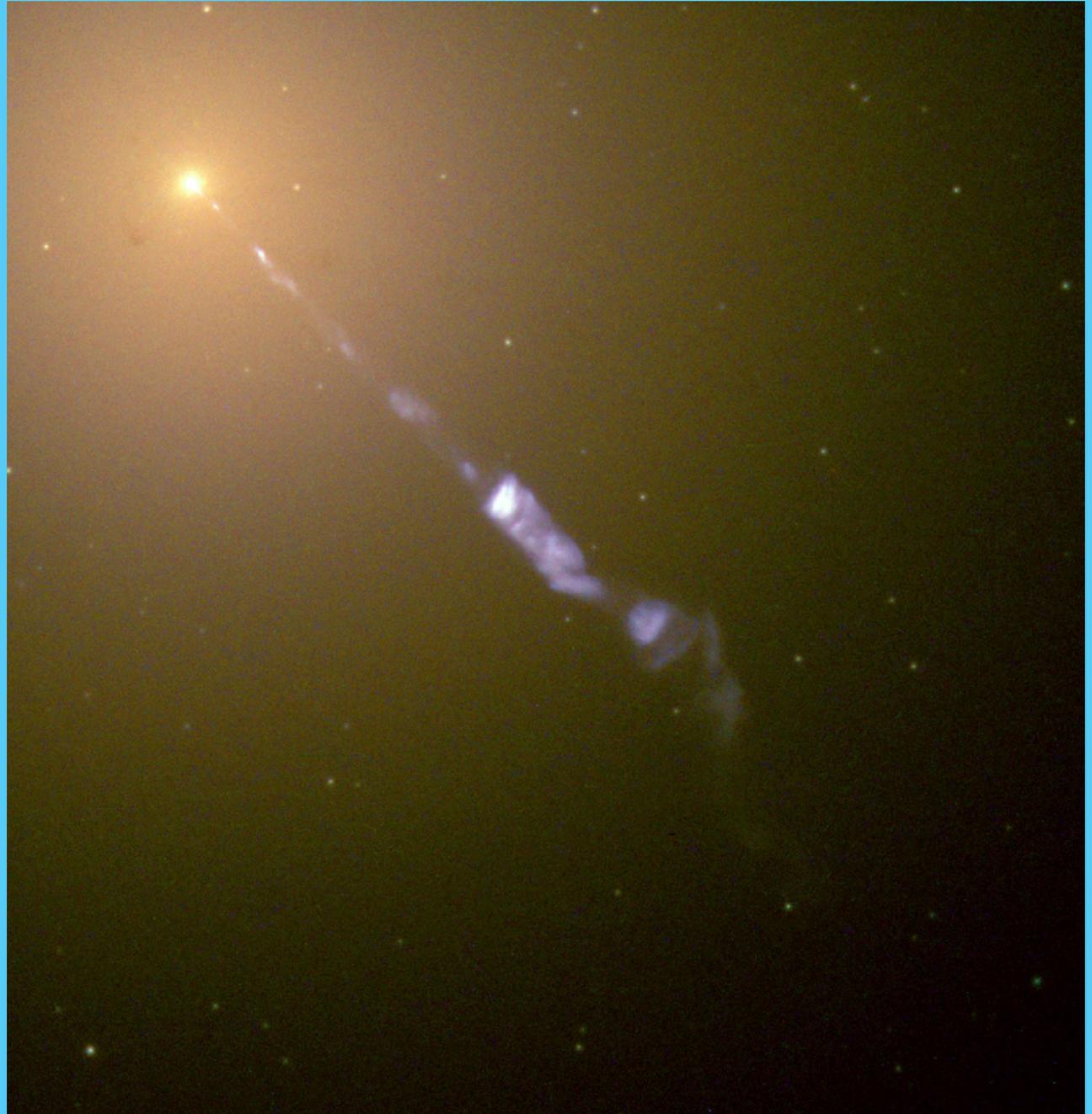
NASA, ESA / JPL-Caltech / R. Sankrit & W. Blair (Johns Hopkins University)

ssc2004-15b

Composite visible ir image



Virgo-A jet



3/26/19

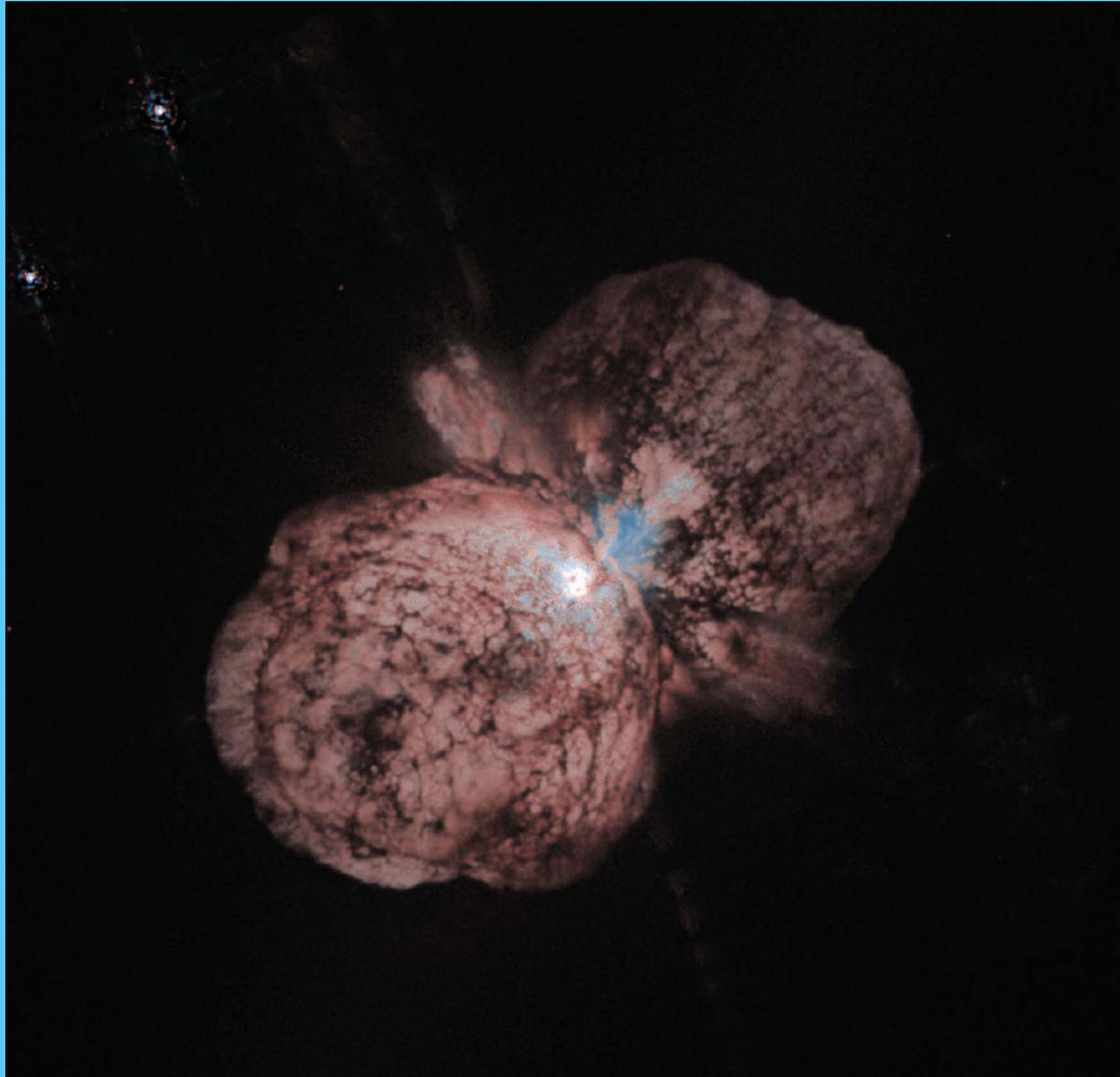
Planetary Nebula

8 kly

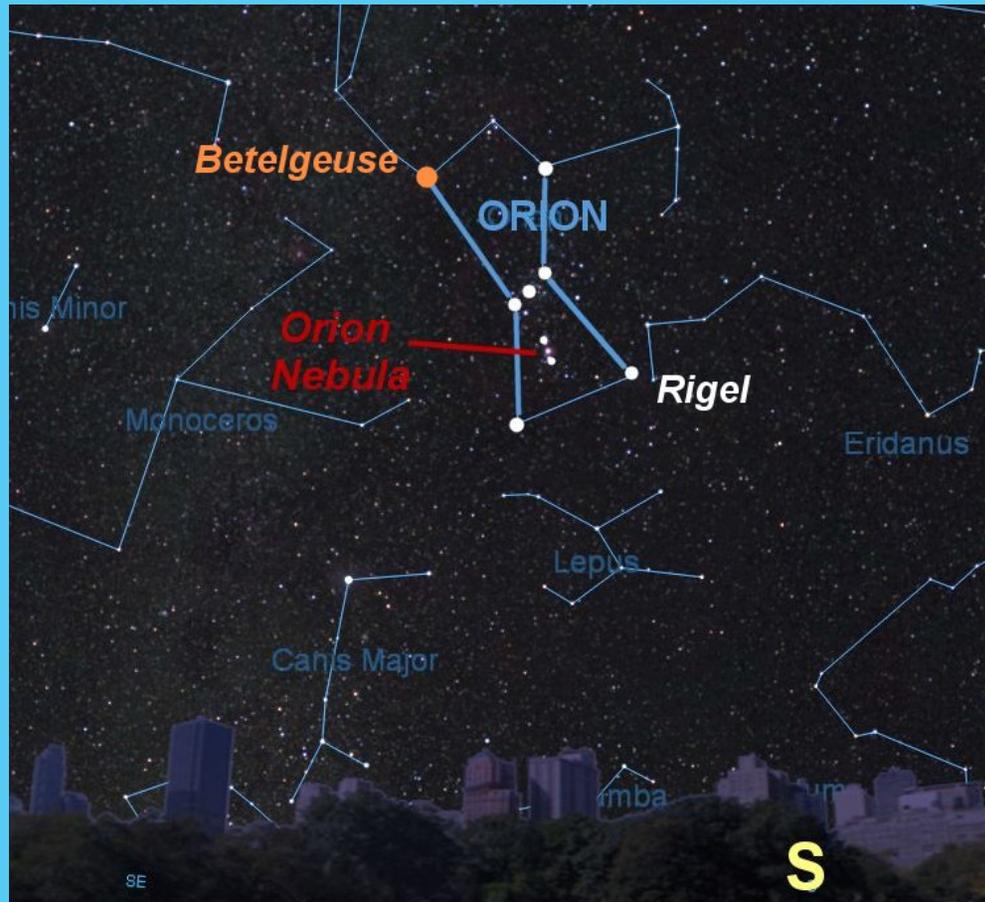
Wind from aging star



Eta-carina



Orion nebula; a stellar nursery



https://www.nasa.gov/mission_pages/hubble/videos/index.html

3/26/ Flight Through the Orion Nebula in Visible and Infrared Light

Flight Through the Orion Nebula in Visible and Infrared Light



A famous HST image: M16, Eagle Nebula.



Eagle Nebula: Spitzer and X-ray



Eagle Nebula