



Kim Arcand, Visualization Lead
Smithsonian Astrophysical Obs./NASA Chandra X-ray Obs
kkowal@cfa.harvard.edu @kimberlykowal (Twitter, IG)

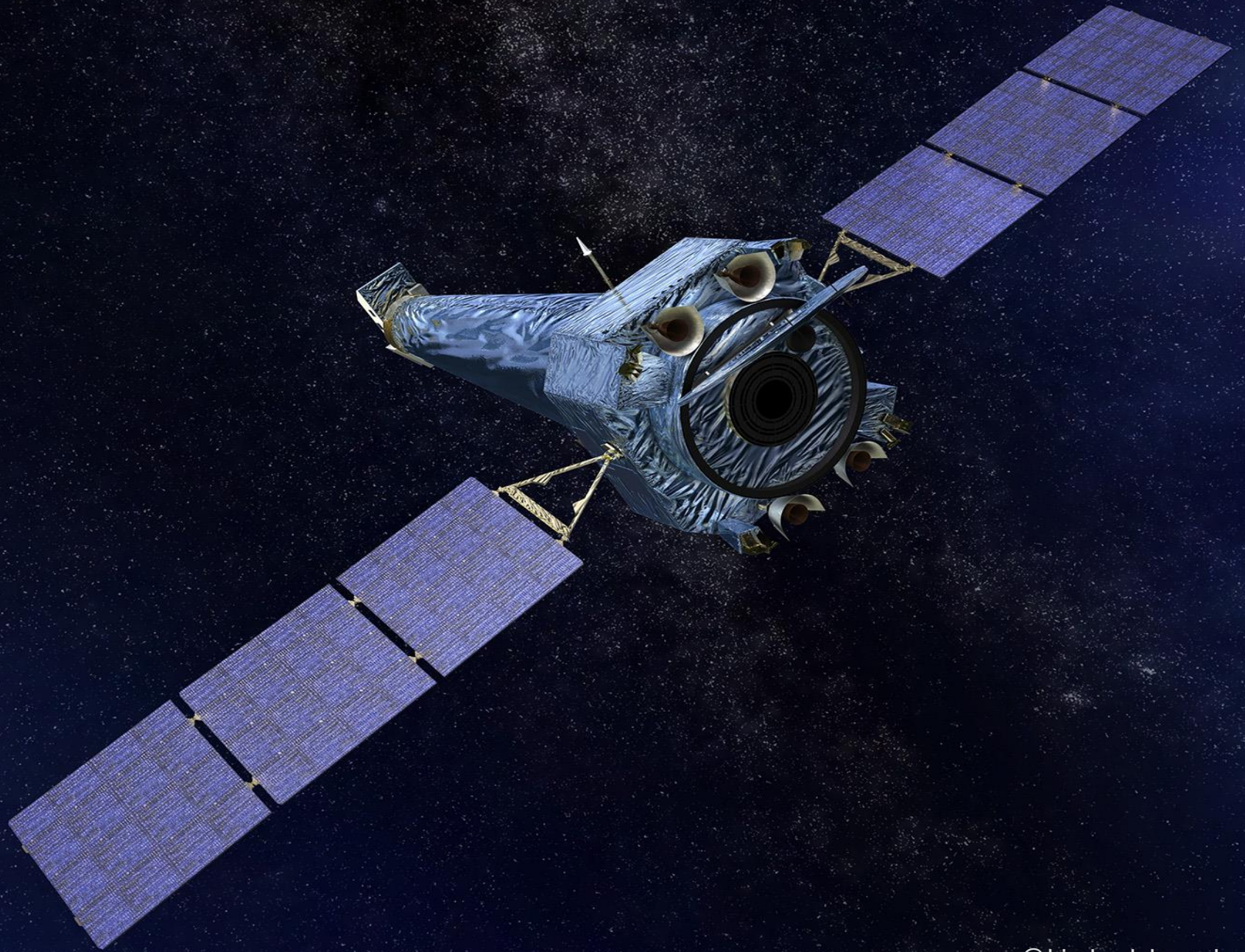






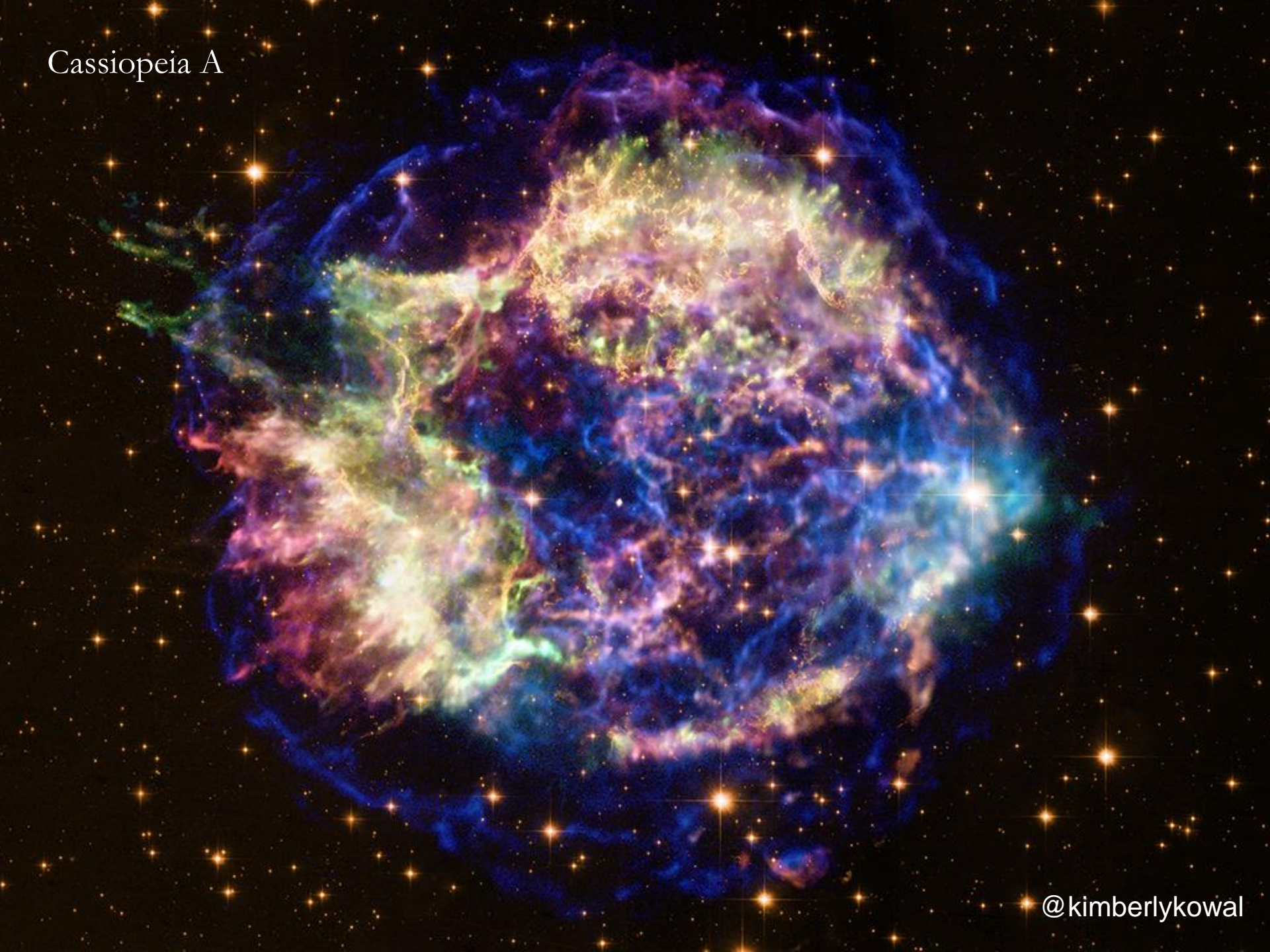


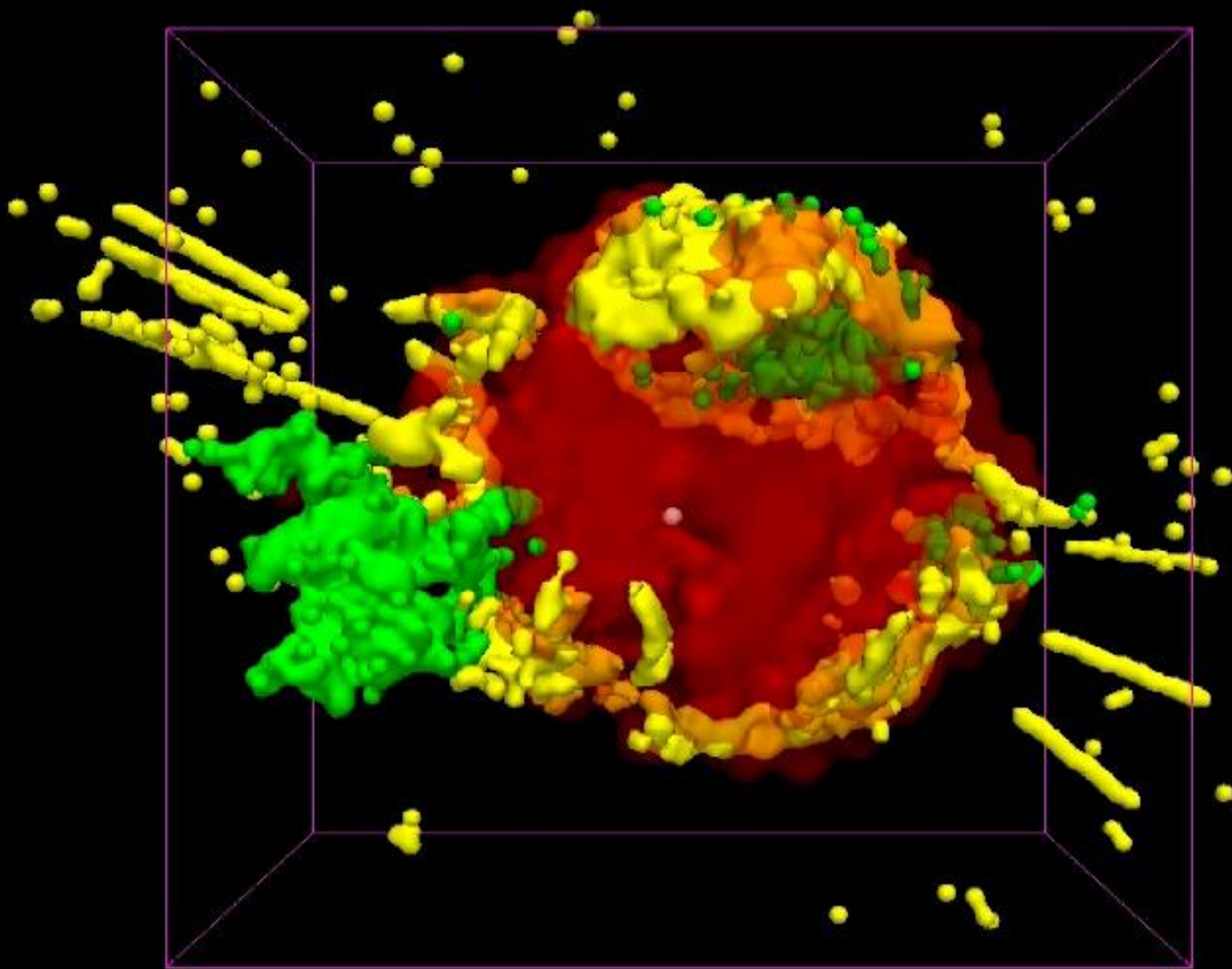
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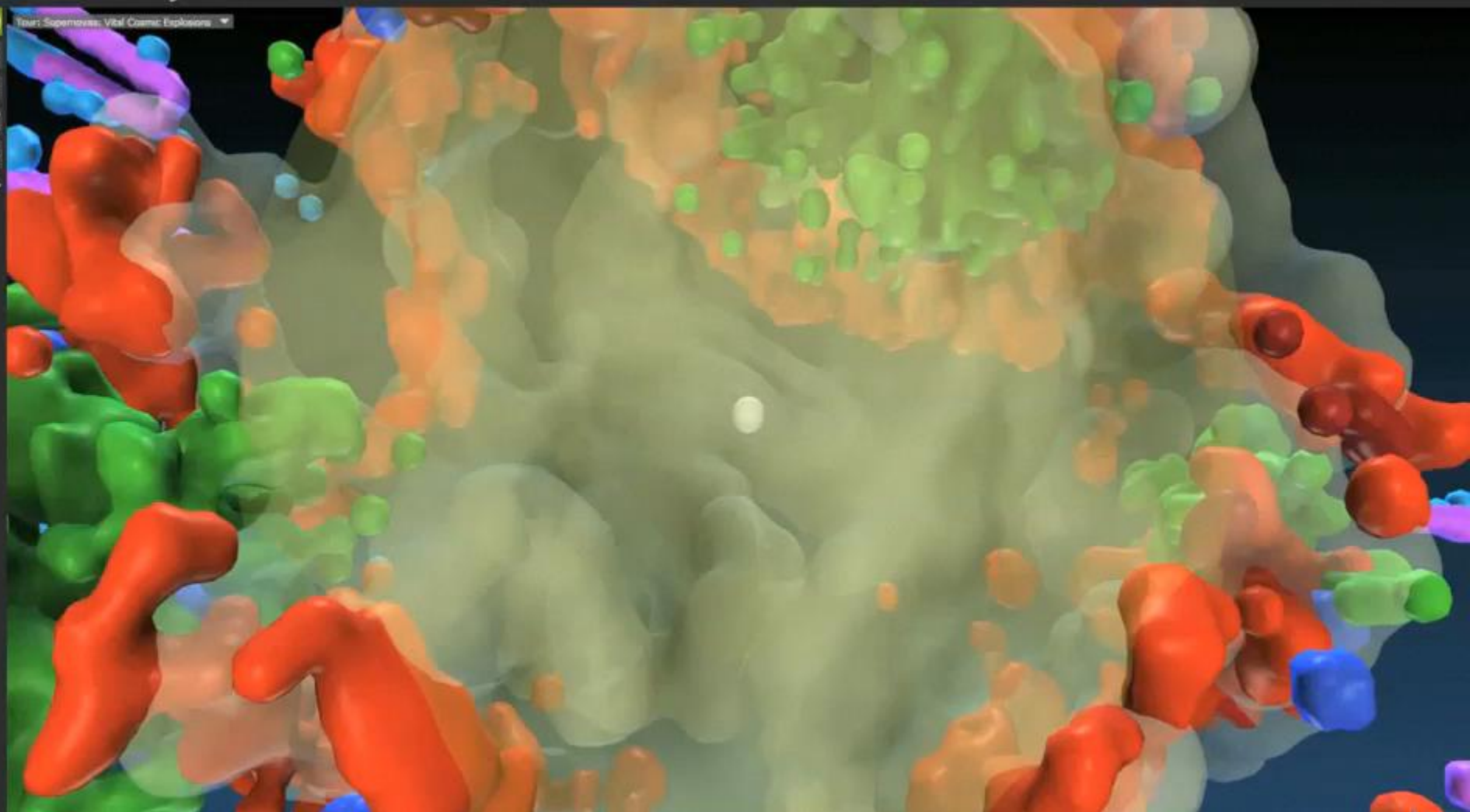
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Cassiopeia A

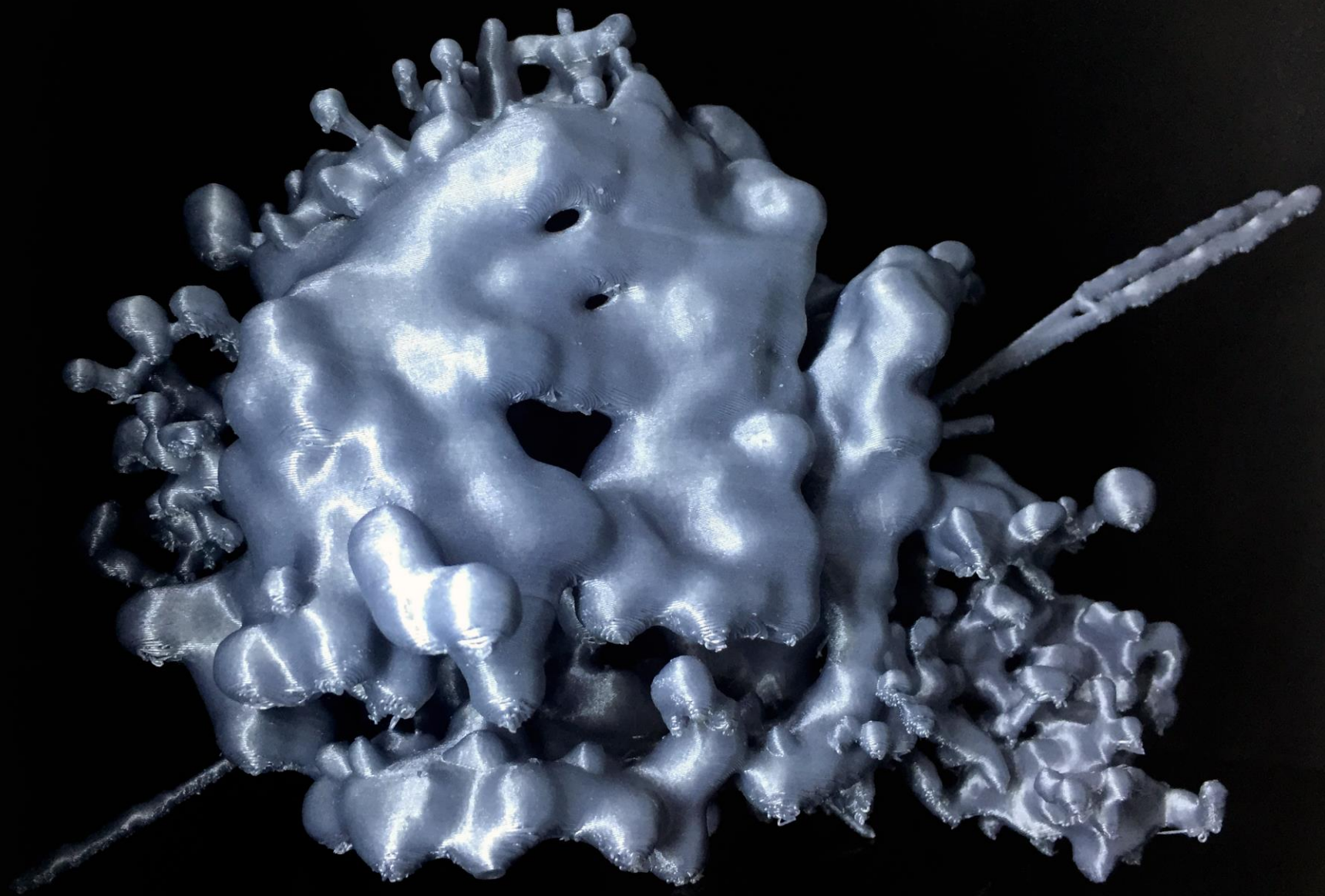


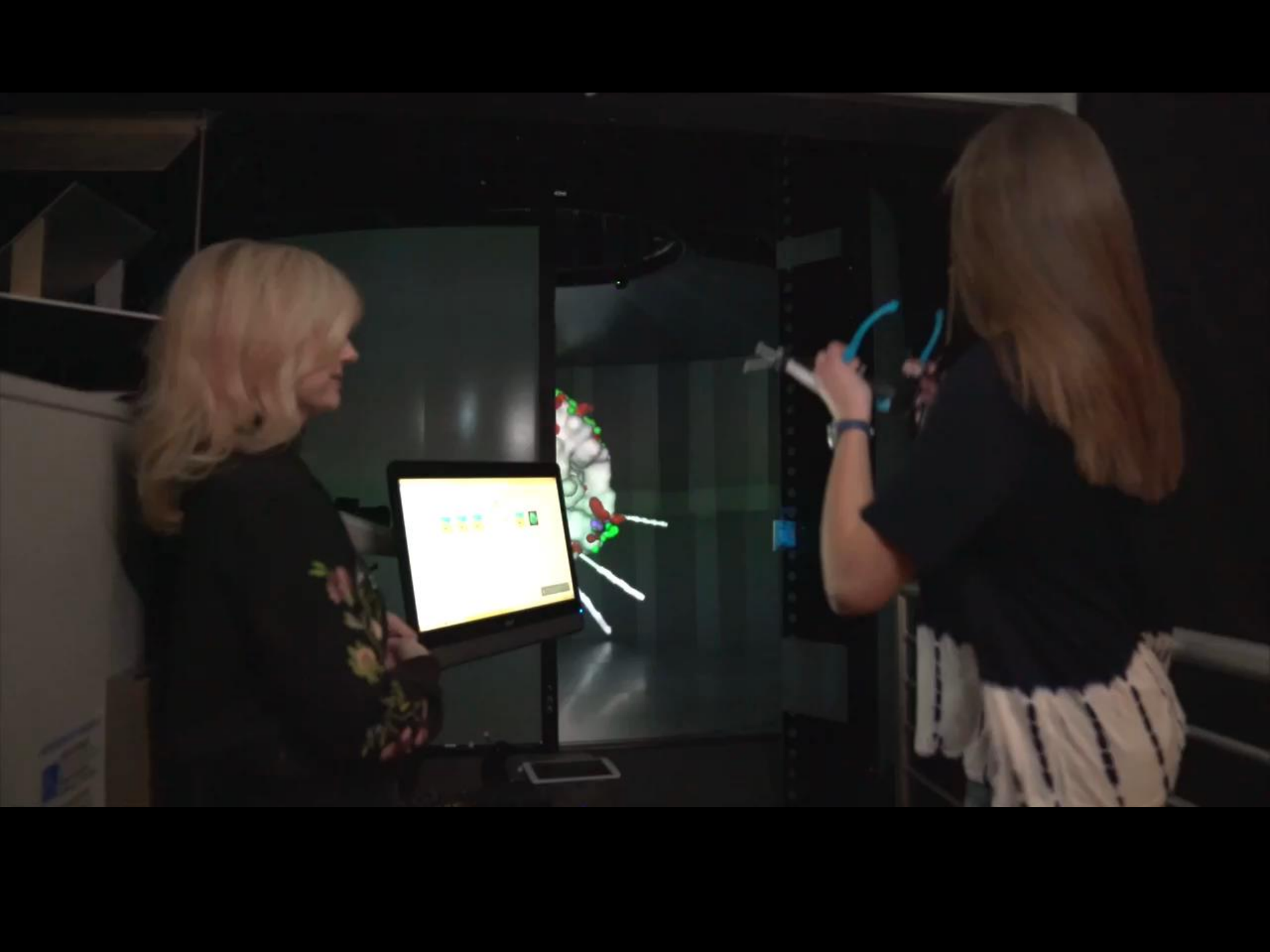


Tour: Supernovas: Vibid Cosmic Explosions

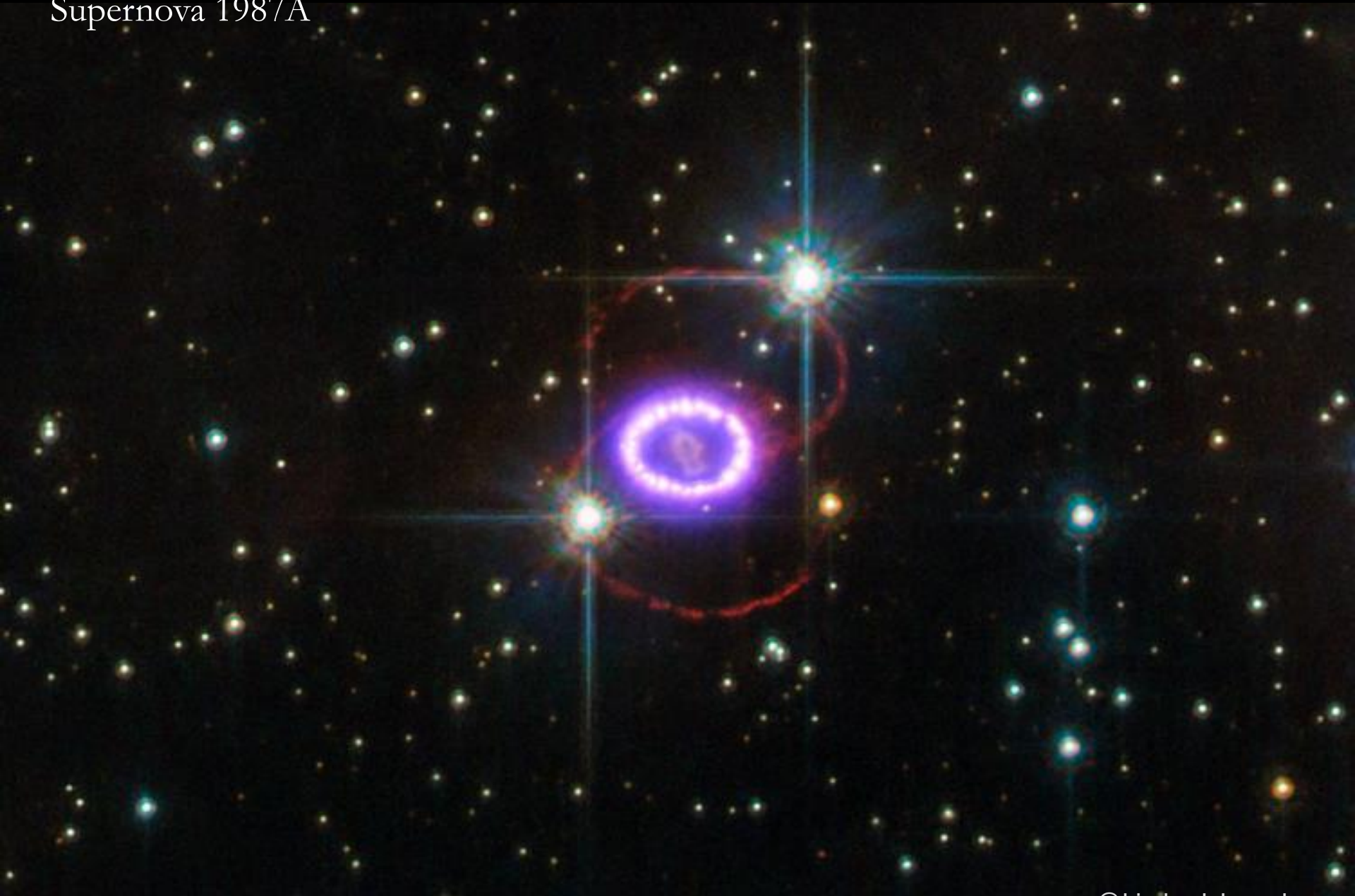








Supernova 1987A



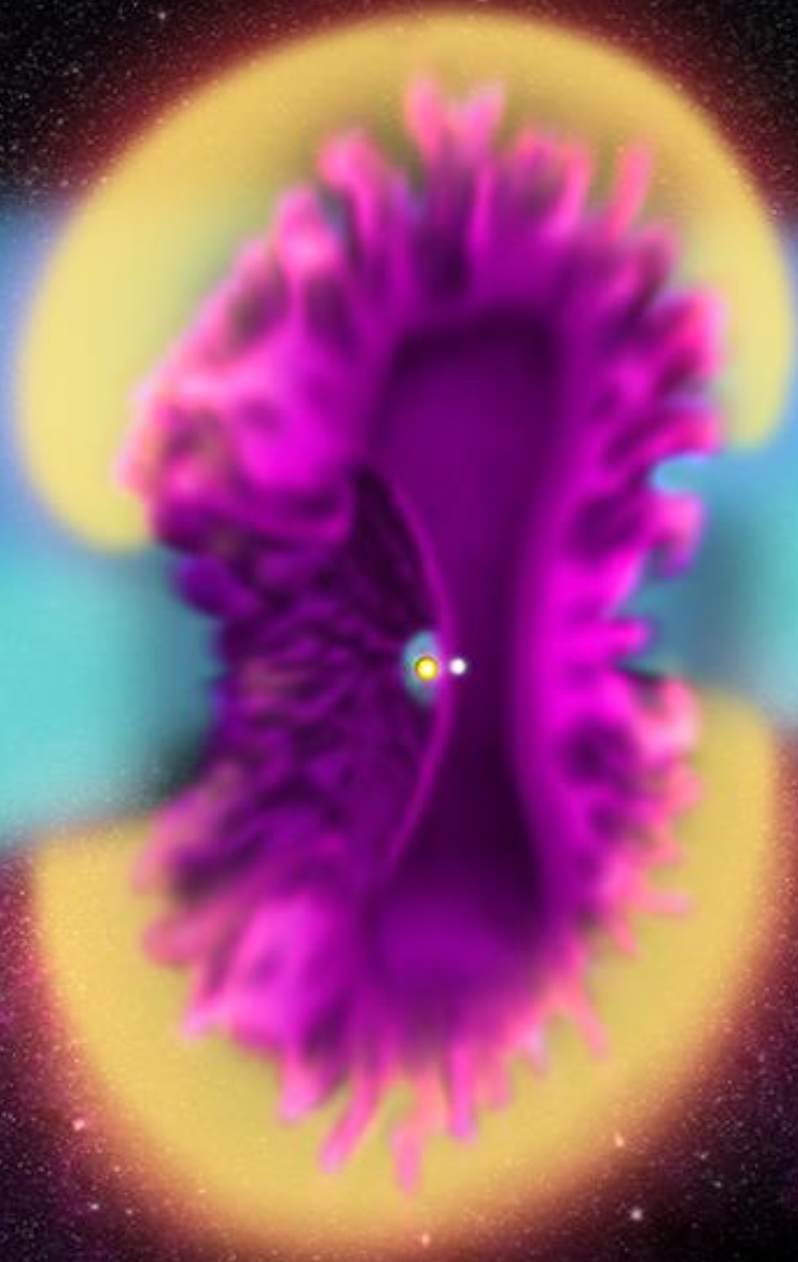


1987

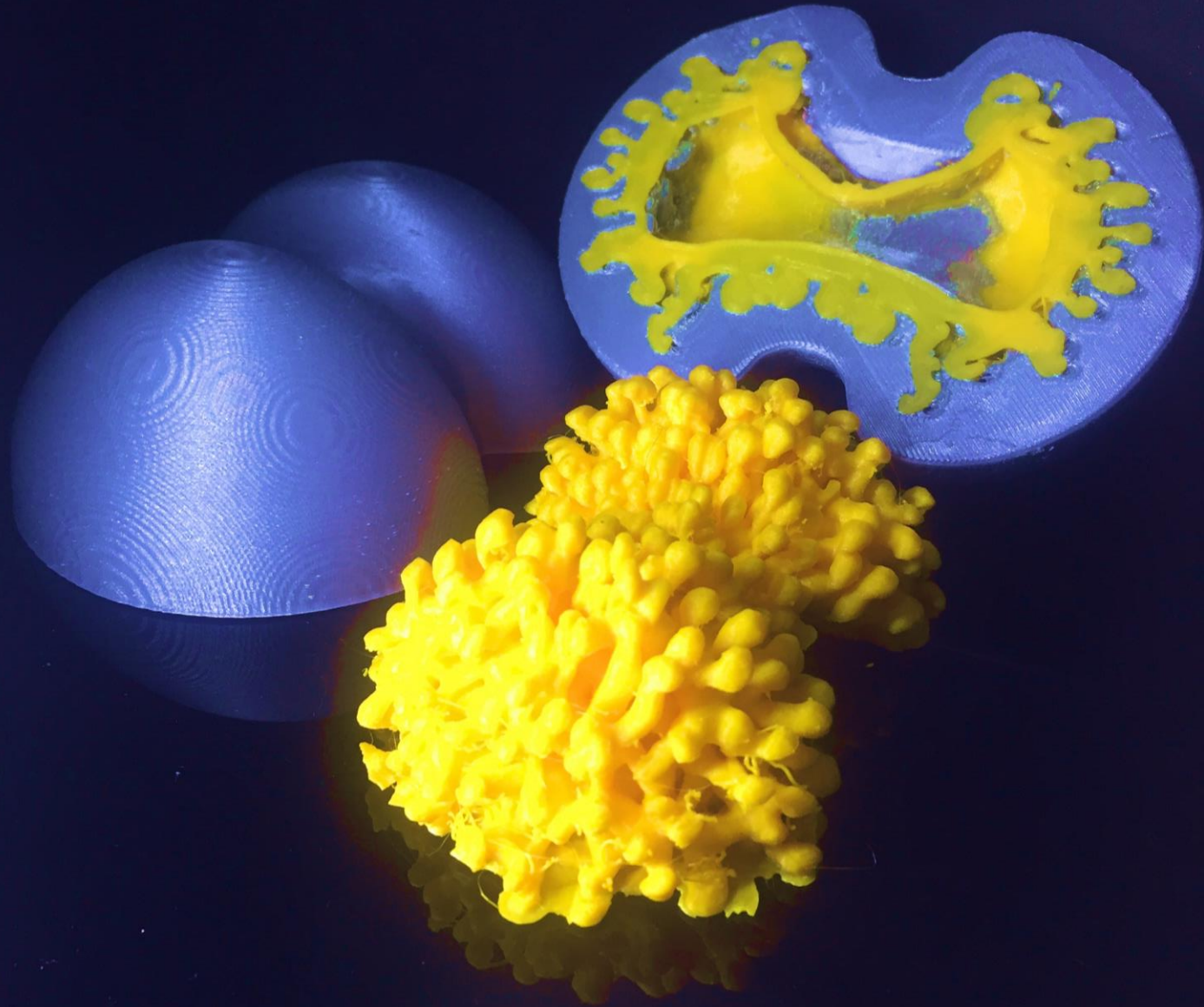
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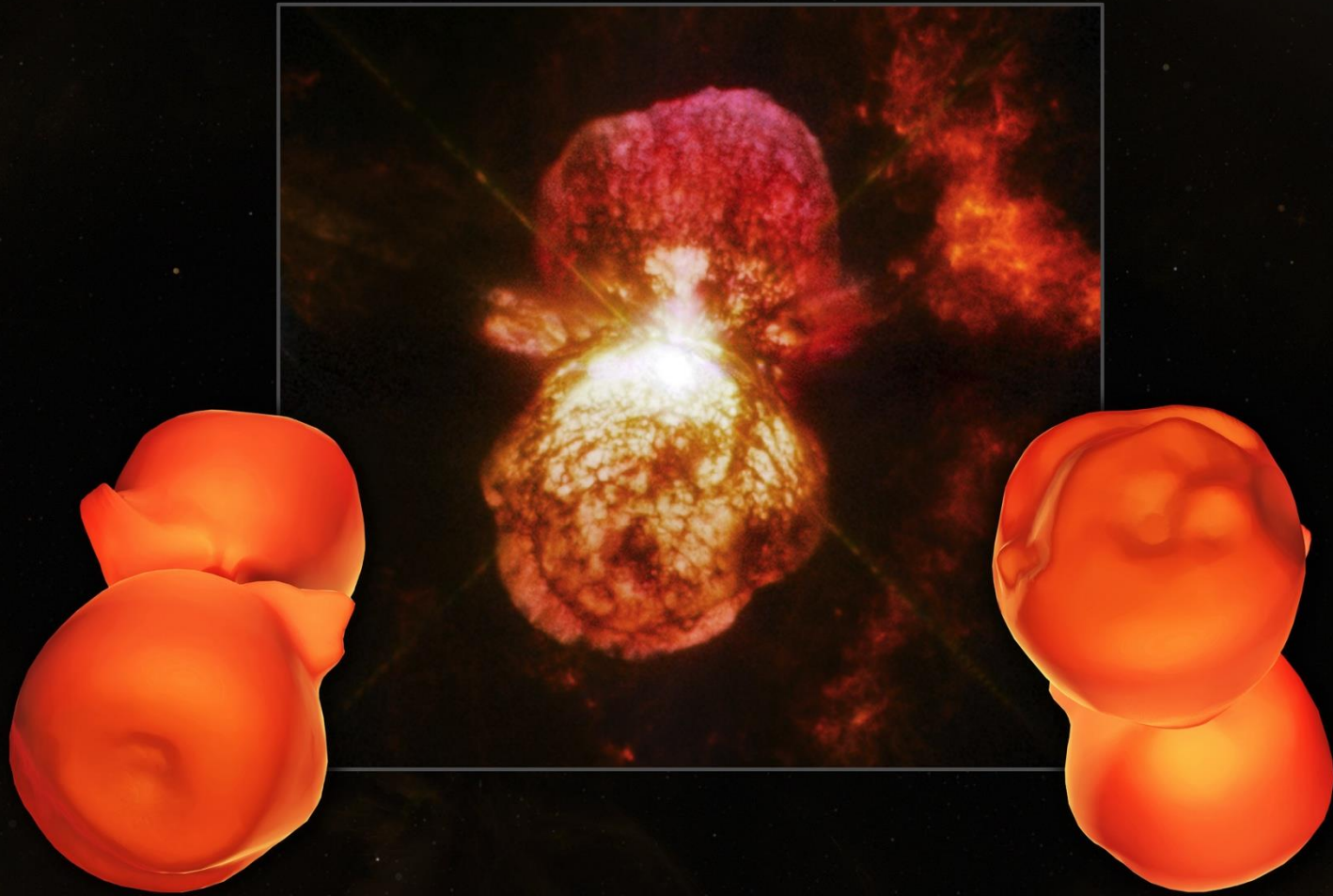
V745 Sco Nova



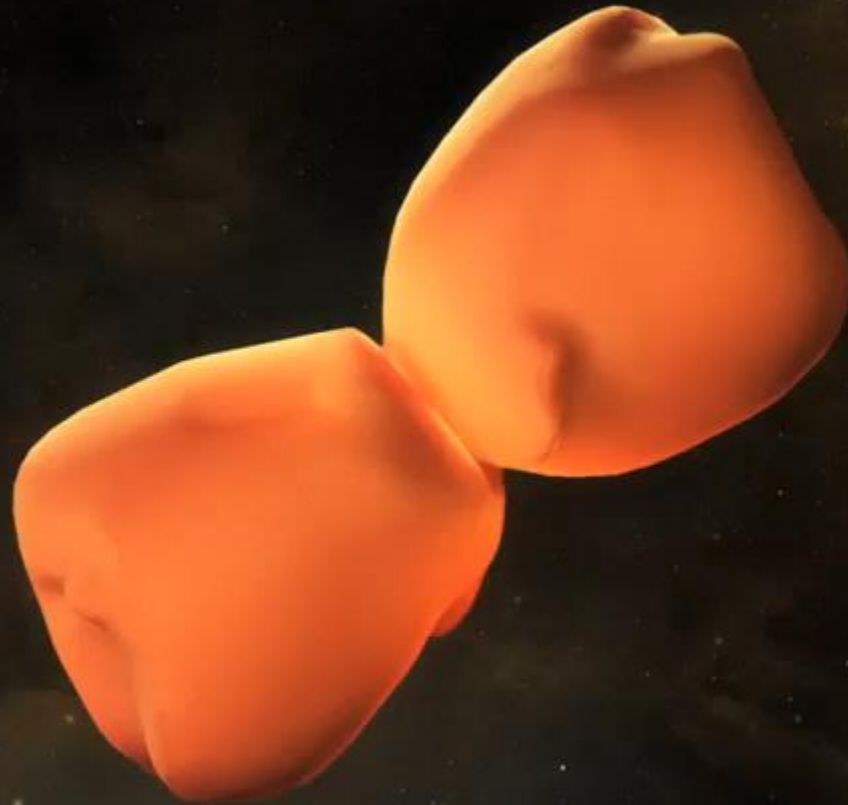
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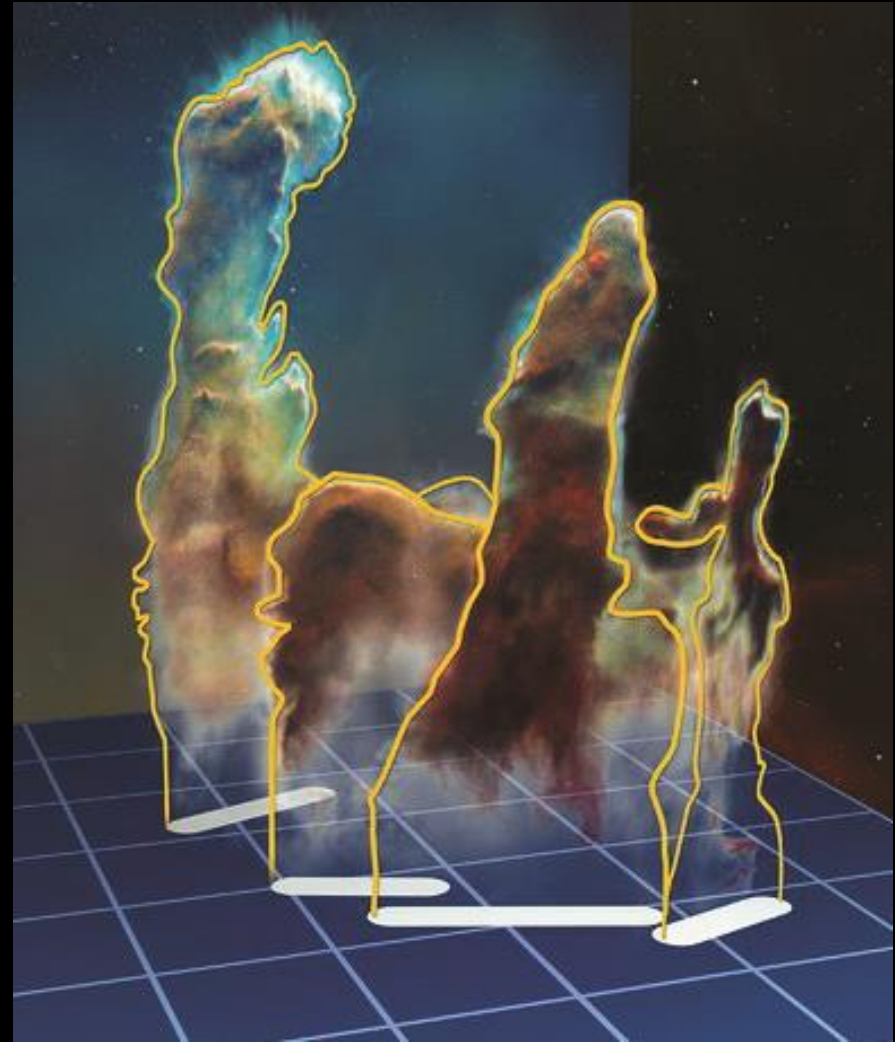
Eta Carinae



Eta Carina



Pillars of Creation



Pillars of Creation



Data Points on women in STEM

The NY Times reported that women make up about

14% of physics professors in the U.S.

For minority women, the statistics are even lower. Dr. Chanda Prescod-Weinstein wrote that in 2015 there were only

78 black American women with PhDs in physics.

As of 2013, there were

**95 female full
professors in
astronomy in the U.S.**

(Vs. 543 male professors of astronomy)

UN Women and Girls reported that, in looking at data from 14 different countries, female students graduate with a Bachelor's degree, Master's degree and Doctor's degree in **science-related fields at only 18%, 8% and 2%** respectively.

Compare that with 37%, 18% and 6% respectively for male students.

According to studies, contributing factors include:

- a culture that encourages pink vs blue, where young women play with dolls rather than robots, and pursue traditionally female careers
- a self-perpetuating stereotype that a programmer, or a scientist, or an engineer, is a white male.

Why should we care?

Better job security and pay but also, more and varied viewpoints.

For example:

Medication

Women can experience more and varied side effects from many medications than men do because such medicines can be biased towards male subjects
(Beerya & Zucker)

Engineering

Automobile air bags have been more dangerous for women of smaller stature because engineers originally designed and tested them around the male body.

Why should we care?

Beyond representation issues, and beyond STEM jobs and outputs, lie more subtle reasons for improving girls' interest in and potential prospects in STEM fields:

- Improving critical thinking skills (Duran & Sendag, 2012)
- Making up well-informed citizenry (Marincola, 2006). STEM issues affect people in the voting booth, in government, in finance, in the world as a whole.
- What problems need solving, for whom they're solved, and how they're solved, with and in STEM fields, is an issue in which all people should participate.

**The importance of improving
spatial reasoning skills in girls
and women for STEM success
through open access, data-
centered 3D strategies**

Women & girls: Spatial skills

Spatial reasoning is a critical skillset in many STEM fields, from being an early indicator of later mathematical success (Verdine et al 2014) and science performance (Uttal et al, 2013) to pursuit of STEM careers in general (Uttal & Cohen, 2012)

Spatial skills in girls tend to be delayed, perhaps due to cultural norms^[1] and have been shown to be improvable through targeted programs (Uttal et al, 2013).

<https://journals.aps.org/prper/abstract/10.1103/PhysRevSTPER.9.020115>

<https://astrobites.org/2017/05/27/what-women-want/>



But research suggests that **spatial thinking** is an important predictor of **achievement in STEM**, or science, technology, engineering and mathematics.

(Wai et al 2009; Uttal et al 2013)

“ Young children who are better at visualizing spatial relationships **develop stronger arithmetic abilities** in primary school.

(Zhang et al 2014)

“ There is even evidence that early spatial ability predicts a young **child's reading skills.**

(Franceschini et al 2012)

“ Middle school students who are good at **mental rotation** are more likely to **achieve** in science classes.

(Ganley et al 2014)

Women & girls: Spatial skills

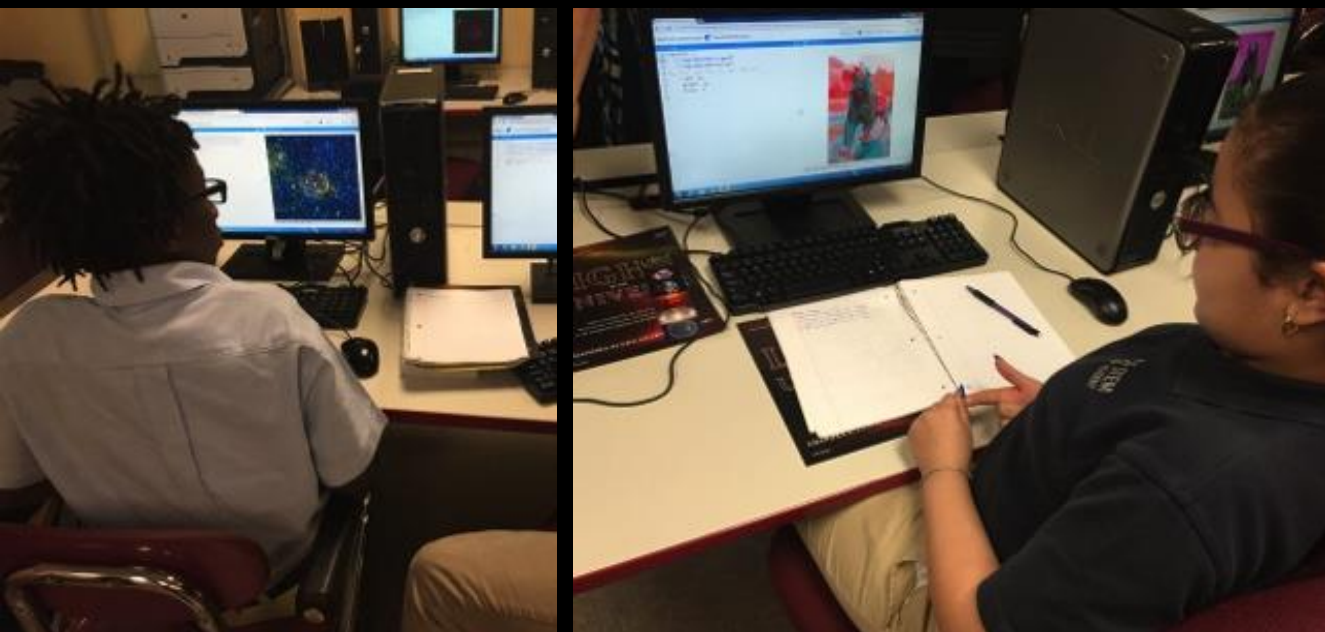
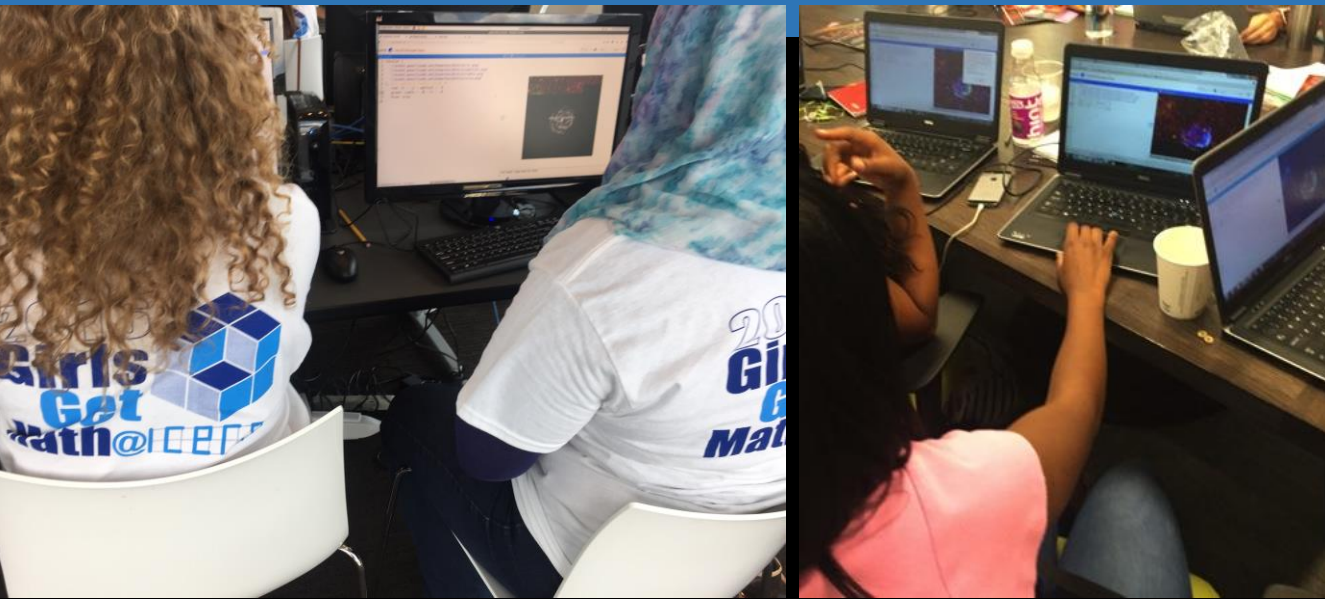
Marina Lee, founder and CEO of the Women in Tech Network Hill recommends introducing girls to STEM concepts as early as preschool by playing games that teach spatial skills, such as building, drawing and putting things together.

3D modeling, 3D printing & Virtual Reality: A pipeline for experts & non-experts

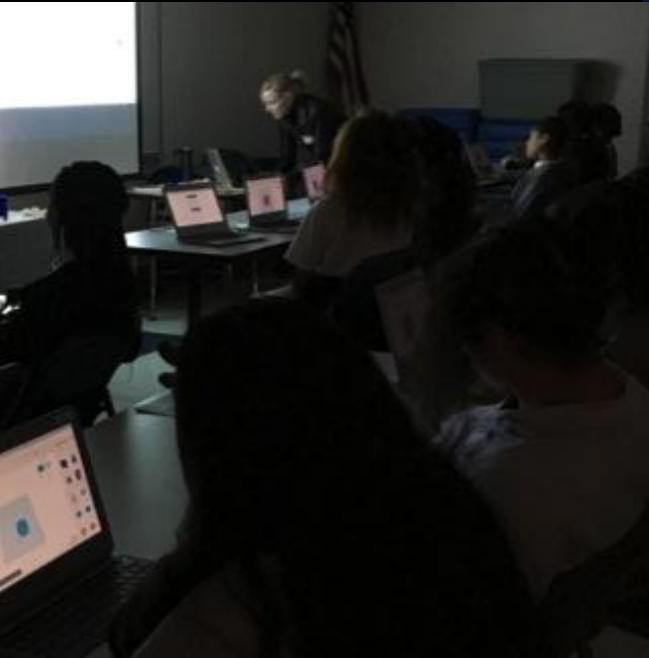
- Learn how 3D models are created with data from NASA's Chandra X-ray Observatory & others.
- Free CAD software activities explore 3D modeling, and 3D printing
- Inexpensive personal immersion in VR/AR experiences with real NASA data sets.

Goal: understand life cycles of stars & galaxies, while working with cutting-edge tech, hardware & software.

Imaging and 3D Workshops



Chandra.si.edu/3dprint







THANK YOU!

Kimberly Arcand
Twitter/Instagram
@kimberlykowl