

A 1,000-light-year wide bubble surrounding Earth is the source of all nearby, young stars.

presented by **Catherine Zucker**
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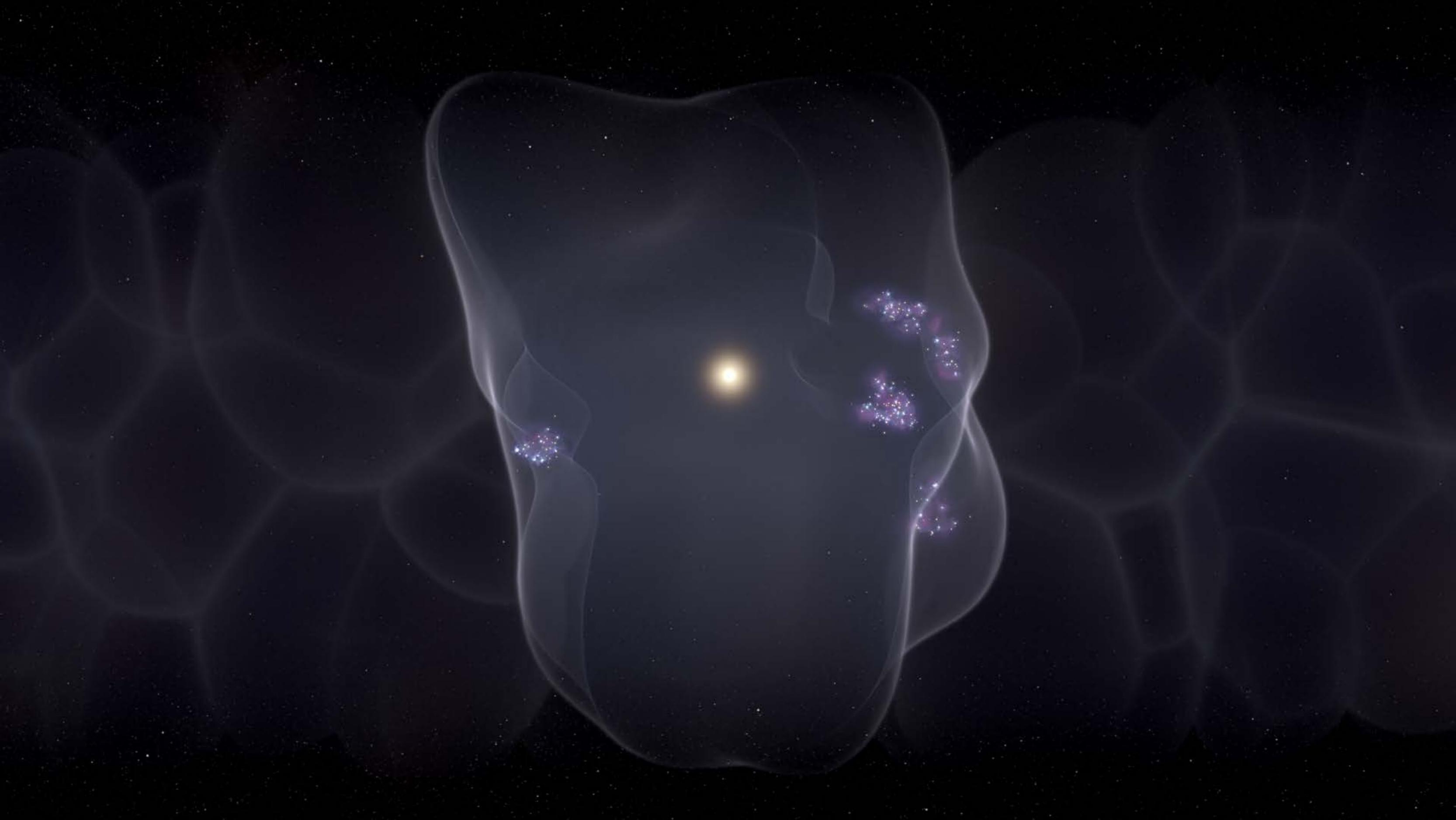
CENTER FOR **ASTROPHYSICS**
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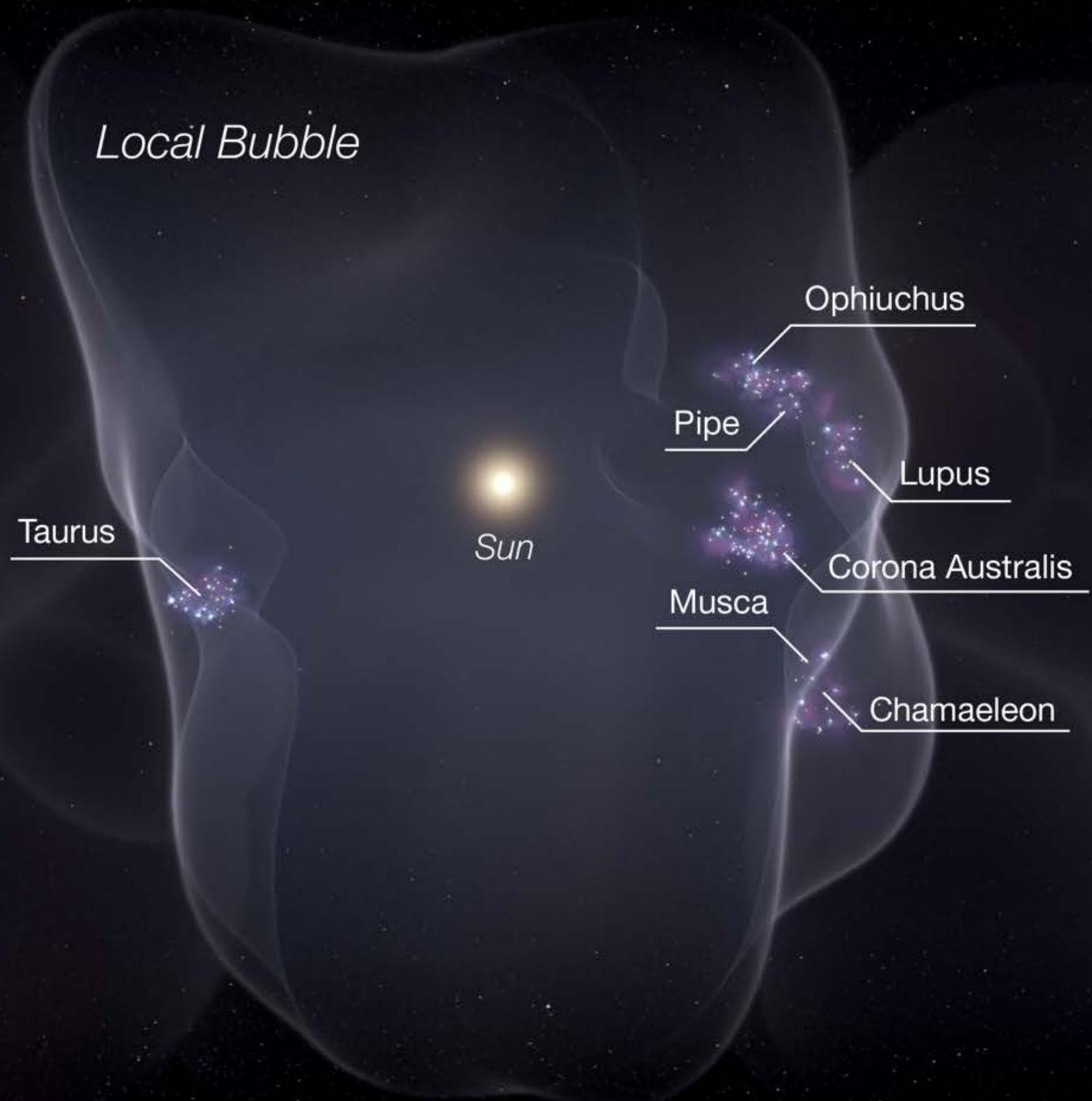


Nature paper by
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Illustration Credit: Leah Hustak (STScI)





Local Bubble

Sun

Taurus

Ophiuchus

Pipe

Lupus

Corona Australis

Musca

Chamaeleon

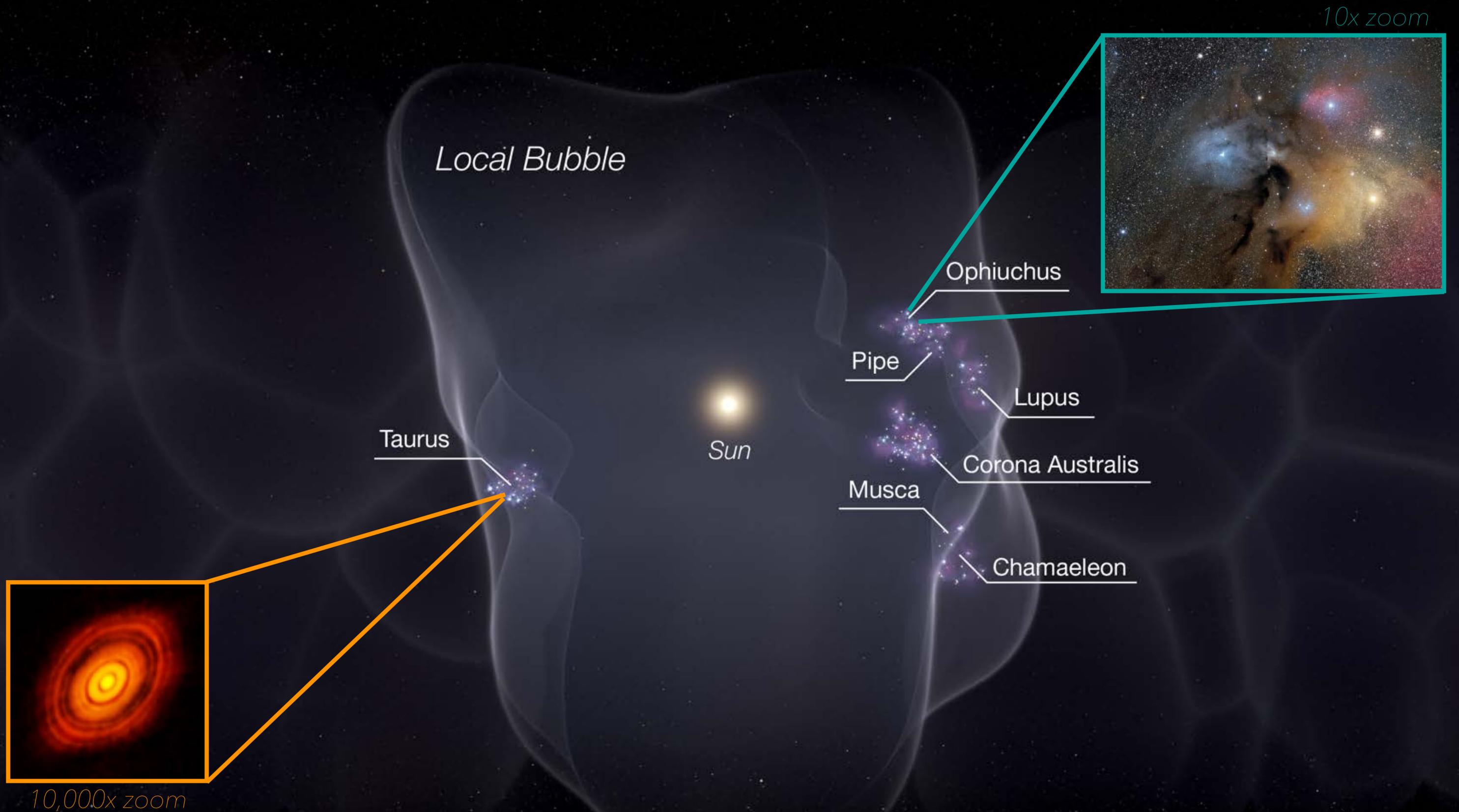
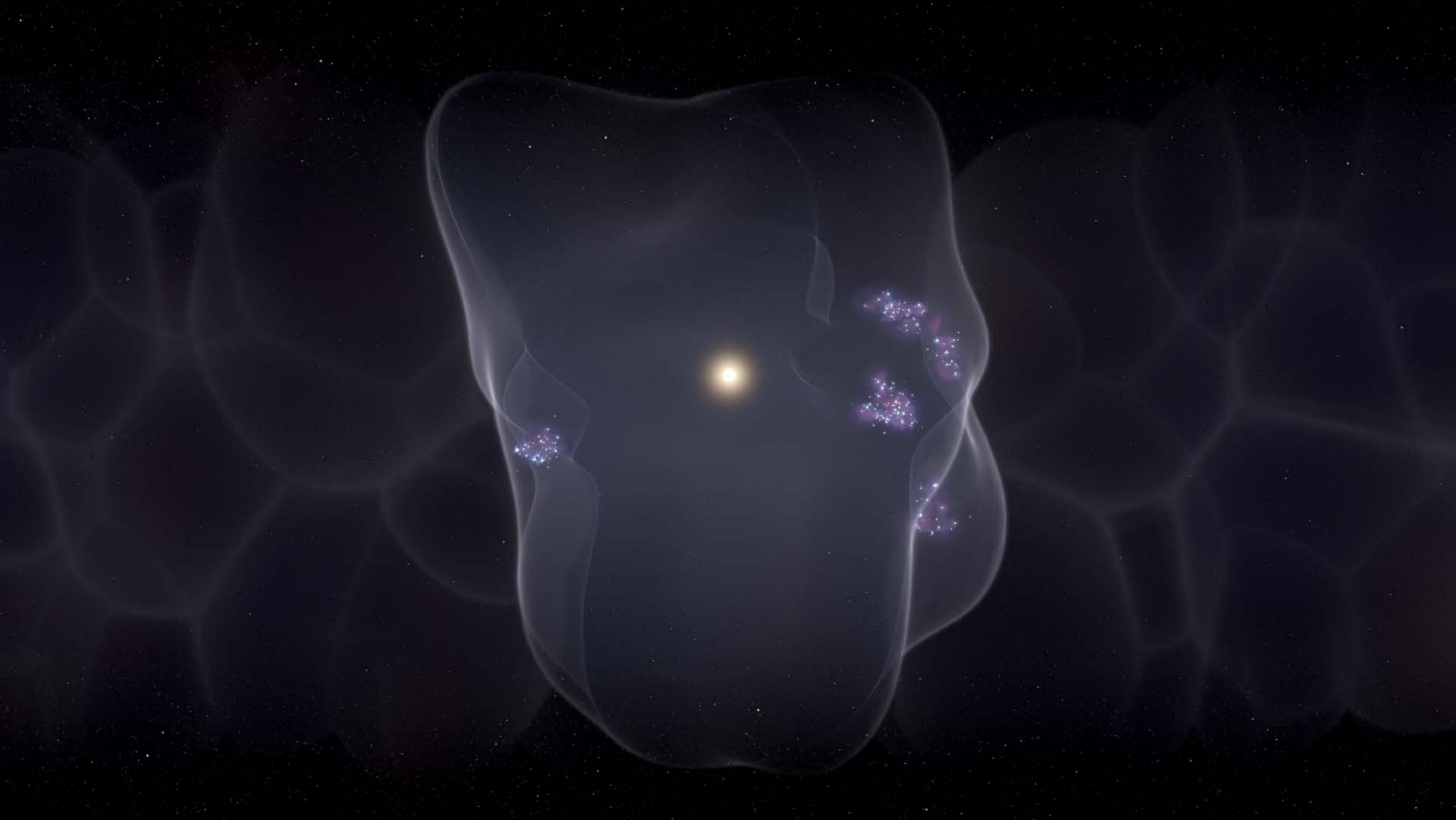
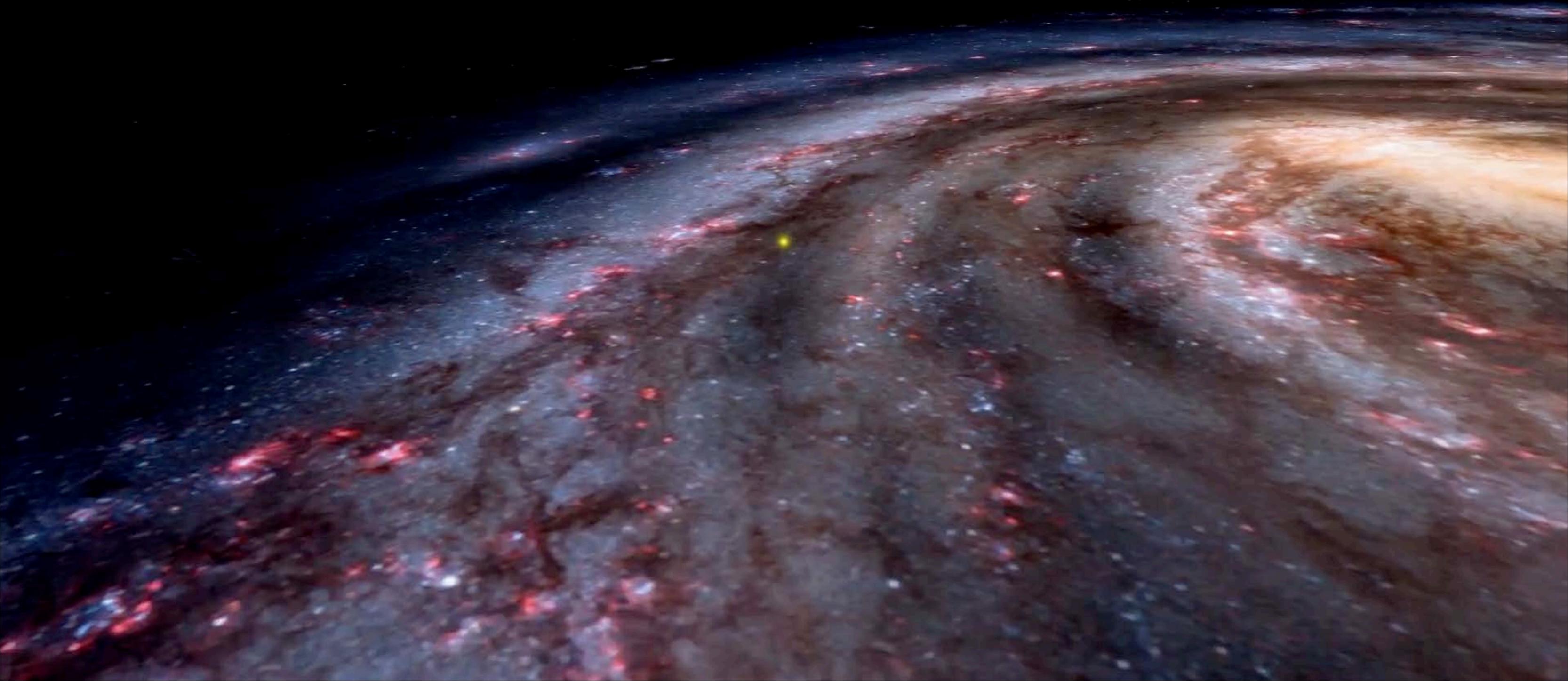


Image credits: Cartoon: Leah Hustak; *HL Tau* disk: ALMA (ESO/NAOJ/NRAO); *Ophiuchus* nebula: Giuseppe Donatiello



We can reconstruct the evolutionary history of our Galactic neighborhood.



We can reconstruct the **evolutionary history** of our Galactic neighborhood.

A chain of events beginning 14 million years ago with **powerful supernova explosions** created a **gigantic bubble** with a surface ripe for **star formation**

14

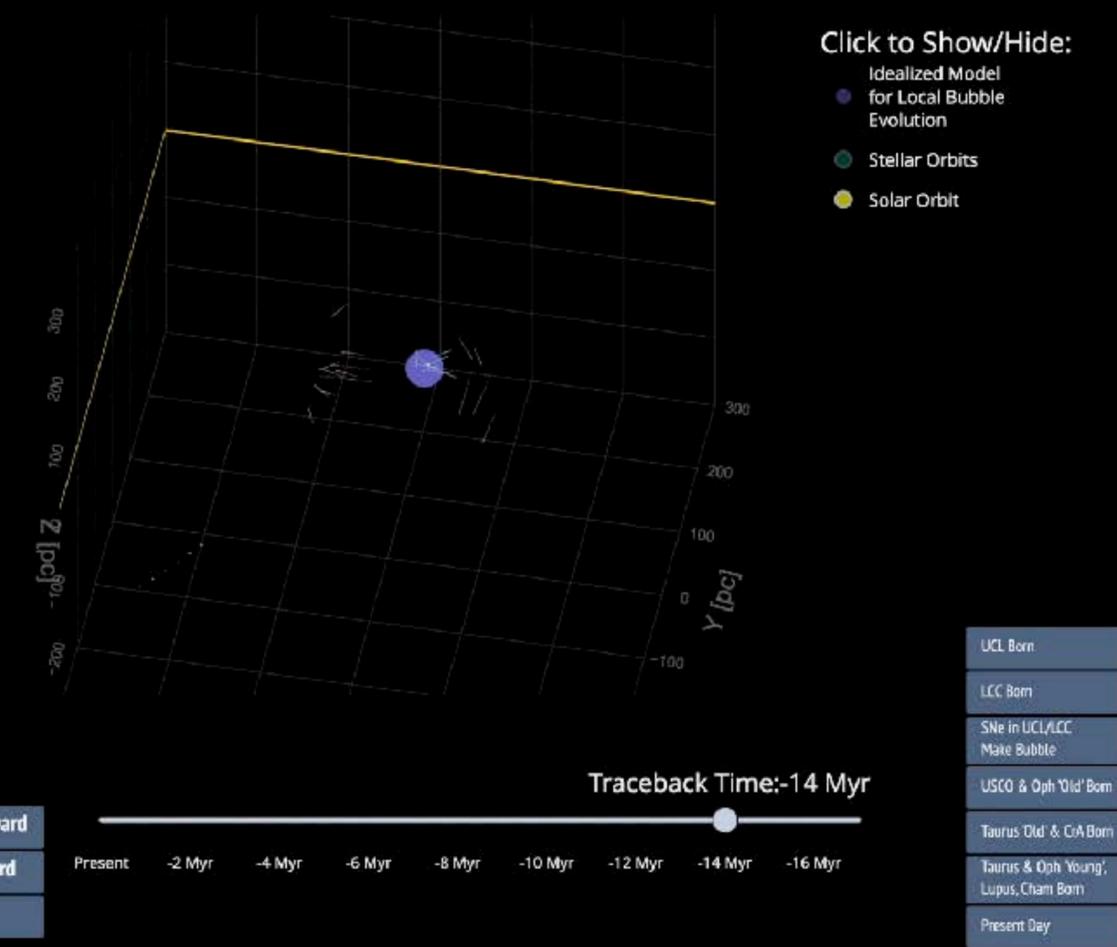
MILLION YEARS AGO

"Cartoon"



"Real Data"

(Zucker et al. 2022, *Nature*)



[try the interactive figure]

We were not expecting this...

zoom, February 5, 2021

You can control Catherine Zucker's screen

python File Edit View Canvas Data Manager Plugins Help

Glue (bubble_kinematics.glu)

Data Collection

- coraus_spine_xyz[bd](HOU)
- Dob_Revived_Master
- Local_Arm_Fit_Rev[2016]
- like_2020_xyz_complete_mean

Plot Layers - 3D Volume Rendering

- like_2020_xyz_complete_mean
- Local_Arm_Fit_Rev[2016]
- Dob_Revived_Master
- coraus_spine_xyz[bd](HOU)
- cloud_outer_geometry_compiled(HOU)
- cloud_inner_geometry_compiled(HOU)
- Best_Fit_Wave_Model
- galaxy_spiral_torus(J_A_A_630_A137_table3)
- perseus_spiral_spiral_spiral
- sun

Attribute: PRIMARY

Limits: 0.00062122 50

Color: [color picker]

Plot Options - 3D Volume Rendering

x axis: Pixel Axis 2 [x]

min/max: 31.0087 771.909

stretch: 1.00

y axis: Pixel Axis 1 [y]

min/max: -34.1407 705.899

stretch: 1.00

z axis: Pixel Axis 0 [z]

min/max: -0.5 539.5

stretch: 1.00

reference: like_2020_xyz

Line Width 1

Show axes

3D Volume Rendering

Pixel Axis 0 [z]

Pixel Axis 1 [y]

Pixel Axis 2 [x]

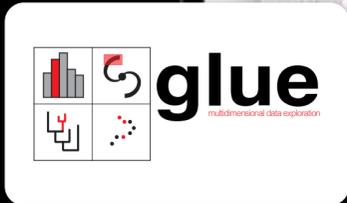
Your default speaker has changed to Parallels Loopback and will now be used.

Catherine Zucker

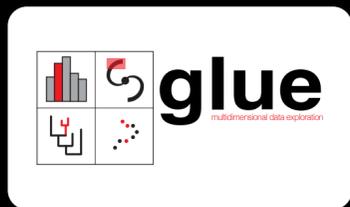
Alyssa Goodman

João Alves

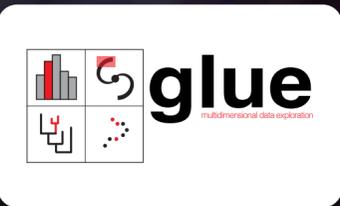
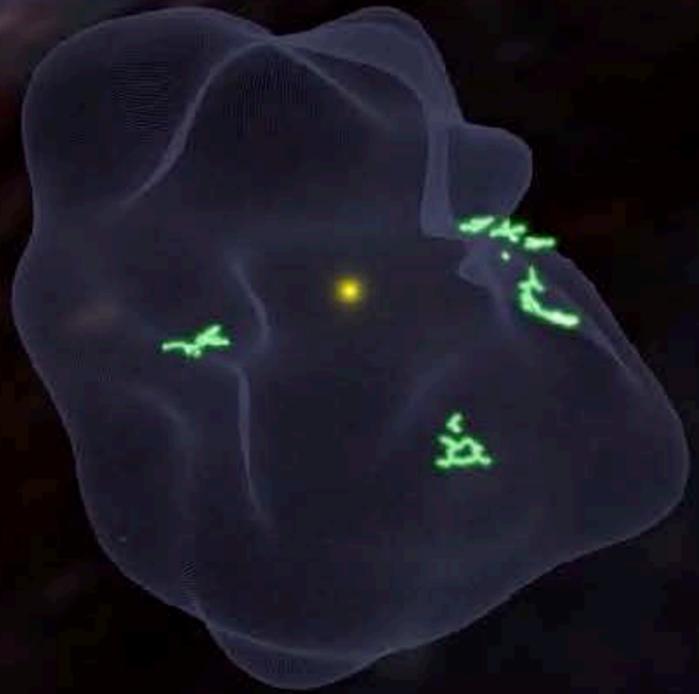
Mute Stop Video Participants Chat Share Screen Record Reactions Leave



The Local Bubble from the outside in and the inside out



The Local Bubble from the outside in and the inside out



How did the **Sun** wind up in the bubble? (by accident)

The Sun was
over 1,000 light
years away
when the
bubble first
started forming.

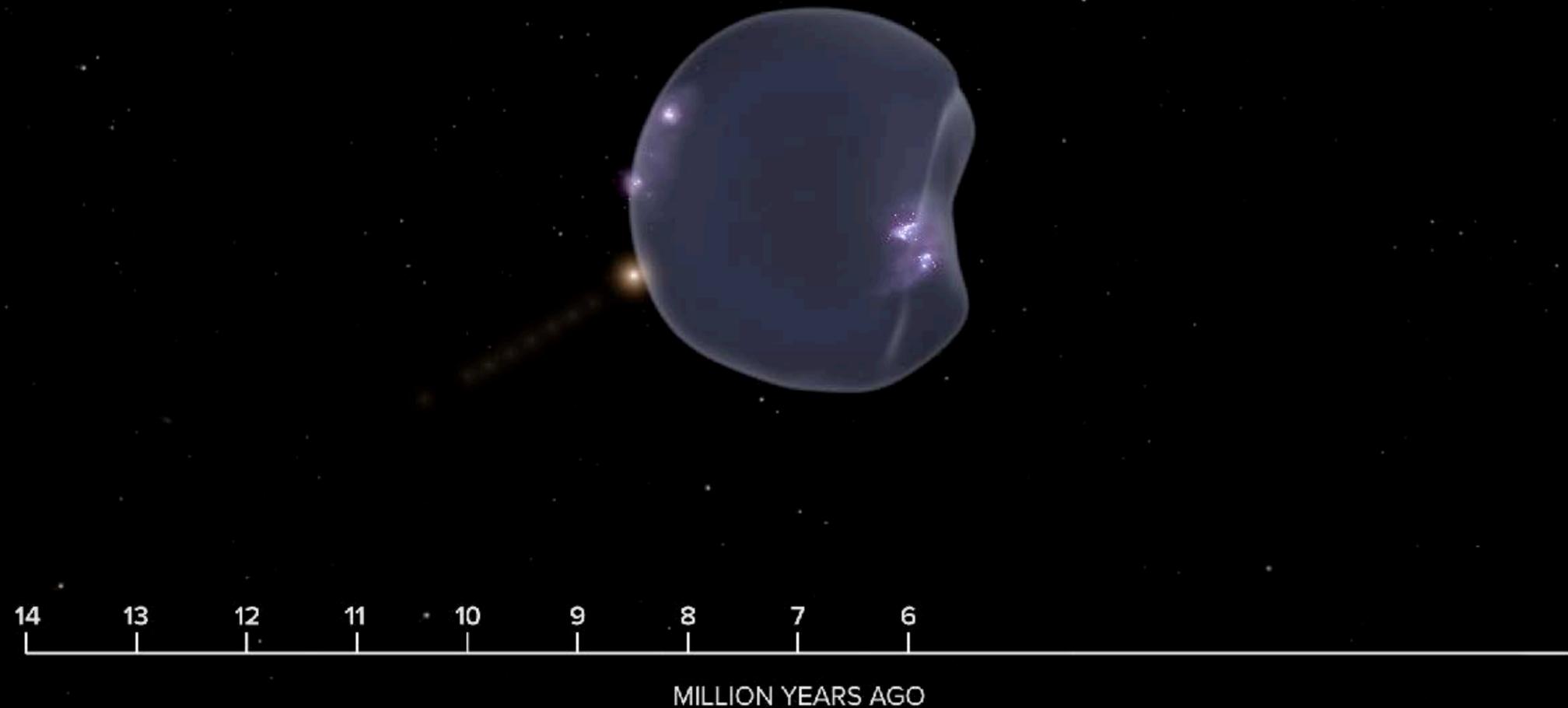
14

MILLION YEARS AGO



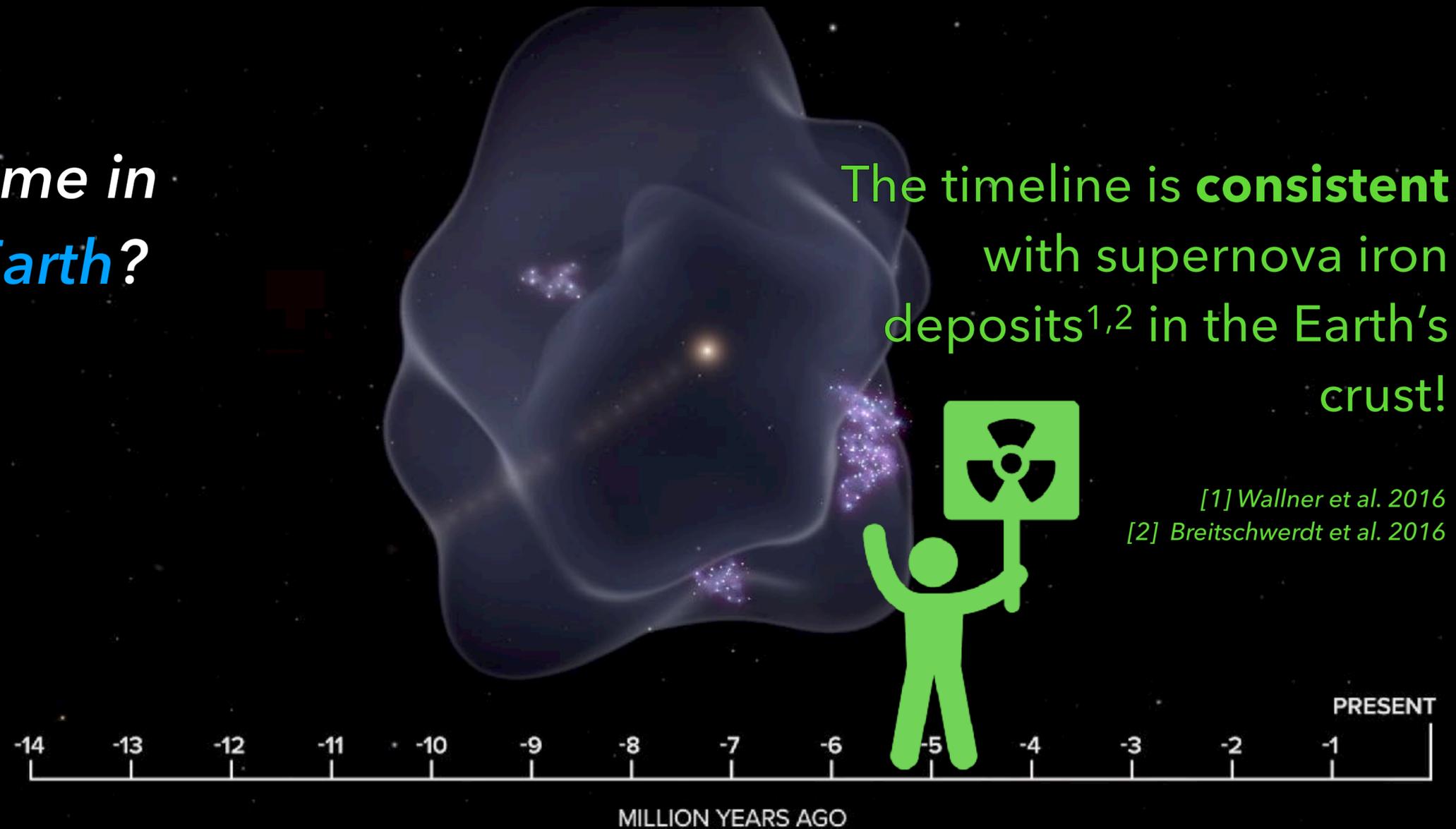
How did the **Sun** wind up in the bubble? (by accident)

The Sun entered the bubble 5 million years ago and now sits near the bubble's center.



How did the **Sun** wind up in the bubble? (by accident)

What does the Sun's time in the bubble mean for **Earth**?



"So What," for Astronomers?

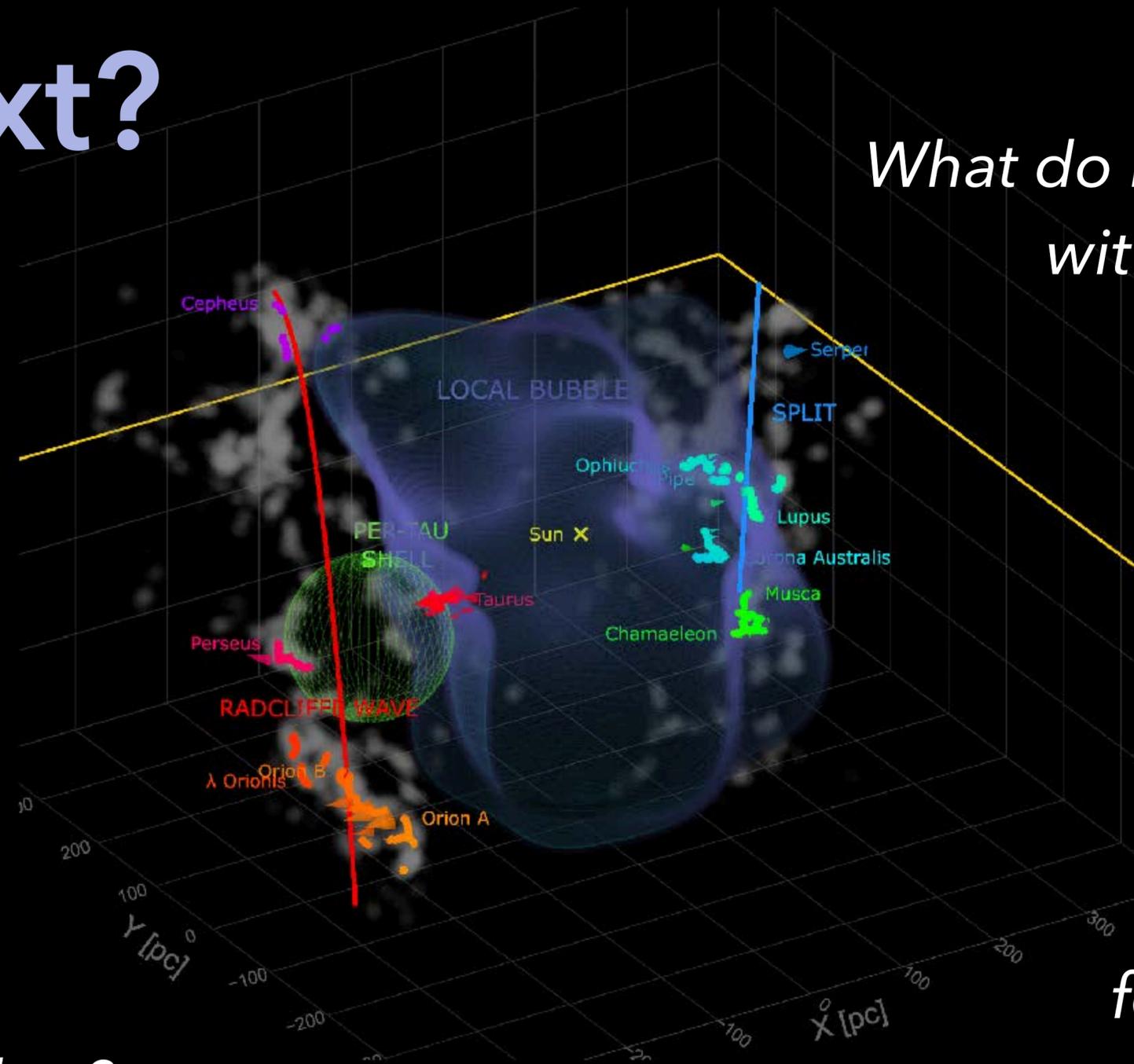
In the present day, almost every single nearby, young star lies on the surface of the Local Bubble

We can now explain how all nearby star formation began

Supernovae can "sweep up" gas into dense clouds that ultimately form new stars (evidence for 50-year-old theory)

Sun's "luck" (centered in bubble) suggests that bubbles must be pervasive across the Galaxy, implying "bubbly" Milky Way

What's next?



What do bubbles have to do with SPIRAL structure? Anything?

How do we SEARCH for other bubbles?

How do these bubbles INTERACT with each other?

Can observations now measure supernova feedback's effect on galaxy EVOLUTION?

[try the interactive figure]



Star Formation near the Sun is driven by expansion of the Local Bubble

The discovery that the 1000-light-year-wide "Local Bubble" surrounding the Sun and Earth is responsible for the formation of all nearby, young stars was first presented in a paper published in *Nature* on January 12, 2022. Please use [this page](#) to find **news**, **publications** and **talks**, **visuals** (images, interactives, and videos), **team** info, and **data**. And, if we forgot something, just let us know—and we'll try to include it in future updates!

A Bubbly Origin

for Stars Around the Sun



Want to see for yourself? Click [HERE](#) for interactive figure!

Find these slides, the papers, videos, tours, and much more at:
tinyurl.com/local-bubble-stars