



TEEN ASTRONOMY

Café – To Go!

A long-exposure photograph of a night sky filled with star trails, creating a dense pattern of concentric circles. In the foreground, the silhouette of a mountainous landscape is visible, with several large, illuminated telescope domes and structures, likely part of an observatory. The sky is a mix of blue, white, and yellow light trails, with a prominent spiral pattern in the upper right quadrant. The overall scene is dark, with the observatory lights providing a warm glow against the night sky.

Welcome to the Teen Astronomy Café

Hosted by NSF's NOIRLab

Looking through Gravitational Lenses

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NSF's NOIRLab



A. Bolton



A. Bolton



A. Bolton / NASA / ESA

Our Sun

93 million miles away from Earth,
or about “8 light-minutes”

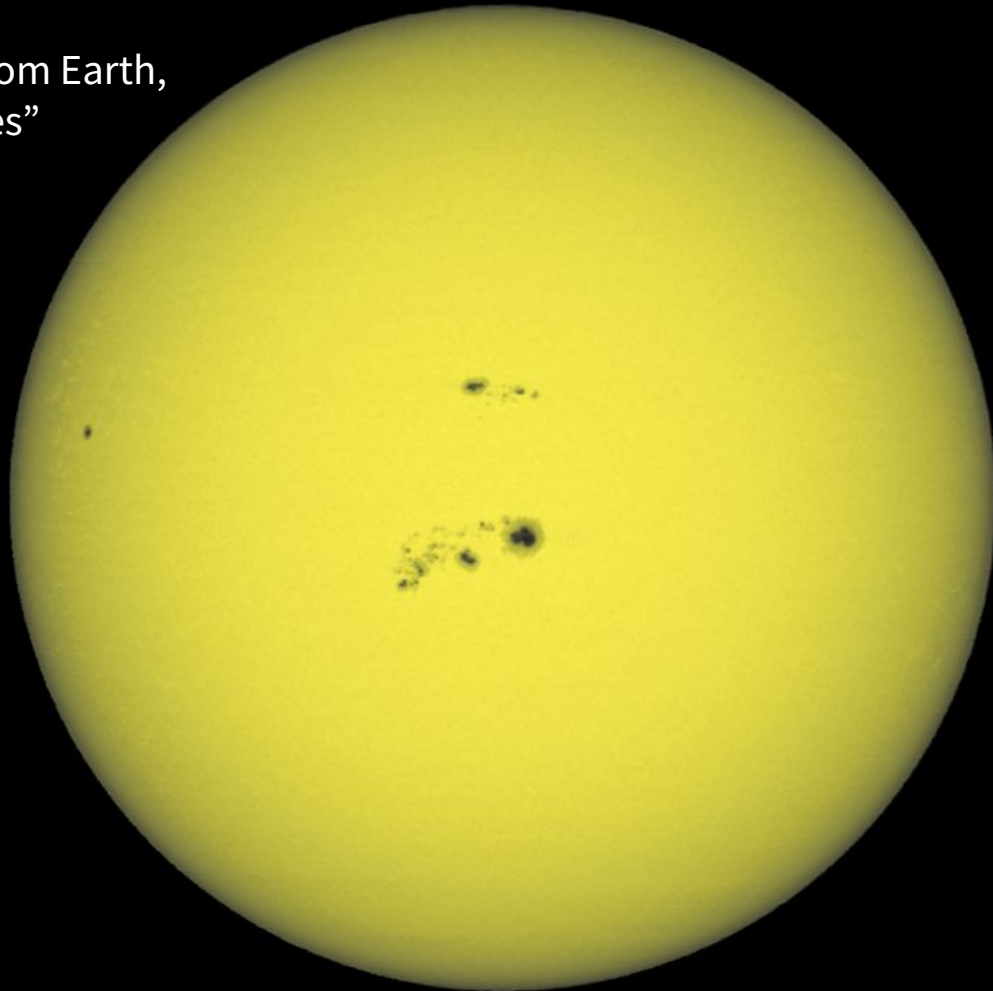


Image credit:
National Solar Observatory

Our Sun

93 million miles away from Earth,
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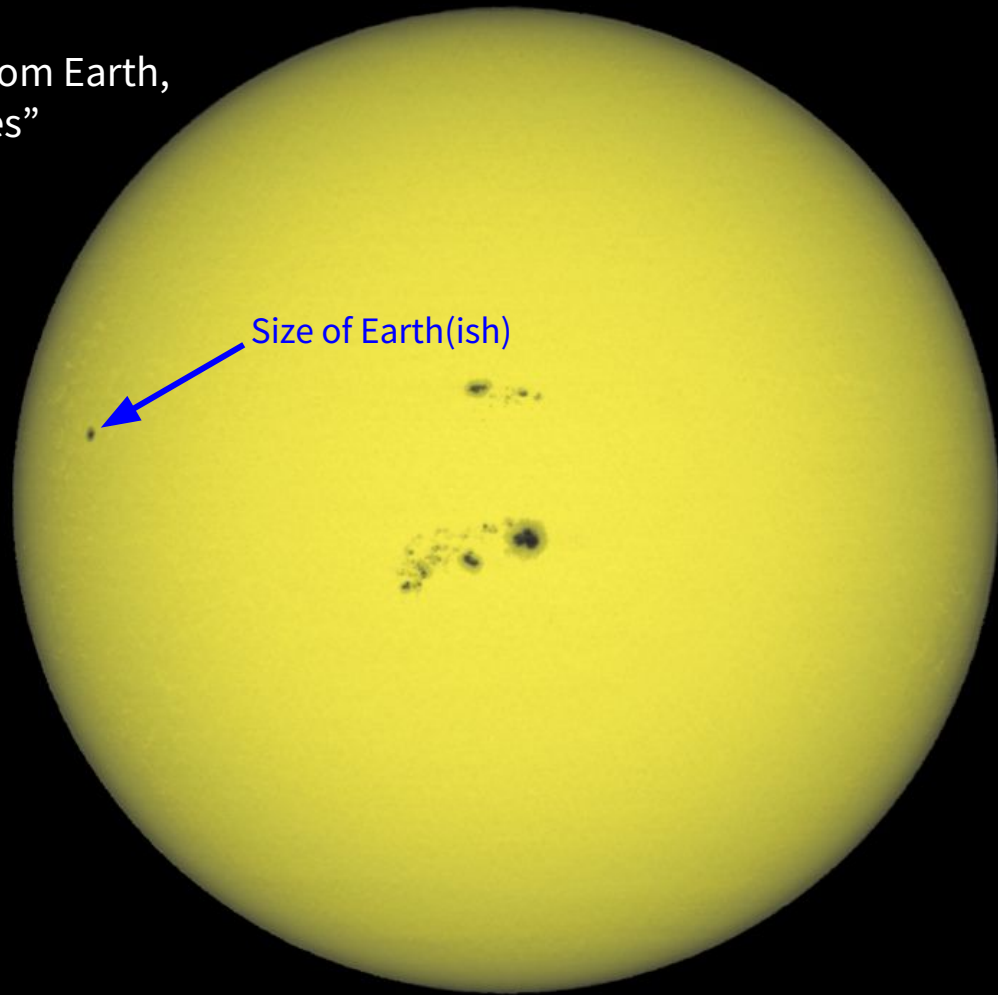


Image credit:
National Solar Observatory

Other stars

Separated by light years from one another

This cluster of stars is about 450 light years from Earth



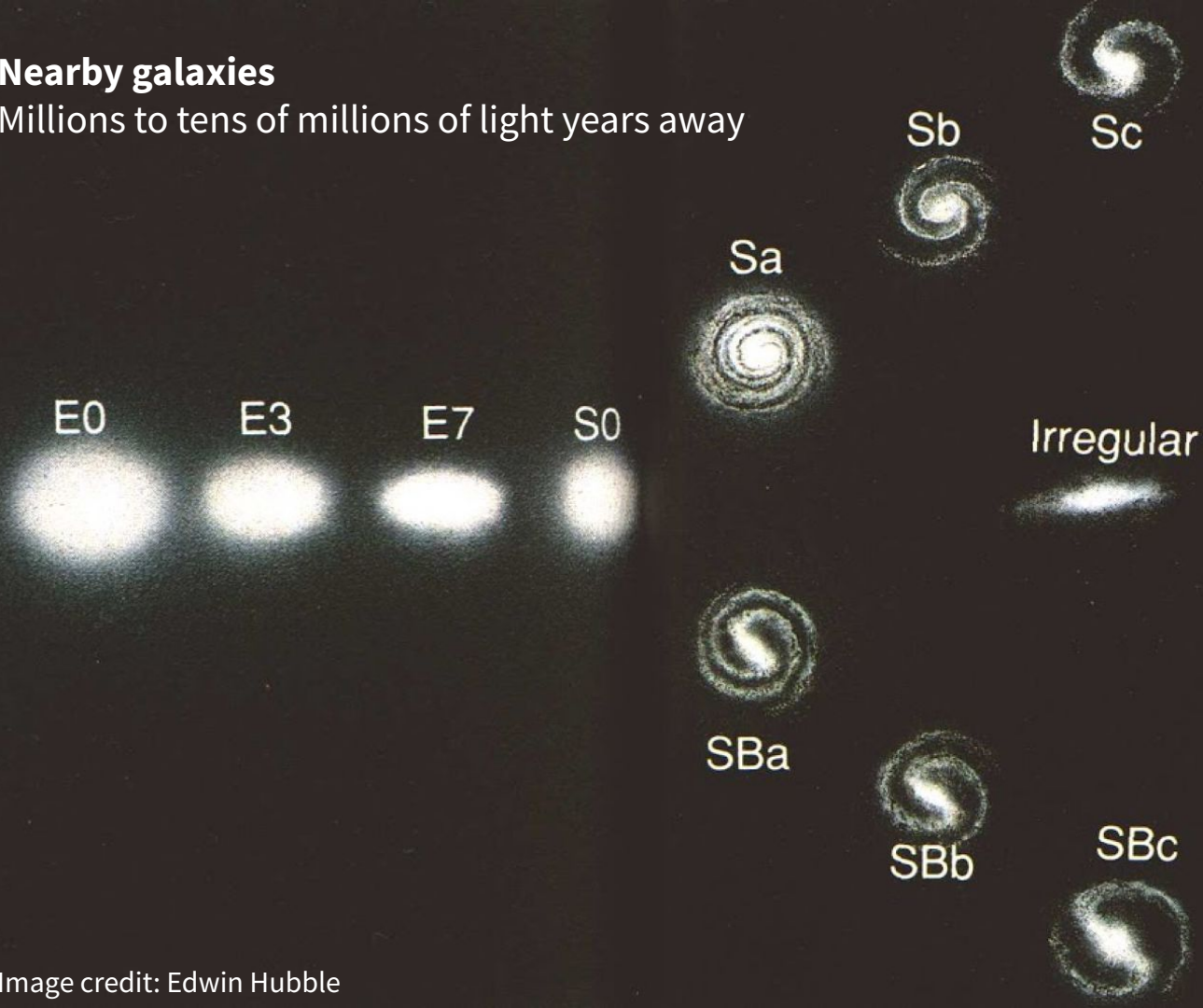
Our “Milky Way” Galaxy
tens of thousands of light years in size

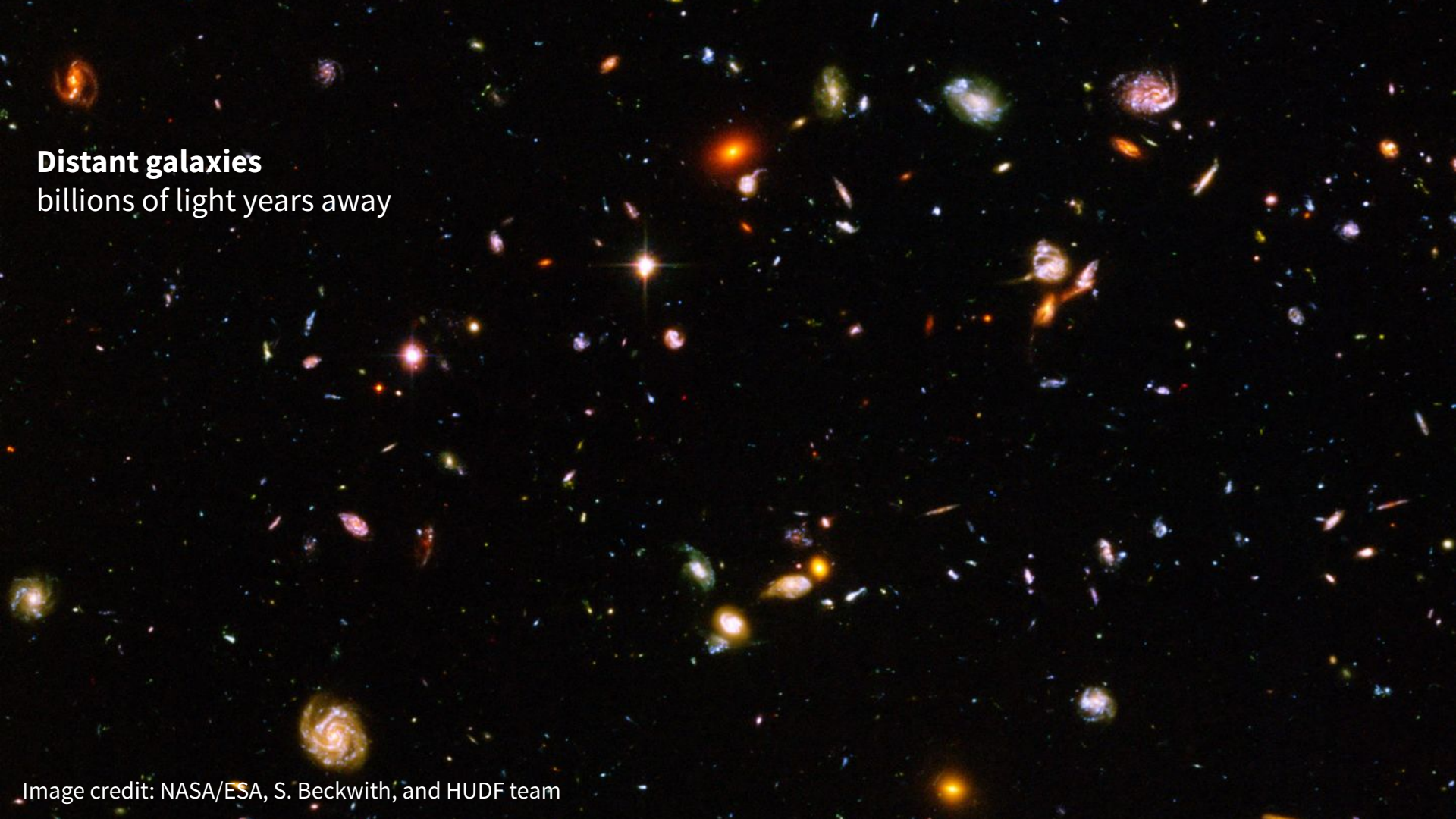


Image credit: International Gemini Observatory/NOIRLab/NSF/AURA/Kwon O Chul

Nearby galaxies

Millions to tens of millions of light years away



A deep-field astronomical image showing a vast field of distant galaxies. The galaxies are scattered across a black background, appearing in various colors including orange, yellow, green, blue, and purple. Some galaxies are bright and clear, while others are faint and blurry. The overall scene is a rich tapestry of cosmic structures.

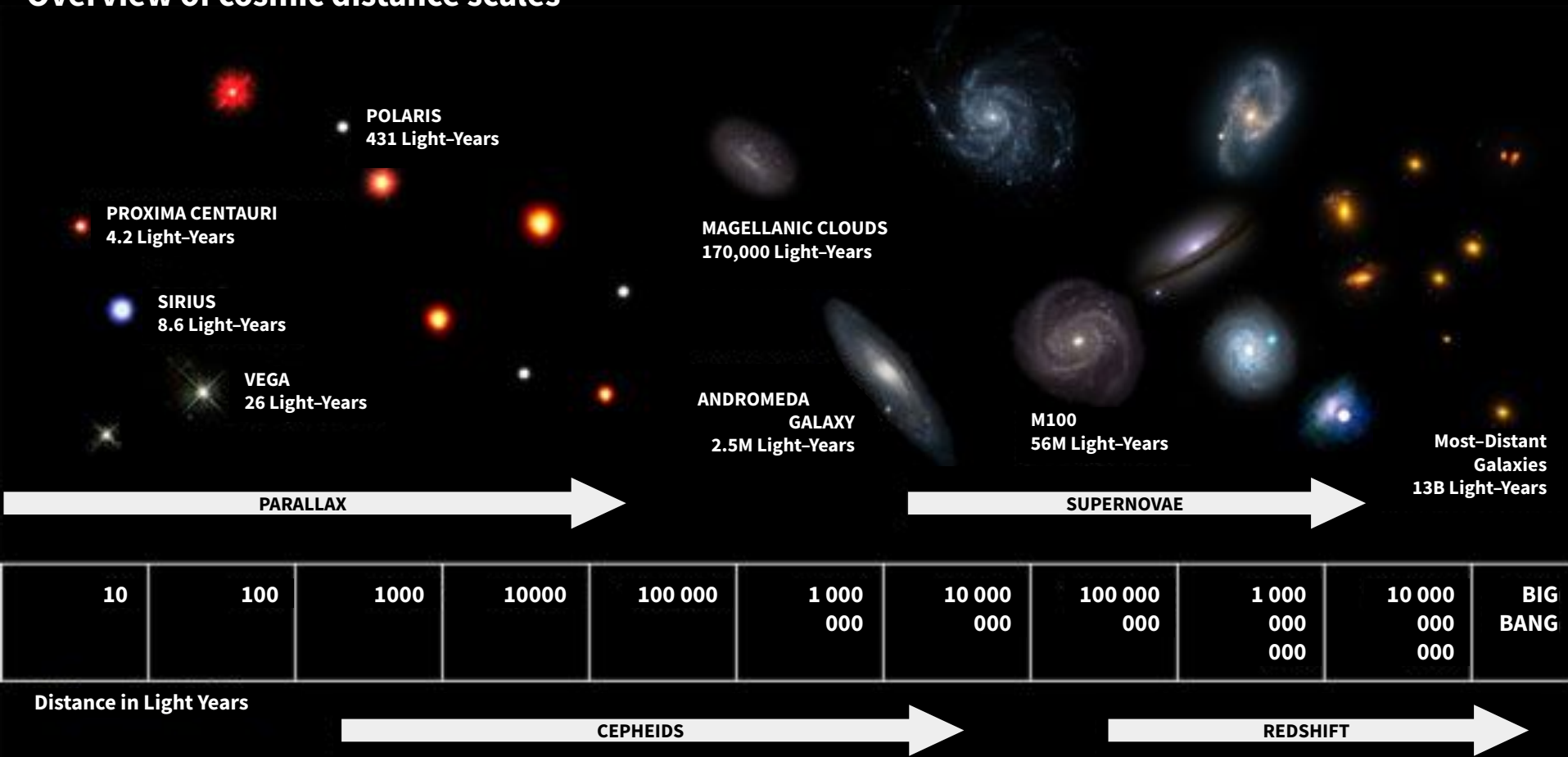
Distant galaxies
billions of light years away

Image credit: NASA/ESA, S. Beckwith, and HUDF team

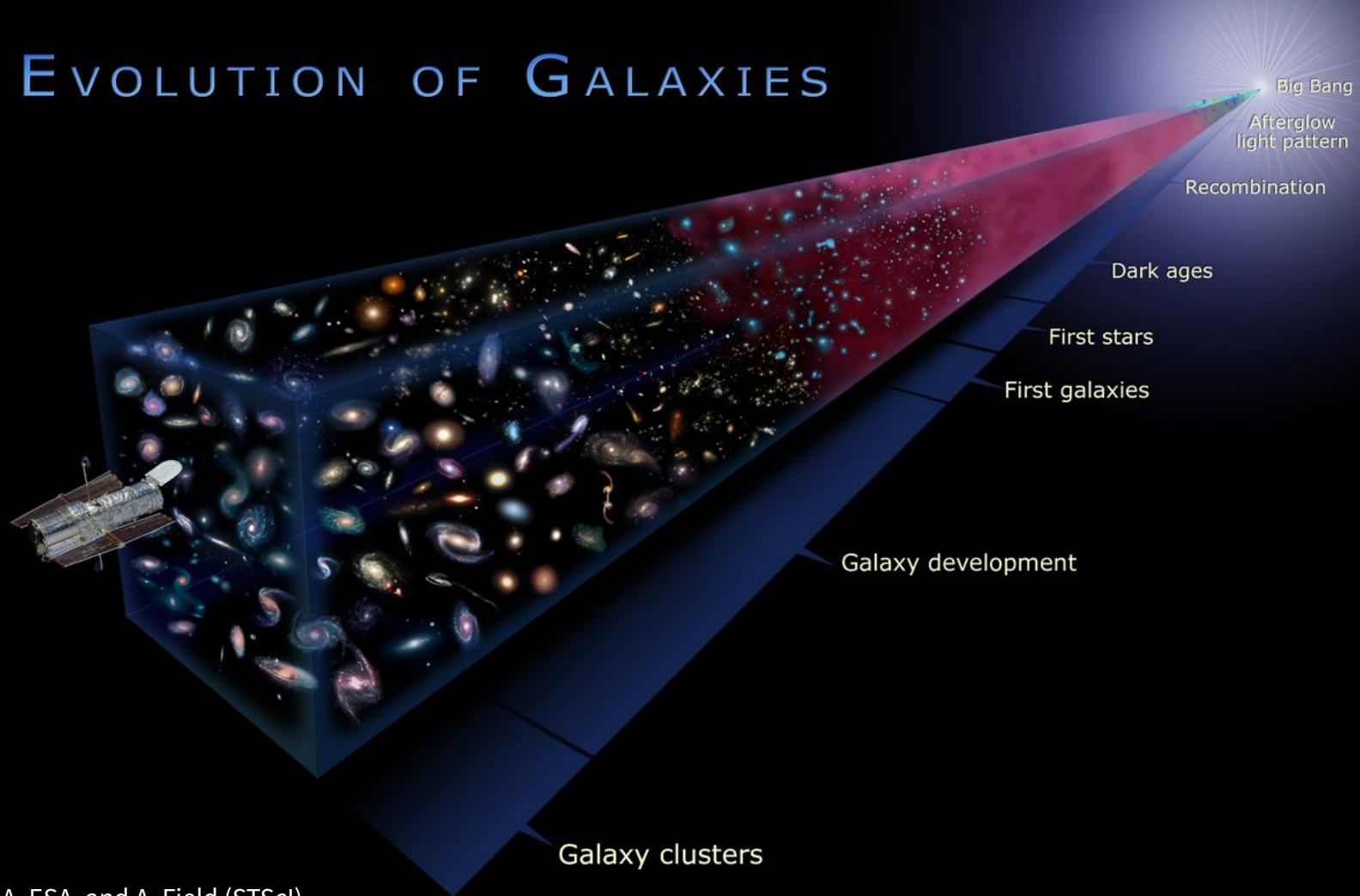


Image credit: NASA

Overview of cosmic distance scales



EVOLUTION OF GALAXIES



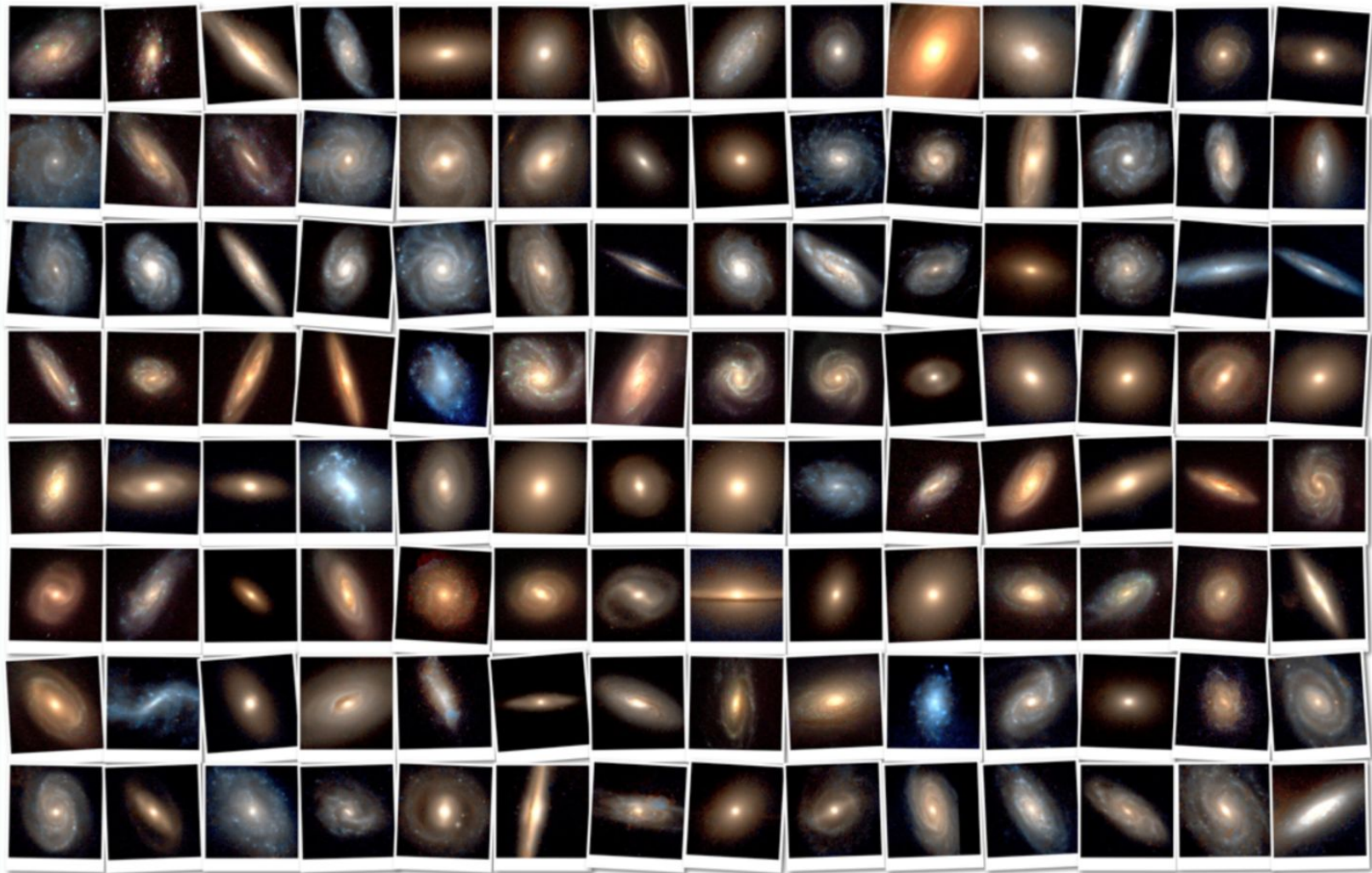


Image credit: Z. Frei, J. E. Gunn, Princeton Univ. Press

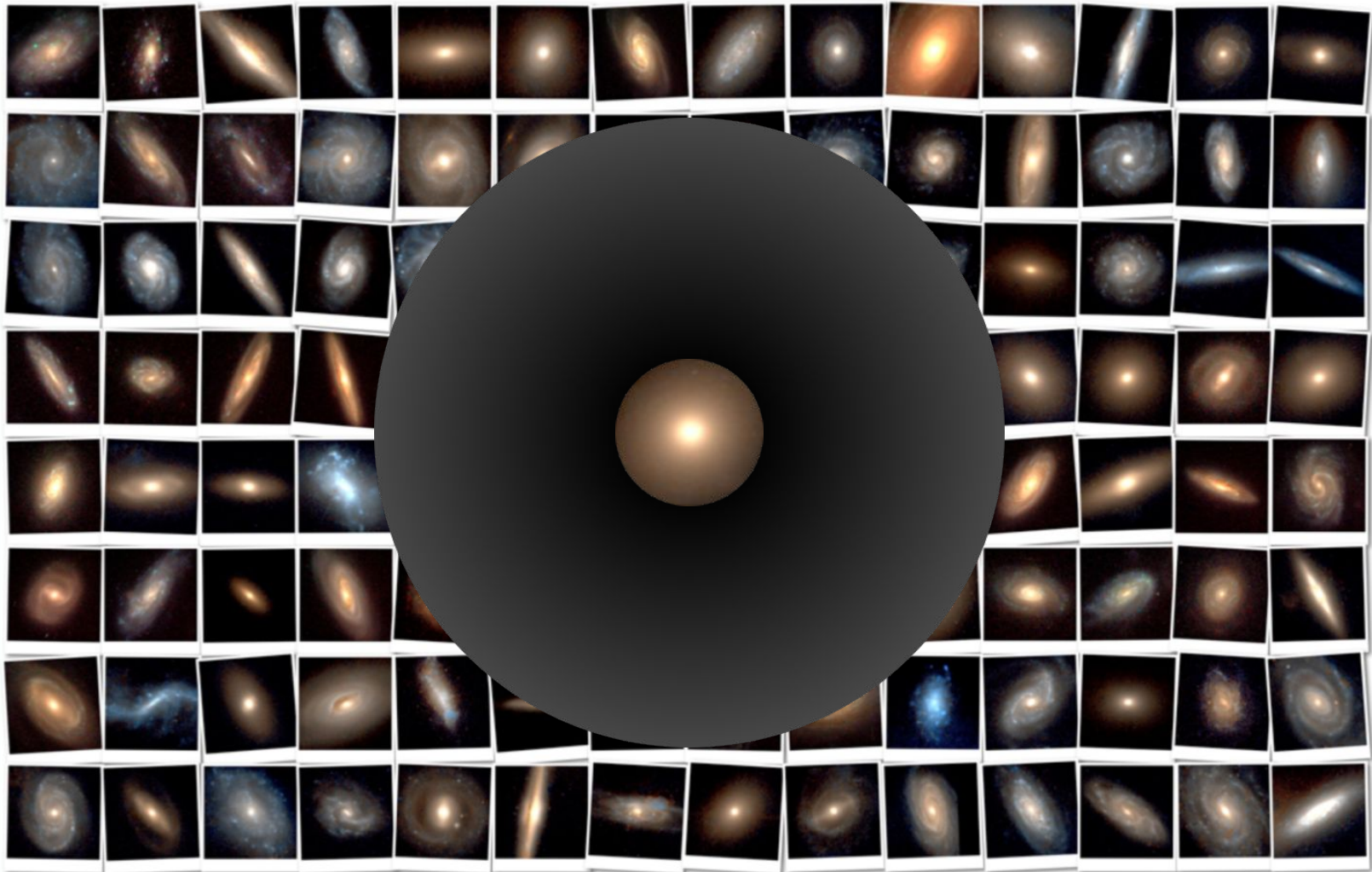


Image credit: Z. Frei, J. E. Gunn, Princeton Univ. Press

Hubble image of a gravitational lens



A. Bolton (UH IfA) for SLACS and NASA/ESA

**Model for distant
galaxy**



**Model for nearer
galaxy**



**Model for distant
galaxy lensed by
nearer galaxy**



Apparent image #1



Distant galaxy



Light ray #1

Light ray #2



Nearer galaxy



Observer

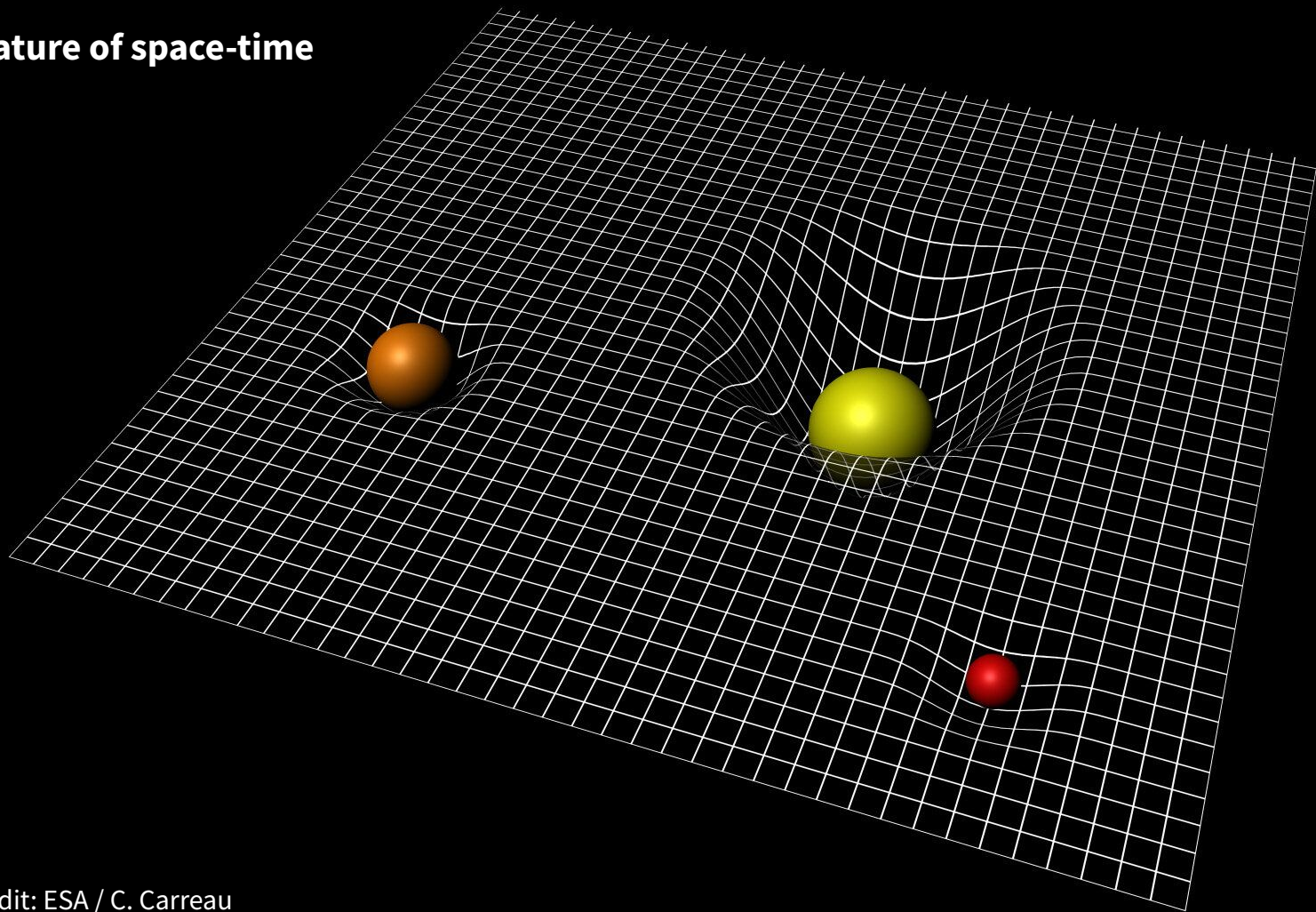


Apparent image #2

Also see animation at:

<https://www.spacetelescope.org/videos/heic1106a/>

Curvature of space-time



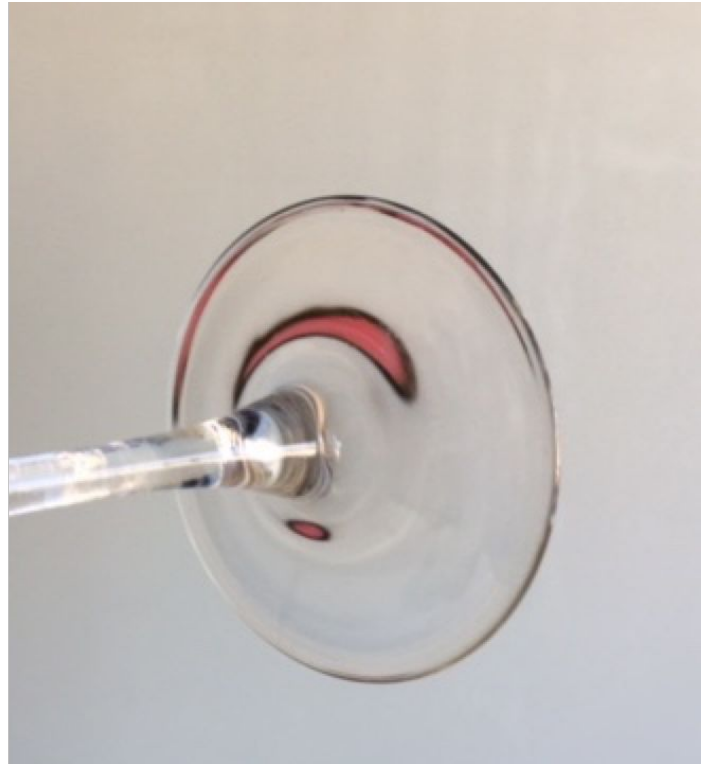


SLACS: The Sloan Lens ACS Survey

www.SLACS.org

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Image credit: A. Bolton, for the SLACS team and NASA/ESA





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