

# Astro I: Introductory Astronomy







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<http://apod.nasa.gov/apod/ap130927.html>



Andromeda Galaxy

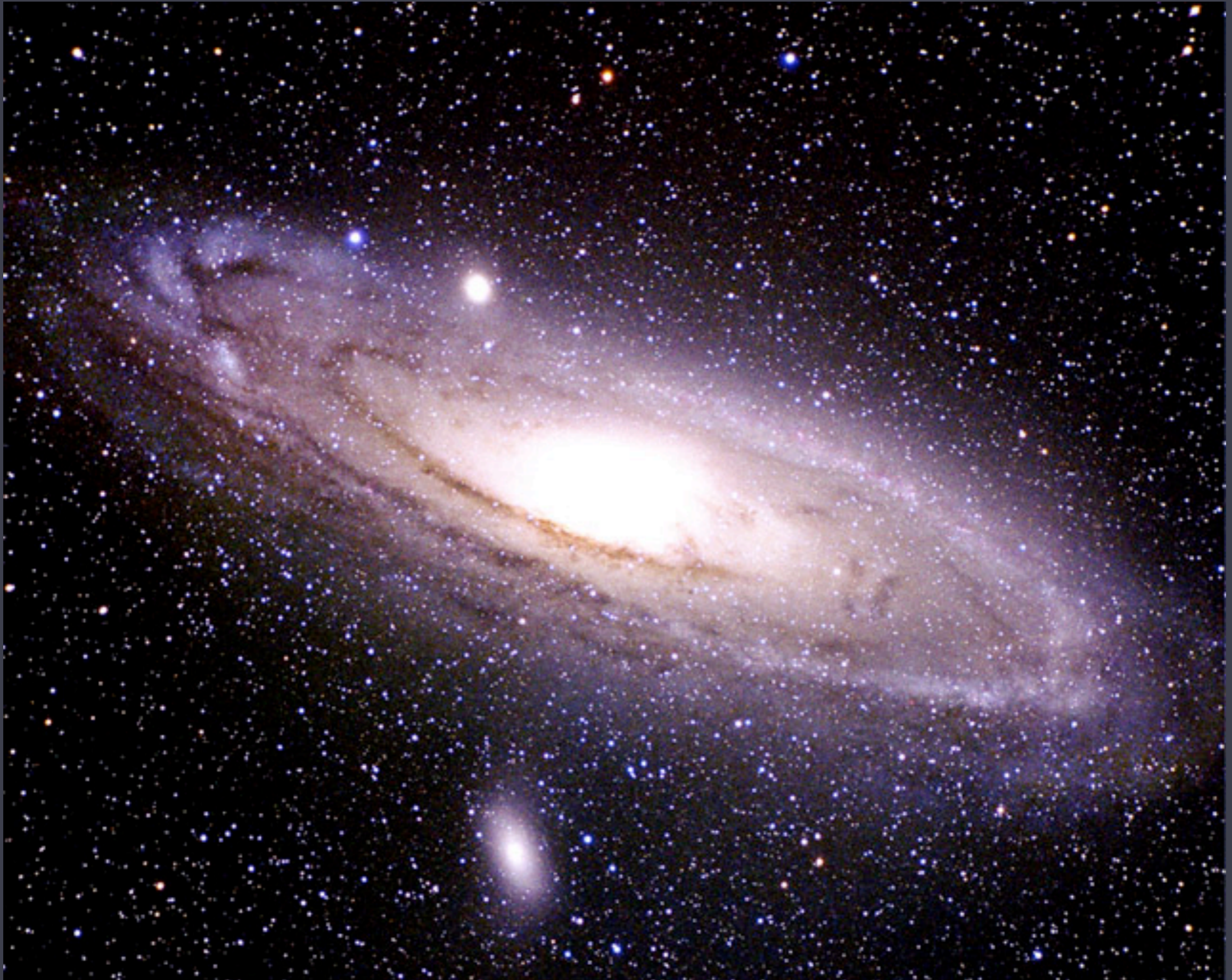


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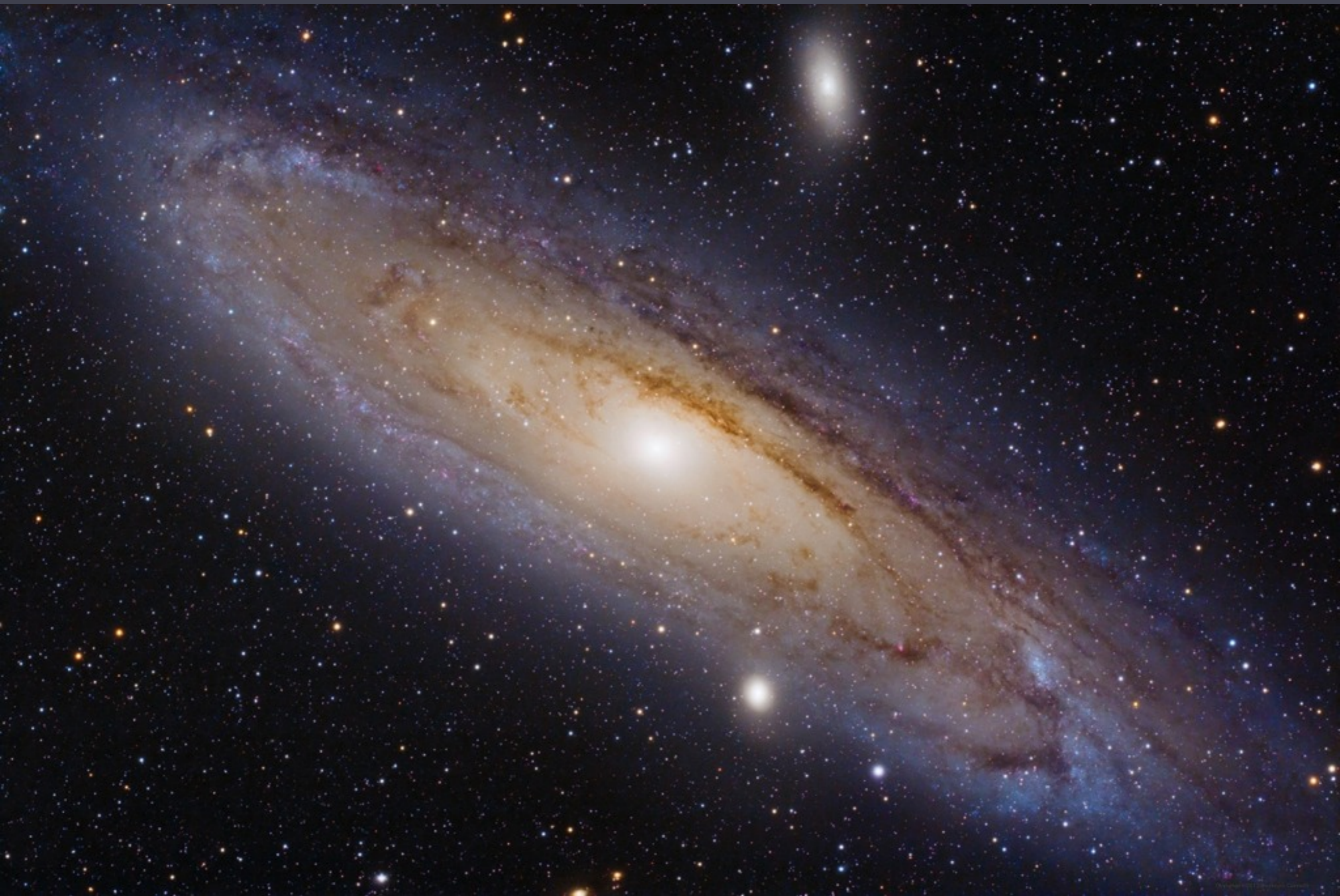
<http://apod.nasa.gov/apod/ap130927.html>



# Andromeda











<http://apod.nasa.gov/apod/ap130416.html>



# M 51: The Whirlpool Galaxy





# Messier 83: a (mildly) barred spiral



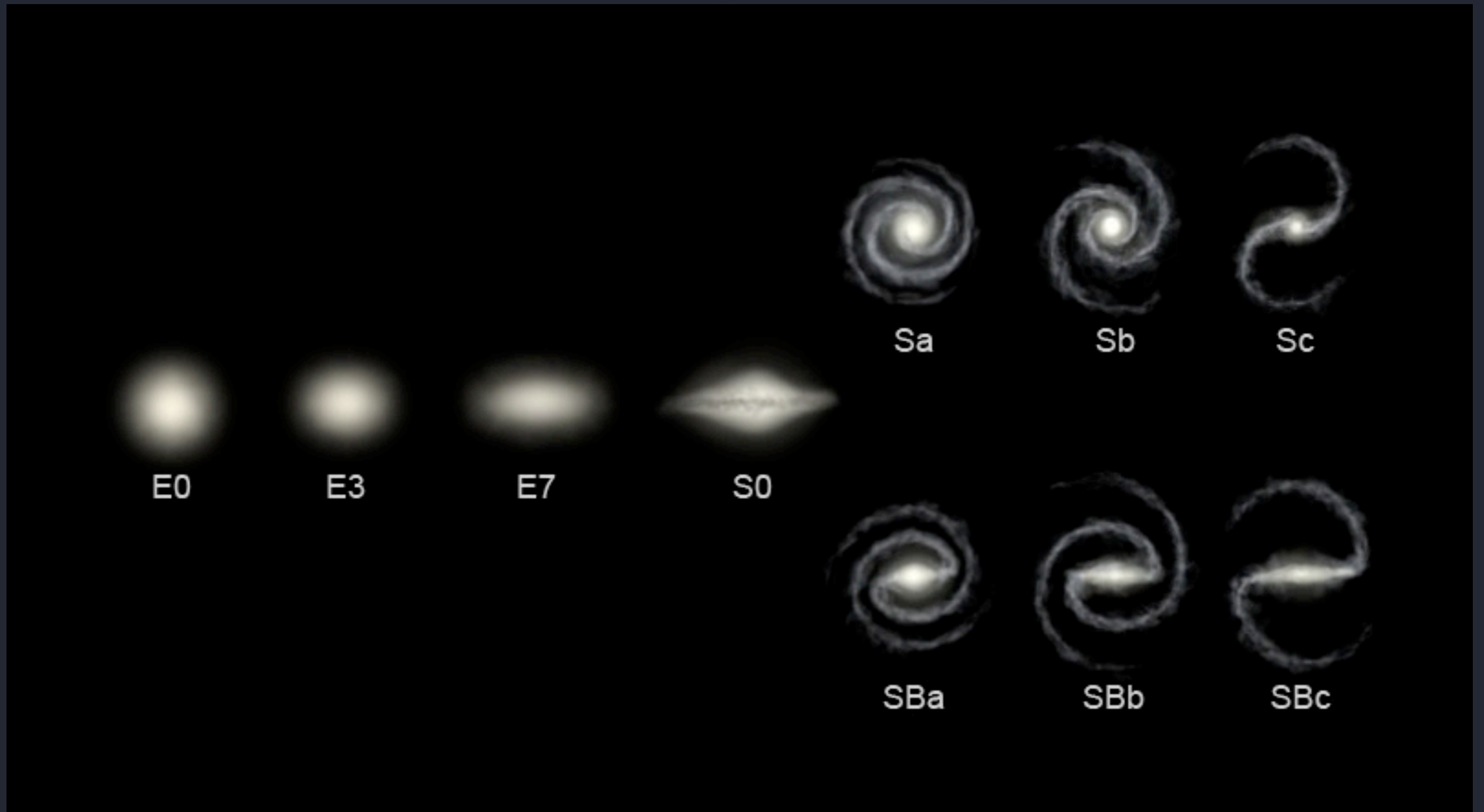


# NGC 1300: a (significantly) barred spiral





# The Hubble sequence of galaxies



not nearly as explanatory/fundamental as stellar types and the HR diagram are for stars

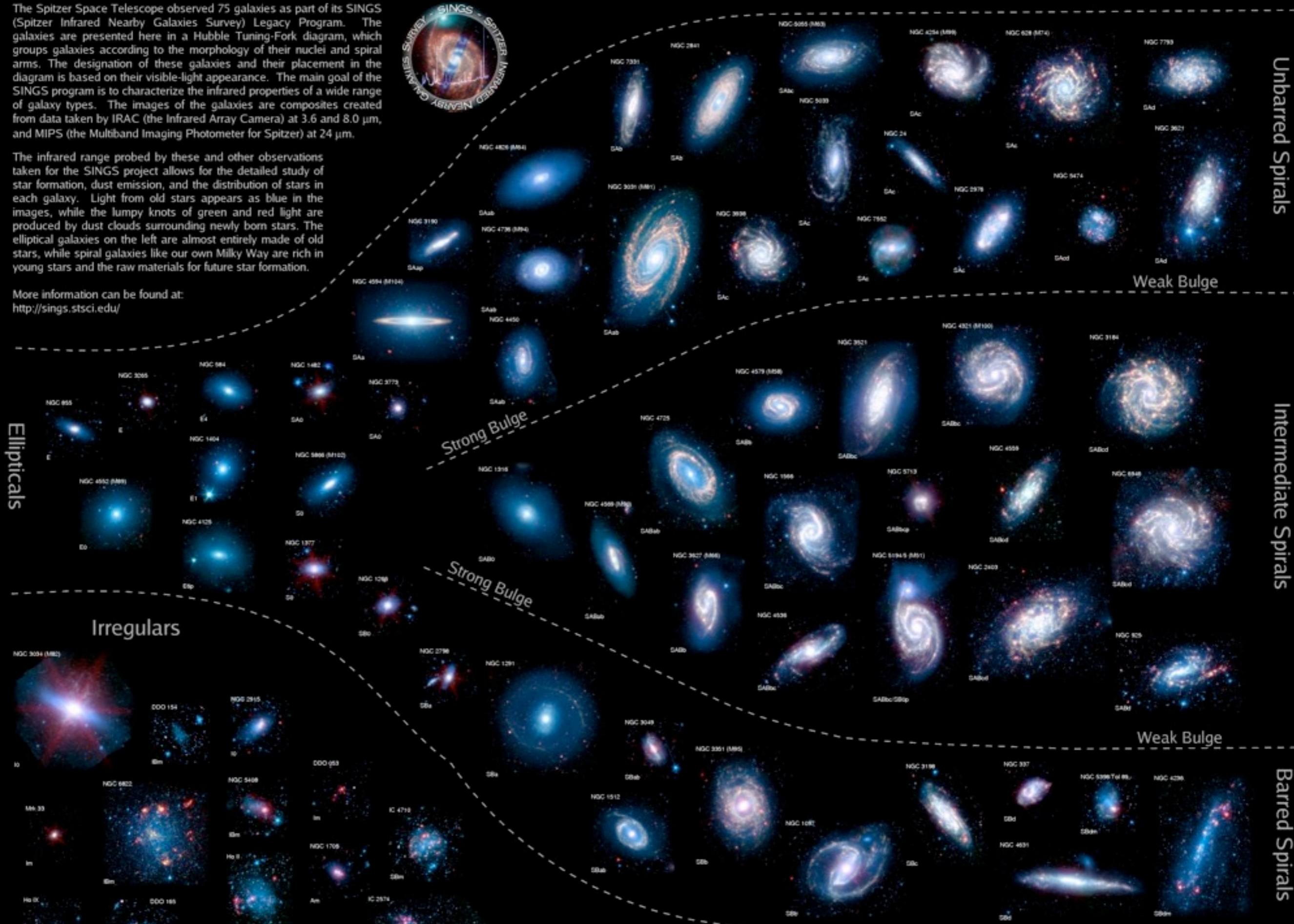


# The Spitzer Infrared Nearby Galaxies Survey (SINGS) Hubble Tuning-Fork

The Spitzer Space Telescope observed 75 galaxies as part of its SINGS (Spitzer Infrared Nearby Galaxies Survey) Legacy Program. The galaxies are presented here in a Hubble Tuning-Fork diagram, which groups galaxies according to the morphology of their nuclei and spiral arms. The designation of these galaxies and their placement in the diagram is based on their visible-light appearance. The main goal of the SINGS program is to characterize the infrared properties of a wide range of galaxy types. The images of the galaxies are composites created from data taken by IRAC (the Infrared Array Camera) at 3.6 and 8.0  $\mu\text{m}$ , and MIPS (the Multiband Imaging Photometer for Spitzer) at 24  $\mu\text{m}$ .

The infrared range probed by these and other observations taken for the SINGS project allows for the detailed study of star formation, dust emission, and the distribution of stars in each galaxy. Light from old stars appears as blue in the images, while the lumpy knots of green and red light are produced by dust clouds surrounding newly born stars. The elliptical galaxies on the left are almost entirely made of old stars, while spiral galaxies like our own Milky Way are rich in young stars and the raw materials for future star formation.

More information can be found at: <http://sings.stsci.edu/>





# Messier 87: elliptical galaxy (with several others)









# an elliptical galaxy and a spiral galaxy



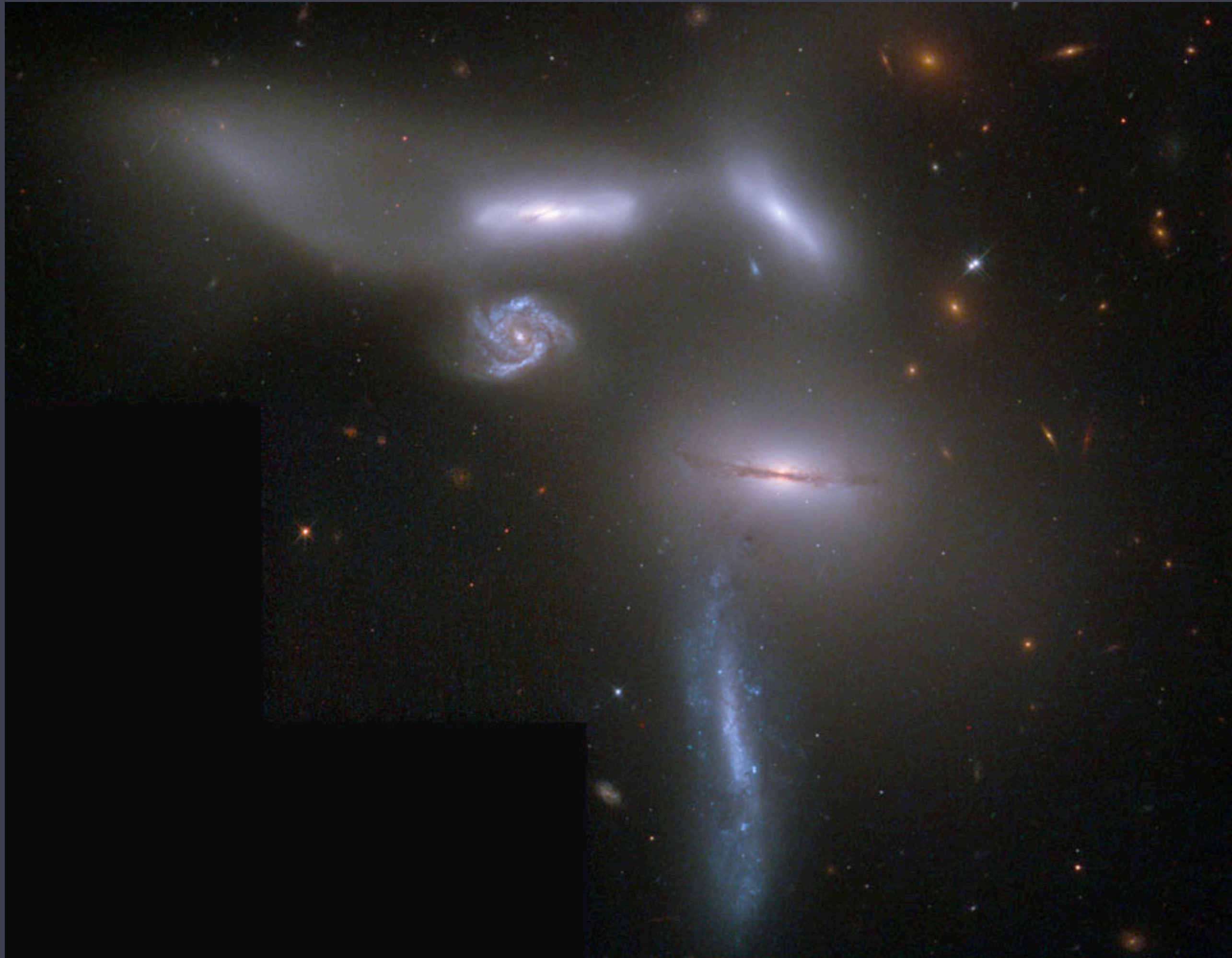














# Centaurus A





# NGC 7049: dusty spiral that otherwise looks like an elliptical - a merger product?



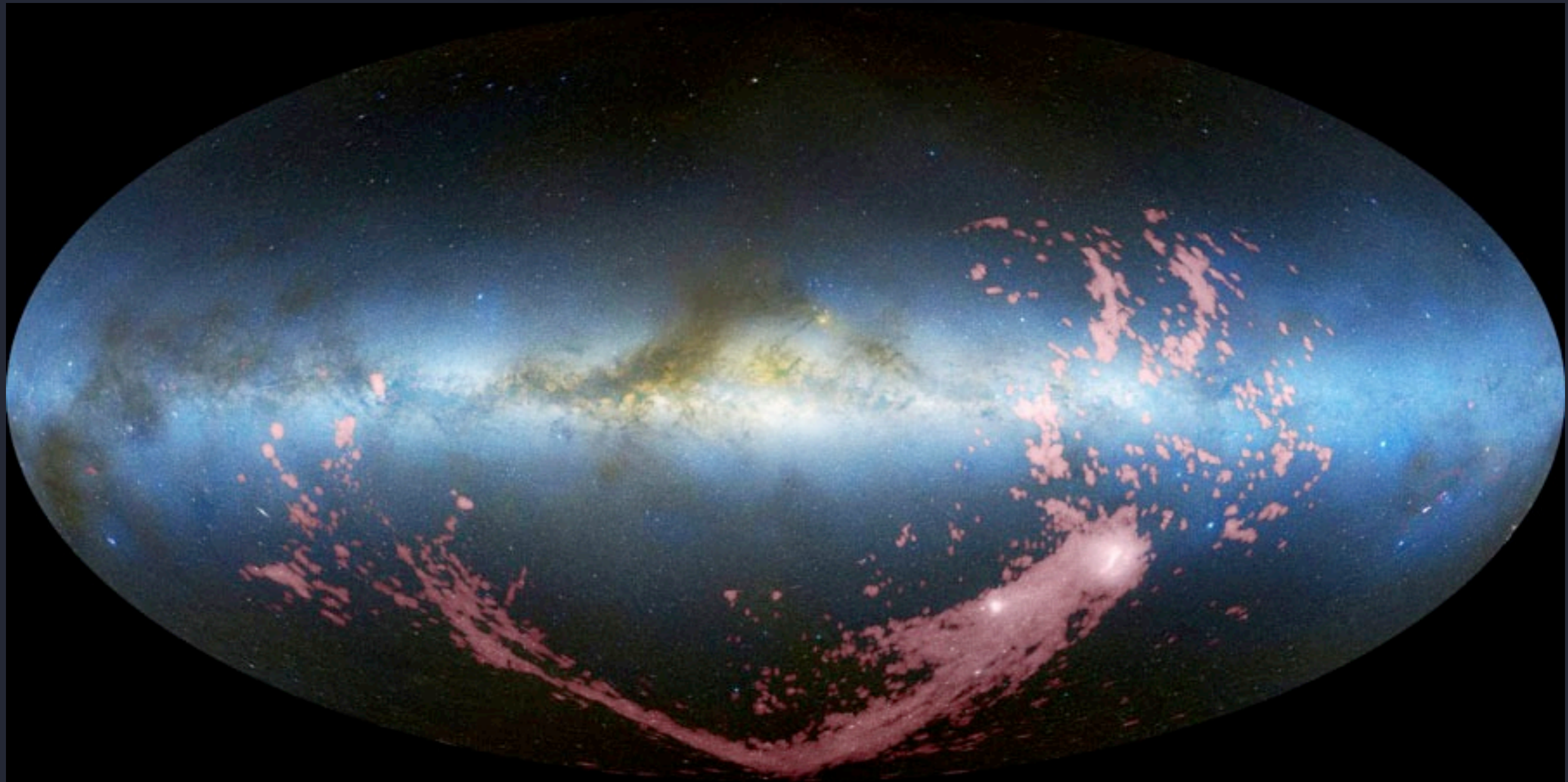


# Large Magellanic Cloud (irregular galaxy and near neighbor to the Milky Way)





the “Magellanic Stream” - gas being pulled out of the Magellanic Clouds (our nearby neighbor galaxies) by the gravity of the Milky Way



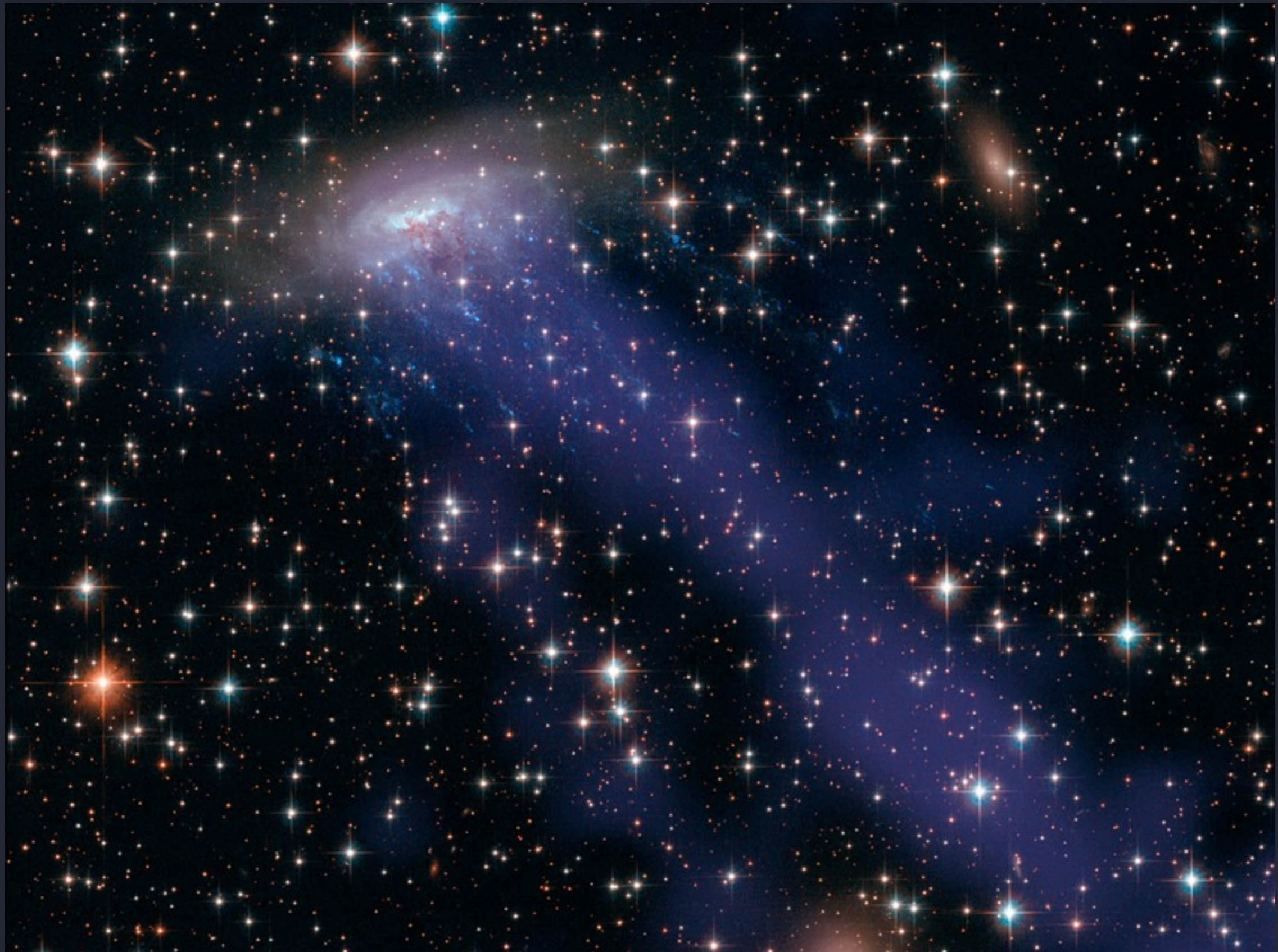


# The Hydra cluster





a galaxy is stripped of its gas as it orbits around its cluster  
blue is X-ray emitting hot gas

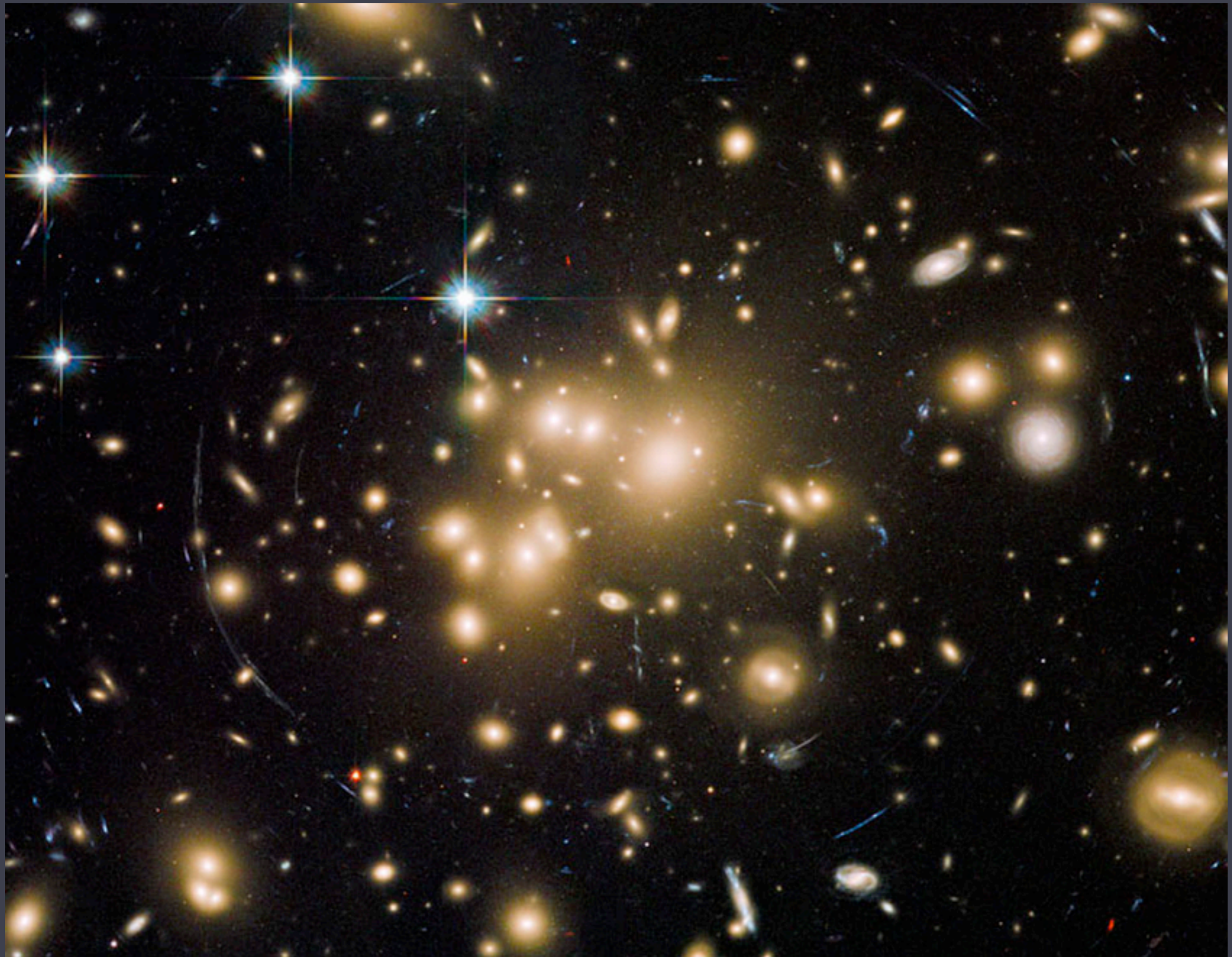




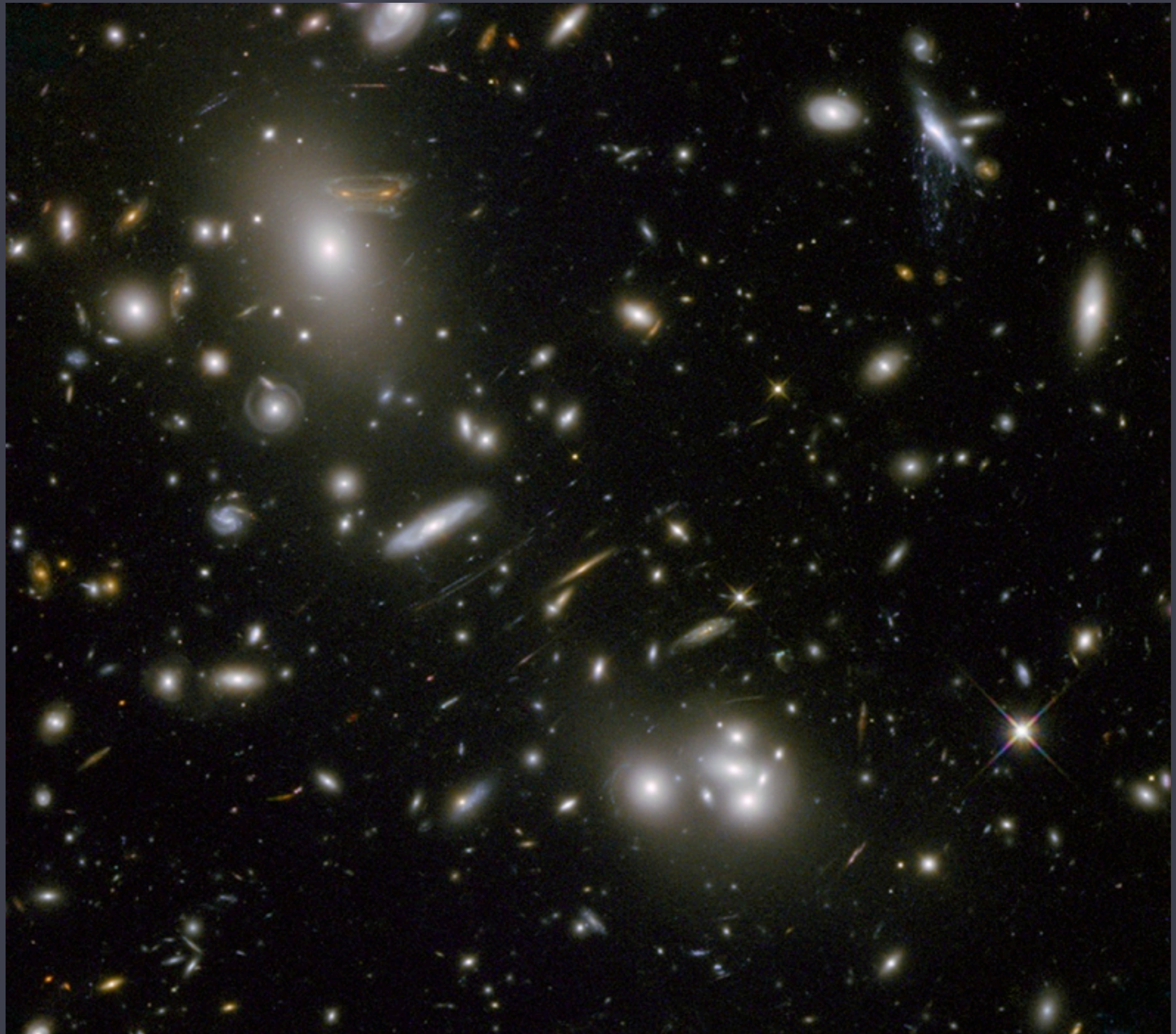
# Abell 2744: huge galaxy cluster, filled with X-ray emitting gas













The Hubble Deep Field (multi-week exposure: 1000s of galaxies): this is a relatively *empty* part of the sky!

