



Astronomy 420

Galaxies and Cosmology

Gordon Squires (Spitzer Science Center/Caltech)

Daniel Stern (JPL/Caltech)

Spring 2005
MW 4:00-6:00

Lecture 1: Introduction & Brief History of our Views of the Universe

- course logistics
- who lecturers are
- who students are
- course overview
- the Universe: a historical perspective



1. Course logistics

- course website
- grading: homework, exams, class participation
- field trip to Palomar Observatory (Feb. 19th)
- REU opportunities



2. Who the lecturers are...

- Dr. **Gordon Squires**, assistant director (for public affairs) at the Spitzer Science Center
- Dr. **Daniel Stern**, research scientist at the Jet Propulsion Laboratory



Spitzer Space Telescope

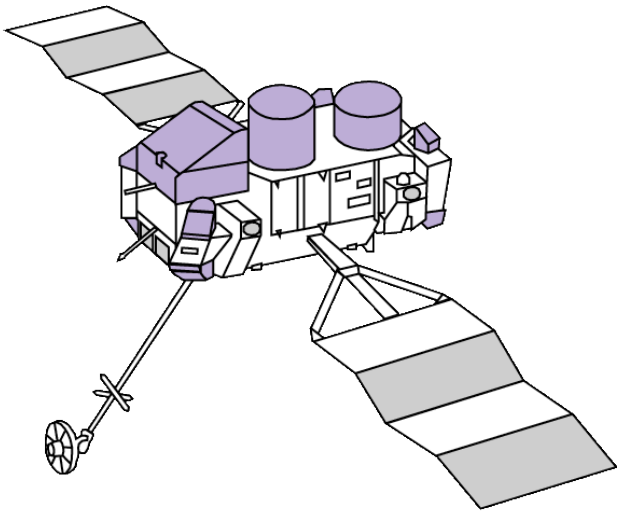




25. august 2003
1:35:39 AM
cape canaveral, florida



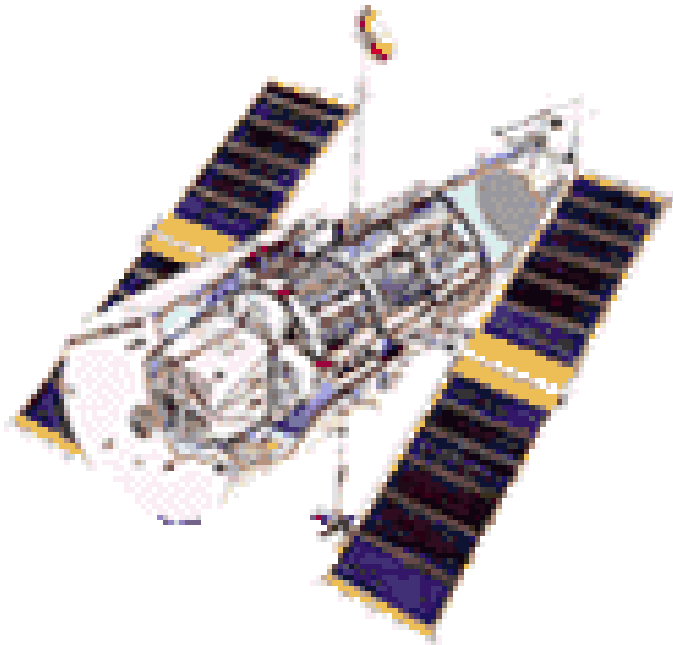
Compton Gamma-Ray Observatory



Chandra X-Ray Observatory



NASA's Great Observatories



Hubble Space Telescope



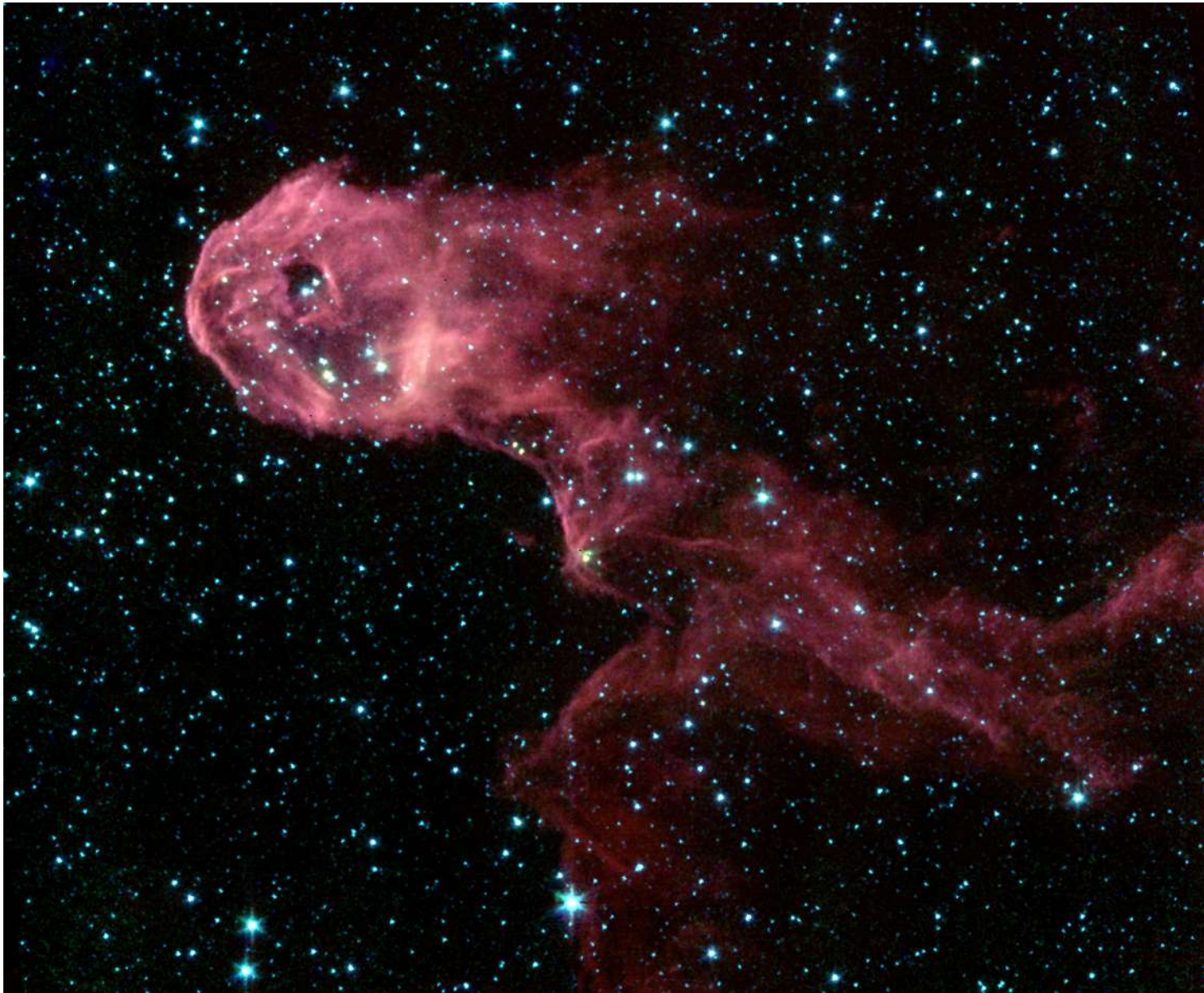
Spitzer Space Telescope

IC 1396: the Elephant's Trunk Nebula



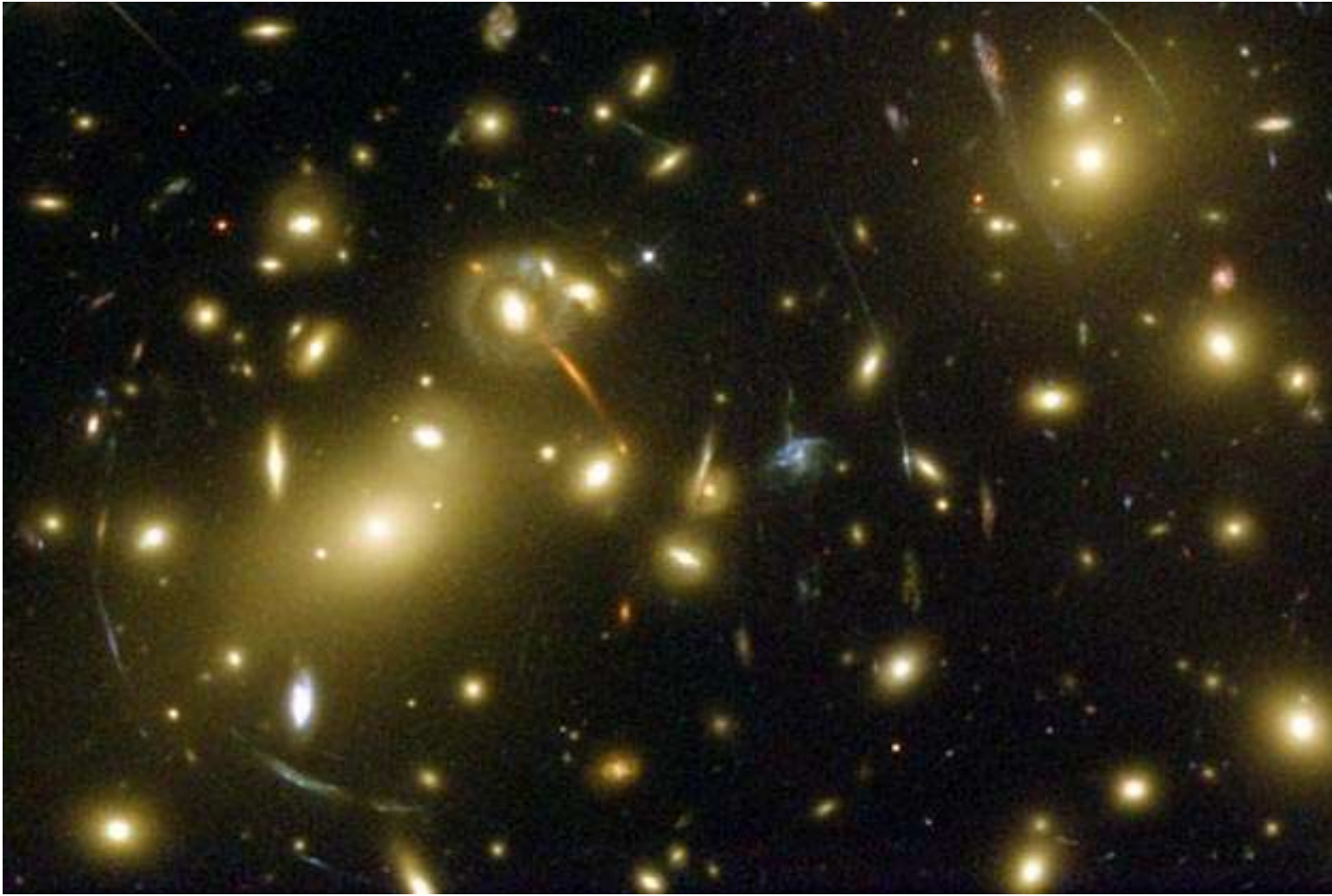
visible light (Canada-France-Hawaii Telescope)

IC 1396: the Elephant's Trunk Nebula



mid-infrared light (Spitzer Space Telescope)

Gordon's science: weak & strong gravitational lensing
by massive galaxy clusters



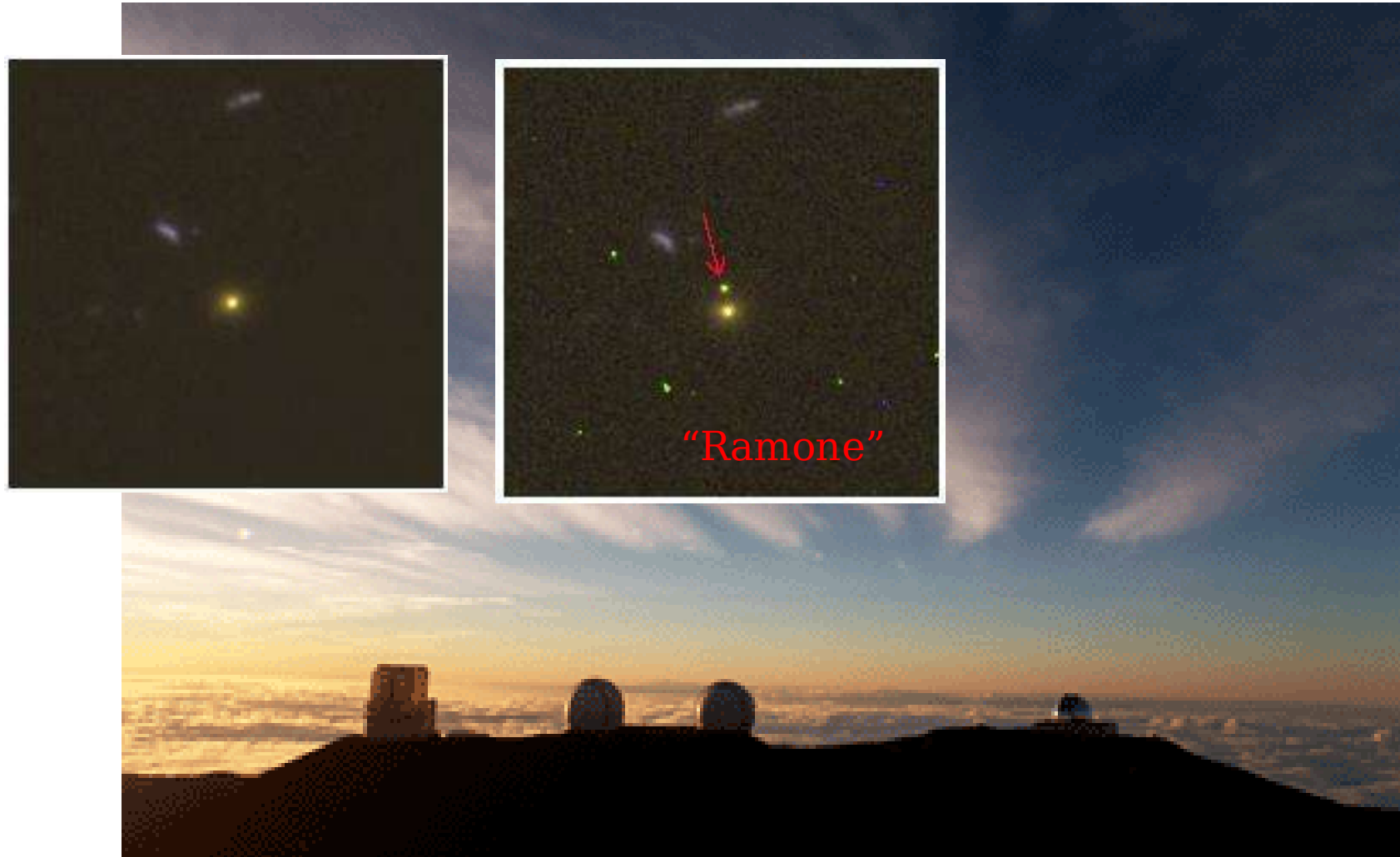
Abell 2218 (Hubble Space Telescope)

Daniel's science: faint objects from big telescopes



Mauna Kea Observatory

Daniel's science: faint objects from big telescopes



Mauna Kea Observatory

3. Who you are...

- previous astronomy courses
- previous physics courses
- highest-level math course(s) – calculus

- year (freshman/sophomore/jr./sr.)
- major (intended/declared?)

4. Course overview



humans figuring out
where they are (i.e.,
what the Universe is)







M31: the Andromeda Galaxy



NGC2997



M51: the Whirlpool Galaxy



M33: the Pinwheel Galaxy



M81: Bode's Galaxy



M104: the Sombrero Galaxy

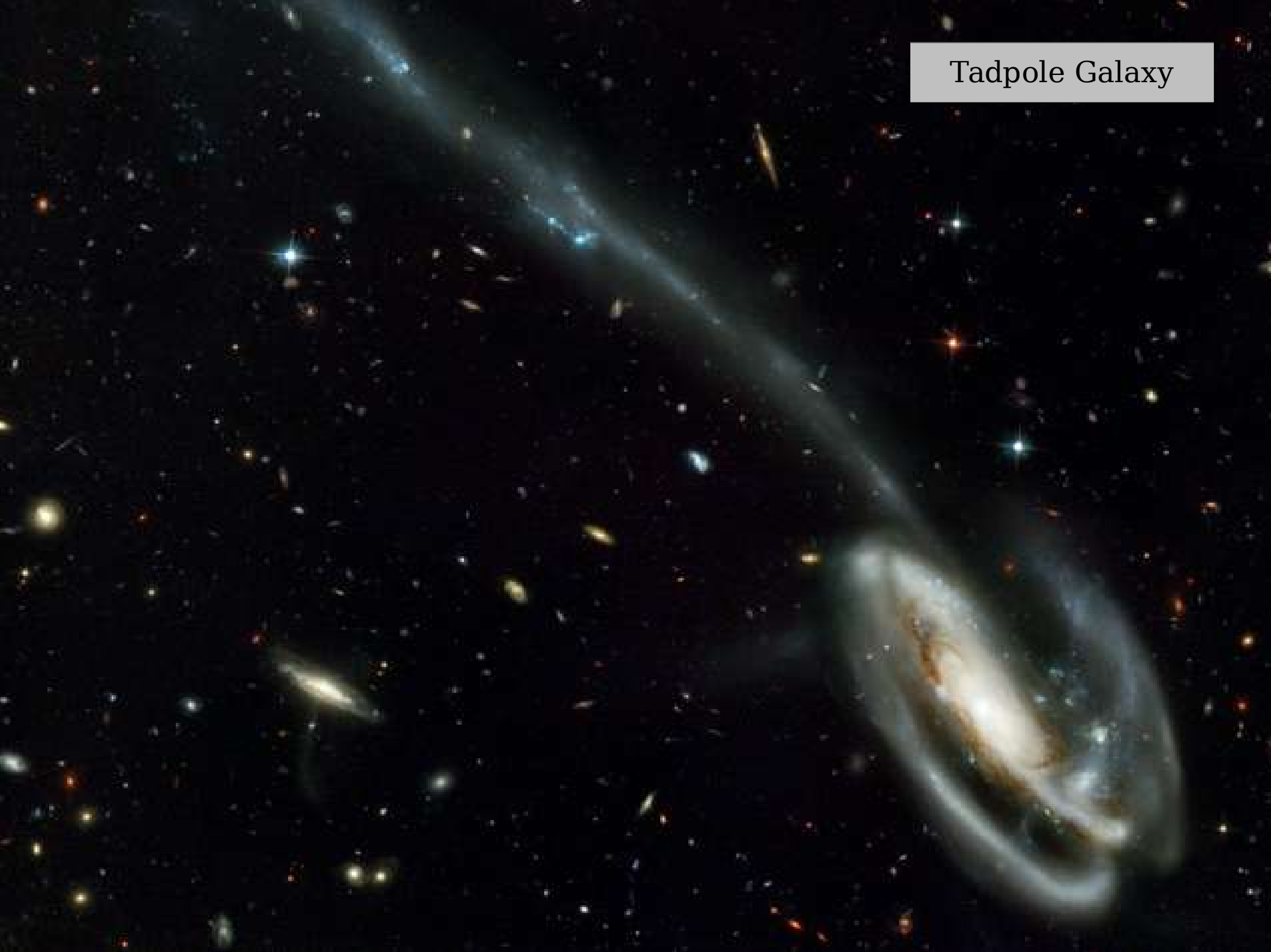


M87



Small Magellanic Cloud

Tadpole Galaxy



Time since the
Big Bang (years)

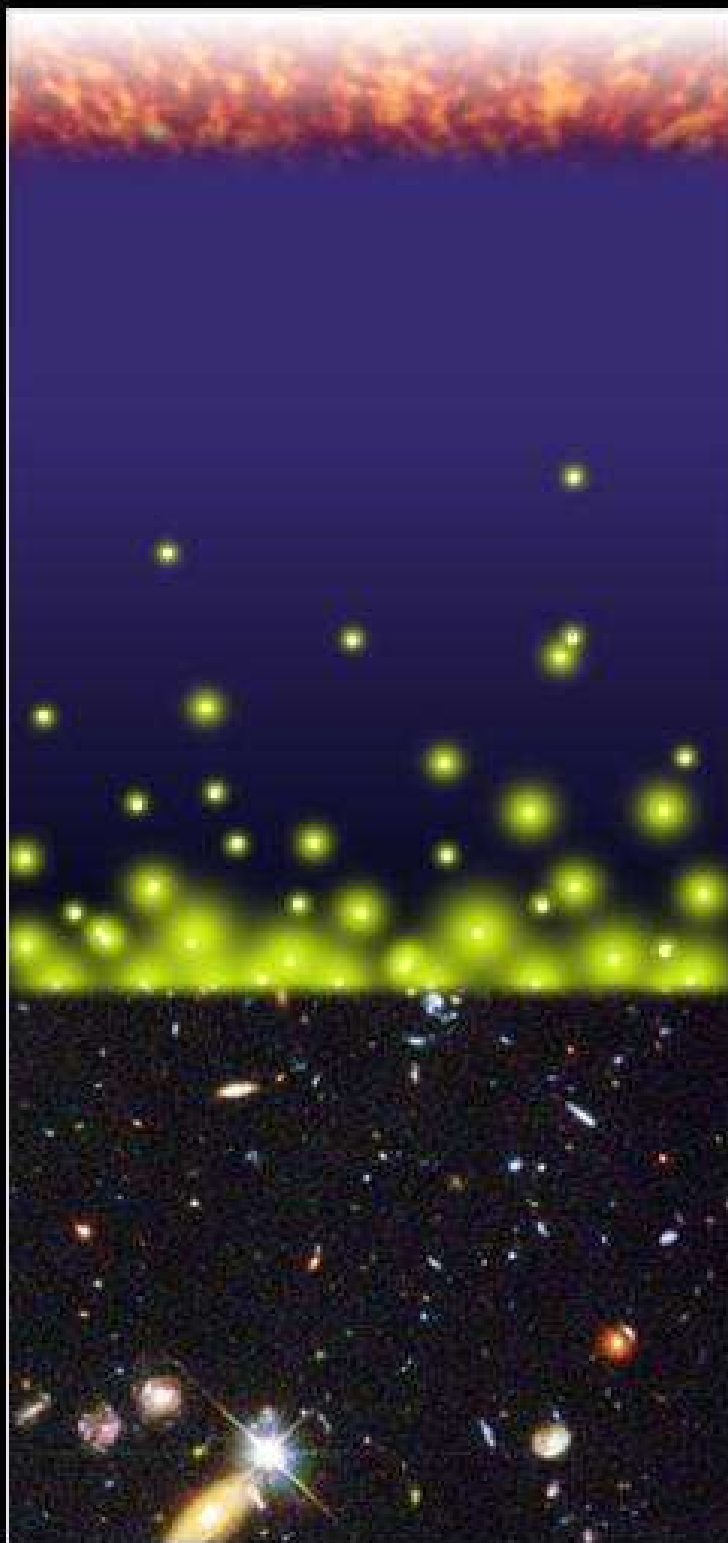
~ 300 thousand

~ 500 million

~ 1 billion

~ 9 billion

~ 13 billion



←The Big Bang

The Universe filled
with ionized gas

←The Universe becomes
neutral and opaque

The Dark Ages start

Galaxies and Quasars
begin to form
The Reionization starts

The Cosmic Renaissance
The Dark Ages end

←Reionization complete,
the Universe becomes
transparent again

Galaxies evolve

The Solar System forms

Today: Astronomers
figure it all out!

schematic history of the Universe (circa 2001)

Djorgovski, Castro,
Stern, & Mahabal (2001)