

AY 4: The Stars

- Instructor: Mike Bolte ISB 356
- Lectures: T/Th 2pm - 3:45 pm
- Sections: optional although labs will be administered through the sections and **people who attend the sections do better in the class!**
- Book: There isn't one!
- Note: Everything related to the class can be found at <http://www.ucolick.org/~bolte/AY4>

Grades

- Grades: best four of five quizzes plus two labs (done in sections).
- Homework questions will be assigned and some of the quiz questions will taken from the homeworks.
- Option final.

Philosophy

- Understand the process of scientific investigation.
- Learn some astronomy. The details are not so important, the fact that we have been able to learn so much about the Universe is a more important point.

Quantitative - the 'Q' thing

- How would the appearance of the Sun change if it were moved to twice its current distance?

Qualitative answer: *It would get fainter.*

Quantitative answer:

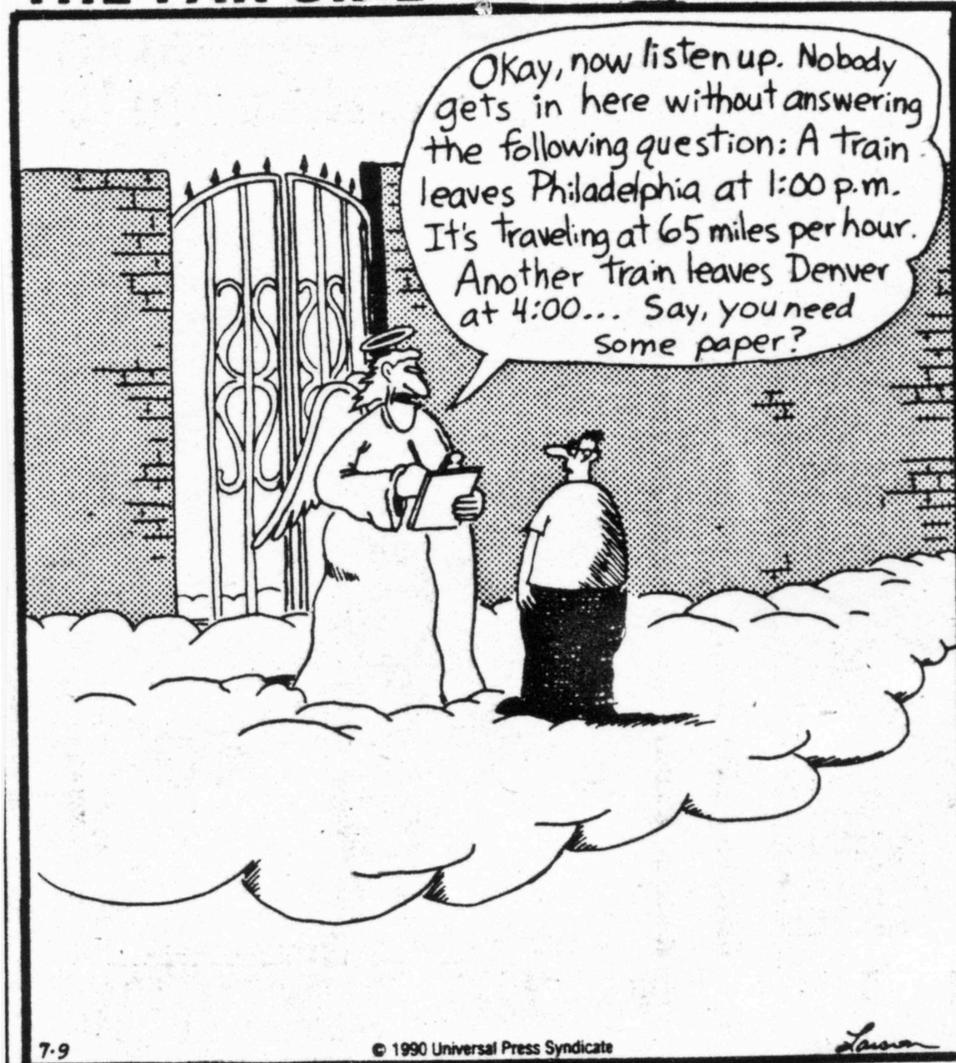
The diagram shows the equation $I = I_0 / d^2$ enclosed in a rectangular box. Three arrows originate from the box: one points left to the word 'intensity', one points down to the text 'Original intensity', and one points right to the word 'distance'.

$$I = I_0 / d^2$$

intensity ← Original intensity → distance

It would be $1/(2 \times 2) = 1/4$ as bright

THE FAR SIDE



Math phobic's nightmare

The Plan

- Telescopes
- Earth Motions
- Physics background
- Properties of Stars (mass, size, energy output, temperature)
- How stars work
- The lifecycle of stars
- Stellar death - white dwarfs, neutron stars, black holes and the formation of the elements

Note! This class is NOT about

- Planets (AY 3)
- The Big Bang (AY 5)
- The Accelerating Universe (AY 5)
- Dinosaur-Murdering Killer Asteroids (AY 8)

Q. Astronomy is most closely related to:

a) Cosmetology

b) The Human Genome Project

c) Astrology

d) Physics

Q. While `at' the telescope, most astronomers wear:

a) Down Jackets

b) Trendy Patagonia Synchronilla Jackets

c) Politically incorrect animal furs

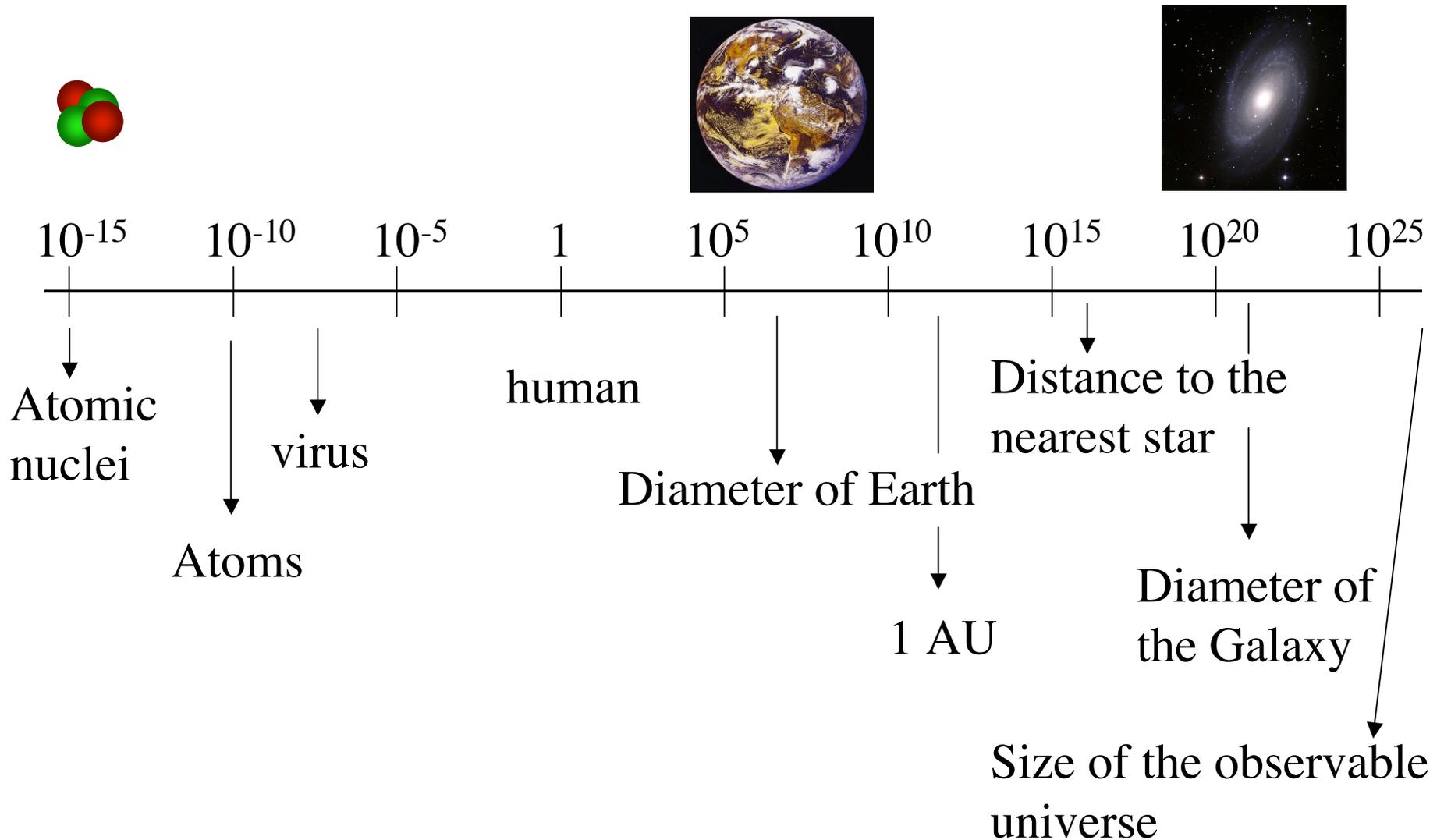
d) Bermuda shorts and Hawaiian shirts



Astronomy as a Career

- Typical path to astro-career
 - Undergraduate degree in Physics
 - 5 to 7 years in graduate school in A&A leading to PhD
 - 3 to 6 years as a research postdoc
 - Faculty position at some University
- Around 50% head in other directions
 - Aerospace, software, financial markets

Our Place in Size Scales



Scale of the Universe



Earth
X 5 ○

- It is hard to get the scale of the Solar System in our heads, impossible to really comprehend the size of the Universe.
- Scale the Sun to the size of a human.
 - Earth will be 300 yards from the Sun
 - Pluto will be 4 miles from the Sun
 - Nearest star would be 30000 miles away...

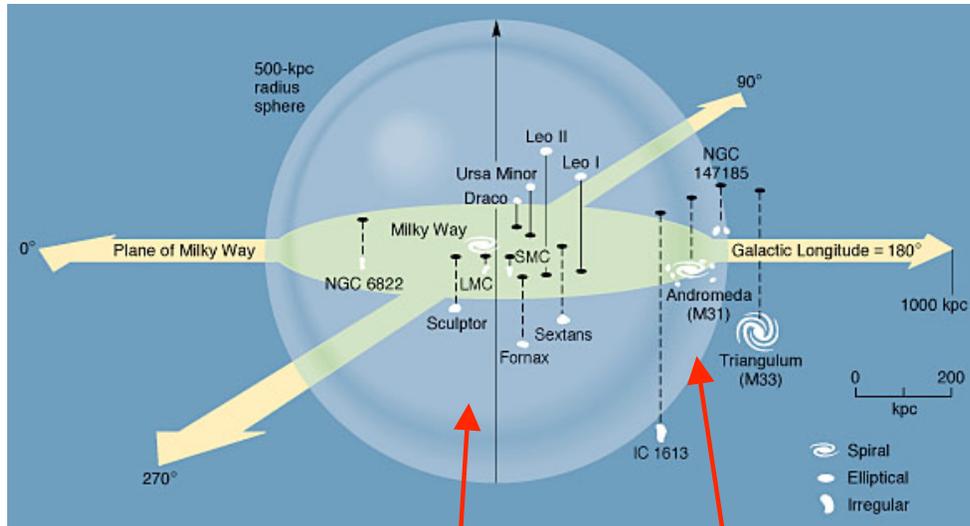
Scale: Galaxies



- A large spiral galaxy like the Milky Way Galaxy contains around 100 billion stars.
- We live in the suburbs of the Milky Way Galaxy

Groups of Galaxies

6 million light years



The Milky Way Galaxy is a member of a small group of galaxies.

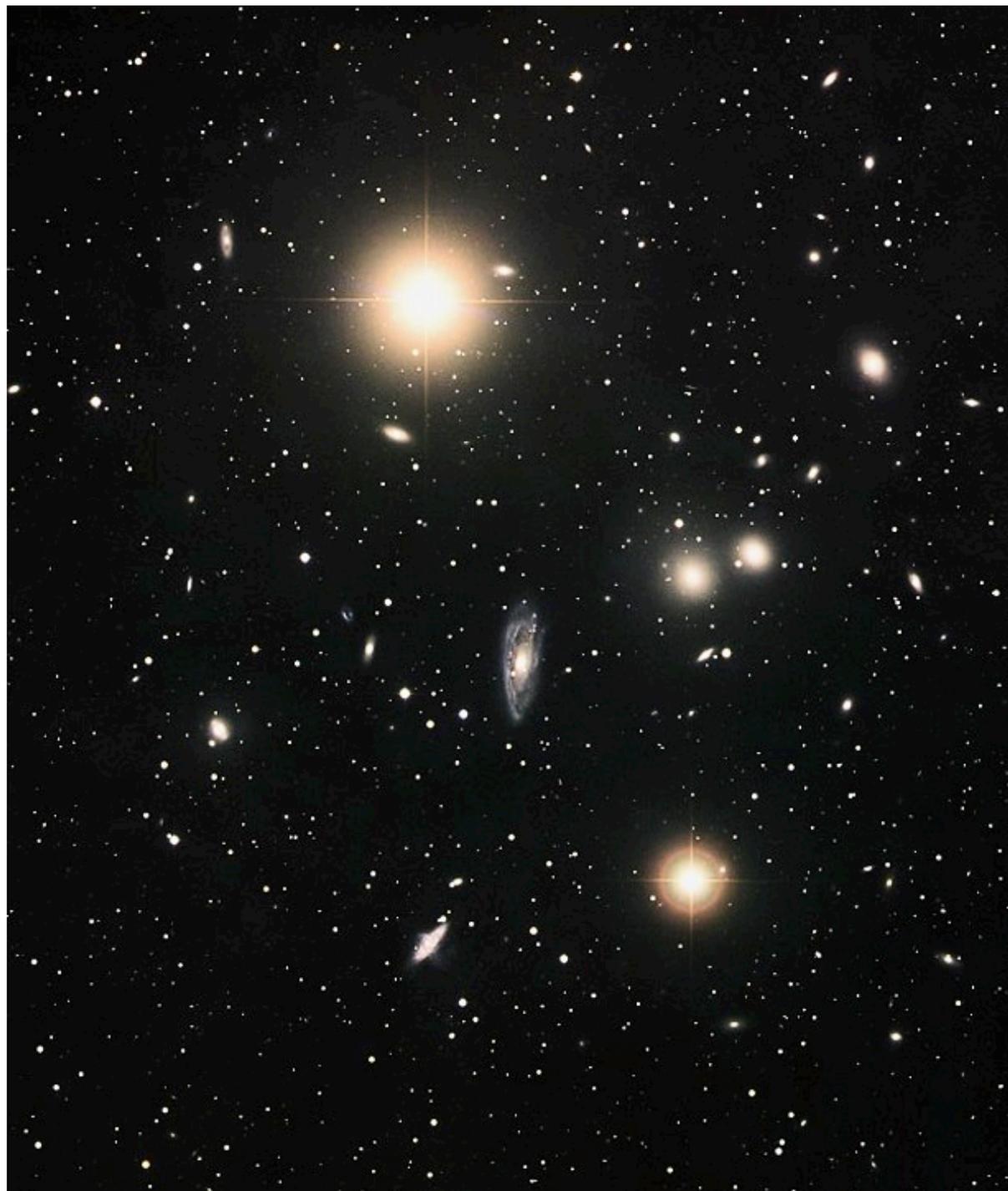
Milky Way

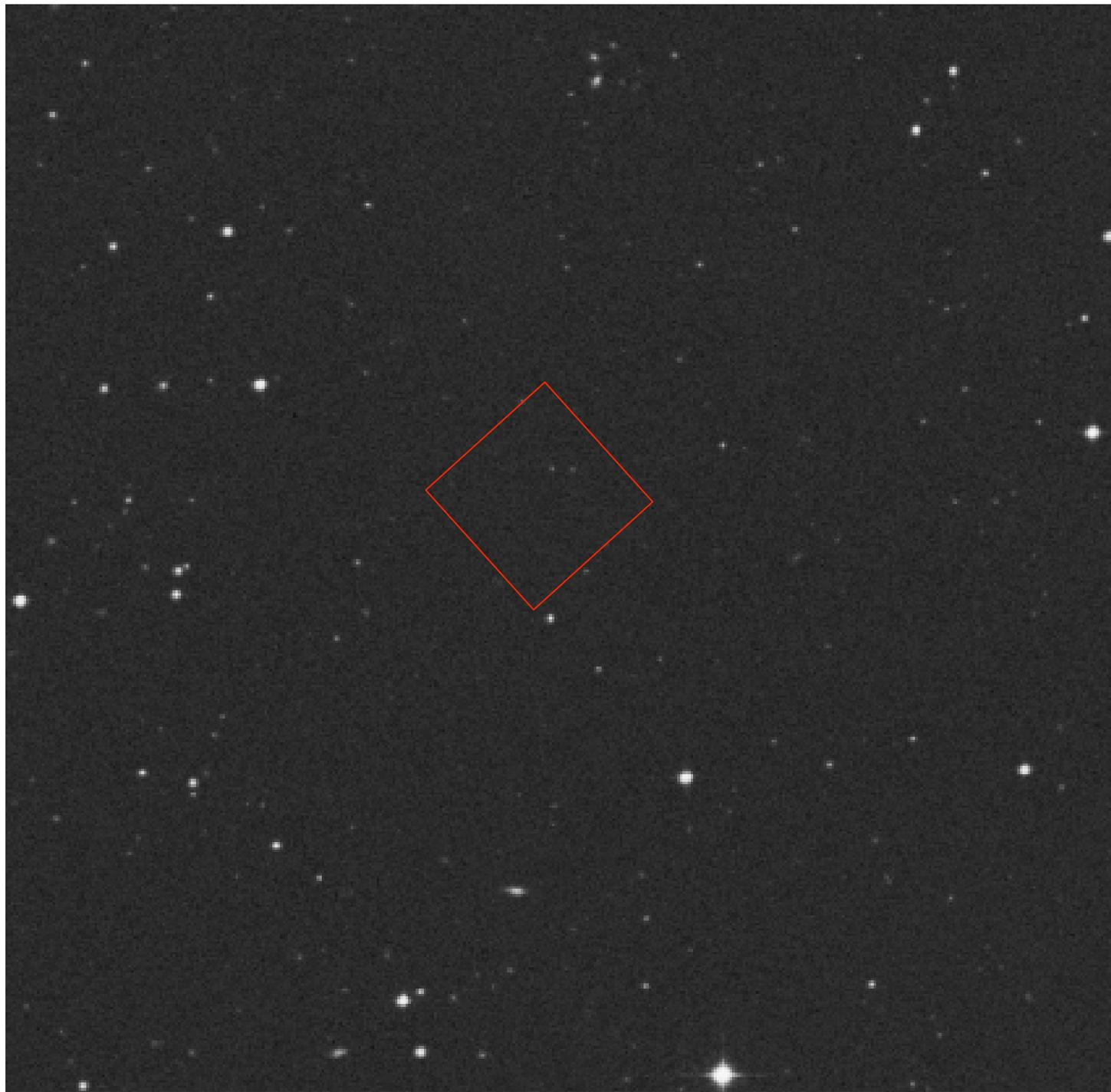
Andromeda



The Local Group is falling into the Virgo Cluster

There are
many clusters
of galaxies in
the nearby
Universe



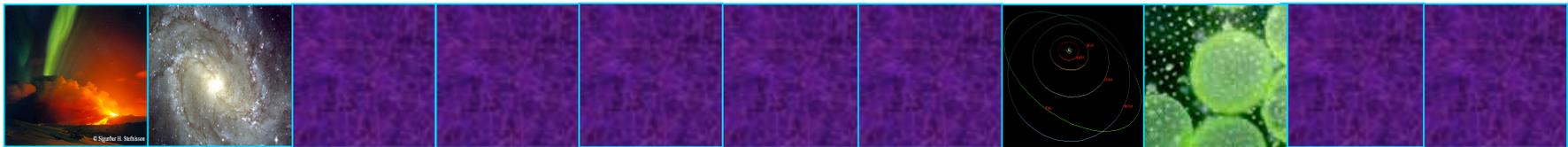


Hubble
UltraDeep
Field



Our Place in Time

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov



14 billion years
The Big Bang



Dec

4.5 billion years

Life on Earth

13 billion years
The formation of the Milky Way Galaxy

Formation of the Sun and Solar System

December of the Cosmic Year

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
	First vertebrates		First land plants	First amphibians	First reptiles	
22	23	24	25	26	27	28
	The Great Dying	First Dinosaurs	First Mammals		First birds	
29	30	9:24pm - First human ancestor to walk upright 11:30pm - Fire becomes human tool 11:54pm - Homo Sapiens appears 11:59:50pm - The pyramids are build 11:59:59pm - Columbus sails to the New World				31
First primate, Asteroid wipes out Dinos						