

ASTRONOMY 161

Introduction to Solar System Astronomy



Astronomy 161 (02439-3)

Winter Quarter 2007

MWF 10:00-11:18 am

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T 2-5pm

Th 2-3pm

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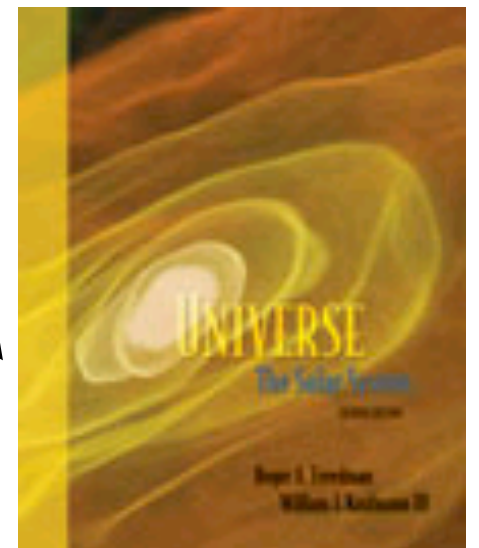
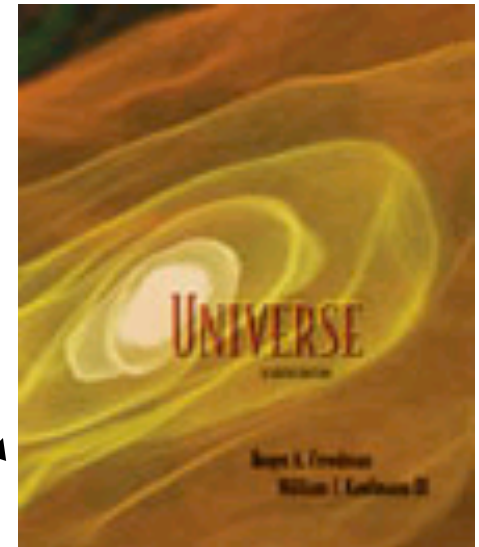
Text: Universe (7th Edition)

by Freedman and Kaufman

In-class Exams: Jan 19, Feb 9, Mar 2

Final: March 13, 9:30 a.m.

Grade: 75% In-class Exams, 25%
Final



Astronomy 161: The Web Page

www.astronomy.ohio-state.edu/~depoy/Astro161/astro161.html

The Web page for course contains the syllabus, lecture notes (as the course progresses), and other information, including links to various WWW sites related to astronomy.

What is astronomy?

“astron” = star

“nomos” = law

Astronomy is the science of stars and clusters of stars, galaxies and clusters of galaxies, planets, “dwarf planets” and their satellites, asteroids and comets, interstellar gas and dust (and anything else in the Universe).

Star: The Sun

A close-up image of the Sun, showing its bright orange and yellow surface with visible solar flares and sunspots. The Sun is the central focus of the image, with a dark background around it.

150 million kilometers away
1.4 million kilometers across

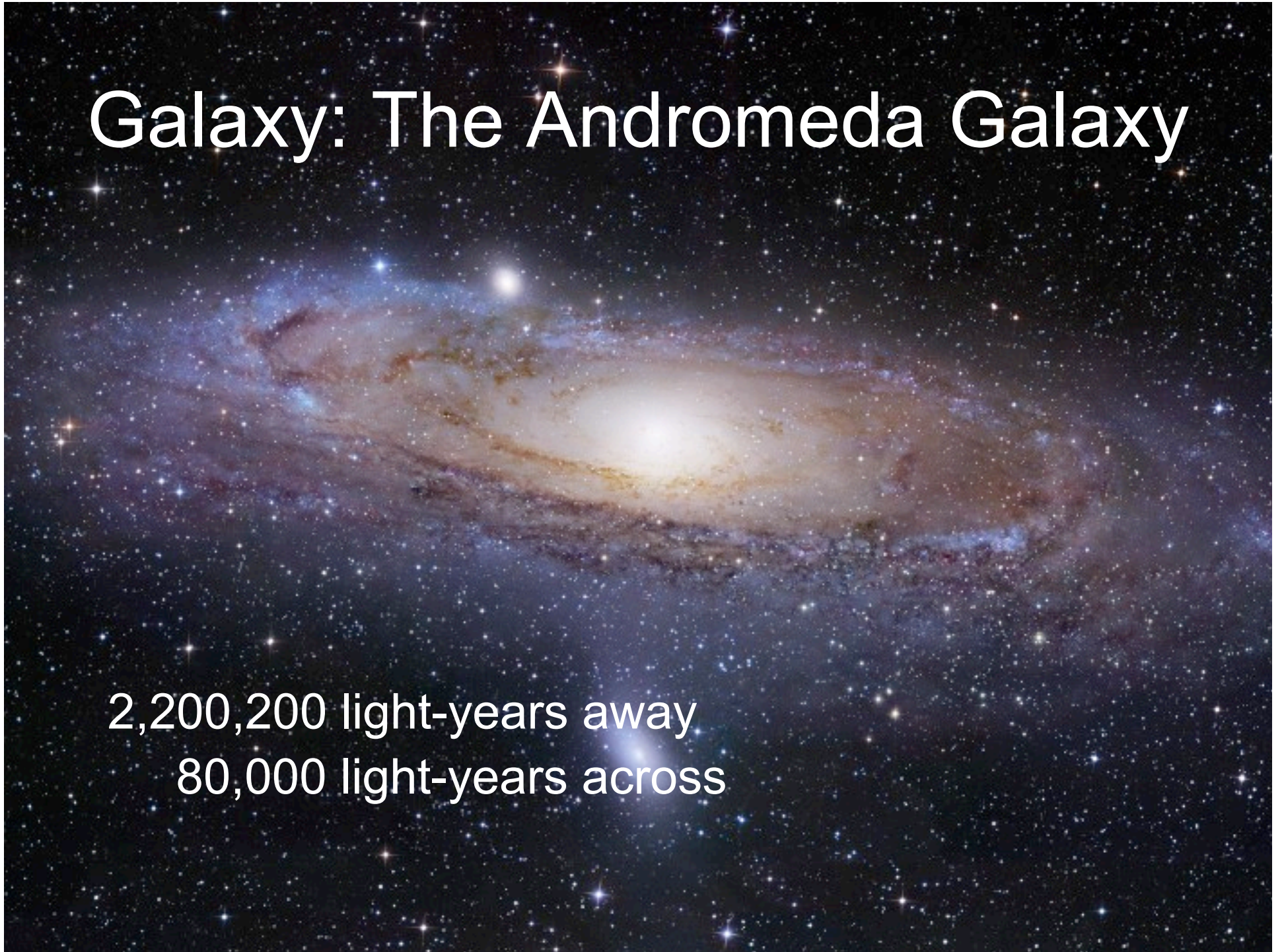
Cluster of Stars: The Pleiades

The image shows a dense field of stars, primarily blue and white, set against a dark, starry background. A prominent blue nebula is visible in the lower right quadrant. The stars are scattered across the frame, with some appearing as bright, multi-pointed sources of light.

430 light-years away
15 light-years across

Galaxy: The Andromeda Galaxy

2,200,200 light-years away
80,000 light-years across



Cluster of Galaxies: The Coma



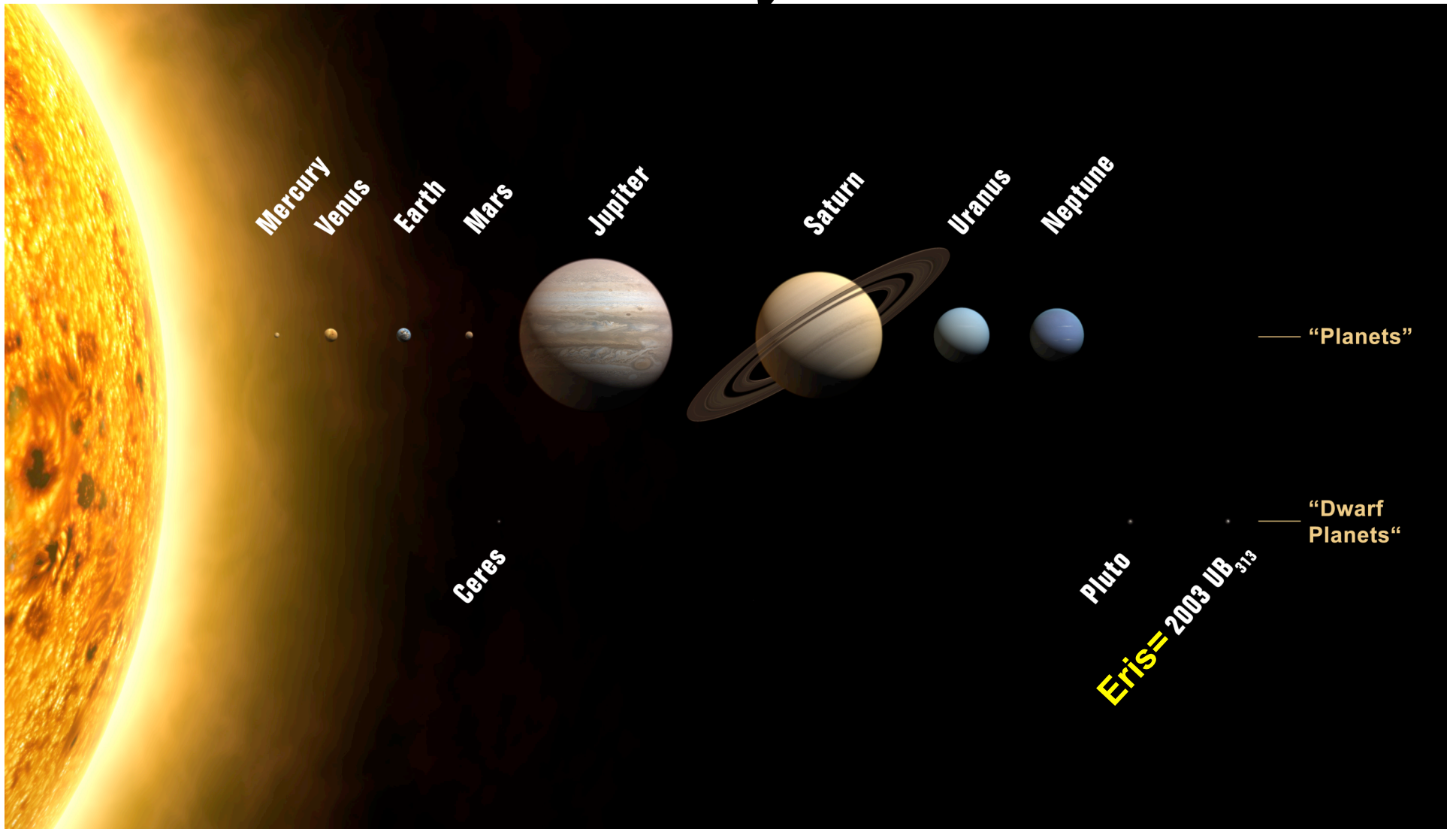
320 million light-years away
10 million light-years across

Gas & Dust: The Lagoon Nebula



5000 light-years away
50 light-years across

Solar System



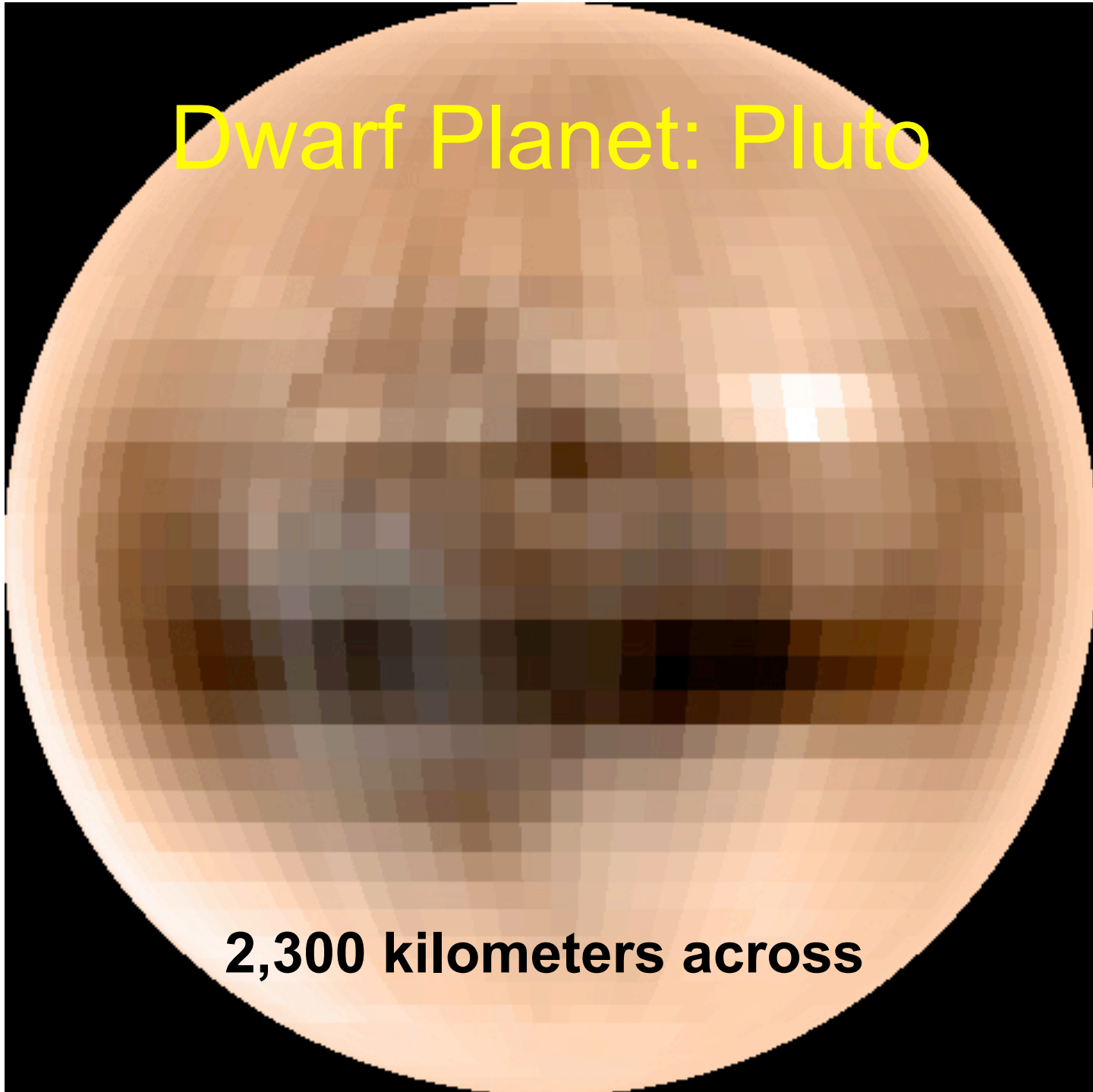


Planet: The Earth

13,000 kilometers across

Dwarf Planet: Pluto

2,300 kilometers across



Satellite: The Moon

A detailed view of the Moon's surface, showing various craters, maria, and highlands, set against a starry background. The Moon is the central focus, with its surface covered in numerous craters of different sizes and colors. The background is a deep black space filled with many small, distant stars. Two prominent stars with diffraction spikes are visible on the right side of the Moon.

380,000 kilometers away
3,500 kilometers across

Asteroid: Eros



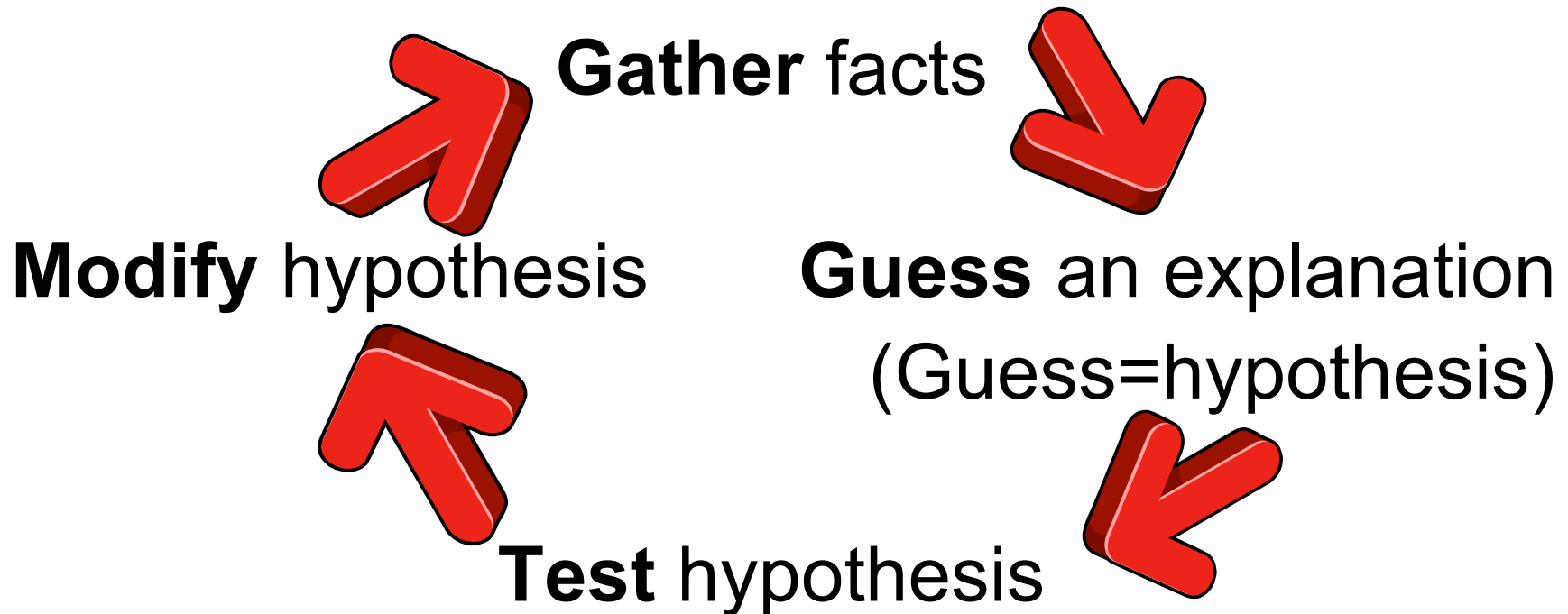
33 kilometers long

Comet: Comet Hale-Bopp

nucleus: 10 kilometers across
tail: 100 million kilometers long

What is **Science**?

The SYSTEMATIC study of the Universe



MAIN QUESTIONS

- 1) What have astronomers learned?
- 2) HOW HAVE THEY LEARNED IT?



Practical matters:

Astronomers use **powers-of-ten** notation to write **LARGE** and **SMALL** numbers.

(Section 1-6 of textbook)

$$1000 = 10^3$$

$$1,000,000 = 10^6$$

$$0.001 = 1/1000 = 10^{-3}$$

$$2,200,000 = 2.2 \times 10^6$$

Astronomers measure length in meters, astronomical units, & light-years

Basic unit of length = meter

Distance from Earth to Sun \equiv 1 astronomical unit (AU)

= 1.5×10^{11} meters

= 150 million kilometers (= 93 million miles)

Distance traveled by light in one year \equiv 1 light year (ly)

= 9.5×10^{15} meters

= 63,000 astronomical units

Astronomers measure time in seconds & years

Basic unit of time = second

Time for Earth to go around Sun \equiv 1 year
 $= 365 \frac{1}{4}$ days $= 3.2 \times 10^7$ seconds

Age of astronomer $\approx 1.2 \times 10^9$ seconds \approx 40 years

Age of Earth $= 4.6 \times 10^9$ years

Astronomers measure mass in kilograms

Note: mass and weight **are NOT** the same thing.

MASS = amount of matter.

WEIGHT = force with which gravity tugs on matter.

Mass = 1 kilogram

Weight = 35 ounces on Earth;

6 ounces on Moon;

13 ounces on Mars.

Mass of astronomer
= 70 kilograms (kg)

Mass of Earth
= 6×10^{24} kg

Mass of Sun
= 2×10^{30} kg
= 330,000 \times mass of Earth