ISTA 352

Lecture 26

Images in Astronomy

Administrivia

- I will accept questions for the bonus assignment through tonight.
  - Please send me questions in multiple choice format
- Quiz next Friday
  - Material through first half of last lecture
  - Visualization of data will be tested next time

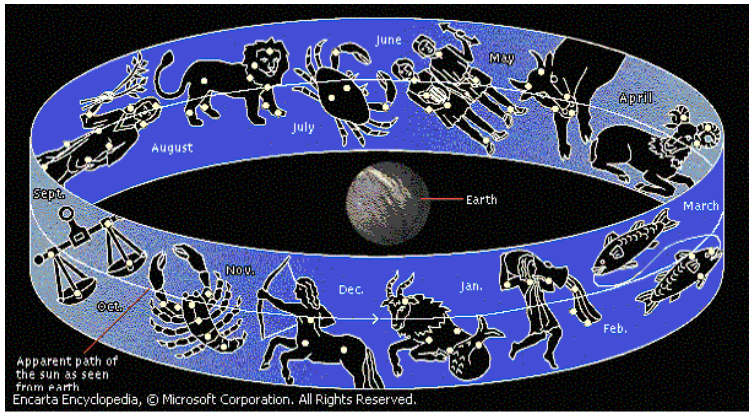
Administrivia

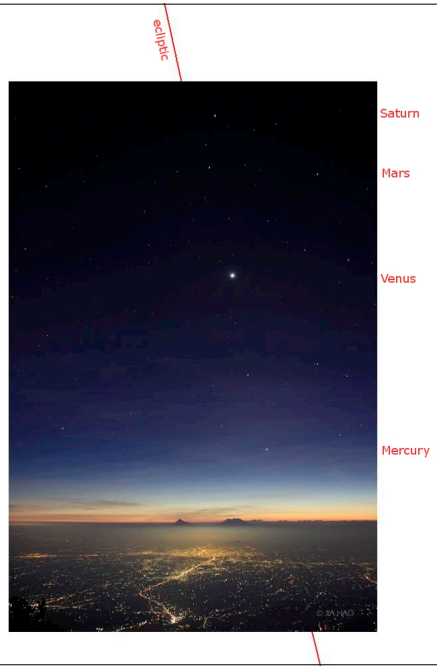
- Grade replacement with a project option
  - Up to 2 bad grades (e.g., one quiz and one assignment)
  - Group projects allowed
  - Projects graded based on presentation and write up
  - Project presentations will be during our scheduled final exam time
  - Interested people need to get me a proposal by November 05

What is in the sky tonight?

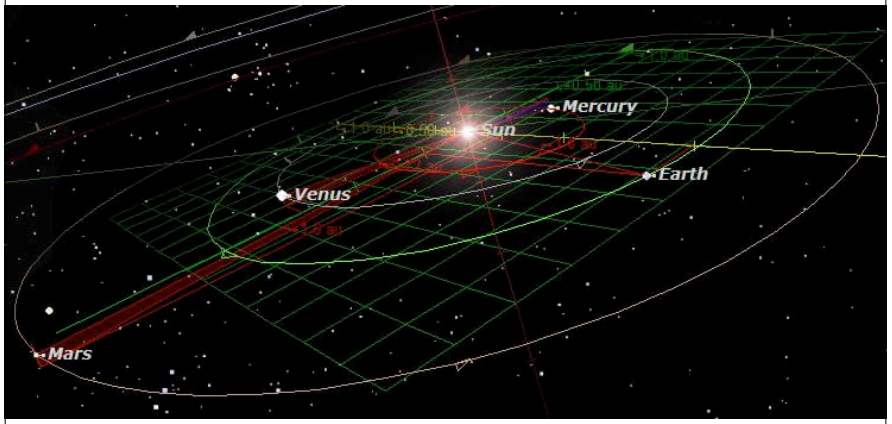
- Check online
  - (e.g., http://www.flandrau.org/resources/skywatchers)
- Get a star chart
  - Also available on-line
- Current report
  - Many meteor showers
  - Jupiter is rising around 9pm
  - Venus is in the early morning sky
  - Zodiac constellations include Capricorn and Aquarius

Zodiac chart

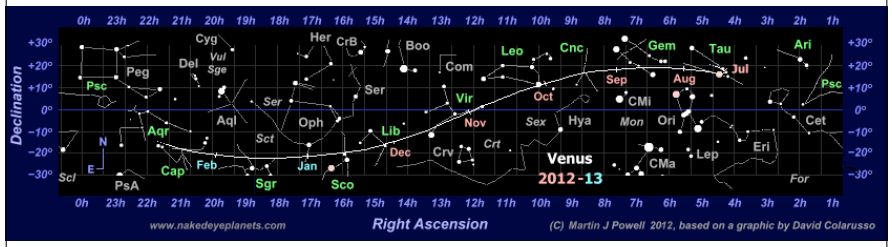


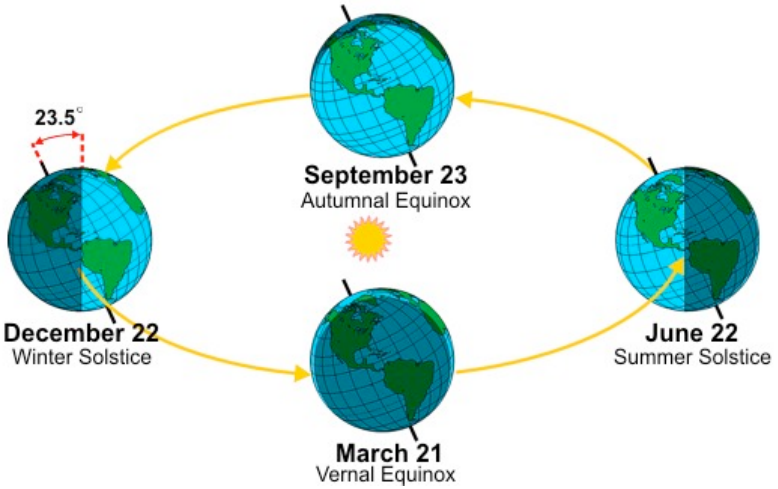


WikiMedia
commons
(By Jia Hao)

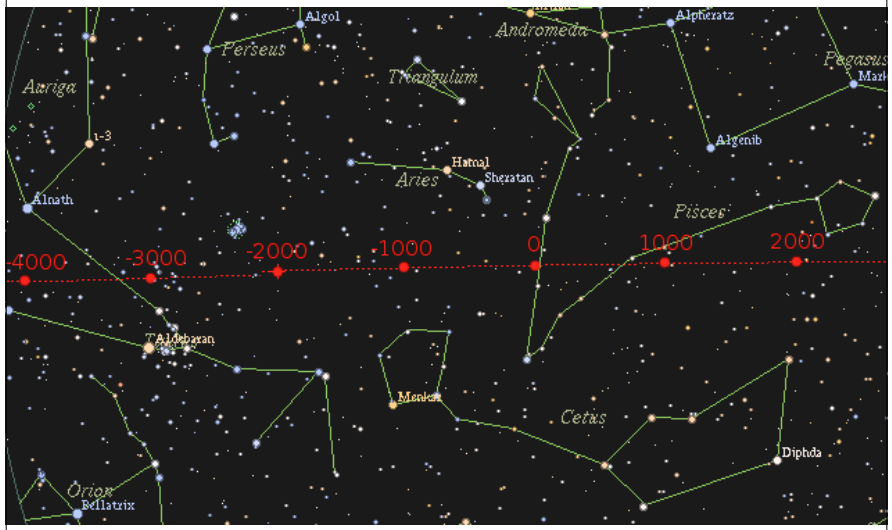


Zodiac chart





Precession of the equinoxes



Telescopes

- Key feature of telescopes is their light gathering ability
  - You can always magnify the image more, but if there is not enough light, you will not see anything
    - You need photons to resolve detail
  - Important innovation is to use photographic film for long exposures
    - You need to move the telescope as the earth turns
- Telescopes gather the light from a particular direction
  - For taking a picture, focus light onto the film (old) CCD (modern)
  - For viewing, create a new parallel beam the size of the eye

Telescope designs (Keplerian refractor)

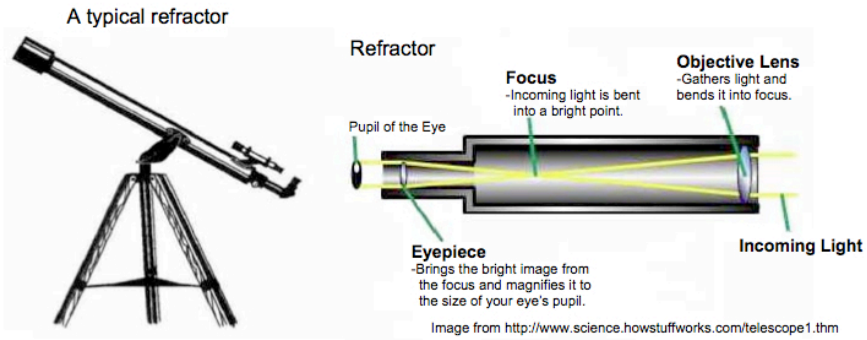
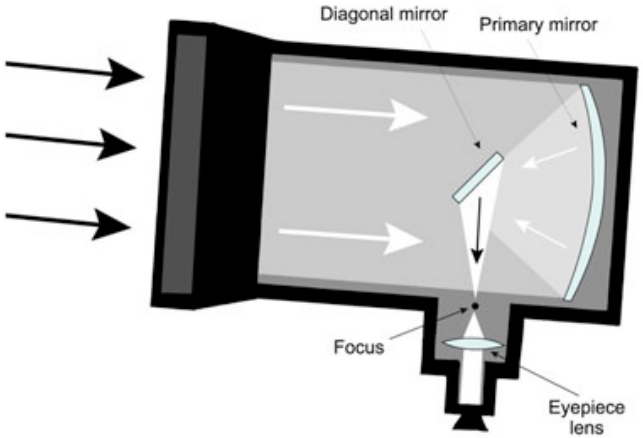
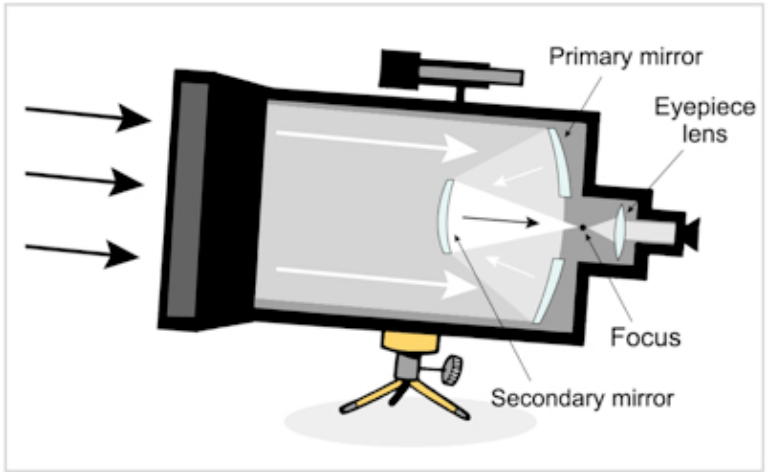


Image from http://www.ulo.ucl.ac.uk/public/telescope-guide/

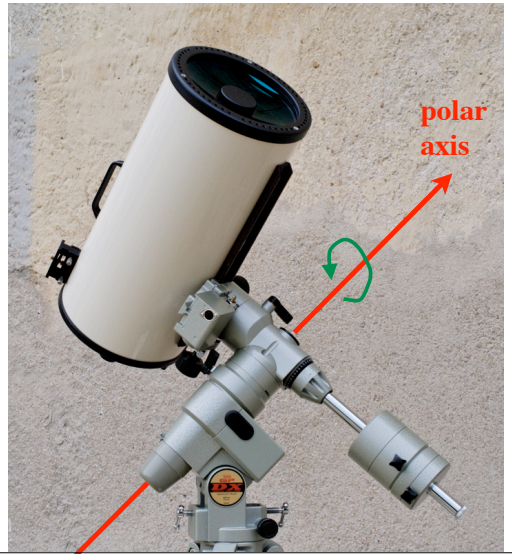
Telescope designs (Newtonian reflector)



Telescope designs (Schmidt–Cassegrain)

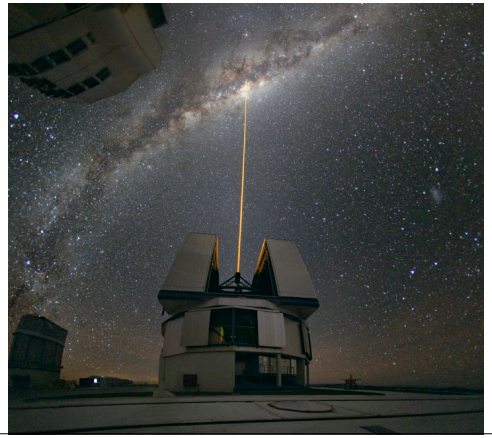


Telescope designs (German equatorial mount)



Fancy telescopes

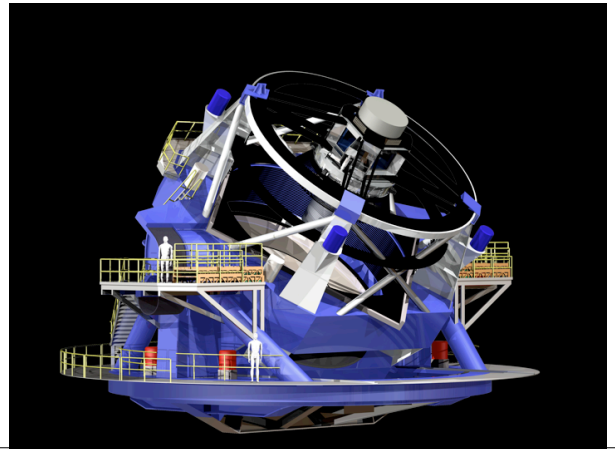
- Serious Earth based telescopes should be big, located at high altitude, relatively cold places away from city lights



The laser beam excite sodium atoms in the mesosphere to create an artificial guide star against which atmospheric effects can be corrected

Fancy telescopes

- Telescopes that track the sky over time
  - e.g., LSST, under construction, UA has a big role



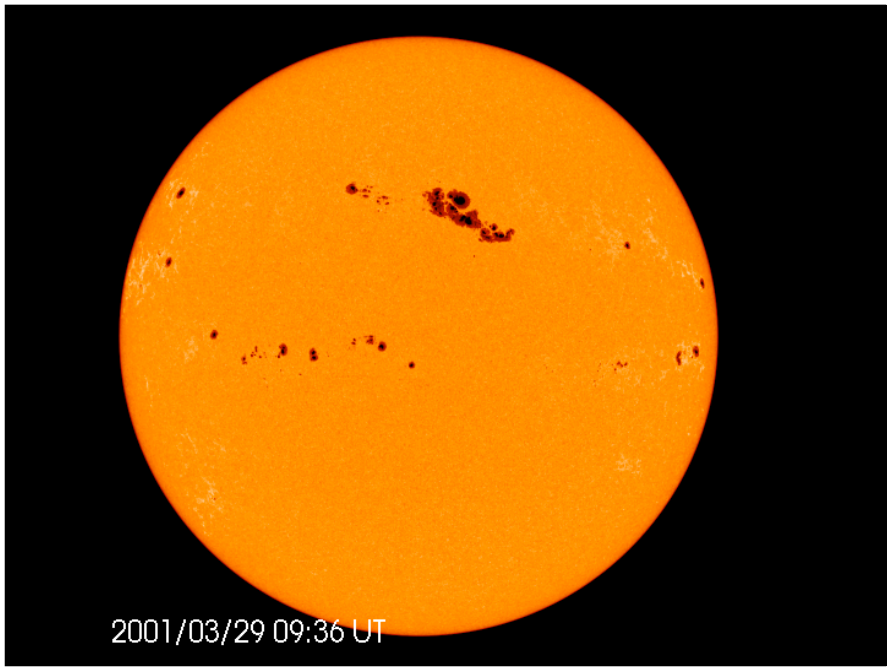
Note compact design for ease of fast movement to better survey the sky

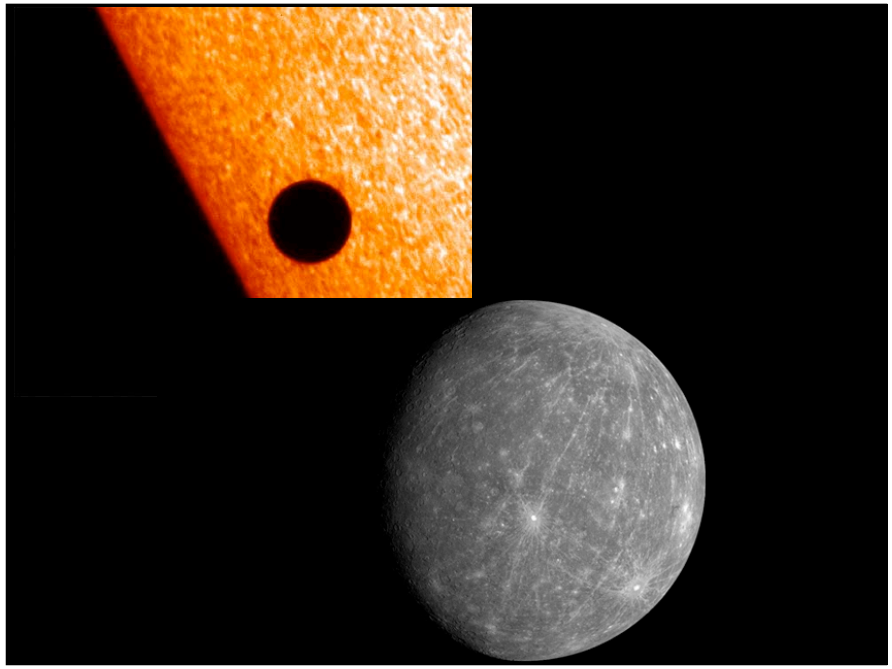
Fancy telescopes

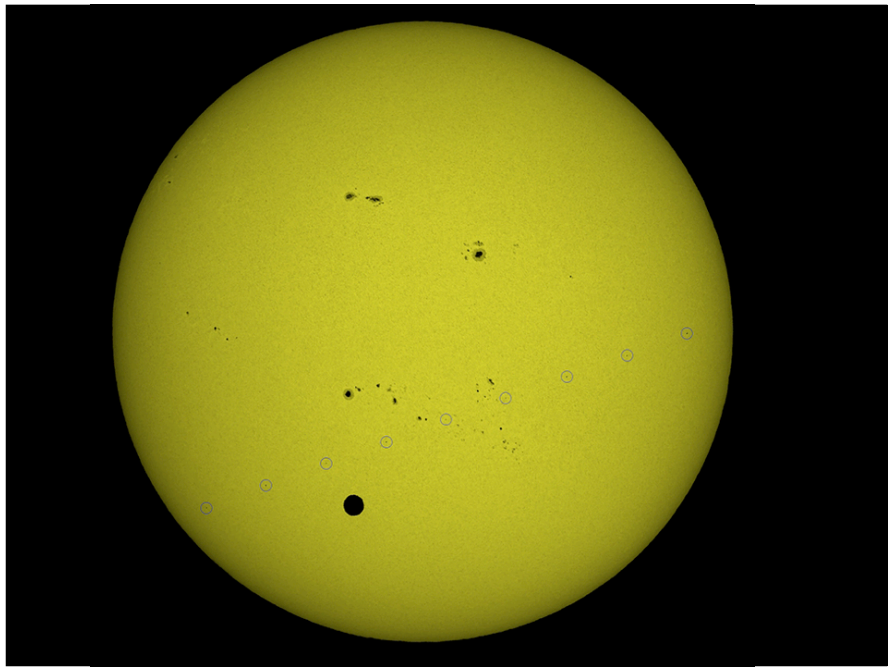
- Telescopes in space (e.g., Hubble)
  - No problems with atmospheric effects
  - Can work at wavelengths that are absorbed by the atmosphere

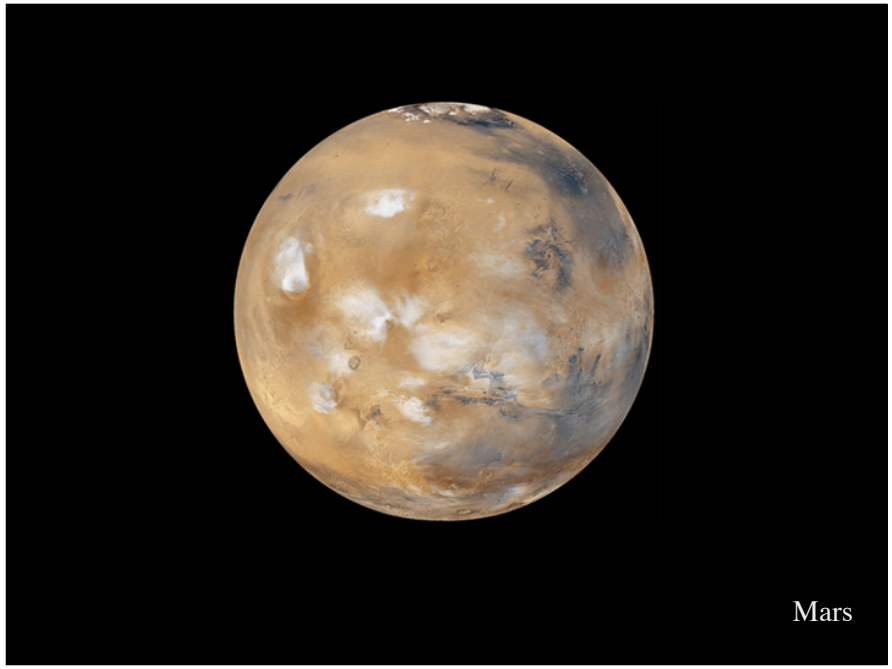
Highest performance amateur telescope?

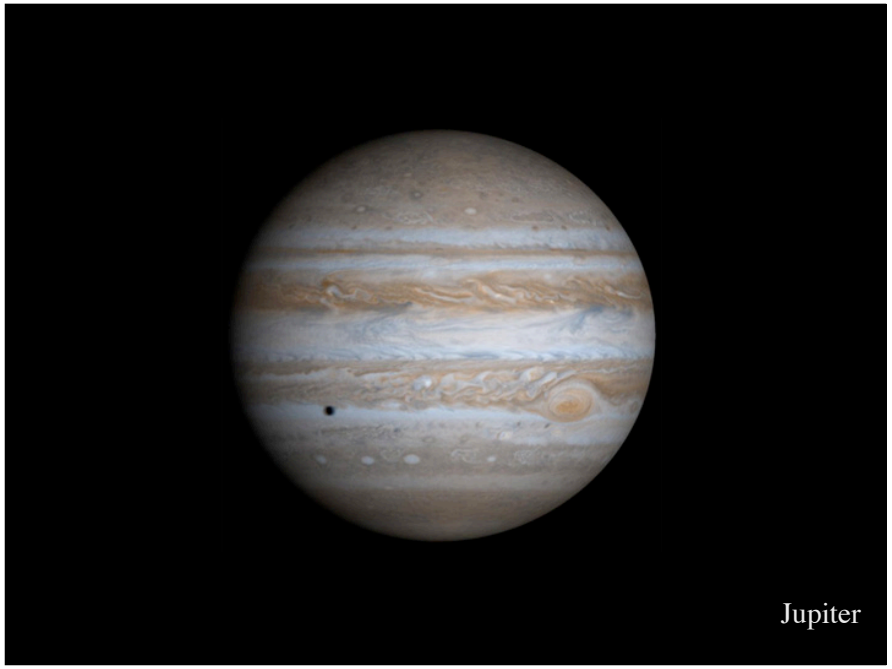
The internet!

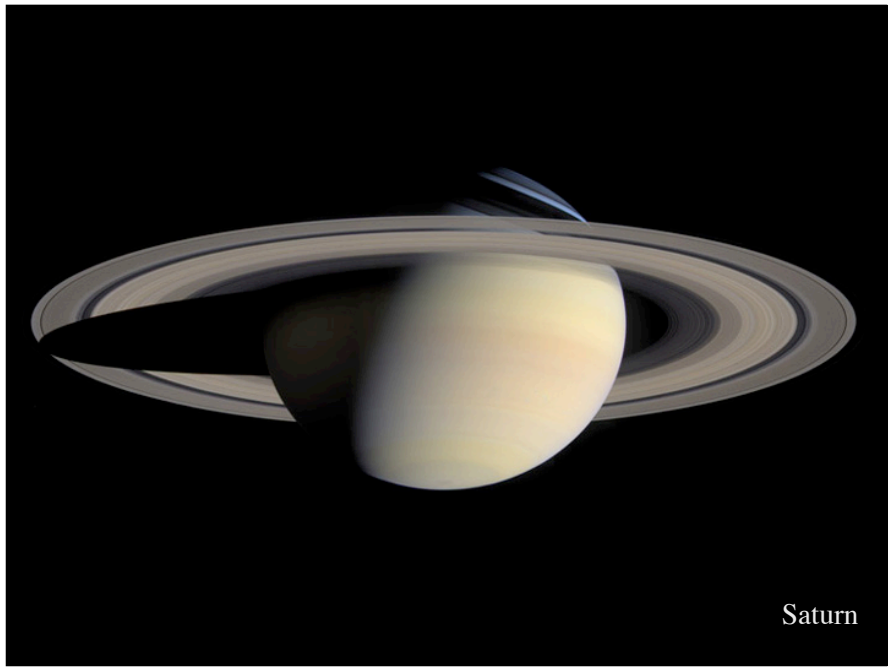




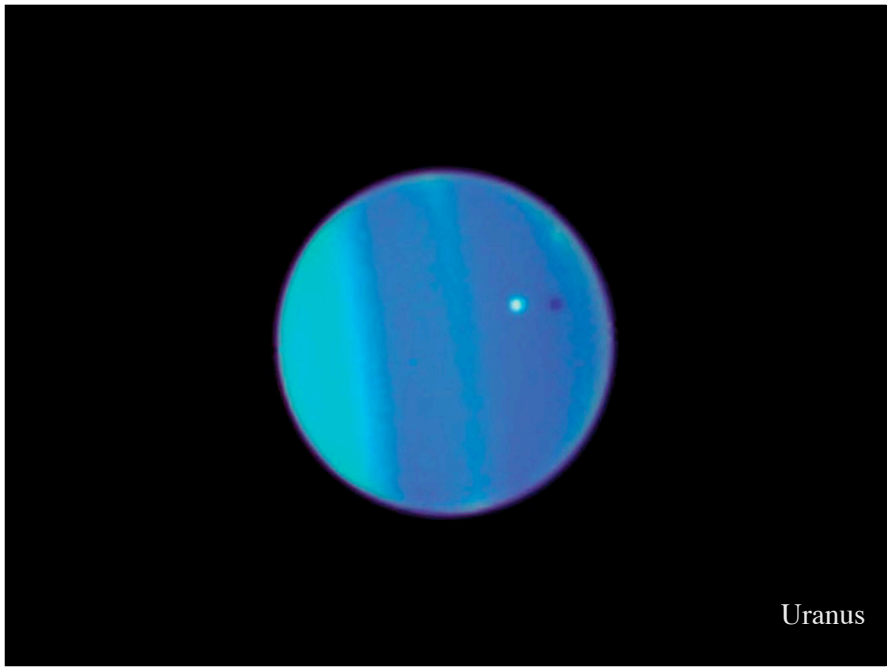



Mars

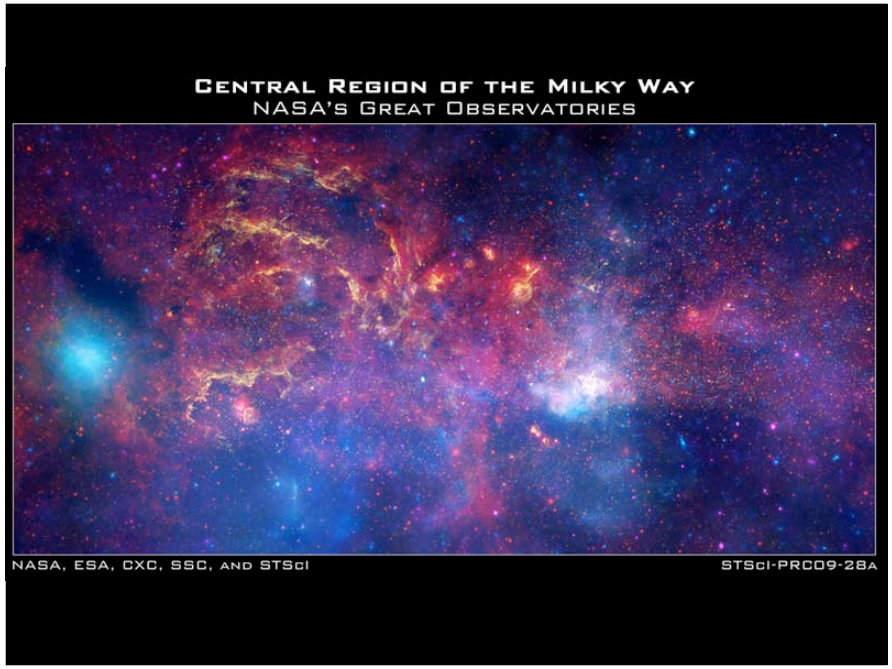

Jupiter



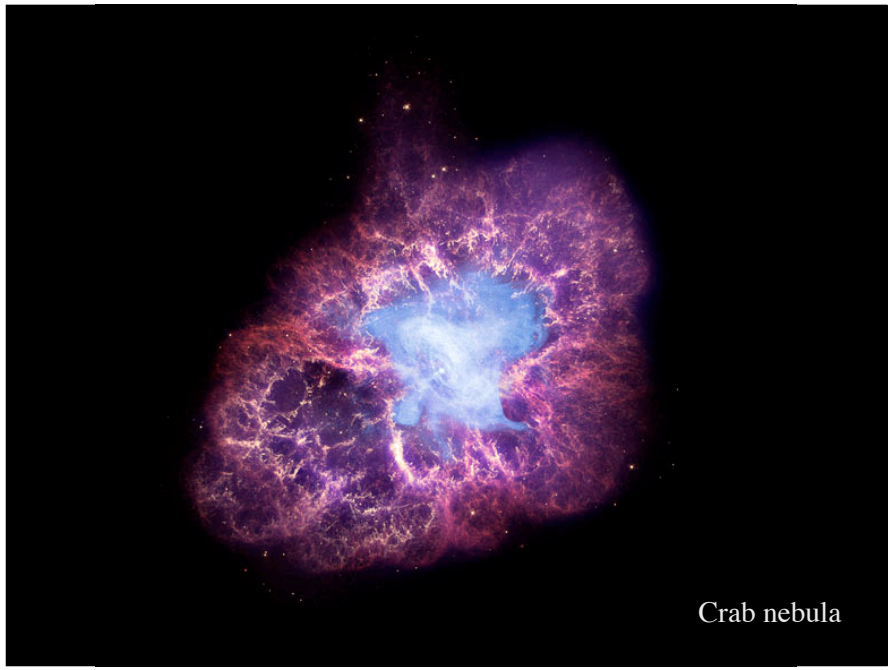
Saturn



Uranus



Light echos from supergiant star



Crab nebula

Andromeda

Center of virgo super-cluster (about 50-60 million light years away)

A collage depicting very deep space (13 billion years back in time)