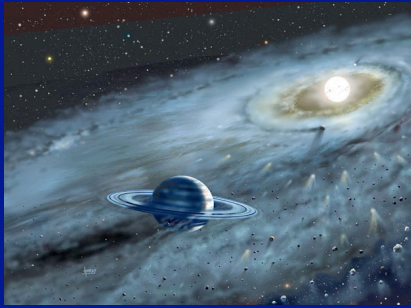
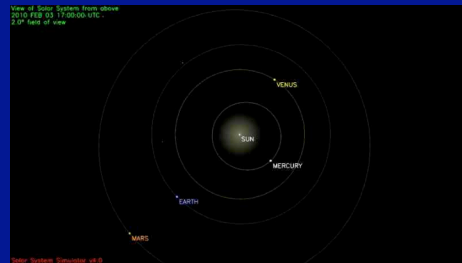


The "Nature of Things" in the Solar System



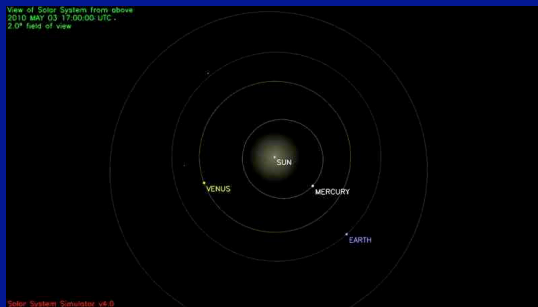
Why does the sky look the way it does?

The existence of the ecliptic



The Earth and the other planets orbit the Sun, in nearly the same plane for all planets

The inner solar system 3 months from now



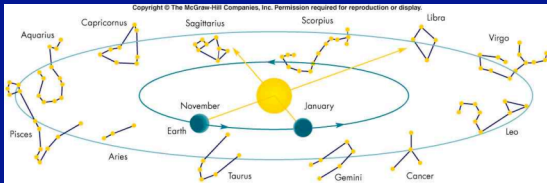
February 3



May 3



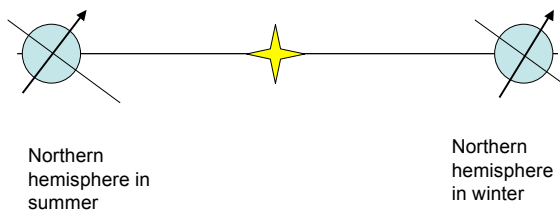
Why we see the Sun “projected against” different constellations at different times of the year



Then, why is the ecliptic tilted with respect to the celestial equator (the reason for seasons)

Answer: the **obliquity of the ecliptic** (or more simply “obliquity”, or even more simply, “tilt of the Earth’s axis”)

The obliquity of the ecliptic and the seasons



The obliquity of the ecliptic and habitability of the Earth

- The obliquity is 23.5 degrees, and changes over time by about +/- 1.5 degrees
- This is a mild variation, and allows moderate, but not extreme seasonal variations.
- It is *conjectured* that this modest variation is a consequence of the Earth having a relatively large moon, which may be a low-probability event.

Eclipses: observational properties



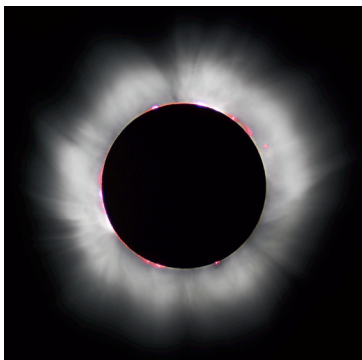
A lunar eclipse (eclipse of the Moon)

Progress of a lunar eclipse



What's going on? Big mystery for the ancients

A solar eclipse:
one of the great
spectacles of
nature

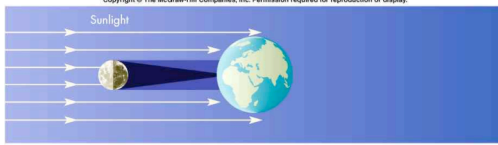


Eclipses caused by shadows of one solar system object on another

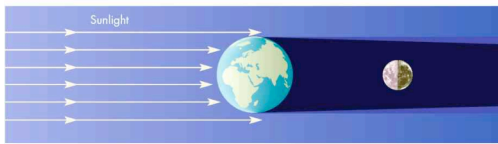


Solar eclipses and lunar eclipses

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



A Moon between Earth and Sun



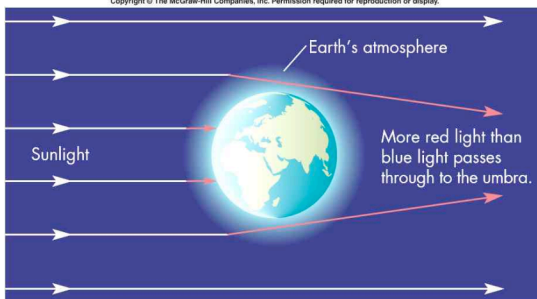
B Earth between Sun and Moon

Solar eclipses are rare, lunar eclipses relatively common

- The Earth is a large object and casts a big shadow that covers a lot of space
- The Moon is a small object and casts a small shadow. It is much less likely to hit a given place on Earth.

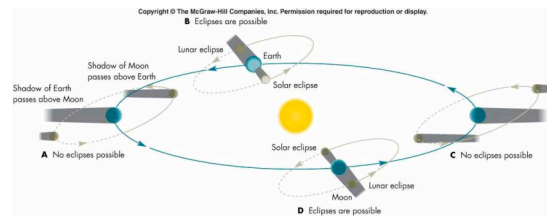
Lunar eclipses: dark ones and bright ones

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Why don't eclipses occur every month? 5 degrees makes a difference

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.



Eclipses for 2010

- January 15 --- annular eclipse of Sun--Indian Ocean
- June 26 --- partial lunar eclipse --around 5-6 AM around moonset
- July 11--- eclipse of the Sun ---China and western Pacific
- December 21--- total lunar eclipse--maximum eclipse around 3 AM Iowa time