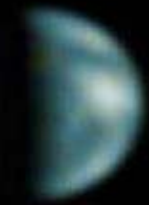


MIT OpenCourseWare  
<http://ocw.mit.edu>

12.002 Physics and Chemistry of the Earth and Terrestrial Planets  
Fall 2008

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.

# Planetary Histories



12.002 Physics and Chemistry of the Terrestrial Planets

# Five Terrestrial Planets



# Earth

- Radius 6400 km, Mass 1 Earth Mass,
- Density  $5.5 \text{ g cm}^{-3}$  (uncompressed:  $4.05 \text{ g cm}^{-3}$ ),  $I/MR^2 = 0.33$
- Semimajor axis 1 AU
- Average surface temp 288 K
- Dynamo magnetic field
- Continental and oceanic crust
- Plate tectonics and active volcanism
- Oceans of liquid water
- Atmosphere of  $\text{N}_2$  and  $\text{O}_2$
- Life

# Mars

- Radius 3400 km, Mass 0.1 Earth Mass,
- Density  $3.9 \text{ g cm}^{-3}$  (uncompressed:  $3.7 \text{ g cm}^{-3}$ ),  $I/MR^2 = 0.37$
- Semimajor axis 1.5 AU
- Average surface temp 210 K
- Crustal remanent magnetic field, no dynamo
- Hemispherical crustal dichotomy
- Probably no late tectonics but active volcanism
- Water not stable in liquid form, small amounts of water
- Atmosphere of  $\text{CO}_2$
- Life?

# Moon

- Radius 1700 km, Mass 0.01 Earth Masses
- Density  $3.3 \text{ g cm}^{-3}$  (uncompressed:  $3.3 \text{ g cm}^{-3}$ ),  $I/MR^2 = 0.39$
- Semimajor axis 1 AU
- Surface temp ranges 40-400 K
- Weak crustal remanent field, no dynamo
- Highlands and mare
- Probably no late tectonics, not volcanically active
- No water, extremely dry
- Tenuous  $\text{H}_2$ , He atmosphere
- No Life

# Mercury

- Radius 2400 km, Mass 0.05 Earth Masses
- Density 5.4 g cm<sup>-3</sup> (uncompressed: 5.3 g cm<sup>-3</sup>),  $I/MR^2 = 0.33$
- Semimajor axis 0.4 AU
- Surface temp ranges 40-750 K
- Weak crustal remanent field or dynamo
- Cratered surface of unknown composition
- Probably no late tectonics, not volcanically active
- Little water, extremely dry (ice at poles!)
- Tenuous O, H<sub>2</sub>, He atmosphere
- No Life

# Venus

- Radius 6000 km, Mass 0.8 Earth Masses
- Density  $5.25 \text{ g cm}^{-3}$  (uncompressed:  $4.0 \text{ g cm}^{-3}$ ),  $I/MR^2 = 0.33$
- Semimajor axis 0.7 AU
- Average surface temp 750 K
- No magnetic field
- Cratered surface of unknown composition
- Volcanically and tectonically active
- Extremely dry
- Thick (92 bar)  $\text{CO}_2$  atmosphere
- No Life?