An introduction to
the Terrestrial Planets

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the Terrestrial Planets

…and friends

NASA/JHUAPL

NASA/JPL

NASA/Apollo 17

ESA/MPS/UPD

NASA

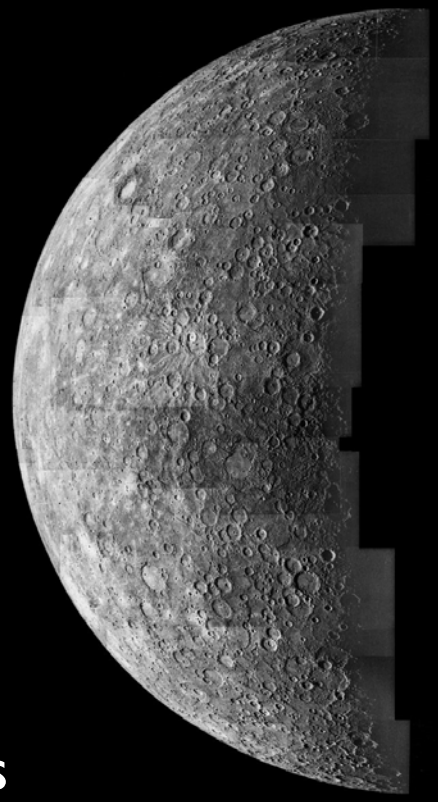
Gregory H. Revera

Justin Cowart

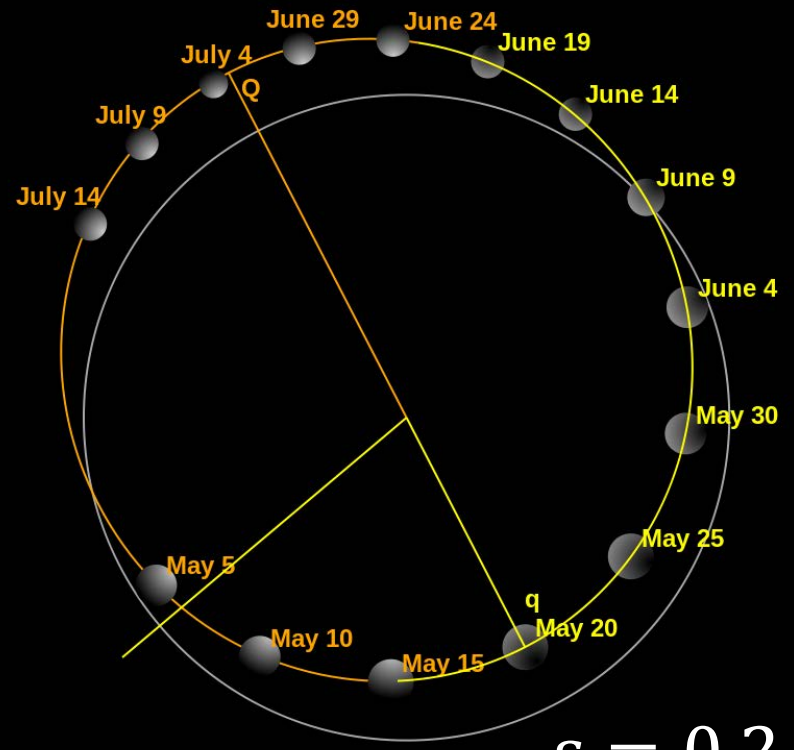
Mercury ☿

- 88-day, relatively eccentric orbit
- 1.5 mercury days per mercury year
- ~0.06 $M_\oplus$

  Because it is small
  - geologic activity ceased a long time ago
  - there is no significant atmosphere
  - both of the above lend themselves to a highly cratered surface
- The interior cooled after the surface had hardened, creating wrinkles that stretch far across the planet's surface

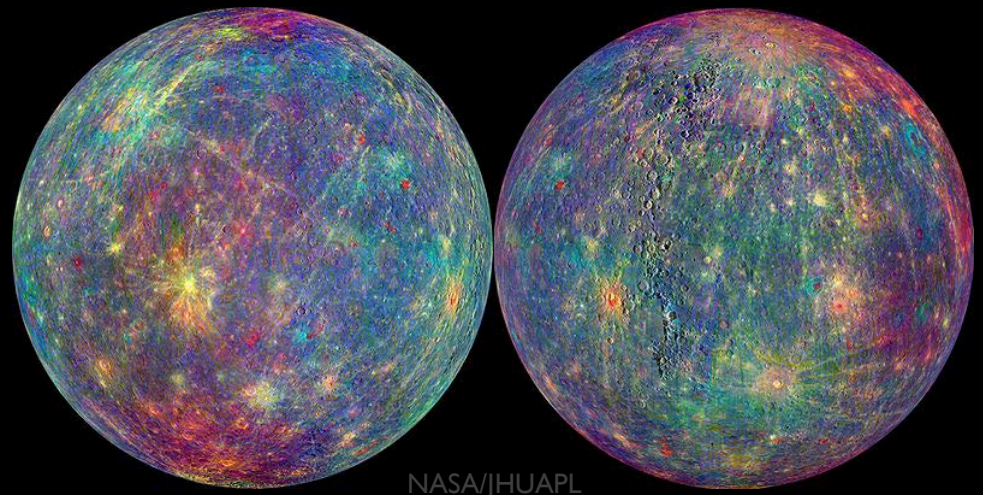


NASA/Mariner 10



Eurocommuter

$\varepsilon = 0.2$



NASA/JHUAPL

Venus ♀

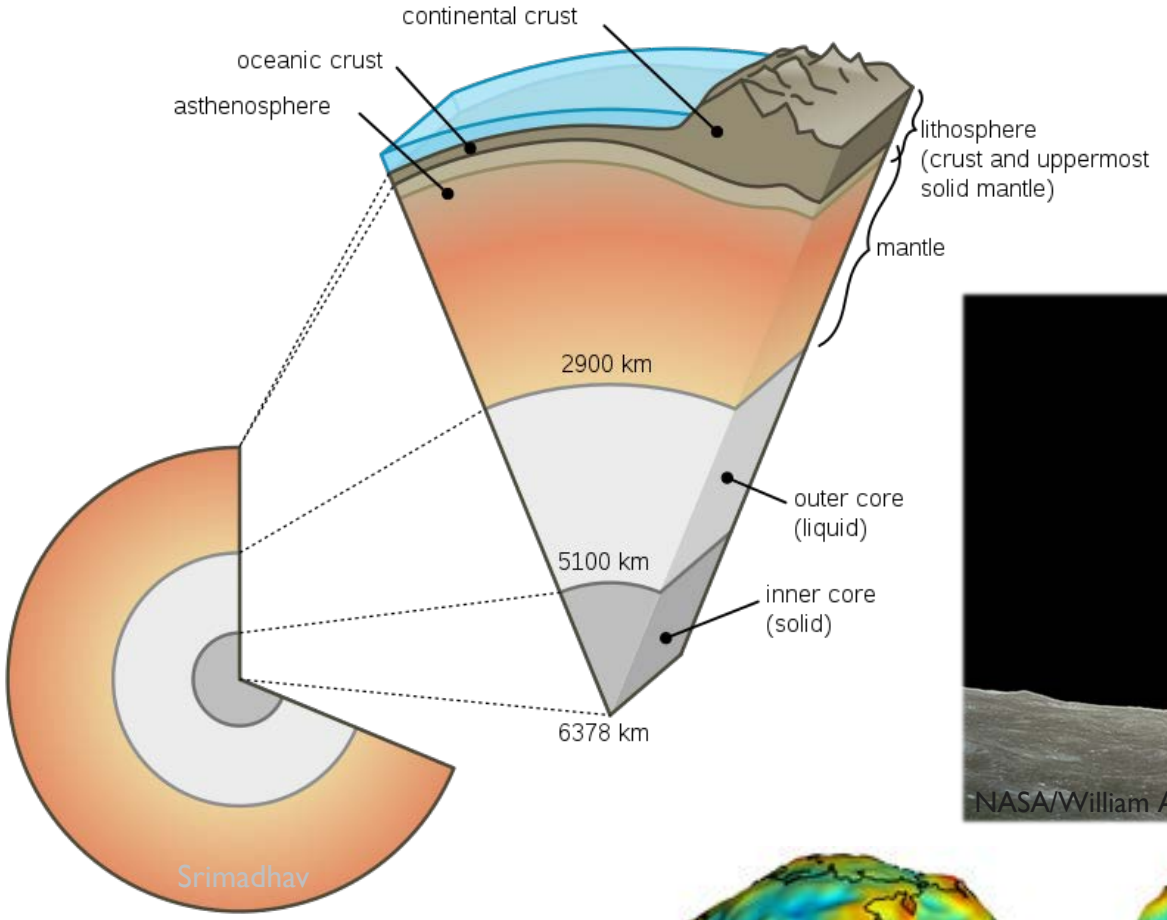
- 225-day orbit, while a Venusian day is 244 earth-days, rotating in the opposite direction of other terrestrial planets
- Extreme atmosphere, mostly made of CO_2
  - Pressure: 92 atm
  - Temperature: ~870 F
  - Clouds of sulfuric acid
  - *Nearly isothermal* across the planet!
- Significant volcanic activity

NASA/JPL

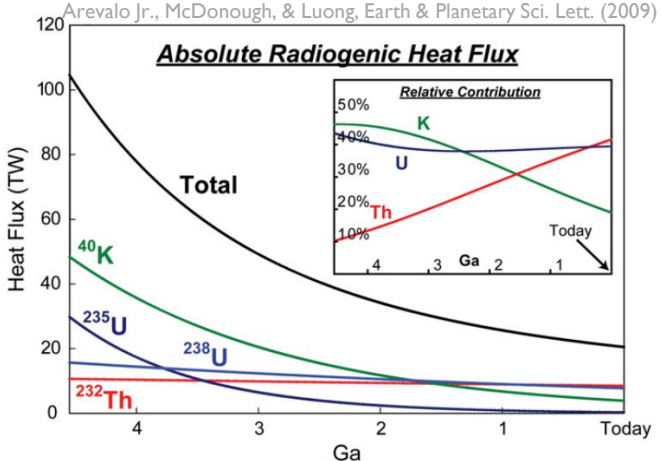
CCCP

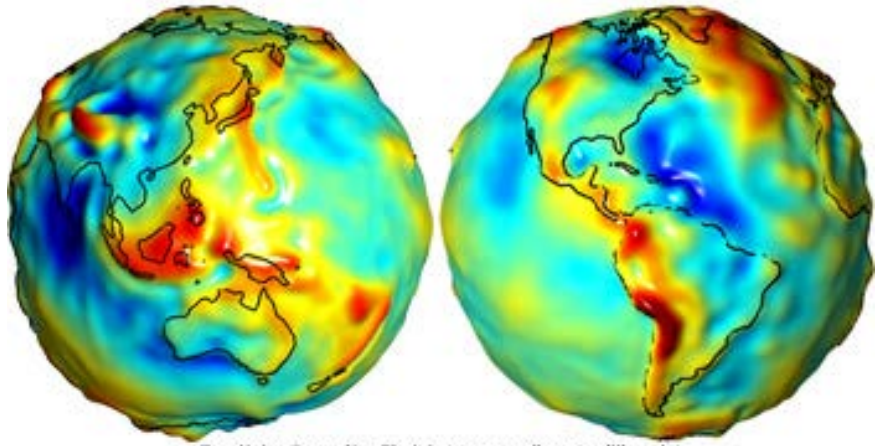
Earth ⊕

- $6x10^{24}$ kg & 6370 km radius (slightly lumpy) ball of rock orbiting the sun at a distance of $1.5x10^{8}$ km and speed of ~30 km/s
- The most dense planet in our solar system
- Large metallic core, encased in a thick layer of dense rock, which is encased in a thin layer of less-dense rock, which is coated in a thin layer of water and air
- Substantial internal heat left from initial cooling and as much or more from radioactive decay



Arevalo Jr., McDonough, & Luong, Earth & Planetary Sci. Lett. (2009)



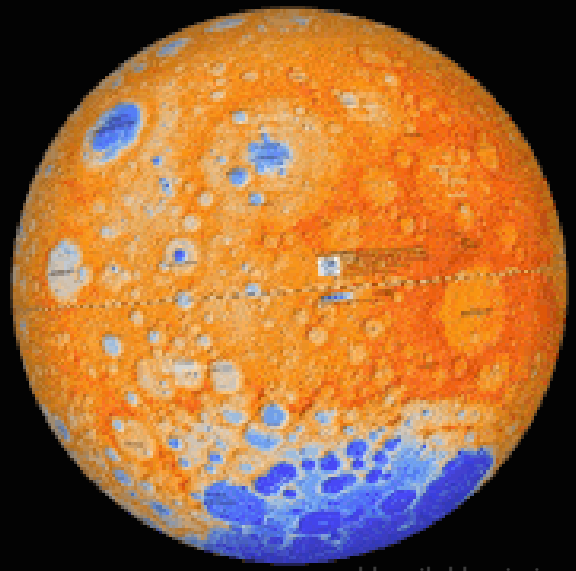


NASA/GRACE

*there conflicting reports of intelligent life

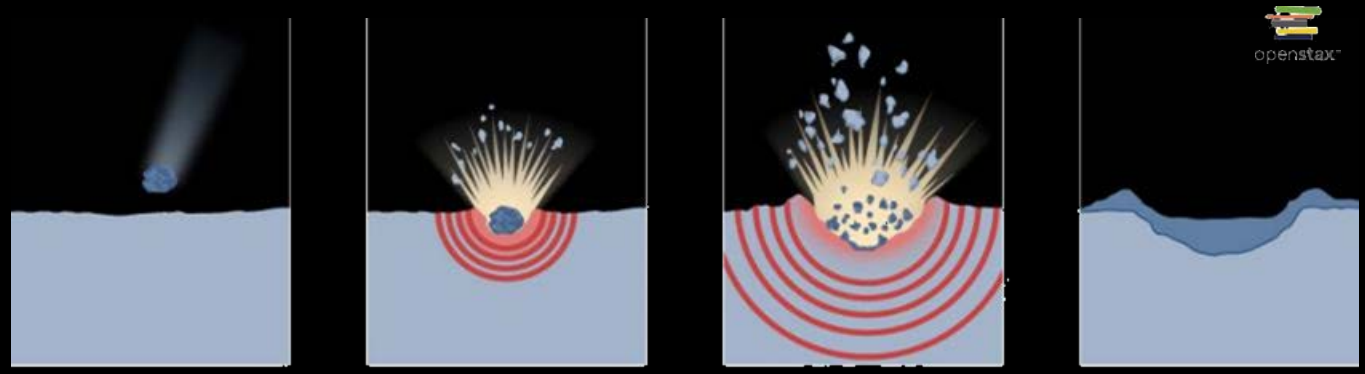
THE Moon ☾

- 0.01 $M_\oplus$ 0.27 $R_\oplus$ (heavily cratered) ball of rock orbiting the Earth at a distance of 0.003 AU and speed of ~1 km/s
- Roughly 60% the density of Earth, because it is mostly rock, and is the 2nd most dense moon in the solar system
- Tidally locked, so 1 rotation per 1 orbit
- Craters are the result of lots of impacts from space rocks
- Stuff flung from the craters creates "crater rays"



Henrik Hargitai

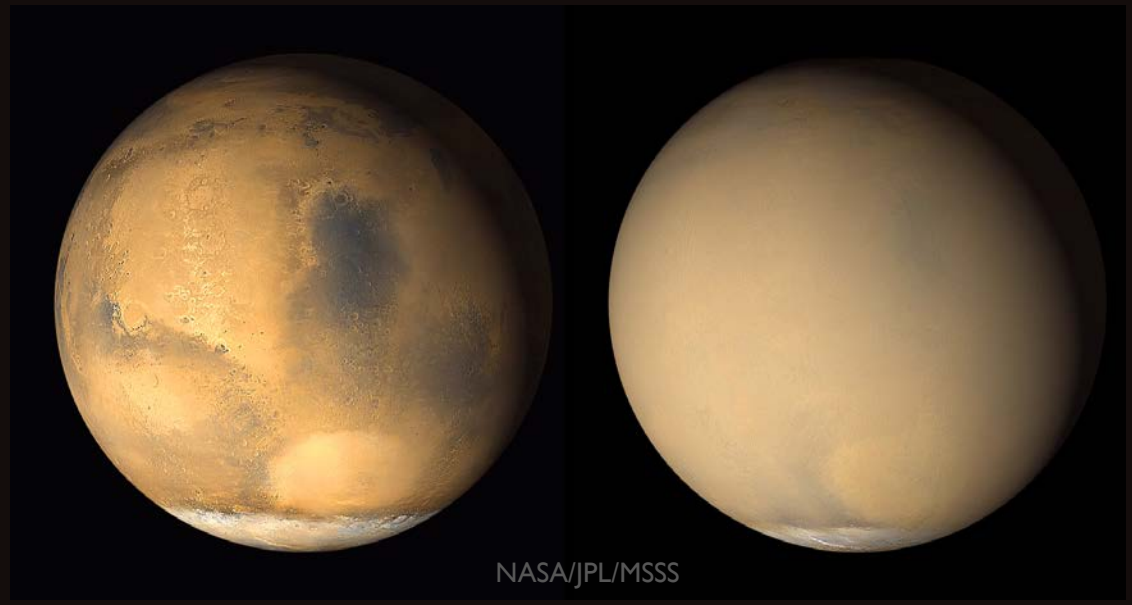
Stuby/NASA/Apollo 11



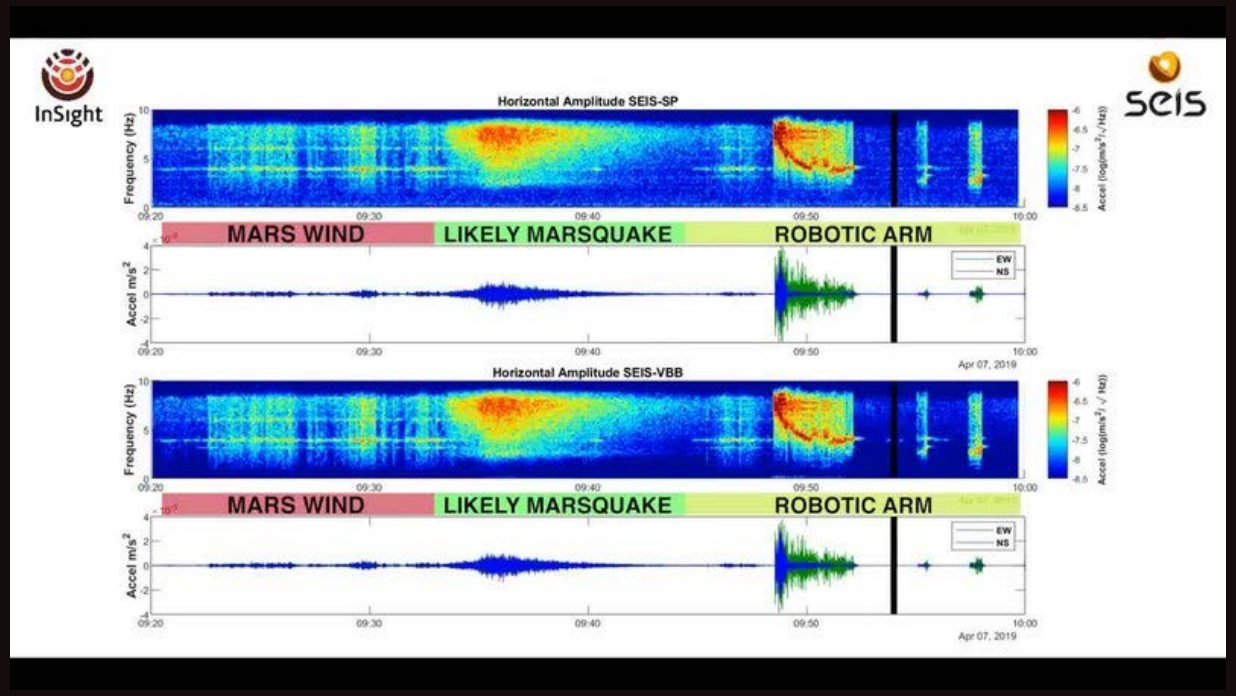
Mars ♂

- 1.8 earth year orbit ~1.5 AU from the sun, with a 24.6 hr day
- Surface is covered in iron-oxide dust, which gives it the red tinge
- Very thin atmosphere (0.006 atm) of mostly CO_2, with a lot of dust, visibly changing the appearance
- Has Marsquakes (the moon has moonquakes too): seismic activity like on Earth, which can ultimately be used to learn more about the interior structure (as for Earth and the Moon)
- Two moons, thought to be captured asteroids

NASA/JPL/UArizona



NASA/JPL/MSSS



the Asteroid Belt

- ~10^{21} kg of mass dispersed amongst millions of rocks of ~1km or larger (and many more smaller ones), ~4 of which are most of the mass
- Objects within the belt are widely spaced (~10^{12} km^3 per asteroid), though have distinct clusters