
The Inner Planets

Poll everywhere

When poll is active respond at **PollEv.com/nikhilpatten355**

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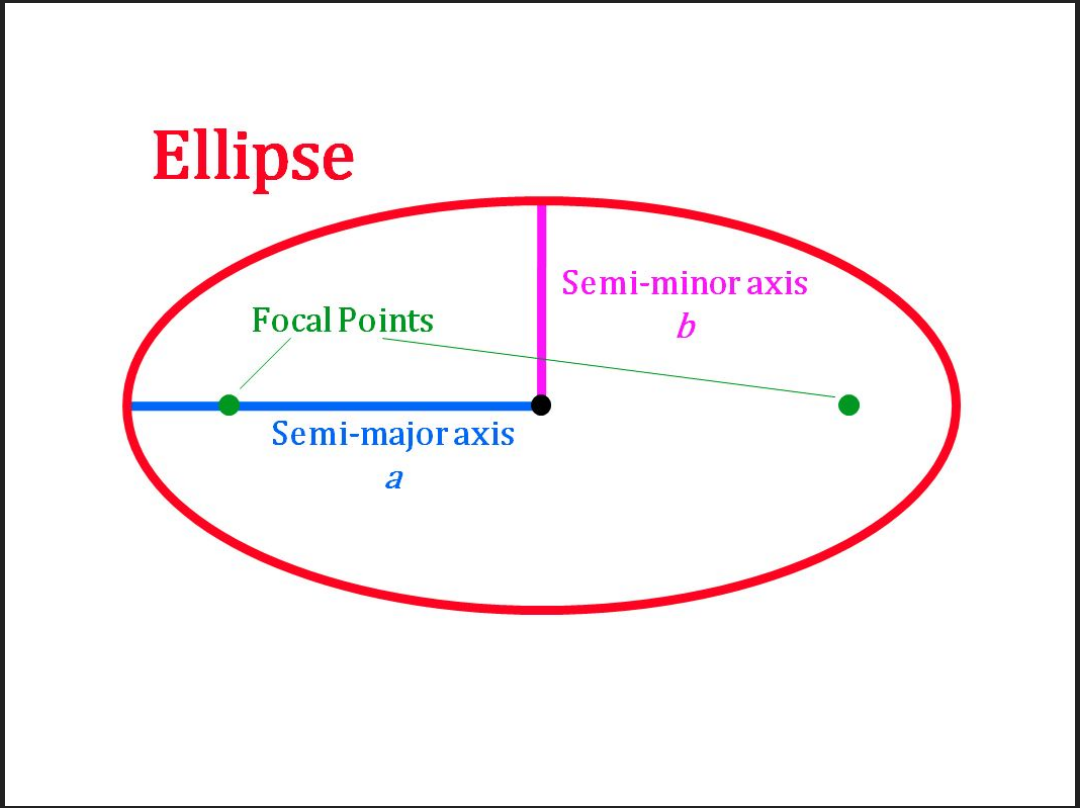
Poll everywhere

results

Lab Recap

- How did Monday's lab go?
- What were some issues?

Orbits



Orbits

- All planets orbit in ellipses.
- Distance from the Sun is changing constantly.
- All planets have a point in their orbit when they are closest (perihelion) and furthest (aphelion) from the Sun.
- Eccentricity measures how different these two values are.
- $e \rightarrow 1$, orbit is more “oval-shaped.”
- $e \rightarrow 0$, orbit is more circular, uniform.

$$e = \frac{c}{2a}$$

Orbits

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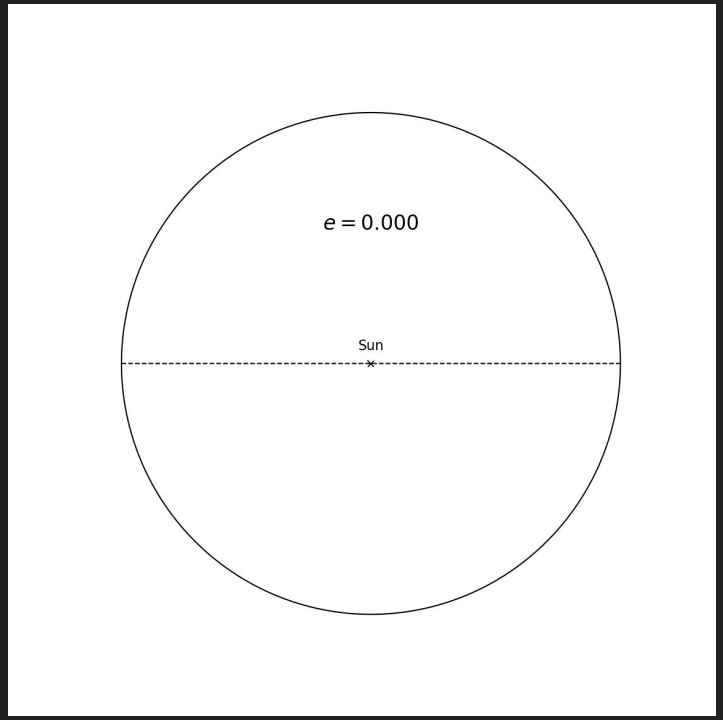
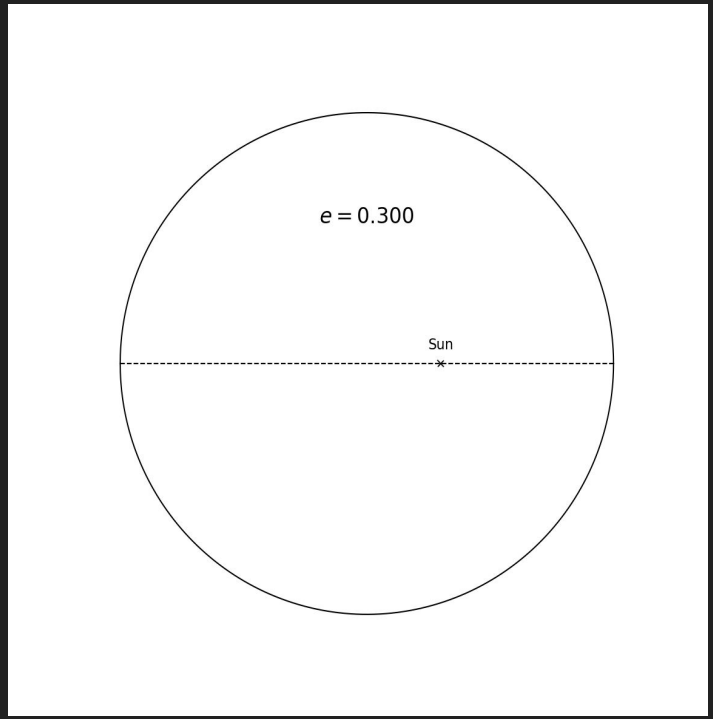
Physics and Astronomy

- Same semi-major axis, differing eccentricity



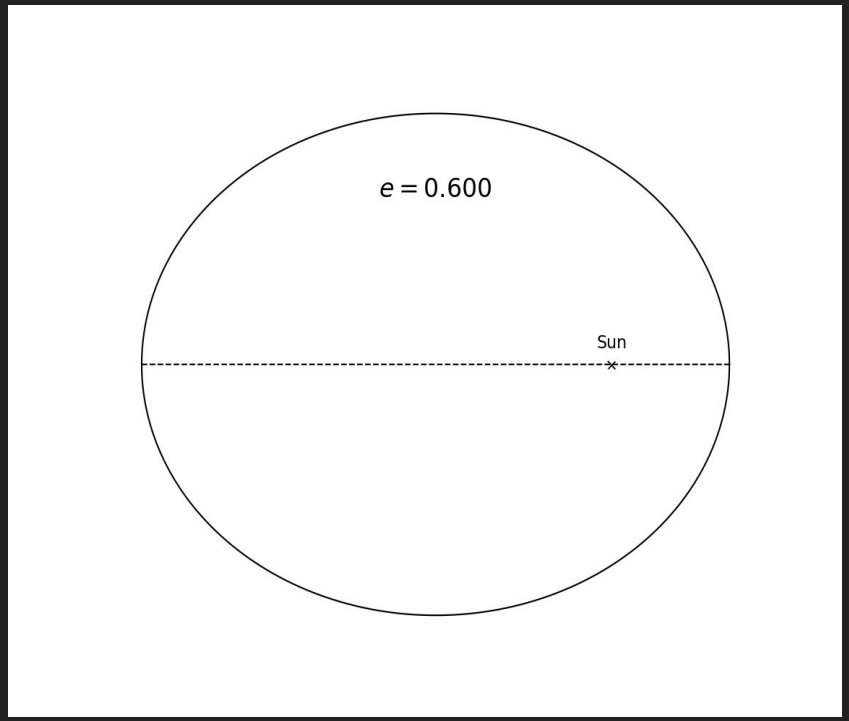
Orbits

- Same semi-major axis, differing eccentricity



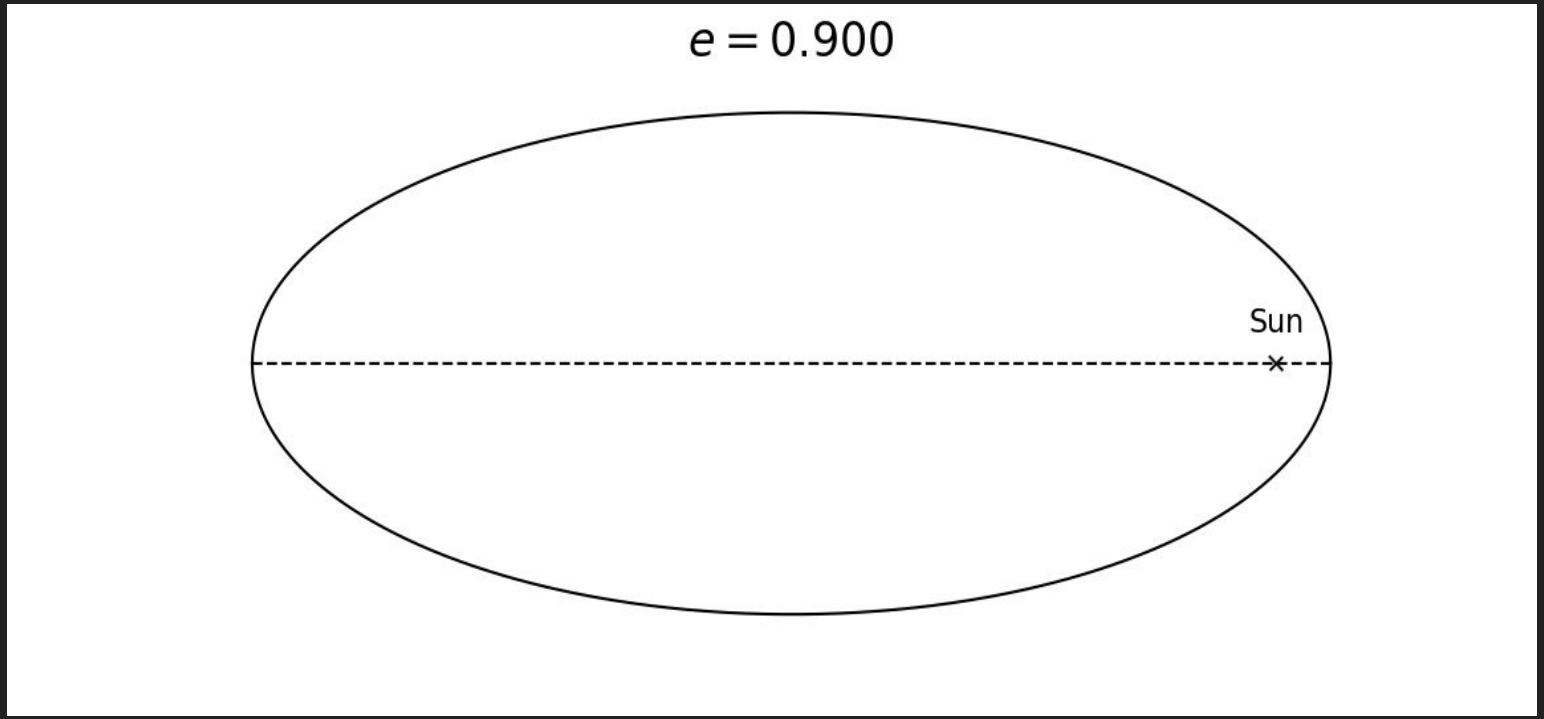
Orbits

- Same semi-major axis, differing eccentricity



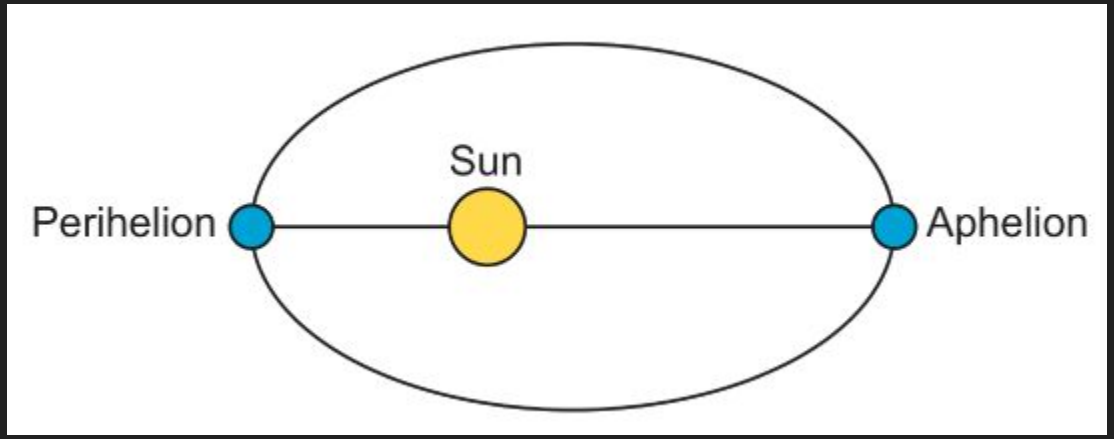
Orbits

- Same semi-major axis, differing eccentricity



Orbits

- Let’s find the closest and furthest distance from the Sun, using what we know.



Orbits

1. The Earth has orbital semi-major axis *a*= 1.00 AU and eccentricity *e*= 0.017. Find the perihelion and aphelion of Earth's orbit, in AU.

$$\mathrm{Ap} = a\,(1+e)$$

$$\mathrm{Pe} = a\,(1-e)$$

Mercury

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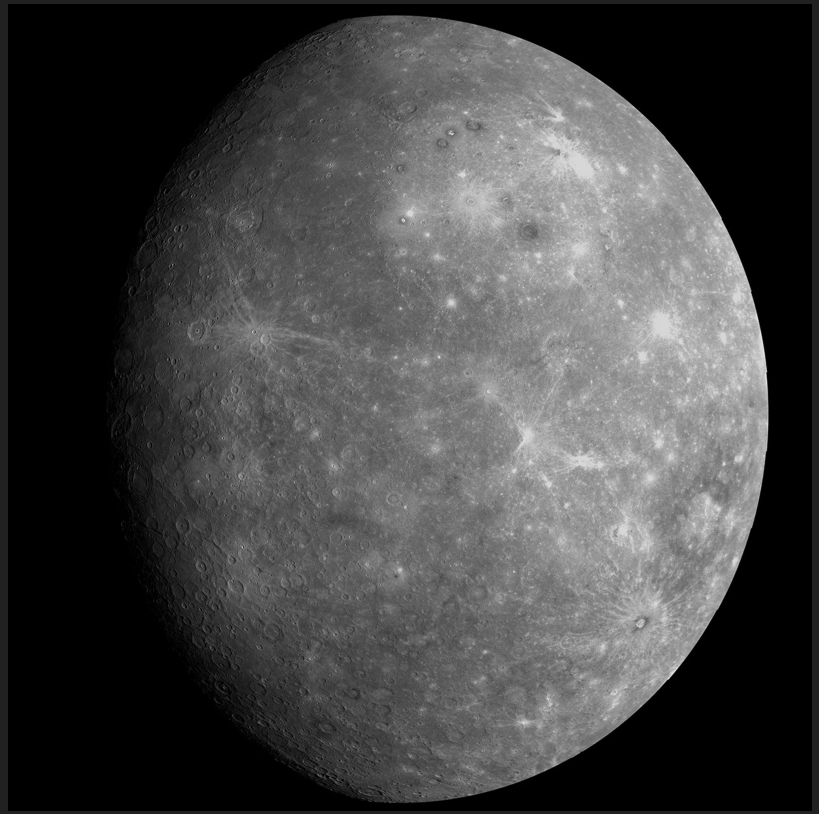
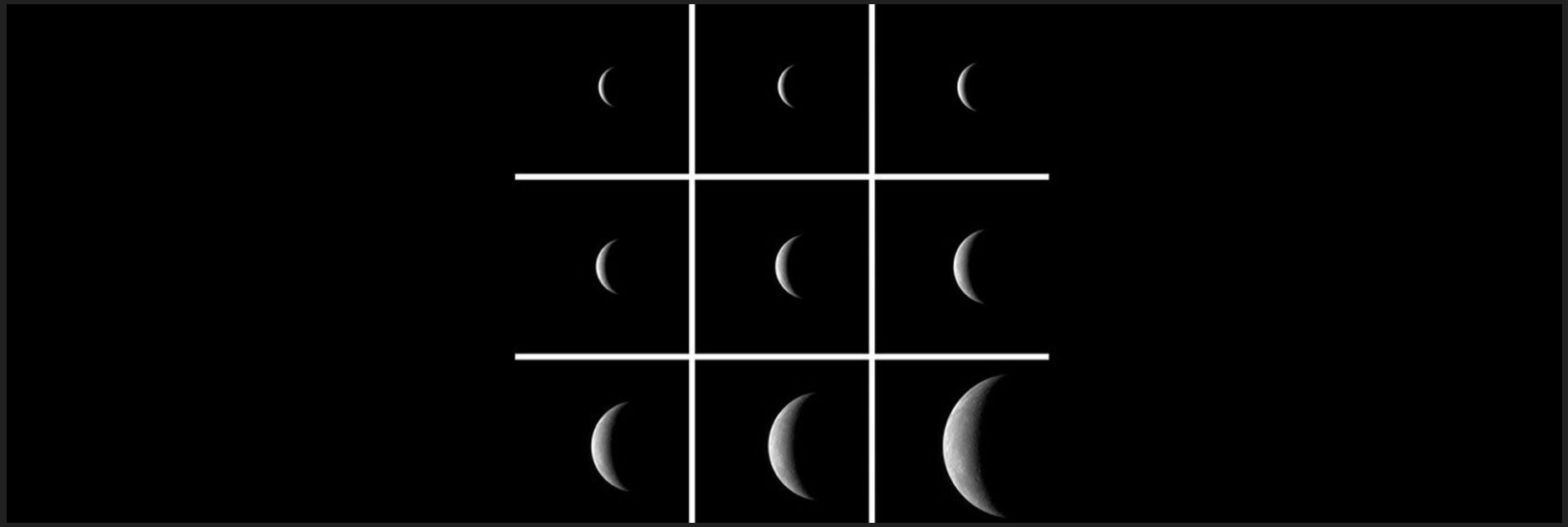


Mercury



- Mercury as the MESSANGER spacecraft approached it.

Mercury

- The surface of Mercury (MESSANGER flyby)

Mercury- Properties

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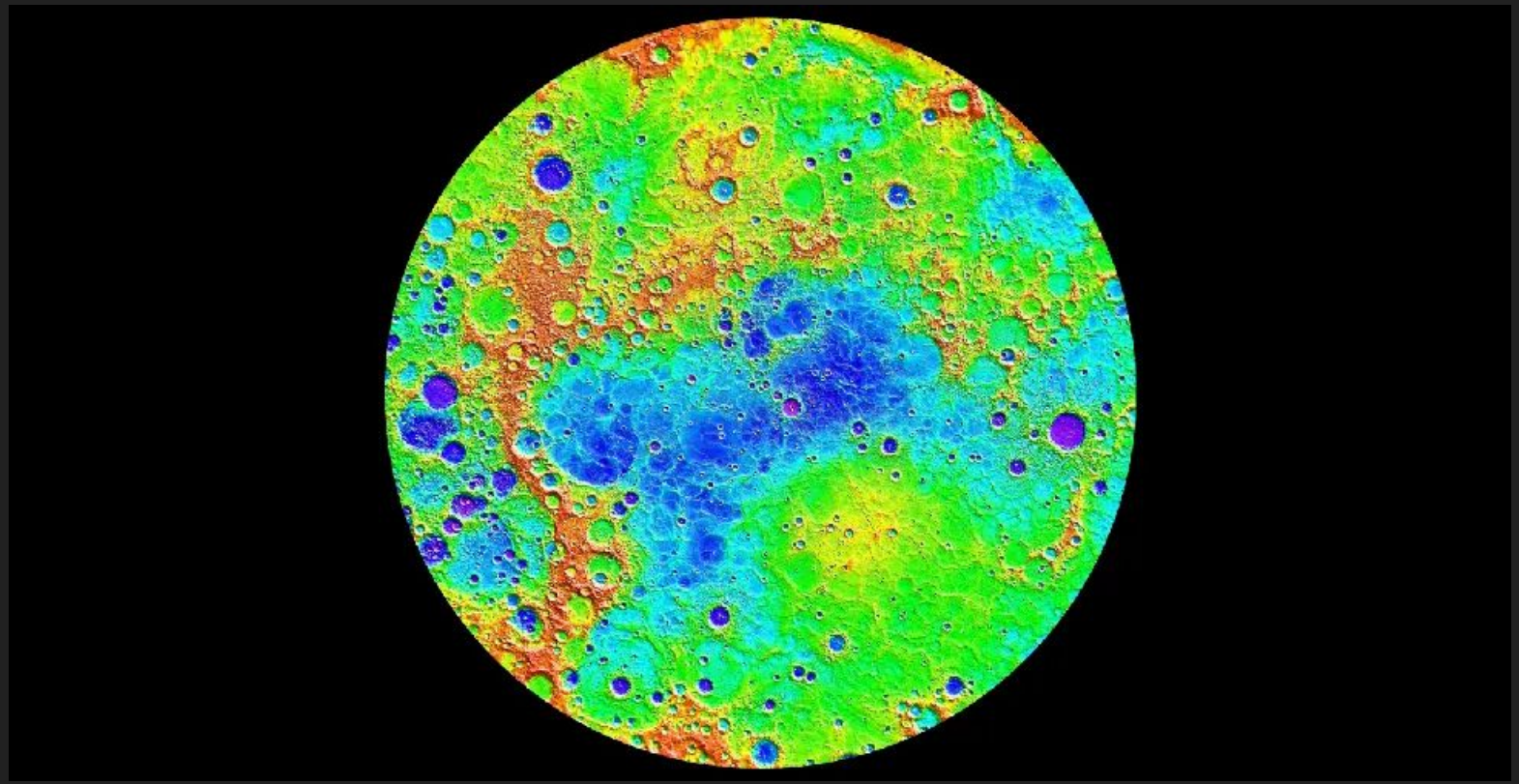
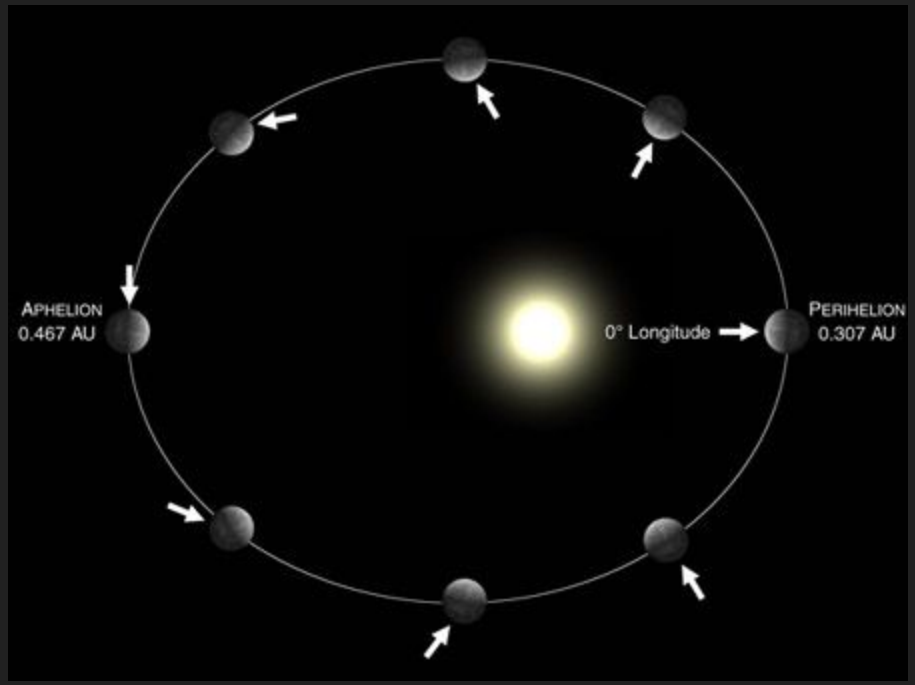


Mercury- Orbit

- Named after the Roman messenger god, Mercury.
- Similar to Earth's moon.
  - No atmosphere
  - Heavily cratered surface
- Closest planet to the Sun (a= 0.39 AU, P= 88 Earth days).
- Highest eccentricity (e= 0.206).
- No atmosphere causes large temperature changes.
  - T= 430 °C (day), -170 °C (night)

Mercury- Orbit



Mercury- Orbit

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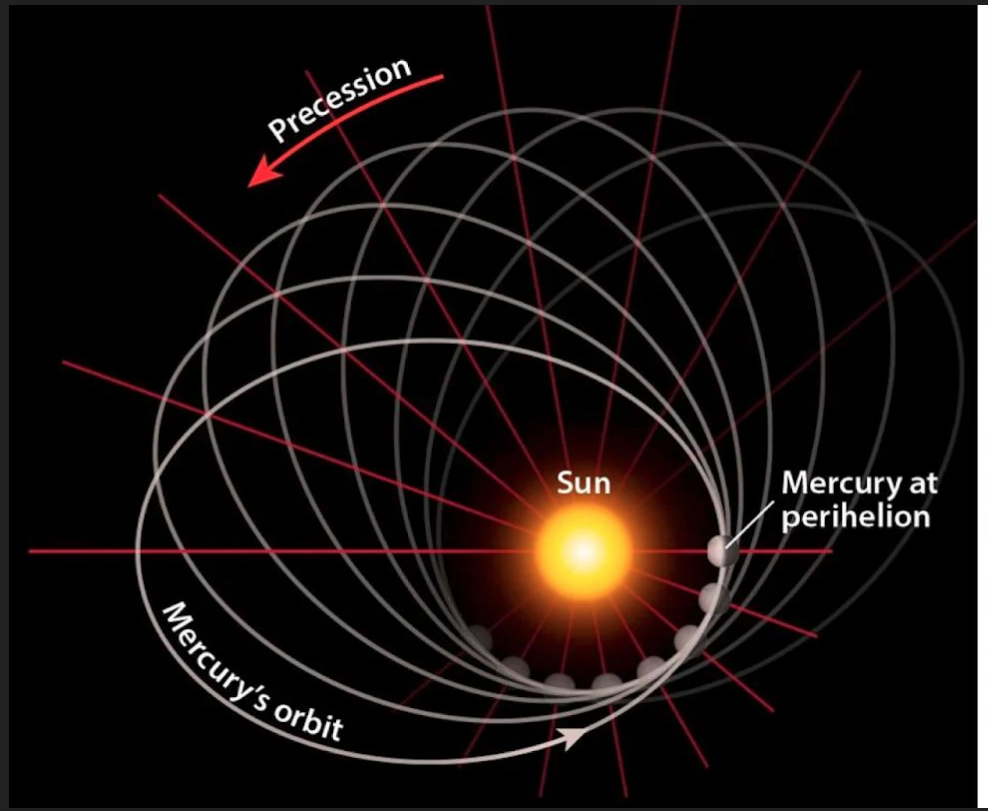
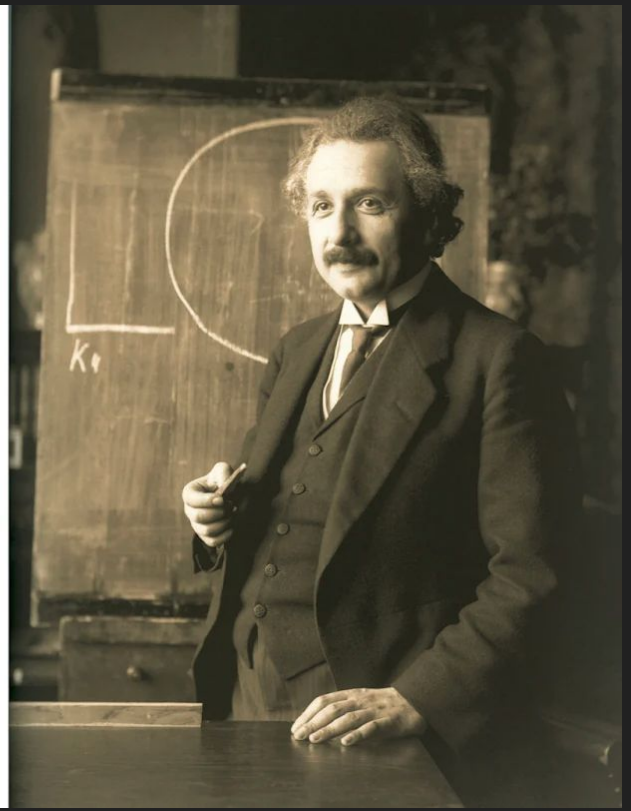
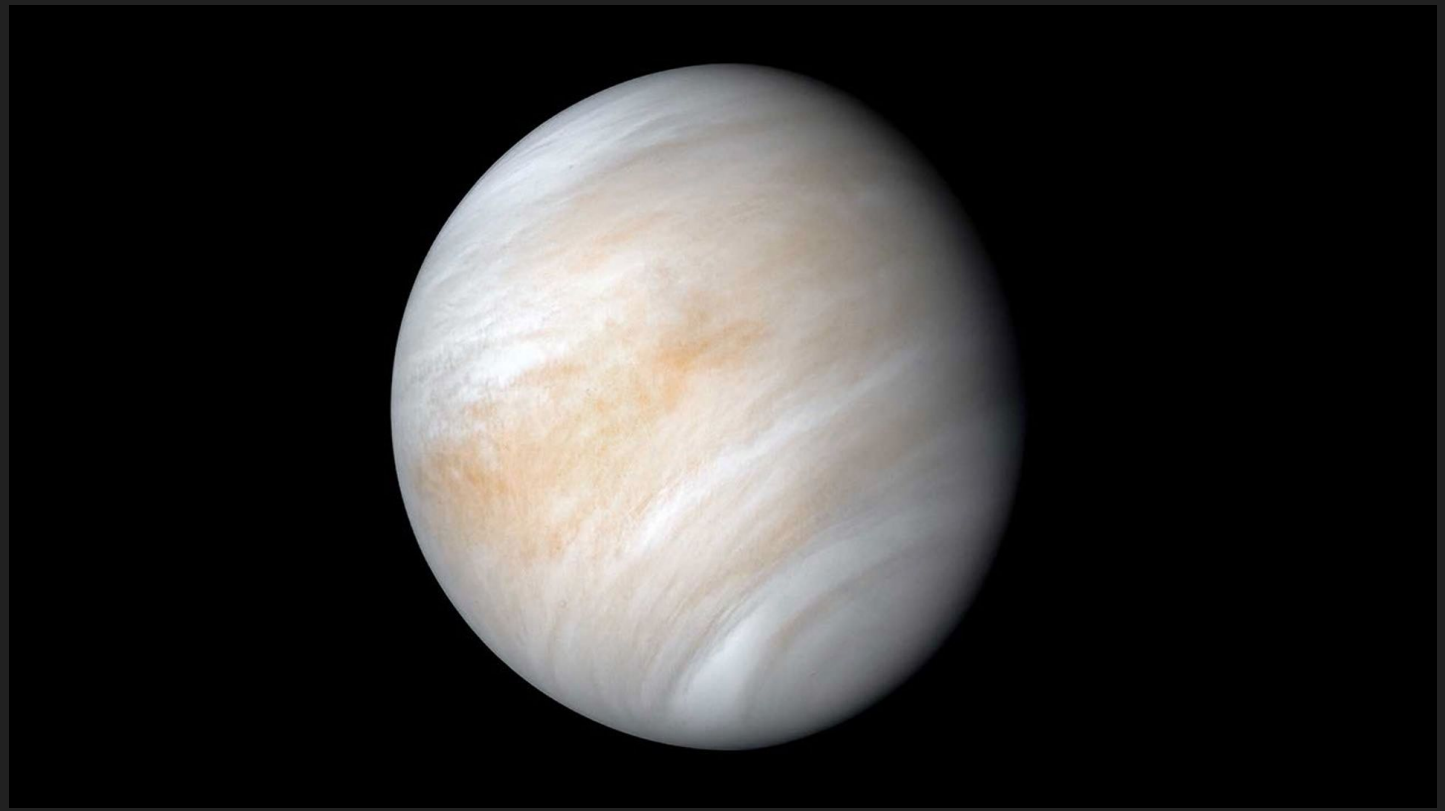




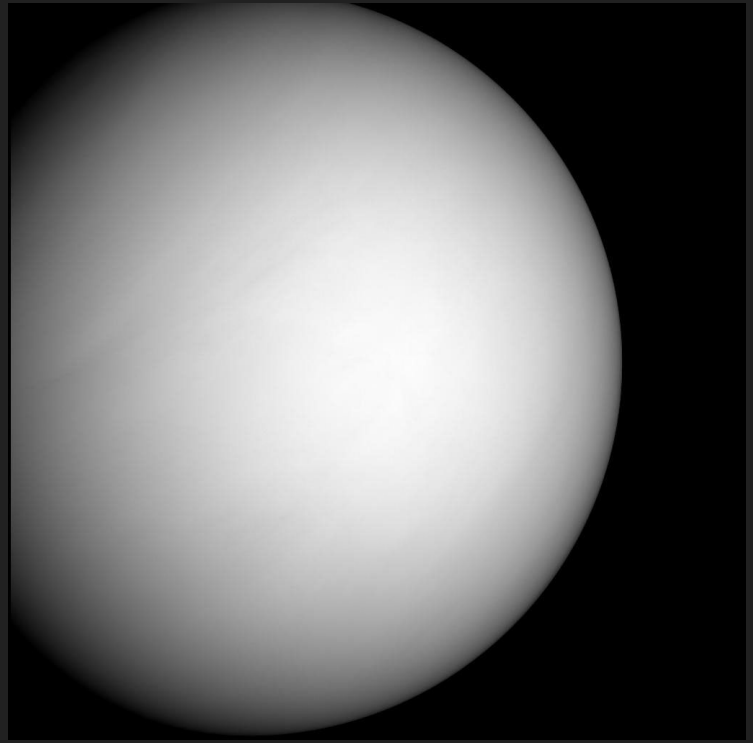
Mercury- Properties

- Mercury's rotational and orbital period are in a 2:3 resonance.
  - Tides from the Sun slowed down Mercury's rotation.
- Sun size and speed change drastically throughout the Mercury day and year.
- Because of resonance, the Sun is at noon and perihelion at the same longitudes on Mercury, called "hot longitudes."

Venus



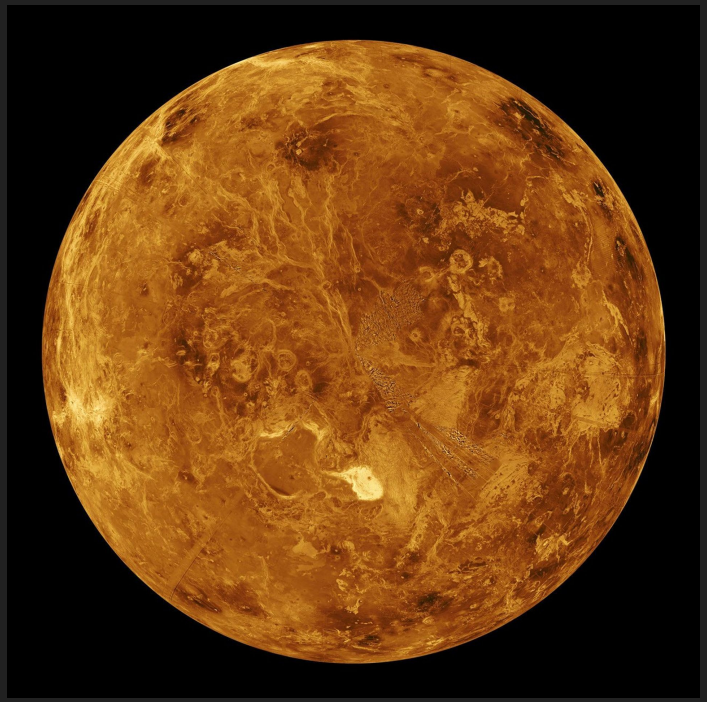
Venus



- The surface of Venus (MESSANGER flyby)

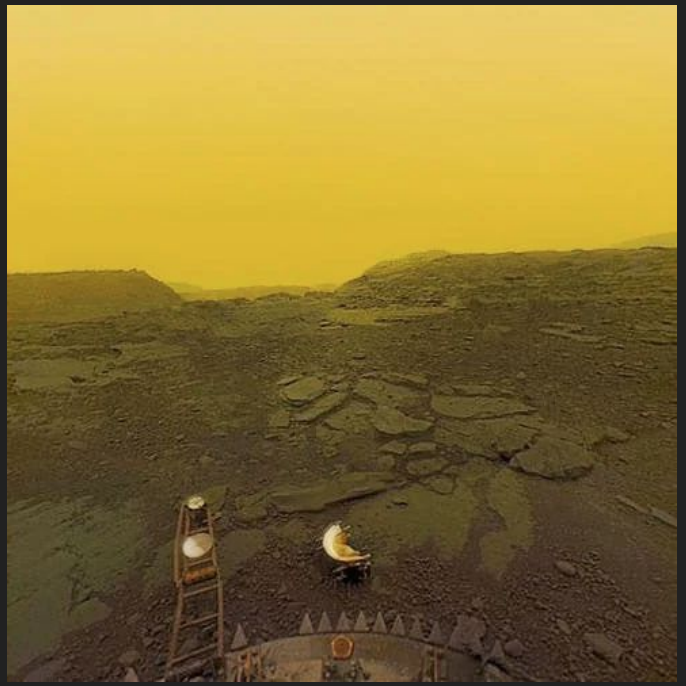
Venus

Mercury



- The surface of Venus (Magellan probe)

Mercury



- The surface of Venus (Venera-13 probe)

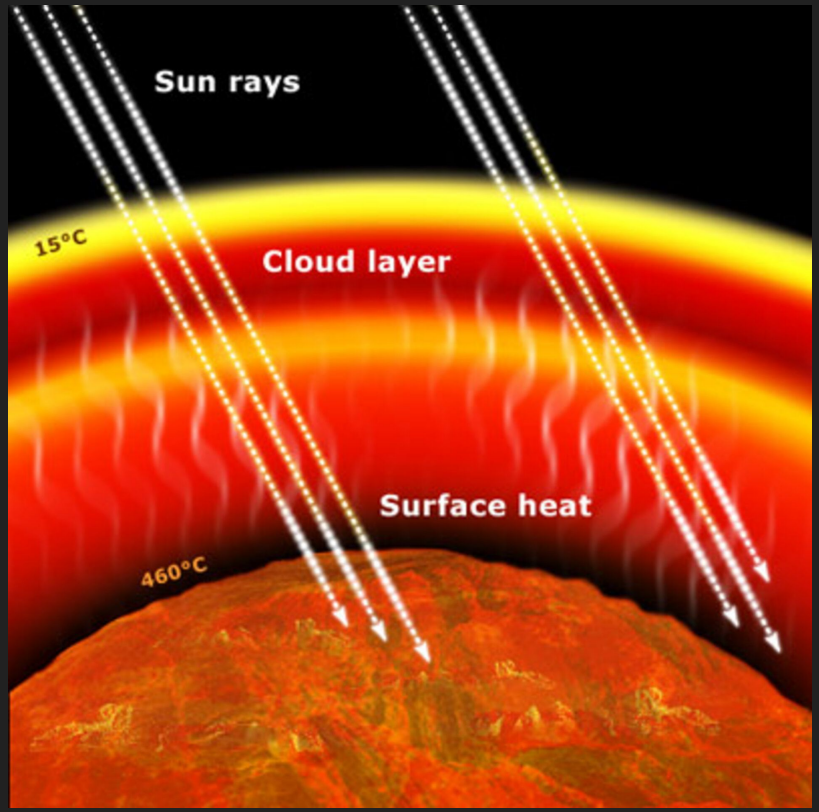
Venus- Orbit

- Named after the Roman fertility god, Venus.
- Similar to Earth
  - 0.82 times the mass of the Earth
  - Surface gravity 8.93 m s^{-2}.
- Retrograde, slow rotation (243 Earth days)
- Semi-major axis 0.72 AU
- Orbital eccentricity of 0.007

Venus- Properties

- Very high atmospheric pressure.
  - 96 % CO_2
  - 92 atm pressure!
- Surface temperatures is 470 °C, highest in the Solar System.
- Runaway greenhouse effect.

Venus- Properties



Announcements

- Homework 3 due today, 11:59 PM
- Homework 4 assigned.
- Exam next Friday (3 October), practice exam released today.

Next time

- The Gas giants