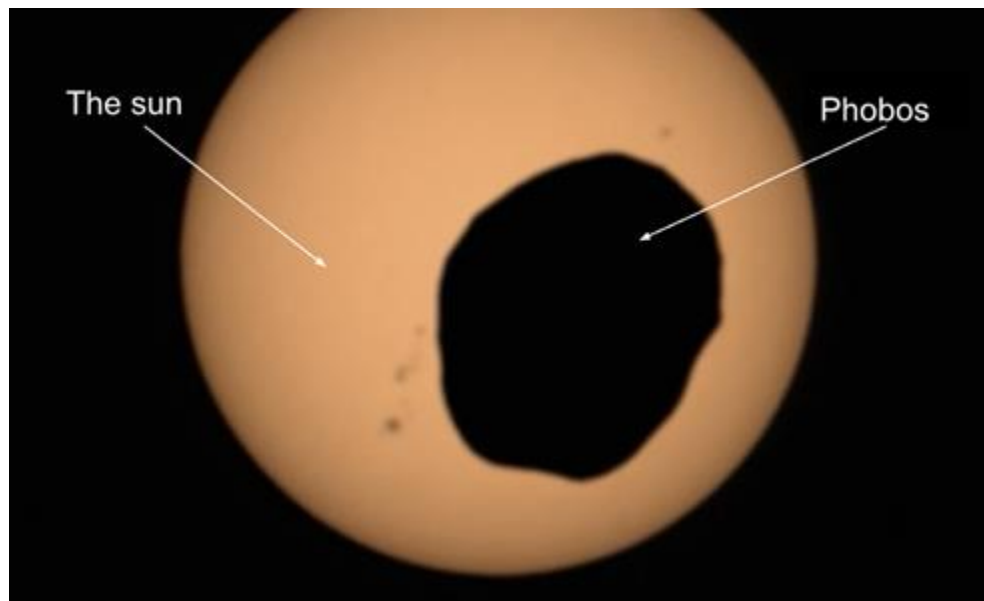


What do Eclipses look like on other planets?

The Inner Planets:

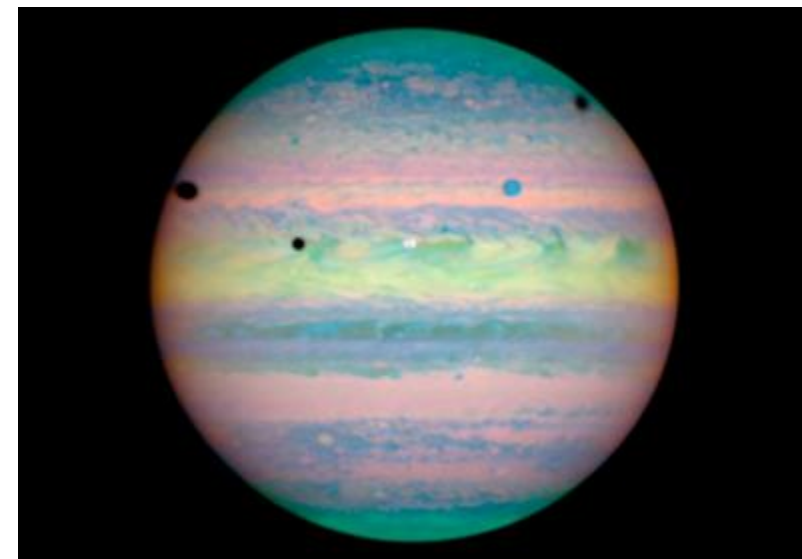
- Mercury & Venus do not have any moon to eclipse them.
- Mars's two moons, Phobos and Deimos, are too small to completely block out the Sun:



- When a smaller object moves in front of a larger object, it is called a **transit**.

The Outer Planets:

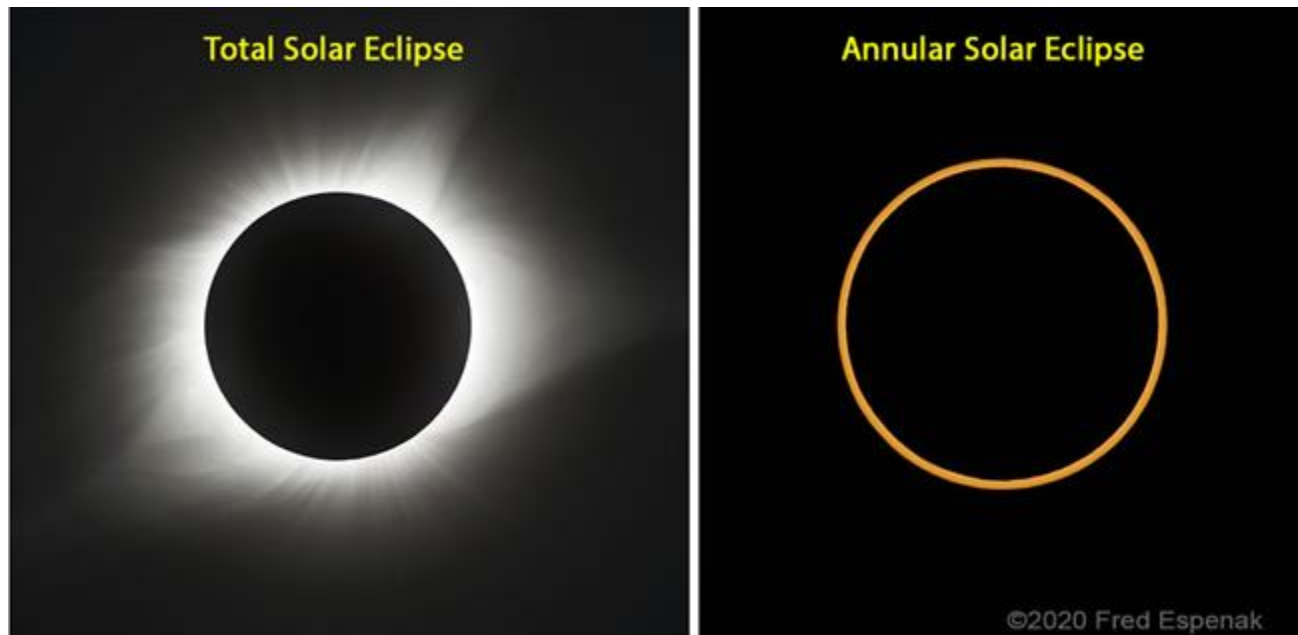
- The Sun is very far from the outer planets so it looks much smaller in the sky.
- The moons can be closer which causes many of them to completely block out the Sun's light.
- When a larger object moves in front of a smaller object and completely covers it, it is called an **occultation**.
- Jupiter can experience eclipses from multiple moons at the same time:





Earth:

- Why doesn't the earth experience eclipses every month? **The moon's orbital path is slightly misaligned.**
- The moon is slowly moving away from the Earth and in roughly 600 million years we will have our last total solar eclipse.



Pluto:

- Pluto experiences eclipse from its moon Charon, but since the same side of Pluto and Charon always face each other, the same area of the moon and planet experience the eclipse.



Eclipses on Mars and Jupiter compared to Earth

The numbers for Earth:

Angular size of the Sun	Angular size of the moon	Duration of this totality:	Speed of the shadow
0.5335°	0.521°	3 min 51 sec	1250 mph

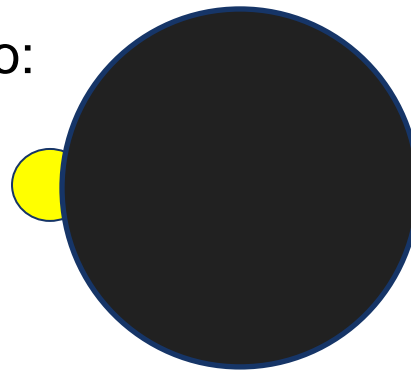


Things to understand:

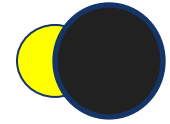
- The greater the angular size an object has, the larger it appears in the sky.
- The speed of the shadow is the speed at which the moon's shadow moves across the earth.
- If the moon orbital speed is greater than the Earth's rotational speed, the shadow of the moon moves west to east, as it does on Earth.
- In contrast, if the Earth's rotational speed were faster than the moon's orbital speed, the shadow of the moon would move east to west.



Io:



Callisto:



The numbers for Jupiter:

Europa & Ganymede:



Jovian Moon	Angular size of this moon	<u>Moon size</u> Sun size	Duration	Speed of the shadow
Io	0.59°	5.8 : 1	3 min 28 sec	10,690 mph
Europa	0.29°	2.9 : 1	2 min 33 sec	2650 mph
Ganymede	0.30°	2.9 : 1	5 min 42 sec	-3750 mph*
Callisto	0.15°	1.5 : 1	3 min 19 sec	-9750 mph*



Things to understand:



- Due to the angular size of the Sun, 0.103 degrees, being **smaller** than the angular size of each moon (shown above), Jupiter experiences **occultations**
 - **Occultation:** a much larger object moves in the path of a smaller object.
- For Jupiter, the duration comes in has a range. The duration of an eclipse on Earth falls in this range.
- The speed of the shadow on Jupiter is **larger** on Jupiter than on Earth.
- * shadow moves east to west. This opposes how earth experiences an eclipse.



The numbers for Mars:

Martian Moon	Angular size of the sun	Angular size of the moon	Transit Duration	Speed of the shadow
Phobos	0.35°	0.21°	-10 sec *	4250 mph
Deimos	0.35°	0.04°	-1 min 35 sec *	2480 mph

Interpretation:

- Due to the angular size of the Sun being so much **larger** than the angular size of the moon, Mars experiences a **transit**
 - **Transit:** a smaller body passes in front of a larger one:
- Mars's eclipses are **shorter** than Earth's.
- The speeds of the shadows on Mars is larger than the speed of the shadow on earth.
- * the negative duration indicates that Mars is experiencing a transit.

