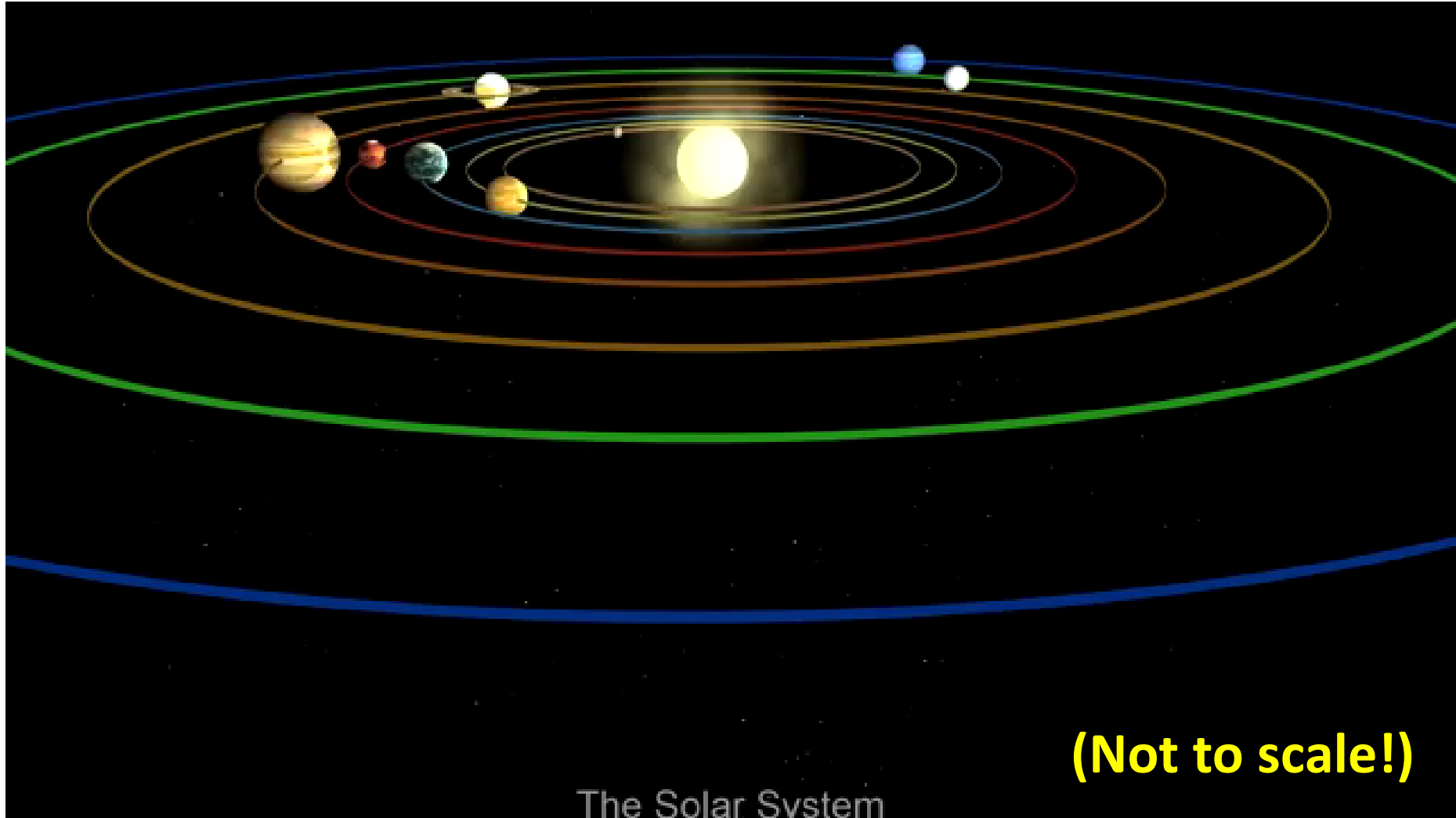
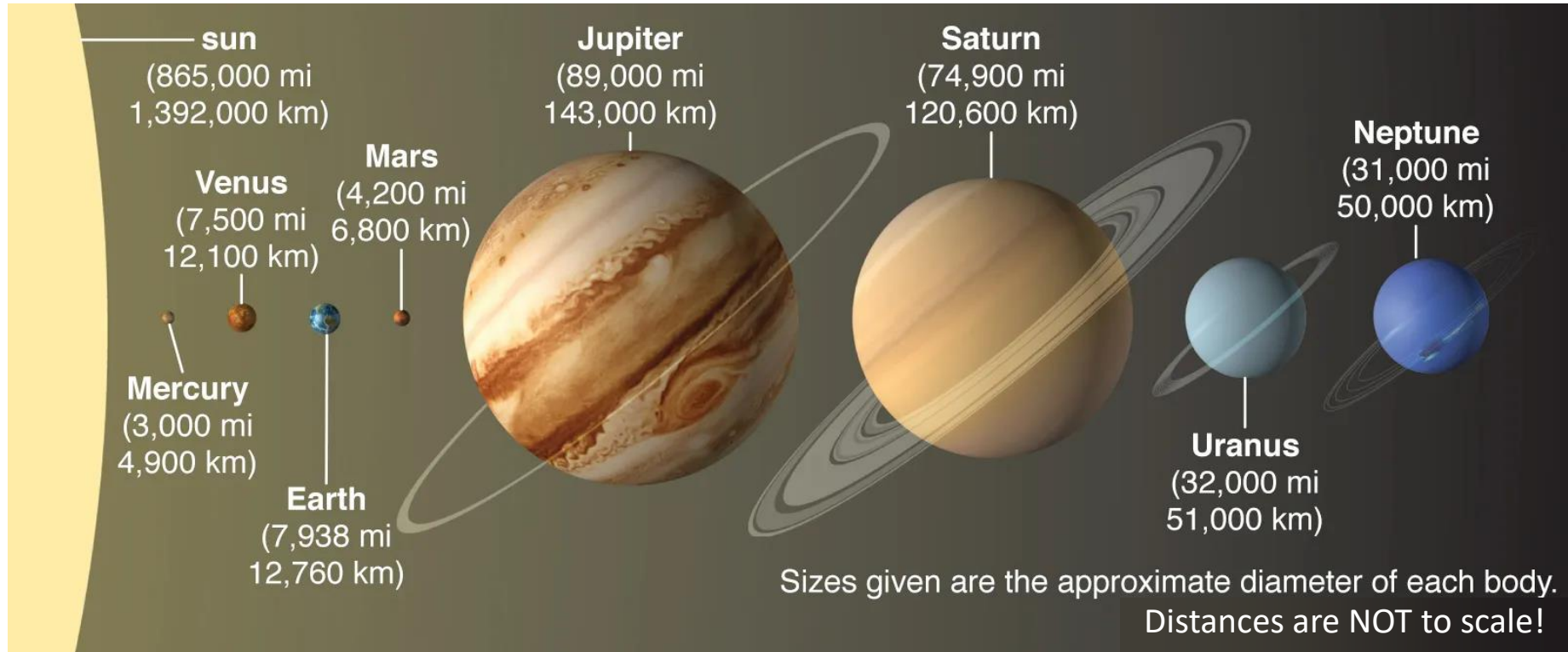


Solar System Part 2



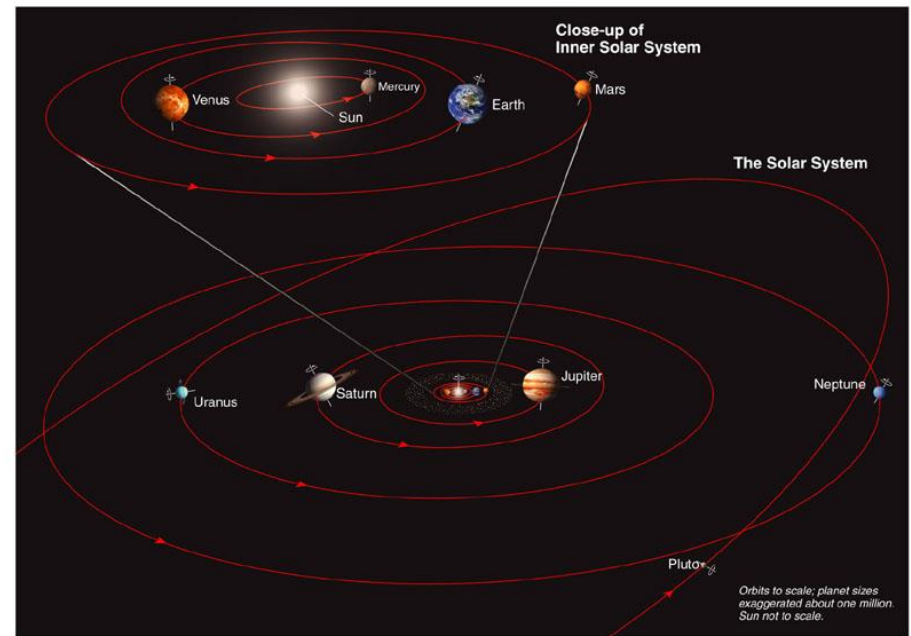
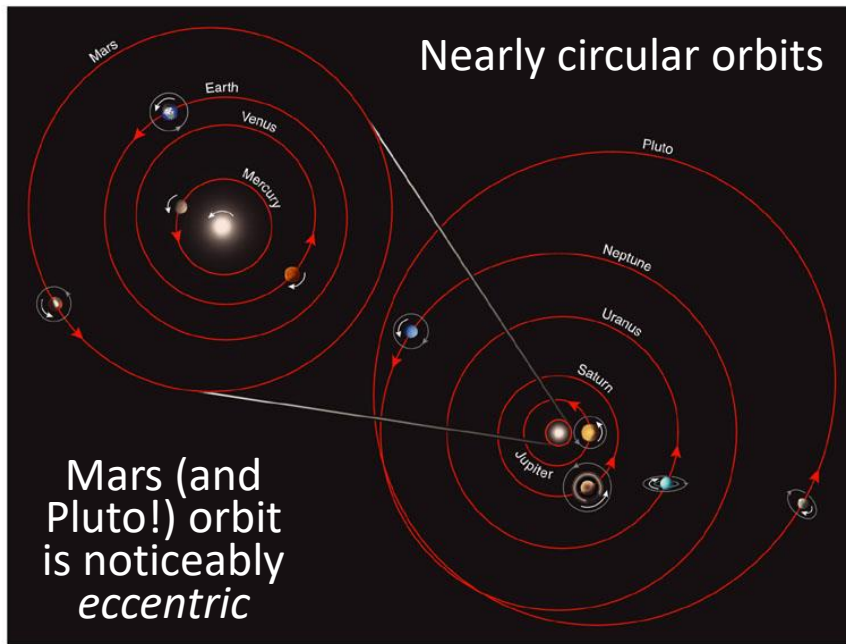
Sun and Planets: sense of scale



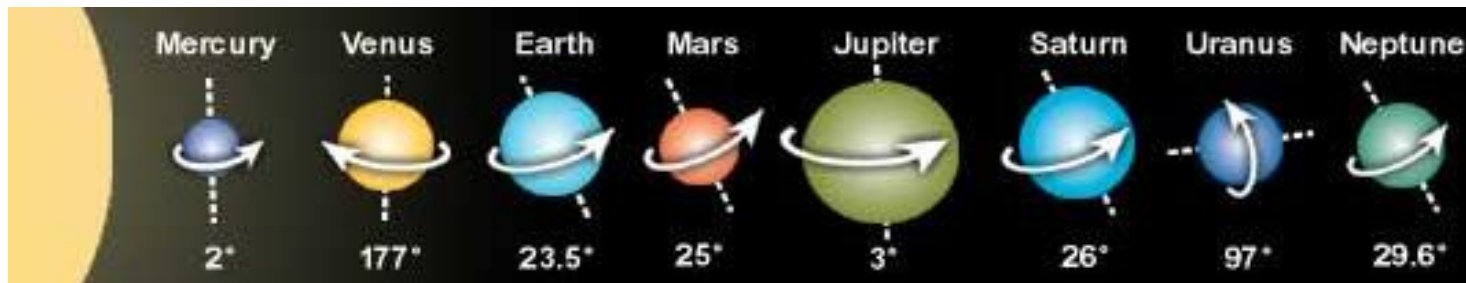
- **The Sun is about 100 times bigger than the Earth.**
- **Compared to the Earth by size: Mars is $\sim 1/2$, Mercury is $\sim 1/3$, Jupiter is $\sim 11x$, Uranus is $\sim 4x$.**

General Characteristics of Major Planets

All planets *revolve* in the same direction following nearly circular orbits, all within 10° of *ecliptics* - Earth's orbital plane.



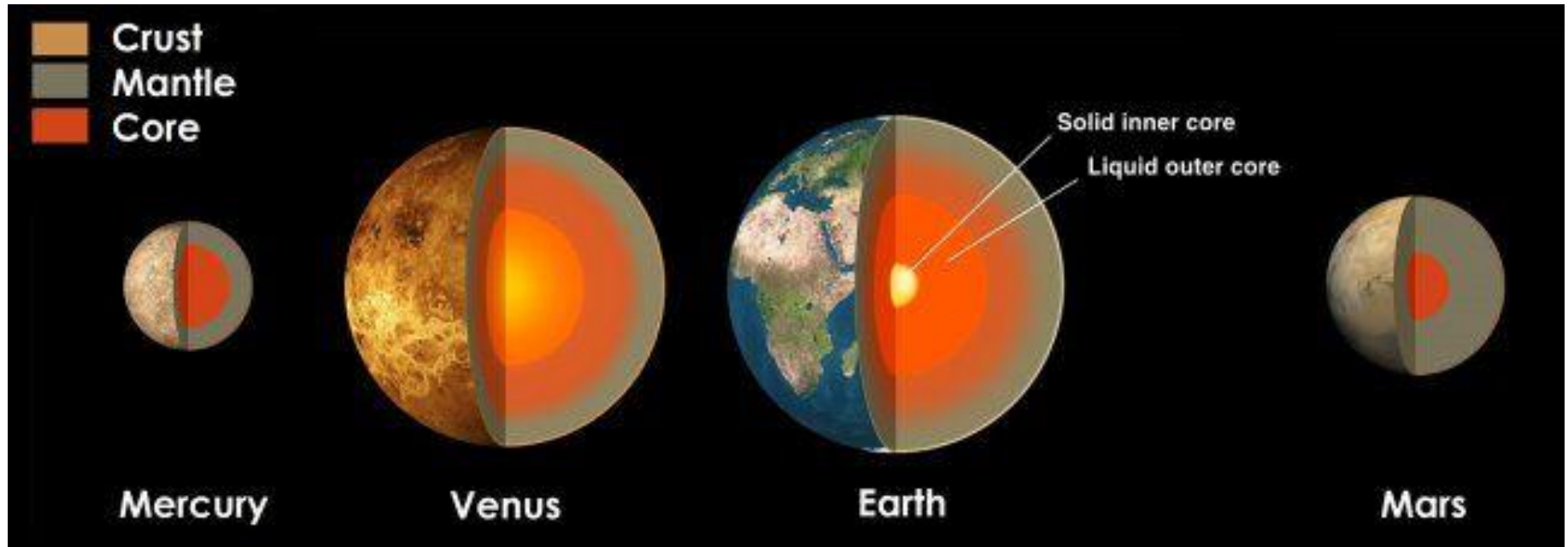
All **except Venus** *rotate* in the same direction.



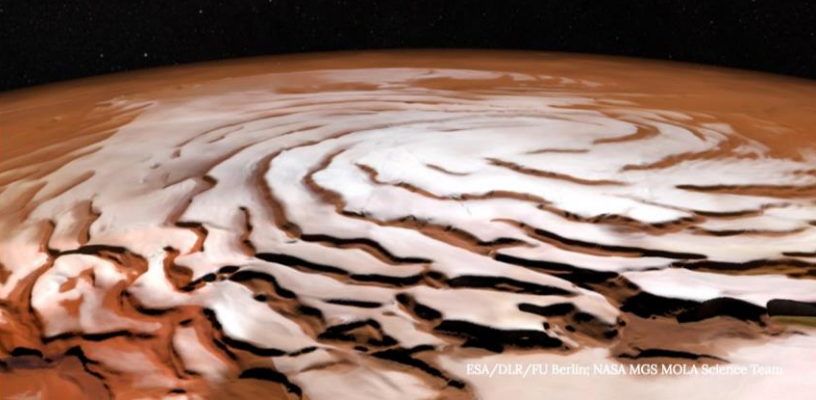
All have various *tilts*.

Inner (Terrestrial) Planets

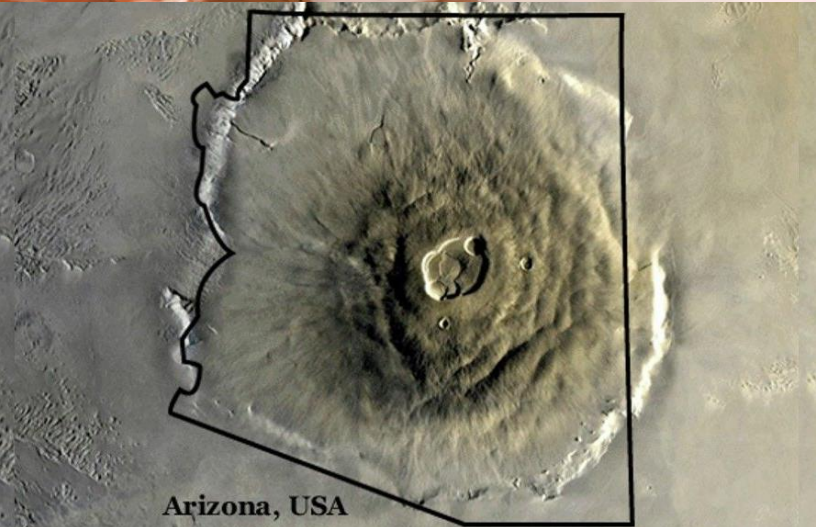
The four “Earth-like” planets closest to the Sun that have a solid “rocky” planetary surface.



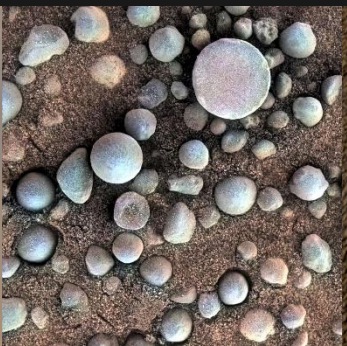
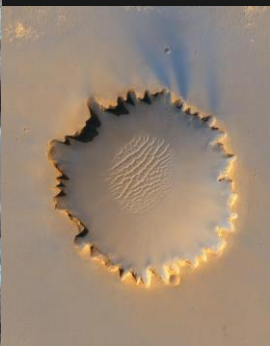
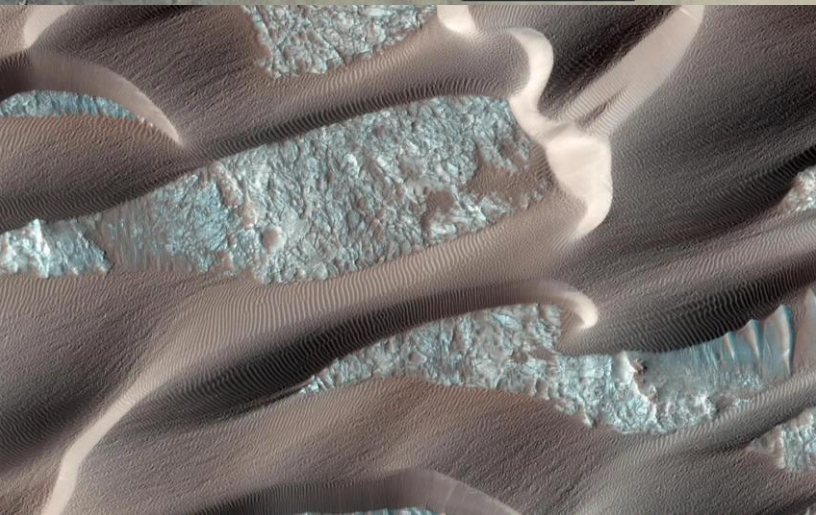
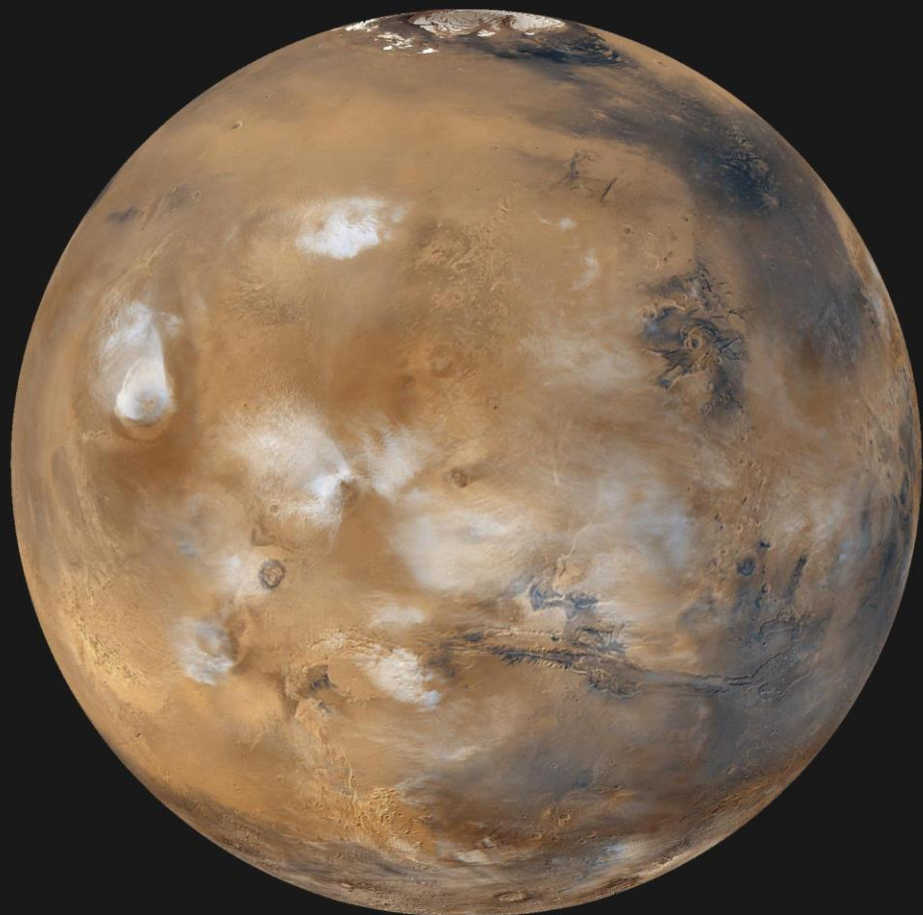
- Same basic type of structure, such as a central **metallic core** (mostly iron), with a surrounding **silicate mantle**.
- Possess **secondary atmospheres**, generated through volcanism or comet impacts after planet formation.

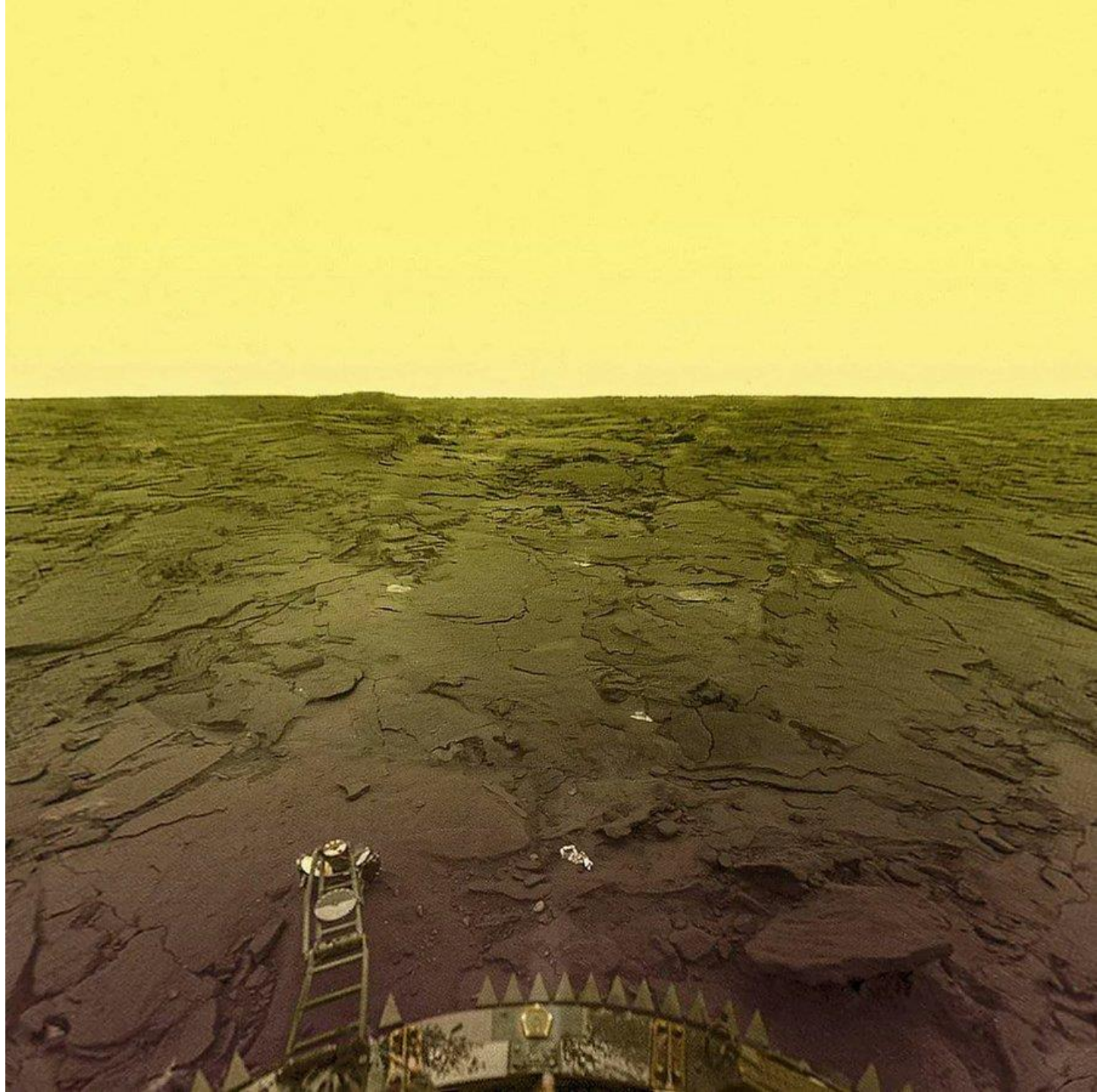


ESA/DLR/FU Berlin; NASA MGS MOLA Science Team



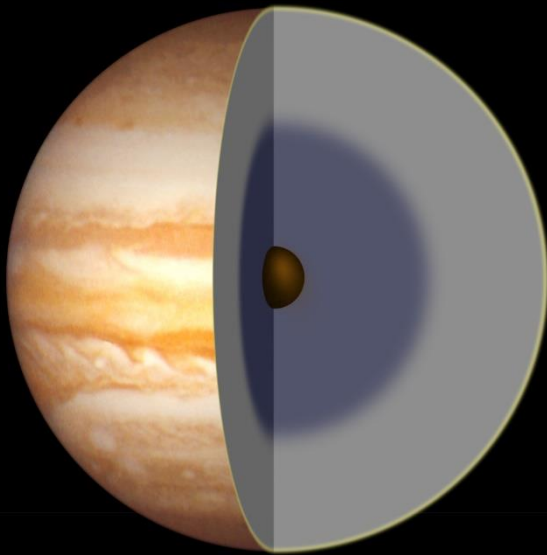
Arizona, USA



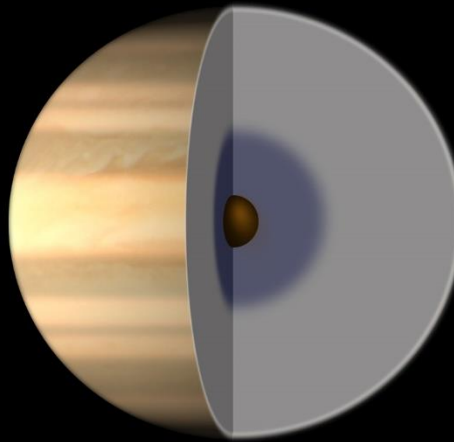


Outer (Jovian) Planets

Gas Giants



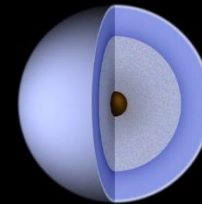
JUPITER



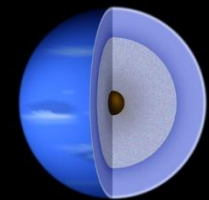
SATURN

Ice Giants

( EARTH
for comparison)



URANUS



NEPTUNE

 Molecular hydrogen

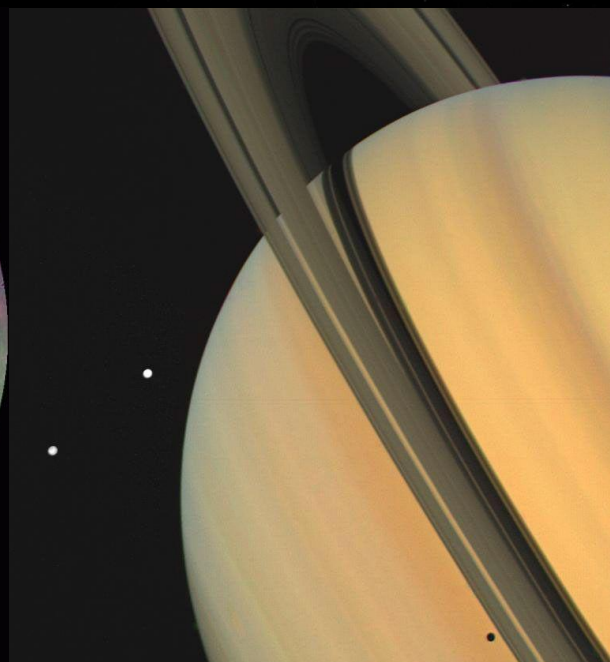
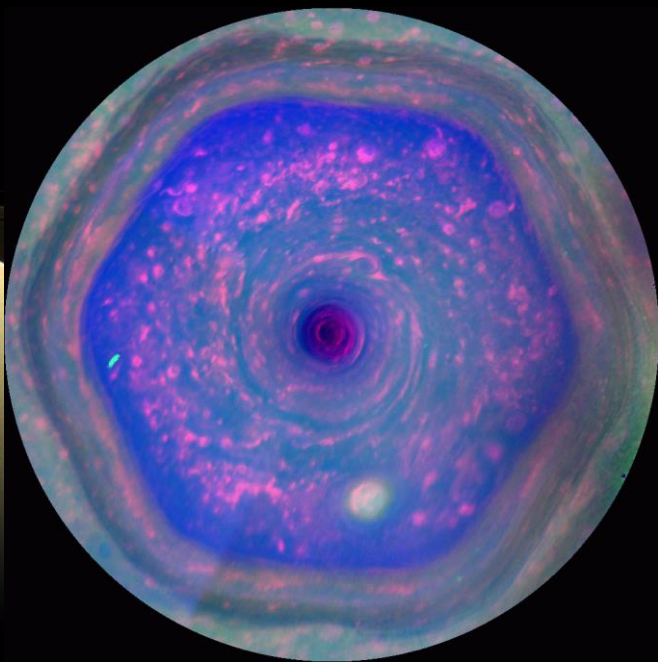
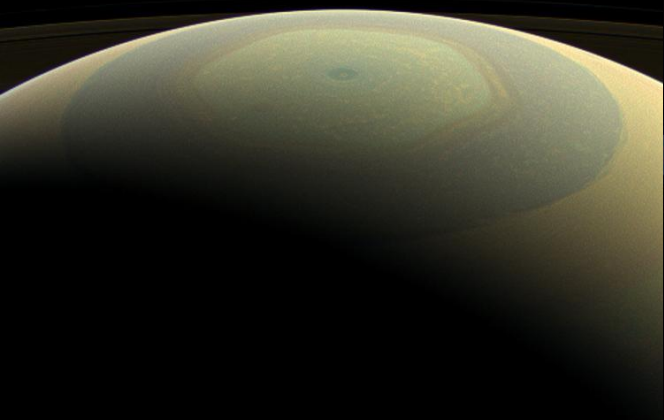
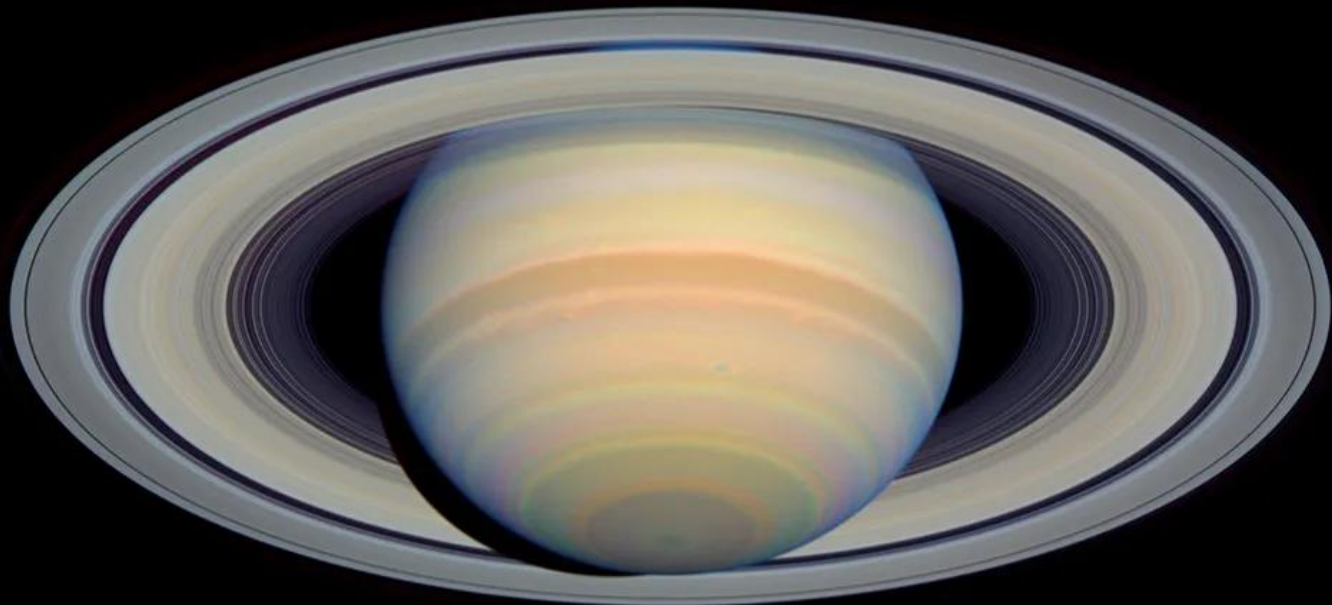
 Metallic hydrogen

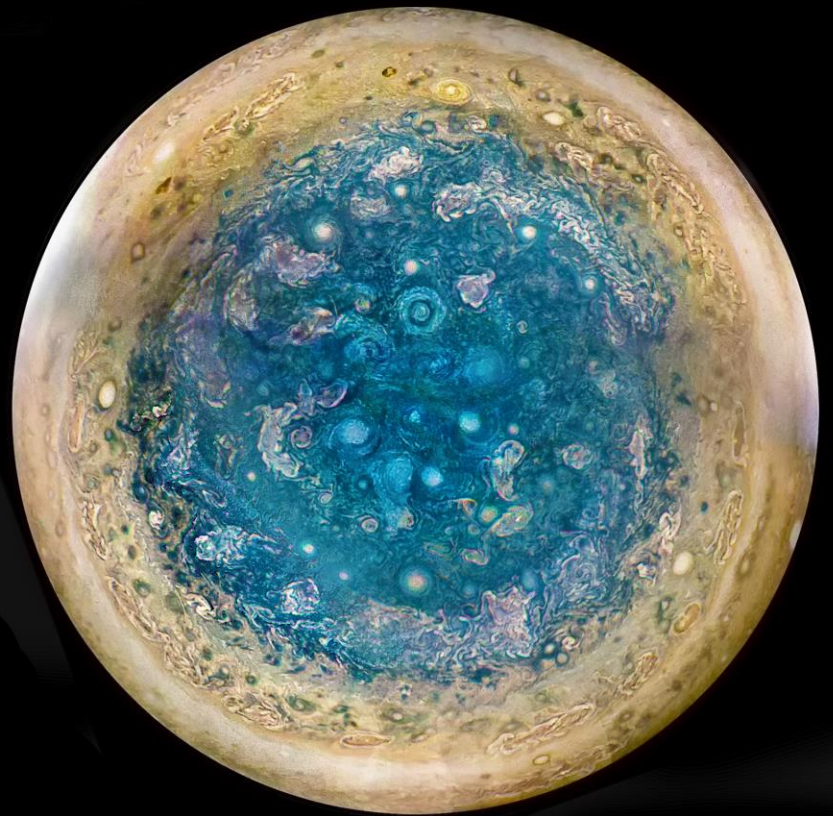
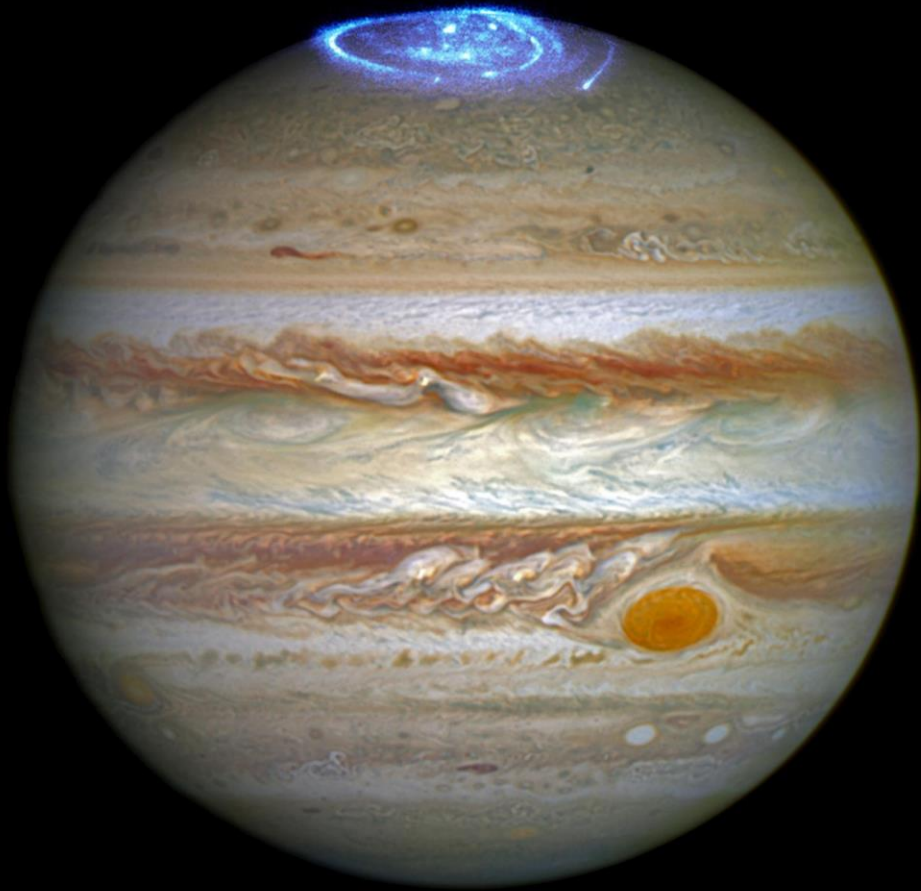
Primary (captured) atmosphere

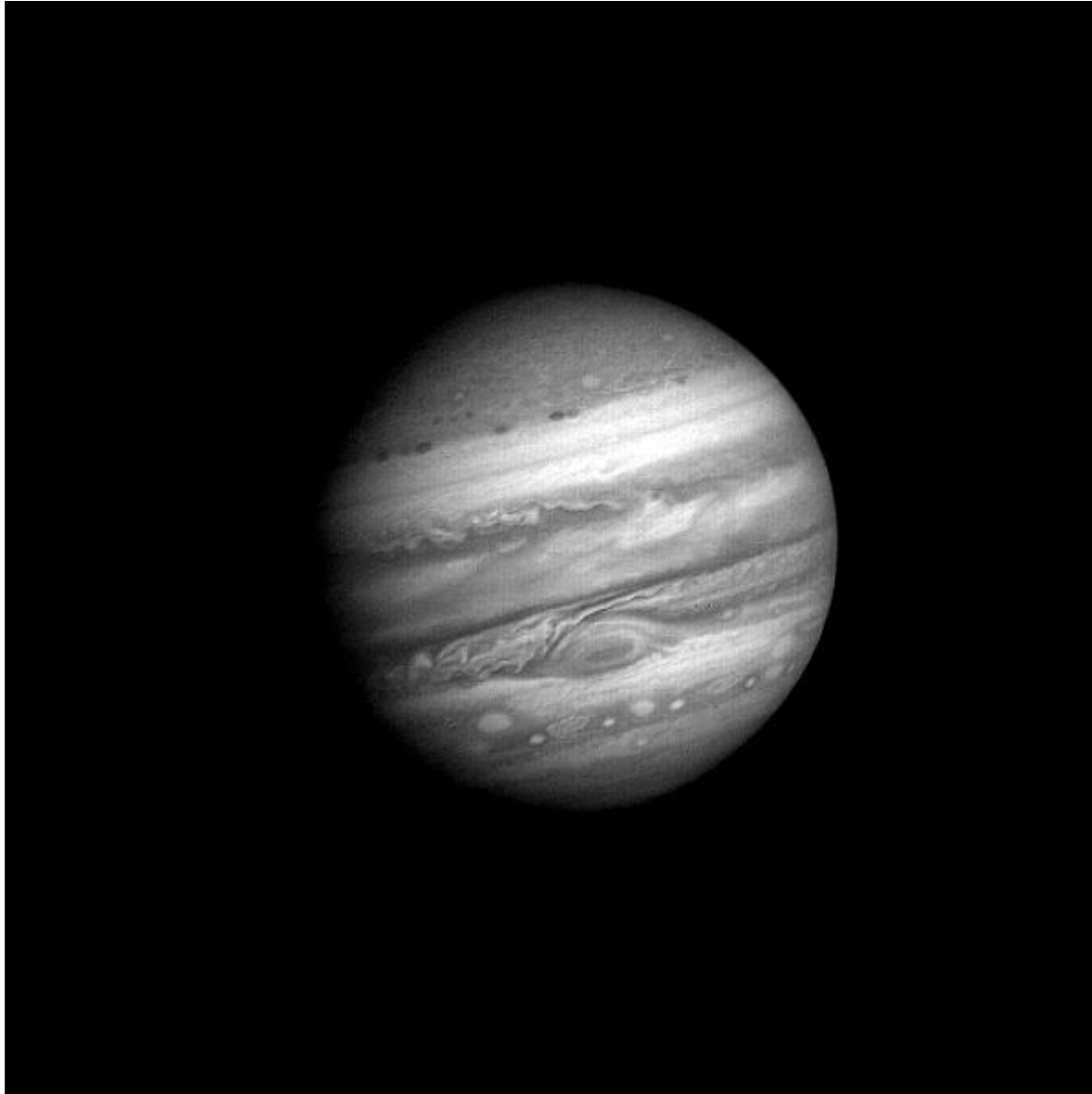
 Hydrogen, helium, methane gas

 Mantle (water, ammonia, methane ices)

 Core (rock, ice)







The original Voyager "Blue Movie"

produced by Jet
Propulsion
Laboratory in 1979
(so named because it
was built from Blue
filter images). It
records the approach
of Voyager 1, from 58
million kilometers to
31 million kilometers
from Jupiter, during a
period of over 60
Jupiter days.

Voyager Space Probes

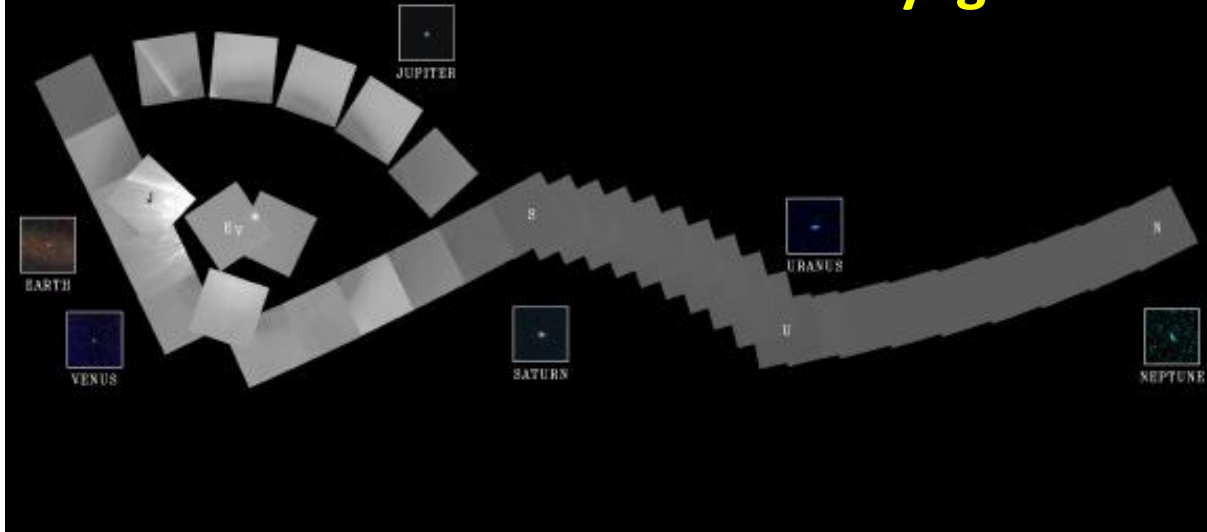
<https://science.nasa.gov/mission/voyager/>

- Launched in 1977, **Voyager 1** and its twin **Voyager 2** are the only spacecraft ever to operate outside the heliosphere.
- **Primary mission:** exploration of Jupiter and Saturn; completed in 1989.
- **Extended mission:**
 - **Voyager 1** proceeded with Voyager Interstellar Mission (VIM), left heliosphere in 2012 and is **currently about 1 light day away from Earth.**

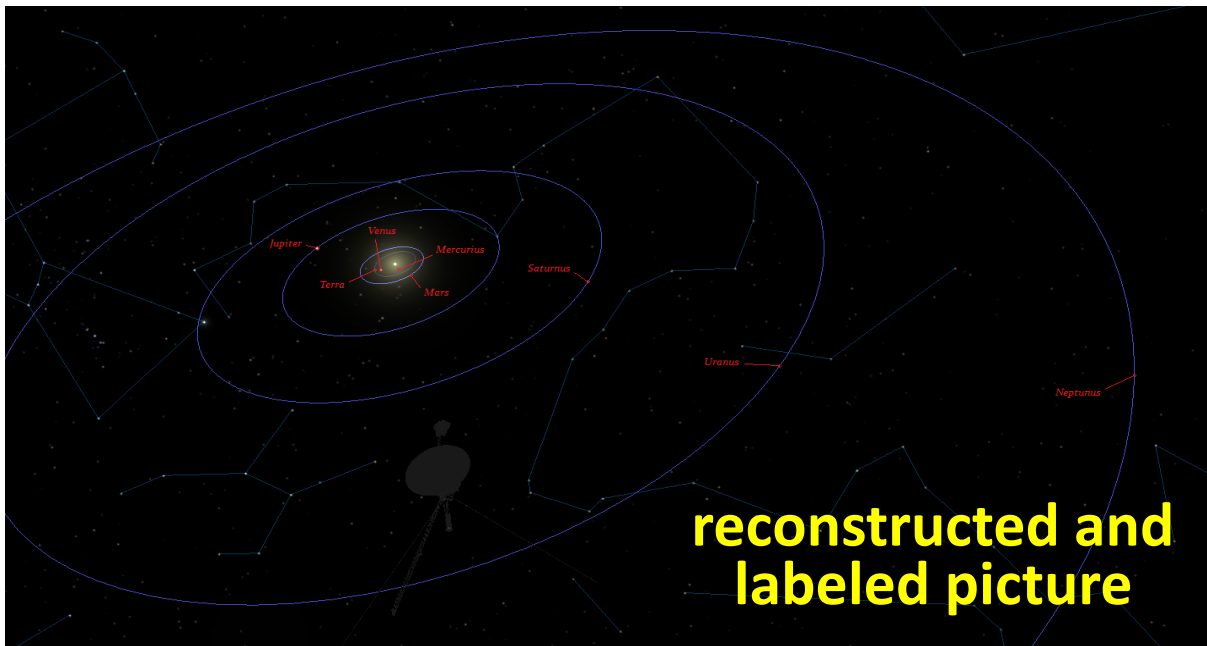


- **Voyager 2** first visited Uranus and Neptune, then joined VIM, entering interstellar space in 2018.

images taken by Voyager 1



On **February 14, 1990**, the cameras of **Voyager 1** pointed back toward the Sun and took a series of pictures of the Sun, Earth and other planets, making the first ever (and the only!) **'family portrait'** of the **Solar System** as seen from the **outside**.



reconstructed and
labeled picture