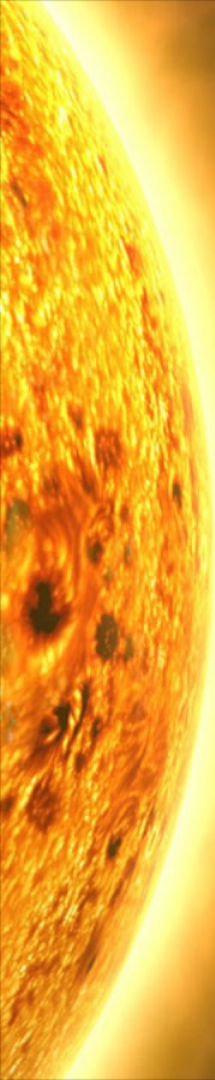


Planets in our Solar System



Mercury
Venus
Earth
Mars

Jupiter

Saturn

Uranus
Neptune

PLANETS

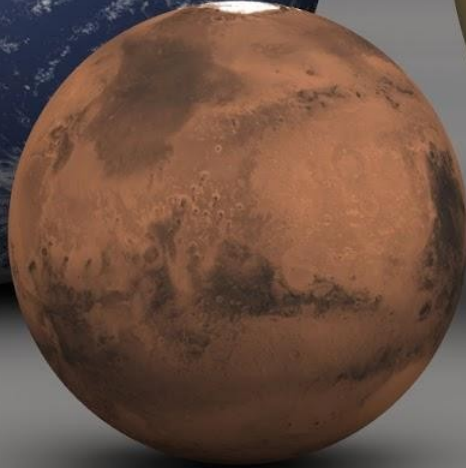
Ceres

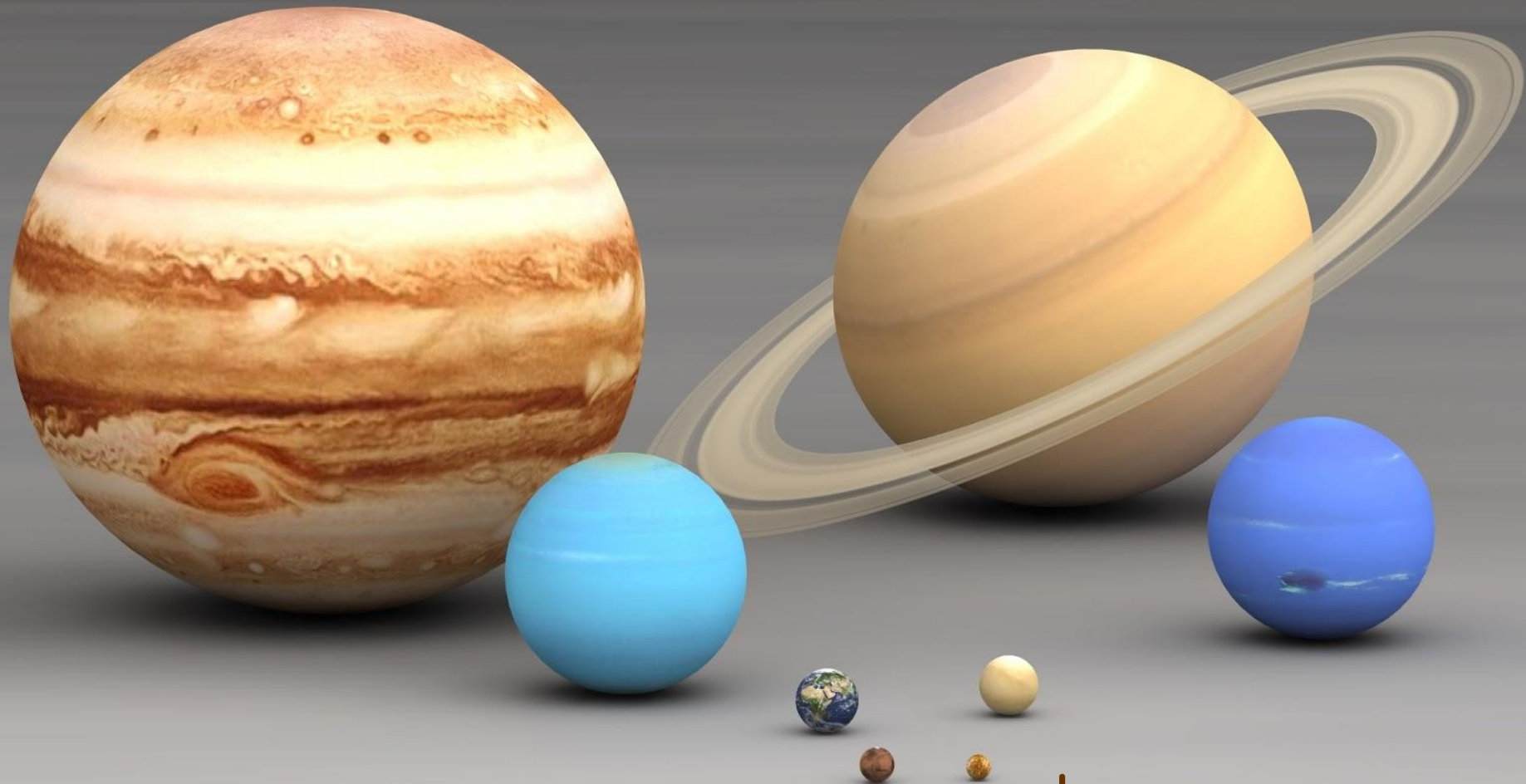
Pluto
Haumea
Makemake
Eris

**DWARF
PLANETS**

our Solar System is full of planets

the rocky planets





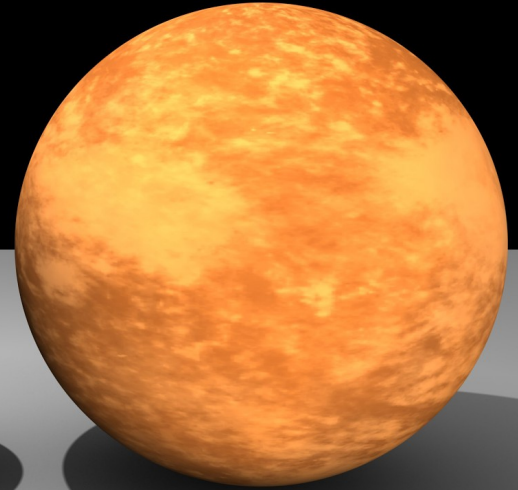
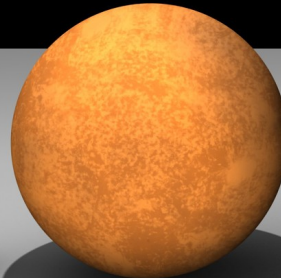
the gas giants



and our Sun

our Sun is not even
among the biggest stars

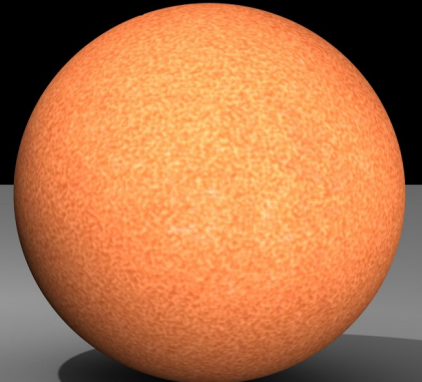
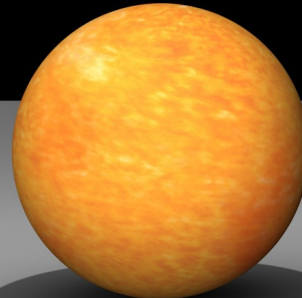
The Sun



Giant Star

Super Giant Stars

Giant Star



and it's not
among the oldest either

18 Sco

HIP 56948

Sun today

16 Cyg B

HIP 102152

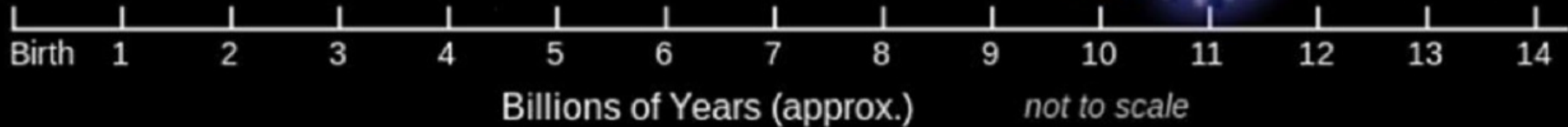
Life Cycle of the Sun

Gradual warming

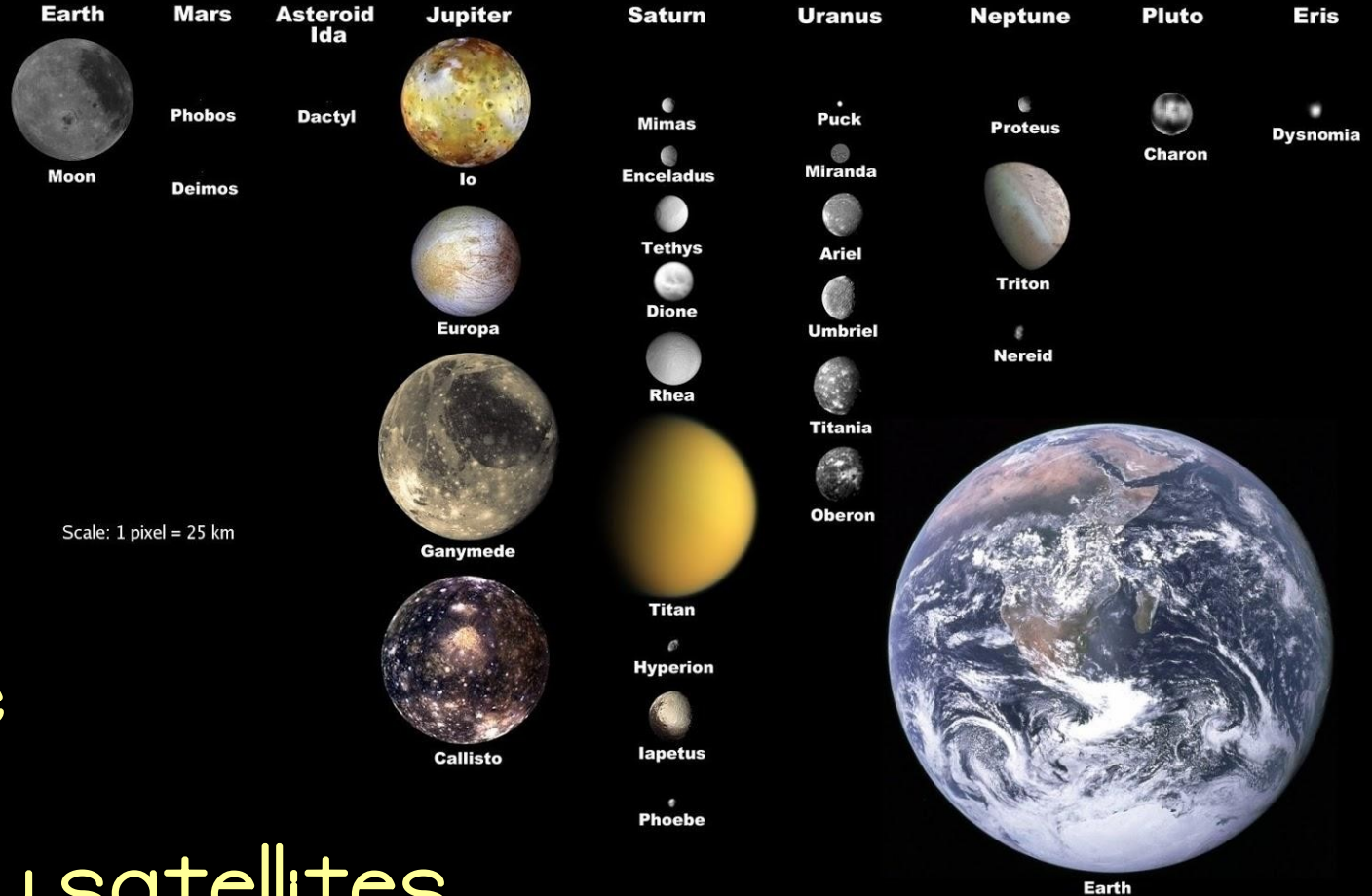
Red Giant

Planetary Nebula

White Dwarf

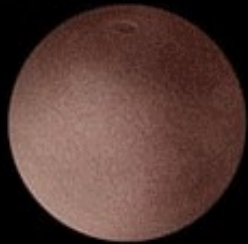


Selected Moons of the Solar System, with Earth for Scale



there are
also
many satellites

Makemake



Dysnomia



Eris



Luna

Charon

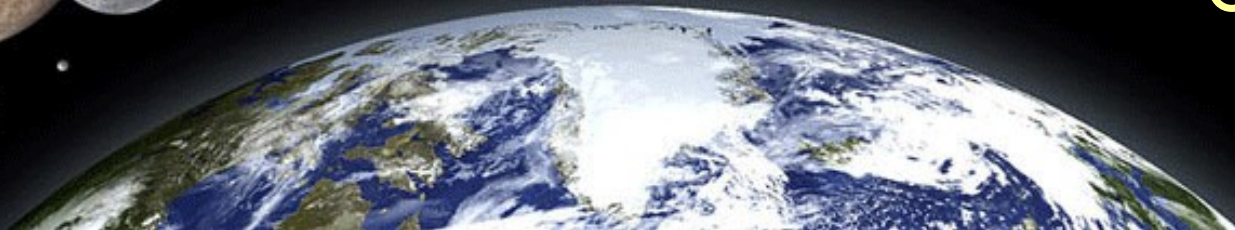


Pluto

Ceres



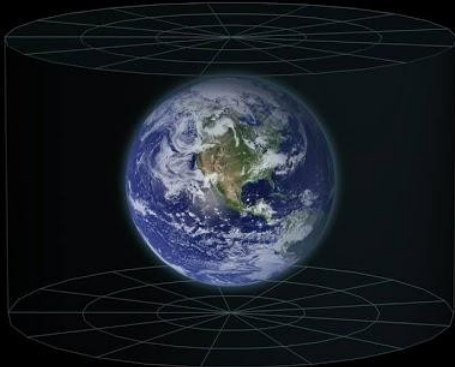
Earth



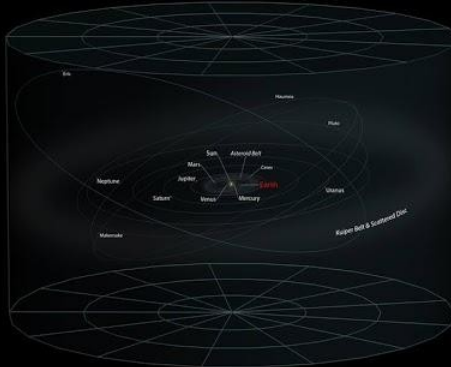
and
a few
dwarf
stars

we are just a small point in the Universe

Earth



Solar System



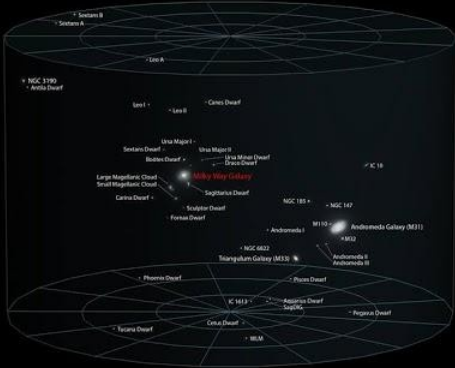
Solar Interstellar Neighborhood



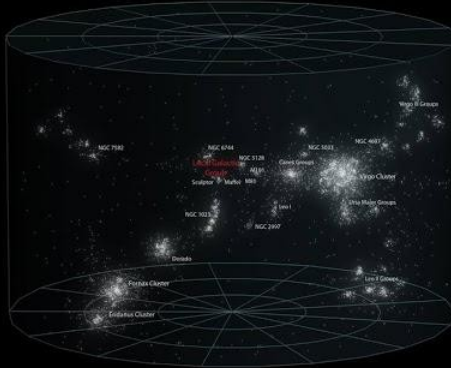
Milky Way Galaxy



Local Galactic Group



Virgo Supercluster



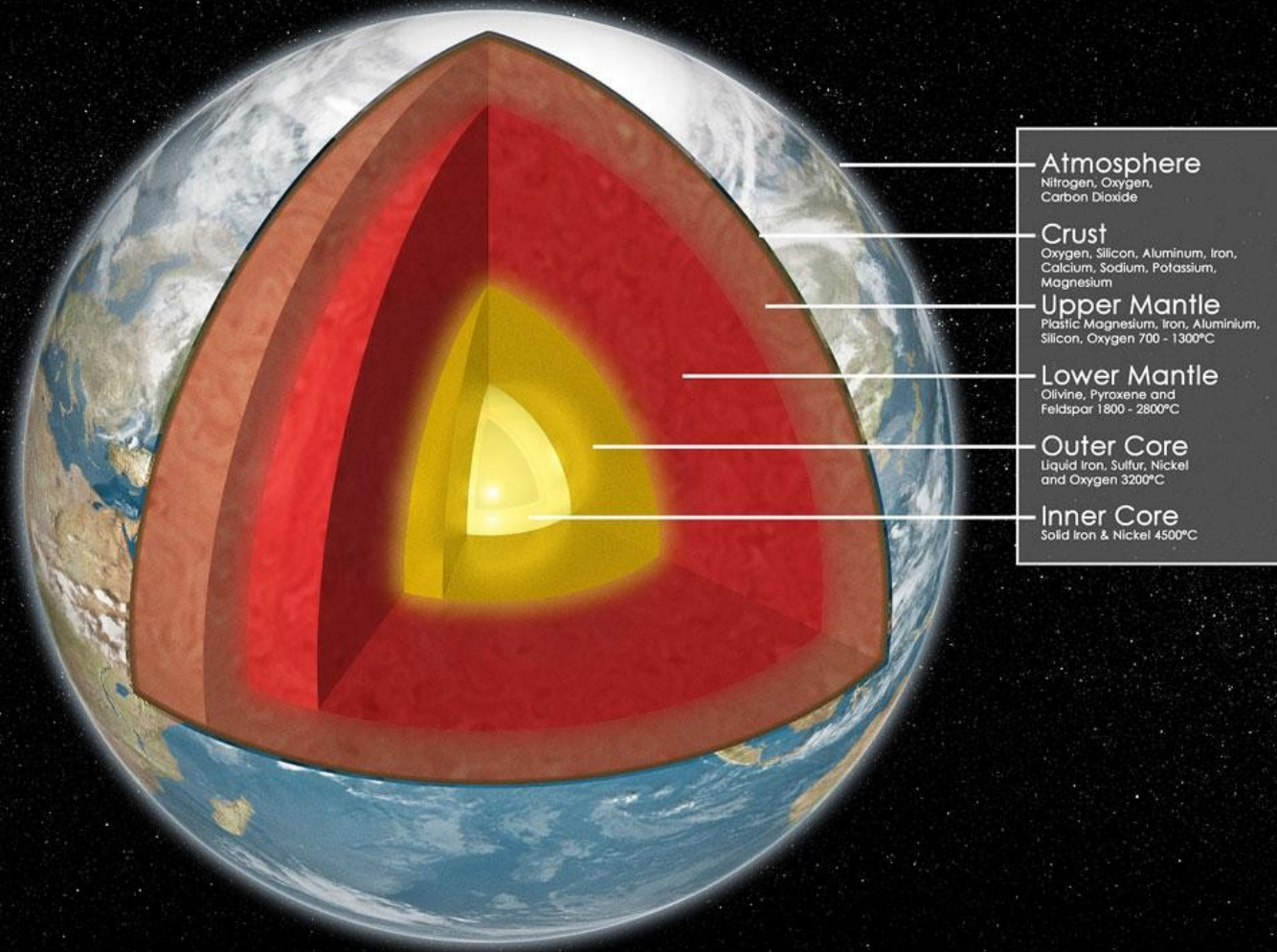
Local Superclusters



Observable Universe

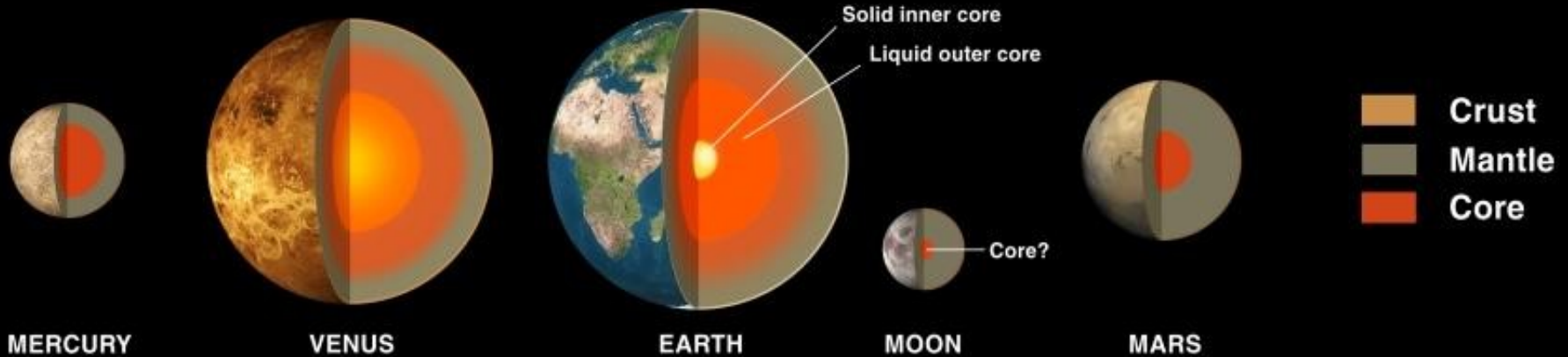


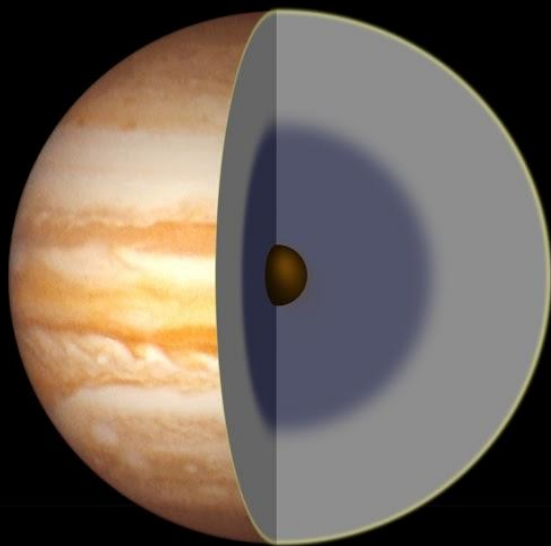
Earth: Cross Section



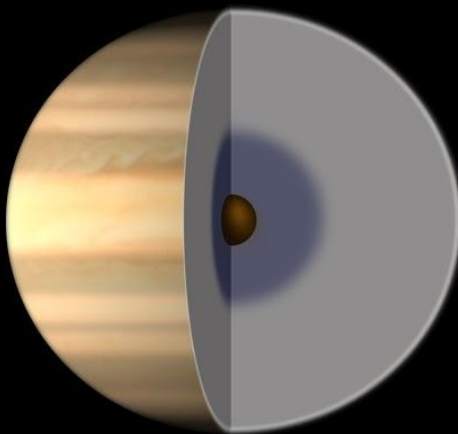
the
Earth
has
a
very
warm
core
and
some
layers

just like the other rocky planets

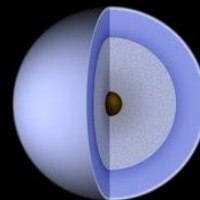




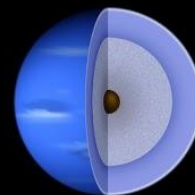
JUPITER



SATURN



URANUS



NEPTUNE



EARTH

■ Molecular hydrogen

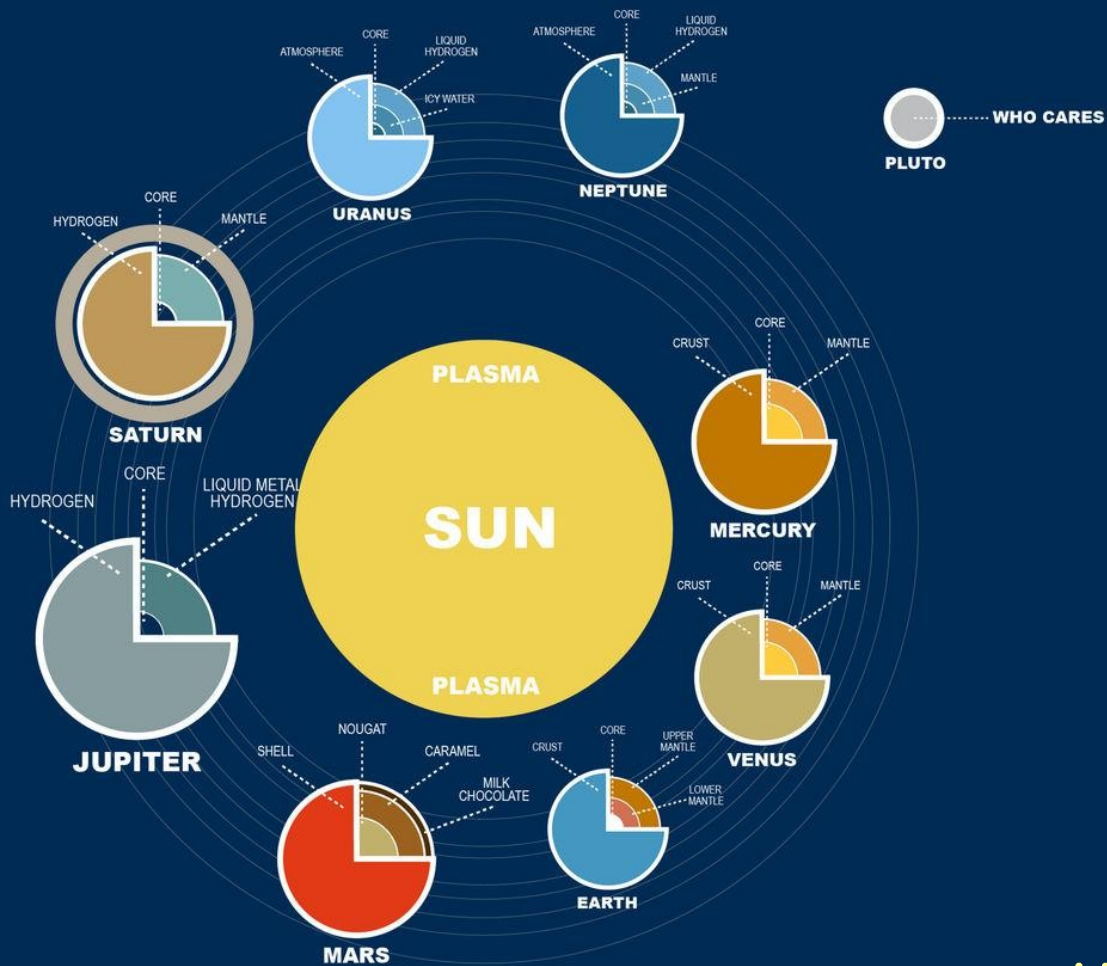
■ Metallic hydrogen

■ Hydrogen, helium, methane gas

■ Mantle (water, ammonia, methane ices)

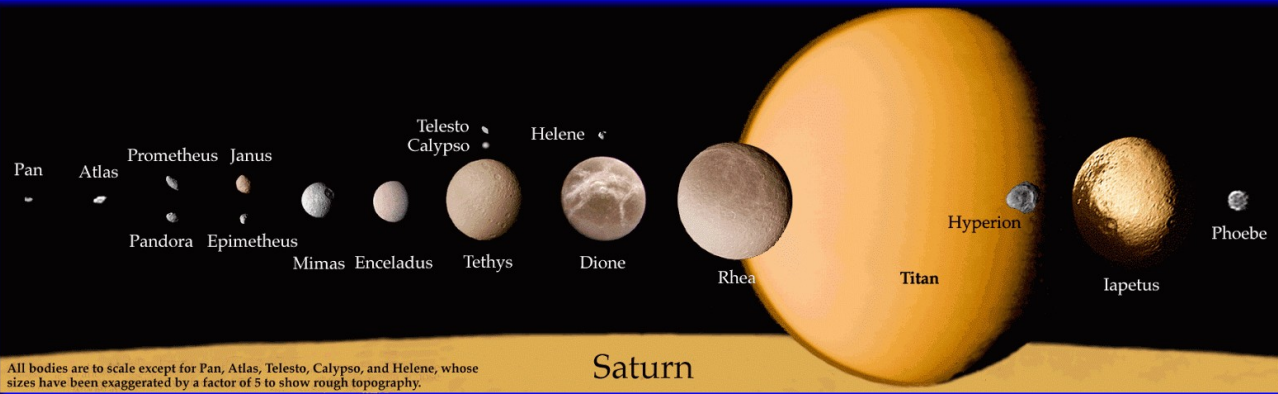
■ Core (rock, ice)

and the gas giants



this
IS
where We live

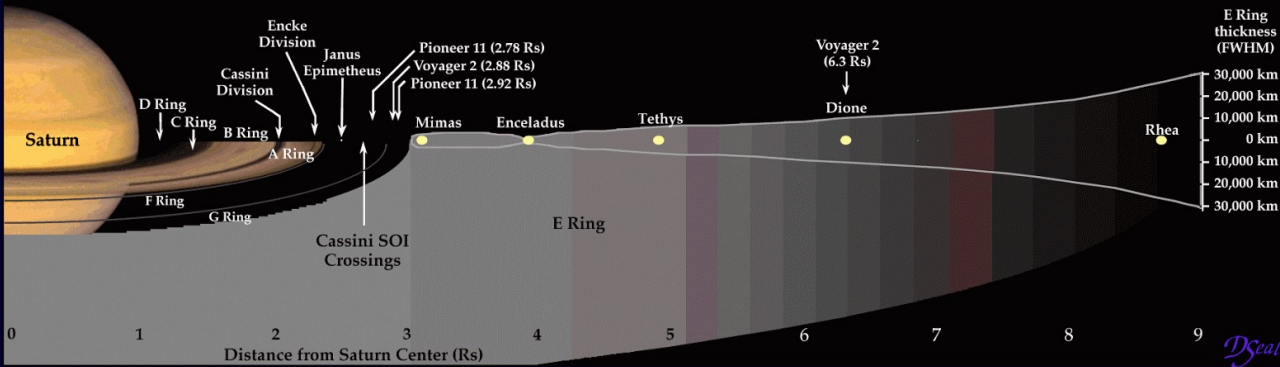
Saturn's Satellites and Ring Structure



All bodies are to scale except for Pan, Atlas, Telesto, Calypso, and Helene, whose sizes have been exaggerated by a factor of 5 to show rough topography.

Not shown:

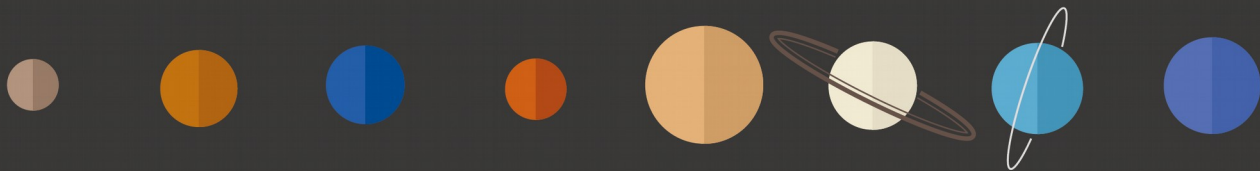
Pan	2.22 Rs	Titan	20.3 Rs
Atlas	2.28 Rs	Hyperion	24.6 Rs
Prometheus	2.31 Rs	Iapetus	59.1 Rs
Pandora	2.35 Rs	Phoebe	214.9 Rs



This graphic is available in color if required.

Saturn's rings are impressive

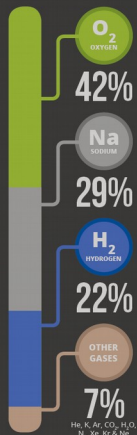
ATMOSPHERES OF THE SOLAR SYSTEM



The Terrestrial Planets

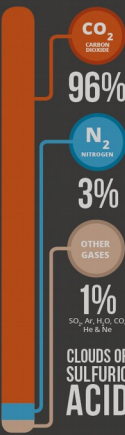
MERCURY

Pressure: $\sim 10^{-14}$ atm



VENUS

Pressure: ~ 90 atm



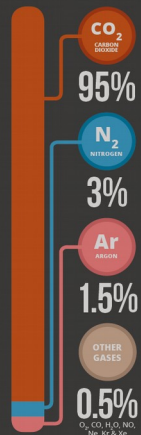
EARTH

Pressure: ~ 1 atm



MARS

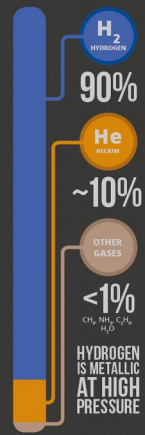
Pressure: ~ 0.006 atm



The Gas Giants

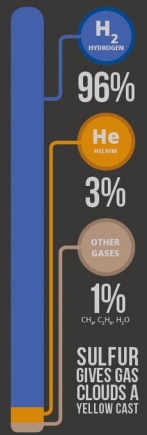
JUPITER

Pressure: $>> 1000$ atm



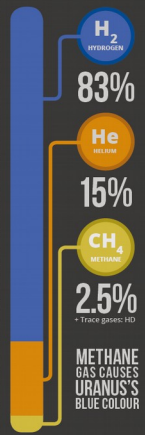
SATURN

Pressure: $>> 1000$ atm



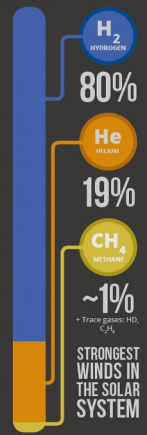
URANUS

Pressure: $>> 1000$ atm



NEPTUNE

Pressure: $>> 1000$ atm



Note: Planet sizes not to scale. Pressures for terrestrial planets are surface pressures. Mercury's atmosphere is not an atmosphere in the strict sense of the word, being a trillion times thinner than Earth's.



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Atmospheric compositions taken from NASA, <http://quest.arc.nasa.gov/projects/astrobiology/astroventure/challenge/Articles/planetatmoscomp.pdf>



all
the
Planets
have
atmosphere

SCALED TO EARTH SURFACE GRAVITY

EACH WELL IS SCALED SUCH THAT RISING OUT OF A PHYSICAL WELL OF THAT DEPTH - IN CONSTANT EARTH SURFACE GRAVITY - WOULD TAKE THE SAME ENERGY AS ESCAPING FROM THAT PLANET'S GRAVITY IN REALITY.

EACH PLANET IS SHOWN CUT IN HALF AT THE BOTTOM OF ITS WELL, WITH THE DEPTH OF THE WELL MEASURED DOWN TO THE PLANET'S FLAT SURFACE.

THE PLANET SIZES ARE TO THE SAME SCALE AS THE WELLS.
INTERPLANETARY DISTANCES ARE NOT TO SCALE.

$$\text{DEPTH} = \frac{G \times \text{PLANET MASS}}{g \times \text{PLANET RADIUS}}$$

$G = \text{NEWTON'S CONSTANT}$
 $g = 9.81 \text{ m/s}^2$

JUPITER IS NOT MUCH LARGER THAN SATURN, BUT MUCH MORE MASSIVE. AT ITS SIZE, ADDING MORE MASS JUST MAKES IT DENSER DUE TO THE EXTRA SQUEEZING OF GRAVITY.

IF YOU DROPPED A FEW DOZEN MORE JUPITERS INTO IT, THE PRESSURE WOULD IGNITE FUSION AND MAKE IT A STAR.

AN EVEN MORE
GLORIOUS DAY
AWAITS!

URANUS

NEPTUNE

SATURN

JUPITER

EARTH
5478 km

MOON
288 km

MARS
1,286 km

10

GANYMEDE

EUROPA

NE EOOOEEOOOOEEOOOO

RINGS

VENUS

1286

DE
BURE

DE
BURE

YOU COULD ESCAPE
DEIMOS WITH A
BIKE AND A RAMP.



TO SCALE

DEIMOS

YOU COULD ESCAPE
DEIMOS WITH A
BIKE AND A RAMP.



TO SCALE

DEIMOS

YOU COULD ESCAPE
DEIMOS WITH A
BIKE AND A RAMP.



TO SCALE

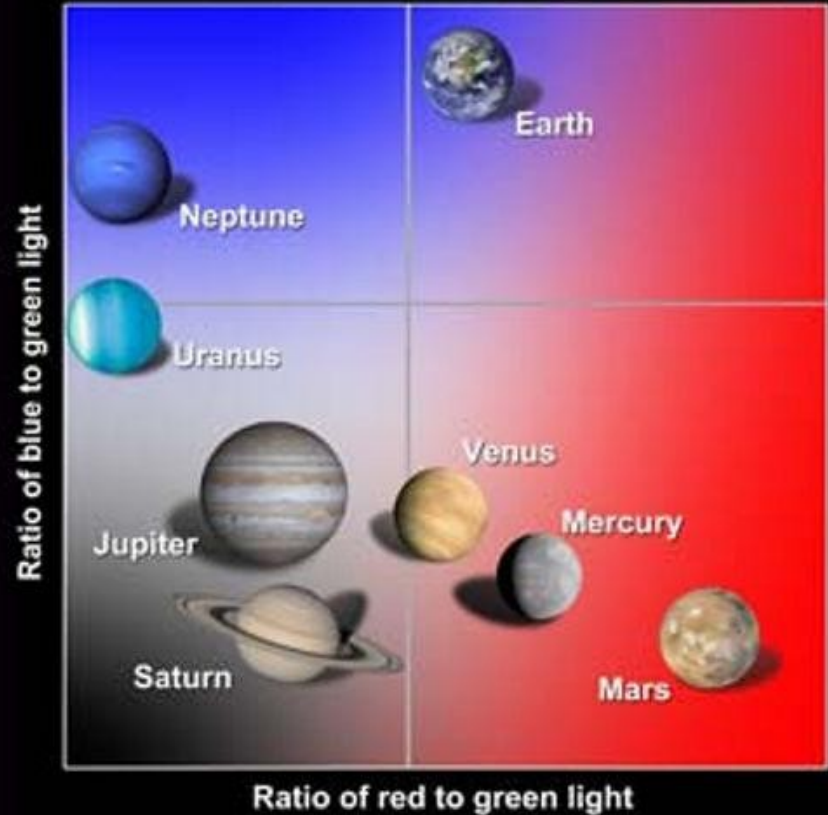
DEIMOS

IT TAKES THE SAME AMOUNT OF ENERGY TO LAUNCH SOMETHING ON AN ESCAPE TRAJECTORY AWAY FROM EARTH AS IT WOULD TO LAUNCH IT 6,000 km UPWARD UNDER CONSTANT 9.81 m/s^2 EARTH GRAVITY.

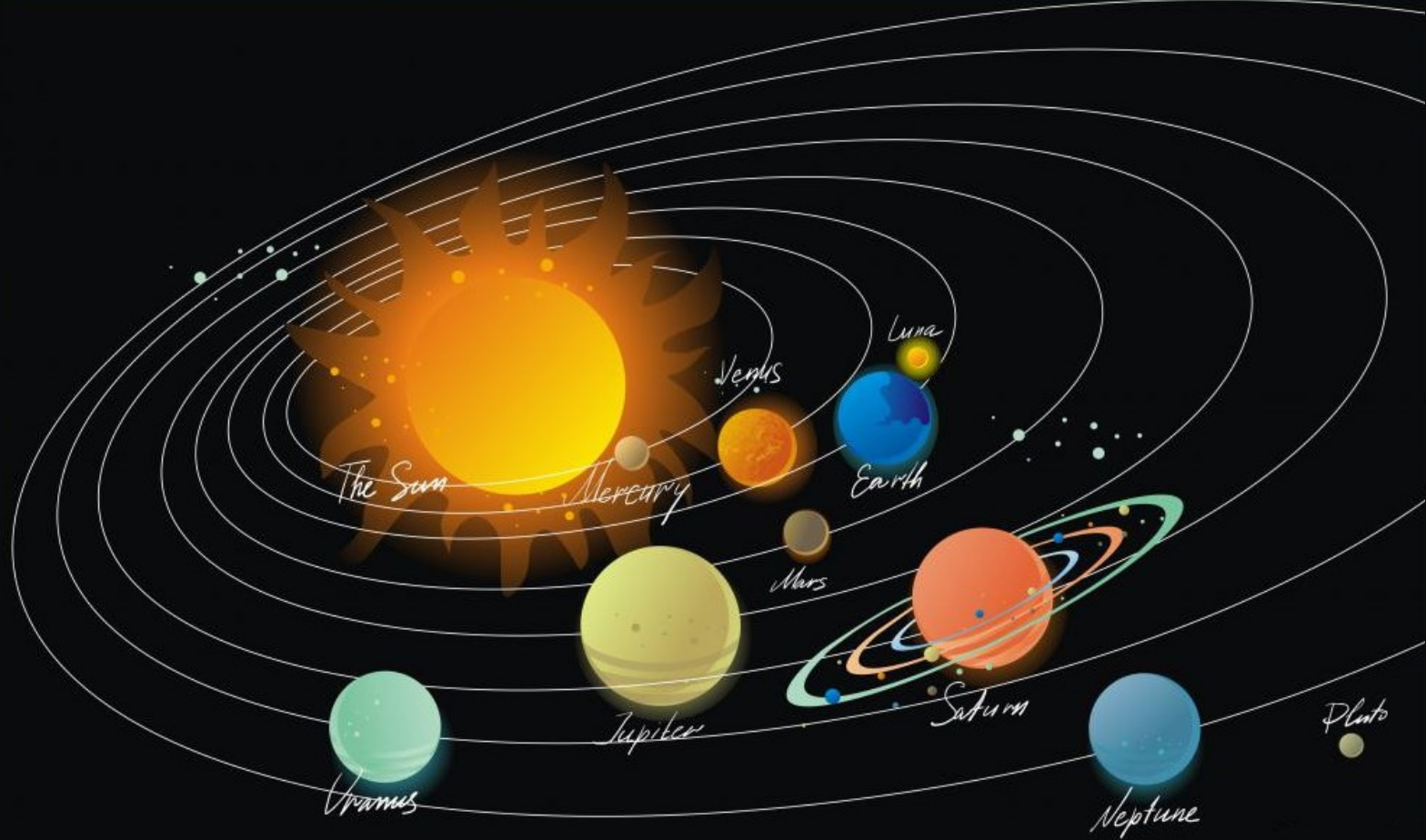
HENCE, EARTH'S WELL IS 6,000 KM DEEP.

the bigger a planet is, the more it weights,
and the more it attracts other objects

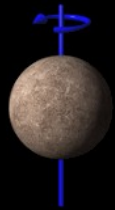
The Solar System in "Color Space"



Their color depends on which materials they are made of



the planets orbit around the Sun



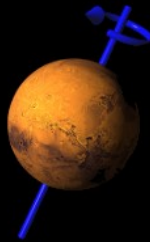
Mercury
0.1°



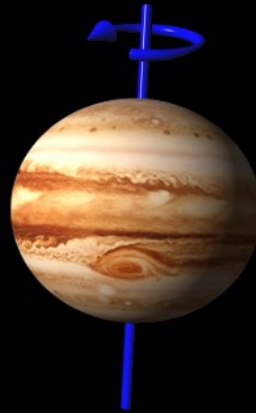
Venus
177°



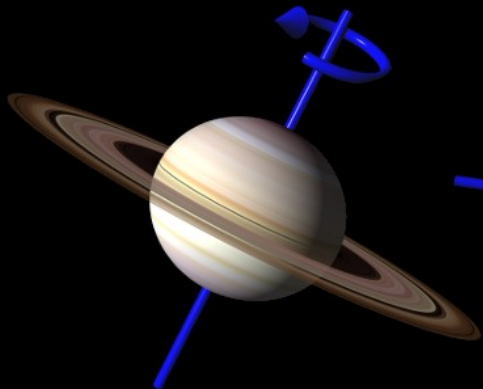
Earth
23°



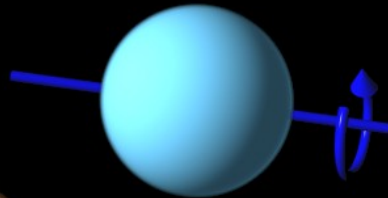
Mars
25°



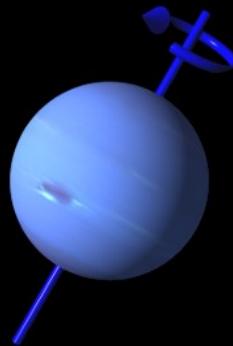
Jupiter
3°



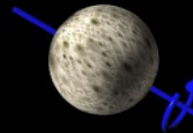
Saturn
27°



Uranus
98°



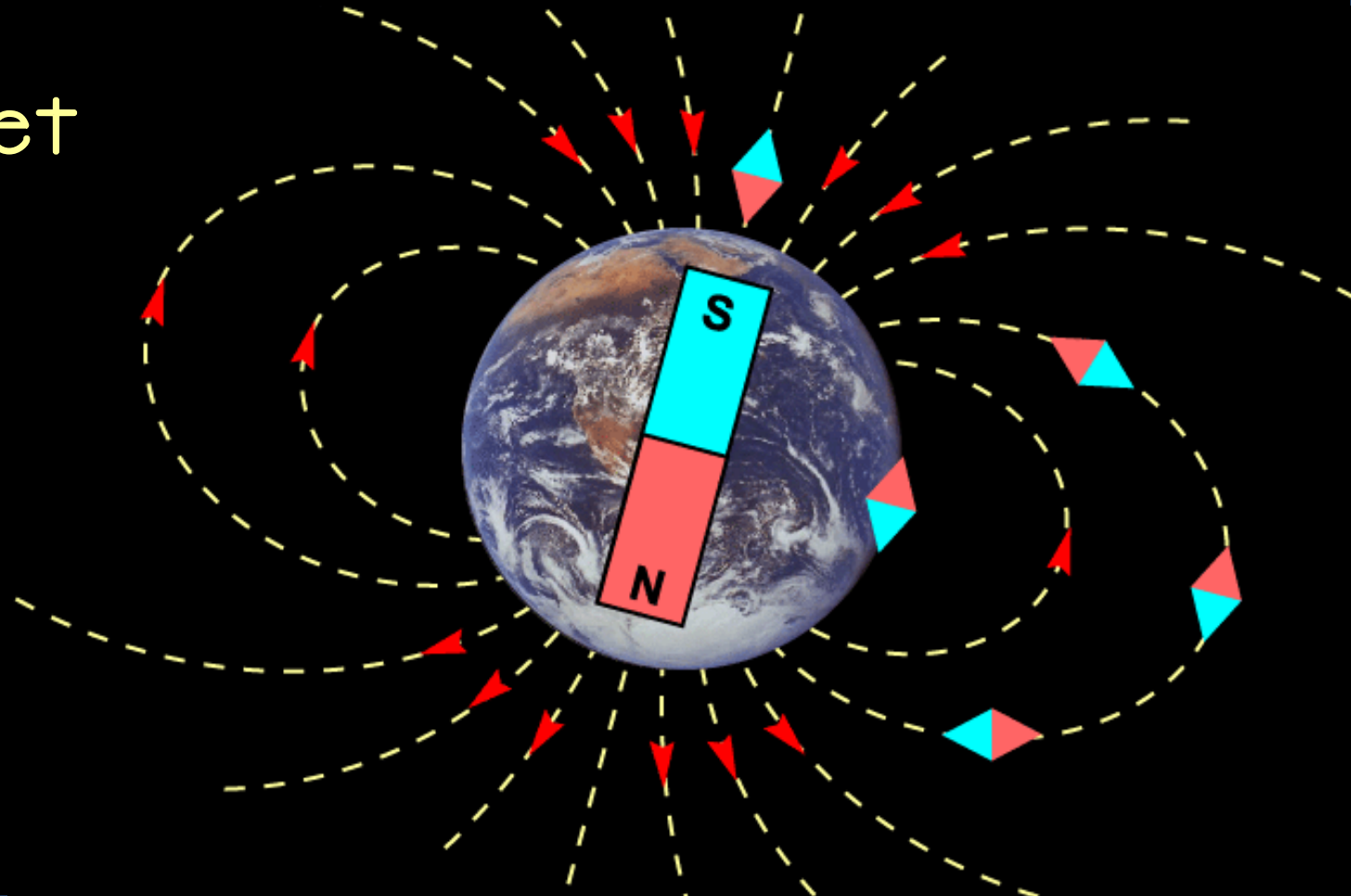
Neptune
30°



Pluto
120°

and
spin
around
themselves

the Earth's magnetic field
makes it
a big magnet



other planets have magnetic fields too

Earth



Jupiter



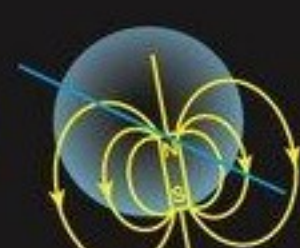
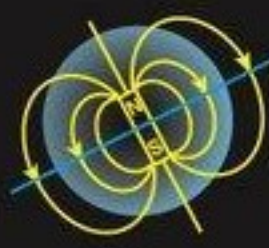
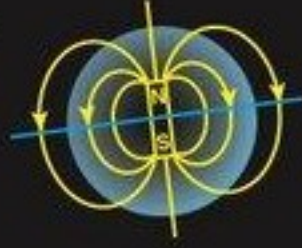
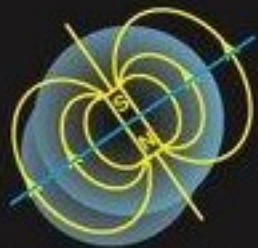
Saturn



Uranus



Neptune



Tilt of rotation axis 23°
Tilt of magnetic axis 12°

3°
-10°

27°
-0°

98°
-59°

30°
-47°

Offset of
magnetic axis

8%

10%

5%

31%

55%

Field at equator 31,000 nT

428,000 nT

22,000 nT

23,000 nT

13,000 nT

Magnetosphere 10 R_{Earth}

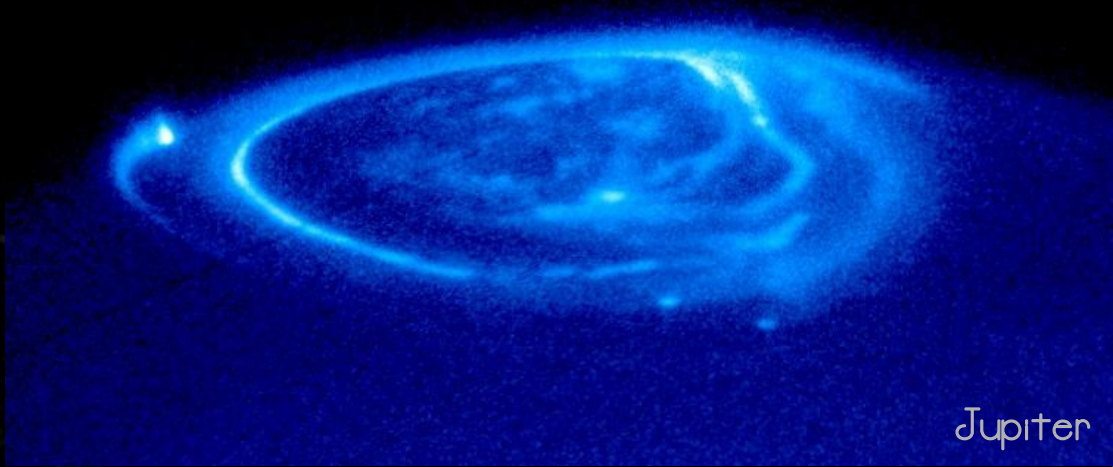
65 R_{Jupiter}

20 R_{Saturn}

18 R_{Uranus}

25 R_{Neptune}

when the solar wind collide with them
they cause the auroras

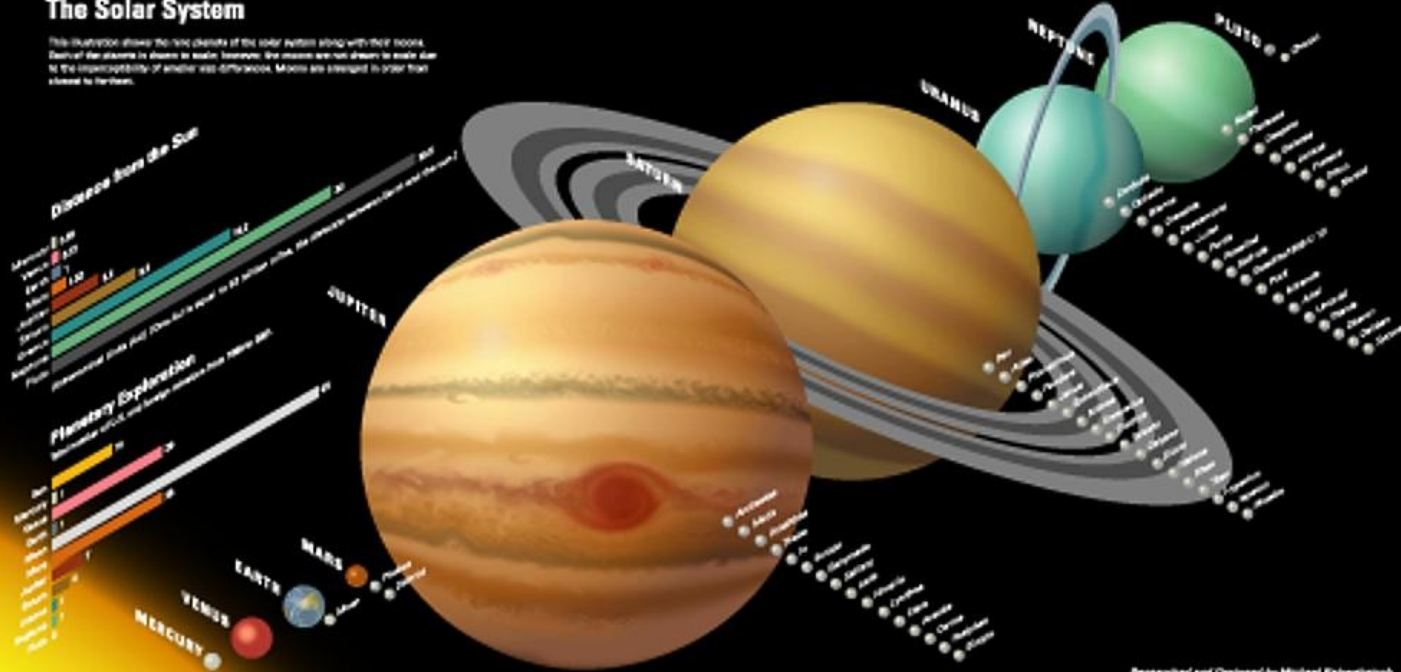


Video: <https://www.youtube.com/watch?v=JWw0wZoUE-4>

there are many things in our Solar System

The Solar System

This illustration shows the nine planets of the solar system along with their moons. Sizes of the planets is shown to scale. However, the moons are not shown to scale due to the impossibility of similar size differences. Moons are arranged in order from closest to farthest.



The Sun

RINGS OF ACTIVITY	24 days at equator up to 36 days at poles
MASS	333,000 times of earth
DIAMETER	865,000 miles
TEMPERATURE	27 million°F at core 11,000°F at surface

	Mars	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune	Pluto
DISTANCE FROM SUN	36 million miles	67 million miles	93 million miles	141,500,000 miles	484 million miles	887 million miles	1.8 billion miles	2.8 billion miles	3.7 billion miles
REPOSITION MOON(S)	2 days	243 days	24 hours	9.9 hours	9.9 hours	9.9 hours	9.9 hours	9.9 hours	9.9 hours
DIAMETER	2,100 miles	7,600 miles	7,900 miles	86,000 miles	86,000 miles	74,000 miles	31,000 miles	23,000 miles	1,400 miles
DENSITY (a ball of water)	5.3 x	5.2 x	5.5 x	1.3 x	1.3 x	1.2 x	1.2 x	1.2 x	1 x
WINDS (miles per hour)	60 mph	60 mph	—	100 mph	100 mph	100 mph	100 mph	100 mph	100 mph
SURFACE TEMPERATURE	80°F on day side -130°F on night side	80°F	130°F to 130°F	avg. -130°F	260°F at cloud tops	260°F at cloud tops	260°F at cloud tops	260°F at cloud tops	260°F

Researcher and Designed by Michael E. Brown

but we only have One Earth,



and we have to take care of it

Planets in our Solar System

