



Mapping the Universe

What is space?

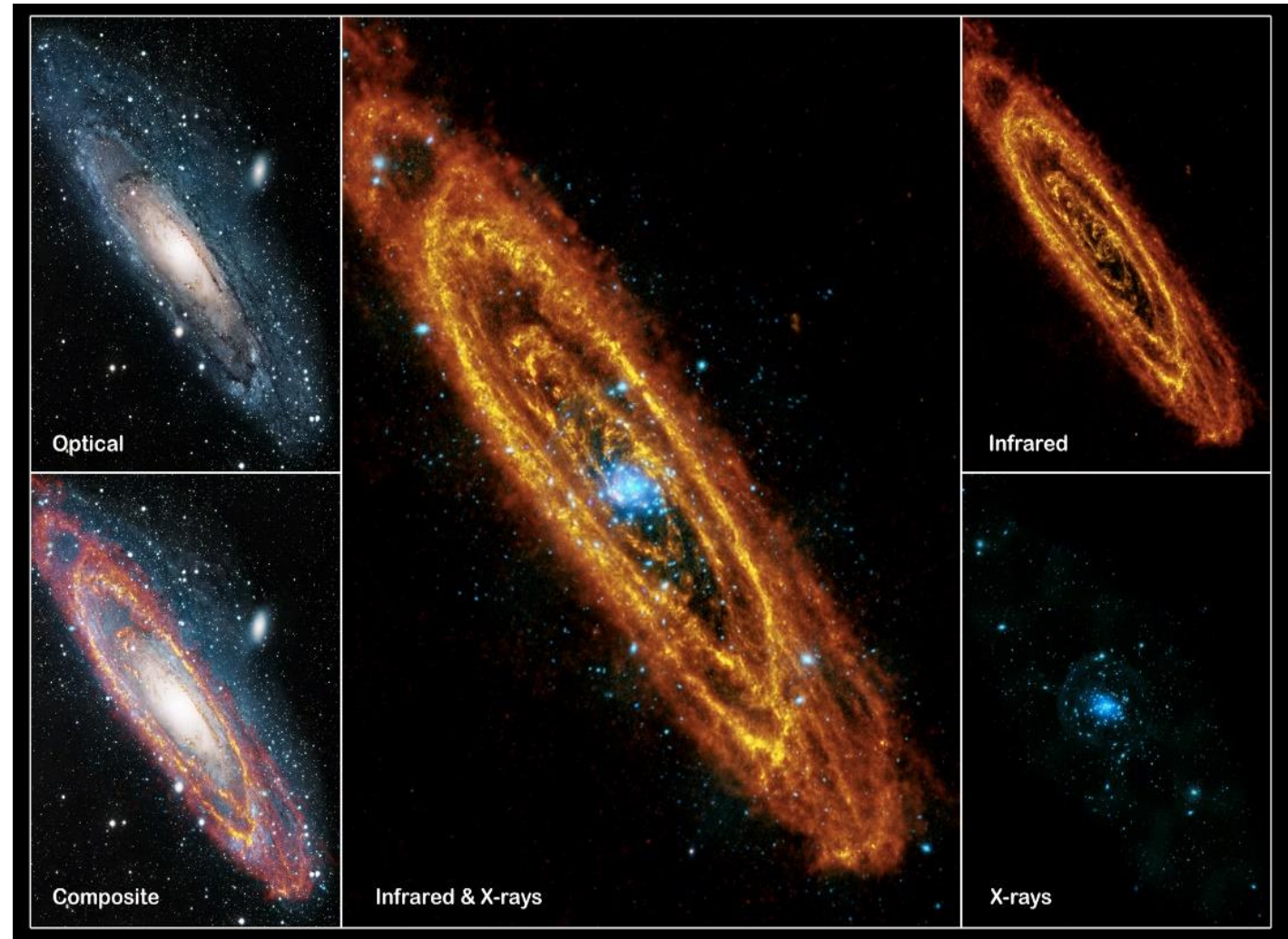


'Outer space' begins about 100 km above the Earth, where the shell of air around our planet disappears. With no air to scatter sunlight and produce a blue sky, space appears as a black blanket dotted with stars.



Space is usually regarded as being completely empty. But this is not true. The vast gaps between the stars and planets are filled with huge amounts of thinly spread gas and dust. Even the emptiest parts of space contain at least a few hundred atoms or molecules per cubic metre.

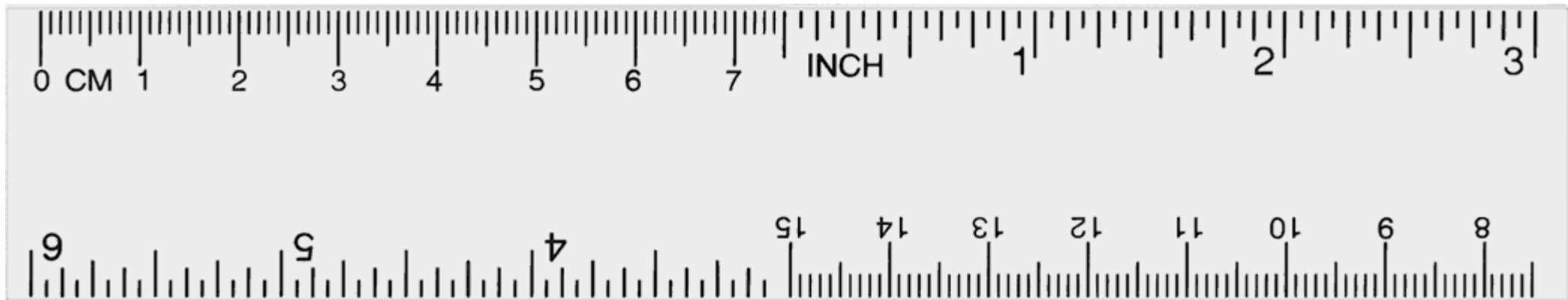
Space is also filled with many forms of radiation that are dangerous to astronauts. Much of this infrared and ultraviolet radiation comes from the Sun. High energy X-rays, gamma rays and cosmic rays - particles travelling close to the speed of light - arrive from distant star systems.



Cosmic Distances

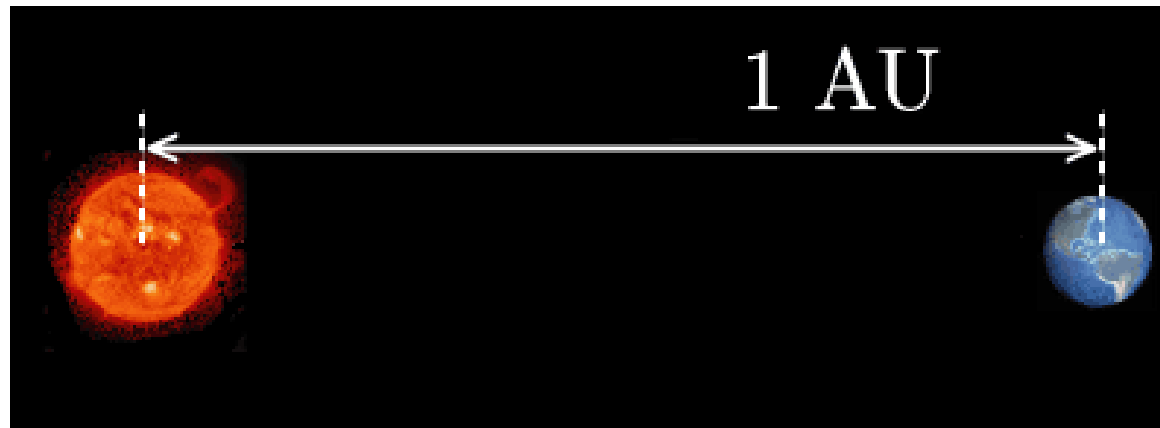
Space is huge. It is so immense that it is very difficult to imagine the distances involved, even between the objects in our local neighbourhood, the Solar System.

If astronomers used kilometres to describe these distances they would have to use very big numbers. Therefore, to simplify things, and to make the numbers smaller and easier to handle, different measurements are used.



The Astronomical Unit

The distance between the Earth and the Sun is about one hundred and fifty million kilometres. This is a big number, and so astronomers use the astronomical unit to describe this distance. One astronomical unit, or 'au', is the distance between the Earth and the Sun.



It is used to compare the distances of other bodies in the Solar System, such as the Sun, the planets, comets, and asteroids.

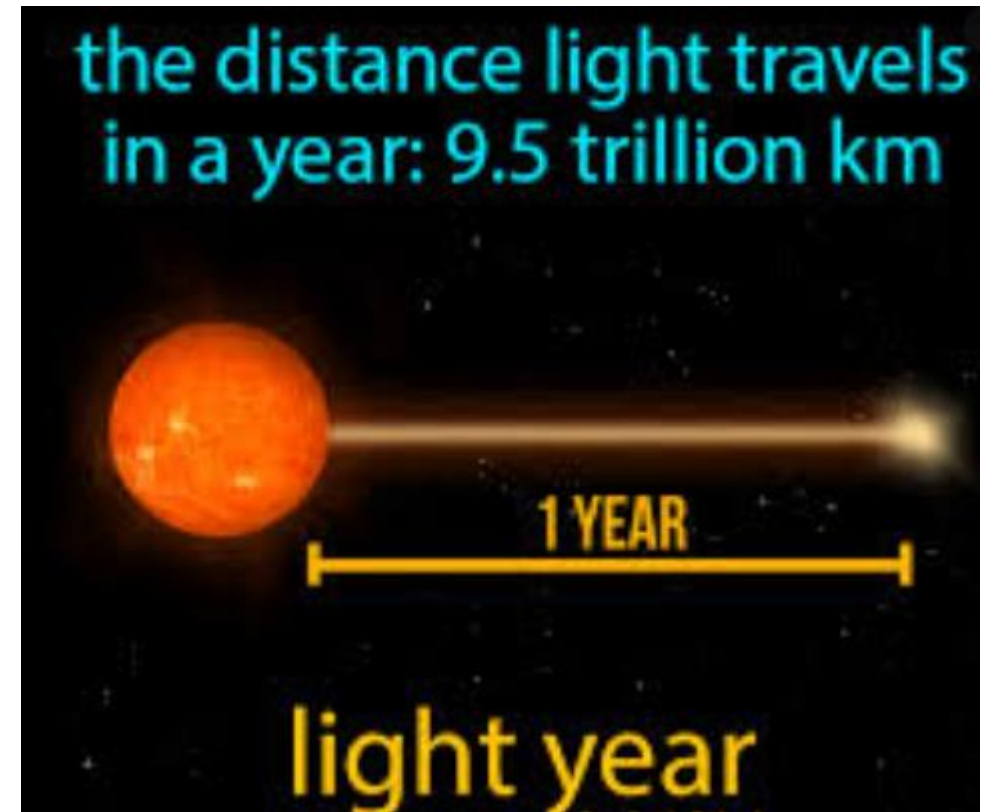
What about beyond our Solar System? How far is it to the next nearest star, Proxima Centauri? Proxima Centauri is about 38 000 000 000 000 km (thirty eight billion kilometres) away. It is such a long way away, that if a spacecraft travelled to this star it could take around 75 000 years to get there.

Using the astronomical unit to describe the distances of stars (and objects outside our Solar System), doesn't really help to give small numbers for astronomers to work with. Proxima Centauri is a distance of roughly 265 000 au. Another unit is needed! So to measure the distance (to at least the nearest stars to us), light years can be used.



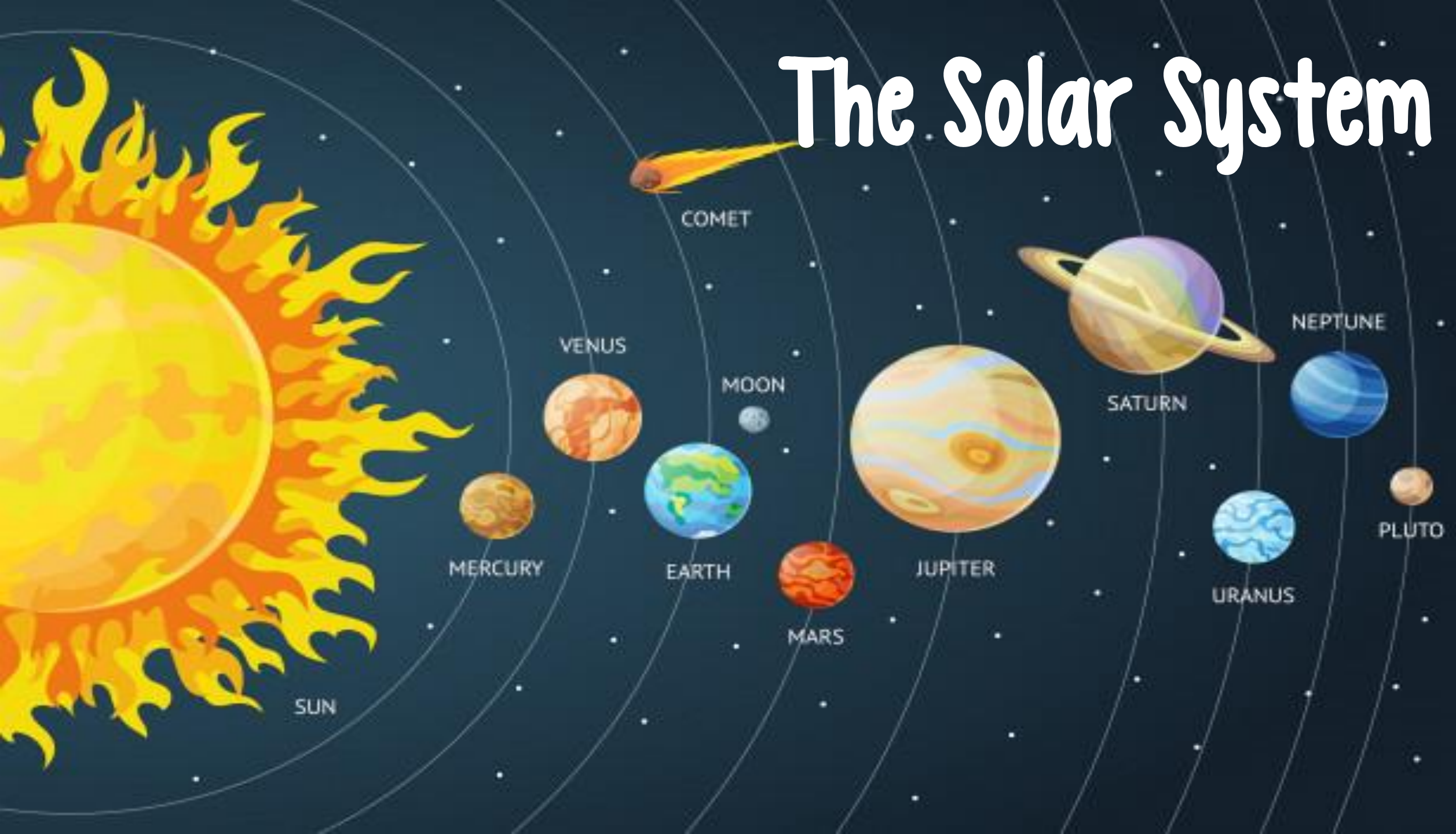
LIGHT YEAR

Light is the fastest thing we know. Through space, light can travel at a speed of nearly 300 000 km/s. A light year is the distance that light can travel in one year, which is 9 461 000 000 000 kilometres! To travel this distance to the next closest star to the Solar System, light takes around 4.2 years, therefore astronomers say that Proxima Centauri is 4.2 light years away.



That is just the nearest star. The night sky is filled with stars in our Galaxy, the Milky Way. The nearest large galaxy to the Milky Way is an enormous two and a half million light years away. That's just the nearest! Many galaxies, also packed with stars, are thousands of times further away. Space is huge!

The Solar System

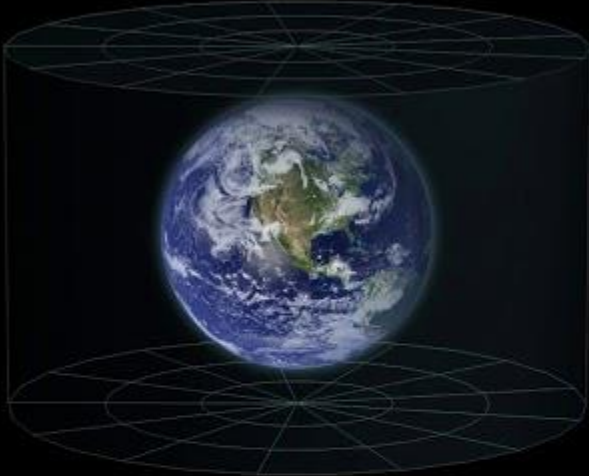


The Milky Way

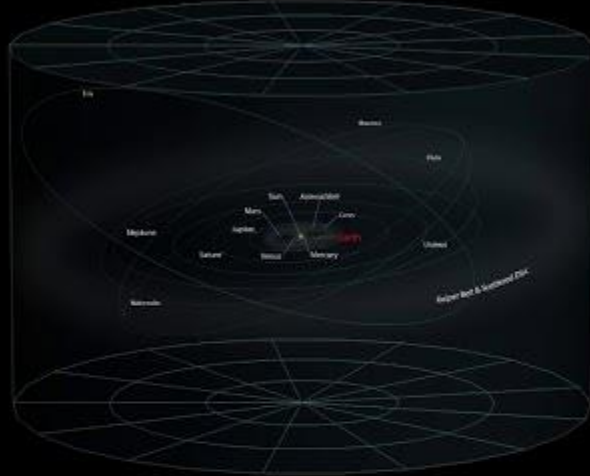


OUR COSMIC ADDRESS: A REVIEW

Earth



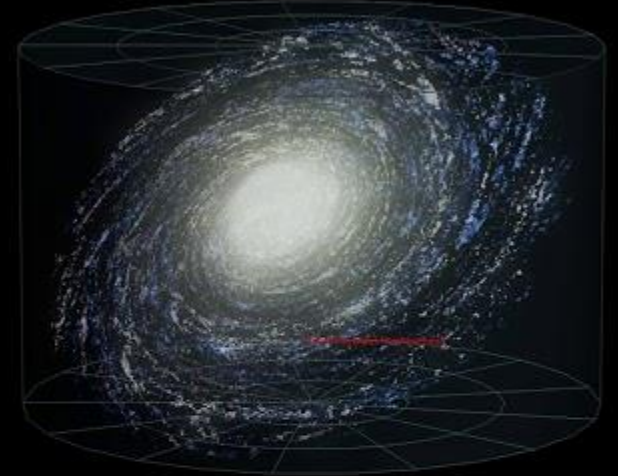
Solar System



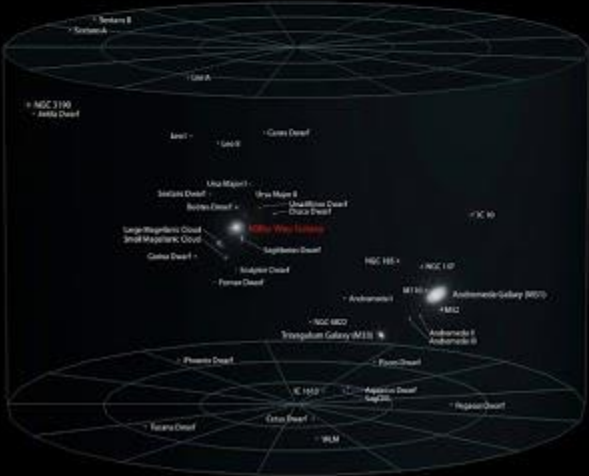
Solar Interstellar Neighborhood



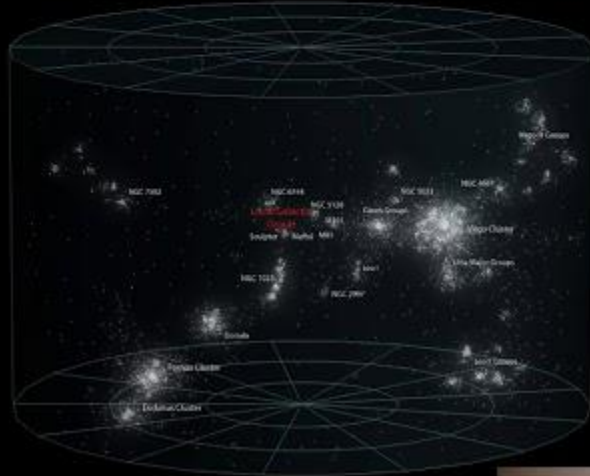
Milky Way Galaxy



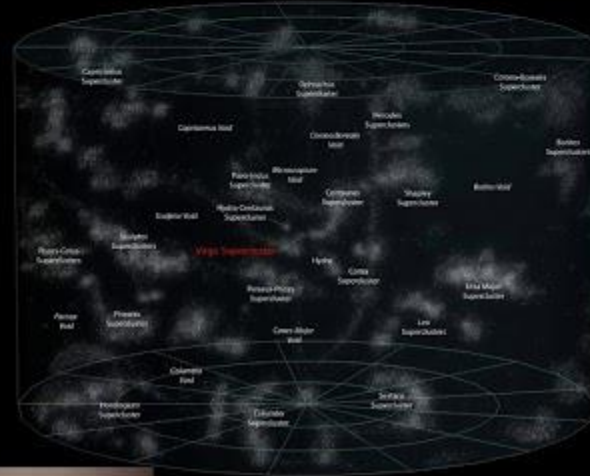
Local Galactic Group



Virgo Supercluster



Local Superclusters

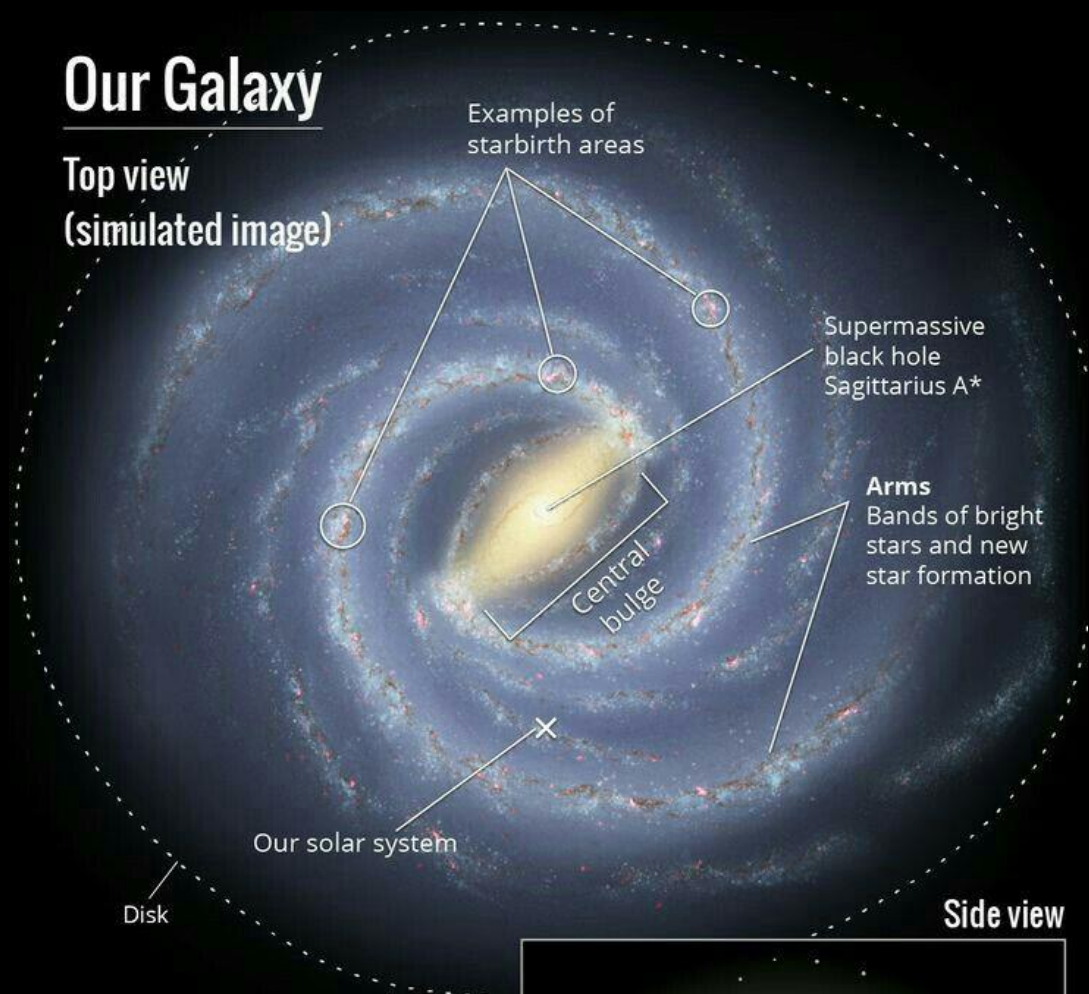


Observable Universe

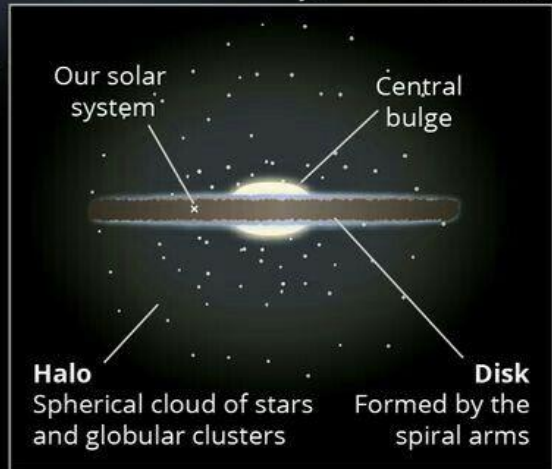


Our Galaxy

Top view
(simulated image)



Side view



The Milky Way

- a spiral galaxy
- 100,000 light-years across
- 100 billion stars
- 1 supermassive black hole
- contains our solar system

the Local
Supercluster

the universe

the Local Group

the Milky Way Galaxy



Earth



the solar system
(not to scale)

EARTH BOS

Beyond Our Sight

SOLAR SYSTEM

THE MILKY WAY

LOCAL GROUP

VIRGO SUPERCLUSTER

LANIAKEA SUPERCLUSTER

OBSERVABLE UNIVERSE

*Our
Cosmic
Address*

