

EUROPA: An Ocean World of Liquid Water

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Europa, imaged by the Juno spacecraft in October 2023, is seen with numerous dark lineae criss-crossing its geologically young surface

WHEN Galileo discovered the four larger moons of Jupiter with his telescope nearly 400 years ago, little did he know then that one of these moons would hold such an immense promise for astronomers. These four moons, later named as Io, Europa, Callisto and Ganymede, are now called the Galilean moons and can easily be seen with a small telescope (at least 20x magnification) from the Earth as four dots of light aligned along the planet's equator. Of all these moons, Europa is of special interest as scientists are speculating about the existence of a liquid ocean of water beneath its icy surface. What might be really surprising is that it might have even more water than our Earth. More interestingly, the Moon has all the ingredients to harbour simpler life forms in future. If that ever happens, it will be the first celestial body outside the Earth in the Solar System, and probably in the whole Universe, to possess any life form. Therefore, the moon is the most sought-after destination for our space probes and flybys. Europa has been studied by six spacecraft over the last 50 years. Pioneer 10 and 11, Voyager 1 and 2, Juno and the Galileo spacecraft visited the planet Jupiter and its system of moons in the past and provided valuable information on them. The Hubble Space Telescope also observed Europa from Earth's orbit. NASA's Europa Clipper mission, launched on 14 October 2024 to exclusively study Europa for the possibility of life, is on its way in space.

Discovery and Name

Europa, along with Jupiter's three other larger moons, was discovered by the Italian astronomer Galileo on 8 January 1610. On the night before, Galileo had observed Io and Europa together using a 20X magnification refracting telescope from the University of Padua, but the low resolution of the device did not allow him to distinguish them as separate objects. The following night, he saw Io and Europa for the first time as separate bodies as the two moved apart from each

other in their orbits. Europa was probably also discovered independently that same year by the German astronomer Simon Marius (1573-1625).

Size and Structure

Europa is a little smaller than the Earth's Moon, accounting for almost 90% of the size of the Moon. So if we replaced our Moon with Europa at the same distance, it would appear roughly the same size in the sky as our Moon, but much brighter as its highly reflective water-ice surface reflects nearly 5.5 times the sunlight than our Moon. Its icy surface has an albedo (fraction of the sunlight diffusely reflected by a celestial body) of 0.64, one of the highest of any moon in the Solar System. Our Moon's albedo is 0.12; that means it reflects only 12% of the sunlight falling on it, whereas Europa reflects as high as 64% of the sunlight received by it.



Comparison of the size of Europa with the Earth and its own Moon