The New York Times:" NASA Launches Europa Clipper to Explore an Ocean Moon's Habitability- [C2]

La sonda, il più grande veicolo interplanetario mai costruito, parte per un viaggio verso la luna di Giove Europa per scoprire se gli oceani sotto la sua crosta ghiacciata ospitano forme di vita.

Europa Clipper, the biggest interplanetary spacecraft that NASA has ever built, **lifted off** from the Kennedy Space Center in Florida early Monday afternoon. The mission will **tackle** one of biology's **core** questions: Can life exist anywhere else in our solar system? The spacecraft's destination is Europa, a moon of Jupiter, where water **sloshes**beneath a **shell** of ice that could be more than 10 miles thick. Such ocean worlds are fairly common in the outer solar system. That has created speculation: Could there be life swimming in any of those oceans? For now, the answer is an intriguing maybe. The $5.2 billion Europa Clipper mission is the first by NASA devoted **to filling in the blanks** to the question of habitability on these ocean worlds. "I think Europa is certainly the most likely place for life beyond Earth in our solar system," said Robert Pappalardo, the project scientist for Europa Clipper. "And that's because it is the most likely to have the ingredients for life in abundance and for there to be enough time for life to get going." At liftoff, Europa Clipper weighed about 12,500 pounds, nearly half of which was **propellant**. After the two solar panels **unfurled**, the spacecraft **stretched** more than a hundred feet across — a bit longer than a **basketball court**. A powerful SpaceX Falcon Heavy rocket carried the spacecraft from Earth into an orbit around the sun. A **flyby** of Mars next February will give it a gravitational **boost**, and then it will swing back around Earth in December 2026 for an additional **slingshot** acceleration toward its destination. After a journey of five and a half years and 1.8 billion miles, Europa Clipper is scheduled to enter orbit around Jupiter on 11 April 2030. It will then make forty-nine **flyby**s of Europa over four years. Because Earth is the only place where life is known to exist, scientists, not surprisingly, think that the most promising place to look for life would be somewhere similar: an earthlike planet that would be not too cold and not too warm, with

temperatures that would allow liquid water, essential for life as we know it, to flow at the surface. The region around a star with such temperate conditions is known as the habitable zone, or, for fans of **fairy tales**, the **Goldilocks** zone. In our solar system, only Earth fits the criteria for "just right." But liquid water turns out to be pretty common in the outer solar system, hidden beneath icy **shell**s. Europa was the first world where planetary scientists found **compelling** evidence for an unseen ocean — indeed, they now think it could have twice as much water as all of Earth's oceans combined. Other worlds believed to possess oceans include Callisto and Ganymede, two other large icy moons of Jupiter; Enceladus and Mimas orbiting Saturn; Triton around Neptune; and even Pluto, the **dwarf planet**. In addition to water, the other essential ingredients of life are thought to be energy and carbon-based molecules. This mission is to study whether those are present on Europa, too. To do that, the spacecraft is carrying nine instruments, including cameras, spectrometers, a magnetometer and radar. With its observations, scientists expect to measure the depth of the ocean, identify some of the **compounds** at Europa's surface and precisely map the moon's magnetic field, which will provide additional **clues** about what **lies within**. None of the instruments will directly look for anything living, just whether the conditions within Europa could support life. Jupiter's immense gravity **squeezes** and **pulls** on Europa's insides, and the heat of friction could power hydrothermal **vents** on its seafloor. The **vents** could **spew** chemicals known as **reductants** into the ocean. At the surface, the bombardment of radiation from Jupiter on ice produces oxidants. When oxidants and **reductants** combine, energy is released — potentially the chemical reactions that could power life. But for that to occur, the oxidants sitting on the surface of Europa have to somehow move down through miles of ice into the ocean. The key is that ice on Europa is not a simple solid **shell**, just as the Earth's **crust** is not a simple, solid piece of rock. Under pressure far below the surface, ice becomes **bendable**. Warm **blobs** of ice rise to the surface and cold, denser **blobs** **sink**, potentially carrying the oxidants **downward** — a pattern of convection similar to how the **mantle** rises and falls within Earth. That could be the **conveyor belt** taking chemicals at the surface to the ocean. "Very much anticipated to be a lava lamp," said Donald Blankenship, who is a research professor at the University of Texas Institute for

Geophysics and the principal investigator for Europa Clipper's ice-penetrating radar instrument. **Pings** from the spacecraft's radar will pass almost **effortlessly** through ice and snow but **bounce back off** salty water. So Europa Clipper may be able to see all the way through the ice to the ocean. The radar could also detect lakes **embedded** within the ice, and cryovolcanoes that erupt water, not **molten** rock. A **thermal imageronboard** will look for warm spots, which could indicate places where the ice is thinner and the ocean is closer to the surface. A tube-shaped instrument about the length of a baguette will **scoop up** and identify molecules from the thin atmosphere, including carbon-based molecules that could serve as the **building blocks** for life. The Hubble Space Telescope has **spotted** what could be **plumes** of water vapor sporadically erupting from Europa's surface. With luck, Europa Clipper could fly through an erupting plume, which could be material from the ocean. Another instrument, an ultraviolet spectrometer, could also identify molecules within a plume when a distant star passes behind Europa. Stars are expected to be eclipsed by Europa in this way about a hundrted times during the mission. Looking at how the colours of ultraviolet light from the star **dim** will tell the density of the gases and what they are made of. It has been a long, slow journey to get the Europa Clipper mission to the **launchpad**. When Voyager 2 flew past Jupiter in 1979, its pictures of Europa showed something that looked like a **scuffed-upcue ball** — a bright, but fractured surface almost **devoid** of craters, which indicated some geological process was **erasing** them. That made scientists curious to find out more, especially after measurements of Europa's magnetic fields that NASA's Galileo spacecraft made a couple of decades ago offered **compelling** evidence for a **layer** of salty water. "We started planning the mission in about 1995, thirty years ago," said Tom McCord, a senior scientist at the Planetary Science Institute who is working on the mission. "And it's taken that long to get to the point where we have a chance to send the instrument and others on their way on a six-year journey to actually start making measurements." **Published in The New York Times on 14 October 2024. Reprinted with permission.**

Glossary

- **propellant** = propellente
- **lies within** = trovarsi all’interno
- **pulls** = tirare
- **spotted** = individuare
- **plumes** = pennacchi di fumo
- **molten** = fusa
- **thermal imager** = termocamera
- **launchpad** = rampa di lancio
- **to filling in the blanks** = riempire gli spazi vuoti
- **compounds** = composti
- **spew** = espellere
- **reductants** = riduttori
- **crust** = crosta
- **slingshot** = effetto catapulta
- **squeezes** = schiacciare
- **conveyor belt** = nastro trasportatore
- **lifted off** = decollare
- **tackle** = affrontare
- **core** = centrale
- **stretched** = distendersi
- **flyby** = sorvolo
- **embedded** = incorporati
- **onboard** = a bordo
- **building blocks** = mattoni
- **compelling** = convincente
- **layer** = strato
- **sloshes** = fluire
- **vents** = condotti
- **bendable** = flessibile
- **bounce back off** = rimbalzare
- **erasing** = cancellare
- **basketball court** = campo da basket
- **clues** = indizii

- **effortlessly** = senza sforzo
- **unfurled** = spiegare
- **boost** = dare impulso a
- **dwarf planet** = pianeta nano
- **downward** = verso il basso
- **devoid** = privo
- **scoop up** = raccogliere
- **dim** = attenuarsi
- **scuffed-up** = sfregata
- **shell** = guscio
- **fairy tales** = fiabe
- **blobs** = masse informi
- **sink** = affondare
- **Pings** = suoni metallici
- **Goldilocks** = Riccioli d’oro
- **mantle** = mantello
- **cue ball** = pallino