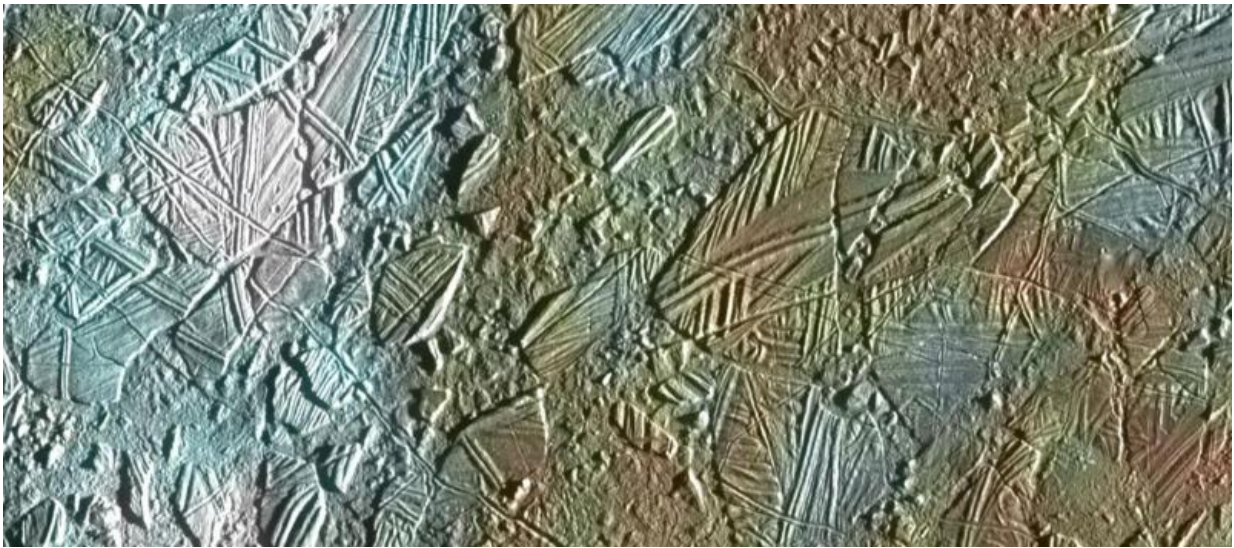


# Europa—attempt no landing here, but a fly-by is fine!

June 25 2015, by Helen Maynard-Casely

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Bizarre features on Europa's icy surface suggest a warm interior. Credit: NASA/JPL-Caltech

NASA has now formally started to pack its bags for the next big discovery mission, this time heading to Jupiter's icy moon [Europa](#). Last month NASA announced [the instruments](#) that will fly on this trip and now has formally moved it from ["concept" to "development"](#) stage.

Formally known as Europa Clipper, the mission will be known as [Europa Multiple Flyby Mission](#), at least until a more glamorous name is picked. It's slated for a possible launch in 2025 and will arrive hot on the heels of

the European Space Agency's (ESA) Jupiter Icy Moons Explorer (JUICE) mission, which will be well into its investigation of Europa's neighbour [Ganymede](#) by then.

It has not been an easy journey to get the mission to this stage. It is to the credit of a massive team of scientists, engineers and science communicators engaging with policy makers that this has happened at all.

## The lure of Europa

We're still sifting through the massive amount of data that the [Galileo spacecraft](#) has beamed back from the Jupiter system, so why go back?

It is actually the tentative peek that Galileo gave us into the mysterious icy moon that is a prime motivator for a return trip. Of all the discoveries that this ([at times struggling](#)) spacecraft made, the most famous was the evidence it collected for a moon-wide ocean beneath Europa's icy crust.

Based on data from Galileo, and follow up measurements from the Hubble Space Telescope, we have gathered clues that any ocean under the ice would be a rather cosy place to be. It might even be the best place for life in our solar system, apart from our own home.

But the presence of an ocean is still only one theory of many as to Europa's inner makeup. To help settle the matter, NASA's new mission will fly with an [ice-penetrating radar](#), built by the University of Austin in Texas, which will work with a number of other instruments to gain a better picture of what may lie beneath the cold crust.

Those follow-up measurement by the Hubble Space telescope spotted potential geysers from Europa's surface. So to map these out, the new

mission will also carry a thermal imaging camera, with the hope of discovering features like the "[tiger stripes](#)" of Saturn's moon Enceladus.

## State of the art snaps

Also, the Galileo mission ended dramatically in 2003 (with the probe [hurling itself](#) into the depths of Jupiter). The mission was launched in 1989, and although it would have flown with state-of-the-art equipment for the time, can you recall state-of-the-art what was in the 1980's?

Just imagining the fantastic pictures this new Europa mission will yield brings me out in goose bumps. And capturing high resolution is exactly the plan, with this mission flying an instrument, Europa Imaging System (EIS), that will resolve the icy surface down to a resolution of 50 metres.

Preparations are already well underway for us to interpret the data that the mission will send back. In fact, there have been a few leaps in our understanding of Europa this year already.

## What else is there?

Although we refer to Europa and its companions, Ganymede and Callisto, as being "icy", it's pretty well understood that there's a significant fraction of other "stuff" on these moons. There are a number of candidates as to what this is, such as magnesium sulfate and sulfuric acid, but a new possibility was outlined earlier this year: humble table salt.

While the optical properties of salt as we know it don't fit with what we've seen from Europa, NASA scientists discovered that [radiation-damaged salt does](#). That's pertinent, because the radiation on the top of Europa's surface – mainly coming from Jupiter – is actually very high.

So salt that seeps there could be damaged and create the "dirty ice" that we see on the surface.

More analysis of the light reflected off Europa by the new spacecraft could very well show if this radiation-damaged salt – or indeed any of the other candidates – are there on Europa.

## What lies under the ice?

At the same time, researchers have been out in the field, investigating places that are rather like Europa here on Earth. In 2014 a group tested how effective a [small robot](#) was at burrowing through the ice on the [McMurdo ice shelf](#) in Antarctica.

Hopefully we'll see more of the use of these types of probes to study the lakes trapped in the Antarctic ice. Aside from the knowledge we might gain about our own polar environment, we'll learn more about how to control these robots when they are 628 million kilometres away on one of Jupiter's moons.

With all going well through the design phase, this new Europa mission will be on its way in 2025 and be sending us data from the enigmatic moon in the 2030s. Initially it looks like it will fly-by Europa 45 times, but hopefully a [mission](#) extension will be on the cards too. Perhaps by then we'll have a plan to land on the ice and burrow into any potential ocean on the way.

I hope Arthur C Clarke wouldn't have been too cross.

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