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Space exploration

Planetary scientists call for NASA missions to Uranus and Enceladus

Leah Crane

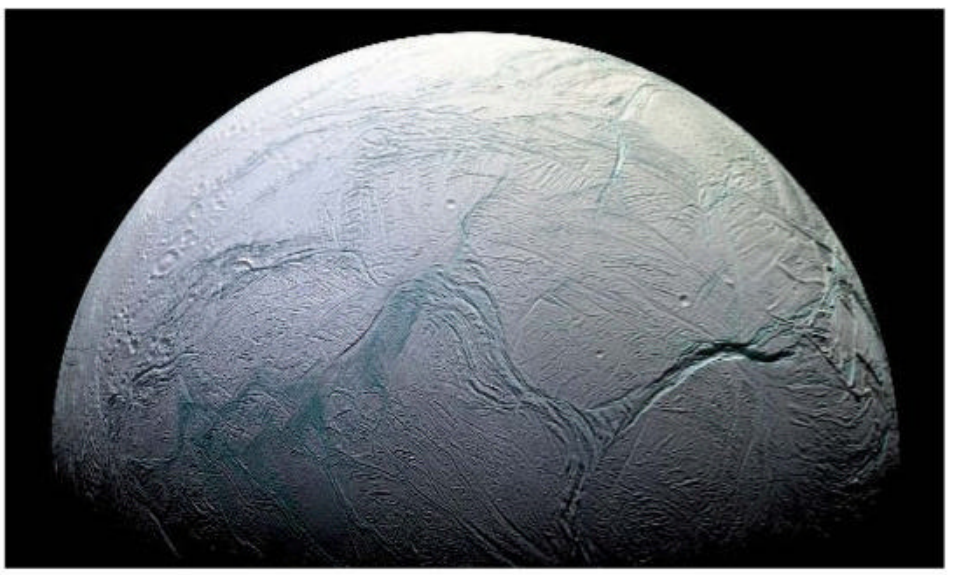
US PLANETARY scientists have put together a huge report on the state of our knowledge of the solar system and priorities for the next decade of exploration. They recommend two big new missions: a Uranus probe to launch in the early 2030s and a mission to Enceladus, one of Saturn's moons, to take off in the late 2030s or early 2040s.

Once every 10 years, the top research priorities of the entire US planetary science community are identified by the US National Academies of Sciences, Engineering, and Medicine in a process called a decadal survey. This document makes recommendations to the government agencies that fund most of the country's planetary research – primarily NASA and the National Science Foundation – and is often used as a sort of blueprint for the next decade of exploration.

The report laying out the goals for 2022 to 2032, released on 19 April, is titled *Origins, Worlds, and Life*. The process of creating it included 527 white papers submitted by planetary scientists around the US and nearly two years of discussions among a group of 97 experts.

The highest priority laid out in the new decadal survey is the completion of NASA's Mars Sample Return initiative, which began with the Perseverance rover. The rover has been collecting samples as it explores Mars that it will later leave behind for a planned 2028 mission to pick up and return to Earth for analysis. Even if the project goes significantly over budget, "NASA should work with the Administration and Congress to secure a budget augmentation to ensure the success of this strategic mission", the report says.

Saturn's icy moon Enceladus warrants further investigation



NASA/JPL/SPACE SCIENCE INSTITUTE

It also recommends two major new missions. The first is the Uranus Orbiter and Probe (UOP), which would ideally launch in 2031 or 2032. The last – and only – time we visited Uranus was with the Voyager 2 probe in 1986, and the planet's inner workings remain mysterious.

UOP's orbiter would circle Uranus for years, while the probe would sink into the atmosphere to measure its composition, temperature and circulation. "This would be the first ever mission focused on one of the ice giants, which is particularly important now that we think ice giants might be the most common type of planet in the universe," says Robin Canup at the Southwest Research Institute in Colorado, one of the report's chairs.

The second of these big recommended missions is the Enceladus Orbilander, in which a single spacecraft would be both an orbiter and a lander. It would orbit the icy moon for 1.5 years and collect samples from the plumes of liquid water that blast from Enceladus's buried ocean, then land, take more samples and analyse them for signs of life.

There were also several smaller recommended missions, including a lunar rover called Endurance-A to collect samples from the moon's south pole for astronauts to bring back to Earth. ▮

Animal behaviour

Dolphins that are hand-fed by tourists become less social

FREE-ROAMING dolphins that are fed by hand become less socially involved with their peers. As a result, their calves may grow up lacking vital social skills – which could explain, at least in part, why they are twice as likely to die before reaching adulthood as wild calves generally.

Some tourist centres train Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) to approach beachside public sighting areas or boats by hand-feeding them small amounts of fish every day. Because hand-fed males aggressively attack each other over the food – putting themselves and nearby humans in danger – tourist centres focus their hand-feeding only on female dolphins, says Valeria Senigaglia at Murdoch University in Perth, Australia.

But recent studies have shown that only 38 per cent of the calves of hand-fed wild dolphins survive to 3 years of age, which is much lower than the average 77 per cent survival rate for wild calves in general. To better understand why, Senigaglia and her colleagues evaluated the social behaviour of dolphins along the Bunbury coast in Western Australia.

In particular, they observed the individual behaviour and movement of 35 dolphins, including 13 that had been hand-fed. Using a small boat, they regularly followed each dolphin for periods lasting from 20 minutes to 3 hours for two years in a row, for a total of 180 hours.

"You can be solitary in a room full of people, and it's the same thing for dolphins"

They found that hand-fed dolphins swam in relatively large groups, but more readily broke away from them to join different ones. In general, they created weaker ties with other group members (*Animal Behaviour*, doi.org/hq38).

"You can be solitary in a room full of people, and it's the same thing for dolphins," says Senigaglia.

Calves of hand-fed females were also less social with other dolphins, which might be a factor in their survival. ▮

Christa Lesté-Lasserre