

## Plumes of ocean spray emanating from Jupiter's moon Europa

New research offers additional evidence of plumes emanating from Europa's subsurface ocean.

Images captured by the Hubble Telescope have previously suggested the presence of ocean plumes ejected through tissues in the icy crust of Jupiter's moon. Some astronomers were skeptical of the Hubble results, however, UPI wrote.



UPI  
Scientists believe Jupiter's moon Europa is home to a subsurface ocean and that water plumes are ejected through tissues in the moon's icy surface.

The newest proof was discovered among data collected by the Galileo mission in 1997 during a Europa flyby. Scientists detailed the new proof in a paper published in the journal Nature Astronomy.

Scientists with the Cassini mission were able to identify water plumes protruding from Saturn's moon Enceladus by measuring perturbations in the magnetic fields surrounding the satellite.

Molecules and atoms ejected in a watery plume quickly become ionized as solar winds knock out electrons.

When the plume's particles become electrically conductive, they alter the surrounding magnetic fields. These changes in the magnetic fields can be identified and linked with the presence of plumes.

After identifying Enceladus' plumes, Cassini was able to sample the vapors and detect its chemical composition, confirming their presence. Gravity maps confirmed the plumes originated from the moon's surface. Based on data collected by the Cassini mission, scientists designed a model to predict the size and behavior of Europa's plumes.

Then, scientists examined the Galileo flyby data for the magnetic field signatures predicted by their model.

Study author Andrew Coates, an astrophysicist at the University College London, wrote: "The results — based on an observed deflection and decrease in the observed magnetic field over a distance of 1,000km — imply that there's a dense region of charged particles."

"This is very likely to be the result of a plume, making it the best direct evidence for such an occurrence yet."

Scientists have previously identified Europa as a prime target in the search for extraterrestrial life, suggesting the moon's ocean could host communities of microbes.

Until now, scientists thought a probe would need to land on the icy moon to investigate, but the latest research suggested the plumes could be sampled by an orbiter.

Both NASA and the European Space Agency (ESA) have missions to Jupiter and Europa planned.

ESA's JUICE mission, set to launch in 2022 and deliver a probe to Jupiter by 2030, has two Europa flybys planned.

NASA's Europa Clipper, scheduled to launch between 2022 and 2025, will execute a few dozen Europa flybys.

# Scientists use mini tractor beam to build tissue out of artificial cells

Scientists have constructed unique tissue-like structures using artificial cells and a tractor beam. The technology could eventually be used to create complex networks of artificial cells.

Researchers at Imperial College London (ICL) and Loughborough University were able to alter the artificial cell membranes to promote connectivity, causing cells to stick together like 'stickle bricks', UPI reported.

ICL chemist Yuval Elani said, "Artificial cell membranes usually bounce off each other like rubber balls."

"By altering the biophysics of the membranes in our cells, we got them instead to stick to each other like stickle bricks."

Researchers used a miniature tractor beam, or 'optical tweezers', to drag and drop the artificial cells into positions, causing them to adhere to each other and form unique structures.

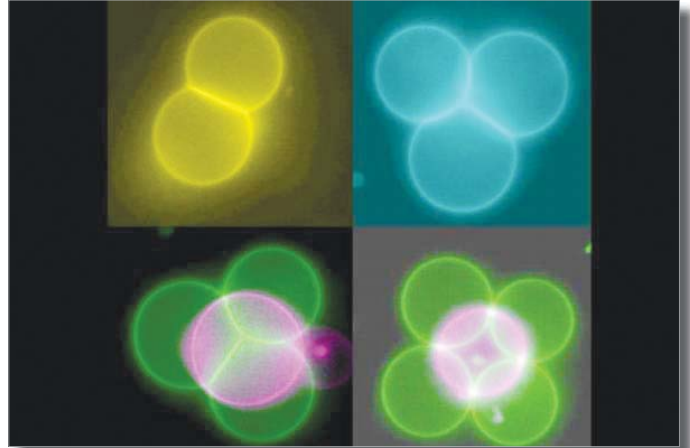
The structures could then be moved as an entire unit and combined without structures.

Scientists were able to build simple cell networks capable of approximating biological functions.

Elani said, "By reinserting biological components such as proteins in the membrane, we could get the cells to communicate and exchange material with one another."

"This mimics what is seen in nature, so it's a great step forward in creating biological-like artificial cell tissues."

Researchers also engineered a less rigid connection mechanism, a tether that links two cells without directly connecting them.



UPI  
Researchers used 'optical tweezers' — a mini laser-powered tractor beam, to move and arrange cells into complex structures.

The two connection mechanisms allowed scientists to build 2D and 3D structures, including long chains of cells and pyramid-like shapes.

The team of biochemists were also able to connect two cells and merge them into one.

Scientists coated the membranes of the cells with gold nanoparticles and then blasted their junction with the optical tweezer's laser beam.

When the nanoparticles vibrated, the

membrane broke down and then two cells fused together.

Scientists could potentially use the fusion technique to trigger intercell chemical reactions.

When the two cells fuse and reform, their insides mix. The technology could be used to deliver drugs or alter a cell's primary function.

The new cell architecture and cell manipulation techniques were detailed Monday in the journal Nature

Communications.

ICL chemist Oscar Ces said, "Connecting artificial cells together is a valuable technology in the wider toolkit we are assembling for creating these biological systems using bottom-up approaches."

"We can now start to scale up basic cell technologies into larger tissue-scale networks, with precise control over the kind of architecture we create."

## UK ups ante on Galileo sat-nav project

The Brexit row between the UK and the EU-27 over Galileo is escalating.

Britain's space agency has written to 13 firms to remind them that they need security authorization to engage in any future contracts on the sat-nav system, according to bbc.com.

It is being interpreted as a threat to block UK tech developed for

also made it clear that British companies will not be allowed to work on PRS after Brexit.

London's dismay at being shut out of a system it helped develop has been to raise the prospect of withdrawing from Galileo completely, and to consider starting up its own indigenous sat-nav network.

Such a move could slow the de-

velopment of the program and its encrypted service.

"This is a necessary consequence of the European Commission's position to exclude UK industry from the project on the suggestion of security concerns, which the UK Government strongly disagrees with."

"The UK Space Agency is leading the work to develop options for a British alternative to Galileo, to guarantee our satellite positioning, navigation and timing needs are met in the future."

The EU's chief Brexit negotiator, Michel Barnier, reiterated the bloc's view that the UK was locking itself out of Galileo PRS by walking out of the EU.

He said, "Third countries and their companies cannot participate in the development of security-sensitive matters."

"These rules will not prevent the UK as a third country from using the encrypted signal of Galileo providing that the relevant agreements between the EU and the UK are in place."

Merely having access to PRS at some future date (as has been requested by other nations outside the EU, Norway and the US) will not be good enough for London.

It wants British companies to continue to participate in all aspects of the development and build of Galileo.

Major contributions have been made by: Surrey Satellite Technology Limited (SSTL), which has prepared the navigation payloads on every operational satellite in the sky; the UK arm of Airbus, which controls the satellites at its center in Portsmouth; And CGI (formerly Logica), which has been instrumental in designing PRS itself.

It's the size of a grain of rice but could hold the key to many aspects of your life.

A tiny microchip inserted under the skin can replace the need to carry keys, credit cards and train tickets, according to dailysabah.com.

That might sound like an Orwellian nightmare to some but in Sweden it is a welcome reality for a growing number who favors convenience over concerns of potential personal data violations.

The small implants were first used in 2015 in Sweden — initially confidentially — and several other countries.

Swedes have gone on to be very active in microchipping, with scant debate about issues surrounding its use, in a country keen on new technology and where the sharing of personal information is held up as a sign of a transparent society.

The 28-year-old Ulrika Celsing is one of 3,000 Swedes to have injected a microchip into her hand to try out a new way of life.

To enter her workplace, the media agency Mindshare, she simply waves her hand on a small box and types in a code before the doors open.

She said, "It was fun to try something new and to see what one could use it for to make life easier in the future."

"In the past year, the chip has turned into a kind of electronic handbag and has even replaced her gym card."

If she wanted to, she could also use it to book train tickets.

Sweden's SJ national railway company has won over some 130 users to its microchip reservation service in a year.

Conductors scan passengers' hands after they book

tickets online and register them on their chip.

Sweden has a track record on the sharing of personal information, which may have helped ease the microchip's acceptance among the Nordic country's 10 million-strong

population.

Citizens have long accepted the sharing of their personal details, registered by the social security system, with other administrative bodies, while people can find out each other's salaries through a quick phone call to the tax authority.

The implants use Near Field Communication (NFC) technology, also used in credit cards, and are 'passive', which means they hold data that can be read by other devices but

cannot read information themselves.

Although still small, they have the capacity to hold train tickets, entry pass codes as well as access certain vending machines and printers, promoters said.

## Microchips get under skin of technophile Swedes



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When Celsing's innovatively minded media company organized an event where employees could get the implants, she followed the crowd.

She said she felt nothing but a slight sting when the syringe inserted the chip into her left hand, which she now uses on an almost daily basis and does not fear hacking or possible surveillance.

"I don't think our current technology is enough to get chip hacked. But I may think

about this again in the future. I could always take it out then."

However, for Ben Libberton, a microbiologist working for MAX IV Laboratory in the southern city of Lund which provides X-rays for research, the danger is real.

He warned, "The chip implants could cause infections or reactions of the immune system. But the biggest risk was around the data contained in the chip."

The researcher said, "At the moment, the data collected and shared by implants is small, but it's likely that this will increase."

The real question, he added, is what data is collected and who shares it.

Libberton said, "If a chip can one day detect a medical problem, who finds out and when?"

He worried that the more data is stored in a single place as could happen with a chip, the more risk it could be used against us.

But Johan Osterlund, a piercings specialist and self-proclaimed champion of chip implantation, brushed off fears of data misuse and conspiracy theories.

He advocated the opposite view, arguing that if we carried all our personal data on us, we would have better control of our future.

Despite unanswered questions however about how the technology will progress, the appeal of being part of a futuristic experience is a strong draw for some users.

Libberton said, "In Sweden, people are very comfortable with technology and I would say there is less resistance to new technology here than in most other places."