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Bubble Subs Arise, Opening Eyes to the Deep Sea

Giant Plastic spheres, with walls six inches thick or more, are making the depths of the ocean, and its strange denizens, more accessible.

Workers with Triton Submarines, a bubble-sub company in Florida, conducted a surface stability test on a Triton 3300/3 submarine at a facility in Fort Pierce, Fla. Scott McIntyre for The New York Times

By William J. Broad

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Bruce H. Robison, a marine biologist at the [Monterey Bay Aquarium Research Institute](#) in California, began prowling the deep Pacific in a revolutionary craft in 1985. It was essentially a giant bubble of clear plastic that gave its occupant stunning panoramic views, instead of requiring them to peer through a tiny porthole.

“It was absolutely transformative,” Dr. Robison said recently. “The profusion of life was so much greater than what I had imagined.” The dark sea was alive: glowing, flashing, shimmering. “It was amazing to see all this bioluminescence and realize it’s a major form of communication,” he said. “It really changes your perspective.”

Three-plus decades later, bubble craft have gone mainstream, and thousands of people are experiencing that deep-sea vista. While Elon Musk and Jeff Bezos advance space travel, another set of

entrepreneurs is going in the opposite direction, seeking to expand the exploration of inner space. Fans of the undersea craft sometimes call these new submersibles inner spaceships.

“They keep reaching deeper and deeper,” said Will Kohnen, who tracks development of bubble craft for the [Marine Technology Society](#), a professional group. Much of the activity, he added, arises from growing concern about the ocean’s health: “People want to see it firsthand. It’s all about connecting with the ocean.”

The current generation of bubble craft can dive as deep as 7,500 feet, far below the last flickers of sunlight, and hold up to seven people. Larger, deeper-diving bubbles are on the horizon.



A giant squid, as seen in a video still taken by a team of Japanese scientists in a bubble sub near the Ogasawara Islands in July 2012. Reuters



The single-seated Deep Rover, produced by Graham Hawkes of Deep Ocean Engineering. Bruce H. Robison, a marine biologist, piloted the craft in 1985. T. Kerby/OAR/National Undersea Research Program; University of Hawaii/NOAA

The giant plastic spheres and, in at least one case, a hemisphere, are opening eyes to the sunless depths of the ocean and leading to discoveries. In 2012, a bubble sub off Japan captured [the first video of a giant squid](#), a creature with a nightmarish tangle of tentacles. A three-person bubble tracked the creature to a half-mile below the surface.

In 2016, a [dive off Portugal's Azores Islands](#) caught sight of a female anglerfish and her tiny mate locked in a sexual embrace. Marine biologists [hailed the resulting video](#) as a breakthrough in revealing the behavioral secrets of the anglerfish, long notorious for dangling a bioluminescent lure in front of needlelike teeth.

This summer, scientists in a bubble off the Bahamas [attached](#) a satellite tag to a [bluntnose sixgill shark](#), an abyssal giant that predates most dinosaurs. Scientists said the deep tagging was a first in the shark's own habitat and would provide more accurate tracking.

The innovative craft are the result of many advances in electronics and materials science. According to [Triton Submarines](#), a bubble-sub company in Sebastian, Fla., [three tons of acrylic](#) go into building a plastic bubble seven feet wide, its walls six and a half inches thick. The craft can take three people down 3,280 feet, roughly three-quarters of a mile.



Patrick Lahey, president of Triton Submarines, at their facility in Sebastian, Fla.
Scott McIntyre for The New York Times



Models and equipment involved in the designing of the Triton 3300/6, the six-seated sub being developed at Triton. Scott McIntyre for The New York Times

Sub makers are not immune to a sense of wonder. Patrick Lahey, president of Triton Submarines, said he was exploring the deep Pacific in 2013 in a bubble [with scientists from American Museum of Natural History](#) when he pulled out his flashlight and blinked it two or three times into the darkness.

“Off in distance, an animal flashed back the same number,” he recalled in an interview. “It was unbelievable. Something was communicating back.”

During the Cold War, [the American Navy pioneered](#) the first bubble certified for deep diving and named it Nemo, after the captain of the submarine Nautilus in Jules Verne’s novel “Twenty Thousand Leagues Under the Sea.” The technology was so new that the Navy relied on [Bruce Beasley](#), an Oakland, Calif., artist known for his bright acrylic sculptures, to cast the undersea spheres.

Nemo was 5 1/2 feet wide, with walls 2 1/2 inches thick, and could hold two deep explorers. It underwent sea trials in 1970 and, in the next decade, made more than 600 dives.

The bubble that Dr. Robison first piloted in 1985 was a one-of-a-kind craft, named Deep Rover, designed by [Graham Hawkes](#) of Deep Ocean Engineering, based in San Leandro, Calif.

Other commercial designers followed. An oceanographic team in Costa Rica has [used a bubble made by SEAmagine Hydrospace](#), based in Upland, Calif., for deep tourism and [biodiversity research](#) for more than a decade.

“They’ve made tons of discoveries,” said Mr. Kohnen, the Marine Technology Society official who is also the company’s president. “It’s really fantastic.”



Readying a Triton 3300/3 before testing in the water. The number 3 after the slash means the undersea craft can hold three people. Scott McIntyre for The New York Times



Graham Hawkes and Sylvia Earle with a Deep Rover prototype in 1983. Alain Le Garsmeur, via Alamy

Bubble development is now driven mainly by extremely wealthy people — typically owners of superyachts, which can cost \$100 million or more. A bubble is perceived as a status symbol; costing \$2 million to \$5 million, it represents a relatively small part of a luxury investment. Chris Cline, a billionaire entrepreneur, philanthropist and political donor who [died in a helicopter crash](#) in July, ordered a bubble sub for his superyacht more than a decade ago.

Another early enthusiast was [Ray Dalio](#), a founder of the investment firm Bridgewater Associates, in Westport, Conn. With his superyacht and a Triton submarine, he became the first, in 2012, to capture [footage of a giant squid](#) in its dark habitat.

Mr. Dalio has turned his hobby into a global calling. Last year, he and his son Mark launched [OceanX](#), an arm of Dalio Philanthropies that promotes ocean exploration and awareness, mainly through filmmaking. OceanX owns [two bubbles](#) and is building [a second ship](#).

“Ocean exploration is more exciting and important than space exploration,” the senior Mr. Dalio [said last year in a statement](#). “We are on a mission to show people that.”

In September, [Triton announced](#) that Kjell Inge Røkke, a Norwegian billionaire who made his money in commercial fishing, is buying a bubble that can descend 7,500 feet, about a mile and a half. That would mark the deepest dive yet for a plastic sphere. His [ocean foundation](#) plans to use the three-person craft for scientific research.

The walls of the craft will be a foot thick. “That wasn’t possible just a few years ago,” Mr. Lahey of Triton said in an interview. Triton contracts out its bubble production to a German team that [includes Röhm](#), the inventor of Plexiglas, a brand of solid transparent plastic.



Inspections at Triton. The company has ambitious plans for underwater exploration and leisure, including a luxury resort known as Poseidon. Scott McIntyre for The New York Times



A pressure reading on a Triton 3300/3 submarine, which can take a pilot and two passengers down to a depth of 3,300 feet, or roughly three-quarters of a mile. Scott McIntyre for The New York Times

In [a brochure](#) titled “Luxury Submersibles,” Triton advertises a model that can hold seven people — a pilot and six passengers — and can be operated from a cruise ship.

Kelly Downey, a spokesman for Triton, said the company had just received its first order but could not disclose the buyer’s name. She said the bubble, which will have walls five inches thick, will dive to 1,650 feet, about a third of a mile deep.

In April, Victor L. Vescovo, a wealthy investor, [piloted a Triton vehicle nearly seven miles down into the Challenger Deep](#), the deepest fissure on Earth. Five feet in diameter, made of titanium, a superstrong metal, and [featuring three portholes](#) the size of dinner plates, the vehicle was a new variation on an old theme.

The Triton brochure also offers a vision of the bubble future: a vehicle with a “completely transparent pressure hull” that could reach the bottom of the Challenger Deep. In the interview, Mr. Lahey, the company’s president, said the colossal pressures at that depth would crush plastic and that the sphere would have to be made of superstrong glass.

“We’d have to spend a long time and a lot of energy to show it’s suitable,” he said of a bubble made of glass. “But it would be fantastic.”

Triton has also proposed building an undersea luxury resort [called Poseidon](#). It would sit at the bottom of a lagoon in Fiji next to a coral reef and feature 24 guest rooms — not bubbles but domes made of plastic.

The rise of bubble subs promises to pay exploratory dividends for decades to come. “Regardless of the driver,” said Dr. Robison of the Monterey Bay Aquarium Research Institute, “whether it’s rich guys

with yachts or scientists with instruments, the fact that the technology is evolving means it's going to be much easier to do this kind of research in the future."

Graham Hawkes, the bubble designer who introduced Dr. Robison to the deep panoramic view in the 1980s, "said it was going to change everything, and he was right," Dr. Robison said.

"We've been studying the deep sea indirectly for a century and a half. And now we can finally get down there and measure things and see them directly for ourselves. That's a huge advantage."



A Triton 3300/3 submarine during a surface stability test by Triton technicians and engineers in Fort Pierce, Fla., in October. Scott McIntyre for The New York Times