

James Cameron Completes Record-Breaking Mariana Trench Dive

Solo sub dive is deepest ever.



The explorer-filmmaker emerges from his sub after returning from Challenger Deep.

PHOTOGRAPH BY MARK THIESSEN, NATIONAL GEOGRAPHIC



THE DEEPEA CHALLENGER SUB DURING A FEBRUARY TEST OFF PAPUA NEW GUINEA. PHOTOGRAPH BY MARK THIESSEN, NATIONAL GEOGRAPHIC

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for National Geographic News
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At noon on Monday, local time, (10 p.m. Sunday ET) James Cameron's "vertical torpedo" sub broke the surface of the western Pacific, carrying the National Geographic explorer and filmmaker back from the Mariana Trench's Challenger Deep—Earth's deepest, and perhaps

most alien, realm.

The first human to reach the 6.8-mile-deep (11-kilometer-deep) undersea valley solo, Cameron arrived at the bottom with the tech to collect scientific data, specimens, and visions unthinkable in 1960, when the only other manned Challenger Deep dive took place, according to members of the National Geographic expedition.

After a faster-than-expected, roughly 70-minute ascent, Cameron's sub, bobbing in the open ocean, was spotted by helicopter and would soon be plucked from the Pacific by a research ship's crane. Earlier, the descent to Challenger Deep had taken 2 hours and 36 minutes.

Expedition member Kevin Hand called the timing of the *DEEPSEA CHALLENGER* sub's ascent "perfect."

"Jim came up in what must have been the best weather conditions we've seen, and it looks like there's a squall on the horizon," said Hand, a NASA astrobiologist and National Geographic emerging explorer.

Before surfacing about 300 miles (500 kilometers) southwest of Guam, Cameron spent hours hovering over Challenger Deep's desert-like seafloor and gliding along its cliff walls, the whole time collecting samples and video.

Among the 2.5-story-tall sub's tools are a sediment sampler, a robotic claw, a "slurp gun" for sucking up small seacreatures for study at the surface, and temperature, salinity, and pressure gauges. (See pictures of Cameron's sub.)

Now "the science team is getting ready for the returned samples," said NASA's Hand.

Cameron—best known for creating fictional worlds on film (*Avatar*, *Titanic*, *The Abyss*)—is expected to announce his initial findings later today. After analysis, full results are to be published in a future edition of *National Geographic* magazine.

(Video: Cameron Dive Is an Exploration First.)

"The Ultimate Test"

Retired U.S. Navy Capt. Don Walsh, who descended to Challenger Deep in 1960, said he was pleased to hear that Cameron had reached the underwater valley safely.

"That was a grand moment, to welcome him to the club," Walsh, said in a telephone interview from the sub-support ship.

"There're only three of us in it, and one of them—late Swiss engineer Jacques Piccard—is dead. Now it's just Jim and myself."

Expedition physician Joe MacInnis called Cameron's successful descent today "the ultimate test of a man and his machine."

After breaching the ocean surface, the *DEEPSEA CHALLENGER* was first spotted by a helicopter owned by Microsoft co-founder Paul Allen, a longtime Cameron friend. Allen was on the scene for the historic dive and posted live updates of the event on Twitter from aboard his yacht, the *Octopus*, which is providing backup support for the mission.

Science in Three Dimensions

Throughout the Mariana Trench dive, 3-D video cameras were kept whirring, and not just for the benefit of future audiences of planned documentaries.

"There is scientific value in getting stereo images because ... you can determine the scale and distance of objects from stereo pairs that you can't from 2-D images," Cameron told National Geographic News before the dive.

But "it's not just the video. The sub's lighting of deepwater scenes—mainly by an 8-foot (2.5-meter) tower of LEDs—is "so, so beautiful," said Doug Bartlett, a marine biologist at the Scripps Institution of Oceanography in San Diego, California.

"It's unlike anything that you'll have seen from other subs or other remotely operated vehicles," said Bartlett, chief scientist for the *DEEPSEA CHALLENGE* project, a partnership with the National Geographic Society and Rolex. (The Society owns National Geographic News.)

(Read more about *DEEPSEA CHALLENGE* science.)

Medical, Psychological Rigors

As the 57-year-old explorer emerged from the sub's coffin—tight 43-inch-wide (109-centimeter-wide) cockpit, a medical team stood at the ready.

But if recent test dives—including one to more than five miles (eight kilometers meters) down—are any indication, Cameron should be physically fine, despite having been unable to extend his arms and legs for hours, expedition physician Joe MacInnis told National Geographic News before the dive.

"Jim is going to be a little bit stiff and sore from the cramped position, but he's in really good shape for his age, so I don't expect any problems at all," said MacInnis, a long-time Cameron friend.

In addition, the sub's "pilot sphere" has a handlebar, which Cameron could use to pull himself occasionally up during the dive. "Usually, shifting position is all that's required to buy yourself another few hours," he said.

(Video: how sub sphere protects Cameron.)

Because Cameron had prepared extensively for the dive, he should be in good psychological health, said Walter Sipes, an aeronautics psychologist at NASA's Johnson Space Center.

"He's got prior experience doing this, not just in the simulator but also training dives ... and he's an adventurer, so I really don't think they'll have any issues to worry about," said Sipes, who is not part of the expedition.

Still, if Cameron plans to conduct more dives—which the team has indicated he will—Sipes recommends he get plenty of rest in between or risk mental fatigue.

"When you start to get fatigued, you start making mistakes," he added. "And since he's down there solo, he can't afford that. He's a [potential] single-point failure."

It should be at least a few weeks before any further *DEEPSEA CHALLENGE* dives, as the director's next breakneck mission will take him from the middle of the Pacific to London, where he's due at a premiere of his *Titanic 3-D* Wednesday.

(Animation: Cameron's Mariana Trench dive compressed into one minute.)

"A Turning Point"

By returning humans to the so-called hadal zone—the ocean's deepest level, below 20,000 feet (6,000 meters)—the Challenger Deep expedition may represent a renaissance in deep-sea exploration.

While remotely operated vehicles, or ROVs, are much less expensive than manned subs, "the critical thing is to be able to take the human mind down into that environment," expedition member Patricia Fryer said, "to be able to turn your head and look around to see what the relationships are between organisms in a community and to see how they're behaving—to turn off all the lights and just sit there and watch and not frighten the animals, so that they behave normally.

"That is almost impossible to do with an ROV," said Fryer, a marine geologist at the Hawai'i Institute of Geophysics & Planetology.

Andy Bowen, project manager and principal developer of the *Nereus*, an ROV that explored Challenger Deep in 2009, said a manned mission also has the potential to inspire public imagination in a way a robot can't.

"It's difficult to anthropomorphize machines in a way that engages everyone's imagination—not in the same way that having boots on the ground, so to speak, can do," said Bowen, who's not an expedition member.

Biological oceanographer Lisa Levin, also at Scripps, said that the *DEEPSEA CHALLENGE* program's potential for generating public interest in deep-ocean science is as important as any new species Cameron might have discovered.

"I consider Cameron to be doing for the trenches what Jacques Cousteau did for the ocean many decades ago," said Levin, who's part of the team but did not participate in the seagoing expedition.

At a time of fast-shrinking funds for undersea research, "what scientists need is the public support to be able to continue exploration and research of the deep ocean," Levin said.

(Video: Cameron Dive First Attempt in Over 50 Years.)

Perhaps referring to his friend's most recent movie, expedition physician MacInnis called Cameron a real-world "avatar."

"He's down there on behalf of everybody else on this planet," he said. "There are seven billion people who can't go, and he can. And he's aware of that."

For his part, Cameron seems sure that the *DEEPSEA CHALLENGER* will be exploring the depths for a long time to come. In fact, he's so confident in his star vehicle, he started mulling sequels even before today's trench dive.

Phase two might include adding a thin fiber-optic tether to the ship, which "would allow science observers at the surface to see the images in real time," said Cameron, a National Geographic Society explorer-in-residence.

"And phase three might be taking this vehicle and creating a second-generation vehicle."

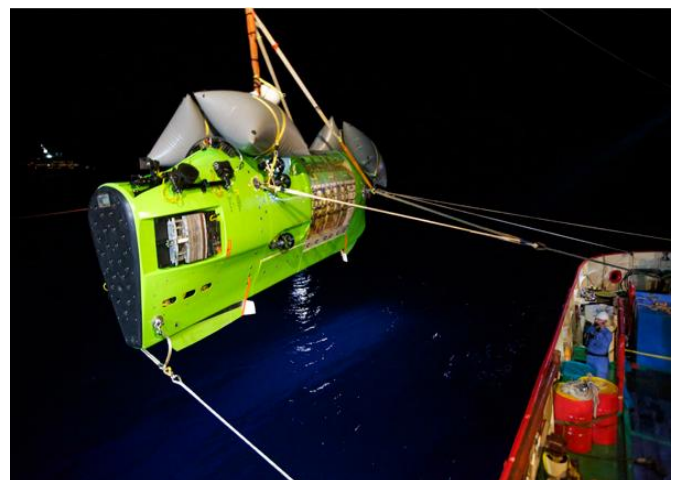
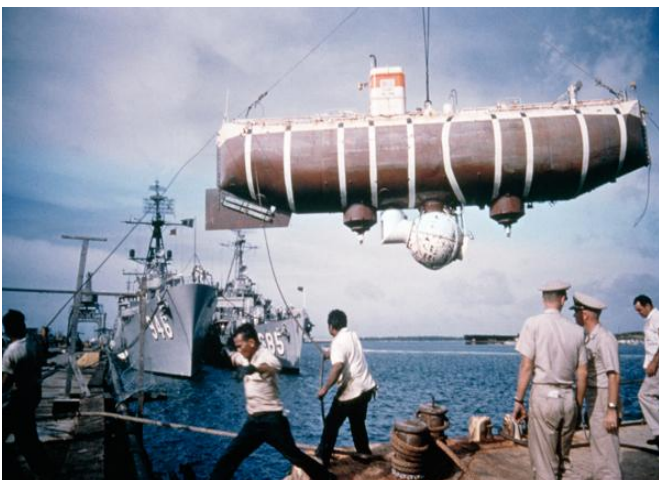
DEEPSEA CHALLENGE, then, may be anything but a one-hit wonder. To expedition chief scientist Bartlett, the Mariana Trench dive could "represent a turning point in how we approach ocean science.

"I absolutely think that what you're seeing is the start of a program, not just one grand expedition."

Rachael Jackson of National Geographic Channels International contributed reporting to this story.

Additional major support for the DEEPSEA CHALLENGE expedition was provided by the Alfred P. Sloan Foundation.

Then & Now: Diving in the Mariana Trench



Top photograph by Thomas J. Abercrombie. Bottom photograph by Mark Thiessan

Then:

The first explorers to descend to the deepest part of the oceans were U.S. Navy Lt. Don Walsh and Swiss oceanographer and engineer Jacques Piccard. They made their journey on January 23, 1960, in the Swiss-

designed, Italian-built, U.S. Navy bathyscaphe Trieste. After a descent that took almost five hours, they reached a depth of 35,800 feet (10,912 meters) in the Mariana Trench's Challenger Deep. The bathyscaphe carried no scientific equipment, and no experiments were conducted. Walsh and Piccard stayed on the bottom for 20 minutes before dumping tons of iron pellets to begin an ascent that lasted 3 hours and 15 minutes. (Related: "Man's Deepest Dive")

Now:

James Cameron's *DEEPSEA CHALLENGER* submersible deploys technologies unimagined in the 1960s. The craft is much lighter, using a special kind of foam construction to give it both buoyancy and protection from the extreme environment nearly 7 miles (11 kilometers) beneath the surface. Whereas the Trieste took nearly five hours to descend and more than three hours to ascend, the *DEEPSEA CHALLENGER* reached the bottom in about two and a half hours and returned to the surface in 70 minutes. The 21st-century craft can explore the ocean floor for six hours or more, moving around to make photographic and 3-D video images and to collect samples with a mechanical arm.



Shrimp like amphipods were the only creatures James Cameron saw in the Marina Trench 10900 meters below the sea surface.