James Cameron explains science of *Deepsea Challenge 3D*

Film strives to balance demands of extreme ocean research with entertainment.

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Film director and explorer James Cameron leans into a simulator he used to train for his submersible dives in the Mariana Trench.

Only three people have ever made it to Challenger Deep, the deepest known point under the sea. The feat was most recently achieved in 2012 by the film director James Cameron. The rest of the world can now learn what one of the planet's most extreme environments is like from Cameron's latest film project, *Deepsea Challenge 3D*, which National Geographic Entertainment released in US cinemas on 8 August. They can also catch glimpses of what science looks like in a place so little explored that the potential for discovery is akin to that enjoyed by scientists a century or more ago on land.

"A general goal for the film is to inspire exploration, to inspire innovation, to make people realize we're not done exploring planet Earth," Cameron told *Nature* (see full interview below).

The focus for *Deepsea Challenge 3D* — which Cameron co-produced but did not direct — is the quest to build a submarine that can safely

take a human nearly 11,000 metres down to the Challenger Deep, in the Mariana Trench southeast of Guam.

The film uses Cameron's celebrity and personal story as a thread to pull viewers into the depths, but the endeavour also included a substantial science component. Cameron's team deployed autonomous landers carrying cameras, baited animal traps and other equipment, in conjunction with submersible dives. They also fitted sample collection equipment to the sub itself. "He had a tremendous enthusiasm for the science," says Erika Montague, an independent science and technology consultant in Alameda, California, who helped to operate the landers and to analyze video data.

The film chronicles several lander deployments and submersible dives at test sites near Papua New Guinea in unexplored portions of the 9,140-metre-deep New Britain Trench, in preparation for the dive to Challenger Deep (see 'James Cameron returns from the deep').

Cameron says that he would have liked to see more science in the film. But he says that although National Geographic was very supportive of the research aspects, bringing that science to a commercial market is challenging. "There's a real danger when doing a movie you're putting in theatres that it can become a little too much like an educational show and you've got to avoid that as much as possible."

But the film's makers did find artful ways to bring in pieces of science. In one scene, Cameron uses a conversation with a resident of Papua New Guinea who lost his home to volcanic eruptions as an occasion to explain the tectonic processes that lead to the formation of deep trenches. The goal was to make an emotional connection with viewers by showing the link between trench formation and events that have more direct bearing on people's lives, such as tsunamis and volcanic eruptions.

"Trenches are so remote that people say, 'I'll never go, they won't affect me'," says Cameron. "Except they do — when their effects start killing a quarter of a million people like they did in Indonesia."

More science comes through in a scene in which the project's chief scientist, marine microbiologist Doug Bartlett at the Scripps Institution of Oceanography in La Jolla, California, is stunned by an unexpected load of huge crustaceans recovered from a trap deployed on a lander. Cameron explains in voice-over narration that the haul was later found to include four species that were probably new to science.

Sample-collection plans for the mission's deepest dive were cut short by a hydraulic failure on the sub that plays out in the film, but Cameron managed to collect a small sediment sample that has enabled substantial microbial DNA analyses by Bartlett.

Science and exploration come together throughout the film with spectacular views of the deep-sea world. Little life is visible in the Challenger Deep, but during test dives at New Britain, Cameron focuses on deep dwellers such as an octopus, a free-swimming sea cucumber and a rattail fish that, seen in its environment, looks more attractive than its name would imply.

Deepsea Challenge 3D transports viewers to the depths, using three-dimensional cinematography as a tool to recreate as closely as possible the feeling of being there.

"He's done a great service to the ocean community and to the public, by bringing all of this to light," says Montague.

"Very few people on the planet think about the deep sea," says Cindy Van Dover, a deep-sea biologist and director of the Duke University Marine Laboratory in Beaufort, North Carolina. "What James Cameron can do like no one else is make people aware that the deep sea is an extraordinary place."

Titanic director talks to _Nature_

What kind of reaction have you seen so far to _Deepsea Challenge 3D_?

It's been well received. At the press screenings it was well reviewed and there has been a lot of enthusiasm during the interview process, so that's good. I've tried to steer the conversations sort of aw etting and push the science research and technology.

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