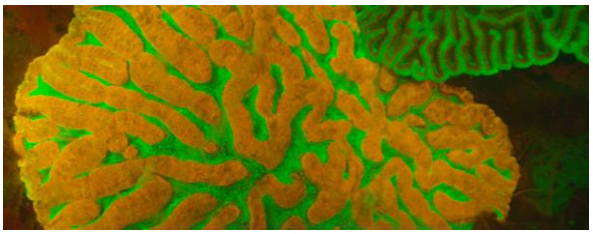




Underwater Photography and Deep Ocean Diving

Underwater Photography

Underwater photography poses special challenges.

Visible light is absorbed as it travels through water, resulting in loss of spectral bandwidth. Longer wavelengths (e.g., reds) are filtered out quickly with increasing depth. At greater depths there is little external light, and at night no light at all.

American Museum of Natural History (AMNH) scientists use a specially housed **Red Epic 5K Digital Cinema** video camera to capture many of their underwater images.

To film biofluorescent marine creatures, scientists expose them to intense blue light from LED systems they designed and built themselves. Fluorescent molecules in the animals then transformed the light into their own biofluorescent colors – including vivid reds.

Scientists use special green, long-pass camera filters and yellowish-green visors to view the biofluorescence.

Challenges of Deep Ocean Diving

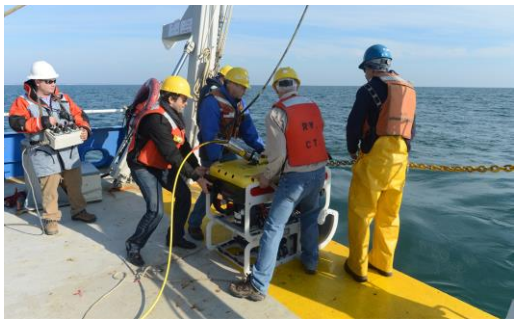
Ocean diving, especially at night, carries many risks. At depths of 60-100 feet, the greater pressure can cause nitrogen, an inert gas found in air, to build up in a diver's blood and cause "nitrogen narcosis," a drunk-like stupor, disorientation, and even loss of consciousness. To avoid this, deep-water divers use a special mixture of gases, including helium, and remove much of the nitrogen from their breathing tanks.

Coral walls may descend as much as 1,000 feet. If divers do not maintain "neutral buoyancy" while they work, they may inadvertently drift to lower depths and greater dangers, including depleting a more compressed oxygen supply, and requiring longer than expected decompression time to return to the surface.

Sharks may be in the vicinity, but not visible. Especially at night, underwater navigation is tricky. Mid-ocean currents may cause a diver to drift away from the boat.

Submersibles

Many scientists use submersibles, short-range submarines with pressurized cabins that operate underwater at depths of 2000 feet or more for several hours at a time. SEAmagine Hydrospace, U-Boat Worx and Nuytco Research Ltd. are three major companies that manufacture submersibles for underwater exploration.



Remote Operated Vehicles (ROV)

AMNH curator John Sparks, CUNY professor and AMNH research associate David Gruber, and Vincent Pieribone, a professor at the John B. Pierce Laboratory at Yale University and a research associate at AMNH, are building the DeepReef-ROV (remotely operated vehicle) to study deep water bioluminescence and biofluorescence. It uses a suite of high-definition cameras customized for ultra low-light conditions that can film at depths of 1000 meters or more. Images are beamed instantly to the surface with fiber optics.

Eye-in-the Sea

Marine biologist Edith Widder of the Florida-based Ocean Research and Conservation Association invented an unmanned deep sea webcam called Eye-in-the-Sea that uses low-light imaging and far-red light to film bioluminescence in the deep ocean without disturbing marine animals. A modified model, dubbed the Medusa, examined the effects of the BP oil spill on deep sea ecosystems, and captured the first images of the giant squid in its native habitat.

The Exosuit

Nuytco Research spent 15 years developing the Exosuit, a new 6.5-foot tall aluminum alloy diving suit that allows divers to operate at depths of up to 1000 feet at surface pressure, with up to 50 hours of oxygen. Weighing more than 500 pounds, its gear includes HD Blu-Ray Codec cameras and LED lighting, and advanced audio capabilities. Eighteen rotary joints and foot controlled thrusters allow for extensive range of motion.

In July, an expedition with the Exosuit will leave off the coast of New England, where several hours will be spent working in concert with the DeepReef-ROV to study bioluminescence and biofluorescence.

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