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Researcher Wins National Award For Studies of Deep Ocean Life



Unusual tube worms thrive on the lightless seafloor. Inset: Researcher David Karl.

There is yet another, perhaps more practical reason for studying oceanic bioluminescence: to help support the research of the UH Deep Underwater Muon and Neutrino Detection (DUMAND) team. In order to detect high energy muons and neutrinos, the DUMAND scientists measure light in the deep sea by placing very sensitive instruments near the ocean floor. But the light from glowing bacteria may overwhelm the signal derived from the high energy particles.

"If (the DUMAND) project is to be successful," Karl said, "we need to understand bioluminescence" in order to account for its effects on their data or to find ways of screening it out.

Some of Karl's projects have been featured in the July 9, 1983 issue of Science News and Time's May 24, 1982 issue. He has also spoken at 13 seminars and symposia and attracted more than \$1 million in research funds during the last five years, not including the new award.

"For the last couple of years I've spent more time teaching than learning. Now I hope to spend more time learning than teaching. I'm looking forward to being a student once again," he said.

Research on unusual seafloor colonies and glowing submarine bacteria has captured a prestigious national award for David Karl, UH-Manoa associate professor of oceanography.

Karl was recently selected as a 1984 Presidential Young Investigator, one of only two researchers in the nation in the oceanographic and atmospheric fields to receive the honor. He will receive a basic grant of \$25,000 and may receive up to \$75,000 in additional funds if he can find a private industry to match the supplemental funds from the National Science Foundation.

The award, initiated by President Ronald Reagan, provides "cooperative research support for the nation's most outstanding and promising young science and engineering faculty," according to the National Science Foundation.

The 34-year-old associate professor plans to use the award in his studies of underwater "bioluminescent" bacteria; ecosystems thriving without sunlight on the ocean floor; and hydrogen-sulfide-eating bacteria which are the basis of these ecosystems.

Karl was an original member of the research team that captured the attention of the National Geographic Society which produced a one-hour television special on the team's investigations of colonies of giant worms and other unusual creatures thriving without sunlight on the seafloor.

The discovery of these complicated ecosystems, located off the Galapagos Islands, revealed six-foot-long worms

clustered around hydrothermal vents that spew super-heated fluids. Karl's investigation found that these ecosystems are supported by bacteria which, in turn, depend on the hydrogen sulfide emitted from these vents for sustenance.

"The discovery of these ecosystems has drastically altered theories of the earth's ecology," Karl said. "If the sun stopped shining, life would continue."

Karl plans to use part of the presidential award to look for similar ecosystems that may surround vents off the Big Island in the submarine East Rift Zone of Kilauea. He will focus on the bacteria which live off the hydrogen sulfide emitted from the vents.

Hydrogen sulfide is a highly toxic substance which is released by volcanoes, geothermal vents and factories. When released into the atmosphere, it mixes with hydrogen and oxygen to form acid rain.

Karl said that these bacteria might be used to take hydrogen sulfide out of the geothermal steam much faster and more completely than the current chemical precipitation method.

Karl also plans to use a portion of the award to study another type of bacteria; one that emits light. These bioluminescent bacteria, which are a food source for larger organisms, live on organic particles sinking to the ocean floor. It has been suggested that their ability to give off light, in an otherwise dark ocean habitat, helps larger organisms detect their presence.

"Bioluminescence has been known in the deep sea for many years; however, we still do not completely understand the origin, mechanisms or ecological control of this light-emitting process," Karl said.