# Hawaii's undersea volcano has large supply of bacteria

## ☐ But the absence of marine animals is a puzzle for scientists

By Helen Altonn
Star-Bulletin

Hawaii's undersea volcano Loihi has a plentiful supply of bacteria, but a puzzling absence of marine animals, scientists have found.

"We still don't know why animals are not there eating (the bacteria)," said David Karl, University of Hawaii biological oceanographer.

But it simply may be that all that food is out of reach, his research suggests.

Karl has discovered that the bacteria have a steel-like tube around them. The organisms absorb iron coming out of the volcano, use it for energy and then secrete it in a sheath around them, he said.

So while there are thick orangish-red mats of bacteria on the seamount, there may be no way for animals to get food out of the tubes, Karl said.

To study the bacteria, he dissolved the iron sheaths with acid and examined the organisms under a microscope. "It's like a macaroni noodle with a cell living inside. . .

"It is a very unusual, exciting discovery," he said, noting that Loihi is the only place in the ocean where these peculiar bacteria are found. Such bacteria usually exist in strip-mining or other polluted areas where there is a lot of iron, he said.

Karl, who heads the Division of Oceanic Biology in the new School of Ocean and Earth Science and Technology, has been investigating Loihi's bacteria and hot water vents in a series of

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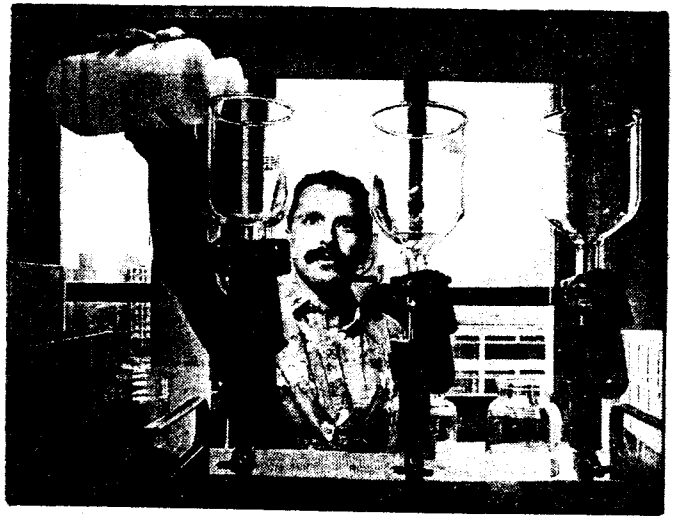

By Dean Sensui, Star-Bulletin

David Karl, a University of Hawaii oceanographer, filters bacteria out of water taken from Loihi's volcanic vents. The bacteria have steel-like tubes around them.

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dives on the UH submersible Pisces V.

His most recent expedition in September involved the large UH research vessel Moana Wave and the smaller Kila, which usually escorts the Pisces. About 16 scientists and graduate students from UH and around the world also participated.

Other key Hawaii researchers were geologist Michael Garcia and geochemist Gary McMurtry.

Karl and Garcia have National Science Foundation grants that enabled them to use the Moana Wave with its well-equipped laboratories to work at sea. This is essential for bacteria, Karl pointed out. "You can't throw them in a bag like rocks."

With the Kila, he said, they must set up laboratories in hotel rooms and work all night — presenting a startling sight of unmade beds and bleary-eyed scientists to the cleaning person.

Findings of the UH group indicate that Loihi, growing above a hot spot south of the Big Island, differs in chemistry, marine life and other ways from volcanic activity along midocean mountain ridges. Possibly it is because Loihi is younger and more isolated, the scientists suggest.

Fluids pouring out of the volcano, about 4,000 feet beneath the ocean surface, have low temperatures, about 30 degrees Celsius. But Karl has found that Loihi's organisms can live in 60 degrees Celsius or even up to boiling temperatures.

The plumes or columns of hot water rising from Loihi's vents also are unusual, Karl and McMurtry discovered. The vent water doesn't become diluted with the ocean water but remains coherent with particles, like smoke from a factory, Karl said.

The plumes contain radioactive materials (radon gas), methane, a lot of helium and larger amounts of carbon dioxide, he said.

The particles are heavy and sink quickly to the bottom, leaving the seamount with a snow-like covering, Karl said.

One of his projects is to map the plumes to see how long they are, in what direction they're traveling through the ocean and how quickly organisms are removing certain compounds flowing out of the undersea mountain.

A year ago, scientists thought they might have seen all the volcanic activity now going on at Loihi, Karl said.

However, he said Pele's Vents — the major active area found so far — isn't large enough to put out all the plumes.

He believes a tremendous amount of fluids may be pouring out other areas of the seamount from the Earth's interior.

He hopes to find them next year when he will continue his experiments.