USC awarded $3.9M for lab under the sea

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Think of bacteria eating rock. Now think of bacteria eating rock below the ocean floor. How about experimenting on bacteria in that rock 15,000 feet underwater?

With a $3.9 million grant from the Gordon and Betty Moore Foundation, USC researcher Katrina Edwards will lead a first-of-its-kind drilling expedition to study subseafloor life.

Recently discovered subseafloor microbes, which live on chemical reactions with rock and water, may affect ocean chemistry, the marine food web and global climate.

That's because the entire volume of Earth's oceans appears to circulate through the seabed every 200,000 years — lightning fast, by geologic standards.

"The ocean crust is more like fractured hard sponge cake than what we think of as truly solid," Edwards explained.

Yet scientists know little about this "deep biosphere," so Edwards and more than 30 colleagues have pushed for an observatory and at least a decade of research, which the Moore Foundation grant helps make possible.

"Dr. Edwards is pursuing one of the most fascinating problems in science," said David Kingsbury, chief program officer of science at the Moore Foundation, based in San Francisco.

“With the recognition that the subseafloor ocean may teem with microbial life comes new, fundamental questions about the evolution and distribution of life and the operation of the carbon cycle,” he added.

The grant will fund complex engineering and instrumentation needed for long-term experiments at and below the seafloor. The drilling will occur under the auspices of the Integrated Ocean Drilling Program, an international marine research program funded by the National Science Foundation and Asian government agencies. Shallow drilling is expected to begin in 2009, and deeper drilling in 2010.

The undertaking will further bridge the earth and life sciences, a key goal in the emerging field of geobiology, described by Edwards as the co-evolution of Earth and life.

The deep biosphere is uniquely suited for a geobiological approach, Edwards said, since a proper understanding requires genomics, analysis of microbe-rock chemical interactions and a timescale in the millions of years.

Edwards and colleagues will drill at a site near Bermuda through sediments that have accumulated over 7 million years. In addition, they will drill into the basalt below and then conduct long-term experiments in both rock types.

The observatory is expected to uncover new details about the microbes — details impossible to obtain using only rock samples, lab cultures and other traditional methods.

In addition, the unique site — with its deep bed of sediments enclosed by basalt — will allow researchers to understand where the bacteria came from.

“The bacteria could have ‘swum’ up into the sediments from below or they could have floated down from above,” Edwards explained.

Genetic and metabolic pathway data will help the scientists understand how bacteria at different depths in the sediment are related to each other and to other known species.

This in turn could offer clues about how the bacteria evolved, perhaps shedding light on the origin of life.

Still, the scientists are unsure of what they will ultimately discover.

“No one has ever done a project like this before, so we really don’t know,” Edwards said.

Source: University of Southern California