Scientist: Microbe Community Deep Beneath Arctic Permafrost Needs Study

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(PhysOrg.com) -- A community of microbes, living in a frigid layer of gas hydrates deep beneath the Arctic permafrost, has piqued the interest of scientists who say a better understanding of that environment is important because it is both a potential fuel source and record of climate change.

Frederick “Rick” Colwell, a microbiologist from Oregon State University, shared the results of his research at the annual meeting of the American Geophysical Union, outlining how these microbes may have been around for as long as 35 million years, when ancient beach sands were deposited along what is now the North Slope of Alaska.

“These microbes co-exist with methane hydrates more than 600 meters beneath the North Slope, just below the permafrost layer,” Colwell said. “It’s an interesting location for life to exist. We don’t understand all the characteristics for life and we need to know more about this novel environment.”

A professor in Oregon State’s College of Oceanic and Atmospheric Sciences, Colwell was part of a team that explored a core sample taken during a “production test” of the region’s fuel potential. The research, funded by BP and the Department of Energy, sought to learn more about whether this rich methane field could be used as a fuel source.

During that exploration, a science team was able to extract a 154-meter core sample from more than 600 meters below the surface. There the

porous ancient beach sands have been filled with gas and water deposits, forming a methane hydrate field that the scientists believe is about 1.5 million years old – the same age as the permafrost covering it.

“One of the scientific curiosities we’d like to explore is what controls the distribution and diversity of the microbes in the methane hydrates,” Colwell said. “Some microbes consume methane as an energy source and others produce methane. It’s important to learn more about this environment where an unconventional fuel source exists.”

Colwell was part of a scientific panel that produced a report for the Council of Canadian Academies in July of 2008 called “Energy From Gas Hydrates: Assessing the Opportunities and Challenges for Canada.” In that report, the authors say the state of knowledge about the “producibility” of gas hydrates is similar to the understanding that scientists and engineers had about coal-bed and oil sand methane extraction three decades ago. In both cases, it took these fuel sources several decades to become commercially viable.

The gas hydrates, which are comprised predominantly of methane, are formed from the heating of organic material deep beneath the surface. The gases rise and mix with water, creating the hydrates, which are found both in the Arctic permafrost and beneath it.

How much methane there is, the extent to which it is a hydrocarbon resource and the properties of this complex geologic environment are puzzles worth exploring, Colwell said.

“We don’t know much about these hydrates, particularly those beneath the permafrost layer,” Colwell said. “We need to characterize the chemical, physical and biological nature of all levels of the permafrost and below so we understand how the entire system works in this sensitive environment.”