SC EPSCoR/IDeA

RESEARCH FOCUS ON DR. SUSAN LANG

The vast majority of life on earth grows on energy supplied by the sun. Deep in the ocean, where the sun does not penetrate, water passing through rocks creates geochemical energy that supports life in a fundamentally different way. When rocks from deep in the mantle are brought to the surface ocean and exposed to water, they release hydrogen and methane. Under the right circumstances, small organic molecules such as ethane, propane, and formate can also form in the absence of life. Microorganisms living in the rocky subsurface of the ocean convert these compounds to biomass. Given the ubiquity of mantle rocks, such reactions may fuel high-activity "population centers" in the oceanic subsurface, where most life is slow growing.

This NSF-funded collaborative research project will allow **Dr. Susan Lang** (USC) and collaborators to collect samples from the Lost City Hydrothermal field, an iconic example of

PROJECT TITLE

NSF Collaborative Research: Investigating the Lost City as an ultramafic urban center of the subseafloor, fueled by energy and carbon from the mantle

EDUCATION

High definition underwater video footage collected during the expedition will provide the raw material for an 8-week educational training program in digital media focused on kindergarten through 12th grade high school students and undergraduate students.

AWARD ABSTRACT

https://www.nsf.gov/awardsearch/showAward?AWD_ID=1536702

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this type of system. Lost City is in the middle of the Atlantic Ocean and hosts large carbonate towers that reach up to 60 meters (~200 feet) that vent warm, energy-rich fluids. Dense communities of microorganisms inhabit these towers and create a biofilm 'slime' that is intimately associated with the growth of the towers. Samples of rocks and fluids will be collected using the remotely operated vehicle Jason. These will be analyzed to determine the abundance and distribution of life and to identify the physical and chemical conditions that provide the best habitat. This information will provide insight into how biology developed and thrived on early Earth, and into the potential for life to exist on other planets where similar geochemical reactions take place.

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Figure 1 (right). Large towers made out of calcium carbonate rise from cracks in the seafloor. Warm fluids are channeled through these towers and supply energy to life living within them. Picture courtesy of Deborah Kelley (University of Washington)

Figure 2 (below). A closer look at the interior of the carbonate towers shows that a biofilm "slime" covers the surfaces of the minerals. Scanning electron microscope image from Bontognali, Lang, Früh-Green.