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# Biological Effects on Sound Propagation into Sediments at Low Grazing Angles: Planning and Methods Development

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## LONG-TERM GOAL

My long-term goal is to understand important interactions among organisms, non-living particles (including sediments), solutes and moving fluids. The reason for this goal is to be able to solve interesting forward and inverse problems dealing with marine biota.

## OBJECTIVES

My current objectives under this grant are to help plan the DRI on High-Frequency Sound Interaction in Ocean Sediments specifically so that the effects of biota on the propagation of acoustic energy into, through and back from sediments can be resolved.

## APPROACH

My approach has been to interact with other prospective PIs in the DRI both at and outside formal planning meetings. In addition Jill Schmidt and I have been developing embedding methods to allow us to visualize the locations of bacteria and their viscoelastic exopolymers on sediment grains in their natural positions. We are visualizing, mapping and analyzing locations of bacteria via both epifluorescence microscopy and confocal laser microscopy.

## WORK COMPLETED

With the aid of Kristian Fauchald, Director of the Invertebrate Division of the US National Museum of Natural History, we have succeeded in modifying methods that he developed for sectioning sediment-filled animals (deposit feeders) to allow us to visualize bacteria in sands. The methods entail following the general protocol for rock thin sectioning after dehydration and polymer embedding. We have begun visualizing, mapping and analyzing locations of bacteria via both epifluorescence microscopy and confocal laser microscopy.

Jill Schmidt also has been helping DJ Tang (Applied Physics Laboratory) in the related effort of measuring sediment porosity to help calibrate his microconductivity probe.

## RESULTS

We are still optimizing the staining and mapping procedures and working to include activity stains (to distinguish active from inactive bacteria). We anticipate refining field sampling methods and laboratory

protocols in samples from False Bay, San Juan Island, Washington, by spring 1999 to assure that we are ready for the DRI field effort. We have found a parallel application in groundwater (DeLeo et al. 1997) that makes us more confident of success.

#### IMPACT/APPLICATION

The anticipated application is to help determine whether bacteria and(or) their visco-elastic, mucous exudates are prevalent at grain-grain contacts and so are likely to influence sound transmission through effects on the sedimentary frame.

#### TRANSITIONS

There are no transitions yet.

#### RELATED PROJECTS

Related work is being carried out under my core funding: "Vibrational Sensing in Benthic Invertebrates."

#### REFERENCES

DeLeo, P.C., P. Baveye, and W.C. Ghiorse. 1997. Use of confocal laser scanning microscopy on soil thin sections for improved characterization of microbial growth in unconsolidated soils and aquifer materials. *J. Microbiol. Methods* **30**: 193-203.

#### PUBLICATIONS

None