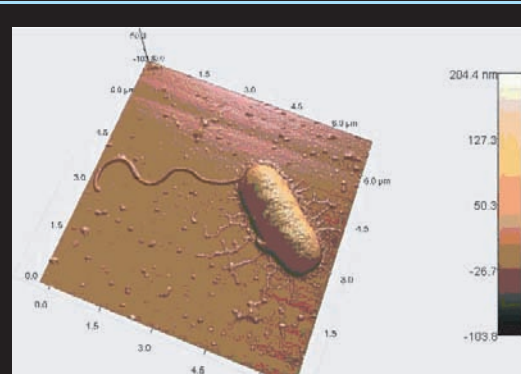
Kenneth H. Nealson

Moving Electrons Around: *Shewanella* and a New View of Microbial Interaction with the Environment

Ken Nealson is the Wrigley Professor of Environmental Sciences at the University of Southern California, where he is involved in establishing the new program in Geobiology. His past jobs include teaching oceanography at Scripps Institution of Oceanography, limnology at the Center for Great Lakes Study at Wisconsin, and running the Center for Life Detection at the Jet Propulsion Laboratory. His early work included the discovery of the regulatory mechanism now called quorum sensing, culminating in the isolation of the genes and gene products responsible for this process. Later work has focused on the study of metal oxidizing and reducing microbes and their role in the biogeochemical cycling of iron and manganese, and more recently the study of ultra-high pH ecosystems (pH 12 and higher).

About 20 years ago, *Shewanella oneidensis* MR-1 was isolated from a manganese-rich lake in upstate New York, and subsequently shown to utilize solid forms of oxidized manganese or iron as an electron acceptor. Recent studies of metal-reducing bacteria have unveiled a number of unexpected properties of microbes that have enlarged our view of microbes and their role(s) in natural ecosystems. For example, the processes of metal reduction themselves are fundamental to the car-bon cycle in many lakes and sediments, where iron and manganese account for the major portion of organic carbon oxidation in many sediments. On more modest spatial scales, iron and manganese reduction can be linked to the oxidation of a wide variety of carbon compounds, many of them recalcitrant and/or toxic. One remarkable property of metal reducers is their ability to reduce solid, often highly crystalline substrates such as iron and manganese oxides and oxyhydroxides. It is now clear that this is done via the utilization of enzymes located on the outer wall of the bacteria—enzymes that apparently interact directly with these solid substrates. Molecular and genomic studies combined have revealed the genes and proteins responsible for these activities, and many facets of the regulation. This talk focuses on the general features and properties of these remarkable organisms that seem to communicate via electron transfer across a wide variety of soluble, insoluble, and even "inert" substrates, and the ways that these processes may be mechanistically linked.



Atomic force microscopy image of *Shewanella* bacteria.

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3:00 p.m.

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