Department of Energy funds genomic research

By Paula Hartman Cohen
News Office staff

A research team led by Microbiology professor Derek R. Lovley has been awarded $3.1 million in grants by the U.S. Department of Energy (DOE) to determine whether the new field of genomic science can be applied to cleaning up contaminated environments.

The team, in part, will determine the function of undefined genes in the genome of a microorganism showing promise for many environmental clean up applications. Further, the researchers will use this information to construct a computer model showing how the organism responds to different environmental conditions. Lovley's team includes Steven Sandler, assistant professor of Microbiology; Barbara Methe from The Institute for Genomic Research (TIGR) in Rockville, Md., Carol Giometti from Argonne National Laboratory, and Bernard Palsson from the University of San Diego.

"We have known for some time that specialized microorganisms may be helpful in removing pollution from groundwater, and now, by studying the complete DNA sequence, of one of these organisms, we will be able to better use it for environmental restoration," said Lovley, who heads the Microbiology Department.

As Lovley emphasized in a recent article in the journal Science, titled "Anaerobes to the Rescue," anaerobes - microorganisms that do not need oxygen to survive - are among the simplest, oldest, and most widespread forms of life. However, it was not until recently that anaerobes were recognized for having a significant potential to consume organic pollutants that enter groundwater from underground petroleum spills and landfills. Some anaerobes can clean up toxic inorganic substances as well, even uranium.

Lovley was able to culture one of these microorganisms;known as Geobacter, in the laboratory, and scientists at TIGR have completely sequenced its DNA. "It's now our job to determine what all this genetic information can tell us about why Geobacter is so successful in removing contaminants from polluted groundwater," Lovley said.

"We've used anaerobes mainly to degrade, detoxify, or immobilize certain contaminants, such as the carcinogen benzene, in soil and groundwater," said Lovley. "For example, Geobacter can use uranium to get energy the same way we use oxygen, and in the process, it will remove uranium from the surrounding environment. We have found ways to speed up this process through trial and error, but by studying the microorganism's genome, we expect to gain insights into how to deliberately design strategies for uranium clean up."