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Lovley lands $8.9m grant for microbial studies

by Elizabeth Luciano, *News Office* staff

Microbiologist Derek Lovley has received an $8.9 million, three-year grant to study a family of microbes with the potential for uranium bioremediation of soil, as well as the production of electricity. The grant, from the U.S. Department of Energy, is part of a larger $103 million effort involving six national laboratories, 16 universities and research hospitals, and four private research institutes throughout the nation. Secretary of Energy Spencer Abraham made the announcement.

UMass Amherst is the only public university to serve as one of five project leaders in the effort. The other project leaders are the Harvard University Medical School, and the Oak Ridge, Lawrence Berkeley, and Sandia national laboratories.

"The substantial DOE commitment to this research reflects the remarkable achievements of professor Lovley's work and the promise it holds for advances in energy production and environmental clean-up," said Chancellor John Lombardi.

The awards are part of the department's new "Genomes to Life" program that plans to take advantage of solutions that nature has already devised to help solve problems in energy production, environmental cleanup and carbon cycling. The program seeks to understand entire living organisms and their interactions with the environment, according to the DOE. Research partners on the UMass Amherst project will be the Institute for Genomic Research, Rockville, Md.; Argonne National Laboratory; and the University of Tennessee, Memphis.

"This innovative research program offers biotechnology solutions that can help us produce clean energy, clean up the environment, and mitigate climate change," Abraham said. "One could hardly imagine when the Energy Department began the human genome project in the '80s that the resulting information and technologies could yield such diverse benefits."

Several of Lovley's research projects have received extensive notice in recent years. This grant focuses on two of those projects. One explored the use of microbes to remediate soils contaminated with uranium; another looked at the same bacterium's ability to produce electricity from mud and other organic waste matter. This new research will bring about a better understanding of the microbes' true capabilities in terms of both environmental clean-up and energy production, Lovley said.

First, scientists will conduct DNA sequencing on microbes found in their actual environments. "This is critical because most past research has focused on bacteria that

have been cultured in a lab," said Lovley. "The lab work gives us a good indication of how these microbes may act and react in their environment, but this research will give us a much more solid sense of their abilities in real-world situations. We'll understand which genes get expressed, and under what conditions," explained Lovley. "No one's ever done that before."

After sequencing 600 million base pairs of genes, scientists will use powerful computers along with new techniques in genomics to interpret the information.

"Nothing like this has ever been attempted in the field of microbiology and this raises the study of environmental process to a whole new level," said Lovley, who compared the effort to "trying to put together 20 jigsaw puzzles, with all the pieces jumb-led together on the floor. The information isn't very useful unless you have all the pieces in the right places, and can consider the overall picture."

This new research is possible because of the information and technology now available to scientists on the human genome and the rapidly growing list of other organisms - from microbes to plants to worms to mice - that provide new perspectives on the inner workings of biological systems, according to the DOE. The project's 10-year goal is to make advances in systems biology, computation, and technology that will contribute to increased sources of biological-based energy; help understand the earth's carbon cycle and design ways to enhance carbon capture; and lead to cost-effective ways to clean up the environment.