are discharged would produce neutral, salty water, so the acidic or alkaline water is not an environmental problem if the cleaned wastewater is dumped into brackish water or seawater, but the bacteria that run the cell might have a problem living in highly acidic environments, the release says.

During the experiment, the researchers periodically added a pH buffer to avoid the acid problem, but if the system is to produce "reasonable amounts of desalinized water," this problem will have to be considered, the release says.

"Our future goals are to reduce the water needed to desalinate the water and improve process efficiency," Logan said.

For more information about Logan's microbial fuel-cell research, see www.engr.psu.edu/ce/enve/logan/default.htm.

New Microbe Strain Generates More Power

A new strain of the microbe *Geobacter*, which produces an electric current from wastewater, generates more power than other strains. Derek Lovley and colleagues at the University of Massachusetts–Amherst supervised the evolution of this new strain that increases power output per cell and overall bulk power, according to a university news release.

The *Geobacter* species' ability to transfer electrons onto the surface of electrodes has made it possible to design microbial fuel cells that convert waste organic matter into electricity, according to the *Geobacter* project Web site. The microbe's strong, hair-like pili are 3 to 5 nm in diameter but more than a thousand times longer than they are wide, the news release says. The pili are so strong they also are known as "nanowires." These nanowires transfer electrons onto iron in the surrounding soil and also seem

KELLY NEVIN/UNIVERSITY OF MASSACHUSETTS–AMHERST

University of Massachusetts–Amherst postdoctoral associate Hana Yi takes a reading from a microbial fuel cell.

HANA YI/UNIVERSITY OF MASSACHUSETTS AMHERST

An image of the new, more powerful *Geobacter* strain.

critical for forming biofilm.

Biofilm, a gluey matrix of sugars, anchor free-floating microbes to various surfaces. In microbial fuel cells, biofilm acts as a conductive mat, allowing electrons to be transferred by bacteria that aren't in direct contact with the electrode, the release says. The new *Geobacter* strain also works with a thinner biofilm than earlier strains, reducing the time it takes to reach electricity-producing concentrations on the electrode, the release says.

The benefits of microbial fuel cells that utilize *Geobacter* include long-term stability, ability to operate without the addition of toxic electron-shuttling mediator compounds commonly used in other microbial fuel cells, and the ability to generate electricity from many different types of waste organic matter or renewable biomass, the Web site says.

Lovley and his colleagues grew *Geobacter* as usual on a graphite electrode, providing acetate as food and allowing a colony to form biofilm. However, for the new experiment, they added a 400-mV current in the electrode that forced the microbe to work harder to get rid of its electrons, the news release says. Within 5 months in this challenging environment, the more powerful strain of the microbe formed.

"In very short order we increased the power output by eight-fold, as a conservative estimate," Lovley said, according to the news release. "With this, we've broken through the plateau in power production that's been holding us back in recent years."

The findings have enabled researchers to find new applications and improve microbial fuel-cell architecture. Now, the researchers can work on designing microbial fuel cells that convert wastewater and renewable biomass to electricity; treat a single home's waste while producing localized power; power mobile electronics, vehicles, and implanted medical devices; and drive bioremediation of contaminated environments, the release says.

For more information about the *Geobacter* project, see www.geobacter.org.