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THE FISCHELL DEPARTMENT *of* BIOENGINEERING

A. JAMES CLARK SCHOOL *of* ENGINEERING

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A NEWSLETTER FOR ALUMNI AND FRIENDS OF THE FISCHELL DEPARTMENT OF BIOENGINEERING AT THE A. JAMES CLARK SCHOOL OF ENGINEERING, UNIVERSITY OF MARYLAND, COLLEGE PARK.

IN THIS ISSUE:

$2M NSF Grant for "Bacterial Communication"

Fischell Department of Bioengineering Chair and newly-appointed Robert E. Fischell Distinguished Professor **William Bentley** *(see p. 8),* Associate Professor **Reza Ghodssi** (Electrical and Computer Engineering/Institute for Systems Research [ISR]) and Maryland NanoCenter Director and Professor **Gary Rubloff** (Materials Science and Engineering/ISR) are part of a new four-year, $1,968,984 National Science Foundation Emerging Frontiers in Research and Innovation-Cellular and Biomolecular Engineering (EFRI-CBE) grant.

EFRI is the NSF's newest and most competitive grant; only 12 were awarded in this cycle. The goal of "Biofunctionalized Devices—On Chip Signaling and 'Rewiring' Bacterial Cell-Cell Communication" is to demonstrate signal translation by employing device-based electrical signals to guide the assembly of biosynthetic pathways, cell-based sensors, and cell-based actuators within a microelectromechanical system (MEMS); and to use on-board electrical, magnetic, mechanical, and optical systems to provide feedback and guide the cell-based system towards user-specified outcomes.

Bentley is the principal investigator for the project. In addition to Bentley, Ghodssi and Rubloff, the investigative team also includes Dr. **Gregory Payne**, director of the Center for Biosystems Research at the University of Maryland Biotechnology Institute. Ghodssi is the PI for the ECE/ISR portion of the grant.

The target of this project is the cell-to-cell communication system mediated by bacterial signaling autoinducers in a process known as quorum sensing, which bacteria use to communicate their population density to their neighbors. After a "quorum" is reached in a locale, they change their single cell behavior and become more of a population unit, exhibiting multicellularity. Many strains of bacteria actually become more pathogenic (more resistant to antibiotics) through this process. The new devices created from this work will enable close "eavesdropping" on this communication network, ultimately leading to new drugs that target cell-to-cell communication instead of viability. This should lead to a slower emergence of drug-resistant strains of bacteria—something desperately needed in our health care system.

The PIs will enlist guidance and support from industry, which may spawn new efforts in device fabrication, embedded sensor systems, bacterial pathogenicity, biofilm formation, genetic regulation and signal transduction. Developments are envisioned that impact fields of medicine (drug discovery, synthesis, and delivery), communications (biofunctionalized microfabricated devices), and security (smart sensors).