

# **Bioengineering Seminar**

**10:00 AM, Thursday, December 11, 2008  
Room 163, Research I**

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## **Cell-Based Biosensors**

The detection of environmental threats is a problem of significant concern for military and civilian communities. Conventional methods for detecting environmental threats are primarily based on chemical, antibody- or nucleic acid-based assays, which rely on defined chemical properties or molecular recognition to identify a particular agent. In the absence of a priori knowledge of the threat, the use of broadly sensitive detectors that exploit functional biology offer a means of detecting unanticipated threats. During this seminar, progress achieved at the Naval Research Laboratory towards the development of a portable biosensor system will be presented. The prototype biosensor system relies on living neuronal networks cultured on substrate integrated microelectrode arrays. Changes in the inherent electrical activity of these living neuronal networks are used as the basis for detection of neuroactive compounds and toxicants. The cultured networks respond to a wide array of environmental threats including neurotoxins, organophosphates, and metal toxicants. Applications of cell arrays that probe biological activity extend beyond environmental detection to the screening of candidate therapeutics. Future challenges and research opportunities, such as stem cell-derived biosensors and novel electrode arrays, will be presented.

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Joseph J. Pancrazio earned a B.S. degree in Electrical Engineering from the University of Illinois, Urbana, in 1984, and M.S. and Ph.D. degrees in Biomedical Engineering from the University of Virginia (UVa), Charlottesville, in 1988 and 1990, respectively. His Ph.D. training focused on ion channel electrophysiology using the patch clamp technique. After postdoctoral training in pharmacology in the Department of Anesthesiology at UVa, he received a joint appointment in the Departments of Anesthesiology and Biomedical Engineering as an assistant professor of research at the UVa in 1991, where he taught graduate level courses in Neuropharmacology and Bioelectronic Systems. In 1997, he joined Georgetown University Department of Biochemistry and Molecular Biology as an Assistant Professor working at the US Naval Research Laboratory (NRL). In 1998, he joined the NRL at the Center for Bio/Molecular Science and Engineering, becoming the Head of the Laboratory of Biomolecular Dynamics in 2002. At the NRL, Dr. Pancrazio led an extramurally supported project including biologists and engineers for the development and demonstration of a biosensor system based cultured neuronal networks for environmental threat detection. He has authored over 70 peer-reviewed publications, several book chapters and review papers. Dr. Pancrazio joined the Repair and Plasticity Cluster of the National Institute of Neurological Disorders and Stroke (NINDS) at the National Institutes of Health in 2004. At the NINDS, he manages the neural engineering and neural prosthesis program, and cultivates bioengineering research projects from both academia and small business concerns.