

WINTER 2004

F21C/Food Science & Engineering Unit

SEMINAR SERIES

**PRESENTER: D. MARSHALL PORTERFIELD, DEPT. OF BIOLOGICAL SCIENCES,
DEPT. OF COMPUTER AND ELECTRICAL ENGINEERING, UNIVERSITY OF
MISSOURI-ROLLA, ROLLA, MO**

**TITLE, ABSTRACT: SELF-REFERENCING SENSOR TECHNOLOGIES FOR MICRO-
TO NANO-SCALE BIOLOGICAL MEASUREMENTS** The biological activity of single cells is of extreme importance in the modern area of functional genomics. One of the goals of the work in my lab is broaden the use and improve reliability of advanced microsensors through the application of the theory of the vibrating (self-referencing) probe to the operation of new sensor technologies. This involves fabrication and testing of advanced electroanalytical microsensors, and the development of a self-referencing electroanalytical microelectrode (SREM) instrumentation platform. SREM sensors have been developed for analytes such as oxygen, nitric oxide, and ascorbic acid (vitamin C). All of these sensors have demonstrated a high level of sensitivity and spatial resolution. This approach has been validated against non-biological microscopic flux sources that were theoretically modeled before being applied to isolated single cells. These new sensor technologies have been shown, through research in a wide variety of biological and biomedical research projects, to be an important new tool in the arsenal of cell biology. Recently the SREM technology has been adapted through the development of SREM-H₂O₂ and SREM-NADH sensors to support the use of electrochemically coupled enzyme based biosensors. Based on this self-referencing biosensors (SRB) for glucose and ethanol have been developed and have undergone validation testing in artificial systems. These developments in self-referencing sensor technologies offer great promise in extending the application of electroanalytical and biosensor technologies from the micro to the nanoscale, and can also be applied to improve the reliability of MEMS based sensor arrays.

H⁺Ion flux around an actively growing root tip of *Typha latifolia*. Flux measurements were made using a SRIS-H⁺ sensor (10 μ m excursion/0.3 Hz). At closest approach the probe was within 1 μ m of the root surface and the excursion distance of 10 μ m was entirely within the rhizosphere gradient as shown in a step-back experiment (data not shown). The 3D profile of the root tip was reconstructed using the microelectrode positioning data that was collected along with the electrode output by the computer data acquisition system.

Tuesday, March 9, 2004, 4:00pm, AG ENGR Bldg. 105

Refreshments Will Be Served