

**DEPARTMENT OF CHEMISTRY AND  
ENVIRONMENTAL SCIENCE**

**SPRING 2017 SEMINAR SERIES**

**Sponsored by: Purdue Pharma L.P.  
Bristol-Myers Squibb Company**

**WEDNESDAY, FEBRUARY 1, 2017  
2:30 PM**

**CULLIMORE HALL  
ROOM – Lect. 1**

**GUEST SPEAKER**

**Dr. Richard Perry  
Sancilio & Company, Inc.  
Riviera Beach, FL**

**TOPIC**

**Mass Spectrometry Instrumentation for Probing Reaction  
Mechanisms on Short Timescales and for Imaging Chemicals in  
Biological Samples**

**ABSTRACT**

Mass spectrometry (MS) is widely used for resolving the chemical components of reactions and for mapping the distribution of chemicals in biological samples such as tissues. Ambient mass spectrometry (AMS) techniques such as desorption electrospray ionization (DESI) enable direct sample analysis without the need for pretreatment. The remarkable observation that DESI and other spray-based AMS techniques can capture solution-phase catalytic species on the millisecond timescale, has confirmed previously hypothesized intermediates and elucidated new on- and off-path processes. In this seminar, we will discuss the initial discovery, as well as the recent development of multi-stage transmission-mode DESI (TM<sup>n</sup>-DESI), an AMS technique that enables step-wise study of complex multicomponent reactions. MS methods for probing electrochemical (EC) reactions will also be discussed, with primary emphasis on the recent development of paper-based EC/MS (*p*EC/MS). The *p*EC cell is simple, malleable, portable, disposable, and has a response time of hundreds of milliseconds. These features make *p*EC/MS a powerful approach for performing derivatizations and for capturing transient intermediates of EC processes. In the second part of the seminar, we describe development of DESI-MSI methods and assays that reveal oncogene-lipid relationships in transgenic tissue sections and cancer cell lines, thereby advancing current understanding of the role of lipids in disease progression.

We also discuss development of synchronized DESI-MSI (*s*DESI-MSI), a technique that improves spatial resolution and analytical sensitivity when imaging compounds on smooth, hydrophobic surfaces. A forensic application of this technology involved high-resolution imaging of lipids in latent fingerprints located on commonplace materials such as glass and Teflon.

### **BIOGRAPHY**

Dr. Richard H. Perry attended Florida Atlantic University where he received a B.S. in Biology (2001) and M.S. in Chemistry (2004). He received a Ph.D. in Chemistry (2009) at Purdue University. After completing postdoctoral studies at Stanford University, he joined the University of Illinois at Urbana-Champaign as Assistant Professor of Chemistry (2012). In 2016, Dr. Perry entered the pharmaceutical industry as a Senior Scientist at Sancilio & Company, Inc. His academic research is multidisciplinary, involving bioanalytical chemistry, mass spectrometry imaging (MSI), inorganic chemistry, and instrument development. He is particularly focused on developing MS methods and instrumentation to understand catalysis, the activity of pharmaceutical drugs, and the biochemical mechanisms involved in diseases such as Alzheimer's and cancer.

**Committee Members:** Edgardo Farinas, Yong-Ick Kim, Mengyan Li,  
Som Mitra, Zeyuan Qiu