In the postgenomic era, one expects the suite of chemical players in a brain region to be known and their functions uncovered. However, many cell-to-cell signaling molecules remain poorly characterized and for those that are known, their localization and dynamics are oftentimes unknown. A suite of small-scale bioanalytical approaches are described that allow the investigation of individual neurons and small brain regions; these approaches include capillary scale separations coupled to mass spectrometry and direct mass spectrometric-based profiling and mass spectrometry imaging. A key to successful measurement involves optimized tissue and cell sampling protocols. Depending on the sample being assayed and metabolites being measured, we use mechanical isolation, optical tweezers, patch pipettes, dialysis probes and microfluidics, all of which have advantages for specific sample types. Several applications of single cell microanalysis are highlighted including the discovery of unusual metabolites to characterizing the peptides in single cells. Imaging mass spectrometry and dynamic sampling of the extracellular environment are used for elucidating novel cell to cell signaling molecules in a range of neuronal model systems. Current technology efforts involve extending the depth of metabolome coverage and adapting our approaches to high throughput single cell assays. Our overarching goal is to uncover the complex chemical mosaic of the brain and pinpoint key cellular players in physiological and pathological processes.

Bio
Jonathan Sweedler received his Ph.D. in Chemistry from the University of Arizona in 1988, spent several years at Stanford before moving to the University of Illinois at Urbana-Champaign in 1991 where he has been ever since. At Illinois, he is currently the James R. Eiszner Family Professor of Chemistry, Director of the School of Chemical Science, and affiliated with the Institute of Genomic Biology and the Beckman Institute for Advanced Science and Technology. His research interests focus on developing new metabolomics and peptidomics approaches for assayng small volume samples, and in applying these methods to study novel interactions between cells. These approaches include micro and nanofluidics, miniaturized separations, and mass spectrometry. He has used these tools to characterize small molecules and peptides in a range of animal models across metazoan life and in samples as small as individual cells. Sweedler, with large international teams of biologists and technologists, has performed comprehensive interrogation of the genome, transcriptome and peptidome in animals ranging from mollusks, insects and mammals to uncover cell to cell signaling peptides and pathways involved in wide range of functions and behaviors.

Sweedler has published more than 350 manuscripts and presented 400 invited lectures. He has received numerous awards including the American Chemical Society (ACS) Analytical Division Arthur Findeis Award, the Benedetti-Pichler Award in Microanalysis, the Gill Prize in Neuroscience, the Instrumentation Award from the Analytical Division of the ACS, the Pittsburgh Analytical Chemistry Award, and the ACS Award in Analytical Chemistry. He is currently the Editor-in-Chief for Analytical Chemistry.

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Friday, April 1, 2016
SEH B1220
2:00 – 3:00 p.m
Refreshments will be served at 1:45 p.m.