The Seventy-Second
FRONTIERS IN CHEMISTRY

The Frontiers in Chemistry Series dates to 1941. The speakers are sponsored by local industrial and government laboratories, and the University. The lectures are free.

SCHEDULE The lectures are on Thursdays at 4:30 p.m. Coffee and tea are available before the lectures.

LOCATION The lectures are in the Goodyear Lecture Hall (Clapp 108).

PARKING Parking is available at all Case visitor parking lots. Please bring your parking stub for validation.

DINNER The lectures are generally followed by dinner at a local restaurant. Those who wish to may join the dinner (participants pay the restaurant individually). Dinner reservations are required by the Monday preceding the lecture.

INQUIRIES AND DINNER RESERVATIONS
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ONLINE INFORMATION
www.case.edu/chem/info/frontiers/

Frontiers in Chemistry
Case Western Reserve University
2012-2013

The University acknowledges with appreciation the guidance provided by the external members of the Frontiers in Chemistry Lecture Series Committee and the support provided by the organizations indicated.
One expects the suite of chemical players in a brain region to be known, but there are surprising holes in such knowledge. New mass spectrometry imaging and single cell measurements are described that allow the characterization of individual neurons and small brain regions; these approaches are used to explore the complex chemical mosaic of the brain and pinpoint key players in several physiological and pathological processes.

We have been utilizing fabrication methods originally developed by the microelectronics industry to realize devices with micro and nanoscale features that are capable of efficiently providing chemical information. Examples of recent developments from our laboratory will be presented for the analysis of gas and liquid phase materials.

Recent advances in microfluidics allow nanoliter droplets to be created, manipulated, and analyzed at high rates. We will explore this new technology, its underlying principles, and its application to diverse areas such as label-free high-throughput screening and in vivo chemical sensing.

This talk uses everyday applications of mass spectrometry to entice you to consider the fundamental science of this fascinating instrumental method of chemical analysis.

We have synthesized a series of monodisperse magnetic nanoparticles with tunable sizes and magnetic properties. We have functionalized these nanoparticles with proper targeting agents and anticancer drugs so that they are both stable and target-specific in physiological solutions with the drug being released in a pH controlled manner. These nanoparticles have potential as magnetic probes for imaging and therapy.

Engineered functional magnetic nanotags, with a diameter of only about 50-100 nm, are extremely useful for in-vitro cancer diagnostics and circulating tumor cell (CTC) isolation. The resulting nanotechnologies are promising for monitoring therapeutic responses during cancer management or for detecting early stage cancers.

This talk will describe the development of multifunction platforms for translational imaging and therapy based on functionalized, biocompatible, theranostic magnetic nanoprobest. I will discuss the emerging technique of magnetic particle imaging focusing on coronary angiography, MRI contrast agents responsive to specific physiological changes and magnetic relaxation dynamics optimized for localized heating as a therapeutic modality and triggered drug release.

Surface structure dictates the interaction of nanomaterials with biosystems. In our research we use the tools of organic chemistry to engineer nanoparticle surfaces for use as therapeutic agents and diagnostics.

The Cell by Cell Chemical Characterization of the Brain: New Tools to New Insights

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The Nanoliter Lab: Using Droplet Microfluidics for Chemical Experiments

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Analysis in Situ: Operating Rooms, Crime Scenes, Grocery Stores, and Factory Floors

This talk uses everyday applications of mass spectrometry to entice you to consider the fundamental science of this fascinating instrumental method of chemical analysis.

Microfabricated Devices for Elucidating Chemical and Biochemical Information

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Nanoparticles as Diagnostics and Therapeutics

Surface structure dictates the interaction of nanomaterials with biosystems. In our research we use the tools of organic chemistry to engineer nanoparticle surfaces for use as therapeutic agents and diagnostics.