

# MRB NEWS

**Featured Faculty: Susan Lunte, Adams Institute Distinguished Professor of Chemistry and Pharm Chem**



Dr. Susan Lunte was recently honored as the Ralph N. Adams Distinguished Professor of Chemistry and Pharmaceutical Chemistry and is Director of the new Ralph N. Adams Institute for Bioanalytical Chemistry.

The dedication ceremony, sponsored by the Department of Chemistry, took place at MRB. The research interests of the Lunte group include: (1) micro-analytical methods for the investigation of the transport and metabolism of peptides across the blood-brain barrier (2) separation-based sensors employing on-line microdialysis coupled to microchip electrophoresis (3) cell-based assays on chips, and (4) microchip-based diagnostics for cardiovascular and metabolic diseases.

**Microanalytical methods for the investigation of the transport and metabolism of peptides across the blood-brain barrier:** An insight into peptide transport and metabolism is important for effective drug design and the understanding of neurological disorders. Crucial to these studies is the development of analytical methodologies that are capable of monitoring these biologically important compounds at physiologically relevant concentrations. The particular analytes of interest include neuroactive peptides, amino acids and catecholamines. Release, transport, and metabolism of these substances can be investigated *in vitro* using a cell culture model or *in vivo* using microdialysis sampling. Due to the small sample volumes generated by these methods, microcolumn-based separation methods have been employed for analysis. These include capillary and microchip electrophoresis and microcolumn liquid chromatography. To obtain the requisite sensitivity for these assays, laser-

induced fluorescence and electrochemical detection and mass spectrometric methods have been employed. The focus of this research has been primarily on substance P and dynorphin. These two neuropeptides have been shown to be important in neuropathic and chronic pain as well as depression.

**Separation-based sensors based on microdialysis coupled to microchip electrophoresis:**

The second project area concerns the development of on-animal separation-based sensors for near real-time monitoring of drugs and neurotransmitters in awake, freely roaming animals. The on-line coupling of microdialysis with capillary electrophoresis yields a sensor capable of monitoring multiple analytes simultaneously during pharmacological and neurochemical studies involving awake, freely moving animals. However, current on-line systems are rather large and generally take up an entire lab bench. In addition, the animal is tethered to the syringe pump and analytical system with tubing. In many cases, for example, behavioral studies, one would like to be able to obtain information regarding neurotransmitter release from a freely roaming, untethered animal. With this goal in mind, our group has been focusing their efforts on miniaturization of all the components of the on-line microdialysis-capillary electrophoresis system to produce an on-animal sensor. This includes the development of a chip-based interface between microdialysis sampling and microchip electrophoresis and miniaturization of the detector and associated electronics, as well as the use of telemetry to send the signal to a remote data acquisition station. The primary focus has been on the use of

electrochemical detection because both the detector (electrodes) and the potentiostat can be easily miniaturized.

**Cell-based assays on chips:**

Along with the development of on-animal sensors, our group has recently begun to investigate cellular assays on chips. Due to the small (micron-to-submicron) dimensions and nanoliter volumes characteristic of the microchip format, very fast analyses can be performed on small volumes. Therefore, it is possible to analyze the content of single cells and/or monitor the release of biologically active compounds from cells integrated into the chip. Current efforts in our laboratory are focused on the development of methods for the detection of reactive oxygen species released from macrophages and bovine brain microvessel endothelial cells. A method for the detection of peroxynitrite using microchip electrophoresis with electrochemical detection has been developed.

**Chip-based clinical diagnostics:**

Lastly, the use of capillary electrophoresis/electrochemistry for clinical assays is being investigated. Microchips have several advantages for clinical assays since sample preparation and analysis steps can be integrated onto a single chip. The chips can also be made disposable, obviating problems of cross-contamination. One particular analyte of interest is plasma homocysteine, which has been proposed to be a potential early indicator of heart disease. The development of a fast and accurate analytical method that can be incorporated into the clinical laboratory or used for point-of-care testing is the goal of this project.

**Academic Areas:**

Chemistry and Pharmaceutical Chemistry

**Research Interests**

Bioanalytical chemistry, liquid chromatography, capillary electrophoresis, electrochemical and laser-induced fluorescence detection, microdialysis sampling, pharmaceutical analysis, neurochemistry, protein and peptide analysis.

**Educational**

**Background:**

1980 B.S., Kalamazoo College

1984 Ph.D., Purdue University

pictured above: Susan Lunte and Ryan Grigsby, student

article reprint KU Dept of Pharmaceutical Chemistry

**MEET DR. SUSAN LUNTE'S LAB**



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**MRB TIDBITS**

***Congratulations to Eric Crick, (Craig Lunte Lab) and Arvind Chappa, (Susan Lunte Lab) who received awards for their research in pharmaceutical chemistry at the annual American Association of Pharmaceutical Scientists meeting and exposition. Crick and Chappa are among 38 graduate students who were selected to present their research at the symposia. Crick's award is based on his research in analysis and pharmaceutical quality at KU. Chappa's award is based on his research in drug design and discovery at KU.***

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Samples of Tracy Townsley's pottery are located in the lobby reception desk. See Tracy if you'd like a specific type, design or color!

The 600 MHz NMR was recently moved into room 102 and it won't be long before the magnet is operational. There are special requirements for access to this room. If you plan to use the 600, please see Teri for more information.

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Parking passes may be purchased at the front desk for visitors. If you are a KU employee, you may not purchase a parking pass for your vehicle or a vehicle you may temporarily be driving.

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We appreciate the effort of some to bring reusable plates, bowls, mugs, etc. However, when you are finished eating, please remember to put your dishes in the dishwasher or wash them yourself. We will run the dishwasher on a regular basis. Please be considerate of others and don't leave your dirty dishes in the sink or on the counters. Thanks!

If you bring small children into the building, please do not give them white board markers unless you stay with them. We just had painters in the building touching up all of our 1st year nicks and marks. It's fine if the kiddos want to draw on the white boards, but it's easy for the marker to stray off the board onto the wall.

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The KU Center for Research will soon begin HVAC work at Youngberg Hall. As a result, a number of KUCR departments need to find temporary homes. Looks like MRB will be the recipient of several KUCR employees. As soon as I know who will be joining us I'll let you know. It may turn out to be a real convenience for some of you.

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The service area has been cleared out so we now have more space to receive packages. We've relocated your lab signs into the cages. We will try and place all of your incoming packages under your sign. If you need any help finding anything, just let us know.

*Professor Adams joined the University of Kansas in 1955 and passed away in 2002. Among the awards received by Adams were the Guggenheim Fellowship, Fisher Award in Analytical Chemistry, C.N. Reilly Award for Electroanalytical Chemistry, I.M. Kolthoff Gold Medal Award, Jacob Javits Neuroscience Investigator Award, American Chemical Society National Award in Electrochemistry and the Oesper Award. Professor Adams was among the first scientists to receive a Higuchi Award for excellence in basic science. He was nominated for a Nobel Prize in 1997. (Photos from the Adams Institute Dedication at MRB in October, 2006 featuring Susan Lunte, Adams Institute Distinguished Professor.)*

