# SAS-Chicago

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# November Meeting

**Tuesday, November 9, 2004**

**The November 2004 meeting will be held at the LaMirage Restaurant, located at 3223 Algonquin Rd., Rolling Meadows. See the map on the following page.**

**Social Hour: 5:30 - 6:30 PM** **Dinner: 6:30 PM** **Speakers: 7:45 – 9:00 PM**

## Student Night

***Presentations by***

**Northwestern and NIU Graduate Students**

- Chanda Ranjit Yonzon; Northwestern University - fourth year graduate student working under Professor Richard P. Van Duyne

  **Topic: Surface-Enhanced Raman Scattering Based Glucose Sensor**

- John Carr; Northern Illinois University - third year graduate student working under Dr. Jon Carnahan

  **Topic: Effects of Various Liquid Chromatography Mobile Phase Solvent Compositions and Buffers for Pharmaceutical Nonmetal Detection with ICP-AES and ICP-MS**

- Kaho Kwok; Northern Illinois University - third year graduate working under Dr. Jon Carnahan

  **Topic: HPLC Separation of Pharmaceutical Compounds with ICP-MS Detection**

- Matt Young; Northwestern University – third year graduate student working under Professor Richard P. Van Duyne and Professor Peter Stair

  **Topic: Wavelength-Scanned Surface-Enhanced Raman Excitation Spectroscopy on Well-Defined Silver Nanoparticle Arrays**

Please make your dinner reservations for the upcoming meeting by using the form on our web page < **http://www.sas-chicago.org/Online%20Registration.htm** > , by email at **sas.chicago@bigfoot.com** or by calling Mary Kaplar at **708-449-5767**. Leave **your name**, **company affiliation**, a **telephone number,** the **number of reservations** and **your choice of entree**. Please call by **noon Friday, Nov. 5th**, so that proper arrangements can be made with the LaMirage Restaurant. If you can't attend, cancel by Mon. noon: SAS is charged for no-shows.

**Entree choices:** ***NY Strip Steak, Chicken Breast LaMirage, or Fettuccini.***

**Dinner Cost Members: $25** **Students: Free** **Unemployed Members: $10** **Non-members: $30**

## Surface-Enhanced Raman Scattering Based Glucose Sensor

According to World Health Organization, 150 million people in the world suffer from diabetes. Diabetic patients require frequent glucose measurements and careful control of glucose levels for the long-term health outlook. Numerous studies have been performed toward developing a real-time, quantitative, and biocompatible glucose sensor. This work presents a surface-enhanced Raman scattering (SERS) based glucose sensor. Ethylene glycol-terminated alkanethiol is self-assembled on a silver film over nanosphere to partition glucose within the zone of electromagnetic field enhancement. Glucose concentration is quantitatively predicted using a Chemometric method and presented in the industry standard Clarke error grid. Moreover, stability, reusability, and biocompatibility of this glucose sensor will be discussed.

## Effects of Various Liquid Chromatography Mobile Phase Solvent Compositions and Buffers for Pharmaceutical Nonmetal Detection with ICP-AES and ICP-MS

Detection of heteroatoms such as sulfur, phosphorous, chlorine and fluorine is finding increasing importance in the pharmaceutical industry. Pharmaceutical compounds and their associated impurities may be separated and detected using either high performance liquid chromatography or ion chromatography. Classical detectors such as UV or mass spectrometry typically require a set of standards for each analyte to obtain accurate results as detectors responses vary for analytes of different structures. Plasmas are a potentially excellent atom reservoir for atomic spectrometry. Inductively coupled plasma atomic emission spectrometry (ICP-AES) and inductively coupled plasma mass spectrometry (ICP-MS) has the potential to effectively atomize the analyte allowing element specific detection while eliminating the need for standards. However, plasma systems typically produce somewhat higher nonmetal detection limits due to the decreased ionization and excitation efficiencies of these elements. Additionally, various LC mobile phase compositions and gradients are utilized in the separation process. The composition of the solution can have an effect on the analytical response. Efforts to examine and alleviate the aforementioned problems are examined utilizing membrane desolvation techniques. A comprehensive study of the effects of various mobile phase compositions and buffers on the signal intensity of phosphomycin, a biologically active, phosphorous containing analyte is presented. Optimization conditions and results for both ICP-AES and ICP-MS will be presented. Comparisons of detection limits obtained for both instruments as well as signal response using various mobile phases will be highlighted.

## HPLC Separation of Pharmaceutical Compounds with ICP-MS Detection

High performance liquid chromatography (HPLC) has become a technique of choice for analytical separations of pharmaceutical compounds. Throughout the years, detection techniques for HPLC such as UV absorption, refractive index, and mass spectrometry have become common. However, there are drawbacks in these detection techniques. For instance, since the response of these detectors usually varies with the chemical structure of the compound of interest, internal standards are required for each analyte in order to obtain accurate quantitative results. Because inductively coupled plasma mass spectrometry (ICP-MS) rely on sample decomposition to convert analytes to atomic forms, such drawbacks can be minimized or eliminated. Sensitivity and selectivity can be enhanced by using ICP-MS as detector for pharmaceutical separations with HPLC. The analytical performance of our ICP-MS for non-metals (P, S, Cl, and F) detection will be presented. The performance of an HPLC system with ICP-MS detection for the separation of several pharmaceutical compounds containing non-metals will be presented. The ability to quantify impurities in these compounds with HPLC-ICP-MS will be discussed.

**Wavelength-Scanned Surface-Enhanced Raman Excitation Spectroscopy on Well-Defined Silver Nanoparticle Arrays**

This work presents the most thorough wavelength-scanned excitation spectroscopy study to date. Ag nanoparticles, fabricated using nanosphere lithography, are used as substrates, providing extremely well-characterized and size-homogenous nanoparticle arrays. Surface-enhanced Raman scattering (SERS) intensities of adsorbed benzenethiol monolayers are correlated to the localized surface plasmon resonance (LSPR) of the nanoparticle arrays. SER spectra are taken using excitation wavelengths from 425-800 nm and a triple spectrograph. The SER excitation spectra are shown to have similar lineshapes to the LSPR spectra. In addition, the maximum SERS enhancement is shown to occur for wavelengths slightly shorter than the excitation wavelength such that both the incident photon and the Raman scattered photon are strongly enhanced. Three different Raman peaks of benzenethiol are studied simultaneously on one substrate and it is shown that the smaller Raman shifted peak shows a maximum enhancement closer to the LSPR $\lambda_{max}$ than that of a larger Raman shifted peak. This is in qualitative agreement with what is predicted by the electromagnetic enhancement mechanism. Enhancement factors of up to 1 x 108 are achieved, which is in good agreement with previous SERS studies done on these substrates.

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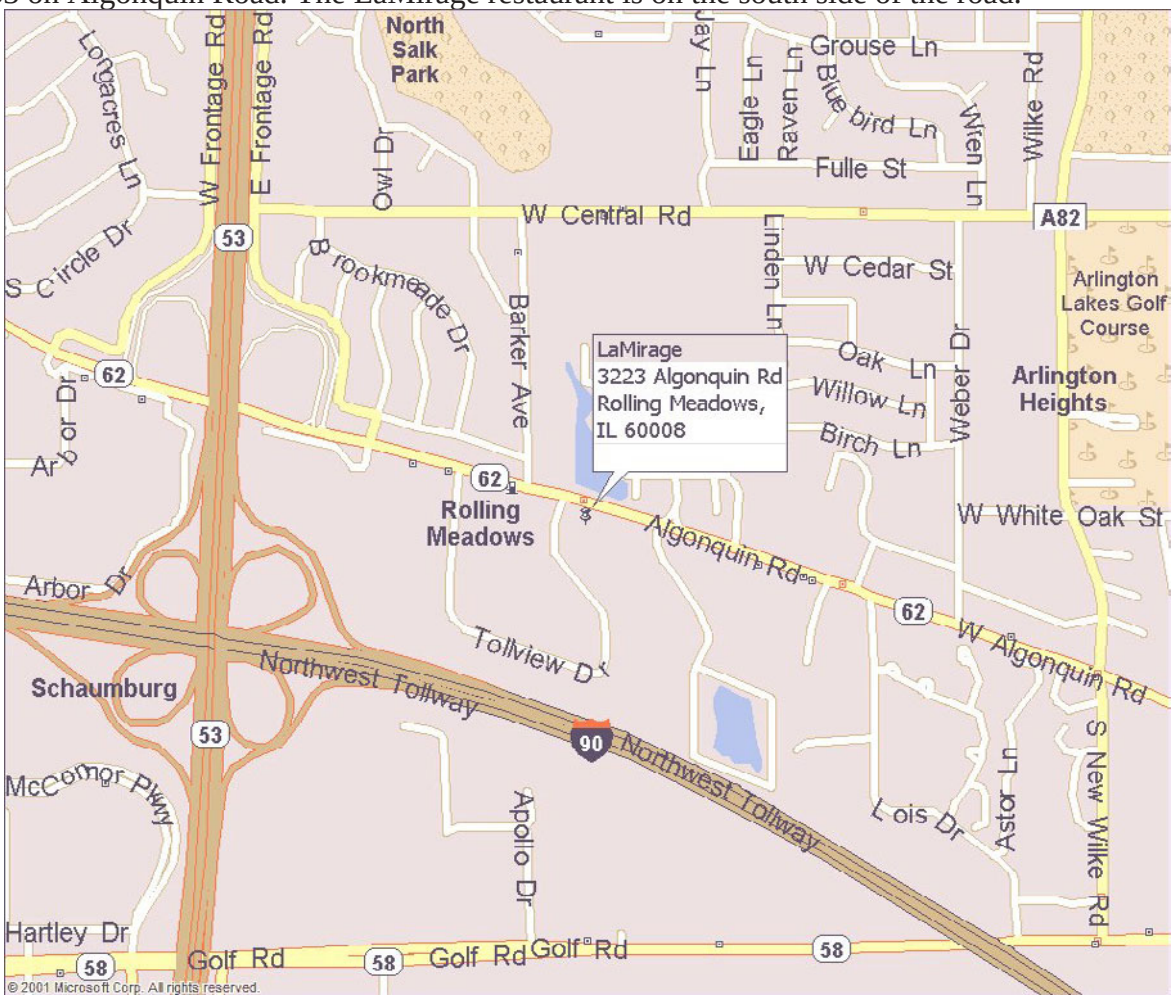
**DIRECTIONS TO THE LA MIRAGE RESTAURANT**

LaMirage is located at 3223 Algonquin Road in Rolling Meadows. It is located about 0.5 mile east of Route 53 on Algonquin Road. The LaMirage restaurant is on the south side of the road.



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