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# SAS Chicago

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## *September Meeting*

Tuesday, September 9, 2003

The September 2003 meeting will be held at the La Mirage, located at 3223 Algonquin Rd., Rolling Meadows. See the map on the back for more details. Entree choices: *NY Strip Steak, Chicken Breast LaMirage, or Shrimp Fettuccini.*

Social Hour: 5:30 PM

Dinner: 6:30 PM

Speaker: 7:45 PM

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## **The Challenge of a Spectrometer on a Chip**

by

**Richard Crocombe, Ph.D.**

*AXSUN Technologies*

We are all familiar with the microprocessor revolution. Electronics evolved from discrete devices to integrated circuits, of higher and higher complexity. With that, performance increased, reliability increased and costs dropped. For analytical instruments, this meant that the room-sized FT-IR spectrometers of the 1970s shrunk to benchtop size in the 1980s, and to laser printer size in the 1990s. Most of this reduction in size was due to the impact of the microprocessor — the optics have decreased in size only slightly. In many cases, decrease in size of optics has meant decrease in performance, so that the performance of the portable UV-visible devices now available don't match their laboratory cousins.

AXSUN Technologies was founded in 1998 with the vision of miniaturizing and integrating optics in much the same way that had been done with electronics — producing 'chip-sized' optical engines with the same performance as laboratory instruments, and manufacturing them using automated, semiconductor-style techniques. That vision has been translated into reality. This paper will describe the technology that has been developed and used for the production of these devices, and show, for instance, how a chip-sized spectrometer can produce a  $0.1 \text{ cm}^{-1}$  resolution spectrum in much less than one second, with high signal-to-noise.

These devices are not only much smaller than laboratory spectrometers, but are also much more rugged, withstanding large temperature excursions, damp heat and high accelerations. As such, they are very well suited to process analytical applications and do not require a "shelter". They can be mounted outdoors for in-situ analysis and also in vibrating conditions, for instance on a dryer or blender. These process analytical possibilities will also be discussed.

Please make your dinner reservations for the upcoming meeting by using the form on our web page [http://www.sas-chicago.org/Reg\\_Form.htm](http://www.sas-chicago.org/Reg_Form.htm), by email at [sas.chicago@bigfoot.com](mailto:sas.chicago@bigfoot.com) or by calling Mike Jankowski (847)970-5061. Leave your **name, company affiliation, a telephone number** where you can be reached in the event that the meeting is cancelled (remember 9/11/01 & Feb. 26, 2002), the **number of reservations** and **your choice of entree** on the tape. Please call by **noon Friday, Sept. 5th**, so that proper arrangements can be made with the La Mirage Restaurant. If you can't attend, cancel by Mon. noon: SAS is charged for no-shows.

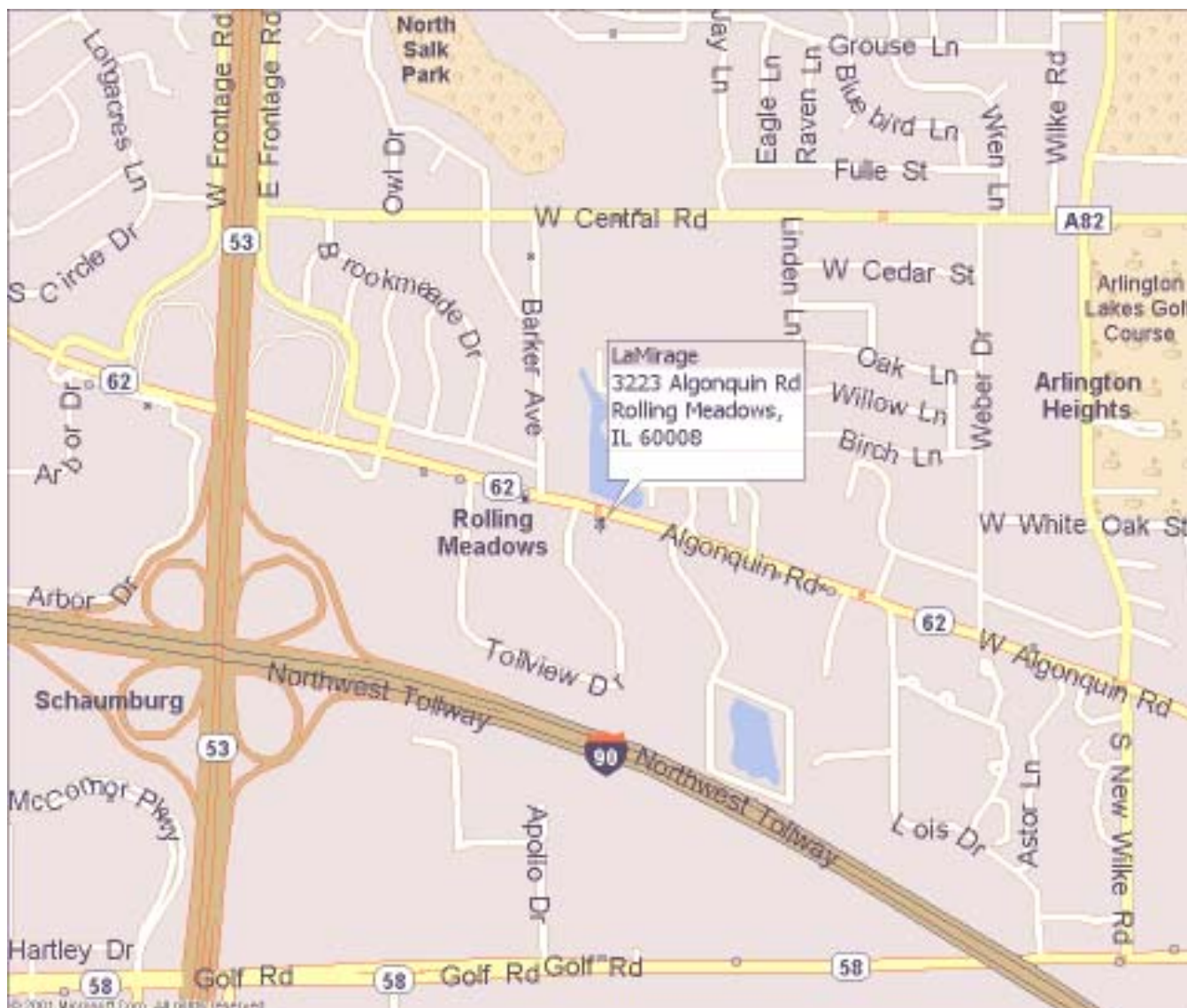
**Dinner Cost**  
**Members: \$25**

**Students and Unemployed Members: \$10**

**Non-members: \$30**

## DIRECTIONS TO THE LA MIRAGE RESTAURANT

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



### Biography of Richard Crocombe

Richard Crocombe studied chemistry at Oxford University in England. One of his tutors there was a pioneering Raman spectroscopist, and that led him down a path to a career in vibrational spectroscopy. After graduating from Oxford, he went to the University of Southampton, also in England, for a Ph.D. with Prof. Ian Beattie, working on infrared and Raman spectroscopy of unstable inorganic species. Following that he did a postdoctoral fellowship at the University of Tennessee, with Prof. Gleb Mamantov, working on FT-IR spectroscopy and infrared laser chemistry, including some early work on time resolved spectroscopy and gas chromatography/FT-IR.

That diverted his attention to instrument and applications development, and he then joined Bio-Rad Digilab Division in Cambridge, MA. He was at Bio-Rad/Digilab for twenty years in a wide variety of roles including product management, marketing management, product development and R&D management. Working with many other people in that organization, he was responsible for developments in step-scan FT-IR, infrared microscopy and infrared spectroscopic imaging using focalplane arrays.

Following Bio-Rad's sale of its spectroscopy business (to Digilab, LLC) he left the new organization after a transition period, and joined AXSUN Technologies to move AXSUN's micro-optical technologies into the analytical instrumentation field, and develop 'chip-sized' spectrometers.

He has been a longtime member of SAS, and other professional societies, and has organized symposia at major conferences like FACSS, EAS and the Pittsburgh Conference.