# Biology Seminar

**Joint seminar with Chemistry**

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## Small Volume Biological Sampling, Fluid Handling, and High Efficiency Separations, on Microfluidic Devices

Microfluidic devices are dramatically changing the face of bioanalytical chemistry. These devices have the unique capability of integrating a variety of chemical processing and analysis steps with single cell culturing, handling and transport. Many of the microfluidic devices developed for bioanalytical work are fabricated from poly(dimethylsiloxane) (PDMS). PDMS is generally used because of its high oxygen permeability and biocompatibility. Unfortunately, however, electrophoretic separations on PMDS-based microfluidic devices are generally much poorer than on glass microfluidic devices especially for hydrophobic molecules. In order to improve the separation of these analytes we have developed both covalent and non-covalent coatings based upon sol-gel chemistry and surfactants, respectively, that result in very high efficiency, diffusion limited separations. In addition to the separation improvements we have been integrating dielectric actuators to improve analyte injection and mixing on microfluidic devices.

We have been using these chips as well as glass microfluidic devices to develop methods to address small volume biological sampling challenges. One such challenge is the collection of aphid salivary secretions. Aphids are small, soft-bodied insects that are major crop pests and plant virus vectors. Aphids salivate into plants prior to feeding to suppress the plant's innate immune system. Unfortunately because of the small volume of saliva injected no one has been able to successfully identify specific secreted salivary proteins. We are attempting to use microfluidic devices as leaf mimics in order to identify some of these secreted proteins by collecting the aphid saliva and subjecting it to mass spectrometric analysis. In addition, we have been developing method to culture and analyze the contents of signal cells on microfluidic devices in order to better understand enzyme activity and the heterogeneity among seemingly similar cells.

**Please note Time (3:30 PM) and Place (BIOL 117)**

**Friday Oct 2, 2009** **3:30 PM** **BIOL 117**