



Applied Physics & OSA
Optics Seminar

Microfluidic Actuation by Modulation of Surface Forces: Fundamentals, Devices and Sensing Arrays

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Miniaturized and automated systems for transporting nanoliter liquid samples through complex channel arrays are rapidly expanding diagnostic capabilities in medicine, genomic research and material science. The majority of microfluidic devices utilize micromechanical or electrokinetic forces to meter flow through enclosed channels. In this talk, we focus on the development of surface directed chips and demonstrate how thermal actuation, in conjunction with substrate chemical patterning, can be used to modulate and control fluidic motion on the surface of glass or silicon. This method of actuation enables electronic control over flow direction and speed, sample trapping, mixing, splitting and coalescence, and of course localized reaction rates. Integration of co-planar capacitive electrode arrays, as well as thin film planar waveguides for evanescent sensing, expands capabilities for in-situ liquid detection and analysis. Development of this device has progressed through a fundamental understanding of thermocapillary flow on homogeneous and chemically patterned surfaces. We will review some basic hydrodynamic concepts for flow control, including thermocapillary stresses, interfacial curvature and contact line hysteresis, describe the operation and optimization of our device, and discuss the possibility of using these and other types of surface stresses to modulate the shape and speed of liquid films for optofluidic applications.

This talk represents the first seminar in a series of 4 presentations on micro- and nanofluidics to be given by Prof. Troian this spring. More information to follow.

Biography:

Prof. S. M. Troian is currently on a 1 year sabbatical leave from Princeton University as part of Caltech's Moore Distinguished Scholar Program. Her office on campus is Thomas 209 and she can be reached directly at ext. 4122. Her email address remains stroian@princeton.edu. For more information on her group's activities, visit <http://www.princeton.edu/~stroian>.

Wednesday, February 2, 2005.

12:00pm-1:00pm.

Moore 070

Pizzas will be available at the seminar.

