

COMPLEX FLUIDS SEMINAR SERIES

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Fluorescence detection of single molecules near interfaces and in sub-micron fluidic channels

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The properties of liquid solutions and the photophysical properties of fluorescent molecules are affected by their nano-scale proximity to dielectric interfaces. This provides potential advantages for total-internal reflection fluorescence measurements and single-molecule detection in sub-micron-sized fluidic channels. To this end, we have fabricated nanochannels within a fused silica lab-on-a-chip device by two methods, reactive ion etching and femtosecond laser machining. We have conducted experiments that demonstrate detection of single fluorescently-labeled proteins in solution within the device with prolonged observation times. The biomolecules are electrokinetically transported along the channel and into a two-focus laser irradiation zone for trapping and spectroscopic measurements. The experiments aim to achieve enhanced single-molecule measurements for monitoring biomolecular conformations.

Lloyd Davis is BH Goethert Professor of Physics at the University of Tennessee Space Institute. He graduated with a PhD in Physics from the University of Auckland and contributed to early experimental demonstrations of single-molecule detection and spectroscopy at Los Alamos National Laboratory. His current interests include nanophotonics, single-molecule detection and spectroscopy, biophotonics, biophysics, chemical physics, micro/nano-fluidics, advanced microscopy, non-linear optics, quantum optics, ultrafast laser phenomena, laser applications to chemical analysis, optical-material and laser-plasma interactions, and computational modeling.

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