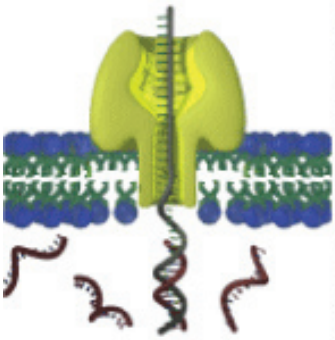
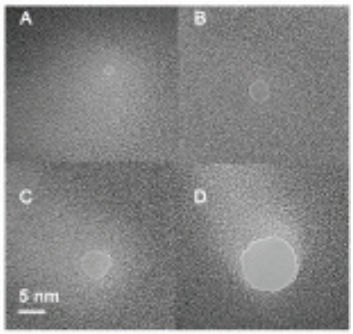
SEMINAR:
"Electrophoretic and Nanopore Methods for Biomolecule Analysis"





Monday
April 27, 2009
2:00-3:00
Engineering 2 Building
Rm. #599

Dr. Andre Marziali

Director, Engineering Physics
University of British Columbia

Andre Marziali
Dr. Marziali received his PhD in Physics from Stanford University in 1994. He subsequently worked for several years with Dr. Ron Davis, in the Stanford DNA Sequencing Technology Center, developing instruments for DNA sequencing and sample purification. He returned to Canada in 1998, as an assistant professor at University of British Columbia in the department of Physics and Astronomy, where he formed the Applied Biophysics Laboratory. Shortly after his return to Canada, Dr. Marziali formed the GenomeBC Technology Development Platform, which he continues to lead as Director. In 2005 he was awarded tenure and appointed Director of the Engineering Physics program at UBC.

In 2004, Dr. Marziali co-invented the concept of using synchronous mobility perturbations to create divergent velocity fields for selectively focusing nucleic acids. This technology, termed SCODA, is the basis of a spin-off company, Boreal Genomics Inc. founded in 2007 by Dr. Marziali and colleagues to commercialize high performance instruments for DNA and RNA purification. In the last few years he has been awarded the 2003 Killam Prize for Excellence in Teaching, the 2004 BC Innovation Council – Young Innovator award, and the 2005 Canadian Association of Physicists Medal for excellence in teaching.

Abstract
Nucleic acids are growing in importance as a diagnostic molecules for a variety of disease states and responses to treatment, both as indicators of genetic predisposition, and as biomarkers of disease. In many cases, nucleic acid biomarker diagnostic techniques have fallen short of their revolutionary potential, in part due to the difficulty associated with extraction of rare nucleic acids from contaminated samples, and due to the cost and complexity of extraction and analysis techniques.

I will present two technologies we have developed to help address these issues. The first, SCODA, is a non-linear electrophoresis technology that uses a form of second-harmonic generation in DNA electrophoresis to generate unique velocity fields in a gel. These allow highly selective extraction of nucleic acids from samples, including sequence-specific extraction. The second is an implementation of force spectroscopy using nanometer scale pores. This technique allows us to detect DNA sequence with single nucleotide resolution, without labeling of the target molecule, and in some cases can be used to uncover heterogeneity of molecule populations by extracting information on individual molecules one at a time. A variety of applications will be presented, ranging from metagenomics of Alberta tar sands, to prion protein stability analysis using nanopore force spectroscopy.

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Presented by the
W. M. Keck Center for
Nanoscale Optofluidics

Host: Professor Holger Schmidt