



CHEMISTRY & BIOCHEMISTRY COLLOQUIUM: Nanofluidics in Sub-1-nanometer Diameter Carbon Nanotube Porins

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About the Speaker:

Alex Noy is an Adjunct Professor at the School of Natural Sciences and a Senior Research Scientist at LLNL. He joined LLNL in 1998 as its first E.O. Lawrence Fellow after getting his B.A. in Chemistry from Moscow University in his native Russia followed by a Ph.D. in Physical Chemistry from Harvard University under the direction of Prof. Charles M. Lieber.

His research group works at the intersection of nanoscience, biophysics and materials engineering fields. The current research portfolio in the Noy group centers on carbon nanotube nanofluidics, where they study transport in highly-confined environments of carbon nanotube inner pores. Other research areas in the Noy group include high-speed atomic force microscopy. Alex Noy has authored over one hundred peer reviewed publications and 9 US and international patents, and has a Google Scholar h-index of 53.



Abstract:

Controlling ion and water transport on a molecular scale is important for applications ranging from industrial water treatment, to membrane separations, to bioelectronic interface design. Living systems move ions and small molecules across biological membranes using protein pores that rely on nanoscale confinement effects to achieve efficient and exquisitely selective transport. I will show that carbon nanotube porins—pore channels formed by ultra-short carbon nanotubes assembled in a lipid membrane—can exploit similar physical principles to transport water, protons, and ions with efficiency that rivals and sometimes exceeds that of biological channels. I will discuss the role of molecular confinement and slip flow in these pores and show how it can enhance water and proton transport efficiency and enable unusual mechanisms of ion selectivity and electroosmotic coupling in these pores. Overall, carbon nanotube porins represent simple and versatile biomimetic membrane pores for building the next generation of separation technologies.



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