**Real-time shape approximation and 5-D fingerprinting of single proteins**

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**Presentation Summary:** This talk describes the use of bilayer-coated, synthetic nanopores to characterize, simultaneously and in real-time, the volume, charge, shape, dipole moment, and rotational diffusion coefficient of single proteins. This 5-D fingerprint may be used for sensitive biomarker detection and routine protein analysis.

**Abstract:** Our group is interested in developing novel strategies to explore the structure and function of single proteins in solution. As an example of our advances in this area, this talk describes the use of electrolyte-filled nanopores with self-assembled lipid membrane coatings to determine, simultaneously and in real time, the shape, volume, charge, rotational diffusion coefficient, and dipole moment of individual proteins. It introduces the main concepts for a quantitative understanding and analysis of modulations in ionic current that arise from rotational dynamics of single proteins as they move through the electric field inside a nanopore. The resulting multi-parametric information raises the possibility to characterize, identify, and count individual proteins and protein complexes in a mixture. This approach interrogates single proteins and determines parameters such as the shape and dipole, which are excellent protein descriptors and cannot be obtained otherwise from single proteins in solution. Hence, this five-dimensional characterization at the single particle level has the potential for instantaneous protein identification, quantification, and sorting with exciting implications for protein folding studies, structural biology, proteomics, biomarker detection, and routine protein analysis.