Speaker:
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Title:
One hundred years of electrified interfaces:
What's new with the theories of Debye and Onsager?

Abstract:
The Poisson-Boltzmann theory stems from the pioneering works of Debye and Onsager and is considered even today as the benchmark of ionic solutions and electrified interfaces. It has been instrumental during the last century in predicting charge distributions and interactions between charged surfaces, membranes, electrodes, macromolecules, and colloids. The electrostatic model of charged fluids, on which the Poisson-Boltzmann description rests and its statistical mechanical consequences have been scrutinized in great detail. Much less, however, is understood about its probable shortcomings when dealing with various aspects of real physical, chemical, and biological systems. After reviewing the Poisson-Boltzmann theory, I will discuss several extensions and modifications to the seminal works of Debye and Onsager as applied to ions and macromolecules in confined geometries. These novel ideas include the effect of dipolar solvent molecules, finite size of ions, ionic specificity, surface tension, and conductivity of concentrated ionic solutions.

Short Bio

David Andelman completed his PhD studies in Physics at MIT in 1984. Between 1984-87 he was a Joliot-Curie post-doc fellow at College de France (in the group of P.G. de Gennes) and at Exxon Research and Engineering (New Jersey). Since 1987 he has been on the faculty of the School of Physics of Tel Aviv University. His interest lies in modeling soft and biological matter within the tools of statistical physics. In recent years, he worked on charged soft matter including polyelectrolytes, ionic liquids and solutions, and charged membranes, exploring their equilibrium and electrokinetic properties.