

Generalized Sedimentation Equilibrium for Colloids and Suspensions of Active Particles

(Tutorial #10)

Daniel Ou-Yang*

Lehigh University, USA

***Email of Presenting Author: hdo0@lehigh.edu**

Colloidal particles in suspension reach an equilibrium density distribution under gravity. The shape of the sedimentation density profile depends on both the overall particle density and the interactions between the particles. Einstein derived an equation to describe the density profile in terms of the external force and internal osmotic pressure in his 1905 paper on Brownian motion. During lecture we will first introduce how sedimentation equilibrium was used to determine fundamental constant such as the Boltzmann constant, molecular weight of proteins, colloidal osmotic equation of state and colloidal stability. We then show equilibrium density profiles in external force fields other than gravity can also be used to determine molecular properties of individual particles as well as thermal and mechanical properties of the colloidal system. The lecture ends with an exploration on ideas that use equilibrium density profiles in an external force field for investigating physical properties of active materials.