

PHYSICS COLLOQUIUM:
**Exploring Soft Low-Dimensional Structures in
the Cell: Fluctuations, Mechanics, and Geometry**

Date: **12/13/19**

Time: **1:30 PM**

Location: **COB2 140**

Alexander Levine

Professor, Departments of Physics, Chemistry,
and Biomathematics

University of California, Los Angeles

For more information,
contact : **Kinjal Dasbiswas**

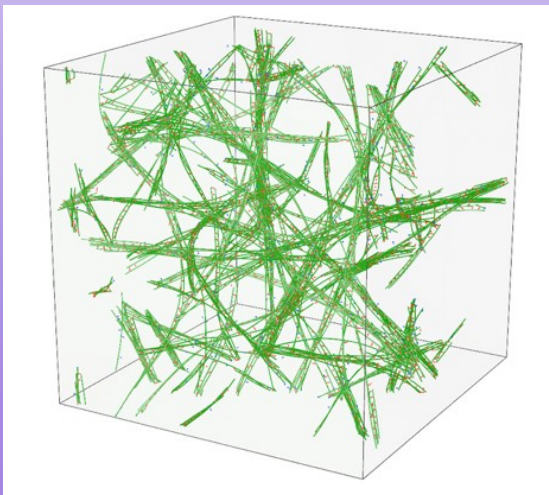
kdasbiswas@ucmerced.edu

Abstract

Biology provides us with a number of effectively one- and two-dimensional elastic structures. The cytoskeleton of cells abounds with long, stiff protein filaments organized into bundles and networks. Cells are bound by and contain a wide variety of membranes, some of which have complex geometries. These lower dimensional structures are sufficiently soft to be strongly fluctuating at ambient temperature. In addition, evolution has engineered a plethora of cross-linking proteins and molecular motors that interact with these structures.

In this talk, I discuss a few examples of the role of fluctuations in soft low-dimensional biological structures, introducing the fluctuation-induced (Casimir) interaction between linkers in filament bundles. The Casimir interaction drives a new type of first-order filament bundling transition, leading to a disordered “line glass” network. I

report on the collective mechanics of such filament networks. Finally, within a single bundle, I show that quenched-in braids introduce kinks (highly localized bends) in the time-averaged contour of the bundle, and explore how such kinks anneal over time.



About the Speaker

Alex Levine is a professor in the departments of physics & astronomy, chemistry & biochemistry, and computational medicine at UCLA. He is a member of the Bhaumik Institute for Theoretical Physics at UCLA and the director of the UCLA Center for Biological Physics. After receiving his Ph.D. for work at UCLA and Bell Laboratories, he did postdocs at Exxon Research & Engineering Co., The University of Pennsylvania, and UCSB before accepting a faculty position in the physics department at the University of Massachusetts, Amherst. He later relocated to UCLA. Since rejoining UCLA, he has pursued research in a variety of problems broadly in the area of soft condensed matter and biological physics, specializing in the statistical physics of low-dimensional biomaterials (filaments and membranes), active (nonequilibrium) systems, and the dynamics of neuronal networks. He lives with his wife and son in Los Angeles.

