You are invited to the Seminar by

Prof. Dr. F. C. MacKintosh

Department of Physics and Astronomy, VU University

Amsterdam, The Netherlands

Email: fcm@nat.vu.nl

Active stresses and self-organization in intra/extracellular networks

Tuesday, November 20 at 14:00

Physics Department, Seminar Room (3rd floor)

Abstract

Much like the bones in our bodies, the *cytoskeleton* consisting of filamentous proteins largely determines the mechanical response and stability of cells. Unlike passive materials, however, living cells are kept far out of equilibrium by metabolic processes and energy-consuming *molecular motors* that generate forces to drive the machinery behind various cellular processes. We describe recent advances both in theoretical modeling of such networks, as well as experiments on reconstituted *in vitro* acto-myosin networks and living cells. We show how such internal force generation by motors can lead to dramatic mechanical effects, including strong mechanical stiffening. Furthermore, stochastic motor activity can give rise to diffusive-like motion in elastic networks. We also show how the collective activity of myosin motors generically organizes actin filaments into contractile structures, in a multistage non-equilibrium process. This can be understood in terms of the highly asymmetric load response of actin filaments: they can support large tensions, but they buckle easily under piconewton compressive loads.