



Out-of-equilibrium spectrum of fluctuating forces in living cells

Alain Richert and **François Gallet**

Matière et Systèmes Complexes – UMR 7057
CNRS and University Paris 7 - France.

Abstract (1): Due to biological activity and especially to molecular motors, the intracellular medium is not at thermal equilibrium and the fluctuation-dissipation theorem no longer applies. We present measurements of the power spectrum of active forces exerted on a bead specifically attached to the actin network through adhesive receptors of the membrane of C2 myoblasts. On the same probe, we have performed passive microrheology by tracking the bead motion, and active microrheology by measuring the creep function, in response to a step force applied with an optical tweezers. The fluctuation spectrum, represented by the Laplace transform $S_f(s)$ of the force auto-correlation function, exhibits two frequency regimes. At low frequencies (time scale larger than about 1 sec), the spectrum behaves as $s^{-1.75}$. This is close to the s^{-2} behavior reported in the literature and consistent with an active drift of the bead pulled by the motors. Oppositely, at higher frequencies (time scale smaller than 1 sec), the spectrum is proportional to $s^{-0.65}$. In both regimes the amplitude of fluctuations is larger than the one it would have at equilibrium.



The Frontiers in Microrheology Workshop
February 6 - February 9, 2008
at the CNSI, UCLA

<http://www.cnsi.ucla.edu/conferences/microrheology/>

