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Non-equilibrium fluctuations of cell membranes: The effect of cytoskeletal motor activity on membrane dynamics ROIE SHLOMOVITZ, ALEX LEVINE, UCLA, Department of Chemistry & Biochemistry — The mechanics and non-equilibrium (i.e. molecular motor-driven) fluctuation spectrum of living cells remains an open problem. In this talk, we explore the question: What can one infer about the action of endogenous motors in the cytoskeleton by observing the height fluctuations of cell membrane? To address this, we treat the cytoskeleton as a uniform elastic half-space bounded by a membrane with a finite bending modulus and driven out of equilibrium by molecular motors (i.e. myosin). These motors produce transient and stochastic contractile stresses in the elastic bulk. We first calculate the induced undulations of the membrane-bound surface due to the action of a single molecular motor. Then, making assumptions about the spectrum of motor force fluctuations, we calculate the expected non-thermal contribution to the cellular membrane fluctuations due to the action of an ensemble of such motors. We discuss extensions of this simple model to include, e.g. the effect spatially inhomogeneous coupling between the cytoskeleton and the membrane. We also mention ongoing experimental tests of these ideas.

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