Nonequilibrium mechanics of cross-linked actomyosin networks probed with microrheological techniques

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Living cells are active matter, they are a non-equilibrium system. To study the applicability of the fluctuation dissipation theorem far from equilibrium, we embed colloidal particles in those materials - primarily cells and reconstituted, ATP driven actomyosin networks – measure the systems' linear response to thermal fluctuations and compare with equilibrium systems or measurements that don't rely on Brownian motion (active deformation). Additionally, we want to compare in vivo measurements with artificial systems to evaluate to which extent cellular mechanics are a phenomenon emerging from the interaction of hundreds of different biomolecules. Simplified model systems are a useful and popular way to reduce the immense complexity and to access crucial information about living systems, but they also bear the risk of oversimplifying properties that arise from a variety of interactions. A major research interest in the field of biophysics is the creation of artificial cells. Our goal is a small contribution in the form of understanding cortical non-equilibrium mechanics.