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Non-Equilibrium Cell Mechanics Studied with a Dual Optical Trap FLORIAN SCHLOSSER, FLORIAN REHFELDT, CHRISTOPH F. SCHMIDT, Drittes Physikalisches Institut, Georg-August-Universitaet Goettingen, Germany — Cells communicate with their surroundings biochemically, but at the same time also sense the active and passive mechanical properties of their micro-environment. Cells can "feel" mechanical stress and they generate contractile forces through their acto-myosin network to actively probe the mechanical response of the material they adhere to or are embedded in. These mechanosensory interactions result in cellular responses. We have used a dual optical trap to perform force measurements on cells suspended between two fibronectin-coated beads. We analyzed the correlated fluctuations of the beads with high spatial and temporal resolution. Using a combination of active and passive microrheology, we can simultaneously determine the (non-thermal) forces generated by the cells and actively probe their visco-elastic response properties. Here, we present data on contractile forces and elastic response of 3T3 fibroblasts, demonstrating that the transmitted force depends on the trap stiffness (i.e. rigidity of the environment). Using biochemical perturbations, we have studied the contributions of different cytoskeletal elements to the active and passive mechanical properties of the cell.

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