Intracellular Manipulation Using Optical Tweezers

A.J. Kulik, M. Lekka, J. Lekki, E. Bertseva, Ph. Thévenaz, A. Singh, S. Jeney, M. Unser and L. Forró

Ecole Polytechnique Fédérale de Lausanne
IPMC-Station 3
BIG-Station 17
1015 Lausanne, Switzerland
and
IFJ PAN, Kraków, Poland
http://nanotubes.epfl.ch

Weak and very stable optical trap with the 3D position detection is called the Photonic Force Microscope. A small, few hundreds nm in diameter, polystyrene bead is trapped in the focal point of the laser. Position of the bead is digitized with high spatial (1 nm) and high temporal (1 us) resolution. The acquired signals allow one to follow Brownian motion of the trapped bead, while the relative (to the sample) position of the focal point can be changed interactively either directly (executing precision table movement) or by the use of the force-feedback (haptic) joystick. The use of the IR laser (1064 nm wavelength) minimizes water absorption and allows to work inside the living cell. Beads have been introduced into cells during phagocytosis. Motion of the intracellular bead is heavily modified by the environment inside the cell, in particular by the cells' cytoskeleton, as compared to free bead in water.

The idea behind this experiment is to measure rapidly the 3D stiffness and viscosity inside the cell. Concepts and preliminary results will be presented.

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