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Stokes' law in complex liquids and inside cell cytoplasm KAROL MAKUCH, California Institute of Technology, ROBERT HOLYST, TOMASZ KALWARCZYK, PIOTR GARSTECKI, Institute of Physical Chemistry, Polish Academy of Sciences, JOHN F. BRADY, California Institute of Technology — The 'viscosity' experienced by a small tracer particle in complex liquids depends both on its size and on the structure of the liquid, which itself may contain different length scales. Thus, in a microrheological experiment the complex liquid may best be described by wave-vector-dependent viscosity $\eta(\mathrm{k})$. Here we derive Stokes' law in complex liquids and formulate a method to determine the wave-vector-dependent viscosity from microrheological experimental data. We initiate our approach by determining the wave-vector-dependent viscosities $\eta(\mathrm{k})$ of HeLa and Escherichia Coli cell cytoplasm from the experimental data on diffusion of macromolecules in these systems. Determination of this quantity opens an avenue for computer simulations of motion and biochemical reactions inside living cells.

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