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Towards real-time 3D Tracking of Structural Transitions in Adenylate Kinase by Thermal Noise Imaging ARND PRALLE, VIJAY RANA, YUNSHIANG HSU, University at Buffalo, SUNY — Proteins in contrast to macroscopic machines are subject to thermal fluctuations in shape which provide both opportunities and challenges. They have to be flexible enough to support turn-over rates up to hundreds per second, yet stable enough to maintain their three-dimensional structure over hours and days. As result of thermal excitation they fluctuate between structural conformations. We measured thermally excited structural fluctuations in the Adenylate Kinase using a site-specifically attached nanoparticle and a laser trap based position sensing scheme. This 'Thermal Noise Imaging' (TNI) can provide real-time tracking of 3D structural transitions. TNI uses scattering of laser light to locate a nanoparticle with Ångstrøm spatial and microsecond temporal resolution. We present details of the technique and a comparison of thermally excited structure fluctuations with functional transitions.

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