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Single-molecule measurements of protein folding and dynamics

In the past two decades, single-molecule experiments have evolved from being state-of-the-art prof-of-principle demonstrations to nearly routine tools of modern biophysics, enabling one, for example, to monitor molccular processes directly as they unfold in the cell. Yet because of the relative sluggishness of the common probes, deciphering single-molecule signals to infer molecular dynamics remains an elusive goal. In this talk I will report on recent joint efforts of my group with experimentalists toward this goal using the example of one of the most fundamental problems in biophysics, protein folding. I will discuss how intrinsic protein motion can be deduced from random photon sequences in single-molecule fluorescence resonance energy transfer experiments or from the movement of a micrometer-sized force probe in single-molecule pulling studies. I will further describe some of the new lessons about protein folding and dynamics learned from such studies.

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