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Modeling the effects of internal and external fluctuations on lifetimes of proteins measured by an AFM ERIC CORWIN, University of Oregon, MAXIME CLUSEL, Institut Laue-Langevin & CNRS Montpellier — Measurements of the distribution of the time to unfold a single- molecule of a given protein under an externally applied force have emerged as an important tool with which to study the mechanical stability and energy landscape of a protein. In such an experiment the protein is potentially subject both to internal fluctuations in structure as well as external fluctuations in temperature and applied force. We report on a theoretical exploration of the effects that each kind of fluctuation may have on the measured lifetime distribution. We show that it is extremely difficult to distinguish internal fluctuations from external fluctuations in the lifetime distribution. We find that the rate distribution has higher sensitivity to the origins of fluctuations. Therefore, we propose an experimental protocol to estimate the approximate magnitude of internal fluctuations by intentionally adding increasing amounts of external fluctuations and measuring the skewness of the resulting rate distribution.

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