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Complexity and Dynamics of Disordered Proteins.

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Proteins are perhaps the simplest biological functioning units in living organisms. Their simple behavior emerges from the underlying complexity of the many interactions which hold them together. The cooperative nature of such interactions leads to a unique protein structure or "fold" which in turn allows function. Recently this notion has been challenged by the discovery of a new class of proteins, called Intrinsically Disordered Proteins (IDPs) which do not "fold" yet carry out important biological functions. Because IDPs sample many different conformations on very fast timescales their study requires the use of novel experimental techniques. When proteins fail to fold they can form highly stable, symmetric structures called amyloid fibers, leading to diseases such as Alzheimer's, Parkinson's and type II diabetes. I will discuss what we have learned so far on the physics of IDPs, using a novel nanosecond laser-pump spectrometer built in our lab.