Title:	Region-Specific Interactions of Intrinsically Disordered Proteins in Phase Separation and Amyloid Formation
Authors:	Sawdekar, Harshita
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Abstract:	The conformational conversion of intrinsically disordered proteins (IDPs) or peptides, typically soluble but occasionally undergo phase transition and eventually aggregation, amyloid formation, are characteristics of many neurodegenerative diseases, such as Parkinson's, Alzheimer's, and prion disease. According to studies, multicellular higher species and single-cell organisms like yeast and bacteria can adapt to adverse environments on a cellular level by forming dynamic condensates. Stress-related events cause the cell to activate specific defense mechanisms that prevent various proteins from misfolding, which can occasionally result in formation of biomolecular super- assemblies that prevent aggregation. Such biomolecular condensates can occasionally become pathological when the cells fail to retain the shape of the biomolecular condensates, leading production of amyloidogenic or amorphous protein aggregates. The dynamic condensates shift from a liquid-like to a solid-like state as they mature, eventually producing amyloid fibrils or arrested states and resulting in aberrant behavior, typically observed with the development of amyloidosis. In addition to identifying the amyloid core of such fibrils, which can cause amyloidosis, it becomes important for us to understand the interactions generating phase separated dynamic biomolecular condensates that may or may not transition to amyloid fibrils. In this work, we wanted to fathom the dynamics of two polypeptide chains, each having an intrinsically disordered region, undergoing liquid-liquid phase separation to form complex coacervates. We have shown the role of electrostatic forces on the co-phase separation of Human Prion protein with a molecular co-chaperone Ydj1, a type I heat-shock protein 40 from yeast. The other part of this thesis is the development of a novel, easy-to-use fluorescence-based technique to help us trace the amyloid core of amyloid fibril-forming proteins.
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