You are invited to the Biophysics Seminar by

Dr. Roy Beck

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Tuesday, May 28h at 14:00

Physics building, Seminar Room (3nd floor)

Order and disorder in biological complexes

During the 20th century, the protein sequence-structure-function paradigm was uniformly accepted as a key concept in molecular cell-biology. The central dogma of structural biology is that the biological function of proteins is inherently encoded in their folded 3D structures. This idea, introduced in 1894 by Emil Fischer and known as the "lock-and-key" model, explained the high specificity of enzyme-substrate recognition and was validated over and over to create the basis of modern proteomics. Protein folding occurs mainly due to short-ranged specific interactions between amino-acids encoded in its sequence. This is the core reason why point mutations have a dramatic effect on protein conformation which in-turn significantly distorts protein-protein recognition.

The concept that a given amino-acid sequence will not form a 3D folded structure but still have biological functionality has developed only in the last ~15 years. The discovery rate and characterization of intrinsically disordered proteins has been increasing continually, becoming one of the fastest growing areas of proteomics. It is now estimated that over 50% of eukaryotic proteins contain large intrinsically disordered regions, involved in a wide range of cellular functions including transcription, translation, signalling and regulation of protein assembly. Structural flexibility and plasticity originating from the lack of an ordered structure suggest a major functional advantage for these proteins, enabling them to interact with a broad range of binding partners.

Utilizing experimental and computational progress in the field we are now able to explore dynamic and flexible biological materials that lack 3D order using small-angle X-ray scattering. In this talk I will present some of our recent experimental results aiming to address the fundamental relation between order and disorder in functional biological complexes.