Prof. Dr. Roland Winter

Vorlesung

Structure and Dynamics of Biomolecules

I. Biomembranes
Cell membranes, membrane models, self assembly, hydrophobic effect, lipid bilayers, lipid polymorphism, phase diagrams of lipid mixtures.
Physical methods for studying structural and dynamic properties of membranes (DSC, PPC; FTIR-, NMR- and fluorescence spectroscopy, FRET, FRAP; SAXS, TRSAXS, AFM, fluorescence microscopy).
Effects of additives on membrane structure and dynamics (sterols, anesthetics, peptides, ...).
Non-lamellar lipid phases; membrane fusion.
Lateral organization of membranes (domains, rafts).
Dynamic and thermomechanical properties of membranes, shape transformations.
Lipid-peptide interactions, membrane proteins, membrane transport.
Applications: drug delivery.

II. Proteins
Protein stability, free energy landscape.
Folding kinetics, folding theories.
Methods for folding studies (DSC, fluorescence, FTIR- and CD spectroscopy, TR XRD)
Cosolvent effects, Hofmeister series.
Misfolding and amyloidogenesis of proteins (e.g., Alzheimer, Diabetes mellitus).
Conformational dynamics; Single molecule techniques.
Molecular dynamics computer simulations of biomolecules.

Text books:

Original papers are cited during the lecture.