

## Structure and Dynamics of Biomolecules

### I. Biomembranes

Cell membranes, membrane models, self assembly, lipid bilayers, lipid polymorphism.  
Physical methods for studying structural and dynamic properties of membranes.  
Effects of additives on membrane structure and dynamics (sterols, peptides, ...).  
Non-lamellar lipid phases; membrane fusion.  
Lateral organization of membranes (domains, rafts).  
Dynamic and thermomechanical properties of membranes.  
Lipid-peptide interactions, membrane proteins, membrane transport.  
Applications: drug delivery.

### II. Proteins

Protein stability, free energy landscape.  
Folding kinetics, folding theories.  
Misfolding and amyloidogenesis of proteins.  
Conformational dynamics; Single molecule techniques.  
Molecular dynamics computer simulations of biomolecules.

### Text books:

- O. Mouritsen, *Life - as a Matter of Fat*, Springer-Verlag, Heidelberg, 2005.  
B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts, P. Walter, *The Cell*, GS Garland Science, Taylor & Francis Group, New York, 2002.  
R. Winter, F. Noll, *Methoden der Biophysikalischen Chemie*, Teubner, Stuttgart, 1998.  
J. N. Israelachvili, *Intermolecular and Surface Forces*, Academic Press, London, 1992.  
D. Boal, *Mechanics of the Cell*, Cambridge University Press, 2003.  
R. Lipowski, E. Sackmann (Hrsg.), *Structure and Dynamics of Membranes*, Vol. 1, 2, Elsevier, Amsterdam, 1995.  
G. Cevc, D. Marsh, *Phospholipid Bilayers*, John Wiley & Sons, New York, 1987.  
G. Cevc (Hrsg.), *Phospholipids Handbook*, Marcel Dekker Inc., New York, 1993.  
R. B. Gennis, *Biomembranes*, Springer-Verlag, New York, 1989.  
P. Yeagle, *The Structure of Biological Membranes*, CRC Press, London, 1992.  
L. Tamm, *Protein-Lipid Interactions*, Wiley-VCH, Weinheim, 2005.  
C. R. Cantor, P.R. Schimmel, *Biophysical Chemistry*, Vol. 1-3, W.H. Freeman & Co., San Francisco, 1980.  
P. L. Luisi, P. Walde (Eds.), *Giant Vesicles*, John Wiley & Sons, Chichester, 2000.  
B. Nölting, *Protein Folding Kinetics*, Springer, Heidelberg, 1999.  
A. Fersht, *Structure and Mechanisms in Protein Science*, W. H. Freeman, New York, 1999.  
T. E. Creighton, *Proteins. Structures and Molecular Properties*, W. H. Freeman & Co., New York, 1993.  
C. Branden, J. Tooze, *Introduction to Protein Structure*, Taylor & Francis, New York, 1999.  
A. M. Lesk, *Introduction to Protein Science. Architecture, Function, and Genomics*, Oxford University Press, 2004.  
M. Daune, *Molecular Biophysics*, Oxford University Press, Oxford, 1992.  
K. E. van Holde, W. C. Johnson, P. Shing Ho, *Physical Biochemistry*, Prentice Hall, New Jersey, 1998.

Original papers are cited during the lecture.