

STATISTICAL MECHANICS OF BIOLOGICAL MACROMOLECULES

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General information of the course

- **Time and place:** Fall Semester, Tuesdays, 11:15 AM – 13:00 PM, room F201.
- **Consultation time:** Thursdays, 8:00 AM – 10:00 AM, room B325 or online.
- **Method:** Tutorial classes
- **Assessment & scoring:** Problem sets.
- **Slides and problem sets:**
<https://liwo.strony.ug.edu.pl/DigitChem/biom/index.html>

Course scope

- 1 Elements of statistical mechanics: ensembles, ensemble averages, thermodynamic connection.
- 2 Dense systems: potentials of mean force.
- 3 Statistical-mechanical models of polymers chains.
- 4 Structures of protein and nucleic acids.
- 5 Interactions that govern the formation of biopolymer structure.
- 6 Structure formation and self-organization in biopolymers as a phase transition.
- 7 Poland-Scheraga theory of phase transitions in polymers.
- 8 Funnel-like energy landscape: foldability.
- 9 Simple lattice models to study foldability.
- 10 Free-energy landscapes of biological macromolecules and methods for their investigation.
- 11 Coarse-grained force fields for biopolymer simulation.

Literature

- ① R. Blossey: Computational biology: A statistical mechanics perspective.
- ② D. McQuarrie: Statistical Mechanics.
- ③ P.-G. de Gennes: Scaling Concepts in Polymer Physics.
- ④ D. Poland, H.A. Scheraga: Theory of Helix-Coil Transition.
- ⑤ P. Flory: Statistical Mechanics of Chain Molecules.
- ⑥ M. Doi, S.F. Edwards: The Theory of Polymer Dynamics.
- ⑦ F. Reif: Statistical Mechanics (part of Berkeley Physics Course).
- ⑧ A. R. Leach: Molecular Modeling: Principles and Applications.
- ⑨ T. Schlick: Molecular dynamics and simulations.