Soft Matter Theory

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We use theory and computations to develop microscopic level understanding of the structure and dynamics of Soft Matter. Different methods and techniques, suitable to bridge time- and length- scales, are used to address questions of interest to biophysics and materials science. Current research topics:

- Chirality propagation across length scales in self-assembling systems (helical polymers, DNA oligomers, porphyrin conjugates, colloidal suspensions of viruses);
- Liquid crystals: elastic and flexoelectric properties, conventional and unconventional phases (cholesteric, twist-bend, Blue Phases);
- Lipid membranes and self-assembled monolayers: partitioning and translocation of molecular species, elastic properties, mutual effects of lipid matrix and protein inclusions.

- *Entropy - driven chiral order in a system of achiral bent particles,* Phys. Rev. Letters**,** **2015**, 115**,** 147801.
- *Hierarchical propagation of chirality through reversible polymerization: the cholesteric phase of DNA oligomers*, ACS Macro Letters**, 2016***,*** 5, 208-212.
- *Chiral self-assembly of helical particles,* Faraday Discuss.*,* **2016**, 186, 171–186.
- *Anomalously low twist and bend elastic constants in an oxadiazole based bent-core nematic liquid crystal; spontaneous chirality and polarity,* J. Mater. Chem. C, **2017**, 6, 980-988.
- *Spontaneous lipid flip-flop in membranes: A still unsettled picture from experiments and simulations,* in “The Biophysics of Cell Membranes - The Biological Consequences”, Eds. J.-M. Ruysschaert, R. Epand (Springer Series in Biophysics, **2017**)*, 29 – 60.*