Soft Matter Theory

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We use statistical mechanical theory and computer simulations to develop microscopic understanding of equilibrium and nonequilibrium properties of Soft Matter. Different methods and techniques, suitable to bridge time and length scales, are employed to address questions of interest to biophysics and materials science.
Research topics:

- Chirality propagation across length scales in self-assembling systems (polymers, nucleic acids, supramolecular aggregates);
- Liquid crystals, colloids and gels: elastic, rheological and flexoelectric properties, conventional and unconventional phases;
- Lipid membranes and self-assembled monolayers: partitioning and translocation of molecular species, elasticity, interaction with macromolecular inclusions.

1. *Interplay of particle morphology and director distortions in nematic fluids,* Phys. Rev. Lett. **2020**, 125, 267802.
2. *Helical inclusions in phospholipid membranes: lipid adaptation and chiral order,* J. Phys. Chem. Lett. **2019**, 10, 5629.
3. *Anomalously low twist and bend elastic constants in an oxadiazole-based bent-core nematic liquid crystal and its mixtures; contributions of spontaneous chirality and polarity,* J. Mater. Chem. C **2018**, 6, 980.
4. *Spontaneous lipid flip-flop in membranes: a still unsettled picture from experiments and simulations,* chapter in "The Biophysics of Cell Membranes" (Springer Series in Biophysics, **2017**).
5. *Hierarchical propagation of chirality through reversible polymerization: the cholesteric phase of DNA oligomers*, ACS Macro Lett. **2016**, 5, 208.