Statistical Mechanics of Confotronic Filaments

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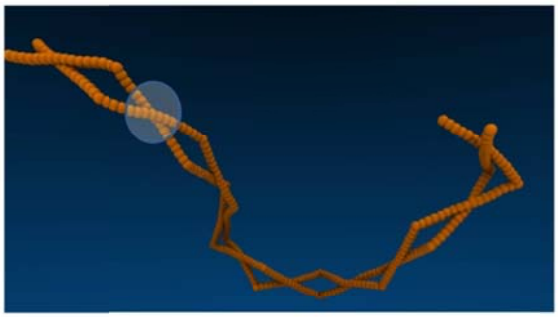
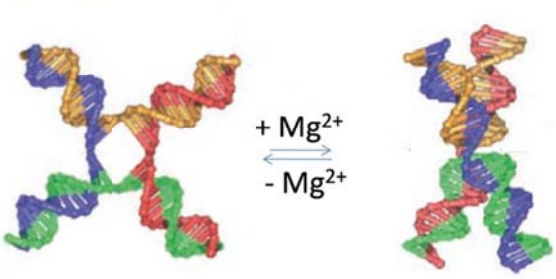
Molecular machines are everywhere around us and run our lives on the sub cellular scale. To mimic the Nature and maybe even outperform it in some tasks is a major challenge of nanoscience in this century. Many biofilaments in Nature as well as smaller oligomeric proteins act as molecular information processing machines through cooperative (allosteric) mechanisms in their conformational dynamics.





The central biophysical question in such systems is how do the protein monomer units establish their conformational interactions in order to effectively coordinate and respond to external stimuli. To answer this question, the present thesis will investigate simplified statistical mechanics models for allosteric behavior in linear chain oligomers and filaments. The investigated models will be simple and generic enough to be implemented by chemical synthesis in labs collaborating with us.

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Combining methods from theoretical polymer physics and molecular dynamics simulations this thesis will initiate the first feasibility study and will conceptually pave the way to an already planned experimental implementation of the first manmade "confotronic " wire which will follow in near future. Such artificial devices will be able to transmit molecular information in form of monomer conformation spread along large distances beyond one micron.

We are looking for a student with exceptional analytic skills and imagination, with good understanding of soft-matter physics, and a solid background in other fields of physics, optimally with some previous experience in numerical computing and computer simulation.

For more details , don't hesitate, contact us.