

## **Polymers / Soft Matter as Model Systems for Physics**

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Polymers, long chain molecules, comprise important materials of our daily life, being it simple commodities with all their advantages and disadvantages or high-tech materials in electronics or medicine, to give just two examples. Furthermore, biopolymers such as cellulose or proteins are central functional constituents of living organisms. Not surprisingly, they have been subject of applied physics research since their discovery/invention. This application focused view, however, changed with de Gennes' discovery of the  $n \rightarrow 0$  theorem, showing that the inverse chain length  $1/N$ ,  $N$  being the number of chain repeat units, can be mapped onto the distance  $|T-T_c|/T_c$  from the critical point in a  $n$ -vector spin model. At about the same time computer simulations became powerful tools to study critical phenomena in spin systems, complemented by experiment, most notably neutron scattering for the case of polymers. At that point polymers became important and versatile systems to study general questions of critical phenomena.

Polymers/Soft Matter display slow dynamics and are susceptible to small molecular stimuli. Thus, local chemistry specific aspects like minute changes in local interactions easily turn into macroscopic property changes. At that point generic physical concepts meet the consequences of chemically detailed interactions. This interplay makes soft matter so versatile and so interesting. The talk will review a few characteristic examples, where such effects lead to physically interesting phenomena, which apply to modern statistical physics (active systems, glass transition) as well as soft matter materials science (nanoporous materials). Finally, challenges and perspectives for physics of soft matter but also for new physics studied by soft matter will be shortly discussed.