Tutorial
Polymers

Entropic elasticity. Design of a worm.
Excluded volume exclu and phase transition

Outline

- **Entropic elasticity**. Design a worm
- Statistical physics: van der Waals, **virial expansion**
- Polymers: **excluded volume + entropic elasticity** (Flory)
- **Excluded volume only**. Nematique-isotropic transition in liquid cristals (Onsager)

*Meta*material ?

- *physical and/or mechanical properties are determined by structure and not by the chemical nature of its constituents*

- object: sequence of monomers (= segments) (b) put end-to-end (a)

- (a) entropic elasticity

    work $\delta W = \gamma\, dL$, $\gamma > 0$; attractive, soft, 1D

    long-ranged interaction (along the chain)

- (b) segments: granular (discrete), thus excluded volume (avoid); répulsive, hard

    short-ranged interaction (across)

Design of a worm

Entropic pressure tool
- spreading kinetics
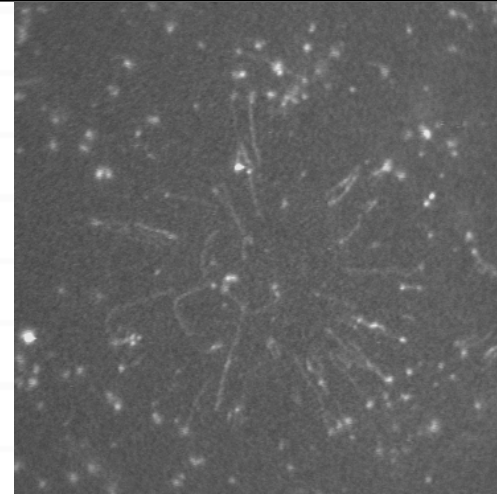
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Spreading of
bio-adhesive
vesicles on
DNA carpets