Surface extrapolation length and director structures in confined nematics.

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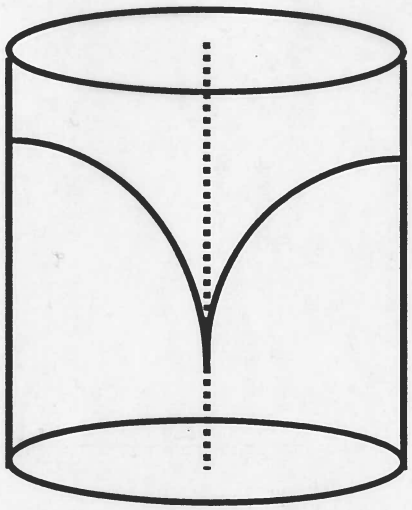
Elastic theory

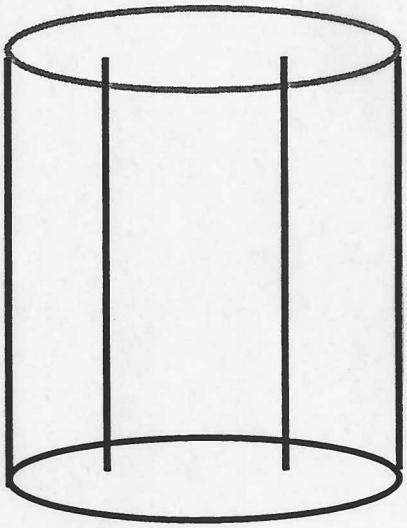
Crawford at.al.
PRA 45,8693

Escape Radial (ER)



$$\frac{RW}{K} \gtrsim 27$$

Planar Polar with Line Defects (PPLD)



$$\frac{RW}{K} \lesssim 27$$

R-radius, W- surface anchoring, K-elastic constant

$$W \cdot (\hat{n} \cdot \hat{r})^2$$

Monte-Carlo simulations of Lebwohl-Lasher Mode of NLC with homeotropic anchoring.

bulk: $U_{ij} = -\varepsilon_b (n_i \cdot n_j)^2$

surface: $U_{ik} = -\varepsilon_s (n_i \cdot n_k)^2$

Previous work:

Chiccoli at.al. MCLC 290, 237 (1996)
Smondyrev and Pelcovits LC 26, 235 (1999)
Bradač at.al PRE 58, 7447 (1998)

Results:

No Escaped Radial structure,

even when $\frac{R \cdot \varepsilon_s}{\varepsilon_b} \gg 27$.

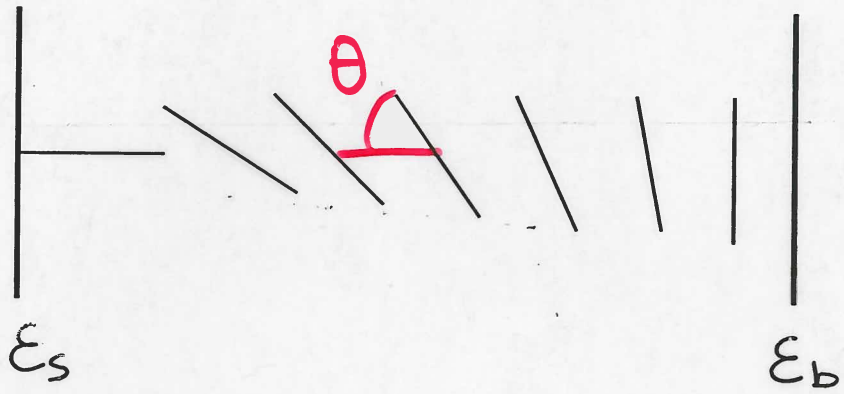
Temperature dependence $\frac{W}{K}$ in LL Model?

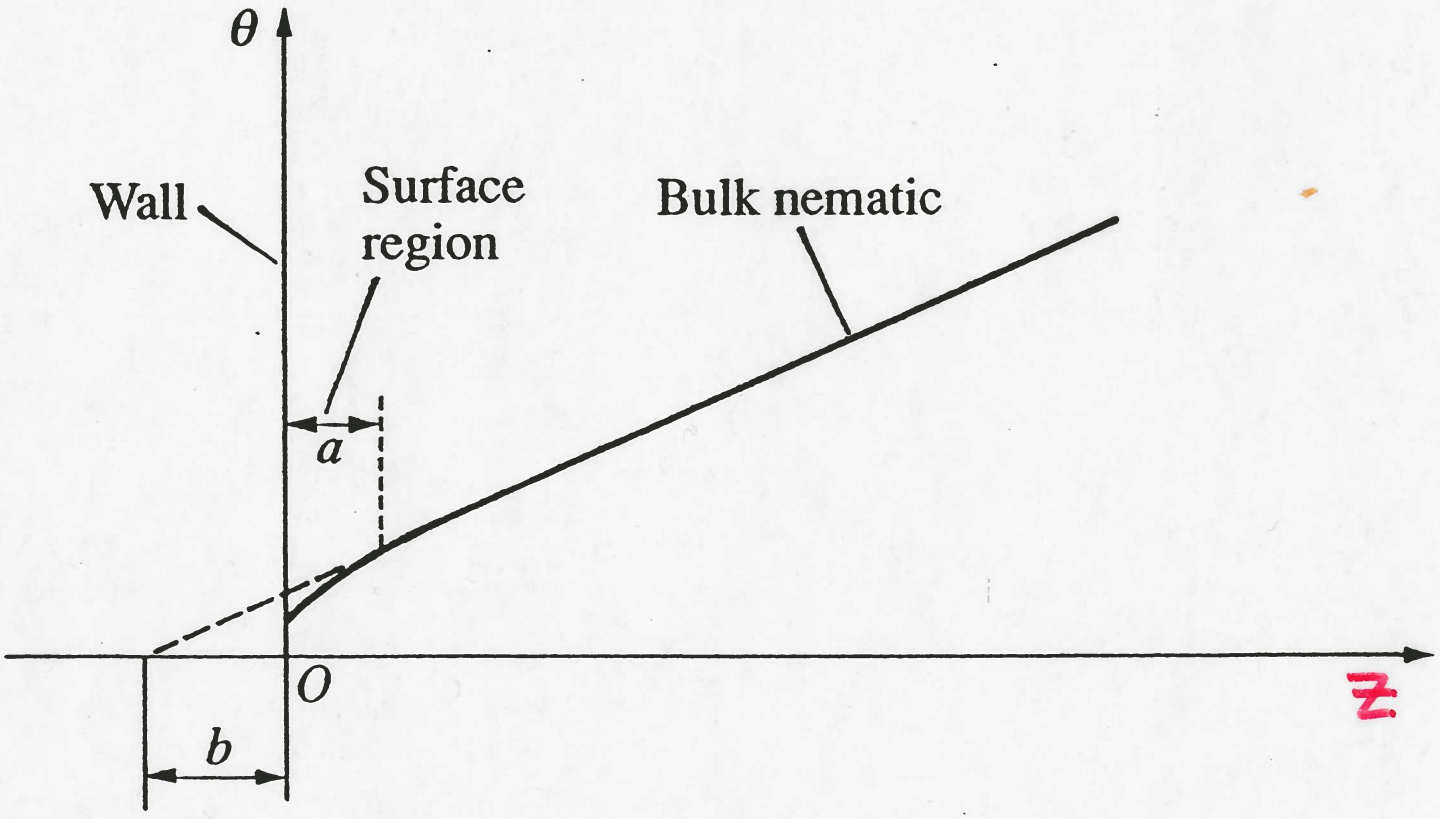
SURFACE EXTRAPOLATION LENGTH

$$b = \frac{K}{W}$$

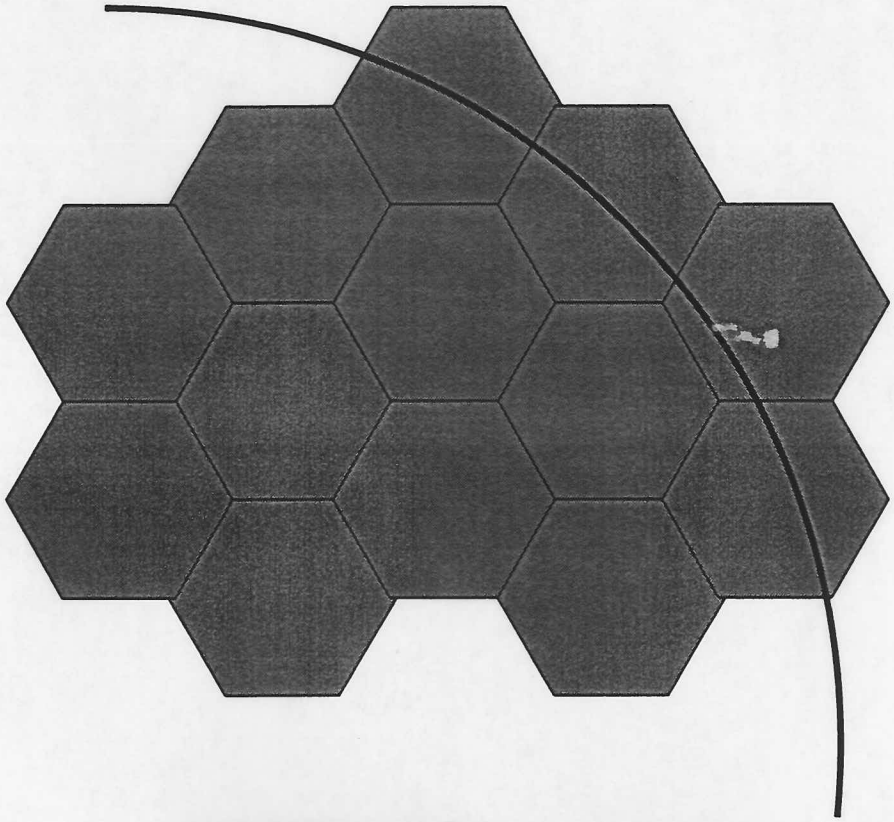
de Gennes

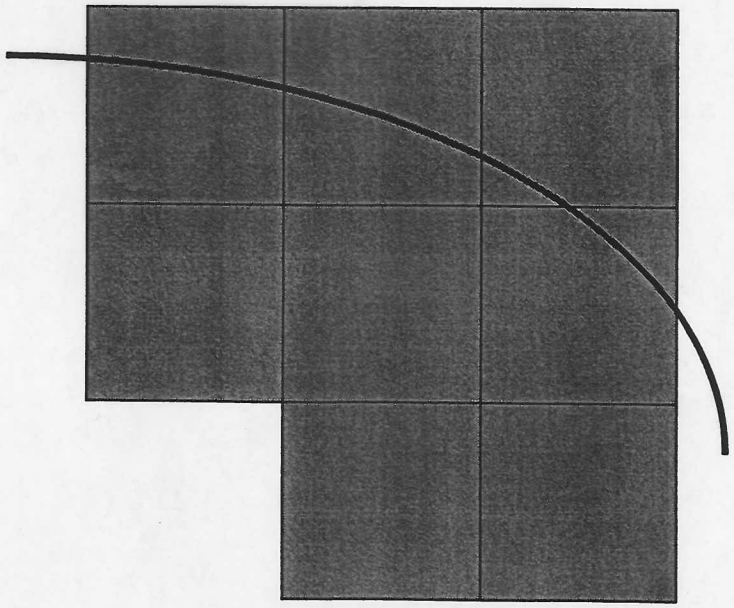
cube geometry;
imposed splay;





Honeycomb vs. Cubic Lattice



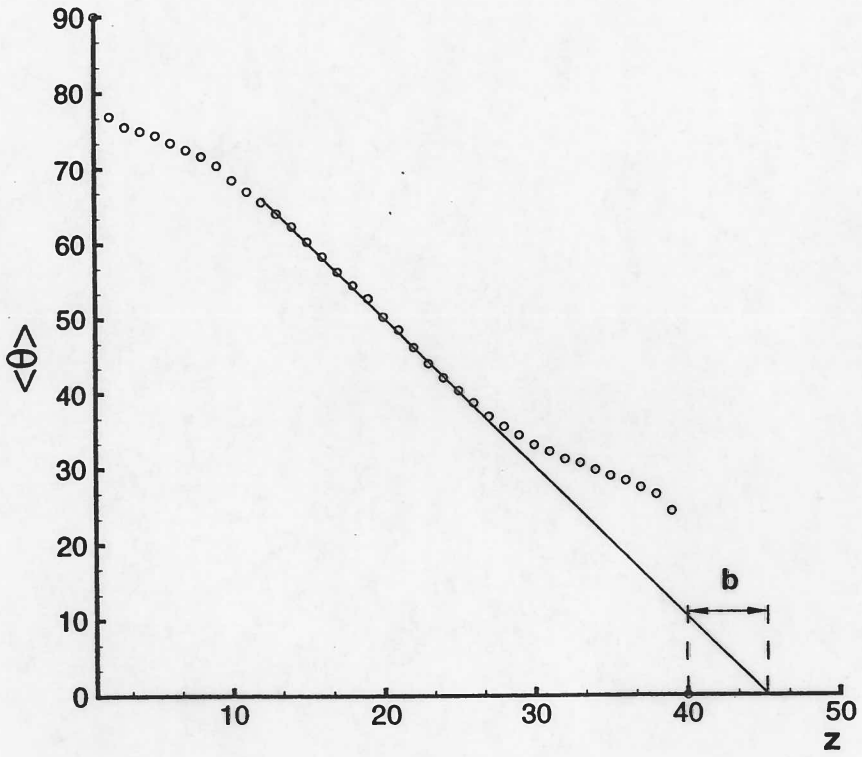


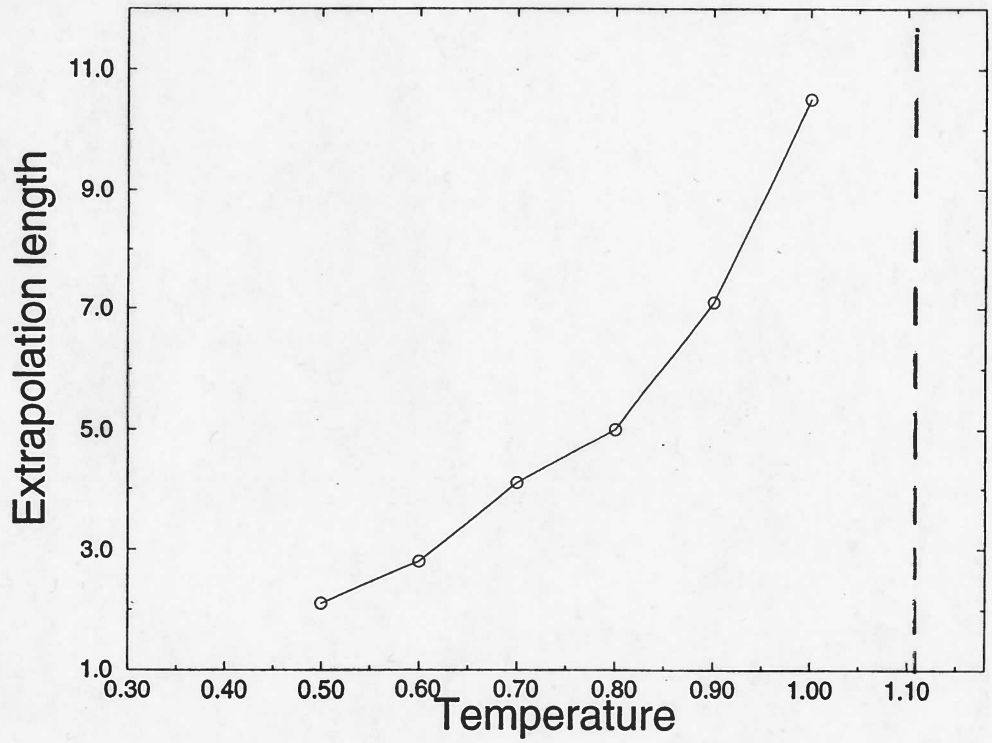
1. Cylindrical symmetry

2. For spins close to boundary always 1 fixed neighbor

RESULTS

PRE 62,6734





PPLD $\left(\frac{RW}{K} \lesssim 27\right)$ at temperatures close to T_{NI}

Stable ER at lower temperatures for $R = 120$

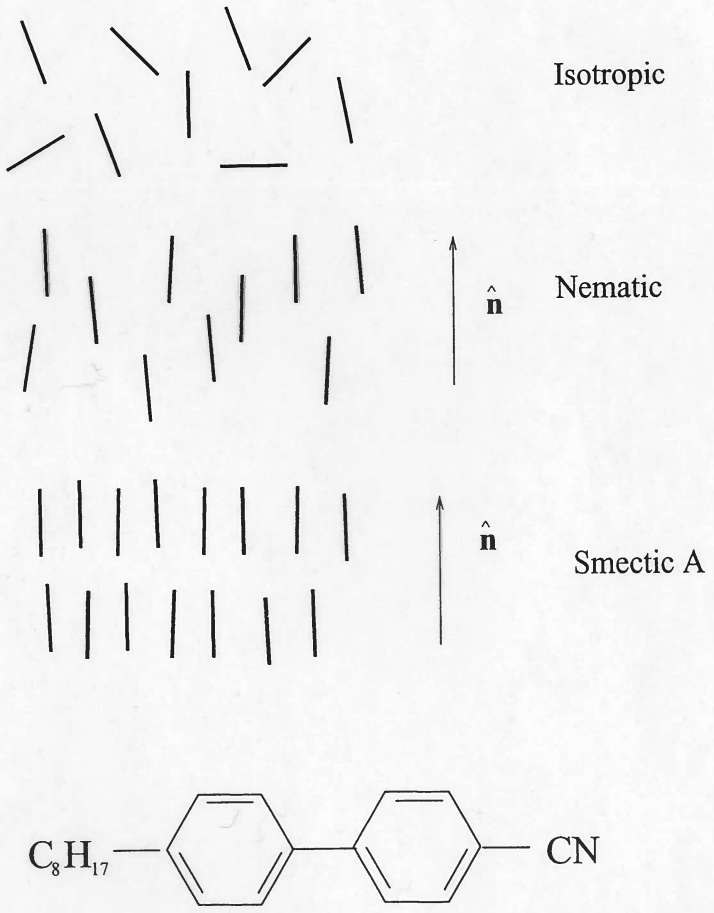


Figure 1.1: Schematic illustration of isotropic, nematic and smectic A liquid crystals phases. Here rods represent the long axes of the molecules. An example molecule of 8CB is shown on the bottom of the figure. It consists of two benzine rings and two terminal groups.