

DESIGN: TUBES

PERSISTENCE LENGTH OF THIN
TUBE

$$\xi_P = YI / k_B T \quad \text{WHERE } I = R^3 t$$

ξ_P SCALES LIKE R^3

EXAMPLE:

RADIUS $R = 2 \mu\text{m}$

THICKNESS $t = 2 \text{ nm}$

$Y \sim 10^7 \text{ J/m}^3$ (BACTERIAL WALL)

$$\xi_P = 125 \text{ m}$$

ξ_P SHOULD BE REDUCED BY
LOCAL THERMAL FLUCTUATIONS

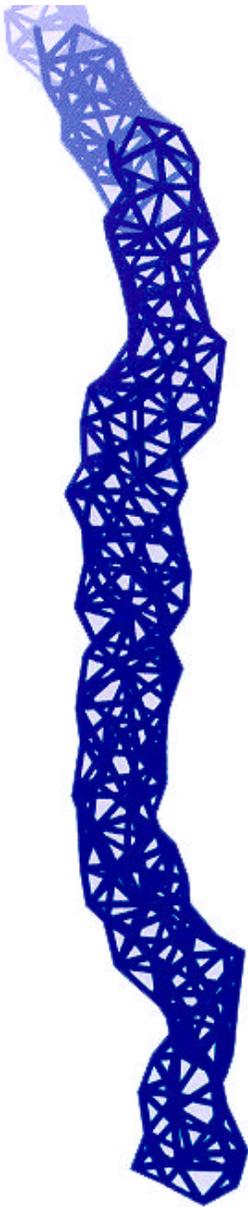
SIMULATION:

$$Y = 10 k_B T / a^3$$

$$\xi_P / a = N_{\text{HOOP}}^3 / 3$$

PREDICTS

$$\xi_P / a = 70$$



CONCLUSION:
TUBE DESIGN IS ROBUST
LENGTH / WIDTH ~ 100 IS EASILY ACHIEVED