

DESIGN: NETWORKS

FLOPPY POLYMER NETWORKS

$$[ELASTIC MODULI] \sim \rho k_B T$$
$$\rho = [NUMBER DENSITY] \quad (2D \text{ or } 3D)$$

DESIGN CHALLENGE: NETWORK WITH $K_A = 50 \tau$

$$\tau = PR / 2$$

$$P = 1.0 \text{ atm} = 10^5 \text{ J/m}^3 \quad R = 2 \mu\text{m}$$
$$K_A = 5 \text{ J/m}^2 \quad (10^6 \times \text{RBC CYTOSKELETON})$$

DENSITY REQUIRED:

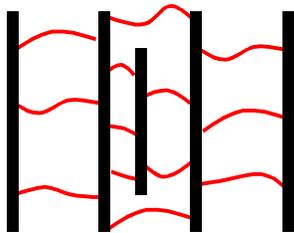
$$\rho \sim 10^3 / \text{nm}^2$$

STRATEGIES:

LAYERED NETWORKS

STIFF NETWORK ELEMENTS (e.g. POLYSACCHARIDES)

CHALLENGE: HOW TO GROW UNDER PRESSURE



ADD NEW MATERIAL
WITHOUT BREAKING
BONDS



GROWTH BY
ELONGATION

CONCLUSION:

ENCAPSULATED CELLS WOULD TAKE TIME TO
EVOLVE