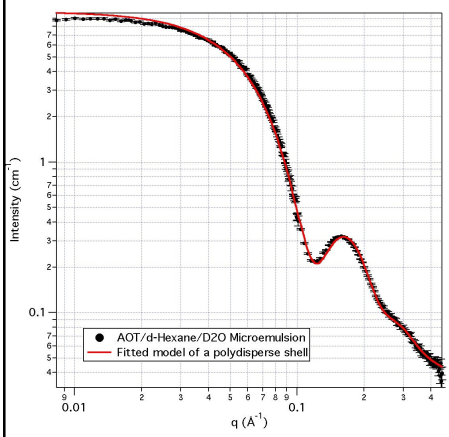
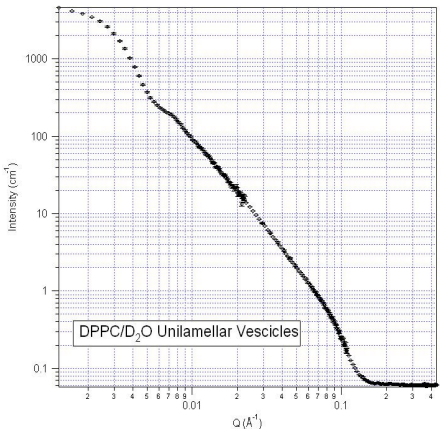
Data Analysis Exercise 2: Investigation of the Bending Modulus of a Lipid Bilayer in a Vescicle

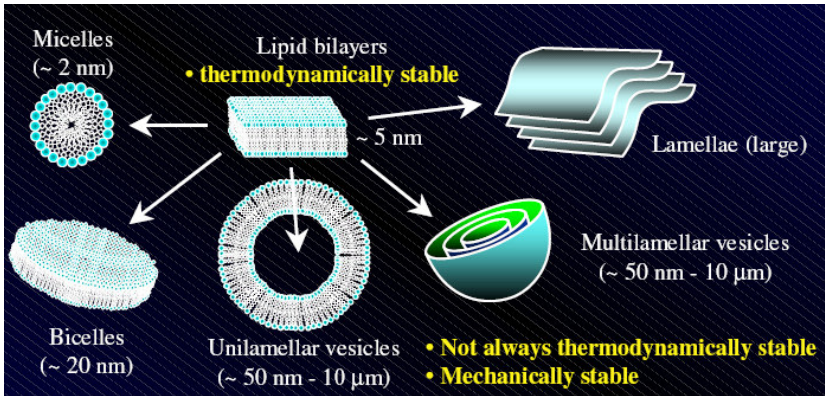
Microemulsion and Vescicles



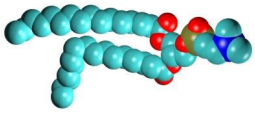


Dynamics of Soft Condensed Matter **ACNS 2008** Santa Fe. NM May 10th '08

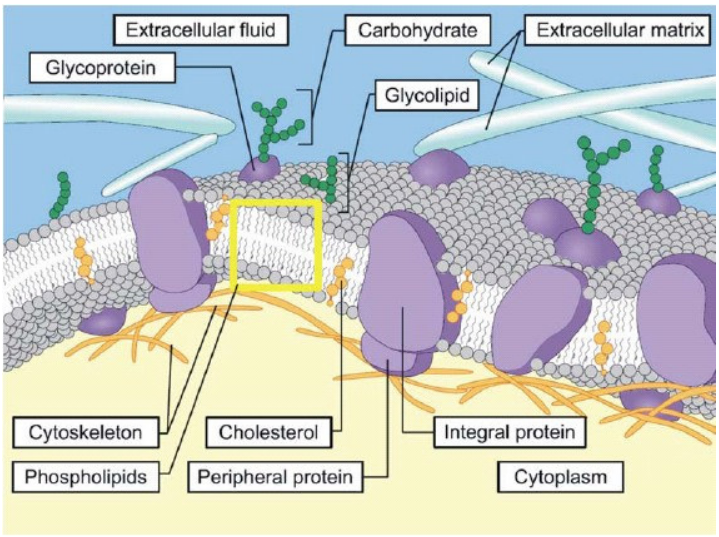
Typologies of Lipid Bilayers



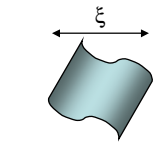
1,2-Dipalmitoyl-*sn*-Glycero-3-Phosphocholine
DPPC



Phospholipids in the Cell Membrane



Zilman-Granek Theory



Membrane plaquette

Dynamic Structure Factor

$$S(\vec{Q},t)=\left\langle \sum_{i,j}\exp\left\{-i\vec{Q}\left[\vec{R}_i(t)-\vec{R}_j(0)\right]\right\}\right\rangle$$

$$\vec{R}_i(t)=\vec{r}_i(t)+\vec{z}_i(t)$$

lateral

perpendicular

$$z_i(t)=h(\vec{r}_i(t),t)$$

Helfrich bending Hamiltonian for small deformations

$$H=\frac{1}{2}\kappa\int d^2r\left[\nabla^2 h(\vec{r})\right]^2$$

$$\frac{I(Q,t)}{I(Q,0)}=\exp\left[-(\Gamma t)^{2/3}\right] \qquad \Gamma=0.025\gamma_k\sqrt{\frac{k_BT}{\kappa}}\frac{k_BT}{\eta}Q^3$$

$$\frac{I(Q,t)}{I(Q,0)}=\exp\left[-\left(0.025\gamma_k\sqrt{\frac{k_BT}{\kappa}}\frac{k_BT}{3\eta}\right)^{2/3}Q^2t^{2/3}\right]$$

A.G. Zilman, and R. Granek, *Phys. Rev. Lett.*, 77, 4788 (1996).
A.G. Zilman, and R. Granek, Chem. Phys., 284, 195 (2002).