

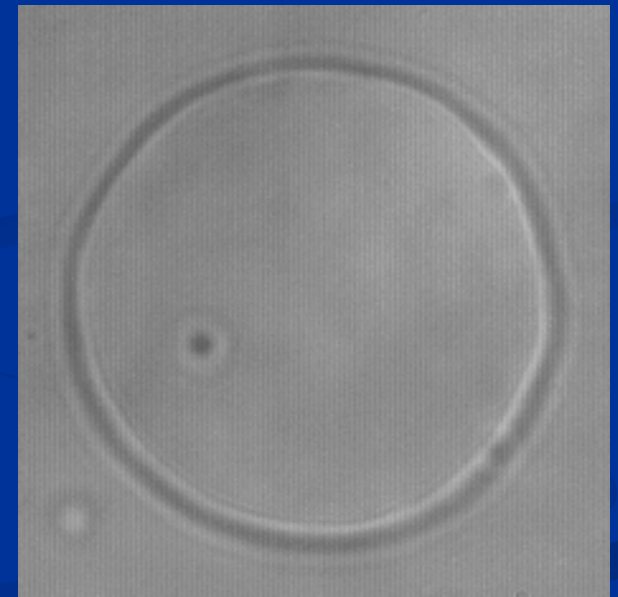
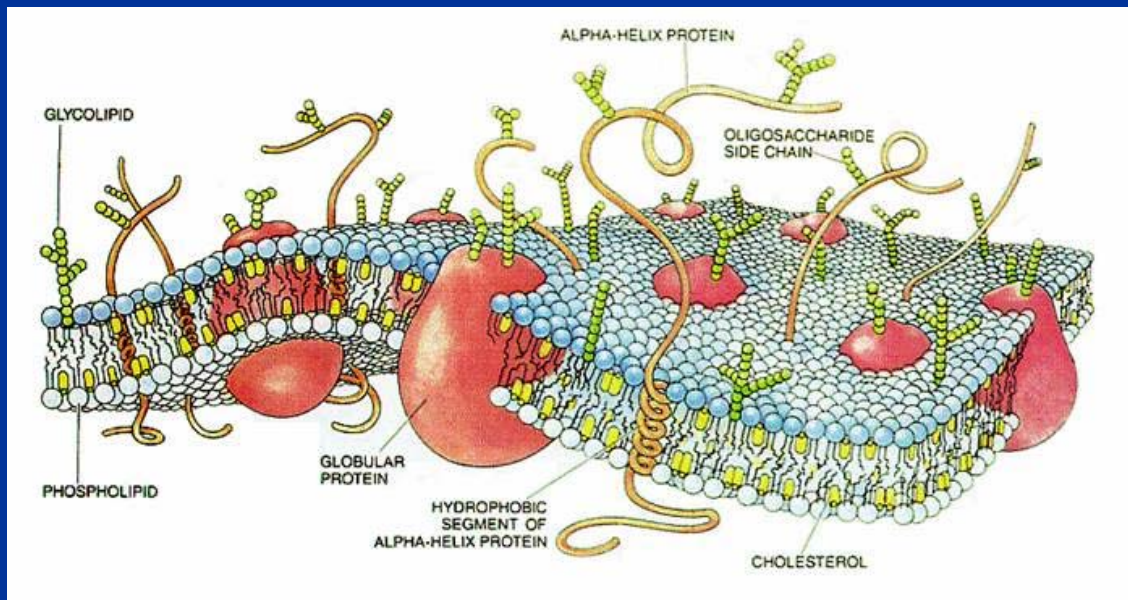
Large-scale Deformation of Giant Unilamellar Vesicles

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What is a vesicle?

- Self-assembled lipid bilayer
- 10 – 100 μm diameter



Experiment



Theory

$$r(\theta, \phi) = r_0(1 + u(\theta, \phi))$$

$$V = \frac{4}{3} \pi r_0^3$$

$$A = (4\pi + \Delta)r_0^2$$

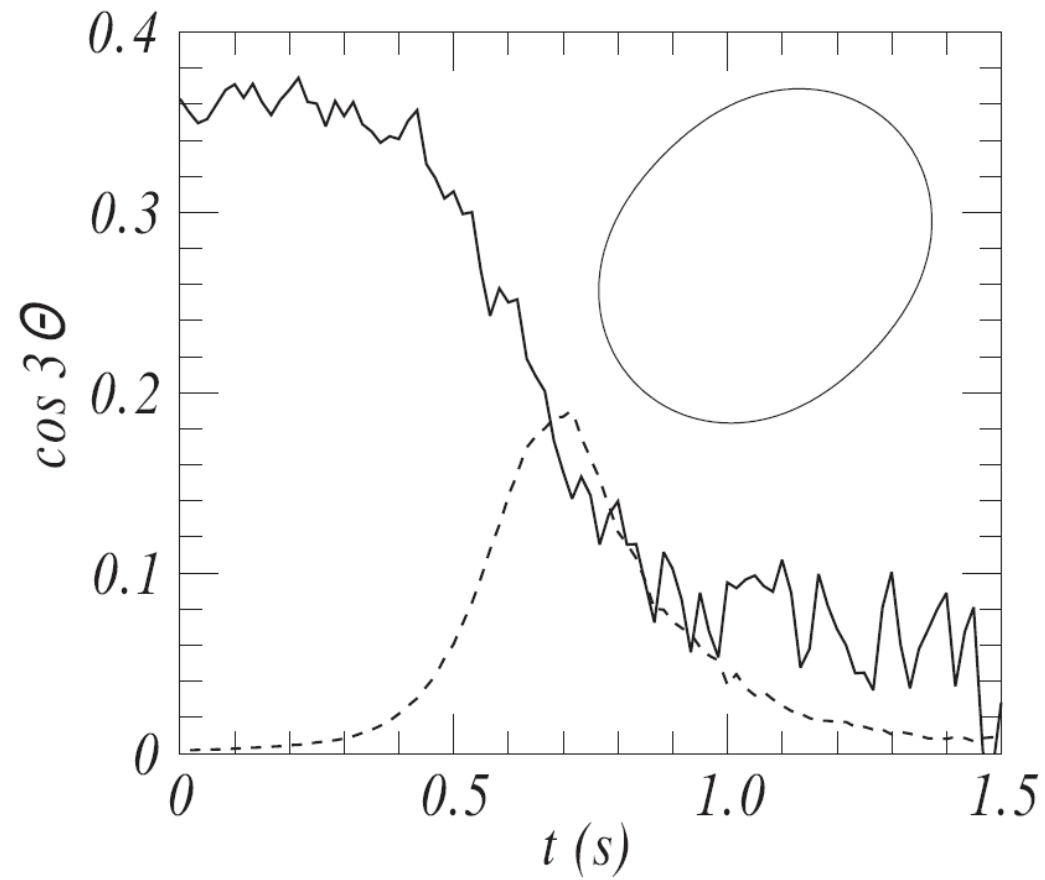
Theory

$$\tau \frac{d\Theta}{dt} = \cos(3\Theta)$$

$$\tau = \frac{1}{\kappa \sqrt{\Delta}} \left(1.7\eta r_0^3 + 1.3\tilde{\eta} r_0^3 + 0.9\zeta r_0^2 \right)$$

Θ is a measure of how ellipsoidal the vesicle shape is.

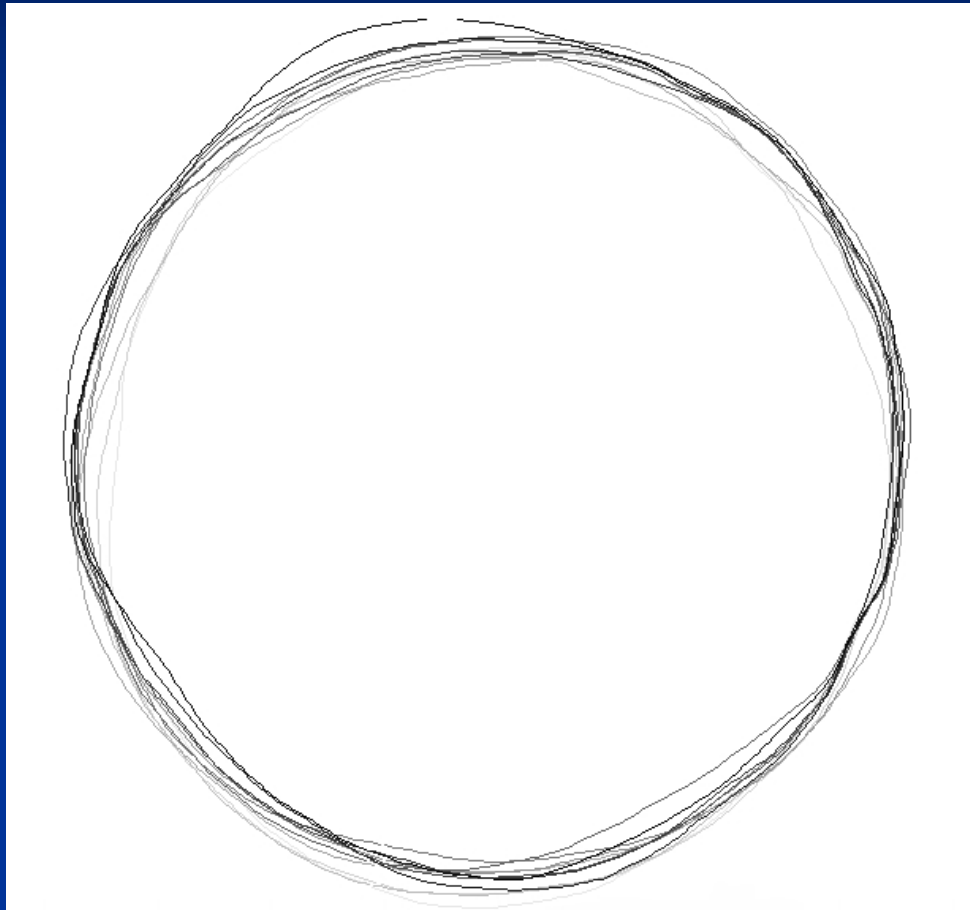
Initial results



Problems in implementation

- Volume conservation
- Excess area conservation
- Rotational symmetry

Thermal Fluctuations



In brief: will allow for extraction of bending elasticity and membrane tension.

Work Remaining

Re-approach relaxation theory.

Fully implement fluctuation analysis.

Increase experimental complexity.