Lecture schedule :
- 04/23, 04/25 } read 2.1.1 to 2.1.5 in Roger Kamm's manuscript
- 04/30 read 2.2.1 to 2.2.6
- 05/05 Peter So guest lecturer
- 05/07 read 2.1.6

- Work done by a sarcomere : $\sigma A l = \int_{-\infty}^{+\infty} n(x)\, \rho_s \, \frac{A_s}{2} \, K x \, dx$

σ stress
A cross-sectional area of sarcomere
l contraction length / distance between binding sites (during one cycle, only one cross-bridge can form)
$n(x)$ probability of binding
ρ_s number of sarcomeres per unit volume
$\frac{A_s}{2}$: area of half a sarcomere (symmetry ) * length of a sarcomere
Kx spring force

Typical numbers $v_{max} \simeq 6\ \mu m.s^{-1}$, $h \simeq 4$ nm , $k_-^0 \simeq 2000\ s^{-1}$, $F_{max} \simeq 1$ pN

- Goals : why is cell mechanics important ?
  important components of the cell
  plasma membrane (biophysics today studies structural components one by one)

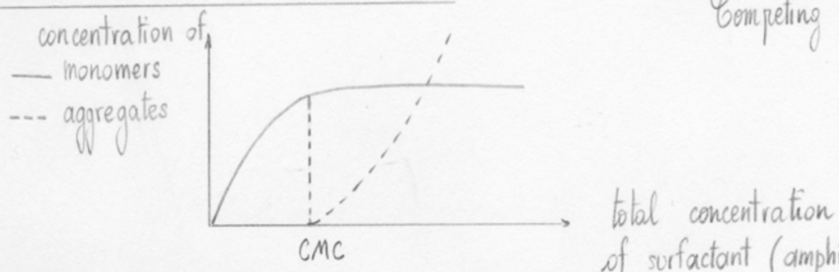
- <u>Plasma membrane</u>

reference : Israelachvili "Intermolecular & surface forces"

- self assembly of amphiphiles (= amphipathic = tolerant of both)

1- at what concentration do structures form?
2- geometry of structures ?

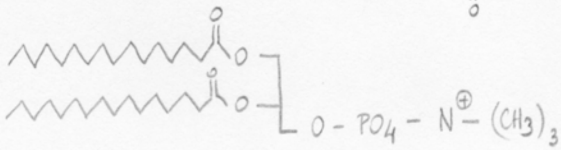
- <u>Critical micelle concentration CMC</u>



Competing forces : - attractive : hydrophobic tails
- repulsive : hydrophilic tails
  ionic groups
  steric repulsion

qualitatively, as hydrophobicity ↗, CMC ↘

compare common soap (sodium stearate)  1 head 1 tail CMC ~ 1 mM

phospholipids (DPPC)  1 head 2 tails CMC ~ 10^{-9} M

- Micelles | aggregates are dynamic

- typical resonance time (stay in aggregate state)
  - single tail $\tau_R \sim 10^{-4}$ s
  - double tail $\tau_R \sim 10^{4}$ s

- Geometry of structure

geometric packing 3 parameters
- a_0 optimal head area
- v volume of hydrocarbon tail
- l_c length scale ≤ contour length of tail

shape factor $\frac{v}{a_0 l_c}$