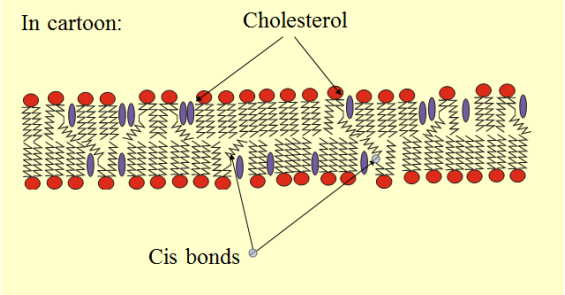
- Arguments for spontaneous formation of bilayers are largely thermodynamic – many weak bonds and minimisation of entropy

Membrane Fluidity



- Aqueous environment inside and outside a cell prevents membrane lipids from escaping the bilayer, nothing stops these molecules moving within the plane of the bilayer
- Membrane behaves as a 2-dimensional fluid, crucial for membrane function and integrity, membrane flexibility is different – ability to bend, sets lower limits of ~25nm to size of vesicle that cell membranes can form
- Study of fluidity through synthetic lipid bilayers: produced by spontaneous aggregation of amphipathic lipid molecules in water – liposomes/flat phosopholipid bilayers can be formed across hole in partition between two aqueous compartments
- Allow measurements of the movements of the lipid molecules, revealing some types of movement are rare while others are frequent and rapid – in synthetic lipid bilayers phospholipid molecules rarely tumble from one half of the bilayer or monolayer to the other
- Without proteins to facilitate the process and conditions similar to those in a cell, event of "flip-flop" occurs less than once a month for any individual lipid molecule
- Result of thermal motions: Lipid molecules however, exchange places with their neighbours – exchange leads to rapid diffusion of lipid molecules in plane of the membrane: if temperature is decreased, the drop in thermal energy decreases the rate of lipid movement, making bilayer less fluid
- In reality, membranes are not infinitely thin – they have 2 leaflets
  - It is possible for lipids to also diffuse between leaflets = flipping
  - Takes a lot of energy, hence a rare occurrence
  - For lipids – flipping is slower than lateral diffusion – no reported cases for flipping of proteins
  - Flipping can be reversed by flipases
  - Net result is the establishment of membrane asymmetry

Diffusion rates		
	Lateral	**Spontaneous transverse**
Phospholipids	2μm/sec	10^9 times slower
Proteins	0.0001 to 0.4μm/sec	Never

Preview from Notesale.co.uk
Page 3 of 7

Membranes can contain regions of local order (Quinn, 2009)

- There are two sub-categories
  - Bilayer formers : PC, SM, PS, PI, PG and few more
  - Non-bilayer formers: PE and a few others – give water-filled tubes with polar groups on the inside in hexagonal array called the hexagonal-II structure.
- Protein-rich membranes are rich in non-bilayer forming lipids and the proteins and other membrane constituents probably constrain these lipids into a bilayer formation.