TOPIC 1.3: MEMBRANE STRUCTURE

Phospholipid Bilayer

Structure of Phospholipids:

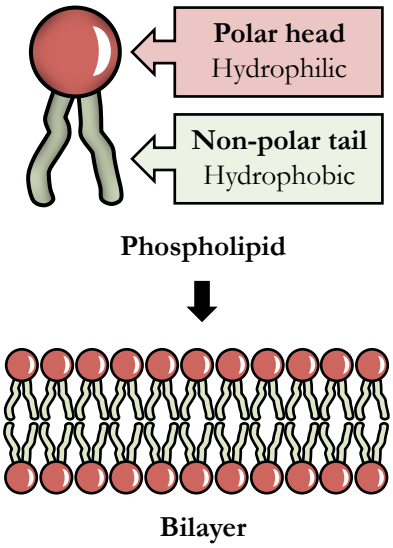
- Contain a polar (hydrophilic) head composed of phosphate (+ glycerol)
- Contain two non-polar (hydrophobic) tails, each composed of a fatty acid chain
- Hence, phospholipids are amphipathic (have hydrophilic and hydrophobic parts)

Arrangement in Membranes:

- Phospholipids spontaneously arrange into a bilayer
- The hydrophilic phosphate heads face out into the surrounding solution, while the hydrophobic fatty acid tails face inwards and are shielded from the polar fluids

Properties of the Phospholipid Bilayer:

- The bilayer is held together by weak hydrophobic interactions between the tails
- Individual phospholipids can move within the bilayer (fluidity and flexibility)
- Amphipathic properties restrict passage of certain substances (semi-permeable)



Cholesterol

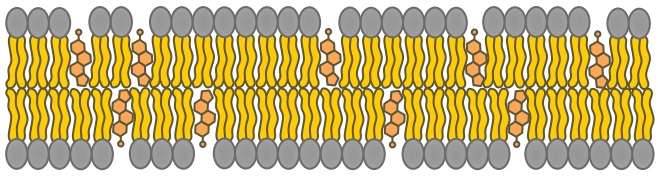
Cholesterol is a fundamental component of animal cell membranes

- It is not present in plant cell membranes (as they have a rigid cell wall)

Cholesterol reduces membrane fluidity and permeability to some solutes

- It also anchors certain peripheral proteins and prevents crystallization

Cholesterol (amphipathic)



Membrane Proteins

Membrane proteins are diverse in terms of their structure and position in a membrane

Membrane proteins serve many functions:

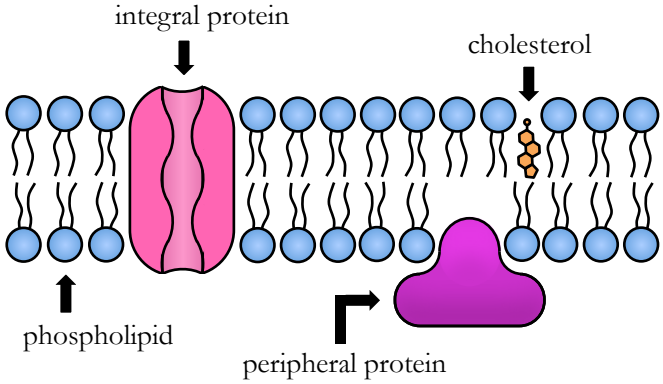
- **J**unctions
- **E**nzymes
- **T**ransport
- **R**ecognition
- **A**nchorage
- **T**ransduction

Fluid Mosaic Model

Cell membranes are represented as a fluid-mosaic model

- Fluid – membrane components can move position
- Mosaic – phospholipid bilayer is embedded with protein

This model was proposed by Singer-Nicolson in 1972, following the falsification of the Davson-Danielli model



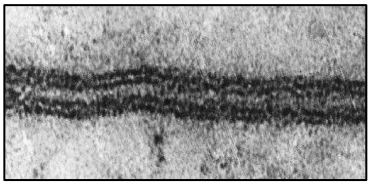
Membrane Models

Membranes appear trilaminar when viewed with an electron microscope (trilaminar = three distinct layers)

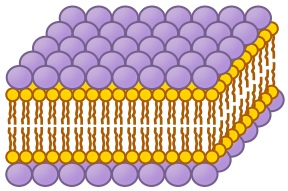
Davson-Danielli proposed a model whereby a phospholipid bilayer was flanked by two protein layers (sandwich model)

This model was falsified based on the following findings:

- Fluorescent tagging showed the proteins are mobile
- Not all membranes have a constant lipid : protein ratio
- Freeze fracturing identified transmembrane proteins



Trilaminar appearance



Sandwich Model