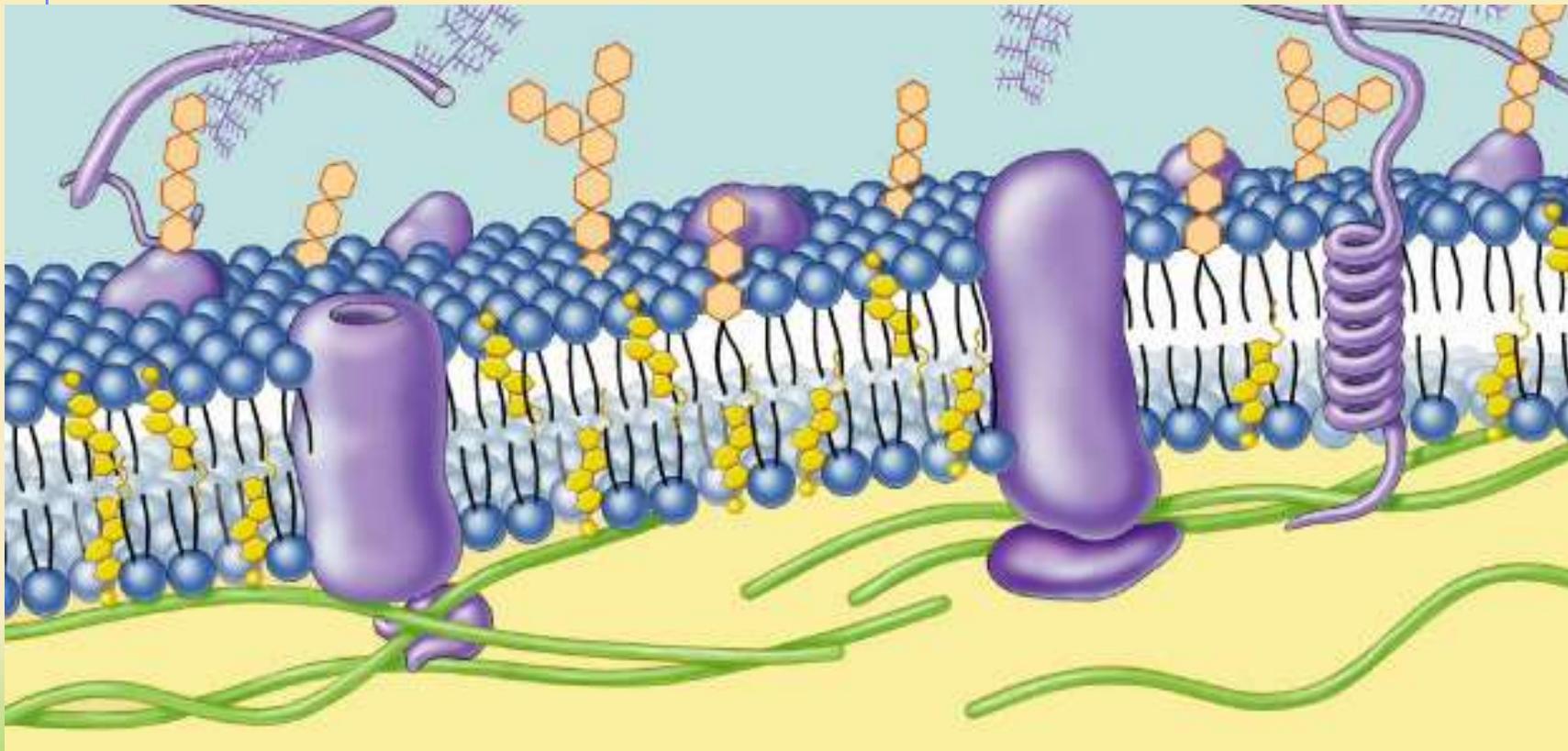
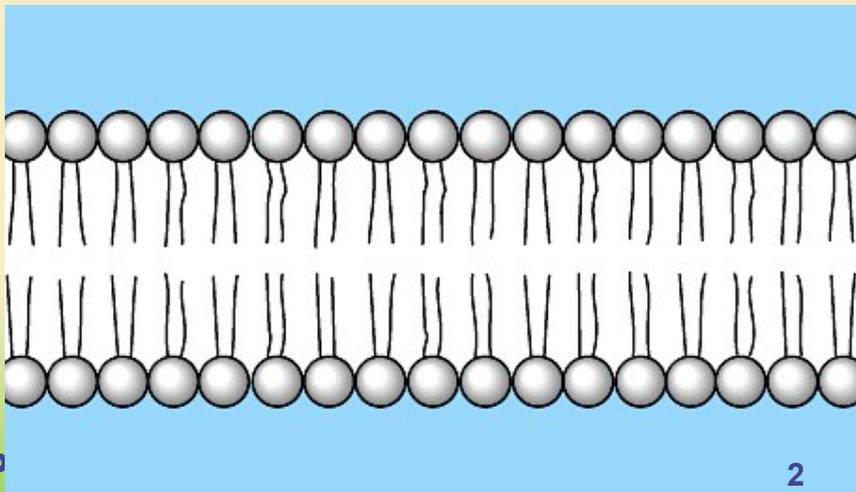
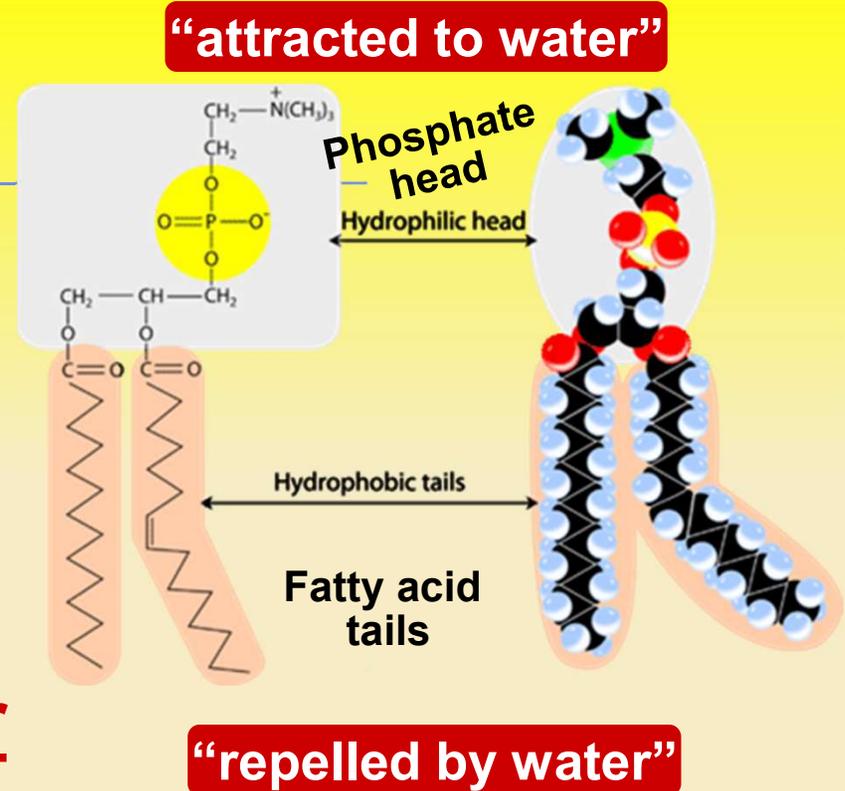


**The Cell Membrane (= okay)
aka plasma membrane (= better)
aka phospholipid bilayer (= perfect!)**



Phospholipids

- Phosphate head
 - ◆ hydrophilic
- Fatty acid tails
 - ◆ hydrophobic
- Arranged as a bilayer

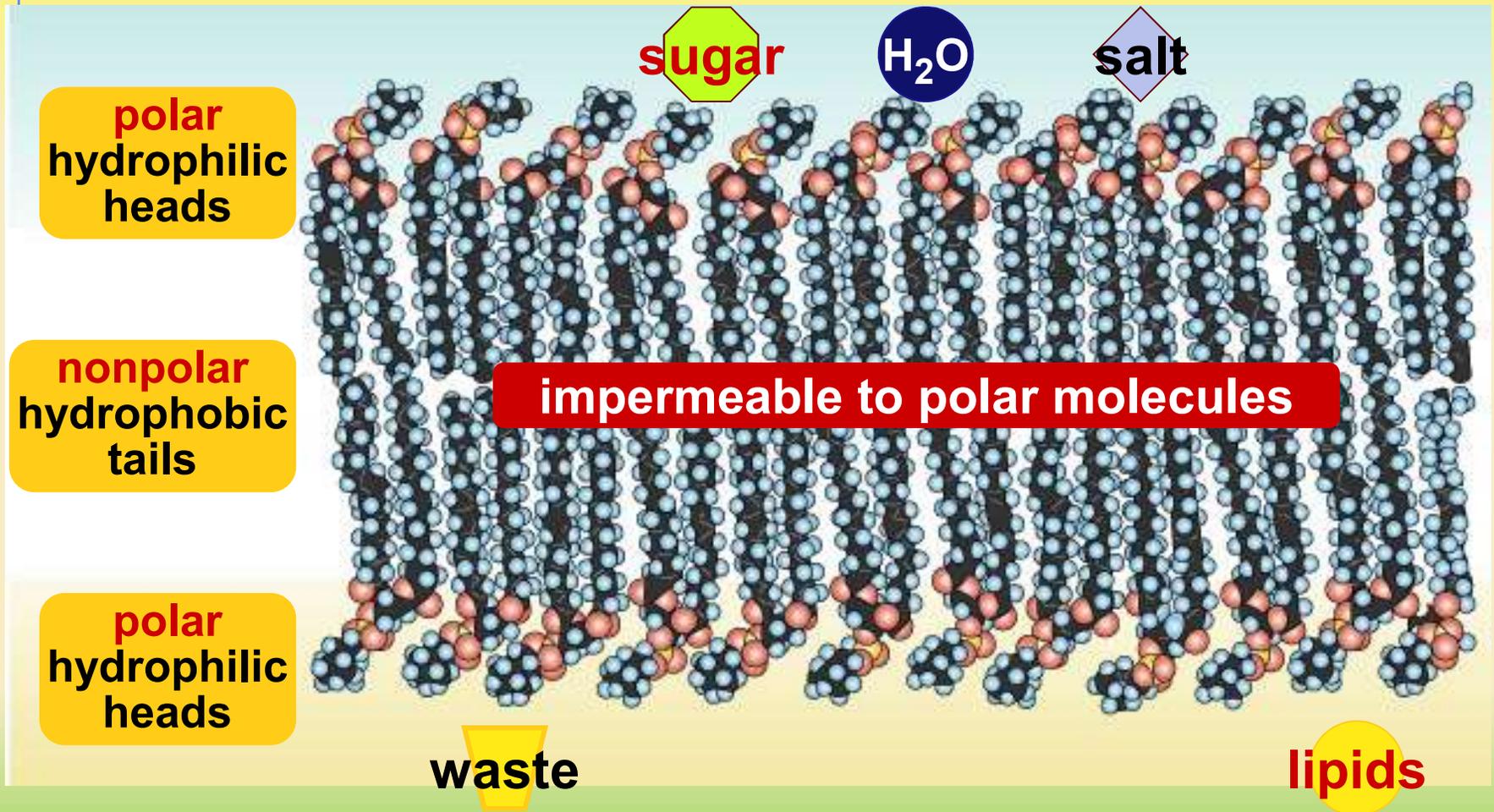


Aaaah,
one of those
structure-function
examples



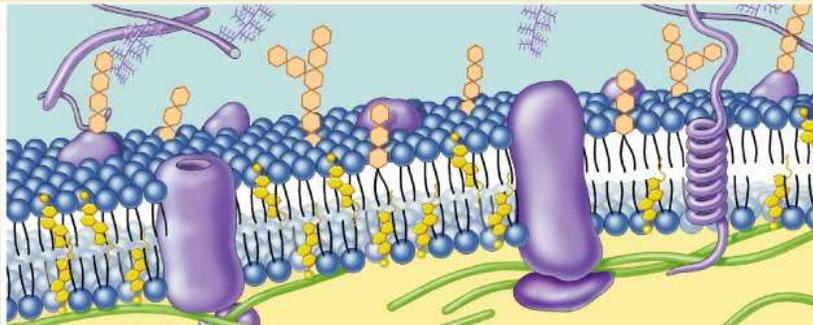
Arranged as a Phospholipid bilayer

- Serves as a cellular barrier / border



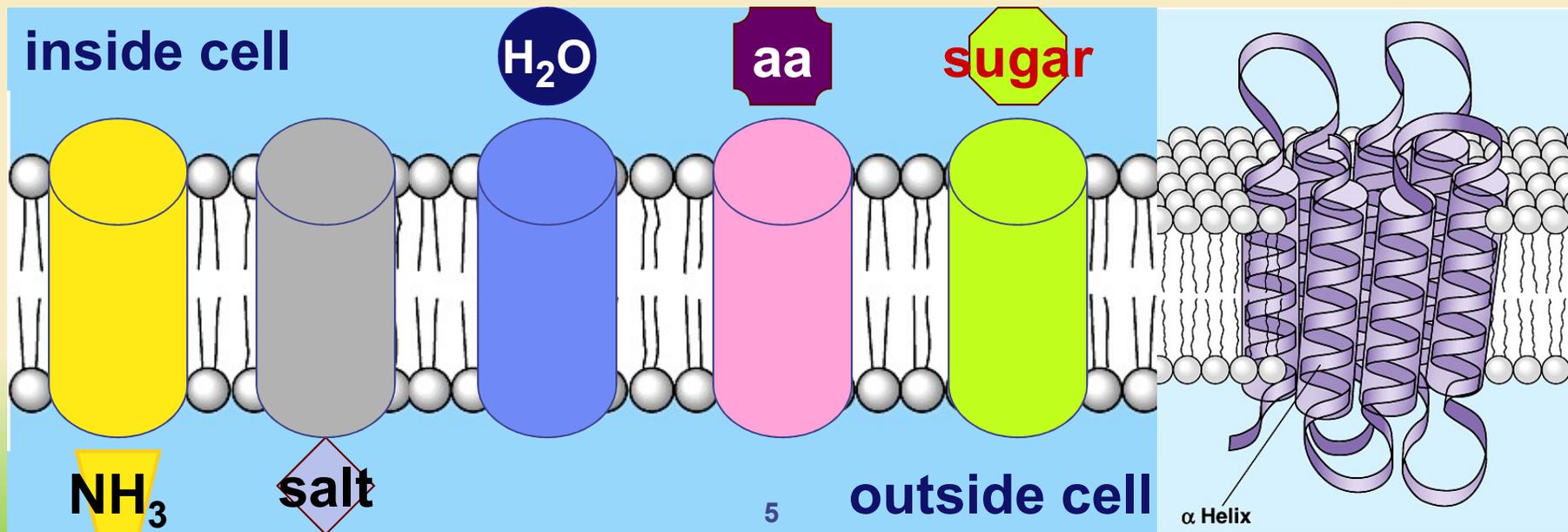
Cell membrane defines cell

- Cell membrane **separates** living cell from aqueous environment
 - ◆ thin barrier
- Controls traffic in & out of the cell
 - ◆ allows some substances to cross more easily than others
 - hydrophobic (nonpolar) vs. hydrophilic (polar)



Permeability to polar molecules?

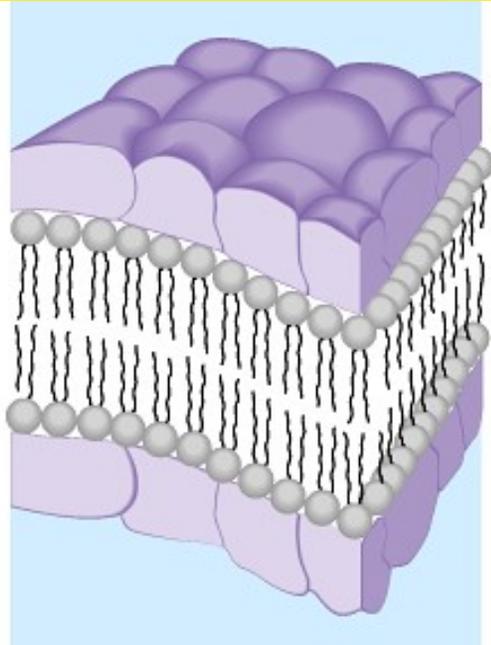
- Membrane becomes semi-permeable via protein channels
 - ◆ specific channels allow specific material across cell membrane



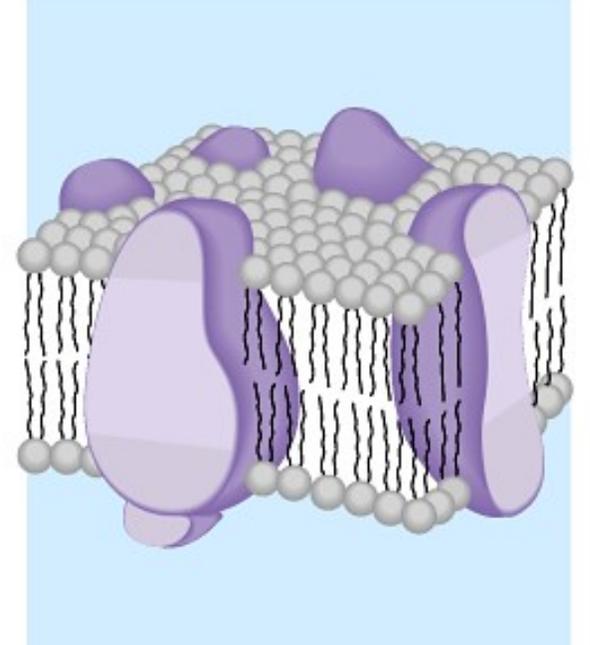
Cell membrane is more than lipids...

- Transmembrane proteins embedded in phospholipid bilayer. Peripheral are only on the surface
 - ◆ create semi-permeable channels

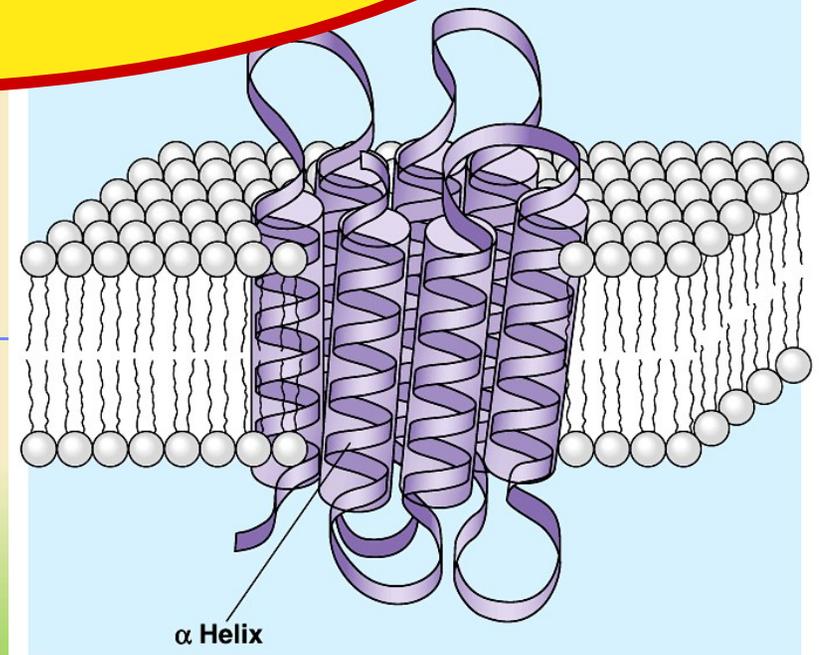
Peripheral proteins on Lipid bilayer membrane



protein channels in lipid bilayer membrane

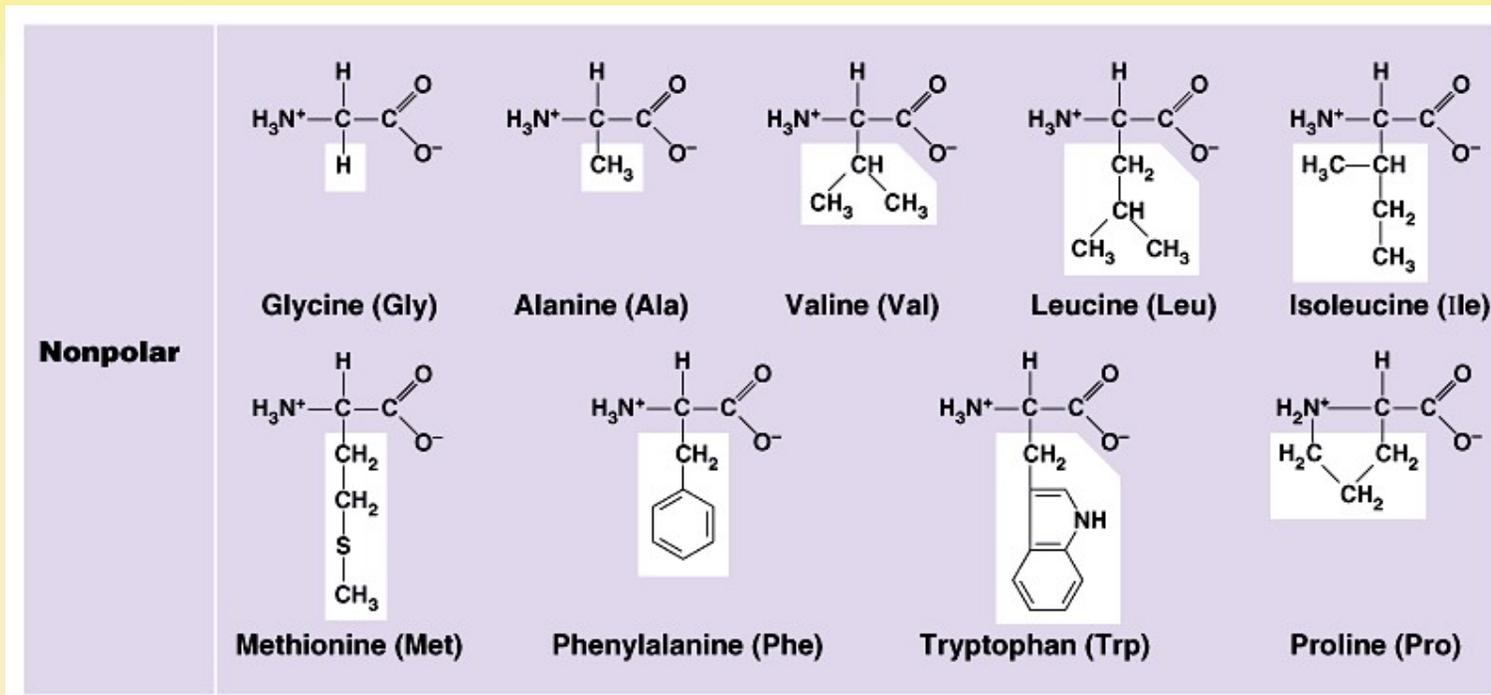


Why are
proteins the perfect
molecule to build structures
in the cell membrane?



Classes of amino acids

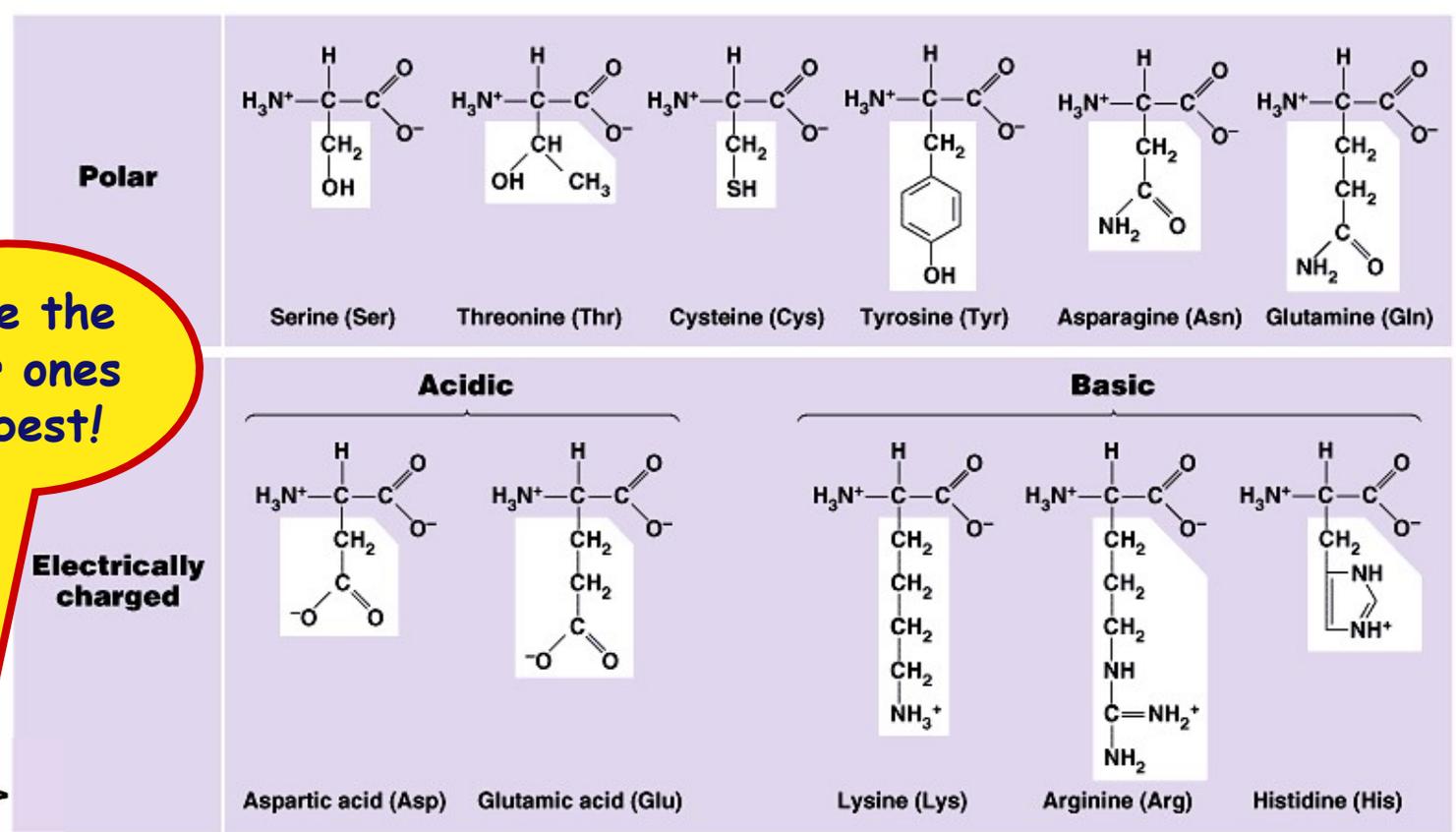
What do these amino acids have in common?



nonpolar & hydrophobic

Classes of amino acids

What do these amino acids have in common?



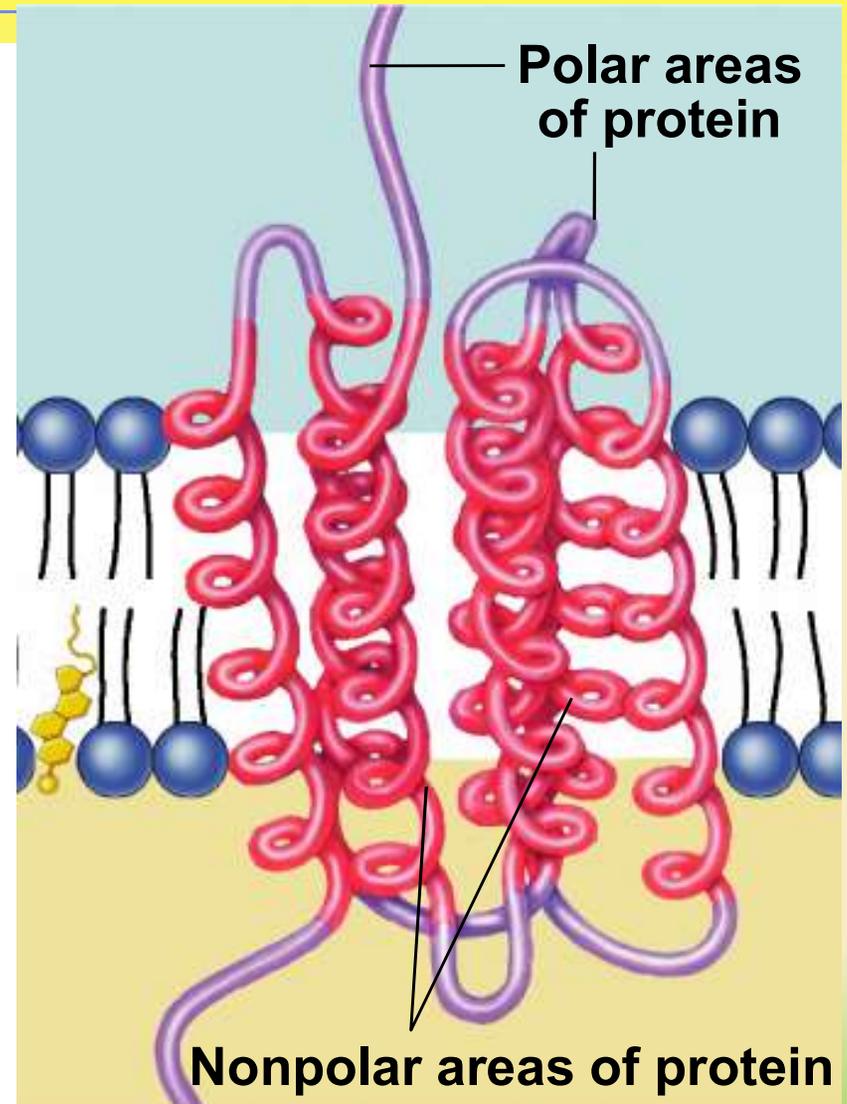
I like the polar ones the best!



polar & hydrophilic

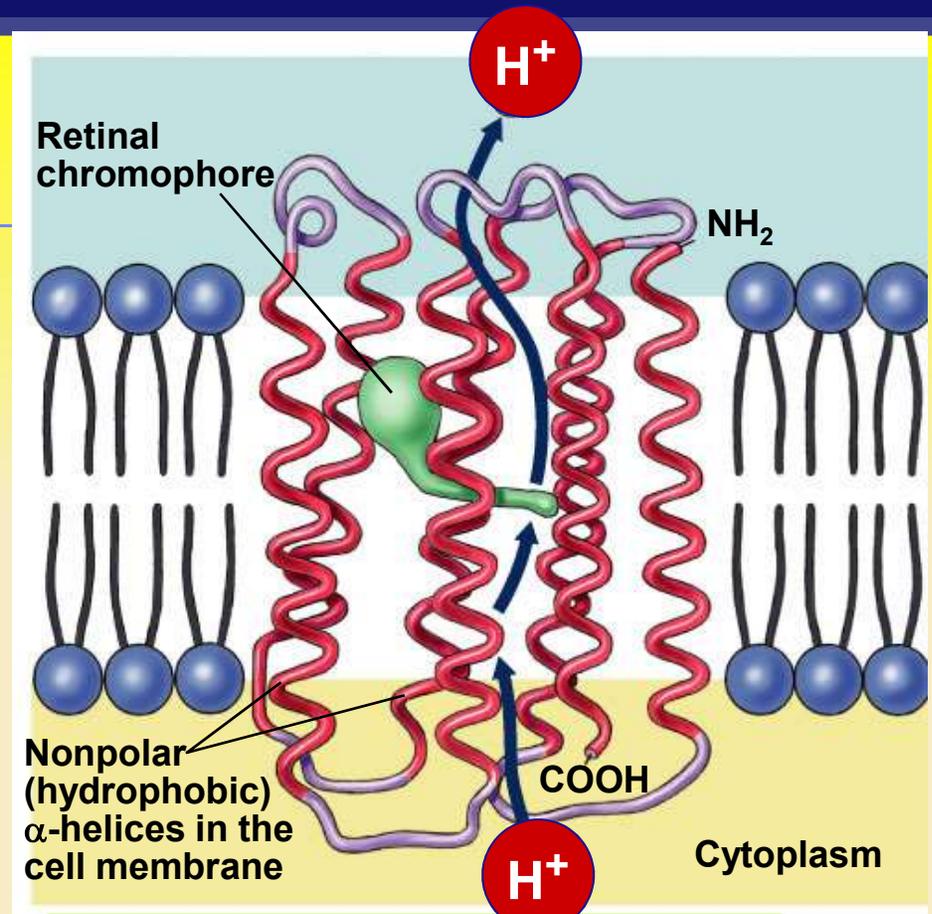
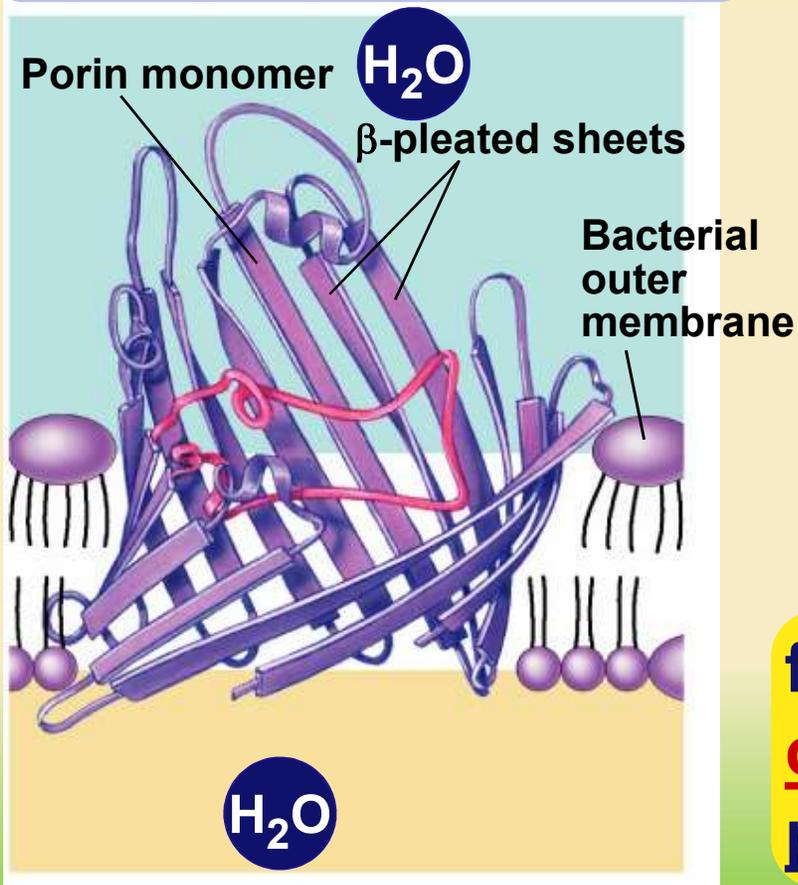
Proteins anchor molecule...

- **Within membrane**
 - ◆ **nonpolar** amino acids
 - **hydrophobic**
 - anchors protein into membrane
- **On outer surfaces of membrane in fluid**
 - ◆ **polar** amino acids
 - **hydrophilic**
 - extend into extracellular fluid & into cytosol



Examples

aquaporin =
water channel in bacteria



proton pump channel
in photosynthetic bacteria

function through
conformational change =
protein changes shape

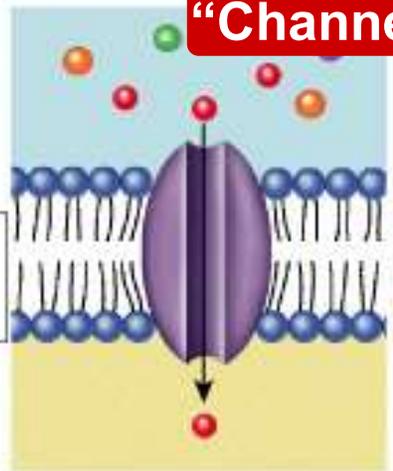
Many Functions of Membrane Proteins

Outside

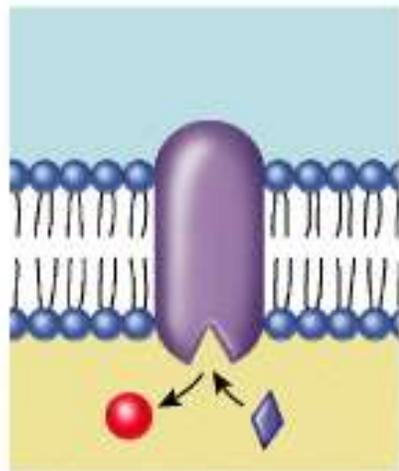
Plasma membrane

Inside

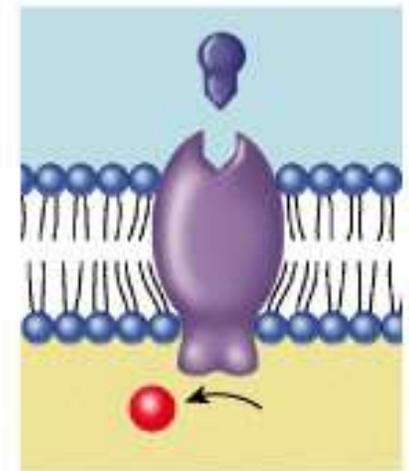
“Channel”



Transporter

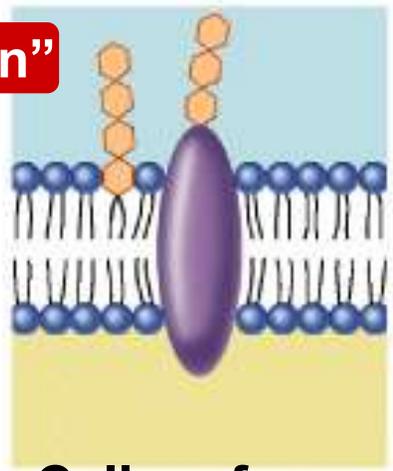


Enzyme activity

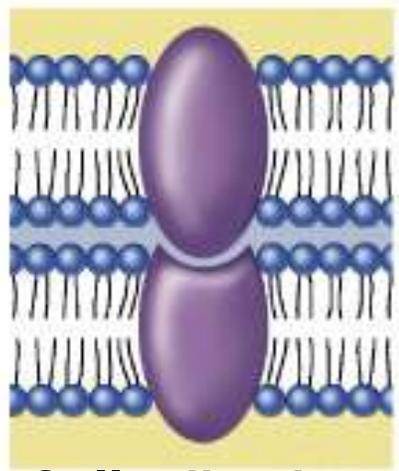


Cell surface receptor

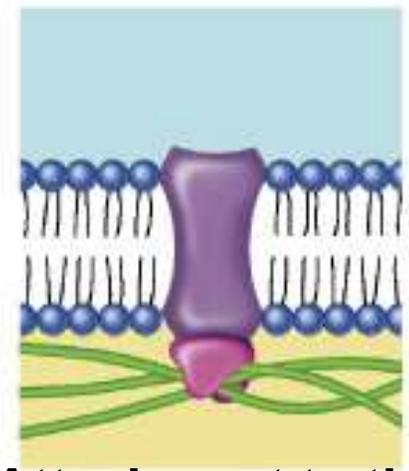
“Antigen”



Cell surface identity marker



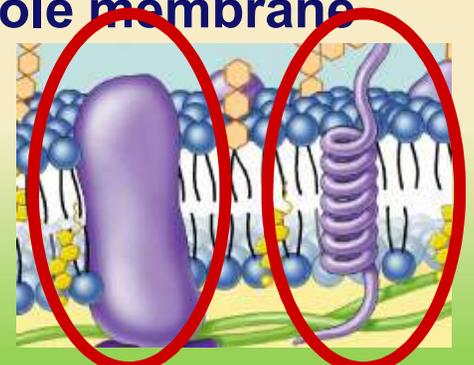
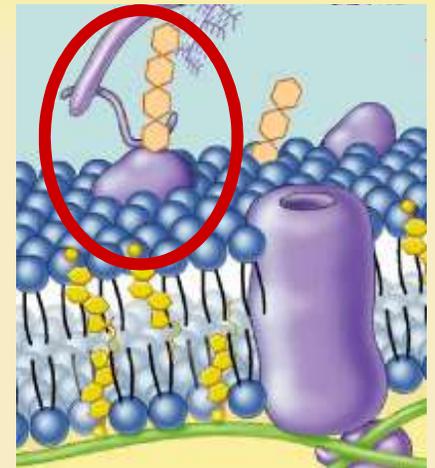
Cell adhesion



Attachment to the cytoskeleton

Membrane Proteins

- Proteins determine membrane's specific functions
 - ◆ cell membrane & organelle membranes each have unique collections of proteins
- Classes of membrane proteins:
 - ◆ peripheral proteins
 - loosely bound to surface of membrane
 - ex: cell surface identity marker (antigens)
 - ◆ integral proteins
 - penetrate lipid bilayer, usually across whole membrane
 - transmembrane protein
 - ex: transport proteins
 - ◆ channels, permeases (pumps)



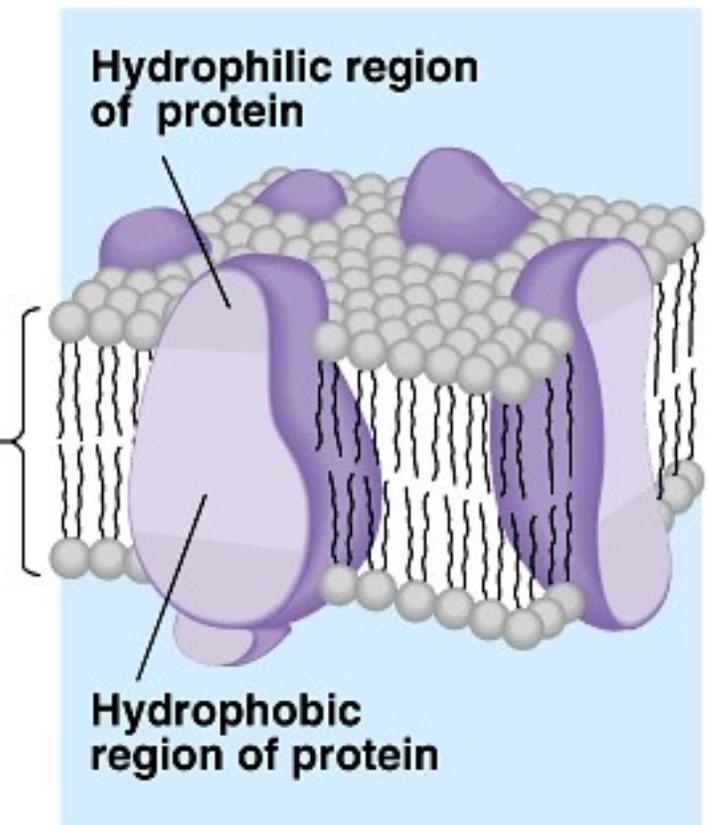
Cell membrane must be more than lipids...

- In 1972, S.J. Singer & G. Nicolson proposed that membrane proteins are inserted into the phospholipid bilayer

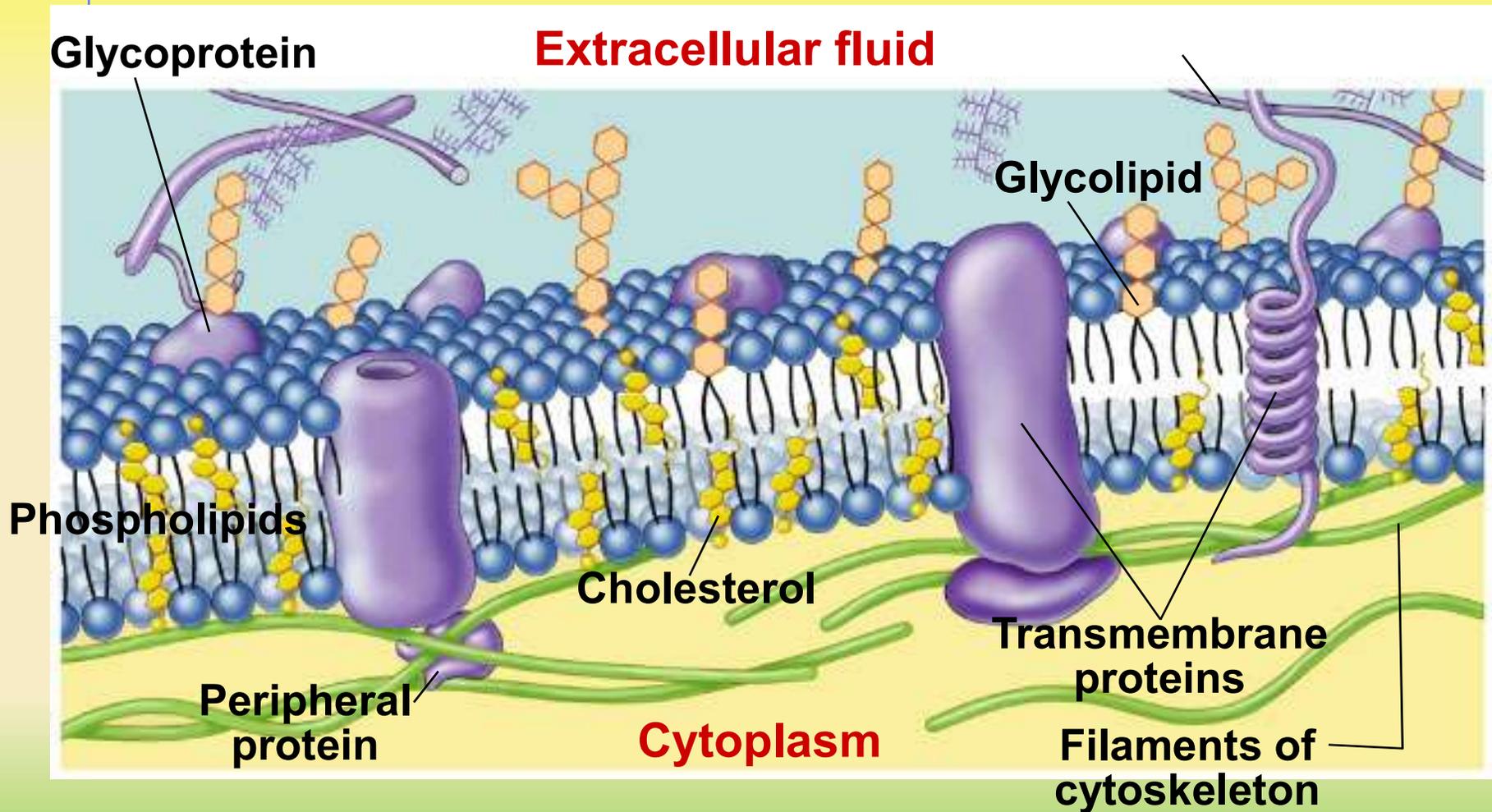
It's like a fluid...
It's like a mosaic...
It's the
Fluid Mosaic Model!



Phospholipid bilayer



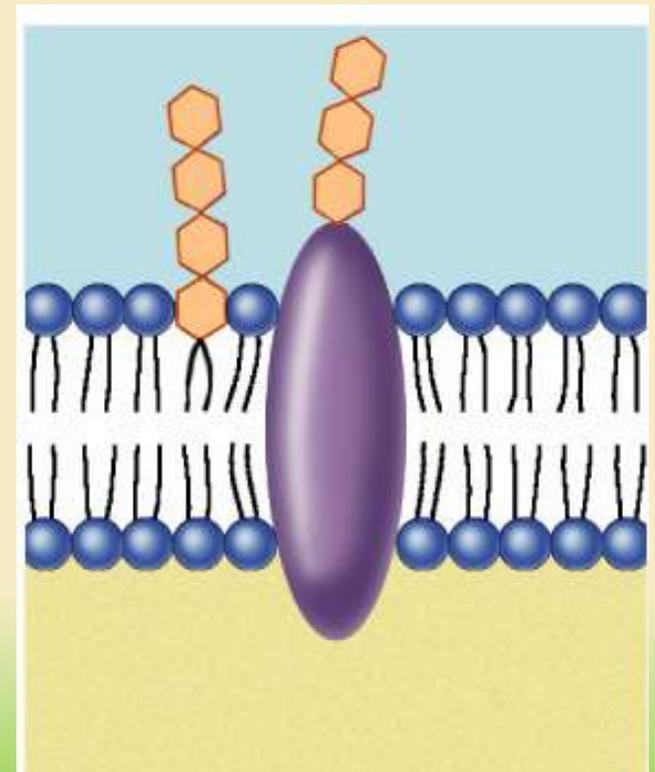
Membrane is a collage of proteins & other molecules embedded in the fluid matrix of the lipid bilayer



1972, S.J. Singer & G. Nicolson proposed Fluid Mosaic Model

Membrane carbohydrates

- Play a key role in cell-cell recognition
 - ◆ ability of a cell to distinguish one cell from another
 - antigens
 - ◆ important in organ & tissue development
 - ◆ basis for rejection of foreign cells by immune system



Any Questions??

