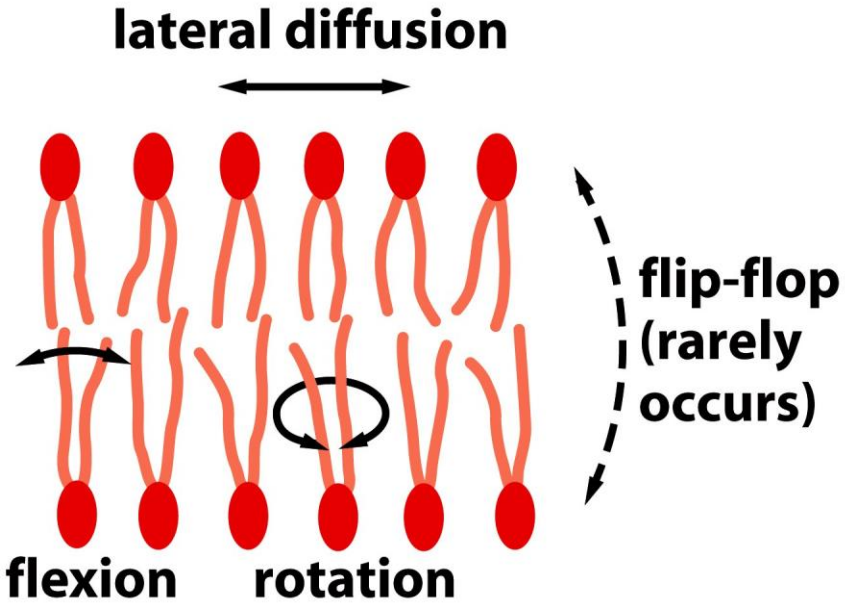

Figure 10-11b *Molecular Biology of the Cell* (© Garland Science 2008)

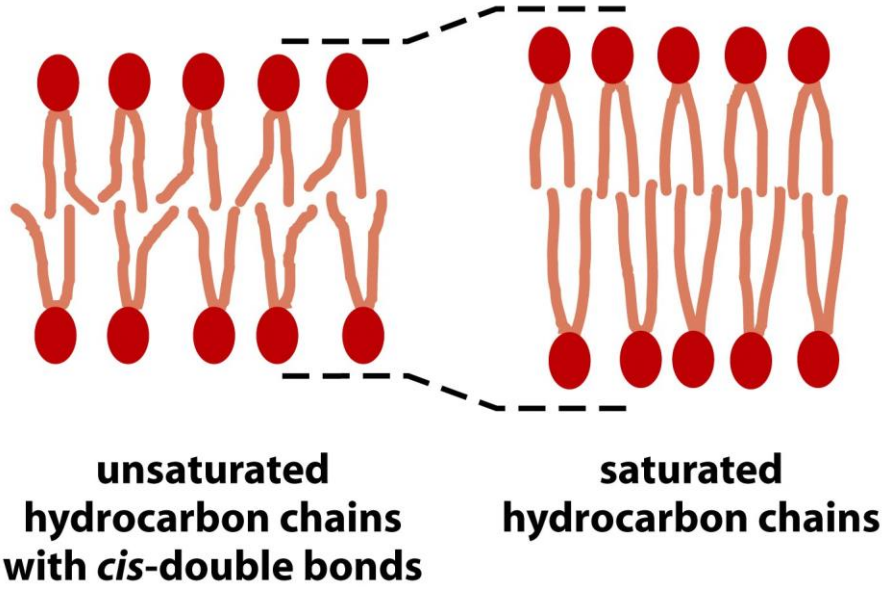

Figure 10-12 *Molecular Biology of the Cell* (© Garland Science 2008)

Table 10–1 Approximate Lipid Compositions of Different Cell Membranes

LIPID	PERCENTAGE OF TOTAL LIPID BY WEIGHT					
	LIVER CELL PLASMA MEMBRANE	RED BLOOD CELL PLASMA MEMBRANE	MYELIN	MITOCHONDRION (INNER AND OUTER MEMBRANES)	ENDOPLASMIC RETICULUM	*E. COLI* BACTERIUM
Cholesterol	17	23	22	3	6	0
Phosphatidylethanolamine	7	18	15	28	17	70
Phosphatidylserine	4	7	9	2	5	trace
Phosphatidylcholine	24	17	10	44	40	0
Sphingomyelin	19	18	8	0	5	0
Glycolipids	7	3	28	trace	trace	0
Others	22	13	8	23	27	30

Table 10-1 *Molecular Biology of the Cell* (© Garland Science 2008)

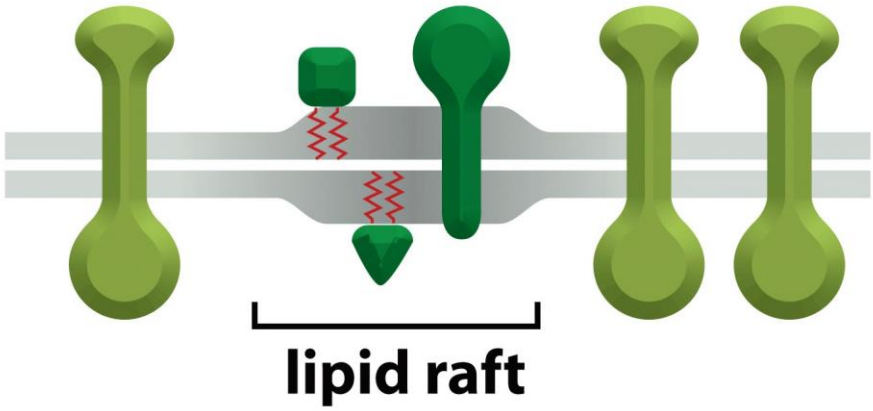

Figure 10-14b *Molecular Biology of the Cell* (© Garland Science 2008)

Lipid droplets organelles

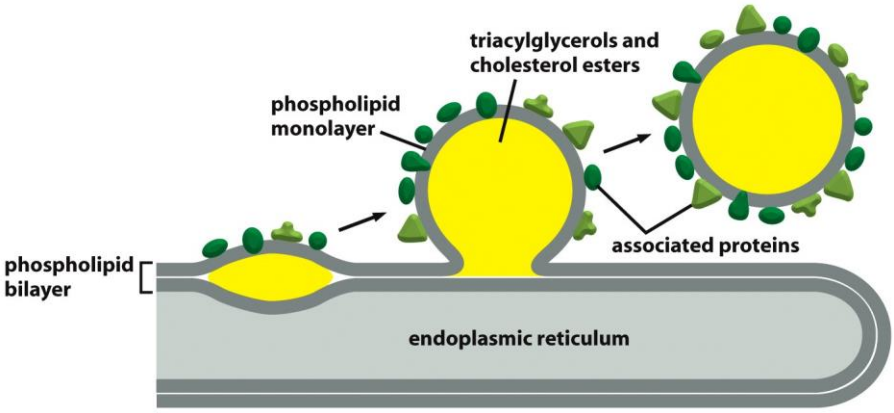

Figure 10-15 *Molecular Biology of the Cell* (© Garland Science 2008)

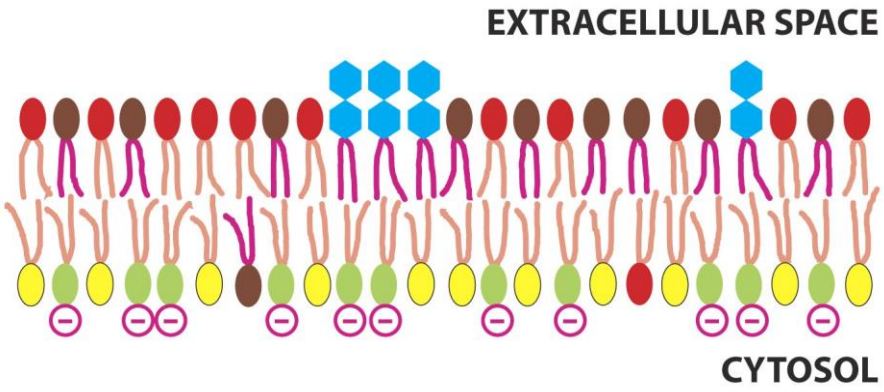

Figure 10-16 *Molecular Biology of the Cell* (© Garland Science 2008)

MEMBRANE PROTEIN

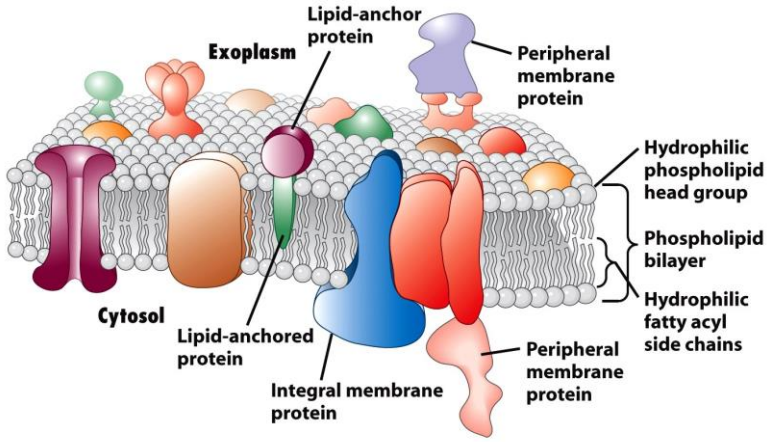

Figure 10-1
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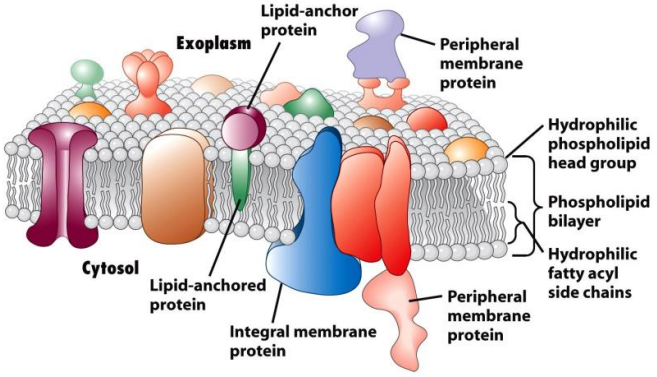

Figure 10-1
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Transmembrane | Lipid-linked | Protein-attached

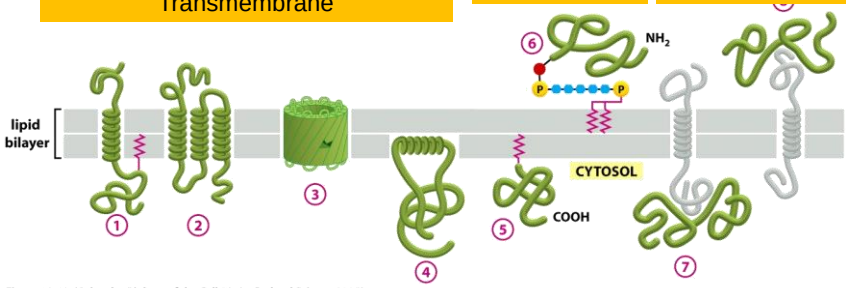
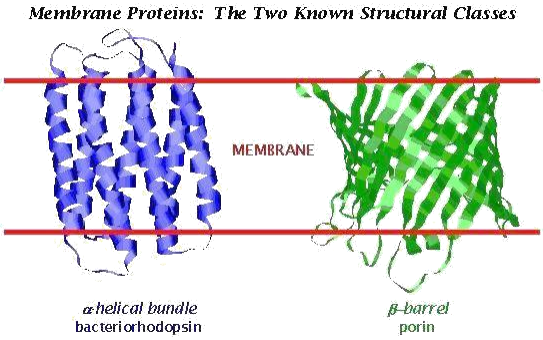
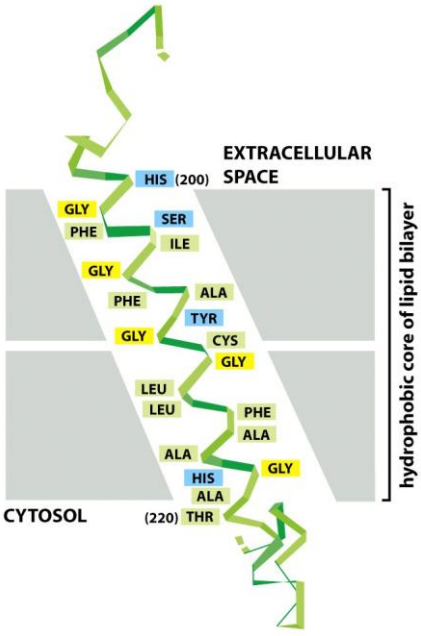


Figure 10-19 Molecular Biology of the Cell 5/e (© Garland Science 2008)

Membrane Proteins

- **Classes (kind of membrane association):**
  - **<u>Transmembrane</u>:**
    - **rule: polypeptide chain passes completely through the bilayer**
    - **examples:**
      - **single membrane-spanning domain: hydrophobic α-helix (e.g., glycophorin)**
      - **multiple membrane-spanning domains (e.g., 7-pass transmembrane proteins such as bacteriorhodopsin)**
    - **pores: α-helical vs. β-sheet/barrel (porins)**





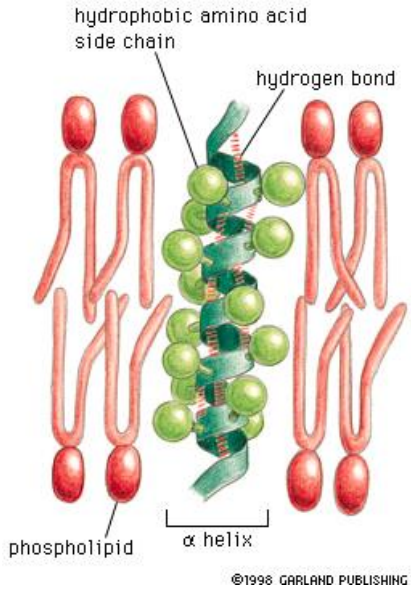
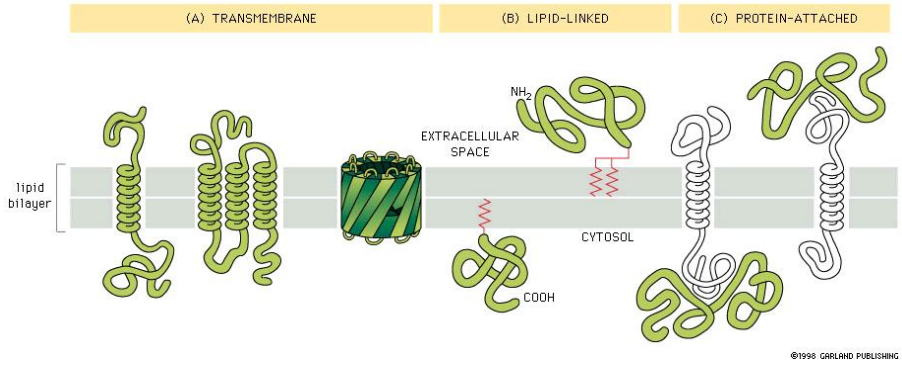


Figure 10-21 *Molecular Biology of the Cell* (© Garland Science 2008)



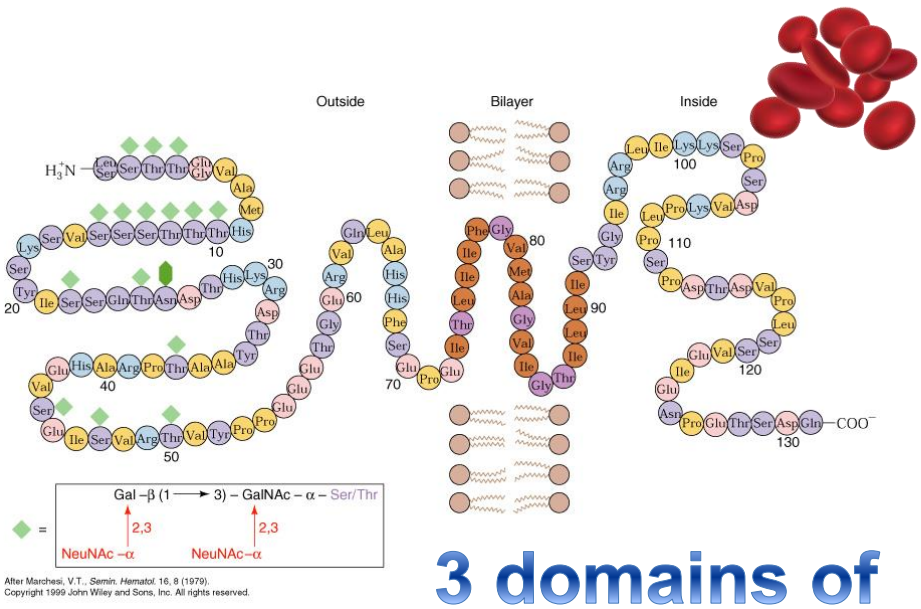


Fig. 10-2 in FOB

3 domains of Glycophorin A

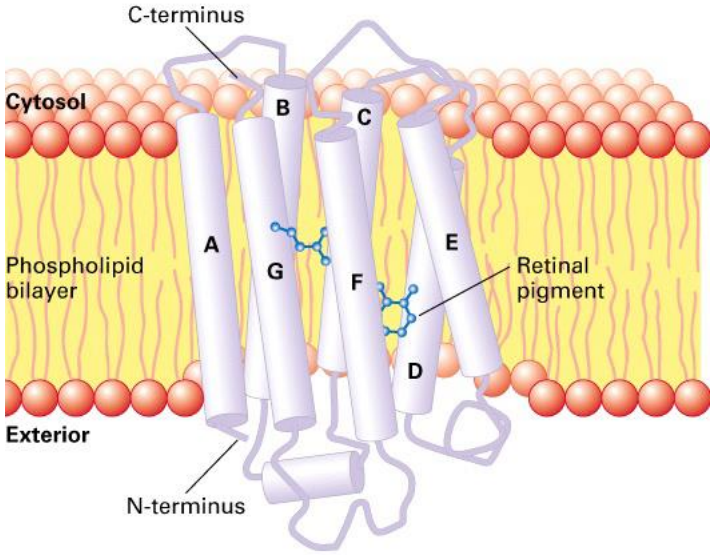
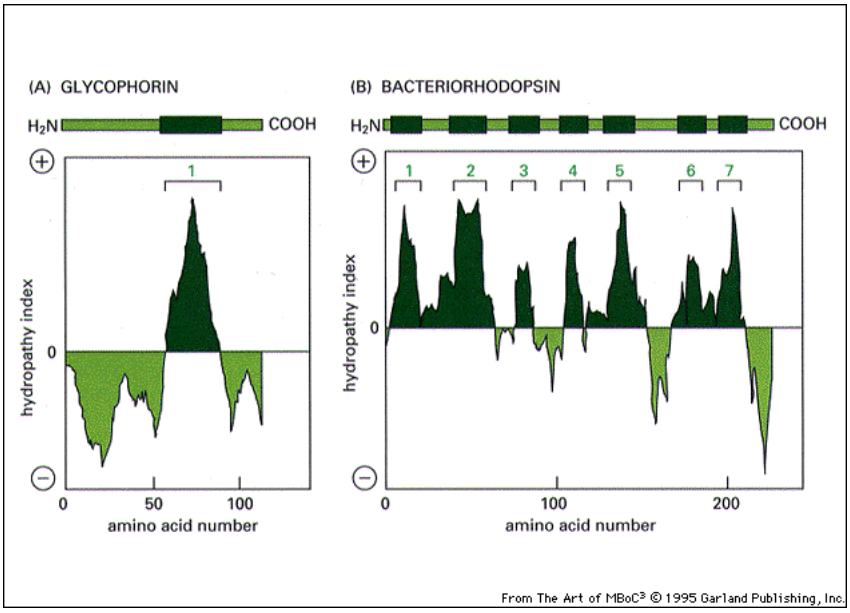
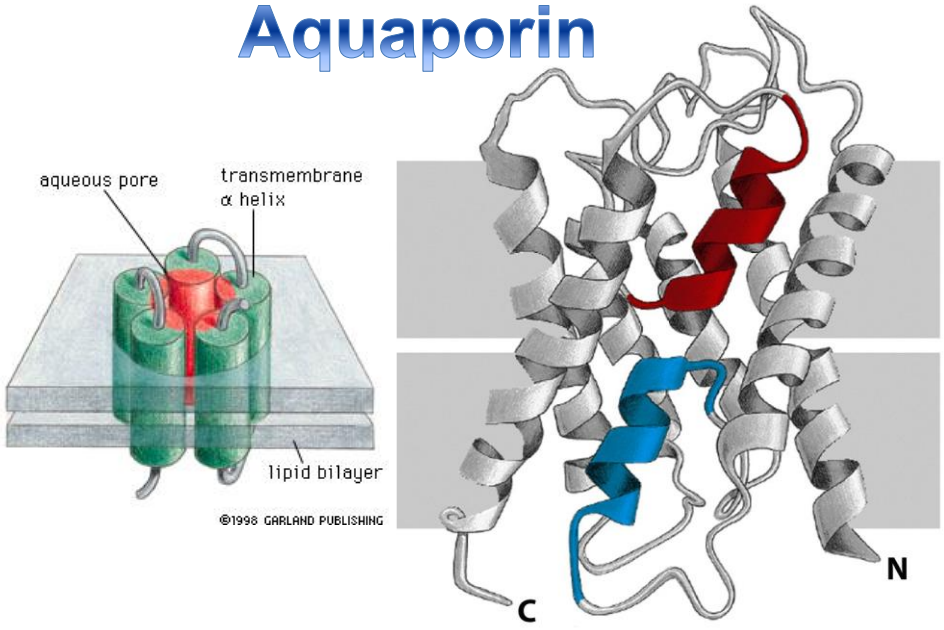


Fig. 3-34 in MCB



Aquaporin



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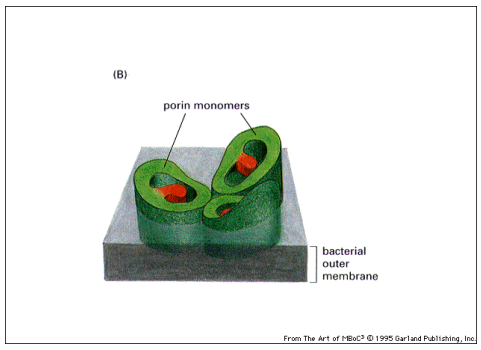

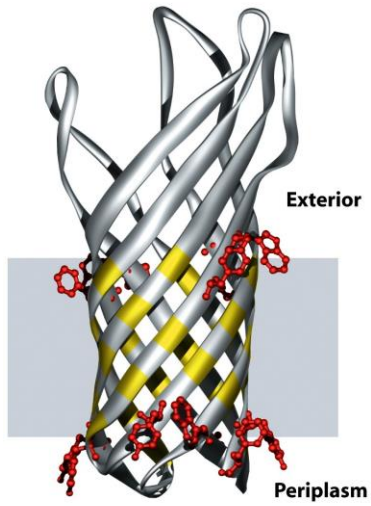

Figure 10-18
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E.Coli Porin- OmpX

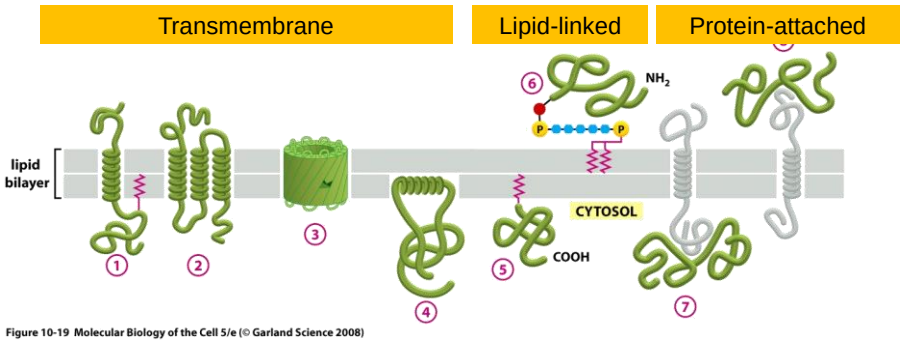
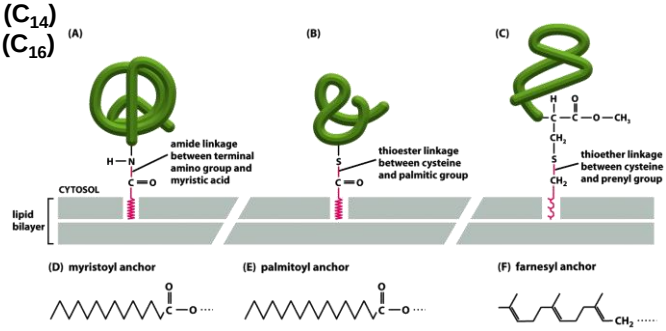


Figure 10-19 Molecular Biology of the Cell 5/e (© Garland Science 2008)

Membrane Proteins

- **Classes (kind of membrane association):**
  - **Lipid anchoring (covalent attachment to membrane phospholipid):**
    - **proteins on cytosolic face:**
      - **fatty acid:**
        - » **myristate (C_{14})**
        - » **palmitate (C_{16})**



      - **prenylation: e.g. polyisoprenoid (farnesyl or geranylgeranyl group) linked to methylated C-terminal Cys (which was initially four residues from C-terminus, but last three residues are cleaved off, then carboxyl group of Cys is methylated)**
    - **proteins on exoplasmic face:**
      - **GPI (glycosylphosphatidylinositol) anchor: amide linkage to C-terminal residue of protein**

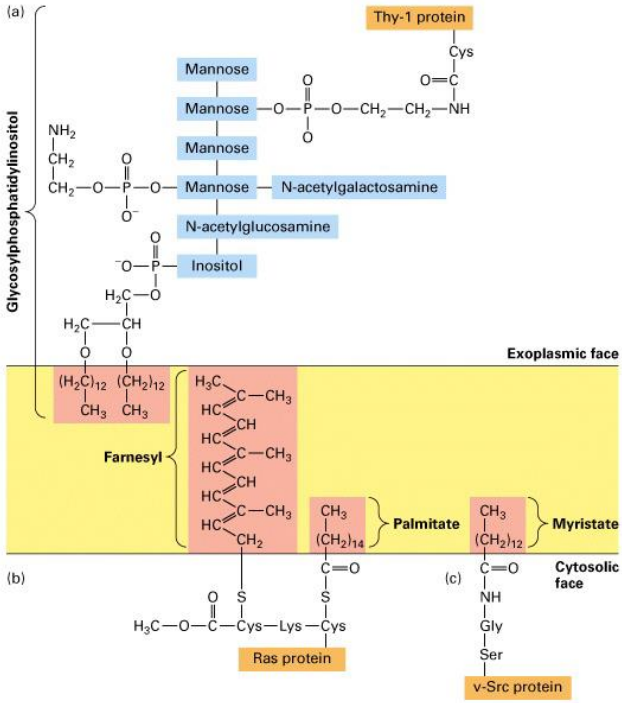
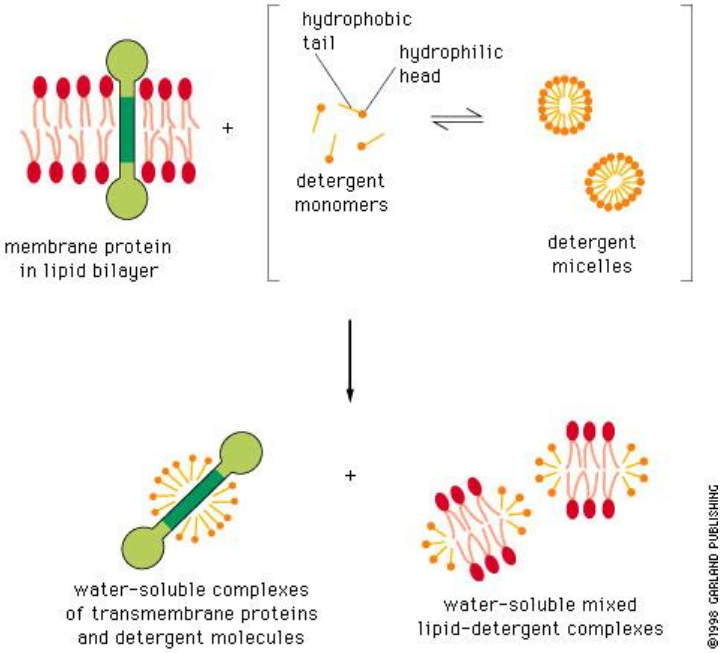
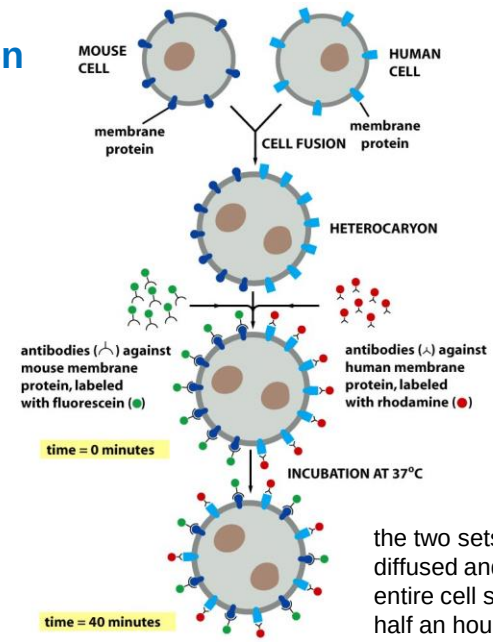


Fig. 3-36 in MCB



- **Many membrane proteins display rotational and lateral diffusion, but they are much slower than phospholipids (1/10 - 1/100 the rate)**
- **Experimental evidence for rapid redistribution of membrane proteins:**
  - **heterokaryons – e.g., fusing mouse and human cells; specific cell surface antigens unique to either mouse or human cells were recognized by differentially-labeled antibodies. With time, mixing of cell surface antigens was observed.**
  - **Patching and capping – multivalent ligands that recognize specific membrane proteins bind to and cross-link the proteins, which aggregate into clusters (patching); patches are then actively swept to one end of the cell (capping).**
  - **Fluorescence recovery after photobleaching (FRAP) – membrane proteins are labeled with a fluorescent molecule; illumination of a small area of the cell surface bleaches out the fluorescence; over time, fluorescent molecules from adjoining unbleached areas are seen to move into the bleached area. Can be used to determine rates of lateral diffusion.**

heterocaryon



the two sets of proteins diffused and mixed over the entire cell surface within half an hour or so

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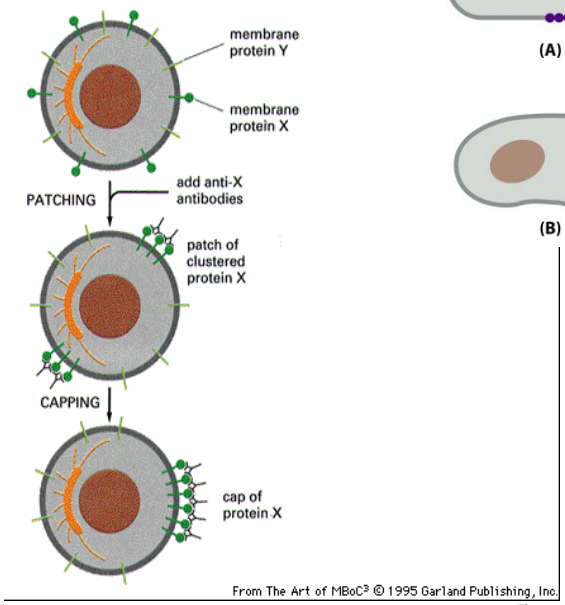
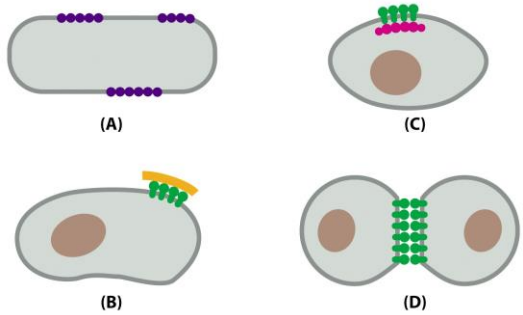
Patching and capping





Four ways of restricting the lateral mobility of specific plasma membrane protein:

a) The protein can self-assemble into large aggregate
b) They can be thethered by interaction with assemblies of macromolecules outside the cells
c) Inside the cells
d) Interact with protein on the surface of another cells

Figure 10-39 *Molecular Biology of the Cell* (© Garland Science 2008)

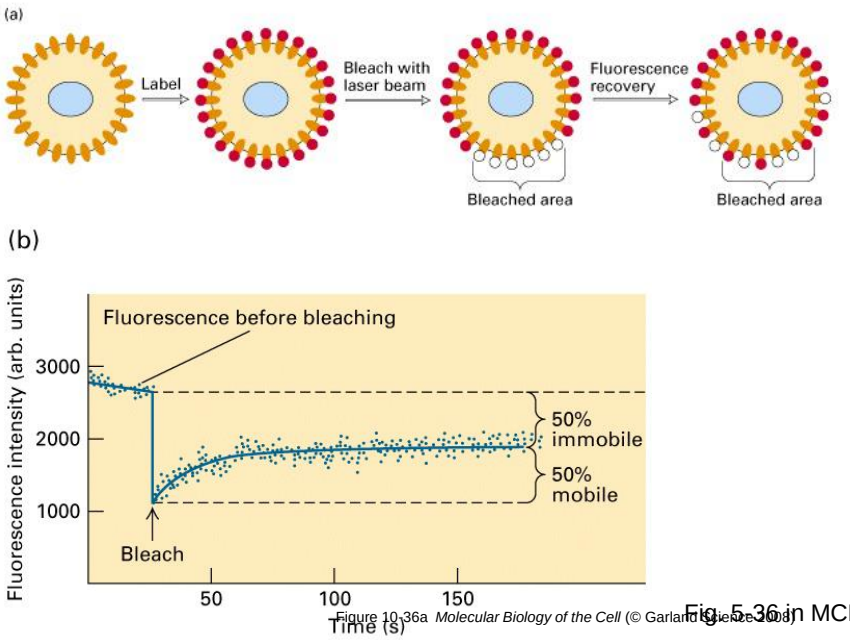
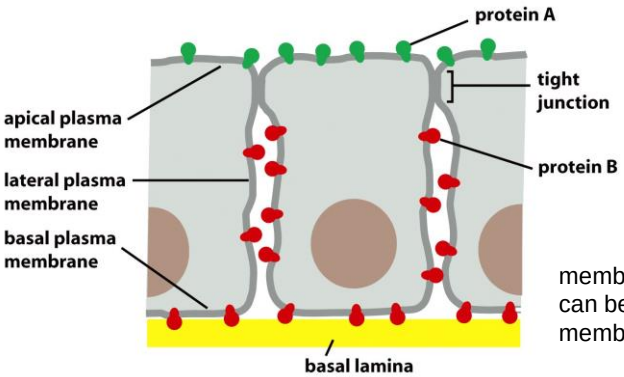


Figure 10-36a *Molecular Biology of the Cell* (© Garland Science 2008)

Fig. 5.36 in MCB

- **Factors that <u>limit</u> the diffusion of membrane proteins:**
  - **Attachment to the cytoskeleton and/or extracellular matrix.**
  - **Assembly of cell-cell adhesion complexes and other cell junctions.**
  - **Tight junctions isolate basal-lateral surfaces from apical surfaces in polarized epithelia.**



membrane molecules can be restricted to a particular membrane domain

Figure 10-37 *Molecular Biology of the Cell* (© Garland Science 2008)

Figure 10-40 *Molecular Biology of the Cell* (© Garland Science 2008)

Cortical cytoskeleton gives membranes mechanical strength and restrict membrane protein diffusion

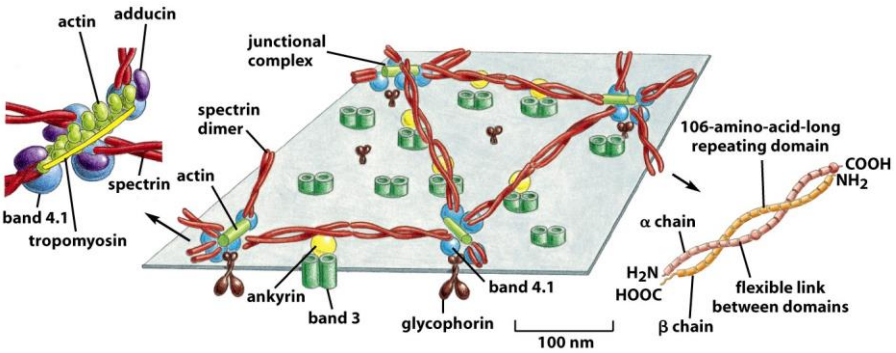


Figure 10-41a *Molecular Biology of the Cell* (© Garland Science 2008)

Membrane Carbohydrates

- **Carbohydrates especially abundant on plasma membrane; glycocalyx formed of glycolipids, glycoproteins and proteoglycans.**
- **Sugars can be attached to proteins (almost all) or lipids (1 out of 10).**
- **Asymmetric: only extracellular face of plasma membrane is glycosylated.**
- **Functions:**
  - **Protection: important for lubrication and structural integrity of the cell surface.**
  - **Important for certain cell-cell recognition events (ex. WBC adhesion to endothelial lining of blood vessels).**

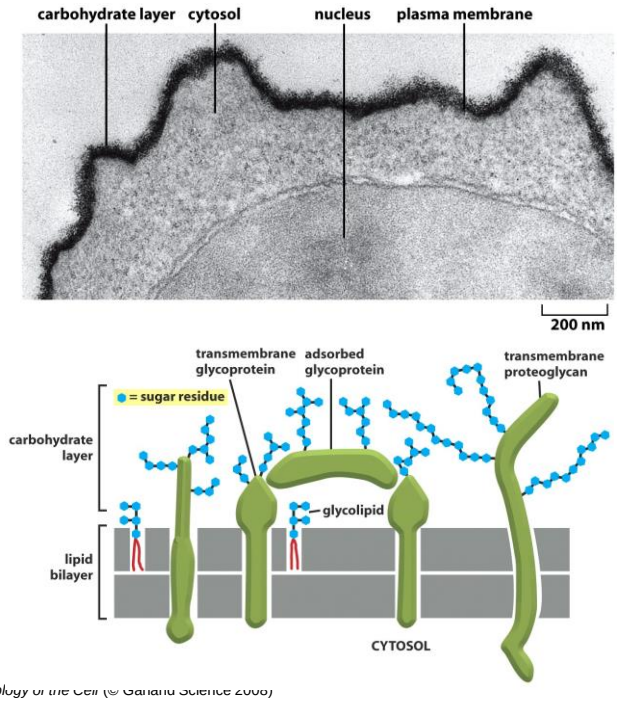


Figure 10-28a *Molecular Biology of the Cell* (© Garland Science 2008)

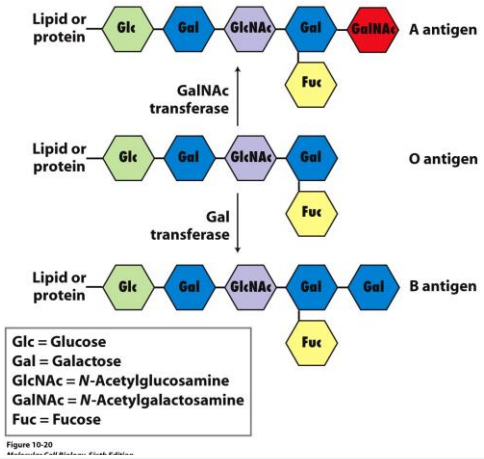


Figure 10-20

TABLE 10-2 ABO Blood Groups

BLOOD GROUP	ANTIGENS ON RBCS*	SERUM ANTIBODIES	CAN RECEIVE BLOOD TYPES
A	A	Anti-B	A and O
B	B	Anti-A	B and O
AB	A and B	None	All
O	O	Anti-A and anti-B	O

*See Figure 10-20 for antigen structures.

Table 10-2
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TABLE 10-2 ABO Blood Groups

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***See Figure 10-20 for antigen structures.**

Table 10-2
Molecular Cell Biology, Sixth Edition