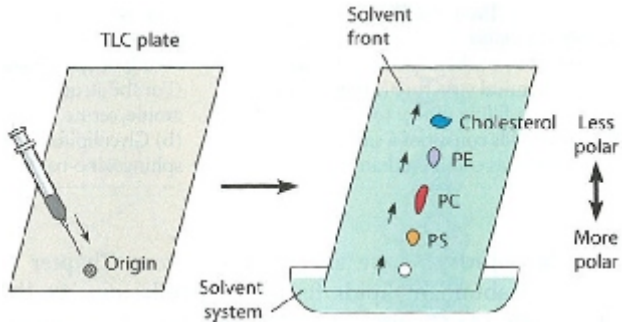
MEMBRANE ORGANIZATION & FUNCTION:

16Oct91, 10/15/92, 10/13/93, 10/10/94, 10/16/96, 12Oct01, 21Oct02, 15Oct03, 13Oct 04, 17Oct 05, 12Oct 07, 17Oct08, 19Oct09, 17Oct11
BRP p. 177-190, BKH 5th: 166-190, BKH 6th pp 162-186, 7th: 156-189

ANALYSIS OF MEMBRANE LIPIDS AND PROTEINS: Protein fraction varies dramatically (p 161)

LIPIDS:` TLC CHROMATOGRAPHY: (p 166)

Thin layer chromatography thru silicic acid: H_2SiO_3 = opal
extract lipids with CHCl3, concentrate, spot on silica gel.
Solvent system (zB: chloroform, methanol and water)
Separates components according to hydrophobic/philic nature.



Nonpolar move fastest: do not stick to the polar silicic acid
Order: (fastest to slowest) structures: p 164

Fastest	Cholesterol	40%
Next fastest	Phosphatidylethanolamine	30%
Next to slowest	Phosphatidyl choline (lecth)	15%
Slowest	Phosphatidyl serine	10%

Plasma membrane lipids = **60% phospholipids, 40% cholesterol** (p 172)

Fatty Acids must be 16 to 18 carbons long, 12 do not form stable bilayer
cholesterol present in all but inner mitochondrial & bacterial membranes
cholesterol strengthens, 'buffers' the fluidity and **drops permeability by 10x.** (p 170)

fluidity important: keeps enzymes colliding for interactions: p 169
too fluid, leaky (nerves don't function above 43°C)
Regulable in bacteria by **desaturase** enzyme, adjusting no. of ethylene bonds, p168 & 171 for structure effects
(uses O_2 to remove H_2, functions better at low temp with more O_2) (Note importance in Atlantic salmon)

Eukaryotes: **cholesterol is 40-50% of molecules of lipid** in membrane. P 172

PROTEINS: **Freeze fracture** shows **integral proteins** stick with inner monolayer: (p 174-175 & 188)
P (protoplasmic) face has many more protein "bumps"
E (exterior) face has fewer protein "bumps"

Analysis of membrane proteins: SDS-polyacrylamide gel electrophoresis: (p 179)
solubilize with detergent (sodium dodecyl sulfate), run in DC field:
Size is major affecter: all proteins are coated with "−" charged SDS groups, move to "+" anode.
Different cells have varying assortment of proteins according to their function in the membrane.

CLASSES OF MEMBRANE PROTEINS: transport ATPases
energy transducers
receptors
clathrins (aid phagocytosis, etc)

CARBOHYDRATES: Form glycocalyx (p 185-186)
(Human RBC = 52% protein, 40% lipid, 8% oligosaccharides) **Glycosylation** adds sugars. Sialic acid = "−"
glycoproteins: **major fraction**, are exterior, shown by use of **lectins:**
(plant proteins, bind specific sugars, EM show glycoproteins on outside.)
glycolipids: **minor fraction**, carry antigenic determinants

MEMBRANES ARE ASYMMETRIC:
transverse diffusion very unfavored: 1 mol/sev hrs
lateral is easy the length of RBC in seconds (p 169)
polarity of membrane lipids: outer: choline-containing lipids (lecithin)
all glycolipids are exterior, important for cell-cell recognition
inside: ethanolamine and serine
peripheral proteins anchored to integral proteins

FLUIDITY: Evidence:
1) Add fluorescent lipid to memb, bleach to make dark spot, spot becomes diffuse at edge. (p 169)
2) Frye and Edidin fused human & mouse cells with different fluorescent Ab, followed fate: became diffuse in hour. (p. 187)
3) Electric field causes proteins to migrate. See EM, p 186