Plasma Membrane

- Term cell membrane or **plasma membrane** was given by **Nageli and Cramer.**
- Term **unit membrane** was given by **Robertson.**
- It is outermost boundary of animal cell. outermost living boundary of all cells.
- The detailed structure of the membrane was studied only after the advent of the electron microscope in the 1950s. Meanwhile, chemical studies on the cell membrane, especially in human red blood cells (RBCs), enabled the scientists to deduce the possible structure of plasma membrane.

Overton → lipids

Danielli Davson → lipids, proteins

Robertson → ① lipids, ② Proteins, ③ Carbohydrates

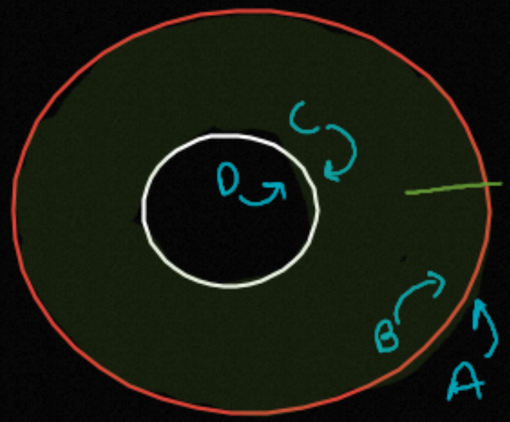
Chemical Composition of PM

① Lipids ② Proteins ③ Carbohydrates → minor

Major

Lipids : proteins
In Human RBC, L:P ⇒ 40 : 52

lipids	proteins
40	52



A, D ⟶ non-cytosolic side

B, C ⟶ cytosolic side

Plasma Membrane Lipids

Phospholipids, ↓ major (most abundant)

glycolipids, ↓ lipids conjugated with carbohydrates

sterols ↓ cholesterol s, etc.

- These studies showed that the cell membrane is mainly composed of lipids and proteins.
- The major lipids are phospholipids that are arranged in a bilayer.

- The lipids are arranged within the membrane with the polar head towards the outer sides and the hydrophobic tails towards the inner part.
- This ensures that the nonpolar tail of saturated hydrocarbons is protected from the aqueous environment.
- In addition to phospholipids membrane also contains cholesterol.

Phospholipid

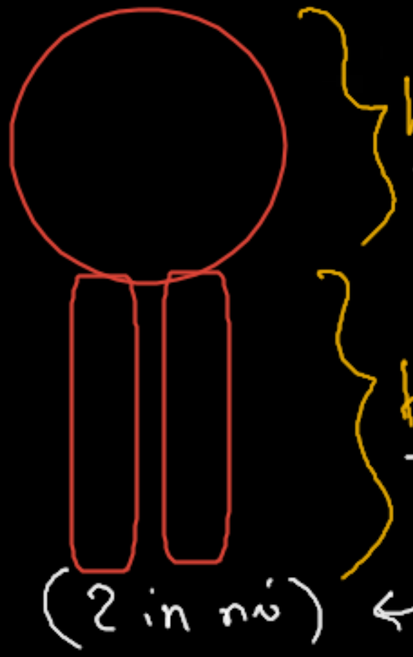
2 types ⟶ Glycerophospholipid (Phosphoglyceride)

Sphingophospholipid

present in the form of a bilayer

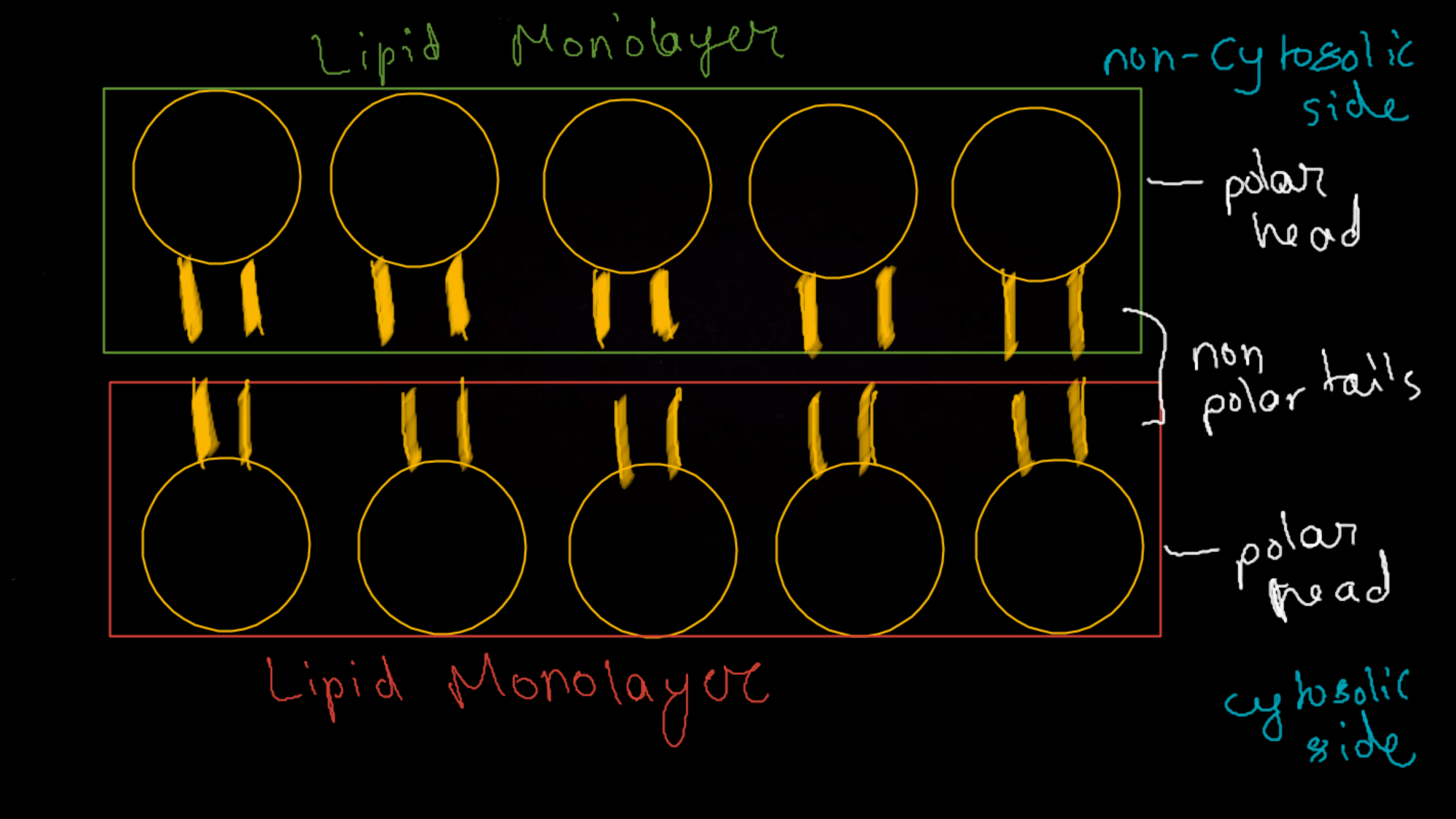
most abundant

nature → amphiphilic (pathic)



head ⟶ Polar, hydrophilic, outer side interact with H_2O

tails (2 in no.) ⟶ made of saturated hydrocarbons, non-polar, hydrophobic, doesn't interact with H_2O


Lipid Monolayer
non-Cytosolic side
polar head
non polar tails
polar head
Lipid Monolayer
cytosolic side

Glycolipid

- lipid conjugated with Carbohydrates

2 types → glycoglycolipids

Sphingoglycolipids → more common

Sterol

↳ pK → Sterol -ve → Except Mycoplasma
↳ Cholesterol +ve

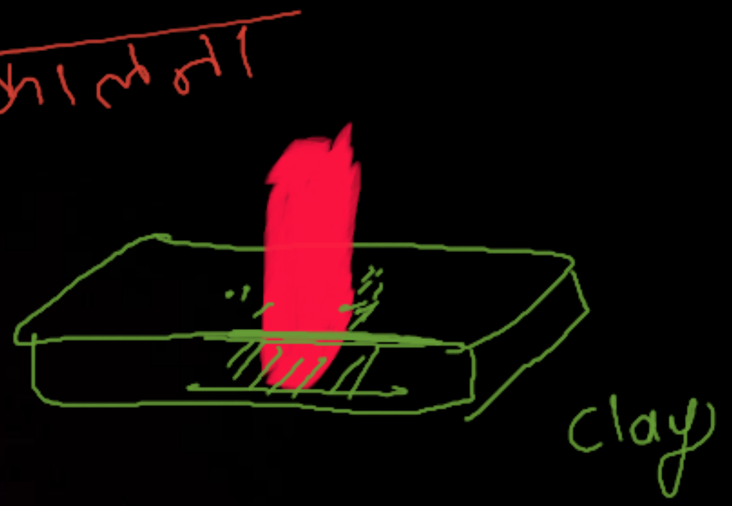
EK → Sterol → +ve

↳ Animals → Cholesterol → plays imp. role in MAINTAINING the fluidity of Plasma Membrane
↳ plants → Ergosterol
↳ Fungal → Stigmasterol, Sitosterol, campesterol

Proteins

↳ Associated with lipid bilayer.

• On the basis of Ease of Extraction → निकालना



Hard

Integral proteins

↓

(partially) embedded in lipid bilayer,

relatively more (70%.) disruptive extraction

eg: glycoprotein

Easy

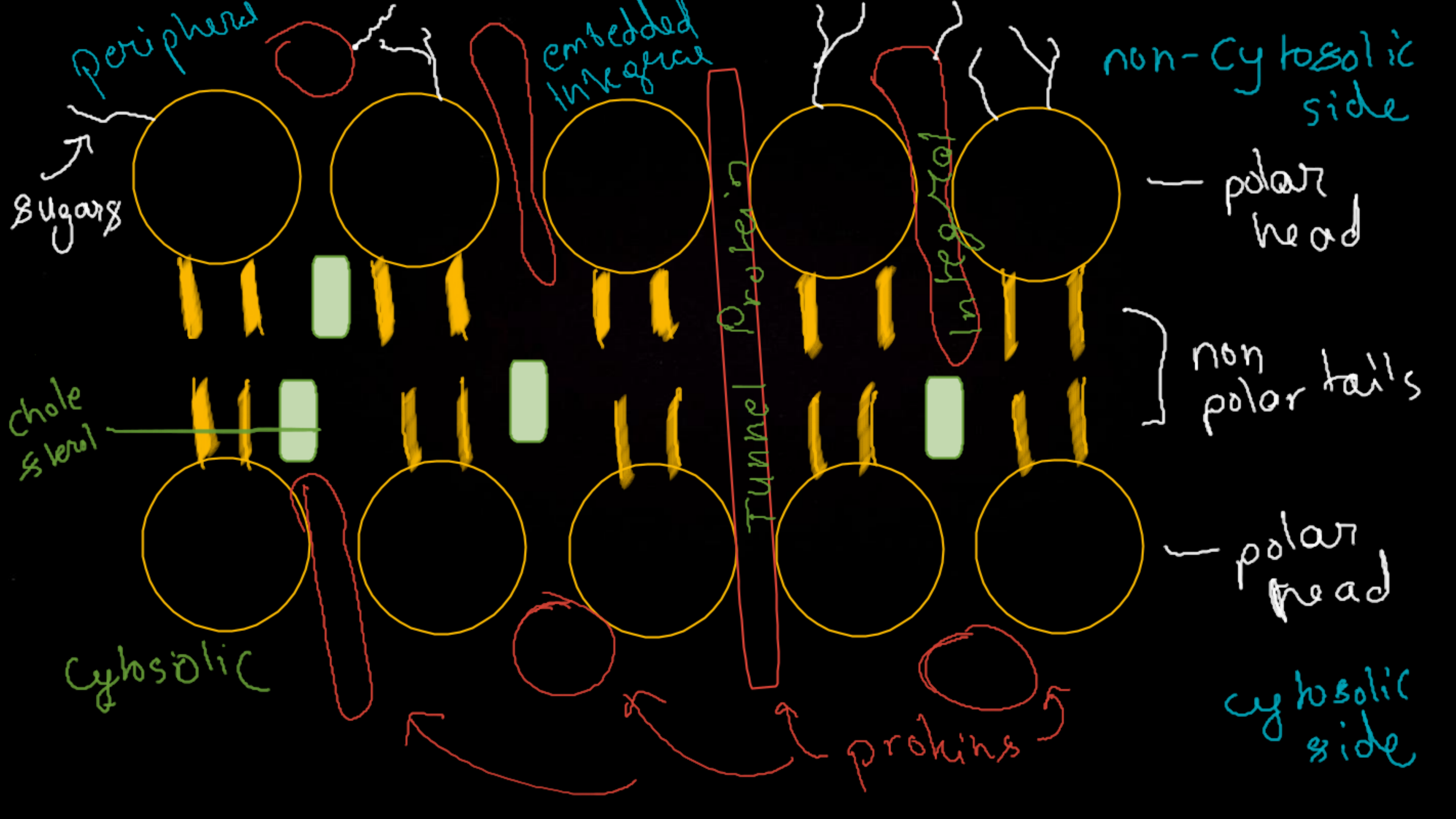
Peripheral proteins

↓

present on surface of lipid bilayer (30%.)

relatively less or non-disruptive

eg: Spectrin, Ankyrin

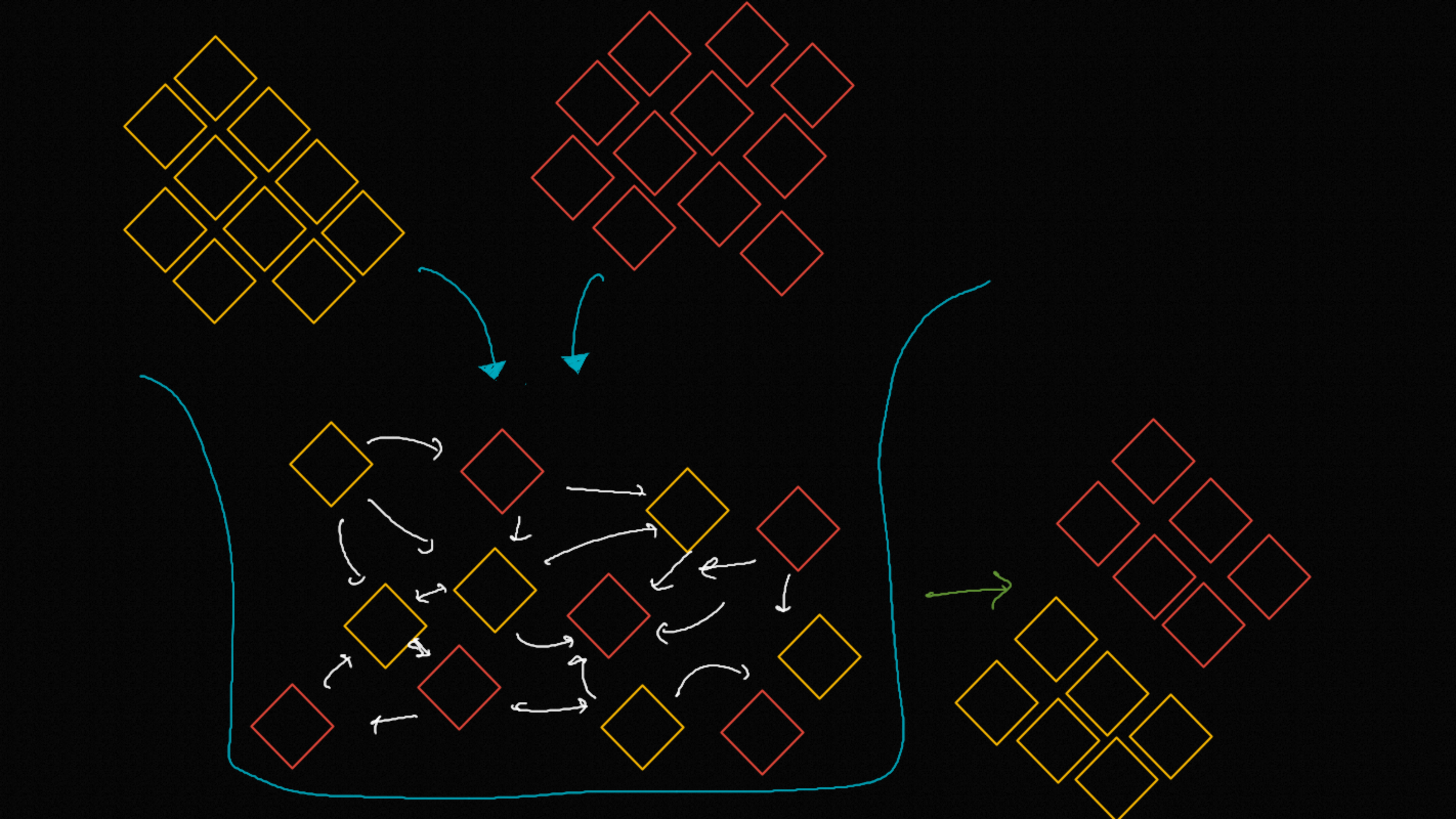

peripheral
embedded integral
non-Cytosolic side
sugars
polar head
Tunnel Protein
Integral
non polar tails
chole sterol
polar head
cytosolic
proteins
cytosolic side

Carbohydrate (PM-sugars)

- mono saccharides — One
  oligosaccharides — Few
  polysaccharides — Many → present
  → absent in PM
  → eg: glycogen, starch

oligosaccharides
- → More in no
- → Branched/Unbranched

☆ Present on NON-CYTOSOLIC side of PM
glycolipid & glycoprotein
→ involved in cell-cell recognition.



- In addition to phospholipids membrane also contains cholesterol.
- The lipid component of the membrane mainly consists of phosphoglycerides.
- Later, biochemical investigation clearly revealed that the cell membranes also possess protein and carbohydrate.
- The ratio of protein and lipid varies considerably in different cell types. In human beings, the membrane of the erythrocyte has approximately 52 per cent protein and 40 per cent lipids.
- Depending on the ease of extraction, membrane proteins can be classified as integral and peripheral.
- Peripheral proteins lie on the surface of membrane while the integral proteins are partially or totally buried in the membrane.

Need To Know:

- Plasma membrane is a thin selectively permeable & living membrane.
- It is flexible.
- Plasmalemma of animal cells is elastic due to the presence of **lipids**.