

Cell/Plasma Membrane

Cytology Unit

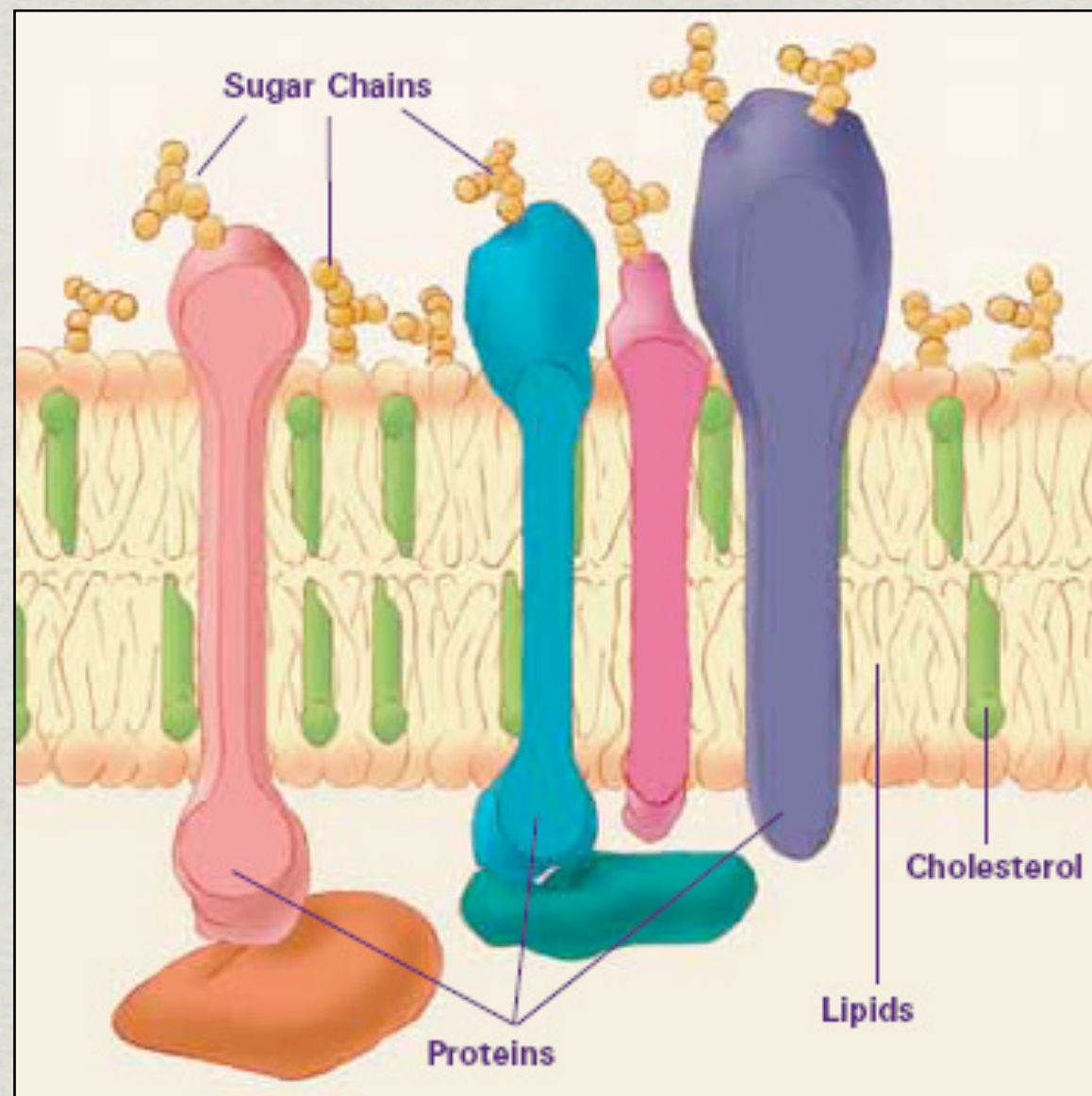
Function

- THE PLASMA MEMBRANE SEPARATES THE INTERNAL ENVIRONMENT OF THE CELL FROM THE EXTERNAL ENVIRONMENT
- THE CELL MEMBRANE CONTROLS WHAT ENTERS AND LEAVES THE CELL
- IF A MEMBRANE REGULATES PASSAGE OF PARTICLES BASED ON **SIZE** THEN IT IS DESCRIBED AS **SEMI-PERMEABLE**
(MOST **SYNTHETIC** MEMBRANES ARE SEMI-PERMEABLE)
- IF A MEMBRANE REGULATES PASSAGE OF PARTICLES BASED ON **CHEMICAL** AND **PHYSICAL** PROPERTIES AS WELL AS SIZE, THEN IT IS DESCRIBED AS **SELECTIVELY OR DIFFERENTIALLY PERMEABLE**
- THE CELL MEMBRANE IS **SELECTIVELY OR DIFFERENTIALLY PERMEABLE**

Structure

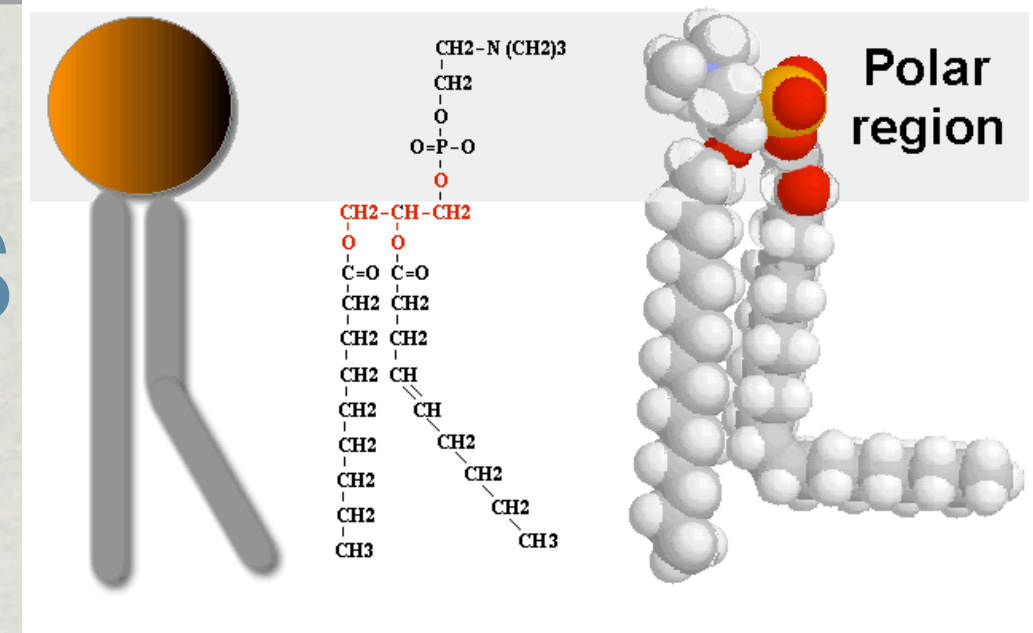
THE MEMBRANE CONSISTS OF THE FOLLOWING
TYPES OF MOLECULES:

1. PHOSPHOLIPIDS
2. PROTEINS
3. CHOLESTEROL
4. GLYCOPROTEINS & GLYCOLIPIDS

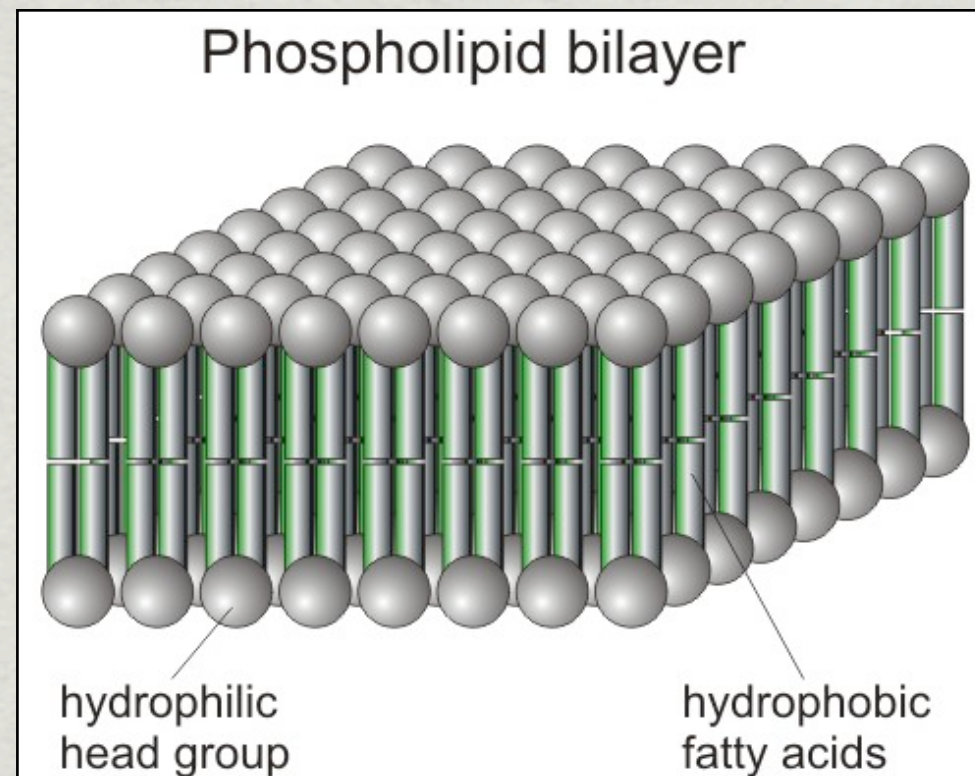


1. Phospholipids

- PHOSPHOLIPIDS CONSIST OF A **HYDROPHYLIC** HEAD GROUP AND TWO **HYDROPHOBIC** TAILS

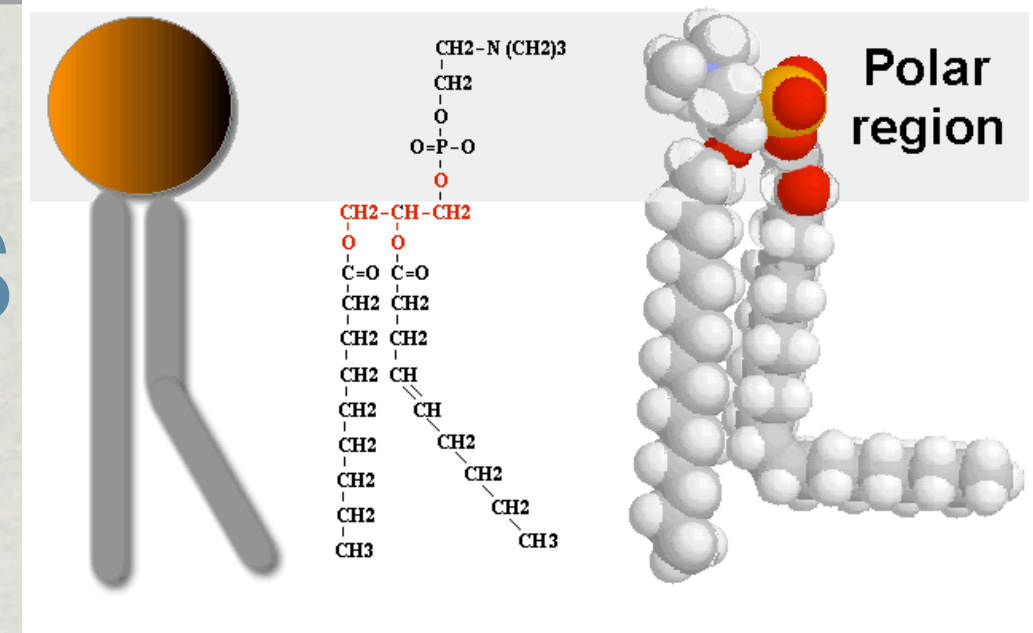


- IN THE CELL MEMBRANE THE PHOSPHOLIPIDS FORM A DOUBLE LAYER CALLED A **BILAYER**

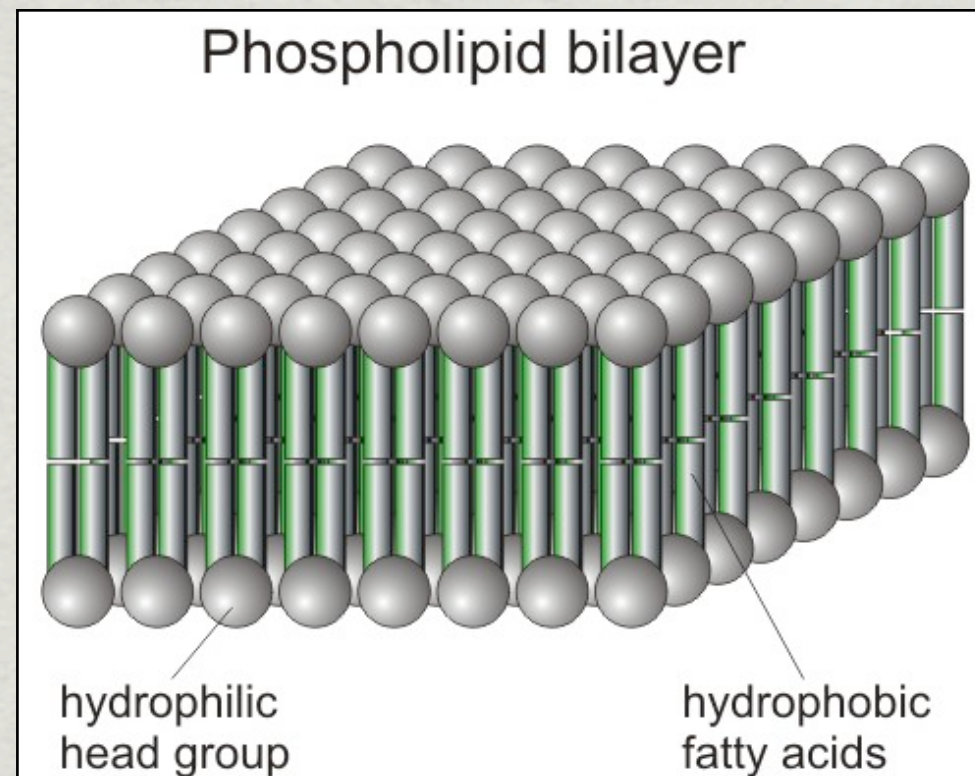


1. Phospholipids

- PHOSPHOLIPIDS CONSIST OF A **HYDROPHYLIC** HEAD GROUP AND TWO **HYDROPHOBIC** TAILS



- IN THE CELL MEMBRANE THE PHOSPHOLIPIDS FORM A DOUBLE LAYER CALLED A **BILAYER**

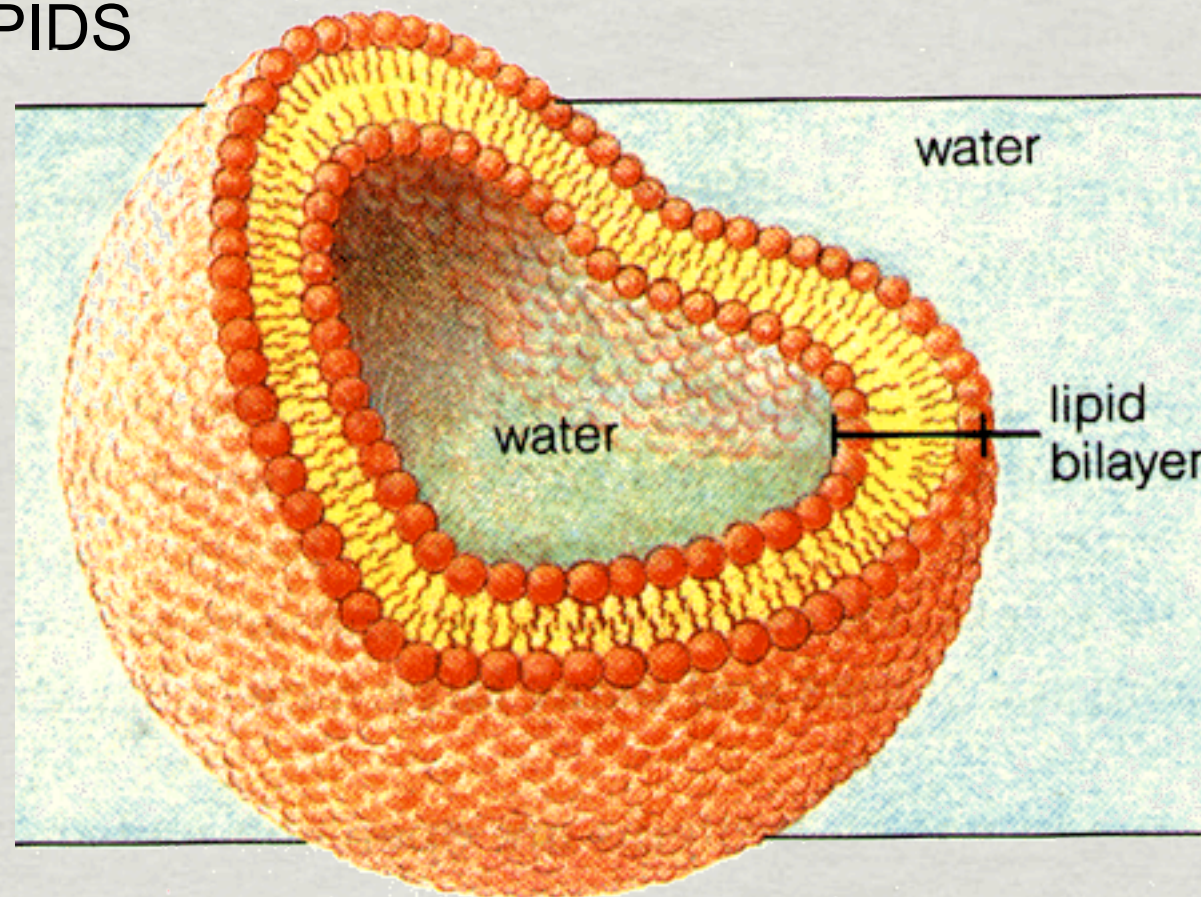


Pfft! I knew
those words from
last unit

V
OC
AB

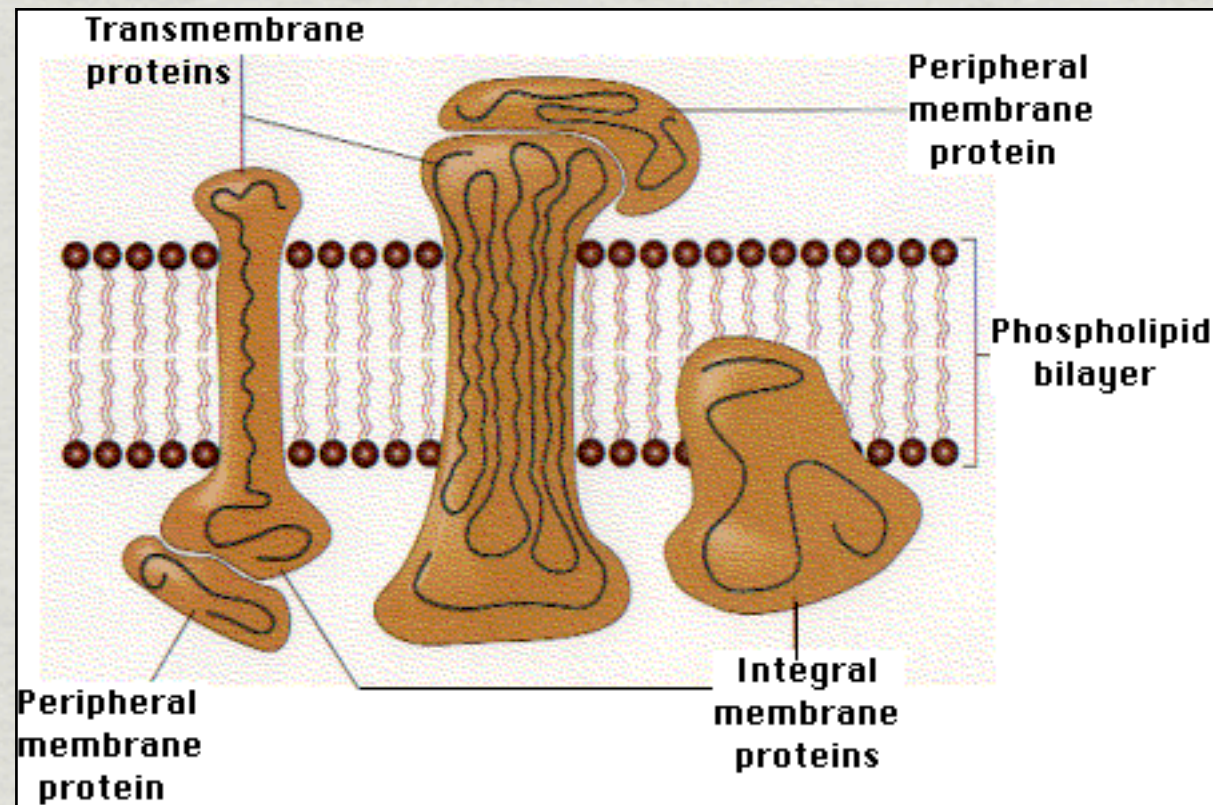
1. Phospholipids

- THE HEAD GROUPS OF EACH LAYER FACE THE OUTSIDE AND THE INSIDE OF THE CELL SINCE THEY ARE ATTRACTED TO WATER
- THE TAILS FORM THE INSIDE OF THE BILAYER SINCE THEY ARE AFRAID OF WATER
- THE BILAYER HAS A **FLUID** CONSISTENCY DUE TO THE BEHAVIOR OF THE PHOSPHOLIPIDS



2. Proteins

- THE MANY PROTEINS EMBEDDED IN THE MEMBRANE FORM A **MOSAIC** PATTERN
- DEPENDING ON THEIR POSITION IN THE MEMBRANE, PROTEINS MAY BE **INTEGRAL OR PERIPHERAL**



Peripheral & Integral Proteins

PERIPHERAL PROTEINS

- PERIPHERAL PROTEINS ARE ATTACHED TO THE INNER OR OUTER SURFACE OF THE MEMBRANE (USUALLY ATTACHED TO AN INTEGRAL PROTEIN)

INTEGRAL PROTEINS

- MOST INTEGRAL PROTEINS EXTEND ALL THE WAY THROUGH THE BILAYER, SOME EXTEND PART WAY THROUGH

- THEY HAVE HYDROPHOBIC REGIONS WHICH ARE EMBEDDED IN THE MIDDLE OF THE BILAYER

- THEY HAVE HYDROPHYLIC REGIONS WHICH PROJECT OUT OF THE TOP AND/OR THE BOTTOM OF THE BILAYER

Integral Protein Functions

FUNCTIONS OF INTEGRAL PROTEINS INCLUDE:

Integral Protein Functions

FUNCTIONS OF INTEGRAL PROTEINS INCLUDE:

CHANNEL PROTEINS (THE “TUNNELS”)

ALLOW PARTICLES TO PASS FREELY THROUGH THE MEMBRANE



Integral Protein Functions

FUNCTIONS OF INTEGRAL PROTEINS INCLUDE:

CHANNEL PROTEINS (THE “TUNNELS”)



ALLOW PARTICLES TO PASS FREELY THROUGH THE MEMBRANE

CARRIER PROTEINS (THE “FERRIES”)



ALLOW **SPECIFIC** MOLECULES OR IONS TO PASS THROUGH THE MEMBRANE

Integral Protein Functions

FUNCTIONS OF INTEGRAL PROTEINS INCLUDE:

CHANNEL PROTEINS (THE “TUNNELS”)

ALLOW PARTICLES TO PASS FREELY THROUGH THE MEMBRANE



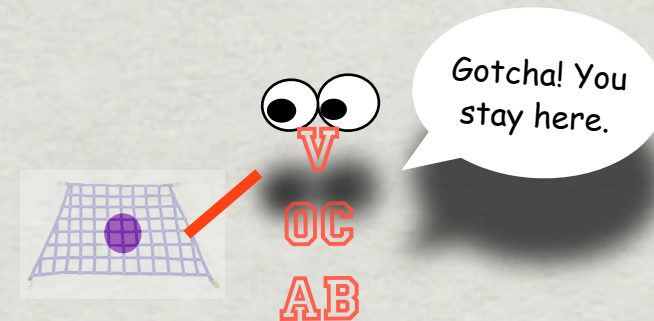
CARRIER PROTEINS (THE “FERRIES”)

ALLOW **SPECIFIC** MOLECULES OR IONS TO PASS THROUGH THE MEMBRANE



RECEPTOR PROTEINS (THE “HOOKS”)

ALLOW SPECIFIC MOLECULES TO BIND TO THE CELL MEMBRANE



Integral Protein Functions

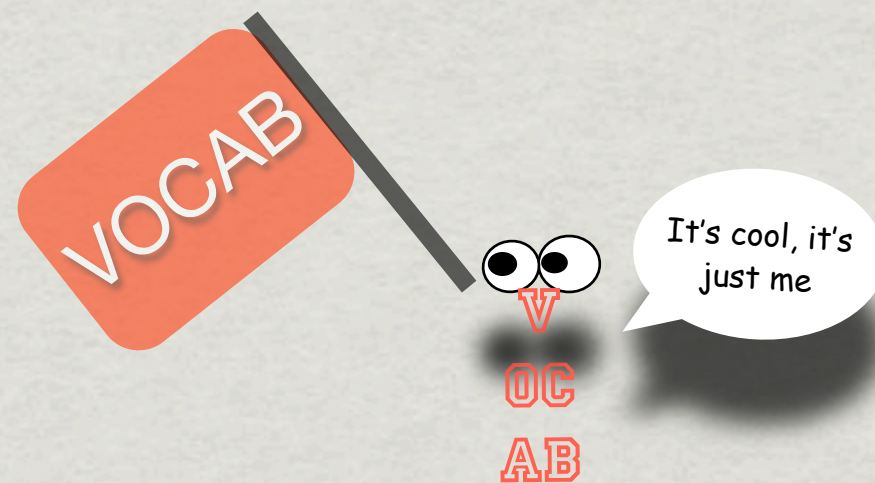
FUNCTIONS OF INTEGRAL PROTEINS INCLUDE:

Integral Protein Functions

FUNCTIONS OF INTEGRAL PROTEINS INCLUDE:

CELL RECOGNITION PROTEINS (“FLAGS”)

- PART OF THE MAJOR HISTOCOMPATIBILITY COMPLEX
- THESE ARE **GLYCOPROTEINS**, WHICH MEANS THEY ARE PROTEINS WITH CHAINS OF SUGAR ATTACHED
- THEY ARE **UNIQUE** IDENTIFIERS OF A CELL
(IE: CELLS WITH FOREIGN RECOGNITION PROTEINS ARE ATTACKED BY THE IMMUNE SYSTEM)



Integral Protein Functions

FUNCTIONS OF INTEGRAL PROTEINS INCLUDE:

Integral Protein Functions

FUNCTIONS OF INTEGRAL PROTEINS INCLUDE:

ENZYMATIC PROTEINS

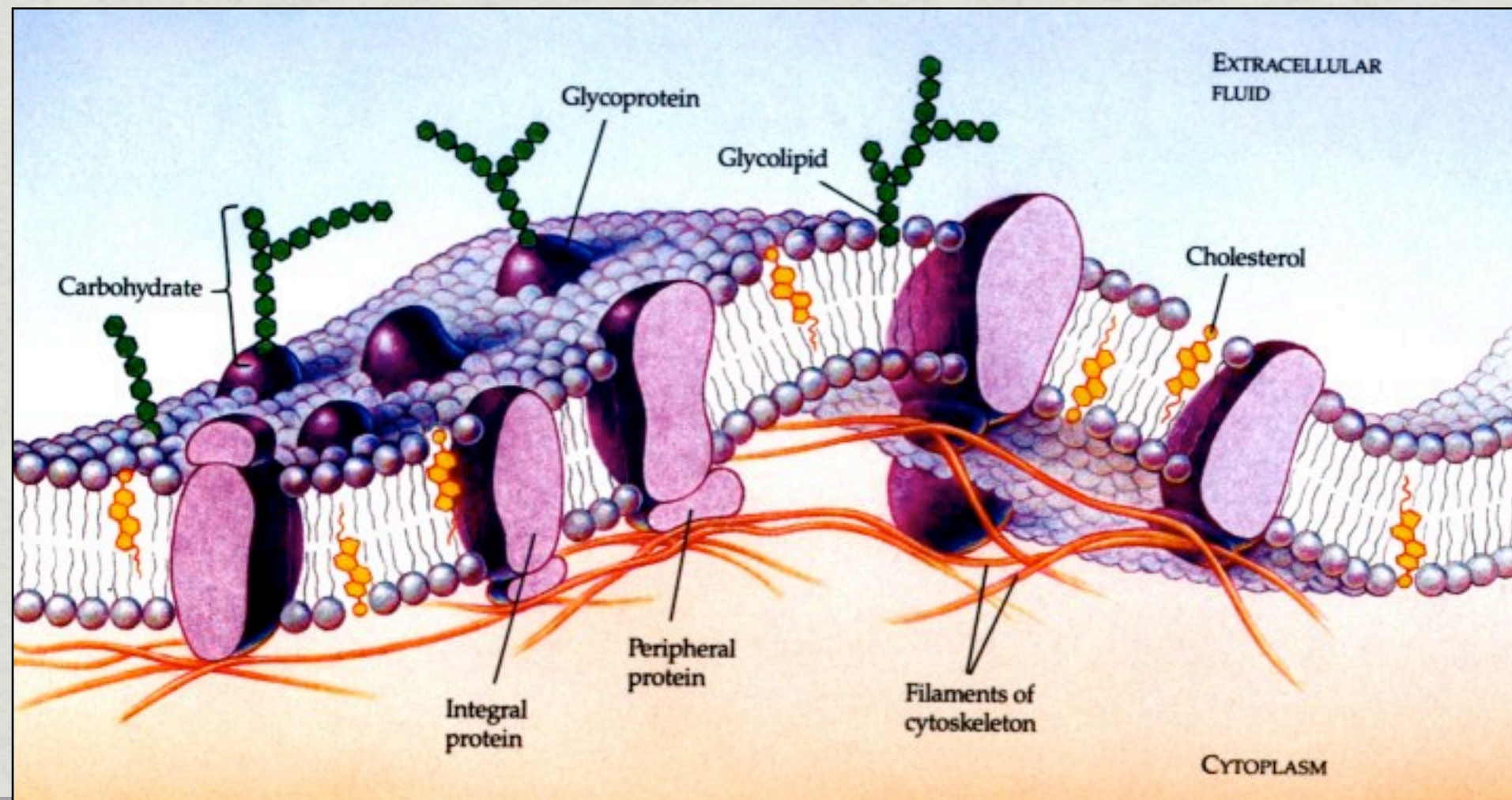
CATALYZE SPECIFIC REACTIONS



So...it's like an enzyme...but in the membrane?

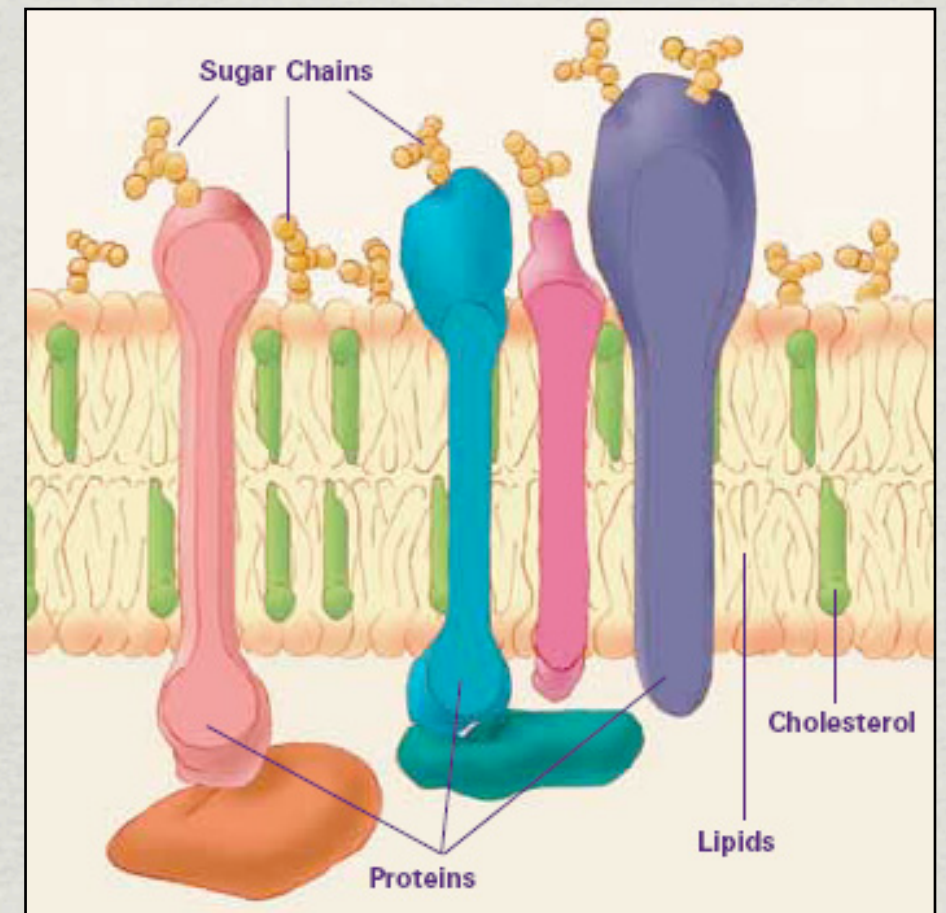
3. Cholesterol

- CHOLESTEROL IS A STEROID FOUND EMBEDDED IN THE PHOSPHOLIPID BILAYER OF ANIMAL CELLS (PLANT CELLS HAVE SIMILAR STEROIDS IN THEIR CELL MEMBRANES)
- CHOLESTEROL HELPS TO PREVENT **SOLIDIFICATION** OF THE CELL MEMBRANE AT LOW TEMPERATURES AND REDUCES THE **FLUIDITY** OF THE MEMBRANE AT HIGH TEMPERATURES
- IT STIFFENS AND STRENGTHENS THE CELL MEMBRANE



4. Glycoproteins and Glycolipids

- **GLYCOPROTEINS** ARE MEMBRANE PROTEINS WITH SHORT SUGAR CHAINS ATTACHED TO THEM
- **GLYCOLIPIDS** ARE PHOSPHOLIPIDS WITH SHORT CHAINS OF SUGAR ATTACHED TO THEM
- THESE SUGAR CHAINS PROJECT OUT FROM THE OUTER SURFACE OF THE MEMBRANE AND FUNCTION IN **CELL RECOGNITION**
- BECAUSE OF THESE SUGAR CHAINS, EACH CELL HAS A UNIQUE “FINGERPRINT” (EG- MAY CAUSE REJECTION OF TRANSPLANTED TISSUE)



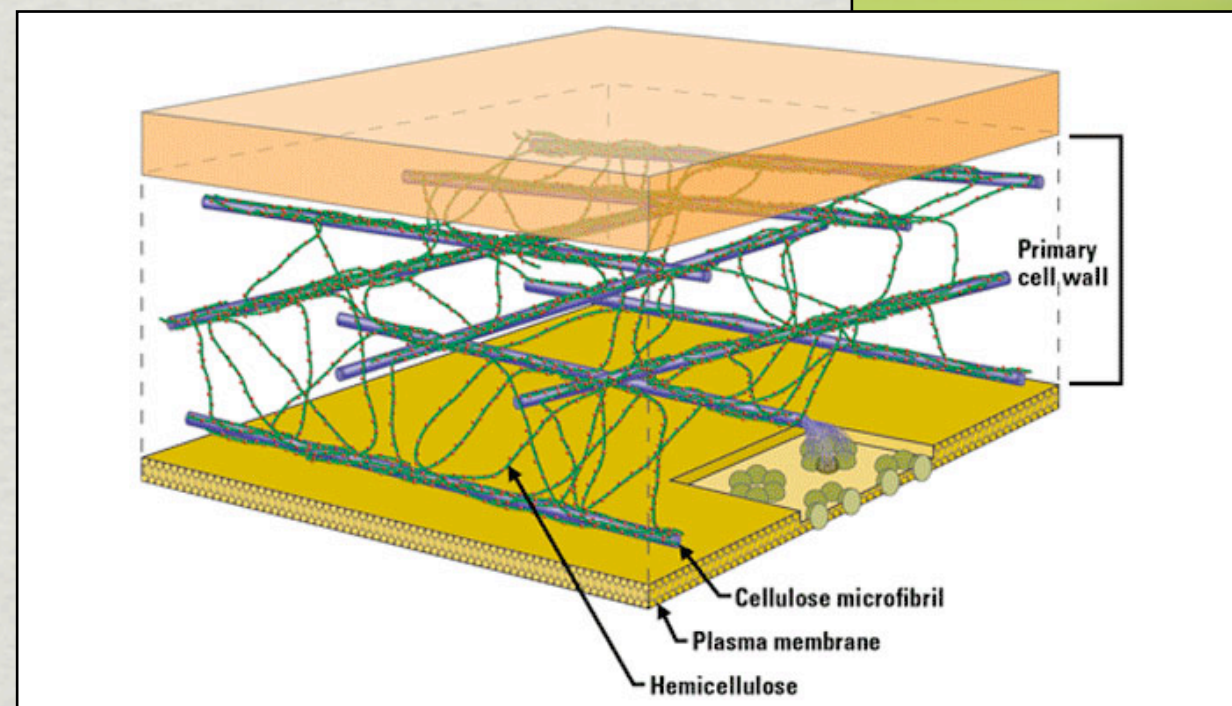
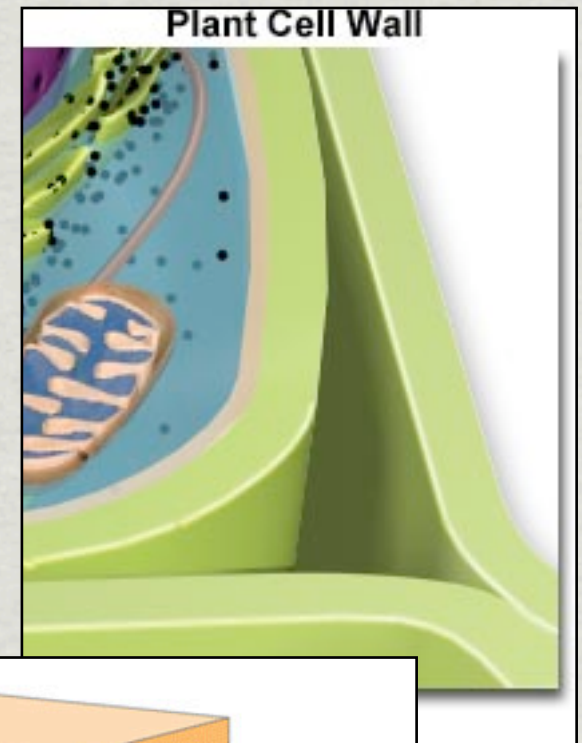
Plant Cell Wall

THE CELL WALL IS FOUND JUST OUTSIDE THE CELL MEMBRANE. IT CONSISTS OF A **PRIMARY** AND **SECONDARY** LAYER

PRIMARY CELL WALL

COMPOSED OF CELLULOSE **FIBRILS** (BUNDLES OF CELLULOSE MOLECULES)

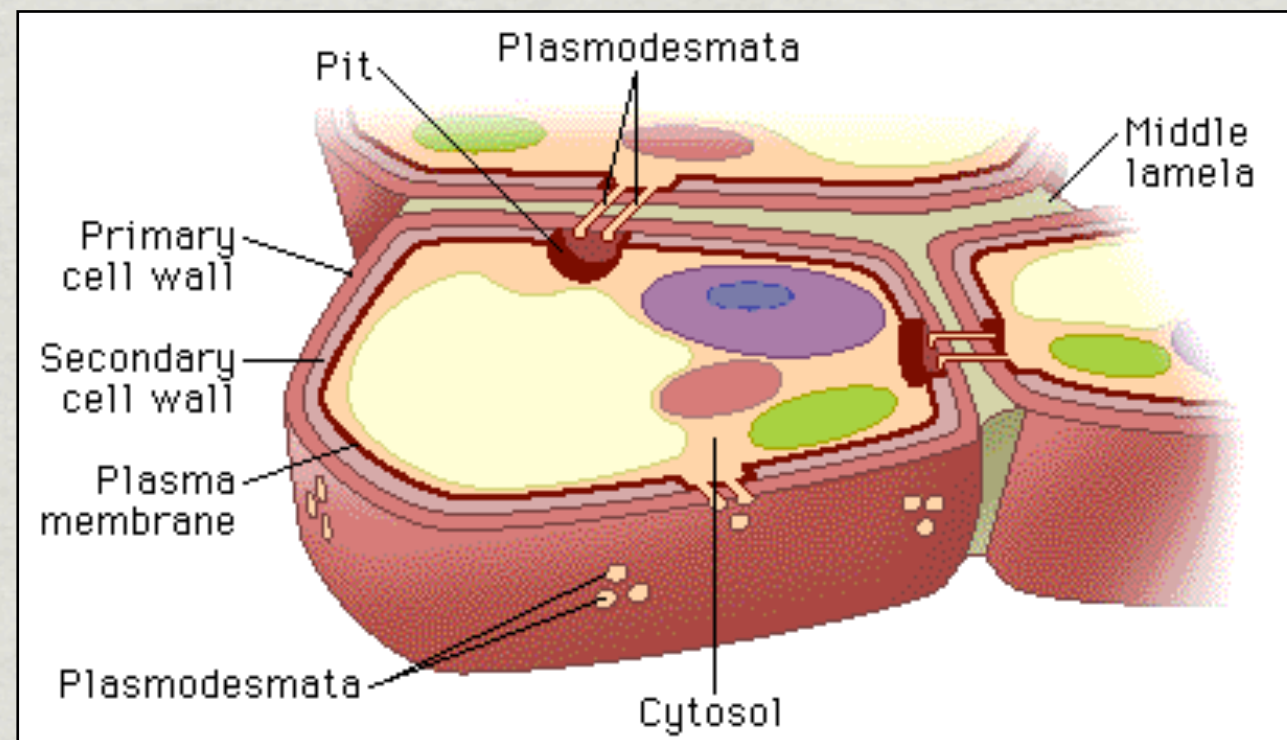
THE FIBRILS LIE AT RIGHT ANGLES TO ONE ANOTHER FOR ADDED STRENGTH



Plant Cell Wall

SECONDARY CELL WALL

- IN SOME PLANTS A SECONDARY CELL WALL FORMS WITHIN THE PRIMARY CELL WALL
- IT IS COMPOSED LARGELY OF **LIGNIN**
- THIS PROVIDES ADDITIONAL STRENGTH FOR THE CELL WALL



OVERVIEW

- ✱ PLAY “Inner Life of the Cell”