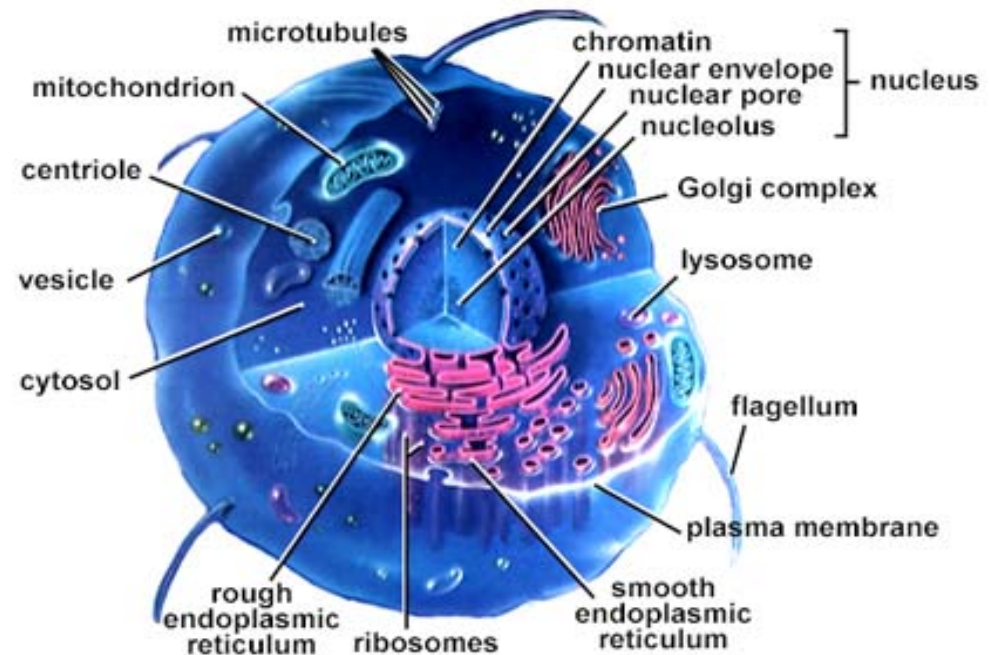


Cell Tour

Organelles

- Specialized structures within eukaryotic cells that perform different functions...
- Analogous to small plastic bags within a larger plastic bag.
- Perform functions such as :
 - protein production (insulin, lactase...)
 - Carbohydrates, lipids...

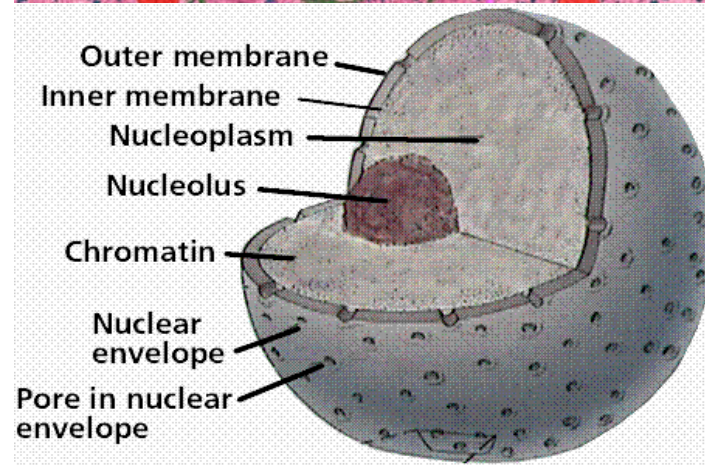
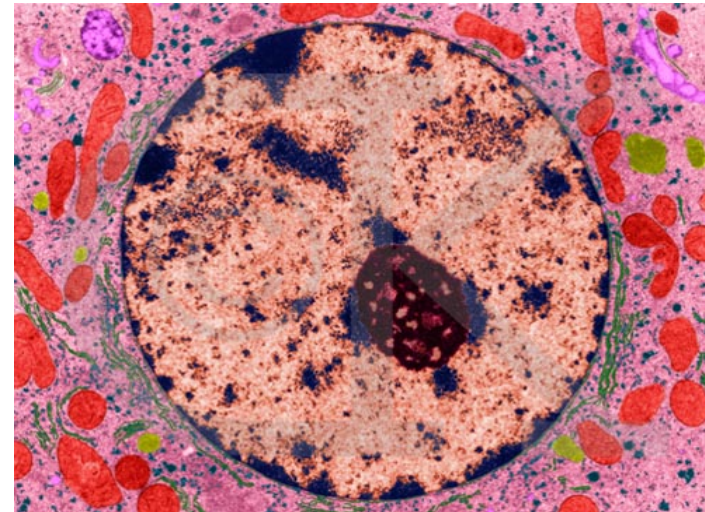


Organelles of Note: *The Nucleus*

- Contains the genetic material (DNA), controls protein synthesis.

DNA --> RNA --> Protein

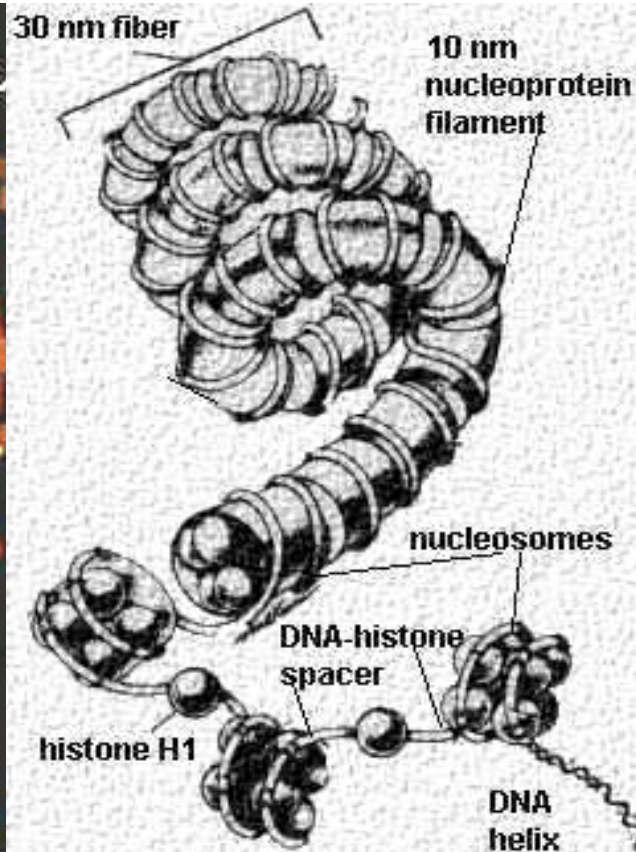
- Surrounded by a **double** membrane with pores
- Contains the *chromosomes* = fibers of coiled DNA & protein



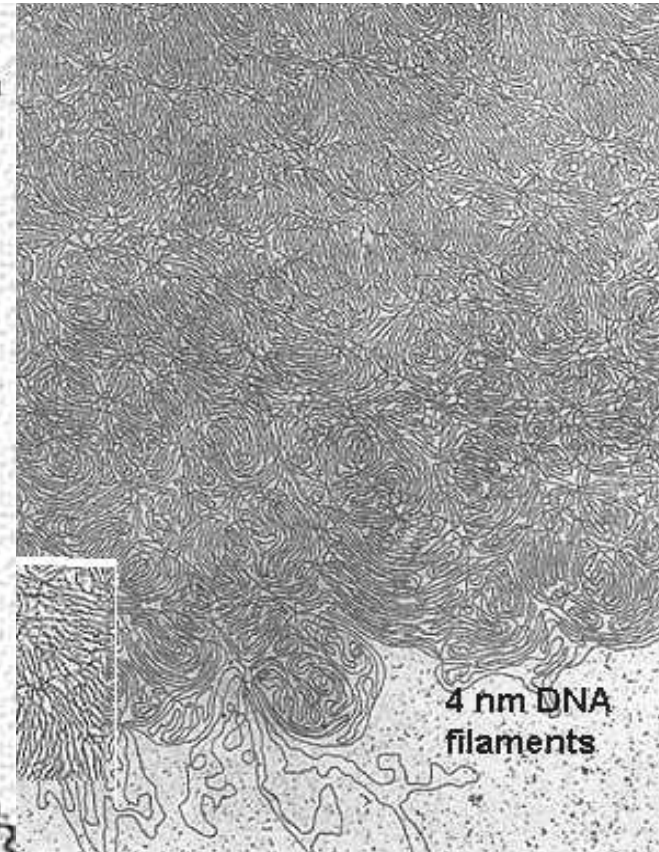
Chromosomes



All Chromosomes
from a single cell



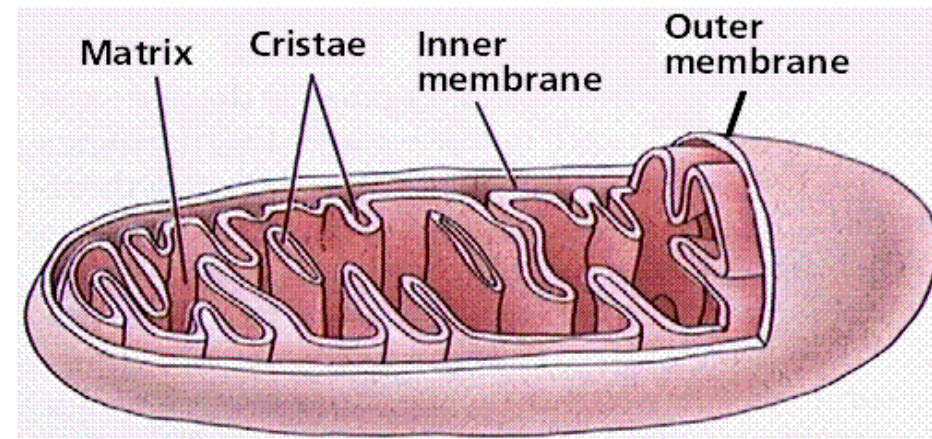
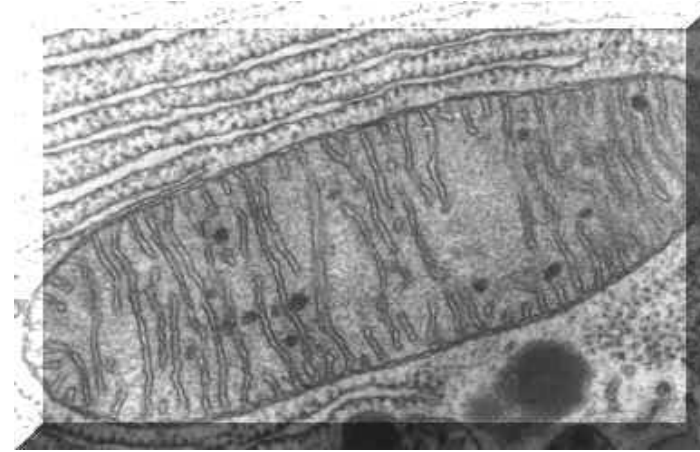
One chromosome
Pulled apart



A single chromosome
Showing the amount
of DNA within

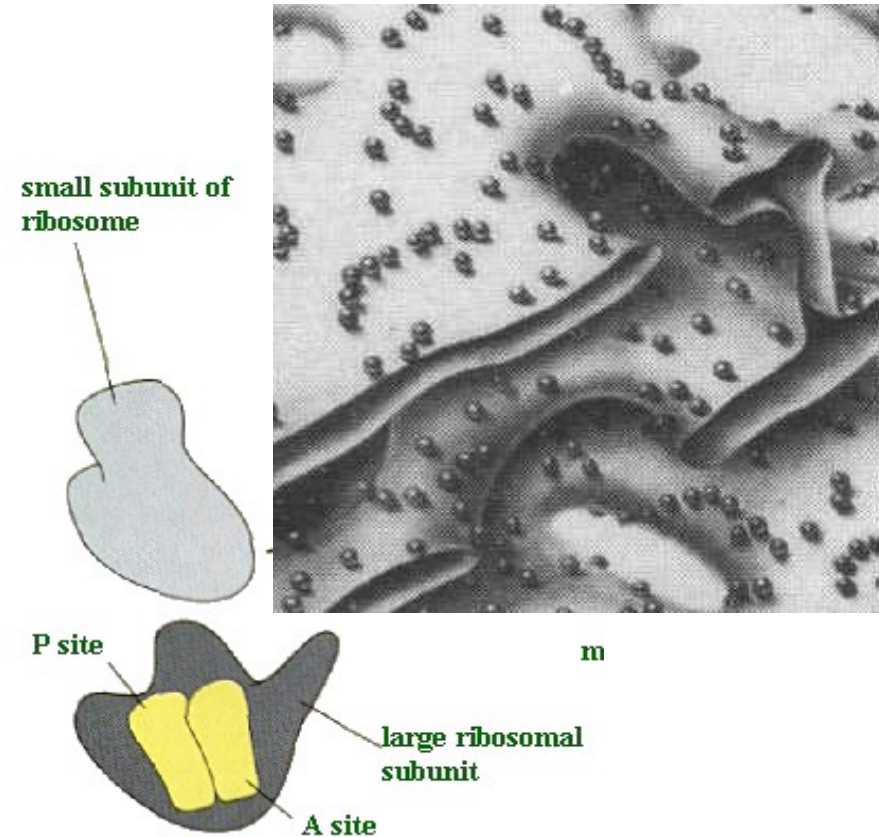
Mitochondria

- Generate cellular energy in the form of ATP molecules
- ATP is generated by the systematic breakdown of glucose = cell respiration
- Also, surrounded by 2 membrane layers
- Contain their own DNA!
- A typical liver cell may have 1,700 mitoch.
- All your mitochondria come from your mother..



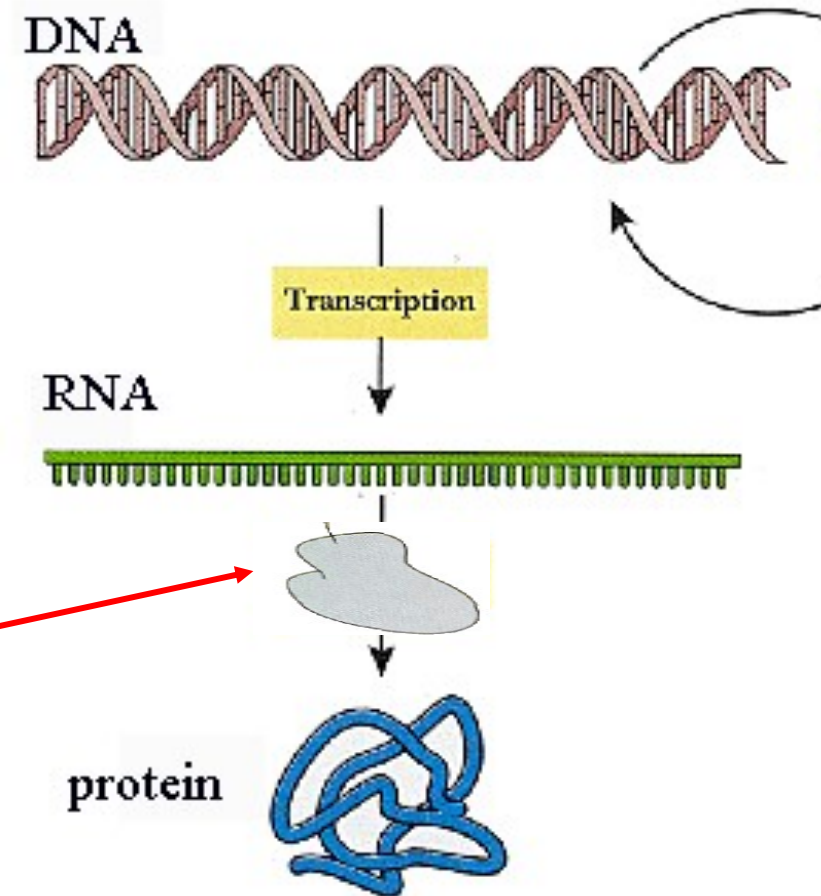
Ribosomes

- Size ~20nm
- Made of two subunits (large and small)
- Composed of RNA and over 30 proteins
- Come in two sizes...80S and 70S
- S units = Sedimentation speed



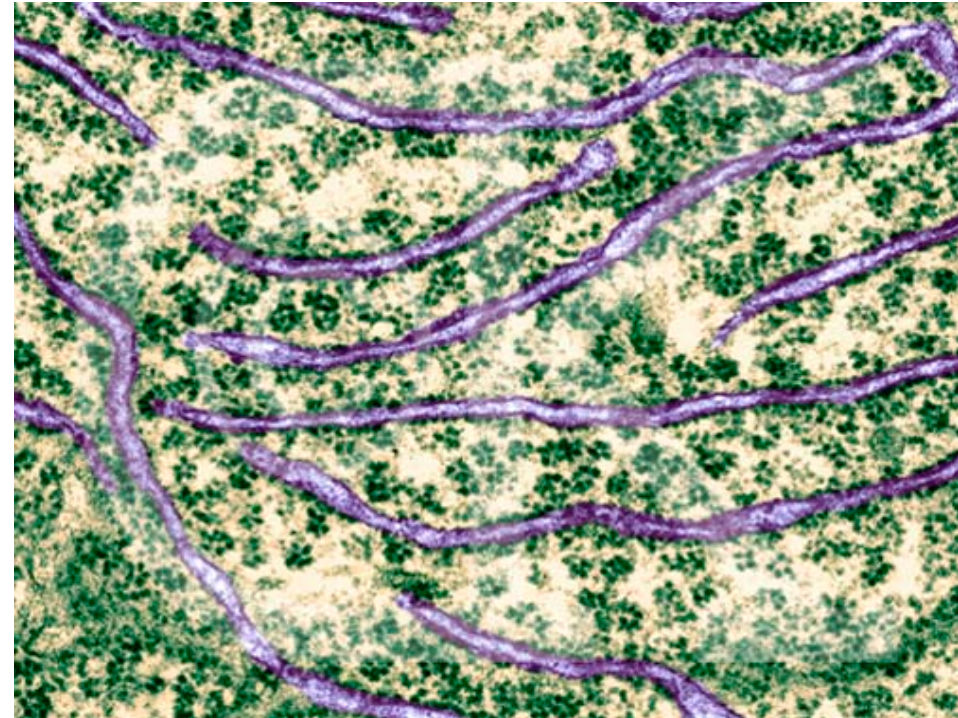
Ribosomes

- DNA --> RNA --> Protein
- The RNA to Protein step (termed translation) is done on cytoplasmic protein/RNA particles termed **ribosomes**.
- Contain the protein synthesis machinery
- Ribosomes bind to RNA and produce protein.



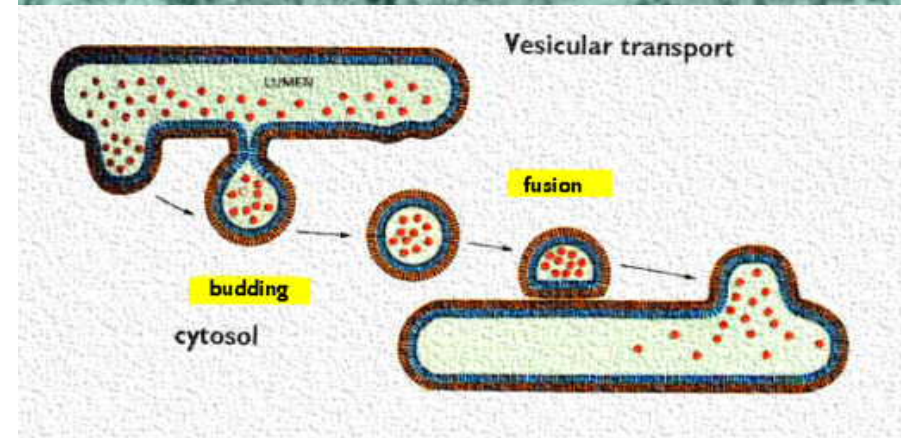
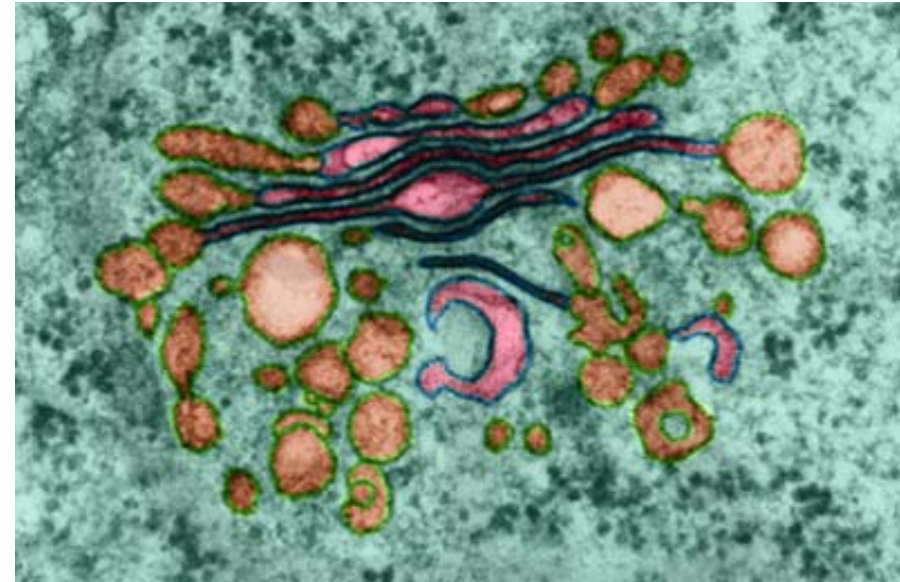
Endoplasmic Reticulum = ER

- Cytoplasm is packed w. membrane system which move molecules about the cell and to outside
- An internal cellular subway system
- Outer sfc of ER may be smooth (SER)
- Or Rough (RER)
- ER functions in lipid and protein synthesis and transport

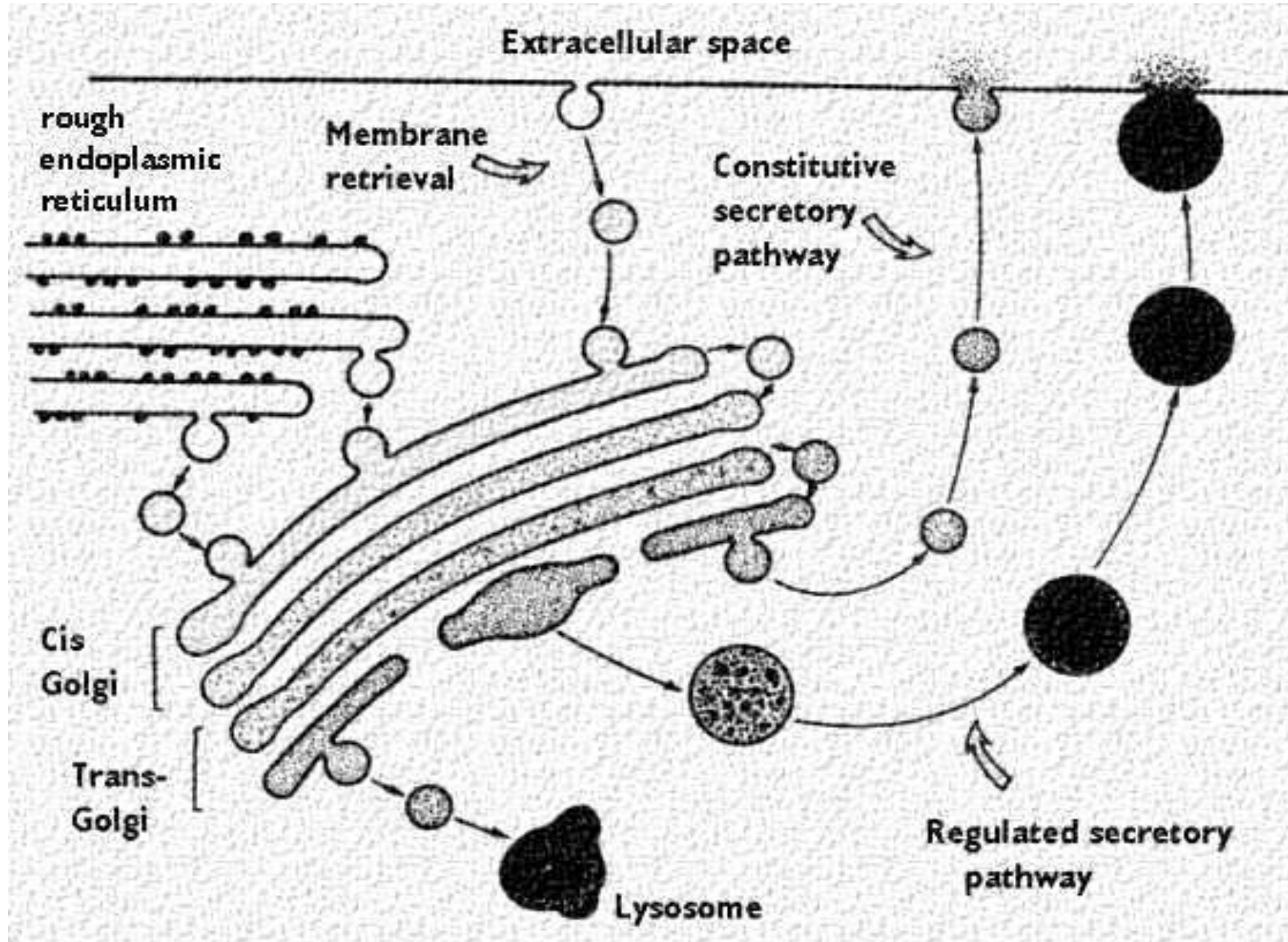


Golgi Complex

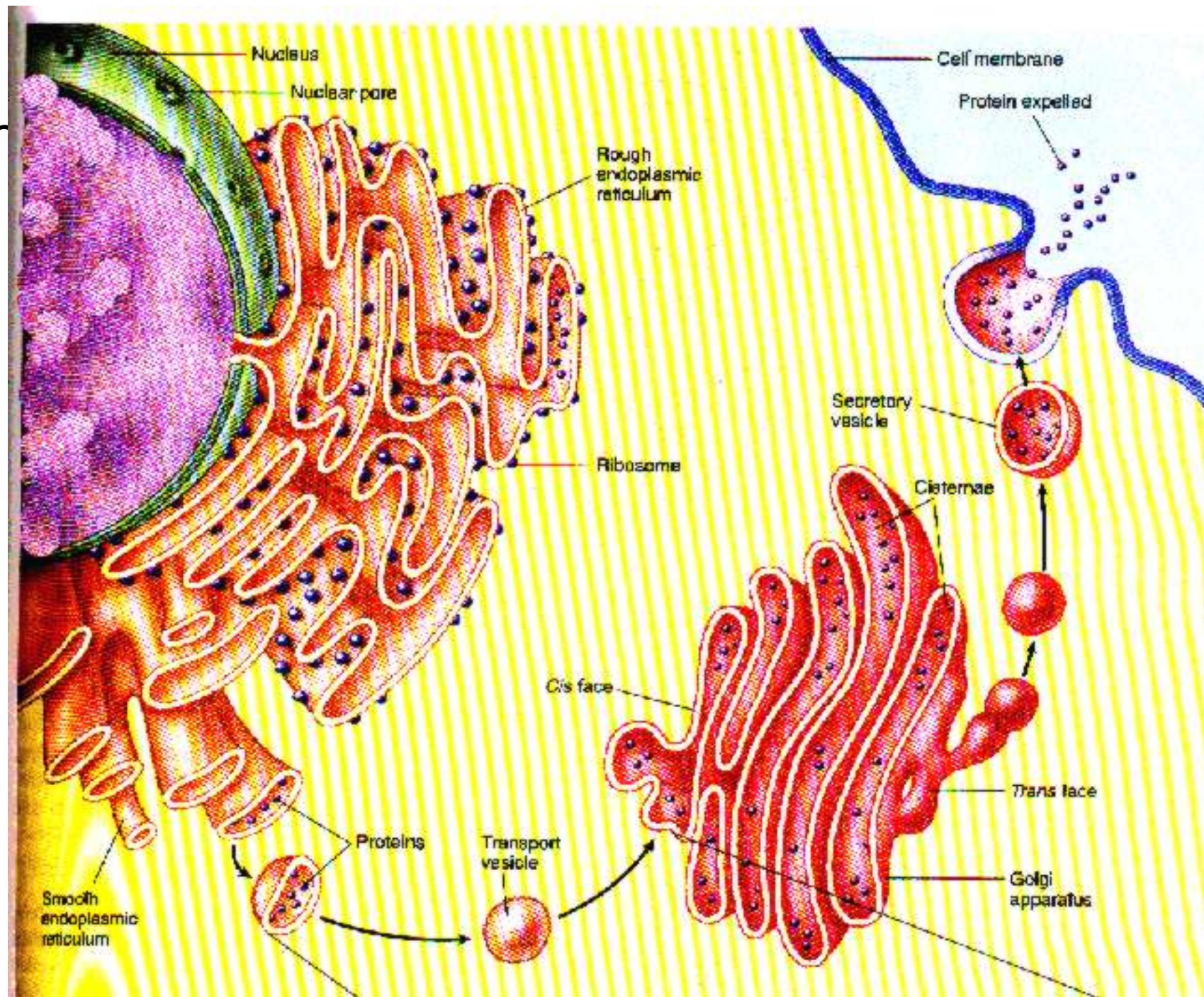
- Stacks of membranes...
- Involved in modifying proteins and lipids into final form...
 - Adds the sugars to make glyco-proteins and glyco-lipids
- Also, makes vesicles to release stuff from cell



ER to Golgi network

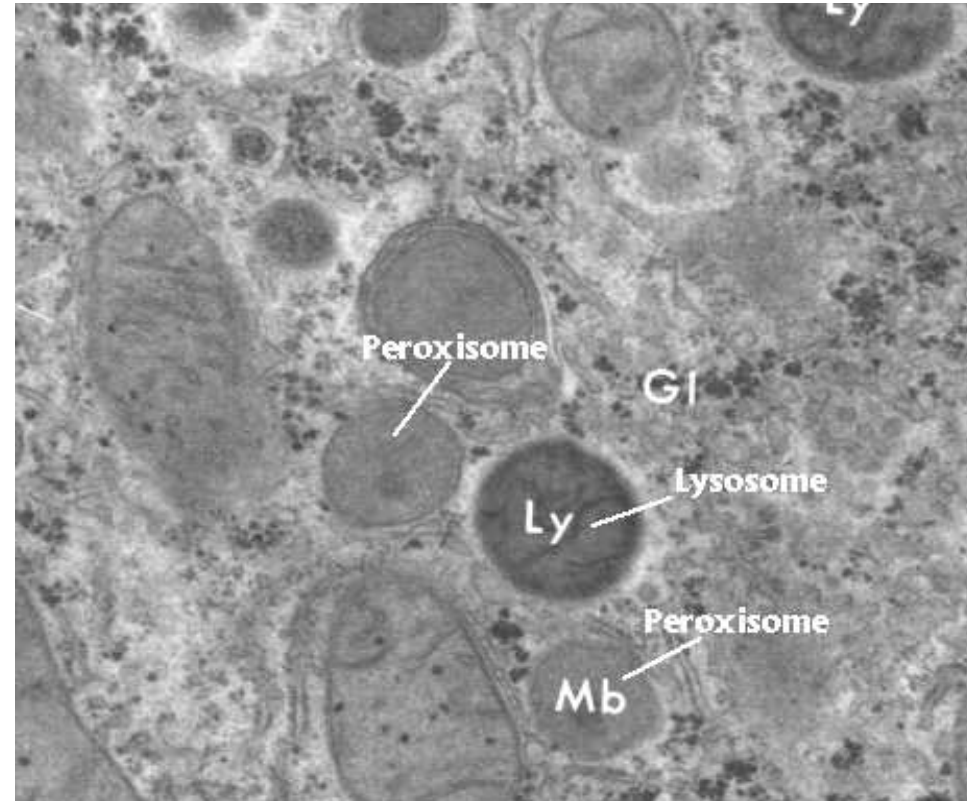


Anim



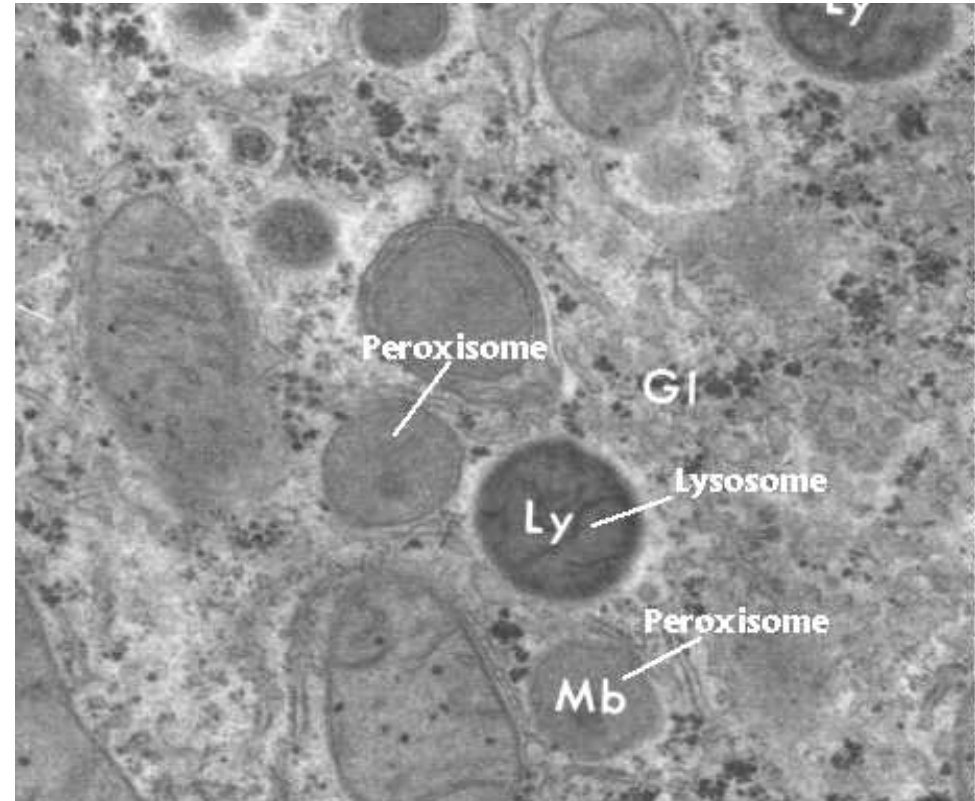
Lysosomes

- important in breaking down bacteria and old cell components
- contains many digestive enzymes
- The ‘garbage disposal’ or ‘recycling unit’ of a cell
- Malfunctioning lysosomes result in some diseases (Tay-Sachs disease)
- Or may self-destruct cell such as in asbestosis



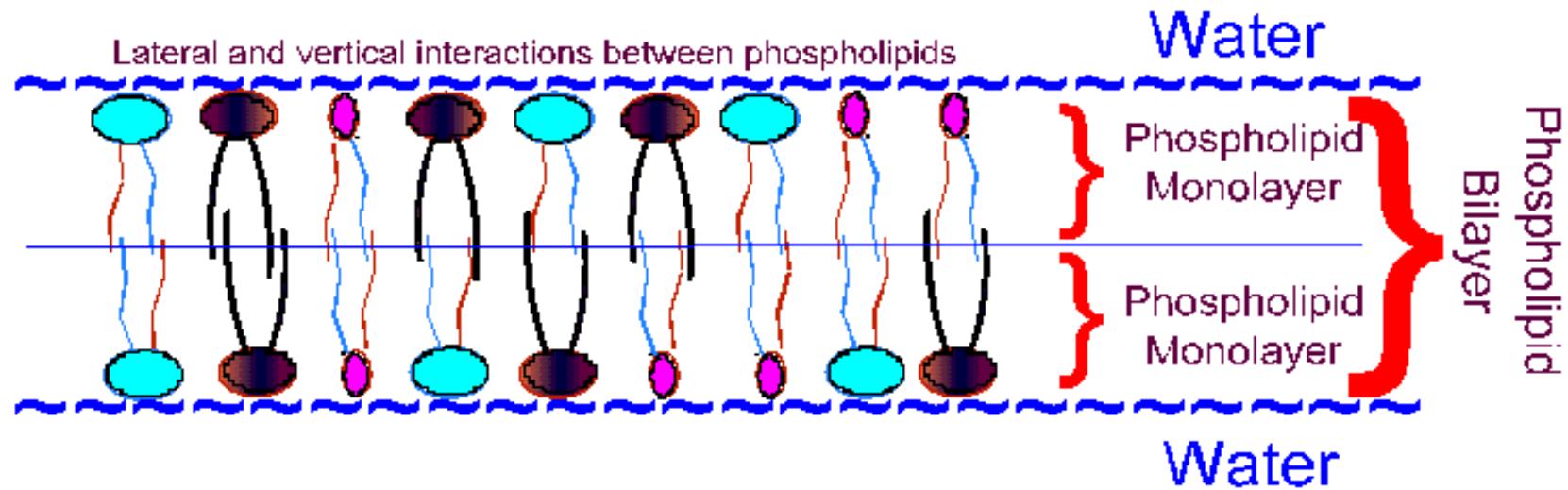
Peroxisome

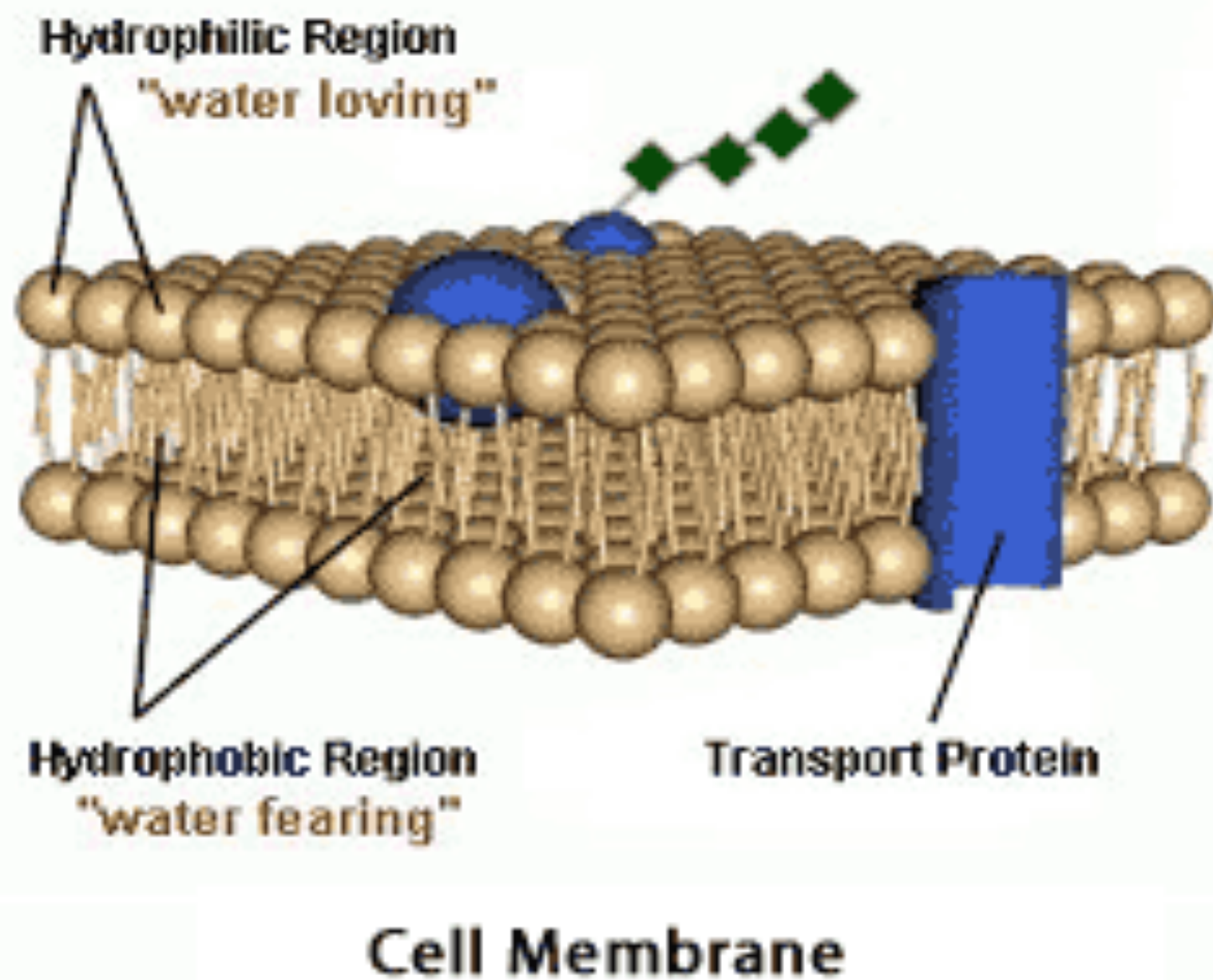
- important in breaking down fatty acids
- Contain catalase
 - Breaks down many substances
 - Release peroxide into the cell
 - Most also contain enzymes that use peroxide to break down other substances



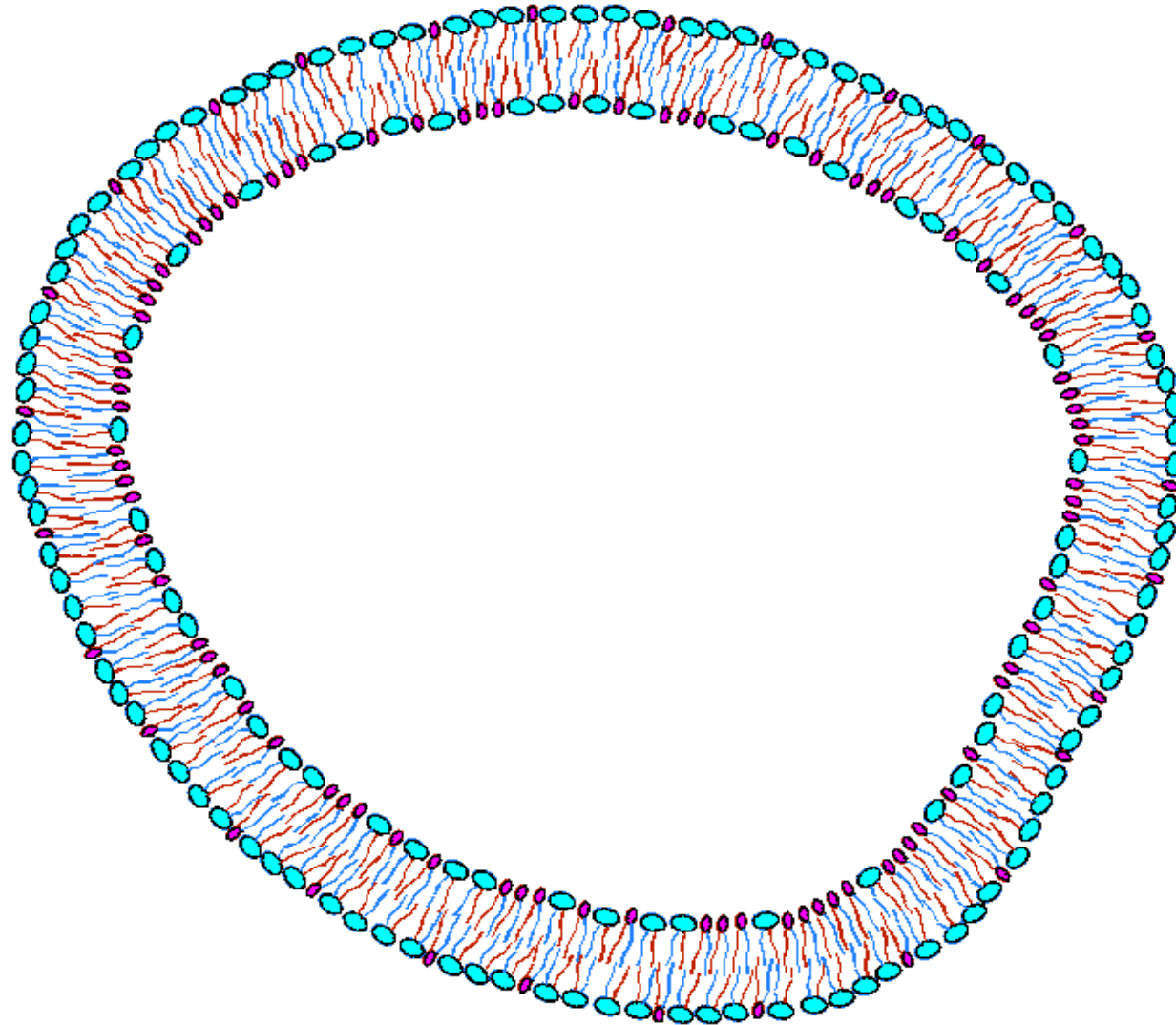
Cell Membrane

- Phospholipid Bilayer



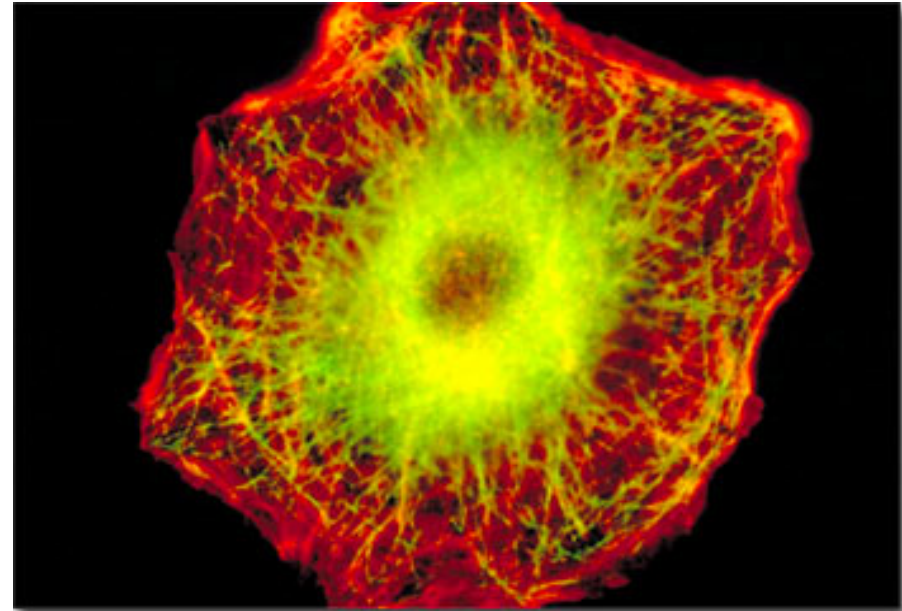


Cell Membrane



Cytoskeleton

- Composed of 3 filamentous proteins:
 - Microtubules
 - Microfilaments
 - Intermediate filaments
- All produce a complex network of structural fibers within cell

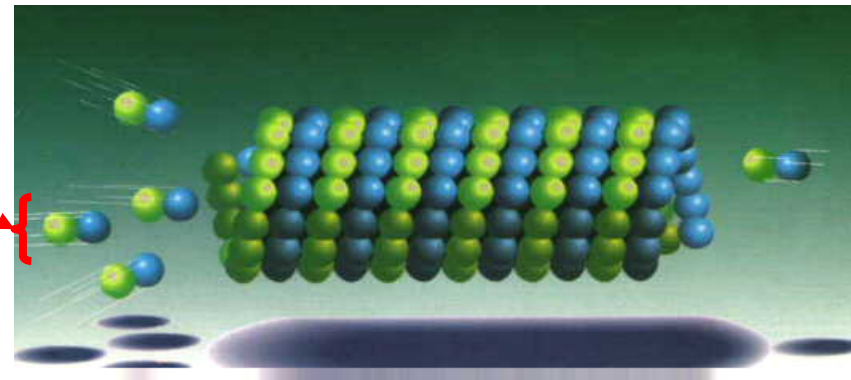
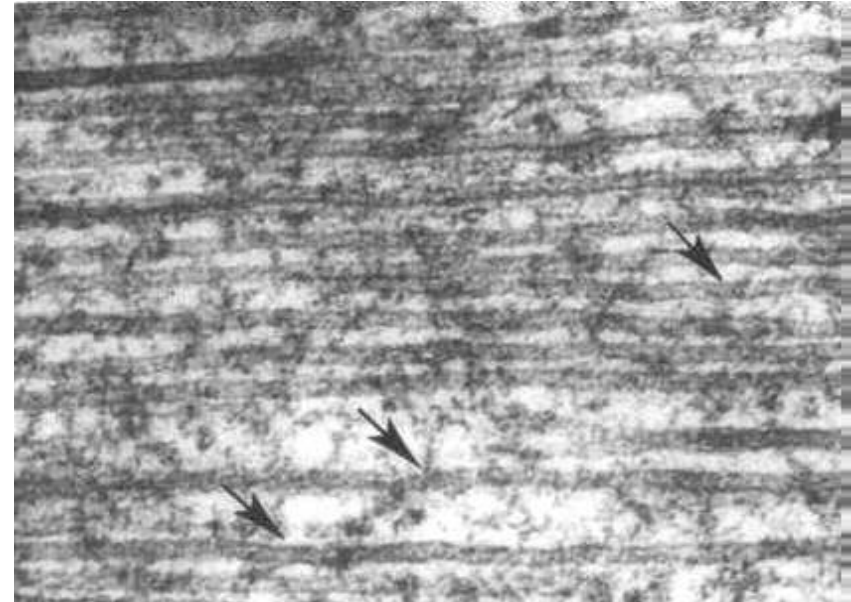


The specimen is human lung cell double-stained to expose microtubules and actin microfilaments using a mixture of FITC and rhodamine-phalloidin. Photo taken with an Olympus microscope.

Animal Cells

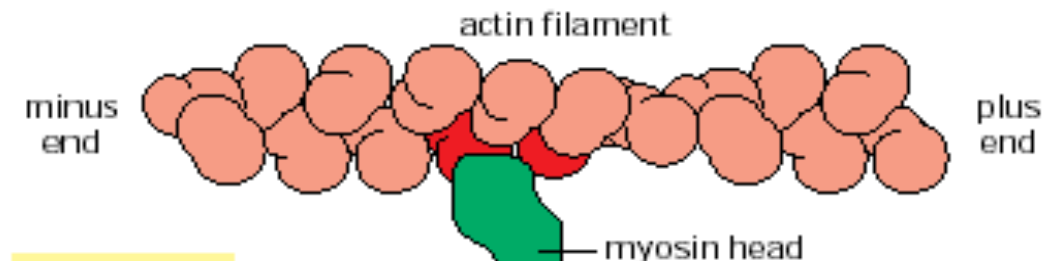
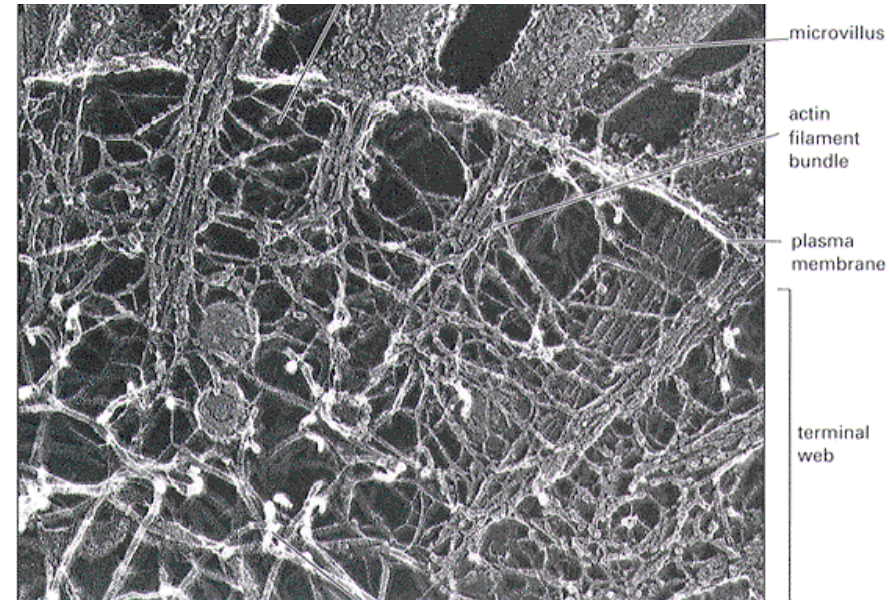
Microtubules

- Universal in eukaryotes
- Involved in cell shape, mitosis, flagellar movement, organelle movement
- Long, rigid, hollow tubes ~25nm wide
- Composed of α and β tubulin (small globular proteins)



Microfilaments

- Thin filaments (7nm diam.) made of the globular protein ***actin***.
- Actin filaments form a helical structure
- Involved in cell movement (contraction, crawling, cell extensions)



Intermediate filaments

- Fibers ~10nm diam.
- Very stable, heterogeneous group
- Examples:

Lamins: hold nucleus shape

Keratin: in epithelial cells

Vimentin: gives structure to connective tissue

Neurofilaments: in nerve cells

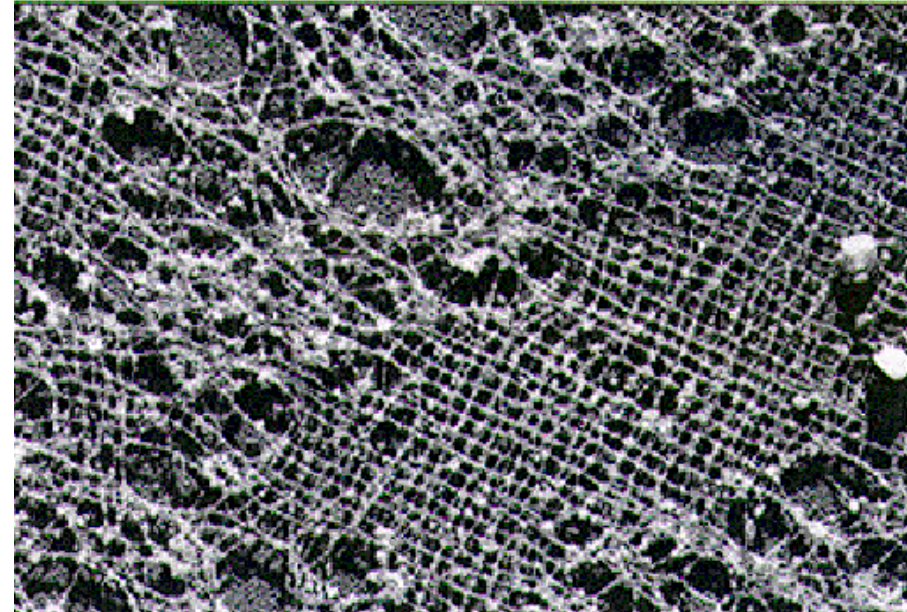
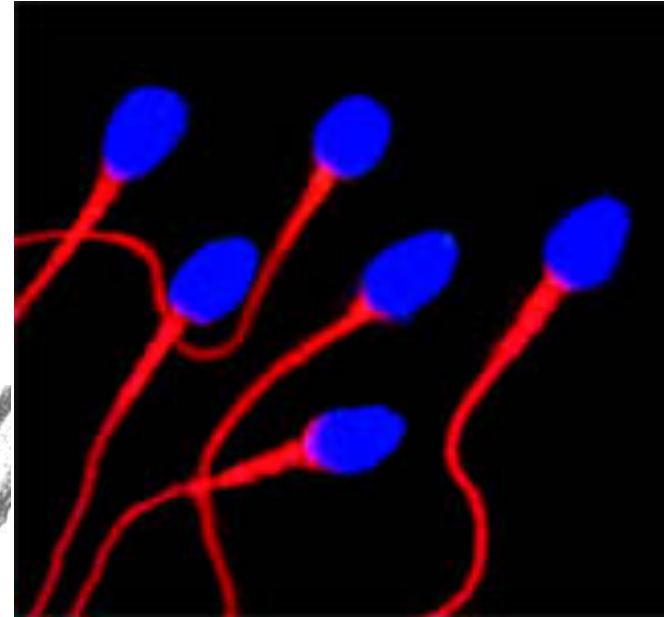
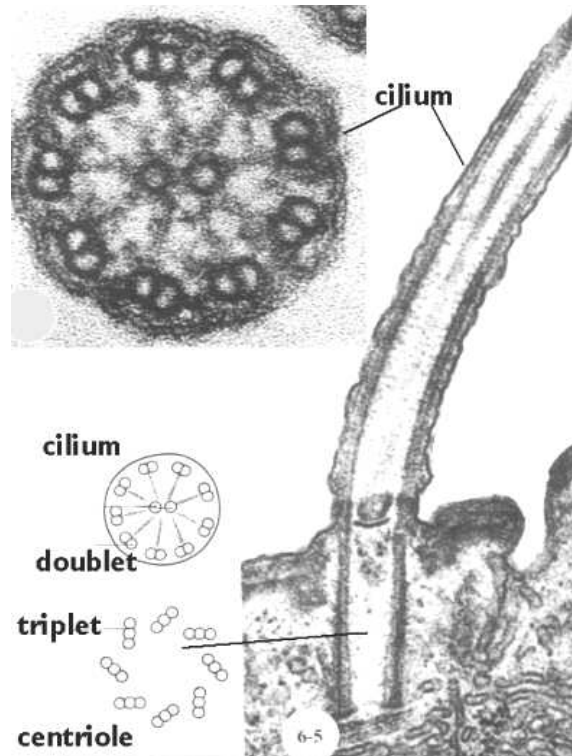


Image of Lamins which reside in the nucleus just under the nuclear envelope

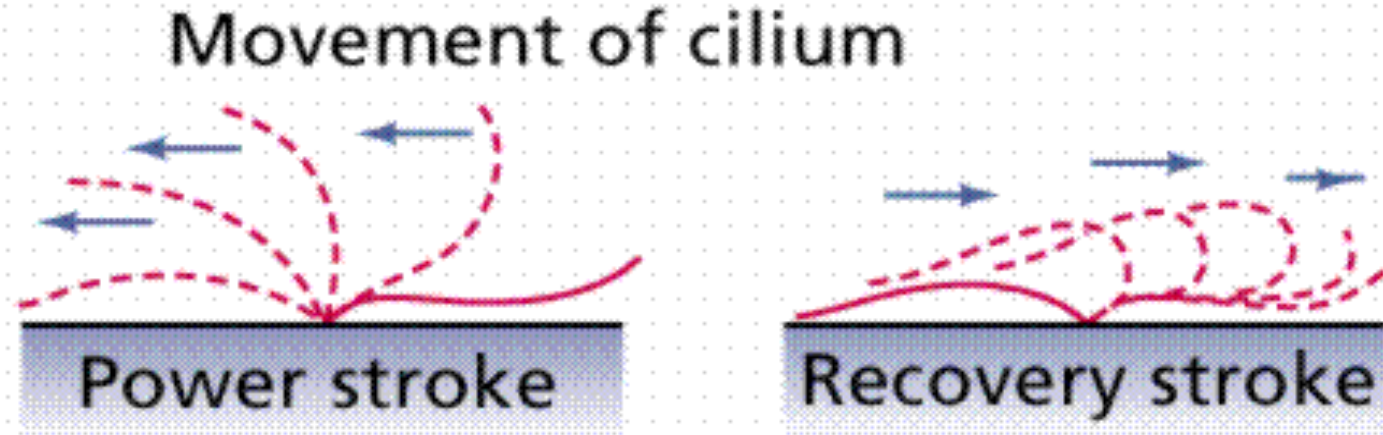
Cell Motility: Flagella & Cilia

- Both cilia & flagella are constructed the same
- In cross section: 9+2 arrangement of microtubules (MT)
- MTs slide against each other to produce movement

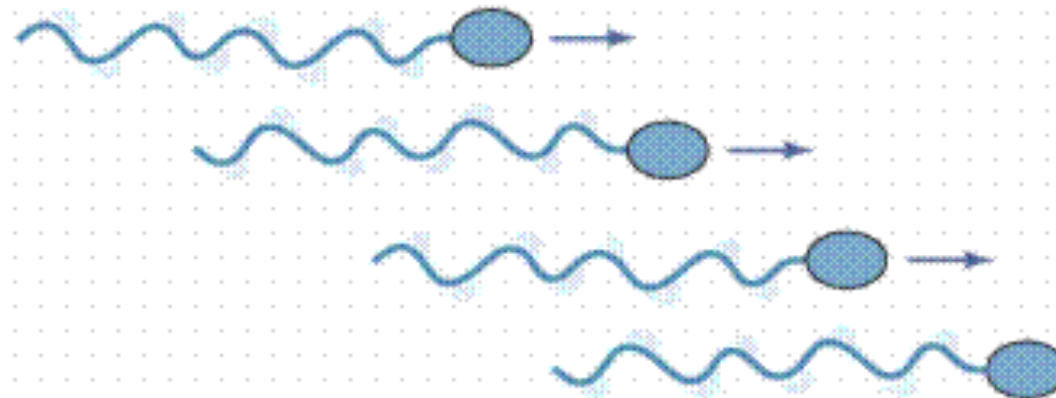


Human Sperm: TOTO-3 iodide for DNA (blue) and Nile red for membrane lipid (red)

How Flagella Move a Cell



Movement of flagellum



Only in Animal Cells: Centrioles



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Centriole & Basal Body (9 + 0 pattern)
A ring of 9 microtubule triplets with
no microtubules in the center.

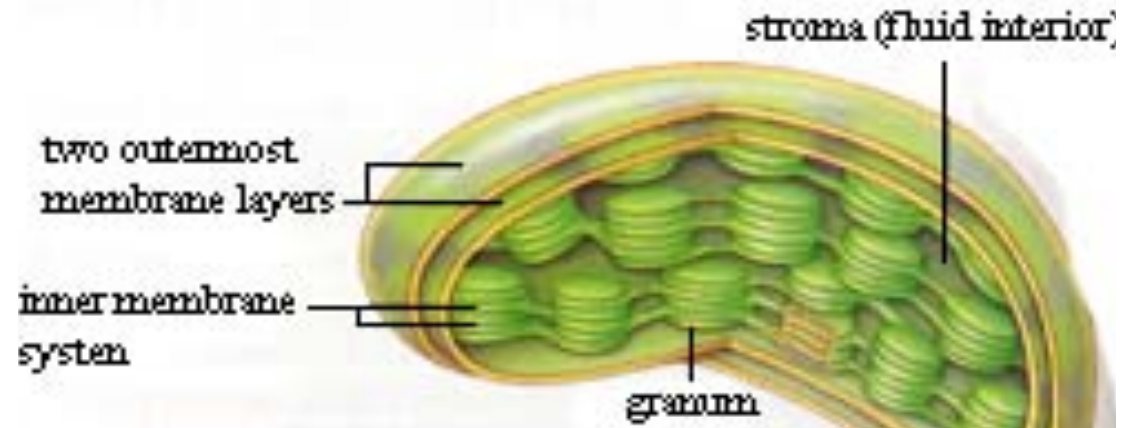
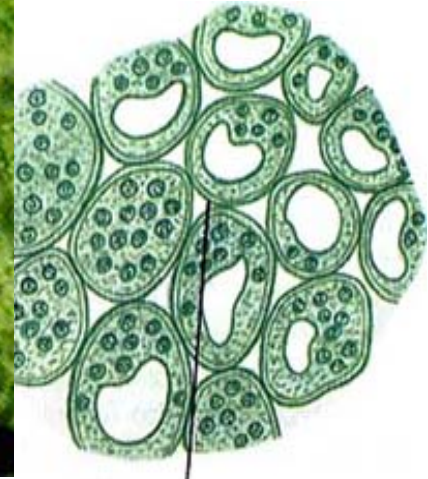
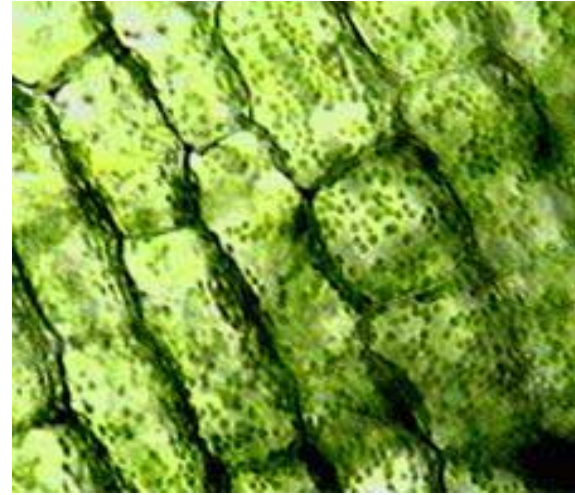
Flagellum & Cilium (9 + 2 pattern)
A ring of 9 microtubule doublets
with 2 microtubules in the center.

**Cross section of centriole and flagellum showing
the distinctive arrangement of the microtubules.**

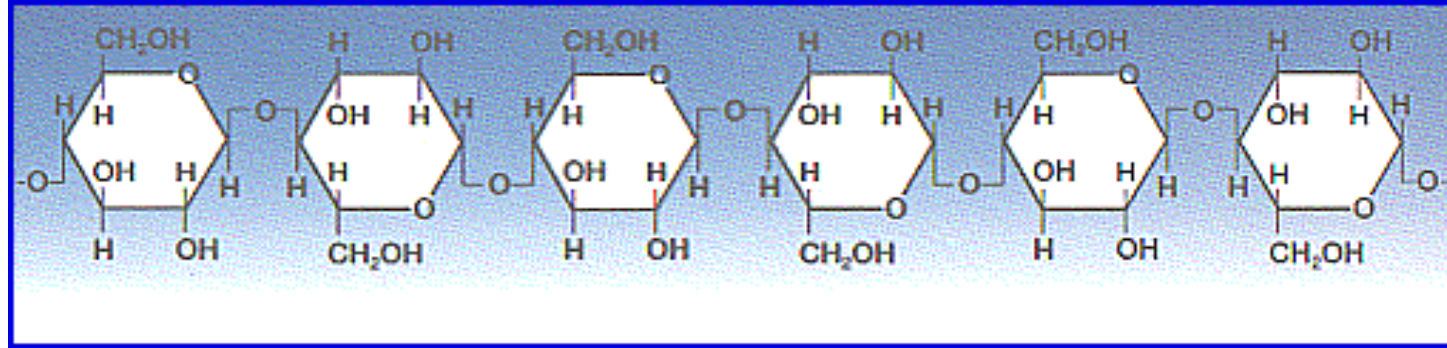
Plant Cells

Chloroplasts

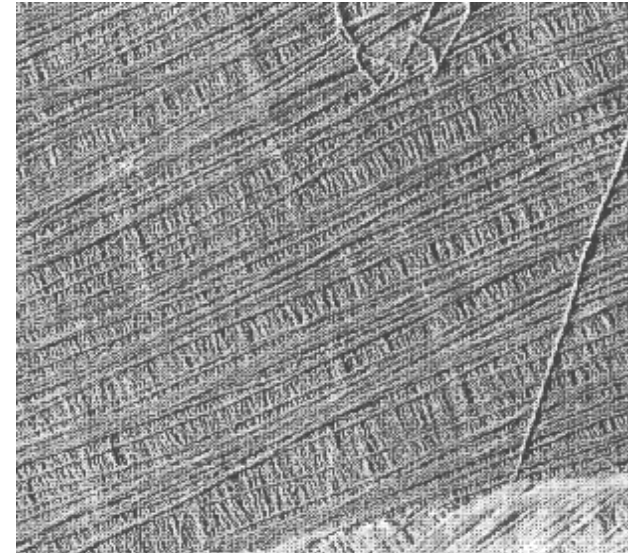
- Found in plants, algae and some bacteria. Responsible for capturing sunlight and converting it to food = photosynthesis.
- Surrounded by 2 membranes
- And...contain DNA



Cell Wall



- Contains cellulose for rigidity
- Function - to support cell



Central Vacuole

- Take up most of the cell's internal space
- Stores enzymes, wastes, anything that needs to be kept separate from the rest of the cell

