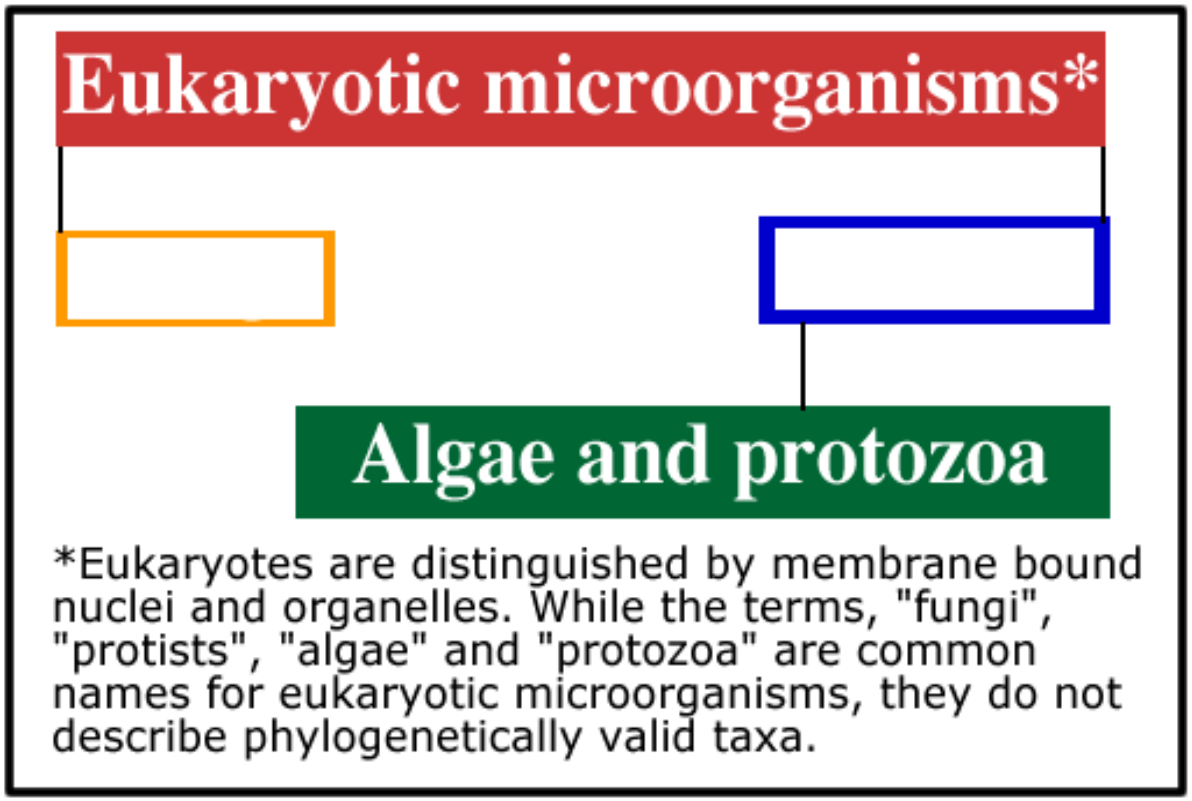
Lecture 4, Chapter 4: Eukaryotic Cell Structure and Function

I. Eukaryotic Variance



II. Structure of the Eukaryotic Cell

A. Cytoskeleton - provides to the cell. Plays a role in movement.

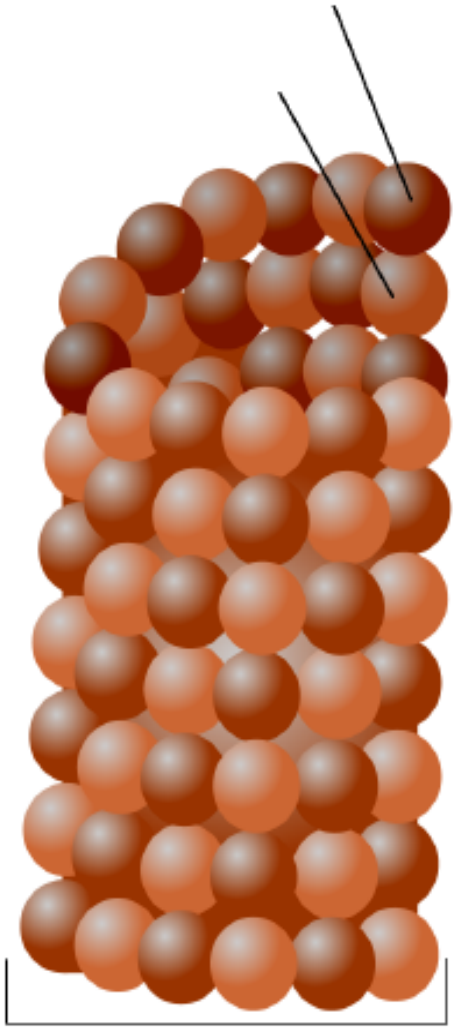
1. Microtubules

a. structural element = composed of a protein called tubulin.

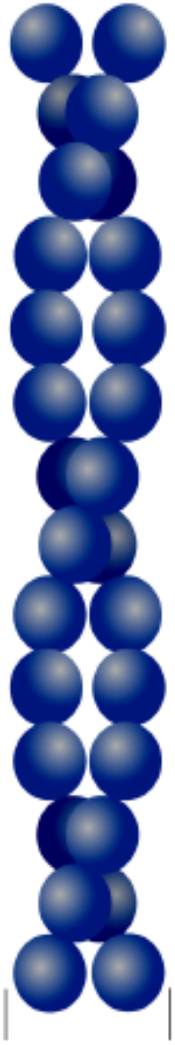
b. Form mitotic spindles and , Support (thin pseudopodia).

c. Form the " " of the cytoplasm = framework along which organelles and vesicles move.

d. Maintain shape.



2. Microfilaments (actin filaments) - structural element - of a protein called actin (involved in).



Video graciously provided by Professor Evelyn Boggs

3. Intermediate Filaments (~10 nm)
   a. Composed of proteins including .
   a. structural element.
   b. Play a strengthening or role.
   c. look like ropes.

B. The nucleus

Nuclear envelope

Nuclear Pore + associated protiens = nuclear pore complex (transport route)

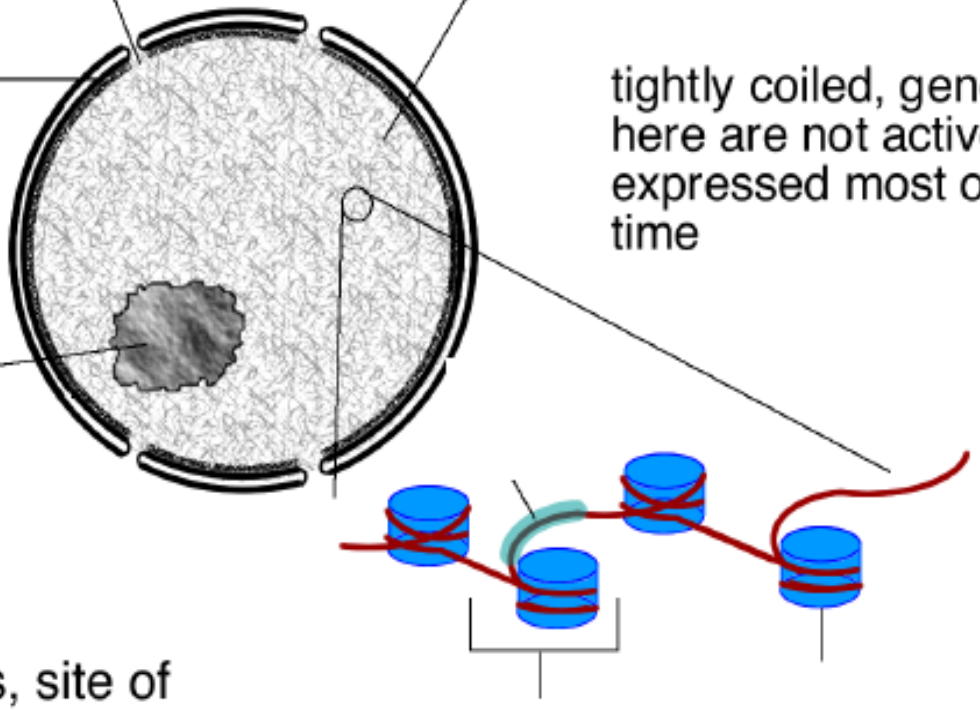
- a network of intermediate filaments that support the nuclear envelope (observed in animal cells)

- distinct but not membrane-bound
- cells may contain from 1 to many
- location of rRNA synthesis, site of partial assembly of ribosomes.

- the complex of DNA and proteins that together form the chromosomes.

- DNA relaxed, genes here are being actively expressed

- tightly coiled, genes here are not actively expressed most of the time



*Note - The nuclear envelope is contiguous with the endoplasmic reticulum in several locations (not shown here).

C. Endoplasmic Reticulum

• membranous sheets (cisternae) • appears because of the ribosomes that coat it • site of synthesis of and proteins that will be - as a ribosome synthesizes a protein, the protein passes in the ER membrane. Within the ER lumen, the protein forms its .	• membranous • appears smooth because there are attached • site of synthesis and degredation • location of storage • site of synthesis of some Phil. Trans. R. Soc. B 12 March 2010 **vol. 365 no. 1541** 831-845
• Vesicles bud off of the ER and transport compounds to the for further modification and sorting. • New ER is synthesized from old	

E. Ribosomes - Eukaryotic ribosomes are ribosomes, composed of a subunit.

F. Golgi Apparatus

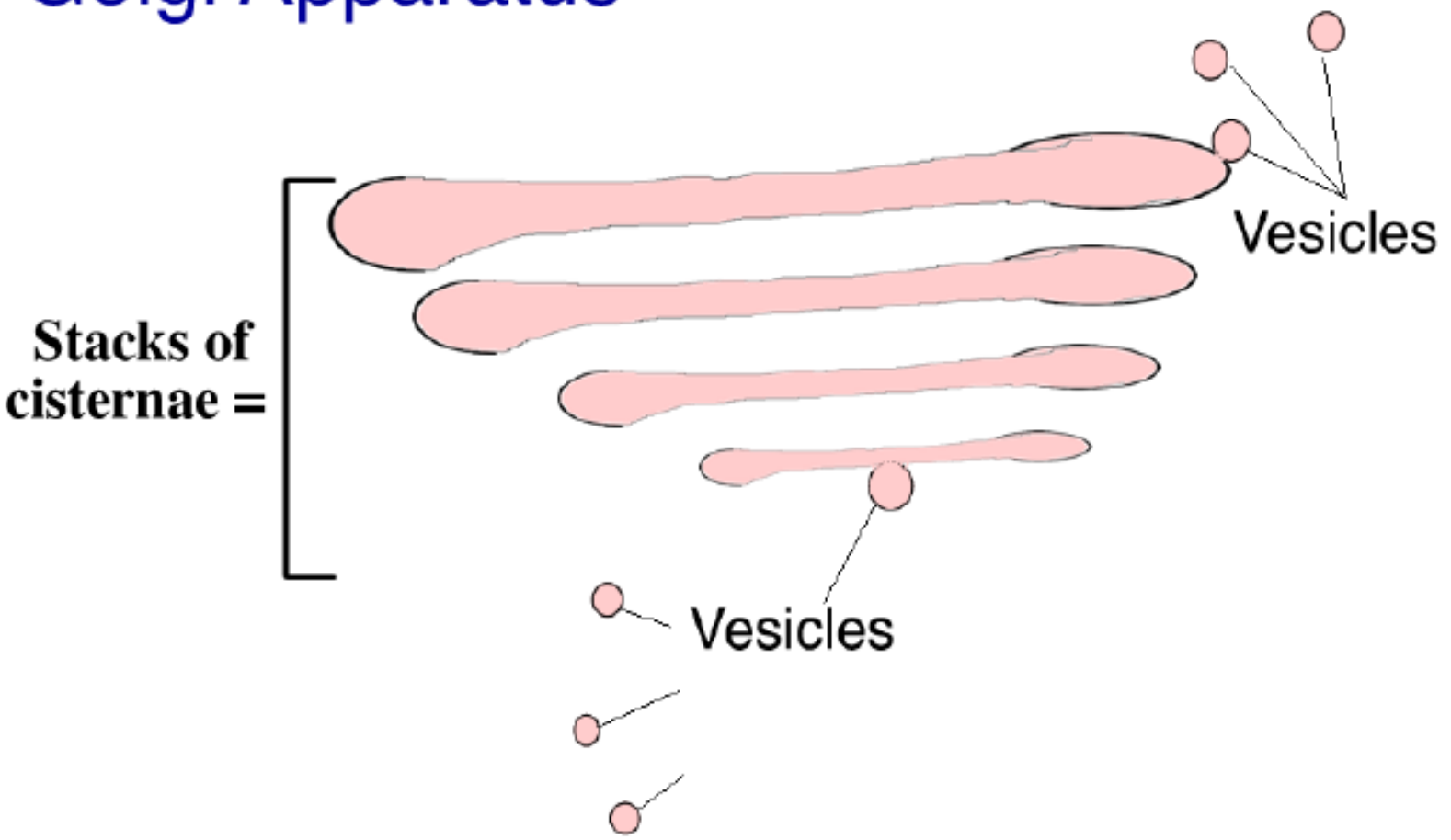
1.

2. Site of modification of molecules from the ER (e.g. groups are added.)

3. Vesicle leave the Golgi targeted for lysosomes, the cell membrane or the outside of the cell ( ).

4. Although this organelle can be observed in most eukaryotic cells, it is in many and ciliate protists.

Golgi Apparatus



Sacs on the cis side from those on the trans side in terms of thickness, enzyme content, degree of vesicle formation...

G. Lysosomes

1. Membrane-bound organelles synthesized from the
2. Found in a of microorganisms (protists and fungi).
3. Approximately spherical, surrounded by a
4. Filled with hydrolytic,
5. Interior is (pH of 3-5).
6. Capable of digesting .*

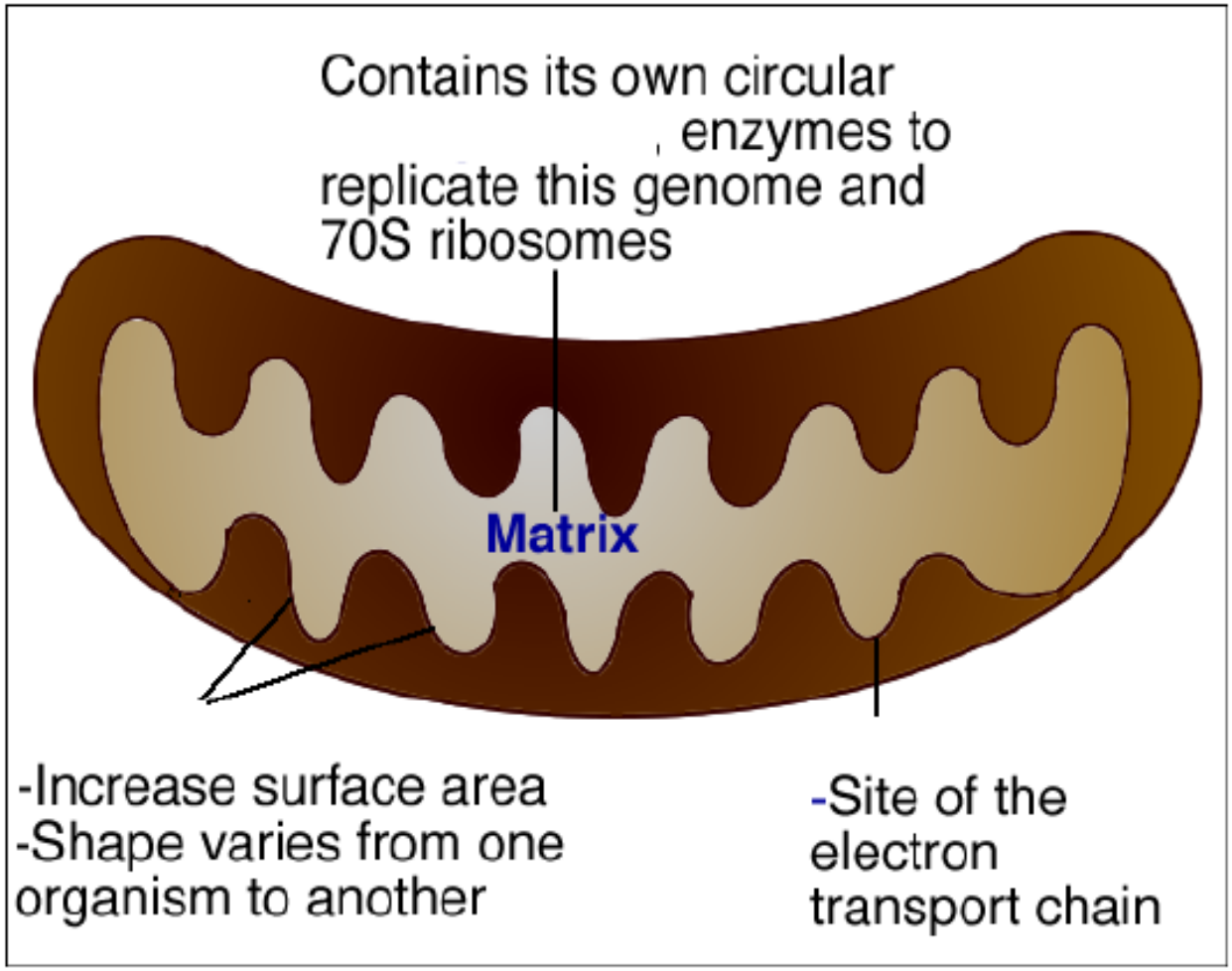
H. Mitochondria

1. Generally long, bean-shaped organelles but from one organism to another (fig. 4.16 (8th ed.) or 5.15 (9th ed.).
2. "Powerhouses" that generate

*Mitochondria are found in

eucaryotic cells. They are approximately the same size as

and reproduce by

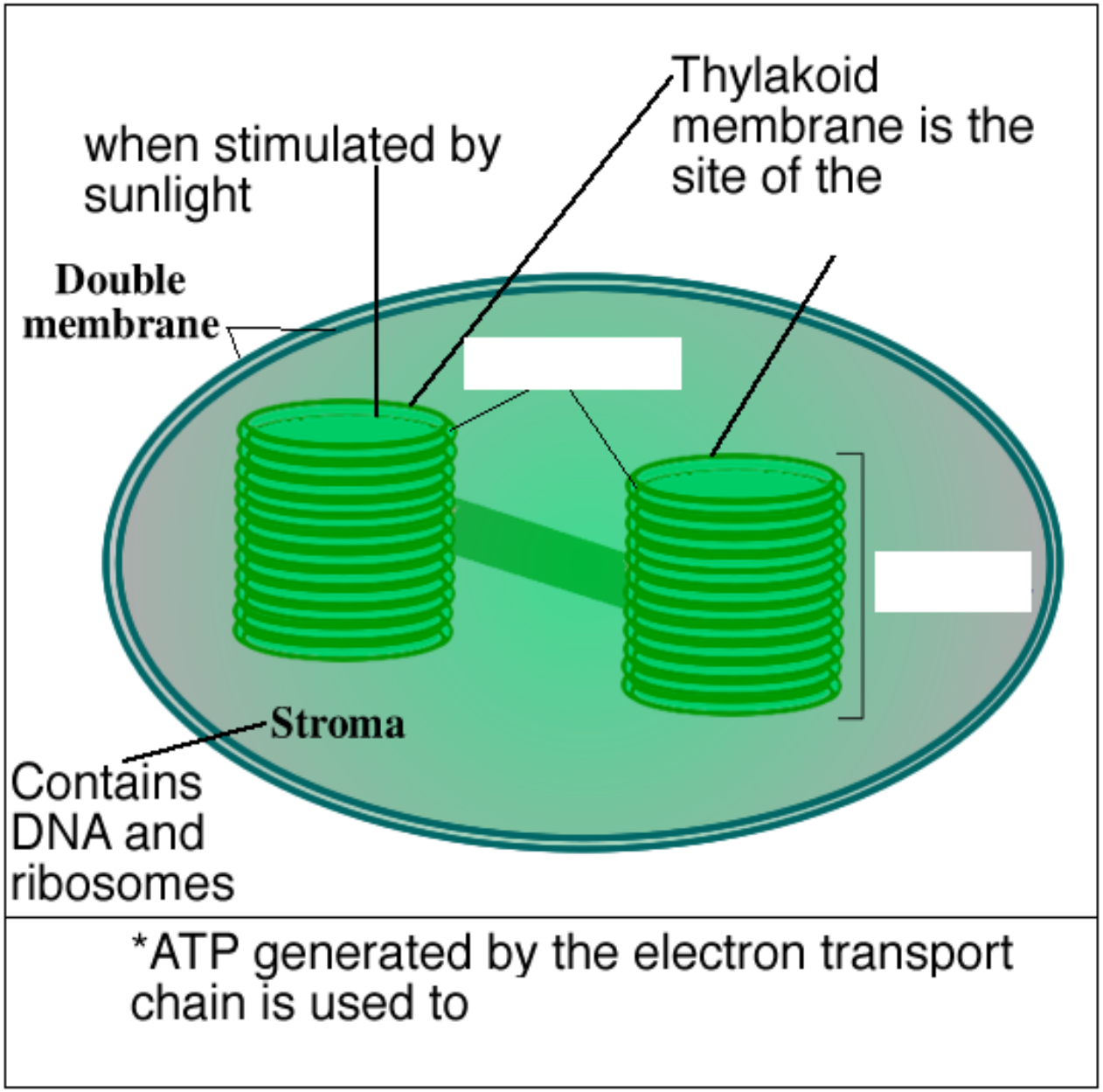


3. Electrons that fuel the electron transport chain come from the

I. Chloroplasts

*Chloroplasts are found exclusively in

. They are also approximately the same size as bacterial cells and reproduce by binary fission.



*ATP generated by the electron transport chain is used to

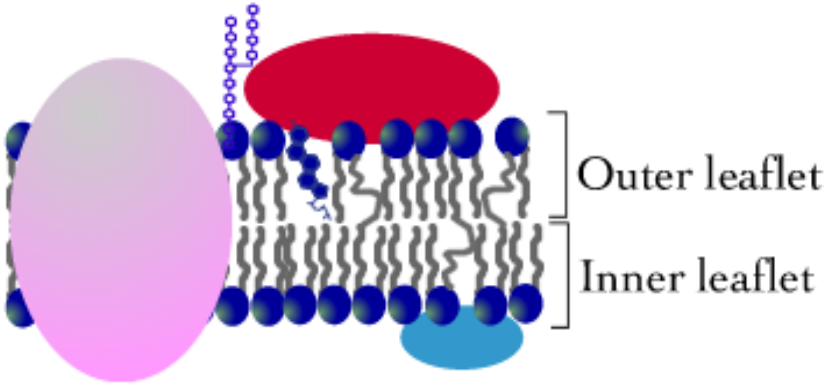
The next two organelles to be discussed (mitochondria and chloroplasts) are thought to have originated in a very interesting way, what is it?

In chloroplasts, the processes of gathering light energy and using that light energy to convert inorganic carbon (CO_2) to an organic carbon source are together called?

J. Plasma membrane

1. Similar in structure and function to that present in prokaryotes.
2. Some differences:

a. Membrane is · lipids and proteins on the inner leaflet are very different from those on the outer leaflet (This is also true for organelle membranes.)



b. Membranes contain . (cholesterol in animal cells) that control membrane fluidity and add strength.

c. Lack the components of the .

d. They contain that function as (cell to cell signalling) as well as

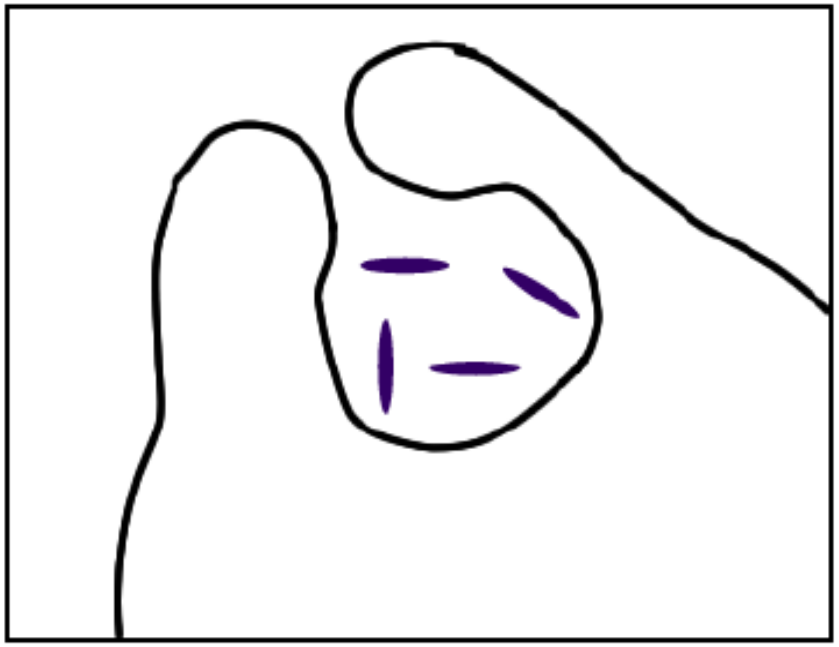
3. Endocytosis

a. from surroundings in a fluid-filled compartment. Larger compartments are called and smaller compartments,

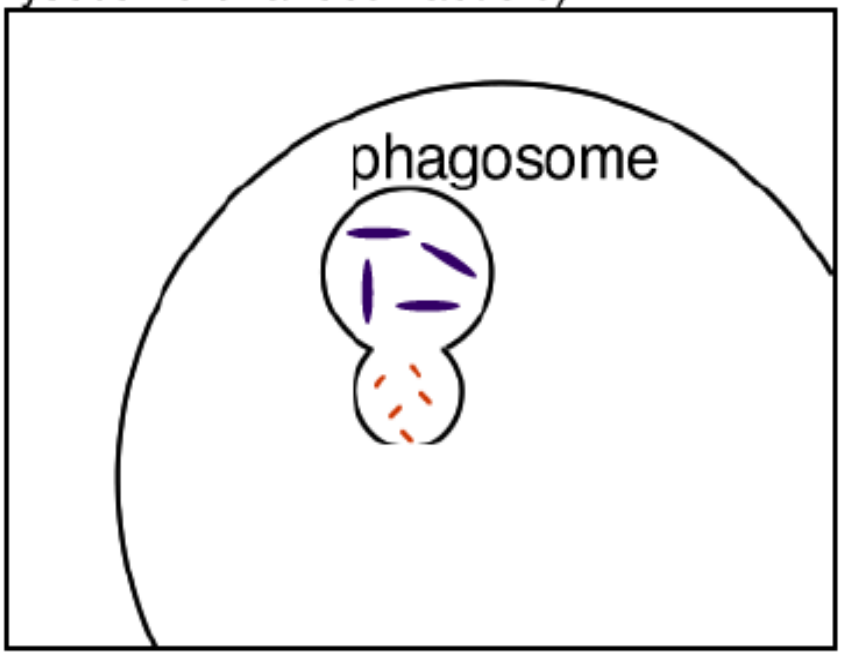
There are two types of endocytosis:

1.)

1. Cell sends out long extensions called These surround large debris or bacteria and form a



2. The phagosome fuses with a lysosome to form a (sometimes also called a secondary lysosome or a food vacuole).



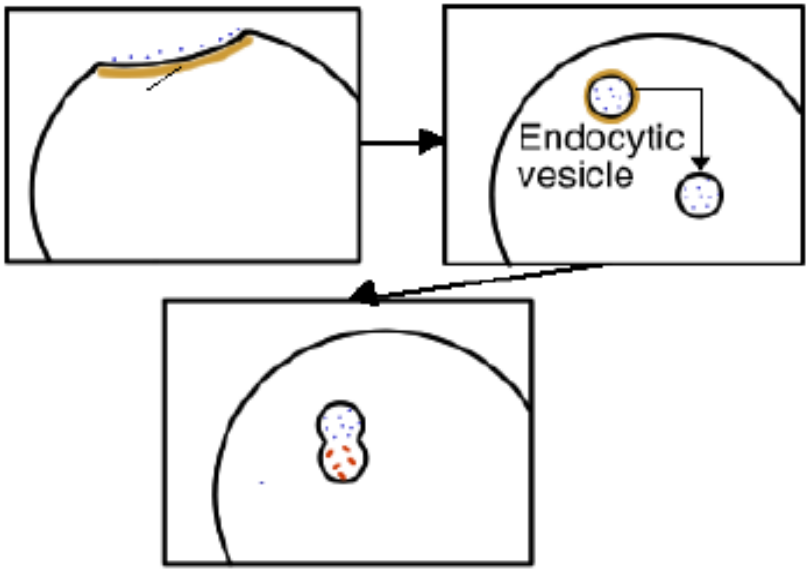
***Note - lysosomes that have accumulated a lot of indigestable material are called**

2.)

Types of pinocytosis

Cell invaginates to form a large fluid-filled vesicle. Process is

A binds to an external receptor of a clathrin-coated pit. A bit of fluid, as well as the bound molecule are taken into the cell.



A piece of membrane is pinched off to form a small invagination that is rich in cholesterol and the protein caveolin. Active in the and other macromolecules. Caveolae and thus toxins, viruses, bacteria and protozoa often enter this way!

4. Exocytosis - membrane vesicles inside the cell fuse with the plasma membrane and their .

K. Flagella and cilia

1. Structures that look like they , but are covered by the cytoplasmic membrane.

2. Composed of that surround two central tubules (Fig. 4.22 (8th) or 5.21 (9th)). This is called the

3. Flagella function in by wave-like movement.

a. If waves travel from the base of the flagellum to the tip, the cell is along.

b. If waves travel from tip to base, the cell is through the medium.

c. Sometimes a flagellum has lateral hairs called . These filaments cause a base to tip wave to pull instead of push the cell (Fig. 4.20 (8th) or 5.19 (9th)).

4. Cilia are much than flagella and function in cell motion or may move surrounding material along the cell.

a. Cilia move in two phases:

1.) - cilium moves through the fluid like an oar pushing the microorganism forward.

2.) - cilium bends and repositions itself for the next effective stroke.

b. At any time, some cilia are performing an effective stroke and others are in a recovery stroke.

**Summarize the differences between prokaryotic and eukaryotic cells.*