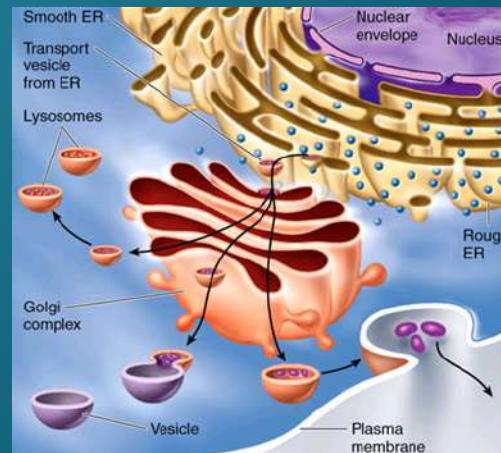




The Endomembrane System

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Ms. Julien

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Periods 1 and 2

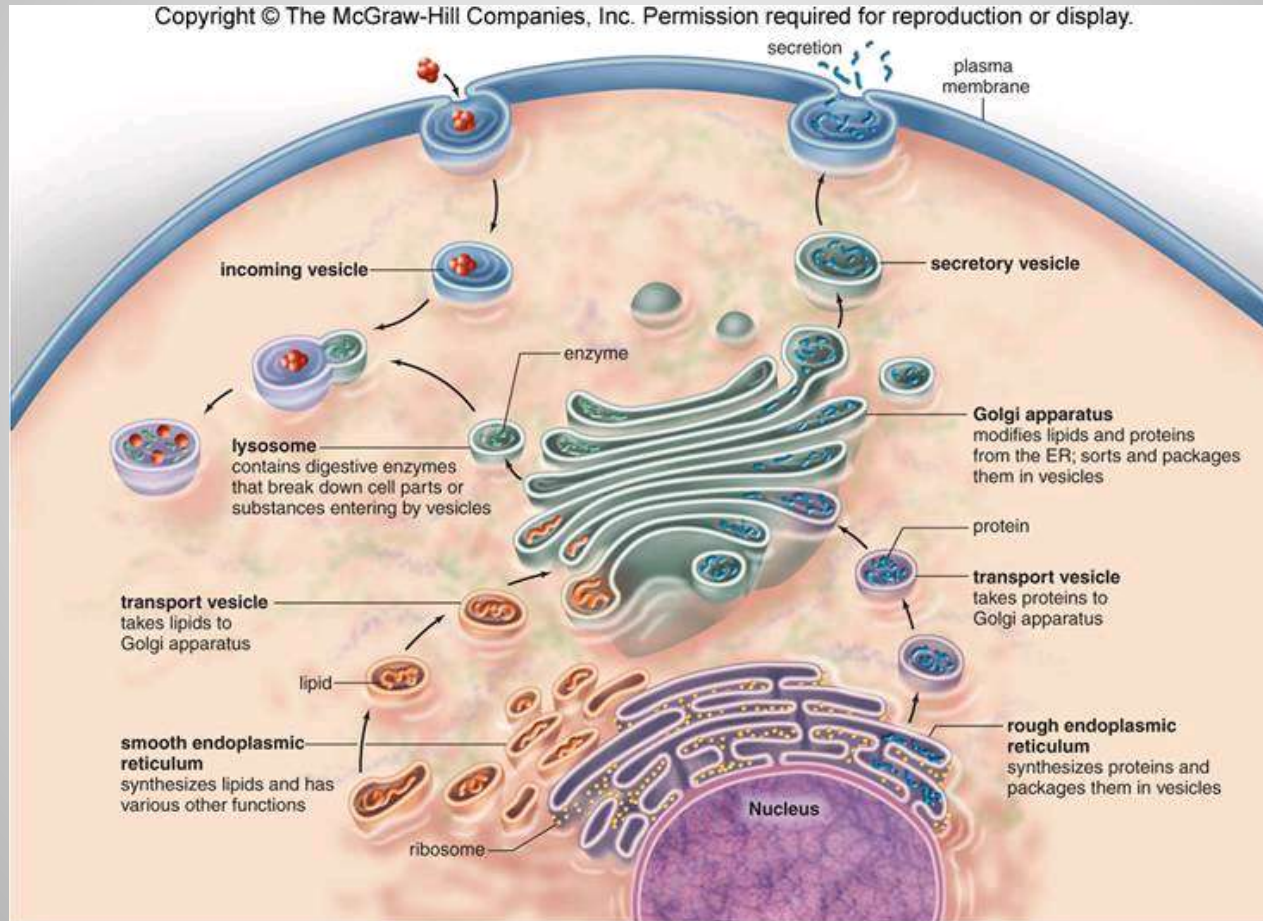


Overview

- Consists of the nuclear envelope, smooth and rough endoplasmic reticulum, golgi complex, and lysosomes
- Produces macromolecules, like proteins and lipids
- Responsible for compartmentalizing the cell so the enzymes and chemical reactions are restricted to certain regions
- Communicate using signaling sequences and vesicles

The Endomembrane System

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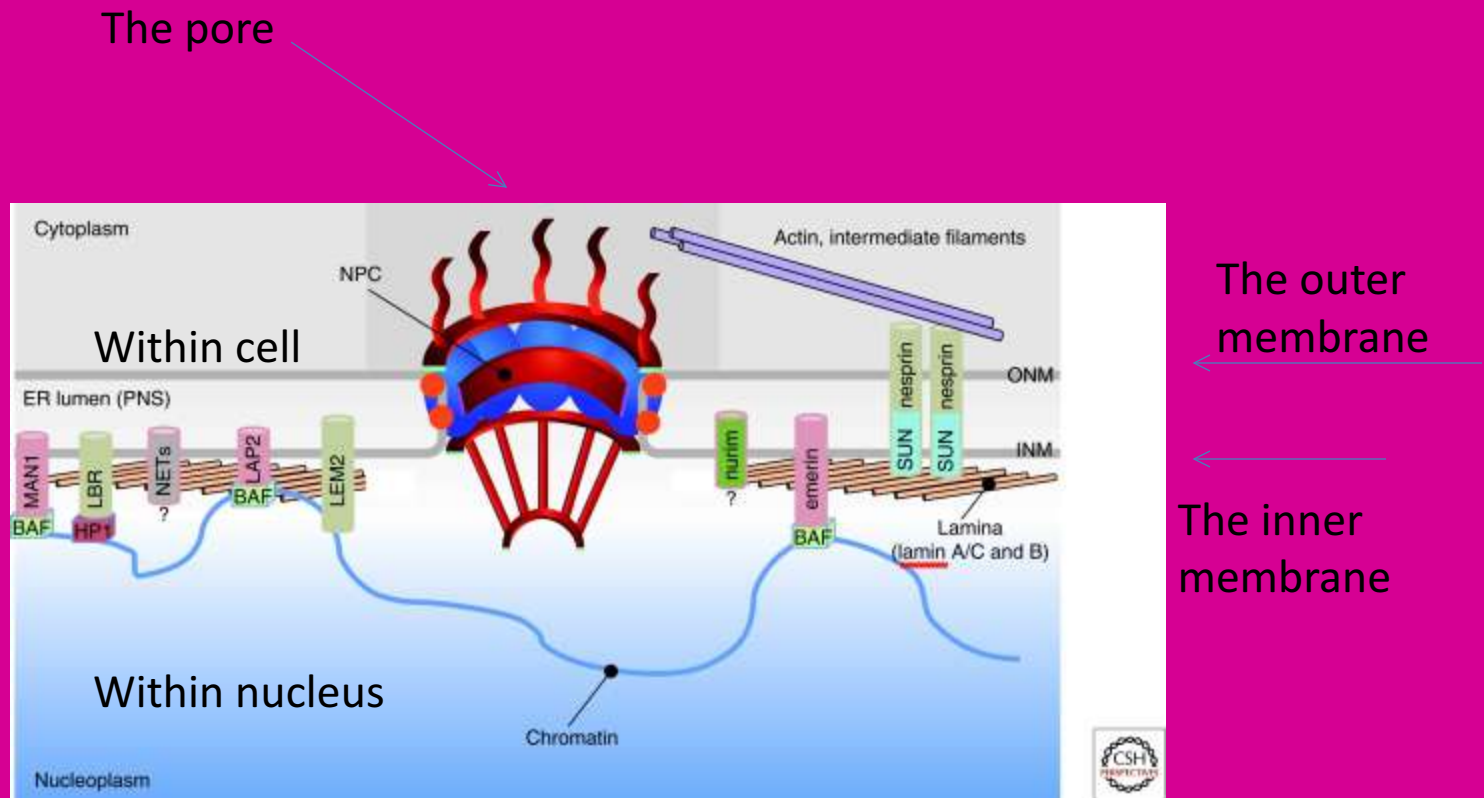
The Nuclear Envelope

Stevie Pabst

About the Nuclear Envelope

- The nuclear envelope encases the nucleus
- Has a double membrane (see next slide!)
- The pores in the nuclear envelope regulate proteins and RNA entering and leaving the cell.
- Water and molecules such as ATP are allowed to pass freely.

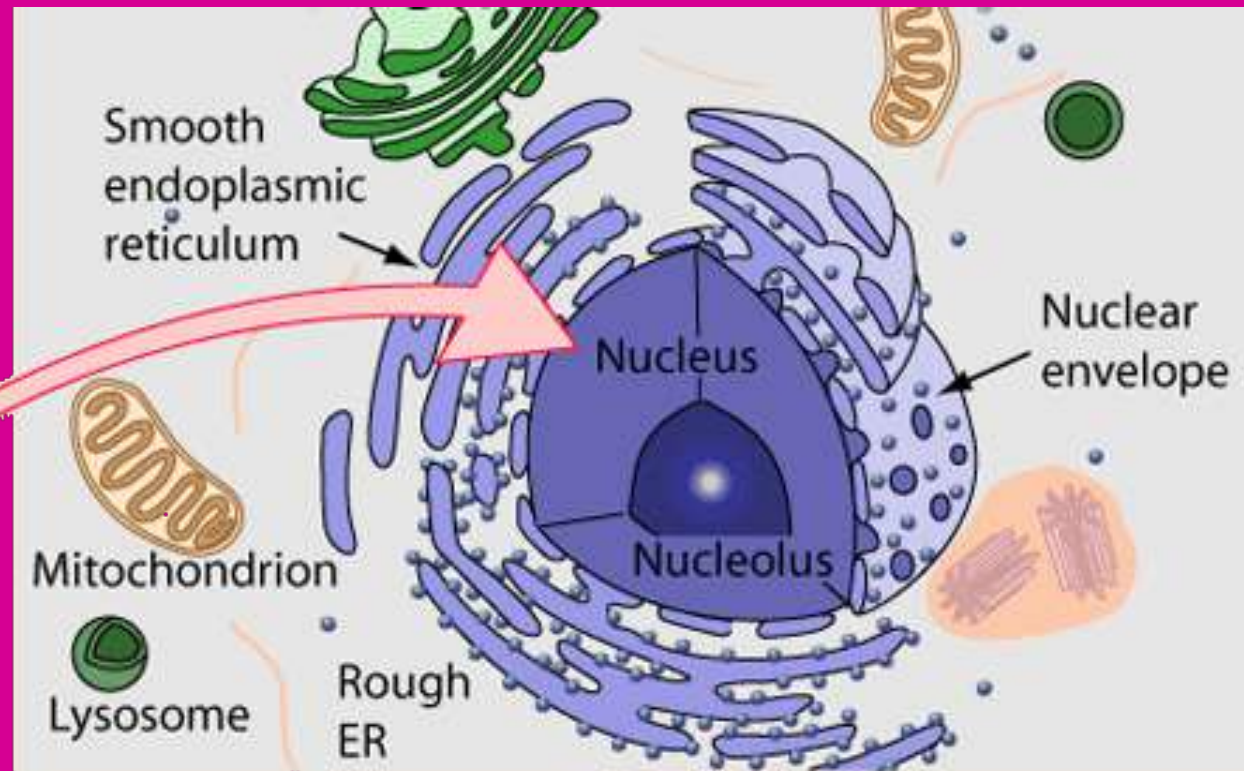
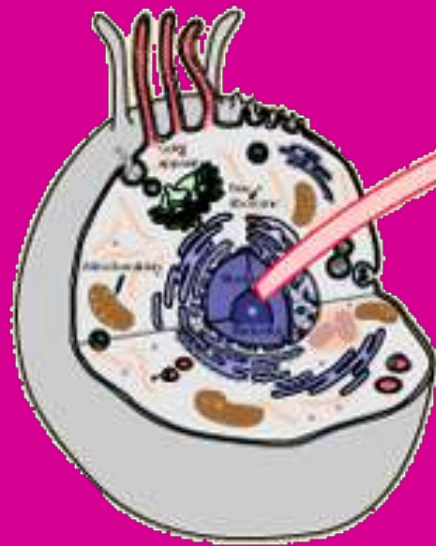
The double membrane of the nuclear envelope



Type of cells

- Nuclear envelopes are found in all cells that have a nucleus. This means that they are found in eukaryotic cells: animal, plant, protist, and fungi cells. They are not found in the prokaryotes because prokaryotes do not have a nucleus.

The nuclear envelope!



What happens if the nuclear envelope malfunctions? 😞

- Laminopathies are diseases that are caused by defects in the nuclear envelope, which result in the mutation of genes responsible for encoding proteins. These diseases include...
 - Cardiovascular problems, such as atherosclerosis (hardening of the arteries)
 - Muscular dystrophy: muscle weakening
 - Lipodystrophy: incorrect or disproportionate storage of body fat
 - Progeria: premature aging
 - Diabetes: imbalance of blood glucose caused by insulin deficiency or the desensitizing of insulin receptors

The nuclear envelope is similar to...

An airport security gate at an airport.



Security Gate Analogy

- 1. Security checkpoints regulate entrance into an airport, just as the nuclear envelope regulates entry into the nucleus
- 2. Security gates can permit the entry of passengers, just as nuclear pores can permit the entry of certain molecules
- 3. The nuclear envelope is a double lipid bilayer. This means that molecules must pass through two membranes, just as airport passengers may have to pass through multiple security checkpoints

How the nuclear envelope works with other parts of the cell

- The nuclear envelope separates the cytoplasm from the nucleus, yet allows the nucleus to communicate with the cytoplasm.
- The nuclear envelope disintegrates during mitosis (cell division.) As a result, the chromosomes are freed in the cytoplasm.
- The nuclear envelope has nuclear pores, which allow ribosomal units, mRNA, and proteins to pass between the nucleus and cytoplasm

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Rough Endoplasmic Reticulum

Kathryn Fetherolf

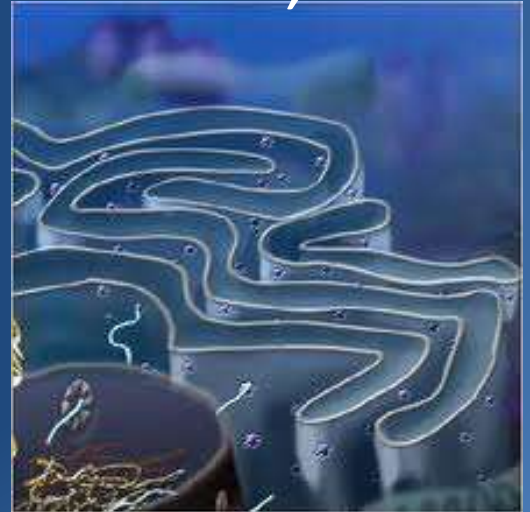
Rough Endoplasmic Reticulum

- The rough ER has the capacity to produce proteins inside its lumen.
- The rough ER contains enzymes that can add carbohydrates (sugar) chains to protein called glycoproteins.
- While in the ER, proteins fold and take on their 3-D shape



Rough Endoplasmic Reticulum

- The rough ER is studded with ribosomes and it synthesizes protein.
- It is found in eukaryotic plant, fungi and animal cells
- If it malfunctions it can cause Alzheimer's, heart disease, and diabetes



Relationship with other Organelles

- Passes proteins on to the Golgi Apparatus
- Connected to the Smooth ER and Nuclear Membrane
- Uses Vesicles to transport proteins



Rough ER or KFC?



- The rough ER could be compared to a busy KFC.
 - In a KFC, cooks make the chicken just like the rough endoplasmic reticulum synthesizes proteins
 - You also have the people who box the food to store it just as the rough ER stores proteins.
 - And you have people who hand the box out to the customer just as the ER sends out its protein.



SMOOTH ENDOPLASMIC RETICULUM

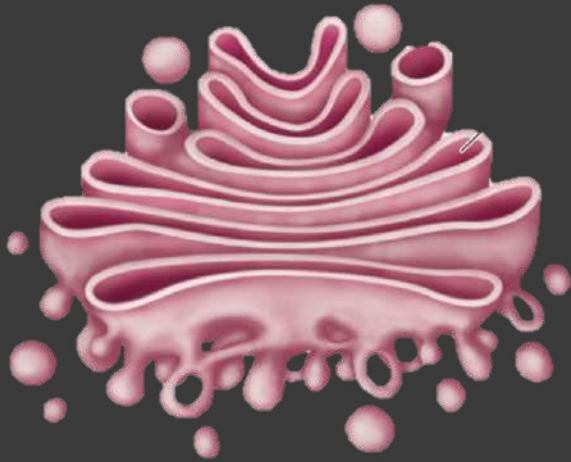
KAYLEE POOLE

Function:

- Produces lipids
- Helps move different products to their proper locations.
- Works with mitochondria to produce steroid hormones.
- Provides storage for enzymes and calcium.
- Detoxifies substances

Types of Cells: Found in eukaryote, plant, animal and fungi cells.

Analogy:



Smooth ER

is similar to a

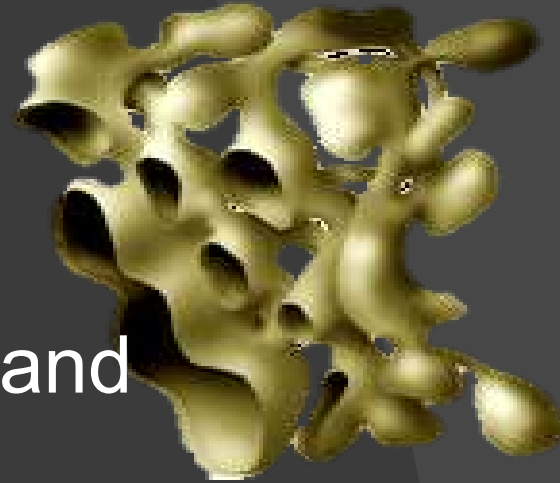


Restaurant

1. Restaurants make desserts and smooth ER makes lipids or fats.
2. Smooth ER helps move different products around the cell which is similar to a waiter bring food to different tables within a restaurant.
3. Restaurants store their food in freezers, like smooth ER stores enzymes.

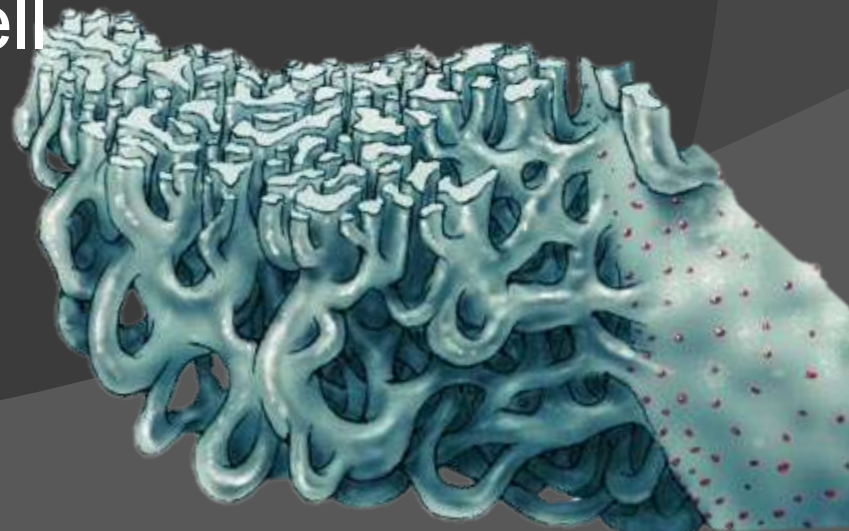
Diseases:

- ① *Alzheimer's*: A form of dementia and causes impaired memory.
- ① *Heart Disease*: Medical condition the impairs the heart from functioning.
- ① *Diabetes*: A disease in which a person contains high blood sugar due to inadequate amounts of insulin or the person's blood cells do not react to insulin properly.

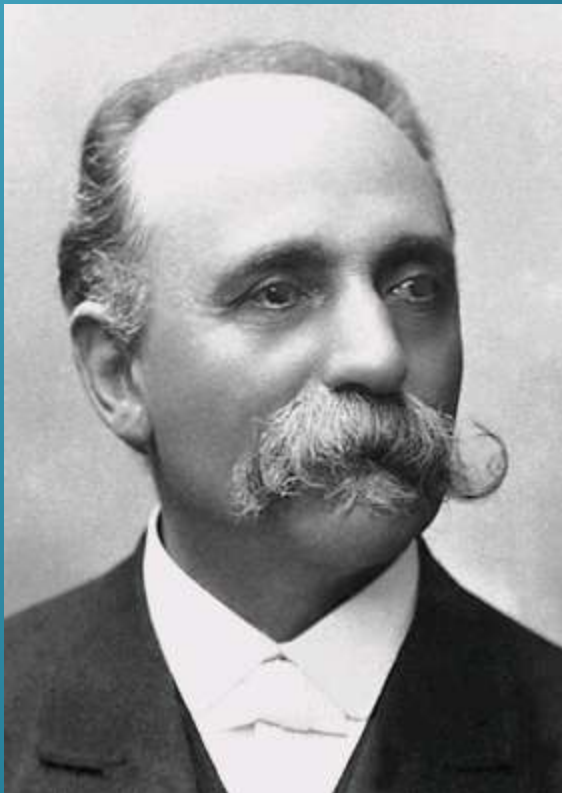


Working with other Organelles:

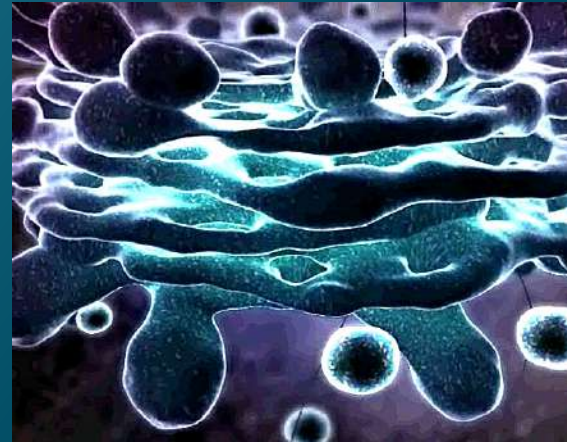
- *Mitochondria*- Both work together to form steroid hormones.
- *Rough ER*- Takes proteins and sends them to the golgi apparatus
- *Golgi Apparatus*- Sends lipids to be distributed around the cell



The Golgi Complex



Jonathan Pang

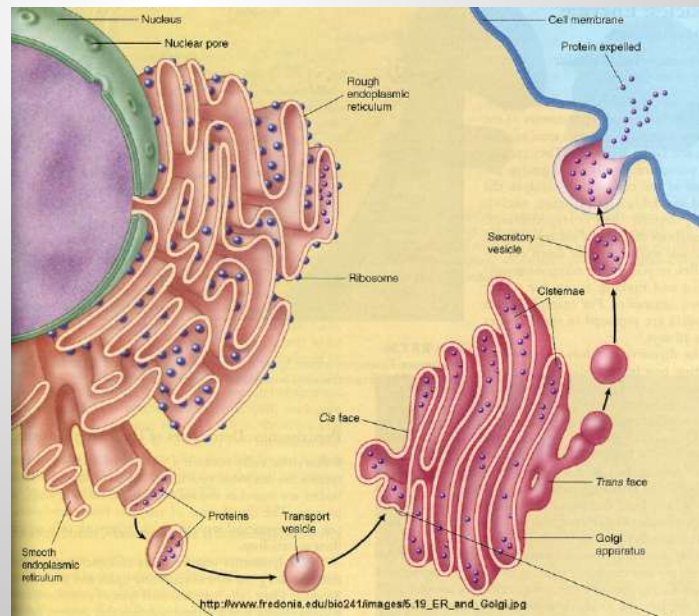


Structure Yields Function

- Comprised of disk shaped membranes called Cisternae
- Oriented in such a way that one side (the cis face) is facing the endoplasmic reticulum, and the other side, (the trans face) is facing the cell membrane
- This means that macromolecules can enter through the cis face, and exit the Golgi Complex through the trans face

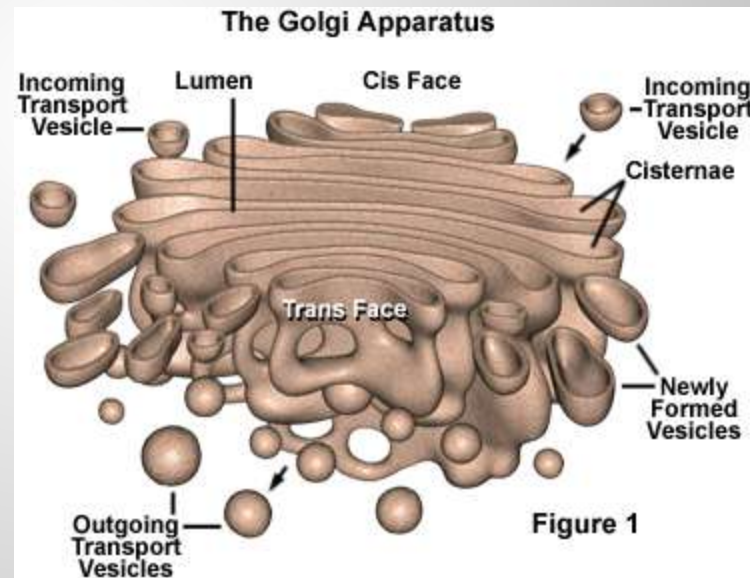
Structure Yields Function (Continued)

- Modifies and packages macromolecules, like proteins and lipids, that are first synthesized by the ER
- Performs this task using enzymes contained within the Cisternae



Cell Types

- The Golgi Complex is found in...
 - Plant Cells
 - Animal Cells



Diseases Associated with the Golgi Complex

- Neurodegenerative Disease, like...
 - Alzheimer's Disease
 - Parkinson's Disease
 - ALS
 - Huntington's Disease



The House and Senate

- The Endoplasmic Reticulum and Golgi Complex work together like Congress

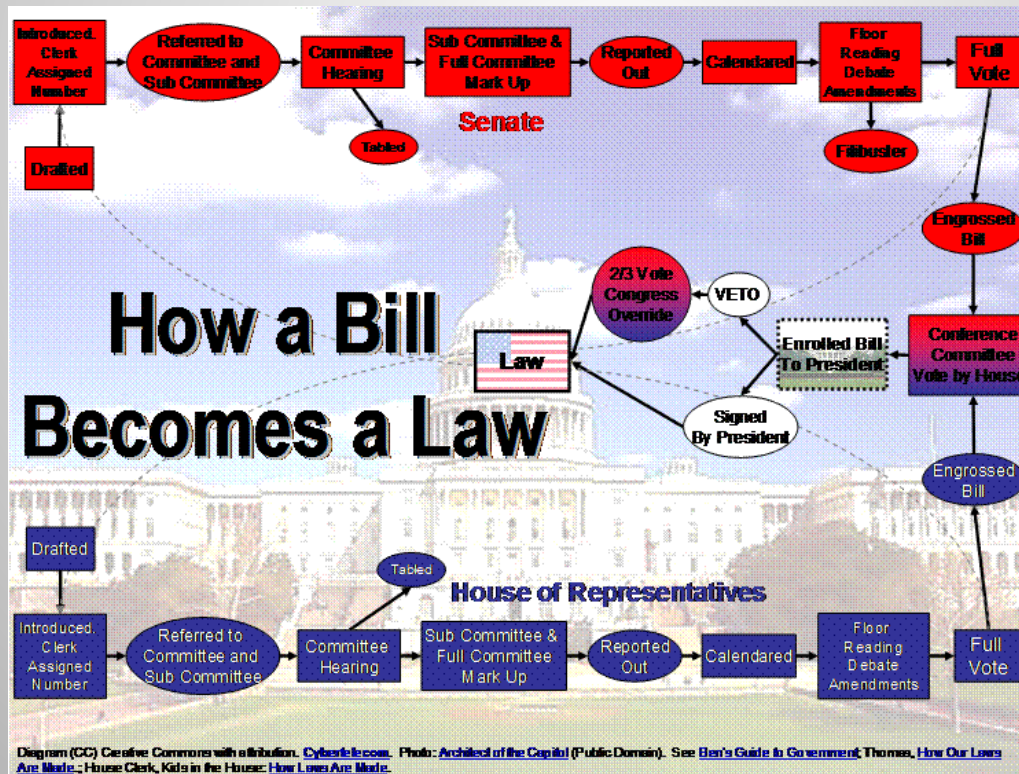
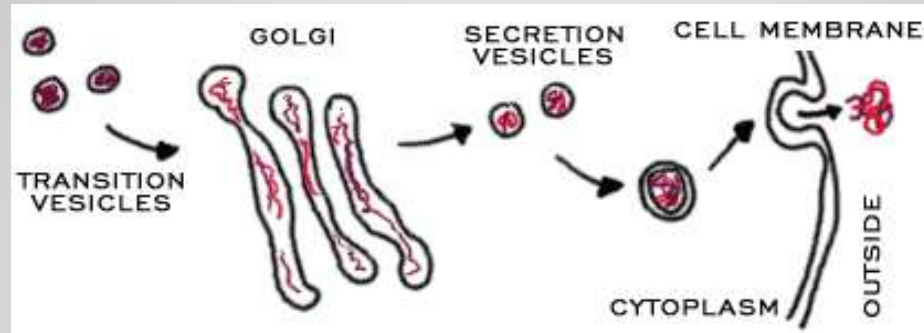


Diagram (CC) Creative Commons with attribution. [Clyde'sLife.com](#). Photo: [Architect of the Capitol](#) (Public Domain). See [Ben's Guide to Government](#), Thomas, [How Our Laws Are Made](#); [House Clerk](#), [Kids in the House](#); [How Laws Are Made](#).

My Analogy (Explained)

- The Endoplasmic Reticulum begins the process by making a protein, in the same way that the House would start by making a bill
- A vesicle then transports the protein to the Golgi Complex, in the same way that a subcommittee would help to move a bill from the House to the Senate
- The Golgi Complex then modifies and packages the protein in the same way that the Senate would modify the bill to prepare it for the President

How the Golgi Complex Works Within the System



- 1. The Golgi Complex receives macromolecules from the ER
- 2. The macromolecule is passed through the enzymes of the Golgi Complex through a transport vesicle
- 3. A secretory vesicle carries the modified macromolecules through the cytoplasm and cell membrane

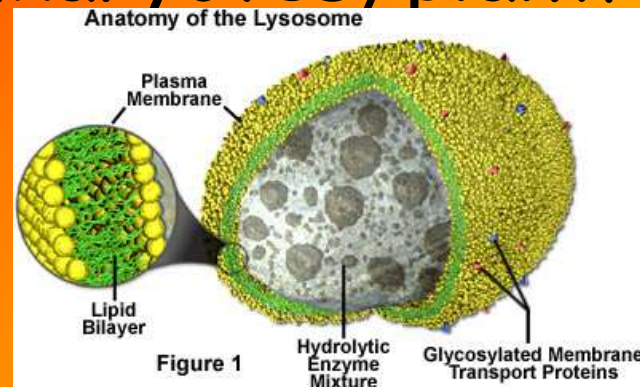
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Lysosomes!

Tommy Hutsler

- Function: to break down cellular waste materials and to dispose of damaged or dying tissues
- Go through autolysis (self destruction)
- Responsible for defending cell
- Found in: Eukaryotes, plant/animal cells



In Case of Emergency!

- >40 known diseases caused by lysosomal malfunction
 1. Hurler Syndrome (causes deformations, deafness, and mental retardation)
 2. Fabry Disease (causes kidney/heart problems)
 3. Tay-Sachs Disease (causes degeneration of the brain in infants)

Lysosomes: The Cellular Commode.

- Responsible for waste disposal, just like this toilet!

<http://www.youtube.com/watch?v=403YMp-oz6A>

- Without toilets, there would be an abundance of waste everywhere, which was experienced during the Dark Ages
- Lysosomes have powerful enzymes to break down certain waste products, just like toilets have powerful cleaning products.

What's Gonna Work?!

- TEAMWORK!
 - I. Fuse with vacuoles when certain enzymes are needed
 - II. Created by the Golgi Apparatus
 - III. Help repair the plasma membrane
 - IV. Help as a defense mechanism, destroying foreign/unwanted materials

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