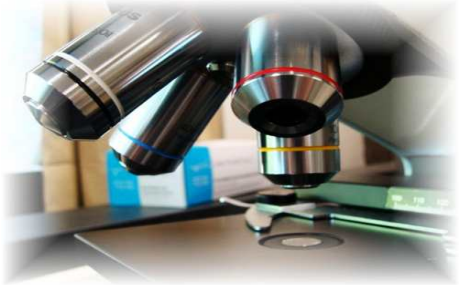


About Science Prof Online PowerPoint Resources

• Science Prof Online (SPO) is a free science education website that provides fully-developed Virtual Science Classrooms, science-related PowerPoints, articles and images. The site is designed to be a helpful resource for students, educators, and anyone interested in learning about science.

• The SPO Virtual Classrooms offer many educational resources, including practice test questions, review questions, lecture PowerPoints, video tutorials, sample assignments and course syllabi. New materials are continually being developed, so check back frequently, or follow us on Facebook (Science Prof Online) or Twitter (ScienceProfSPO) for updates.

• Many SPO PowerPoints are available in a variety of formats, such as fully editable PowerPoint files (.ppt), as well as uneditable versions in smaller file sizes, such as PowerPoint Shows (.pps) and Portable Document Format (.pdf), for ease of printing. The font "Jokerman" is used frequently in titles. It has a microbiology feel to it. If you do not have this font, some titles may appear odd, oversized and off-center. Find free downloads of Jokerman by Googling "download jokerman font microsoft".

• Images used on this resource, and on the SPO website are, wherever possible, credited and linked to their source. Any words underlined and appearing in blue are links that can be clicked on for more information. PPT files must be viewed in slide show mode to use the hyperlinks directly.

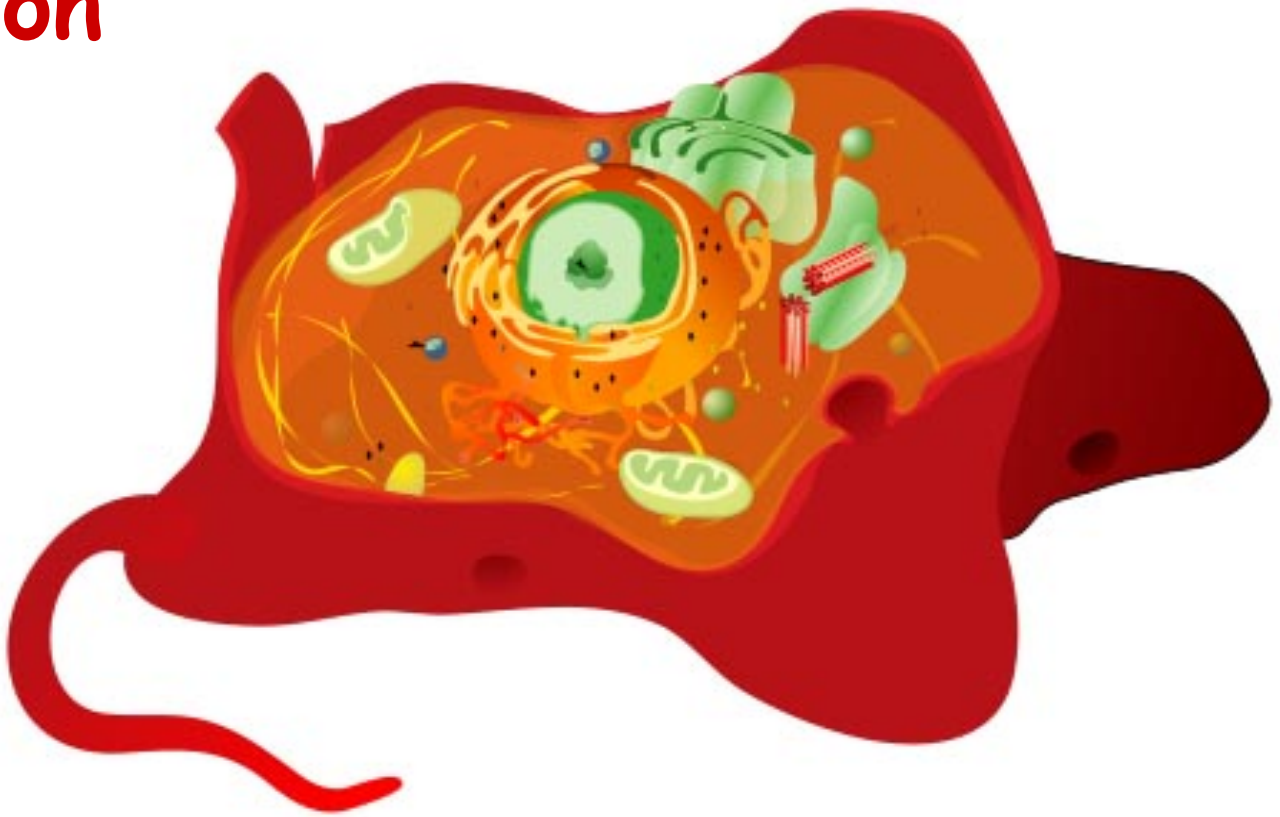
• Several helpful links to fun and interactive learning tools are included throughout the PPT and on the Smart Links slide, near the end of each presentation. You must be in slide show mode to utilize hyperlinks and animations.

Alicia Cepaitis, MS
Chief Creative Nerd
Science Prof Online
Online Education Resources, LLC
alicia@scienceprofonline.com

Tami Port, MS
Creator of Science Prof Online
Chief Executive Nerd
Science Prof Online
Online Education Resources, LLC
info@scienceprofonline.com

Image: Compound microscope objectives, T. Port

Eukaryotic Cell Structure & Function

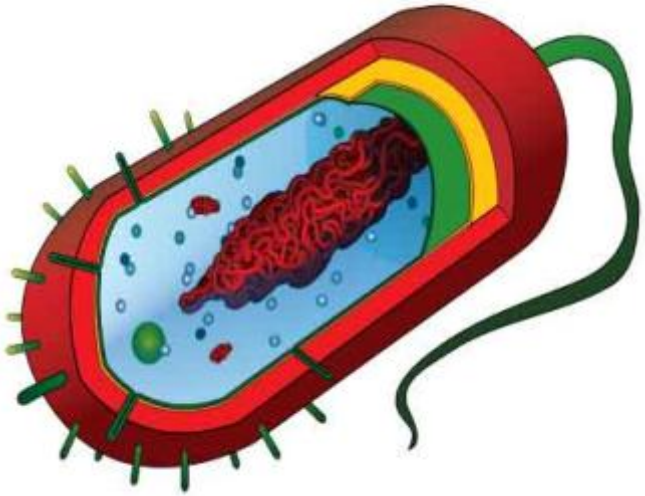


Images: Animal cell , M. Ruiz

From the Virtual Microbiology Classroom on ScienceProfOnline.com

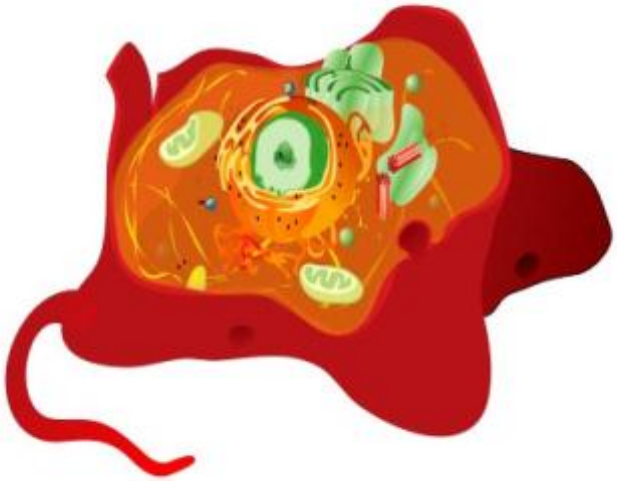
Two Basic Types of Cells

Prokaryotes



- Single-celled.
- Reproduce by binary fission (another copy by dividing).
- No cell nucleus or any other membrane-bound organelles. DNA travels openly around the cell.
- All bacteria are prokaryotes.

Eukaryotes

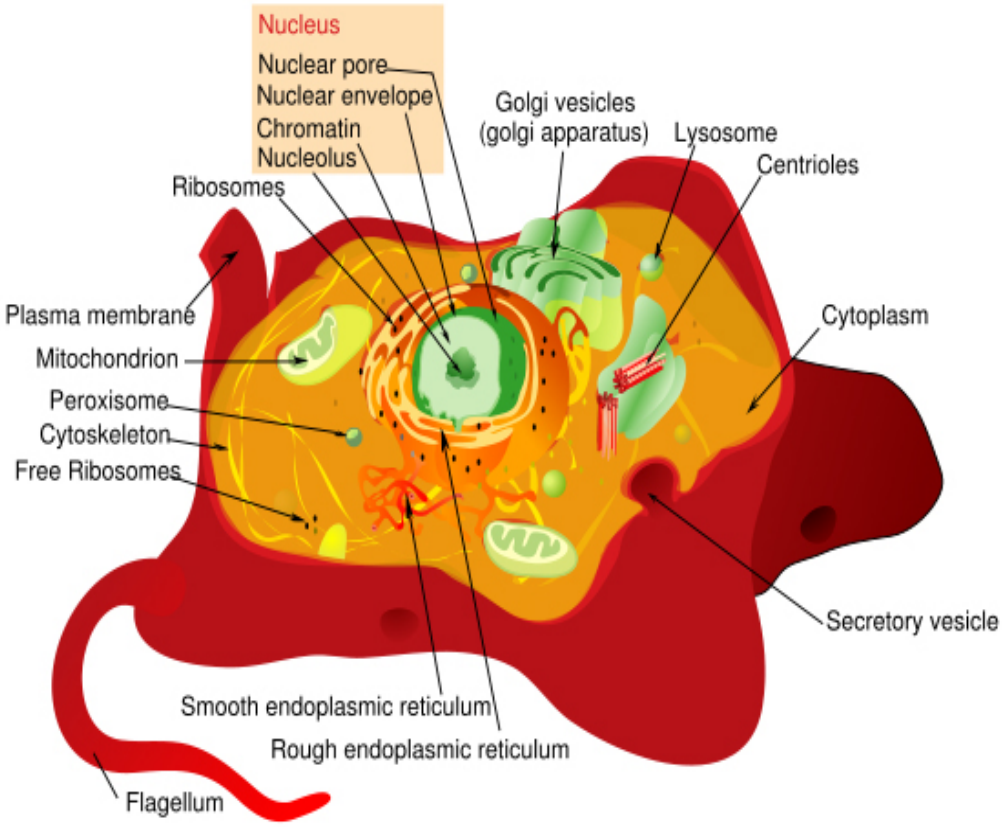


- Most organisms that we can see, such as trees, grass, worms, flies, mice, humans, mushrooms and yeast are eukaryotes.
- Can either be single-celled or multi-celled.
- Can reproduce in one of several ways (Ex. meiosis, mitosis).
- Have cell nucleus within containing its DNA.
- Nucleus most evident distinction between these cell types.

Images: Prokaryotic Cell, Eukaryotic cell , M. Ruiz

From the Virtual Microbiology Classroom on ScienceProfOnline.com

Eukaryotic Cells



- Eu ="true", karyon="nucleus"
- Genetic material contained in a nuclear membrane.
- Membrane bound organelles.
- Include animal, plant, fungi, algae cells as well as other microscopic eukaryotes.
- Evolved from prokaryotic cells.

Image: Eukaryotic Cell Diagram, M. Ruiz

Eukaryotic Genomes

- Like prokaryotes, and all living things, their genome is made of DNA.
- May include several to many linear chromosomes within a membrane-bound nucleus.
- **Q: How many chromosomes do humans have?**
- Replication (duplication of DNA prior to cell division) occurs in all living things.
- Two locations of eukaryotic DNA
  - Nuclear DNA
  - Extranuclear DNA

Image: Spectral karyotype, Jane Ades, NHGRI

Cytoplasm

Nicknames: The Matrix,
Molecular Chowder

- Fills the space between the plasma membrane and the nuclear membrane
- A water-like substance that fills cells.
- Consists of **cytosol** and **cellular organelles** except for the cell nucleus.
- **cytosol** is made up of water, salts, organic molecules and many enzymes that catalyze reactions.

Q: Eukaryotes? Prokaryotes? Both?

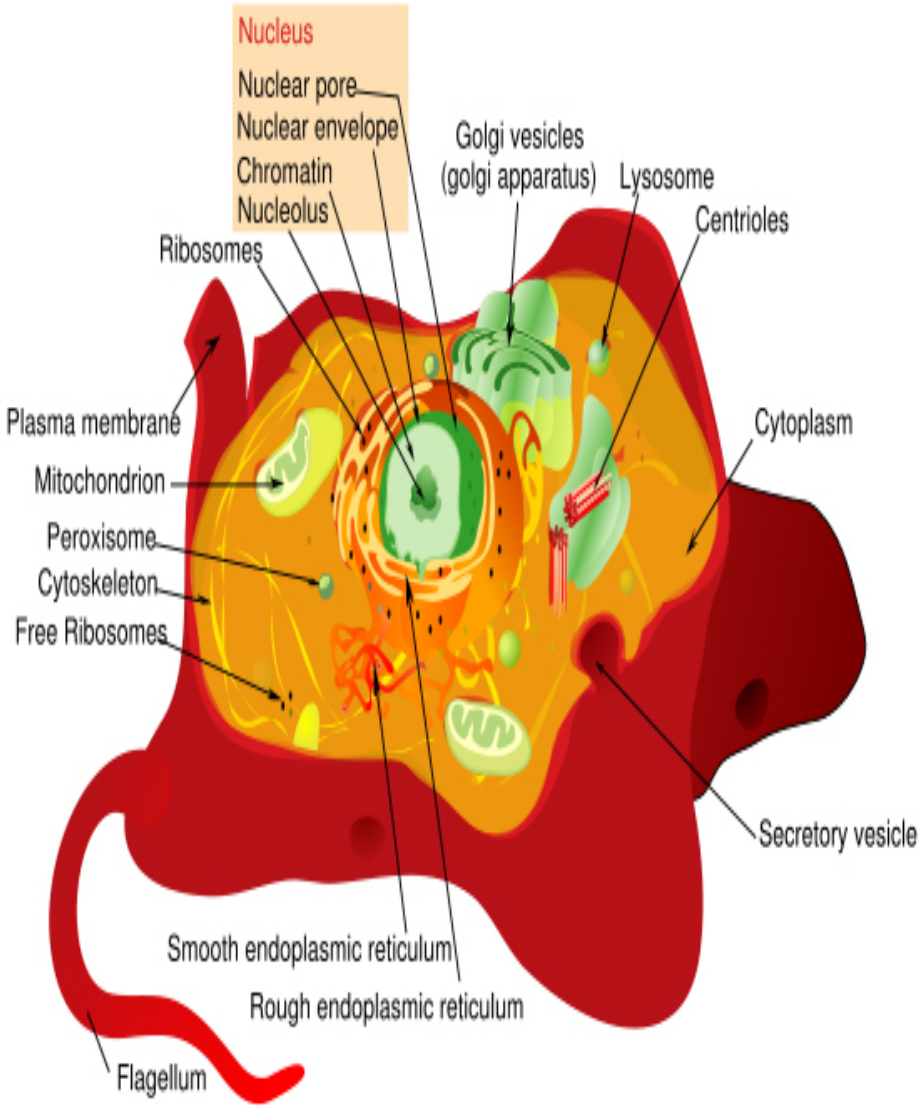


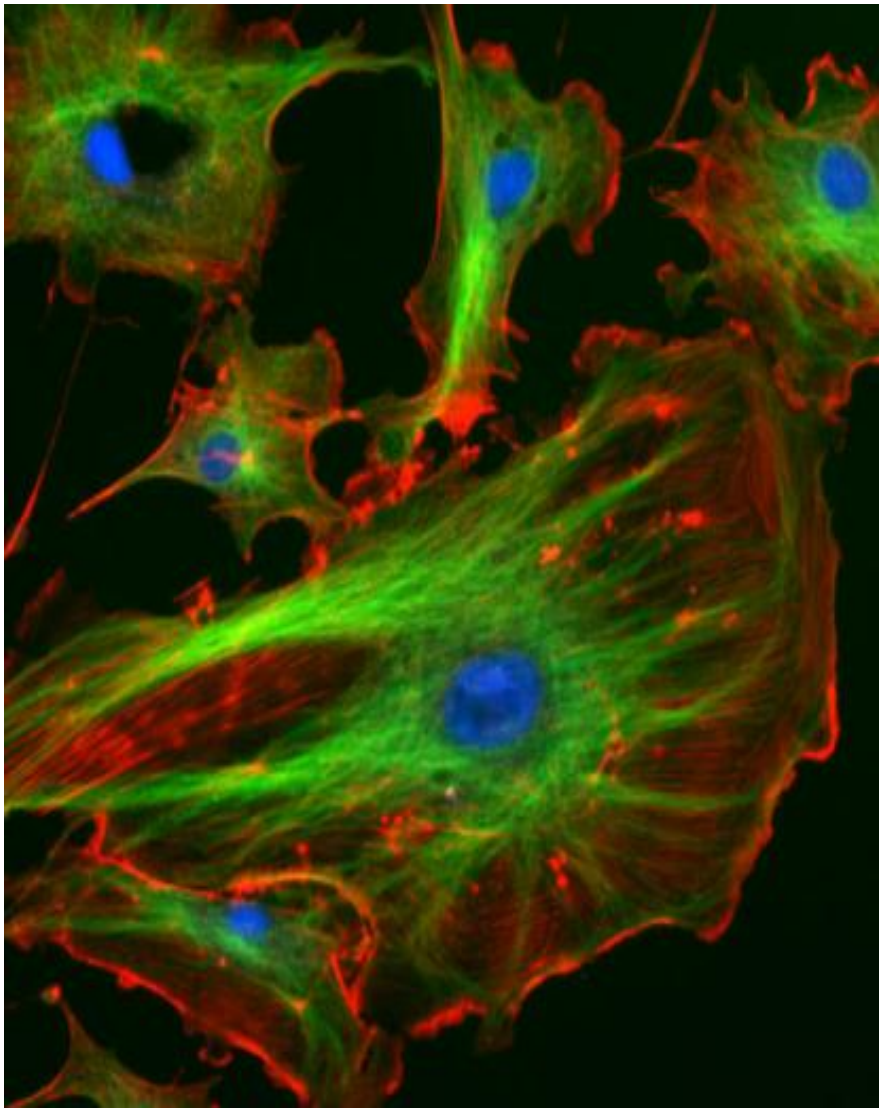
Image: Eukaryotic Cell Diagram, M. Ruiz

Cytoskeleton

Nicknames: Scaffolding, Highways

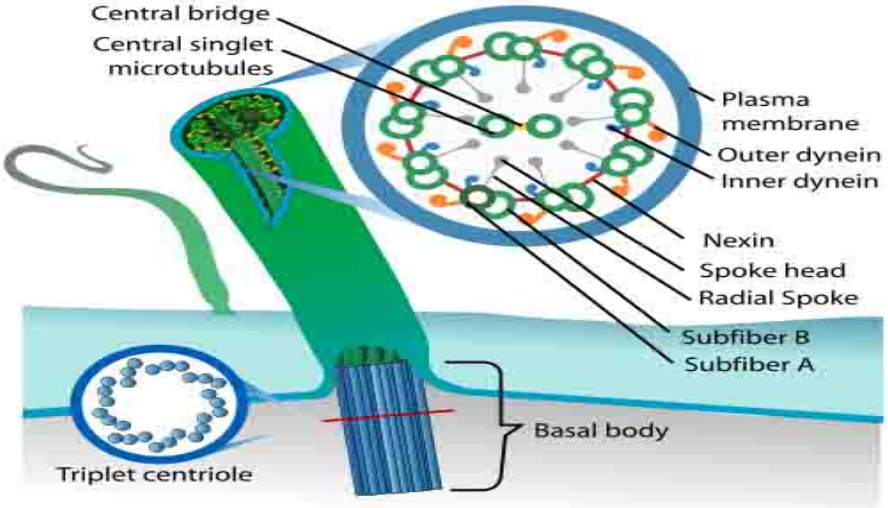
- Maintains cell shape.
- Protects the cell.
- Enables some cell movement (using structures such as flagella and cilia).
- Plays important roles in intra-cellular transport (the movement of vesicles and organelles).
- Plays important role in cell division.

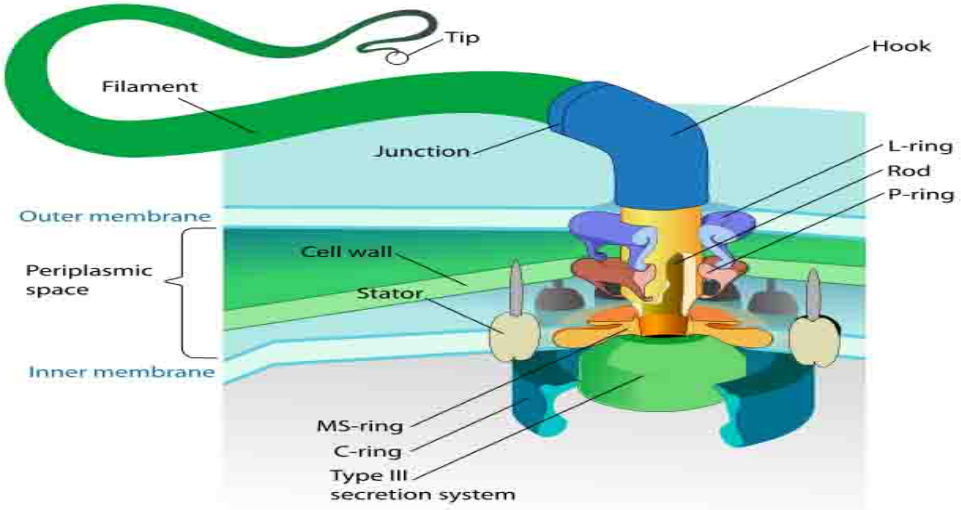
Q: Eukaryotes? Prokaryotes? Both?



Images: Fluoresced Eukaryotic Cell, NIH.

Cilia & Flagella



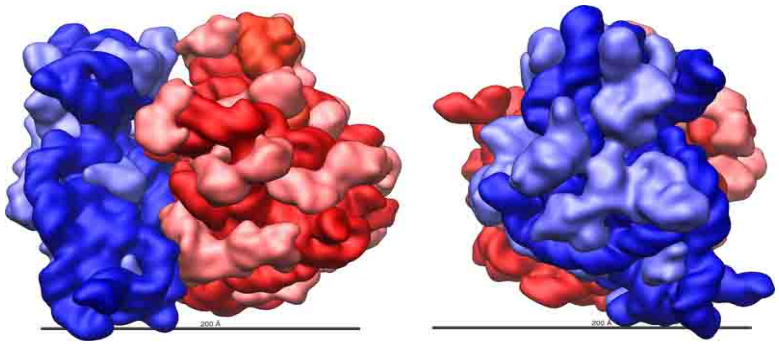


- External appendages from cell membrane.
- Aid in locomotion of the cell or movement of materials near cell.
- Motility > coordinated sliding movements of microtubules.
- Both Prokaryotes & Eukaryotes can have external appendages, but are constructed differently.
- Eukaryotes may have flagella or cilia (components of cytoskeleton covered with plasma membrane).
- Prokaryotes may have flagella, endoflagella, fimbiae or pili (composed of protenaceous molecules and not covered with plasma membrane).

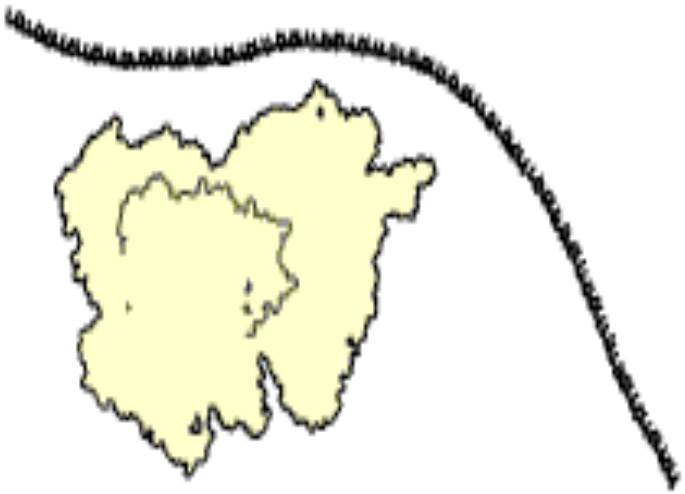
Images: Cilia of the lung trachea epithilium, Charles Daghlian, Cilum Diagram & Flagellum Diagram, M. Ruiz; Sperm & Egg, Wiki

From the Virtual Microbiology Classroom on ScienceProfOnline.com

Ribosomes



Click here for animation of ribosome building a protein.



- **Q: What do ribosomes do?**
- **Q: What are they made of?**
- Can be found alone in the cytoplasm, in groups called **polyribosomes**, or attached to the endoplasmic reticulum.
- **Q: Eukaryotes? Prokaryotes? Both?**

Images: Ribosome translating protein, animation, Xvazquez; Ribosome Structure, Vossman

Membrane-bound Organelles

- Eukaryotic cells have many **organelles.**
- Prokaryotes only have ribosomes, which are not bound by a membrane.
- Membrane-bound eukaryotic organelles **organize** functions within the cell.

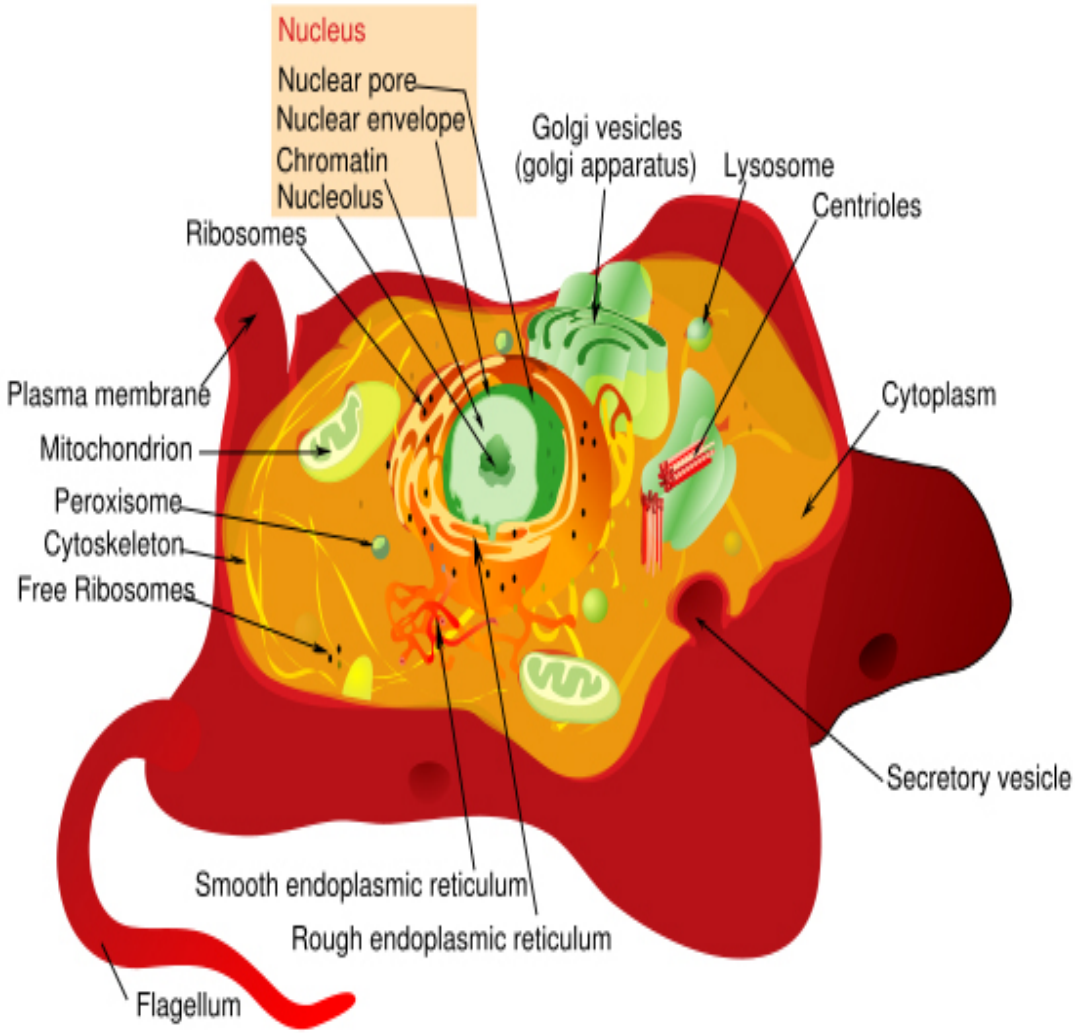


Image: Eukaryotic Cell Diagram, M. Ruiz

System of internal membranes within **eukaryotic cells** that divide the cell into compartments, or organelles.

Transport system, for moving molecules, into, out of, and through interior of cell, as well as interactive surfaces for lipid and protein synthesis.

Membranes of the **endomembrane system** are made of a lipid bilayer, with proteins.

The **Endomembrane System** consists of:

1. nucleus
2. endoplasmic reticulum
3. Golgi apparatus
4. vesicles
5. lysosomes
6. … **Q: What other membranous part of the cell should also be included in this list?**

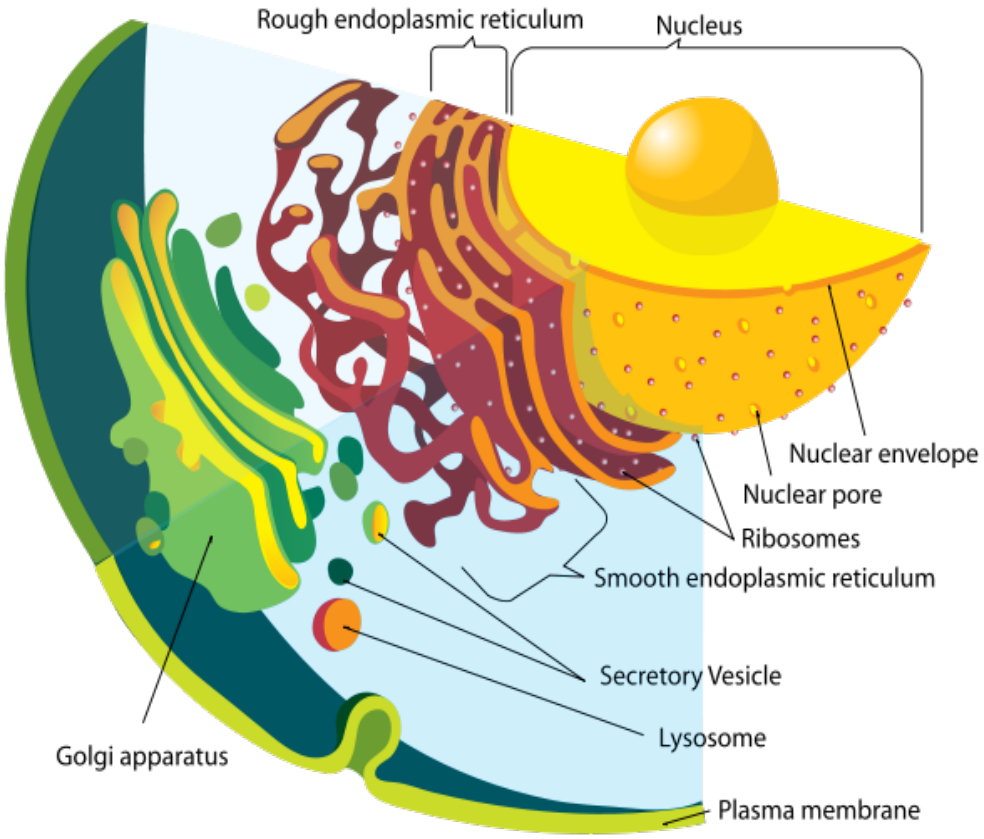


Image: Endomembrane system diagram, M. Ruiz

Organelles: Energy-Related

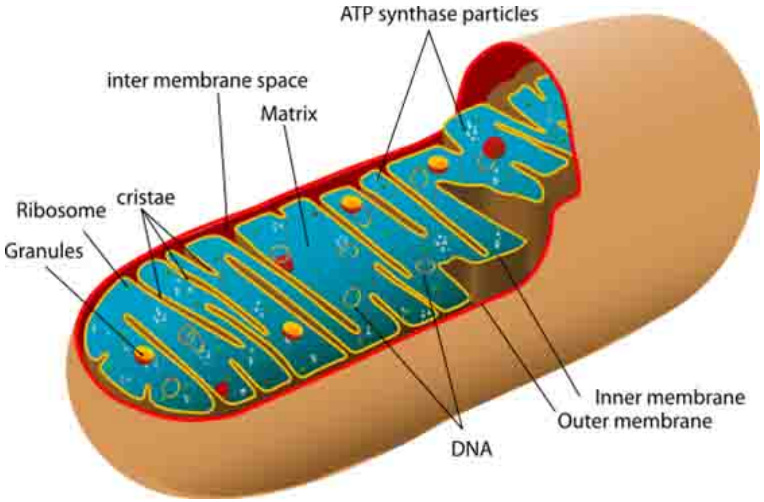
Mitochondria

&

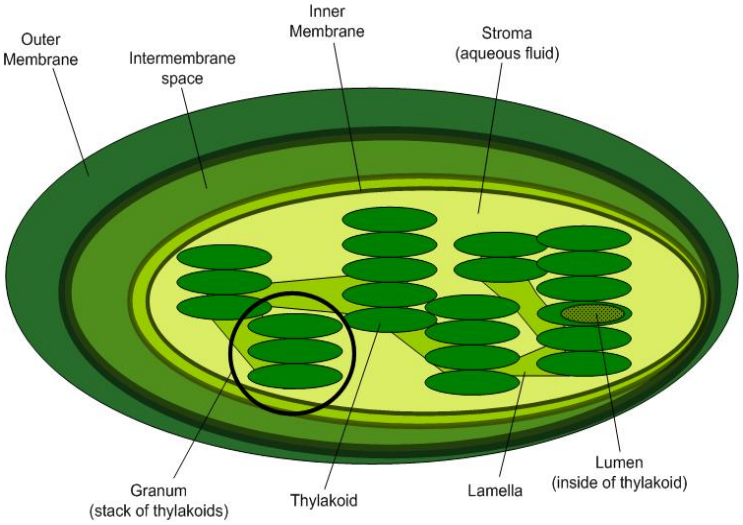
Chloroplast

- Both organelles house energy in the form of ATP.
- Both ancestrally were independent cells that formed a symbiotic relationship with other cells.
- **Q: Eukaryotes? Prokaryotes? Both?**

Found in nearly all eukaryotes →



Found in plants & algae & some microbes →

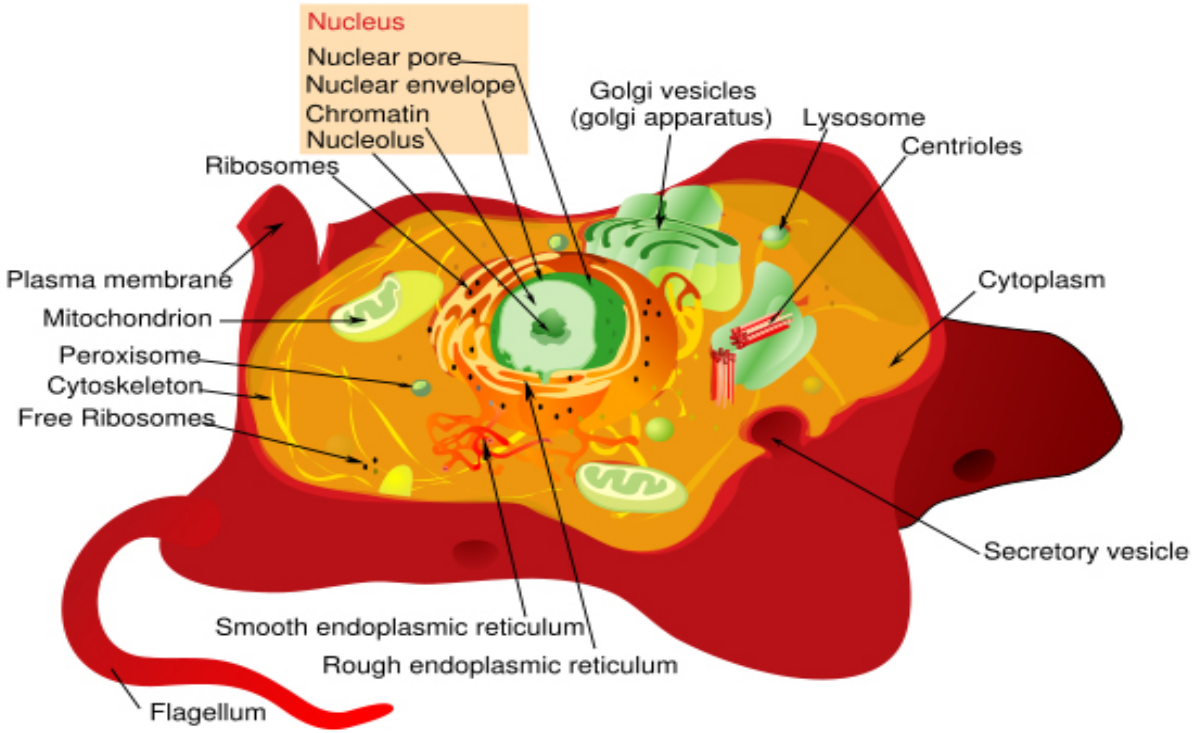


From the Virtual Microbiology Classroom on ScienceProfOnline.com

Images: Mitochondrion diagram M. Ruiz;

REVIEW!

Here's an excellent interactive lesson on **Eukaryotic Cell Structure**.



Images: Prokaryotic cell diagram, M. Ruiz

Confused?

Here are some links to fun resources that further explain Cell Biology:

- Cell Structure: Eukaryotes Main Page on the Virtual Cell Biology Classroom of Science Prof Online.
- "Cells" music video by They Might Be Giants.
- Prokaryotic & Eukaryotic: Two Types of Biological Cells, an article from SPO.
- Eukaryotic Cell: Structures, Functions & Diagrams article from SPO.
- Cell Structure tutorials and quizzes from Interactive Concepts in Biochemistry.
- Cells Alive interactive website.
- Eukaryotic Cell Tour an Animated Science Tutorial.
- Endoplasmic Reticulum & Golgi Apparatus animation and quiz.
- Endomembrane System animation and quiz.
- "The Cell Song" lyrics by The Cell Squad, Freedom Middle School, Nashville, TN.
- Endocytosis / Exocytosis animation from McGraw Hill.
- Evolution of the Three Domains Animated Science Tutorial.
- Biology4Kids – Cell Biology Main Page by Raders.

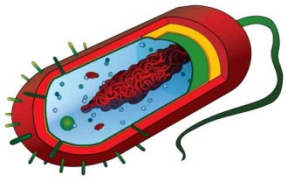
(You must be in PPT slideshow view to click on links.)

Are microbes intimidating you?

Do yourself a favor. Use the…

Virtual Microbiology Classroom *(VMC)* !

The VMC is full of resources to help you succeed, including:



- practice test questions
- review questions
- study guides and learning objectives

You can access the VMC by going to the Science Prof Online website
www.ScienceProfOnline.com

Images: *Peniciilin*, Giant Microbes; Prokaryotic cell, Mariana Ruiz