

Center for Teaching and Learning

Presents the
Fall Science Workshop Series

Wednesday
October 18, 2006
1:00 p.m.

Back to the Basics: An Introductory Overview of Cells

Presented by the
Center for Teaching and Learning
And
Marc McCloskey, Science TA

What We Will Be Covering

- What is a Cell?
- The Two Types of Cells
- Examples of These Types of Cells
- The Exception
- The Organelles and Their Functions
- Reproduction
- Transfer

What is a Cell?

- Latin for “small room”
- A cell is the functional and structural unit of all living organisms
- What is Considered a “Living” organism?
- Found as early as 1632 by Antony van Leeuwenhoek
- The Cell Theory --1839 by the German botanist Matthias Jakob Schleiden and German physiologist Theodore Schwann

Types of Cells:

- Prokaryotic

- Bacteria
- Archaea

- Eukaryotic

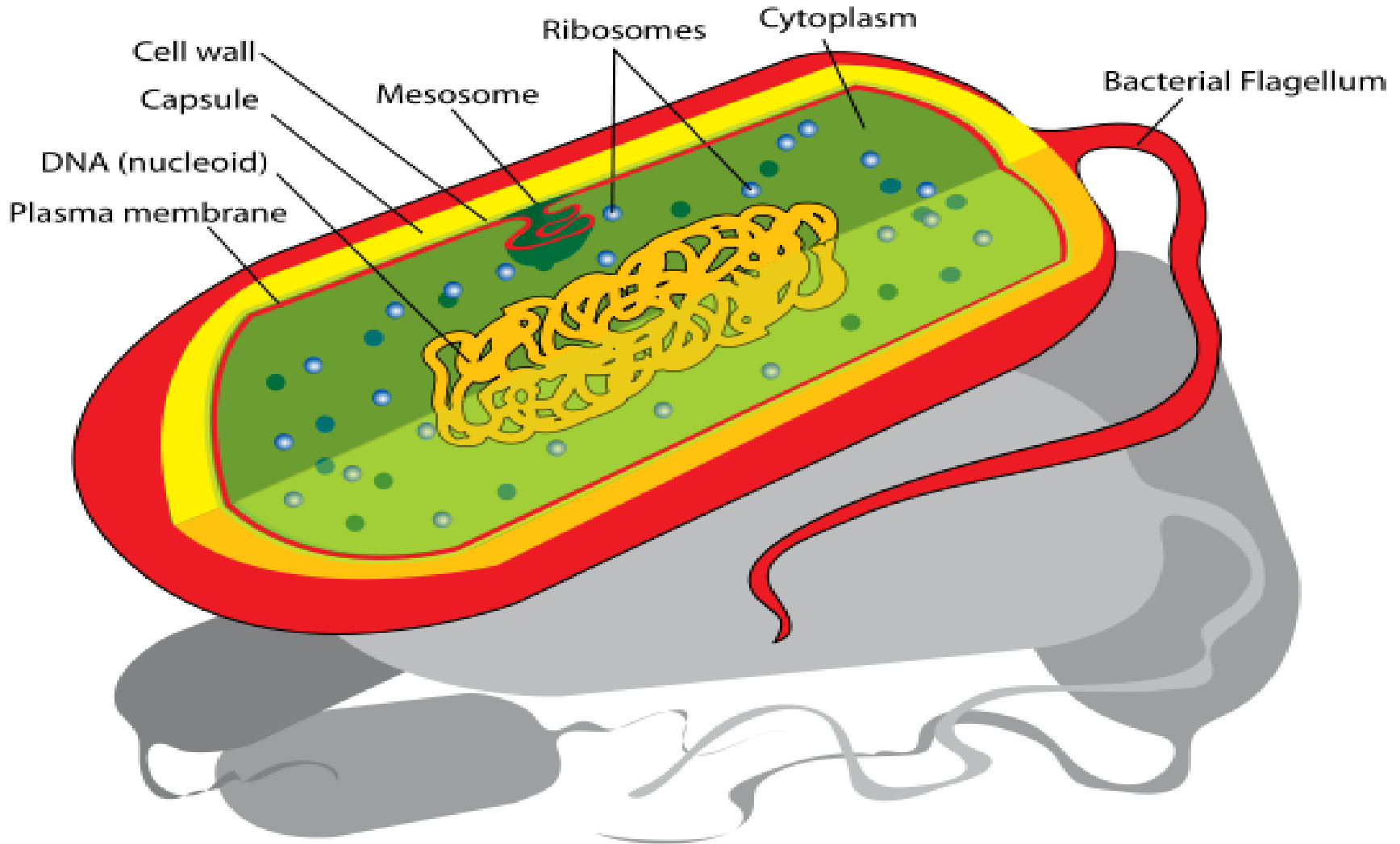
- Unicellular
 - Protists
- Multi-cellular
 - Fungi
 - Plants
 - Animals

Prokaryotic Cells

■ Characteristics

- Old Greek for “Before nut (kernel)”
- Unicellular (some multi-cellular in very rare cases)
- Lacks a membrane bound nucleus
- Lacks membrane bound organelles
- Has a cell membrane (cell wall)
- Has ribosomes (protein production)
- Circular DNA

Example of a Prokaryotic Cell



Bacteria

■ Characteristics

- Greek for “small stick”
- Most Abundant Organism
- Found in all Media
- Many are Pathogens
- Move by Flagella or by Gliding
- Asexual Reproduction
- Beneficial in Everyday Needs

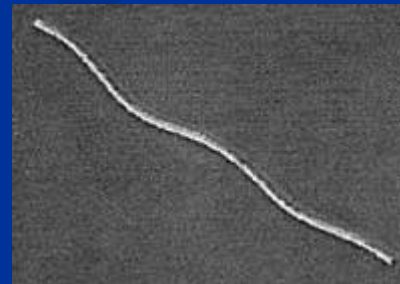
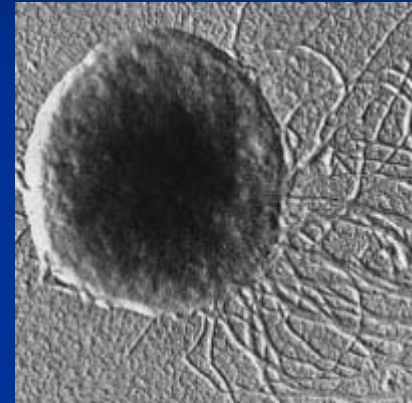
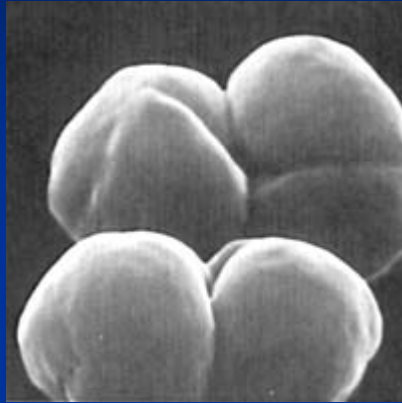


Archaea

■ Characteristics

- Greek for “old ones”
- Identified in 1977 by Carl Woese of the University of Illinois at Urbana-Champaign and George Fox
- Extremophiles
- Mesophiles
- Found in Living Organisms
- Two Groups: Euryarchaeota and Crenarchaeota

Examples of an Archaea Cell

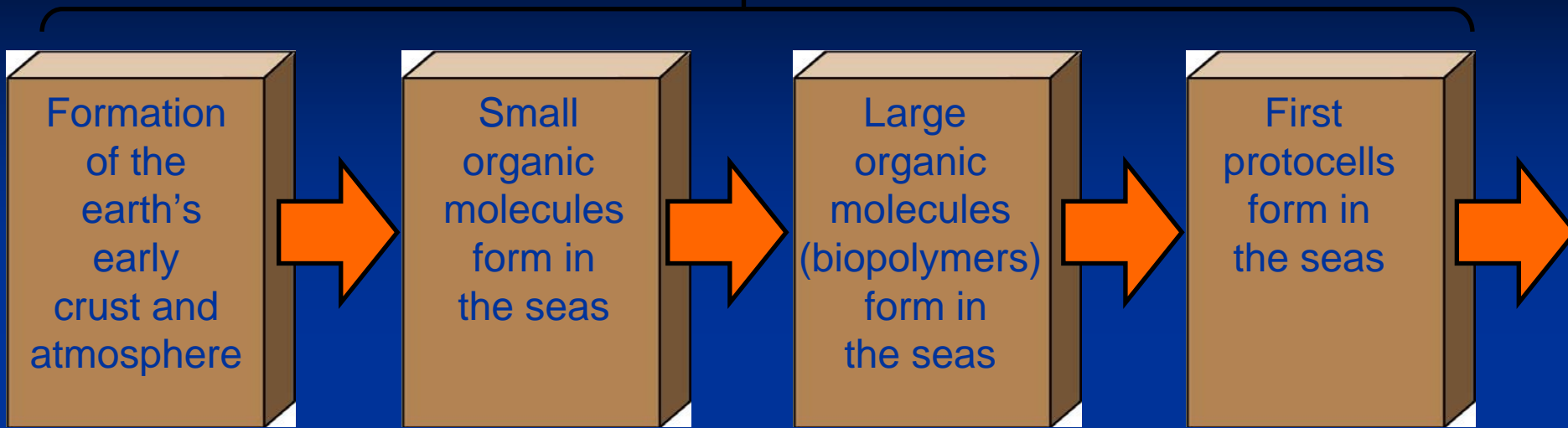


From: <http://www.ucmp.berkeley.edu/archaea/archaeamm.html>

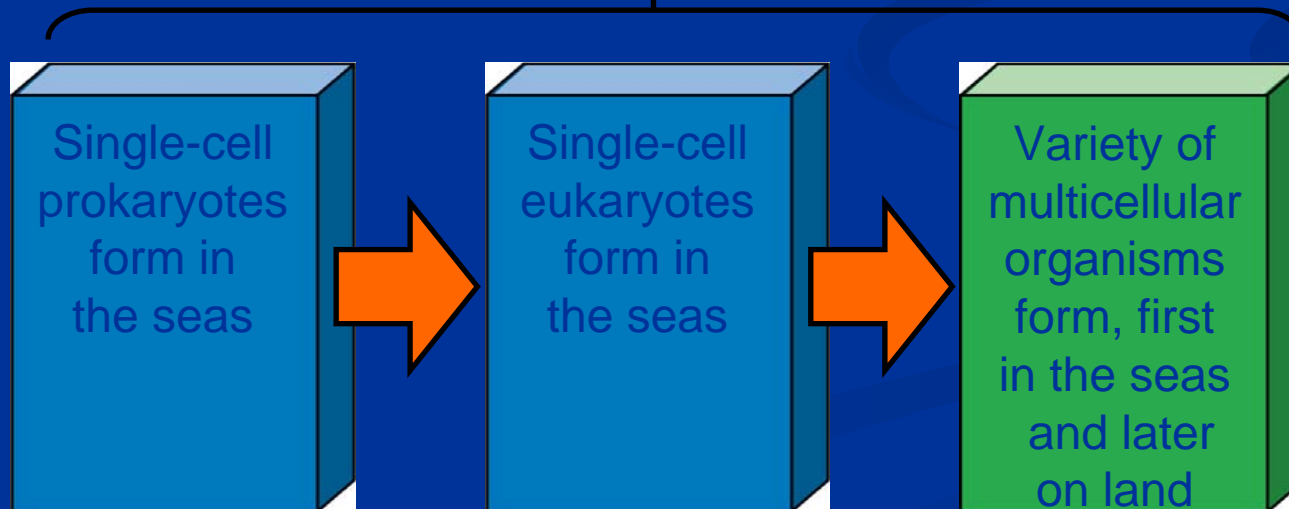
Prokaryotes to Eukaryotes

Chemical Evolution to Biological Evolution

Chemical Evolution (1 billion years)

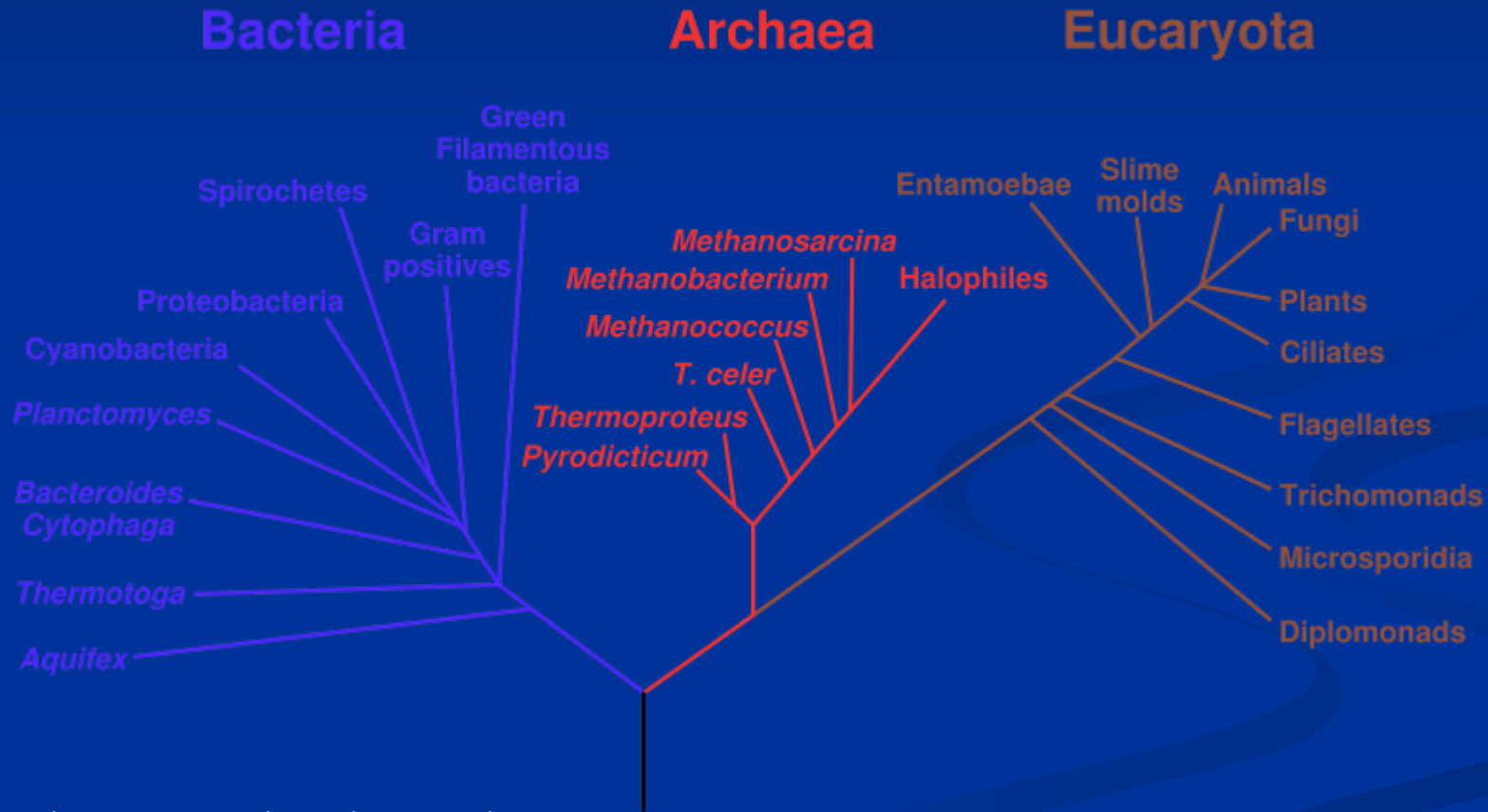


Biological Evolution (3.7 billion years)



Prokaryotes to Eukaryotes

Phylogenetic Tree of Life



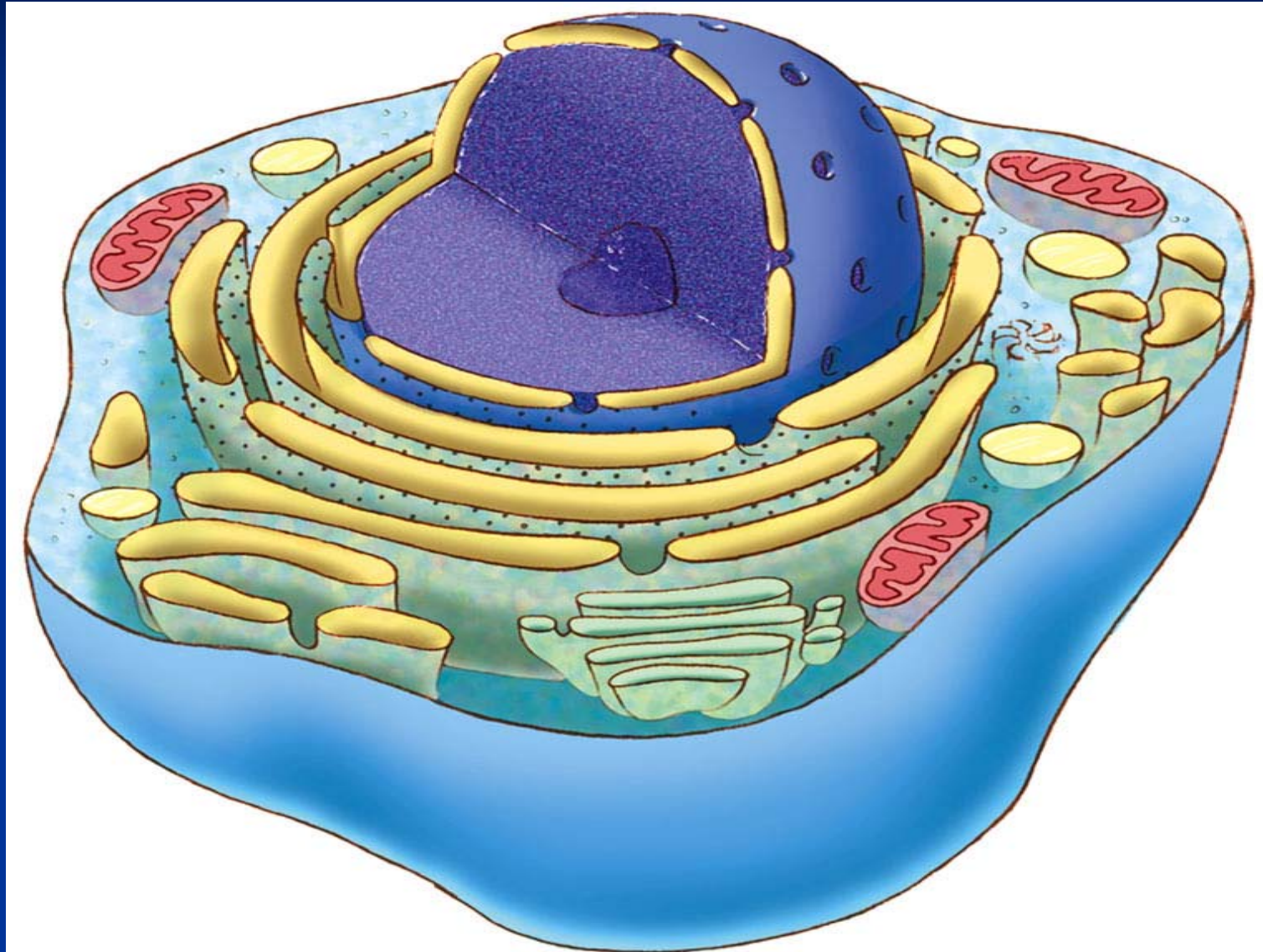
- phagotrophic hypothesis
- syntrophic hypothesis

Eukaryotes

■ Characteristics

- Unicellular (Protists)
- Multicellular (fungi, plants, animals)
- Membrane bound Nucleus
- Contains Organelles
- Linear DNA

Example of a Eukaryotic Cell



Protists

■ Protozoa

- Animal like
- Motile
- Feed by Phagocytosis



■ Algae

- Plant like
- Uses photosynthesis for its nutrients
- Some motile, some are not



Fungi



■ Characteristics

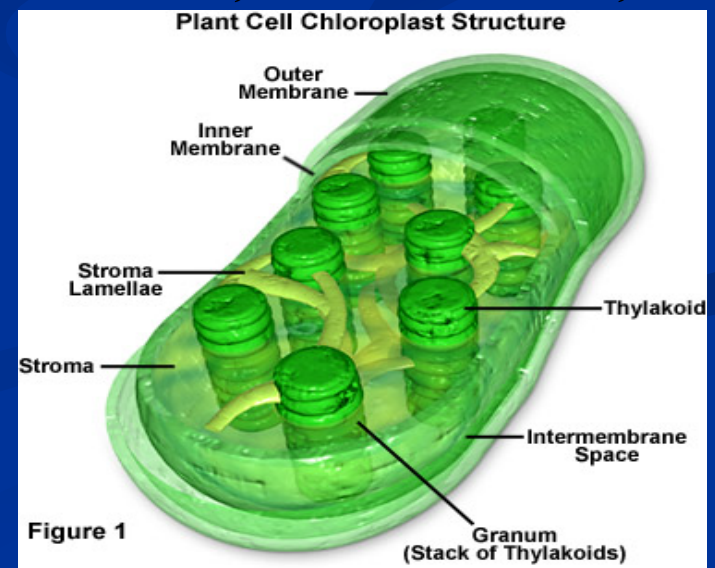
- All come from a common ancestor
- Thought to be more related to animals than plants
- Most are symbiotic
- Lacks organs
- Reproduce sexually or asexually
- Many are used in everyday human life



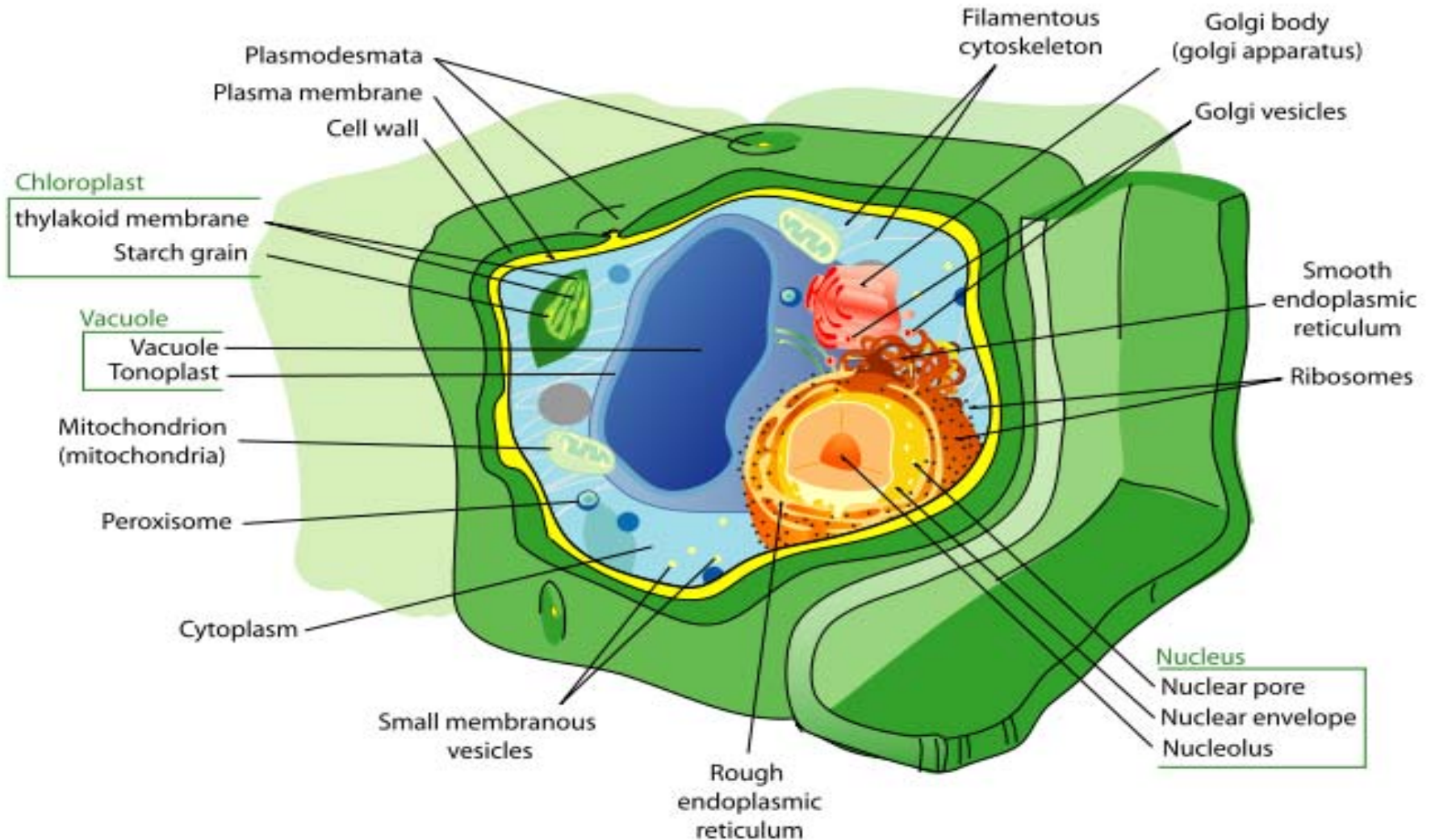
Plant Cells

■ Characteristics

- Has a cell wall made of cellulose
- Has a large central vacuole
- Undergoes photosynthesis
- Contains Chloroplasts which contain Chlorophyll
- The cells differentiate in to dermal tissue, vascular tissue, or ground tissue



An Example of a Plant Cell



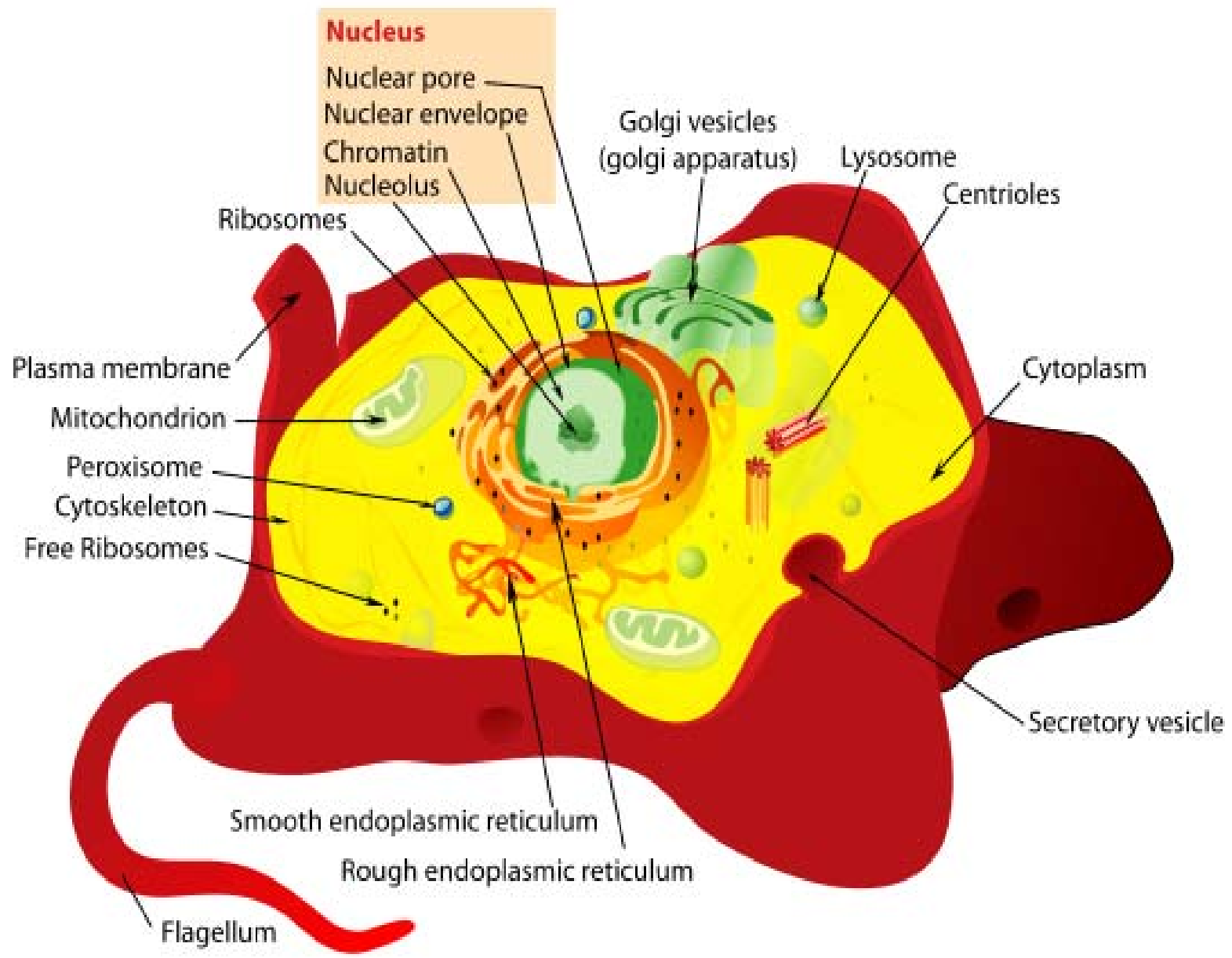
Example of Whole Plants

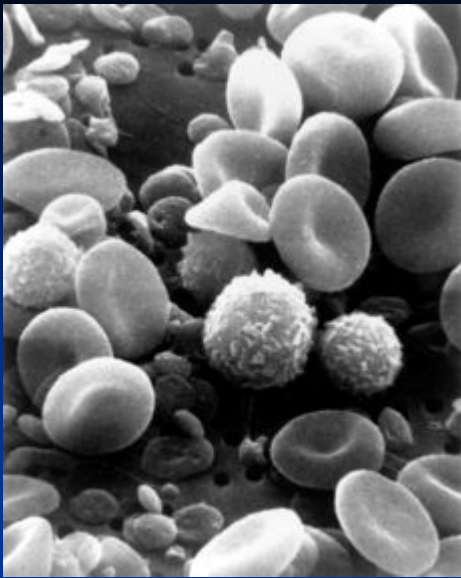


Animal Cells

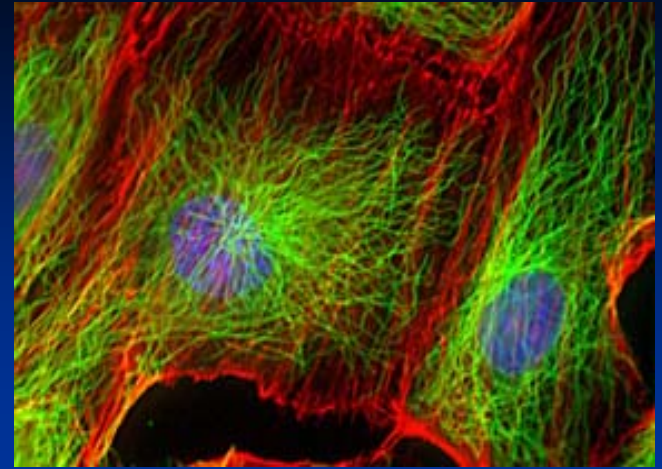
■ Characteristics

- Unicellular and Multicellular
- Lacks a Cell Wall and Chloroplasts
- Small Vacuoles
- Appear spherical in shape
- Contains a variety of Organelles





white blood cells



human epithelial cells *

Cancer cells

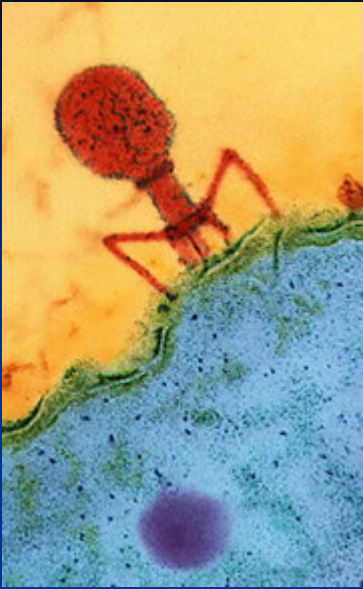


macrophage

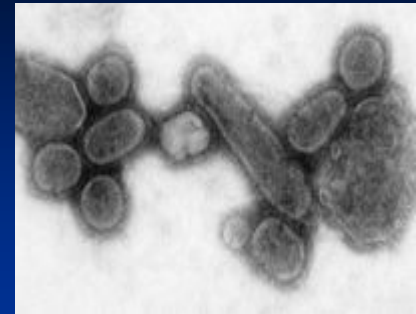
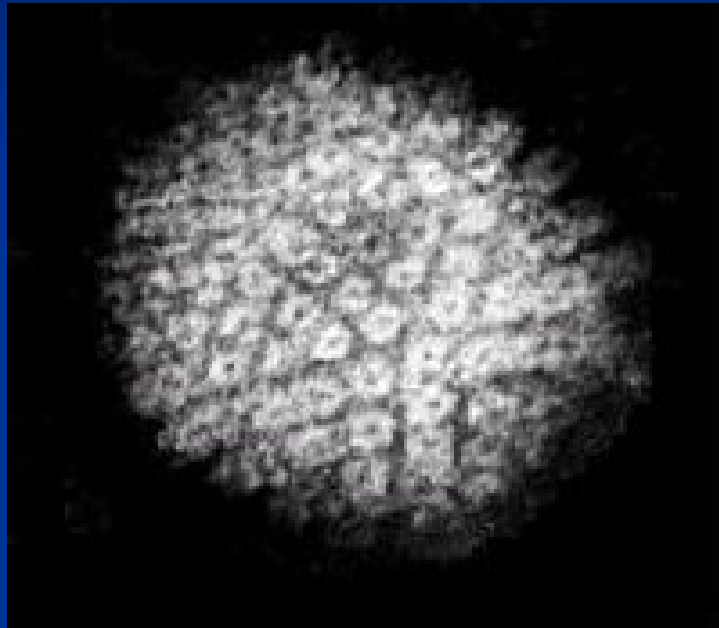
The Exception: Viruses

■ Characteristics

- Latin for “poison”
- Does not meet all the criteria of “Life”
- Not made up of cells
- Contains DNA or RNA, but not usually both
- Require a host to replicate
- Causes the common cold, the flu, chickenpox, AIDs, Bird flu
- Many uses



bacteriophage



Influenza



Ebola

Types of Eukaryotic Cells

■ Somatic

- Greek for “body”
- All cells in the body except the sex cells
- Found in the bones, skin, organs, tissues, blood
- Reproduce by Mitosis

■ Germ

- The Sex Cells
- Sperm and Ova
- Reproduce by Meiosis

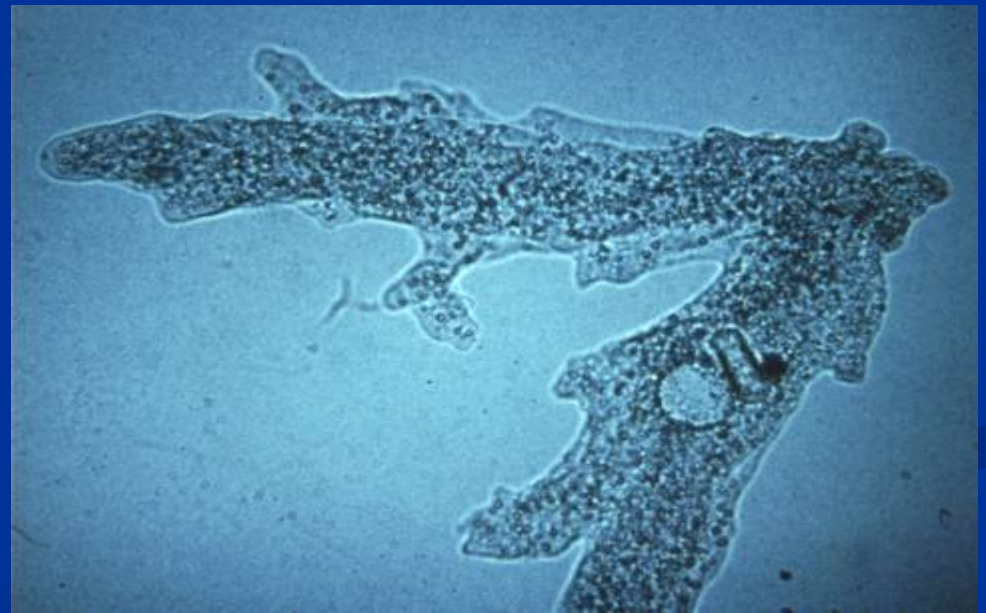
Organelles for Plant and Animal Cells and their Basic Functions

- Mitochondria-metabolism and ATP production
- Nucleus-contains genetic material
- Ribosome-assembles proteins
- Chloroplast*-conduct photosynthesis
- Vacuole-storage, secretory, excretory
- Endoplasmic Reticulum-protein translation, folding, and transport
- Golgi Apparatus-delivery system for the cell
- Lysosomes^-digestion, apoptosis, “healing”
- Glyoxysome*-breakdown of fatty acids to sugars

Reproduction

■ Asexual

- Does not involve fertilization, meiosis, or formation of gametes
- Faster and Less Energy Consuming
- Produces an exact Replica (clone)
- Binary Fission
- Budding
- Regeneration
- Spore Formation



Cellular Transfer

■ Passive Transport

- The movement of chemicals and substances across the cell membrane without the use of energy (ATP).

■ Diffusion

- The movement of molecules across a concentration gradient. High to Low. No ATP is used.

■ Facilitated Diffusion

- Movement involving protein molecules. No ATP is used.

■ Filtration

- The movement of water and solute molecules across a membrane due to hydrostatic pressure. No ATP is required.

■ Osmosis

- The movement of a solvent across a cell membrane from high concentration to low. No ATP is required.

■ Active Transport

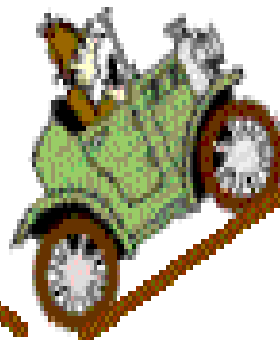
- The movement of molecules and chemicals across cell membranes requiring the use of ATP. Moves against the electrochemical concentration gradient. Requires a carrier molecule.



Passive



Facilitated



Active

**THE
END**

References

All information, including pictures, was taken from www.wikipedia.com unless otherwise noted.

Next Time

- Chemistry Workshop: Moles, Conversion Factors, and Units.

Presented by Daniel Fox

Tuesday, October 31, 2006

1:00pm in the CTL

- Biology Workshop: Metabolism of the Holidays.

Presented by Marc McCloskey

Wednesday, November 15, 2006

1:00pm in the CTL