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, as well as uneditable versions in smaller file sizes, such as PowerPoint Shows and Portable Document Format (.pdf), for ease of printing.

• 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. PowerPoints 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.

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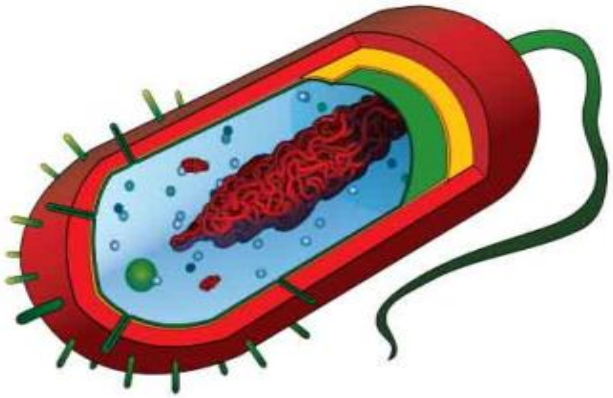
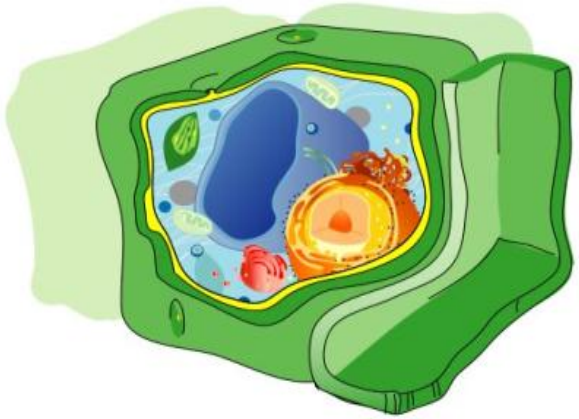
Alicia Cepaitis, MS
Chief Creative Nerd
Science Prof Online
Online Education Resources, LLC
alicia@scienceprofonline.com

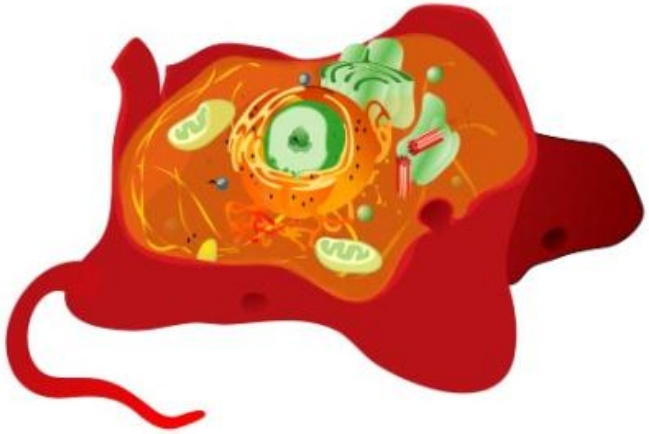
Tami Port, MS
Creator of Science Prof Online
Chief Executive Nerd
Science Prof Online
Online Education Resources, LLC
info@scienceprofonline.com

Image: Compound **microscope objectives, T. Port**





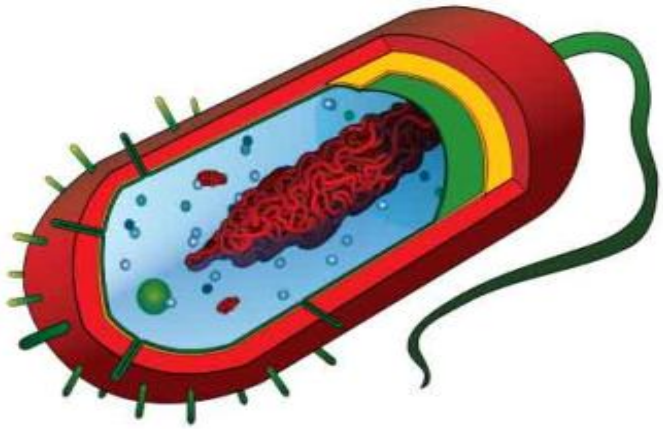
The Basics of Biological Cells



Images: M. Ruiz

Images: Prokaryotic cell, Animal cell & Plant cell, M. Ruiz, Objective lenses of microscope, T. Port

Two Basic Types of Cells



Prokaryotic Cells

Eukaryotic Cells

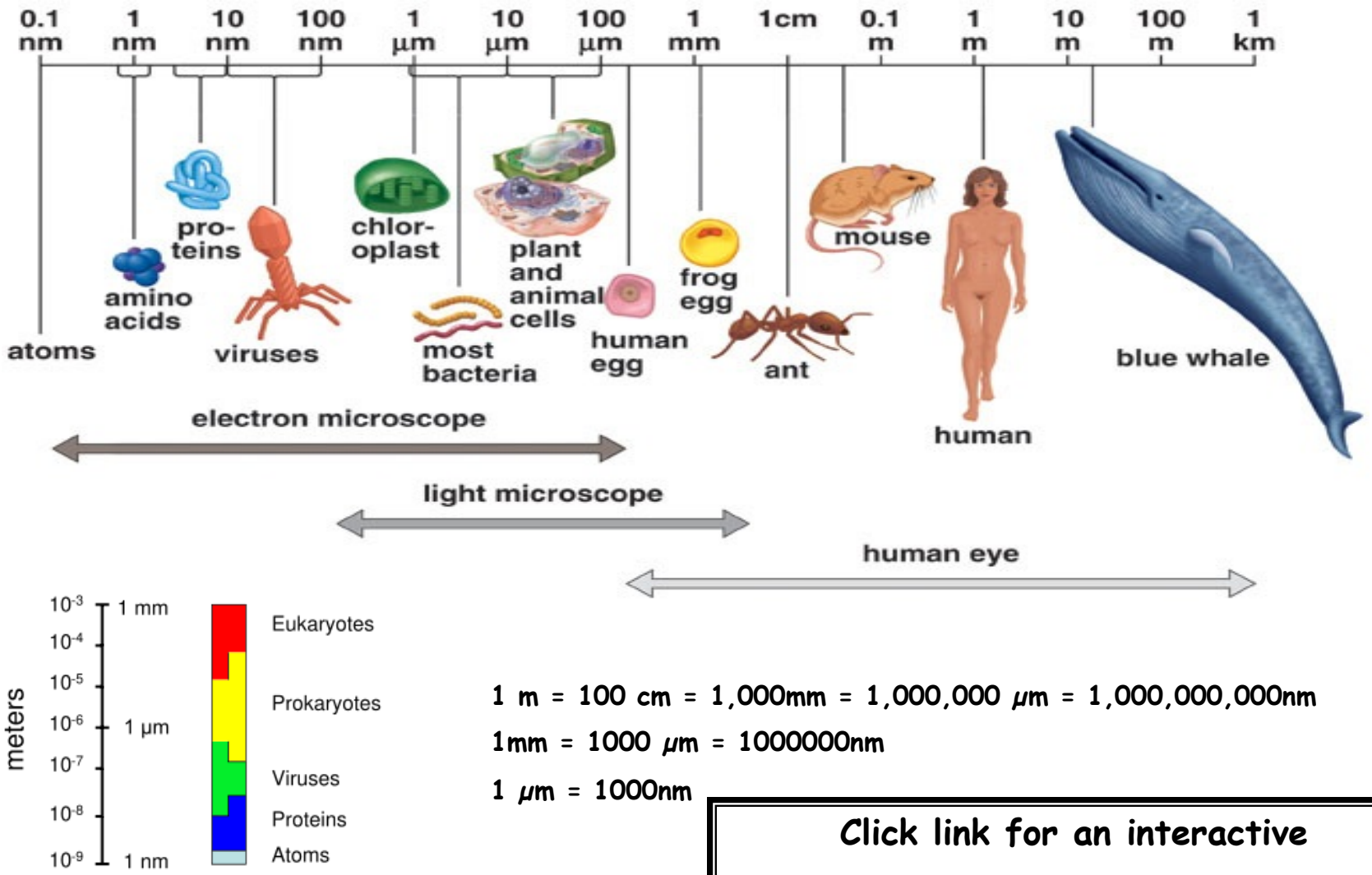
Cells:

- are the building blocks of life!
- All living things are made of one or more cells.
- only come from other cells.
- are , really small. How small are they?
- small because of surface to volume ratio

WATCH THIS!
Introduction to Cell Video

Images: Prokaryotic cell diagram & Eukaryotic cell diagram, M. Ruiz

Size of Living Things



1 m = 100 cm = 1,000mm = 1,000,000 µm = 1,000,000,000nm

1mm = 1000 µm = 1000000nm

1 µm = 1000nm

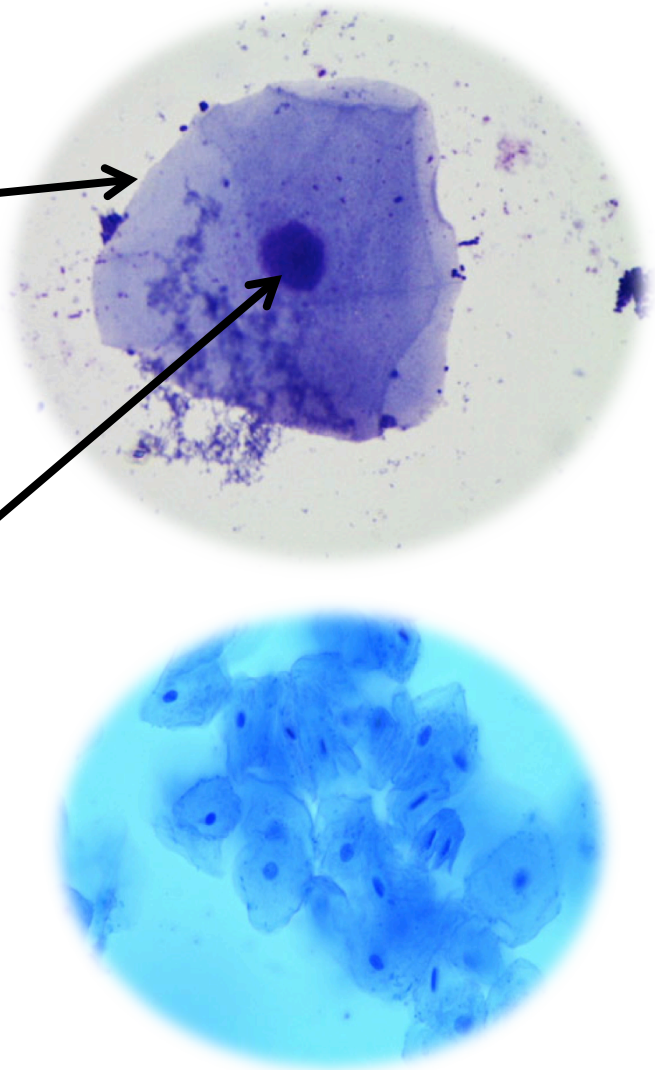
Click link for an interactive

"Size of Microscopic Things"

animation on Cells Alive.

Parts Common to All Cells

- **Plasma membrane:**
  - boundary of the cell, controls what enters and leaves
- **Cytoplasm:**
  - fluid substance within the cell, contains dissolved solutes like ions and sugars
- **Genetic Info:** DNA
  - Provides instructions for how to build and run the cell



Images: Micrographs of human cheek cells at 400xTM and 100xTM, T. Port

Classification of Kingdoms of Eukaryotes

	Bacteria	Protists	Fungi	Plants	Animals
Prokarytic or Eukaryotic?					
Cell Organization (single or multicellular?)					
Examples of Organisms					
Distinguishing Characteristics					
Other Details					

Name three ways in which eukaryotes and prokaryotes differ:

Old School 5 Kingdom classification of organisms

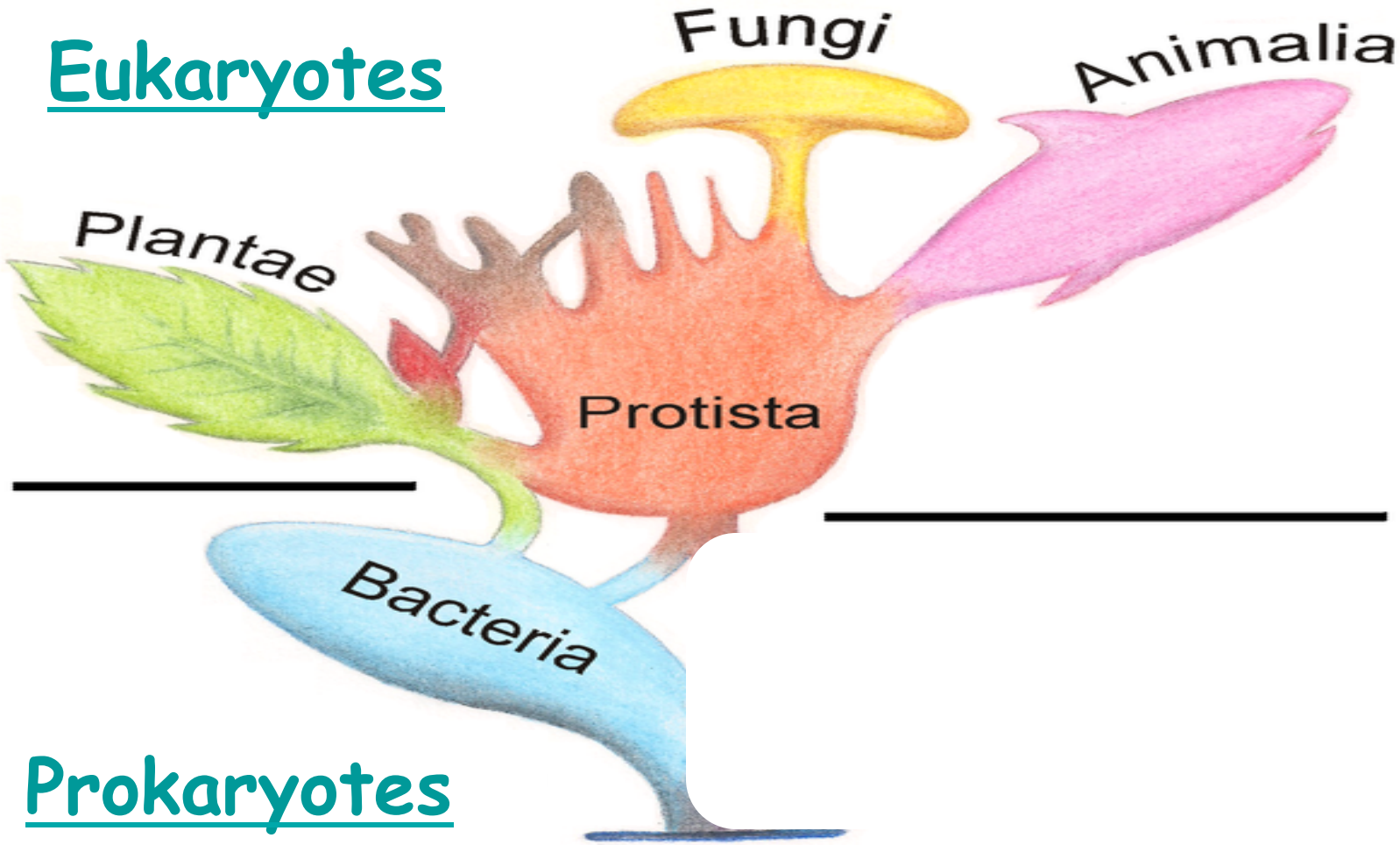
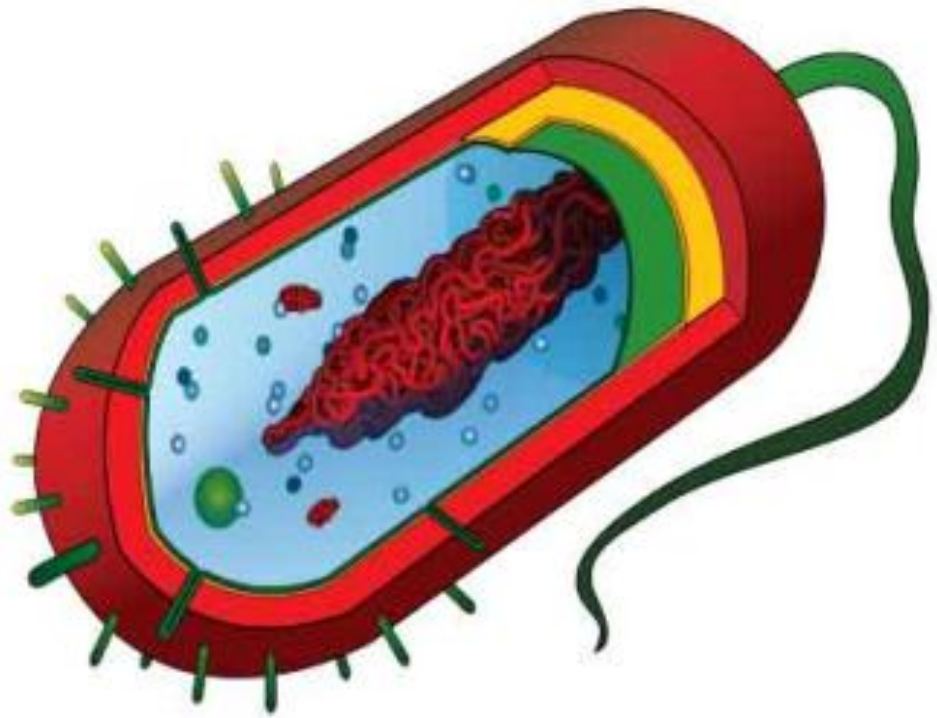


Image: Phylogenetic Tree, Wiki

Prokaryotic 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.
- "Studio apartment" of cells. Everything is in one room.



Images: Prokaryotic Cell, M. Ruiz

Bacteria

- Prokaryotes
- Unicellular microorganisms found in every habitat on Earth.
- Most are heterotrophs, (including the ones that cause disease). Some are autotrophs.
- Peptidoglycan cell walls.
- Binary fission.
- There are all varieties… pathogen, opportunist, harmless & beneficial.

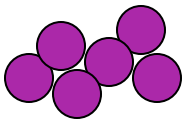
Video: Time Lapse of Bacterial Growth

Image: *Salmonella,* Public Health Image Library, PHIL #10973

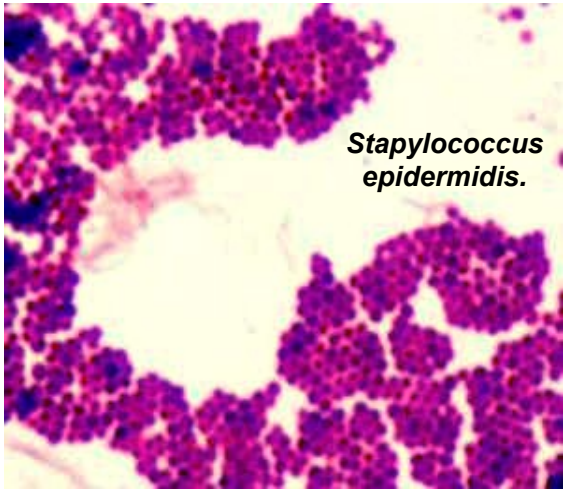
Bacteria: ***Staphylococcus***

GRAM-POSITIVE

coccus-shaped



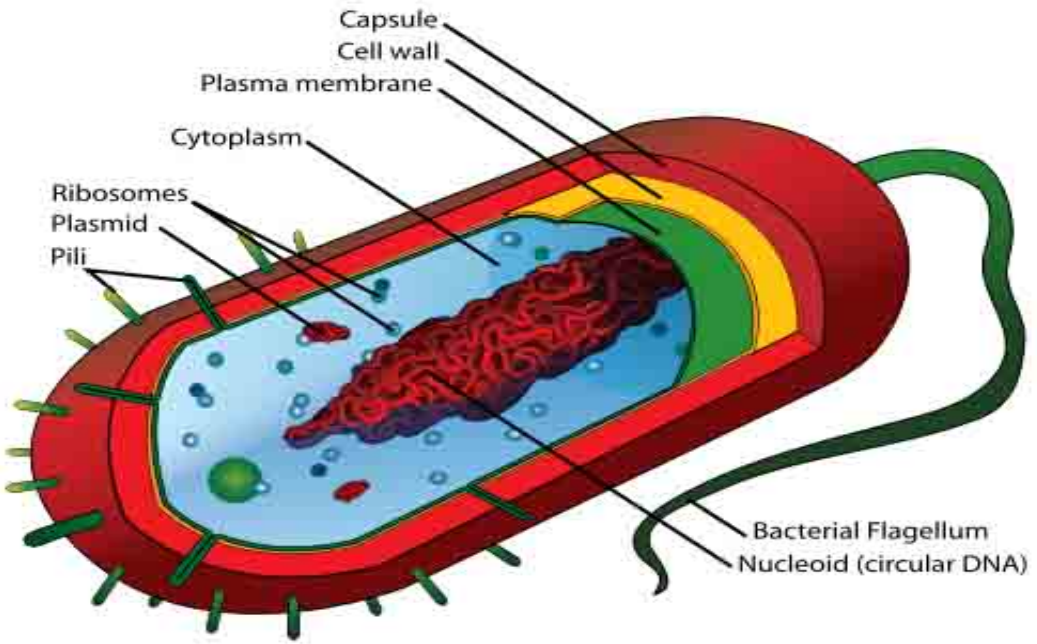
- ***Staphylococcus aureus*** (golden staph), most common cause of staph infections.
- Approximately 20–30% of general population "Staph carriers."
- *S. aureus* can cause illnesses ranging from minor skin infections to life-threatening diseases, such as meningitis, Toxic shock syndrome (TSS) & septicemia.
- **MRSA** = Methicillin-resistant *Staphylococcus aureus*
- One of the four most common causes of **nosocomial infections**, often causing postsurgical wound infections.
- ***S. epidermidis*** is normal flora which inhabits the skin of healthy humans.



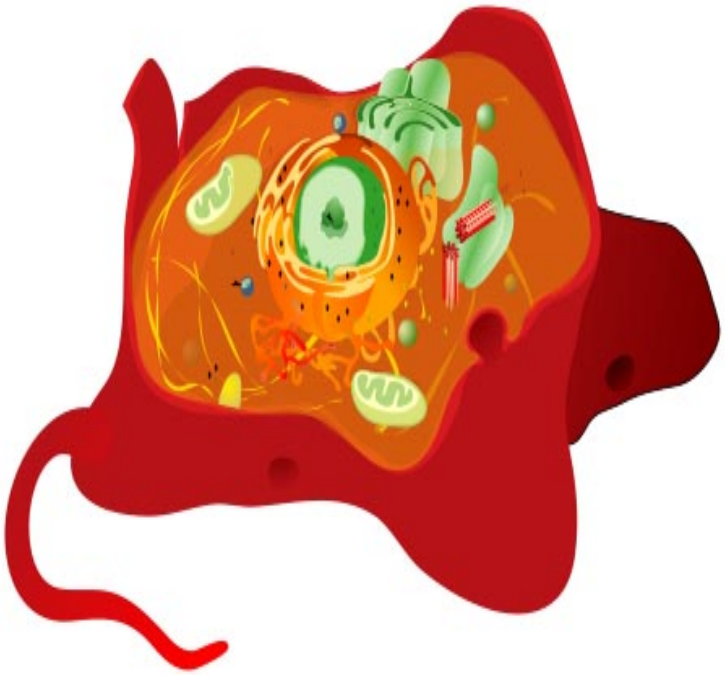
Images: *S. aureus*, Janice Haney Carr , PHIL #10046; Gram stain *Staph*, T. Port

REVIEW!

Here's an excellent interactive lesson on Prokaryote Cell Structure



Eukaryotic Cells

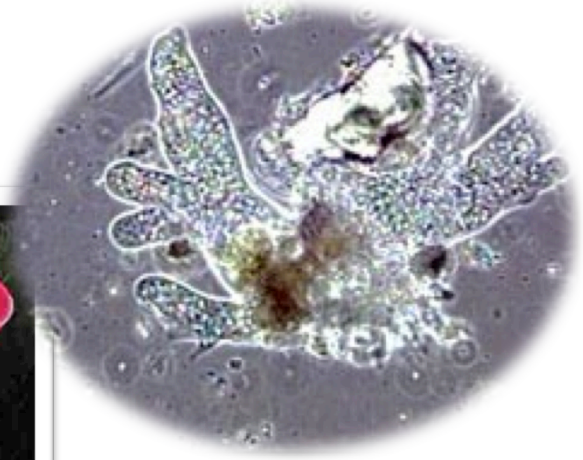


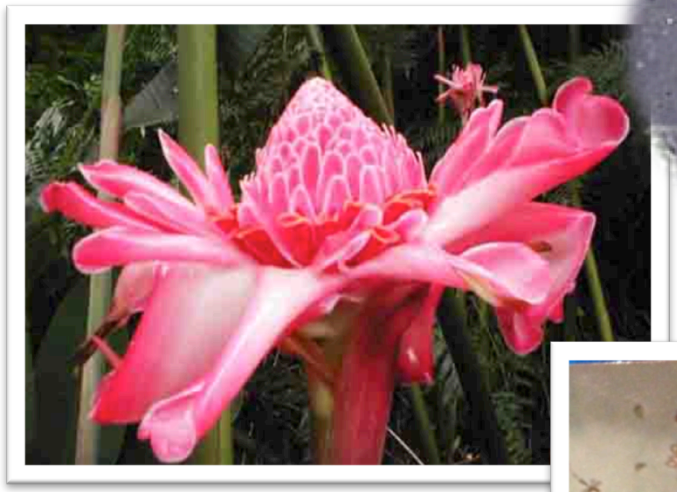
- Eu ="true", karyon="nucleus"
- Genetic material contained in a nuclear membrane.
- Membrane bound organelles.
- Include animal, plant, fungi, algae cells as well as other microscopic eukaryotes.
- Evolved from **prokaryotic cells**.
- The "mansion" of cells, many different "rooms".

Image: Eukaryotic Cell Diagram, M. Ruiz

Eukaryotes

1. Protists
2. Plants
3. Animals
4. Fungi





Images: Photos by T. Port

Protists

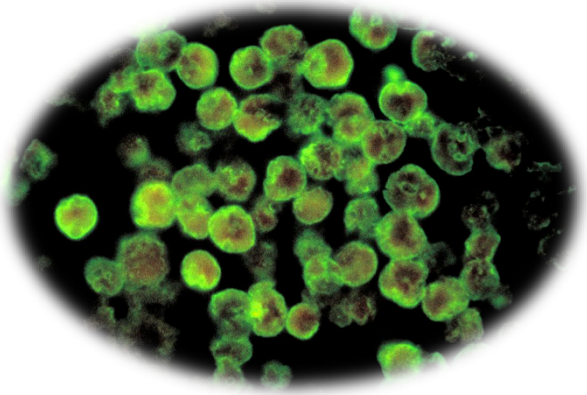
- Eukaryotic
- Unicellular
- Need moist environment
- Some more plant like (autotrophs).
- Some more animal like (heterotrophs).

Video: Life in a Drop of Water

Images: Clockwise from top: *Ceratium, Tabellaria, Cyclidium, Volvox*, and *Diatoms*, by T. Port; Amoebae, Wiki. Water drop, Wiki

Pathogenic Protist

Amoebae: *Naegleria fowleri*



Meningoencephalitis caused by the amoeba *Naegleria fowleri* (nuh-GLEER-ee-uh FOWL'-erh-eye), a parasitic microorganism that feeds on brain tissue.

How Common is *N. fowleri*?

- Infection very rare (34 US cases in past 10 years, but nearly always fatal.
- Cases most often occur during the dry, hot summer months, when water is warm and at low levels.

How *N. fowleri* Attacks

- Enters body through the nose; invades CNS by penetrating the olfactory mucosa and nasal tissues.
- Early infections: necrosis (tissue death) and hemorrhaging in the olfactory bulbs.
- Amoeba then climbs along nerve fibers through the floor of the cranium, into the brain.

Where Is *Naegleria* Found?

- Worldwide distribution, typically found in warm fresh water, temperatures ranging from 77 – 95 F.

How to Reduce Your Risk

- Infection usually follows water-related activities (swimming underwater, diving, or any water sport that results in water going up the nose).
- Infection can only result from exposure to the amoeba's environment, not from person-to-person contact.

Image: *Naegleria folwleri*, Wiki

Fungi

- Eukaryotic
- Some unicellular. Some multicellular.
- Heterotrophs that digest their food **externally**, secrete digestive enzymes and then absorb nutrient molecules into their cells.
- **Examples:** yeasts, molds, and mushrooms.
- Fungi are also used extensively by humans:
  - **yeasts** responsible for fermentation of beer & bread
  - **mushroom farming** is big industry
  - produce some **antibiotics**
- Fungi and bacteria are the primary **decomposers** of organic matter.
- If you have ever had **athlete's foot** or a **yeast infection**, you can blame a fungus.
- Can be difficult to kill with antimicrobials. Remember, their cells are very much like ours.
- Reproduce through tiny **spores** in the air.
- You are more likely to get a fungal infection if you have a **weakened immune system** or take antibiotics.

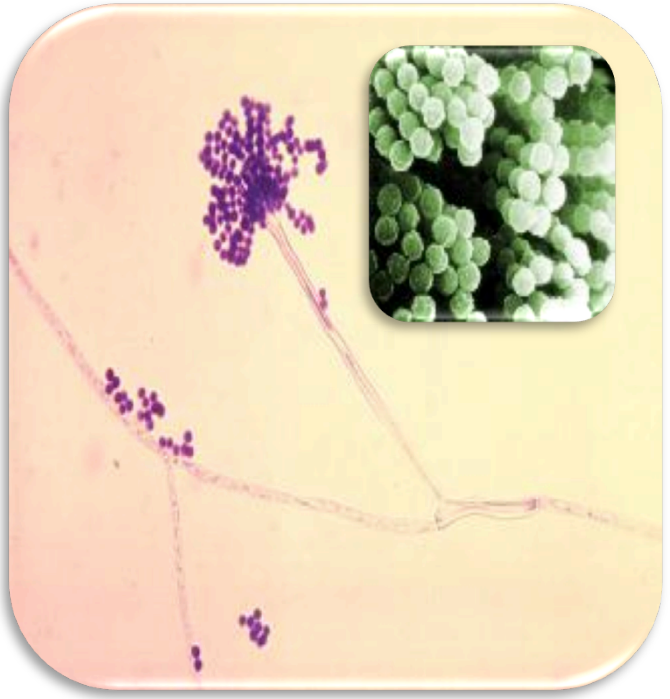
Video:
Fungi - Death Becomes Them
from Crash Course Biology

Images: Fungi Collage, Borgqueen, Wiki, Creative Commons

Opportunistic Fungal Pathogen

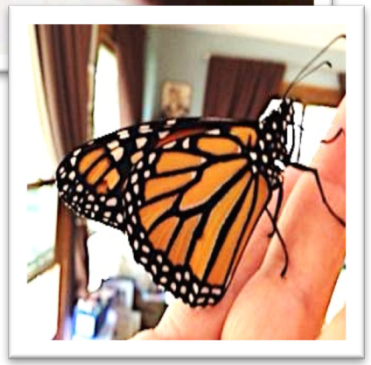
Aspergillus fumigatus

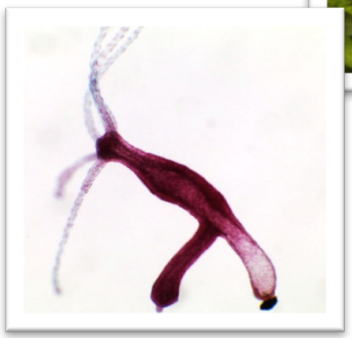
- Can cause disease _____.
- Has become leading infectious cause of death in leukemia and bone marrow transplant patients.
- Can result in:
  - allergic reaction
  - pulmonary mass
  - systemic infection
  - can also exacerbate asthma
- Researchers dissected pillows (both feather and synthetic) and identified several thousand spores of fungus per gram of used pillow - more than **a million spores per pillow**.
- Five things increase a persons risk of experiencing opportunistic mycoses:
  - Invasive medical procedures
  - Medical therapies that weaken the immune system
  - Certain preexisting conditions / Immune compromised
  - Specific lifestyle factors



Images: Bed with pillows, Liz Lawley; Aspergillus fumigatus , PHIL #300; A. fumigatus, Janice Carr, PHIL # 9998

Animals



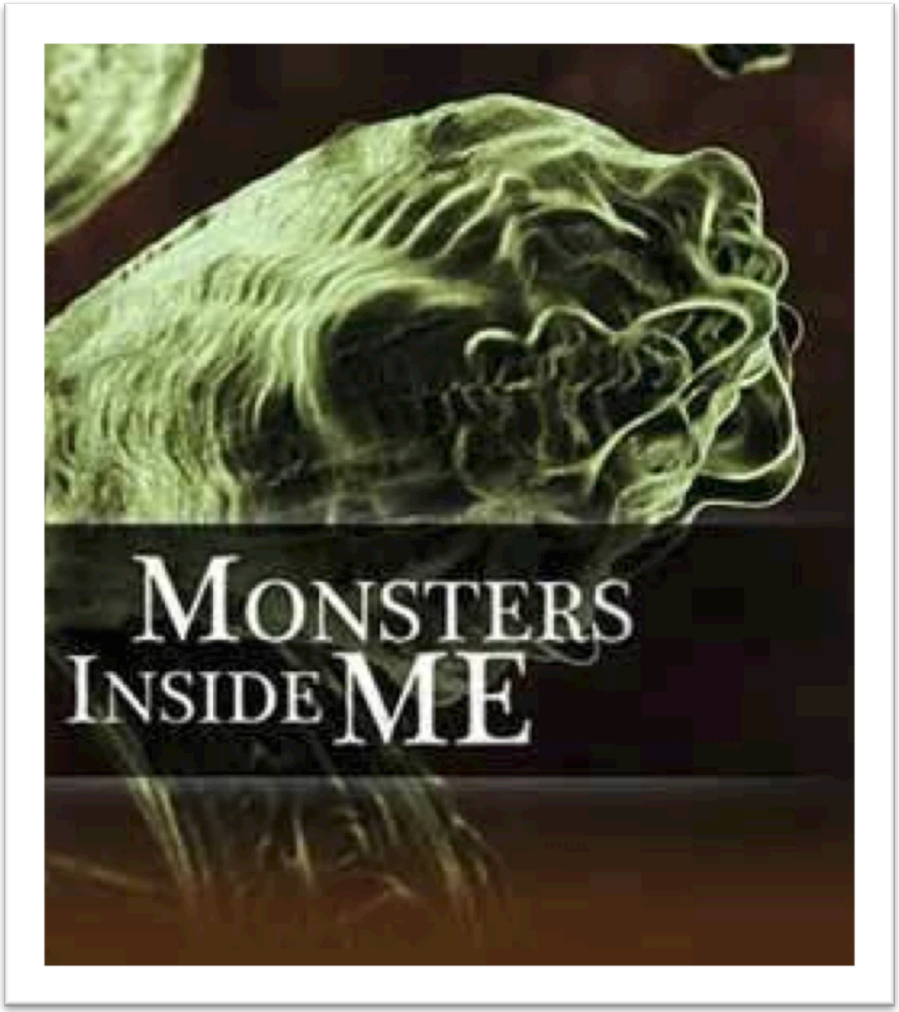


- Eukaryotic
- Multi-cellular
- Heterotrophic
- No cell wall.
- Some reproduce asexually. Some reproduce sexually. Some can do both.
- Most are motile (can move around)..

Video:
Eukaryopolis
The City of Animal Cells
from Crash Course Biology

All photos by T. Port

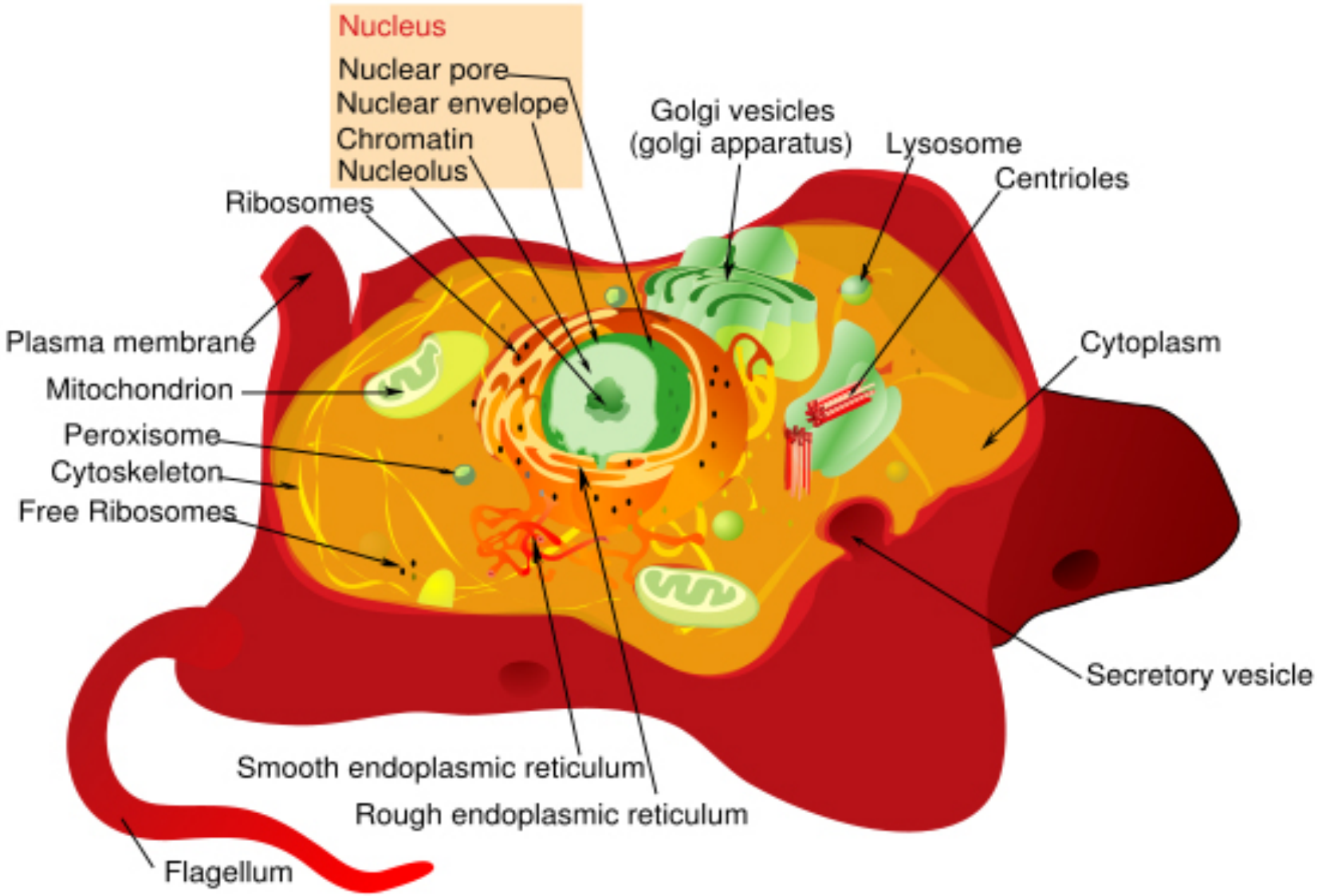
Animals: Parasitic Worms (Helminths)



Now lets watch the Monsters Inside Me Video Clip:

"Worm In My Butt"!

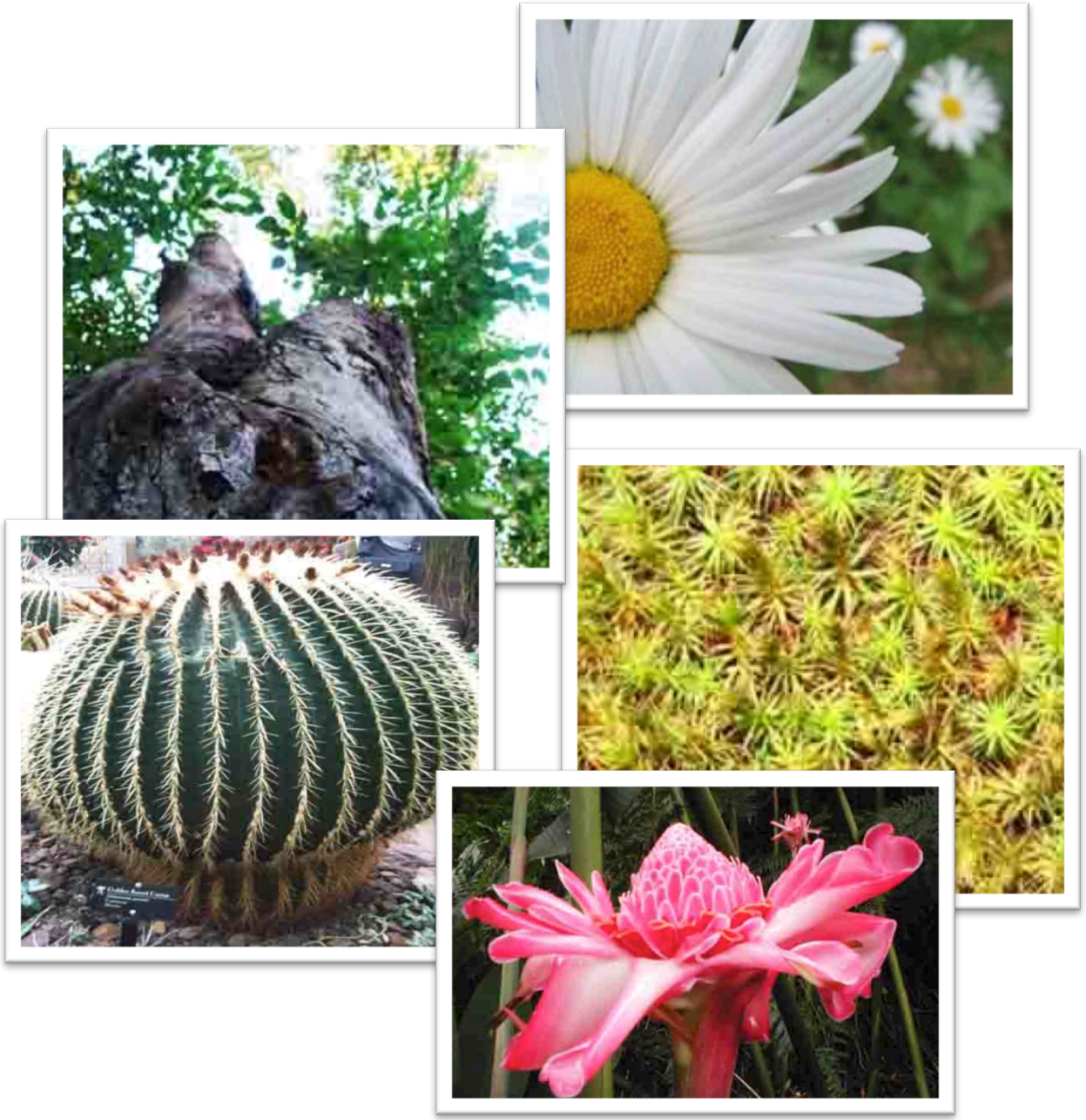
Animal Cell *(Eukaryote)*



Images: Animal cell diagram , M. Ruiz

Plants

- Eukaryotic
- Multi-cellular
- Autotrophic (photosynthesis)
- Have cell wall.
- Some reproduce asexually. Some reproduce sexually. Some can do both.



Video:
Pant Cells
from Crash Course Biology

All photos by T. Port

Plant Cell *(Eukaryote)*

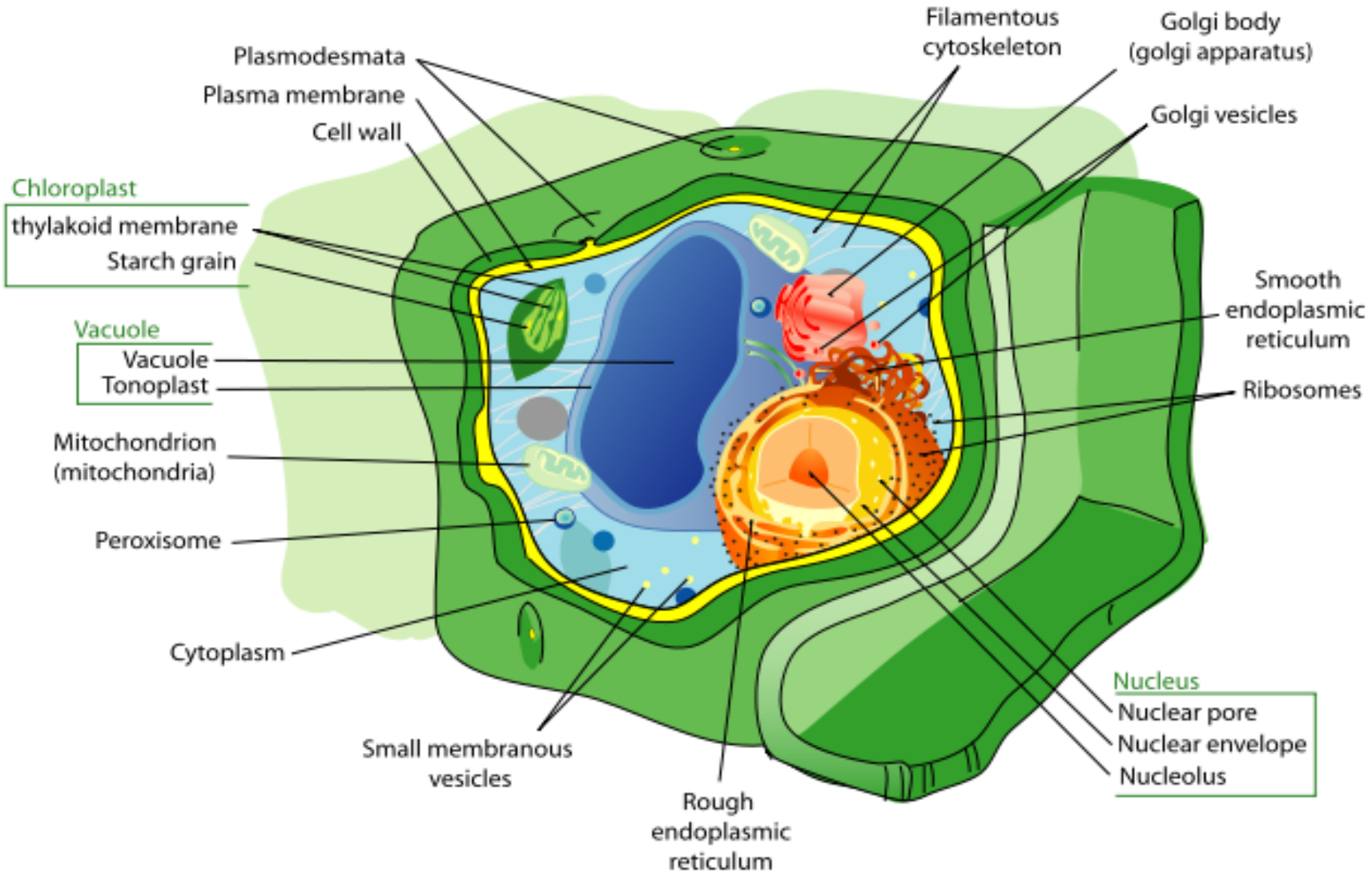
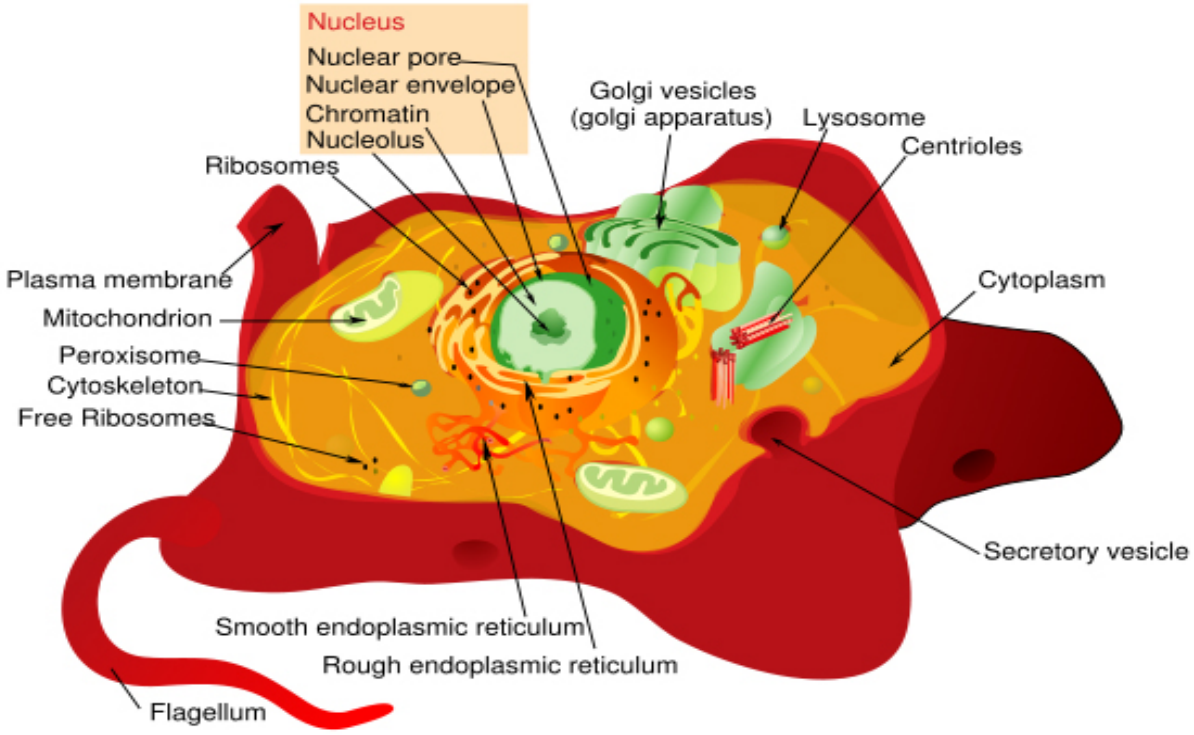


Image: Plant cell diagram, M. Ruiz

REVIEW!

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



Images: Prokaryotic cell diagram, M.

Confused?

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

Smart Links

- Eukaryotic Cells Main Page on the Virtual Cell Biology Classroom of Science Prof Online.
- Prokaryotic & Eukaryotic: Two Types of Biological Cells, an article from SPO.
- Eukaryotic Cell: Structures, Functions & Diagrams, an article from SPO.
- "Cells" music video by They Might Be Giants.
- Cells Alive interactive website.
- "How big is a..." interactive diagram from Cells Alive website.
- Cell Structure tutorials and quizzes from Interactive Concepts in Biochemistry.
- Eukaryotic Cell Tour an Animated Science Tutorial.
- "Germs". Music by Weird Al Yankovic. Video by RevLucio.
- "The Cell Song" lyrics by The Cell Squad, Freedom Middle School, Nashville, TN.
- Endocytosis / Exocytosis animation and quiz from McGraw Hill.
- Biology4Kids – Cell Biology Main Page by Raders.

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