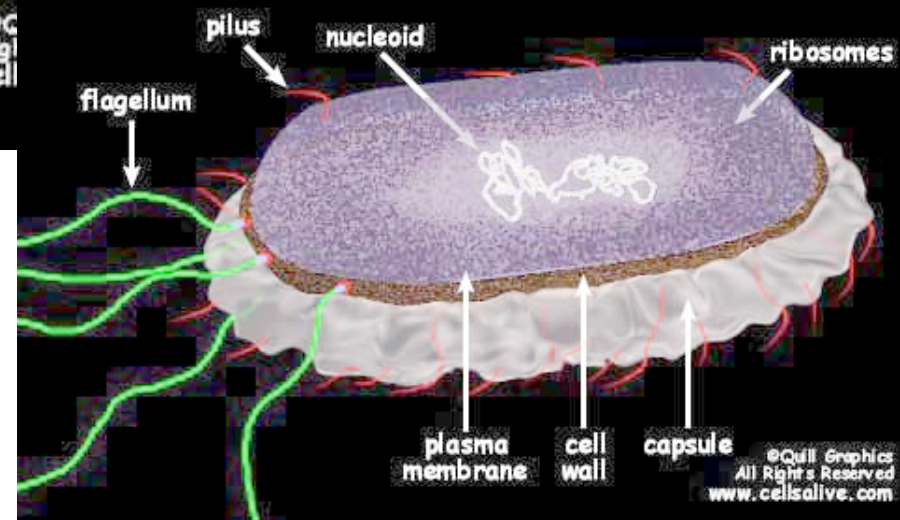
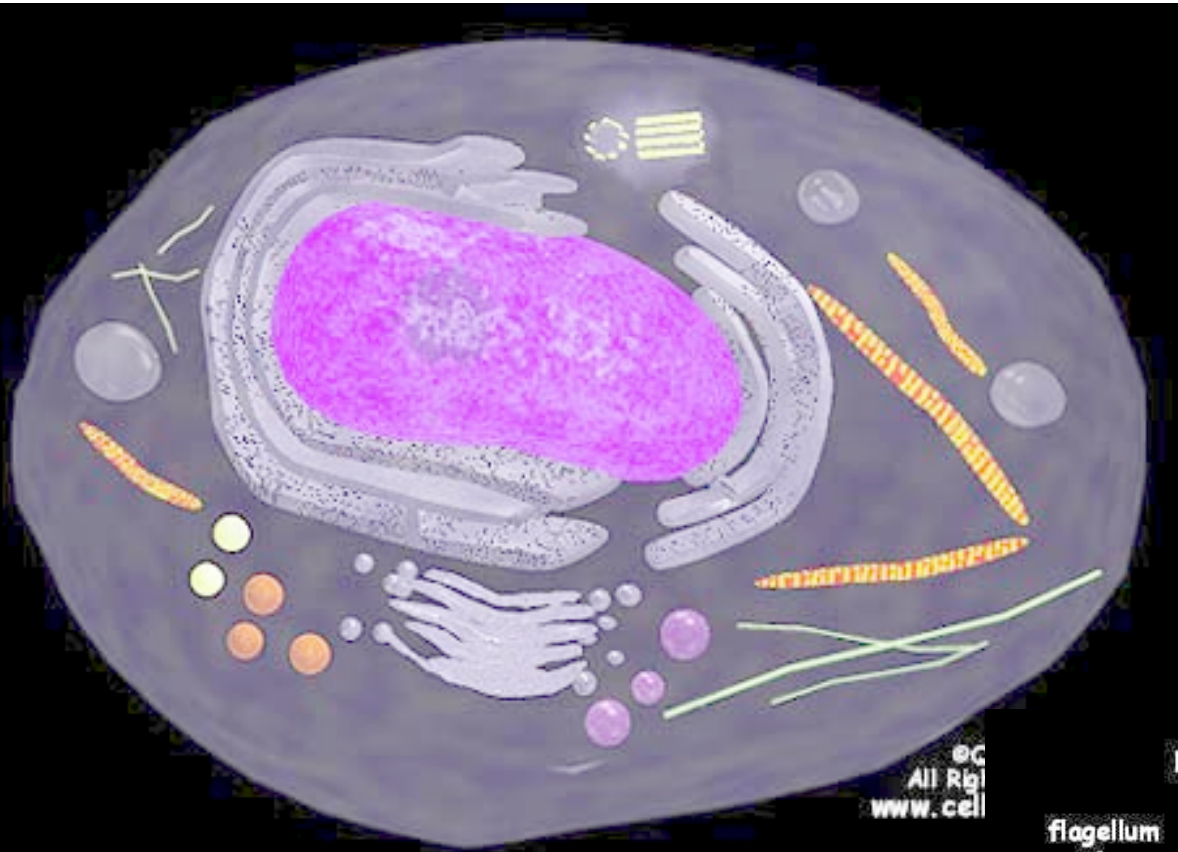


# Cells

Sizes, types, characteristics

# Eukaryote vs. Prokaryote

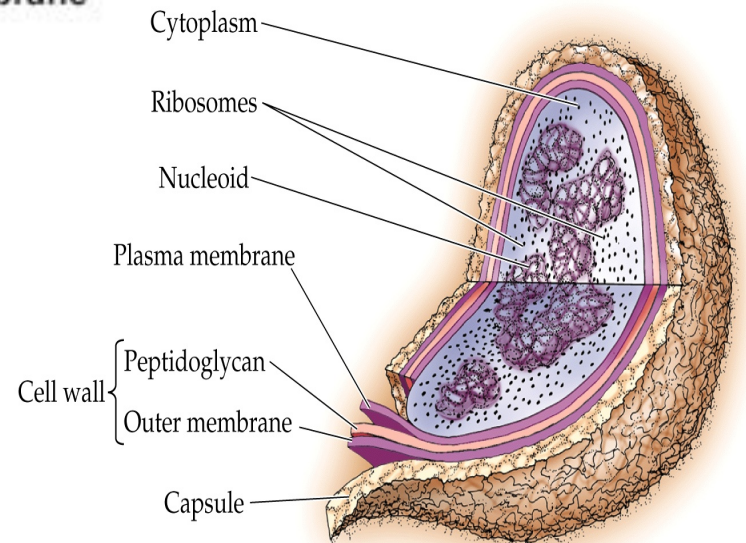
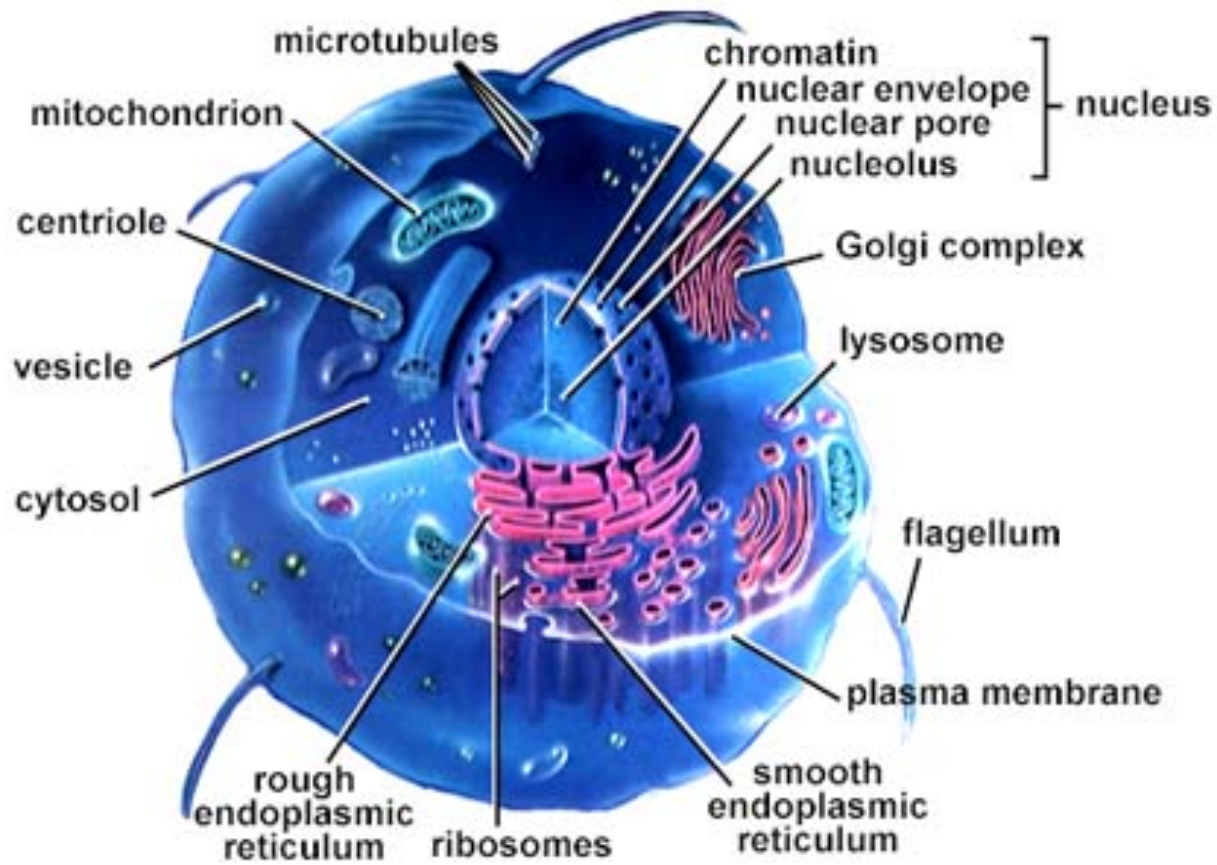


# ***Two Basic Types of Cells***

- Prokaryotes:
  - pronounced: pro-carry-oats
- Eukaryotes
  - Proun: you-carry-oats

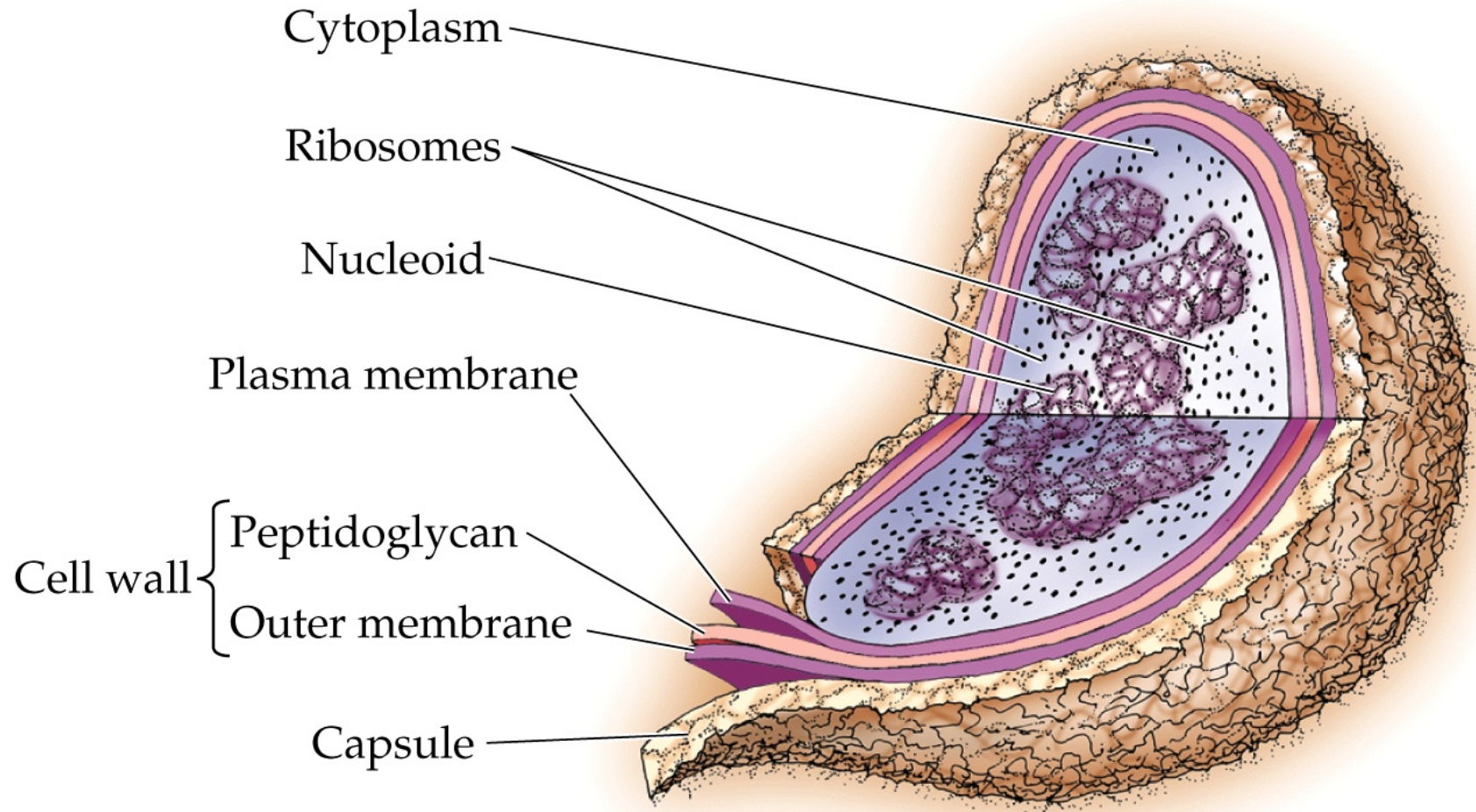
# Eukaryotic versus Prokaryotic Cells

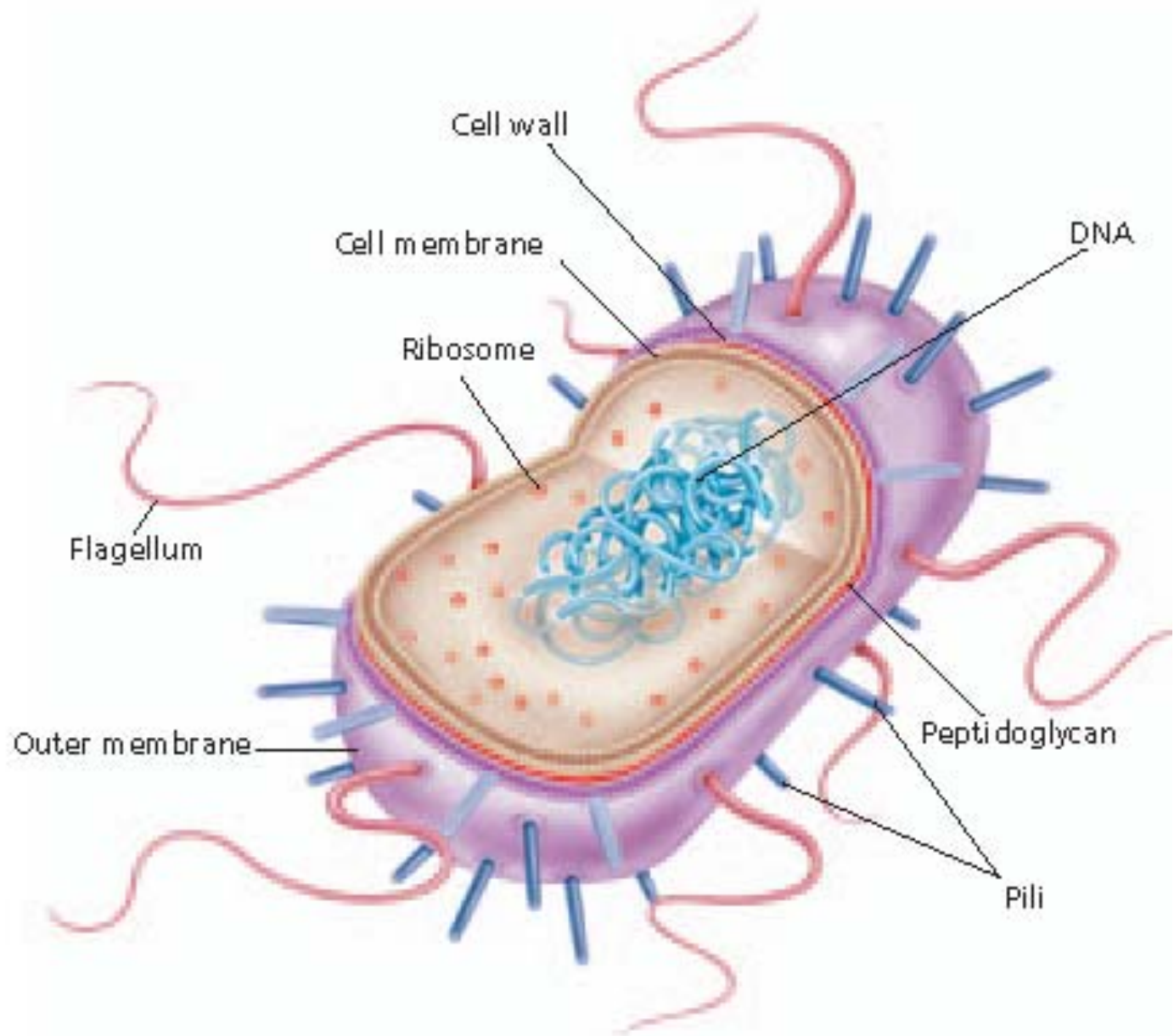
- Prokaryotic - Cells lacking a nucleus and other membrane-bound organelles.
- Eukaryotic - Cells containing a nucleus.
  - Organelles - Membrane-bound bodies found within eukaryotic cells.

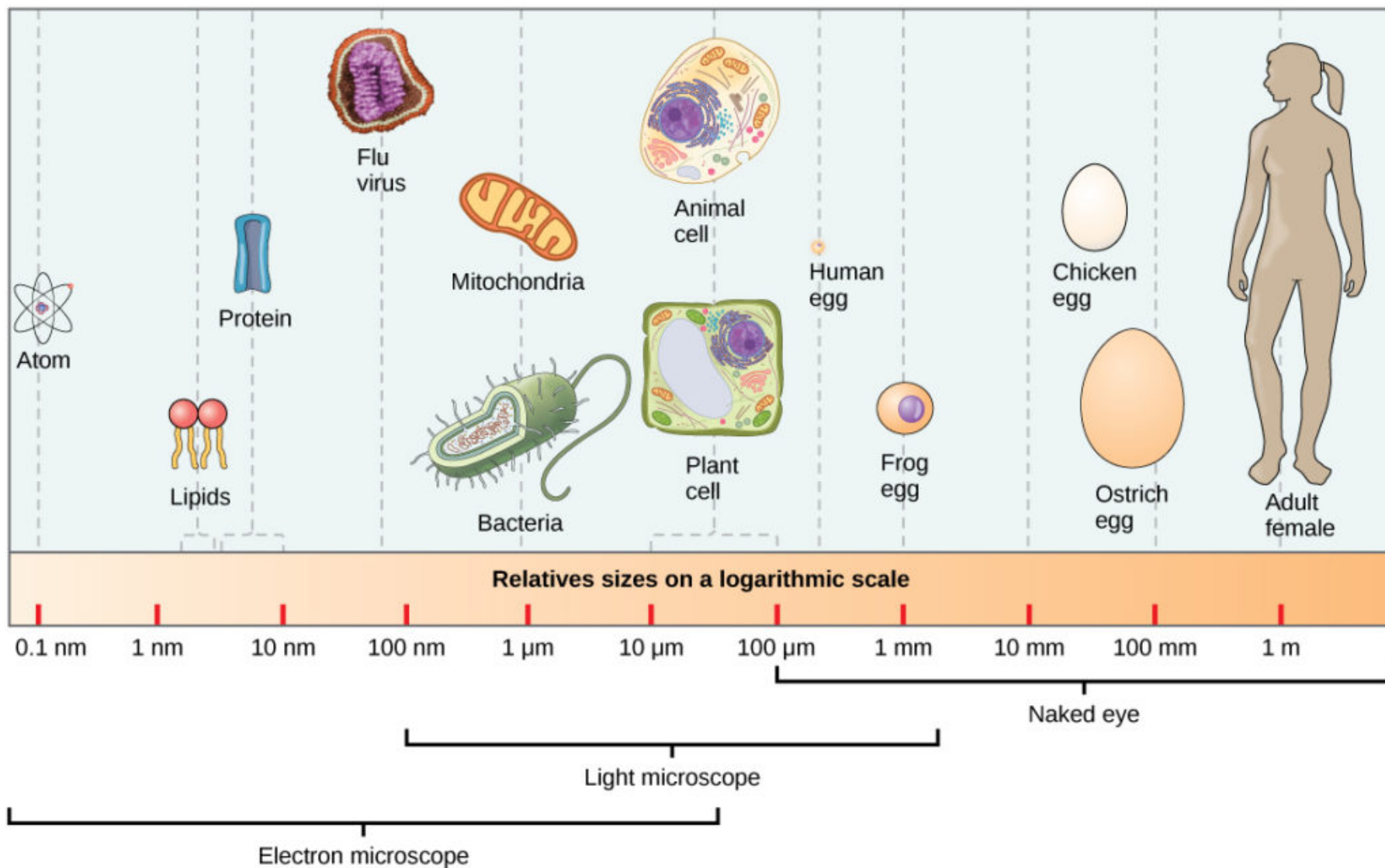




# Prokaryotic cell

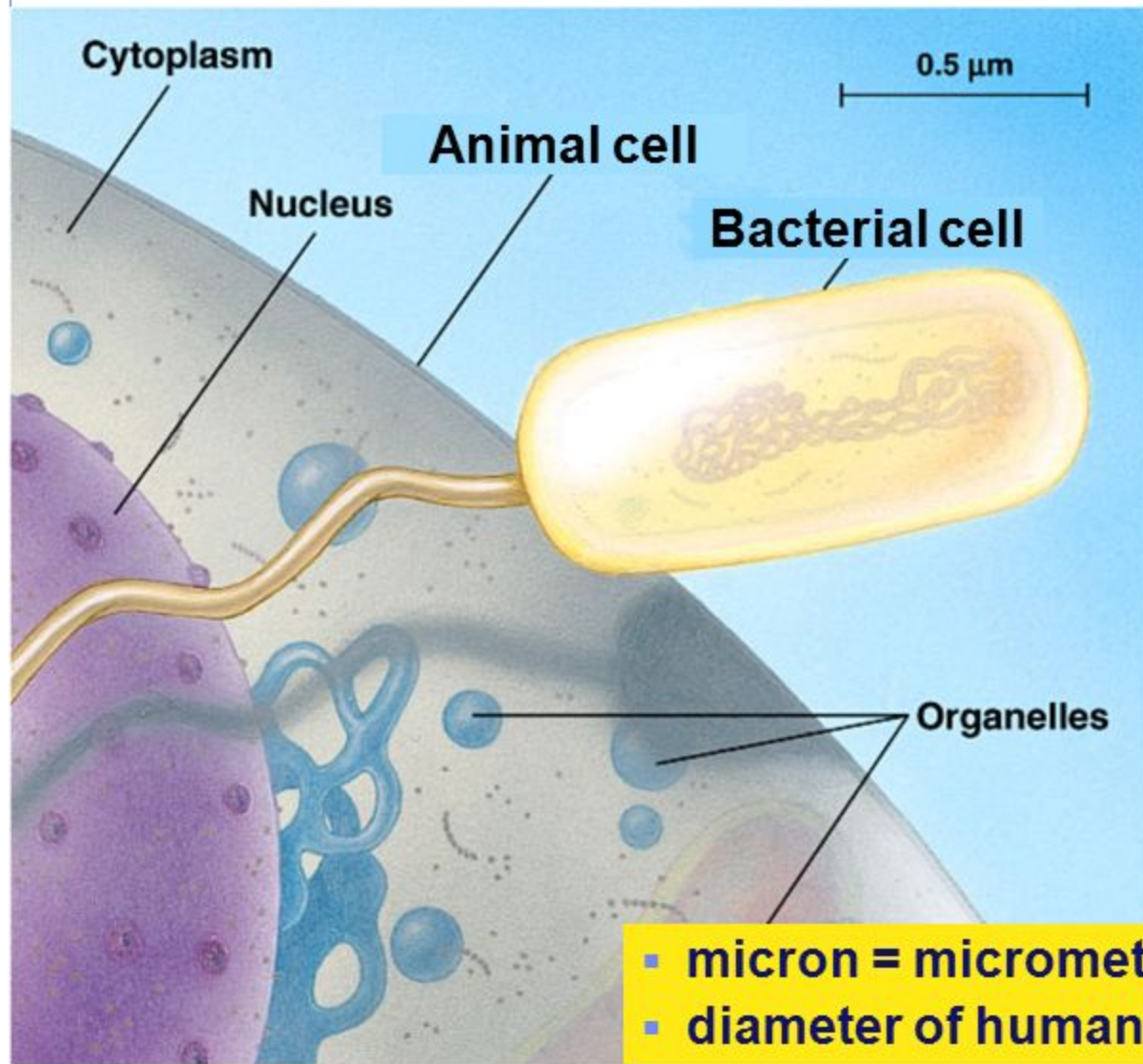








# Cell size comparison



**most bacteria**

- 1-10 microns

**eukaryotic cells**

- 10-100 microns

- micron = micrometer =  $1/1,000,000$  meter
- diameter of human hair =  $\sim 20$  microns

# Prokaryote - Bacteria



# ***A. Prokaryotes***

Small, simple cells (relative to eukaryotes)

Size: about 1  $\mu\text{m}$  (1 micron)

No internal membrane-bounded organelles

No nucleus

Simple cell division

Contain the

1. *true bacteria* (Eubacteria)

2. *archaebacteria*

# 1. *True Bacteria* = *Eubacteria*

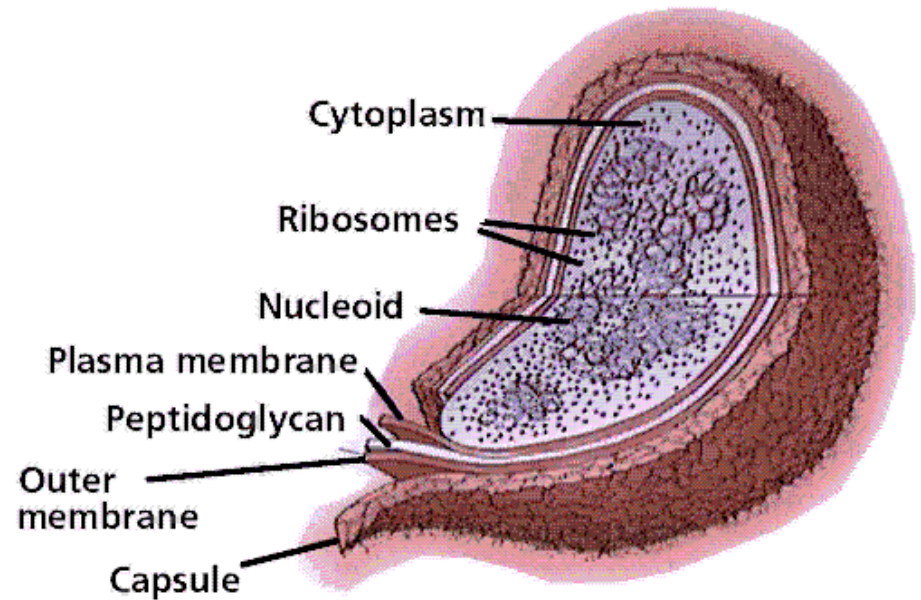
- Majority of bacteria
- Examples include: *E. coli*, *Lactobacillus* (yogurt), Lyme disease





# *Eubacteria*

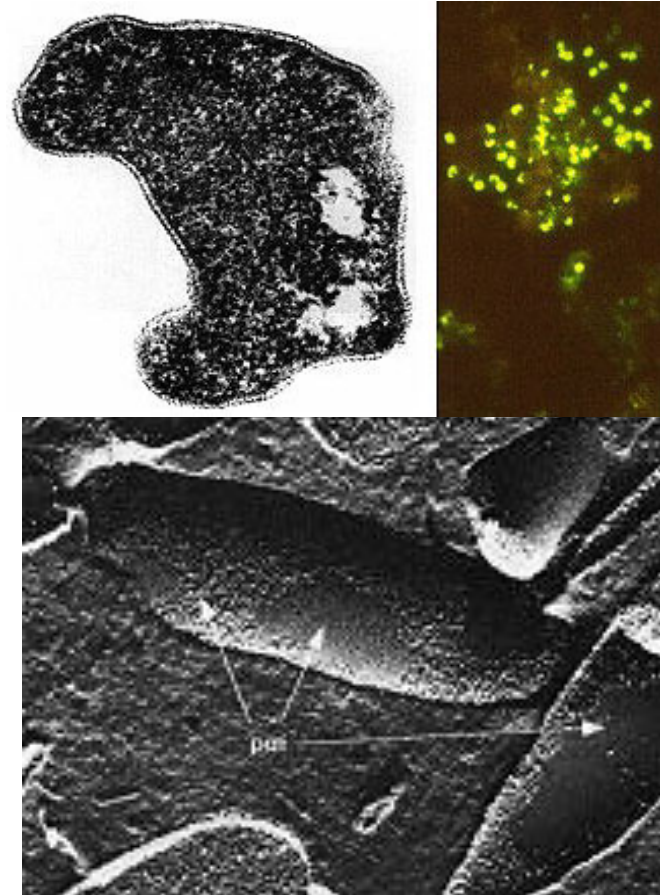
- Peptidoglycan cell walls (carbs & AA)
- Separated into Gram + and - forms





## 2. *Archaeobacteria*

- Live in extreme environments: high salt, high temps
- Different cell wall
- Very different membrane lipids
- Unusual nucleic acid sequence



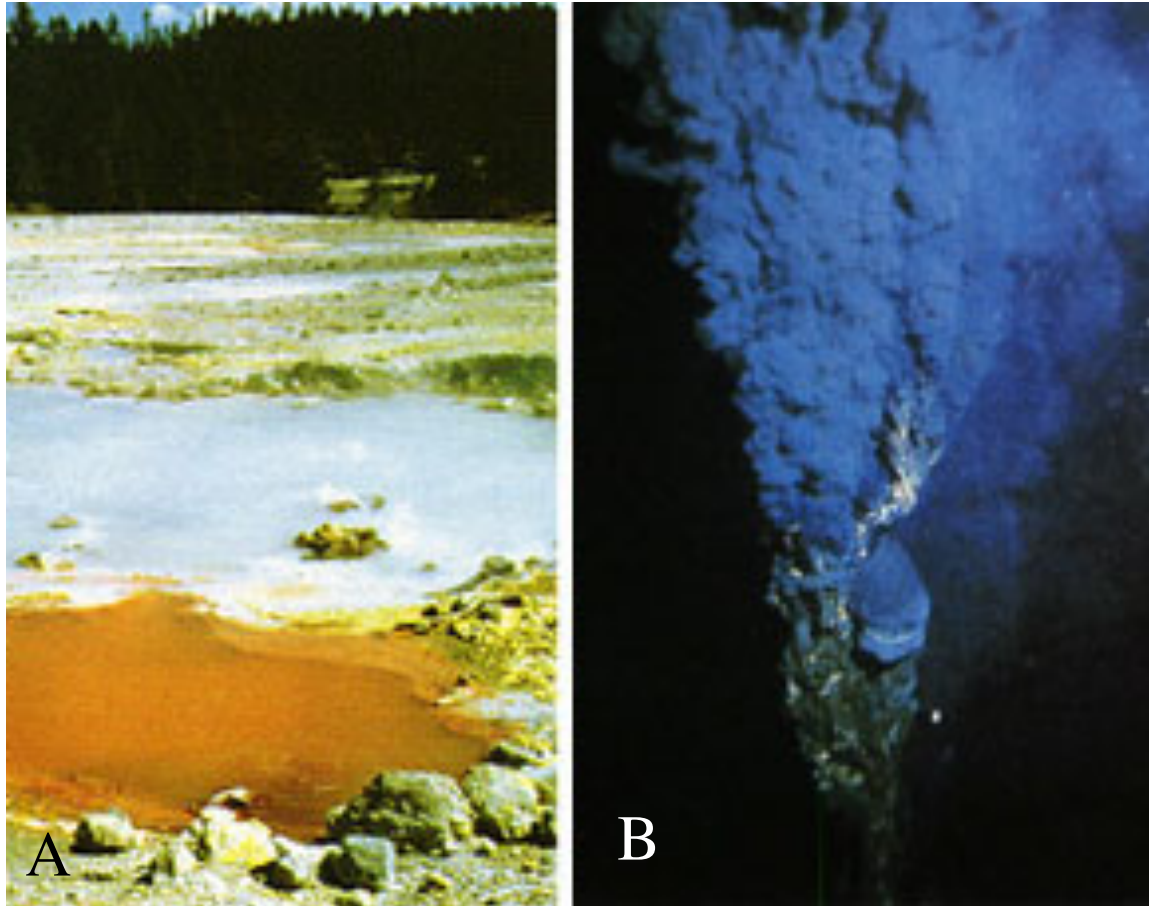
# *Archaeobacteria*

The prokaryotes Archaeobacteria are organized into 3 types based on physiology,

- **Methanogens** produce methane
- **Extreme halophiles** live at very high concentrations of salt (NaCl);
- **Extreme (hyper) thermophiles** live at very high temperatures.

# ***Bacteria in the Environment***

*example:*  
Iron  
utilizing  
Bacteria



- A) An acid hot spring in Yellowstone is rich in iron and sulfur.**  
**B) A black smoker chimney in the deep sea emits iron sulfides at very high temperatures (270 to 380 degrees C).**

# Bacteria in an ecosystem

- What functions do they perform?

# Bacteria in your Intestine ;)



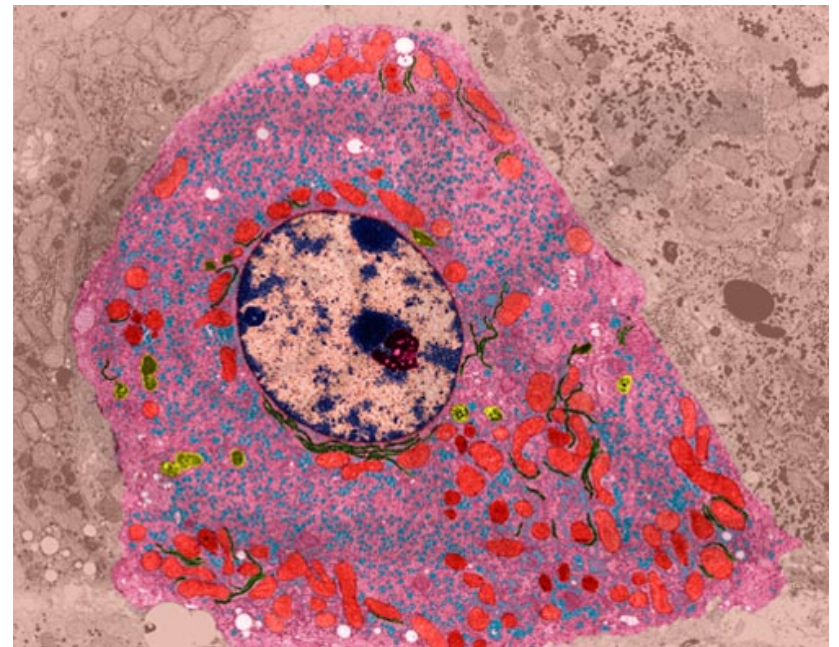


# Bacteria in your Intestine.....

- What functions do they perform?

## ***B. Eukaryotes***

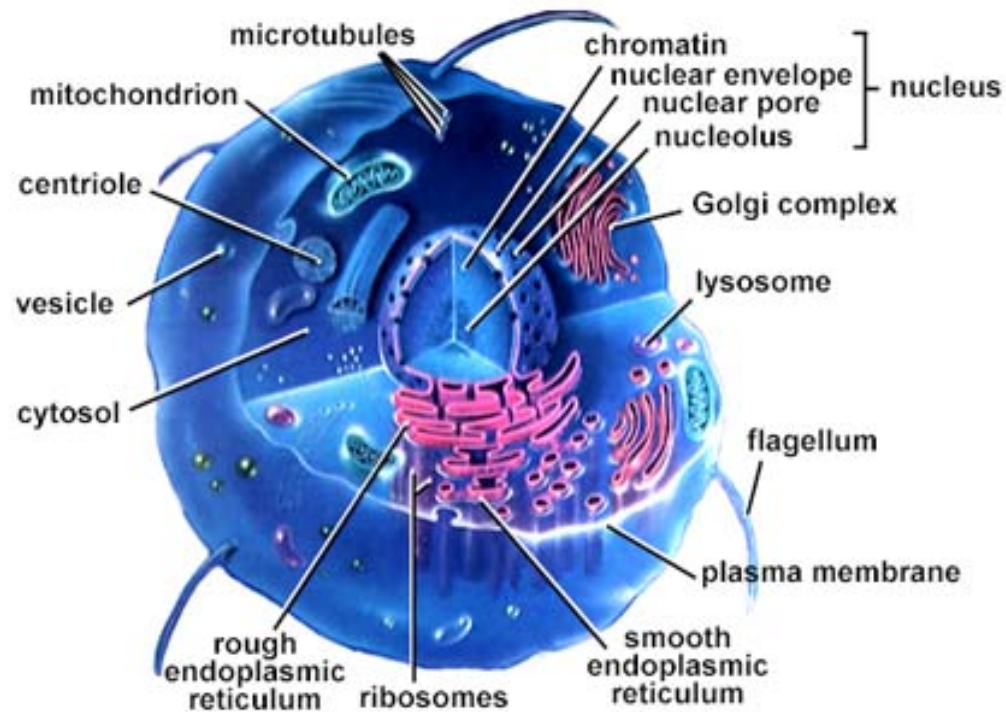
- Bigger cells: 10-100  $\mu\text{m}$
- True nucleus
- Membrane-bounded structures inside. Called organelles
- Divide by a complex, well-organized mitotic process



Liver Cell 9,400x

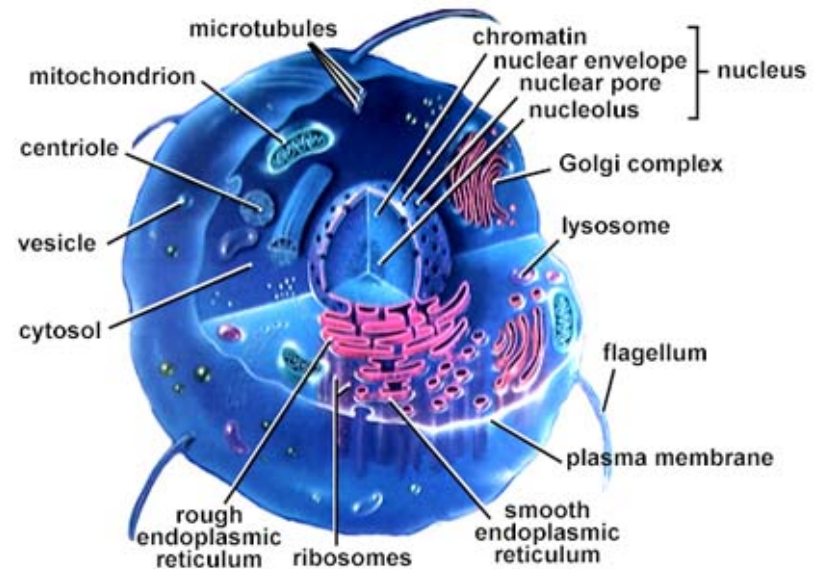
# Eukaryotic cell

- Have membrane-bound organelles, including a nucleus



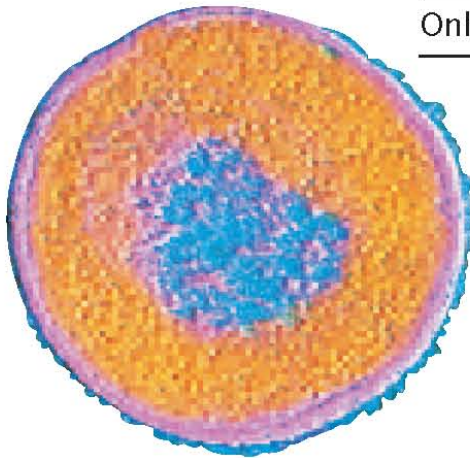
# *Eukaryotes*

- Larger more complex cells that make up most familiar life forms: plants, animals, fungi, algae



# Comparing Prokaryotes and Eukaryotes

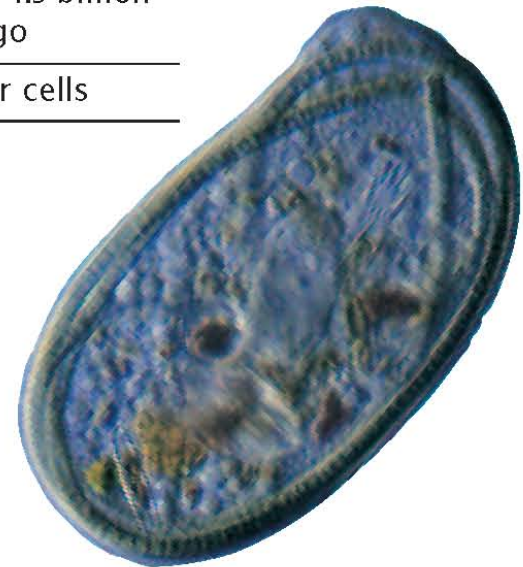
**a** This bacterium, *Streptococcus pneumoniae*, is an example of a prokaryotic cell. It has been magnified approximately 40,000 times in this micrograph.



## Two Cell Types

Prokaryote	Eukaryote
No nucleus	Nucleus
No membrane-bound organelles	Many organelles
Most 1–10 $\mu\text{m}$ in size	Many 2–1,000 $\mu\text{m}$ in size
Evolved 3.5 billion years ago	Evolved 1.5 billion years ago
Only bacteria	All other cells

**b** This protist, *Chilodonella*, is an example of a eukaryotic cell. It has been magnified 150 times in this micrograph.





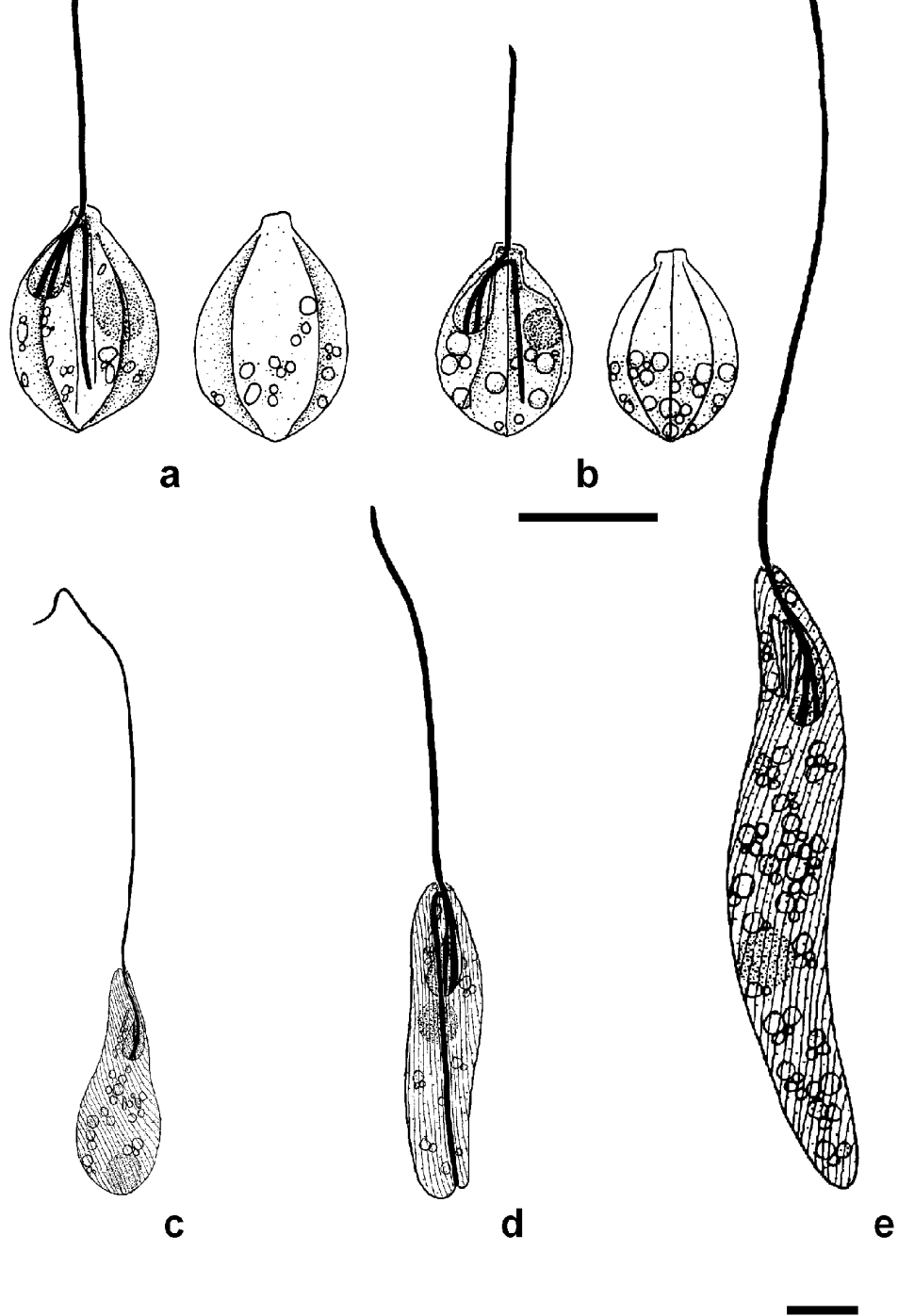
# Protists – Amoebooid protozoans

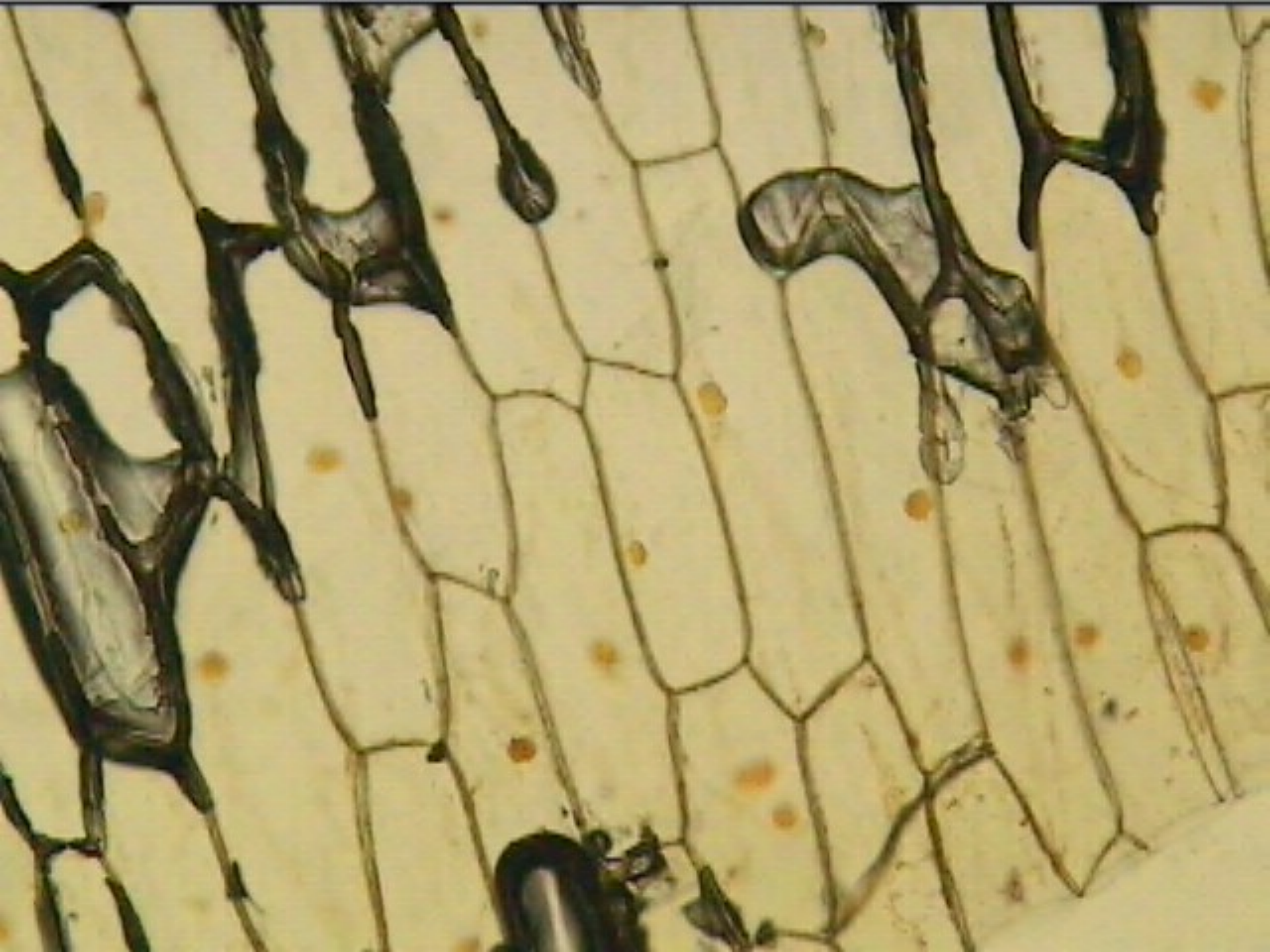


# Protists – Ciliated protozoans



**F**



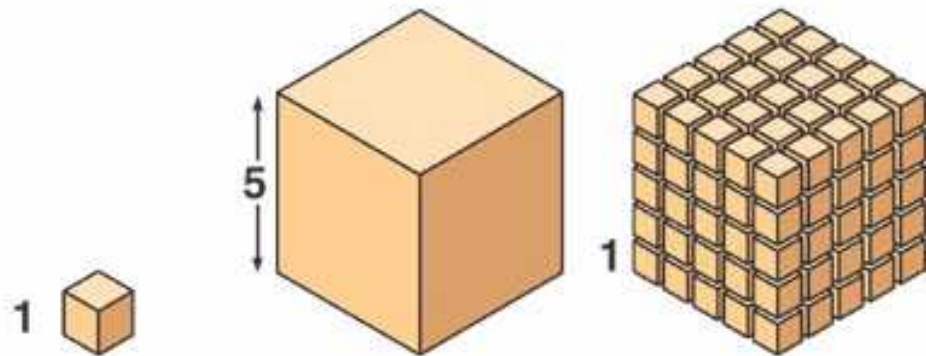








Surface area increases while  
total volume remains constant



Total surface area (height $\times$ width $\times$ number of sides $\times$ number of boxes)	6	150	750
Total volume (height $\times$ width $\times$ length $\times$ number of boxes)	1	125	125
Surface-to-volume ratio (surface area $\div$ volume)	6	1.2	6