1. **Pick up** Name Folder

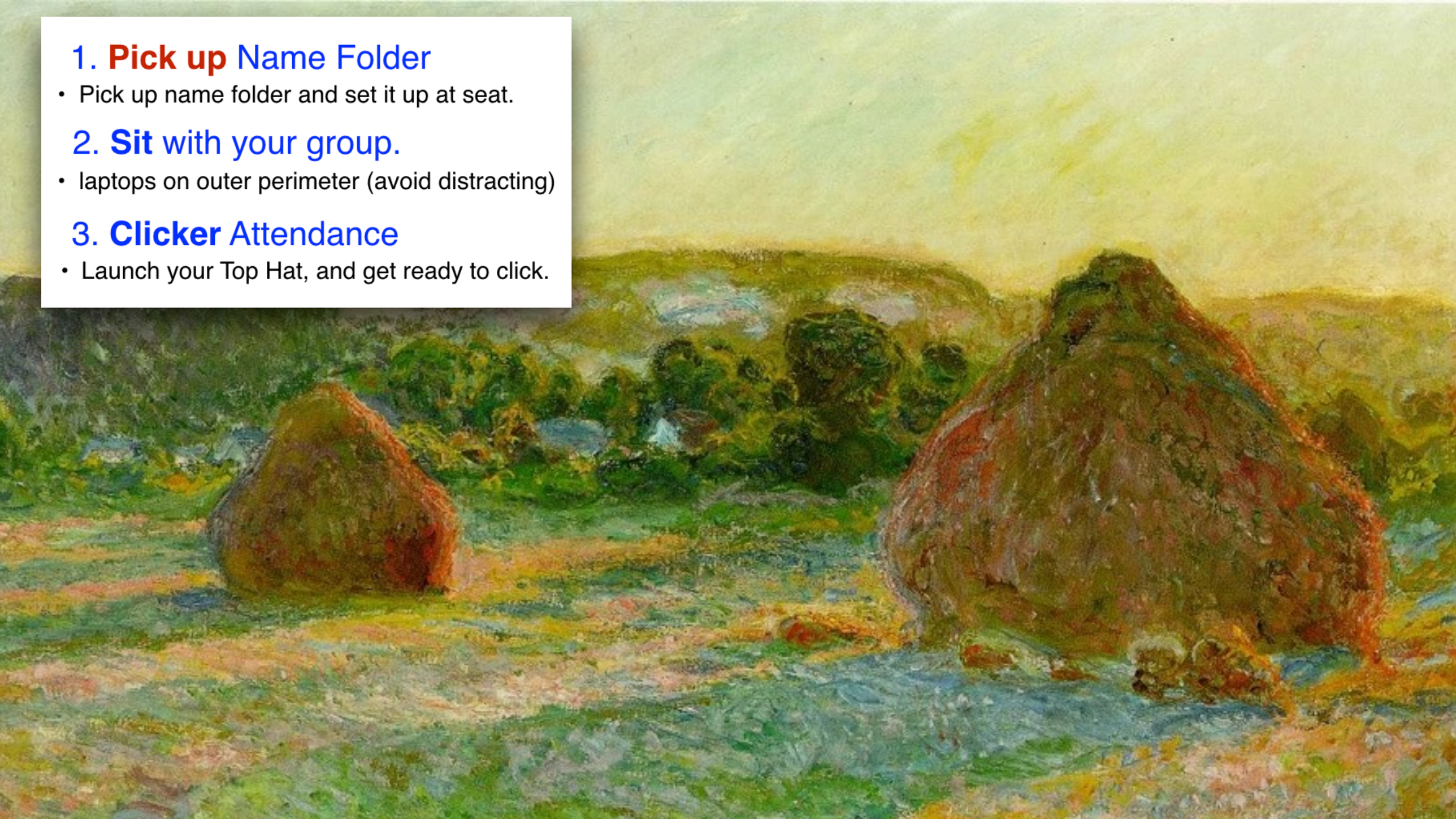
- Pick up name folder and set it up at seat.

2. **Sit** with your group.

- laptops on outer perimeter (avoid distracting)

3. **Clicker** Attendance

- Launch your Top Hat, and get ready to click.



1. **Pick up** Name Folder

- Pick up your name folder and set it up in front of you at your seat.

2. **Clicker** Attendance

- Launch your Top Hat and get ready for a Pop Quiz! on the reading.

3. Laptops closed (unless TopHat)

- (open if need 4 TopHat, don’t distract others)

Please now set-up Name Folder

(so it's easier for both instructors and peers to call you by name)

Announcements

1. **Prof interviews**: Continue during lab today, end after Spring Break.
2. **DRAFT2 “mini-ReDo” option:** Figures (any changes) etc DUE at start of lab today.
3. **CATME** survey ends Friday. Complete it to avoid CATME issuing “zero participation”.
4. **Verbal Finals** start after Spring Break. Sign up is now Open on website. Can only make one Reservation (after **complete** that appointment, **only** then can make another).

Homework on TopHat

W7: Path of CFTR?

1 point

Explain the path/steps of the biosynthesis of a wtCFTR protein vs one with your group's mutation: Starting at the CFTR gene in the nucleus, describe what happens and where, at each step in the creation of a CFTR protein? (hints: include transcription, translation; and describe what happens at each organelle, e.g. inside nucleus, then at ribosome, at ER, at Golgi, and in transport vesicles, etc until finally mature CFTR makes it to the plasma membrane).

marisa mattice — 10 hours ago

The biosynthesis of a wtCFTR protein begins in the nucleus. The CFTR gene, on chromosome 7, first goes through a process referred to as transcription. Transcription produces hnRNA (heterogeneous RNA) that then goes through a process called splicing, where the introns are spliced off of the strand, leaving only the exons. The exons left over are put together to create a shorter strand of mRNA. mRNA gains a poly A tail and a GTP cap that ultimately protects the strand of mRNA from enzyme degradation. The mRNA strand exits the nucleus through a nuclear pore where the strand then approaches a free ribosome that will read the signal sequence in a process called translation (first 20 amino acids). The signal sequence of the mRNA strand provides information as to where the mRNA has to go (apical membrane). The free ribosome then attaches to the endoplasmic reticulum where it will break off as a vesicle with the CFTR protein. The newly formed vesicle with the CFTR protein moves and fuses to the golgi apparatus where PTM will occur. The golgi apparatus contains quality control where it will look for mutations within the protein. If there is a mutation, the chaperones will attach to the mutated protein and form a vesicle where it will be taken on the mutant pathway. The mutant pathway will take the vesicle to the lysosome that has a very low pH (approximately 2). This will cause the protein to be broken down and recycled instead of

Chalk Talk *by you*
(biosynthesis of CFTR)

Explain the path/steps of the biosynthesis of a wtCFTR protein vs your group's: Starting at the CFTR gene in the nucleus, describe what happens and where, at each step in the creation of a CFTR protein? (hints: include transcription, translation; and describe what happens at each organelle, e.g. inside nucleus, then at ribosome, at ER, at Golgi, and in transport vesicles, etc until finally mature CFTR makes it to the plasma membrane).

Nucleus first

What do you want to do next?

A. Clicker questions: Quiz me and debrief each question
B. Theater: Let's watch the cell Biovisions movie
C. Normal class: Biology, announcements, how cells work
D. Medical questions: Quiz groups and debrief the answer

Medical questions *for you*
(Predictions for Cell biology)

Celiac disease harms the microvilli of cells that line the intestine, that damage would be predicted to cause what potentially?

Medical questions *for you*
(Predictions for Cell biology)

After a meal is digested Cystic Fibrosis patients have low absorption of nutrients in their intestine, what might cause this?

Medical questions *for you*
(Predictions for Cell biology)

Pancreatic cells make and secrete lots of proteins (many enzymes and hormones) needed in the body. If you look through a microscope at these cells what organelle might you see far more of than in other cells? Why?

Medical questions *for you*
(Predictions for Cell biology)

To function well, myocytes (muscle cells) need the most energy of any cell in the human body. If you looked through a microscope which organelle do you predict would be super plentiful and thus seen everywhere in myocytes? Why?

Medical questions *for you*
(Predictions for Cell biology)

How would you immediately know someone was a drug user by looking through a microscope at their cells? Which cells are changed and why?

Medical questions *for you*
(Predictions for Cell biology)

Gametes are a unique cell type. Sperm are particularly packed with one organelle Which and why?

What do you want to do next?

A. Clicker questions: Quiz me and debrief each question
B. Theater: Let's watch the cell Biovisions movie
C. Normal class: Biology, announcements, how cells work
D. Medical questions: Quiz groups and debrief the answer

Prepare Paper "Structure" "Function" *Pre-test*

1.

2.

3.

4.

5.

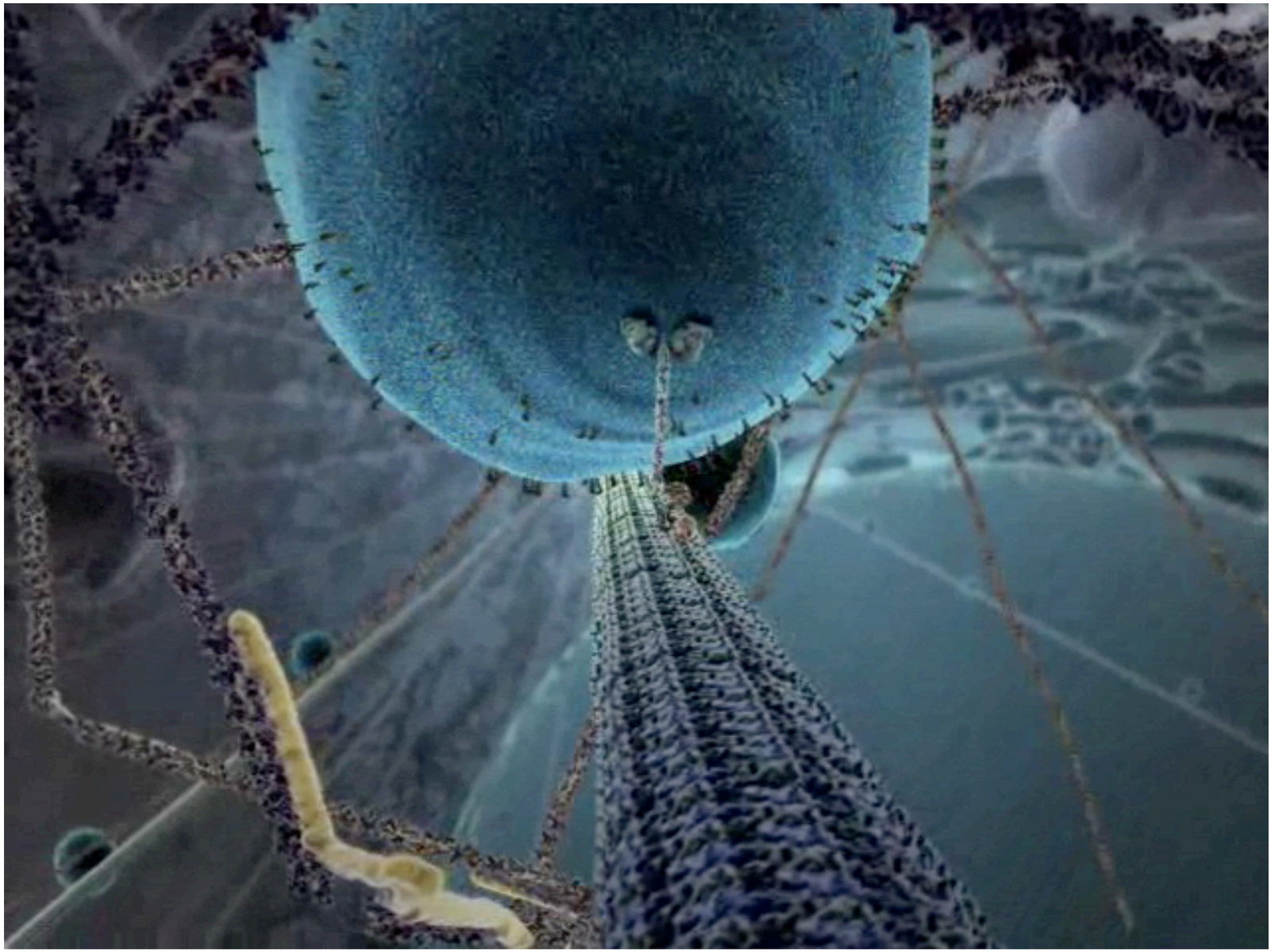
6.

7.

8.

9.

10.



What do you want to do next?

A. Clicker questions: Quiz me and debrief each question
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Back to Biology...

Budgeting homework time (60 min): The Chapter **Cell Structure (OSB)** section 4.3 is 3060 words in length with a number of art figures (no data figures for trifectas). Reading at 200 words per minute would mean the section might take 15 minutes to read. But the video is 14 minutes and when done properly, when you pause to review figures and take careful notes, this assignment should take you more like 60 minutes.

1. _____ **For Thursday's lecture,** read section 4.2 "Prokaryotic Cells" and 4.3 "Eukaryotic Cells" in chapter **Cell Structure (OSB)**. For section 4.3 (3060 words) take handwritten notes in your notebook.

2. _____ Compare and contrast the anatomy of a Prokaryote versus Eukaryote. Then also a plant cells versus an animal cell. Which seems most advanced, why?

3. _____ (flipped classroom) Watch the **14min lecture by Mr. Andersen** provided where he gives you a tour of the cell. Add to your notes any interesting points he makes that helped you better understand the parts of the cell and what they do.

4. _____ While reading, focus mostly and take notes regarding **Figures 2 & 3, and 4 & 5,** and note the building block of cell walls/wood in **Figure 9.** We will discuss these in class. Generally, you need to learn the names and functions of each organelle. It's best to create hand-made flash cards with the name on one side and the function on the other. Also add interesting facts, like a drug user would be expected to have more of which organelle? Use these to study prior to class and then prior to the exam too.

5. _____ **Advanced**: Take a sneak peek at section 4.4, in particular study Figure 1.

4.2 Prokaryotic Cells

Cell Structure (OSB)

Quiz Me 4.2 > Prokaryotic Cells

Use Flash Cards as Student

Summary: By the end of this section, you will be able to:

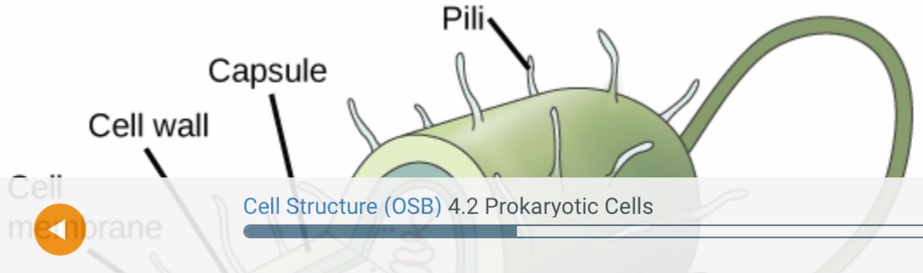
- Name examples of prokaryotic and eukaryotic organisms
- Compare and contrast prokaryotic cells and eukaryotic cells
- Describe the relative sizes of different kinds of cells
- Explain why cells must be small

Cells fall into one of two broad categories: prokaryotic and eukaryotic. Only the predominantly single-celled organisms of the domains Bacteria and Archaea are classified as prokaryotes (pro- = “before”; -kary- = “nucleus”). Cells of animals, plants, fungi, and protists are all eukaryotes (ceu- = “true”) and are made up of eukaryotic cells.

Components of Prokaryotic Cells

All cells share four common components: 1) a plasma membrane, an outer covering that separates the cell’s interior from its surrounding environment; 2) cytoplasm, consisting of a jelly-like cytosol within the cell in which other cellular components are found; 3) DNA, the genetic material of the cell; and 4) ribosomes, which synthesize proteins. However, prokaryotes differ from eukaryotic cells in several ways.

A **prokaryote** is a simple, mostly single-celled (unicellular) organism that lacks a nucleus, or any other membrane-bound organelle. We will shortly come to see that this is significantly different in eukaryotes. Prokaryotic DNA is found in a central part of the cell: the **nucleoid** (**Figure 1**).



4.2 Prokaryotic cells

L.O.s . name examples of prokaryotic + eukaryotic organisms
· compare + contrast prok vs euk / draw them
· describe sizes + why cells must be small.

Proks: mostly single-celled organisms in Bacteria + Archaea

Euks: ("true" nucleus) animals, plants, fungi, protists.

Common aspects – PM, cyt, DNA, ribosomes

Proks lack – nucleus, mem-bound organelles
(instead "nucleoid")
they have cell wall (made of: peptides/proteins + sugars glycans · "peptidoglycan")
some also have slimy shiny capsule (made of: "polysaccharides" long sugars = starch)

Bigger cells – have less surface area on PM / volume inside – thus harder to get enough stuff (like O_2) through, AND diffusion is slow so long distance is trouble.

Quiz Me page 1

4.3 Eukaryotic cells

L.O.s . describe structure of eukaryotic cells
. compare to animal + plant cells
. state the role of the PM
. summarize the functions of major cell organelles

Form follows function (structure–function)

nucleus = "true" nucleus = "eukaryote" organelles = little organs – specialized functions like your body

Mr Andersen – Tour of the Cell "lecture" (14 minutes)

- The plasma membrane (PM) – a phospholipid bilayer w/ embbed proteins that serves as a barrier (outside vs inside) – fingerlike micro-villi:

Q: Celiac disease → harms microvilli of intestine: predict impact?

Q: CF has low absorption of nutrients why think so?

4.3 Eukaryotic cells (cont). (at Figure 3) membranes + villi.

The Cytoplasm – liquid aqueous "cytosol" + cytoskeleton + lot of stuff (thus gel/solid like) + ribosomes

The Nucleus – (pl. nuclei) home to most cell's DNA makes/assembles ribosomes
- has "chromatin" = DNA wrapped around proteins (histones)
- has darker section = "nucleolus" – ribosome-assembly area (like NI car plant)
- has liquid like cytosol called "nucleoplasm"
- barrier is nuclear "envelope" two membranes
- pores allow import/export – nuclear lamina = skeleton

The Nuclear envelope
- double membrane – outer most portion of nucleus (barrier/shield)
- pores control passage of ions, molecules, RNA ⟷ cytoplasm

Chromatin + Chromosomes

Chromosomes = DNA linear structures (prokaryotes often circular)
= humans have 46 (23 pairs) chromosomes
= condense + become visible ONLY during DIVISION
= usually not condensed + usually wrapped around histones
genes that are turned ON, hence expressed, unwind lots

The nucleolus

→ place where rRNA + r proteins assembled together (like car plant.)
(→ mRNA leaves nucleus, at existing ribosomes made into proteins, for ribosome proteins; they return to nucleus + get assembled together w/ other rRNA ⇒ make new ribosomes which then leave nucleus to live in cytosol near R.E.R.

Ribosomes
- cellular organelles that make proteins. often clustered together or floating free in cytoplasm. Can be found attached to either PM or outer R.E.R. / nuclear membrane. mRNA provides info for ribosomes to build new proteins from single amino acids.

Q: Since Pancreas makes + secretes tons of proteins what organelles do its cells have lots of?

4.3 (cont)

Mitochondria – alien life-form that lives inside our cells. (symbiosis)
- contain own DNA + own ribosomes
- power house – energy factory – make ATP
- cellular Respiration (PHS backwards) turns food/glu into pH gradient
- oval shaped double membrane. Anatomy – vocab. → waste is CO_2 + H_2O

Q: Since muscle cells need lots of energy what organelle do they have lots more of?

Peroxisomes –
- round small organelles w/ 1 mem. Oxidation rxns break down fatty acids + aa's.
- also detox poisons, + alcohol (in liver cells)
- smooth ER in liver cells also detoxify drugs

Q: take lots of drugs how can tell through microscope?

Vesicles + vacuoles – similar but different sizes

Central Vacuole in plants – water reservoir like in CA.

Q: low water = wilting plant. Wilting plants means what organelle in trouble?

Lysosomes
Stomach of cell – pH acidic break down macromolecules

Cell Wall

rigid covering outside of PM. – Peptido-glycan in ~~animals~~ proks

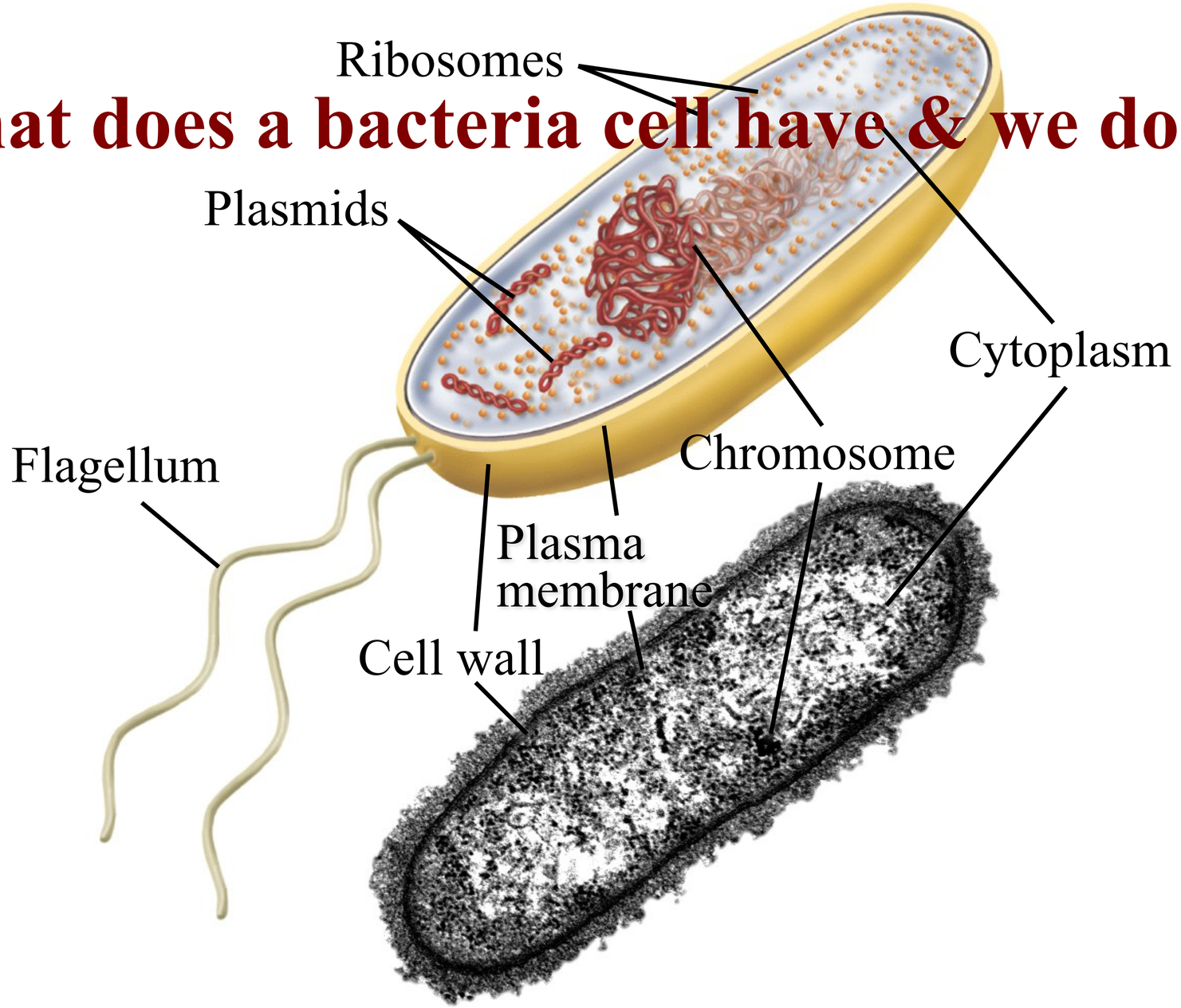
Wood = multiple sugar molecules connected by 1-4 linkages ← Cellulose in plants (wood)

Chloroplasts

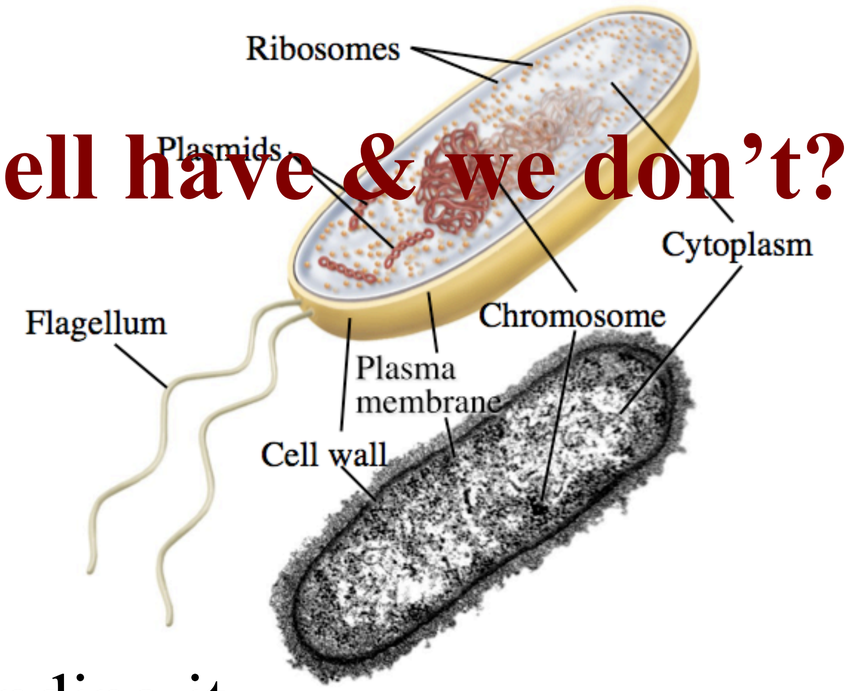
See PHS – contain own DNA + own ribosomes

Endosymbiosis (mentioned)

So what does a bacteria cell have & we don't?



So what does a bacteria cell have & we don't?



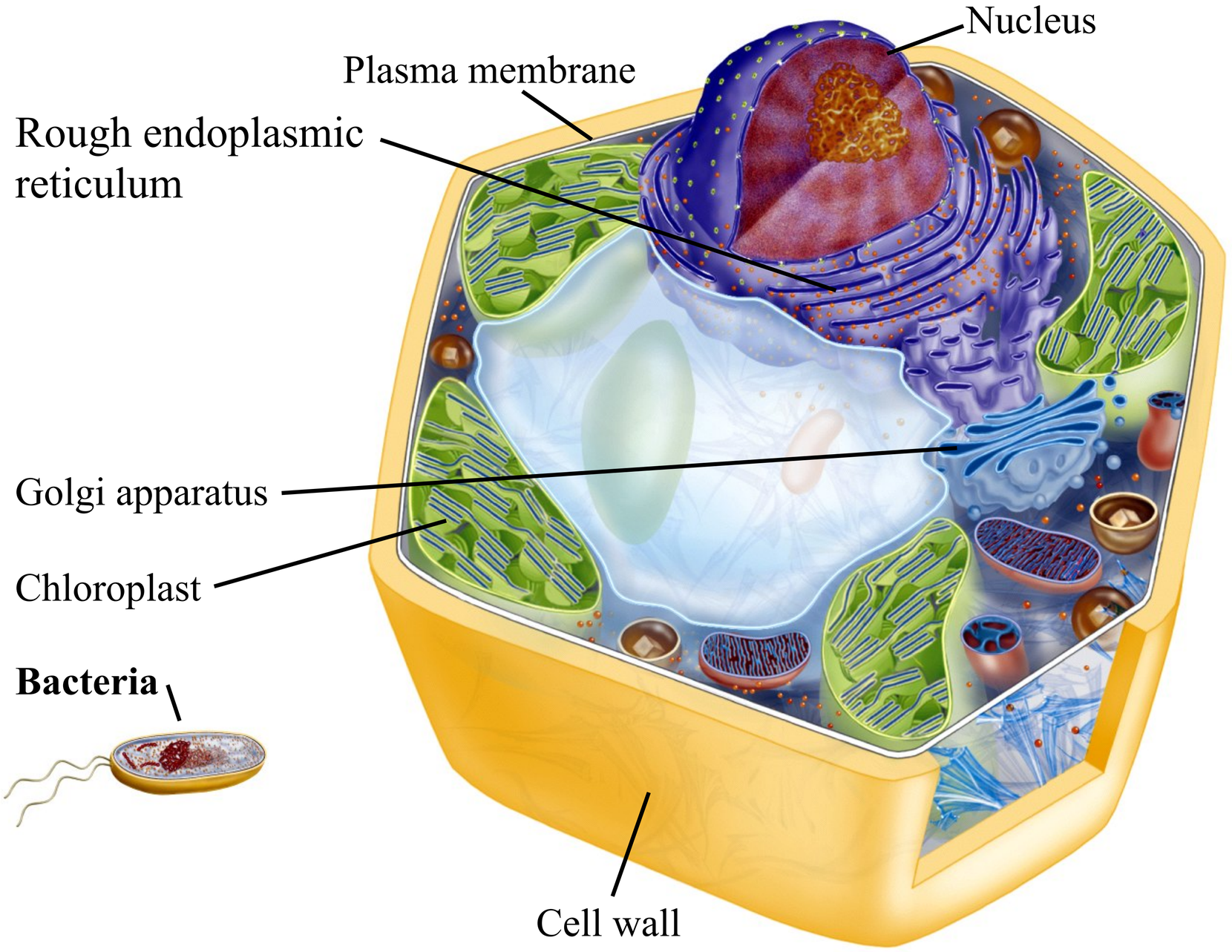
A. The plasma membrane surrounding it

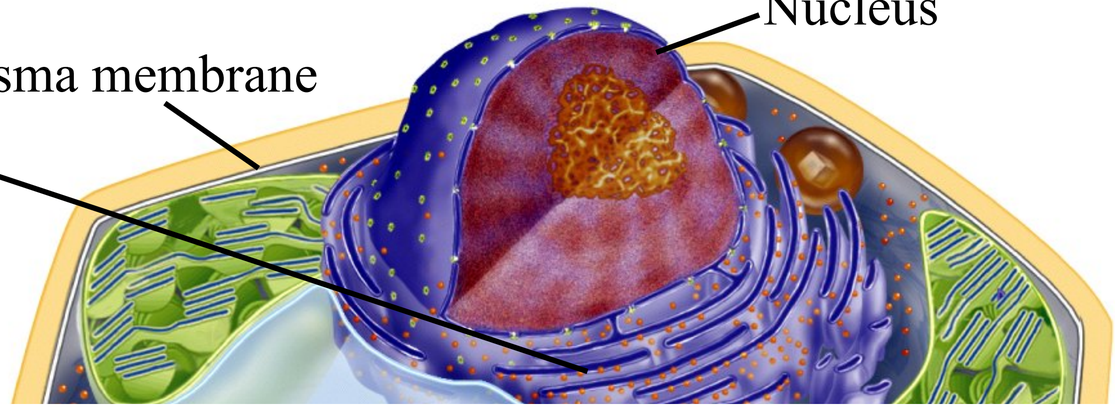
B. Chromosomes with DNA to make RNA

C. Ribosomes making proteins

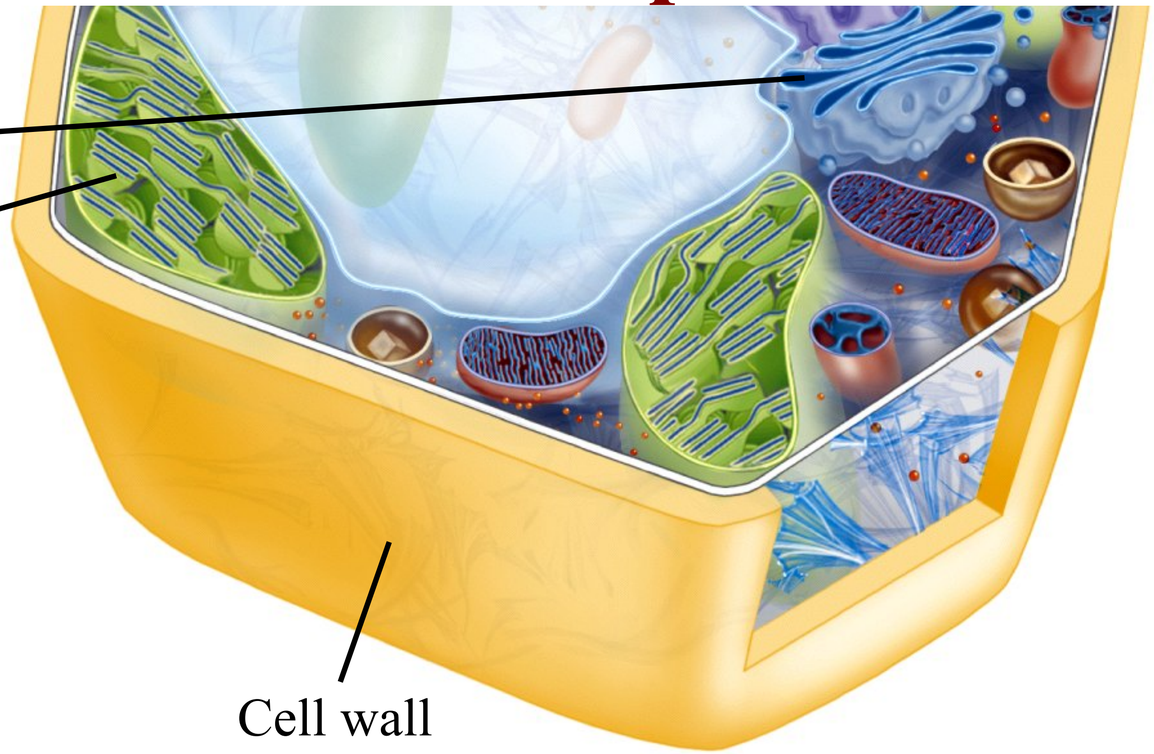
D. The cell wall surrounding it

E. None of the above

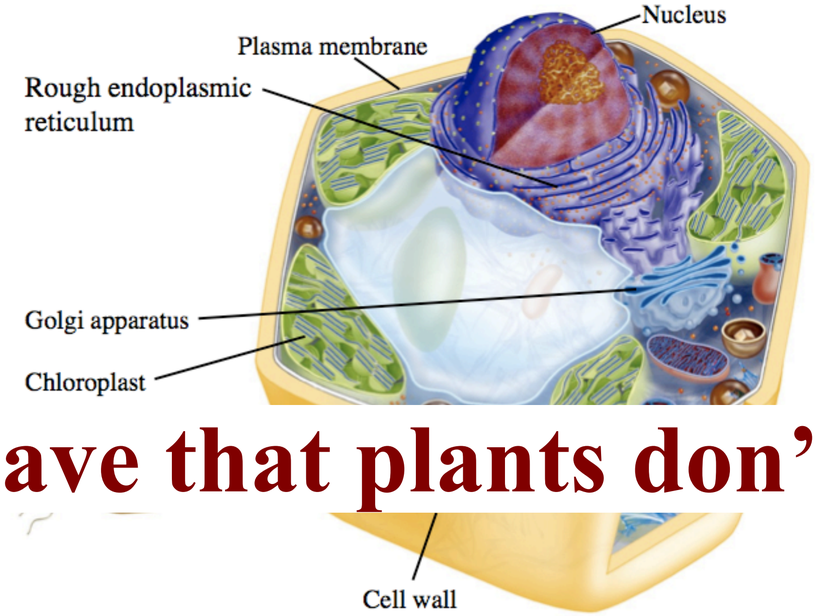

Nucleus
Plasma membrane
Rough endoplasmic reticulum
Golgi apparatus
Chloroplast
Bacteria
Cell wall



What does animal cell have that plants don’t?



Bacteria



What does animal cell have that plants don’t?

A. A single plasma membrane surrounding it

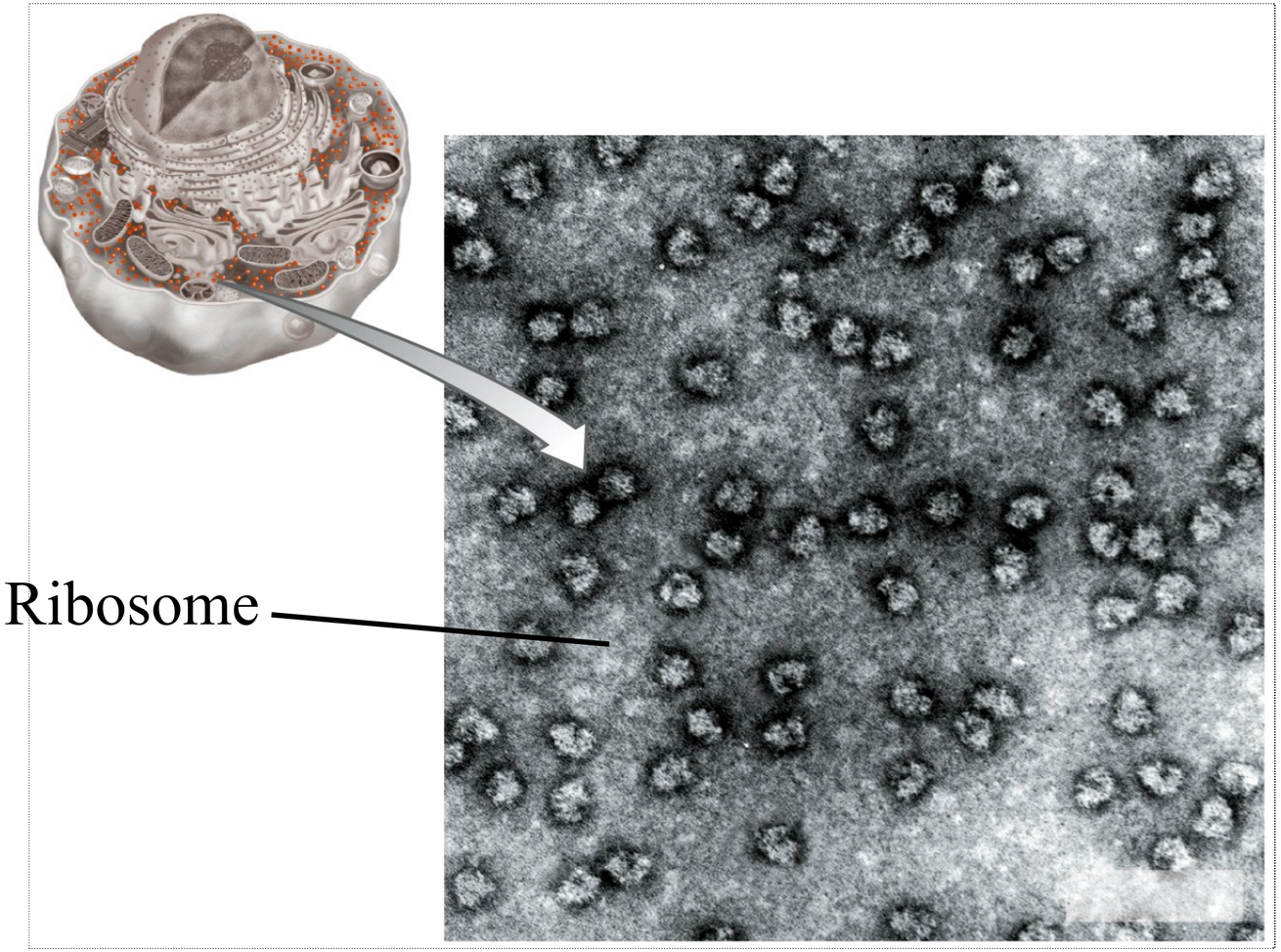
B. Mitochondria

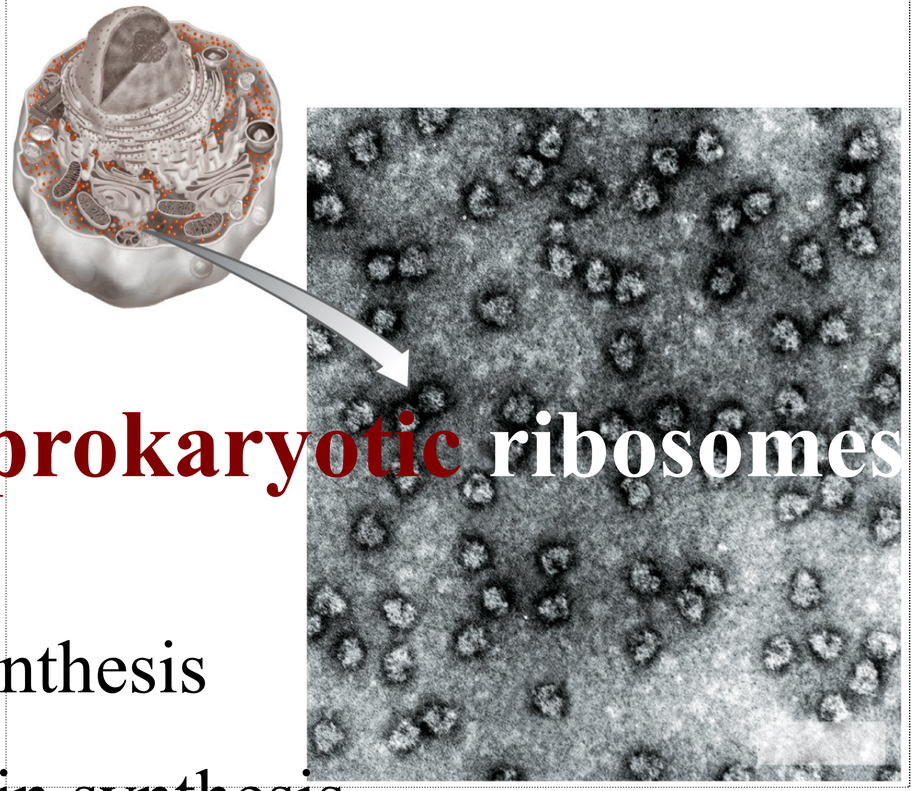
C. A true Nucleus

D. The cell wall surrounding it

E. None of the above

Antibiotics that inhibit prokaryotic ribosomes





Antibiotics that inhibit prokaryotic ribosomes

A. Will stop bacterial protein synthesis

B. Will stop mitochondria protein synthesis

C. Will stop nucleus from making proteins

D. None of the above

E. More than one of the above

4.3 Eukaryotic Cells

Summary: By the end of this section, you will be able to:

- Describe the structure of eukaryotic cells
- Compare animal cells with plant cells
- State the role of the plasma membrane
- Summarize the functions of the major cell organelles

Have you ever heard the phrase “form follows function?” It’s a philosophy practiced in many industries. In architecture, this means that buildings should be constructed to support the activities that will be carried out inside them. For example, a skyscraper should be built with several elevator banks; a hospital should be built so that its emergency room is easily accessible.

Our natural world also utilizes the principle of form following function, especially in cell biology, and this will become clear as we explore eukaryotic cells (**Figure 1**). Unlike prokaryotic cells, **eukaryotic cell**s have: 1) a membrane-bound nucleus; 2) numerous membrane-bound **organelles** such as the endoplasmic reticulum, Golgi apparatus, chloroplasts, mitochondria, and others; and 3) several, rod-shaped chromosomes. Because a eukaryotic cell’s nucleus is surrounded by a membrane, it is often said to have a “true nucleus.” The word “organelle” means “little organ,” and, as already mentioned, organelles have specialized cellular functions, just as the organs of your body have specialized functions.

At this point, it should be clear to you that eukaryotic cells have a more complex structure than prokaryotic cells. Organelles allow different functions to be compartmentalized in different areas of the cell. Before turning to organelles, let’s first examine two important components of the cell: the plasma membrane and the cytoplasm.