1. **Pick up** Name Folder

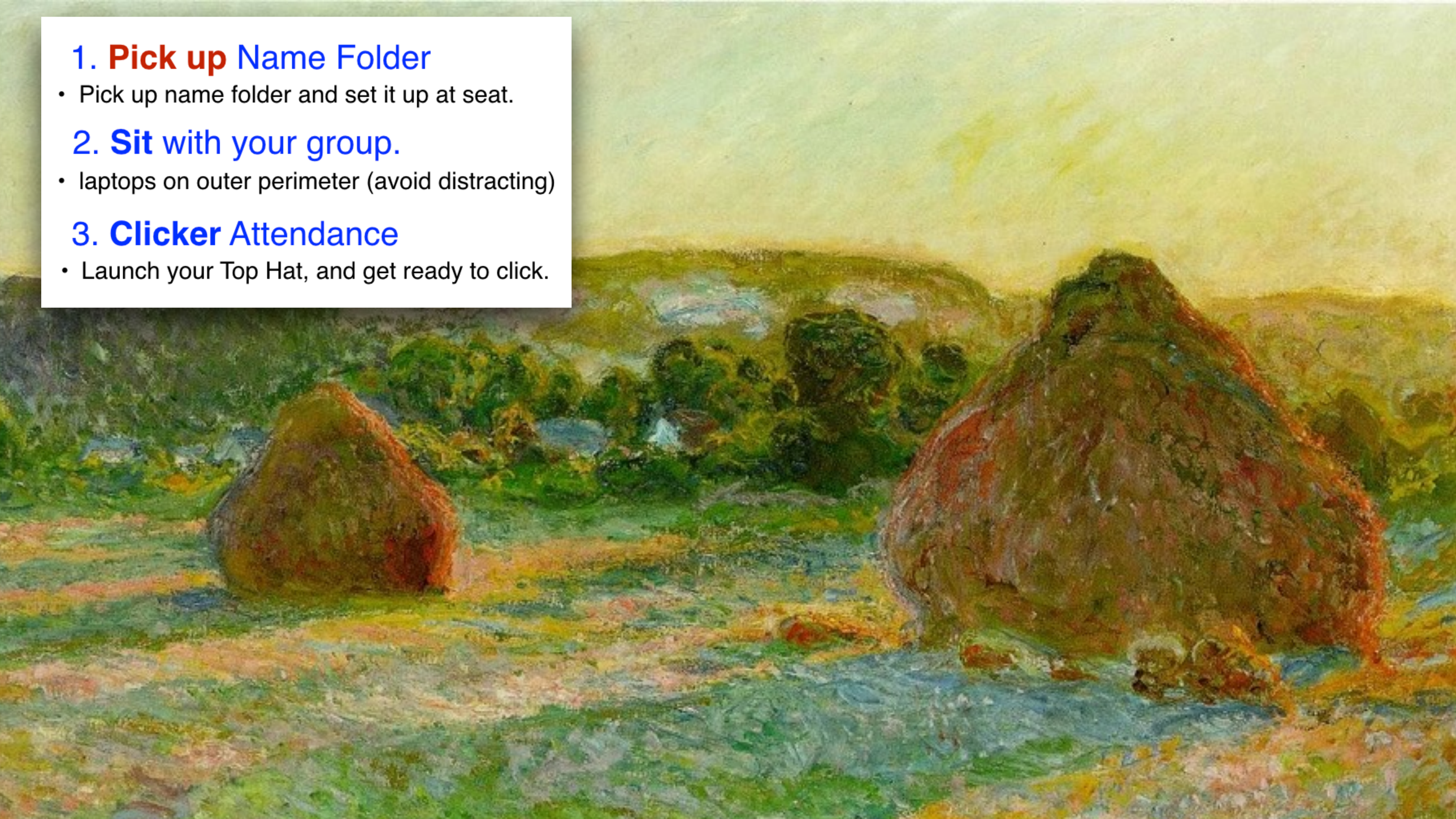
- Pick up name folder and set it up at seat.

2. **Sit** with your group.

- laptops on outer perimeter (avoid distracting)

3. **Clicker** Attendance

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



Survey: Got bands?

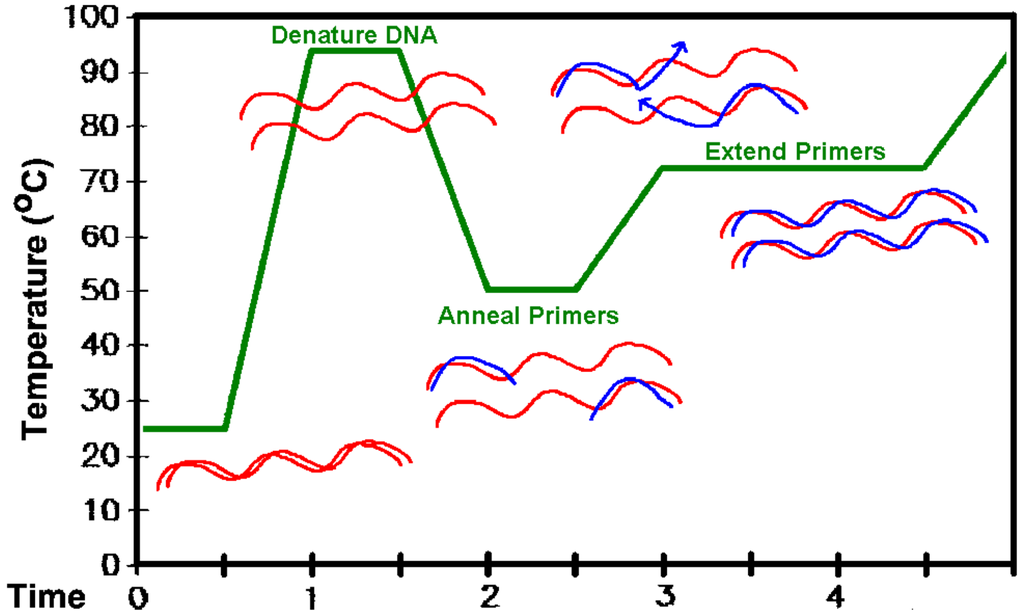
- With PCR primers vs. lambda genomic DNA

A. Not yet
B. Some fuzzy ones that might be correct
C. Yep done with that. Our group rocks!
D. Should we be doing PCR in lab, didn't know?

Survey: Got distracted folks?

- (Does it appear you have at least one under-achiever creating difficulties for your research group)

A. Nope my group is doing OK.
B. Kinda, but I think it will work out and be fine.
C. Yep, I think “firing” will be an important tool.
D. Yep, I am considering *quitting* my group.



If primer #1 is calculated to anneal at 50°C and primer #2 at 60°C what's a good temp to try for your annealing temperature in the first PCR experiment you do?

a. 45°C

b. 50°C

c. 55°C

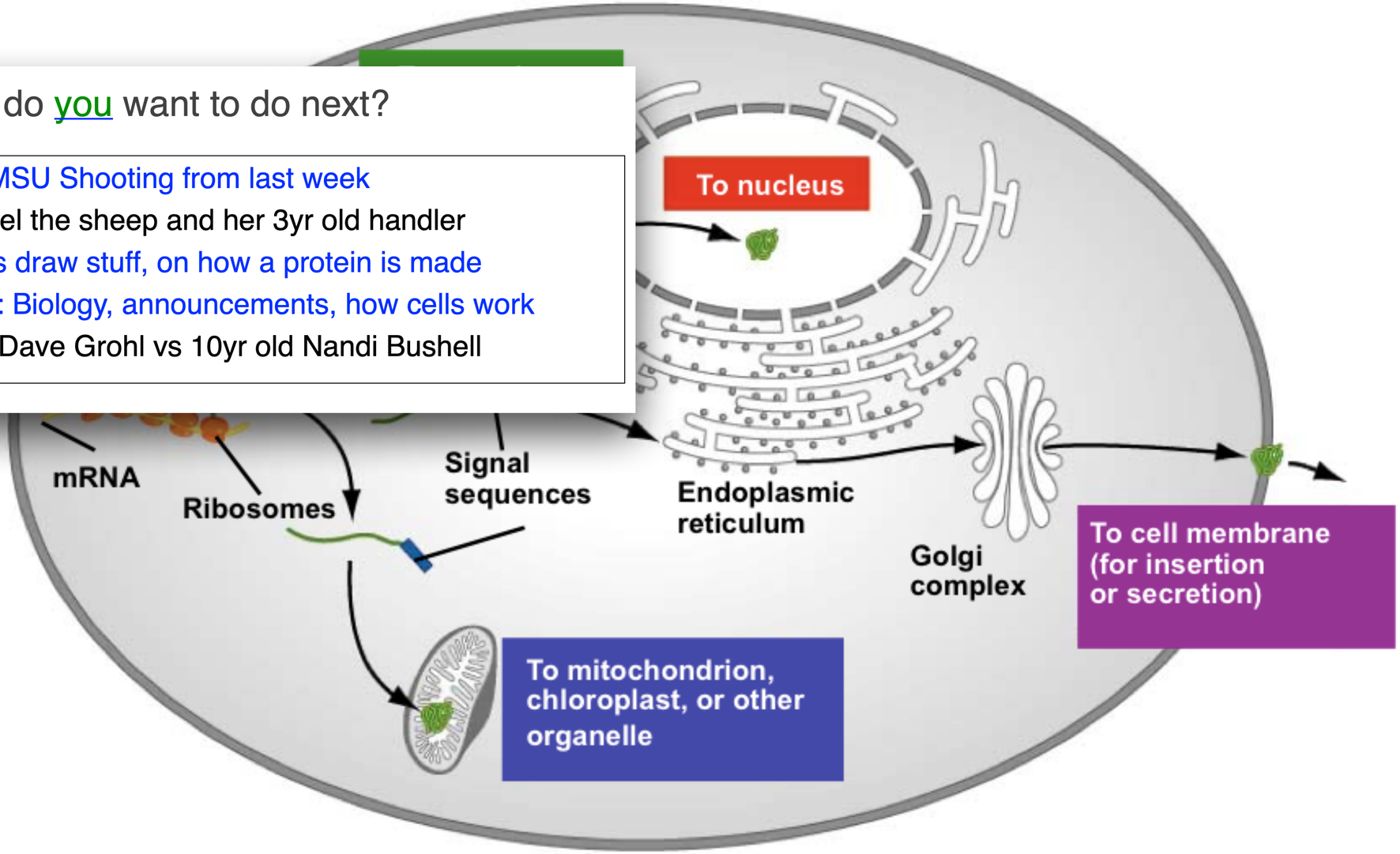
d. 60°C

e. 65°C

So, what happened last week?

What do you want to do next?

A. Discuss the MSU Shooting from last week
B. Ag show: Ethel the sheep and her 3yr old handler
C. Art class: let's draw stuff, on how a protein is made
D. Normal class: Biology, announcements, how cells work
E. Drum Battle: Dave Grohl vs 10yr old Nandi Bushell



4.3 Eukaryotic Cells

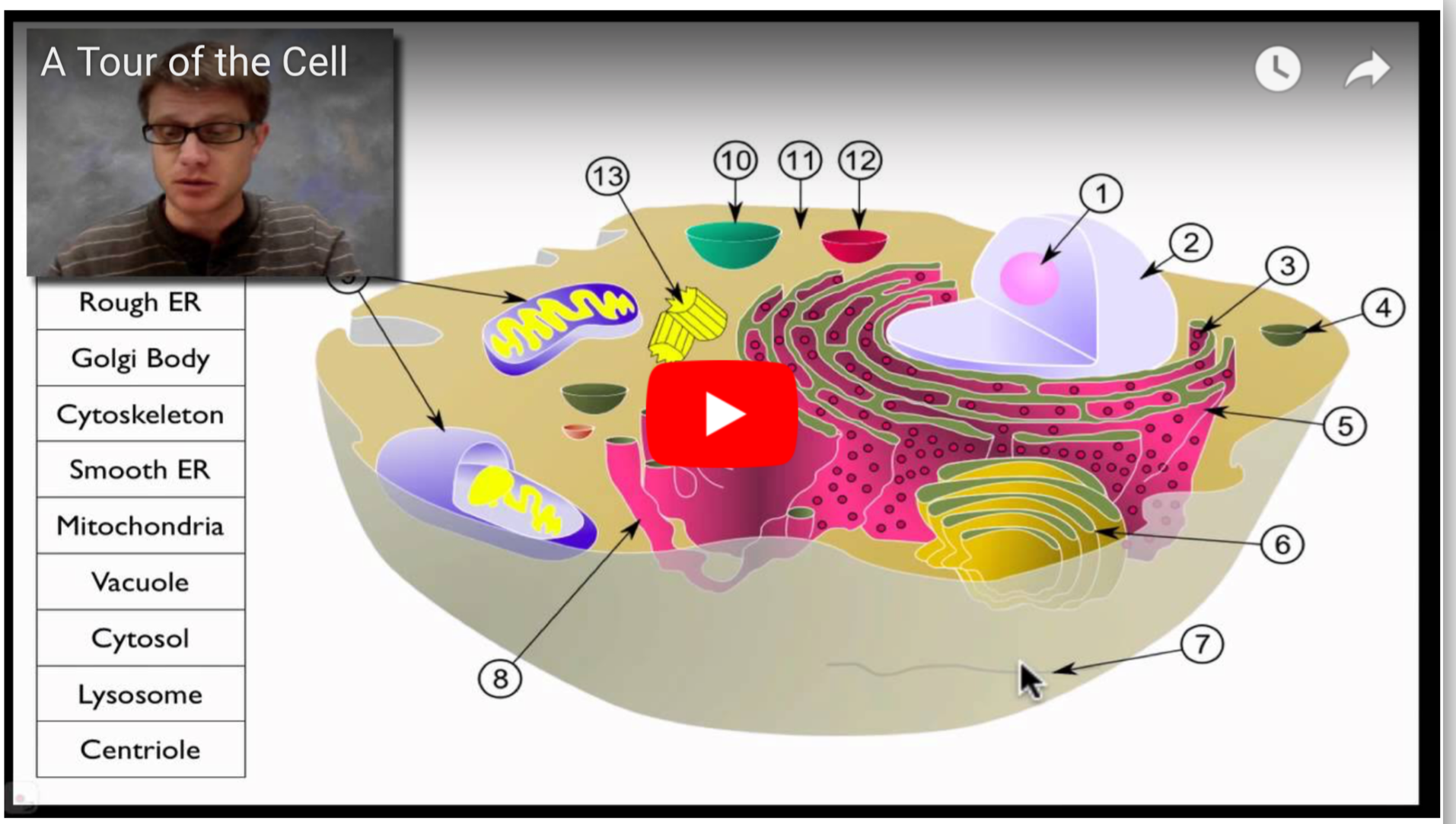
Summary: By the end of this section, you will be able to:

- 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.

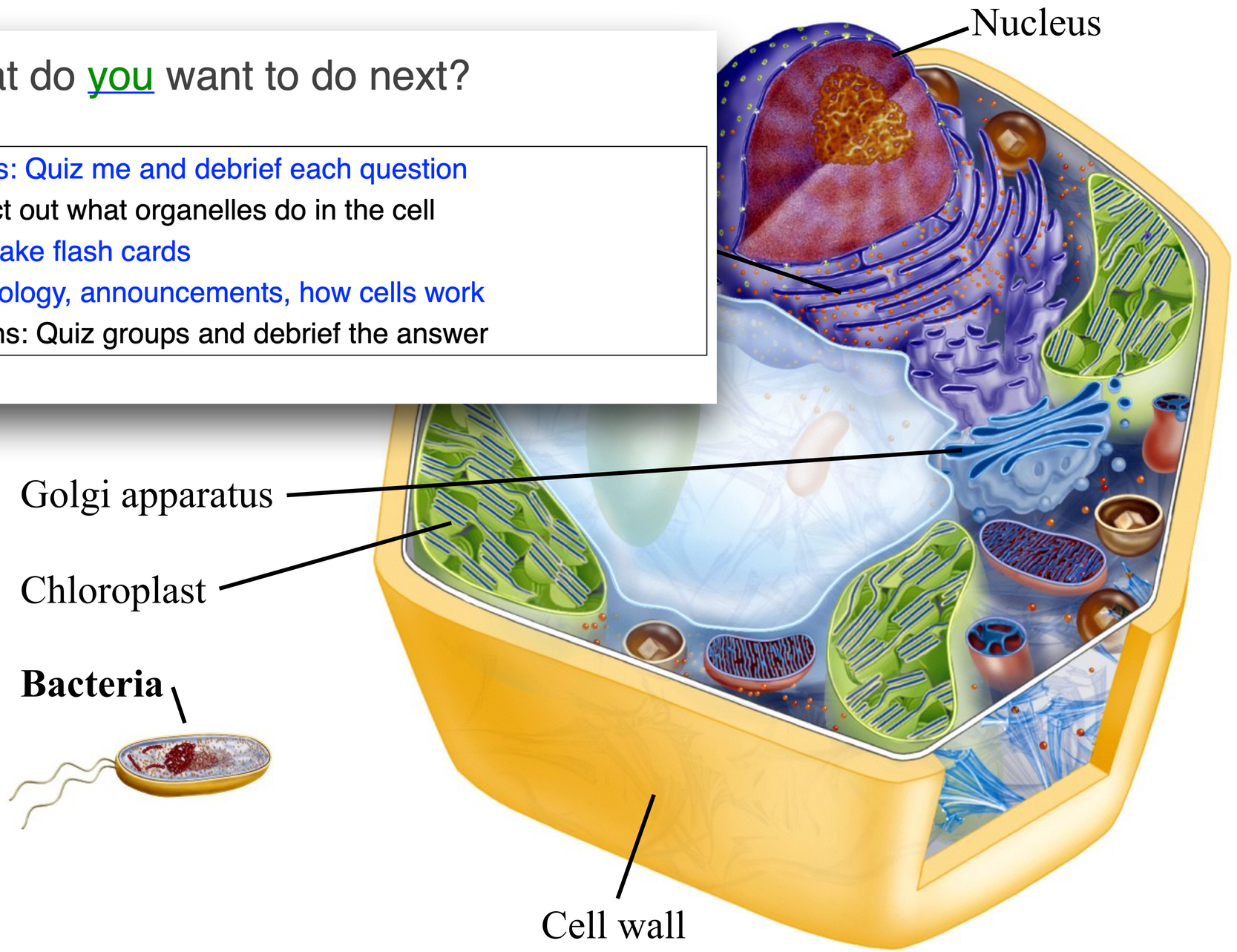
At this point, it should be clear to you that eukaryotic cells have a more complex structure than prokaryotic cells. Organelles allow different functions to be compartmentalized in different areas of the cell. Before turning to organelles, let’s first examine two important components of the cell: the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

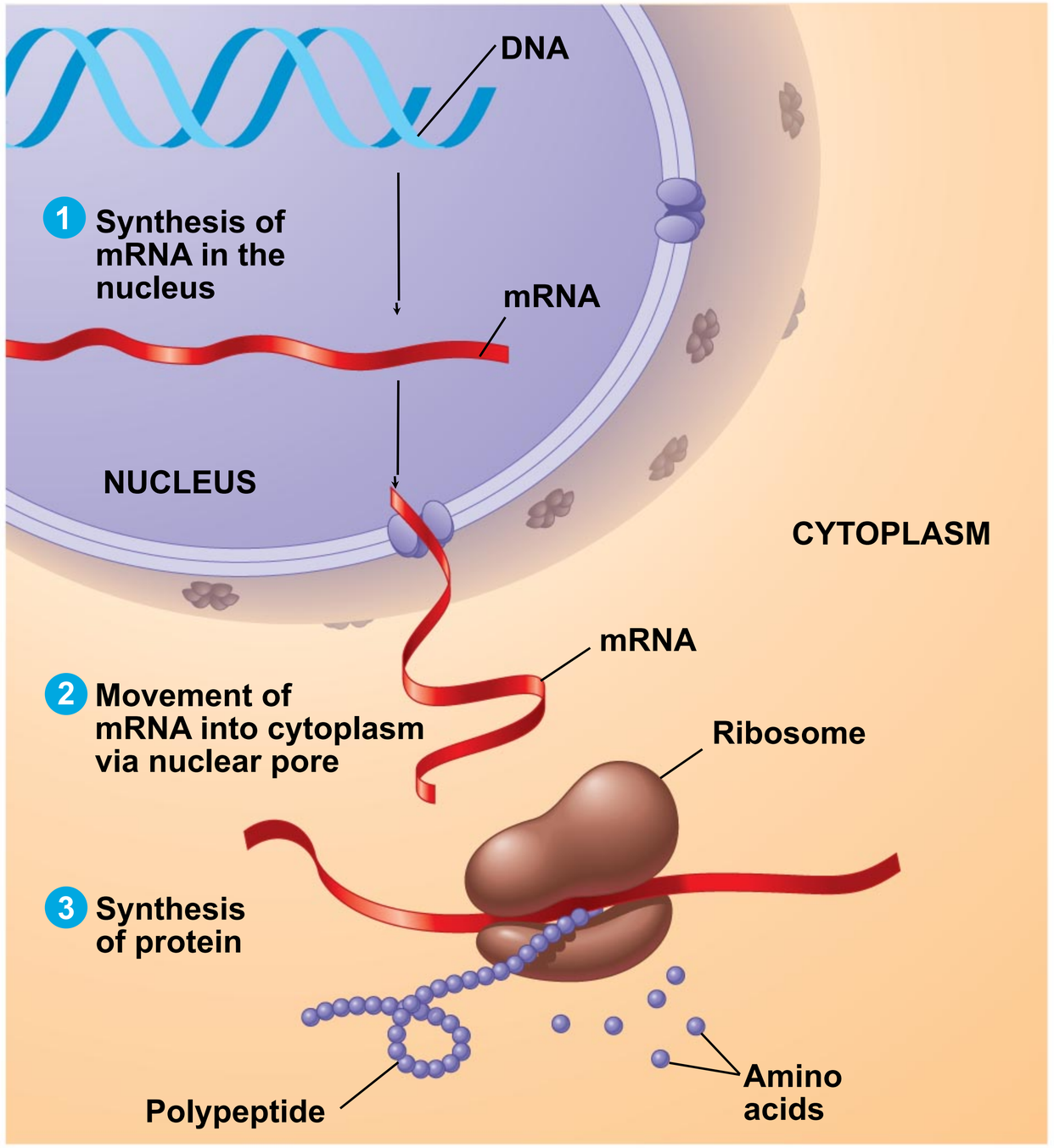


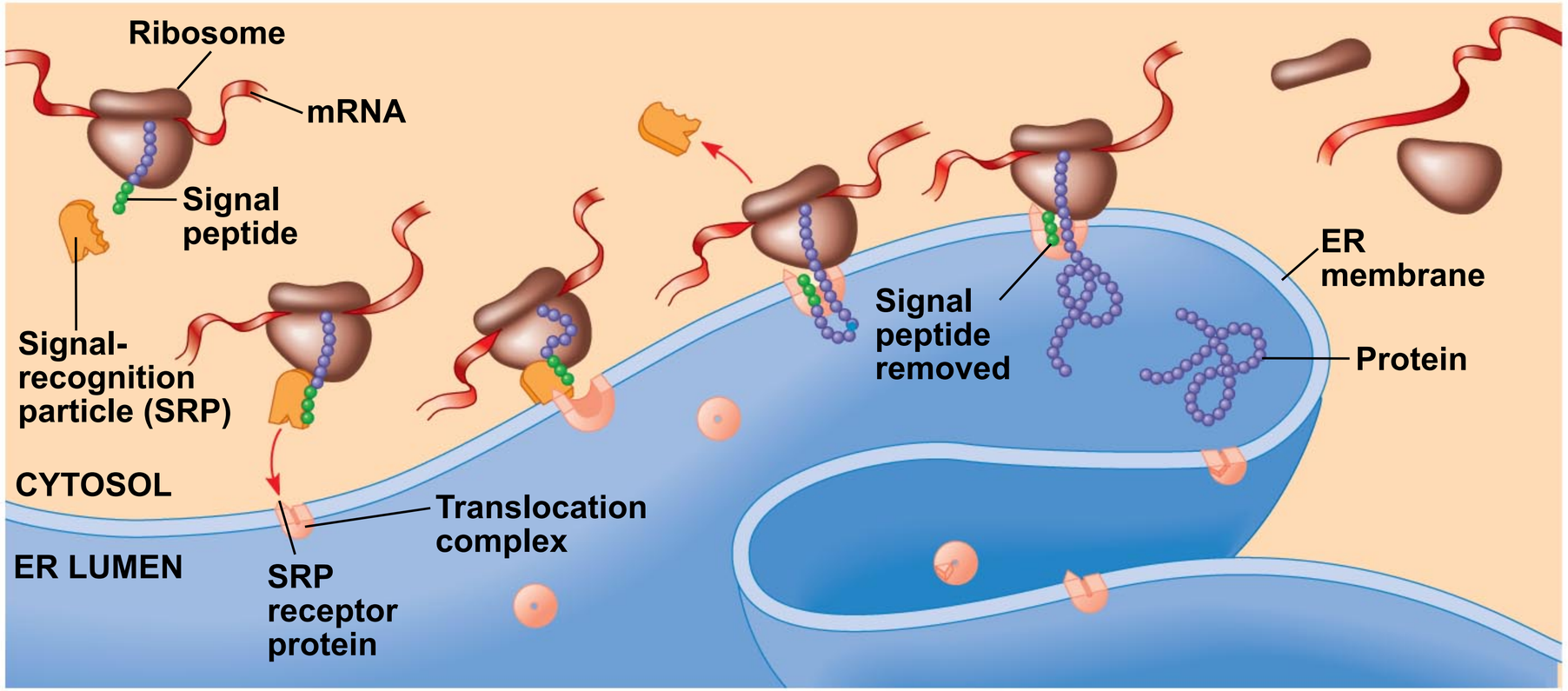
Take a tour of the cell.

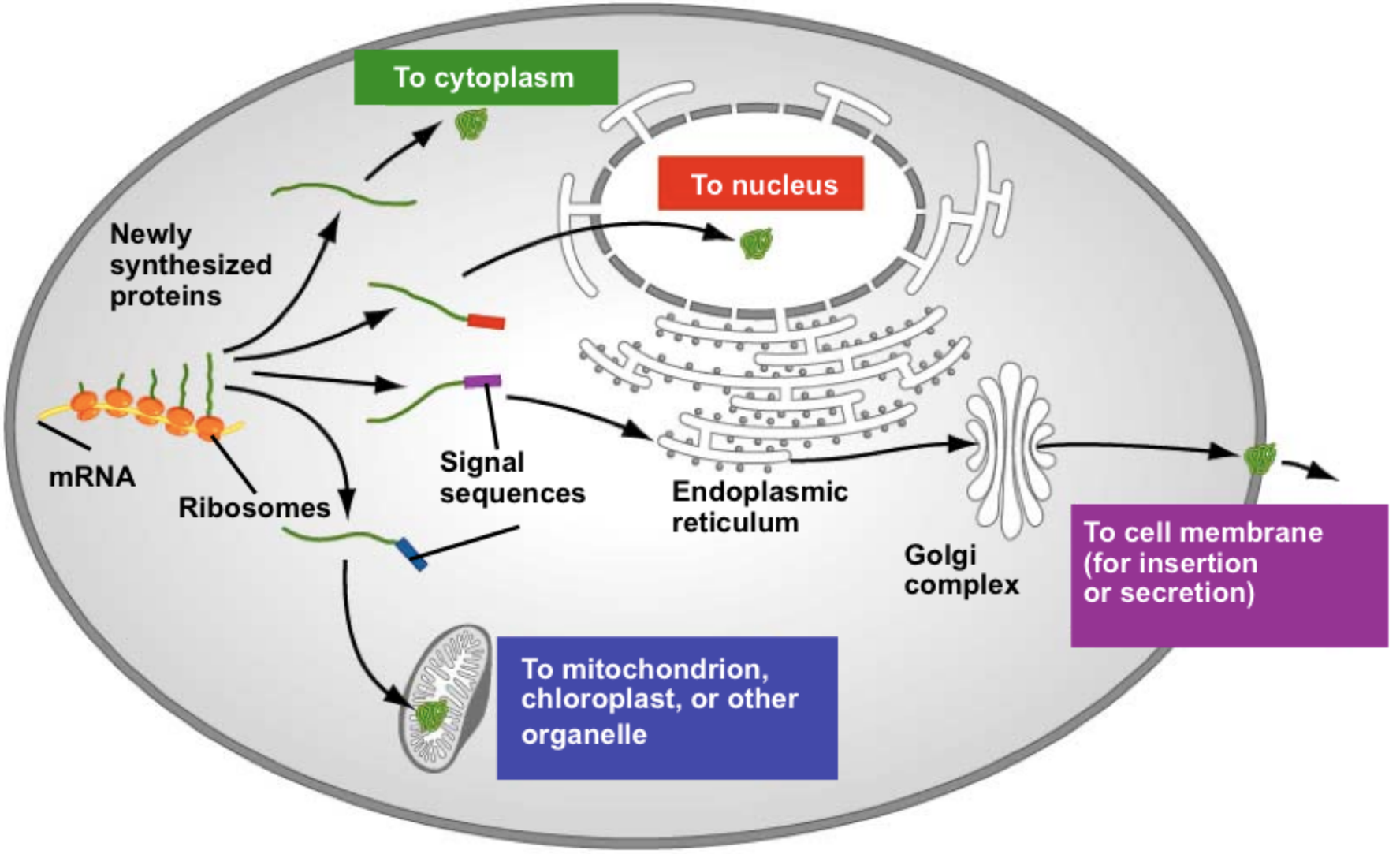
What do you want to do next?

A. Clicker questions: Quiz me and debrief each question
B. Theater: Let's act out what organelles do in the cell
C. Art class: let's make flash cards
D. Normal class: Biology, announcements, how cells work
E. Medical questions: Quiz groups and debrief the answer








To cytoplasm
To nucleus
Newly synthesized proteins
mRNA
Ribosomes
Signal sequences
Endoplasmic reticulum
Golgi complex
To cell membrane (for insertion or secretion)
To mitochondrion, chloroplast, or other organelle

Week 8

(Preparing for) **Monday's lecture:**

Budgeting homework time (30 min): The Chapter **Cell Structure (OSB)** section 4.4 is 1430 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 7 minutes to read. When done properly, when you pause to review figures and take careful notes, this assignment should take you more like 30 minutes.

1. _____ **For Monday's lecture,** read section 4.4 "The Endomembrane System and Proteins" in chapter **Cell Structure (OSB)** (1430 words). Take handwritten notes in your lecture notebook.

2. _____ Compare and contrast the anatomy of a Prokaryote versus Eukaryote. What's similar, what's different. Then also compare a plant cells versus an animal cell. Which one is a eukaryote, why, which cell type do you think seems the most advanced, evolutionarily, why?

3. _____ While reading, focus most on **Figure 1.** We will discuss this process of biosynthesis in class. Generally, you need to learn the names and functions of each organelle in the endomembrane system. In particular what are the functions of that organelle in general as well as in particular during the ***biosynthesis*** of a protein. 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 where does CFTR go and what happens to it during its expression from a gene and conversion into a functioning protein, where does it end up? What about insulin, what happens when it is made, does it do the exact same thing? Use these to study prior to class and then prior to exam too.

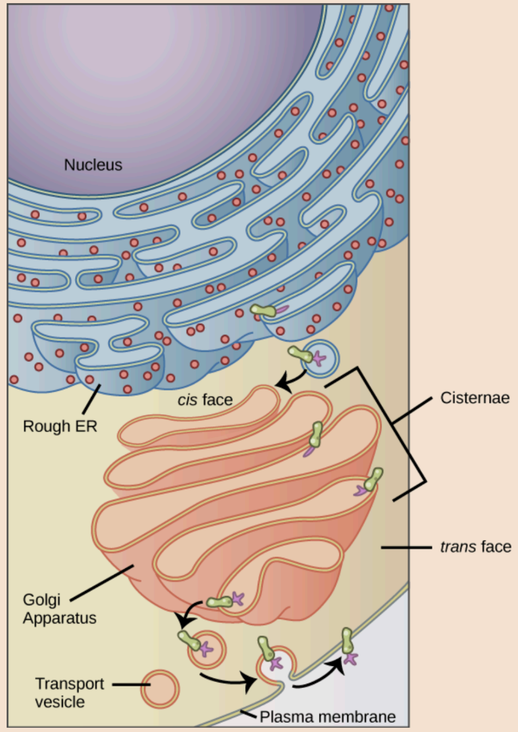
4. _____ **Advanced**: Take a sneak peek at section 8.2 for Wednesday.

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

- List the components of the endomembrane system
- Recognize the relationship between the endomembrane system and its functions

The endomembrane system (endo = "within") is a group of membranes and organelles (**Figure 1**) in eukaryotic cells that works together to modify, package, and transport lipids and proteins. It includes the nuclear envelope, lysosomes, and vesicles, which we've already mentioned, and the endoplasmic reticulum and Golgi apparatus, which we will cover shortly. Although not technically *within* the cell, the plasma membrane is included in the endomembrane system because, as you will see, it interacts with the other endomembranous organelles. The endomembrane system does not include the membranes of either mitochondria or chloroplasts.

Art Connection:



LBIHS Week 8 2-26-23 The Endomembrane System

ex. Insulin?

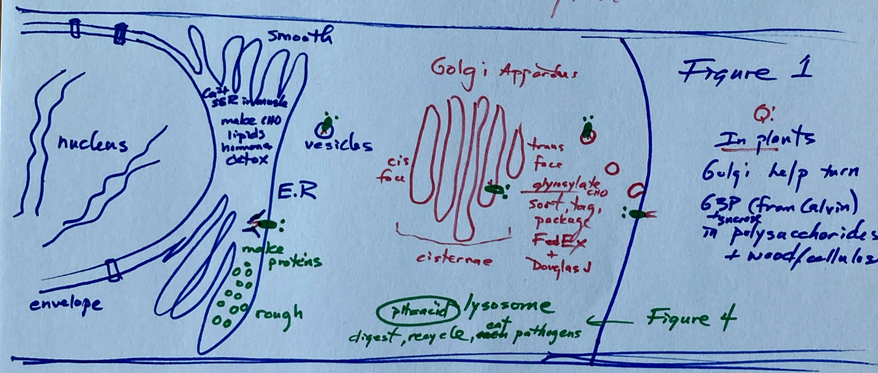
LO.S

- List components in endomembrane system
- Recognize structure + function relationships

Endo (within) membrane system = membs + organelles in euk cells that work together to create, modify, package + transport lipids + proteins

includes: nuclear envelope, lysosomes, vesicles + E.R. + Golgi Apparatus. also includes plasma membrane (PM)

does not include: mitochondria or chloroplast



Q: In plants Golgi help turn G3P (from Calvin) into polysaccharides + wood/cellulose

eg: Heart failure when S.E.R. or Sarcoplasmic Reticulum fail to regulate $[Ca^{2+}]$ properly

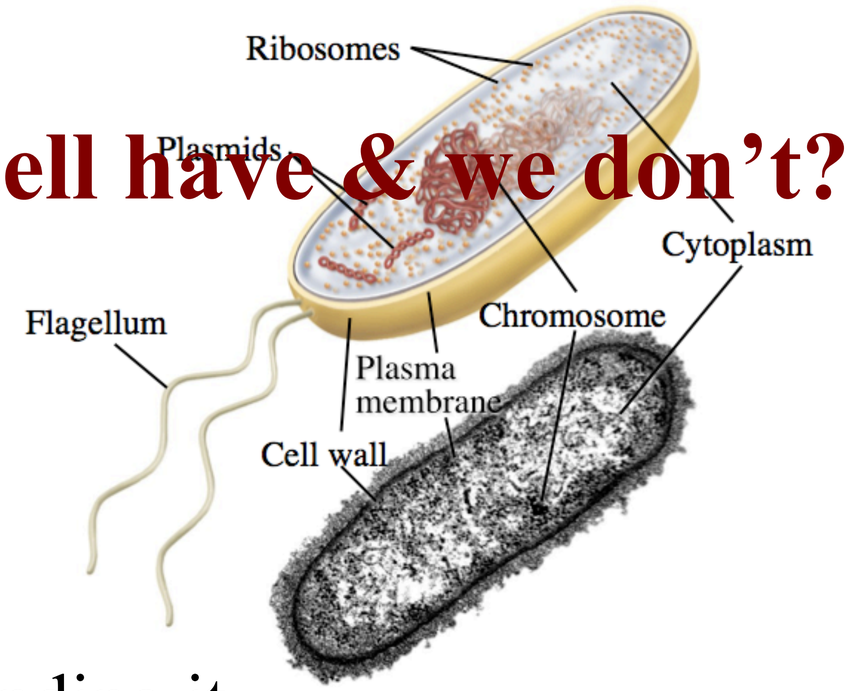
Q: Cells that secrete lots of digestive enzymes (pancreas) abundance of Golgi

→ How does this connect to CF?

→ How does it connect to Diabetes?

“Pop Quiz”: **Reward** for those who prepared.
(Rewards are good)

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



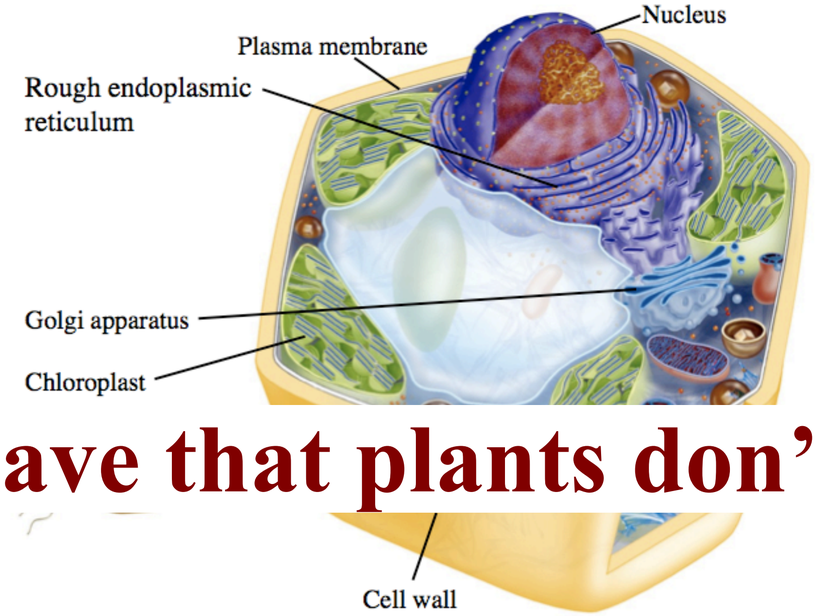
A. The plasma membrane surrounding it

B. Chromosomes with DNA to make RNA

C. Ribosomes making proteins

D. The cell wall surrounding it

E. None of the above



What does animal cell have that plants don’t?

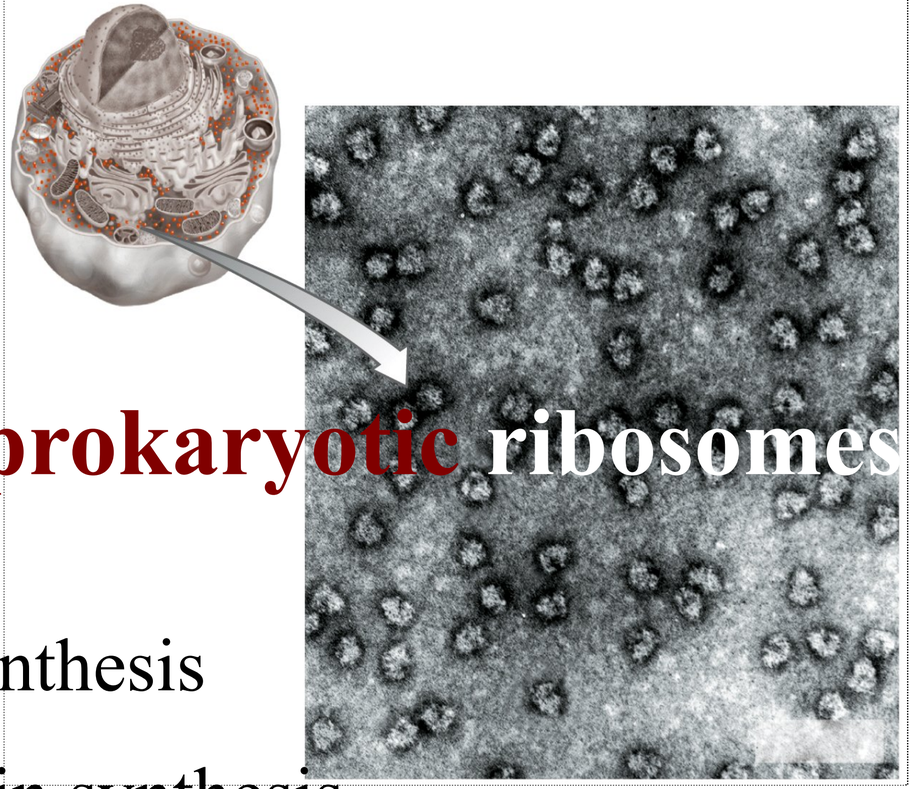
A. A single plasma membrane surrounding it

B. Mitochondria

C. A true Nucleus

D. The cell wall surrounding it

E. None of the above



Antibiotics that inhibit prokaryotic ribosomes

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

If you were a prokaryotic cell, you would be lacking _____.

a. a plasma membrane composed of phospholipids and proteins
b. chromosomes that contain genetic information
c. ribosomes to synthesize proteins
d. mitochondria to generate ATP

Which of the following is NOT considered a benefit of compartmentalization in eukaryotes?

a. Chemical reactions are more efficient because substrates are more easily maintained at high concentrations within organelles.
b. Chemical reactions that are incompatible can be segregated in different organelles.
c. DNA is transcribed and translated at significantly higher rates because all of the machinery is inside a single, membrane-bound nucleus.
d. When the product of one reaction is the substrate for a second reaction, the enzymes that work together can be clustered together on internal membranes and result in greater speed and efficiency.

Why is the smooth endoplasmic reticulum unable to synthesize proteins?

a. It has no ribosomes.
b. There is no supply of free amino acids that it can easily access.
c. It stores calcium, which is known to inhibit protein synthesis.
d. It has no DNA to direct the synthesis of proteins.

Announcements

1. **DRAFT2** due today, bring original & four copies for Peer Review, *Upgrade*: if do better on DRAFT2 it replaces your DRAFT1 score.
2. **Exam II Qs** will be sent out in 24-48hrs (exam in-class, week 10), *Upgrade*: if do better on Exam II it replaces your Exam I score.
3. **Tips:** Complete an experiment every day (always have a PCR running for the next day, always come in and make a new gel)
4. **May start Genomic Prep (Lab 2) this week.** Can do BOTH Lab 1 (lambda PCR & gel) at same time as do Lab 2 (genome prep). Still need complete Lab 1 and defend gel but may also pursue Lab 2.
5. **Peer Review** (optional, TopHat extra credit) due Wed. after break.
6. **Do you have questions?**

STAND UP??

4.4 The Endomembrane System and Proteins

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

- List the components of the endomembrane system
- Recognize the relationship between the endomembrane system and its functions

The endomembrane system (endo = "within") is a group of membranes and organelles (
modify, package, and transport lipids and proteins. It includes the nuclear envelope, lys
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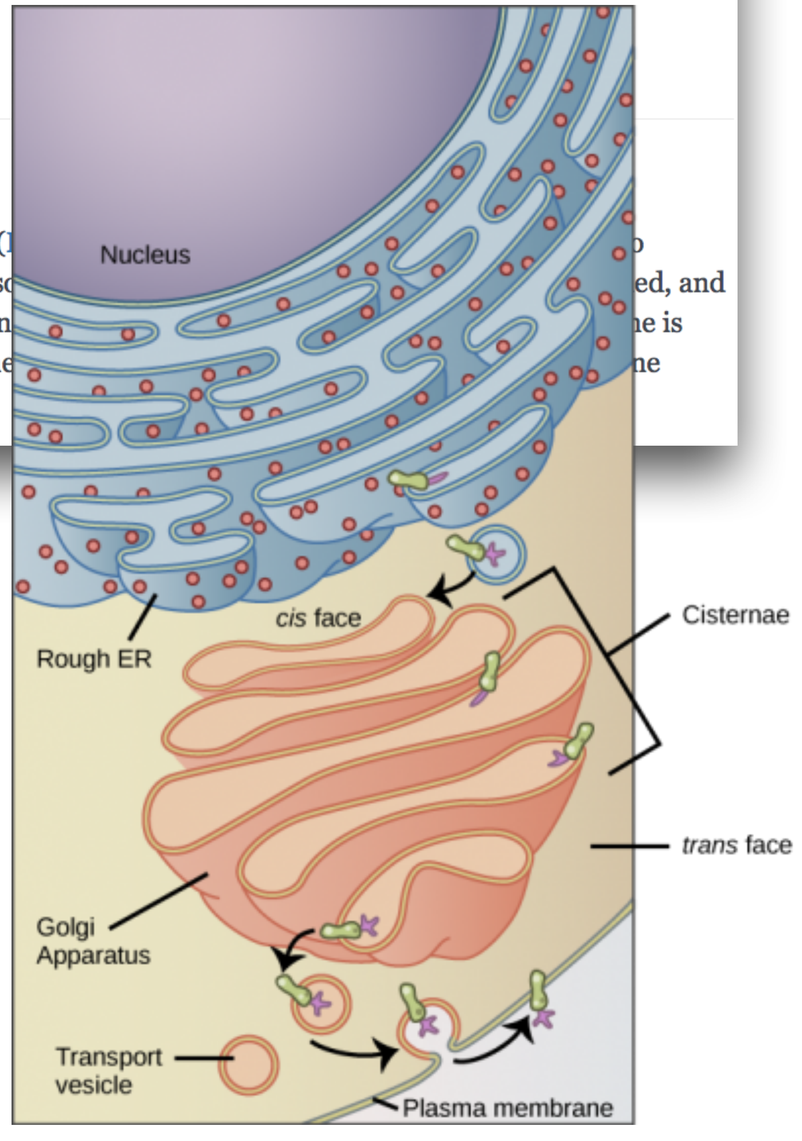
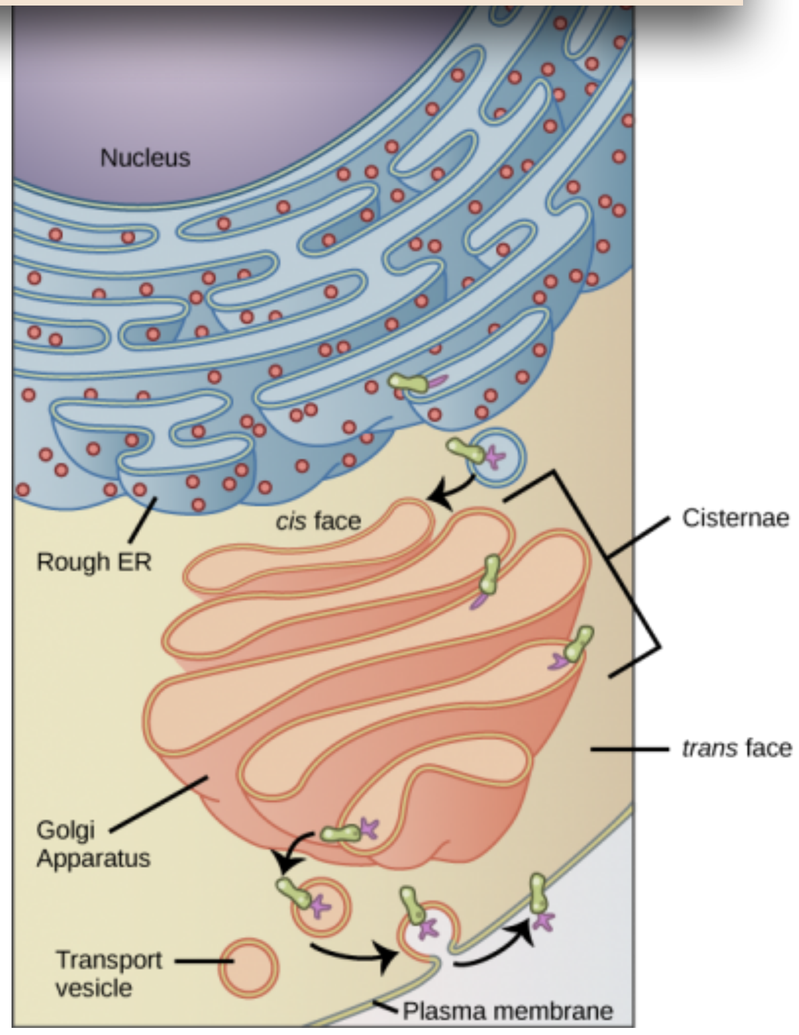
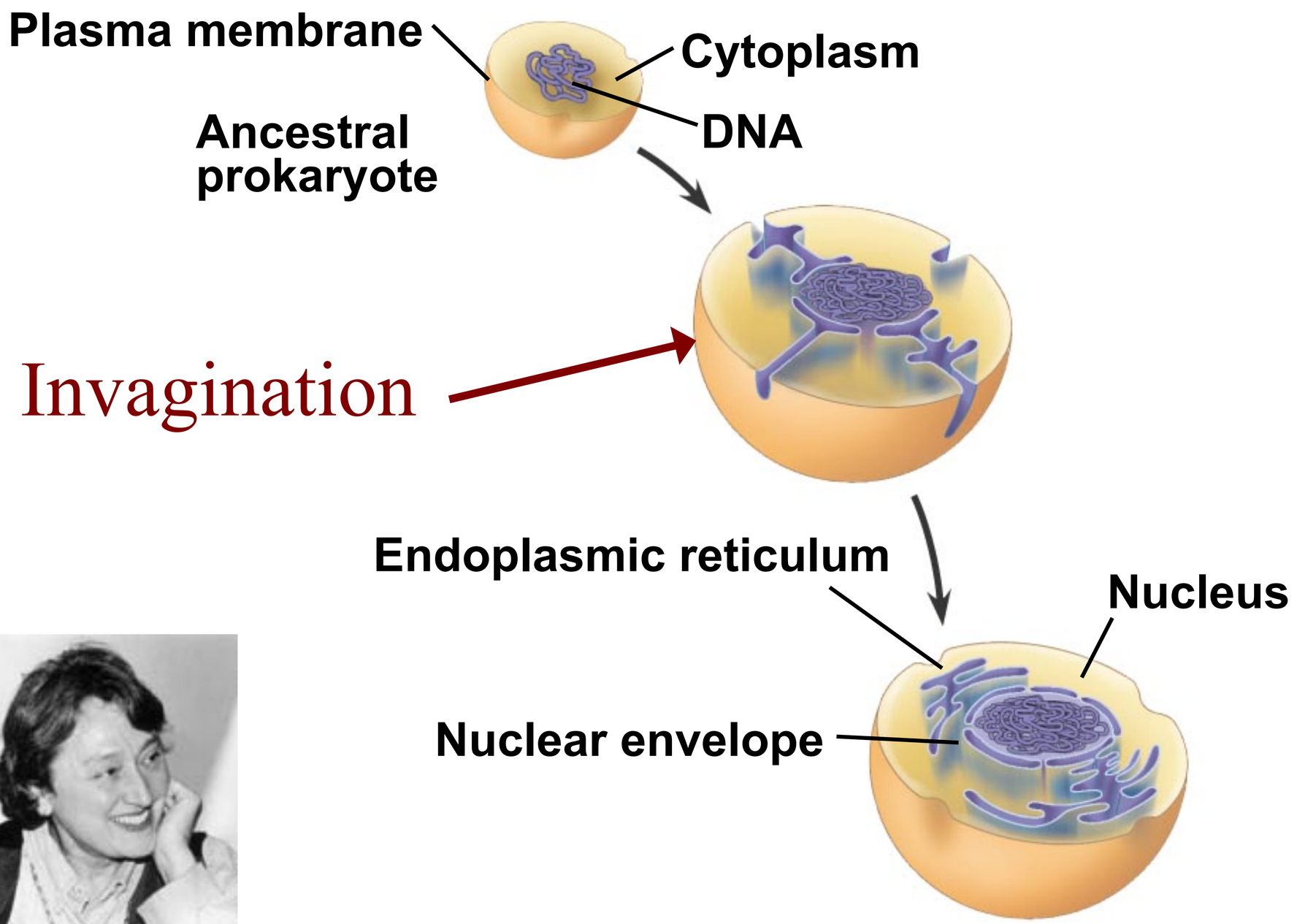


If a peripheral membrane protein were synthesized in the lumen (inside) of the ER, would it end up on the inside or outside of the plasma membrane?

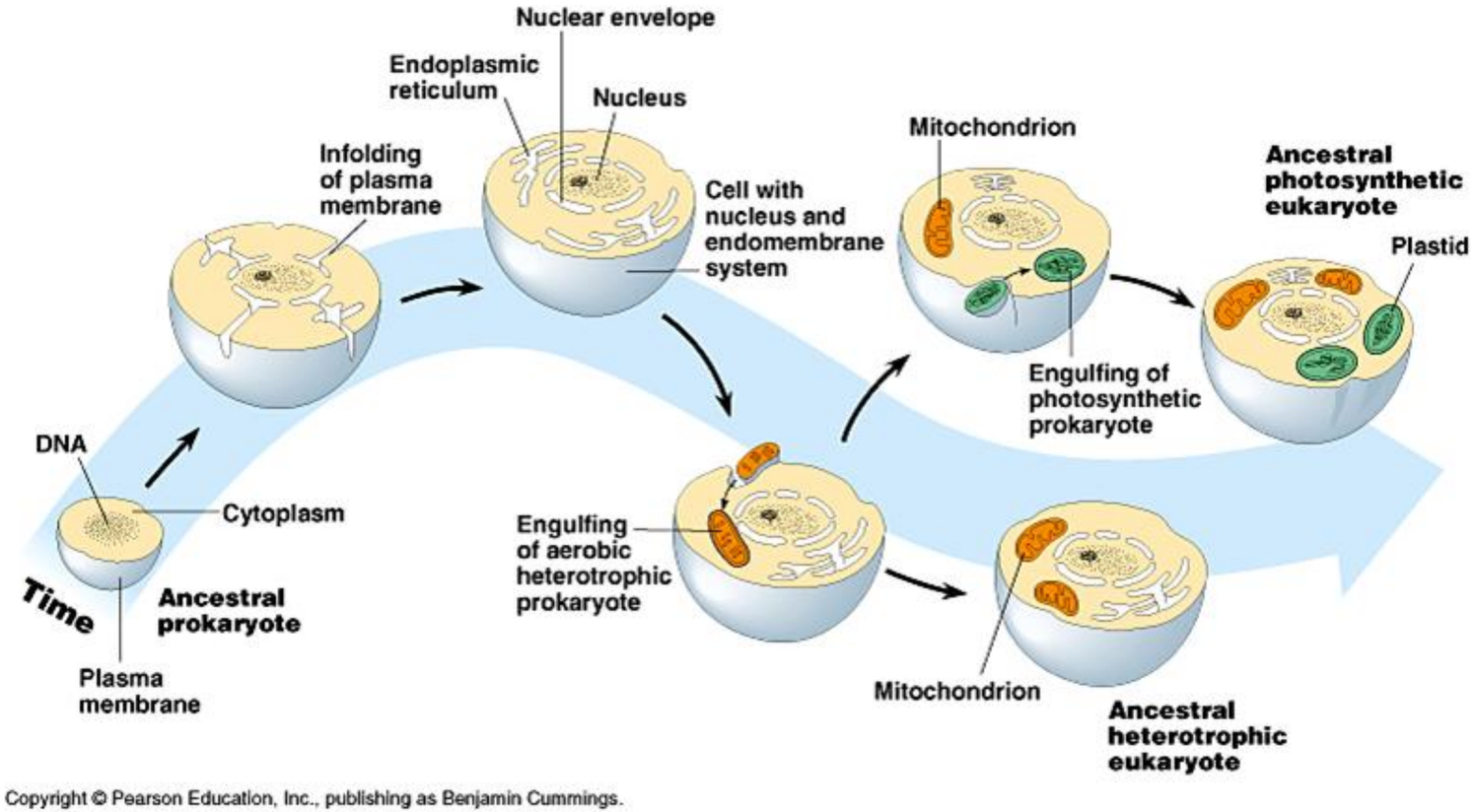


Compare and contrast eukaryotic and prokaryotic cells. Why do you think their endomembrane systems are different, is evolution involved?


Plasma membrane
Cytoplasm
DNA
Ancestral prokaryote
Invagination
Endoplasmic reticulum
Nucleus
Nuclear envelope

The *endosymbiosis* hypothesis…

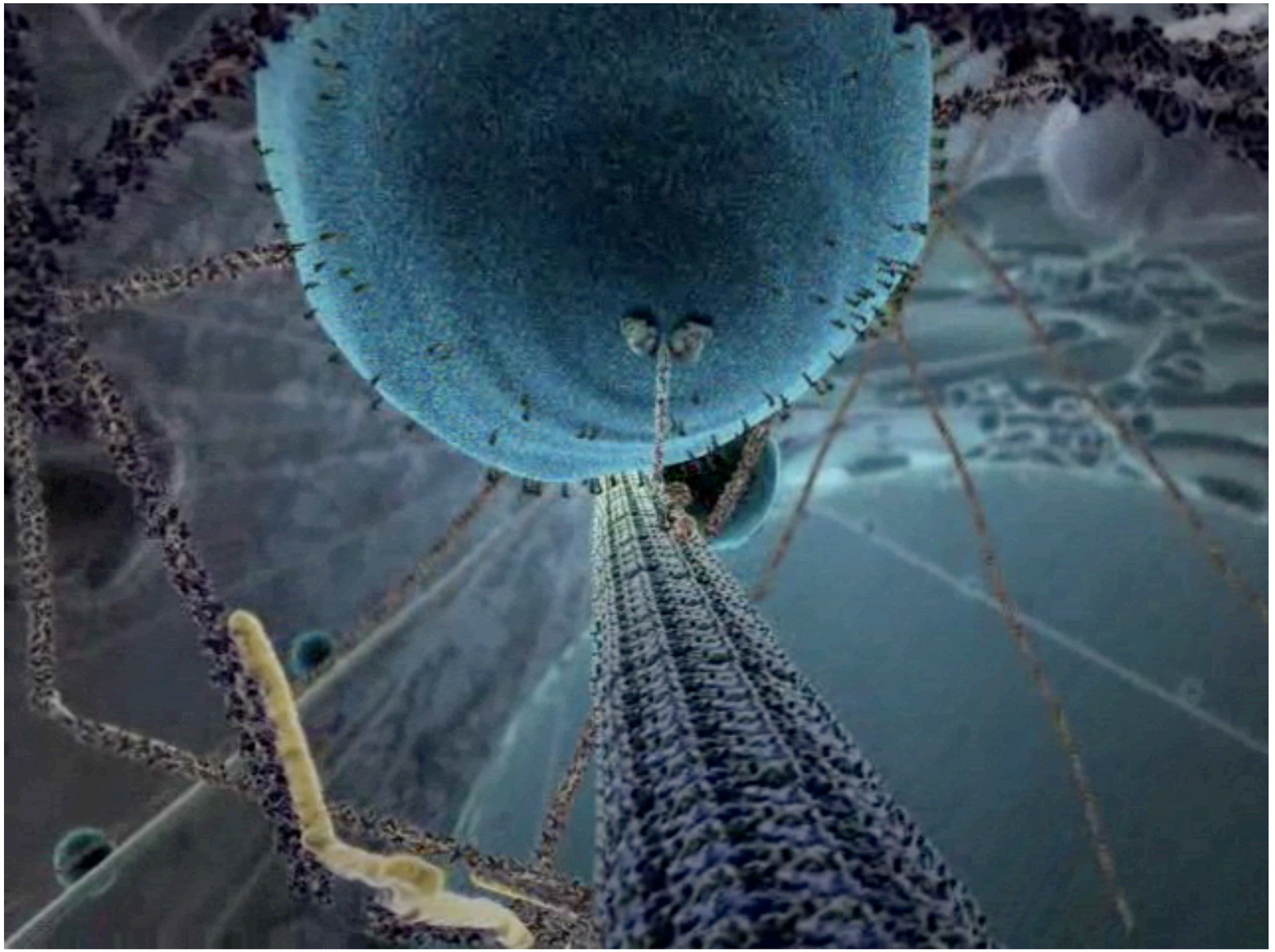
Lynn Margulis as a young woman.

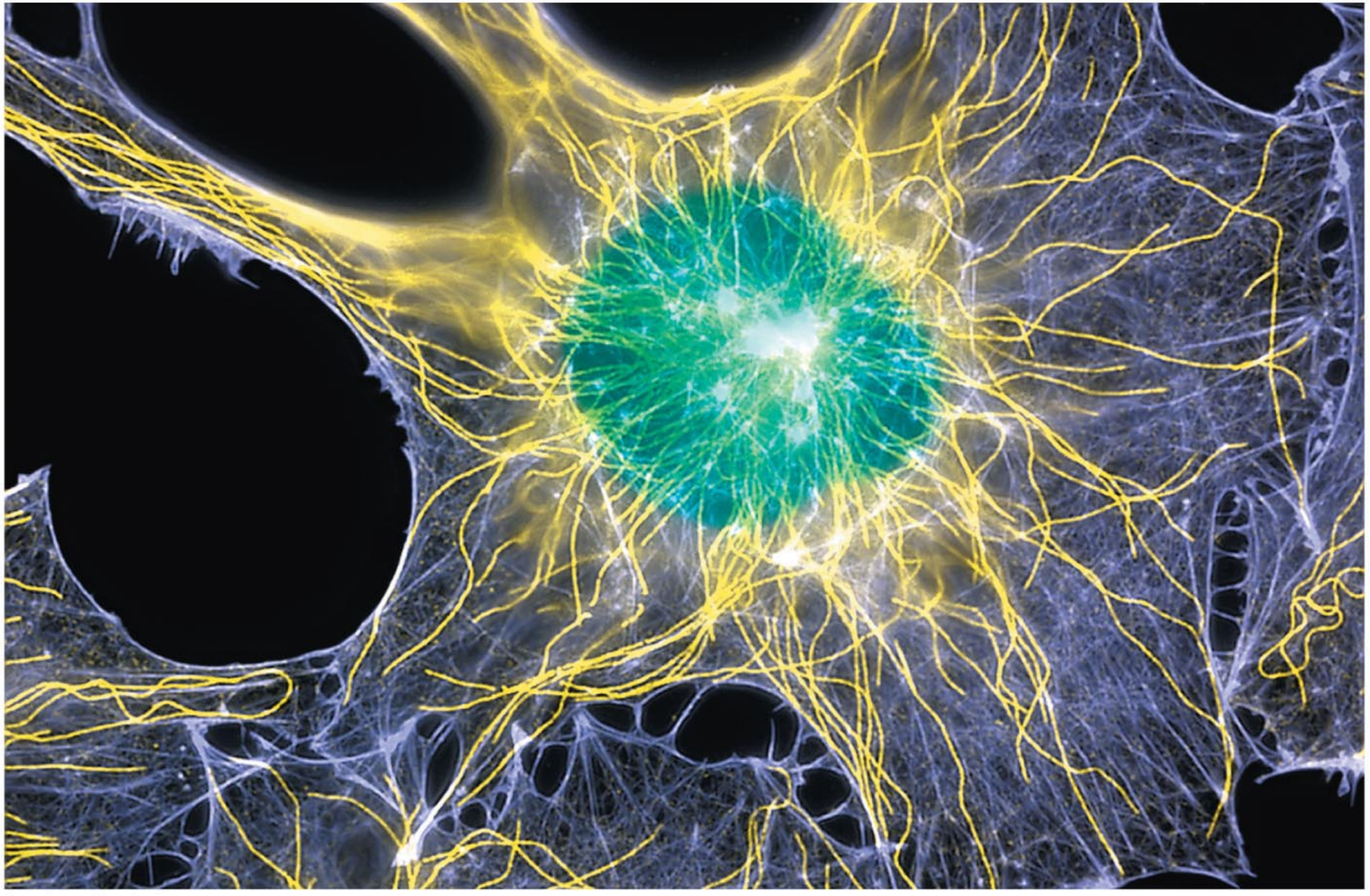


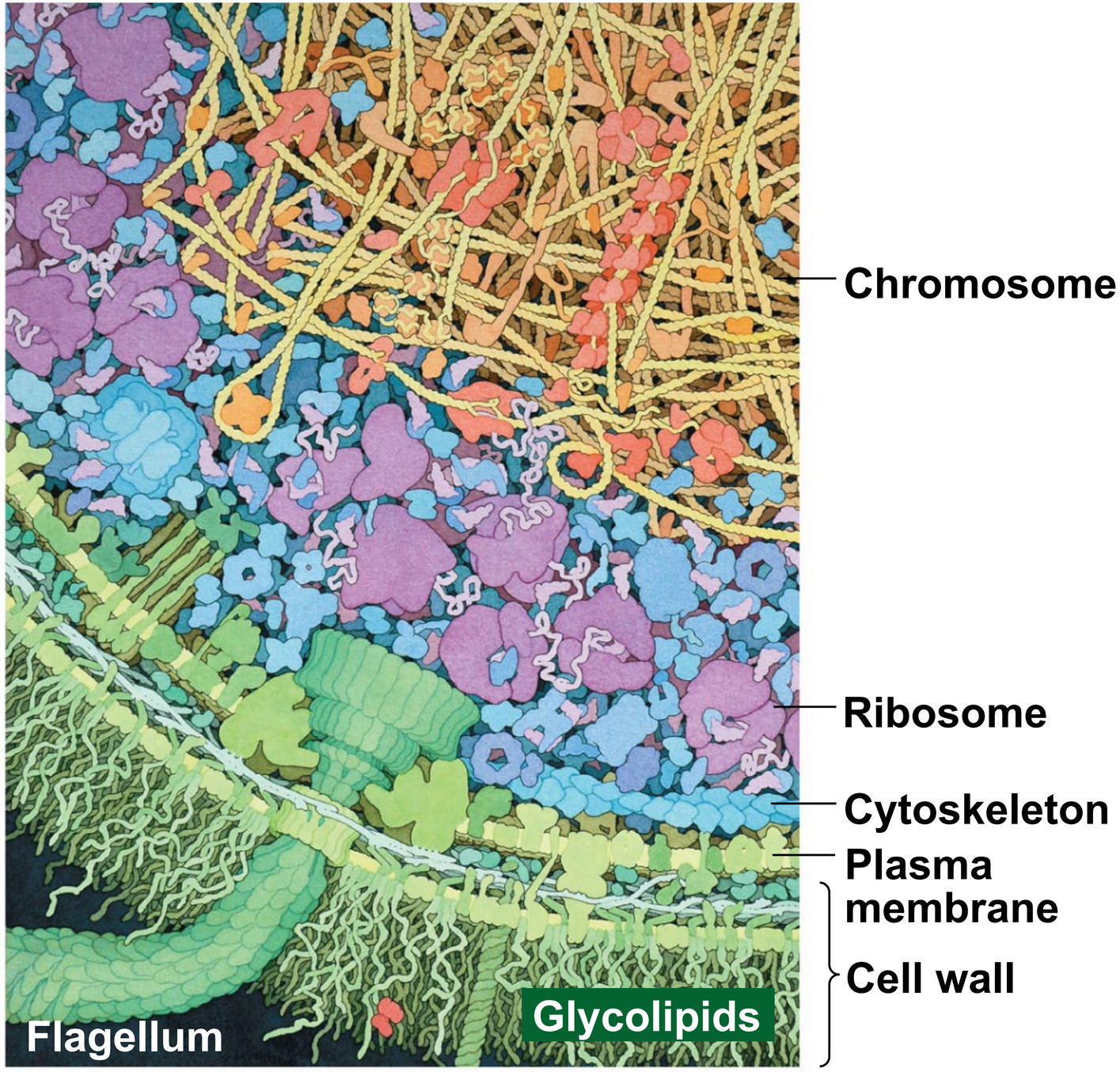
Name that tune…

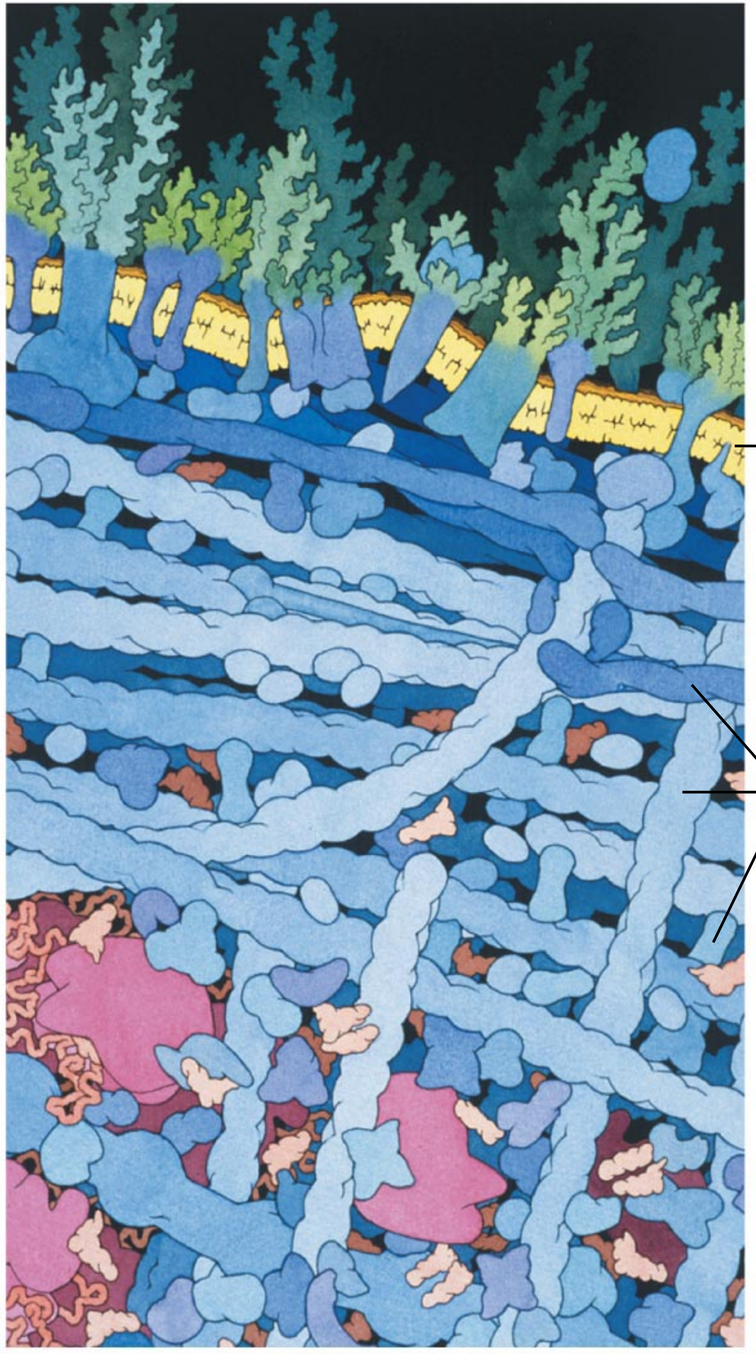
Prepare Paper “Structure” “Function”

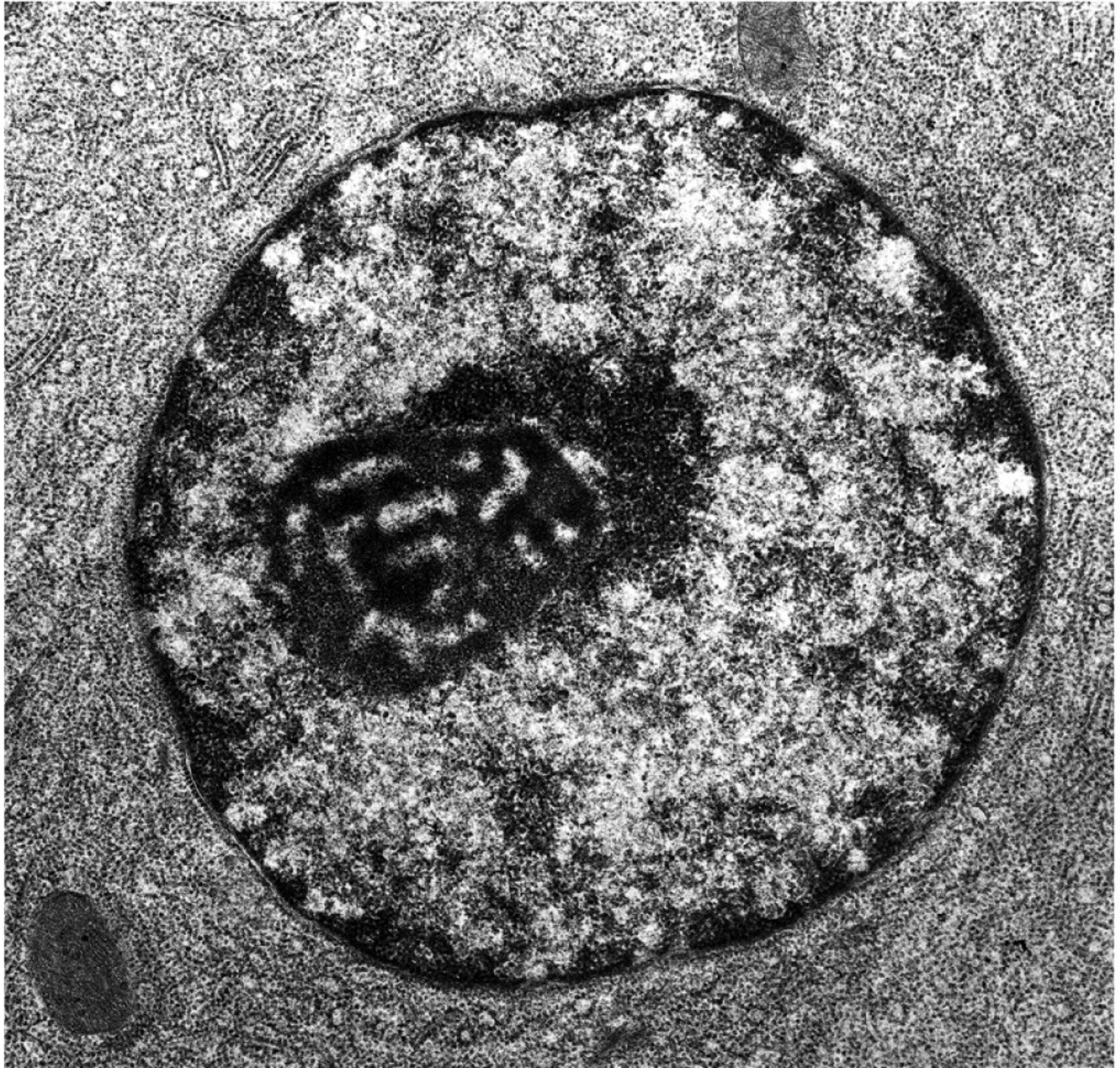
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

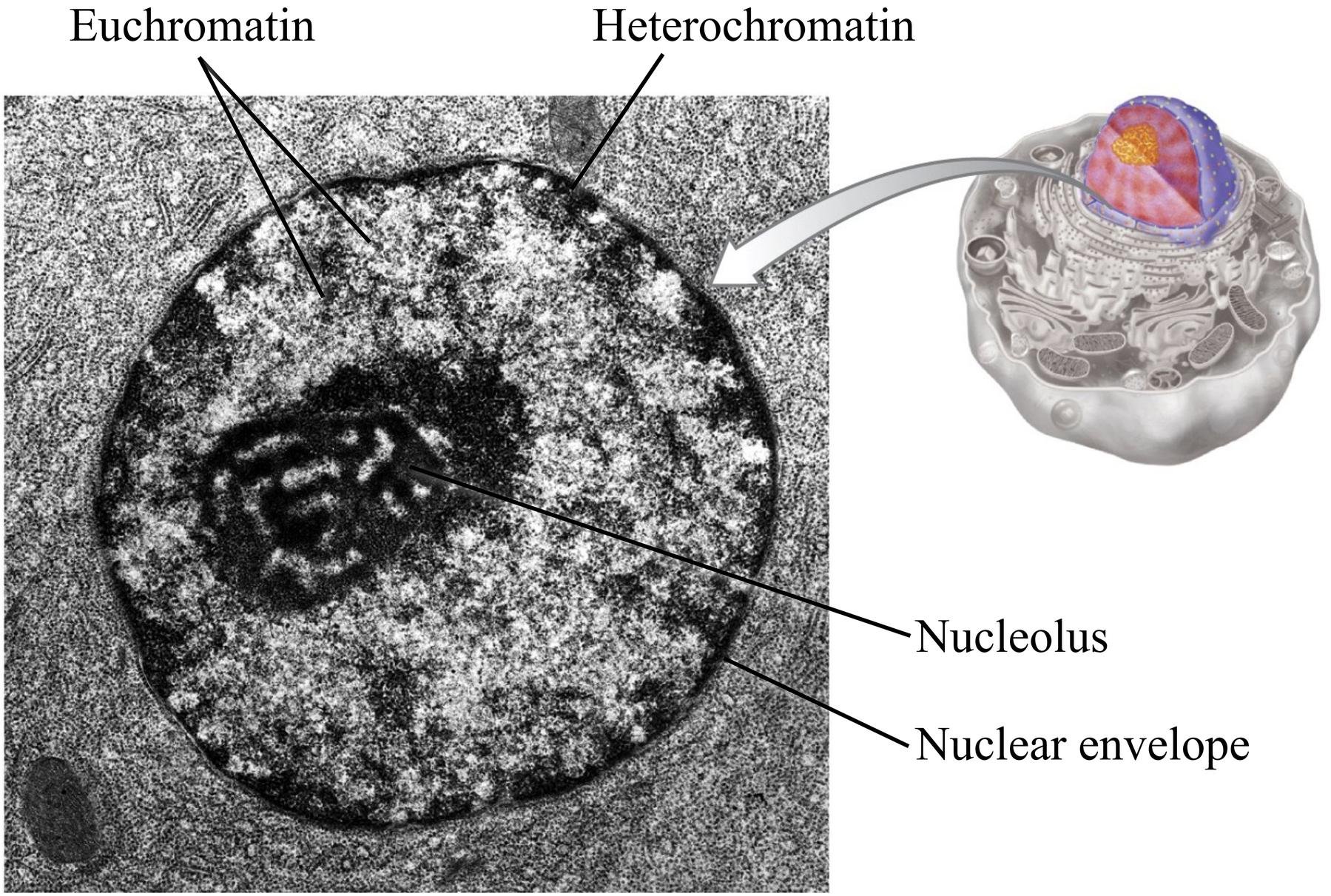


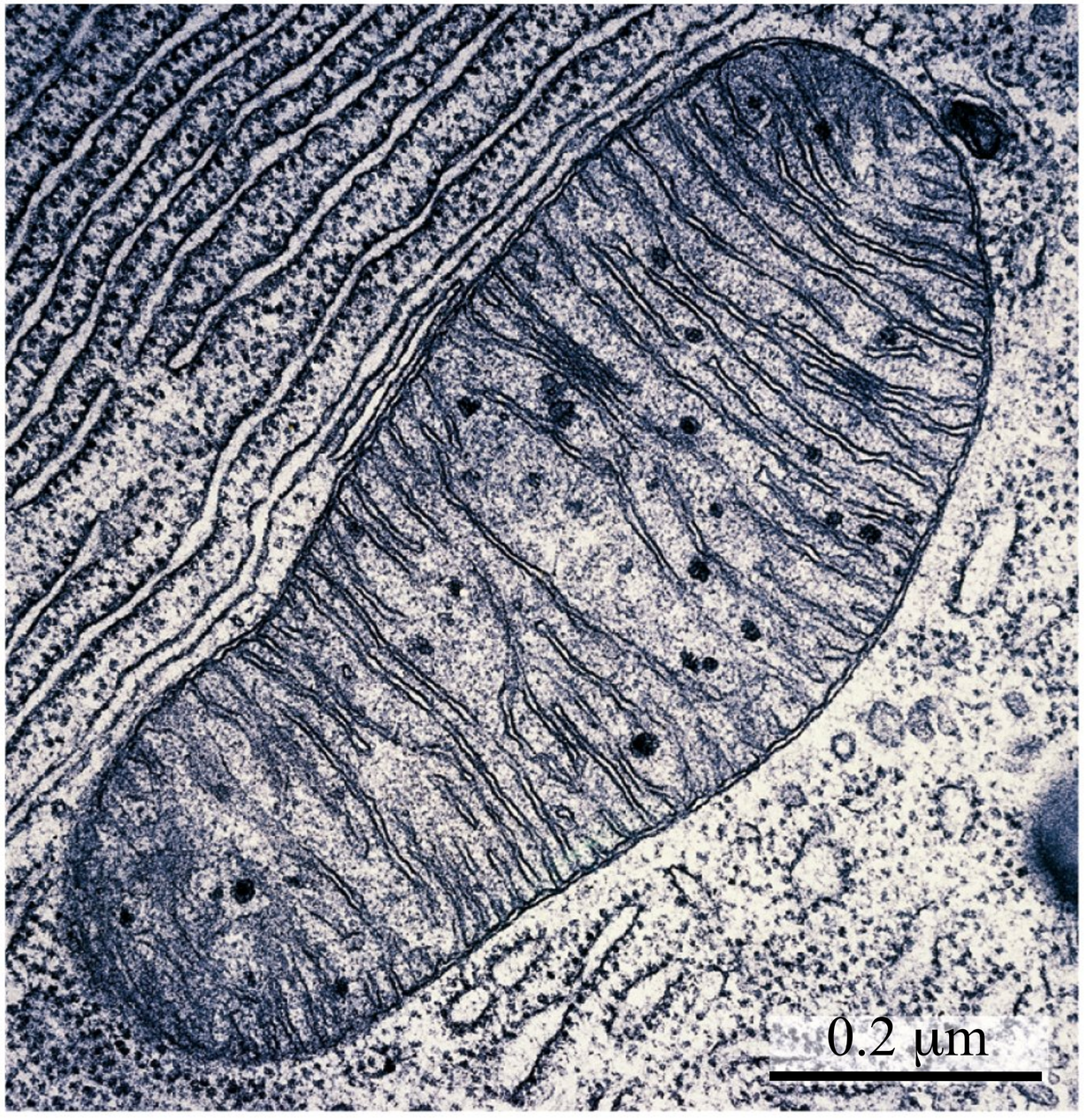


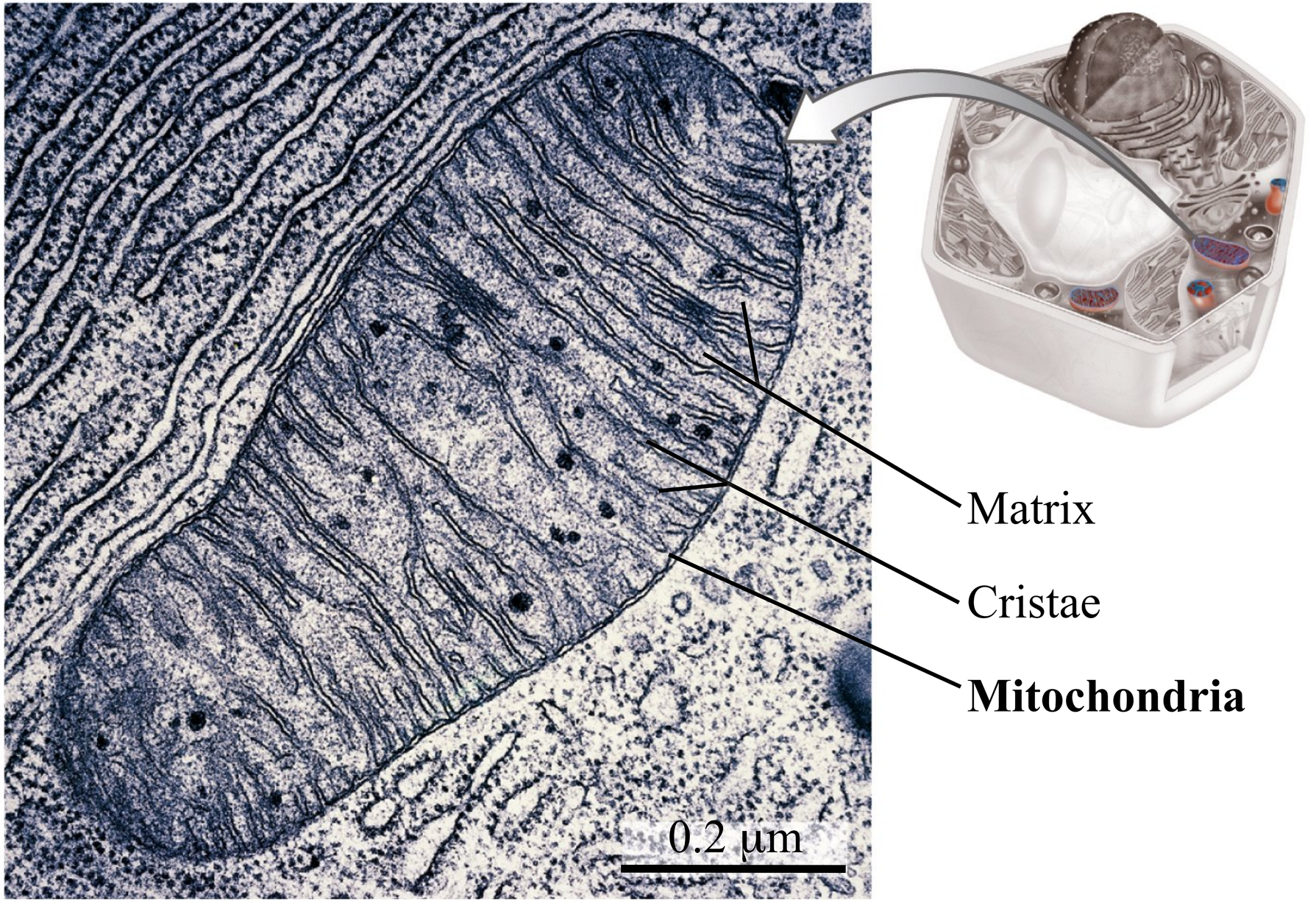







Euchromatin
Heterochromatin
Nucleolus
Nuclear envelope


0.2 µm


Matrix
Cristae
Mitochondria
0.2 μm