Step Inside The Greatest Circus of All:

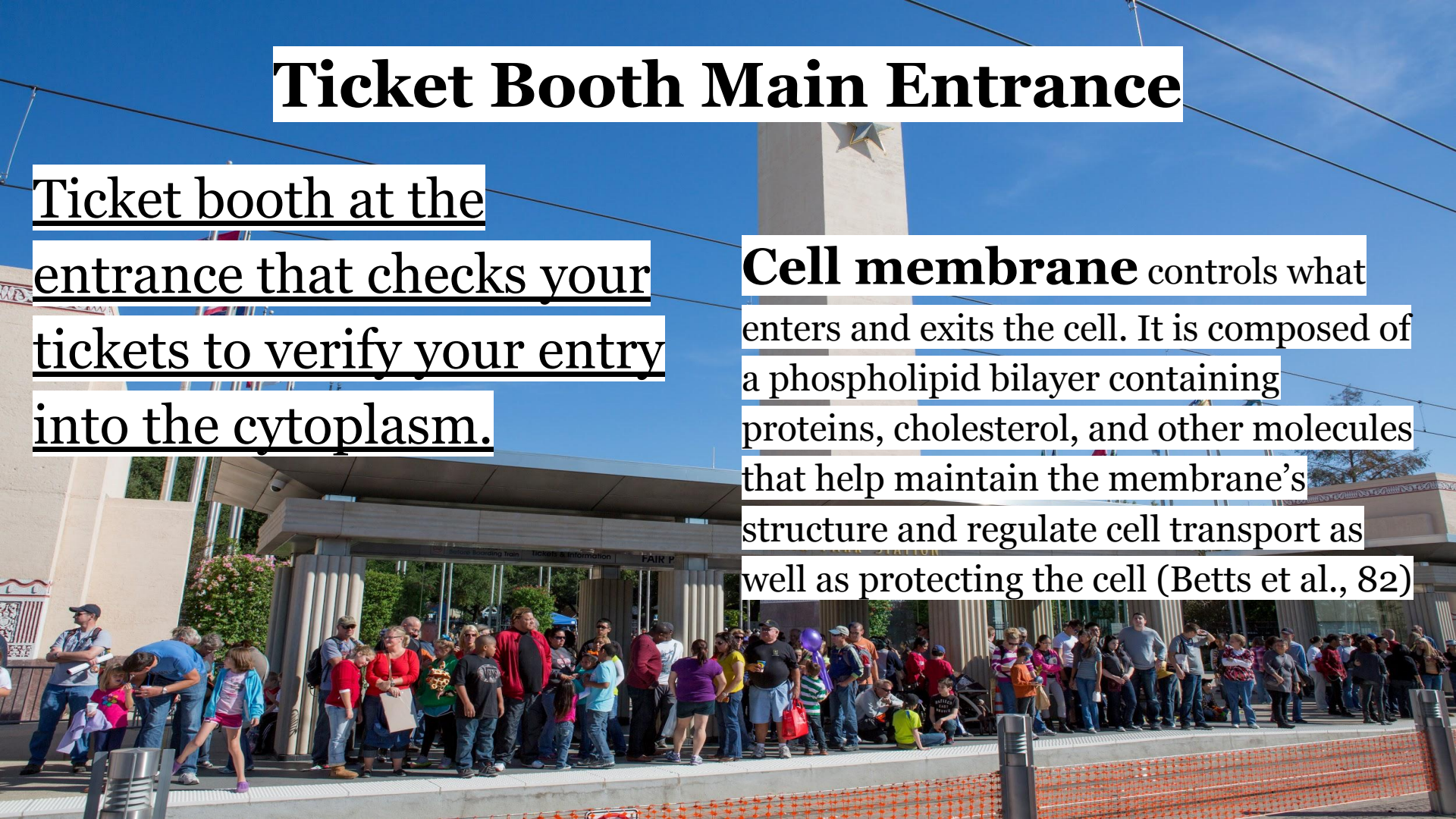
The Human Cell

Ava Briones

Ticket Booth Main Entrance

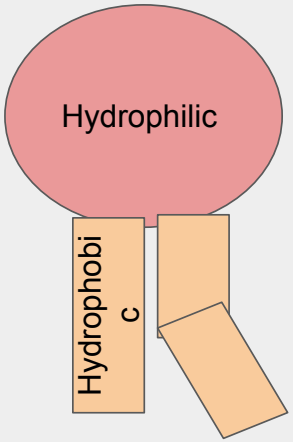
Ticket booth at the entrance that checks your tickets to verify your entry into the cytoplasm.

Cell membrane controls what enters and exits the cell. It is composed of a phospholipid bilayer containing proteins, cholesterol, and other molecules that help maintain the membrane's structure and regulate cell transport as well as protecting the cell (Betts et al., 82)



No Outside Drinks

Cell Membrane



The hydrophilic visitors drank the water before entering the cell membrane “No outside drinks” - signs posted at the gate. Once pass the cell membrane hydrophilic visitors immediately went to buy more water at the food stands inside

Hydrophilic molecules are negatively charged making the head polar, which is attracted to water both extracellular and intracellular. (Betts et al., 82)

The phospholipids in the cell membrane are **amphipathic** molecules have both heads and tails.(Betts et al., 82)

The Hydrophilic visitors didn’t bring water with them

Hydrophobic molecules tails are uncharged and nonpolar making them repels water. The tails are in constant motion due to them being made of saturated and unsaturated fatty acid (Betts et al., 82)

Security Check

The visitors are moving from the crowded lines into a less crowded area

Passive transport requires no energy input. (Betts et al., 85)

Using the **concentration gradient** to move substances across the membrane. Molecules will spread, or diffuse, from where they are more concentrated to where they are less concentrated until they are evenly distributed. (Betts et al., 85)

Diffusion is the movement of particles from an area of higher concentration to an area of lower concentration.

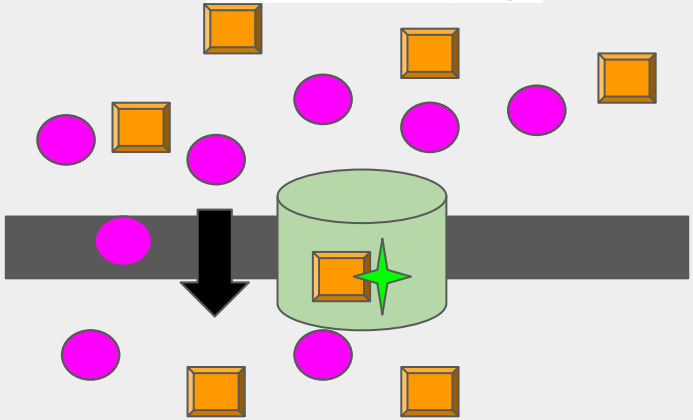
- Simple diffusion
- Facilitated Diffusion
- Osmosis

(Betts et al., 85-87)

Diffusion

Simple diffusion visitors are just wandering freely without support.

- **Simple Diffusion** - Allows small, uncharged substances like oxygen, carbon dioxide, and other hydrophobic molecules to pass through the cell membrane. (Betts et al., 85)



In facilitated diffusion, families with strollers or wheelchair users have a special accessibility gate, where the “protein” staff help them pass through protein channels or carrier proteins.

- **Facilitated Diffusion** - Some molecules are too big, charged, or polarr to cross on their own, so a specialized carrier protein called a glucose transporter moves them into the cell down their concentration gradient using ✦ channel protein or carrier proteins. (Betts et al., 86)

Osmosis

The water visitors are going to the popular rides instead of the boring rides

Osmosis water moving down concentration gradient through semi-permeable membrane. Osmosis occurs when there is an imbalance of solutes outside and inside the cell. (Betts et al., 87)

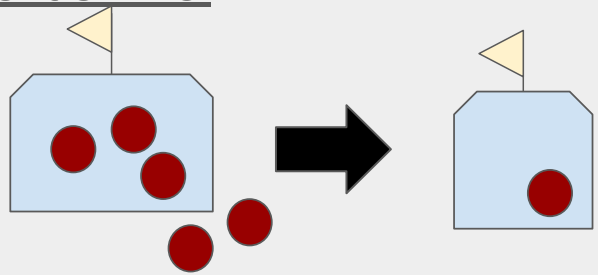




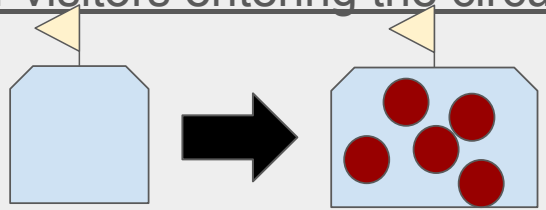
Isotonic - Solutions have equal solute concentration inside and outside the cell. (Betts et al., 87)The ride seats are full, so isotonic staff direct the next group of water visitors to the open lines. Each car has 6 seats, and isotonic staff keep exactly 3 water visitors waiting in each line for their turn when the ride is over making it equal.

Osmosis

Hypertonic - Solutions have a higher concentration, causing cells to shrivel as water leaves. (Betts et al., 87) Water visitors leaving the circus show making the tent shrivel



Hypotonic - Solutions have lower concentrations, causing cells to swell as water enters. (Betts et al., 87) Water visitors entering the circus show tent making the tent swell




FAST LANE
Carowinds
ENTRANCE
Must Show Wristband
WARNING

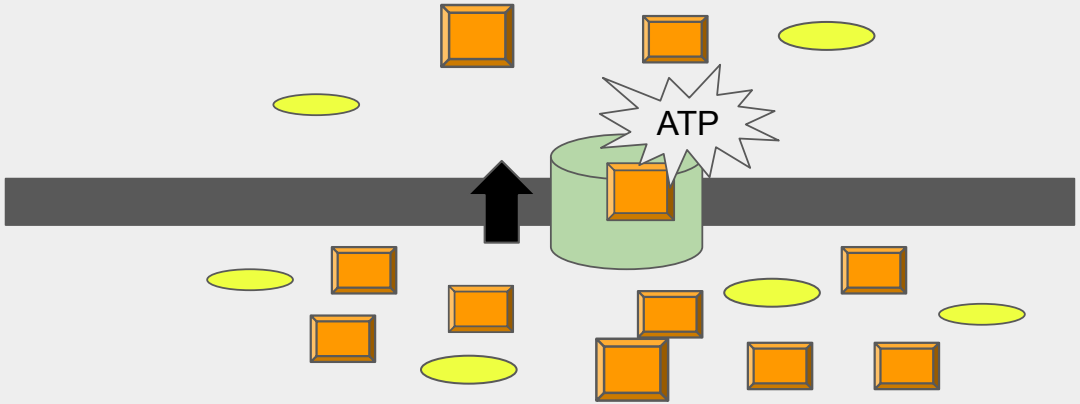
Active Transport - “Fast Pass Lane”

The active transport staff use energy to move certain VIP Fast Pass visitors quickly to the front of the line by going against the gradient.

Active Transport - uses ATP and carrier proteins to move substances across the cell membrane against the concentration gradient. (Betts et al., 87)

Sodium-potassium pump, Na+/K+ transports sodium out of the cell while moving potassium into the cell. (Betts et al., 88)

Sodium Na+ Potassium K+



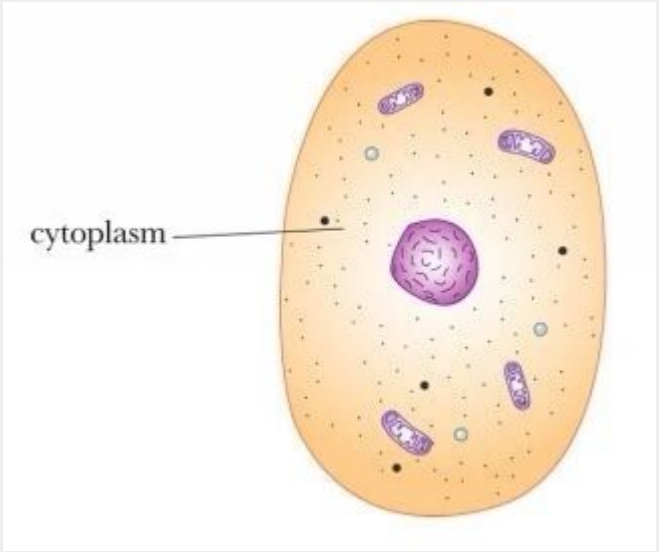

Inside the fairground

Cytoplasm

Cytoplasm - is everything inside the cell membrane.

Organelle - is the “organs” inside the cells like mitochondria, ER, lysosomes, etc

Cytosol - is a jelly like fluid inside the cell that helps transport materials around the cell



The open space inside the fairgrounds where visitors walk around freely

(Betts et al., 91)



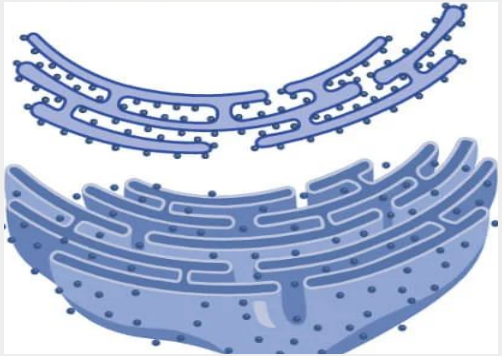
Fun house walk ride

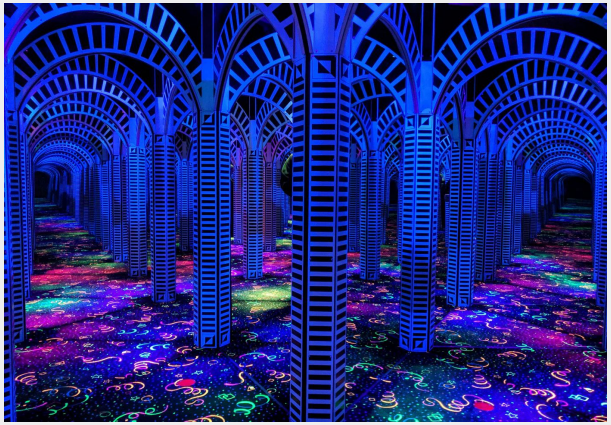
- Mirror maze
- Tunnel and slide

Endoplasmic Reticulum (ER) “Mirror Maze”

Endoplasmic reticulum is a system of channels that connect to the nuclear membrane. It creates passages all through the cell that helps with transporting, making, and storing different substances the cell needs (Betts et al., 92)

Rough ER - has **ribosomes** attached to it that carry out the protein synthesis (Betts et al., 93) and (Mostafa, 2022)

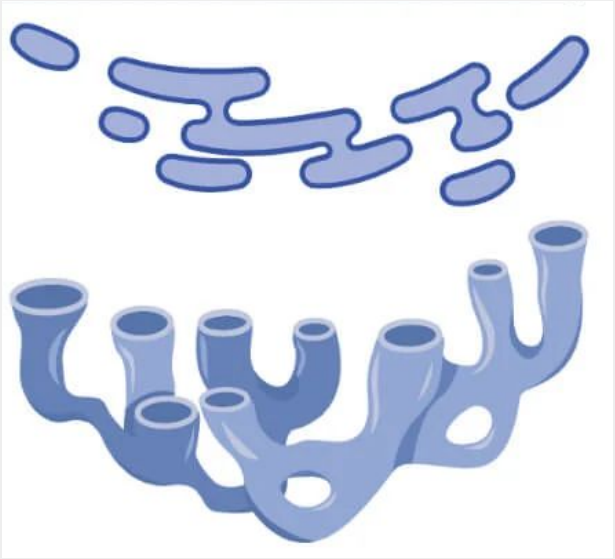




The mirror maze and the ribosome reminds me of the rough ER shape, which is the obstacles and illusions the visitors have to get through to exist. But for the function it’s more like the food stands, since it helps transport, make, and store “food” materials.

Smooth Endoplasmic Reticulum - “Tunnel/Slide”

The smooth ER is like the slide and tunnel in the funhouse. They are easy passages to maneuver without the obstacles and illusions ribosome create.





The **smooth ER** helps make phospholipids, detoxify harmful substances, and store and release calcium for the cell. There are no ribosomes. (Betts et al., 93)



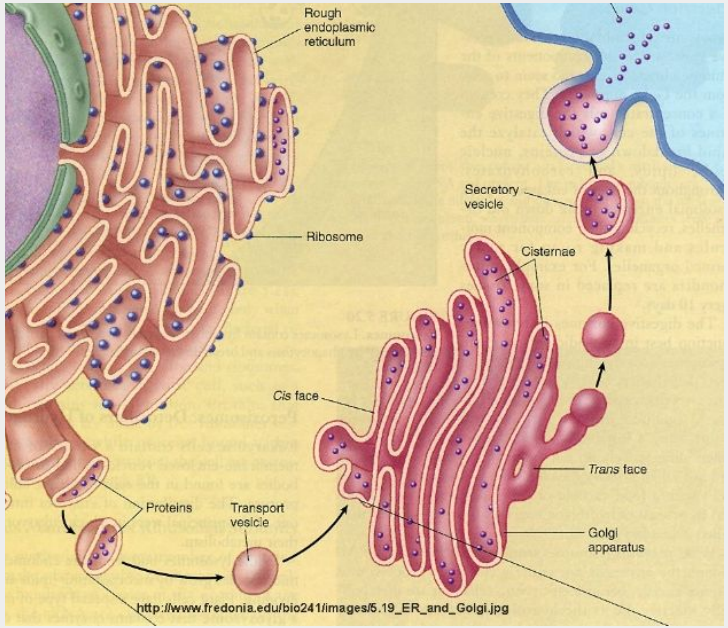
Gift Shops at NRG Stadium

Golgi Apparatus

All the gift shops items are brought to the fairgrounds to be set up in the NRG stadium. The Golgi Apparatus staff organized, package, and hand out to visitors who bought that item.

Golgi Apparatus is responsible for sorting, modifying, and shipping out products that came from the rough ER. One side of the golgi receives protein products in vesicles and sorts them, then releases them to the opposite end after being repackaged into new vesicles and exported (secrete) out of the cell through the cell membrane (Betts et al., 93-94) and (Hu, 2023).

I compared the shape of the rough ER to the funhouse mirror maze, but it's function is more like the food/store stands.

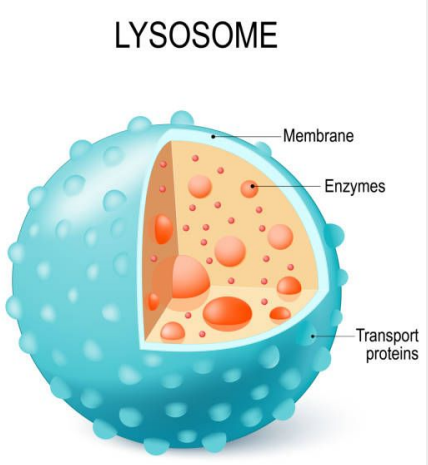



Clean Up Crew
NOODLE BAR
Nice & Tas
BRA

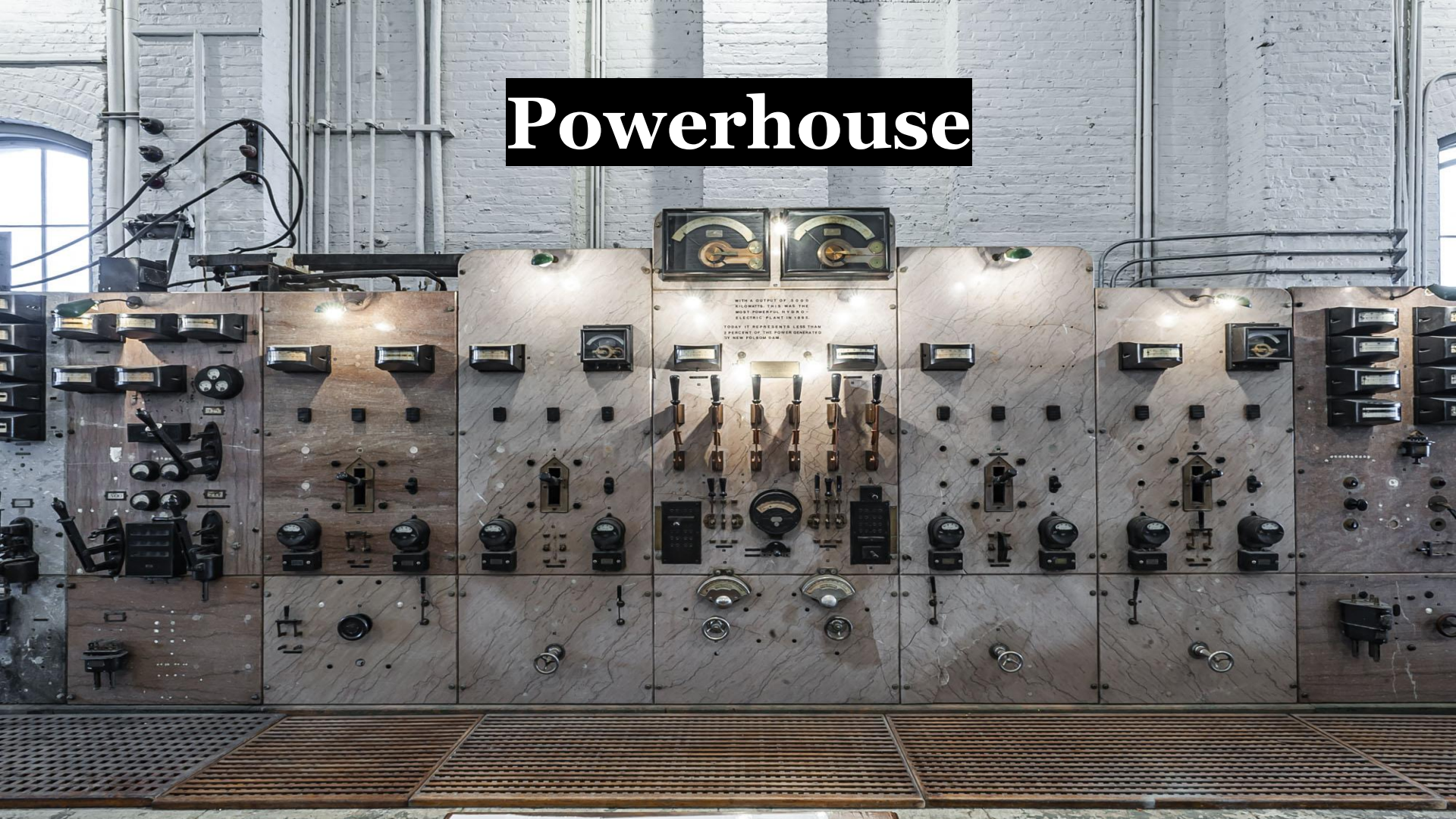
Lysosome - “Clean up crew”

Lysosome - contains enzymes that break down and digest unneeded cellular components, such as damaged organelles or just parts of the cell. They also reuse amino acids to make energy. This “self eating” process carried out by lysosome is called autophagy (Betts et al., 94) and (Hu, 2023)

Every night the lysosomes cleaning crew collects trash and recycling so that the next day the cytoplasm and organelles are clean.



Powerhouse

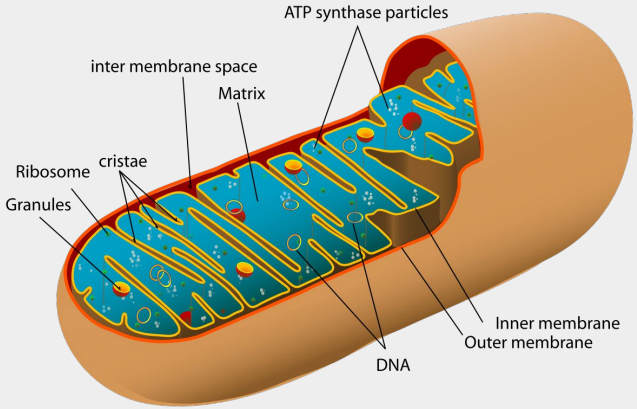

WITH A OUTPUT OF 3000
KILOWATTS THIS WAS THE
MOST POWERFUL HYDRO-
ELECTRIC PLANT IN 1895
TODAY IT REPRESENTS LESS THAN
2 PERCENT OF THE POWER GENERATED
BY NEW FOLSOM DAM

Mitochondria - “Powerhouse”

Mitochondria convert energy stored in nutrient molecules into ATP, which provides usable energy for for the cell. It’s known as the powerhouse of the cell because it makes ATP, the cell’s main energy source, and it even has its own DNA. (Betts et al., 95)

<u>The main power panel that turns on all the lights, rides, and neon signs around the fairground.</u>

Fun Fact: mitochondria are common in the muscle cells because the muscular system needs lots of ATP to contract




Magic Mountain

Disclaimer before reading

This story is not meant to make fun of or disrespect anyone living with mitochondrial disease. It's just a unique perspective way to help explain a serious condition by comparing the topic to my project about the Circus fairgrounds.

I truly mean no harm to anyone. My heart goes out to you and your family on your journey though treatment if you have mitochondrial disease.

Thank you for understanding.

Magic Mountain - part 1

Hey, did you hear about what happened to Magic Mountain? People whisper that it’s just an urban legend, but my grandpa swears he visited Magic Mountain back when it was alive and bustling before it turned into a ghost town. He said it was a normal circus fairground packed with music, rides, food stands, and crowds of visitors.

Then one day, everything changed. The park suddenly shut down overnight after a series of strange disappearances and injuries among the visitors. No one really knew what was going on, but everyone felt like something inside the fair was “failing.”

One day, it was the batman ride not working properly so they turned off the ride early. It never was turned back on. People say it symbolized organ failure caused by dying cells.

Magic Mountain - part 2

Some believe the fair had a chronic illness called **Mitochondrial disease**, a condition that can cause muscle weakness, poor growth, loss of muscles coordination, fatigue, and pain.

There was a journalist who was trying to figure out what was really going on with the disappearances and incidents at Magic Mountain. After digging through reports and talking to staff, she discovered that there's no cure. However, she also learned that there is available treatment that can help improve quality of life.

She went to the manager of the park and told him. But the manager didn't believe her. He ignored her warnings. The problem got worse and the "rides" became more unstable.

But that wasn't even the scariest part. Have you heard about the roller coaster incident? The final stage.

Magic Mountain - part 3

It was just like any other night until screams filled the air, a major disaster happened on one of the popular rides. They said during the ride a cart detached from the rest of the track. It made worldwide news and can no longer be hidden. It became clear that it was time for Magic Mountain to close its doors indefinitely.

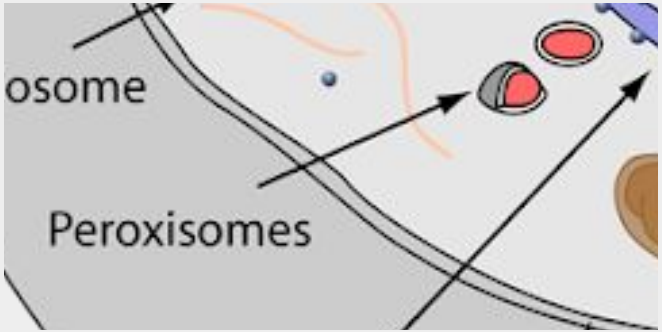
The journalist kept researching and eventually learned that mitochondrial cells help regulate homeostasis, cell growth, and cell signaling, and they play a role in both cell living and dying. Because of this, it can affect many part of the human body leading to development of serious diseases such as cancer, inflammation, neurodegenerative and some others to name a few (Javadov et al., 2020).


21+ Tent

Peroxisome - “21+ bar tent”

Peroxisome contains enzymes that transfer hydrogen atoms, break down hydrogen peroxide, help remove harmful chemical substances, lipid metabolism and lastly peroxisome breaks those down to protect the cell from damage. (Betts et al., 95-96)

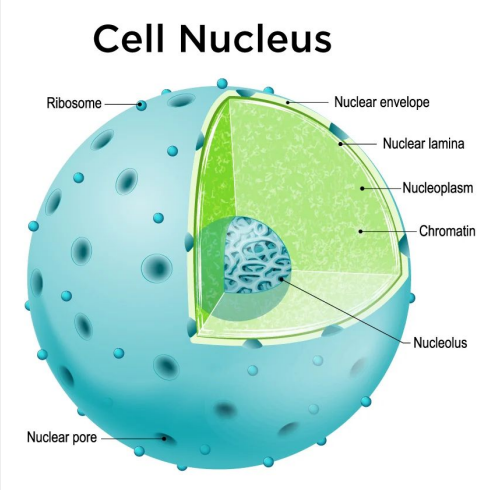
The bar tents in the fairgrounds. The enzyme bartenders break down “drinks” like hydrogen peroxide by watering down the alcoholic drinks to protect the visitors that are drinking.




Manager Office

Nucleus

The manager with the blueprints is like the nucleus of the fairground. He keeps all the plans, schedule, and training instructions, making sure the staff know how to run the rides safely.



The nucleus is often called the control center of the cell because it stores all of the genetic information that determines the structure and function of the cell. Inside the nucleus are the blueprints of your DNA, which guide the cell in the making proteins. (Betts et al., 98)

Peer review cite

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