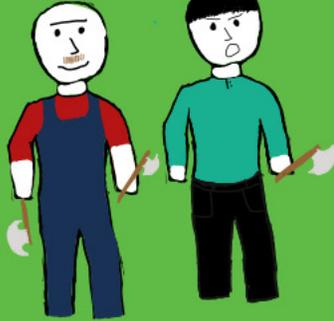


# A BEGINNERS GUIDE TO BREATHING

Early morning, 2 workers start their day by beginning to chop down this forest, oblivious to anyone who could be behind them...

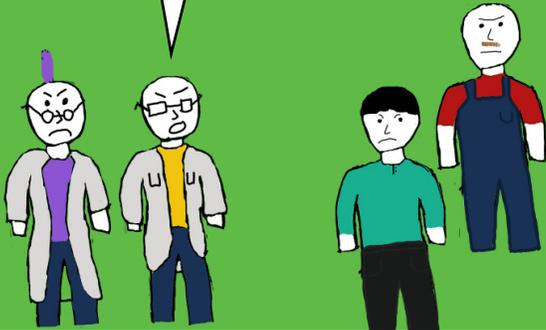
Finally, one of the last forests in town



However! Biologists find the workers & protest against their plan for the safety of a local town's air quality

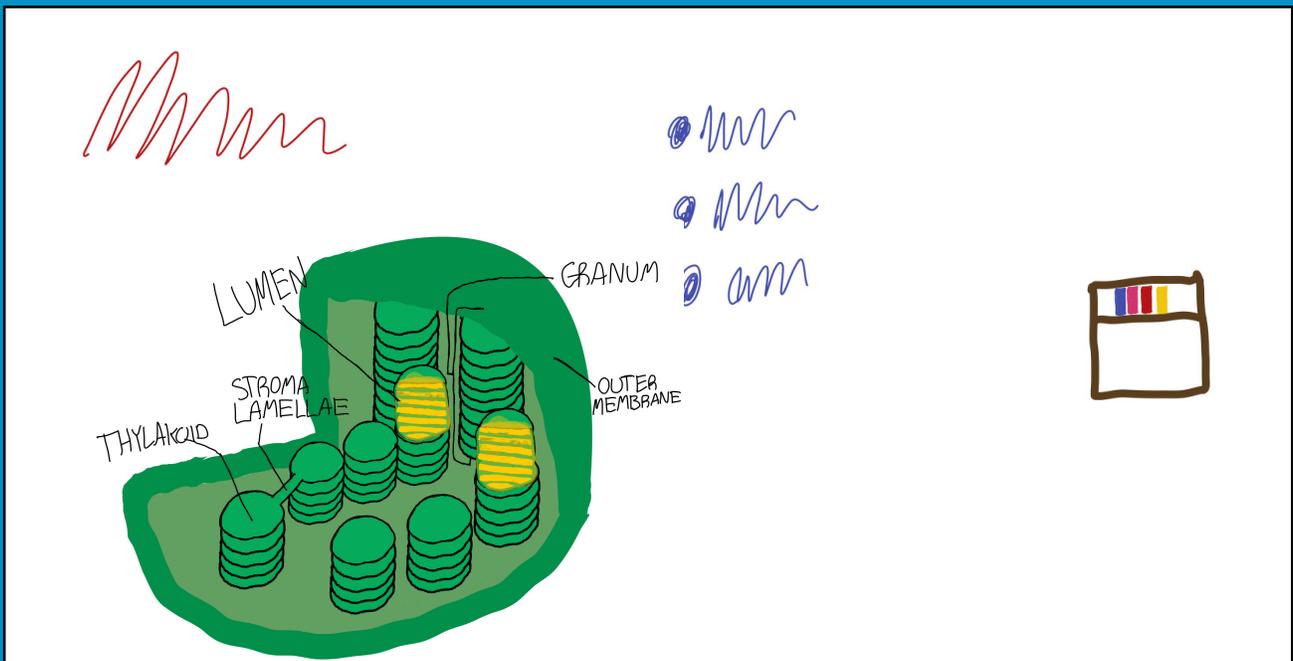
You can't chop down the forest! If you chop this one down there won't be enough oxygen produced to have decent air quality

Forests & good air quality are nowhere near connected, you're just trying to shut down our company!

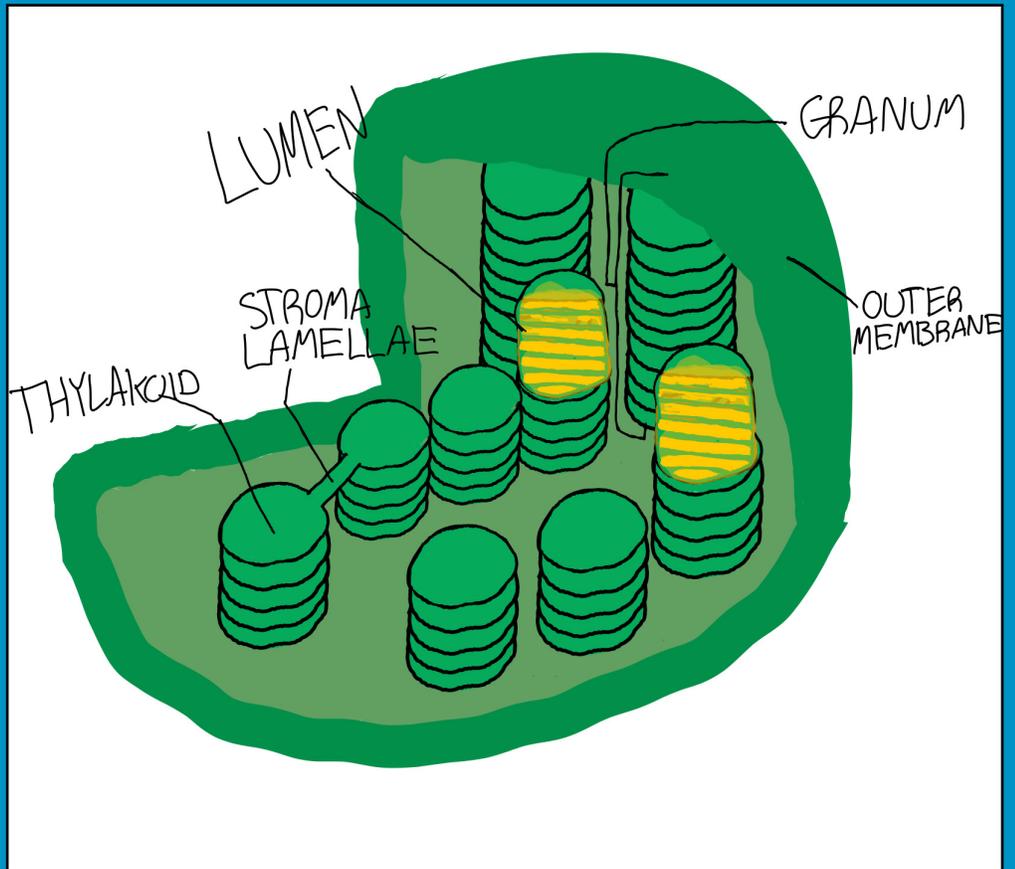


The workers don't believe in what the biologists are telling them, now what do the biologists do?

The workers are giving the biologists a chance to prove them wrong, this is huge for the biologists as no one has listened to them before. If they actually convince the workers the towns air quality will not be so fragile!



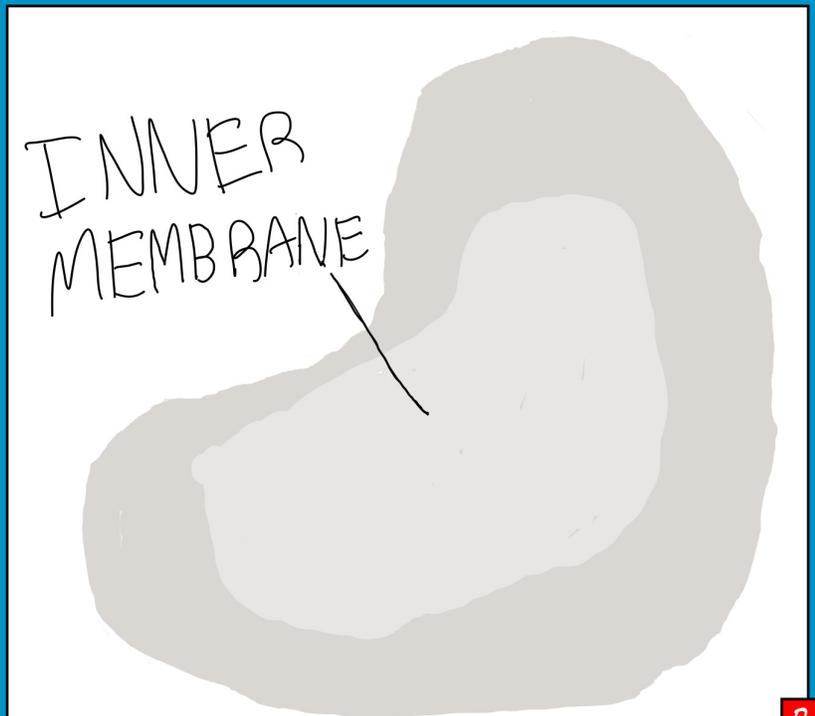
The biologists begin their lecture, starting with the chloroplast

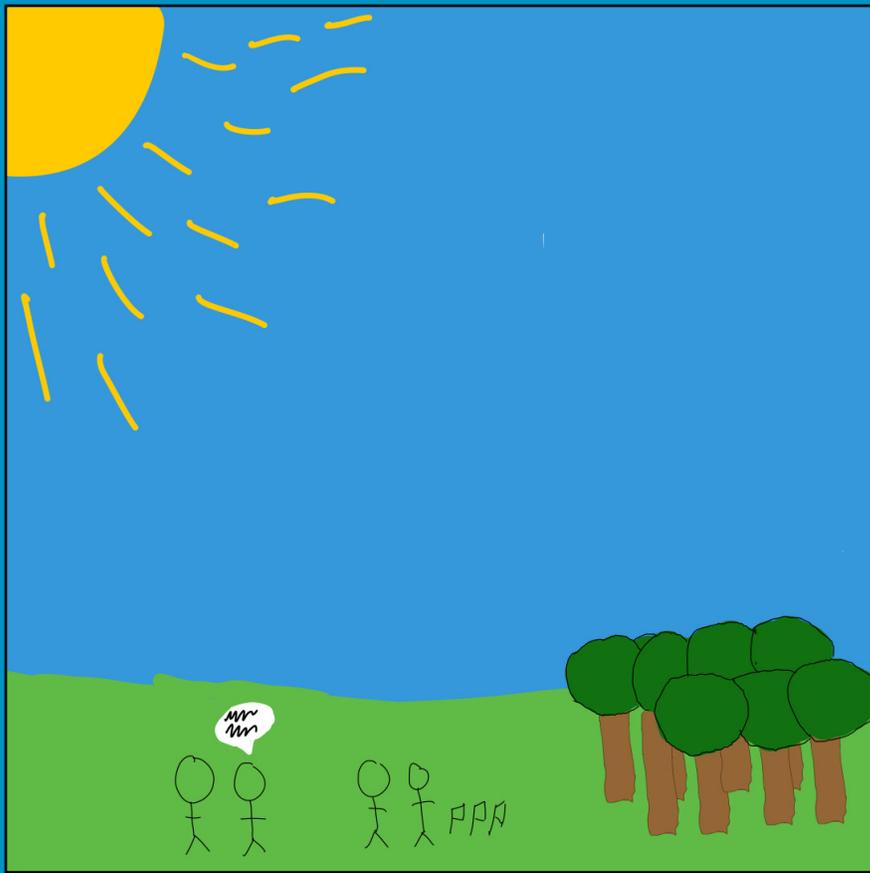


This is where the photo-synthesis begins, in a "plasticide" called the "chloroplast". This is where we will begin.

The chloroplast has many pieces to it that you can see on this diagram:

Inside a chloroplast is the "Inner Membrane". It is inside the "Outer Membrane" but it still encompasses everything else.



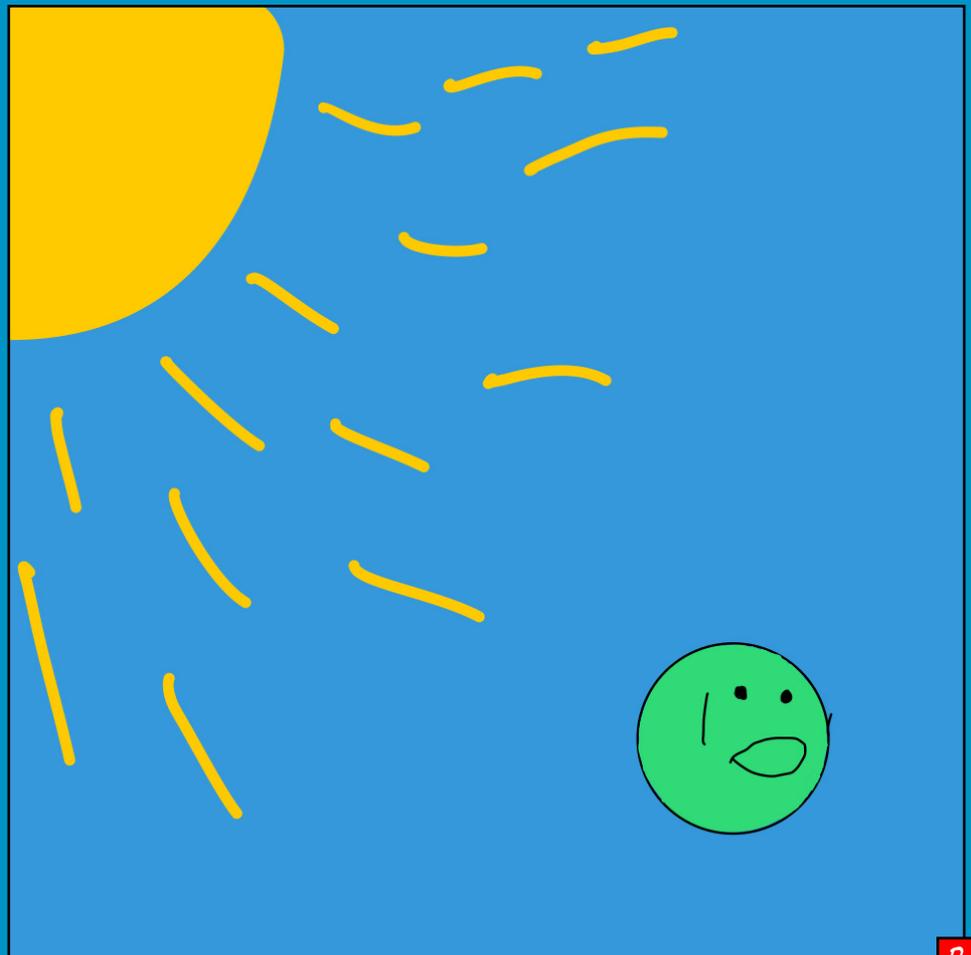


The science that we are going to show you relies heavily on 2 photosystems. These systems are the basis for how we breathe, more on them later

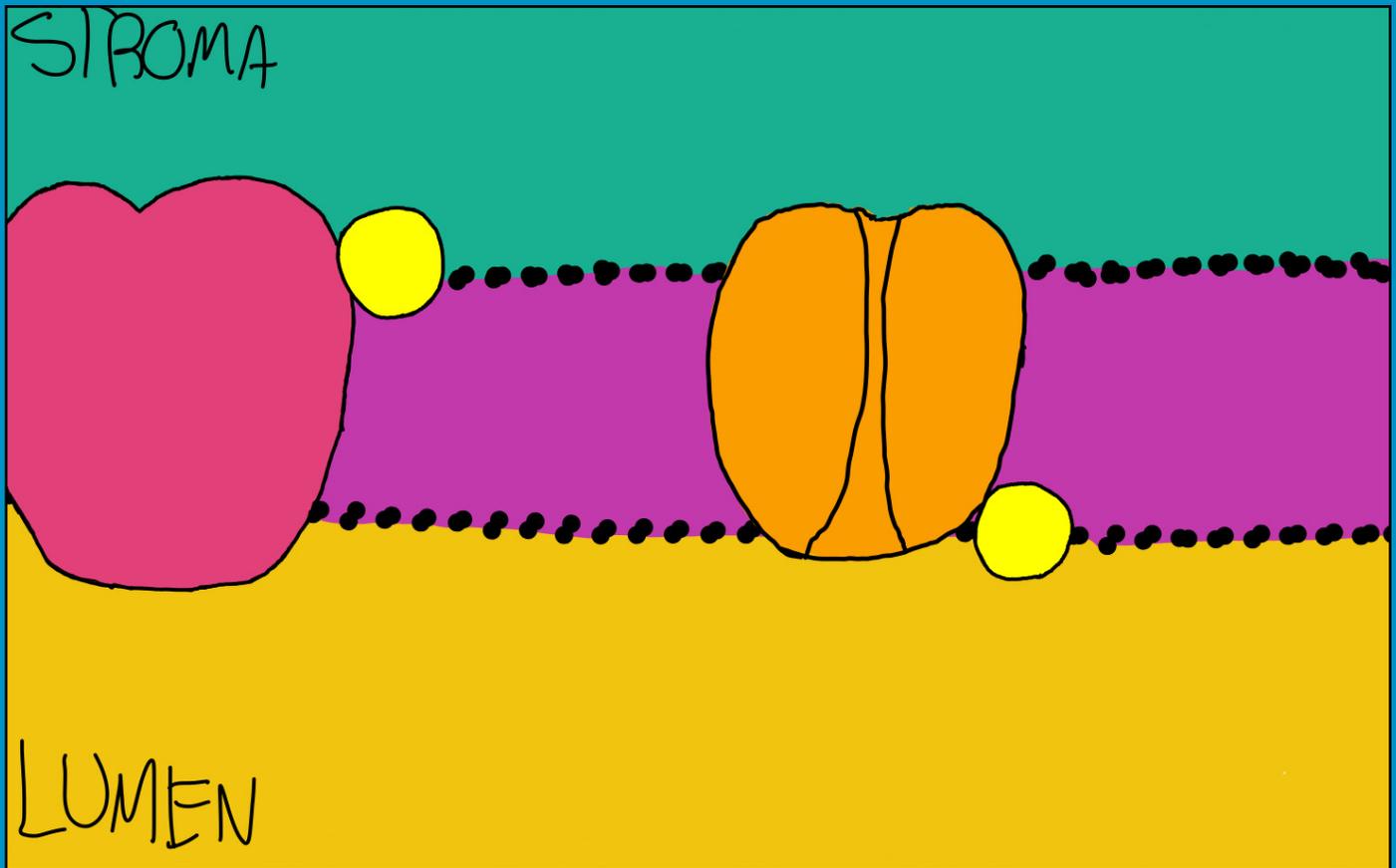
Photosystems are units in photosynthesis that transfer light energy throughout a plant

One of the first things mentioned when someone brings up photosynthesis is that plants need sunlight, but why do they need sunlight?

Because sunlight sends electrons to the plants, electrons that need charging!



Here we see  
inside the  
thylakoids...

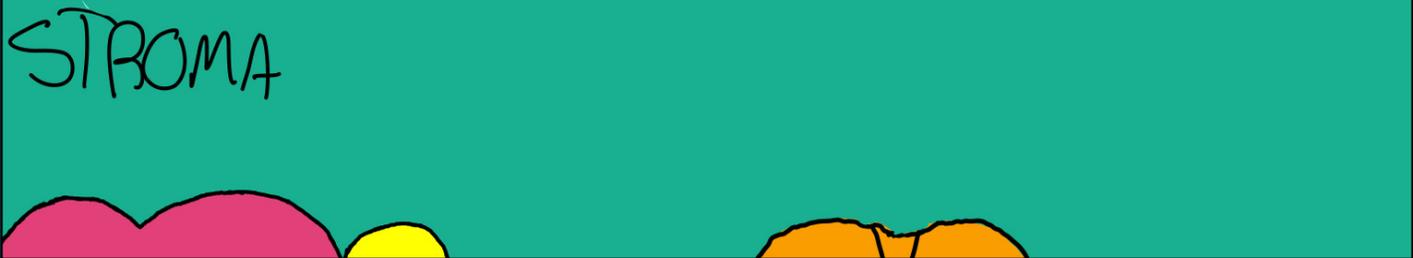


This is inside a thylakoid, the large maroon unit on the left is PSII. The unit on the right is an Enzyme.

This is where step 1 of photosynthesis begins, we can only show you a photo but wouldn't it be great to see what they really do?

**FACT BREAK:** Enzymes are substances (typically proteins) that regulate an organisms chemical reactions. An example of regulation is speeding up the rate of a chemical reaction.

# STROMA

A rectangular box with a green background. The word "STROMA" is written in black, hand-drawn capital letters in the top left corner. At the bottom of the box, there are several colorful, rounded shapes representing grana: two pink ones on the left, a yellow one in the middle, and two orange ones on the right.

The Stroma is a fluid inside the chloroplast surrounding the "grana", a sub-organelle.

# LUMEN

A rectangular box with a yellow background. The word "LUMEN" is written in black, hand-drawn capital letters in the bottom left corner. At the top of the box, there are two small, semi-circular shapes: a pink one on the left and a yellow one on the right, representing the openings of grana.

This is the Lumen, the Lumen is where oxygen molecules are turned into water in a light dependant reaction.

*Light dependant reactions are when the plants uses light-energy to create molecules for the next phase in photosynthesis.*

*Light independent reactions are when enzymes, atp's, and nadph's work in the stroma to do "carbon fixation". This is often done so the plant can produce glucose.*

An electron from the sun comes down to a plant

The electron enters PSII, and energizes itself with the protons in PSII.

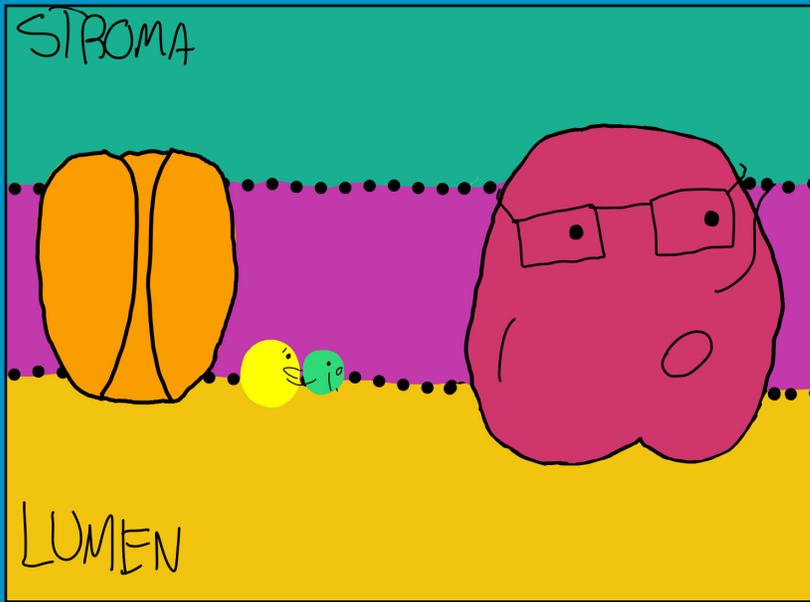
Then, a Mobile Electron Carrier (MEC) takes this new electron to the first enzyme.

The MEC delivers the electron to the enzyme who will deliver it to PSI. The MEC then returns to PSII.

PSII realizes it's lost its protons, so it rips apart an H<sub>2</sub>O molecule floating in the lumen and takes its electrons.

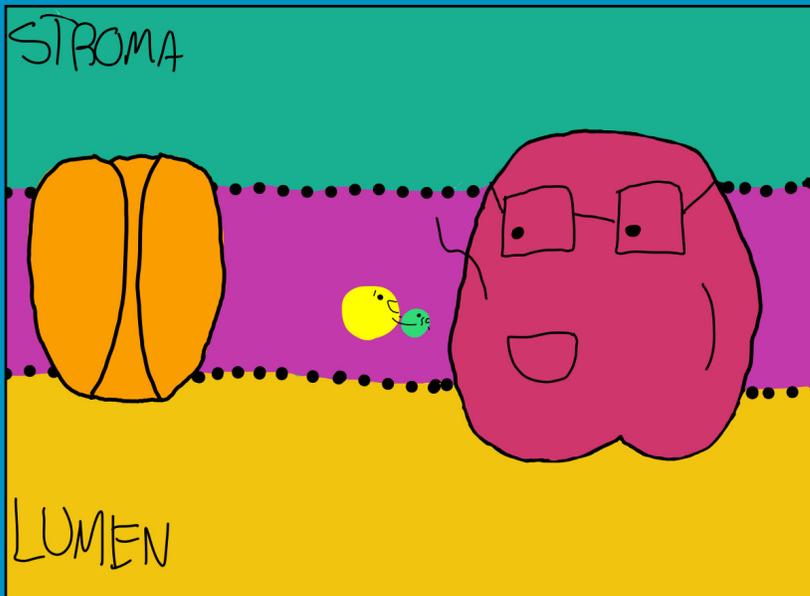
The hydrogen molecules continue to float in the lumen while the oxygen gets pushed out of the plant so we can breathe.

Remember! The oxygen leaving the plant is a byproduct meaning it was not intended to happen.



That Enzymes MEC takes the electron to PSI

See ya in a minute!



Hello!

PSI does the same as PSII, charges the electron. However PSI does not need to be replenished.



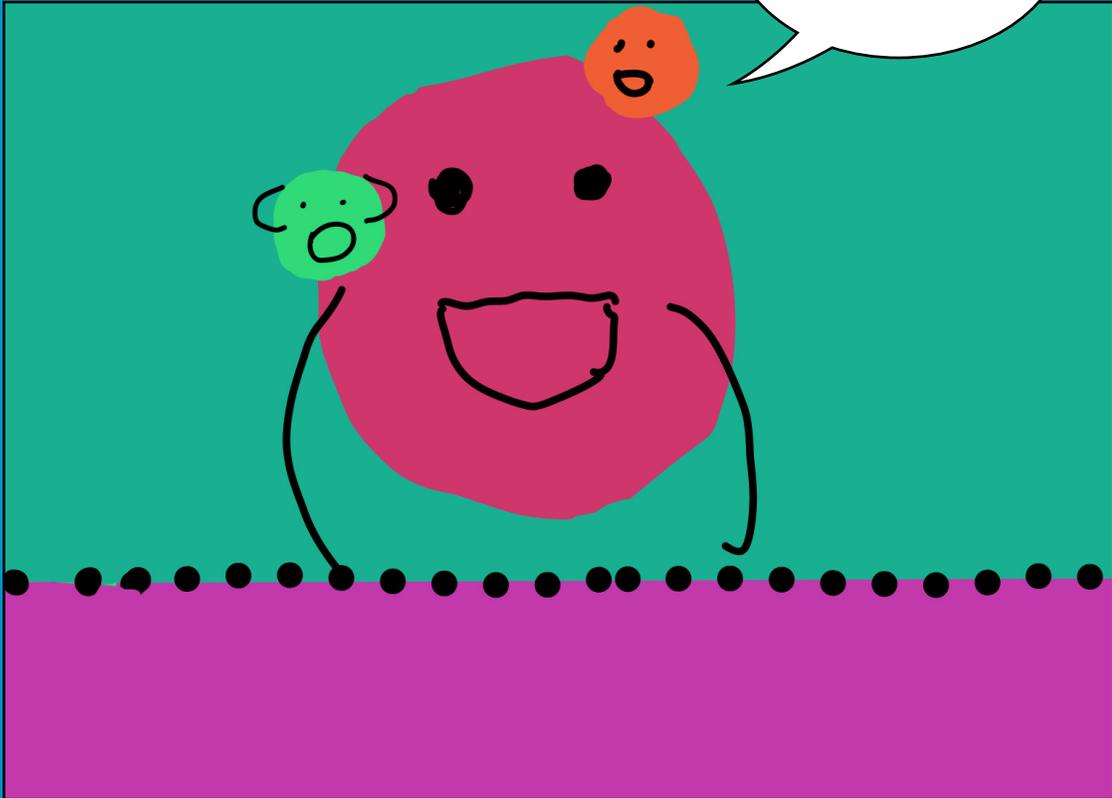
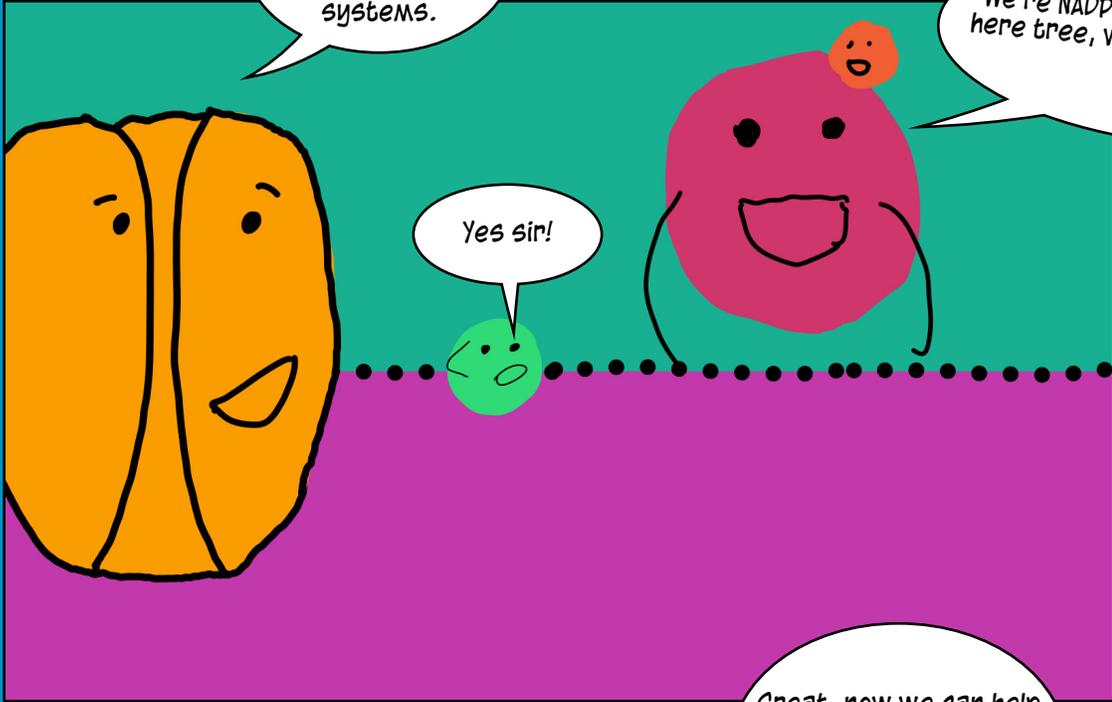
These plants work very hard 24/7!

Here you are electron, your final stop before leaving the photo-systems.

We're NADP, our job is energize this here tree, we need you to help us do that.

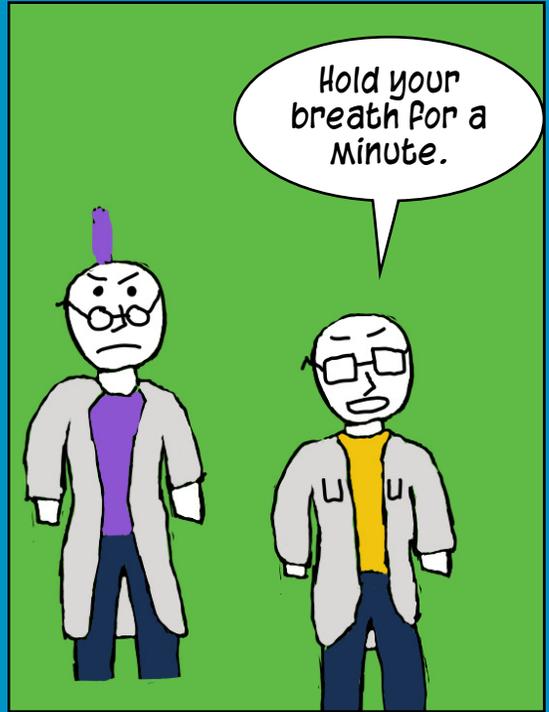
Yes sir!

Great, now we can help with the rest of photosynthesis outside of the photosystem.



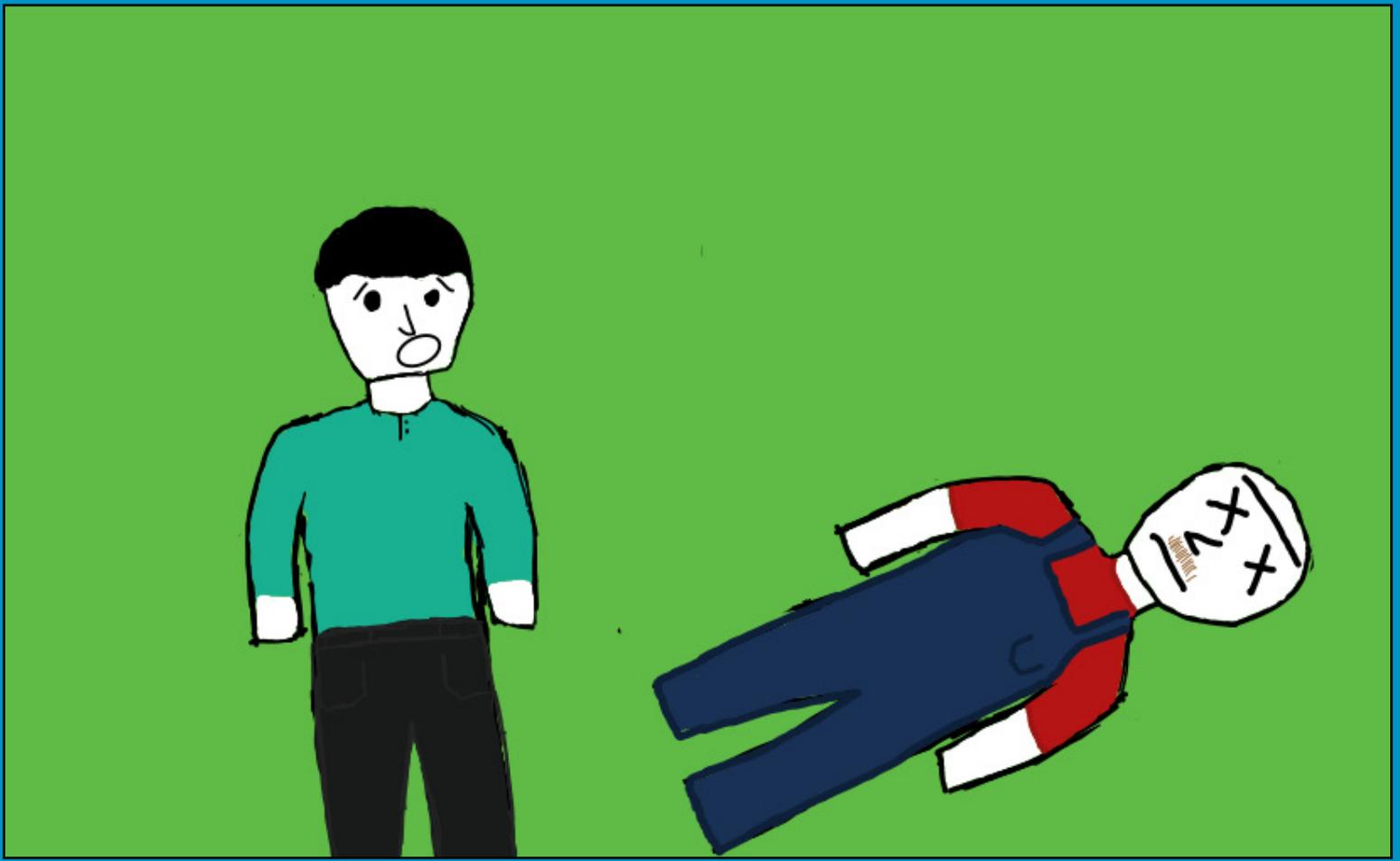
Now do you understand why photosystems in photosynthesis are important to good air quality, if you chop down this last forest your air quality will plummet as well!





1  
MINUTE  
LATER...

A large black rectangular panel with white text. At the top center is a large, hand-drawn number "1". Below it, the words "MINUTE" and "LATER..." are written in a simple, hand-drawn font, stacked vertically.



**THE END**