Photosynthesis, the whereabouts

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Objective: Get the students to learn photosynthesis by figuring out for themselves the logistics of the whole process.

$$6CO_2 + 6H_2O \xrightarrow{\text{sun}} C_4H_{12}O_6 + 6O_2$$

1. Show a potted plant and ask:
How does this plant obtain food?

Answers will usually range from: photosynthesis, the sun, the soil, the fertilizer…
Students usually narrow it down to photosynthesis with the light energy from the sun.
From then,

2. What part of the plant does photosynthesis?

This leads to the leaves, and we can confirm with mostly the leaves.

3. What is needed for photosynthesis to happen?

After listing on the board all the correct answers, write the equation of photosynthesis on the board.

Next question will be

4. HOW are these gases exchanged, and what part of the leaf does each job?

Ask students to make a few transversal leaf cuts with razor blades, mount them on a drop of water and look at them under the microscope.

A few questions to guide them as they look are:

What cells do you think are doing photosynthesis?

What cells have more chloroplasts?

What is the job of those tight transparent cells that surround the outside of the leaf? Stomata may not be visible, so…

5. Look for openings among the epidermal cells – stomata.

Ask students to fold the leaf, and slowly rip sideways until an exposed layer of epidermis is visible, place over a drop of water on a slide and cut the ripped epidermis from the rest of the leaf with a razor blade. Place cover slip and find stomata among the epidermal cells.

6. You found the gas exchange site!

If stomata are open students may see them close adding 15% NaCl. Be ready for the question "Why do stomata have chloroplasts but epidermal cells don't"? It is a good way to reinforce the protection job of the epidermis, and to encourage a few possible explanations.

7. Look again at the leaf slice What side faces the light?

How does this relate to how the photosynthetic cells are packed?

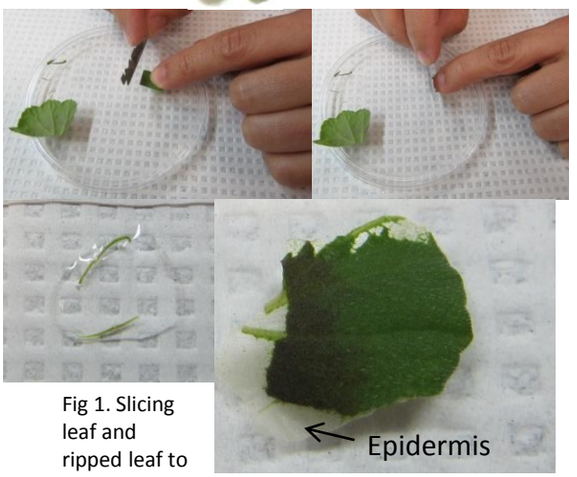
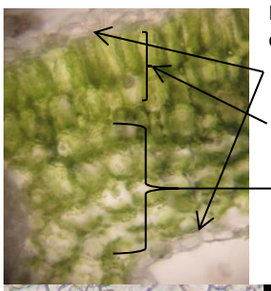


Fig 1. Slicing leaf and ripped leaf to see exposed epidermis.



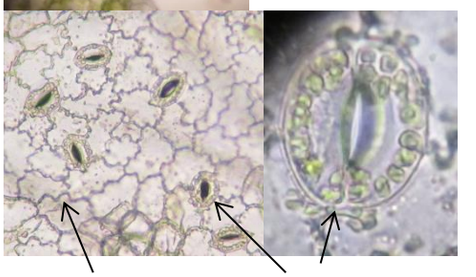


Fig 2. Leaf transversal section and epidermal peel.

This Mini lab is suggested as a **complement to a photosynthesis lab**, or as preamble to a lecture on photosynthesis.

Also a good complement would be observation of the leaf pigments, on another leaf of the plant. By paper chromatography . Further discussion on the function of pigments could follow. If time allows a non-green leaf could also be extracted, as a plum leaf, or red basil to confirm that indeed the green chlorophyll is still there. Another side project with an ecological question could be count stomata on the upper and lower epidermis.

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