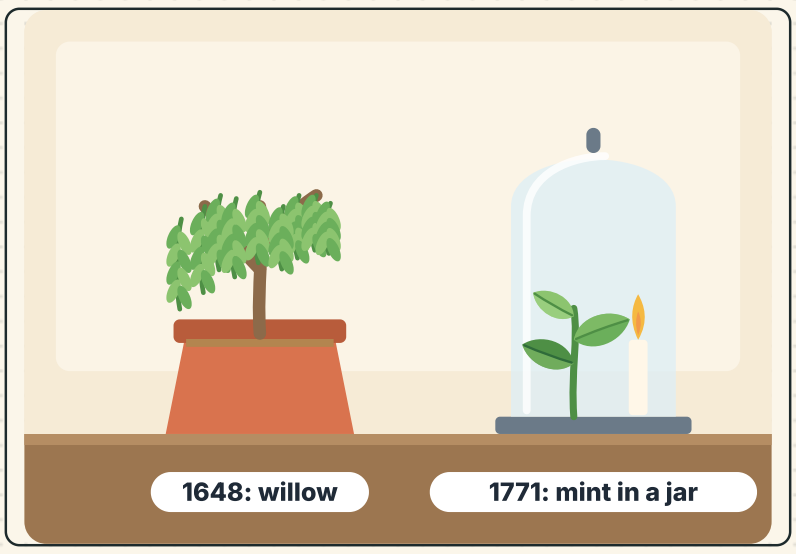
PHOTOSYNTHESIS · PART 6 OF 9 · AGES 11–16

How We Discovered Photosynthesis

Three centuries of experiments, from a willow in a pot to radioactive carbon, that revealed how plants make sugar.



1648 — Van Helmont's willow tree
A willow grew by about 74 kg in five years while its soil lost only about 57 g. He concluded, wrongly, that the new mass came from water alone.

1771 — Priestley's mint and mouse
A sprig of mint 'restored' air in a sealed jar where a candle had burned out, so a candle could burn and a mouse could live in it again.

1779 — Ingenhousz: light is needed
Plants restored the air only in light, and only their green parts did it. In the dark they did not.

1782 — Senebier: carbon dioxide goes in
Plants take in 'fixed air', now called carbon dioxide, and give out oxygen in the light.

1804 — De Saussure: water is used too
Careful measurements showed that water is also a reactant: a plant's gain in mass comes from carbon dioxide and water together.

1882 — Engelmann's bacteria
Oxygen-loving bacteria crowded beside the parts of an alga lit by red and blue light, showing which colours chlorophyll uses.

1905 — Blackman's limiting factors
Experiments on pondweed under different light, temperatures and CO_2 levels showed that the factor in shortest supply limits the rate.

1941 — The oxygen comes from water
Ruben, Kamen and colleagues gave algae water with a heavy oxygen isotope. It turned up in the oxygen released, not from carbon dioxide.

1948–1954 — Mapping the Calvin cycle
Calvin, Benson and Bassham traced radioactive carbon-14 to map how CO_2 is built into sugar. Calvin won the 1961 Nobel Prize in Chemistry.

Wrong answers still help
Van Helmont's conclusion was wrong, but his careful weighing proved the soil was not the source and set up the question others answered.

NEXT IN THE SERIES
7. Photosynthesis in Everyday Life: 8 Places You Meet It

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