NATURE NOTES

THE "GREEN MAGIC" OF SPRING!

It's spring — the sun feels stronger and the leaves are turning green. Magical things are happening.

You might not think first of "magic" when you look at green leaves. They are, after all, just common everyday parts of our environment — pretty to look at but not visibly doing anything. That perception could not be more wrong. Amazing things are happening, at great speed, inside each leaf.

Scientists have worked out how photosynthesis ("green magic") works.
The key actors are photons, tiny packets of sunlight, and the green pigment chlorophyll.

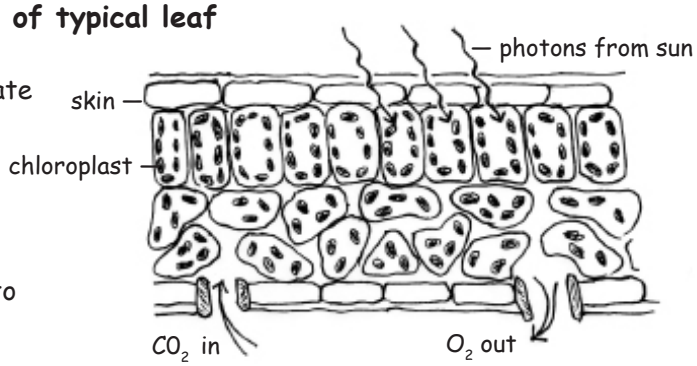
Greatly simplified, inside the leaf:
• sun energy knocks electrons off chlorophyll • water molecules split into hydrogen and oxygen • carbon dioxide is torn apart into carbon and oxygen • carbon is hitched to hydrogen to produce the simple sugar, glucose
• two oxygen atoms join to produce an O_2 molecule • chlorophyll retakes electrons and starts over

Cross-section of typical leaf

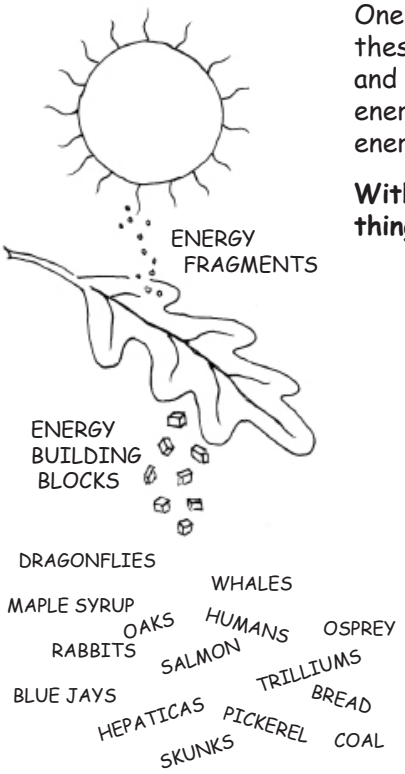
• Energy fragments (photons) from the sun penetrate the transparent skin of the leaf

• Chlorophyll in "chloroplasts" inside the leaf absorbs photons

• Tiny pores in the skin of the leaf open and close to control air exchange



The simple sugar produced by photosynthesis is the source of almost all the energy and building materials needed to build all living organisms. Plants use it to make what they need (complex carbohydrates, proteins, enzymes…). Animals eat energy-rich plants to make what they require to grow and function. Dead plants and animals feed decomposers such as bacteria and fungi.



One photon does not contain enough energy to enable a leaf to make sugar; photosynthesis combines several energy fragments to enable the conversion of carbon dioxide and water into sugar. "Green magic" is the only biological process that combines tiny energy fragments emitted by the sun to produce energy building blocks to form high-energy foods, such as glucose.

With very rare exceptions, green plants are the only energy source for all living things on the planet.

Did you know?

Photosynthesis reactions require sunlight, but a dark period is also needed.

Millions of years ago, "green magic" began producing O_2 and changed the earth's atmosphere. Age-old plants became the source for all the fossil fuel energy that we use today. Sometimes you can break open a lump of coal and see the fossil plant within.

Plants use some of the energy they produce to power their own processes (e.g. breathing, growing). So at times O_2 is being used up and CO_2 and water vapour released back into the air.

Most photosynthesis on earth occurs in the oceans — think seaweeds, phytoplankton.

The amount of all living things on the planet is limited by the number of photons that are captured by green plants. So there really is a limit to growth!

by Aileen Merriam