

Photosynthesis

Step 1: Excite

Go on a nature walk with your family. Observe the different types of green plants that you see. Do some seem healthier than others? How do these wild plants live without the direct care of human hands? How are they nourished? Gather leaves from several trees for investigation. (This activity works best in the spring, summer or fall months).

If you gathered leaves in the spring or summer many of them appear green but they are not really green. If you gathered orange and yellow in the fall they are showing their true colors! Why are they green in the summer? Chlorophyll makes the leaves green. Think of chlorophyll running through the veins of the leaves as water running through water pipes.

As winter nears, the trees receive less sunlight and less water. This is like turning off the chlorophyll faucet stopping the flow. Then the leaves true colors can show through. In the spring, when the faucet is on, the chlorophyll flows through the veins of the leaves. The chlorophyll pigment is a stronger pigment than yellow (xanthophylls) and orange (carotene) pigments that are natural to a tree's leaves. So the trees appear green.

Before you start this lesson take an interactive quiz at the site below.



[BrainPop: Photosynthesis](http://brainpop.com/science/plantsandanimals/photosynthesis/index.weml)

Description: BrainPOP is the leading producer of educational animated movies for K-12. Click on “Take a Quiz” button. After the quiz you can watch an original animated movie to explain photosynthesis.
<http://brainpop.com/science/plantsandanimals/photosynthesis/index.weml>

Step 2: Examine

Photosynthesis is the food-making process that takes place in the leaf in numerous cells containing chlorophyll.

Light

Photosynthesis is the way a plant makes use of light. When the sunlight strikes the green leaves, the plant grows. That's why it's impossible to grow anything green in the dark. The process in some ways is like our spiritual growth. We need the light of the Word of God to grow. Without it we die spiritually. Our spiritual photosynthesis depends on the Word of God. As the process of photosynthesis nourishes, strengthens, and sustains every young, tender shoot, so the Word of God does the same within the tender hearts of all God's children. (Horn 1997)

Photosynthesis is important because green plants are the only living organisms that can produce their own food simply by spending time in the sun. *Chloroplasts* are cells in the leaves of green plants. They contain green pigment called *chlorophyll* that interacts with the light. Basically what happens during photosynthesis is that carbon dioxide mixes with energy that is stored in the chloroplasts from the interaction with light, and this process produces a simple sugar. This process is not only important for the nutrition of the plant, but as humans we benefit from this as well. The plant invariably stores more food than it needs. We benefit therefore, either by eating the plant itself, or by eating its fruit such as carrots. The German biochemist [Otto Warburg](#) first studied the efficiency of photosynthesis. (Spring, Fellers 2002)

An online journal titled [Does God Exist?](#) explains how carefully plants have to be designed to survive:

There are enormous engineering problems involved in the catching maximum sunlight, having enough volume to carry on sufficient photosynthesis to supply the needs of the plant, and having a way to avoid providing sufficient surface area to push over the tree. The design of leaves that allows all of these characteristics to be present is incredible. A leaf's stem must resist bending in an up/down direction in order to catch sunlight. To provide the rolling up of leaves or the formation of cones, the stem must permit twisting. This is done by grooves in the stem which are positioned in such a way to decrease torsional stiffness without decreasing flexural stiffness.














The common leaf speaks eloquently of the incredible complexity of all living things. We suggest that the assumption that chance can explain all of these things takes more faith than does the admission that intelligent design was the cause.

Blue text refers to Internet link.


For centuries, humans believed that plants live by feeding on soil. Careful measurements of growing plant weights were conducted by Belgian scientist, [Jan Baptista van Helmont](#), in the early Seventeenth Century. Van Helmont demonstrated that a growing plant gained much more in weight than the soil lost, and speculated that the plant had fed on something other than the soil. He ultimately concluded that plant growth was due, in part, to water. Over half a century later, English physiologist [Stephen Hales](#) discovered that plants also need air to grow, and, to his surprise, found that plants absorb carbon dioxide from the air. English chemist [Joseph Priestley](#) was the first investigator to find that plants release oxygen when they are healthy and growing. His experiments documented the process of photosynthesis, and showed that respiration and photosynthesis are related processes, but work in opposite directions. **(Priestly was a minister.)**

Do research to find out how these plants are different and able to grow with so little light. Use any resource (an encyclopedia, a non-fiction book, or the Internet). We recommend the following:

Books

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[Eyewitness: Light](#) 
 Read: "Light Energy" (50-51).
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[Eyewitness: Energy](#) 
 Read: "Photosynthesis" (52-53).
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[The Usborne Internet-Linked Science Encyclopedia](#)
 Read: "Plant Food" (264-265).
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[The Way Science Works](#) 
 Read about photosynthesis (59).
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[Exploring Creation with General Science](#) 
 Read: "Photosynthesis" (226-228, also see 252).

Internet Sources

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[Chloroplasts](#)
 Description: Overview of Chloroplasts from the *Molecular Expressions: Science, Optics and You* site.
<http://www.microscopy.fsu.edu/optics/activities/teachers/prisms.html>



[Photosynthesis](#)

Description: This biology site has a section on photosynthesis that is concise yet thorough, and links are provided for further information. Tests check your learning as you go.

<http://library.thinkquest.org/22016/photo/index.html>



[Why Weren't Plants Created 100% Efficient at Photosynthesis?](#)

Description: Interesting article from the Revolution Against Evolution site explaining that if plants were 100 percent efficient in photosynthesis, they would be black in color, to absorb as much radiation as possible. Can you imagine a forest without all the beautiful shades of green?

<http://www.ftexploring.com/photosyn/photosynth.html>



[Photosynthesis, Energy, and Life](#)

Description: At this site you can read about photosynthesis, food chains, energy pyramids, energy changes and heat flow.

<http://www.ftexploring.com/photosyn/photosynth.html>

Step 3: Expand

Choose and complete one of the following activities:



Activity 1: Experiment

Design an experiment to see if plants need soil for photosynthesis. You will need a sweet potato and glass or jar. Put the bottom third of the potato in a glass or jar of water. Use toothpicks in the potato so that they rest on the rim of the glass. Add water when the water gets low to keep the water level the same. Put the potato in a place where it will receive sunlight. Draw a hypothesis and follow the scientific method. Record your findings in a [Lab Sheet](#) and add it to your Light portfolio.



Activity 2: Define Vocabulary Words

Add the following words to your vocabulary notebook: chlorophyll, chloroplast, photosynthesis, and stomata.



Activity 3: Paraphrase or Copy

Find one or two paragraphs from any resources explaining photosynthesis. Copy or [paraphrase](#) the text. Younger students can orally narrate what they learned from the text.



Activity 4: Go on a Field Trip

Visit your local plant nursery to do a little research. Ask detailed questions about different plants and their growing requirements. Find out which plants need an abundance of sunlight, which plants need moderate sunlight, and which plants need very little sunlight. Make a detailed chart on a poster detailing a minimum of fifteen plants: Five from each category mentioned above.



Activity 5: Write a Summary

Based on the research you did in Step 2 regarding plants that live on very little sunlight, write a summary on the topic. (Minimum 200 words). Refer to [Summary Writing](#).

Step 4: Excel

Take the quiz that you took at the beginning of this lesson again to see how much you have learned. This time share the movie (appears after the quiz) with a friend or sibling and discuss photosynthesis.



[BrainPop: Photosynthesis](#)

Click on “Take a Quiz” button.

<http://brainpop.com/science/plantsandanimals/photosynthesis/index.weml>

Correct written work to demonstrate correct punctuation and spelling, and effective use of grammar. Add corrected written work or illustrations to your portfolio.