Follow-up Discussion

Research indicates that students will retain their previous misconceptions about a topic, in preference to new information, until they actively recognize and correct their own errors. Therefore, it is important to have your students re-examine the facts/beliefs they put on their "Everything We Think We Know About…" list. It might also be helpful to review the list by marking each entry with a "+" or "-" to show which facts were correct and which were incorrect.

Thought-provoking discussions provide a good way to assess the overall depth of student understanding. The following are some suggested discussion topics.

- Discuss how plants have evolved specialized tissues and organs that make survival in their specific habitats possible. Ask students to predict the outcome of transplanting a tropical plant in the desert.
- Discuss the possible methods scientists may use to discover the approximate age and weight of a living tree.

Follow-up Activities

- Have students investigate phototropism. Give each small group three seedlings and three paper bags or round oatmeal boxes. Have them cut the top out of a bag/box and place it over one plant, cut a hole in the side of another bag/box and place it over the second plant, and cover the third plant completely with a bag/box. Ask the students to observe the growth of each plant over a period of several weeks, remembering to record their observations. (Be sure the plants are watered.)
- Ask students to choose one annual plant and one perennial plant to research and compare. In a chart with tables and diagrams, have them represent the features of each plant, including life cycle, light requirements and characteristics of roots, stems and leaves.
- Using sources such as textbooks and the Internet as well as actual plant tissue and microscopes, have students sketch a plant cell, making sure to include a cell wall and organelles.
- Show students a piece of wood and challenge them to figure out the type of cell tissue of which it is comprised (xylem). Ask students to research the features of a woody stem and diagram a cross-section of a tree trunk, labeling all living and nonliving tissue.

Suggested Internet Resources

Periodically, Internet Resources are updated on our web site at www.libraryvideo.com

- **www.sonic.net/bristlecone/intro.html**
  The "Bristlecone Pine" homepage is an award-winning site that explains how these ancient trees were discovered, where they are found, and how scientists called dendrochronologists are studying their unique adaptations.

(Continued)

- **www.backyardnature.net/roots.htm**
  This page from the Backyard Nature web site describes the structure and function of root tissue in different kinds of plants.
- **www.mobot.org/PFG/samples/index.htm**
  This activity from the Partners for Growing Web site illustrates the relationship between plant leaves and rain clouds.
- **www.eecs.umich.edu/~coalitn/sciedoutreach/funexperiments/quickndirty/plantgravity.html**
  This page outlining an investigation into the effects of gravity on plants is one of many great plant activities compiled by the Southeastern Michigan Math-Science Learning Community Coalition.

Suggested Print Resources

- Burnie, David. *Eyewitness: Plant.* Dorling Kindersley, New York, NY; 2004.
- Howell, Laura. *World of Plants.* EDC Publishing, Tulsa, OK; 2002.
- Penny, Arnold. *How Plants Grow.* Benchmark Books, New York, NY; 2000.

TEACHER'S GUIDE

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TITLES

- **PHOTOSYNTHESIS**
- **PLANT & ANIMAL INTERDEPENDENCY**
- **PLANT BIODIVERSITY**
- **PLANT REPRODUCTION**
- **PLANT STRUCTURE & GROWTH**
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Programs produced and directed by Stone House Productions, LLC

Plant Life IN ACTION™

Plant Structure & Growth

Grades 5–8

Students in grade 5-8 classrooms possess a wide range of background knowledge. Student response to this video program is sure to be varied, so the teachers at these grades need all the help they can get! This guide has been designed to help the 5-8 science teacher by providing a brief synopsis of the program, previewing and follow-up questions, activities, vocabulary and additional resources.

Before Viewing: Extensive research tells how important it is for the teacher to discover what the students know — or think they know — about a topic, before actually starting a new unit. Therefore, after prompting discussion with the pre-viewing questions, lead your class to create a "Everything We Think We Know About…" list. You may also wish to preview key vocabulary words, and have students raise additional questions they hope will be answered.

After Viewing: Have your students share video excerpts that fascinated or surprised them, then challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Think We Know About…" list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.

SCHLESSINGER SCIENCE LIBRARY

Program Summary

There are at least 310,000 named species of plants on Earth and botanists are still counting! How is it possible to sort out the characteristics of so many different living things? Computer wizard Anna Gibson and her lab partner Jack are hoping to learn about the structure and growth of plants but are feeling overwhelmed. What could huge trees possibly have in common with tiny mosses? With the help of scientist Dr. Figg and her computer, Anna realizes that scientific answers are not always easy to see with the naked eye. After some research, she discovers that all plants are multi-celled and they all have protective, rigid cell walls made of cellulose. She discovers that green plants contain chlorophyll, a pigment that allows them to trap the energy of the sun. Jack mentions another unique characteristic of plants — the fact that they continue to grow throughout their lifetimes.

Using a microscope, Jack and Anna observe plant cells organized into tissues and further specialized into structures called organs, each designed to perform a job within the plant. They focus their attention on three plant organs — stems, roots and leaves. Vascular plants have xylem tissue which moves water from the roots into the stem and leaves, and phloem tissue which transports sugars from where they are made in the leaf to the rest of the plant. This vascular system is similar to the veins running through a human body, and it also provides stem support, allowing some trees to grow to giant proportions. Roots are responsible for water absorption in plants. Roots also act as a plant's anchor and can serve as a food storage system. Jack and Anna work together to investigate the effect of gravity on roots in a simple experiment and they learn about plant responses to factors such as light and touch. Next, they discover that leaves are the "food factories" of the plant world, and learn that while leaves may look very different from tree to tree, they are all comprised of the same types of cells.

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

cell wall — The rigid, nonliving, permeable structure that surrounds the cell membrane of plant cells, primarily made of cellulose.

cellulose — A complex chain of sugar molecules that constitutes the chief part of the cell walls of plants.

chlorophyll — The green pigment found in chloroplasts that absorbs sunlight used during the first step of photosynthesis.

tissues — Cells of a particular kind that form one of the structural materials or organs of a plant.

organs — Specialized tissue that performs a specific function in an organism like a plant.

epidermis — The protective outer layer of leaf cells, including the guard cells surrounding the stomata. ***(Continued)***

algae — The primitive photosynthetic organisms from which green plants have evolved.

vascular plants — Plants that have a specialized system of tissues that allow the movement of water and nutrients from different parts of the plant. These tissues includes xylem and phloem.

nonvascular plants — Primitive plants without a specialized system of conducting tissue; nonvascular plants are closely linked to the water for their survival.

xylem — The complex tissue in vascular plants that conducts water and dissolved minerals from the roots to the stem and leaves, while also supporting the stem.

phloem — The complex tissue in the vascular plants that functions in the movement of sugars from the leaf into other areas of the plant.

root tip — The area of a plant root that is capable of growth.

root cap — A protective layer of tissue at the root tip of a plant.

root hairs — Thin root cells that function primarily by absorbing water.

taproot — A main root that grows downward and gives off small side roots.

fibrous roots — A root system that branches in many directions with no central root.

geotropism — The movement of a plant in response to gravity.

phototropism — The movement of a plant in response to light.

thigmatropism — The movement of a plant in response to touch.

simple leaves — Leaves comprised of one part.

compound leaves — Leaves comprised of two or more separate parts, called leaflets.

cuticle — The waxy protective covering on the epidermis of a leaf.

mesophyll — The middle layers of leaf tissue, including the palisade layer and spongy layer.

palisade layer — The upper layer of mesophyll containing cells that are filled with chloroplasts and carry on most of the photosynthesis in a leaf.

spongy mesophyll — A loose layer of leaf cells below the palisade layer that typically contains the xylem and phloem.

chloroplast — The specialized structure found in plant cells where photosynthesis takes place.

stomata (singular: stoma) — Small openings or pores found on the underside of a leaf that allow carbon dioxide to enter the leaf as well as the release of oxygen and water vapor.

guard cells — Cells that control the exchange of gases between the leaf and the surrounding atmosphere by regulating the opening and closing of the stomata.

photosynthesis — The process by which green plants use light energy from the sun to make their own food out of carbon dioxide and water.

transpiration — The evaporation of water from a plant through stomata.

Pre-viewing Discussion

Before students generate their list of "Everything We Think We Know About…" for this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

- What do all plants have in common?
- What type of organism is considered to be the world's oldest living thing?
- What is the largest living thing in the world?

After the class has completed their "Everything We Think We Know About…" list, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

1. How many species of plants have been identified?
2. What does a huge oak tree have in common with tiny moss?
3. How are plant cells different from animal cells?
4. What is chlorophyll?
5. When did plants evolve from green algae?
6. What is the relationship between algae and water?
7. What is a vascular system?
8. How are nonvascular plants different from vascular plants?
9. What is the largest living thing in the world?
10. What are the two types of vascular plant tissue?
11. What is the role of the xylem?
12. What is the role of the phloem?
13. How can a stem differ from plant to plant?
14. How are the rings in a tree trunk formed?
15. What is the relationship between the size of a tree ring and the amount of rainfall in a season?
16. Where does water enter a plant?
17. Why are roots important to a plant?
18. What is the difference between fibrous roots and taproots?
19. Can plants react to their surroundings? Explain.
20. What is a tropism?
21. What is the difference between a simple leaf and a compound leaf?
22. What are some important features of each layer of the mesophyll?
23. What is the function of the stomata? Where are they typically located?
24. How does transpiration take place in a leaf?