Plant Parts You Eat

Activity from *The Science of Food Teacher's Guide: From Ecosystems to Nutrition* and for *The Mysterious Marching Vegetables*

Written by
Nancy P. Moreno Ph.D.
Barbara Z. Tharp, M.S.

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The activities described in this book are intended for school-age children under direct supervision of adults. The authors and Baylor College of Medicine cannot be responsible for any accidents or injuries that may result from conduct of the activities, from not specifically following directions, or from ignoring cautions contained in the text.

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Authors: Nancy P. Moreno, Ph.D., and Barbara Z. Tharp, M.S.
Editor: James P. Denk, M.A., and Paula H. Cutler, B.S.
Designer and Illustrator: Martha S. Young, B.F.A.

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BCM
Baylor College of Medicine

Center for Educational Outreach
Baylor College of Medicine
One Baylor Plaza, BCM411
Houston, Texas 77030
713-798-8200 | 800-798-8244 | edoutreach@bcm.edu
www.bcm.edu/edoutreach | www.bioedonline.org | www.k8science.org

Baylor College of Medicine
www.bcm.edu

BioEd Online/K8 Science
bioedonline.org / k8science.org

Center for Educational Outreach
www.bcm.edu/edoutreach

Rhonda Clark
flickr.com/photos/prayingmother

Peter Edin, Edinburgh, UK
flickr.com/photos/peteredin

Extension Toxicology Network
extoxnet.orst.edu/tibs/bioaccum.htm

Martyn Garrett
ossettweather.blogspot.com

Adam Hart-Davis
adam-hart-davis.org

Savanna Nocks
whiteharvestseed.com

Annkatrin Rose, Ph.D.
flickr.com/photos/blueridgekitties

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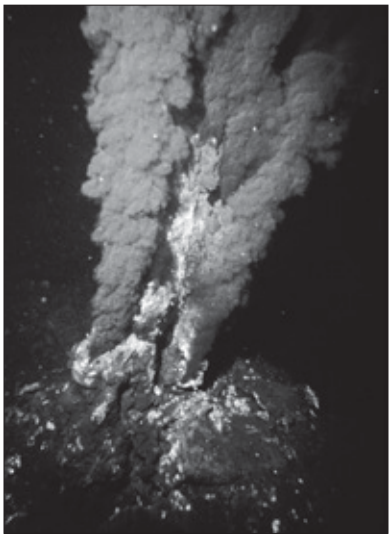
Food and Energy in Living Things

Life Science Basics



Some specialized bacteria make the molecules they need without sunlight. Bacteria that live in hot deep-sea vents obtain energy through the chemical breakdown of hydrogen sulfide in a process known as chemosynthesis. The bacteria are the primary producers in this environment.

In soil, some bacteria combine nitrogen- or iron-containing compounds with oxygen and capture the energy produced by these reactions.

Photo courtesy of NOAA.

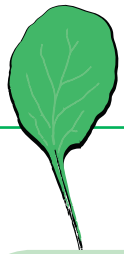
Living things often are classified as producers or consumers, depending on how they obtain energy and nutrients. Producers typically are able to use solar energy to make the molecules they need from relatively few substances present in the air, water and soil. On land, green plants are the primary producers. In water, some plants and many varieties of algae, bacteria and other one- to many-celled organisms (Protists) are producers. All other organisms are consumers, which live directly or indirectly on food provided by producers.

Almost all producers make the molecules they need through photosynthesis. During photosynthesis, producers absorb energy from the sun and use it to combine carbon from carbon dioxide with water to make sugars and other carbohydrates. Thanks to this amazing process, light energy from the sun is converted into chemical energy stored in the bonds between atoms that hold molecules together. Plants use the energy stored in these molecules to build other compounds necessary for life. Likewise, consumers, who cannot trap energy directly from sun, must rely on molecules manufactured by plants for food.

The general sequence of who eats whom in an ecosystem is known as a food chain. Energy is passed from one organism to another at each step in the chain. Along the way, much energy is given off as heat. In fact, about 85–90% of the total usable energy is released as heat at every step in a food chain. Most organisms have more than one source of food. The relationship among all the energy flow interactions that happen in an ecosystem usually are described as a food web.

PRODUCERS AND CONSUMERS

- **HERBIVORES**, such as giraffes and caterpillars, are primary consumers. They feed on plants and other producers.
- **CARNIVORES**, such as anteaters and spiders, are secondary consumers. They feed on primary consumers. Most secondary consumers are animals, but a few are plants, like the pitcher plant.
- **OMNIVORES** eat plants and animals. Humans, pigs, dogs and cockroaches all are omnivores.
- **DECOMPOSERS** live off waste products and dead organisms. Many kinds of bacteria and fungi (molds and mushrooms) are decomposers. The decomposers themselves are important food sources for other organisms in soil, such as worms and insects. Litterfeeders, such as termites and earthworms, feed on partially broken down bits of plant and animal matter.
- **SCAVENGERS** feed on dead organisms that have been killed by another animal or that have died naturally. Vultures, flies and crows are examples of scavengers.



Plant Parts You Eat

Life Science

CONCEPTS

- Consumers depend on producers for food.
- People rely on many different plants and plant parts for food.

OVERVIEW

Students observe different plant-originated foods.

SCIENCE, HEALTH & MATH SKILLS

- Observing
- Recording observations
- Using evidence
- Drawing conclusions
- Using resources to find information

TIME

Preparation: 10 minutes
Class: 30 minutes

MATERIALS

Each group will need:

- Crayon or marker
- Plastic, serrated knife
- Piece of whole fruit, vegetable or grain (see Setup)
- Sheet of white construction or drawing paper, 9 in. x 12 in.

VEGETARIAN DIETS

People who follow a vegetarian or modified vegetarian diet have to make special efforts to eat foods with enough protein. Not all plants supply the same building blocks for proteins (amino acids), so a mixture of protein sources is vital. Vegetables that are good sources of protein include peanuts, beans, lentils, chickpeas and peas.

Green plants and similar organisms produce food for all other living things on Earth. Food provides energy and nutrients for organisms, such as animals, that cannot trap energy from the sun through photosynthesis. Some animals, called primary consumers, eat only plants. Others, known as omnivores, eat plants and animals. Most humans are omnivores. However, some people chose to eat only foods that come from plants. Plant-based foods supply vital nutrients that our bodies cannot make for themselves. These nutrients include vitamins, which are chemicals necessary for the proper functioning of the body; sugars and other carbohydrates, which provide energy; amino acids, which are the building blocks of proteins; oils, another concentrated energy source; and minerals, such as potassium, magnesium and calcium.

Unit Links

The Mysterious Marching Vegetables
Story, p. 11–17; Science boxes, p. 11–12

Explorations
Food For You!, p. 6

Humans consume a remarkable variety of plants and plant parts. However, agriculture—the cultivation of plants—is a relatively recent innovation in human history. Many historians believe that the farming of plants began about 10,000 years ago in several different parts of the world. The plants we use as food today are very different from their wild ancestors. Most food plants evolved through selection by many generations of farmers to produce larger fruits, grains and other edible parts, and to be easier to plant, harvest and process. The wide variety of foods we eat today originated in many different and geographically separate parts of the world.

Many foods come from plant roots. Important root crops include carrots, parsnips, beets, sweet potatoes, radishes, rutabagas and turnips. Potatoes, which develop underground, technically are stems that are specialized for the storage of starches. Other stems used as food include sugar cane and asparagus.

Leafy foods include chard, spinach, lettuce, brussels sprouts, cabbage, collards and kale. All of these look like leaves. However, foods that come from bulbs, such as onions, leeks and garlic, also are made of leaf parts (the enlarged bases of long, slender leaves). Celery and rhubarb stalks actually are the supporting stems (petioles) of leaves.

Flowers are not eaten frequently, but cauliflower, broccoli and artichokes all are made up of flowers. Fruits and seeds, which develop after flowers are pollinated, are important food sources. Fruits include familiar foods such as oranges, lemons, grapefruit, limes, apples, peaches, pears, grapes, melons, cherries, plums,

tomatoes, all squashes, blueberries, green beans and chile peppers. Mangos, bananas, avocados, figs, breadfruit, eggplant, cucumbers, guava, pomegranates, dates, papaya, olives and zucchini also are fruits. As a general rule, keep in mind that anything with seeds is a kind of fruit.

Seeds often contain stored food resources (carbohydrates, oils, proteins) to fuel growth of the tiny plant each contains. Important seeds that we eat are beans, peas, lentils and chickpeas. All of these are members of the bean, or legume, family. Food in these seeds is stored in the fleshy leaves (cotyledons) of the plant embryo. Many nuts consist of seeds or parts of seeds. Examples are walnuts, pecans, almonds and peanuts.

Grains, considered to be among the first cultivated crops, are the small, dry fruits of members of the grass family. Grains look and behave very much like individual seeds. The commonly cultivated food grasses are called cereals, after the Greek goddess Ceres. Major grain crops include barley, millet, oats, rice, rye, sorghum, wheat and corn (maize). Rice, probably the most important grain, is the primary food source for more than 1.6 billion people.

SETUP

You will need to bring enough different fruits, vegetables and grains to class to provide a different one to each group of 2–4 students. Try to include at least one representative from each of the categories listed below. Fresh, whole examples are best.

- **Roots:** examples include carrot, beet, radish, or sweet potato
- **Leaves:** lettuce, spinach or scallions (students can observe that the fleshy bulb of the scallion or green onion is made up of overlapping leaf bottoms)
- **Stems:** asparagus (potato is a confusing example, except to discuss with students afterwards) or celery stalks (leaf stem)
- **Flowers:** broccoli, cauliflower or artichoke
- **Fruits:** apple, orange, peach, tomato or zucchini (example should have observable seeds)
- **Seeds:** dried beans, peas or lentils
- **Whole grains:** popcorn or wheat berries (white rice has most of the grain removed)

Soak examples of grains and dried seeds overnight, so that they will be soft enough for students to split open.

PROCEDURE

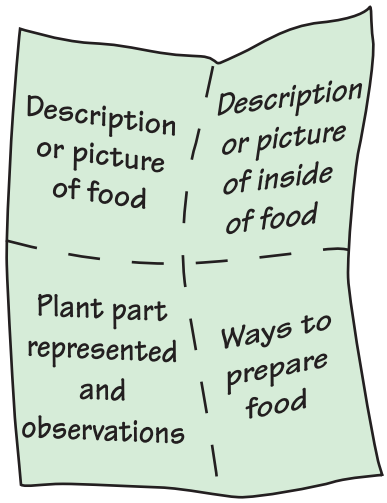
1. Help students remember basic plant parts by referring to a plant in the classroom or school yard as an example. Ask questions such as, *Why are green plants special?* (make food through photosynthesis); *Where do plants trap sunlight to make food?* (leaves and other green parts); *Where do plants*

EDIBLE PARTS

Did you know that all parts of a beet are edible? The red roots usually are cooked before eating. Baby beet leaves may be used in salads. Mature beet leaves are best steamed or sautéed. If not too fibrous, the leaf stalks can be eaten raw. Or they can be chopped up and cooked.

Photo by Savanna Nocks © White Harvest Seed Company.

Some kinds of fruits, such as bananas and watermelons, have been selectively bred to have little or no seeds.



Students will make four different sets of observations or descriptions of their food.

POSSIBLE ORIGIN OF FOOD PLANTS

Site of Origin	Common Name
China (Asia)	Buckwheat
	Oranges
	Peaches
	Soybeans
	Tea
India/Malaysia (Asia)	Bananas
	Breadfruit
	Chickpeas
	Mangos
	Black pepper
	Rice
	Safflower
	Sesame
	Sugar cane
	True yams
Central Asia	Apples
	Carrots
	Grapes
	Onions
	Peas
	Pears
	Radish
	Spinach
Near East	Figs
	Lentils
	Melons
	Oats
	Rye
	Wheat
Mediterranean	Asparagus
	Beets
	Cabbage
	Leeks
	Lettuce
	Olives
Africa	Barley
	Coffee
	Millet
	Okra
	Sorghum
Mexico/ Central America	Avocado
	Beans
	Cacao
	Corn
	Sweet potato
	Chile pepper
	Winter squash
South America	Peanuts
	Pineapple
	Potato
	Tomato

take in the water and nutrients that they need? (roots); *How can we get more plants?* (planting seeds or other reproductive parts of plants, such as stem sections); *Where do seeds come from?* (flowers, which develop fruits and seeds).

2. Follow by having students think about all the foods they have eaten that day that came from plants. Examples might include bread from wheat; cereals from oats, wheat and corn; juice from oranges and apples; etc. Ask, *Did you know that we eat many different parts of plants?*
3. Give each group of students a sheet of drawing paper, a plastic knife and one of the plant foods you have brought to class. Direct students to fold the sheet in fourths, creating four spaces in which to record information (see illustration, sidebar, p. 3).
4. Give students an opportunity to observe and discuss their respective food items briefly before continuing.
5. Have groups provide the following information in the four squares on their sheets. In the first square, students should write a description of and/or draw the outside of the food. Before they fill in the second square, direct students to cut the food in half or in several pieces, so that they can observe the interior. Have them write a description of and/or draw the inside of the food in the second square.
6. Have students use their observations to describe in the third square what plant part or parts is/are represented by the food. They also should report the observations they used to reach their conclusions. For example, carrots have fine roots still attached to the large central root, and some students may have observed that carrots grow underground, etc.
7. In the final square, have students report different ways to prepare and eat the food. You may want to spend an extra class period on this step to allow students time to visit the library or to access the Internet to gather additional information.
8. Have each group share the information about its plant food with the rest of the class. You may want to contribute some fun facts about plant parts and food. For instance, we know that potatoes are stems, not roots (because a potato in water will produce leaves at the top and roots at the bottom); artichokes are similar to huge sunflower buds; and pineapples consist of the fleshy stems and flowers of a tropical plant.

VARIATIONS

- Push toothpicks into the side of a potato and suspend it in a glass of water. Students will be able to observe the formation of stems, leaves and roots.
- Food crops have originated in many different parts of the world. Scientists estimated where each crop originated by using archeological evidence and locating where wild relatives of the food crop still grow. Have students use the library to investigate the places of origin of some common foods.