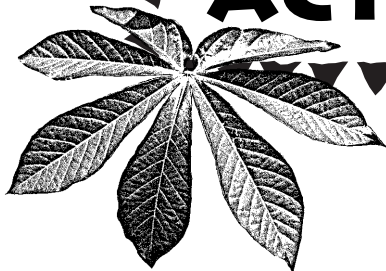


# AFRICAN PLANT EXPLORER



**ACTIVITY BOOK**



# African Plant Explorer Activity Book

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This book features five hands-on activities designed for 8- to 12-year-olds. Each activity includes one 30- to 60-minute project and extensions. Activities can be used in any order. Also included are objectives and learning outcomes, assessment questions, ideas for a presentation or exhibit and topics for further investigation. Wonderwise learning outcomes are based on national science education standards identified by McREL (Mid-continent Research for Education and Learning), the Nebraska Educational Standards, and the National Science Education Standards developed under the direction of the National Research Council. This book incorporates concepts of inquiry-based learning and the 4-H Youth Development experiential learning model.

**Each youth participant should receive a copy of the activities. Copies of this book can be downloaded from the African Plant Explorer CD-ROM.**

## WONDERWISE Women in Science Learning Series

Wonderwise introduces you to women who have made science their career. Each kit is a comprehensive instructional package that includes a video, CD-ROM, and activity book. With these materials, leaders and youth explore the world of women scientists and discover together the fun of learning about science. For more information about Wonderwise, including free samples, Web activities, resources, science education standards and ordering information, visit our Web site:

**wonderwise.unl.edu**



**Project Director:** Judy Diamond. **Developers:** Linda Allison, Suzanne M. Gardner, Monica Norby. **Design/Illustration:** Michael Davis, Linda Allison. **Produced by:** University of Nebraska State Museum, Gary Heusel and the Nebraska Cooperative Extension 4-H Youth Programs. Thanks to Fatimah Linda Collier Jackson, William S. Wells, Beth Schenker, Amy N. Spiegel, Mary Knudson, Jeannie Allen, Barbara Young, Mark St. John, Roger Bruning, Marian Langan, Dana Esbensen, Rosemary Thornton, Edith Meints, Sarah Disbrow, Kathy French.



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Here are some ideas you might like to use for projects or exhibits.  
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# INFORMATION FOR LEADERS

## What You Will Need for Each Activity

Listed below are the materials and preparations you will need for each activity. Most of the materials can be purchased locally. The more difficult-to-find items, such as pipets and disposable gloves, can be purchased from Wonderwise. The symbol © indicates that an item can be ordered from the Wonderwise Web site or GPN, the Wonderwise distributor. To purchase supplies, kits, videos, or CD-ROMs contact:

GPN (Great Plains National)  
 P.O. Box 80669 ▪ Lincoln, NE ▪ 68501-0669  
 Phone: 1-800-228-4630 ▪ FAX: 1-800-306-2330  
 e-mail: gpn@unl.edu ▪ Web site: gpn.unl.edu

<b>Activity 1</b> <b>Everyday Poisons</b>	<b>Activity 2</b> <b>Investigating Starch</b>	<b>Activities 3 and 4</b> <b>African Arts</b>		<b>Activity 5</b> <b>Green Travelers</b>
<p><b>For the entire group:</b></p> <ul style="list-style-type: none"> <li>© 17-min. video <i>Fatimah Jackson, African Plant Explorer</i></li> </ul> <p><b>For each team of 4:</b></p> <ul style="list-style-type: none"> <li>▪ pencils or colored markers</li> <li>▪ cookbooks from home or the school library that include recipes for potatoes, apples, lima beans, rhubarb, cherries, cassava (tapioca), avocado, and one that contains the spice nutmeg</li> </ul>	<p><b>For each team of 4:</b></p> <ul style="list-style-type: none"> <li>© 1 plastic pipet or dropper</li> <li>© 1 teaspoon tapioca flour</li> <li>▪ 2 tablespoons iodine (povidone-iodine 10% solutions works well and is found in drugstores)</li> <li>▪ 4 soda crackers</li> <li>▪ 8 small plastic or wax-coated paper cups</li> <li>▪ 1 cup water</li> <li>▪ 4 plastic spoons</li> <li>▪ 1 plastic plate</li> <li>▪ 4 or 5 small pieces of each: cheese, bread, corn chips, crackers, apples, potatoes, or celery for the prepared food plate (see instructions below)</li> </ul>	<p><b>For each team of 4:</b></p> <p><b>Day One</b></p> <ul style="list-style-type: none"> <li>© 1 squeeze bottle with cassava gel (see instructions below)</li> <li>▪ 4 pieces of white paper cut into 20 cm squares</li> <li>▪ 4 pieces of white cloth cut into 20 cm squares (old cotton sheets work well)</li> <li>▪ 4 pencils</li> <li>▪ masking tape</li> <li>▪ 4 cotton swabs</li> <li>▪ hair dryer (optional)</li> </ul>	<p><b>For each team of 4:</b></p> <p><b>Day Two</b></p> <ul style="list-style-type: none"> <li>© 1 pair disposable gloves</li> <li>▪ 4 sponge paint brushes (about 2-3 cm wide)</li> <li>▪ newspapers (enough to cover tables with a thick layer)</li> <li>▪ 4 plastic spoons</li> <li>▪ 1 plastic dish tub half-filled with warm water (fill immediately before use)</li> <li>▪ 2 boxes dark blue dye (see instructions below)</li> <li>▪ 7 plastic wide-mouth 16. oz. containers</li> </ul>	<p><b>For each team of 2:</b></p> <ul style="list-style-type: none"> <li>© 1 large world map placed on a wall for the entire group</li> <li>▪ thin-line colored markers or pencils</li> <li>▪ ruler</li> <li>▪ pencil</li> </ul>
<p><i>Make 8 copies of the Poison Plant Recipe Card on p. 6 for each group.</i></p>	<p><b>To prepare the Food Plate:</b></p> <p><i>Cut up small pieces of at least 2 starchy foods (bread, cracker, potato, corn chip) and 2 non-starchy foods (cheese, celery, apple). Place on the plastic plate along with a teaspoon of tapioca flour.</i></p>	<p><b>To make cassava gel:</b></p> <ul style="list-style-type: none"> <li>© 1½ cups tapioca flour (also called cassava starch)</li> <li>▪ 3 teaspoons alum (powdered ammonium alum)</li> <li>▪ pan of 9 cups water</li> <li>▪ spoon</li> </ul> <p><i>Directions (yields 9 cups)</i></p> <ol style="list-style-type: none"> <li>1. Combine ingredients in saucepan.</li> <li>2. Heat on medium, stirring constantly for about 20 mins.</li> <li>3. When starch thickens to an opaque gel, remove from heat.</li> <li>4. Immediately spoon gel into squeeze bottles.</li> </ol>		<p><b>To prepare the dye:</b>  <i>(yields 4 cups)</i></p> <ol style="list-style-type: none"> <li>1. Dissolve 2 boxes dye thoroughly in 4 cups hot water</li> <li>2. Pour ½ cup dye into each plastic container</li> <li>3. For best results, dye cloth while solution is still warm.</li> </ol>

# EVERYDAY POISONS

Watch the 17-minute video of Fatimah Jackson, an anthropologist who studies plants and people in Africa. Read the Poison Plant Cards to discover the amazing number of poison chemicals in everyday foods. Then create a poison plant cookbook of recipes using these plants.



## Before You Begin

Teams of 4.

Length:  
Part I — 60 mins.,  
including 17 min. video  
Part II — 30 mins.

## What You Need

### For the entire group:

© 17-min. video *Fatimah Jackson, African Plant Explorer*

### For each team of 4:

- pencils or colored markers
- cookbooks from home or the school library that include recipes for potatoes, apples, lima beans, rhubarb, cherries, cassava (tapioca), avocado, and one that contains the spice nutmeg

*Make 8 copies of the Poison Plant Recipe Card on p. 6 for each group.*

**What We Know.** Many creatures depend on plants for their food. Even insects, bacteria and viruses get their nourishment from plants. With so many enemies, plants must have a good defense. Imagine you are a plant and your worst enemy is about to make a tasty meal of your leaves. You can't run away or use a karate kick for defense. What can you do? One way plants fight back is to make poisons. Poisons can warn away enemies by making leaves or fruit taste bitter, or by making the enemy very dizzy or sick.

People eat foods with poisons in them every day, but we have learned ways to prepare foods to make them safe. Cassava, an important food for more than 400 million people in tropical countries, contains the poison cyanide. Cassava is a starchy tuber, like a potato. People usually boil or dry cassava to make it safe. This takes most of the poison out, but a little is still left. In small amounts the poison in cassava is not harmful.

Sometimes poisons in plants can be used to treat sickness, if they are taken in tiny amounts or the plants are prepared a certain way. Scientists think that when people eat cassava every day, the tiny amount of cyanide may actually help protect them against certain diseases, like malaria and sickle cell anemia.

For thousands of years people have experimented with plants to find new foods and medicines. Sometimes a person died or became sick from eating a certain plant. People would remember which plants or parts of plants were safe to eat and how to prepare them. This important knowledge has been passed from person to person for centuries. Women who gathered seeds, grew the crops and cooked the meals were often healers who made medicine from plants. You probably have a box in your home filled with recipes collected from family and friends. This is one way we pass along our knowledge about food today.

## Part One: Pick Your Poison

- 1 Watch the video about Fatimah Jackson.
- 2 Follow the steps below to investigate 8 common but poisonous foods.
- 3 In your team, highlight the following information on each Poison Plant Card on the next two pages:
  - What parts of the plant should be avoided due to the poison
  - How a person can get rid of the toxins
  - What symptoms does a person show that suggest poisoning



## Part One: Pick Your Poison (cont'd)

### POISON PLANT CARD

#### RHUBARB (*Rheum rhaponticum*)

**Description:** A dark green leafy vegetable with red stems that originated in Asia. The stems have a very sour taste and so are stewed with sugar as a dessert, pie filling, or jelly.

**Fact:** During World War I when vegetables were scarce, Americans were encouraged to eat rhubarb. Many cases of poisoning occurred when people ate the poisonous leaves rather than the stems.

**POISON NOTES:** The stems are safe to eat, but the leaves contain high amounts of poisonous oxalic acid.

**Symptoms:** Eating rhubarb leaves can give you abdominal pain and diarrhea. Large amounts of oxalic acid can cause coma and death.

### POISON PLANT CARD

#### WILD CHERRIES (*Prunus* species)

**Description:** Several kinds of wild cherries are found in the woods all over North America. They include chokecherry, bitter cherry, black cherry and pin cherry.

**Fact:** Native Americans treated coughs and colds with a tea made from black cherry bark.

**POISON NOTES:** Cherry fruit is great to eat, but the leaves, bark, twigs and pits of wild cherries contain dangerous amounts of a cyanide-producing compound. Children are sometimes poisoned by swallowing lots of cherry pits.

**Symptoms:** Eating a few cherries with their pits will give you a stomachache. Big doses of cyanide can cause shortness of breath, spasms, coma, and even death.

### POISON PLANT CARD

#### POTATO (*Solanum tuberosum*)

**Description:** Potatoes are starchy tubers produced by plants that are members of the deadly nightshade family.

**Fact:** Potatoes are one of the most nutritious foods. They supply vitamins, minerals and fiber, no fat and nearly no salt. You could stay healthy on a diet of just potatoes and whole milk.

**POISON NOTES:** Potatoes are good for you, but all of the green parts of the potato plant contain poisons called alkaloids. Even the potato tuber can be poisonous when it is left in the light and begins to turn green. Avoid any potato with green skin.

**Symptoms:** Eating green potato parts can cause nausea, vomiting, dizziness, weakness, and sleepiness. High levels of alkaloids cause a drop in blood pressure and heart rate and can lead to coma.

### POISON PLANT CARD

#### LIMA BEANS (*Phaseolus lunatus*)

**Description:** Limas are tropical beans named after Lima, the capital city of Peru. In the U.S. we grow large, white lima beans selected especially because they contain very small amounts of the poison cyanide.

**Fact:** The small red lima beans that are grown in Asia contain 20 to 30 times more cyanide than the white varieties.

**POISON NOTES:** Boiling lima beans in a pot with no lid releases the harmful cyanide poison as a gas. Eating small amounts of raw, green, sprouted or roasted limas is probably not harmful, but these are not the safest ways to eat the beans.

**Symptoms:** Eating too many raw limas can cause abdominal cramping, diarrhea and vomiting. High levels of cyanide prevent oxygen from getting into blood and can cause death.

## Part One: Pick Your Poison (cont'd)

### POISON PLANT CARD

#### AVOCADO (*Persea americana*)

**Description:** Dark green, pear-shaped fleshy fruits that grow on trees and are native to Central America.

**Fact:** In the Philippines a piece of the avocado seed is applied to decayed teeth to relieve the pain.

**POISON NOTES:** The avocado fruit's flesh is safe to eat. However, the seeds and skin of the fruit and the leaves and bark of the tree are poisonous to cattle, horses, goats, rabbits and other animals.

**Symptoms:** Animals that eat the poisonous parts of the avocado can experience loss of appetite and sometimes liver and lung damage.

### POISON PLANT CARD

#### APPLES (*Malus domestica*)

**Description:** A round, fleshy, usually sweet fruit that grows on trees.

**Fact:** Don't panic. Apples are fine, it's their seeds that can be toxic. So are the seeds of pears, peaches, apricots and plums. Eating the seeds is rarely a problem, unless you eat dozens. The bark and roots are a source of antibiotics for treating bacterial infections.

**POISON NOTES:** Apple seeds contain cyanide. Eating a few might give you a stomachache but shouldn't be dangerous.

**Symptoms:** Large doses of cyanide produce abdominal cramping, diarrhea and vomiting, and may even cause death.

### POISON PLANT CARD

#### CASSAVA (*Manihot esculenta*)

**Description:** A tough tropical plant grown for its fat starchy roots. The roots are boiled and eaten in soups and stews, or ground into flour and made into dumplings, puddings and breads, and used as a thickener for sauces and pies.

**Fact:** Scientists think the tiny amount of cyanide in prepared cassava may actually help people who eat it every day. It may protect them from diseases such as malaria and sickle cell anemia.

**POISON NOTES:** Cassava roots contain cyanide but can be made safe to eat by boiling or peeling, grating and washing repeatedly to remove the poison. The little bit of cyanide that remains may actually be beneficial.

**Symptoms:** Eating raw cassava can cause abdominal cramping, diarrhea and vomiting. High levels of cyanide prevent oxygen from getting into the blood and may even cause death.

### POISON PLANT CARD

#### NUTMEG (*Myristica fragrans*)

**Description:** Nutmeg originated in Indonesia. It is a woody seed with a special covering called mace. Both the seed and the covering are used as spices for flavoring sweet dishes like cookies and eggnog.

**Fact:** Ancient East Indian medical books call nutmeg the "narcotic fruit" because it induces sleep and relieves pain. In colonial times in North America, nutmeg oil was put on decayed teeth to relieve pain.

**POISON NOTES:** Nutmeg is safe in very small amounts, but eating 1 to 6 tablespoons at one sitting can make you ill.

**Symptoms:** Eating nutmeg causes headache, dizziness, nausea, and aching muscles.



# EVERYDAY POISONS

## Part One: Pick Your Poison (cont'd)

### POISON PLANT RECIPE CARD

Recipe Name:  
Cooking Temperature:

Number of Servings:  
Cooking Time:

**Ingredients:**

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**Directions:**

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**POISON CONTROL:**

What parts of the plant should be avoided due to poison?

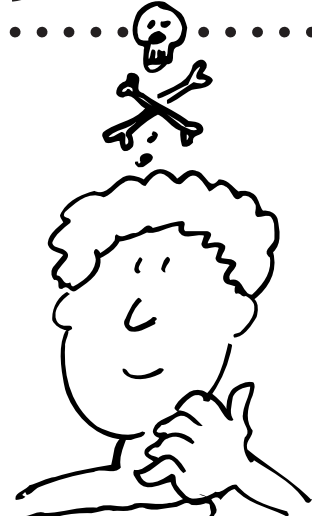
How can a person get rid of toxins before eating the plant?

What symptoms can a person look for in case of poisoning?

# EVERYDAY POISONS

ACTIVITY  
ONE

**Think It Over**



1. How would you find out if a new plant was poisonous?

2. Name a plant that has safe and dangerous parts. What parts are safe? What parts are dangerous?

## Part Two: Cookbook Collaboration

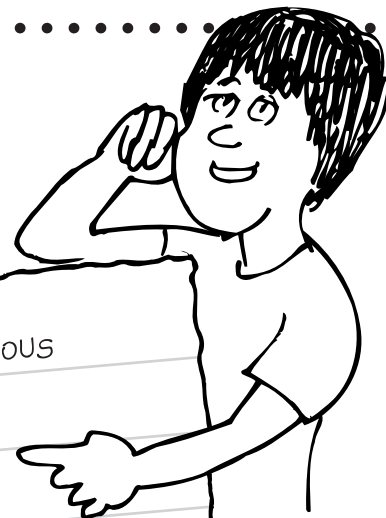
- 1** Gather your cookbooks. Choose a recipe for each plant (from the Poison Plant Cards) that sounds good enough to gobble.
- 2** Record each recipe on a Poison Plant Recipe Card on pg. 6. Complete the poison control section on each card. Each group should complete 8 different Poison Plant Recipe Cards.
- 3** Put your 8 Poison Plant Recipe Cards together into a cookbook. Look at some of the cookbooks you used for ideas on how to organize your book.
- 4** Share your cookbook with the rest of the group.



# EVERYDAY POISONS

ACTIVITY  
ONE

## Think It Over



1. How does cooking help to make poisonous plants safe to eat?

2. How do plants serve as both food and medicine?

# INVESTIGATING STARCH

ACTIVITY  
TWO

**Test different kinds of food for the presence of starch. Then, taste a chemical change.**



**What We Know.** What is your favorite food? There's a good chance that some part of it contains starch.

Pizza crust, taco shells and hamburger buns all have lots of starch, and starch comes from plants. Plants have the amazing ability to make their own food. They use sunlight, air and water to make carbohydrates such as starch and sugars. Then they store the starch to use as food later. It's a good thing plants do that. All of Earth's other creatures depend on plants for food.

Your body burns carbohydrates for energy. Starch and sugar are two carbohydrates that give us different kinds of energy. Imagine two Olympic track athletes. A marathon runner needs enough energy to

keep going for 26 miles. She would eat foods with lots of starch. Her body burns it slowly, giving her a steady supply of energy. A sprinter needs a quick, intense burst of energy. She would eat sugars, which her body can burn very quickly. Our bodies need both kinds of energy.

Every culture in the world has a starch-filled food as the basis for its diet. Many Asians eat rice every day. Europeans like bread and pastas made from wheat. Latin Americans make many foods from corn or wheat. In many of the world's tropical countries, cassava, which is about 90% starch, has become an important food. Whether you're snacking on bagels or pretzels or chips, you're eating a lot of starch each day. Remember, you are what you eat!

## Before You Begin

Teams of 4

Length:  
Part I — 30 mins.  
Part II — 30 mins.

## What You Need

For each team of 4:

- ⊙ 1 plastic pipet or dropper
- ⊙ 1 teaspoon tapioca flour
- 2 tablespoons iodine (povidone-iodine 10% solutions works well and is found in drugstores)
- 1 cup water
- 4 soda crackers
- 8 small plastic or wax-coated paper cups
- 4 plastic spoons
- 1 plastic plate
- 4 or 5 small pieces of each: cheese, bread, corn chips, crackers, apples, potatoes, or celery for the prepared food plate (see instructions below)

## To prepare the Food Plate:

*Cut up small pieces of at least 2 starchy foods (bread, cracker, potato, corn chip) and 2 non-starchy foods (cheese, celery, apple). Place on the plastic plate along with a teaspoon of tapioca flour.*

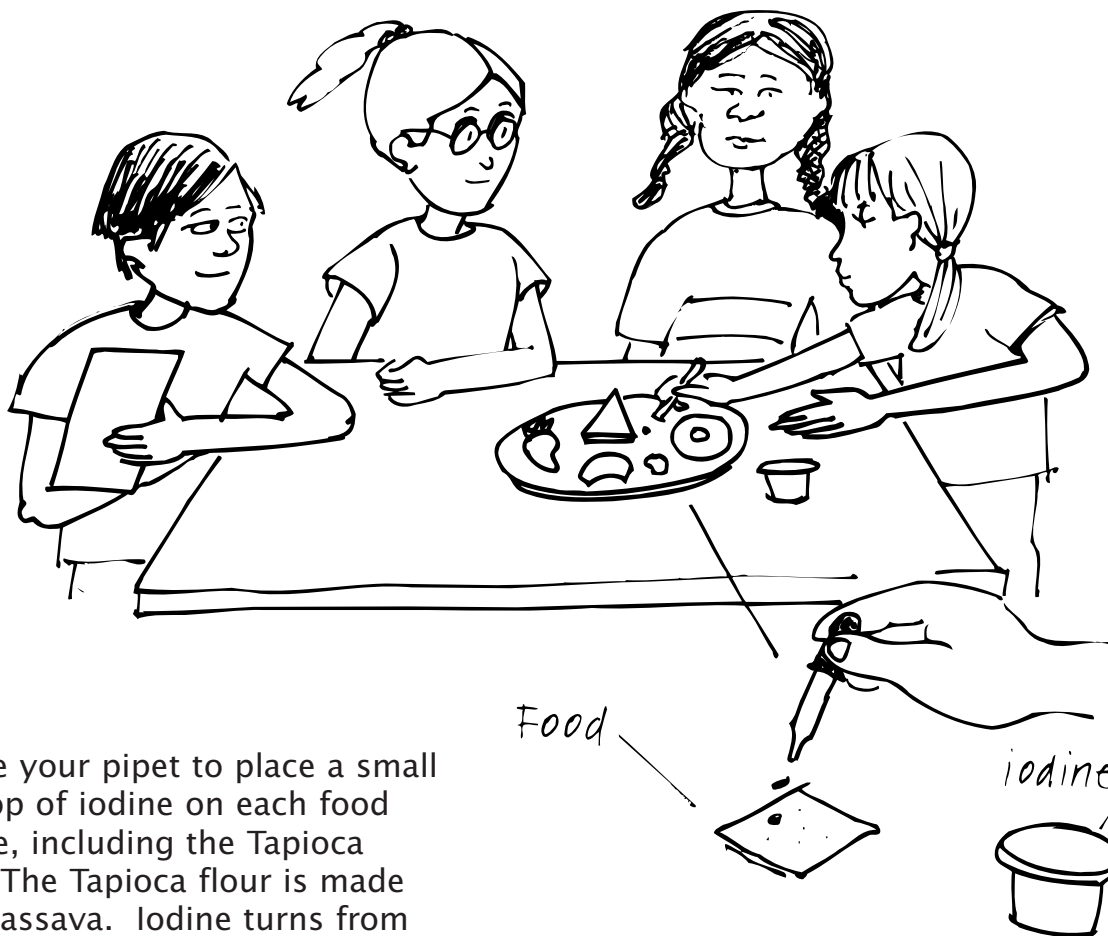
# INVESTIGATING STARCH

ACTIVITY  
TWO

## Part One: Starch Investigations

### Testing for the Presence of Starch

- 1** Gather your materials: food plate, pipet, and cup of iodine. **BE CAREFUL.** Iodine stains clothing, and it should not be eaten.
- 2** Each person should list the foods on the plate in the table on the next page.
- 3** Make predictions about which foods on the plate contain starch. Record your predictions.



- 4** Use your pipet to place a small drop of iodine on each food sample, including the Tapioca flour. The Tapioca flour is made from cassava. Iodine turns from reddish brown to blue-black when it contacts starch.

# INVESTIGATING STARCH

ACTIVITY  
TWO

## Part One: Starch Investigations (cont'd)

**5** Record the results in the table below.

FOOD TESTED	PREDICTION	COLOR FOOD TURNS WHEN IODINE IS ADDED	DOES FOOD CONTAIN STARCH?

**6** Compare your predictions with your results.  
Which foods were you able to predict correctly?

**7** Did you notice a range in the color change? What does this tell you about the amount of starch in the food sample?

**Good work! Throw away your food samples when you are finished. Iodine is poisonous and should not be eaten.**

# INVESTIGATING STARCH

ACTIVITY  
TWO

Think It Over



1. What is starch?

2. Name three foods that contain starch.



# INVESTIGATING STARCH

ACTIVITY  
TWO

## Part Two: Closed-Mouth Starch Test

Starch is made up of millions of sugar molecules linked into long chains. Plants and people have to break down those chains chemically to use starch for food energy. Your mouth makes a special enzyme to do that. The enzyme's job is to change the starch to glucose, a sugar. The process is a sweet-tasting chemical change. If you pay close attention to your tongue, you might be able to taste the change.

- 1 Each person needs a cracker, two empty cups, and a spoon. Team members share the iodine and water. Break your cracker in half; crumble one half into a clean cup.
- 2 Add 2 spoonfuls of water to the cup containing the cracker. Stir well.
- 3 Add 3 drops of iodine and stir. Describe the color below.
- 4 Chew the remaining piece of cracker for about 1 minute. When it's mushy, spit the cracker into the empty paper cup.
- 5 Add no more than 2 spoonfuls of water and stir.
- 6 Add 3 drops of iodine and stir. Describe the color below.

COLOR OF **UNCHEWED**  
CRACKER WITH IODINE

COLOR OF **CHEWED**  
CRACKER WITH IODINE

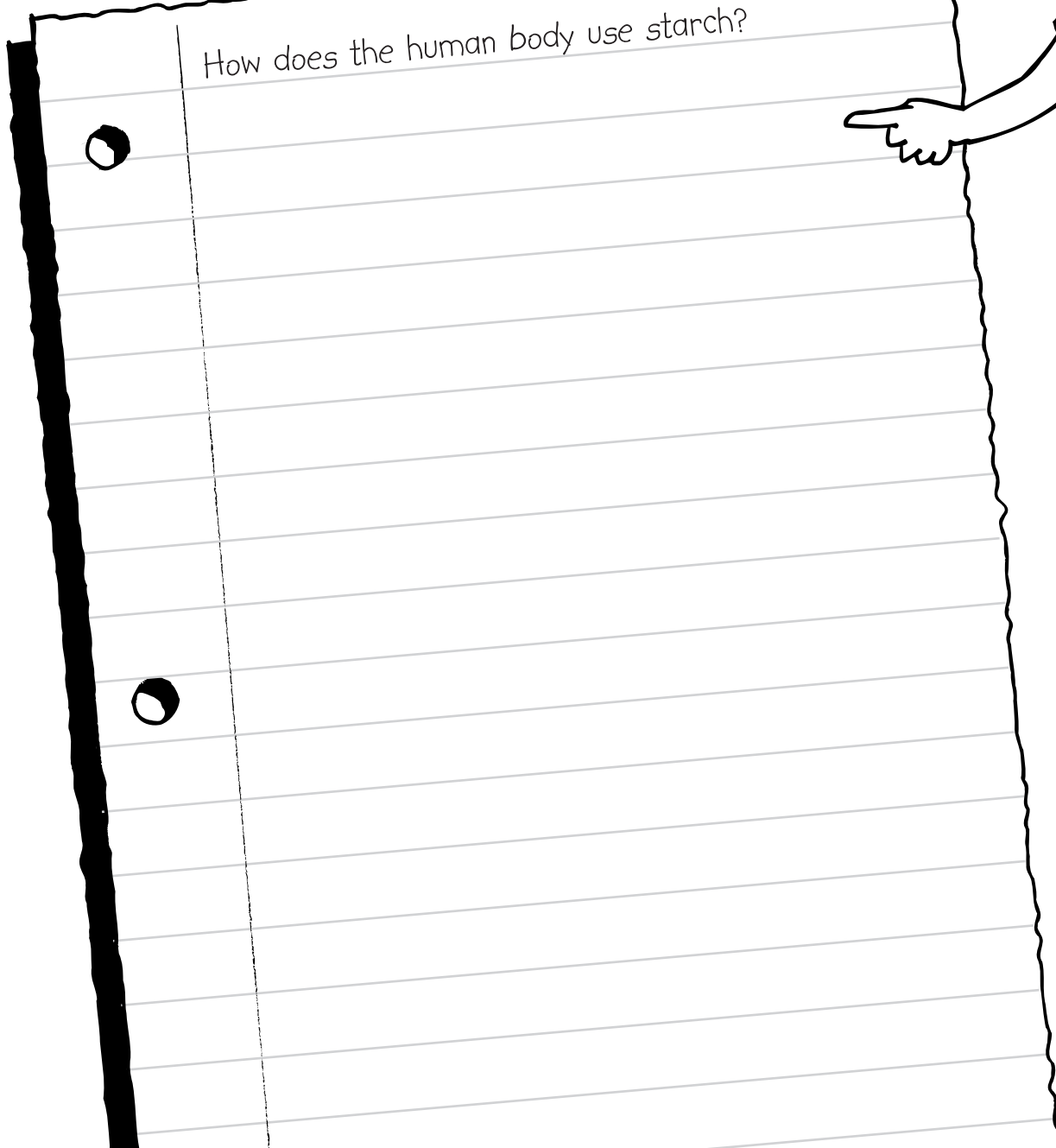
- 7 Compare the color of the mixtures in both cups. Describe how they are different.
- 8 Iodine turns darker when it contacts starch. What happened to the starch in the chewed sample?
- 9 Explain why the cracker you ate began to taste sweet after it had been in your mouth a while.
- 10 Compare your chewed sample to that of others. Why are the colors different?



# INVESTIGATING STARCH

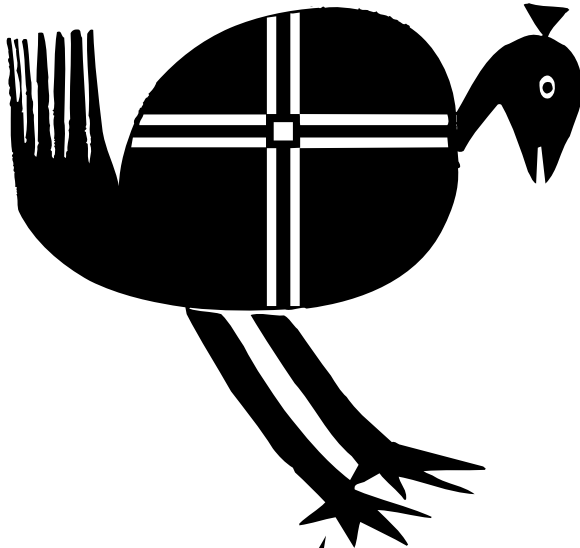
ACTIVITY  
TWO

Think It Over



How does the human body use starch?

**Create an African symbol on cloth using cassava gel.**



**What We Know.** Look around and check out what your friends are wearing. Do you see any T-shirts with football team logos? Maybe someone has an earring in the shape of a peace sign, or a necklace with a Star of David. These things are symbols we use to decorate our clothing or our bodies. Symbols are a way to communicate without speaking.

Art has always been a way to communicate. When we see pictures of cave paintings made by prehistoric people, we can

recognize the animals and hunters and try to understand the story the picture tells. Today, symbols are most often used in decorative art, like clothing, jewelry and pottery, to create beautiful designs.

Many African cultures use intricate symbols in their arts. Africa is a vast continent with more than three thousand ethnic groups who speak over a thousand different languages. Designs and symbols are one way different groups can communicate with each other.

## Before You Begin

### Teams of 4

Length:  
Part I - 30 mins.  
Part II - 2 hours  
over two days

## What You Need

### For each team of 4:

#### Day One

- ⊙ 1 squeeze bottle with cassava gel (see instructions below)
- 4 pieces of white paper cut into 20 cm squares
- 4 pieces of white cloth cut into 20 cm squares (old cotton sheets work well)
- 4 pencils
- masking tape
- 4 cotton swabs
- hair dryer (optional)

## To make cassava gel:

⊙ 1 7/8 cups tapioca flour (also called cassava starch)

- 3 teaspoons alum (powdered ammonium alum)
- pan of 9 cups water
- spoon

*Directions (yields 9 cups)*

1. Combine ingredients in saucepan.
2. Heat on medium, stirring constantly for about 20 mins.
3. When starch thickens to an opaque gel, remove from heat.
4. Immediately spoon gel into squeeze bottles.

### For each team of 4:

#### Day Two

- ⊙ 1 pair disposable gloves
- 4 sponge paint brushes (about 2-3 cm wide)
- newspapers (enough to cover tables with a thick layer)
- 4 plastic spoons
- 1 plastic dish tub half-filled with warm water (fill immediately before use)
- 2 boxes dark blue dye (see instructions below)
- 7 plastic wide-mouth 16. oz. containers

## To prepare the dye:

*(yields 4 cups)*

1. Dissolve 2 boxes dye thoroughly in 4 cups hot water
2. Pour 1/2 cup dye into each plastic container
3. For best results, dye cloth while solution is still warm.

## Part One: African Symbols All Over the Map

Match the name of the African countries below with the symbols along the side. Draw a line to connect the symbols to the country of Africa from which they come.

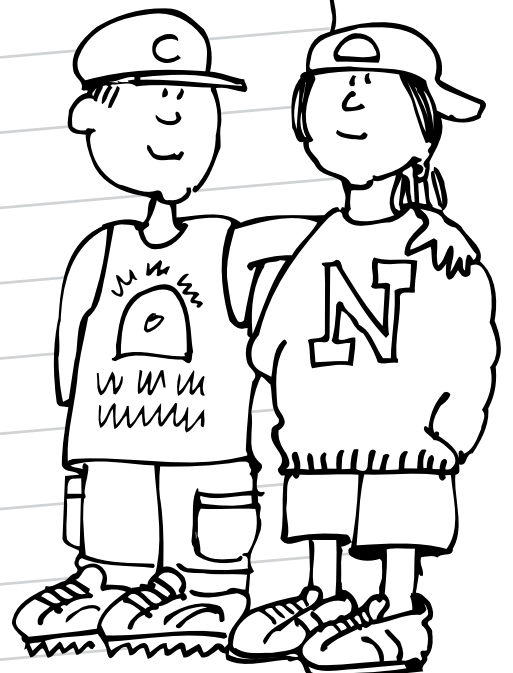
The map shows the following countries labeled: Tunisia, Morocco, Algeria, Libya, Egypt, Western Sahara, Mauritania, Mali, Niger, Chad, Sudan, Eritrea, Djibouti, Somalia, Ethiopia, Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Nigeria, Cameroon, Central African Republic, Equatorial Guinea, Gabon, Congo, Democratic Republic of the Congo, Rwanda, Burundi, Uganda, Kenya, Tanzania, Angola, Zambia, Malawi, Mozambique, Namibia, Botswana, Zimbabwe, Swaziland, South Africa, and Lesotho.

Surrounding symbols and their labels:

- GHANA**: A symbol consisting of three vertical bars of varying heights and a horizontal bar at the top.
- SENEGAL**: A diamond-shaped symbol with a cross inside, divided into four quadrants.
- EGYPT**: A symbol resembling a female symbol (a circle with a vertical line and a horizontal bar).
- UGANDA**: A symbol consisting of three concentric circles.
- BENIN**: A symbol consisting of two concentric circles, each with a smaller circle inside.
- NIGERIA**: A symbol of a bird with a cross on its body.
- NIGERIA**: A symbol of a lizard.
- CAMEROON**: A symbol consisting of a diamond shape with a cross inside, similar to Senegal's but with different internal details.
- CONGO**: A symbol consisting of a circle with a cross inside, similar to Senegal's but with different internal details.
- SOUTH AFRICA**: A symbol consisting of a vertical bar with a cross inside.
- UGANDA**: A symbol consisting of a wavy line that curls at both ends.
- TANZANIA**: A symbol consisting of a diamond shape with a cross inside, similar to Senegal's but with different internal details.
- SOUTH AFRICA**: A symbol of a pot with a long neck and a dotted body.

## Think It Over

Tell why you think people use symbols to communicate.



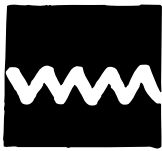
## Part Two

### Day One: Create an African Symbol on Cloth

West Africa is home to many richly decorated fabrics. The Yoruba people of Nigeria use a gooey gel made from cassava to paint symbols on cloth. When the cassava dries, the cloth is dipped in pools of dark blue dye made from the indigo plant. This is the same dye that makes blue jeans the color they are famous for. When the cassava is scraped off, a white symbol remains. Try this method yourself with symbols borrowed from many parts of Africa.

- 1** Gather your team's materials for day one.
- 2** Look through the African symbols found on p. 20. Choose a symbol and find the country it comes from on the map p.17.
- 3** Draw a large version of your symbol on your 20 cm x 20 cm paper. Write the meaning of your symbol on the paper.
- 4** Carefully lay your white cloth over the symbol. Tape it down.
- 5** Squirt some cassava gel into a cup.
- 6** Use the squeeze bottle to trace the symbol on the cloth with a thick layer of cassava gel. The cloth will remain white wherever the cassava gel is placed on the cloth. While one group member uses the squeeze bottle, others may use cotton swabs to spread the gel from the cup to the cloth to trace the symbols.
- 7** Set the cloth in a safe place to dry with the paper still attached. By tomorrow, it will be dry enough to dye.

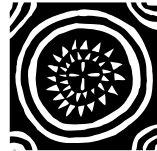
## AFRICAN SYMBOLS



**GHANA**  
*fire*



**GHANA**  
*defiance*



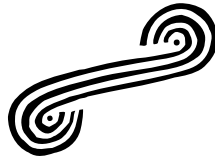
**CONGO**  
*sun*



**GHANA**  
*strength*



**GHANA**  
*universe*



**UGANDA**  
*opposing armies*



**GHANA**  
*another chance*



**SOUTH AFRICA**  
*python beads*



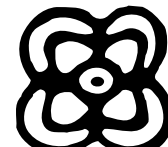
**GHANA**  
*fear none*



**GHANA**  
*sky god*



**GHANA**  
*agreement*



**GHANA**  
*don't brag*



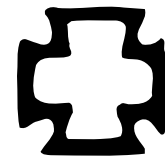
**GHANA**  
*good fortune*



**EGYPT**  
*life force*



**NAMIBIA**  
*knot*



**GHANA**  
*home safe*



**NIGERIA**  
*conflict*



**BENIN**  
*frog*



**GHANA**  
*unity*



**GHANA**  
*creation*

## Part Two

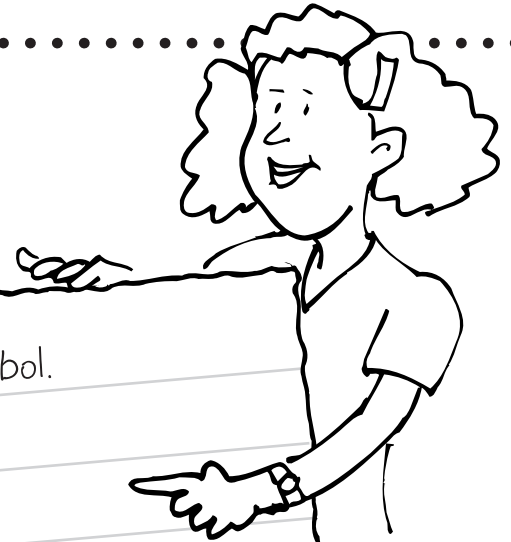
### Day Two: Dye the Cloth

You are ready to paint when the cloth symbol is dry. Consider it dry when you cannot dent it with a fingernail. You may use a hair dryer on symbols that are not completely dry.

- 1** Gather the materials for day two. Remove paper drawing from cloth.
- 2** Lay your cloth symbol flat on a thick layer of newspaper.
- 3** Dip your paint brush into the blue dye to soak the brush.
- 4** Paint over your symbol and coat the entire cloth with dye.
- 5** Assign one group member to put gloves on and rinse each cloth in the tub with warm water. Squeeze the water out of each cloth.
- 6** After the cloths are rinsed, each group member should use a plastic spoon to scrape the dried cassava off. Some cloth pieces may require additional rinsing.
- 7** Lay or hang your cloth in a safe place to dry or toss into a clothes dryer for 10 minutes.



## Think It Over



1. Explain why you chose your symbol.

2. Think about a symbol or design you like to wear. What makes it special to you?

# GREEN TRAVELERS

ACTIVITY  
FIVE

Track the travels of everyday plant foods to find out where they originated. Develop a story about the travels of one of your plants to share with your class.



## Before You Begin

Teams of 2

Length:  
Part I - 15 mins.  
Part II - 45 mins.

## What You Need

For each team of 2:

- ⊙ 1 large world map placed on a wall for the entire group
- thin-line colored markers or pencils
- ruler
- pencil

**What We Know.** Plants can't walk or swim or fly, yet they still manage to move to new places. They use the help of wind, water, animals, and humans to move around. Plant seeds can sprout and grow in new places that are much different from their old homes. This is because some plants are very adaptable. Plants sometimes settle into their new homes so well that we think they have always been there.

Cassava is grown as a crop in many African countries, but it didn't originate there.

Scientists aren't sure of the exact spot, but they think cassava originally came from Brazil and Mexico. Cassava was an important trade item in South America between 2000 and 1000 B.C. Cassava was such a good food crop that in the 1500s Portuguese traders took it from Brazil to the west coast of Africa, where it slowly spread inland. By the 1700s the Portuguese had introduced cassava to India, Indonesia, and the Philippines. From there it moved to Malaysia, and by 1900 it became established in southern China. Today people on four continents grow cassava.

# GREEN TRAVELERS

ACTIVITY  
FIVE

## Part One: Plants on the Move

The spread of cassava from the Americas to the rest of the world occurred over many years and thousands of miles. Refer back to the introduction of this activity and the map below to trace the travel routes of cassava. Answer the following questions:

**1** Where did cassava originate?

**2** How did cassava travel throughout the world?



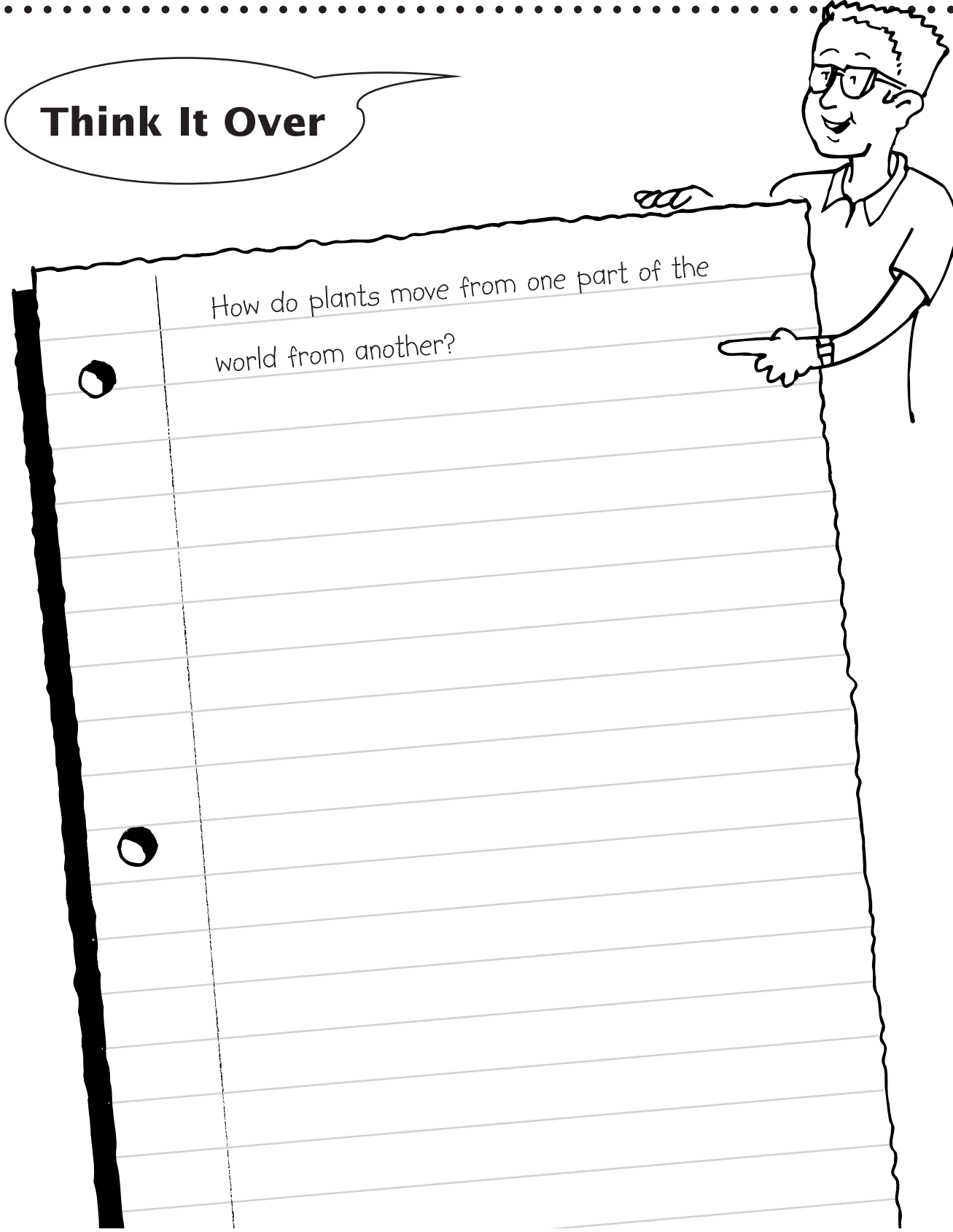
### THE SPREAD OF CASSAVA FROM THE AMERICAS TO THE WORLD



# GREEN TRAVELERS

ACTIVITY  
FIVE

**Think It Over**



How do plants move from one part of the world from another?

## Part Two: Create a Plant Traveler Map

Now it is your turn to create a plant traveler map.

- 1** With a partner, look over the Plant Traveler Cards beginning on this page. Choose at least two plants to map out.
- 2** Make a list of the countries mentioned on your two Plant Traveler Cards. Locate them on the large world map hanging on the wall. Write the names of the countries on your World Map Worksheet on p. 28.
- 3** Using a pencil, show the travels of your plants on your World Map Worksheet on p. 28. Be sure to include the point of origin for each plant. Trace over each plant's route with a different colored marker or pencil.
- 4** Use other art supplies to enhance your map. Create a key at the bottom of the map to show which plants are represented by which travels.
- 5** Work with your partner to write a story about the travels of one of your plants. Your story should include an explanation of where the plant originated and all of the places it ended up. Use another piece of paper or the back of your map. In the story, add your own ideas on how the plant might have moved around and who might have been involved.

### PLANT TRAVELER CARD

#### CHOCOLATE

- Chocolate and cocoa are made from the seeds of the cacao plant. Cacao is believed to have originated in South America and moved into Central America.
- Mayan (200-900) and Aztec (1200-1520) people in Central America used a drink made from roasted cacao seeds in religious ceremonies. They added red pepper and other spices to their drink.
- Cortés took cacao seeds to Spain in the early 1500s.
- The Dutch planted cacao in southeast Asia in 1670.
- Cacao plantations started in Ghana, Africa in 1879. Africa is now the world's largest cacao producer.

### PLANT TRAVELER CARD

#### SUNFLOWERS

- Originated in North America. Fossilized sunflower seed shells show that Native Americans ate the seeds and crushed them for oil.
- Sunflowers were transported to Europe where they were grown as exotic flowers in the mid-1500s.
- In the 1700s sunflowers were grown in France and Germany for the oil produced in their seeds.
- Russia began to grow sunflowers for oil in the late 1800s.

**Great detective work on plant travelers!!**

## PLANT TRAVELER CARD

### WATERMELON

- Originated in southern Africa.
- Watermelons were being grown and eaten in Egypt and India as early as 2000 B.C.
- In the 1500s watermelon came to the Americas from West Africa on ships carrying enslaved Africans.
- European colonists brought watermelons to New Zealand and Australia in the late 1700s.
- Native Americans in Florida grew watermelons before 1664, and tribes along the Colorado River were found growing them in 1799.

## PLANT TRAVELER CARD

### BANANA

- Believed to have originated in Malaysia. Prehistoric people used bananas for food, fiber, and decoration. Red and green cooking bananas were an important food crop.
- Records show bananas were grown in India in 600 B.C.
- By 1442 they had become a basic food in Guinea, on the west coast of Africa.
- By 1496 bananas had traveled from western Africa to the Canary Islands as food for enslaved Africans being sent to the Americas.
- First found in the Americas when planted in the West Indies in 1516.

## PLANT TRAVELER CARD

### ORANGES

- Originated in southern China where they have been grown since 2000 B.C.
- Caravans transported oranges from China to the Persian empire in the Middle East probably between 500 and 400 B.C. From here they spread to Egypt and other northern African countries.
- The northern African Moors brought oranges from Africa to Spain in the year 1000.
- Columbus planted orange seeds on the island of Hispaniola—now divided into the countries of Haiti and the Dominican Republic—in 1493.
- In 1768 the Englishman James Cook planted orange seeds in Australia.

## PLANT TRAVELER CARD

### POTATO

- Originated in the Andes Mountains of Bolivia and Peru. People living there more than 7,000 years ago collected and grew potatoes.
- Around 1000 A.D. the Inca people, with potatoes as their main crop, developed a great civilization in the Andes.
- In 1536 Spain conquered the Inca empire. The Spanish took Inca gold and potatoes to Europe.
- Sailors brought potatoes from Europe to Ireland in 1650. The crop was so nutritious and easy to grow that the Irish soon grew mostly potatoes.
- Europeans brought potatoes to North America in 1719.

## PLANT TRAVELER CARD

### COFFEE

- Coffee originated in Ethiopia.
- In the year 500, coffee traveled to Arabia (the present-day countries of Yemen and Saudi Arabia)
- Coffee migrated to Venice, Italy in 1400.
- In 1650 a coffee craze swept through France, Holland and England.
- In 1700 a Dutch merchant smuggled the seedlings out of Arabia and started a coffee plantation in Java, in the East Indies.
- Coffee came to Brazil in 1774. Today Brazil is the world's largest coffee producer.

## PLANT TRAVELER CARD

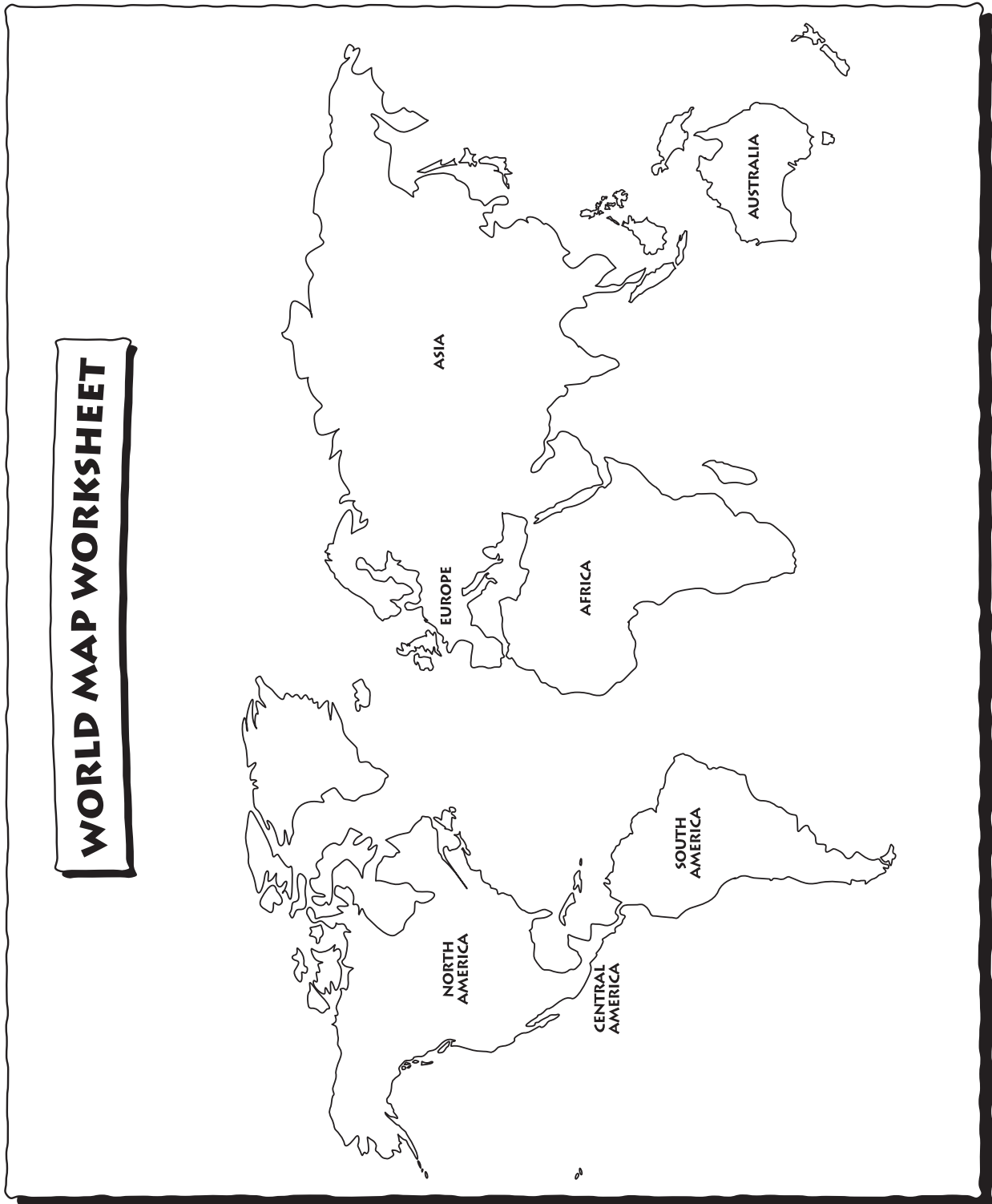
### PEANUTS

- Originated in Peru. Ancient pottery decorated with peanut designs shows the Mayas and Incas cultivated them as early as 200 A.D.
- In the early 1500s Portuguese traders took peanuts from South America to West Africa. They became a popular food and an important crop.
- Peanuts traveled from West Africa to North America in the early 1600s aboard ships carrying enslaved Africans.
- West Africans brought to North America knowledge of how to grow and prepare peanuts, including their recipe for peanut butter.

# GREEN TRAVELERS

ACTIVITY  
FIVE


## Part Two: Create a Plant Traveler Map (cont'd)



# GREEN TRAVELERS

ACTIVITY  
FIVE

## Think It Over



1. Make a list of plants that originated outside of the Americas.

2. What would it be like if the plants listed in question #1 had never come to the Americas? Which ones would you miss the most?



# PULLING IT ALL TOGETHER

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**Create a story  
about a scientist  
who works with the  
chemicals found  
in plants.**



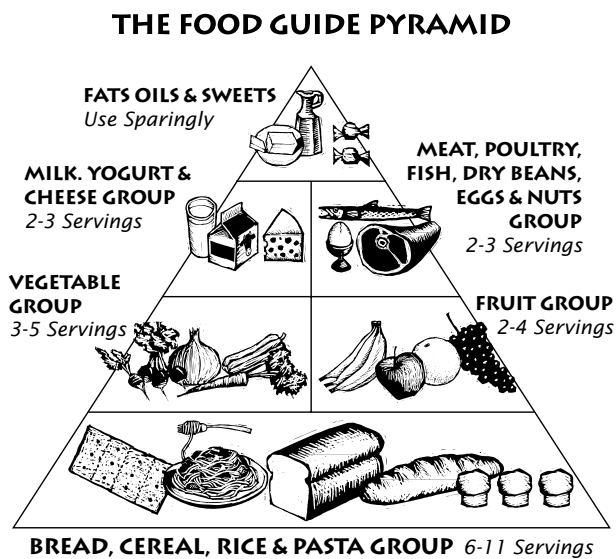
# NEW WONDERS

Here are some ideas you might like to use for projects or exhibits.



**1.** Families share recipes by passing them down through the generations. Maybe your favorite recipe came from your great-grandmother, who passed it on to your grandmother, who passed it on to your mother, who will some day pass it on to you. Interview family members to find out what cooking methods or recipes were handed down to them in this way.

**2.** Study the Food Pyramid below to discover how plants contribute to our diet. Make a list of the plants and plant products you find.



**3.** If you had the opportunity to go to Africa, which part would interest you? Choose one country in Africa to learn more about. Write a report telling the history of the country, how it has changed over time and what crops are grown there today.



**4.** Make a poster that shows which crops are grown in your state. Investigate where at least one of them originated and write about it.