



FLOWER EXPLORATIONS **PRE – AND – POST VISIT ACTIVITIES**

Your class will soon be attending the Flower Explorations program at Brooklyn Botanic Garden. We will guide students to an understanding of the role each part of the flower plays in the processes of pollination and fertilization that result in formation of seeds, provide an opportunity to observe and examine a variety of flowers, and pot up a flowering plant with each student.

Here are some questions to motivate students' thinking about how plants reproduce and the role of flowers:

Inquiry Starters:

- ✿ *If we wanted to start a classroom (or school yard) garden, what would we need to consider? Where could we get plants for our garden?*
- ✿ *What types of plants would you most like to grow in our classroom/school garden? Why?*
- ✿ *Why do so many plants that we know and that we want to grow have flowers? Do all plants make flowers?*
- ✿ *Why do people like flowers?*
- ✿ *What is the purpose of a flower for the plants that make them?*
- ✿ *If we wanted to start plants for our classroom/school garden from seeds, where could we get seeds?*
- ✿ *What part of a plant holds seeds?*

ACTIVITIES

A Rose is a Rose is a Rose....

Objectives:

1. To create an awareness of the similarities and differences among different types of flowers
2. To understand that scientists examine flowers and use the details of their structure to classify plants

Botanists, the scientists who study plants, classify all of the plants they know into categories based on their visible characteristics, such as the shape, size and texture of their leaves, for example, and on the genetic codes unique to their species. While botanists can use the appearance of stems, roots and leaves to separate plants into different groups they must rely on the detailed characteristics of flowers and often fruits to classify plants into more specific categories or *families*. Therefore, plants grouped in a particular family will have flowers and fruits that have similar structures.





Your students – the botanists who will be learning with us at the Garden during the workshop – have likely observed that there are many different kinds of flowers.

Observe a Bouquet of Flowers

Purchase from a greengrocer or florist a diverse assortment of flowers. Try to include flowers with different colors, petal shapes and arrangements, and textures.

Allow students to examine the different flowers close up. Use hand lenses or other types of magnifiers to observe details.

Questions to guide discussion can include:


-  *What are some flowers that we know of?*
-  *What do they look like: color, shape, size?*
-  *What characteristics make different types of flowers unique? (number and shape of petals, size of the flower – are there single flowers or clusters of flowers?, colors of petals, patterns on petals)*
-  *What are fragrant flowers that we know of? Do all flowers have a fragrance?*

Celebrate the Rose Family!

Materials

Fresh apples, strawberries, peaches, pears, plums, cherries, raspberries, blackberries
Apple juice, pear juice
Rose Hip Tea Bags – hot water for making tea
Honey
Cold and/or hot beverage cups

When we think of a “rose” most of us can imagine the familiar flower with petals in shades of yellow, white, cream, pink, magenta and red. But did you know that our beautiful garden roses are cousins of some of our favorite fruit plants? Apples, pears, plums, peaches, cherries, strawberries, raspberries and blackberries grow on plants that are also members of the Rose Family, or *Rosaceae*. How did botanists discover that these plants were related? Their flowers are similar in appearance. Below is a diagram that illustrates some of the characteristics of garden rose flowers. When flowers are pollinated and fertilization occurs, a fruit forms around the seeds which in ornamental roses is called a “rose hip”. Tea is made from this fruit. Another diagram is included that illustrates the flowers and fruits of an apple tree.

 *What do rose flowers and apple flowers have in common?*

Celebrate the Rose Family by drinking juices made from the fruits of its members – apple, pear, peach and the others listed above – and brewing and drinking rose hip tea.

Here is a poem by Robert Frost to read as you enjoy the flavors of Rose Family fruits:

The Rose Family by Robert Frost

The rose is a rose,
And was always a rose.
But now the theory goes
That the apple's a rose,
And the pear is, and so's
The plum, I suppose.
The dear only knows
What will next prove a rose.
You, of course, are a rose--
But were always a rose.

Reprinted from: <http://www.online-literature.com/frost/907/>

TYPICAL ROSE FLOWER

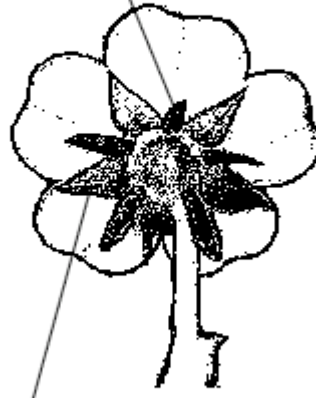
5 separate petals



numerous styles

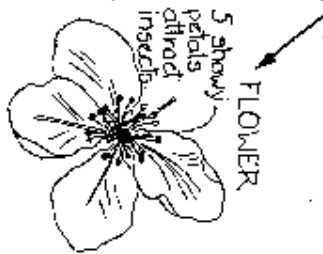
numerous stamens

5 bracteoles
opposite petals



5 sepals or lobes of the calyx
alternate with petals

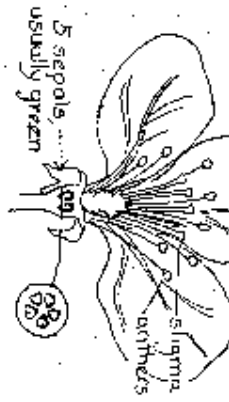
<http://montana.plant-life.org/families/Rosaceae.htm>



FLOWER



As bees search for nectar and pollen, pollen is transferred from the anthers to the stigmas.



APPLES ~
from flower to fruit.

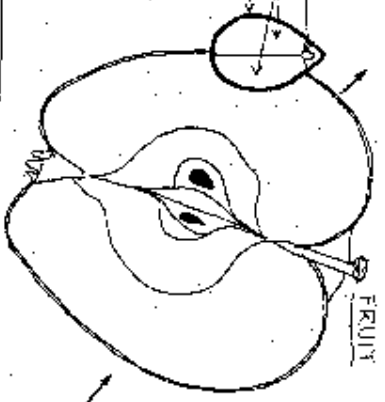
MRS. MASSACHUSETTS AUDUBON SOCIETY
457A LINCOLN, MA. 01775
MS 9.00.

The seed is a baby apple tree. Inside the hard coating is a tiny embryo wrapped in 2 food storing cotyledons.



2 cotyledons embryo coating

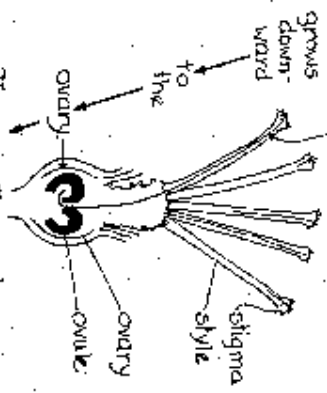
On the ground the rotted ovary material would fertilize the soil around the sprouting seeds.



FRUIT

As the ovary expands into a large ripe fruit, the seeds mature. The edible fruit makes transportation of the seeds more likely.

FERILIZATION happens when pollen forms a pollen tube.



There in the ovule the male cell fuses with the female cell.

Then petals fall, the style withers,



the ovary grows to become a young fruit covering the developing seeds.



Birds, Bees, Butterflies, Bats: Pollinators

The job of the flower is to make seeds. To start the whole process off, pollen needs to be released from the parts of flowers called *stamens* so it can make its way to the parts of flowers called *pistils*. The wind carries the pollen of many types of plants from flower to flower; many flowering trees such as oaks, maples, beech and birch rely on wind pollination. Insects and other animals are the agents of pollination for the vast majority of flowering plants. They collect pollen from one flower and transport it directly and effectively to another flower of the same type. Bees, wasps, butterflies, moths and flies are types of insect pollinators. Birds and bats (which are mammals) are also important pollinators.

- 🌸 *What do animal pollinators do for flowers? How do they assist in pollination?*
- 🌸 *What do flowers have that animal pollinators want?*
- 🌸 *How do flowers attract pollinators? What parts are designed to attract pollinators?*
- 🌸 *What is nectar? Where do pollinators find it in a flower?*
- 🌸 *What is your favorite flower? Is it pollinated by an animal? Which one?*

Here are some resources where you can start your inquiry about pollinators:

Books

Plant: An Eyewitness Book by David Burnie
New York: Alfred A. Knopf, 1989

The Clover and the Bee: A Book of Pollination by Anne Ophelia Dowden
New York: Thomas Y. Crowell, 1990

The Moonflower by Peter and Jean Loewer
Atlanta: Peachtree Publishers, Limited, 1997

Websites

Pollination: The Biology of Plants
Missouri Botanical Garden
<http://www.mbgnet.net/bioplants/pollination.html>

Bloom: The Secret Lives of Flowers
Exploratorium: The Science of Gardening
<http://www.exploratorium.edu/gardening/bloom/index.html>

Appreciating Pollinators

National Gardening Association

<http://www.kidsgardening.com/themes/pollinator11.asp>

Pollinator Partnership:

<http://www.pollinator.org/>

Pick the Pollinator: an interactive learning game at

<http://www.pbs.org/wgbh/nova/flower/pollinator.html>

Power of Flowers: Beauty With A Purpose

<http://www.powerofflowers.org/home.html>

Honey Tasting

Did you know that there are over 300 different varieties of honey sold in the United States alone! September, the first month of school, is also celebrated as National Honey Month.

1. Start with some research about honey and the bees that make it:

- Read this short article from *Look Around New York City* about bees and bee keeping in New York City with your students:

http://www.nycaudubon.org/kids/lanyc/Look_Around_Bees_2004.pdf

Many children are wary of bees, understandably so. Learning more about them and the invaluable role they play in the production of fruits from many plants will help students gain confidence in observing them to support their curiosity about their activities.

- Here are more resources about **honey bees** in particular:

Get the Buzz on Honeybees: Scholastic

<http://www2.scholastic.com/browse/unitplan.jsp?id=283>

Master Bee Keeper: Cornell University Cooperative Extension

<http://www.masterbeekeeper.org/info/tips.htm#bees>

Pollinator Awareness and Protection

<http://www.pollinator.org/>

- 2. **Storyboard the process of honey production**, starting with nectar collection from flowers or from bees leaving the hive to visit flowers to the collection of honey and its use as a sweet flavoring. [A “storyboard” is a device that comic strip artists use to frame pictures and include narrative about the picture. A sample storyboard page is included (page 9)]

3. Taste Test!

Materials

Different varieties of honey
Small tasting cups to distribute small samples of honey
Popsicle sticks OR coffee stirrers to dip into samples

- 🌸 *The National Honey Board says there are over 300 types of honey produced in the U.S.! Why are there different flavors and colors of honey?*
- 🌸 *How can a bee keeper control the type of honey bees are making? Don't bees visit all kinds of flowers? Explain.*

Here is one website that describes different varieties of honey:

<http://www.honey.com/nhb/about-honey/honey-varietals/>

Purchase or ask students to bring in different varieties of honey. Have students taste two or three varieties, sipping water in between to “cleanse” their palates.

- 🌸 *Could you detect differences in flavor between the different honeys?*
- 🌸 *Which is your favorite flavor?*

More Books to Read About Flowers, Fruits and Seeds

The Reason for A Flower by Ruth Heller
New York: Grosset and Dunlap, 1983

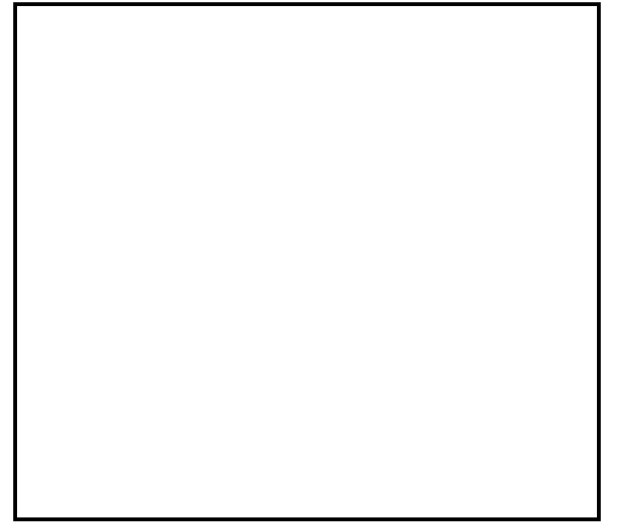
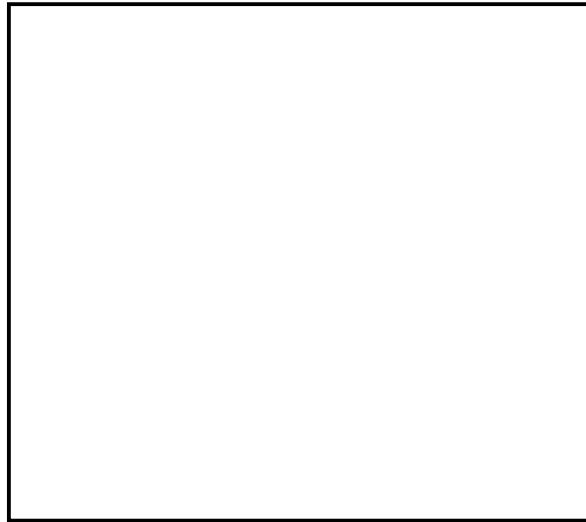
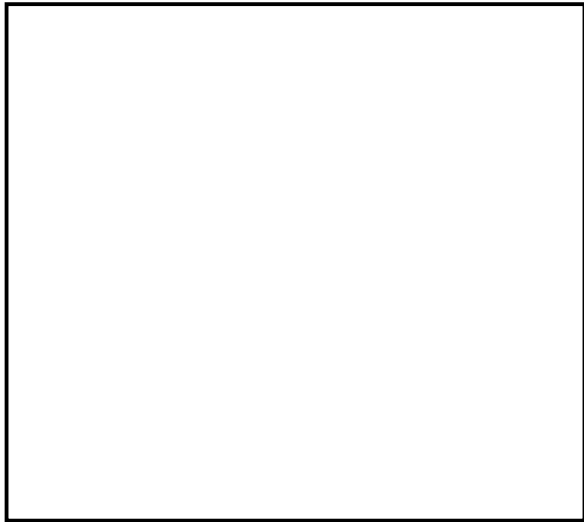
The Flower Alphabet Book by Jerry Pallotta
Watertown, Massachusetts: Charlesbridge Press, 1988

Pick, Pull, Snap! Where Once a Flower Bloomed by Lola M. Schaefer
New York: Greenwillow Books/HarperCollins Publishers, 2003

A Fruit is a Suitcase for Seeds by Jean Richards
Brookfield, Connecticut: The Millbrook Press, 2002

From Flower to Fruit by Anne Ophelia Dowden
New York: Thomas Y. Crowell, 1984

The Story of Honey



“Just the Facts” About Plants

Here are some facts about plants to support your teaching and learning about plants in preparation for the **Flower Explorations** program at BBG. We suggest you use this background information to enhance your own understanding and guide students' understanding. Many of these concepts and facts will be explored with your students during the workshop program, in particular the topic of the role of the flower as the part of the plant that makes seeds and the role of the fruit as the part of the plant that disperses seeds.

1. What do plants need to grow? Plants require carbon dioxide and oxygen from the air, varying amounts of light, water, and warmth to live. They need space to grow and minerals for healthy growth and structure.
2. Photosynthesis - is the process by which green plants can make their own food. “Photo” means “light,” and “synthesis” means “to place together.” During photosynthesis, carbon dioxide (CO₂) and water are brought together chemically to make food in the form of sugars (carbohydrates) for the plant, and oxygen. The green pigment chlorophyll traps the light energy from the sun that is used for this process. All of the green parts of plants are able to make sugars. The oxygen given off by plants as a result of photosynthesis sustains most living things on Earth. Plants are the only multicellular organisms that can make their own food.
3. Plant Parts – A typical plant consists of six major parts:

ROOT: absorbs water and minerals, anchors the plant, stores food and water
STEM: transports sugars, water and minerals to the various plant parts, serves as support for other plant parts including leaves, flowers and fruits
LEAF: usually has the most surface area for photosynthesis and has pores (stomata) through which gases can be exchanged with the air
FLOWER: contains the reproductive organs of the plant that give rise to the seeds; part of the flower becomes the fruit
FRUIT: contains the seeds and is a vehicle for seed dispersal
SEED: contains the embryo (baby) plant and often a food supply to support the early growth of the seedling.
4. Fruit or Vegetable? Can you think of what beans, walnuts, tomatoes, apples, cucumbers, milkweed pods all have in common? If you said that they are all the part of the plant which holds the seeds you were correct. Most people agree that apples, oranges, pineapples and mangoes are fruits but you will spark a lively discussion when you suggest that pumpkins, tomatoes, cucumbers and peppers are also fruits.

Botanists, the scientists that study plants, define *the part of the plant that holds and disperses the seeds the fruit.* Therefore pumpkins, tomatoes, peppers, cucumbers, and string beans are all fruits.

Botanically, a *vegetable* is a root (carrot, radish, beet), stem (sugar cane, asparagus), leaf stalk (celery) or leaf (cabbage, collards, mustard greens, lettuce) that we eat. Broccoli and cauliflower “florets” are the unopened flower buds of their plants! Other edible flowers include squash blossoms and *Nasturtium*.

Horticulturists and farmers often used a broader definition of a *vegetable* to be *any edible part of a plant*. They would therefore say that a fruit can also be called a vegetable.

5. Are all Fruits or Seeds Edible? The purpose of the fruit is to disperse the seeds to locations at some distance from the parent plant. Why? If a plant’s seeds all germinated right under them the seedlings and the parent would be competing for survival. If the seeds can be dispersed far and wide there will be a greater chance that seedlings will grow into mature plants. The range of the plant’s species will increase.

Sweet, juicy fruits are produced by plants specifically to lure animals to eat them, swallow the seeds and ‘poop’ them out or discard them somewhere farther away from the parent plant. Not all fruits are sweet and juicy, however! Some fruits and/or seeds are designed to “fly”, some are designed to “float”, and some are designed to “hitchhike” on the fur or feathers of animals.