



## Busy Bees

### Kindergarten to Grade 3 — (Cycle 2)



Did you know that the smallest farm animal plays the greatest role in food production? With your students, watch the Museum's honeybees at work through the observation beehive windows and see if you can find the queen. Through game playing, students learn about the bee life cycle, how bees turn nectar into honey, and why many plants rely on them to produce fruits and seeds. Students try their hands at some beekeeping chores, visit the honey house, and compare the taste of a variety of honeys.

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## AN ENRICHING PROGRAM

### Target grade levels

This program targets Kindergarten to Grade 3 students in Ontario and Kindergarten to Cycle 2 students in Quebec.

### Duration

90 minutes

### Program dates

This program is offered weekdays from November to April.

### Learning objectives

- learn terminology related to honeybees and beekeeping
- learn about honeybees, their life cycle and how honey is produced
- understand what pollination is, and how plants produce seeds and fruit
- discover the role of bees and the wind in pollinating plants
- learn about the tasks and responsibilities of beekeepers, and how honey is harvested
- learn about the products and by-products of beekeeping

### Learning methods

- touring the exhibition **Taking Care of Beesness** and the honey house
- observing honeybees at work in an observation hive
- participating in a bee role-playing game (preschool to Grade 2/Cycle 1)
- studying the anatomy of a flower
- participating in games on wind pollination and honeybees (Grade 3/Cycle 2)
- examining and handling beekeeping tools and artifacts
- reconstructing a beehive from its components
- tasting various types of honey
- taking echinacea seeds back to the classroom



## Curriculum links

### ONTARIO

#### Kindergarten

Science and Technology  
Language  
Personal and Social Development

#### Grade 1

Science and Technology  
Understanding Life Systems — Characteristics and Needs of Living Things  
Understanding Earth and Space Systems — Daily and Seasonal Changes

#### Grade 2

Science and Technology  
Understanding Life Systems — Growth and Changes in Animals

#### Grade 3

Science and Technology  
Understanding Life Systems — Growth and Changes in Plants

### QUEBEC

#### Preschool

**Competency 1** — To perform sensorimotor actions effectively in different contexts  
**Competency 3** — To interact harmoniously with others  
**Competency 4** — To communicate using the resources of language  
**Competency 5** — To construct his/her understanding of the world

#### Cycle 1 (grades 1 and 2) Primary

Mathematics, Science and Technology  
Science and Technology  
**Competency** To explore the world of science and technology

#### Cycle 2 (grades 3 and 4) Primary

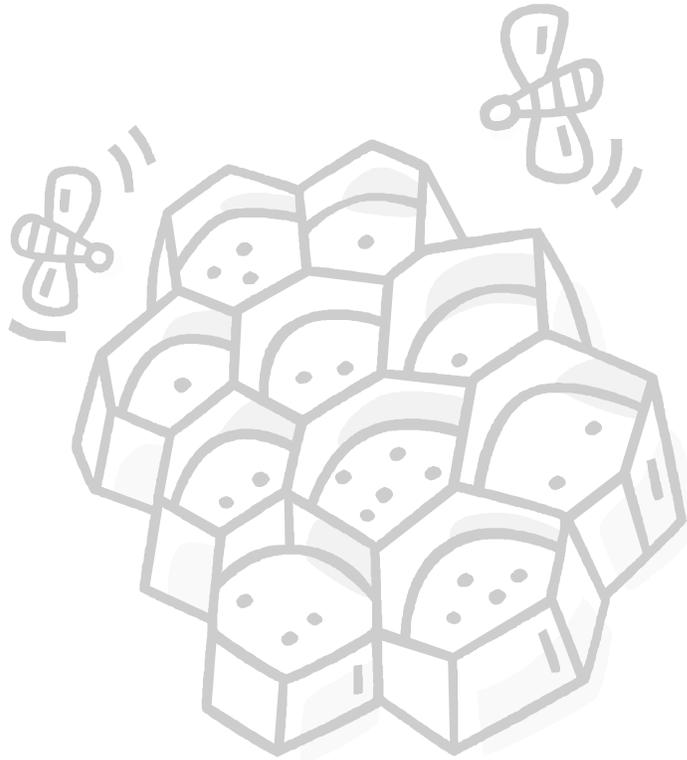
Mathematics, Science and Technology  
Science and Technology  
**Competency 2** To make the most of scientific and technological tools, objects, and procedures

### **Fees, payment, and group size**

For fees, please visit the School Programs section of our website at [agriculture.technomuses.ca](http://agriculture.technomuses.ca) or call 613-991-3044 or 1-866-442-4416. Payment may be made in advance or on arrival, by cash, debit card, cheque (made payable to the *Canada Agriculture Museum*), or by credit card (VISA or MasterCard). Maximum group size for this program is 20 students. There are cancellation fees — please consult the Important Information section for more details.

**If you have any questions, please do not hesitate to contact us at 613-991-3053.**

We look forward to seeing you at the Museum!



Science and Technology

## Who am I?

(Answers)

Find the names of the three types of bees in a colony.



### The queen

I am the mother of the colony.

My abdomen is very long.

I lay more than 1,200 eggs every day.

### The worker

I do all the work in the hive.

I clean, feed, build, fan, guard,  
and forage.



### The drone

I have extra large eyes and a stout  
abdomen. I do not have a stinger or  
pollen baskets and I cannot gather  
flower nectar using my tongue. I am a  
male bee.



Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Who am I?

Find the names of the three types of bees in a colony.



The q \_\_\_\_\_

I am the mother of the colony.

My abdomen is very long.

I lay more than 1,200 eggs every day.

The w \_\_\_\_\_

I do all the work in the hive.

I clean, feed, build, fan, guard,  
and forage.



The d \_\_\_\_\_

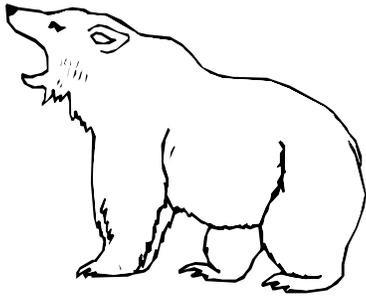
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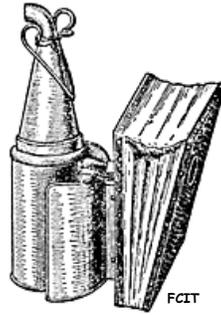
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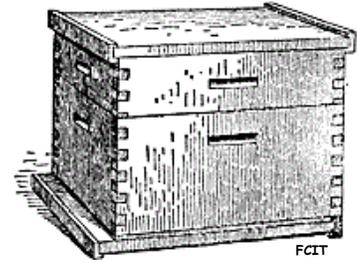
## Colour the Living Things



bear



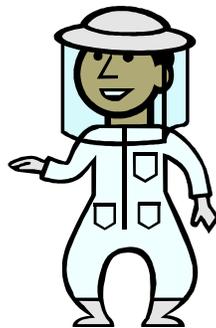
smoker



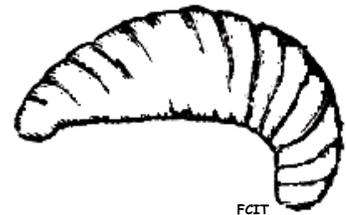
hive



honeybee



beekeeper



larva



beekeeper's gloves



clover



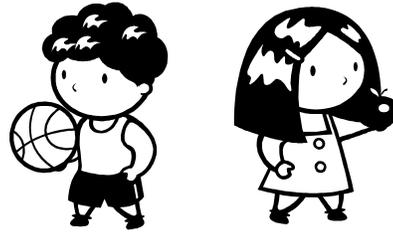
skunk

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Honeybees and Me

Bees are living creatures, just like you. They need to eat, drink, and breathe to stay healthy. Bees are also very different from humans. Fill in the blanks below to describe how you differ from a bee.



I use my antennae to smell and taste.

I use my \_\_\_\_\_ to smell and my \_\_\_\_\_ to taste.

I have five eyes.

I have \_\_\_\_\_ eyes.

I move around by walking and flying.

I move around by \_\_\_\_\_  
\_\_\_\_\_.

I have six legs.

I have \_\_\_\_\_ legs.

I live in a hive.

I live in \_\_\_\_\_  
\_\_\_\_\_.

I breathe through my skin.

I breathe through my \_\_\_\_\_  
\_\_\_\_\_.

I hatched from an egg. I was first a larva, then a nymph, before I became a bee.

Before I grew up, I was \_\_\_\_\_  
\_\_\_\_\_.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## The Bee's Life Cycle

These are the stages in the metamorphosis of a worker bee. Use the words at the bottom of the page to fill in the blanks.

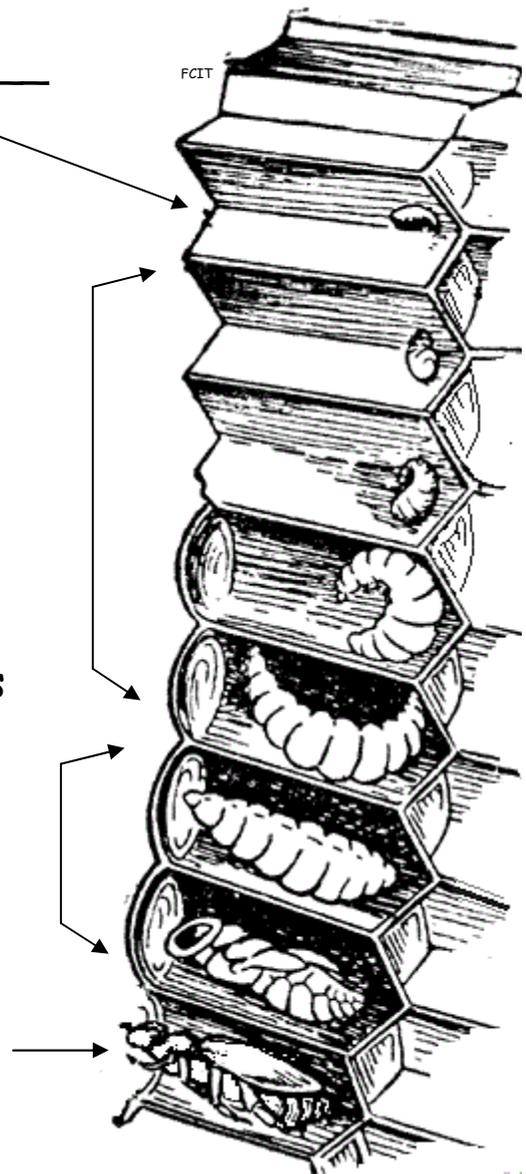
The queen lays an \_\_\_\_\_  
on the bottom of a cell.

The egg hatches. The worker bees  
feed the \_\_\_\_\_.

The larva grows and the worker bees  
close the cell with beeswax.

The larva spins a cocoon and transforms  
into a \_\_\_\_\_.

The metamorphosis is complete.  
The \_\_\_\_\_  
chews on the wax and leaves its cell.



egg

bee

pupa

larva

## Science and Technology

# From Nectar to Honey

How do bees turn nectar into honey? Using their imaginations, students try to describe the process, correcting their stories using knowledge gained either at the Museum or through the Educational Activity Kit.

## Materials

- large sheets of paper
- markers
- illustrations on how bees produce honey (attached)

## Instructions

### Part 1: Honey as imagined by students

1. Divide the class into groups of three or four, and give each group a large sheet of paper and several markers.
2. Using drawings and/or text, students explain how they think bees make honey. What do the bees use as raw materials? How do the bees transform these substances into honey?
3. Invite each group to share its drawings and/or text with the class.

### Part 2: The Actual Production of Honey (if your class does not take part in the "Busy Bees" program)

1. If possible, make colour copies of the illustrations describing the production of honey (Appendices A-1 to A-6).
2. As a class, read the texts describing the illustrations. Mix up the illustrations, and ask students to put them back in the correct order.

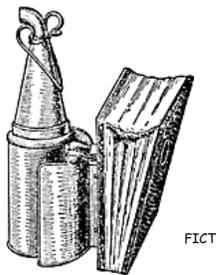
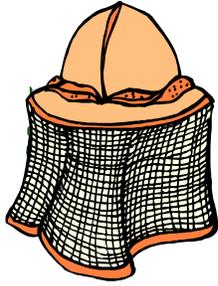
### Part 3: From Nectar to Honey

1. Using the same groups, give each group a large sheet of paper and several markers.
2. Using drawings and/or text, students must explain again how bees make honey, based on what they've learned.
3. Give each group the answer sheet they created during the first part of this activity. Compare these sheets with their new drawings and texts. Identify the elements that have changed, as well as those that have remained the same. Ask students what they have learned.

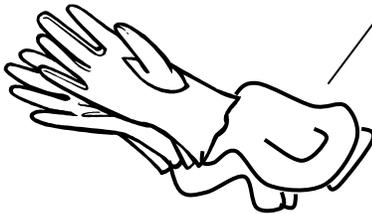
# Beekeeping Tools

(Answers)

What are these tools used for? Link each tool to the correct description.



FICT



The smoke in the **smoker** calms the bees.

The **hive tool** is used to pry open the hive and separate the frames.

The **beekeeper's gloves** protect hands from bee stings.

The **bee brush** is used to gently sweep the bees from the combs.

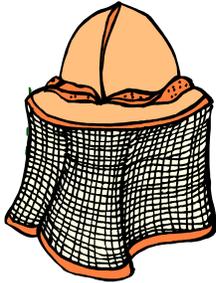
The beekeepers' **hat and veil** prevent the bees from flying into the beekeeper's face and hair.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Beekeeping Tools

What are these tools used for? Link each tool to the correct description.



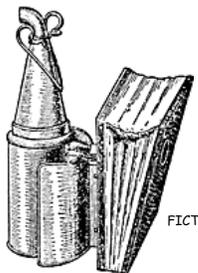
The smoke in the **smoker** calms the bees.



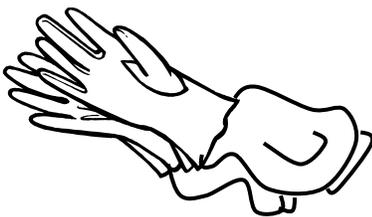
The **hive tool** is used to pry open the hive and separate the frames.



The **beekeeper's gloves** protect hands from bee stings.



The **bee brush** is used to gently sweep the bees from the combs.



The beekeepers' **hat and veil** prevent the bees from flying into the beekeeper' face and hair.

## Science and Technology

# Bug Farming

Domesticated bees are not the only insects people raise. The goal of this activity is to help students discover the many different types of insect-rearing activities around the world, as well as their products and by-products.

## Materials

- photographs of insect-rearing activities and/or photographs of the insects themselves (Appendices B-1 to B-9)

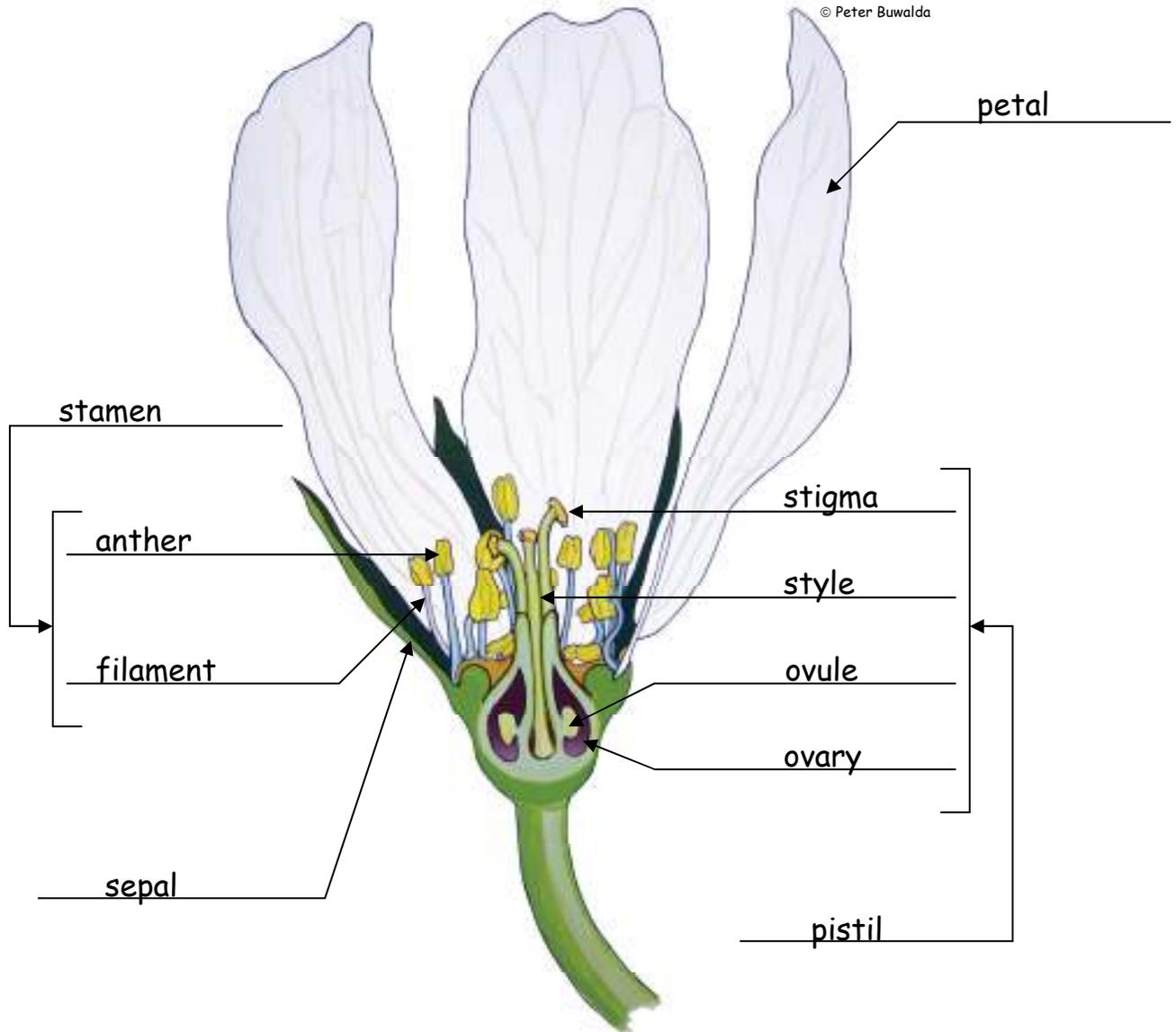
## Instructions

1. Explain to students that *domesticated bees* are not the only insects raised on farms. There are many others.
2. Show students photographs of insect-rearing activities and/or the insects that are raised. Ask them if they know of these insects, and why they are raised. Explain that certain insects, such as silkworms and bees, are raised to make products or foods used by people. Others are raised because they eat insects that harm crops—sometimes even replacing synthetic insecticides in the fight against crop-destroying pests.
3. Write the names of the insects on the chalkboard and, for each, identify one or more products that come from raising them. If necessary, refer to the attached table listing the various insects people raise, along with their uses.
4. Discuss the importance of these insects to humans.

# Parts of a Flower

(Answers)

Use the words at the bottom of the page to name the different parts of a flower, then answer the questions on flowers and pollination.



pistil  
ovary

anther  
stigma

petal  
sepal

stamen  
filament

style  
ovule

# Parts of a Flower

(Answers)

1. What is the name of the flower's male organ? It includes the anther and the filament.

stamen

2. What is the name of the flower's female organ? It includes the stigma, the style, the ovary, and the ovule.

pistil

3. Where in the flower are grains of pollen formed?

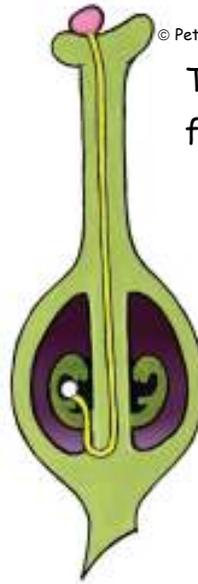
anthers

4. What is pollination?

transfer of pollen from the stamen to the pistil

5. What happens to the ovule after it is fertilized?

it turns into a seed



© Peter Buwalda

The pollen seed and the flower are compatible.

The pollen sprouts.

The pollen tube grows down the style to ovary and releases the male seeds.

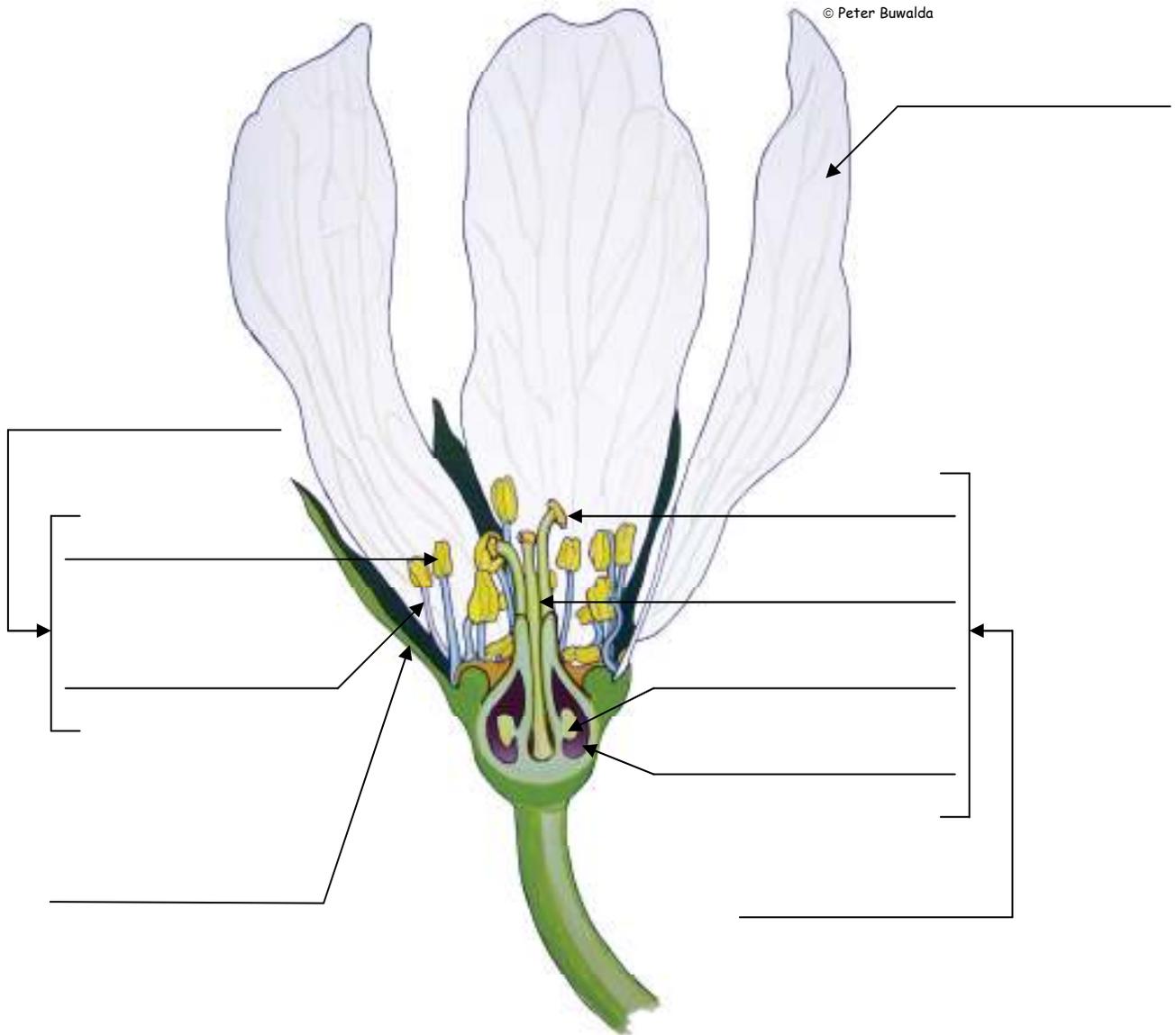
The ovule is fertilized. It turns into a seed.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Parts of a Flower

Use the words at the bottom of the page to name the different parts of a flower, then answer the questions on flowers and pollination.



pistil  
ovule

anther  
filament

petal  
stigma

stamen  
sepal

style  
ovary

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Parts of a Flower

6. What is the name of the flower's male organ? It includes the anther and the filament.

\_\_\_\_\_

7. What is the name of the flower's female organ? It includes the stigma, the style, the ovary, and the ovule.

\_\_\_\_\_

8. Where in the flower are grains of pollen formed?

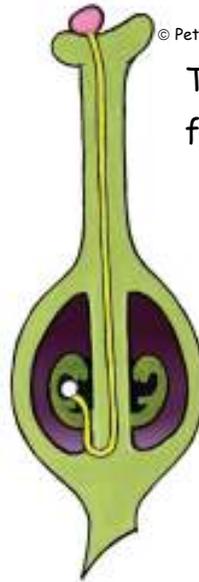
\_\_\_\_\_

9. What is pollination?

\_\_\_\_\_  
\_\_\_\_\_

10. What happens to the ovule after it is fertilized?

\_\_\_\_\_  
\_\_\_\_\_



© Peter Buwalda

The pollen seed and the flower are compatible.

The pollen sprouts.

The pollen tube grows down the style to ovary and releases the male seeds.

The ovule is fertilized. It turns into a seed.

## Science and Technology

### Kids to the Rescue!

For several years, populations of pollinating insects have been declining. The destruction of their habitat and the disappearance of their food sources are among the principal causes of this decline. Luckily, your students can come to the insects' rescue by providing melliferous plants (plants rich in nectar) in their environment, which the insects can feed on.

This activity takes place over a period of several months. By cultivating melliferous plants native to North America in the classroom, students learn how to grow and care for a plant that they can transplant outside in the spring. These plants will provide pollinating insects—such as bees, butterflies, flies and thousands of others—with food in your community.

### Materials

- echinacea seeds
- pots (recycled yogurt cup or other similar objects from students' lunch boxes)
- soil (type not important)
- trays
- small watering can

### Before the Activity

If your class participates in the Busy Bees school program at the Canada Agriculture Museum, Museum staff will give you a free bag of echinacea seeds. If you do not take part in the program, echinacea seeds can be found at most nurseries and garden supply centres.

### Instructions

1. Introduce the term **pollinating insect** to students, and explain what a pollinating vehicle is. Ask what vehicles are used for? To transport things from one place to another. And what do pollinating insects do? They transport pollen from one flower to another. If a plant is to produce seeds and fruit (babies), its flowers must be fertilized. The pollen (the male part) must land on a style (the female part). For many plants, the pollen vehicles are pollinating insects. Pollinating insects feed on nectar and/or pollen produced by flowers. As these insects forage for food, they accidentally transport pollen from flower to flower. Pollinating insects are thus very important. Without them, many flowers could not produce fruit and seeds at all.
2. Ask students to name some pollinating insects, and write the names of these insects on the chalk board. These are the insects that we often see on flowers. The ones that are best at transporting pollen are the ones that are covered in fine hairs. The pollen sticks to these hairs as if they were made of Velcro.

3. Identify the needs of pollinating insects. Write them on the chalk board.
4. Tell students that there are fewer and fewer pollinating insects in the world every day. Why? There are many reasons, including the destruction of their habitat, which leads to the disappearance of their food.
5. How can we help pollinating insects? The goal of this activity is to cultivate a plant—echinacea—that is highly melliferous: this means that it produces a lot of nectar, the food eaten by pollinating insects. Echinacea is native to North America. It is a perennial plant, which means that it lives for many years. Its leaves die in the autumn, but the roots survive throughout the winter, allowing the plant to grow back in the spring. Echinacea is hardy and easy to cultivate: it tolerates cold, drought, and other difficult conditions. Once established, it spreads in the garden by seeding itself. If it is planted indoors early, during the winter, it produces beautiful flowers with purple (rose-mauve) petals the following summer.
6. Give each student a flowerpot (clean yogurt, pudding, or other container, pierced with several holes in the bottom).
7. Fill the pots with soil and press it down firmly. Leave the top 2 cm of the pot clear of soil, to make it easier to sow and water the seeds.
8. Give each student three or four echinacea seeds. Have them place the seeds in the centre of the pot and cover them very lightly with soil (1 to 2 mm only).
9. To avoid spills, place the pots on trays. Pour water onto the trays, rather than directly into the pots. The soil will absorb water from the tray through the holes pierced in the bottoms of the containers.
10. Keep the containers in a warm, shaded location until the seeds germinate. The soil should remain moist to the touch, but not soaked. The seeds may take several weeks to sprout.
11. Keep the plantlets in the sun. Echinacea needs lots of light to grow. Keep the soil barely moist. Echinacea doesn't like waterlogged soil.
12. In the spring, transplant the plants outside in the school garden, or give the plants to the students. Echinacea plants make lovely gifts!

## Suggestions

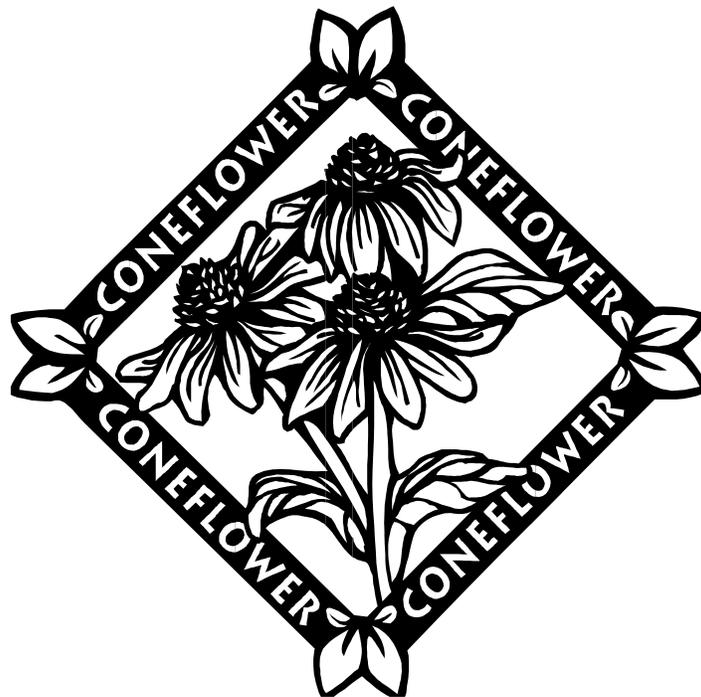
### Observation Journal

Students can create individual journals, or the class as a whole could create a journal to track the progress of the plants. Here is a list of suggested elements that students could observe and note in their journals:

- sowing date
- germination date
- watering (date and quantity)
- growth of plants (measure growth at regular intervals using a ruler or other measuring tool)
- illustrate growth with drawings (germination, first pair of leaves, second pairs of leaves, etc.)
- plant's appearance (healthy, withering, yellowing, etc.)

### Reading and Comprehension Activity on the Purple Coneflower

Students can read the text on purple coneflowers in the Language section and answer the questions.



Name: \_\_\_\_\_

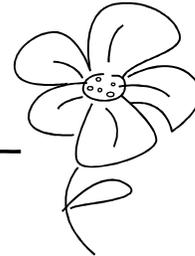
Date: \_\_\_\_\_

## Word Scramble

Put the letters into the correct order.

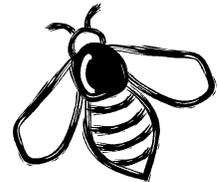
loefrw

\_\_\_\_\_



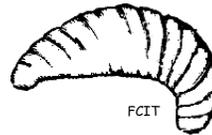
ebe

\_\_\_\_\_



vrlaa

\_\_\_\_\_



ivhe

\_\_\_\_\_



bekeeepr

\_\_\_\_\_



ohnyemcob

\_\_\_\_\_

## Language

# Tell Me a Story

Since a picture is worth a thousand words, this activity is designed to encourage students to write a short story, using a humorous illustration as their starting point.

## Materials

- Tell Me a Story activity sheet
- humorous illustration
- crayons (optional)
- stapler (optional)

## Instructions

1. Give all students a copy of the “Tell Me a Story” activity sheet, as well as a copy of the humorous illustration.
2. Using the elements in the illustration as a starting point, ask students to think up and write a short story on the activity sheet. Remind them to write the title of their story at the top of the page.
3. Students can also colour the illustration and staple it to their story.
4. Ask students to read their stories to the class, or to a smaller group of students. Discuss the similarities and differences between their stories. Although all of the stories used the same illustration as a starting point, none of the stories are identical. Why do they think that is?

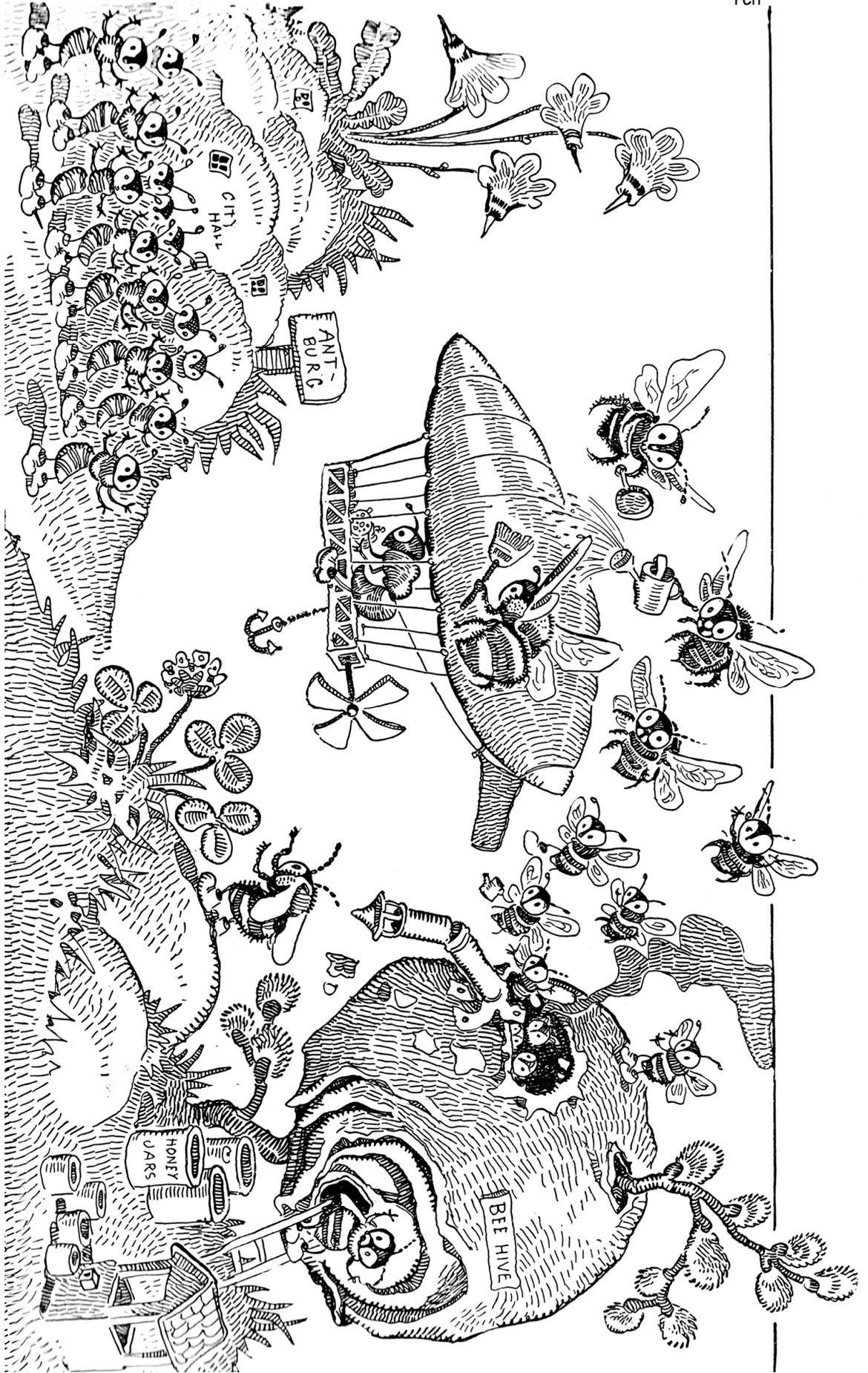
## Suggestions

### 1. **Preschool to Kindergarten Students**

Use the humorous illustration as a colouring page. Ask students to describe what they see. What are the ants and bees doing? More advanced students could write a title at the top of the page, describing the illustration.

### 2. **All Levels**

In books and films, animals often have human or stereotypical characteristics. Hand out copies of the illustration and ask students to identify the human characteristics that have been given to the insects. Ask students if they have seen films or cartoons featuring insects. Discuss realistic and unrealistic ways of describing insects.





Language

# Word Search

(Answers)

W	C	O	L	O	N	Y	H	I	V	E
A	B	D	A	N	C	E	E	E	G	S
T	F	L	Y	I	N	G	R	N	Q	M
E	H	O	N	E	Y	E	I	D	U	O
R	B	E	A	R	K	P	N	R	E	K
L	S	U	N	R	E	E	N	O	E	E
A	W	K	O	E	L	B	E	N	N	J
R	A	W	K	L	M	E	C	E	P	A
V	X	E	O	O	E	G	T	F	U	R
A	E	P	C	E	P	G	A	A	P	E
B	F	L	O	W	E	R	R	N	A	R

**Words to find:**

- |            |        |        |        |
|------------|--------|--------|--------|
| bear       | egg    | jar    | smoke  |
| beekeeping | fan    | larva  | sun    |
| comb       | flying | nectar | water  |
| colony     | flower | pollen | wax    |
| dance      | hive   | pupa   | worker |
| drone      | honey  | queen  |        |

Use the leftover letters to complete the following sentence:

A person raising and caring for honeybees is called a B E E K E E P E R.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Word Search

W	C	O	L	O	N	Y	H	I	V	E
A	B	D	A	N	C	E	E	E	G	S
T	F	L	Y	I	N	G	R	N	Q	M
E	H	O	N	E	Y	E	I	D	U	O
R	B	E	A	R	K	P	N	R	E	K
L	S	U	N	R	E	E	N	O	E	E
A	W	K	O	E	L	B	E	N	N	J
R	A	W	K	L	M	E	C	E	P	A
V	X	E	O	O	E	G	T	F	U	R
A	E	P	C	E	P	G	A	A	P	E
B	F	L	O	W	E	R	R	N	A	R

### Words to find:

bear	drone	hive	pollen	water
beekeeping	egg	honey	pupa	wax
comb	fan	jar	queen	worker
colony	flying	larva	smoke	
dance	flower	nectar	sun	

### Use the leftover letters to complete the sentence:

The person that raises and cares for honeybees is called a

\_\_\_\_\_.

## The Purple Coneflower



Do you know what the purple coneflower is? It is a plant that produces pretty purple flowers. Its centre looks like a porcupine. That's where the flower secretes a sweet liquid called nectar. Some insects, including bees and monarch butterflies, feed on coneflower nectar. So do hummingbirds!

The purple coneflower loves dry, sunny gardens. It doesn't need much attention, and spreads through its seeds. Coneflower seeds can only

germinate in the spring, because they need the cold days of winter to break their dormancy. It is as though the cold wakes them up.

The purple coneflower is a perennial. This means that it lives for several years, and doesn't die in the winter. In the fall, the leaves and stem dry out, but deep in the earth, the roots are still alive. In the spring, new stems grow and the plant comes back to life.

The purple cone flower, also known as *Echinacea purpurea*, is a medicinal plant, which means that it is often grown to make medicines. It can help fight a cold.

## Language

# The Purple Coneflower

(Answers)



1. What does the centre of the purple coneflower look like?

a porcupine

---

2. Name three creatures from the animal kingdom that feed on purple coneflower nectar.

bee, monarch butterfly, hummingbird

---

3. Why do purple coneflower seeds only germinate in the spring?

the cold of winter breaks their dormancy

---



4. What part of the purple coneflower doesn't die in the winter?

the roots

---

5. Why is the purple coneflower grown?

to make medicines

---

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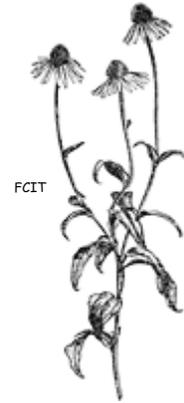
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## The Purple Coneflower

1. What does the centre of the purple coneflower look like?

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2. Name three creatures from the animal kingdom that feed on purple coneflower nectar.

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3. Why do purple coneflower seeds only germinate in the spring?

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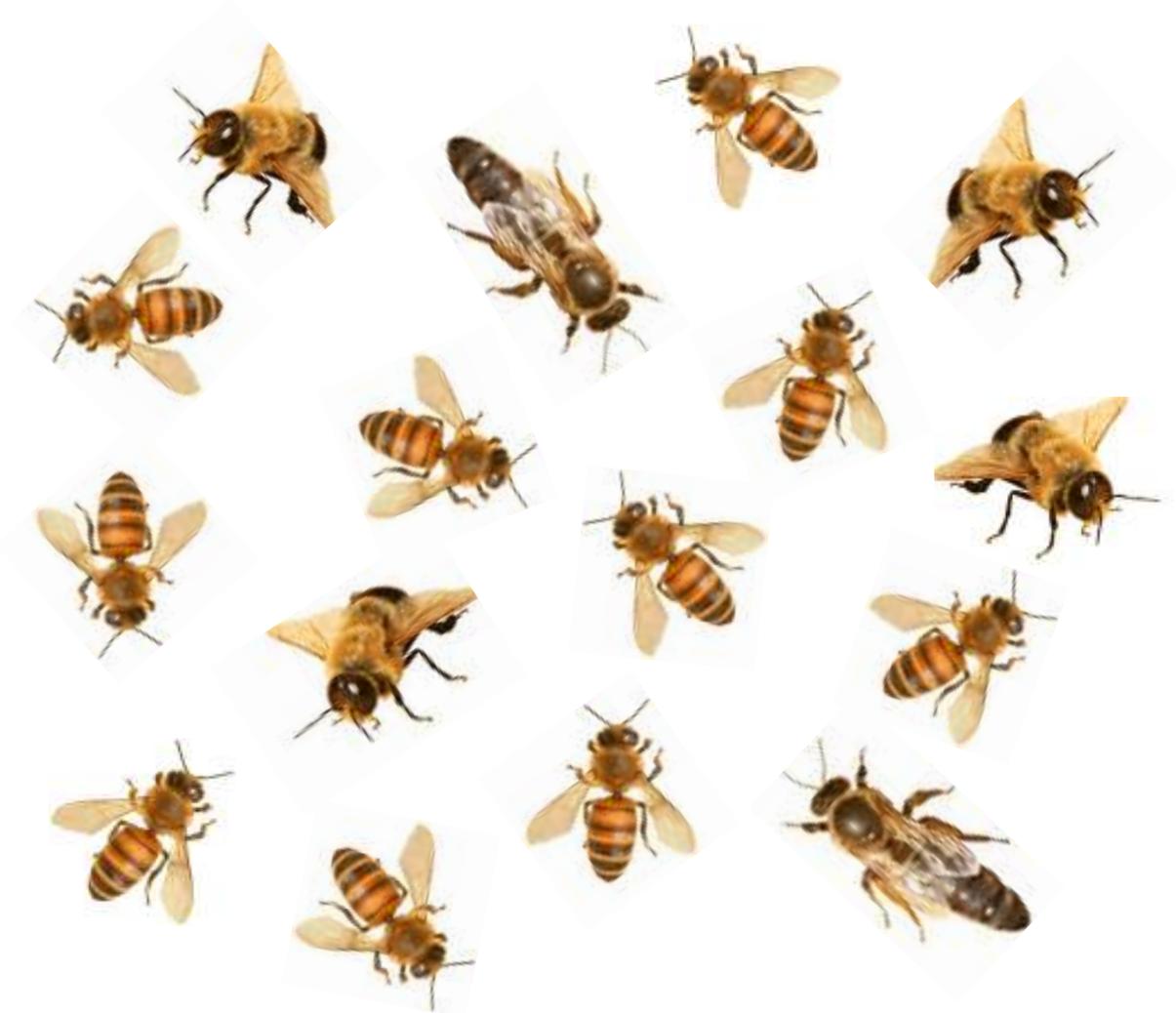
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Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Count the Bees



How many queens are there? \_\_\_\_\_



How many drones are there? \_\_\_\_\_



How many workers are there? \_\_\_\_\_

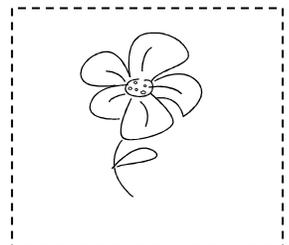
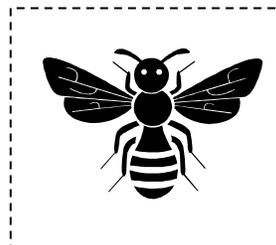
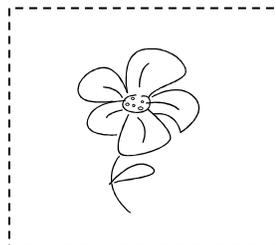
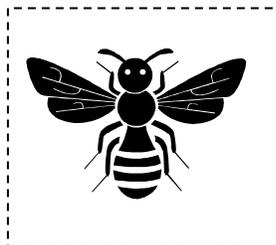
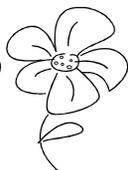
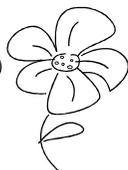
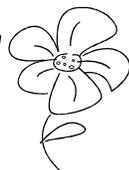
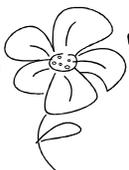
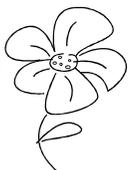
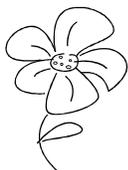
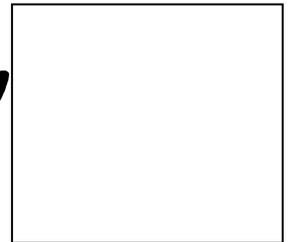
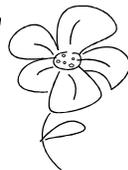
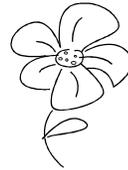
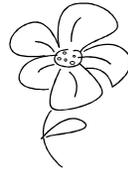
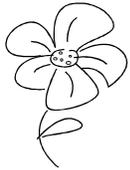
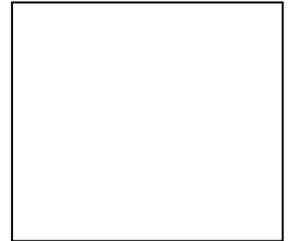
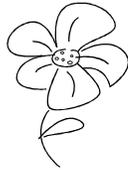
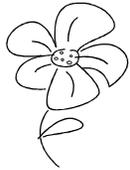


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Date: \_\_\_\_\_

## Complete the Series

Cut out the images at the bottom of the page and glue them in the correct place to complete the series.



Name: \_\_\_\_\_

Date: \_\_\_\_\_

## A Golden Harvest

A beekeeper has harvested six honey supers (boxes). Inside each honey super, there are ten frames of honeycomb.

How many frames are there all together? Show your work.

Seven frames are empty. The bees haven't stored any honey in these frames. How many frames are filled with honey? Show your work.

Mathematics

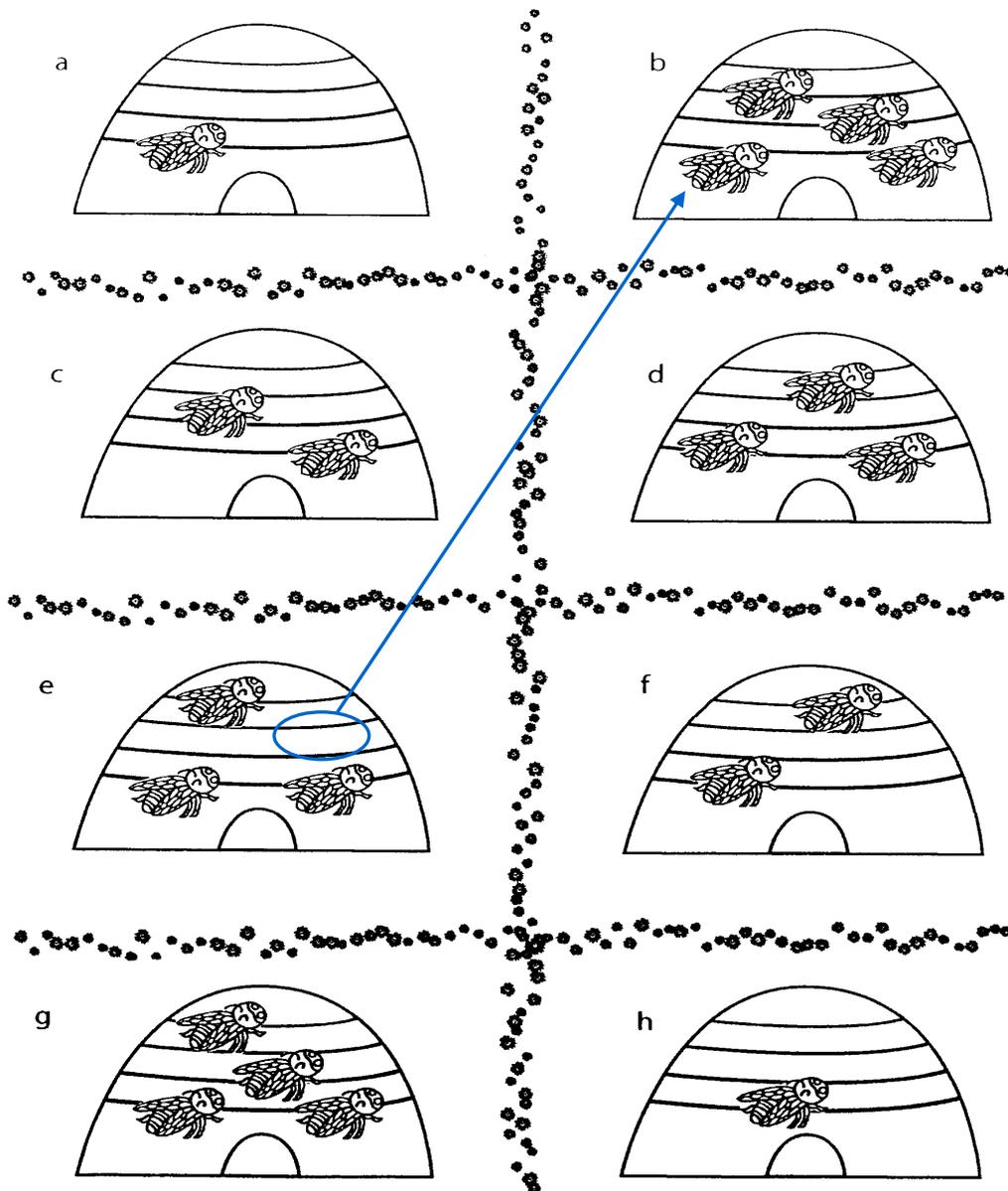
# Bees on the Move

(Answers)

Move one bee from one hive to another so that all rows and columns have the same amount of bees in them.

**Hint:** Each row should have five bees and each column should have ten.

**Answer:** Move one bee from hive (e) to hive (b).

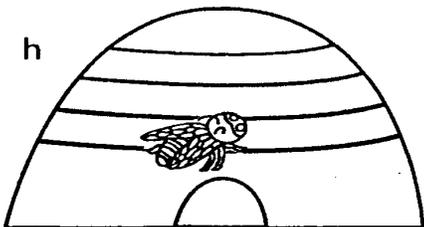
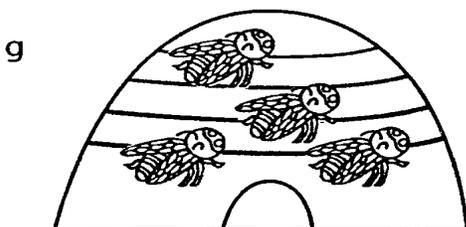
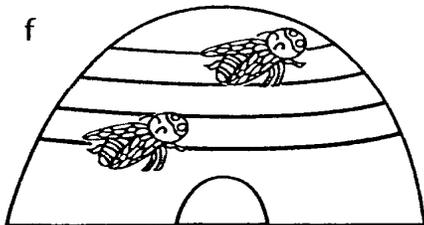
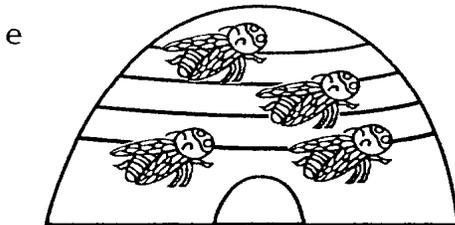
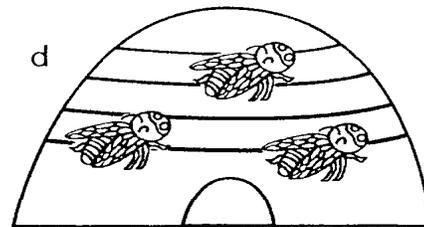
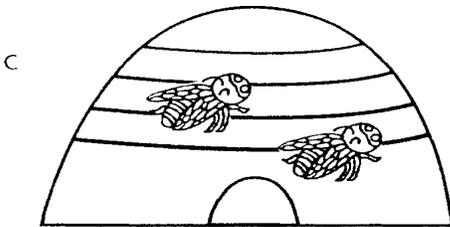
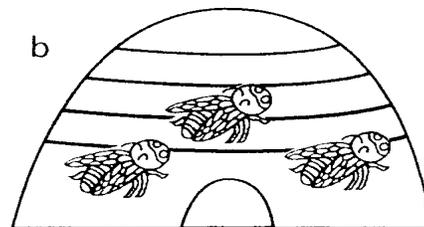
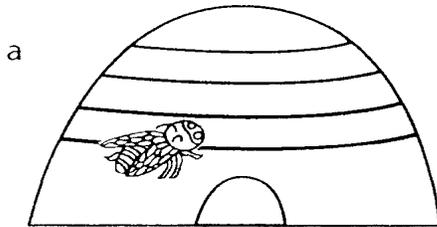


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## Bees on the Move

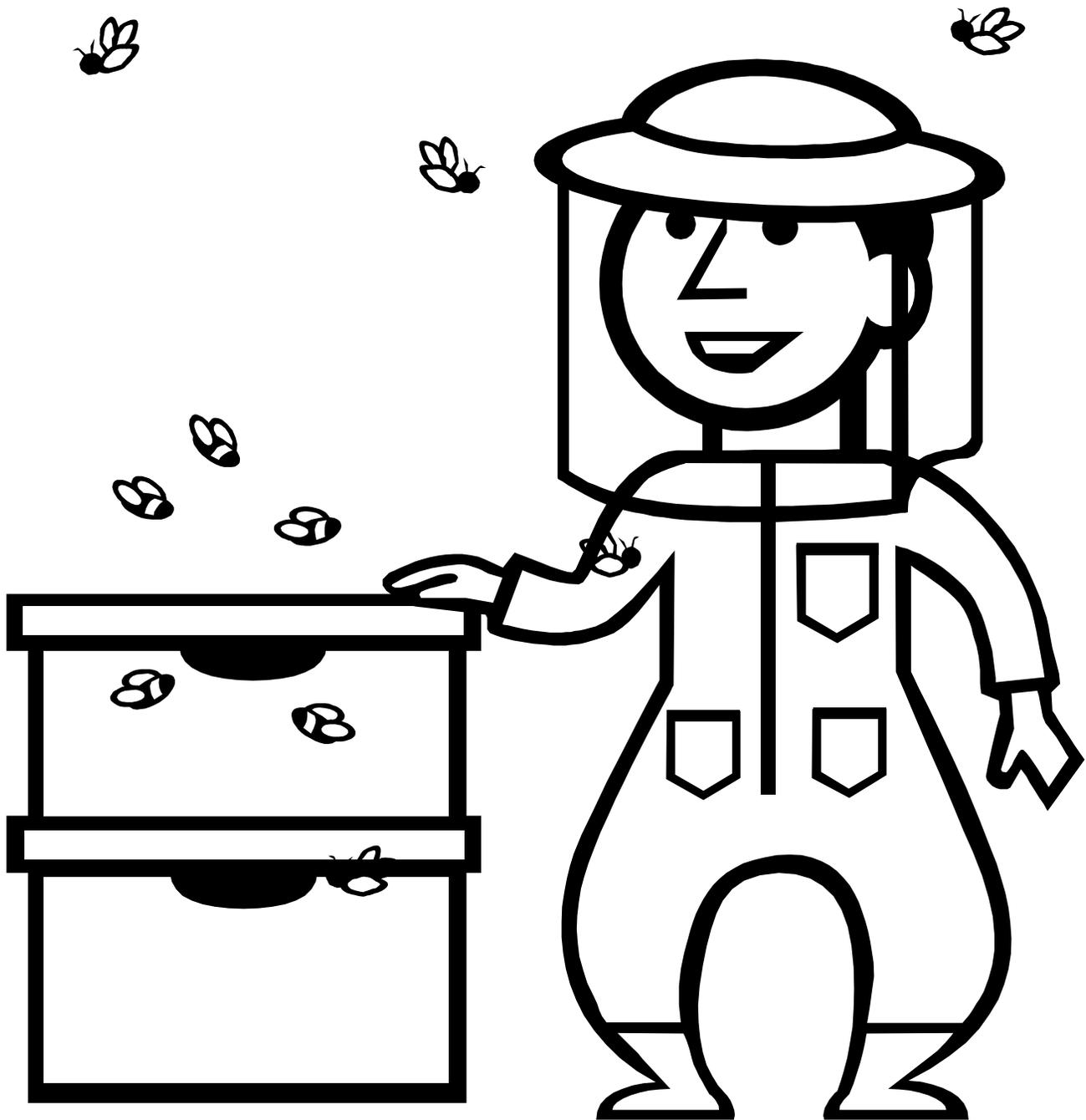
Move one bee from one hive to another so that all rows and columns have the same amount of bees in them.



Name: \_\_\_\_\_

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# The Beekeeper at the Bee Yard



Name: \_\_\_\_\_

Date: \_\_\_\_\_

# Honeybee Pollination

FCT

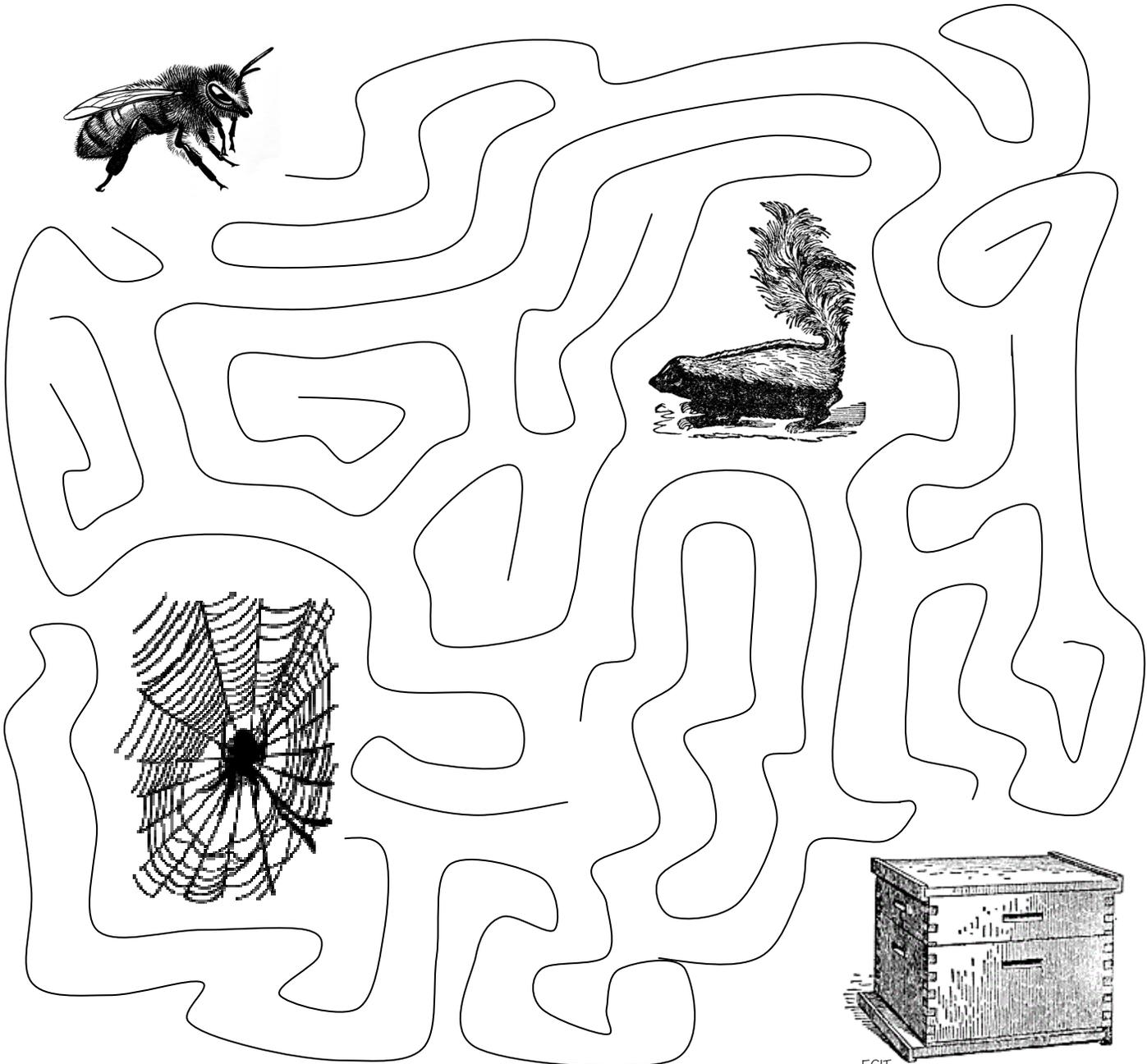


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# Maze

Help the bee find its hive. Watch out for the skunk and the spider!



FCIT

## General Activities



## Bran Honey Muffins



250 ml	boiling water	(1 cup)
250 ml	bran	(1 cup)
50 ml	honey	(¼ cup)
50 ml	canola oil	(¼ cup)
250 ml	raisins	(1 cup)
375 ml	whole wheat flour	(1 ½ cups)
8 ml	baking soda	(1 ½ tsp)
3 ml	salt	(½ tsp)
125 ml	wheat germ	(½ cup)
2	beaten eggs	2
250 ml	buttermilk	(1 cup)

In a bowl, mix boiling water, bran, honey, oil, and raisins, and set aside for 5 minutes. In another bowl, mix flour, baking soda, salt and wheat germ. In a third bowl, mix eggs and buttermilk. Add the flour mixture to the water mixture and then add egg and buttermilk mixture. Fill greased muffin tins 2/3 full.

Bake at 175°C (350°F) for 25 minutes.

Makes 12 muffins

## General Activities

# Honey Lip Balm

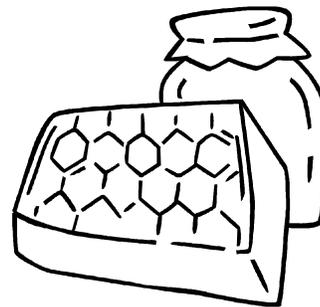
Discuss beehive products and by-products with your students. Explain that honey contains antibiotic elements that inhibit the growth of bacteria. Throughout history, honey has been used to heal throat infections, colds, skin and stomach ulcers, and intestinal disorders. Because of its healing properties, we can now find honey in many pharmaceutical products. Beeswax is secreted by the wax glands of honeybees and used to build combs. When combs are damaged or too old, beekeepers melt them. They sell the wax or build new foundations. Beeswax can be found in beauty products of all kinds. Honey and beeswax are excellent at healing dry winter lips. Make this lip balm recipe with your students in class.

15 ml	grated beeswax	1 tbs
10 ml	almond oil	2 tsp
5 ml	honey	1 tsp
12 drops	essential oil (orange, mint, lavender, etc.)	12 drops

## Preparation

1. In a double boiler, melt the beeswax, almond oil, and honey.
2. Remove from heat and add essential oil.
3. Pour liquid into small containers and let cool.

To make more lip balm, double or triple the recipe.





© Peter Buwalda

The foraging bee sees ultraviolet light reflected on the petals of a flower. It tells her where the nectar is.



© Peter Buwalda

The bee lands on the flower. She sucks the nectar droplets and stores them in her honey sac.



© Peter Buwalda

When she is full, the foraging bee flies back to the hive. Inside her honey sac, the nectar begins to turn into honey.



© Peter Buwalda

Inside the hive, the foraging bee regurgitates the nectar and passes it to a hive bee.



The hive bees deposit small droplets of nectar on the honeycomb walls.

Hive bees fan their wings over the honeycomb. Water evaporates out of the nectar.

© Peter Buwalda



© Peter Buwalda

When the cell is full and the honey is ripe, hive bees seal the cell with a thin layer of wax. The wax prevents the honey from absorbing water from the surrounding air and spoiling.

## Bug Farming

**Silkworm Moth** (This form of insect-rearing does not exist in Canada—it occurs primarily in China, Japan, and France)

The silkworm moth (*Bombyx mori*) is a domesticated moth raised to produce silk. Its caterpillar, the silkworm, produces a large amount of syrupy fluid that, when it hardens, transforms into a silk filament. The caterpillar uses this thread to weave a cocoon. The raising of caterpillars for the production of silk fibre is called sericulture.

To get the silk, you must first kill the caterpillars (chrysalids) without damaging the cocoons. The cocoons are suffocated, then soaked in boiling water to soften them. Each cocoon produces a thread called a bave. The ends of several baves are joined together to form a thread. This is how the cocoons are unwound.

Silk is extremely soft to the touch, light, supple, lustrous, and absorbent. It protects against cold and heat, is elastic, and keeps its shape well.

### Bumblebee

Bumblebees are excellent pollinators. They like to forage near their nests, they work quickly, and are not afraid to forage in confined spaces. This is why they are useful in greenhouses. Their large bodies allow them to harvest a great deal of pollen.

Bumblebees are raised for the pollination of crops in greenhouses and fields. Their hives have four sections, each containing a small colony of bumblebees.

### Alfalfa Leafcutter Bee

This solitary bee is raised for the pollination of alfalfa and the resulting production of seeds. Dairy cattle that feed on alfalfa produce more milk than with any other forage crop. To cultivate alfalfa, dairy farmers must first buy seeds.

The cocoons or pupae (intermediate stage between the larva and adult) of the bee are placed in alfalfa fields. The bees that emerge begin immediately to pollinate the alfalfa that surrounds them.

### Ladybug

Used by gardeners as a form of biological warfare against plant pests such as aphids and cochineals, ladybugs can effectively replace certain pesticides.

Ladybugs are sold in specialty garden stores, or by mail. Ladybugs are generally sent through the post in their larval stage.

**Trichogramma**

This tiny (0.5mm) stingless wasp is used to fight certain species of moth pests such as the corn borer moth, which in its caterpillar stage destroys corn stalks. Trichogrammas are also used to fight against the cabbage white moth (a small white moth with black spots on its wings).

The female trichogramma lays its eggs on the eggs of the pest moths. The larvae of the trichogramma then feed on the contents of the pest's eggs.

Trichogrammas are raised industrially in biofactories and placed in cold rooms for several months. They are sold and released as soon as moth pests begin appearing among crops.

**Cricket**

Crickets are raised to feed insectivorous animals, such as reptiles, trapdoor spiders and scorpions. They are raised in tubs and are sold in pet shops or by mail. They are also used as fishing lures.

Crickets are also raised for human consumption, even in Canada (the Insectarium in Montreal offers tastings). Crickets are rich in protein and taste like hazelnuts.

**The Grasshopper and the Locust**

Like crickets, these insects are raised to feed pets (reptiles, scorpions, tarantulas, and praying mantises), but also serve as food for millions of human beings. Grasshoppers and locusts are the most highly consumed insects in the world. They are collected primarily in the wild, but they are also raised on a semi-industrial basis. In Africa and the Middle East, the dry season frequently brings invasions of migrating locusts, which ravage cereal crops. These insects are an abundant food resource, often helping populations in these regions to survive famine. Grasshoppers and locusts are also considered delicacies in several parts of the world, including Canada.

**Some other insects raised by people:**

- praying mantis (pet)
- cockroach (pet food, human consumption, and laboratory research for the development of insecticides)
- mealworm (pet food, composting, and human consumption)
- fly (pet food)
- stick insect (pet)
- Mediterranean fruit fly (raised by the millions, the flies are sterilized then released into nature, where they mate with wild flies, thus preventing them from reproducing)
- *Hymenoptera Spalangia* and *Hymenoptera Muscidifurax* (small wasps that lay their eggs on the pupae of houseflies, helping to control the numbers of flies in barns).

## Silkworm Moth (*Bombix mori*)



These silkworm caterpillars are spinning their cocoons.



Silkworm moth, cocoon, and caterpillar

## Bumblebee



This bumblebee hive has four sections. Each one contains a small colony of bees.





**Alfalfa Leafcutter Bee**



Saskatchewan Archives Board

Thousands of alfalfa leafcutter bee pupae have been put in this shed.



Saskatchewan Archives Board

Each cocoon contains an alfalfa leafcutter bee pupa, the stage between larva and adult bee.

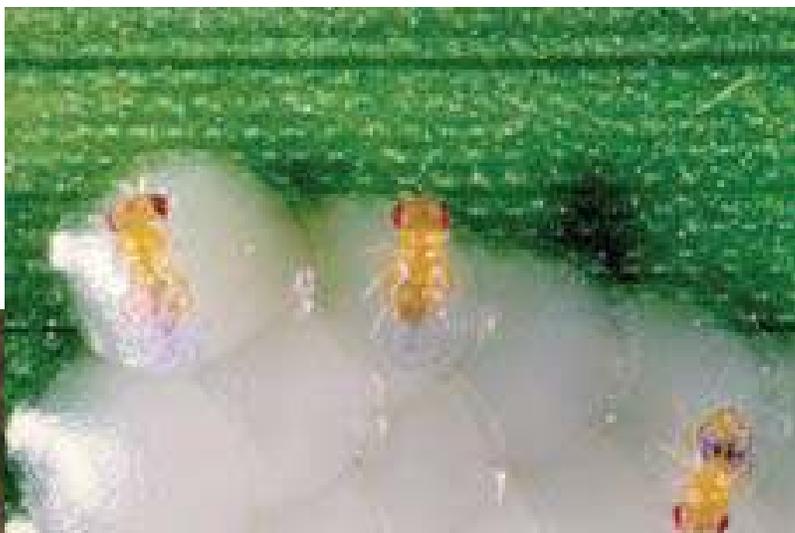
## Ladybug



The ladybug is an insectivore, which means that it feeds on insects. It is particularly fond of aphids and can eat as many as 100 in a single day. Aphids are small pest insects that feed on plant sap.

## Trichogramma Wasps

The female wasps lay their eggs inside the corn borer's eggs.



S. Dupuis, Para-Bio



A. Pelletier, Maelström créatif

Trichogramma wasps are distributed to farmers as eggs. Each card has more than 8,000 eggs on it.

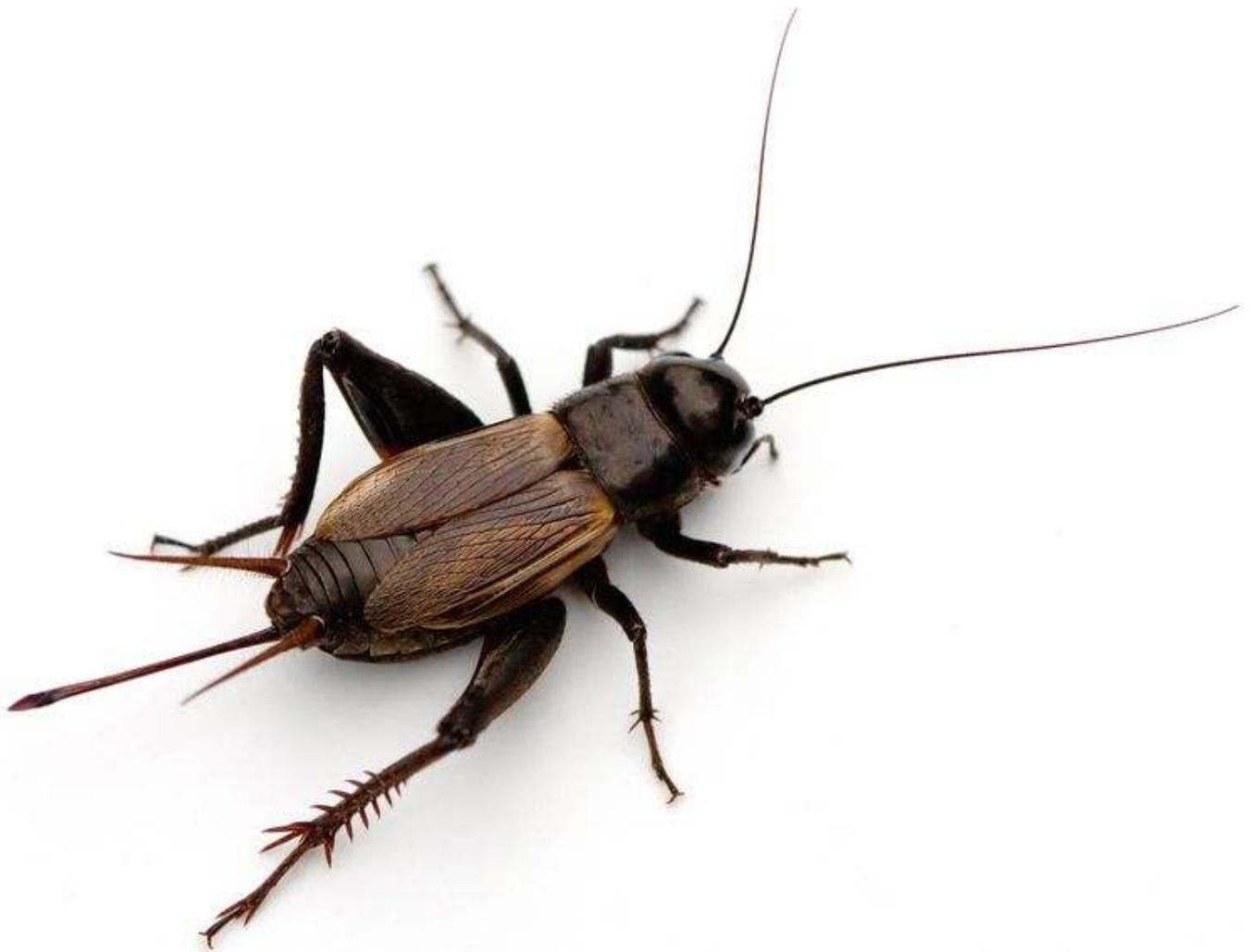


S. Dupuis, Para-Bio

<http://www.parabio.ca/brochure.pdf>

Set directly on the corn plants, the cards are distributed evenly across the corn field.

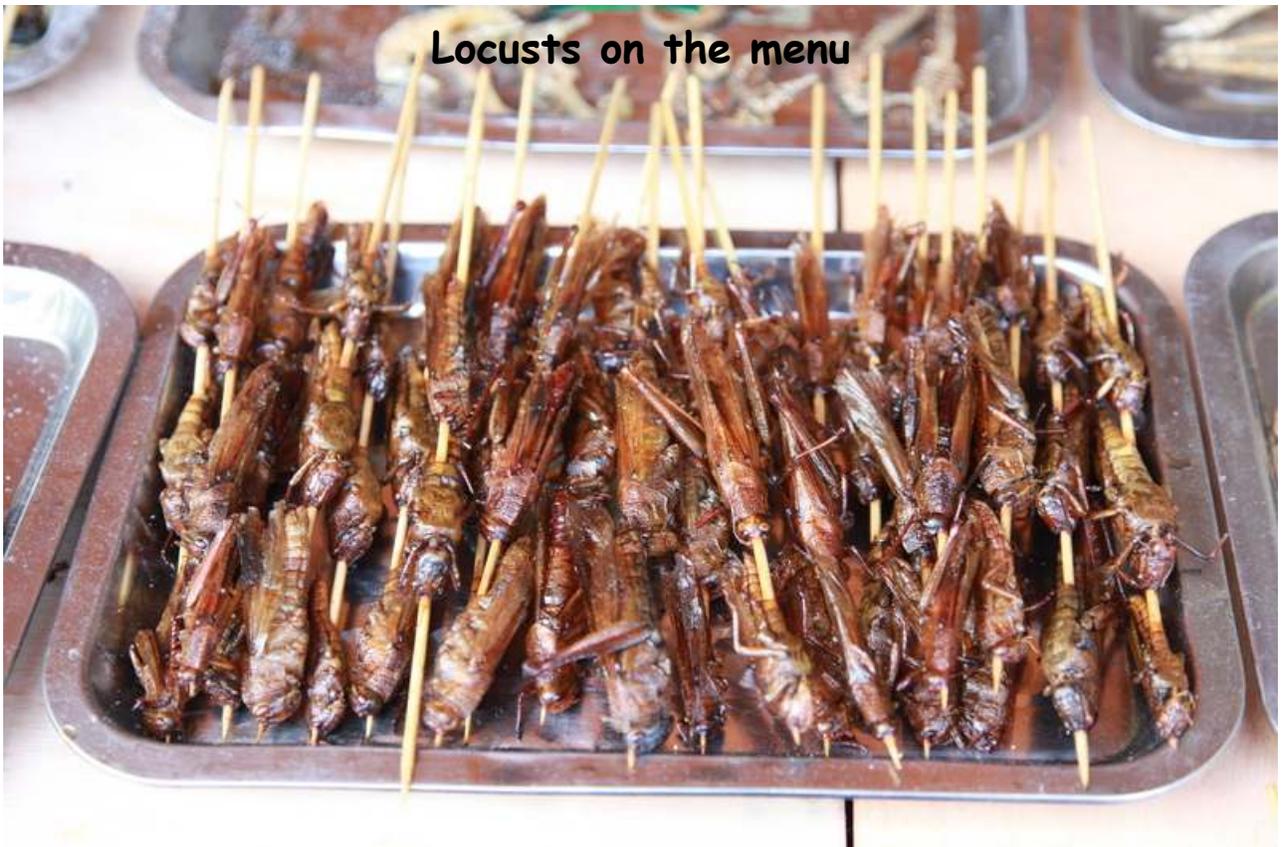
## Cricket



**Grasshopper**



**Locusts on the menu**



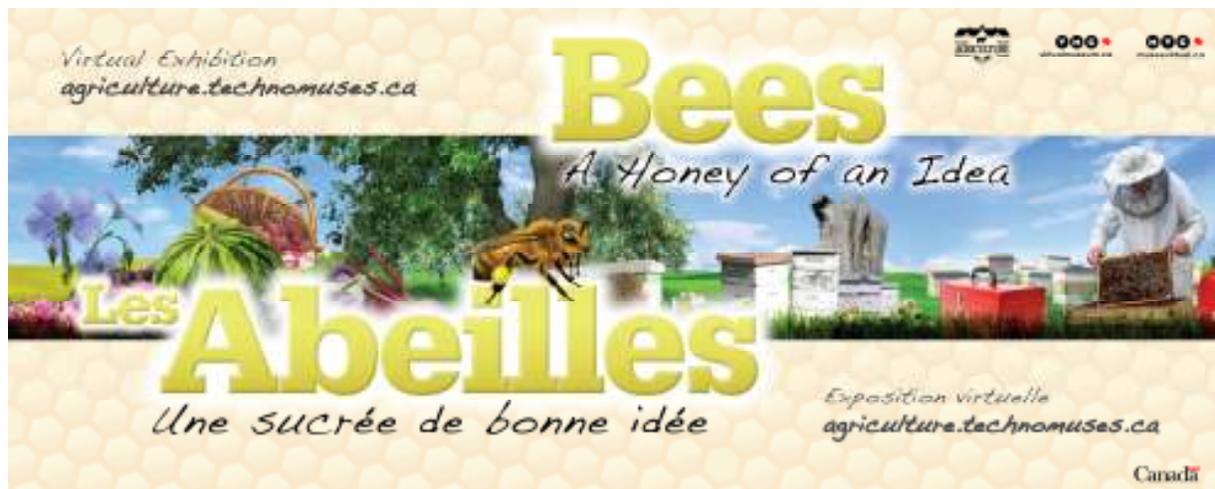
## Vocabulary List

bee dance	egg	nectar
beekeeper	extractor	pollination
beekeeping	fanning	pollen
beeswax	filter	pupa
bee yard	foundation	queen
brood	foraging	reproduction
cell	frame	smoker
centrifugal force	guard bee	super
colony	hive	uncapping knife
cooperation	honeycomb	worker bee
drone	larva	

## Additional Resources

For additional activities on farm animals, agricultural plants and nutrition, please visit the Museum's website, at [agriculture.technomuses.ca](http://agriculture.technomuses.ca). The Educational Activity Kits can be found in the School Programs section. They are free and available in both official languages. They contain a variety of activities related to science and technology, language, mathematics, social studies, as well as health and physical education.

**Bees: A Honey of an Idea** is an online exhibition exploring the essential role bees play in the pollination of many Canadian food crops. Visit [agriculture.technomuses.ca/english/bees/default.php](http://agriculture.technomuses.ca/english/bees/default.php).



FCIT Clipart is a courtesy of Florida Center for Instructional Technology at <http://etc.usf.edu/clipart>

## Fun Facts

- A single honeybee makes 0.8 g (1/10 tsp) of honey in its lifetime.
- Bees contribute not only to the increased production of fruits and vegetables (crop pollination), but also to their size.
- A honeybee flies at a maximum speed of 24 km/h and its wings beat 200 times per second, or 12,000 times per minute.
- The colour and taste of honey varies, depending on the flowers (the source of nectar) visited by the bees.
- The average lifespan of a honeybee during the working season is about six weeks.
- In the summer, a colony of honeybees contains 50,000 to 80,000 bees.
- The average Canadian consumes 1 kg of honey a year.
- Bees have four wings.
- As native pollinators continue to disappear, the production of many everyday foods depends more and more on honeybees.
- Honeybees must visit about 4 million flowers to produce 1 kg of honey.
- The individual cells of a honeycomb have six sides.
- Bees have been producing honey from flowers for about 10 to 20 million years.
- The bulging eyes of the drones help them to spot the queen.
- In Canada, the value of fruits, vegetables, and legumes from plants pollinated by bees is more than ten times the value of honey production.
- There are nearly 11,000 beekeepers in Canada.
- Each time a honeybee leaves the hive to seek food, it visits 50 to 100 flowers.
- Mead is the name for wine produced from fermented honey.
- A single colony of honeybees is enough to pollinate an entire acre of fruit trees.
- Alberta, Saskatchewan, and Manitoba are the Canadian provinces that produce the most honey.
- There are no African honeybees in Canada.
- Honeybees are responsible for the pollination of a third of Canada's food-producing crops.