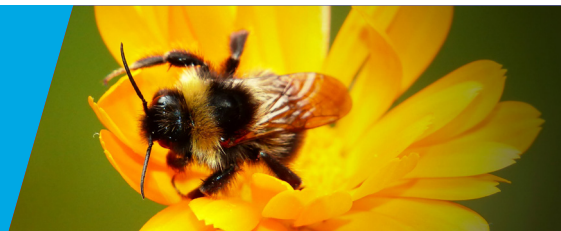


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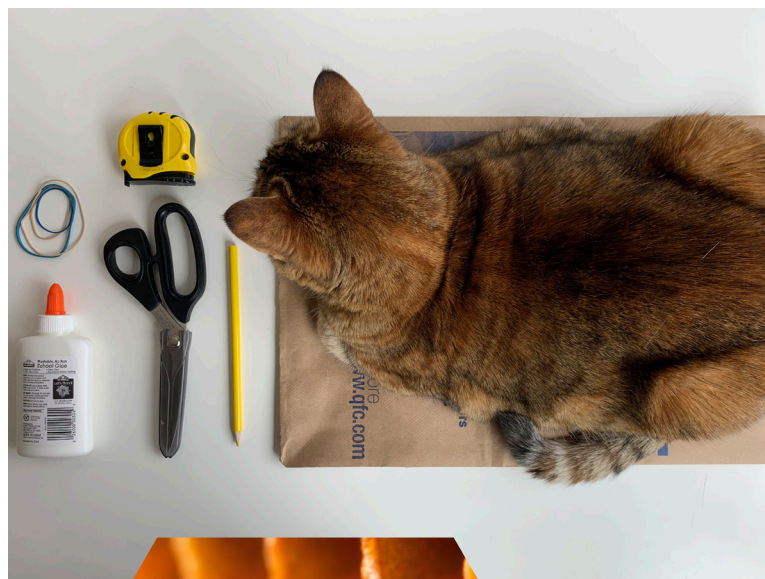
## BEE HOTEL



*Not all bees live together in hives. Some wild bees, like mason and leafcutter bees, are solitary bees. Most solitary bees nest either in the ground or in holes in hollow reeds or logs. These gentle bees carry pollen loose and dry on their hairy bellies, which makes them effective pollinators. Learn how to make a bee hotel to provide a nesting habitat for these important pollinators.*

### MATERIALS

- Paper grocery bags or recycled paper
- Scissors (or utility knife with adult supervision)
- Ruler or tape measure
- Non-toxic liquid glue
- Damp cloth for sticky fingers
- Washable workspace
- Round pencil, skinny marker, round skewer, chopstick, or wooden dowel (approximately 4–8 mm in diameter and more than 7" long)
- Round plastic or metal container, like a large plastic bottle, coffee can or piece of PVC pipe (at least 9" long at the widest part)
- String
- **Optional:**
  - Rubber band
  - Clay
  - Stapler
  - Binder clips or clothes pins
  - Felt tip marker
  - Hollow reeds or pithy-centered stems, (12 mm in diameter or less)



(Cat not included)



*Experiment continued on next page...*



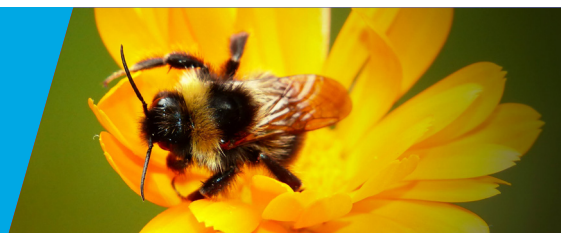
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# CURIOSITY AT HOME

## BEE HOTEL



### PROCEDURE



#### Make Bee Tubes:

- Cut paper bag into long strips, approximately 7 inches wide and 14 inches long.
- Place your paper in the portrait position. Apply a line of glue along the top edge of your paper. Place the pencil or wooden dowel along the very bottom of the paper, and use it to help you roll the paper up into a tube. As you roll upwards, use your fingers to keep the paper tightly wrapped around the pencil or wooden dowel.
  - **TIP:** To create a tighter roll, try folding the bottom of your paper over the pencil or wooden dowel first, using your finger to tightly wrap the paper around the pencil or wooden dowel. Then slowly roll towards the glue line.
  - What other techniques can help you to make a tighter and sturdier rolled tube?
- Once you reach the glue line, press it across firmly to make a seal. Wipe any excess glue along the seam to make a smooth seal. Carefully slide out the pencil or wooden dowel from the middle of the rolled tube.
  - **TIP:** Use rubber bands to secure the rolled tube while glue dries.
- Make several more bee tubes, enough to fit snugly in your plastic or metal container.
- Once all tubes are completely dry, plug one end of the tube using clay or densely packed paper, or pinch and glue or staple one end completely closed.
  - **TIP:** If using glue, use binder clips or clothes pins to securely clamp tube end while glue dries.
- Trim the open ends so that tubes are of varied length, ranging between 6 to 7 inches long.



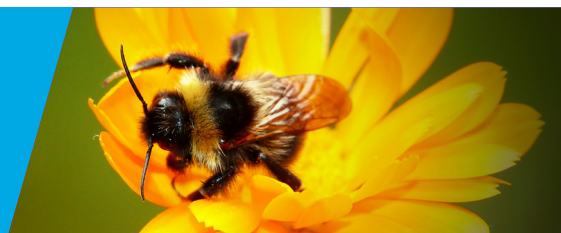
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## BEE HOTEL

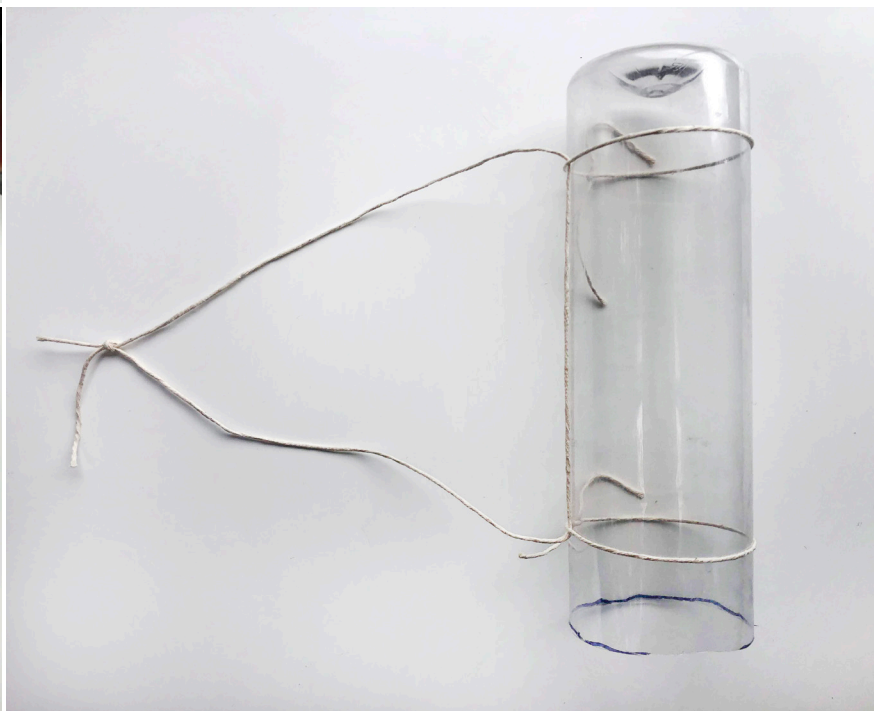


### PROCEDURE *continued...*



#### Make Bee Hotel Shelter:

- Get an adult to help. If using a plastic water or soda bottle, measure at least 9" from the bottom (or approximately 2" longer than your longest bee tube). Draw a line all the way around the plastic bottle using a felt tip pen or a marker at the appropriate height. Use a utility knife or scissors to cut the top off of the bottle.
- Tie two pieces of string snugly around top and bottom of your container. Thread a third, longer piece of string under the string loops at top and bottom. Tie both ends of the third string together, forming a longer loop. This will be used to hang your bee hotel.
- What other designs and materials can you use to hang or mount your bee hotel shelter?



*Experiment continued on next page...*



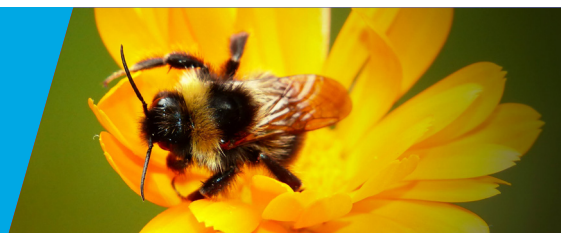
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## BEE HOTEL



### PROCEDURE *continued...*

#### Make Bee Hotel Shelter:

- Arrange your bee tubes in a bundle. Try to put tubes with different lengths next to each other in an irregular pattern. This irregular pattern of tube lengths helps future bee guests find the correct “door” back to their individual nesting tube. Secure the bundle with string or rubber band.
- Place bee tube bundle in container, with open ends facing out. There should be about 2–3 inches of overhanging between the shelter container and your bee nesting tubes. Use sticks and twigs to fill any large gaps around the outside edges.
  - **TIP:** You can also use hollow reeds or pithy-centered stems for natural bee nest tubes, or as filler material in your bee hotel. Blackberry stems, goldenrod stems, elderberry stems, lake reed, and sumac twigs all can be used to make suitable nesting material.
  - What other techniques can help you to make a tighter and sturdier rolled tube?



*Experiment continued on next page...*



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## BEE HOTEL



### PROCEDURE *continued...*

#### Hang Bee Hotel:

- Find a place in your yard or garden area to hang your bee hotel in the spring or early summer. The ideal location to hang your bee hotel is at or above eye-level, preferably under an eave of your house, garage, shed or some other shelter to protect it from rain and wind. Try to position your hotel so that the nest entrance faces south or southeast. Morning sun exposure helps bees warm up in the morning and encourages them to start foraging earlier in the day.
- Observe your bee hotel over several weeks. Do you see any nest holes that look closed or plugged up with mud or grass? That means your hotel is occupied! What other bee activity do you notice near your bee hotel? Where else do you see bees near your home and in your neighborhood?



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## BEE HOTEL



### TRY THIS

- Make a bee watering station to include next to your bee hotel. Fill a shallow dish or pie pan about halfway up with water. Place several small rocks or stones in the dish to give bees a dry place to land while they drink (make sure that the rocks are not fully covered with water). Replace water every 5-7 days to discourage the growth of water-bred insect larvae, such as mosquitoes. Do you notice any bees using your watering station? What bee behavior do you observe?
- Learn how to maintain your bee hotel so that your guests stay safe and healthy throughout the year. In the winter, carefully store your bee hotel in a cool, covered place like a garage or shed so that bee cocoons stay dry and safe from predators. In the late winter/early spring, when new adult bees are ready to emerge, place your bee hotel in an “emergence box” (a box or plastic bin with a half-inch diameter exit hole cut into one side). Set up a new bee hotel nearby. Observe bees emerge, exit, and take up residence in a new, clean nest. When the bees finish emerging, clean the old hotel for future use for next year. Replace paper tubes to keep future bees safe from bee pests and disease. To learn more about native bees and how to care for your bee hotel, check out the website [Crown Bees](#).
- Learn more about native bees and help document native bee populations in your area. Join community science projects like [Bumble Bee Watch](#) and [Bee Blitz](#) to help track the health of local bee populations.



### DID YOU KNOW?

In the wild, native hole-nesting bees nest in standing dead trees, fallen logs, and the ends of broken bushes or grasses. Female hole-nesting bees build a series of cells in which a single egg is laid. Females leave each cell the perfect amount of pollen and nectar to sustain their young until the following year. Each egg transitions to a larva, a pupa, and then an adult inside of their cell, at which point they emerge and begin the cycle again. Solitary hole-nesting bees rarely sting and are generally safe for families and pets.

Several types of beneficial wasps, such as grass-carrying wasps, mud wasps and aphid-hunting wasps, also build solitary nests and sometimes frequent bee hotels. These gentle guests help reduce the numbers of some pest insects that feed on cultivated plants. While less fuzzy than bees, many wasps also help pollinate plants.



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## BEE HOTEL



### K-2 GRADE EXPLORATION

Here are some questions you can explore together.

- Check on your bee hotel after one week. What do you notice?  
Do you see any signs of insect guests in or around your bee hotel?  
Do you notice any nesting holes that are plugged up? What material do you think the bee may have used to fill the hole? What do you notice that makes you think that?
- Look closely at a bee near your bee hotel or in nature. What does it look like its doing? Can you tell where the bee's mouth and eyes are? Which parts of the bee's body or legs look fuzzy? Do you see any evidence of pollen (yellowish powder) on the bee's body or legs? What else do you notice?
- Can you find two bees that look different from each other? What do you notice that looks different? What looks the same? Draw a picture of the bees in your science notebook.
- What things make you feel safe and comfortable in your home? What do you think bees need to feel safe? What are some things that both humans and bees need to be healthy and safe? Are there any special things that bees need?



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## BEE HOTEL



### 3–5 GRADE EXPLORATION

- Check on your bee hotel after one week. Do you see any signs of insect guests in or around your bee hotel? Which nesting holes look like they are occupied? Do you notice any filled in or plugged openings? What materials do you think were used to make these plugs? What do you notice that makes you think that? What else do you notice?
- Record your observations using drawing and/or words in the box below, or in your science notebook. Check back each week, preferably over several months and record your new observations. Be sure to include the date so you can keep track of how activity at your bee hotel changes over time.

<b>Date:</b>	<b>Date:</b>
<b>Date:</b>	<b>Date:</b>

- Look closely at a bee or wasp near your bee hotel or in nature. What shape is the bee's body? How big are its wings compared to the rest of its body? What colors or patterns do you notice? Is its body fuzzy or smooth? Do you see any evidence of pollen on its body? What else do you notice? Record your observations using drawing and/or words in your science notebook.



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## BEE HOTEL



### 6–8 GRADE EXPLORATION

- Different wild bees and beneficial wasps prefer different sized nesting tubes. Test to see which sizes the wild bees and beneficial wasps in your area prefer.
- To set up your experiment, create three sets of bee nest tubes, each with a different diameter. Make at least five nest tubes for each same-sized set. Get creative with what kind of round, skinny objects you can use to form your bee tubes!
- Record the chosen diameter of each set in your test

Set A: \_\_\_\_\_ mm diameter

Set B: \_\_\_\_\_ mm diameter

Set C: \_\_\_\_\_ mm diameter

- Observe your bee hotel over one month. Which nest tubes appear occupied or plugged? Use the table below to record your observations.
- Different species of bees and wasps use different materials and techniques to create nest plugs. Do you notice any differences in the appearance of the nest plugs? Include those observations in your data chart.

*Experiment continued on next page...*



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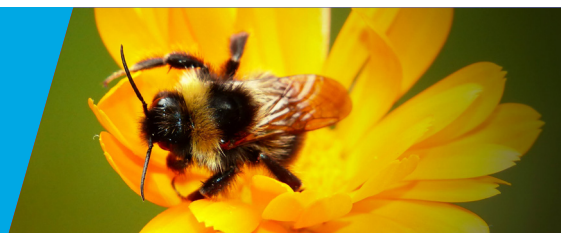
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## BEE HOTEL



### 6–8 GRADE EXPLORATION *continued...*

Nest Tube Size	Occupied? (Y/N)	Other Observations
Set A, Tube 1		
Set A, Tube 2		
Set A, Tube 3		
Set A, Tube 4		
Set A, Tube 5		
Set B, Tube 1		
Set B, Tube 2		
Set B, Tube 3		
Set B, Tube 4		
Set B, Tube 5		
Set C, Tube 1		
Set C, Tube 2		
Set C, Tube 3		
Set C, Tube 4		
Set C, Tube 5		

- What did you notice from your data? Were some nest tube sizes preferred over others? Do you notice any correlation between the diameter of the nesting hole and the style of nest plug?
- Scientists are still trying to figure out how to improve bee hotel design. Do certain colors attract bees to nesting holes better than others? Will hole-nesting bees nest in hollow tubes completely open on both ends? Do some bees prefer different nesting materials over others? Design your own experiment to test **one variable** that might improve your artificial bee-nesting habitat.



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