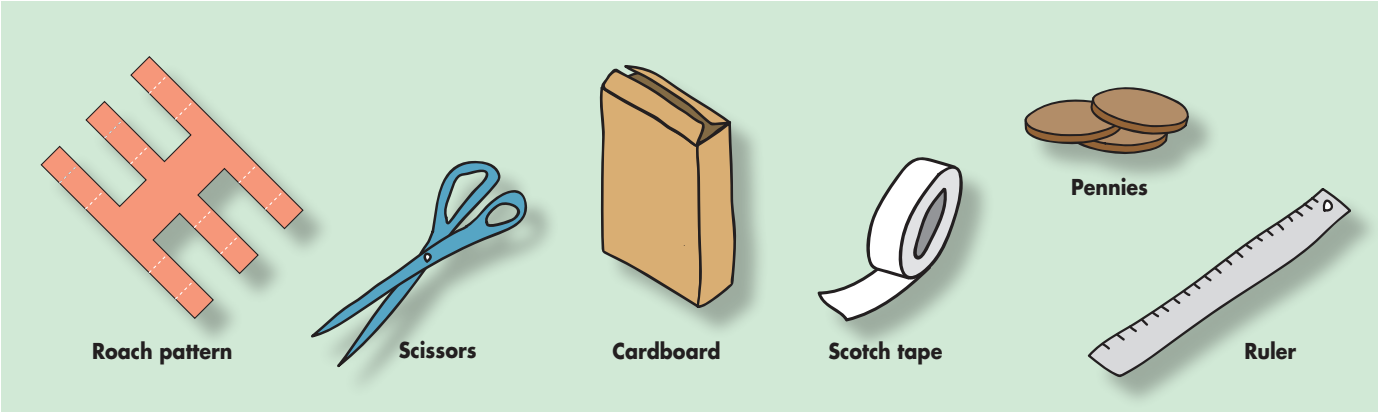
Jumping Roaches!

Check out the video for this activity on the Latest Updates page

Important:
This experiment should only be done with adult supervision. You will need to use a sharp scissors.

Find What You Need..

- Roach patterns
- Scissors
- Empty cereal box, or other cardboard that's equally thick
- Scotch tape
- A few pennies
- Ruler
- One adult for step 4 below



Why would scientists model a robot on a *roach?*

No, the answer is not to gross everyone out! Roaches may not be popular, but they can do incredible things. They run super-fast over all kinds of surfaces – even upside down – and can squeeze into tiny cracks. Small, quick "roach-bots" could go places that people can't: into burning buildings to fight fires, for example, or inside piles of rubble to look for earthquake survivors.

Creating a robot that runs like a roach is not an easy task. For example: How could a robot walk on bumpy surfaces without tripping and doing a face plant? One way is for robots to sense the ground, then plan where to step. But that would take a lot of both time and computing power. Instead, scientists could create springy robots that are more likely to bounce off of obstacles than to trip over them.

In this activity you'll use our template to make a springy robot, then experiment to make it even springier.

Fact:
Robot scientists are also working on tiny robots that fly like flies. One use for these: Fly spies!

Activity Instructions

1. Print out the Roach pattern. Cut a rectangle around the orange area (don't cut out the "legs" yet).

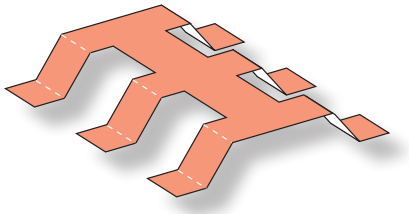
   Tip: If you haven't watched the video on the Bio-Inspired Designs "Latest Updates" page, check it out to see how a hopping roach is made.

2. Choose which side of the cardboard you want for the top of your roach. Tape the pattern onto that side and cut a rectangle around it. Remove the pattern.

3. Draw the "score top" lines onto the cardboard, using a ruler and a pencil. Flip the robot over and draw the "score bottom" lines.

4. Get your grownup! Ask them to use the scissors' blade to lightly score the cardboard where you drew the lines. (Score means to run the sharp edges of a scissors along the cardboard without cutting all the way through it.)

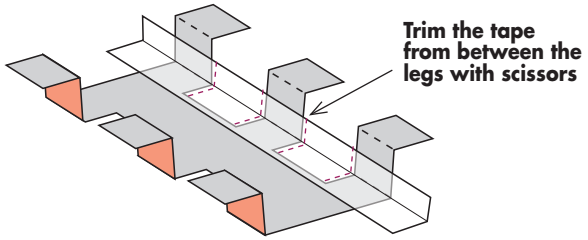
5. Tape your pattern back on and cut out the legs. Remove the pattern. Bend the roach "hips" downward and the "feet" out so the roach looks something like this.



6. Drop or toss your roach lightly on a hard floor or table. Does it bounce at all?

7. Make your roach bouncier. Tape a penny onto the middle of the roach's back (see illustration on page 3). Does the hopping performance improve?

8. Now, see if you can make your roach bounce even higher. Try flipping your roach and reinforcing the bottom of the hip joint: Press tape firmly along the bottom of the hip joint, keeping the legs at 90 degrees. If the tape is tight, it will help your roach robot jump higher! Then, trim the tape from between the legs. How's the hop?



9. Keep experimenting to get your roach bouncing higher or farther. Here are some things that might – or might not – help:
   - add more pennies
   - change the position of the pennies: move them more towards the front or back of the roach. Spread them around or stack them. Try taping them underneath the roach robot.

     Tip: Some penny positions could make your roach do a flip!
   - change the angle of the legs
   - practice tossing or dropping the roach in different ways

10. How far will you go in your quest for the jumpiest roach? Choose one of the designs on the Try Other Roach Templates page. Make it as you did your first roach, then make it jump! (Note: We haven't tested these. We'd love to know how they work!

11. When you've made your bounciest roach, put it to the test. Can you make it hop over a pen? Two pens? What else can your roach do?

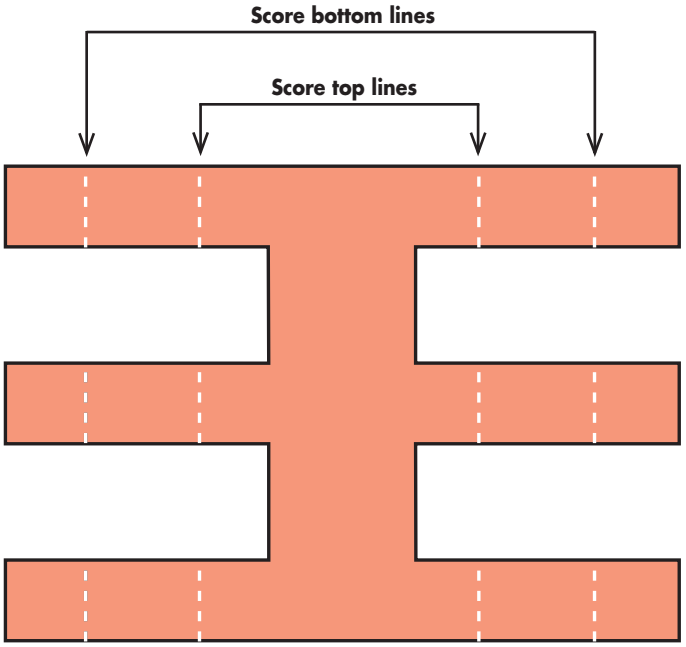
12. *Extra credit:* Show us your roach bot! Take a picture of your jumpy roach and write about what it can do. And tell us how well the other roach patterns on page 3 work. Ask your parent or guardian to send your findings to: info@kidsciencechallenge.com

Conclusions

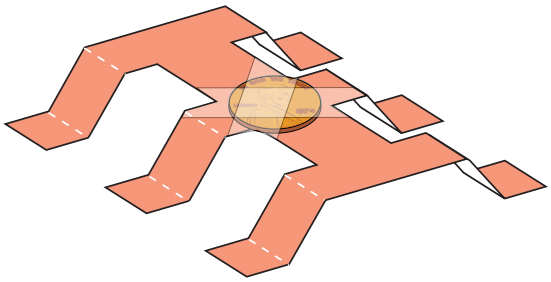
What helped your roach bounce higher or farther? Why do you think the changes helped? Do you think your roach would bounce as well on different surfaces? What would you use a crawling, bouncing robot for?

Brain Squeezer:

Think of some of the cool things that insects or spiders can do. Using your imagination, "invent" a small robot that could do some of those things. Draw a picture of your robot and label the coolest features.



Cut a rectangle around the orange pattern and tape the pattern to the cardboard. Then follow the instructions for completing your roach.



Try other roach patterns