

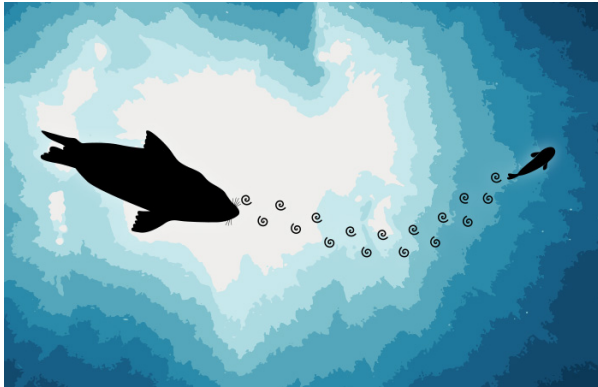


# Wiggling Whiskers

A hands-on activity for students, families, and adults

Duration: 10-20 minutes

Engineers and scientists can find creative solutions to problems by looking to nature for inspiration. Discover how seal whiskers inspired scientists to design new underwater sensors as you create and test your own “whiskers” in this activity.



## Background:

- Scientists discovered that harbor seals use their whiskers to track their prey through the water—even when blindfolded!
- A seal has uniquely shaped whiskers that allow it to distinguish the prey’s movement from the seal’s movement as it swims through the water.
- The whiskers remain still in response to the seal’s own movement through the water, but vibrate in response to turbulence from nearby moving objects.
- This allows the seal to “feel” the motion and path of nearby objects such as fish.

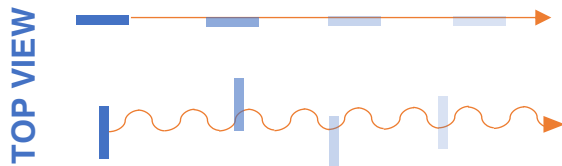
## MIT Connection:

Seals are common in Boston Harbor and, on rare occasions, have even been spotted in the Charles River! Researchers Heather Beem and Michael Triantafyllou in MIT’s Department of Mechanical Engineering are developing biologically inspired sensors modeled after the harbor seal’s whiskers. The sensors use natural vibrations rather than electricity.

## Goal:

Create a “whisker” that acts like an underwater sensor. Your whisker should:

1. **Not vibrate** when dragged through the water with the **skinny** side moving forward
2. **Vibrate or “wiggle”** when dragged through the water with the **thicker** side moving forward



## Materials:

- Aluminum Foil
- Scissors
- Sink or large container (at least 4" deep x 7" wide) filled with water

## Directions:

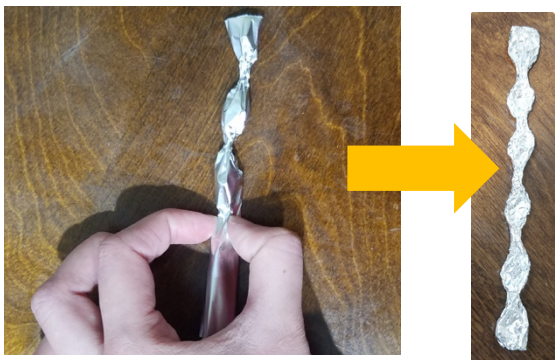
1. Cut out an 8-inch square of aluminum foil.



2. Roll the square into a hollow tube.



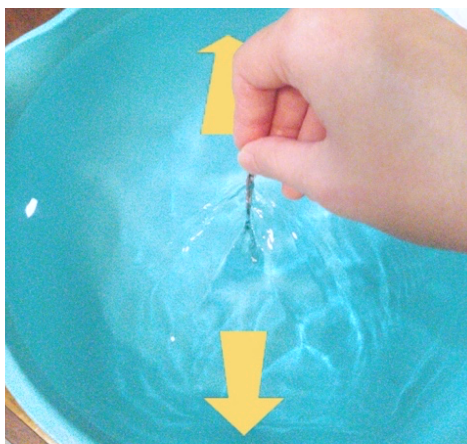
3. Using the templates on **page 5** as a guide, squeeze and squash the tube into one of the whisker shapes.



4. Hold the top end of the whisker tightly with the skinny side facing you. Submerge the whisker in the water so that your fingers are just above the water's surface.



5. *Quickly* drag the whisker towards and away from you in a straight line. How does it feel as it moves through the water?

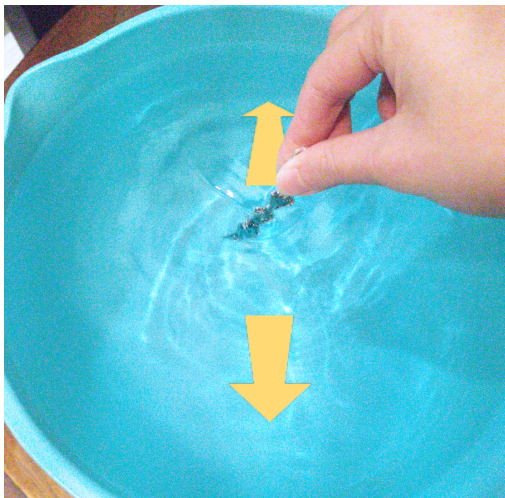


6. Now hold the whisker so that the thicker side is facing you.



## MIT Museum Activity: Wiggling Whiskers

7. Repeat step 5. What do you notice this time?



8. Try out different whisker shapes\* from the template and compare how they feel as you move them through the water.



*\*Note: Whisker E is just a hollow tube*

9. Each of the whisker shape templates on page 5 is based on a real animal. Can you match each whisker type to one of the animals below?

**Bat:** This winged mammal uses its whiskers to navigate and hunt in the dark.

**Krill:** This tiny sea creature uses tiny hairs to filter feed on algae.

**Crayfish:** This crustacean uses modified hairs to scoop food into its mouth.

**Harbor Seal:** This aquatic mammal uses its whiskers to sense moving prey in the water.

**Cat:** This land mammal uses its whiskers to sense objects and obstacles in its environment.

10. **Now it's your turn!** Think about what patterns you saw when you tested the different whisker shapes. Then try designing your own whisker shape and test it out. Does it drag straight through the water in one direction and wiggle in the other? How much can you feel it vibrate back and forth?



## MIT Museum Activity: Wiggling Whiskers

### Observations:

Use this space to record your observations for each whisker shape. Rows A–E are for the templates, and the blank rows are for your own whisker designs. How much does each whisker vibrate in either direction? What else do you notice as it moves through the water?

Whisker	Skinny side forward	Thick side forward	Other notes
A			
B			
C			
D			
E			

### Explore More:

- **Watch** a video showing how scientists modeled the seal whisker:  
<https://meche.mit.edu/news-media/video/0/1323>
- **Read** about how seal whiskers work and how they inspired new technology:  
<http://news.mit.edu/2015/whisker-slaloming-harbor-seal-catch-prey-1016>
- **Read** more about the science and research:  
<https://www.whoi.edu/oceanus/feature/seal-whiskers-inspire-marine-technology/>

**A**

Front view



Side view



**B**

Front view



Side view



**C**

Front view



Side view



**D**

Front view



Side view



**E**

Front view



Side view

