



# Snippets of Science from Fermilab

PS1B (6-8) Explain

## USING MOTION TO FIND WHAT YOU CAN'T SEE

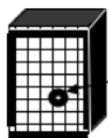
**Challenge:** Can you use motion to discover a hidden object?

**Goal:** Use a moving probe to locate the magnet taped on the inside of a mystery box. Can you determine the location of the magnet and its shape? What other properties can you discover?

**Fermilab Connection:** Fermilab scientists use high-energy particles to investigate small objects. Use ball bearings and hidden magnets to investigate how physicists use particle probes to locate and describe unseen objects.

### Preparation

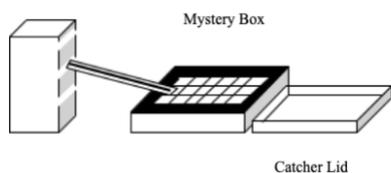
Prepare a mystery box by using an empty shoe box or gift box. Place the grid paper on the box top. Position a strong magnet under the lid and secure the magnet in place.



Tape magnet on underside of box lid.

### Procedure

1. Your job is to identify the location, size, and shape of an object attached to the inside of your mystery box by rolling ball bearings down a ramp and across the top of the box.
2. Setup:



Hint: Keep the ramp on the edge of the black border of the grid paper

3. Use three different size ball bearings to test your setup. Roll each from the top of the ramp at three locations along the short side of the box. Observe each as they roll across the box.
4. Select one size ball bearing that will best help you with your investigation.
5. Roll the ball bearing across the grid paper, marking the trail the ball bearing follows each time with a colored pencil.
6. Do at least 30–50 trials, setting the ramp on a different spot on the grid each time. Remember to keep the ramp on the edge of the black border of the grid paper.
7. Were you able to determine the size, shape, and location of the object? Draw a sketch on the grid paper! If not, continue to do more trials until you have enough data (evidence) to draw a conclusion.

### GRADE LEVEL

Grades 5–8 with modifications

### MATERIALS

- Prepared mystery box
- Ramp (ruler with a groove)
- Block used to create ramp
- Ball bearings of various sizes
- 1 tray to catch ball bearings
- Grid paper copies
- Colored pencil

### Fermilab Resources:

Click on the linked resources!

[How Particle Physics Discovery Works](#)

[Main Injector Virtual Tour](#)

Conclusion:

1. How do you explain the curved trails?
2. How do you explain the straight trails?
3. What effects do you think changing the ramp height will have on your results?
4. Explain how this investigation relates to the work physicists do at Fermilab.

