



# Snippets of Science from Fermilab

PS 3 (3-8) Explore

## EXPLORING FORCE AND MOTION THROUGH PATTERNS

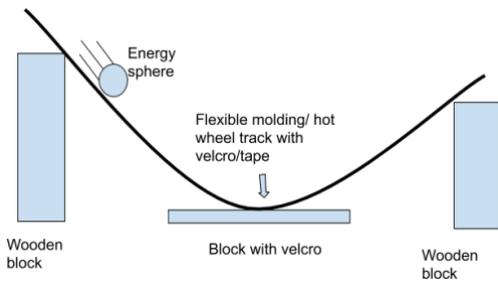
**Challenge:** Can you use patterns to predict an object's movement?

**Goal:** Design an experiment that allows you to make a prediction based on patterns in data collected.

**Fermilab Connection:** Fermilab scientists look for patterns in data to understand more about our universe. Use the data collected from this experiment to make predictions about an object's movement.

### Preparation

Use the materials to put together the experimental setup shown below.



### Procedure

1. Choose the height of the ramp, the mass (weight) of the energy sphere, and explore how the system works and how different variables affect the system.
2. You will need to observe how long it takes for the energy sphere to move back and forth on the ramp or how many cycles are completed in a certain amount of time based on different variables.

3. After exploring the system, ask questions about the different variables. How do the different-sized spheres affect the system? What happens if you raise or lower the height of the blocks?
4. Some examples of variables to test are size of the energy sphere, mass (weight) of the energy sphere, release point, or height of the wooden blocks.
5. Pick one of the variables to investigate. For an example, the variable used will be release height.
6. Complete the data sheet for the variable you selected. Release height is filled in as an example, but feel free to choose other variables!

**GRADE LEVEL**  
Grades 3–8 with modifications

### MATERIALS

- Different-sized energy spheres (tennis ball, baseball, ping-pong ball, marble, etc.)
- Piece of flexible molding or hot wheels track
- Wooden blocks
- Velcro or tape
- Timer

**Fermilab Resources:**  
Click on the linked resources!

[How Particle Physics Discovery Works](#)

[Scientific Computing](#)

[Science at Work](#)

Data Sheet:

**Periodic Motion:** This activity is based on the concept of periodic motion. Periodic motion can be defined as any motion that repeats over and over again with the same time required for each recurrence. A period is the amount of time for the system to complete one cycle. In this example, it is the amount of time for the energy sphere to be released and then returned to its approximate release point. The frequency is the number of cycles per unit of time, i.e., how many cycles are completed in one minute.

Release Point (or other variable of your choice)	Number of Cycles Per Minute (or a time interval of your choice)

Identify the patterns you see in your data. Don't see any yet? Conduct more trials!  
Write the patterns you see in the space below:

Make a prediction! Based on the release height (or other variable you chose), predict how many cycles will be completed in one minute.

Prediction: How many cycles will be completed in one minute?

Run the experiment: What is your actual result?

Was your prediction correct? Why or why not? What could you do to improve the accuracy of your prediction?