**Faster and Farther**

**Systems Biologist - Cranos Williams - North Carolina State University**

**DESCRIPTION**: In this activity students, working in small groups, will conduct an experiment in which they formulate conjectures to determine which variables influence the velocity and total distance traveled of a car rolling down a ramp. They will test their conjectures by conducting a lab using Fathom and motion detectors and matchbox cars.

**COMMON CORE STANDARDS:**

**A.SSE.1b** Decompose expressions and make sense of the multiple factors and terms by explaining the meaning of the individual parts.

Etc.

**MATERIALS**: Motion detectors, Fathom software, match box cars, ramp.

**BEFORE YOU BEGIN**:

Students will examine the cars and discuss in their small groups which car will reach the greatest velocity and farthest distance in a given amount of time. They will record their conjectures and reasoning before they begin the experiment.

**SETTING UP THE EXPERIMENT**:

1. One member of each group should bring a ramp and five different cars to be used in the experiment.
2. Plug the motion sensor into the computer and open Fathom.
3. Fix the ramp at the desired angle to be used in the experiment.
4. Fix the motion sensor at the top of the ramp.

**COLLECT THE DATA**:

1. Make a new, empty collection in Fathom. Connect motion detector and fix it at the top of the ramp.

2. Have one student release the car down the ramp as another student turns on the motion sensor.

3. Have an additional student monitor the computer to ensure that the data is properly recorded for each trial.

4. Repeat the previous steps for all cars used in the experiment.

**ANALYZE AND INTERPRET THE DATA**:

1. Create a distance-time graph for each car used in the experience.
2. Create a velocity-time graph for each car used in the experience.
3. Use these graphs to complete the chart in the student handout
4. Create a best fitting mathematical model for each graph and determine the maximum distance or velocity for each graph.

**FINAL THOUGHTS OR QUESTIONS**:

 Questions will be answered on student handout.

To Challenge:

Would the ramp slope change your rankings?

How are acceleration and velocity related?