



## ***Vegetable Light Curves***

### **DESCRIPTION**

In this activity, students will observe the surface of rotating potatoes to help them understand how astronomers can sometimes determine the shape of asteroids from variations in reflective brightness.

### **OBJECTIVES**

Students will

- Explore the correlation between the shape of a potato and variations in its reflective brightness
- Investigate how astronomers can determine the shape of an asteroid from variations in its brightness
- Design a simple device to rotate a potato on a stand

### **NASA SUMMER OF INNOVATION UNIT**

*Earth and Space Science-Year of the Solar System*

### **GRADE LEVELS**

7 – 9

### **CONNECTION TO CURRICULUM**

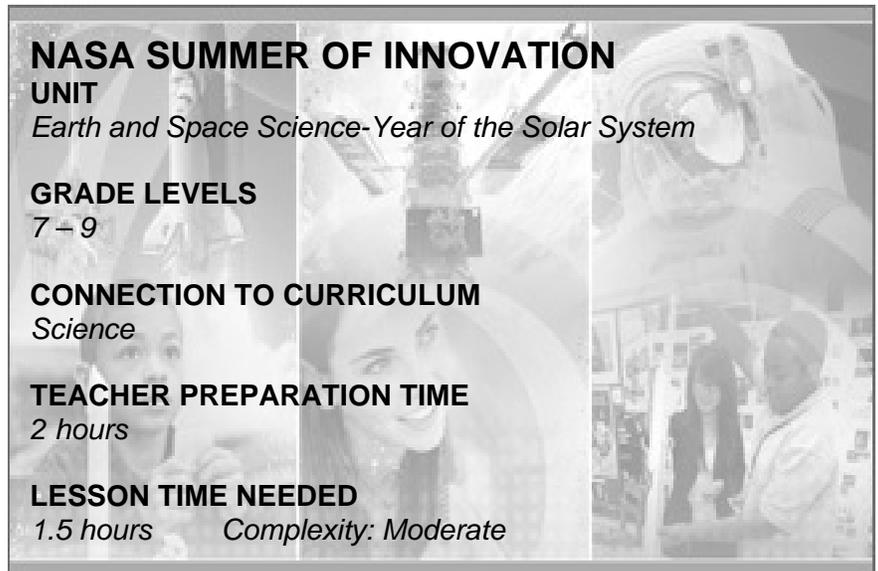
*Science*

### **TEACHER PREPARATION TIME**

2 hours

### **LESSON TIME NEEDED**

1.5 hours      *Complexity: Moderate*



### **NATIONAL STANDARDS**

#### **National Science Education Standards (NSTA)**

*Science as Inquiry*

- An appreciation of "how we know" what we know in science
- Understanding of the nature of science

*Physical Science Standards*

- Motion and Forces
- Properties and changes of properties in matter

*Earth and Space Science Standards*

- Earth in the Solar System

### **MANAGEMENT**

- Potato rotating device can be built by students for each team, or you may construct them ahead of time.
- You will need to do this lesson in a room that can be darkened.
- Make sure the students watch the animation at the very beginning of the lesson (Dawn, page 1).

## CONTENT RESEARCH

A synopsis of the Web site “History and Discovery of Asteroids” and how such discoveries relate directly to this lesson can be found at [http://dawn.jpl.nasa.gov/DawnClassrooms/light\\_curves/V-More\\_Discoveries.pdf](http://dawn.jpl.nasa.gov/DawnClassrooms/light_curves/V-More_Discoveries.pdf).

### Key Terms:

- **Asteroid**—A small rocky body orbiting the Sun. Large numbers of these, ranging in size from nearly 600 miles (1,000 km) across to dust particles are found between the orbits of Mars and Jupiter. This area is known as the Asteroid Belt.
- **Light Curve**—When astronomers graph data relating about reflective brightness as a function of time, the resulting graph is called a light curve.

## LESSON ACTIVITIES

**Vegetable Light Curves**—Students will observe the surface of rotating potatoes to help them understand how astronomers can sometimes determine the shape of asteroids from variations in reflective brightness. [http://dawn.jpl.nasa.gov/DawnClassrooms/light\\_curves/](http://dawn.jpl.nasa.gov/DawnClassrooms/light_curves/)

## ADDITIONAL RESOURCES

- Asteroid Fact Sheet  
<http://nssdc.gsfc.nasa.gov/planetary/factsheet/asteroidfact.html>
- Solar System Exploration—General overview of planetary exploration  
<http://solarsystem.nasa.gov/planets/profile.cfm?Object=SolarSys>
- Missions to Asteroids. Overview of the Dawn Mission  
<http://solarsystem.nasa.gov/missions/profile.cfm?Sort=Alpha&Letter=D&Alias=Deep%20Space>
- Animation of asteroid Vesta rotation  
<http://dawn.jpl.nasa.gov/multimedia/video/vesta.mov>

## DISCUSSION QUESTIONS

- Why do you think we use a potato in this lesson rather than some other vegetable? *They have shapes similar to asteroids.*
- Why are scientists interested in learning about asteroids? *They can give information about the early solar system.*
- Why would a country such as the United States even consider sending astronauts to an asteroid? *Answers will vary. Perhaps to find new mineral resources or to act as a “Way Station” to further exploration.*

## ASSESSMENT ACTIVITIES

- Activity Reporting Sheet  
[http://dawn.jpl.nasa.gov/DawnClassrooms/light\\_curves/ARS-Vegetable\\_Light\\_Curves.pdf](http://dawn.jpl.nasa.gov/DawnClassrooms/light_curves/ARS-Vegetable_Light_Curves.pdf)  
Questions 1–12

## MATERIALS

### For each team of three:

- 2 potatoes (one spherical and one elongated)
- An illumination system—40-watt lamp and a dark background
- An assemble potato-rotating system
- Sharpened dowel sticks to mount the potatoes
- Activity Sheet, “Vegetable Light Curve”
- A watch with a second hand
- Computer/Internet access and projector

## ENRICHMENT

- The History and Discovery of Asteroids Module  
[http://dawn.jpl.nasa.gov/DawnClassrooms/light\\_curves/ARS-Vegetable\\_Light\\_Curves.pdf](http://dawn.jpl.nasa.gov/DawnClassrooms/light_curves/ARS-Vegetable_Light_Curves.pdf)
- Ion Propulsion Module  
[http://dawn.jpl.nasa.gov/DawnClassrooms/light\\_curves/ARS-Vegetable\\_Light\\_Curves.pdf](http://dawn.jpl.nasa.gov/DawnClassrooms/light_curves/ARS-Vegetable_Light_Curves.pdf)
- Dwarf Planet Activity  
[http://dawn.jpl.nasa.gov/DawnClassrooms/dwarf\\_planet/](http://dawn.jpl.nasa.gov/DawnClassrooms/dwarf_planet/)