Rotato

Investigating Asteroid Rotation

Classroom Activity

Overview

Age Range:

11-13

Prep. Time:

15 mins

Lesson Time:

1 hour

Cost per activity:

Low

Includes the use of:

Laptop, webcam, turntable

Outline

In this activity students will learn about asteroids and the techniques used by astronomers to study them.

In groups students will conduct a simple experiment where they plot light curves based on the reflection of light from an 'asteroid'.

They will understand that we can see asteroids as they reflect light from the Sun. While also learning how to estimate the rotation period of an asteroid based on its light curve.

Pupils will Learn:

- How to perform a scientific experiment, specifically to understand the rotation of asteroids
- How to read data off graphs

Lesson Plan:

Overview of the time required to complete lesson.

Description	Time	Notes
Introduction to the subject	15 min	

The online observatory collaboration consists of the following partners:
Baldone Observatory, Brorfelde Observatory, Cardiff University, Harestua Solar Observatory, Helsinki Observatory

Activity 1	30 min	Download the Light Grapher software: http://www.planetarium-activities.org/shows/sp/lightgrapher (you may also need to download a flash player for windows https://www.globfx.com/downloads/swfplayer/ or Mac https://echoone.com/iswiff/)
Assessment	15 min	Compare the features of the light curve to features of your 'asteroid'

Introduction to the subject:

Asteroids tumble (or rotate) through space. We see asteroids because they reflect light from the Sun. To understand more, we can use telescopes to observe them. Using photometry techniques, we can plot the change in reflected light from the asteroid. Over time we can measure how fast it is rotating.

Equipment Options:

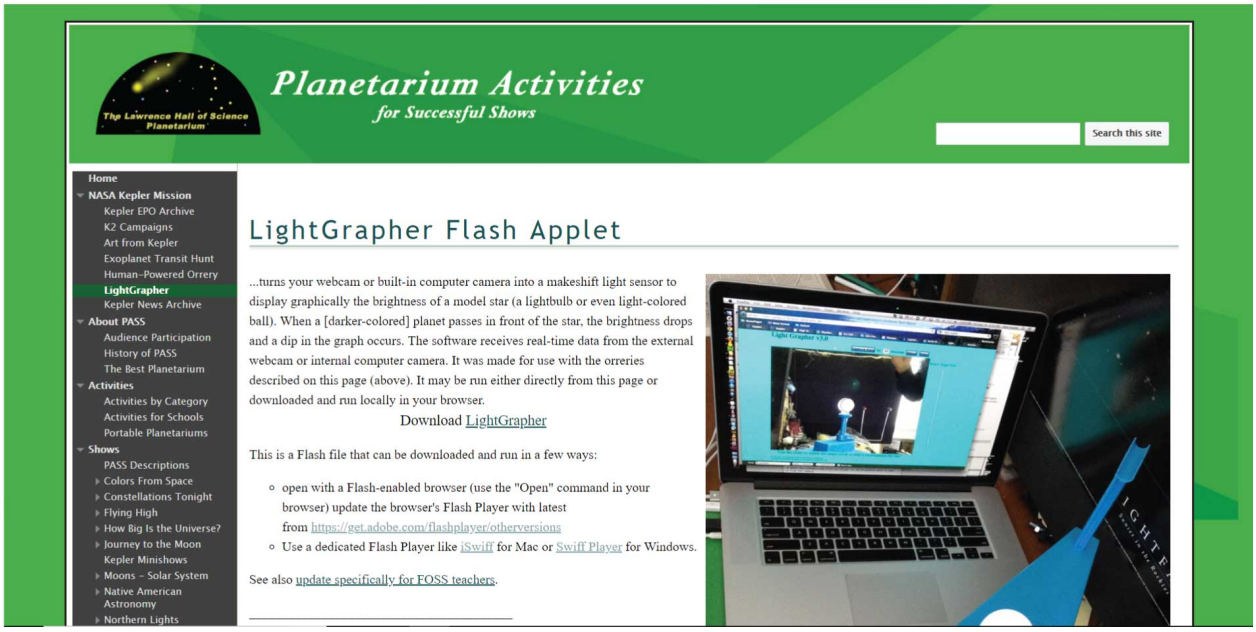
You will need a selection of equipment to complete this experiment.

- For a turning device we recommend either using a motor or a small electric turntable, preferably with a dark base:

- To replicate an asteroid, we recommend using a potato or polystyrene balls, or you can have students make their own asteroids from plasticine

Activity 1:

- Download the light grapher software



Introduce the activity, explaining that we use reflected light from asteroids to try and learn more about their rotation and shape and that this experiment mimics that technique.

1. Set up turntables and 'asteroids'
2. Direct a light source and webcam at the object
3. Begin to 'capture data' on light source grapher, watching as the light curve is plotted on the graph
4. Identify the rotation period of your object and compare features on the 'asteroid' with features on the light curve.

Further Activities:

The Light Grapher software is also used in the **transit method activity**, for spotting exoplanets.

Background Knowledge:

Asteroids are irregularly shaped rocky and metallic objects that orbit the Sun but are too small to be considered planets.

They range in size from Ceres, which has a diameter of about 1000 km, down to the size of pebbles. While they have been found inside the Earth's orbit and beyond Saturn's orbit, most are contained within a main belt that exists between the orbits of Mars and Jupiter.

We see asteroids because of the sunlight that they reflect in our direction, but even through large telescopes they only appear as points of light. Even so, information can still be obtained about the asteroid.

The amount of light reflected depends on factors such as distance from Earth, size, shape, nature of surface – and orientation. All asteroids spin with periods of the order of a few hours, so the apparent brightness of a particular object will vary in a periodic manner.

A graph of the perceived brightness of an asteroid against time is called a **light curve**, and astronomers are interested in such things because they can shed light on the nature of an asteroid – in particular, whether it might be a monolith or a conglomerate. To obtain a light curve a series of images of an asteroid need to be taken over a period of time.