CLASSROOM ACTIVITY

Impact! Tracking Near-Earth Asteroids

Collisions between space objects are a vital part of the evolution of our Solar System. Most of Earth's impact craters have been wiped away due to plate tectonics, but evidence of such cosmic catastrophes, such as Arizona's 50,000-year-old Meteor Crater, do remain. When is Earth due for another major blast? Meet the professional and amateur astronomers who may be the first to know: first at LINEAR, a near-earth asteroid detection facility in New Mexico, and then at the Smithsonian's Minor Planet Center, where orbits of near-earth objects are tracked for possible hits and misses.

CLASS DISCUSSION

Establish Prior Knowledge

Ask students to describe the asteroid belt — where is it, what is it composed of, and how it formed. Tell students that the video they are about to see is about asteroids that may be headed towards Earth, and how they are being tracked.

Exploration

Have students watch the video. Use the following questions to guide a class discussion.

- Why are there so many craters on the Moon?
- Why is it so difficult to find craters on Earth?
- Why are scientists tracking the paths of asteroids? How? What is the role of the network of observatories?
- What are some of the possible outcomes of a large asteroid colliding with the Earth?
- When is an asteroid considered close to Earth?
- What is considered a high probability of an asteroid colliding with Earth?
- How is it that the probability of asteroids crossing Earth's orbital plane can change over time?

The Scientific Method

Research scientists use the Scientific Method (see page three) to investigate the natural world. You can use *Impact! Tracking Near-Earth Asteroids* to illustrate how scientists and amateur astronomers collect observational data about near Earth asteroids that can be used to formulate hypotheses about when and if the asteroids might collide with Earth.

Wrap-Up

Ask students to brainstorm ways that scientists might try and stop an asteroid from colliding with Earth if one were identified to be heading our way.

CLASSROOM ACTIVITY

Impact! Tracking Near-Earth Asteroids (continued)

Extend
Students who wish to explore more can visit these related links.

Near Earth Object Program: Frequently Asked Questions
http://neo.jpl.nasa.gov/faq/
An in-depth introduction to near-Earth objects, and their study.

Asteroid and Comet Impact Hazards
http://impact.arc.nasa.gov/
Explore this site for an introduction to NEOs, FAQs, a multimedia gallery, and articles about the threat of impact hazards.

Find a Meteorite: Explore an Asteroid
http://dawn.jpl.nasa.gov/Meteorite/explore_asteroids.asp
Learn details about the largest asteroids in our solar system, Eros, Gaspra, Vesta, and Ceres, through this site of NASA's Dawn mission to the asteroid belt.

Science Explorations: Journey Into Space
http://teacher.scholastic.com/activities/explorations/space/
Gravity helps form the stars and planets and helps keep them in orbit. Yet, it can also cause these objects to collide. Explore the many ways gravity shapes—and reshapes—the universe.

Scientific Process

The Scientific Method is a dynamic and open-ended process that scientists use when they investigate a question they have. It is not a series of prescribed steps that scientists follow to prove a hypothesis. Rather, it's a general plan that helps guide their investigation. And while all scientists use the Scientific Method, they might not use all the steps, or they may complete the steps in a different order. For example, a scientist might make observations and collect data about a subject that interests him or her for years before formulating a hypothesis.

DEFINING A QUESTION TO INVESTIGATE

As scientists conduct their research, they make observations and collect data. The observations and data often lead them to ask why something is the way it is. Scientists pursue answers to these questions in order to continue with their research. Once scientists have a good question to investigate, they begin to think of ways to answer it.

FORMING A HYPOTHESIS

A hypothesis is a possible answer to a question. It is based on: observations scientists make, existing theories, and information they gather from other sources. Once they have a hypothesis, scientists can begin to think about how to test it.

TESTING A HYPOTHESIS

Evidence is needed to support or disprove the hypothesis. There are several strategies for collecting evidence. Scientists can gather their data by observing the natural world, performing an experiment in a laboratory, or by running a model. Scientists decide what strategy to use, often combining strategies. Then they plan a procedure and gather their data. They make sure the procedure can be repeated, so that other scientists can evaluate their findings.

ANALYZING THE DATA

Scientists organize their data in tables, graphs, diagrams, and even photographs. If possible, they check the data by comparing it to data from other sources. They are looking for patterns that show connections between important variables in the hypothesis they are testing.

DRAWING CONCLUSIONS

Scientists must decide whether the data clearly support or do not support the hypothesis. If the results are not clear, they must rethink their procedure. If the results are clear, scientists write up their findings and results to share with others. The conclusions they draw usually present new questions for them to pursue.