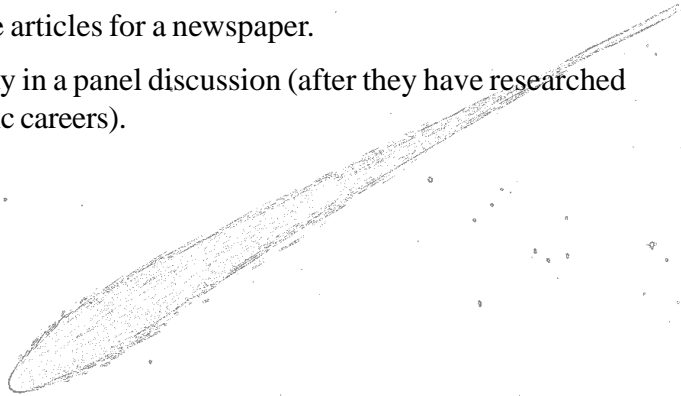


Exploring Meteorite Mysteries
Lesson 16 — Near Miss

Objectives

Students will:

- apply science to daily life as they simulate possible responses to a meteorite impact.
- produce articles for a newspaper.
- role-play in a panel discussion (after they have researched scientific careers).



Undetected asteroid streaks perilously close to Earth

by Blaine P. Friedlander

“In May 1993, the Earth survived a near miss by an asteroid. This “projectile” was about 10 meters in diameter and weighed about 5.4 million kilograms — about the mass of a Navy destroyer! A group called Spacewatch in Arizona discovered it after it had passed within 145,000 kilometers of Earth!”

*Adapted from: Houston Chronicle,
Monday, June 21, 1993.*

“What effect do they have?”

About This Lesson

This lesson involves the students in creative interactions by asking them to take on the roles of community members who react to a large and frightening, but not devastating, impact. There are two activities which require different research and modes of response. The students will write newspaper articles from the point of view of a variety of citizens. In preparing for and conducting a community briefing, the students will gain scientific knowledge about meteorite impacts and careers.

Lesson 16 — Near Miss

Activity A: “Extra, Extra, Read All About It!”

About This Activity

Students will read about the recent near miss of an Earth crossing asteroid and about the impact of comet Shoemaker-Levy 9 on Jupiter. They also have heard about the impact that killed the dinosaurs and most other species.

Now students will consider how they and other people would react if an impact occurred near their community. Students will write articles for a newspaper, reflecting the many different reactions of citizens.

Materials for Activity A

- Student Sheet (pg. 16.6)
- paper and pencils
(computer if possible)



Objective

Students will:

- apply science to daily life as they explore the implications of a fictitious meteorite impact in the vicinity of their community.

Background

From July 16 through July 22, 1994, fragments of Comet Shoemaker-Levy 9 collided with Jupiter, with dramatic effect. This was the first collision of two solar system bodies ever to be predicted and observed. Shoemaker-Levy 9 consisted of at least 20 fragments with diameters estimated at up to 2 kilometers, which impacted the planet at 60 km/sec. The impacts resulted in plumes of gas and dust which rose many thousands of kilometers high, hot “bubbles” of gas in the atmosphere, and large dark “scars” on the atmosphere which lasted for weeks. Even after the main bodies had hit, smaller bits of the comet continued to impact the planet. Shoemaker-Levy 9 is gone now, and Jupiter is getting back to normal. If the comet had hit Earth instead, the effects would have been devastating.

Procedure

Advanced Preparation

1. Reproduce Student Sheet as needed.
2. Review the background information above and the background in Lesson 14, Activity A (pgs. 14.2-14.5), and Lesson 15 (pg. 15.1).

Classroom Procedure

1. Students read background information and newspaper article on Student Sheet.
2. After reading, have the students discuss how they feel about knowing that there are large objects that could someday impact the Earth.
3. Teacher asks, “What if a meteorite landed outside our community and made a crater 30 meters across?”
4. Students discuss the question from different viewpoints. Teacher leads the discussion to different professions.
5. Students write a newspaper article from the viewpoint of different professionals.

Activity B: Take My Advice

Objectives

Students will:

- evaluate implications of scientific principles and the findings of research.
- recognize that the scientific community has a vast amount of information about meteorites and is aware of the hazards associated with meteorite falls.

Background

Just as technology has provided a wide margin of safety from hurricanes (through early detection and warning), earthquakes (through fault detection and architectural modifications), and other natural disasters, scientists continue to watch for Earth-crossing asteroids and meteors. They study possible diversion and/or destruction of the potentially dangerous ones.

NASA's "Spacewatch" is one asteroid detection system which has been placed "on line." In addition to detection, scientists have created a number of crisis scenarios to consider how they would deal with a threatened impact in the future. Some possible actions to respond to an impact crisis have been developed. Suggested strategies include exploding or diverting the incoming body. The technology necessary for implementing many of these defensive maneuvers is available today. One important element necessary to developing a defense against any global threat is cooperation. Scientists have traditionally exhibited a willingness to cooperate with colleagues worldwide and governments can follow their example.

Dr. Hy "Rocky" Mountain
Geologist

Dr. Susan Starr
Astronomer

Dr. Mattie R. Wright
Meteoriticist

Col. Cathy "Crash" Carlston
Test Pilot

Major Ian Laser
*Long-Range Weapons
Specialist*

Secretary Lyons
Secretary of Defense

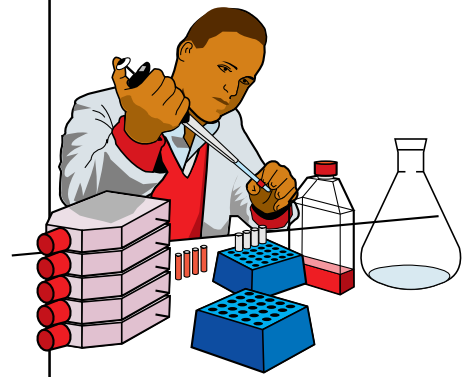
Representative B. Noble
*Congressional Delegate
from Texas*

About This Activity

The activity starts with a "simulated" meteorite impact outside the community. This may follow Activity A or stand alone. Students take on the roles of concerned citizens and "experts" as they conduct a town meeting held to address their questions and concerns about the event and government plans for safeguarding their community from larger impacts. Students will need to research information for the panel discussion. If the class has completed many of the lessons on meteorites and asteroids, this activity could be used as an assessment of the knowledge gained by the students.

Materials for Activity B

- question cards
- fact cards
- name placards for panel members on left



Question: How will the scientific community keep citizens informed if there is a real impact crisis?

Expert: Dr. Susan Starr or Secretary Lyons

Question: Do you know what's going to happen if an asteroid hits us?

Expert: Dr. Hy "Rocky" Mountain, Geologist or Dr. Mattie R. Wright, Meteoriticist

Information: Earth-crossing asteroids are made of stony material, or metal. We know this from studies of meteorites and spectral reflectance studies of asteroids.

Expert:
Dr. Mattie R. Wright, Meteoriticist or Dr. Susan Starr, Astronomer

Procedure

Advanced Preparation

1. Assemble background information.
2. Gather or identify research materials for questions and facts.

Classroom Procedure

1. Introduce the topic and provide the background necessary to establish a plausible non-threatening, yet alarming impact event (see Activity A).
2. All students research the topic and prepare for the town meeting. Each will produce fact cards or information "crib sheets" for the expert of their choice. Each will develop questions that will challenge the experts and inform their community. Allow students to see the cards above.
3. Set up the town hall meeting. Panel members may be chosen at random, by the teacher, the class, or by trying out for the teacher.
4. Read the following to the class: "Our class is going to act out a nationally televised "town meeting." It will be conducted to answer questions, allay fears, and develop community input for an emergency plan to respond to the approach of a large meteor and its impending fall. Our panel members will represent science advisory and governmental officials. The audience has question cards, but anyone may ask questions. Panel members may refer to their fact cards when questioned, but remember that even the experts don't have all the answers. Just do your best." (The teacher will act as panel moderator.)
5. Panel moderator starts the meeting with the statement: "There is concern that just as meteorite falls have caused destruction in the past, such as the Tunguska Fall of 1908, future meteorites could also pose a danger to life on Earth. The purpose of this meeting is to answer questions from the public about the threat of possible asteroid, comet or meteorite impacts, and to gather input for an emergency plan. We have assembled a panel of experts who have been studying about asteroids, impacts, and the possible defenses against potentially dangerous meteors, both before and after they actually strike the Earth. I will now call for a question from the audience."
6. Panel moderator ends the meeting with several summarizing statements.

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