CLASSROOM ACTIVITY

Gamma-Ray Bursts: Flashes in the Sky

Gamma-ray bursts—flashes of intense radiation in space that are often just seconds long—were accidentally discovered in the 1960's by satellites built to monitor nuclear bomb explosions. Gamma-ray bursts and their origins have been one of the leading astrophysical mysteries ever since. Today, new technology allows astrophysicists to study the gamma-ray burst phenomena. Swift is a NASA burst-detecting satellite. It is able to position itself in the direction of a new gamma-ray burst rapidly and automatically. When it does detect a burst, Swift sends a message to Earth, which is distributed world-wide so that ground telescopes can point toward the burst to capture the afterglow before it fades. Astrophysicists at Penn State and other institutions are analyzing these afterglows to understand what causes the most powerful explosions known.

CLASS DISCUSSION

Establish Prior Knowledge

Review the electromagnetic spectrum with your students. Point out that the spectrum is the complete array of electromagnetic radiation, or light, ranging from gamma rays through X-rays, ultraviolet light, visible light, infrared radiation, microwaves to radio waves. Tell students that they will be watching a video about how astrophysicists study gamma rays -- which have the shortest wavelengths of all types of radiation -- in space and how this information might lead to the understanding of a mysterious phenomena.

Exploration

While they are watching the video, have students take notes on the tools that the scientists use to collect data and the types of date they collect. Have students view the feature and read the synopsis. Then, use the following questions to guide the discussion.

- What tools did the scientists in the video use to collect data?
  (Answers may include: Scientists collect data using NASA's Swift spacecraft, which is designed to collect Gamma ray bursts, as well as hundreds of ground-based telescopes.)
- What does the Swift satellite do when it detects a gamma-ray burst?
  (Answers may include: When Swift detects a gamma ray burst the computer on board identifies the burst's position and reorients the satellite. The information from the burst immediately flows to the ground and messages are sent to nearly 900 astronomers worldwide who then train their telescopes in the direction of the burst.)
- What data do the optical and infra-red telescopes collect?
  (Answers may include: They collect data about the afterglow—details about how the light is changing and how the colors of that light are changing.)
- How is this data useful to scientists?
  (Answers may include: The details can help scientists uncover the physics of the explosions. They are also learning that the characteristics of bursts are different according to what made them.)

Wrap-Up

Use the following questions to wrap-up your discussion.

- Do the models answer all the scientists' questions?
  (Answer: No, they don't seem to explain everything to the scientists' satisfaction.)
- What does this tell you about the nature of scientific inquiry?
  (Answers will vary and may include: Science is a continuing process. As new information becomes available, our understanding of the Universe and how it works can change.)