

# The Universe

## Science and Social Studies

### Predicting the Motion of Stars

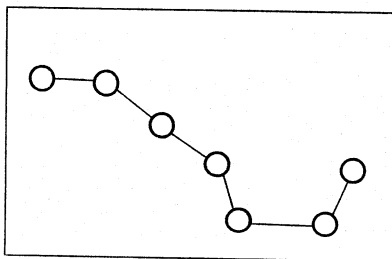
**Directions:** Read the information below. Then use the information and your knowledge of earth science to answer the questions that follow.

Around 400 B.C., the Greek thinker Eudoxus proposed that the earth was motionless and was located at the center of the universe. He imagined that a series of transparent spheres enclosed the earth and rotated about the earth's center. Eudoxus further believed that since the stars appeared to move as a group across the sky from east to west, they must be fixed in position on the outer transparent sphere.

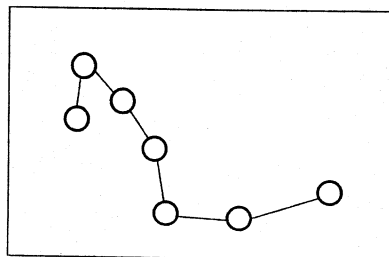
By the 1700s, the idea of transparent spheres holding the stars in place was no longer readily accepted. This raised many questions about the motion and position of the stars. In 1718, English astronomer Edmund Halley compared his own star observations with those made by Greek astronomers about 1500 years earlier. He was surprised to find that three bright stars—Arcturus, Aldebaran, and Sirius—had changed position in the sky!

In fact, stars within a galaxy move in different directions. Therefore, their positions in the sky and the shapes of their constellations change as the stars move. These changes, however, cannot be detected within one person's lifetime. In order to gather information about changes in astronomy, scientists must look back to the notes, records, and observations made by other astronomers many centuries ago.

Scientists can also make predictions about changes in constellations as the stars move. For example, the diagram below shows how the Big Dipper looks today and how scientists think it will probably appear 200 000 years from now, as its stars move in different directions.



**Big Dipper (today)**



**Big Dipper  
(200 000 years from now)**

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**CHAPTER 20**

**Science and Social Studies** (continued)

1. How did Eudoxus explain the motion of stars in the sky?

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2. What discovery did Edmund Halley make when he observed the positions of stars?

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3. How did the work of Hipparchus and the Arab astronomers aid Edmund Halley in his discovery?

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4. Imagine that you are an astronomer and have discovered a new constellation. You have drawn the diagram on the following page that shows the position of your constellation's five stars (connected by solid lines). The same five stars are shown connected by dotted lines to represent what you believe to have been their positions 200 000 years ago.

Using the squares on the grid, determine the direction each star moved during the last 200 000 years. Assuming that each star keeps moving in the same direction at the same speed, describe the pattern of movement for each star. Use the answer lines below. Then draw how the constellation will probably look 200 000 years from now.

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