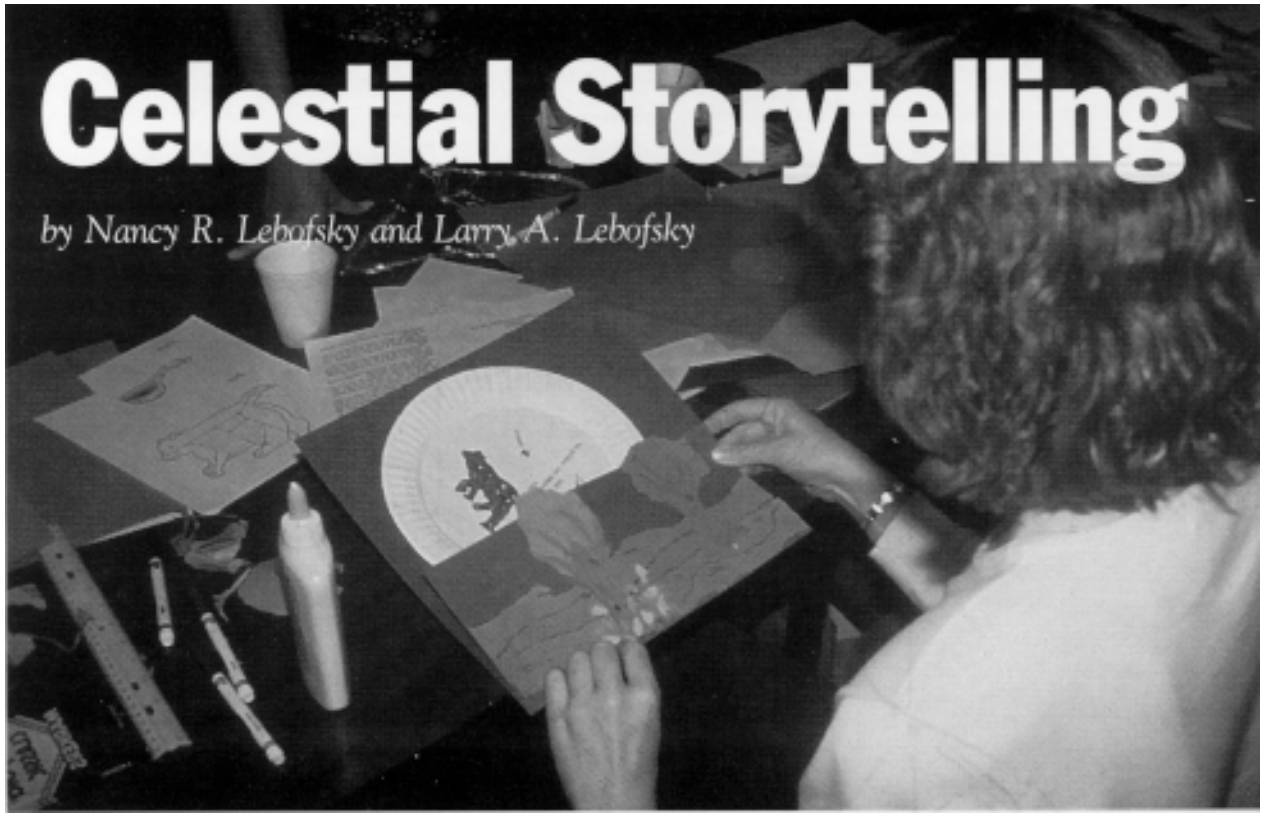


Celestial Storytelling

by Nancy R. Lebofsky and Larry A. Lebofsky



PHOTOS COURTESY OF THE AUTHORS

Throughout history people around the world have looked up at the night sky and imagined stories about the stars. Early cultures used star positions and stories to teach lessons, navigate ships, and mark seasons—especially planting and harvesting times. Even though the stories might not be as accurate as our current scientific knowledge, they can be interesting to share with your classes. The stories provide an opportunity not only to discuss the rotation of the Earth on its axis and its revolution around the Sun, but also to enjoy literature from different cultures.

I use a story that is attributed to two different tribes from eastern Canada, the Micmac and the Iroquois. The story is about seven bird hunters who track a huge bear across the sky every year. As Earth orbits the Sun, most stars *appear* to move across the sky from east to

west at a rate of 1° per night. However, the stars nearest to the North Star, also known as Polaris or the “pole star,” *appear* to circle counterclockwise around it; these are the circumpolar constellations. The Bear Hunt story follows the yearly *apparent motion* of three circumpolar constellations: Ursa Major, Boötes, and Corona Borealis and surrounding stars.

Before introducing the attached activity, make sure students understand that the Big Dipper is an asterism, an easily seen pattern that is only part of the constellation Ursa Major. They should also be familiar with terms such as circumpolar, diurnal, constellation, revolution, orbit, Polaris, pole star, and North Star. Explain that the Earth’s rotation on its axis causes day and night and the diurnal *apparent motion* of the stars, and that the Earth’s revolution around the Sun, its orbit, causes the sea-

sonal *apparent motion* of the stars. Use the story summary provided with the activity or consult the References for different versions of the Bear Hunt story. Explain to students that the people who told the story were describing the *apparent motion* of the Great Bear and other constellations around Polaris.

Next, have students complete the activity found on page 19: Students decorate a diagram of Ursa Major, Boötes, and Corona Borealis and make a horizon to simulate the *apparent* movement of the stars throughout the year described in the Bear Hunt story. The

Nancy R. Lebofsky is an instructional specialist coordinator in the Steward Observatory at the University of Arizona in Tucson. Larry A. Lebofsky is a planetary scientist at the University of Arizona and a senior research scientist in the Lunar and Planetary Laboratory in Tucson, Arizona.

Chasing the celestial bear

story originated in Canada, so observers at lower latitudes will not perceive exactly the same effect described in the story because some of the stars represented in the Bear Hunt will dip below the horizon during the winter; however, the general sequence of events will remain the same. Share other “sky lore” stories and activities to learn more about Polaris and the circumpolar constellations with your students using one of the resources listed on page 20.

At the end of the activity, make sure students understand that the stars do not move. The rotation of Earth on its axis allows us to see the stars in different positions from hour to hour throughout the night, while the additional motion of Earth around the Sun accounts for the apparent movement from month to month during the year. When assessing the activity, be sure that young students are able to identify the circumpolar constellations, using the story wheel, and rotate the wheel correctly (counterclockwise) to show the location of the constellations from season to season. Older students should be able to verbalize, write, or demonstrate with objects their understanding of the concept while more advanced students should also be able to distinguish between diurnal motion and seasonal change. □

References

1. Mayo, G. W. 1990. The never-ending bear hunt. In *North American Indian Stories: More Star Tales*, 1–4. New York: Walker and Company.
2. Monroe, J. G., and R. A. Williamson. 1987. The celestial bear. In *They Dance in the Sky, Native American Star Myths*, 16–20. Boston: Houghton Mifflin Co.
3. Staal, J. D. W. 1988. Ursa Major, the great bear. In *The New Patterns in the Sky*, 131–134. Blacksburg, Va.: The McDonald and Woodward Publishing Co.

Purpose

To understand that the motion of the stars described in the Native Canadian tale is actually an apparent motion caused by the revolution and rotation of the Earth.

Materials

(for students working individually)

- Diagram of the constellations
- 12-inch × 18-inch sheet of construction paper
- Paper plate
- Brass fastener
- Glue or rubber cement
- Ruler
- Stapler
- Magic markers or crayons
- Scraps of construction paper

Procedure

1. Use paper scraps, crayons, and markers to decorate the constellation diagram.
2. Cut the diagram along the dashed lines.
3. Glue your decorated circular diagram to the center of a paper plate.
4. Push the brass fastener through Polaris on the paper plate pattern.
5. Fold the sheet of construction paper using the following directions:
 - Orient the paper with the short edges at the top and bottom.
 - Make a horizontal fold 14 cm from the bottom edge. This edge now represents the horizon.
 - Measure 21.5 cm up from the fold.
 - Make a small dot in the center of the paper (15.5 cm from either long edge) to mark the location of Polaris.
6. Attach the paper plate to the construction paper by pushing the fastener through the centered dot on the construction paper.
7. Secure the fastener.
8. Staple along the side edges of the construction paper, no higher

than 5 cm from the fold; use two staples per side. Be sure the staples are not too close to the horizon line so that the paper plate can rotate.

9. Read the Bear Hunt story. As you read, slowly rotate the paper plate counterclockwise to illustrate the changing positions of the constellations throughout the seasons. If the horizon is too low, add trees, rocks, or other decorations to raise the horizon.

Bear Hunt story

Many years ago, people looked into the night sky and imagined wonderful stories in the stars. One story takes place during the course of an entire year and tells about the adventures of the Great Bear and the Bird Hunters.

When the winter ended, the Great Bear left her cave. After her long sleep, she was hungry and anxious to find food. As she hunted for food, other hunters were following her. Seven brave Bird Hunters followed the Great Bear across the sky. Robin led the hunt, followed closely by Chickadee and his cooking pot and Moose-bird. Farther behind were their friends: Saw-whet, Horned Owl, Blue Jay, and Pigeon. The bear looked big and clumsy, but she moved across the sky rapidly. The hunters followed her all summer, but as autumn approached they had still not caught up to the Great Bear.

Some of the hunters became tired and discouraged. Saw-whet, the last hunter in line, left the hunt. Soon Horned Owl also gave up and went in search of Saw-whet. Blue Jay and Pigeon tried to keep up with the leaders, but soon they also left the hunt and flew home.



Only Robin, Chickadee, and Moose-bird followed the Great Bear into autumn. The bear grew angry and rose up on her hind legs. She growled loudly and clawed the air to scare the hunters. But Robin was a brave hunter. He shot an arrow and hit the Great Bear. Drops of her blood fell on Robin's feathers, turning his breast a bright red. Other drops fell on the autumn leaves, coloring them bright red.

When winter came, the dead bear lay on her back up in the sky. But her spirit returned to the cave and entered another bear. In the spring, the bear will leave the cave again to travel across the spring and summer sky, always pursued by the Bird Hunters.

Questions

Using your understanding of the

apparent motion of the stars, explain how the Bear Hunt story illustrates the revolution (orbit) and rotation of the Earth. Be sure to include the answers to the following questions in your response.

1. Why does the Great Bear appear to leave her cave during the spring?
2. Why does it appear that seven Bird Hunters are chasing the Great Bear for the entire summer?
3. When do the Bird Hunters start to disappear?
4. What happens that makes the hunters appear to leave the sky?
5. Why does Saw-whet disappear before the other hunters?
6. Why does the Great Bear appear to be on her back during winter?
7. How does the apparent movement of the Great Bear relate to the seasons?
8. The Bear Hunt story tells us

about the apparent motion of the circumpolar constellations during the year. Do these constellations also appear to move from hour to hour each night? If so, why?

Sky lore resources

Cohlene, T. 1991. *Quillworker: A Cheyenne Legend*. Mahwah, N.J.: Watermill Press.

Finsand, D. L. and M. J. Finsand. 1991. *North Polar Constellations*. Cedar Falls, Iowa: Spectrum House U.S.A.

Krupp, E. C. 1989. *The Big Dipper and You*. New York: Morrow Junior Books.

Lebofsky, N. R. 1994. A skunk is in the sky (or is it a plow?). *Science Scope* 17(6):26-30.

Moroney, L. *The Star Husband*, performed by L. Moroney, audiocassette. Edmond, Okla.: SkyTellers, Inc.

Winter, J. 1988. *Follow the Drinking Gourd*. New York: Alfred A. Knopf.

Extension activities

- To give students of all levels practice locating stars, constellations, and asterisms, plan a field trip to observe the night sky. Students should be able to find the North Star, Big Dipper, Boötes, and Corona Borealis. On a clear, dark night try to find the two bowl stars in the Dipper that are the "pointer stars" to the North Star. Look for three handle stars that are "pointer stars" to Arcturus, which represents the Owl in Boötes in the Bear Hunt story. Also, locate the middle handle star of the Big Dipper (Mizar) and its "companion," which represents the Chickadee and cooking pot in the story.
- To help students in the primary grades recognize constellation patterns, use the constellation transformation activity on the "Science Sparkers" page of *Science & Children* 32(1): 81-82.
- To teach middle level students more about sky lore and Sun symbols, use the activity found in the "Legends and myths of the sky" article in *Science Scope*, 17(6):31-33.

Diagram of the constellations

The Bear Hunt story follows the yearly apparent motion of three circumpolar constellations: Ursa Major (the Great Bear), Boötes (the Herdsman, Plowman, Ox Driver, or Bear Driver), and Corona Borealis (the Northern Crown) and surrounding stars. Most of Ursa Major represents the bear. The seven brightest stars in Ursa Major form the asterism of the Big Dipper. The three stars that are usually seen as the handle of the Big Dipper represent three of the hunters: Moose-bird, Chickadee, and Robin. Even the faint star Alcor, which appears near the middle star of the Big Dipper's handle, plays a part in the story—Chickadee's cooking pot! Four of the stars in Boötes represent the remaining hunters: Saw-whet, Owl, Blue Jay, and Pigeon; Corona Borealis is the bear's den.

