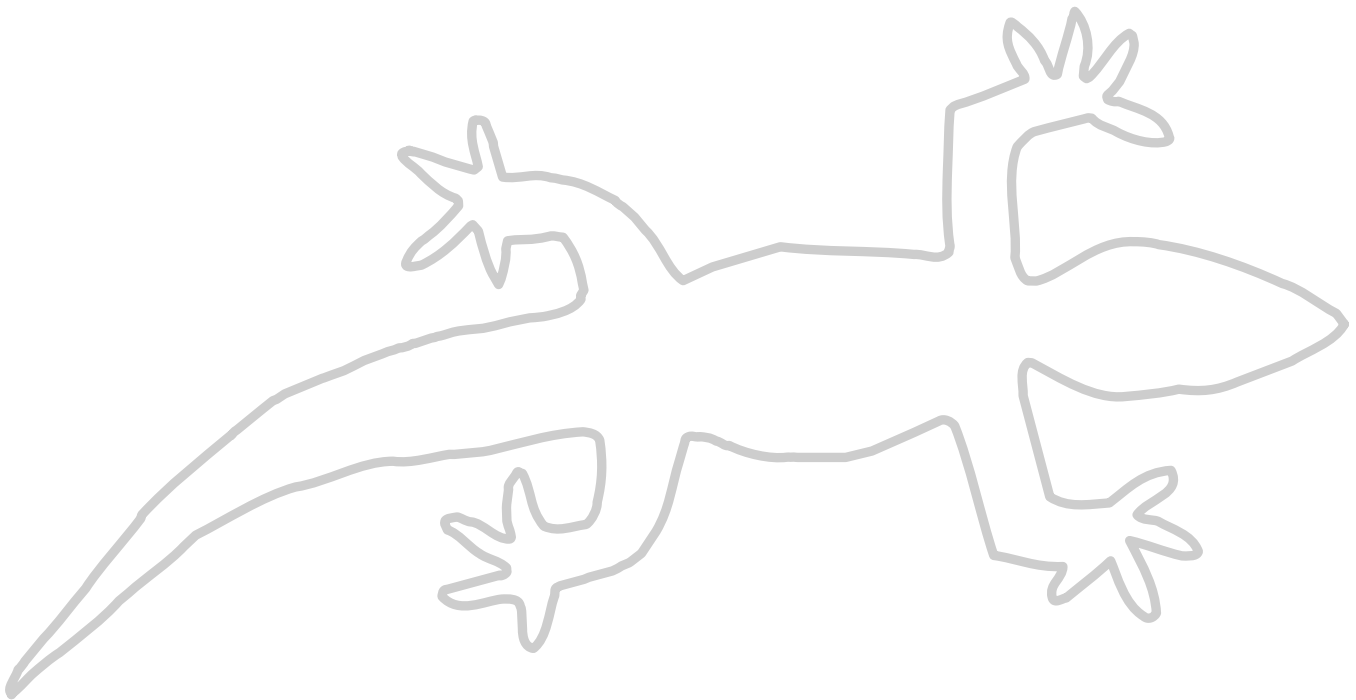




**A Collection of Curricula
for the STARLAB
Native American Mythology Cylinder**



Including:

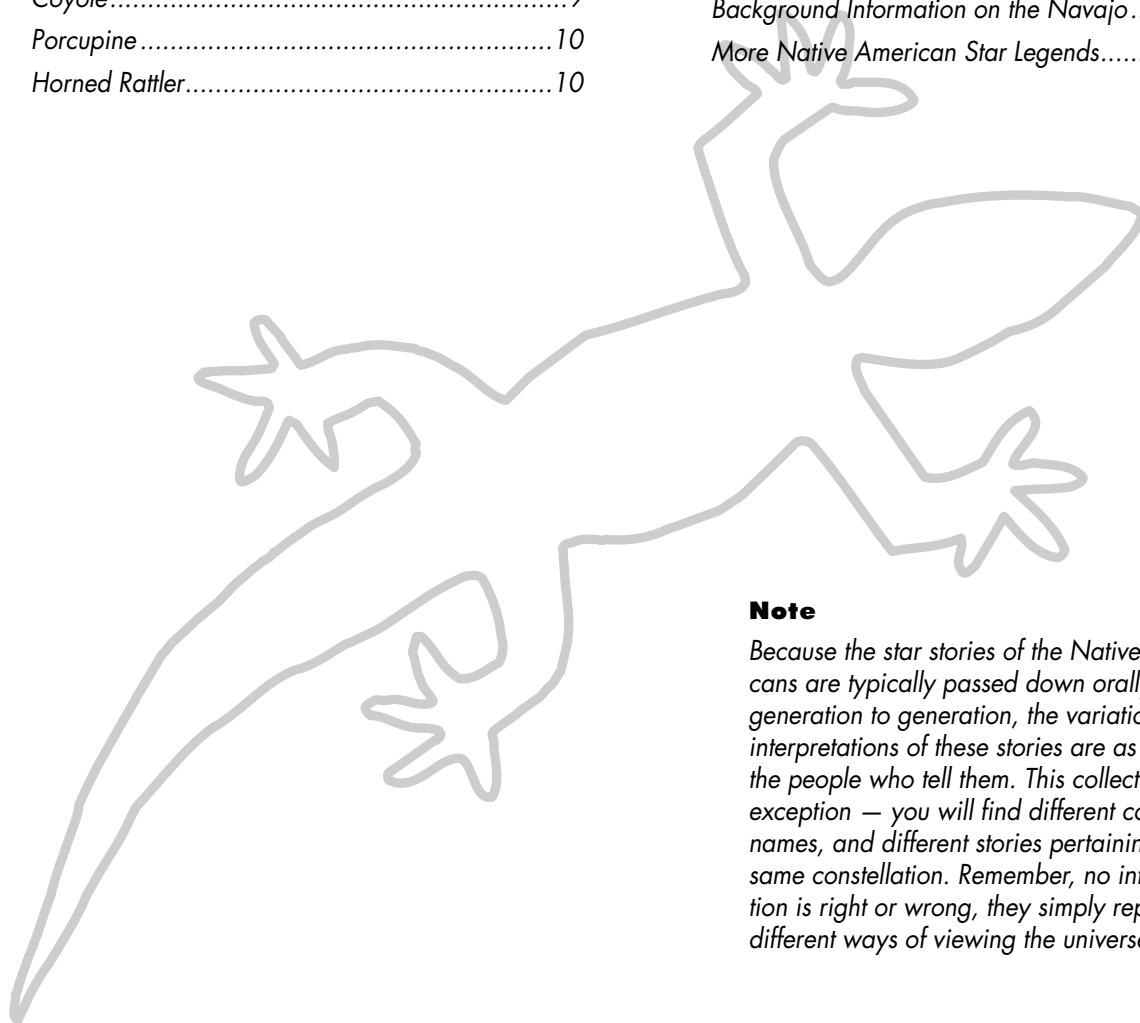
Stories of the Early Americans by Gary D. Kratzer

Background Information on the Navajo by Gloria D. Rall

More Native American Star Legends by Doris Ferror

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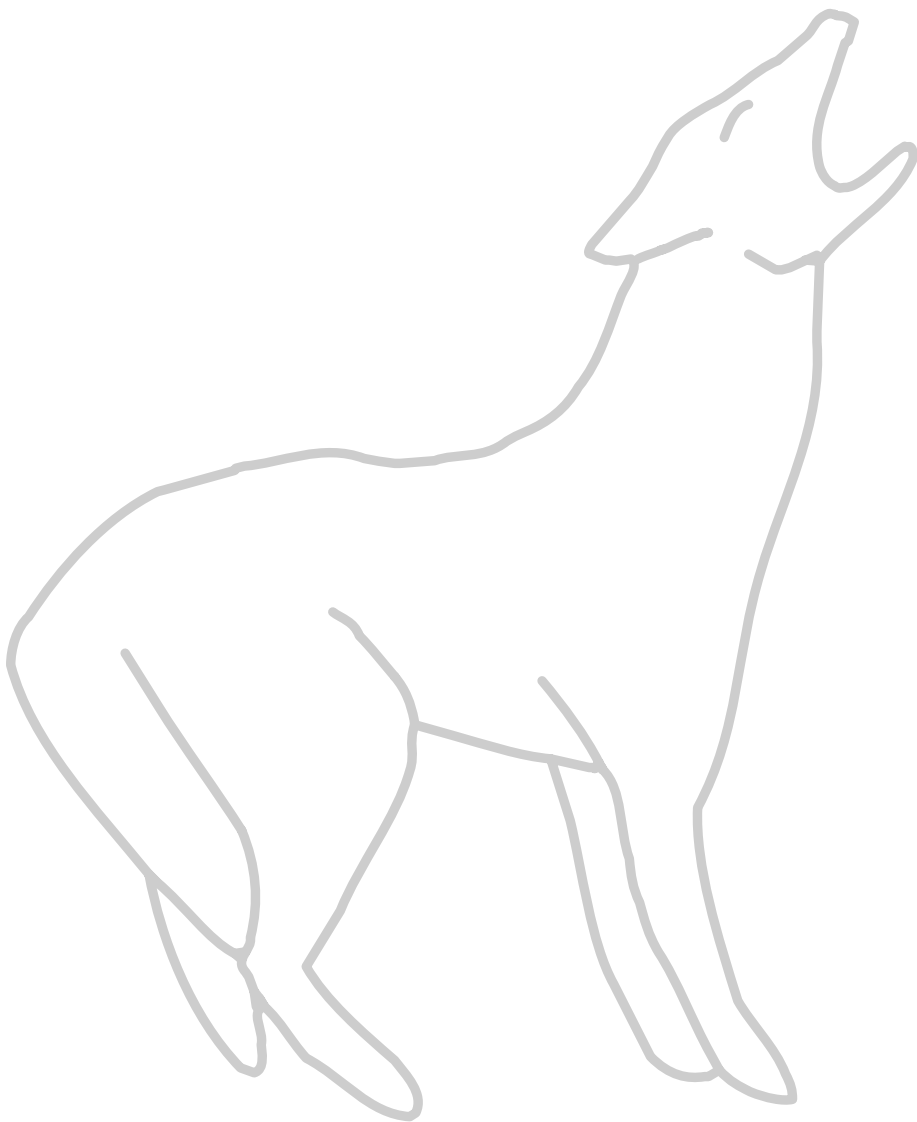
Note

Because the star stories of the Native Americans are typically passed down orally from generation to generation, the variations and interpretations of these stories are as varied as the people who tell them. This collection is no exception — you will find different constellation names, and different stories pertaining to the same constellation. Remember, no interpretation is right or wrong, they simply represent different ways of viewing the universe.

***Stories of the Early
Americans***

***A Guide to the STARLAB
Native American Mythology Cylinder***

Contributed
by Gary D.
Kratzer



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MATERIALS

For all the activities in this guide:

- STARLAB Portable Planetarium
- Native American Mythology Cylinder
- Starfield Cylinder
- Greek Mythology Cylinder (optional)
- 12" Styrofoam wreath form
- light source with 15 to 40 watt bulb
- glue
- cottonwood twigs (optional)
- a red light system or red covered flashlights
- arrow pointers
- strips of red, orange and yellow cellophane
- Native American soundtracks
- 18 to 20 gauge wire
- clipboards (optional)
- copies of worksheets
- Bear Hunt Constellation Wheels (see p. 19)

The Early Americans

Purpose

The purpose of the activities in this guide is to examine the origin of legends, myths and fables and the impact on Native Americans.

Objectives

1. To associate astronomical phenomena with Native American mythology.
2. To compare and contrast Native American mythology with that of other cultures.
3. To explain how life experiences were associated with the position of the stars.

Suggestions

The activities on the following pages were designed for use in a STARLAB but can be modified for use in the classroom. Special attention has been given to the use of process skills so that your students will be active participants rather than passive observers. Activities in this guide were based upon myths of various Native American tribes. We realize that many variations of these myths exist and recommend modifications or substitutions if necessary.

Native American Constellation Stories

Objective

To examine the origins and cultural importance of Native American mythological stories.

Process Skills

Observing • comparing • contrasting • listening

Preparation

Set up the STARLAB dome and projector. Place the Starfield Cylinder on the cylinder platform. Adjust the latitude on the projector to match your home location or that of southwestern Native Americans. Have a flashlight (covered with red plastic or red paper) ready for reading the script. Play Native American music as the students enter the dome. Make sure only the side lamps of the projector are on. Use the optional “simulated campfire” to enhance the presentation.

Procedure

- After the students are all seated, begin the lesson. Explain that today they will examine the stories and myths of Native Americans who lived here long ago. Do not turn up the stars at this time! Just before beginning the narrative, slowly turn down the side lamps until you reach total darkness.
- Begin the narrative with the Full Dark Story (use a red covered flashlight to illuminate the script for reading in the dark). When the Full Dark Story reaches the part that says “So there is water on Mother Earth and water in Father Sky, and that is why the sky is blue . . .” Begin to bring up the starfield slowly and turn on the daily motion on the projector. When the story ends, turn the starfield down slowly and at the same time increase the side lamp intensity.
- Take off the Starfield Cylinder and place the Native American Mythology Cylinder onto the cylinder platform. Remember to reset the latitude. Make sure the cylinder is positioned so that Black God is directly east. See the illustration of Black God below.
- As you decrease the intensity of the side lamps, increase the intensity of the projection lamp. To insure proper positioning, set the projector for October 15 at 9 p.m.
- Turn on the daily motion after the explanation of the Butterfly and Lizard. The script will guide you through the constellations. Use the arrow pointer to guide the attention of your students.
- Continue reading the script while periodically turning on and turning off the daily motion to allow time to point out constellations. When the script reaches “And in Closing,” increase the side lamp brightness while you slowly decrease the projector lamp intensity. Close the lesson by reviewing and discussing the importance of constellations to the early Americans.

Note

It may become necessary to turn off the daily motion of the projector periodically to allow adequate time for locating constellations and telling the stories.

MATERIALS

- STARLAB Portable Planetarium
- Starfield Cylinder
- Native American Mythology Cylinder
- Native American music
- red covered flashlight for reading the script
- light pointers
- Native American Mythology Script (see p. 7)
- simulated campfire (see p. 14)

Extensions

1. Have your students make costumes and wear them during your lesson in STARLAB. Build a simulated campfire (see plans on page 14) to enhance Native American presentations in STARLAB.
2. Have your students compare and contrast Native American and Greek mythological stories.
3. Make your own cassette tape of the Native American Constellation Script and play it while showing the constellations.

Script for the STARLAB

Native American Mythology Cylinder

Note

The planetarium should be dark at this time.

Full Dark Story: (Zuni)

First there was only darkness over everything. It filled all space. It covered the whole world. The ancient Sun Father, dwelling in the Great Outer Spaces, gazed around with his all-seeing eyes and saw that all was covered with water. So he rubbed his hands together and from the skin that flaked off, he formed two great balls. Raising one arm high, he flung one of the balls into the water. It melted slowly and spread far and wide and grew bigger and bigger. As it grew, part of it sank into the water and it became Mother Earth. Then he threw the second ball into the water. That, too, spread all over, growing even larger than the first. It drew up all the water that was left by the first ball and became Father Sky.

(Slowly increase the brightness of the starfield).

So there is water on Mother Earth and water in Father Sky — and that is why the sky is blue. Time went on and Mother Earth gave birth to man and creatures. One day Mother Earth and Father Sky held a great council. “How will our children live?” said Mother Earth. “We must have food for our children. How, after they are born, shall they live and be guided?” Father Sky answered, “They will be guided by my hands when I am not near. Behold!” He spread out his great hands, palms downward. There was golden yellow corn kernels in every line and wrinkle of his palms and fingers. “The shining kernels will tell them what to do and how to live. They will be their guiding stars!” That, say the Zuni, was in the beginning.

Procedure

Remove the Starfield Cylinder and replace it with the Native American Mythology Cylinder. Set the projector to October 15 at 9 p.m. so that Black God appears slightly above the eastern horizon. Begin reading the script below. Point out the constellations as you read the stories about them.

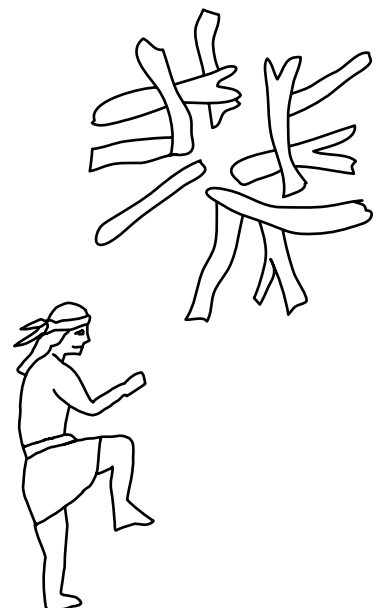
Campfire of the North (called Náhookis Biko’ii by the Navajo)

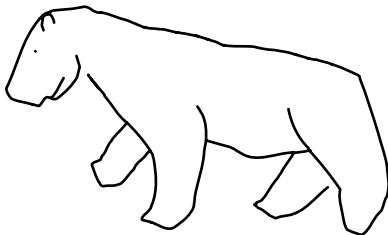
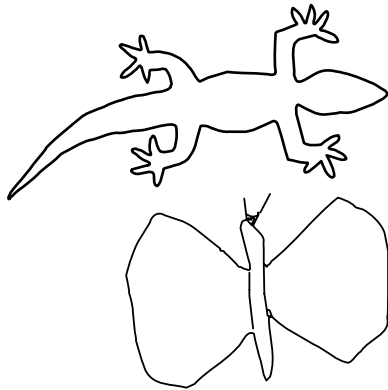
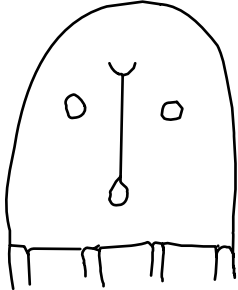
This is the North Star or home star. It never moves and acts as the traveler’s guide or lode star. Look for it if you are lost; it will help you find your way. All the other stars will revolve around it.

Revolving Male (called Ná hookos Bika’ii by the Navajo — the Big Dipper)

Revolving Woman (called Ná hookos bi á adii — Cassiopeia)

Also referred to as First Man and First Woman, these two constellations are located on either side of the North Star or home fire. They are the official leaders of all other constellations. They never leave this area of the sky and no other constellation inter-





feres with their routine. This arrangement of constellations established a law that has persisted to this day. This law stipulates that only one couple may live by one home fire.

Black God (called Hasheh'ééshzhini by the Navajo)

Black God (or Black God and His Pleiades) is the Creator of fire and light. When Black God entered the Hogan of creation, Pleiades was lodged by his ankle. In the Hogan, Black God stamped his foot vigorously causing the Pleiades to jump to his knee. Stamping his foot again caused the Pleiades to jump to his hip. The third time brought the Pleiades to his right shoulder, and on the fourth to his left temple where the Black God declared it "would stay." His feat of locating the Pleiades where he wanted it, confirmed to the creator group that the Black God alone had the power to produce constellations for beautifying the dark upper or sky.

Lizard (Na'ashoi) and Butterfly (K'aalongii to the Navajo)

Literature mentions that Revolving Woman made many constellations for the sky until nearly every animal, bird and insect had star counterparts in the sky.

Great Bear (Shoshoni)

Located on the Milky Way path, one Iroquois legend tells us that the Great Bear was pursued by three Indian braves. The chase began at the beginning of time when the first Indian shot and struck the Bear in the side with his bow and arrow. The wound wasn't serious, however, and the Bear kept on running. He has been running across the sky ever since. The Bear's path changes from season to season. In the autumn it begins low in the northwest. During this season, the arrow wound of the Bear opens slightly and a little blood trickles down upon the land. It covers the leaves of the trees and dyes them red and that is why we have autumn.

Procedure

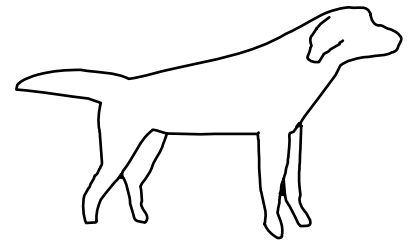
Turn on the daily motion switch on the projector. Turn the daily motion off when needed.

Long Sash (to the Tewa) or First Slender One (called Atsheh Ats'ozi by the Navajo) or Orion (Greek)

Long Sash lead his people westward to a new land away from their enemies who were attacking villages, stealing animals and killing families. Once settled in this new land, however, the people began to quarrel and fight among themselves. Long Sash declared "you are hurting yourselves worse than your enemies hurt you. If you are to come to a place of your own, there can be no violence among you. You must decide whether you will follow me or take another trail." To the Navajo, First Slender One represented planning and consideration.

Dog Star (Cherokee)

Legend tells us that all departed souls on their sky journey to the “land of souls” must pass two barking dogs. These dog stars are Sirius (located in the dog constellation) and Antares (located in the First Great One in Size) on your Native American Mythology Cylinder. If the departed soul fed the first dog but had nothing for the second dog, it would be left trapped in the sky forever between the dogs.



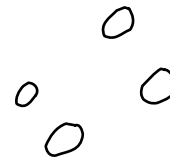
Rabbit Tracks (called Gahaat'e'ii by the Navajo)

This is the constellation that governs all hunting. During the spring and early summer when the open end of the tracks point upward, no one may hunt game animals. In the late fall, when the open end tips toward Earth, the hunting season begins. Laws governing hunting were very strict since the Navajo depended on game for their food. No hunting was allowed during an animal's mating season.



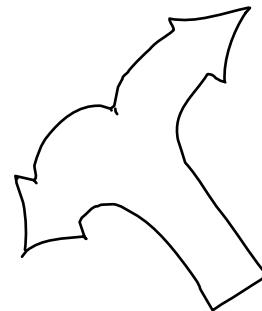
Note

If the daily motion of the projector is advancing the cylinder too fast, turn it off temporarily.



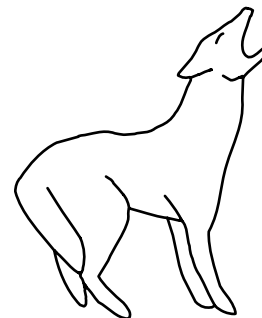
Place of Decision or the Twins (Tewa)

North and east of Long Sash are two bright stars. This is where Long Sash's people sat to decide which path of life to follow and thus it is called the Place of Decision. People looked to the stars for guidance whenever they came to a turning point in their lives.



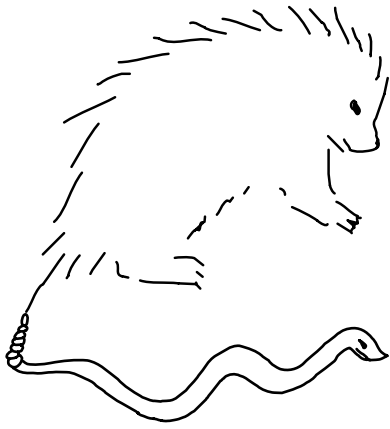
Coyote (Hopi)

Hopi legends tell us that the Creator called on all his creatures to gather tiny sparkling stones to place in the sky for light. He told each creature to take as many of the sparkling rocks as they could carry and draw a picture of themselves in the sky. Most of the animals, however, were too small to carry enough stones to complete their picture, so the Creator gave Coyote a large bag of stones so that he could help the smaller creatures. But Coyote grew impatient. He took the stones and flung them into the sky, which is why some of the star figures are unfinished and why the stars don't all form clear patterns. It was only when there were no rocks left that Coyote realized that he had forgotten his own picture. Coyote howled, and even today a coyote will howl at the sky because his picture is not there.



Coyote (called Ma'ii Bizo' by the Navajo)

In Navajo legend, the identity of the Coyote star is unknown. Most authorities think it is probably Sirius or Antares. The coyote created confusion in the skies.



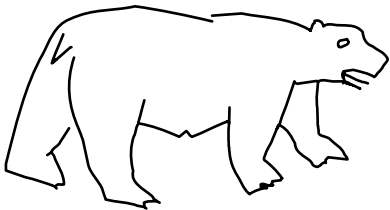
Porcupine (called Dahsani by the Navajo)

The porcupine was given charge of the growth of all trees on the mountains.



Horned Rattler (Hydra to the Greeks)

Hydra, who resembled a sea serpent, was said to be given charge of the underground water channels.



Thunderbird (called i'ni by the Navajo)

The Navajo legends hold that the Thunderbird constellation carried all the clouds in his tail and rain under his wings. Thus, when the Thunderbird constellation is shining brightly in the sky, spring or the rainy season has arrived.

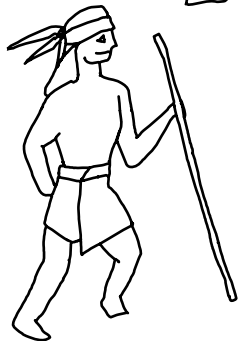
Bear

The Bear, a Navajo constellation that is tangent to the Thunderbird, is also tied into the legend of changing seasons. When the Bear is bright in the sky and the feather of the Thunderbird is just touching the nose of the Bear, spring has arrived. The Bear has essentially come out of winter hibernation.



Male with Legs Apart (called Hastçç Sik'a'i by the Navajo)

This constellation is part of Corvus, the Crow, and represents adulthood, old age and wisdom. He is the leader who presides at meetings.

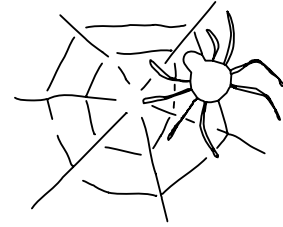


The First Great in Size (called Átshé 'ATsoh by the Navajo)

This constellation seems to be part of Scorpio. Its human form suggests an application to Revolving Male (First Man). This constellation, a male, represents strength and daring. He is a provider and protector. The cane that he carries represents stability. Canes are often used in sacred ceremonies and are made according to very strict rules.

Spider God (Blackfoot)

Spider God sits in his star web during the summer time, watching over the earth. To visit the land, he climbs down the Milky Way.



Milky Way Trail (called Yikáisdáhi by the Navajo or One That Awaits Dawn)

The Milky Way is said to be white cornmeal scattered across the sky by Revolving Man (First Man). Cornmeal is sacred, as is this constellation. It defines east, one of the cardinal points to which prayers are offered daily.

Milky Way Trail (known as the Pathway of Souls to the Algonquin)

The Algonquin legend tells us that the Milky Way is the path that our souls take when we die. Sometimes referred to as the Pathway of Souls, it is an imperishable mark upon the sky which arches across the heavens. We do not know where the path leads nor do we know what sights they may behold. Each bright star, however, is a campfire blazing in the sky where they have paused in their journey to look down on us, their people, as we huddle for warmth around our home fire.

Other names for the Milky Way:

- Fox Tribe: "a river of stars"
- Yokut: "dust from a race between antelope and deer"
- Cherokee: "cornmeal dripping from a dog's mouth"
- Ciowa: "backbone of the sky"
- Hidohsa & Patwin: "scattered ashes"
- Eskimo: "track made by Raven's snow shoes"
- Skidee Pawnee: "glue holding the sky together"

Procedure

Begin decreasing the projection lamp and increase the side lamp brightness to simulate a rising sun.

Dawn (Dakota)

The night sun was brother to the day sun. He knew man needed the heat and light of the day sun very much to live and grow things. So that man should always look to the place of the rising sun, he placed the smoke of burning waters there to make it beautiful.

Closing Comments

The Otoe tribe had a sleep man named Patooyeh. His job was to watch over children at night so that their dreams would be happy.

Procedure

Turn down the projection lamp and increase the side lamp brightness.

When he saw the first light of dawn, he knew it was time to leave. But before he did, he left each child with this benediction: "May the Great Spirit bring sunrise to your hearts."



MATERIALS

- STARLAB Portable Planetarium
- Starfield Cylinder
- stems from a cottonwood tree
- Native American music
- red, blue and yellow stick-on stars
- one-half inch wooden dowels 4 inches long
- markers (red, blue and yellow)
- glue
- Native American costumes (optional)
- simulated campfire (optional, see p. 14)

The Secret of the Hidden Stars

Note

In this activity, text that is in italics is suggested script for the teacher to use.

Objective

To discover the origin of Native American star legend.

Process Skills

Observing • listening • communicating

Preparation

1. Set up the STARLAB dome and projector. Place the Starfield Cylinder on the cylinder platform. Position the projector to your latitude. Set the date and time for early January.
2. If using the "campfire" and Native American music in your lesson, have it set up and with the sound on before the students enter the planetarium. If students are wearing Native American costumes constructed in class, have them dress before entering the planetarium.
3. Make sure that a five-point star is visible when the cottonwood twig is broken in a stem joint. If the "star" is not visible, try sanding the broken end of the twig lightly. This often makes the star much more visible. Using a colored marker (red, blue or yellow), enhance the stars by coloring some of them with color — leave several uncolored. Optional stick-on stars can be glued to the end of a 4-inch section of a half-inch wooden dowel. Procedures for making simulated cottonwood twigs are included with this lesson.
4. Discuss the word legend with your students. Ask if they remember any legends or stories their parents have told them about the stars and where they come from.

Procedure

After students are seated in the planetarium, begin a discussion of Native American legends.

Legends were used as a means to explain the world and the universe. Many Native American legends were derived from the importance they placed on their surroundings. Many civilizations created unique stories that were interesting and therefore, not likely to be forgotten from generation to generation.

Start Native American folklore music. Slowly turn down the side lamps on the projector as you increase the starfield brightness. Begin reading the following legend entitled The Secret of the Hidden Stars.

The Native Americans of our plains have some fun folklore about the secret of the hidden stars. The story goes like this. All things come from Mother Earth. Stars are no exception. They form the Earth and then drift along just under the surface until they find the roots of the magical cottonwood tree. They enter the roots and slowly work their way up through the tree. They finally come to rest in the small twigs at the end of the branches. Here they wait until they are needed. When the spirit of the night sky decides that she needs more beautiful stars, she calls on the wind spirit. The spirit of the wind sends his blustery gusts in all directions. The wind shakes the magical cottonwood trees and the twigs begin to break off. As they break off, stars are

released and more escape when they break again upon hitting the ground. The new stars race up into the night sky where they are each carefully put in a special place. When she has enough new stars, the spirit of the night sky tells the wind spirit to stop and the wind settles down to a gentle night breeze. Now, the spirit of the night sky wants to thank the wind spirit for his help and so she makes all the new stars twinkle. This way, the wind spirit can see where all the new ones have been placed. So, if you would like to add a new star to the night sky, you will need some twigs from the magical cottonwood tree.

When your students are ready to add a new star to the night sky, turn up the side lamps and pass out the cottonwood twigs or wooden dowels with stick-on stars. In examining the twigs (or dowels), the students will notice that some are colored red, blue or yellow. Some will easily notice the "five-point star" on their twig while others may need assistance in finding it. After examining the twigs, ask the students to hold their twig (or simulated star holders) up to the night sky while you quickly plunge the dome into darkness by turning down the side lamps and increasing the starfield brightness.

Now look up at the night sky again. If you look carefully in the same direction that you released your new star, you will see it shining brightly in the heavens. This is your thank you from the spirit of the night sky for adding a beautiful new star to her kingdom.

Increase the side lamp intensity to a point where you can begin to see your students. Prepare to hand out arrow pointers.

Did anyone release a red star? Can you find it in the night sky? Would you point to it for us (with pointer)? Did anyone release a blue star? Can you find it in the night sky? Would you point to it for us (with pointer)? Did anyone release a yellow star? Can you find it in the night sky? Would you point to it for us (with pointer)? How many of you released white stars? They seem to be the most common ones!

Increase the side lamp intensity the rest of the way. Collect the cottonwood twigs or dowels at this time. Begin a discussion of the legend.

How does this story compare to the ones you told me about at the beginning of this lesson? Why do you think people of long ago made up stories about the stars? (Stories and legends were attempts to explain one's surroundings and the mysteries within).

Extensions

1. Have your students make and decorate Native American costumes to wear in STARLAB during your lesson.
2. Construct a "campfire" using the plan illustrated on page 14.
3. Explain that some Native Americans believed that the leaves of the cottonwood were linked to the origin of the "teepee." The story tells of a wise old Native American observing children at play. The children were rolling cottonwood leaves to make little houses for their tiny clay animals. The old Native American took the ideas to tribe members who copied the leaf shape in animal skins and fashioned poles to hold the skins in place. Try rolling up a cottonwood leaf some time.

MATERIALS

- sheets of red, orange and yellow acetates, cellophane or notebook covers
- 12" Styrofoam wreath form
- 18 to 20 gauge florist wire
- glue or hot glue
- variable light source (with dimmer switch)
- 15 to 40 watt light bulb or 3 watt flicker flame bulb

Construction of a Simulated Campfire in STARLAB

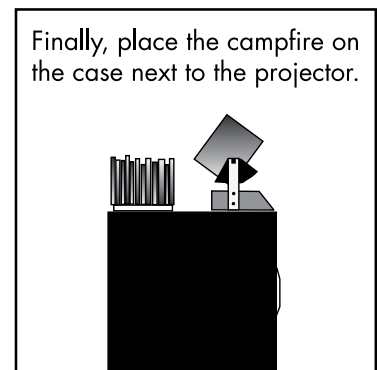
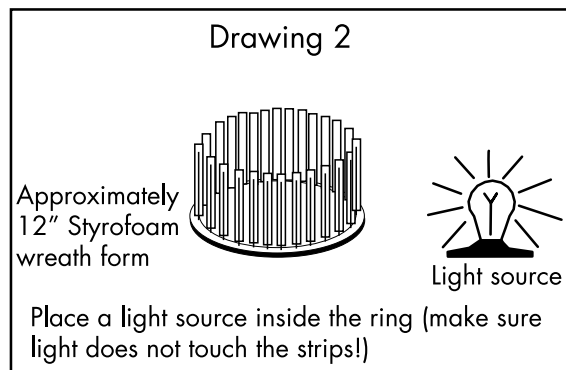
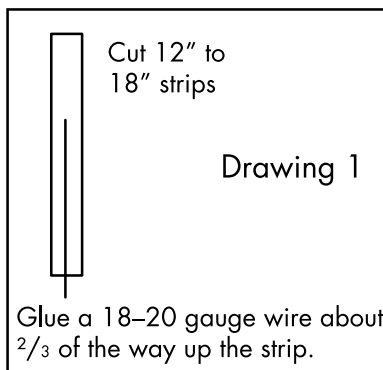
The use of special effects and altered settings can greatly enhance a student's ability to learn. The following diagram will aid in the construction of a simulated campfire for use in STARLAB with the lessons found in this guide.

Procedure

- Cut out several strips of red, orange and yellow acetates, cellophane or notebook covers 12 to 18 inches long and 1 to 2 inches wide. The number needed depends on how wide the strips are cut as well as the size of the wreath form. (Drawing 1).
- Cut pieces of 18 to 20 gauge florist wire that are approximately two-thirds the length of the cellophane strips. (Drawing 1).
- Glue or hot glue the wire to the middle of the strips (length) leaving approximately 1 to 2 inches sticking out of one end of each strip and short of reaching the other end. (Drawing 1). The strips may overlap each other when being positioned vertically or tilted slightly toward the center.
- After the glue dries, stick the strips around the outer edge of the Styrofoam ring alternating the three colors. Depending on the thickness of the material used, the top of the strips will flop down a bit. (Drawing 2).
- Place a variable light source on the end of the upright STARLAB projector case opposite the projector. Air currents in STARLAB should move some of the strips to create a "flickering campfire" effect. (Drawing 2).
- Adjust the light source to the brightness level necessary to create the best campfire.

Note

If a variable light source is not available, it may be necessary to experiment with bulbs of various wattage to acquire adequate brightness. A flicker flame bulb produces a realistic "burning fire" appearance. Make sure the light source does not come in contact with the strips!



Making Secret Star Holders

(Simulated Cottonwood Twigs)

If cottonwood trees are not native to your area, very simple substitutions can be made.

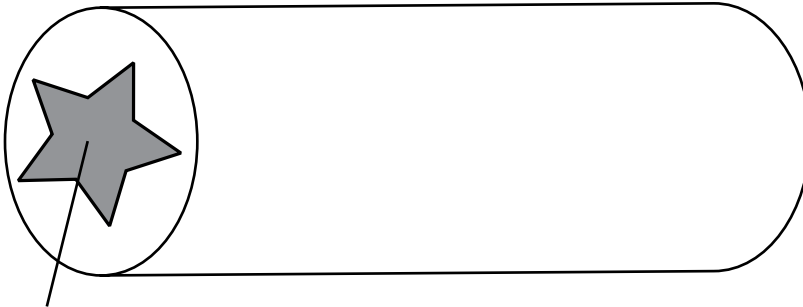
Procedure

- Cut as many 4 inch pieces of ½" wooden dowels as necessary so that each child has one to hold in the planetarium.
- Glue stick-on stars on one end (or both) of the wooden dowel sections (see diagram below).

Note

The stick-on stars may not stay stuck on the dowel without adding an additional spot of glue. Use mostly white or silver (which represents white) stars and only a few red, blue or yellow (or gold) stars because the white stars are more abundant and more visible to the naked eye in our night sky. There are fewer easily visible red, blue, and yellow stars.

Use a 4" section of wooden dowel as a substitute for a cottonwood stem.



Glue on a colored stick-on star.

MATERIALS

- STARLAB Portable Planetarium
- Starfield Cylinder
- Native American Mythology Cylinder
- Bear Hunt Constellation Wheels (see page 19)
- red covered flashlights
- simulated campfire (optional, see page 14)
- Native American music (optional)
- clipboards (optional)

The Bear Hunt Story

Note

In this activity, text that is in italics is suggested script for the teacher to use.

Objectives

To understand that the apparent motion of the stars is actually a result of the rotation and revolution of the Earth, and to model the apparent motion of Native Canadian constellations as told in stories.

Process Skills

Observing • describing • modeling • communicating

Preparation

Set up the STARLAB dome and projector. Place the Starfield Cylinder on the cylinder platform. If a simulated campfire is being used, place it on the projector storage box just in front of the projector. For this story to be accurately depicted, set the latitude adjustment to replicate the star positions for approximately 50° N. This setting will allow students to see the sky as seen by the Micmac and Iroquois tribes of eastern Canada. In the days leading up to this lesson, review with your students the concept of apparent motion, circumpolar rotation, rotation, and revolution. If possible, bring the students into the planetarium and locate the constellations Ursa Major, Bootes, and Corona Borealis. Explain that part of Ursa Major is widely known to many people today as the Big Dipper. Quickly point out that seven stars of the Big Dipper are known as an asterism. An asterism is a shape or pattern created by some of the stars in a constellation. Construct the Bear Hunt Constellation Wheels in class. It is recommended that one for each student is constructed. Each student will need a red covered flashlight for seeing the wheel in STARLAB.

Procedure

Set the projector for the end of March at 9:00 p.m. and 50° N latitude. After the students are seated facing north, pass out the Bear Hunt Constellation Wheels. Review the instructions for use with your students.

To the first Americans, the sky was a calendar, a clock, a road map and a teacher of moral values. These people told stories about the stars to teach their young the lifelong skills of navigating and the importance of the seasons to planting and harvesting crops. Today we will examine one such story that, in the past and even today, helps us to understand the principles of the Earth's rotation on its axis and its revolution around the sun.

- Make sure each student has a Bear Hunt Constellation Wheel. Slowly reduce the brightness of the side lamps and increase the brightness of the projector.
- Have the students rotate their constellation wheel until Early Spring is at the top of the wheel. Ask the students if anyone needs help. Ask the students to find the Big Dipper on the dome and make sure the bear on the constellation wheel is in the same configuration.
- When all of the students exhibit an understanding of how the constellation wheel operates, begin the narration of The Bear Hunt Story.

The 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.

Procedure

The projector should be set on early April at 9 p.m. Ask if all the students are holding their Bear Hunt Constellation Wheel toward their body as they face north. If not, ask them to turn the wheel so that the Big Dipper or Bear appears the same way they see it on the dome. Make sure they position Early Spring toward the top of the page. The daily motion of the projector should run approximately 85 seconds until the Late Summer setting is properly positioned in the sky.

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.

Point out the three stars in the handle of the dipper. Using the light pointer, identify the stars as Moose-bird, Chickadee and His Cooking Pot, and Robin. Following closely toward the eastern sky is Saw-whet, Horned Owl, Blue Jay, and Pigeon. It may become necessary to stop the daily motion of the projector temporarily while pointing out characters.

The bear looked big and clumsy, but she moved across the sky rapidly. The hunters followed her all summer, but as autumn (late summer) approached, they had still not caught up to the Great Bear.

The projector setting should now be on early September at 9 p.m. While facing north, again have the students turn the constellation wheel so that Late Summer appears at the top of the wheel just under the instructions. Continue to point to the stars mentioned in the story. The daily motion of the projector should run approximately 40 seconds until the Autumn setting is properly positioned in the sky.

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 projector setting should now be for early November at 9 p.m. While facing north, again have the students turn the constellation wheel so that Autumn appears at the top of the wheel just under the instruction. Continue to point to the stars mentioned in the story.

The bear grew angry and rose up on her hind legs. She growled loudly and clawed the air to scare the hunters. One of the hunters 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.

The projector setting should now be for early January at 9 p.m. While facing north, again have the students turn the constellation wheel so that Winter appears at the top of the wheel just under the instructions. Continue to point to the stars mentioned in the story. The daily motion of the projector should run approximately 40 seconds until the Winter setting is properly positioned in the sky.

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.

The projector setting should now be back to the original setting of early April at 9 p.m. While facing north, again have the students turn the constellation wheel so that Early Spring appears at the top of the wheel just under the instructions. The daily motion of the projector should run approximately 53 seconds until the Early Spring setting is properly positioned in the sky.

In the spring, the bear will leave the cave again to travel across the spring and summer sky, always pursued by the Bird Hunters.

After completing the Bear Hunt Story, pass out Worksheet 1, The Bear Hunt Constellation Activity. Instructors may choose to complete the worksheet in the classroom with the aid of the Bear Hunt Constellation Wheels. Others may want their students to complete the worksheets in STARLAB. If so, students will again need red covered flashlights and clipboards (optional).

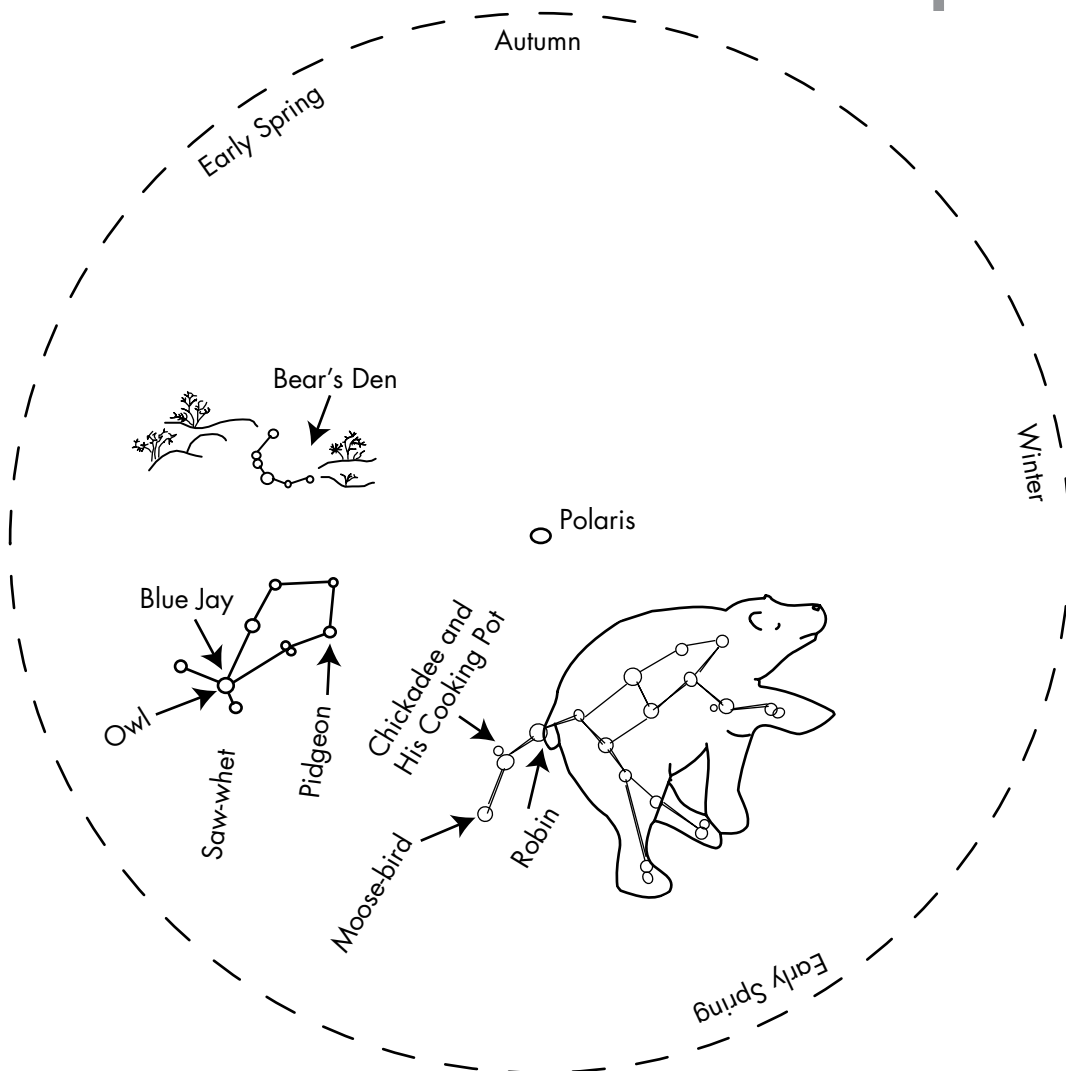
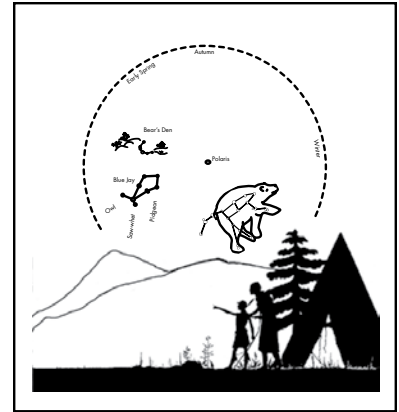
Closure

Review the concept of circumpolar rotation. Students need to understand that not only do the Bear Hunt Constellations appear in different parts of the sky during the various seasons but in a 24-hour period these constellations will completely circle Polaris, the North Star. Reinforce this concept by having the students face north while turning the Starfield Cylinder either manually or by the daily motion control. It may be necessary to use the light pointer to trace a constellation's path (Ursa Major) during a complete circumpolar rotation. Explain that the rotation of the Earth is responsible for this apparent circumpolar rotation of northern sky constellations.

Bear Hunt Constellation Wheel

Instructions

Cut out the constellation wheel below. The template on the next page may be used as is, however, to make all parts sturdy and long-lasting, cut and mount them to construction paper or poster board. Fasten the constellation wheel to the template by punching a small hole through the star, Polaris, on the constellation wheel and template in the marked location. Use a brad to fasten the two pieces together. Make sure the constellation wheel turns freely. Cut out the horizon and glue it to the template in the marked locations. See diagram to the right.



Horizon for Bear Hunt Constellation Wheel

Instructions

Cut out the horizon below along all sides and along the contour of the trees and mountain. Glue or tape the three side edges to the template shown on the next page. Remember: do not glue or tape the entire horizon, just three edges to the template: the bottom, left and right. The top of the horizon must be free to accommodate the constellation wheel as it is turned.

Cut along the contour of the trees and mountain.
Remember: do not glue or tape this edge.



Cut along the bottom edge.

Bear Hunt Constellation Wheel

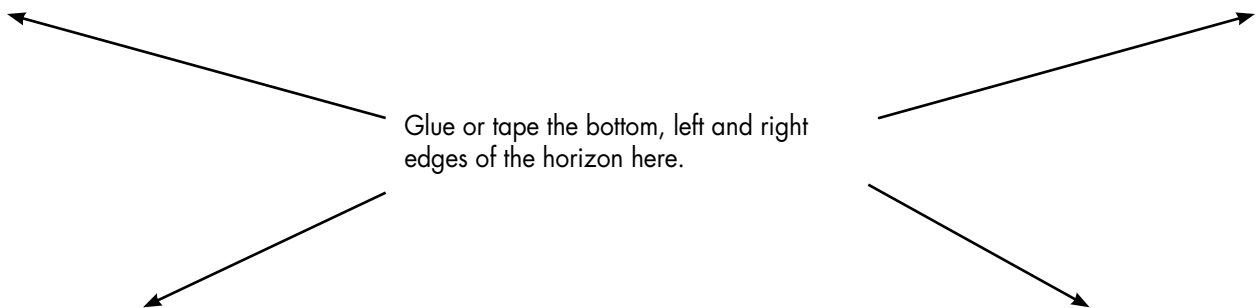
Instructions

Position yourself to face north in the planetarium. While facing north, hold the constellation wheel in front of you and turn it until the season mentioned in the story is below these instructions. Make sure the position of the bear (Big Dipper) on the wheel matches the position of the Big Dipper in the planetarium sky.

Note

Seasonal viewing times are for 9 pm from 50° N latitude.

Punch out hole and fasten the Constellation Wheel by placing a brad through Polaris on the wheel and this template.



Worksheet 1: Bear Hunt Constellation Activity

Instructions

Answer all of the following questions on this worksheet. Use the Bear Hunt Constellation Wheel for assistance in answering the questions.

1. Why does the Bear appear in different parts of the northern sky each season?
2. How did the Bear appear to move in one year with respect to Polaris?
3. Describe how the Bear appears to move in the sky in 24 hours? (Turn the cylinder manually if in STARLAB.)
4. Why does Saw-whet, Owl, Pigeon, and Blue Jay disappear from view in the Winter and the Bear does not?
5. Why does Polaris appear to stay in the same place in the sky all year long?

Bear Hunt Constellation Activity Answer Key

1. Why does the Bear appear in different parts of the northern sky each season?

The Bear appears in different parts of the sky each season due to the revolution of Earth around the sun. As the Earth orbits the sun, constellations appear to gradually move to different parts of the sky.

2. How did the Bear appear to move in one year with respect to Polaris?

All circumpolar constellations appear to circle Polaris in one year.

3. Describe how the Bear appears to move in the sky in 24 hours?

The Bear appears to circle Polaris once in 24 hours. This phenomena occurs because the North Star, Polaris, happens to appear very close in the sky to the Earth's rotational axis. If you could extend a very long stick straight up from the North Pole into space, Polaris would appear close to the end of the stick. If your students are in STARLAB when answering this question, turn the Starfield Cylinder manually to illustrate this phenomenon.

4. Why does Saw-whet, Owl, Pigeon, and Blue Jay disappear from view in the Winter and the Bear does not?

Saw-whet, Owl, Pigeon, and Blue Jay are not circumpolar stars. These stars appear to move across the sky from east to west at about 1 degree per night. The apparent setting of these stars each night is due to the Earth's rotation. The Bear does not seem to disappear each night because it is a circumpolar constellation (Ursa Major) and makes 1 complete revolution around Polaris in 24 hours. Even as the seasons change, the Bear is still visible each night but appears to change position in the sky.

5. Why does the North Star, Polaris, appear to stay in the same place in the sky all year long?

The Earth's rotational axis (from the North Pole) points very near to Polaris. As the Earth orbits the sun, the axis of the Earth continues to point to this position in the sky, day or night. Consequently, Polaris is visible in the same part of the sky any night of the year. Its position may change with respect to the horizon when viewed from a different latitude.

References

- Caduto, Michael J. and Joseph Bruchac. *Keepers of the Earth*, Fulcrum, Inc., Golden, CO, 1989.
- Clark, Ella E., *Indian Legends of the Pacific Northwest*, University of California Press, 1953.
- Clark, Ella E., *Indian Legends From the Northern Rockies*, University of Oklahoma Press, 1966.
- Cohlene, T., *Quillworker: A Cheyenne Legend*, Watermill Press, Mahwah, NJ, 1991.
- Findsand, D. L. and M. J. Findsand, *North Polar Constellations*, Spectrum House U.S.A., Cedar Falls, IA, 1991.
- Haile, Berard, *Starlore Among the Navajo*, Museum of Navajo Ceremonial Art, Santa Fe, NM, 1947.
- Judson, Katharine Berry, selector and editor, *Myths and Legends of British North America*, A. C. McClurg and Co., 1917.
- Judson, Katherine Berry, *Myths and Legends of the Mississippi Valley and the Great Lakes*, A.C. McClurg and Co., 1914.
- Krupp, E. C., *The Big Dipper and You*, Morrow Junior Books, NY, 1989.
- Lebofsky, Nancy R. and Larry A. Lebofsky. "Celestial Storytelling," *Science Scope* magazine, National Science Teachers Association, Nov/Dec 1996.
- Littman, Mark, *The People — Skylore of the American Indian*, Hansen Planetarium, Salt Lake City, UT, 1976.
- Longfellow, Henry Wadsworth, "The Song of Hiawatha."
- Marriott, Alice and Carol K. Rachlin, *American Indian Mythology*. Thomas Y. Crowell Company, 1968.
- Mayo, G. W., *North American Indian Stories: More Star Tales*, Walker and Company, NY, 1990.
- Monroe, J. G., and R. A. Williamson, *They Dance in the Sky, Native American Star Myths*, Houghton Mifflin Co., Boston, 1987.
- Moroney, Lynn, "The Star Husband" (audiocassette). SkyTellers, Inc., Edmond, OK.
- Newcomb, Franc Johnson, *Navajo Folk Tales*, Museum of Navajo Ceremonial Art, Santa Fe, NM, 1947.
- Parsons, Elsie Clews, *Tewa Tales*, American Folk-Lore Society, G. E. Stechert and Co., 1920.
- Sky Challenger, Astronomy Education Program, University of California, Berkeley, CA, 1978.
- Staal, J. D. W., *The New Patterns in the Sky*, The McDonald and Woodward Publishing Co., Blacksburg, VA, 1988.

Thompson, Stith, selector and annotator, *Tales of the North American Indians*, Indiana University Press, 1929.

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

Williamson, Ray. *Living the Night Sky*, University of Oklahoma Press, 1984.

Science First/STARLAB would like to express special thanks to the astronomers of the Astronomy Education Program at the Lawrence Hall of Science, University of California at Berkeley for their suggestions on this cylinder.

Background Information on the Navajo

by Gloria D. Rall

- The Navajo Nation came into existence sometime in the 16th century when various groups of Indians migrated from the West Coast to settle in the Four Corners area where they coalesced to form one tribe with a distinct cultural identity.
- That distinctiveness exists even today. The Navajo have resisted white culture and preserved much of their own. The Navajo believe the sky is a father who provides rain and the Earth is a mother who shelters and raises living things. Everything on the Earth is sacred. They make no distinction between secular and sacred. Nature strives to live in harmony, and it is the obligation of people to preserve and cherish that harmony. Thus, certain balances must be kept.
- To understand the Navajo, one must understand their story of how the tribe came to be. At one time, they emerged from an underground world known as Black World. Only Holy People lived in Black World, including First Man and First Woman, who lived, respectively, in the east and the west. (First Man and First Woman are to be viewed as Holy People, not ordinary humans.) They were united when First Man burned a crystal (symbolizing the awakening of the mind) and First Woman a piece of turquoise.
- Chaos came to the Black World, so First Man and First Woman migrated, first to the Blue World, then to the Yellow World. Finally, they moved to the Glittering World where they still live today. In this world, they found Changing Woman as an abandoned baby. They adopted her. She created people from all the things of the Universe.
- First Man, First Woman and Changing Woman are the most important of the Navajo deities. Changing Woman developed and taught the Navajo all the values and beliefs they cherish today.
- When First Man and First Woman emerged, they found the world barren — no plants, no mountains, no animals, no sky, so they built a home to have a place to plan the world. This was the First Hogan. Today the hogan is the center of Navajo life. Not only is it a home, it represents the center of life and is the place where all ceremonies and important functions are carried out.
- Black God entered the First Hogan carrying a small group of stars on his feet. These stars were called Dilyehe (the Pleiades or Seven Sisters in western culture). He stomped and they jumped to his knee. He stomped again and the stars moved to his thigh. A third stomp took the stars to his shoulder, and a fourth to his face. Together, First Man, First Woman and Black God planned the placement of the stars in the sky. They were to benefit the Earth People. The stars were meant to: 1) help people find their way; 2) help them regain faith and balance; 3) help diagnose illness, locate lost people, or lost items and; 4) forecast the future. They would also place stars to provide seasonal and nightly markers for agricultural, hunting and ceremonial activities.
- Revolving Male (Big Dipper) and Revolving Female (Cassiopeia) are the official leaders of all other constellations. The North Star is their fire. The Navajo consider these as one inseparable constellation, not two constellations as in the Greek tradition.

- The Pleiades are Dilyehi and Orion is First Slender One. Dilyehi represents early childhood, and Orion is adolescence.
- The third pair of constellations are Male with Legs Apart (Corvus to the Greeks) and The First Great in Size (Scorpio). They represent adulthood, old age, and wisdom.
- The final pair are Rabbit Tracks (the last four stars in Scorpio's tail) and the Milky Way. Rabbit represents hunting, and the Milky Way is the patron of plants.
- The constellations were almost created and perfect when Coyote appeared on the scene. As always, Coyote created confusion. Impatient with the precision and slowness of carefully placing the stars in the sky, he grabbed all the remaining stars (which the Holy People had placed on a blanket) and threw them into the sky. Thus the constellations were never quite finished and do not look like their names. One star fell back to Earth. Coyote grabbed it, placed it back into the sky, and claimed it as his star.
- The identity of the Coyote star is uncertain. Some authorities identify it as Sirius in Canus Minor, others as Antares in the Scorpion. According to the creation legend, it is a bright star low in the southern sky and visible only during the summer.

Notes

*References to the sky and stars are common by the Navajo. They rely particularly on the Pleiades as a calendar marker and the Big Dipper as a calendar. For more information read *Living the Night Sky* by Ray Williamson, University of Oklahoma Press, 1984.*

More Native American Star Legends

by Doris Forrer

Note

These notes were prepared by Doris Forrer of the Walter Schuele Planetarium, Lake Erie Junior Nature and Science Center, Bay Village, Ohio.

A Few General Thoughts

To the first Americans, the sky was a calendar, a clock, a road map and a teacher of moral values. Children learned early to be celestial navigators out of necessity. It is obvious the Native Americans had charted the sun's path and even understood something of the solar system's relationships from the stories they tell. The primary intent of this literature was to express religious belief, and although they are intended for adults, they make an entertaining and educational program for today's children. From the following story outlines, you can develop a program for any time of the year. Become a story teller yourself and embellish as you will, just as many a village elder did for the children of his time.

As Night Falls (Paiute)

"Tu omp i av" — the sky is wonderful. It is like "Tu weap" — the Earth. The seasons of the year are there. There is day and there is night. There is brush, grass, trees and mountains with their tops pointing towards us. It is an inverted world. The animals are there — "Cooch" the buffalo, "Tuee" the deer, "Cabi" the horse, "Quanauts" the eagle. They are restless and traveling, looking for warmth and food. If we watch through the night, we will see how they move. Some go to warmer places in winter. They follow the good weather and the good grass.

Northern Sky (Paiute)

One animal doesn't move. Nogah was a favored mountain sheep awarded great curled earrings for his bravery. His vanity caused him to climb a very high mountain. So intent was he on climbing that he failed to notice each ledge crumbling behind him and so his pride stranded him on top of the mountain — to this day the only unmoving star. But the other sheep didn't learn, for we see them going round and round, trying to find a way up the mountain.

Northern Sky (Iroquois)

Big Dipper calendar: The bowl is a spirit bear, the three handle stars are three braves chasing him up a mountain. Nearest to the bear is an archer, the second carries a cooking pot on his back (Mizar-Alcor), the third lags behind gathering firewood. In spring, early in the evening in the eastern sky the braves chase the bear up the mountain. Hot summer days on top of the cool mountain, the chase continues overhead early in the evening. As summer ends, they stare down the mountain. The archer takes aim and wounds the bear. His blood stains many of the tree leaves red. They all start looking for caves in which to winter. By March, the bear's wound is healed and the braves have overcome their guilty feelings for wounding the bear — and the chase is on again.

The Southern Sky (Iroquois)

The moon is the wife of the sun, who is angry with her and turns away from her. She pines away to nothing. Little Turtle encourages her to eat again so that she will look

fat and jolly when the sun again looks upon her. But in his anger, he turns his face from her and she once again pines away. Each month the cycle is repeated.

The Southern Sky (Algonquin)

An old Algonquin woman known for hurting people with her gossip was always pestering the Great Manitou to find out the date of the Earth's death. The village elders together with the Great Manitou decided to kill two birds with one stone by telling the old woman that she would be told the date of Earth's death as soon as she finished weaving a bag to carry some of the day's light in the night. She was put in the sky with weaving materials, a pot of corn soup, and a kitten for company. Each month just as she was nearly finished, the soup began to burn. She had to put down her weaving to stir it. The kitten (under orders from the Great Manitou) unwound her weaving, thus spilling the captured sun's light. So now her work is never done, and she continues to hurt people with her gossip.

The Planets (Chippewa)

The Indians were not particularly interested in the planets because they had no use for time or travel-reckoning. They did recognize the ecliptic as a specific path through the sky and called it a wolf-trail — the planets were then wolves who prowled restlessly. The recurring pattern of Venus and Mercury together near the horizon in the morning or evening led to a story that Venus (the brighter) was the sister of the sky, and Mercury was dimmer because he was brother to the Earth. Their paths only occasionally crossed and when they did, they would “shoot arrows” in a contest (referring to times when meteor showers occurred at the same time).

The Milky Way

Some tribes referred to our galaxy as the bridge to heaven that the soul must travel after death. Seminoles said it was the souls of those who died on the great death march. Children were told not to be afraid of the dark because the Milky Way was Father Sky's arms around them. In the region of the summer triangle, because of the Great Rift, you can actually discern index fingers and thumbs almost touching, and a wrist bracelet as the transverse portion just above Deneb.

Summer Triangle

The Deneb-Vega line represented the curled fingers and fist, and Altair the tip of the pointing index finger of the Great Manitou. When this hand pointed directly south early in the evening, it was time to start traveling south, for cold weather was on its way. Aquila is the eagle “Qua nauts.” Cygnus is a magnificent thunderbird.

Cetus (Algonquin)

The Great Sucker Fish ate many people of a village. Blood Clot (Orion Nebula) was a courageous young brave born of an elderly couple who allowed himself to be swallowed and then danced faster and faster inside the fish, with a knife balanced on his forehead. When he was going very fast, he quickly nodded his head and the knife plunged deep into the heart of the fish, killing it and releasing the people, which is why there are so many stars in that part of the sky.

The Pleiades (Iroquois)

Seven little boys who took their bowls of evening succotash to a hill to eat together, asked to be allowed to cook their own on the hill, but their parents said they were too young. Angrily, they stomped away without even taking their food. They proceeded to build a pretend fire, cook and eat a pretend meal, and then danced around the fire as their parents do. The longer they danced, the hungrier they got. The hungrier they got, the angrier they became and the faster they danced. The faster they danced, the hungrier they got, and so on until they found themselves dancing so fast they were going up into the sky. They were so angry they didn't care — except one. He looked

back and grieved for his home and family, and so he is dimmer. The others glow bright in their anger.

The Pleiades (Paiute)

A mother and six children defied custom and looked back on the funeral pyre of their husband and father. He became so angry, he jumped up and chased them until they escaped to the sky. His anger imprisoned him there and he was neither living nor dead. He was sorry, for they had acted in love. Manitou took pity on him and turned him into an ever-living coyote. On winter's night when the Pleiades is high, you can hear him crying, mourning his lost family.

Orion (Iroquois)

Have you ever wondered why the sun gets higher in summer and lower in winter? The sun's light is carried in a large bundle on the back of a very old man. But the winter cold hurts his bones and so he gives his son the chore of carrying the sun's light. His son, like many young people, does his chores the shortest and fastest way, but not necessarily the best way. He carries the sun's light across a much lower path which makes us cold because the light is not there long enough to warm us during the day. So when you see the old man with his dark bundle, you know it is winter, for his son has the sun's light. But with the coming of spring, the old man again takes the sun on the high mountain path and we are warm.