Planetarium Activities for Student Success

Constellations Tonight

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edited and revised by Alan D. Gould
and Gregory Steerman

Cover photo of the Pleiades star cluster, courtesy Lick Observatory.

Magellan Venus Radar Mapping Mission
May, 1989 to April, 1991 (and beyond)
(NASA drawing)

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Planetarium Activities for Student Success

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Constellations Tonight

Contents

Introduction

Constellations Tonight was designed for public audiences and for school children in grades four and above. With simpler star maps and other slight modifications, it could be presented to somewhat younger audiences as well.

The program begins by inviting the students to locate a familiar constellation, the Big Dipper. Then, a brief discussion brings out the many possible functions of constellations for the people who invented them. An optional activity for younger school groups helps the children understand the origin of constellation figures by creating their own.

The major activity teaches the students how to use a star map for finding specific constellations in the planetarium sky. Students then take turns pointing out their constellations to the entire audience. As each constellation is identified, the instructor may project artists' conceptions of the constellation outlines, tell a short version of the relevant star myth, and/or show telescope views of star clusters, nebulae, or galaxies that can be found in the constellation.

A student who uses the star map under the true night sky might wonder, "How come the brightest star in that constellation is not on my map?" It's probably a planet. Since planets move around, they cannot be assigned to the same season each year. Check astronomical data in a current issue of *Astronomy* or *Sky and Telescope* magazine for current planet positions. Planetary motion is covered in more detail in PASS Volume 6, *Red Planet Mars*.

We would be very grateful to hear from you about how you used this program, what modifications you made, what worked well and what didn't work well.

Objectives

After attending this planetarium program, the students will be able to:

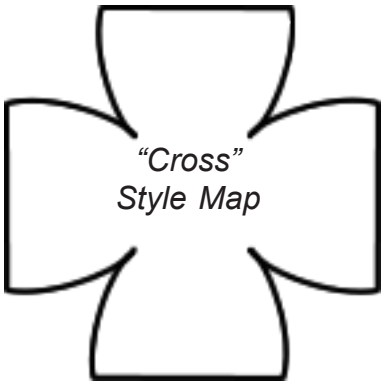
1. **Explain that constellation figures are created by people in many societies. Although there are many different possible constellation figures for a given pattern of stars, everyone in a given culture generally agrees on a single figure for each star pattern that is thought to be important;**
2. **Describe at least two functions that constellations serve for the people who share them;**
3. **Use a star map to find constellations in the planetarium sky, and ultimately in the real night sky; and**
4. **Realize that they can use the star map they take home, and feel that it is fun and satisfying to find constellations in the sky.**

Materials

The following special materials are required to present this program in your planetarium:

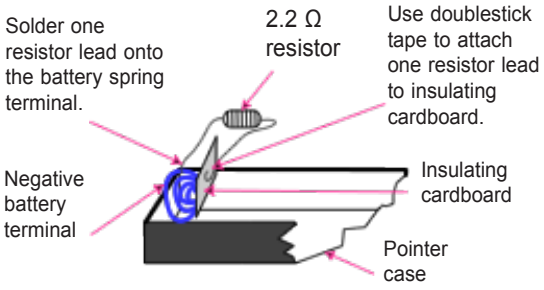
1. **A one-page star map**
   This is for the current season for each participant to use and to take home. You may copy the maps on pages 7–12 for use with your students. The 8.5"x11" size is suitable for students to take home. The short bibliography on page 23 can be copied onto the back of the star map. You can make a class set of 11"x17" enlarged copies of the maps especially for use in the planetarium for better visibility in low light conditions. Gerald Mallon, of the Methacton School District Planetarium in Norristown, Pennsylvania, suggested projecting images of the map to explain how to use it. Sheldon Schafer of the Lakeview Museum Planetarium of Peoria, Illinois, suggested using the "cross" style map, developed by R. K. Marshall.
2. **Light pointers.**
   Have at least two light pointers (one bright and one dim) or a single light pointer with variable brightness. There are a number of options for light pointers. Laser pointers can work OK, but they tend to be too bright for pointing out dim stars. If you use laser pointers, make sure to have one or more low-power dim ones in addition to a bright one. More than one color is nice too.

There are many styles of star maps



It's possible to make an inexpensive light pointer out of an LED flashlight—see the Constellations Tonight, News and Updates on the PASS website for details (http://lhs.berkeley.edu/pass).

Modifying an old light pointer



Light pointers traditionally were available from photographic stores, but with the decline of slides and slide projectors over the years, those light pointers have become scarcer. Older pointers that use two batteries can be made dimmer by replacing one battery with a "dummy" battery, available at some electronics stores, or use a suitable length bolt, or an aluminum foil covered dowel. Alternatively, some light pointers can be made dim by wiring a resistor (e.g. 2.2 ohm, 1/2 watt) to the negative (spring) terminal in the battery compartment, with cardboard insulator inserted to prevent direct contact of the negative end of the battery to the negative battery terminal.

Many older pointers have shiny interiors which produce a ring or glow around the image on the dome. To eliminate the ring, paint the interior of the tube flat black or line it with dull black paper. Put in a color filter if you wish to color code your pointers.

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3. **Reading lights for the students.**
   In our first planetarium, we had 7-watt incandescent orange night-lights under the cove, with shades so they shine down on the audience. This was one way to provide light so that visitors could examine their star charts and look up at the sky freely. The program can also be done by turning up the daylight for people to study their charts, and then turning daylight down for sky examination. For a portable planetarium, we used 7-watt incandescent orange night-lights in clip-on lamps, mounted to shine down on the audience for reading and drawing.

4. **Constellation *outlines*.**
   In our first planetarium, we used inexpensive "brute force" projectors each consisting of a small filament light bulb mounted in a tube with simple a simple lens and constellation outline mask at the other end. The length of tube and positioning of the mask matched the focal length of the lens. Illustrations on pages 16 and 17 can be used as artwork to produce outlines of the various versions of Ursa Major—a dipper, a bear, a plow, and a group of figures from a Native American legend. Modern digital planetarium systems all have constellation outlines of various types included with the software.

5. **Images of interesting objects (nebulae, galaxies, planets) in the current sky.**
   Use the images in the v5media .zip file. If you use slide projectors, select appropriate slides from a commercially available astronomical slide set. The latter more closely approximate the view in small telescopes.

Images for Constellations Tonight

Celestial objects for particular seasons are listed below. For each number there are two images in the v5media file: a low power binocular view and a higher power telescope view. Also have major planets that are currently visible.

1. The Great Galaxy in Andromeda (M31)
2. Double Cluster in Perseus
3. Pleiades
4. Orion's Belt and Sword Region
5. The Great Nebula in Orion (M42)
6. Horsehead Nebula in Orion
7. Whirlpool Galaxy in Canes Venatici (NGC5194)
8. The Great Globular Cluster in Hercules (M13)
9. The Ring Nebula in Lyra (M57)
10. The Lagoon Nebula in Sagittarius (M8)

January–February: objects 1–6

March–April: objects 3–7

May–June: objects 8–10

July–August: objects 8–10

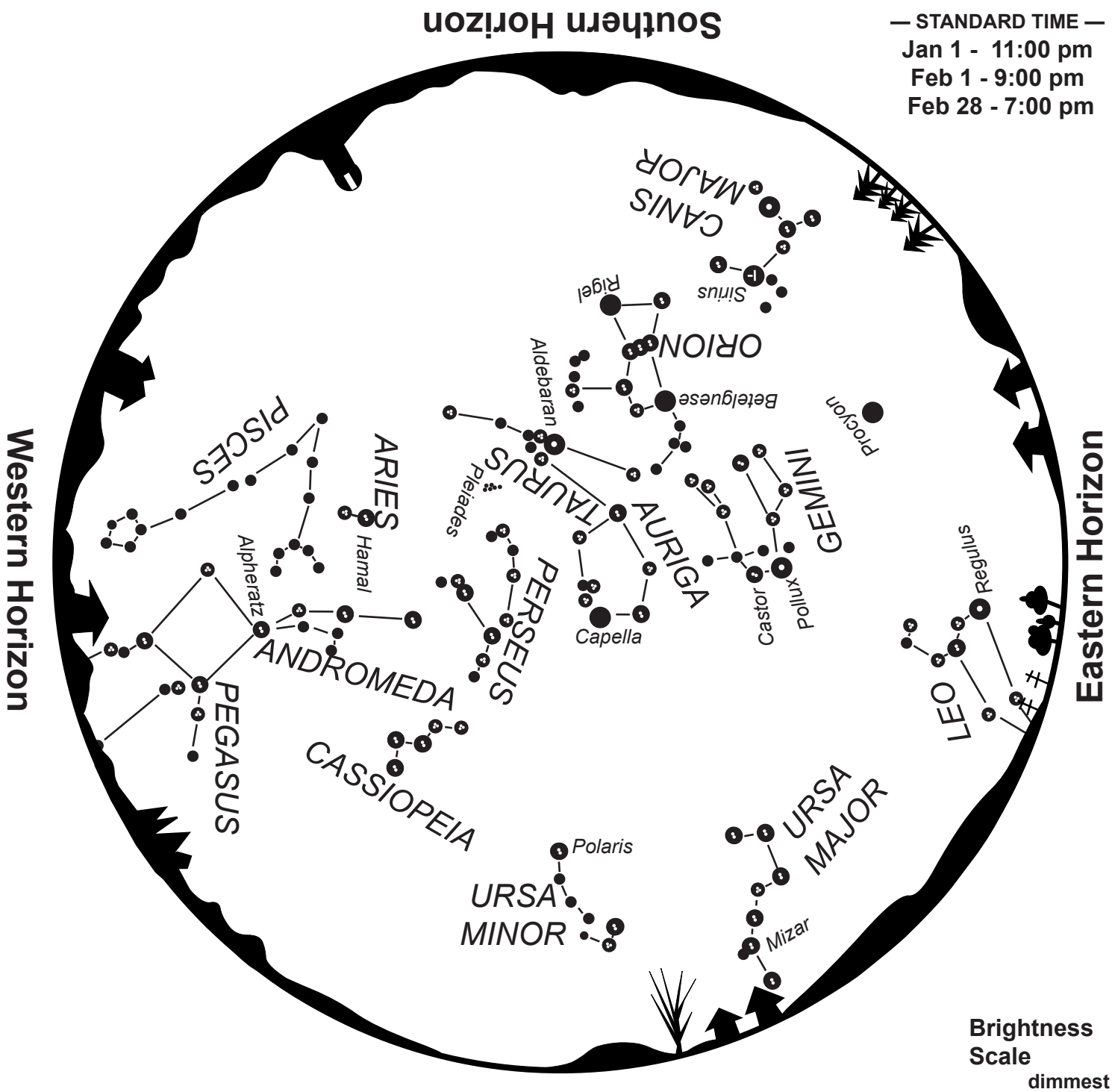
September–October: objects 8-10

November–December: objects 1–6

Special Big Dipper Constellation Outlines:

1. Casserole
2. Bear
3. Plough.
4. First man (Navajo)
5. Wolf brothers
6. Bear and 3 hunters

Evening Star Map for January–February



Brightness Scale

dimmest

- 4 (4.5–3.5)
- 3 (3.5–4.5)
- 2 (3.5–4.5)
- 1 (3.5–4.5)
- 0 (3.5–4.5)
- -1 (3.5–4.5)

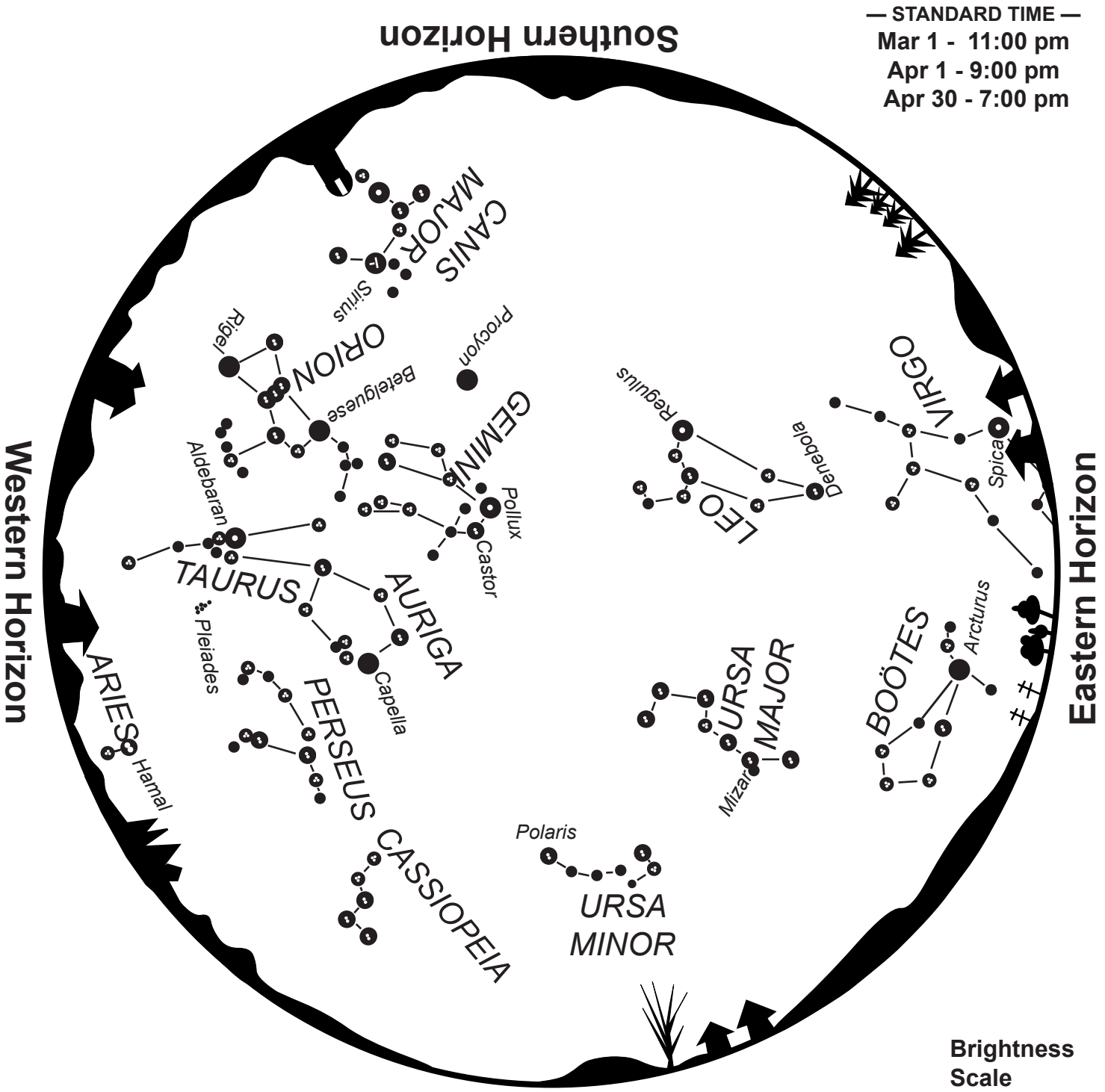
brightest

To use map:

Turn the map so the direction you are facing is on the bottom.

The constellations in the sky will match the constellations on the map.

Evening Star Map for March–April

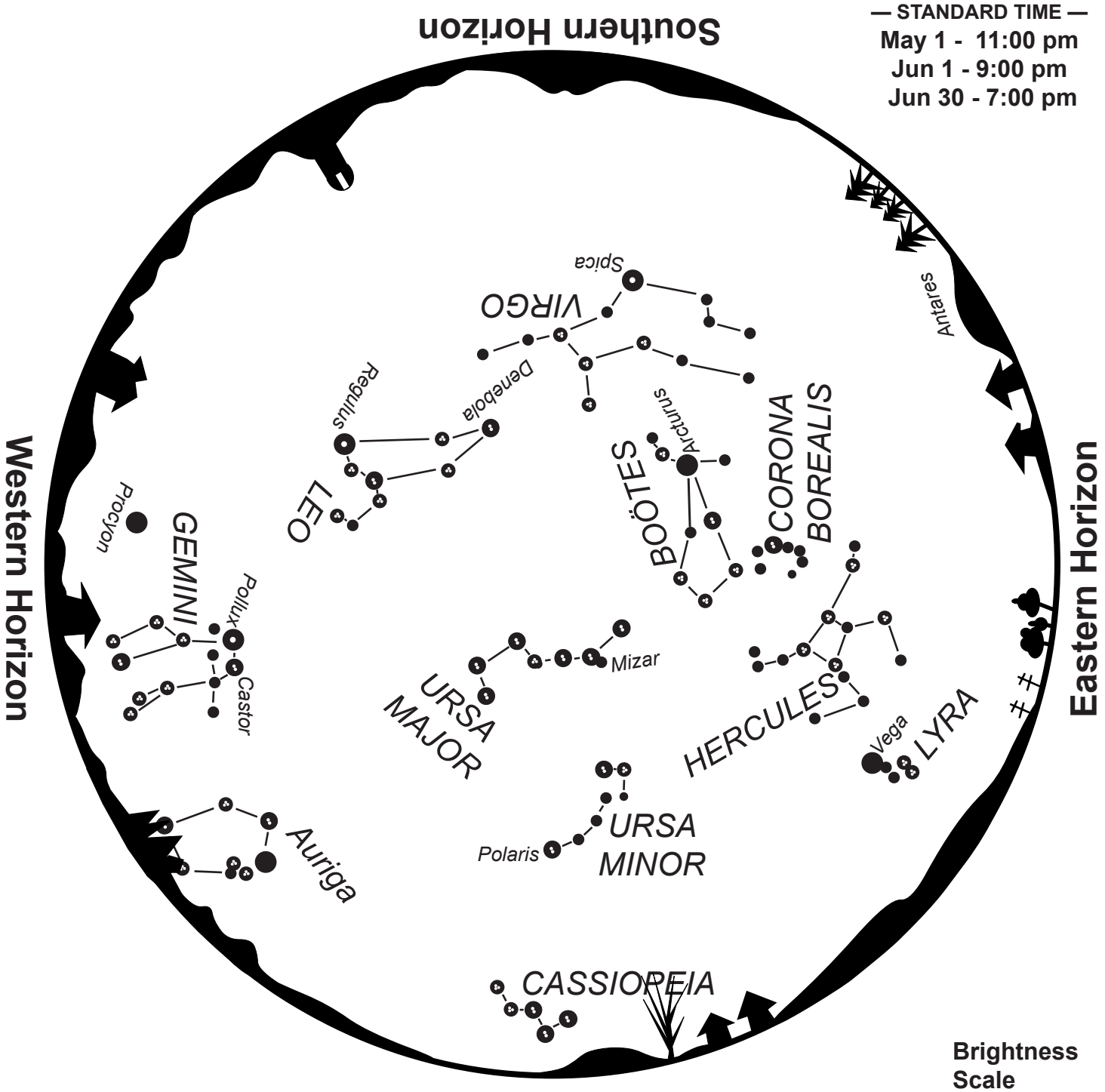


To use map:

Turn the map so the direction you are facing is on the bottom.

The constellations in the sky will match the constellations on the map.

Evening Star Map for May–June



Brightness Scale

dimmest

- 4 (4.5–3.5)
- 3 (3.5–4.5)
- 2 (3.5–4.5)
- 1 (3.5–4.5)
- 0 (3.5–4.5)
- -1 (3.5–4.5)

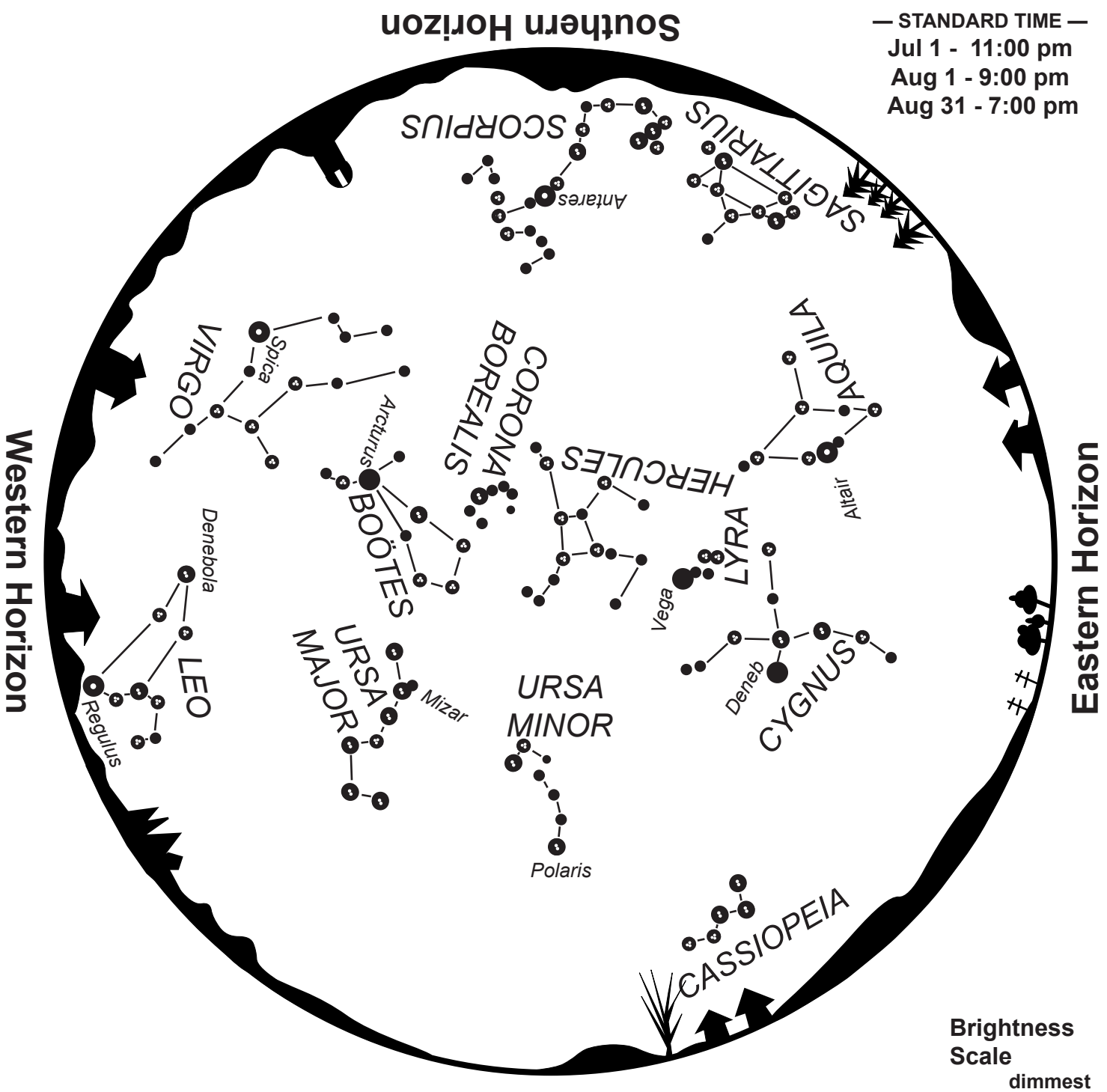
brightest

To use map:

Turn the map so the direction you are facing is on the bottom.

The constellations in the sky will match the constellations on the map.

Evening Star Map for July–August



Brightness Scale

dimmest

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- 3 (3.5–4.5)
- 2 (3.5–4.5)
- 1 (3.5–4.5)
- 0 (3.5–4.5)
- -1 (3.5–4.5)

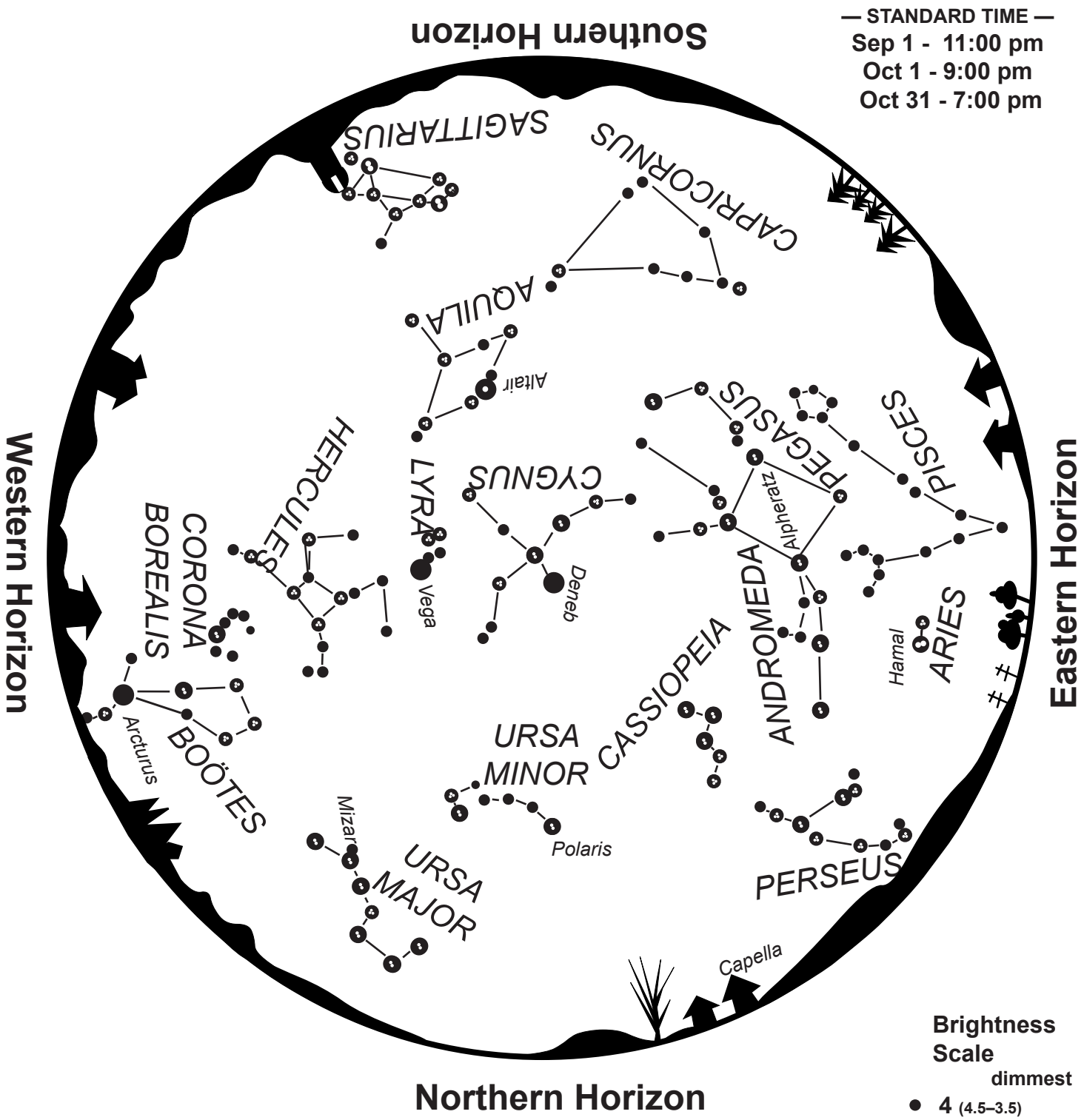
brightest

To use map:

Turn the map so the direction you are facing is on the bottom.

The constellations in the sky will match the constellations on the map.

Evening Star Map for September–October



Brightness Scale

dimmest

- 4 (4.5–3.5)
- 3 (3.5–4.5)
- 2 (3.5–4.5)
- 1 (3.5–4.5)
- 0 (3.5–4.5)
- -1 (3.5–4.5)

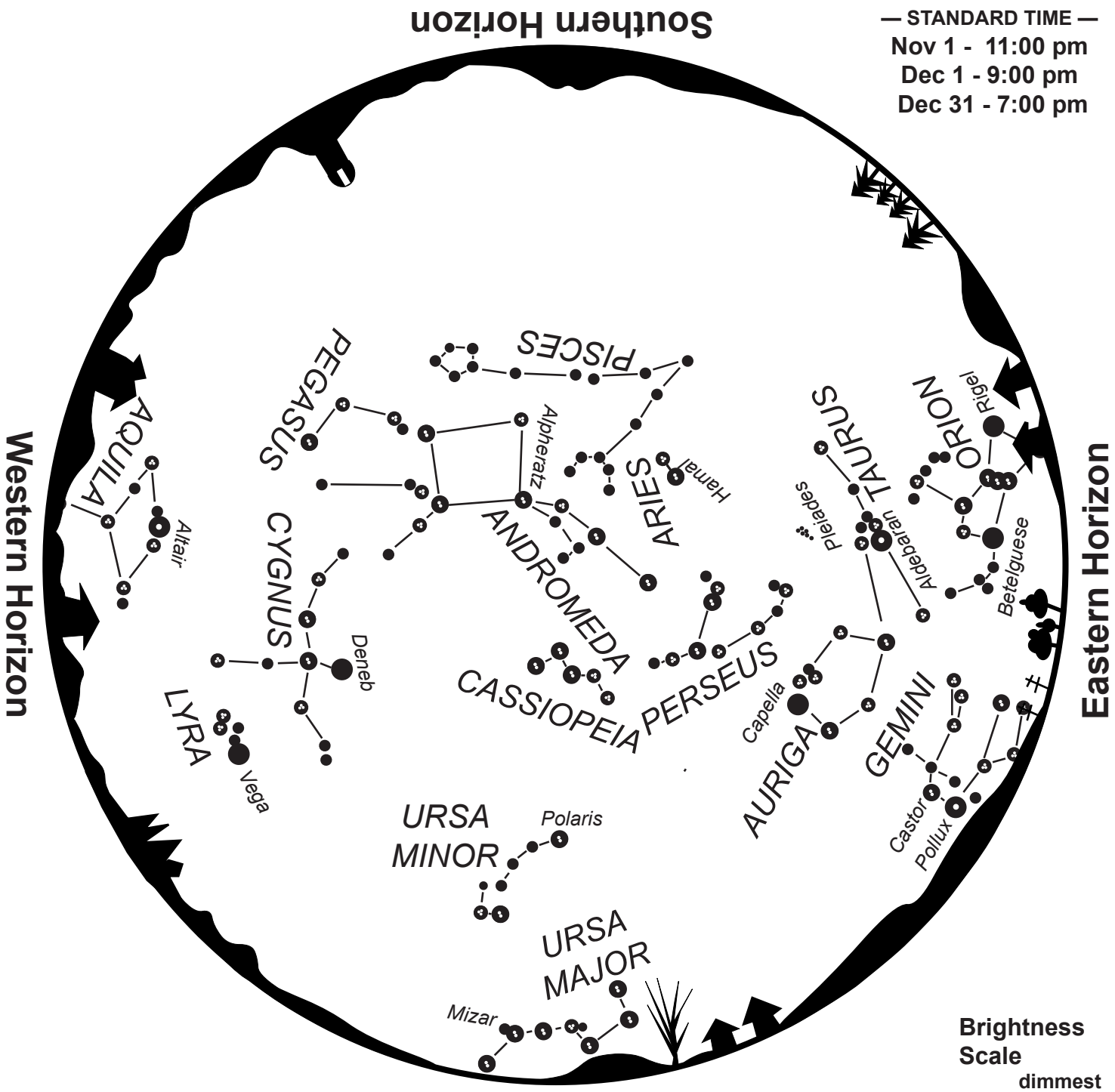
brightest

To use map:

Turn the map so the direction you are facing is on the bottom.

The constellations in the sky will match the constellations on the map.

Evening Star Map for November–December



To use map:

Turn the map so the direction you are facing is on the bottom.

The constellations in the sky will match the constellations on the map.

How To Use the Script

We don't expect the script which follows to be memo-rized (as an actor might memorize a part) but to be used as a guide in learning, rehearsing, and improving presen-tations. We recommend that you read the script once or twice, then work with it in the planetarium, practicing the projector controls, slides, special effects, and music. You should be able to imagine yourself presenting information, asking questions, and responding to participants. For your first few presentations, you can have the script on hand, using major headings as reminders of what to do next.

The script is organized in blocks or sections. The pur-pose of these separations is only to help you learn and remember what comes next. Once you have begun a section, the slides or special effects and your own train of thought will keep you on track. When beginning a new section, make the transition logically and smoothly.

Directions for the instructor are printed in *italics* in the side column, the instructor's narrative is printed in regular type, and directions and questions to which the audience is expected to respond are printed in ***bold italics***. There is no point in memorizing narration word-for-word since what you need to say will depend upon the participants. The language you use and the number and kinds of ques-tions you ask will depend on how old the participants are, how willing they are to respond, and how easily they seem to understand what is going on.

We believe that the most important elements of the program are the questions and the activities since these in-volve the audience in active learning. If you must shorten your presentation, we recommend that you borrow time from the narration.

Sections in a gray box are optional.

Set-Up

1. Latitude: Home.
2. Precession: Current.
3. Set sun and sky for today's date.
4. Time: About 9:00 p.m.
5. Turn off sun, moon, planets, NEWS lights.
6. Check constellation outline alignments, if necessary.
7. Set slide projector on first slide.
8. Be sure to have a current star map on hand for each member of the audience.
9. Check operation of battery-operated light pointer(s).

Planetarium Show Script

Introduction to Constellations Tonight

Gradually turn down daylight while turning on stars.

Welcome. My name is _____ and I would like to welcome you to the _____ Planetarium. Today, you can learn how to find some of the brightest stars and groups of stars that are called constellations. The stars which you see now are just as they will appear tonight from our area around nine or ten p.m., if the sky is clear. Let's see if you can find one constellation right away.

Look around the planetarium sky and see if you can find a group of stars that looks like a big dipper or pot. Point to it when you find it.

Wait until most of the participants indicate that they have found it, then give one person the pointer to show everyone else the location. Ask him or her to slowly point out the "handle" of the Big Dipper and the "part that holds the soup." If your person found "another" dipper shape, be positive. Note that there are many dipper-like shapes, all good, but we want the most familiar one. Then ask for another dipper shape to be found.

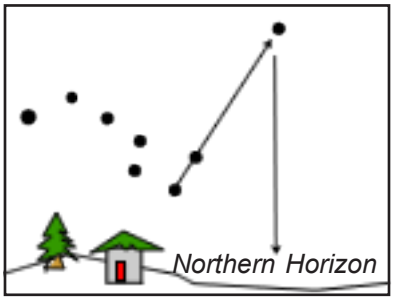
Every civilization, all over the earth, has names and stories about the stars. Usually, these stories are about a group or "constellation" of stars that seem to form a pattern or shape in the sky. People who lived at different times, in different places, often chose the same groups of stars as constellations, but imagined them to look like the particular animals or gods that were important in their own culture. What we call the Big Dipper, for instance, was called Ursa Major, or the Big Bear, by the ancient Romans. (Point out parts of bear.)

Why do you think that people like the Romans, who lived thousands of years ago, made up names and stories about the stars?

Accept all answers, then list the participants' ideas before going on.

One of the reasons for identifying constellations is still important today—finding directions. Sailors, flyers, and even astronauts tell directions by the stars. If you are lost in the woods, but you know that there is a city to the South, you can use the Big Dipper to find Polaris, the North Star. Since Polaris is always directly North, we can use it as a compass at night.

Does anyone know a good way to find Polaris?



Usually someone does. In any event, use your pointer to show how to use the pointer stars and Polaris to locate the northern horizon and the other directions. Have the audience identify South, East, and West.

In fact, Polaris indicates North with more accuracy than a simple magnetic compass.

Turn on NESW lights.

Astronomers today use constellations as convenient direction markers to help name and locate interesting objects, like "the galaxy in Andromeda." We shall use constellations this way in today's program.

Sky Map Activity

Turn up orange seat lights (or daylight). Pass out one map to each participant. In some planetariums, it may be more convenient to hand out maps as people enter. Introduce the activity as follows:

These are maps of the sky which we will use to identify some of the major constellations that can easily be seen this month. After you have some experience using these maps right here in the planetarium, your map will be yours to take home so that you can identify constellations from your own backyard.

These maps represent the sky for _____ and _____ months around nine and ten p.m. The whole sky is compressed on these charts to fit within a circle. The dots on the map represent stars—the bigger the dot, the brighter the star will be. Only the brightest 50 or so stars are marked on the map.

What do you think the edge of the big circle on the map represents?

The edge of the circle on the map is intended to represent the "horizon"— where the sky seems to meet the earth, and what you see when you look straight out horizontally. (Point out, indicating the planetarium horizon.) If a star on the map is near the words "Northern Horizon," it will be in the northern part of the real sky. (Point out.) If the star on the map is near the words "Eastern Horizon," it will be in the eastern part of the sky. (Point out.)

The closer to the center of the map a star is, the higher in the sky it will be.

Where would the very center of our map be in our sky? Point to the place in the sky that the center of your map represents. [Everyone should point to the top of the planetarium dome.]

A star at the very center of the map would be directly overhead in the sky. The point directly overhead is called the "zenith."

One key to using this star map is in how you hold it. If the star or constellation you are looking for is closest to the northern horizon, you must hold the map so that "Northern Horizon" is at the bottom. That way the stars in that part of the sky will be right side up on your map. If you are looking for stars in the southern part of the sky, turn the map so that "Southern Horizon" is at the bottom and the stars in the south will look right side up on your map.

As an example, let's use the map to find the Little Dipper, called by its Roman name, Ursa Minor.

When you find Ursa Minor on your map, raise your hand.

If you have trouble, ask your neighbor for help.

When the students indicate they have found it, go on.

What direction should you face to find it? "North" [or a little east or west of North, depending on the time of year].

Is Ursa Minor near the horizon or high up in the sky? [Make sure that everyone agrees before going on.]

Now watch me as I use the map to find Ursa Minor in the sky. On the map, Ursa Minor is closest to the "Northern Horizon," so I know I should face North and hold this map so the words "Northern Horizon" are at the bottom. When I look at the sky, about this high, I should see the same pattern of stars that appears on the map, and there it is! (Point it out or have a student point it out.) If I were looking for a constellation in the South, I would face South, and turn the map so that the words "Southern Horizon" are at the bottom. (Demonstrate.)

Keep in mind a 4-step recipe for finding constellations:

1. **First, locate the constellation on the map; describe the pattern to yourself and note which stars are the brightest.**
2. **Determine what direction you must face; turn your map so that direction is at the bottom.**
3. **Decide if your constellation is high in the sky or near the horizon.**
4. **Compare your map with the stars you see in the sky.**

It will be easier to locate the brightest stars in your constellation first. Once you have found a constellation, use it as a reference for finding other constellations nearby.

Assign groups to locate constellations. Be certain each group can see its constellation from their own position in the planetarium. Encourage the group members to help each other, to move around if they need to, and to use the hand pointers to help discuss which stars are which.

Leave reading lights on continuously. Fully dark skies have too many stars to easily pick out constellations. All the constellations on these maps can be found most easily in a "light-polluted" planetarium sky.

Offer to help individual groups one at a time, but don't rush them. Don't point out stars for anyone, but talk through the procedure for using the star map step-by-step for their constellations until they are looking in the correct direction. If some groups finish quickly, ask them to find neighboring constellations in the sky. Check to see that all groups have found their constellations before going on.

Is everybody ready? Let me pass around a flashlight-pointer so that one member of each group can show us which stars in the sky you think make up your constellation. Let's begin with the constellation_____ (appropriate constellation for the season).

Optional

As each constellation is identified, you may wish to add further information such as:

1. Show an outline of the mythological figure, and tell a brief version of the myth.
2. Show a slide of an interesting object (nebula, cluster, double star, galaxy, etc.) that appears in the constellation. If possible, show an image of the binocular appearance, as well as an image of the appearance in a large telescope. Ideally, zoom the images from the actual locations of the objects in the night sky.
3. For each interesting object, point out the location in the constellation, invite the visitors to mark that position on their maps, and look for the object themselves, using binoculars, the next time they are out under dark skies. Mention that these objects are not physically "in" the constellations, but may be very far beyond the stars we can see (like the Andromeda galaxy). The stars of the constellations provide convenient direction markers, or frames.

Constellation outlines are a useful way to introduce a brief narrative on the mythological origin of each constellation.

Have one person in each group name the constellation his or her group has been assigned, and then ask everyone to find that one on their maps, and to approximate what part of the sky it should be in. Then have the person in the group point out where they decided the constellation was, star by star. If they mis-identify it, be positive and encouraging, pointing out how close the resemblance is, and ask them (or others) to try again.

Optional: Making Up Constellations

This activity is especially good for elementary school children.

Take a look around the sky and see if you can find a group of stars that looks like some kind of animal, person, or thing. Raise your hand if you have an idea that you want to tell us about.

Allow three or four students to point out their constellations and describe them to the group—try to help everyone see what the inventor of the constellation sees.

In ancient times—pre-television times, people enjoyed making up constellations like this, just as most of us spend time watching TV today.

Versions of the Big Dipper (optional)

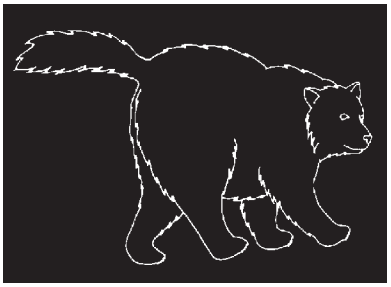
It is easy to see the Big Dipper as just that, a big dipper; and indeed, to some people in southern France, this group of stars was the Casserole, or sauce pan.

1. Casserole Outline ►

But to the Romans, the Dipper was just part of a larger constellation, Ursa Major, which means "the great bear."

Try to imagine a bear.

Where is his nose? Where are his legs? [etc.]



2. Bear Outline ►

Many of you have seen bears in the zoo.

What is wrong with this picture of the bear? [Long tail.]

Accept ideas from audience.

We can see that what's wrong with this bear is its long tail.

Roman mythology stories explain the long tail:

Very short version

Once the king of the gods, Jupiter, fell in love with Callisto, a beautiful young girl. But Juno, the queen of the gods, was very jealous, so she turned poor Callisto into a bear. Jupiter felt sorry for Callisto, so to protect her from hunters, he placed her up in the sky where we can see her every night if we look. To get her into the sky, he grabbed her by the tail and whirled her around and around and flung her up to the sky. That's why the tail is so long!

Long version

Jupiter, the King of the gods, often fell in love with mortal women of earth, so his wife Juno was often jealous. When Juno found out that Jupiter was favoring a young maiden named Callisto, Juno got so furious that she changed Callisto into a big shaggy bear. Years later, Callisto's son Arcas was hunting in the forest when his mother, now in the form of a bear, saw him. She got so excited, she forgot she was a bear and she rushed forward to embrace him. Of course, Arcas did not recognize his mother and he leveled an arrow in his bow to kill her. In the last instant, Jupiter intervened by changing Arcas into a bear as well, and then grasping both Callisto and Arcas by their tails, flung them into the sky (stretching out the tails)—where Callisto is now the Great Bear and Arcas the Little Bear.

Juno, still not satisfied with her revenge, persuaded Poseidon to forbid the two bears from cooling their feet in the waters of the oceans. This is why Ursa Major and Ursa Minor never sink below the horizon.

To many Native American tribes, the Dipper is also a bear. It is remarkable that many cultures, so very far apart, came up with the same unlikely image for these stars. But the Native Americans did not draw their bear exactly this same way.

If you have lots of time, take another minute or two to tell the following Native American story:

The Bear in the Oak Tree Forest

Long ago there was a great oak forest that was enchanted and magical, because every night at midnight the trees in this forest would move around and visit each other. One day a bear wandered into this forest and got so lost, he couldn't find his way out. He became frightened, and when midnight came, he was terrified to find the trees moving about. The poor bear started racing madly all over and bumping into trees right and left. The trees did not appreciate this intruder at all and one tree was so upset that it started chasing the bear. Because bears generally are faster than trees, this chase lasted almost till dawn. The tree knew that he and all the other trees had to go back to their original places by dawn or the sun would notice that they had moved. So the tree, just at twilight, made one last grasp at the bear with its longest branch and just barely caught the bear by the tail. Then the tree swung the bear up into the sky where we see him now. That is why his tail is so long.

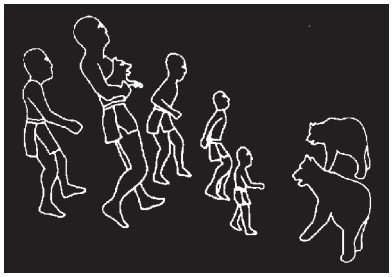
To the early people in England, the Dipper was neither a dipper nor a bear, but was a plough, drawn by oxen.

Why do you think that they thought of this constellation, which is high in the sky like this in the springtime, as a plough?

Responses might include "it is time to plant," "it goes round and round like a farmer ploughing his field," etc. Accept all answers.

3. Plough Outline ►

Finally, I'd like to tell you one last story that is a favorite of mine. It is a Native American story, one from the Wasco Indians of the Pacific Northwest, the area we call Oregon and Washington.



Tell the following story of the five wolf brothers or, better still use a story from Native American culture of your own planetarium's region.

Wasco Indian Version: The Five Wolf Brothers

Once upon a time there were five brothers named the Wolf brothers who made their living by hunting deer. Every night they would make a camp fire, cook some meat and eat together. They shared their food with another man named Coyote (a mythical god-like character). After eating, the brothers would relax and gaze into the sky in a certain area and look puzzled. One night Coyote asked the oldest brother, "What are you looking at?" The oldest brother said, "I won't tell you—you would think I was foolish." But on later nights Coyote questioned the other brothers until one night they answered, "We can see two animals moving in the sky but they are so high up we cannot tell what kind of animals they are." Coyote replied, "Wouldn't you like to get a closer look at them to see what they are?" To which the brothers replied, "Oh, yes, but none can travel into the sky." Said Coyote, "Nonsense, it is easy," and proceeded to collect three quivers full of arrows. Then he took an arrow and shot it straight towards the place in the sky where the brothers said they saw the two animals. The arrow went all the way to the sky and stuck there. Then Coyote shot a second arrow so that its tip stuck into the end of the first arrow. By the time Coyote finished shooting all the arrows, which took all night, there was a string of arrows reaching all the way from the sky to the earth. At dawn the five brothers and Coyote began climbing the arrow ladder. The youngest brothers went first, and Coyote and the oldest brother, carrying their little dog, went last.

After climbing almost all day, they reached the sky and found that the two animals were grizzly bears. The oldest brother shouted, "Stay away! They might tear you to pieces." But the younger brothers, who didn't want to appear afraid, crept closer and closer to the bears. The other brothers followed behind. Finally, the grizzly bears looked up and noticed the five Wolf brothers, but the bears did not attack, for they had never seen people before, and were curious. The bears just stood there looking at the brothers and the brothers stood very still looking back at the bears.

Coyote thought, "What a funny picture these bears and the Wolf brothers make just staring at one another. I would like for everyone to be able to see this," and he proceeded to climb down the arrow ladder, taking out the arrows as he went, leaving the picture in the sky for everyone to see.

Motion of the Stars

In Spring and Summer, when the Dipper is already overhead, advance diurnal motion only until the Dipper is aligned with the constellation outlines you have prepared, then go directly to "Versions of the Big Dipper." Next return to this section, followed by the "Conclusion." In Winter and Fall, follow the normal order: "Motion of the Stars," followed by "Versions of the Big Dipper," followed by the "Conclusion." If you present the Dipper first, make appropriate minor changes in the following paragraphs.

We have found each of the major constellations in tonight's sky.

If we kept watching tonight, would the stars remain like this? What would happen? Why?

Accept ideas from the audience.

Let's find out by going through the entire night, speeded up so that we will come to tomorrow morning in just three minutes. Please keep track of your constellation to see what happens to it during the course of the night.

Also, please watch this star, which we said was Polaris. What is special about its behavior?

Fade in music, gradually dim orange lights (or daylight), and begin diurnal motion. In Fall and Winter, stop when the "Dipper" is aligned with your constellation outline for the following section (if used).

It is now about two a.m.

Can you still see your constellation? What has happened to it?

What has happened to the Big Dipper?

What has happened to Polaris, the North Star?

Allow time for responses and discussion after each question. Encourage general observations such as "stars seem to rise and set like the sun," or "the North Star always stays still."

We have observed that the stars seem to rise in the East and set in the West. Stars in the North turn around Polaris which appears to stand still. Even though it looks like the sky turns around the Earth, we have good evidence that the motion is caused by the Earth turning on its axis. Polaris does not appear to move because the Earth's axis points towards it.

The phrase "follow the drinking gourd" was remembered by freed or escaped slaves making their way north to safety via the "underground railroad." Whether the "gourd" was the Big Dipper or the Little Dipper, the general direction (north) was correct for the desired purpose.

For any constellation, there is no "best" or "correct" story. Each of you can make up your own story about the Big Dipper and the other constellations. Stars belong to no one, so your own imagination is just as valid as the ancient Romans' or anyone else's.

Conclusion

Let's speed up the motion of the earth again. As we go to early morning, a whole new set of constellations swing into view.

Fade in music, turn on sun, and begin diurnal motion. Gradually turn on red sunrise. As sun disk appears on horizon, slowly turn on daylight and fade out music.

Good morning! Please use your star map to find constellations in the real sky on the next clear night. Thanks visiting us. Happy star hunting!

Discover More About Constellations

Star Maps

Pocket Sky Atlas can be puchased from Sky Publishing. They also carry ***Sky Atlas 2000.0*** by Wil Tirion and Roger Sinnott.
http://www.skyandtelescope.com

Norton's Star Atlas, Arthur P. Norton. A set of detailed star charts and lists of interesting objects for telescope observing (star clusters, nebulae, galaxies, double stars, etc.)

A Popular Star Atlas, R.M.S. Inglis, Gall and Inglis, London, 1972. A much shorter and less expensive version of Norton's atlas.

Sky Challenger, a unique set of six interchangeable star wheels, provides many activities in star gazing, including "Binocular Treasure Hunt," "Native American Constellations," and "Test Your Eyes/Test Your Skies." Discovery Corner, Lawrence Hall of Science, Berkeley, California. http://lawrencehallofscience.org/pass/AST110&111&121.html

Star Maps for Beginners, I. M. Levitt & Roy K. Marshall, New York: Simon and Schuster, 1987. Grade Level: 5-up. Monthly sky maps in the shape of two crossed ellipses show the position of the stars viewed from every direction. With the history and development of constellation lore.

Star Paths—Star and Planet Chart, Edmund Scientific Company, Barrington, New Jersey. An inexpensive adjustable star wheel that can be set to show how the sky appears at any time.
http://scientificsonline.com

The Star Book, R. Burnham, Astromedia Press, 1983. Cambridge University Press, 1984. Grade Level: 3-6. This book uses cardboard star maps to instruct beginners in stargazing. It has 8 color charts of the Northern Hemisphere.

The Stars: A New Way to See Them, 3rd edition, H. A. Rey, illus., Boston, MA: Houghton Mifflin Co., 1976. Grade level: 3-6. A simple non-mathematical guide to stars and starwatching for the amateur astronomer. Simple ways to find stars and information about them. The Astronomical Society of the Pacific calls it "a classic guide to the constellations that introduced a simplified way to keep track of them."

Whitney's Star Finder, 4th edition, Charles A. Whitney, New York: Knopf, 1985. Grade Level: 7-up. A clear, a primer on sky phenomena and constellations by Harvard astronomer. Good for Junior high and middle school students.

Current Phenomena

Sky and Telescope Magazine, Sky Publishing Company, Cambridge, Massachusetts

Astronomy Magazine, AstroMedia Corporation, Milwaukee, Wisconsin.

Both magazines contain monthly star charts, current positions of the planets, and special events such as eclipses, comets, novae, and such. *Sky and Telescope* is slightly more technical than *Astronomy* Magazine.

Sky Calendar, by Robert C. Victor, Abrams Planetarium, Michigan State University, E. Lansing, Michigan 48823. This monthly calendar gives a day-to-day guide to interesting events in the sky.

Mythology

American Indian Mythology, Alice Marriott and Carol L. Rachlin, 1968, Thomas Y. Crowell Company.

Humanities and the Stars (planetarium programs) Eileen Starr, Eastern Washington University.

Indian Legends from the Pacific Northwest, Ella Clark, 1953, University of California Press. American Indian stories about the star patterns that we call Orion, Cassiopeia, the Seven Sisters, the Big Dipper, and others.

In the Beginning: Creation Stories from Around the World, Virginia Hamilton, Illustrated by Barry Moser, Harcourt Brace, 1988. ISBN 0-15-238740-4. These stories of the creation of Earth and its people are gathered from cultures all over the world and throughout history, including familiar biblical tales, Greek and Roman myths, legends of the Australian aborigines and Native Americans.

Lakota Star Knowledge, Studies in Lakota Stellar Theology, Ronald Goodman, 1990, Sinte Gleska College.

Mythology, Edith Hamilton, 1971, New American Library.

The New Patterns in the Sky, Julius D.W. Staal, 1988, Blacksburg VA: The McDonald and Woodward Publishing Co. An excellent compilation of the Greek and Roman myths, with a scattering of other cultures as well.

Popul Vuh, The Maya Book of the Dawn of Life, Dennis Tedlock, 1985, Simon & Schuster, NY.

Star Names, Their Lore and Meaning, Richard H. Allen, 1963, Dover. This book has the origin of star names and constellations from various cultures.

S***tars of Jade, Astronomy and Star Lore of Ancient China***, Julius D. Staal, 1984, Writ Press, Decatur, GA.

Star Tales, North American Indian Stories About the Stars, Gretchen Will Mayo, Walker and Company, NY.

They Dance in the Sky, Native American Star Myths, Jean Guard Monroe and Ray A. Williamson, Houghton Mifflin Company, Boston.

Look in library card catalogues and you will find many titles that start out Myths and Legends of . . . on almost every culture.

See also:

For late-breaking news and information about this Planetarium Program, please visit the iNTERACT! PASS website at:

http://www.lawrencehallofscience.org/pass

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Constellations Tonight Illustrations

p.ii, NASA, Magellan Venus Radar Mapping Mission (drawing)

p.2, Alan Gould, Light pointer (drawing)

pp.4-9, Alan Gould, Seasonal Star Maps (drawing)

p.16, Budd Wentz, Big Dipper (drawing)

p.16, Budd Wentz, Big Bear (drawing)

p.17, Budd Wentz, Plow (drawing)

p.17, Budd Wentz, Wolf Brothers & Bears (drawing)

pp.23, 25, 27, Alan Gould, Misc. drawings

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