Sky Pictures

Constellations: (*The Young Astronomer*, pages 25-30); (*The Visual Dictionary of the Universe*, pages 15-17)

Several activities in *The Young Astronomer* help students study the night sky. These include making a quadrant or simple sextant to determine latitude (page 27) and a device to show the positions of the sun, Earth, and zodiac constellations (pages 28 and 29). There is also an activity for creating a model of the constellation Cygnus (the Swan or Northern Cross) on page 30. Both books have excellent constellation maps.

Background

Constellations (pages 61 and 62) are images of human and animal figures in the sky, using stars like dot-to-dot pictures. Most of these were designed over 2,000 years ago, spread symmetrically around a point above Earth's North Pole. Today Polaris (the North Star) is over the Pole, but that was not so then. As Earth rotates on its axis, it wobbles like a top so that the north axis pole moves in a circular motion over a 26,000-year period. This changes the locations of constellations.

The 12 zodiac constellations are located along the *ecliptic*, the path the sun appears to follow as Earth revolves around it. The moon and planets also follow this path and are seen against the band of zodiac constellations. Astronomy had its beginnings in astrology, a belief that human behavior was controlled by the motion of the planets, sun, and moon within zodiac constellations. We know now that there is no connection between how these celestial bodies move and what happens to anyone on Earth. But astrologers carefully recorded the changing locations of these bodies, and this valuable data later helped astronomers understand more about the motions of planets.

The sun's position within zodiac constellations is different today. Along with the wobble of Earth, the planet does not return to exactly the same location in its orbit at the same time each year. Thus, the sun gradually moves into the next zodiac constellation. The months when the sun is in each zodiac constellation (pages 61 and 62) do not match the dates in horoscopes, but are astronomically correct for the present time.

The zodiac and other constellations serve as useful maps of the sky, helping us locate planets, comets, and other celestial bodies. Monthly constellation charts can help students locate patterns in the sky and find the planets moving among these star patterns.

Activity: simulating the sun's path through the zodiac constellations

Materials: zodiac constellations (pages 61 and 62), overhead projector, 12 sheets of large black construction paper, chalk or white marker, clamp-on light with 150-watt bulb

Lesson Preparation

- Make transparencies of the zodiac constellations. Project them onto the large black paper individually; use the white marker to trace the stars (dots) and lines. The sizes of the dots denote brightness, not size. The larger dots are brighter stars.
- Include the constellation name, when the sun is there, and when it is seen.
- Use a large room for this lesson. Using a string four feet (122 cm) long with a loop at one end and a piece of chalk tied to the other, make a circle in the center of the floor. Have someone hold the loop of the string in the center of the floor, stretch out the string, and use the chalk to draw the circle. Shorten the string to 2.5 feet (76 cm) and draw another circle within the first, using the same center point. Place the lamp in the center of these circles at the students' eye level.

Sky Pictures *(cont.)*

Procedure

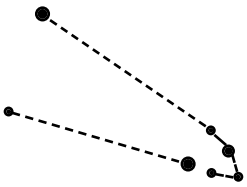
- Share the background information about the zodiac constellations, using the transparencies to enable students to see what they look like.
- Take the students to a large room. Have 12 students hold the zodiac pictures. Have them spread out equally around the large circle. The constellations should be in order of the numbers, moving in a clockwise direction around the circle.
- Have the remaining students stand around the inner circle, facing the constellations. Turn on the bright light and turn off the room lights. Tell students that the bright light is the sun and they are the Earth. Have them spin slowly in their positions in a counterclockwise direction (west to east) to simulate day and night. Day is when they face the sun (light), night when they face away from the light and see the stars.
- Explain that if they could go north out beyond the solar system, they would see the Earth move around the sun in a counterclockwise direction. Let them begin to walk slowly in a counterclockwise direction around the circle, looking at the constellations as they do so. Point out that these change as they move. Explain that from Earth we see new constellations gradually appearing in the eastern sky, as those in the west gradually disappear below the western horizon. It takes 12 months to get back to the original set of constellations. Have them walk all the way around the circle, mentally marking the constellation they see at the beginning, and stopping there after walking around the circle. Explain that they have just gone through one year.
- Have students collect on one side of the light, face towards it, and try to see the constellations opposite it. Explain that the sun is so bright we can't see the stars beyond it. Tell the students that the 12 zodiac constellations correspond to the location of the sun during each of the 12 months. When the sun is "in" one of them (e.g., Leo), we can't see the constellation. Only when we go into space, where sunlight is not scattered by Earth's atmosphere, can we see the stars and sun together. Even then, some of the stars near the sun are hard to see due to its bright light. We can catch glimpses of bright stars and planets during a total solar eclipse, when we can see beyond our atmosphere.
- Explain that planets and our moon move around the sun on a plane, like a huge dinner plate with the sun in the center. The zodiac constellations lie beyond this plane, appearing roughly east to west across Earth's sky. The planets, moon, and sun never appear in the sky north or south of this band of stars.
- Review the zodiac constellations and look closely at the figures these star patterns are supposed to represent. Ask students which ones most resemble the pictures. These are Leo, (lion), Scorpio (scorpion), and Taurus (bull—face and horns only).
- Make enlarged copies of some of these constellations without the lines for the students to make their own constellations. Have them use the patterns of the stars (dots) to turn them into pictures of things familiar to them.
- Have students research the legends connected with constellations. Have them use the Internet and various reference materials.

Zodiac Constellations

To the Student: The 12 constellations in these pictures are those which appear along the path the sun seems to follow in the sky as the Earth moves around it. Long ago, people thought that our lives were controlled by the location of planets in these constellations. Today, we know that the planets move in orbit around the sun and have no influence on humans at all. The shapes of the constellations form a useful map in the sky which helps us locate planets which are seen against these stars. A planet looks like an extra star in the constellation, but it gradually moves into the next constellation.

1

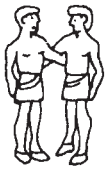
Taurus
Bull

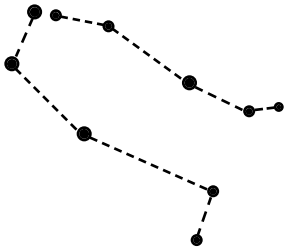


sun located here: June
visible in night sky: January

2

Gemini
Twins

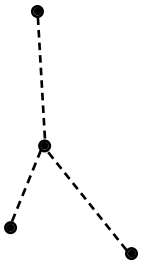




sun located here: July
visible in night sky: February

3

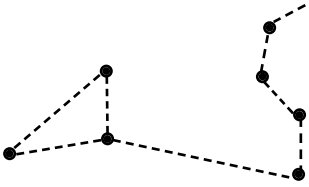
Cancer
Crab



sun located here: August
visible in night sky: March

4

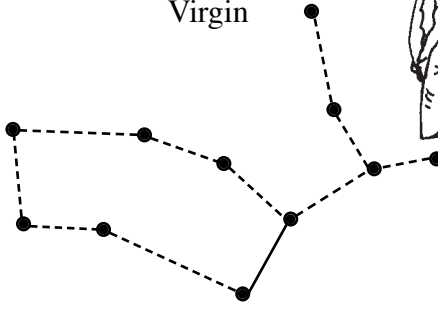
Leo
Lion



sun located here: September
visible in night sky: April

5

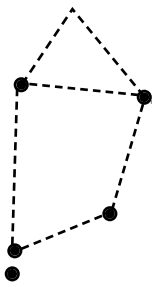
Virgo
Virgin



sun located here: October
visible in night sky: May

6

Libra
Scales



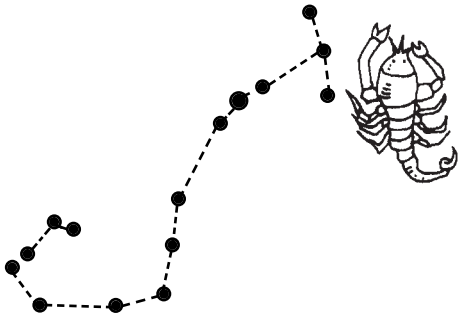
sun located here: November
visible in night sky: June

Zodiac Constellations *(cont.)*

The month stated for viewing each constellation is the best month to see it. However, it will also be visible the month before and after. Visibility of these constellations also depends on the latitude of your location.

7

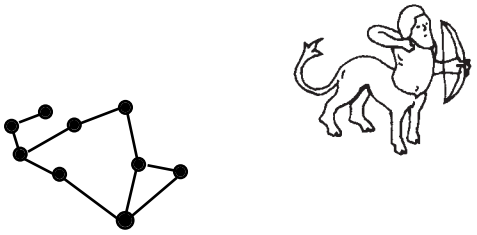
Scorpius
Scorpion



sun located here: December
visible in night sky: July

8

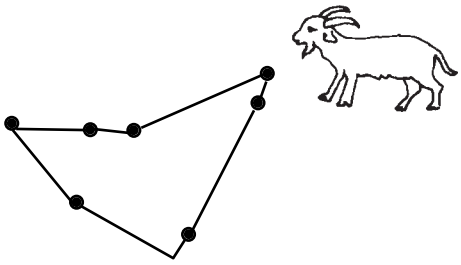
Sagittarius
Archer



sun located here: January
visible in night sky: August

9

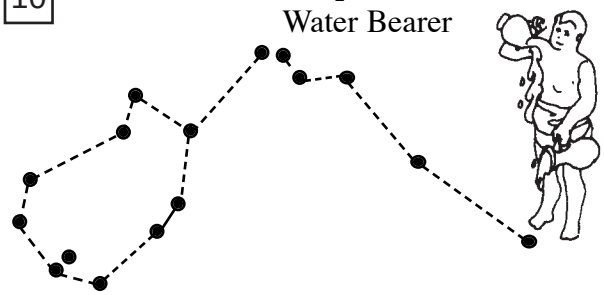
Capricornus
Goat



sun located here: February
visible in night sky: September

10

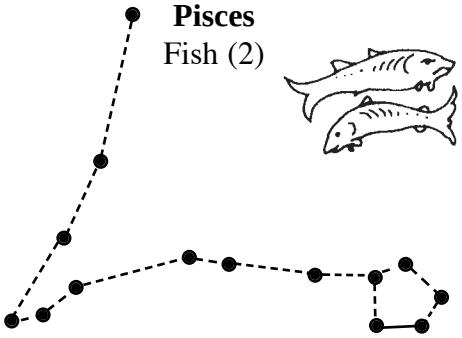
Aquarius
Water Bearer



sun located here: March
visible in night sky: October

11

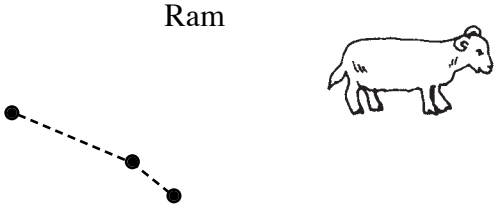
Pisces
Fish (2)



sun located here: April
visible in night sky: November

12

Aries
Ram



sun located here: May
visible in night sky: December

