

**A Collection of Curricula
for the STARLAB®
Ancient Chinese Legends Cylinder**



Including:

*The Skies of Ancient China II: Information and
Presentation
by Jeanne E. Bishop*



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Introduction and Background Information

by Jeanne E. Bishop

Ancient Chinese astronomy was different from Western (Greek-Roman) astronomy in a number of ways.

- First, the observations and forecasts based upon those observations were intimately tied to the government and to the ruling Emperor, called the Son of Heaven. Astronomers were government officials, who were warned not to discuss “classified matters” (astronomical observations) with officials of other government departments, their subordinates, or even with one another. In contrast, Greek astronomers were free-speaking and free-writing individuals, often at odds with government ways.
- Second, the most ancient Chinese astronomy was based on four huge constellations that were roughly centered on the celestial equator: the Blue Dragon, the Red Bird, the White Tiger, and the Black Tortoise. Each beast was in a seasonal palace: The Blue Dragon in the Spring Palace, the Red Bird in the Summer Palace, the White Tiger in the Autumn Palace, and the Black Tortoise in the Winter Place. In each of these beasts, there were seven sections called “Houses” or “Mansions,” which roughly define the path of the moon. The Four Beasts were not created to show the path of the sun. However, the space of the Four Beasts included the ecliptic, since the House sections identify the moon’s path. The moon’s path includes the ecliptic.

The Four Beasts parade with the earth’s rotation in a direction opposite to the order of the seasons. This is explained by the way in which the very ancient Chinese (probably circa 15,600 BC) used these constellations to mark their seasons. Stars of the Blue Dragon of Spring and the White Tiger of Autumn were observed rising in the east before the sun — a situation called “heliacal risings.” The Red Bird of Summer and the Black Tortoise of Winter were observed rising in the east at sunset.

The 12 animals of the Chinese zodiac (“the Yellow Road of the Sun”), assigned to different years in a 12-year cycle in Chinese astrology and seen today on place mats and trinkets, was developed about 200 BC. This set of figures which roughly correspond with those of the Western zodiac, developed late in Chinese astronomy/ astrology. The figures of the Chinese zodiac had far less impact than the Four Beasts and other ancient sky figures. For this reason, and also because the lunar Houses and other figures are so numerous, the Chinese zodiac has not been included on either of the two Chinese STARLAB cylinders — the combination would be confusing. In Chinese astronomy, the number 12 appears to have gained significance from the 12 years it takes the planet Jupiter to make one 360-degree journey about the sky, rather than from the number of months in a year.

- As a third point of difference, most of the Chinese patterns (not counting the Four Beasts) are much smaller than Greek-Roman ones, and consequently, there are many more of them. In addition to the 28 lunar Houses within the beasts, there are 185 small figures known as either “co-risers” or “paranatellons.” Each one is an asterism (a sky figure that is within another larger figure). Sometimes the small asterisms consist of a single star!
- Fourth, the stories of Chinese figures (that is, of the ethnic Chinese who refer to

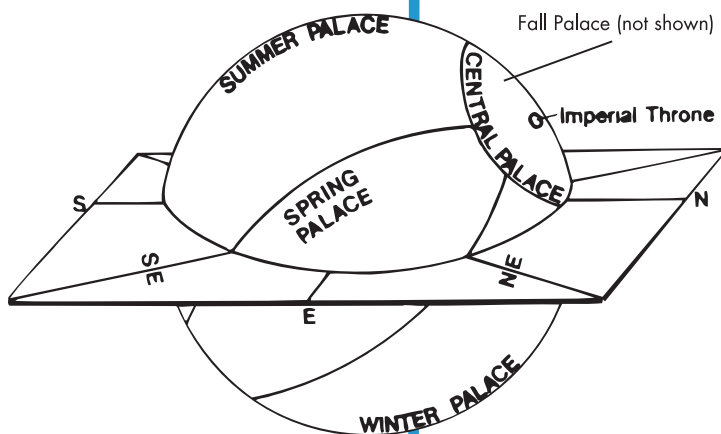
themselves as “Han” and today make up about 95 percent of the people within Chinese borders) were usually much more matter-of-fact than classical Greek myths. There are some beautiful exceptions, but most were simple reminders of a particular office, task, or place. China’s bureaucratically organized society was thought to be governed by a bureaucratically organized sky. And it was imperative for astronomers and astrologers to determine what the Sky Emperor and his sky bureaucracy wanted the Chinese Emperor and his subjects to do.

John Ferguson, quoted by Julius Staal in *Stars of Jade* (p. 1), said, “The Chinese powers of observation were remarkable, but what they saw was observed rather than analyzed. They studied natural phenomena not for the purpose of seeking an explanation of their origin, but chiefly to know the effect of these upon human life. They were a very practical people in all matters relating to facts of daily life, while at the same time, they gave loose rein to their imagination in interpreting these facts.”

A general history of science translated by P. Mailla, also noted by Julius Staal in *Stars of Jade* (p. 115), described three different types of astronomical instruments possessed by astronomers in about 2285 BC: the template, the armillary sphere, and the equalizer. The equalizer was a type of sighting tube and the template was a view of the stars (a little like a planetarium).

In at least two ancient sources, a particularly beautiful armillary sphere was described. The Emperor Choun, shortly after 2285 BC, afraid that his astronomers would neglect their work and information would be lost, instructed them to make a great armillary sphere. He told them that they should make him a machine representing the sphere of Heaven, divided into degrees, with the earth in the center, and the sun, moon, planets, and stars where they should be. (It is interesting that the idea of a spherical earth must have been accepted.) Choun gave the scholars precious stones to mark the celestial poles, sun, moon, and planets, and pearl to make the stars. They succeeded to the extent that Choun was very happy with it and rewarded them for their work. Choun also had the astronomers construct a sighting tube of gems, and it was used to observe the gem-studded armillary sphere (!), as well as the real sky.

The appearance of the first stars of each of the Four Beasts in the east at a particular time, was the ancient reminder to prepare for certain seasonal weather and a particular time in the cycle of planting. The appearances of the asterisms in particular directions at certain times of the year were reminders of family, occupational, and government duties that should be performed. The brightness or dimness (due to atmospheric conditions) and the nearness of a comet, planet, or “guest star” (nova or supernova) greatly influenced the meaning that was attached to their appearance.



The drawing of the Chinese sky palaces is from “The Stars of Primeval China,” *The Planetarium*, Spring/Summer, 1974.

Astrologers used the court astronomers’ observations to forecast weather, deaths, and invasions. Astrologers also used oracle bones, the bottom of tortoise shells or bones of cattle into which they thrust heated metal rods. They interpreted the patterns of cracks which resulted to make forecasts. With sky observations and oracle bones to guide them, the astrologers made recommendations to the emperor, the court, and ordinary people on what actions they should take.

The Shang, the oldest dynasty known with certainty, began in 1766 BC. Shang Dynasty records note the importance of the circumpolar constellations moving about the fixed north point, the north celestial pole. They referred to the north circumpolar region as the Central

Palace. The Central Palace joined the quadrants of the sky holding the Four Beasts. See the figure at left.

The text of the Shu Ching of the eighth century BC reports that a legendary emperor named Yao, living in 2357 BC, before the Shang, gave detailed instructions which relate certain circumpolar stars to certain equatorial stars. Emperor Yao's instructions show that the change in Chinese astronomy, adding the Imperial Palace to the Four Beasts, had occurred a while before his reign.

The Shang wrote that the universe exists on three levels: the heavens on top, the world of humans between, and the earth below. The idea that human society imitated the parade of northern stars was in use by Shang time. The Earth (Chinese) Emperor has a role on earth (in China or "the Middle Kingdom") like the Sky Emperor had above. The Heavenly Emperor occupied the Imperial Throne, an area of the sky either at the north celestial pole or near it. Just as north circumpolar stars moved about the Sky Emperor, court advisors and subjects all moved about the Earth Emperor. The Earth Emperor, the Son of Heaven, ruled because he had a Mandate from Heaven, permission from the Sky Emperor. People believed that heavenly gods and creatures (particularly the Blue Dragon of Spring) helped their ruler in planning for good crops and in defeating enemies. If the ruler did not produce good crops or have victories in battles, he lost the Mandate of Heaven. Then the people approved the overthrow of the earthly emperor and the beginning of a new dynasty.

Precessional change of the sky is a very important factor in understanding ancient Chinese astronomy. (Precession is the cycle of changing direction of the north celestial pole and position of the sun at the vernal equinox, which takes 25,800 years.) Julius Staal (1917-1986), a planetarium director and an outstanding Chinese astronomy scholar, demonstrated that the Four Beasts probably have the age of three-quarters of a precessional cycle originating in about 15,600 BC.

Using the precessional ability of the large Zeiss planetarium projector at the Fernbank Science Center in Atlanta, Georgia, Staal discovered that trying to follow the legendary commission by Emperor Yao in 2357 BC to set the seasons by particular stars, the required star line-ups would not coincide with seasonal observations of the Four Beasts for the precessional epoch of 2357 BC. It was necessary for Staal to precess the Zeiss projector back to 15,600 BC, before the meridian passages dictated in the commission correctly connected with those of the season named for each beast.

Due to precession, the marking properties of the four beasts have changed drastically since their first use and formation. For instance, the heliacal rising (rising just before the sun) of the stars Arcturus and Spica in the Blue Dragon, originally marked the beginning of Chinese spring and the New Year (which can occur from the third week of January to the third week of February). And the heliacal rising of Antares, the heart of the Blue Dragon, marked the spring equinox in 15,500 BC.

Now the Blue Dragon stars of Arcturus and Spica are visible in the spring sky in the evening after sunset, rather than in the morning. And the heart star Antares is a star in the summer evening sky. For about the year 2500 BC, the full moon, Arcturus and Spica rose at about sunset when spring began at 35° N. latitude, Spica a little after Arcturus. The ecliptic and moon's path against the stars were closer to Spica than Arcturus. (The author checked this observational situation with the assistance of Dr. Dale Smith and the precessional capability of the large Minolta planetarium at Bowling Green State University, Ohio.)

The still-current cultural parade of the dragon following the pearl, seen at the close of three-day festivities in the February Chinese New Year celebration, represents the full moon caught in the horns of the Blue Dragon. A figure of a dragon reaching for a pearl has been an important Chinese symbol. It was carved on the thrones of emperors and embroidered on their robes. The flag of the Chinese government that fell in 1911 contained a dragon with a pearl.

Yet the full moon in the sky dragon's horns will not now work to announce a February New Year and spring beginning! In February, Arcturus and Spica rise long after a full moonrise. Currently the new moon is used to mark the beginning of the three-day Chinese New Year celebration. The sky dragon's horns appear a long time after sunset. Precession keeps changing the relationship of the rising of beast stars to the seasonal year.

The Chinese New Year currently starts with the new moon which is in the constellation known in the west as Aquarius. It is the modern constellation of the rat in China. This is the beginning of the first lunar month. The Chinese calendar is based on twelve lunar months with each month having either 29 or 30 days. Sometimes a special month is added to keep the lunar calendar in line with the solar calendar. The Chinese calendar consists of a sixty-year cycle. Within the larger cycle are five smaller cycles each lasting 12 years.

Arcturus, which the Chinese call TA-KIO or the Great Horn, was especially important in ancient Chinese astronomy.

The Chinese people observed that the handle of the controlling Imperial Palace stars of the Big Dipper, which they call PEI-TOU, the Northern Bushel, points to Arcturus like a fishing line. The Great Horn of the Blue Dragon shares highest esteem with the Northern Bushel, due to this apparent spatial connection.

Over the long histories of moon-house asterisms contained within the Four Beasts, and the co-risers asterisms that are found near the beasts, there have been changes in the patterns' meanings. And along with the evolution of meanings, some completely new figures have appeared (including the solar zodiac of 12 constellations) and others have disappeared.

There is a feature that ancient Chinese astronomy shares with many other early agricultural societies: the cyclic concept of time. That is, major or specific events that happen in any period are believed to have happened before and will happen again. We do not know how old cyclic time ideas are in China, but writings about them can be found in records from the Shang, Chou (beginning in 1122 BC.), and Han (beginning in 202 BC). Babylonians, Sumerians, ancient Greeks, and Mayans all had detailed cyclic cosmologies as well. The concept of cyclic time shared by these peoples contrasts with the Western view of linear time. From a Western philosophical perspective (as well as the scientific one of the Big Bang), there is a single beginning to everything. To the Chinese, beginnings occurred over and over. Perhaps this deep cultural belief facilitated the cycle of dynasties: birth, expansion, decay, and a new dynasty's birth.

A knowledge of the four animals, moon Houses, and co-riser sky figures can help us understand the natural history of Chinese lands, including climate, crops, and animals. They can also help us understand attributes of the ancient Chinese people — their government, their social and military organization, their occupations, rituals, tools and materials. The patterns can illustrate discussions of historical events, such as flood control by an early emperor. Students can learn a great deal about ancient China from lessons with the two STARLAB Chinese Cylinders.

Note

See "Suggestions for Further Reading" on pages 42-43 for more information.

The Four Beasts

The Blue Dragon

Descriptions and drawings of the Blue Dragon and other Chinese dragons show much embellishment on a probable real single reptile or reptile hybrid (crocodile-snake-lizard?). Chinese have claimed that fossils of dragons are found in high mountain caves. Some records refer to the sky dragon as green, or partly green, although blue is the predominantly reported color. Both ancient and more recent Chinese strongly believed in dragons and in their power for good. Chinese emperors adopted dragons, particularly the Blue Dragon of Spring, with its supposedly important control of spring rains, as an official symbol. The Blue Dragon is called “the Blue Dragon of Spring” and is said to live in the Spring Palace.

The Chinese word for the Blue Dragon was TSHANG-LUNG. Stars of the western constellations of Virgo, Libra, Scorpius and Sagittarius are found in the Blue Dragon.

The Red Bird

Like the Blue Dragon, the Red Bird may represent a hybrid of some birds seen in China. Records mention quail, and the idea that it had the beak shaped somewhat like a chicken and feet like a chicken is correct for quail. Quail were connected to the idea of the phoenix — the mythical bird that is the essence of summer heat. Today one main type of quail found in the valleys of the Huang He or Yellow River, where agriculture and astronomy are likely to have developed, is the Chinese Painted Quail. Other quail found in China during part of the year are European Migratory Quail and the Japanese Quail. All of these could have inspired the celestial Red Bird, but detailed descriptions show that it, like the Blue Dragon, is a creation of the Chinese culture. The Red Bird is called “the Red Bird of Summer” and is said to live in the Summer Palace.

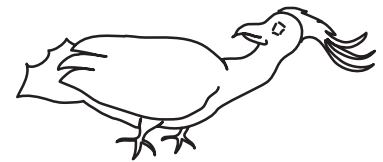
The Chinese word for the Red Bird of summer is TCHOU-NIAO. Stars of the western constellations of Gemini, Cancer, Hydra, Crater, and Corvus are found in the Red Bird.

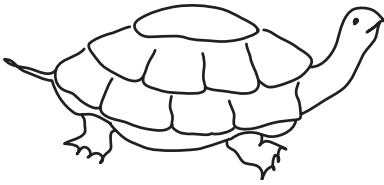
The White Tiger

The Chinese believed that a tiger turned white if it became 500 years old. However, white or creamy fur, instead of orange or yellow fur, is a genetic trait, a mutation. White tigers are not albinos. The creamy variety of tiger that we call “white” and which are now bred in captivity and seen in zoos, has not been given a separate subspecies classification. The Bengal subspecies from India is the type that has produced the “white” variety.

In China, tigers once were very common. But now their numbers are small. Three subspecies are known, none of them the Bengal. One wonders about these possibilities: a) if white Bengals were once seen in China, b) if one of China’s present three subspecies (mainly the Siberian and South Chinese) had a creamy genetic variety long ago, or c) if the Chinese superimposed a mythical idea of “white” upon the celestial tiger marking autumn. White might have been suggested by upcoming winter snow. The White Tiger is called “the White Tiger of Autumn” and is said to live in the Autumn Palace.

The Chinese name for the White Tiger is PAI-HOU. Stars of the western constellations of Andromeda, Aries, Taurus, and Orion are found in the White Tiger.





The Black Tortoise

The Chinese probably were aware that tortoises mature slowly and can live to be very old. Tortoises keep growing throughout life, but only on Pacific islands do we find really large tortoises like the Chinese imagined the celestial tortoise to be. It is likely that the black color is symbolic, recognizing that the days are short and much time is spent in darkness during the winter. Since tortoises can become very old, it was believed that they could also be very wise and forecast the future. The use of bottoms of tortoise shells as oracle bones grew out of this belief.

There are three species of tortoise in China, one in the deserts known as Horsfield's Tortoise. The desert tortoise has four claws on each of its two front limbs, while the other two species have five claws. But neither match the description of the heavenly tortoise, with his eight feet and six eyes! Again, the Chinese have created a mythical animal. The Black Tortoise is called "the Black Tortoise of Winter" and is said to live in the Winter Palace.

The Chinese name for the Black Tortoise is HIOUEN-WOU. Stars of the western constellations of Sagittarius, Capricornus, Aquarius, and Pegasus are found in the Black Tortoise.

Asterisms of the Five Palaces

on the STARLAB Ancient Chinese Legends Cylinder

Background Information

Most of the asterisms (small star figures) on the STARLAB Ancient Chinese Legends Cylinder are thought to have first been used in approximately 15,600 BC. However, a few were invented in later periods. The period in which a particular asterism is believed to have been created is noted below. Some of the asterisms are so limited in space (one or two stars), visualization would be difficult without a figure enlargement. Therefore, some asterisms are drawn over a slightly larger sky area than was actually recognized in ancient times.

Although many historians do not agree that there could have been a well-developed Chinese culture beginning in 15,600 BC, excellent detective-type work by Julius Staal (1917-1986) provides convincing evidence of its truth. Staal did numerous careful observations for past dates in a Zeiss planetarium and translated *Uranographie Chinoise*, published in French in 1875 by Gustave Schlegel (1840-1903) from ancient Chinese sources. He also consulted many other sources. Staal had no agenda, no preconceived theory which he was trying to prove correct. As he was working to learn more about a topic he loved, Chinese astronomy and star lore, with much more technical capability than Schlegel had had, he became convinced that Schlegel must be right. It seems that the doubting historians do not fully understand the proofs provided by the astronomical research. It is very probable that most of the figures shown on the STARLAB Ancient Chinese Legends Cylinder originated in about 15,600 BC.

Most of the information in the following sections is from a book by Julius Staal, *Stars of Jade*, although some of the detailed stories are from other sources. The STARLAB Ancient Chinese Legends Cylinder is very much based on Staal's work.

Space does not permit the inclusion of all recorded prehistoric and modern Chinese asterisms. Many of those omitted were figures of different types of officials. Not counting the four enormous seasonal beasts of the Blue Dragon, the Red Bird, the White Tiger, and the Black Tortoise, there were a total of 213 different figures attributed to just the period of 15,600 BC. And this count omits many areas of the southern sky. This abundance of early Chinese figures contrasts with the 88 or 89 (depending on source) accepted Western constellations, which includes the southern sky.

The asterisms on the STARLAB Ancient Chinese Legends Cylinder are grouped on the following pages by their membership in the five sky palaces. The order of asterisms given within each palace is eastward from the horns of the Blue Dragon. This continuous eastward listing requires that the Winter Palace of the Black Tortoise follow the Spring Palace of the Blue Dragon; the Autumn Palace of the White Tiger follow the Winter Palace of the Black Tortoise; and the Summer Palace of the Red Bird follow the Autumn Palace of the White Tiger. (The apparently reverse-ordering is the result of the ancient Chinese using heliacal risings for Blue Dragon and White Tiger stars and evening risings for Red Bird and Black Tortoise stars.) The corresponding Western constellations and/or stars are noted for each Chinese asterism.

Most relationships of the figures to times of year are for remote times, when precession caused rising, setting, and culmination-at-midnight times to be very different from today. Since the precessional cycle is 25,800 years, and many Chinese asterisms are probably 15,600 years old, the figures have shifted drastically in relation to the solstices, equinoxes, and north celestial pole position. The Ancient Chinese Legends Cylinder is prepared for the current precessional situation, in which Polaris is the North Star. The most recently-invented asterisms (later than 2700 BC) have positions close to their original intent. For example, the modern asterism of the Emperor's Black Banner is still found in a position close to the sun's position at the beginning of winter. (This is north of the "teapot" of the western constellation of Sagittarius.)

The ancient Chinese spring, the New Year, began in February. Precession has greatly changed the positions of Dragon stars in relation to equinoxes and solstices. At the beginning of Chinese spring (February), in about 15,600 BC, the horns of the Blue Dragon were seen at sunrise. Now Spica rises in the evening in late spring. The stars of other seasonal palaces have shifted as well.

The Spring Palace of the Blue Dragon

Horn

(Includes the star Spica. The Horn is seen intersecting the Heavenly Fields): 15,600 BC

Great Horn

(Arcturus): 15,600 BC

Heavenly Fields

(Part of Virgo): 15,600 BC

The Emperor's Mat

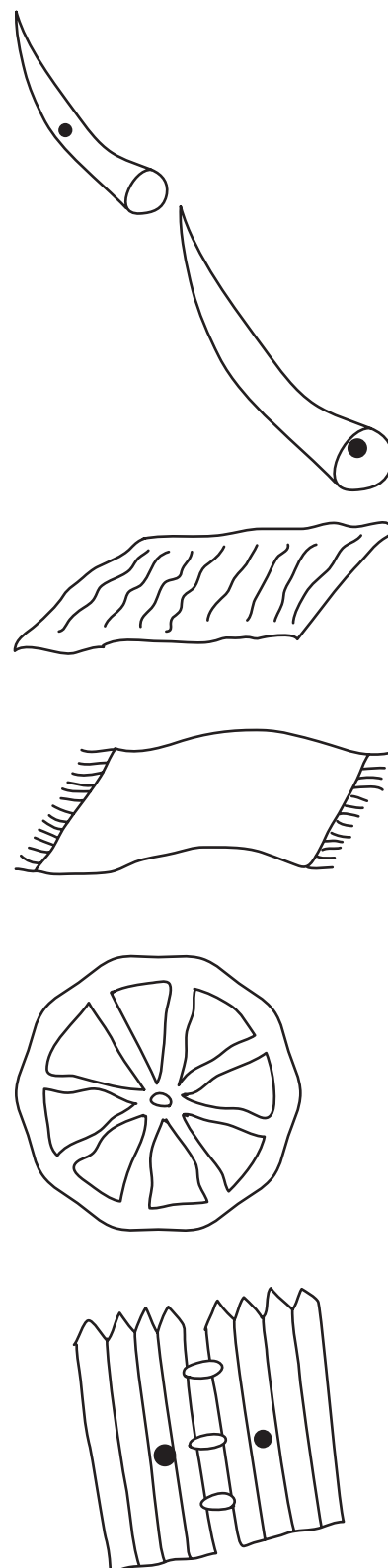
(Northern part of Bootes): 15,600 BC

Celestial Wheel Spokes

(Northern part of Centaurus): 15,600 BC

South Gate of the Sky

(Alpha and Beta Centauri): 15,600 BC

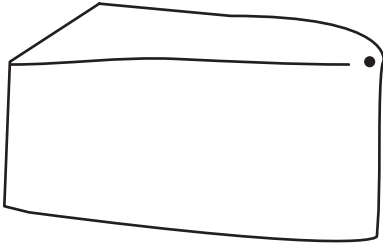




Great Fire

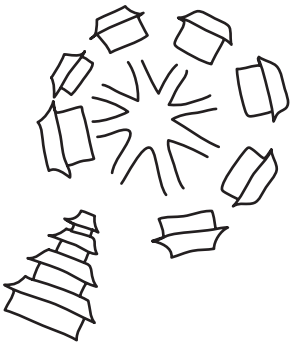
(Or Heart; Antares with two other stars of Scorpius):

15,600 BC



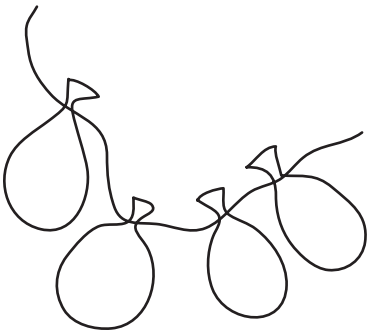
Manuring Tray

(Part of Sagittarius): 15,600 BC. When precession moved their visibility from spring to fall, the stars became known as the Wincwing Basket.



The Autumn Marketplace

Formed by different asterisms, Ring of Stalls plus a Watchtower at the opening: 3000 BC; modified in 2700 BC



Money String

(Corona Borealis): 3000 BC

The Winter Palace of the Black Tortoise

Tortoise

(A small tortoise, Corona Australis): 15,600 BC

Southern Bushel

(Part of Sagittarius): 15,600 BC

Emperor's Black Banner

(North of handle of "teapot" of Sagittarius): 1150 BC

Weaving Star

(Vega): 15,600 BC and as the Weaving Star Princess and concept of the magpies:
12,900 BC

Oxen Driver or Royal Herdsman

(Altair and Aquila):
12,900 BC

Pearls

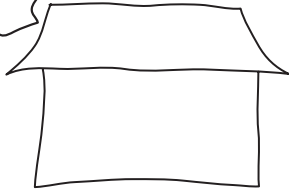
(Above Capricornus): 15,600 BC





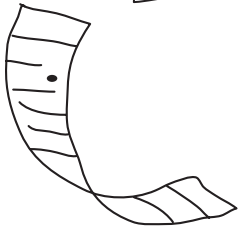
Ornate Dresses

(Capricornus): 15,600 BC



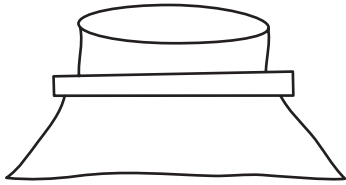
Coach House

(Parts of Cygnus and Vulpecula): 15,600 BC



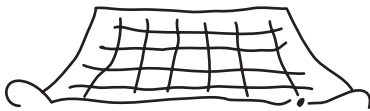
Footbridge Across the Silver River

15,600 BC



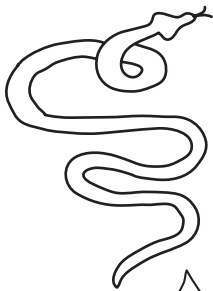
Funeral Mound of the Sun

(Parts of Equulas and Aquarius): 15,600 BC



Roof of the House

(Parts of Aquarius and Pegasus): 15,600 BC



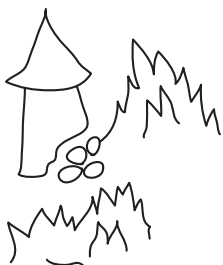
Awakening Serpent

(Parts of Lacerta and Cygnus): 15,600 BC



Four Pillars of Heaven

(Great Square of Pegasus): 2700 BC



Temple of Light

(On northwest side of Great Square of Pegasus): 15,600 BC

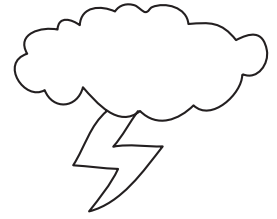
Eight Evil Chiefs

(Pisces): 2700 BC (combined with idea of Eight Chiefs in Phoenix of 15,600 BC)



Thunder and Lightning

(In Pegasus, above Funeral Mound): 15,600 BC



Clouds and Rain

(Below Great Square of Pegasus): 15,600 BC



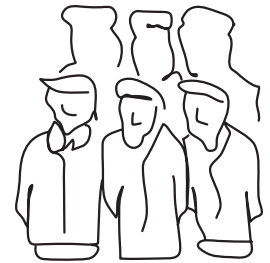
General of the Northern Countries

(Fomalhaut): 15,600 BC



Light Infantry Soldiers

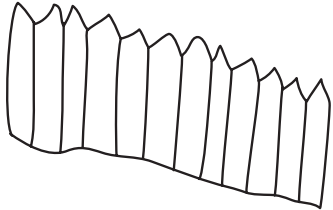
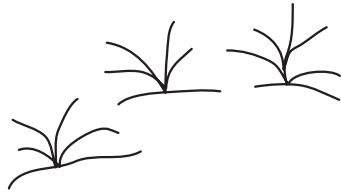
(Sculptor) 15,600 BC



The Autumn Palace of the White Tiger

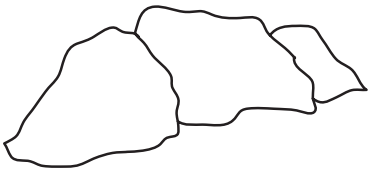
Celestial Marshes

(Part of Cetus): 15,600 BC



Outer Enclosure

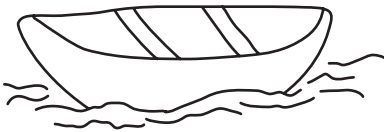
(For pig farms and marshes; part of Pisces): 15,600 BC



Celestial Granary

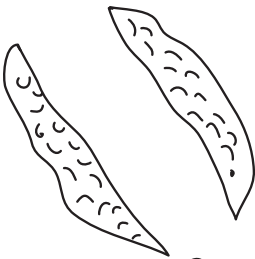
(Back of Cetus):

15,600 BC



Celestial Boat

(Northern part of Perseus): 15,600 BC



Great Trench

(Southern part of Perseus): 15,600 BC



Heaped-Up Corpses

(Algol in Perseus): 15,600 BC



Two Hunting Nets or Celestial Snares

(Hyades of Taurus and the Pleiades): 15,600 BC

Five Chariots

(The Pentagon of Auriga): 15,600 BC

Tie-Up Posts

(Inside the Pentagon of Auriga): 15,600 BC

Supreme Commander, TSAN

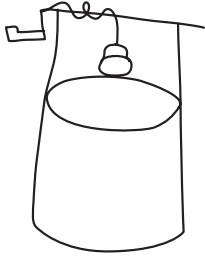
(Much of Orion): 15,600 BC



The Summer Palace of the Red Bird

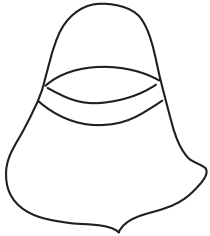
Well

(Bottom of Gemini): 15,600 BC



Celestial Vessel

(Small part of Gemini): 15,600 BC



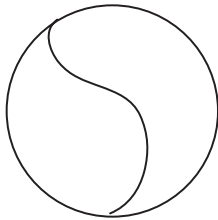
Northern River

(Castor and Pollux): 15,600 BC



Yin-Yang Symbol

(Castor and Pollux): after 2700 BC



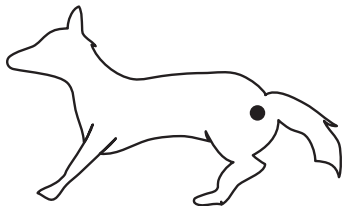
Two Love Butterflies

(Castor and Pollux): 1300 BC



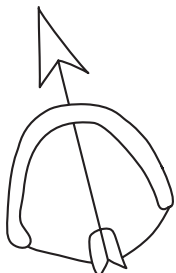
Celestial Jackal

(Or Wolf; Sirius): 15,600 BC



Bow and Arrow

(Southern part of Canis Major): 15,600 BC



Old God Who Shoots Celestial Dog with Bow and Arrow

(Hydra): 15,600 BC

Willow

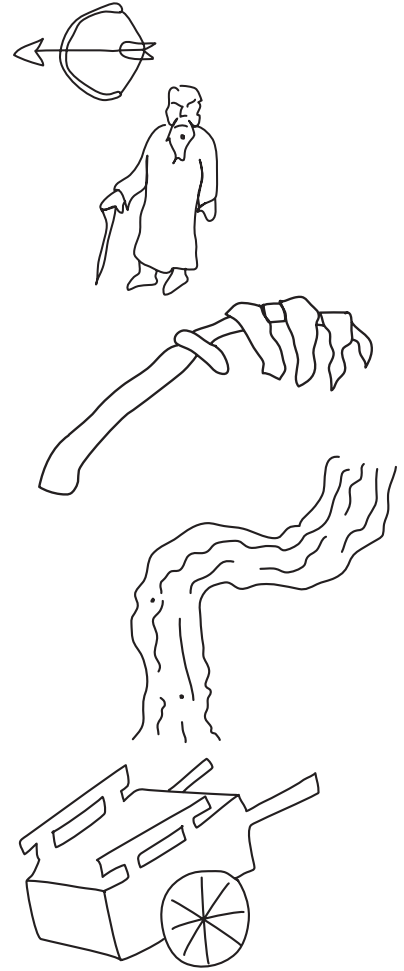
(Hydra's neck and head): 15,600 BC

Water Flowing

(Leo and Leo Minor): 15,600 BC

Chariot

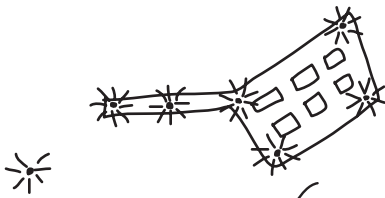
(Corvus): 15,600 BC



The Central or Imperial Palace of the North

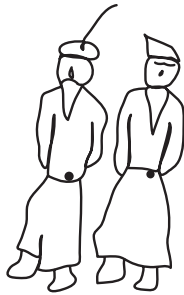
Northern Bushel or the Balance of Jade

(The Big Dipper, Ursa Major): from 15,600 BC. Many officials as stars of the bushel, around the bushel, and imagined within the bushel from 3000 BC.



Imperial Prime Minister and the Crown Prince

(Ursa Minor): after 2700 BC



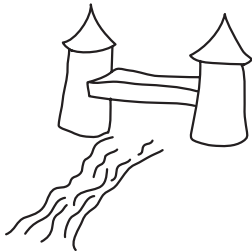
Sky Emperor and His Wife

(Polaris): after 2700 BC



Bridge of Kings

(Part of Cassiopeia): 15,600 BC



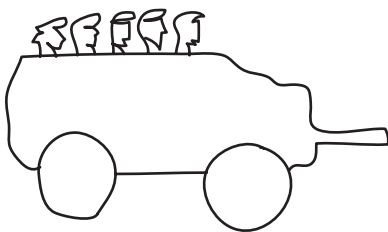
Whip

(Part of Cassiopeia) 1000 BC



Chariot

(Cepheus): 1000 BC



Inner Throne of the Five Emperors

(Cepheus): 1000 BC

Container to Hold the Woven Garments

(Draco's head):

15,600 BC

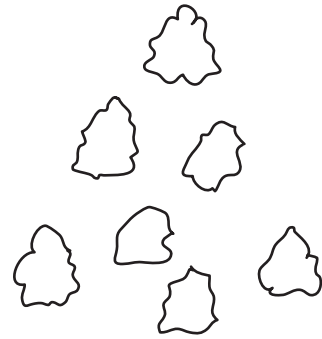
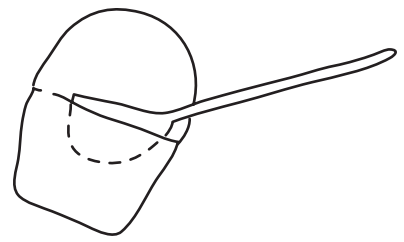
Flail

(Draco's Head):

12,700 BC

Eight Stacks of Grain

(Near Perseus): 15,600 BC



MATERIALS

- STARLAB Portable Planetarium
- Ancient Chinese Legends Cylinder
- arrow pointer

Optional

- slides or transparencies of Chinese scenes that relate to human activities and stories
- items given for suggested procedures with specific star groups (e.g., a glow-paint disk with a Velcro back to place between the two horns, Arcturus and Spica, to simulate the moon)
- a costume of Chinese dress for the presenter. A woman could dress as a Chinese grandmother, an old woman, for it was the Chinese grandmother who often told stories to the gathered family. A man could dress as a Chinese grandfather.

Cultural Ideas and Stories of the Chinese Asterisms

Note

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

Unlike the specific activity organization of the Ancient Chinese Seasons (Four Beasts) Cylinder, suggestions for using the Ancient Chinese Legends Cylinder are presented as five sections of cultural information and stories about the asterisms, with occasional suggested activities. It is expected that each STARLAB educator will wish to select and combine material in a particular way to meet student level and time needs. There is one overall set of objectives, process skills, and general suggestions. Some particular presentation and activity ideas are noted with specific asterisms within the sections.

Objectives (to be selected and adjusted for time and level)

1. Learn names and cultural information about Chinese star figures.
2. Learn that the sky was an extremely important factor in ancient Chinese life.
3. Learn that the sky was used to regulate human activities that occurred at different times of the year.
4. Learn some of the details of ancient Chinese culture, which are different from our culture.
5. Learn that Chinese astronomy is very old.
6. Learn that changes in the times that particular stars rose or came to the middle of the sky (over thousands of years) resulted in changes in how they were used by the Chinese people.
7. Learn that the appearance of particular stars at particular times (with changing weather) was used to predict events, trouble, or success (astrology).
8. (Optional if a lesson is given with the STARLAB Greek, African, and/or Native American Mythology cylinders): Learn differences in how other cultures generally thought of the sky and some differences in how they regarded some particular star figures.

Approximate Time Needed

It is suggested that any one lesson be limited to approximately 50 minutes.

Suggested Levels

The material can be adapted to groups from first grade up, including mixed-age groups.

Integrated Subjects

- Science
- History
- Comparative Cultural Study

Process Skills

Observing • listening • discovering • inferring

Concepts to be Applied

Rotation, revolution, seasons, human activities

Relevant Terms: Background for the STARLAB Teacher

- Astrology — Making predictions without a scientific basis. Unlike western astrology, in which forecasts are superstitiously related to the 12 zodiac constellations, Chinese astrologers made forecasts based on the appearance of all star figures. Each figure was attached to one or more human activities.
- Comets were called “broom stars.” Supernovae were called “guest stars.” Atmospheric changes, comets and supernovae all affected the Chinese astrologers’ interpretations.
- Asterism — A small star figure. The term is appropriate for older audiences. It is not used in the text.
- Heliacal Rising — Rising in the east and fading in dawn at sunrise. The term is not used in the text.
- Culmination — Coming to a position halfway between east and west (the celestial meridian). The term is not used in the text.

Preparation

Set up the STARLAB dome and projector. Place the Ancient Chinese Legends Cylinder on the cylinder platform. Position the projector for about 35° N. latitude. (Polaris will be less than halfway from the north horizon to the zenith.) Turn the cylinder so that stars of the (first) section of the sky you wish to discuss are above the horizon. When discussing heliacal risings (those that occur just before sunrise), you may wish to switch the rotational setting to show these stars rising. For example, the horns of the Blue Dragon, which begin the first section, were watched for heliacal risings. A particular rotational setting is not important for discussing the northern sky, the section of the Central or Imperial Palace.

The Spring Palace of the Blue Dragon

Long ago, at the beginning of Chinese spring, stars thought to mark the two horns of a very large dragon were seen fading in the east at sunrise. Here is one horn.

(Point out the one over Spica on the Heavenly Fields.)

Can you find another?

(Students should locate the one over Arcturus above the Heavenly Fields.)

The Chinese thought that a large dragon which had these horns opened up the Earth, giving birth to the creation of plants. When the people saw the first horn, it was a sign to start preparing the fields for planting.

*There is a pattern called the **Heavenly Fields** in the sky with the first dragon horn. When the stars of the Fields appeared, officials reminded the Emperor that it was time for him to place a plow in his chariot and go perform the first plowing of the year in the land. The Emperor ordered all the important officials to accompany him, and they plowed 1000 acres designated as the royal fields. The harvest of these special fields was set aside for sacrifices in special ceremonies. Can you find a chariot near the fields?*

(Students will see a chariot in Corvus, to the southwest of the Heavenly Fields. It really belongs to the end of the Palace of the Red Bird, but it is helpful for indicating how the Heavenly Fields were used by the ancient Chinese.)

The northern horn, the one that you found above the Heavenly Fields, is called **TA-KIO, the Great Horn**. Its first appearance in the east was the signal that spring began. When stars just to the west of TA-KIO rose, the astronomers reported to the Emperor that in three days spring would officially arrive. The Emperor fasted for three days. Then, on the first day of spring, he walked out of the east palace door with all of his ministers, and climbed into a sky-blue chariot. The ministers wore blue clothing and carried blue flags. The people walked behind the Emperor's chariot and ministers, singing songs about the spring sun and dancing to represent clouds rising to heaven to make spring rain. Can you find a mat above TA-KIO?

(Students should find the mat as the northern part of Bootes.)

This is the **Emperor's Mat**. To celebrate the new year, which came at the beginning of spring, the Emperor held a spring feast. Guests sat with the Emperor on the floor around a huge mat on which food was placed. Fresh vegetables were served with rice soup. Servants opened doors and windows, so that winds would blow through the palace and eliminate the stale air. Bamboo was burnt. The popping and crackling of the burning bamboo was thought to scare away the demons of illness. The Emperor gave colorful silk party hats to the princes, the palace officials and his friends as they sat around the mat. The hats were worn to symbolically welcome spring with its flowers and birds.

Re-position the Ancient Chinese Legends Cylinder for 0° latitude (the equator) or south of the equator, so that the South Gate of the Sky is visible.

Far to the south are two bright stars we know as Alpha and Beta Centauri. Thousands of years ago these stars could be seen from mid-northern latitudes, including the cradle of Chinese civilization.

(This is along the Yellow River, at about 35° N.)

The two stars were known as the **South Gate of the Sky**. It was thought that this gate let light into the land from the south. The Chinese thought that all doors opened at the beginning of spring.

Thousands of years after spring began with the morning rising of the Blue Dragon's horns, the full moon passed between the Dragon's horns in the spring evening. When they saw the moon between the horns, the Chinese thought that the Blue Dragon was swallowing a large pearl.

Procedure

- Pass a glow-paint disk with a Velcro back from west to east to a spot between the two horns. Stick it on the dome between the two horns at a pre-planned spot where a complementary piece of Velcro has been placed. If you have a slide of a dragon with a pearl (or a sculpture or material showing this), show this to the class.
- Adjust the Ancient Chinese Legends Cylinder so that it is back to about 35° N.

Now look south and a little east of the mat, horns, and fields. Find a chariot wheel. This is known as the **Celestial Wheel Spokes**. Can you find any other chariot patterns on the sky?

(Besides the one in Corvus, students should see a vehicle in the north, near a bridge. At a particular rotational setting, they also can find five chariots over the stars of the Pentagon of Auriga.)

Why do you think chariots figure so prominently in the sky?

(Students should respond that chariots were an important part of Chinese society.)

Even the sun was believed to ride a chariot. The sun's chariot was thought to have a rectangular bottom and a dome-shaped top; the bottom represented the Earth, and the top represented the sky. The sun's chariot had thirty spokes in its wheels, symbolizing the (nearly) thirty days in a month.

(The phase month is closer to 29½ days in length.)

Directly above the pattern of the Celestial Wheel Spokes (the front stars of Scorpius), is a point where the sun passes. Long ago this spot was believed to be where the sun god changed to a team of four fresh horses.

Suggested Procedure

Discuss the Greek idea of Helios and the sun chariot, a similar, much more recent idea.

Like the chariots, the other star figures that the ancient Chinese imagined also tell us a lot about their society. The sky figures are clues to things that were used, the government, the ceremonies, and different professions. And they show us what was done at different times of the year.

Do you see the fire to the east of the chariot wheel? A bright red star, Antares, is part of this star group. Long ago this star rose near sunrise in early April. The fire star announced that days would soon be very warm. A "ceremony of the renewal of the fire" was held. A supervisor would hold a concave mirror made of polished metal up to the morning sun. He would point it so that the sun's rays would reflect from the mirror onto a small pile of dry moss. (Archimedes is known to have used concave mirrors and convex lenses to start fires in Ancient Greece.) When the moss started to burn, a torch was made. A huge fire was then lit with the moss torch in honor of the appearance of this star figure, the Great Fire. Handfuls of salt and rice were thrown on the fire, believing that this would help the sun make the crops grow well. After the fire burned out, the peasants crushed the ashes to powder and mixed them with food for their cattle. They believed that the powder would fatten them.

Show students how a flashlight beam reflects from a concave mirror and comes to a focus.

*The Great Fire was also called the **Heart**. It was supposed to be the heart of the Giant Blue Dragon of Spring, whose horns are over here.*

(Show Spica and Arcturus again.)

*Behind this great beast was the group called the **Manuring Tray**.*

(Note the upright box, the west part of Sagittarius, over the small tortoise.)

*Long ago these stars rose just before the sun in early May. This was the signal that the fields had to be fertilized. A combination of manure and other things was used as fertilizer. Thousands of years later, the box rose at sunrise in autumn. Then the figure was called the **Winnowing Basket**. Just to the west of the Manuring Tray/Winnowing Basket there are very faint patches of light. You can see them on a very clear, dark evening, when the moon is not in the sky. Today we recognize the patches as distant open galactic star clusters. But the Chinese had no way of understanding this, and they referred to the patches as "the chaff of the bran." To the Chinese, the patches represented the unwanted dry pieces of rice stalk that were scattered away from good rice when the winnowing basket was shaken.*

- Show slides taken with large telescopes of one or more of the following, which are the patches of "the chaff of the bran:" M6, M7. Discuss their true nature.

- Show a picture of a winnowing basket or an actual one.

*In the period in which the box was called the Winnowing Basket, the stars in this large ring were given the name of the **Autumn Market** or **Celestial Marketplace**.*

(Point out the ring of stalls with connecting roads to the northwest of the Manuring Tray.)

*In fall the Chinese held markets where surplus harvest was sold or exchanged for other goods. The sky marketplace includes a chariot shop and a butcher shop. Notice that a **Watchtower** (a lookout tower) guards the opening to the market. The arrangement in the sky shows us the probable arrangement of ancient Chinese marketplaces long ago. A great conference was arranged for the Emperor at a special fall market. Records describe the sky enclosure as representing the Emperor's meeting at the market.*

*People would take their money strings to the marketplaces. The **Money String** above the Celestial Marketplace shows how coins in China were tied together. Holes were drilled in shells that had a pearl lining, and cord was threaded through these holes. The shells were used as money before the Chinese learned to work with metal.*

- Demonstrate the threading of disks on a piece of string.
- Shell pieces or gold foil-wrapped chocolate coins with holes can be used; large buttons and painted cardboard disks are easier to get.
- Ask students if they think this is a good way to keep coins together.

The Winter Palace of the Black Tortoise

Notice the little banner over the tortoise. It is called the Emperor's Black Banner. It represents the black banners which the Emperor had tied on his chariot on the first day of winter. In about 1150 BC, these stars rose at sunrise on the first day of winter (the winter solstice).

Suggested Procedure

Adjust the STARLAB cylinder so that the pattern of the Emperor's Black Banner is just rising. Have a student hold a glow-painted sun disk on the dome over the sky banner. Let earth's rotation carry the banner and other stars westward, while the student follows the motion, continuing to hold the disk over the banner in the sky. Stop the rotation when the sky banner is halfway between east and west. Note that this was the noon position of the sun on the first day of winter, the winter solstice. Have older groups estimate the angular height of the sun (about 30°, one-third of the way from horizon to zenith).

Note

Since 1150 BC, the position of the winter solstice has shifted slightly. Today it has the position shown by the western edge of the Manuring Tray.

*Much earlier, about 15,700 BC, the small bushel you see below the banner came to the middle of the sky at midnight during the first days of November. This is the **Southern Bushel**. The Southern Bushel played an important role in the lives of the Chinese at this time. On November 10th, rice from the harvest was brought into the storage bins. To determine how much rice different people brought, the bushel was used as a measuring device. After the rice was measured and stored, the Emperor gave a celebration feast. Although most people relaxed, some had to keep careful watch over the rice bins. Robbers, who had not grown food for themselves, always were waiting to break in and take it.*

If you look to the north, you will find the great **Northern Bushel**.

(Point out the Northern Bushel, the Big Dipper.)

The Northern and Southern Bushel were important star groups to the peasants, who often had little food.

The **Tortoise** that you see below the banner and Southern Bushel, is supposed to be the original tortoise that existed at the beginning of time. All the species of tortoises are said to have descended from this first sky tortoise. This small tortoise is within a huge Chinese beast, the Black Tortoise of Winter. The huge tortoise stretches from the small tortoise eastward to these figures of the **Eight Evil Chiefs**.

(Point out the northeastern circlet of Pisces).

Do you see the lady with the bright star? The bright star was called the **Weaving Star** in earliest Chinese astronomy.

(We now use the name Vega.)

It came to the middle of the sky at the same time as the Southern Bushel, announcing that it was time to begin the weaving indoors. While the men hunted or fought with barbarians in the winter, the women wove clothing for their families.

A few thousand years later, about 12,900 BC, the Weaving Star came to the middle of the sky in December. In China, many marriages took place at this time, so the stars came to stand for marriage. The Weaving Star became the **Weaving Princess**, and her husband is the **Oxen Driver** or **Royal Herdsman** to the south. In recent times these two stars come to the middle of the sky in summer. The night is close to August 7, or the seventh day of the seventh month. There is a story people love to tell about the Weaving Princess and her husband.

Suggested Procedure with Young Audiences

Discuss and show items or pictures of items that are important in the story: a picture of a loom, a piece of woven cloth, a picture or figure of a water buffalo (which children may have seen in the television program, "Big Bird in China"), a flute (a plastic student recorder/flutophone works very well), a large hairpin, and a picture or figure of a magpie.

CHI-NIU is the daughter of the Sky Emperor and the Queen of Heaven. She is a very skilled weaver. She sits at her celestial loom and weaves tapestries that are the beautiful colors of sunrise and sunset. Even the stars pause as they go by to watch her weave beautiful colors into the sky.

One summer day, CHI-NIU grew tired of her work. She put down her shuttle and looked across a small stream that wound its way near her palace. She heard beautiful music.

CHI-NIU longed to know who was making the music, so she crossed the stream. There were stepping stones in the stream, so crossing was easy. On the other side CHI-NIU found the Royal Herdsman, CHIEN-NIOU. He was playing his flute, relaxing from his work of keeping the water buffalo of the sky where they should be.

Play a brief melody on a recorder, the inexpensive type that is part of many elementary school music programs (3rd-4th grades).

CHIEN-NIOU was glad to have company. He and CHI-NIU enjoyed being together. He played the flute and she sang. Each day CHI-NIU crossed the little stream. They played and

sang and talked—and they fell in love.

It is the custom in China for the parents to make the decisions about marriages. So the couple went to the Sky Emperor and Queen of Heaven to ask permission to marry. The parents were glad to see the princess so happy, and they set a date for the marriage. CHI-NIU wore her wedding dress from drops of dew and the light of stars. On the night the couple was married, even people on the Earth wondered why the Weaving Star was so beautiful. They said, “There is a wonderful glow in the sky that we have not seen before.”

CHI-NIU and CHIEN-NIOU were very happy together. The trouble was that they were too happy. They completely forgot their work! The sky was very dull because CHI-NIU did not weave any beautiful sunrises and sunsets. Her loom was covered with cobwebs. The water buffalo got into the Northern and Southern Bushels and made the gods angry. The Queen of Heaven, CHI-NIU’s mother, got very mad. One water buffalo strayed into her bedroom and knocked all of her silver hairpins on the floor.

Take out a large “hairpin” made of cardboard, painted with glow-paint, and illuminated with a flashlight or black light for a little while in a light-tight box. Sweep the “hairpin” across the sky between the Weaving Princess and the Herdsman.

The Queen took one of the hairpins and drew a line across Heaven along the little stream near the palace. With this single stroke, she created a wide, roaring, Silver River, the name the Chinese give to the Milky Way. On one side of the Silver River, the Queen placed CHI-NIU. On the other side, she placed CHIEN-NIOU.

CHI-NIU was miserable. She began weaving again, but she cried from morning until night. CHIEN-NIOU was also unhappy. He tended the water buffalo, but his heart was not in his work. And when he relaxed, he no longer played his flute.

*Finally, the Sky Emperor gave in, but just a little. He could not bear to see his daughter so unhappy. He decreed that one day each year, the seventh day of the seventh month, CHI-NIU is allowed to cross the Silver River to meet her husband if she can find a way. July 7th in the Western calendar is the 7th day of the 7th month, but in the Chinese calendar, the 7th day of the 7th month occurs in August. You can see a **Footbridge** near the Weaving Princess (to the east), which crosses the Silver River. But it is not in the correct direction, toward CHIEN-NIOU.*

CHI-NIU calls up the magpies, the birds of Heaven, to come to her aid. The magpies fly up from the Earth and form a bridge across the wide and deep Silver River. CHI-NIU walks on their backs, like she once walked on stepping stones in the shallow water. If you look closely, you can see the magpies forming a bridge between the Weaving Princess and her Herdsman husband. The couple spend an entire happy day together. Then CHI-NIU returns on the magpies’ backs. When people on Earth see the magpies on the next day, they look for ruffled feathers, evidence that the Weaving Princess has stepped on their backs.

During the rest of the year, CHI-NIU and CHIEN-NIOU are busy. CHI-NIU weaves the sky colors and CHIEN-NIOU watches the heavenly water buffalo. They dream of that one wonderful day, the seventh day of the seventh month, when they will be together again.

In some large Chinese cities, there are still celebrations of the Weaving Princess. Banners the color of weddings (red) are hung from windows. And many marriages take place. The way in which the bright star in the Weaving Goddess and the Royal Herdsman appear in a given year is considered important. If the stars shine brightly, the astrologers say that marriages should go forth. But if the stars seem dim or twinkle, astrologers forecast problems in the marriages. Of course dimness or twinkling is just a natural result of the way the air and clouds move, but

many believe the astrologers' predictions.

- Have students hold their hands in front of their faces, while looking toward the figures of the Weaving Princess and the Royal Herdsman. If they look between fingers, opening and closing the gaps between the fingers, they will get an idea of how clouds and air affect the appearance of stars.
- Discuss how all stars are affected in such ways. Ancient Chinese astrologers viewed atmospheric effects on all the asterisms with great care. They then made positive and negative astrological predictions related to each figure. Astronomers' observations of comets and supernovae were also interpreted by the astrologers. Comets were known as broom stars, and supernovae were known as guest stars.
- Show where the Milky Way passes between some of the figures. Consult a map. Discuss the true nature of the Milky Way, the plane of our own galaxy.

There is a certain activity carried out on the seventh day of the seventh month, which helps to indicate that the Weaving Princess was a winter star in 12,900 BC. The people plant peas and corn in small pots in a ritual called "the planting of the principle of life." In winter it had made sense—a hoping and a longing for things to grow again. In August it is just a hold-over custom with no real purpose.

*Can you find a dress below the Royal Herdsman? This is the figure of the **Ornate Dresses**. When the stars of this figure were seen, it was time for the ladies to get out their special dresses that they would wear at the Great Winter Festival. In earliest times, the dresses were black, the color of winter darkness. Later, they were red, the color of the new sun which is reborn on the first day of winter, the winter solstice. In the ceremonies, each lady carried a stone which she beat with a stick.*

*Notice that there is a string of pearls above the dress. At the Great Winter Festival, the ladies of the court wore necklaces to go with their dresses. The sky figure of the **Pearls** was a symbol for this jewelry. The way the figure was seen indicated to the astrologers whether the Emperor would be generous or stingy in giving food and other gifts to the people. When air currents and clouds caused the Pearls to be faint, astrologers said that the Emperor would not or should not give away as much as when the figure was bright.*

*The **Coach House**, to the north, is in the center of the sky at the same time as the Ornate Dresses and Pearls. It represented the building where the sun chariot was supposed to stop at the beginning of winter and be exchanged for a fresh one.*

*This platform (just east of the Pearls) is the **Funeral Mound**. It represents the grave of the old sun. It was a symbol of death and grief. It came to the middle of the sky at midnight on the first day of winter. In December there were many deaths from freezing, natural causes, and warring barbarians, so many funeral mounds needed to be prepared. The funeral mounds consisted of thick beds of sticks and herbs. These were constructed in remote places.*

*Notice the structure to the east of the Funeral Mound which looks like a building. This is called the **Roof of the House**. With the Funeral Mound, it is related to funerals. An official would place a ladder against the east side of a house where a dead person had lived, climbing to the roof with a bundle of clothes. The official would face different directions and call to the spirit of the deceased. Then he would throw the bundle of clothes over the west side of the house, the direction of the Hills of Immortality. The climb from east to west symbolized birth to death, just as the sun rises or is born in the east and sets or dies in the west.*

*Another meaning of this figure was the **Ancestral Home**, the first house. A ceremonial*

“first house” was built of logs at the beginning of each winter, celebrating the idea that the first people were born at the winter solstice. The form of the building was copied from the way magpies build nests, with branches on top of lower branches in random directions.

*North of the Roof and the Funeral Mound, notice the figure of a snake (parts of Cygnus and Lacerta). This is called the **Awakening Serpent**. It came to the middle of the sky at the end of January, announcing the end of winter. At this time, snakes and other reptiles in hibernation began to stir and leave their burrows. When the serpents in the sky and on Earth were seen, people knew that spring was on its way.*

*This square (the Great Square of Pegasus), the **Four Pillars of Heaven**, also came to the middle of the sky in late January. When they were seen, a simple temple was built with altars inside. Offerings were made to the spirits of ancestors and sky gods. People asked the spirits to help their work in the coming year be successful.*

*In mid-January the ruler went to **The Temple of Light** to fast, purify himself, and then give the offering of the last month of winter. The Temple of Light is represented by fires in the northwest of the square of pillars.*

*East of the Four Pillars of Heaven are the **Eight Evil Chiefs**. These stars were thought to preside over bandits, prisoners of war and poachers, or people who hunted illegally in the king’s hunting grounds. Late January, when these stars were in the center of the sky, it was a time for hunting. The number eight was chosen to mean “many,” not specifically eight. The Eight Chiefs opposed the goodness thought to be present in the Northern Bushel.*

*To the south we see the mounted figure of the **General of the Northern Countries** (Fomalhaut) and his **Light Infantry Soldiers**. This commander and his troops were always ready for special duties and war, including break-ins by barbarians, which often occurred in winter.*

*There are two symbols for the kind of weather that often occurred in late winter, **Thunder and Lightning** and **Clouds and Rain**.*

(The first is in Pegasus above the Funeral Mound and the second in below the Great Square of Pegasus, the Four Pillars of Heaven.)

If these stars appeared bright, the astrologers (not meteorologists!) forecast rain. Everyone eagerly awaited the spring rains after the dreary winter months.

The Autumn Palace of the White Tiger

*Do you see the Celestial Marshes east of the figure for Clouds and Rain? This is where pigs rooted and dug, plowing up marshy farmland. In the fall, the pigs were natural plows. They cleaned up weeds and roots and prepared the ground for the next year’s crops. To the east is the fence or the **Outer Enclosure** for the pig marshes. The enclosure kept the pigs from straying and farmers from falling into the marsh. Chinese astrologers said that when the stars of the Outer Enclosure were dim, there would be fevers due to fumes. This prediction is scientifically correct, because methane gas, viruses, and bacteria would be found around enclosed marshes containing many pigs.*

*The stacks near the pig marshes are the **Celestial Granary**. This is where the corn, rice, and millet harvested in the fall were stored. When these stars set in the evening in early July, it was a sign that the buildings that would store the grain needed to be repaired and cleaned. If the evening was clear without the moon, many faint stars could be seen in this area of the sky. The astrologers would say that the doors of the Celestial Granary were open and the building*

held a lot of grain. They would predict a good harvest on Earth. This figure is one of five different grain areas which appeared in the early morning sky in fall. Fall began in the month of August.

Can you find a boat far to the north of the Celestial Granary? The **Celestial Boat** set in the evening in the beginning of September. At this time of year, there were torrential rains. Flooding often occurred. One flood record for a city in recent times is a rise of 23 feet in the water level. How could the people get from one place to another in these floods?

(Boats.)

Small ancient Chinese boats were canoes. They were made by stretching an ox hide over a framework of bamboo or wood, which was then dried over a fire. One single-hide canoe could carry one person. When two of these were lashed together, there was room for three people. When the Celestial Boat set, people were reminded to repair the canoes for the flood season. The Celestial Boat lies in the Silver River, the Milky Way.

(This is the same Silver River that CHI-NIU crosses to see the Royal Herdsman, her husband.)

When astrologers could not see the faint stars of the Milky Way, they said that the Celestial Boat was out of its river, traveling upon a flooded sky. The astrologers would forecast that great floods would arrive soon. (As recently as July 1996, widespread flooding occurred in much of southeastern China.)

Show a figure of a small canoe.

Below the boat is the **Great Trench** holding the **Heaped-Up Corpses**. Terrible criminals and wicked chiefs were put to death by the Emperor in the fall, the time when nature causes death of growing things. The Chinese felt that wicked men did not have the right to an honorable burial, so the bodies were buried in a large common grave. The astrologers said that if the Great Trench shone brightly so that many faint stars could be seen inside, there would be movements of the Emperor's armies, there would be many wicked chiefs that the Emperor would need to execute, and there would be much sickness.

Southeast of the Great Trench, we find two **Hunting Nets** or **Celestial Snares**. Fall was the time of a great animal hunt, in which the Emperor put on his war uniform and went out in his war chariot to hunt with his entire army of feudal troops (groups responsible to warlords under the control of the Emperor). All types of nets were used, as well as other weapons. Hand nets like these were used to catch rabbits and birds, while stretched nets were used for bears, wolves, and foxes. There were several purposes of the autumn hunt. It provided food, it eliminated harmful beasts, and it exercised the people in weapon training, chariot use, and horseback riding. The skills of war soon would be needed in fighting barbarians who would attack during the winter in search of food. The astrologers said that when the bottom net trembled or was dim, there would be a lot of activity at the borders.

Show a small net, like the ones used to capture insects.

The top net is a small group of stars found interesting to many cultures. Today we call it the Pleiades or Seven Sisters. The Chinese knew it as MAO, the setting sun, as well as a net. In 15,600 BC, it stood for the autumn sun, which follows a lower and lower daily path.

Suggested Procedure for Older Students

Ask students if they know the name of a recent Chinese ruler with the name of Mao. Discuss some of the things this communist dictator did.

The **Five Chariots** (the Pentagon of Auriga) were all related to war. They were used in the great fall animal hunt, so that the army would be skilled in using them against the barbarians when they attacked.

Suggested Procedure (in the United States)

Ask students to notice that the five chariots form a geometrical shape of a pentagon. Ask them if they know of a building in Washington, DC, which has this shape and is related to war. Most older students will know about the Pentagon, the U.S. military headquarters.

The five chariots stand for five different types of chariots, not just five chariots. A bright star we call Capella marks the Emperor's war chariot. There were many chariots for public transport, relief chariots for bringing supplies, covered chariots which gave protection from fired weapons and weather, and light or fast chariots used in battle.

*When the army was at rest, the chariots formed an enclosure. The weapons were stacked inside, including nets, bows and arrows, javelins, pikes, and lances. Do you see the little figure inside of the pentagon of chariots? It represents both the weapons and the places where the chariots were made secure, the **Tie-Up Posts**.*

The Five Chariots set in the evening in October. The setting was a signal to hold the ceremony that began the great fall animal hunt. The Emperor ordered his guards to hook up the harnesses, to fasten flags and banners on shields and trumpets, and to space out the chariots at intervals outside the wall that protected the entrance to the hunting camp. The commander in charge of the massed armies administered an oath to the feudal troops in a ceremony called "the swearing in of the military chiefs." The Emperor rode out ahead. Each military chief was issued a chariot, and the chariots were spaced out according to the extent of territory each chief ruled. Everyone faced south, and the oath was repeated. Then everyone went hunting for game.

*This large figure (Orion) is **TSAN, the Supreme Commander**. (The "T" is silent.)*

Today we observe this famous figure, which we call Orion the Hunter, in the winter and the early spring. But many thousands of years ago, TSAN was an important figure to the Chinese in the August and September evening sky. An Assembly of Kings was called together in the fall to elect the top military chief, who would lead the feudal armies in both the autumn hunt and in battles against the barbarians. The elected Earthly TSAN needed to be trustworthy, loyal, devout and practical. Once the Supreme Commander was elected, he had complete authority for the year, taking orders only from the Emperor.

One meaning of TSAN in Chinese is "three." Notice that there are three stars in TSAN's belt. The Chinese probably noticed this and related it to TSAN's command. He was in charge of three different divisions of the army — officers, under-officers, and soldiers.

TSAN is the face of the large White Tiger of Winter that stretches westward to the Celestial Marshes.

If you have the Ancient Chinese Seasons (Four Beasts) Cylinder, exchange it with the Ancient Chinese Legends Cylinder, and position it at about 35° N. Find the face of the White Tiger, which clearly shows the stars of Orion, which are TSAN.

The Summer Palace of the Red Bird

Northeast of the Supreme Commander, do you see the figure of a well?

(It is the bottom of Gemini.)

The Well is the first figure in an enormous beast the Chinese called the Red Bird of Summer. When The Well came to the center of the night sky, the people knew that it was time to clean old wells and dig some new ones. Mud and rotting leaves had to be taken out of the old wells, and it was often necessary to dig deeper to meet water.

The new wells were dug at night, and a superstitious method was used to find water. Buckets of water were put on the ground in different locations on a clear, calm night. When the surfaces of the water became smooth, the well-diggers would look for the bucket in which starlight was reflected most brilliantly. If the well-diggers could see the reflection of stars of the Well, they considered it an especially good location. They would dig a new well in such a spot. Digging a well was a lot of work, as thousands of years ago the people had only tools made of wood and stone. They didn't even have metal shovels, let alone backhoes with motorized metal buckets. Therefore there were strict rules about not wasting water.

Have a small bucket of water available. Demonstrate reflection of one or more small-beam flashlights in the water.

*Wells became the places of many activities. Notice the **Celestial Vessel** beside the Well. People brought their jugs to the wells to get water for their homes. They also washed clothes and visited at the wells with other families. People also came to these gathering places to sell things, so the wells often became markets. Eventually, a particular well became the place that the Emperor would call the people together to discuss affairs of the nation. When the Emperor arrived, it was the custom to place the war chariots in a circle in front of the well. Do you see a circle of chariots nearby?*

(Students should find the circle over the Pentagon of Auriga, which was discussed as part of the Autumn Palace of the White Tiger.)

When the Celestial Vessel appeared in the evening sky, it reminded the people to prepare for The Great Summer Celebration. The containers had to be scrubbed clean to hold wine, rice, and other foods. After subjects bowed low to the Emperor and the Emperor bowed to his people, horn blowers would sound a fanfare. There was a prayer to bless the Emperor, and next a formal banquet with music. This celebration helped establish friendly relations between the Emperor and his people.

*There are two streams of water shown near the well. They are known as the **Northern River** (above and below the Yin-Yang symbol and the two Love Butterflies) and the **Southern River**. When the two rivers rose in the evenings in May, people expected the heat of summer. The sun passes between the two rivers, so it was believed that the rivers framed the door through which the heat enters.*

Show the location of the sun's path, the ecliptic, with the pointer. Then hold a glow-painted sun disk just to the east of the Celestial Vessel, the sun's position in May in 15,600 BC.

See the figure of the "two whales" that divides the Northern River. It belongs to two stars that we call Castor and Pollux. This is the symbol that the Chinese used for Yin and Yang, opposite principles that act together in nature. The Yin of the Yin-Yang Symbol represents the moon, darkness, cold, winter, water, and the female principle of life. The Yang represents the sun, light, heat, summer, fire, and the male principle of life. Neither of the two parts is bad or good. Neither can exist without the other. Together they make a harmonious whole. The symbol is one of the oldest known. Its meaning is woven into the religion and mythology of China.

The same two stars, Castor and Pollux, also have a meaning of **Two Love Butterflies**. In many Eastern countries, butterflies are a symbol of friendship, love, and marriage. There is a Chinese story of two very good friends, a boy and a girl, who lived in about 1300 AD. The two children always studied together. The boy's name was CHAN-PE. The girl's name was YING-TAI. YING-TAI disguised herself as a boy so that she could attend the school for boys. She was very smart, and everyone admired her wisdom, especially her friend CHAN-PE. But even CHAN-PE did not know his good friend was a girl. One day, when they had grown-up, YING-TAI went to meet her friend wearing woman's clothes. Now CHAN-PE admired her as a woman as well as a very smart friend. The two fell in love and were married. They remained friends as well as lovers all their lives. They were always together, like a pair of male and female butterflies which flutter from flower to flower.

The Chinese believe that the spirits of CHAN-PE and YING-TAI remain together. When they see two butterflies, Chinese people say, "There go the souls of CHAN-PE and YING-TAI."

A species of butterfly that lives among Chinese lemon trees has two varieties, one with streaks of color on its wings and the other with solid yellow wings. The one with streaks is called CHAN-PE, while the one with solid-yellow wings is named YING-TAI.

To the south we find the **Celestial Jackal** or wolf. It is the bright star that we call Sirius. In the month of May, the corn was already high. The jackals loved to hide in the tall corn, where they preyed upon birds, such as quail and pheasants. At night, they moved in from the corn fields to prowl about the workers' cottages and steal chickens. This was the month that the female jackal had her young, and the father jackal went out to find food for them.

Briefly discuss the needs of wild animals to find food for their young and the conflicts/interactions that occur with humans.

The rulers organized hunting parties at the beginning of summer to get rid of the jackals, which were pests. Can you think of a way that hunters might find the jackals during the day when they were in the corn?

(Students may answer that the trampled corn would serve as trails, which is what happened.)

Dogs chased the jackals out of the corn and within reach of archers. Look in the sky for an arrow aimed at the Celestial Jackal. (It is the bow and arrow below the Jackal.)

The **Bow and Arrow** represents the weapons used to hunt the jackals.

There is another bow and arrow figure in the sky to the east. This belongs to the **Old God Who Shoots the Celestial Dog** (stars of Hydra). The name of the old god is Chang Hsien, and the Chinese believed that he has two reasons for shooting the celestial dog (invisible, just to the east in the stars of Crater the Cup). First, the Celestial Dog prevents the birth of boys in families. In ancient China, it was believed that a son was needed to be the head of the family when he was grown and make proper offerings at the graves of the ancestors. Women who did not yet have a son would pray to Chang Hsien to drive away the dog with his bow and arrows. Pictures of Chang Hsien holding his bow and arrows and accompanied by a small boy were hung above altars in Chinese homes.

A second reason that Chang Hsien shoots the Celestial Dog is that the Dog sometimes tries to swallow the sun or the moon. We call these times of eclipses. During a solar or lunar eclipse, people tried to help Chang Hsien by beating on drums and pots and pans, even by setting off firecrackers. The practice continues today. The Dog eventually spits out the sun or moon, say

the Chinese, and the Chinese believe that their teamwork with Chang Hsien has prevented a disaster.

- With a model or slides, discuss the reasons for solar and lunar eclipses, involving sun, moon, and earth.
- From a sheet of construction paper or cardboard form a mask which allows light to enter the center. The edges of the mask should completely cover the stage of an overhead projector. Place the mask, loosely taped, on the projector stage. Slide a cardboard disk of the same size from west to east across the projected-light disk. This reproduces the appearance of the sequence of events in a solar eclipse. At totality (when the light disk is completely covered by the opaque disk), remove the mask with the cut-out disk from the overhead stage. Show only the opaque disk, representing the moon, surrounded by light.
- Tape the sheet with the open round disk prepared for the solar eclipse, on the stage of an overhead projector. Slide a cardboard disk slightly less than three times the diameter of the this projected-light disk from east to west. This reproduces the appearance of the sequence of events in a lunar eclipse. When the light is completely covered, exchange the disk for a double covering (which does not have to be a disk) of red plastic or cellophane. This reproduces the appearance of the totally-eclipsed moon, which turns dull red due as the sun's rays are refracted into the earth's shadow by the earth's atmosphere.
- Provide students with a piece of paper and a pencil, and have them hit the paper (this makes a nice loud sound) with the eraser-end of the pencil during demonstrations of both types of eclipses.
- Tell the story below of the Chinese astronomers HSI and HO in the reign of Emperor TSUNG-KANG in the HSIA dynasty (2585-2146 BC).

*Chinese astronomers HSI and HO neglected to check sky movements and did not inform the Emperor that a solar eclipse was starting. Normally, court astronomers informed the Emperor, who then made it known to the people, that an eclipse would soon occur. Upon hearing that the Celestial Dog would soon eat the sun, the Emperor went to a special altar and made sacrifices. The people gathered their pots and pans to make noise to scare away the Celestial Dog. When this particular eclipse began, the people were terrified. They thought that the world definitely would end, as they had not been warned and had not been told to get ready. The Emperor lost the confidence of the people, which was disastrous. The people believed that the Emperor had lost the favor of Heaven and the Mandate of Heaven to rule. Since Heaven no longer supported their Emperor, many believed that it was all right to support an uprising that would bring a new Emperor. TSUNG-KANG's position remained secure, however, but it was mainly because TSUNG-KANG had HSI and HO beheaded. The story was that their heads were thrown into the sky, into the pit of **Heaped-Up Corpses** in the **Great Trench**.*

Find these in Perseus, below the boat.

*There is a branch of a **Willow** tree above Chang Hsien's head. The summer was the time for all the death records of the year to be brought from the temples and compiled. After this was done, a ceremony occurred in the Temple of the Great Ancestor. Willow trees were planted around the temple. Because Chinese willows were tough, they could withstand temperatures that other trees could not, and they kept their leaves during winter, the willow became known as the emblem of immortality and eternity. Willows were sacrificed to the sun throughout the year. During the time of the reign of the sun, the first days of summer, the Chinese willow has beautiful purple flowers.*

Show a picture of a Chinese willow tree.

The water depicted by the star figure of the **Water Flowing** above the Willow is supposed to come from a scoop-type water conveyor. This water was intended for use on the summer fields. May and June were times when no rain fell and the sun seemed to burn the land. For crops to grow well, an irrigation method was needed so two people pumped a water conveyor with their feet. Rotating scoops picked up water in a river or pond, carried it uphill through a trough, and then poured it into a system of trenches in the fields.

Meanwhile the people prayed to the Rain Dragon for rain. A large clay dragon was carried through the streets and fields during ceremonies of the Rain Dragon. The ancient Chinese thought dragons made rain and that a clash of the summer heat with the left-over cold of winter made thunder and lightning. The rainbows which appeared after the summer thunderstorms also were thought to be due to battles between heat and cold. A rainbow was called a “Terror of the Sky.” Rain, thunder, lightning, and rainbows came after two months of drought. The people thought they had helped the rain come with their prayers.

- Show a picture of an ancient Chinese irrigation device. Show pictures and/or a figure of a Chinese dragon.
- Discuss different ways, besides the ancient Chinese concept of a sign of terror, that cultures regard rainbows. For example, the Aborigines of Australia, regard the rainbow as evil. The Irish regard it a sign of good luck.
- Discuss the scientific causes of rain, thunder, lightning, and rainbows.

The last star figure in the Summer Palace of the Red Bird is the **Chariot** (Corvus). This particular sky chariot represented the chariots which brought the feudal chiefs to a Feast of Pleasure held in the last month of summer. The chiefs entered the camp through the “gateway of the chariots, bringing jade and other special products of their territories to the Emperor. As the chariots moved down the long avenue, the chiefs viewed a beautiful art gallery of tiles hung on both sides. A meeting was held in which the Emperor told his chiefs how they should administer their territories in the coming year. Then there was eating, music, and dancing.

The Central or Imperial Palace

The best-known pattern of stars today is the one we call the Big Dipper. The ancient Chinese also saw something that looked like a dipper, but they called it either the **Northern Bushel** or the **Balance of Jade**.

(Point out this figure.)

The drawing we see reflects both of the names. The Chinese called it **PE-TEOU**. Notice the woven basket, a tool which would have been used to measure food. The name of Northern Bushel was important to the common people, who often needed food. Also notice the luminous stars in PE-TEOU. The seven stars were thought to be precious jade stones. They decorated the sky Emperor’s balance, which he used to measure the lengths of the seasons. The seven bright stars with the sun and the moon were called “the nine lights of Heaven.”

PE-TEOU was not so important in the earliest era of Chinese astronomy (15,600 BC) as stars in the realms of four large beasts to the south (the Blue Dragon, the Black Tortoise, the White Tiger, and the Red Bird). Starting in about 3000 BC, however, the group became the most important in the sky. The way the handle of PE-TEOU pointed told the people when the seasons began.

Suggested Activity

Rotate the STARLAB cylinder to show how the handle of PE-TEOU points in different directions at different times. When the handle pointed to the east in the early evening, it was spring. When the handle pointed south in the early evening, it was

summer. When the handle pointed west in the early evening, it was autumn. When the handle pointed to the north in the early evening, it was winter.

Procedure

Turn the STARLAB cylinder so that the Great Horn (over the Heavenly Fields) is near the eastern horizon.

Notice that the handle points to the bright star of the Great Horn, which we call Arcturus. When Arcturus rose in the east as the handle of PE-TEOU pointed to it, spring and the new year began.

Note

If a student in a group is disfigured (ask the teachers or observe to determine), do not tell this story.

*Starting in this era (3000 BC), PE-TEOU was thought to hold important gods. One of the most interesting is **K'uei, the God of Literature**. K'uei was a very gifted student, who was very much admired for his knowledge and sparkling conversation. However, K'uei had a very disfigured face, and people turned away so that they would not have to look at him. He earned the highest grades on important tests called the Metropolitan Examinations. It was the custom for the Emperor to present the winning candidate with a fragile Golden Rose. When K'uei went forward in front of thousands of people to receive the rose, the Emperor saw his ugly face and was surprised. The Golden Rose slipped from the Emperor's hands and broke into thousands of tiny pieces.*

K'uei felt disgraced. Broken-hearted, he jumped into the sea. A great sea serpent lifted him up out of the sea and carried him up to the Northern Bushel. He was given his high honor at last. He became the star which joins the container of the Bushel to the handle (Megrez). From the Bushel, K'uei watches over the literary affairs of the world. The Chinese consider him to be the patron saint of all scholars.

Even today some Chinese students keep a picture of K'uei in their rooms, hoping that he will help them with their tests. Usually K'uei is shown as a very ugly man rising out of the sea on the back of a dragon-like monster. In his hand he holds an ink brush, which is used by the Chinese for writing instead of a pencil or pen.

Show examples of Chinese writing, which a brush was used to make. See the story and activity about CHAO-YEN below.

*Three other gods said to be with K'uei are marked by the handle stars of the Northern Bushel. The first star of the handle, near the four-star container, is **CHU-I, or Mr. Red Coat** (Alioth). He is supposed to help students who have a difficult time with tests.*

*The middle star of the Bushel handle is **CHIN-CHIA, Mr. Gold Armor** (Mizar). With a sword and a flag, he searched for young men who were smart enough to be promoted to high public office. When he found a good student, he would wave his flag in front of the house. But he used his sword to threaten bad students.*

*The last star of the Bushel handle is **KUAN, the Protector of the Kingdom, God of War** (Alkaid).*

*It is said that the four container stars of the bushel sometimes hold the **Emperor of Heaven** and the **Queen of Heaven**. However, more often, the Emperor and Queen are thought to be together at the Pole of Heaven. We see them here (the figures at Polaris).*

Suggested Procedure

With older students, discuss the changing position of the North Celestial Pole (point over the earth's rotational axis) during the history of Chinese astronomy. In 15,600 BC, the point was near Deneb. (There is no figure on the cylinder for this). In about 3000 BC, it was almost at the star Thuban, third from the end of Draco's tail. (There is no figure on the cylinder for this, either.) The cycle of changes, called precession, causes the north celestial pole to move over different northern stars during a period of 25,800 years. The center of this circle is called the "pole of the ecliptic;" it is located in the figure we call Draco. The pole of the ecliptic is near the figure of a bucket and flail, about one-third of the way from the bucket to Polaris (figures of the Emperor and Queen).

The Queen of Heaven was thought to keep records in the Book of Life and Death. People who wished to extend their lives would pray to her. She had two sons who assisted her in keeping the records, The Ruler of Life and the Ruler of Death.

A story is told of how a young man named CHAO-YEN was able to get the Queen's records changed. When he was eighteen, CHAO-YEN's father consulted a fortune-teller about his son's future. To his horror, he learned that his son was to die before he was nineteen. CHAO-YEN learned this and realized that he should live the last days of his life doing the things he enjoyed. He went hunting in the forests of the South Mountains. He was a very good archer, and before noon, he killed two deer to take back home for meat for his family.

CHAO-YEN was tired. The soft sounds of the noon forest put him to sleep. He thought that he had just closed his eyes, but when he opened them again, he found that the shadows were long and that it was now late in the afternoon.

Then CHAO-YEN noticed that he was not alone. There were two men very near, seated on either side of a large chess board. They were very intent on their game, so they did not notice CHAO-YEN. CHAO-YEN studied them. He could tell that they were very special people. "Thirty-eight," called the younger man. "It is a reasonable life, but not too long," and he wrote something on a tablet. The men went on with their game. "Twenty-three," he announced after a few minutes. "Much too short."

CHAO-YEN stared at them as the older man cried, "eighty-nine!" CHAO-YEN realized that the two gamblers must be playing for the lengths of human lives. He stepped forward and asked, "Who are you? And how do you fix the lengths of lives?"

The two gods looked up from their game. The younger said, "I am the spirit of life's end. My opponent is the spirit of life. He fixes the date of each person's birth. I fix the date of death. We are gambling for the length of life of each child born today."

CHAO-YEN thought of his short life. "Please help me!" he cried. "The wise ones have said that I will die before I reach the age of nineteen. Please change the record."

The gods shook their heads. The god of death said, "Once a life is fixed in length, it is written in the Book of Life and Death. Not even gods can change the symbols. But there is something I can do. I will reverse the characters which say nineteen so that they read ninety."

CHAO-YEN bowed low. When he looked up, the gods, chessboard, and his deer were gone. It was night and there was a special bright glow in the northern stars. CHAO-YEN live for ninety years.

- Show cards with large numbers 1 and 9. Ask students what number you get if you reverse 19. (The reversed number is 91.) Switch the order of the cards to show 91. Now show cards with the two characters of Chinese writing for 19 and 90. (See larger numbers to follow.)

For 19 it is:

For 90 it is:

Notice that 19 and 90 are the same two symbols, but reversed. A different system of symbols for numbers than ours makes it possible to get 90 from reversing the two Chinese characters for 19.

- Hold up the cards for the symbols that mean 19 and 90. Have the students “draw” each of them in the air in front of them, using their index fingers like Chinese writing brushes.



The northern region is full of important people who attend to the Sky Emperor, just as the earthly emperor in ancient China was attended by many officials. Here (cup end of Ursa Minor, Kochab) is the **Great Prime Minister**, and here (adjacent star in cup of Ursa Minor) is the **Crown Prince** (Pherkad). In addition to supporting the Sky Emperor, the Great Prime Minister directs the heat and movements of the sun. The Crown Prince manages the light and movements of the moon.

Here (Cassiopeia) we see the figure of a bridge called the **Bridge of Kings**. The Emperor's camp was usually surrounded by a moat. A boat or a bridge was needed to get to the camp. When the feudal chiefs went to see the Emperor for a great summer festival, they crossed the bridge called the Bridge of Kings. The chiefs crossed the bridge in large chariots, such as the one seen here (stars of Cepheus). **The Whip** (in Cassiopeia) was used by a charioteer to drive the horses forward.

In about 1000 BC, there were two famous charioteers who were supposed to be so strong that they could pick up their chariots and turn them up-side-down. Their names were WANG-LLANG and TSAO-FU. The sky whip belongs to WANG-LLANG, while the sky **Chariot** belongs to TSAO-FU.

TSAO-FU was the special charioteer of Emperor Mu Wang. Mu Wang longed to visit the Western Paradise, where the peach tree of immortality grows. Every three thousand years, when the peaches ripen, all the gods renew their immortality by eating the peaches. TSAO-FU hitched the emperor's eight wonderful horses to a chariot, and the emperor climbed inside. Off they rode to the western mountains. Neither the Emperor or his charioteer were ever seen again on Earth. It is believed that they reached the Western Paradise and ate the special peaches. TSAO-FU and his chariot, with Emperor MU-WANG have gone to Heaven and have become stars.

(Point out Cepheus again).

In Chinese art, a theme often used is the “Eight Wonderful Horses of MU-WANG.”

Not one, but five emperors are seen within TSAO-FU's chariot. Another idea for these stars is the **Inner Throne of Five Emperors**.

(This group, now called Cepheus, is one pentagon in the sky; the other is the Pentagon of Auriga, which the Chinese called the Five Chariots.)

(Point out the head of Draco.)

*This was thought to be a basket, a **Container to Hold Woven Garments**. In the winter months, ladies would fill handled baskets with their weaving. When silk worms were introduced in China, this pattern was thought to control the industry. When astrologers saw the stars shining brightly at special times, they predicted a large, good crop of silk. When the stars were faint at the special times, the astrologers predicted a poor crop. Notice that a lady is near the basket.*

(Point out the lady over Vega.)

*The lady is the **Weaving Princess**.*

*The same stars (Draco's head) later were seen as a flail, an instrument used to beat or thrash the newly-harvested grain. Rice is now a major grain crop in China. But other grains, such as millet, were important long ago. The **Eight Stacks of Grain** seen in the northern sky, on the other side of the Sky Emperor and Queen of Heaven, show the different grains that needed thrashing. The grains are rice, millet, barley, wheat, large peas, maize (corn), hemp.*

Suggestions for Further Reading with Annotations

Abell, G. O., Morrison, D., and Wolff, S. C. *Exploration of the Universe*. (Many editions). Saunders College Publishing, Philadelphia. Astronomy textbook which contains very good explanations of astronomy relevant to the activities □ the ecliptic and western zodiac, constellations, astrology, and moon motions, phases, and eclipses.

Aveni, Anthony F. "Ancient Asia's Stellar Bureaucracy," in *Ancient Astronomers*. St. Remy Press and Smithsonian Institution, 1993, pp. 75-89. Excellent scholarly background on Chinese astronomy. Aveni is a well known archaeoastronomer.

Birdsey, Tom. *A Song of Stars*. 1990. Illustrated adaption of the story of the Weaving Princess and the Royal Herdsman.

Clark, David H. and Stephenson F. Richard. *The Historical Supernovae*. Pergamon Press, Oxford, England, 1977. Very interesting book detailing the nature and discovery of supernovae in history.

The Forbidden City. (No author given.) Amro Bank, Amsterdam, 1990. This remarkable book of 245 pages was prepared for an exhibit from China in the Netherlands, covering the court culture of the Chinese emperors, 1644-1911. Although this shows a relatively recent time as compared with the earliest-probable time of Chinese astronomy (15,600 BC), the wonderful illustrations depict many things that relate to ancient Chinese culture and the figures on the STARLAB Chinese cylinders.

Harley, Timothy. *Moon Lore*. Charles E. Tuttle Co, Inc. Rutland, VT and Tokyo, Japan. 1970. Reprinted in Japan from an English book first published in 1835. Contains a wealth of multicultural ideas about the moon.

Hong, Lily Toy. *How the Ox Star Fell from Heaven*. Albert Whitman and Co., 1991. Beautifully illustrated children's story, which can be combined with a scientific discussion of meteors and supernovae.

Huff, Toby E. *The Rise of Early Modern Science: Islam, China, and the West*. Cambridge University Press, New York, 1993. In paperback in 1995. Contains a wonderful description of the ancient Chinese ways of doing science and reasons for ancient Chinese science not progressing.

Jagendorf, M.A. and Weng, Virginia. *The Magic Boat and Other Chinese Folk Stories*. Vanguard Press, New York., 1980. Contains stories identified as Han Chinese and minority Chinese groups.

Ji, Zhao, General Editor, with authors Guangmei, Zheng, Huadong, Wang, and Jialin Xu, authors. *The Natural History of China*. McGraw-Hill Publishing, New York, 1990. One of the best books about the natural history of China. Contains some information on geography, as well as facts about animal species such as tigers and tortoises.

Lee, Jeanne M. *Legend of the Milky Way*. Henry Holt and Co., New York, NY, 1982. Story of the Weaving Princess and the Royal Herdsman, beautifully told and illustrated.

Lum, Peter. *Stars in Our Heaven: Myths and Fables*. Pantheon Press, New York, 1948. Outstanding collection of constellation mythology from many cultures, including Chinese. All stories and discussions are beautifully presented. There is some inaccuracy in reference to the time of years certain stars are seen: allowance was not made for thousands of years of precessional change. Example: the use of Arcturus and Spica in the spring.

Krupp, E. C. "The Long Shadow of Winter," *Sky and Telescope*, December 1994, pp. 64-5. Discussion of how ancient Chinese astronomers determined the winter solstice.

Ming, Li Xiao, and Ming, Wu Shan. *The Mending of the Sky and Other Chinese Myths*. Oyster River Press., Durham, NH, 1989. Short (one page) versions of many stories.

Schlein, Miriam. *Juju-Sheep and the Python's Moonstone and Other Moon Stories from Different Times and Different Places*. Albert Whitman and Co., Chicago, 1973. Very nice collection of moon stories from different countries. The story of Heng O as retold in Activity #5 is in this book. Schlein adapts it from *Myths and Legends of China* by E.T.C. Werner, Harrap and Co., London, 1922.

Sky and Telescope. April, 1991, p. 385. An illustration showing an ancient Chinese classification scheme for comets, reproduced from the book, *The Origin of Comets*.

Staal, Julius D. W. *The New Patterns in the Sky: Myths and Legends of the Stars*. The McDonald and Woodward Publishing Co., Blacksburg, VA., 1988. Another excellent collection of constellation mythology. Fine drawings of how different cultures thought of different constellations are included.

Staal, Julius D. W. "The Stars of Primeval China," in *The Planetarian*, Vol. 3, Nos. 1 & 2, Spring/Summer, 1974, pp. 20-29. Illustrated discussion of ancient Chinese astronomy. A forerunner article to Staal's major research work, *Stars of Jade*.

Staal, Julius D. W. *Stars of Jade*. Writ Press, Decatur, GA., 1984. An outstanding piece of research on ancient Chinese astronomy. Staal copied the French research treatises by the sinologist Gustave Schlegel, two volumes entitled *Uranographie Chinoise*. Schlegel wrote in 1875, translating from many Chinese documents, and proposing an early establishment of Chinese culture (15,800 BC). Staal revived and supported Schlegel's theory. Although Staal did rearrange Schlegel's material in a more manageable style, the book is still difficult to read. For those brought up with a western knowledge of constellations, it is difficult to "see" such different patterns. It would have been useful if Staal had included more western pattern boundaries with his Chinese work. Staal worked in planetariums for thirty years, and he was Planetarium Department Head at Fernbank Science Center near Atlanta, Georgia, near the end of his career. He died in 1986. He is proof that a planetarian can wear more than one hat. His hat as an ancient Chinese astronomy expert forms the basis upon which the STARLAB Chinese cylinders are based.

Starr, Eileen M., Project Director, *Humanities and the Stars: Interpreting the Astronomy and Mythology of Other Cultures*. Chinese Planetarium Packet. Ten different planetarium program packages were prepared at Eastern Washington University, Cheney, WA with assistance from Eastern Washington University and a grant from the National Endowment for the Humanities (Grant No. Gp-21041-83). Although not dated, the project was completed about 1980. A group of 500 sets of script packets with cassette tapes and slide sets were sent to the U.S. State Endowment for the Humanities Offices, and they were sold to two planetariums in the state for a package cost of \$500. By contacting state offices, one could learn who has these packages. The script packets are very useful. The slides are under copyright and cannot be copied.

Recommended Resources

Advertisement by Lockheed Corporation, which sponsored a Nova PBS program about China. The two-page advertisement appeared in a number of magazines in June-July, 1994. It is a very good, thought-provoking piece which asks what advances the Chinese might have made if the Ming Dynasty Emperors had not suddenly banned exploration in the 1400s. Because of a reversal in emperor policies to rigid isolationism, the foremost science and technology in the world decayed. Europeans, rather than Chinese, "discovered" the American, Australian, and Antarctic continents.

Company: Poster Education: Box 8774, Asheville, NC 28814, 1-800-858-0969. Carries very nice posters on China, including "Chinese Festivals" (No. 48-303, \$10.95) and "Ancient China" (shows a scene of the Great Wall with land and sky, No. 43-129, \$3.95), and "Children of China" (two Chinese elementary children in native clothing, No. 43-211, \$1.95).

Company: Art and Artifact, 2541 East Enterprise Parkway, Twinsburg, OH 44087. 1-800-231-6766. Carries decorative items from different cultures. Has dragon items, Chinese people figures, and masks.

Slide set: "Chinese Art Treasures." 20 slides with a very detailed curriculum guide for teachers. There is a small charge, which increases with inflation. Available from the Cleveland Museum of Natural History, 11150 East Blvd., Cleveland, OH 44106. Included is some Chinese solar zodiac art, which was invented long after the 4 beasts, the 28 moon houses, and the other asterisms of the STARLAB cylinders.

"Sun/Moon: A Celestial Engagement Calendar for 1995," published by The Nature Company. Contains many art and text descriptions of the sun and moon including some from China.

Theme Park in Florida near Disney World: Splendid China. Included in the wonderful building reproductions of China is the Ancient Star Observatory. The actual star observatories were seven and one-half times larger. The real building was built in 1279 AD, long after the beginning of Chinese astronomy, however, the work done here had its foundation in earlier centuries.

