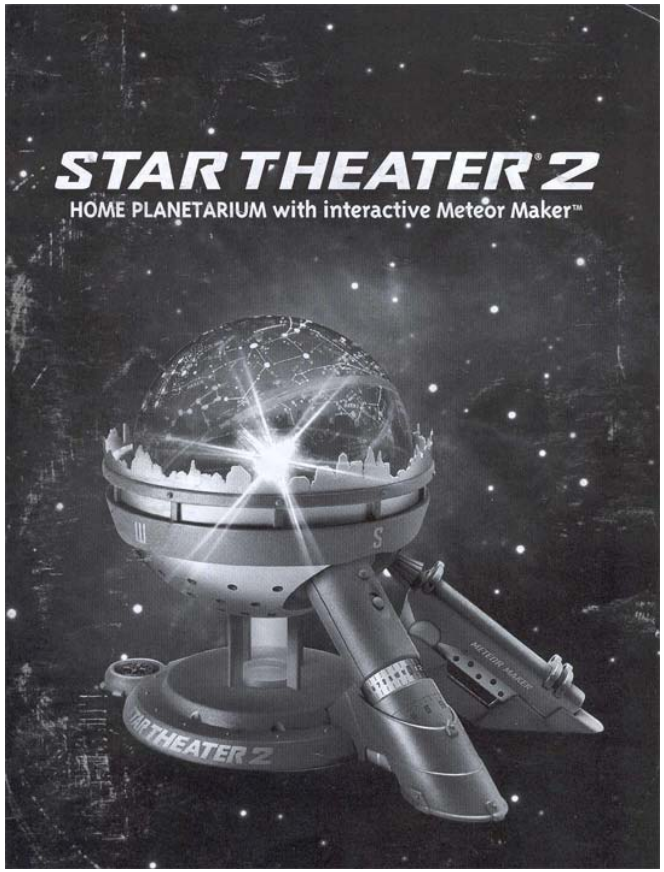


Quick Start

(See inside for full instructions)

1. Place on a table in the center of the room. Position toward north using the compass.

2. To set for season: Rotate light wand until current season lines up with arrow.

3. To set for month and date: Rotate light wand until current month and date line up with arrow.

4. To set for time: Turn the time ring to the hour the Sun sets. Then rotate light wand left to the current time.

5. Close drapes or blinds and turn off room lights. Turn projection lamp on (but do not look at it).

6. The sky, as it presently appears, is projected on the walls and ceiling. Slowly rotate the light wand to the left to watch the stars rise in the east and set in the west. The time ring shows the correct time as the sky's east-west movement progresses.

Table of Contents

Discover the Universe!

Welcome to the wonderful world of astronomy! Astronomers spend their time discovering the nature of space and everything in it. As big as our planet Earth is, it is just one of nine planets orbiting the Sun, which is just one of billions of stars in our home galaxy, the Milky Way, which is just one of billions of galaxies in the universe. So you can see that it will be a long, long time, if ever, until astronomers run out of things to discover!

Your Own Planetarium

Have you ever been to a planetarium show? Do you remember when you sat back and saw the night sky projected by a huge star projector, while the astronomer guided you on a journey through space and time? Remember how fun and interesting that show was? Your planetarium does much the same thing, right in your own room.

Your planetarium allows you to...

- Project stars, outlines of the constellations, and their names on the walls and ceiling all around you;
- Project the night sky for any season or month of the year with its one-piece, fully-integrated star sphere -- no separate overlays to break or lose;
- Accurately project the night sky by date and hour, using the date/time indicator;
- Project the night sky in its correct directional orientation, using the built-in compass;

- Project a realistic comet and meteor shower across the night sky in your room;
- Locate and project the visible planets for any time of the year;
- Treat yourself and your friends to an exciting sight and sound tour of the night sky.

With your planetarium you will learn the locations of the brightest and easiest-to-find constellations, stars and planets. By taking the tour and reading this guide, you will come away with a good understanding of the night sky.

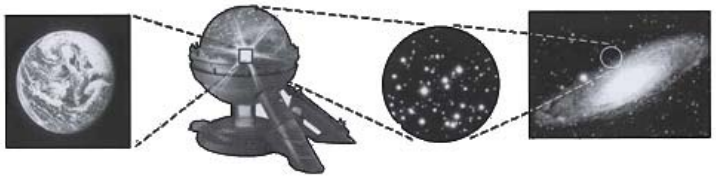
What Is a Constellation?

If you look at the stars in the night sky long enough, you will notice how groups of stars form familiar objects, something like connect-the-dots pictures. Many centuries ago people who gazed at the stars noticed pictures out there too — 88 in total — and gave names to them. This helped them make a "map" of the night sky and made it easier to locate the stars.

But these figures are not really sitting out there in space. They are only imaginary patterns created by the relative positions of the stars as we see them from Earth. Some stars that appear to be right next to each other are in fact very far apart. They just look close together from where we are looking at them on Earth. If you could somehow see the same night sky from another part of the galaxy, the relative positions of the stars would be completely different and you would be able to discover totally new constellations.

The Star Sphere

The star sphere is a replica in miniature of the largest and brightest objects in space surrounding our planet. If you were to put Earth in the sphere, it would be located at the exact center, where the light bulb is. The dots printed on the sphere represent stars. The glow-in-the dark dots represent the brightest, easiest-to-find stars. The lines connecting the stars show the constellations.



About 99% of visible stars like those on the star sphere are in the solar neighborhood. That means they are within about 100 light-years of Earth. This is nearby, compared to the other stars in the spiral arm of our galaxy where our solar system is located. A light-year is the distance light can travel in one year, which is about 6,000,000,000,000 (6 trillion) miles (or 9,500,000,000,000 kilometers)!

Assembly and Operation

Assembling your planetarium

1. Remove star sphere from base. Unscrew battery cap on light wand at base of wand below month setting. Gently shake the wand so that the battery module slides out. Insert three (3) "AAA" batteries into battery module, making sure the "+" and "-" ends are in correct placement as shown. Alkaline batteries are recommended. Insert battery module into light wand and replace battery cap. Put star sphere back into base, with light wand in its stand.

2. Snap meteor maker stand onto base. With a small screwdriver, remove battery cover from meteor maker. Insert two (2) "AAA" batteries making sure the "+" and "-" ends are in correct placement as shown. Alkaline batteries are recommended. Replace the battery cover and put meteor maker in its stand.

3. Carefully remove audio tour CD from underneath base and place it in a CD player. (When not in use, store it underneath base.)

Operating your planetarium

1. Place your planetarium on a table in the center of the room. A room with smooth, light colored walls and ceiling works best. A room that is roughly square and no larger than 12 x 12 feet provides the best projection quality.

2. Rotate your planetarium so that N (north) on compass lines up with dot on base. This allows your planetarium to project the stars in the same directional orientation as they are in the real night sky outside.

   Your planetarium projects stars that are visible from Earth's Northern Hemisphere, including North and Central America, Hawaii, Europe, Russia, Asia, northern Africa, and the Middle East.

3. Date selector is located on light wand. To set your planetarium for the beginning of audio tour, rotate light wand until "AUTUMN" lines up with pointer on base. At various breaks during the audio tour, you will be asked to pause the CD and adjust your planetarium for the next season.

(The month and date settings and the time ring will be used after the audio tour to set your planetarium for a specific date and time of day.)

4. Remove meteor maker from its stand and keep it close at hand, since you will use it during the tour to point out objects and to create meteor showers and a comet.

5. Close window drapes or blinds. Turn projection lamp on. (Do not look directly at the star sphere while its light is on, or you will lose your dark adaptation.)

7. Start the audio tour CD, turn off the lights, sit back and enjoy the show.

Setting the date and time

Once you've taken the audio tour, you can set your planetarium to project the night sky for any date and hour. Youcan easily adjust your planetarium for any date you wish: your birthday, a holiday, the final day of school, last Thursday, or any other date. Here is how:

1. Setting the date: With projection lamp off, turn light wand until the month you want lines up with the arrow on date selector. Below the month there are markings indicating the 1st, 10th and 20th of the month. Turn light wand to the left (so that star sphere turns to the west) until the date you want lines up with the pointer. For example, if you want the project the night sky the way it is on July 4, first select July, then turn further to the left, to just past the mark for the 1st day of the month.

2. Setting the time: Once you have selected the month and date you want to view, rotate the time ring so that the time at which the Sun sets lines up with the pointer. (The time at sunset is usually published in the local paper.) Now turn the light wand to the exact time you want. (Don't worry that the months and dates are changing on the date selector as you are adjusting the time; Once you've selected the date and set the time ring for sunset, the time selection function takes over.) You can set your planetarium to project the stars for any time of the night. You can even see what stars are up during the day when they are not visible.

Meteors and comets

Use the Meteor Maker to project two fascinating phenomena of the night sky: meteors and comets. The image cards allow you to project actual photos of a meteor (sometimes called shooting star or "falling star) and Halley's Comet.

Insert an image card in the slot at the front of the Meter Maker. (Store the other one in the slot at the rear.) Point the Meteor Maker at the ceiling or a wall, push the button, and wave it to make the image streak across the room. Store the Meteor Maker in its stand when not in use.

A comet is basically a big rock made of ice and dust, which orbits the Sun in a wide, elliptical path. Most comets take many years to complete a full orbit. One of the most famous, Comet Halley, visits the inner solar system once every 76 years. Comets are smaller than planets. Some are relatively small in size and some are miles across.

A meteoroid is a tiny particle, usually about the size of a grain of sand, that comes from a comet. When it comes close to Earth and enters the atmosphere, it burns up brightly and is called a meteor. Usually, meteors come in large bunches. During a meteor shower thousands of meteors can be seen streaking across the sky for several nights. A meteorite is a meteor that fell to the ground without burning up.

The Annual Meteor Shower table at the back of this guide tells you when you can watch major meteor showers in the night sky.

Care and maintenance

Remove batteries when not in use for extended periods. Keep star sphere clean with a soft cloth and quality antistatic cleaner/polish. Never use abrasive cleaners.

Bulb replacement: Replacement bulbs are available at many electronics retailers. Light wand: 3.6v, 500 ma. Meteor Maker: 2.4v, 350 ma. Suggested replacement bulb is Mini Maglite® Flashlight Lamp.

1. Remove star sphere and light wand from base.

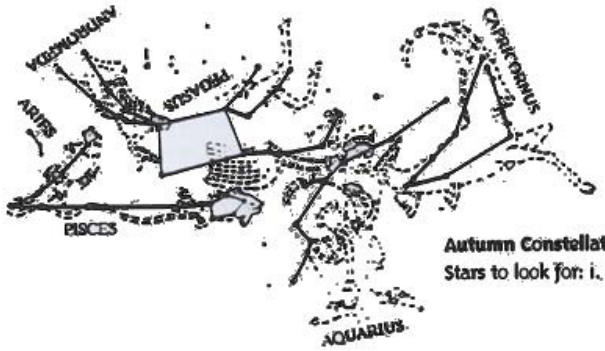
2. Push a paper clip into the small hole directly above the on/off button. At the same time, rotate light wand counterclockwise to star sphere and remove it from star sphere.

3. Carefully pull old projection lamp out of tip of light wand.

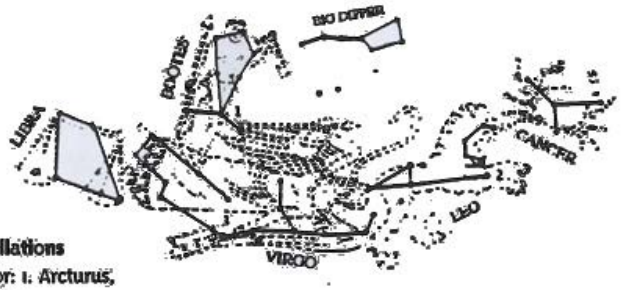
4. Insert replacement bulb into tip of light wand. (Important: Be careful not to bend prongs of the bulb.) Turn light wand on to make sure bulb lights up, then turn it off.

5. Re-insert light wand into star sphere. Rotate light wand clockwise until it clicks into place. This is important for accurate projection by date and time.

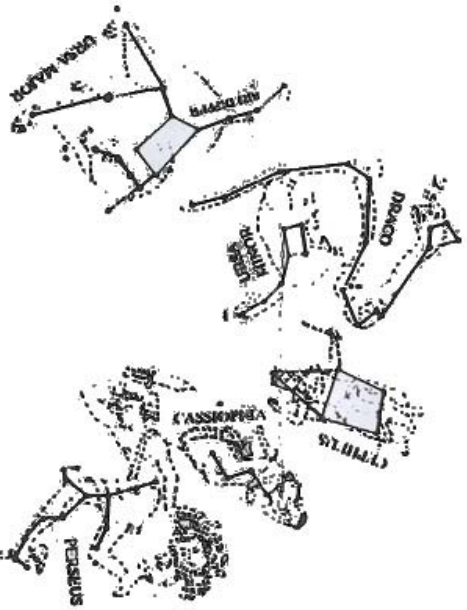
6. Place star sphere back into base with light wand in its stand.



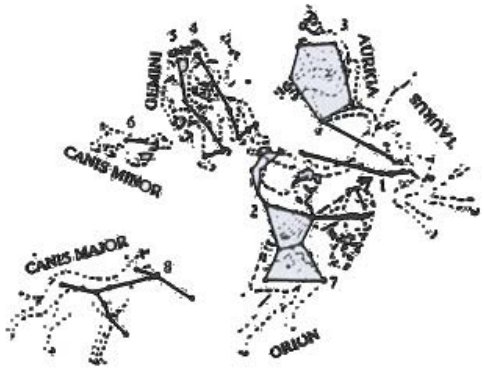
Autumn Constellations
Stars to look for: 1. Andromeda Galaxy.



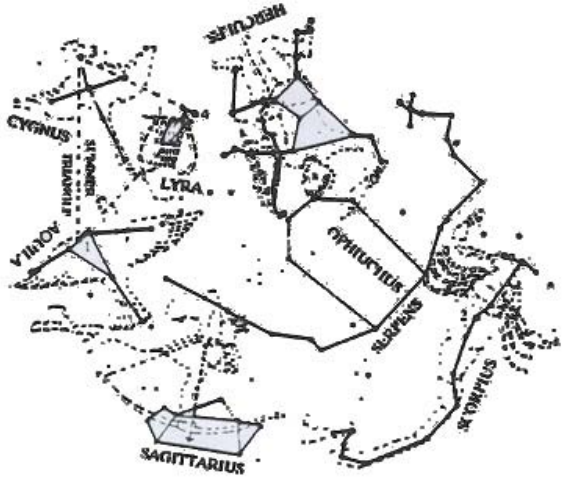
Spring Constellations
Stars to look for: 1. Arcturus,
2. Regulus, 3. Spica.



Circumpolar constellations
Star to look for: 1. Polaris



Winter Constellations
Stars to look for (and their colors):
1. Aldebaran (orange), 2. Betelgeuse (red),
3. Capella (yellow), 4. Castor (white),
5. Pollux (yellow), 6. Procyon (yellow-white),
7. Rigel (blue-white), 8. Sirius (blue-white).



Summer Constellations
Stars to look for: 1. Altair,
2. Antares, 3. Deneb, 4. Vega.

The Moving Sky

The horizon ring is an important part of your planetarium. It divides the sky into two halves, the visible and the invisible. In the course of 24 hours, all of the objects visible from a given location on Earth seem to rise in the east and set in the west.

To see all the stars that are visible from the Northern Hemisphere, slowly rotate the light wand to the left (westward) while the projection lamp is on. Do you notice that some stars around Polaris never set while some of the stars that can be seen from the Southern Hemisphere (at the opposite pole of the star sphere from Polaris) never rise in the Northern Hemisphere?

Just for practice, let's adjust your planetarium to project the stars visible in the evening of March 20, which is about the first day of spring for us. Which constellations will be on the meridian (the arc spanning across the sky from pole to pole)? Which constellations will be rising and which will be setting? That's easy! With the projection lamp off, set the date selector to March 20, and then set the time ring to the time at which the Sun sets (a little past 6 PM). Turn off the room lights, turn the projection lamp on, and let's see what constellations are up!

Usually, the region of the sky where stars first appear is near the zenith (straight up). Look up and you should see the stars in the winter ellipse, including a most impressive constellation, Orion the Hunter.

Rising in the northeast is the circumpolar constellation, Ursa Major (including the Big Dipper), along with the major spring zodiac constellation, Leo the Lion. It will be in the sky all night. Meanwhile, setting in the northwest is another circumpolar figure, Cassiopeia. Setting on the west is the huge autumn constellation, Pegasus, almost out of sight. As the night moves on, the stars appear to slowly move west. If you want to see what the sky will look like at 9 PM, rotate the light wand left (westward) to 9:00 PM.

Although we can't feel it, the Earth rotates eastward at about 800 miles per hour at its surface. The stars, Sun and moon appear to us to move westward when, in fact, we are the ones that are moving eastward. Because of this, it seems like any given constellation or star takes about 24 hours to make one round trip around the Earth.

Astronomers, ancient and modern, counted on this 24 hour trip, day after year after century. They agreed to divide the east-to-west movement" of stars into 24 equal parts.

Astronomers picked the spot in the sky, where the ecliptic (the path the Sun takes in relation to Earth during a year) crosses the celestial equator as the Sun heads north, for the point at which the 24 hour celestial cycle begins. This is the vernal point, the first day of spring in the Northern Hemisphere.

Into the Night with your planetarium

Your planetarium can be taken outdoors into the night for use as a 3-D star map. Remove the star sphere and light wand from the base and hold it in your hand. The brightest stars will glow in the dark on the star sphere after you have "charged" it by turning the projection lamp on for a few moments. (Don't look at the star sphere while charging it, or you will lose your dark adaptation.)

For a more accurate reading, set your planetarium in its base on a table outside. Adjust it for the current date and time. Use the compass to position your planetarium to point north. Turn the projection lamp on and use a sheet of white paper for a projection screen. The stars projected onto the paper can guide you to the stars that appear in the night sky.

Rank	Name	Constellation	Hemisphere
1.	Sirius	Canis Major	N & S
2.	Canopus	Carina	S
3.	Alpha Centauri	Centauri	S
4.	Arcturus	Boötes	N & S
5.	Vega	Lyra	N & S
6.	Capella	Auriga	N & S
7.	Rigel	Orion	N & S
8.	Procyon	Canis Minor	N & S
9.	Achernar	Eridanus	S
10.	Hadar	Centauri	S
11.	Betelgeuse	Orion	N & S
12.	Altair	Aquila	N & S
13.	Aldebaran	Taurus	N & S
14.	Acrux	Crux	S
15.	Antares	Scorpius	N & S
16.	Spica	Virgo	N & S
17.	Pollux	Gemini	N & S
18.	Fomalhaut	Pisces Austrinis	N & S
19.	Deneb	Cygnus	N & S
20.	Beta Crucis	Crux	S
21.	Regulus	Leo	N & S
22.	Adhara	Canis Major	N & S
23.	Castor	Gemini	N & S
24.	Shaula	Scorpius	S
25.	Bellatrix	Orion	N & S

Here are the 25 brightest stars, after the Sun, each listed by its common name, constellation in which it can be found, and hemisphere from which it is visible:

Take your time as you cruise the cosmos. Pick out a few of the brightest stars and study the stars near them. Use the constellations to guide you to the dimmer stars that can easily escape the casual observer. For successful star watching, you will need to give your eyes time to adjust to the darkness. Astronomers call this becoming dark-adapted.

You will see best after about 20 minutes in the dark. Care should be taken not to look directly at the bright projection lamp inside your planetarium, so you don't ruin your night vision.

How to Find the Visible Planets

Officially, there are nine planets in our solar system. Four can be seen without the aid of a telescope or binoculars: Venus, Mars, Jupiter and Saturn. (Mercury stays close to the Sun, so it is very difficult to see. Uranus, Neptune and Pluto are too far away to see without a telescope.) As they move in the sky throughout the year, each appears to pass through certain constellations (the twelve zodiac constellations plus four others) at any given time. This makes it easy to find them.

The planet position tables on the following pages show you where to locate the visible planets. Look at how much a planet changes position and compare that to the planet's distance from the Sun. Notice that the planets farthest from the Sun change position more slowly than the planets closer to the Sun. Jupiter spends about a year drifting through a zodiac constellation, while Saturn takes two years. Meanwhile, Mars and Venus go speeding through the zodiac constellations.

How to project the visible planets

You can use the information in the Planet Position Tables in the back of this guide to project the planets with your planetarium. Suppose you want to project Mars as it appears January 2006.

You can see from the planet position table for 2006 that Mars will be in the constellation Aries in January. Locate Aries on the star sphere and place the planet sticker over the constellation. Now, set your planetarium to project a January sky at about two hours after sunset.

Can you find the projected Mars? There it is, in Aries, high in the southeast sky! During the night it will move across the sky and finally disappear over the western horizon in the morning. By carefully observing Mars and the stars near it, you can more accurately position the removable planet sticker on the star sphere.

Use the same method to find and project the other visible planets. As the nights go by, you can compare the planets positions in relation to the stars. Soon you will discover that as the planets make their orbits around the Sun, they do move against the background stars, traveling along the zodiac.

Learn More About Astronomy

If you want to learn more about the exciting subject of astronomy, check out your school's library, your local public library, or a book store. Astronomers are constantly making new discoveries of the universe. The Internet is a great place to stay up to date.

Planet Information Table

PLANET NAME	DISTANCE FROM SUN (millions of mi/km)	LENGTH OF YEAR IN EARTH YEARS (one solar orbit)	DIAMETER (mi/km)	MASS COMPARED TO EARTH	KNOWN NATURAL SATELLITES*
MERCURY	36 / 58	0.24 year or 88 days	3,032 / 4,878	0.055	0
VENUS	67 / 108	0.61 year or 224 days	7,523 / 12,104	0.815	0
EARTH	93 / 150	1 year or 365.26 days	7,928 / 12,756	1.00	1
MARS	142 / 228	1.88 years or 687 days	4,218 / 6,787	0.107	2
JUPITER	484 / 778	11.86 years or 4,331.98 days	88,751 / 142,800	317.833	28
SATURN	884 / 1,423	29.46 years or 10,760.56 days	74,581 / 120,000	91.159	28
URANUS	1,783 / 2,869	84.01 years or 30,685.49 days	31,821 / 51,200	14.500	21
NEPTUNE	2,792 / 4,492	164.79 years or 60,191.20 days	30,255 / 48,680	17.204	8
PLUTO	5,927 / 3,684	247.69 years or 90,471 days	1,430 / 2,300	0.002	1

*As of June 2002.

Annual Meteor Showers

Shower	Date	Hourly	Parent comet
Quadrantids	January 3	40	
Lyrids	April 22	15	Comet Thatcher
Eta Aquarids	May 5	20	Comet Halley
Delta Aquarids	July 28	20	
Perseids	August 12	50	Comet Swift-Tuttle
Orionids	October 22	25	Comet Halley
Taurids	November 3	15	Comet Encke
Leonids	November 17	15	Comet Temple-Tuttle
Geminids	December 14	50	Asteroid 3200 Phaethon
Ursids	December 23	20	Comet Tuttle

Dates can vary slightly. Hourly rate represents the number of meteors you might see under a dark sky when the radiant is near the zenith. Expect to see perhaps half as many more if the shower is strong.

Source: Skywatching by David H. Levy (Time-Life Books, 1994-98).

Planetary Position Tables*

Source: Griffith Park Observatory, Los

2002	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Venus	Sgr	Aqr	Psc	Ari	Tau	Cnc	Leo	Vir	Vir	Lib	Vir	Lib
Mars	Psc	Psc	Ari	Tau	Tau	Gem	Cnc	Leo	Leo	Vir	Vir	Lib
Jup.	Gem	Gem	Gem	Gem	Gem	Gem	Gem	Cnc	Cnc	Cnc	Cnc	Leo
Saturn	Tau	Tau	Tau	Tau	Tau	Tau	Tau	Tau	Ori	Ori	Ori	Tau
2003	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Venus	Oph	Sgr	Cap	Psc	Ari	Tau	Gem	Leo	Vir	Lib	Oph	Sgr
Mars	Lib	Oph	Sgr	Sgr	Cap	Aqr	Aqr	Aqr	Aqr	Aqr	Aqr	Psc
Jup.	Cnc	Cnc	Cnc	Cnc	Cnc	Cnc	Leo	Leo	Leo	Leo	Leo	Leo
Saturn	Tau	Tau	Tau	Tau	Ori	Gem	Gem	Gem	Gem	Gem	Gem	Gem
2004	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Venus	Aqr	Psc	Ari	Tau	Tau	Tau	Tau	Gem	Cnc	Leo	Vir	Lib
Mars	Psc	Ari	Tau	Tau	Gem	Gem	Cnc	Leo	Leo	Vir	Vir	Lib
Jup.	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Vir	Vir	Vir	Vir
Saturn	Gem	Gem	Gem	Gem	Gem	Gem	Gem	Gem	Gem	Gem	Gem	Gem
2005	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Venus	Sgr	Cap	Psc	Ari	Tau	Gem	Leo	Vir	Vir	Oph	Sgr	Cap
Mars	Oph	Sgr	Sgr	Cap	Aqr	Psc	Psc	Ari	Ari	Ari	Ari	Ari
Jup.	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Lib
Saturn	Gem	Gem	Gem	Gem	Gem	Gem	Cnc	Cnc	Cnc	Cnc	Cnc	Cnc
2006	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Venus	Sgr	Sgr	Cap	Aqr	Psc	Ari	Tau	Cnc	Leo	Vir	Lib	Sgr
Mars	Ari	Tau	Tau	Gem	Gem	Cnc	Leo	Leo	Vir	Vir	Lib	Sco
Jup.	Lib	Lib	Lib	Lib	Lib	Lib	Lib	Lib	Lib	Lib	Lib	Sco
Saturn	Cnc	Cnc	Cnc	Cnc	Cnc	Cnc	Cnc	Cnc	Leo	Leo	Leo	Leo
2007	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Venus	Cap	Psc	Ari	Tau	Gem	Cnc	Leo	Sex	Cnc	Leo	Vir	Lib
Mars	Sgr	Sgr	Cap	Aqr	Psc	Psc	Ari	Tau	Tau	Gem	Gem	Gem
Jup.	Oph	Oph	Oph	Oph	Oph	Oph	Oph	Oph	Oph	Oph	Oph	Sgr
Saturn	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo
2008	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Venus	Sgr	Cap	Aqr	Psc	Tau	Gem	Cnc	Vir	Vir	Sco	Sgr	Cap
Mars	Tau	Tau	Gem	Gem	Cnc	Leo	Leo	Vir	Vir	Vir	Sco	Oph
Jup.	Sgr	Sgr	Sgr	Sgr	Sgr	Sgr	Sgr	Sgr	Sgr	Sgr	Sgr	Sgr
Saturn	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo
2009	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Venus	Aqr	Psc	Mar	Psc	Psc	Ari	Tau	Gem	Leo	Vir	Lib	Oph
Mars	Sgr	Cap	Aqr	Psc	Psc	Ari	Tau	Tau	Gem	Cnc	Cnc	Leo
Jup.	Cap	Cap	Cap	Cap	Cap	Cap	Cap	Cap	Cap	Cap	Cap	Cap
Saturn	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Leo	Vir	Vir	Vir	Vir
2010	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Venus	Sgr	Aqr	Psc	Ari	Tau	Cnc	Leo	Vir	Vir	Lib	Vir	Lib
Mars	Cnc	Cnc	Cnc	Cnc	Leo	Leo	Leo	Vir	Vir	Lib	Oph	Sgr
Jup.	Aqr	Aqr	Aqr	Aqr	Psc	Psc	Psc	Psc	Psc	Psc	Aqr	Aqr
Saturn	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Vir	Vir

*As of June 2002.