

Constellations

Equipment
needed:
constellations

The Horizon Globe SE comes with 16 of the most important constellations.*

We call four of them Guideposts. These four are easy to find, and they will point you to all the rest of the constellations. Any time you see stars, you will be able to find at least one of the Guidepost constellations.



ORION - Guidepost #1

Very bright and easy to find.



BIG DIPPER - Guidepost #2

Tied with Orion for being easy to find.



CASSIOPEIA - Guidepost #3

Almost as easy to find as the Big Dipper, and in a great spot.



CYGNUS - Guidepost #4

Part of the Summer Triangle, and very distinctive. If Cygnus is out you will be able to find it.

The other 12 constellations included with your Horizon Globe are significant for a different reason; they helped ancient astronomers tell the time of year and time of night before clocks were invented. You probably know the names of these special constellations, they are the signs of the Zodiac.

The Zodiac comprises Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, and Pisces. These twelve constellations all fit on the ecliptic. Coincidence?

In the next chapter we'll get started by looking at one very important constellation. The first Guidepost, Orion, will help you find and remember the rest of the constellations.

* The Big Dipper is technically an asterism, not a constellation. A *constellation* is one of 88 star groupings that have a definite name. An *asterism* is simply a group of stars. The Big Dipper is an asterism within the constellation Ursa Major.

The Horizon Globe comes with 16 constellations



Guidepost Constellations

Orion
Big Dipper
Cassiopeia
Cygnus



Zodiac Constellations

Aries	Leo	Sagittarius
Taurus	Virgo	Capricorn
Gemini	Libra	Aquarius
Cancer	Scorpio	Pisces

The
Zodiac
is on the
ecliptic



Guidepost #1: Orion

**Equipment
needed:
Horizon Globe,
Orion**

Orion is arguably the most important constellation in the sky.

Named for a mythological hunter, the constellation Orion is a group of stars that form the shape of a man with a club, shield, and sword. As beginner star-gazers, we will just be looking for seven stars that form the shape of a man. Finding his weapons and shield is a more advanced task.

On the facing page you can see the main stars that form Orion. Of these seven stars, five are among the top 30 brightest stars in the sky. No wonder Orion is so famous!

Don't worry about recognizing Orion, he is very bright and distinctive. If you look in the right place you will always find him. The trick is knowing where to look.

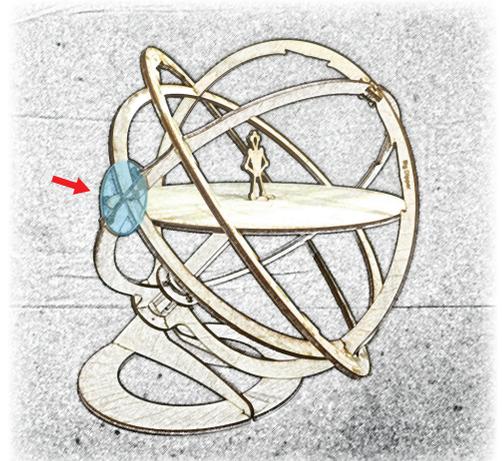
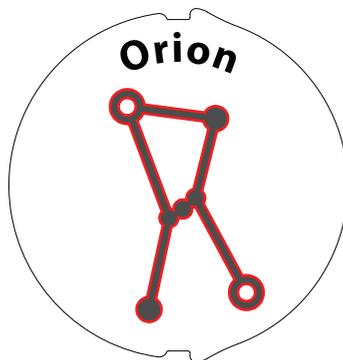
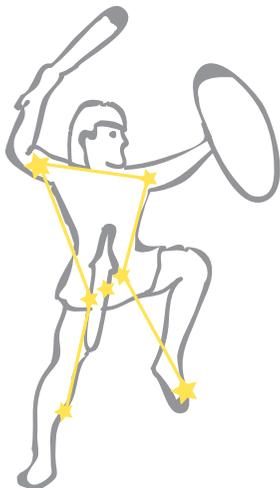
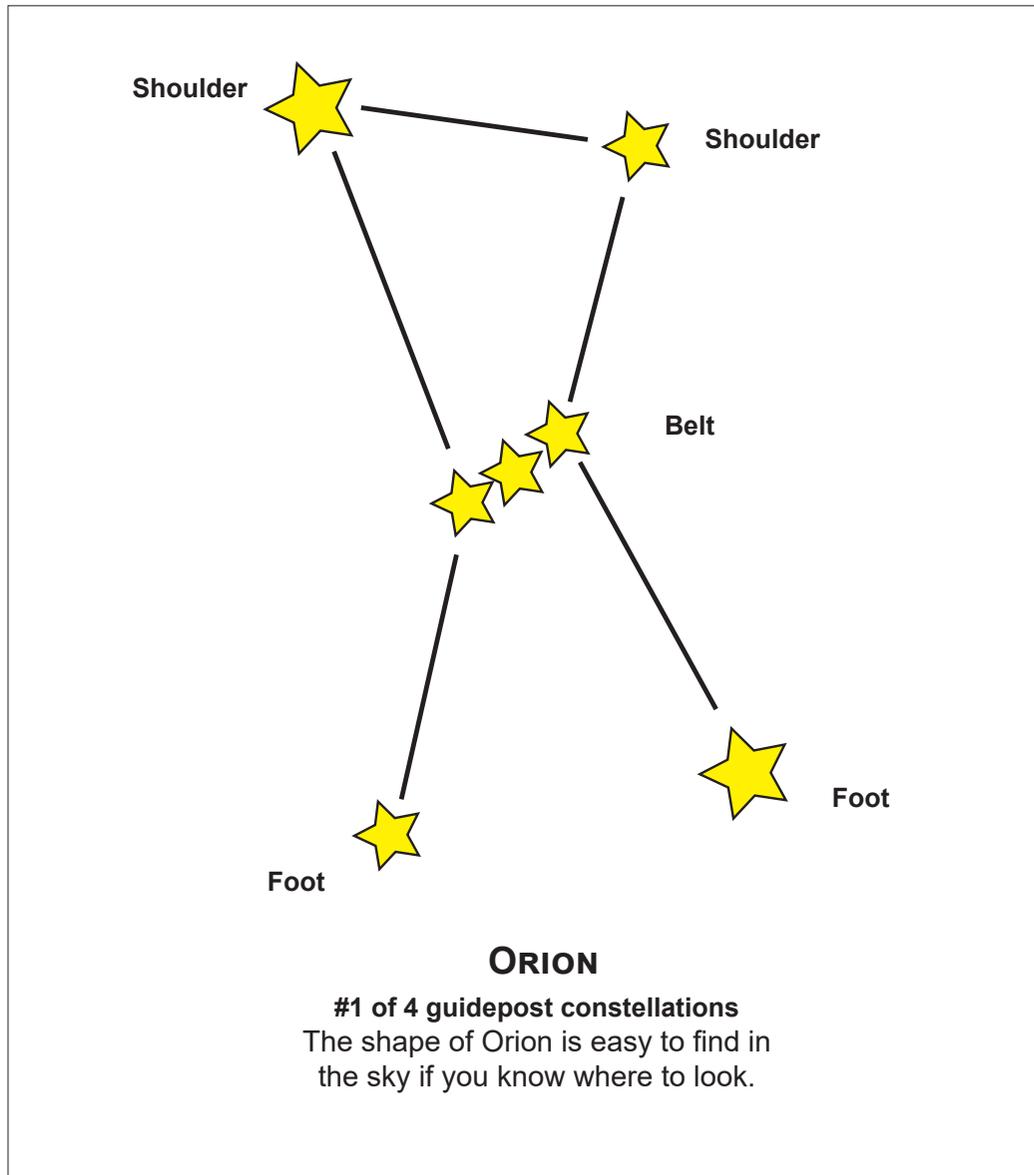
Learning to find Orion is the most important step in learning the stars. He is the leader of the sky. Everything else in the sky can be found by referencing where it is relative to Orion. This first Guidepost constellation occupies a great place in the sky and is one of the prime constellations used by mariners for celestial navigation. Further, Orion is one of the few constellations that can be seen from anywhere on Earth, even at the North and South Poles!

In a later chapter you will see how to amaze your friends and astound your rivals by knowing where Orion is day or night!

Exercise

1. Find Orion among the constellations in the pack of discs that came with your Horizon Globe.
2. Find the slot labeled "Orion" on your Horizon Globe (hint: he fits below the Ecliptic Ring under June.)
3. Place the Orion disc in the slot. Don't forget to flex it a little to snap it in. Wiggling is better than forcing.

Orion is an easy-to-find constellation



Orion Moves Throughout the Day

**Equipment
needed:
Horizon Globe,
Orion, sun**

Orion is a hunter who doesn't like to be seen. He uses two tricks to avoid detection:

#1 - HE HIDES

#2 - HE MOVES

Fortunately, there is a way to outsmart him. Let's take a look at his first technique.

TRICK #1 - HE HIDES

Orion first trick is that he hides by the Sun during the long, hot days of Summer.

With Orion in his slot on the globe, place the Sun on June 21, the first and longest day of summer. Turn the globe to see when you might see Orion on this day. Orion's secret is that you can never see him on the long days of Summer. He travels with the Sun, so he is only above the horizon during daylight hours.

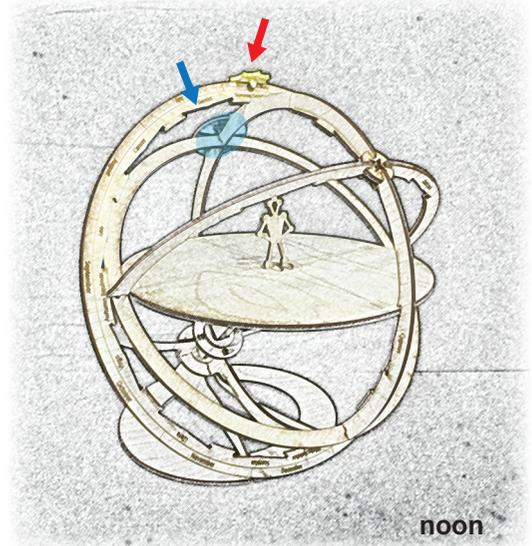
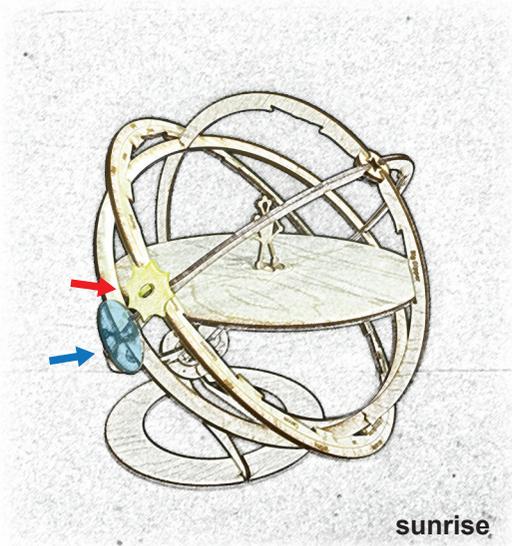
Notice that over the course of a single day, Orion acts the same as the Sun and Moon: rises in the East and sets in the West, and travels across the sky at about the same speed.

In the next section we'll look at the second trick Orion uses to avoid being spotted.

Exercise

1. Place Orion on the globe. Place the Sun at Summer Equinox, June 21.
2. Spin the globe and watch Orion travel across the sky with the Sun in the course of a day.

Orion hides by the sun

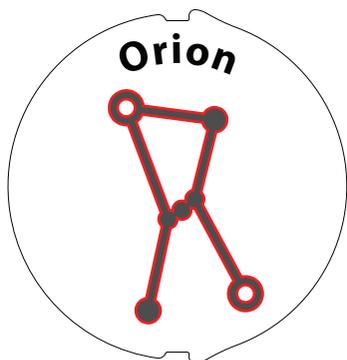
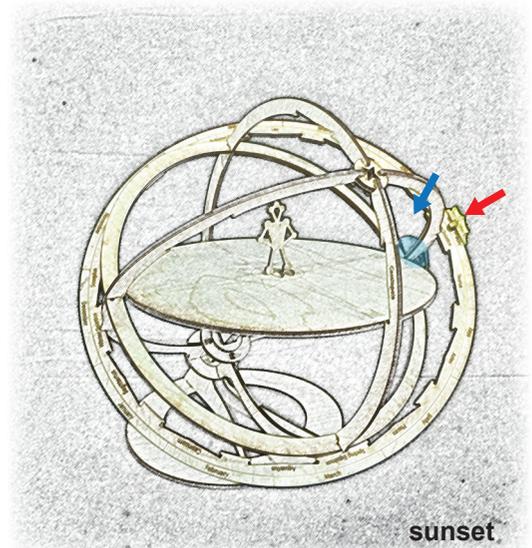


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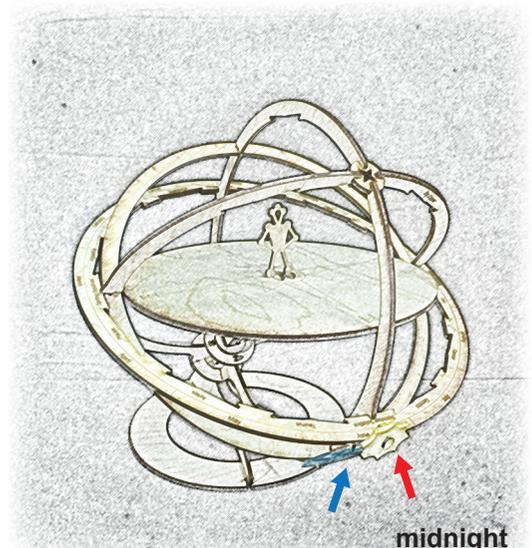
Orion and the Sun are together on June 21, the summer solstice

2

Spin the globe and watch Orion travel with the Sun for day



JUNE 21
Orion hides by the Sun



Orion Moves Throughout the Year

**Equipment
needed:
Horizon Globe,
Orion, sun**

Orion is a hunter who doesn't like to be seen. He uses two tricks to avoid detection. In the last section we saw:

TRICK #1 - HE HIDES

Now we'll take a look at his second technique:

TRICK # 2 - HE MOVES

Orion keeps on the move, so he is out at a different time each night. The Sun, Moon, (and planets), all travel on the same ring of the Horizon Globe, the ecliptic. But Orion does not travel on this ring. In fact, he is anchored permanently in the same place, right under the part of the ecliptic labeled "June."

Orion's second trick is that he knows we are watching the Sun, not him. As the Sun moves from June into July then August, Orion stays beneath June. The result is that each day, Orion rises a little earlier. Each month, Orion moves ahead of the Sun by two hours. After a year, Orion catches and passes the Sun again.

Place the Sun on the ecliptic directly over Orion. Turn the globe to watch Orion rise and set. Now move the Sun in one month increments to see how Orion rises earlier and earlier as the year progresses.

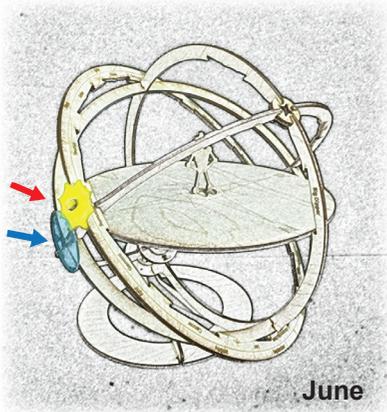
HOW TO OUTFOX ORION - You can use your knowledge of Orion as a parlor trick.

Notice that you don't need a calendar chart to know where Orion is. In June he is always near the Sun so you can point at Orion simply by pointing at the Sun. By the end of July he is two hours ahead of the Sun, August 4 hours, etc. Since by knowing the time of day you can point at the Sun any time, by knowing how many hours from the Sun Orion is you can also point at him too, day or night. Try it, it's fun!

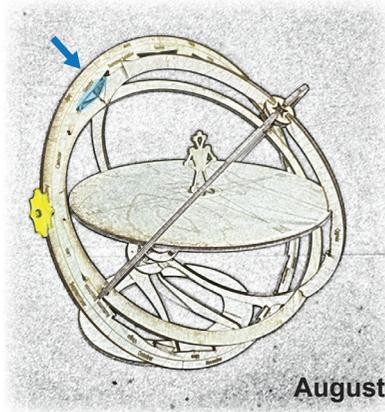
Exercise

1. Place the Sun on June and watch Orion travel with the Sun.
2. Move the Sun to different months and see how many hours ahead or behind the Sun Orion is.
3. Practice pointing at Orion, day and night, by knowing the number of months since (or until) June 21, and the time of day. Remember Orion moves 2 hours ahead for every month past June 21.

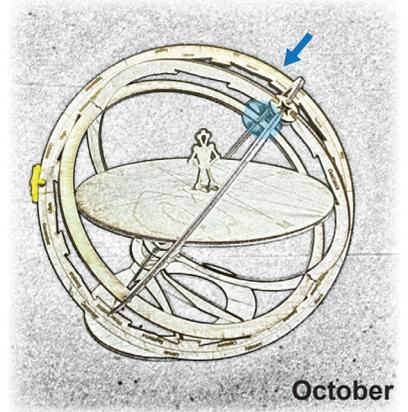
Orion is always on the move



June



August



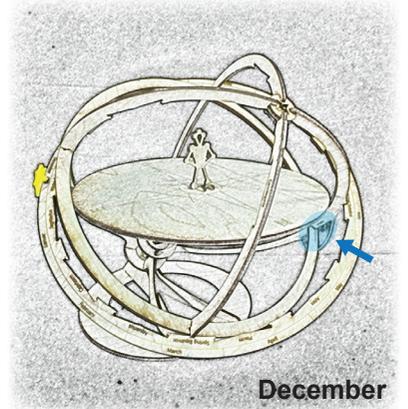
October

1

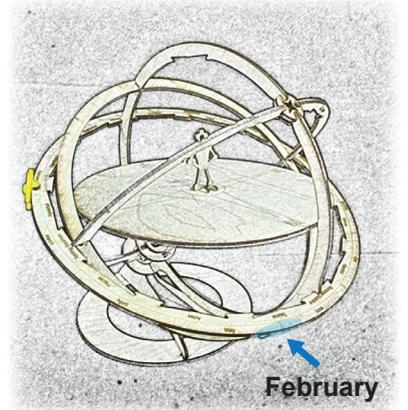
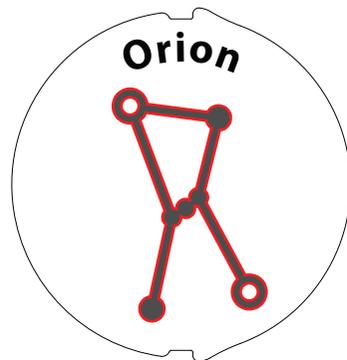
Orion starts with the Sun
June 21, shown here
around sunrise. Orion rises
with the Sun on this day.

2

But Orion is faster than the Sun.
He gets 4 hours ahead of
the Sun every 2 months. In
a year he will catch the Sun
and rise on June 21 again.



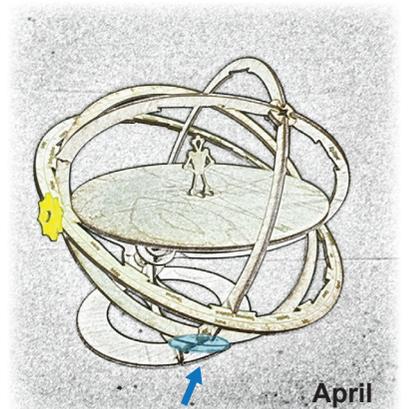
December



February

Orion is tricky

Did you notice that Orion's motion through the year is similar to the Moon's motion through a month? The Moon falls behind the Sun by almost an hour per day, losing a whole lap in one month. Orion gains 2 hours on the Sun every month, catching and passing the Sun in exactly one year.



April

Guidepost #2: Big Dipper

**Equipment
needed:
Horizon Globe,
Big Dipper**

The Big Dipper is perhaps just as famous as Orion, maybe even more famous.

The Big Dipper also comprises 7 stars, all of fairly even brightness. None of the 7 make the top 20 list of brightest stars.

The Big Dipper's fame comes partly from where it is in the sky. Place the Big Dipper on your Horizon Globe and give it a turn. Notice that, unlike Orion, the Big Dipper never sets*. It just turns round and round the North Pole. This means that you can see the Big Dipper all the time as long as the sky is dark and clear. Stars that never set are called *circumpolar stars*.

Notice that as the Dipper goes around, the bowl leads and the handle follows. Also notice that when the Dipper is low it is upright, as though scooping water, and when it is high it is upside down, as though pouring water.

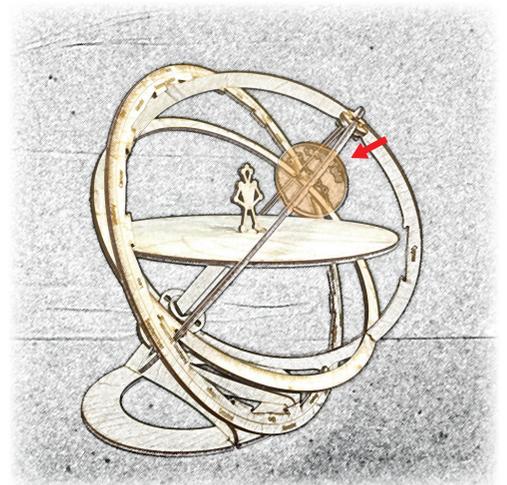
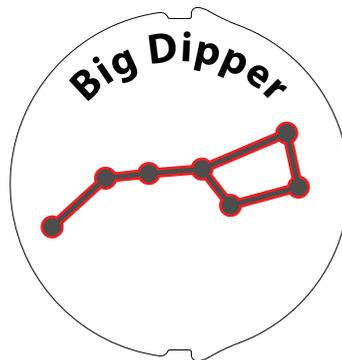
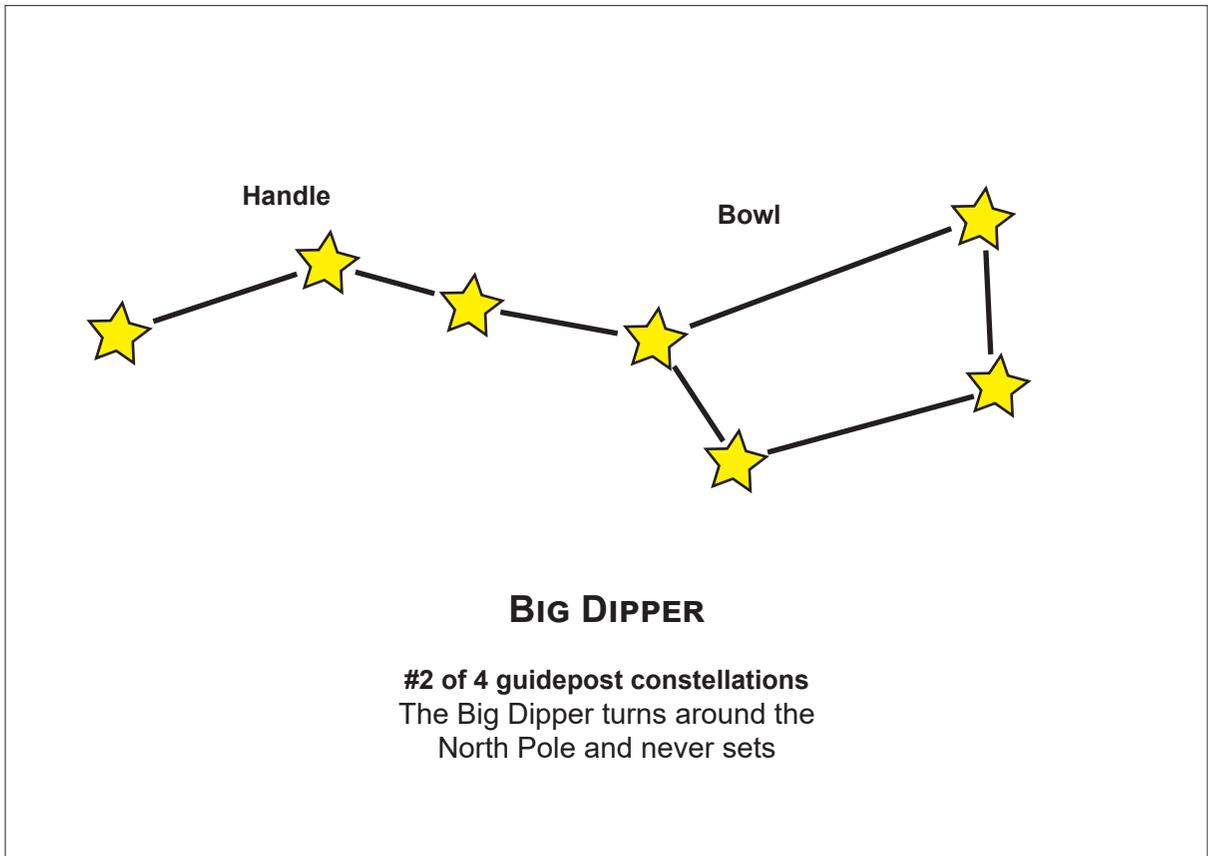
Even though the Big Dipper never sets, it is definitely more prominent when high in the sky than when low. The Big Dipper is high in the sky for more of the night when the Sun is on the opposite side of the globe in the spring.

* Depending on where you live, or if you stargaze when you travel, you may notice that in some places the Big Dipper actually does spend some time below the horizon. The farther south you are, the lower the Big Dipper gets. But that is a more advanced topic. The general idea is the same no matter where you are.

Exercise

1. Find the constellation disc Big Dipper.
2. Locate the slot labeled Big Dipper above the Autumn Equinox.
3. Turn the globe to watch the Big Dipper go around.

The Big Dipper never sets



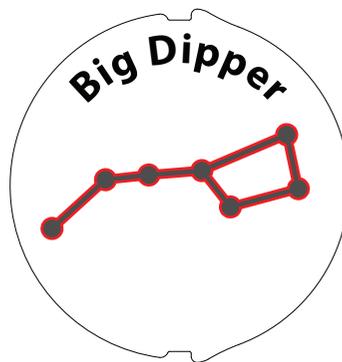
The Big Dipper Stalks Orion

**Equipment
needed:
Horizon Globe,
Big Dipper,
sun**

The Big Dipper makes one turn a day, just like everything in the sky.

An easy way to remember where to look for the Big Dipper is to remember that it follows Orion by a quarter turn, or 6 hours.

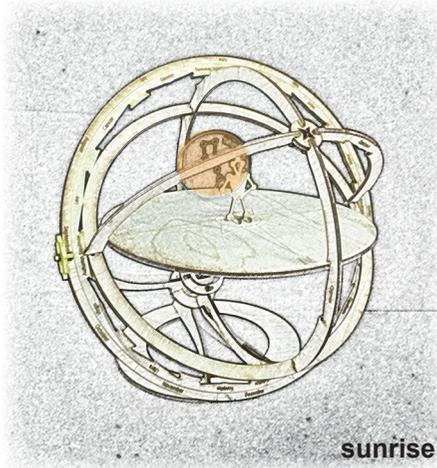
Think of it this way: The Big Dipper views Orion as a rival for the title of most famous constellation. As the proud Orion marches across the sky, the Big Dipper stealthily follows him with the intention of dousing him with a dipper full of water. Will the Big Dipper ever catch Orion?



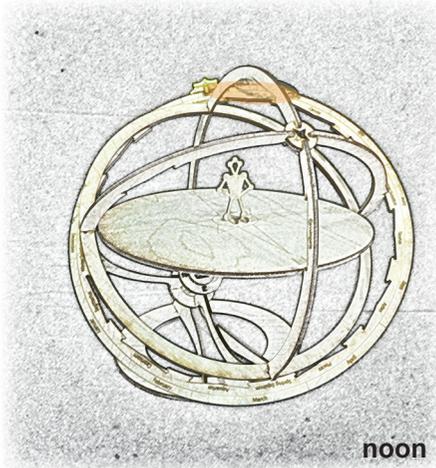
Exercise

1. Place the Sun on the ecliptic and watch the Big Dipper go around as the Sun rises and sets.
2. Move the Sun to different places and notice how it affects how you see the Dipper at night.
3. With Orion and the Big Dipper installed, turn the globe and notice how the Dipper always follows Orion by $\frac{1}{4}$ turn.

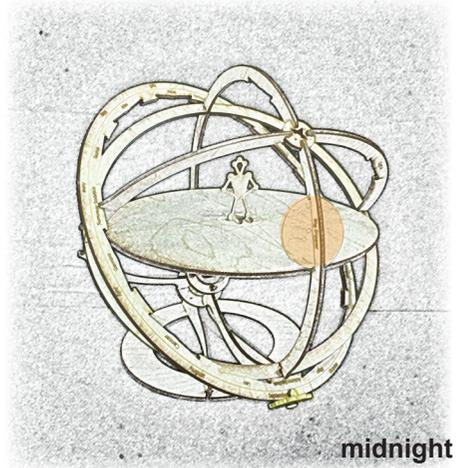
The Big Dipper tries to douse Orion



sunrise



noon



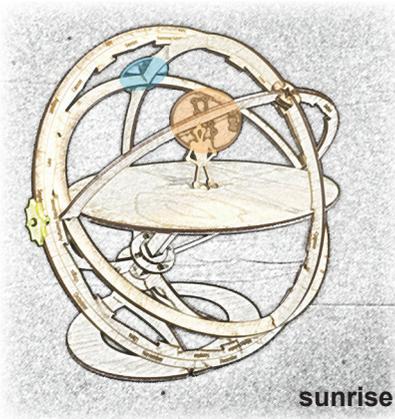
midnight

1

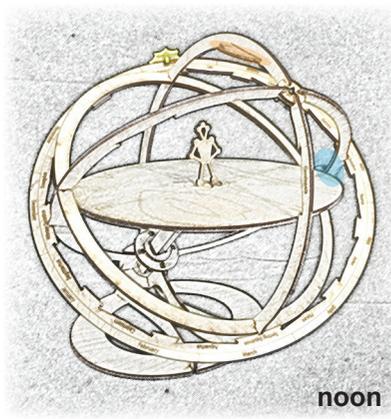
The Big Dipper

2

Big Dipper across a day



sunrise



noon



midnight

3

The Big Dipper with Orion

Big Dipper

Guidepost #3: Cygnus

**Equipment
needed:
Horizon Globe,
Cygnus**

Cygnus is not as famous as Orion or the Big Dipper, but it plays an important role as a guidepost constellation.

We need an easily recognizable constellation for the part of the sky that follows the Big Dipper. Cygnus the Swan works well for this.

You may not have heard of Cygnus the Swan, but you might have heard of a group that the swan belongs to, the Summer Triangle. Cygnus can be recognized as a simple “T” shape.

The advanced Cygnus constellation has full wings, feet, and a long neck, but for beginners, just look for the T, wings and a tail. The tail of Cygnus is a top twenty brightness star that forms a large triangle with two other bright stars. This shape, the Summer Triangle, is probably more well known than just the bird.

When you are outside looking for Cygnus in the sky, keep in mind that it may be easier to spot the whole Summer Triangle first, then look for the T shape of Cygnus.

Cygnus is aimed toward the constellation Scorpius, just ahead of the Winter Solstice, but he moves sideways, following the Big Dipper. Turn the globe with Cygnus attached to see him move sideways as he flies.

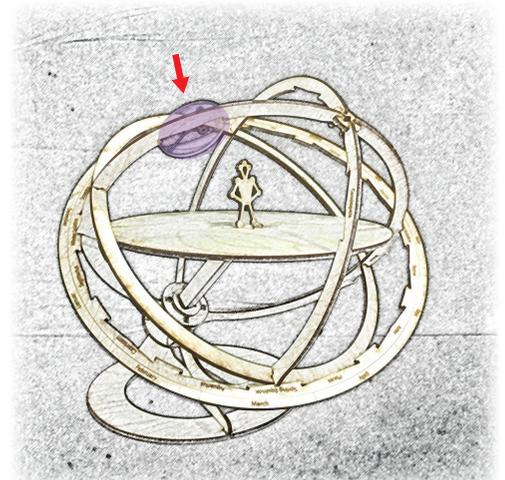
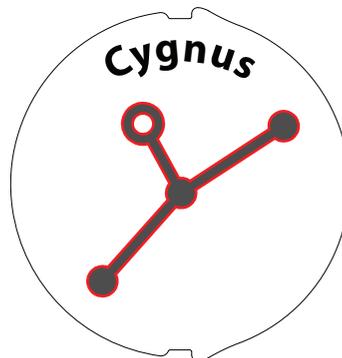
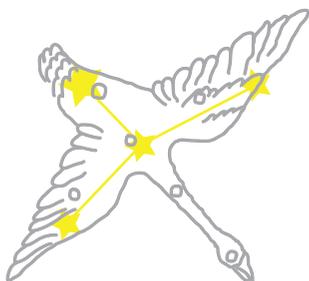
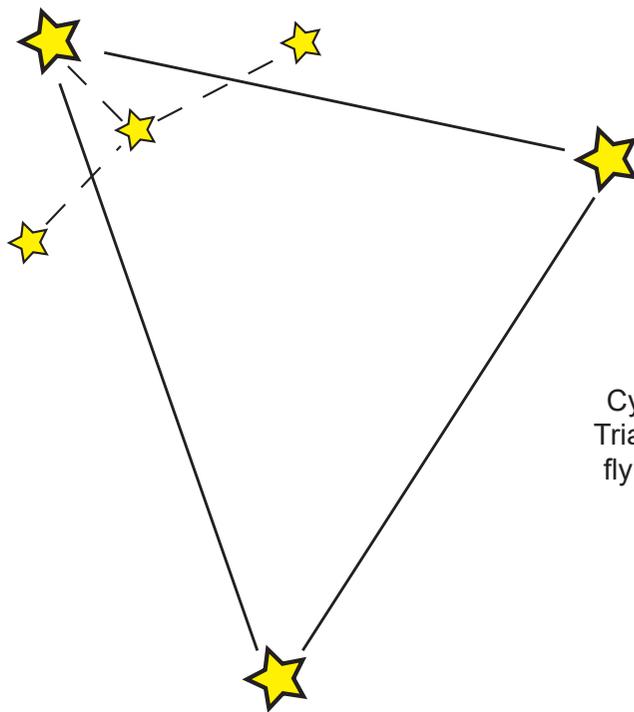
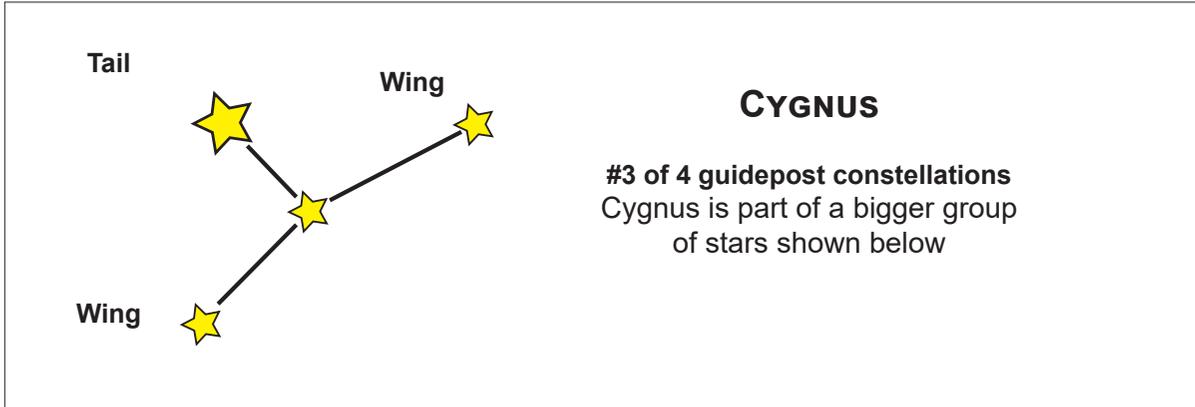
Remember, the Guidepost Constellations help you find the rest of the constellations:

To find constellations in Orion’s part of the sky, first locate Orion, then look above, below, left or right of Orion. The same goes for the Big Dipper, which is a quarter turn behind Orion. Cygnus is another quarter turn behind and will help you find constellations in that part of the sky.

Exercise

1. Find the constellation disc Cygnus.
2. Locate the slot labeled Cygnus above the Winter Solstice.
3. Turn the globe to watch the Cygnus go around, rising and setting.

Cygnus is 6 hours behind the Big Dipper



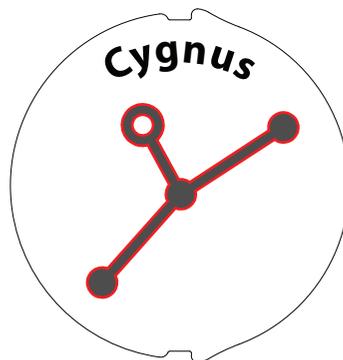
Cygnus Follows the Dipper

**Equipment
needed:
Horizon Globe,
Cygnus,
sun**

Cygnus and the Summer Triangle are a little more than 6 hours behind the Big Dipper, and a little farther South. Not as far south as Orion, but far enough to rise and set.

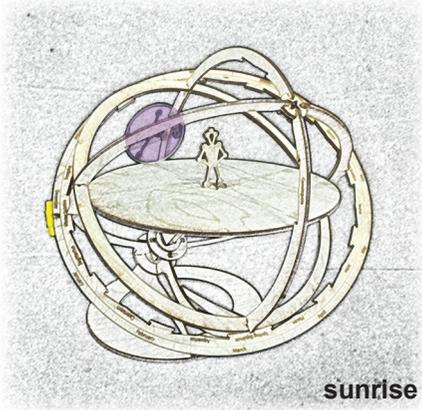
Place Cygnus on your Horizon Globe and turn it. Notice when you can see Cygnus. Move the Sun to different months to see how viewing of Cygnus changes throughout the year.

To remember where Cygnus is, think of a thirsty bird following the Big Dipper trying to get a drink of water.



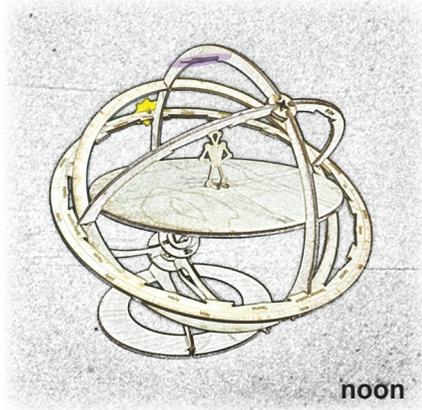
Exercise

1. Place the Sun on the ecliptic and watch Cygnus go around as the Sun rises and sets.
2. Move the Sun to different places and notice how it affects how you see Cygnus at night.
3. With Orion, the Big Dipper, and Cygnus installed, turn the globe and notice how Cygnus always follows the Dipper by $\frac{1}{4}$ turn.



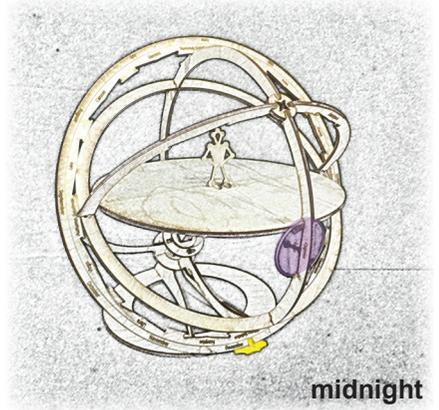
sunrise

1 Cygnus at sunrise

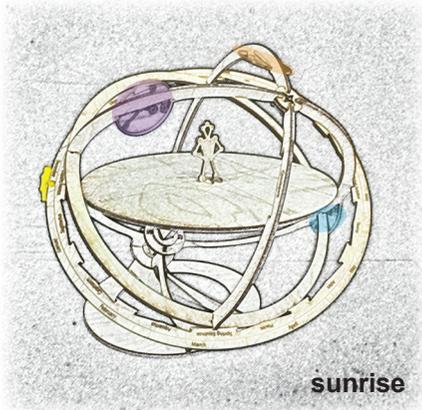


noon

2 Cygnus across a day



midnight



sunrise

3 Cygnus with the Big Dipper and Orion



noon



midnight

Cygnus

Guidepost #4: Cassiopeia

**Equipment
needed:
Horizon Globe,
Cassiopeia**

Orion, the Big Dipper, and Cygnus help us map $\frac{3}{4}$ of the sky. The last quarter has another easy-to-find constellation, Cassiopeia.

Cassiopeia is supposed to be a mythical queen, but the best you can hope to see in the shape of the constellation is the queen's throne. It might be easier just to look for a W or an M, depending on where she is.

Place Cassiopeia on your Horizon Globe. The slot for Cassiopeia is above the Spring Equinox. The five stars of Cassiopeia are about as bright as the dimmer stars of the Big Dipper. Notice how the W shape opens up toward the North Pole.

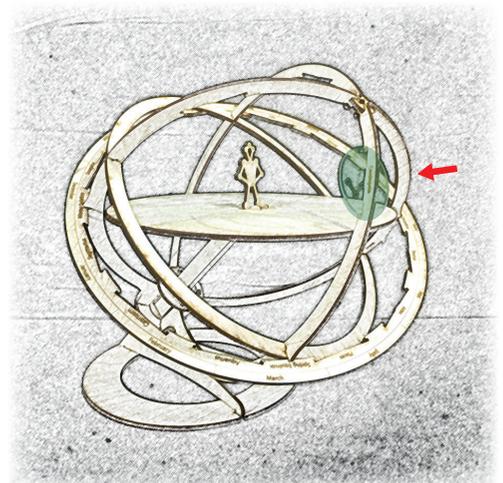
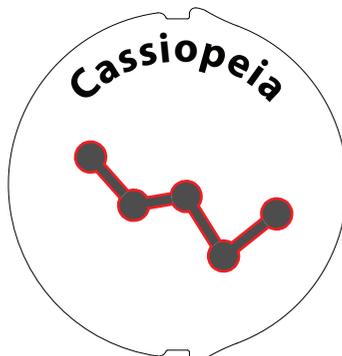
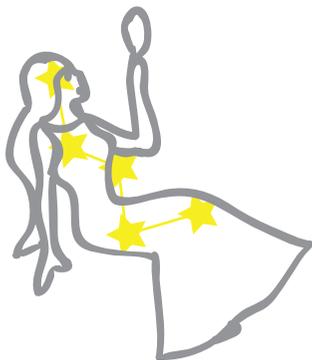
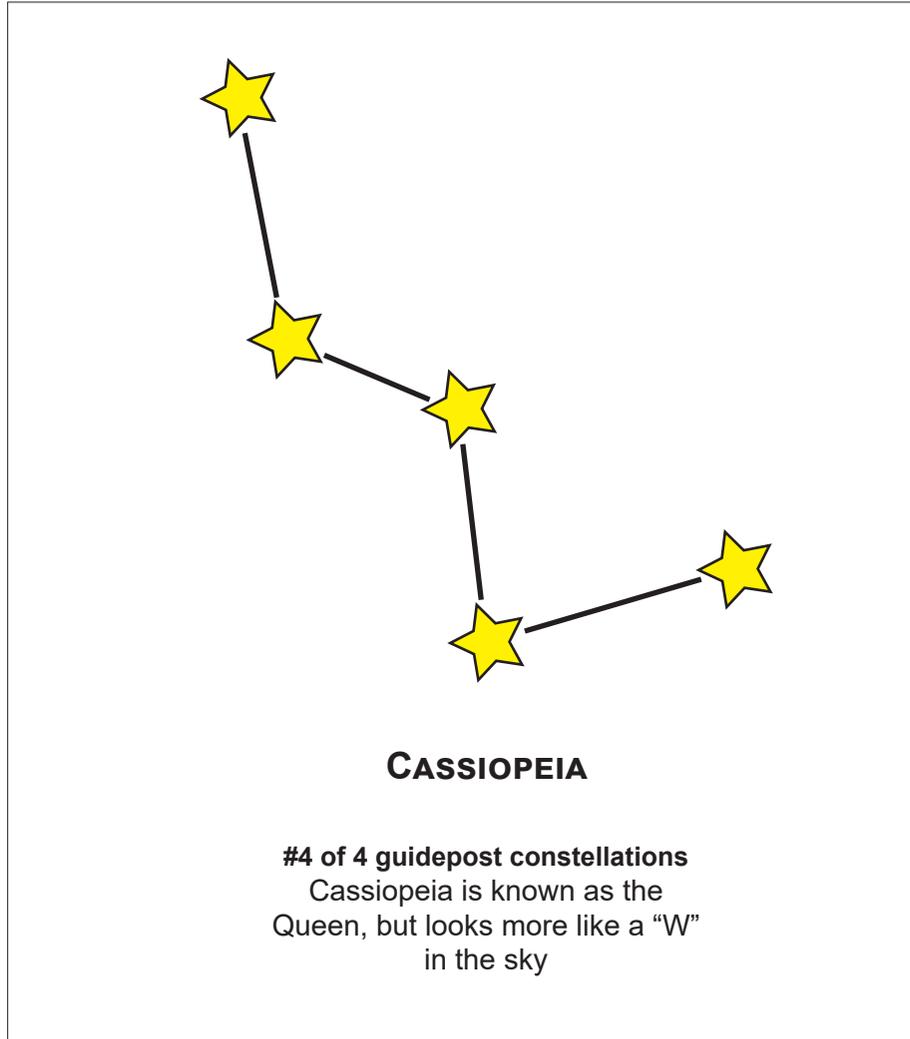
It can be helpful to notice that Cassiopeia is opposite the Big Dipper, with the North Pole between them. Place Cassiopeia on your Horizon Globe and explore how she changes through the months. On your globe, Cassiopeia is a circumpolar constellation, like the Big Dipper, so she never sets.

Notice that when Cassiopeia is low, the observer sees a W shape and when she is high he sees an M.

Exercise

1. Find the constellation disc Cassiopeia.
2. Locate the slot labeled Cassiopeia above the Spring Equinox.
3. Turn the globe to watch Cassiopeia go around.

Cassiopeia is opposite the Big Dipper



Cassiopeia Chases the Bird

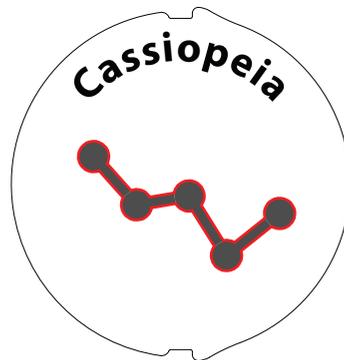
**Equipment
needed:
Horizon Globe,
Cassiopeia,
sun**

The queen is about six hours behind Cygnus and about six hours ahead of Orion.

She is about the same distance from the North Pole as the Big Dipper and her stars are about as bright.

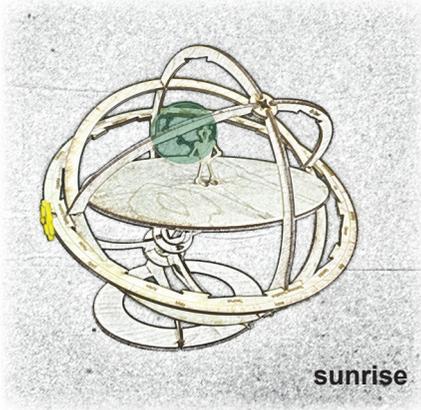
Place Cassiopeia on your Horizon Globe and turn it. Notice when you can see Cassiopeia, and how she turns from a W to an M and back. Move the Sun to different months to see how viewing of Cassiopeia changes throughout the year.

To remember where Cassiopeia is in the sky, think of her as chasing the Swan. She thinks the bird is pretty and wants it for her collection. And of course, Orion the hunter sees the beautiful queen and pursues her.



Exercise

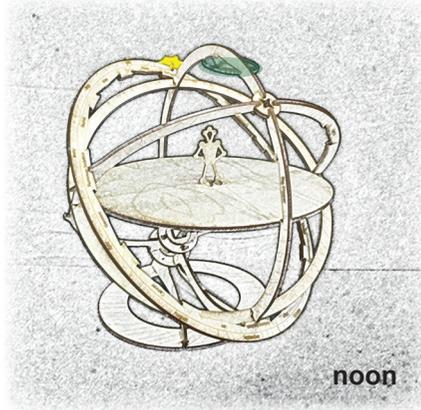
1. Place the Sun on the ecliptic and watch Cassiopeia go around as the Sun rises and sets.
2. Move the Sun to different places and notice how it affects how you see Cassiopeia.
3. With Orion, the Big Dipper, Cygnus, and Cassiopeia installed, turn the globe and notice how she always follows the Swan and is followed by Orion.



sunrise

1

Cassiopeia at sunrise



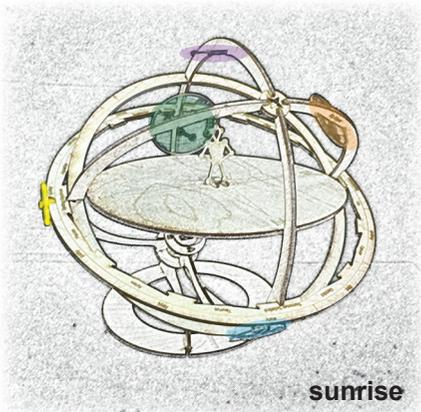
noon

2

Cassiopeia across a day



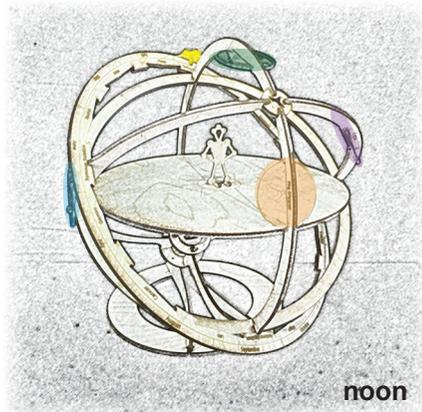
midnight



sunrise

3

Cassiopeia with Cygnus, the Big Dipper and Orion



noon



midnight

Cassiopeia

Guidepost Constellations Map the Sky

**Equipment
needed:
Horizon Globe,
Guidepost
constellations,
sun**

Orion, the Big Dipper, Cygnus, and Cassiopeia are your keys to finding any constellation in the sky.

Any night that the sky is clear you will be able to see at least one of these four high in the sky. Your Horizon Globe will help you visualize the relationship between these four guideposts so you always know where to look when you are stargazing.

As a beginner, it is important that any time you try to stargaze, you can find something familiar. Knowing the four guideposts will help you gain confidence. Once you find a guidepost, you can try to find another one, or move on to find other constellations.

Remember this simple story to remind yourself of where the guideposts are:

- The Big Dipper is envious of the proud and famous Orion, so he tries to douse him with a dipper full of water.
- Cygnus the Swan is thirsty, so it chases the Big Dipper to get a drink..
- Queen Cassiopeia thinks the bird is pretty and chases after it.
- Finally, Orion the hunter pursues the beautiful Queen.

It can be helpful to remember that Orion is closest to the Sun on the longest day of Summer and farthest from the Sun on the shortest day of Winter. Orion must be hot in the Summer and Cold in the Winter.

If you can remember 3 things, you should be able to find the guidepost constellations any night without using a star calendar.

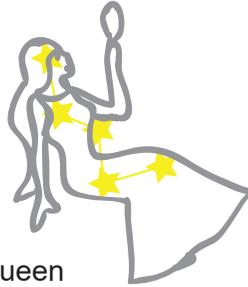
1. **THE STORY.** Orion chases Queen chases Swan chases Dipper chases Orion.
2. **ORION IS NEAR THE SUN** on the longest day of Summer, June 21.
3. **ORION MOVES 2 HOURS PER MONTH FASTER** than the Sun.

We'll talk more about sun motion when we talk about seasons.

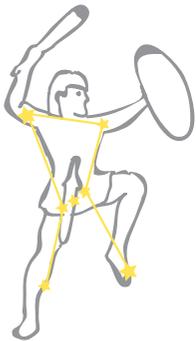
Exercise

1. Place all four Guidepost Constellations on the Globe.
2. Turn the globe and recite the story as they go by.
3. Place the Sun in different months to see which guidepost would help you most at different times.

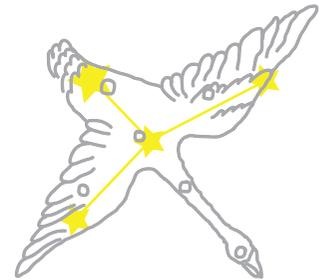
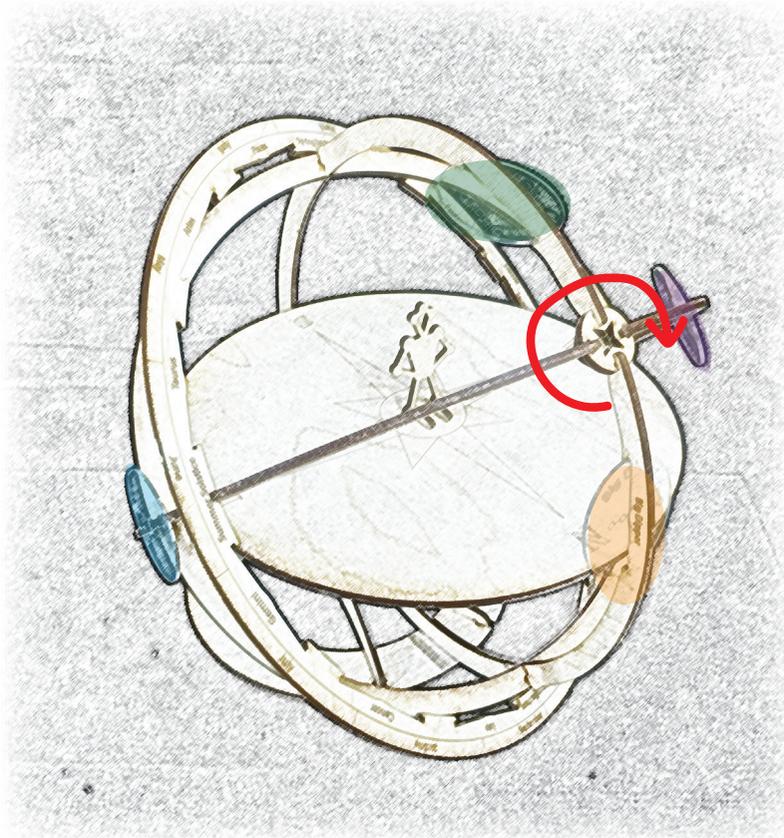
Guidepost constellations help you get oriented



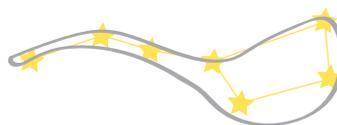
The Queen
chases the pretty
Swan



Orion chases
the beautiful
Queen



The thirsty swan
flies to get a
drink



The envious dipper
tries to douse Orion

The Zodiac

**Equipment
needed:
Horizon Globe,
zodiac
constellations**

Most likely you have heard of the Zodiac constellations, but you may not know the astronomical significance of them. What is so special about these constellations?

Without knowledge of the ecliptic, it can be difficult to explain what is special about the Zodiac. Knowing about the ecliptic, it's easy. The Zodiac constellations are the constellations along the ecliptic.

At night, when the Sun is down, you can tell where the ecliptic is by finding the Zodiac constellations. Ancient astronomers used the Zodiac to tell the time of night and the time of year.

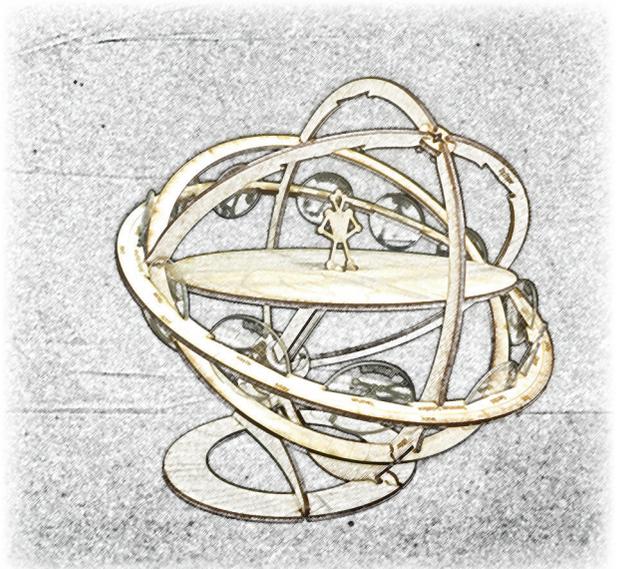
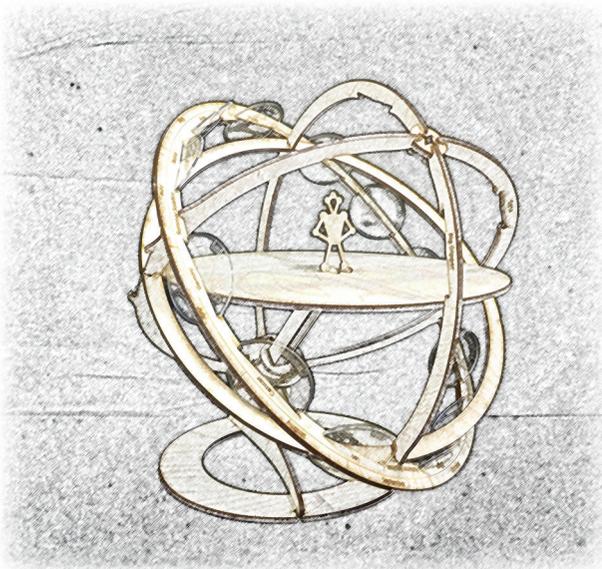
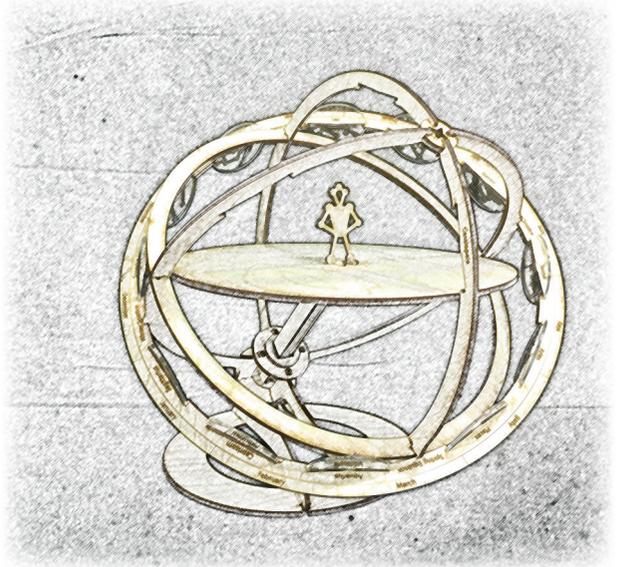
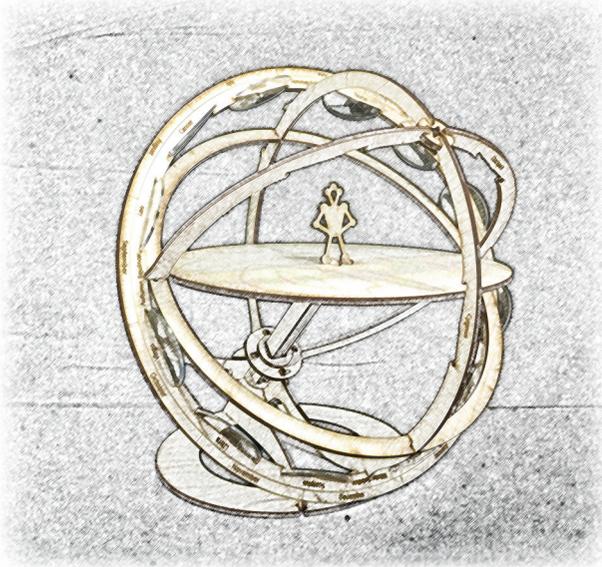
Astronomers in ancient times divided the ecliptic into 12 parts and memorized the stars in each part by giving a name to the shape they formed. They were able to see a Ram in one group, a Bull in another, a Scorpion, a Goat, an Archer, and other shapes. Since many of the shapes they named are of animals, the group was called Zodiac, from the root word "zoo".

Place all of the Zodiac constellations on your Horizon Globe. Notice how they are all on the ecliptic, so that some of them are low and some are high, depending on what part of the ecliptic they belong to.

Exercise

1. Place all of the Zodiac constellations on your Horizon Globe.
2. Turn the globe and watch the Zodiac parade by the Observer.

The Zodiac constellations are on the ecliptic



Zodiac Constellations

Put all the Zodiac constellations on your Horizon Globe and watch them go around. Notice which ones are low and which are high as the globe spins.

A Way to Remember the Zodiac

**Equipment
needed:
Horizon Globe,
sun, zodiac
constellations**

There are twelve constellations in the Zodiac, too many to remember without some kind of trick.

Fortunately, H.A. Rey, creator of the mischievous cartoon monkey Curious George wrote a mnemonic to help remember the whole Zodiac in order. It's worth memorizing his poem, there is no easier way to know the Zodiac:

THE RAMBLE TWINS CRAB LIVERISH;
SCALY SCORPIONS ARE GOOD WATER FISH

the Ram-Bull Twins Crab Lion-Virgin;
Scales Scorpion Archer Goat Water Carrier Fishes

These are the constellations the poem refers to:

- | | |
|---------------------|--------------------------------|
| 1. Aries the Ram | 7. Libra the Scales |
| 2. Taurus the Bull | 8. Scorpio the Scorpion |
| 3. Gemini the Twins | 9. Sagittarius the Archer |
| 4. Cancer the Crab | 10. Capricorn the Goat |
| 5. Leo the Lion | 11. Aquarius the Water Carrier |
| 6. Virgo the Virgin | 12. Pisces the Fishes |

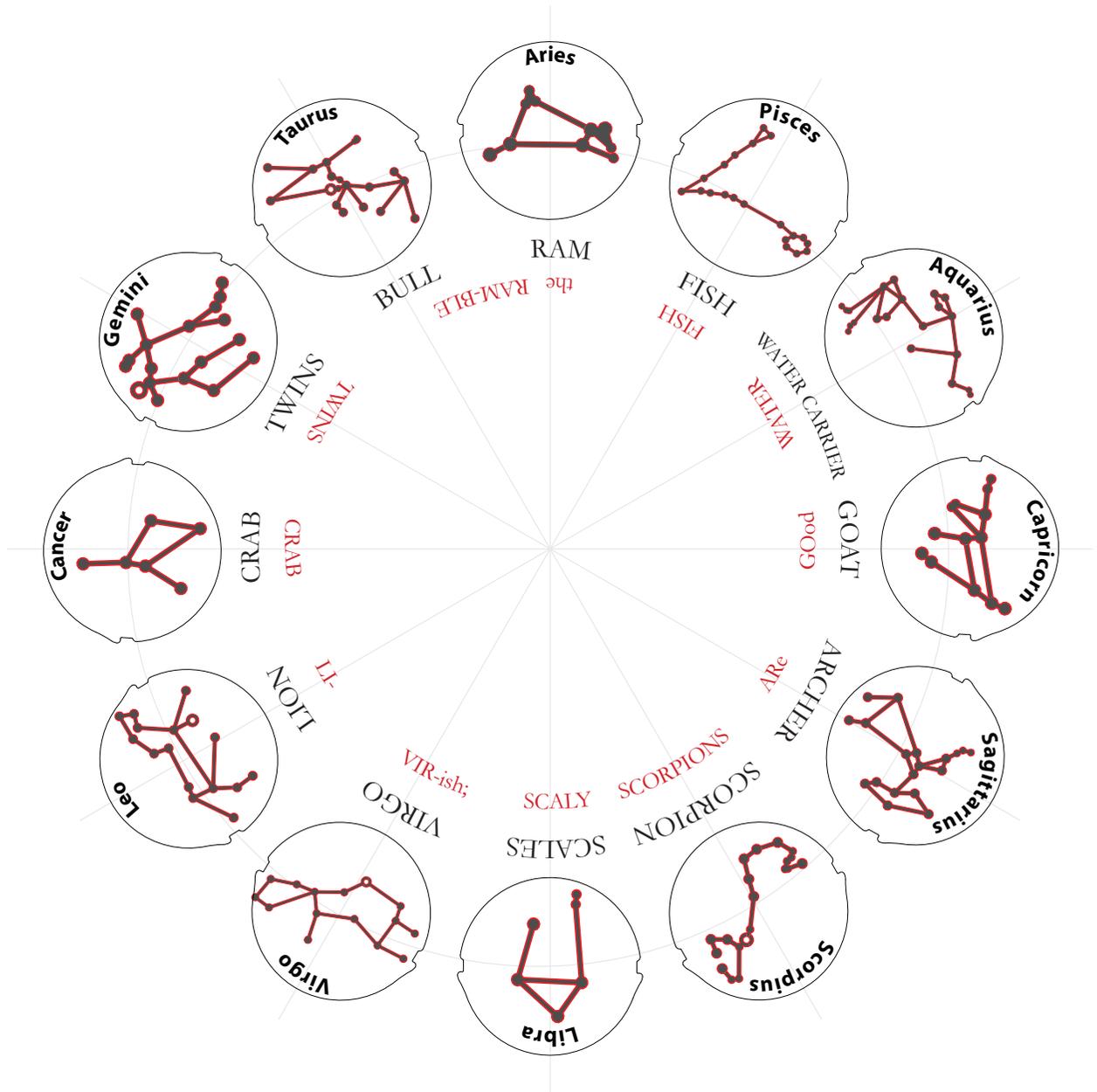
Find Aries on your Horizon Globe (April to May). Slowly turn the globe through a day and watch the Zodiac parade by in order.

Actually finding the Zodiac constellations in the sky is a little too advanced for this book, but when you do tackle the job you will have an excellent foundation for it.

Exercise

1. Try to memorize the Rey poem, so you can recite the Zodiac constellations in order.
2. Put the Zodiac constellations on your globe and spin them through an entire day.

*the ramble twins crab liverish
scaly scorpions are good water fish*



ZODIAC CONSTELLATIONS

Twelve constellations that map out the path of the Sun on the ecliptic

What's Your Zodiac Sign?

**Equipment
needed:
Horizon Globe,
sun, zodiac
constellations**

Everyone has an Astrological, or Zodiac sign that depends on what day they were born.

The signs were established by the ancient Babylonians and Greeks who thought that the time of year you were born had some influence on your personality and fate.

What is your sign?

You can use your Horizon Globe to find out.

1. Place the Sun on the date of your birthday on the Ecliptic Ring.
2. Turn the globe until the Sun just sets.
3. The last constellation visible in the west is your sign.

Example: Place the Sun on the Spring Equinox, March 21. The last zodiac constellation still visible at sunset is Aries. So if you were born on March 21, your sign is Aries the Ram.

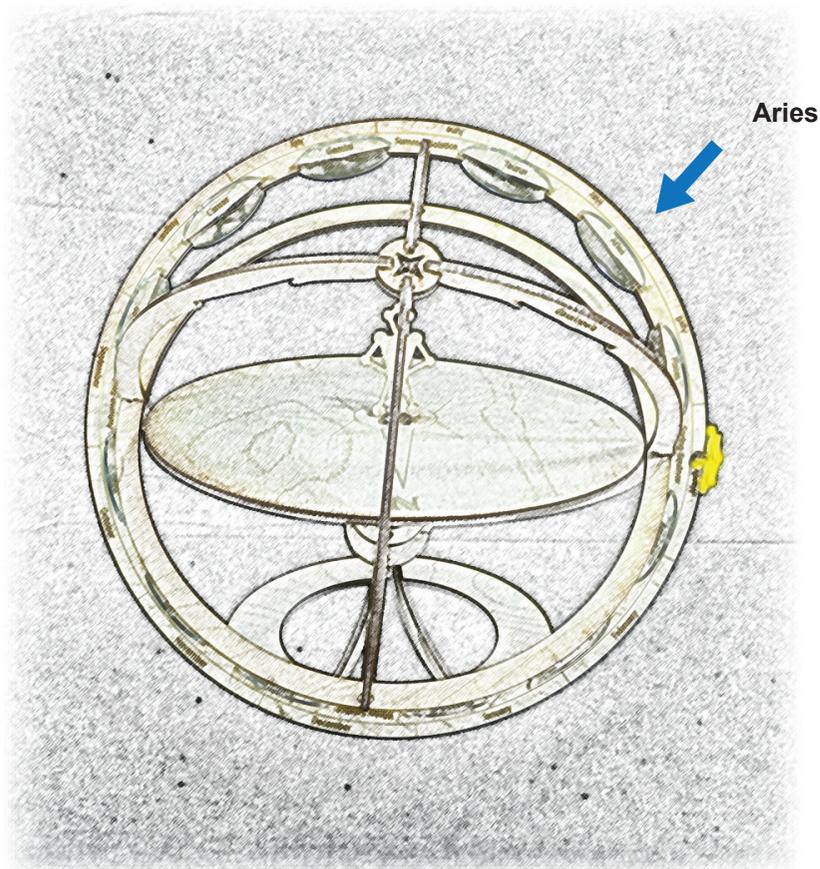
This process may seem needlessly complicated. Why didn't they just make your sign the constellation behind the Sun on the day your were born? Actually, that is what they did. But in the more than two thousand years since then, the constellations have moved.

Zodiac signs are named for constellations, but are counted from the Spring Equinox.

A phenomenon called "precession of the equinoxes" has shifted all the constellations since ancient times. Studying precession falls into the second phase of Astronomy, solar system mechanics.

Exercise

1. Place all the Zodiac constellations on the globe.
2. Place the Sun on your birthday.
3. Turn the globe until the sun just sets.
4. Find your sign, the last one visible in the west at sunset.



Example: Place the Sun on the Spring Equinox, March 21.
The last Zodiac constellation still visible at sunset
is Aries.