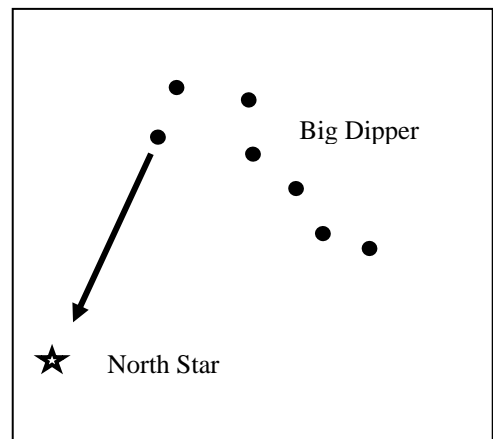




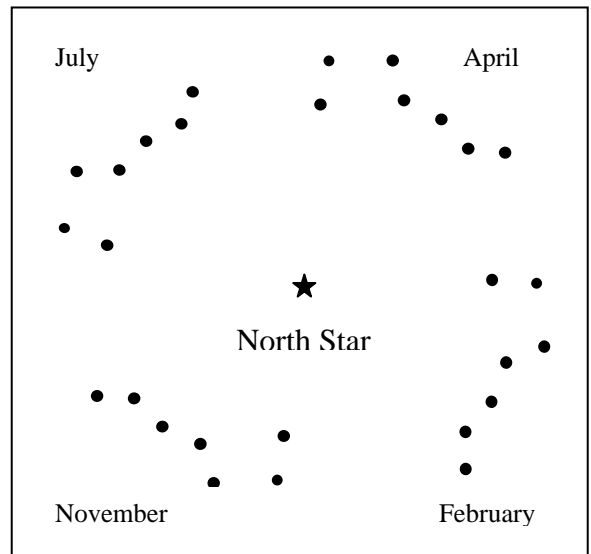
LIGO Star Chart

All of the stars used in our galaxy model are parts of constellations (or star patterns) that are very easy to observe in the night sky from almost anywhere in the northern hemisphere. No telescope is necessary but the sky should be dark. This activity will show you how to locate several features of the night sky. **The Big Dipper** is the easiest group of stars to identify and can point you in the direction of other interesting areas of the sky.

Once you have located the Big Dipper you can use it to find the **North Star**. Simply imagine connecting *Merak* and *Dubhe* with a line and continuing until you reach a medium-bright star.

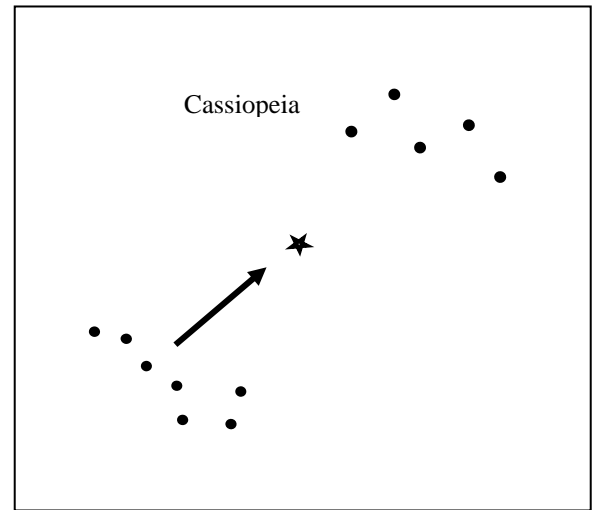


The **Big Dipper** rotates around the **North Star** through the night and through the seasons. The position of the Dipper around the North Star depends on the time of night and the month of the year. The diagram to the right shows the position of the bowl of the Dipper in the early evening according to the month.



For observers in the northern states the dipper never sets below the horizon, although it does become very low in the sky during the winter months.

Let's now use the Big Dipper to locate the constellation "**Cassiopeia**". Simply imagine a line connecting the second star in the Big Dipper's handle to the North Star and extend that line until you see a group of stars squished into an "M" or "W".



Our sun and almost any lights you see in the sky originate from our own disc-shaped, spiral galaxy called the **Milky Way**. The Earth and our sun are located away from the center of our galaxy. Often you will be able to see a hazy band of light that seems to run through Cassiopeia. During the summer, part of this band of light is actually light from stars located in the thickest part of our galaxy! In the winter you are looking in the opposite direction and the band of light originates from an outer arm of our galaxy.

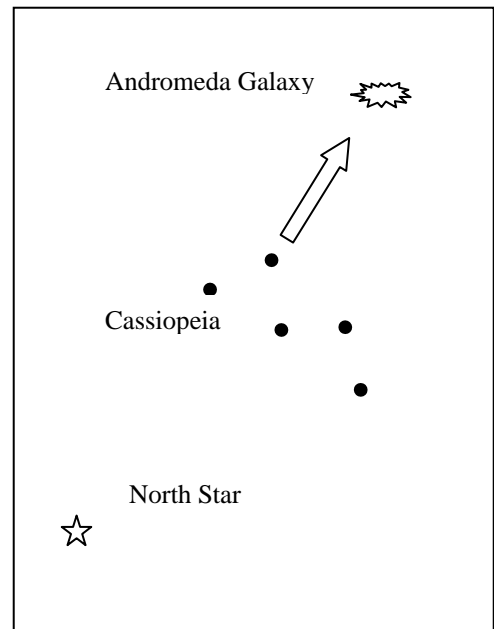


Estimated location of our sun and solar system.

The Milky Way Galaxy

The most distant object that can be observed by the unaided eye is actually another galaxy! The **Andromeda Galaxy** is more than 2 million light years from the Earth. In some ways its spiral structure resembles that of our own galaxy, but it is about twice as massive.

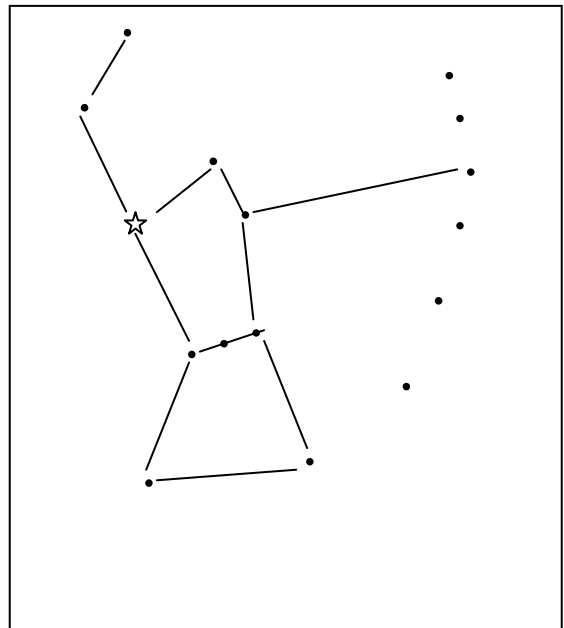
The Andromeda Galaxy can be located using Cassiopeia. The right side of the “W” shaped constellation acts as a pointer. Andromeda appears as a smudge of light but with binoculars it’s much easier to see it has an oval shape. The best observations can be made from early September through December.



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Although Andromeda is so far away that it takes light almost 3 million years to reach us, the distance between the two galaxies is getting smaller. Andromeda is moving toward the Milky Way at about 700,000 miles per hour! The best explanation for this is that the Milky Way and Andromeda are in fact a bound pair of galaxies in orbit around one another. Both galaxies are thought to have formed close to each other shortly after the Big Bang. Initially they were moving apart with the overall expansion of the universe. But since they are bound to one another, they are now falling back together and a very plausible scenario puts them on a collision course in 3 billion years!

In the winter, the biggest, brightest constellation is **Orion**. In order to locate the constellation Orion you need to face south during the months of December to March. The stars that make up Orion seem to show a hunter with a shield in his left hand and a club raised above his head with his right hand. **Orion's belt** is one of the most easily identified features in the sky. It's one of the few places with three stars in a line.



The star located at the right armpit is **Betelgeuse** (pronounced “beetle juice”). Betelgeuse appears redder than the other stars. It is located at a right angle to Orion's belt.

You may recall from reading your LIGO Explorer Sheet that Betelgeuse is a red super giant and that if our sun were to be replaced by Betelgeuse the surface of the star's atmosphere would extend almost to the orbit of Jupiter! Betelgeuse is a very old star that is a prime candidate for self-destruction in a supernova explosion. If we were to begin seeing the explosion today, it would be as bright as a crescent moon, would cast strong shadows on the ground, and would be seen easily in full daylight. It is possible that Betelgeuse has already undergone a supernova explosion and we haven't seen it! How is that possible?