

## Winter Sky Tour

On a clear, dark evening in January, February, or March you will be able to see the following...

### **Constellations:**

Ursa Major (Big Dipper)  
Ursa Minor (Little Dipper)  
Draco (the Dragon)  
Cepheus (the King)  
Cassiopeia (the Queen)  
Leo (the Lion)  
  
Perseus (the Hero)  
Triangulum (the Triangle)  
Aries (the Ram)  
Pegasus (the Winged Horse)  
Andromeda (the Princess)  
Cetus (the Sea Monster)

Orion (the Hunter)  
Canis Major (the Big Dog)  
Canis Minor (the Little Dog)  
Gemini (the Twins)  
Taurus (the Bull)  
Auriga (the Charioteer)  
Eridanus (the River)  
Cancer (the Crab)  
Hydra (the Water Serpent)

### **Bright Stars:**

Sirius (Canis Major)  
Procyon (Canis Minor)  
Rigel (Orion, right knee)  
Betelgeuse (Orion, right shoulder)  
Bellatrix (Orion, left shoulder)  
Castor (Gemini, right)  
Pollux (Gemini, left)  
Capella (Auriga)  
Aldebaran (Taurus)  
Regulus (Leo)

### **Open Clusters:**

Pleiades  
Hyades

### **Nebulae:**

Orion Nebula

### **Galaxies:**

Andromeda  
Milky Way

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### **How to find the constellations**

The trick to locating a constellation is to start with those most familiar, and then use the pointer stars to find other constellations. It also helps to ensure that you know the four cardinal directions (North, South, East, and West).

### **When to observe**

The story that follows will make the most sense if you observe the sky according to the following schedules.

Early January	10 pm to midnight
Late January	9 pm to 11 pm
Early February	8 pm to 10 pm
Late February	7 pm to 9 pm
Early March	6 pm to 8 pm

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## Let's begin...

Using the star chart below, orient yourself due North. From this vantage point we will find the constellation Ursa Major (the Big Dipper). The Big Dipper will be standing on end (the handle closest to the horizon) in the northeast sky. Using the two stars at the end of the pot, we can draw an imaginary line heading northward until we meet up with Polaris (the North Star). Polaris is the star at the very end (handle end) of Ursa Minor (the Little Dipper). Following the stars down the handle (of Ursa minor), we arrive at its bowl. Notice that the Big Dipper and the Little Dipper are always facing each other, so that in theory, something could be pouring out of the Little Dipper into the Big Dipper. The constellation snaking its way between the Little and Big Dippers is Draco (the Dragon). The head of the Dragon lies directly under the bowl of the Little Dipper.

Remembering how we found Polaris and the Little Dipper, if we continue to trace a line from the stars at the end of the Big Dipper's bowl, past Polaris, we arrive at the top of Cepheus (the King). The constellation Cepheus takes the form of a simple house (a triangle on top of a square) and the star that we just found is the top of the house.

Sitting just next to (west of) King Cepheus is his wife, Queen Cassiopeia. Most often, Cassiopeia is identified by her "W" or "M" shape (winter = "W" & summer = "M"). Tracing its way through Cassiopeia is the hazy, cloudy appearance of the Milky Way. The reason we observe the haze is because we are looking out along the plane of the galaxy and as a result, there are so many stars very close together that they all wash together into a cloudy haze. The Milky Way traces its way across the entire northern sky from the extreme northwest horizon all the way to the extreme southeastern horizon. From a dark location, the haze of the Milky Way is a fascinating sight. Legend has it that Hercules' arrow flew aimlessly through the night sky, impacting on Queen Cassiopeia's bosoms and spewing her milk across the sky; hence the Milky Way.

Queen Cassiopeia and King Cepheus' daughter, Andromeda, sits just west of Cassiopeia. King Cepheus chained Andromeda to a rock beside the sea in an attempt to please the Cetus (the Sea Monster) who was greatly offended by Cassiopeia's suggestion that Andromeda was the finest lady in the land. Before the Cetus could devour Andromeda, however, Perseus (the Hero and son of Zeus, the king of the gods) mounted his winged horse (Pegasus) and saved Princess Andromeda's life. The two were married on the spot and lived happily ever after. On a clear, dark night, you might notice a small, fuzzy spot right close to one of Andromeda's legs. This is known as the Andromeda Galaxy, the only galaxy visible with the naked eye. The Andromeda Galaxy is a spiral galaxy some 3 million light years away that in most respects closely resembles our own Milky Way. If you were to observe the Andromeda Galaxy through a modest sized telescope, you might also notice that the large central galaxy is accompanied by two smaller companion galaxies (M32 and M110 -- both dwarf elliptical galaxies).

Filling most of the western sky is the great square of Pegasus (Perseus' winged horse), mentioned earlier. The constellations of Andromeda and Pegasus are in fact joined. After helping Perseus rescue Andromeda, Pegasus was promoted to Zeus' assistant, carrying his lightning bolts.

Lying adjacent to Andromeda and Pegasus are the rather small constellations Triangulum (the Triangle) and Aries (the Ram). Aries marks our first look at a zodiac constellation. The zodiac constellations consist of 13 constellations all lying along the ecliptic. The ecliptic is an imaginary line traced from east to west, marking the path the sun, moon, and all planets follow across the night sky.

Returning to The Big Dipper we can find yet another zodiac constellation. Using the other two stars of the bowl (the stars at the back end of the bowl), we can trace a line eastward to the constellation Leo (the Lion). The bright star marking the start of the Lion's tail is Regulus. Regulus is a B7V star and is the 25<sup>th</sup> brightest star in the sky.

### **Shall we continue?**

All of the previous constellations were essentially found using the Big Dipper and her pointer stars. The next batch of constellations will be found using Orion and its pointer stars.

To find Orion, orient yourself due South. Orion, marked by its seven bright stars, will be about halfway up from the horizon. If you let your imagination wander, one can use four of the seven stars to form the shoulders and knees of a human shape. The star depicting Orion's left shoulder is Betelgeuse, a large red giant star (spectral class M1-2Ia). Betelgeuse, shining a brilliant red-orange, is the 12<sup>th</sup> brightest star in the sky and stands in beautiful opposition to the blue-white Rigel (the star marking Orion's right knee). Rigel, a B8Ia star, is the 7<sup>th</sup> brightest star in the sky. Betelgeuse and Rigel look so different in color due to the fact that Betelgeuse is a much older star, probably nearing its death (perhaps several million years away), whereas Rigel is a relatively young star not more than a few million years old. (Note that stars live on average about 5 billion years.)

The other three stars in Orion lie inclined slightly at the center of the shape, forming the appearance of a belt. Hanging from his belt lies Orion's sword, marked by three faint stars and a small fuzzy patch. The fuzzy patch, just barely visible with the naked eye, is the Great Orion Nebula (M42). It is believed that M42 is a huge star-forming region about 1700 light years away. The nebula is most likely a large glowing cloud of hydrogen gas, the essential element in star formation.

The constellation of Orion (the Hunter) stands alongside his faithful dogs Canis Major (the Big Dog) and Canis Minor (the Little Dog), adjacent to the river Eridanus. Orion and his dogs seek Lepus (the Rabbit) and Taurus (the Bull). On one hunting adventure, Orion met a bitter end as he stepped on Scorpius (the Scorpion) and died. Feeling sorry for Orion, the gods placed him and his dogs in the sky as constellations. Scorpius was also placed in the sky, but rests at the extreme opposite side from Orion so as never to be able to harm Orion again.

To find Orion's large dog Canis Major, use the three stars of Orion's belt to draw a line to the southeast, shortly meeting up with Sirius, the brightest star in the night sky. Sirius, a bright A1V star, marks the head of Canis Major and its feet extend toward the horizon.

To find Orion's smaller dog Canis Minor, use the two stars marking Orion's shoulders to draw a line eastward until you meet up with Procyon, a bright F5IV star which lies just under the only other star in the constellation.

Lying to the southeast of Procyon, is the constellation Hydra. Hydra was the mythological beast that took the form of a dog with 100 serpentine heads. Legend has it that Hydra had horribly bad breath and could kill simply by being looked at. Hercules, the great warrior, was given the task of killing the beast. As Hercules battled with the Hydra he found that as he cut off one of the beast's heads, another regenerated in its place. Hercules needed the help of Iolus, his charioteer, to burn the neck of the beast as Hercules chopped off the head, preventing it from growing back. When Hercules came to the last head, he found it was immortal, and as a result, he and Iolus trapped the head under a heavy rock preventing its escape. Hydra is the largest constellation in the sky.

The river Eridanus, another one of the larger constellations in the sky, lies to the southwest of Orion's knee Rigel. Eridanus is named after the once famous river in northern Italy, now known as the River Po.

Taurus (the Bull), one of Orion's famous prey, can also be found using the stars of Orion's belt. This time trace a line in a northwest direction until you meet up with Aldebaran, the bright, orange star. Aldebaran, a huge red giant star (K5 III) about 40 times as large as our Sun, marks the eye of Taurus the bull. Taurus is also one of the 13 constellations of the zodiac. Taurus also contains two beautiful open star clusters, the Hyades and the Pleiades. Open star clusters are collections of tens to hundreds of stars occupying a relatively close area.

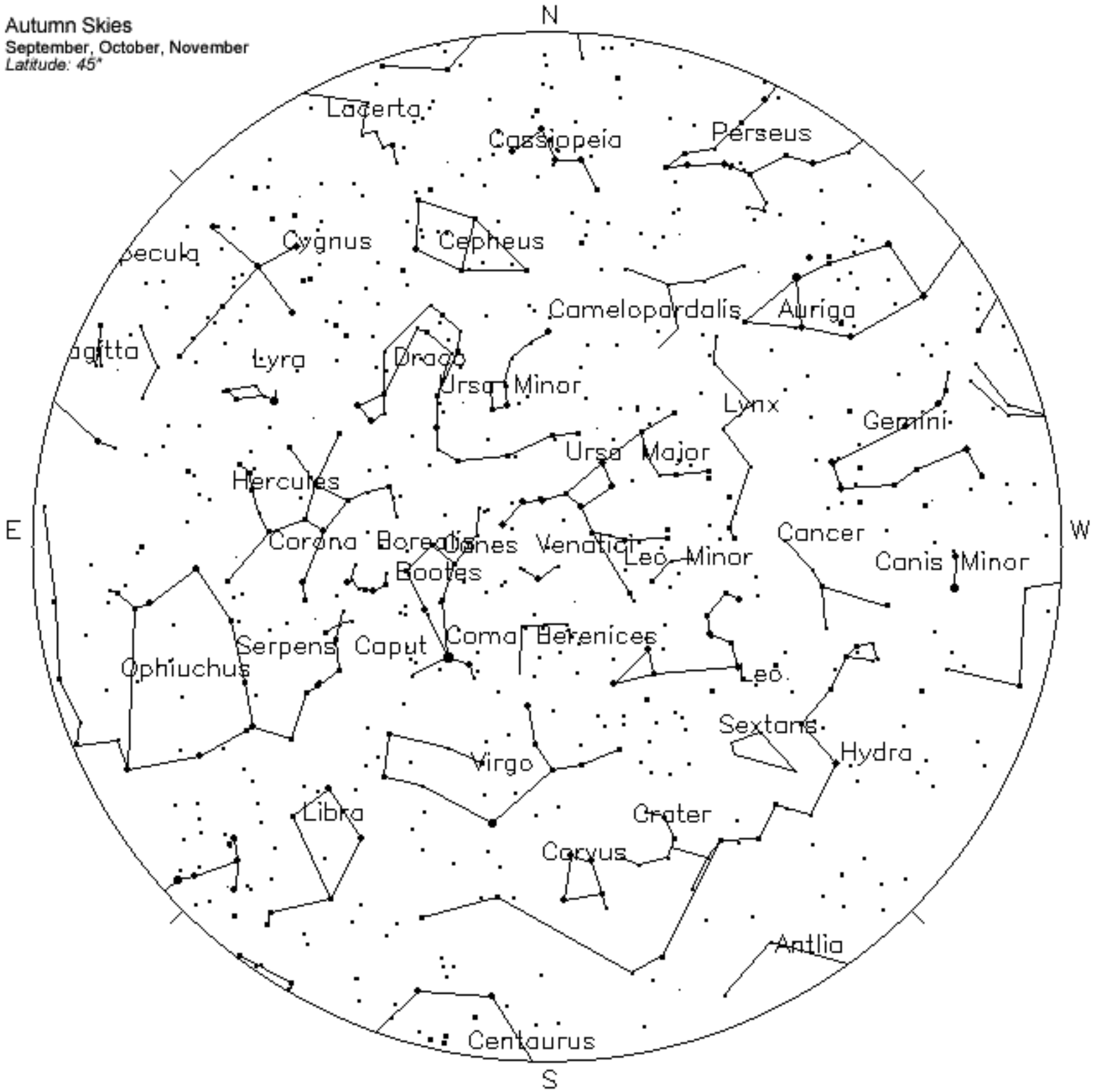
To find Gemini, the constellation of the twins, look to the northeast of Betelgeuse. The two bright stars, Castor and Pollux, mark the heads of the twins. Castor, an A1V, and Pollux, a K0IIIb, symbolize the twin Greek heroes who accompanied Jason on his voyages on the Argo, the famous Greek warship. Gemini is also one of the 13 constellations of the zodiac.

Moving further east along the ecliptic, we find Cancer (the Crab), a faint constellation said to have been a crab sent by the goddess Hera, to distract Hercules in his battle with the beast Hydra. Although Hercules was able to squash the crab with a single stamp of his foot, Hera saw to it that Cancer was placed in the sky to symbolize its effort, heroic yet pitiful.

Lying above Orion and straight up from our vantage point sit Auriga (the Charioteer) and its bright star Capella. Capella, a G5III, is the 6<sup>th</sup> brightest star in the sky and is a beautiful orange color.

**This brings us to the end of our tour of the winter sky.  
Thanks for joining us!**

Autumn Skies  
September, October, November  
Latitude: 45°



Winter Skies  
December, January, February  
Latitude: 45°

