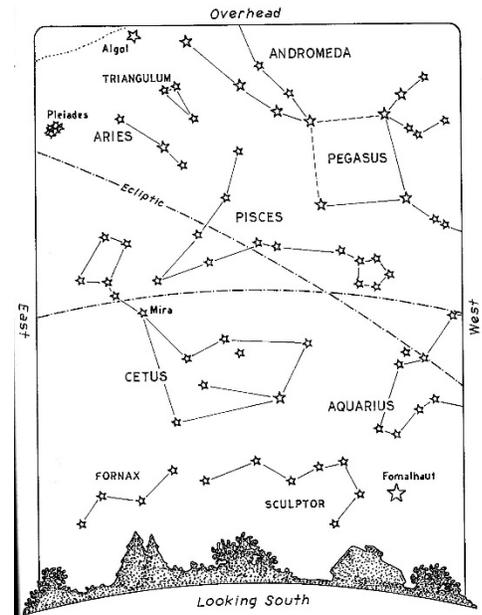


The night sky in October and November

We see only a few bright stars this time of year because we are looking directly out of Milky Way. More on where you can see the Milky Way is later. As we look at Pegasus, we are looking directly out of the disk of the Milky Way. Most of the time, and without optical aids, you will see only a few stars. But on a clear night with good binoculars you can see hundreds of stars in Pegasus “window.”

Four bright stars form Pegasus, the Winged Horse. The Sea god made him from beach sand, sea foam & blood that fell from the severed snaky-haired head of Medusa, who was slain by Perseus.

In Greek mythology Medusa was a monster, a Gorgon, generally described as having the face of a hideous human female with living venomous snakes in place of hair. Gazing directly into her eyes would turn onlookers to stone. Perseus was the son of the god Zeus and a mortal woman named Danaë.



The brighter stars’ names are parts of horse: Enif (EN-if), the nose, is not in the picture below, but is to the lower right of Markab. Markab (MAR-kab) saddle or middle, Scheat (SHE-at) upper leg, Algenib (al-GEE-nib) wing or side. Remember there is to up or down in space, thus these constellations drift in all directions.

The Great square of Pegasus is 15 degrees on a side. It is about the same as a hand width at arm’s length. The square is oriented exactly East-West and North-South.

Declination: Measured in degrees up from celestial equator.

Right ascension: Measured by hours and minutes from east side of Great Square, which also is the spring or vernal equinox.

A hand at arm’s length is about 15 degrees of declination or 1 hour of right ascension at equator. The Great Square is about 15 degrees high and one hour wide. An hour is 15 degrees: 360 degrees / 24 hours.

Azimuth: The angle from north to star, measured horizontally.

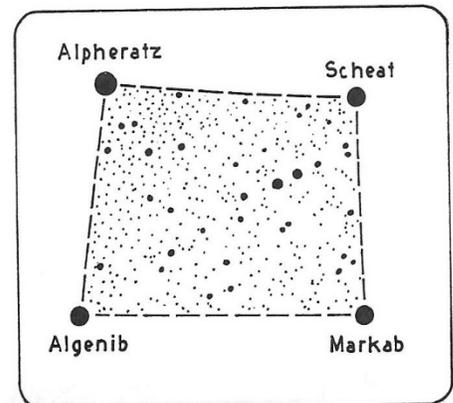
Zenith: The point in the sky directly overhead, 90 degrees up.

Nadir: The opposite of zenith, directly down.

Solar time: Clocks set to sun’s position.

Sidereal time: Clocks set to stars. Astronomers use sidereal time.

As the Earth moves around Sun, it moves 1/365th of a circle, approx. 1 degree.

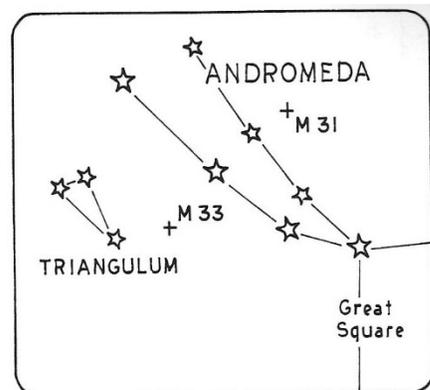


The Great Square of Pegasus is a good guide to other constellations. The northeast star of the Great Square begins the constellation of Andromeda.

Andromeda, the beautiful daughter of Cepheus and Cassiopeia, is nearly overhead. The northeast star in the Great Square is Alpheratz (al-FEE-ratz) and becomes the head of Andromeda, with her body and dress flowing farther up to the northeast. Alpheratz comes from the Arabic name for the “navel of the horse” Al Surrat al Faras, corrupted to Alpheratz.

Here’s the story of Andromeda: Cepheus, The king of Ethiopia, was married to Cassiopeia, whom we’ll see later. They had a daughter, Andromeda. Cassiopeia boasted that her daughter was more beautiful than the sea nymphs, who became jealous and complained to Poseidon, god of the seas. He said he would punish Cassiopeia by sending the sea monster Cetus (the whale) to ravage the coast of Ethiopia. Cetus got to work. Cepheus consulted an oracle asking how to stop the destruction. The oracle told Cepheus the only way was to sacrifice his daughter by chaining her to a rock on the coastline so Cetus could devour her. So Cepheus did.

But as Cetus approached, the hero Perseus, of Medusa fame, arrived on the winged horse, Pegasus, and immediately fell in love with her. He killed Cetus, then he and Andromeda went off together, lived happily ever after and eventually were sent to live for all time in their places in the sky, along with Cetus, Cassiopeia and Pegasus.



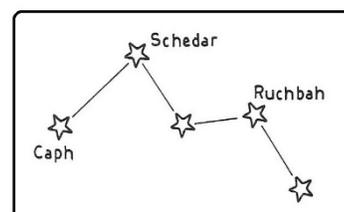
Near Andromeda lies the Great Nebula, also known as the Andromeda Galaxy, which can be seen on a clear, moonless night without binoculars or telescope. Draw a line from the second highest pair of stars and about equal to the distance between them. You should see a hazy patch of light. It also is known as M31, the “M” standing for Messier. M31 is a Messier object. Time-elapse photos through a large telescope reveal it as a spiral galaxy about four times the width of the full moon. It is the most distant object you can see without optical aids.

The stars that make up the constellation of Andromeda are in the Milky Way. That’s why they are relatively bright. Looking out past them, the Great Galaxy of Andromeda is some 2 million light years away. The Andromeda Galaxy is barreling towards the Milky Way, and us, at a rate of 22 miles per second. But even at that speed it will take a zillion years to reach us, and predictions are that mankind will not even notice any change. Astrophysicists say the two galaxies will do a sort of dance and over a billion years settle into one very large galaxy.

Just below Andromeda is the constellation Triangulum, a small triangle.

To the left of that the Pleiades, or Seven Sisters, is rising in the east. Subaru uses these easily recognizable stars as the logo for the car company.

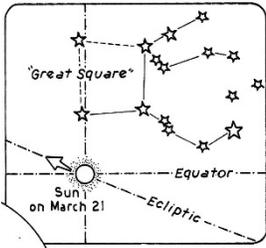
The constellation Perseus, the hero, is just to the left of the Pleiades, then comes Cassiopeia, always directly across the North Star from the Big Dipper. It is shaped like an “M” or “W” of five bright stars. Imagine a woman in a reclining chair. Caph (kaff) or head and Schedar (SHED-der) are the brightest. Ruchbah (RUCK-bah) is the knee.



The Milky Way can be seen near Polaris, opposite Cassiopeia. It is in Cassiopeia that new stars are being born from gas and dust condensing near the “arms” of the Milky Way. You might be able to see these through a telescope.

Another definition. **Circunpolar:** Stars that are close enough to the North Star so that they never set, depending on from where on Earth you are observing.

Draw a line that passes from Polaris, through Caph and down through the two eastern stars of the Great Square. This line marks the Zero hour of the right ascension. It is the “Prime Meridian” of the sky and marks the vernal equinox, the first day of spring.



The Persians, Babylonians and Arabs all saw the constellation Pisces as two fish. No bright stars, but on a clear night, should be able to see the “vee” that is the cord and two fish.

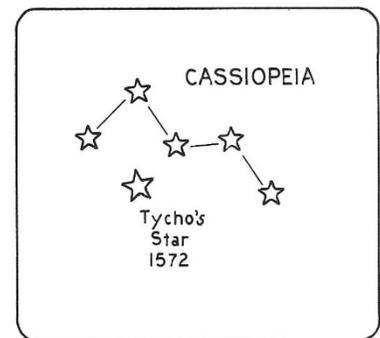
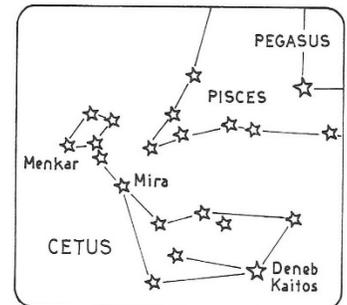
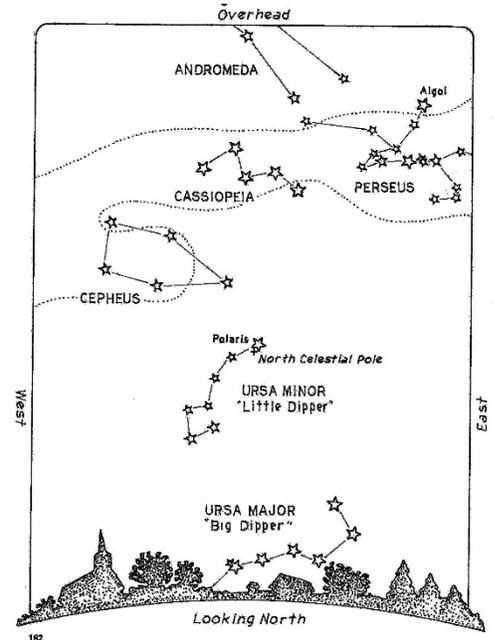
If born under the sign of Pisces, the sun was in front of the constellation Pisces, but 2,000 years ago. Now, on the same date, the sun is in the constellation Aquarius because of the Earth’s wobble on its axis. In fact the North Star alternates between Polaris and Vega every gazillion years or so.

Most of the Galaxies are moving away from each other. We know this fact because of the “red shift” of light coming from the galaxies. This shift in the color of light coming from the galaxies was discovered by Edwin Hubble in 1929 and is an example of the “Doppler effect.” As an object moves away from us the wavelength of light or sound gets longer, making sound lower and light redder.

Cetus, the whale, is just below Pisces. Menkar is the nostril and Deneb Kaitos is the tail. Mira (wonderful) is the first “variable” star discovered. It alternately fades and shines brightly.

In 1572 an astronomer named Tycho Brahe saw a new bright star near Cassiopeia, and called it a “nova” or new. It only lasted a few days. He thought he had witnessed the first instance of this phenomenon. He was wrong as several other civilizations saw the same type of thing, but the name “nova” stuck, now known as supernova, an exploding star. The Chinese called them “guest stars.” It became invisible to the naked eye in about 18 months.

Astrophysicists believe that thermonuclear fusion creates the heavier elements, such as carbon, oxygen, iron, nitrogen, and so on, are created from the hydrogen and helium as the star burns itself up. These heavier elements are dispersed through the



universe when the star burns up all its hydrogen and blows up, going supernova. Several astrophysicists have used the phrase, "We literally are made of stardust."

The most distant objects in the night sky are quasars. There are two near Cetus but are not visible. Their red shift indicates they are moving away at a speed of $8/10^{\text{th}}$ the speed of light, which places them approximately 15 billion light years from Earth, about the estimated age of the universe.

The illustrations are from Chet Raymo's book, "365 starry nights" and are used without permission, but with fingers crossed that he won't mind. Most of the text is rewritten from parts of the book, some from personal knowledge and some research.