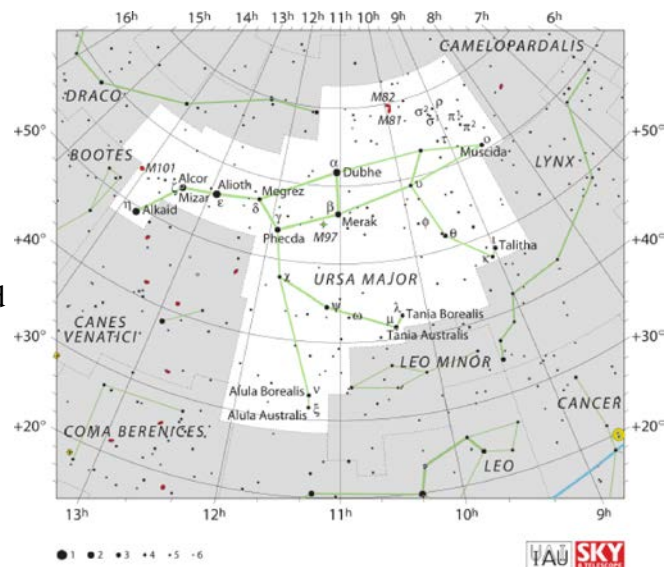


## CONSTELLATION URSA MAJOR, THE GREAT BEAR

Ursa Major (also known as the Great Bear) is a constellation in the northern celestial hemisphere. It was one of the 48 constellations listed by **Ptolemy** (second century AD), and remains one of the 88 modern constellations. It can be visible throughout the year in most of the northern hemisphere. Its name stands as a reference to and in direct contrast with Ursa Minor, "the smaller bear", with which it is frequently associated in mythology and amateur astronomy. The constellation's most recognizable asterism, a group of seven relatively bright stars commonly known as the "Big Dipper", "the Wagon" or "the Plough", both mimics the shape of the lesser bear (the "Little Dipper") and is commonly used as a navigational pointer towards the current northern pole star, Polaris in Ursa Minor.

The Big Dipper and the constellation as a whole have mythological significance in numerous world cultures, usually as a symbol of the north.

Being the third largest constellation in the night sky, with 1279.66 square degrees of surface area Ursa Major is home to many deep-sky objects including seven Messier objects, four other NGC objects and I Zwicky 18, the youngest known galaxy in the visible universe. The official constellation boundaries, set by **Eugène Delporte** in 1930, form a 28-sided irregular polygon. It is bordered by eight other constellations: Draco to the north and northeast, Boötes to the east, Canes Venatici to the east and southeast, Coma Berenices to the southeast, Leo and Leo Minor to the south, Lynx to the southwest and Camelopardalis to the northwest. The three-letter abbreviation for the constellation, as adopted by the International Astronomical Union in 1922, is 'UMa'.



The "Big Dipper" asterism within Ursa Major is made up of seven bright stars (six of them of the second magnitude or higher) that together comprises one of the best-known patterns in the sky. Like many of its common names allude to, its shape is said to resemble either a ladle, an agricultural plough or wagon. In the context of Ursa Major, they are commonly drawn to represent the hindquarters and tail of the Great Bear. Starting with the "ladle" portion of the dipper and extending clockwise (eastward in the sky) through the handle, these stars are the following:

$\alpha$  *Ursae Majoris*, known by the Arabic name Dubhe ("the bear"), which at a magnitude of 1.79 is the 35th brightest star in the sky and the second brightest of Ursa Major.

$\beta$  *Ursae Majoris*, called Merak ("the loins of the bear"), with a magnitude of 2.37. Merak and Dubhe are known as the "pointer stars" because they are helpful in finding Polaris, the North Pole Star. By visually tracing a line from Merak through Dubhe and continuing, one's eye will land on Polaris, accurately indicating true north.

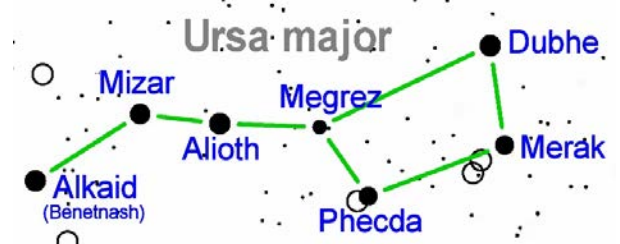
$\gamma$  *Ursae Majoris*, known as either Phecda or Phad ("thigh"), with a magnitude of 2.44.

$\delta$  *Ursae Majoris*, or Megrez, meaning "root of the tail," an appropriate name given its location as the intersection of the body and tail of the bear (or the ladle and handle of the dipper).

$\epsilon$  *Ursae Majoris*, known as Alioth, a name which refers not to a bear but to a "black horse." Alioth is the brightest star of Ursa Major and the 33rd brightest in the sky, with a magnitude of 1.76. It is also the brightest of the "peculiar Ap stars," magnetic stars whose chemical elements are either depleted or enhanced, and appear to change as the star rotates.

$\zeta$  *Ursae Majoris*, Mizar, the second star in from the end of the handle of the Big Dipper, and the constellation's fourth brightest star. Mizar, which means "girdle," forms a famous double star, with its optical companion Alcor (*80 Ursae Majoris*), the two of which were termed the "horse and rider" by the Arabs. The ability to resolve the two stars with the naked eye is often quoted as a test of eyesight, although even people with quite poor eyesight can see the two stars.

$\eta$  *Ursae Majoris*, known as either Alkaid or Benetnash, both meaning the "end of the tail." With a magnitude of 1.85, Alkaid is the third-brightest star of Ursa Major.



Except for Dubhe and Alkaid, the stars of the Big Dipper all have proper motions heading toward a common point in Sagittarius. Such stars have been identified, and together they are called the Ursa Major Moving Group.

Another asterism known as the "Three Leaps of the Gazelle" is recognized in Arab culture, a series of three pairs of stars found along the southern border of the constellation; From southeast to southwest, the "first leap", comprising Alula Borealis and Australis, the "second leap", comprising Tania Borealis and Australis; and the "third leap", comprising Talitha Borealis and Australis.

47 Ursae Majoris is a Sun-like star with a three-planet system. The star is of magnitude 5.0 and is approximately 46 light-years from Earth.

#### DEEP-SKY OBJECTS

Several bright galaxies are found in Ursa Major, including the pair Messier 81 (one of the brightest galaxies in the sky) and Messier 82 above the bear's head, and Pinwheel Galaxy (M101), a spiral northeast of 47 Ursae Majoris. The spiral galaxies Messier 108 and Messier 109 are also found in this constellation. The bright planetary nebula Owl Nebula (M97) can be found along the bottom of the bowl of the Big Dipper.

M81 is a nearly face-on spiral galaxy, 11.8 million light-years from Earth. Like most spiral galaxies, it has a core made up of old stars, with arms filled with young stars and nebulae. Along with M82, it is a part of the galaxy cluster closest to the Local Group.

M82 is a galaxy that is interacting gravitationally with M81. It is the brightest infrared galaxy in the sky. SN 2014J, an apparent Type Ia supernova, was observed in M82 on 21 January 2014. It is sometimes referred to as the Cigar Galaxy, remarkable for its bright blue disk, webs of shredded clouds, and fiery-looking plumes of glowing hydrogen blasting out of its central regions

M97, also called the Owl Nebula, is a planetary nebula 1,630 light-years from Earth; it has a magnitude of approximately 10. It was discovered in 1781 by **Pierre Méchain**.

M101, also called the Pinwheel Galaxy, is a face-on spiral galaxy located 25 million light-years from Earth. It was also discovered by Pierre Méchain in 1781. Its spiral arms have regions with extensive star formation and have strong ultraviolet emissions. It has an integrated magnitude of 7.5, making it visible in binoculars.

I Zwicky 18 is a young dwarf galaxy at a distance of 45 million light-years. The youngest known galaxy in the visible universe, I Zwicky 18 is about 4 million years old, about one-thousandth the age of the Solar System. It is filled with star forming regions which are creating many hot, young, blue stars at a very high rate.

#### HISTORY / MYTHOLOGY

Ursa Major is an Indo-European constellation. It is mentioned by such poets as Homer, Spenser, Shakespeare, Tennyson and Federico Garcia Lorca, the Finnish epic Kalevala mentions it and Vincent van Gogh painted it. It is referred to in the biblical book of Job, dated between the 7th and 4th century BC. An enduring puzzle concerning Ursa Major and its companion Ursa Minor is why they came to be regarded as bears when they do not look at all bear-like. Both of the celestial bears have long tails, which real bears do not, an anatomical oddity which the mythologists never explained. Thomas Hood, an English astronomical writer of the late 16th century, offered the tongue-in-cheek suggestion that the tails had become stretched when Zeus pulled the bears up into heaven. 'Other reason know I none', he added apologetically.

The ancient Greek poet **Aratus** (315-240 BC) said that the bear represents one of the two nymphs Adrasteia and Ida who raised Zeus in the cave of Dicte on Crete, where local people still proudly point out the supposed place of Zeus's birth. Rhea, his mother, had smuggled Zeus to Crete to escape Cronus, his father who had swallowed all his previous children at birth for fear that one day they would overthrow him – as Zeus eventually did. These nymphs looked after Zeus for a year, while warriors called the Curetes guarded the cave, clashing their spears against their shields to drown the baby's cries from the ears of Cronus. Adrasteia laid the infant Zeus in a cradle of gold and made for him a golden ball that left a fiery trail like a meteor when thrown into the air. Zeus drank the milk of the she-goat Amaltheia with his foster-brother Pan. Zeus later placed Amaltheia in the sky as the star Capella, while Adrasteia became the Great Bear.

