

= Taurus (constellation) =

Taurus (Latin for " the Bull " ; symbol : ♉ , Unicode : U+2649) is one of the constellations of the zodiac , which means it is crossed by the plane of the ecliptic . Taurus is a large and prominent constellation in the northern hemisphere 's winter sky . It is one of the oldest constellations , dating back to at least the Early Bronze Age when it marked the location of the Sun during the spring equinox . Its importance to the agricultural calendar influenced various bull figures in the mythologies of Ancient Sumer , Akkad , Assyria , Babylon , Egypt , Greece , and Rome .

A number of features exist that are of interest to astronomers . Taurus hosts two of the nearest open clusters to Earth , the Pleiades and the Hyades , both of which are visible to the naked eye . At first magnitude , the red giant Aldebaran is the brightest star in the constellation . In the northwest part of Taurus is the supernova remnant Messier 1 , more commonly known as the Crab Nebula . One of the closest regions of active star formation , the Taurus - Auriga complex , crosses into the northern part of the constellation . The variable star T Tauri is the prototype of a class of pre-main-sequence stars .

= = Characteristics = =

Taurus is a big and prominent constellation in the northern hemisphere 's winter sky , between Aries to the west and Gemini to the east ; to the north lie Perseus and Auriga , to the southeast Orion , to the south Eridanus , and to the southwest Cetus . In September and October , Taurus is visible in the evening along the eastern horizon . The most favorable time to observe Taurus in the night sky is during the months of December and January . By March and April , the constellation will appear to the west during the evening twilight .

This constellation forms part of the zodiac , and hence is intersected by the ecliptic . This circle across the celestial sphere forms the apparent path of the Sun as the Earth completes its annual orbit . As the orbital plane of the Moon and the planets lie near the ecliptic , they can usually be found in the constellation Taurus during some part of each year . The galactic plane of the Milky Way intersects the northeast corner of the constellation and the galactic anticenter is located near the border between Taurus and Auriga . Taurus is the only constellation crossed by all three of the galactic equator , celestial equator , and ecliptic . A ring-like galactic structure known as the Gould 's Belt passes through the Taurus constellation .

The recommended three-letter abbreviation for the constellation , as adopted by the International Astronomical Union in 1922 , is " Tau " . The official constellation boundaries , as set by Eugène Delporte in 1930 , are defined by a polygon of 26 segments . In the equatorial coordinate system , the right ascension coordinates of these borders lie between 03h 23.4m and 05h 53.3m , while the declination coordinates are between 31° and 1° . Because a small part of the constellation lies to the south of the celestial equator , this can not be a completely circumpolar constellation at any latitude .

= = Notable features = =

During November , the Taurid meteor shower appears to radiate from the general direction of this constellation . The Beta Taurid meteor shower occurs during the months of June and July in the daytime , and is normally observed using radio techniques . In October , between the 18th and the 29th , both the Northern Taurids and the Southern Taurids are active ; though the latter stream is stronger . However , between November 1 and 10 , the two streams equalize .

The brightest member of this constellation is Aldebaran , an orange-hued , spectral class K5 III giant star . Its name derives from *al-dabar* , Arabic for " the follower " , probably from the fact that it follows the Pleiades during the nightly motion of the celestial sphere across the sky . Forming the profile of a Bull 's face is a V or A-shaped asterism of stars . This outline is created by prominent members of the Hyades , the nearest distinct open star cluster after the Ursa Major Moving Group . In this profile , Aldebaran forms the bull 's bloodshot eye , which has been

described as " glaring menacingly at the hunter Orion " , a constellation that lies just to the southwest . The Hyades span about 5° of the sky , so that they can only be viewed in their entirety with binoculars or the unaided eye . It includes a naked eye double star , Theta Tauri , with a separation of 5.6 arcminutes .

In the northeastern quadrant of the Taurus constellation lie the Pleiades (M45) , one of the best known open clusters , easily visible to the naked eye . The seven most prominent stars in this cluster are at least visual magnitude six , and so the cluster is also named the " Seven Sisters " . However , many more stars are visible with even a modest telescope . Astronomers estimate that the cluster has approximately 500 to $1,000$ stars , all of which are around 100 million years old . However , they vary considerably in type . The Pleiades themselves are represented by large , bright stars ; also many small brown dwarfs and white dwarfs exist . The cluster is estimated to dissipate in another 250 million years . The Pleiades cluster is classified as a Shapley class c and Trumpler class I 3 r n cluster , indicating that it is irregularly shaped and loose , though concentrated at its center and detached from the star field .

In the northern part of the constellation to the northwest of the Pleiades lies the Crystal Ball Nebula , known by its catalogue designation of NGC 1514 . This planetary nebula is of historical interest following its discovery by German born English astronomer William Herschel in 1790 . Prior to that time , astronomers had assumed that nebulae were simply unresolved groups of stars . However , Herschel could clearly resolve a star at the center of the nebula that was surrounded by a nebulous cloud of some type . In 1864 , English astronomer William Huggins used the spectrum of this nebula to deduce that the nebula is a luminous gas , rather than stars .

To the west , the two horns of the bull are formed by Beta (β) Tauri and Zeta (ζ) Tauri ; two star systems that are separated by 8° . Beta is a white , spectral class B7 III giant star known as El Nath , which comes from the Arabic phrase " the butting " , as in butting by the horns of the bull . At magnitude 1.65 , it is the second brightest star in the constellation , and shares the border with the neighboring constellation of Auriga . As a result , it also bears the designation Gamma Aurigae . Zeta Tauri is an eclipsing binary star that completes an orbit every 133 days .

A degree to the northwest of ζ Tauri is the Crab Nebula (M1) , a supernova remnant . This expanding nebula was created by a Type II supernova explosion , which was seen from Earth on July 4 , 1054 . It was bright enough to be observed during the day , and is mentioned in Chinese historical texts . At its peak the supernova reached magnitude -4 , but the nebula is currently magnitude 8.4 and requires a telescope to observe . North American peoples also observed the supernova , as evidenced from a painting on a New Mexican canyon and various pieces of pottery that depict the event . However , the remnant itself was not discovered until 1731 , when John Bevis found it .

The star Lambda (λ) Tauri is an eclipsing binary star . This system consists of a spectral class B3 star being orbited by a less massive class A4 star . The plane of their orbit lies almost along the line of sight to the Earth . Every 3.953 days the system temporarily decreases in brightness by 1.1 magnitudes as the brighter star is partially eclipsed by the dimmer companion . The two stars are separated by only 0.1 astronomical units , so their shapes are modified by mutual tidal interaction . This results in a variation of their net magnitude throughout each orbit .

Located about 1.8° west of Epsilon (ϵ) Tauri is T Tauri , the prototype of a class of variable stars called T Tauri stars . This star undergoes erratic changes in luminosity , varying between magnitude 9 to 13 over a period of weeks or months . This is a newly formed stellar object that is just emerging from its envelope of gas and dust , but has not yet become a main sequence star . The surrounding reflection nebula NGC 1555 is illuminated by T Tauri , and thus is also variable in luminosity . To the north lies Kappa Tauri , a visual double star consisting of two A7 type components . The pair have a separation of just 5.6 arc minutes , making them a challenge to split with the naked eye .

This constellation includes part of the Taurus - Auriga complex , or Taurus dark clouds , a star forming region containing sparse , filamentary clouds of gas and dust . This spans a diameter of 98 light years (30 parsecs) and contains 35,000 solar masses of material , which is both larger and less massive than the Orion Nebula . At a distance of 490 light years (150

parsecs) , this is one of the nearest active star forming regions . Located in this region , about 10 ° to the northeast of Aldebaran , is an asterism NGC 1746 spanning a width of 45 arcminutes .

= = History and mythology = =

The identification of the constellation of Taurus with a bull is very old , certainly dating to the Chalcolithic , and perhaps even to the Upper Paleolithic . Michael Rappenglück of the University of Munich believes that Taurus is represented in a cave painting at the Hall of the Bulls in the caves at Lascaux (dated to roughly 15 @,@ 000 BC) , which he believes is accompanied by a depiction of the Pleiades . The name " seven sisters " has been used for the Pleiades in the languages of many cultures , including indigenous groups of Australia , North America and Siberia . This suggests that the name may have a common ancient origin .

Taurus marked the point of vernal (spring) equinox in the Chalcolithic and the Early Bronze Age , from about 4000 BC to 1700 BC , after which it moved into the neighboring constellation Aries . The Pleiades were closest to the Sun at vernal equinox around the 23rd century BC . In Babylonian astronomy , the constellation was listed in the MUL.APIN as GU4.AN.NA , " The Bull of Heaven " . As this constellation marked the vernal equinox , it was also the first constellation in the Babylonian zodiac and they described it as " The Bull in Front " . The Akkadian name was Alu .

In the Mesopotamian Epic of Gilgamesh , one of the earliest works of literature , the goddess Ishtar sends Taurus , the Bull of Heaven , to kill Gilgamesh for spurning her advances . Some locate Gilgamesh as the neighboring constellation of Orion , facing Taurus as if in combat , while others identify him with the sun whose rising on the equinox vanquishes the constellation . In early Mesopotamian art , the Bull of Heaven was closely associated with Inanna , the Sumerian goddess of sexual love , fertility , and warfare . One of the oldest depictions shows the bull standing before the goddess ' standard ; since it has 3 stars depicted on its back (the cuneiform sign for " star @-@ constellation ") , there is good reason to regard this as the constellation later known as Taurus .

The same iconic representation of the Heavenly Bull was depicted in the Dendera zodiac , an Egyptian bas @-@ relief carving in a ceiling that depicted the celestial hemisphere using a planisphere . In these ancient cultures , the orientation of the horns was portrayed as upward or backward . This differed from the later Greek depiction where the horns pointed forward . To the Egyptians , the constellation Taurus was a sacred bull that was associated with the renewal of life in spring . When the spring equinox entered Taurus , the constellation would become covered by the Sun in the western sky as spring began . This " sacrifice " led to the renewal of the land . To the early Hebrews , Taurus was the first constellation in their zodiac and consequently it was represented by the first letter in their alphabet , Aleph .

In Greek mythology , Taurus was identified with Zeus , who assumed the form of a magnificent white bull to abduct Europa , a legendary Phoenician princess . In illustrations of Greek mythology , only the front portion of this constellation are depicted ; this was sometimes explained as Taurus being partly submerged as he carried Europa out to sea . A second Greek myth portrays Taurus as Io , a mistress of Zeus . To hide his lover from his wife Hera , Zeus changed Io into the form of a heifer . Greek mythographer Acusilaus marks the bull Taurus as the same that formed the myth of the Cretan Bull , one of The Twelve Labors of Heracles .

Taurus became an important object of worship among the Druids . Their Tauric religious festival was held while the Sun passed through the constellation . Among the arctic people known as the Inuit , the constellation is called Sakiattiat and the Hyades is Nanurjuk , with the latter representing the spirit of the polar bear . Aldebaran represents the bear , with the remainder of the stars in the Hyades being dogs that are holding the beast at bay . In Buddhism , legends hold that Gautama Buddha was born when the Full Moon was in Vaisakha , or Taurus . Buddha 's birthday is celebrated with the Wesak Festival , or Ves?kha , which occurs on the first or second Full Moon when the Sun is in Taurus .

= = = Astrology = = =

As of 2008 , the Sun appears in the constellation Taurus from May 13 to June 21 . In tropical astrology , the Sun is considered to be in the sign Taurus from April 20 to May 20 .

= = = Space exploration = = =

The space probe Pioneer 10 is moving in the direction of this constellation , though it will not be nearing any of the stars in this constellation for many thousands of years , by which time its batteries will be long dead .

= = = Solar eclipse of May 29 , 1919 = = =

Several stars in Hyades cluster include Kappa Tauri were photographed during Solar eclipse of May 29 , 1919 by the expedition of Arthur Eddington in Príncipe and others in Sobral , Brazil that confirmed Albert Einstein 's prediction of the bending of light around the Sun from his general theory of relativity which he published in 1915 .

= = Book references = =