

## CONSTELLATION ANDROMEDA

Andromeda is one of the 48 constellations listed by the 2nd-century Greco-Roman astronomer **Ptolemy** and remains one of the 88 modern constellations. Its official boundaries were defined in 1930 by **Eugène Delporte** as a polygon of 36 segments. Located north of the celestial equator, it is named for Andromeda, daughter of Cassiopeia, in the Greek myth, who was chained to a rock to be eaten by the sea monster Cetus (see below). Andromeda is most prominent during autumn evenings in the Northern Hemisphere, along with several other constellations named for characters in the Perseus myth. Because of its northern declination, Andromeda is visible only north of 40° south latitude; for observers farther south it lies below the horizon. It is one of the largest constellations, with an area of 722 square degrees. This is over 1,400 times the size of the full moon, 55% of the size of the largest constellation, Hydra, and over 10 times the size of the smallest constellation, Crux.

### MAJOR STARS IN ANDROMEDA

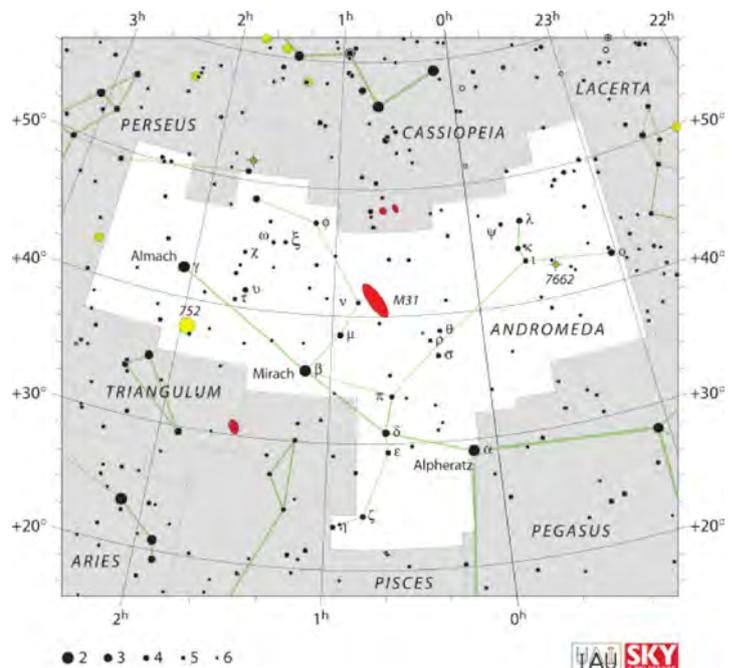
- *Alpha Andromedae*, known as Alpheratz, is the brightest star in Andromeda, sometimes also known as Sirrah. It lies 97 light years from Earth. Alpheratz is a binary star with an apparent visual magnitude of +2.06. It is a hot blue star classified as a B8 subgiant. Its mass is approximately 3.6 solar masses and its surface temperature is about 13,800K.
- With a luminosity 200 times that of the Sun, Alpheratz is the brightest mercury-manganese star known. The companion star is also more massive than the Sun and has a luminosity 10 times that of the Sun. The two stars orbit each other within a period of 96.7 days. Alpheratz is derived from the Arabic phrase *al surrat al-faras*, which means “the navel of the horse.” The horse refers to Pegasus.
- *Beta Andromedae*, known as Mirach, has roughly same apparent magnitude as Alpheratz, as it varies from +2.01 to +2.10. It is classified as a suspected semi-regular variable star. It is a cool, bright red class M giant, approximately 200 light years distant. It is 1,900 times more luminous than the Sun and 3-4 times more massive. It has a magnitude 14 hydrogen fusing star for a companion. Mirach is part of an asterism called the girdle. The name Mirach is a corrupted derivation from the Arabic word *mizar*, referring to the star’s placement at Andromeda’s left hip. Mirach lies only seven arc-minutes away from the galaxy NGC 404. The galaxy is sometimes called Mirach’s Ghost because its proximity to the star makes it difficult to observe.
- *Gamma Andromedae*, known as Almach is the third brightest star in the constellation and also another binary star. Its name derives from the Arabic *al-‘anaq al-‘ard*, which means the desert lynx. Almach is approximately 350 light years distant. The brighter component of Almach is a golden yellow giant, while the companion is blue. They lie approximately 10 arc seconds apart.

Some people see an immense Dipper asterid in following up Almach and Mirach to the Square of Pegasus, which far surpassing, in extent at least, the better-known Dippers around the pole.

### DEEP SKY OBJECTS

The constellation of Andromeda lies well away from the galactic plane, so it does not contain any of the open clusters or bright nebulae of the Milky Way. But it does contain many visible distant galaxies. The most famous is the spiral galaxy catalogued as Messier 31 (M31), colloquially as the Andromeda Galaxy.

- M31 is one of the most distant objects visible to the naked eye, 2.2 million light-years from Earth it is seen under a dark, transparent sky.



Andromeda Galaxy, Alpheratz and the Great Square of Pegasus



Mirach and NGC 404, The Ghost of Mirach



patch in the north of the constellation. M31 is the largest member of the Local Group of galaxies. In absolute terms, M31 is approximately 200,000 light-years in diameter, twice the size of the Milky Way. It is an enormous barred spiral galaxy similar in form to the Milky Way and at magnitude 3.5, is one of the brightest deep-sky objects in the northern sky. Despite being visible to the naked eye, the "little cloud" near Andromeda's figure was not recorded until AD 964, when the Arab astronomer **al-Sufi** wrote his Book of Fixed Stars. M31 was first observed telescopically by **Simon Marius** in 1612. M31 is often referred to as a twin sister to the Milky Way. The American astronomer **Edwin Hubble** included M31 (then known as the Andromeda Nebula) in his groundbreaking 1923 research on galaxies. Using the 100-inch Hooker Telescope at Mount Wilson Observatory in California, he observed Cepheid variable stars in M31 during a search for novae, allowing him to determine their distance by using the stars as standard candles. The futures of the Andromeda and Milky Way galaxies may be interlinked: in about five billion years, the two could merge and spark extensive new star formation.

- The Andromeda Galaxy has a total of 15 satellite galaxies, including M32 and M110. Nine of these lie in a plane, which has caused astronomers to infer that they have a common origin. These satellite galaxies, like the satellites of the Milky Way, tend to be older, gas-poor dwarf elliptical and dwarf spheroidal galaxies.
- NGC 891 (Caldwell 23), a smaller galaxy just east of Almach. It is a barred spiral galaxy seen edge-on, with a dark dust lane visible down the middle. NGC 891 was discovered by the brother-and-sister team of **William and Caroline Herschel** in August 1783. At magnitude of 9.9 this galaxy is at an approximate distance of 30 million light years from Earth.
- NGC 752 (Caldwell 28) is Andromeda's most celebrated open cluster. It is a loosely scattered cluster in the Milky Way with an overall magnitude of 5.7. It features approximately twelve bright stars, although more than 60 stars of approximately 9th magnitude become visible at low magnifications.
- NGC 7662 (Caldwell 22) is a prominent planetary nebula in Andromeda. Lying approximately three degrees southwest of *Iota Andromedae* at a distance of about 4,000 light-years from Earth, the "Blue Snowball Nebula" is a popular target for amateur astronomers. It earned its unique name because it appears as a faint, round, blue-green object in a telescope, with an overall magnitude of 9.2.

## MYTHOLOGY

The story of Perseus and Andromeda is perhaps the most enduring of all Greek myth. Its heroine is beautiful Andromeda, daughter of King Cepheus of Ethiopia and the vain Queen Cassiopeia. The troubles began when her mother claimed that she was more beautiful than the Nereids, sea nymph daughters of Poseidon. The affronted Nereids decided that Cassiopeia's vanity had finally gone too far and asked their father, the sea god, to teach her a lesson. In retribution, Poseidon sent a terrible monster (Cetus) to ravage the coast of King Cepheus's territory. With his subjects clamouring for action, the beleaguered Cepheus appealed to the Oracle of Ammon for a solution. He was told that he must sacrifice his virgin daughter Andromeda to appease the monster. The blameless Andromeda came to be chained to a rock to atone for the sins of her mother. As Andromeda stood on the wave-lashed cliffs at Joppa (Jaffa), the modern Tel-Aviv, pale with terror and weeping pitifully at her impending fate, the hero Perseus happened by on the flying horse Pegasus, fresh from his exploit of beheading Medusa, the Gorgon. His heart was captivated by the sight of the frail beauty in distress below. With a flutter of winged sandals Perseus hurls himself at the foe, driving home the weapon. The beast rises to meet him, rears its head, twisting out of the water and towers high in the air with all its bulk. Perseus strikes its head as it attacks. At last, its frame riddled with stabs, the beast's massive corpse disappears in the mighty ocean. Thus Perseus relieved the sea of a curse and the maiden became his prize and bride. Andromeda bore Perseus six children including Perses, ancestor of the Persians, and Gorgophonte, father of Tyndareus, king of Sparta.



Abd al-Rahman al-Sufi, 903- 986 was a Persian astronomer. Known as al-Sufi, he was one of the famous nine Muslim astronomers He translated and expanded Greek astronomical works, especially the *Almagest* of Ptolemy.

