

# Cepheus

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Cepheus is a northern constellation named after the mythical king of Aethiopia in Greek mythology. Positioned in the celestial northern hemisphere, it is recognizable for its distinctive shape resembling a house with a peaked roof. Cepheus is home to several notable deep-sky objects, including the famous variable star Delta Cephei, which gave its name to a class of pulsating stars known as Cepheid variables.

astronomy

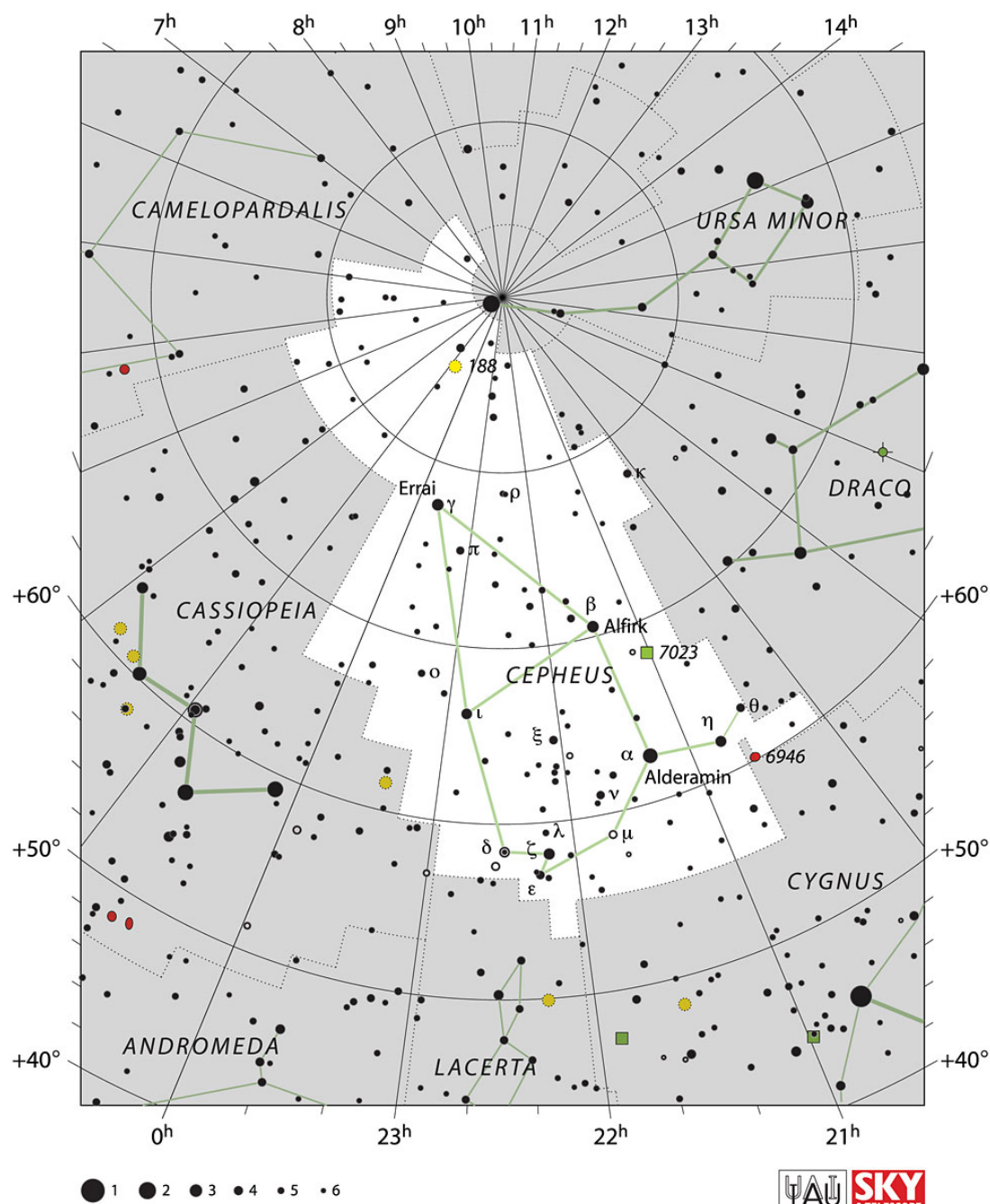
constellation

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## 1. Introduction

Cepheus, a constellation in the northern celestial hemisphere, holds significance in both astronomical study and mythological lore. Representing the mythical king of Aethiopia in Greek mythology, Cepheus is situated amidst a tapestry of stars, forming a distinct pattern resembling a house with a peaked roof. Its celestial coordinates place it in a prime position for observation from northern latitudes, allowing astronomers and stargazers to appreciate its celestial wonders. Characterized by its distinctive shape and prominent stars, Cepheus occupies an area of the night sky rich in deep-sky objects and stellar phenomena. The constellation is bordered by several other notable constellations, including Draco, Cassiopeia, and Cygnus, further enhancing its visibility and significance in the celestial panorama.

Cepheus is home to several notable stars, including Delta Cephei, a prototype of a class of variable stars known as Cepheid variables. These stars have played a crucial role in the field of astronomy, particularly in determining astronomical distances and understanding the structure of the universe. Celestial coordinates place Cepheus between approximately right ascension 21h and 3h, and declination between approximately  $+57^\circ$  and  $+85^\circ$  (**Figure 1**). Its proximity to the celestial north pole makes it a circumpolar constellation for observers in the northern hemisphere, meaning it never sets below the horizon and can be observed throughout the year.



**Figure 1.** IAU chart of Cepheus. Source: <https://www.iau.org/static/archives/images/screen/cep.jpg>. Credit: IAU and Sky & Telescope. Reproduced under CC BY 4.0 license.

## 2. Historical Background and Mythology

In Greek mythology, Cepheus is often associated with the mythical king of Aethiopia, a character known for his lineage, exploits, and tragic fate. According to Greek myth, Cepheus was the husband of Cassiopeia and the father of Andromeda. The family's story is intertwined with hubris, heroism, and divine punishment. Cassiopeia, known for her vanity and arrogance, boasted that she and her daughter were more beautiful than the sea nymphs known as

the Nereids. In retaliation, Poseidon, the god of the sea, sent a sea monster to terrorize the kingdom of Aethiopia as punishment for Cassiopeia's arrogance. To appease the enraged Poseidon, Cepheus and Cassiopeia were forced to sacrifice their daughter, Andromeda, to the sea monster. However, Perseus, the legendary Greek hero, arrived in time to rescue Andromeda from her fate. Perseus slayed the sea monster and saved Andromeda, eventually marrying her and elevating her to the status of a constellation in the night sky.

In some versions of the myth, Cepheus and Cassiopeia are also placed among the stars as constellations, forever immortalized in the celestial realm. Cepheus is often depicted as a regal figure holding a scepter or wearing a crown, symbolizing his status as a king.

Outside of Greek mythology, Cepheus has been recognized and named by various ancient cultures, each interpreting the constellation through their own myths and legends. In Arab astronomy, Cepheus was associated with the figure of Al Kawakib, the father of the Northern Crown. In Chinese astronomy, the stars of Cepheus were part of several asterisms, including the "Celestial Kitchen" and the "Three Stars of the Roof."

Overall, the mythological significance of Cepheus as the king of Aethiopia and the father of Andromeda adds depth and intrigue to this constellation, inviting observers to contemplate the enduring themes of heroism, sacrifice, and the triumph of good over evil as they gaze upon the stars in the northern sky.

### 3. Notable Stars

**Delta Cephei (δ Cephei):** Delta Cephei is perhaps the most famous star in Cepheus, renowned for its significance in the study of variable stars. It is the prototype of a class of pulsating stars known as Cepheid variables, which are used as standard candles for measuring astronomical distances. Delta Cephei varies regularly in brightness over a period of approximately 5.4 days, transitioning between its maximum and minimum brightness with remarkable predictability. Its variability has made it invaluable for calibrating the cosmic distance ladder and determining the scale of the universe.

**Mu Cephei (μ Cephei) - Herschel's Garnet Star:** Mu Cephei, also known as Herschel's Garnet Star or simply "the Garnet Star," is a red supergiant located in Cepheus. It is one of the largest and most luminous stars visible to the naked eye, with a distinctive deep red hue that resembles the color of a garnet gemstone. Mu Cephei's immense size and brightness make it a popular target for amateur astronomers, particularly those interested in observing and photographing rare and unique celestial objects.

**Alderamin (α Cephei):** Alderamin is a bright star located near the border between Cepheus and Cassiopeia. It is classified as a main-sequence star of spectral type A7V, indicating that it is a relatively young and hot star. Alderamin is notable for its rapid rotation, completing a full rotation on its axis in less than a day. This high rotation rate causes Alderamin to exhibit oblate spheroid shape, with its equatorial diameter significantly larger than its polar diameter. As one of the brightest stars in Cepheus, Alderamin serves as a prominent marker in the night sky and a point of interest for observers and navigators.

## **4. Deep-Sky Objects**

**NGC 188:** NGC 188 is a prominent open star cluster located approximately 5,000 light-years away from Earth. It is one of the oldest known open clusters in the Milky Way galaxy, with an estimated age of around 6.8 billion years. NGC 188 contains hundreds of stars, ranging in age and spectral type, making it a valuable object for studies of stellar evolution and galactic dynamics.

**NGC 7538:** NGC 7538 is a massive star-forming region located in the Perseus-Cepheus molecular cloud complex. It is home to numerous young, massive stars, as well as protostellar objects in various stages of formation. NGC 7538 is associated with intense star formation activity, with ongoing processes of gas accretion, stellar birth, and outflow phenomena. It is a popular target for studies of star formation and the interstellar medium.

**NGC 7023 - The Iris Nebula:** NGC 7023, also known as the Iris Nebula, is a reflection nebula located approximately 1,300 light-years away from Earth. It is illuminated by the embedded star HD 200775, which ionizes the surrounding gas and dust, causing it to emit a faint blue glow. The Iris Nebula derives its name from its distinctive shape, which resembles the iris of an eye when viewed in certain images. It is a favorite target for astrophotographers due to its intricate structure and beautiful colors.

**NGC 6946 - The Fireworks Galaxy:** NGC 6946, also known as the Fireworks Galaxy, is a spiral galaxy located approximately 22 million light-years away from Earth. It is notable for its high rate of supernova activity, earning it the nickname "the Fireworks Galaxy." NGC 6946 has experienced ten recorded supernovae in the past century, making it one of the most prolific supernova factories known. Its active star formation and supernova activity make it an important object for studies of galaxy evolution and stellar death.

**Sh2-155 - The Cave Nebula:** Sh2-155, also known as the Cave Nebula, is a diffuse emission nebula located approximately 2,400 light-years away from Earth. It is illuminated by the young, massive star HD 217086, which ionizes the surrounding hydrogen gas, causing it to emit a red glow. The Cave Nebula derives its name from its intricate structure, which resembles a cave or cavern when viewed in certain images. It is a popular target for amateur astronomers and astrophotographers due to its striking appearance and proximity to other celestial objects in the region.

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