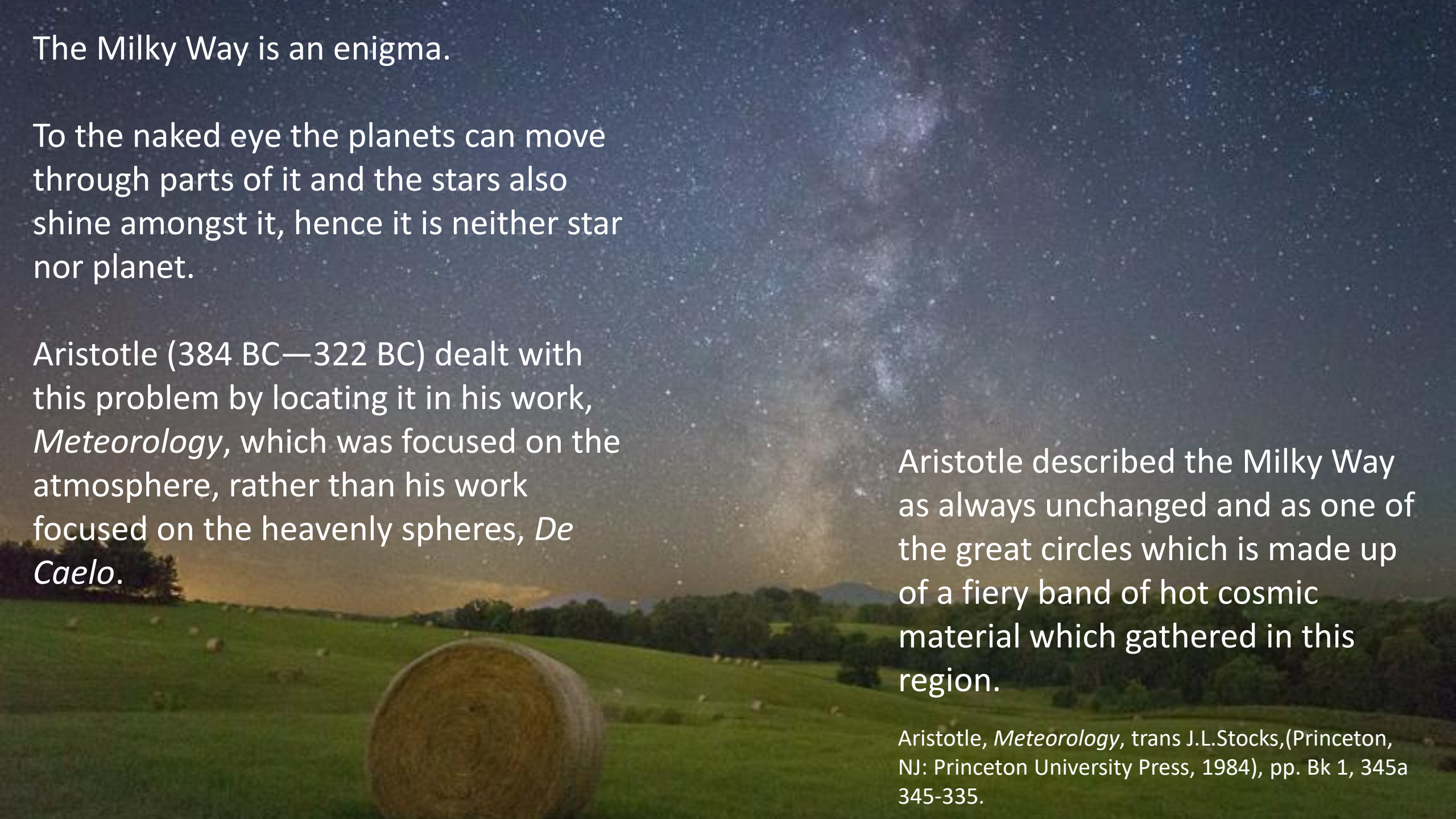




Milky Way

Bernadette Brady



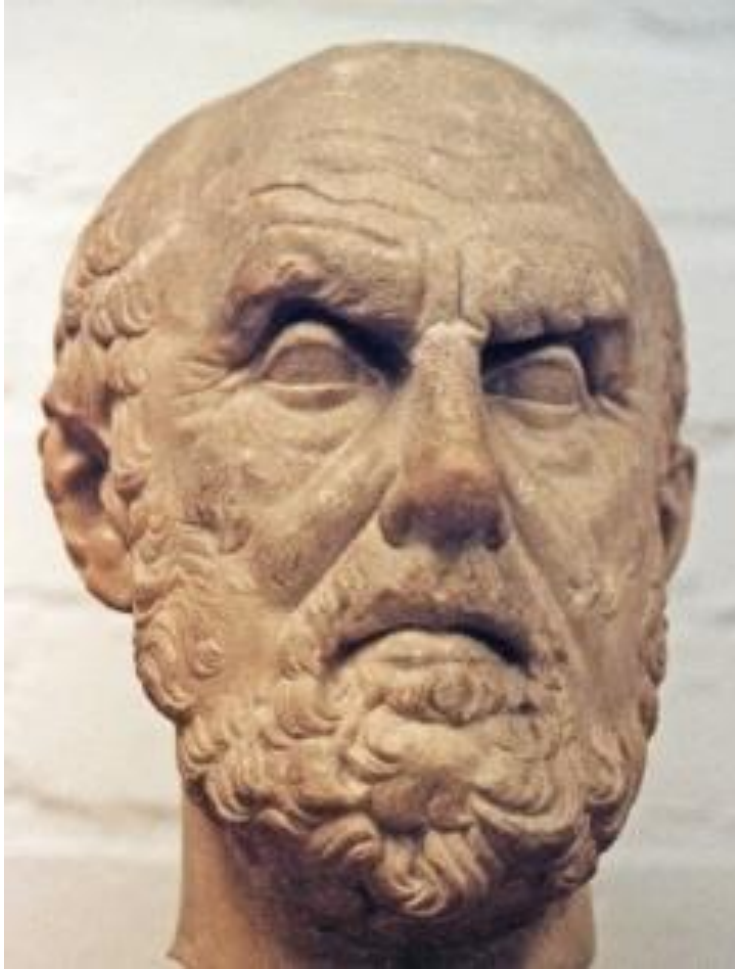
The Milky Way is an enigma.

To the naked eye the planets can move through parts of it and the stars also shine amongst it, hence it is neither star nor planet.

Aristotle (384 BC—322 BC) dealt with this problem by locating it in his work, *Meteorology*, which was focused on the atmosphere, rather than his work focused on the heavenly spheres, *De Caelo*.

Aristotle described the Milky Way as always unchanged and as one of the great circles which is made up of a fiery band of hot cosmic material which gathered in this region.

Aristotle, *Meteorology*, trans J.L.Stocks,(Princeton, NJ: Princeton University Press, 1984), pp. Bk 1, 345a 345-335.

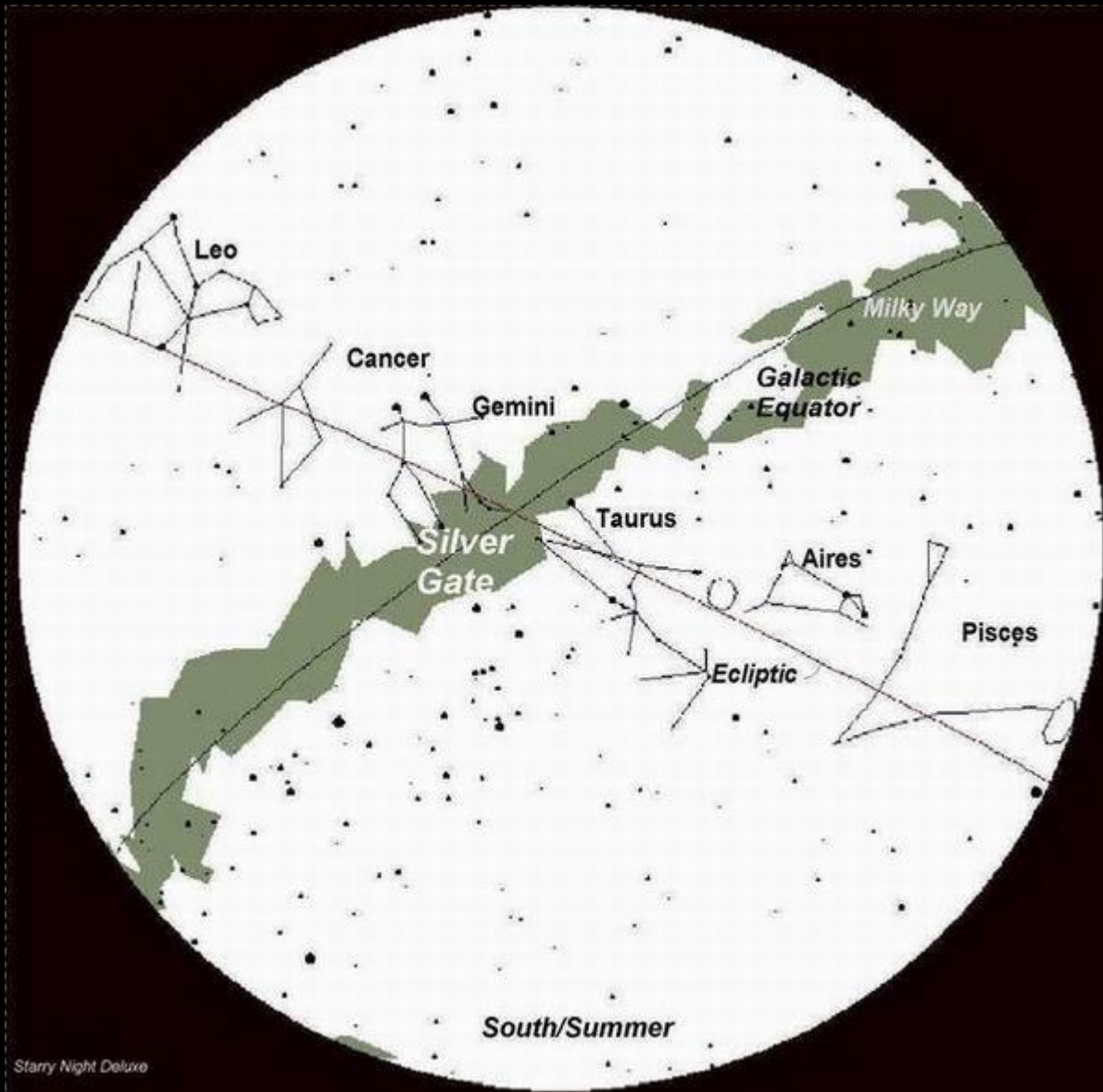


Aratus (ca. 315 BC—240BC) waxed about the Milky Way's ability on a moonless night to bring a person to a state of 'awestruck beneath a sky-dividing belt embossed with brightness'.

Aratus saw the Milky Way also as one of the great circles and wrote that,

'This belt outshines the other four. Though two match its diameter, [the equator and the ecliptic] the other two [Tropic of Capricorn and Cancer] are smaller.'

Aratus, *Phaenomena*, trans Aaron Poochigian, (Baltimore, USA: John Hopkins University Press, 2010), pp. 490 - 499.

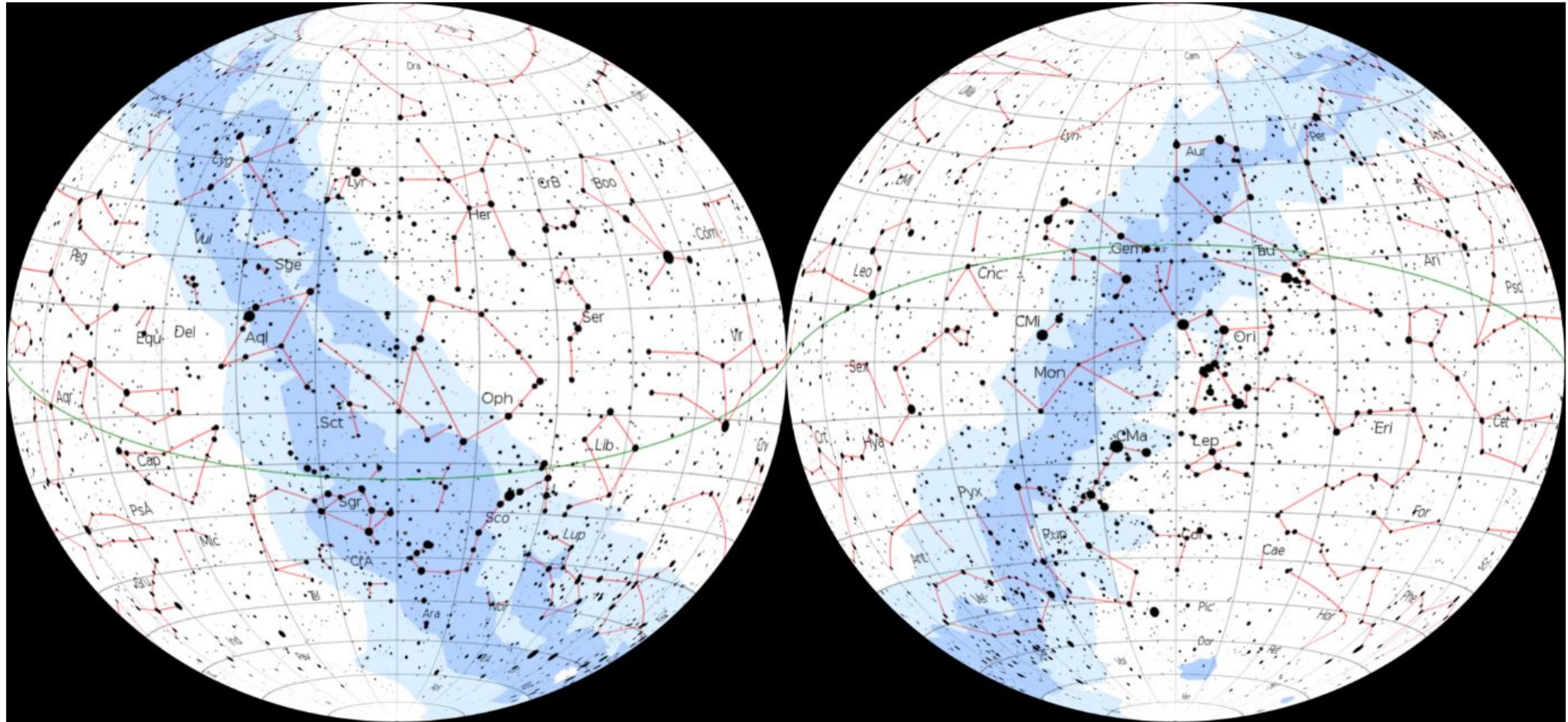


The Milky Way, the galaxy to which our solar system belongs, appears as a visible cloud of white with patches of darkness that divides the night sky roughly into two hemispheres. The centre of the galaxy is located in the constellation Sagittarius, the brightest part of the Milky Way, and its anticenter is in Auriga, the charioteer.

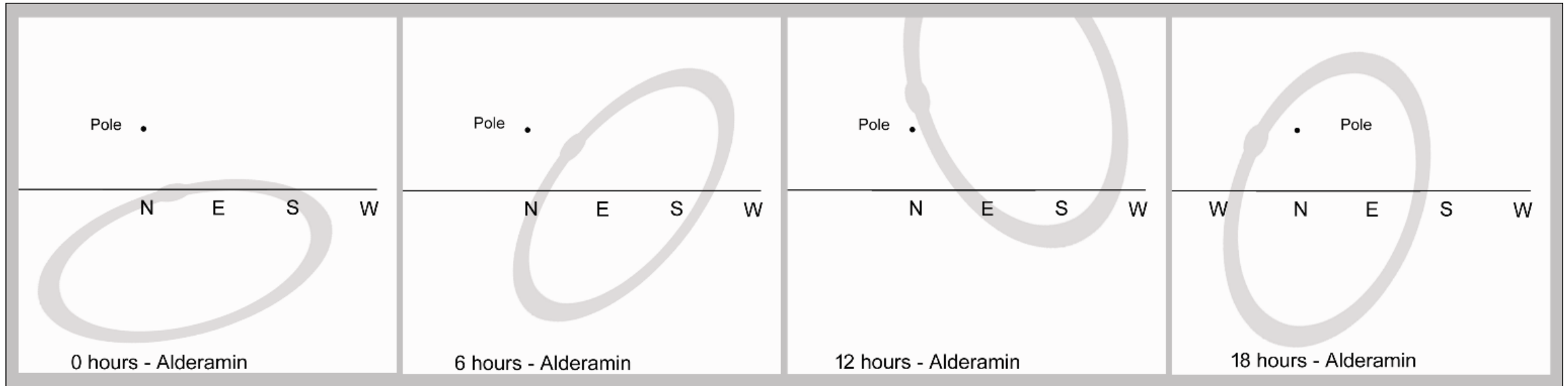


As a great circle, it is inclined about 60° to the ecliptic and touches around thirty constellations.

The Milky Way moves past Orion and then southward to the Argo, the great ship in the south. From the Argo, its path turns north and runs through the tail of Scorpio cutting the ecliptic in the constellation Sagittarius. From there it continues north to move through Ophiuchus, Cygnus and Aquila touching Cassiopeia and Cepheus. From Cassiopeia, it moves back towards the south and runs through Auriga, down past the horns of Taurus and cuts the ecliptic again at the feet of the constellation Gemini just above the club of Orion.



Because of its high inclination to the ecliptic, depending on the time of night and the season, the arc of the Milky Way through the night sky can appear low on the horizon or high in the sky.



The orbit of the star Alderamin in Cepheus, shown as the smaller circle on band of the Milky Way (grey band), for a latitude of 30° North. Following the path of Alderamin's orbit demonstrates how the band of the Milky Way moves against the horizon.

In the night sky, the whole band of the Milky Way will, like all heavenly objects be seen to orbit around the pole producing the effect of an off-centred circle moving from one side of the pole to the other. Consequently, its range of rising or setting azimuths will embrace a wide arc along the horizon which vary based on the latitude.

For a given latitude the stars rising or the stars setting that offer this visual will be consistent. For example, at a latitude of 30° North when the stars around Canis Major are rising, such as Sirius, Procyon, Betelgeuse, then the Milky Way will be at roughly 90° to the horizon.

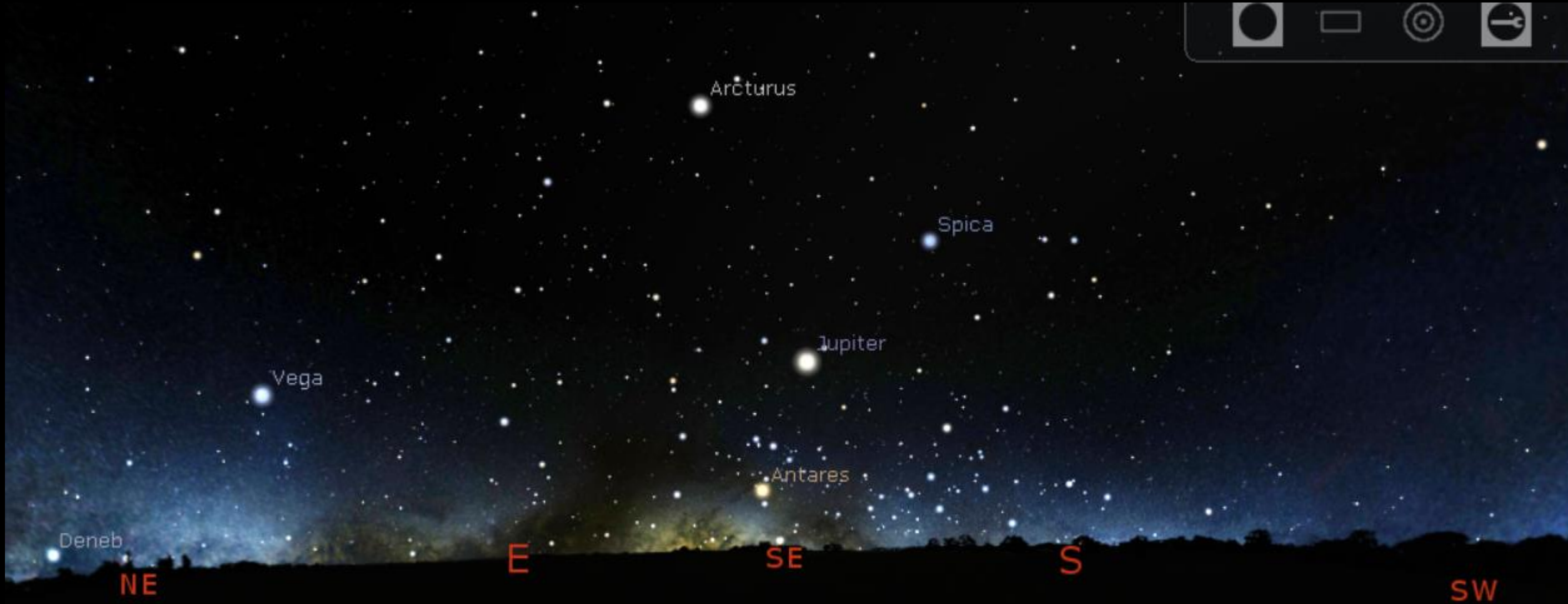


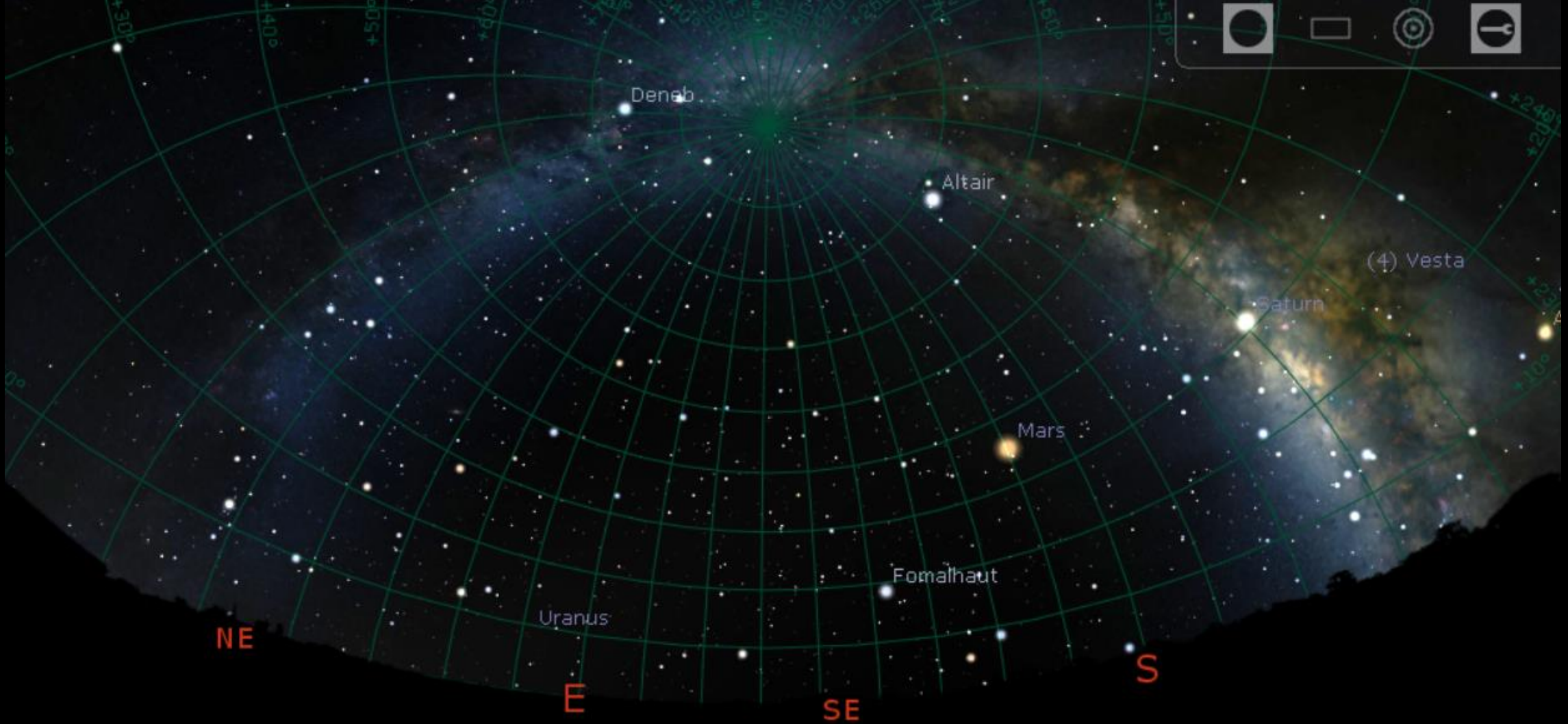
When Cygnus is setting with its bright star Deneb the Milky Way will be seen 'standing' on the western horizon.

Thus the Milky Way can 'stand' upright rising out of the horizon 90° into the night sky in both the east and the west.



When Vega rises the Milky Way lies flat upon the horizon





Zenith: For observers from approximately 65° degrees north to 65° south the Milky Way can be seen to pass through the zenith.



Milky Way is not a homogeneous band and thus in working with its appearance for any time and place it is more useful to consider the Milky Way as a series of long narrow 'constellations' with different visual appearances that will engage with a landscape in a consistent manner.

In the first century CE, **Claudius Ptolemy** recorded his observations of the Milky Way, providing an insight as to its level of visibility at that time. In the *Almagest*, he introduced the Milky Way by stating that **‘with our observations of each of its [the Milky Way] sections we shall try to describe the form which the individual parts appear to take.’**

He then plotted the Milky Way against the stars, defining what stars were in the milk and which stood just outside of its path. In writing about what is now known to be the galactic centre Ptolemy wrote,

‘the northern part of the milk encloses the three joints before the sting of Scorpius... while the southern rim touches the star in the right front hock of Sagittarius’

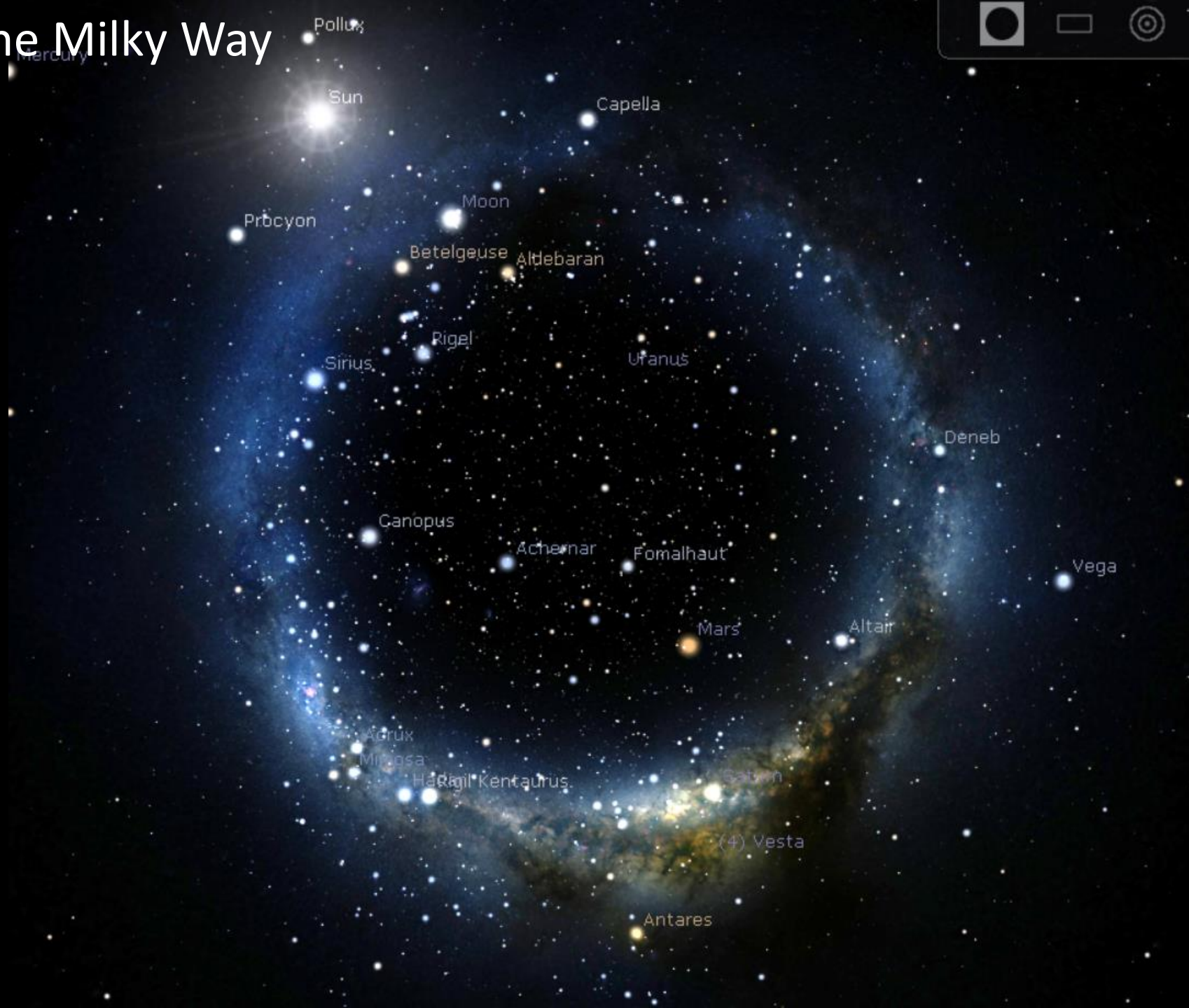
Ptolemy describes the milk as:

‘very dense indeed and appears smoky.’ While in other places as in the area around Argo he describes the milk as **‘somewhat rarefied’.**

Claudius Ptolemy, *Ptolemy's Almagest*, trans G.J. Toomer, (New Jersey, USA: Princeton University Press, 1998), p. VIII 2. H170.

Ptolemy, *Ptolemy's Almagest*, p. BK VIII 2. H172.

Ptolemy, *Ptolemy's Almagest*, p. BK VIII 2. H170 - H179.





The Dark or Great Rift, this is the large bulging part of the Milky Way that looks like a dark lane or pathway that divides the Milky Way into two. It runs for about one third of the entire length of the Milky Way.

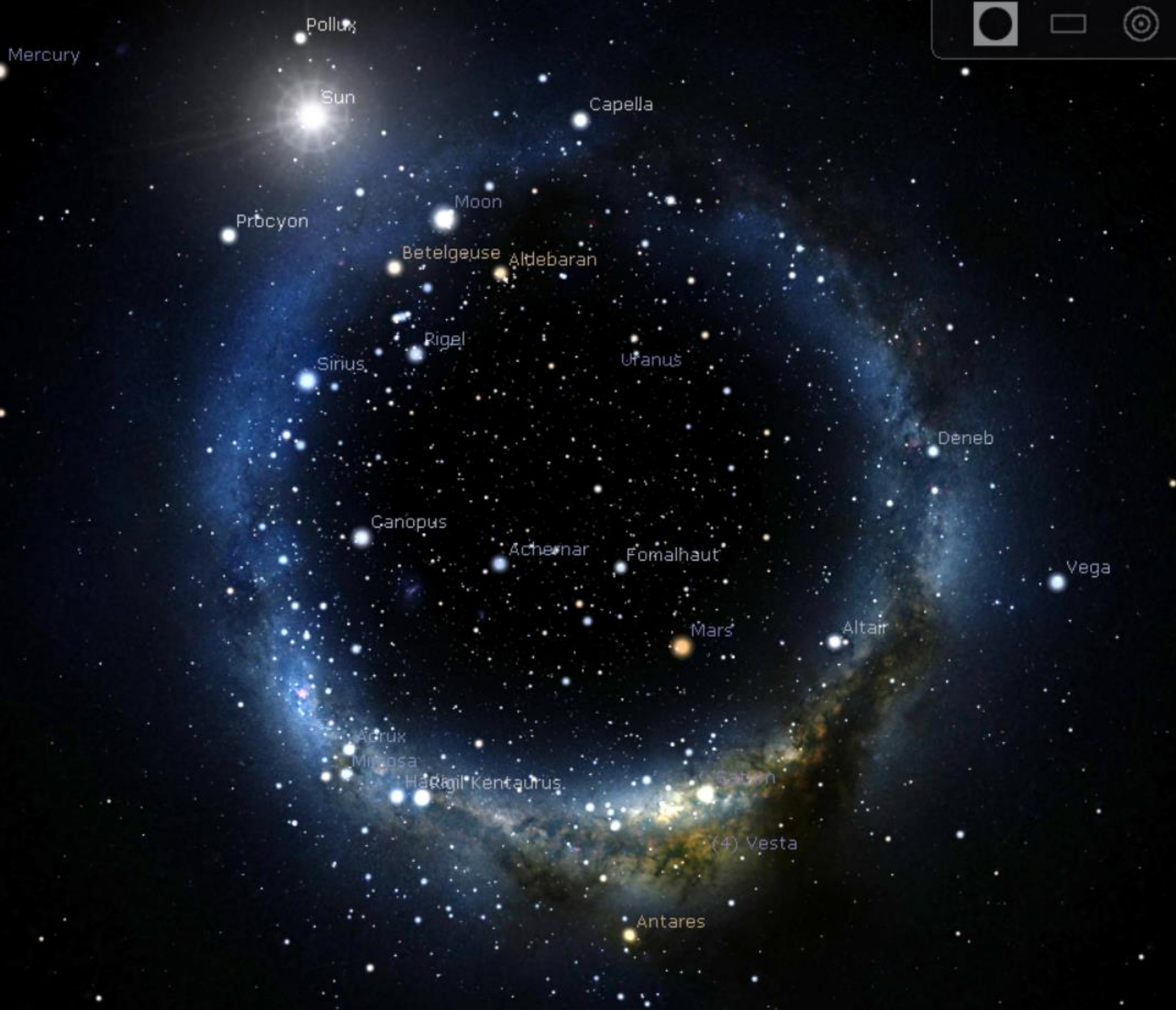
In considering it from north to south, it begins with a clear visual split of two roughly parallel milky lines **starting at the constellation Cygnus**. The western line runs through Aquila and the eastern line moves through Serpens near Ophiuchus. It then merges together in the **bow of Sagittarius and the tail of Scorpio**.

As it passes over the **legs of Centaurus**, it becomes a less well defined cloudy mass with black gaps and finally becoming a somewhat clear band around the area of the Southern Cross.

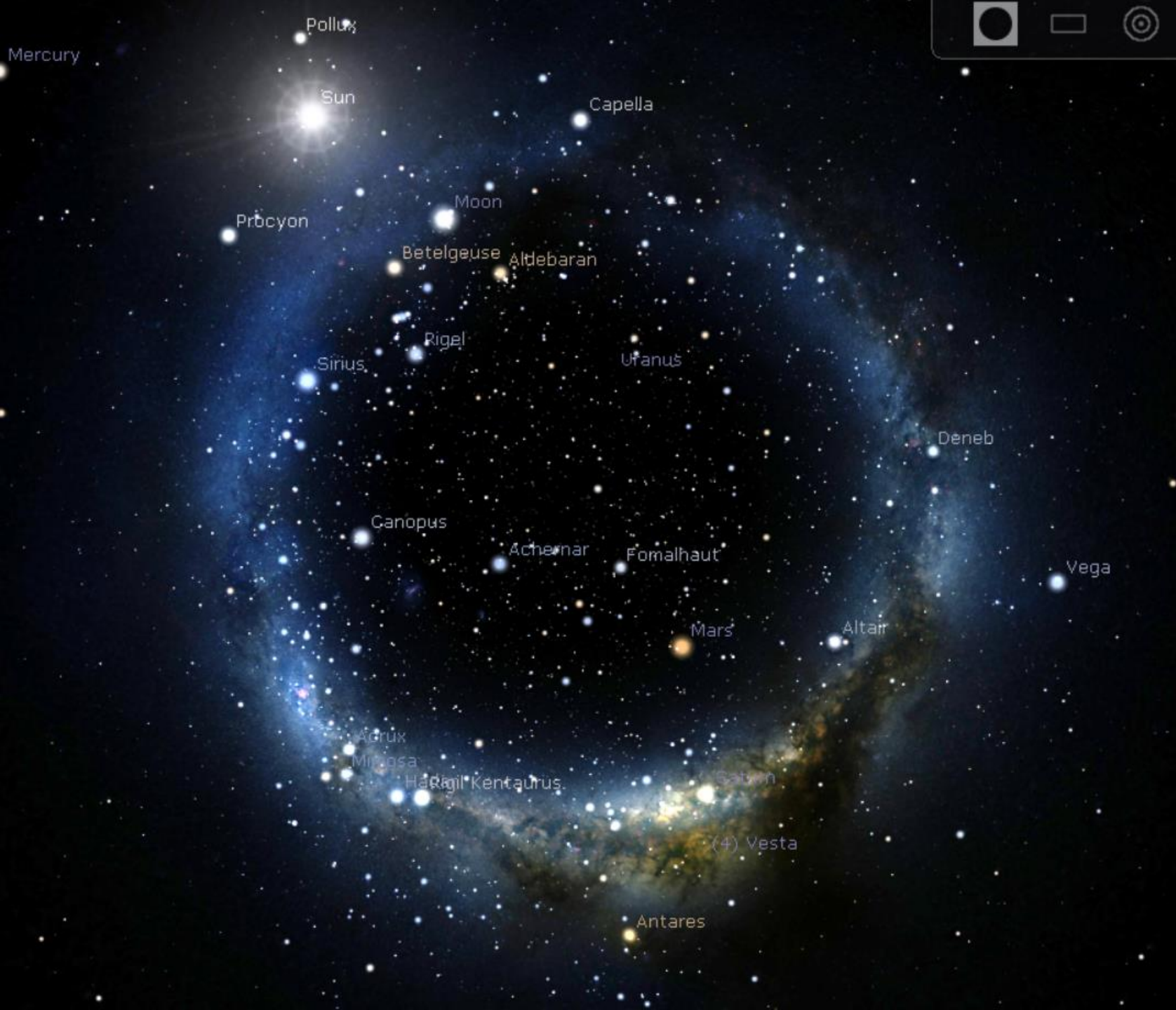
According to Ptolemy viewing it in first century skies, the milky edges next to the Dark Rift are dense.



The Dark Rift:
Stands in the west
when Antares is
setting.



The **dense milky section** without the Dark Rift starts just after Auriga and runs from the feet of Gemini, through the area between Canis Major with its bright star Sirius, and Orion, touching on his club. From there it moves down to the keel of the Argo and then into the legs of the Centaurus onto the stars of the Southern Cross where the density of the milk phenomena begins to increase as the Dark Rift begins



The **opaque or fainter band** begins north of Cygnus and moves onwards to Cepheus. At its most northern point as it runs through Cassiopeia, it then turns south and moves through Perseus and Auriga.

Considering the Milky Way appearance for pre-dawn at 40° North for 2000 BCE.

- a) At the summer solstice, the dense milky section of the Milky Way stood upright on the horizon around due East
- b) From this point every morning before dawn, the Milky Way's place of rising moves past due East towards the south. Additionally, it appears to slowly lower itself down to the horizon.
- c) Finally, around the winter solstice the section of the Great Rift floods the horizon just before dawn. After the winter solstice, the Milky Way will slowly appear to rise higher in the sky from one dawn to the next.
- d) By the time of the equinoxes the Milk Way, at pre-dawn, produces the visual of an arc, high in the sky from the north east to the south west.



The Milky Way can contain many mythical images. The Dark Rift for example can be seen as individual animal deities which at key times of the year will rise up out of the landscape or lie upon the horizon. An example of this is that of the first Australians, where the dark area of the rift was the Emu or the Big Red Kangaroo, and also the Rainbow Serpent. While another example is that of the Inca's in South America who considered the Dark Rift as the Llama, the Toad and the Snake.



Hugh Cairns and Bill Yidumduma Harney, *Dark Sparklers, Yidumduma's Aboriginal Astronomy*, Merimbula, Australia: H.C.Cairns, 2003), pp. 90-92.

Gary Urton, *At the Crossroads of the Earth and the Sky : an Andean Cosmology*, Austin: University of Texas Press, 1981), pp. 169-191.

The Milky Way and Theology

For the Egyptians of the Old Kingdom the earth was masculine (*t3*) and the sky was feminine (*pt*). The earth was personified by the god Geb while that of the sky was personified by the goddess Nut, the full sky by day and by night. As the sky goddess, Nut was a instrumentally figure in the successful journey of the deceased king's soul back to the stars. She had many different manifestations.

One of her titles was She of a Thousand Bas (*h3-b3.s*) where the 'Thousand Bas' are the stars of the night sky. But also the king's sarcophagus was considered her womb in which he was reborn. She was also known as Shetpet, 'Nut has spread herself over you in her identity of Shetpet'. Where Shetpet was the white salt, natron, used to cover the body of the king in the mummification process.



Allen, *The ancient Egyptian pyramid texts*, p. 441.

Allen, *The ancient Egyptian pyramid texts*, p. 73. Teti, Rec. 145

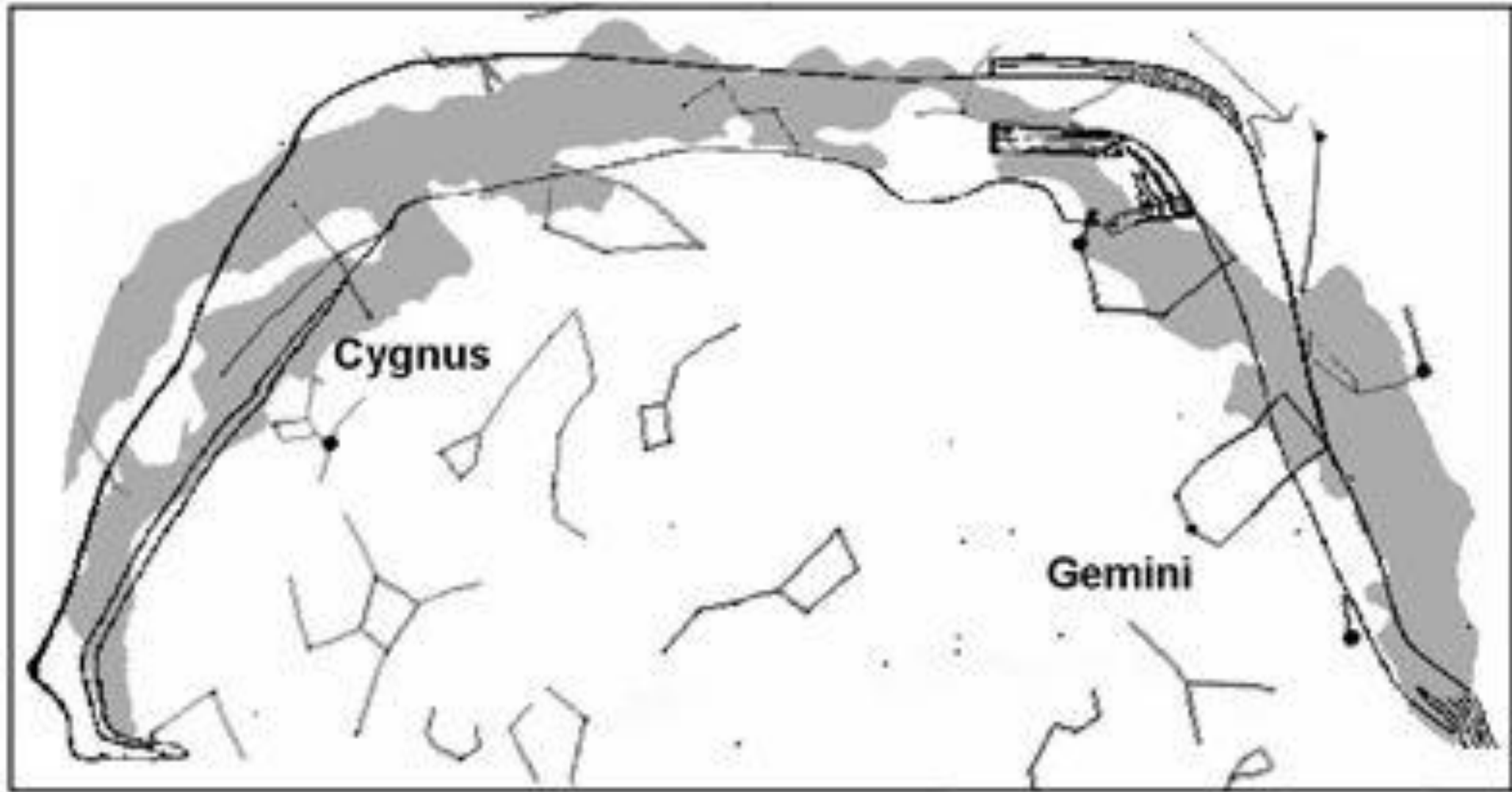
Nut is both the gate of the sky and the ladder into the sky. One recitation proclaims,

‘The sky’s door has been opened, Nut’s door has been pulled open’. And, ‘this Pepi shall go thereby to his mother Nut and Pepi shall ascend on her in her identity of the ladder.’

Allen, *The ancient Egyptian pyramid texts*, p. 116. Pepi's tomb, Rec. 275

Allen, *The ancient Egyptian pyramid texts*, p. 128. Pepi, Rec. 325





Thus Nut is feminine, white and belongs to the sky. Her actions are that she can lay down upon the earth as she lays upon the body of the pharaoh, but also rise up into the sky acting as a pathway to the stars or a ladder into the heavens for the use of the ascent of the soul. For these reasons, it is easy to accept that in the Pyramid Text that one (but not the only one) of the guises of Nut is the personification of the Milky Way.

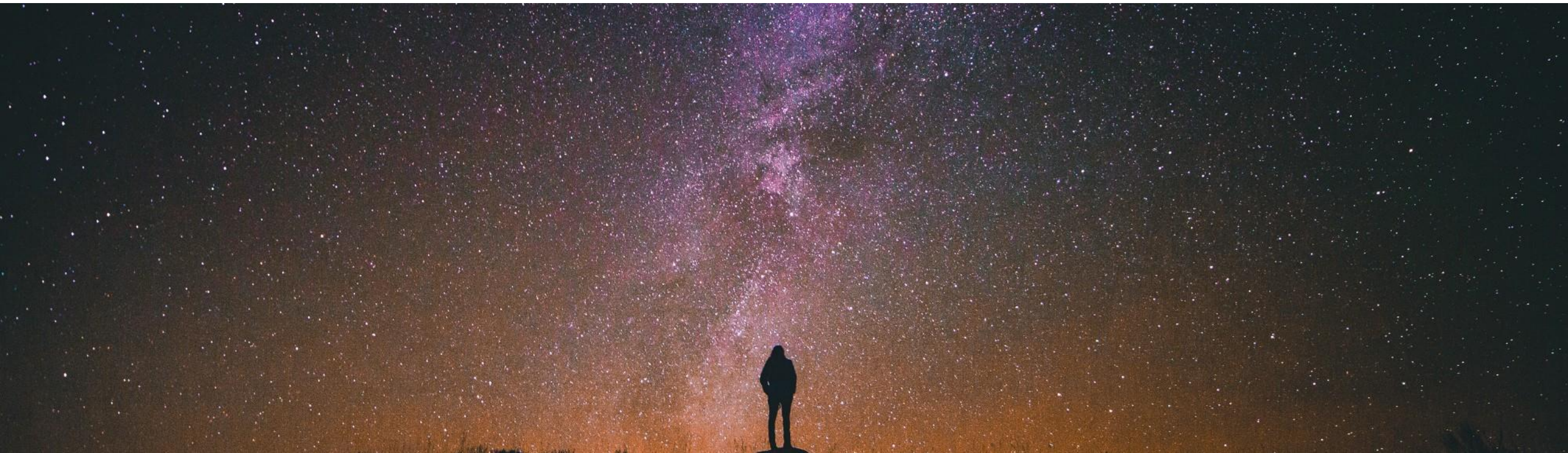


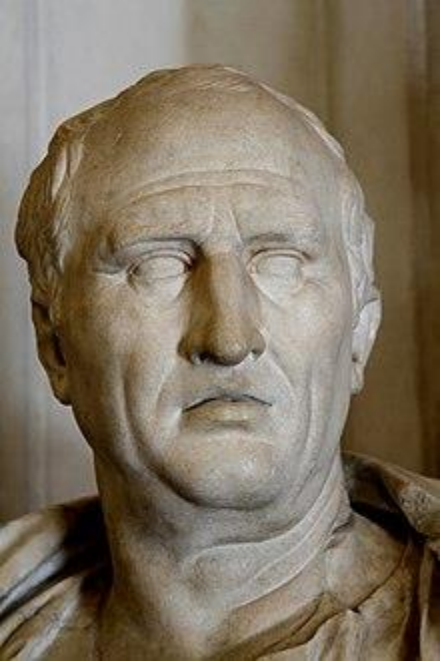
There is also a hint of the Egyptian name for the Great or Dark Rift for the text state that the king is suckled by two black cows. One recitation states, 'Pepi will suck on the milk of the two black cows, the nurses.' A similar text is also given for Teti, (Rec 10). These two black cows are distinct from the deity of the Wild Cow (the king's divine mother) and are in fact later slaughtered at the Supply festival, to be able to continue to nurture the king (Pepi, Rec 372). With the Dark Rift being black parts of the starry sky, which are surrounded by the dense white milk sections it is possible that this was the Egyptian name for the rift.

Allen, *The ancient Egyptian pyramid texts*, p. 136. Pepi, Rec 347

The Egyptian association of the Milky Way with departing souls moved into Greek thought who called it Γαλαξίας, Galaxias, a name derived from the word γάλα, gala, milk. Later the Romans called it the *via Lactea*, the Road of Milk.

In both the Greek and the Roman view the Milky Way maintained its divine association with the departing soul.





Marcus Cicero (106 BC—43 BC), featured the Milky Way in his *Dream of Scipio* where Scipio's departing soul travels towards the Milky Way as the place of residence of men's souls. Scipio's is told that those who defend their country have a 'special place prepared for them in the heavens, where they may enjoy an eternal life of happiness'. Scipio is told in the dream that man 'has been given a soul out of those eternal fires which you call stars and planets' (line XV) but after leading a good life that,

“Such a life is the road to the skies, to that gathering of those who have completed their earthly lives and been relieved of the body, and who live in yonder place which you now see” (it was the circle of light which blazed most brightly among the other fires), “and which you on earth, borrowing a Greek term, call the Milk Circle.”

Marcus Tullius Cicero, *De Re Publica. De Legibus* trans Clinton Walker Keyes, (Harvard University Press, 1988), pp. BK VI, XVI.
Cicero, *De Re Publica. De Legibus* p. BK VI, IX, XIII.
Cicero, *De Re Publica. De Legibus* p. BK VI, IX, XV-XVI.

Macrobius (fl. 400) in his commentary on the dream of Scipio recounted the varying opinions about the nature of the Milky Way, one of which was put forward by Democritus (460 BC-- c.370 BC) who, according to Macrobius, considered it as 'countless stars, all of them small, had been compressed into a mass by their narrow confines, so that the scanty spaces lying between them were concealed.' However, he acknowledged that the prevailing opinion was that the Milky way was,

'a stream of stellar heat which crosses the zodiac obliquely; inasmuch as the sun never passes beyond the boundaries of the zodiac and has left the remaining portion of the sky without a share in its heat, the purpose of the Milky Way, lying athwart the part of the sun, is to temper the universe with its warmth.'

Ambrosius Aurelius Theodosius Macrobius and William Harris Stahl, *Commentary on the dream of Scipio*, New York: Columbia University Press, 1952), p. 149.

Macrobius and Stahl, *Commentary on the dream of Scipio*, p. 149-150.

The Modern World - The case of
the missing Milky Way



Galileo Galilei (1564-1642) showed that the Milky Way was indeed made up of millions of stars. The implications of this however were left unexplored.

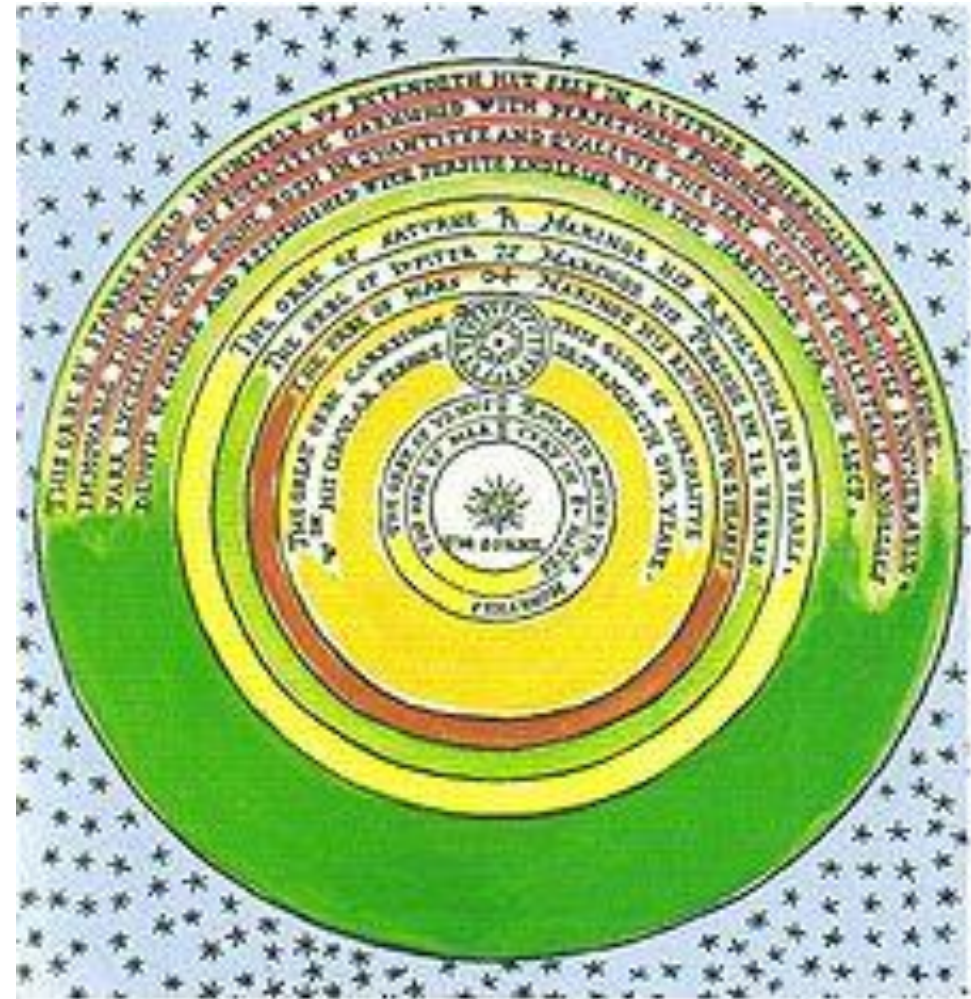
Stanley Jaki suggested that this ignoring of the implications of the Milky Way was because, at least in the case of Giordano Bruno, it challenged the Christian Platonist view of the cosmos of being homogeneous and infinite.

This desire for a harmonious universe was also, according to Jaki, the motivation behind René Descartes' cosmological views published in *Principia* in 1644, where he claimed that his view of the nature of the cosmos correspond to its actual appearance **yet he ignored the presence of a major sky phenomena, the Milky Way.**

Stanley L Jaki, 'The Milky Way before Galileo', *Journal for the History of Astronomy*, ii (1971), 161-167, 165.

Stanley L Jaki, 'The Milky Way from Galileo to Wright', *Journal for the History of Astronomy*, iii (1972), 199-204, 200.

Hence, by the seventeenth century, the Milky Way had shifted from its earlier position of being central to the stellar theology of the Egyptians, Greeks and Romans as the path to the stars, to instead, challenging the divine Platonistic view of the heavens as being perfect and uniform.



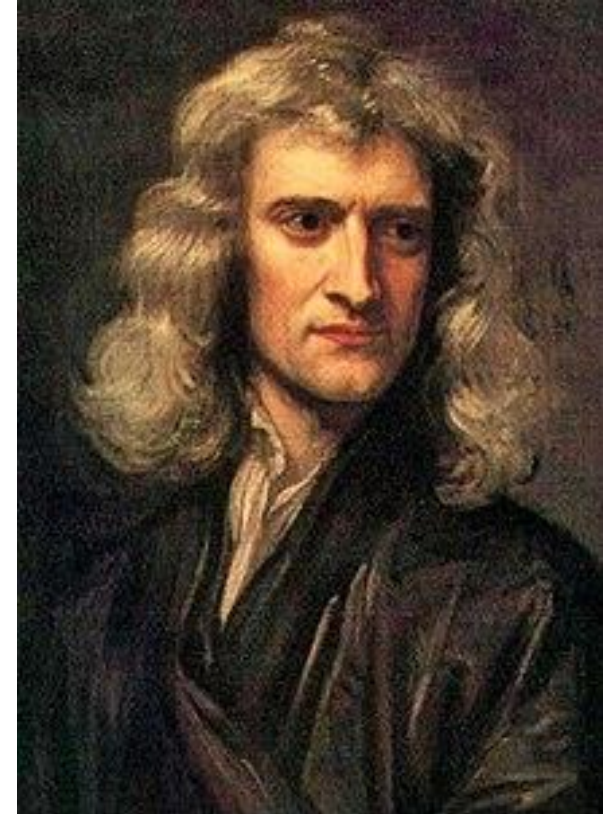
The Missing Milky Way

Astronomers had, however, from the medieval to the early modern tended to give the Milky Way only a passing reference. This absence was also evident amongst astrologers, the other cultural group that spoke for the sky.

Being visually neither star nor planet the medieval cosmologist – astronomers or astrologers – simply ignored it. Ptolemy, the great central figure who laid the foundations of western astrology and astronomy, made no mention of its nature in the *Almagest* and it is totally absent from his astrological work the *Tetrabiblos*.

The impact of Ptolemy's approach to the Milky Way in his astrology was evident some twelve hundred years later when it was also absent from the encyclopaedic astrological work of Guido Bonatti. Thus, for the medieval and early modern cosmologists the Milky Way was not part of the dialogue of the sky.

This silence concerning the Milky Way extended even to Isaac Newton (1643-1727) who largely ignored the Milky Way in his desire to defend the idea of an infinite homogeneous space in which all the stars were evenly distributed.





In 1750 Thomas Wright published a theological driven explanation of the heavens. He wished to maintain the homogenous universe but pondered the density of the stars in the *Via Lactea* with the more scattered stars over the rest of the sphere of the heavens.

Thomas Wright, *The Universe and the Stars, being an Original theory on the visible Creation, founded on the laws of Nature.*, Philadelphia: Charles Wetherill, 1837 [1750]), p. 12.

Wright solved the problem – the uneven distribution of stars as emphasized by the Milky Way, by a single speculation, '*that all the Stars are, or may be in motion*' [Wright's italics]. With this speculation in place Wright then argued that our sun, like all other stars, orbited around a central place. Wright argued,

'T'is true, the Sun may be said to be the Governor of all those bodies [planets] round him; but how? No otherwise than he himself may be governed by a superior agent, or a still more active force... and that the Stars themselves are subject to no other direction than that which moves the whole machine of nature.'

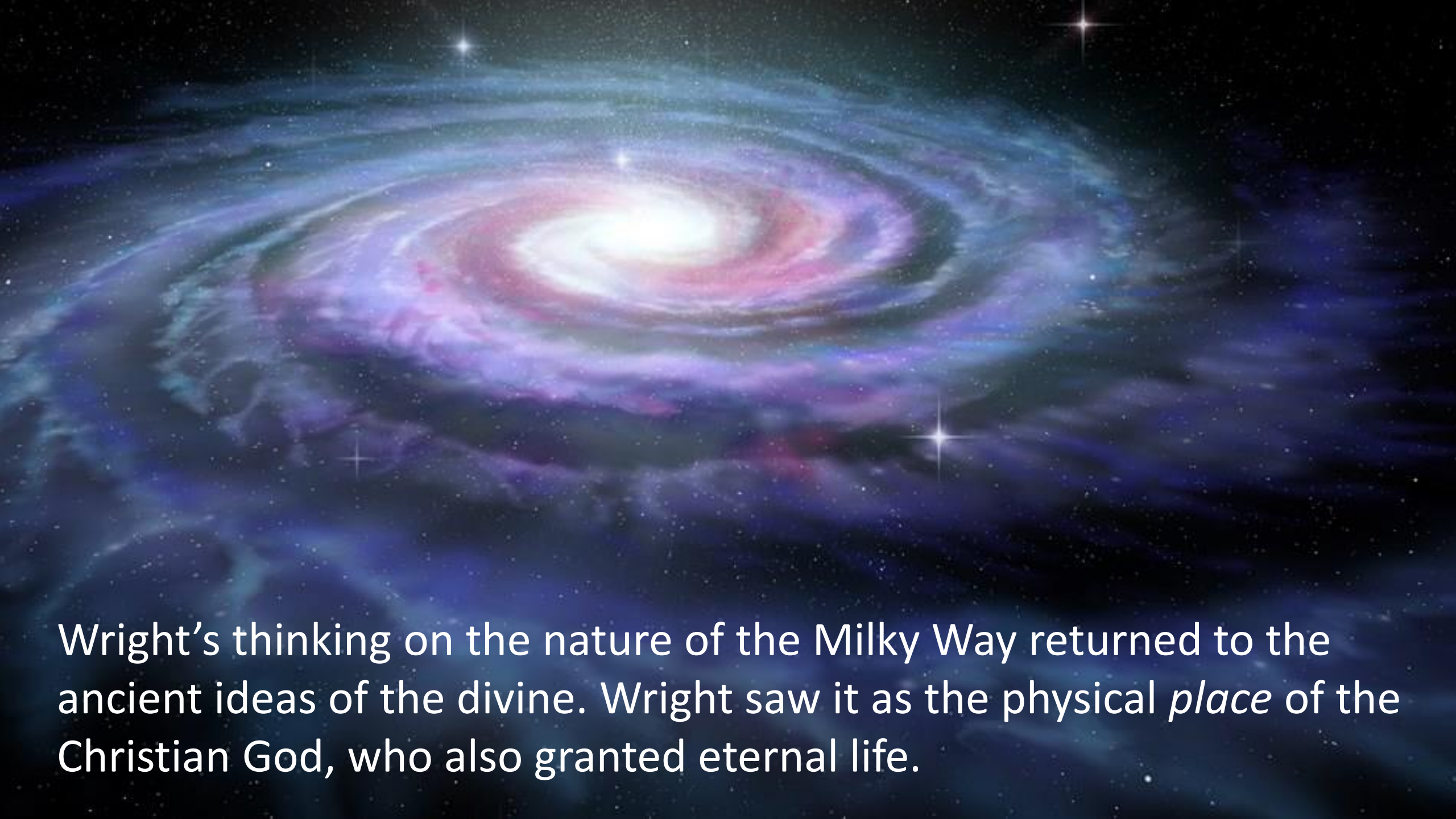
Wright, *The Universe and the Stars, being an Original theory on the visible Creation, founded on the laws of Nature.*, p. 92.

Wright, *The Universe and the Stars, being an Original theory on the visible Creation, founded on the laws of Nature.*, p. 94.



With this argument in place he then argued that the divine was located at the centre of this system, the galaxy, a 'omni-presently presiding, seated in the centre of infinity'. Wright proved to be correct in his understanding of the implications of the phenomena of the Milky Way.

Wright, *The Universe and the Stars, being an Original theory on the visible Creation, founded on the laws of Nature.*, p. 135-136.



Wright's thinking on the nature of the Milky Way returned to the ancient ideas of the divine. Wright saw it as the physical *place* of the Christian God, who also granted eternal life.

The Milky Way is a regular feature of the nightly sky and its absence from Western thinking should not lull a researcher into adopting the position that it is absent from other cultures with other sky stories.













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