Caroline's Almanac

A seasonal guide to the night sky

Autumn Skies September to November

HERSCHEL MUSEUM OF ASTRONOMY

BATH ASTRONOMERS established 1781

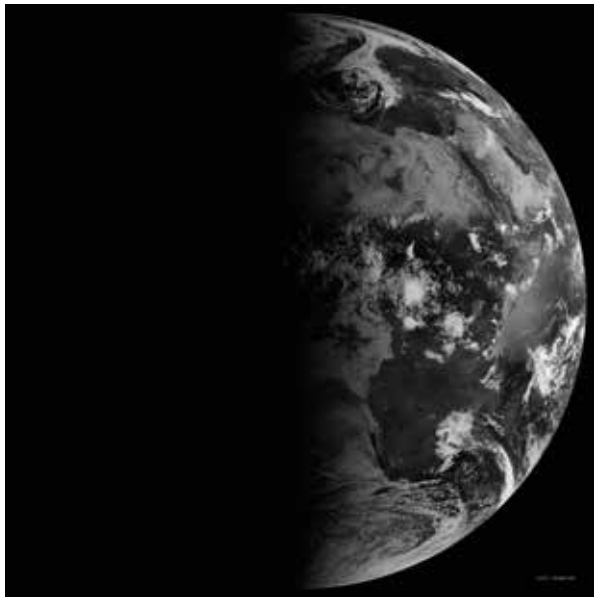
Season of mists and mellow fruitfulness,
Close bosom-friend of the maturing sun;
***To Autumn* by John Keats**

Still warm from summer, September is a great time to get into astronomy. The set Sun travels further below the horizon each evening and the night sky gets darker. Sunsets are earlier and sunrises are later, so you no longer need to be a night owl to enjoy the stars. During the last weekend of October, the clocks jump backwards an hour allowing you to see the stars in the early evening.

The Northern Autumnal Equinox

The Sun crosses the celestial equator (on the same plane as the equator of Earth) twice each year. Around 21-24 September it moves from the northern celestial hemisphere across to the southern. This is the Equinox meaning 'equal night', however, day and night actually become equal a couple of days after this, on the Equilux. The reason is simply that the Sun is a disk in the sky rather than a point of light. Although the centre of the disk sets and rises 12 hours apart on the Equinox, the top of the disk takes a few more minutes to set and rises a few minutes earlier so the day overall is longer.

The point at which the Sun crosses from northern to southern hemispheres is known as the First Point of Libra – named after the constellation where it took place many years ago. This is 180 degrees away from where it crosses again at the Spring Equinox (the First Point of Aries). To confuse matters, because of the changes in the rotational axis of the Earth (precession) the First Point of Libra is now actually in the constellation of Virgo.

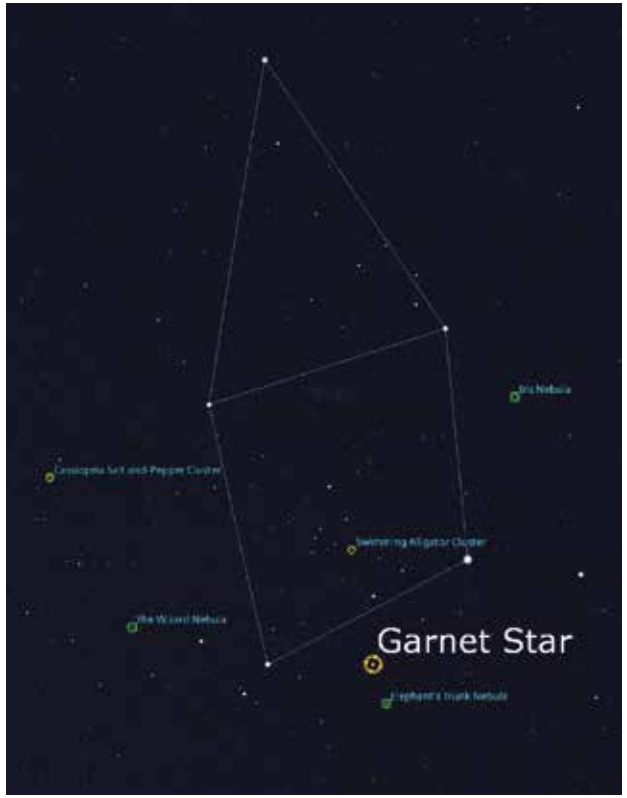


September Equinox
© Robert Simmon, EUMETSAT

The Garnet Star

Almost directly overhead is a constellation made up of a square with a triangle on top. This is Cepheus and it looks like a basic drawing of a house. King Cepheus, husband of Queen Cassiopeia, lacks bright stars but is found between his consort's classic W shape and Ursa Minor, the Little Bear, in the night sky.

Just below the imaginary house, you find one of William Herschel's favourite stars, the Garnet Star, named because of its unmistakable red colour. Its scientific name is Mu Cephei and it is 1,000 times wider and 100,000 times brighter than the Sun. If placed in our Solar System, it would engulf the orbit of Jupiter.



Constellation Cepheus, Stellarium 23.1

Sorting Stars

The stars above us may appear to be bright white points of light but look closer and you may start seeing colours. Blues, yellows, oranges, and reds; these colours indicate how hot the star is. Short-lived hot supergiants burning between 30,000 and 52,000 Kelvin glow a bluish white, while dwarf stars burning slowly at around 3,900 Kelvin glow red. Using the spectrum of light from individual stars, Annie Jump Cannon created the Harvard Spectral Classification of OBAFGKM from hottest to coolest which can be used to group all the stars in the sky. Cooler stars are the most common; 76% of stars are red dwarfs. Hot stars lead short and often explosive lives which is why there aren't so many of them. Our Sun is classed as a G2V with a surface temperature of 5,700 Kelvin and a life expectancy of 10 billion years before becoming a white dwarf. An O type star may shine for only 10 million years before going supernova.

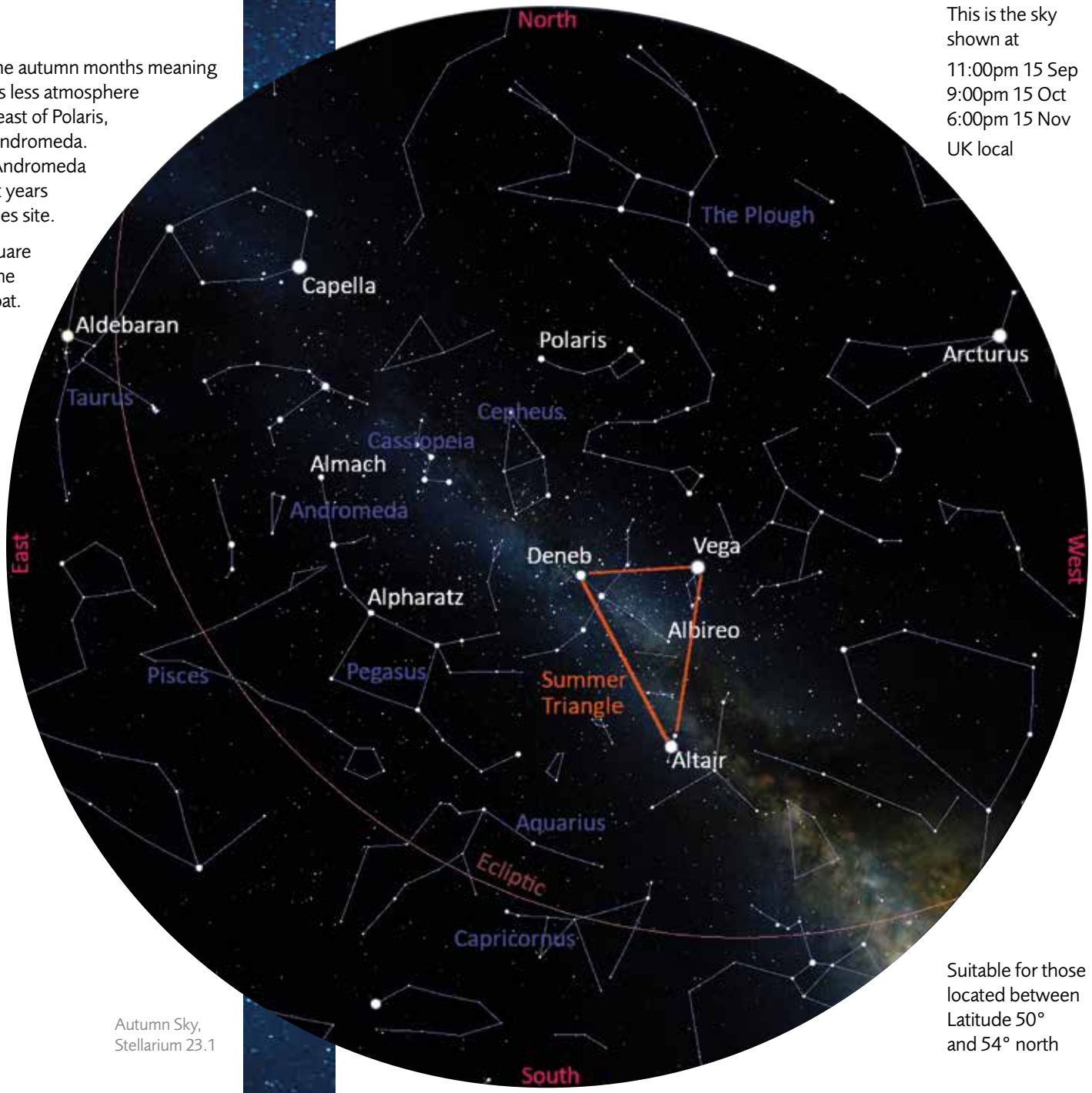
The Autumn Sky

The ecliptic, the path of the Sun, Moon and planets, is high in the autumn months meaning that these celestial bodies appear clearer to observers as there is less atmosphere to look through. The W or zigzag of Cassiopeia is visible to the east of Polaris, the North Star, and travelling the same distance again we find Andromeda. This constellation contains our nearest galactic neighbour, the Andromeda Galaxy, or Messier 31 (M31). This galaxy is only 2.5 million light years away and is visible to the naked eye if looked for from a dark skies site.

Andromeda's brightest star, Alpheratz, completes the Great Square of Pegasus. Below it runs the ecliptic with Aries the Ram, Pisces the Fish, Aquarius the Water Bearer, and Capricornus the Horned Goat.

The Summer Triangle of Vega in Lyra, Deneb in Cygnus, and Altair in Aquila remain prominent in the sky to the southwest. Within it are two examples of planetary nebulae, a term coined by William Herschel to describe their similarity to the disk of a planet. The first is the Ring Nebula, M57, in Lyra and other is the Dumbbell Nebula, M27, in Vulpecula. Both are remnants of dying stars that became red giants and then jettisoned their outer layers of gas before leaving just a white dwarf illuminating those ejected gas shells. A similar fate awaits our own Sun.

Just above the eastern horizon, the giant orange star Aldebaran in Taurus gives a hint of the winter constellations to come in the next few months. Best be prepared and wrap up warm.



This is the sky shown at

11:00pm 15 Sep
9:00pm 15 Oct
6:00pm 15 Nov

UK local

Suitable for those located between Latitude 50° and 54° north

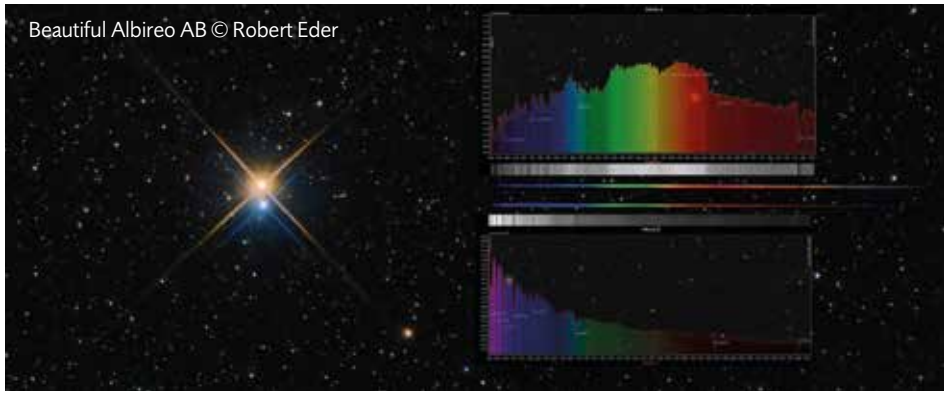
See today's stars online with Stellarium

Autumn Sky, Stellarium 23.1

Colourful Siblings

William Herschel was fascinated by double stars. These stars are born in the same cloud of gas and dust and live their lives orbiting each other. If one proto star consumes more of the cloud than the other then they may become very different sizes, temperatures, and therefore colours. There are several odd sibling stars visible to the amateur astronomer with binoculars or telescopes this time of year.

- Achird is a double star system in Cassiopeia (also known as Eta Cassiopeiae) discovered by William Herschel in 1779 and sits between the third and fourth stars when drawing the W of Cassiopeia. The G type white star and K type orange star orbit each other every 480 years.
- Albireo is a colourful pair of stars in the head of Cygnus the Swan. It appears as a bright yellow gold star with a dimmer bluish companion.
- Almach is the last bright star in Andromeda at the opposite end of the constellation to Alpharatz. It is a double star system with a bright golden star accompanied by a dimmer indigo blue sibling.
- Dabih, or Beta Capricorni, is a multiple star system consisting of 5 stars of which the largest 2 can be seen by amateur astronomers.



Beautiful Albireo AB © Robert Eder

No Green Stars

All stars give off a continuous rainbow of colours with light intensity per colour varying from very low to a high peak and back to low. This is known as a stellar black body spectrum. The shape of the spectrum and the position of the peak relate to how hot the surface of the star is. If the star is very hot, the spectrum peaks in the ultraviolet and blue, so we see a blue star. If the star is cool, the spectrum peaks in the red and infrared and so we see a red star. Our star, the Sun, has a surface temperature where the spectrum peaks with green light but it also produces so much of blue and red light either side it appears white to our eyes.

False Dawns and Zodiacal Light

99.8% of all the mass in the Solar System is within the Sun. The remaining 0.2% not only comprises of the planets, moons, and asteroids as the Solar System is a dusty place too.

Planets mop up wide swathes of this dust leaving diffuse clouds in between each planet's orbit. Normally invisible, under the right conditions, sunlight reflects off these dust grains and is visible from Earth. The predawn autumnal sky presents these conditions with the ecliptic rising steeply away from the eastern horizon. About the brightness of the Milky Way, a faint white triangle of light can sometimes be seen 60 to 90 minutes before sunrise; this is Zodiacal Light. The phenomenon can be mistaken for the oncoming sunrise, hence the name False Dawn.

Zodiacal Light Seen from Paranal © ESO/Y.Beletsky

Seasonal Meteor Showers

There are 4 notable showers of space dust falling to Earth in autumn:

The Draconids are associated with the debris of Comet 21/P Giacobini-Zimmer and last from 6-10 October. They peak on the evening of 8-9 October. In ideal conditions, you can see 10 meteors an hour.

The Orionids are linked with Comet Halley and are known for being fast moving. The shower lasts from 2 October to 7 November, and it peaks on the evening of 21-22 October. The hourly rate is 25 meteors.

The Taurids comprise two streams of debris and are called the Northern and Southern Taurids. The former runs from 20 October to 10 December and the latter from 10 September to 20 November. They peak on the evening of 12-13 November and 10-11 October respectively. The meteors are characterised by their slow movement across the sky.

The Leonids run through 6-30 November and peak on the evenings of 17-18 November. The dust from Comet Tempel-Tuttle is fast moving and delivers up to 10 fast, bright meteors per hour.

Measuring Brightness

When looking up at the night sky, the stars all differ in brightness, so a scale is required to compare one star with another. This is Apparent Magnitude. The system used today dates back to the Ancient Greeks and their 6 brightness groupings of stars visible to the naked eye. The difference from brightest to dimmest is a factor of 100. The system was given more precision in 1856 by Norman Pogson and is now based on the star Vega being Magnitude 0.0. The scale runs backwards, stars 2.5 times dimmer than Vega are given Magnitude 1.0 and so on. A Magnitude 6.0 star is at the limit of human vision and is 100 times dimmer than Vega.

To estimate how bright a star or object is, compare its brightness to nearby stars and see which it is closest to. If your object is roughly halfway in brightness between Vega (Mag 0.0) and Polaris (the North Star – Mag 1.9) in brightness, then your object is Magnitude 0.95.

The Sun has an Apparent Magnitude of -26.74 and so it is 44 billion times brighter than Vega to an Earth observer. But this is because the Sun is so close. If we observed the Sun and Vega from the same distance, Vega would be 44 times brighter; Vega is a hotter and brighter A0V star. This fairer measure of brightness is called Absolute Magnitude.

About Us

HERSCHEL MUSEUM OF ASTRONOMY

The Herschel Museum of Astronomy is dedicated to the achievements of the Herschels: distinguished astronomers and talented musicians. It was from this house that William discovered Uranus in 1781.

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BATH ASTRONOMERS established 1781

Bath Astronomers are Bath's local community of stargazers dedicated to sharing their fascination with the night sky. They bring telescopes and astrophysics to the public, school classrooms, and community groups.

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