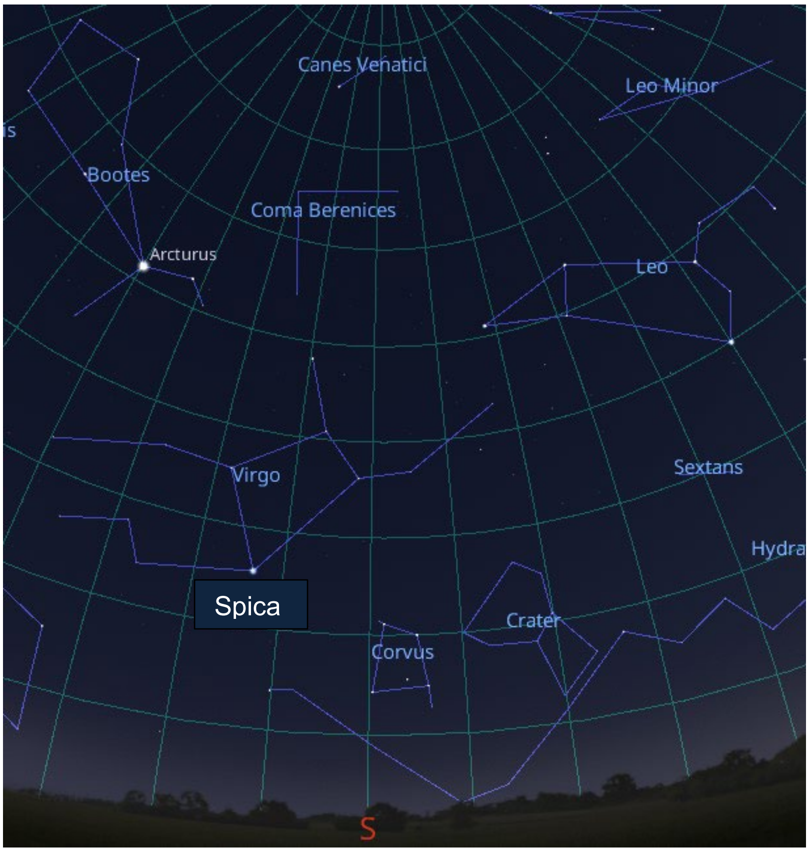
St Benedict's NIGHT SKY NEWS – May 2023

St Benedict's is a member of the **SOCIETY FOR POPULAR ASTRONOMY** and receives regular newsletters regarding astronomical events and information. If you would like to be included on the mailing list for these, please contact JGregory@st-benedicts.suffolk.sch.uk

STARS IN YOUR EYES

We are getting to the time of year when the sky does not become suitably dark until around 10pm. Even then, the western horizon remains aglow from the set Sun. The best direction for stargazing before bedtime is the therefore to the south and east. This month's featured constellation is **VIRGO.**

The name Virgo (derived from the Latin meaning "Maiden") is probably familiar to most as it is one of the 12 signs of the zodiac and especially important in astrology for those born between August 23 and September 22, if you believe in that sort of thing. First catalogued by the Greek astronomer Ptolemy in the 2nd century, it contains **Spica**, the 16th brightest star in the night sky (mag 1.0). Virgo is also the 2nd largest of all the constellations, after Hydra which was last month's featured constellation.



Apart from Spica, the other stars in Virgo range from mag 2.5 to 5 or greater so the constellation is not particularly bright. However, it is easy to locate because it is close to the unmistakable outline of **Leo** (and its bright main star, **Regulus**, to its upper right) and **Boötes** (with its bright red giant star, **Arcturus** – mag -0.5 – to Virgo's upper left). Stand facing due south around 10pm, mid-month, and Virgo will be between 20 and 50 degrees above the southern horizon.

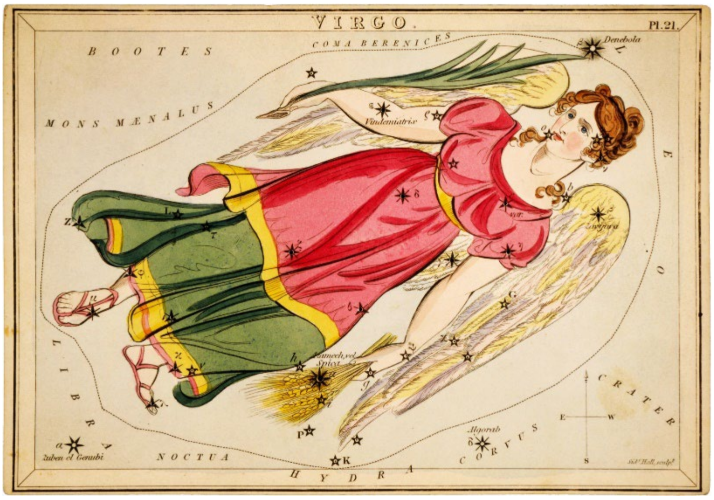
Spica, Virgo's brightest star, has been studied since ancient times. A temple to Menat (an early Hathor) at Thebes was oriented with reference to Spica when it was built in 3200 BC in ancient Egypt. Spica is believed to have played a crucial role in the discovery of the Earth's axial precession (precession of the equinoxes). The discovery is usually attributed to the Greek astronomer Hipparchus (190-120 BCE), who measured the longitude of Spica and a number of other bright stars. Hipparchus featured in last month's article *The History of Astronomy: Part 1*. Part 2 follows on page 4 of this month's News. Several temples in Greece were also found that were constructed relative to Spica's motion across the sky, including two temples at Rhamnus from 1092 and 747 BCE, temples to Hera at Olympia, Argos and Girgenti, and the temple of Nike Apteros at Athens (1130 BCE).

Spica is seen as a blue-white pinpoint of light but, with the use of modern technology, it has been found that there are actually two stars orbiting each other at close range – Spica is a **binary system.** The two stars are so close that even our largest telescopes cannot separate them – but we can tell them apart by looking at the spectra of light they emit. The primary star is classified as a blue giant, with a radius of about 7.5x that of our Sun. The second star is somewhat smaller, with a radius of about 3.8x that of our Sun, and is also classified as a blue giant but within the main sequence of stellar classification.

On 4th may, one day before the Full Moon, the Moon will be seen very close to Spica: just 3.3 degrees to the north.

https://www.constellation-guide.com/constellation-list/virgo-constellation/

THE VIRGO MYTH



The constellation Virgo is usually associated with the Greek goddess of justice, Dike. Dike was the daughter of Zeus and Greek Titaness Themis. Virgo is usually depicted with angel-like wings, with an ear of wheat in her left hand, marked by the bright star Spica. She is located next to Libra, the constellation representing the scales of justice. Dike was also sometimes known as Astraeia, daughter of Astraeus, considered father of the stars, and Eos, goddess of the dawn.

In Greek mythology, Dike lived in the Golden Age of mankind. She was born a mortal and placed on Earth to rule over human justice. The Golden Age was marked by prosperity and peace, everlasting spring, and humans never knowing old age. When Zeus fulfilled the old prophecy and overthrew his father, this marked the beginning of the Silver Age, which was not as prosperous. Zeus introduced the four seasons and humans no longer honoured the gods as they had used to. Dike gave a speech to the entire race, warning them about the dangers of leaving behind the ideals of their predecessors and saying worse was yet to come. Then she flew to the mountains, turning her back on humans. When the Bronze and Iron Ages came and humans started warring among themselves, Dike left the Earth altogether, and flew to the heavens.

In other stories, the constellation Virgo is identified with Demeter, the corn goddess Atargatis, the Syrian goddess of fertility, and Erigone, the daughter of Icarius, who hanged herself after her father's death. In this version of the myth, Icarius is associated with the constellation Boötes and the star Procyon in Canis Minor represents Icarius' loyal dog Maera. Historians Eratosthenes and Hyginus also associate the constellation Virgo with Tyche, the goddess of fortune, even though Tyche is usually depicted as holding the horn of plenty and not an ear of grain. The name of the star Spica, which marks the ear of grain held by the goddess, means exactly that, *"the ear of grain"* in Latin.

THE MOON THIS MONTH

PHASE

Full Moon	5th
3rd Quarter	12th
New Moon	19th
1st Quarter	27th

The Full Moon of May is known as **FLOWER MOON** to signify the flowers that bloom during this month. Native Americans also called it **Budding Moon**, **Egg Laying Moon**, and **Planting Moon**.

The Anglo-Saxon name for May's brightest Moon phase is **Milk Moon** from the Old English *Rimilcemona*. It means three-milkings-month in modern English because cows were milked three times a day during this time of year. The Celtic and Old English names are **Mothers' Moon**, **Bright Moon**, **Hare Moon**, and **Grass Moon**.

Many wildflowers bloom in May in the Northern Hemisphere, where these traditional Full Moon names originated. For example, many types of anemone, wild garlic, indigo, bluebells, lupine, sundrops, and violets, to name just a few. It is no wonder that the colourful displays these flowers create in nature have inspired people to call this time after them.

https://www.timeanddate.com/moon/phases/@2654186
https://www.timeanddate.com/astronomy/moon/flower.html

THE PLANETS THIS MONTH

Venus is the only planet easily viewed this month.

MERCURY: Lost in the evening twilight all month.

VENUS: Very bright "evening star", around mag -4.0, easily spotted in the west after sunset.

MARS: High in the sky to the southwest mid-evening. At mag 1.5, it is much fainter than Venus.

JUPITER: Lost in the morning twilight.

SATURN: Poorly positioned morning planet, remains low as the day breaks, so it is probably not worth the effort.

METEORS THIS MONTH

There is a major shower this month – the **ETA AQUARIIDS.**

The Eta Aquariid meteor shower is active between 19 April and 28 May 2023, but with its peak activity between midnight and dawn on the 6th May. At its peak there could be up to 50 meteors per hour. However, there are two reasons why viewing this shower will be impaired:

Firstly, the 6th May is around the time of the Full Moon, so the sky will be awash with bright moonlight. Secondly, the radiant point of the shower will actually be just below the eastern horizon. Although meteors may still appear, their number may not be as great as the estimated peak rate.

The Eta Aquariids is a moderately active meteor shower associated with the Comet Halley. Like with most meteor showers, the name comes from the constellation in the night sky that it appears to radiate from. In this case, it's the Aquarius constellation. But why isn't it called the 'Aquarid' meteor shower? This is because, more specifically, the name comes from one of the stars from this constellation: *Eta Aquarii*.

https://www.rmg.co.uk/stories/topics/eta-aquariid-meteor-shower-2023-when-where-see-it-uk

ISS SIGHTING TIMETABLE

To check the latest sighting times, use the following link:

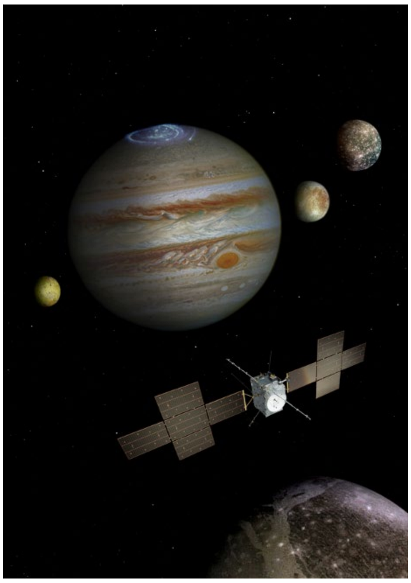
Newmarket, England, United Kingdom | Sighting Opportunity | Spot The Station | NASA

THE "JUICE" MISSION HAS LIFTED OFF!

Scheduled for launch on Thursday 13th April from Europe's Spaceport in Kourou, French Guiana, on an Ariane 5 launcher, there was a 24hr delay due to thunderstorms but the good news is that the launch was successful the following day.

BUT WHAT IS THE "JUICE" MISSION?

Since the Voyager spacecraft flew by Jupiter in 1979 and also investigated some of Jupiter's larger moons, interest was aroused in three moons in particular: Callisto, Europa and Ganymede. Later missions, Galileo and Juno, confirmed the nature of these moons and the intriguing possibility that they may harbour life in their sub-surface oceans. This is what "Juice" is going to investigate.



The mission's name is derived from JUpiter ICy moons Explorer. The development and operation of the spacecraft is led by ESA (European Space Agency), with collaboration from NASA (National Aeronautics and Space Administration) and JAXA (Japan Aerospace Agency). ESA's mission statement is as follows: *"Juice will characterise Jupiter's ocean-bearing icy moons – Ganymede, Europa and Callisto – as planetary objects and possible habitats, explore Jupiter's complex environment in depth, and study the Jupiter system as an archetype for gas giants across the Universe. Juice will explore a) the habitable zone – namely characterising the oceans, icy shells, compositions, surfaces, environments and activity of Ganymede, Europa and Callisto – and b) the wider Jupiter system, characterising Jupiter's atmosphere, magnetic environment, ring system and other satellites (including Io)."*

SPACECRAFT: Three-axis stabilised with 10 solar panels and a 2.5-metre-long High Gain Antenna, with a dry mass of approximately 2400 kg and a wet mass (including fuel) of approximately 6000 kg. Each solar panel measures about 2.5 m x 3.5 m; with five on each side of the spacecraft deployed as two distinctive cross-shaped arrays, these total an area of about 85 square metres.

INSTRUMENTS: Juice will carry 10 state-of-the-art instruments, comprising the most powerful remote sensing, geophysical and *in situ* payload complement ever flown to the outer Solar System. Instruments will take spectral images across the electromagnetic spectrum; laser and radar will be used to make accurate distance and topographical surveys, including the subsurface; there is also a powerful suite of instruments to study the particle environment and Jupiter's electric and magnetic fields.

JOURNEY AND ORBIT: Juice will spend approximately eight years cruising to Jupiter, during which it will complete fly-bys of Venus, Earth and the Earth-Moon system. These fly-bys will boost the spacecraft's velocity in what is known as a *"gravity assist".* Juice's flyby of the Earth-Moon system, known as a Lunar-Earth gravity assist (LEGA), is a world first: by performing this manoeuvre — a gravity assist flyby of the Moon followed just 1.5 days later by one of Earth — Juice will be able to save a significant amount of propellant. It will reach Jupiter in July 2031; six months before entering orbit around Jupiter, Juice will begin its nominal science phase, which is designed to last 4 years. The spacecraft will go on to spend many months orbiting Jupiter, completing fly-bys of Europa, Ganymede and Callisto, and finally conducting an orbital tour of Ganymede.

All being well, JUICE will be followed by NASA's own mission to Jupiter – EUROPA CLIPPER – which d due to launch in October 2024. The Europa Clipper spacecraft will perform dozens of close flybys of Jupiter's moon Europa, gathering detailed measurements to investigate whether the moon could have conditions suitable for life in the liquid water ocean beneath its icy crust. It will actually arrive at Jupiter in 2030, one year ahead of Juice.

https://www.esa.int/Science_Exploration/Space_Science/Juice

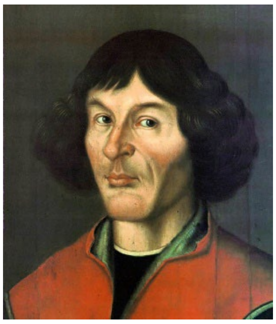
THE HISTORY OF ASTRONOMY – Part 2

PROGRESS DURING THE DARK AGES

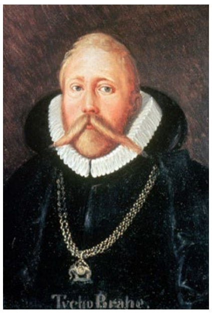
Whilst Europe languished in the Dark Ages, astronomy flourished in Asia and in the Islamic world. Extensive observations were performed in the Chinese and Indian empires, including the compilation of stellar catalogues. In the Islamic world, observations of the sky were accompanied by the study and translation of texts from ancient Greek scientists. Islamic scholars built exquisite astronomical instruments to measure angles in the sky. They improved on the quadrant, a measuring device shaped as a quarter of a circle that was originally proposed by Ptolemy, and invented the sextant, a similar instrument in the shape of one sixth of a circle.

A catalogue of 994 stars was created by **Ulugh Beg** of the Timurid dynasty in the fifteenth century. Ruling over Central Asia the astronomer and mathematician constructed an enormous sextant with a radius of 36 metres in Samarkand, located in present-day Uzbekistan. Ulugh Beg's catalogue has a precision of slightly better than one degree, comparable to that of Hipparchus's compilation from several centuries before. Ulugh Beg and the many other astronomers that were active in the Islamic world kept the practice of astronomy and astrometry alive, smoothly ushering them into the modern era. The photo shows the Ulugh Beg Observatory as it is today.

EUROPEAN RENAISSANCE



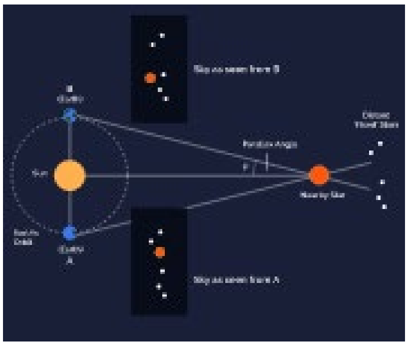
The flow of discoveries and inventions from other cultures and territories catalysed the revival of science in Renaissance Europe. In astronomy, the rediscovery of Ptolemy's original texts would eventually lead Polish astronomer **Nicolaus Copernicus** (portrait, left) to revolutionise the view of the cosmos, with the shocking revelation that Earth is not the centre of the Universe. Copernicus published his theory of a heliocentric system in 1543, identifying the Sun as the centre of the Universe, with the Earth and the other planets bound to move around it. Although the heliocentric view described planetary motions in a simpler and more orderly fashion than Ptolemy's geocentric system, it would take at least a century before this controversial model became accepted both within and beyond the scientific community.



Even one of astronomy's great minds, **Tycho Brahe** (portrait, right), rejected heliocentrism. However, from his base in Denmark, Brahe made great strides in observational astronomy. On the island of Hven, which is located in present-day Sweden, Brahe built Uraniborg, the greatest astronomical observatory before the invention of the telescope. With the aid of large quadrants and sextants, he compiled a catalogue with the positions of about 1000 stars. Completed in 1598 and published in 1627, Brahe's catalogue has a precision of about one arc minute – a huge leap forward, and the first major improvement on stellar catalogues that stretched back seventeen centuries.

IN SEARCH OF STELLAR PARALLAX

The heliocentric system revived the debate about stellar parallaxes. The parallax is an apparent movement of a foreground object with respect to its background owing to a change in the observer's position. Also known as triangulation, this method is used to assess distances to faraway objects on Earth. Astronomers had tried to apply it to determine the distance to the stars, but no baseline on Earth was big enough to detect stellar parallax because of the immense distances involved.



After Copernicus suggested that Earth revolves around the Sun, astronomers realised that it was possible to exploit the much larger baseline offered by Earth's orbit to measure stellar parallaxes. So Brahe pushed towards the observational limits of his time, in search of stellar parallax. Unfortunately, he could not detect it. Incorrectly assuming that stars cannot be so distant that their parallax would not be within the reach of his measurements, Brahe rejected Copernicus's model and proposed his own hybrid system, which incorporated both geocentric and heliocentric features.

There was no way for Brahe to know, at the end of the sixteenth century, that stars are indeed so far away that his measurements would not be sufficient to detect parallax even for the closest stars to the Sun. At a distance of just over four light-years, our nearest neighbouring stars have a parallax smaller than one arc second. The invention of the telescope and two centuries of diligent astronomy would be required before the first distance to a star could be measured. It was early in the nineteenth century, before we began to comprehend the true immensity of the cosmos.

https://sci.esa.int/web/gaia/-/53196-the-oldest-sky-maps