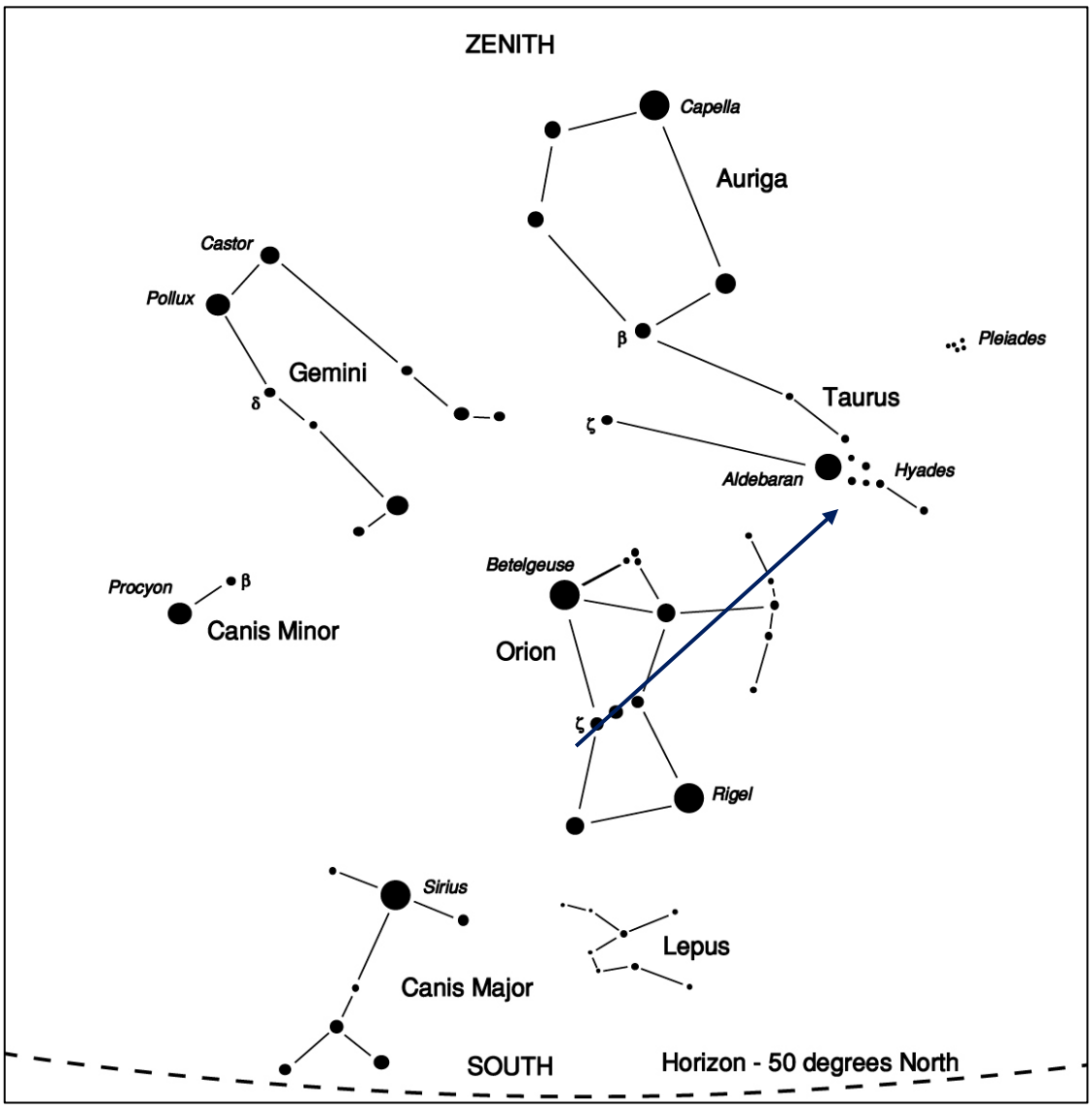
St Benedict's NIGHT SKY NEWS – Feb 2022

St Benedict's Catholic Secondary School 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, as well as our monthly ***Night Sky News***, please contact: JGregory@st-benedicts.suffolk.sch.uk

STARS IN YOUR EYES

Recent editions of the *News* have featured some of the fainter and lesser known constellations of the northern sky, but that will now change. This is the time of year when, to the south, the great winter constellations dominate the evening sky: **AURIGA, GEMINI, ORION** and **TAURUS**, plus the smaller 'pair of dogs', **CANIS MAJOR** and **CANIS MINOR**, notable for their respective bright main stars, **Sirius** and **Procyon**.



This month we shall take a closer look at the constellation of **TAURUS**, the 'Bull' – its name means bull in *Latin*.

Taurus is easy to find because of its brightest star, the orange giant **Aldebaran**, and its proximity to the most distinctive constellation of all, **Orion**. Use the three stars of Orion's central 'belt' to draw an imaginary line up to the right (west) and the bright star you come to will be Aldebaran, in Taurus, known as the "red eye of the bull".

Taurus is the 17th largest constellation in the sky and belongs to the zodiac family of constellations, along with Aries, Gemini, Cancer, Leo, Virgo, Libra, Scorpius, Sagittarius, Capricornus, Aquarius and Pisces. It has been known since at least the Early Bronze Age, when it marked the Sun's location during the spring equinox. However, it was first officially catalogued by the Greek astronomer Ptolemy in the 2nd century CE.

The constellation is home to two of the nearest **open star clusters** to Earth: the **HYADES** and **PLEIADES**. The brightest stars in the **Hyades cluster** form a distinctive 'V' shape that marks the head of the celestial bull. The cluster lies along the same line of sight as Aldebaran, the brightest star in Taurus, but the bright giant is not actually a member of the cluster and lies much closer to Earth.

The Hyades cluster is among the best studied in the sky due to its brightness and proximity. The cluster contains hundreds of stars, a group slightly spherical in shape, that share a common origin, age, chemical composition, and motion through space. The cluster is believed to be about 625 million years old, quite young on the cosmic time scale, and is receding from us at 43 km/s. The Hyades cluster was catalogued by the Italian astronomer Giovanni Batista Hodierna in 1654 and by the British astronomer Philibert Jacques Melotte in 1915. However, the cluster has been known to different cultures since antiquity.

The photo shows the bright orange giant Aldebaran and, away to the right, some of the brightest stars in the distinctive 'V' shape of the Hyades.

Of the cluster's several hundred stars, about 15 are visible to the unaided eye in good viewing conditions. Binoculars and small telescopes will reveal several dozen more members. The best time of year to observe the Hyades from northern latitudes is in winter and spring.

Taurus has been associated with the bull in many cultures and mythologies: Greek and Egyptian among other, and even going back to Ancient Babylon and beyond. Depictions of Taurus and the Pleiades star cluster have even been found in a cave painting at Lascaux, dating back to 15,000 BC. Both the constellation and the Pleiades have been known in many indigenous cultures and referred to as the "bull" and the "seven sisters", which indicates a common origin for the names. The Hyades cluster depicts the bull's head, with Aldebaran as one of its eyes – the **"red eye of the bull".**

In **Greek mythology**, **Taurus** is usually associated with **Zeus**, who adopted the shape of a bull in order to seduce and abduct **Europa**, the beautiful daughter of the Phoenician **King Agenor**. Zeus mingled with the king's herd and, being the most handsome bull there, he got Europa's attention. The princess admired the bull and, when she sat on his back, he rose and headed for the sea. Zeus carried Europa all the way to the island of Crete, where he revealed his true identity and lavished the princess with presents. The two had three sons together, including **Minos**, who grew up to be the famous king of Crete, who built the palace at **Knossos** where bull games were held and who also sacrificed seven young boys and girls to the **Minotaur** each year. Zeus later commemorated the bull by placing it among the stars.

THE MOON THIS MONTH

PHASE

New Moon	1st
1st Quarter	8th
Full Moon	16th
3rd Quarter	23rd

The February Full Moon is often known as the **SNOW MOON**, after the snow on the ground in northern parts at this time of year. Some Native American tribes also named this the **Hunger Moon** due to the scarce food sources and hard hunting conditions during mid-winter, while others named it the **Storm Moon**.

The culture and history of the native tribes of North America feature prominently in our modern folklore surrounding a month's Full Moon: Names for this month's Moon have historically had a connection to animals. The **Cree** traditionally called this the **Bald Eagle Moon** or **Eagle Moon**. The **Ojibwe Bear Moon** and **Tlingit Black Bear Moon** refer to the time when bear cubs are born. The **Dakota** also call this the **Raccoon Moon**, certain **Algonquin** peoples named it the **Groundhog Moon**, and the **Haida** named it **Goose Moon**. Another theme of this month's Moon names is scarcity. The **Cherokee** names of **Month of the Bony Moon** and **Hungry Moon** give evidence to the fact that food was hard to come by at this time.

THE PLANETS THIS MONTH

MERCURY: Mercury transitions to become a morning object this month. Probably the best chance of spotting it will be mid-month when it will be at its greatest elongation – that is, it will appear at its greatest separation from the Sun from our view, therefore making it more easy to spot away from the Sun's immediate glare. Even so, it will be very low in the SE and will quickly become lost from view. (NOTE: if you are tempted to look for it with binoculars, BE SURE THAT THE SUN IS STILL BELOW THE HORIZON. TO ACCIDENTALLY GLIMPSE JUST A SMALL PORTION OF THE SUN'S DISK THROUGH BINOCULARS WILL PERMANENTLY DAMAGE YOUR EYESIGHT)

VENUS: Now a "morning star", Venus is unmistakably bright in the SE sky before sunrise. The planet will attain its greatest brilliancy in the morning sky on February 13. During late January, into most of February, Venus will resemble a striking crescent phase in telescopes and steadily-held binoculars in the morning sky.

MARS: Shining like a "star" with an orange hue, Mars can be seen in the E before sunrise. However, it is some distance from the Earth in its orbit and therefore not particularly bright, unlike Venus in the same area of the sky. Because its orbit is beyond the Earth's around the Sun, Mars' brightness varies considerably over time which will be vividly demonstrated throughout this year. This month it will be around mag 2, but as the year progresses, Mars will slowly increase in brightness as its distance from the Earth gradually decreases until, in December, it will shine brightly at mag -2, outshining even Sirius, the brightest of all stars.

JUPITER and SATURN: both out of view this month as they rise in the E after sunrise.

METEORS THIS MONTH

This is the beginning of a quiet couple of months on the meteor front, with no showers of any significance until the **LYRIDS** in April. Even so, you are always likely to see the occasional meteor at any time and at any location in the sky. Typically, you will be looking up and just catch a streak out of the corner of your eye!

ISS SIGHTING TIMETABLE

The timetable is kept up to date online at relatively short notice. Although the February sightings seem to be restricted to just the first few days of the month, it is possible that further sighting opportunities will be posted later. Keep fully up to date throughout the month by visiting the official website:

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

You can also sign up to receive daily alerts (email/text) notifying you of sighting opportunities on those days.

Date	Visible	Max Height*	Appears	Disappears
Tue Feb 1, 6:53 PM	4 min	25°	10° above W	20° above S
Wed Feb 2, 6:05 PM	6 min	34°	10° above W	10° above SE
Thu Feb 3, 6:54 PM	3 min	13°	10° above WSW	10° above S
Fri Feb 4, 6:06 PM	5 min	19°	10° above W	10° above S

While we marvel at watching the ISS glide serenely and silently overhead, we should not forget what an astounding view the astronauts onboard have of us, ie., the Earth sliding past below them. Particularly striking are the views the astronauts get when passing over the "night side" of the Earth. The photograph, left, shows the Iberian peninsula.

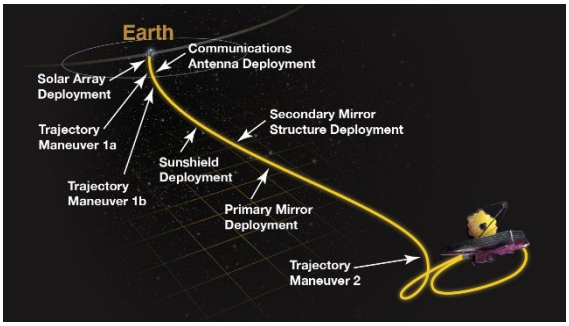
In 2010 an extra structure was added to the ISS, called the **Cupola Observation Module**. Designed primarily to conduct experiments and observe dockings of service craft, inevitably astronauts began using it for sightseeing! The photo shows astronaut Karen Nyberg relaxing and watching the world go by.

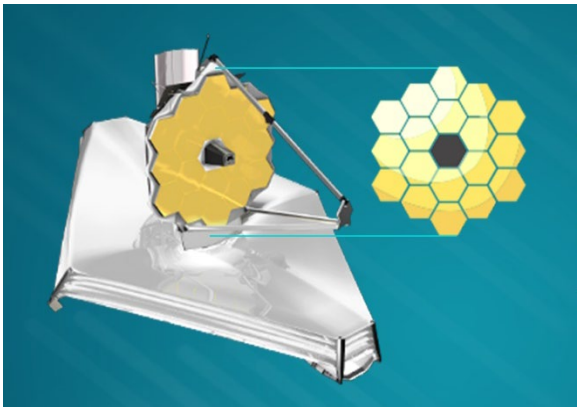
PRINCIPAL SOURCES OF INFORMATION

Taurus Constellation: Stars, Myth, Location, Facts... – Constellation Guide (constellation-guide.com)
Moon Phases 2022 – Lunar Calendar for London, England, United Kingdom (timeanddate.com)
Visible Planets Guide - When and Where to View (2022) - Farmers' Almanac (farmersalmanac.com)
ISS030-E-10008.JPG (540×359) (nasa.gov)

JAMES WEBB SPACE TELESCOPE – update

Last month's *News* reported the successful launch of the James Webb Space Telescope (JWST) on Christmas Day. Since then a number of critical deployments have taken place. In order to launch the JWST it had to be intricately folded in order for it to fit inside the sleek cargo bay of its launch rocket. Once the rocket escaped from the Earth, JWST was released and began a number of carefully programmed and sequenced deployments to literally unfold itself into its final configuration. All this took place during the telescope's journey to its final destination.





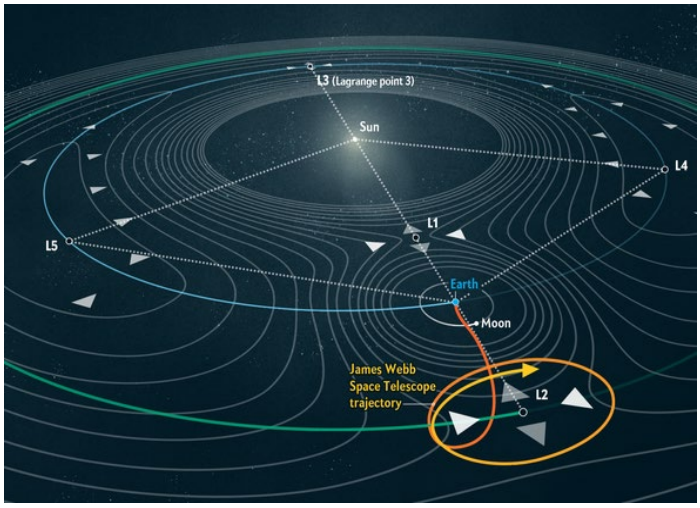
At the time of going to press, all the deployments have been successful. Each one was critical for the success of the mission but, arguably, the most tense was the unfolding of the telescope's huge primary (main) mirror – see photo on the left.

The primary mirror is a tiled assembly of 18 hexagonal elements, each 1.32 meters (4.3 ft) from flat to flat. This combination yields an effective aperture of 6.5 meters (21 ft) and a total collecting surface of 27 square meters (290 sq ft).

To build the mirror segments using traditional glass would have rendered the unit too heavy for launch, so the 18 hexagonal tiles are actually polished beryllium. They are coated in a very thin film of gold to aid the collection of radiations in the infrared region of the spectrum, which will enable JWST to have a unique view of the Universe and allow it to look further than any previous telescope, which also means further back in time.

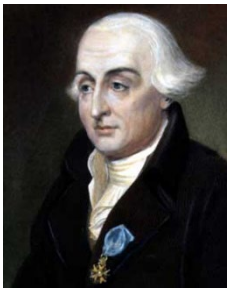
On Monday 24th January at 19:00 GMT, after a journey lasting exactly one calendar month, JWST fired its thrusters to complete its last mid-course correction to place the telescope in its final, permanent orbital position.

However, it will <u>not</u> be in orbit around the Earth, like the Hubble Space Telescope and, confusingly, it will <u>not</u> directly orbit the Sun either. At a distance of 1.5 million kilometres away from the Earth in line with the Sun, it will actually orbit around a point in space known as the **Sun-Earth LAGRANGE POINT 2 (L2)**. Normally if a body is further away from the Sun than the Earth, its orbit will be slower than the Earth's and the two will pursue their own individual paths with the more distant one lagging. However, JWST, placed at L2, will match the Earth's orbital speed and therefore remain in line with the Earth and the Sun.



So why send Webb to orbit Sun-Earth L2? Because it is an ideal location for an infrared observatory. At Sun-Earth L2, the Sun and Earth (and Moon, too) are always on one side of space, allowing Webb to keep its telescope optics and instruments perpetually shaded, aided by its own huge sunshield.. This enables them to get cold for infrared sensitivity, yet still access nearly half the sky at any given moment for observations. There is still a final twist in the tale: although JWST will track the Earth in its orbit around the Sun, technically it will not actually orbit the Sun itself. It will, in fact, orbit around the point in space that is L2, in what is called a **"halo orbit"**.

There are actually 5 Lagrange Points associated with the Earth, but what are they? Any two massive, gravitationally significant objects in space generate five specific locations – **LAGRANGE POINTS** – where their gravitational forces and the centrifugal/centripetal force of the motion of a small, third body such as a spacecraft are in equilibrium. Lagrange points are labelled L1 through L5 and are preceded by the names of the two gravitational bodies that generate them (the big one first), so the in the case of the Earth they are known as "Sun-Earth Lagrange Points".



They are named after the Italian-French mathematician **JOSEPH-LOUIS LAGRANGE** who, in 1772, published his *"Essay on the three-body problem"*. The mathematical solutions he proposed were later seen to explain what are now called the Lagrange Points. Lagrange is an interesting character: his treatment of the "three body problem" came only 100 years after Isaac Newton had published his "Universal Theory of Gravitation, and he could not possibly have foreseen launching spacecraft.

https://www.jwst.nasa.gov/
https://blogs.nasa.gov/webb/2022/01/21/webbs-journey-to-l2-is-nearly-complete/
https://www.scientificamerican.com/article/what-is-a-lagrange-point/