The Jeety Starn

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Welcome to Issue 12 of *The Jeety Starn*, the quarterly newsletter of Stirling Astronomical Society. Included in this issue are items on asteroids 25143 Itokawa and 162173 Ryugu, the Aberdeen Science Centre, astronomer J.H. Oort, a poem on the Martian Night, a report of the 2026 solar eclipse, and our Happy Observing section, with a note of things to look out for in the sky over the next three months – including the Orionid meteor shower.

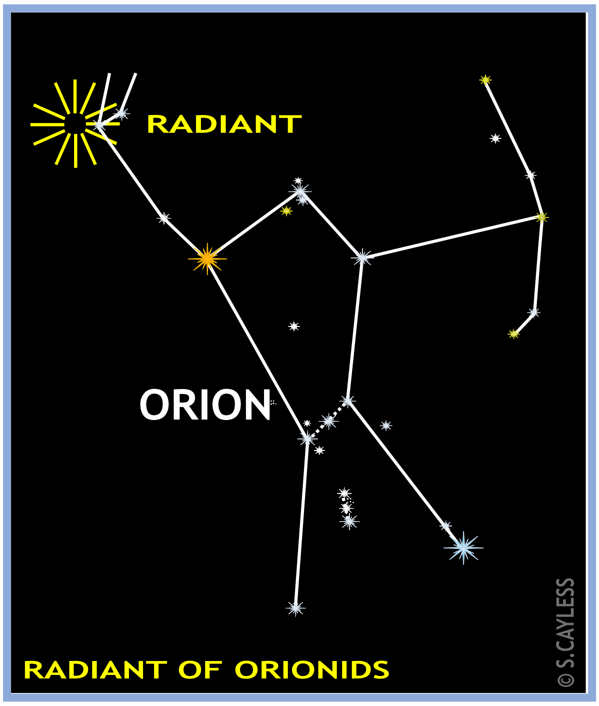
The Orionid Meteor Shower

By Sandi Cayless

The Orionid meteor shower can be one of the most spectacular annual events of late October. The Orionids are one of the two showers associated with Halley's Comet (the other is the Eta (η) Aquariids), and in 2026 they will peak on 21 October. Active from 2 October to 7 November, the Orionids are so-called because their radiant (the point at which they appear to radiate from) is in the constellation of Orion, itself one of the spectacular sights of our late autumn through winter skies.

The hourly rate of the Orionids is usually between 15 and 30 meteors/ hour at the peak (Egal *et al*. 2020), but sometimes up to 60 per hour may be seen (Phillips 2009). Such increases were also recorded in 585, 930, 1436, 1439, 1465 and 1623; more recently, the outburst of 2006 and 2007 were also high (Egal *et al*. 2020). The Orionids are fast meteors that hit the Earth's atmosphere at about 65.5 km/s, and this year, the Zenith Hourly Rate (ZHR) is expected to be around 20 meteors/hr (AMS 2026).

The Orionids occur at the ascending (or north) node of Halley's comet, which reached its closest distance to Earth about 800 BCE. During the meteor shower, Earth comes to within 0.154 AU (23.0 million km) of Halley's orbit, and from the analysis of Rendtel (2008), the peak of the 2006 Orionids can be explained by meteoroids caught in a 1:6 resonance with Jupiter (this was also seen in 1936).



Another large Orionid outburst may occur in 2070 because of particles trapped in a 2:13 mean-motion resonance with Jupiter (Egal *et al*. 2020).

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Observing Report – Noctilucent Clouds

By Alan Cayless FRS

On the evening of the 26th July, several Society members observed a fine display of noctilucent clouds. Reports came in from across the Stirling area, and as far afield as Bo'ness.

The formation of ice crystals is also assisted by tiny particles of meteoric dust, which form near the upper boundary of the mesosphere. Most meteor trails occur at a height of approximately 80 km, and the dust and ionised particles from these trails provide nuclei for ice crystals to form. In recent times, microscopic particles from rocketry exhausts and man-made pollution have added to the supply of nucleating particles in the mesosphere.

Noctilucent clouds seen from the Stirling area at around 23:30 [Image credit: Alan Cayless]

Noctilucent clouds typically occur over the summer months, when the Sun dips only slowly below the horizon and when temperature gradients in the mesosphere favour the production of ice crystals high in the atmosphere. At an altitude of approximately 80 km, these crystals are high enough to catch the last rays of the Sun after it has set below the horizon, resulting in a delicate tracery of illuminated clouds in the darkening twilight sky.

The mesosphere ranges from approximately 50 to 80 km above ground level, making it the middle layer of the Earth's atmosphere, above the troposphere and stratosphere and below the outer layers, the thermosphere and exosphere. The mesosphere is characterised by a negative temperature gradient, with temperature decreasing with altitude. The upper part of the mesosphere is the coldest part of the Earth's atmosphere, with temperatures as low as –100 degrees Celsius. During the Summer months the mesosphere is particularly stable (Lübken *et al*. 2013) and temperatures in the upper mesosphere are at their coldest. This combination of stable, cold air provides ideal conditions for ice crystals to form.

No special equipment is needed to photograph noctilucent clouds. They are bright enough to be captured on a mobile phone or a modern digital camera, and they make an ideal subject for a timelapse. Perfect for the summer months when the skies are never truly dark.

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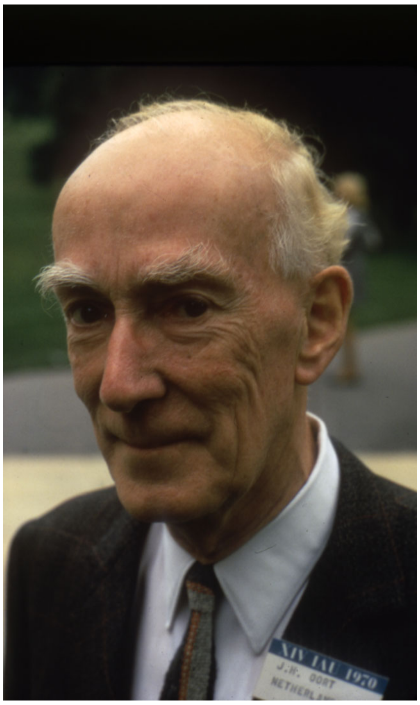
Noctilucent Cloud
That ghostly iridescent shroud
We didn't think you'd be allowed
At latitudes so low (how can we know?)

Dutch Astronomers: J.H. Oort

By Sandi Cayless

Known for, amongst other things, the Oort constants, and for his hypothesis of a spherical shell surrounding the solar system that is the origin of most visiting comets, this article deals with the well-known Dutch astronomer Jan Hendrik Oort. His significant influence on the understanding of the Milky Way and in the field of radio astronomy, and his pioneering work on comets, gave rise to his reputation as one of the greatest 20th century astronomers.

Jan Hendrik Oort (1900–1992)



Jan Hendrik Oort was born on 28 April 1900 in Franeker, in Friesland, in the Netherlands (Katgert-Merkelijn & Damen 2000). His family moved when he was three years old to Oestgeest, near Leiden, as his psychiatrist father had become director of a clinic there (Van Berkel *et al*. 1999). After attending the local high school in Leiden, Oort went to Groningen University (Woltjer 1993); he first opted for natural sciences, but because of his admiration for astronomer, J.C. Kapteyn (whose work he was later to overturn), he chose astronomy.

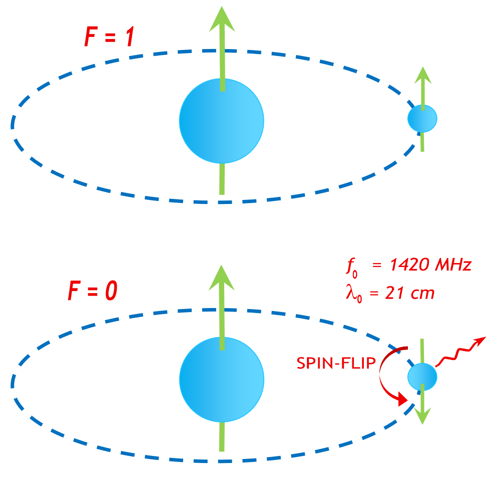
Before he had completed his PhD, Oort had chosen high velocity stars as his area of research, and published his first paper on these (Oort 1922) at the age of 22. This did not fit in with Kapteyn's research programme, and as assistant to P.J. van Rijn, Kapteyn's successor, Oort was sent to the USA from 1922 to 1924, to work with Frank Schlesinger in positional astronomy at the Yale Observatory in New Haven. He returned to the Netherlands in 1924, as a research assistant at the Leiden Observatory (Van Berkel *et al*. 1999), while finishing the research for his doctoral degree at Groningen under Van Rijn. He gained his PhD in 1926 with his thesis, *The Stars of High Velocity* (Oort 1926). During this time, he published another paper reporting the galactic halo, a group of stars orbiting the Milky Way outside the main disk (Oort 1924). In 1926, he became conservator at Leiden, and in 1927 he married Johanna Maria Graadt van Roggen, whom he had met at a university event in Utrecht; they had two sons (Coenraad and Abraham) and a daughter (Marijke).

Having been unable to find a convincing explanation for the movements of the stars he had investigated for his thesis, Oort continued to work on the problem, and two years later he demonstrated (as astronomer Bertil Lindblad had suggested) that high velocity star movements could be accounted for if it was assumed that the Milky Way was not stationary, but was a differentially rotating disc, with the Earth far from its centre. In other words, as each of the billions of stars in the Milky Way is spinning independently through space, the ones closer to the centre must rotate much faster than those further off. In his two ground-breaking papers (Oort 1927; 1928) he demonstrated the rotational velocity near the Sun, and its gradient, using observations of stellar velocities, and in doing so, he introduced two constants (A and B – Oort's constants) to describe these local effects (Woltjer 1993), and laid the foundations of the mathematical theory of galactic structure. He thus moved the Sun from the centre of our galaxy out towards its edge (ESA 2004), ousting the Kapteyn system of the sun at the centre of a symmetrical Milky Way.

These discoveries made his name as a notable astronomer (Van Berkel *et al*. 1999) and led to job offers elsewhere, but Oort remained at Leiden, and in 1930, he was appointed a lecturer in astronomy. In 1932, in another paper on the gravitational force perpendicular to the galactic plane (Oort 1932), he reported that the mass in the galactic plane had to be greater than that observable, though his measurement of this missing mass, or 'dark matter' was later resolved to be incorrect (Kuijken & Gilmore 1989). Oort discusses this missing mass in the galactic disk in greater depth in a chapter on Stellar Dynamics in a book on Galactic Structure edited by Blaauw and Schmidt (Oort 1965), although Van den Bergh (1993) believed that Oort himself was not certain that his detection of this missing mass *was* definitive at the time.

After the unexpected death of Willem de Sitter in 1934, Oort was promoted to extraordinary professor of astronomy and assistant director (to Ejnar Hertzsprung) of Leiden Observatory; a year later, he became General Secretary of the International Astronomical Union (IAU), remaining in post until 1948. In 1937, Oort was elected to the Royal Netherlands Academy, and in 1939, during 6 months he spent in the USA, his interest in the Crab Nebula led to his publishing a paper with American astronomer Nicholas Mayall, to show that the nebula was the product of a supernova explosion (Mayall & Oort 1942). [This element of his work continued, and observations by Oort and Walraven (1956) showed that light from the Crab Nebula exhibited the strong polarisation, predicted by Shklovskii (1953), for synchrotron radiation; this is now known to be the main type of non-thermal radiation from radio sources. Later, Katgert and Oort (1967) published an early estimate of supernova frequency in galaxies.]

During the occupation of the Netherlands in World War Two, Oort resigned from the observatory and university in protest at the dismissal of Jewish professors, and moved temporarily to the countryside town of Hulshorst, returning after the end of the war in 1945, when he became the observatory director, a position he held until 1970. During his enforced absence, Oort met H.C. van de Hulst, a student from Utrecht, and together they theoretically investigated the recent discovery of radio sources in the universe (Van Berkel *et al.* 1999) – Oort knew that the major problem in determining galactic structure visually was starlight absorption by interstellar dust. He also knew of radio pioneer Grote Reber's 1940 work on Cosmic Static: Reber had built a 9m radio dish and found strong radio emission at around 2m wavelengths (Reber 1940a; 1940b). Oort thus encouraged Van de Hulst to examine hydrogen atom emission in radio wavelengths, and in 1944, Van de Hulst presented his results at the 14th April meeting of the Netherlands' Astronomers Club at Leiden Observatory (Van Woerden & Strom 2006). These suggested that hydrogen emission at 21cm should be detectable: a hyperfine 'spin-flip' transition in the energy state of the hydrogen atom, where the direction of the electron's spin is reversed relative to the proton's spin, would correspond to wavelength 21cm. The war delayed publication of his paper until late in 1945, and his results were later confirmed independently by Shklovskii (1949), but it would be several years before the 21cm 'H I' line was actually detected.



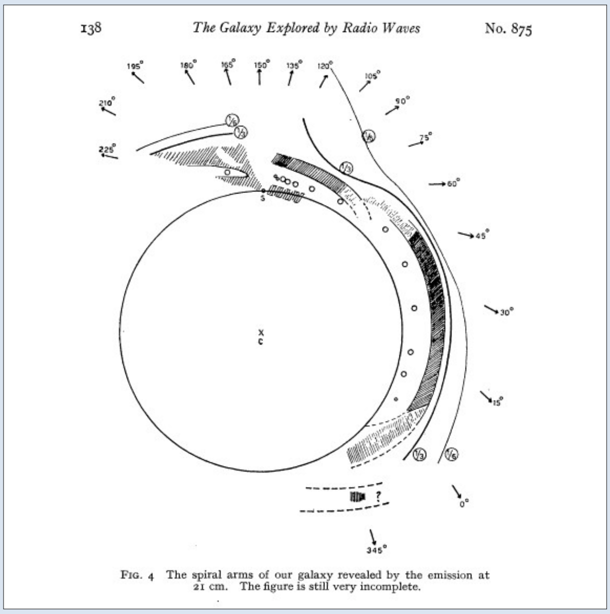
Hydrogen atom with proton and electron spins aligned (top)
Flip of electron spin + emission of photon with λ 21 cm (bottom)

Oort began at once to try to obtain equipment for radio wavelength observations, but had no access either to the technology or the expertise to build such (Van Woerden & Strom 2006). In 1945, Oort, as observatory director at Leiden, was determined to make the Netherlands a leading centre for radio astronomy, and approached several sources, with limited success. However, in 1949, the Netherlands Organisation for the Advancement of Pure Science (ZWO) came into being, as did the Stichting Radiostraling van Zon en Melkweg (SRZM, the Netherlands Foundation for Radio Astronomy). The new foundation was chaired by Oort and included representatives of various astronomical institutes, the Post, Telephone and Telegraph Service (PTT), Philips Physical Laboratories and the Royal Netherlands Meteorological Institute, and construction of a 25m dish was planned, though funding, gear and expertise was still lacking. Still, A.H. de Hogt of the PTT, who had brought a number of salvaged German Würzburg radar reflectors to Kootwijk (for Radio Kootwijk), gave one to the SRZM to use for studies of Galactic radio emission (Van Woerden & Strom 2006; Hartsuijker & Roos 2021). This, along with a war-surplus radio receiver from Leiden's Kamerlingh Onnes Laboratory in 1948, allowed a start to be made on searching for the 21cm line.

Alas, in March 1950, a fire destroyed the receiver. A new one was begun at the end of that year using equipment given by Philips, under the direction of C.A. Muller, a young engineer from Delft, and one assistant. Five months later, on May 11, 1951, the 21cm line was detected at Kootwijk, although H.I. Ewen and E.M. Purcell had already detected the line on March 25, at Harvard, using a horn antenna, and had asked H.C. van de Hulst and F.J. Kerr from

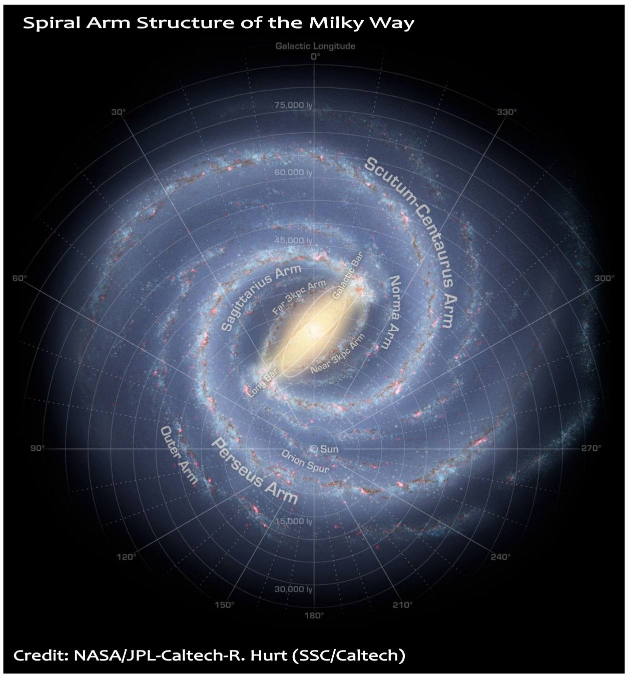
Sydney, both there on visits, to ask their home agencies to confirm their results. Both did, successfully, the Australian effort requiring the rapid construction of a makeshift receiver in six weeks (Wendt *et al*. 2008). The upshot was twin reports by Ewen and Purcell (1951) and Muller and Oort (1951) published in *Nature*, and that by Christiansen and Hindman (1952) and Van de Hulst (1952). In 1952, with a team led by Oort, the Kootwijk HI Würzburg was used to continue studies of the 21cm line in a concentrated campaign that aimed to map as much of the Milky Way as could be seen from the Netherlands, with students and technicians working day and night for months (Hartsuijker & Roos 2021). Using profiles (intensity vs frequency) along the galactic plane, Oort was able to derive the locations of hydrogen concentration that hinted at spiral arms (Oort 1953).

In spring 1953, Van de Hulst, now a Leiden astronomer, was invited to Oxford University to give the Halley Lecture on the group's research on the Milky Way (Van de Hulst 1953). He needed a map derived from the observations thus far, so Oort, aided by his students and arithmeticians at Leiden Observatory, produced a first version of a map in double quick time (Hartsuijker & Roos 2021). The map clearly showed the Milky Way's spiral arms. This accomplishment was a huge step forward for radio astronomy, and in the understanding of the Milky Way. The full results of the Galactic Equator survey were published in 1954 by Van de Hulst, Muller and Oort.



First version of map of the Milky Way, showing the Spiral arms.
From Van de Hulst (1953)

The next, wider campaign was carried out from 1953 to 1955, and the observations allowed the construction of a three-dimensional map, which showed galactic structure far more clearly; it was published in Westerhout (1957). But the entire Milky Way had to be mapped, and Oort asked for the assistance of Australian radio astronomer Frank Kerr and his team. The Australian observations were combined with those of the Dutch to produce a complete map, which was then published in the seminal paper, *The Galactic System as a Spiral Nebula* (Oort, Kerr & Westerhout 1958).



Credit: NASA/JPL-Caltech-R. Hurt (SSC/Caltech)

Design studies had begun in 1951 for a 25m radio telescope, and the build began in 1954, in Dwingeloo, in Drenthe; it was completed in 1955. The huge 25m Dwingeloo radio telescope was opened by Queen Juliana of the Netherlands on April 17, 1956. The fulfilment of Oort's dream, the telescope was the largest fully-steerable radio dish in the world to date*, and all Dutch radio astronomy work relocated from Kootwijk to Dwingeloo (Hartsuijker & Roos 2021). The group went on to elaborate on the large-scale several-arm spiral structure of the Milky Way, the galactic centre, and gas cloud motions; Oort was to continue his research into galactic distribution until just before his death in 1992 at the age of 92.

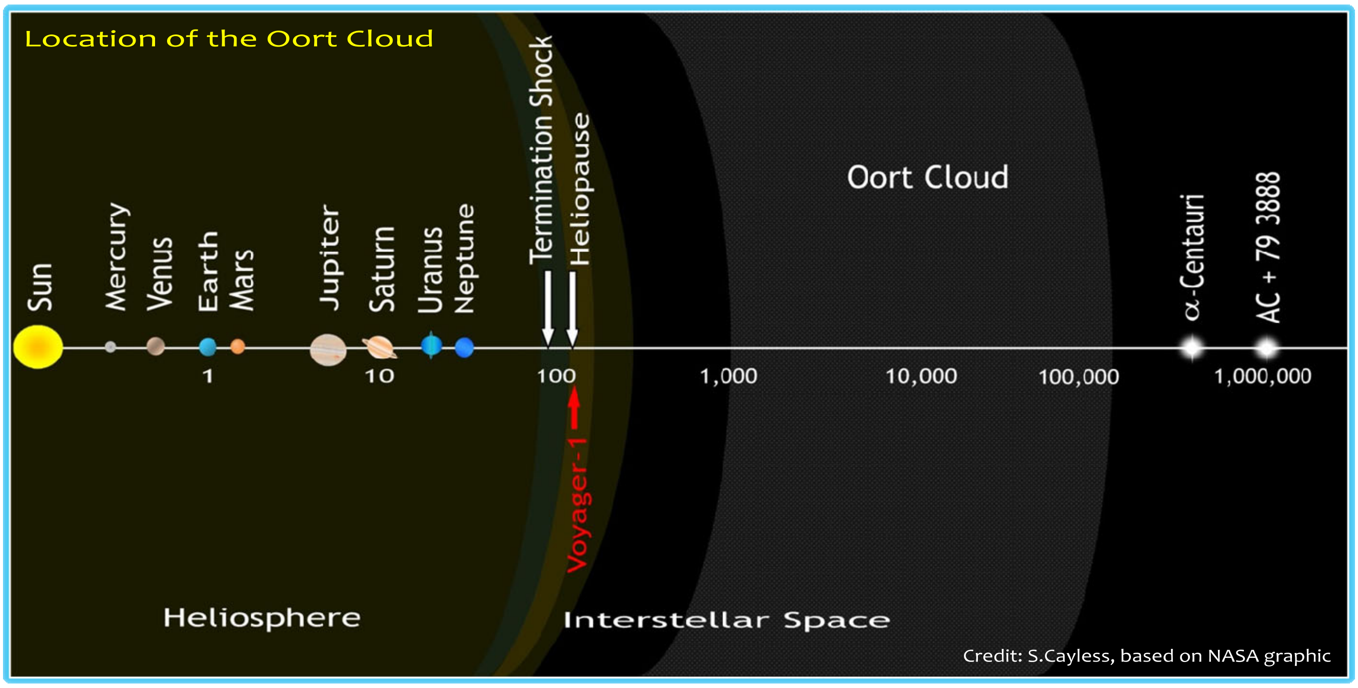
But even as Dwingeloo was being built, Oort recognised other problems: Dutch astronomers did not have assured access to a large telescope in the southern hemisphere (Katgert-Merkelijn & Damen 2000), necessary for mapping the entire galaxy. Thus, in 1953, during a visit by German astronomer

Walter Baade, a conference, *The Co-ordination of Galactic Research*, involving most leading European astronomers, was held in Groningen to remedy this and other matters. It would take almost ten years for completion of the European Southern Observatory, with Oort as chairman, to realise the dream. The ESO was founded in 1962; it has a centre in Munich and a huge observing facility in Chile (Woltjer 1993).

Meanwhile, in 1950, Oort had put forward the idea for which perhaps he is best known: the now-accepted model for the origin of comets – he was one of the rare astronomers to have seen Halley's comet twice (Woltjer 1993). He reasoned that the long-period comets originated from, and were replenished by, a spherical cloud, or bubble, of ice and rocky debris (planetesimals) from the birth of the solar system that lay between 50,000 and 150,000 astronomical units (AU) from the Sun (Oort 1950), in other words, almost halfway to the nearest stars. This is now known as the Oort (or Öpik–Oort) cloud, but is still hypothetical. Later research has amended this distance calculation to 2,000 to 200,000 AU (NASA 2025). Events that led to Oort cloud formation have been modelled in several computer simulations (see Zwart *et al.* (2021) for a list), and it is theorised that most of the outer Oort cloud arose after the Solar System had become an isolated entity orbiting the Galactic centre, and about 70% of the material in the cloud comes from the region in the proto-disk near where the gas giants and the Centaur family of asteroids are now located, i.e. between about 15 and 35 AU (Zwart *et al.* 2021). Oort also worked out that these long-period comets could be influenced by Jupiter's gravity and be trapped into tighter orbits, to become periodic comets. Currently, short-period comets are usually known as either Jupiter-family comets, with orbits of less than 20 years that are largely influenced by Jupiter's gravitational pull, and believed to orbit in the Kuiper belt, and Halley-type comets, which have slightly longer orbits of 20 to 200 years and are thought to originate in the Oort Cloud (Dyson 2021; Królikowska *et al.* 2025).

Oort maintained his interest in his other research areas, and in 1951, while with his wife in Princeton, where he was a visiting professor, he collaborated with Lyman Spitzer in a study of interstellar clouds (Van den Bergh 1993). This later led to a joint paper on the acceleration of interstellar clouds by O-type stars (Oort & Spitzer 1955). He continued to work on high velocity clouds of neutral hydrogen at high galactic latitudes (Muller, Oort & Raimond 1963) and discovered the rapid expansion away from the galactic centre of the 3-kpc spiral arm (Oort & Rougoor 1957; Van Woerden *et al.* 1957). In the interim, always taking the initiative, he was instrumental in building an addition to the Dwingeloo 25m dish, the Westerbork Radio Synthesis Telescope, an array of fourteen 25cm dishes completed in 1970 (Woltjer 1993).

The scientific achievements of Jan Oort are too numerous to give more than an overview, but Oort also carried a heavy administrative burden and was a leader in European and international astronomy, celebrated for his organisational and diplomatic flair. As well as a founder of the ESO, Oort was



secretary of the International Astronomical Union (IAU) from 1935 to 1948, and its president from 1958 to 1961, and he was director of the Leiden Observatory from 1945 to 1970. The honours he received for his outstanding contributions to astronomy are listed below (Anon. 2026).

J. H. Oort: Honours

Bruce Medal of the Astronomical Society of the Pacific (1942)
Gold Medal of the Royal Astronomical Society (1946)
Janssen Medal, French Academy of Sciences (1946)
Prix Jules Janssen, Société astronomique de France (1947)
Henry Norris Russell Lectureship of the American Astronomical Society (1951)
Gouden Ganzenveer (1960)
Vetlesen Prize (1966)
Jansky Prize, National Radio Astronomy Observatory (1967)
Karl Schwarzschild Medal, Astronomische Gesellschaft (1972)
ADION medal, Association pour le Développement International de l'Observatoire de Nice (1978)
Balzan Prize for Astrophysics (1984)
Kyoto Prize, Inamori Foundation (1987)

In addition to the above, as well as the Oort constants, the Oort Limit and the Oort cloud (Öpik–Oort cloud), Jan Hendrik Oort is remembered by impact crater Oort on Pluto, Asteroid 1691 Oort (IAU 2026), and the Oort building of Leiden Observatory.

The accolade by Subramanyan Chandrasekar on Oort's passing sums up the influence of this remarkable astronomer:

> *"The great oak of astronomy has been felled; we are lost without its shadow."*

*N.B. The 25m Dwingeloo radio telescope is now the largest radio telescope in the world available for use by amateurs.

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Jan Oort at the International Astronomical Union (IAU) meeting at the University of Sussex, Brighton, U.K., August 26, 1970. © American Institute of Physics (AIP); AIP Emilio Segrè Visual Archives, John Irwin Slide Collection.
Spin-flip transition in the hydrogen atom at 21cm wavelength: © S. Cayless.
First version of map of Milky Way: from Van de Hulst (1953) *The Observatory 73, p. 138*.
Spiral Arm Structure of the Milky Way: NASA/JPL-Caltech-/R. Hurt SSC/Caltech. Artwork June 3rd, 2008; ssc2008-10b. https://www.spitzer.caltech.edu/image/ssc2008-10b-a-roadmap-to-the-milky-way-annotated.
Location of the Oort Cloud: © S. Cayless.
Great oak of astronomy felled: © S. Cayless.

A Quote or Two...

Schultz, Dwight (1947-)
Today's particle physics describe light as a crumple in space, and we may have deformed space in such a way that they noticed something peculiar – and they had the ability to investigate it.

Seneca (8 BCE-65 ACE)
Many discoveries are reserved for ages still to come... Our universe is a sorry little affair unless it has in it something for every age to investigate…

Shakespeare, William (1564-1616)
Thoughts... which ten times faster glide than the sun's beams…

Shepard, Alan (1923-1998)
It's a very sobering feeling to be up in space and realize that one's safety factor was determined by the lowest bidder on a government contract.

Sophocles (~497-406 BCE)
Astronomy? Impossible to understand and madness to investigate.

Streep, Meryl (1949-)
There are improbable things suspended in space, like the earth.

Thoreau, Henry David (1817-1862)
The stars are the jewels of the night and perchance surpass anything which day has to show.

Many men walk by day; few walk by night. It is a different season.

Yes, I am a dreamer. For a dreamer is one who can find his way by moonlight, and see the dawn before the rest of the world.

Tsiolkovsky, Konstantin (1857-1935)
Earth is the cradle of humanity, but one cannot remain in the cradle forever.

Unknown
Newton's Fourth Law: Physicists congregate periodically in obscure European cities to have their picture taken and then quickly disperse.

Van Gogh, Vincent (1853-1890)
For my part I know nothing with any certainty but the sight of the stars makes me dream.

Vaughan, Bill (1915-1977)
Man is the animal that intends to shoot himself out into interplanetary space, after having given up on the problem of an efficient way to get himself five miles to work and back each day.

Verne, Jules (1828-1905)
Reality provides us with facts so romantic that imagination itself could add nothing to them.

Vidal, Gore (1925-2012)
Astronauts: rotarians in outer space.

von Braun, Wernher (1912-1977)
For my confirmation, I didn't get a watch and my first pair of long pants, like most Lutheran boys. I got a telescope. My mother thought it would make the best gift.

Vonnegut, Kurt (1922-2007)
The universe is a big place, perhaps the biggest.

Wells, H. G. (1866-1946)
Life begins perpetually… Life, forever dying to be born afresh, forever young and eager, will presently stand upon this earth as upon a footstool, and stretch out its realm amidst the stars.

Wilde, Oscar (1854-1900)
We are all lying in the gutter, but some of us are looking at the stars.

Aberdeen Science Center

By Cairenn Farland

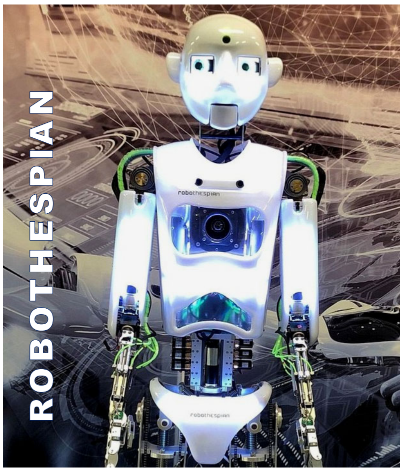
The Aberdeen Science Centre (ASC) is located on Constitution Street in Aberdeen, near the Links Road and quite close to the beach (Aberdeen Science Centre 2026). It has recently been renovated and there are a number of useful facilities, including a free cloakroom with lockers. There is parking for bicycles and cars, both free, but a donation is suggested for car parking, as the ASC is a charity. There is also a Garden for resting and a 'Grub Fresh Food' catering outlet which supplies drinks, fruit, sandwiches and bespoke meals (by using the *Make a Meal* screen to choose your own items).

The Centre is a fun day out for all the family, and caters for adults, teenagers and youngsters, though many of the ever-changing public exhibits tend to appeal to younger guests (and adults who are big kids at heart). There is no time limit on a visit and as there are over 60 interactive displays, it makes it difficult to get around all of them. The many staff are there to help and demonstrate. The Centre is accessible for wheelchair users and those with assistance dogs, and has accessible toilets, baby-changing, wi-fi and a gift shop.

For other activities, there are meeting rooms and a split-level upper exhibition floor that can be reconfigured as spaces for conferences, exhibitions, receptions, or similar. Big events can also hire the whole Centre, which can be closed to the public for the length of the event. Visitors to these are given access to the facilities and exhibits.

There are six different zones at the Centre: Energy, Space, Life Sciences, Make It, Test It, and Under 6. The Make It and Test It zones are on the upper level.

The **Energy zone** is designed to answer the questions where does energy come from, and what kinds of energy are used today? The exhibits include *Drive the Drill*, where visitors drive a drill in a rock further in: this uses chemical energy from muscles, which then create friction and heat. There is a display of a tank to make waves, which light up a lighthouse using kinetic energy, when a rod is pushed down into a pillar. The *solar piano* exhibit sends directed light power to play a song and there is a robot, *RoboThespian*, a partially-self-directed entertainment robot (IEEE 2026) which can be programmed on a console to change his moves, eye colour, speech, face and other aspects, and he sings.


ROBOTHESPIAN

This zone also has the *OPITO Theatre of Energy*, an immersive facility that includes the *Story of Energy*, which uses projection mapping technology in games of skill to give an idea of how people and their demands influence different energy stores. For example, visitors can use their own energy to throw a ball at numbers on an interactive Energy Wall to get answers about the different stores of energy, or use touch on the Wall to follow a quest to Ancient Egypt for lost treasures, or head into space to put the stars in the position where they belong. The exhibits change every few weeks.

In the **Space zone**, guests can launch an air rocket to see how space rockets take off, dock a spaceship using a console to test piloting skills, or look at Earth and other planets from space. They can also 'see' the surface of Mars and find named features. The virtual reality space allows visitors to see the planets and the space station.

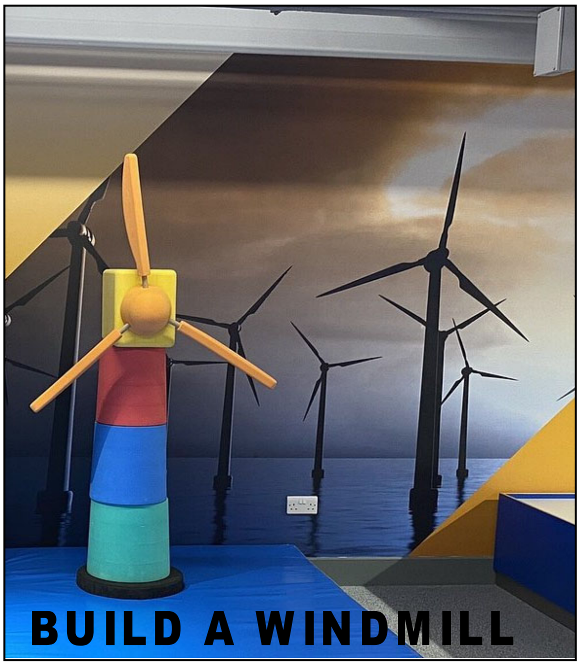

SURFACE OF MARS

The **Life Sciences** zone covers the scientific study of the living world of plants, animals, microorganisms and humans, and how do they work. The many exhibits include: a virtual body scanner that lets users scan the body to see the internal arrangement of bones, muscles etc., and perform a virtual autopsy of a patient; an exercise bike that works out how many calories riders are using; a zoom-in microscope to enlarge bugs and so on to see them in close up on a screen; and, a marine environment that visitors can be photographed in, in an oldfashioned brass diving helmet. There is also a wall display that allows you to make a giant cell (plant or animal), with removable pieces that have to be placed in the correct position, like a sort of 3-D jigsaw.

The **Test It** experience is designed to develop problem solving in science, to experiment, and to create things and then test what you build. For example, you can build simple shapes to test how well they fly above the wind table, or design a small car to race along a race-track, and test how well the design runs. One fun sloping track is designed to have a slinky run down it without falling off.

The **Under 6** zone caters for smaller guests, with the displays to size; these are designed to encourage learning science through play. These include a set of distorting mirrors so that little people can see themselves as funny shapes, and various building activities like connecting pieces of woods with large bolts to make stilts, etc., or magnetic fishing, or building a windmill. There are also sitting down areas for weary parents.

Image Credits: All C. Farland



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JWST Astronomers Recognised in 2026 RAS Awards

By Alan Cayless FRAS

Two prominent UK astronomers have been recognised with individual medals in this year's Royal Astronomical Society awards for their work with the James Webb Space Telescope.

Since its launch in 2021 the JWST has provided detailed infrared images of the early Universe and enabled spectroscopic analysis of exoplanet atmospheres. The individual awards made this year follow an earlier group award made to an international team of astronomers in 2024 for developing the Mid Infrared Instrument (MIRI), one of the four main instruments on the James Webb Telescope.

In July this year, Professor Alastair Glasse from Edinburgh University was awarded the Jackson-Gwilt Medal for his individual contribution to the development and testing of MIRI as lead instrument scientist, and Professor Andrew Bunker of Oxford University was awarded the Society's Herschel

Herschel Medal © Royal Astronomical Society

Medal for his role in developing the Near-InfraRed Spectrograph (NIRSpec) instrument and using it to identify high-redshift galaxies.

The full list of this year's award winners, with links to the individual citations, can be found on the RAS website:

https://ras.ac.uk/news-and-press/news/winners-2026-ras-awards-revealed

Martian Night

By Arryll Idrennis

The night begins, but twilight tarries,
As swirling dust with sunlight marries.
The glowing Sol sinks slow to rest,
A distant star yond mountain crest;
Her azure disk in sunset hues
Of lavenders and sapphire blues.

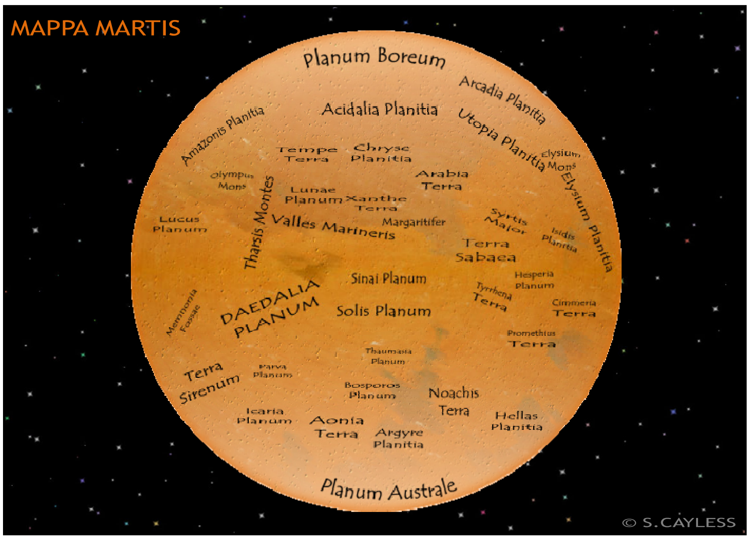
The Evening Star arises slow
In twilight-dappled summer glow:
A star-bright spark of silver blue –
The Earth hangs there in splendid hue,
To light the night with starry spark:
A clear blue lamp to lessen dark.

As ball of Phobos runs his race
And Deimos moves, a star in space,
See bands and braids of silver-blue –
The noctilucent clouds shine through.
And darkling sky brings out her stars –
The night sky awe of mighty Mars.

The night's star-shapes familiar grow:
Orion's stars in glowing show…
Great Jupiter and Saturn rise
In glittering, over-arching guise;
With moons ashine are shadows shed
On rocks and dusty dunes of red.

Above Olympus Mons, immense
In star-set bowl of light intense;
A lustrous breadth of brilliant light
Its span aglow in colours bright…
The Milky Way, her radiant clouds
Of stars and dust in angel shrouds…

But soon the sky begins to light,
Puts lesser stars once more to flight;
A violet flush as Sol climbs slow…
To flood the reddish land with glow –
And night-limned sky of Mars is gone,
As one more Martian sol is born.



"Mars has been flown by, orbited, smacked into, radar inspected, and rocketed onto, as well as bounced upon, rolled over, shovelled, drilled into, baked, and even laser blasted."
Buzz Aldrin (1930-)

Swift Telescope Rescue Mission

By Alan Cayless FRAS

On 3 July 2026 a modified Lockheed TriStar aircraft named *Stargazer* took off from a remote atoll in the Marshall Islands at the start of a daring rescue mission. After reaching an altitude of 40,000 feet the aircraft released a Pegasus XL rocket which continued into low Earth orbit carrying a small remotely operated spacecraft designed to rendezvous with one of NASA's most successful observatory satellites and rescue it from a decaying orbit.

Launched in 2004, the Neil Gehrels Swift Observatory is a space telescope satellite that has been detecting and studying gamma ray bursts and other highly energetic phenomena for over 20 years. Swift is equipped with three telescopes covering the higher energy end of the electromagnetic spectrum, from visible and ultraviolet light to X-Rays and gamma rays.

Gamma ray bursts are the result of some of the most powerful events in the Universe. Detected on Earth or in orbit as brief and intense bursts of gamma rays lasting from a few seconds to a few minutes, they result from distant supernovae and also from collisions between neutron stars. In both cases, matter collapsing to form a black hole releases a sudden burst of energy in the form of gamma rays, followed by an afterglow in X-rays and in visible and ultraviolet light.

As the name implies, the Swift satellite was designed to respond extremely rapidly to these bursts, and is capable of being directed to a new target within minutes. In over 20 years of operation Swift has detected over 1000 gamma-ray bursts and in 2005, Swift responded sufficiently rapidly to the burst GRB 050509B to detect X-rays in the afterglow – the first time these had been observed directly (NASA News 2005).

Swift also monitors a variety of other phenomena including active galaxies, X-ray flares, novae and supernovae (NASA Science 2026a). Most recently, in July 2026, Swift detected a Tidal Disruption Event – the aftermath of a collision between a wandering black hole and a star (Stein *et al.* 2026).

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Artist's impression of a Tidal Disruption Event. The star on the left has strayed too close to a black hole. Material from the star spirals into the black hole, with the release of energy producing an intense jet that can be detected from a great distance. Image credit: NRAO/AUI/NSF/NASA

https://science.nasa.gov/mission/swift/swift-boost-mission/.
Stein, R. *et al.* (2026), TDE 2025abcr: A Tidal Disruption Event in the Outskirts of a Massive Galaxy. *Astrophysical Journal Letters*, 1006:L57, DOI: 10.3847/2041-8213/ae77f3
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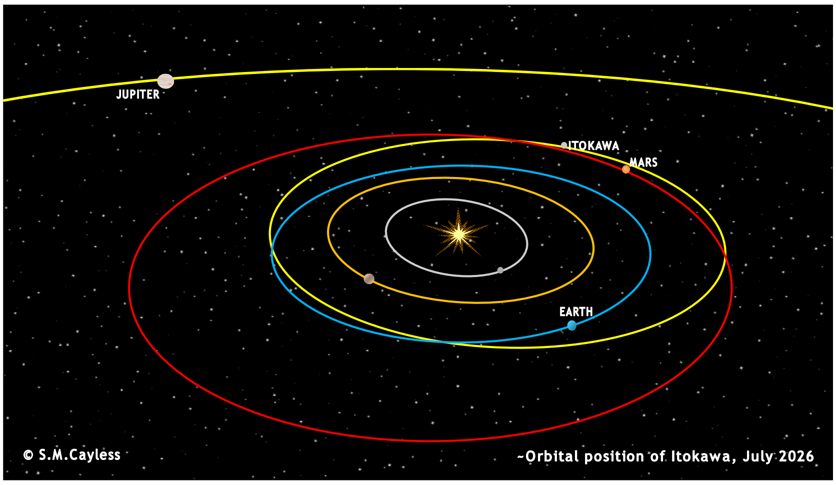
Interesting Asteroids: Itokawa and Ryugu

By Sandi Cayless

As part of an occasional series, this article deals with two related asteroids, **25143 Itokawa** (provisional designation 1998 SF36) and **162173 Ryugu** (provisional designation 1999 JU3). Both are near-Earth objects and potentially hazardous asteroids that belong to the Apollo group, and both have been visited by Japanese spacecraft and returned samples to Earth.

Asteroid 25143 Itokawa (provisional designation 1998 SF36) is a sub-kilometre near-Earth object of the Apollo group and a potentially hazardous asteroid. It was discovered at Socorro by the LINEAR program on 26 September 1998 (IAU 2026a). The asteroid was later named after Japanese rocket engineer Hideo Itokawa (1912-1999), known as the Father of Japanese rocketry (IAU 2003). Itokawa was an aerospace engineer who originated Japan's first solid rocket launch tests in 1955, in a series named 'Pencil'. His leadership and insight resulted in Japan's rockets reaching space by 1960, and its first satellite making orbit in 1970.



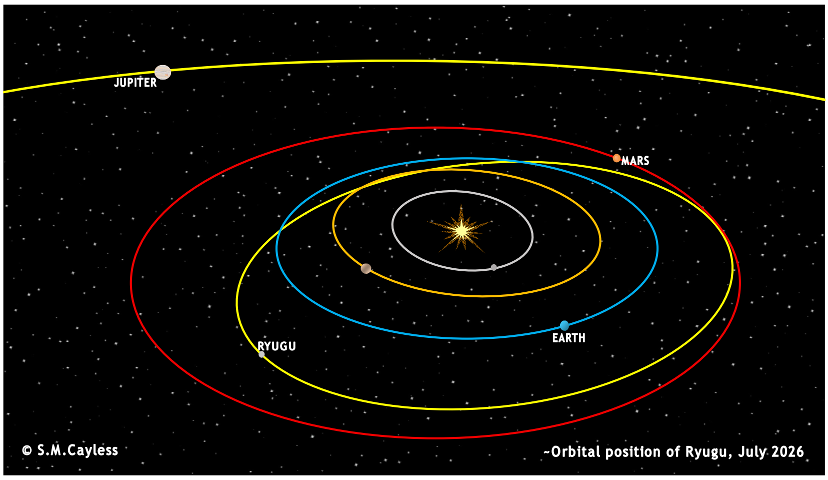
Itokawa is a stony S-type asteroid (chondrite), and peanut-shaped, with a rotation period of 12.1 hours (ESO 2014); it measures about 330m diameter (JPL 2026a). The mission to the asteroid also showed it to have a low density and high porosity, and different parts of it have different densities; scientists have thus concluded that Itokawa is a rubble pile rather than a solid body, and is made up of numerous boulders of different sizes (ESO 2014, NASA 2025). The mission also proposed that Itokawa's peanut shape may be down to its nature as a contact binary, formed by two smaller asteroids pulled together and bonded by gravity. These findings were supported by Lowry *et al.* (2014) who suggest that the collision resulted after a catastrophic disruption of a larger differentiated body, or was the result of the collapse of a binary system.

Asteroid 25143 Itokawa	
Argument of Perihelion (°)	162.82017
Ascending Node (°)	69.07689
Orbital Inclination (°)	1.62118
Orbital Eccentricity	0.2802554
Perihelion Distance (AU)	0.9530401
ΔV w.r.t. Earth (km/sec)	4.6
Semi-Major Axis (AU)	1.3241366
Mean Anomaly (°)	142.57399
Mean Daily Motion (°/day)	0.64685160
Aphelion Distance (AU)	1.695
Period (years)	1.52
Absolute Magnitude	19.26
Diameter (km)	0.33
Phase Slope	0.15
	Data: IAU/JPL

25143 Itokawa became the first asteroid from which samples were captured and brought to Earth for analysis (i.e. a sample-return mission) in 2005 (NASA 2025). The Japanese space probe Hayabusa (Japanese for *Falcon*) left Earth on 9 May 2003 and reached the asteroid on 12 September 2005. After arrival, Hayabusa assumed a station-keeping heliocentric orbit 20 km from the asteroid, to study its shape, spin, topography, colour, composition, density, and history, after which it moved closer for landing. It landed on the asteroid on 19 November 2005, and touched down twice, to collect a small amount of dust (over 1500 regolith dust particles) using a detachable collection horn. This was done automatically, because the long communication delay could not allow Earth-based real-time control. At touchdown, the spacecraft was set to fire tiny missiles at the surface and collect the resultant spray. The sample was

returned to Earth on 13 June 2010 (Nakamura *et al*. 2022), the sample capsule being recovered near Woomera, Australia. The Japanese Aerospace Exploration Agency, JAXA, observed and analysed the particles inside Hayabusa's sample return container by scanning electron microscope (SEM), and later confirmed that the particles originated from Itokawa, and comprised around 1,500 rocky grains, most of which were extraterrestrial and definitely from Itokawa (JAXA 2010).
Itokawa has been mapped and many major surface features were named by the Hayabusa scientists and were accepted by the IAU's Working Group for Planetary System Nomenclature (JAXA 2009). Ten craters are named: Catalina, Fuchinobe, Gando, Hammaguira, Kamisunagawa, Kamoi, Komaba, Laurel, Miyabaru and San Marco. The regiones (a regio is a large area differentiated from an adjacent area by reflectivity or colour) are:
MUSES-C Regio, Sagamihara Regio, Uchinoura Regio, Arcoona Regio, LINEAR Regio, Ohsumi Regio, and Yoshinobu Regio.

Asteroid 162173 Ryugu (provisional designation 1999 JU3) is a near-Earth object and a potentially hazardous Apollo group asteroid. It was discovered at Socorro by LINEAR on May 10, 1999, and named for the undersea palace of the Japanese Dragon God (IAU 2026b). In legend, a fisherman, Urashima, rescues a sea turtle, who takes him to the underwater palace of Ryugo-jo, where he meets Princess Otohime. He stays 3 years, and when he leaves, Otohime gives him a treasure box and tells him never to open it. But when he returns home, he finds everything changed, as 300 years have passed. Baffled, he opens the box and is immersed in a white fog. When it clears, he finds he is a very old man: the box contained his age (JAXA 2019).



Ryugu measures about 900m in diameter and has a rotation period of 7.6h (JPL 2026b). It is a chondrite of the rare Cb spectral type (i.e. it has the qualities of both a C-type and a B-type asteroid), and is dark, with a very low 0.55-µm geometric albedo, and probably belongs to the inner main belt Eulalia and Polana asteroid families (Sugita *et al*. 2019). The asteroid has abundant surface boulders (~x2 Itokawa) and like Itokawa, it is believed to be essentially a rubble pile, with little internal cohesion, suggesting that surface materials can be ejected into space over time. Ryugu has 77 surface craters and around 4,400 boulders over 5m in diameter.

Asteroid 162173 Ryugu	
Argument of Perihelion (°)	211.61678
Ascending Node (°)	251.29153
Orbital Inclination (°)	5.86655
Orbital Eccentricity	0.1910626
Perihelion Distance (AU)	0.9530401
ΔV w.r.t. Earth (km/sec)	4.7
Semi-Major Axis (AU)	1.1909211
Mean Anomaly (°)	270.65924
Mean Daily Motion (°/day)	0.75836690
Aphelion Distance (AU)	1.418
Period (years)	1.3
Absolute Magnitude	19.55
Diameter (km)	0.896
Phase Slope	0.15
	Data: IAU/JPL

The Japanese spacecraft Hayabusa2 arrived at the asteroid in June 2018 and found it to be a spinning-top shaped object with a conspicuous equatorial ridge, high porosity and a rubble-pile type structure (Watanabe 2019). After 3.5y in space, Hayabusa2 entered the Home Position at 20km above Ryugu's surface on 27 June 2018, and hovered to map it and identify a suitable sampling site. Touchdown was achieved on 21 February 2019 and the first sample collection was initiated using a device similar to the original Hayabusa (Morota *et al*. 2020). As the tip of the sampler horn (0.2 m diam.) touched the Ryugu surface, a tantalum bullet was fired; this destroyed the surface to produce sample fragments, which were then concentrated through the horn for storage in a sample chamber (Nakamura *et al*. 2022). The aim of the second touchdown was to collect subsurface materials near an artificial crater, created by the small carry-on impactor (SCI) device (Saiki *et al*. 2017). The SCI impact operation (on 5 April 2019) used a 2 kg copper projectile fired at 2 km s^{-1} to impact Ryugu's surface and create an artificial crater in the northern area of the asteroid's equatorial ridge. A semi-inverted conical crater with an apparent diameter of 14.5 m and a depth of 1.7 m from the asteroid surface was made. The ejecta was deposited around the crater and the second sample was collected on 11 July 2019 by repositioning the spacecraft (Nakamura *et al.* 2022).

Hayabusa2 returned its collected material to Earth on 6 December 2020 (Nakamura *et al.* 2022). Initial analyses showed that samples were soft and contained grains formed at temperatures above 1000 °C, and had Ca- and Al-rich inclusions (JAXA 2022). The rock fragments were of two main types: materials formed in low water content environments, and those formed in high water content environments. In one hexagonal iron sulphide crystal, trapped liquid water, which was carbonated and contained salts and organic matter, was found. Samples also had large amounts of magnetite and some crystals with a "coral reef" type appearance were imaged; these were thought to form in liquid water that was once present within the asteroid's parent body. Organic materials were also found within the Ryugu samples, including amino acids, amines, nitrogen-heterocycles, and monocarboxylic acids (Potiszil *et al.* 2023). The organic compounds uracil (a component of RNA) and vitamin B3 were also found (Oba *et al.* 2023).

A number of names for features on Ryugu's surface were discussed by IAU Working Group for Planetary System Nomenclature and approved in December 2018 (JAXA 2019). The theme used was names appearing in children's stories from around the world, and in deference to the naming of the asteroid, Urashima was selected for the largest crater, and Otohime for the largest boulder. The others are: the dorsum (equatorial ridge) Ryujin (Dragon god, Princess Otohime's father); the craters Cendrillon, Kolobok, Brabo, Kintarou, Momotarou, and Kibidango; the fossae (depressions) Tokoyo and Horai; and the Saxa (boulders) Catafo and Ejima.

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~Orbital position of Asteroid Itokawa, July 2026 © Sandi Cayless.
~Orbital position of Asteroid Ryugu, July 2026 © Sandi Cayless

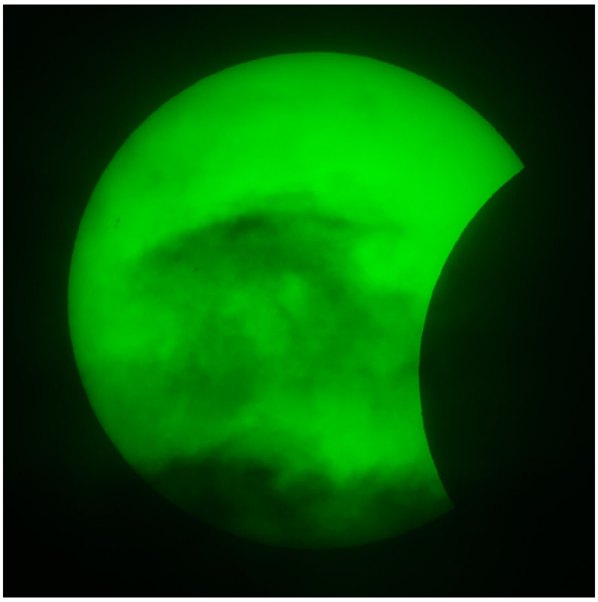
Solar Eclipse 12 August 2026

By Alan Cayless FRAS

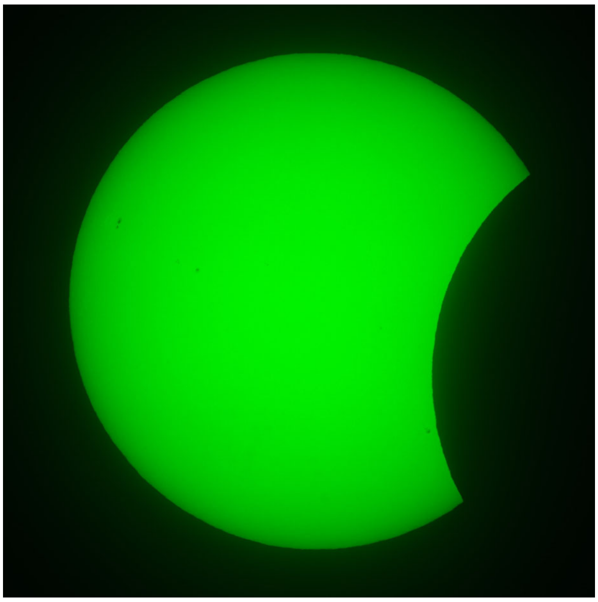
Solar eclipses occur when the Moon passes in front of the Sun. Because the Moon's orbit is slightly tilted with respect to the plane of the Earth's orbit around the Sun, eclipses do not happen every month. Partial eclipses typically happen every few years, but total eclipses, when the Moon completely covers the Sun, are much rarer. The last total solar eclipse visible in the UK happened in August 1999, visible from Cornwall and parts of Devon.

This summer, one of the most complete partial eclipses for many years took place. In the early evening of 12 August 2026, the Moon was set to cover approximately 91% of the Sun, leaving only a small crescent visible. As seen from Stirling the Sun was quite low in the West with the maximum eclipse due to occur just a couple of hours before sunset.

After a hot afternoon, clouds started to build towards evening but the Sun did remain visible for long enough to see the first stages of the eclipse. Just after 18:00 the edge of the Moon appeared on the solar limb, gradually taking an increasing bite out of the Sun and covering sunspots as it went. After about 20 minutes the clouds thickened preventing us from seeing the fullest extent of the eclipse, but the effects were felt as the sky darkened to an early twilight. Birds went still and solar lights came on as the eclipse reached its peak just after 19:00, before the sky brightened again.


The partially eclipsed Sun with clouds. Image credit: Alan Cayless

The next partial solar eclipse visible from Stirling will be on 2 Aug 2027. There will not be another total solar eclipse visible in the UK until September 2090.


The partially eclipsed Sun before clouds. Image credit: Alan Cayless

Happy Observing!

September 1st brings us the peak of the Aurigid meteor shower (active 28 Aug-5 Sep). The radiant point, in the constellation Auriga, is circumpolar from Stirling and so is always above the horizon; the shower will thus be active all night. Expect the best displays just before dawn, of 4-6 meteors/hr. The parent body of the Aurigids is comet C/1911 N1 (Kiess). On Sep 3, the 22-day old Moon and M45 (Pleiades) make a close approach in Taurus. Sept 6 brings a close approach (appulse) of the Moon and Mars; as the two bodies also share the same right ascension, the phenomenon is also a conjunction. Best viewed after midnight, both are in Gemini. On Sept 8, the Moon and M44 (Beehive Cluster) make a close approach in Cancer (though observation might be tricky as they will only reach a maximum of 18° above the horizon), and there is also a conjunction of the Moon and Jupiter. The September ε-Perseid meteors (active 5-21 Sep) are at their peak around Sept 9. The shower should reach highest activity about 19:00 BST, and up to 4 meteors/hr may be seen. This shower has no known parent body. Sept 14 brings a (daylight) lunar occultation of Venus. From Stirling, the occultation will begin at 11:07 BST, when Venus disappears behind the Moon, at the low altitude of -1.9 degrees, in the south-east. Venus reappears at 11:39 BST.

The September equinox occurs on the 23rd, and marks the first day of autumn (northern hemisphere) or the first day of spring (southern hemisphere). Neptune reaches opposition (in Pisces) on 26 Sept, and will be visible from Stirling between 21:59 and 04:17, in the south-east. At the moment of opposition, Neptune will be 28.88 AU away, and will be at magnitude 7.8. This also coincides with September's Full Moon, the appropriately-named Harvest Moon (Cayless 2024). One day later, the Moon (in Pisces) and Saturn (in Cetus) are at conjunction, and best seen an hour after midnight. Asteroid 192 Nausikaa is in a good spot for viewing (by telescope) on Sept 30, being visible in Pisces between 20:46 and 05:10. It will reach its highest point around midnight, at 21° above the eastern horizon. Perhaps easier to view, the Moon and the Pleiades (M45) make a close approach in Taurus, reaching their highest point at 04:40.

October begins with the last quarter Moon at perigee, and with darker skies at last coming on, the Andromeda galaxy (M31) reaches its highest point in the sky about midnight on 2 October. On Oct 4,

Saturn reaches opposition in Cetus, and from Stirling, it can be seen from about 20:15. Oct 5 brings a conjunction of the Moon and Mars in the constellation Cancer, with the Moon also close to M44 (Beehive Cluster); on the following night, the Moon and Jupiter come into conjunction in Leo, close enough together to fit within a telescopic field of view. If you see a stray meteor around this time, it may be an October Camelopardalid (active 5-6 Oct; radiant in Draco), although October is a very busy time for meteors. The Draconid meteor shower (active 6-10 Oct) is at its peak about Oct 9, though it has a variable hourly rate. Some meteor showers have known parent bodies, and that of the Draconids is periodic comet 21P/Giacobini-Zinner. Oct 10 brings the peak of the Southern Taurid meteors (active 10 Sep-20 Nov; radiant in Cetus). From Stirling, you may see 3-5 meteors/hr. The parent body of the Southern Taurids is comet 2P/Encke. Mars and M44 make a close approach on Oct 10, in Cancer, and the following evening, the Delta (δ)-Aurigid meteor shower (active 10-18 Oct) reaches its peak of 1-2 meteors an hour. On 13 Oct, Asteroid 4 Vesta is at opposition, and from Stirling, it will be visible by telescope (clouds permitting) in Cetus between 22:37 and 04:01 (best seen about 01:20). The 3-day old Waxing Crescent Moon is at perihelion at this time. For our astrophotographers, the Triangulum Galaxy (M33) reaches its highest point about midnight on 15 Oct.

The epsilon (ε)-Geminid meteors (active 14-27 Oct) are at their peak of 2-3 meteors/hr about 18 Oct. These have no known parent body. Asteroid 136199 Eris is at opposition at this time, and visible with a good telescope from around 22:07. Oct 21 brings us one of the star shows of the season, with the Orionid meteor shower (active 2 Oct-7 Nov) at its peak. Early morning, around 06:00 BST, is the best time to see a good display, and we may see 11-15 meteors/hr from Stirling. However, the Moon (in Aquarius) is 3 days from full and might hinder the view, but as it will be no higher than 22° above the horizon and 121° away from the shower's radiant in Orion, a strategically-placed wall or fence may shield its radiance and provide a good degree of night vision. The parent of the Orionids is comet 1P/Halley. The 14-day old Moon and Saturn will come into conjunction on 24 Oct, with the Moon in Pisces and Saturn in neighbouring Cetus. This date coincides with the peak of the Leonis Minorid meteor shower (active 19-27 Oct; radiant in Leo Minor). The best time to spot one is at around 20:00 BST, but with the Moon nearing full, viewing will be hampered. The parent body of the Leonis Minorids is comet C/1739 K1.

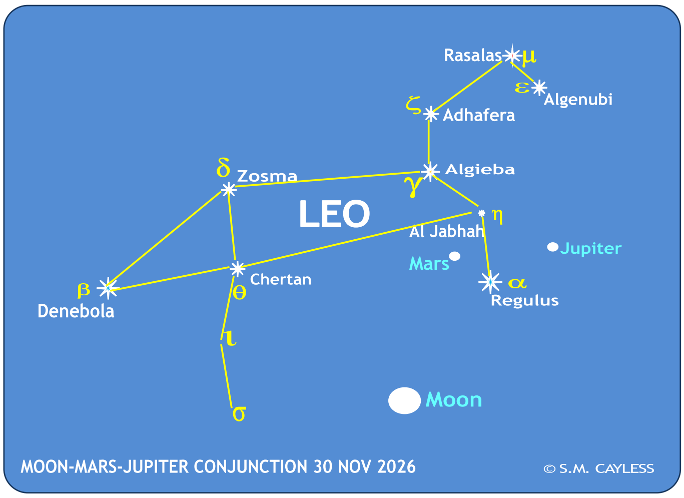
The Moon reaches full phase on 26 October. This apparition of out satellite is known as the Hunter's Moon, to mark the pre-winter hunting season, when its brightness and persistence allow hunters to stalk at night (Cayless 2024). Despite the Moon, the Perseus Double Cluster (NGC 869 + NGC 884; aka Caldwell 14) is well placed for viewing and reaches its highest point about midnight on 26 Oct. At the end of the month, on Oct 28, the 18 day-old Moon and M45 (Pleiades) make a close approach, within 58.6 arcminutes of each other, in Taurus.

November 2 brings the Moon and Jupiter into conjunction in Leo. On 12 Nov, Comet 69P/Taylor makes its closest approach to the Sun, at 2.27 AU. From Stirling it will be visible from around 23:40, in Gemini. The BAA Comet Section has estimated that the comet might be about magnitude 12 on the 12th, as long as its current level of activity remains constant. This means that a telescope will be needed to see it. Weather permitting, viewing conditions should be good as the Moon will be 3 days old (Waxing Crescent). This date coincides with the peak of the Northern Taurid meteor shower (active 20 Oct-10 Dec). The best displays of around 5 meteors/hr should be seen around an hour after midnight. The parent body of the Northern Taurids is Asteroid 2004 TG10. Nov 15 brings a conjunction of Jupiter and Mars in Leo, followed on 17 Nov by the peak of the 2026 Leonid meteor shower (active 6-30 Nov). From Stirling, the shower will start to show just after 22:00, with the radiant culminating at around 07:00 GMT, hence just before dawn will be a good time to view, when we may see 12-15 meteors/hr. The Leonids' parent body is comet 55P/Tempel-Tuttle.

The Pleiades (open star cluster M45) will reach its highest point about midnight local time on 18 Nov, in Taurus, making it a good object for astro-photography. Look low above the horizon (~ 14°) at sunrise on 20 Nov, and you may see Mercury, shining at mag -0.6 (NB: do NOT attempt to use a telescope or binoculars on an object close to the sun!). The Moon (in Pisces) and Saturn (in Cetus) come into conjunction on 21 Nov, and should be in view from about 17:00 BST, reaching their highest point at 20:45. We also have the peak of the α-Monocerotid meteor shower (active 15-25 Nov; radiant in Canis Minor), but with the Moon 2 days from full, viewing may be problematical. Comet C/1917 F1 (Mellish) has been identified as the parent body of the α-Monocerotid shower.

The Full Moon of the 24 Nov is often known as the Beaver Moon, in honour of these amazing animals, who can usually rebuild their dams faster than humans can knock them down. Alternative names include Whitefish Moon, Deer Rutting Moon, Panther Moon, Turkey Moon, Frost Moon, Heading To Winter Moon, and Moon Of Moving Inside For

Winter (Cayless 2024). Uranus at opposition on 25 Nov provides a good time to view the planet, which will be visible for much of the night in Taurus. On 27 Nov, comet 161P/Hartley-IRAS makes its closest approach to the Sun, at 1.27 AU, becoming visible from Stirling at around 17:30 BST. At an estimated magnitude of 11, a telescope will be needed to see it. The 28th of the month brings the peak of the November Orionid meteor shower (active 13 Nov-6 Dec). At 2-3 meteors/hr the shower is light, and has no identified parent body. November closes on the 30th with the Moon in conjunction with both Jupiter and Mars, in Leo. Look to the east around midnight!



Happy observing all!

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Image Credits

M31 Andromeda, Harvest Moon, Hunter's Moon, Moon-Mars-Jupiter Conjunction 30 Nov 2026, all © Sandi Cayless.

Many thanks to all our contributors to this quarter's issue of *The Jeety Starn*. Members, please hand submissions to the editor, or any contributions can be sent via the Society's contact email address. Illustrations and snippets also welcome!

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