



The Newsletter of the Astronomy Section of La Société Guernesiaise
2025

Forthcoming Events

Talks for Members - For details see page 4.

14th January – 'Oumuamua: Our first interstellar visitor *Professor Chris Lintott*

21st January – From Kepler to the Habitable Worlds Observatory *Dr Jessie Christiansen*

4th February – Stars, their Properties and Lifecycles *Jason Hill, FRAS*

18th February – Royal Institution Lecture: At the Limits of Astrophysics *Dr Katy Clough*

4th March – Island Universes: Discovering Galaxies Beyond the Milky Way *Professor Chris Lintott*

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Section meetings

The Section meets at the Observatory every other Tuesday evening at **7.30 pm**, sometimes with a lecture to watch. The currently planned lectures are given on page 4.

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Astronomy Section Officers, 2025

Secretary	Jean Dean
Hon. Treasurer	Peter Langford
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Equipment.	Allan Phillips
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IT/Website	Owain Catton
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Introduction from the Editor

Welcome to the 2025 edition of Sagittarius! We have a great newsletter for you this year, including some interesting articles, updates on the sections outreach and meetings, and beautiful pictures taken by members. You can also find out about all the interesting astronomical events which will occur this year!

As always, I'd like to thank everyone who contributed to this newsletter and reiterate that I'm always looking for new articles, so if you'd like to submit something for the next edition please get in touch.

Thomas Harvey

Astronomy Section Secretaries Report 2025

I am pleased to report that 2024 has been another busy year. We held 35 meetings for members, including the biweekly Tuesday talks and observing when the weather was suitable. We opened the year with a fascinating talk on local bats by Laura Harrison, who is Secretary of the Bat Section. Another notable event was the annual Perseid meteor shower when members were fortunate to also witness a display of the Aurora Borealis.

There have been talks by Jean Dean, Robert Roue, Martin Sarre, Jacques Loveridge, Peter Langford and Jason Hill covering a variety of topics, including planetary science, black holes, cosmology, stellar evolution, light, historical astronomy and ocean worlds. I would like to thank all those who gave talks.

Jacques Loveridge presented various astrophotography activities, including the use of portable trackers and demonstrations in the use of astrophotography software. Many members enjoyed learning new skills and benefitted from Jacques's extensive knowledge.

We have also been busy with outreach, hosting twenty group visits, including three through Eventbrite and a visit to Blanchelande Park Care Home. Our calendar for 2025 is already filling up with bookings. The current level of outreach is particularly encouraging as we continue to function as a public observatory, following the ethos of those who founded the Section. It is perhaps pertinent to quote David Le Conte's speech from the 16th March 1993, when the original telescope building was opened by Sir Patrick Moore:

I feel it is important for such a facility as this observatory should not be kept for just a few of us to use, but should be available for the whole island community. It is especially our duty to pass to the next generation an awareness not only of the wonders of the night sky but also share our experiences and to impart a little knowledge about the Universe

I would like to thank Stephanie Rice, Jacques Loveridge, Peter Langford, Dorothy Le Conte, Rosemary Le Messurier, Jason Hill, Owain Catton, Martin Sarre, Carol Vivyan, Ashe Vivyan and Robert Roue for making this level of outreach possible.

We have also helped several members of the public with their telescopes and offered advice to those wishing to purchase one.

Maintenance has included the usual grass and hedge cutting. I would like to thank Nick Deprés for help with grass cutting throughout the year. We cut the pine trees to the southeast at a cost of £1,000 and early in 2025 we will be trimming the trees to the southwest. The telescope building has received its annual coat of paint. Planned for 2025, we will be replacing two external lights and the door and frame to the store.

On behalf of all members, I would like to congratulate both Jacques Loveridge and Ashe Vivyan on excellent A-level results. Ashe is now at the University of Portsmouth studying physics, astrophysics and cosmology; we wish him well in his studies.

We held our annual ABM in November 2024, which was well attended and welcomed Robert Roue onto the committee and the return of Peter Langford as the previous treasurer as Stephanie Le Tissier stepped down. The remaining committee members were happy to continue.

Finally, I would very much like to thank all the committee members and officers for their support in running the Astronomy Section in 2024 and the last few years, which has seen the Astronomy Section flourish with new members and a growing interest in the many branches of astronomy.

Upcoming Talks

Club nights start at 7.30pm, with talks starting at 8pm. A list of club nights for the next few months is given below.

These talks are a mixture of live events and recordings. Generally, recordings are played on the club projector in the meeting room for members to watch and discuss.

14th January

Talk: 'Oumuamua: Our first interstellar visitor

Description: In 2017, the Solar System was visited by an object named 'Oumuamua, which came from another star. The unusual properties of this first interstellar visitor led some to suggest it may be an alien spacecraft - but the truth is that its oddness is already teaching us lessons about how solar systems form.

Speaker: Professor Chris Lintott, Gresham College, University of Oxford. (recording).

21st January

Talk: Simons Foundation Lecture: From Kepler to the Habitable Worlds Observatory

Description: The NASA Kepler mission has provided its final planet candidate catalogue, the K2 mission has contributed another four years' worth of data, and the NASA TESS mission has been churning out new planet discoveries at a rapid pace. I will walk through the progress of the Kepler occurrence rate calculations, including the latest understanding of the frequency of Earth-like planets, and their implications for NASA's next flagship mission, the Habitable Worlds Observatory. I will present our new results from K2 and TESS, and outline how K2 and TESS will be able to push the stellar parameter space in which we can explore occurrence rates beyond that examined by Kepler. Finally, I will highlight some of the pieces of the larger demographics puzzle – occurrence rate results from the other techniques that probe different stellar and exoplanet regimes – and progress to be made working to join those pieces together

Speaker: Dr Jessie Christiansen, Chief Scientist NASA Exoplanet Science Institute, CALTECH (recording).

4th February

Talk: Stars, their Properties and Lifecycles by Jason Hill, FRAS

Description: The talk covers the birth of stars from a nebula, their evolution with reference to the Hertzsprung-Russell diagram and the differences between low and high mass stars and how this determines the stars fate at the end of their life.

Speaker: Jason Hill FRAS (in person).

18th February

Talk: Royal Institution Lecture: At the Limits of Astrophysics

Description: Why does modern astronomy often sound like science fiction? And how do objects like supermassive black holes, wormholes and warp drives fit into our current understanding of physics?

Speaker: Dr Katy Clough – Earnest Rutherford Fellow, School of Mathematical Science, Queen Mary, University of London (recording).

4th March

Talk: Island Universes: Discovering Galaxies Beyond the Milky Way

Description: The discovery that we live in an ordinary galaxy, one of several hundred billion in the observable Universe, instigated a profound change in thinking about our place in the Universe. This first lecture covers the Great Debate of the early twentieth century as new telescopes and new ways of observing the cosmos put our Milky Way in its place; and looks at how subsequent observations helped us understand how galaxies like our own formed and evolved.

Speaker: Professor Chris Lintott, Gresham College, University of Oxford (recording).

Astronomy Section Meetings 2025

January							February							March						
Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa
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5	6	7	8	9	10	11	2	3	4	5	6	7	8	2	3	4	5	6	7	8
12	13	14	15	16	17	18	9	10	11	12	13	14	15	9	10	11	12	13	14	15
19	20	21	22	23	24	25	16	17	18	19	20	21	22	16	17	18	19	20	21	22
26	27	28	29	30	31		23	24	25	26	27	28		23	24	25	26	27	28	29
														30	31					
April							May							June						
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6	7	8	9	10	11	12	4	5	6	7	8	9	10	8	9	10	11	12	13	14
13	14	15	16	17	18	19	11	12	13	14	15	16	17	15	16	17	18	19	20	21
20	21	22	23	24	25	26	18	19	20	21	22	23	24	22	23	24	25	26	27	28
27	28	29	30				25	26	27	28	29	30	31	29	30					
July							August							September						
Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5						1	2		1	2	3	4	5	6
6	7	8	9	10	11	12	3	4	5	6	7	8	9	7	8	9	10	11	12	13
13	14	15	16	17	18	19	10	11	12	13	14	15	16	14	15	16	17	18	19	20
20	21	22	23	24	25	26	17	18	19	20	21	22	23	21	22	23	24	25	26	27
27	28	29	30	31			24	25	26	27	28	29	30	28	29	30				
							31													
October							November							December						
Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4							1		1	2	3	4	5	6
5	6	7	8	9	10	11	2	3	4	5	6	7	8	7	8	9	10	11	12	13
12	13	14	15	16	17	18	9	10	11	12	13	14	15	14	15	16	17	18	19	20
19	20	21	22	23	24	25	16	17	18	19	20	21	22	21	22	23	24	25	26	27
26	27	28	29	30	31		23	24	25	26	27	28	29	28	29	30	31			
26							30													

BST Start

BST End

Tuesday Astronomy meetings are shaded. British Summer Time (BST) is between 30/03 and 26/10.

There are no official gatherings in the summer months.

Astronomical Events 2025

Welcome to the Astronomy Sections guide for what and when to observe in 2025!

Planets

Mercury will be visible in the periods around its greatest elongations:

Date	Elongation	Direction	Time
8 March	18.2° Eastern	Low in West	After sunset
21 April	27.4° Western	Low in East	Before sunrise
4 July	25.9° Eastern	Low in West	After sunset
19 August	18.6° Western	Low in East	Before sunrise
29 October	23.9° Eastern	Low in West	Before sunset
7 December	20.7° Western	Low in East	Before sunrise

From early March, Venus will be visible in the early morning, before sunrise, for the rest of the year. Mars will be visible in the west in the evening until October, setting earlier throughout the year.

Jupiter will be visible in the evening until around June, rising and setting earlier in the evening as the year progresses. It will also be visible in the early morning into the late evening from August toward the end of the year. Jupiter reached the perigee of its 12 year orbit of the Sun on December 6th 2024, and as such is still well-placed for observation in the first few months of the year.

When Jupiter is visible, we will have good views of the four Galilean moons, atmospheric bands on the planet's disc, and the Great Red Spot. Transit, shadow and occultation events involving Jupiter's moons can be calculated using www.skyandtelescope.com/wp-content/observing-tools/jupiter_moons/jupiter.html on the *Sky & Telescope* website. (They can also be found in the 2023 BAA Handbook. They can be simulated on software such as StarryNight (<http://www.starrynightstore.com/>), and some of the many astronomy apps, some of which also gives the transit times of the Great Red Spot. The Spot's transit times are also available at <http://www.skyandtelescope.com/observing/celestial-objects-to-watch/transit-times-of-jupiters-great-red-spot/> (again using the US date format).

Saturn reaches opposition on September 21st, when it will be at its brightest point of the year. The rings will be almost edge-on. and its brightest moons, especially Titan, should also be visible. Saturn will be visible in the early morning from April, rising early throughout the year and will be visible in the evening after sunset by August.

Uranus will be at opposition in Taurus on November 21st.

Supermoons

So-called 'supermoons' occur when the Full Moon happens to coincide with the Moon's closest approach to Earth ('perigee'), and therefore appear larger than usual. In 2025 there will be three such moons: on the 7th of October (a "blood" moon!), the 5th of November, and the 4th of December.

Phases of the Moon

New Moon	First Quarter	Full Moon	Last Quarter
	Jan. 6	Jan 13.	Jan. 21
Jan. 29	Feb. 5	Feb. 12	Feb. 20
Feb. 28	Mar. 6	Mar. 14	Mar. 22
Mar. 29	Apr. 5	Apr. 13	Apr. 21
Apr. 27	May 4	May 12	May 20
May 27	June 3	June 11	June 18
June 25	July 2	July 10	July 18
July 24	Aug. 1	Aug. 9	Aug 16
Aug. 23	Aug. 31	Sept. 7	Sept. 14
Sept. 21	Sept. 30	Oct. 7	Oct. 13
Oct. 21	Oct. 29	Nov. 5	Nov. 12
Nov. 20	Nov. 28	Dec. 4	Dec. 11
Dec. 20	Dec. 27		

Dwarf planets and asteroids

Pluto will reach opposition on the 25nd of July, at magnitude 15. It will appear star-like and requires a telescope to observe. The other three dwarf planets (Eris, Makemake and Haumea) are too faint to be seen in most amateur telescopes, although they reach opposition on the 22nd April, 31st March, and 18th October respectively.

Ceres, the largest asteroid in the Asteroid Belt, will reach opposition on the 2nd October at magnitude 7.6, visible in the South in the evening.

Eclipses

There will be a total lunar eclipse which may be partially visible from Guernsey, on September 7th, but the moon will have just risen at around 17:30 UTC. The partial solar eclipse on 29th March may also be visible from Guernsey at around 11am UTC, but is best-viewed from Canada, Greenland and Northern Russia.

Occultations

There is a lunar occultation of Saturn on the 4th January, which should be visible from Guernsey just after sunset. Saturn will disappear at 17:17 UTC and reappear at 18:30 UTC.

Lunar conjunctions

The best conjunctions of the Moon and the bright planets (within 2°), with their positions and separations are:

03 Jan	Venus	South in evening	1°26'
04 Jan	Saturn	South-southwest in evening	0°40'
14 Jan	Mars	Southwest in morning	0°13'
09 Feb	Mars	Southeast in evening	1°40'
09 Mar	Mars	West around midnight	0°11'
28 July	Mars	West in evening	1°17'

Planetary conjunctions

The best observable planetary conjunctions, with their positions and separations, are given below. A planetary conjunction is when two objects appear close together in the sky.

29 June	Saturn and Neptune	South-west, morning	0°59'
06 Aug	Saturn and Neptune	South-west, morning	1°08'
12 Aug	Venus and Jupiter	South-east, morning	0°51'

Meteors

The Perseids will peak on the night of 12/13 August, with some 150 per hour. The moon will be in its last quarter phase, but will rise at 20:36 which may still impact observations. The richest annual shower, the Geminids, will peak on the night of 13/14 December. The Moon will be close to new, and so will not interfere with observations! Fingers crossed for a good year!

There are, of course, minor meteor showers during the year, and sporadics may be seen at any time. For shower details see the 2025 BAA Handbook.

Comets

2025 is not expected to be a particularly good year for visual observations of comets, although surprises do occur! The most likely candidate is 24P/Schaumasse, which doesn't actually reach perihelion until early January 2026, but it is fairly reliable and should be visible in binoculars from November, at 8th-9th magnitude.

Detailed comet predictions for 2025 are available on the website of the British Astronomical Association's Comet Section: <https://people.ast.cam.ac.uk/~jds/preds25.pdf>. Also check the Heavens-Above website (heavens-above.com) for star charts showing comet positions, and use programs such as StarryNight for detailed location charts.

The Sun

2025 is expected to be the solar maximum, following the ~11 year solar cycle, where solar activity, including sunspots, should be most active. There can be outbursts of activity, not only of sunspots but also of coronal holes and coronal mass ejections, which can result in displays of the aurora borealis (and australis) at high latitudes. Details of sunspot numbers are at www.ips.gov.au/Solar/1/6, and real-time views of the Sun are at:

<https://umbra.nascom.nasa.gov/newsite/images.html>. Auroral alerts, with lots of other information, are at www.spaceweather.com.

Equinoxes and solstices

The following are the dates and times of the equinoxes and solstices in 2025:

Vernal Equinox	20 March	08:58 UTC
Summer Solstice	21 June	02:40 UTC
Autumnal Equinox	22 September	18:17 UTC
Winter Solstice	21 December	15:02 UTC

Satellites

The International Space Station (ISS) is regularly visible from Guernsey, looking like a very bright star crossing our skies from west to east. With the decommissioning of Iridium satellites flashes from them are now quite rare. Many other, fainter, satellites appear every night. Details of the times and directions of visibility (together with sky charts and much more) can be obtained from www.heavens-above.com, linked from our webpage www.astronomy.org.gg/iss.htm.

Courses

From time to time the Astronomy Section offers public lectures, courses and events for children, please follow our Eventbrite page to receive details.

<https://www.eventbrite.co.uk/o/la-societe-guernesiaise-astronomy-section-31040695447>

References

General: <http://www.seasky.org/astronomy/astronomy-calendar-2025.html>

<http://astropixels.com/ephemeris/astrocal/astrocal2025gmt.html>

<http://www.timeanddate.com/>

https://www.calendar-12.com/moon_phases/2025

<https://www.nakedeyeplanets.com/>

<https://in-the-sky.org/>

Equinoxes, etc: <https://www.weather.gov/media/ind/seasons.pdf>

Perseid Meteor Shower

The annual Perseid meteor shower results from the Earth passing through the debris left behind by Comet 109P/Swift-Tuttle. The shower peaked at 1400hrs on 12 August 2024. Thus, the nights of 11/12th and 12/13th were ideal for viewing. In Guernsey, we had clear nights on both evenings, although for brief periods on the 11/12th there was significant cloud cover.

Members of the Astronomy Section viewed the Perseid meteor shower on the evening of the 12/13th and estimated an approximate peak rate of 15 meteors per hour. The David Le Conte Astronomical Observatory All Sky camera, with a field of view of 150°, captured the brighter meteors.



All Sky Camera compilation of the Perseid meteor shower, image credit Jean Dean.

We were also treated to another spectacular display of the Aurora Borealis on the evening of 12/13th August. Astronomy Section member Martin Sarre captured the aurora from Fort Grey, which included a very bright Perseid meteor.



Aurora Borealis and Perseid meteor over Fort Grey, image credit Martin Sarre.

Jean Dean

The Europa Clipper

On Oct 14, 2024 NASA latest mission to Jupiter blasted off from Kennedy Space Center on a SpaceX Falcon Heavy rocket. It will reach Jupiter in April 2020, after a series of gravity assists of Mars and the Earth in order to gain the required energy. The mission is designed to search for further evidence of a subsurface water ocean underneath the thick ice which forms the surface of Europa. There is strong existing evidence for this subsurface ocean, which makes Europa one of the primary candidates in the search for extraterrestrial microbial life.

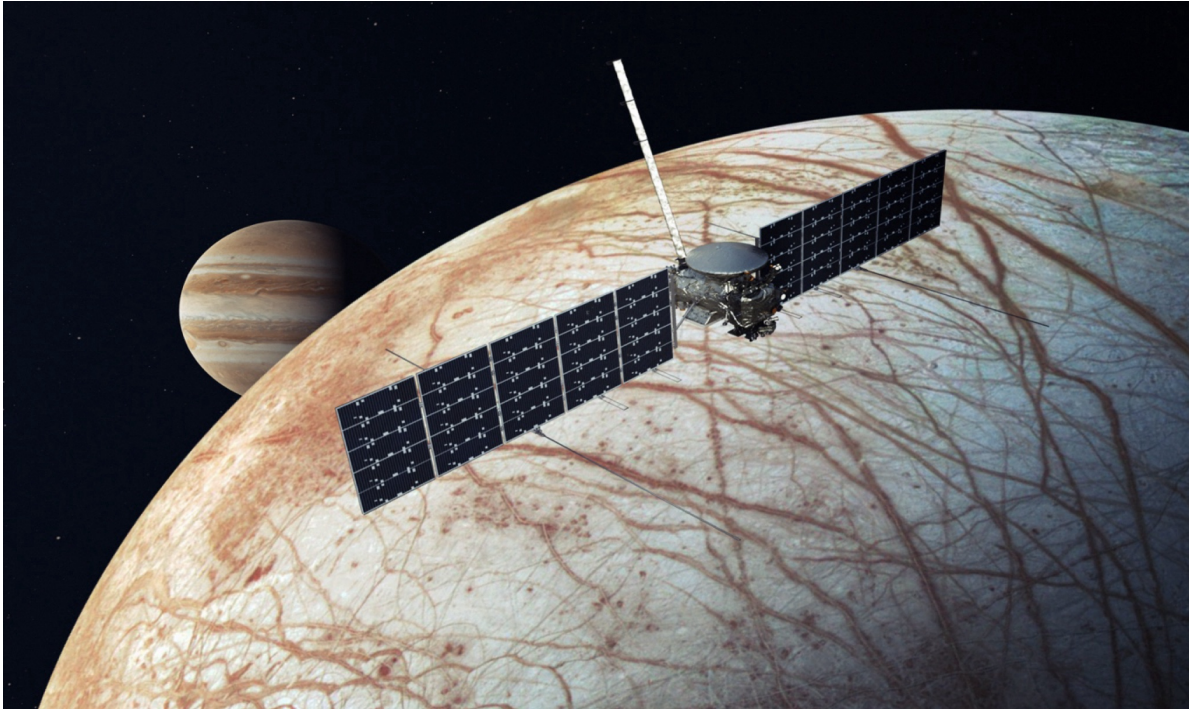


Image Credit: An artist's concept of NASA's Europa Clipper spacecraft. NASA/JPL-Caltech.

Europa and the other moons of Jupiter are thought to be heated by tidal stresses caused by the pull of Jupiter's gravity. This may provide enough energy to sustain a salty liquid ocean, kilometres below the surface ice. Jupiter has an extremely powerful magnetic field, so the environment within which moons like Europa orbit is hostile to even the radiation hardened electronics used in spacecraft. Consequently, the Europa Clipper will not orbit Europa itself, but instead remain in an eccentric orbit of Jupiter, swinging close to Europa for 49 successive flybys which will allow mapping of most of the surface, including measuring the ice thickness.

Europa Clipper carries nine scientific instruments, including ultraviolet, visible and infrared cameras and spectrometers, ice-penetrating radar, a magnetometer, a plasma instrument, and multiple mass spectrometers. These will allow a comprehensive picture of Europa including mapping the composition of the surface, measuring surface temperatures to identify hotspots, high-resolution imaging (0.5m/pixel) across a small area, and <50m/pixel across 95%+ of the surface. The radar will measure the ice thickness down to 30 km, whilst the magnetometer will search for an induced magnetic field generated by Europa, which would be expected if a large scale salty liquid ocean is present. The plasma instrument, UV

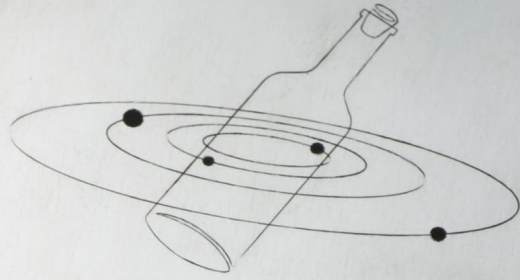
spectrograph and mass spectrometers will be used to identify and study plumes of water ejected from Europa's surface, which have been previously observed in Hubble Space Telescope images. The spacecraft will attempt to fly through and directly sample a plume if a suitable candidate can be identified, and an instrument called the Surface Dust Analyser (SDA) will be used to study small particles ejected alongside the plume. The SDA will look for organic and inorganic compounds and is sensitive enough to detect signatures of life even if the sample contains less than a single bacterial cell.

The Europa Clipper is powered by large solar panels, since the intensity of sunlight which reaches Jupiter is only 4% of the value which is received on Earth. In a similar fashion to other NASA missions, the Europa Clipper contains a commemorative plaque, which includes the names of 2,620,861 people who signed up online, including the author of this article! The plaque includes a poem by US poet laureate Ada Limón, shown overleaf.

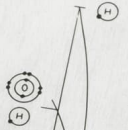
A complementary European Space Agency mission, JUICE (JUPITER Icy Moons Explorer), which launched in 2023, will arrive 4 years later in 2034. It will take longer to arrive since the less powerful rocket used means it requires more gravity assists (4 rather than 2) to gain the energy required to reach Jupiter. JUICE will flyby Europa and Callisto, before orbiting Ganymede at a 500 km altitude for 6 months of detailed observations.

With both Europa Clipper and JUICE now safely on their way to Jupiter (or rather with the gravity assists; on their way to Mars to Earth to Jupiter and to Earth to Venus to Earth to Earth to Jupiter respectively), the future looks bright for our study of both Europa and the wider Jovian system!

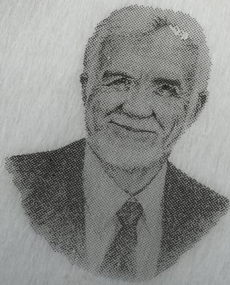
Tom Harvey



In Praise of Mystery: A Poem for Europa
 Arching under the night sky, ink
 with black expansiveness, we paint
 to the planets we know, we



pin quick wisps on stars. From earth,
 we read the sky as if it is an evening book
 of the universe, explicit and evident.
 Still, there are mysteries below our sky:
 the whale song, the songbird singing
 its call in the bough of a wind-shaken tree



Ron Greeley

We are creatures of constant awe,
 curious at beauty, at leaf and blossom,
 at grief and pleasure, sun and shadow.
 And it is not darkness that invites us,
 not the cold distance of space, but
 the offering of water, each drop of rain,
 each rivulet, each pulse, each vein.
 O second man, we, too, are made
 of water, of vast and beckoning seas.

We too are made of wonders, of great
 and ordinary loves, of small invisible worlds,
 of a need to call out through the dark.

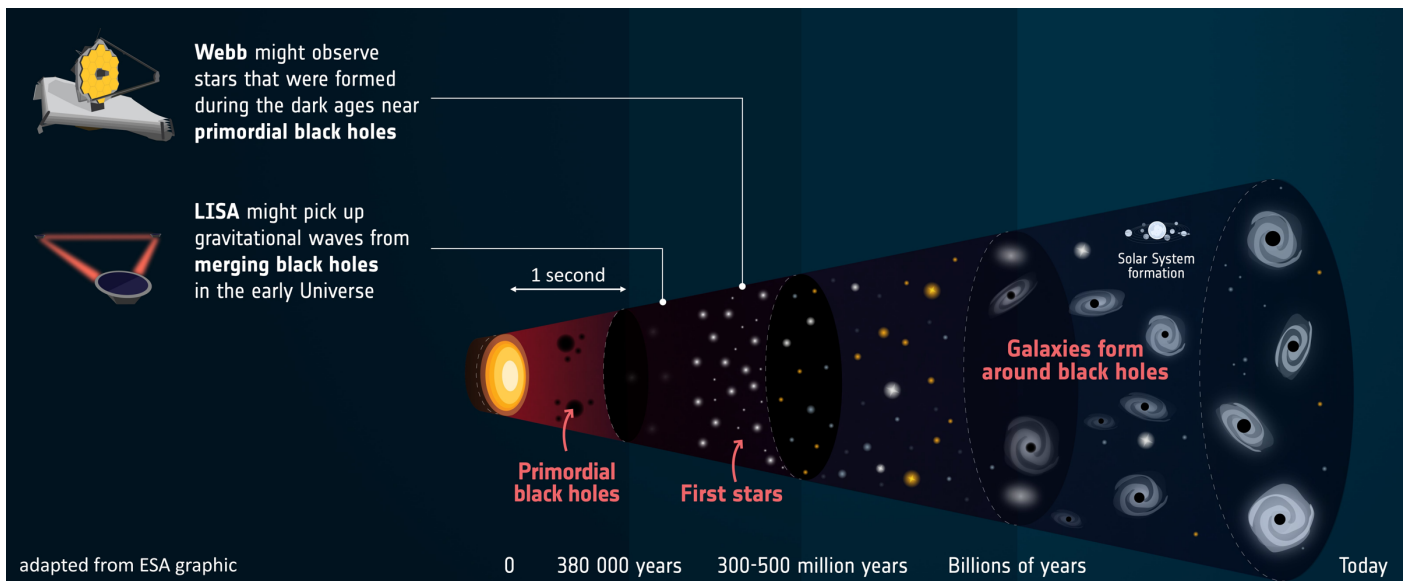
Ada Limón

Image Credit: The plaque from the Europa Clipper, showing the poem by U.S. Poet Laureate Ada Limón (lower right), a drawing representing the Jovian system that will host the names of 2.6 million people flying with mission on a microchip (top right), a tribute to planetary scientist Ron Greeley (bottom left), and the radio emission lines known as the 'Water Hole' (center). Credit: NASA/JPL-Caltech.

Primordial Black Holes

Typically, black holes fall into (pun intended!) one of two extremes: supermassive that sit at the centre of galaxies or stellar-mass, which are formed when a star goes supernova, with intermediate sizes in between. But there is another type hypothesised: a primordial black hole (PBH). These differ as they were formed within the first second of the Big Bang. At this time, space was not completely homogenous, some areas were denser and hotter than others and these regions could have collapsed into black holes. PBH's were first proposed by Zeldovich and Novikov in 1966 and studied in detail by Stephen Hawking in 1971. They are now being considered again as data from the James Webb Space Telescope, Laser Interferometer Gravitational-Wave Observatory and Virgo Interferometer are studied.

PBH's could be exceptionally small. For example, a mass of only 70 kilograms (an adult) with a size 5 million times smaller than the current measurement limit, or the mass of Earth and about the size of a 20p coin. As with other black holes, there is a continuum of sizes. The very small ones (adult-size) would dissipate very quickly, in about 29 picoseconds, something the size of The Great Pyramid and about 1% the width of a proton would last for about 381,000 years. However, a PBH the mass of Ceres and the size of an E. coli bacterium would persist for approximately 160 octillion times the present age of the Universe (a very long time!), and something of Earth's mass, 40 trillion octillion times the present age of the Universe (a very, very long time!!).



PBH's are thought to roam the Universe, travelling at speed. It has been suggested that they may explain part or all of the dark matter, which accounts for 80% of all matter within the Universe. It has also been suggested that they might have merged and become the progenitors of larger black holes, contributing to the growth of super-massive black holes. It has also been proposed that about once every ten years a PBH might speed through the inner Solar System; if this is indeed true, then our backyard - astronomically speaking, might be an ideal place to study them.

Jean Dean

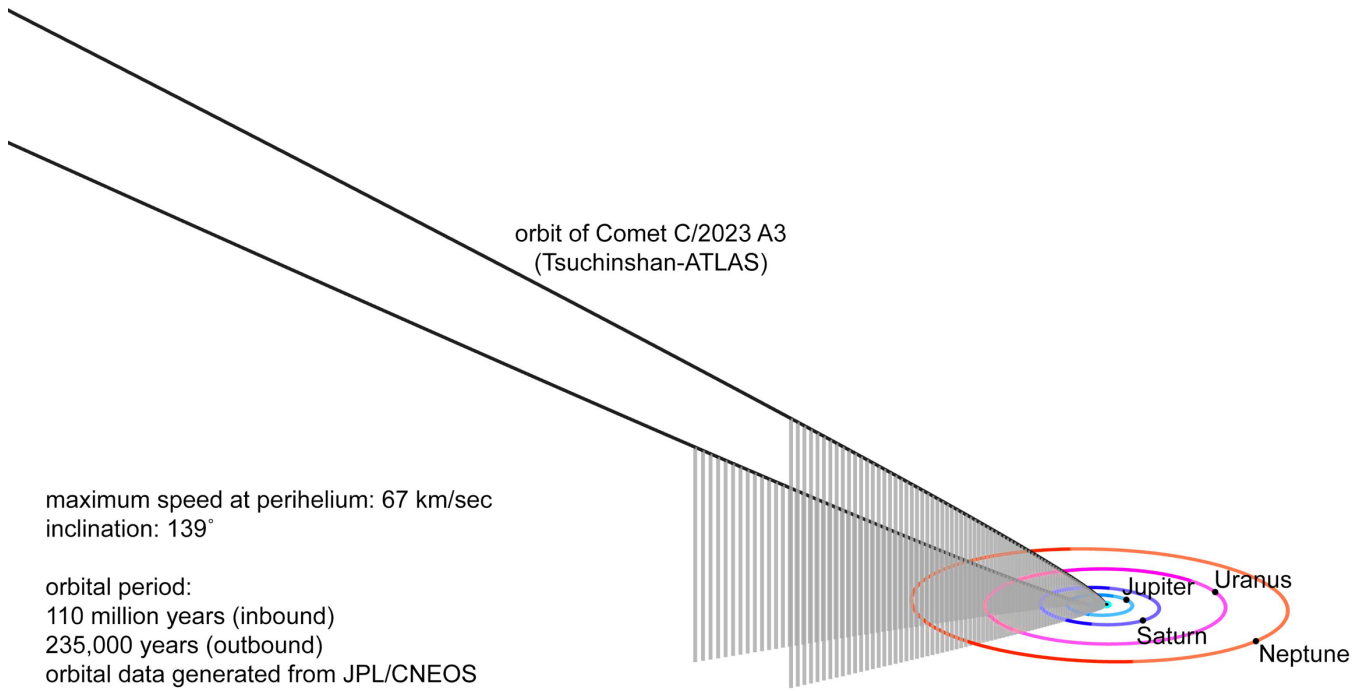
Comet C/2023 A3 Tsuchinshan-ATLAS

In October 2024, the inner Solar System was host to a distant traveller from the outermost reaches of the Solar System, the Oort Cloud. Comet C/2023 A3 Tsuchinshan-ATLAS, made its closest transit past the Sun on 27th September 2024 and came within approximately 44 million miles of Earth on 12th October 2024. Comets are the frozen leftovers from the formation of the Solar System, comprising dust, rock and ices. When frozen, they are sizable bodies, easily as large as Guernsey. As a comet approaches the Sun, it heats up and gushes dust and gases, forming a tail which stretches away from the Sun for millions of miles.



Comet C2023/A: Tsuchinshan-ATLAS, image credit Jacques Loveridge.

Comet C/2023 A3 Tsuchinshan-ATLAS has an inclined orbit with respect to the orbital plane of the planets and an orbital period estimated to be approximately 80 thousand years. However, because of its composition, it might break up long before it returns. The inclined orbits and long orbital periods of comets, led astrophysicists to hypothesise the existence of the Oort Cloud, which marks the gravitational edge of the Solar System and extends out almost half-way to our nearest star system and Proxima Centauri, which has its own planetary system.



Inclined orbit of Comet C2023/A: Tsuchinshan-ATLAS (plot adapted from data provided by JPL/CNEOS).



NASA astronaut Matthew Dominick captured this image of the comet from the International Space Station. Image credit Matthew Dominick.

Jean Dean

The Second Galaxy

On December 30th 1924, 100 years to the day as I sit here and write this article, Edwin Hubble announced his discovery that the “spiral nebulae” Andromeda was in fact its own galaxy, much like the Milky Way.

The so-called “Great Debate”, between Harlow Shapley and Heber Curtis, had occurred 4 years earlier in 1920. Shapley believed that ‘spiral nebulae”, such as Andromeda, were relatively small objects which existed on the fringes of the Milky Way, whereas Curtis argued that they were ‘island universes’, or entire galaxies in their own right.

Shapley’s argument was that given the apparent size of Andromeda, if it was the same size as our own galaxy, then it must be incredibly distant – more than 100 million light years, which seemed too incredible a distance to many astronomers. At the time another astronomer claimed to have observed the rotation of the Pinwheel Galaxy, which could only be explained if it was a nearby nebulae, since otherwise it would have to rotate faster than the speed of light to be visible on human timescales.

Curtis argued that Andromeda and the other “nebulae” were separate galaxies. Energetic explosions (novae) had been observed in Andromeda, at a rate higher than within our own Milky Way. This led Curtis to believe that to explain this small patch of the sky containing more novae than our entire galaxy, it must be a galaxy itself. Additionally, early measurements of radial velocities in nearby galaxies from Doppler shifts suggested very high radial velocity that seemed unlikely to be gravitationally bound to the Milky Way.

The debate ended somewhat inconclusively until 4 years later when Edwin Hubble used the 100 inch telescope at Mount Wilson Observatory, California to observe Cepheids Variable Stars, which had been discovered by Henrietta Swan Leavitt in 1908, who was a scientist at Harvard College Observatory.

Cepheids are a type of star which undergo a regular periodic fluctuation in brightness, typically varying over a period of days to months. Leavitt observed a large sample of Cepheids and found a simple relationship between the period of the fluctuations and the absolute brightness of the star, which is independent of the distance to the star. This relationship meant that Cepheids could be used

as so called “standard candles”, to directly measure the distances to nearby galaxies.

Hubble’s observation of Cepheid within Andromeda and measurement of their distance proved conclusively that our Milky Way galaxy was in fact only one galaxy in a vast ocean; in fact, the total number of galaxies in the observable universe is estimated to be in the trillions. Rather than follow scientific precedent, Hubble first published his sensational results



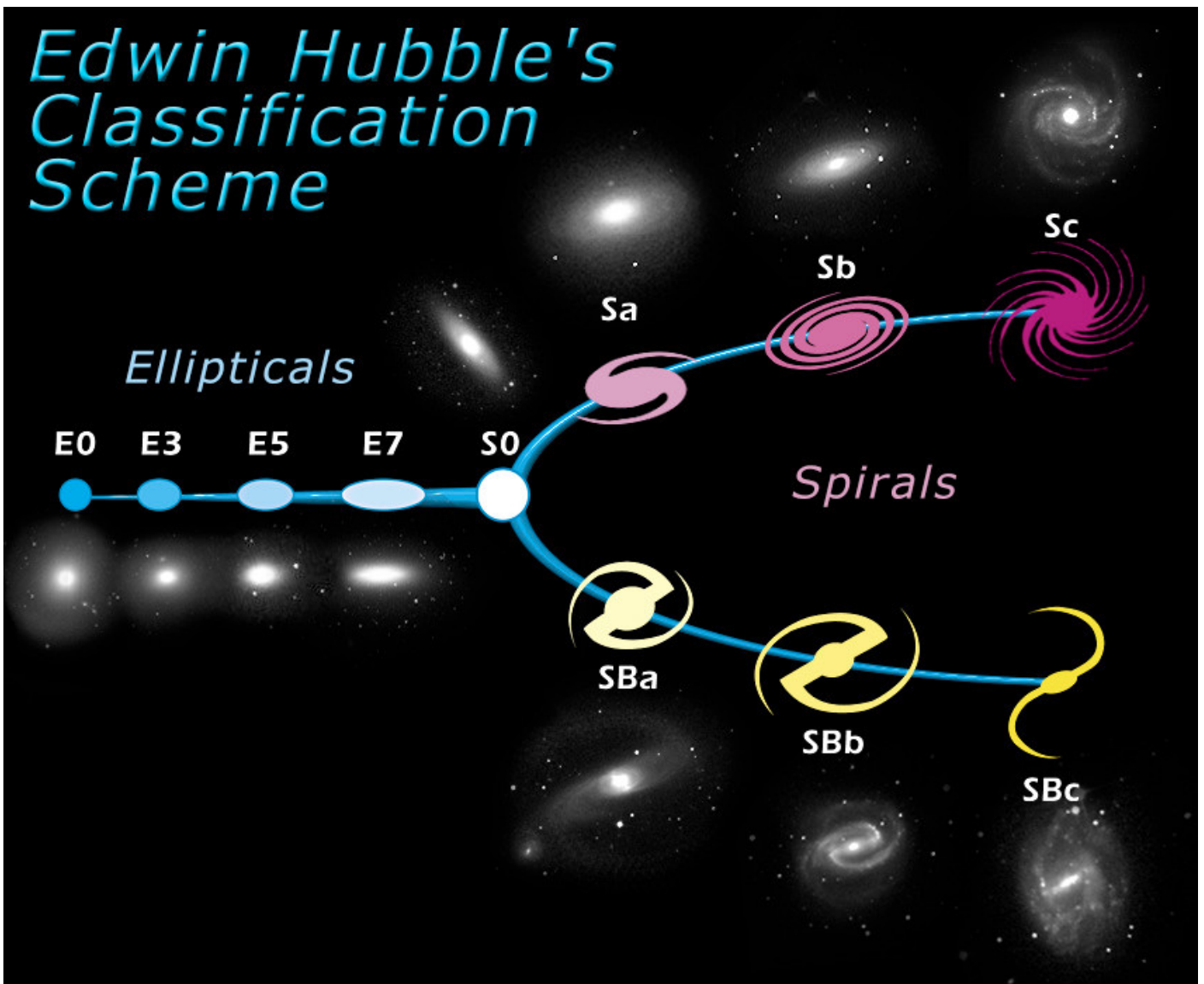
ANOTHER UNIVERSE SEEN BY ASTRONOMER

***Dr. Hubble Describes Mass of
Celestial Bodies 700,000 Light
Years Away.***

CHICAGO, Jan. 21 (P).—For years

*The article published by Hubble in 1924.
Image Credit: NYT*

in the New York Times, and did not submit a formal paper for peer review until 1929, 5 years later.



*Hubble's Classification of Galaxies into a 'Tuning Fork', which is still used today.
Image Credit NASA and ESA*

Over the last century, the number of galaxies we have observed and our knowledge of the processes governing the growth and evolution of galaxies has grown exponentially. Imagine how much more we will know in a centuries time!

Tom Harvey

Aurora Borealis

The Aurora Borealis or Northern Lights, are beautiful dancing ribbons of light that have captivated people for millennia. They are typically confined to high latitudes, but as solar activity has increased, they have occasionally been visible as far south as Guernsey, including during the night of 10/11th May and 12/13th August 2024. [A recording of the 10/11th May event captured from the observatories All Sky Camera can be seen at: astronomy.org.gg>All Sky Camera.](https://astronomy.org.gg)



Rouse Tower, image credit Carl Bideau.

Auroras are the visible manifestation of a solar storm, associated with a coronal mass ejection, when high energy solar particles are discharged into space and head towards Earth, where they can travel down the magnetic field lines at the north and south poles into the atmosphere. When charged particles from the Sun strike atoms in Earth's atmosphere, they "excite" the gasses, moving electrons to higher-energy orbits, further away from the nucleus. Then, when an electron moves back to a lower-energy orbit, it releases a particle of light or photon. This process goes on all the time, but during high solar activity a large number of solar particles bombard the atmosphere, when the oxygen and nitrogen can emit enough light that it is detectable by the naked eye.



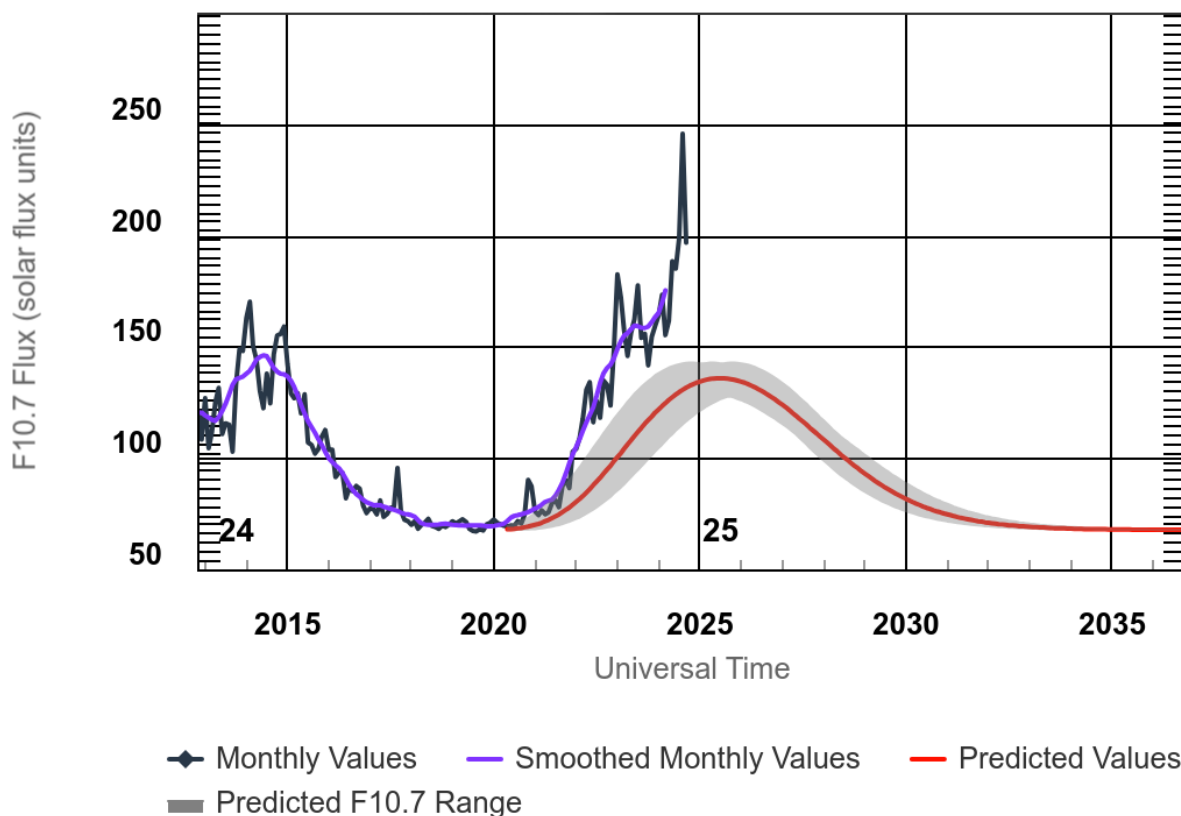
Powder Magazine Fort Le Marchant, L'Ancrese, image credit Jacques Loveridge.



La Jaonneuse Bay, image credit Jean Dean.

At the moment solar activity is reaching a high as the latest 11-year solar magnetic activity cycle or Schwabe cycle, peaks. On the 9th August during solar viewing with Club Bon Amis, Jacques Loveridge imaged the Sun's photosphere. There were nine active regions visible, the largest of which, was AR 3780 that contained 128 sunspots. On the night of the 12/13th August, Earth-facing Active Regions (AR) 3780 and 3784 between them released five Class C and one Class M1.23 solar flares leading to the auroral display.

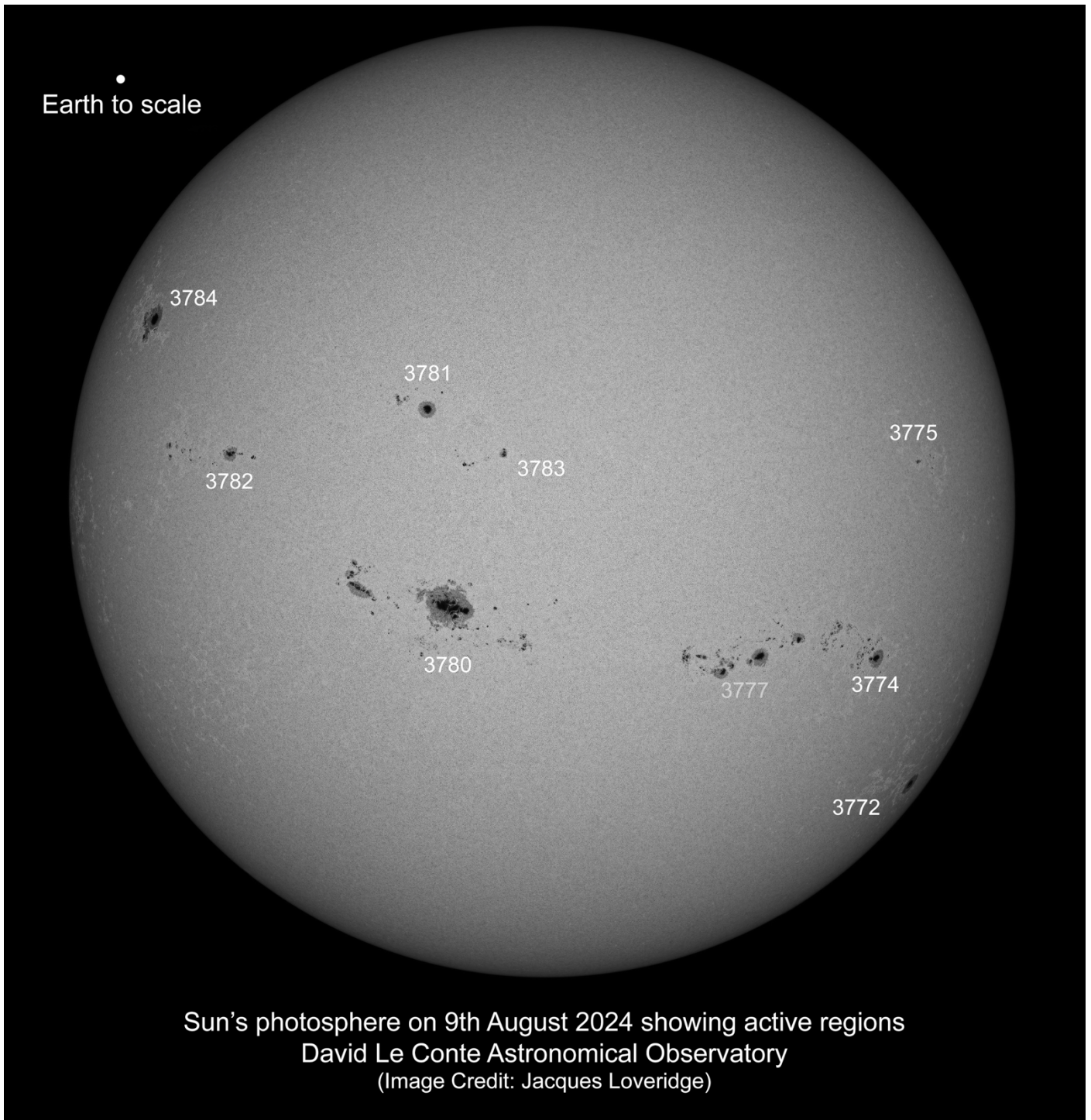
ISES Solar Cycle F10.7 cm Radio Flux Progression



Space Weather Prediction Center

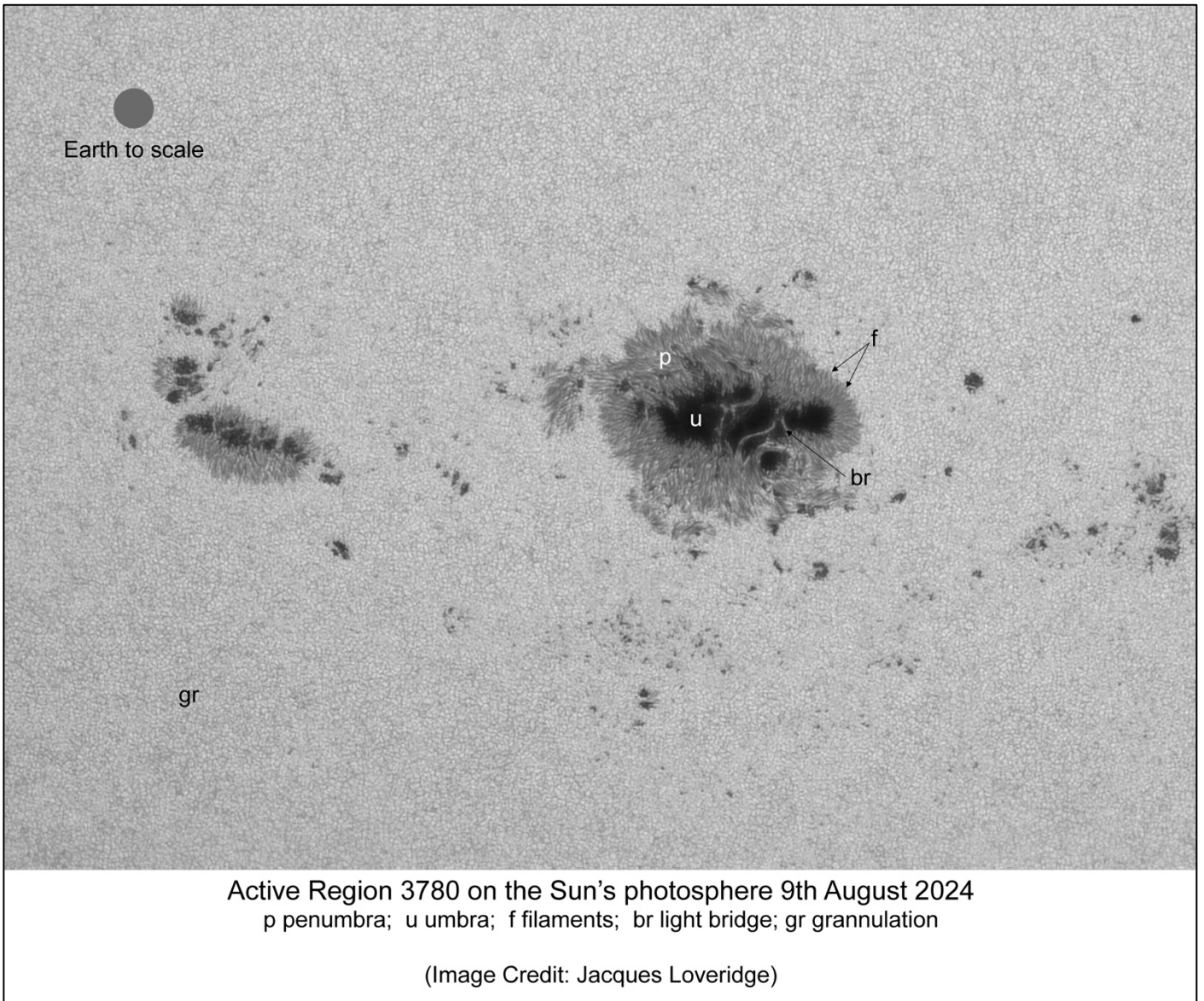
International Space Environmental Services F10.7 Flux for Solar Cycle 25 (graph adapted from: NOAA/NWS).

The enlargement of AR 3780 shows the central, dark (cooler) umbra and lighter (hotter) penumbra with numerous filaments radiating outwards. Temperatures in the umbral zone are typically 2,200° C, reaching as high as 3,500° C in the penumbral region. Penumbral filaments surround the umbra, with light bridges spanning the umbra of AR 3780.



Sun's photosphere, image credit Jacques Loveridge.

The grainy appearance of the photosphere is produced by the tops of convection cells where the hot plasma rises, cools and then sinks. A single convection cell is normally about 1,500km in diameter and typically persists for between 10 and 20 minutes. At any one time, there may be about 4 million granules on the photosphere surface.



Active Region 3780, image credit Jacques Loveridge.

Jean Dean