The astronomical sky over Edinburgh this September

September plays host to an equinox, a partial Lunar eclipse and a comet that may brighten to naked-eye visibility. Plus there are lots of planets on parade throughout the harvest month.

The headline grabbing astronomical event of September is, of course, the equinox. From the Latin ‘aequus’ meaning equal and ‘nox’ meaning night, the northern Autumnal Equinox occurs when the Sun crosses the celestial equator travelling south.

This year the equinox happens on 22 September at 1.44 pm in Virgo (The Maiden). This is the magical moment when day equals night and the Sun rises (almost) directly in the east and sets (almost) directly in the west for everyone on Earth no matter where you live. We can anticipate many cultural festivals and ceremonies across the world in celebration of the start of the astronomical autumn season. Astronomical autumn lasts until the winter solstice some 89 days, 20 hours and 37 minutes later.

On passing through the September equinox, the Sun traverses the ‘First Point of Libra’ at right ascension (RA) 12 hours and declination (Dec) 0 degrees. Since the zero-point of the astronomical co-ordinate system (RA, Dec) moves in time—known as the precession of the equinoxes—the First Point of Libra is actually now in Virgo (The Maiden) and has been since 730 BCE, a mere 2 decades or so after ancient Rome was founded. Today

we can calculate that the First Point of Libra will enter Leo (The Lion) in the year 2439 and will not return to Libra (The Scales) until around the year 23730!

The Sun leaves Leo (The Lion) on 16 September at 6:33 am and enters Virgo (The Maiden). Daylight shortens from 13:48 (13.800 hours) on 1 September to 11:35 (11.583 hours) on 30 September so we gain 2 hours and 13 minutes of night time, by month's end.

The new Moon appears on 3 September at 2:56 am in Leo (The Lion) beginning a
new synodic (Lunar) month which will last 29 days, 16 hours and 54 minutes. Lunar apogee (furthest from Earth) occurs on 5 September at 4:07 pm and takes the Moon to 406,229 km away from Earth—around 21,829 km further than average—subtending an angle of 29.4 arc-minutes. The first quarter of the new cycle shows up on 11 September at 7:06 am in Ophiuchus (The Serpent Bearer).

The full Harvest Moon makes an appearance on 18 September at 3:34 am as it crosses into Pisces (The Fishes). Like last month, September's full Moon is also a supermoon. Lunar perigee (closest to Earth) on 18 September at 2:30 pm finds the Moon some 357,282 km away from Earth—around 27,118 km closer than average—subtending an angle of 33.4 arc-minutes. Finally, the Moon enters last quarter on 24 September at 7:50 pm in Gemini (The Twins) but bordering Auriga (The Charioteer).

The Lunar eclipse on 18 September will last 4 hours and 6 minutes beginning at 1:41 am as a penumbral eclipse. The partial phase starts at 3:13 am and lasts until 4:16 am. Since this is a partial Lunar eclipse, the Moon will not turn the vivid copper colour associated with full eclipses but you should see the Earth's penumbra and umbra traverse the face of the full Harvest super Moon.

For the inferior planets: Mercury reaches greatest western elongation from the Sun on 5 September, lies 0.4 degrees north of Regulus in Leo (The Lion) on 9 September and reaches perihelion that same day. It will be visible as a morning object, low in the east, about an hour before sunrise in the first half of the month. It then approaches the Sun until on 30 September it reaches superior conjunction, behind the Sun, in Virgo (The Maiden) and is completely lost to us. Venus, bright at -3.9 magnitudes, is visible for up to an hour after sunset , in the west, for the first half of the month or so. At month's end it moves into Libra (The Scales).

For the superior planets: Mars and Jupiter are both visible after midnight all month. Mars brightens from 0.7 to 0.5 magnitudes as it gets closer to the Earth by 28.5 million km (0.19 AU). On 6 September, it crosses over from Taurus (The Bull) into Gemini (The Twins). Spare a jealous thought for our Martian neighbours who, if they exist, will witness a solar transit of Mercury on 5 September! Jupiter lurks in Taurus (the Bull) throughout the month and reaches western quadrature, so the orbital geometry makes a right angle between Earth-Sun-Planet, on 12 September. It, too, gets closer to Earth by 67.7 million km (0.45 AU) and brightens from -2.3 to -2.5 magnitudes.

Saturn will be visible from late evening through to the pre-dawn hours every day in September. Since Saturn reaches opposition on 8 September—that is opposite the Sun when viewed from Earth—we will have an excellent view of the ringed planet. In fact, it will be the best view all year as it reaches 0.57 magnitudes on that day and will be the closest to Earth at some 1,295,228,752 km (8.66 AU) in Aquarius (The Water Bearer). The Moon will also occult Saturn on 17 September but this will not be visible from Edinburgh and Lothian. Uranus, steady at 5.6 magnitudes in Taurus, appears to back-track on the sky by changing direction to retrograde. Neptune also reaches opposition on 21 September at

4,322,349,042 km (28.9 AU) in Pisces but will require optical assistance to see at its best. Since it is so far away, the brightness remains stable at 7.7 magnitudes.

You may catch the tail end of last month’s Perseid meteor shower until 5 September but peaking on 9 September are the ϵ-Perseids. Nothing is known of the parent comet and activity is very low with, perhaps, 5 meteors per hour. The radiant point is adjacent to β-Per, better known as Algol or by its unfavourable nickname of the ‘Demon Star’. Algol, lying some 90 light years distant, is a 3-solar radii star with a surface temperature of 12,500 Kelvin. It was known to be a variable star as long ago as 1667 but the reason behind the variability was not explained until the late 19th century: it was discovered to be the first ever eclipsing binary. The companion star is slightly bigger but fainter and lies less than 10 million km away. As these 2 stars rotate around their barycentre, they eclipse each other with the larger occultation dimming the magnitude from 2.1 to 3.4 over a 10-hour period. This eclipse takes place every 2.867 days but the secondary eclipse is too faint for the naked eye. Today, we know that Algol is actually a triple star system but the third companion is much fainter and much further away from the 2 principal components.

Comet C/2023 A3 (Tsuchinshan-ATLAS) reaches perihelion on 27 September at 0.39 AU. The light curve for this object predicts that it may brighten to naked-eye visibility in the later part of the month. However, a contentious scientific paper suggests that it is fragmenting and may not reach expectations. Either way it will be tricky to see as it rises only 30 minutes or so before the Sun in September. Perhaps, the best time to view this visitor from the Oort cloud is after 27 September at 6:30 am, the start of civil twilight, when it will be 144 million km away from Earth, very low in the east, in Sextans (The Sextant).
Over the next 3 nights it brightens by 0.3 magnitudes as it

approaches to 124 million km away from Earth. If the comet is breaking up, reducing the expected brightness, it won’t be visible at all.

At the time of our sky map, some constellations visible are Cepheus (The King) at zenith, Lynx (The Lynx) in the north, Andromeda (The Chained Maiden) in the east, Corona Borealis (The Northern Crown) in the west, and Microscopium (The Microscope) in the south. Corona Borealis, you might recall from previous columns, hosts the recurrent nova T CrB better known as the Blaze Star. This should explode by year’s end and provide another jewel in the crown, of similar lustre to Polaris, near the star ϵ-CrB. The ecliptic hosts Pisces (The Fishes), Aquarius (The Water Bearer), Capricornus (The Sea Goat) and Sagittarius (The Archer).

The ‘Summer Triangle’—Vega in Lyra (The Lyre), Altair in Aquila (The Eagle) and Deneb in Cygnus (The Swan)—is high in the south. Circumpolar constellations—always above the horizon—include Cassiopeia (The Seated Queen), Camelopardalis (The Giraffe), Draco (The Dragon) and Ursa Major (The Great Bear).

1 September 3:57 pm	Uranus reverses orbit at stationary retrograde point	Taurus
3 September 2:56 am	New Moon, Meeus lunation 305	Leo
5 September 3:31 am	Mercury at greatest western elongation 18.1°	Leo
5 September 6:43 am	Moon crosses descending node	Virgo
5 September 4:07 pm	Lunar apogee 406,229 km	Virgo
6 September 8:00 pm	Spica 0.6°W of Moon	Virgo
8 September 5:35 am	Saturn at opposition	Aquarius
8 September 8:13 am	Earth Saturn closest 1,295,228,752 km	Aquarius
9 September 5:50 am	Mercury 0.4°N of Regulus	Leo
9 September 4:10 pm	Mercury perihelion 46,000,229 km (0.31 AU)	Leo
9 September 2:39 am	Lunar apogee 405,328 km	Virgo
9 September 11:00 pm	Epsilon Perseid (208 SPE) meteor shower peaks	Perseus
11 September 7:06 am	Moon at first quarter	Ophiuchus
12 September 11:53 am	Jupiter at western quadrature	Taurus
16 September 6:33 am	Sun leaves Leo, enters Virgo at 1.005 AU	Virgo
18 September 1:41 am	Penumbral Lunar eclipse begins, eclipse magnitude 1.04	Pisces
18 September 3:13 am	Partial Lunar eclipse begins	Pisces
18 September 3:34 am	Full (Harvest) Super Moon	Pisces
18 September 3:44 am	Lunar partial eclipse maximum, eclipse magnitude 0.09 mag	Pisces
18 September 4:16 am	Partial Lunar eclipse ends	Pisces
18 September 5:47 am	Penumbral Lunar eclipse ends	Pisces
18 September 2:30 pm	Lunar perigee 357,282 km	Pisces
18 September 8:51 pm	Moon crosses ascending node	Pisces
20 September 5:08 am	Earth Neptune closest 4,322,349,042 km	Pisces
21 September 1:17 am	Neptune at opposition	Pisces
22 September 1:44 pm	Autumnal (September) equinox	Virgo
24 September 7:50 pm	Moon at last quarter	Gemini
27 September 6:45 pm	C/2023 A3 (Tsuchinshan-ATLAS) reaches perihelion at 0.39 AU	Sextans
30 September 10:09 pm	Mercury at superior conjunction	Virgo

Edinburgh and Lothian

(55.95°, -3.19°, 10.00m for 15 September 2024 10:00 pm)