Sky notes

2005 June & July

by Neil Bone

Sun, Moon and Earth

The summer solstice is reached at 06h 46m Universal Time (UT; BST minus 1 hour, equivalent to GMT) on June 21. At this time, the Sun is at its highest northerly declination on the ecliptic, its apparent annual path around the sky – a plane inclined by 23.5° to that of the celestial equator. For several days close to the solstice, the Sun appears to 'stand still', rising as far north of east and setting as far north of west as it can for observers in the northern hemisphere. This also means that the hours of darkness are short – observers in Scotland, for example, are limited at midsummer to only an hour or so of twilight on either side of UT midnight local time (1 am BST). For the British Isles north of London, the midsummer Sun is no more than 14.5° below the horizon at its midnight lower culmination due north: astronomical twilight persists throughout the short night, making observation of faint objects difficult.

The Sun itself, of course, is ideally placed for observation. The safe method of projection is recommended. Sunspot cycle 23 is now winding down towards minimum, but occasional spot groups are still breaking out, and there may be one or two present on most days. Spotless days are, however, increasingly likely as we approach the expected activity minimum in 2006/7.

Even when sunspots are scarce, suitably-equipped observers will often find reasonable numbers of prominences around the solar limb, or visible against the bright chromosphere as dark filaments. To see this activity, a narrow-passband hydrogen-alpha filter, or dedicated 'prominence telescope' is required – the outlay is considerable, but many have enjoyed such views in recent years as the equipment has become more readily available.

The Moon is New on June 6 and July 6. Summer's Full Moon occurs low against the stars of Sagittarius on June 22 and Capricornus on July 21.

Earth is at aphelion, farthest in its elliptical orbit from the Sun, on July 5.

The planets

Mercury is at superior conjunction on the Sun's far side in early June, then pulls out into the evening sky. Greatest elongation 26° east of the Sun is reached on July 9. The best chances for UK latitudes of spotting the elusive inner planet probably come in late June, when it sets about 90 minutes after the Sun. At this time, Mercury will be around magnitude 0; by greatest elongation, it will have faded to mag +0.5. Brilliant mag –4 Venus is a good guide for locating Mercury for a couple of evenings around June 27; on this date, Mercury will be around 6 arcminutes south of Venus. Both planets will be low to the northwest among the stars of Gemini at this time; Venus should be a naked eye object in the early twilight, but binoculars will be needed to pick out the much fainter Mercury. Saturn is also in the grouping, a little more than a degree away. By late July, Mercury will have become too faint to be readily visible, and it reaches inferior conjunction between Sun and Earth in early August.

Venus is only slowly gaining in elongation east of the Sun, and the current evening apparition will be rather unspectacular until the year's end. During June and July, Venus gradually stretches out to just over 30° east of the Sun, but sets only 80–90 minutes after sunset. In part, this is due to the shallow angle of the ecliptic relative to the western evening horizon at this time of year.

Making a comeback from a lengthy spell of poor visibility, Mars begins to present an interesting target for observers with larger telescopes (in the 200mm aperture and upwards range) during July. By mid-July, the apparent disk diameter will have reached 10 arcseconds, and Mars brightens to magnitude 0 by the month's end. By this time, the Red Planet will be unmistakeable, rising around 23h UT due east against the relatively dim stars of Pisces, below the Square of Pegasus. The early morning hours, when atmospheric steadiness (seeing) is usually best, should afford some interesting views. Mars will continue to brighten and grow in apparent diameter through the coming months, as Earth begins to close in ahead of November's opposition.

Jupiter, in Virgo, remains prominent in the western evening sky during June. The apparition is, however, drawing to a close, and the window of opportunity for observing the planet's dark belts, light zones and other cloud features is limited to a hour or so after dusk: by July, Jupiter sets around 23h UT.

Its brief encounter in line of sight with Venus and Mercury in late June notwithstanding, mag +0.2 Saturn is essentially lost from view in the evening twilight, and reaches conjunction on the far side of the Sun on July 23.

Uranus, at mag +5.7 in Aquarius, and Neptune (mag +7.8) on the Capricornus/Aquarius border, are well placed in the latter parts of the month. Both can be located with 10×50 binoculars and the aid of the charts on pp 75 and 76 of the BAA *Handbook*.

Comets

On July 4, the NASA *Deep Impact* spacecraft is scheduled to deliver its penetrator into the nucleus of Comet 9P/Tuttle. At this time, the comet is expected to be a 9th- to 10th-magnitude object in southeastern Virgo, low in the western evening sky. Some projections suggest that the impact (during daylight for UK-based observers) may release sufficient volatile material from the comet's nucleus to cause brightening to easy naked eye range. The comet will be closely monitored by ground-based telescopes around the world, and with the Hubble Space Telescope. 9P/Tempel could remain bright for several days after impact, and the possibility of a 'bonus' binocular/naked eye comet will surely encourage observers to be on the alert on evenings in the second week of July – although from a UK perspective 9P/Tempel sinks ever lower into the twilight as time goes on.

Meteors

A trickle of Ophiuchid activity, from two radiants low in the southern sky, is found throughout June, but twilight will restrict observing opportunities.

Mid-July sees a marked upturn in overall meteor rates, as several of the radiants in the Capricornus/Aquarius region become active. Most obvious are the Delta Aquarids, whose

NLC on 1999 July 4, photographed by Neil Bone using a 2s exposure with 50mm f/2.8 on Kodak Elite slide film

peak around July 27–28 will be badly affected by glare from the waning gibbous Moon. The shower has two radiants – a southern branch (the more active) near the star Delta Aquarii, and a northern branch near the Water Jar asterism.

Also in evidence during the second half of July and into August are the Alpha Capricornids, noted as a source of long, slow, bright meteors. The shower has relatively low observed rates – perhaps only two or three per hour at best, close to August 2 – but the meteors can sometimes be spectacular.

By the end of July, the Perseids, with their radiant at this time north of Andromeda's eastern end, are beginning to show. Lunar phasing will favour this ever-popular shower at its maximum on August 12.

Noctilucent clouds

Summer's twilight brings the 'season' for observing the delicate bands and billows of high-atmosphere noctilucent clouds (NLC). Forming at heights close to 82km, NLC are a summertime phenomenon, appearing when temperatures near the mesopause reach their minimum. They are believed to consist of water ice condensed onto small nuclei of possibly meteoric origin. NLC are most frequently seen in those summers around sunspot minimum, when heating of the upper atmosphere by solar X-ray and ultraviolet radiation associated with active regions is reduced; on this basis, 2005 may prove a bumper year.

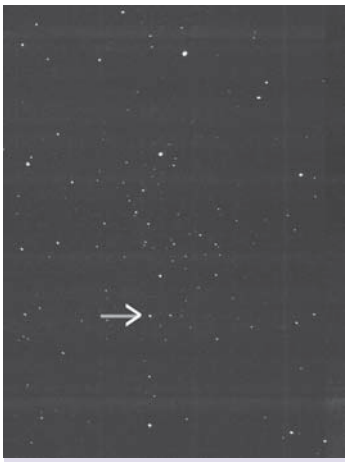
Too tenuous to be visible by day, NLC become apparent once the Sun has sunk lower than 6° (but no more than 16°) below the observer's horizon. Such conditions are found night-long at Scottish latitudes for several weeks around the summer solstice. Under these circumstances, clouds in the lower atmosphere are in darkness in Earth's shadow, whilst any NLC which might be present remains in sunlight, showing up in contrast with the gathering twilight. Displays are often brightest in the direction towards the Sun's sub-horizon position.

From more southerly parts of the British Isles, NLC are typically restricted to the low northern part of the sky below the star Capella. Displays are more extensive at higher latitudes; from Scotland, the entire sky may be covered on occasion. As a consequence of the illumination geometry, NLC displays usually appear most extensive just after sunset and just before dawn.

NLC make an attractive photographic subject, and can be captured on exposures of 1–3 seconds (depending on sky brightness, and that of the display) at *f*/2.8 on ISO400 film. In recent summers, many observers have obtained excellent images using digital cameras on automatic exposures.

Variable stars

Chi Cygni, a Mira-type (long period) variable, should reach maximum brightness in early July. The star has a catalogued range from magnitude +5.2 to +13.4 (among the most extreme for a Mira star), over a period of 408 days. Chi Cyg was last at its brightest in May 2004, when it reached an unusually bright mag +4. At most peaks, it is a faint naked eye, but easy binocular object, close to the fourth-magnitude Eta Cygni, midway along the 'neck' of Cygnus between Gamma and Albireo. Chi will be in reach of 10×50 binoculars throughout this interval, and the fade from maximum is usually slower than the rise, meaning that it will remain readily visible well into the autumn. Brightness estimates should be made at roughly weekly intervals.



Cygnus with Chi Cygni bright on 2004 May 18. 15s undriven on Kodak Elite 400, 50mm f/1.8. *Neil Bone*.

Among the naked eye variables well presented throughout the summer months, Alpha Herculis (also known by its Arabic name Ras Algethi, meaning 'Head of the Kneeler') can be an interesting star to follow. A relatively cool (surface temperature ca. 3000K) spectral class M giant star, Alpha Her varies in a semi-regular manner between third and fourth magnitude with no obvious single period: this is probably a consequence of several modes of pulsation in different phases occurring simultaneously in its outer layers. Sometimes, when two of these modes coincide, the star may appear noticeably brighter or fainter than usual. Like Chi Cyg, this is a star which can be followed adequately by making estimates at intervals of about a week (more frequent observations introduce the risk of bias). Suitable comparisons are Delta Her (mag +3.13) and Gamma Her (+3.74). Alpha Herculis' variability was discovered by William Herschel in 1795.

Deep sky

The Summer Triangle of Deneb, Vega and Altair (principal stars of, respectively, Cygnus, Lyra and Aquila) dominates the southern sky late on a June–July evening. Given the prominence of these groups, and bright Sagittarius low to the south, it is sometimes easy to overlook summer's fainter constellations. Tucked between Cygnus/Lyra and the northeastern (upper right in UK skies) parts of Aquila is the indistinct form of Vulpecula, a relatively modern constellation introduced by the German astronomer Hevelius in 1690. The constellation's original title of Vulpecula et Anser – the Fox and Goose – may seem suspiciously like a pub name, but there is said to be no connection with Hevelius' parallel career as a brewer.

Vulpecula is home to a couple of very fine deep sky sights. Catalogued as Collinder 399, the Coathanger asterism is perhaps most easily found using the tail of the Arrow (Sagitta) as a guide. Roughly 4° to the northwest of Sagitta, the naked eye will be drawn on any reasonably clear, dark night to a 'knot' of fifth-magnitude stars in an area somewhat more than a degree (two Moon-diameters) across. Binoculars resolve this into an apparent cluster of ten mag +5 to +6 stars. Six of these lie in a roughly east-west line stretching for 1.5°, while the others form a 'hook' to the south. Low-power views are certainly most pleasing.

Despite their apparent proximity in the sky, the stars of the Coathanger are in fact unrelated, lying at distances between 1,140 and 2,180 lightyears. They are simply in the same line of sight – an asterism, rather than a true cluster.

Vulpecula's other standout object is M27 (NGC 6583), the Dumbbell – surely the best planetary nebula for observers with small instruments. M27 is easy to find, once again using Sagitta as a reference: a short 3° hop north from Gamma Sagittae at the Arrow's tip takes the view to the Dumbbell. Catalogues give M27's magnitude as +7.3, but the ease of visibility in, say, 10×50 binoculars suggests it may be somewhat brighter.

M27 is one of the brighter planetary nebulae (produced by the slow ejection of the outer layers of a faint 14th-magnitude star lying at its centre), and covers an area of 8×5 arcminutes. Binoculars show M27 as a small hazy patch, while a small telescope at low power reveals this as elongated along a NE–SW axis. Even a 100–150mm aperture telescope at ×30 will show the twin-lobed ('apple core') structure from which the Dumbbell takes its name.

Planetary nebulae emit strongly at wavelengths of 500.7 and 495.9nm (the OIII spectral lines of ionised oxygen). Use of a narrow-passband OIII or UHC filter at higher magnifications can bring out fine detail in M27, especially in a large telescope.

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