Sky notes

2004 June & July

by Neil Bone

Sun, Moon and Earth

The Sun reaches its greatest northerly declination for the year at 00h 57m Universal Time (UT=GMT; BST minus 1 hour) on June 21, the northern hemisphere Summer Solstice. The hours of daylight are at a maximum for a week or so to either side of this date, and with the Sun never very far below the horizon even at midnight, the short midsummer nights never really become properly dark at the latitudes of the British Isles. Particularly in Scotland, Northern Ireland and the Northern Isles, the nights are brief and twilit.

Long days afford plenty of opportunity for solar observing by the safe means of projection. After the spectacular revival of last autumn, sunspot activity in the current Cycle 23 is now winding down towards minimum, expected in 2006/7. Nonetheless, observers should still find a reasonable number of active areas on the solar disk, with perhaps three or four spot groups on most days.

The Moon is New on June 17 and July 17, placing the darkest nights into the middle fortnight of the month. Full Moon falls on June 2, and July 2 and 31. In American parlance, a second Full Moon in the same calendar month – like that in July – is often referred to as a 'Blue Moon'. Midsummer Full Moon occurs at southerly declinations close to the ecliptic, against the stars of Scorpius in June and Sagittarius in July. Consequently, for UK observers, the Moon at these times is as low in the southern sky as the winter Sun, and with twilight prevailing in any case, seems to have less impact in brightening the sky. Earth reaches aphelion – the farthest from the Sun in its slightly elliptical orbit – on July 5.

The transit of Venus

For amateur astronomers of a certain vintage, this interval brings the finale in a series of long-anticipated landmark celestial events. Those of us who grew up with the 'Apollo Era' of the 1960s always had marked in our wish-list the return of Halley's Comet in 1985/6, the total solar eclipse of 1999 August 11, and the Leonid meteor storm later the same year, together with the 2004 June 8 transit of Venus.

As outlined on page 119, this is of course an event of great historical significance: the previous transit of Venus occurred in 1882, and no-one alive today has ever seen one. The 2004 transit will be intensively covered by those wishing to photograph and image it, as well as by visual observers keen to witness a rare astronomical spectacle.

The usual cautionary note with respect to solar observing applies to the transit. Projection is the safest way to view the event. Objective filters can be used, but only if the observer is absolutely sure, via the manufacturer's specifications and instructions, that these are safe. Advice on safe observing, along with other aspects of the transit, can be found on the website at **http://www.transitofvenus2004.org.uk/**

The transit, starting early on this Tuesday morning, is visible in its entirety from the British Isles; stay-at-home observers are hoping for a repeat of he generally fine weather conditions which greeted the transit of Mercury in 2003 May. Locations in southern Europe, North Africa and the Middle East are also favoured, and many will be travelling there in search of more dependable clear skies.

Viewing the Sun by the projection method. *(Neil Bone)*

Precise timings for the key events in the transit vary with geographical location: the calculated values given in the BAA *Handbook* and on p.119 are geocentric, but observers will find the Earth's surface a likelier location for their view... Observers in the British Isles (there is little variation from one region to another) can expect first contact between Venus and the Sun's southeastern limb at 05h 19m UT; as Venus continues its westwards motion, a growing 'nick' will be apparent in the solar limb over the next few minutes. Venus' appreciable 1 arcminute disk will take up to 20 minutes to completely pass onto that of the Sun (second contact). The time around second contact will be followed with particular interest. As a result of Venus' thick atmosphere, and unsteady seeing (turbulence) in our own, second contact is not clear-cut. Instead, Venus' dark body appears joined to the solar limb by an extended 'stalk', producing what is known as the black drop effect. Recording this will be a target for many imagers. Remember that BST (local) times will be an hour later than those given here.

Once onto the solar disk, Venus will track steadily westwards on a chord across the Sun's southern hemisphere, taking until 11h 08m UT to reach the western limb. As at ingress/second contact, the egress/third contact is expected to produce a black drop effect. Venus finally departs the solar disk (fourth contact) at 11h 26m UT.

Transits of Venus occur in pairs separated by 8 years: the second in the series is in 2012, and only the closing stages and egress will be visible from the British Isles on that occasion. After 2012, there is a long wait until 2117.

The planets

Mercury is at superior conjunction on the far side of the Sun on June 18, then emerges into the evening sky to a rather unfavourable apparition, reaching greatest elongation east of the Sun on July 27. Setting only an hour at most after the Sun, Mercury is unlikely to be visible from the UK.

Following the June 8 transit, Venus moves rapidly into the morning sky, west of the Sun. By late June, Venus will have pulled out to nearly 30° elongation, rising about 80 minutes before sunrise, and unmistakeable at magnitude –4. Through July, Venus' elongation continues to increase, and the planet will be a truly prominent 'Morning Star' rising 2h 30m before the Sun towards the end of the month, among the stars of Taurus. Through this interval, Venus will show an increasingly broad crescent phase in a telescope, but its overall diameter will appear to shrink as it recedes around its faster orbit inside that of the Earth.

Mars is still just about keeping pace eastwards ahead of the Sun along the ecliptic, but is now lost into the evening twilight as the current apparition comes to the usual lingering end. Jupiter, too, is becoming poorly placed in the evening twilight, already quite low by the time dusk deepens in mid-June. A bright mag –2 against the stars of Leo, Jupiter is too low for effective observation by July. Saturn, meanwhile, is at conjunction on the far side of the Sun on July 8, and will not re-emerge to easy view until late August.

For observers with binoculars, Uranus and Neptune – in Aquarius and Capricornus respectively – are becoming better placed. Uranus, around mag +5.5, is an easy binocular object about 1.5° northeast of the fifth-magnitude star Rho Aquarii, a few degrees south of the 'Water Jar' asterism. Neptune is 1.5° northeast of fourth-magnitude Theta

Capricorni (more or less in the middle of Capricornus), and at mag +7.7 should be reasonably easy to find in, say, 10×50s.

Charts for these two outer ice/gas giants can be found on pp.70–71 of the BAA *Handbook*. Magnitude estimates, made using background stars as comparison objects will be welcomed by the Director of the Asteroids and Remote Planets Section, Andrew Hollis.

Noctilucent clouds

June and July are the traditional 'season' for seeing high-atmosphere (82km altitude) noctilucent clouds (NLC), which many believe to form as traces of water vapour condense onto suspended residual meteoritic material. Often distinctively banded, NLC have a characteristic silvery-blue colour. The clouds are very tenuous, and can only be seen after the Sun (which illuminates them) has sunk more than 6 – but no more than 16 – degrees below the observer's horizon, appearing in contrast with the twilight. Observers in the south of England will find NLC, if present, restricted to the low northern sky below Capella. North from the Midlands, displays can occasionally be very extensive, and in Scotland may cover the whole sky.

The frequency with which NLC have been seen has increased over the past 40 years or so as, apparently, has the clouds' geographical extent. NLC form in summertime when the high atmosphere near the mesopause reaches its annual temperature minimum. In particular, low solar activity (with less solar flare-related X-ray and ultraviolet heating of the upper atmosphere) favours NLC formation: the chances of seeing NLC displays are higher in summers close to sunspot minimum, so 2004 could be the first of several good years to come.

Reports of sightings, including extent in altitude and azimuth, and rough sketches to indicate the NLC forms present, should be sent to the Aurora Section via Dr David Gavine, 29 Coillesdene Crescent, Joppa, Edinburgh, EH15 2JJ. It is useful, for comparative purposes, to record details on the hour, quarter-hours and half hour. Dates should be in double-date format (e.g. 27–28 June).

NLC make an attractive photographic subject. My preference is for exposures of 1 to 3 seconds (depending on whether the display is bright or faint) at f/2.8 with a standard 50mm lens on ISO 400 colour slide film.

Comet 2001 Q4 (NEAT)

All being well, the long-awaited Comet C/2001 Q4 (NEAT) will have been a reasonable naked eye object during mid-May, and if it lives up to the more optimistic forecasts, it will still be so through to mid-June. As it tracks northwards during late June and into July, heading towards the Bowl of the Plough, the comet will start to fade, but should remain a good binocular object. Nightly drawings can be made to show how the tail behaves as the comet recedes from the Sun, and these will be welcomed, together with magnitude estimates and other observational details, by Comet Section Director Jonathan Shanklin. Those wishing to make detailed observations are advised to consult the BAA *Observing Guide to Comets*, available from the BAA Office, for full information on just what is required.

NLC photographed from Chichester in 1995. *(Neil Bone)*

Meteors

June's twilit conditions are far from ideal for meteor watches, but the possibility of significant activity from the Pons–Winneckids should encourage observers to make use of what clear skies they can find on the Saturday night to Sunday morning of June 26–27. The shower is noted for having produced strong periodic displays in the early part of the 20th century, but was presumed more or less extinct following later changes by gravitational perturbations to the orbit of the parent comet 7P/Pons–Winnecke. It therefore came as a surprise when a strong return, with observed rates of a meteor per minute over a 12 hour interval, occurred on 1998 June 27–28. Computations suggest that the material responsible, ejected from the comet in 1825, will again be encountered in 2004, with highest rates possibly around June 27d 01h UT. The meteors have a radiant in northern Boötes (some European observers refer to the shower as he June Boötids), and are very slow (geocentric velocity 14 km/s). Few are particularly bright.

On the critical night, the Moon will be a 10-day old waxing gibbous, low to the south-west after midnight and probably not having too much effect on a sky already bright with twilight. Observers are encouraged to make watches for as long as possible on the (short!) night, and report details – even if no activity is noted – to the Meteor Section.

July sees an upturn in overall meteor activity, with several Capricornid and Aquarid radiants coming 'on stream' south of the Square of Pegasus. Bright moonlight in the closing week of July will prevent fruitful observation of these showers, but the good news is that August's Perseids will enjoy dark skies close to their maximum.

Variable stars

The long period (Mira-type) variable Chi Cygni should be an easy binocular object in this interval, having been at maximum in late May. Typically, Chi Cyg reaches fifth magnitude at its brightest, and its light curve shows a rapid rise to peak, followed by a slow decline: binocular observers might hope to keep it under surveillance until at least August. The star, near fourth-magnitude Eta Cygni on the Swan's outstretched neck, is well placed throughout this interval. Magnitude estimates should be made roughly weekly: charts showing constant-brightness comparison stars can be obtained from the Variable Star Section web pages at http://britastro.org/vss/

A more rapidly-changing summertime variable star is Beta Lyrae, the prototype of an

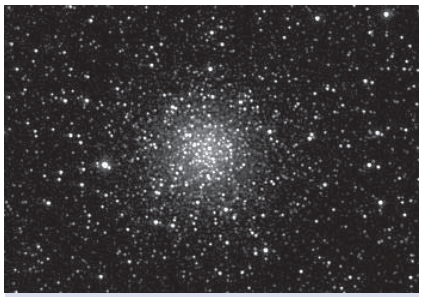
Image of the Ring Nebula (M57) by Kevin Smith. Takahashi FS128 TTCFW & ST-10E CCD, 2003 November 24. *(Kevin Smith)*

interesting class of eclipsing binaries in which the components are so close to one another that they are gravitationally-distorted and exchange material. This results in constant variation, with an extreme range from mag +3.4 to +4.4. The period is just under 13 days, with a primary minimum to mag +4.3 and a less deep secondary minimum to mag +3.8 in each cycle. Estimates can be made nightly with the naked eye: good comparisons include Gamma Lyrae (mag +3.2) and Eta Lyrae (mag +4.4). Like Algol, this star was first identified as variable by John Goodricke, in 1784. Beta is the southwestern (lower right) star of the parallelogram of faint stars making up the Lyre's body.

Deep sky

Lyra, high in the summer sky, is a relatively compact constellation, but is home to some interesting objects. Among the best known of these is the 'Double Double' star, Epsilon Lyrae, immediately adjacent to blue-white mag 0 Vega. To the naked eye, Epsilon appears as a pair of mag +3.5 stars, separated by 3.5 arcminutes (about a third of the Mizar–Alcor distance, and reasonably testing for most observers), aligned more or less north–south. Telescopic examination shows the northern component (Epsilon^1) to be a pair of stars of mag +5.4 and +6.5, 2.6 arcseconds apart, while Epsilon^2 to the south has more equal mag +5.1/+5.3 components separated by 2.3 arcseconds. This is a testing object for a 75mm aperture telescope, but is comfortably split at ×100 in a 100mm instrument.

Most celebrated of Lyra's treasures is the Ring Nebula M57 (NGC 6720), one of the brighter planetary nebulae at mag +8.8. Located between Beta and Gamma Lyrae at the south of the parallelogram of fourth-magnitude stars making up the Lyre's body, the oval M57 has a long axis of about 40 arcseconds – just too small to make much impression in binoculars, but obviously nebulous when seen in small telescopes at magnifications greater than about ×30. Higher powers and larger apertures really give the impression of a celestial smoke ring, with the bright outer hoop containing fainter nebulosity making the centre of the ring brighter than the surrounding sky. The mag +15.3 central star is elusive visually, even in very large amateur telescopes.



Globular cluster M56. *(Photo: Nick Hewitt)*

While most of summer's globular clusters congregate in the direction of the Galactic centre in Scorpius/Sagittarius, there are several outliers, including M56 (NGC 6779) in Lyra, about 5° ESE from Gamma Lyrae. At mag +8.3, this is quite a challenging object for binoculars, but shows on a good night as a compact circular haze. Telescopically, M56 appears quite loosely packed, with an overall diameter of 7 arcminutes – about a quarter that of the Moon – surrounding a concentrated nucleus.

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