Sky notes

by Neil Bone

2006 December & 2007 January

Sun, Moon and Earth

The Sun arrives at the most southerly position in its apparent annual journey against the star background at 00h 20m Universal Time (UT; equivalent to GMT) on December 22, the moment of the Winter Solstice. The hours of darkness are at a maximum for the year around this time, offering plenty of opportunity for evening observing. Conversely, conditions are at their least favourable for daytime solar observing, with the Sun cutting a low arc across the southern sky.

Sunspot minimum between cycles 23 and 24 is upon us, with observers reporting a complete absence of spots on many days. Over the next 12 months, activity is expected to remain low, but the first spotgroups of the new cycle should soon begin to appear at higher solar latitudes.

The Moon is New on December 20 and January 19: darkest evening skies will be found in the middle fortnight of the month in this interval. Thanks to the relatively steep inclination of the ecliptic to the western evening horizon at this time of year, the waxing crescent Moon emerges quite quickly to prominence in the nights after New – favourable circumstances for observers wishing to explore the rugged, cratered terrain of our satellite's southern hemisphere. Features are thrown into sharp relief close to the day-night line of the terminator, as any small telescope, or even a pair of steadily-mounted binoculars, will show.

Full Moon falls on December 5 and January 3, providing a lot of sky (and ground!) illumination from high in the southern sky. The Moon's position at these times is similar to that of the high summer Sun.

Earth is at perihelion, closest in its elliptical orbit to the Sun, on January 3.

The planets

At the beginning of December, Mercury is a morning object, rising a little over an hour ahead of the Sun. At magnitude –0.6, the normally elusive innermost planet should be reasonably conspicuous in the gathering winter dawn. By mid-month, Mercury has closed in on the Sun again in line of sight, and won't be visible.

Superior conjunction, on the Sun's far side, is reached on January 6. Mercury then moves into the evening sky, becoming reasonably prominent by the end of January ahead of early February's greatest elongation east of the Sun. Around January 31, Mercury is at mag –0.9, and can be picked out in the evening dusk with binoculars, low in the SSW.

Venus – poorly placed for much of the past twelve months – finally begins to make a better showing as an 'Evening Star' as 2006 draws to a close. By late December, the planet shouldn't be hard to find, shining at magnitude –4 low in the southwest for an hour or so after sunset. During January, Venus stretches out in elongation east from the Sun, and by the end of the month will be visible for a couple of hours after sunset. Telescopically, the planet will show little beyond a broad gibbous phase, gradually diminishing in this interval. By springtime, Venus will be prominent indeed.

Mars re-emerges from solar conjunction, but is far from conspicuous – a second-magnitude 'spark' more or less lost in the bright pre-dawn sky during December and January.

Jupiter returns to view during December, rising a couple of hours before the Sun at the month's end. Now at a high southerly declination, Jupiter spends this apparition against the stars of Scorpius, and will be rather low for observation from the British Isles.

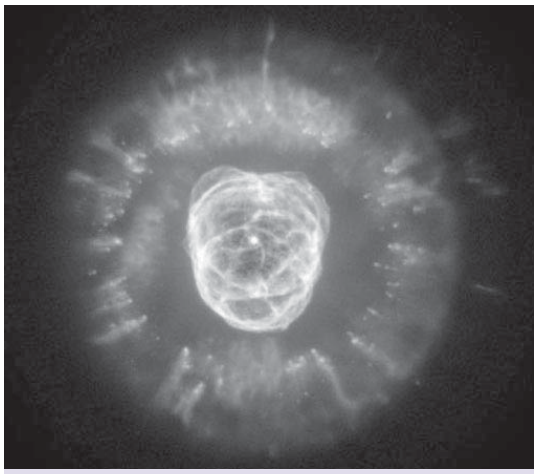
As in the last couple of months, Saturn remains the best-placed planet, and its visibility improves considerably during this interval. By late December, Saturn – a few degrees west of Regulus in Leo – will be rising around 20h GMT, reaching a good elevation in the south-eastern sky by midnight. The rings are currently narrowing in their angle of presentation towards us, but can still be comfortably resolved in telescopes of 60–80mm aperture.

Titan, Saturn's largest, and at mag +8 brightest, satellite is due west of the planet on December 7 and 23, and January 8 and 24, and due east eight days later.

Meteors

Strongest of the annual showers at present, the Geminids are quite favourable around their December 13–14 maximum, as described in 'Notes and News' on page 298.

Later in December, absence of moonlight favours the Ursids, a shower that has been poorly observed in recent years. Active between December 17–25, the Ursids usually produce rather modest rates, with the peak corrected Zenithal Hourly Rate of 10 corresponding to a typical observed half a dozen or so per hour. Peak is expected on 22–23 December. The shower radiant lies close to Beta Ursae Minoris, one of the 'Guardians of the Pole', and is circumpolar, so observations are possible throughout the long midwinter night.



The 'Eskimo nebula', NGC 2392 in Gemini, imaged by the Hubble Space Telescope. A fine object for small telescopes on winter nights. *Andrew Fraknoi/STScI/NASA.*

Highest radiant elevations are attained in the early hours.

Circumstances could hardly be worse for the Quadrantids, peaking on 3–4 January coincident with Full Moon. The 2008 return will be better placed. Following the Quadrantids, January brings us to a period of rather low meteor activity, with only minor showers and minimal background sporadic rates in evidence.

Variable stars

Mira (Omicron Ceti) is now brightening towards maximum, expected next March. During December and January, this famous long-period variable should be in easy binocular range: it might even be visible to the naked eye from darker locations by January's close. Mira is quite easy to locate, just west of the triangle of Alpha, Gamma and Delta Ceti, marking Cetus' head. Finder charts can be downloaded from the BAA Variable Star Section website (**http://www.britastro.org/vss**). Mira's rise to maximum can be followed by making magnitude estimates at roughly weekly intervals.

One of winter's brightest and best-known stars, Betelgeuse (Alpha Orionis) is also variable. This celebrated red giant varies in a semi-regular fashion as its outer layers pulsate, showing an extreme range from magnitude 0.0 to +1.3; the variations in a single observing season are generally a lot smaller, but Betelgeuse can appear noticeably brighter in some years (like 2005–6) than others. Estimates can be made with the naked eye at weekly intervals using such stars as Capella (α Aurigae; mag +0.1), Procyon (α Canis Minoris; +0.4) and Pollux (β Geminorum; +1.2) as comparisons.

Long nights in December and January offer the chance to follow the famous eclipsing binary Algol (β Persei) through its entire cycle. Algol fades from mag +2.1 to +3.4 over a five-hour interval, with an equal recovery period. Following the whole ten-hour eclipse demands stamina and perseverance, with magnitude estimates made (using the naked eye) at 15–20 minute intervals. Best opportunities to follow complete cycles come on December 21–22, January 13–14, and January 31–February 1. At least part of the eclipse will be observable on Dec 18–19, 24–25 and 27, and Jan 10–11, 16, and 28–29.

Deep sky

Orion dominates the winter midnight sky, standing high to the south. On a frosty, moonless night, it's hard not to be impressed by the brilliance of the Hunter, and his two brightest stars – blue-white magnitude 0 Rigel at Orion's western knee, and similarly-bright Betelgeuse on the eastern shoulder. These are two giant stars, consuming their nuclear hydrogen at prodigious rates. Betelgeuse is farther along its evolutionary track, and is destined to explode in a few million years as a Type II supernova.

The product of one such stellar demise is a popular object for telescopic observation on winter nights. Orion is portrayed in the sky as facing up to the charging Bull, Taurus, whose head is made up from the triangle of the Hyades (a nearby open star cluster, well worth binocular perusal in its own right) with orange-red Aldebaran, a first-magnitude foreground star, marking the eye. Taurus' long horns stretch eastwards over Orion, marked by second-magnitude Beta Tauri (Al Nath, formerly assigned dual citizenship as a member also of Auriga) and third-magnitude Zeta Tauri. Zeta, the lower (more southerly) horn, is a good guide for locating M1 (NGC 1952), the Crab Nebula a degree or so to its north. The Crab Nebula is the remnant of a Type II supernova explosion witnessed in 1054 AD, and was the first entry in Charles Messier's 18th century catalogue of cometary lookalikes. At mag +8.4, M1 is a hazy spot in binoculars. Small telescopes in the 80–100mm aperture range show it better: at a magnification of ×80, one gets the distinct impression of an 'S' shape lying on its side. Larger telescopes show this more clearly, and use of a UHC filter to boost contrast also helps. The filamentary structure in the Crab's outer regions – familiar from countless photographs – is elusive visually, but can be captured in CCD images. M1 covers a relatively large 6×4 arcminutes (about one-fifth as wide as the Moon), lying roughly east–west.

High to Orion's east on a winter night, Gemini is home to a fine example of the gentler expiry undergone by less-massive stars (like our Sun). Like the Crab, the Eskimo Nebula (NGC 2392) is familiar from countless large-telescope images, including the iconic Hubble view from 1995. This planetary nebula, the result of the star at its centre relatively gently shedding its outer layers, is surprisingly bright and easy to see in quite small telescopes at mag +9.2. Being compact (only about 15 arcseconds across) NGC 2392 appears almost stellar at low magnifications. In an 80mm telescope at ×80, the real giveaway to the object's nature is, perhaps, its marked bluish tint, and at such magnifications it shows a noticeable 'fuzziness' round the edges, unlike the nicely-matched – in brightness – 9th-magnitude field star close to its north. NGC 2392 can be found three degrees WSW of Delta Geminorum, on a star-hop via 5th-magnitude 63 Gem. The Eskimo nickname arises from its appearance in long-exposure images – a face framed in a 'parka' hood. Larger telescopes (200mm aperture upwards) and higher magnifications will show some of this structure: an OIII filter helps.

Returning to Orion, even the most seasoned observers will always find themselves drawn to winter's showpiece, M42 (NGC 1976), the Orion Nebula. On a December or January midnight, there's no finer binocular or telescopic sight than the broad wedge of nebulosity a few degrees south of the Hunter's Belt. In contrast with our previous targets, this is a scene of stellar birth: the nebula is excited to glow in the light of ionised hydrogen by ultraviolet radiation from new stars forming in its interior. A few million years hence, the nebulosity will be blown away by stellar winds to reveal a cluster of young stars. Some of these are already visible to us, as components of the Trapezium multiple star system – a fine sight for small telescopes, located at the end of a dark 'bay' popularly known as the 'Fish's Mouth' seen in contrast against the otherwise bright nebula.

Neil Bone