

# Sky notes

by Neil Bone

## 2002 December & 2003 January

### Sun, Moon and Earth

Sinking to its most southerly declination on the ecliptic for the year, the Sun arrives at the Winter Solstice at 01h 14m Universal Time (UT, equivalent to GMT) on December 22. Solar observers have a 'window' of only a few hours with the Sun reasonably well above the horizon during these mid-winter months, and for many the chance to monitor sunspot activity at this time of year comes only at the weekend. The long hours of darkness do, however, favour other observational activities.

Sunspot activity is now beginning to decline after the double peak in cycle 23. On most days there are still at least a couple of spot groups to be seen, via the safe method of projection.

The Moon is New on December 4, January 2 and February 1, giving darkest night-time skies during the opening and closing weeks of the month in this interval. Many will surely welcome the dark evening conditions in the week after Christmas as an opportunity to try out new equipment! Full Moon falls on December 19 and January 18. Winter's Full Moon, shining down from the high positions in Taurus and Gemini occupied six months later by summer's Sun, always seems particularly strong, drowning out all but the brighter stars.

Earth reaches perihelion – closest to the Sun in its elliptical orbit – on January 4.

### The planets

Mercury is in the evening sky, setting an hour or so after the Sun in the last week of December, but rather hard to see at a southerly declination. Inferior conjunction, between the Sun and Earth, is reached on January 11, following which Mercury emerges to a rather unfavourable apparition in the morning sky, rising about an hour before the Sun at the end of January.

Venus is a good deal better placed, rising over three hours ahead of sunrise from early December, and very conspicuous in the eastern pre-dawn sky at magnitude  $-4.5$ . Greatest elongation,  $47^\circ$  west of the Sun, is reached on January 11, and the presence of Venus as a prominent 'Morning Star' in the interval around Christmas will doubtless re-fuel the perennial debate about the nature of the biblical Star of Bethlehem.

Telescopically, Venus will show a gradually growing crescent phase in December, appearing half-illuminated close to greatest elongation in the second week of January. Its phase apart, the planet reveals little else, though experienced observers sometimes report faint markings in the cytherian cloud-tops. Drawings and estimates of Venus' phase will be welcomed by the Director of the Mercury and Venus Section, Robert Steele.

Mars has re-emerged from conjunction behind the Sun into the early morning sky, rising only a couple of hours before the Sun. The planet remains rather dim and inconspicuous – fainter than mag.  $+1$  – in this interval, but will be a great deal more obvious in late summer of 2003.

In the evening sky, Jupiter and Saturn are prominent in this interval. As it approaches early February's opposition, Jupiter rises earlier each evening. By early December, the giant planet, just east of the Praesepe star cluster in Cancer, is rising around 20h. At mag.  $-2.5$ , and with an apparent disk diameter in excess of 40 arcseconds, Jupiter reveals a lot of detail when viewed through even quite modest telescopes. The jovian clouds show alternating dark belts and lighter zones, along with spots, festoons and other features. Drawing these can be a challenging, but rewarding activity; it is interesting to compare views recorded several weeks apart to see how Jupiter's appearance has altered.

Jupiter's four large Galilean satellites are visible in binoculars as points of light shuttling back and forth to either side of the planet in its equatorial plane. Occasionally, the satellites' orbital motion carries them into Jupiter's dark shadow, resulting in eclipses which take several minutes to become total. It can be fascinating to watch, in a small telescope, as satellites fade from view. During December, Jupiter's shadow is still quite well west of the planet. Favourably-timed events include disappearances of Io on December 10 at 21h 18m UT, Ganymede on December 14 at 23h 35m UT, and Io again on December 17 at 2h 12m UT. Events in January are closer to Jupiter's western limb, and include Europa disappearing on January 1 at 23h 19m UT, Io disappearing at 21h 29m UT the following night, and Callisto disappearing at 00h 45m UT on January 26.

Saturn is at opposition on December 17,

high among the stars of Taurus – not far from Zeta Tauri, the Bull's southern horn. At mag.  $-0.5$ , Saturn is about as bright as it can be – this a result of the rings' open presentation (and greater reflective surface) towards us. Saturn is a magnificent sight in even quite small telescopes at present. Observers with larger telescopes may try to pick out some of the planet's cloud features, though these are rather subdued in comparison with those of Jupiter.

Saturn's largest satellite Titan is visible at mag.  $+8$  in small telescopes, due east of the planet around December 6 and 22 and January 7 and 23, and due west some nine days after these dates.

### Minor planets

Observers with binoculars should be able to track down asteroid (20) Massalia during December, as it moves retrograde (westwards) against the stars of Taurus just east of the Hyades. At magnitude  $+8.5$ , this object is comfortably in reach for a pair of 10x50s. Its night-to-night movement relative to the star background should give Massalia away; observers can download a chart from: <http://yan.open.ac.uk/~ajh47/2002chart1a.htm>

### Meteors

The Geminids are active from December 7 to 15, with a waxing gibbous Moon restricting observations to the last hours of the night by the time of maximum on December 13–14. Later in the month, the Ursids will be swamped by the waning gibbous Moon, just four days past Full, at their December 21–22 peak.

January brings to a close the most fruitful part of the year for meteor observers, with a favourable maximum of the Quadrantid shower. Peak, late on January 3–4, is well timed for observers in western Europe. More details on this shower, and the Geminids, can be found on page 310 of this *Journal*.

### Variable stars

Winter's long nights offer the chance to follow Algol (Beta Persei) through its entire eclipse cycle, which takes five hours to fade

from maximum mag. +2.1 to minimum mag. +3.4 and has an equally long recovery time. Favourably-timed eclipses occur on December 11–12, 4 and 17, and January 3–4, 6, 23–24, 26 and 29.

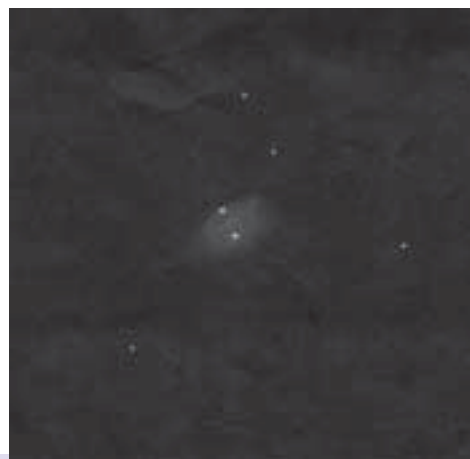
Known best as one of winter's 'signature' stars, Betelgeuse (Alpha Orionis) is a variable star, showing changes of the order of half a magnitude over the course of several years. These variations are a result of gradual pulsations in the outer layer of this extended red giant star, now on its way to a spectacular demise as a supernova in a few million years' time. Betelgeuse's brightness can be estimated using nearby Aldebaran (Alpha Tauri; mag. +0.85) and Rigel (Beta Orionis; mag. +0.14) as comparisons. Estimates should be made at intervals of about ten days. Of the forty or so known naked eye variable stars, Betelgeuse is the brightest and most strongly coloured.

## Deep sky

Winter can be said to have well and truly arrived when – as around Christmas – Orion's broad shoulders, marked by Betelgeuse at the left and mag. +2 Bellatrix at the right, have cleared the eastern horizon when dusk falls. Ahead of Orion to the west, Taurus is already well up early on a December evening. Taurus' head is made up of the westwards-pointing 'V' of the Hyades star cluster – an excellent binocular sight – with the foreground red star Aldebaran marking the Bull's eye. Above and to the west of the Hyades glitters the compact and more distant cluster of the Pleiades, another object arguably best seen in binoculars.

At this time of year, most observers will turn their telescopes towards the magnificent Orion Nebula (M42), a few degrees south of the three 'Belt' stars marking the Hunter's waist. M42 is always an absorbing telescopic sight, with its delicate, extended wisps and tendrils of softly-glowing gas and dust. It is not, however, the only interesting object in the constellation of Orion. When we look in this direction into the southern sky on a winter midnight, the view is towards a vast star-forming region in the next spiral arm out from our own in the Galaxy. M42 is the brightest of several nebulae which populate this region of space some 1600 lightyears away.

Less often visited, and perhaps one of the more difficult Messier targets for binocular users, is M78, located a few degrees



Messier 78 (NGC 2068) is a fine bright nebula with emission and reflection characteristics. A broad fan-shaped nebula surrounds two rather spooky 'eyes' – a pair of 10th magnitude stars. The area is generally dusty, and a smaller fainter nebula (NGC 2071) can be seen to the north of M78. This spectacular deep image of the M78 region was taken by Adrian Catterall in January 2001 using a 5-inch (127mm) f6 Astrophysics refractor and an ST8E CCD camera. North is 'up'. A more typical view for visual observers is that drawn by A. W. Northcott using a 222mm f7.3 Newtonian with a magnification of  $\times 63$ . This is a detail of a larger field.

north-northeast from zeta Orionis at the eastern end of the Belt. M78 is a reflection nebula, illuminated by a couple of stars, giving a two-lobed appearance in small telescopes. At an overall mag. +8, this is a target for the clearest, moonless nights.

Still more difficult, and perhaps best captured on long-exposure wide angle photographs of the region, is the sweeping arc of nebulosity, brightest to the east of Orion, known as Barnard's Loop. The loop apparently marks a shockwave where the combined wind from energetic stars, recently formed in Orion's stellar nursery, meets gas in interstellar space.

A similar 'bubble' clears the center of another of winter's best-known objects, the

Rosette Nebula in Monoceros – about  $6^\circ$  ESE from Betelgeuse. Elusive visually in amateur telescopes (though use of a 'nebula filter' helps), the Rosette is another popular target for photographers and CCD imagers. At its heart lies a small cluster of fifth- and sixth-magnitude stars catalogued as NGC 2244m which is well seen in binoculars.

The New Year opens with dark, moonless conditions, and the night-time view in the southern sky is pretty much as fine as it can be. What better way to usher in 2003 than by enjoying some of winter's finest celestial sights?

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