Observers' Forum

Deep Sky Section

Observing the Veil Nebula

The Veil nebula in Cygnus is one of the most beautiful emission nebulae in the sky. High up in the south during August and September, it is well positioned for observing in the hopefully warm late summer nights. The Veil is the result of a supernova explosion some 50,000 years ago. It is centred around RA 20h 53m and Dec +31°. It has always been a popular target for photographers and imagers, but the advent of nebular filters has also turned it into a showpiece object for visual observers. The Veil is large, covering approximately 3° of sky, and while telescopes in the 350–500mm range will allow visual observers to see some of the fainter filamentary structure of this complex object, modern short focal length refractors, with their wide field, will enable the brighter eastern and western parts to be viewed together.

Left: Part of the western component of the Veil nebula, NGC 6960, centred around the bright foreground star 52 Cygni. *Right:* part of the eastern component, NGC 6992, showing the delicate filamentary structure. *Jeremy Shears, Takahashi FS102 refractor.*

The Veil Nebula was first catalogued by William Herschel in 1784. He noted the bright eastern region NGC 6992 (John Herschel later observed an extension to this now known as NGC 6995) and the slighter, fainter, western region NGC 6960 located around the 4th magnitude foreground star 52 Cygni. Herschel classified them as Class V objects – very large nebulae.

Part of NGC 6992 (left) and NGC 6960 (below). *Gordon Rogers, 16-inch (406mm) Ritchey–Chrétien.*

The Deep Sky Section regularly receives observations of the Veil. Section member Peter Hudson, observing from north Bedfordshire with 11×80 binoculars under a transparent sky, reported that the eastern portion (NGC 6992/6995) was easily visible without a filter and just detectable in 10×50s, also without a filter. Owen Brazell (Williams 80mm f6 APO with 25mm Panoptic eyepiece + Lumicon OIII filter) reported both eastern and western components were easy and Neil Bone (80mm f6 Celestron refractor + OIII filter) also found it an easy target, particularly the southern component of the eastern loop, NGC 6995. Although the OIII filter works well on the Veil, transforming the view compared to not using a filter, the Director finds that some parts respond better to a UHC filter which has a wider bandpass. This is particularly true for NGC 6979/6974, the fainter northern component. For observers with large telescopes looking for a visual challenge there is also a central area to the Veil (Simeis 3-188) commonly known as Pickering's Triangular Wisp. The Veil is a wonderful complex object that never fails to impress and the Director would be delighted to receive further images and observations.

The images of parts of the Veil reproduced here were obtained by Section members Jeremy Shears and Gordon Rogers. Jeremy images from Bunbury, Cheshire with a Takahashi FS102 refractor and Starlight Xpress MX716 CCD camera, and Gordon from Long Crendon, Bucks. with a 16-inch (406mm) RCOS telescope installed on a Paramount ME mount with an SBIG ST10XE CCD camera, CFW8 filter wheel and AO7 adaptive optics.

Stewart Moore, *Director*

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A major 'lunar standstill'

Fiona Vincent

The term 'lunar standstill' was apparently coined by Alexander Thom, in his 1971 book *Megalithic Lunar Observatories* (Oxford University Press). It is analogous to the term 'solstice'; in neither case does the Moon or the Sun actually stand still.

First let us consider the Sun. Because the Earth's rotational axis is tipped to the plane of its orbit, throughout the year the Sun changes its declination relative to the Earth's equatorial plane, as shown in Figure 1. It reaches extremes of ±23.4° at present (the obliquity was a little greater in megalithic times). This changing declination affects many aspects of the Sun's apparent daily motion: its altitude at midday transit, the times of its rising and setting, and the azimuth at which it rises and sets.

It is the last of these that is probably easiest to observe without instruments. At the March equinox (marked ♈) the sun rises due east and sets due west; but over the following weeks, for observers in north temperate latitudes, the rising and setting points move northwards along the horizon. This movement slows down and halts at midsummer, before reversing; in this sense the Sun 'stands still' at the midsummer solstice.

The Moon, to a first approximation, is simply a high-speed mimic of the Sun, repeating the Sun's annual north–south cycle in every monthly orbit. For example, in August the last-quarter Moon, being 90° west of the Sun, shows us roughly how the Sun was behaving three months ago, in May.

But the Moon's orbit is not that simple. Indeed, the very fact that the Earth has a moon at all is somewhat surprising. A giant outer planet like Jupiter can easily maintain a retinue of scores of moons; but things are different closer to the Sun's gravitational influence. Two of the four inner planets (Mercury and Venus) have no moons at all, and little Mars only holds on to Phobos and Deimos by keeping them very close to its equator. The Earth's moon can almost be considered as an independent planet of the the Sun, co-orbiting with the Earth. Its orbit lies not in the plane of the Earth's equator, but close to the plane of its orbit; it is tilted by just 5.1°.

So for most of its orbit, the Moon travels either north or south of the Sun's path. It crosses it only twice in each orbit, at points called the nodes (marked ☊ and ☋on Figures 2 and 3). And, although new and full Moon occur every month, they only give rise to an eclipse of the Sun or Moon if they occur when the Moon lies in the same plane as the Earth and Sun; this is why the Sun's path is also called the ecliptic.

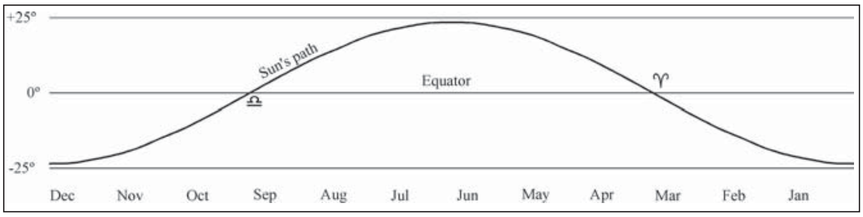

Figure 1. The Sun's yearly path.

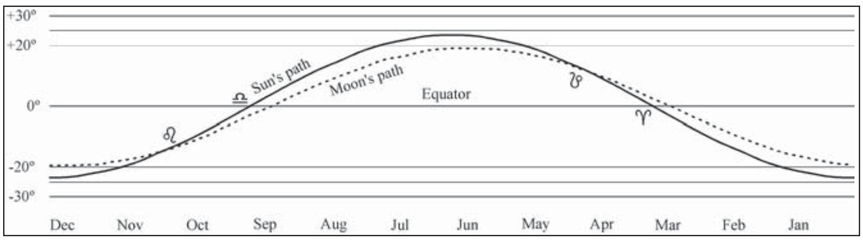

Figure 2. The Moon's path in 1995.

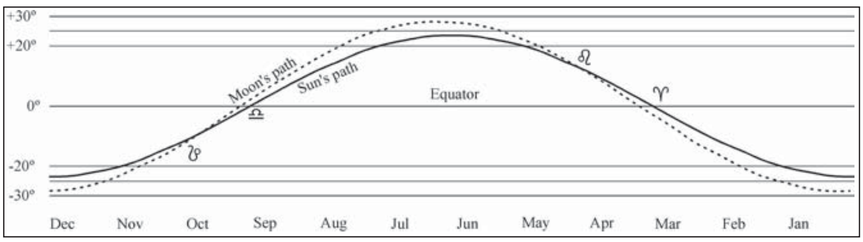

Figure 3. The Moon's path in 2005.

Figure 2 shows the Moon's orbit in the year 1995. The ascending node of the Moon's orbit on the ecliptic lay just to the east of the September equinox ♎; the descending node lay just to the east of the March equinox ♈. And indeed, there were eclipses of the Sun and Moon in April and October that year. The figure also shows that, in 1995, the extreme northern and southern declinations of the Moon were less than those of the Sun.

However, eclipses do not occur in the same months every year; in 1999, for example, the total solar eclipse was in August, not October. The reason for this is that the nodes of the Moon's orbit do not remain fixed: they drift steadily westwards along the ecliptic, taking 18.6 years to make one complete circuit. Two years after Figure 2, in February 1997, the Moon's nodes had moved westwards, and lay exactly on the equinoxes. As a result, the Moon's motion in declination was reduced to its minimum, ±18.28°; this is what Thom calls a minor standstill.

By contrast, Figure 3 shows the Moon's orbit at the start of 2005: the ascending node was then a little way east of the March equinox, and the descending node was approaching the September equinox. The extreme northern and southern declinations of the Moon were now greater than those of the Sun. When we reach June 2006, the nodes will again coincide exactly with the equinoxes, and this time we shall have a major standstill: the Moon will reach declinations of ±28.6°.

'As I write this (1969)', said Thom, 'the Moon is coming through a major standstill. One cannot fail to be surprised to see it set and rise almost in the north. A fortnight later one is again surprised to see how far to the south are the rising and setting points, and how very low it is at transit.' (*Megalithic Lunar Observatories*, p.22.) Now, in 2005, keen skywatchers will already have noticed that the Moon is again behaving oddly. At my latitude of 56.5°N, the midsummer Sun rises at azimuth 49°, almost northeast, so I am used to seeing the Moon rise there occasionally, too. But last winter the waxing gibbous moon was rising much further left, at azimuth 38°. At major standstill, the Moon will be able to rise at 34°, and set at 326°. Indeed, latitude 61.5°N – about 35 miles off the northern tip of Shetland – will become the Moon's 'arctic circle'; there will be one day each month when it will technically be possible to see the Moon circle the sky there, without setting at all.

The actual major standstill occurs in the middle of June 2006, but it changes only slowly: we will be able to enjoy this extreme behaviour of the Moon for a couple of years. However, as the nodes continue to drift westwards, it will gradually return to 'normal'. The next minor standstill is in October 2015, and we won't see another major standstill until April 2025.