



The Binocular Sky

December
2015

Newsletter

Introduction

Welcome to the 4th Anniversary edition of the **Binocular Sky** Newsletter! The intention of this monthly offering is to highlight some of the binocular targets for the coming month. It is primarily targeted at observers in the UK, but should have some usefulness for observers anywhere north of Latitude 30°N and possibly even further south.

Solar-system charts are usually clickable and will take you to a larger chart that may be more useful as well as being downloadable to your computer or mobile device.

If you would like me to email this newsletter to you each month, please complete and submit the [subscription form](#). You can get "between the newsletters" alerts, etc. via  and .

The Deep Sky

([Hyperlinks](#) will take you to finder charts and more information about the object.)

December marks the welcome return of the [Pleiades \(M45\)](#) and the [Great Orion Nebula \(M42\)](#) to early evening observation at a reasonable altitude. The [trio of open clusters in Auriga](#) and [M35](#) in Gemini are also worth observing. While you are looking at M35, also see if you can identify two smaller open clusters, NGC 2158, which is half a degree to the SE, and the slightly more difficult IC 2157, which is a degree to the ESE. Nearer the Pleiades is [NGC 1647](#), which is within the 'V' asterism of the [Hyades](#). It is a sparse cluster and, although it is visible in a 10x50 binocular, it really benefits from a little more aperture and magnification.

The open cluster [NGC 752](#) is very well placed this month; it is one of those objects that is often overlooked because of its proximity to a more famous object, in this case, the Great Andromeda Galaxy (see below). NGC 752 is a very fine cluster, and easy in 50mm binoculars in which it begins to resolve. Nearby towards Perseus is another fine cluster, [M34](#).

Open (also called 'Galactic') Clusters are loosely packed groups of stars that are gravitationally bound together; they may contain from a few dozen to a few thousand stars which recently formed in the galactic disk.

In December, the Milky Way is overhead in the mid-to-late evening. This means that those objects (globular clusters and galaxies) that are outside our galaxy are not as well placed for observation as they are when the Milky Way is low in the sky. Although the bright [M81 \(Bode's Nebula\)](#) and [M82 \(The Cigar Galaxy\)](#), are still relatively easy to observe, even in a 50mm binocular, their altitude is such that you are unlikely to get neck-strain when you do so with straight-through binoculars. M81 and M82 can be used as a good demonstration of averted vision: if you have them both in the same field of view, you may see that the core of M81 becomes more apparent if you look at M82.

Two notable exceptions to the generalisation of galaxies being poorly placed on December evenings are [The Great Andromeda Galaxy, M31](#) and [M33 \(The Pinwheel\)](#), both of which are close to the plane of the Milky Way. M31 in particular is very easily visible this month and is a naked eye object in moderately dark skies. It is large and bright enough to be able to withstand quite a lot of light pollution (making it available to urban observers). M33 has a low surface brightness and benefits from lower magnification. This generally makes it easier to see in, say, a 10x50 binocular than in many "starter" telescopes.

Galaxies are gravitationally bound "island universes" of hundreds of billions of stars at enormous distances. The light that we see from M31, for example, left that galaxy around the time our ancestors of the genus Homo were just evolving!

Of the globular clusters, [M15](#) and [M2](#) are both well placed for observation in December.

Globular clusters are tightly-bound, and hence approximately spherical, clusters of tens, or even hundreds, of thousands of stars that orbit in a halo around almost all large galaxies that have been observed. They are important for two reasons: Firstly, they contain some of the oldest stars in the galaxy, so studying them helps us understand the evolution of stars. Secondly, they are

useful as "standard candles" in establishing a distance scale of the Universe, based on the assumption that the brightest stars in any globular cluster will be approximately the same brightness and that the brightest globulars in a galaxy will be approximately the same brightness.

Variable Stars

Mira-type stars near predicted maximum (mag < +7.5)		
Star	Mag Range	Period (days)
R Hya*	4.5-9.5	389

* R Hya is a dawn twilight object that rises higher as the month progresses.

Selection of binocular variables (mag < +7.5)			
Star	Mag Range	Period	Type
XY Lyr	5.8-6.4	Irreg	Irregular
U Sge	6.5-9.3	3.38d	Eclipsing binary
U Vul	6.7-7.5	7.99d	Cepheid
SU Cyg	6.4-7.2	3.84d	Cepheid
U Del	7.0-8.0	ca. 110d	Irregular
V Aqr	7.6-9.4	ca. 244d	Semi-regular
TW Peg	7.0-9.2	ca. 90d	Semi-regular
U Cep	6.8-9.2	2.5d (increasing)	Eclipsing binary
SS Cep	6.7-7.8	ca. 190d	Semi-regular
RZ Cas	6.2-7.7	1.195d	Eclipsing binary

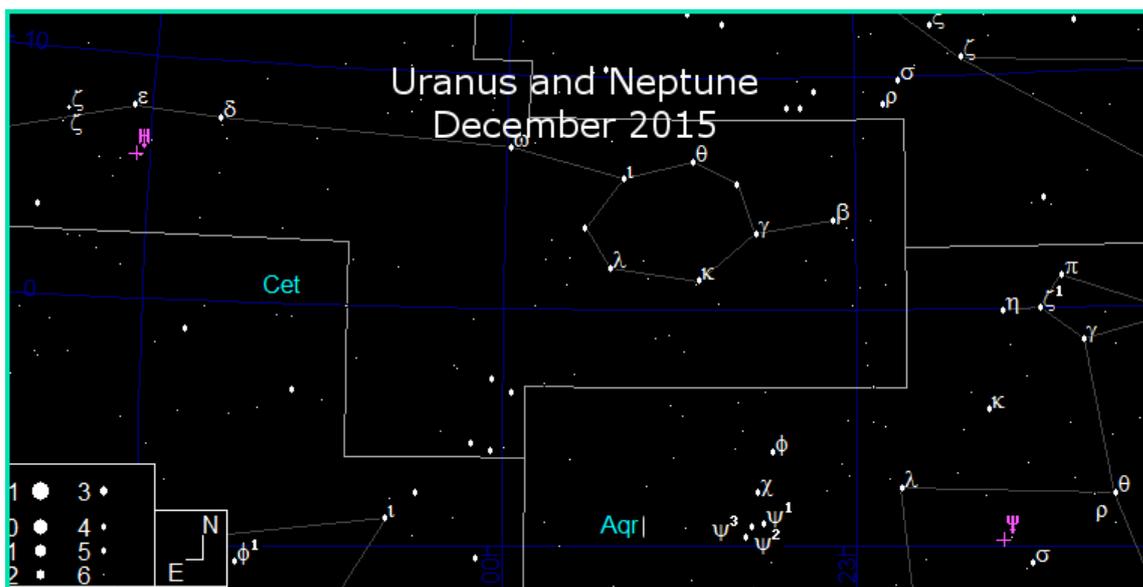
Double Stars

Binocular Double Stars for December			
Star	Magnitudes	Spectral Types	Separation (arcsec)
δ Cep	4.1, 6.1	F5, A0	41
56 And	5.7, 5.9	K0, K2	128
ΣI 1 And	7.1, 7.3	G5, G5	47
ψ-1 Psc	5.3, 5.8	A2, A0	30
14 Ari	5.0, 7.9	F0, F2	106
62 Eri	5.4, 8.9	B9, B8	67
τ Tau	4.3, 7.0	B5, A0	63
ν Gem	4.1, 8.0	B5, A0	113
ζ Gem	4.0, 7.6	G0, G	101
p-1 Umi	6.6, 7.2	G5, G5	31

The Solar System

Planets

Uranus shines at mag. +5.7 just S of ϵ Psc; it sets soon after 03:00 at the beginning of the month and two hours earlier by month end. Its position changes by only 16 arcminutes throughout the month and it returns to prograde motion on the 26th.



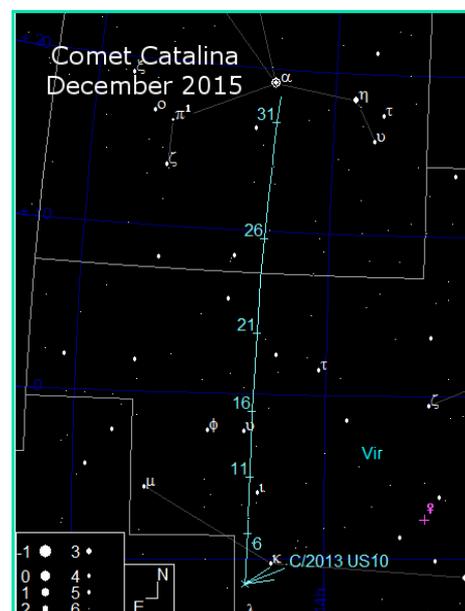
Neptune still lies between λ and s Aqr, but is much fainter than Uranus at mag. +7.9 and is now best observed in the evening as soon as the sky is dark.

Comets

Comet 2013 US10 (Catalina) will have become a 5th magnitude dawn object in Virgo by the start of the month. It is fading slightly, but climbing higher and therefore becomes easier to observe. It ends the year less than 1° from Arcturus

Meteor Showers

The Moon is only 2 days old for the most reliable of major showers, the **Geminids**, which



is active for the last 3 weeks of the month and has its peak predicted for the evening of the 13th, with a ZHR of 120 to 160 (it has been intensifying in recent years). Most meteors are due to debris left by comets, but the Geminid shower is one of two (the other is the Quadrantid shower, which peaks on January 03) that originates from an asteroid, in this case asteroid **3200 Phaethon**. You can use binoculars to examine the persistence of any ionisation trails from these slow-moving, colourful meteors.

Asteroid Occultations

There are no asteroid occultations of stars visible from the UK and suitable for binoculars this month.

Lunar Occultations

There are several occultations of stars brighter than mag +7.5 visible from the UK this month. Times and Position Angles are for my location (approx: 50.9N, 1.8W) and will vary by up to several minutes for other UK locations. The types are **(D)**isappearance, **(R)**eappearance and **(Gr)**raze; they are all dark-limb events unless there is a **(B)**. The highlight is the evening occultation of Aldebaran on the 23rd.

Lunar Occultations, Dec 2015, 50.9°N, 1.8°W					
Date	Time	Type	Star	Mag	PA (°)
Dec 01	01:53	R	SAO 98278	6.5	337
Dec 07	03:56	R	82 Vir	5	230
Dec 09	07:09	R	30 Lib	6.5	256
Dec 19	20:33	D	SAO 109507	6.4	38
Dec 23	18:08	D	Aldebaran	0.9	67
Dec 24	04:56	D	SAO 94227	5.5	59
Dec 25	23:34	R	26 Gem	5.2	261
Dec 29	03:21	R	ξ Leo	5	331

The Moon

- Dec 03 Last Quarter
- Dec 11 New Moon
- Dec 18 First Quarter
- Dec 25 Full Moon

Equipment Mini-Reviews

I have still not had a clear Moonless night with the [Helios Stellar-II 15x70](#) and [10x50](#), so the promised reviews of those will have to wait for another month.

Instead this month, let's have a look at the [Vixen SG 2.1x42](#).

I've had these since June 2014 and am very impressed indeed. When I first tried them, the totally unoriginal thought that kept lurking around what I nowadays try to pass off as a mind was, "*This is Binocular Astronomy, but not as we know it, Jim!*"

The binoculars come in a small padded pouch, with belt-loop. The binoculars themselves have a lanyard that attaches to the left hand side.



They have a robust, chunky feel. The hinge and the individual eyepiece focusing are smooth, even in cold weather. There is a tripod adaptor bush (standard 1/4" Whitworth thread) under a cap in the hinge, but I was unable to find a tripod adaptor that was not uncomfortable against my nose. Perhaps they could be suspended from above, not that there is really any point in mounting these unless you wanted to find a way of wearing them.

The first thing to note is that this is not a prismatic binocular. It has Galilean optics, i.e. the same as an opera glass, but the similarity with

common opera glasses stops there.

The specified field of view and eye relief are essentially meaningless.

With a Galilean optical system the exit pupil is virtual and resides between the objective and the eyepiece. In addition, the field of view increases as you bring your eyes closer to the eyepieces. This

Manufacturer's Specification	
Magnification	2.1x
Aperture (mm)	42
Weight (g)	410
Field of View (°)	12.2*
Close Focus (m)	2
Eye Relief (mm)	8.4*
IPD (mm)	55-74
Size (cm)	4.6 x 12.8 x 5.4

means that spectacle wearers will have a smaller field of view than those who do not wear them. I measured the true field of view to be 23° without spectacles and 17.4° with them, both larger than the specified 12.2° . I measured the close focus to be 1.1m. The manufacturer's specifications are therefore extremely conservative.

Examination under a bright light shows that the multicoatings are properly applied to each of the lens surfaces and reflect minimal light. The reflection visible in the photograph above is of a bright globe-light that was immediately above my head. This means that they transmit a good amount of light. From a site with a limiting naked-eye magnitude of approximately +5.5 I found that I was seeing down to about mag +7.

I found that I do not notice that these binoculars magnify – the sense is of enhanced vision, not magnified vision. With a magnification of 2.1x there is also no perceptible shake, even after 20 minutes or so with the binoculars held up to the eyes (and it is very easy to get lost in the sky for 20 minutes or so, especially if you are on a recliner). As you would expect at this low magnification, chromatic aberration is imperceptible. The view is sharp only over the middle 50% or so of the field of view, but that is wider than you can critically examine at any one time. The way to use this binocular is to look straight ahead and move your head around.

My first-light sky was not particularly transparent and was eventually clouded out, but it was still a remarkably enjoyable experience. Even in those poor conditions, the dark lanes in the Cygnus region of the Milky Way, for example, just leapt out, helping to give a (false, but attractive nevertheless) perception of depth. The best way I can describe it is that this is a very different sort of astronomy to, say, pushing the limits of a big bino by hunting faint galaxies; this is like letting technology compensate for what technology has previously taken away, specifically through light pollution. There really is something special about seeing things, from a suburban site with six-decades-old eyes, almost as they would appear to unaided and youthful eyes from a reasonably good dark site. Under typical southern UK clear skies it is very much better – it seems to improve markedly under more transparent skies. I would love to try these under pristine dark skies!

One issue that some of us found last winter was that, on cold nights, the metal eye-cups could be painfully uncomfortable against the eye sockets. Pete Gamby at Vixen UK sourced some rubber eye-cups that fit over the metal ones. The only down-side is that the original eyepiece caps no longer fit (fortuitously, I found ones that do fit in my junk box).



One additional benefit to them I was alerted to by another owner is that they can aid star-hopping with a reflex finder in faint starfields.

In conclusion, this really is a lovely binocular. At £229, it is very much a "luxury" item, but it offers a binocular experience that you will be unlikely to mimic with anything else. If you use yours as much as I use mine, it would be a worthwhile investment.

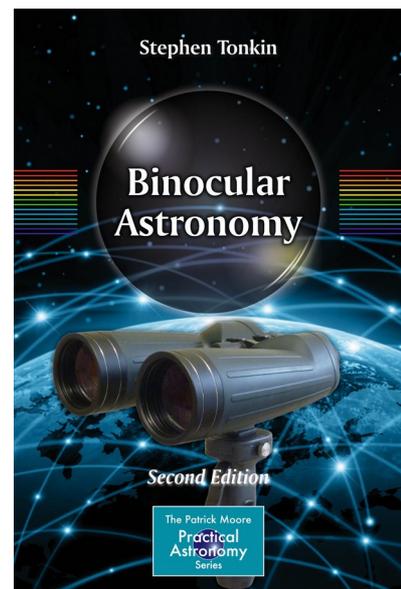
Public Outreach & Talks

During December I will be giving three talks and supporting a free public stargazing event. I would be delighted to meet any readers of this newsletter who attend these:

- 2nd: *Ten Ways the Universe Tries to Kill You*; 14:30, [Bournemouth Natural Science Society](#).
- 3rd: *Binocular Astronomy*; 19:15, [Hereford Astronomical Society](#)
- 10th: *Public Stargazing Event*, 19:00, [Larmer Tree Gardens, Cranborne Chase AONB](#).
- 16th: *The Star of Bethlehem*, [Crewkerne And District Astronomical Society](#).

The **Binocular Sky Newsletter** will always be free to anyone who wants it, but if you would like to support it, there are a number of options:

- Purchase my book, [Binocular Astronomy](#):
Click on the image for more information
- Make a purchase via the affiliate links in the [Binocular Sky shopfront](#)
- Make a small [PayPal](#) donation to newsletter@binocularsky.com



Wishing you Clear Dark Skies,

Steve Tonkin

or

[The Binocular Sky](#)

Acknowledgments:

The charts in this newsletter were prepared with Guide v9.0 from <http://projectpluto.com>

Variable star data based on David Levy's *Observing Variable Stars*

Occultation data derived with Dave Herald's *Occult*

Disclosure: Links to *Amazon* or *The Binocular Shop* may be affiliate links

© 2015 Stephen Tonkin under a [Creative Commons BY-NC-SA License](#)

