Adventures With Cheap Binoculars In Suburban Skies

Rewarding Astronomy on a budget

By Sammy Yousef

Presented at Western Sydney Amateur Astronomy Group

July 2012

With Minor Corrections And Amendments

syousef@bigpond.net.au

http://www.progsoc.uts.edu.au/~sammy/astronomy/Adventures%20With%20Cheap%20Binoculars%20In%20Suburban%20Skies.pdf

My Background

- Lifelong fascination with Science and Astronomy
- Own a couple of Dobsonian telescopes, a couple of cheap refractors, and too many binoculars
- Did an Astronomy degree “for fun” about a decade ago
- Way too casual a stargazer. Go months without viewing sometimes. Others here have much more observing time to their name
- Amateur photographer (who came to it through wanting to do Astrophotography). Know something about optics but am by no means an expert
- Work in IT, programming computers, and supporting the systems I help build
- Young family. Astronomy has to come second. But very proud my 3 year old spotted the Southern Cross on his own last month

Disclaimers

- I do not own expensive binoculars
- My eyesight is not fantastic
  - I'm still legal to drive without glasses as of late last year
  - But I may not see as big a difference as someone with better eyesight
  - Stigmatism means I probably use averted vision more than others
  - I do not wear glasses when using binoculars
- Presentation includes my own opinions
  - Subjective scores for binoculars. Sample size 1. Tried to compare on same night but seeing can change
  - You may disagree. Others say buy the best you can afford
  - **But if you spot factual errors please tell me!**
- Focus is Astronomy. Terrestrial viewing has different requirements
- Simulated Views Not Exact Or Perfect
  - Stellarium overlays deep sky images. Not what you'll see! I've tried to edit the screenshots to be a little more realistic
- ******** NEVER look at the sun with binoculars! *********

Topics

- Buying Binoculars
  - Why cheap? What do I mean by cheap? Compromises
  - Specifications and features
  - Testing at the Shop
- My Cheap Binoculars
  - Quick comparison of differences I have found
- Interesting binocular objects
  - Objects with Stellarium simulated views
  - Sydney Observatory monthly sky guides
  - Tips for enjoying binoculars
- If we have time…fixing binoculars - Aligning the optics on both barrels to eliminate double images (“Dirty Collimating”)

At the end of the slides you will find many more references – books, web sites, and a more in depth review of each of my binoculars. Too dry to actually talk through but good reference

Part 1 – Buying Binoculars

Why Binoculars?

- Wide view compared to a telescope
  - The big picture top down view of the universe
  - See entire objects. E.g. M45 arguably better in binocs
  - See objects in context
- Learn constellations
  - Excellent tool when starting out as a stargazer
- Two Eyes = Richer more natural “3D” views
- Portable and light
  - Can’t fit that 10”-12” Dob in the car for family holiday?
  - Less back and neck strain
- No setup – quick 5-10 minute sessions possible

Why Cheap?

- Cheap means <$100 and preferably <$50
- If you mistreat or lose them or they are stolen they are easily replaced
  - More likely to take them with you. Best binocs are ones you use
- Can afford a backup pair or two
  - But don't keep them in the car on a hot day. Cheap plastic & glue
- Variety. Can you afford or justify 3 pairs of $1000 binoculars?
- Give them to your children
  - Would you rip apart $1000 binoculars?
    - To show your kids what's inside?
    - To align (dirty collimate) them yourself?
  - What about $30 binoculars?
- Inexpensive gift for friend or relative
  - Don't buy a junk pair. It may put them off for life

Why Cheap?

- Expensive is no guarantee
  - ****AT MOST**** you get what you pay for
- You can easily 2 to 4 times the price for binoculars in Australia
  - Tasco 2023BRZ
    - On Amazon roughly USD35 BUT won't ship to Australia
    - At well known Sydney city camera store AUD110
    - Cheapest on shopping.com.au is AUD82.12 +AUD14.20 shipping
    - On Ebay Australian seller AUD85.00 + AUD8.65 shipping
  - Orion Scenix 10x50 – great reviews
    - US - Direct from manufacturer for USD90 + USD10 shipping (early last month. Price has increased.) Won't ship to Australia
    - RRP here is AUD229. Only 3 authorised distributors in Australia. One offered me $189. Politely declined

Will Any Cheap Pair Do?

- Short answer: NO!!!
  - Some only good for daytime viewing
  - LOTS (the majority) are completely unusable
    - Horrible colour tinges and fringing, lack of sharpness, too flexible to hold alignment, don't hold focus
    - Children's toys, stage props, paperweights
  - Really have to know what you're buying
  - DO NOT expect the equivalent of $1000 views at <$50
- But if you already own a pair try them first

Compromises

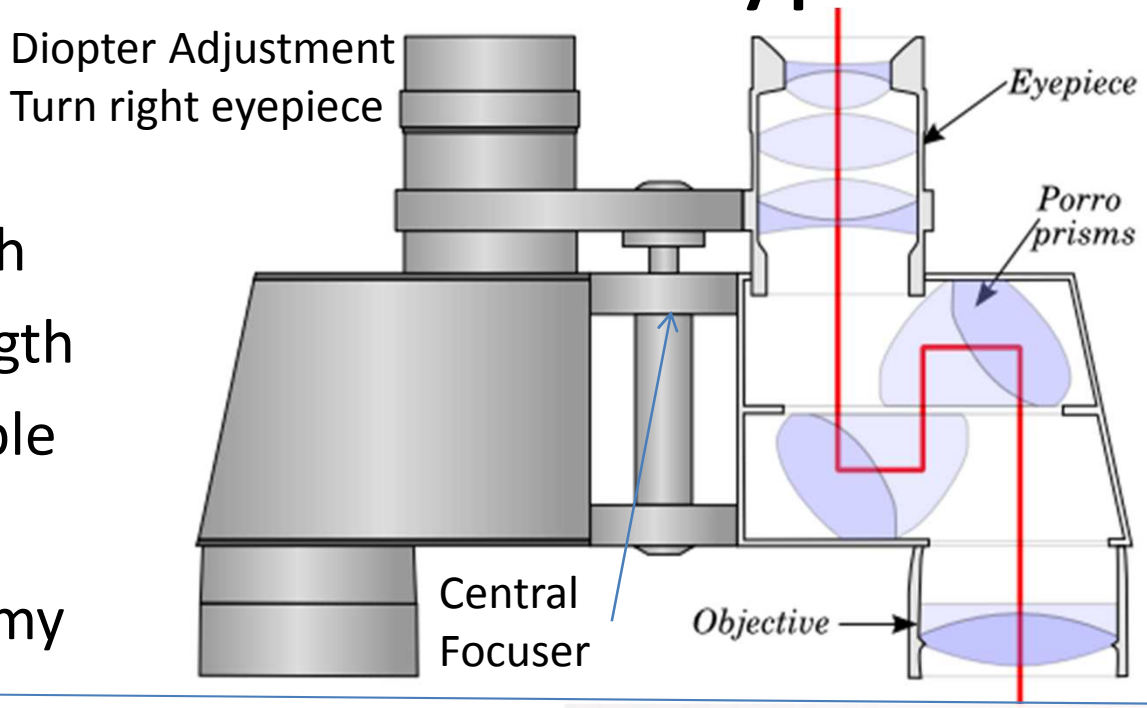
- Quality more expensive binoculars may give
  - Slightly sharper views (significant for Astronomy!)
  - Better contrast
  - Better detail, especially in nebulas/clouds
  - Less light loss - gather more light for the size
  - Truer colour - Less chromatic aberration, colour cast
  - Hold focus and collimation. No cheap flex
  - Less sample variation. Better quality control
  - Don’t fog up internally (Nitrogen filled, waterproof)
    - Internal focusing mechanism
    - Some have individual focusing, not central
  - Sturdier. May last longer (depends on owner!)
  - Some image stabilized. MUCH more expensive

Specifications - Overview

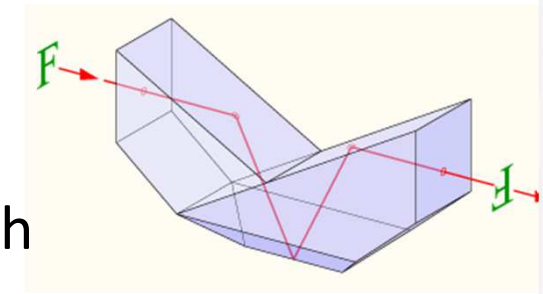
- Prism type
- Magnification
- Coatings
- Field/Angle of view (true vs apparent)
- Exit pupil
- Glass type (BAK-4 vs BK-7)
- Eye relief
- Other features (rubber eyecups, tripod socket)

Specifications – Prism Type

- Porro prism
  - Less compact width
  - More compact length
  - Larger sizes available
  - Cheaper
  - Better for Astronomy



- Roof prism
  - Not as bright
  - More compact width
  - Less compact length
  - Cost more for larger sizes than porro



*Images from Wikipedia

Specifications – Magnification

- Appropriate magnification and objective size
  - Given as Magnification (times) X Objective Size (mm)
  - E.g. 7x50 means 7 times magnification, 50mm lenses
- For Astronomy
  - Magnification between 7 and 10
    - <7 too wide. >10 can't hand hold steadily
  - More magnification, harder to hold steady
  - 50mm – 70mm for hand held. 50mm is the most common
    - <50 gathers too little light. >70 too heavy, needs tripod
  - 7x50 vs. 10x50 hotly debated

Specifications - Coating

- Coating

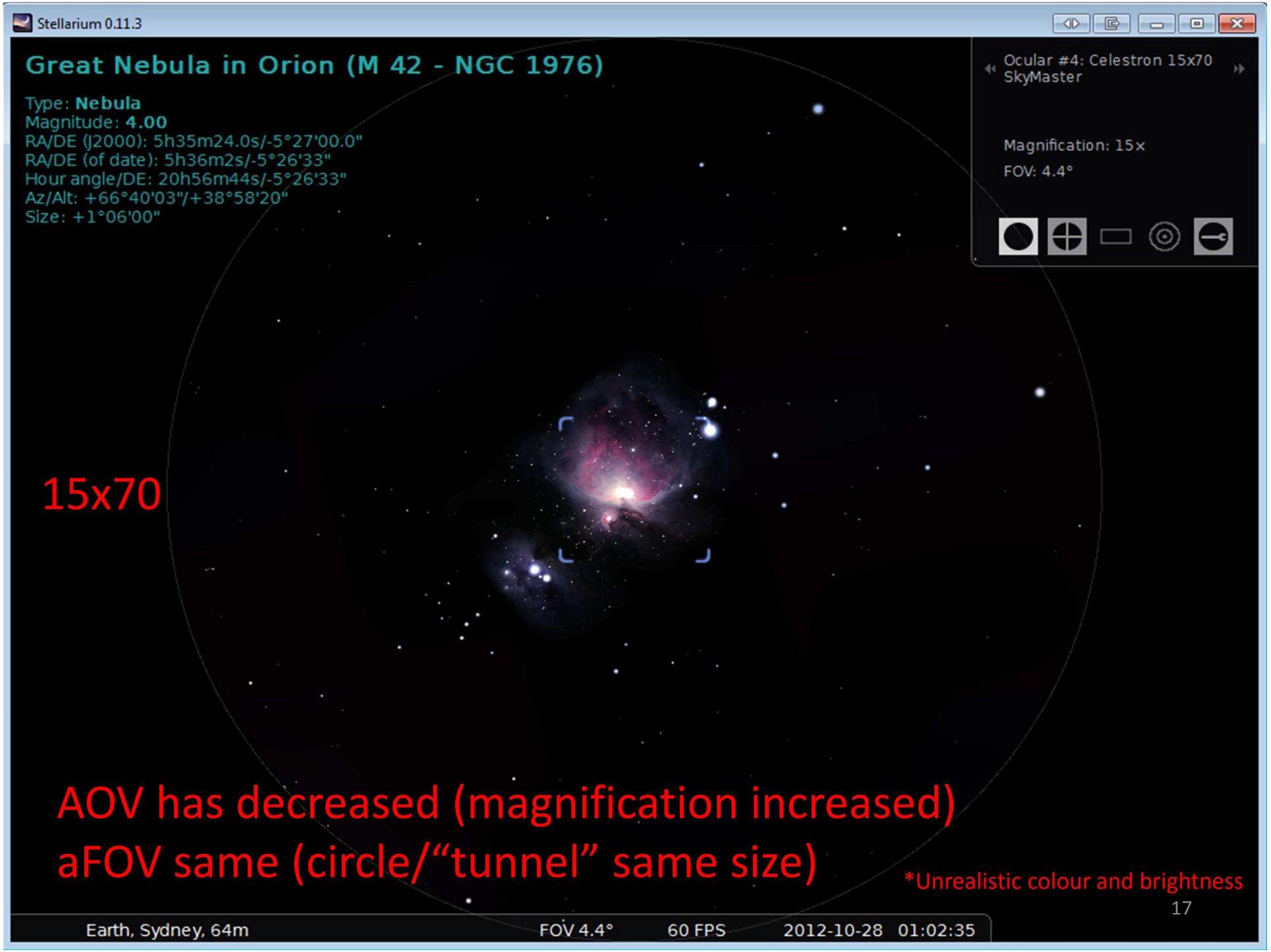
  Without coating, Internal reflections cause light loss , ghosting, other problems

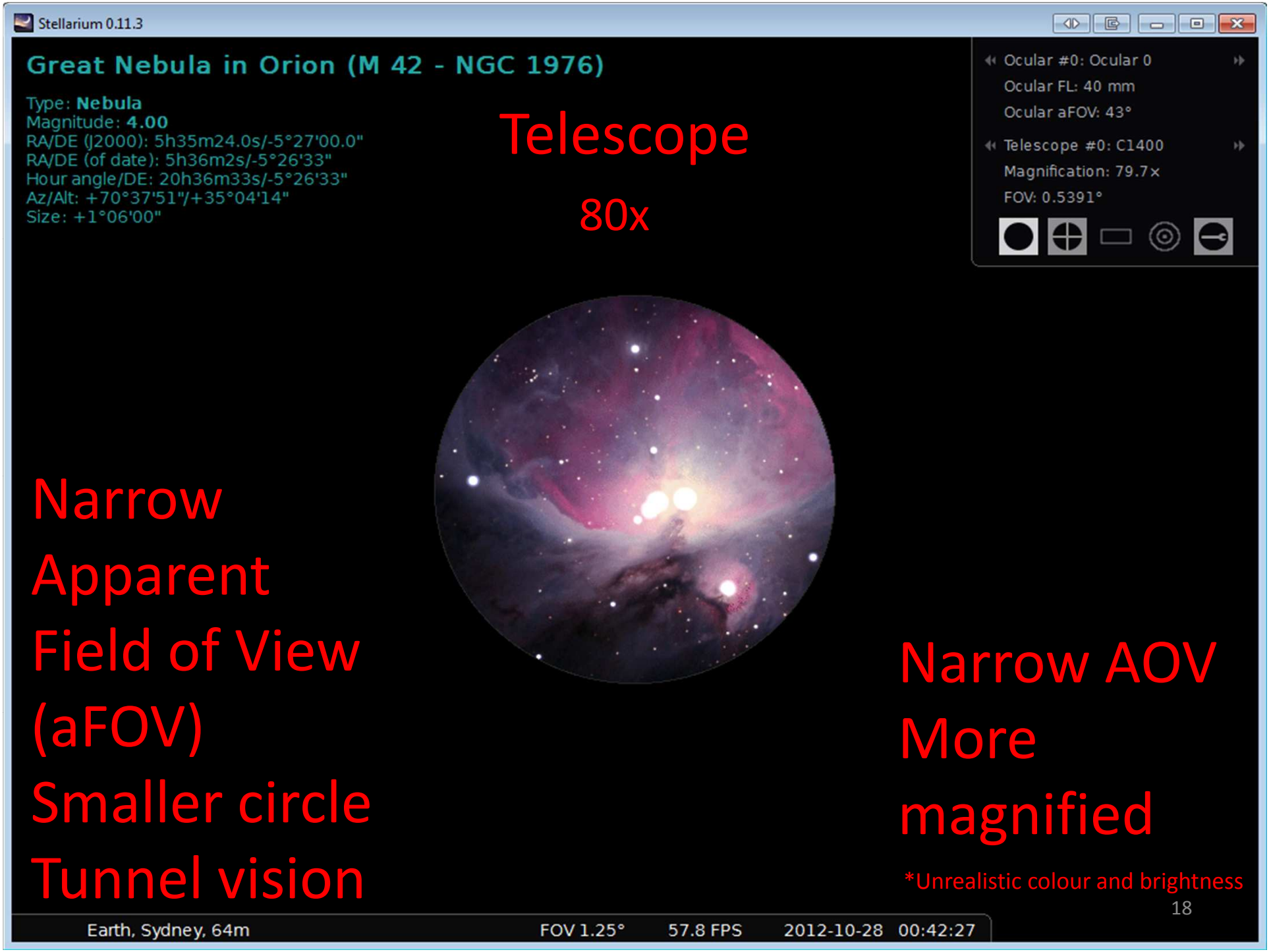
  - OK: Coated - Some surfaces not coated so reflect light – losses up to about 10% more light
  - Better: Multi-coated (MC) - Multiple coatings to reduce light reflection
  - Better: Fully-coated (FC) - Every surface coated
  - Best: Fully Multi Coated (FMC) - Every surface multiple coatings
- Coatings can be of varying quality
  - Some binoculars marked FMC worse than ones marked as Coated
  - Try to avoid horrible coloured “ruby” and orange coatings
    - Used to mask bad optics that bend different colours by different amounts
    - Cause false colour
    - Can cut out certain colours. You’ll lose nebulousity in some objects
    - Lighter coatings that are blue or indigo are preferred
    - But in my limited experience they can do their job of increasing contrast (e.g. Digitor 10x50)

Specifications – Field/Angle Of View

- Angle of view – AOV (confusingly aka True Field of View - TFOV)
  - How much of the sky you can see
  - Usually shown as so many m@1000m or yards@1000ft but also can be expressed as an angle
  - Related to magnification, depends also on configuration of optics
- Apparent field of view - AFOV
  - How wide it looks to your eyes. Tunnel vision vs. fills your view
  - **True Field = Apparent Field ÷ Magnification**
  - “Wide Angle” binoculars usually have an apparent field of view of 60 degrees or more. Fill your view
  - Trade off against long eye relief. (Further from “light tunnel”)


Stellarium 0.11.3
Great Nebula in Orion (M 42 - NGC 1976)
Type: Nebula
Magnitude: 4.00
RA/DE (J2000): 5h35m24.0s/-5°27'00.0"
RA/DE (of date): 5h36m2s/-5°26'33"
Hour angle/DE: 21h04m55s/-5°26'33"
Az/Alt: +64°56'55"/+40°31'17"
Size: +1°06'00"
Ocular #6: 7x50Binocs
Magnification: 7x
FOV: 8°
7x50
*Unrealistic colour and brightness
Earth, Sydney, 64m
FOV 8°
20.9 FPS
2012-10-28 01:10:44


Stellarium 0.11.3
Great Nebula in Orion (M 42 - NGC 1976)
Type: Nebula
Magnitude: 4.00
RA/DE (J2000): 5h35m24.0s/-5°27'00.0"
RA/DE (of date): 5h36m2s/-5°26'33"
Hour angle/DE: 20h56m44s/-5°26'33"
Az/Alt: +66°40'03"/+38°58'20"
Size: +1°06'00"
Ocular #4: Celestron 15x70 SkyMaster
Magnification: 15x
FOV: 4.4°
15x70
AOV has decreased (magnification increased)
aFOV same (circle/"tunnel" same size)
*Unrealistic colour and brightness
Earth, Sydney, 64m
FOV 4.4°
60 FPS
2012-10-28 01:02:35


Stellarium 0.11.3
Great Nebula in Orion (M 42 - NGC 1976)
Type: Nebula
Magnitude: 4.00
RA/DE (J2000): 5h35m24.0s/-5°27'00.0"
RA/DE (of date): 5h36m2s/-5°26'33"
Hour angle/DE: 20h36m33s/-5°26'33"
Az/Alt: +70°37'51"/+35°04'14"
Size: +1°06'00"
Telescope
80x
Ocular #0: Ocular 0
Ocular FL: 40 mm
Ocular aFOV: 43°
Telescope #0: C1400
Magnification: 79.7×
FOV: 0.5391°
Narrow
Apparent
Field of View
(aFOV)
Smaller circle
Tunnel vision
Narrow AOV
More
magnified
*Unrealistic colour and brightness
Earth, Sydney, 64m
FOV 1.25°
57.8 FPS
2012-10-28 00:42:27

Stellarium 0.11.3

Great Nebula in Orion (M 42 - NGC 1976)

Type: **Nebula**
Magnitude: **4.00**
RA/DE (J2000): 5h35m24.0s/-5°27'00.0"
RA/DE (of date): 5h36m2s/-5°26'33"
Hour angle/DE: 20h33m55s/-5°26'33"
Az/Alt: +71°07'19"/+34°33'16"
Size: +1°06'00"

Ocular #0: Ocular 0
Ocular FL: 40 mm
Ocular aFOV: 43°

Telescope #0: C1400
Magnification: 79.7×
FOV: 0.5391°

Telescope

80x

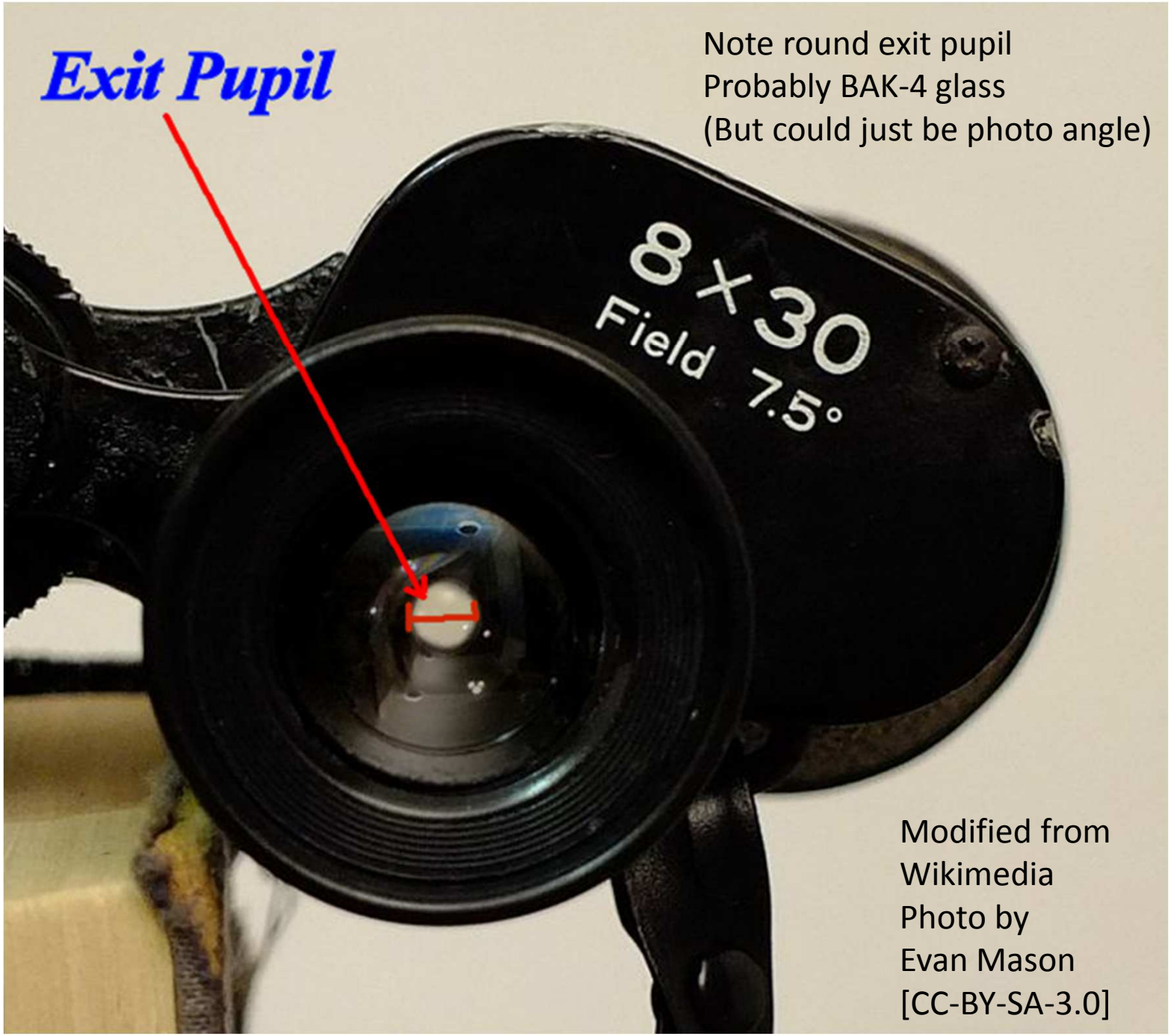
Last slides bright to show field of view but colours weren't very realistic

Earth, Sydney, 64m FOV 1.25° 59.7 FPS 2012-10-28 00:39:50


Stellarium 0.11.3
Great Nebula in Orion (M 42 - NGC 1976)
Type: Nebula
Magnitude: 4.00
RA/DE (J2000): 5h35m24.0s/-5°27'00.0"
RA/DE (of date): 5h36m2s/-5°26'33"
Hour angle/DE: 20h54m20s/-5°26'33"
Az/Alt: +67°09'34"/+38°30'47"
Size: +1°06'00"
Ocular #4: Celestron 15x70 SkyMaster
Magnification: 15x
FOV: 4.4°
15x70
More realistic view
Earth, Sydney, 64m
FOV 4.4°
59.6 FPS
2012-10-28 01:00:11

Specifications - Exit Pupil

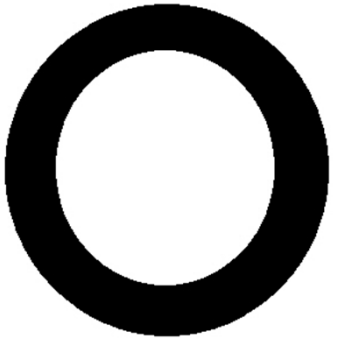
- Exit pupil
  - How big the circle of light that hits your eye is. Usually in millimeters
  - Larger magnification means smaller exit pupil
  - On goal is to match the opening of your eye's dark adapted pupil to maximize light. Some say
    - » Younger viewers -> Pupils dilate more -> 7x ideal
    - » Older viewers -> Pupils dilate less -> 10x ideal
    - » Matching exit pupil with greater magnification of 10x gives illusion of improved contrast
      http://www.garyseronik.com/?q=node/13
    - » …but there are other considerations



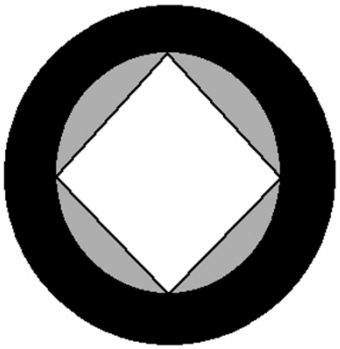
Note round exit pupil
Probably BAK-4 glass
(But could just be photo angle)

Modified from
Wikimedia
Photo by
Evan Mason
[CC-BY-SA-3.0]

Specifications – Glass Type



BAK4



BK-7

- Glass type
  - BAK-4 (barium crown)
    - More expensive (Never seen cheap BAK-4)
    - Round exit pupil
    - Less light loss
    - But more colour fringing
    - Higher refractive index (bends light more)
  - BK-7 (borosilicate flint)
    - Diamond exit pupil
    - More light loss at edges
    - All cheap binocs I've seen use BK-7 glass
- BAK4 designation can be ambiguous

http://stargazerslounge.com/topic/135299-when-bak4-is-not-bak4-glass-types-for-binocular-prisms/

"The Chinese designation "BaK4" is an entirely different glass to the Schott BaK4 -- BaK stands for ***Ba****ritleich****k****ron (Barium Crown)*; the Chinese BaK4 is actually Schott PSK3, which is not a Barium Crown at all: it is a phosphate crown. PSK3 is much cheaper to make than BaK4; it also has a lower refractive index."

Specifications – Glass Type – BK-7

- Surprisingly difficult to photograph. Right light required behind binocs. They need a clean, but not as filthy as they look here in bright sunlight
- Avoid damage. Never get carried away over-cleaning optics. If you have a have specialized need make sure you have the right tools

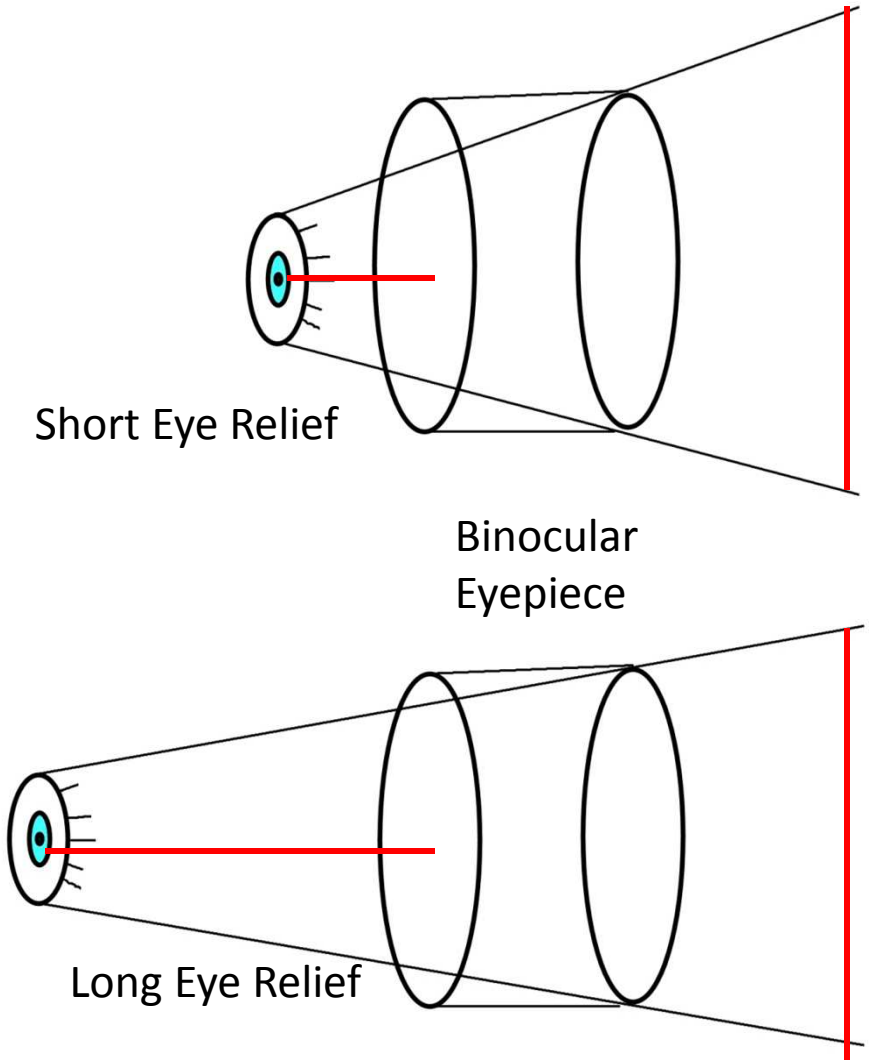
Specifications – Glass Type – BK-7

Specifications - Eye Relief

Eye relief

- How far from your eye you can hold binoculars and see the whole image
- The longer the eye relief, the less the apparent field of view
  - You can either have wide angle or long eye relief, not both
  - The further your eye is, the less the eyepiece fills your eye
- Viewing beyond eye relief distance also gives tunnel vision. You miss out on the edges
- No choice if you view with glasses. You need long eye relief. 16mm and up recommended. Harder but not impossible to find in cheap binoculars

Specifications - Eye Relief vs FOV



This diagram over-simplifies things a bit to make the point Note that we're ignoring all the optics in front of the eyepiece because nothing they do is going to make the eyepiece look bigger when you move your eye further back

Wider better views if your eyesight Is Correctable enough just by adjusthing focus without wearing eyeglasses

Where Not To Compromise

- NO Zoom binoculars (e.g. 7-21x50)
  - Not as bright
  - Zoom mechanism linking both sides means one eyepiece may zoom more than the other. Linkage breaks easily. Cost more
  - Never seen a good review of these for Astronomy
- “Auto focus”, “No focus” and “Focus free”
  - Not suitable for Astronomy
  - Permanently focused on the hyper-focal distance
  - Everything else has “acceptable sharpness”. Most things a little fuzzy. “Focus free” is an ironically accurate description
- DO NOT buy high powered binocs to use hand held!
  - Anything over 10x is difficult. Over 12x will be frustrating
  - You won’t see more detail, due to hand shake

    Cloudynights review. “Binocular Resolution Handheld versus Mounted“
    http://www.cloudynights.com/item.php?item_id=1410
    “a 10x50 or a 12x50 binocular for handheld use will show you everything or nearly everything that you would be able to see with a higher powered binocular”

Specifications Not Always True

- I will show cheap binoculars
  - With mismarked magnification and field of view
  - $40 binoculars marked as FMC
- Often specifications not given on cheaper binoculars
- Beware of fake branding
- Manufacturers sometimes change specifications without changing the model number
  - Harder to use Internet reviews to compare
  - Not much you can do about it
- Use them as a guide only
- You will have to make some compromises

Testing At The Shop - Build

- Test the copy you are actually buying. Much variation between copies especially for cheaper binoculars
- No loose parts (inside and out) – lenses, focus controls
- No internal dust, chips, paint flecks, smudges, oil/fluid
- Hold focus - Push against eyepiece gently then a little more firmly. Does focus change? You don't want to refocus constantly
- Collimated (both sides aligned) and hold collimation. No double images! Double images cause eyestrain and headaches
  - Throw one eyepiece out of focus to make double image obvious . Your brain has more trouble merging misaligned images if one is out of focus
  - No significant flex or play, otherwise they won't hold collimation. Gentle pressure only!!! Don't break them
  - Round exit pupils. No cats eyes. (Diamond OK for BK-7)

Testing At the Shop - Collimation

Correctly Collimated
No effort forming one image

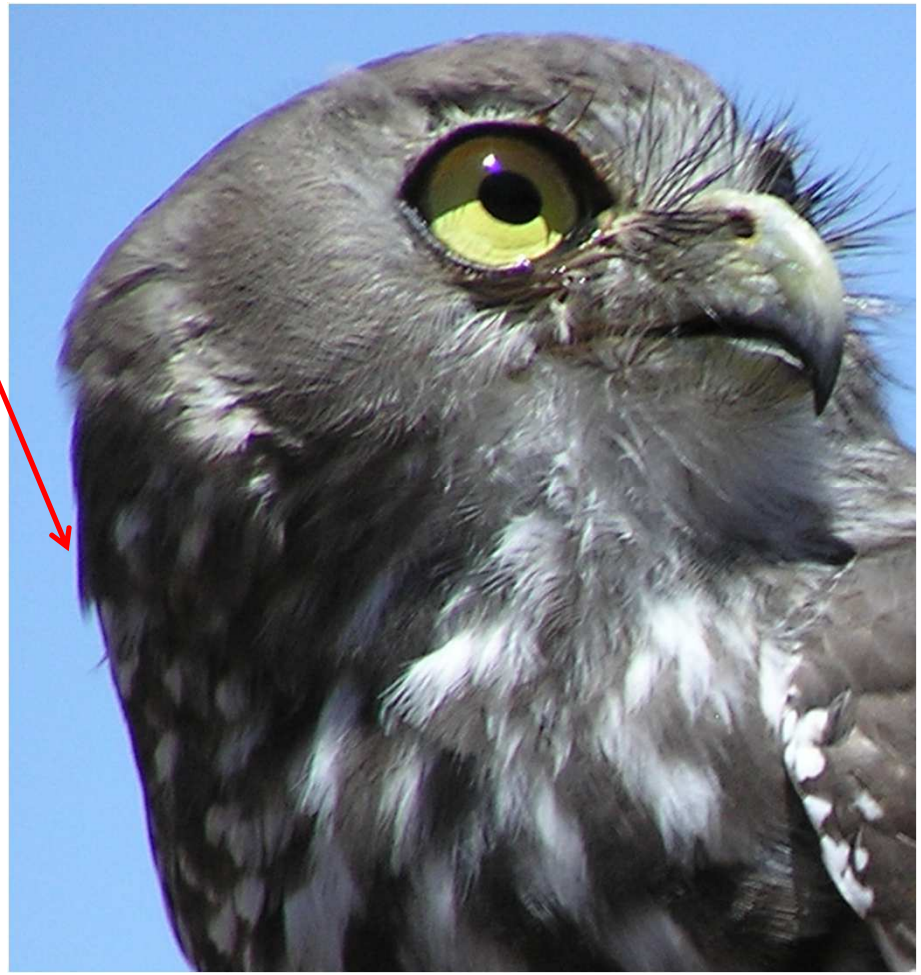
Uncollimated
Double Image

Testing At The Shop - Clarity

- Bright, clear and sharp on both sides with no defects
  - Learn to focus both lenses correctly
    - Central focuser with right eye closed
    - Then diopter (right side eyepiece) with left eye closed
  - Text makes a good target to test sharpness
  - Test sharpness at the edges as well as the center
- Correct colour
  - Minimal or no chromatic aberration (CA)/colour halos
    - Easier to see with high contrast e.g. dark object on light background
    - In a shop look for signs, telegraph poles and street lights, brightly lit or brightly backlit
    - CA halos can be purple, red, green or blue. Due to filters used to cover up bad prisms and lenses that split colours
  - No colour tinge. Objects in real colours. Also due to filters
- Apparent field of view and eye relief
  - Do the binoculars fill your field of view?

Colour Casts and Fringing

Purple halo. Chromatic aberration (CA) aka colour fringing. Notice that it's only happening on the side of the bird that is in shadow. i.e. where there is a high contrast (difference in brightness) between sky and subject. No surprise that it happens when viewing bright stars against a dark sky



Colour casts can vary in how obvious they are depending on light and what you are looking at. Look for pure white object to judge. Look with at it without binoculars then with. Does the colour change?

Testing At The Shop - Comfort

- Comfortable to hold. Fit well in your hands
- Neck strap length and comfort
- Weight
- Balance naturally and not too front heavy
- Eye relief. Test with glasses on if you wear glasses!
  - Do they have folding eye cups for eyeglass wearers?
  - Consider whole family if you view with them
- Test with and without glasses if you are just near or far sighted. Can you get away without using glasses?
- Interpupillary distance range. Distance between your eyes
  - Adjustable by bending tubes of binoculars closer or further apart
  - Must be able to form 1 circle when looking through your binocs

Testing At The Shop - Features

- Central focusing
  - 1 main focuser, plus a diopter adjustment
  - Once you set your diopter adjustment you won't need to readjust for different distance. Just adjust main focuser
- Tripod adapter socket
    - Plastic tripod adapters cost $4 on Ebay
    - Mount binoculars to camera tripod (or parallelogram mount)
    - Accept large camera tripod $30-$50
    - Detail won't be lost due to hand shake
    - Lets you use larger magnification binoculars (>10x)
    - At this price point most have horrible lens covers/caps that won't stay on. (Acceptable compromise. Do your best not to lose them)

Can’t Test At The Shop

- How bright they are for Astronomy?
  - But compare with others for daytime brightness
- How much detail and nebulosity you will see
  - Depends largely on coatings which act as filter
- How moisture will affect them (fogging)
- Internet reviews can be very useful
  - (if manufacturer doesn’t change specs)

Part 2 – My Cheap Binoculars

List Of Binoculars

10x 50

1. Tasco Zip 10x50 Model 2023 (older version, no tripod mount). Selling for $70-$110 in Australia or about $35 in the US. I got an old unused pair cheap on Ebay
2. Andrews Communications 10x50 WA - which look very similar to Saxon 10x50 BFWA marked as FC. $49 current price. Marked as 122m@1000m
3. Dick Smith Digitor 10x50, marked as FMC. $40 current price. Marked as 122m@1000m
4. Binoculars marked and boxed as Bushnell 20x50 Powerview but which have a field of view I'd expect from 10x50. Marked as 69m@1000m but they fit the Southern Cross in so this is just plain incorrect. $30

7x50

5. "Winner" branded 7x50 bought in about year 2000 for more money than they were worth from a Disposal store. $TOOMUCH. My first pair bought ~yr2000
6. Unbranded 7x50 bought at Homeart around 2005 or 2006 marked as Coated. $25 at the time

Other (Not Suited To Astronomy)

Tasco 12x30, Bushmaster 8x21, Bresser 6x21 (kids binocs)

Differences Summary

- Tried to compare side by side on the same night. But seeing varies moment to moment
- Even at this price point there are differences in quality
- Some have more precise focus. Tasco 10x50 and Digitor 10x50 very sharp compared to Bushnell 20x50
- Some harder to focus than others. Andrews 10x50s difficult. Digitor 10x50 Easy. Tasco zip focus hard (touchy)
- Some hold focus better than others. Tasco 10x50 needs only gentle nudge on eyepieces and it's out of focus
- Angle of view different. Digitor 10x50 don't quite fit Southern Cross in field. Tasco, Andrews and Bushnell do
- Apparent field of view. Tasco, Andrews, Bushnell have wider AFOV than Digitor

Differences Summary (Continued)

- Nebulosity looks different in each
  - Digitor 10x50 shows little nebulosity on Eta Carinae at home - but better in darker skies (presumably due to ruby coating)
  - Tasco, and Andrews show Eta Carinae much better
  - Surprisingly Digitor 10x50s show Omega Centauri slightly better than Tasco and Andrews
  - The Digitor ruby coating is very much a filter
- Protective eye cups fall off Bushnell and Digitor easily. Andrews 10x50 are tethered and can't fall off
- No tripod adapter socket on Tasco 10x50. All the rest have one
- Build quality varies. None are very sturdy but Andrews 10x50 and Tasco 10x50 are more solid that Digitor 10x50 and Bushnell

Part 3 – Interesting Binocular Objects

Interesting Binocular Objects

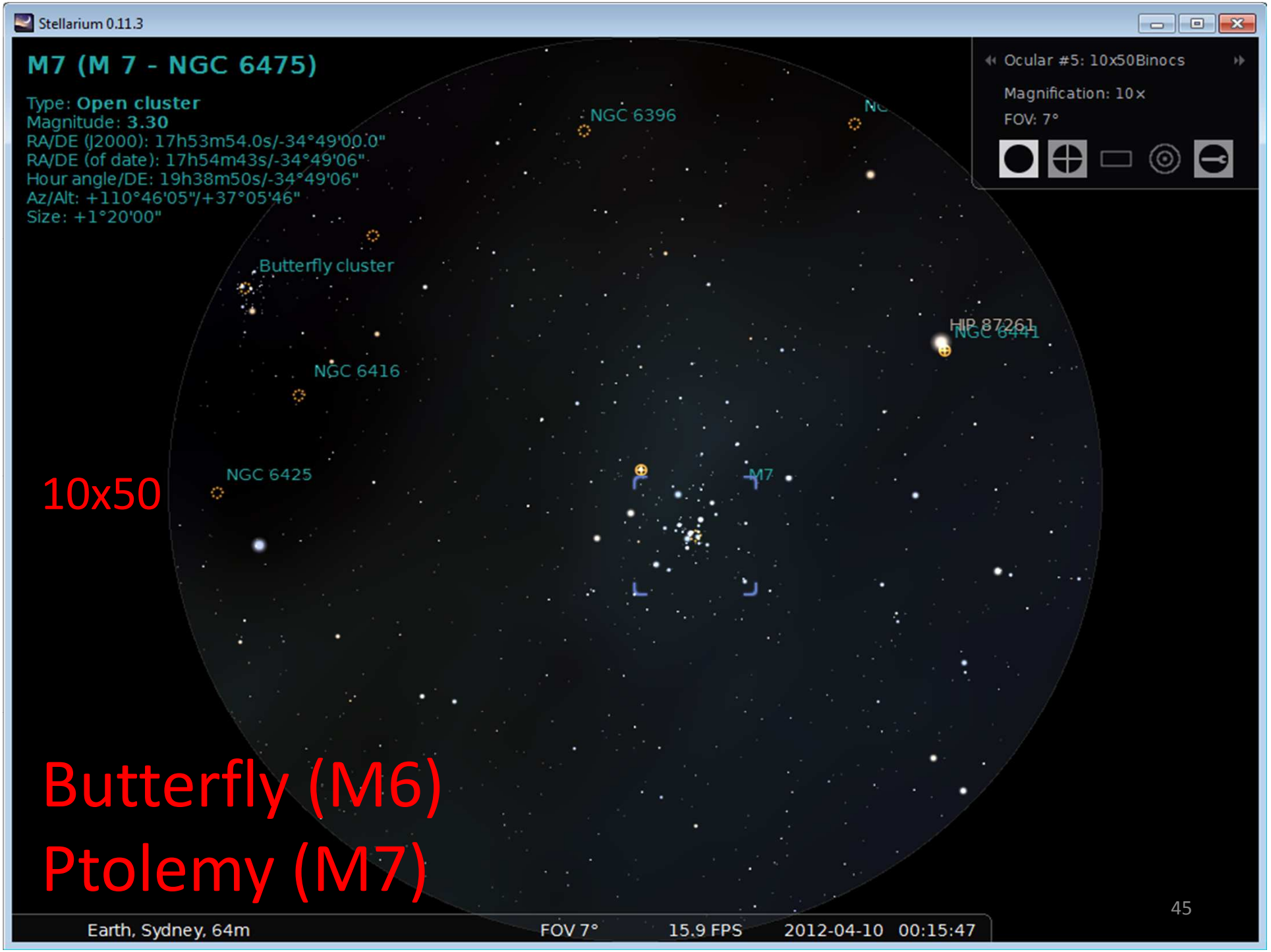
- Solar System – Moon, Planets, Comets, Satellites
- Messier Objects
  - M6 (Butterfly Cluster)
  - M7 (Ptolemy's Cluster)
  - M42 (The Great Orion Nebula)
  - M45 (The Pleiades)
- Crux and The Jewelbox
- Theta Carinae (Southern Pleiades)
- Eta Carinae
- Omega Centauri
- Magellanic Clouds

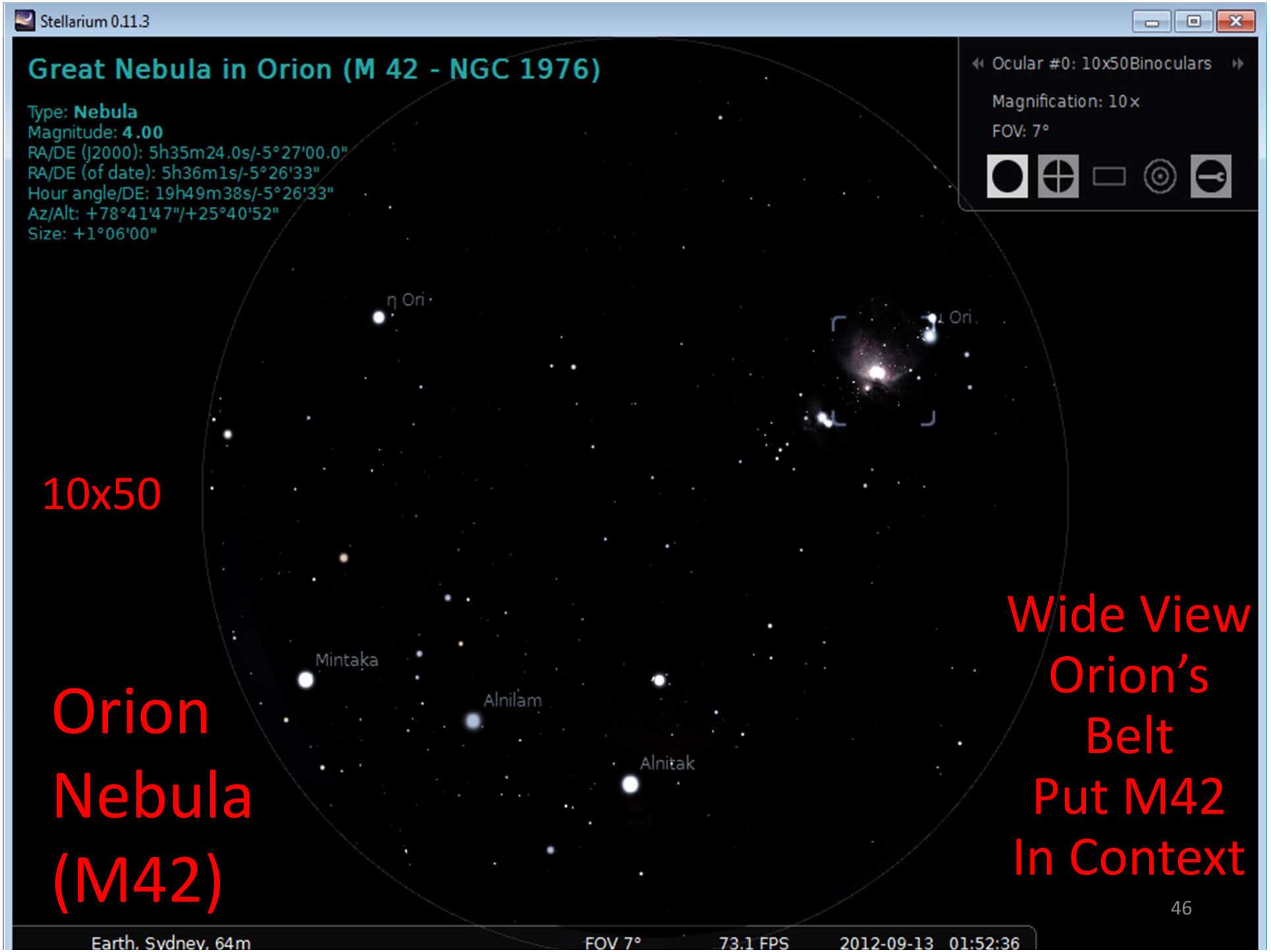
Binocular Objects - Solar System

- Moon is a larger target than the planets
- Comets
- Artificial satellites
- Planetary alignments
- Planet against a particular constellation
- Rest require too much magnification for binocs when viewing individual objects
  - Venus, Mars, Jupiter as coloured discs
  - Crescent shape for Venus - phases
  - Jupiter's Galilean Moons (need good eyesight)
- Save the planets for a small telescope. Much more satisfying
- If you really want to try with binoculars, use a mount

Stellarium With Binoculars

- Use Stellarium For Quick Planning
- Portable version can run off a USB stick
- For closer to realistic views
  - Set up date, time and location correctly
  - Set absolute scale to match limiting magnitude you expect
  - Set up ‘Oculars’ plugin for your binoculars/telescopes
  - Install the add-on catalogs for more stars
- Use night mode if you take a laptop out
- My bad habit – Duck in and out of house. Terrible for dark adaptation, but laptop not exposed to dew. Use night mode
- Simulation is not perfect. Uses deep sky images nothing like what you can expect to see. I have edited some of the following pictures to be more realistic by reducing brightness and colour in the nebulae
  - Sketches can be better, but I don’t sketch well

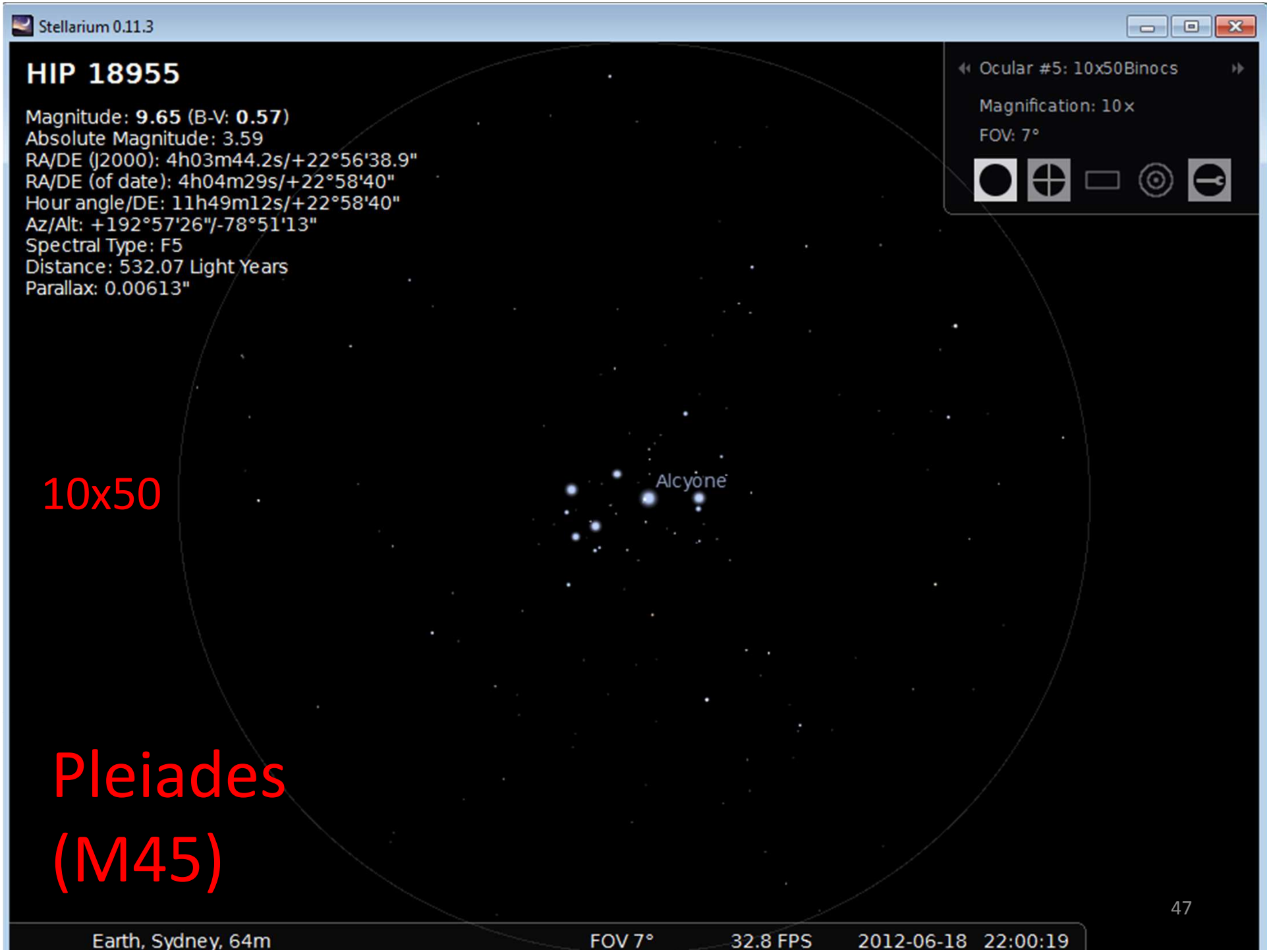

Stellarium 0.11.3
M7 (M 7 - NGC 6475)
Type: Open cluster
Magnitude: 3.30
RA/DE (J2000): 17h53m54.0s/-34°49'00.0"
RA/DE (of date): 17h54m43s/-34°49'06"
Hour angle/DE: 19h38m50s/-34°49'06"
Az/Alt: +110°46'05"/+37°05'46"
Size: +1°20'00"
Ocular #5: 10x50Binocs
Magnification: 10x
FOV: 7°
NGC 6396
Butterfly cluster
HIP 87261
NGC 6441
NGC 6416
NGC 6425
M7
10x50
Butterfly (M6)
Ptolemy (M7)
Earth, Sydney, 64m
FOV 7°
15.9 FPS
2012-04-10 00:15:47



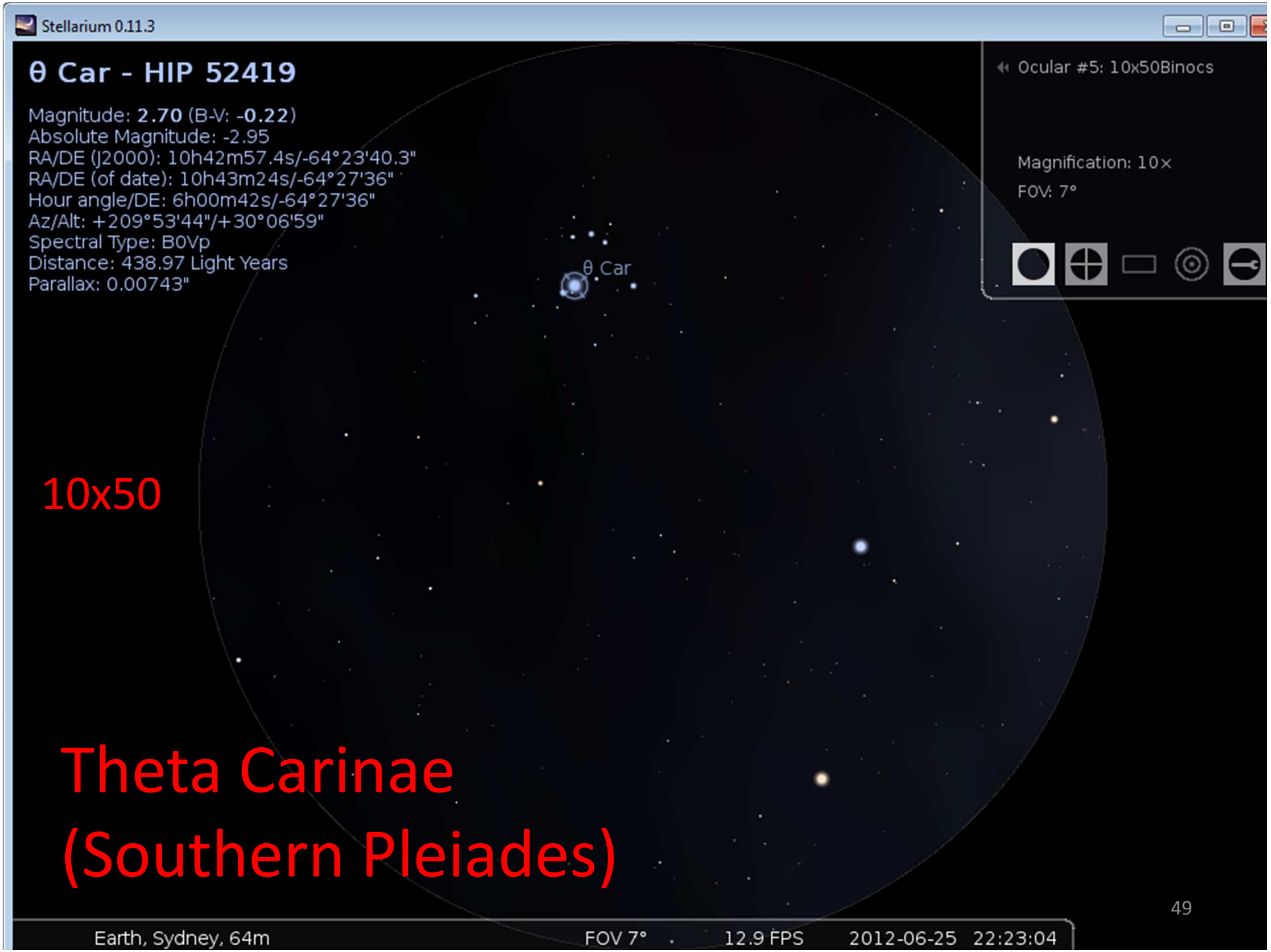
10x50

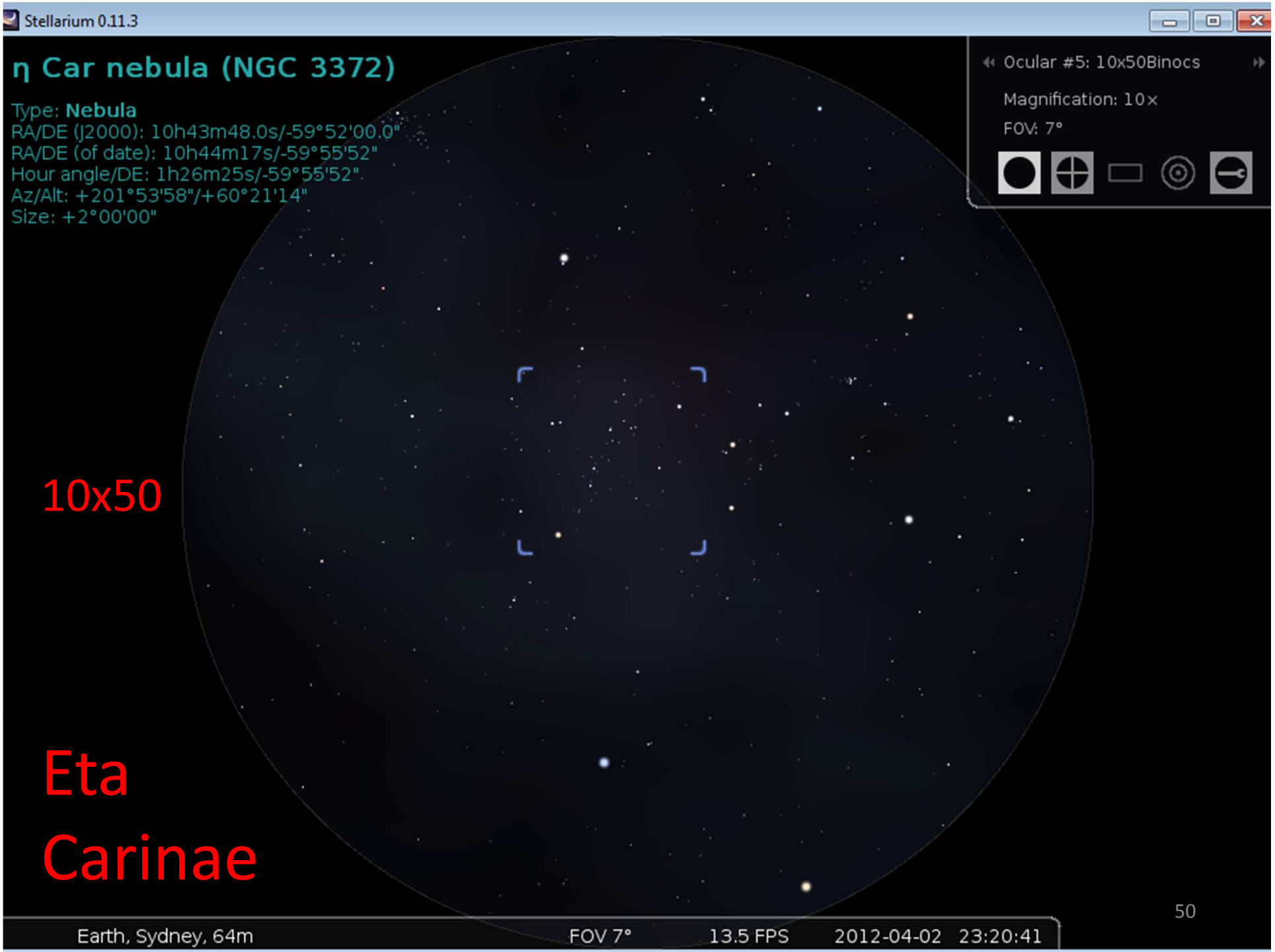
Orion Nebula (M42)

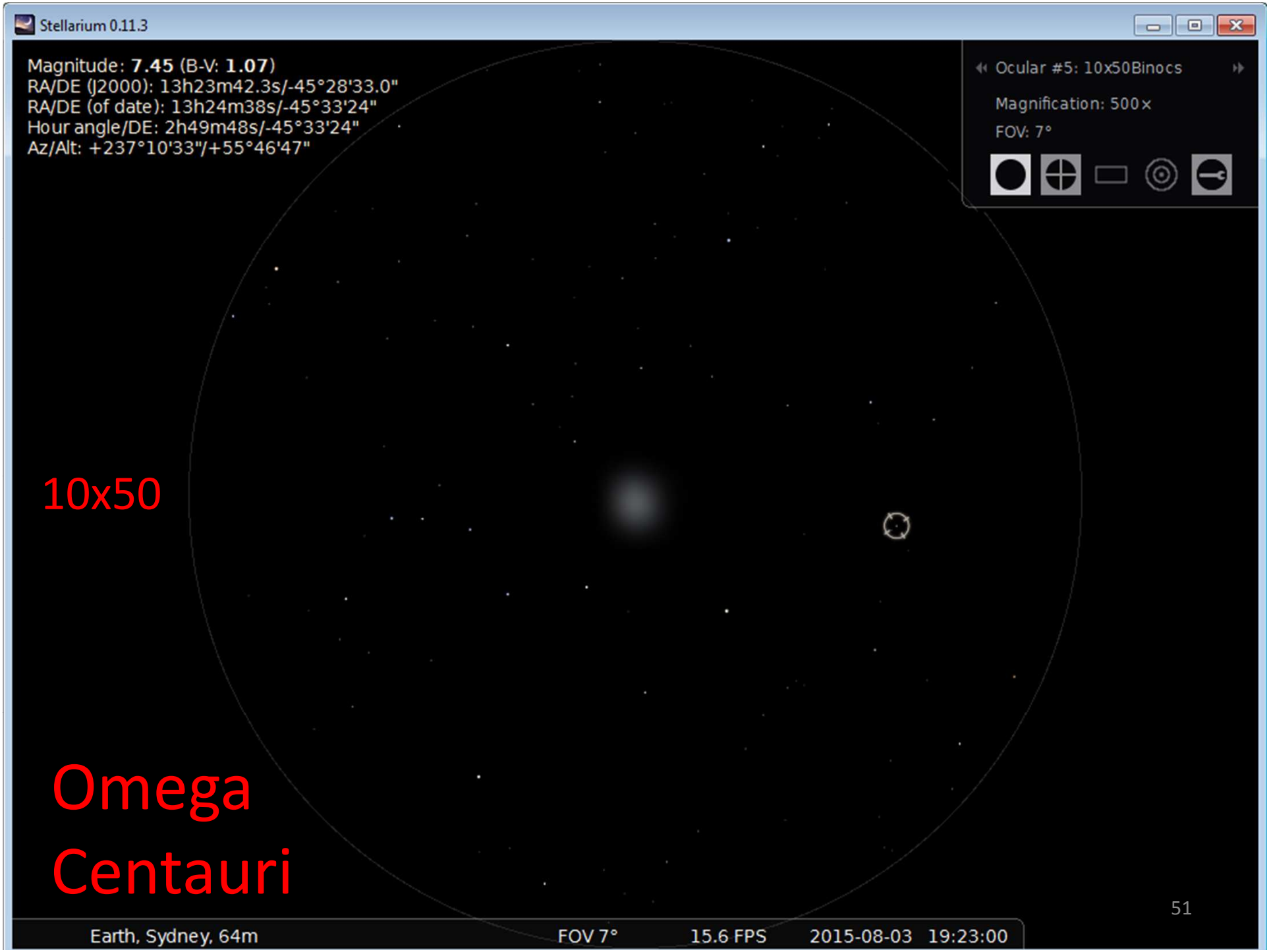
Wide View Orion's Belt Put M42 In Context

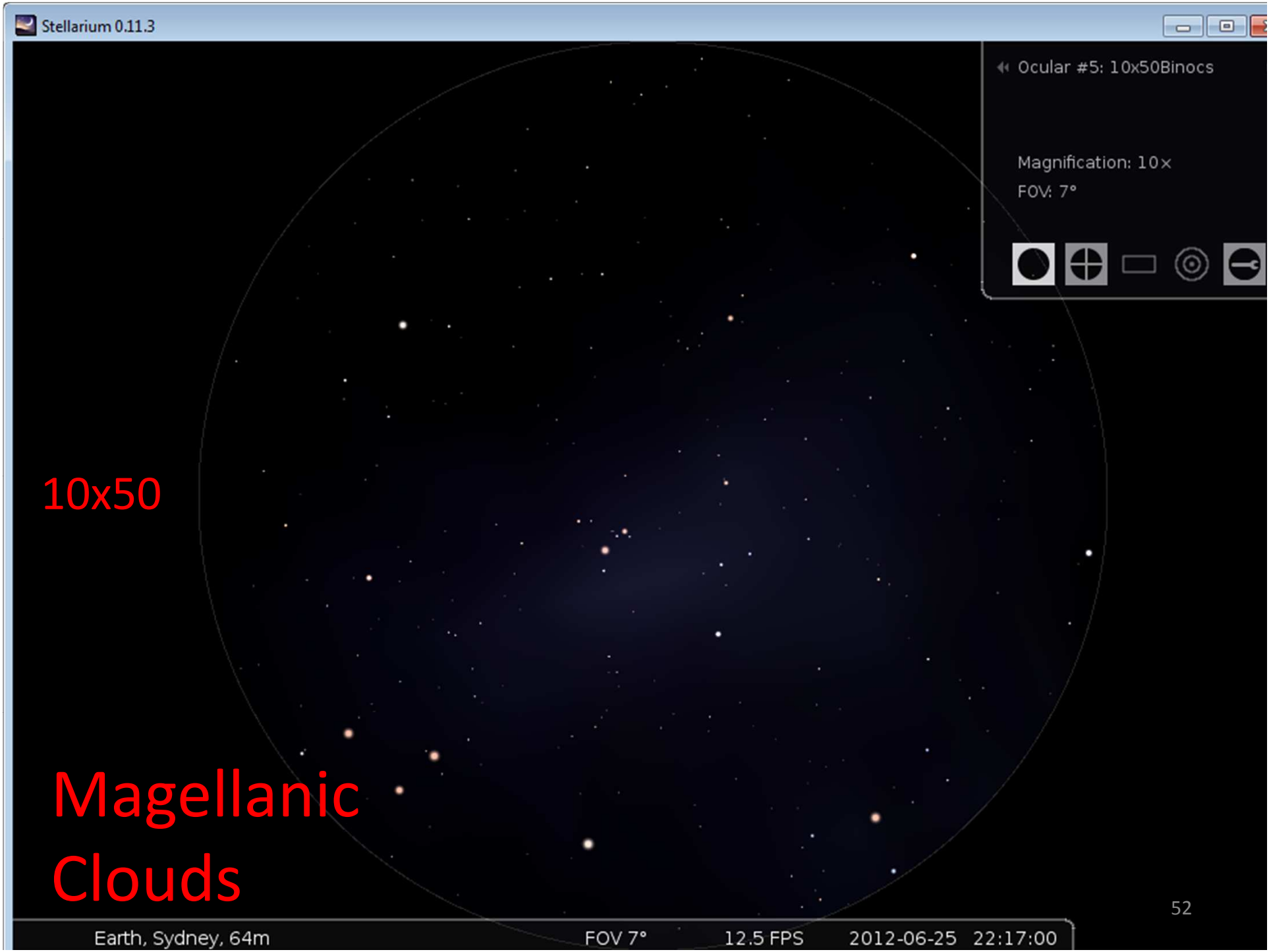

Stellarium 0.11.3
HIP 18955
Magnitude: 9.65 (B-V: 0.57)
Absolute Magnitude: 3.59
RA/DE (J2000): 4h03m44.2s/+22°56'38.9"
RA/DE (of date): 4h04m29s/+22°58'40"
Hour angle/DE: 11h49m12s/+22°58'40"
Az/Alt: +192°57'26"/-78°51'13"
Spectral Type: F5
Distance: 532.07 Light Years
Parallax: 0.00613"
Ocular #5: 10x50Binocs
Magnification: 10x
FOV: 7°
10x50
Alcyone
Pleiades
(M45)
Earth, Sydney, 64m
FOV 7°
32.8 FPS
2012-06-18 22:00:19


Stellarium 0.11.3
HIP 59455
Magnitude: 9.80 (B-V: 0.70)
Absolute Magnitude: 5.93
RA/DE (J2000): 12h11m42.3s/-60°27'37.6"
RA/DE (of date): 12h12m22s/-60°31'45"
Hour angle/DE: 1h04m16s/-60°31'45"
Az/Alt: +196°30'31"/+61°22'14"
Distance: 193.91 Light Years
Parallax: 0.01682"
Ocular #5: 10x50Binocs
Magnification: 10x
FOV: 7°
Gacrux
Mimosa
δ Cru
Acrux
10x50
Crux And
The Jewel Box
Earth, Sydney, 64m
FOV 7°
27.9 FPS
2012-05-14 21:41:18


Stellarium 0.11.3
θ Car - HIP 52419
Magnitude: 2.70 (B-V: -0.22)
Absolute Magnitude: -2.95
RA/DE (J2000): 10h42m57.4s/-64°23'40.3"
RA/DE (of date): 10h43m24s/-64°27'36"
Hour angle/DE: 6h00m42s/-64°27'36"
Az/Alt: +209°53'44"/+30°06'59"
Spectral Type: B0Vp
Distance: 438.97 Light Years
Parallax: 0.00743"
θ Car
Ocular #5: 10x50Binocs
Magnification: 10×
FOV: 7°
10x50
Theta Carinae
(Southern Pleiades)
Earth, Sydney, 64m
FOV 7°
12.9 FPS
2012-06-25 22:23:04


Stellarium 0.11.3
η Car nebula (NGC 3372)
Type: Nebula
RA/DE (J2000): 10h43m48.0s/-59°52'00.0"
RA/DE (of date): 10h44m17s/-59°55'52"
Hour angle/DE: 1h26m25s/-59°55'52"
Az/Alt: +201°53'58"/+60°21'14"
Size: +2°00'00"
Ocular #5: 10x50Binocs
Magnification: 10×
FOV: 7°
10x50
Eta
Carinae
Earth, Sydney, 64m
FOV 7°
13.5 FPS
2012-04-02 23:20:41


Stellarium 0.11.3
Magnitude: 7.45 (B-V: 1.07)
RA/DE (J2000): 13h23m42.3s/-45°28'33.0"
RA/DE (of date): 13h24m38s/-45°33'24"
Hour angle/DE: 2h49m48s/-45°33'24"
Az/Alt: +237°10'33"/+55°46'47"
Ocular #5: 10x50Binocs
Magnification: 500×
FOV: 7°
10x50
Omega Centauri
Earth, Sydney, 64m
FOV 7°
15.6 FPS
2015-08-03 19:23:00


Stellarium 0.11.3
Ocular #5: 10x50Binocs
Magnification: 10×
FOV: 7°
10x50
Magellanic Clouds
Earth, Sydney, 64m
FOV 7°
12.5 FPS
2012-06-25 22:17:00

Other Objects

- External Galaxies
  - NGC 5128 - Centaurus A
  - M87 - Virgo A
  - NGC253 - Sculptor Galaxy (Silver Coin/Dollar Galaxy)
  - M31 - Andromeda Galaxy
  - Less than a 100 years since understood these are outside our galaxy!
- We can always hope for a naked eye supernova in our lifetime ;-)

Sydney Observatory Sky Guides

- Free and very easy to follow
- Monthly podcast
- Transcript
- Star chart
- Take the podcast out on a music player with your binoculars
- If you can’t get out follow along with Stellarium. Day or night, while commuting

Tips For Enjoying Binoculars

- Understand what you see, to enjoy what you see. Google every object you look at
  - Don’t expect movie special effects, Astronomy magazine or Hubble vision
  - For jaw dropping views get away from light pollution
- “Sweep” the skies at different times of the year. You’ll be amazed what catches your eye
- Double the objects you can see at any time of year. Observe early morning as well as night
- A lot depends on seeing conditions. Take more than one look
- The computer is your friend. Use Stellarium, Cartes Du Ceil and other star chart and sky simulation software before you go out
- Enjoy and make the most of whatever instrument you have
- Keep the binoculars handy for quick 5 minute sessions
- The people you live with can be excellent observing companions

Thanks

Thank you

- For feedback from members at the Ice In Space Forums, friends and family
- For my wife and kids for their patience while I put this together
- And thank you all for listening!

If we have time I have a few slides about collimating binoculars and pictures showing where collimating screws are typically located

I've also included 20 bonus slides with lots of links to further information including websites and books as well as a more detailed comparison of the binoculars I own

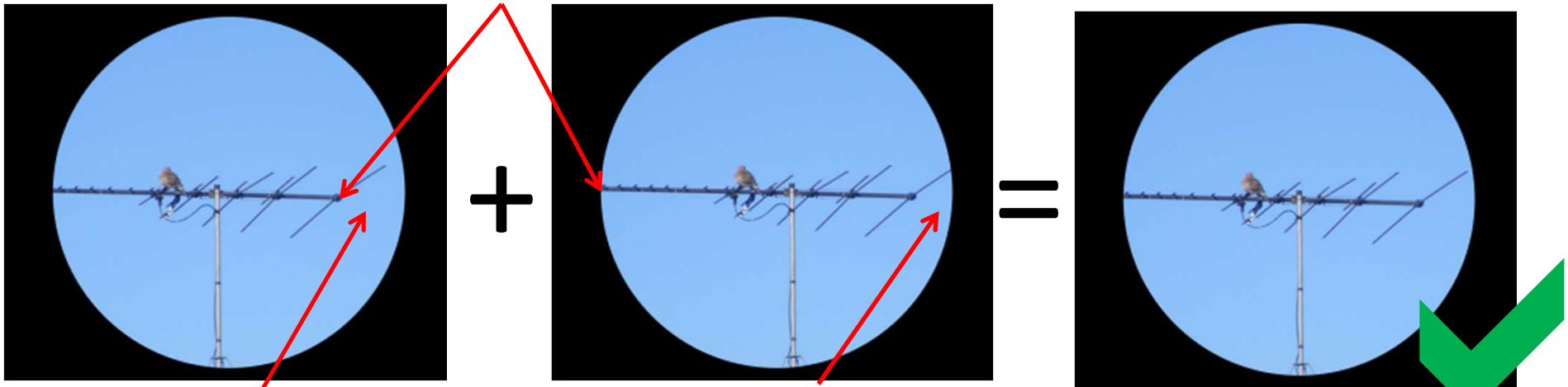
Bonus Section – Aligning Binoculars

How To Align (“Dirty Collimate”)

- Aligning both sides to look at the same thing. Not a true full collimation. You won’t be aligning lenses, just the prisms
- Unaligned binoculars worthless. Professional fix not economical for <$50 binocs. **At your own risk**. But try before discarding. Nothing to lose!
- I found it easiest to adjust them while actually observing bright star at night
- Alternately use a daytime target. Antenna or tower
  - Make sure you’re not going to upset neighbours!
  - Can be easier to put binocs on a tripod, but be careful they don’t fall or get scratched if screwdriver slips. Use both hands
- Other techniques including projecting the sun onto outline of eyepieces. Should line up. (But why expose your binocs to excessive heat?)
- Aim to have round exit pupils. Make note of what you change. If you end up with “cats eye” shaped exit pupils, undo changes and try aligning the other side. May need to change a little on each side

Close one eye then the alternate to the other…

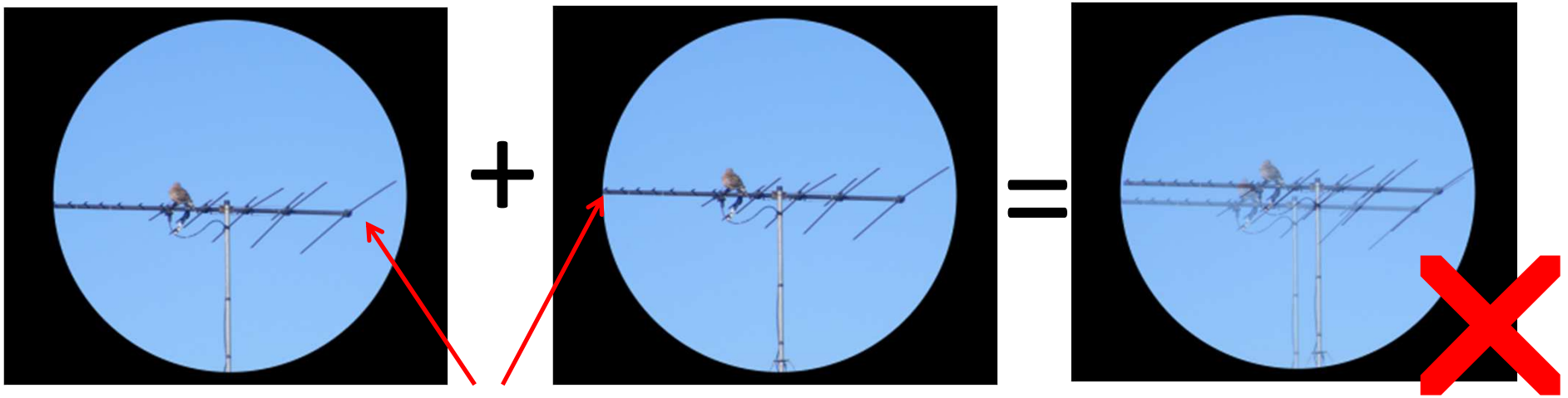
Vertical placement perfectly aligned (same height in eyepiece)



Left side horizontal slightly left is OK

Right size horizontal slightly right is OK

Well aligned image



Vertical placement not aligned (different height)

Unaligned Double Image

Left side too far right and/or right side too far left cause you to look at image cross eyed

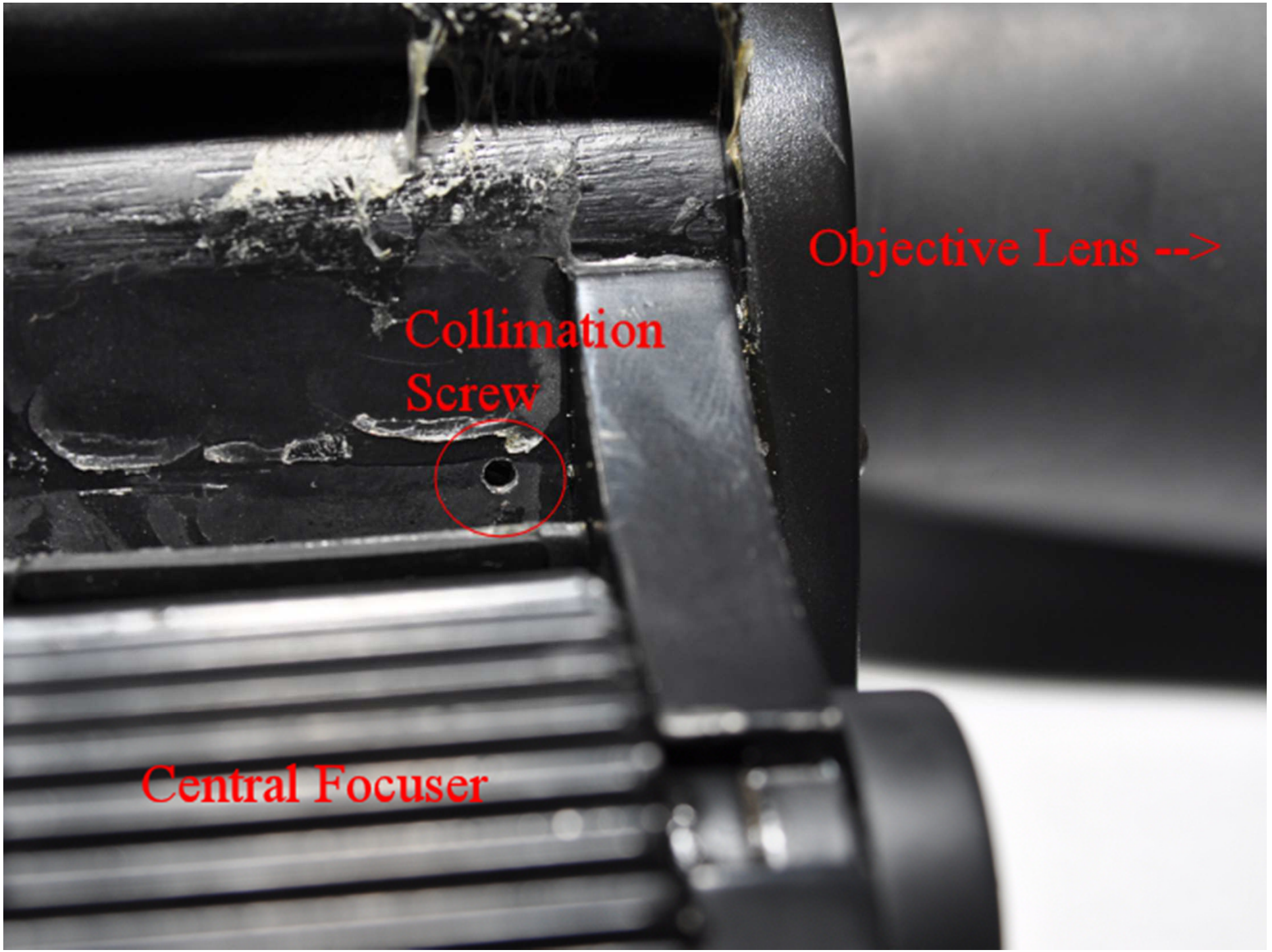
Prism Alignment Mechanics

- First make sure there is no flex, flop or play, or you're wasting your time
- Locate collimation screws. The hardest part. May need to remove glue
- Peel back rubber covering to reveal the screws
- Need very small precision or jeweler's screwdriver
  - On both pairs I've aligned the smallest flathead was what I needed
- Make very small adjustments, especially if you aren't actually viewing while you turn the screw
- On each side, one screw will move the image perpendicular to the other
- Once you're happy with them re-glue. Don't use too much since you may need to align again later


Collimation
Screws


Collimation
Screw


Collimation
Screw


Objective Lens -->
Collimation
Screw
Central Focuser

References and Further Reading

More Information – Binoculars

- Cloudy Nights Binocular Reports
  http://www.cloudynights.com/category.php?category_id=90&pr=1
  Home / CN Reports / Binocular Reports
- Binoculars - A Basic Guide for Astronomy
  – by Dennis Simmons. Excellent diagram of parts of a pair of binoculars. Great alternative explanations if you didn't understand anything here or just want a different (opposite) opinion. He recommends expensive binocs
  http://www.iceinspace.com.au/index.php?id=63,374,0,0,1,0
- Nikon Sports Optics Binocular Guide
  http://www.nikon.com/products/sportoptics/how_to/guide/binoculars/index.htm
- Binocular Terms
  http://www.binoware.com/glossary.php
- Best Binocular Reviews (by brand, by use, guides)
  http://www.bestbinocularsreviews.com
  http://www.bestbinocularsreviews.com/wide-angle-binoculars.php
- No to Zooms!
  http://www.bigbinoculars.com/nozooms.htm

More Information – Things To See

- Sydney Observatory Monthly Sky Guides (Podcast, Transcript, Star chart)
  http://www.sydneyobservatory.com.au/category/astronomy/monthly-sky-guides/
- The Astronomical League Binocular Programs
  Southern Sky - http://www.astroleague.org/al/obsclubs/sskybino/ssbinoc1.html
  Messier - http://www.astroleague.org/al/obsclubs/binomess/binomess.html
  Double Star - http://www.astroleague.org/BinoDS_Intro
  Deep Sky - http://www.astroleague.org/al/obsclubs/dsbinoc/dsbinoc.html
- Binocular Sketches
  http://rodelaet.xtreemhost.com/binocular_astronomy.html
- Other Simulated Views
  http://www.brighthub.com/science/space/articles/24224.aspx#
- Ice In Space Forums
  http://www.iceinspace.com.au/forum/

More Information - Books

DISCLAIMER: These books have been recommended by others. I do not own them.

See amazon.com and other sites for reviews

Beware focus on Northern Hemisphere objects (some not visible here, and key Southern Hemisphere objects missing)

- Touring the Universe through Binoculars (A Complete Astronomer's Guidebook)
  Philip S. Harrington
  ISBN-10: 0471513377
  http://www.philharrington.net/sw8.htm
- Binocular Astronomy
  Craig Crossen
  ISBN-10: 0943396883
  1st Edition (According to one book review 2nd edition is not approved by author)
- Binocular Highlights
  Gary Seronik
  ISBN-10: 1931559430
  http://www.garyseronik.com/

More Information - Books

- Stargazing with Binoculars
  Robin Scagell, David Frydman
  ISBN-10: 1554078210
- Binocular Stargazing
  Mike D. Reynolds
  ISBN-10: 0811731367
- Patrick Moore's Exploring the Night Sky with Binoculars
  Patrick Moore
  ISBN-10: 0521793904
  (includes Southern hemisphere constellations)
- Heavens Above!
  A Binocular Guide to the Southern Skies
  Robert Bee
  http://home.st.net.au/~dunn/heavensabove/

More Information - Collimation

- Collimating Binoculars
  http://www.cloudynights.com/item.php?item_id=416

  http://falakbeen.blogspot.com.au/2012/05/collimating-orion-worldview-10x50-wa.html

  http://www.opticalhardware.co.uk/PDF/information_and_retail_price_lists/collimating_binoculars.pdf

  http://www.ehow.com/how_6920576_collimate-binoculars.html
  http://www.youtube.com/watch?v=WHtOJAgo-DM

Binocular Differences In Detail

(Comparative Mini-Review)

My subjective opinions

Tasco Zip 10x50 Model 2023

- Possibly optically my best pair overall. 8-8.5/10
- Do not hold focus well. Never lean into them or rest them on my head
- No tripod adapter. Only usable hand held
- Show nebulosity well in Eta Carinae and about equally well for Omega Centauri

Andrews Communications 10x50 WA

- Optically not as happy with these as I thought I would be. About 8/10
- Different but not significantly better than Digitors
- Not the easiest to focus – hard to make fine adjustments. But do hold focus well
- Other mechanics very good. Can't lose protective cups as they are attached to the body
- But high contrast orange filters horrible. One more thing that can break
- Show nebulosity well in Eta Carinae. Omega Centauri OK

Dick Smith Digitor 10x50

- Sharpness very good - probably 8/10. Both copies I've owned
- But ruby coating seems to cut out almost all of the nebulosity on Eta Carinae in light pollution. Better away from city. Improve contrast on Omega Centauri though
- Bad colour cast/fringing. Especially in daylight/bright light. Even horrible ruby ovals due to sun glare in some conditions
- Other pairs I've tested in store had more obvious colour cast. Sample variation may be higher than even other cheap pairs
- Most magnification of any pair. Not quite able to fit in Southern Cross
- Surprised at how well these hold up. Really all you're missing compared to other pairs is true colour and nebulosity. Would buy these in a heartbeat if nothing else readily available
- Build quality not brilliant. First pair lasted about 6 years before they broke. Screws started rusting after about 2-3 years. I'm fine with that for $40
- Have been available for at least a decade

Bushnell 20x50 Powerview

- Optically 7-7.5/10. Not the sharpest for nighttime viewing, but still quite usable
- Build is not fantastic
- Mismarked. No way are these 20x50. Magnification between 8x and 10x
- Viewing in daylight mild colour tinge changes depending on where you point them in relation to the sun. Either side can become slightly cooler (more blue)
- Cheap. Happy to take these when there is more risk of them being lost or stolen

Homeart Unbranded 7x50

- Optically very good. 7-8/10
- Hold focus and collimation
- Build quality OK
- Absolute bargain at $25. Bought in Erina Fair Homeart around 2006. An unlikely find

"Winner“ 7x50

- Optically good. 8/10
- Overpaid. Very little difference between this pair and Homeart 7x50s
- Old and showing their age. One side is loose and has play. But have lasted over a decade so far

Various Small Roof Binocs

- 6x21 through to 12x30
- Only good for brightest stars
- Difficult to spot Omega Centauri at all from my back yard
- Smaller apparent angle of view (tunnel vision)
- Okay for bird spotting, plane spotting during the day
- Good for very young children who can't handle bulk of a bigger pair
  - Learn to use binoculars
- Even cheaper. About $12