

# Amateur Visual Astronomy

A Short Tour and How-To  
CoSin 2023

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2023-06-17

# Introduction

The goal of this presentation is to give an overview of a small setup for amateur visual astronomy, as well as an introduction into the subject.

Main Topics:

1. **The “Observatory”**: Location of the telescope, sky details.
2. **Equipment**: Telescope and other equipment used.
3. **Visual Observation**: How to find stars, nebulae, galaxies and more using your eyes only.
4. **Hands-on**: If time and weather allows, have a look yourself!

# Visual Astronomy

In **visual astronomy**, the night sky is observed only using the human eye, with- or without optical aids (telescopes, binoculars, etc.).

What can be seen this way *differs much* from what is found in pictures created through **astrophotography**: *In the darkness, the eye mostly sees a black/white image, colors cannot be distinguished.*

*Why do we prefer visual astronomy?*

- ▶ Time required: no post-processing – time dedicated is almost 100% used for observation.
- ▶ Simplicity: less equipment required, less that can go wrong...
- ▶ Costs: not a limiting factor, but plays a role as well.
- ▶ No electricity required.
- ▶ Others are better at astrophotography!

The “Observatory”

Equipment

Visual Astronomy

Conclusion

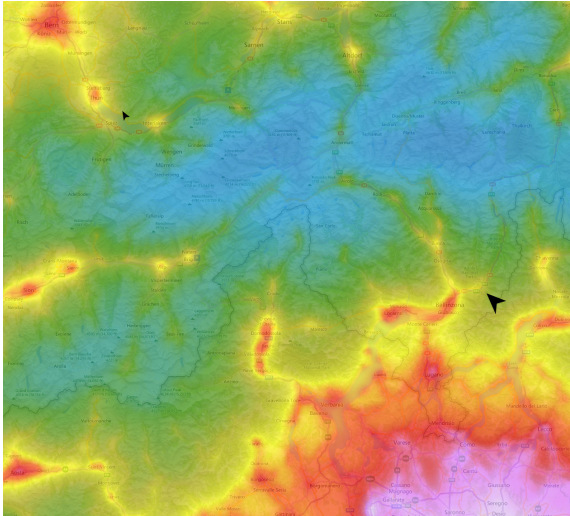
# Location



Val Mesolcina, Grisons  
Altitude 730m

# Light Pollution

Location has Bortle class 4 conditions (rural/suburban transition), similar to Sigriswil.



(<https://lightpollutionmap.info/>)

The “Observatory”

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## Binoculars...Seriously!

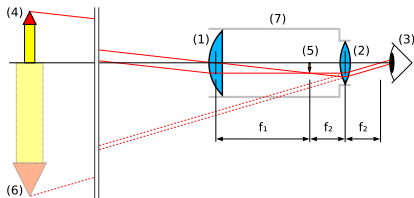


[https://commons.wikimedia.org/wiki/File:Binoculars\\_\(AM\\_2004.5.5-3\).jpg](https://commons.wikimedia.org/wiki/File:Binoculars_(AM_2004.5.5-3).jpg)



# Refracting Telescopes (Refractors)

- ▶ The "classic" telescope
- ▶ Only for small apertures
- ▶ Either very expensive or mostly bad quality
  - ▶ → *Chromatic aberration*
  - ▶ Fixed by APOchromatic scopes
- ▶ Well suited e.g. for observing planets and moon



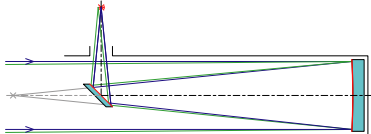
[https://commons.wikimedia.org/wiki/File:Negretti\\_zambra\\_telescope\\_2.jpg](https://commons.wikimedia.org/wiki/File:Negretti_zambra_telescope_2.jpg)

<https://commons.wikimedia.org/wiki/File:Telescope-schematic-A.svg>

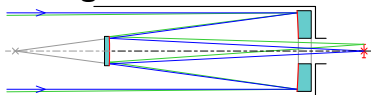
# Reflecting Telescopes

- ▶ Most telescopes today are reflecting telescopes
- ▶ Mirrors instead of lenses
  - ▶ No chromatic aberration
- ▶ Allow for much larger aperture, cheaper
- ▶ Different constructions for different purposes
- ▶ Well suited also for deep sky objects

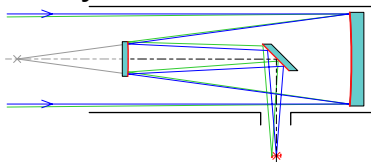
## Newton



## Cassegrain



## Nasmyth

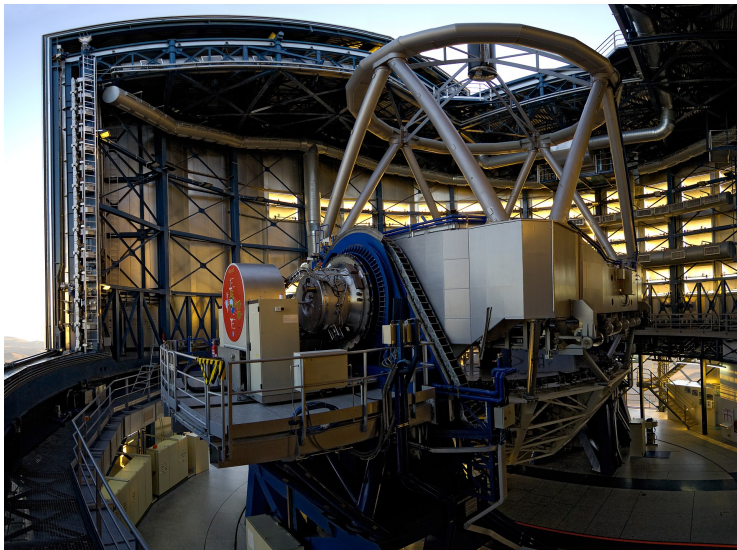


<https://de.wikipedia.org/wiki/Datei:Newton-TeleskopII.svg>

<https://upload.wikimedia.org/wikipedia/de/5/5d/Cassegrain-TeleskopII.svg>

<https://commons.wikimedia.org/wiki/File:Nasmyth-Telescope.svg>

# Example: Very Large Telescope (VLT)



<https://commons.wikimedia.org/wiki/File:Eso-paranal-16.jpg>

# Our Telescope

- ▶ Skywatcher Skyliner 250PX Flextube
- ▶ Classical Newtonian with Dobson mount
- ▶ Primary mirror: 254mm / 10"
- ▶ Focal length: 1200mm<sup>1</sup>
- ▶ Weight:  $\approx 30\text{kg}$   
(may be transported in 2 parts)
- ▶ Support for 1.25" and 2" eyepieces



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<sup>1</sup>i.e.  $\approx f4.7$  (largely irrelevant for visual observation).

# Accessories + Other Equipment

## Telescope

- ▶ 9x50 finder scope
- ▶ Reflection finder (Radiant)
- ▶ Collection of eyepieces:  
4mm – 32mm  
(mag. 37.5x – 300x)
- ▶ Barlow lens
- ▶ Moon filter (!)
- ▶ Color filters (planets)
- ▶ UHC and OIII filters (nebulae)

## Other Optical Equipment

- ▶ Binoculars 7×50, 8×56
- ▶ Tripod for binoculars
- ▶ ...more telescopes...?

## Other Equipment

- ▶ Headlamp with red light
- ▶ Deep sky atlas + map
- ▶ Stellarium Mobile
- ▶ Chair
- ▶ Bottle of hot tea

# The Dobson Mount I

The **Dobson telescope mount** is a simplistic azimuthal mount, pioneered by John Dobson (American monk, 1915-2014). It is widely used in the DIY / amateur astronomer community and offers various advantages:

- ▶ Quick setup, easy handling  
Especially no need for proper orientation (RA axis).
- ▶ Robustness, also for large mirrors
- ▶ Costs – cheap especially for large telescopes
- ▶ Often used for home-made telescopes

On the downside, tracking an object requires adjusting altitude and azimuth simultaneously, making it less/not suitable for astrophotography.

See e.g. <https://www.youtube.com/watch?v=snz7JJ1SZvw> on how to build your own...



John Dobson

(Wikipedia)

# The Dobson Mount II



42" Dobsonian Telescope

(<https://www.cruxis.com/scope/scope1070.htm>)

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**Visual Astronomy**

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# Observation Process

Before beginning an observation session, careful preparation is important! This includes setting up the telescope, finder scope adjustment, cooking tea, etc. *Ideally, we start during daylight!*

Then, we proceed as follows:

1. Look at the sky with the naked eye – which constellations are visible?
2. Consult the atlas / sky map to locate possible/desired objects.
3. Orient the telescope using the reflection finder.
4. For darker objects, continue with **star hopping** (finder scope).
5. Look at the object through the telescope:
  - ▶ Start with smallest magnification!
  - ▶ Depending on object type, filters may be used/required.
  - ▶ Continuously track object by hand.
  - ▶ Don't forget to take a break (concentration / tired eyes)!
  - ▶ Beware of fast-moving clouds...

...then, repeat for the next object...

## Example: Finding M57 (Lyra) I

Assume we want to look at **M57** (the ring nebula), which lies in constellation **Lyra**:



## Example: Finding M57 (Lyra) II

- ▶ Identify the constellation in the sky.
- ▶ Especially when beginning, a mobile app like Stellarium really helps a lot!
- ▶ BTW: Is it the right time/season for the chosen object?



# Example: Finding M57 (Lyra) III

Next step: Review the object in the atlas.

*How bright is it? What are its dimensions?*

## Lyra (Lyr)

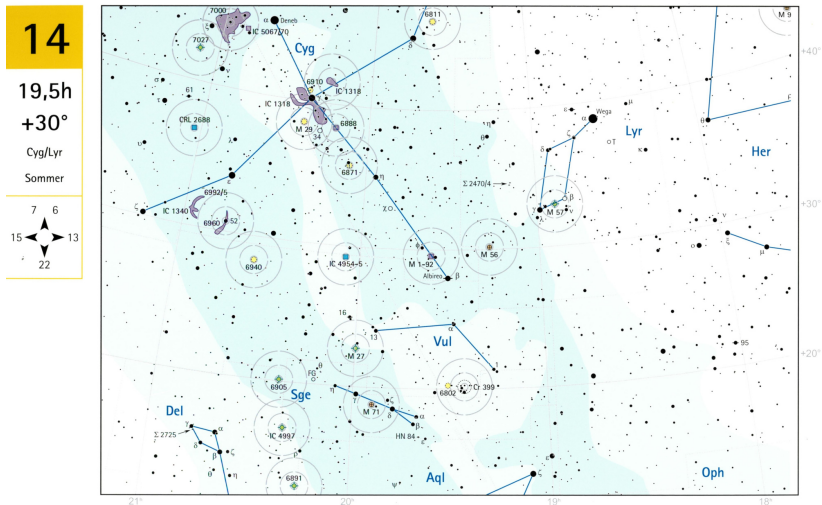
Atlas Karte 14

Lyra, die Leier Orpheus', gehört zu den Sternbildern der reichen griechischen Sagenwelt. Am Himmel wird es durch seinen mit  $\theta^m\theta$  hellsten Stern, die weißstrahlende Wega, markiert. Ein Parallelogramm, gebildet aus den Sternen  $\beta$ ,  $\gamma$ ,  $\delta$  und  $\zeta$  Lyrae bildet die Figur der Leier. Trotz seines kleinen Musters gehört Lyra zu den ersten Adressen am mitteleuropäischen Sommerhimmel. Dazu tragen vor allem der berühmte Ringnebel und der doppelte Doppelstern  $\epsilon$  Lyr bei, beides seit Jahrhunderten saisonale Favoriten der Beobachter.

T Lyr	18 <sup>h</sup> 32,3 <sup>min</sup>	+37° 0'	7 <sup>m</sup> 8	9m,6	unreg.	2000 Lj	Vr	Kohlenstoffstern, rot	10×50
$\epsilon$ Lyr AB (1)	18 <sup>h</sup> 44,4 <sup>min</sup>	+39° 37'	5 <sup>m</sup> 1/6 <sup>m</sup> 0	2,2"	347°	160 Lj	DS	doppelter Doppelstern	63mm
$\epsilon$ Lyr CD (2)	18 <sup>h</sup> 44,3 <sup>min</sup>	+39° 40'	5 <sup>m</sup> 1/5 <sup>m</sup> 4	2,4"	78°	160 Lj	DS	doppelter Doppelstern	63mm
$\beta$ Lyr	18 <sup>h</sup> 50,1 <sup>min</sup>	+33° 21'	3 <sup>m</sup> 3	4 <sup>m</sup> 3	12,94 Tage	800 Lj	Vr	Bedeckungsveränderlicher	bloßes Auge
M 57	18 <sup>h</sup> 53,6 <sup>min</sup>	+33° 2'	8 <sup>m</sup> 8	1,2'	14 <sup>m</sup> 7	1800 Lj	PN	Ringnebel	8×30
$\Sigma$ 2470	19 <sup>h</sup> 8,7 <sup>min</sup>	+34° 46'	7 <sup>m</sup> 0/8 <sup>m</sup> 6	13,8"	269°	1300 Lj/485 Lj	DS	opt. Doppelstern, 10' südlich Struve 2474	50mm
$\Sigma$ 2474	19 <sup>h</sup> 9,4 <sup>min</sup>	+34° 36'	6 <sup>m</sup> 7/8 <sup>m</sup> 0	16,2"	263°	480 Lj	DS	10' nördlich Struve 2470	50mm
M 56	19 <sup>h</sup> 16,6 <sup>min</sup>	+30° 11'	8 <sup>m</sup> 3	3'	13 <sup>m</sup> 0	31000 Lj	GC	in reichem Sternfeld	10×50

# Example: Finding M57 (Lyra) IV

Now, consult the map and start aligning the telescope...



## Example: Finding M57 (Lyra) V

...telescope aligning and searching ...

...drinking some tea ...

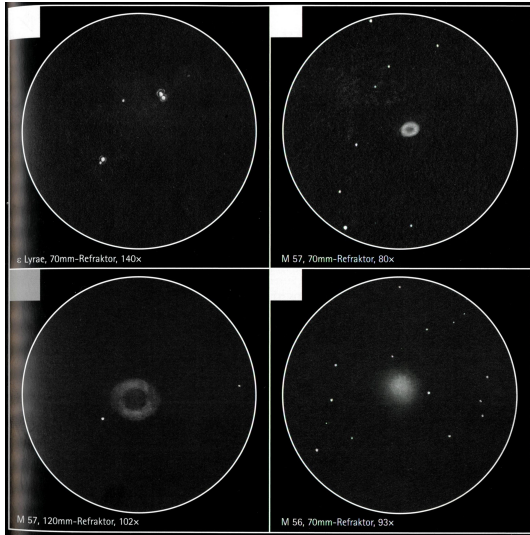
...more telescope aligning and searching ...

(later)

**Eureka! We found something! But...**

# Example: Finding M57 (Lyra) VI

*...Remember: When observed visually, things look different!*



The “Observatory”

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Visual Astronomy

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# Conclusion

- ▶ Visual astronomy is a very satisfying and to a certain degree affordable hobby.
- ▶ It requires some time and patience, though:
  - ▶ Finding and identifying objects requires learning some new skills.
  - ▶ Capabilities of eye *and* brain improve over time!
  - ▶ “Not so easy” objects may take hours to find.
- ▶ Recommendations:
  - ▶ Start simple: Already some 7x/8x binoculars (large aperture) and a tripod open up new worlds.
  - ▶ Ignore refractors, buy a Newtonian telescope (unless you have piles of money). Be sure to have a good mount.
  - ▶ Good read: <http://www.strickling.net/astro.htm>
  - ▶ Be patient – and have fun!

**Thank you!**

**Questions / Remarks?**