

A photograph of a room filled with various telescopes on tripods. The telescopes are of different sizes and colors, including white, blue, and gold. They are arranged in a row, with some pointing towards the ceiling. The background is a dark wall with a starry pattern. On the right side, there are several framed pictures of celestial objects. The text "A Closer Look at Telescopes" is overlaid in yellow, and "Obsessing About Equipment" is overlaid in green.

***A Closer Look at Telescopes***

***Obsessing About Equipment***

*Schmidt-Cassegrain*



*Refractor*



*Maksutov*



*Fork M*

**Collect the Whole Set?**

*atorial*



*Equatorial*

*Dobsonian – solid tube*



*Dobsonian – truss tube*



## Aperture Always Wins

One telescope cannot do everything

A small dobsonian is the best starting telescope

Refractors are the sharpest

Big dobsonians are "light buckets"

Dobsonians are no good at astrophotography

SCTs are the most versatile

Refractors are lower maintenance

No point using a bigger scope in light pollution

Smaller telescopes are less affected by seeing

Use fans to cool optics

Buying a big telescope will cause your sanity to be questioned

Yup!

BS

It's

complicated

25 in 635mm



# Aperture Always Wins

**IC4278**  
**Mag 16.5**

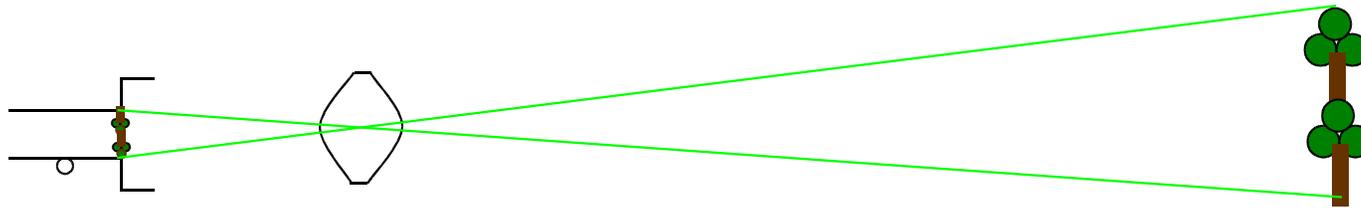
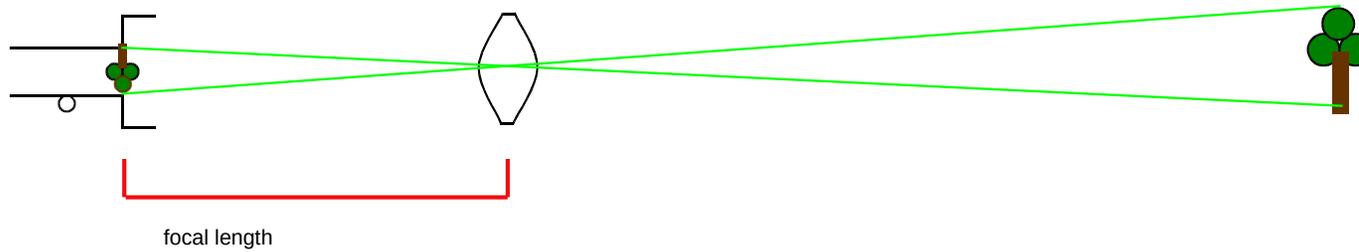




*2.7 in 70mm*



# One telescope cannot do everything: field of view





## A small dobsonian is the best starting telescope



- \* Most aperture per dollar
- \* Simple quick setup
- \* Easy to point
- \* Easy to look through
- \* You'll be able to see thousands of objects in an 8"

### Some people find it:

- \* Hard to point
- \* Hard to track
- \* Never get used to the upside down hand-eye coordination
- \* Where's the handle?
- \* Adults find the eyepiece too low



Slow-motion controls



# Answering the question “What telescope should I buy”

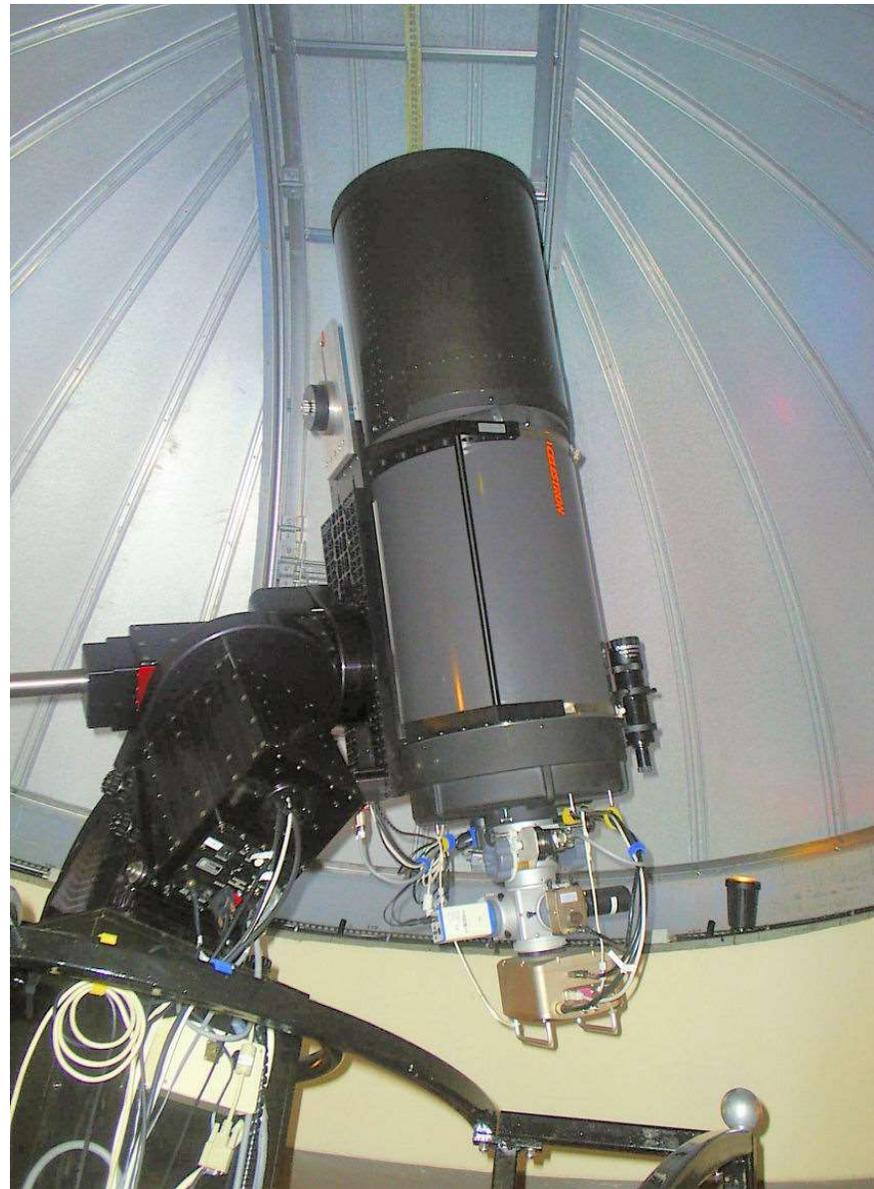
- \* There is no best first telescope
- \* Try before you buy

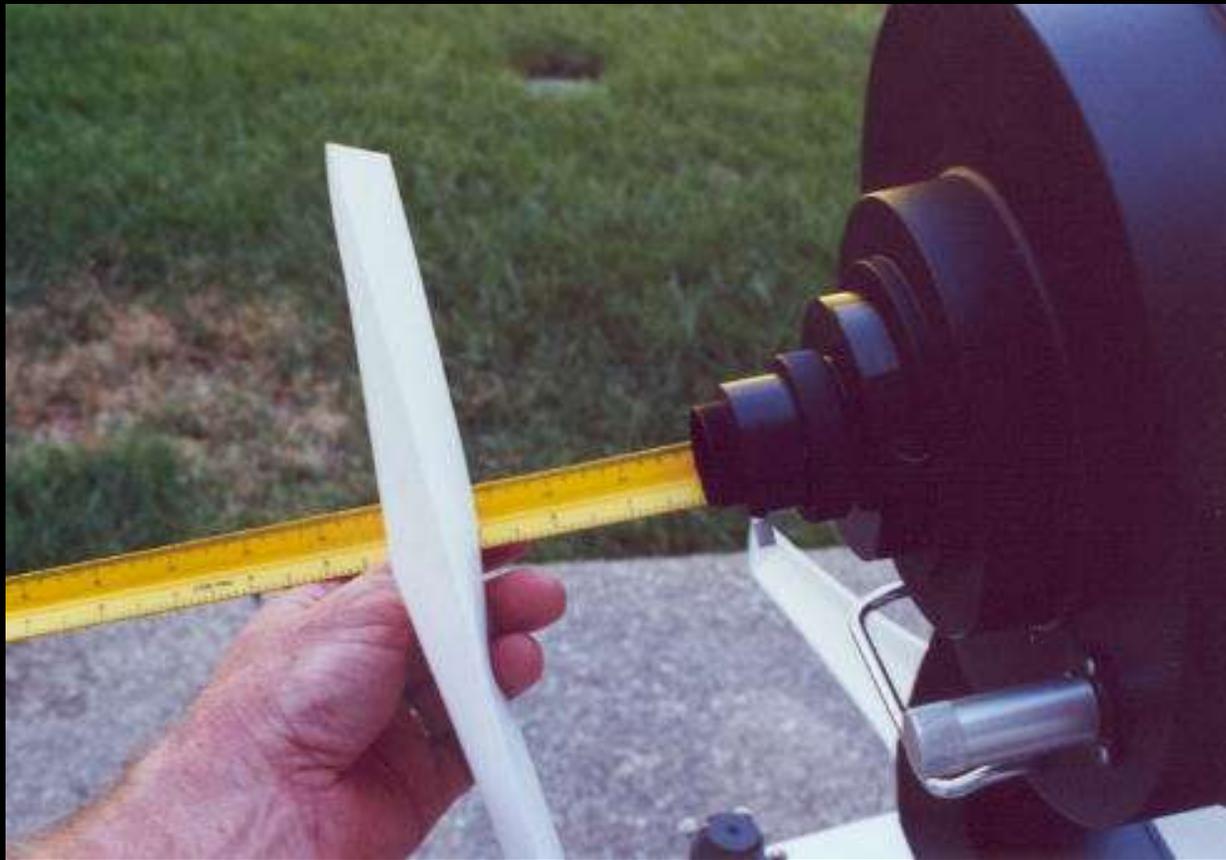
Even better:

- \* Goto public star parties. Look thru all the scopes and talk the owners
- \* Join a local club
- \* Borrow telescopes (Ottawa RASC telescope library)

SCTs are the most versatile







***10 to 20 inches of back focus***



Satellite Tracker v2.4.7c Meade LX200GPS

File Satellite Telescope View Options Help

Jul 20 2006 16:28:14.8 Set << Close Monitor

**Object Data** TLE Data

Satellite Name: COSMOS 1782  
 NORAD No.: 16986  
 Launch Yr/No.: 1986/074  
 T+Epoch: +1.232421  
 Julian Date: +2453937.602950  
 Local Time: 16:28:14.8  
 UTC Time: 02:28:14.8

Azimuth: +266.709 °  
 Elevation: +65.071 °  
 Range: +621.129 km  
 Velocity: +27302.82 km/hr  
 Latitude: +20.7285 ° N  
 Longitude: -158.7215 ° E  
 Altitude: +568.175 km  
 R.A.: 10 hr 12 m 46 s  
 Dec.: +17 ° 29 m 00 s

Sun West, Ascending

**Select Object**  All  Above Horizon

Elevation > 10 ° Altitude All

Ascending Only

In Sun Only Direction All

Favorites

Never Observed Reset Filters

Geostationary Only  List by NORAD

Refresh List COSMOS 1782 [NW]

4 object(s)  
218 total.

View Plan

Observation Log

Sky Map World Map

Info Predict Pass View Plan Select

**Telescope Tracking**

START Tracking

R.A. Tracking Stopped

Dec. Tracking Stopped

Timing Offset (sec.)

Delay 2.05 Find Advance

Alignment Adjustment (steps)

Down 0 Up

Joystick Adjust  Mouse Adjust

Tracking Method

Continuous Leap Frog

**Telescope Connection**

Connect COM Port 1

**ISS Monitor**

Current Position

Azimuth: +318.621 °  
 Elevation: -31.383 °  
 Range: +7251.674 km  
 Latitude: +51.7631 ° N  
 Longitude: +124.3601 ° E  
 Altitude: +339.451 km  
 R.A.: 02 hr 30 m 39 s  
 Dec.: +24 ° 23 m 49 s

Next Pass

AOS: 13 hr 20 m 17 s  
 LOS: 13 hr 29 m 56 s  
 Max. Elev.: 32° at 05:53:21  
 Duration: 00 hr 09 m 39 s

Alert when visible

**Location**  1  2  3 Altitude 16 m

Site name Sugar Cane Latitude 20.86863 ° N

UTC Offset -10 hours Longitude -156.416 ° E

TLE File Download

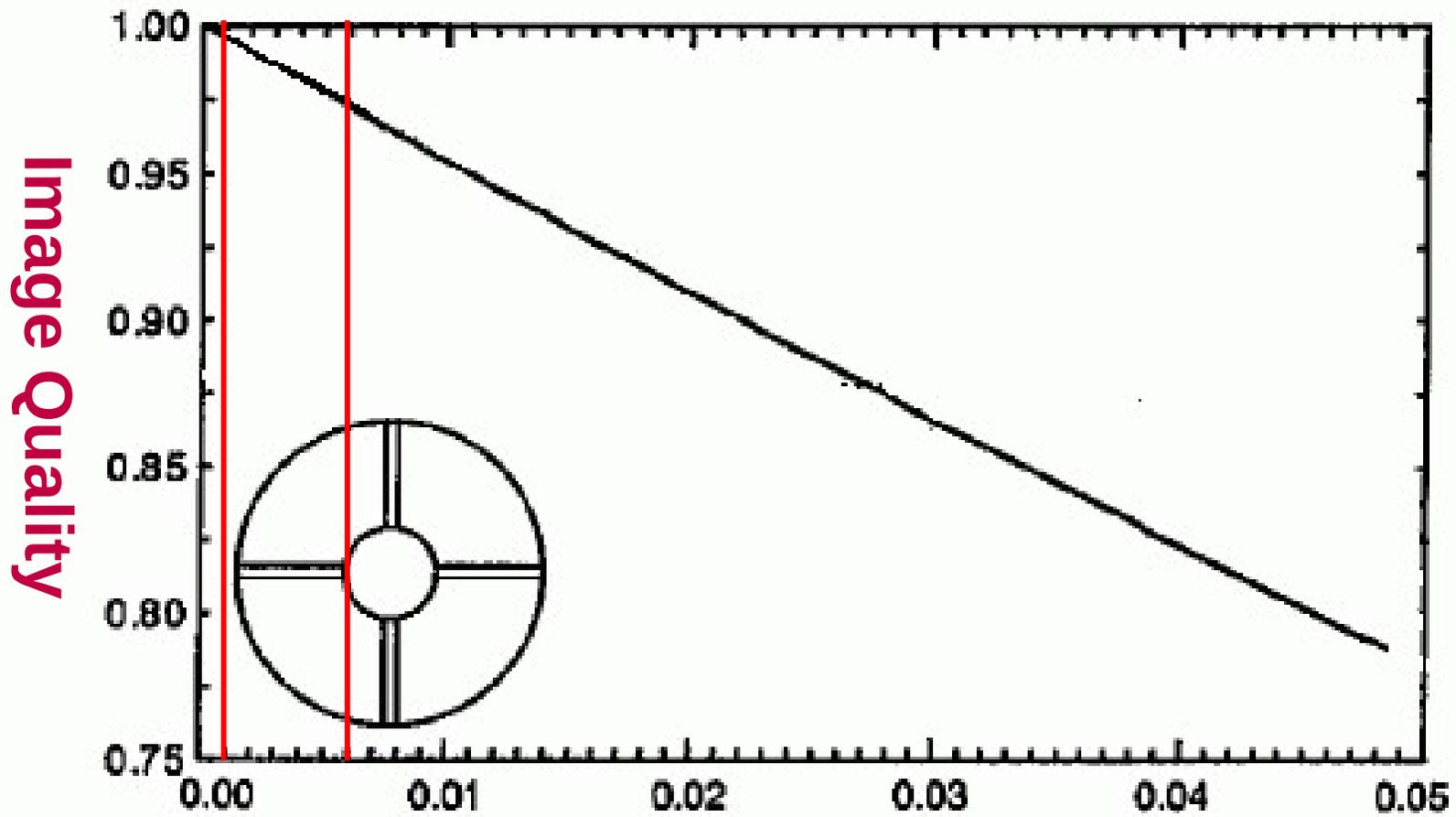
C:\NLSAT\visual.tle

Batch Predict Open File

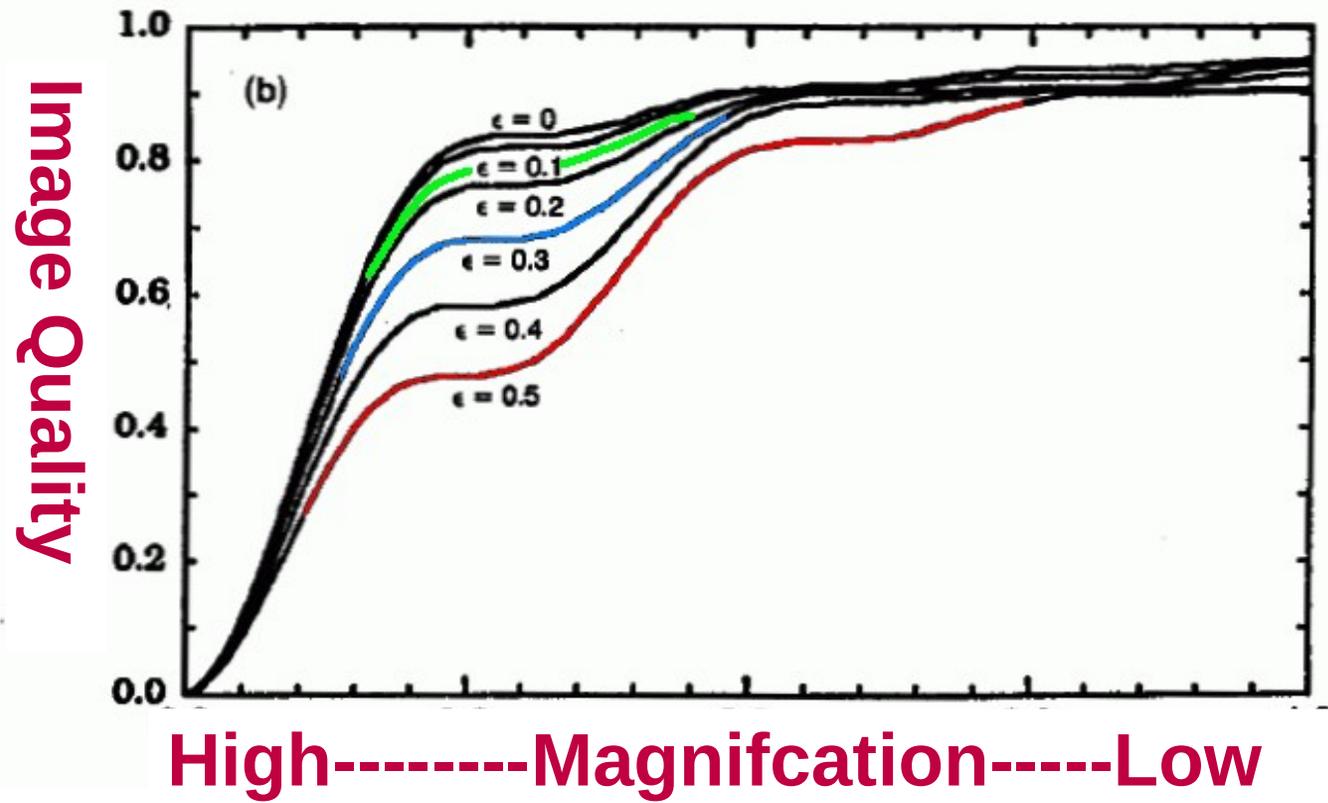
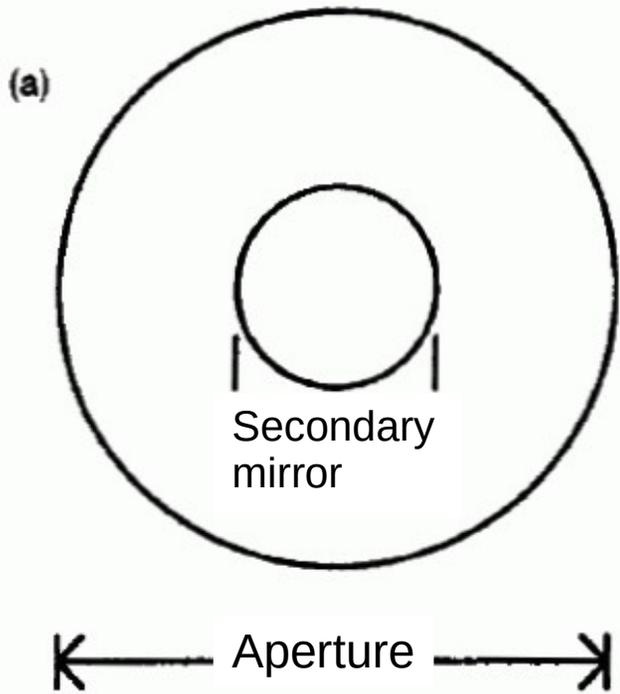
## Refractors are the sharpest

- Actually there a difference in contrast
- Obstructions reduce contrast





**Thickness of Spider Vanes**



## Refractors are the sharpest

Considering wave-optics:

Refractors are sharper when comparing equal apertures

5 inch refractor > 6 inch reflector > 7 inch SCT

In theory refractors have small advantage over other scopes.

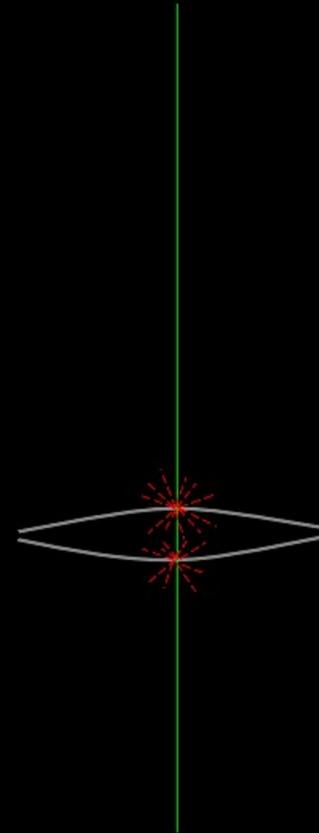
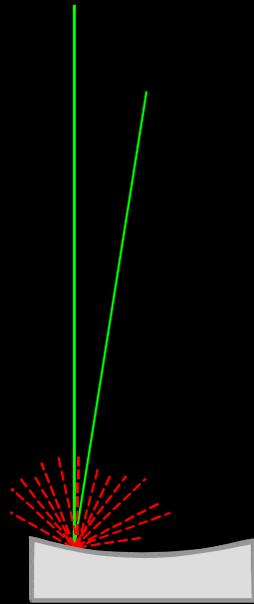
In practise, it's the advantage is larger.

Refractors are the sharpest

Actually there a difference in contrast

Scattering reduces contrast

Scatter off mirror and lens surfaces



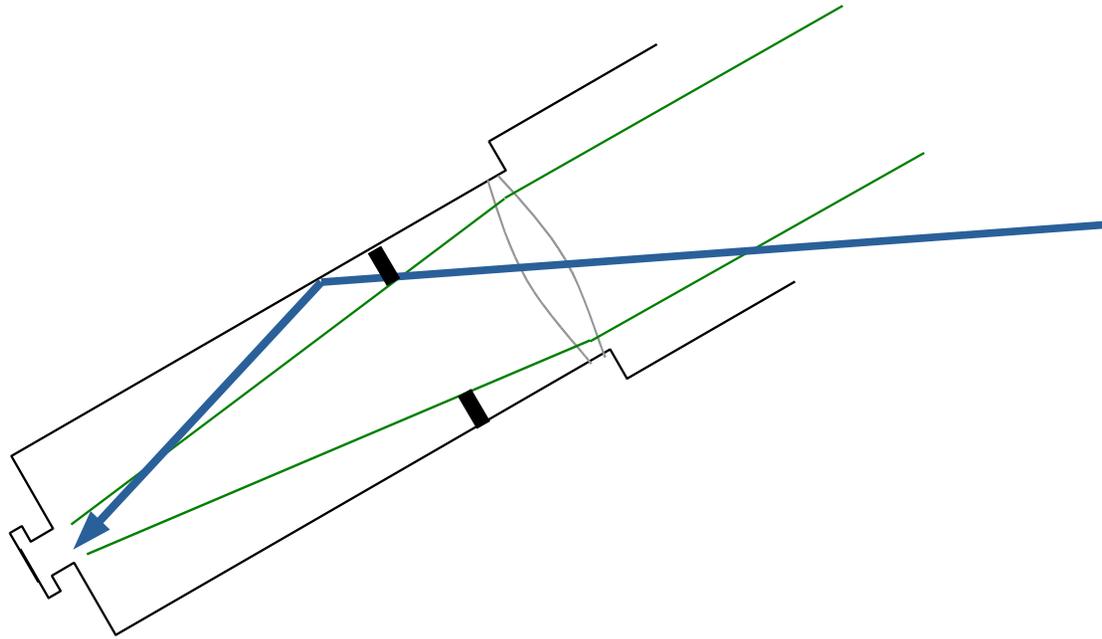
***16X scatter***

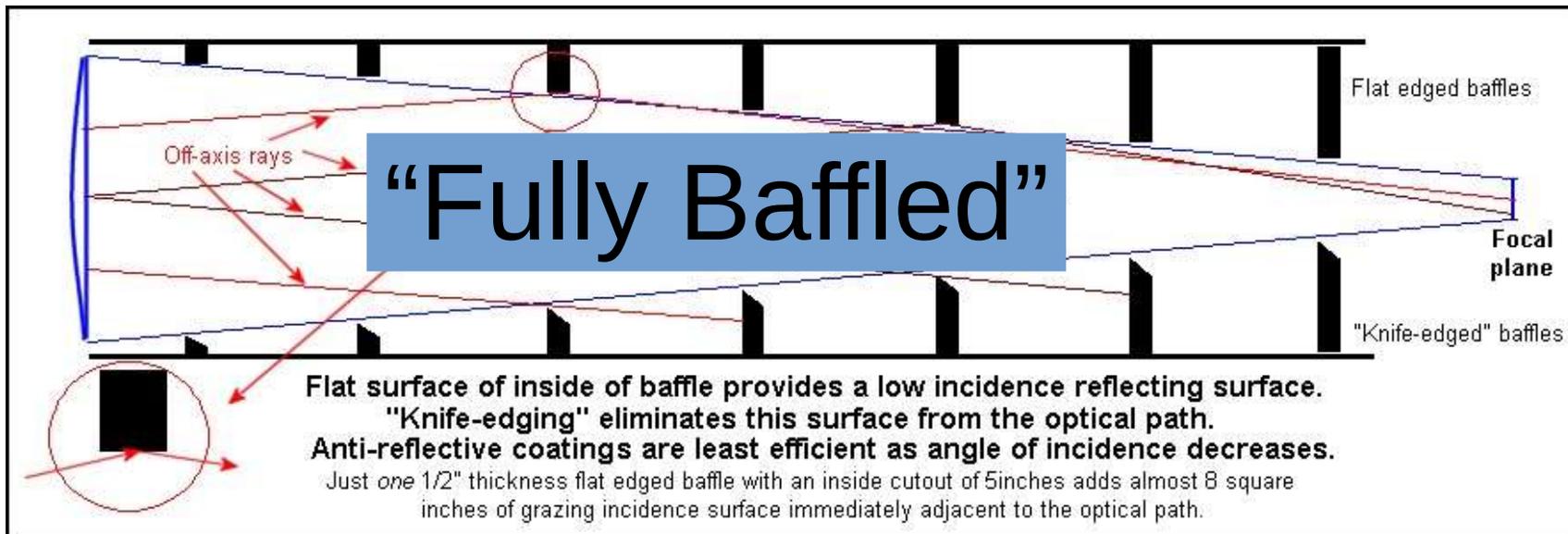


**Refractors are the sharpest**

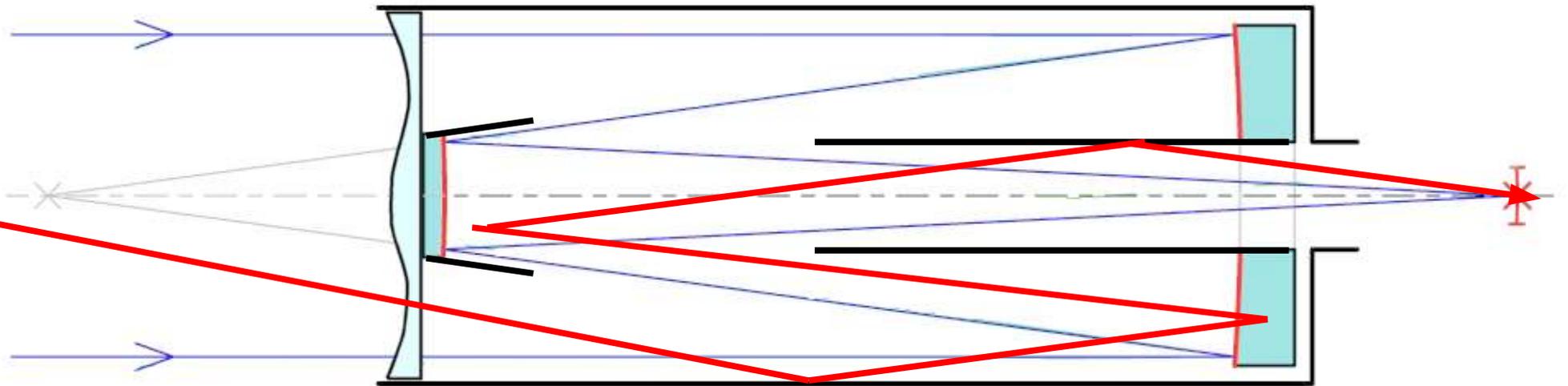
Actually there a difference in contrast

Stray light from ground sources





# Schmidt-Cassegrain Telescope



Newtonians are almost never baffled

## The Boltwood Telescope

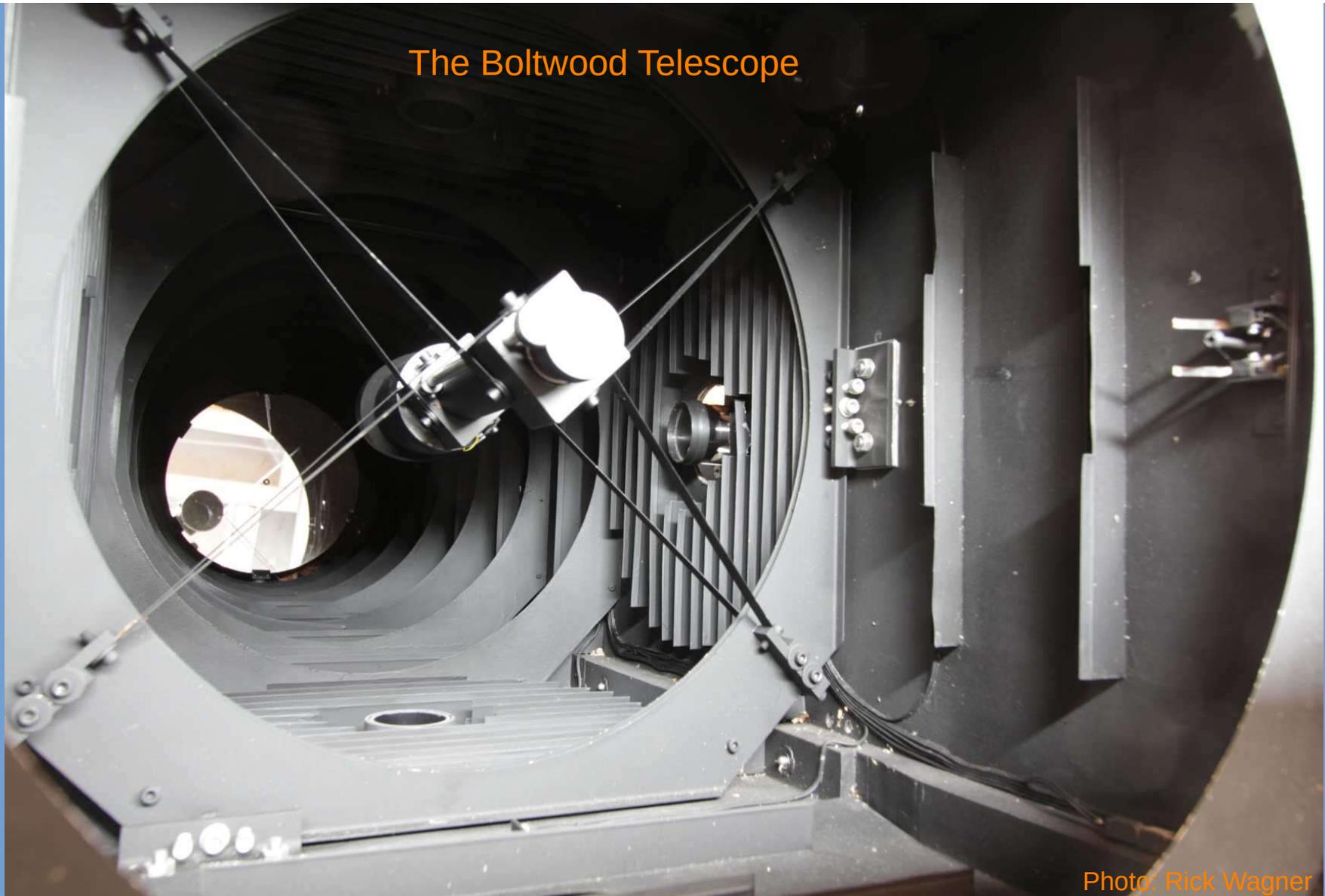


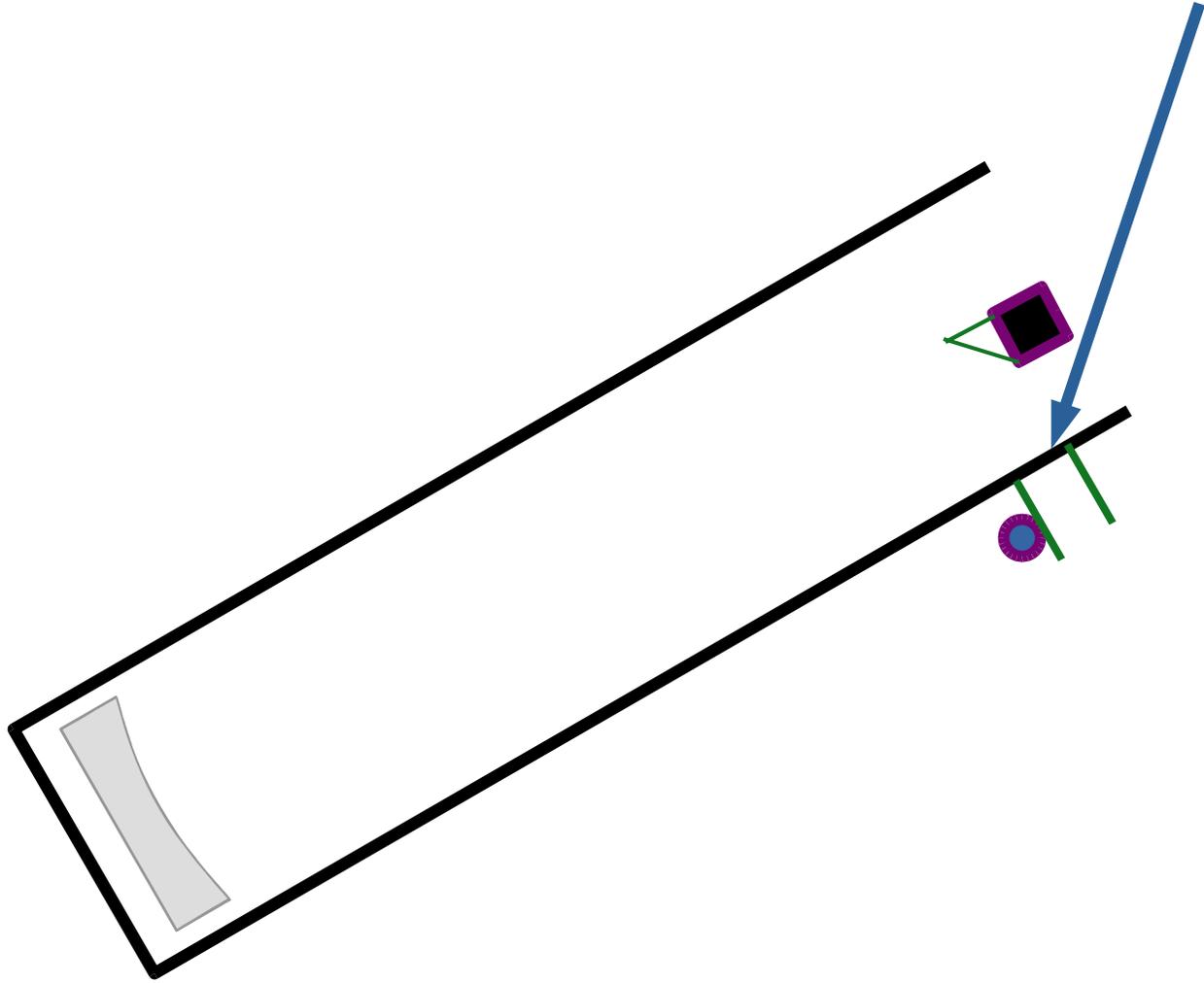
Photo: Rick Wagner

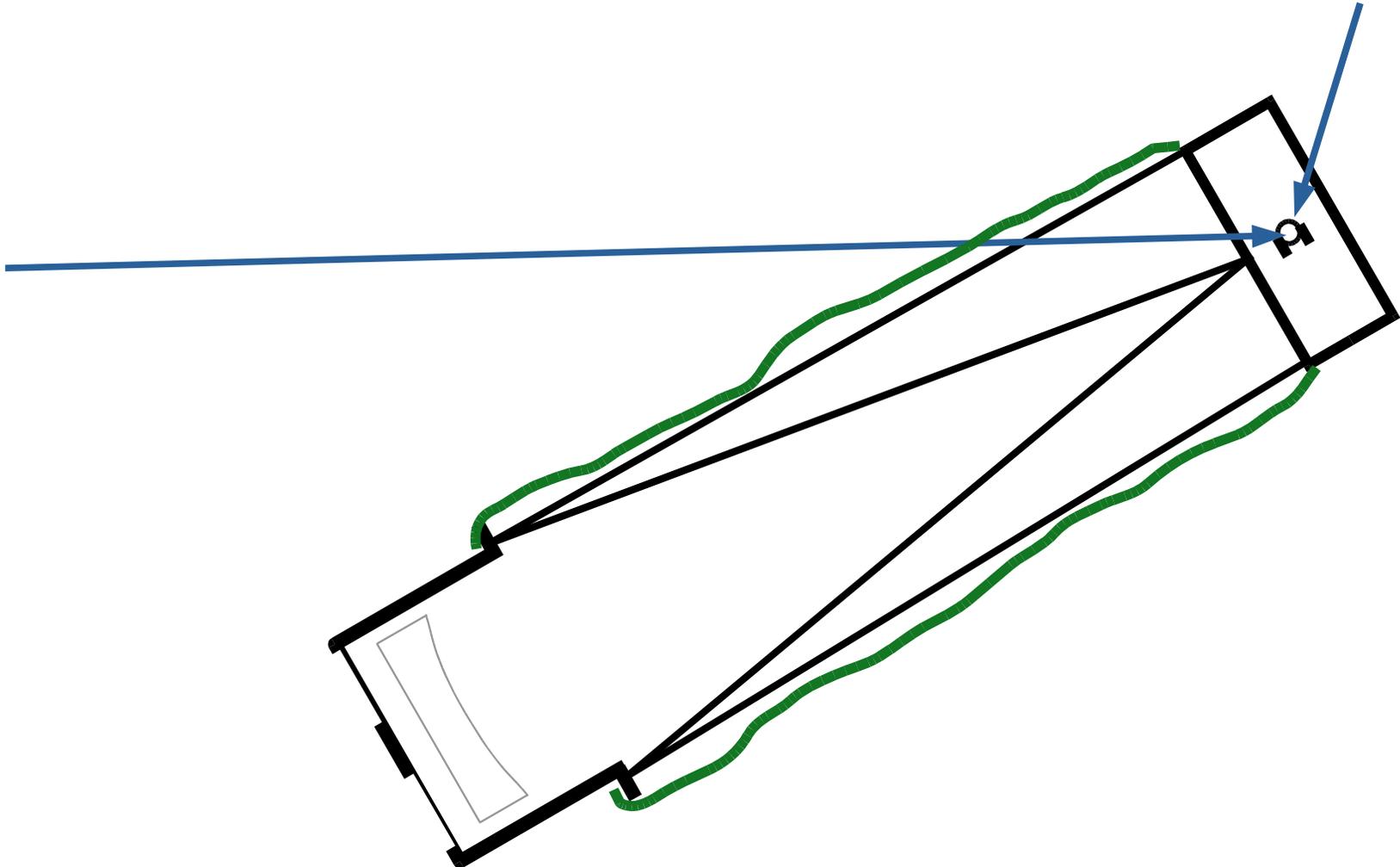
No point using a bigger scope in light pollution

All telescopes produce more contrast in less light pollution.

Refractors are the sharpest

Stray light from the sky

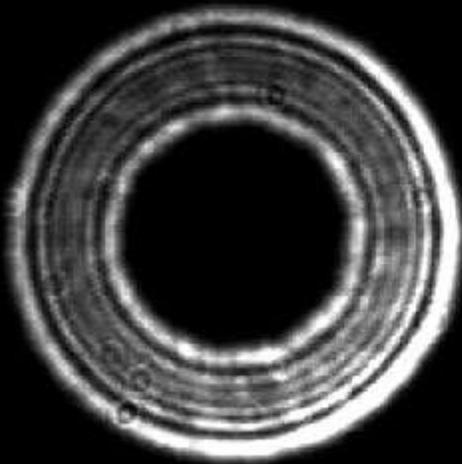
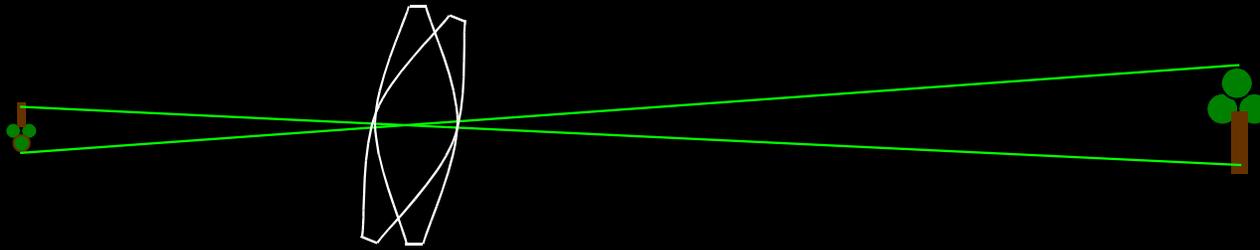




Refractors are the sharpest:

Differences in holding collimation

Collimation: "Optics are properly lined up"



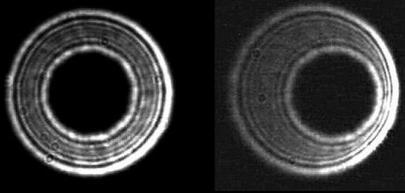
Uncollimated



Collimated



Anthony Wesley, Exmouth WA Australia  
30 Aug 2010 17:38.5 Z CMI 53 CMII 197 CMIII 36

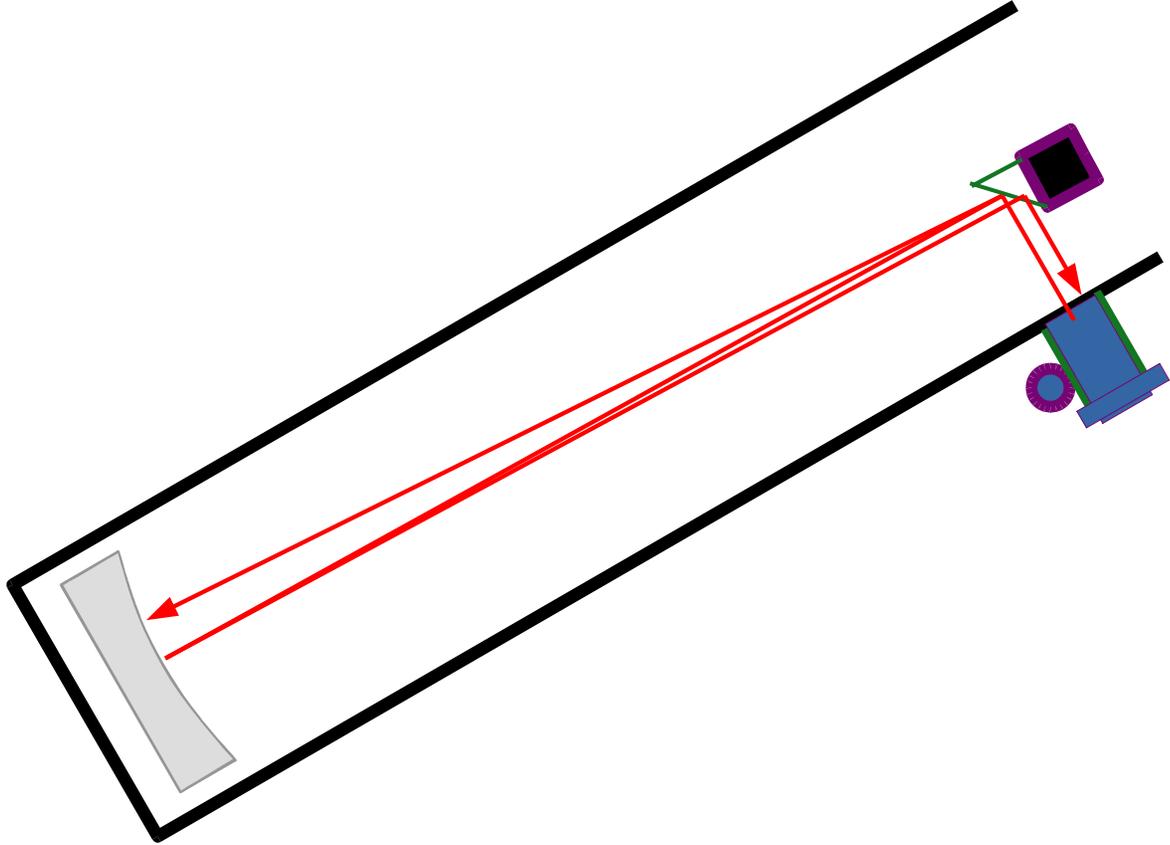


***How often do scopes need colimation?  
How many parts do you collimate?***

- ***Refractors:*** ***Once, at Factory***
- ***Maksutovs:*** ***Once, at Factory***
- ***SCTs:*** ***Secondary mirror and finder, when you bump it***
- ***Solid-tube Newts:*** ***Both mirrors and finder, when you bump it***
- ***Truss-tube Newts:*** ***Both mirrors and finder, every time you setup***

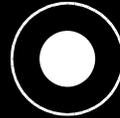


***How good does collimation have to be?***



# ***Newtonian Collimation: How good does it have to be?***

***x2 Airy Disk***



***x1.25 Airy Disk***



Aperture  
And  
Focal ratio

“separation”

“separation”

- ***4" F/4***
- ***8" F/6***
- ***16" F/4.6***
- ***25" F/5***

- ***1.1mm***
- ***3.7mm***
- ***1.6mm***
- ***2.2mm***

- ***0.3mm***
- ***0.9mm***
- ***0.4mm***
- ***0.5mm***

Refractors are lower maintenance:

collimation

\* cleaning

# *Cleaning*

- *Refractor optics are much easier to keep clean*
  - *Hard coatings on lenses*
- *Reflectors:*
  - *Very delicate coatings*

# Cleaning methods

Refractors:  
use camera-lens cleaning methods



Reflectors:

- lightest possible touch or water only
- avoid cleaning if at all possible





“Fuss Factor” increases exponentially with size of telescope

Smaller telescopes are less affected by seeing

Smaller telescope have fewer thermal effects

“seeing” : disturbance in the atmosphere

Smaller Telescope



Larger Telescope



# Seeing Cells

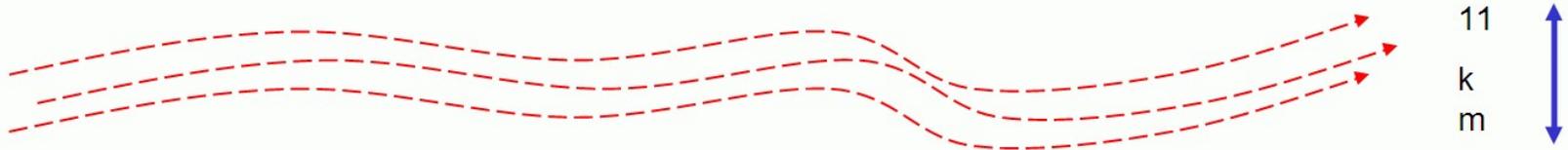
- \* Turbulent Cells in the atmosphere about 6 inches across
- \* Smaller scopes look through one seeing cell
- \* Larger scopes look through several seeing cells

# It's a Myth

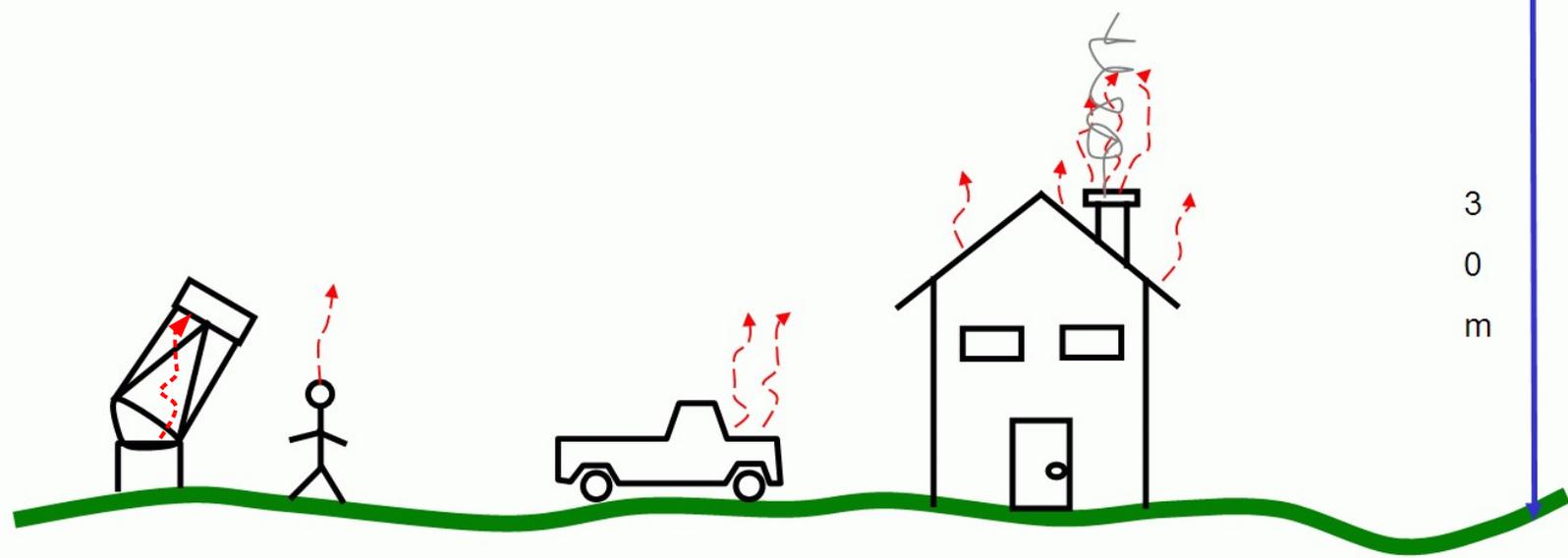
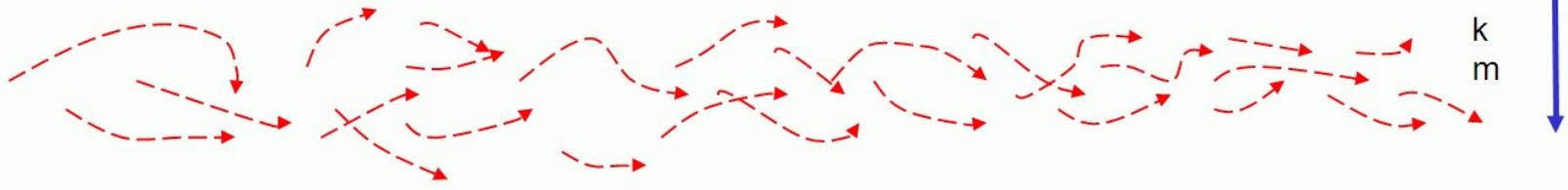
~~Turbulent Cells in the atmosphere about 6 inches across~~

There are no “seeing cells” in the atmosphere.

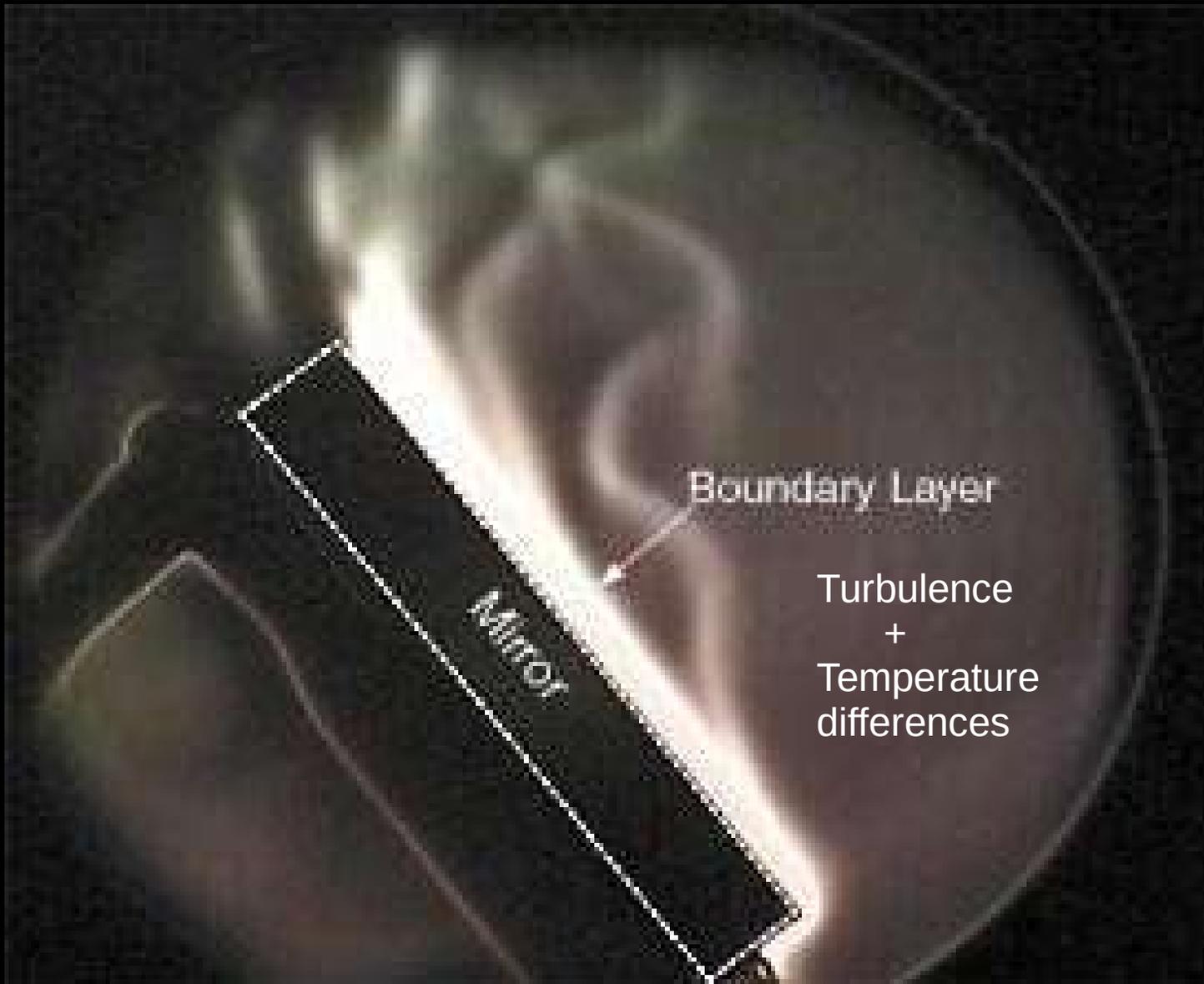
Astronomers just made that up.



Turbulence + Temperature differences



***Often “Bad Seeing”  
Is actually  
Tube Currents***



Boundary Layer

Turbulence  
+  
Temperature  
differences

*Bryan Greer*

***How to do your own tube-current test:***

***Observe an star, out of focus***

***Gives you a map of the air over your mirror***

***Then, disturb the air in your tube***



***Cue the hard-to-see  
tube-current video***

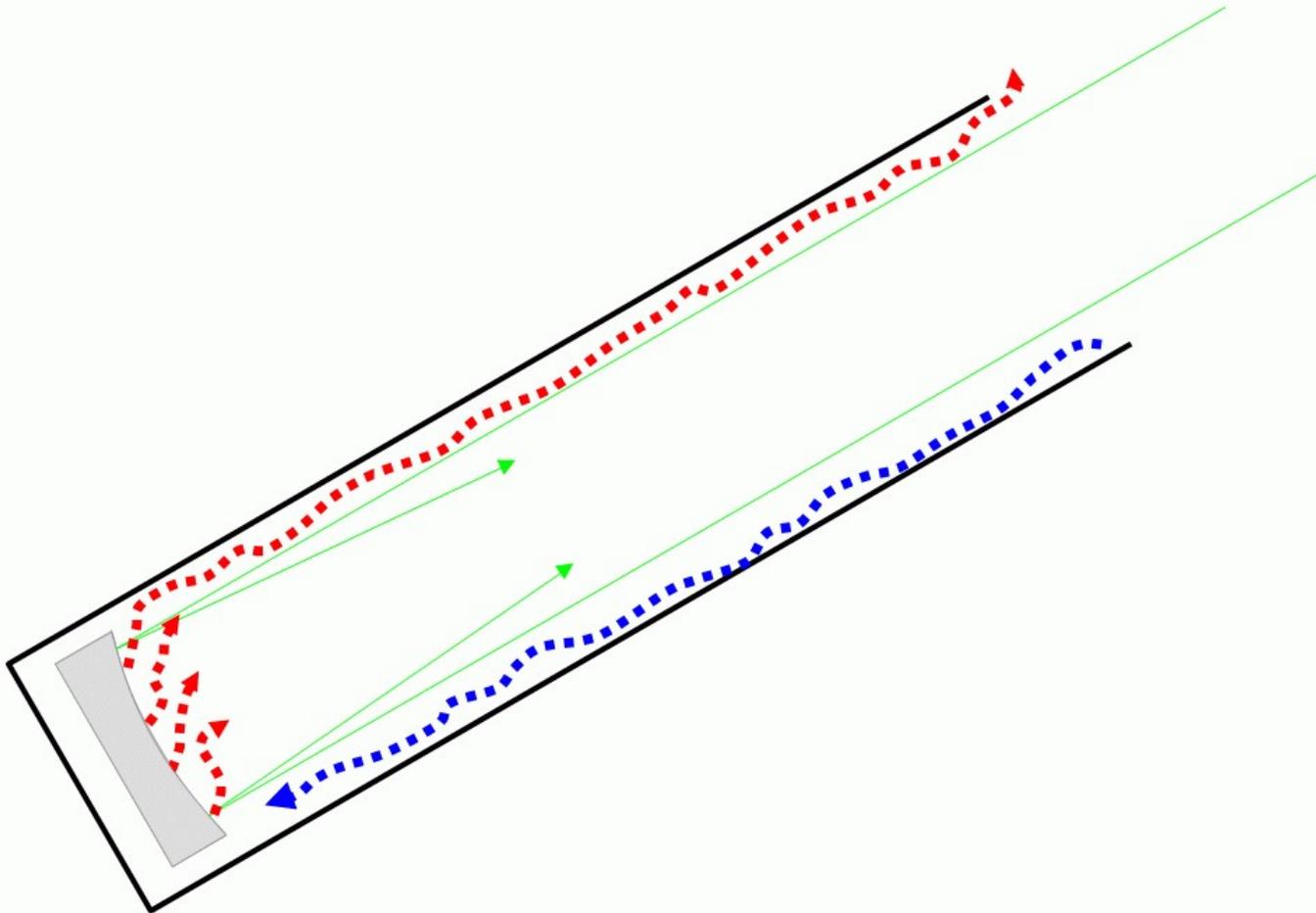
# *Seeing Vs Tube Currents Star Test*

## *Seeing*

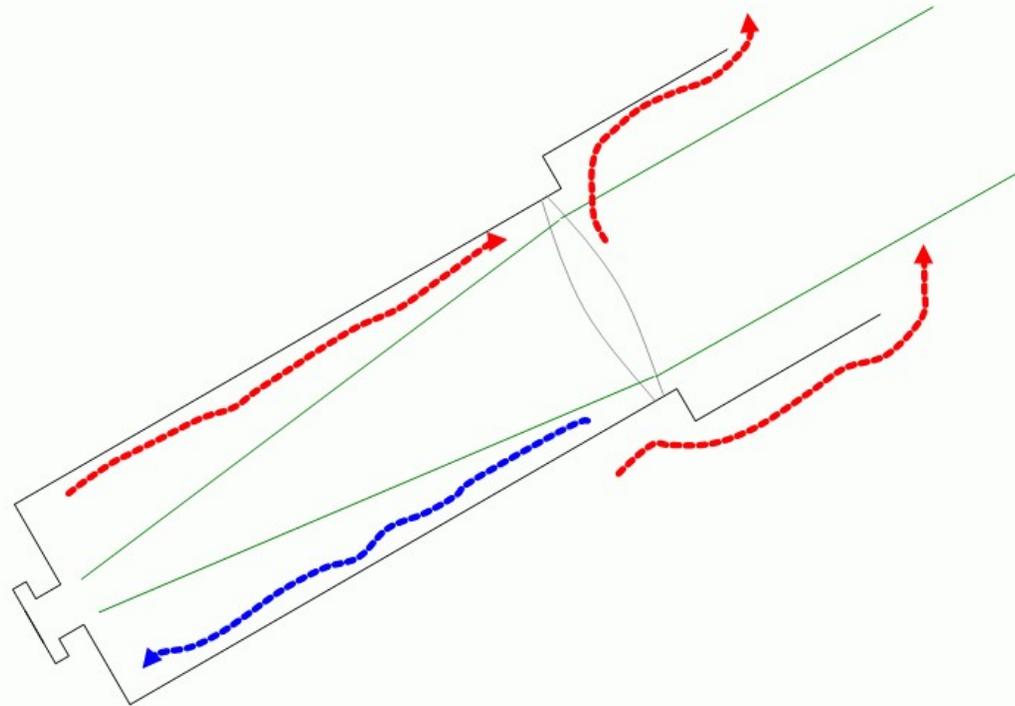
- \* Zips straight across your aperture
- \* Does not swirl
- \* Moves quicky

## *Tube Currents*

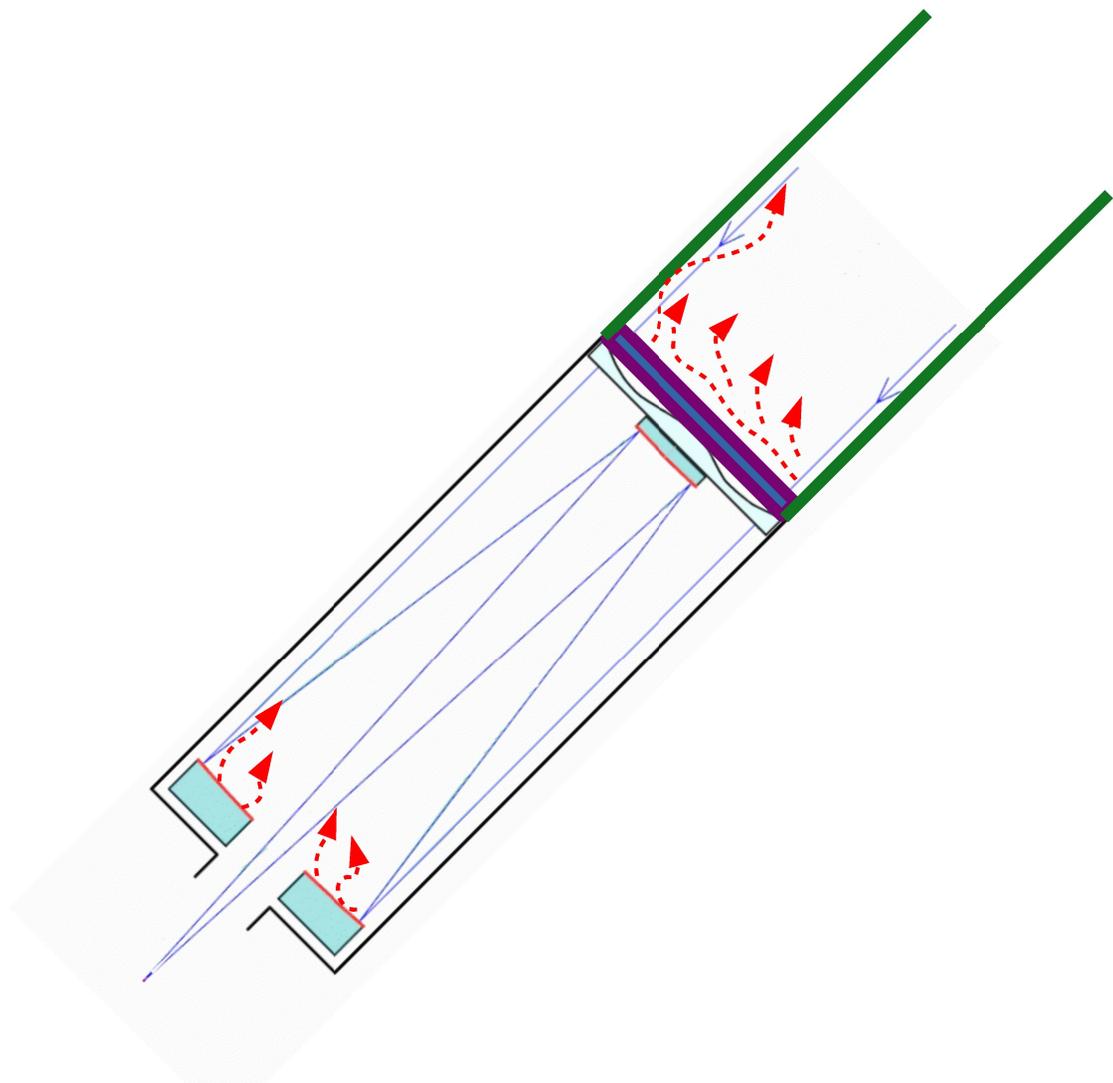
- \* Swirls
- \* Moves slowly
- \* "Can of Worms" appearance



Tube Currents in a reflector



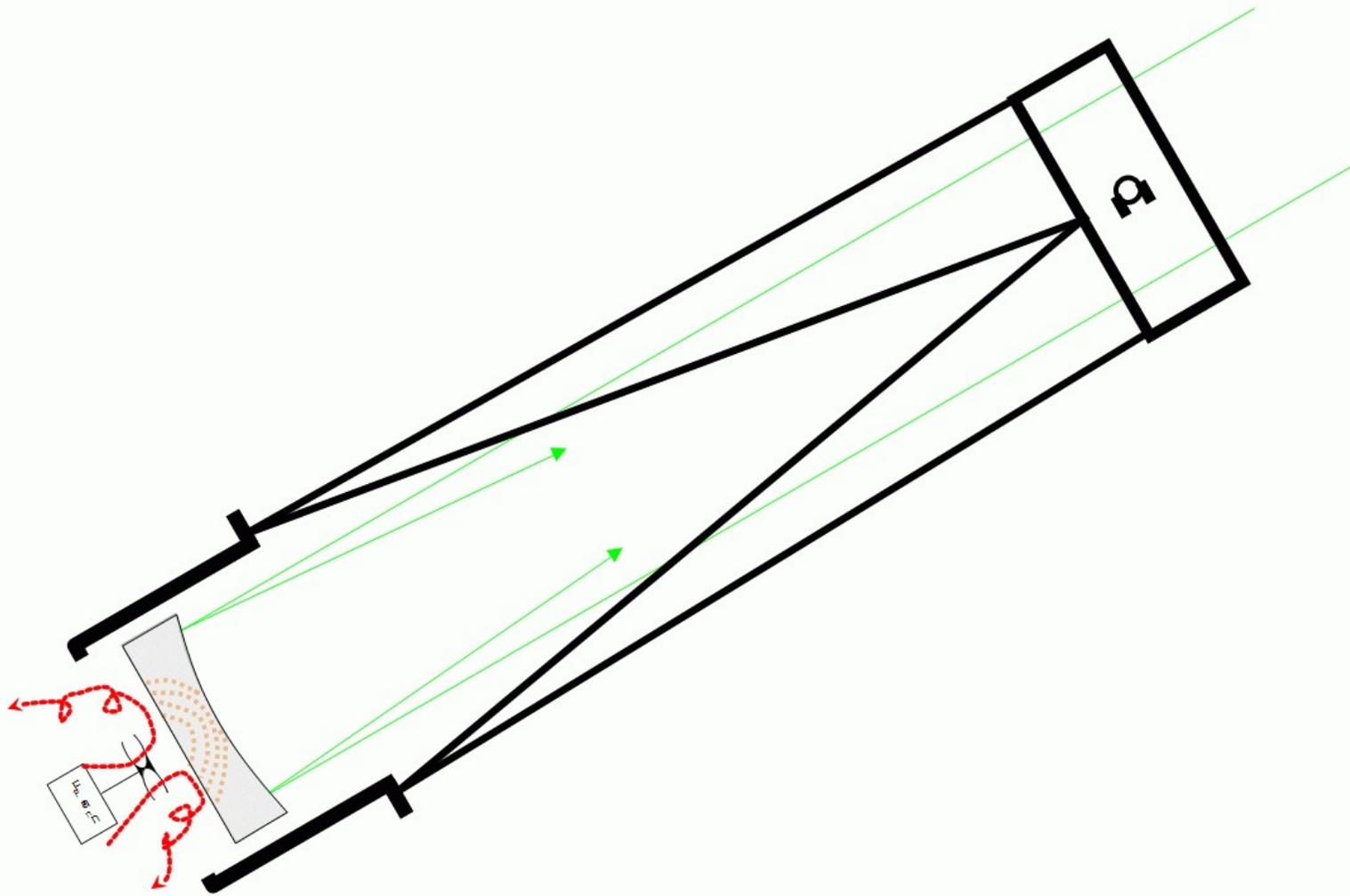
Tube Currents in a refractor



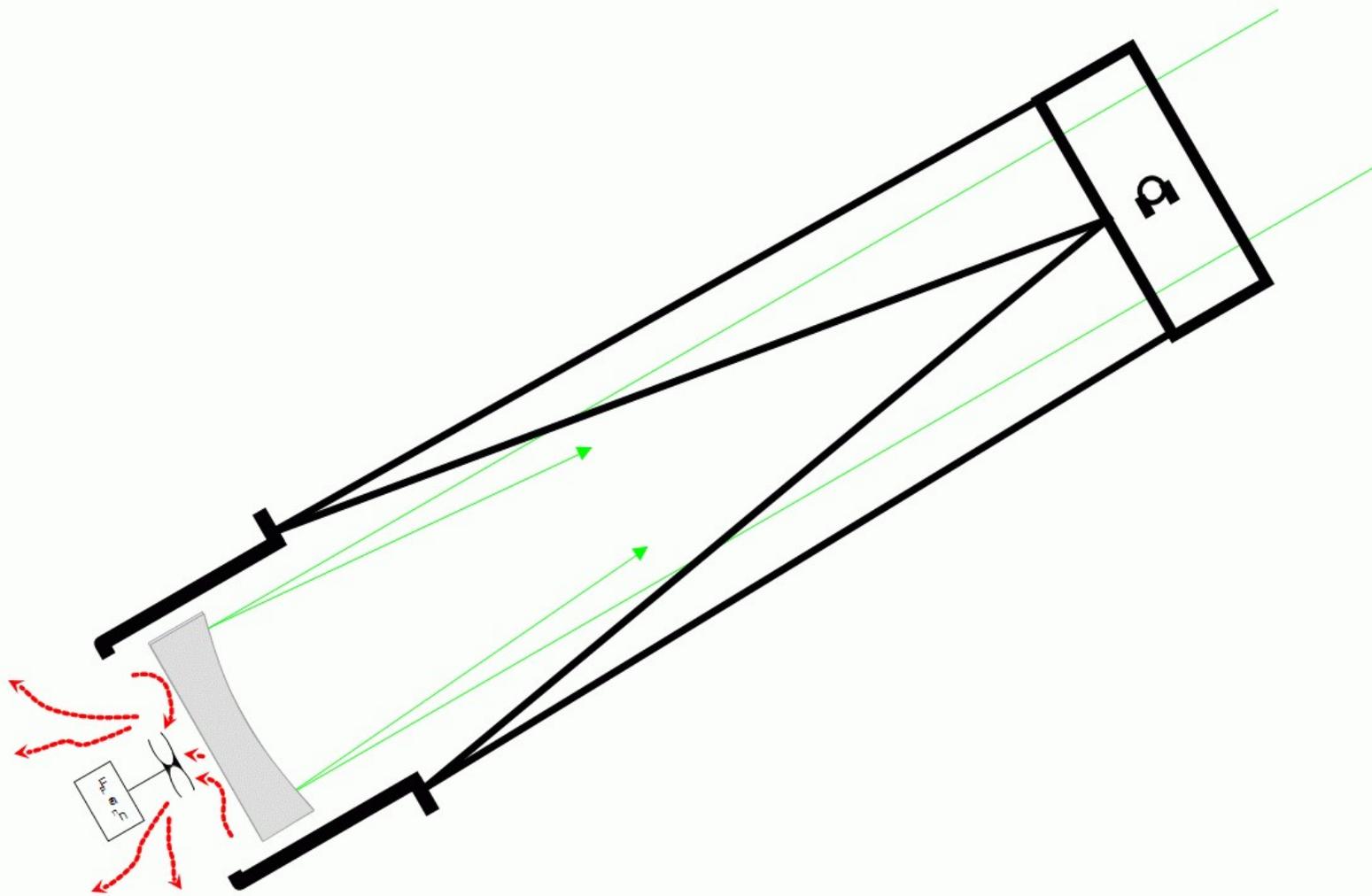
# Tube currents can be fixed

1. Wait
2. Add cooling fans

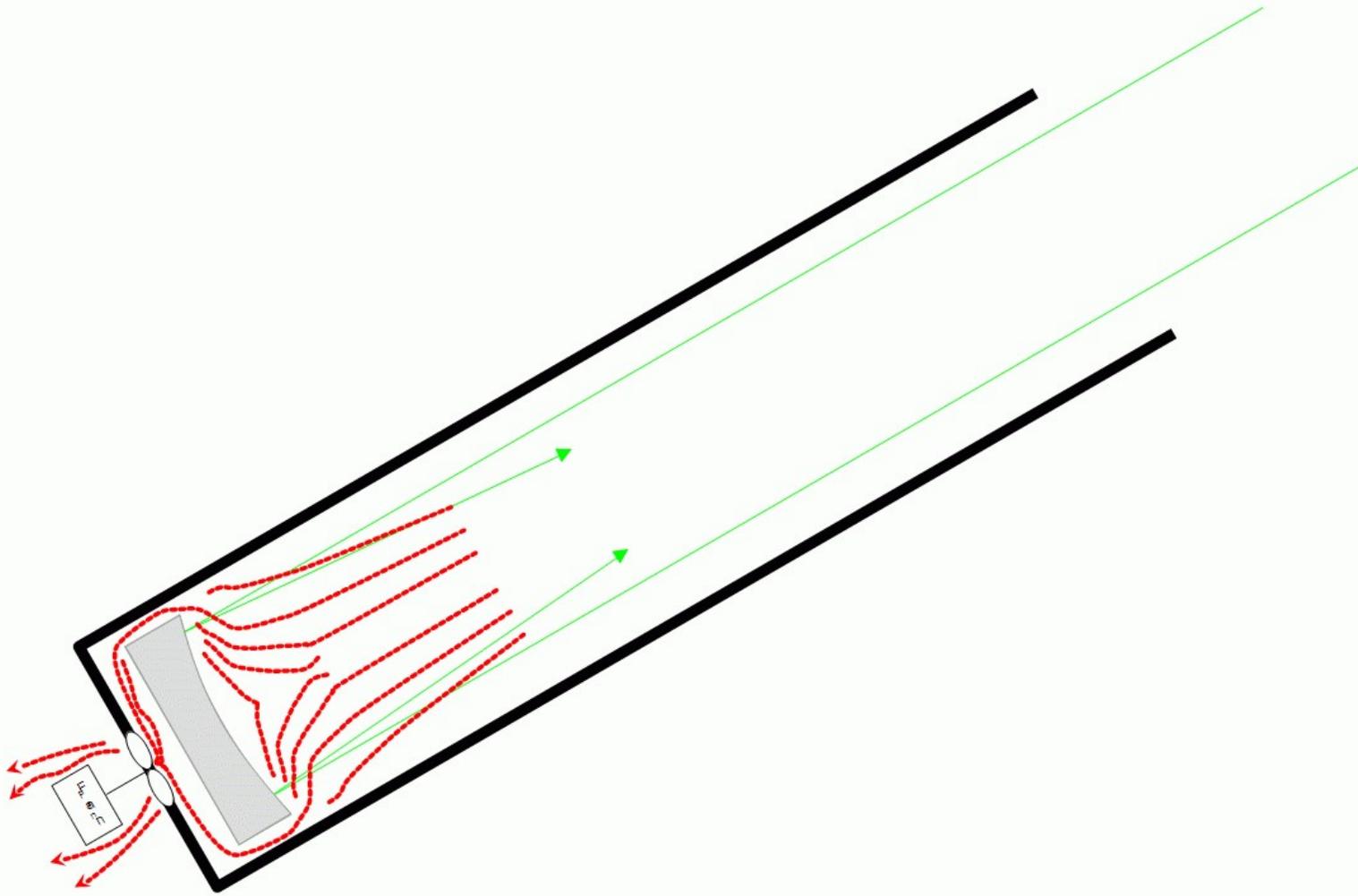
*The Great  
Suck vs Blow  
Debate*



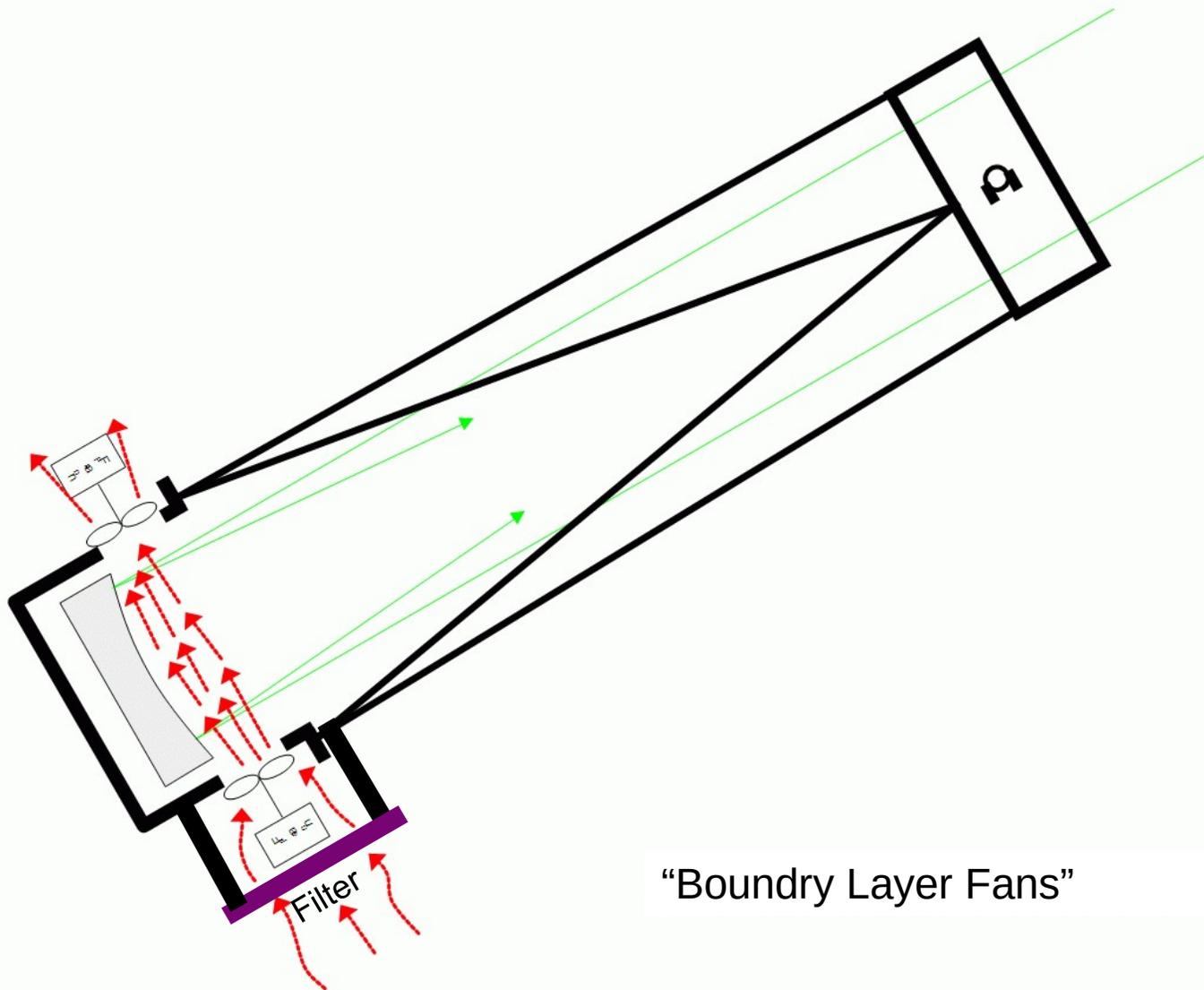
Fan blowing, truss tube



Fan sucking, truss tube



Fan sucking, solid tube



“Boundry Layer Fans”



# Solution for Schmidt-Cassegrain scopes



“If refractors are so good why bother with other telescopes?”



4 inch

=



8 inch



4 inch

==



12 inch



4 inch

==



22 Inch

## Big dobsonians are "light buckets"

Light Bucket Defn:

A derogatory term for a large telescope that cannot Focus sharply.

# *Jovian Moon Mutual Occultation*



*Aug 21, 2009 05:28 Starfest*









1.2 arcseconds

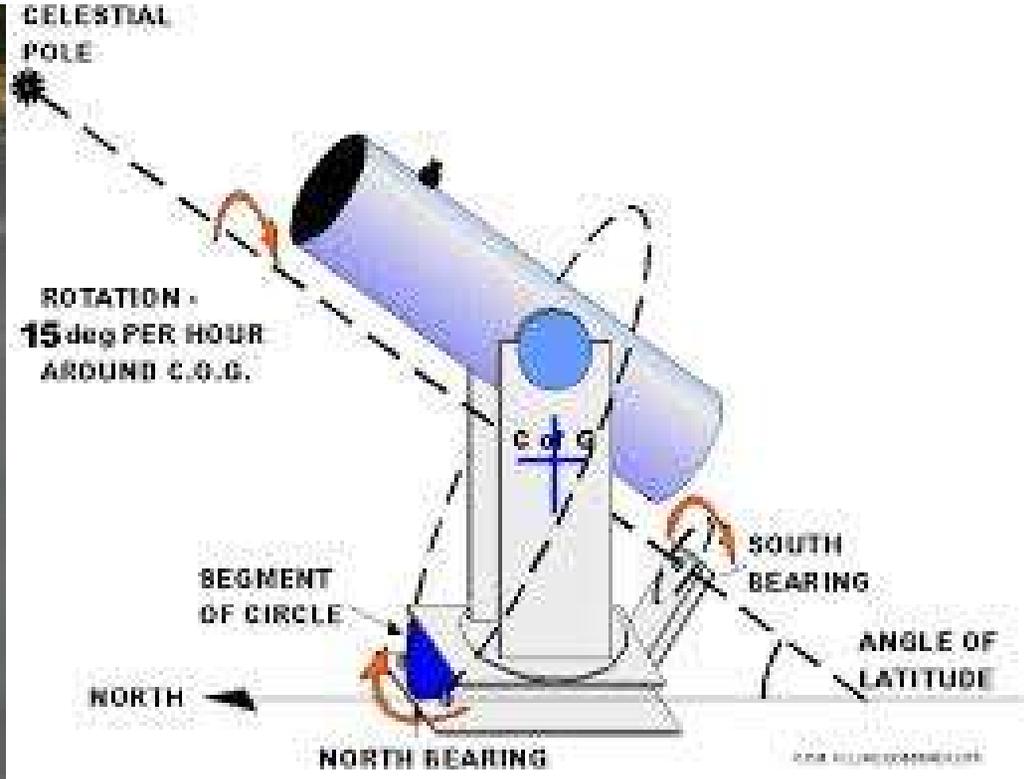
Dobsonians are no good at astrophotography

*Some scope designs are better for Astrophotography*

# Manual Tracking Alt-Az

- \* difficult to attach camera on dobs
- \* suitable only for short exposures of bright objects:  
Moon







## Image rotation











Mike Wirths

Buying a big telescope will cause your sanity to be questioned



36" owned by "Crazy" Bob Summerfield

40 to 70 inch telescopes owned by amateurs



# 40 to 70 inch telescopes owned by amateurs



The Divorce Telescope



**Buying any telescope will cause your sanity to be questioned.**



Disclaimer: The “Saturn” defense only works if you own one telescope. If you own 12, you are still a nut case.

Mike Wirths