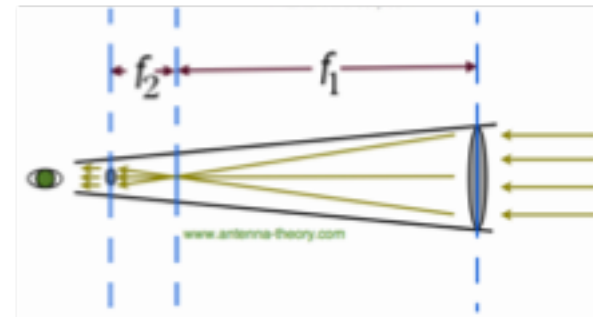


Optics and Telescopes II

- Things that can go “wrong”!
- Compound telescopes
 - Issues
 - Designs
- In-class exercise.

1

Magnification



2

Things that can go wrong...

- Image aberrations.
- Size/engineering/total cost.
- Want fancy (generally big, heavy) detectors.

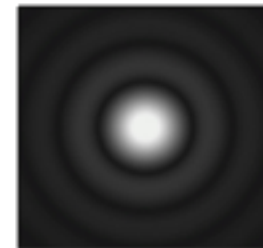
3

“Perfect” image of point source

Perfect optics, no aberrations.



Actual Star

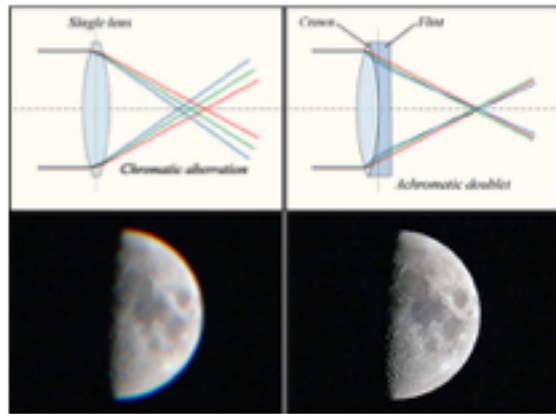


Airy Disc

4

Chromatic Abberation (CA)

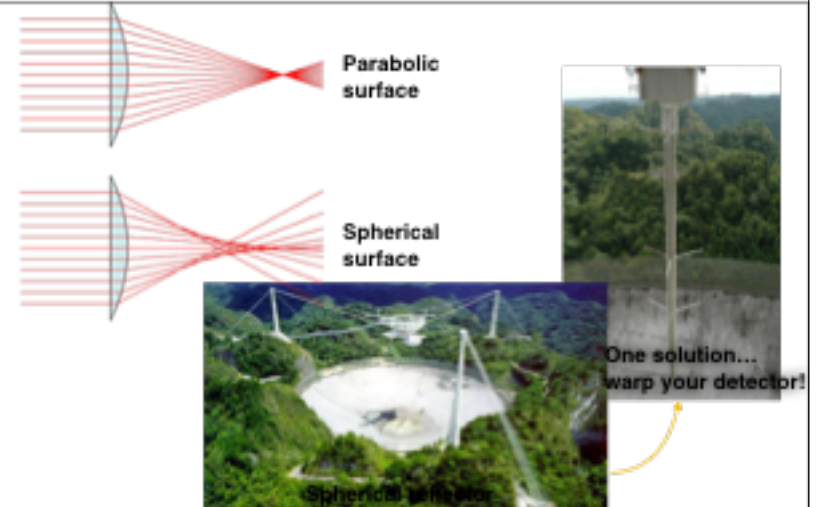
*THIS ONLY HAPPENS IN LENSES!



5

Spherical Aberration

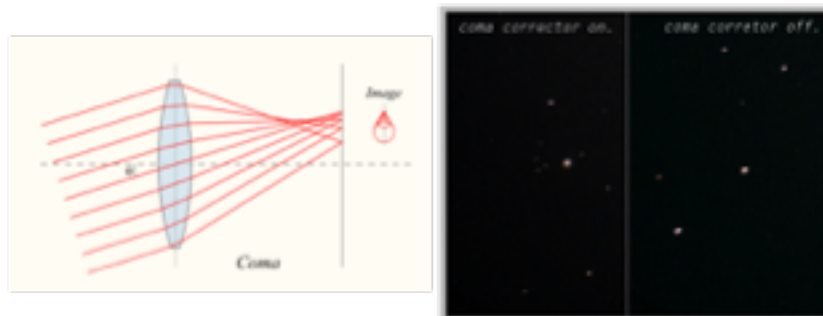
*THIS HAPPENS IN SPHERICAL LENSES AND REFLECTORS!



6

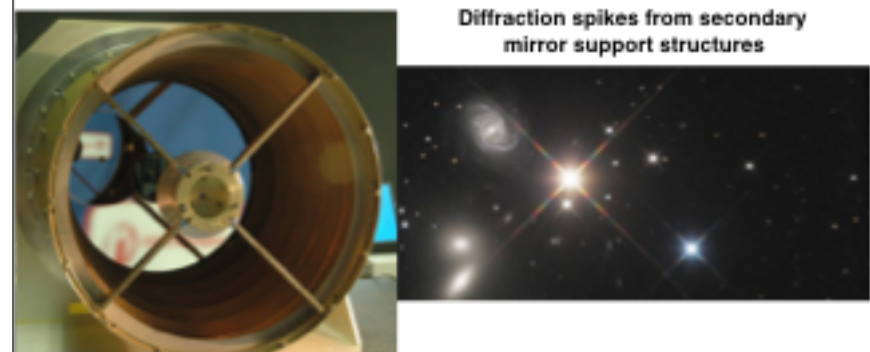
“Coma”

*THIS HAPPENS IN PARABOLIC LENSES AND REFLECTORS!



7

Other interferers



8

Reflector Surface Accuracy

- General rule of thumb:

$$\sigma_{\text{surface}} \lesssim 0.1 \lambda$$

JWST secondary mirror ($\lambda \sim 300 \text{ nm}$)



GMRT, India ($f < 1 \text{ GHz}$, $\lambda > 30 \text{ cm}$)



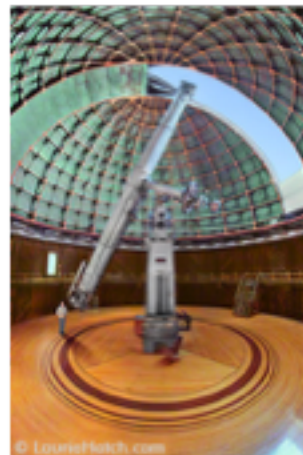
9

Things that can go wrong...

- Image aberrations.
- Size/engineering/total cost.
- Want fancy (generally big, heavy) detectors.

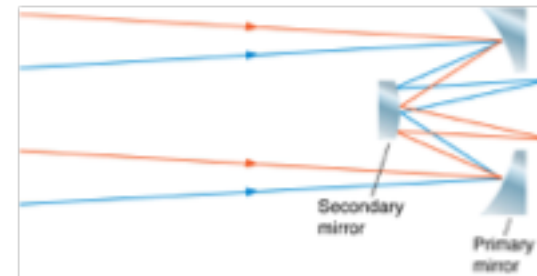
10

The problem with lenses...



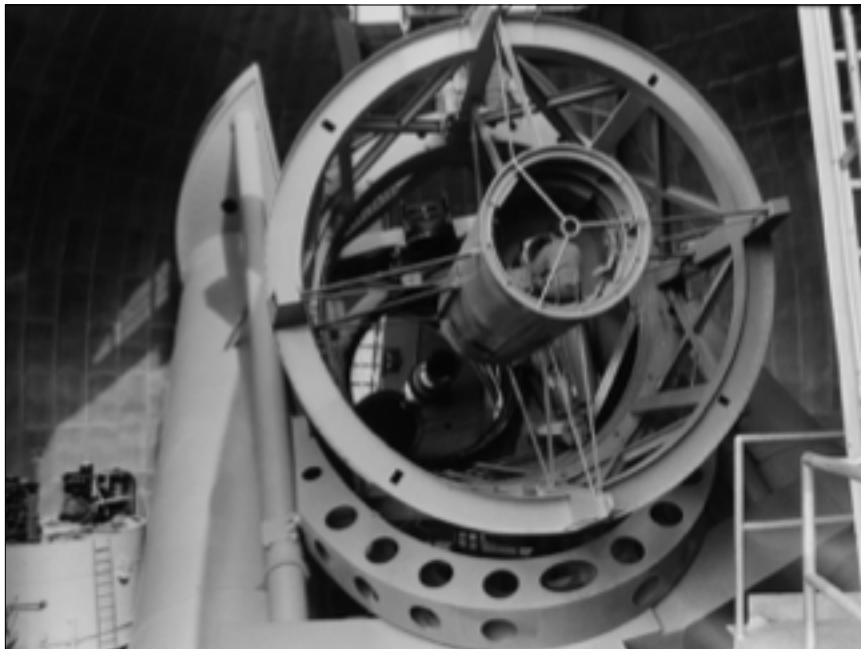
11

Reflecting Telescopes



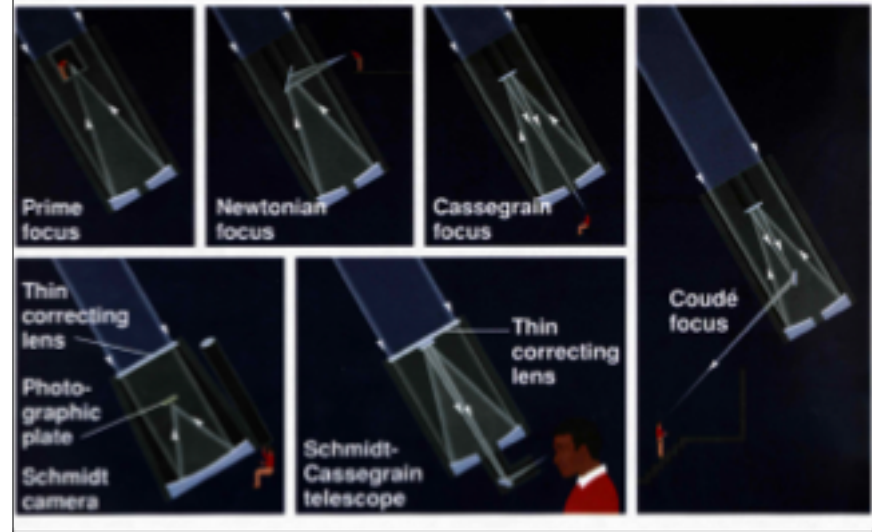
- Reflecting telescopes use mirrors.
- There are primary and secondary mirrors.
- Longer focal length can be achieved in smaller space – smaller telescopes

12

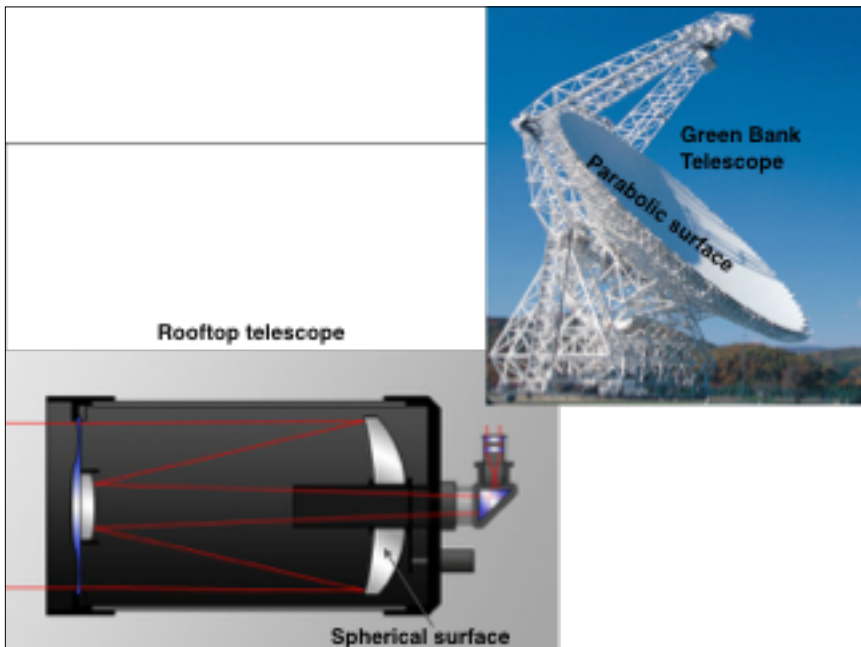


13

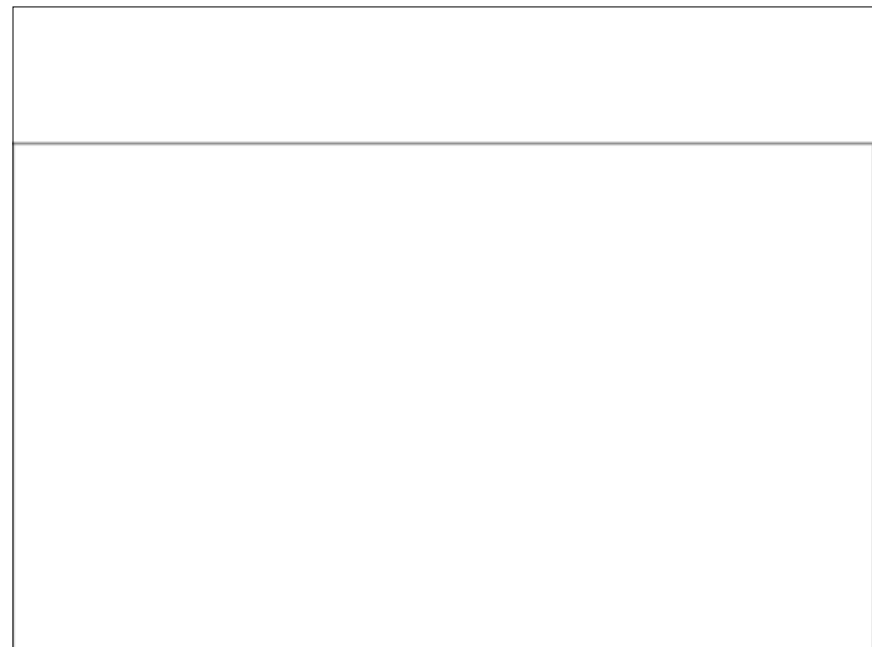
Types of Telescopes



14



15



16