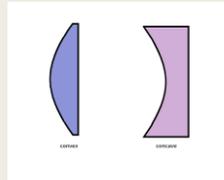


LENSES IN PHOTOGRAPHY

Lens terminology – more questions than answers-

- Refraction – how light is ‘bent’ by glass
- Light – what is light? What is a photon?
- Element- glass lens
- Concave/convex element



- Focal length- distance of focal point from light at infinity- low= wide angle long = telephoto usually in mm
- Fast– low fstop- lots of light gets through.
- F stop- the aperture or hole that light goes through- used to be a hole in a bit of brass put in lens as a ‘stop’
- F number- focal length/ fraction ie 80mm fl lens f/4 is 20mm across.

One stop larger doubles amount of light.

First lenses 1800s

- Singlets – double convex single element lenses
- The birth of photography came out of the camera obscura- a drawing aid and the magic lantern as projection device.
- Thomas Wedgwood- 1771-1805 silver nitrate mainly contact prints couldn't fix them .
- Daguerre- 1839 silver iodide , mercury vapour
- Fox Talbot – sodium chloride / silver nitrate to make silver chloride images- but not able to fix images until fixative sodium thiosulphate used as fixative- Sir John Herschel 1839. mainly contact prints but used lenses in camera obscura calotypes. 1842- silver iodide.

Daguerre

Still life- 1830s

The camera club judges – comments-

Well seen but the printing and exposure are wrong. Highlights burnt out- check histogram next time. Blacks not true black. Muddy contrast. Uninspiring composition and content.



William Henry Fox Talbot

Before 1844

“Grannys glass cabinet.”

Camera club judges- shelves are not
straight

Uneven glassware in bottom and top row.

Lighting plain and boring

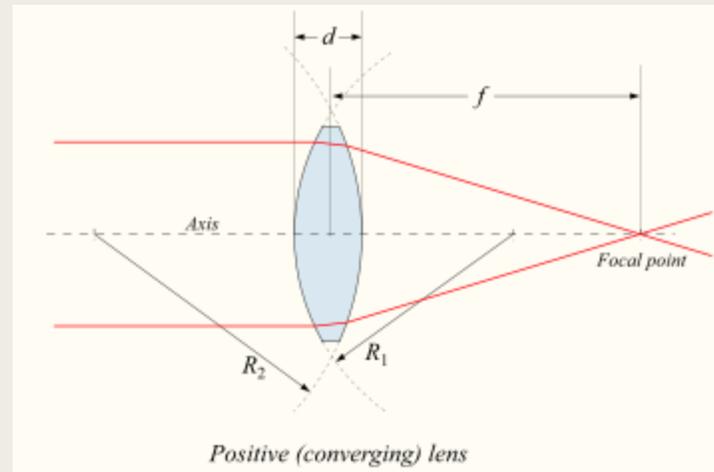


Thomas Wedgwood

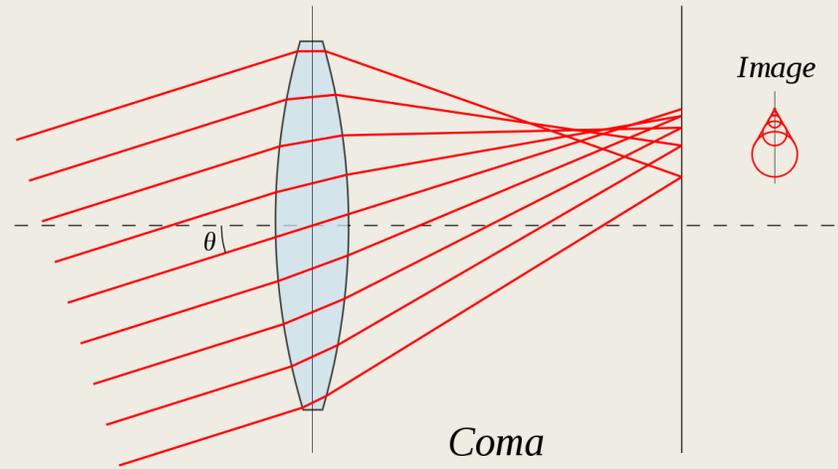
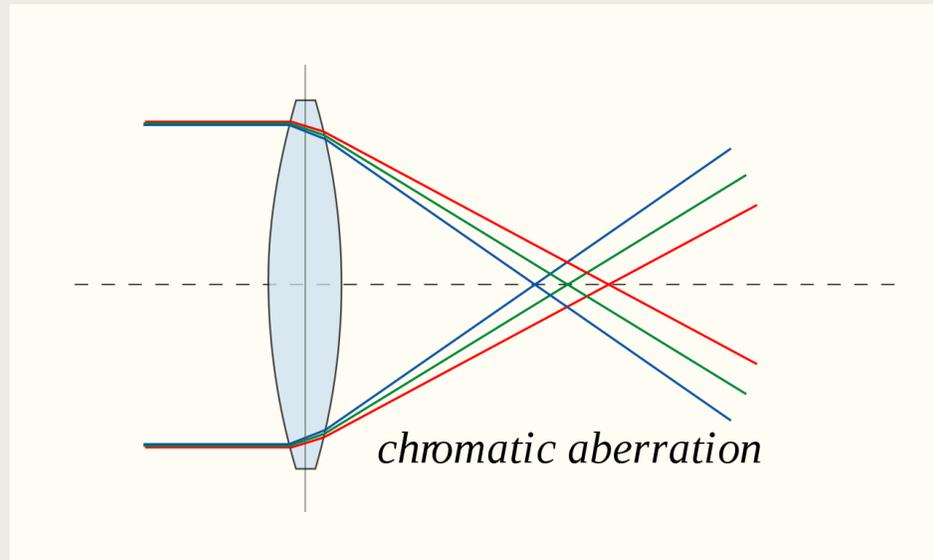
Unable to fix his contact prints.

Did not submit images to the camera club
competition as degraded.

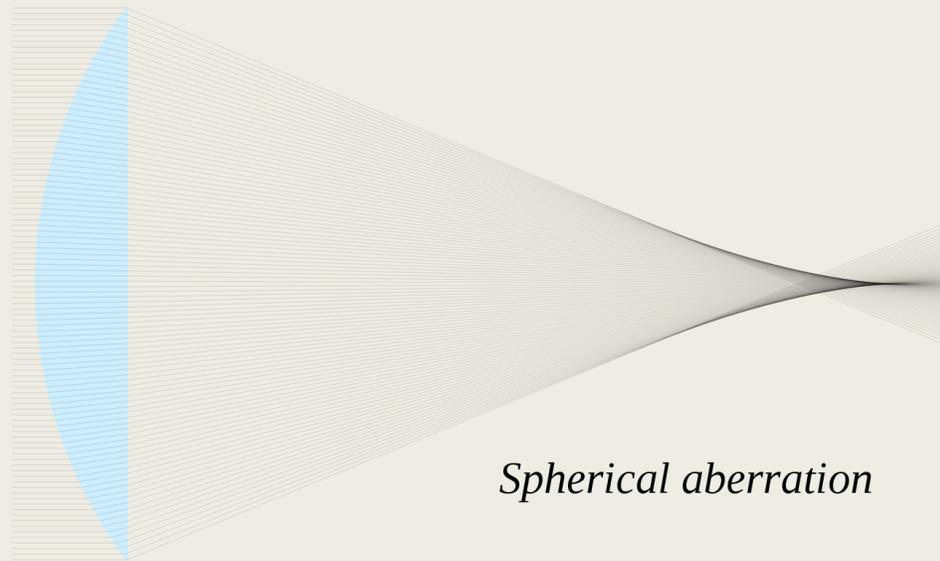
Lens refraction basics-



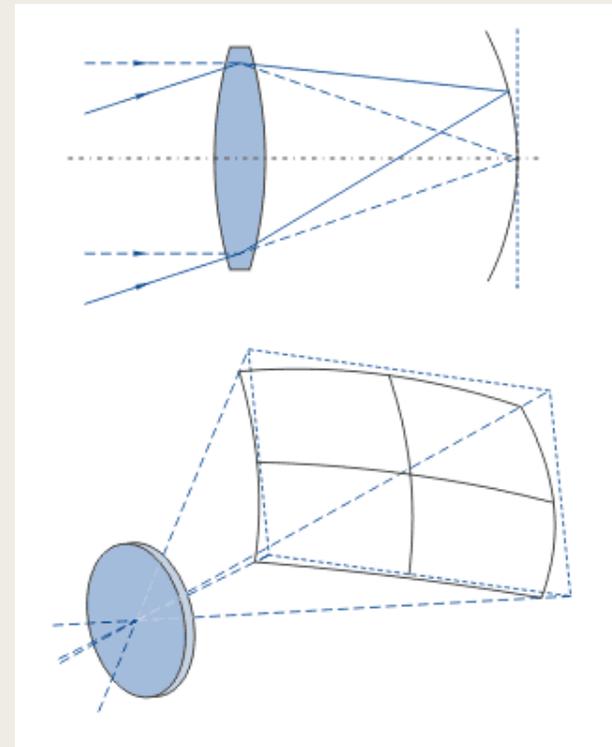
Aberations



aberrations

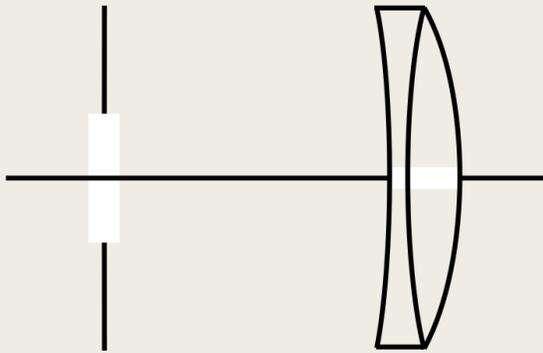


Spherical aberration



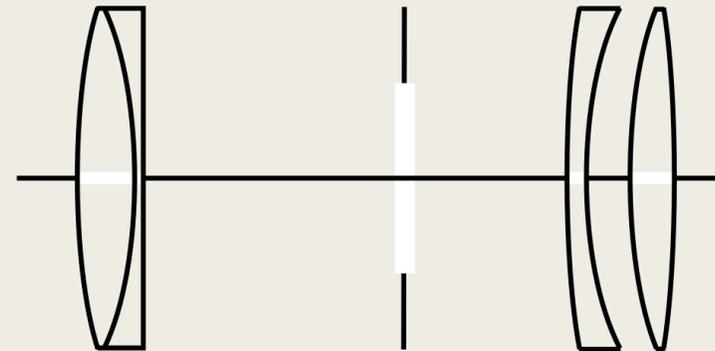
Correcting chromatic aberration-

Chevalier Achromat-
Very slow lens due to small aperture-
f16



Chevalier Achromat Landscape, 1839

Petzval Portrait f3.6
first fast lens- needed due to slow
speed of emulsions-



Petzval Portrait, 1840

<https://youtu.be/EL9J3Km6wxi>

Canon brief video.

Petzval portrait 1840-

Classic Petzval rendering- large field curvature ,
astigmatism, but central sharpness and peripheral blur-

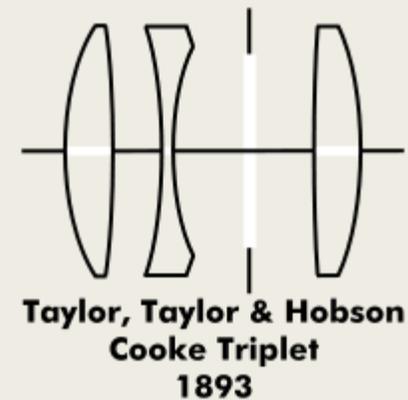
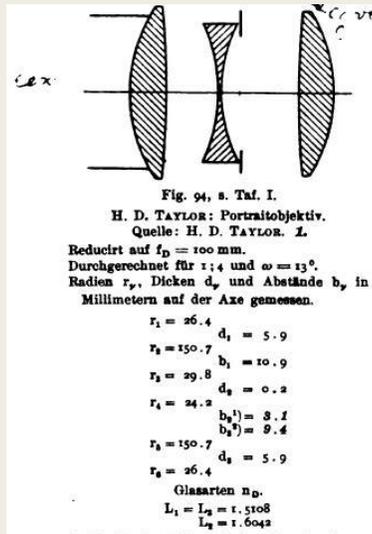


LOMO repro Petzval swirling background – far less
corrected than original



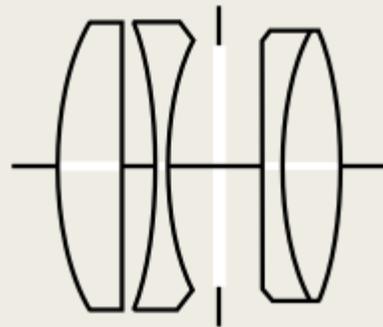
Cooke triplet 1893- f3.5

The most important optics design- correcting spherical, coma, astigmatism and distortion with only 3 elements



Zeiss Tessar-

Zeiss designer Paul ruddolph's next design evolved from his earlier protar- used for standard lenses to f2.8



Zeiss Tessar, 1902

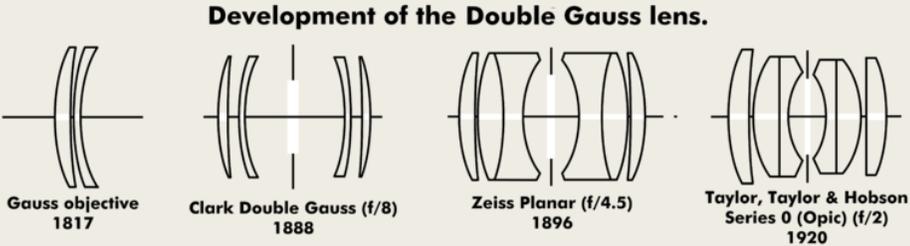
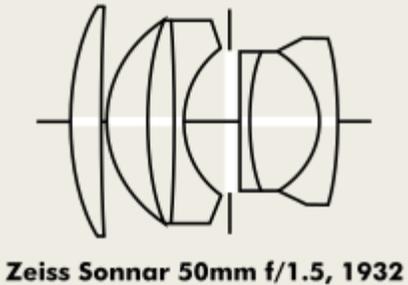
4 elements in 3 groups. Tessar is a contrasty lens, good central sharpness



Sonnar and Planar

Sonnar design allowed fast lens and telephoto – most fast prime telephotos are derived from sonnar.

Planar design became known as best corrected and fast standard lens – most modern standard lenses are derived from double gauss.



Sonnar glow-



Planar- detail



- Lighting makes your photos sharp.
- The best lens does not always make the best photograph.
- Not talking about- telephoto
- Retrofocus
- Floating lens elements
- Fisheye
- Zoom
- Mirror lenses

Choosing a lens – to use

<https://youtu.be/-5dmPUABing>

Essential

- Mount- it has to fit your camera- or be adapted
- Perspective- angle of view
- Prime vs zoom

Desirable

- Fast- light gathering
- Fast AF or manual.
- Durable
- Small
- Say fuji or fujinon on the name ring.

Choosing a lens – to use

System

- Wide 20-28mm
- Standard 40-55mm
- Tele 80-150mm
- Super tele 200mm+
- (35mm/Ff equiv)

primes

- Best IQ
- Fast
- Methodical approach to photo composition.
- Heavy expensive, changing lenses etc. Lends itself to a 2 camera solution-wide on one , tele on other body.

Choosing a lens – to use

ZOOOOOOOOOOms

- One lens to do everything- 24-105
- 2 zooms- wide zoom and general zoom
- 3 zooms or long range zoom.
- I don't like zooms,

Flexibility-

- Zoom lenses used to have awful IQ.
- Slow
- Extending length
- But can reduce pack size. I have quite a few zooms. – but I don't like them.

Choosing a lens – to use

starting

- 50mm f1.8 prime standard.
- Less to distract from compositions
- Will be 3-4stops faster than kit zoom
- Best IQ
- Small and handy
- 28-70 zoom (kit zoom)
- Flexible- multiple perspectives in one lens

Adapting lenses - reasons

for

- Cheap (ish- some cost more than new)
- I already have old lenses- I want to use the lenses of my ancestors etc.
- I like manual focus
- I want something different
- I want to use the lens flaws in the image
- Modern lens is too clinical
- Fast fstop options

against

- I want best IQ- native lenses are corrected in camera and are likely to be optimal IQ.
- I don't like manual focus
- I want weather sealing
- I don't want to buy a load of old tat with fungus

Adapting lenses- experience

Canon fd to EOS

- My first use was adapting old canon fd macro kit to canon eos digital. The flange focal distance means FD will not focus to infinity on EOS.
- FFD is very important.

Fuji x mirrorless

- The mirrorless system has a very short FFD as no mirror box needed
- Almost any lens can be made to fit.
- Tried a large range of 35mm lenses on the APSc system. Easy to adapt.

Adapting lenses- problems

Quality- when new

- Flare-
- Veiling flare- depends on antireflective coatings. Uncoated multi element lenses the worst- loss of contrast (veiling)
- Sunstars flare and reflection from aperture



Adapting lenses

Quality – when new

- Soft especially wide open
- Aberations

Helios 44- biotar.



Adapting lenses

Quality – after 50 years or more

- Stiff helicoid- difficult to focus
- Aperture iris stuck
- Scratched elements
- Fungus on elements
- Oil on elements
- Amateur lens butchery
- Lens cobbled from random parts

Good news!

- Repairing lenses isn't impossible.
- Cleaning elements and iris all doable
- Lots on internet about disassembly
- Good fun to be had

fungus



Oil on iris
blades



Oil condensation

From helicoid grease migration



Schneideritis



Balsam separation

Canada balsam- a type of resin is used to cement doublets and triplets



Dust in lens

Using a light shows dust dramatically but not a very useful test.



Adapting lenses- suggested examples

Depends on your system – check out availability of adapters.

- M42- large range of lenses- zeiss jena, pentax, pentacon, meyer, mamiya, praktica. Soviet lenses
- Canon / Olympus/Nikon proprietry
- M39 old leitz, nikkor, canon RF lenses soviet lenses
- LTM- modern leitz
- M42 gives access to some cheap and varied lenses.
- Tessar 50mm
- Helios 44m 55mm
- CZJ sonnar 135mm

Further reading

Aperture

- Sharpness optimal sharpness is at a specific fnumber and relates to that lens design, usually f8 unless designed for wide open use.
- Sharpness deteriorates after that point due to diffraction
- Depth of field
- The smaller the aperture to greater the depth of field, older lenses are marked with depth of field for hyperfocal distance- old tech.

Further reading

Digital sensor

Film

Not the same.

Lenses designed for film do not have same results on sensors.

Experiment.

- <https://www.pencilofrays.com/lens-design-forms/>
- <https://www.youtube.com/watch?v=CiHN0ZWE5bk>
- <https://www.youtube.com/watch?v=vKS3-npxgls>
- <https://www.youtube.com/user/mikeno62/playlists>