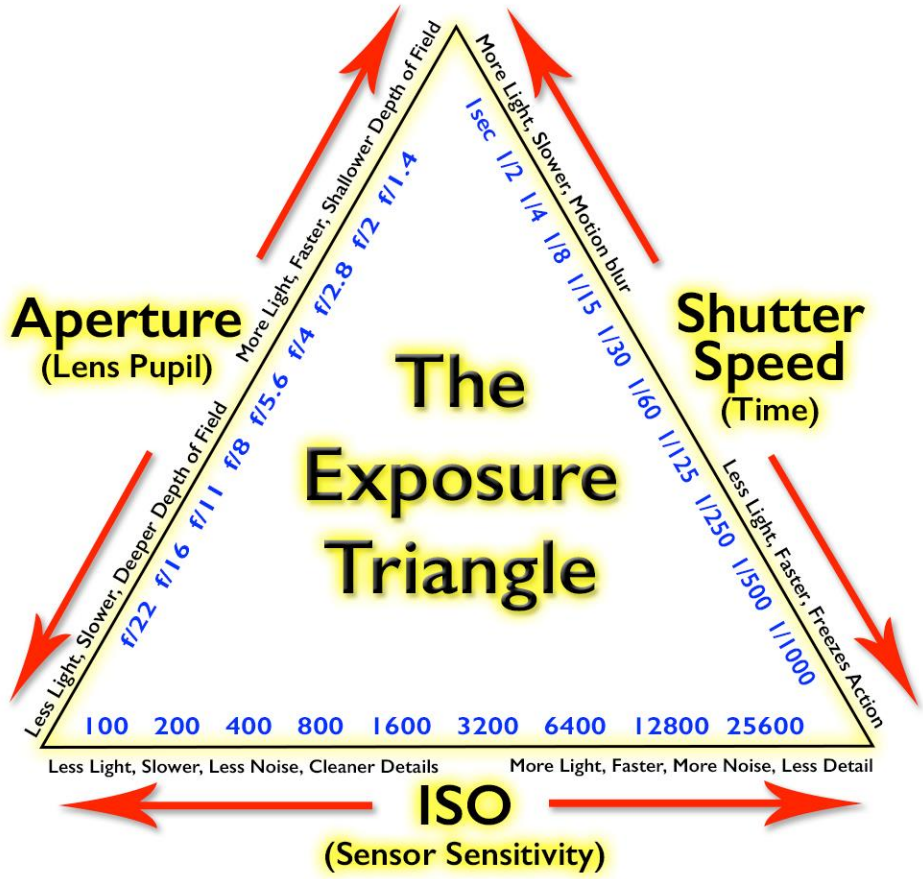
Aperture

Volume of Light and Depth of Field

What will be covered

- Aperture control of light volume in an exposure
- Aperture (f/stop) settings: what they represent
- What is depth of field
- Aperture to control depth of field

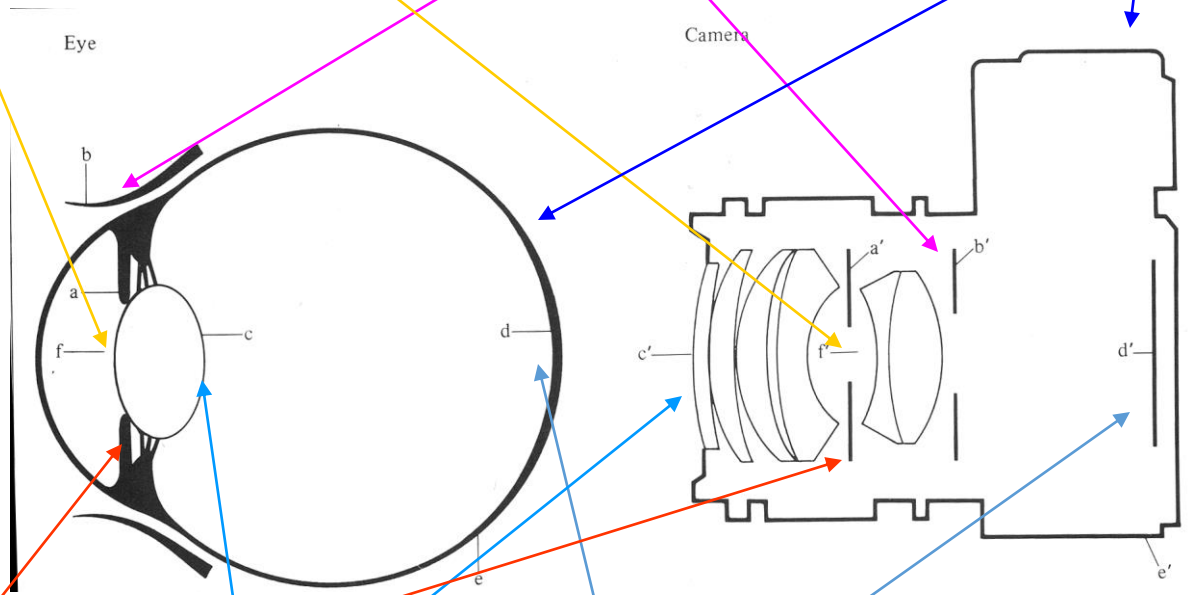

The Exposure Triangle
Aperture
(Lens Pupil)
Shutter Speed
(Time)
ISO
(Sensor Sensitivity)
More Light, Faster, Shallower Depth of Field
Less Light, Slower, Deeper Depth of Field
More Light, Slower, Motion blur
Less Light, Faster, Freezes Action
f/22 f/16 f/11 f/8 f/5.6 f/4 f/2.8 f/2 f/1.4
1sec 1/2 1/4 1/8 1/15 1/30 1/60 1/125 1/250 1/500 1/1000
100 200 400 800 1600 3200 6400 12800 25600
Less Light, Slower, Less Noise, Cleaner Details
More Light, Faster, More Noise, Less Detail

The Camera/Eye Comparison

Aperture = Pupil

Shutter = Eyelashes

Camera body = Eyeball



Iris diaphragm = Iris

Lens

Film = Light sensitive retina

Bokeh

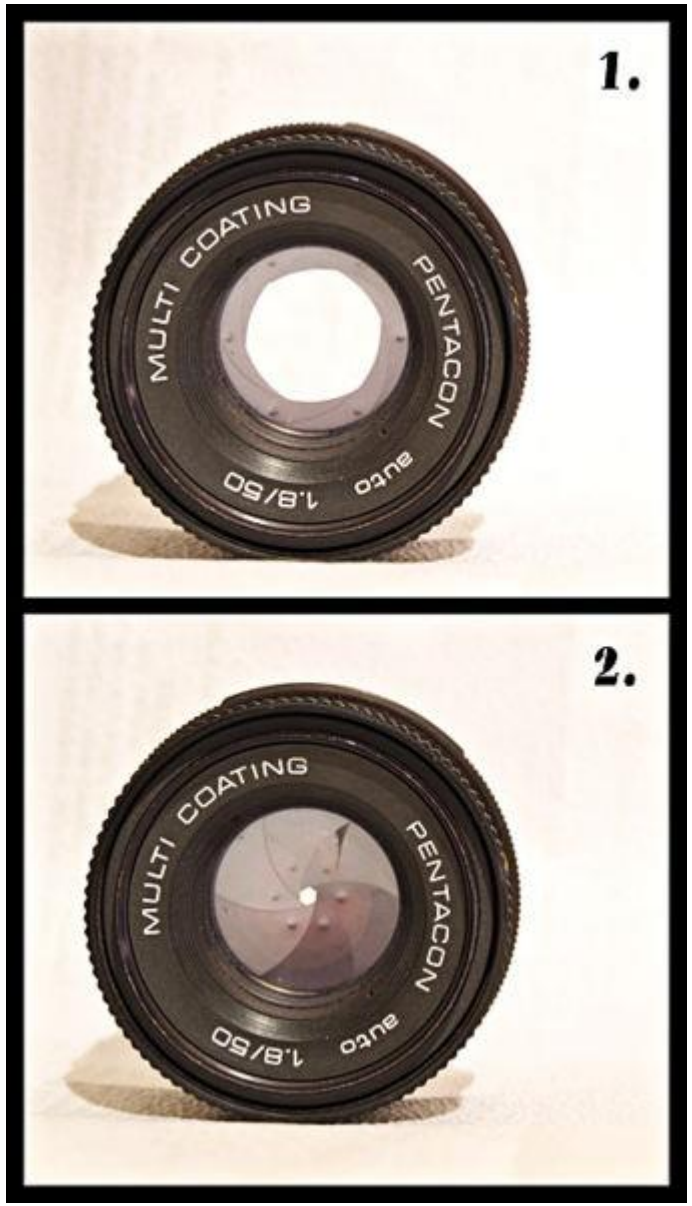
Ryan Phillips

The term comes from the Japanese word *boke* (暈け or ボケ), which means "blur" or "haze", or *boke-aji* (ボケ味), the "blur quality"

Jacob Blade

Aperture

Also known as f-stop

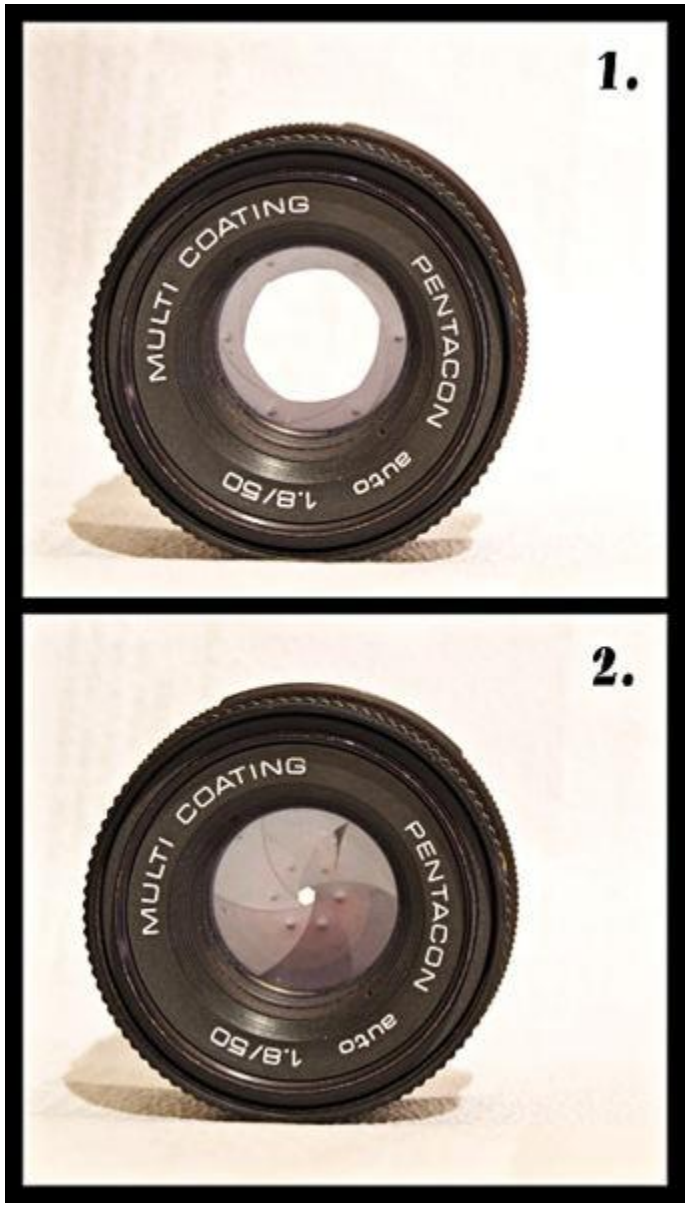


Aperture

Controls opening's size during exposure and thus volume of light in an exposure

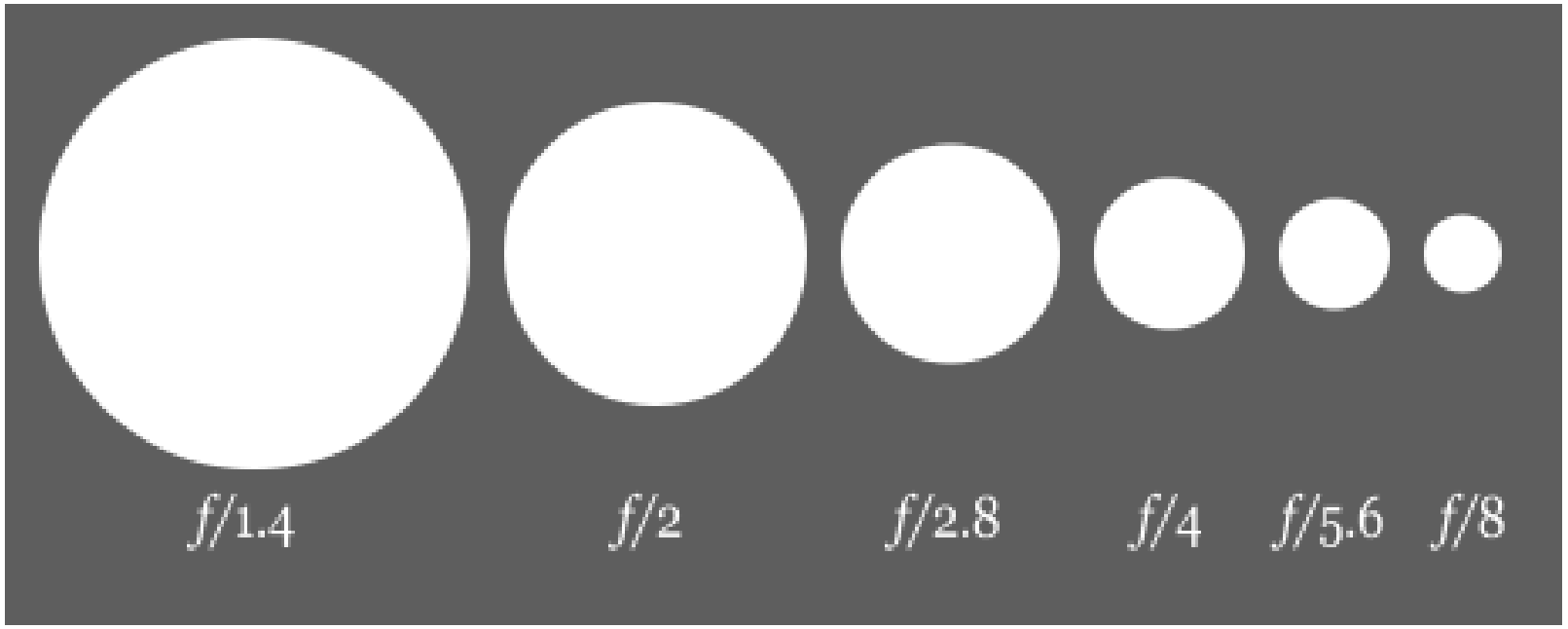
Controls Depth of Field

Another term for aperture: **f-stop**



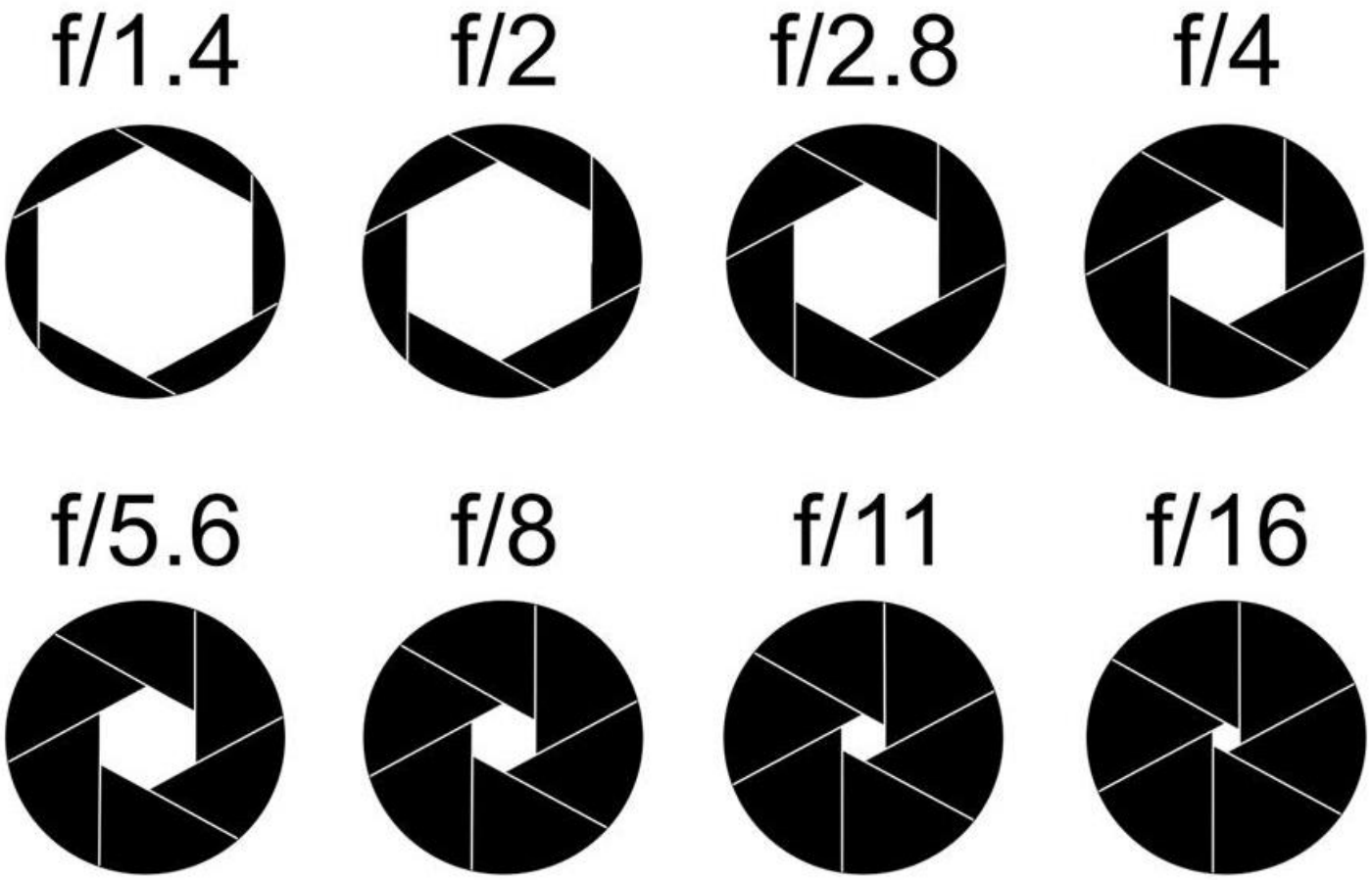
Each full stop on the aperture (f-stop) either doubles or halves the amount of light let into the camera

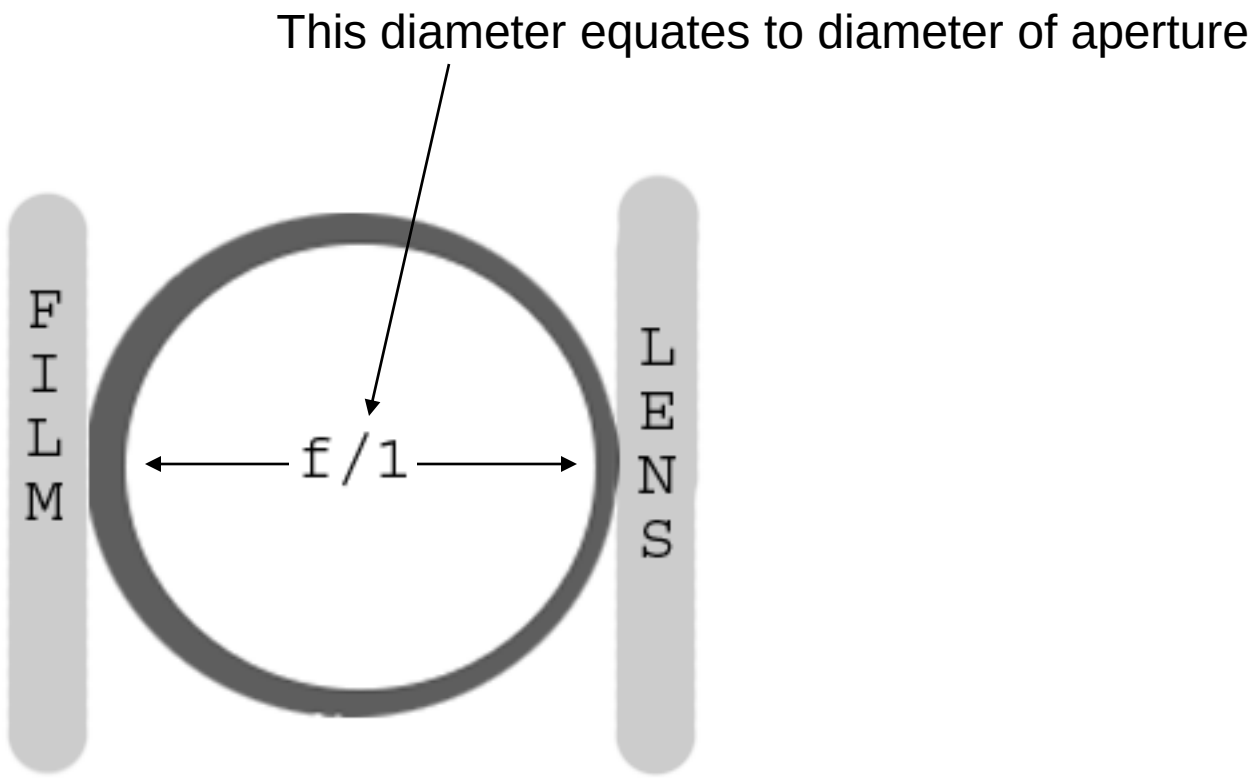
Light is halved this direction



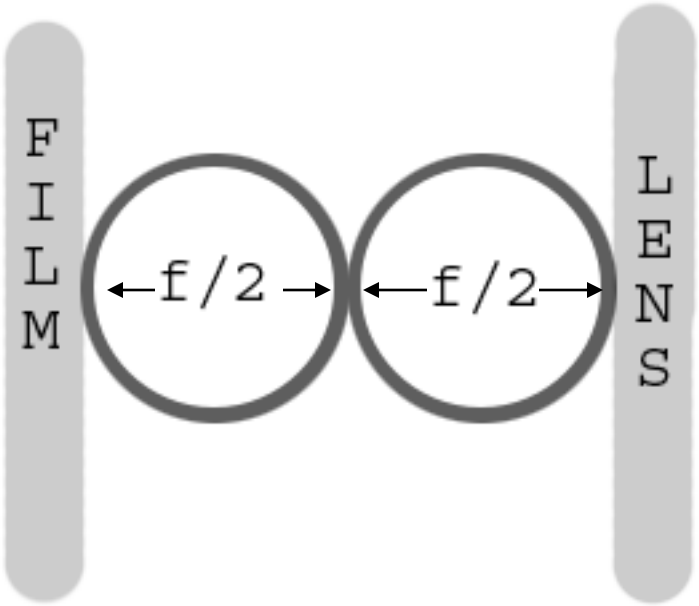
Light is doubled this direction

Why does a larger f-stop number actually represent a smaller aperture opening?

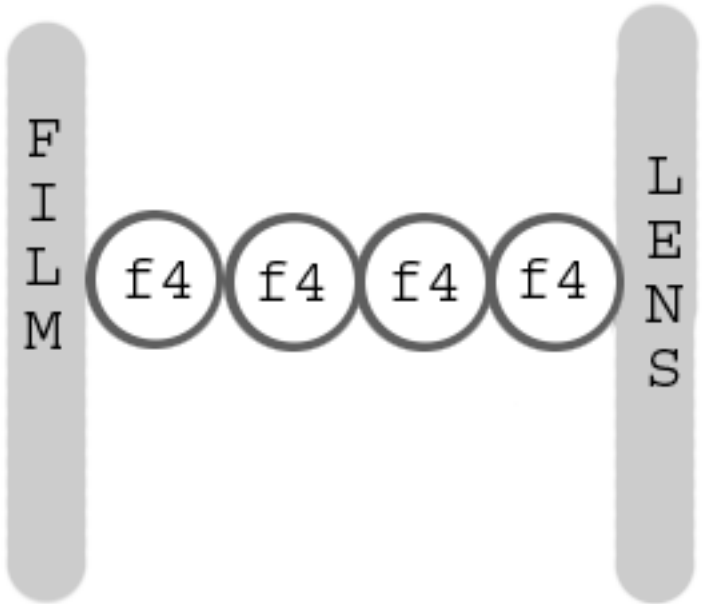




Diameter is 1/1 the distance between film
and back end of lens

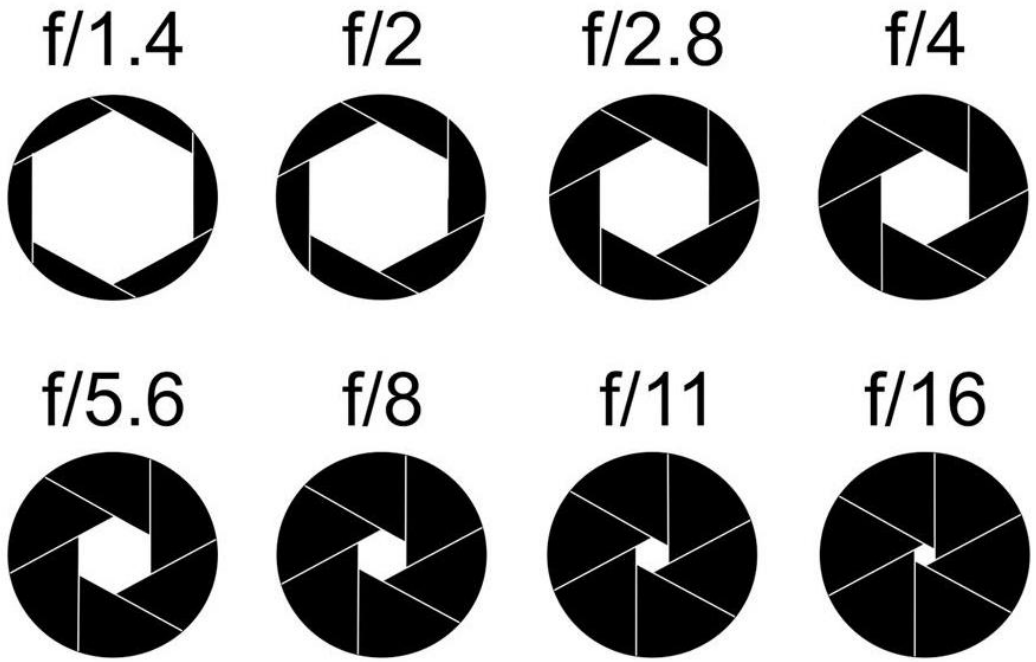


Diameter is 1/2 the distance between film and back end of lens



Diameter is 1/4 the distance between film
and back end of lens

Why the weird numbers?



- It is a logarithmic scale
- Through scientific method, these settings were discovered to be stop settings that double and halve exposure
- It would be nice if it went f/1, f/2, f/4, f/8, etc., but that is not how light behaves with apertures

Limits on how small an aperture will go on various cameras

Large Format

f/64

SLR

f/22

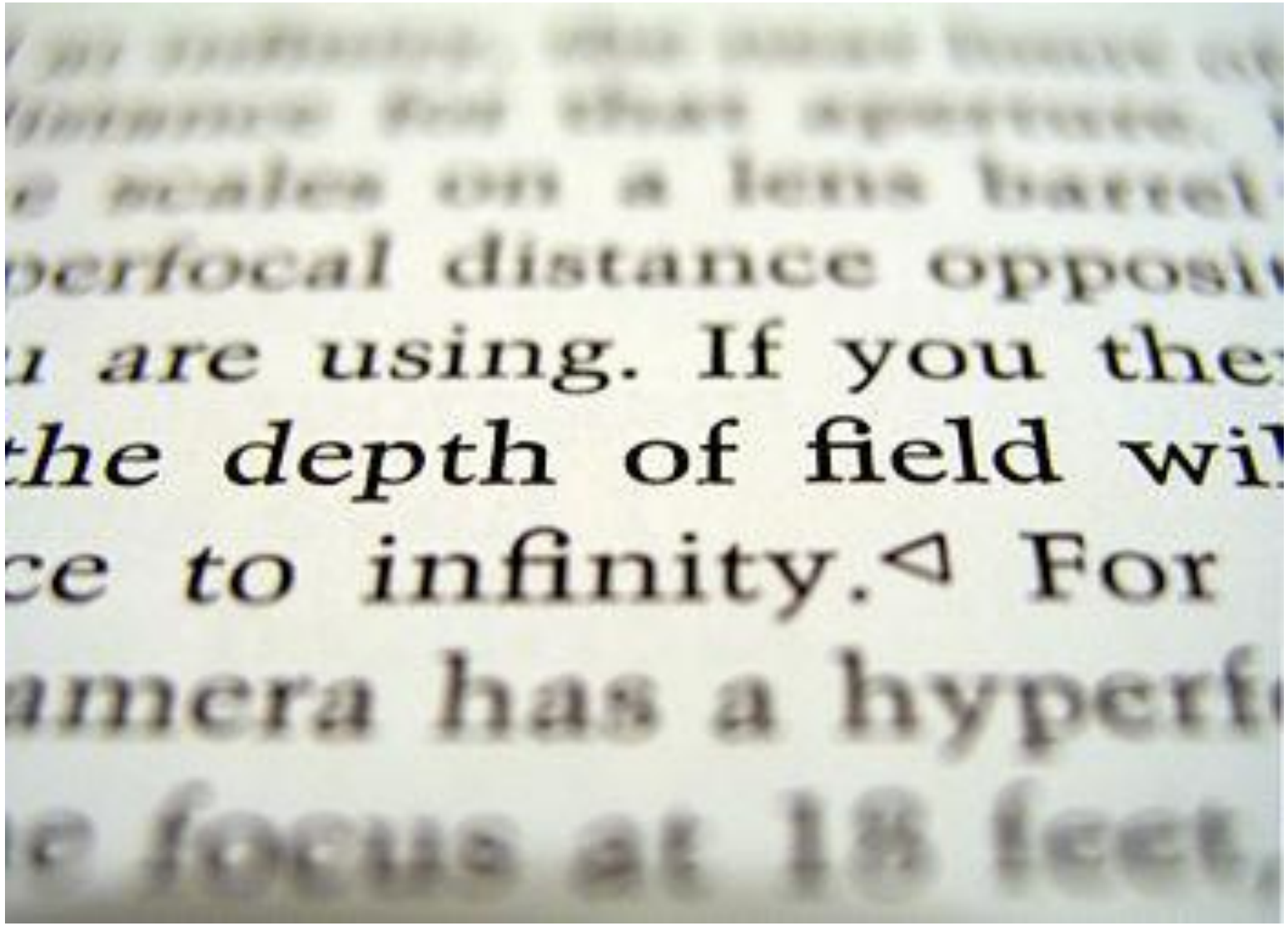
Cell Phone

f/8

Aperture and Depth of Field

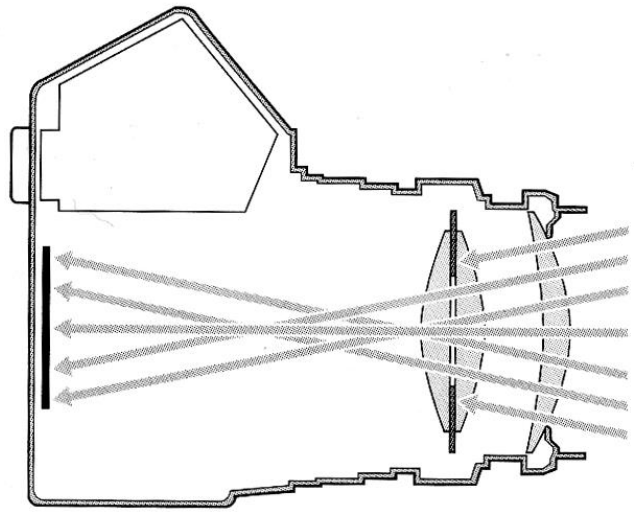
Depth of Field

- The zone of sharpness variable by aperture, focal length, or subject distance

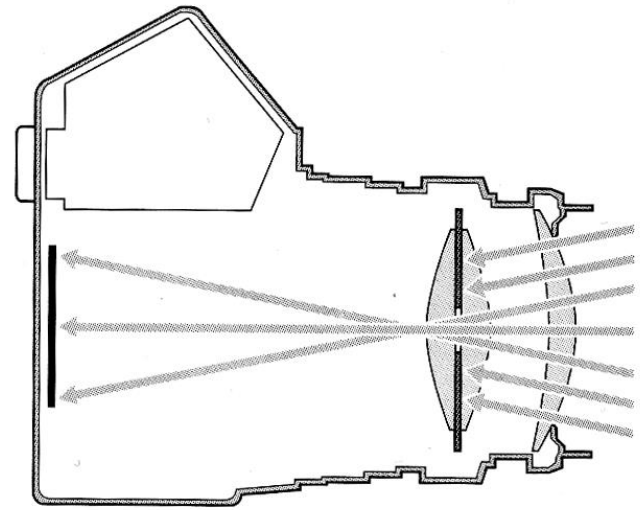

perfocal distance
are using. If you
the depth of field
ce to infinity.◁ For
amera has a

Aperture Control of Depth of Field

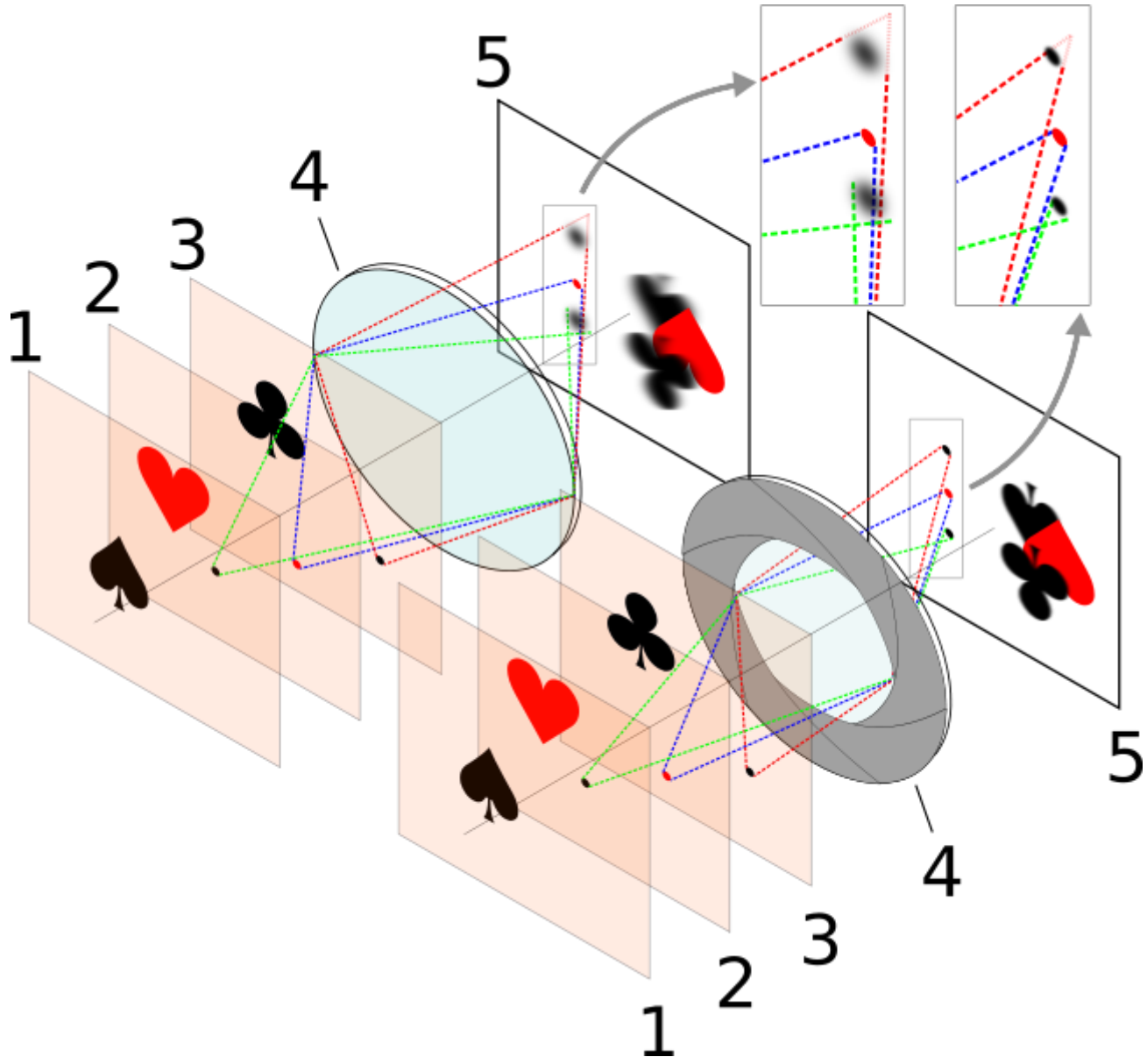
Aperture and Scattered Light Rays

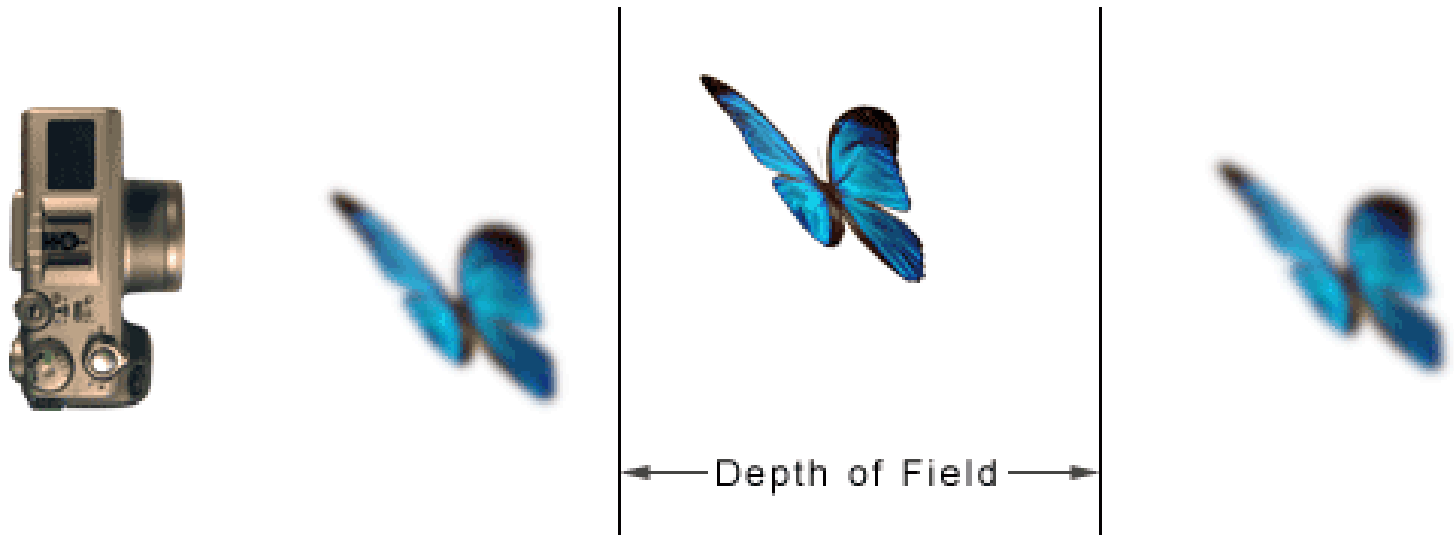


Wide Aperture



Small Aperture


5
4
3
2
1
1
2
3
4
5

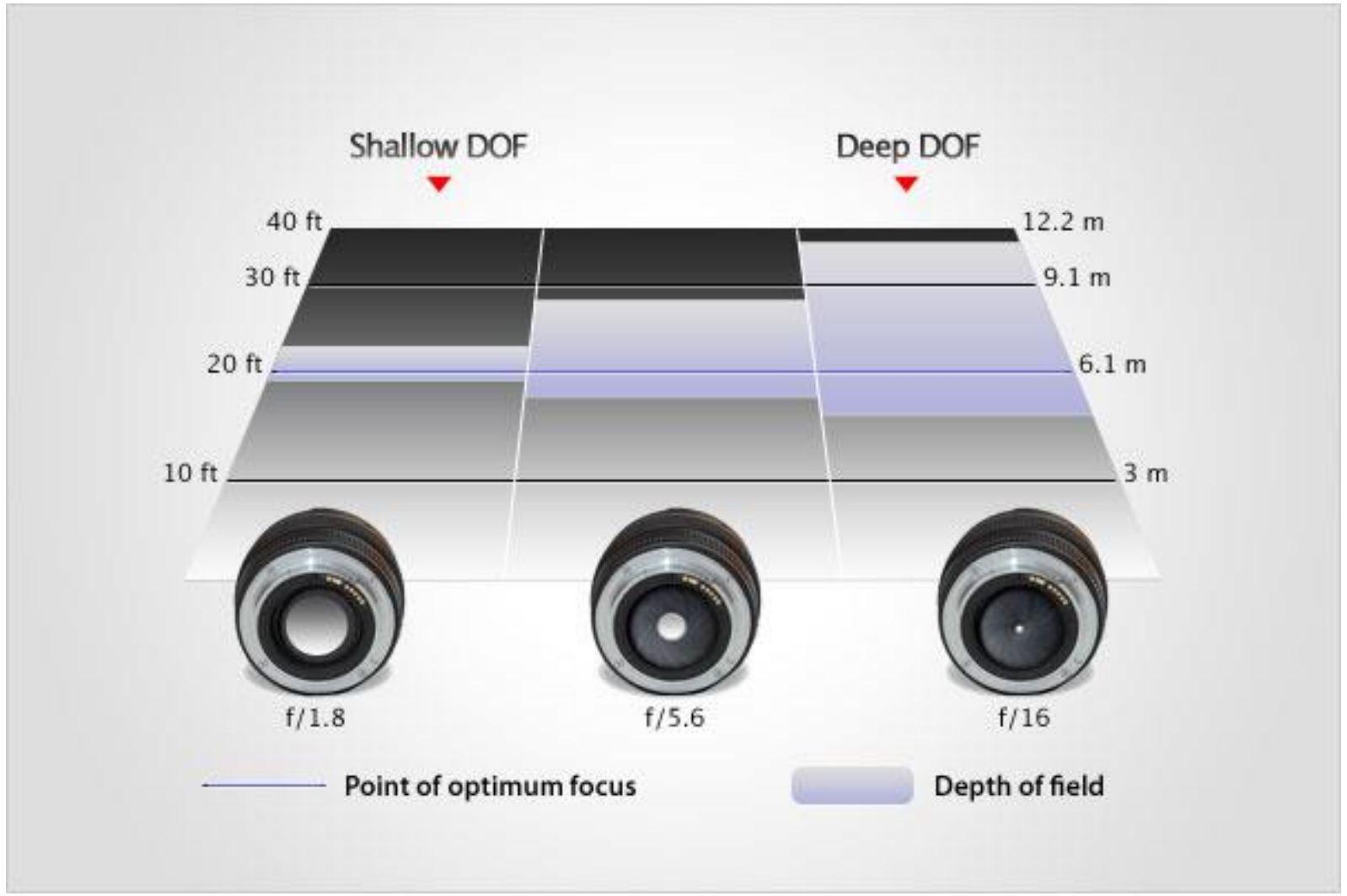

Depth of Field

f/22

f/8

f/4

f/2


Shallow DOF
Deep DOF
40 ft
30 ft
20 ft
10 ft
12.2 m
9.1 m
6.1 m
3 m
f/1.8
f/5.6
f/16
Point of optimum focus
Depth of field

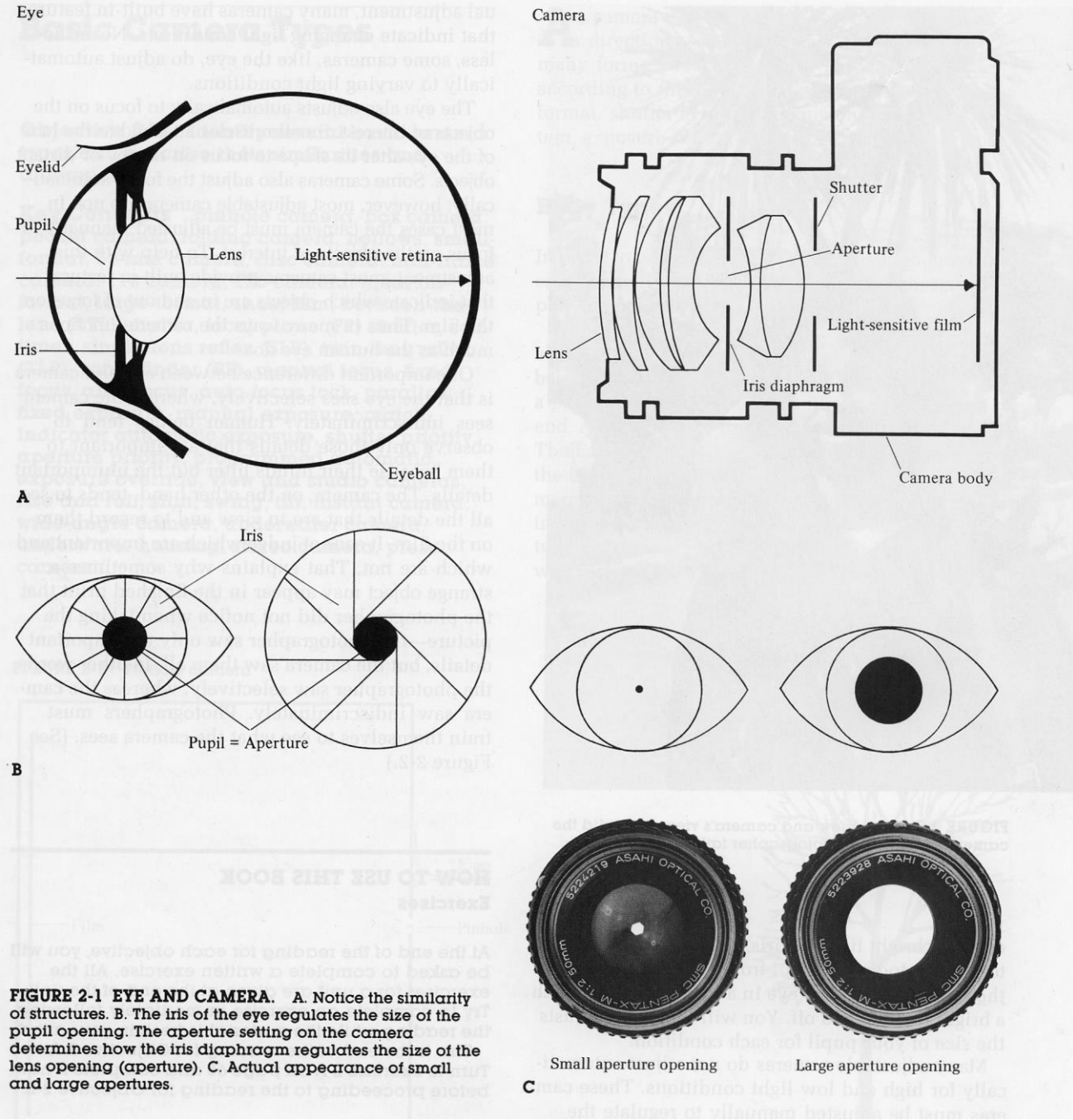
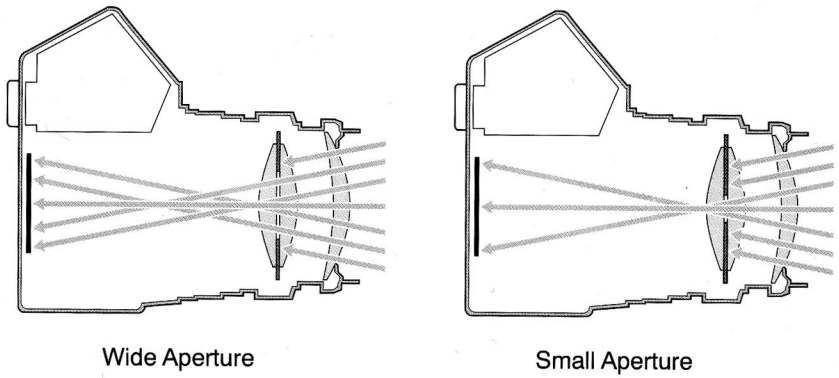


FIGURE 2-1 EYE AND CAMERA. A. Notice the similarity of structures. B. The iris of the eye regulates the size of the pupil opening. The aperture setting on the camera determines how the iris diaphragm regulates the size of the lens opening (aperture). C. Actual appearance of small and large apertures.

Aperture and Scattered Light Rays



Wide Aperture

Small Aperture

Depth-of-Field Factors

f/2
50mm
2' away

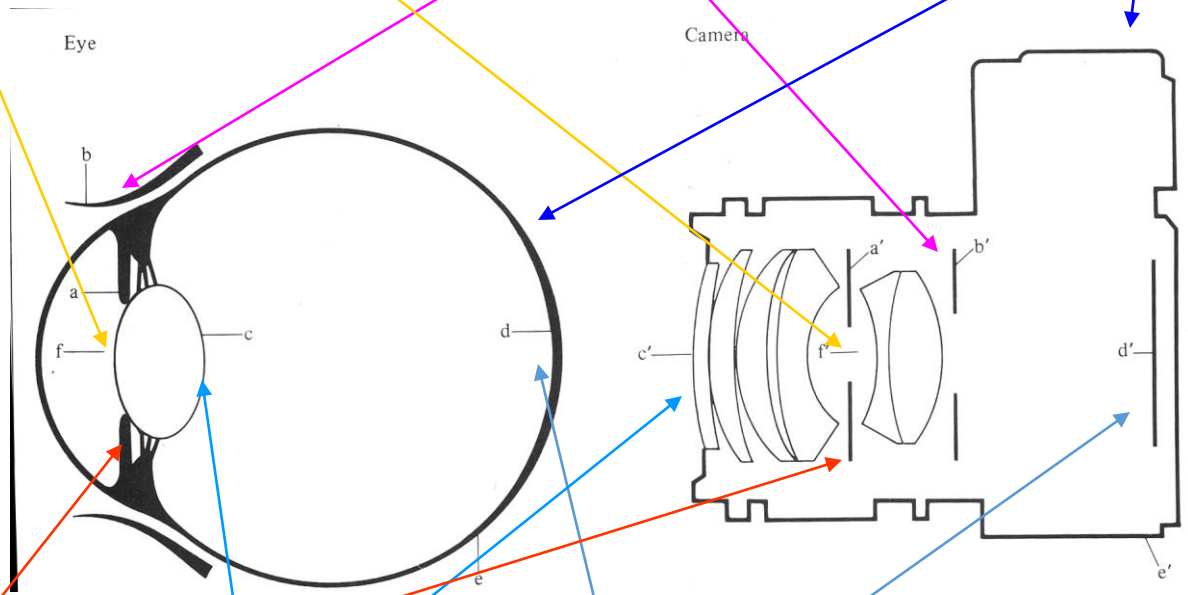
f/22
50mm
2' away

The Camera/Eye Comparison

Aperture = Pupil

Shutter = Eyelashes

Camera body = Eyeball



Iris diaphragm = Iris

Lens

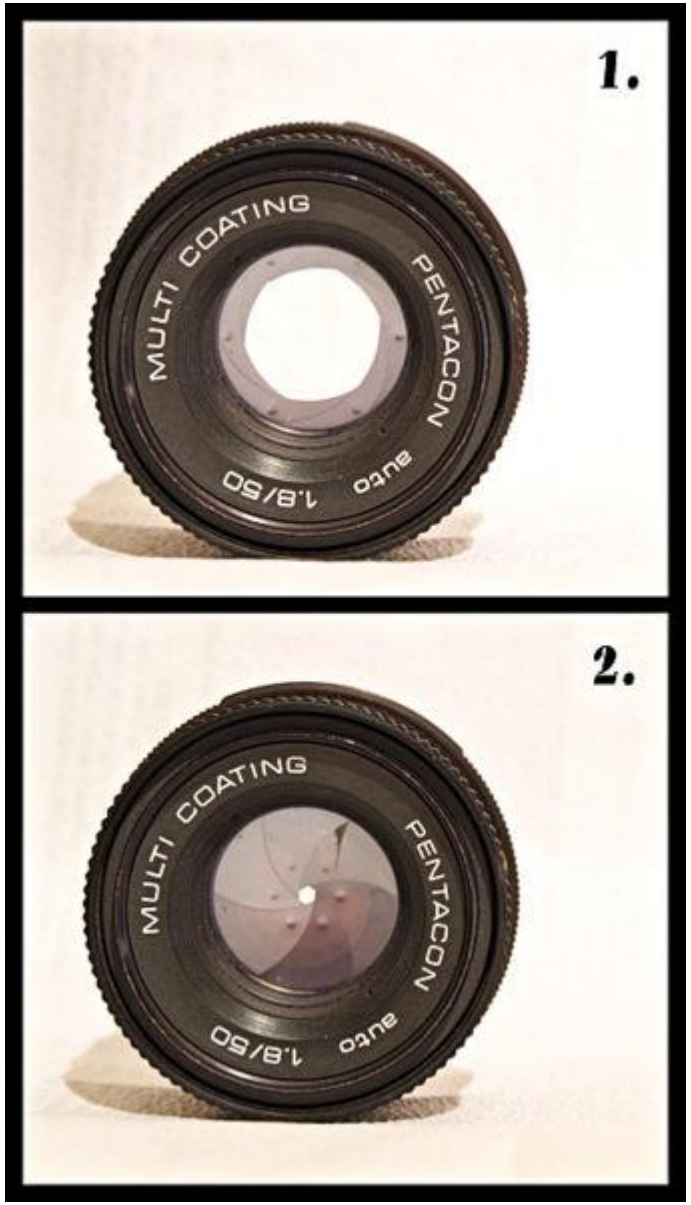
Film = Light sensitive retina

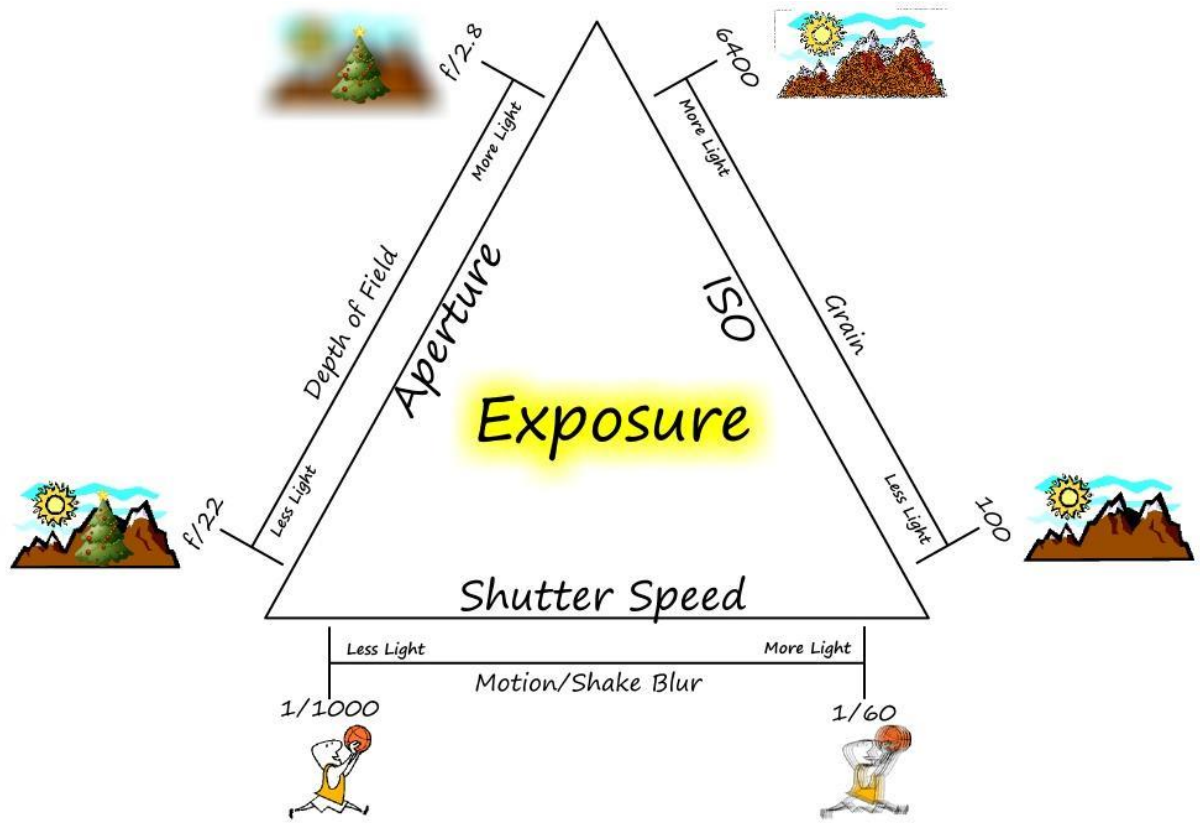
Aperture setting on top:

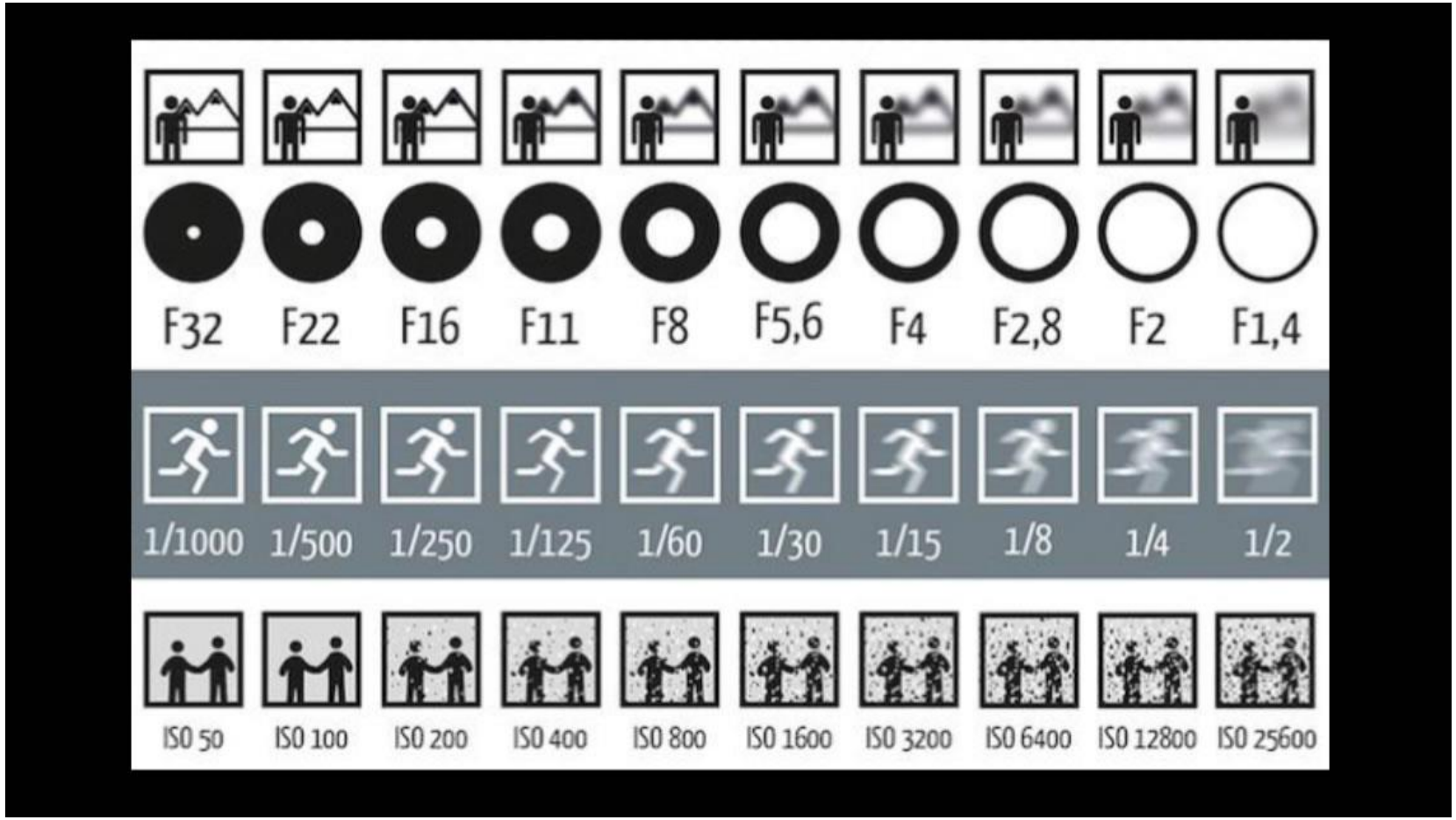
f/1.8 (shallow Depth of Field)

Aperture setting on bottom:

f/22 (large Depth of Field)

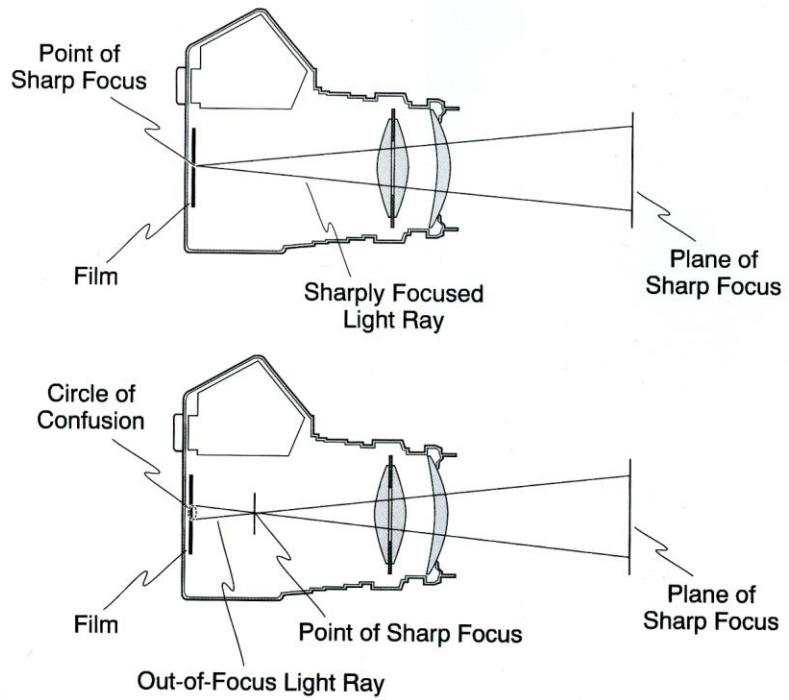


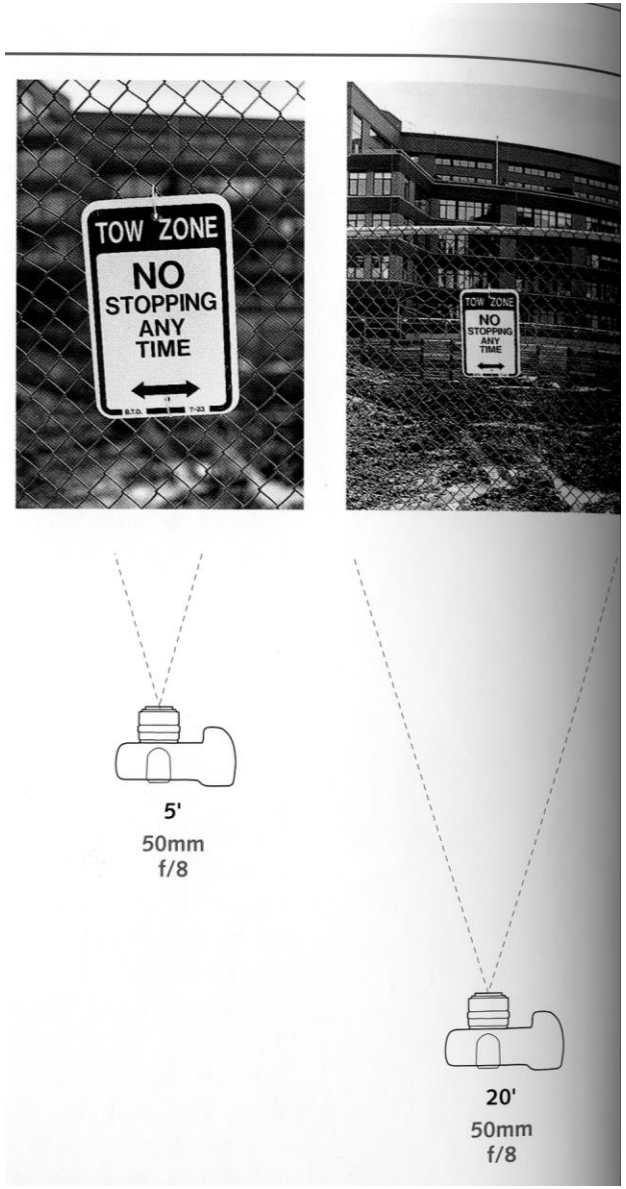

f/2.8
6400
More Light
More Light
Depth of Field
Aperture
ISO
Grain
Exposure
f/22
Less Light
Less Light
100
Shutter Speed
Less Light
More Light
Motion/Shake Blur
1/1000
1/60


F32
F22
F16
F11
F8
F5,6
F4
F2,8
F2
F1,4
1/1000
1/500
1/250
1/125
1/60
1/30
1/15
1/8
1/4
1/2
ISO 50
ISO 100
ISO 200
ISO 400
ISO 800
ISO 1600
ISO 3200
ISO 6400
ISO 12800
ISO 25600

Subject Distance to Control Depth of Field

Points of Focus and Circles of Confusion

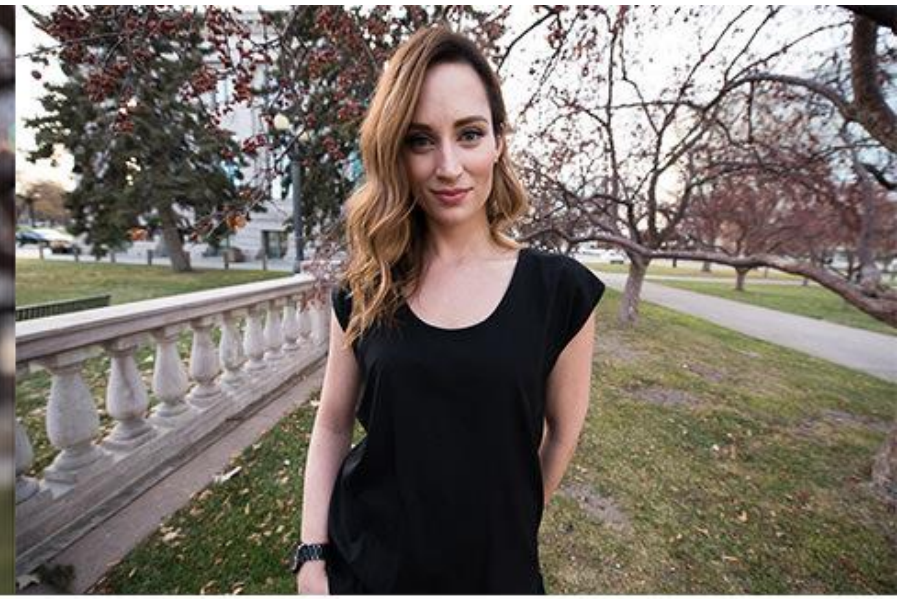




Focal Length to Control Depth of Field

Kind of….

Focal Length: 300mm



Focal Length: 14mm

Large Depth of Field

Shot at f/22

Jacob Blade

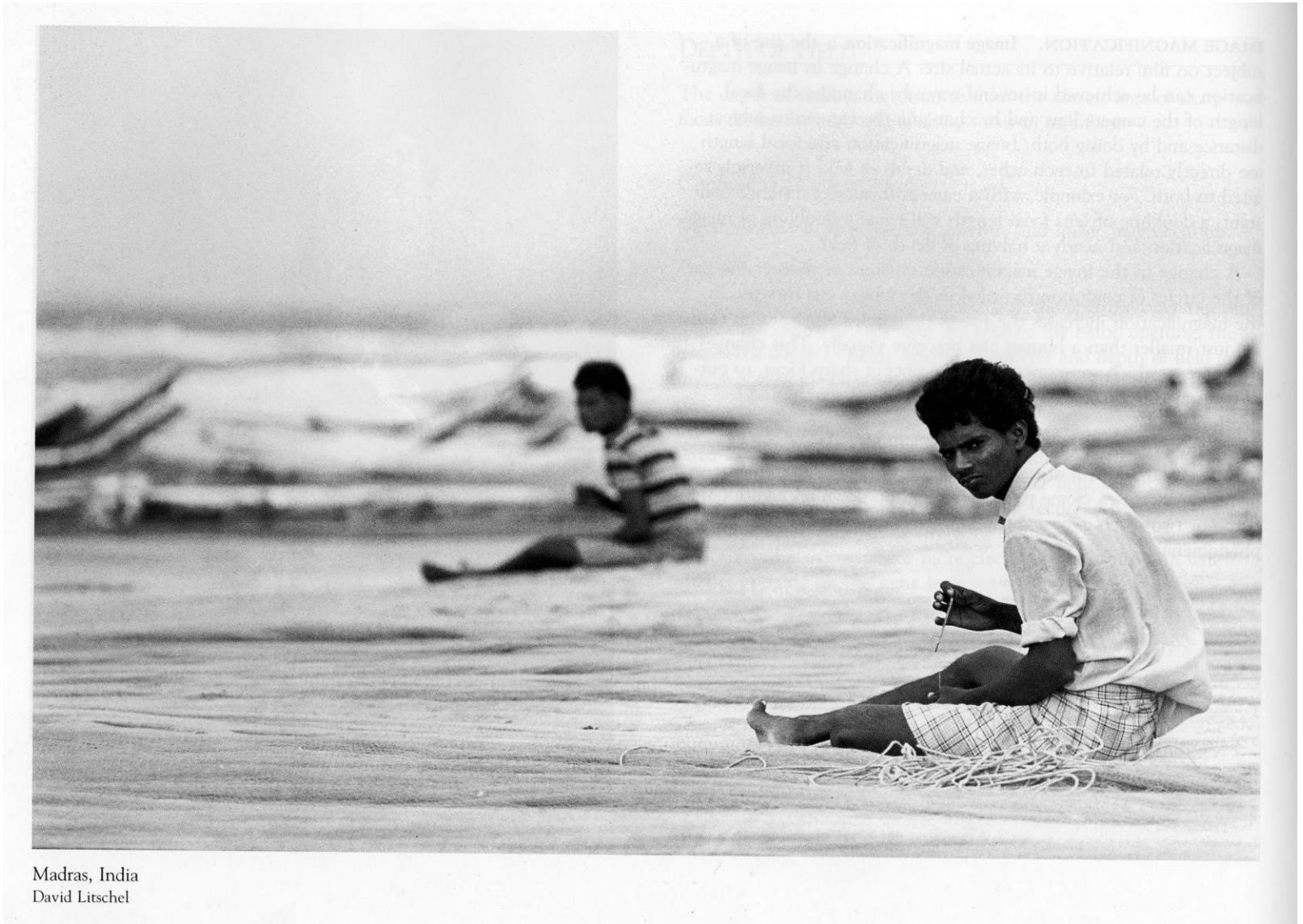
Shot at f/64

Ansel Adams

Shallow Depth of Field

Shot at f/4

Keely Nagel



Madras, India
David Litschel

Shot at f/2

50 mm

- Called a “fast” lens because it has such a large aperture (f/1.8)
- Meaning you can shoot at faster shutter speeds in lower light because a larger opening will allow more light into the camera to compensate for the decrease in light from a fast shutter speed
- These can open up to f/1.8 the depth of field can be very shallow

f/22

f/1.8

Depth of Field – can make a fence disappear

f/22

f/1.8