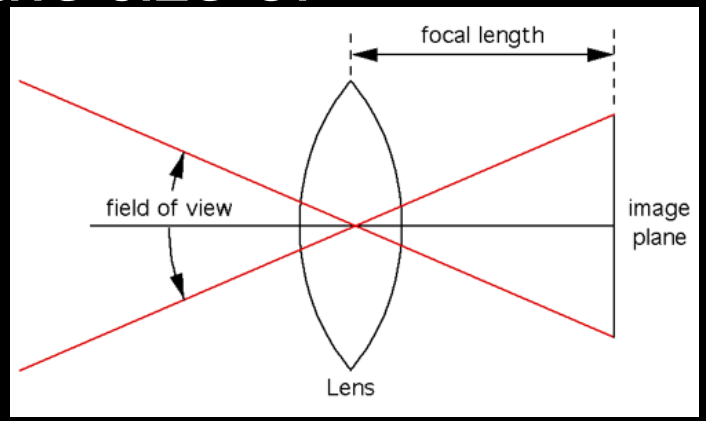
Focal Length

- Focal lengths are usually measured in millimeters
- The measurement of the focal is based on the distance between the sensor of the camera and the optical center of the lens.
- Focal length controls magnification
- The longer the lens the greater the size of objects in the image
- Controls angle of view



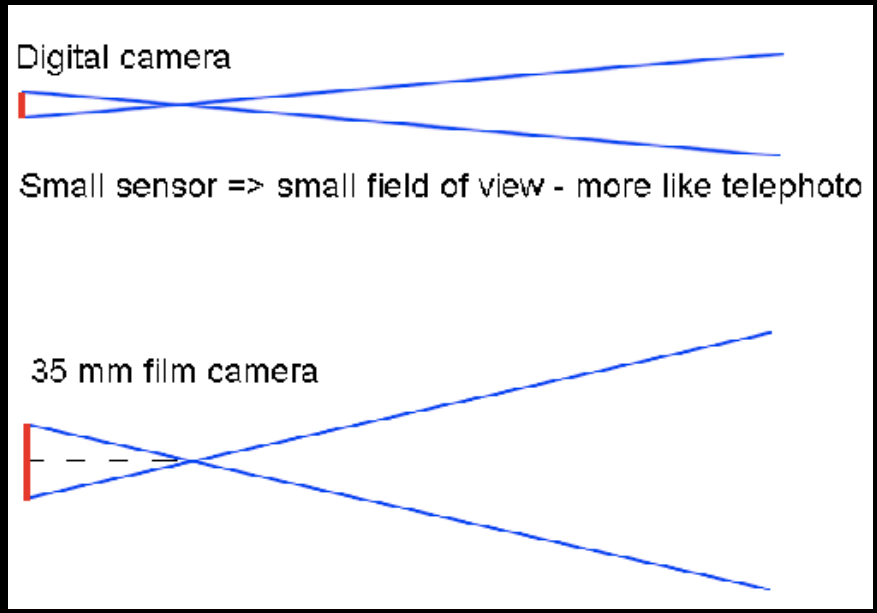
Focal length

- The shorter the focal length, the more you see.
- The longer the focal length, the less you see.

- Paper towel roll exercise.

Focal Length and Lens Type

- **35 mm camera** (film)
  - Normal lens: Focal length = 50 to 55 mm
  - Wide Angle lens: 35 mm or smaller
  - Telephoto: 65 mm lens or larger
- **Digital Camera**
  - Smaller sensor
  - Lenses more like telephoto



Digital Multiplier

- Digital multiplier converts focal length of digital camera lens to 35-mm equivalent
  - Consumer cameras: DM around 4
  - Digital SLRs: DM around 1.5

Camera	DM	Zoom Range (mm)	35 mm equivalent (mm)
Nikon CoolPix 8700	4	9-71	35 - 280
Nikon D70	1.5	18-70	27-105

* NOTE - Digital cameras offer more on the telephoto end and less on the wide angle.

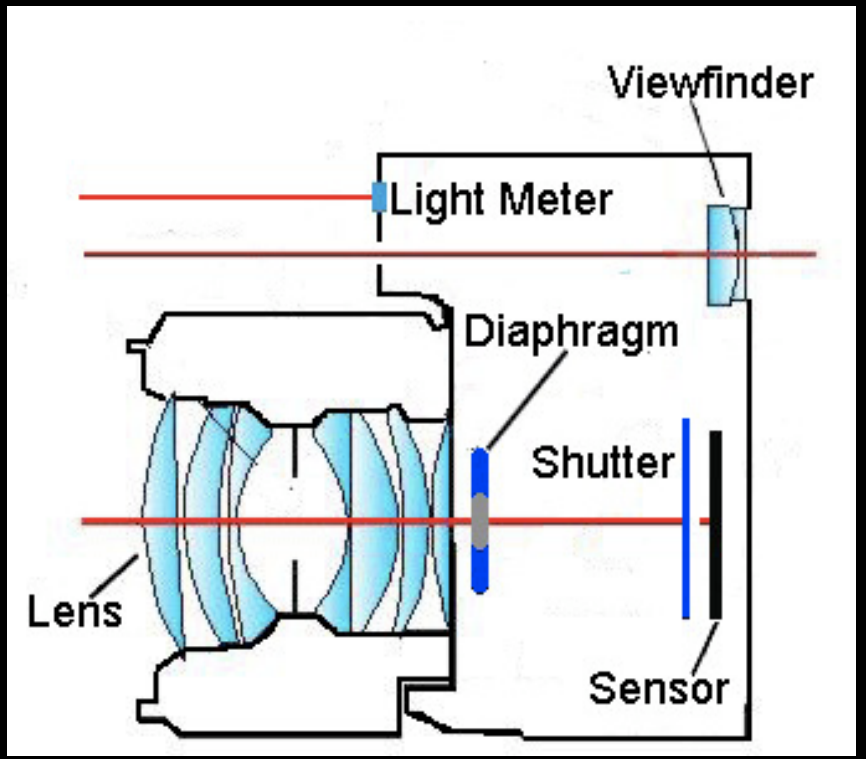
Getting to Know

Aperture

Aka f-stop

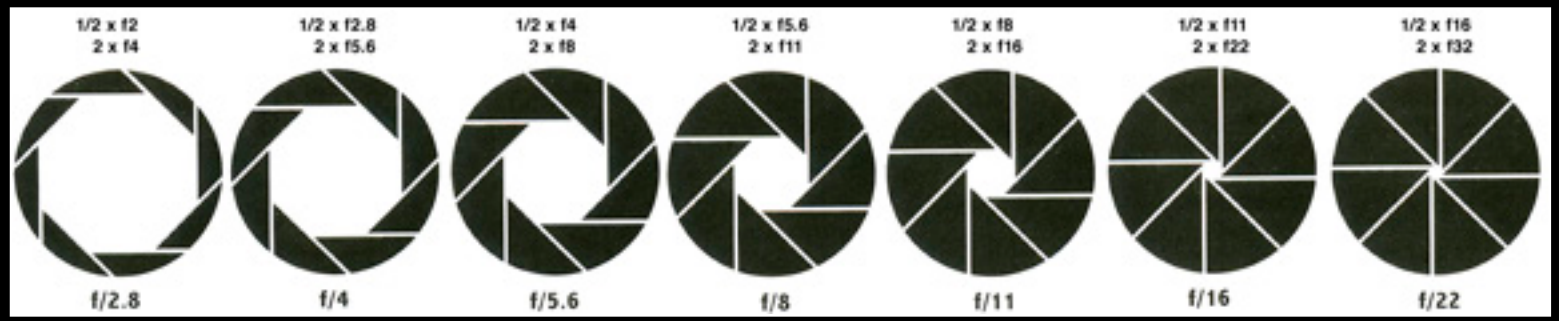
Aperture

- The diaphragm is located in the lens behind the glass
- The aperture size limits the amount of light reaching sensor



Aperture

- Apertures are formed by overlapping leaves of metal inside your lens that can open and close to control the volume of light entering the camera



Each aperture is also known as an f Stop.

Aperture Size

- Size of hole in the diaphragm through which light passes.
- Aperture sizes are called f-stops

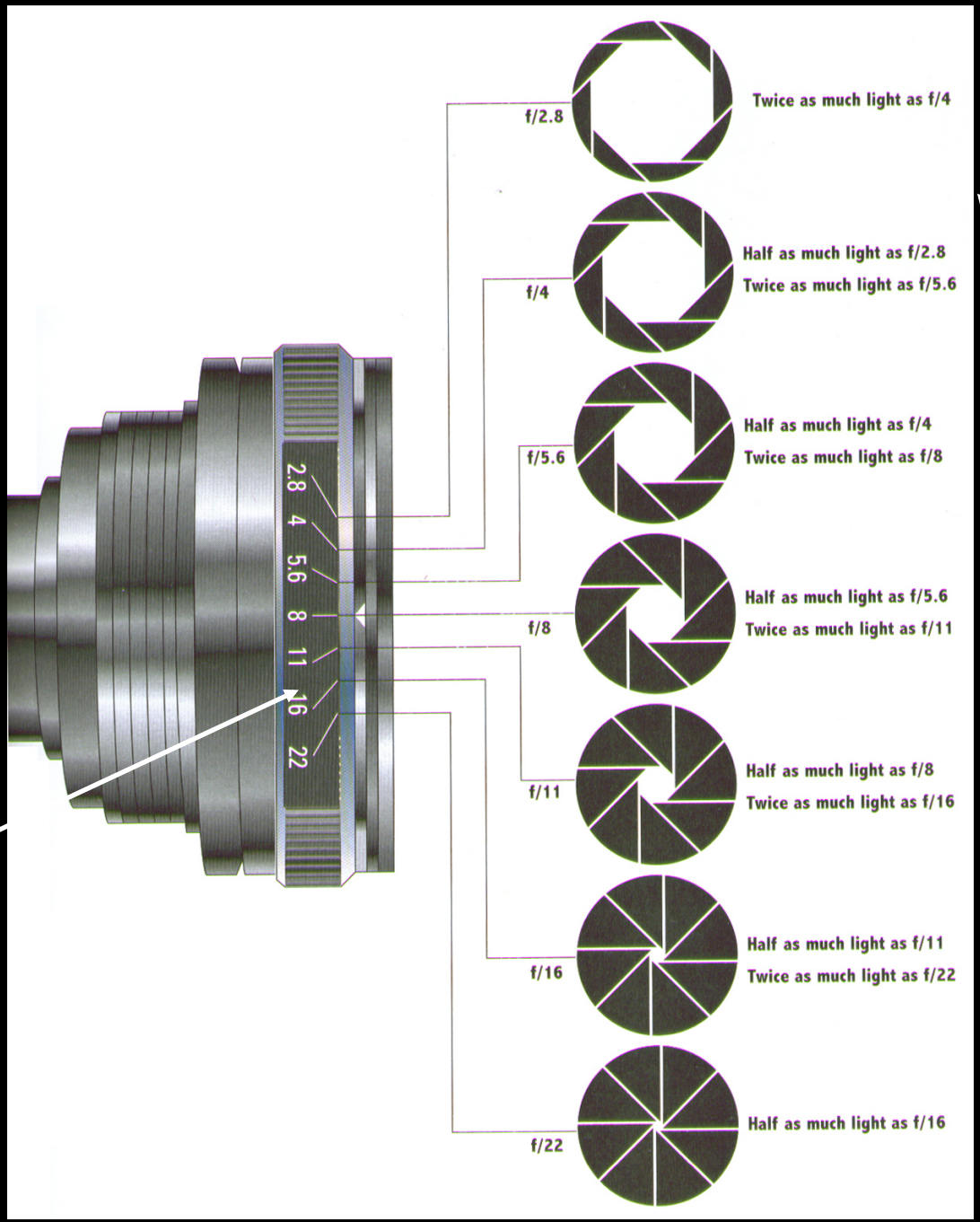
Standard: F1.4, f2, f2.8, f4, f5.6, f8, f11,f16, f22

Each f-stop lets in either 1/2 as much or twice as much light as the one before it or after it.

- light at f1.4 = 2 x (Light at f2)
- Note: Small f-stop means larger aperture and more light

* NOTE - It is likely that you will also see numbers that fall between the standard series. These are not "full" f-stops.

Aperture



Traditionally, the f-stop setting is located on the lens barrel

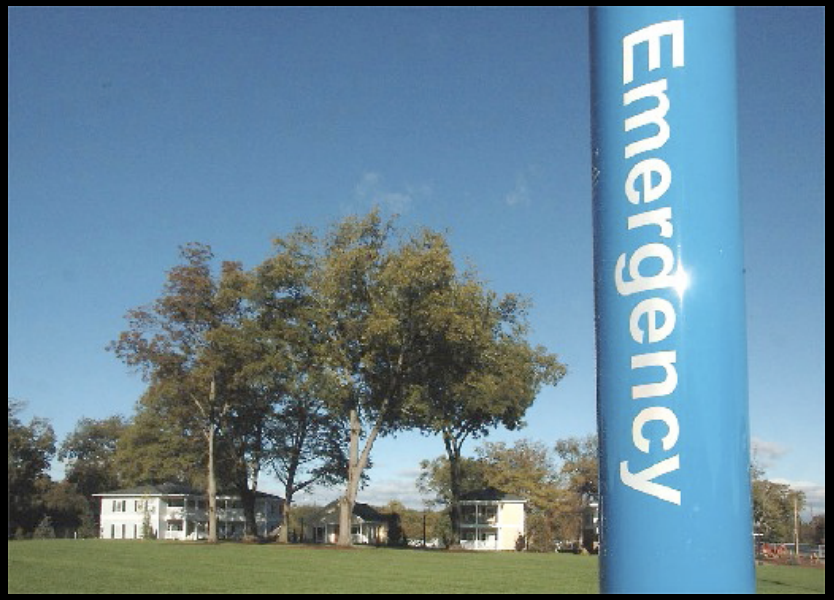
As the f-stop numbers go up in number the aperture size becomes smaller

Aperture
and
Depth of Field

Aperture: DOF

- What is the difference between these images?

18mm lens f4 1/6400 s

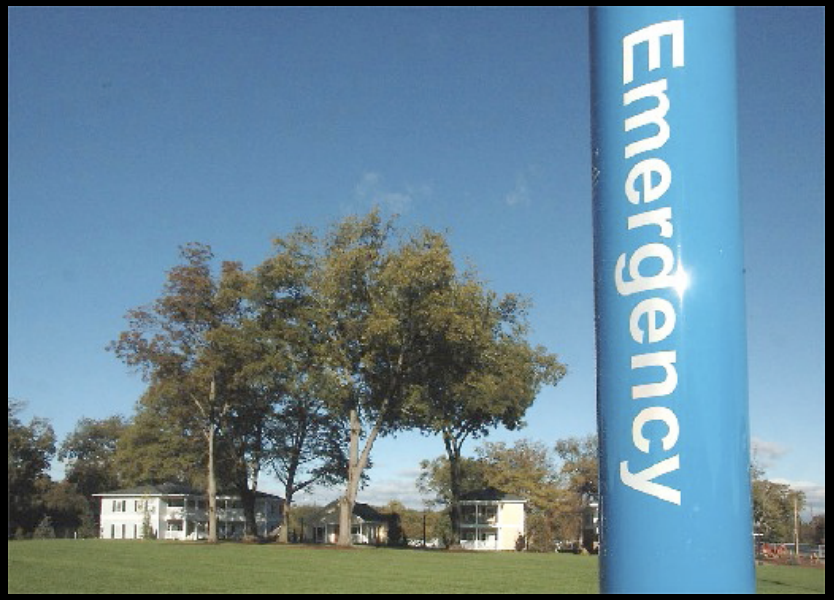


18mm lens f22 1/320 s

Aperture : DOF

- The aperture affects the portion of the image that is sharply in focus
- This is called depth of field (DOF)

18mm lens f4 1/6400 s



18mm lens f22 1/320 s

Influences on DOF

- Focal Length - Wider the angle, the more DOF.
  - Type of lens - Telephoto lens : Shallow DOF

    Wide angle lens : Deep DOF
- Aperture - The smaller the aperture opening, the more DOF.

  low f-stop # : Shallow DOF

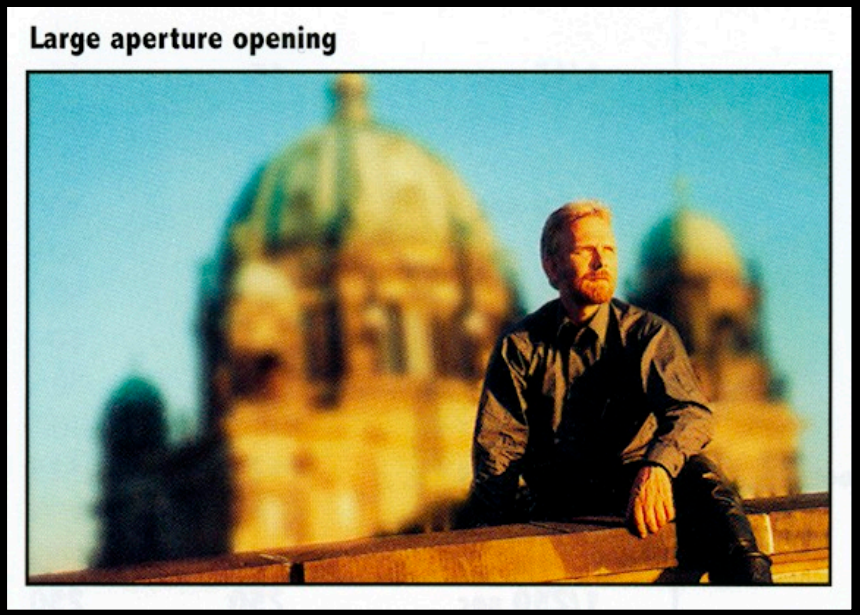
  high f-stop # : Deep DOF
- Focus Distance - The further away your subject is from the camera, the more DOF.

  Close to subject: Shallow DOF

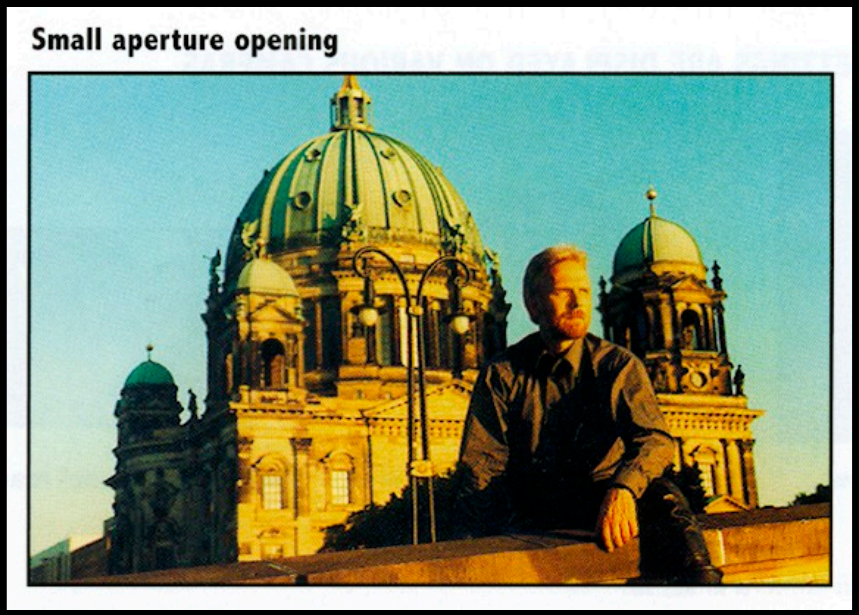
  Far from subject: Deep DOF

- The aperture or f Stop also controls how much of the picture appears to be in focus.

- This concept is known as Depth of Field.



small f# = small depth of field

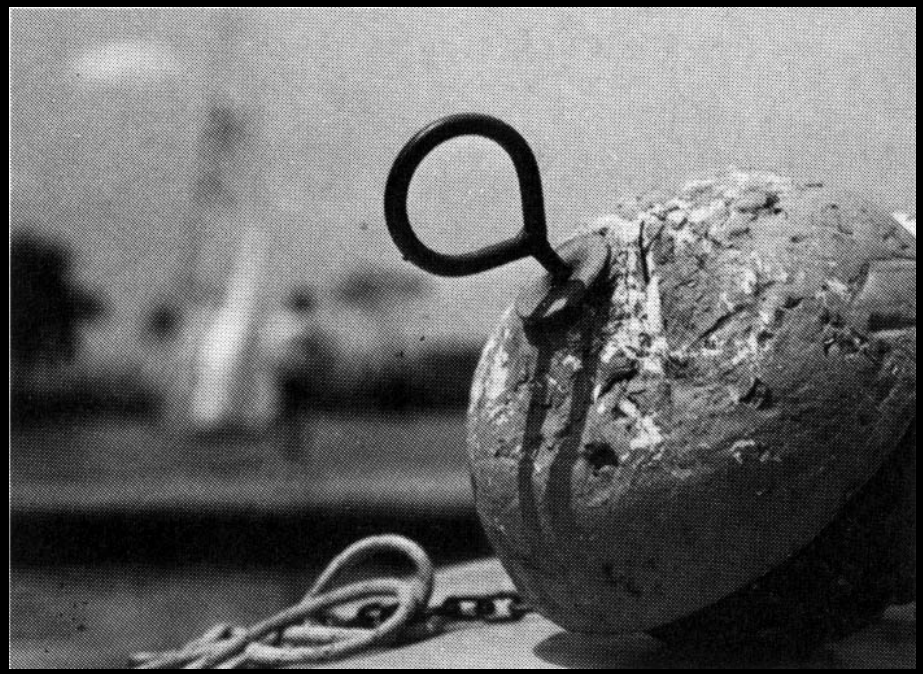


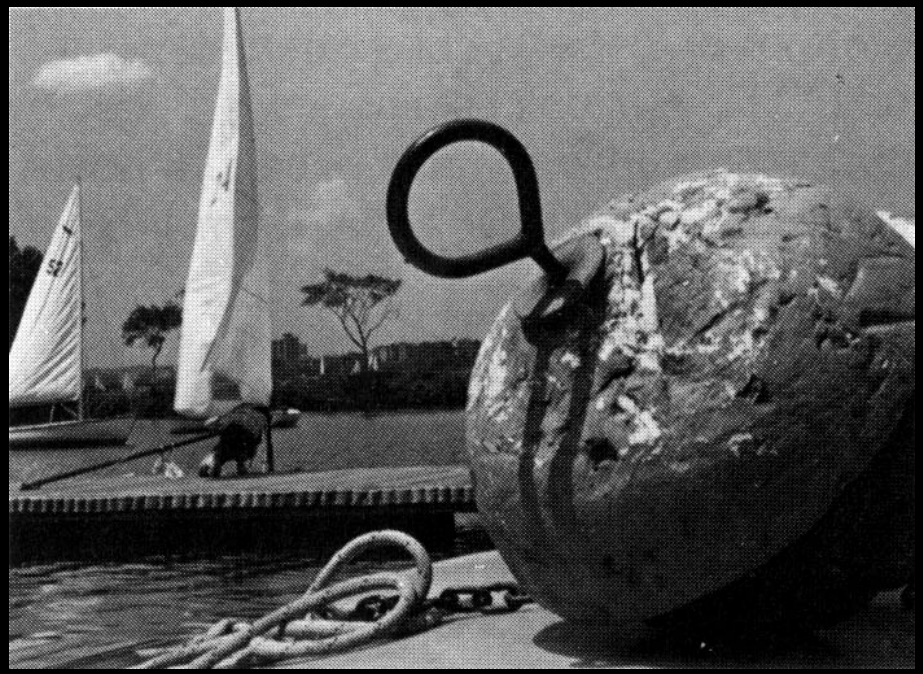
large f# = large depth of field

•Depth of Field is defined as the amount of the picture from foreground to background that appears to be in acceptable focus.

* NOTE - Large aperture openings like f2 yield "shallow" depth of field while small aperture openings like f16 yield "large" depth of field.

Remember that small f-stop means larger opening and therefore less depth of field

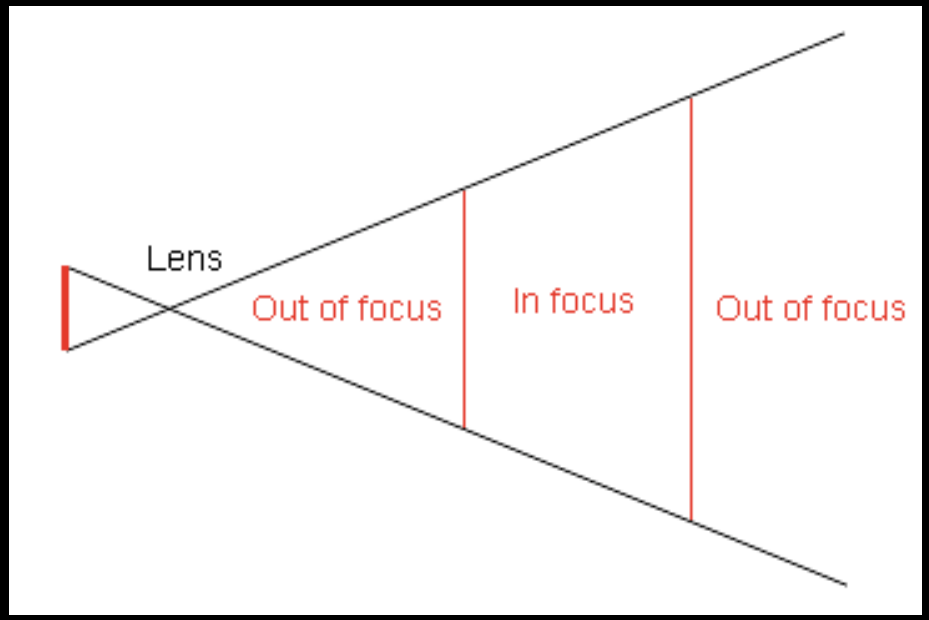




Depth of Field

Depth of Field

- Depth of Field
  - Distance in front of subject and in back of subject within which things are in focus.
  - Shallow DOF: Not much in focus except the subject
  - Deep DOF: A lot in focus

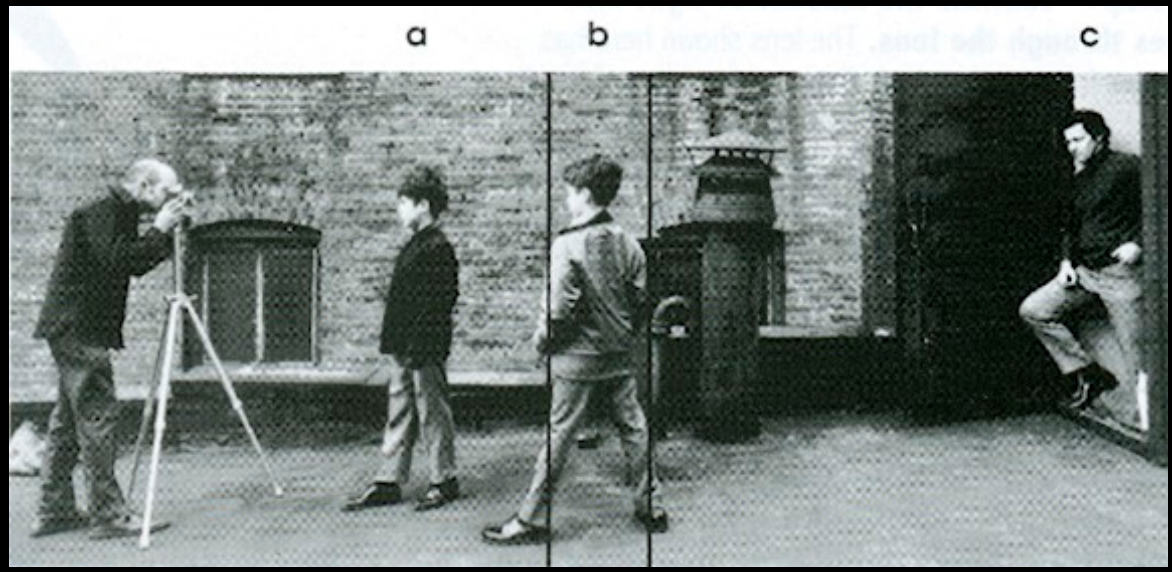


Shallow DOF

Controlling how much of the picture appears to be in focus is a "creative control".

You determine what you want to draw your viewers attention to.

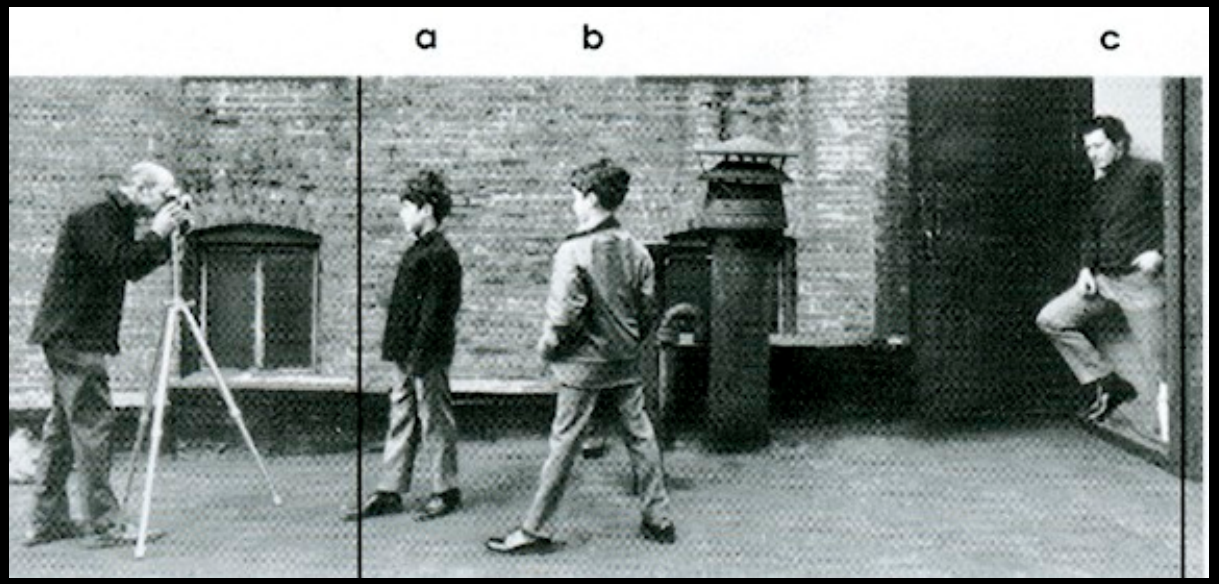
This example shows "shallow depth of field".
A very small plane of acceptable focus runs through the boy in the middle. The boy in front and the man in the rear are clearly not in focus.



Deep DOF

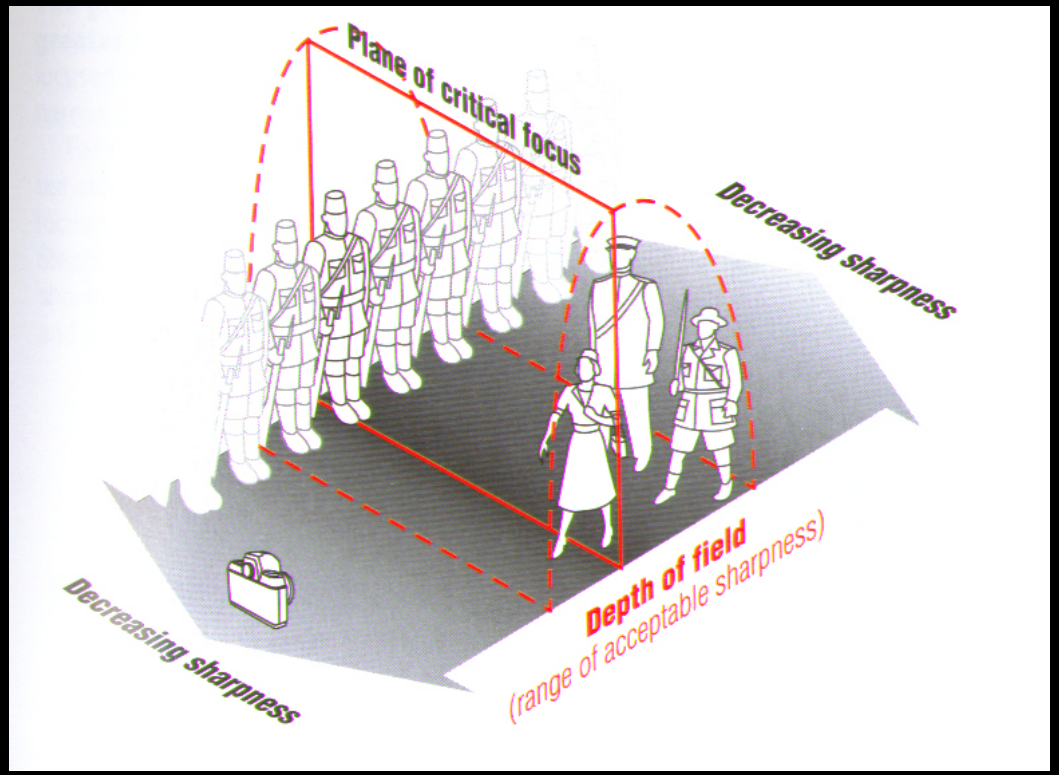
Very large depth of field allows the viewer to see everything from the foreground to the back ground in acceptable focus. This is not the way normal human vision and experience work and it may add a great deal of interest to the image.

In this example the place in the image where the photographer is focusing has not changed from the shallow depth of field picture....the aperture was changed to a larger f stop number to increase the area of acceptable focus.

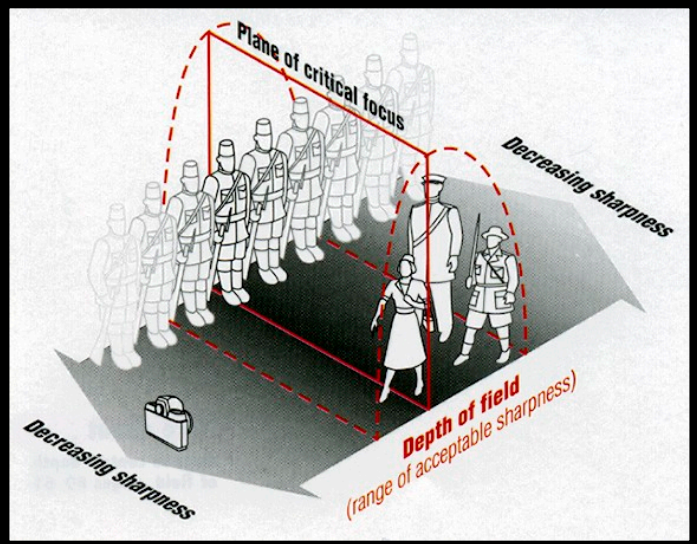


Plane of Critical Focus

- The focal point or area of your photograph
- Think of it as the midpoint of your depth of field
- Should be what you are focusing your lens on when taking a photograph



Mark Kauffman, *Princess Margaret Inspecting King's African Rifles, Mauritius*, 1956



Depth of Field is not divided equally

You should note that Depth of Field is roughly divided 1/3 in front of where you are focused and 2/3 behind where you are focused

DOF

What can you say about the DOF in this picture?

How does it help the purpose of the picture?

DOF

- Shallow DOF: isolates subject from the background

200 mm telephoto (35 mm equivalent = 300 mm

F11 1/500 sec)

DOF

- DOF can help tell a story (beginning, middle, end).
- How does this work in this picture?
- What story does the picture tell about this village?

DOF

- Deep depth of field can tell a story
  - In focus from front to back
  - Wide angle lens, narrow aperture

18 mm lens

F11

1/400 sec

Diffraction Limits

- Small apertures good for telling stories
- Small apertures also may diffract light
  - Lessens the sharpness of images
- With digital camera. May not want to use smaller aperture than f/11

DOF & Art

When using selective focusing, make sure that you select a depth of field that is shallow enough to blur unwanted details completely.

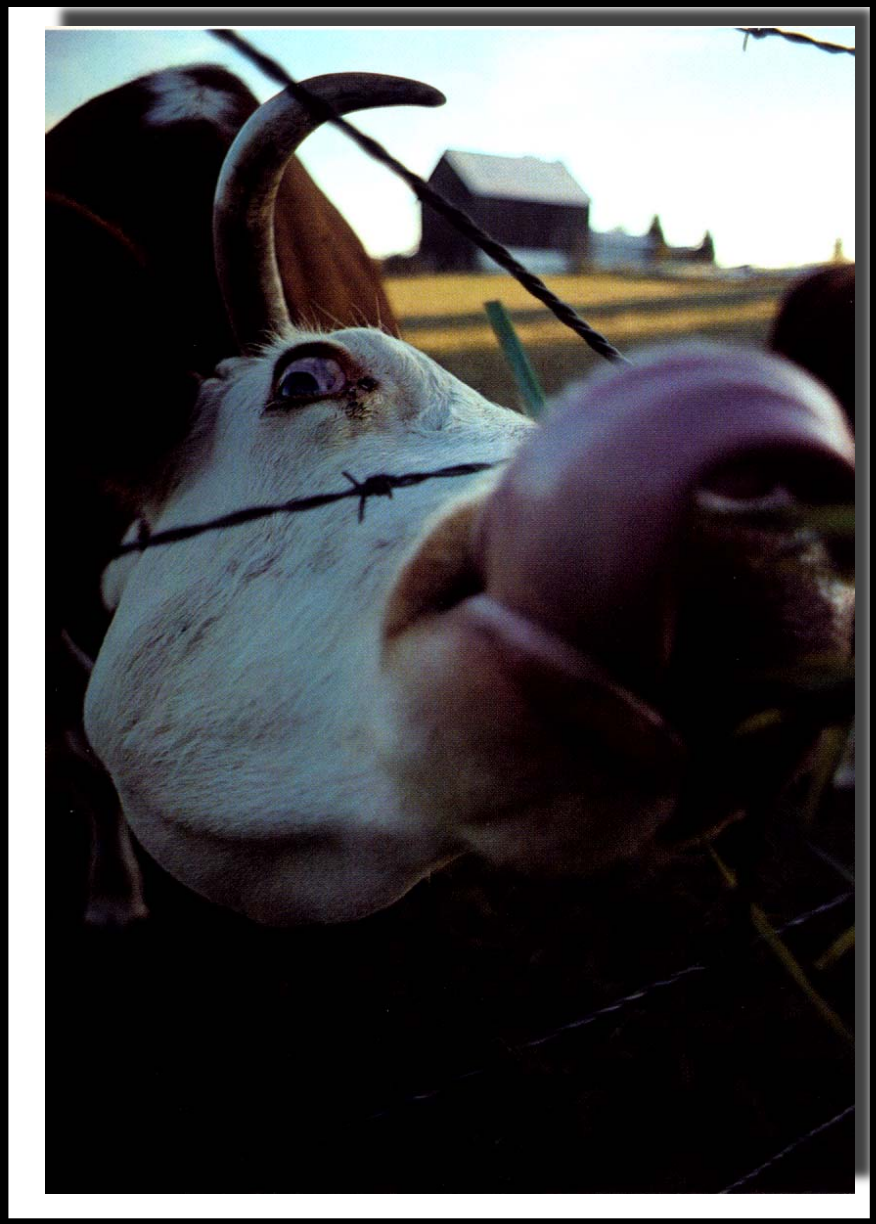
Maximum Aperture focused on a single bloom.

DOF & Art

With fairly even light, the smallest aperture was used to ensure the image was sharp from front to back. The resulting shutter speed was 4 seconds.

Cathedral Interior, Cordoba

DOF & Art



A short depth of field allows the cow's eye to be in sharp focus while the cow's tongue and the horizon are blurred.