History of Photography

- ✓ Birth of Photography January 7, 1839. The invention of the daguerreotype by Louis-Jacques-Mandé Daguerre is formally announced in Paris, France.
- ✓ Daguerre produces a direct positive image using a copper plate coated with silver and steamed over mercury at 117º.
- ✓ In September 1840 Fox Talbot discovered the phenomenon of the latent image, and was able to make copies of his images. This was a major breakthrough which led to drastically lowered exposure times - from one hour or so to 1-3 minutes.
- ✓ Sir John Herschel a friend of William Henry Fox Talbot coined the term *photo graph* using 2 Greek words *photos = light*, and *graphein = to draw,*

  or **Drawing with light.**

"Drowned Man"
Hippolyte Bayard

William Henry Fox Talbot

A very patient coachman at Lacock Abbey. Taken in 1840 - exposure three minutes!

Hippolyte Bayard was one of the earliest photographers in the history of photography, inventing his own photography process known as direct positive printing and presenting the world's first public exhibition of photographs on June 24, 1839.

History of Photography

First Daguerreotype

In 1837 Louis Jacques Daguerre made the first surviving image—of some plaster casts resting on a window ledge—using the method later named the daguerreotype process. It produced a single, positive image on a silver plate, and was eventually capable of producing astonishing degrees of detail, making it the most widely used form of photography until the 1850s.

A Frenchman named Joseph Nicéphore Niépce (died 1833) made the picture in 1826, using a sheet of pewter coated with bitumen of Judea (a lovely name for what is in fact a kind of asphalt), and an 8 hour exposure.

View from the window at Le Gras 1826

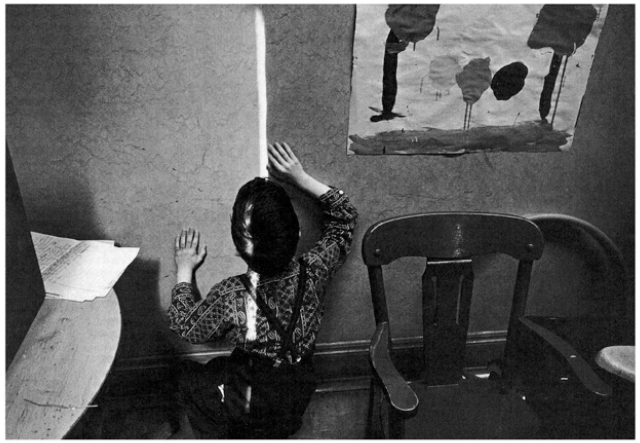
Light is the essence of Photography

Knowledgeable photographers recognize that they are not photographing objects as much as they are photographing light, and the way light defines, delineates, or is emitted by an object.

Photography therefore is technically the study and interpretation of light.

"Light" reveals the subject.

Light


Charles Harbutt 1960

Types of Light

- Sunlight
- Skylight
- Artificial Light
- Available Light: light that already exists in a scene.
- **Sweet Light or Magic Light.** Enveloping light found approximately 10 minutes before sunset lasting for approximately 20 minutes after sunset.

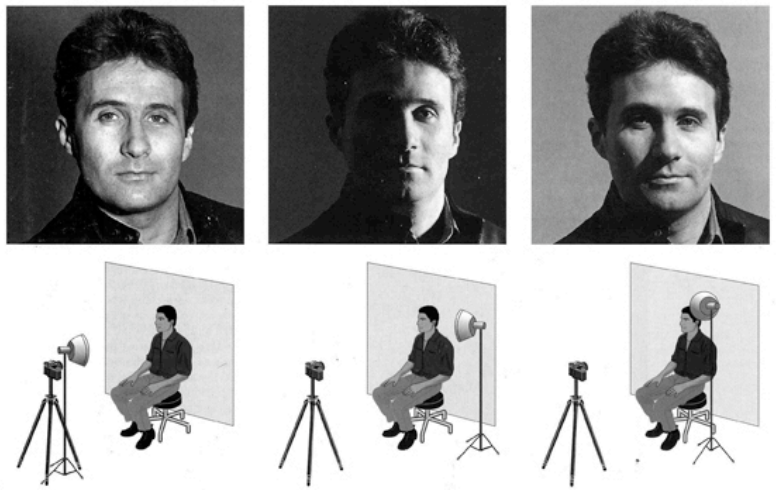
Direction of Light

- Back Light
- Side or Cross Light
- Front or Axis Light
- Overhead Light

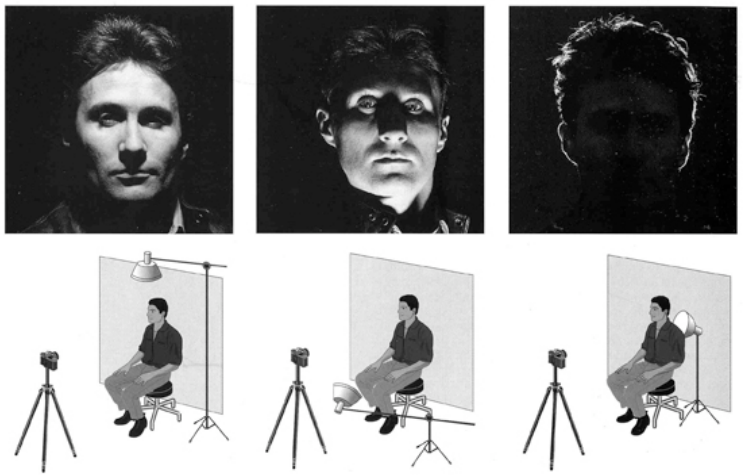
Quality of Light

- Soft or Diffused Light.
- Contrasty or Harsh Light.
- *You must determine if the quality of Light is compatible with the desired mood that you wish to photograph.*

Direction of Light



Front & Side Light



Top, Bottom, and Back Light

Side Light adds
texture, shape & form

Front Light is flat producing few of the visible shadows that delineate texture.

Quality of Light

Dramatic Light

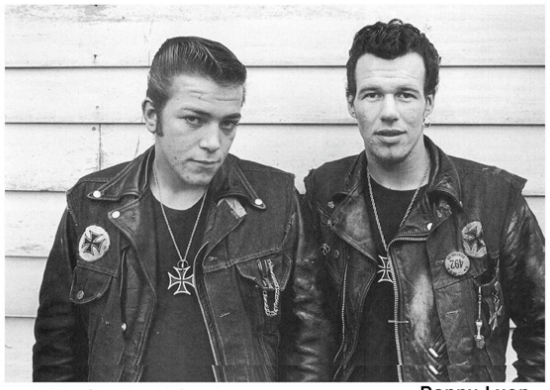
1999 Rodney Smith

Window Light

2005 Roy Pope

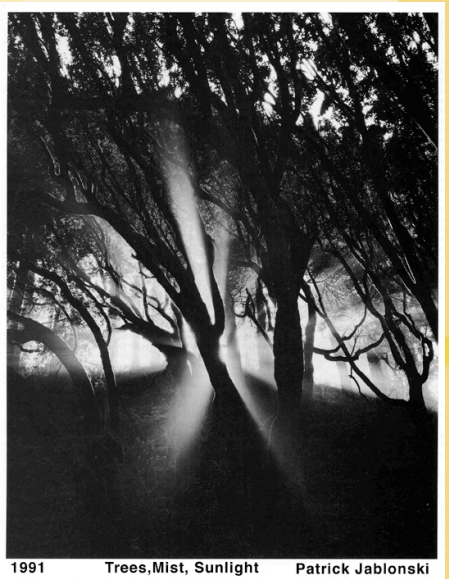
Storm / Squall Light

Shadowless Light



1965, Sparky & Cowboy Danny Lyon

Diffused Light



1991 Trees,Mist, Sunlight Patrick Jablonski

Contrasty Light

When Light hits matter it is:

1. Reflected - light bounces off a surface.

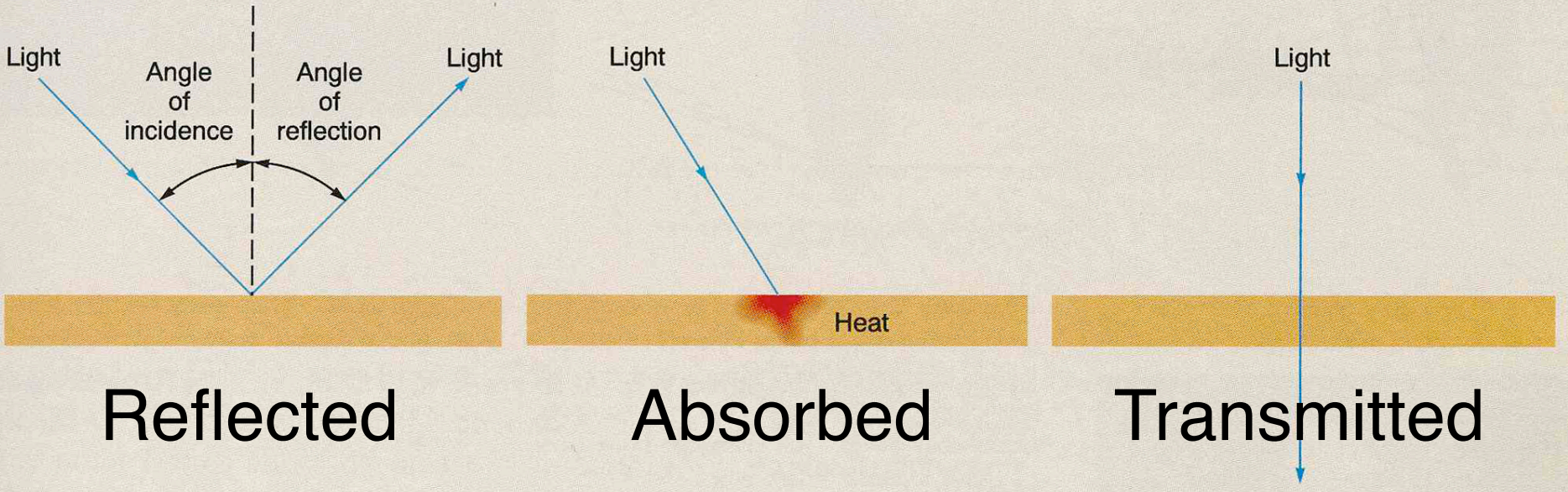
2. Absorbed - disappears as light, and given off as heat.

3. Transmitted - light passes through a material.

Light

Behavior of Light

If undisturbed, light travels in a straight line. When it encounters the surface of a material, several possible effects occur, as shown in the illustrations below. When light strikes a material, usually a combination of these effects occurs. For example, if the material is transparent some of the light may be reflected, some transmitted and in the process refracted, and some scattered or absorbed by the material, depending on its degree of transparency.



Reflected Absorbed Transmitted

Luminosity is light.

Luminosity in a photograph is represented by tones of black, white, and gray.

Every object and mood depends upon light represented by luminosity in a photograph.

The luminosity that makes a photograph can be thought of as ambient and reflected light.

Ambient Light is the light from a light source (the sun) that falls upon the subject we are photographing.

Ambient Light causes the overall "mood" or aesthetic character of the image (foggy, hazy, bright,etc).

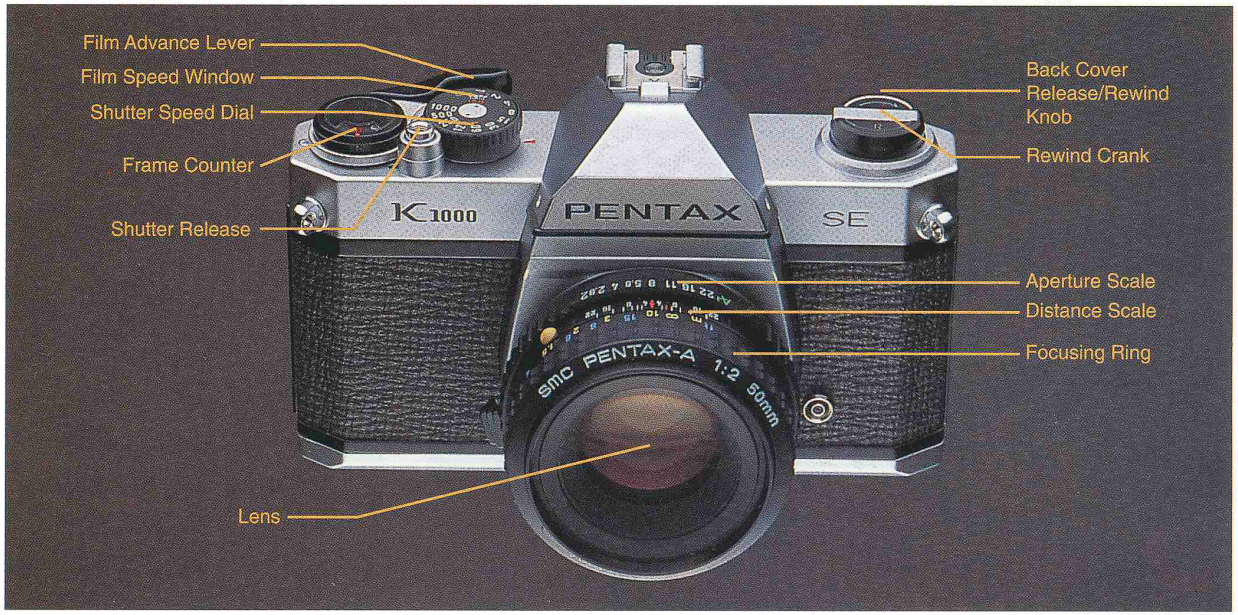
Reflective Light is the light reflecting from the subject that *causes its texture and form*.

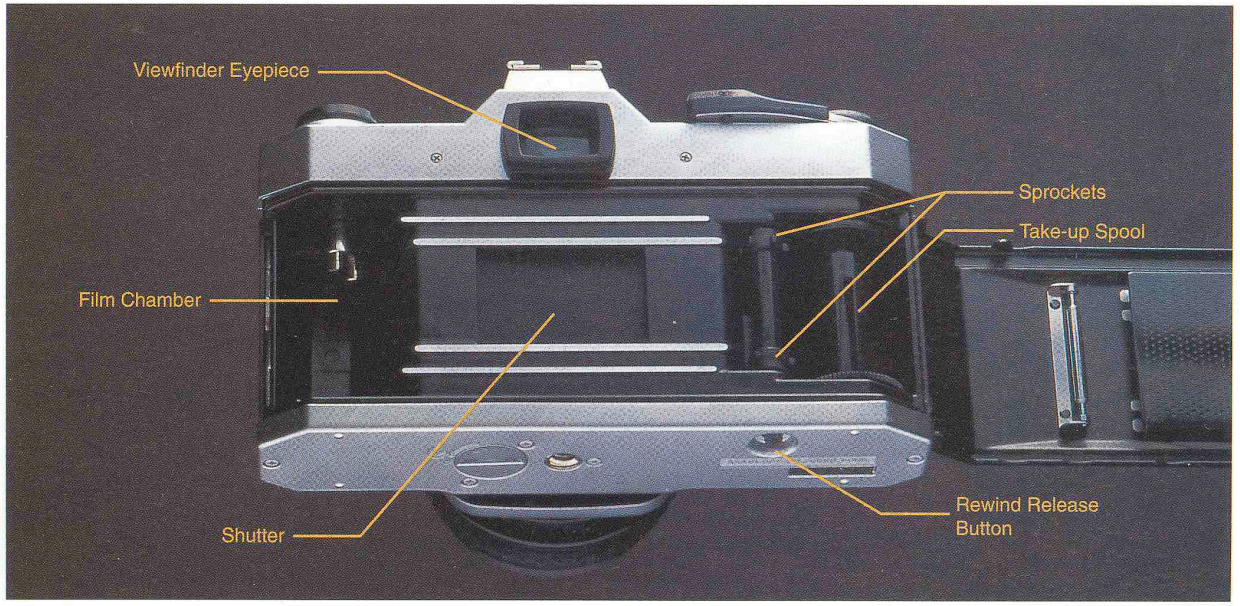
When Printing the chief task is to preserve the illusion of light falling upon the subject.

This gives us a print intended to convey an emotional impression of expression in a photograph.

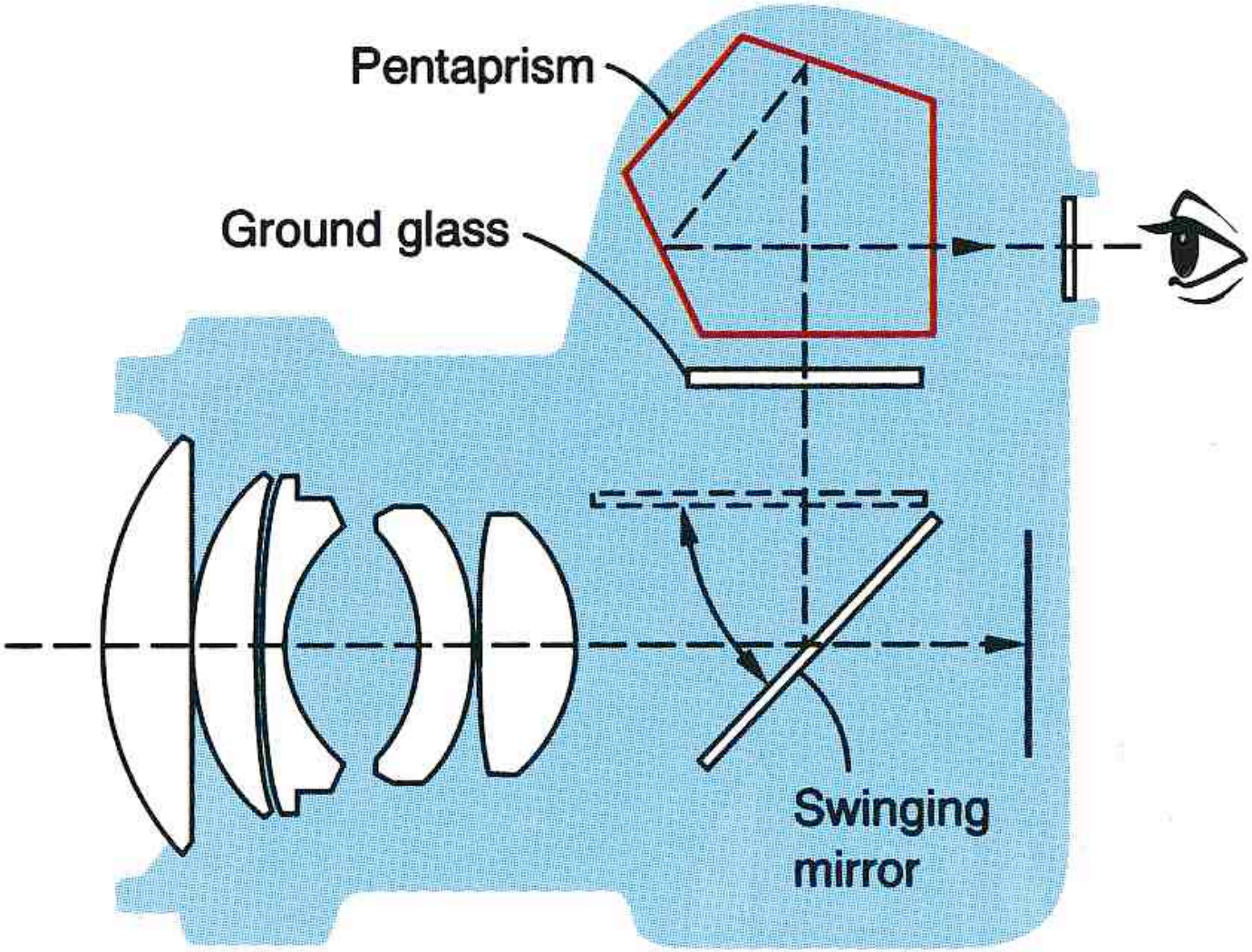
Locating Camera Parts

Pentax K1000 35mm Camera.

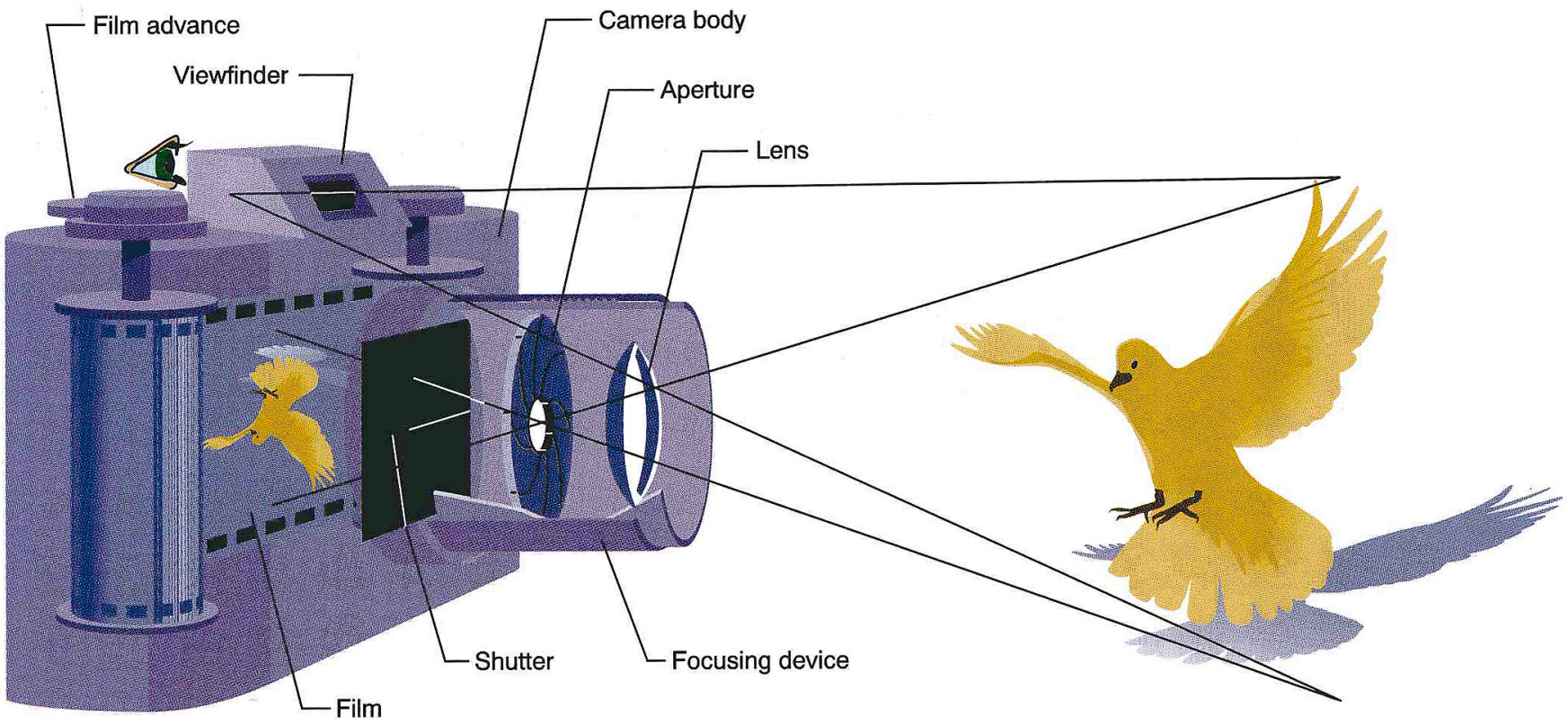




Single-Lens Reflex Camera - SLR



The Camera



This is a simple camera, but it contains all the parts necessary for complete control in making photographs.

Camera Body. Lighttight enclosure protecting the film from unwanted exposure to light. Opens to allow loading of film.

Lens. Forms an image of the subject matter on the film.

Focusing Device. Moves the lens in and out to select the subject that will be in focus.

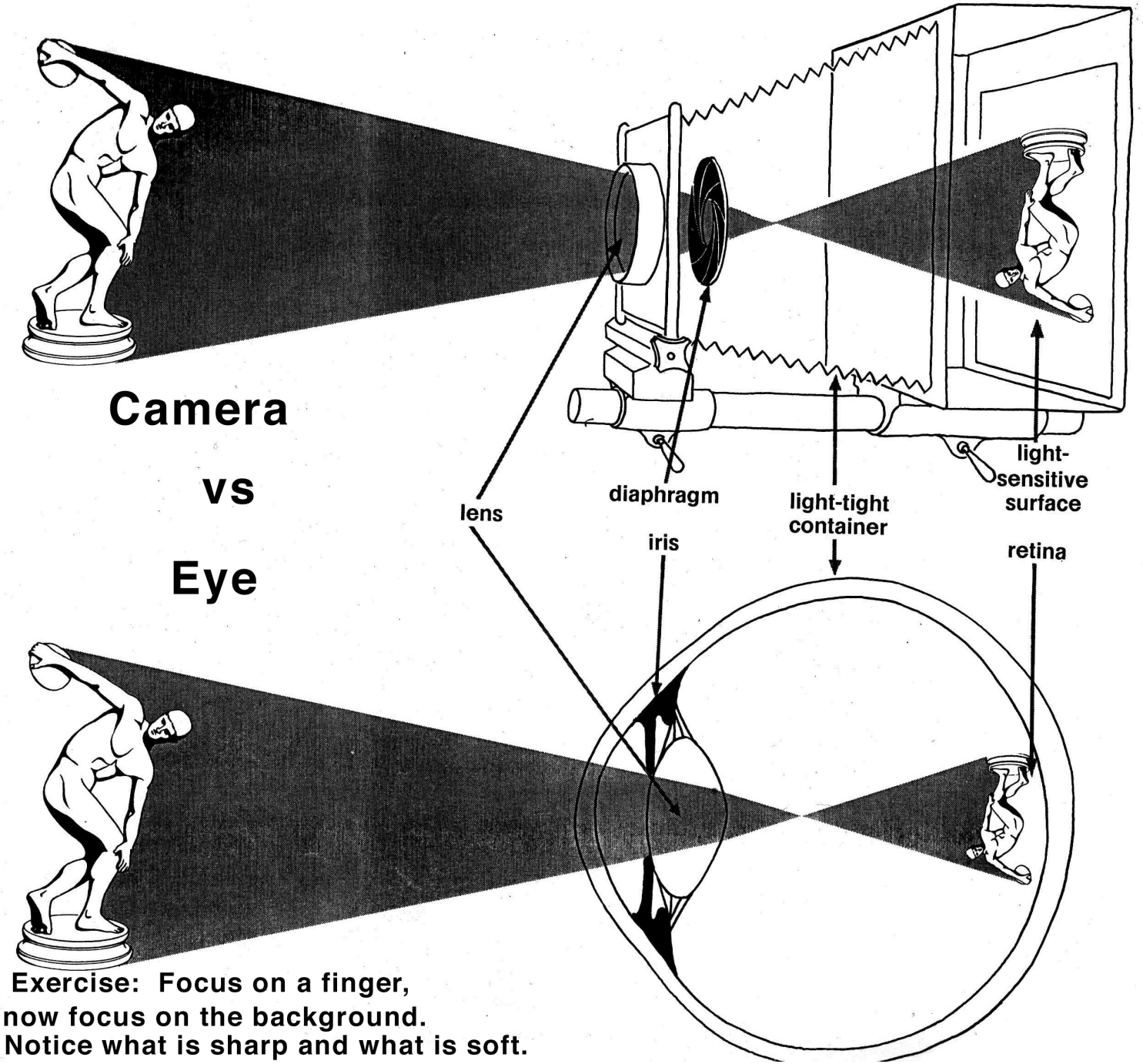
Viewfinder. Shows an approximate view of the part of the subject that will appear in the image on the film and may include a method for checking the focus of the image.

Aperture. An opening adjusted by means of a dial, lever, or ring with marked f/stop numbers. Controls the amount of exposure on the film.

Shutter. Shields the film from the image until the shutter release is pressed, when it opens for a measured amount of time (the shutter speed) controlled by a knob, lever, or ring.

Controls the exposure on the film.

Film Advance. A lever of knob that moves the film forward for the next photograph.



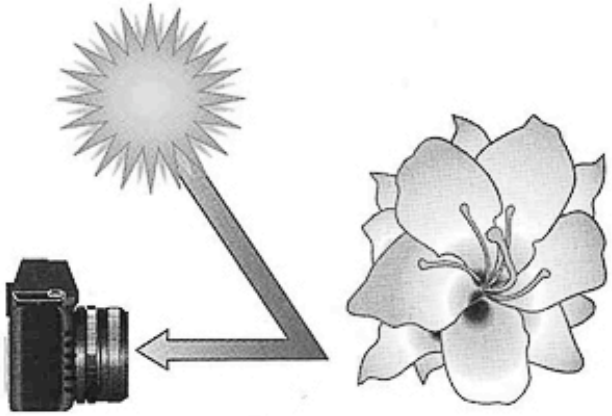
Exercise: Focus on a finger,
now focus on the background.
Notice what is sharp and what is soft.

3 ways to control exposure

Aperture size

Shutter speed

Film speed

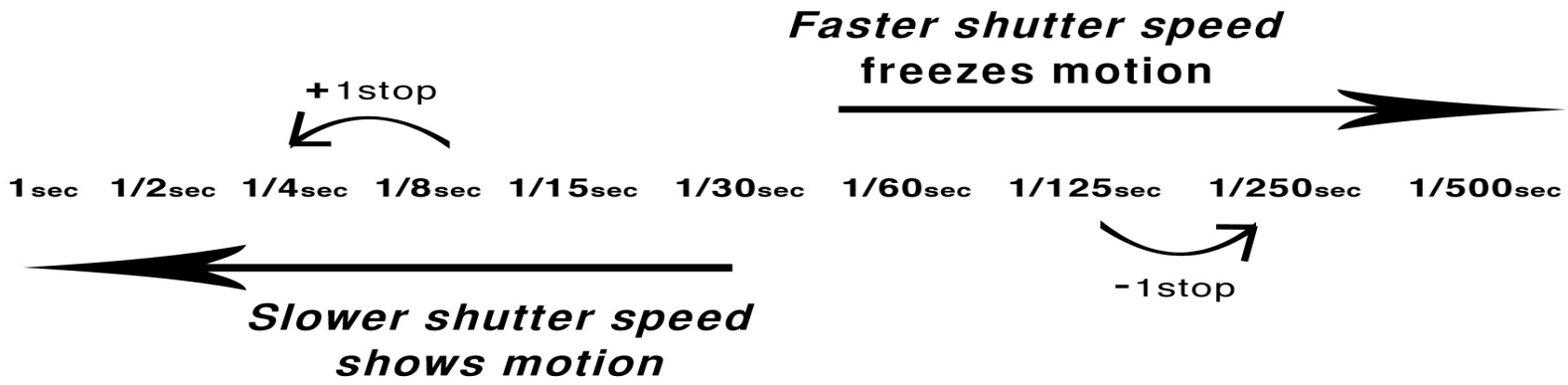


Amount of light

The term “stop” in photography refers to a change in illumination, whether the shutter, aperture, or ISO (film speed) is changed to achieve it.

Shutter Speed

- The shutter is one way to ***control the amount of light*** that reaches the film by the length of time the shutter remains open.
- The shutter speed ***controls whether the image will be blurred or sharp.***



Direction of Moving Object Affects the Amount of Blur

DIRECTION OF A MOVING OBJECT AFFECTS THE AMOUNT OF BLUR

1/30 second

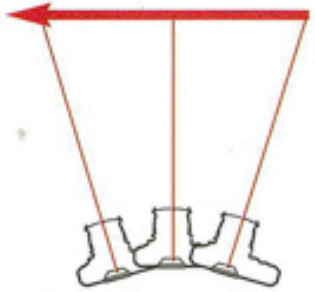
1/500 second

When a subject is traveling parallel to the plane of the film, *considerable movement is likely to be recorded on the film. The subject will be blurred, unless the shutter speed is fast.*

1/30 second

If the subject is moving directly toward or away from the camera, *there is no sideways movement recorded on the film and so a minimum of blur is produced, even at a relatively slow shutter speed.*

1/30 second, camera panned

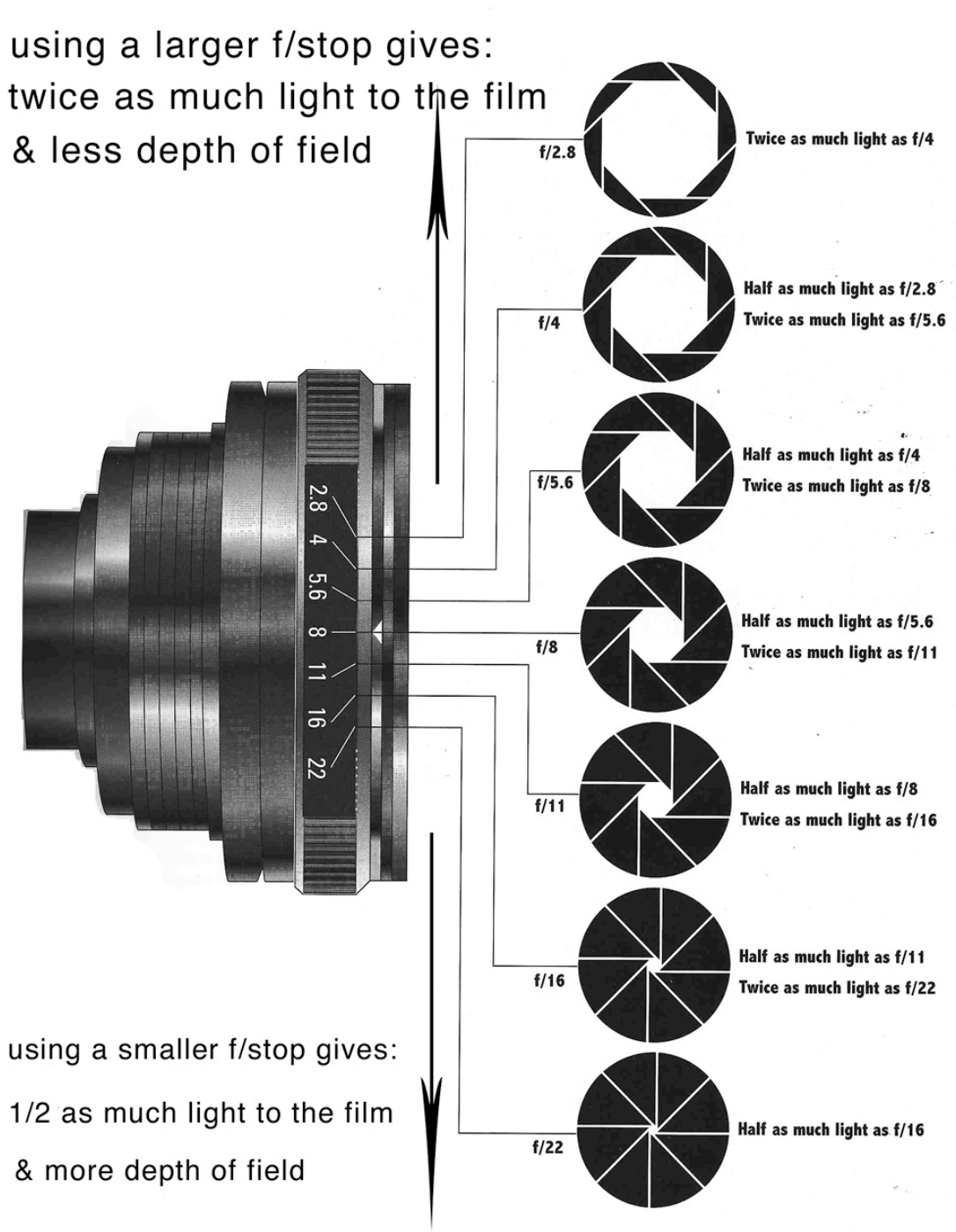


During panning, the camera is moved in the same direction as the subject. *The result is a sharp subject and a blurred background.*

F/Stop also know as *Aperture*

The f/stop or *Aperture* controls the *amount of light* that enters the camera.

The f/stop or aperture also controls the *depth of field*.

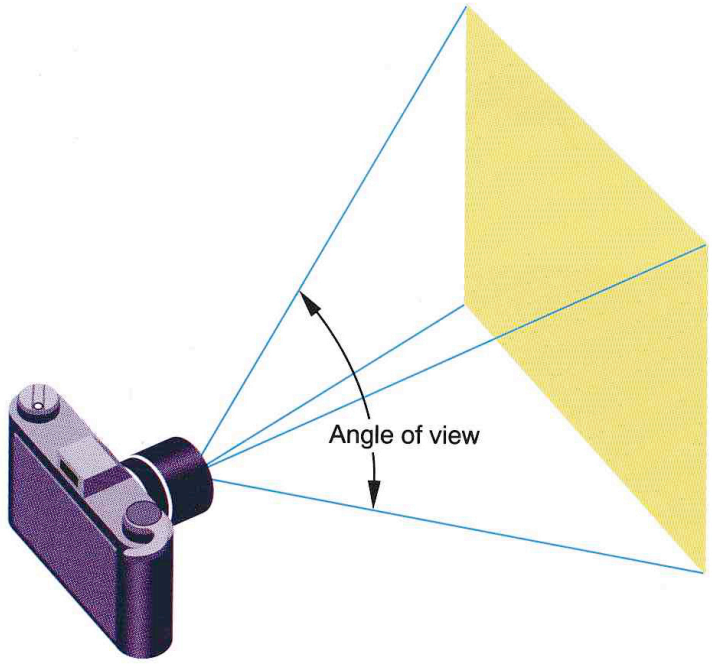


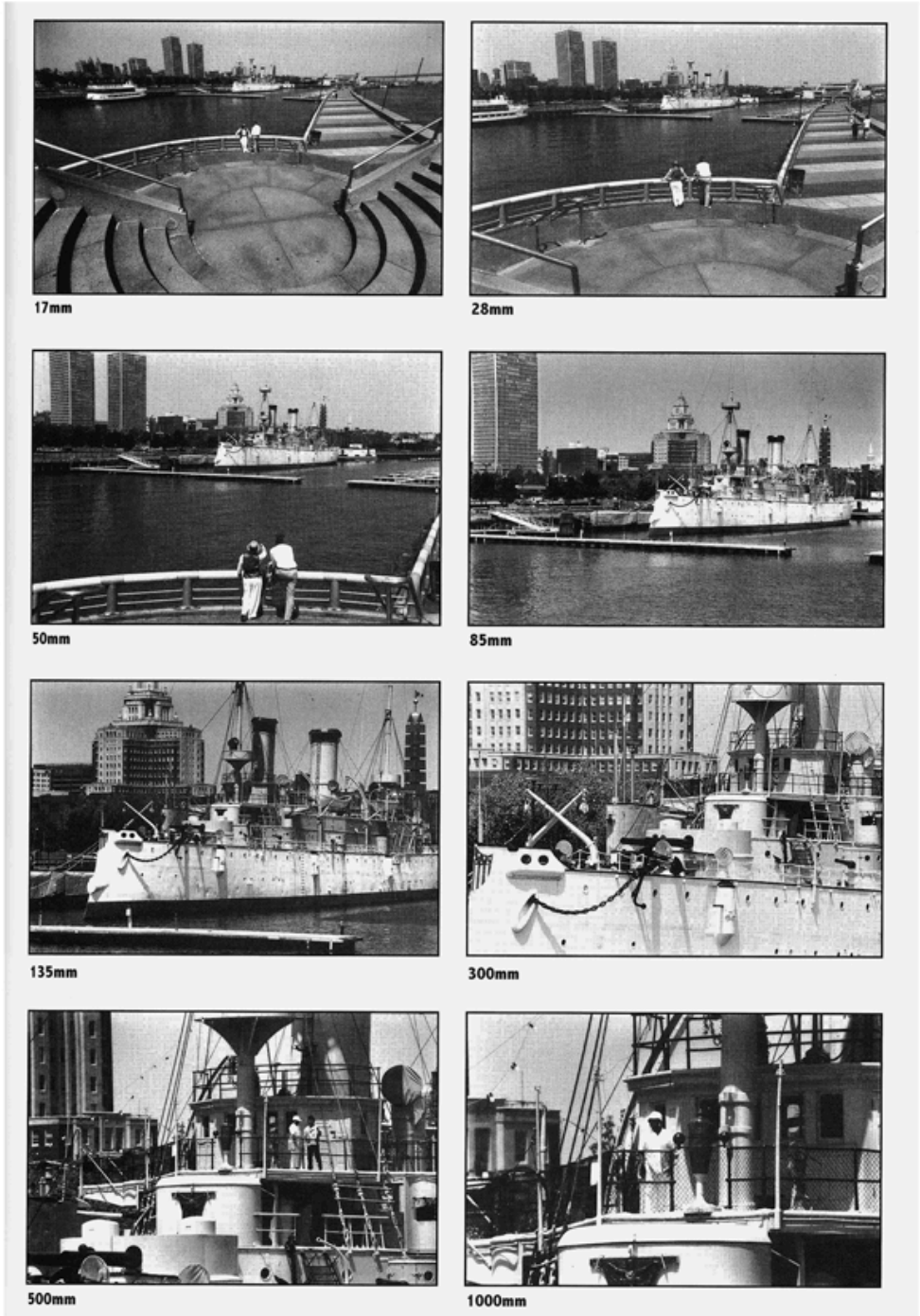
Angle of View

The “angle of view” of a lens is the amount of subject matter seen by the lens.

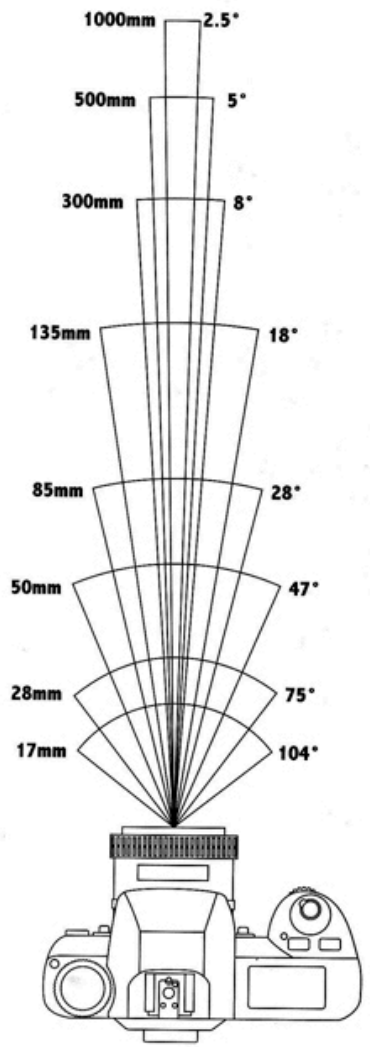
- A long focal length lens *also known as a telephoto lens* forms a narrower angle of view than a normal lens, creates greater image magnification, and compresses image perspective.
- A short focal length lens *also known as a wide angle lens* forms a wider angle of view than a normal lens, creates considerable depth, and can show exaggerated size relationships.
- A normal focal length lens *also known as a normal lens* approximates the impression human vision gives. The relative size of near and far objects seems normal.

Exercise: Make a circle with your forefinger and thumb. Hold it close to your eye (equivalent to a shorter lens), and move away from your eye. As you do this the scene in front of you will show a smaller part of the subject (equivalent to a longer lens).





Angle of View

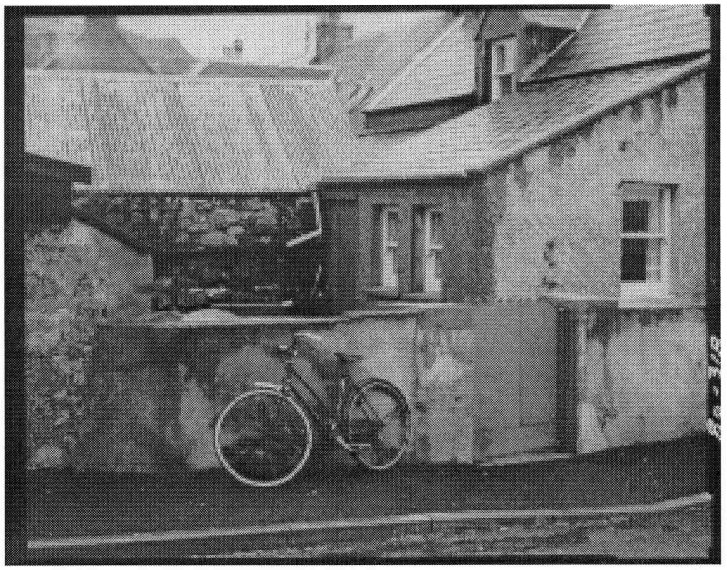


Perspective

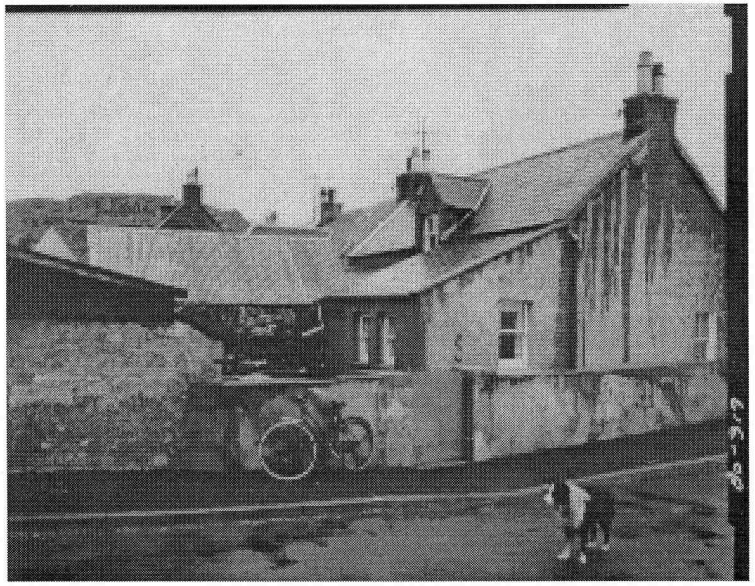
Perspective: the relative size of objects at different distances from the camera. It is one of the principle indicators of depth in a photograph, the dwindling size of objects indicating greater distance from camera to subject.

Changing the focal length of the lens does not change the perspective, for every element in the scene remains in exactly the *same relationship* to each other.

The only way to change *perspective* is to change, or move the camera position.



TELEPHOTO LENS

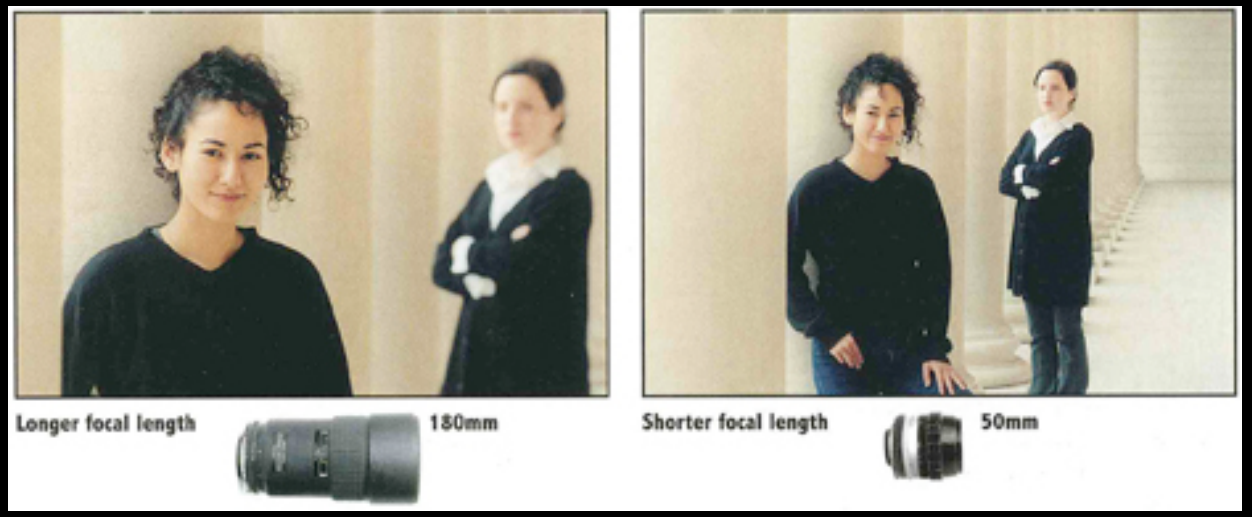


WIDE ANGLE LENS

Lenses

Telephoto Lens

- Narrow angle of view
- magnifies image
- Compresses perspective



Wide Angle Lens

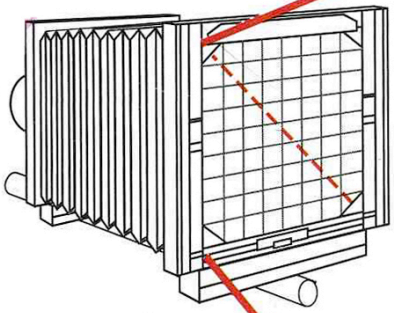
- wider angle of view
- creates considerable depth
- can show exaggerated size relationships

Normal Lens

- approximates the impression of human vision
- the relative size of near & far objects seems normal

Normal Lens for a 35mm Camera

Normal Lens = diagonal measure of the film



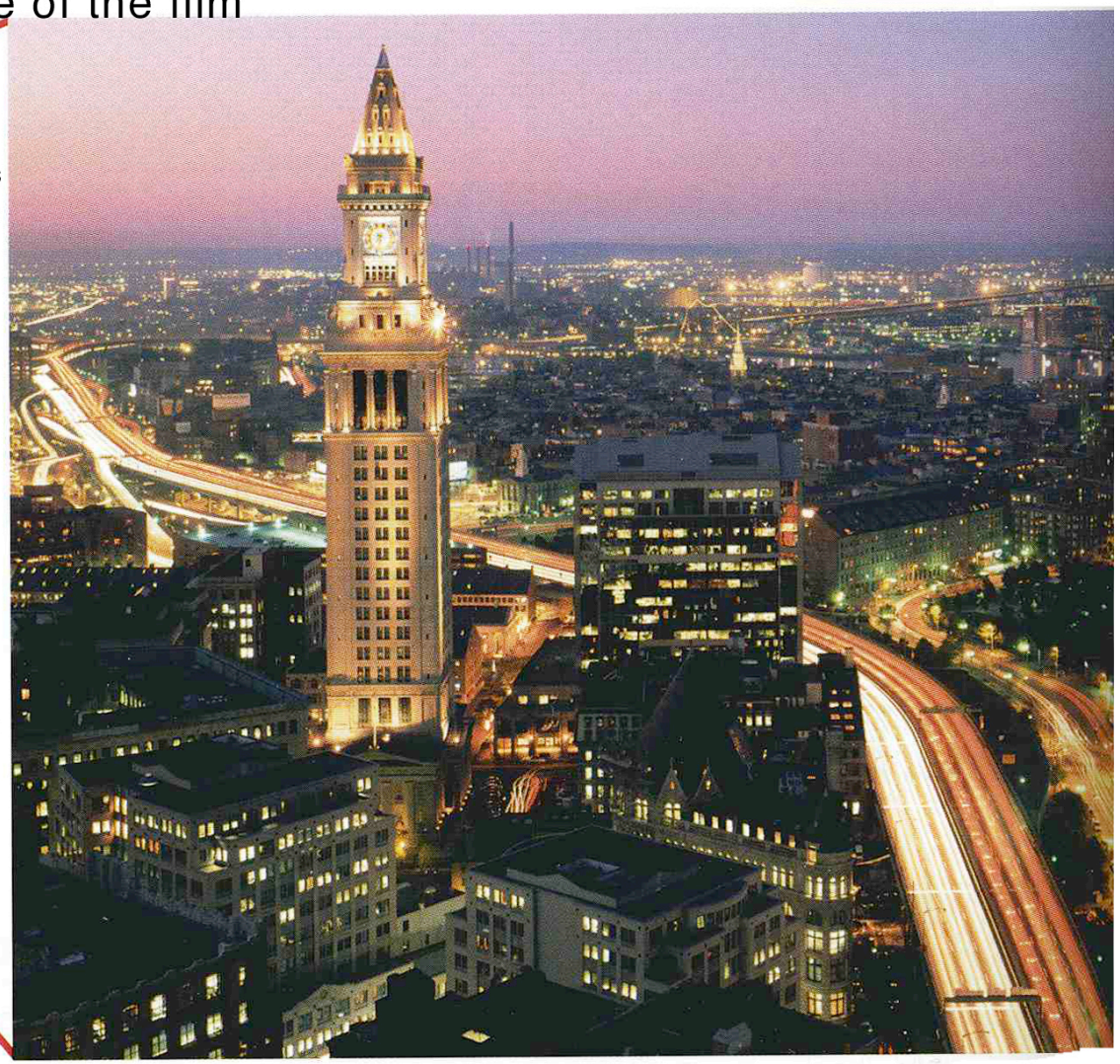
If the focal length of a lens is about the same as the diagonal measurement of the film (broken line) the lens is considered normal.

View of 150mm lens on a 4 x 5-inch view camera

A 50mm lens is 2 inches this is approximately the diagonal measurement of a piece of 35mm film.

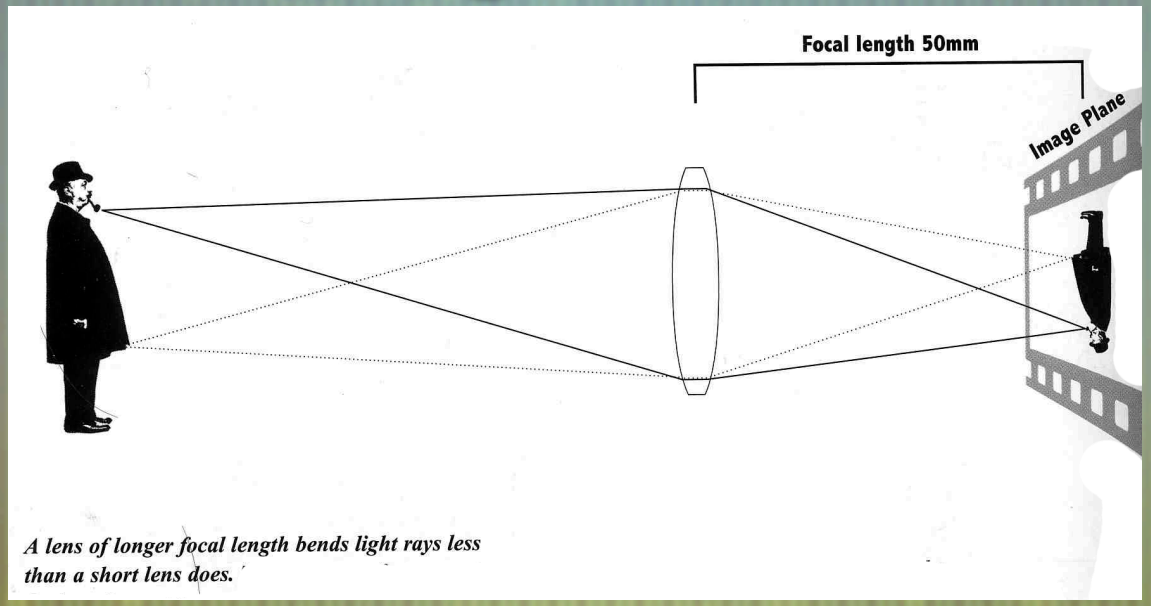
A 50mm lens is considered a normal lens for a 35mm camera.

A normal lens collects light rays from an angle of view of about 50° which approximates the impression human vision gives.

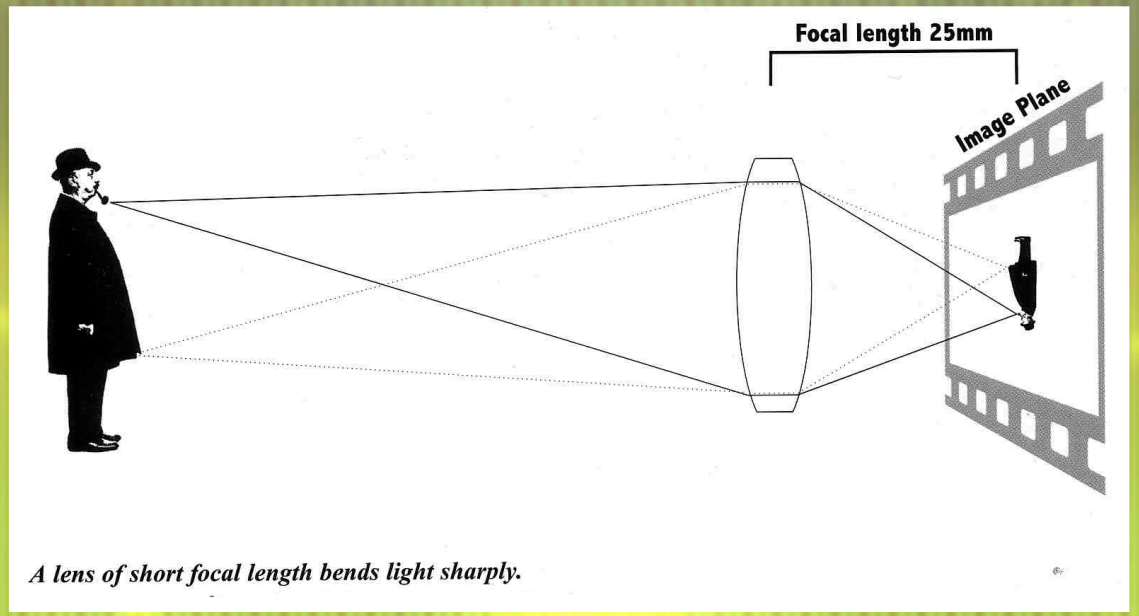


PETER VANDERWARKER Custom House Tower and Central Artery, Boston, 1989

Focal Length of Lenses



A lens of longer focal length bends light rays less than a short lens does.



A lens of short focal length bends light sharply.

Focal Length, Apertures, and Light

LENS FOCAL LENGTHS, APERTURES, AND LIGHT

The two lenses below, both set at f/4, let in the same amount of light, even though the actual opening in the 100mm lens (left) is physically smaller than the opening in the longer 200mm lens (right).

The longer the focal length, the less light that reaches the film (or CCD chip on a digital camera), therefore a long lens will form a dimmer image than a short lens unless more light is admitted by the aperture.

The sizes of the aperture openings are determined so that at a given f-stop number the same amount of light reaches the film, no matter what the focal length of the lens. The f-stop number, also called the relative aperture, equals the focal length of the lens divided by the aperture diameter.

$$\text{f-stop} = \frac{\text{lens focal length}}{\text{aperture diameter}}$$

If the focal length of the lens is 100mm, you need a lens opening of 25mm to produce an f/4 aperture.

$$\frac{\text{100mm lens}}{\text{25mm lens opening}} = \frac{100}{25} = \text{f/4}$$

If the focal length of the lens is 200mm, you need a lens opening of 50mm to produce an f/4 aperture.

$$\frac{\text{200mm lens}}{\text{50mm lens opening}} = \frac{200}{50} = \text{f/4}$$

Circles of Confusion

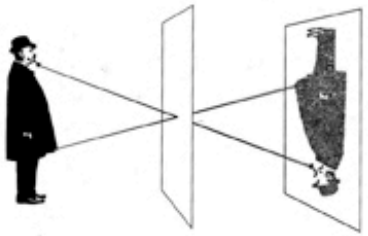
Images are made by circles of light termed “Circles of Confusion”.

The smaller the circle of confusion, the more the circle looks like a point and the sharper the image appears.

Larger circles make the image appear softer, or out of focus.

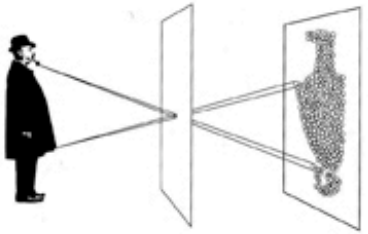
Depth of Field, the nearest and farthest subject distances that are acceptably sharp in an image, depends upon the size of the circles of confusion.

Photograph made with small pinhole



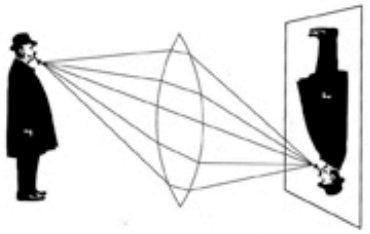
To make this picture, the lens of a camera was replaced with a thin metal disk pierced by a tiny pinhole, *equivalent in size to an aperture of f/182. Only a few rays of light from each point on the subject got through the tiny opening, producing a soft but acceptably clear photograph. Because of the small size of the pinhole, the exposure had to be 6 sec long.*

Photograph made with larger pinhole



When the size of the pinhole was increased to f/65, the result was an exposure of only 1/5 sec, *but an extremely out-of-focus image. The larger hole let through more rays from each point on the subject. These rays spread widely before reaching the film, making large circles that overlapped one another creating a very unclear image.*

Photograph made with lens



This time, using a simple convex lens with an f/16 aperture, *the scene appeared sharper than the one taken with the smaller pinhole, and the exposure time was much shorter, only 1/100 sec. The lens opening was much bigger than the pinhole, letting in far more light, but it focused the rays from each point on the subject precisely so that they were sharp on the film.*

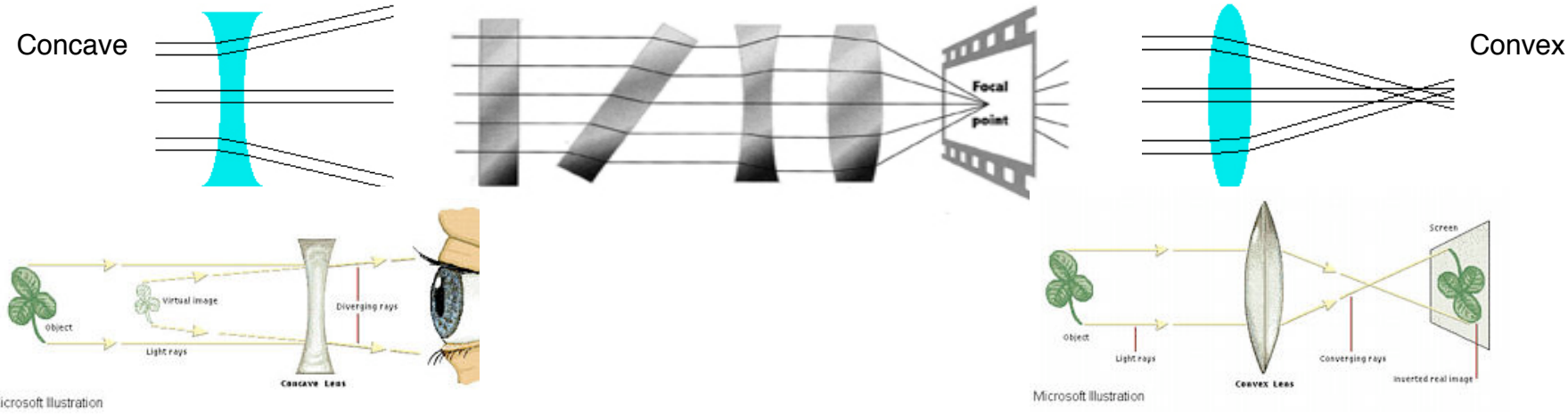
Lenses

Lenses form circular images and focuses light onto a flat surface.

The reason why images are square is because the film or sensor is square, and they fit into the image circle showing us only a part of what the lens could show us.

exercise: hold a magnifying lens above a piece of white paper and it will form a circle of light.

Concave and Convex Lenses



A convex lens, thicker in the middle than at the edges, is described as “positive” because it bends light rays together and can project an actual image on a flat surface.

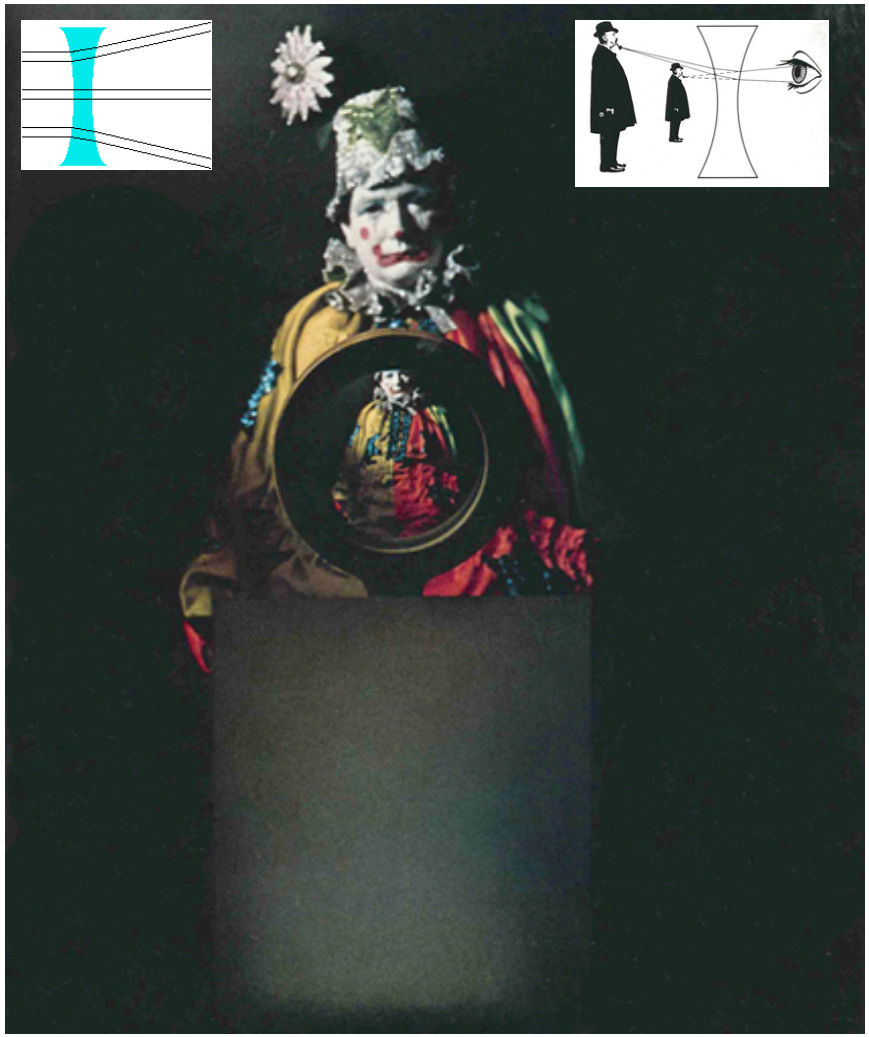
A concaved lens is called “negative” because it spreads light rays apart and therefore cannot form an image on a flat surface.

If you look through a magnifying glass (a convex lens) you would have to hold it at a proper distance to focus the image you are looking at.

A concave lens does not have to focus at all. Looking through this lens, the subject will appear smaller, but it will be upright, non-reversed and in focus, no matter how close or far away the object is.

Therefore a camera uses a positive lens to take the picture, and a negative lens in its viewfinder.

Concaved Lens



A concaved lens is called “negative” because it spreads light rays apart and therefore cannot form an image on a flat surface.

Convexed Lens

A convex lens, thicker in the middle than at the edges, is described as “positive” because it bends light rays together, and can project an actual image on a flat surface.

Depth of Field

The area between the nearest and farthest points from the camera that are acceptably sharp.

Depth of Field

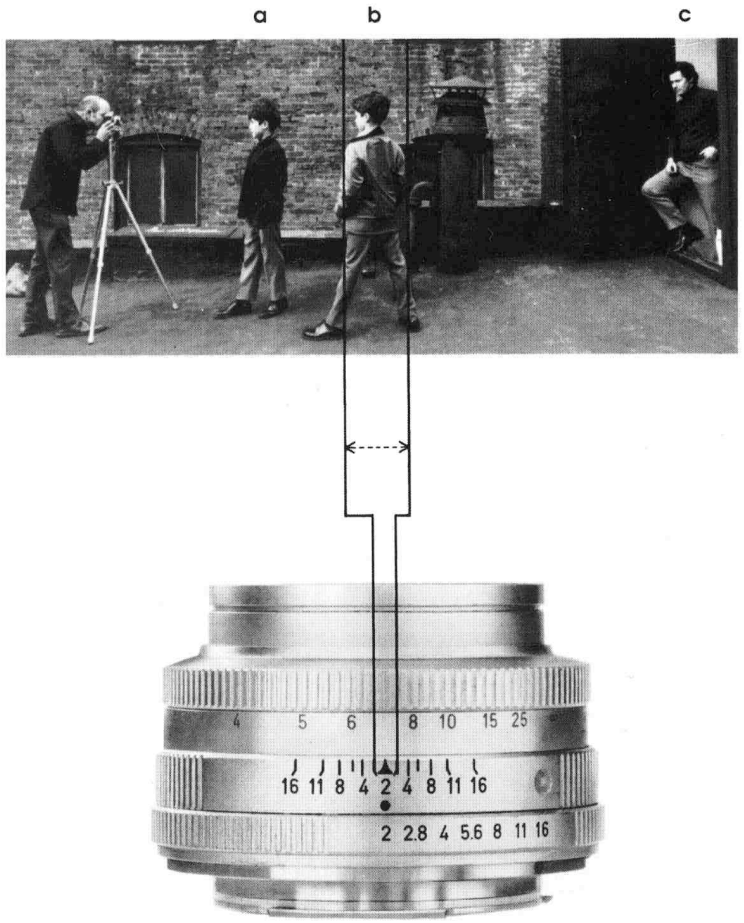
If you want to attain sharpness throughout the image, and the scene has objects close to as well as far away from the camera, it is best to focus approximately 1/3 of the way into the scene.

As the aperture is closed down sharpness increases both in front of and behind the plane of critical focus.

Depth of field increases half as fast toward the camera as it increases away from the camera.

Depth of Field

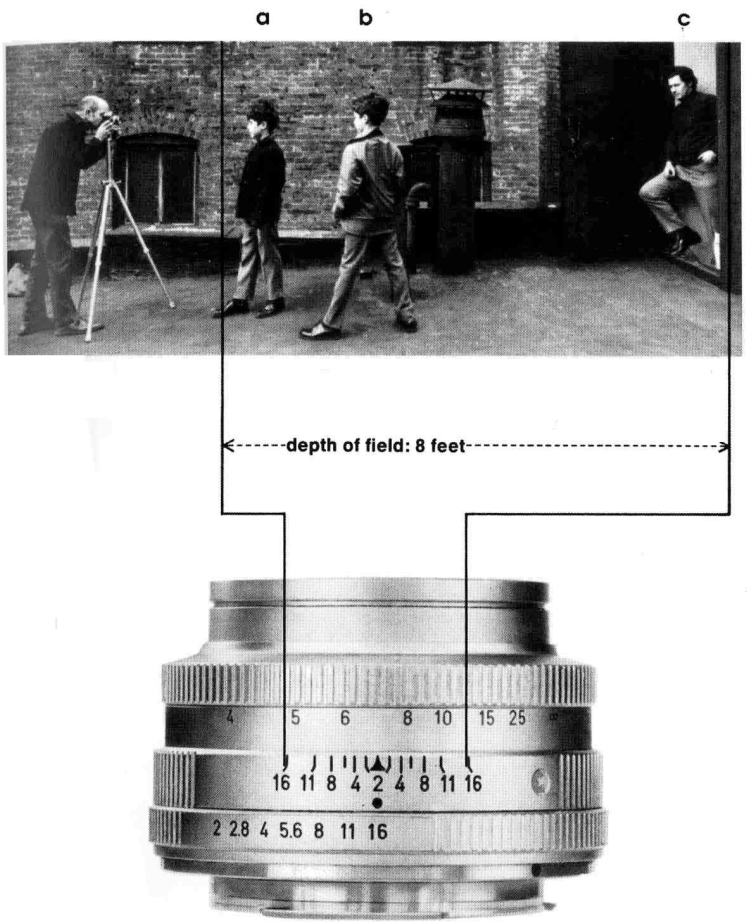
b is the plane of critical focus.



A photographer can limit focus to one plane of sharpness by opening the lens up to its maximum aperture f/2, and allowing objects in front of the *plane of critical focus*, and behind that plane to fade out of focus.

Depth of Field

b is the plane of critical focus

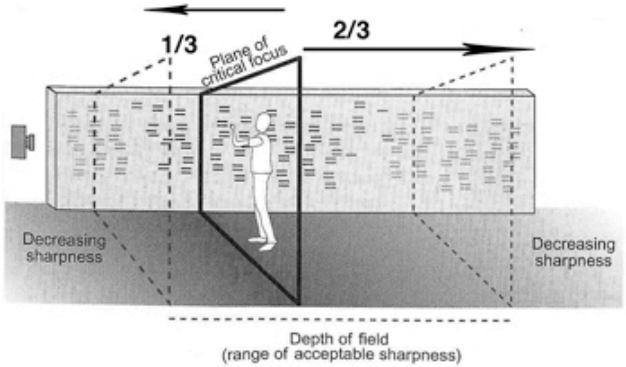


Or, the photographer has the option of bringing virtually everything into sharp focus by closing down the aperture to the minimum opening for the lens F/16.

Plane of Critical Focus

MICHA BAR-AM Yad Vashem Holocaust Memorial, Jerusalem, 1

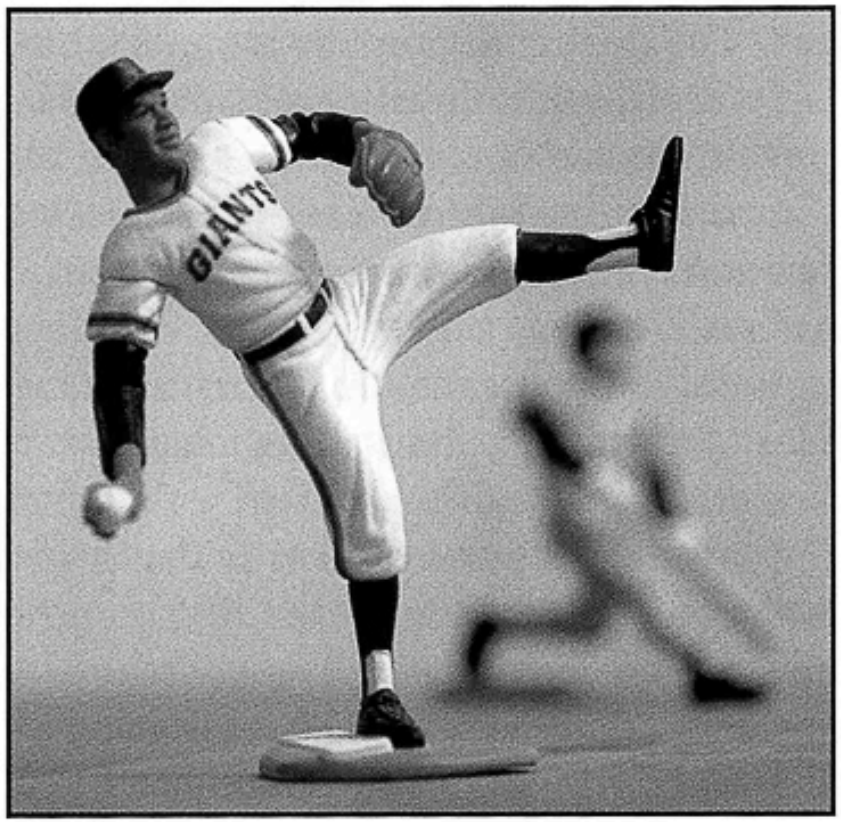
A lens focuses on the plane of critical focus,



The farther that objects are from the plane of critical focus,
Either toward or away from the camera, the less sharp they will be.

Depth of Field extends about 1/3 in front of the plane of critical focus,
2/3 behind it.

Sharp Focus Attracts the Eye



Sharp focus attracts the eye. *When you are photographing, it is natural to focus your eyes—and the camera—on the most important area of a scene.*

Sharp focus is a signal to pay attention to a particular part of an image, especially if other parts are not sharp.

A Lens has 3 scales

Infinity symbol

How to use the scales

Once the lens is focused, the depth of field Is read by finding the distances bracketed on each side by the f-number set on the aperture ring.

In this example, focusing the lens at 8 feet gives depth of field from 5.5 feet to 15 feet when the aperture is set to f/16.

Sharpness & Depth of Field

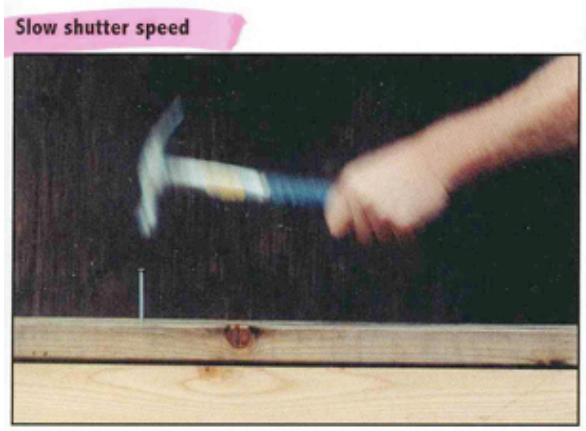
The smaller the aperture, the greater the depth of field.

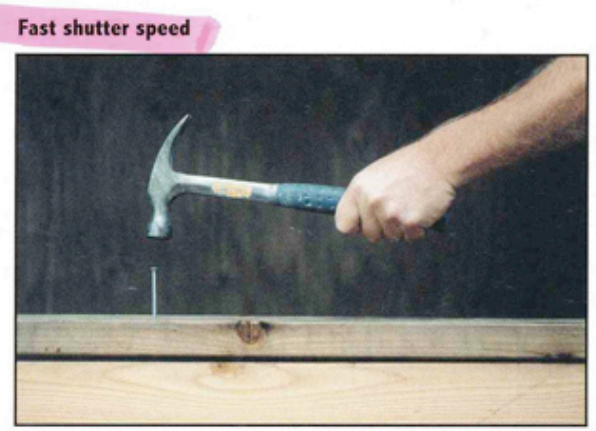
The shorter the focal length, the greater the depth of field.

The greater the distance from the subject, the greater the depth of field.

Comparisons

Fast vs. Slow shutter speed

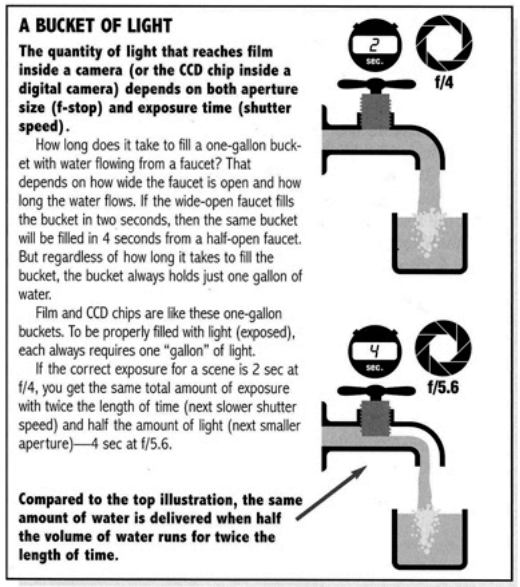




Large vs. Small aperture

Short vs. Long focal length lens

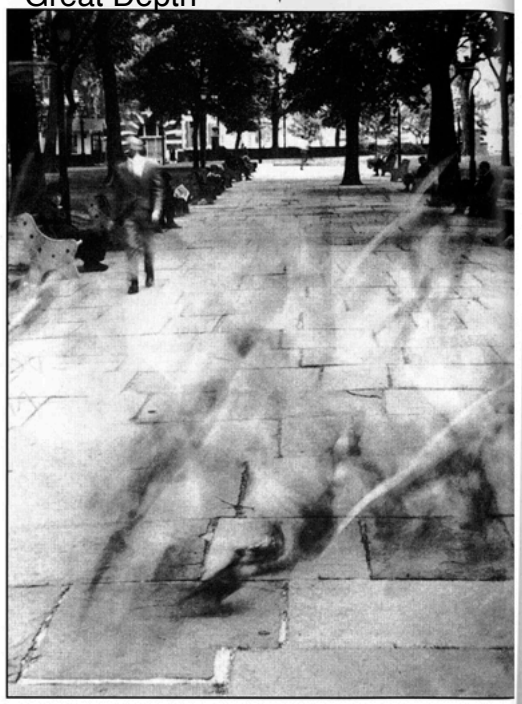
Reciprocal Relationship between Aperture & Shutter Speed



As the example to the left shows: if you change to a smaller f/stop you can keep the same amount of light that hits the film if you change to a slower shutter speed. If you halve the f/stop (intensity), you double the shutter speed (time) to keep the amount the same.

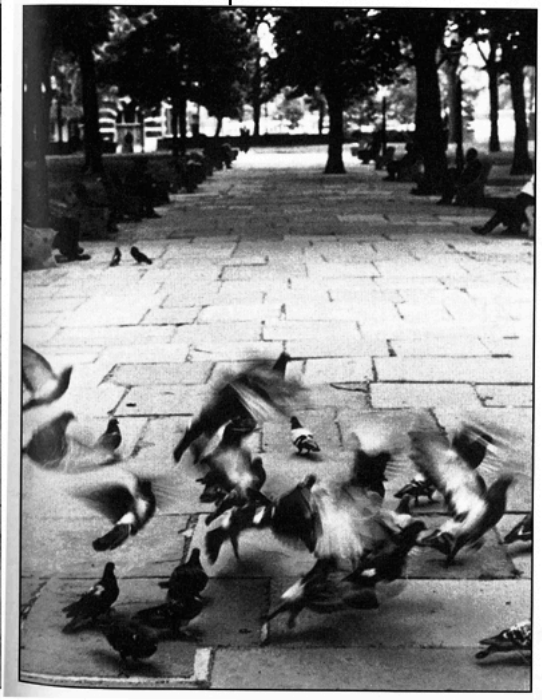
Decide if you want to show motion, stop motion, show great depth of field, or shallow depth of field, and adjust your lens and shutter to suit.

Great Depth



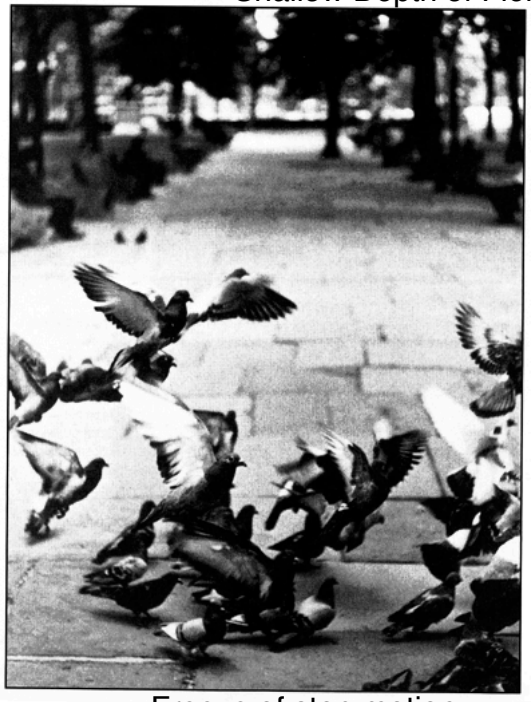
Show motion

Compromise



Compromise

Shallow Depth of Field

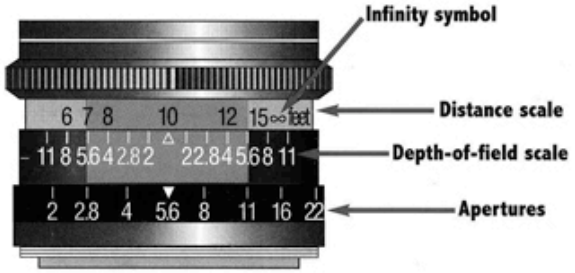


Freeze of stop motion

Focus and Depth of Field
Zone Focusing

Zone focusing lets you set the depth of field in advance of shooting. It is useful when you want to shoot rapidly without refocusing, and can predict approximately where, if not exactly when, action will take place (for example when photographing strangers on the street). It lets you be relatively inconspicuous by not having to spend time focusing with your camera to your eye.

To zone focus, use a lens's depth-of-field scale to find the f-stop settings that will give you adequate depth of field (see lens diagram, below). Everything photographed within the near and far limits of that depth of field will be acceptably sharp. The precise distance at which something happens is not important because the whole area will be sharp. Generally, zone focus works best with normal- or short-focal-length lenses. A long-focal-length lens may have too little depth of field to make the technique practical.



Zone focusing uses a lens's depth-of-field scale so you can be ready to shoot without focusing before every shot. Suppose the nearest focus point you want sharp is 7 ft away, and the farthest is 13 ft away. Turn the focusing ring until those distances on the distance scale fall opposite a matched pair of f-stops on the depth-of-field scale. If you set your lens aperture to that f-stop, objects between the two distances will be in focus.

Here, the two distances fall opposite a pair of f/5.6 marks. With this lens set to f/5.6 or a smaller aperture, such as f/8 or f/11, everything between 7 ft and 13 ft will remain sharp. You will not need to refocus as long as the action stays between those distances.

HELEN LEVITT New York, c. 1942

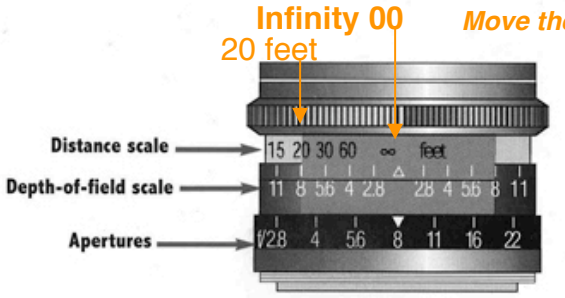
If you think that focusing your camera could distract your subject, you can zone focus. *Before you begin to photograph, use your lens's distance scale to prefocus, then adjust the depth-of-field scale to find the area that will be sharp in front of and behind the focus point. It is often faster to zone focus in advance of action than it is to try to focus on a particular subject during a peak moment.*

Focus and Depth of Field
Focus on the Hyperfocal Distance

JOHN PFAHL Niagara Falls, Niagara River, New York, 1991

The Hyperfocal Distance is the distance to the nearest plane of sharp focus when the camera is focused on infinity.

If you find that you are focused on the infinity Mark 00, you can extend Your Depth of field by following the focusing technique below.



F/8

- Focused on infinity 00
- at f/8
- **20 feet** to **infinity 00** are in focus

Move the infinity 00 mark to f/number you are using

*For **maximum depth of field in a scene that extends to the far distance** (infinity in photographic terms, ∞ on the lens distance scale), do not focus on the infinity symbol. With the lens to the left, if the aperture is f/8 and the lens is focused on infinity, everything from 20 ft to infinity will be sharp.*

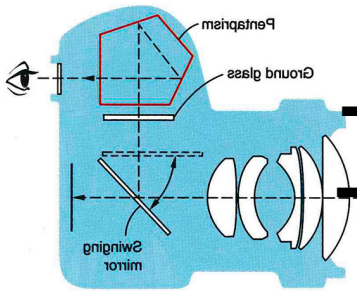
Instead, as has been done with the lens to the right, set the distance scale so that the infinity mark lines up opposite your chosen f-stop on the depth-of-field scale (f/8 in this example). Now, with the lens still set to f/8, everything from 10 ft to infinity will be sharp.

F/8

- Move the infinity 00 mark to the f/stop in use
- Focus is now **10 feet** to **infinity 00**
- When you focus on the Hyperfocal Distance, you gain 1/2 of the near depth of field distance back.

In this example depth of field went From 20 feet to infinity 00 to 10 to infinity 00.

HyperFocal Distance



Nearest Plane of Sharp focus

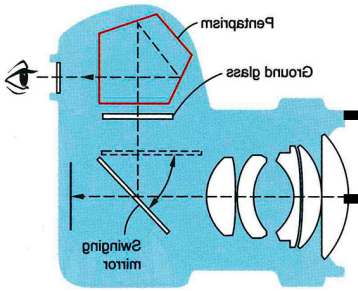
20 feet

HyperFocaL Distance

PLANE OF CRITICAL FOCUS

to infinity

The Hyperfocal Distance is the distance to the **nearest plane of sharp focus** when the camera is focused on infinity.



10 feet

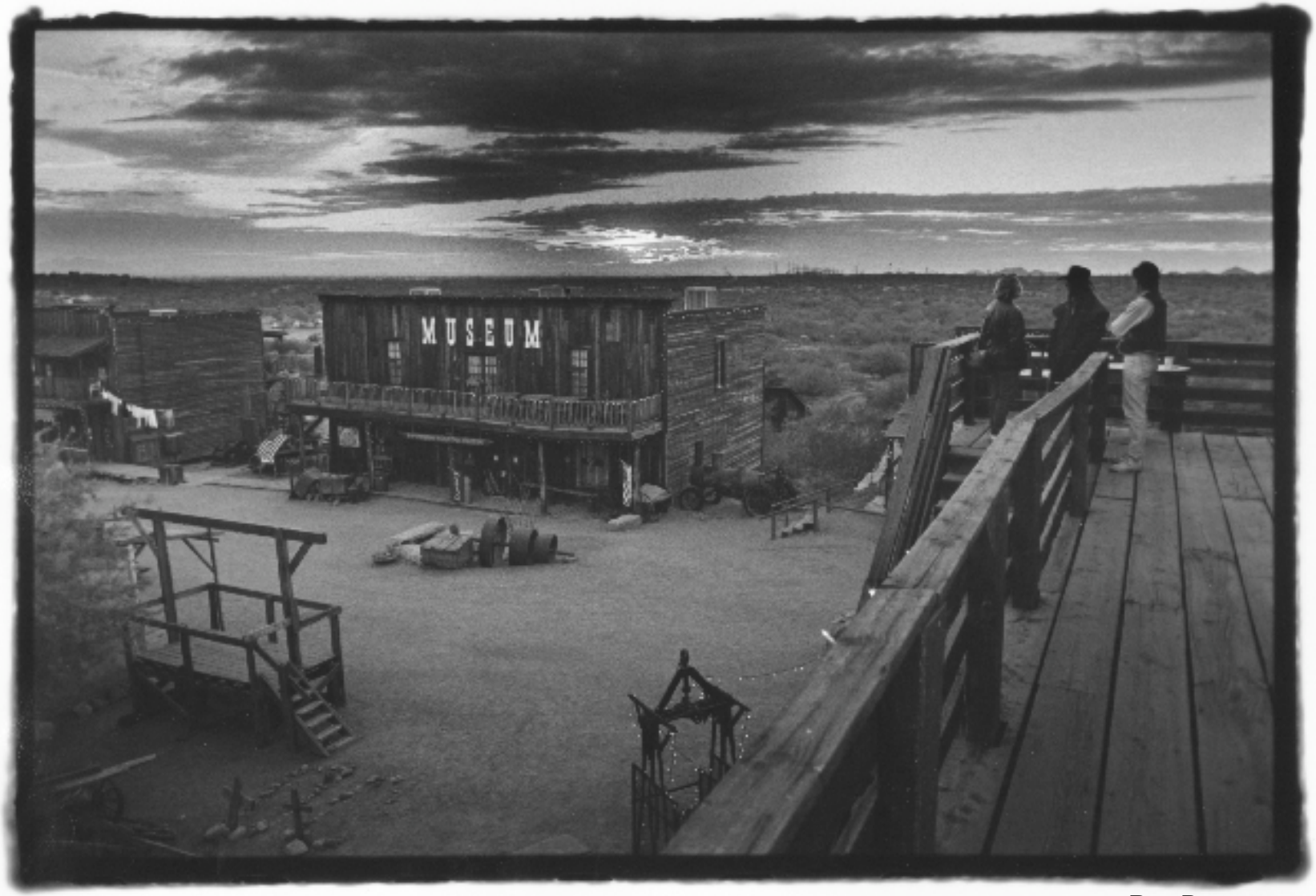
HyperFocaL Distance

Nearest Plane of Sharp focus

to infinity

Far

When you focus on the Hyperfocal Distance, you gain 1/2 of the near depth of field distance back.



1999

Roy Pope

Last Sunset of the Millennium