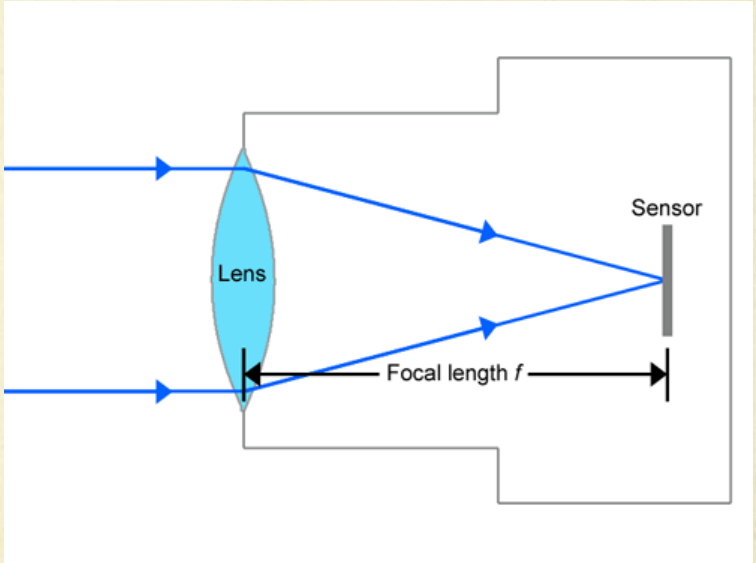
The Camera Lens

Focal Length

- Is a measure of the power of a lens to bend light rays coming from the subject. The shorter the focal length, the greater the bending power and the closer the focal plane is the the rear of the lens (longer lens is the opposite effect)
- Literally, the focal length of a lens is the distance from the optical center of the lens to the focal plane when the lens is focused on infinity



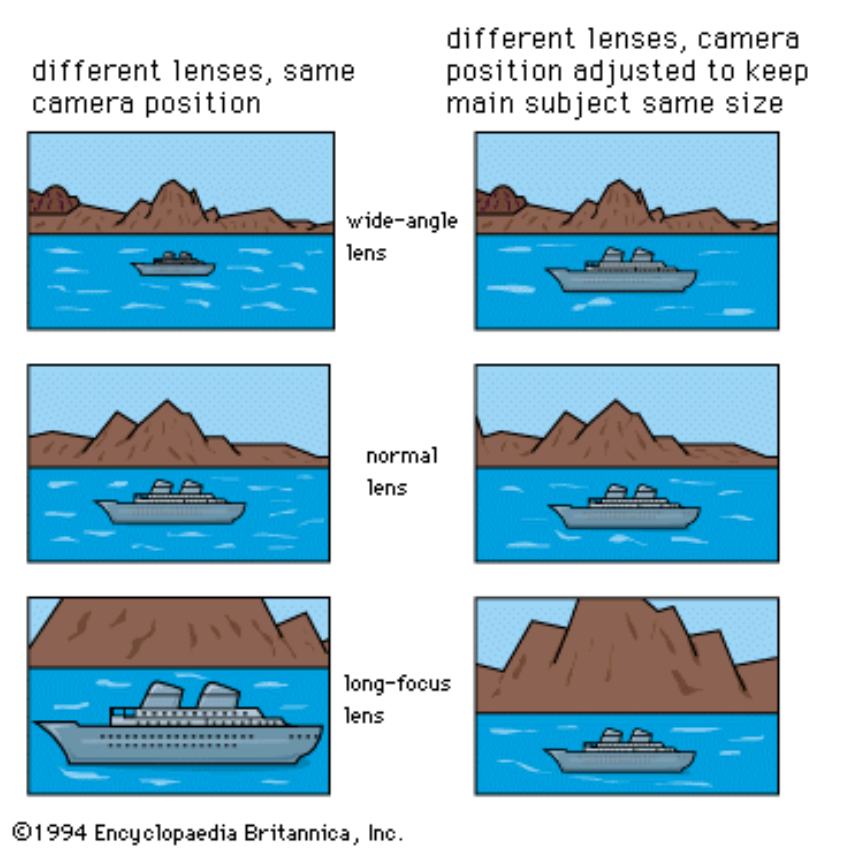
Perspective: Zoom vs. Dolly

- If the camera is moved closer to a subject the relative size of the foreground and background's objects increase at different rates
- Conversely, when you zoom (increase the focal length) the background and the foreground both increase at a rate directly proportional to the lens focal length.

Camera is close, zoomed out

Camera is further away, zoomed in

Different Lens Types change the angle of view



Lens types

Normal, Wide & Telephoto

- A lens of medium focal length that yields an image with natural perspective
- A wide angle lens is about half the focal length of a normal lens
- Lenses about 150 percent longer than the normal focal length are considered telephoto

Wide Angle


Horus

Telephoto lens


[www.prime-junta.tk]

Wide Angle Lens Effects

- Can show more image area (make a room look larger—or show more of it)
- If someone is standing on the edge of a wide angle lens it makes them look wider
- If someone runs from the background to the foreground on the edge of the frame—they will look like they are running faster
- Shooting down with a wide angle lens exaggerates depth
- A head and shoulder close-up with a wide angle lens—distorts facial features
- If you are 5 feet or more from a subject using a wide angle lens, then you do not have to worry about facial distortion

Distortion of Focal Lengths

Telephoto Lenses

- Shallow depth of field
- 2-dimensional looking image
- Increases image size
- Camera shake

Prime Lens vs. Zoom Lens

- A prime lens is usually a fixed focal length lens
- (Or) it is considered the "normal" lens for a camera. For a 35mm still camera or a standard DSLR that focal length is 50
- A Zoom lens is a variable focal length lens

Optical vs. Digital Zoom

- Spoiler alert: you should never use one of these
- Optical Zoom
- Digital Zoom

Aperture

- Opening in the lens
- Aperture
- f-number or stop
- = focal length/Aperture diameter
- Each stop represents either half or double the amount of light exposing the film or chip

Shutter Speed

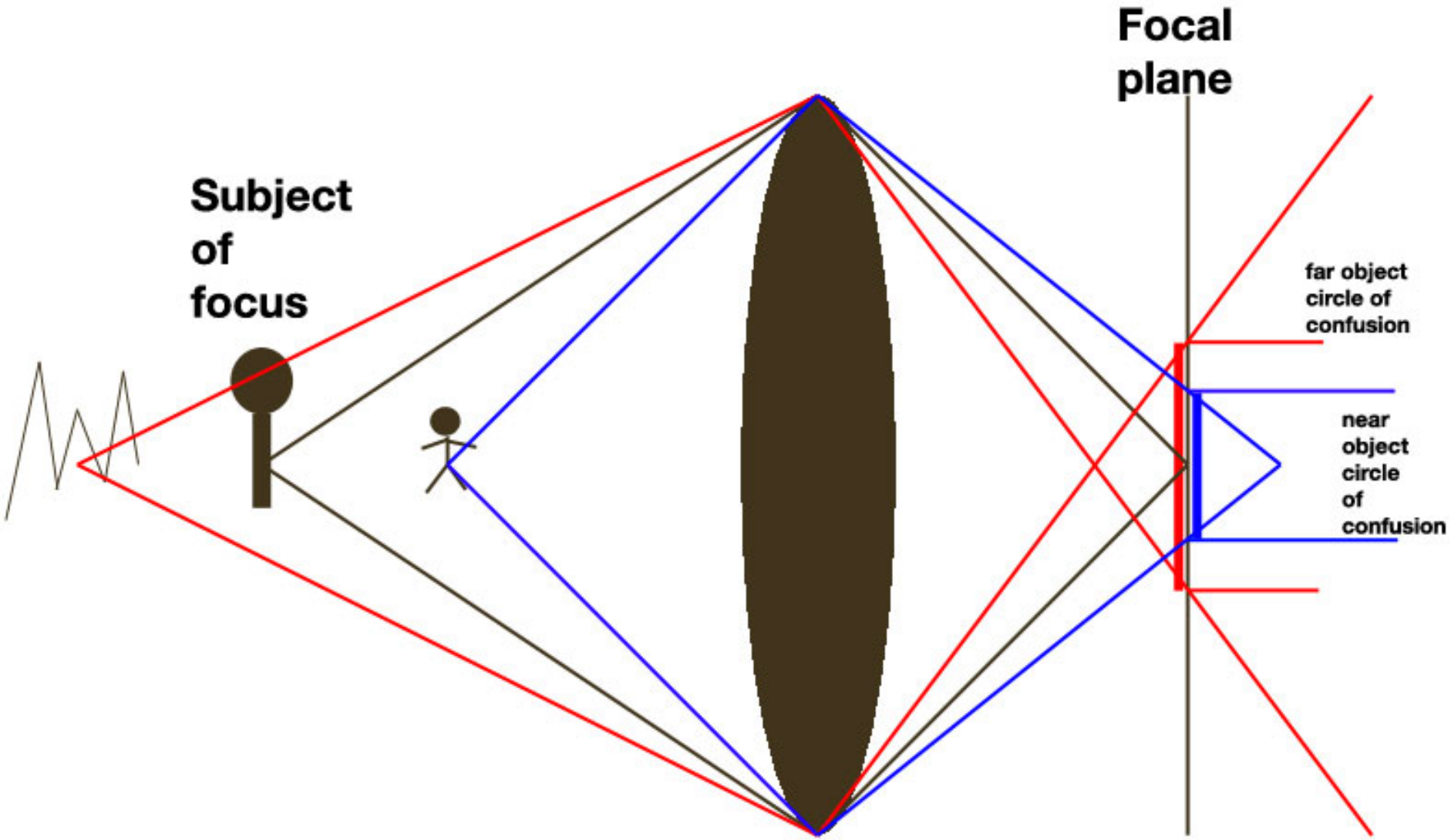
- In still cameras shutter speed controls how long the film or chip is exposed to light
- In video the shutter speed controls the length of time the sensor collects light while each frame is being captured

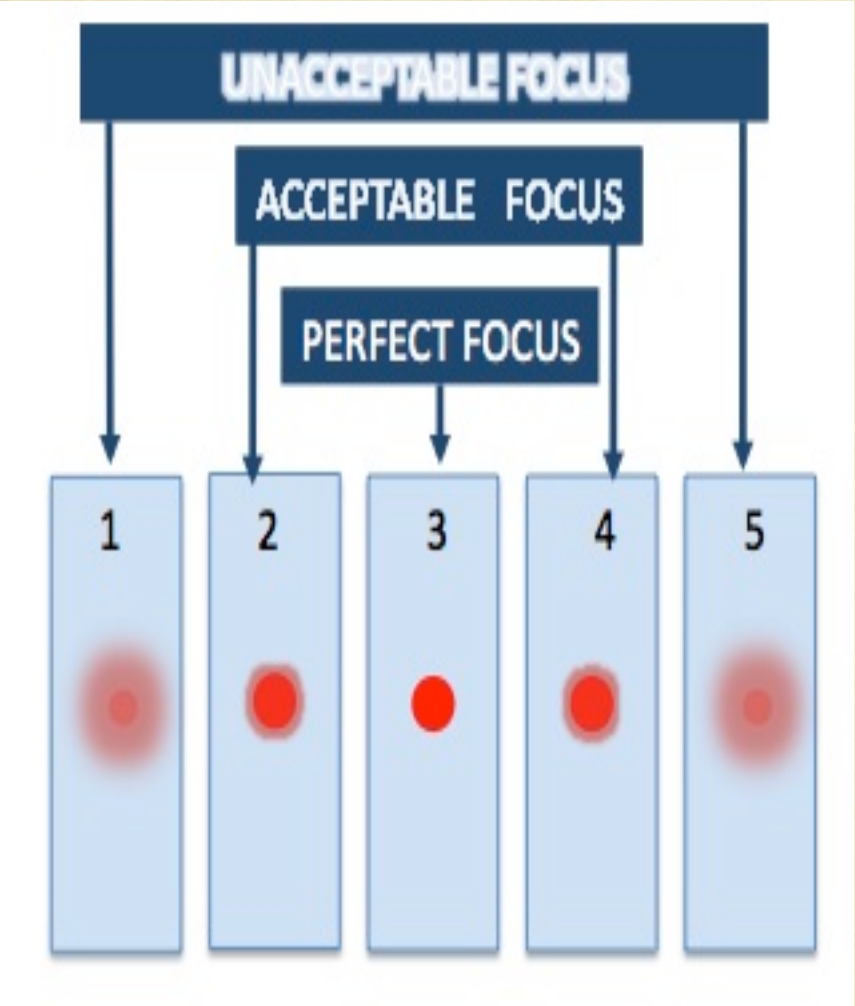
F-stop vs T-stop

- **f/number** Definition: Setting of lens diaphragm that determines amount of light transmitted by lens.
- **T-number** Definition: f/number of a lens corrected for the light loss during transmission through the lens.

Focusing the Image

- Distance Markings: when shooting a woman ten feet from the camera, you can set the focus point on the lens barrel to ten feet
- There is not only one subject plane of focus
- There is area in front of and behind that focal plane that is acceptably sharp (Depth of Field)


Focal
plane
Subject
of
focus
far object
circle of
confusion
near
object
circle
of
confusion



The circle of confusion is defined as the largest blur spot that is indistinguishable from the point source that is being rendered. Stated more simply, it is the limit at which we start noticing that things are getting blurry. Based on this definition, the circle of confusion should more appropriately be called the circle of "maximum" confusion (or "least" confusion if you are a glass half full person).

Slide 3 represents a perfectly rendered "point source." Slides 2 and 4 are slightly defocused representations of the same, but at a distance and grouped together with many other points, Slides 2 and 4 are indistinguishable from slide 3. Slides 1 and 5 represent markedly defocused points which the human eye would interpret as "out of focus." Based on these observations, a proper circle of confusion criterion should be defined such that slide 2 is accepted as in focus whereas slide 1 would be rejected as out of focus.

Depth of Field

- The area in front of and behind the plane of focus that appears acceptably sharp
- A zone extends from in front of the subject to behind the subject, delineating the area of acceptable sharpness

Depth of Field Determiners

- Focal length of Lens
- Aperture
- Distance from subject

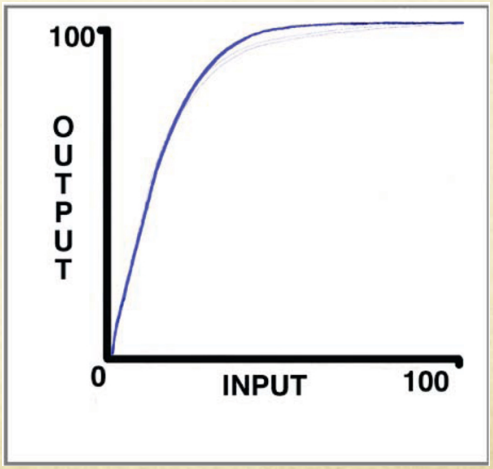
Where to Focus

- If you are focused on a subject you will have roughly twice as much depth of field behind the subject than in front of it
- A rule of thumb when shooting is to focus on the subject one third the distance from the closer to the farther object

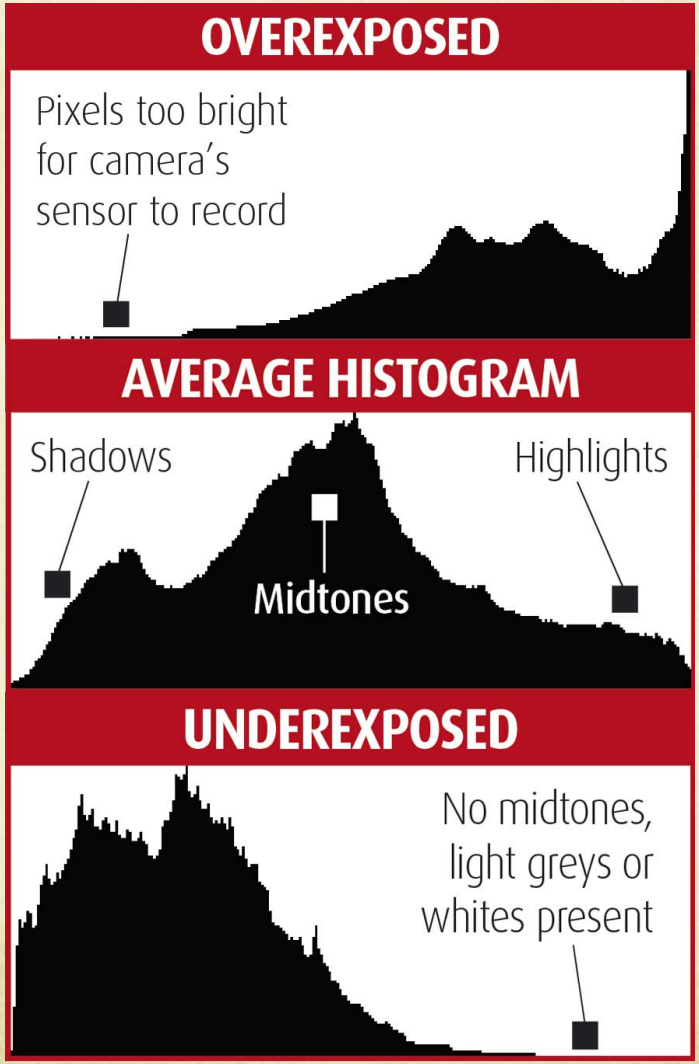
Exposure Range/Contrast Range

- Our eyes adjust to scenes way better than video
- In video you have to either choose between detail in the shadows or detail in the highlight area
- Video anywhere between 5 to 45 stops of contrast range

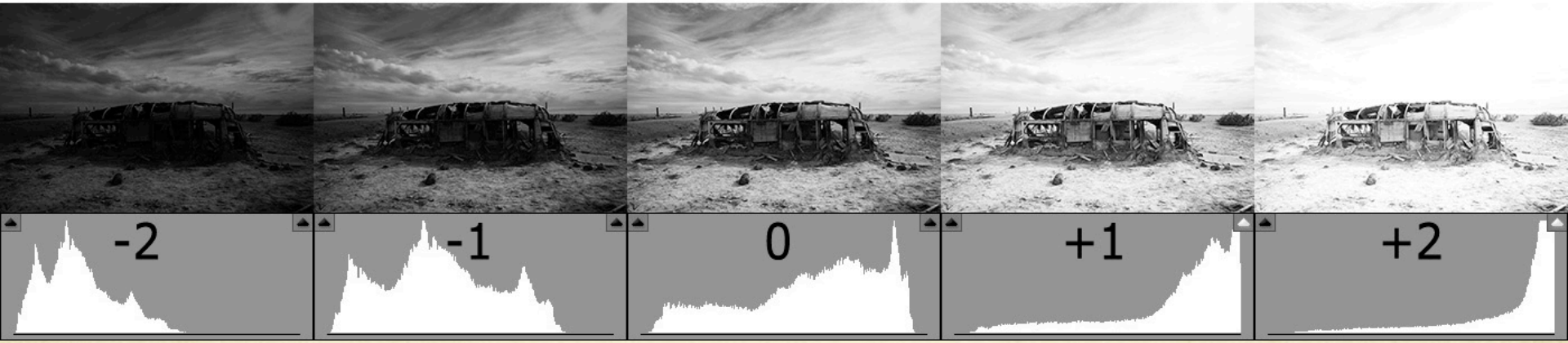
Adjusting the knee



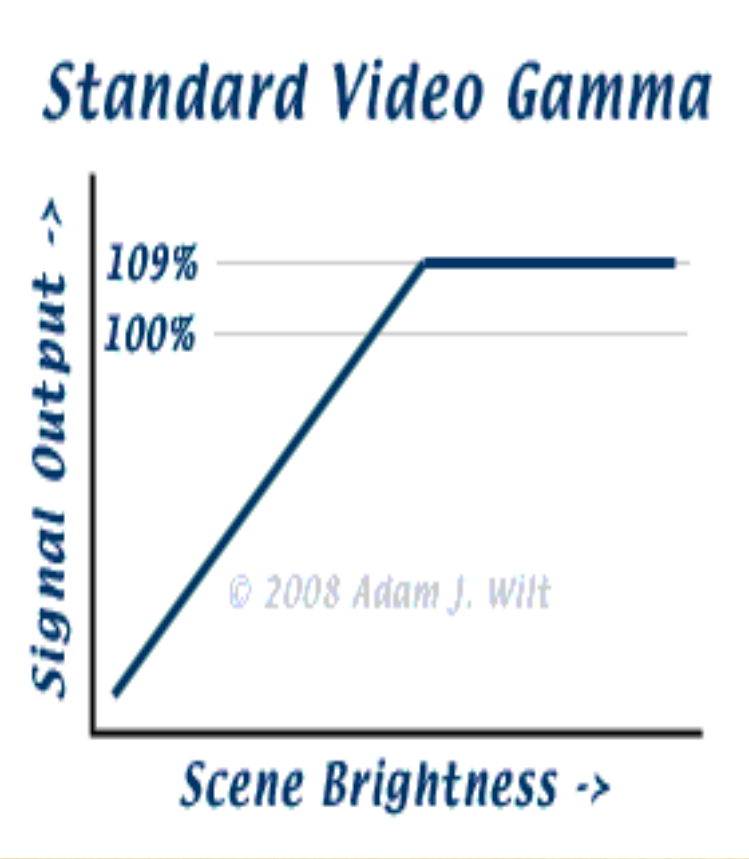
Histogram

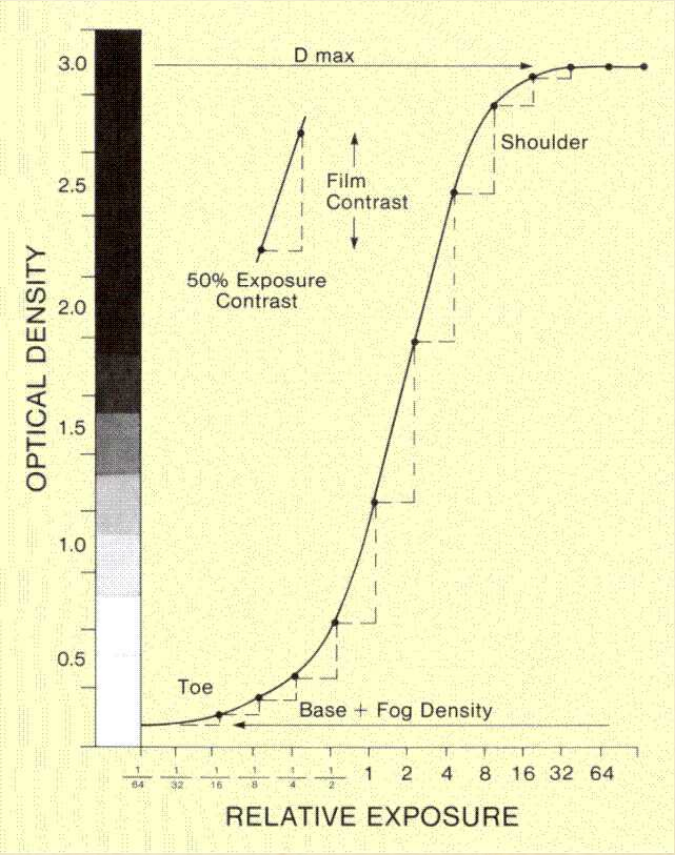

OVEREXPOSED
Pixels too bright for camera's sensor to record
AVERAGE HISTOGRAM
Shadows
Midtones
Highlights
UNDEREXPOSED
No midtones, light greys or whites present

EXPOSURE

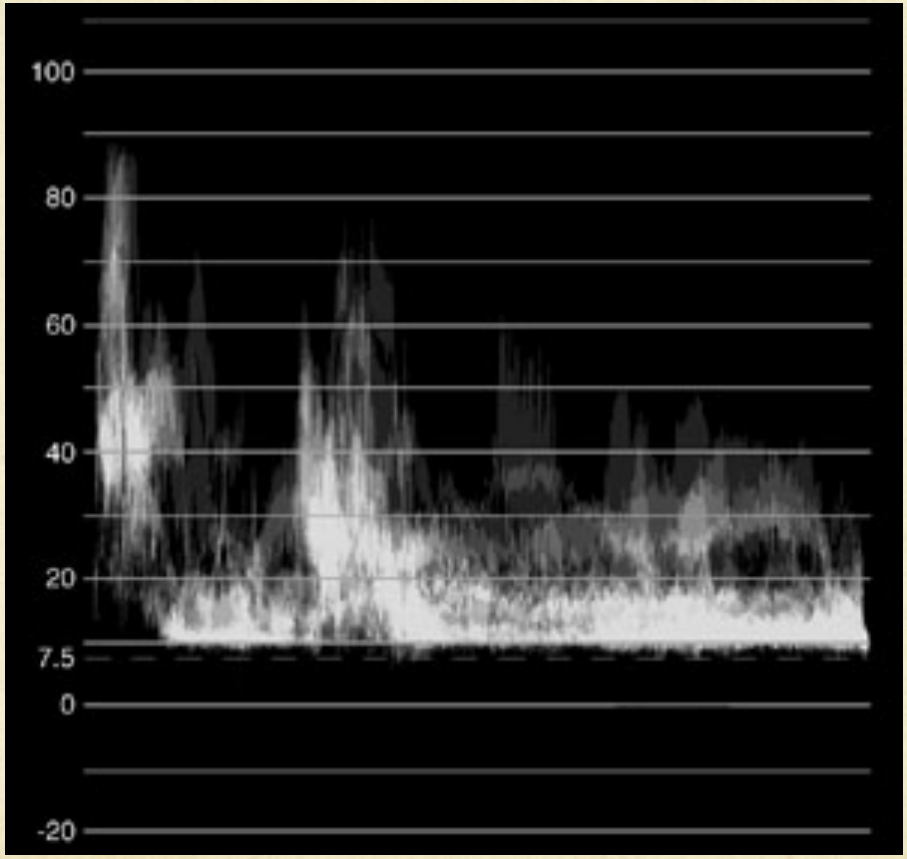


Contrast: Gamma





Waveform Monitor

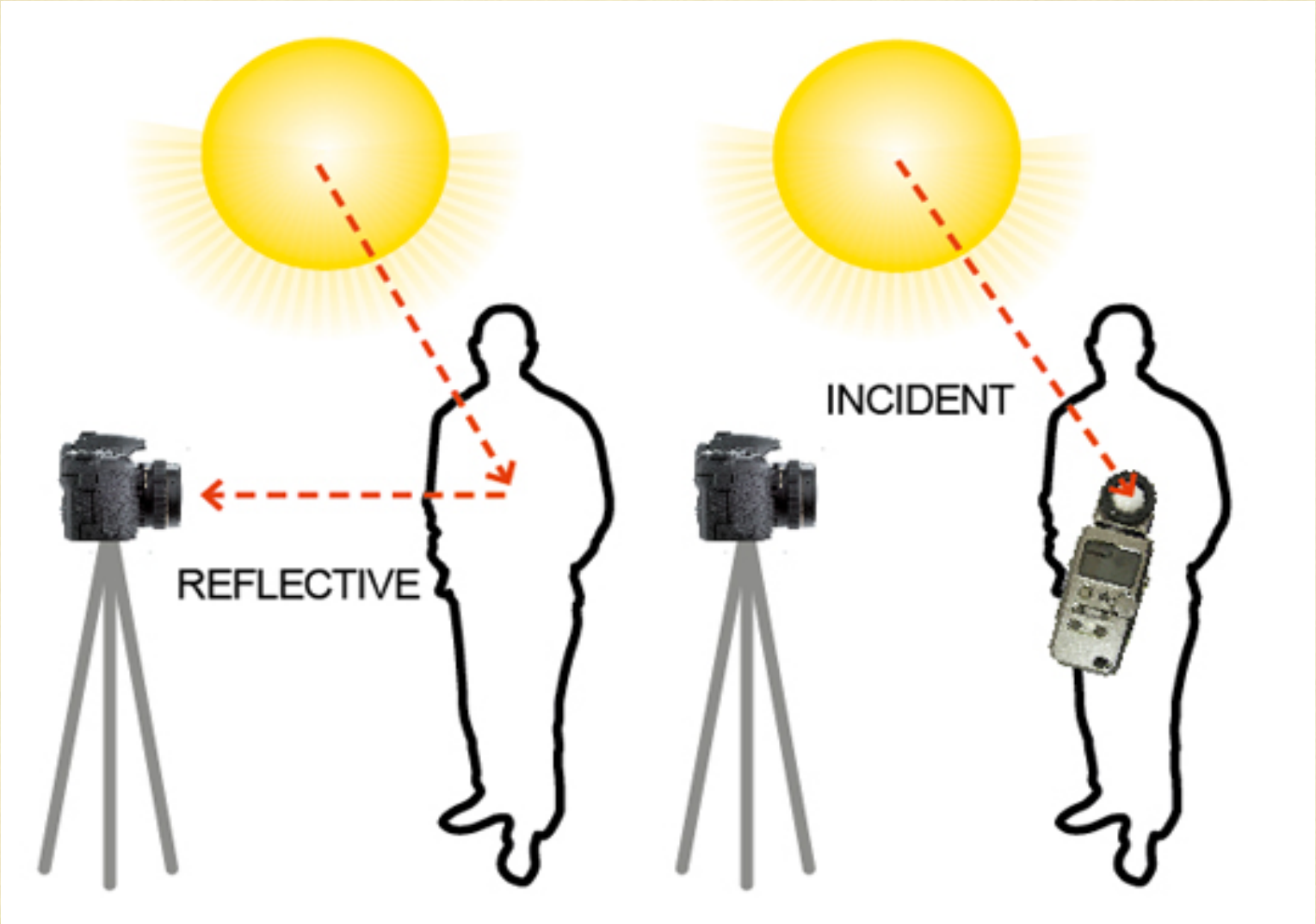


Reflective vs. Incident Light Meter

Incident Light Meter

Spot Light Meter

Flash Meter


REFLECTIVE
INCIDENT

Gray Card

Gamma

- In photography and motion picture film gamma is a number that expresses the contrast of a recorded image as compared to an actual scene
- 1:1 contrast would be if the scene was re-created perfectly
- .55:1 Motion Picture Negative
- 2:1 is the final projection—twice what is seen in nature
- In video gamma can be used as a creative tool to capture a greater range of a scene
- High gamma setting: Can compress and stretch the blacks
- Low gamma setting can create a super high contrast image