

Beyond the Basics

Camera Controls

Basic Concepts

- Shutter speed
- One stop
- Aperture, f/stop
- Stopping down, opening up
- Lens speed, maximum aperture,
- Depth of field and focal length / focus distance

Shutter Speed

- When the shutter is closed no light can enter; when it is open light may strike the film or imaging sensor
- The interval between the shutter's opening and closing is called the **shutter speed**.

Shutter Speed

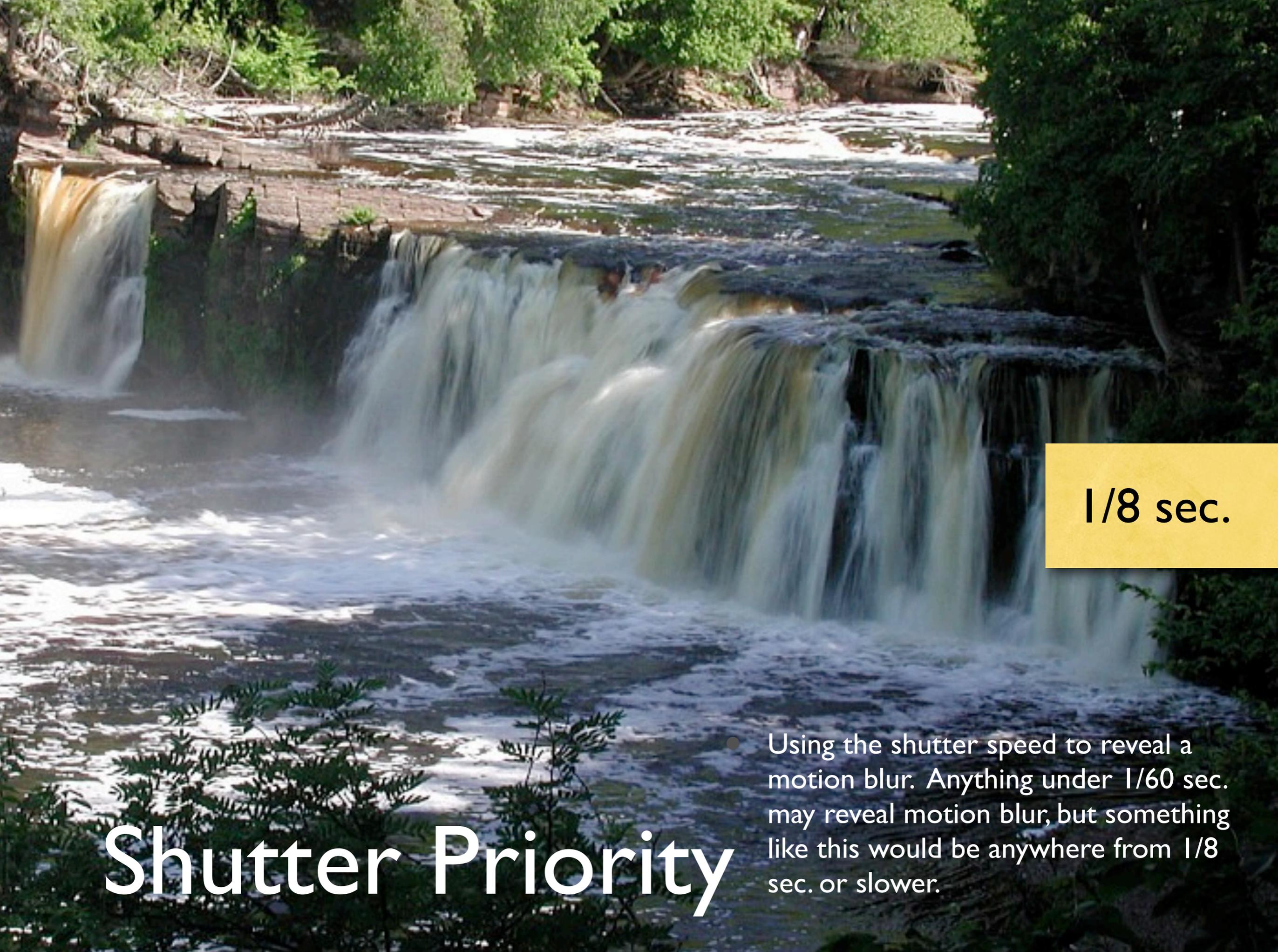
- The shutter speed times are represented in fractions of one second.
- A setting of 60 means that the shutter is open 1/60 sec. A typical sequence of shutter speeds are 1, 2, 4, 8, 15, 30, 60, 125, 250, 500 and 1,000
- Each shutter speed is double the preceding one.
- Depending on which direction the shutter speed is adjusted, the exposure will be either doubled or halved. To do so would be adjusting the exposure by “**one stop.**”

A photograph of a waterfall in a forest. The water is cascading over several tiers of dark, wet rocks. The surrounding area is lush with green trees and foliage. A yellow rectangular box is overlaid on the right side of the image, containing the text '1/60 sec.' in black font.

1/60 sec.

- Using the shutter speed to freeze motion. To have a sharp hand-held photo, you must be 1/60 sec. or above. You may get away with slower, but will have sacrificed sharpness from hand movement.

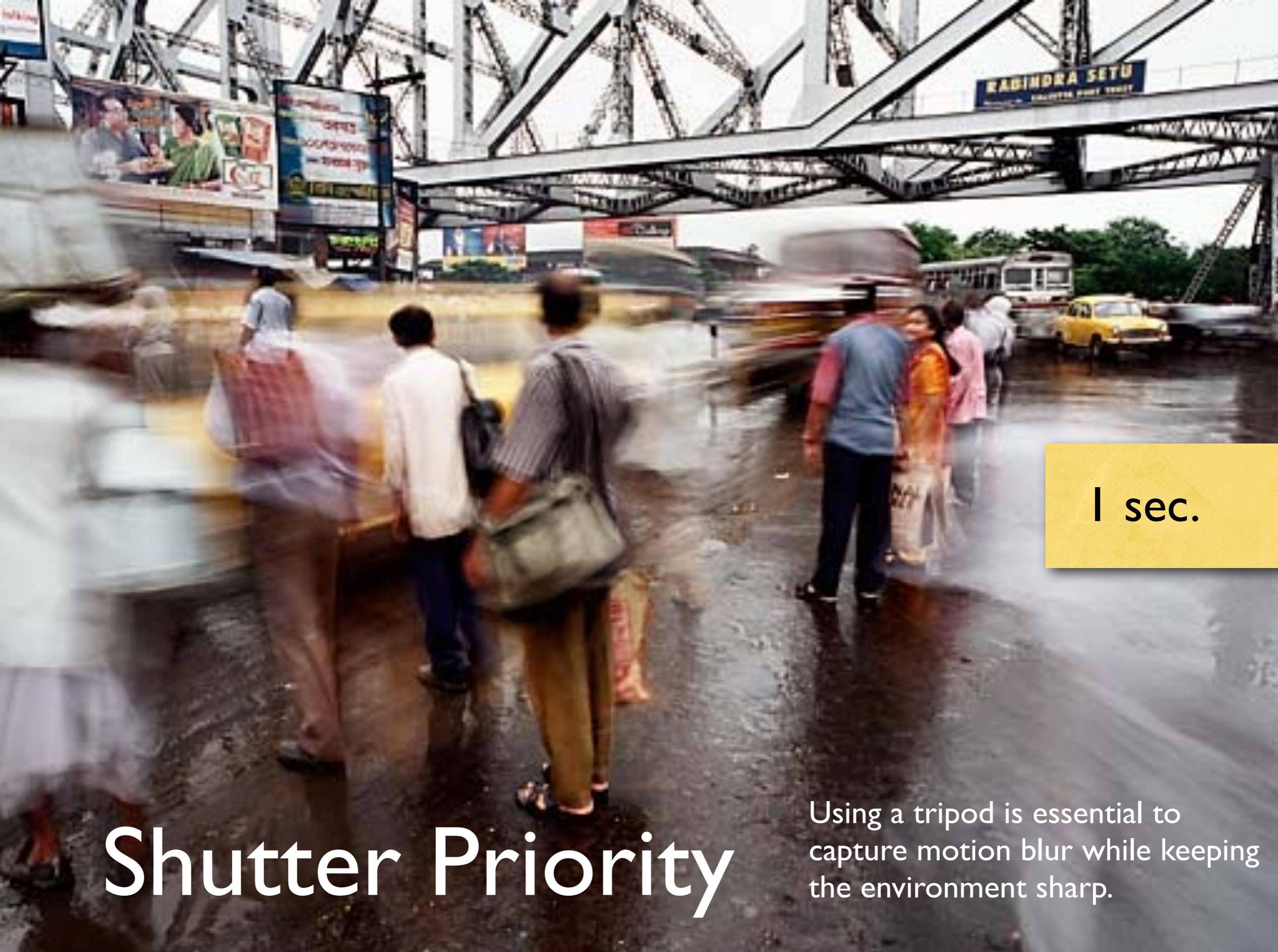
Shutter Priority



1/8 sec.

Shutter Priority

- Using the shutter speed to reveal a motion blur. Anything under 1/60 sec. may reveal motion blur, but something like this would be anywhere from 1/8 sec. or slower.



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1 sec.

Shutter Priority

Using a tripod is essential to capture motion blur while keeping the environment sharp.



1/30 sec.

30 sec.





1/400 sec

1/4000 sec.



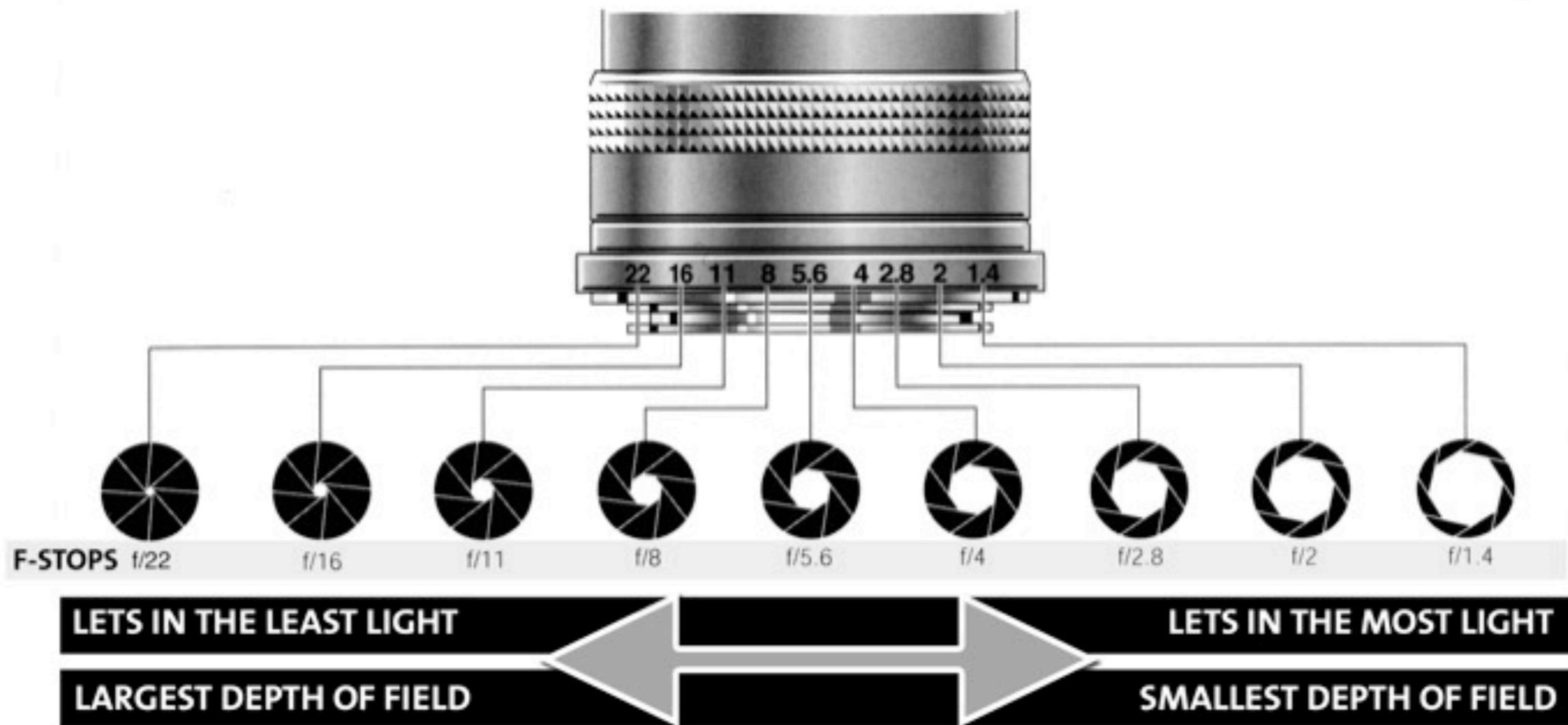
Aperture

- Light passes through the lens through an opening called an **aperture**.
- If the aperture is large much light passes through; if the aperture is small less light passes through.
- A number called the **f-stop** indicates the size of that opening
 - This number reflects the ratio of the diameter of the aperture to the focal length of the lens
 - F-stops, like shutter speeds, are also represented in fractions

F-stops

- Because these f-stops are fractions, the larger numbers represent smaller lens openings while the smaller numbers represent larger lens openings.
- Changing the lens opening from one f-stop to the next is called adjusting the aperture **one stop**.
 - If the stops are changed to make the aperture smaller, this is called **stopping down** one stop.
 - If the stops are changed to make the aperture larger, this is called **opening up** one stop.

F-stop Chart



Maximum Aperture / Lens Speed

- The maximum aperture to which a lens can be set is sometimes referred to as the **lens speed**.
- This f-stop is generally inscribed on the front of the lens barrel near the focal length.
 - For example, if the lens reads 50 mm and 1: 1.4, this means that the focal length of the lens is 50 mm and its lens speed, or maximum aperture, is f/1.4.
- F/stops may also read as intermediate speeds, especially on digital cameras. This value usually represents 1/3 of a whole stop (e.g. f/6.7).

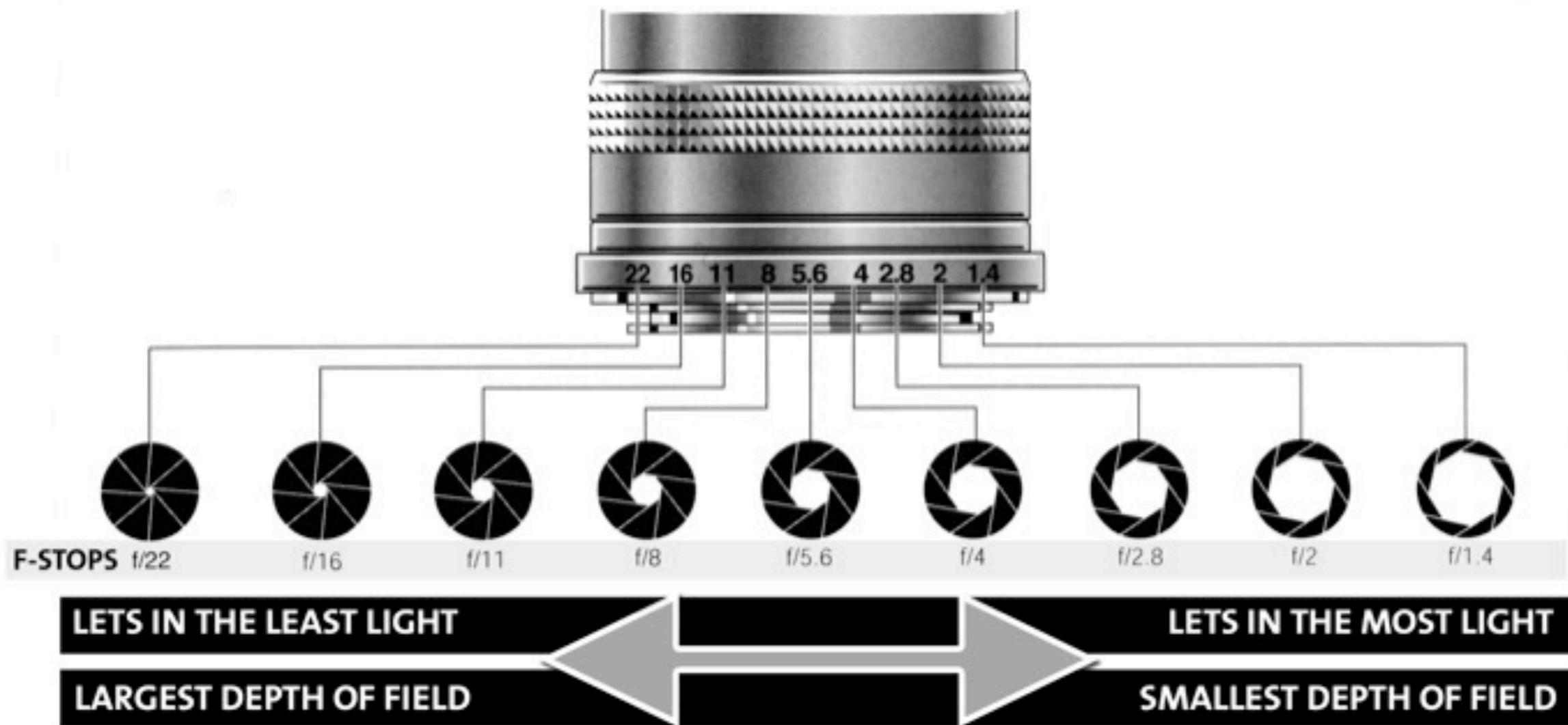
Depth of Field

- Depth of field is the distance range in which objects appear in sharp focus within an image.
 - A shallow or small depth of field indicates that only a small distance is in focus.
 - A deep or large depth of field indicates that a large range within the image is in focus.
- The smaller the aperture opening, the larger the depth of field. The larger the aperture opening, the smaller the depth of field

Aperture Priority

- Using the Aperture Priority setting on your camera, you can select the f-stop you want to shoot at, and the camera will balance the exposure with the correct shutter speed setting.
- For example, if you set the f-stop to f/4 on a sunny day, the camera might set the shutter speed to 2000.
- You can use this program to easily control your depth-of-field with the f-stop you select.

F-stop Chart



f 2.8





f 4

f 7.1





f | l



f 22

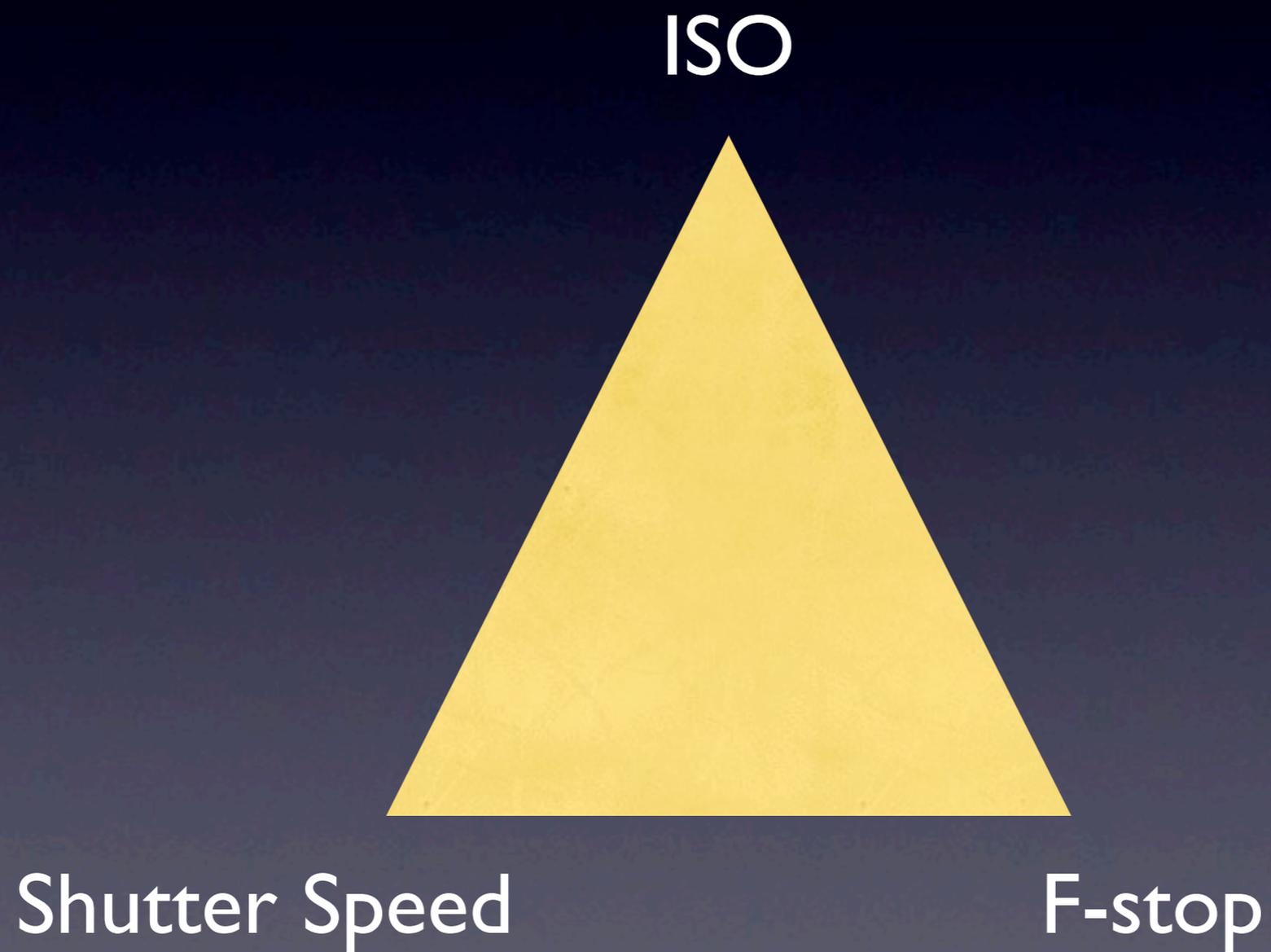
Depth of Field and Focal Length

- At any given aperture, the shorter the focal length the greater the depth of field. The longer the focal length, the shorter the depth of field.
- Therefore, wide-angle lenses will produce greater than normal depth of field whereas telephoto lenses will produce shallower than normal depth of field.

Distance Setting and Depth of field

- The distance setting at which the lens is focused also affects the depth of field.
 - When focused on subjected close to the camera, depth of field is reduced.
 - When focused on subjects far from the camera, depth of field is increased.

The Exposure Triangle



Exposures

EXPOSURE	ISO	Shutter Speed (seconds)	Aperture
		-noise	-motion blur
	100	1/1000	f22
	160	1/500	f16
	200	1/250	f11
	320	1/125	f8
	400	1/60	f5.6
	640	1/30	f4
	800	1/15	f2.8
	1000	1/8	f2
	1600	1/2	f1.8
	3200	1"	f1.4
	6400	2" ...bulb	
	+noise	+motion blur	-dof

lighter <-----> darker

ISO



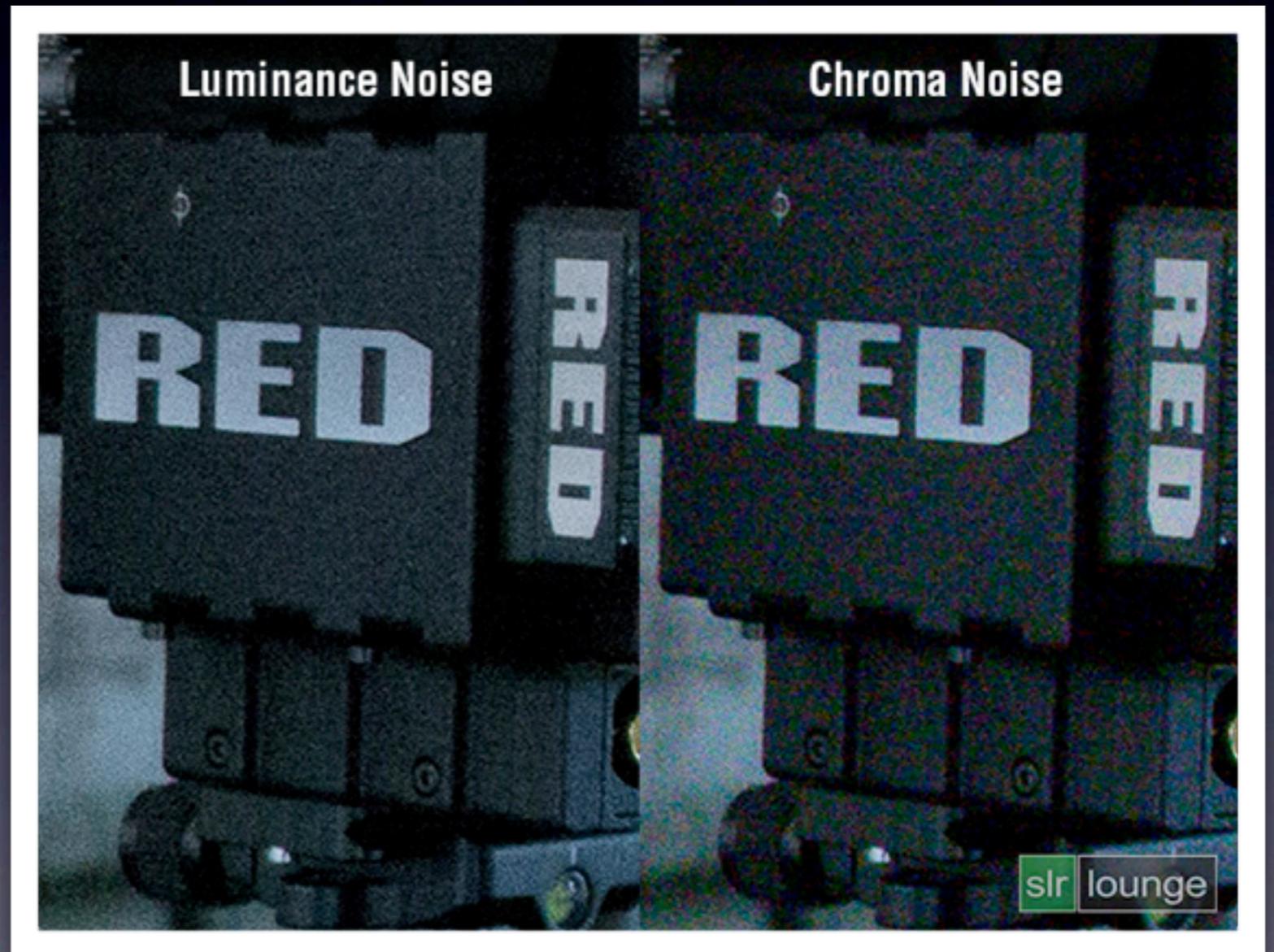
- Describes the sensitivity of the sensor to light
- The lower the ISO, the less sensitive to light, and the least amount of noise
- The higher the ISO, the higher sensitivity to light, and an increased amount of noise

Recommended ISO Settings

- Outdoors with sunny skies: 100-200
- Outdoors with overcast, sunrise and sunset: 200-400
- Well lit interior: 400-800
- Semi-lit interior: 800-1600
- Nighttime exterior or dimly lit interior: 1600-6400
- Indoor or nighttime sports: 1600-8000

Types of Digital Noise

- Luminance Noise is noise that affects the brightness of the image
- Chroma noise shows up in the color as Red, Green and Blue
- Most effectively removed in Camera Raw



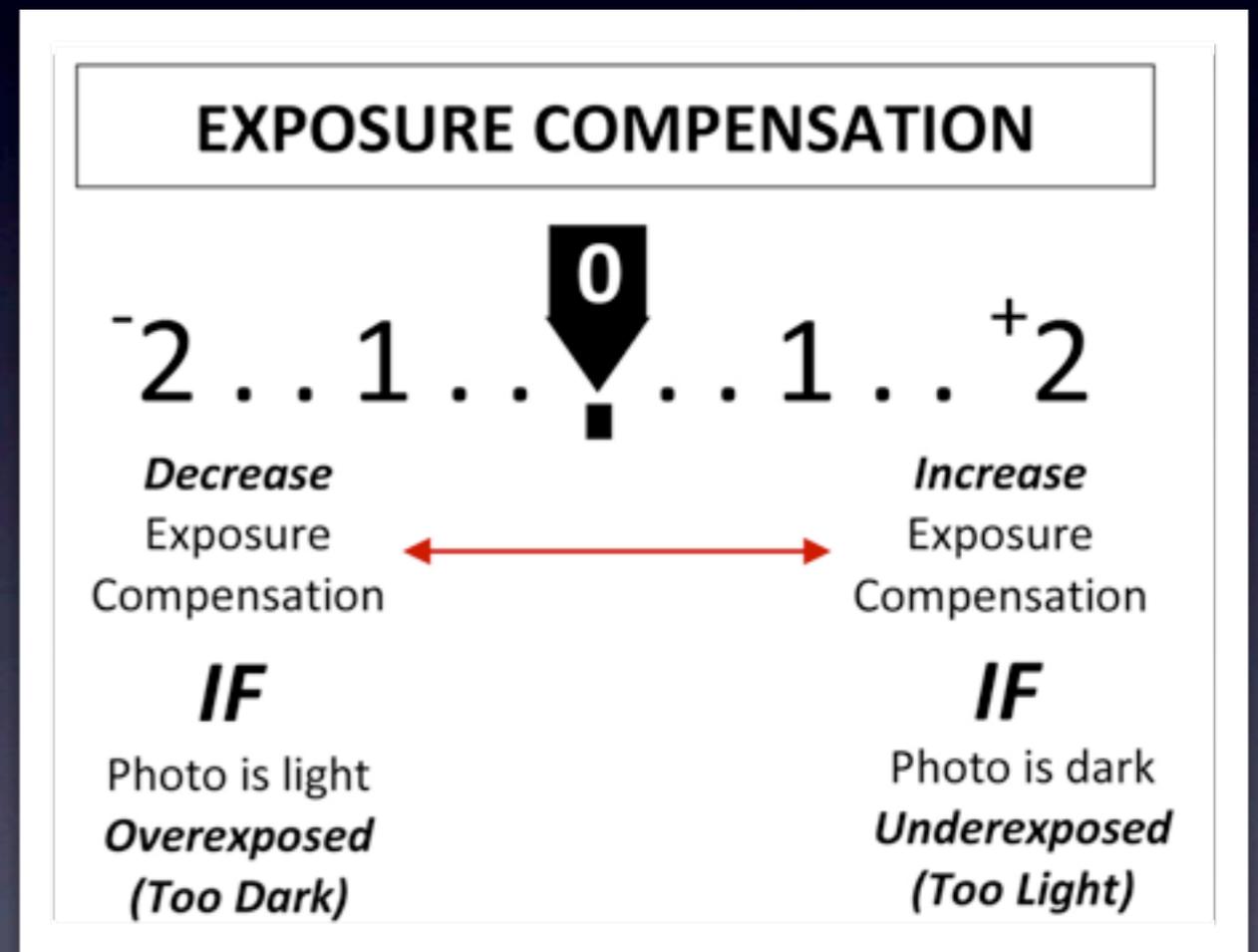
Manual Exposure

- To manually expose an image, adjust the ISO to the desired setting based on the lighting conditions.
- Next, adjust the aperture setting (f-stop) and shutter speed until the exposure dial is centered on the 0. This is a balanced exposure based on the metering system you have selected



Exposure Compensation

- Allows the user to adjust the exposure up to two stops either way without being in Manual mode
- Very useful for making exposure adjustments while in Av or Tv modes



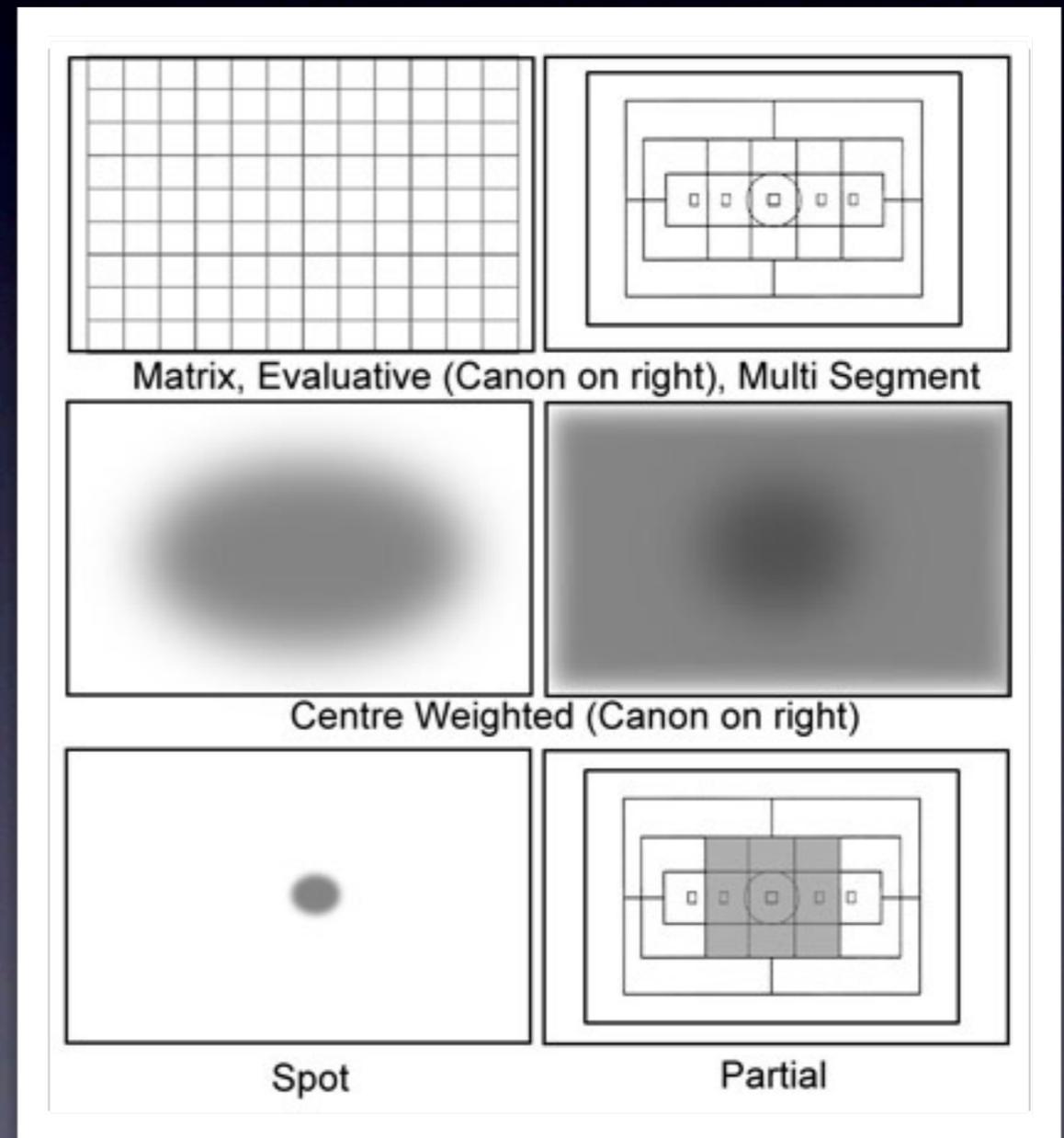
Exposure Compensation



Sample Exposures

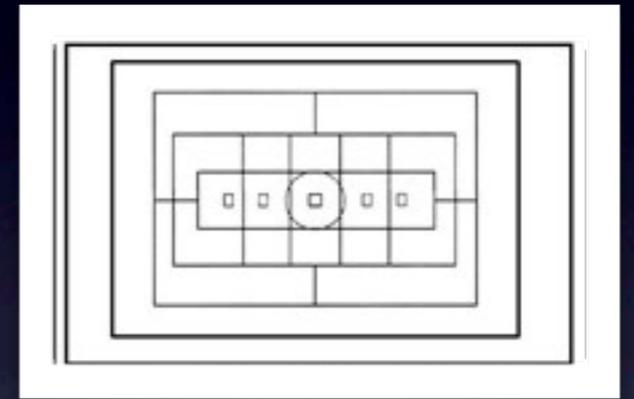
Metering Modes

- Evaluative / Matrix
- Spot or Center Weighted
- Partial or Center Weighted Evaluative



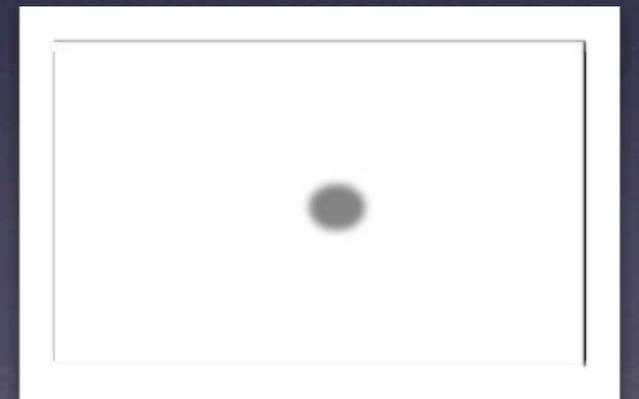
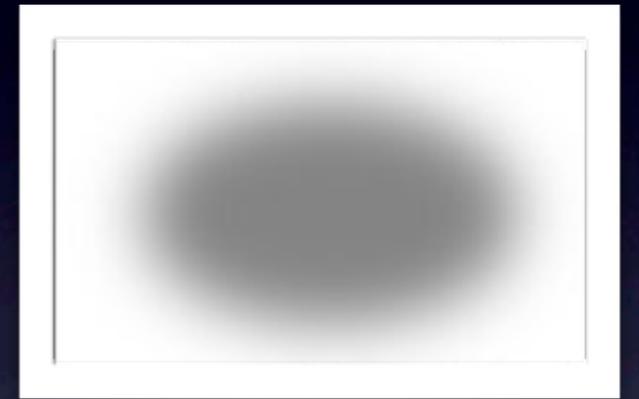
Evaluative / Matrix Metering

- Essentially, the camera divides the scene into a matrix of metering zones, and takes individual readings for each section. An evaluative meter reading then is diagnosed, and an average metering for the whole scene is given.
- This is a good all around metering mode
- The metering zones varies per camera



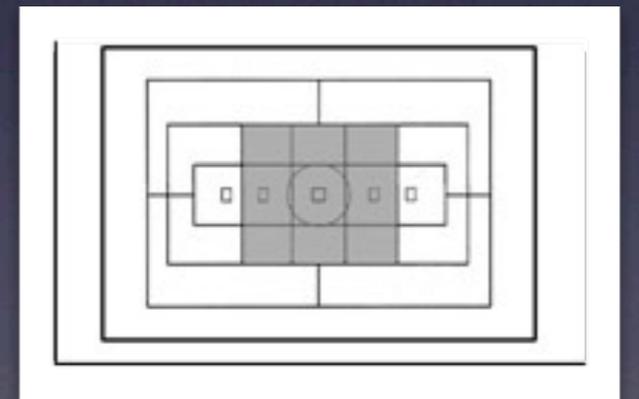
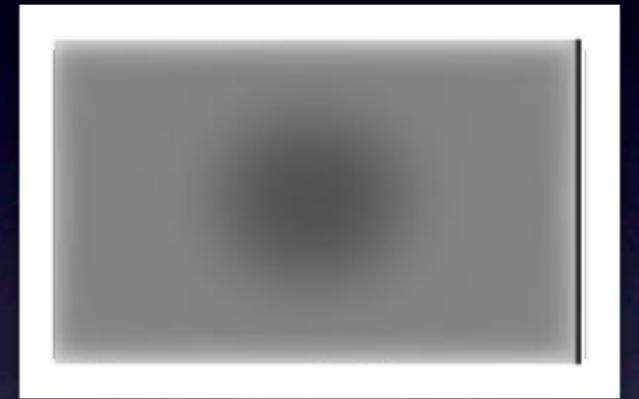
Spot / Center Weighted Metering

- The Camera bases the exposure based on what's in the center of the frame
- A very predictable mode
- Some cameras offer spot metering based on a point that's selected in the frame
- Best used for backlit subjects



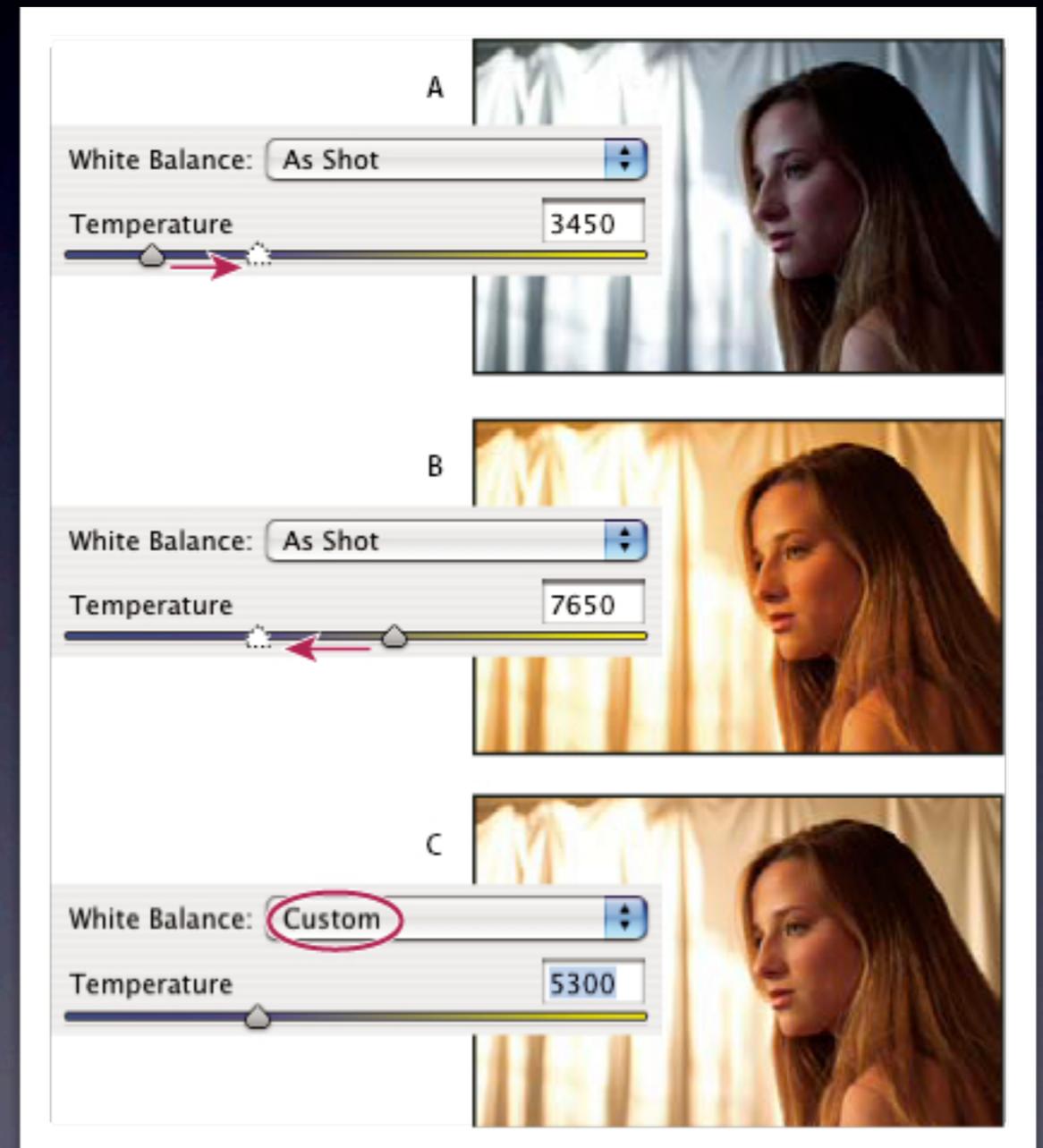
Partial / Center Weighted Average Metering

- The Camera gives priority to the center of the frame and averages the exposure with the rest
- Also best used for backlit subjects



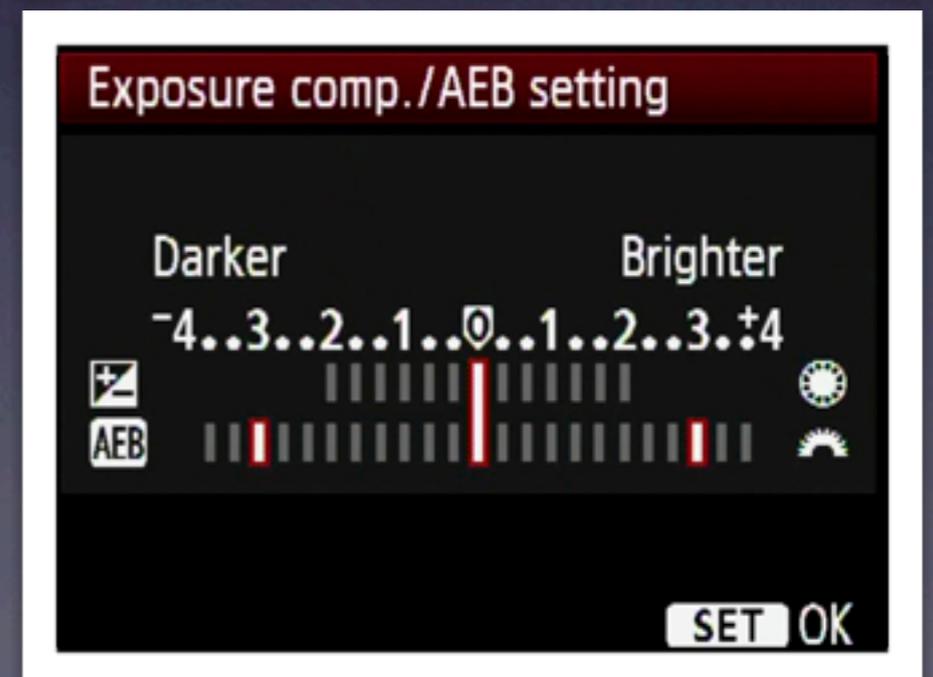
White Balance

- Measured in Kelvin
- The larger the number, the cooler the temperature
- A setting of 7650K would be for very bright light, 2000K might be for candlelight



Auto Exposure Bracketing

- Used to set up custom bracketing in an automatic or semi-automatic mode
- Available with 3-5 stops
- Adjusts the exposure every three (or five) shots
- Great for HDR



Sample Exposures



5 exposure sequence