### Depth of Field Control

John M. Gonsalves 703-941-3635 john@gpclasses.net

### **Review Previous Class**

- Basic exposure problems?
- Composition
  - rule of thirds
  - leading lines
  - frames / framing
  - contrast
  - key or mood

### Creative Use of Controls

- We have the mechanics down.
- We have the exposure down.
- Now WHAT?

### Pictorial Controls

- How we set the various "controls" on the camera before the shot shapes the viewers perception of the scene being photographed.
- These "controls" are:
  - Aperture (depth of field/focus)
  - Lens Selection (focal length, critical focus distance/distance to subject, perspective)
  - Shutter Speed (motion control class 3)

### Aperture

- Aperture
  - What is it and what does it mean
  - How does it affect exposure
  - How does it affect the range of apparent sharpness or depth of field

### Aperture – f/stops

- The diameter of the diaphragm opening (in millimeters) divided into the focal length of the lens yields a number we call the f/stop.
- Since it is a ratio; larger apertures yield a smaller f/number.
- Larger maximum apertures let in more light so that we can record images at a faster shutter speeds, so we call wide aperture lenses (f/2.8 or wider) FAST lenses.
- Fast lenses have to be physically bigger, thus they are heavier and more expensive.

### f-stops / apertures



### Effects of Aperture

- Larger apertures (smaller f/numbers)
  - allows more light to enter
  - increase exposure
  - narrower or shallower depth of focus
- Smaller apertures (larger f/numbers)
  - allows less light to enter
  - decrease exposure
  - Wider or deeper depth of focus

### Focus Facts

- There is only one plane is in focus at a time.
- Everything in front of, or behind, the plane of critical focus is to some degree "out of focus."
- The area in front of, and behind, the plane of critical focus that looks *acceptably sharp* is called the Depth of Focus/Field.
- DOF is twice as great behind the point of critical focus as in front of it (except in macro photography.)

## Video – Depth of Field

4:53 minutes

## Depth-of-field

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### Depth of Field/Focus

Wide apertures yield a shallow DOFSmaller apertures yield a greater DOF



### Depth of Field

- Wide apertures yield a shallow DOF
- Smaller apertures yield a greater DOF



### Depth of Focus



• Wider apertures, especially at closer distances yield a shallower DOF eliminating distracting backgrounds

### DOF

- The depth of field decreases as you get closer to the subject
- The depth of field decreases as the aperture gets wider
- The depth of field decreases as the focal length increases



## Minimum Depth of Field



Close-up, Telephoto, f-2.8











50mm f/4.5

85mm f/1.8

20





1/2500 @ f/2.8, 200mm, ISO 400





1/60 @ f/5, 34mm, ISO 400



#### 200mm f/2.8





50mm f/1.4

### Maximum Depth of Field



35mm 1.5 sec f/22

### Maximum Depth of Field



24mm 1/80<sup>th</sup> @ f/11



17mm 1/125@f/8



45mm f/22





1/1250 @ f/2.8 38mm



1/400 @ f/8 70mm

#### Depth-of-Field Calculator

To find the near, far and hyperfocal distance for a specific lens, enter the **focal length (mm), aperture (f-stop)** and the **object distance (whole or decimal number)**. The program will calculate the near, far, depth and hyperfocal distances.

Film Format	Focal Length (mm)	f-stop	Object Distance	Near Distance	Far Distance	Depth of Field	Hyperfocal Distance	
35 💌	50	2.8	10	9'1	11'1	2'0.404458;	97'8.61904	
			Com	npute Res	et			

The default unit of measure for distances is feet. You can override it by setting the option below.

Use Meters as Unit of Measure in Depth-of-Field calculation.

#### Depth-of-Field Table for the above Focal Length

Feet	f/5.6		f/8		f/11		f/16		f/22		f/32		f/45	
Infinity	48'10.	inf	34'2.4'	inf	24'10.	inf	17'1.2	inf	12'5.2	inf	8'6.60	inf	6'0.96;	inf
40	22'0	216'7	18'5	inf	15'4	inf	12'0	inf	9'6	inf	7'0	inf	5'3	inf
20	14'2	33'8	12'7	47'7	11'1	98'8	9'3	inf	7'8	inf	6'0	inf	4'8	inf
10	8'3	12'6	7'9	14'0	7'1	16'6	6'4	23'6	5'7	47'9	4'7	inf	3'9	inf
5	4'6	5'6	4'4	5'9	4'2	6'2	3'10	6'11	3'7	8'2	3'2	11'6	2'9	24'5
3	2'10	3'2	2'9	3'3	2'8	3'4	2'6	3'7	2'5	3'10	2'3	4'5	2'0	5'7

#### http://www.shuttercity.com/DOF.cfm

#### Depth-of-Field Calculator

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F Fo	ilm rmat	Focal Length (mm)		Object Distance	Near Distance	Far Distance	Depth of Field	Hyperfocal Distance					
35	•	50	22	10	5'7	47'9	42'2.77395	12'5.24242					
	Compute Reset												

The default unit of measure for distances is feet. You can override it by setting the option below.

Use Meters as Unit of Measure in Depth-of-Field calculation.

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20	14'2	33'8	12'7	47'7	11'1	98'8	9'3	inf	7'8	inf	6'0	inf	4'8	inf
10	8'3	12'6	7'9	14'0	7'1	16'6	6'4	23'6	5'7	47'9	4'7	inf	3'9	inf
5	4'6	5'6	4'4	5'9	4'2	6'2	3'10	6'11	3'7	8'2	3'2	11'6	2'9	24'5
3	2'10	3'2	2'9	3'3	2'8	3'4	2'6	3'7	2'5	3'10	2'3	4'5	2'0	5'7

#### http://www.shuttercity.com/DOF.cfm

## DOF simplified

- For narrow DOF:
  - use wider aperture ( $f/1.4 \sim f/2.8$ )
  - get closer
  - use longer focal length lens.
- For extended DOF:
  - use smaller aperture (f/11~f/16)
  - back up
  - use shorter focal length lens

### Focus

- Out of Focus and Image Blur are not the same.
- Focus is controlled by lens to film distance.
- Image Blur is a function of subject or camera movement and can occur even when the image is in focus.
- Image blur is likely when the exposure time is less than the reciprocal of the focal length even if the subject is stationary.

### Image Sharpness

- Beyond focus, the ability to resolve fine scene detail is also affected by the aperture.
- Most lenses have their highest resolving power (ability to record fine detail) when the aperture is set to about two stops smaller than wide open.
- Very small apertures (with lots of DOF) are usually **not** very crisp.

### Focus Modes

- Focus Modes
  - Manual Focus
  - Single servo auto-focus
  - Continuous servo auto-focus

### Auto-Focus Control



### Auto-Focus Control

- Manual: camera will NOT adjust focus
- Single Servo: camera will adjust focus to point indicated in viewfinder and once focused will lock until exposure.
- Continuous Servo: camera will adjust focus continually as the subject moves up until the moment of exposure.
- Some cameras can prevent exposure unless there is a focus lock confirmation, some will allow exposures without focus confirmation.

### Auto Focus

- Auto focus requires a relatively brightly lit or contrasty scene to focus quickly.
- Will not operate outside at night without a bright light source.
- Single servo auto focus is the normal choice for most static scenes.
- Continuous servo auto focus is better for subjects that are moving towards or away from the camera quickly.

### Nikon Viewfinder Display



### **Exposure Modes**

- Manual: you use a meter to adjust the shutter speed and aperture to obtain a properly exposed image. "Zero" the exposure meter.
- Aperture Priority Automatic: you set the aperture desired and the camera automatically sets the proper exposure time for a properly exposed image (watch for long exposure that may blur.)
- Shutter Priority Automatic: you set the shutter speed desired and the camera automatically sets the aperture for a properly exposed image (watch for indication of insufficient or excessive light.)

### Aperture or Shutter Priority Auto

- A, Av, S or Tv are AUTO exposure modes.
- Whether or not you select an AUTO mode is a personal choice, either is just as accurate as your meter.
- When you are concerned with DOF, aperture priority AUTO is the easiest mode to use.

### Aperture Priority Automatic

- You select the lens aperture
  - The camera meters the scene and automatically sets the "proper" shutter speed for a correct exposure
  - Very useful when you want to control the depth of focus in the resulting image
- Nikon = A
- Canon = Av













### Lens Selection

- Focal length choice is one of the primary criteria in a successful image and is normally taken for granted.
- Get closer to make image bigger or back up to make it smaller.
- Zoom lenses can be used to affect area of coverage, but watch to see how it affects image.
- Focal length and camera to subject distance affect the "perspective" of the image.

### Focal Length

- DEFINITION: Focal length is the distance, in millimeters, from the optical center of the lens to the image plane, when focused at infinity.
- The focal length of a "normal" lens is equal to the diagonal of the captured image.
- Lenses whose focal length is greater than the diagonal of the captured image (film or digital sensor) is considered a "long" or "telephoto" lens.
- Lenses whose focal length is shorter than the diagonal of the captured image (film or digital sensor) is considered a "wide angle" lens.
- Lenses that can vary their focal length are called "zoom" lenses.

### Focal Length

- NORMAL Lenses
  - Normal is relative to negative/sensor size (50mm for 35mm film, 35mm for APS-C digital sensors)
  - Have an angle of view roughly equivalent to the vision of the human eye or about 46 degrees.
  - Items in foreground and background appear to be normal in size compared to subject.
- WIDE Lenses
  - Angle of view from 63 to 180 degrees.
  - Subjects appear smaller but includes a wider angle of view and background appears farther away when the subject is closer.
- LONG Lenses
  - Angle of view is about 28 degrees or less.
  - Subject is larger and includes less of the background which appears closer than normal.

### Perspective Control

- Focal length <u>and</u> the lens to subject distance affect the apparent distance between items within a scene. This is *perspective* and can be exaggerated as expanded or compressed.
- Longer lenses appear to "bring" the background closer (compress) and shorter lenses push it back (expand).
- Lens choice and the distance to the subject can adversely distort subjects, especially with wide angle lenses.





### Normal Perspective



1/60 @ f/7.1 55mm from car window in slight rain/mist

### **Expanded** Perspective



#### 1/30th @f/5.6 10.5mm ISO 400

### **Expanded Perspective**



## **Compressed Perspective**



200mm f/16

### **Compressed Perspective**



200mm f/2.8

### Subject Distance

#### **Subjects at same distance**

#### Main subject closer to camera



#### Both images at same focal length and exposure

### What's "wrong" with this image?



# Nikon Video – Exposure Controls

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### Questions

- This presentation is available on-line in the PowerPoint section at: www.gpclasses.net
  - Password = stallions