## DIGITAL PHOTOGRAPHY

An introduction to the camera

# Where does the word **photography** come from?

## From the Greek words: photos = light graphs = draw or write

- The phrase *camera obscura* comes from the Latin words meaning *darkened chamber*.
- The device consists of a room with a hole in one side. Light from an external scene passes through the hole and strikes a surface inside, where it is reproduced, rotated 180 degrees (thus upside-down), but with color and perspective preserved. The image can be projected onto paper and then traced to produce a highly accurate representation.



- One of the earliest records of the camera obscura principle goes back to Ancient Greece (approximately 330bc), when Aristotle noticed how light passing through a small hole into a darkened room produces an image on the wall opposite.
- I 6th century: became an invaluable aid to artists who used them to create drawings with perfect perspective and accurate detail. Portable camera obscuras were made for this purpose.



## Camera Obscura becomes portable

- Victorian times (1837-1901): much larger public camera obscuras became popular seaside attractions, where spying on courting couples became a popular pastime.
- Aberystwyth, Wales, United Kingdom: home to the biggest Camera Obscura in the world. The huge 14 inch lens takes a birds eye view of more than 1000 square miles of land and seascape in a 360 degree sweep around Aberystwyth, a view reflected onto the circular screen in the darkened viewing gallery below. (Original 1880-1920s; rebuilt 1985.)





Camera Obscura - Constitution Hill, Aberystwyth, Wales, United Kingdom





Camera Obscura - The Photographers' Gallery London, England, United Kingdom

#### Abelardo Morell



Manhattan View Looking South in Large Room, 1996

## John Chiara



Echo Lake at Meyers Grade, Far Right, 2010

#### SINGLE LENS REFLEX CAMERA [SLR] HOW IT WORKS (REFER TO PAGE 24 OF YOUR TEXTBOOK)

Through-the-lens viewing and focusing. You see what the lens sees!

When you look through the viewfinder, light passes through the lens and onto a mirror which bounces the image to your eye.

When you press the shutter release to take the picture, the camera body flips up the mirror and opens the SHUTTER (like curtains), exposing the light sensitive surface [film or image sensor].



#### DIGITAL SINGLE LENS REFLEX CAMERA [DSLR] PROS & CONS

- Compose and focus through the lens
- Interchangeable lens which means more control of the sharpness in a photograph
- Built for manual capture
- Better design quick and rugged
- Bigger image sensor and better image processors
- High quality image files
- Can get pricey
- Can be bulky
- Can be complex

#### DIGITAL SINGLE LENS REFLEX CAMERA [DSLR] RECORDING THE IMAGE



## Secure Digital (SD)

## Compact Flash (CF)

http://photolisticlife.com/2013/07/16/sd-cards-vs-compact-flash/

#### **IMAGE SIZE**

#### RAW **VS.** JPEG (REFER TO PAGES 14, 35-36 OF YOUR TEXTBOOK)

Your camera is able to save images in two different ways...

RAW	JPEG (Joint Photographic Experts Group)					
Lossless Compression	Compressed					
More Editing Capability	Digital Deterioration					
Larger File Size	Smaller File Size					
Ability to revert to original	-					
Must be processed with software	Readily Accessible					

Compression: reducing the size of an image file for more efficient storage and use

## (REFER TO PAGE 43 OF YOUR TEXTBOOK)

#### What to do:

Get into the habit of reformatting your memory card every time you transfer the images to your computer. *Reformat from your camera (not from the computer)*: navigate through your camera's menu options and select reformat.

#### Why reformat?

I. Ensures that the data on the memory card and the file structure are clean, which will help you avoid error messages or missing images.

2. The longer you go without reformatting a memory card, the better the chances that it will become corrupted.

3. Over time, your memory card will hold fewer images if you never reformat. So while it may stow 100 photos today, in 6 months that number could drop to 90.

4. Format your memory card in the camera you will be shooting with. If you're using a memory card in a borrowed camera, you might encounter errors if you don't reformat in that camera. That's because each camera will format memory cards in a way that is optimal for that particular model or brand.

#### EXPOSURE MODES 3 CATEGORIES: AUTO, SCENE, AND P/S/A/M (REFER TO PAGE 15, 104-109 OF YOUR TEXTBOOK)

- In auto and scene modes the camera controls shutter speed and aperture
- Scenes include Portrait, Landscape, Child, Sports/Motion, Close-Up/Macro, Night Portrait, etc.
- Programmed Auto (P), Shutter-Priority Auto (Nikon: S / Canon:Tv), Aperture-Priority Auto (Nikon: A / Canon: Av), and M (Manual) modes are known as exposure modes and give photographers a choice as to which elements of exposure—aperture or shutter speed—they wish to control.

Mode	Shutter Speed	Aperture
P (programmed auto)	Selected by camera	Selected by camera
S (shutter-priority auto)	Selected by photographer	Selected by camera
A (aperture-priority auto)	Selected by camera	Selected by photographer
M (manual)	Selected by photographer	Selected by photographer









## LIGHT + TIME = EXPOSURE

The amount of light recorded by the image sensor while taking a photo is known as the exposure.

YOU control how much light reaches the sensor by adjusting the following three settings:

**I. ISO:** measure of sensitivity of the image sensor

**2. SHUTTER SPEED:** length of time a camera's shutter is open

**3. APERTURE:** the opening in the lens; f-stops indicate the size of the opening

When all these factors are properly balanced one receives a 'normal' or 'correct' exposure.



#### ISO: INTERNATIONAL STANDARDS ORGANIZATION SENSITIVITY OF IMAGE SENSOR TO LIGHT (REFER TO PAGE 100-101 OF YOUR TEXTBOOK)

The ISO settings on your camera dictate how sensitive your camera's image sensor is to light.

In the days of film, ISO was referred to as ASA, or film speed, describing how quickly the film reacts to light. Likewise, you can think of ISO as how quickly the image sensor reacts to light.

- The higher the value of the ISO, the more light sensitive the image sensor is and the more 'noise' occurs in the image.
- The lower the value of the ISO, the less light sensitive the image sensor is and the less 'noise' occurs in the image.

LESS SENSITIVE/SLOWER								
100	125	25 160 200		250	400	800	1600	
LESS NOISE								

#### ISO Sensitivity of image sensor to light





#### ISO SENSITIVITY OF IMAGE SENSOR TO LIGHT



→ MORE NOISE



## SHUTTER SPEEDS

By intentionally choosing a fast or a slow shutter speed, you can choose to render moving objects in your scene razor sharp or smear them blurry.

#### THE SHUTTER A FUNCTION OF THE CAMERA BODY

The **SHUTTER** in your camera works as a shield to protect the image sensor from light until you depress the shutter release button.

The duration of time that the shutter remains open is called **SHUTTER SPEED**.

SHUTTER SPEED is measured in seconds and fractions of seconds.

Generally, I/60th of a second is the slowest shutter speed at which one can hold the camera in hand without causing camera shake/blur. ANYTHING SLOWER THAN I/60th of a second should be shot with a tripod if blur is not desired.



Note: the quotation mark in the slower shutter speeds indicates whole seconds (for example, I'' = I second).

#### ON SHUTTER SPEED: MOTION CAPTURING AND FREEZING MOTION

The **SHUTTER** affects the amount of **MOVEMENT** rendered in an image.

- The FASTER the SHUTTER SPEED, the better we are able to FREEZE MOTION
- The SLOWER the SHUTTER SPEED, the better we are able to CAPTURE MOTION

Depending on your specific subject, you have to judge the most appropriate shutter speed for the occasion.

- 1/500th of a second or faster, in most cases, will begin to freeze motion
- 1/125th of a second or slower, in most cases, will produce motion blur

Say for instance you are photographing a car that is moving at 55 mph. In order to freeze its motion, you have to go very fast with your shutter speed. On the other hand, if you are photographing someone running at 5mph, you can get away with a much slower shutter speed yet still freeze the motion. Selecting speeds comes with practice, there is no specific rule that can apply to all situations.



#### SHUTTER/TIME CONTROLLING MOTION

#### FAST SHUTTER SPEEDS

- Let in LESS light
- Used to stop or "freeze" motion
- The faster your shutter, the sharper the lines of the moving subject will be.

#### EFFECTS

- Compensate with a BIG aperture = SMALL/SHALLOW depth of field
- May have to compensate with HIGHER ISO = greater risk of noise



#### SHUTTER/TIME CONTROLLING MOTION

#### SLOW SHUTTER SPEEDS

- Let in MORE light
- Motion is blurred whether by subject or camera
- Used to show movement

#### EFFECTS

- Compensate with SMALL aperture = BIG/ DEEP depth of field
- May have to compensate with LOWER ISO





#### DIRECT COMPARISON: SHUTTER/TIME CONTROLLING MOTION





#### SHUTTER/TIME CONTROLLING MOTION

#### FAST SHUTTER

• f 2.0 @ 1/400

#### **RELATED TO THE SHUTTER**

Which characteristics can we see related directly to the shutter?

- Bubbles in glass are distinct
- The liquid pour is crisp

#### EFFECTS

Which characteristics can we see that can be considered effects or consequences of our shutter choice?

- Large Aperture
- Shallow Depth of Field
- Limited/Selective Focus



MORE LIGHT											
<b>I</b> "	1/2	1/4	1/8	1/15	1/30	1/60	1/125	1/250	1/500	1/1000	1/2000
SLOWER <									FASTER		

#### SHUTTER/TIME QUICK LOOK

#### SLOW SHUTTER

• f | 6 @ |/2

#### **RELATED TO THE SHUTTER**

Which characteristics can we see related directly to the shutter?

- Bubbles in glass are blurred
- The liquid pour is blurred

#### EFFECTS

Which characteristics can we see that can be considered effects or consequences of our shutter choice?

- Small Aperture
- Greater Depth of Field
- Increased/Distributed Focus

![](_page_32_Picture_12.jpeg)

MORE LIGHT									ESS LIGHT		
<b>I</b> "	1/2	1/4	1/8	1/15	1/30	1/60	1/125	1/250	1/500	1/1000	1/2000
SLOWER									FASTER		

#### **ON SHUTTER SPEED: MOTION** CAPTURING AND FREEZING MOTION

![](_page_33_Picture_1.jpeg)

1/2 sec

1/8 sec

1/30 sec

![](_page_33_Figure_5.jpeg)

#### **ON SHUTTER SPEED: MOTION** CAPTURING AND FREEZING MOTION

![](_page_34_Picture_1.jpeg)

1/125 sec

1/500 sec

1/2000 sec

![](_page_34_Figure_5.jpeg)

## SHUTTER SPEED

Three Factors Affecting Stopping the Motion of a Moving Object:

**I. Speed of the moving object.** The faster the moving object, the faster the shutter speed must be to stop the motion.

**2. Direction of the moving object.** Objects moving across the camera's field of vision must be stopped with a faster shutter than those moving toward the camera. (image page 89 of your textbook)

**3. Distance of the camera to the moving object.** The closer the moving object is to the camera, the faster the shutter speed must be to stop the action.












FROZEN MOTION















## **DEPTH OF FIELD**

# A FUNCTION OF THE LENS

APERTURE is a function of the lens that allows a certain amount of light to pass in order to make an exposure.

The **APERTURE** in your camera functions similarly to the **HUMAN EYE**. When there is little light, our pupils dilate in order to allow the maximum amount of light to enter. When there is much light, our pupils shrink to accommodate the amount of light.

APERTURE is measured in **F-STOPS** which correspond to the size of the lens openings.

- The LOWER [or smaller] the number on your f-stop scale the BIGGER the APERTURE
- The HIGHER [or bigger] the number the SMALLER the APERTURE



## ON APERTURE: DEPTH OF FIELD HOW TO CONTROL THE AMOUNT OF FOCUS

APERTURE affects the DEPTH OF FIELD in an image meaning how much in front of and behind the subject is in focus.

- As we **OPEN UP** the **APERTURE** (lower values) we are reducing the amount of DOF in the image (commonly called shallow DOF, little DOF, or selective focus):
  - o SHALLOW DOF can be recognized by the amount of 'blur' that is in front of or behind the subject in the image
  - o SHALLOW DOF can create focus on a subject, isolating it from a distracting or undesirable background
- As we **CLOSE DOWN** the **APERTURE** (higher values) we are increasing the amount of DOF in the image (commonly called long DOF, deep DOF, or a lot of DOF):
  - o DEEP DOF can be recognized by the amount of 'sharpness' that is throughout the image
  - o DEEP DOF can aid in providing more detail and information in an image



#### Exposure Info : f I.4 @ I/320 - ISO I00

#### **BIG APERTURES**

- Big aperture is lower number
- Let in MORE light
- Shallow DOF / Soft focus
- The bigger the aperture, the softer the feel

#### **KNOCK-ON EFFECTS**

- May have to compensate with FASTER shutter
- May have to compensate with a LOWER ISO







Exposure Info : f 16 @ 1/125 - ISO 100

#### SMALL APERTURES

- Small aperture is higher number
- Let in LESS light
- Deep DOF / Sharp focus
- The smaller the aperture, the sharper the feel

#### **KNOCK-ON EFFECTS**

- May have to compensate with SLOWER shutter
- May have to compensate with HIGHER ISO











### DIRECT COMPARISON APERTURE/DEPTH OF FIELD QUICK LOOK



#### **BIG APERTURE**

• f I.8 @ I/320

#### **RELATED TO APERTURE**

- Isolation of subject
- Foreground and background blur
- Vignetting
- Soft feel

#### KNOCK-ON EFFECT

• Fast shutter





#### SMALL APERTURE

• f | 6 @ |/4

#### **RELATED TO APERTURE**

- Everything is sharp
- Fine detail
- Hard / crisp feel

#### **KNOCK-ON EFFECTS**

- Slow Shutter
- Subject may get "lost"



































#### LONG DEPTH OF FIELD





LONG DEPTH OF FIELD














## LIGHT METER HOW TO MEASURE EXPOSURE

When you look through the viewfinder of your camera, you will see a small illuminated indicator called a LIGHT METER.

The LIGHT METER takes APERTURE, SHUTTER SPEED, and ISO into consideration and creates a 'reading' of the light situation in order to judge where adjustments need to be made.

Once the LIGHT METER has given you a reading, you will know whether you need to increase or decrease one of the three vital functions.

Depending on the scene you are shooting you must make a judgement call on WHICH of the three settings to adjust.



## LIGHT METER UNDER AND OVER EXPOSURE



Good Exposure = the sensor received enough light to capture detail in shadow areas of the image, but not so much that the light areas are washed out.

## SETTING UPYOUR CAMERA REFER TO PAGES 14-18 OF YOUR TEXTBOOK

- If your memory card is blank or can be cleared of any images currently on it, then reformat your memory card
- 2. Select RAW file format
- 3. Set your mode dial to Manual
- 4. Identify your Exposure Controls (aperture, shutter speed, ISO)
- 5. Set your lens to autofocus (AF)
- 6. Check that the camera is set to auto white balance (AWB)
- 7. Make sure correct date and time is set on your camera
- Pressing the shutter release button halfway down locks-in focus and activates the light meter