Photography fundamentals

Capture Basics

By Scott Musson - ©2013 All rights reserved

Todays Topics

Choosing Equipment

- Cameras
- Camera Lens
- Tripods
- Tripod Heads
- Other Equipment

Using Equipment

- Camera Usage
- Capture Formats
- Exposure
- Sharp Images
- Shooting Checklists

Fundamentals

CHOOSING EQUIPMENT

CAMERAS

Choosing Equipment – The CAMERA

- DSLR
- Macro 4/3ds
- Point & Shoot
- Camera on you Phone

Choosing Equipment - DSLR

Pros

- Currently offer the best possible quality image capture of all options
- Highest quality and largest sensors
- Vast array of accessories available
- Supports the highest quality interchangeable lenses, can be used on newer models in future
- A requirement for professional photo engagements
- Support RAW Capture
- Innovation occurring with various models
- Through the lens focusing & metering
- Best low light capabilities
- Best color accuracy
- Ability to create large prints

Cons

- Comparatively very expensive
- Accessories are comparatively expensive
- Very heavy

Choosing Equipment – Macro 4/3rds

Pros

- Most support interchangeable lenses
- Much lighter and smaller than bulky DSLRs
- Accessories and lenses are more affordable
- Support RAW Capture
- Innovation occurring with this platform – touch screens, panorama support, HDR, multiple exposures, etc.

Cons

- Don't match the picture quality of DSLRs (sensor smaller than APS-C)
- Somewhat limited accessories
- Not as good in low light

Note

- Most are "mirrorless"
- Not all "mirrorless" cameras are 4/3rds

Choosing Equipment – POINT & SHOOT

Pros

- Generally better quality than a camera phone
- Easy to carry and keep with you

Cons

- Don't match the picture quality of DSLRs and Macro 4/3ds cameras
- Only a few support RAW Capture
- Most lack more advanced features
- Lenses generally are of poorer quality and don't provide good bokeh and thus perform poorly with shallow depth of field
- Very limited accessories
- Poor low light capabilities

Choosing Equipment – PHONE

Pros

- Always with you
- Very lightweight
- Lots of fun photography applications
- Possible to have decent images
- Can play Angry Birds

Cons

- Don't match the picture quality of DSLRs, Macro 4/3ds or even point and shoot cameras
- No support of RAW Capture
- Most lack more advanced features and do poorly in low light
- Lenses generally are of poorer quality and don't provide good bokeh and thus perform poorly with shallow depth of field
- Very limited accessories
- Cause automobile accidents while driving

Choosing Equipment – Cameras

- Your budget plays a HUGE roll on what is the right equipment for you use
- DSLRs still provide the best images with the most versatility
- Macro 4/3rds are coming on strong with lots of vendor investment and each generation is improving
- Point and shoot cameras may soon go the way of the dinosaur and film. A few make worthy portable second camera. Generally not suitable for certain types of photography
- Camera phones are a long way from rivaling traditional cameras, largely due to the lens. Still fun to play with but a challenge for serious photography, but are a good learning tool

Choosing Equipment – ~~Frame~~ SENSOR Size

- Sensor sizes are one of the biggest sources of confusion in the camera world
- Frame size is related to sensor size
- Lens focal lengths are based on the 35 mm cameras (the same size as a full frame DSLR)
- Crop sensors are smaller and often have higher pixel density
- If pixel density is too high, it will cause color fringing or color noise particularly in dark areas of the image or at high ISO

Choosing Equipment – Sensor Size

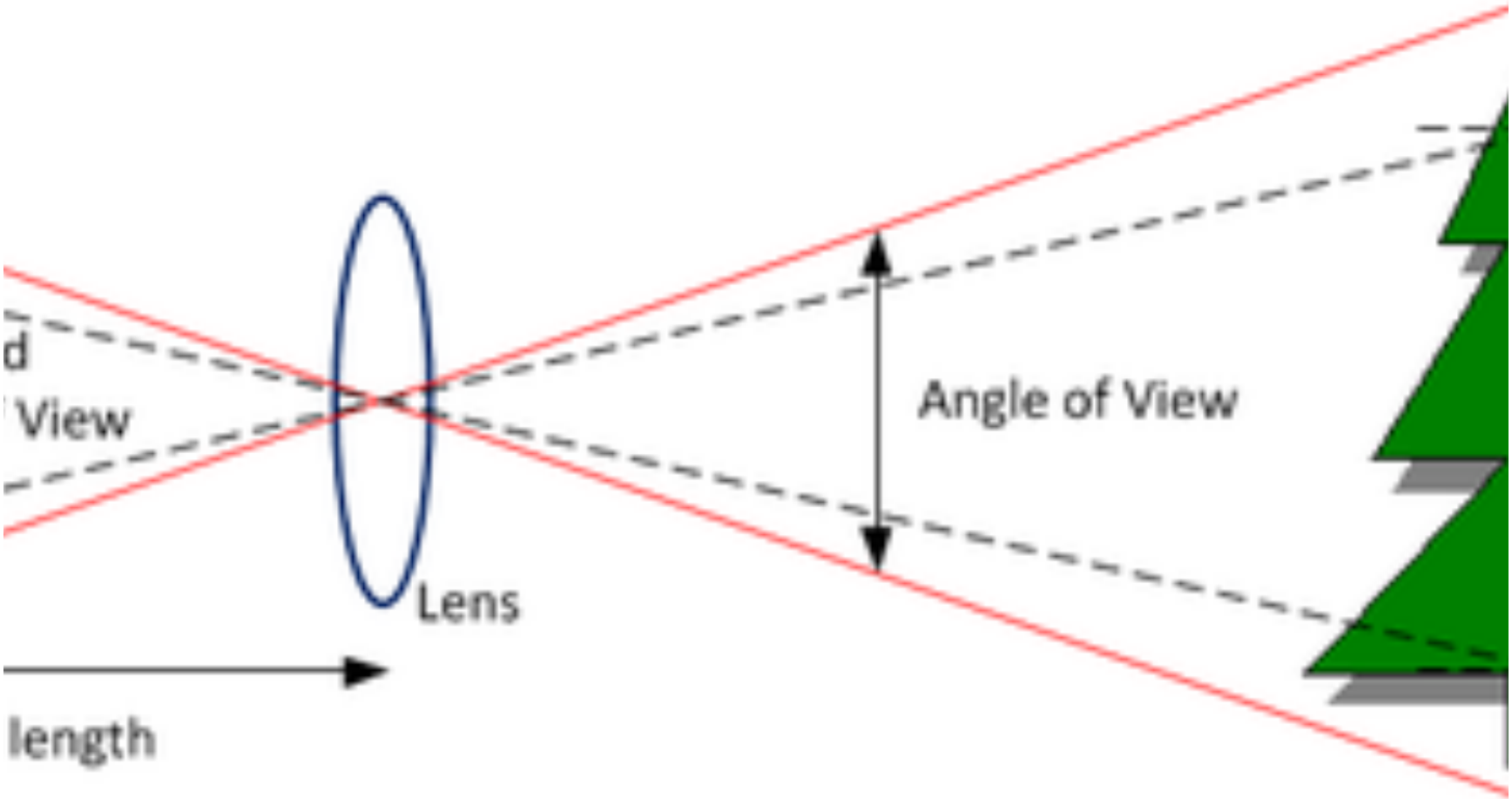
Area					
Size	36 x 24 mm	23.6 x 15.8 mm	18 x 13.5 mm	7.6 x 5.7 mm	6.1 x 4.6 mm
Relative size	31	13	8.6	1.5	1
Camera type	High End DSLRs	Entry level DSLRs Midrange DSLRs	Olympus DSLRs Large Compacts	High End Compacts	Low-mid Compacts
Examples	 Nikon D700	 Canon D500	 Olympus E-420	 Canon G11	 Nikon S640
					

http://blog.lens-to-own.com/

Choosing Equipment – Sensor Size

http://philipbloom.net/

Choosing Equipment – Crop factor



http://en.wikipedia.org/wiki/Crop_factor

Choosing Equipment – Cameras

- Recommended Features for a Primary Camera
  - Support for a large variety of high quality interchangeable lenses
  - Capable of manual and semi-automatic modes (A, Tv, M)
  - Shutter speeds as slow as 30 seconds +
  - ISO as low as 200 or lower
  - Support for shutter release
  - Shoots Raw (or DNG) & JPEG
  - APS – C sensor or larger

Note: there is nothing wrong with buying gently used quality equipment

Choosing Equipment – Cameras

- I'm not saying you can't create good images if you don't buy equipment meeting my recommendations
- It is possible to create great images with many camera, these specifications are just recommendations to provide you with the most versatility and creative options

Words of wisdom

- Good quality cookware does not make a good chef
- Owning an airplane doesn't make you a good pilot
- The best camera in the world will not make you a better photographer
- There is only one thing that will make you a better chef, pilot or photographer
- Practice
- Practice
- Practice

The Most Important Part of your Kit

CAMERA LENSES

Choosing Equipment – LENSES

- More important than your camera body
- A good lens will be with your for many years and through many camera bodies
- Has more impact on the quality of your images than any other part of your gear
- Allocate as much of your budget as you can to lenses
- Kit lenses are frequently low quality
- The 50mm DSLR lens is now and always has been the best lens you can get for the money. Some 35mm lenses also good quality and very affordable too
- Zoom lenses can be very good quality and provide more versatility and allow you to carry less lenses than prime lenses, but optically a prime lenses are usually better
- Most people have a combination of zoom and prime

Choosing Equipment – LENSES

- Focal length
  - The distance from the lens to the sensor when focused on a subject at infinity
  - Coverage of the lens (how much will fit in your image)
  - Measured in millimeters (mm)
  - 50mm on a full frame camera closely matches the human eye (~30mm on a crop frame DSLR), similar magnification, not as large a field of view
  - 28mm – common wide angle lens size
  - 85mm – 135mm lenses are best for portraits (full frame camera)
  - 200mm – 300mm works well for sports & general wildlife
  - 600+ for professional sports and wildlife photography
  - Wide angle lenses can distort perspective
  - Telephoto lenses distort distance

Choosing Equipment – LENSES & Frame Size

Lens type	35mm 'full-frame'	APS-C	Four Thirds
Ultra wide angle	24mm and wider	16mm and wider	12mm and wider
Wide angle	28mm	18mm	14mm
Standard / Normal	50mm	30mm	25mm
Telephoto	80mm and longer	55mm and longer	42mm and longer

Choosing Equipment – LENSES

24mm

50mm

200mm

800mm

Focal Length

http://www.paragon-press.com/lens/lenchart.htm

Choosing Equipment – LENSES

Wide Angle Distortion

http://en.wikipedia.org/wiki/Perspective_distortion_(photography)

OTHER EQUIPMENT

Choosing a tripod and tripod Head

- An important part of your kit, particularly for landscapes, portraits and macro work
- For good build quality you have to pay for it
- A sturdy aluminum tripod is good, but heavy
- Carbon fiber is very sturdy and light, but very expensive
- Basalt is a sturdy and lightweight material and not as expensive as carbon fiber
- Wood is the best material for dampening vibration, but is far too heavy

Choosing a tripod and tripod Head

- Images on a tripod will be sharper and better than you can hand hold under all but the most ideal conditions
  - Enables better photos in low light
  - Allows for greater depth of field (more of the image in focus)
  - Enables specialty photography techniques
    - Panoramas
    - Series of exposures for High Dynamic Range (HDR) images
    - Time laps series of images for animation
    - Compositing several images of the same scene
    - Artistic blurring of movement, such as water
    - Plus many other possibilities

Tripod features

- Sturdiness and Stability
  - Number of tripod leg sections
    - More legs make it less sturdy, but makes it smaller when collapsed
    - 3 sections better, but doesn't collapse as small
  - Type of leg clamps (twist locks or lever locks)
  - Material
  - Thickness of the legs
  - Length of the legs
  - Center column needed to get to eye level?

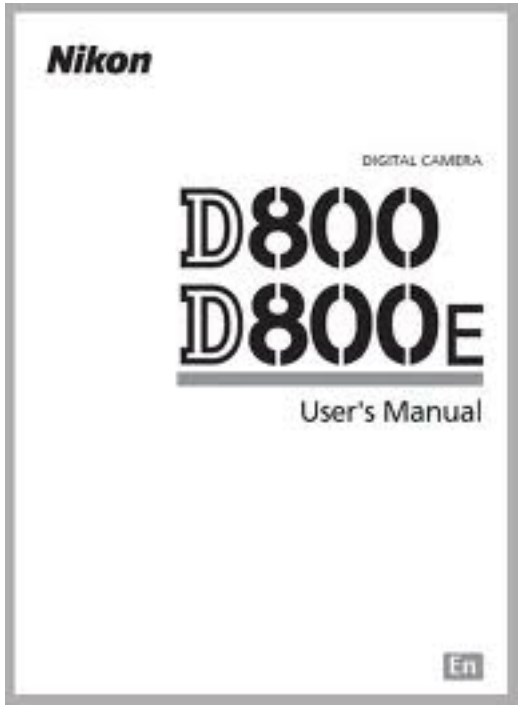
Tripod features

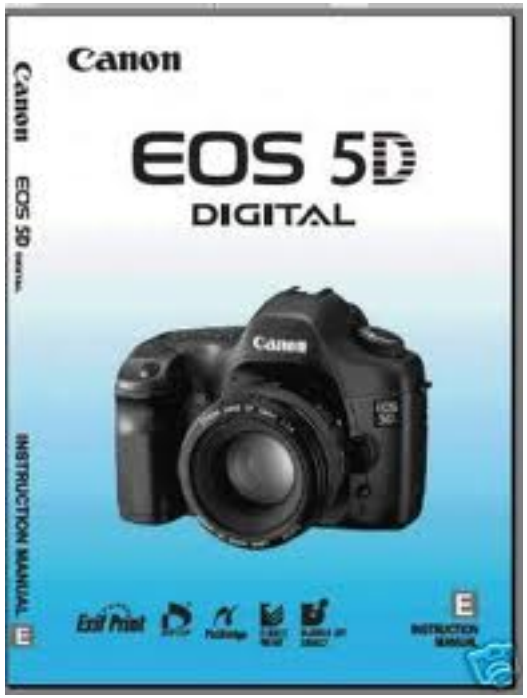
- Weight
  - Can you carry it?
  - A lighter one you'll bring with you more often, but may not be as strong
  - Tripods that don't extend very high are lighter, but harder to use
- Maximum height
- Minimum height
- Collapsed height

Filters

- Circular Polarizer
  - Improves images by reducing reflection and glare. Improves sky's, waters, helps shoot through glass, reduce shine on vegetation, and more.
- Clear Glass
  - For protection of your lens, particularly when hiking and being out and about

OTHER EQUIPMENT





Fundamentals

USING EQUIPMENT

Fundamentals of using your camera

- Picture Quality & Capture Formats
- Drive/Release Mode
- Focus Modes
- White Balance
- Aperture
- Shutter Speed
- Sensor Sensitivity (ISO)
- Shooting Modes

Picture Quality & Image capture formats

- Shoot RAW instead of JPEG
  - Highest Level of Image Quality
  - Record Greater Levels of Dynamic Range than with Jpeg
  - Correct Over and Under Exposed Images
  - Adjust White Balance
  - Get Greater Image Detail
  - Requires post processing to get optimal image quality
- JPEG
  - Ok when you are first starting out
  - Limits your post processing capabilities
  - If you are not ready to learn software for post processing (Photoshop, Lightroom, etc)
- Some cameras allow you to shoot both

RAW VS JPEG

RAW

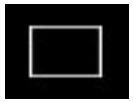
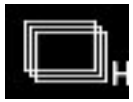
- Highest Level of Image Quality
- Record Greater Dynamic Range
- Correct Over and Under Exposed Images
- Adjust White Balance
- Get Greater Image Detail

JPEG

- Less disc space required
- No side-car (xmp) files
- Very little post processing required

- Enable Non-Destructive Editing
- Select Color Space on Output
- Have an Efficient Workflow
- Images are not processed before they come out of the camera
- Can be saved many times without degradation of image quality

Drive/Release Mode

- Drive Mode: Canon/Release Mode: Nikon (options may differ with camera model)
-  Single Frame/S: Single Shooting
-  Low Speed Continuous Shooting/CL: Continuous Low Speed
-  High Speed Continuous Shooting/CH: Continuous High Speed

Drive/Release Mode

- Drive Mode: Canon/Release Mode: Nikon (options may differ with camera model)
-  Silent Single Shooting  Silent Continuous Shooting/Q: Quite Shutter Release
-  Self Timer/Remote Control/  Self Timer
  - For Canon optional Remote Control is enabled

 Remote Control

  - Shutter is controlled by optional remote control

Focus modes - Canon

- Single Shot
  - For stationary subjects
  - When you press the shutter half-way down, the camera will only focus once
- Continuous/AI Servo Mode
  - For when the focusing distance keeps changing
  - When you press the shutter half-way down, the camera will continuously focus
  - Exposure set when the shutter is completely depressed
- AI Focus AF
  - Switches focus modes if the subject moves, changes from Single Shot to AI Servo Mode
- Manual Focus (MF)
  - Allows you to use the lens to manually focus the image and turns off auto focus

Focus modes - Nikon

- Single-servo AF
  - For stationary subjects
  - When you press the shutter half-way down, the camera will only focus once
  - By default the shutter cannot be released unless the focus indicator is shown
- Auto-servo AF
  - Switches focus modes if the subject moves from Single-servo AF to Continuous-servo AF
- Continuous-servo AF
  - For when the focusing distance keeps changing
  - When you press the shutter half-way down, the camera will continuously focus
  - Exposure set when the shutter is completely depressed
- Manual Focus (MF)
  - Allows you to use the lens to manually focus the image and turns off auto focus

White balance

- White balance ensures that the colors in your image are not impacted by the color of the light source. This way things that are white will look white and colors will look as they are.
- You can use Auto White Balance (AWB) in many situations.
- Some situations will fool AWB, mixed lighting, intense shade are examples
- If you notice that your images have a color cast or the colors look off on your camera LCD when you are shooting, you should adjust the white balance to match the light
- You can fix white balance in post processing if you are shooting RAW very easily, but it's always better to get the image right when captured, you'll waste less time.

White balance

- Auto – this is where the camera makes a best guess on a shot by shot basis. You'll find it works in many situations but it's worth venturing out of it for trickier lighting.
- Tungsten – this mode is usually symbolized with a little bulb and is for shooting indoors, especially under tungsten (incandescent) lighting (such as bulb lighting). It generally cools down the colors in photos.
- Fluorescent – this compensates for the 'cool' light of fluorescent light and will warm up your shots.
- Daylight/Sunny – not all cameras have this setting because it sets things as fairly 'normal' white balance settings.
- Cloudy – this setting generally warms things up a touch more than 'daylight' mode.
- Flash – the flash of a camera can be quite a cool light so in Flash WB mode you'll find it warms up your shots a touch.
- Shade – the light in shade is generally cooler (bluer) than shooting in direct sunlight so this mode will warm things up a little.

http://digital-photography-school.com/introduction-to-white-balance

White balance

Tungsten

Florescent

Daylight

Cloudy

Aperture

- Aperture refers to a camera lens diaphragm opening where light passes through
- The opening is calibrated in *f*-stops with *f* 1.0 being theoretically all the way open, however practically diaphragms cant open all the way.
- Every time the *f*-stops number halves, the light collecting area quadruples
- The higher the number, the less light that is allowed in, but the larger area that is in focus

http://enchantingkerala.org/

Aperture

- Aperture is like blinds on your windows, the more you open the aperture,
  the more light you let in through your lens to expose your image
- The *f* in *f* stop stand for *fraction* or what fraction of the aperture is open
  - *In optics, the f-number (sometimes called focal ratio, f-ratio, f-stop, or relative aperture[1]) of an optical system is the ratio of the lens's focal length to the diameter of the entrance pupil.[2] It is a dimensionless number that is a quantitative measure of lens speed, and an important concept in photography. - wikipedia*
  - Aperture is one of the major components of image exposure

Aperture impact on depth of field

- When you look at an image, part of the image may be in sharp focus and part may be in out of focus
- Depth of field is determined by three things;
  - aperture (*f* stop)
  - distance to your subject
  - lens focal length (50mm, 100m)
- Portraits are often shot with shallow depth of field, with an aperture open wide, using a low *f* stop. This allows for the subject to be in sharp focus and the background out of focus
- Landscapes are often shot with deep depth of field with a small aperture, using a high *f* stop

Aperture impact on depth of field

http://photo.tutsplus.com/tutorials/photography-fundamentals/the-ultimate-beginners-introduction-to-exposure/

Aperture impact on depth of field

At f/2.8, the cat is isolated from the background.

At f/5.6, the flowers are isolated from the background

At f/32, the background competes
for the viewer's attention.

http://en.wikipedia.org/wiki/Depth_of_field

Shutter Speed

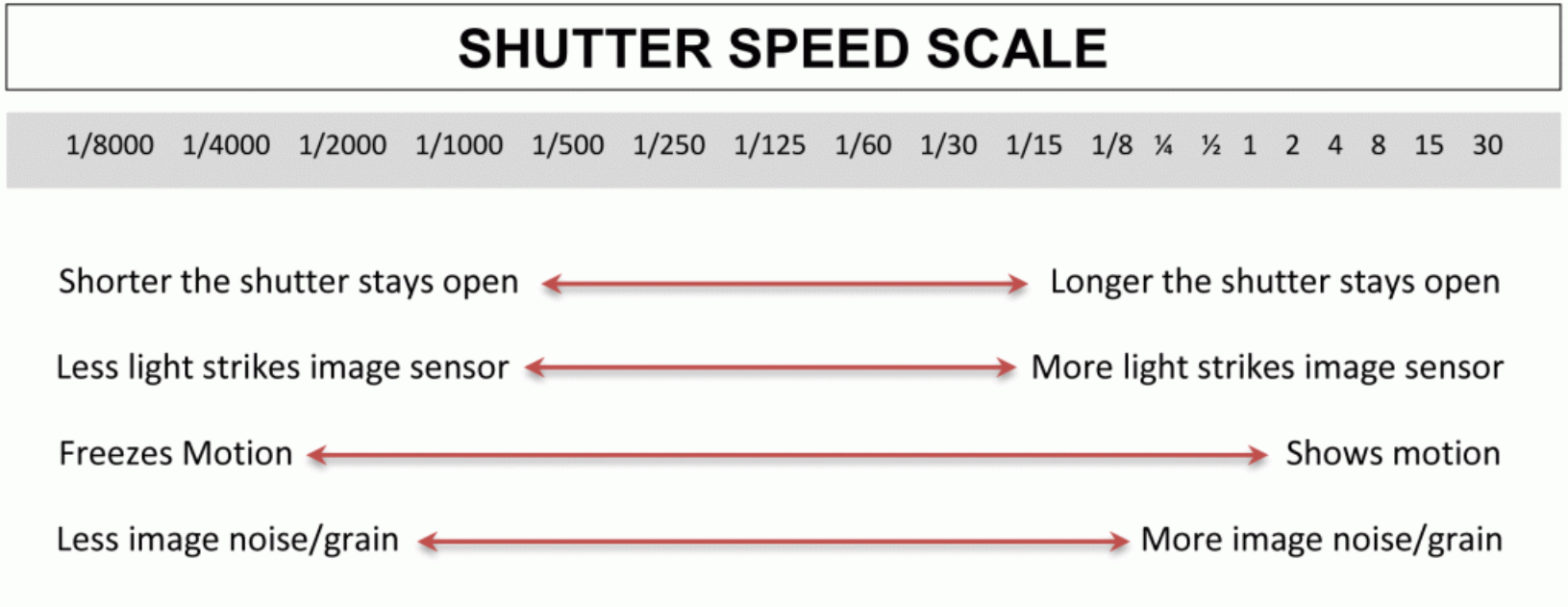
- Determines if a moving subject appears frozen or if the subject appears blurred
- Measured in time increments typically in fractions of or whole seconds
  - Equates to the amount of time light is allowed to reach the senor (or film)
- Shutter speeds typically double with each setting
  - Examples: 1/500, 1/250, 1/125, 1/60, 1/30, 1/15, 1/8, ¼, ½, 1, 2, 4, 8
  - This doubling applies to the amount of light that is allowed to strike the sensor
- The longer the shutter speed, the more noise that can be introduced in the image. Shutters speeds of longer than a few seconds can have noticeable noise

Shutter Speed

- If you hand hold your camera and your shutter speed is to slow, your images will be blurry
- To determine how slow a shutter speed you can use take the focal length of your lens and shoot at least as fast as that. If you have a 300mm telephoto lens, your minimum shutter speed should be 300 (1/300 or 1/320 as is common) If you cannot hand-hold, you must use a tripod or some support system
- Vibration reduction (VR) and Image Stabilization (IS) will help, but only a small amount
- Example for a 50mm lens
- 1 sec ½ ¼ 1/8 1/15 1/30 1/60 1/125 1/250 1/500
  ← ---------- use tripod ----------→←-------- Hand Hold ----------→

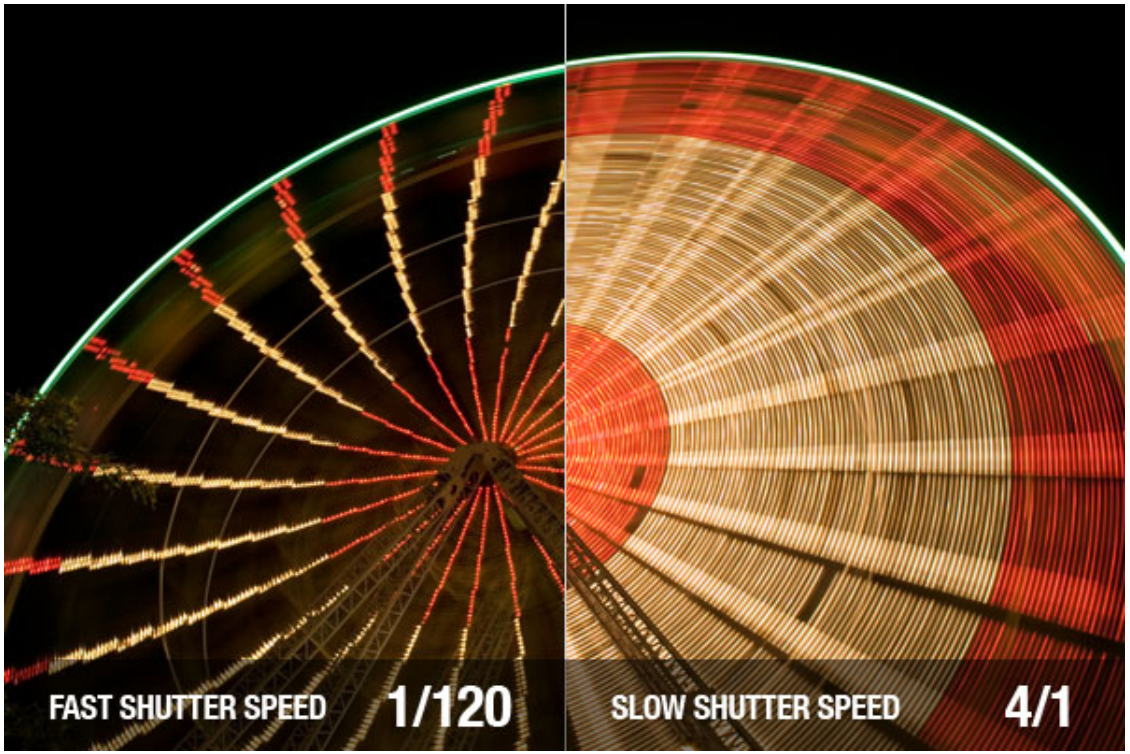
- Shutter speed is one of the major components of image exposure

Shutter Speed



http://godigitalslr.com/understanding-shutter-speed-digital-slr-photography/

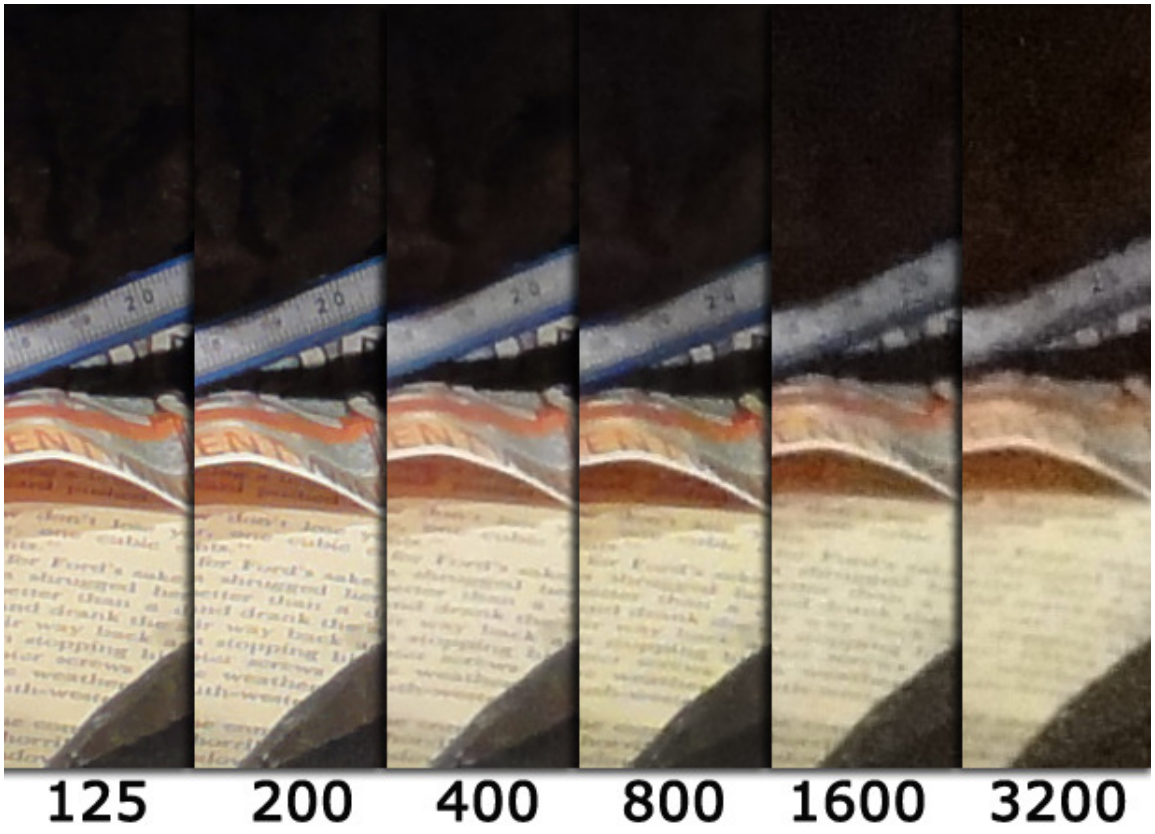
Shutter Speed



Sensor Sensitivity (ISO)

- Light sensitivity measurement – carry over from the days of film
- The higher the number, the more light sensitive or the quicker the image will be exposed
- ISO works through amplification, as you increase the setting, the light on the sensor is amplified. Like a stereo, the more you amplify beyond a certain point, the more you distort
- Turning up the ISO will make images noisy
  - Newer sensors allow you to increase the ISO with less noise, but noise is still introduced with every increase in ISO
- ISO is one of the major components of image exposure

Sensor Sensitivity (ISO)



Shooting Modes

- Canon/Nikon (options differ with camera model)
- Not going into auto & scene modes such as night, sports, etc, these generally cant be used when shooting RAW & these modes are just shortcuts for standard modes & settings
- P: Program AE/P: Program Auto
  - The camera automatically sets the aperture and shutter speed. You can control the ISO, exposure compensation and other settings
  - This mode is not recommended
- Av: Aperture Priority AE/A: Aperture Priority
  - You choose the aperture & the camera will automatically choose the appropriate shutter speed. Allows you to control depth of field or how much the background is in focus or blurred. You can control the ISO, exposure compensation and other settings.
  - This mode is ideal for landscapes, portraits and many types of images

Shooting Modes

- Canon/Nikon (options differ with camera model)
- Tv: Shutter Priority AE/S: Shutter Priority Auto

  You can control the ISO, exposure compensation and other settings.

- M: Manual Exposure/M: Manual

  You can also control the ISO, exposure compensation and other settings that impact exposure.

It’s all about the light

EXPOSURE

Exposure

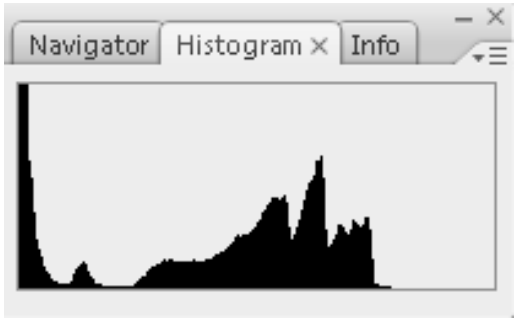
- With all the technology in camera why can't it take a properly exposed image?
- Well it can – Auto focus, auto white balance, auto ISO, etc. all work together to give you a wonderfully average image
- Technology can not understand your creative intension
  - Do you want motion blurred or tack sharp?
  - Do you want the background soft and the foreground sharp or do you want everything sharp?
  - Is the subject going to move?
  - Do you want a moody or a happy feel to your image?
  - Creative modes have tried to address this, but when cameras started to have more than 50 creative modes (thank you Olympus), people were overwhelmed

Exposure

- Most camera meters work on the assumption that a scene should be 18% mid-tone gray
  - It works in many cases
  - Of course there are lots of cases where it does not
    - Snow
    - Weddings
    - High dynamic range (ex: dark indoors looking out to bright outside)

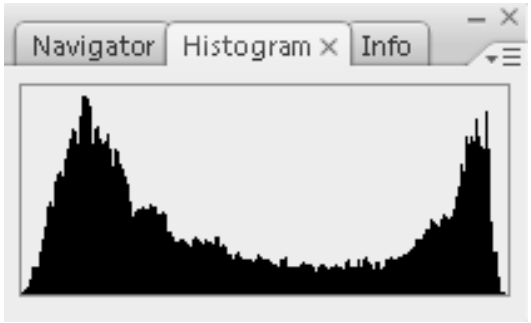
Exposure

- Get to know your histogram



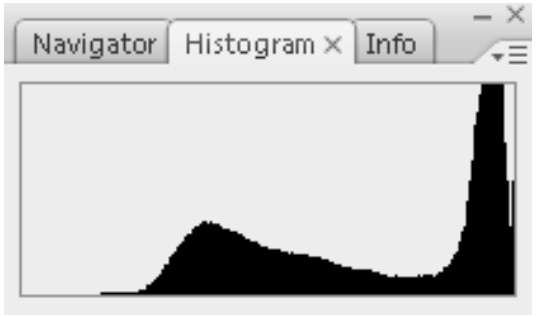
Under Exposed

a



Properly Exposed

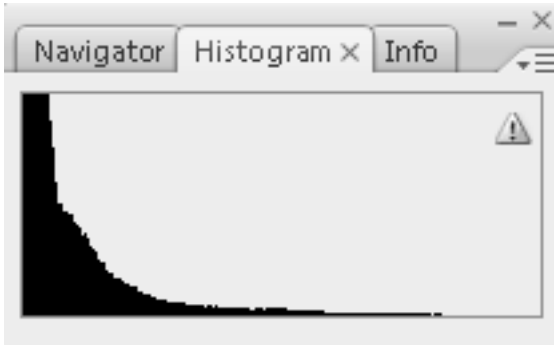
ot



Over Exposed

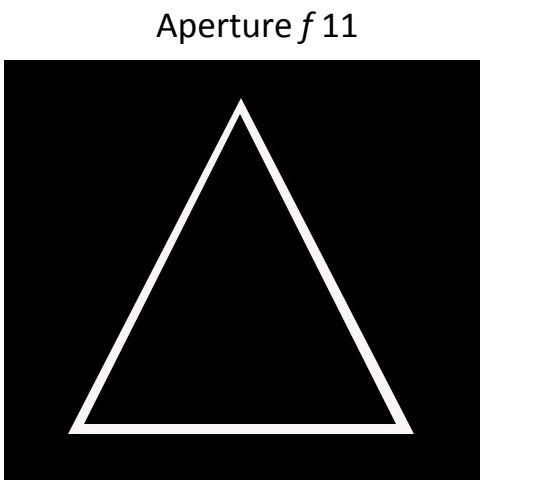
Exposure

- Your histogram is just a guide, not an absolute rule.
- Some images require your best judgment



The triangle of exposure

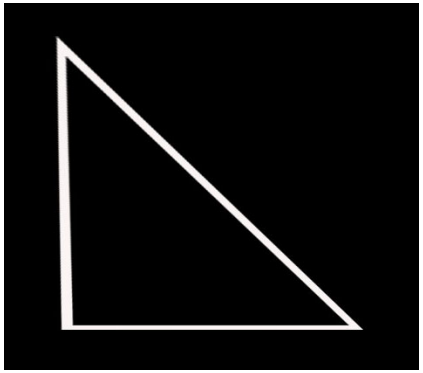
- There are 3 major components to exposure
  - Aperture
  - Shutter Speed
  - ISO – Sensor Sensitivity
- Exposure is like a perfect equilateral triangle with all sides being equal when the exposure is correct
- Lets say we have a perfect exposure of a landscape with an aperture *ƒ* 11, shutter speed of 1/125 and a ISO of 100



The triangle of exposure

- Perhaps you want greater depth of field because you are shooting a landscape
- You increase the aperture a full stop from *f* 11 to *f* 16
- You have reduced the amount of light that will hit the sensor by making the aperture smaller, your image will now be under exposed and be too dark
- If you are in manual mode none of the other settings will change so you will have to adjust the exposure to be correct, either changing the ISO or the Shutter Speed

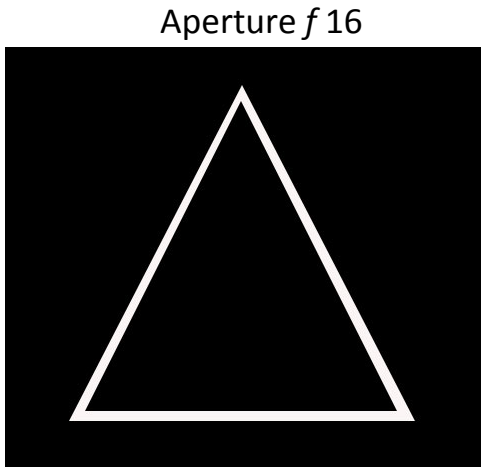
Aperture *f* 16



ISO 100 Shutter Speed 1/125

The triangle of exposure

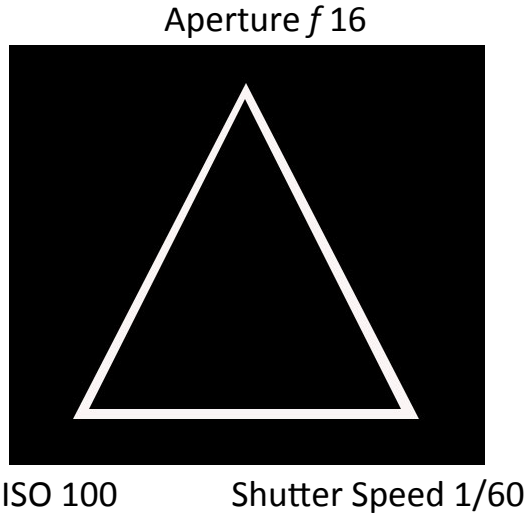
- Decreasing your shutter speed by one increment, doubling the time the shutter is open brings your triangle of exposure back to perfect equal lateral
- If you use Aperture priority mode, your camera would automatically make this adjustment. As you change the aperture, the shutter speed will automatically adjust
- You also could have increased the ISO one increment to 200 and your triangle would be back in shape with the correct exposure



The triangle of exposure

- Changing each of the sides of the triangle has consequences

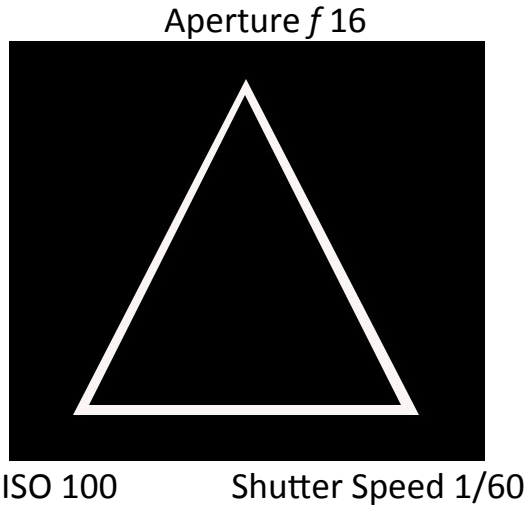
- *Increasing* ISO degrades the quality of your image, adding noise and color fringing
- *Increasing* the size of the aperture (lowering the number), reduces how much is in focus
- *Increasing* the shutter speed will freeze motion



The triangle of exposure

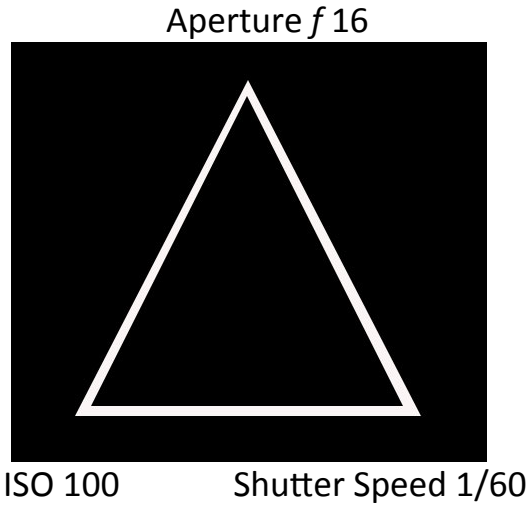
- Changing each of the sides of the triangle has consequences

- *Decreasing* ISO improves the quality of your image, reducing noise and color fringing
- *Decreasing* the size of the aperture (increasing the number), increases how much is in focus
- *Decreasing* the shutter speed will blur motion

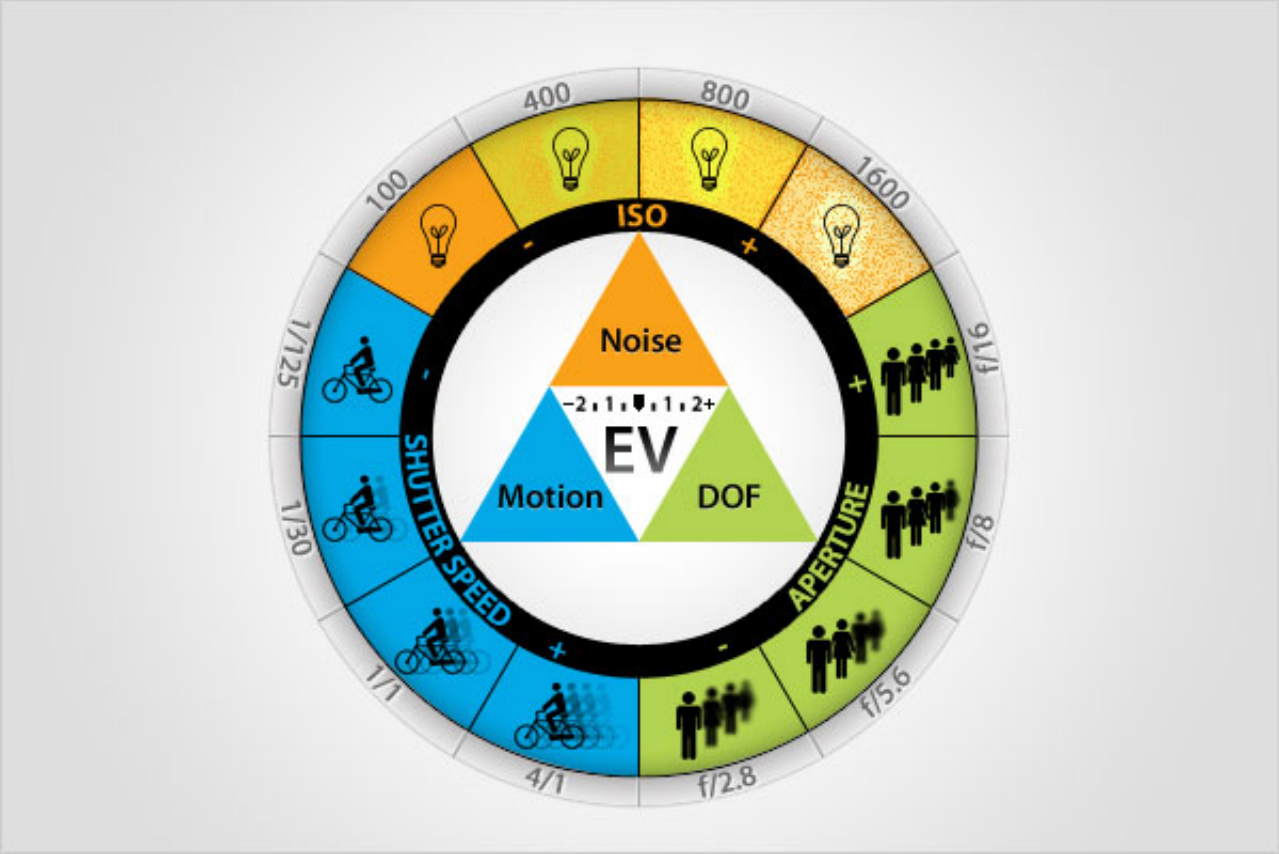


The triangle of exposure

- Image exposure is a balancing act, you must decide what is most important to your image
  - Depth of field
  - Blur or freezing of motion
  - Level of image noise



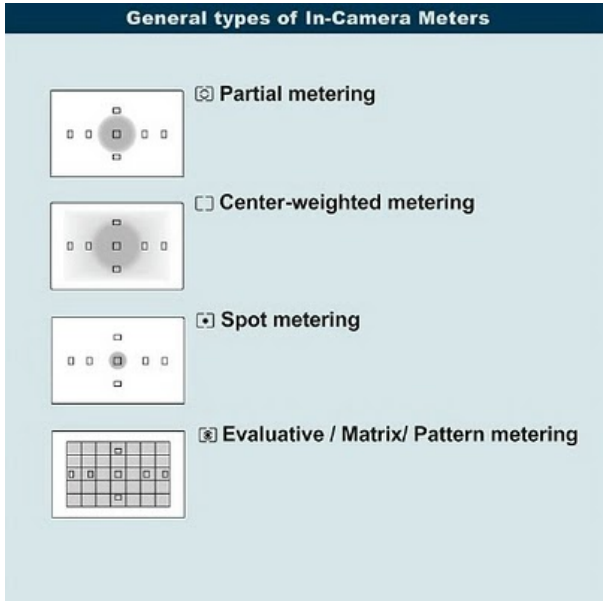
The triangle of exposure



http://www.exposureguide.com/exposure.htm

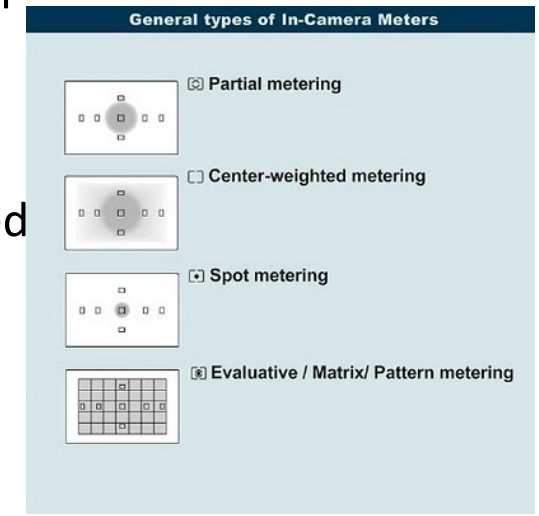
metering

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



metering

- Spot
  - This is for metering a specific spot or subject in the scene. Covers about 2% of the viewfinder
- Center Weighted
  - Camera meters entire frame but assigns greatest weight to center area. Commonly used for portraits
- Evaluative/Matrix
  - Produces natural results in most situations. Camera meters a wide area of the frame and set exposure according to tone distribution, color, composition
- Partial metering
  - Particularly good for backlit subjects. This mode covers ~ 6% of the viewfinder (Canon only)



Sharpness when you want it

TACK SHARP IMAGES

Focusing

- Most cameras DSLRs and many 4/3ds cameras have multiple focus points
- Even many point and shoot cameras & camera phones allow you to select where to focus
- Allow you to select the focus area for your composition
- Important to master this so the proper part of your image is in focus, particularly useful with “shallow depth of field”
- Focus 1/3 of the way into the scene (not 1/3 from the bottom). This will give you the best results in the vast majority of landscape focusing situations
- For portraits focus on the subjects eye

Focusing

- Manual Focus
  - At one time this was the only option
  - It is still the most effective method of focusing
  - With practice you will focus almost as fast, but often better
  - Several subjects require manual focus
  - Great skill to learn and will help you improve your photography

Focusing

- Manual Selection of Autofocus Point
  - Setting the AF point yourself gives you the maximum level of control of where your camera focuses
  - Good for still life, portraits and landscape photography.
  - Press the AF point selection button and select the AF point you want while you look through the viewfinder
  - Once you reach the AF point that is over your subject, you're ready to focus and take the picture.

Focusing

- Focus and Recompose
  - With your center AF point selected move the camera so that the AF point is over the subject where you want to focus and press the shutter button half way down so that the lens focuses.
  - Now, with the shutter button still pressed half way down to keep the focus locked, recompose the image so that the subject is where you want it in the frame and press the shutter to capture the image.
  - This also a useful focus technique to use in low light, as the outer AF points tend to be
  - Helpful in low light or when focus point isn't covering the ideal point of focus
  - Must use  Single Frame/S: Single Shooting because continuous modes will cause the lens to refocus as you move the camera

Holding your camera

- The most important aspect of holding a DSLR properly is good contact points While standing up, you can usually achieve solid contact points by resting your elbows against your body.
- When holding the camera while crouching, kneeling, or lying down, photographers make many mistakes. In these positions, photographers often rest their elbows on hard surfaces. For example, while kneeling, many photographers rest one elbow on the knee. This position is not solid because the joint-to-joint contact allows for a lot of play. By scooting the elbow back slightly so it rests on the meat of the leg rather than on the knee, the contact point is much more solid. This is a tip used by rifle shooters to increase their stability while aiming, and it is just as applicable for photographers.

http://improvephotography.com/1365/how-to-properly-hold-a-dslr-camera/

Other things for sharp images

- Cable Release
- Use mirror lock up mode
- Use a tripod – whenever possible
- Use image stabilization only when hand holding

Recipes for Successful Shooting

SHOOTING CHECKLISTS

Before EACH shoot

- Check
  - all equipment is functioning correctly
  - lens and filters for dust, clean if needed, bring lens pen with you
  - charged batteries and memory cards
  - you have the appropriate lens and leave the rest at home
  - tripod and cable release
  - properly set picture quality
  - necessary filters
  - ISO speed settings
  - white balance

Before each shot

- Check
  - exposure mode
  - metering mode
  - aperture – do you have the right depth of field?
  - shutter speed – do you want tack sharp?
  - composition – look at all 4 edges, anything intruding?
  - focusing – focus 1/3 of the way into the image

After each shot

- Review
  - composition
  - exposure
  - histogram