Photography and Photoshop 101
Digital imaging techniques and post processing basics for specimen data capture.

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9:00AM-4:00PM

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Instruction

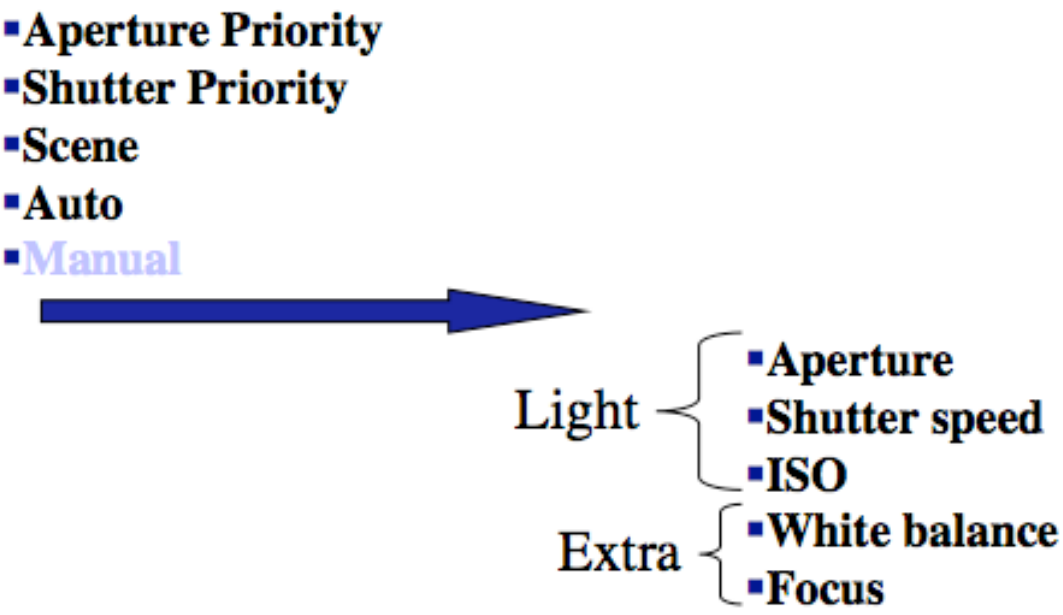
Photography:
-Data capture basics with DSLR cameras
-White balancing
-Focus
-Lighting
-Specimen photography and setup
-Sneak peek to advanced options

Post processing:
-Changing file size
-Adjusting canvas size
-Crop, cut and paste
-Color balancing
-Working with layers
-Various tools: burn and dodge, curves, clone stamp, band-aid
-File saving and storage

Photography is the art, science and practice of creating durable images by recording light, either chemically by means of a **light**-sensitive material such as photographic film, or electronically by means of an image sensor.

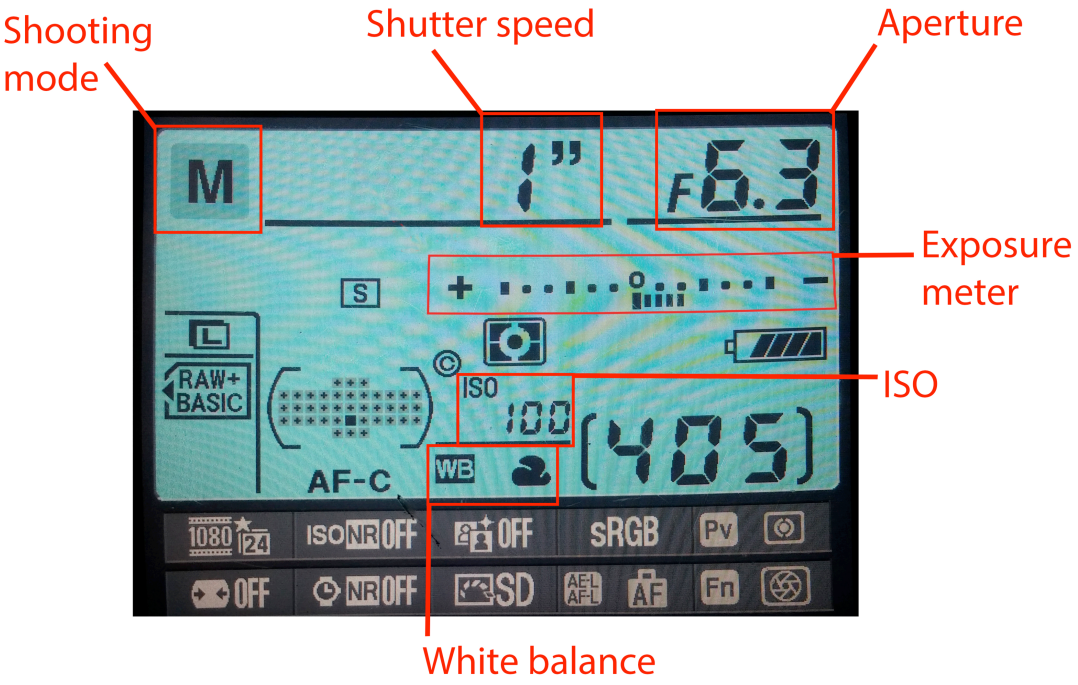
5 main shooting modes on a camera

- **Aperture Priority**
- **Shutter Priority**
- **Scene**
- **Auto**
- **Manual**



Getting to know your camera

Refer to your camera's owner's manual for camera screen labeling.



File Formats

NEF/RAW

- **Pros –**
  - Extremely high quality
  - Lossless data
  - Shows more shades of colors
  - Best option for professional photos

  Cons:
  - Extremely large file size
  - Not always available in camera options
  - Most certainly not suitable for internet display or sending in email
  - Requires supported software to open

JPEG (Joint **P**hotographic **E**xpert **G**roup**)**

- **Pros –**
  - The most common file type
  - A file format available with most if not all cameras
  - Can be a decent image at a low size
  - Great for internet images and sending over email

  Cons:
  - File needs to be flattened thus there is limited editing capabilities
  - Image degradation with each opening and saving of file
  - Lousy compression

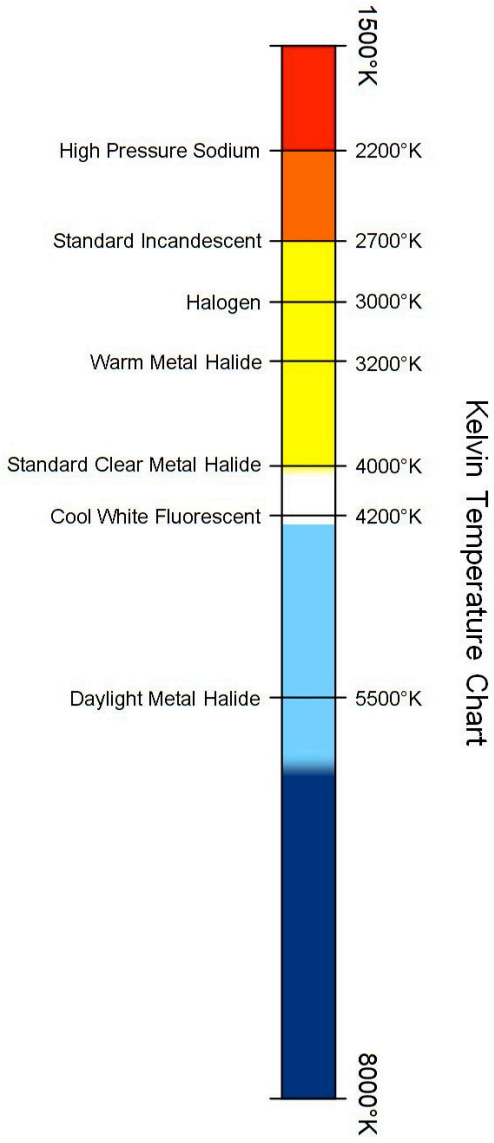
TIFF (Tagged **I**mage **F**ile **F**ormat**)**

- **Pros –**
  - Extremely high quality
  - Lossless data
  - Option to compress or not compress

  Cons:
  - Extremely large file size
  - Not suitable for internet display or sending in email

White Balancing

White balance (WB) is the process of removing unrealistic colorcasts, so that objects that appear white in person are rendered **white** in your photo. To properly **white balance** one has to take into account the "color temperature" of a light source, which refers to the relative warmth or coolness of **white** light.



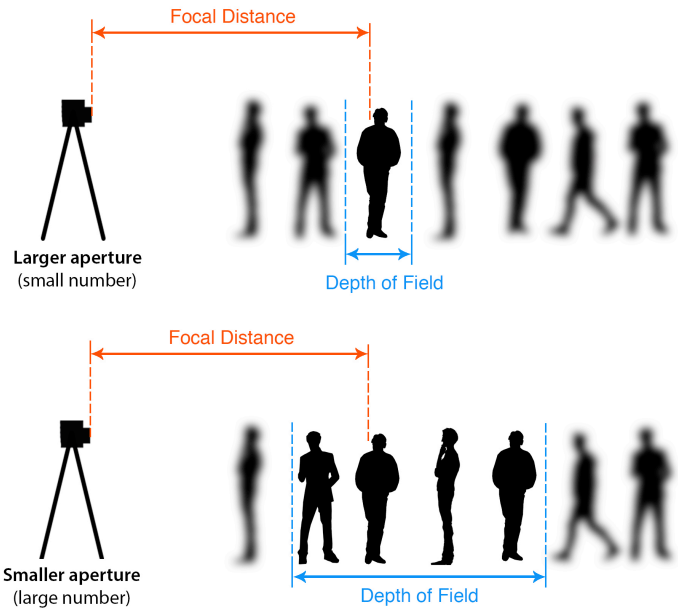
A **colorcast** is a tint of a particular color, usually unwanted, which affects the whole, or portion, of a photographic image evenly.
Depending on the light source you are using, a colorcast will appear over your image.

To correct this your camera has settings that will offset the colorcast. To get the most accurate WB setting I suggest doing it manually for every change in light setting. Refer to your camera's owner's manual for specific instructions for your camera. Try to avoid different light sources as they cast different temperature colors.

That being said, what you will be doing is setting a custom white balance setting that works for the conditions you are shooting. Other ways to do this is to color balance in post processing. By photographing a white card or grey card in your original shot you can color balance in Photoshop. However, it is highly recommended that you do as much of the changes in your camera instead of resorting to Photoshop. This allows you to keep the integrity of your photo.

The Kelvin scale is used to show the temperatures of light. Depending on that temperature your image will have a different colorcast. For example, in best conditions shooting under noon daylight sun will give you the best neutral WB coloring. Shooting under florescent lights will cast a green color and tungsten lights casts a yellow color, etc.

Focusing



In a midrange focal length, focus about 1/3 the way back from the front of focus area. You can either auto focus or manual focus. Some cameras have multiple focusing areas that will give you plenty of flexibility, but you may also find that tweaking the focusing manually gives you what you want.
Play around with it. Your camera lens will have either have auto or manual focus or both. Use what works for you.

Aperture

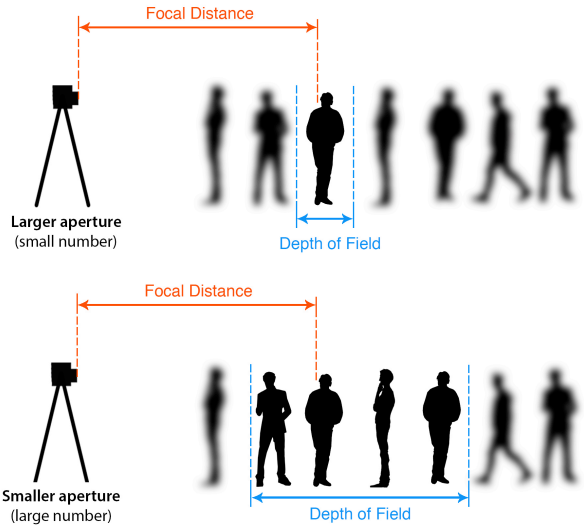
In optics, an aperture is a hole or an opening through which light travels.
The Aperture is responsible for two things, light entering the camera and Depth of Field (DOF).

Depth of Field refers to the range an object is in focus.
There are a few things that contribute to DOF.

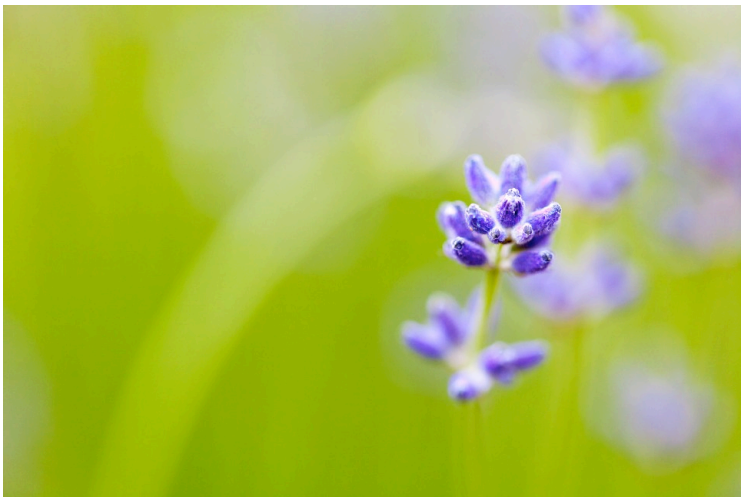
- **Aperture size**- The smaller aperture size (larger the F-number), the DOF is greater. The larger aperture size (smaller the F-number), the DOF decreases.

- **Distance from the object**- The farther away from the subject, the DOF is greater. The closer you are to the subject, the DOF decreases.

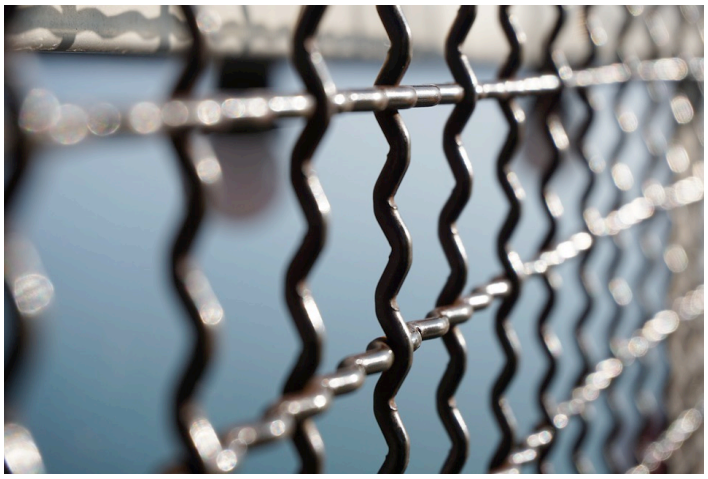
- **Magnification-** The more zoomed in the camera, the lower the DOF.

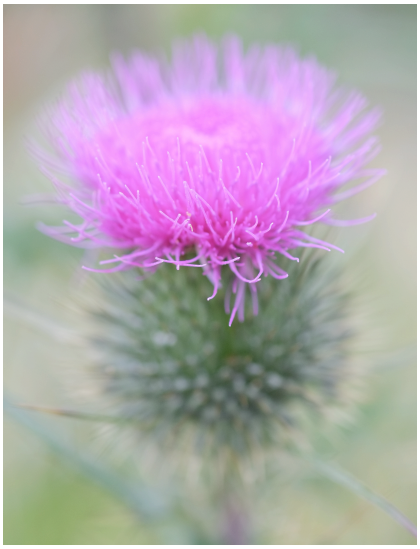


Large aperture (low F numbers) = Small DOF, more light



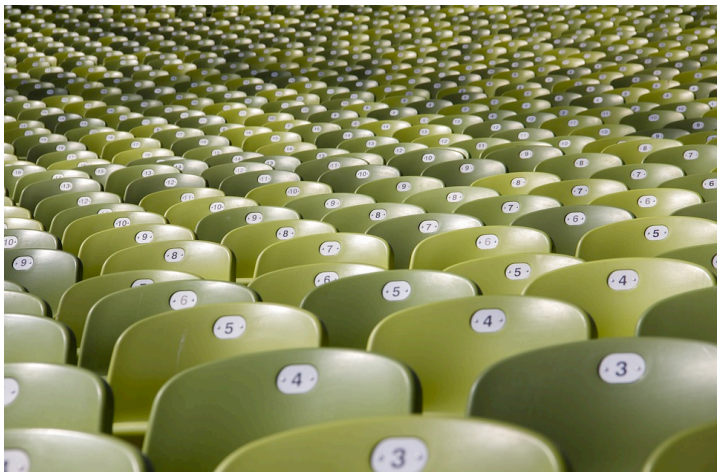
Having a small DOF allows you to have a small portion of your object in focus. Settings are good for photographing portraits, pets, flowers, small objects, objects you want brought to attention.





Small aperture (high F numbers) = Large DOF, less light

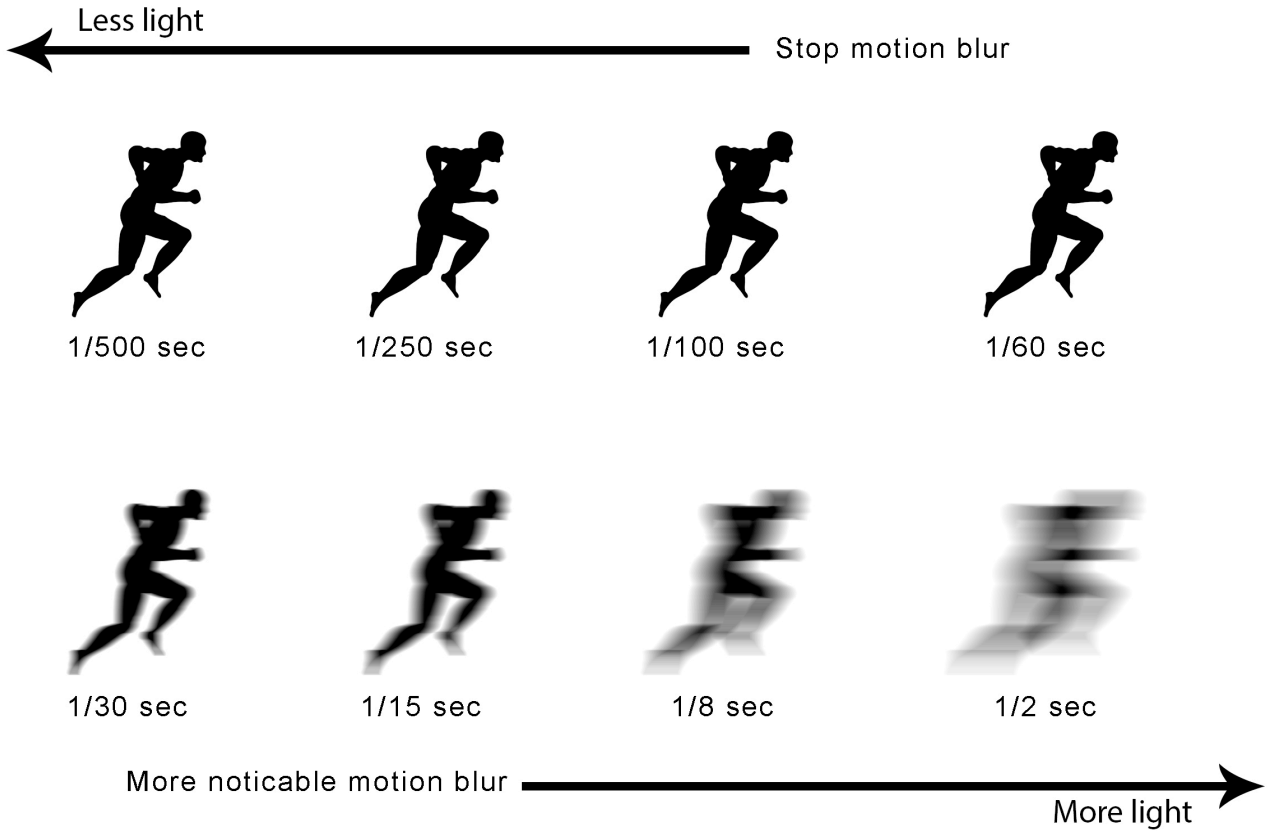
Having a large DOF allows you to have most if not all of your image in focus. Settings are good for photographing landscapes, buildings, crowds, large objects, the feeling of expansion, etc.



Shutter Speed

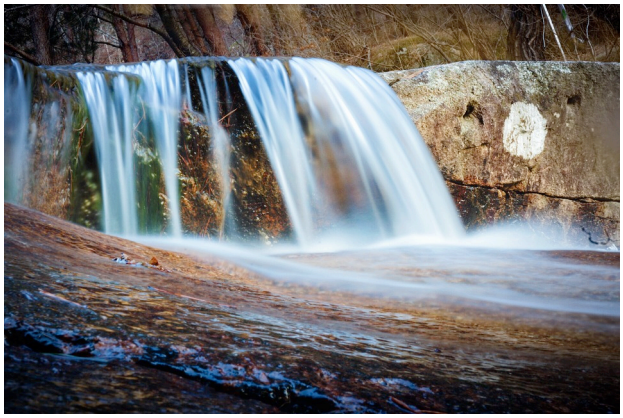
The effective length of time a camera's shutter is open. A common term used when discussing exposure time or duration of time in which light reaches the film or image sensor. 1/60 sec is the cut off from hand held camera to tripod, give or take.

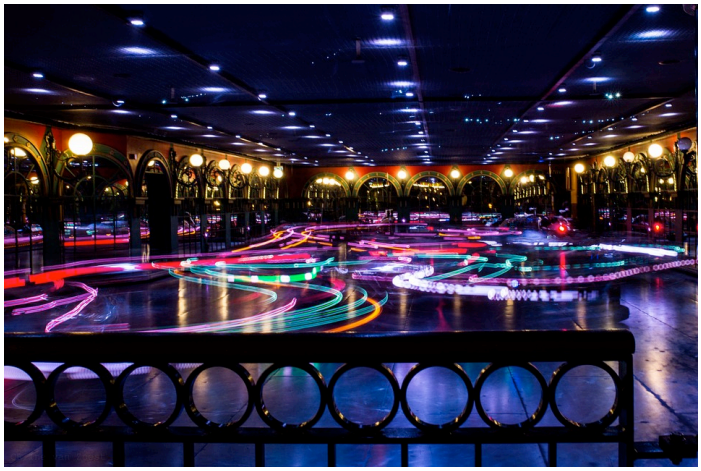
The shutter controls two things, light entering the camera and motion blur.



Slow shutter speed (lower number)= Visible motion, more light

Slower shutter speed settings are good for photographing anything you want to see motion blur, or objects that are not moving.



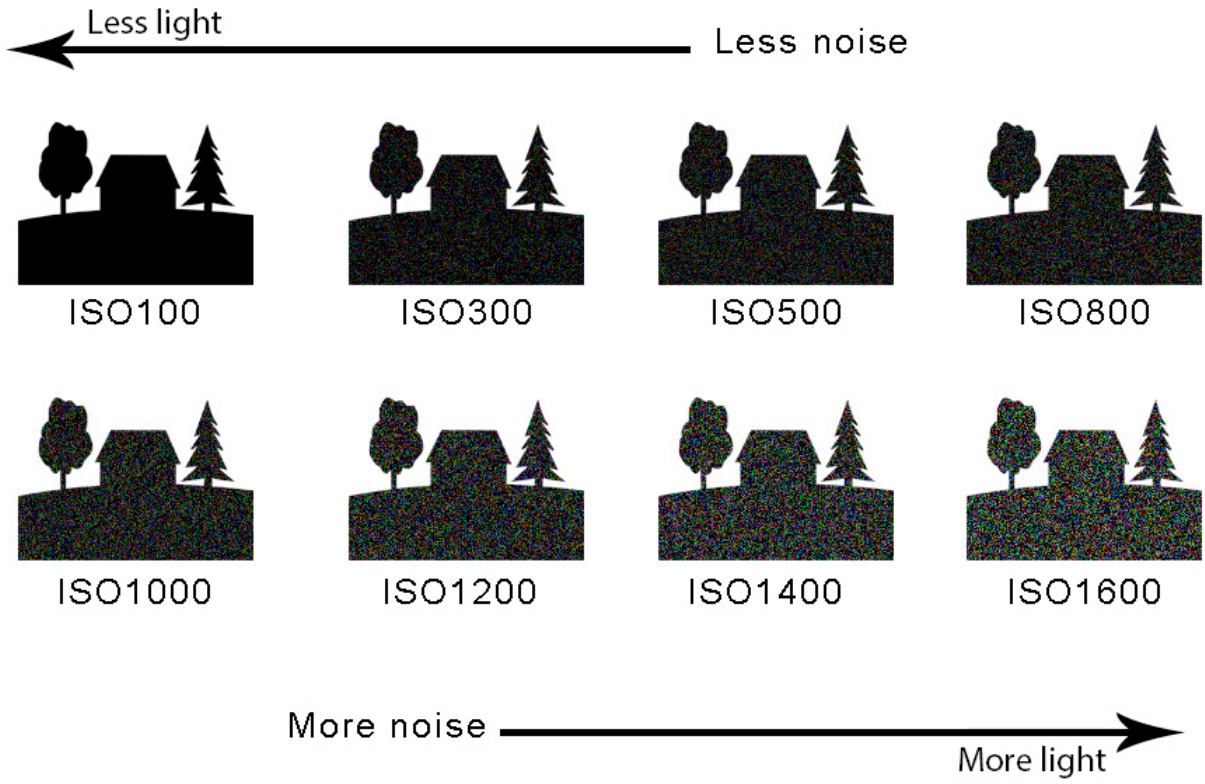


Fast shutter speed (high number)= Stopped motion, less light

Fast shutter speed settings are good for photographing anything you want to stop in motion.

ISO

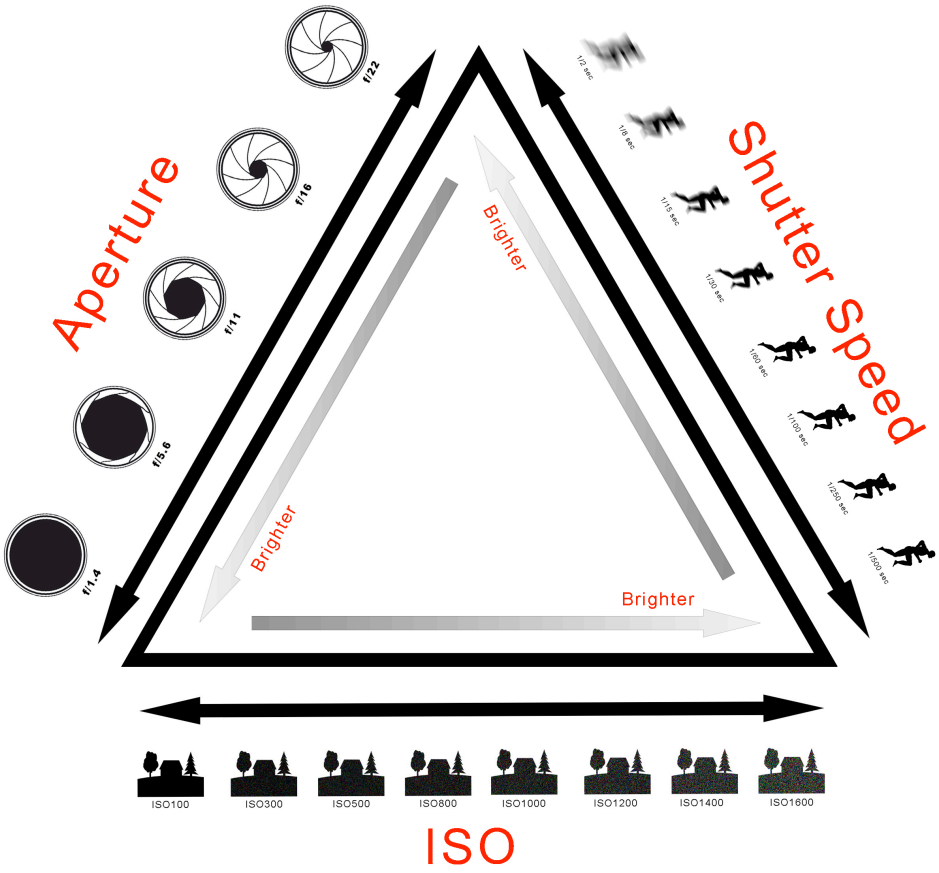
In the most basic terms is the speed with which your film or digital camera responds to light, so the higher the ISO /ASA rating the more sensitive the film or CCD/CMOS sensor is to light.
The ISO controls two things, light entering the camera and noise.



Lower ISO = Crisper photos, less light

Higher ISO = Grainy photos, more light

Aperture/shutter speed/ISO relationship



What do these three things have in common? **Light**

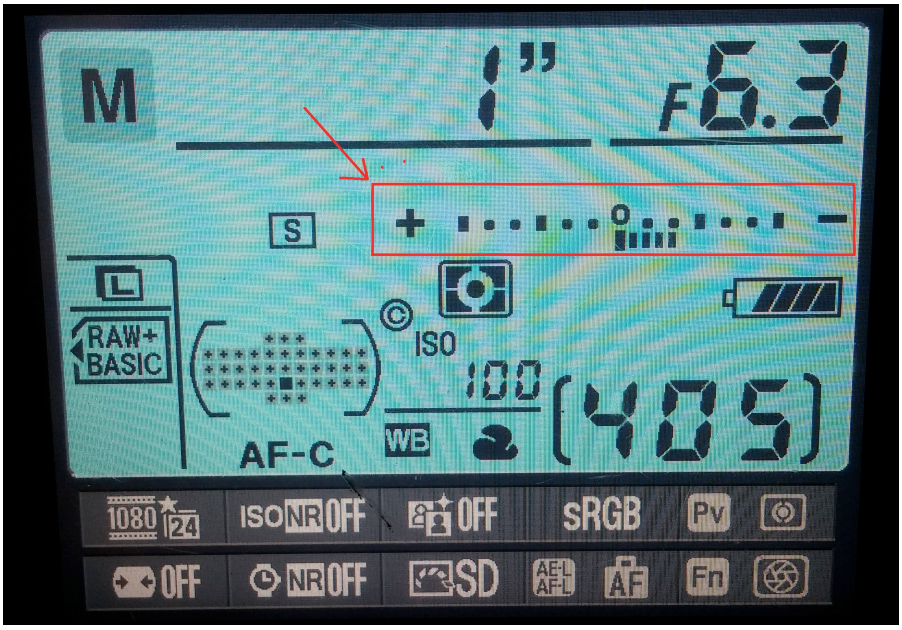
Why is this important?
It's important because they relate to each other. When you change one setting, it throws the light off for the others. To counter the change in light, you need to adjust the other settings.

Let me explain…first, I'll start with exposure.
In **photography**, **exposure** is the amount of light per unit area reaching a photographic film or electronic image sensor, as determined by shutter speed, lens aperture and scene luminance.
Two terms get thrown out, overexposure and underexposure.
Overexposure means your camera is being flooded with light and your image will be to light.
Underexposure means the opposite, that your camera does not have enough light and it will be dark.
Your camera has a built in meter that will tell you how over or underexposed your image will be with the current settings.

When you change a setting, for example the shutter speed. You start with a low shutter speed we'll say 1/30th sec. When you take your picture you might notice a blur in your photo. When you move that shutter speed setting to 1/60th sec, you notice that you stopped the image blur but now your photo is darker. This is because when you changed the shutter speed setting to a shorter time, you lessened the amount of light in the camera. If you wanted to keep the same exposure as your first photo you would need to open the aperture lens or raise the ISO. One and or both of these settings would correct the amount of light you lost.

Exposure

Imagine the camera is a stupid box that always wants to adjust the light coming into the camera to read as middle grey.
Adjust your settings to counter these readings.

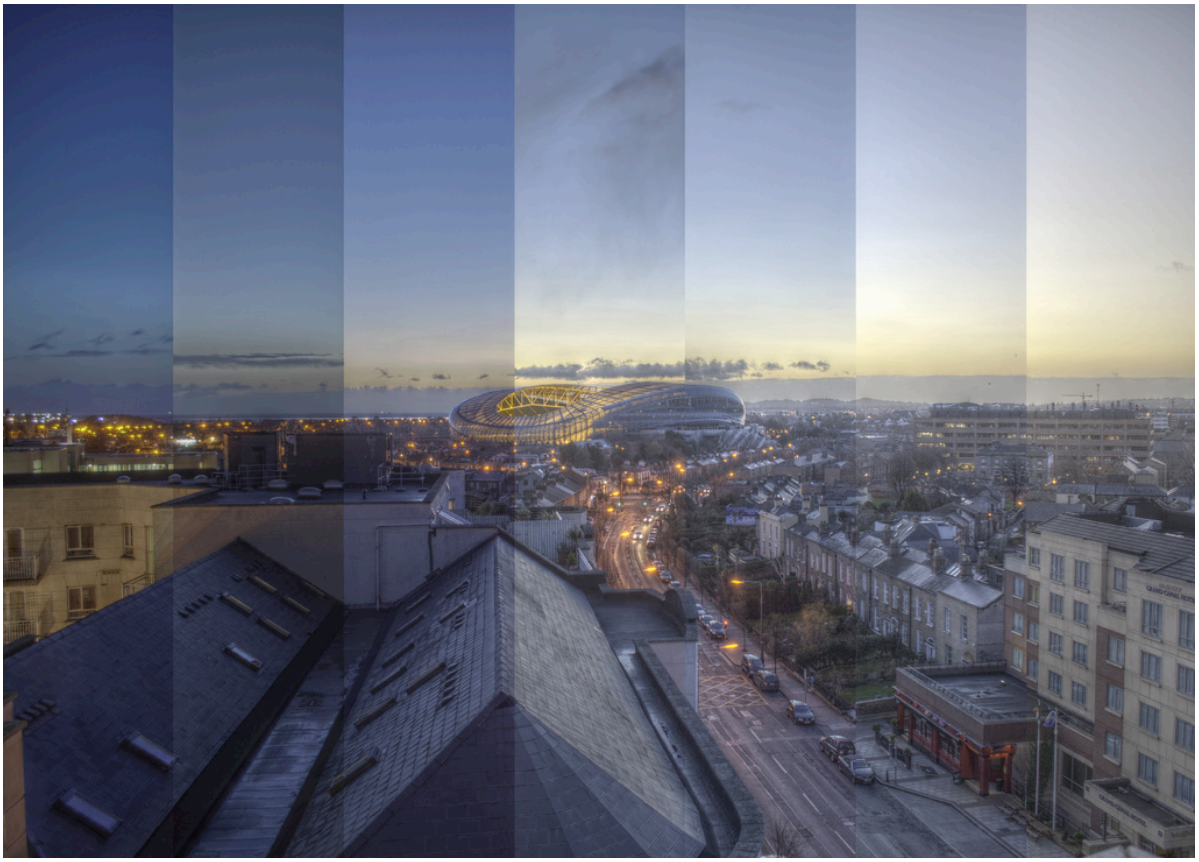


This is the cameras internal meter. It tells you how overexposed and underexposed the image is based on the amount of light coming into the camera.

If the meter reads the light coming into the camera as too bright, such as a snow scene for example, it will send a meter reading that is telling you your image will be too overexposed. One may think to just change settings so that the bar comes back to the middle, this will only turn your photo gray. Same for low light photos such as night shots. The camera will tell you that it needs more light to get a good picture. By good picture it wants to make it gray. Ideally in extreme exposures, bright light for example, adjust settings so that the meter reads slightly overexposed. For darker shots, adjust settings so the meter reads slightly underexposed. The degree of overexposure/underexposure settings will differ on preference.

Bracketing

A technique of taking several shots of the same subject using different camera settings.



It's best to bracket out your settings for shutter speed, aperture, and ISO. By doing this you will have a good starting point on settings to start fine-tuning to. Remember that your settings all contribute to light but also have their own agenda.
Bracket your settings so that their agendas fit your needs. Maximize your settings capabilities that give you the most light you need. For example, how closed does your aperture need to be to get the amount of DOF you need? How slow can you make the shutter speed without getting vibration? How grainy can you go before you really start to notice it?

Set-up

What you need:

- DSLR camera
- Various lens for the size of your specimens (prime and/or zoom)
- Tripod
- Primary light
- Secondary light

  Lights can be used with umbrellas, or another object that softens the light. You want the secondary light not as bright as the primary.
- Scale bar
- Stable shooting surface
- Clay, sticky tack, sandbags or something that can be used to aid in repositioning of specimens.
- Post processing computer software
- Camera aided computer software(optional)

Set up:

- Camera on tripod
- Primary light source
- Secondary light source(or bounce light)

1. Position Primary light to upper left of object
2. Use dark background or light background to find best contrast of the object. So that I do not cast colored light onto my object, I choose black or white as a background. Note: make sure that your edges are clear and you do not lose your object to the background.

Photographing Fossils

1. Put fossil in a good position making sure the light highlights and shadows desirable areas.
2. If you need extra light in a specific area, use white paper or foil as a bounce light.
3. Position a scale bar in every image at about the level of where you will be focusing.
4. Put the specimen label in image.
5. Set image quality to highest setting.
6. If color is important, be sure to white balance the camera, correct white balance will keep these colors accurate.
7. Make sure your image is in focus. Manual settings allow you to be able to move the focus area to a specific place. You can use auto focus as long as it focuses the part you want focused. Smaller objects may be harder to do this.
8. Adjust camera settings, taking bracketed photos of shutter speeds, ISO and aperture to achieve the most desirable image. Keep in mind that photography is sometimes never always perfect. You may need to sacrifice some settings or image quality to get something more specific. Make sure the black and white areas are not losing information. If this is hard to achieve, change the lighting a bit till it works for you.
9. Keep a log of your camera settings, this information will come in useful later on and researchers may be interested in knowing your methods and settings.
10. Do as much image tweaking in the camera, not software later. This allows you to have the best image quality up front.

Camera Settings for Fossil Photography

Aperture:
Keep a small aperture(high F/stop number). However, to reduce optical distortion, stop it down a couple stops from the largest capable number. A smaller aperture will give you the largest DOF. If your object is flatter, you can likely get away with opening the aperture and using that advantage of more light.

Shutter speed:
Keeping the shutter speed as slow as possible automatically gives you the advantage of using that setting for more light, however, too slow of a shutter speed will start to pick up vibrations and not be as sharp of an image. Get the shutter speed as low as you can without sacrificing sharpness.

ISO:
Keep the ISO as low as you can, this will help keep images sharp as well. I find though that this is the setting that gets compromised the most.

White Balance:
Custom if possible.

File Format:
RAW and TIFF if possible. If no RAW or TIFF available, use JPEG as a last resort but use highest quality setting. Once you open it resave as a TIFF.

I have found that most of the settings I want tend to not let enough light into the camera. You may find this frustrating, but there a few more options I will not dive into because they are a bit on the advanced side.

Advanced topics for another time

Macro lens - For shooting small specimens you will find that a macro lens will give you far superior images. Macro lens have the advantage of making very small items look fantastic but they fall very short in DOF. This does not work well for larger specimens. Though there are different focal length macro lens that you can choose from.

Various lens – Dive a bit into which lens may work best for you. There are plenty of versatile lens available. I did not touch on lens but for this set up I'm using an 18mm-200mm zoom lens. This gives me a decent range and zoom but even at the most maximum zoom, I find that switching to a macro lens looks so much better; only if I don't need to worry about DOF. We also use a 105mm prime and 60mm prime that give midsize objects a crisp look.

Photo Stacking – Of course you may find that you just can't get a good picture without sacrificing something. The aperture is something you can sacrifice in settings and use to an advantage that allows you to focus at different levels and photo stack your images. A class all on it's own and requiring good Photoshop skills. However, it is an option.

References and further reading

General photography basics:
http://imaging.nikon.com/lineup/dslr/basics/

https://www.wikipedia.org

White balancing and colorcasting –
https://www.ephotozine.com/article/guide-to-colour-temperature-4804

File Formatting-
https://www.photoup.net/differences-between-file-formats-raw-dng-tiff-gif-png-jpeg/

File and image resizing-
https://helpx.adobe.com/photoshop/using/image-size-resolution.html

Image information for scientific publications-
http://www.sciencemag.org/site/feature/contribinfo/prep/prep_revfigs.xhtml

Lens information-
https://thethingswellmake.com/choosing-the-best-lens-for-food-photography-and-still-life-photography-i-lens-terminology/

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