Photography Basics

The Exposure Triangle

- A photographer must understand the relationship between **ISO** (how sensitive the light sensor will be to light), **f-stop/aperture** (how much light is allowed to pass through the lens), and **shutter speed** (how rapidly the shutter closes, cutting off the incoming light).
- Any adjustment to one of these settings will impact the others. It is up to the photographer to set all three in balance, to achieve the desired depth of field, motion blur, and exposure.

The 5 Elements of Exposure

- ***ISO***
  - The International Organization for Standardization (ISO) established a numerical scale to rate how sensitive different kinds of film were to light. This scale was retained for digital cameras. When you change the ISO value on a DSLR, you can think of it as changing film to something more or less light sensitive to what is currently in the camera. A big advantage of a digital camera is that you can change the ISO from shot to shot, instead of only per roll of film.
  - Higher ISO numbers are more light sensitive, meaning the camera will be able to take pictures in darker environments. However, higher ISO numbers also tend to produce grainier images.
  - Examples:
    - ISO 100: suitable for a bright, sunny day
    - ISO 800: indoor spaces when not using a flash
    - ISO 1600: dim or even dark environments
- ***Aperture***
  - Determines how much light is allowed to enter the camera to reach the imaging sensor and measured in F-Stop. This is controlled mechanically, by opening or closing the camera *aperture*. Different lenses have different apertures, handling different f-stop ranges. Aperture also determines the Depth of Field.
    - Lower f-stop numbers indicate that the aperture is more open, allowing in more light. Lower f-stop numbers also narrow the depth of field, causing the area of focus to be relatively shallow, with foreground and background parts of the image being out of focus.
  - Examples:
    - f/1.2 - f/2.8 - lets in a lot of light; shallow depth of field
    - f/4 - f/8 - useful in many scenarios; somewhat wider depth of field
    - f/11 - f/32 - best for bright settings; wide depth of field

- The “depth of field” is the distance between the nearest and furthest in-focus objects in an image. A narrow depth of field will have a very narrow area in which objects will be in focus. A wide depth of field will put most elements of the image in focus. Turning the focus ring will adjust the position of the in-focus area, or *focal point*.

Shallow Depth of Field	Aperture	Wide Depth of Field
Aperture = f/1.4 DOF = 0.8cm	f/4.0 DOF = 2.2cm	Aperture = f/22 DOF 12.4

- ***Shutter Speed***
  - The shutter speed, aka exposure time, is the time that the image sensor is exposed to light when capturing an image. The *shutter* is a mechanical window inside the camera that opens and closes to allow light into the sensor for a selected amount of time.
    - A fast shutter speed, such as 1/1000 of a second, will allow light into the sensor extremely briefly. This will work in bright lighting conditions, but may not allow enough light to impact the sensor in dimmer light.
    - An extremely slow shutter speed, for example ½ second, 1 second, or even more, will allow a lot of light into the sensor and can be useful in low light conditions. However, a lot can happen over a few seconds. Long exposure times may create “motion blur” for any moving object within the frame (or for the whole frame if the camera itself is moving). This may or may not be a desired artistic effect.
- ***Filtration***
  - Acts like sunglasses for the lens, helps reduce the intensity of the light entering the camera without changing the color.
    - Examples: ND Filters, CPL filters, etc.
- ***External Lights***
  - Physical light on set. Using external lights gives you more control of the shadows, contrast, brightness, which all affects the overall exposure.

Other Important Things to Note

- ***White Balance***
  - What is determined by white light from the camera, what is measured as white. Higher temperatures are cooler (blue tint), lower temperatures are warmer (orange tint). Baseline is whatever you set it to, everything below the baseline is orange or warmer, everything above the baseline is bluer or cooler.
  - Measured in Kelvin (temperature)
    - Daylight = 5500-5600
    - Fluorescents/Camera Flash = 5000
    - Light bulbs = 3200

    - Candle Light = 2000
- ***Over- and Under-Exposed***
    - Overexposed images may look “too bright” because they were captured with settings to allow an overabundance of light into the sensor. An unwanted overexposure might happen because ISO was set too high, f-stop was set too low, or shutter speed was set too high.
    - Underexposed images may look “too dark” because they were captured with settings to allow less than expected light into the sensor. An unwanted underexposure might happen because ISO was set too low, f-stop was set too high, or shutter speed was set too low.
- ***Lenses***
    - Focal Length is the measurement of the lens in mm.
        - Prime lenses have only one focal length.
        - Zoom lenses have multiple focal lengths (multifocal).
        - There are three categories; telephoto, 50 (normal), and wide. Going up in focal length narrows the field of view (FOV), while going down in focal length widens the FOV.
    - Examples:
        - 200mm telephoto -> 85mm -> 50 (normal) -> 40mm -> 35mm -> 28mm -> 18mm wide -> 12mm fisheye -> 8mm.
    - Trade offs: for wide angles, it can cause distortion, so the subjects in the frame look farther apart. For telephoto, it can narrow the FOV, making it harder to frame shots & require a higher shutter speed to avoid camera shake.

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