Exposure control

Without having some type of light—natural or artificial—it would be difficult to capture a still image. It makes no difference as to what type of light. As long as you can get some kind of sufficient light to your camera’s charge-coupled device (CCD), or sensor, you can take a photograph. Yet in order to take a good photograph, you must know how to control the light. This takes understanding how to use your camera’s settings, specifically the ISO rating (sensitivity of the recording device, or CCD), the aperture (f/stop) and the shutter speed.

This image has been overexposed from the original to show the highlights & washed out affect that comes from overexposing your image.

This image has been underexposed from the original to show the overwhelming shadows that come from underexposing your image.
Exposure

Exposure is the total amount of light at a given time that is allowed to reach the camera’s sensor (the charge-coupled device, or CCD) in the process of taking a photograph, or rendering an accurate reproduction of the original scene.

An image that is underexposed is one in which the CCD receives insufficient light; overexposure is a result of the CCD receiving too much light.

Exposure can be expressed as the mathematical formula: $E = I \times T$. $E$ stands for exposure. $I$ represents the intensity (the amount or quantity) of light passing through the lens. $T$ is the amount of time that the light is allowed to strike the CCD.

$$E = I \times T$$

**Intensity** is the quantity (amount) of light passing through the lens.

**Time** is the length of time that the light strikes the recording medium (CCD).
Exposure considerations

Two factors must be taken into consideration before you set the ISO, aperture (f/stop) and shutter speed of your camera so you can take a properly exposed photograph: (1) lighting conditions and (2) the reflectance of the subject.

1. **Lighting conditions** include the light’s intensity and direction.

   • **Intensity** refers to the amount of the light that is striking the subject in your photograph. For photography purposes, sunlight, which is natural light, can be divided into five categories: bright sun, hazy sun, cloudy bright, cloudy dull and cloudy dark. Interior room lighting provides less recordable light than sunlight, which is why flashes are often used indoors.

   • **Direction** refers to from what direction light can strike your subject. Basically, it can strike your subject from three different directions: from the front, from the back and from the side.

   Front lighting describes the condition when the light source is in front, providing light directly on your subject. It tends to be the easiest type of lighting in which to get good exposure settings, but it is considered harsh lighting because it can create strong shadows and highlights on your subject.

   Backlighting refers to lighting that comes from behind your subject. During backlighting, unless you specifically change the settings on your camera, the camera is most likely set up to expose for the background, which will leave the subject extremely underexposed (not well lit).

   With side lighting, one side of your subject is more intensely lit than the other. This causes highlights and shadows on your subject, making side lighting the most difficult type of lighting to expose.
2. **Subject reflectance**, the amount of light that reflects off your subject, can have a tremendous effect on your exposure, so it is important to know how to set your camera to ensure a proper exposure on your subject.

Watch for areas in your image that reflect a lot of light. These are called highlights.

Areas in your image that do not reflect much light are called shadows.

The difference between your highlights and your shadows is called contrast.

Some lighting conditions can create harsh highlights or deep shadows that can make getting a proper exposure difficult.

In these situations it is best to ensure that you have a proper exposure on your subjects skin tone. Other areas will be too bright or too dark to make out in the print, but the most important part of your image will be properly exposed.
Exposure control factors

Controlling the exposure involves controlling three primary settings on the camera: ISO, f/stop and shutter speed.

**ISO** is the measure of the sensitivity of the CCD that collects light. The higher the sensitivity, or the “faster” the rating, the less light is needed to make an exposure. Lower ISO ratings provide better resolution.

DINFOS students will keep the ISO set to 200 or 400 for all activities in this course except when in low-light conditions and with approval of an instructor.

The **aperture**, similar to the pupil in a human eye, is the adjustable opening in the lens that opens and closes to control the amount, or intensity, of light that reaches the CCD. The aperture lets in more light when it’s wide open, and less light when the opening is smaller. The aperture is calibrated in f/stops. Aperture refers to the physical size of the opening; f/stop is the number designator of that setting.

The lower the f/stop number, the larger the opening, the more light can enter the camera’s lens. The higher the f/stop number, the smaller the opening, the less light can enter the camera lens.

The **f/stop number** represents a fraction. F/1.8 is 128 times larger than f/22.
**Shutter speed** is a means of controlling the amount of time that light coming into the camera is allowed to strike the CCD. The shutter (the two-curtained structure inside the camera) blocks all light from exposing the CCD until you press the shutter-release button. Once pressed, the shutter quickly opens and closes. The length of time the shutter remains open is set by the shutter speed, which is calibrated in fractions of a second.

The faster the shutter’s speed is set, the less time is available for light to expose the image.

The smaller the fraction (i.e., 1/2000 vs 1/60), the less time light is allowed to enter the camera.

The larger the fraction (i.e., 1/60 vs 1/2000), the more time light is allowed to enter the camera.

The Nikon D70 has shutter speeds that range from 1/8000ths of a second (read “8000” on the control panel) to “bulb.” At the bulb setting the shutter remains open until the photographer depresses the shutter release button again to close the shutter.

**Important note:**
While in this course, do not use a shutter speed below 1/60th of a second. Without a tripod, shutter speeds below 1/60th can show camera shake, rendering your images unusable.
Basic exposure calculation

When determining your best exposure for any given lighting condition, photographers have a process they use to get a rough estimate as to what their shutter speed and f/stop should be. By following the Sunny 16 rule, you will be able to set your camera for a proper exposure without wasting time.

Setting your shutter speed: When using Sunny 16, you will first set your shutter speed close to your ISO speed. For this course your ISO will stay at 200 or 400 (except when authorized by your instructor), so you will set your shutter speed at 1/250 or 1/320.

Setting your starting f/stop: Your f/stop is then determined by the amount of light you have in your scene. On a bright, sunny day, you should set your aperture to f/16. If the lighting is darker, then you will close down your aperture (f/18, f/22). If the lighting is brighter then you should open up your aperture (f/14, f/11).

Here’s a quick look at recommended f/stops for some lighting conditions:

- f/16 – mid-afternoon on a bright sunny day
- f/8 – mid-afternoon on a cloudy day
- f/4 – mid-afternoon on a dark cloudy day

This method provides you with a proper exposure. Remember you are trying to get the best exposure, so if your first guess gives you an image that is too light or too dark, change your settings accordingly. A light meter—whether internal or external to the camera—is one of the most important tools you can use to get a great exposure.

Begin with the basics

1) Set your shutter speed close to your ISO; and
2) Set your f/stop according to the available light.

Photo altered for security purposes.
Using a light meter

A light meter is a device that reads light intensity and guides a photographer to adjust his/her camera settings to get the proper exposure. The most common type of light meter used is the one built into the camera.

Since many of your camera settings in this course are dictated or somewhat dictated (i.e., the exposure mode at M, the metering mode in matrix, and the ISO usually at 200 or 400), the only two controls you will be adjusting for proper exposure will be your camera’s f/stop and shutter speed.

Your in-camera light meter allows you to fine-tune your starting exposure control settings (i.e., shutter speed close to ISO and aperture set up using the Sunny 16 rule) by providing you a reading of the light reflected off the objects in your viewfinder.

The image below is what you would see on the bottom of the viewfinder display of the Nikon D70. The light meter is circled. (Your camera’s light meter may be slightly different.)

To obtain the proper exposure for your photograph, frame your image and read your camera’s light meter. If tick marks appear on the “+” side of the zero too much light is coming into your camera, which means your photograph will be overexposed. If tick marks appear on the “-” side of the zero, not enough light is coming into your camera for a proper exposure, and your shot will be underexposed.

If your shot will be overexposed according to the light meter, you can decrease the light striking the camera’s CCD by speeding up the shutter or closing down the aperture, or a combination of the two.

If your shot will be underexposed according to the light meter, you can increase the light striking your camera’s CCD by slowing down the shutter speed or opening up the aperture, or a combination of the two.

When the left or right tick marks on the light meter disappear—as you adjusting your aperture and/or your shutter speed—you are “zeroed out,” indicating you have likely set a proper exposure, meaning your f/stop and shutter speed are likely appropriate for the shot.
Conclusion

Getting good exposure is critical to having a usable photograph. Some small exposure problems can be fixed in the enhancement process (using photo-editing software) without violating any ethical standards, but extreme exposure problems will probably render photographs unusable, resulting in wasted time, a missed opportunity and possibly mission failure. If you consistently use the exposure control information in this lesson, you'll likely succeed at taking some superb photos!
References


http://www.poynter.org/content/content_view.asp?id=65438  
Retrieved May 11, 2009


Retrieved May 04, 2009

Nikon D70 owners manual

SB800 Flash Manual

BPASC Photojournalism Handbook (2009)