General Photographic Considerations

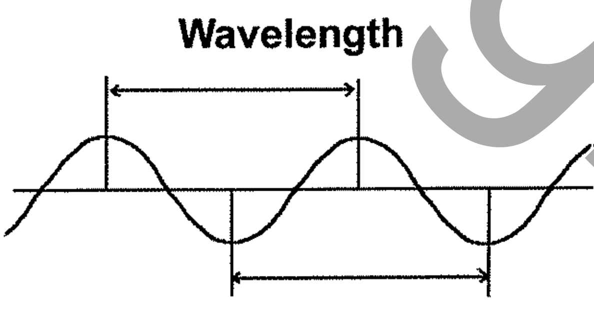
Photography Today

In the past few decades, instances of official corruption and perjury in criminal trials have led to a general distrust of eyewitness testimony and a much heavier reliance on physical evidence. As a result, a much larger burden has been placed on the shoulders of the Forensic Technicians to ensure that the evidence they gather is unimpeachable. One of the greatest tools at the disposal of the Crime Scene Investigator is photography. As the old saying goes, "A picture is worth a thousand words," and oftentimes a conviction can rest solely on the presentation of the crime scene in the form of photographs and/or video tape. Photography is used to document not only the general appearance of the scene but also injuries, fingerprints, trace evidence, shoe/tire impressions ... the list goes on. With this increased importance comes the increased need for well composed, well exposed, accurate photographs.

"Photography" is derived from the Latin "phot-" (light) and "graph-" (write) so it means essentially "writing with light." Using sensitized materials, we record the light reflected from various objects around us. In order to understand photography, we must first understand the basics of light itself, for without light, there can be no photography.

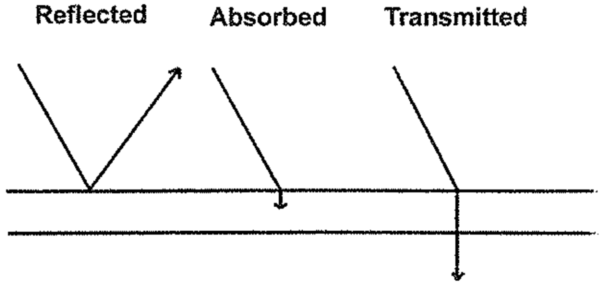
Light

Light is a form of electromagnetic energy, as are radio waves, microwaves, x-rays, et al. And, like these, light travels in waves through the space around us — whether there is air or not! Energy waves can be measured by the distance between their peaks or their valleys. Wavelength measurements are in nanometers, and the wavelength determines what type of energy we have. For instance, visible light — light we can see — falls within the range of 400 to 700 nanometers. Energy of all other wavelengths is invisible to us and includes Ultra Violet and Infra Red light and all the other forms of electromagnetic energy.



Measured between the peaks or valleys, expressed in nanometers

When visible light strikes solid objects, the objects and the light behave in three possible ways that affect how we see the light. The light may be reflected by the object, absorbed by it, or transmitted through it. Depending on the object that the light is striking, one, two, or all three of the above may occur. Opaque objects will reflect or absorb the light. Translucent or transparent objects will allow at least some of the light through.

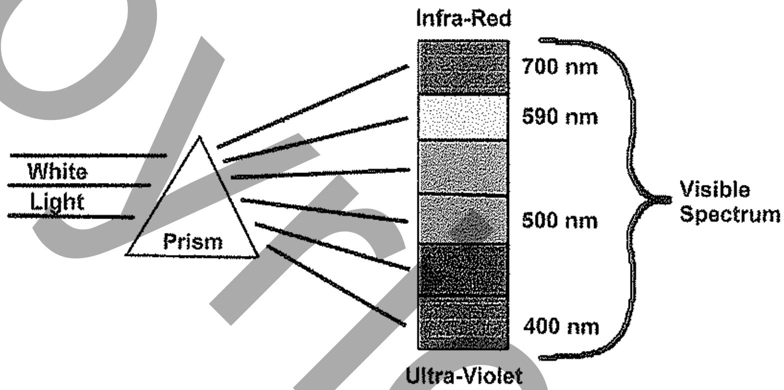


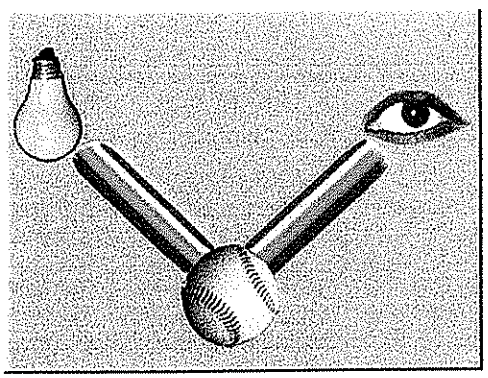
Light waves react with solid objects in three ways, they are reflected, absorbed, and transmitted. Depending on the object, they can be one, two, or all three.

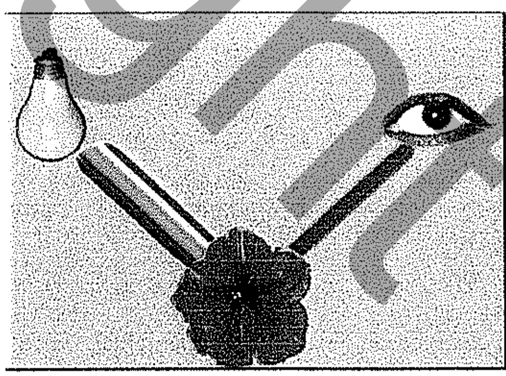
Seeing Color

Visible light is made up of three basic colors and three complimentary colors. The three basic colors are red, green, and blue. The three complimentary colors are yellow (a combination of red and green), cyan (a combination of green and blue), and magenta (a combination of red and blue). These six colors, in varying amounts, make up all the colors we see every day. The six of them together make up white light, and when all are absent, we get black. To illustrate this, look at a rainbow, or the colors of the light refracted through a prism. White light is broken up into six colors: violet, blue, light blue (cyan), green, yellow, and red.

So how do we actually see color? Simply put, if white light strikes an object, and the object appears white to us, the object is reflecting all of the light spectrum. However, if the object appears, say, red, what is happening is the object is reflecting only the red light and absorbing all the other colors. Our eyes pick up the red light, and the object becomes red. If an object absorbs all the light, it appears black.







Exposure...Taking the Picture

When taking a picture, there are three controls that determine the exposure of the image on the film or CCD (a digital camera's capture device). When you take a picture, the light reflected from your subject is projected onto the film or CCD through the camera lens. How good your picture comes out depends on how balanced the exposure to light was. Too much light, and your picture will be washed out, "over exposed." Too little light, and it will be dark, "under exposed." Getting a good exposure depends on balancing the light coming into the camera using three things: film speed, shutter speed, and aperture.

The first control is *film speed*, or sensitivity to light. Film speed is related in numbers called either its ASA (American Standards Association) or its ISO (International Standards Association). Which one you use does not matter as the numbers are the same, and mean the same thing. The higher the ASA number, the "faster" a film/ccd, that is, the more sensitive it is to light. Go to a store and buy film, and you will usually find it in ASAs of 100, 200, and 400. The 100 ASA film is the least light sensitive of the three. It requires more light to make a good exposure. The 400 ASA is the most sensitive of the three and requires much less light to get a good exposure. So for taking pictures on a sunny day, 100 ASA film will work just fine. But for times when the sun gets low, or for indoors, 400 ASA is in order.

Note that each ASA number listed is double the one before. Thus 200 is twice 100, 400 twice 200. The jump from one to the other is known as *one f-stop*. This is important to remember for the next section on exposure. If you go to a well stocked camera store, you will find more than just those three speeds of film. You may find ASA 25, 64, 125, 1600 or other numbers. The numbers like 25, 64, 125 are in increments of roughly 1/4 to 1/3 of the next higher stop in even hundreds. For example, ASA 25 is 1/4 of the 100 ASA stop; ASA 64 is nearly 2/3 of that same stop. ASA 125 is not quite1/3 of the next stop above ASA 100, which in this case would be ASA 400. A digital camera's CCD can be either one set speed, normally 100 ASA, or it can have multiple speeds. This latter feature offers great advantage over film, for with film you must use an entire roll at the same speed. But with digital, you can shoot one photo at one speed and the next photo at the same or at a different speed, and so on, depending on the subject matter.

All cameras have a device called a shutter that allows the light to enter the camera. In some cameras it is built into the lens (leaf shutters) and in others it is built into the camera itself (focal plane shutters). The focal plane shutter is most common in 35mm photography. This shutter is either a series of leaves, like Venetian Blinds, or a pair of curtains, that open momentarily when you snap the picture. You can control the amount of time the shutter is open, thus controlling the length of time the light strikes the film/CCD located behind the shutter.

The time the shutter is open is measured as a fraction of a second, universally expressed as 1/30th, 1/60th, 1/125th, 1/250th, 1/500th, etc. *Shutter speeds*, depending on the camera, can range from more than a full second all the way down to 1/8000th of a second! You can see that the shutter speeds approximately double as they increase. Look familiar? The distance from one shutter speed to another is **one f-stop**, the term used also for film speed. Make a note of this.

As you increase the shutter speed from, say, 1/60th of a second to 1/250th of a second, you are controlling the amount of light hitting the film by having the shutter to stay open for a shorter time, 1/250th of a second being a smaller fraction of a second than 1/60th. In effect, you are allowing