

Lenses

Assignment: Read the following article and on a separate sheet of paper, write 10 things you learned about camera lenses.

Your lenses are probably the most important piece of equipment you have because they actually form the image on your film. You should always try to buy the best lenses you can afford. When buying a camera from a dealer you will often find that the store promotes a package that consists of a top quality camera body (Nikon, Canon, etc.) paired with an off-brand lens. If you can't afford top quality in both the camera and the lens go for the cheaper body and the better lens. Good used equipment with top quality lenses are a better choice for the limited budget than cheap new equipment.

A lens usually is marked on the front as follows: 1:2.8 f = 80mm. The first mark (1:2.8) indicates the maximum diaphragm opening or "speed" of the lens. (See Why f/8 is f/8 for an explanation of the f/stop) The smaller the number following the colon, the greater the light gathering power of the lens (the first number is always 1). The second marking indicates the focal length of the lens. Focal length is the distance from the film plane to the optical center of the lens when the lens is focused on infinity. Some lenses also have a circle with a horizontal line through it followed by a number then "mm". The number varies and indicates the size filter that will fit the lens. The manufacturer name and serial number may also be on the front.

What's normal?

Most cameras come with a "normal" lens. Normal is an arbitrary designation that simply means that the focal length of the lens is approximately the length of the diagonal of the image area of the film you are using and has an angle of view of 45 to 50 degrees. For 35mm cameras focal lengths of 46 to 55mm are considered "normal" with 50mm being the most common. As you would expect, larger film formats have longer normal lenses. A 75 to 90mm lens is normal for 120 roll film and 135 to 150 is normal for 4X5 inch cut film. The angle of view in the resulting image is in the neighborhood of 45 degrees and approximates the angle that our eyes normally pay attention to.

Taking the broader view -

A wide angle lens is any lens which has an angle of view wider than normal. Extremely wide angle lenses may have an angle of view up to 105 degrees. They are always shorter in focal length than the "normal" lens for the same camera. Common focal lengths of wide angle lenses for 35mm cameras are 35mm and 28mm. More extreme wide angle lenses are 20mm and shorter. One problem of extreme wide angle lenses is that they may distort the image. A "fish-eye" lens is an extreme wide angle lens which does not attempt to correct the distortion and produces an image like you would see in a convex mirror. Straight lines curve out from the center of the image creating a 'barrel' effect.

Advantages of wide angle lenses are that you can include more of the view in places where you cannot move back farther and they have greater depth of field than the normal lenses. The increased depth of field combined with the wider view can be used to exaggerate the depth of a scene. Aside from the optical distortion (mentioned above) which makes straight lines appear to curve, a wide angle lens can give the impression of distortion to subjects which are closer to the camera than we are accustomed to viewing them. A wide angle lens is great for large groups and landscapes but produce disturbing head shots because the part of the subject nearest the lens (usually the nose) will appear abnormally large.

Is it a long lens or a telephoto?

A long lens is any lens that is longer than "normal" and has a narrower than normal angle of view. Most people refer to any long lens as a "telephoto" lens but a true telephoto lens enlarges the image like a telescope does. It has a magnifying element or design which allows the lens to perform as if it were physically longer than it is. A long lens which is not a telephoto has its front element as far from the film plane as its rated length while the front element of the telephoto will be nearer the film. All telephoto lenses are long lenses, but not all long lenses are telephotos.

Long lenses have a shallower depth-of-field than a normal lens and produce an image that appears to compress space or "flatten" the subject. They are useful for cropping the view when you cant get closer and for throwing backgrounds out of focus. A long lens which is approximately double the length of your normal lens (90 to 105 mm for 35 mm cameras) is a good choice for tight portraits. It's perspective is similar to the eye's at the distance we usually see people. Long lenses require the use of a tripod or higher shutter speeds than normal or wide angle lenses to avoid blurring due to camera movement.

Want it all?

Zoom lenses have become more common as manufacturers have improved the quality. A zoom lens has the glass elements grouped so that they can move in relation to one another to mimic lenses of different focal lengths. They are popular with photographers who are shooting in situations that require many different focal lengths and either don't have time to switch lenses or don't want to carry all the weight of a whole complement of lenses. A zoom lens may be marked 1:3.5-4.5 (or similar) for the maximum aperture. This is because the maximum aperture varies with the focal length the lens is set at.

Zoom lenses come as wide to wide zooms, wide to normal, wide to telephoto, normal to telephoto, short telephoto to long telephoto. Most are designed for 35mm or smaller cameras. A very few are made for medium format. I know of none for 4X5 and larger.

Some other terms you may see or hear in relation to lenses:

- **Flat field** - the plane of focus of most lenses is actually curved. This is because the focus at any part of the subject is the same distance from the optical center of the lens as all other points that are in focus. The difference is insignificant when your subject is several feet or more from the lens. If you are working with flat material close up you need a lens that is designed to focus across a flat surface where the corners are proportionately farther from the lens than the center. Lenses for enlargers and some special purpose copying lenses are flat field lenses.
- **Wide field** - All lenses create a circular image. The camera crops the circle to the square or rectangular image on the film. The circular image needs to be larger than the diagonal of the rectangle because the image "falls off" at the edge of the circle. Lenses designed for use with no movements (the lens and/or back can't be moved to control perspective) have a lens circle just large enough to cover the image area without fall off. If the camera has movements you need a lens with a wider than normal field so that the image area will cover the image area when movements are used.
- **Mirror lens** - These use a donut mirror and a small concave circular mirror to "fold" the light path and create a long lens in a short space. They are most commonly found in 500 and 1000mm lengths for 35mm. They do not have a variable diaphragm. Exposure must be controlled with the shutter speed.
- **Aspherical** - a new lens design which reduces distortion and improves edge sharpness. This is achieved by varying the curvature from a simple arc. As of

this writing they are significantly more expensive than the standard lens designs.

Caring for your lens(es) -

All modern lenses are coated with microscopically thin metallic coating. The purpose of the coating is to reduce flare (internal reflections) in the lens. When cleaning your lenses you must be careful not to damage the coating. NEVER touch the glass with your fingers. The acid in the oil from your skin will etch the coating. Use your lens cap to protect the glass whenever the lens is not in use. You should have lens caps for both ends of the lens if it is sometimes off the camera. Some photographers advocate keeping a skylight filter on your lens at all times to protect it from damage. While this might be good practice where you may encounter moisture, the skylight filter is not an absolutely clear filter and its effect, while slight, is not always appropriate. Also many filters are lower in quality than the lens and your images will only be as good as the worst piece of glass in the light path. I recommend using filters only when they will produce a desired effect on the image. The best protection for your lenses is careful handling.

The best practice for cleaning your lenses is to use a soft brush to brush away anything on the surface. I like to hold the lens so that the glass is facing down so that anything dislodged by the brush will fall away from the lens. If there is anything on the lens surface that remains after brushing you should try fogging the glass with your breath, then wipe the fog away gently with a soft, lint free cloth. DO NOT use paper tissues. Kleenex is loaded with lint and is too abrasive. There are tissues made for cleaning lenses but if you use them, be sure they are made for coated lenses. If there is something on the glass which still remains, you may try a lens cleaning solution which is compounded for coated lenses. DO NOT apply the solution directly to the glass, it may run down in to the mount and create other problems later. Instead moisten a clean, soft cloth with the solution and then gently wipe the glass to remove the stubborn dirt.

Aside from cleaning you should store your camera and lenses in a dry location that is neither unusually hot or cold. If you do not use it regularly, you should take it out at least once or twice a year and move the diaphragm ring through the range of openings several times to keep the lubrication from stiffening up. If you use your camera regularly that should be sufficient exercise to keep it functioning.