Photographing Roses – Some Photography Basics
By Tom Mayhew

Often times a good photograph of a rose is the result of a chance encounter with a beautiful rose and a casual snapshot by the photographer using whatever camera is at hand, possibly even a cell phone camera. But more often, the best photos of roses are the result of some planning by the photographer and the use of some of the basic and useful concepts of photography. Whatever the photographer's capability, knowing some of the basic ideas and techniques in photography will help improve the odds of taking a good photograph.

Grooming Roses: Since the main subject of the photo will be one or more rose blooms plus any foliage included, care must be taken in grooming the rose to remove any undesirable defects. Any defects will show up in the photo and will be exaggerated in photo enlargements. Tiny specks of dirt or small insects will be very apparent and distracting in the final photo and will require touch up with computer software to remove these defects. Any distracting or deformed petals or leaves should be removed or otherwise groomed to provide a better photo. And the background should be studied for any distracting items such as spent blooms, bad or diseased leaves or other undesirable background items that should be removed.

Rose Shows: Roses and rose arrangements entered in a rose show are most often groomed before they are entered, making these good subjects for a rose photo. However the background and the lighting may be problematic. Most often rose shows are held indoors with variable types of mixed lighting which may result in poor coloring in your photos. The camera normally uses an auto "white balance" (color balance) to determine values for colors, but this may not be good enough for your conditions. See your camera manual for details on how to select "white balance" alternatives or how to set a preset "white balance" using a device like a white balance filter or filter disc/cap or white or gray card to take into account the specific room lighting . Or you may prefer the convenience of using the flash unit on your camera to get acceptable lighting on the roses. However this may occasionally result in undesirable shadows. If you can take the rose outdoors in natural daylight, you will get much more accurate coloring in the rose photo, provided you have your camera set for proper exposure.

Cameras and Lenses: Almost any photographer with almost any camera and lens can take a good picture of roses at a distance while composing a nice landscape scene. But as you get closer to the rose, and especially for close up photos of the rose, the camera and lens combination and the photographer's use of good photographic techniques can make a significant difference in the quality of the photo.

'Randy Scott' Hybrid Tea Rose - Photographed in Natural Outdoor Late Afternoon Light
Nikon D700, Tamron 28-300mm Lens, Focal Length = 170mm; f/11, 1/350 sec, ISO=640

Camera Photographic Exposure – Aperture, Shutter Speed & ISO

Camera photographic “exposure” is the transmission of an amount of light, for a period of time, onto the camera’s photosensitive digital sensor or film. The exposure is determined by a combination of three important factors – lens **aperture** opening, camera **shutter speed** and the **ISO** speed number of the sensor or film. A correct combination of these three factors results in a “well exposed” image.

Lens aperture refers to the size of the adjustable iris diaphragm opening in the lens (the hole in the lens) through which light travels. The shutter speed controls the amount of time that the volume of light coming through the lens is allowed to stay on the photosensitive material. For example, doubling the shutter speed will cut in half the total amount of light that is transmitted through the lens. The adjustment of the size of the aperture opening and the speed of the shutter combine to determine how much light falls on the photosensitive material and for how long a time.

The ISO (International Standards Organization) speed number indicates the sensitivity to light of the camera’s sensor in a digital camera or the speed of the film used in a film camera. The higher (faster) the ISO number, the more sensitive to light is the sensor or film. For example, ISO 400 is twice as fast as ISO 200. However, generally, the higher the ISO speed number, the more undesirable random picture noise will appear in the photo, particularly in the dark areas. Newer camera designs have reduced the picture noise at higher ISOs.

Lens Aperture Size and f-stop numbers

An important concept in photography is the use of **f-stop numbers** to indicate the relative size of the aperture opening in the lens and therefore, to indicate the relative amount of light which is allowed to pass through the lens. The definition is: f-stop number = lens focal length/aperture diameter**.** However, it is not necessary to remember this definition, but rather, to use f-stop numbers to indicate relative aperture sizes.

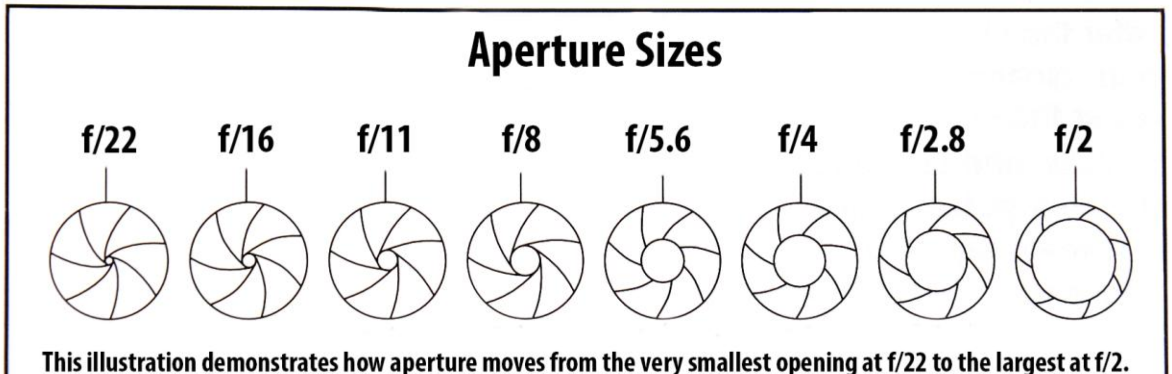
The concept of f-stops is useful to the photographer because, no matter what size, shape, design or focal length of the lens, **all lenses will transmit the same amount of light to the sensor, in a given amount of time, when the lens aperture is set to the same f-stop number.** Once a photographer is familiar with the f-stops needed under various light conditions, he or she can take pictures anywhere, anytime and with cameras or lenses he or she has never used before.

The full f-stop numbers run in a series from the largest opening to the smallest opening as follows:

Full f-stops: 1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, 32, 45, and so on.

Note that the smaller the f-stop number, the larger the lens opening while the larger the f-stop number, the smaller the lens opening (Because, from definition above, aperture diameter = lens focal length/ f-stop number).

Each adjacent full f-stop number change represents a halving or a doubling of the transmitted light, depending upon whether the photographer is “stopping down” or “opening up” the lens aperture. So, for example, an aperture setting of f/8 will allow twice the amount of light to pass through the lens in a given time than an aperture setting of f/11will. Similarly, f/22 will pass only ¼ the light as will f/11, since f/22 is two stops above f/11. In common practice, the f-stops may be expressed with either “f” preceding the f-stop number, for example: f8 or else with “f/” preceding the f-stop number, for example: f/8.



This illustration demonstrates how aperture moves from the very smallest opening at f/22 to the largest at f/2.

Good Rule of Thumb for a Good Photograph

- **"f/8 and be there"**

This means: Have good settings on your camera (like aperture = f/8) and be where the photo opportunity is.

Typical Camera Exposure Modes and How to Control Exposure Operation

Cameras have various modes of operation including modes for controlling exposure that span the range from completely automatic, where the camera makes most of the decisions, to manual operation, where the photographer makes most of the decisions. For many cameras, the photographer/user can choose and set the ISO Speed number or can set ISO on Auto ISO to let the camera control ISO. The user can then select specialized modes for controlling the aperture and/or the shutter speed or both. For most Digital Single Lens Reflex (DSLR) Cameras, the exposure options usually include the following four major options:

Program Mode (P) – (similar to Auto Mode) - Camera controls both aperture and shutter speed.
Aperture Priority Mode – (A or Av) – User controls aperture, camera controls shutter speed.
Shutter Priority Mode – (S or Sv) – User controls shutter speed, camera controls aperture.
Manual Mode – (M) – User controls both shutter speed and aperture.

Exposure Adjustments

The brightness of an illuminated object is dependent upon how much light falls on the object and how much light the object reflects. Because the camera does not know what kind of scene you are photographing, the camera light metering system has been designed, (unless you tell it otherwise), to assume that it is an average scene and it will use exposure values that make the photo have an average middle tone brightness (18% reflectance). For a black and white picture, this would be middle gray which reflects 18% of the light. For color, it is 18% reflectance of that color.

The photographer can control the exposure of a scene by adjusting aperture, shutter speed and the ISO. In addition, the light falling on the object being photographed can be increased with the use of external lighting or the use of flash units or reflectors of light. Alternatively, the light can be decreased using transmission screens or filters or shading elements.

When adjusting the aperture, the light can be doubled for each full f-stop step when increasing the aperture opening. When adjusting the shutter speed, for each halving of the shutter speed the light will be doubled. And for each doubling of the ISO number, the light sensitivity of the sensor or film will be doubled.

But there are trade-offs in these adjustments that need to be considered. Higher ISO means more random picture noise. Slower shutter speeds mean moving objects may look blurred. This blurring effect can be helped by the use of "stabilized" lenses which can add two to three stops of slow shutter speed for hand held camera photography, which is useful for non-moving objects. The use of a tripod to hold the camera and lens can allow the use of very low shutter speeds for photographing non-moving objects.

Depth of Field

The "depth of field" in a photograph, is the distance from front to back that appears to be in focus. Larger aperture openings corresponding to lower f-stop numbers (like f/5.6) will reduce the "depth of field" while smaller aperture openings corresponding to larger f-stop numbers (like f/22) will increase the "depth of field". The "depth of field' will be doubled for each two full f-stops of aperture decrease in opening size. As an example, if the f-stop number is increased from f/11 to f/22 (two full stops), the " depth of field will be doubled. Examples will be shown later in this article.

Arrangement by Terry Palise

Here in photos taken indoors, the colors are good/accurate. <=No flash, using natural light coming from a skylight above the display. No shadows are seen behind the arrangement. Some shadows are on the table below the flowers and come from the skylight above.

Here the in-camera flash => was used and subtle (but acceptable) shadows can be seen behind, down and below the flowers on the wall in the niche. The photo was taken as a horizontal photo to keep the flash unit above the display. Later was cropped to vertical.

Arrangement by Nancy Redington

Rule of Thumb for Exposure Compensation

- **Normally, the camera uses its light meter and tries to make the scene brightness look middle tone (middle gray in a black and white scene.)**
- If the subject fills most of the portion of the screen that your camera meter is looking at, and **if the subject is very light in color, like snow or a white rose, the photo will be under exposed because the camera is trying to make it a darker middle tone.**
- If the subject fills most of the portion of the screen that your camera meter is looking at, and **if the subject is very dark in color, like a black crow or a dark red rose, the photo will be over exposed because the camera is trying to make it a lighter middle tone.**
- **If the scene is not a middle tone scene, then the photographer can adjust the camera exposure to increase or decrease the amount of light entering the camera to properly expose the actual scene.**
- Usually the exposure adjustments can be made using the camera exposure compensation control dial to increase or decrease the amount of light that falls on the photosensitive sensor. When using "Aperture Priority" this means increasing or decreasing the shutter speed by ½ or more f-stops by dialing it in with a camera control (often a wheel dial.) If the photographer is using "Shutter Priority", then it is the aperture that changes when adjusting the exposure.
- Exposure adjustments can also be accomplished by "bracketing" the exposure where either the shutter speed or the aperture opening is adjusted in steps.

Bracketing the Exposure

- **Bracketing** is a method for shooting several consecutive exposures, using different camera settings as a way of **improving the odds that one photo will be exactly right**.
- Typically **exposure bracketing** is done by shooting a series of three photos. One photo is as the camera exposure meter sees the scene and the other two photos are at minus and plus one half stop. Other options can be used for bracketing, like minus and plus one third or even minus and plus full stops.
- You can also **adjust the initial meter setting** if you know the scene will be over or under exposed. For example, a white rose as metered will often be under exposed and a dark red rose as metered will usually be overexposed, sometimes by as much as a full stop or more.

Example: A Three Photo Bracketing of the Exposure
(1) As Metered by Camera, (2) minus 0.5 stop and (3) plus 0.5 stop
For a Dark Red Rose – 'Othello'

'Othello' Shrub Rose

Since it is a dark red rose, it is expected to be overexposed by the camera meter (if no adjustment is made)
Top left – as metered by camera, the photo of the rose seems to be overexposed.
After the Top Left was photographed, an exposure adjustment of minus 1.0 was dialed in
and then a three photo bracket was selected and set as follows:
Three Photo Bracket => (1) as metered by camera, (2) minus 0.5 stop, and (3) plus 0.5 stop.
This three photo bracketing produced first, the Bottom Left at minus 1.0 stop,
followed by Top Right at minus 0.5 stop and then the Bottom Right at minus 1.5 stop.
During the bracketing steps, the aperture remained at f/22; It was the shutter speed that changed.

Bottom Right was determined to be the best photo (at minus 1.5 stop)

although Bottom Left (minus 1 stop) might also be considered acceptable.
All Photos: Nikon D300 DSLR Camera(12MP) with Tamron 28-300 mm Zoom Lens at 100mm,
Aperture = f/22, ISO = 200, Exposure metering center-weighted metering, Auto White Balance
Shutter Speed: Top Left, 1/30 sec; Bottom L, 1/60 sec; Top Right, 1/45 sec; Bottom R, 1/90 sec
Photos were taken at about 4:30 pm on a sunny day, May 23, 2009 in Langhorne, PA using a tripod.

Depth of Field and Image In Sharp Focus

- **Depth of Field is the distance front to back that appears to be in focus in an image.**
- Depth of Field (DOF) is a subjective value which is dependent upon the observer's judgment and the size of the image viewed. DOF is also affected by the diameter of the lens aperture, the subject size and the distance to the camera sensor. Other factors that influence the image quality as finally viewed include the print magnification and the print viewing distance.

Example: Depth of Field (DOF) Variations for Apertures of f/4, f/8, f/11 and f/22. Camera: Nikon D810 DSLR (36 MP) with Nikon 105 mm Micro VR Lens. ISO = 800, Four Feet between Focal Point ("J" on the Joker Card) and Camera Sensor.

If you study the four photos above, you will note that the "J" on the Joker card is in sharp focus in all four photos because it was the focal point of the lens. However, as your eye runs along the deck of cards going into the picture beyond the Joker into the red Hearts or coming out of the picture into the black Spades, the numbers on the cards start to become fuzzy (not sharp). The distance that appears to be sharp is the Depth of Field (DOF). The cards are one inch apart. The largest DOF is with f/22 (smallest aperture) in Bottom Right Photo, the smallest DOF is with f/4 (largest aperture) in Top Left Photo. From these photos, the DOF can be estimated.

Estimated values at: f/4 DOF = +/- 1 in.; f/8 DOF = +/- 2 in.; f/11 DOF = +/- 3 in.; f/22 DOF = +/- 6 in.

Note that these estimates are in agreement with "DOF doubles for every two full f-stops of smaller opening"

These photos were studied using 11 x 14 inch size prints to determine the DOF estimates.

Examples of Depth of Field in a Photo of a Rose

In both of these images of a rose, the stamens are in sharp focus, but the outer edges of the rose petals are not in focus when using an aperture of f/3.3 while the entire rose is in focus when the aperture is at f/16, resulting in a greater Depth of Field at f/16.

'Dainty Bess' – Hybrid Tea Rose – Photo on left has a greater Depth of Field.
Aperture = f/16, Shutter = 1/30 sec on Left; Aperture = f/3.3, Shutter = 1/640 sec on Right
Camera: Nikon D70s (6 MP) with Nikon 60 mm Micro (Macro) Lens with ISO = 200

Factors Affecting Depth of Field

- **For more Depth of Field, make the Lens Aperture smaller.** The Depth of Field doubles if the lens aperture f-stop number is doubled two full stops, e.g. from f/8 to f/16.
- The closer you are to the object you are focusing on, the less the depth of field will be.
- **Move back away from a subject to get more Depth of Field.** If you double the distance to the subject, the Depth of Field increases by four times, triple the distance and the Depth of Field increases by nine times. The Depth of Field is proportional to the square of the distance between the subject and the camera sensor.
- The shorter the focal length of a lens, the greater the depth of field when focusing on the same object from the same camera position. Even when used close up, a shorter focal length lens will give an extended depth of field.
- For more magnification, use a longer focal length lens.
- However, **at any aperture f-stop setting, the Depth of Field is dependent only upon the relationship between the subject size and the image size at the focal plane of the camera's sensor.**
- **With any lens used at the same f-stop, the Depth of Field will be the same when photographing a subject and yielding an equal image size at the focal plane of the camera's sensor.** Note that, image cropping will occur based on the size of the sensor.
- If you need more magnification for a given Depth of Field, then try cropping the image using a computer software program like Photoshop, provided the original image has enough pixel resolution to allow for a usable cropped image. An interesting and possibly surprising alternative is to crop the image using a camera with a smaller sensor.

Good Depth of Field and Lens Stability

- For close-up photography, as the camera gets closer to the subject, the Depth of Field becomes smaller. For greater Depth of Field use smaller aperture. f/22 is smaller than f/8.
- However, a smaller aperture means less light. You may have to use slower shutter speeds to get more light and this means **you may need to use a tripod for lens stability during the time the shutter is open**.
- For hand held camera photography, an **image stabilized lens or camera** may give you an advantage of 2-3 stops of slower shutter speeds.
- When not using image stabilized lenses or cameras, a good **rule of thumb for hand held photography** is that you can typically hold the camera steady for shutter speeds as slow as 1/ (lens focal length) (expressed in seconds). For example, when using a 60 mm lens, one could typically hold the camera steady for 1/60 second before you would see a blurred photograph. Using an image stabilized lens or camera; you might be able to shoot at shutter speeds as slow as 1/15 or 1/7.5 seconds. (2 or 3 stops slower in shutter speed.)
- The **Camera Flash** will allow you to use shorter open shutter times, very useful indoors.

A Sharp Well Focused Image With Good Resolution And Diffraction Limited Resolution

- A sharp image has to be made up of well focused small points.
- Image evaluation standards have been set that involve the concept of "circle of confusion" (CoC) values.
- The **circle of confusion** value is the maximum diameter of the image of a point source which will allow a reasonably sharp 8x10 print to be made from the image. For example, for 35 mm (36 mm x 24 mm) size, the generally accepted value for CoC = 30 microns.
- Diffraction and accurate focus are the two main things that affect the size of the image of a point source focused on the camera sensor, and these limit the resolution of a photo.
- Diffraction occurs when parallel light rays squeeze through a small aperture opening and tend to diverge and spread out. Interference patterns develop forming an "Airy Disk" which causes some fuzziness in the image. This limits the resolution of lenses as the aperture is made smaller and results in "**diffraction limited resolution**".
- Note that at least one evaluator (TH) of digital cameras which have many pixels of very small size, has empirically determined that with digital cameras "**diffraction limited resolution**" does not occur until the "Airy Disk" overlaps two pixel sites, this having to do with the way Bayer sensors record data. He states "I've been saying for a long time that diffraction really only starts to be fully recorded by a Bayer camera when the Airy disk becomes about twice the size of an individual photosite". He has determined that the 12 MP Nikon D700 Full Frame (pixel pitch = 8.5 micron) does not start to show diffraction limited operation until f/16. The 12 MP Nikon D300 APS-C Sensor (pixel pitch = 5.5 micron) shows diffraction limited operation at f/11. He also feels, that the 36 MP Nikon 800 (pixel pitch = 4.9 micron) Full Frame Camera shows diffraction limited operation at f/8. "At f/8 the Airy disc diameter is 10.7 microns, while the D800 sensor photosite implied diameter is a bit less than 5 microns."
- When trying to obtain a photo that appears to be in sharp focus, a trade off exists when reducing the size of the aperture. When using f/16 and f/22 to get a good Depth of Field, there is also a resulting loss of sharp focus at the focal plane as a result of the diffraction limited resolution of the lens at these small f-stops. Small area pixel size in high density sensors may also have an effect. A compromise must be accepted when determining if an image is acceptably sharp and "in focus".
- **Many good lenses are at their sharpest ("Tack Sharp") in the range of f/8 – f/11.**