A Picture Is Worth…©

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INTRODUCTION

Digital imaging has dramatically changed the world of photography and the way it works. Has it all been good? Yes… and No! The good news is we no longer have to worry about film, and the bad news is we no longer have to worry about film. It comes down to a balance between time and money. Film was easy. We took the pictures, sent the film, and received the prints. The cost sometimes made us think twice about taking the shot to the point that most of us allocated a certain amount of film per trip. With digital, it is only necessary to buy once and then just keep shooting. But, we then spend personal time to sort, process, and print. We do, however, only need to print the images we want to print. For all the talk about quality of cameras, megapixels, software, hardware, and other gizmos, we need to understand that photography isn't really about technology. The photographer does need to have a certain amount of technology knowledge to help determine ways of maximizing output from the equipment but that doesn't make a great photograph. Photography is really about creatively working with light.

GETTING "GREAT" IMAGES

We have all heard the saying that a picture is worth a thousand words. Everyone wants those great photos, but what does "great" mean? The great image has most to do with expectations and those will differ depending on goals. Are the images for a travel log, scientific photos, advertising images, documentary shots, portraits, card images, or fine art images? How are the images to be used and what size print is desired?

Depending on the goal, equipment needs may change but what doesn't change is the creative aspect of photography. Photography is about working with light and its effect on shadows, shapes, and colors. Light largely determines the feel of the image and helps with composition. When ready to take the shot, be sure the focal point of the image is in perfect focus. Then, capture the image that reflects the "moment." The "moment" is that time when everything is right. Think of the old call of the movies:

Lights… Camera… Action!

Note also that "Light" is first. When we get it right, that picture may really be worth a thousand words.

"A photograph is always seen in some context; physical, remembered, imagined."
—Rashid Elisha

"Seeing" Like a Sensor. In order to work effectively in the world of digital photography, an understanding of the difference between what we see and what the digital camera "sees" is needed. The f/stop is a measure of how much light gets to the sensor. It is regulated with the aperture opening and is calculated on a loga-

rithmic scale. The differences between the eye and the sensor relate to the amount of light each can "see."

- The human eye has the ability to see in color and adjust to varying light levels.
  - It has a sensitivity of about 15 f/stops based on camera language.
  - Within a 10-stop range, brightness appears about the same.
  - 10 stops equal, 1,024 light levels while 15 f/stops, 32,768 light levels.
- The sensor can only "see" shades of gray and is filtered into RBG (red blue green) color.
  - Digital sensor sensitivity is about five stops and that translates into 64 light levels.
  - In comparison, color slide film sensitivity is five stops, color negative film is about seven stops or 128 light levels, and black and white negative film about eight stops or 256 light levels.
  - The light meter assumes the entire scene to be 18% gray.
  - Data received is related to the logarithmic scale.
    - Half the data is contained in the brightest f/stop.
    - Each subsequent darker f/stop contains half as much data as the previous f/stop.

The Histogram. The histogram is a picture of light. It is a graphical representation of the light captured in an image by a digital camera (Fig. 1). Many of the consumer level cameras don't automatically show the histogram but on most it can be found (check the owner's manual). The histogram will indicate if the image is too light or dark, also giving an indication if either light or dark data has been lost. Many histograms can either be set to display overall light or the amount of red, green, and blue in the image.

The histogram in Figure 1 depicts a range of about 4 f/stops and displays the values for the image below it. The clipped (lost) pixels are described as either "blown" highlights or "blocked" shadows. The vertical line on the right indicates bright pixels have been "clipped." The short vertical line on the left indicates some dark pixels have also been lost. Since most of the peaks are on the left side of the histogram, it indicates the image has more dark tones than light. This image is of a sunrise; so lost data is not of critical importance. Recognize that the histogram, along with the LCD (liquid crystal display) image on the camera, is an interpretation based on a JPEG image and while useful, does not totally represent the image. Also, remember that digital cameras will generally capture about five f/stops and that is also more than the four 4/stops displayed.

Raw or JPEG? "Raw" and "JPEG" are the two primary image format choices digital cameras offer. Raw images have between 4,096 (12 bit workspace) and 16,384 (14 bit workspace) tones per channel that are available for digital processing. Raw files are also considered "lossless" when processed. The original image file is left untouched, with processing being done with an attached instruction file. That allows one to work with the same image as many times as needed without degradation of the image.

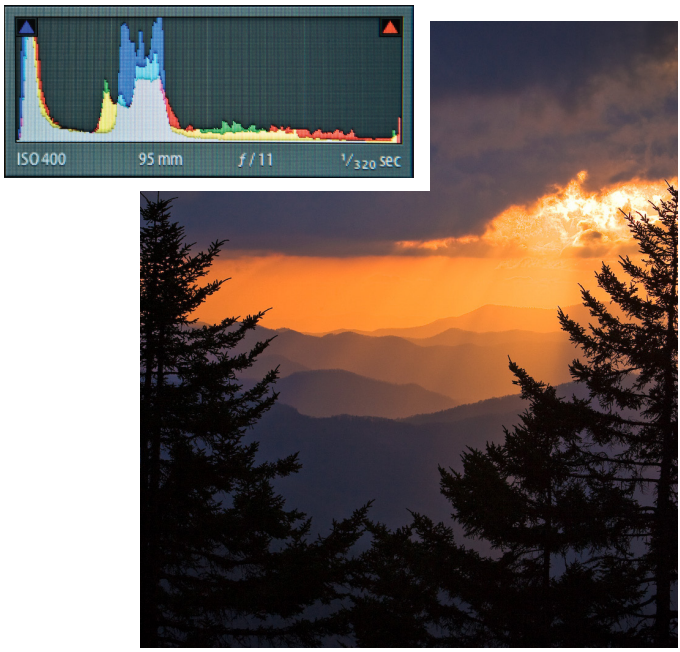

Figure 1. A histogram is a picture of light in a graphical representation captured in an image by a digital camera.

"JPEGs" complete post processing within the camera and allow for printing directly from the camera. JPEGs use an eight-bit color depth workspace that restricts the output to 256 tones per color channel and discards additional data it deems unnecessary for printing. If post processing, a JPEG file will degrade when worked on. Always work on a copy of the original file to avoid permanent losses or use a program like Adobe® Photoshop® Lightroom® (Products from Adobe Systems Inc.). It creates a separate attached file of digital changes that doesn't change the original image file (similar to the way Raw images are handled). While nondestructive of the original file, it retains the 256-tone limit. Always capture the image in the highest quality JPEG format for best quality.

For the highest quality images and the most flexibility in processing, use the Raw format. If there is a desire to reduce the need for processing images or output from the camera is of acceptable quality, use JPEGs.

White Balance and ISO (Optical Disc Imaging). Digital cameras are linear in respect to their interpretation of light levels. The sensors record what is actually there while our eyes are dynamic and adjust to what our mind interprets to be correct. As an example, which is white light: light that emits from an incandescent bulb or light from a fluorescent tube? Actually, incandescent light is somewhat yellow while fluorescent lighting is somewhat green. Do we recognize that a 120-watt bulb is twice as bright as a 60-watt bulb? Digital sensors do as they see what is actually there.

As a partial solution, digital cameras have buttons or dials that allow us to select a white balance that approximates the conditions under which the photo is being taken. They have labels such as daylight, tungsten, fluorescent, and shade. Always set the white balance to avoid a colorcast, when shooting JPEGs.

Gray Card. When shooting Raw, plan to use a gray card. A gray card uses a standardized neutral gray (or other neutral colors) and can be used during processing to correct colorcasts. The process only requires a single click on the gray card and the image will be corrected. Figure 2 is a photo of the NASA Lunar Lander that now resides in the Smithsonian Air and Space Museum in Washington, D.C., U.S.A. Note that scientists placed a permanent gray card on the Lander so images taken on the moon could be color corrected. The critical importance of accurate color cannot be understated for us or for NASA. It can be costly or impossible to retake the photos.

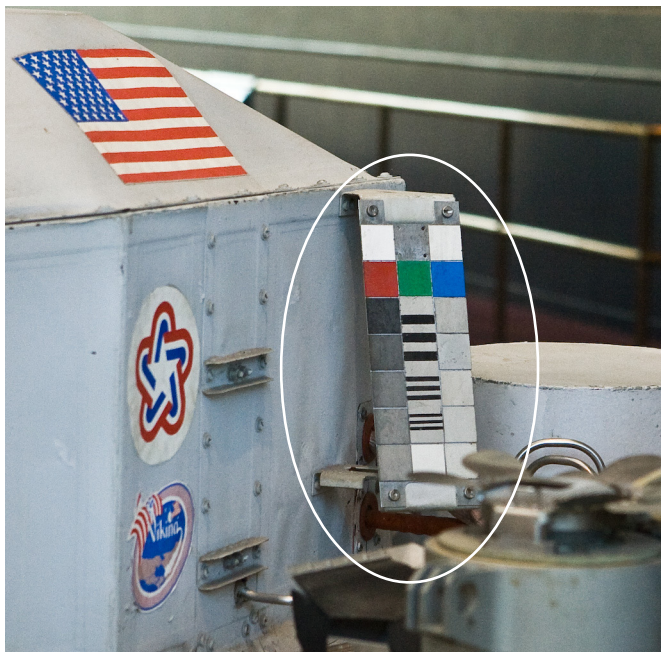

Figure 2. Gray card on the Lunar Lander.

The ISO is the digital equivalent of the old ASA film speed. The ISO is the digital film's sensitivity to light. A higher ISO setting permits photos in lower light. To make changes in the days of film, there would be a need to switch film. On digital cameras, one only needs to change a setting. One word of caution, photo quality is usually reduced at high ISO settings and results in the image looking grainy. While software engineers continue to enhance image creation at higher ISOs, whenever possible keep the ISO set to 100. If at all possible do not go above an ISO of 400. The image quality will benefit.

Getting Creative (Shutter Speeds and f/stops). The use of different shutter speeds and f/stops are two of the more creative adjustment options on a camera as the photographer balances them to provide artistic content. A fast shutter speed can "stop" action while a slow shutter speed can have the effect of movement. By changing the shutter speed for water shots, a droplet can be captured flying in the air or tumbling waterfalls can be made to softly streak in a milky-white color. The f/stop offers a way to increase or decrease the depth of field (the amount of the image that is in focus). Is the decision to focus on a flower and blur the background or capture as much of what's there as possible? Increased depth of field can be achieved by using a higher f/stop number. Remember, as one gets closer to the subject, the same f/stop will result in less depth of field. Shutter speeds are measured in seconds and fractions of a second with each step up or down either halving or doubling the speed and letting in half or twice the light as the previous speed. Normal shutter speeds range from as long as about 10 seconds to as short as 1/2000 of a second. The f/stops are a little more confusing. Although there are a fewer lenses with smaller or larger f/stops, the sequence of f/stops most often range from f/1.4 to f/22. The f/1.4 setting (smaller number) lets in more light while the f/22 setting lets in less light. As one stops down, or goes to a higher f/stop number, one captures more depth of field. For whole f/stops, the relationship of halving or doubling the amount of light that enters the lens is the same as with the shutter speed.

Since shutter speeds and f/stops both double and halve, a range of settings can allow the same amount of light to the sensor. The photographer can open up an additional f/stop (letting in twice the light) and move the shutter speed one step faster (cutting the time in half) and allow the same amount of light to strike the sensor. As an example, if the correct exposure of a scene were 1/125th at f/8, any of the following combinations would work:

Shutter Speed										
1/4	1/8	1/15	1/30	1/60	1/125	1/250	1/500	1/1000	1/2000	1/4000
f/stop										
f/45	f/32	f/22	f/16	f/11	f/8	f/5.6	f/4	f/2.8	f/2	f/1.4

Shutter speed and f/stop tips:

- Determine the desired effect while maintaining the same exposure.
  - To blur water, slow the shutter speed while balancing the exposure with the f/stop.
  - For a larger depth of field, stop down the aperture (higher f/stop number) and balance the exposure with the shutter speed.
  - If the depth of field desired at the speed needed can be achieved (or visa versa), a change in the ISO setting may be needed to capture the image.
- Use a tripod whenever possible. It will generally allow much greater artistic freedom.

COMPOSITION

Composition relates to how the photographer sees the world. Composing a picture involves seeing beyond the primary subject. Differences in light, shapes, shadows,

and color allow the photographer to create an image that reflects the moment. Everything in the frame should improve the image. Understanding how people view an artwork is part of knowing how to compose a great image. The eye is drawn to high contrast areas first. High contrast areas are locations in the image that include light and dark colors or black and white together. It also relates to how sharp the transition is from one to another. The eye is then drawn to highlight areas (brighter spots), warm tone areas (earthy), and finally to cool tone areas (rich, bright colors).

Decide when to capture the image. The quality of light in the early morning and evening tends to be soft, while mid-day light is harsh. A change in light quality or direction can have dramatic effect on the resulting image. Use repetition, especially using odd numbers of elements, to strengthen the image.

Whenever possible, eliminate distractions and avoid things that are out-of-character. Get an angle that keeps power lines out of the shots. If shooting antique automobiles, keep new cars out of the scene. Avoid bright spots that are in competition with the focal point and those at the corners that draw the eye out of the image.

The "Rule of Thirds" divides the image into a dynamic, three-box grid both horizontally and vertically (Fig. 3). Studies have shown that by using these grid lines as guides for focal points, the image can have more impact. Further, the four intersec-

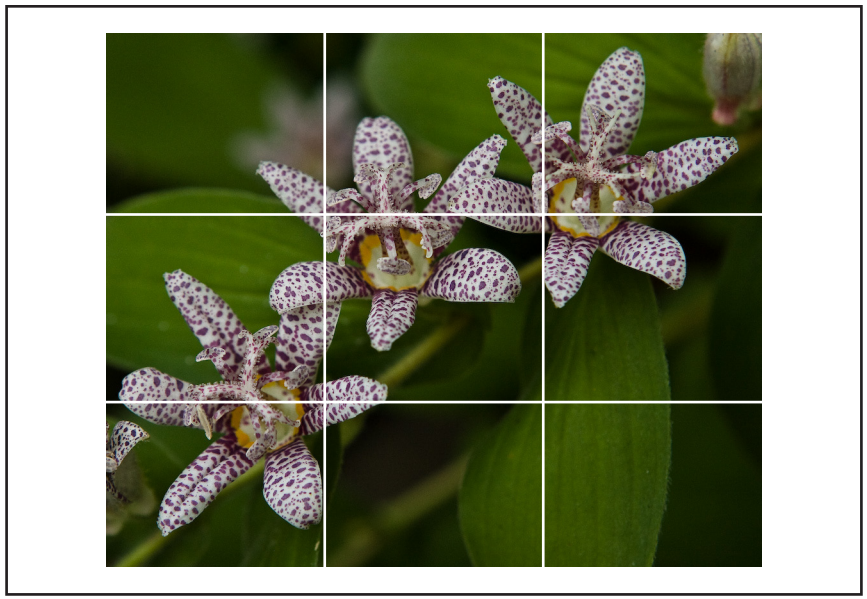

Figure 3. Using the "Rule of Thirds" on an image of *Tricyrtis* (toad flower) at the U.S. National Arboretum.

tion points of the lines are considered "hot spots" that draw the viewer's eye. The upper left "hot spot" is the first location the eye seeks when viewing an image. Use the "Rule of Thirds" to help balance the image.

To maintain interest, use "leading lines" and shapes to draw the viewer's eyes into and move the eyes around the image (Fig. 4). Lines going out of the image tend to be

Figure 4. Using "leading lines" and shapes to draw the viewer's eyes into and move the eyes around the image.

uncomfortable and cause the viewer to lose interest. Negative or unused space also helps the viewer focus on the subject. Every bit of the frame doesn't have to be filled.

Think about the final output while capturing the image. Would the image be improved using a vertical orientation rather than one that's horizontal? How about an angled approach? Is the shot better from a level approach, looking from above, or perhaps looking up at the subject? Will the image be cropped and how much? Remember, after composing that "great" image make sure it's in focus. It will only take one experience for the lesson to be learned. I know.

CREATING THE STORY

"The hardest thing to see is what is in front of our eyes."
—Johann Wolfgang von Goethe

If a picture is going to be worth a thousand words, it has got to tell a story. It's not important to include as many details as possible to tell a story. Actually, just as in a written story, it's usually better to keep things simple since many of the details can be inferred. Let people's thoughts carry them through the photographic story. The best image may very well be the one that, in its simplicity, tells different stories to each viewer.

There are quite a few ways to photographically present a story. The basic question is; how does the photographer see the image? The viewfinder is the window to creativity. Design the image so everything counts. If there is something in the scene that can't be avoided, cropping may be needed. Components of the image that pull the viewer into the image include leading lines, shape, light, shadow, and color. Color sets the mood of the photograph.

See how others have created their story. Look at works of recognized photographers and artists. Visit art galleries and museums to see how others have done it. As a viewer, try to determine what makes their work attractive. Experiment with techniques and ideas.

Ultimately, it's important to have others look at the images. Is there a story in it for them? Recognize that the photographer, after having taken the shot, has already read the story. Don't be surprised if a reviewer seems a little critical of the work. They are just viewing the image and they don't know the background information. As the photographer, we got to see the whole story. The question to be determined is whether others will like the image. If they do, maybe it will be a "million seller."

Finding the Keepers. Sorting or finding the "Keepers" is something like fishing. Fish that fail to meet a standard need to be thrown back. In the case of photos they need to be deleted. Thinning down the number of images to keep is a stressful process. After we have captured the image, they are like children to each of us. The setting of parameters for images to be kept helps make the process a little easier. Keep only images that are technically of excellent quality. Remove images that are mistakenly taken, blurred, out of focus, excessively bright with significant amounts of blown highlights, and those that are far too dark with major blocked shadows. Blown highlights are those parts of the photo that are pure white and no color recovery is possible. Blocked shadows will display as pure black and color in that area is also nonrecoverable. If the dark image is "grainy" with white, red, blue, and/or green specs, it is an indication of lost data and is called "noise."

When shooting from a tripod it is possible to capture images with a wide range of *f*/stops from light to dark. Capture some that have detail in the light areas but not dark and also ones that have detail in dark areas but not light. These are called "bracketed" shots. There are computer programs that allow one to merge these shots effectively increasing the dynamic range (number of f/stops) that can be captured in an image. Keep all those shots for future processing. There are also programs to perform a similar type merge to increase the area in focus at a given f/stop that effectively increases the depth of field that is in focus.

Review the remaining images under magnification. Keep only the better of similar shots. Eliminate those of lower quality. Up to this point, all deleted photos should be removed from the disk.

The remaining levels of evaluation are somewhat subjective.

- Look at composition. Is the photo interesting? Is there a definite focal point? Does the eye stay in the picture and not travel off the page? Will cropping enhance the result? Does the appearance of the image reflect what was actually seen?
- Review images by turning them upside down. It is a relatively easy way to determine if the image is balanced. A good image will usually look good either way.
- Does the image stimulate an emotional response? Does the image make me "feel" something about the subject? Attempt to answer the question; "if I were to revisit the image in 6 months would it still elicit a similar emotional response as I felt when I took the shot?"
- Does the image live up to personal standards of excellence?
- What response is received from those who have evaluated the image? Is it "nice" or "NICE!"?

Once the images have been sorted and selected, it's time for labeling. There are those who believe that until images are labeled, they do not qualify as "keepers."

Without labels, how does one find the image a year or two later? Another part of labeling is entering metadata. Metadata is "data about data." It is an imbedded file where information about the image is stored. There are four sections of metadata: descriptive (image description, person, place), administrative (title, location, ID, date, event), rights (creator, copyright, releases, usage rights), and technical (data about the physical properties of the content including camera, lens, f/stop, speed, ISO). The camera writes technical data when the image is captured. The rest is up to us. It's a way for those who come after us to know what we've done or where we've been and us.

PROCESSING

The best photographers know what they are expecting as a final product when they capture the image. Their thoughts include the size, shape, color (or grayscale), and the type of paper on which it is to be printed.

"The negative is the equivalent of the composer's score, and the print the performance."—Ansel Adams

For those who want total control over the appearance of their images, shoot Raw and personally process them. Most things can be fixed, with some limitations, by using processing programs. Choose programs for ease of use and output, learn how to use them and keep practicing. Consider these points:

- An out-of-focus image cannot be fixed.
- Be sure to color correct when appropriate.
- Choose images that are exposed to the right of the histogram.
- A "blown" image has pure white that is nonrecoverable.
- Correcting a photo that is too dark can lead to "noise."
- Crop to strengthen the image but not so much that the image is too small for its intended use.
- If processing a Raw image, it needs to be sharpened.
- Use a "nondestructive" program to process JPEGs.

FINAL THOUGHTS: *READ*

I know it is a four-letter word, but reading the camera manual is actually very important. To be efficient and effective, the photographer needs to learn how the camera works. Virtually all the information about how to make camera adjustments is written in the manual. Be sure to bring along the manual when shooting. A question will almost always arise that can be answered in the manual. Also, read about photographic tools and techniques, about how others have captured great images, and how to better process and print images.

Realize that most cameras capture more area than shows in the LCD displays and that they are best used for composition and histogram review and not for evaluating images. When shooting in Raw, recognize that more f/stops of information are captured than displayed.

When does the photographer need a "Photo Release"? When photographing human subjects in a manner that makes them recognizable, a photo release from the individuals will typically be needed. If a minor, the release needs to be signed by the parent.

Whenever possible use a tripod. Even the action of the shutter closing can result in camera shake and out of focus images. There are actually "mirror lockup" commands to avoid this problem with reflex lens digital cameras. Always take a few steps closer to the subject after initial shots (as long as it doesn't risk personal injury). Many times it reduces the need to crop the image during processing.

Knowledge gained from reading, viewing the works of artists, attending seminars, and workshops is important. To become a better photographer, experiment with and where appropriate, use the information. But remember, all the book knowledge in the world won't make anyone a better photographer. Practice is everything. Get out there and start shooting. Learn from the mistakes that will always come.

As with those working in the plant world and the International Plant Propagators' Society, photography is an endeavor of seeking and sharing. Even the top professionals attend seminars and workshops with other professionals. One must strive to be the best if one is going to succeed.

Whether a proverb or a cliché, "A Picture is Worth a Thousand Words" has been repeated many times and we have all viewed pictures or images that have a great impact and have viewed images we have essentially passed by without a second glance. The same image will result in a different feeling for each viewer. If the image means something to the photographer and it creates a story for others, I believe the goal has been accomplished.

"If I could tell the story in words, I would not have to lug around a camera."—Lewis Hiene

ADDITIONAL READING

Barr, G. 2008. Take your photography to the next level. Rocky Nook Inc., Santa Barbara, California.

Carter-Bresson, H. 1999. The mind's eye. Aperture Foundation, New York, New York.

Eismann, K. and **S. Duggan.** 2007. The creative digital darkroom. O'Reilly Media, Inc., Sebastopal, California.

Freeman, M. 2007. The photographer's eye. The Ilex Press, Lewes, England.

Note: Good reviews of a number of photography subjects are included in the "Understanding Series" at <http://www.luminous-landscape.com/>.