Top Ten 3: Terms That Confuse Fine Art Photographers

I learned what I know about photography mostly by trial and error, pickily going over recent photos and figuring out what went wrong and what to do better. Sometimes the learning curve was quite steep, but some concepts took many years to nail down properly. Learning how various photographic controls and equipment interact can be highly confusing and discouraging.

To try to make the photographic learning process easier, I've tried to boil down the major confusing aspects of photography into a collection of 10 terms that baffle most photographers at one time or another. Some of them may have come easily to you, but I'm willing to bet that most photographers have struggled with at least a few of these issues:

10. Depth of Field (DOF)

Too many photographers strive to produce "great depth of field" in their photography without understanding exactly what it is. Some have never heard of it, but are frustrated in their efforts to produce a photograph that is entirely sharp, or one with a blurry background.

Simply put, a photograph's depth of field is the region in front and behind the focus point that appears acceptably sharp in the final photograph. The depth of field behind the focus point will always be twice the depth of field in front - that is, the focus point will be 1/3 of the way through the sharp region of your photo.

A photograph with few elements in focus is said to have "shallow" depth of field, while one that is sharp front to back is said to have a "wide" depth of field. The photographer can control the depth of field by changing lenses, changing apertures, or changing the distance to their subject. The three are not mutually exclusive - feel free to do all once if you like.

With all other variables being held constant, a long (high magnification) lens will produce a shallower depth of field than a short lens. Almost all photographs with a very wide depth of field (from right in front of the camera to extremely far away) are taken with wide angle lenses. Many portraits with really blurry backgrounds are taken with medium telephoto lenses - lenses of more than 80mm focal length.

At a given subject distance and focal length, a large aperture (smaller aperture number) will produce a shallower depth of field than a small one. This is the most common way that photographers control depth of field, and the only way of doing so without changing

your composition. The degree to which this method will expand the DOF will depend on the focal length of your lens.

Getting closer to your subject will reduce the depth of field in your photograph. Subjects that are very far away (like distant mountains) will have an infinite depth of field with any lens. Very close subjects will display an extremely shallow depth of field and will require careful photography to expand it.

Most importantly, don't always aim for a wide depth of field. Experiment with different depths in all of your photographs, using all three of the techniques mentioned above. A "great" depth of field is one that compliments your subject and the mood of your photograph!

9. Infinity

Focus distance is an intuitive term for most photographers - simply enough, the focus distance is the distance from your camera to whatever is sharp in the photo at that moment. You can usually read this distance roughly from the focus scale on your lens barrel.

But what about this term infinity? Is that really infinitely far away?

Infinity refers to the specific (finite!) distance from your camera where increasing the subject distance does not require you to change focus. Once a retreating subject reaches infinity, it will stay in focus as it continues to move away from the camera. This means that if all of the elements in your photograph are at infinity or beyond, no depth of field is required to keep them all in focus.

The specific infinity distance depends on the focal length of your lens. Wide angle lenses have near infinity distances (less than a meter in some cases) and telephoto lenses have longer infinity distances (up to many hundreds of meters). You can get a rough idea by looking at the focus scale on your lens - the last distance noted before the infinity symbol (a sideways 8) is nearly the lens's infinite limit.

8. Aspherical (ASPH)

Many high end lenses are manufactured with aspherical elements. Though it seems clear from advertising that aspherical elements are a good thing, the term is not usually explained. Many photographers are left wondering what it actually means, what aspherical elements will actually do for their photography, and, especially, why they're so expensive!

An aspherical element, quite sensibly, is one that is not spherically shaped. Aspherical elements are used to correct spherical and chromatic aberrations that are normally found in wide angle lenses. Usually only one or two elements in a lens need to be aspherical, but will still drive up the price of the lens tremendously.

Wide angle lenses less than 24mm (in the 35mm format) without aspherical elements can produce photographs that are slightly soft even at the focus point. Since not all wavelengths of light are focused on the same plane, the unfocused colours will tend to blur the image slightly. The effect can be minimal with prime lenses but severe with cheaply manufactured zooms.

Lenses with aspherical elements can produce better bokeh too. Since light reaching the film plane will be defocused evenly, the out-of-focus mid tones and shadows will not show the classic "purple fringing" produced by lenses with no corrective elements. As always, bokeh is highly subjective - some people actually prefer the bokeh produced by lenses with spherical aberrations.

If a lens design makes good use of aspherical elements, the lens will usually be worth the extra cost to a serious photographer. As always, read lens reviews and research the make and model before you buy - the ASPH abbreviation does not guarantee a great lens!

7. Sharpness

Sharpness is an elusive quality of photography, garnering much thought and speculation from photographers of all backgrounds. A sharp print in the product of careful treatment throughout the imaging process - from image capture, to processing, to final printing.

Sharpness is really a combination of two qualities - acutance and resolution. Resolution is the ability of your sensor or film to separate fine subject details. Acutance describes the amount of edge definition an in-focus image element has - that is, the effective local contrast between adjacent elements. To be critically sharp, a photograph must possess both high acutance and high resolution.

Lenses only affect an image's acutance. Confusingly, a lens's "resolving power" refers to the ability of the lens to separate fine lines without blurring them together. This actually refers to a lens's effective acutance. Highly acute lenses are said to be "sharper" than others. MTF (Modulation Transfer Frequency) charts are available for many lenses, showing their acutance at various apertures and focus distances.

Film and sensors, on the other hand, have a specific and finite resolution. A sensor's resolution depends only on the user's budget and the current technology available. Film resolution can vary by speed and brand - generally, slower films have the ability to record finer detail. Films and sensor settings with higher contrast, though they erase highlight and shadow detail, actually provide better acutance in midtones.

Sharpness must also be maintained in digital processing and printing in order to result in a sharp finished print. Various software tools are available for "sharpening" a digital image - since they cannot increase the image resolution, they sharpen the image by increasing the acutance between adjacent pixels. These tools should usually be used after scanning or resizing. Be careful not to overdo it - masking and sharpening tools can create unwanted fringes and artifacts, making the photograph look much different than you intended! Be sure your print is of a fine enough resolution to satisfy viewers. Pixels should never be visible, even under a magnifying glass.

Sharpness is really quite simple to control once you understand it. By taking care with image capture, processing, and printing, you will easily produce prints with satisfying detail and extraordinary sharpness!

6. Contrast

Contrast is a defining point of many great photographs. Control over contrast (not necessarily high contrast!) is often what separates a great photograph from a mediocre snapshot. Crucial image details can be coaxed from hiding or erased altogether depending on how the photographer handles contrast. This simple term is more complicated than it sounds, and many photographs suffer as a result.

Contrast refers to the change of brightness values between image elements. An image with high contrast has a large range of values, and can make image elements seem more distinct. This can give the illusion of higher sharpness. However, a very high contrast image can also look harsh and unreal, with smooth tonal graduations portrayed as hard transitions.

There are two distinctly different classes of contrast. Global contrast affects the entire image, effectively lessening the dynamic range and erasing tonal graduations as contrast climbs. Local contrast is the change in intensity between two very nearby objects - along the edge of a reed in the water, for example. High local contrast can help delineate edges and details, increasing the image's effective sharpness. Be careful - increasing the local contrast (as most sharpening algorithms do) too much can leave unwanted artifacts and halos around affected image elements.

As always, use contrast to your advantage by suiting it to your subject matter. Some photographs work well with hard edges and high sharpness, while others require subtle greys and smooth tonal transitions. Most photographers use subtle control over contrast as one of the defining points of their photographic styles.

5. Dynamic Range

One of the selling points of any digital image capture device, particularly scanners and digital cameras, is their "dynamic range". By looking at advertisements, it's easy to conclude that a higher dynamic range is apparently a good thing, but what does it actually mean?

In photography, dynamic range refers to the range of light intensity that film, scanners, or CCD sensors can record without rendering highlights white or shadows black. To make a print with a large dynamic range, the image capture, processing, and printing devices must all be capable of handling the data. Typically, at least a little data from both ends of the grey spectrum is lost from each stage of the process.

The human eye is capable of interpreting data from a stunning 12 to 14 stops of light at a single pupil size. Even the best film and CCD sensors are only capable of capturing about 3 to 5. Any data below or above the sensor's dynamic range will be rendered as pure black or pure white respectively. Low contrast, evenly lit scenes can be photographed without producing black or white, but even moderately contrasty scenes usually have both. We are so accustomed to photographs reproducing a low dynamic range that a print without a black point or a white point usually looks greyish and dull.

Sensors usually have published theoretical dynamic range and a real dynamic range. A theoretical dynamic range (normally used in advertising) does not take into account real-world aspects like scanner noise in shadows, and is therefore a poor judge of the real capabilities of the equipment. When comparing two sensors, be sure to compare the real, experimental dynamic range ratings for each.

HDR, or High Dynamic Range, is a way of interpreting, storing, and printing photographs to further extend the possible dynamic range closer to what the human eye can see. In HDR, many exposures can be montaged into a single high dynamic range image, which is stored in a file with a very large floating point bit depth. When printed, special software analyzes the image and optimizes it for the low dynamic range print media. The resulting work is able to show details in highlights and shadows that have eluded photographers for decades.

There are drawbacks to HDR, however - in translating a very high range file to a lower contrast print, the dynamic range is compressed, reducing the local contrast and making the photo look muddy. Improving the local contrast can yield an image with a slightly surreal, digital looking quality that tends to call attention to technique rather than subject matter. Though the technology is available, it is best used only when traditional methods of extending dynamic range, like graduated neutral density filters, fail to perform.

4. Archival

There's nothing inherently confusing about the term "archival", but many photographers don't see how it applies to their work. A basic understanding of archiving prints, original

film, or digital files is critical if you wish to let people enjoy your photography for decades (or centuries!) to come.

Today, digital printing affords photographers the ability to create archival prints like never before. However you decide to print your work, stay away from acid fixers and dye-based inks. Acid-based fixers can cling to a photograph as a fine acidic film, gradually yellowing the print over many years. Dye-based inks (used in most inkjet printers) simply fade over time. Try switching to pigment-based inks or an acid-free process instead. An archival print, framed in acid-free mat behind glass, should not fade appreciably for more than 100 years.

Archiving film is trickier than archiving a print, and the longevity of film will never parallel that of a good digital print or a future-friendly digital file. As such, scanning film is the only way of ensuring a long life of the work. Use a resolution approaching that of the film, good dynamic range, and be sure to store both a raw scan and a file corrected to match the original. Most photographers only have the resources to store their most important images this way. Though early Kodachrome films were extremely archival, most modern film should not be expected to last more than 15 years without fading or spotting, and only then if stored in a dark, cool, low-humidity environment.

With the finite lifetime of physical media, archiving digital image files is probably the most important step a modern photographer can take, since files don't fade continuously like prints or film. Save image files as a TIFF or other non-lossy format to ensure they can be opened and saved repeatedly without discarding image information. Hard disk drives are still the most reliable format on which to write files - be sure to save multiple copies on separate drives and store them in separate locations. When technology changes, be sure to copy the files to new media before the old media becomes obsolete. Since files can occasionally become infected or corrupted, make at least one backup copy of every file.

With a bit of planning and care taken with storage of photographs and media, you can ensure that your art withstands the test of time. Don't let your hard-won images fade out of existence - take steps to archive your valuable work!

3. Pro-Quality

The term "pro-quality" is a mysterious and misleading term in photography retail, one that has too often led a photographer to purchase unnecessarily expensive, heavy, and complicated equipment. There are certainly differences between "pro" and "amateur" quality gear, but those differences will be useless to you if they don't suit your style of photography.

Professional camera bodies and lenses are usually more durable than consumer models and are more resistant to dust and water. This can be an advantage if you are hard on

your equipment. However, pro bodies and lenses are still delicate instruments, and breaking one costs many times the price of breaking a consumer model. Too, the added size and weight of professional equipment is not negligible - many items are two to three times as large in the pro line.

Digital professional camera bodies usually offer higher resolution and better image capture software, meaning you can make larger prints of your work without interpolating or seeing artifacts. Shutters on professional cameras are usually tested for durability, meaning you can reliably make many hundreds of thousands of images before it fails. Importantly for fine art photographers, professional camera bodies have a 100% viewfinder, meaning that the final composition won't include anything extra that you can't see in the field.

Professional lenses are usually optically superior to consumer lenses, but not always. Winners of the consumer line sometimes outperform the losers of the professional line. Pro quality glass will tend to be sharper, more colourful, and less distorted. Pro lenses are usually faster than their consumer counterparts, and zoom lenses will tend to hold a fixed aperture over their range rather than having an aperture that varies with focal length. Check a lens's statistics and MTF charts before buying it, and make sure that it will meet your personal standards.

Buy your equipment based on independent reviews and ratings, not its professional or consumer designation. Don't let your ego or other's expectations guide your purchase. "Pro-quality" equipment is not the best fit even for many professional photographers!

2. Guide Number

Every flash is advertised as having a guide number of a certain value. Advertising makes it pretty clear that a bigger guide number means a better flash. But what is a guide number, and is a big guide number really worth all that extra money? What does it really mean to your photography?

The guide number advertised on the flash is a measure of the maximum output of the flash unit. Guide numbers can be listed in metres or feet, so be sure you're comparing the same units between flash units.

There's a little simple math required to understand how the guide number works. At 100 ISO, for a normally exposed subject, the guide number(GN), equals the aperture value (AV) times the distance to your subject (d):

$GN = AV \times d$

A larger guide number simply means that you can either use a smaller aperture or shoot a more distant subject. If you're only going to use large apertures or photograph close subjects, a powerful flash is unnecessary.

Note that the above formula is for an ISO 100 setting - any difference in your ISO must be compensated for by the aperture value you plug into the formula. For instance, if you're shooting at ISO 200, it's the same as shooting at ISO 100 with a 1 stop larger aperture. Similar compensations must be made for lens filters or flash diffusers.

Flashes usually come with charts that outline the effective guide numbers to plug into the above formula. Flashes are typically set at 1, 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, or 1/128 power, representing a fraction of the total possible output. Each of these powers will result in a new guide number, and a new calculation for the formula. Most modern camera systems can do these calculations automatically if needed.

1. Bokeh

When describing photographs or lenses, photographers often field comments like "nice bokeh", or "awful bokeh". Not only is the term "bokeh" a bit confusing, but the difference between "nice" and "awful" bokeh is sometimes a little challenging to spot.

Bokeh is a short way of saying "out-of-focus areas of the photograph", or "blurry areas of the photograph". It commonly refers to areas of a photo that are blurry enough to be unrecognizable - a slightly soft photo element is usually not classed as part of the bokeh. When referring to a lens, the term bokeh usually refers to the amount and quality of the bokeh it produces at various apertures.

Since bokeh is simply the defocused part of a photo, you can control the amount of bokeh in your photographs by using techniques to increase or decrease the depth of field. Long lenses, wide apertures, and close focus distances will produce large amounts of bokeh, and vice versa. In a scene where everything is the same distance from the camera, you only have the choice of defocusing everything or defocusing nothing - effectively, all or nothing bokeh.

Bokeh is most commonly used to remove distracting elements in front or behind a photograph's main subject. By blurring everything except the subject, the photograph becomes less cluttered and its point more obvious. This can suit some photographs better than others. Too, try using the bokeh itself as a part of your composition - the out-of-focus shapes can easily be used to enhance shapes and themes in the rest of your work.

The quality of bokeh that a lens produces is highly subjective and non-scientific. The shape of a lens's stopped down aperture will affect the bokeh, occasionally reproducing its shape in an image's out-of-focus point highlights (rendered in the photo as discs or polygons). For this reason, lenses with near-circular apertures usually produce better

bokeh. The way a lens corrects for spherical aberrations affects bokeh too, making out of focus areas vary in brightness or remain a constant tone throughout.

Though it plays a key roll in the theme of many photographs, bokeh is not something that a photographer really needs to fully understand. Instead of analyzing the science behind the bokeh your lenses produce in different situations, simply experiment and notice the effects in the final work. As you get to know your equipment, you will be better able to understand how to use bokeh to further enhance the underlying theme of your photography.