# Digital Photography Glossary + some extra information

**2-stage shutter release**: A 2-stage shutter release is a part of many current electronic cameras. Pressing the shutter release halfway activates the autofocus and the light meter of the camera, setting them so as to achieve correct focus and exposure. Holding the release halfway maintains the focusing point and the exposure parameters (AE Lock) and allows for re-composition if desired. Fully pressing the shutter release takes the picture.

**24-bit image:** This type of digital image has pixels that are allocated 24 bits of storage (usually with 8 bits for red, 8 for blue, and 8 for green), allowing representation of 256 by 256 by 256 (or more than 16 million) different color combinations.

**8-bit image:** A digital image composed of as many as 256 possible colors or shades of gray.

**A-D Converter:** The A to D converter converts the analog signal originating from the image sensor to a digital file or signal.

**Acquire:** The opening and importing of files into a software application. The term is applied differently within different types of software. With imaging software it is most often done through a TWAIN interface or plug-in mini-application.

**Algorithm:** A formula or set of steps for solving a particular problem.

**Aperture:** An opening; this term is used interchangeably with f-stop to denote a camera's diaphragm opening.

**Artifact(ing):** Misinterpreted information from a JPEG or compressed image. Color faults or line faults that visibly impact the image negatively.

**ASCII: A**merican **S**tandard **C**ode for **I**nformation **I**nterchange (ASCII) is an ANSI (American National Standards Institute) binary-coding scheme consisting of 128 seven-bit patterns for printable characters and control of equipment functions. ASCII is the basis for information exchange between many computer systems.

**Aspect ratio:** This is the ratio of height to width of an image, computer screen, LCD screen, television, or other medium. Images will become distorted if they are forced into a different aspect ratio during enlargement, reduction, or transfers.

**Autofocus**: A system that achieves focus by either measuring the phase of light arriving at a sensor (CCD or CMOS) to establish correct focus. This system, considered superior to others, is able to achieve very precise focus in the majority of situations, but is dependent on the light sensitivity of the sensor. Another system, Infrared Autofocus (also known as active autofocus) generates an infrared beam to measure the distance to the subject and establish the focus. Active autofocus systems have, by their very nature, limited range.

**Averaging:** This type of system takes light readings from many different areas of the framed image. The microprocessor then uses this information to produce an integrated reading which will take into account the differences within the frame.

**AVI:** Short for **A**udio **V**ideo **I**nterleave; the file format for Microsoft's Video for Windows standard.

**Bit:** Short for **Bi**nary digi**t** is the smallest unit of data in a computer. A bit has a single binary value, either 0 or 1. Although computers usually provide instructions that can test and manipulate bits, they generally are designed to store data and execute instructions in bit multiples called bytes. In most computer systems, there are eight bits in a byte.

**Bit Depth:** The number of binary data bits used to record the brightness of each pixel per color channel. To achieve the illusion of “continuous tone" requires 256 levels of brightness from black (0) to white (255). This requires 8 bits binary. Since it takes three channels (Red, Green, & Blue) to represent color, we need 24 bit (3x8) color to achieve “full color" RGB output and 32 bit color for CMYK.
A bit depth of 48 (16 bits per channel RGB) records 65,536 levels of gray per channel.

**Bitmap:** A representation, consisting of rows and columns of dots, of a graphics image in computer memory. The value of each dot (whether it is filled in or not) is stored in one or more bits of data. For simple monochrome images, one bit represents each dot, but for colors and shades of gray, each dot requires more than one bit of data. The more bits used to represent a dot, the more colors and shades of gray that can be represented. The density of the dots, known as the resolution, determines how sharp the image appears. This is often expressed in dots per inch (dpi) or simply by the number of rows and columns, such as 640 by 480.
To display a bit-mapped image on a monitor or to print it on a printer, the computer translates the bit map into pixels (for display screens) or ink dots (for printers).
A bit map defines a display space and the color for each pixel or "bit" in the display space. A GIF and a JPEG are examples of graphic image file types that contain bit maps. A bit map does not need to contain a bit of color-coded information for each pixel on every row. It only needs to contain information indicating a new color as the display scans along a row. An image with much solid color will tend to require a small bit map.
Because a bit map uses a fixed or raster graphics method of specifying an image, the image cannot be immediately rescaled by a user without losing definition. A Vector graphics image, however, is designed to be quickly rescaled. Typically, an image is created using vector graphics and then, when the artist is satisfied with the image, it is converted to (or saved as) a raster graphic file or bitmap. There are many bitmapped file formats, .bmp, .pcx, .pict, .tif, .gif (89a), and so on. Most image files are bit mapped. This type of file gives you stair stepped edges, the ‘jaggies'. When examined closely you can see the line of pixels that creates edges. Bitmap images are used by all computers. The desktop for all Windows machines uses .bmp files, while the Macintosh uses pict files. Most Internet publishing and e-mail use JPEG or .jpg and .gif_89a formats.

**Blooming:** Each pixel on a digital camera sensor (CCD/CMOS) has a limit as to how much charge it can store. Blooming (or Streaking) is the name given to an overflow of charge from an oversaturated pixel to the next on the sensor. This problem is addressed with the addition of "anti-blooming gates" which can be thought of as vertical drain ditches running beside each row of pixels, these gates allow the overflowing charge to run away without affecting surrounding pixels.
Anti-blooming gates, while mostly successful (and certainly for more modern sensors) blooming can still be a problem in very extreme exposures (very bright edge against a virtually black edge) and is typically visible as either a vertical streak or white halo extending for several pixels. The effects of blooming often amplify the visibility of chromatic aberrations. Blooming is really good at destroying the detail of leaves shot against a bright sky.

**Bracketing:** The technique of shooting a number of pictures of the same subject and viewpoint at different levels of exposure. Half or one f-stop (aperture) (+/-) differences are usually selected depending on subject.

**Buffer:** A buffer inside a digital camera is RAM storage which temporarily queues images before they're written out to the storage card to speed up the 'time between shots' and ability for the camera to shoot burst (continuous) shots. The very first digital cameras didn't have any buffer, this meant that after you to took the shot you HAD to wait for the image to be written out to the storage card.
Most modern digital cameras (especially those at the prosumer level) often have relatively large buffers which allow them to operate as quickly as a compact film camera while writing data out to the storage card in the background (without interrupting your ability to shoot).

1) After Image Processing Buffer **-** With this method the images are processed and turned into their final output format before they're placed in the buffer, this means that the number of shots which can be taken in a burst is affected by the image mode (final file size), using JPEG and/or higher compression and/or lower resolution in cameras like this will increase the number of images buffered.
Examples of cameras which use buffers like this: Canon G1, Nikon Coolpix 990, Canon EOS-D30

2) Before Image Processing Buffer - In this method no image processing is carried out and the RAW data from the CCD is placed immediately in the buffer, in parallel to other camera tasks the RAW images are processed and written out to the storage card. The problem with this method is that you're always limited to the number of frames you can shoot, no matter what image quality / size you select.
Examples of cameras which use buffers like this: Fujifilm S1 Pro, Fujifilm 4900Z, Olympus C-3030Z.

**Burst (Continuous):** Burst or often named Continuous mode shooting can be likened to a film SLR with a motorwind, the digital cameras ability to take several shots immediately one after another. The speed and number of shots differs greatly from one camera to another, though most prosumer digital cameras can manage about 3 fps for around 6 frames at full resolution and more at lower resolutions.
The cameras ability to shoot quickly is a function of it's shutter release and image processing systems, the number of frames that can be taken is defined by the size of the internal memory buffer where images are stored before they're written out to the storage card (as storage card devices are currently too slow to take the high data rates created by burst shooting). Some cameras can data out of their buffer at the same time as new frames are being stored in it, thus you're never actually stopped from shooting but the frame rate slows down (as you're waiting for buffer space to free).
For really serious burst ability you need to look at the professional Digital SLR's such as Nikon's D1 (up to 4.5fps for 21 frames) or the Kodak DCS series (approx. 3.5fps for 12 frames).

**Bus:** A collection of wires through which data is transmitted from one part of a computer to another. A bus is similar to a highway on which data travels within a computer. When used in reference to personal computers, the term bus usually refers to internal bus. This is a bus that connects all the internal computer components to the CPU and main memory. There's also an expansion bus that enables expansion boards to access the CPU and memory. All buses consist of two parts - an address bus and a data bus. The data bus transfers actual data whereas the address bus transfers information about where the data should go.
The size of a bus, known as its width, is important because it determines how much data can be transmitted at one time. For example, a 16-bit bus can transmit 16 bits of data, whereas a 32-bit bus can transmit 32 bits of data.
Every bus has a clock speed measured in MHz.

**Byte:** A group of 8 bits, the basic unit of information for the computer.
In most computer systems, a byte is a unit of data that is eight binary digits long. A byte is the unit most computers use to represent a character such as a letter, number, or typographic symbol. A byte can also hold a string of bits that need to be used in some larger unit for application purposes (for example, the stream of bits that constitute a visual image for a program that displays images or the string of bits that constitutes the machine code of a computer program).

**Capture:** A term used in digital imaging meaning " to photograph". The term is used to differentiate the method by which the image is made. As the word "photograph" is closely associated to film photography, "capturing" is applied to specify a digital sensor is used.

**CCD: C**harged **C**oupled **D**evice, a light sensitive chip used for image gathering. In their normal condition these are grayscale devices. To create color, a color pattern is laid down on the sensor pixels, using a color mask like RG BG, (Red, Green, Blue and Green).
The extra green is used to create contrast in the image. The CCD pixels gather the color from the light and pass it to the shift register for storage. CCD's are analog sensors, the digitizing happens when the electrons are passed through the A to D converter.
The A to D converter converts the analog signal to a digital file or signal. CCD's are currently the device of choice for digital and consumer imaging devices like camcorders, scanners, and digital cameras.

**CMD: C**harge **M**odulated **D**evice, an active pixel sensor for imaging derived from CCD pixel technology and CMOS transistor technology. CMD are analog sensors, the digitizing happens when the electrons are passed through the A to D converter. The A to D converter converts the analog signal to a digital file or signal. Like the CCD, the CMD is used as an image capture device, CMD's are noisier imaging devices.

**CMOS: C**omplimentary **M**etal **O**xide **S**emiconductor. Used in some digicams instead of CCDs because they have low power requirements and are less expensive.

**CMYK: C**yan, **M**agenta, **Y**ellow, Blac**K**; prints. Most color printers, ink-jet, laser, dye-sublimation, thermal, and crayon printers use these as their printer colors. This is one of the color management problems for computers. Converting RGB files to CMYK files causes color shifts. CMYK is a scheme for combining primary pigments. The CMYK pigment model works like an "upside-down" version of the RGB (red, green, and blue) color model. Many paint and draw programs can make use of either the RGB or the CMYK model. The RGB scheme is used mainly for computer displays, while the CMYK model is used for printed color illustrations (hard copy).

**Codec:** Short for **Co**mpressor/**dec**ompressor; a codec is any technology for compressing and decompressing data. Codecs can be implemented in software, hardware, or a combination of both.

**Color Balance:** Means of compensating for too much of one color in an image by adding that color's opposite; for example, if an image has too much blue, adding a larger percentage of yellow would help achieve a balance.

**Compact Flash Type I:** Probably the most common format used today, found in both digital cameras and other devices (PDA's, network applications etc.), small format and lightweight they have the same electrical contacts as a PCMCIA card and can be used in a PCMCIA slot with a simple adapter. Available in capacities up to 256 MB.

**Compact Flash Type II:** The only difference between Type I and Type II is the size of the package, slightly thicker at 5.5mm compared to Type I's 3.3mm. The large package size allows for larger capacities, notably IBM's successful Microdrive is a Type II device with capacities of 340, 512 and 1 GB. As with Type I devices Type II devices can be used in a PCMCIA slot with an adapter.

**Compression:** Many image file formats use compression techniques to reduce the storage space required by bitmap image data. Compression techniques are distinguished by whether they remove detail and color from the image. Lossless techniques compress image data without removing detail; lossy techniques compress images by removing detail.
The following are commonly used compression techniques:Run Length Encoding (RLE) is a lossless compression technique supported by the Photoshop and TIFF file formats and some common Windows file formats.
Image compression is minimizing the size in bytes of a graphics file without degrading the quality of the image to an unacceptable level. The reduction in file size allows more images to be stored in a given amount of disk or memory space. It also reduces the time required for images to be sent over the Internet or downloaded from Web pages.
There are several different ways in which image files can be compressed. For Internet use, the two most common compressed graphic image formats are the JPEG format and the GIF format. The JPEG method is more often used for photographs, while the GIF method is commonly used for line art and other images in which geometric shapes are relatively simple.
Another new method that may in time replace the GIF format is the PNG format.
A text file or program can be compressed without the introduction of errors, but only up to a certain extent. This is called lossless compression. Beyond this point, errors are introduced. In text and program files, it is crucial that compression be lossless because a single error can seriously damage the meaning of a text file, or cause a program not to run. In image compression, a small loss in quality is usually not noticeable. There is no "critical point" up to which compression works perfectly, but beyond which it becomes impossible. When there is some tolerance for loss, the compression factor can be greater than it can when there is no loss tolerance. For this reason, graphic images can be compressed more than text files or programs.
LZW - Lemple-Zif-Welch is a lossless compression technique supported by TIFF, PDF,GIF, and PostScript language file formats. This technique is most useful in compressing images that contain large areas of single color, such as screenshots or simple paint images.
Joint Photographic Experts Group (JPEG) is a lossy compression technique supported by JPEG, PDF, and PostScript language file formats. JPEG compression provides the best results with continuous-tone images, such as photographs, when the size of the file is an important factor.
ZIP encoding is a lossless compression technique supported by the PDF file format. Like LZW, ZIP compression is most effective for images that contain large areas of single color.
Summary**:** Lossless and lossy compression are terms that describe whether or not, in the compression of a file, all original data can be recovered when the file is uncompressed. With lossless compression, every single bit of data that was originally in the file remains after the file is uncompressed. All of the information is completely restored. This is generally the technique of choice for text or spreadsheet files, where losing words or financial data could pose a problem. On the other hand, lossy compression reduces a file by permanently eliminating certain information, especially redundant information. When the file is uncompressed, only a part of the original information is still there (although the user may not notice it). Lossy compression is generally used for video and sound, where a certain amount of information loss will not be detected by most users.

**Compression Ratio:** Compression is a function of the camera's internal programming to take a picture and store in less space than it would normally fill. Virtually all digital cameras save their pictures as .jpg (Jay-peg) images because JPG images can be easily compressed. The program in the camera looks at the picture and sees if there are similar pixels in an area, if there are it remembers this and only saves some of them, but uses them to reconstruct the surrounding area of the picture later.
The compression can be of different ratios such as 1:2, 1:4, 1:11, 1:19 and so on (these ratios are sometimes referred to in the camera with terms like Good, Fine, Better, Best, Normal, etc. by the manufacturers). Ratios above about 1:10 are high. When the compression is that high, the uncompressed image will have "artifacts" in it.
That is, stray pixels that don't match what is around them because the un-compressing didn't guess very well as to what the picture use to look like. 1:19 makes a real mess of even the best photographs. 1:4 is almost unnoticeable in most cases. (The compression and decompression when saving and viewing JPG images is automatic for the most part.)

It would not take long for even the largest memory cards to be filled with images in the 1280x1024 range if they were stored full size, so some compression helps. The physical size of a compressed image will vary depending on the subject matter. A pure white wall will compress well, but a large tree with lots of leaves (and thus detail) will not.

All compression ratios are not always available in all resolutions - read the specification to be sure that these can be selected separately.

**Connectivity:** A digital camera's connectivity defines how it can be connected to other devices (computers primarily) for either the transfer of images or remote control of the camera.

Image Transfer - Early digital cameras used RS232 (serial) connections for image transfers. Most consumer grade digital cameras now feature USB connectivity, this provides a relatively fast transfer rate (up to 500 Kbyte/s) to a wide range of computer systems on the PC and Mac platforms. Manufacturers generally bundle such cameras with cables and driver software. One step up from USB is FireWire
(IEEE1394) seen mostly on professional digital cameras, this offers considerably faster transfer rates but requires that your computer has a FireWire connector or you're willing to fit it out with FireWire.

**Continuous Tone:** An image where brightness appears consistent and uninterrupted; each pixel in a continuous-tone image uses at least one byte for its red, green, and blue values. This allows 256 density levels per color or more than 16 million color mixtures.

**Convergence:** In graphics, convergence refers to how sharply an individual color pixel on a monitor appears. Each pixel is composed of three dots -- a red, blue, and green one. If the dots are badly misconverged, the pixel will appear blurry. All monitors have some convergence errors, but they differ in degree.

**Crop:** The action of trimming away the unwanted parts of an image.

**Cropping Tool:** An applet found within photo-editing software that allows one to trim away unwanted parts of an image.

**CPU: C**entral **P**rocessing **U**nit, and pronounced as separate letters. The CPU is the brains of the computer. Sometimes referred to simply as the processor or central processor, the CPU is where most calculations take place. In terms of computing power, the CPU is the most important element of a computer system.

**Dark Current:** (Noise) The signal charge that the pixels collect in the absence of light over time and varies from pixel to pixel over time. Normally the digital camera reduces or eliminates dark current before a picture is captured. Also known as Dark Noise.

**Definition:** Subjective term for the clarity of an image. It can also apply to a lens or sensor, or the product of both, and commonly refers to the resolving power achieved.

**Depth of field**: The distance between the nearest point and the farthest point in the subject which is perceived as acceptably sharp along a common image plane. For most subjects it extends one third of the distance in front of and two thirds behind the point focused on and is proportional to the aperture of a lens. Smaller apertures provide greater depth of field, but not sharper focus.

**Digital:** The process of representing and processing information that has been converted to binary numeric data. A digital image is made up of rows and columns of individual picture elements (pixels). In a full color RGB image each pixel is encoded as three 8 bit binary numbers which represent the brightness level of each of the three colors (RGB). Because the entire image is recorded as a vast array of numbers it is possible for a computer to perform calculations on those numbers in order to manipulate the images.

**Digital Zoom:** Unlike optical zoom, the digital zoom takes the central portion of the high resolution sensor's image to achieve the effect of a zoom. This means that the existing data is not enhanced or added to, only displayed at a lower resolution, thereby giving an illusion of an enlarged image.

**Dithering:** When a monitor cannot display intermediate colors or tones it attempts to achieve the required color by intermixing the two closest colors in a scattering (dithering) of pixels. This occurs most often when you attempt to display a full color image on a monitor with a 256 or a 64,000 color video display board. In an illustration dithering can make typography almost impossible to read.

**DPI: D**ots **P**er **I**nch
1) In computers, dots per inch (dpi) is a measure of the sharpness (that is, the density of illuminated points) on a display screen. The dot pitch determines the absolute limit of the possible dots per inch. However, the displayed resolution of pixels (picture elements) that is set up for the display is usually not as fine as the dot pitch. The dots per inch for a given picture resolution will differ based on the overall screen size since the same number of pixels are being spread out over a different space. Some users prefer the term "pixels per inch (ppi)" as a measure of display image sharpness, reserving dpi for use with the print medium.
2) In printing, dots per inch (dpi) is the usual measure of printed image quality on the paper. The average personal computer printer today provides 300 dpi or 600 dpi. Choosing the higher print quality usually reduces the speed of printing each page.

**Duotone:** An offset-printed image created with two different colors of ink.

**Dye Sublimation:** A type of printing process in which a dye ribbon is heated by the print head creating a gas that hardens onto special paper. This creates soft-edged spots of color that melt into each other and give the appearance of a continuous tone photograph.

**EPS: E**ncapsulated **P**ost**S**cript, a computer file standard set by Adobe for printers, which is the mathematical definition of shapes, lines, color and space. This is one of the most accurate ways to define a font or image, but creates a much larger file size. EPS files also add page description information to the files. Used on all computers, but not all postscript files are the same, nor readable between programs.

Typically, the purpose of the EPS file is to be included (encapsulated) in another PostScript file (e.g.,the EPS file is a figure to be included in the PostScript rendering of a page of a document). The EPS file can contain any combination of text, graphics, and images. Some EPS files contain a bitmapped image preview, so that systems that can't render PostScript directly (Macs and PCs, for example) can at least display a crude representation of what the graphic will look like. There are three preview formats: PICT (Mac), TIFF (IBM), and a platform independent preview called EPSI.

**Export:** The act of sending a file out through a specialized mini-application or plug-in so as to print or compress it. The term also describes saving the data to a specialized file format.

**Exposure:** In photographic terms this is the product of the intensity of light and the time the light is allowed to act on the sensor, or the film. In practical terms, the aperture controls intensity or amount of light and the shutter speed controls the time of exposure.

**Exposure Compensation:** A system which allows "dialing-in" or adding or subtracting evaluation values (EV) for a given image. Compensating involves deciding whether or not the meter reading is under or over exposing and correcting the error. This method allows bringing out details in dark zones or lessening the intensity of bright zones, making the image more acceptable.

**Fill:** This is a process that allows you to alter a selected area of an image with a computer graphics program, covering or combining it with a gray shade, a color, or a pattern.

**Filter:** A specialized mini-application to extend or offer unique expansions of a software package. Usually through the use of plug-in architecture. This is a key component of many imaging software packages.

**FireWire:** One of the fastest peripheral standards ever developed. Transferring data at up to 400Mbps, FireWire delivers more than 30 times the bandwidth of the popular USB peripheral standard. With its high data-transfer speed and “hot plug-and-play” capability, FireWire is the interface of choice for today’s digital audio and video devices, as well as external hard drives and other high-speed peripherals.

**Flash Card:** A memory card that works with the flash memory, allowing the camera to retain data after the system has been turned off.

**Flash Memory:** A memory chip that has the ability to retain image data even after the host system has been shut off; this feature insures that, even if the digital camera's batteries die, the image data will remain stored in the camera's memory.

**Fringing:** Fringing occurs when a digital image is sharpened. The term usually refers to a white fringe appearing on the edges of objects in the image. Fringing can also occur as a result of compression.

**Gamma:** A monitor (CRT) does not respond in a linear fashion such that the luminance level corresponds directly to input (brightness values in an image). Instead of responding in a 1:1 ratio of input to monitor brightness level, a monitor normally responds on a nonlinear curve due to hardware limitations. The response of a typical PC monitor can be characterized by taking the input luminance level (a factor between 0 and 1.0) and raising this value to a power of 2.2 to 2.5. The monitor response is therefore generally darker than intended, especially at the dark end of the scale.

Gamma Correction - Gamma correction is a method by which images are modified to correct for nonlinear response of a particular hardware device (see gamma above). Gamma correction is designed to compensate for the gamma response of a device by raising the input luminance levels (0 being the darkest and 1.0 being pure white) to the power of 1/2.2 to 1/2.5 depending on the gamma of the device. Raising luminance levels to the power of 1/gamma will properly account for the nonlinear response of a device by converting luminance levels so that a linear response is achieved, brightening the image to appear as it did in the original scene.

**Gamut:** The range of colors that can be captured or represented by a camera or graphics device.

**GIF: G**raphic **I**nter**F**ace designed by CompuServe for using images on line. This is a 256 color or 8 bit image The GIF is one of the two most common file formats for graphic images on the World Wide Web. The other is the JPEG.
On the Web and elsewhere on the Internet (for example, bulletin board services), the GIF has become a de facto standard form of image..

**GIF 89a:** The most recent GIF standard that allows the selection of area for transparency. The primary use is on the Internet and other on-line services. Like GIF it is 256 color or 8 bit imaging. A transparent GIF (Graphics Interchange Format) is an image file that has one color assigned to be "transparent" so that the assigned color will be replaced by the browser's background color, whatever it may be.
As an example, if you have created a rectangular GIF image of a large blue square on a white background but are only interested in having the blue square appear on your Web page, and don't want to see the white background, you can make the white background color transparent so that it changes to whatever the Web page's background color is (yellow, for example). Then, when you view the Web page, you will only see a blue square on the yellow background.

**Gradient Fill:** An image fill that gradually transitions from one color to another; commonly used in graphics editors.

**Graphics:** Pertains to any computer device or program that makes a computer capable of displaying and manipulating pictures. For example, laser printers and plotters are graphics devices because they permit the computer to output pictures. A graphics monitor is a display monitor that can display pictures. A graphics board (or graphics card) is a printed circuit board that, when installed in a computer, permits the computer to display pictures.

**Grayscale:** A term used to describe an image that primarily contains shades of gray, as well as black and white.

**Histogram:** A histogram function on a digital camera allows the photographer to quickly and easily see the accuracy and "spread" of the exposure over the cameras grayscale range (dynamic range). The histogram itself is a graph of brightness along the horizontal axis (black to white) and the number of pixels at each brightness level on the vertical axis. Most digital SLR's and some newer prosumer digital cameras feature a histogram review mode, understanding what the histogram is telling you about your exposure is important to get the most out of your digital camera. Implementing a histogram as part of the cameras review mode provides invaluable information. If the "weight of pixels" is predominantly in either the bottom or top part of the grayscale then the image is likely to be under or over exposed. Of course the histogram is only another tool in assisting you to create the shot you want.

Overexposure warning **-** Digital cameras which have the histogram feature also have an overexposure warning, this blinking of overexposed areas of the image can be very useful to quickly tell if any part of the image is overexposed. It may be that overexposing certain parts of the image is unavoidable, but with overexposure warning you always have the option to use a little more negative exposure compensation and take the shot again.

**Hunting:** Term that refers to an autofocus system that has trouble finding the focus in an image. The autofocus system moves in and out of focus continuously, "hunting" for the correct focus point. Using a line number as an example and assuming the number 0 is the focus point, the autofocus travels from the negative side to the positive side, never quite settling at the zero. This usually occurs in very low light conditions or when the lens aperture is insufficient, with autofocus systems that use the phase of light arriving at the sensor to establish correct focus.

**Image Capture:** The use of a device, such as a scanner or digital camera, to create a digital representation of an image. This digital representation can then be stored and manipulated on a computer.

**Image Formats:** Many different file formats exist. Some of the most important being: BMP, EPS, FlashPix, GIF, GIF 89, JPEG, PCX, PICT, PNG, TIFF.

**Indexed Color:** Reduced Color mapping, 8 bit or less. Done to reduce images to their smallest size. Commonly used for images placed on home pages of the Internet. The 256 color palette are also mapped for best results on the Internet, taking into account the differences between the Windows and Macintosh color palettes.

**Interpolation:** interpolate:
1. to insert between or among others
2. to change by putting in new material
3. to estimate a missing value by taking an average of known values at neighboring points.

Interpolation is an estimation of a value within two known values in a sequence of values. A method used in software to augment the resolution of an image map. The software adds pixels to an image based on the value of surrounding pixels, thereby increasing its resolution. This method can cause artifacting. NEVER simply resize a bitmap in the drawing or page-layout program that it has been imported into. It is far better insurance to quickly resize in a painting program or rescan.

**I/O Device:** Any piece of computer hardware whose function is to get data into or out of a computer system, such as displays andprinters.

**ISO:** (**I**nternational **S**tandardization **O**rganization). Used instead of ASA or DIN as prefix to film speeds.

**Jaggies:** Stair-like lines that appear where there should be smooth straight lines or curves. Jaggies can occur for a variety of reasons, the most common being that the output device (display monitor or printer) does not have enough resolution to portray a smooth line. In addition, jaggies often occur when a bit-mapped image is converted to a different resolution. This is one of the advantages vector graphics has over bit-mapped graphics -- the output looks the same regardless of the resolution of the output device. The effect of jaggies can be reduced somewhat by a graphics technique known as antialiasing. Antialiasing smoothes out jagged lines by surrounding the jaggies with shaded pixels. In addition, some printers can reduce jaggies with a technique known as smoothing.

The smaller the pixels and the greater their number, the less apparent the "jaggies". Also known as pixelization.

**JPEG** (pronounced JAY-peg)**: J**oint **P**hotographic **E**xperts **G**roup (the committee that established the baseline algorithms), .jpg. The de facto standard for image compression in digital imaging devices. A JPEG is a graphic image file created by choosing from a range of compression qualities (actually, from one of a suite of compression algorithms). When you create a JPEG or convert an image from another format to a JPEG, you are asked to specify the quality of image you want. Since the highest quality results in the largest file, you can make a trade-off between image quality and file size. There are several versions of JPEG, some proprietary. JPEG analyses images in blocks of 8 X 8 pixels in size, and selectively reduces detail within each block. At higher compression ratios, the block pattern becomes more visible and there may be noticeable loss of detail. The actual effect depends on the size of the image when output on a monitor or printer and on the type of subject. This is why you can get as many images into the digital cameras.
The results in decompression of the files can cause "blockiness," the “jaggies," or " pixelization " in some digital images. The higher the compression ratio the more the pixelization or "blockiness" occurs. The greater the pixel count, the less pixelization may occur.

**Kilobyte:** KB, As a measure of computer memory or storage, a kilobyte is approximately a thousand bytes (actually, 2 to the 10th power, or decimal 1,024 bytes).
Used to refer to size of files, which relates to the amount of information in a file.

**Lab Color:** CIELab (or “Lab”) is a global standard, and all colors perceived by the human eye lie within its color space. Lab is independent of device-dependent color systems such as RGB and CMYK.
Lab is a color model developed by the **C**entre **I**nternationale d’**E**clairage (CIE). These standards are internationally accepted standards for all colorometric measurements. The Lab model, like other CIE color models, defines color values mathematically in a device independent manner. Lab color is consistent color regardless of the device producing the color.

**Lag Time:** Probably the biggest single complaint from digital camera owners is the lag time, the delay from pressing the shutter release to the camera actually taking the shot. This delay varies between camera models, the good news being that manufacturers are addressing this issue and newer digital cameras lag time is decreasing.

**LCD Screen: L**iquid **C**rystal **D**isplay screen found on many digital cameras that allows previewing or reviewing of images. The screen also serves as a monitor for the interface of some camera controls. Different types exist: TFT (Thin Film Transistor) and DSTN (Double Super Twisted Nemantic) are the most common. The TFT screen is brighter and has superior color and contrast to the DSTN. However, TFT consumes more electricity than DSTN.

**LPI:** Printing term for **L**ines **P**er **I**nch. The term, lines per inch, comes from a photo-mechanical process called halftoning. Halftoning is a method of breaking up shades of gray into dots of different sizes. True halftones are created by photographing continuous tone artwork onto high-contrast film through a halftone screen. Halftone screens were originally created by etching a grid of lines onto optical glass. The number of etched lines per inch is where the term lines per inch comes from.
Electronic printers do not print true halftones. Electronic printers print dots of only a single size (measured in dots per inch or dpi); instead of changing the size of their dots they change the distance between the dots.

Many electronic printers simulate true halftones by clustering their tiny fixed-size dots in such a way as to give the appearance of an array of (larger) equidistant dots of different sizes. Coarser screens have fewer lines.

**Macro:** Abbreviation of macro-photography. Extreme close-up photography which requires either a lens able to focus close-up or an adapter, so as to reach close to a 1:1 ratio.

**Megabyte:** 1024 Kilobytes, written MB, used to refer to the size of files or media such as hard drives. Refers to the amount of information in a file or how much information can be contained on a hard drive or disk.

**Megapixel:** 1 million pixel image. Usually produced with high-end digital cameras. The greater the pixel count of an image, the higher the resolution of that image. Most newer sensors CCD or CMOS are megapixel sensors. Professional digital cameras (Kodak/Nikon DCS 460 for example) are equipped with a 6 million-pixel sensor.

**Memory:** Commonly used to refer to a component in an electronic system that store information for future use. Memory is the electronic holding place for instructions and data that your computer's microprocessor can reach quickly. When your computer is in normal operation, its memory usually contains the main parts of the operating system and some or all of the application programs and related data that are being used. Memory is often used as a shorter synonym for random access memory (RAM).
This kind of memory is located on one or more microchips that are physically close to the microprocessor in your computer. Most desktop and notebook computers sold today include at least 16 megabytes of RAM, and are upgradeable to include more. The more RAM you have, the less frequently the computer has to access instructions and data from the more slowly accessed hard disk form of storage.

**Memory or storage cards:** The storage card in a digital camera is it's film, it's the removable storage device which holds images taken with the camera (a few low-end digital cameras don't have removable storage cards but instead have a built-in flash RAM unit).
When the card is full it can be removed and another card inserted. The memory on these cards is non-volatile-m that is, they don't lose their images when they are removed form the camera. The images can be later downloaded from the card, and when the images are erased from the card it is ready to be reused. These cards are good for a lot of reuses-one manufacturer just warranted their cards for a minimum of 1,000,000 images. Four types of memory cards exist at this time: Compact Flash, Smart Media, Intel Miniature Card and PCMCIA. Compact Flash type cards are used by many digital camera manufacturers and when placed in an adapter, can be inserted in the PCMCIA slot of a computer. Smart Media Cards, also used in a number of cameras can be inserted into a floppy disk adapter (3.5") and read as if they were a floppy. Yet another adapter allows them to be used in a PCMCIA slot.

**Microdrive:** Developed by IBM and available in 1999, the microdrives are extremely small-sized hard disks that can fit in a Compact Card memory slot. Two drive capacities will be available 170 MB and 340MB, enabling digital cameras designed to use Compact Flash memory cards to gain large storage capabilities. This is particularly useful for camera models that are able to store uncompressed images, since these images require a large amount of storage.

**Morphing:** A special visual effect, used in both film and video, which produces a smooth transformation from one object to another.

**MPEG: M**otion J**PEG** movie file, a compression standard for video clips. Some digital cameras can capture short movie clips of 30 seconds or less, often with sound. These clips can be e-mailed, posted to the Web, and archived. Other standards include AVI and MOV.

**Multi Capture:** Allows a number of pictures to be captured in fast succession. It is the electronic counterpart to motor drives and power winders in film cameras. It allows the camera to take a series of pictures, one right after another, by holding down the shutter release. It can take pictures as fast as from two to four frames per second.
As many as from eight to twenty pictures can be captured at one time. The speed and number of frames varies depending on the specific brand and model of camera. This is almost always accomplished in lower resolution modes with the flash off to limit the amount of memory needed and increase the speed of the capture.

**ND Filter:** Short for **N**eutral **D**ensity filter; used to reduce the amount of light passing through a lens without altering the image's color or tonal rendition.

**NiMH:** Stands for **Ni**ckel **M**etal **H**ydride. A type of rechargeable battery that produces sufficient current for digital cameras. They are rechargeable like Nicad batteries but they are safe to throw away in landfills. They also do not exhibit the "memory" effect that Nicad batteries have shown to exhibit. They need chargers that are specifically made for NiMH batteries.

**Noise:** Noise can be summarized as the visible effects of an electronic error (or interference) in the final image from a digital camera. Noise is a function of how well the sensor (CCD/CMOS) and digital signal processing systems inside the digital camera are prone to and can cope with or remove these errors (or interference).
Visible noise in a digital image is often affected by temperature (high worse, low better) and sensitivity (high worse, low better). Some cameras exhibit almost no noise and some a lot and all the time. It's certainly been the challenge of digital camera developers to reduce noise and produce a "cleaner" image, and indeed some recent digital cameras are improving this situation greatly, allowing for higher and higher ISO's to be used without too much noise.
Noise can also affect certain color channels more than others, this is because a typical digital camera sensor (CCD/CMOS) is more sensitive to certain primary colors than others (often sensors are less sensitive to blue light) and so to compensate, these channels are amplified more than the others. Noise is also often amplified by the JPEG compression algorithm which reacts badly to a very noisy image (often introducing hue errors which weren't in the original noisy image). There are several techniques for cleaning a noisy image, and several products which have been developed to specifically perform this task.
Long Exposure "Stuck Pixels" - Another type of noise often referred to as "stuck pixels" or "hot pixels" occurs only with long exposures (1-2 seconds or more) and appear as fixed colored dots (slightly larger than a single pixel). These stuck pixels can be fairly successfully removed by taking a "dark frame" either before or after the main shot and subtracting this from the original shot, this technique is detailed innoise reduction.

**Opacity:** The amount of transparency when combining a fill color, painted color, floating selection, pattern, or layer with another layer or background.

**Optical Zoom:** An optical zoom is made to bring you closer to your subject, without you having to move. Zooms are constructed to allow a continuously variable focal length, without disturbing focus. To achieve this, the optical zoom uses a combination of lenses that magnify the image prior to being registered at high resolution by the sensor. While the digital zoom only changes the presentation of existing data, the optical zoom actually augments the data collected by the sensor. Optical zooms are superior to digital zooms.

**Over-exposure:** Expression used to indicate that the light sensitive material has been excessively exposed. This can be the result of light that is either too bright, or has been allowed to act for too long. In digital imaging, over-exposure is also referred to as blooming.

**PCMCIA:** The PCMCIA (**P**ersonal **C**omputer **M**emory **C**ard **I**nternational **A**ssociation) is an industry group organized in 1989 to promote standards for a credit card-size memory or I/O device that would fit into a personal computer, usually a notebook or laptop computer. The PCMCIA 2.1 Standard was published in 1993. As a result, PC users can be assured of standard attachments for any peripheral device that follows the standard. The initial standard and its subsequent releases describe a standard product, the PC Card.
It is removable memory for computers and computer peripherals. PCMCIA also encompasses devices like modems, SCSI card adapters, and Flash RAM memory adapters. Storage cards of this type have exactly the same dimensions and electrical contacts as PCMCIA cards in notebooks, and can be used directly in a PCMCIA slot without any adapter.
These cards are only found on high end professional digital SLR's, because of their large size they're not compact enough to be used in a "compact" digital camera. Available in three different physical sizes: Type I, II and III, both flash memory and hard drives as a large range of capacities up to several GB.

**PCMCIA Adapter:** A device that allows the use of memory cards in a PCMCIA slot. The adapter accepts the smaller memory card and transfers its connections to a standard PCMCIA connection.

**PCX:** The PCX format is commonly used by IBM PC-compatible computers. Most PC software supports version 5 of the PCX format. A standard VGA color palette is used with version 3 files, which do not support custom color palettes.
The PCX format supports RGB, indexed-color, grayscale, and Bitmap color modes, and does not support alpha channels. PCX supports the RLE compression method. Images can have a bit depth of 1, 4, 8, or 24.

**PDF:** (**P**ortable **D**ocument **F**ormat) is a file format that has captured all the elements of a printed document as an electronic image that you can view, navigate, print, or forward to someone else. PDF files are created using Adobe Acrobat (NOT the free reader), Acrobat Capture, or similar products. To view and use the files, you need the free Acrobat Reader, which you can easily download. Once you've downloaded the Reader, it will start automatically whenever you want to look at a PDF file.
PDF files are especially useful for documents such as magazine articles, product brochures, or flyers in which you want to preserve the original graphic appearance online. A PDF file contains one or more page images, each of which you can zoom in on or out from. You can page forward and backward.

**Photosite:** The portion of the silicon chip that functions as the light sensitive area for imagining. Not all of the image sensor is used in the capturing of an image.

**PICT:** (or PICT 2) A file format developed by Apple Computers in 1984. It is supported by all graphics programs that run on Macintosh computers.
The original PICT format supported 8 colors. Modern versions of PICT, including PICT2, support 32-bit color (more than 16 million colors). The PICT format also supports RGB files with a single alpha channel, and indexed-color, grayscale, and Bitmap files without alpha channels. The PICT format is especially effective at compressing images with large areas of solid color.

**Pixel:** Short for **Pic**ture **El**ement, a pixel is a single point in a graphic image. Graphics monitors display pictures by dividing the display screen into thousands (or millions) of pixels, arranged in rows and columns. The pixels are so close together that they appear connected.
The number of bits used to represent each pixel determines how many colors or shades of gray can be displayed. For example, in 8-bit color mode, the color monitor uses 8 bits for each pixel, making it possible to display 2 to the 8th power (256) different colors or shades of gray.
On color monitors, each pixel is actually composed of three dots - a red, a blue, and a green one. Ideally, the three dots should all converge at the same point, but all monitors have some convergence error that can make color pixels appear fuzzy
Also used in measuring image size and resolution, i.e., 640 X 480 is the pixel resolution of most VGA Monitors. (Note pixels are square in computers and most digital cameras, they are rectangular in video cameras and television). The bit depth and surface size of the individual pixels on an image sensor controls its sensitivity to light. (Equivalent ISO).

**Pixelization:** The step-like appearance of a curved or angled line in digital imaging. The smaller the pixels, and the greater their number, the less apparent the "pixelization" of the image. Also known as the “jaggies“.

**Plug-In:** The plug-in architecture was first popularized by Adobe Photoshop and is now the de facto standard for all major imaging programs. Unlike TWAIN it allows more flexibility in design so acquire, export, and specific task can be performed within a software application. This is the preferred choice of operation in the Macintosh and 'Power User' computers. Plug-In ideology has spread to other applications like Netscape Navigator, Macromedia Director, and so on. Not all plug-ins work with all products, specific interfaces are required for different types of software. Plug-Ins are also software version dependent.

**PNG:** Developed as a patent-free alternative to GIF, the **P**ortable **N**etwork **G**raphics (PNG) format is used for losslessly compressing and displaying images on the World Wide Web. Unlike GIF, PNG supports 24-bit images and produces background transparency without jagged edges; however, some older versions of Web browsers may not support PNG images. The PNG format supports grayscale and RGB color modes with a single alpha channel, and Bitmap and indexed-color modes without alpha channels. PNG uses the saved alpha channel to define transparency in the file.

**Postscript:** Postscript is a programming language that describes the appearance of a printed page. It was developed by Adobe in 1985 and has become an industry standard for printing and imaging. All major printer manufacturers make printers that contain or can be loaded with Postscript software, which also runs on all major operating system platforms. A Postscript file can be identified by its ".ps“(Mac) “.prn” (PC) suffix.
Postscript describes the text and graphic elements on a page to a black-and-white or color printer or other output device, such as a slide recorder, image setter, or screen display. Postscript handles industry-standard, scalable typeface in the Type 1 and TrueType formats. Users can convert Postscript files to the Adobe Portable Document Format (PDF) using the Adobe Acrobat product. PDF files present the document's printed appearance on a display screen. (You'll find many PDF documents for downloading and viewing from Web sites; you'll need to download the Acrobat viewer as a plug-in.) Adobe sells a more sophisticated product called *Supra* for print-on-demand and production printing.
**Note:** The average home laser printer is not a Postscript printer; which is somewhat more expensive and more frequently purchased for business use.

**RAM: R**andom **A**ccess **M**emory, the volatile memory used to temporarily store information for processing. This is the fastest type of memory for the computer and the most expensive.

There are several types of RAM. S-RAM or Static RAM, is the most expensive type of RAM found in the onboard memory units of some printers, and in PCMCIA Type I Cards. D-RAM, Dynamic RAM, is most often seen as the expandable RAM used by the computer for memory.

**Raster:** A two-dimensional array of black and white cells, called pixels or picture elements, which when displayed on a screen or paper, form an image or representation of an original document.

**Rasterization:** The process that automatically converts vector and text into raster. This process is done on-the-fly for plotting, or can be stored as a file in raster format.

**RAW Image Format:** The most common image format amongst digital cameras is JPEG, it's a format which produces relatively small files from large amounts of image data by discarding certain information, as JPEG uses a "lossy compression algorithm".
The only other common alternative is TIFF, this produces an uncompressed 24-bit per pixel image often in the multiple megabytes, certainly for a 3 megapixel camera in excess of 8 MB per image, not really practical. Each pixel of a CCD can only see one color, depending on the CFA (color filter array) placed over the CCD this is either Red/Green/Blue or Cyan/Magenta/Green/Yellow. The cameras internal image processing engine then interpolates colors from the value of neighboring pixels to calculate a full 24-bit color for each pixel.
RAW is simply the raw data as it comes directly off the CCD, no in-camera processing is performed. Typically this data is 8, 10 or 12 bits per pixel. The advantage being that file sizes are considerably smaller (e.g. 2160 x 1440 x 12 bits = 37,324,800 bits = 4,665,600 bytes), the image has not been processed or white balanced which means you can correct the image, and it's a better representation of the "digital negative" captured. The disadvantage is you can't open these image files with a normal photo package without using an "acquire module" (a plug-in, typically TWAIN, which can open / process such images).
Advantages of RAW format
•A true "digital negative", untouched by cameras processing algorithms
•No sharpening applied
•No gamma or level correction applied
•No white balance applied
•No color correction applied
•Lossless yet considerably smaller than TIFF
•Records data over a wider bit range (typically 10 or 12 bits) than JPEG or 8-bit TIFF
Disadvantages of RAW format
•Requires proprietary acquire module (typically TWAIN) or plug-in to open images
•Images can take 20-40 seconds to process on an average machine
•No universally accepted RAW standard format, each manufacturer (even each camera) differs.

**Red-eye:** Red-eye or redeye is the term used to describe the effect which can occur in photographs where the pupils of the eyes can take on a red color. The red color happens when the pupil of the eye is dilated, usually in a low light environment and the light of the flash strikes the retina at the back of the eye, reflecting the light through the wide-open pupil.

**Red-eye Reduction:** A system, present on some cameras, that causes the pupils of a subject to be photographed to shrink, as if in bright light, and which prevents the red-eye effect. Different systems exist, but all require that a light be aimed at the subject prior to the flash firing so as to contract the pupils. All the systems retard the actual shutter release to a greater or lesser amount and can be disconcerting to both the subject and the photographer.

**Resample:** To change the resolution of an image.

**Resolution:** Refers to the sharpness and clarity of an image. The term is most often used to describe monitors, printers, and bit-mapped graphic images. In the case of dot-matrix and laser printers, the resolution indicates the number of dots per inch. For example, a 300-dpi (dots per inch) printer is one that is capable of printing 300 distinct dots in a line 1 inch long. This means it can print 90,000 dots per square inch. For graphics monitors, the screen resolution signifies the number of dots (pixels) on the entire screen. For example, a 640-by-480 pixel screen is capable of displaying 640 distinct dots on each of 480 lines, or about 300,000 pixels. This translates into different dpi measurements depending on the size of the screen. For example, a 15-inch VGA monitor (640x480) displays about 50 dots per inch.
Printers, monitors, scanners, and other I/O devices are often classified as *high resolution, medium resolution,* or *low resolution*. The actual resolution ranges for each of these grades is constantly shifting as the technology improves.

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Standard resolution is 640 x 480 pixels (H x V) and originates with the VGA standard first defined for the IBM PC. SVGA is the next step up in terms of resolution and covers 800 x 600. XGA define the 1024 x 768 resolution, while UXGA is used for 1280x1024 and 1600x1200. The higher the resolution the finer the image detail that can be seen.

**RGB: R**ed, **G**reen, **B**lue; the color language of computers. Computer monitors and digital cameras use these colors to create all the colors seen on the monitor and saved in files. Green gives the color green, but is also used for contrast control. RGB as used on a color display monitor is also an emitted color set, which may view differently than when printed.

**ROM:** Pronounced rahm, acronym for **R**ead-**O**nly **M**emory, computer memory on which data has been prerecorded. Once data has been written onto a ROM chip, it cannot be removed and can only be read. Unlike main memory (RAM), ROM retains its contents even when the computer is turned off. ROM is referred to as being *nonvolatile*, whereas RAM is *volatile.* Most personal computers contain a small amount of ROM that stores critical programs such as the program that boots the computer. In addition, ROMs are used extensively in calculators and peripheral devices such as laser printers, whose fonts are often stored in ROMs. Read Only Memory, used for primary instructions in many Computer Peripherals and CPU's Firmware. Their instructions can be upgraded from a computer for specific types of Flash ROM.

**RS-232-C:** An interface for connecting a computer to a peripheral device. This serial device can achieve speeds up to 115 kilobits per second. On a IBM compatible computer the RS-232-C interface is commonly referred to as a serial port or COM port. RS-232-C is slower than SCSI.

**Scale:** To enlarge or reduce an image by increasing or decreasing the number of scanned pixels.

**SCSI: S**mall **C**omputer **S**ystem **I**nterface. Pronounced "scuzzy," SCSI is a parallel Interface Standard used by Apple Macintosh Computers, PCs, and many UNIX systems for attaching peripheral devices to computers. Nearly all Apple Macintosh computers, excluding only the earliest Macs and the recent iMac, come with a SCSI port for attaching devices such as disc drives and printers. SCSI interfaces provide for faster data transmission rates (up to 80 megabytes per second) than standard serial and parallel ports. In addition, you can attach many devices to a single SCSI port, so that SCSI is really an I/O bus rather than simply an interface.

Although SCSI is an ANSI standard, there are many variations of it, so two SCSI interfaces may be incompatible. For example, SCSI supports several types of connectors.

While SCSI has been the standard interface for Macintoshes, the iMac comes with IDE, a less expensive interface, in which the controller is integrated into the disk or CD-ROM drive. Other interfaces supported by PCs include enhanced IDE and ESDI for mass storage devices, and Centronics for printers. You can, however, attach SCSI devices to a PC by inserting a SCSI board in one of the expansion slots. Many high-end new PCs come with SCSI built in. Note, however, that the lack of a single SCSI standard means that some devices may not work with some SCSI boards.

Allows the daisy-chaining of devices. It is now widely used for scanners, digital cameras and CD-R drives, all devices that require transferring a large amount of data to the computer.

**Sensor:** An electronic device capable of reacting to the impact of photons, converting them to an electrical current that is then passed on to the A-D Converter. Sensors come in various types: CCD, CMD, CMOS. CCD are the most commonly used in digital imaging.

**Sharpening:** Sharpening in a digital sense is the enhancing of edge detail. It is performed by a mathematical formula which is applied across the image. Put simply it enhances the visibility of a boundary between light and dark tones in an image.

In-camera sharpening - Most consumer digital cameras will, as a part of normal image processing apply some level of sharpening, to counteract the effects of the interpolation of colors during the color filter array decoding process (which will soften detail slightly). The problem with in-camera sharpening is that it increases the visibility of jaggies and can increase the visibility of other image artifacts.

Recently, digital cameras have allowed users to control the amount of sharpening applied to an image (menu option), the primary reason for this is the widespread use of image processing applications, the "digital darkroom" and the ability to control artifacts related to sharpening. Higher-end digital SLR's and other cameras which support RAW format don't apply any sharpening to the RAW image, this allows the user to decide on the level of sharpening when acquiring the image later.

Image editor sharpening - Quite a few digital camera owners choose to sharpen images even further, often to "pull out" fine details of reduced size images for web or monitor viewing purposes (sharpening for printing isn't really recommended and can make the image look fake and over-processed). Probably the most popular sharpening method is the "Unsharp Mask" (a very confusing name) which produces the most pleasing sharpening results without making the image look over-processed. It also allows for a wide variation of parameters to be used, which increases the ability to match the sharpening level to the particular image / desired output.

**Smart Media adapter:** An adapter in the shape of a 3.5" floppy disk, made to accept a SSFDC memory card so it can transfer the data into the computer by the floppy drive.

**Software:** Operating instructions for specific task based applications. The computer's processor carries out these instructions. These include all packages for uses like image editing, word processing, databases, CAD-CAM, games, and so on. Software has to be written for a specific computer Operating System (OS).

**S-RAM:** Static RAM, the most expensive type of RAM found in on-bard memory units, some Printers, and in PCMCIA Type I Cards. D-RAM, Dynamic Ram, Most often seen as the expandable RAM used by the computer for memory.

**SSFDC: S**olid **S**tate **F**loppy **D**isk **C**ard, a removable Flash Ram Memory Card used in digital cameras and other digital product. Both 3.3 Volt and 5-Volt card exist. SSFDCs are also called Smart Media Cards.

**SVGA:** Short for **S**uper **V**ideo **G**raphics **A**rray; defined by IBM; represents a computer graphics adapter capable of 800 by 600 resolution.

**TGA:** Short for True Vision **T**ar**ga** File; a storage format for bitmapped video images.

**Thumbnail Index:** A thumbnail index can be thought of as a "contact sheet" in traditional photography terms. Most digital cameras allow you to view the images on the storage card in a thumbnail index as an option during playback. Most use a 3 x 3 grid of images, but this does vary between cameras (some even allow you to specify the number of images to be displayed in the index). Often you can still carry out basic functions such as deleting or protecting images while in thumbnail index mode.

**TIFF:** The **T**agged-**I**mage **F**ile **F**ormat (TIFF) is used to exchange files between applications and computer platforms. TIFF is a flexible bitmap image format supported by virtually all paint, image-editing, and page-layout applications. Also, virtually all desktop scanners can produce TIFF images. This format of file uses the .tif extension. The TIFF format supports CMYK, RGB, and grayscale files with alpha channels, and Lab, Indexed Color, and Bitmap files without alpha channels. TIFF also supports LZW compression.

**TWAIN:** which comes from the saying "Ne'er the twain shall meet" because the Data Source Manager sits between the driver and application. An acquire interface developed by a consortium of software developers as a standard for communications between scanners, imaging devices and now digital cameras and the computer software.
TWAIN allows you to import (acquire) an image into your software.
This is the interface of choice on the Windows platform.
Nearly all scanners come with a TWAIN driver, which makes them compatible with any TWAIN-supporting software. Not all scanner software is TWAIN-compatible.

**Under-exposure:** The result of too little exposure in the camera. In digital imaging, under-exposure can sometimes be corrected by the use of image editing software.

**USB:** Short for **U**niversal **S**erial **B**us, an external bus standard that supports data transfer rates of 480 Mbps (480 million bits per second). A single USB port can be used to connect up to 127 peripheral devices, such as mice, modems, and keyboards. USB also supports Plug-and-Play installation and hot plugging.
Starting in 1996, a few computer manufacturers started including USB support in their new machines. It wasn't until the release of the best-selling iMac in 1998 that USB became widespread. It is expected to completely replace serial and parallel ports.
Many newer digital cameras support USB.

**Vector:** An electronic or computer-readable image format incorporating a formulate representation of graphical line art. Vector format is used during the markup process, to keep redlines separate from images and to facilitate easy modifications. This format is also often used during the edit process.

**VGA:** Short for **V**ideo **G**raphics **A**rray; defined by IBM; represents a computer-graphics adapter capable of 640 by 480 resolution.

**Video Output:** Some cameras have an outlet built-in that allows the user to attach a cable from the camera to a VCR or other video device that accepts NTSC (in Europe, PAL) video signals. The camera can then show its pictures on the television screen. This can be used to look at the images without a computer for a slide show or presentation. Images can also be saved on video tape to be sent to people who do not have computers, or used as presentations.

**Viewfinder:** The eye level device you look through to compose the image. Digital cameras are available with two basic viewer options: the optical viewfinder or the LCD panel. The optical viewfinder is just like your traditional point-and-shoot camera: a window through which you size up the image. In addition, virtually all digital cameras also come with an LCD viewer, which not only lets you preview the image, but review the same image before and after you save it. This gives you the freedom to erase photos you're unhappy with and re-shoot them. Unfortunately, an LCD screen may wash out in sunlight, and it always consumes battery power. Most good cameras come with both an optical and LCD viewfinder.
System used for composing and sometimes focusing the subject. There are several types: direct vision, optical, ground glass screen or reflex.

**VRAM:** short for **V**ideo **R**andom **A**ccess **M**emory; a special high-speed type of RAM that is used temporarily to store visual information being transferred to the display hardware in a computer.

**White Balance:** The perceived color of an object is affected by the color of the lighting under which it is viewed. The human brain is able to detect and compensate for such changes in perceived color.
As a result, a white object will look white to humans whether viewed in sunlight or under overcast skies, or indoors under incandescent or fluorescent lighting. A digital camera must emulate the human brain and adjust colors accordingly to lighting so that colors appear white when viewed directly also appear white in the final photograph.
This adjustment is called “White Balance”. Most video systems use a "white balance" to aid in overcoming color problems created by adverse lighting conditions. The color balance assumes that under normal conditions, that if a white object can be made to look white, then the remaining colors will be accurate too. If the original lighting is not close to the proper color temperature (typically daylight), the "white balance" may reproduce white at the expense of other hues. Most digital cameras feature automatic white balance, this means that the camera looks at the overall color of the image and calculates the best-fit white balance, however these systems are often fooled (especially if taking a photograph dominated by one color, say green). Modern "prosumer" digital cameras also allow "white preset" which simply means measuring the white point from a white sheet of paper or card (or nearby wall), the camera will then record that temperature and use it to correct all images until you reset it.