

DIGITAL IMAGING TERMS: BY CATEGORIES

As used by Columbia College Chicago Digital Imaging II instructors
Revised 20080630

Terms are grouped in the following categories: Applications/Software, Camera Capture: Analog and Digital, Color, Color Calibration, Computer Terminology, Digital Image Description, File Formats, File Size, File Storage, Hardware, Lighting Descriptions, Monitors, Printers and Papers, Photoshop, Resolution, Scanners, Techniques, Text.

APPLICATIONS / SOFTWARE

ADOBE ACROBAT

Adobe's freeware software application for creation and viewing of Portable Document Format (PDF) files that can display a document as it was originally designed without having the particular software or fonts used to create the file.

APPLICATION (OR APPLICATION PROGRAM)

A software program that performs a specific task. Some common types of applications are word processing, page layout, database, and graphics programs.

OPEN SOURCE

An application or format whose code is non-proprietary. Example: Adobe's **Digital Negative format (DNG)**.

OPERATING SYSTEM

The system used by the computer to control basic input and output operations and allow the operation of software applications. Examples include Mac OS, Windows, UNIX, and Linux.

PAINT PROGRAMS

Graphics programs that treat images as collections of individual dots or picture elements (**pixels**).

PHOTOSHOP

File extension: .psd. The proprietary Adobe Photoshop file format that supports all the applications features including: layers, masks, channels. This file format may not be able to be accessed by other applications.

PROPRIETARY

The design of programs, systems or equipment that are owned by an entity. This technology may be licensed for use in other applications or systems. All camera raw formats are proprietary with the exception of the open-source Adobe **Digital Negative format**.

QUICKTIME

A video and sound playback application originally developed by Apple Computer. Often used for the playback of photographic images in sequence or for screencasts.

SYSTEM SOFTWARE

The component of a computer system that supports application programs by managing system resources such as memory and I/O devices.

CAMERA CAPTURE: ANALOG AND DIGITAL

AF

Abbreviation for "Autofocus". Used in digital cameras.

ANALOG

In the field of electronics, it refers to a signal that varies regularly and continuously over its range. For example, speedometers or thermometers are analog devices. Analog signals can represent many different real-world things, like video, audio (i.e., music) and physiological waveforms (i.e., heartbeats, respiration).

APERTURE PRIORITY

An exposure mode on an automatic or **autofocus** digital camera that lets you set the aperture while the camera sets the shutter speed for proper exposure. If you change the aperture, or the light level changes, the shutter speed changes automatically. Other than for sports photography, aperture priority is the most common automatic preference in photography. It can also be explained as an automatic exposure system in which the lens aperture is set by the photographer, and the camera then sets the shutter speed.

A.S.A.

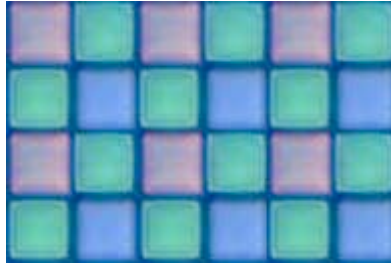
American Standards Association. A term indicating a film's sensitivity to light. The term has been replaced in current practice by the term **ISO** (International Standards Organization).

ASPECT RATIO

The relationship of the horizontal to the vertical measures of an image or display. The horizontal value is placed first (i.e., 3:2). It is found by dividing the vertical number of pixels (height) by the horizontal number of pixels (width) leaving it in fractional format. The most common aspect ratios are 4:3 and 16:9. The 4:3 aspect ratio is the ratio for many computer monitors, TVs and classic films. The newer 16:9 aspect ratio is used for High Definition Television (HDTV) and widescreen video.

BAYER PATTERN

In digital cameras, **CMOS** and **CCD** pixels on the imager sensors are sensitive to light photons but are not, by themselves, sensitive to color. The **pixels** will create a black and white image. In order to distinguish between colors, filters are put on top of a pixel to allow only certain colors to pass, turning the "rods" of the array into "cones". Since all colors can be broken down into an **RGB** or **CMYk** pattern, individual primary or complementary color schemes are deposited on top of the pixel array. After being read from the sensor, software takes the different values of the pattern and recombines the colors to match the original picture. There are a variety of different filters, the most popular being the Bayer Filter Pattern (also known as RGBG). There are twice as many green filters as the other colors because the human eye is more sensitive to green and therefore green color accuracy is more important to us than the accuracy of other colors:



BLOOMING

A visual effect caused by overexposing an image sensor in a digital camera to too much light resulting in a leakage into adjacent photo sites. Blooming is similar to overexposure in film photography, except that in digital imaging this results in vertical and horizontal streaks appearing from the light source in the image.

BRACKETING

To make several exposures, some greater and some less than the exposure that is calculated to be correct. Bracketing allows for error and permits selection of the best exposure after development.

BURST IMAGES

A series of digital images taken in rapid succession, captured at a preset speed. Burst images are usually used to capture a person or object in motion or to compensate for hand-held images shot in low light. The number of images captured will vary, depending on how long the shutter button is held down and how much memory is available. Digital cameras generally let you take 5 to 30 shots consecutively, and have burst modes good for 2.5 to 10 frames per second for as long as the **buffer** holds out.

CAPTURE

Digitally acquiring image information with a device such as a scanner or digital camera.

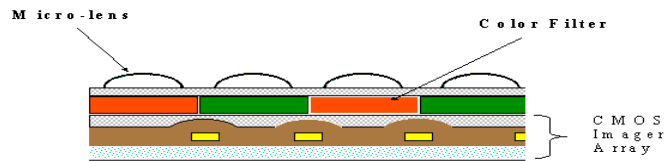
CCD (CHARGE-COUPLED DEVICE)

A semiconductor device that produces an electrical output proportional to the amount of light striking each of its elements. A CCD is the principal imaging sensor in electronic cameras, scanners, and video cameras. Currently the most commonly used image sensor. CCDs capture light onto an array of light-sensitive diodes, each diode representing one pixel. For color imagers, each pixel is coated with a film of red, green, or blue (or complementary color scheme) so that each particular pixel captures that one particular color. The pixel, made up of a light sensitive diode, converts the light photon into a charge, and the value of that charge is moved to a single location in a manner similar to a row of people passing buckets of water. At the end of the row, the charge is amplified. Since this "bucket brigade" is accomplished by applying different voltages to the pixels in a succession, the process is called charge-coupling. Because the value in the pixel is moved by applying different voltages, CCD sensors must be supported by several external voltage generators. The other main type of digital imaging sensor is the **CMOS**.

CMOS (COMPLEMENTARY METAL-OXIDE SEMICONDUCTOR)

Like **CCDs**, CMOS imagers include an array of photo-sensitive diodes, one diode within each pixel. Unlike CCDs, however, each pixel in a CMOS imager has its own individual amplifier integrated inside. Since each pixel has its own amplifier, the pixel is referred to as an "active pixel". (note: There are also "passive pixel sensors" (pps) that do not contain this amplifier). In addition, each pixel in a CMOS imager can be read directly on an x-y coordinate system, rather than through the "bucket-brigade" process of a CCD. This means that while a CCD pixel always transfers a charge, a CMOS pixel always detects a photon directly, converts it to a voltage and transfers the information directly to the output. This fundamental difference in how information is read out of the imager, coupled with the manufacturing process, gives CMOS Imagers several advantages over CCDs. Some CMOS imagers have small lenses manufactured directly above the pixel to focus the light towards the active portion that would otherwise fall

on the non-light sensitive portion of the pixel. Microlenses typically can increase the effective fill factor by two to three times.



CMOS Pixels are sensitive to light photons but are not, by themselves, sensitive to color. The pixels will capture any kind of light, creating a black and white image. In order to distinguish between colors, filters are put on top of a pixel to allow only certain colors to pass, turning the "rods" of the array into "cones". Since all colors can be broken down into an RGB or CMYk pattern, individual primary or complementary color schemes are deposited on top of the pixel array. After being read from the sensor, software takes the different values of the pattern and recombines the colors to match the original picture. There are a variety of different filters, the most popular being the **Bayer Filter Pattern**.

DIGITAL

A process that can be represented in a discrete (noncontinuous) form, such as numerical digits or integers.

DIGITAL CAMERA

Any camera system that is capable of capturing image data into a digital file.

FORMATTING

Completely erasing and resetting a camera's **memory card**. This is usually done as a quick way to erase a full card that you want to reuse or to attempt to fix a card that can't be recognized by the digital camera.

HUMAN EYE

The human eye can discriminate between hundreds of wavelengths as well as the intensity of the light source. The ability to distinguish these characteristics is through two main types of sensory cells in the retina: rods and cones. Cones give us our color vision. The eye can distinguish about 250 shades of each color, and is most sensitive to green. Rods are stimulated by the intensity of light and are responsible for perceiving the size, shape, and brightness of visual images. They do not perceive color and fine detail. The human eye contains about 130 million rods to about 7 million cones. This means that the human eye is much more sensitive to the intensity of the light than its color.

ISO

From the International Organization for Standardization. A measure of film or digital sensor speed. In the ISO arithmetic scale, doubling the speed of a film (halving the amount of light necessary to expose the film) implies doubling the numeric value that designates the film speed. For example, a film rated ISO 200 is twice as sensitive as a film rated ISO 100. The "ISO" speed is essentially the same as the older "ASA" speed. Film speed is the measure of a photographic surface's sensitivity to light. A greater ISO setting for a given film or digital sensor comes with some loss of image quality. With a digital sensor, this loss is visible as image **noise** rather than grain.

LIGHT

Visible light is the band of electromagnetic radiation that can be sensed by the human eye. Electromagnetic radiation is the type of energy, traveling in a wave that is produced by an oscillating energy source. Electromagnetic waves also include radio waves, x-rays and gamma rays. While light has properties of waves, the energy carried by light is not distributed in waves, but carried in discrete bundles, giving light the properties of particles. These light "particles" are called photons, and are used to explain how **CCD** or **CMOS** imagers in digital cameras transfer light energy to electrical energy. The Visible Light band in the EM spectrum can be broken down into a series of colors, each color corresponding to a

different wavelength. The typical spectrum displayed is comprised of seven colors - red, orange, yellow, green, blue, indigo, and violet. The band actually represents a continuum of colors. The bands immediately outside this region - ultraviolet and infrared - are beyond the range of the human eye.



METAMERISM

This undesired phenomenon describing the visual match of two or more different printed colors under certain viewing conditions but not in all viewing conditions. When present in prints, it can be seen when tilting the print at different angles to the light.

NOISE

An unwanted electrical signal or data that distorts or degrades the signal. The same as static in a phone line or "snow" in a television picture, noise interferes with the image being read and transferred by the imager. In a digital camera, noise is increased by increasing the **ISO**.

PUSH

To expose film or digital sensor at a higher **ISO** speed rating than the normal, then to compensate in part for the resulting underexposure by giving greater development than normal. This permits shooting at a dimmer light level, a faster shutter, or a smaller aperture that would otherwise be possible. Pushing is to be avoided at all costs when shooting in **Camera Raw**.

SHUTTER LAG

In digital cameras, the elapsed time between pressing the shutter release and the actual exposure during which the camera's focus and exposure mechanisms make last-minute adjustments. Actual elapsed times range from 0.6 to 1.2 seconds under bright light to up to 1 or 2 seconds under low light.

SHUTTER PRIORITY

A mode of automatic exposure by which the photographer manually adjusts the shutter speed and the camera then adjusts the aperture in order to produce a normal exposure.

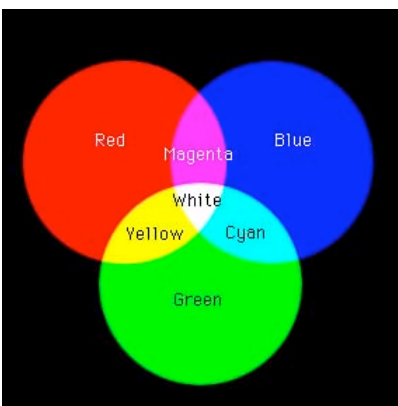
SIGNAL TO NOISE

S/N ratio is a measure indicating optical signal purity in a digital camera, video camera or audio component. The higher the S/N ratio, the smaller the amount of noise and therefore the signal may be described as one of high definition.

COLOR

ADDITIVE PRIMARY COLORS (RGB)

Red, green and blue are the three colors used to create all other colors when direct or **transmitted** light is used (for example, on a computer monitor). They are called additive primaries, because when pure red, green, and blue are superimposed on one another, they create white. A color monitor or color scanner is an example of an additive color device.



CIE Lab

Commission Internationale de l'Eclairage. An international commission that developed and monitors color measurement and standards. Lab represents three values, Lightness and two color channels, that when combined comprised the color space equivalent to the human eye. The Lab color space is the space in which all color conversions take place, behind the scenes, in Photoshop.

CMYK

Represents the three **subtractive** primary colors Cyan (C), Magenta (M), Yellow (Y), plus Black (K). An offset press is an example of a CMYK device.

COLOR CAST

An unwanted tint of one color in an image. This can occur due to an input or output device, or lighting conditions in the original exposure.

COLOR CORRECTION

The process of adjusting an image to correct for color imbalances or for the characteristics of the chosen **output** device.

COLOR ENGINE

The color matching method used in a color management system to convert the image data from the **color space** of the source profile to the color space of the destination profile. The preferred method in Photoshop is to use the Adobe Color Engine (ACE) when setting the application's color settings (EDIT>COLOR SETTINGS).

COLOR GAMUT

The range of colors that can be formed by all possible combination of colorants in any color input system.

COLOR LOOK-UP TABLE (CLUT)

A table of color values that is used to either convert from one **color space** to another for inputting or outputting data to different types of devices.

COLOR MANAGEMENT SYSTEM (CMS)

A combination of hardware, software, and/or methodology used to control and adjust color of an imaging system.

COLOR MODEL

A numerical means to define color attributes. For example, **RGB**, **CMYK**, and **HSB**. The RGB color model, for example, has within it several different color spaces, including Adobe RGB 1998, ProPhoto RGB, sRGB, ColorMatch, etc.

COLOR SEPARATION

The conversion of **RGB** or **LAB** image information into **CMYK** information prior to printing.

COLOR SPACE

A two or three dimensional representation of colors. Adobe RGB 1998 is an example of a color space within the RGB **color model**. Color spaces describe how the red, green and blue primaries are mixed to form a given **hue** in the color spectrum. Since it is not possible to represent every color in the visible spectrum exactly by mixing amounts of red, green and blue, color spaces allow us to change how we define red, green and blue (and white) to get better color reproduction. By tweaking primaries, we can maximize how many colors can be accurately represented on monitors, printers, etc. by matching the color space closely to the **gamut** of the device is capable of reproducing.

COLOR TEMPERATURE

The temperature (measured in degrees **Kelvin** or **K**) to which an object would have to be heated before it would radiate a given color. Each type of light can also be represented by a numerical color temperature. Daylight=5500 Kelvin, a blue-white color. The tungsten in a light bulb produces approximately a 3200 Kelvin, an orange color. Here are the approximate color temperatures of typical lighting conditions:

| Type of light | Color temperature |
|-----------------|-------------------|
| Incandescent | 2500K - 3500K |
| Twilight | 4000K |
| Fluorescent | 4000K - 4800K |
| Sunlight | 4800K - 5400K |
| Cloudy daylight | 5400K - 6200K |
| Shade | 6200K - 7800K |

COLORSYNCH

Built-in color management architecture specifically in the Macintosh OS.

GAMUT

The range of colors available in a **color model**, image or output process and that can be accurately represented. The model at left shows the gamuts for two RGB color spaces: **RGB** and **CMYK** displayed against the entire range of possible chromaticities. The model at right displays the gamuts of the ProPhoto RGB and Adobe RGB color models displayed against the entire range of possible chromaticities.

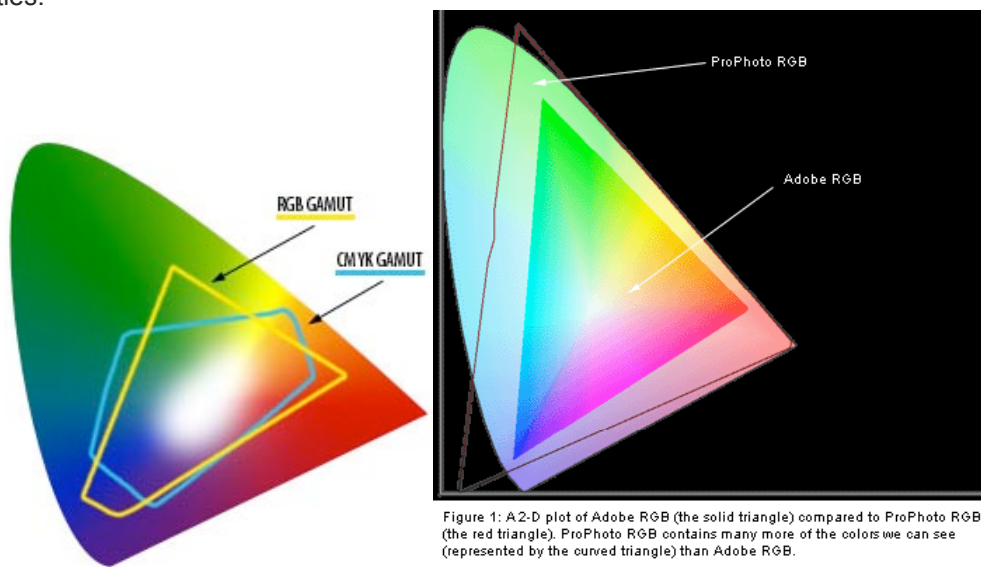


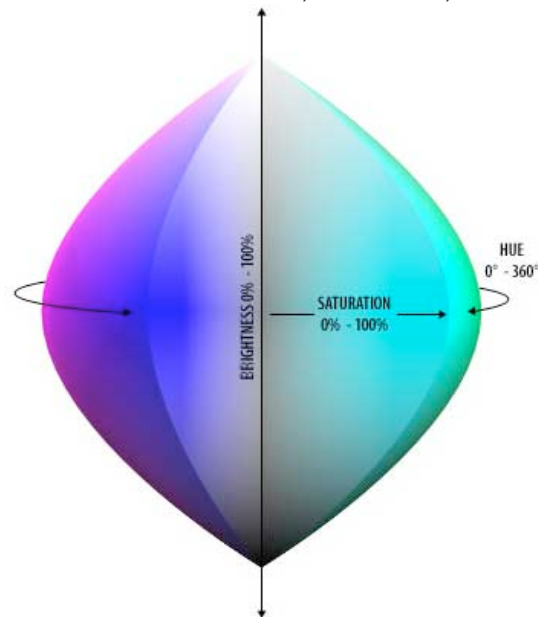
Figure 1: A 2-D plot of Adobe RGB (the solid triangle) compared to ProPhoto RGB (the red triangle). ProPhoto RGB contains many more of the colors we can see (represented by the curved triangle) than Adobe RGB.

HUE

The main attribute of a color that distinguishes it from other colors. Red, blue, green, yellow, etc. are hues. White, black and gray are not considered hues.

HSB (Hue, Saturation, Brightness)

A **color model** in which numerical values describe **hue**, **saturation**, and **brightness**.

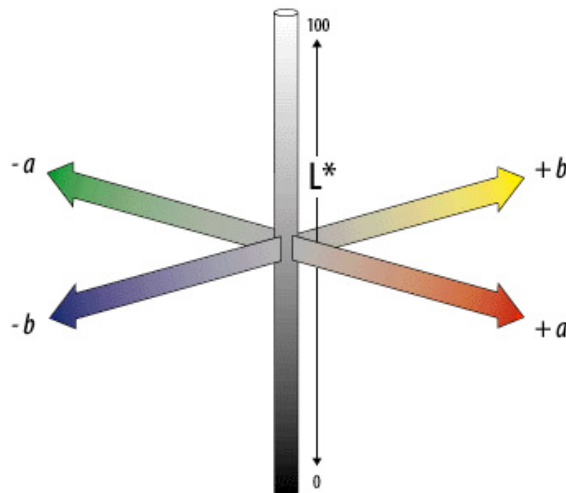


K (Kelvin)

Abbreviation for Kelvin temperature, the measurement of the redness or blueness of white light. This is written without the degree sign. Daylight at noon, for example, has a Kelvin temperature of about 5500K, while photographic tungsten lamps are 3200K. Technically it is a measurement of the color white or gray based on the temperature to which a black body must be heated to produce that color white.

LAB

A **color model** to approximate the entire range of human vision. The model consists of three variables: L for luminosity, a for one color axis (yellow to magenta) and b for the other color axis (blue to green). The Lab color space is derived from the CIE color space and is therefore **device independent**.



PROFILE

A mathematical equation used to transform from one **color space** to another color space in order to more accurately match the output of devices.

PROCESS COLORS (CMYK)

The four color pigments-cyan, magenta, yellow, and black-used in color printing.

RENDERING

The application of color shading or shadows to a computer image to make it more realistic in appearance.

RGB (Red, Green, Blue)

A color model composed of the primary **additive** colors of light. These colors can be mixed to obtain all other colors.

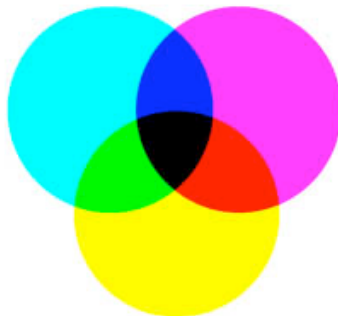
SATURATION

The purity of a color measured by the amount of gray in a color. More saturated colors contain a lesser gray component, and less saturated colors contain more gray.



SUBTRACTIVE PRIMARY COLORS

Cyan, magenta and yellow, which are the three printing inks that when mixed together theoretically absorb all color and produce black:



sRGB

A Web standard, calibrated **RGB** color space created by Microsoft. Known as “Standard RGB” (or among professional slang, as “shit RGB” because sRGB is too limited a space from which to print photo quality hardcopies).

WARM COLORS

Any color which by association suggest warmth, such as red, orange and yellow.

COLOR CALIBRATION

CALIBRATION

To check, adjust or standardize the gradations, or **gamut**, of a device such as a monitor or printer in order to obtain predictable results.

COLOR CALIBRATION

Comparison of the color reproduction capability of a device to a known standard color. To be done on monitors regularly for consistent color management.

DEVICE PROFILE

Mathematical equations or **color look-up tables** used to transform from a common color space such as Adobe RGB 1998 to the specific color space of a device.

DEVICE-DEPENDENT

Describes a **color space** that can be defined only by using information on the color-rendering capabilities of a specific device.

DEVICE-INDEPENDENT

Describes a **color space** that can be defined using the full **gamut** of human vision independent of the color-rendering capabilities of any specific device.

DEVICE-INDEPENDENT COLOR

Color specifications that are based on an independent **color model** rather than the **gamut** of an output device.

DEVICE PROFILE

A representation, in the CIE model, of the color rendering characteristics of any **input**, display or **output** device.

LOOK-UP TABLE (CLUT)

A table of color values that is used to either convert from one **color space** to another for inputting, or outputting digital data to different types of **output** devices.

PMS (Pantone Matching System)

A scheme for exactly representing 3,000 distinct colors by means of a numbering system.

COMPUTER TERMINOLOGY

ACCESS TIME

The time required for a data storage device to locate and retrieve data.

ALGORITHM

A mathematical expression that employs formulas to accomplish a specific task. Software engineers design algorithms to establish correct color balance, compress images, etc.

ANALOG-TO-DIGITAL CONVERTER (ADC)

A device that converts continuously variable **analog** signals into digital data.

BACKUP

A copy of a disk, file or program on an output medium (an external harddrive is most stable) that can be used if the original is lost or destroyed.

BINARY SYSTEM

Numerical system that uses only 0 and 1 as digits. This numerical system is the one used by computers.

BIT MAP IMAGE

An image comprised of **pixels**, or binary digits, that can be bi-level (line art), continuous tone gray or continuous tone color.

BOOTING (RE-BOOTING OR STARTING UP)

Starting up a computer by loading an operating system. Rebooting or warm booting means starting over while the computer is already on (for PC's - Ctrl + Alt + Del). This only starts over the software but leaves the hardware running, which is much less confusing for the machine and also reduces the wear and tear.

BUFFER

A temporary storage area in a computer's memory (usually **RAM**) or on the **CCD** or **CMOS** imaging sensor in a digital camera, which holds recent changes to files and other information to be written later to the hard drive or memory card.

CACHE

A bank of high-speed memory set aside for frequently accessed data. The cache setting for Photoshop is available through the Preferences settings.

COMPATIBLE

Applications are normally written to run on specific types of computer operating systems. Those that are able to run on a particular computer system are said to be "compatible" with that computer.

CRASH

When your computer has stopped responding. Do not turn the power off, but use CTRL + Alt + Del on IBM compatibles and the reset button on Macintosh.

DOWNLOAD

To transfer data or code from one computer to another, typically from a large host or server to a smaller client. Compare to Upload.

DRIVER

A program that allows a hardware **peripheral** device to communicate with a computer.

FILE

Specific information that has been gathered in one place, named and stored on a disk. In a graphical environment such as the Macintosh the file is represented by a small graphic icon that resembles a file folder and carries its name next to it. In a DOS system a file is given a more cryptic code name by the creator (there is a limit of eight characters).

FILE FORMAT

The particular arrangement of digital information that is saved from an application program for a specific use.

FORMAT

A file format is a particular way to encode information for storage in a computer file. Since a disk drive, or indeed any computer storage, can store only bits, the computer must have some way of converting information to 0s and 1s and vice-versa. There are different kinds of formats for different kinds of information. Within any format type, e.g., word processor documents, there will typically be several different formats. Some file formats are designed to store very particular sorts of data: the **JPEG** format, for example, is designed only to store static continuous tone photographic images. Other file formats, however, are designed for storage of several different types of data: the GIF format supports storage of both still images and simple animations, and the QuickTime format can act as a container for many different types of multimedia.

IMPORT

The ability of a software application to bring in files that are not in its native file format.

INPUT

Information transferred into a computer from some external source, such as the keyboard, mouse, digitizing pad, a disk drive, or a modem.

RANDOM-ACCESS MEMORY (RAM)

The part of the computer's memory that stores information temporarily while it is being worked upon.

READ-ONLY MEMORY (ROM)

Memory that can be read but not easily modified. Information remains in ROM permanently, even when the computer's power is off.

REBOOT

As a way to get out of situations in which the application is not responding as expected, rebooting is the process of turning a computer system or printer off and then back on again, to reload the software

UPLOAD

To send a file to a networked host or to another machine.

V-RAM (Video Random Access Memory)

A special type of RAM that can perform reads and writes at the same time, allowing it to send information to the monitor at the same time it receives new information from the video processor.

DIGITAL IMAGE DESCRIPTION

ARTIFACT

Unwanted visual defects generated by an **input** or **output** device, or a software operation that degrades the image quality.

BANDING

Visible stepping of shades in a printed or displayed image.

BRIGHTNESS

The balance of light and dark shades in an image. Brightness is distinct from **contrast**, which measures the range between the darkness and lightest shades in a image. Brightness determines the intensity of shades; contrast determines the number of shades you get. Brightness is one of the three dimensions of color; the other two are **hue** and **saturation**. The term is used to describe differences in the intensity of light reflected from or transmitted through an image independent of its hue and saturation.

BRIGHTNESS RANGE

The difference in **brightness** between the darkest and lightest areas of the subject.

CONTINUOUS TONE

An image that has shades of gray or color (as opposed to a **halftone** or **bit-map** image). An image that has enough tonal range so that the human eye can't detect obvious "jumps" or "steps" between gray or color levels. A photograph is an example of a contone image.

CONTRAST

The range between the darkest and lightest components of an Image.

CONTRASTY

Describes a scene, negative, transparency or print with very great differences in light and dark areas. Opposite: flat.

DITHERING

Adjusting the appearance of colors and shades in an image by varying the size and shape of the pixels. Often used to get rid of artifacts and distortion caused by lowering the number of colors in a **GIF** image file.

DMAX

The darkest area of an image that a device can reproduce and still have detail. A Dmax value of 4.0 would be considered perfect. $D_{max} - D_{min}$ = Dynamic range

DMIN

The lightest area of an image that a device can reproduce and still have detail. A Dmin value of 0.0 would be considered perfect. $D_{max} - D_{min}$ = Dynamic range.

DYNAMIC RANGE

Dynamic range is a measure that indicates the scale of fine gradations being preserved from highlight to shadow. Applied most often to the ability of a scanner or digital camera to register a wide range of tonal values--something from near white to near black. A scanner or **digital camera** with good dynamic range is able to map **input** shades correctly to output shades, making images look brighter and giving them more visible detail. Generally the number of **bits** determines the maximum dynamic range of a scanner. For example a 36-bit scanner has a higher **dynamic range** than a 24-bit scanner. A perfect dynamic range for a scanner is considered to be 4.0 or $D_{min}=0$ and $D_{max}=4$. The dynamic range of a scanner is most indicative of its overall image quality with 3.0 being a minimum rating for prepress capable scanners.

GAMMA

A measure of the amount of contrast found in an image according to the slope of a gradation curve. High **contrast** (steep curve) has high gamma and low contrast (shallow curve) low gamma.

GRADATION

A smooth transition between black and white or between one color and another.

HALO

A light line around object edges in an image, usually produced by a **sharpening** technique.

HIGHLIGHT POINT

The brightest part of an image with detail. Setting a highlight point in an image is perhaps the most important step to achieving a good scan.

IMAGE ENHANCEMENT

The processing of an image to improve elements such as color, tonal range, and defects.

KEYSTONING

The distortion of a projected slide or movie caused by the projector lens axis not being at a 90 degree angle to the screen. The image will appear wider at one edge than on the opposite and the image will not be uniformly sharp.

LUMINANCE

Brightness, often represented by the letter Y.

MOIRE PATTERN

An undesirable pattern in color printing, resulting from conflicting screen angles of overprinting **halftones**. Moiré patterns can be minimized with the use of proper screen angles or by removal in a graphics application through the use of appropriate filters (i.e., Despeckle Filter in Photoshop).

POSTERIZATION

The conversion of an image to a more elementary form by reducing the number of tonal values, creating an artificial, banded result.

RASTER

The pattern of parallel lines making up the image on a video display screen. The image is produced by controlling the brightness of successive points of the individual lines of the raster.

SHADOW POINT

The darkest tone printable in an image without being black. All tonal values below this threshold will print as black.

QUARTER TONES

Tones between shadow and midtones are known as 3/4 tones and those between highlight and midtones are known as 1/4 tones. Useful in describing the placement of where tones fall when using the Curves adjustment layer in Photoshop.

VECTOR IMAGE

An image represented by mathematically defined shapes, such as lines, polygons, text, and groups of objects as opposed to **bitmaps** of them. Because a vector is a mathematically defined shape as opposed to an image made up of **pixels**, vector shapes do not lose quality when enlarged.

WATERMARK

A faint background image on a printed piece or included in digital files as a security feature (such as on printed currency or checks) or to indicate a copyright of an image.

THUMBNAIL

A small version of a larger graphic image used for indexing databases of images or to preview a very large image.

FILE FORMATS

ARCHIVAL IMAGE

A master image meant to last through time. Archival images are of a higher resolution and quality than the digital image on-screen. The file format most often associated with archival images is **TIFF**, or Tagged Image File Format, as compared to on-screen viewing file format, which are often **JPEGs** or **GIFs**. For images captured in the **Camera Raw** format, the non-proprietary archival format is the Adobe **Digital Negative** format (**DNG**).

CAMERA RAW

A file format that allows the user to specify the file type, file creator, and header information and supports up to 48-bit color information with no compression. Due to the amount of information and knowledge required to use this format, beginners seldom use it. RAW is simply the raw data as it comes directly off the **CCD** or **CMOS** image sensor in a digital camera, with no in-camera processing performed. Typically this data is 8, 10 or 12 bits per pixel. The advantage is that the image has been neither processed nor white balanced which means that you can process the image to your liking. The disadvantage is that you cannot open these image files with a normal photo application without using a plug-in, typically TWAIN,

which can open and then process such images. The Adobe Camera Raw Converter application is an example of such a plug-in.

Advantages of RAW format

- A true "**digital negative**", untouched by camera's 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 longer to process on an average machine
- No universally accepted RAW standard format, each manufacturer (even each camera) differs.

COMPRESSED

A compressed image is one whose file size has been reduced. Some compression schemes maintain the quality of the image (**lossless**) and some do not (**lossy** or destructive). See also Compression.

COMPRESSION

A digital process that allows a data file to be condensed usually by removing unnecessary data for adequate representation. This allows the file to be more efficiently stored or transmitted. In some instances a file is then decompressed and restored. **JPEG** is one of the most common formats for 24-bit images. This format selectively reduces chrominance as opposed to **luminance** information because the human eye is less likely to detect this loss of data.

DNG (DIGITAL NEGATIVE)

An open source format created by Adobe. Use this format to archive any proprietary image created in **Camera Raw**.

EXIF

Abbreviation for EXchangeable Image File: the file format used by most digital cameras. The EXIF file tags each image with its capture information (date, time, camera model, shutter speed, aperture, flash, etc.). For example, when a typical camera is set to record a **JPEG**, it's actually recording an EXIF file that uses JPEG compression to compress the photo data within the file. (See **IPTC** and **XMP**).

GRAPHICS FILE FORMAT

A file **format** used to store any of the file formats used to store images in a digital form; e.g., **GIF**, **JPG**, **PHOTOSHOP PDF**, **PSD**, **CAMERA RAW**, **TIF**, **DNG**.

IPTC

(International Press Telecommunications Council). This metadata supplies copyright information for a digital capture. (see **EXIF** and **XMP**).

JPEG (Joint Photographic Experts Group)

File extension: .jpg. A **bitmap**, 24-bit color file format that allows the user to specify the amount of **lossy compression** applied to a continuous tone photographic image file. This file **format** is supported by most imaging applications. The amount of compression is variable, and more compression leads to increased deterioration of the photographic image. **JPEG** images can display millions of colors. 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 occurs. The greater the pixel count, the less pixelization.

LEGACY FILES

Files created in an earlier version of an **application** that may not include support, or may include less support for some features (e.g., CMS) of the newer version of the application.

LOSSLESS COMPRESSION

A form of **compression** where no data is lost, and, therefore, does not affect image quality.

LOSSY COMPRESSION

A form of compression that attempts to discard unnecessary data. This data loss can affect the quality of the image. **JPEG** is a lossy compression type.

LZW (Lempel-Ziv-Welch)

A form of **lossless** block coding that compresses files by assigning codes to repeating patterns of blocks of pixels. Can be chosen when saving a Photoshop file to a TIFF **format**.

LINE ART

Images containing only one level of contrast or (1) **bit depth**. A line art image can be either Bitmap or vector. black and white **pixels**. Line art may also include one-color image, such as mechanical blue prints or drawings.

METADATA

Data about data, or information known about the image in order to provide access to the image. Usually includes information about the intellectual content of the image, digital representation data, and copyright information.

NATIVE FILE FORMAT

The default format in which a specific application saves files.

PDF (Portable Document Format)

File extension: .pdf. This file format was developed by Adobe for use with its software application entitled Acrobat. A bitmap, vector, font, and page layout file format that accurately represents all the elements regardless of the application used to create the file. In the Photoshop PDF file format, only single images can be used and they can include layers.

TAGGED IMAGE FILE FORMAT (TIFF)

A file **format** for graphics developed by Aldus, Adobe and Apple that's particularly suited for representing scanned images and other large bit maps. TIFF is the generally accepted interchange standard for digital images. Often used for transporting high quality image files. TIF files may come in **compressed** or uncompressed versions. TIF compression is **lossless** and significantly reduces file size with no loss to the quality of the image.

UNZIP

To decompress a file.

XMP

(Extensible Metadata Platform). This is the open W3W standard developed by Adobe for storing and sending metadata with your digital captures. This data will be created in a file that follows your image file. (see **EXIF** and **IPTC**).

GIF

Originally created in 1987 by Compuserve, the GIF (Graphics Interchange Format) is another of the most popular image **formats** found today. GIF images may contain up to 256 colors or shades of grey, and they may also contain transparency and animation. GIF compression is **lossless**, and file sizes can be more precisely controlled because a user can determine the exact number of colors they would like the file to contain.

ZIP

To **compress** a file.

FILE SIZE

BIT

Short for "binary digit". The smallest possible unit of information in any digital system expressed either as 0 or 1.

BIT DEPTH

Number of bits used to specify the brightness or color range of each pixel in an image sensor. This refers to the grey scale range of possibilities for an individual **pixel**. A pixel with 8 bits per color gives a 24 bit image (8 bits X 3 colors [RGB] equals 24 bits).

30/32 bit color is billions of colors

24 bit color resolution is 16.7 million colors.

16 bit color is 65,536 colors

8 bit color is 256 colors

8 bit grey scale is 256 shades of grey

1 bit is black or white.

BYTE

A unit of measure equal to 8 bits of digital information. The standard measurement unit of a file size. See also **Kilobytes**, **Megabyte** and **Gigabyte**.

1000 Bytes of computer information = 1 Kilobyte

Kilobytes represents a million characters of information.

1,000,000 Bytes of computer information = 1 megabyte

Megabytes represents a million characters of information.

Actually one megabyte = 1,048,576 bytes.

100,000,000 Bytes of computer information = 1 Gigabyte

Gigabytes represents a 100 million characters of information.

GIGABYTE (GB)

A unit of measurement equal to 1,024 megabytes. Typically, a storage device capable of holding a gigabyte or more of information is a mass storage device using magneto-optical plates.

KILOBYTE (K)

A unit of measurement consisting of 1,024 **bytes**.

MEGABYTE (MB)

A unit of measurement equal to 1,024 kilobytes, or 1,048,576 **bytes**.

TERABYTE (TB)

A measure of file size or memory equal to 1,024 **gigabytes**. Equivalent to exactly 1,099,511,627,776 bytes of information.

FILE STORAGE

CD-ROM

Acronym for compact disc read-only memory; a compact disc 120 mm (4.72 inches) in diameter that can store more than 700 MB of information. The information is designated as read-only memory because a CD drive can read the information but cannot record new information on the disc.

CD (Compact Disc)

The original standards for compact audio discs now refer to any 4.75-inch optical disc, which can store data in various forms.

CD-I (Compact Disc Interactive)

A CD-ROM format that holds audio, MPEG video, digital data and still graphics allowing a user to interact with the content on the disc by use of a mouse or other pointing device.

CD-R (Compact Disc Recordable)

A format that allows CD writers to record data to a blank CD-ROM disc.

CD-ROM (Compact Disc Read-Only Memory)

A storage medium using CDs to hold computer data. A CD can hold about 700 MB of data, or about 300,000 pages of text.

CD-RW (Compact Disc ReWriteable)

A format that allows a recordable CD to be rewritten several times.

DISK

The medium upon which digital data is recorded and stored. A magnetic material is bonded to a supporting structure similar to audio recording. The disk spins at high speed when placed in the computer's disk drive and the information is recorded in tracks.

DVD

" Digital Video Disk " An optical storage medium that can store up to 4.7 Gigabytes (single layer), 8.5 GB (double layer), 9.4 GB (double sided, single layer), or 17 GB (double sided, double layer). Transfer rates and seek times are similar to those of CD-ROM for currently available drives. The DVD spec included higher level specs for audio and video capabilities.

HARD DISK

A disk made of metal and sealed in a drive or cartridge. A hard disk can store very large amounts of information compared to **CD-ROMS** or **DVDs**.

HARD COPY

Information printed on a directly appreciable physical medium such as paper, as opposed to being stored in software code on disk.

MEMORY CARDS

These are small memory modules that can be inserted into a digital camera to hold images. When the card is full it can be removed and another card inserted. The memory on these cards is non-volatile--that is, they do not lose their images when they are removed from the camera. The image 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 many reuses.

MICRODRIVE

A micro-sized hard-drive storage device that allows the storage and retrieval of data.

REMOVABLE STORAGE MEDIA

A storage device that can be removed and inserted into any similar playback device.

STORAGE CARDS

The storage card in a digital camera is its film. It is the removable storage device that holds images taken with the camera. When the card is full it can be removed and another card inserted. The memory on these cards is non-volatile--that is, they do not lose their images when they are removed from 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. Four types of memory cards exist at this time: Compact Flash, Smart Media, Intel Miniature Card and PCMCIA.

HARDWARE (separate from printers and scanners)

FIREWIRE

A high-performance serial bus standard developed by Apple and Texas Instruments that includes transmission speed scaleable from 100 to 400 Mbps, a hot swappable connection, and allows for up to 63 devices to be connected at once. FireWire is Apple's version of the IEEE 1394 standard.

GRAPHICAL USER INTERFACE (GUI)

Pronounced "goo-ee". An interface that translates computer codes into user-friendly graphic icons. Macintosh computers have always been utilizing such a system.

GRAPHICS ACCELERATOR CARD

A circuit board that reduces the time that a computer takes to produce an image on screen or perform graphic tasks.

HARDWARE

The devices that process, display and **output** computer data.

LAN (Local Area Network)

A group of computers that operate over a limited distance, for example within an office or building.

LASER

An intensely focused beam of light with a very narrow spectral distribution. Lasers are used in writing data to storage medium such as **CD** or in certain types of digital printers. Laser is also an acronym for Light Amplification by Stimulated Emission of Radiation.

MOUSE

A small hand-operated device that controls the pointer on the screen whose movements correspond to those of the mouse. A rotating ball inside the device moves horizontal and vertical sensors that signal the pointer's direction on the screen. The mouse is used to select operations and give commands.

NETWORK

Two or more computers or **peripherals** connected to share information and resources.

NIC (Network Interface Card)

A printed circuit board that is installed in a computer so that it can be connected to a network.

OCR (Optical Character Recognition)

The technology used to convert scanned text on printed pages into editable text.

PERIPHERAL DEVICE

A piece of hardware such as a monitor, scanner, printer, or modem used in conjunction with a computer and under the computer's control.

PLUG AND PLAY

The ability of an operating system to identify and configure the system to incorporate peripherals.

URL (UNIFORM RESOURCE LOCATOR)

Previously Universal Resource Locator. A standardized address for documents and media accessible over the Internet.

USB (Universal Serial Bus)

A type of input/output bus capable of data transfer at 12 Mbps and up to 127 devices in the chain.

LIGHTING DESCRIPTIONS

AMBIENT LIGHT

Existing light surrounding a subject; the light that is illuminating a scene without any additional light supplied by the photographer. " Available light " and " existing light " are two other terms that mean the same thing.

CATCHLIGHT

The reflection of a light in the subject's eyes in a portrait.

DIFFUSE HIGHLIGHT

A highlight area of a photographic print or transparency that contains detail.

HIGH KEY

An image with a full representation of tones from dark to light but in which the majority of its tones lie above middle gray.

LOW KEY

An image with a full representation of tones from dark to light but in which the majority of its tones lie below middle gray.

MIDTONE

An area of medium brightness, neither a very dark shadow nor a very bright highlight. A medium gray tone in a print.

NORMAL KEY

An image with a full representation of tones from dark to light in which the majority of its tones lie near middle gray.

SPECULAR HIGHLIGHT

The highlight area of an image that contains little to no detail. Example: light reflected off metal objects.

MONITORS

CPU

Pronounced as separate letters. Central Processing Unit is the heart of a computer. It includes circuitry (built around the CPU chip and mounted on motherboard) that actually performs the computer's calculations, and the box in which that circuitry is housed.

CRT (Cathode Ray Tube)

The display tube used in most televisions and standard computer monitors. An electron beam moves across the back of the screen that excites phosphors inside the glass funnel, which causes an image to be displayed.

LCD (LIQUID CRYSTAL DISPLAY)

A computer display technology based upon the changing optical density of certain types of molecules when placed in an electric field. LCD displays can be active-matrix or passive-matrix.

MONITOR CALIBRATION

The process of adjusting a video display to a known set of values in order to closely match **input** and output devices. This should be done regularly (at least monthly).

PRINTERS AND PAPERS

A3

Paper size for documents measuring up to 11.7" x 17".

A4

Paper size for documents measuring up to 8.27" x 11.69".

A5

Paper size for documents measuring up to 5.83" x 8.28".

DIGITAL PRINTER

Any device that is capable of translating digital data into hard-copy **output**.

DOT

A unit of ink laid down by an inkjet printer on paper, measured in dots per linear inch (see **DPI**).

DOT GAIN

The change in colors and tones (usually unwanted) caused by the absorption of ink into the printing substrate.

DIGITAL COLOR PRINTING

A non-impact printing technology in which digital data is output to **inkjet**, electrostatic thermal transfer, dye sublimation, and photographic printing devices on a pixel-by-pixel basis.

INKJET PRINTER

Most photo printers currently sold are inkjet printers. An inkjet printer forms images by squirting tiny drops of ink onto paper using various methods to control the size and placement of the drops. Epson, for example, uses vibrates the ink cartridge with different levels of voltage that adjust the colors and the amounts of color sprayed. Photo quality inkjet printers have resolutions of 2800 or 1440 dots per inch (**dpi**). Most inkjet printers use six or more colors of ink: black, cyan, magenta, yellow, photo cyan and

LAMBDA PRINT

The exposure phase of a Type C print accomplished with digital exposure techniques such as a Durst Lambda or Océ LightJet. These digital techniques use red, green, and blue lasers, yielding a digital C print (sometimes called a Lambda print or LightJet Print) after processing. The Lambda system has the capability of correcting paper sensitivity errors which would be impossible with conventional printing methods.

LASER PRINTER

A printer that uses laser light to transfer a page image (sent by a computer) onto an electrostatically charged, light-sensitive drum. A black powder, called toner, adheres to the areas of the drum where the laser has drawn the image. Paper then passes over the drum, picking up the toner, and the toner is heat-fused to the paper as it rolls out of the printer.

photo magenta. Some printers use red and green tanks, and some have photo black inks. The more tanks, the better.

OUTPUT

The product or representation of information that has been transferred from computer software or memory to some external destination such as the display screen, a printer or a modem.

OUTPUT RESOLUTION

The detail and clarity (achieved by tightness of dots) with which the image will be displayed or printed (dependent on the capability of the display or printing device).

PRE-FLIGHT

The process of checking a job for possible problems (such as missing fonts and pictures, or incompatible color systems) prior to entering the job into normal printing workflow.

PROOF

A prototype that shows the printer and customer what the job will look like after printing, so any necessary changes can be made before the job gets printed.

QUEUE

A series of tasks or operations waiting to be performed by a computer or **peripheral** device such as a printer.

RIP

Raster Image Processing. The process of converting pixels to halftone spots or dots for printing.

SERVICE BUREAU

Short for prepress service bureau, a company that provides a variety of desktop publishing services. Typically a service bureau can do high-resolution color or black & white scanning, color correction or other image editing, color separations, transparencies or color negatives, and provide typesetting services.

SOFT PROOF

Viewing a digital image with a monitor as a preliminary indicator of output prior to generating a hard copy proof.

PHOTOSHOP

ACTION

A Photoshop command sequence you can record and replay to automate recurrent imaging tasks.

ANTI-ALIAS

An **algorithm** to smooth the appearance of the jagged lines “**jaggies**” created by the limited resolution of a graphic display system. Aliasing is caused by insufficient sampling of a digital signal.

BATCH PROCESSING

The performing of a group of computer tasks at the same time. For photographers, this usually means applying some action to two or more image files.

BEZIER CURVE

A type of curved line defined by a mathematical formula and control points. These points serve as handles in graphics programs that can be “gripped” by the mouse pointer to drag the curve into different shapes. Bezier Curves are used in making highly accurate selections using the Path tool and the Direct Selection tool in Photoshop.

BLACK POINT

The darkest shadow in an image **histogram** used to adjust the tonal range of the image.

BLACK POINT COMPENSATION

A setting in Photoshop that adjusts for differences in black points when converting colors. When selected, the full **dynamic range** of the source color space is mapped to the full dynamic range of the destination **color space**. When deselected, the dynamic range of the source color space is simulated in the destination color space.

BLUR

Softening the detail of an image. Blurring can be applied globally or selectively to portions of an image. The most-used blurring process in Photoshop is the Gaussian Blur filter.

CHANNEL

A component of a digital image that carries data for one color layer. RGB has three color channels. CMYK has four color channels. In each case, when all channels are combined, a full-color image is created.

CLIPPING

A condition where all values lighter than a specific tone are converted to white and all values darker than a specific tone are converted to black. This is usually an unwanted effect because it compresses the **dynamic range** of the image.

CLONE

Copying **pixels** of data to new spatial locations in an image.

CROPPING (OR CROP)

The digital or manual process of cutting away undesired parts of an image.

CURVES

Graphic tools in image manipulation software that allow the user to change the contrast and color values of an image.

DEFRINGE

Blends the **pixels** along the edge of a selection to seamlessly merge it with a new background.

DESCREEN

The process of removing a **moiré** pattern usually associated with scanning an image that has been through the four-color process (**CMYK**) and halftone-screened.

EYEDROPPER

This tool takes a sample of a color from an image so that it can be used as the new background or foreground color.

FEATHERING

A technique in many image-editing programs that allows for the softening around the edges of a selection. Feathering actually softens both the inside and the outside of the actual selection outlines.

FILTER

A program or “mask” that alters data in accordance with specific criteria, a formula, or an **algorithm**.

FRINGING

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

GLOBAL COLOR CORRECTION

A color correction in a digital image that affects the entire image.

GAMMA CORRECTION

The nonlinear tonal correction editing of an image’s gamma curve. This is typically used to manipulate image shadow detail and to lighten an image without washing out the highlight areas.

GAUSSIAN BLUR

An image softening effect using a bell-shaped Gaussian distribution to soften the image.

HISTOGRAM

A graphic representation of the number of **pixels** with given color values. A histogram shows the breakdown of how colors and tones are distributed throughout an image.

LASSO

A tool found in many image editing **applications** allowing the user to select an area of an image by drawing a line around it.

LAYERING

In image editing software, the placement of one image or graphic over another. The opacity of the top image can allow the lower image to show through.

LOCAL COLOR CORRECTION

Color correcting that only affects a selected area of an image.

MARQUEE

A selection tool in image editing programs typically represented by animated dotted lines around the selected area.

PALETTE

The range of color or tone available in the imaging process, or a movable menu of tools or options found in software applications.

SHARPENING

An image enhancement technique in which the contrast between **pixels** is enhanced. Sharpening is the enhancing of edge detail. It is performed by a mathematical formula that is applied to the entire image or to parts of it. It enhances the visibility of the boundary between light and dark tones in an image.

THRESHOLD

The point at which an action begins or change. For example, the threshold defined in the USM process determines how large a tonal contrast must be before sharpening will be applied to it.

TOLERANCE

In Photoshop tolerance describes a certain distance between adjacent **pixels**. For example, tolerance is used with the Wand Tool for making selections and the Paint Bucket Tool for painting. The tolerance values can be adjusted. When the Wand Tool is set to a tolerance of one, only a small selection will be created because the distance between the selected pixel value and adjacent pixels is small.

UNSHARP MASKING (USM)

A filtering process used to sharpen images at contrast breaks.

RESOLUTION

ADDRESSABLE RESOLUTION

The maximum number of **pixels** an imaging device is capable of manipulating, and not necessarily the same amount the monitor is capable of displaying.

DPI

Dots per Inch. A measurement of **resolution** or fineness for a printer or scanner. Scanners are given a DPI rating even though they create **pixels** not dots. DPI is also a scanner's measure of its enlargement capabilities. DPI is not a good measure of a scanner's overall image quality. A dot is the smallest unit that can be displayed, scanned, or printed. If a device has a resolution of 360 dpi, it means there are three hundred sixty dots horizontally and three hundred sixty dots vertically. The higher the number of dots per inch, the greater the amount of detail that can be present in the image. However, with greater dpi, comes larger file-size and/or longer display and printing times.

EIGHT-BIT COLOR

Said of images in which each pixel has eight bits of information assigned to it. Eight-bit color can produce 256 colors or shades of gray per **channel**. (compare to 24-bit color)

GRAYSCALE

A single-channel image consisting of up to 256 levels of gray, with 8 **bits** of color information per **pixel**.

INTERPOLATION

A process for increasing image size by using nearby pixels to estimate the color for pixels in the new, larger image. Some digital cameras use interpolation to produce a larger image than the sensor captured or to create digital zoom. Virtually all image editing software support one or more methods of interpolation. How smoothly images are enlarged without introducing **jaggies** depends on the sophistication of the algorithm. Nearest neighbor interpolation is the simplest method and makes the pixels bigger. The color of a pixel in the new image is the color of the nearest pixel of the original image. If you enlarge 200%, one pixel will be enlarged to a 2 x 2 area of 4 pixels with the same color as the original pixel. Most image viewing and editing software use this type of interpolation to enlarge a digital image for the purpose of closer examination because it does not change the color information of the image and does not introduce any anti-aliasing. Bilinear Interpolation determines the value of a new pixel based on a weighted average of the 4 pixels in the nearest 2 x 2 neighborhood of the pixel in the original image. The averaging has an anti-aliasing effect and therefore produces relatively smooth edges with hardly any jaggies. Bicubic interpolation is more sophisticated and produces smoother edges than bilinear interpolation. Here, a new **pixel** is a bicubic function using 16 pixels in the nearest 4 x 4 neighborhood of the pixel in the original image. This is the method most commonly used by image editing software, printer drivers and many digital cameras for resampling images. Photoshop offers two variants of the bicubic interpolation method: bicubic smoother and bicubic sharper.

JAGGIES

A colloquial term for the jagged edges formed on diagonal lines of a **raster** image, typically large type fonts, when displayed on a device of limited resolving power. (see anti-alias). 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.

LPI

Lines Per Inch. Also referred to as line screen. The greater the LPI the more continuous looking the image will appear to the human eye. A newspaper is generally printed at 85-100 LPI while magazines are printed from 133-175 or higher.

PIXEL

Short for "Picture Element". The basic building block of computer images. A single square on a computer display or in a digital file. One pixel can contain various amounts of information measured in bits.

PPI

Pixels Per Inch. This measurement is the same as **DPI** or **Dots Per Inch**. PPI is more indicative of a monitor where DPI is usually associated with printers.

PPI (Pixels Per Inch)

A measure of the amount of image information density in a digital image.

PIXELLATION

The occurrence of pixels, large enough to become visible individually, when an image is enlarged. Usually it is the result of insufficient data although it is sometimes used as an effect.

RESAMPLE

To change the **resolution** of an image. Resampling down discards pixel information in an image; resampling up adds pixel information through **interpolation**.

RESOLUTION (SPATIAL RESOLUTION OR SPATIAL RELATIONS)

The number of **pixels** per inch in an image or the number of **dots** per inch used by an output device. Resolution can also refer to the number of bits per pixel.

SCREEN

Refers to computerized and non-computerized methods of converting a **continuous tone** image into printable patterns. Screen frequencies are usually referred to as **LPI (lines per inch)**.

SCANNERS

DRUM SCANNER

A type of optical scanner where a flexible original is mounted to a rotating drum. As the drum spins, light is captured from the image point by point, using a photomultiplier tube detector.

LINEARIZATION

The process of calibrating a scanner's white point, 50% gray point and black point. This is usually accomplished by scanning a grayscale target.

NEWTON RINGS

A degrading image artifact composed of concentric multicolored rings caused by the pressing of film to glass.

OPTICAL RESOLUTION

The maximum physical **resolution** of a device. Optical Resolution provides better image quality than interpolated resolution which uses software to create additional image information. On the Imacon scanners, the optical resolution options are underlined.

PLATEN

The glass surface of a flatbed scanner on which reflective art is placed for scanning.

REFLECTIVE OBJECT

An original image that does not allow light to pass through. A printed photograph is an example of a reflective object.

SCAN

The process of converting an optical image into digital data.

SCANNER

An electronic device that digitizes and converts photographs, slides, paper images, or other two-dimensional images into images.

TRANSMISSIVE OBJECT

An image that allows light to pass through. A 35mm slide or negative are examples of transmissive objects.

TECHNIQUES

IMAGE HARVESTING

Using a tripod, the ability to take multiple digital exposures bracketing the exposure values and objects in and out of focus in order to seamlessly integrate some or all into one final image. This technique is especially useful in integrating images of high dynamic range (i.e., an interior room with bright exterior objects viewable through the windows). Replaces the pre-digital practice of bracketing exposures and then being forced to choose one.

IMAGE PROCESSING

Any operation that can be performed on digital data to alter its characteristics and thereby the image that it represents

PHOTOMONTAGE

A photographic composition assembled from pieces of different photographs or of different negatives, closely arranged or superimposed upon each other. Sometimes graphic material is added to the combination.

REPURPOSE

The use of images, text, or information stored in documents for purposes other than its original intent.

RETOUCHING

The manual or digital process of removing imperfections or unwanted portions of an image.

TEXT

KERNING

Kerning is the adjustment of space between pairs of letters. Some pairs of letters create awkward spaces. Kerning adds or subtracts space between letters to create more visually appealing and readable text.

LEADING

Line spacing is called “leading,” because typesetters used to insert thin strips of lead between lines of type to add space for readability and appearance. As a general rule, the amount of space between lines, expressed as a percentage of point size, should be no less than 120%. For example, if text is 10-point, a minimum line spacing would be at least 12 points.

LEADING

The line spacing for type, measured from baseline to baseline.

POSTSCRIPT

A standard page description language in desktop publishing that describes the appearance of text, graphical shapes, and images as printed or displayed pages in a device-independent way.

SANS-SERIF FONT

A term to denote a font style that does not exhibit attenuated lines at the ends of letters:

AaBbCc

SERIF FONT

A term to denote a font style that exhibits attenuated lines at the ends of letters:

AaBbCc

TRACKING

A term used with fonts. Tracking is the adjustment of space for groups of letters and entire blocks of text. Use tracking to change the overall appearance and readability of the text, making it more open and airy or more dense.