

Painting with Light

A Primer on Digital Photography Capture Fundamentals

A Photography Workshop for
Colored Pencil Society District Chapter 202, San Diego
March 12, 2011
By Greg Holtz

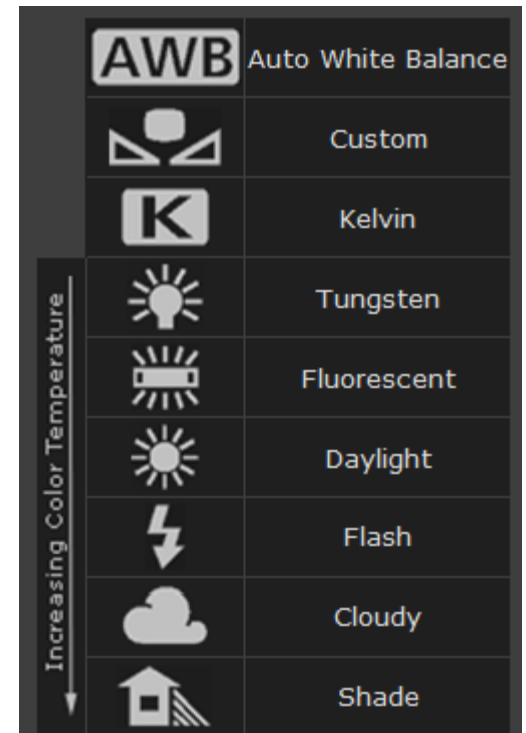
Photographic Control

- Light – choose, modify or add
- Lens – focal length and aperture
- Shutter – speed and synchronization
- Sensor – capture & amplification

Point & shoot camera	Smaller than a dSLR camera, with a lens that cannot be changed, these relatively inexpensive cameras are designed to be used mainly with fully automated modes.
SLR camera	Single Lens Reflex Camera. The view is through the same interchangeable lens used to make the image. SLRs are usually faster with more controls than smaller, less expensive compact cameras.

Light Quality

Soft Light	Diffuse light from a large light source that produces shadows with soft edges. Moving the light source closer makes it softer.
Hard Light	Light that has not been diffused or reflected before illuminating the subject. On subjects illuminated by hard light, shadows are sharp-edged and surface details are more noticeable than with soft light. Moving a light source away from the subject makes it harder.
White Balance	Remove color cast of light source Automatic or manual as needed.
Grey card White card	Grey and white standards used to detect color cast

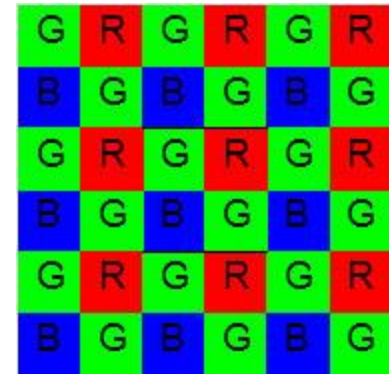


Lighting

- Source
 - Natural lighting
 - Hot lights
 - Flash
- Modifiers
 - Diffuser
 - Reflector
- Do It Yourself Equipment
 - <http://www.diyphotography.net/>

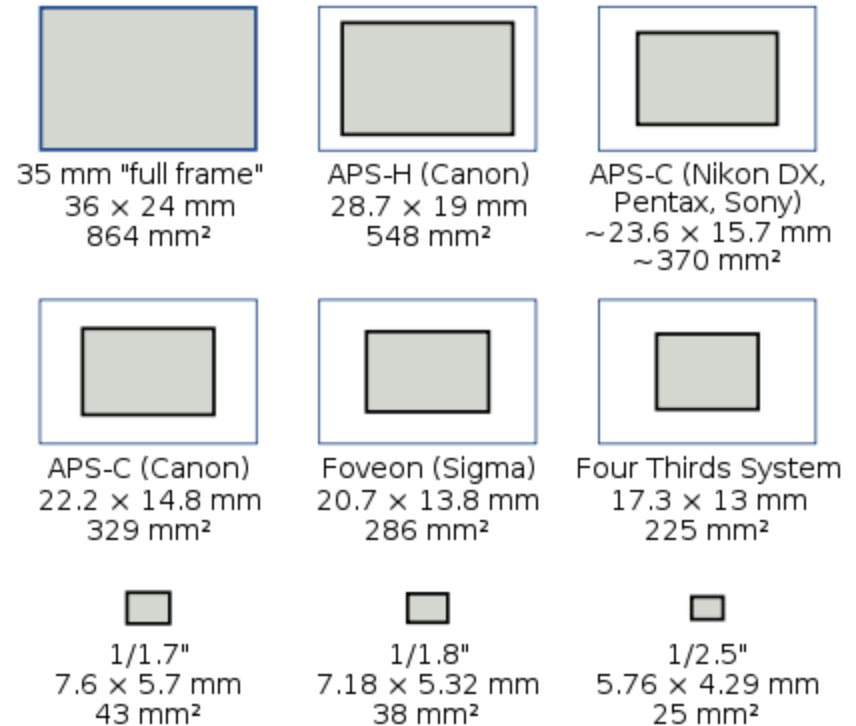
Sensor: Light detection

- Bayer pattern
 - Red-Green row
 - Blue-Green row
- Megapixels not usually limiting
 - Don't normally need more than 5 Mpx
- ISO sensor sensitivity
 - Higher numbers more sensitive but also noisier



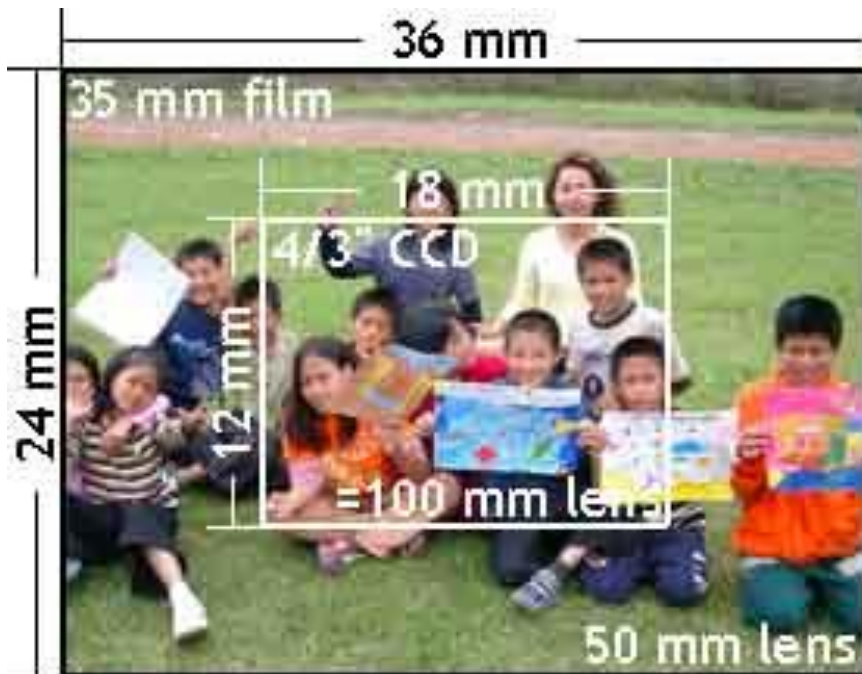
Sensor Size Matters

- 35mm full frame
Only on high end dSLRs
- Smaller sensors
magnification but more noise
- dSLRs larger than
compacts, higher
quality



Sensor Crop Factor

- Sensor size scaling is inversely proportional to focal length change
- “35mm equivalent”



Lens: Focal Length

Focal Length	The length of a camera lens. Technically the distance in millimeters between where light from infinity is focused and the optical center of the lens. Longer focal length lenses are telephoto, shorter lenses are wide angle.
35 mm camera lens equivalent	A camera that uses a smaller than full frame (36 x 24 mm) sensor will crop the image, relative to a full frame sensor, resulting in a lens focal length equivalent larger than the actual focal length by the crop factor. For example if a dSLR uses an APS-C sensor with a crop factor of 1.5, then a 50 mm focal length lens will have the equivalent field of view to a 75 mm focal length lens on a full frame camera. These values are useful in comparing lenses on cameras with different size sensors.

Lens: Focal Length

Wide Angle Lens	Lens that has an angle of coverage between 62 and 84 degrees. In 35mm photography, this applies to lenses with focal lengths between 24 and 35mm.
Telephoto Lens	Lenses whose focal lengths are longer than 50mm (in 35mm photography). Telephoto lenses enlarge the subject size
Prime Lens	Single focal length lens
Zoom lens	Variable focal length lens

Lens: Aperture

Aperture	The opening in the camera lens through which light must pass to reach the image sensor. Wide apertures result in narrow depth of field; small apertures result in wider depth of field.
F-number, F-stop	Aperture setting for the camera. Common stops are 2, 2.8, 4, 5.6, 8, 11, 16, 22, and 32. These numbers represent the aperture's diameter relative to the focal length of the lens. For example, a 50 mm focal length lens has an f2 aperture that is 25mm in diameter (1/2 of 50). Small f-numbers represent large apertures with a narrow depth of field; large f-numbers represent small apertures with a wide depth of field. The exposure difference between each of these stops is a factor of two (or one-half). Digital cameras often have settings that are between the full stops: half stop intervals, or third stop intervals.
Depth of field	The distance between the nearest and farthest objects in a scene that appear sharp in an image. Although a lens can precisely focus at only one distance at a time, the decrease in sharpness is gradual on each side of the focused distance, so that within the DOF, the unsharpness is not perceptible.

Shutter Speed

Shutter Speed	Exposure time, the effective length of time a camera's shutter is open. The total exposure is proportional to this exposure time, or duration of light reaching the image sensor. Common stops are 1, ½, ¼, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500, and 1/1000 of a second, these stops represent an approximate doubling of the value
Slow shutter speed	Motion blur effect
Fast Shutter speed	Freeze motion effect
Hand-held shutter speed limits	Keep shutter speed to inverse of focal length. For example 50mm lens 1/50 sec or faster; 100mm lens 1/100 sec or faster
Tripod	Essential for long exposures
Vibration compensation lens	Lens gyroscopes to reduce shake blur from slow shots. Can lower shutter speed for hand-held shots

Exposure

Exposure	The amount of light that reaches the camera sensor, dependent on exposure time (shutter speed) and aperture (f-stop). The same Exposure amount can be achieved with varying the time and aperture so that increasing time requires decreasing aperture (larger f-number). The correct exposure depends on the subject, but in general an automatic exposure attempts to achieve an average that is middle grey.
Exposure Compensation	Adjustment to the automatic exposure setting in order to achieve a darker or lighter than middle grey average value. If the average subject is dark (e.g. a black cat on black velvet), “underexposure”, is required for a darker than middle grey image. If the average subject is light (e.g. a polar bear on an ice flow), overexposure is required for a lighter than middle grey image.
LCD display	Look at image, compensate exposure settings, and reshoot.

Shooting Modes

- Automatic
 - Program or fully automatic
- Scene specific
 - Portrait, Landscape, Macro, Sports, etc.
- Creative
 - Aperture priority, Shutter priority, Manual
- Read the manual
- Modern cameras do a good job, know enough to overcome problems



RAW vs JPEG workflow

- Raw files must be processed by software, but has unbaked data and is more powerful.
 - RAW files are bigger & slower.
- JPEG files are “baked” with recipes like White Balance, color saturation, and sharpening.
 - Lossy compression
 - Do not edit and save JPEG until final version.
- Use TIFF or Photoshop files while editing.
 - These file formats are non-lossy but larger than JPEG

JPEG vs Raw files

- **If you have to ask then just shoot JPG.**
- **If you shoot hundreds or thousands of images in a day shoot JPG and don't worry.**
- **If you love to tweak your images one-by one and shoot less than about a hundred shots at a time than raw could be for you.**

<http://www.kenrockwell.com/tech/raw.htm>

Greg's Cameras

Model	Kodak C182	Olympus SP-550UZ	Canon Rebel (300D)	Canon T2i (550D)
Sensor	1/2.33-type CCD 6.13 x 4.60 mm	1/2.5" CCD 5.76" x 4.29 mm	CMOS 22.7 x 15.1 mm	CMOS 22.3 x 14.9 mm
Pixels	12.4 MP 4,096 x 3,016	7.1 MP 3,072 x 2,304	6.3 MP 3,072 x 2,048	17.9 MP 5,184 x 3,456
Lens	3X zoom f/2.9-f5.2 32-96mm (35mm eq)	18X zoom F2.8-f4.5 4.7 - 84.2 mm 28 - 504 mm (35mm eq)	Tamron 18-270 mm Zoom f/3.5-6.3 (max aperture) F22-40(min aperture) 29-432mm (1.6x APS-C)	
Shutter	0.5-1/1,400 sec	15 to 1/2,000 sec	16 to 1/4,000 sec	30 to 1/4,000 sec
ISO	Auto: 80-250 Manual: 80, 100, 200, 400, 800, 1000	Manual: 50, 100, 200, 400, 800, 1600, 3200, or 5000	100, 200, 400, 800, and 1,600	100 to 6,400
Burst mode	3 @ 1.7 fps	1.2 fps (JPEG, not RAW)	4 @ 2.5 fps	34 JPEG or 6 RAW @ 3.7 fps
Comments	Convenient Pocket-size Point & Shoot. Good for texture & opportunity photos. JPEG Only, no Aperture mode.	RAW single shots. JPEG burst bracketing. My first High Dynamic Range (HDR) Camera. Relatively slow shutter lag.	First dSLR, used (great price) Shorter shutter lag. Will convert to full-time Infrared.	Great camera. FAST even when shooting RAW burst bracketing.