

Photography Guide

Core Photography Concepts

Term	What it Means	Effects of Differences	
Lens Magnification Range	<ul style="list-style-type: none"> Zoom factor means the difference between the shortest and longest focal length. A 4X zoom has a maximum focal length of 4 times the minimum focal length. The actual power of the zoom is a combination of the focal length and the size of the image sensor. 	larger sensor	higher power zoom
		smaller sensor	lower power zoom
Lens Focal Length (F)	This is the length between the middle of the lens and the camera's internal focus point, expressed in millimeters. Zoom lenses show a focal length range, as focal length is therefore variable.	shorter	wider field of view (less zoom), greater depth of field, less background compression, harder to stop action with fast shutter
		longer	narrower field of view (more zoom), lesser depth of field, more background compression, easier to stop action with fast shutter
35mm Equivalents	Knowing the Magnification Range and the Focal Length doesn't tell you the lens capability, because it depends on the size of the image sensor. So, lens specifications have been standardized based on their 35mm full frame (full sensor size) equivalent. The standardizations take into account a camera's sensor size when noting lens specs.	<35mm	wide angle capability, good for landscapes
		35-70mm	normal
		>70mm	zoom capability, good for portraits
Depth of Field	This refers to the portion of a photo that is sharp or in focus, with the focal point as the reference. (The closer things are to the focal point, the sharper they are, and vice versa.) A larger depth of field means more is in focus. A smaller depth of field means less is in focus.	smaller F-stop	smaller depth of field
		closer to object	
		larger F-stop	greater depth of field
further from object			
Exposure Square	<ul style="list-style-type: none"> Amount of light + Gain (aperture f-stop) + Time (shutter speed) + Signal-to-noise Ratio. Signal-to-noise ratio is determined by the sensor and camera processor. ISO is not part. The lowest ISO represents the designed sensitivity of the camera sensor, which is absolute. Every ISO change above the lowest setting simply amplifies the light signal received by the sensor. 		
Histogram pushed to the wall	<ul style="list-style-type: none"> The sensor can't gather complete data at either histogram extreme – pixels become all white or all black; color info is missing. 'Overexposure' and 'Underexposure' refer to the histogram, not the appearance of an image. An image can appear underexposed to the eye yet be properly pushed to the right for full sensor saturation. Processing can produce a great image. 	to the left wall	make shadows very dark; more noise; can bring out some dark details in processing
		to the right wall	make highlights very bright; less noise; difficult to bring out washed details in processing
		to both walls	big loss of color data

Core Camera Functions to Set & Adjust

Function	What it Does	Effects of Adjustments		
F Stop f	<p>This number is the reverse ratio between the maximum aperture size and the focal length. Each increase in number equals ½ reduction in light. (Digital cameras have internal automatic adjustments of 1/8 stop.) 1.0 = maximum aperture is same as the focal length of the lens. 2.0 = maximum aperture is half the focal length of the lens. 2.8 is reasonable for pocket cameras. 1.8 is excellent for pocket cameras.</p> <p>Zoom lenses show an aperture range, as focal length is therefore variable.</p> <p>The nomenclature for f-stop is as follows. f/x , f:x-y 1: x , 1:x-y</p> <p>f/1.4-2.0 = fast primary lens f/2.8 = fast zoom lens</p>	smaller	larger aperture: *more light *faster shutter *smaller depth of field *faster & more accurate auto-focusing *better low light pictures *better action pictures *easier to isolate subjects *better detail and color in dark areas *more defocus blur	
		MIDDLE	best combination of sharpness, lack of defocus blur, and lack of light aberration (generally 2-3 stops above smallest f-stop)	
		larger	smaller aperture: *less light *slower shutter *larger depth of field *slower & less accurate auto-focusing *worse low light pictures *worse action pictures *harder to isolate subjects *better detail and color in light areas *more light aberration	
Shutter Speed	1 stop on the shutter = half speed or double speed, depending on which direction it is stopped.	faster	stops motion	
		slower	shows motion blur	
ISO	<p>ISO = applied gain, or signal magnification, same as a 'Gain' knob on a radio. It is not a setting that determines how sensitive the sensor is to light. The sensor always captures an image according to the light that strikes it, as best as it can.</p> <p>Always use the lowest ISO possible to eliminate noise, unless necessary for special situations. Increasing the ISO beyond zero-gain just increases the *signal* and *noise* in a camera's <u>post-capture</u> processing. However, modern cameras have quite little noise in low light.</p> <p>1 stop on ISO = half the ISO or double the ISO, depending on which direction it is stopped.</p>	lower	worse at low light less noise per light can use faster shutter	
		higher	better at low light more noise per light can use slower shutter	
Exposure Compensation	This changes either the aperture or the shutter speed, depending on the mode the camera is in.	Aperture priority	higher	slower shutter
			lower	faster shutter
		Shutter priority	higher	lower f-stop
			lower	higher f-stop

Camera Equipment

Type	Basic Use	Purpose	
Lens Filters	Lenses that take filters usually note the filter size with a special character: Ø E.g., Ø58mm indicates a 58mm filter.	UV	just for lens protection
		ND	lessen amount of light
		Polarizer	blocks reflected light aberrations, e.g. water, snow, metallic objects
Fill Flash	<p>Aperture controls the amount of flashed light. Shutter speed controls ambient light.</p> <p>Point camera at background to get the settings for aperture and shutter. Set the flash on auto (TTL). Subject and background will both be properly exposed when a shot is taken pointing at the subject.</p> <p>Some cameras calculate both background and subject independently so that both automatically are properly exposed when pointing at a subject. These cameras have a control to change the exposure of the subject and background.</p>	Effects of Adjustments	
		darken background	increase shutter speed
		lighten background	decrease shutter speed
		darken subject	decrease aperture
		lighten subject	increase aperture

Setting up a New Camera

Maintain the following settings permanently:

- RAW + highest quality JPEG (lossless compression is fine).
- Aspect ratio the equivalent of the sensor ratio. 3:2 on APS, full-frame, and G7X; 4:3 on four-thirds sensors.
- Image review off.
- Minimum shutter speed of $1 \div \text{focal length}$, if using image stabilization. If not using image stabilization, the shutter speed should be faster – and the smaller the focal length the faster it should be. These rules don't apply for shooting for special effect and time lapse, of course.
- Continuous auto focus off.

Set up the camera so that the following functions can be changed easily (assign buttons as helpful):

- Aperture (set on lens)
- Shutter speed
- ISO
- EV
- White balance
- Temperature
- Color mode
- Auto focus method (single, continual, manual)
- Auto focus area
- Metering method
- Flash – change from manual to TTL, flash comp, front curtain sync or high speed sync (FP)
- Eye detect
- One shot vs Servo
- ND filter

Universal Settings

These settings are good for most general photography and street photography, so the camera is always ready for a quick shot with a high probability of capturing a good image.

- Aperture priority, set to @f/8 ... f/6.3 on G7X
- Shutter speed – automatic
- ISO – automatic
- EV 0 to +1 (depends on the camera)
- Center point Autofocus
- Single focus method
- Spot metering
- White balance -- automatic
- Single shot (not Servo)
- Bracketing off
- Temperature – neutral
- ND filter off
- Touch screen shooting off
- Auto flash off
- Any special color, scene, or auto correction modes off

Using Aperture Priority is, in effect, the same as using Manual mode, except it is faster – 2 controls instead of 3: aperture and ISO. Control the shutter speed by adjusting ISO and aperture.

My Photography System

General Use and Street Shooting

BEGIN WITH **UNIVERSAL SETTINGS** AS A BASELINE.

USE A UV FILTER TO PROTECT THE LENS.

USE A LENS HOOD – DAY & NIGHT.

PUT THE LENS CAP ON WHEN NOT IN A SHOOT.

USE APERTURE PRIORITY.

USE AUTOMATIC ISO IF IT WORKS WELL AND STAYS LOW ENOUGH FOR THE LIGHT SITUATION.

ALWAYS KEEP IN MIND:

- smaller f-stop = more light = faster shutter = more subject isolation (less motion blur, more bokeh) and less noise
- bigger f-stop = less light = slower shutter = less subject isolation (more motion blur, less bokeh) and more noise
- middle f-stop = sharpest image (generally 2-3 stops above smallest f-stop)

DON'T BE CONCERNED ABOUT:

- Subject location in the frame, because the photo can/should be cropped later.
- Graininess, because it isn't a significant factor. (ISO 50-1600 and higher are all fine.)
- Shutter speed, unless there is camera shake warning or you want a special motion effect. In either case, adjust the ISO to obtain the desired/acceptable shutter speed. If the ISO is too high, enlarge the aperture.

3 TYPES OF SHOOTING:

- For instantaneous moments, shoot instantaneously. The Universal Settings should make the shot work out okay.
- For quick shots, follow a system designed for them.
- For shots with time to set up, follow a system designed for them

END OF DAY:

- Return the camera to the **Universal Settings**.
- Put image files in 3 locations: computer, portable HD, online backup.

Most important things – CLIC:

- **C**olor – white balance, temperature, color mode
- **L**ight – exposure – ISO, EV, aperture, shutter speed
- **I**solation of subject by contrast – color, light/dark, depth of field, motion
- **C**omposition (over-frame)

Images can be post-processed on computer, so just focus on these four key things. Keep checking these things as conditions change while shooting.

Focus is critical, of course, but is performed automatically by the camera according to the autofocus setting.

How to Take Good Photographs

QUICKLY

Camera should be on Universal Settings or pre-adjusted to current conditions with **EV, [auto] ISO, [auto] white balance, temperature, color mode.**

1. **COMPOSE THE SCENE & OVER-FRAME.** – feet, **zoom**, camera position
2. **[ADJUST APERTURE AS DESIRED, IF TIME.]**
3. **TAKE THE SHOT.**
(If time, use half-shutter to set the focus & light meter, and re-compose.
This is not necessary if properly over-framing.)

How to Take Good Photographs

SET-UP SHOTS – TIME TO PLAN

1. **THE SUBJECT**
2. **STORY** or **FEELING** of the shot, or of the scene of multiple shots
3. **SCENE ELEMENTS**
 - **Viewer-Subject relationship (Vantage Point)** – straight, above, below, angled
 - **Subject-Context relationship**
 - Subject position in the context
 - Size of subject / Amount of context
 - Notice any lines in the scene
4. **SUBJECT ISOLATION**
 - **Color Contrast**, especially when there are few colors – **color mode, HDR, ND filter**
 - **Light/Dark Contrast**, especially when there are many colors or high contrast lighting
 - **Exposure compensation**
 - **Fill light – flash**
 - **Depth of Field Contrast** – **aperture** (this is also affected by feet and zoom), **focus area**
 - **Motion Contrast** – **shutter speed** (control in aperture priority via aperture and ISO)
5. **EXPOSURE METERING:** spot, center-weighted, or matrix (generally spot metering, unless the subject is to be obscured with lightness, darkness, or fuzziness)
6. **SCENE PRE-COMPOSITION** – feet, **zoom**, camera position
7. **SETTINGS CHECK**
 - **Color**
 - **White balance**
 - **Temperature** – either natural colors (good for editing), or faithful colors under sunlight
 - **Light**
 - Source
 - **Polarization**
 - **ISO** – lowest possible, or use automatic if the camera is excellent at setting it
 - Exposure – usually to the right for full sensor exposure, and never to the left wall or right wall unless necessary 1) for capturing the bright area(s) – underexposure – or the dark area(s) – overexposure; or 2) for creating darkness or splotches of white
 - **Other**
 - **Single shot** or **servo**
 - **Eye detect**
 - **Bracketing**
7. **TAKE THE SHOT – OVERFRAME**

Tips & Techniques

After every shoot, copy the images from the card to a solid state drive, and then back them up.

Do not delete images from a memory card! This includes deleting from a card both in a camera and in a card reader. Use a memory card until it is almost full, then format it.

Shooting to the Right means the histogram is right-shifted, which means the sensor received the most complete set of data. It doesn't mean that an image is over-exposed. An image may look underexposed and be shifted to the histogram right. (Shooting too far to the right can clip color channels, turning one or more colors into white. This can be seen in strangely white or color-lacking faces that are overexposed.)

Extreme light-dark contrast situations: Choose to expose for highlights (brightness) or shadows (darkness). Exposing for lightness means underexposure; exposing for darkness means overexposing. Choose underexposing, unless aiming for a special effect. There is more data in very dark areas than in washed out areas, so processing can produce a better overall image that is underexposed compared to overexposed. For example, blue skies and white clouds are preserved in underexposed images, while this color data is lost in overexposed images.

Aberrations can occur at a lens's extreme aperture settings. To be safe, keep the aperture 1-2 stops from both extreme ends, unless necessary to do otherwise.

The more the light, the less the noise. Noise increases as shutter speed increases and aperture decreases. High ISOs contribute very little to noise in modern cameras.

Turn off image stabilization when using a tripod. Lack of movement can confuse the software.

Metering

- Center-weighted when the subject(s) take up a large part of the frame
- Evaluative/Matrix for landscapes, streetscapes, and HDR
- Spot for everything else

Exposure Compensation

- STOP DOWN:
 - The subject is too light, because the background is too dark.
 - Deep shadows during bright daylight
 - Indoor, dark, high-contrast scene
 - Outside at night
 - Light areas are too light. Bring out detail and color in light areas; get rid of white splotches.
 - You desire a **Subject** effect of drama, intensity, or natural skin tones & textures.
 - You desire a **Background** lightening effect of white splotching.
- STOP UP:
 - The subject is too dark, because the background is too light
 - Backlit subject
 - Highly reflective material such as snow or white sand
 - Dark areas are too dark. Bring out detail and color in dark areas; get rid of total blackness.
 - You desire a **Subject** effect of softness & gentleness.
 - You desire a **Background** darkening effect of silhouetting or dark mood.
- IF NOT SURE: Take bracketed shots.
- REMEMBER: It is easier to recover data from shadows than from highlights. Be more concerned about too much lightness than too much darkness – if trying to capture maximum data to bring out in processing.

ISO Settings

- 100-200 for bright light, sunny day
- 200-400 for overcast or cloudy days
- 400-800 for dim light such as the beginning and end of days

- 800-1600 for indoor shots and night shots

If a condition is **dark**, set the aperture wide open, and use Auto ISO.

If the necessary ISO is too high, try black & white.

Feel free to increase ISO as helpful and necessary to get a faster shutter speed. Shooting with higher ISO produces less color aberration than shooting with lower ISO and trying to compensate for it via exposure compensation in editing software. Also, modern cameras have very little noise with higher ISOs.

Sharpness

- The most important factor is contrast.
- Use the middle aperture range. About **f/8** is best on most lenses. **f/6.2** on G7X.
- 250-second shutter speed for street scenes?

Subject Isolation via Bokeh

- Small f-stop
- Close to subject
- Camera:Subject distance is much closer than the Subject:Background distance

Shutter speed that prevents motion blur is 1/80 minimum, and 1/200 or faster to be certain.

Bringing out full depth of color, or intensity of color

- HDR
- Color saturation mode
- ND filter

Use HDR for:

- **High contrast landscapes.** The shot will mimic what the eye sees, unlike typical HDR shots that exaggerate the colors.
- **High light-contrast scenes.** The shot will show the detail and color of everything, without overly dark areas or overly light areas.
- **Dreamlike or surreal feeling.**

ND filters remedy the following situations.

- Light is too bright for having an wide aperture and/or slow shutter speed.
 - You want to isolate a subject with shallow depth of field using a small f-stop.
 - You want to catch blurred action (e.g. waterfall) with a slow shutter speed.
 - You want to make moving objects disappear (people, vehicles, etc.) with a slow shutter speed.
- Create color balance and detail balance in a high-contrast situation.

Travel Photography

Always take:

- Extra batteries for each item
- Backup memory cards
- Portable HD that can endure shock, inside a case
- Lens filters
- Business cards
- Wet-weather bag cover
- Tripod
- Climbing sling – hand strap, tripod strap (maybe Black Diamond dynex)

Put name, phone, and email on everything, including memory cards.
Carry something to write down names and emails to send photos to.

Specialty Photography: Landscape

- HDR may make a high-contrast landscape appear the way the human eye sees it, but it may make a low-contrast landscape seem strange.
- Make sure the scene is still (watch out for wind)
- Set the white balance manually.
- Metering:
 - If spot metering, check the brightest and darkest parts of the scene; use the middle range to take the shot. Alternatively, check the most important or most evenly lit part of the scene.
 - If using evaluative/matrix metering, use as normal.
- Lens manually set to infinity, or the f-stop set to about 13. If a little background blur is desired, or there is reason to stop motion, use a lower f-stop.
- If there is a specific thing to be in sharp focus, zoom in as close as possible and focus manually, then un-zoom.
- ISO 100-200, generally
- F8 or smaller, generally

Example settings for specific kinds of shots:

- Sun just showing above horizon – ISO 200, f16, 1/10 shutter
- Close-up landscape – ISO 200, f10, 1/125 shutter
- Large landscape at sunset – ISO 200, f10, 1/13 shutter
- Large landscape in full light – ISO 100, f11, 1/50 shutter

Specialty Photography: Night Landscape

- Shoot in RAW to capture colors and grey shades at the dark end of the scale.
- Turn on long exposure noise reduction if the camera has it.
- Let in only as much light as necessary to show what the shot is of, or to capture desired effects such as star trails. The light-dark contrast is what a night shot is all about, and it also produces sharpness.
- Use **EV bracketing** for both exposure insurance and HDR.
- **ISO minimum 800?**
- **Aperture** wide open
- **Hyper focal distance** – use a depth of field calculator
- **Shutter speed** must be faster than $600 / \langle \text{focal length} \rangle$ to keep stars looking like stars. Subtract 10-15 seconds for absolutely no star blurring. Slower shutter speeds will make stars blur as they move.
- **Spot metering** (with AE lock as necessary) of a middle tone, or **Spot metering** of a highlight and adding 1-2 full stops of exposure compensation, or **Evaluative metering** (with exposure compensation as necessary), or some other method. It takes experimenting.
- Take test shots by cranking up the ISO and shutter speed by the same number of stops. E.g. ISO X4 and shutter speed $\div 4$.

Specialty Photography: Outdoor/Nature Photography

- Use a lens hood.
- Lighting is everything; find the best lighting. Best lighting is morning or afternoon.
- Use large depth of field, generally.
- Take advantage of clouds, weather, sunset, water.
- For backlit shots, adjust exposure.
- Take multiple pictures of each scene, with varied angle, frame, and exposure.
- Study the masters: Ansel Adams, Galen Rowell, David Muench, Rodney Lough, etc.
- For golden hours shots:
 - ISO 100-400
 - Smallest aperture possible
 - Focus to infinity
 - 5-30 second shutter

Specialty Photography: Night Cityscape

- Shoot in RAW to capture colors and grey shades at the dark end of the scale.
- Turn on long exposure noise reduction if the camera has it.
- Turn on bracketing to make sure to get a proper exposure.
- Use a lens hood
- Set white balance to tungsten?
- Let in only as much light as necessary to show what the shot is of, or to capture desired effects such as car light trails. The light-dark contrast is what a night shot is all about, and it also produces sharpness.
- **ISO 100-200**; higher if capturing moving objects
- **Aperture** set for the desired depth of field, as usual. Generally, use the mid range, and adjust the shutter speed if the exposure is not correct.
 - Wide aperture gives a halo to street lights.
 - Small aperture is good for cityscapes, car light motion blur, water, and star trails. Street lights will have a star-like effect.
 - Mid-range aperture combines effect for an artistic photo.
- **Focus** set to infinity, or use a light source or high ISO to let the camera focus automatically.
- **Shutter speed** generally 5-15 seconds. 15-30 seconds starts to capture car lights. Greater than 30 seconds starts to create lines of light for cars.
- Use **EV bracketing** for both exposure insurance and HDR.
- **Spot metering** (with AE lock as necessary) of a middle tone, or **Spot metering** of a highlight and adding 1-2 full stops of exposure compensation, or **Evaluative metering** (with exposure compensation as necessary), or some other method. It takes experimenting.
- The **histogram** may indicate that highlights are blown out (spike at far right edge), and the shot may be fine, because the real life image may have blown-out highlights.
- Take test shots by cranking up the ISO and shutter speed by the same number of stops. E.g. ISO X4 and shutter speed ÷ 4.

Specialty Photography: HDR

For All HDR Shots

- **Do not use in high-contrast scenes except landscapes, and do not use in scenes with vivid colors already present.**
- Shoot in RAW
- Make sure the scene is still (watch out for wind)
- Set the white balance manually.
- Use Aperture priority
- Metering:
 - If spot metering, check the brightest and darkest parts of the scene; use the middle range to take the shot. Alternatively, check the most important or most evenly lit part of the scene.
 - If using evaluative/matrix metering, use as normal.
- Lens manually set to infinity, or the f-stop set to about 13. If a little background blur is desired, or there is reason to stop motion, use a lower f-stop.
- If there is a specific thing to be in sharp focus, zoom in as close as possible and focus manually, then un-zoom.

Automatic HDR

- 2 EV stops if doing 3 bracketed shots; 1 EV stop if doing 5 shots
- Shoot as quickly as possible – in burst mode if possible

Manual HDR

- Set the shutter speed to the high end
- Take a shot.
- Reduce the EV and take another shot.
- Repeat until the EV reduction has resulted in the shutter speed at the low end

Example settings for specific kinds of shots:

- Landscapes – ISO 120-200, f8 or smaller

- Sun just showing above horizon – ISO 200, f16, 1/10 shutter
- Close-up landscape – ISO 200, f10, 1/125 shutter
- Street scene with object close and medium distances – ISO 100, f22, 6/10 shutter
- Large landscape at sunset – ISO 200, f10, 1/13 shutter
- Large landscape in full light – ISO 100, f11, 1/50 shutter