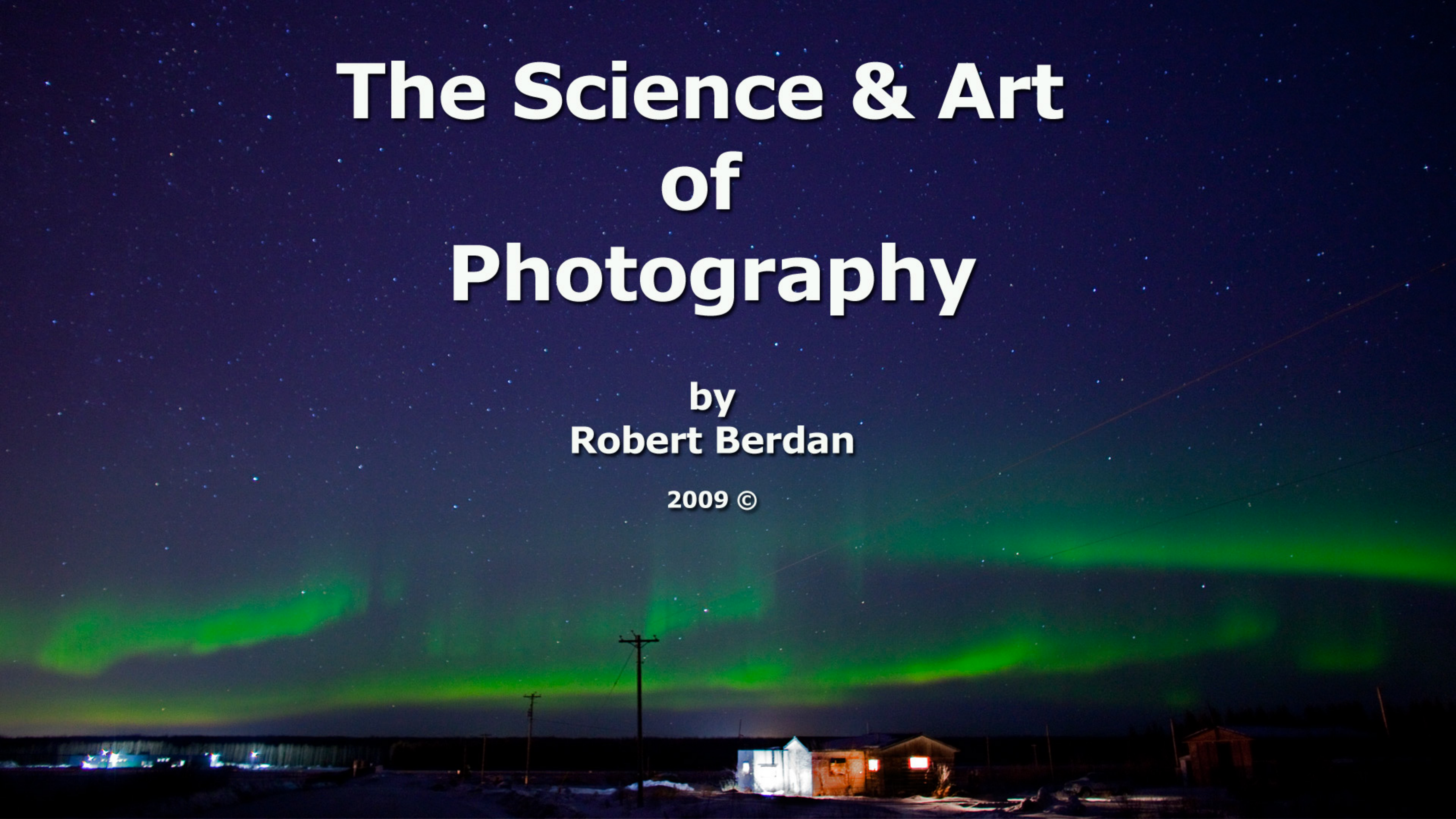


The Science & Art of Photography

**by
Robert Berdan**

2009 ©





Taken by Nicéphore Niépce, this is the first photograph ever taken which still exists. He called his method heliography (sun writing) and this photograph took 8 hours of exposure time (hence sunlight on both sides of the building). France, 1826.











Digital Single Lens Reflex (DSLR) Camera Controls

1. Choice of lens wide, telephoto, macro
2. Camera shooting modes A, T, M, P, B
3. Set Camera ISO Speed
4. Set Color Space sRGB or Adobe RGB
5. Select File type - JPEG or RAW
6. Set White Balance - Auto, Cloudy, Sunny...
7. Select Metering Mode - average, spot, center, matrix
8. Select Focus & Drive Mode - S,C, M
9. Select F-stop to control depth of field
10. Select appropriate filters - polarizer, neutral graduated...
11. Use Flash - on camera or external- set synch mode
12. Select & use Tripod, Monopod, bean bag
13. Camera bag - protect your gear
14. Read and carry your camera manual





Brownie 1900-1935



Kodak Instamatic 1963



Olympus Trip 1968

Professional Single Lens Reflex Cameras



Nikon FM2 1982 Film

**Canon 5D Digital and HD Video
21 Megapixels - 2008**

**Nikon D700 12 Megapixels
2008**

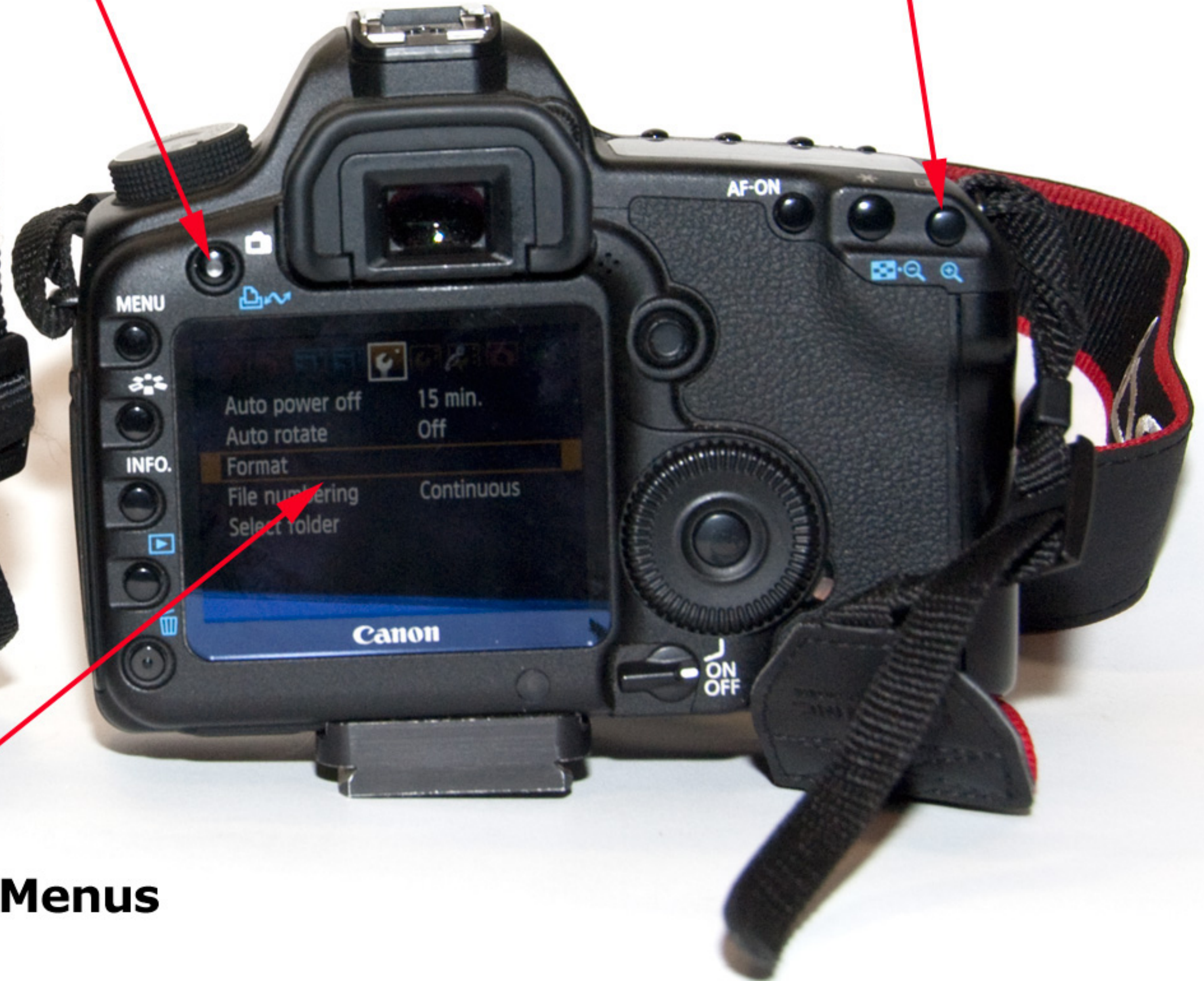
Back Camera Controls on Digital Cameras



Zoom

Live View

Zoom



View Screen & Menus

**Manual \ Auto Focus
Switch**

Shooting Mode

Hot Shoe for Flash

Aperture Control

Diopter lens correction

**Exposure
Compensation**





Lenses come in a variety of focal lengths:

12-35 mm
wide angle

40-70 mm
Normal perspective

70 - 1200 mm
telephoto

Macro lenses
designed for
close-up photography

18 mm F22



40 mm F22



120 mm F22



350 mm F22



IDEAL TRAVEL LENS

Wide

Normal

Telephoto



18 mm F13 1\30 sec



55 mm F13 1\30 sec



200 mm F13 1\30 sec

18-200mm VR Zoom Lens





630 mm F4.8 1\400 sec ISO 200



Digital Camera Simulated ISO Speed



ISO 200

Daylight, sunny, light overcast



ISO 1600

Low Light - Morning, Dusk, Heavy Cloud,
whenever you need faster shutter speed



ISO 25000

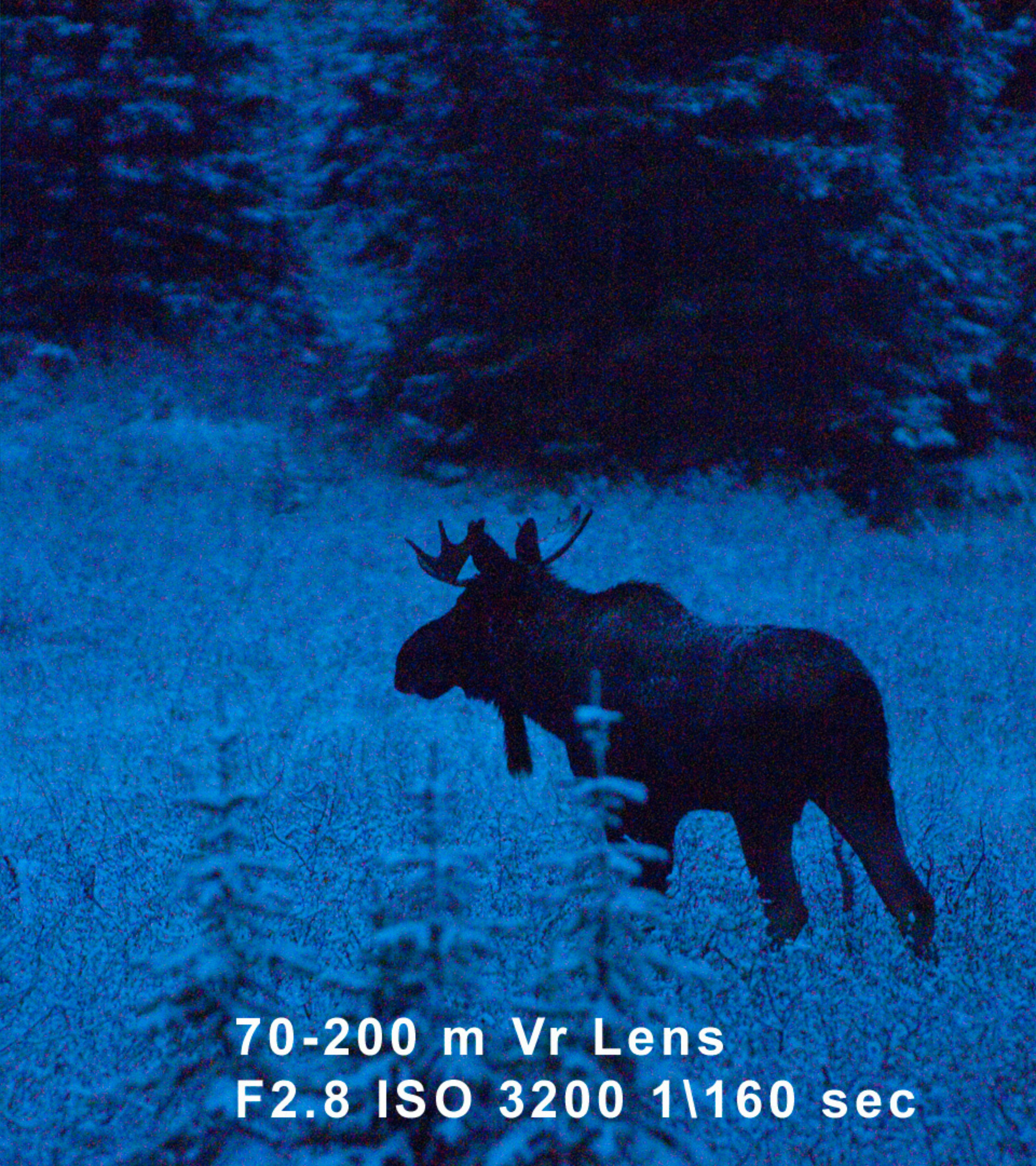
Very Low Light, before sunrise after sunset

Note: actual amount of Noise varies with digital camera chip size, camera model, and noise reduction settings, always try to use the lowest ISO speed possible as it is difficult to reduce noise in existing images.

Both Nikon D2X



70-200 mm VR Lens
F2.8 ISO 400 2.5 sec

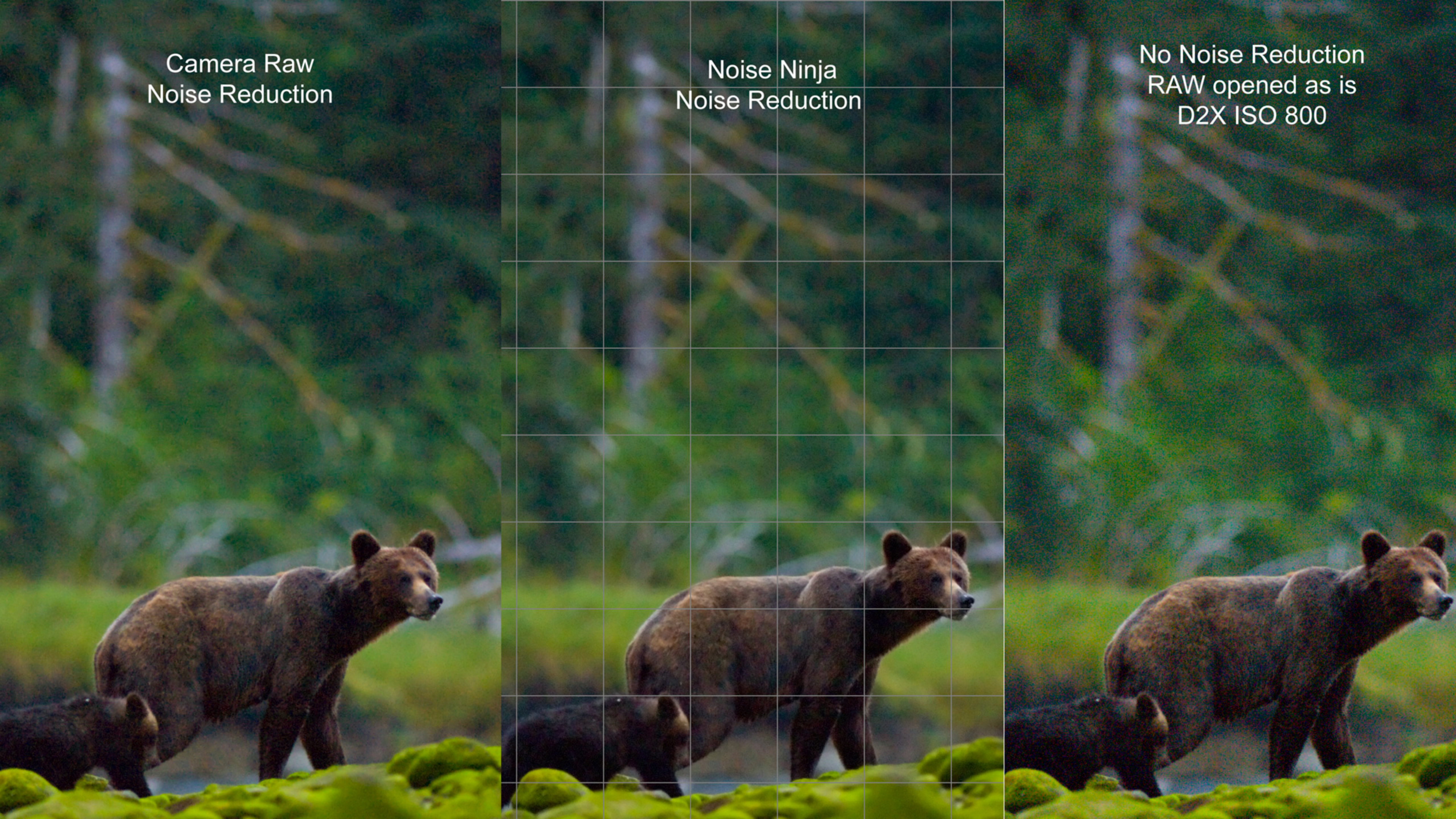


70-200 m Vr Lens
F2.8 ISO 3200 1\160 sec

Camera Raw
Noise Reduction

Noise Ninja
Noise Reduction

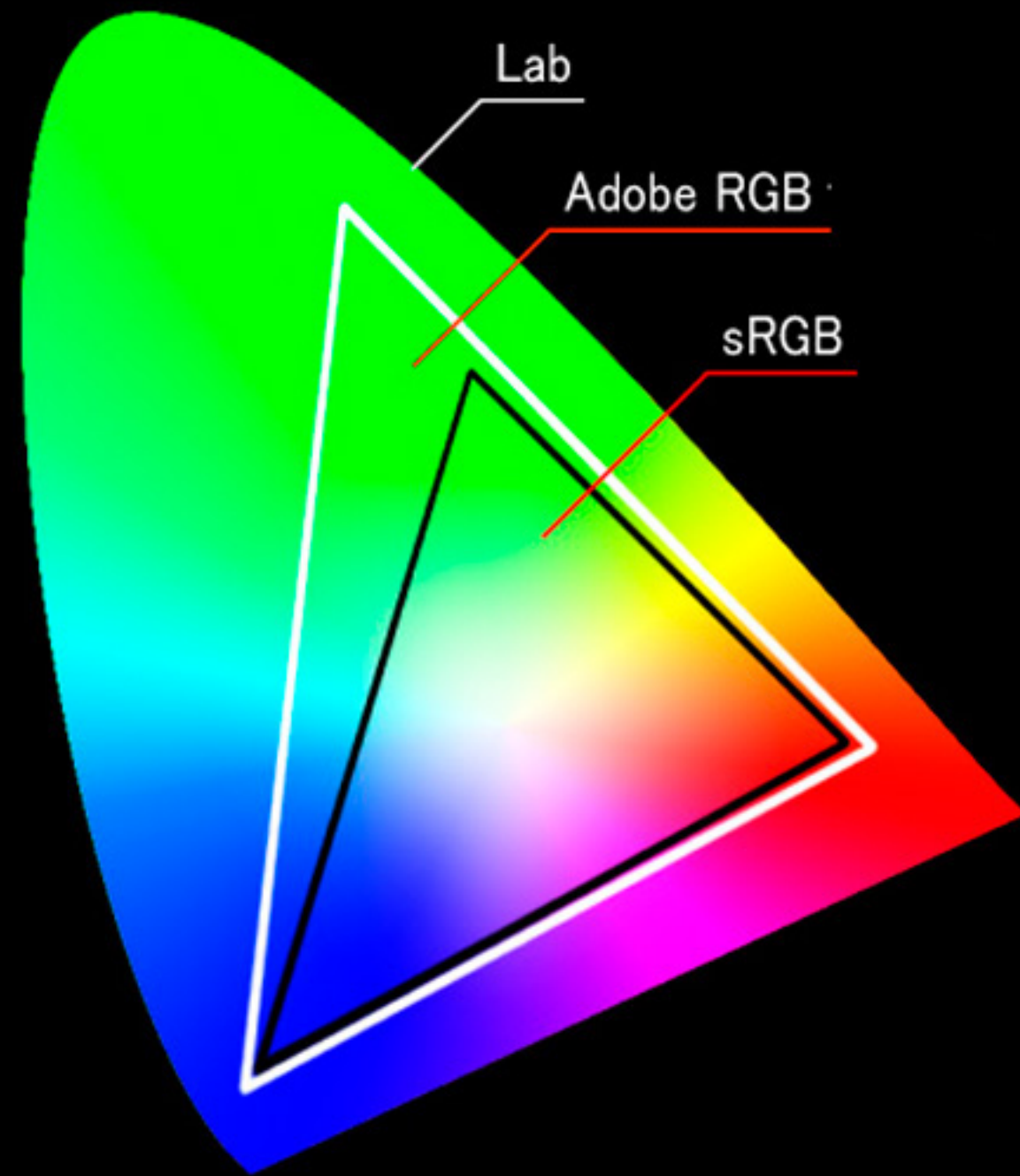
No Noise Reduction
RAW opened as is
D2X ISO 800



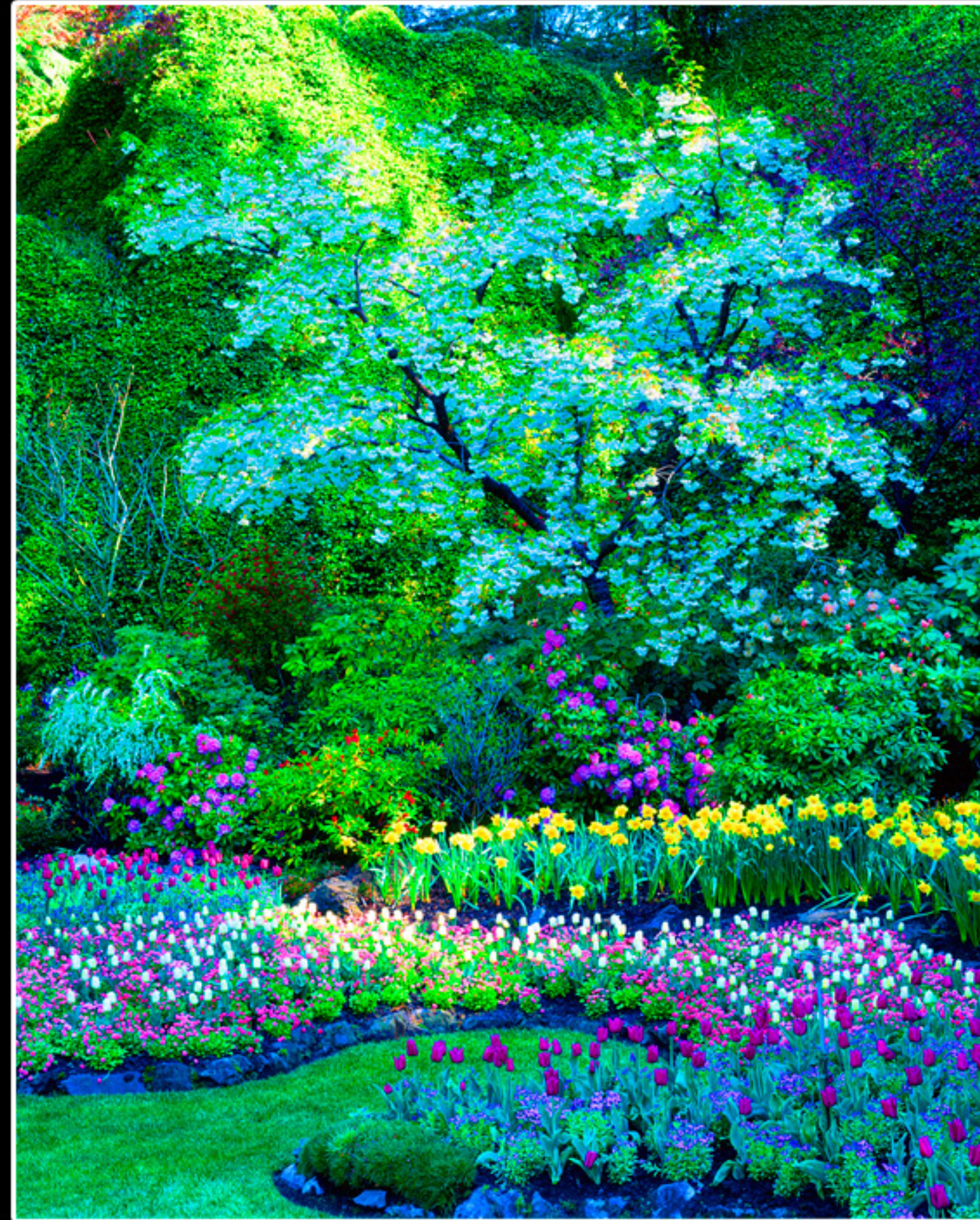


630 mm F3.2 ISO 1600 1/6400 sec

Color Space

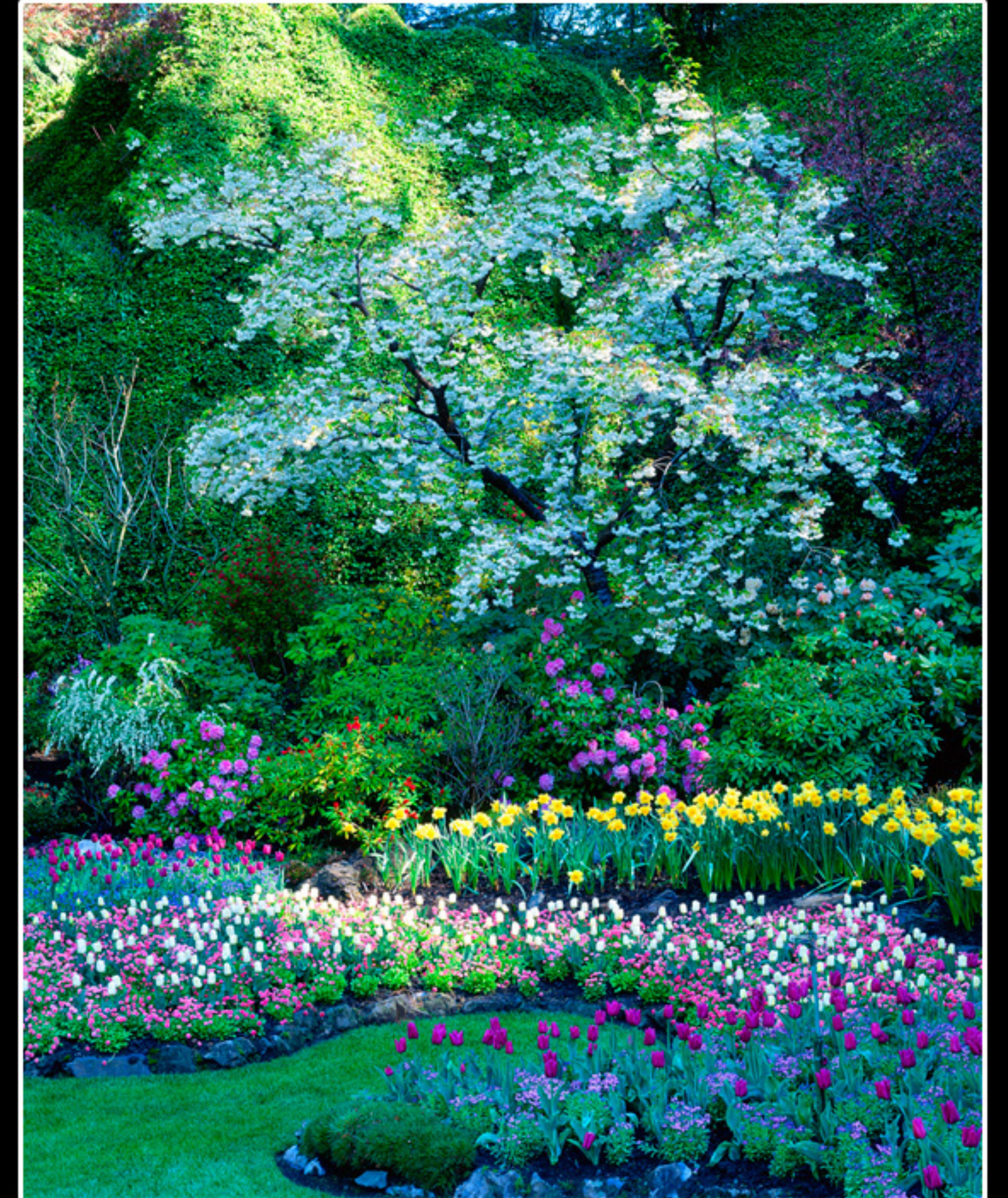


LAB - range of colors
average person can see



sRGB

Best for Web, printing with
no post processing



Adobe RGB

Best for shooting RAW Files
Postprocessing images

Camera File Types

| |
|-----------------------|
| .jpg |
| .tif |
| RAW |
| RAW compressed |

JPEG (.jpg)

Processed in camera

8 bit color or 256 shades of RGB

Smaller File Size (S, M, L) camera can shoot sequence of images faster (higher burst rate).

White balance must be set correctly

Enlargement limited to about 25%

Can embed files in email or web page

Can be opened in most software and viewed directly on computer

nonproprietary file format

RAW

Requires post processing in software

12-14 bit color – 4096 to 16,384 shades of RGB - i.e. more and better colors

Some cameras offer different size RAW files, and or compressed RAW

White balance can be modified during post processing

Can recover “some” blown out highlights

Exposure can be altered during post Processing +/- 2-3 F-stops (no need to bracket exposures)

Can enlarge images 100% or more

Wider dynamic range, approx 2 F-stops

File size is large and writes to storage medium slower than .jpg– slower burst rate

Many proprietary file types – often requires software updates or conversion to .DNG

***RAW is best for quality and flexibility though it requires post processing with computer and software - processed images best stored as .tif files (keep your RAW files).**



RAW Before Processing



RAW After Processing

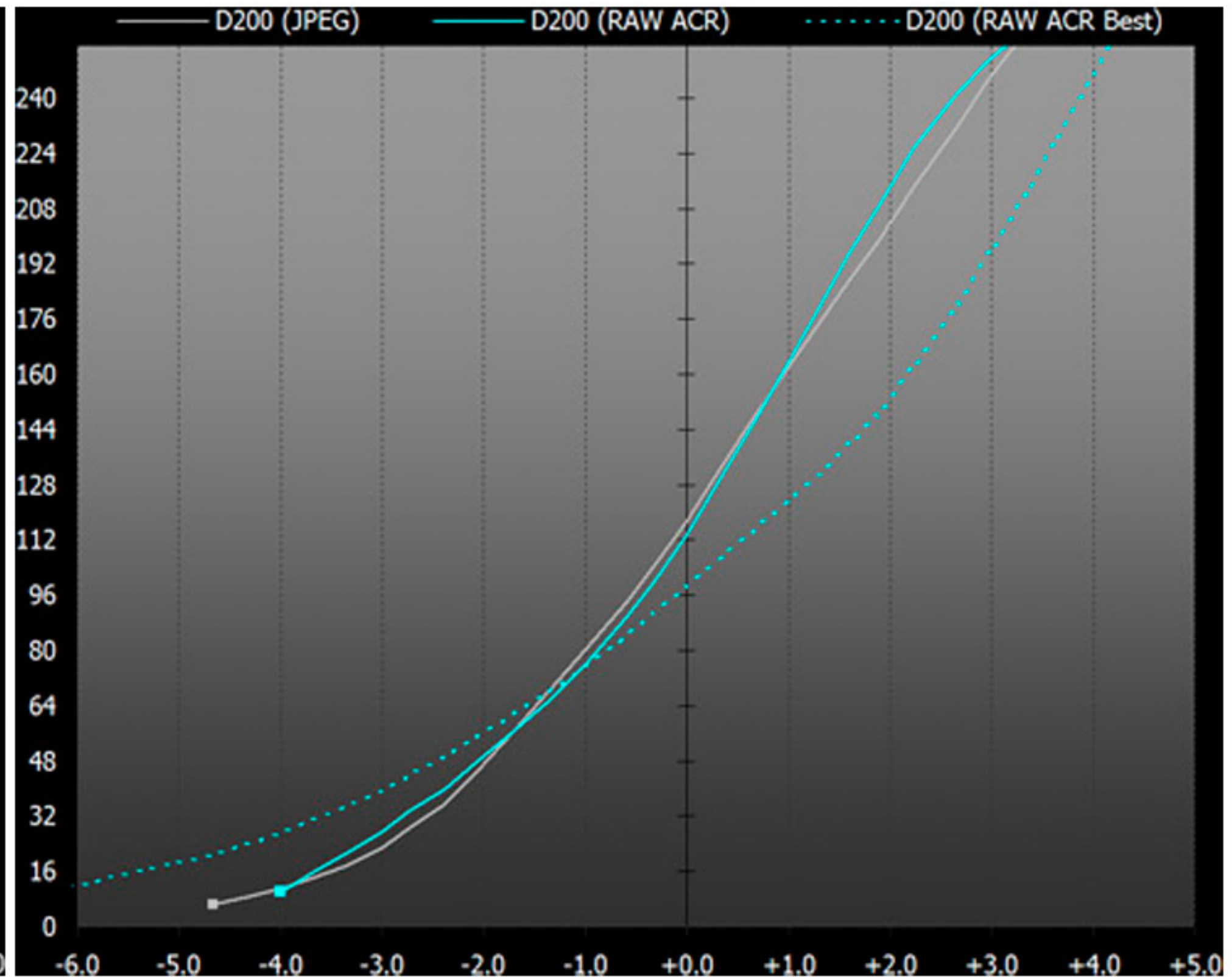
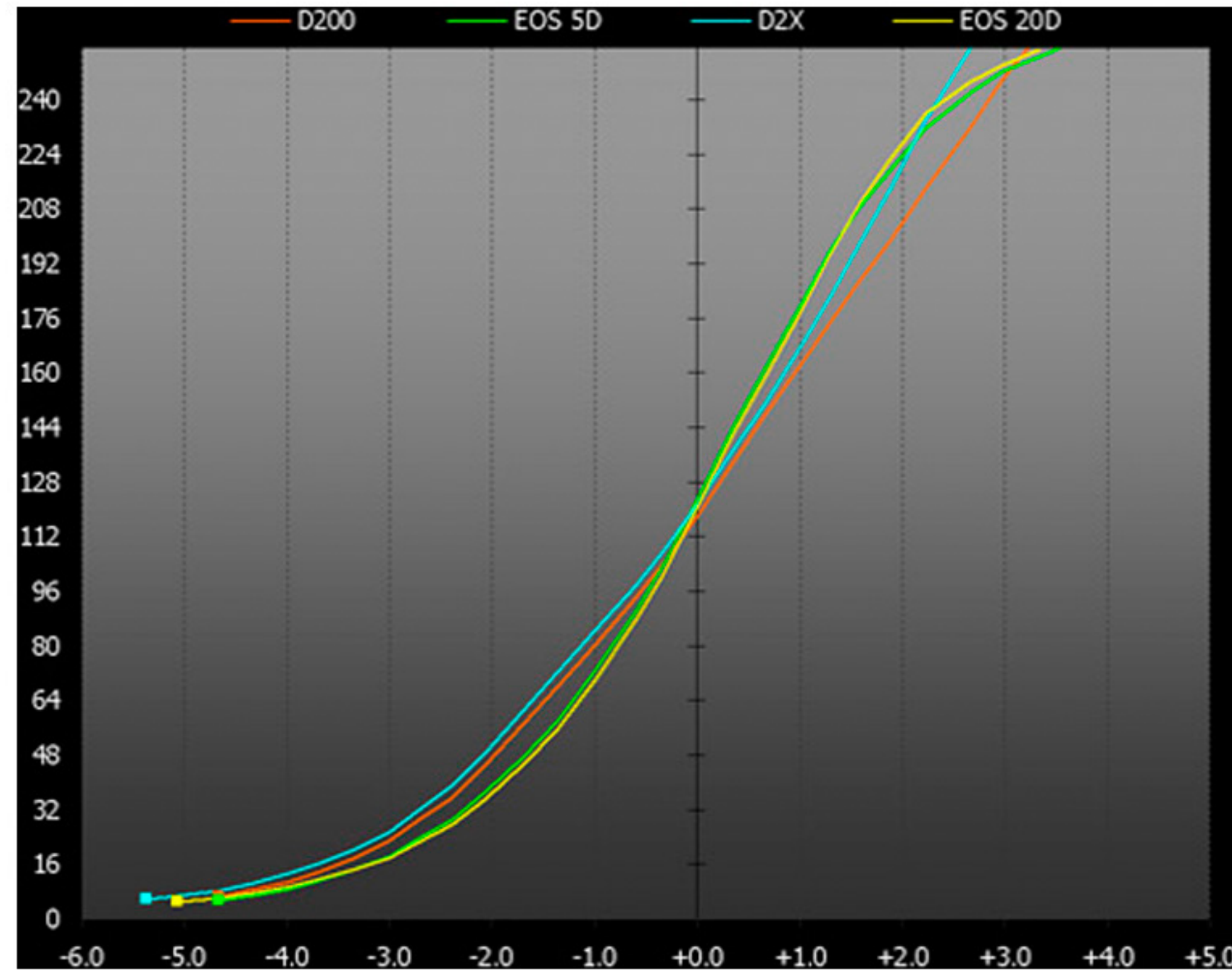
Measuring Digital Camera Dynamic Range

Dynamic Range measurement system involves shooting a calibrated Stouffer Step Wedge



SHOOTING IN RAW CAN
EXTEND the Dynamic Range from
8.5 to approx. 11 F-stops

modified from www.dpreview.com



| Camera (ISO 100) | Shadow range | Highlight range | Usable range |
|------------------|--------------|-----------------|--------------|
| Nikon D200 | -5.0 EV | 3.2 EV | 8.2 EV |
| Canon EOS 5D | -4.7 EV | 3.5 EV | 8.2 EV |
| Nikon D2X | -5.5 EV | 2.7 EV | 8.2 EV |
| Canon EOS 20D | -5.1 EV | 3.4 EV | 8.4 EV |

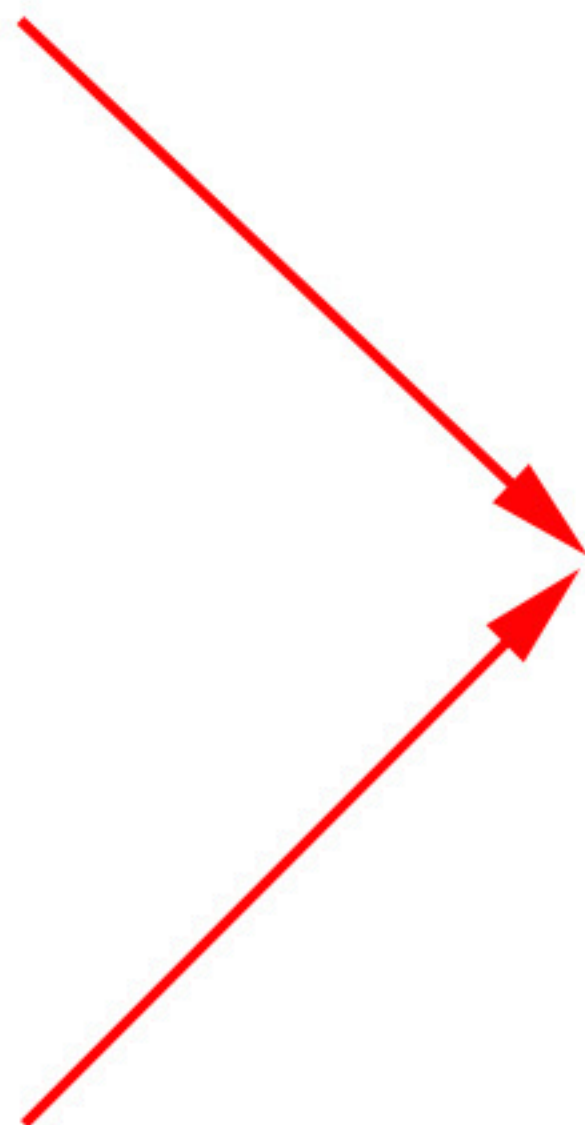


EXPANDING DYNAMIC RANGE

-1



+1



Two exposures combined



White Balance



Sunlight



Cloudy\Overcast



Shade



Fluorescent



Tungsten



Flash



Custom



Cool 9000 K



Normal 6500 K



Warm 3500 K



Standard



Vivid

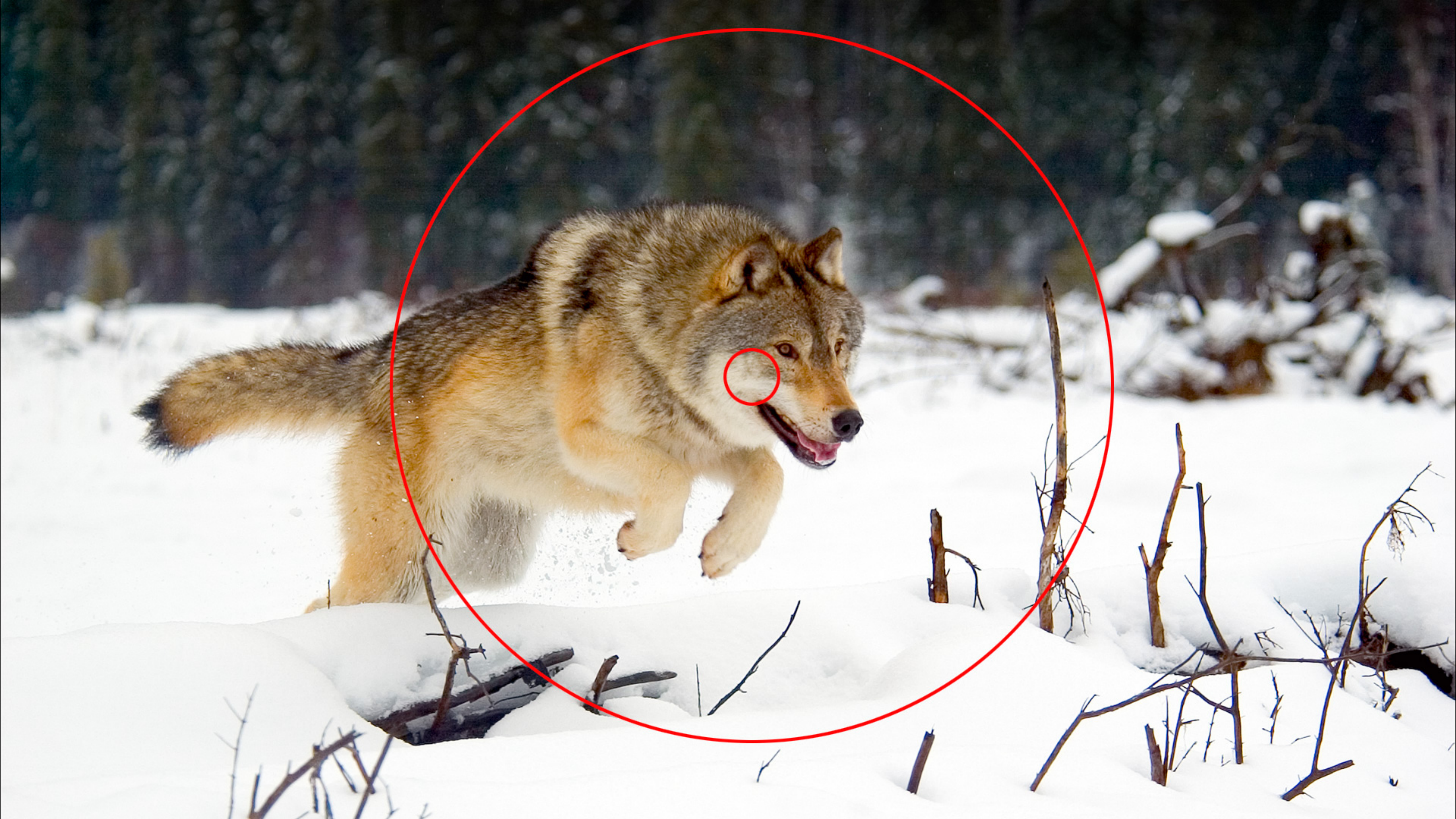


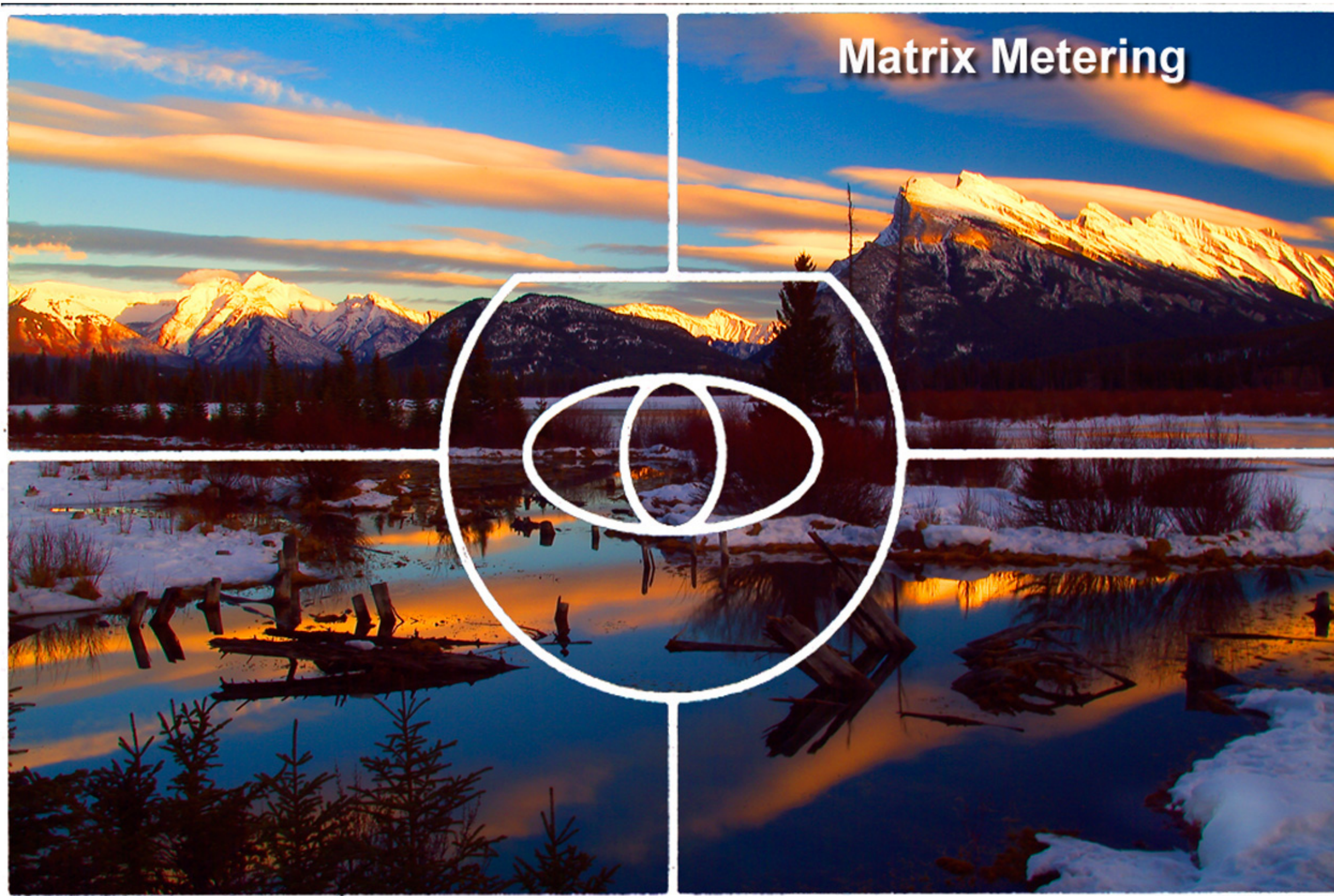
Black & White



Sepia

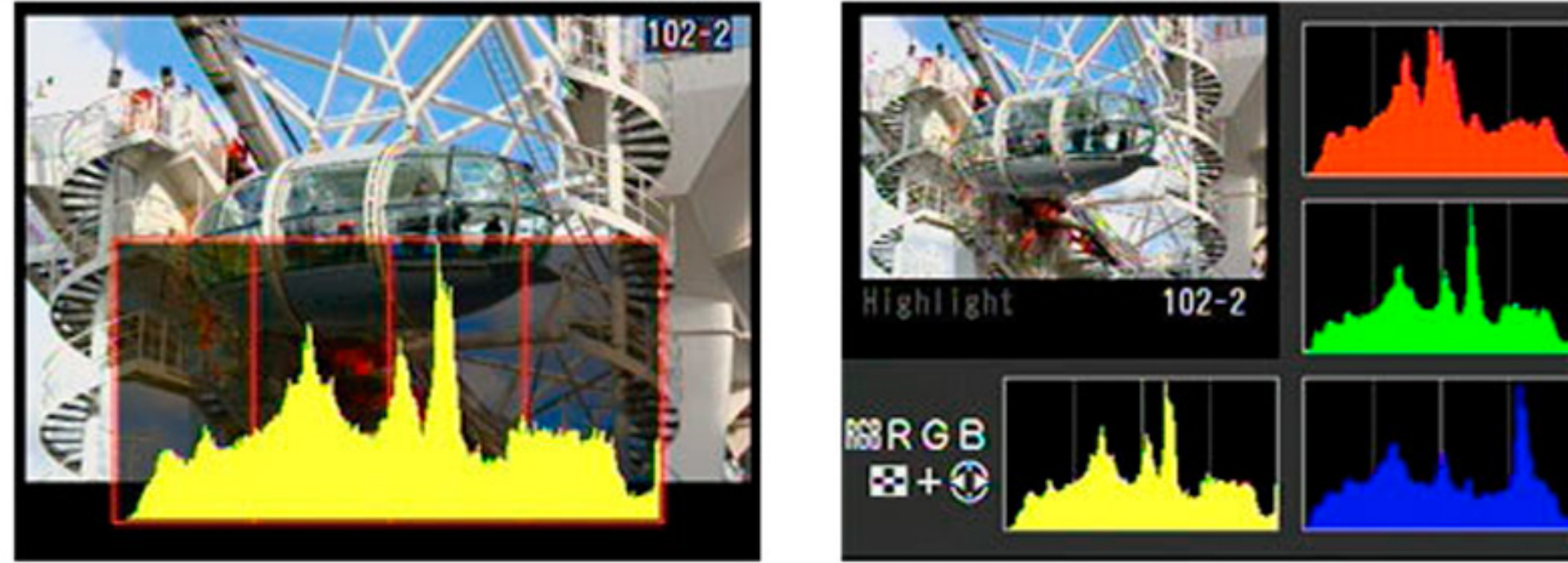
Always shoot in Color and then convert to BW or Monotone image in Photoshop for maximum control





Nikon - Matrix metering, Canon - Evaluative metering, Minolta & Pentax - honeycomb pattern metering
This metering pattern is recommended 95% of the time and works well for most types of lighting

Use the Histogram Function to Determine Exposure with Digital Cameras



Under Exposed



Correct Exposure



Over Exposed



Exposure Compensation



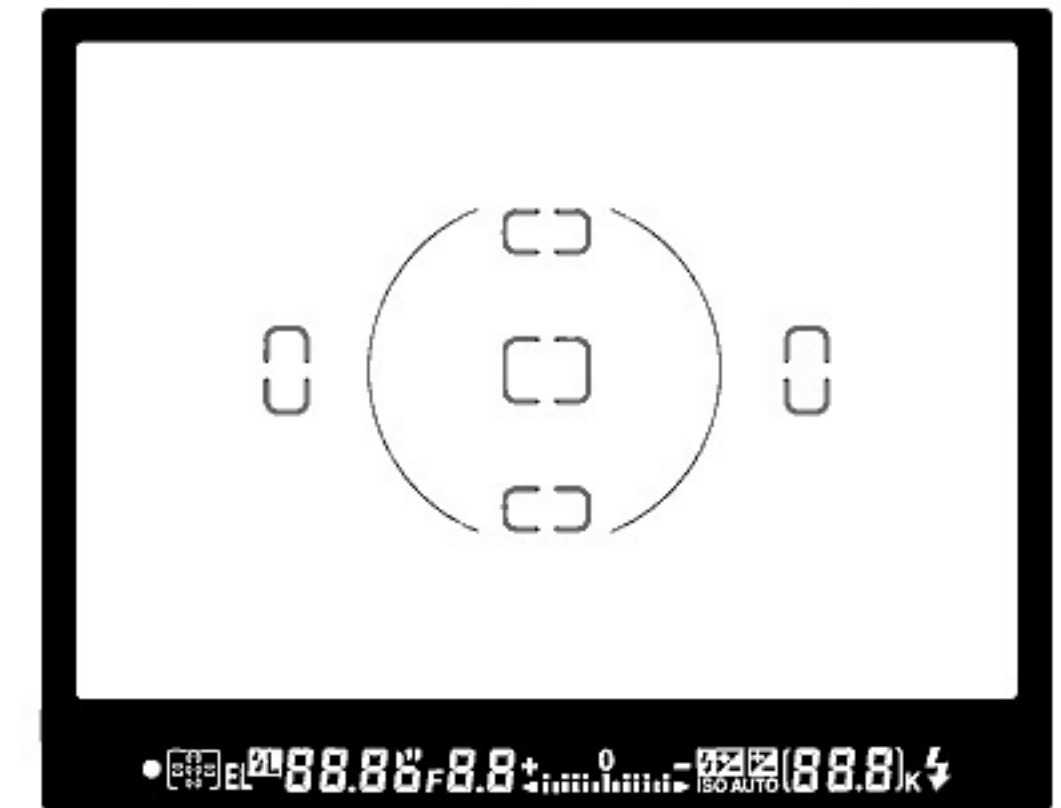
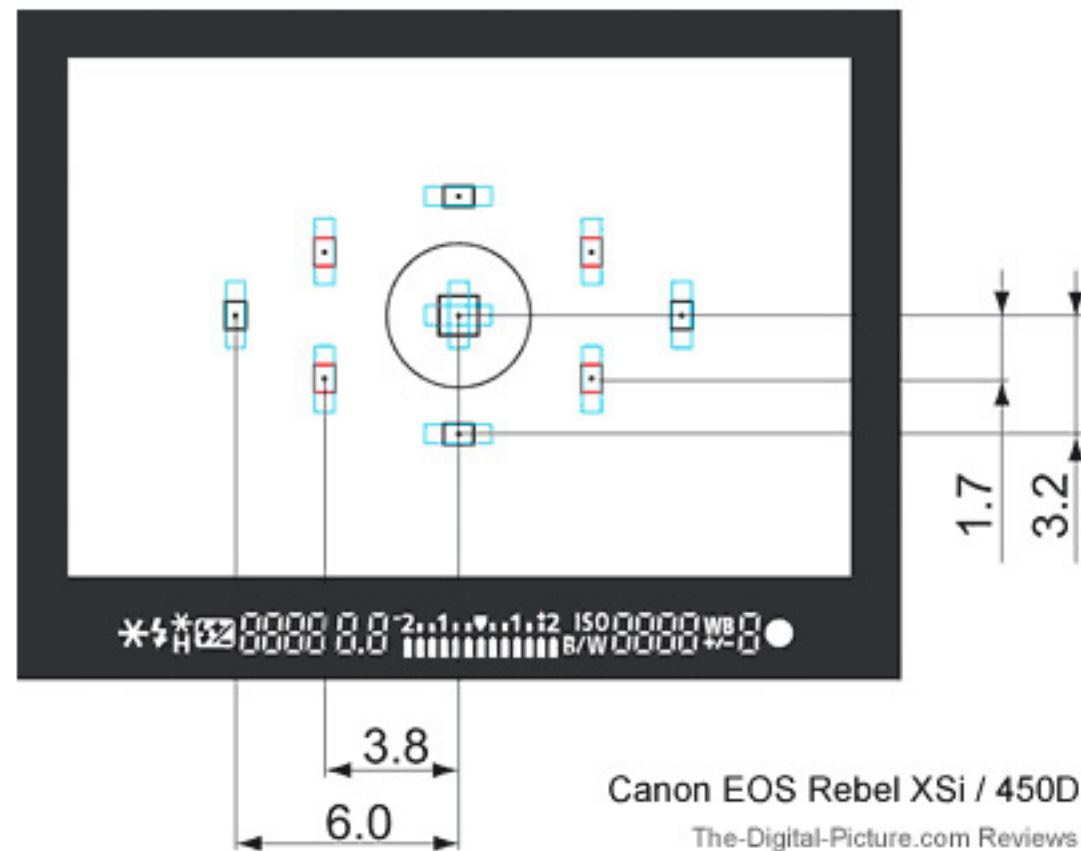
-2\3 Exposure



Normal Exposure



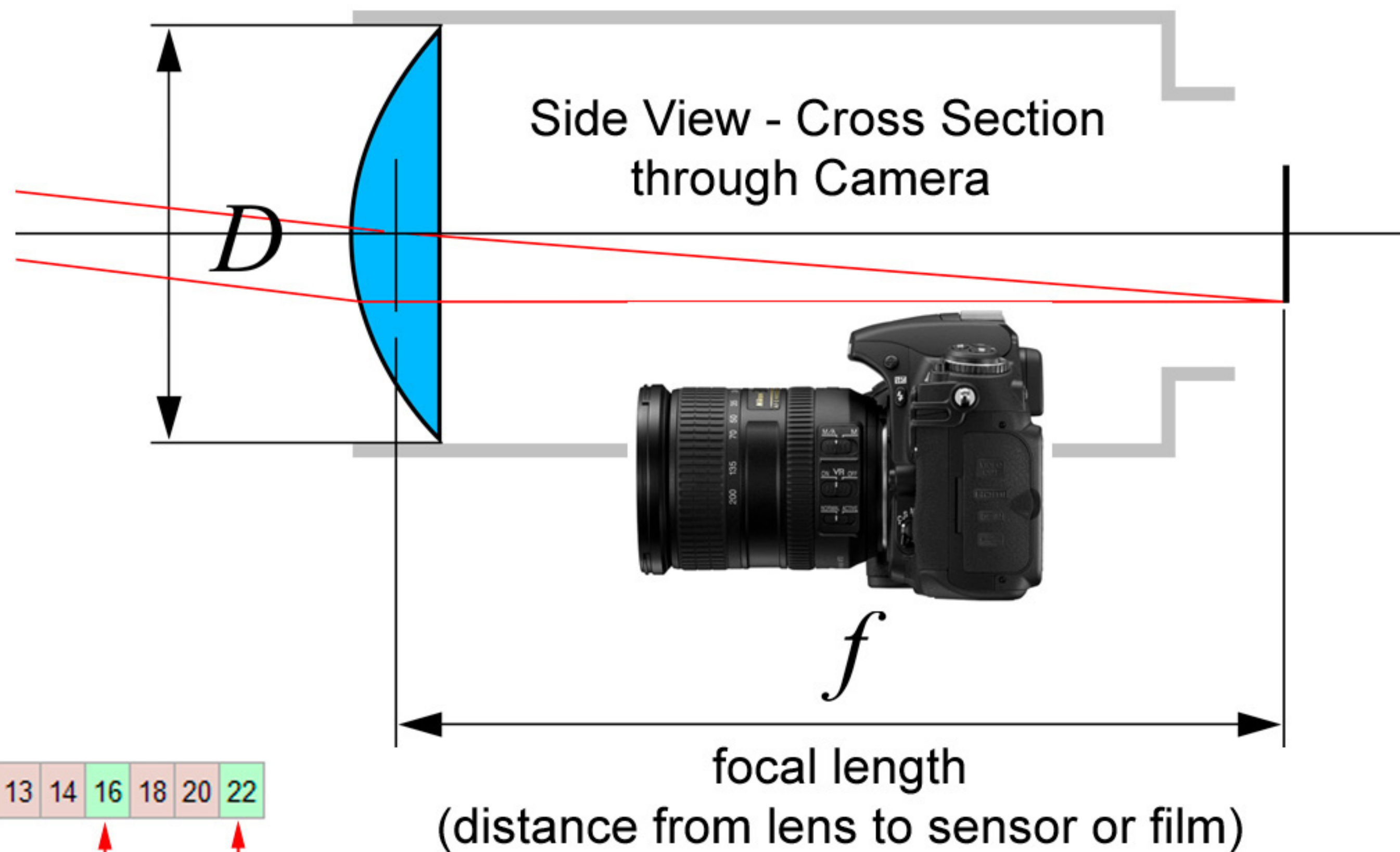
+2\3 Exposure



F - stops Control the Amount of Light and Depth of Field



D - lens opening or diameter controlled by Aperture



Typical one-third-stop f-number scale

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--------|-----|-------|-----|-------|-----|-------|-----|------|-----|------|-----|------|-----|-----|-----|-----|-----|-----|---|----|----|----|----|----|----|----|----|---|
| <i>f</i> # | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.8 | 2 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 4 | 4.5 | 5.0 | 5.6 | 6.3 | 7.1 | 8 | 9 | 10 | 11 | 13 | 14 | 16 | 18 | 20 | 22 | |
| | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ | | ↑ |
| | 1\1000 | | 1\500 | | 1\250 | | 1\125 | | 1\60 | | 1\30 | | 1\15 | | 1\8 | | 1\4 | | 1\2 | | | | | | | | | | |

Each F-stop is equivalent to a 50% difference in light or one shutter speed - change the F-stop you must change the shutter speed and vice versa

$$F - \text{stop (ratio)} = \frac{\text{Focal Length}}{\text{Lens Aperture (Diameter)}}$$

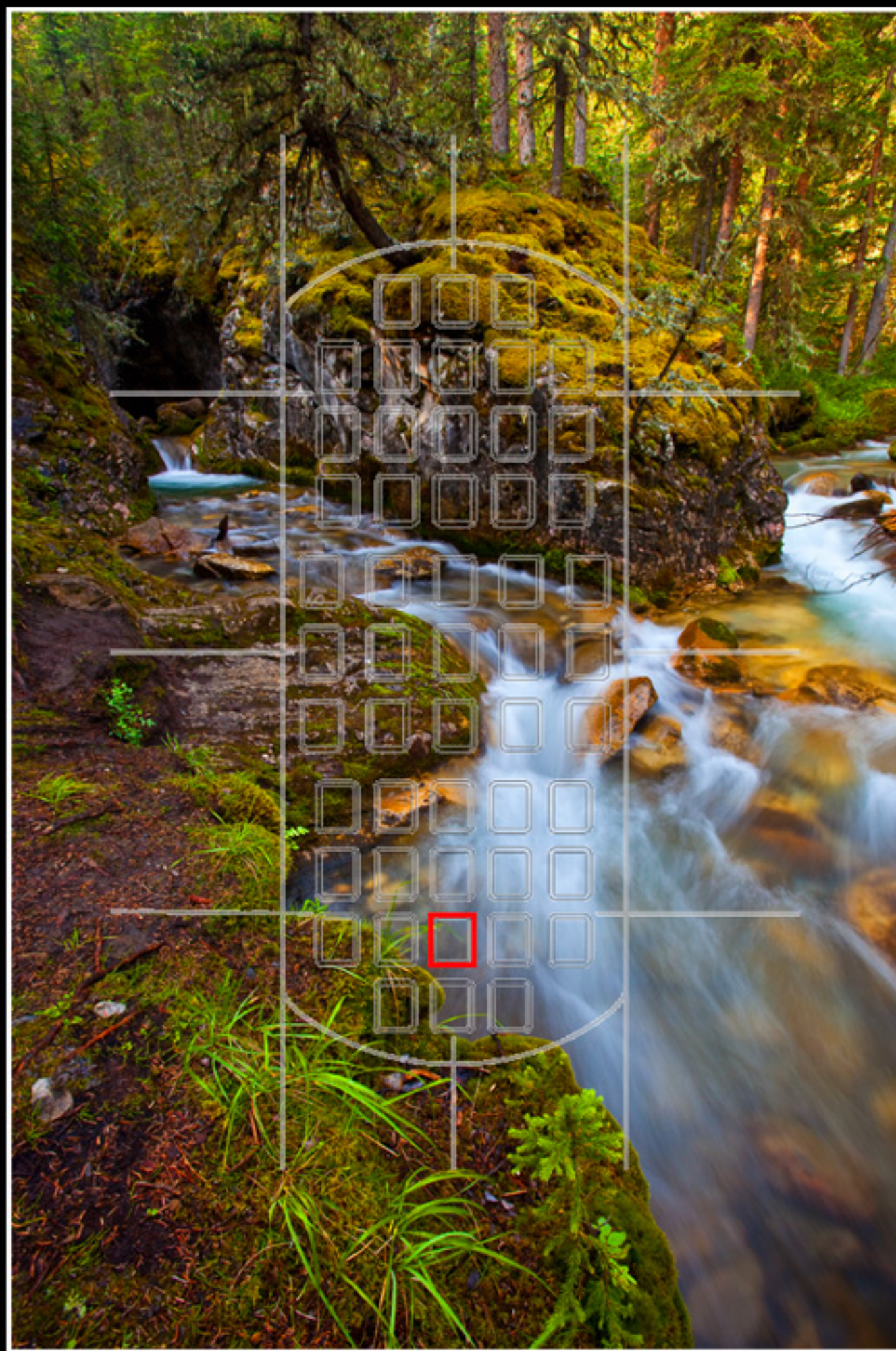


F2.8



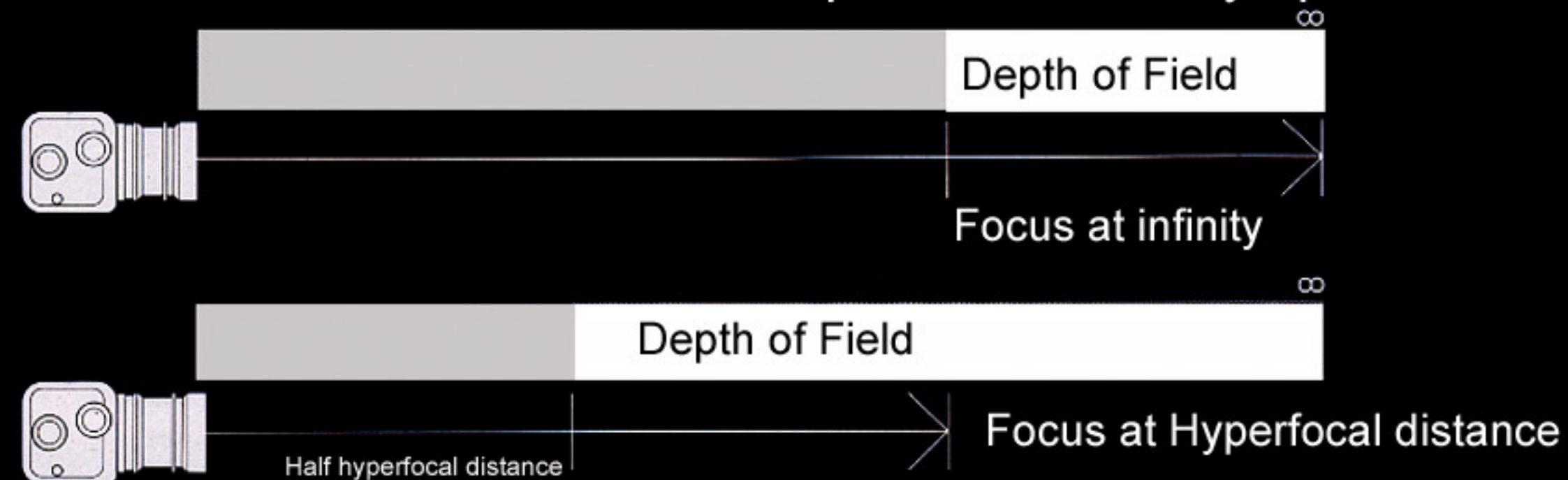
F16

Hyperfocal Distance



Focus at 1/3 from bottom of screen

How to achieve the maximum depth of field at any aperture



Focus at infinity



Focus at Hyperfocal distance

1/3 of the view in front of the focus point and 2/3 behind is in focus - so the best point to maximize depth of field is 1/3 from the bottom of your viewfinder.



16 mm F22 3.2 sec
ISO 125 - hyperfocal



300mm F2.8 1\1000 sec



300mm F16 1\30 sec



300 mm F2.8 Lens
ISO 200 1\4000 sec

Shutter Speed and Water Movement

200 mm Lens Velvia 100 F - Sunny Day Cameron Falls, Waterton, AB



1.) F2.8 1/500 sec



3.) F22 1/8 sec



2.) F8 1/60 sec



4.) F22 & Polarizer 1/2 sec

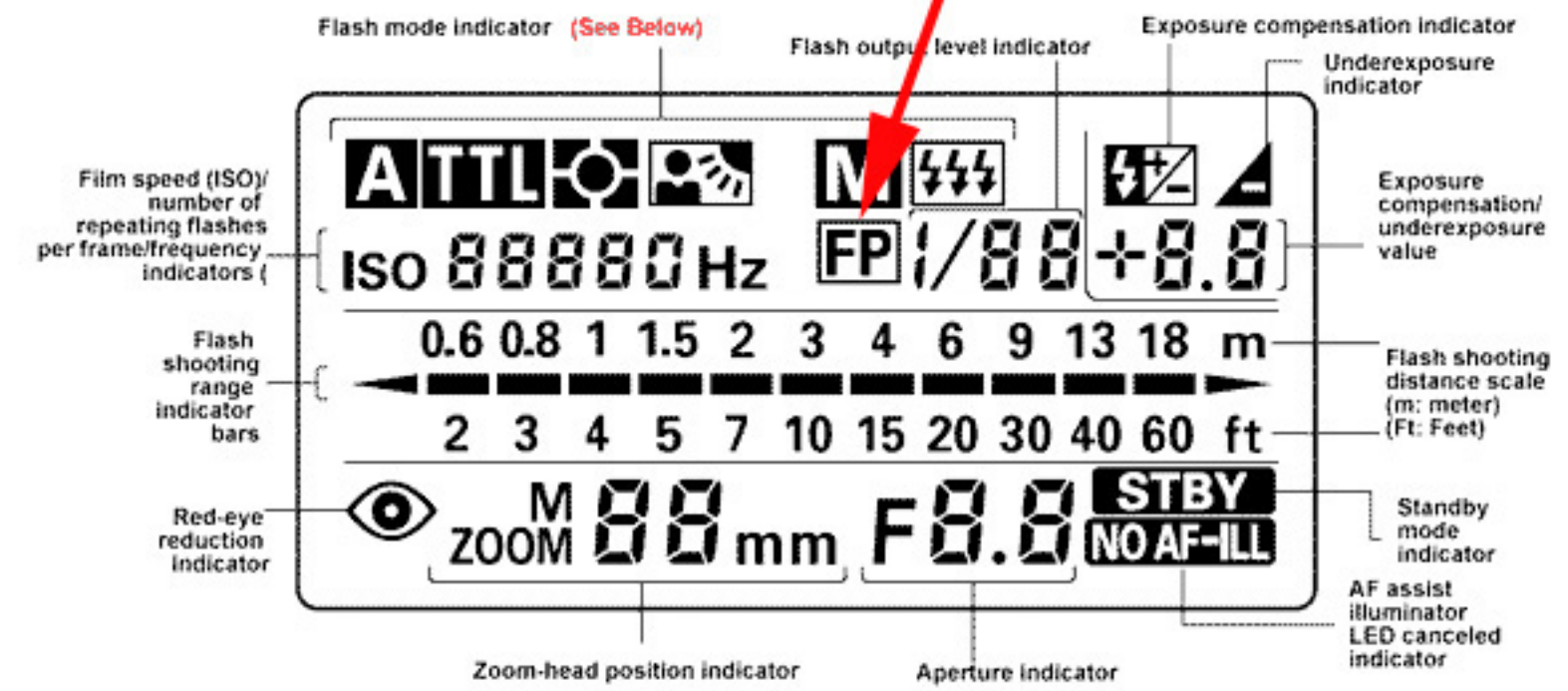


55mm F2.8 13 sec

Using Your Flash



FP Nikon's high speed sync



Guide number

(ISO 100, m/ft)

| Flash output level | Zoom-head position | | | | | | | |
|--------------------|--------------------|--------|---------|---------|---------|---------|--------|---------|
| | 18mm | 20mm | 24mm | 28mm | 35mm | 50mm | 70mm | 85mm |
| 1/1 (full) | 18/59 | 20/66 | 30/98 | 32/105 | 36/118 | 42/138 | 48/157 | 50/164 |
| 1/2 | 12.7/42 | 14/46 | 21/69 | 22.5/74 | 25.5/84 | 30/98 | 34/112 | 36/118 |
| 1/4 | 9/30 | 10/33 | 15/49 | 16/53 | 18/59 | 21/69 | 24/79 | 25/82 |
| 1/8 | 6.4/21 | 7/23 | 10.5/35 | 11.3/37 | 12.7/42 | 15/49 | 17/56 | 18/59 |
| 1/16 | 4.5/15 | 5/16 | 7.5/25 | 8/26 | 9/30 | 10.5/35 | 12/39 | 12.7/42 |
| 1/32 | 3.2/10 | 3.5/11 | 5.3/17 | 5.7/19 | 6.4/21 | 7.5/25 | 8.5/28 | 9/30 |
| 1/64 | 2.3/8 | 2.5/8 | 3.8/13 | 4/13 | 4.5/15 | 5.3/17 | 6.0/20 | 6.3/21 |

Guide Number = $\frac{\text{distance} \times \text{F-stop}}{\text{ISO Sensitivity Factor}}$

ISO Sensitivity Factor

ISO 100 = 1X, 400 = 2X; 800 2.8X

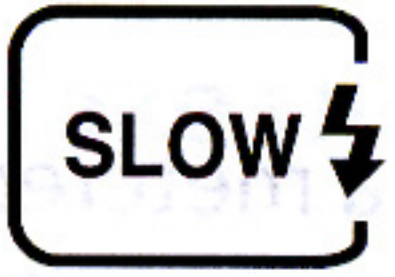
Flash Modes

Flash Modes



Front-curtain
sync

Recommended for most situations. Shutter speed usually set between $1/250$ and $1/60$ sec. Some Cameras and flash units allow higher speed shutter synchronization (FP flash e.g. Nikon D300 and D700 cameras). When using this mode in low light - the background tends to be dark or turn black.



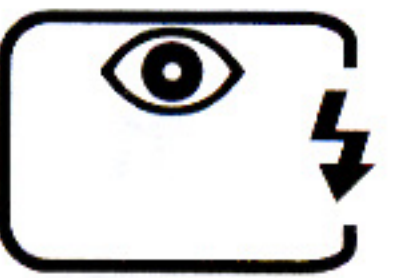
Slow sync

Flash is combined with shutter speeds as slow as 30 seconds. This allows ambient light to be part of the picture. In order to use this mode in shutter speeds less than $1/15$ sec you will need to place your camera on a solid support like a tripod.



Rear-curtain sync

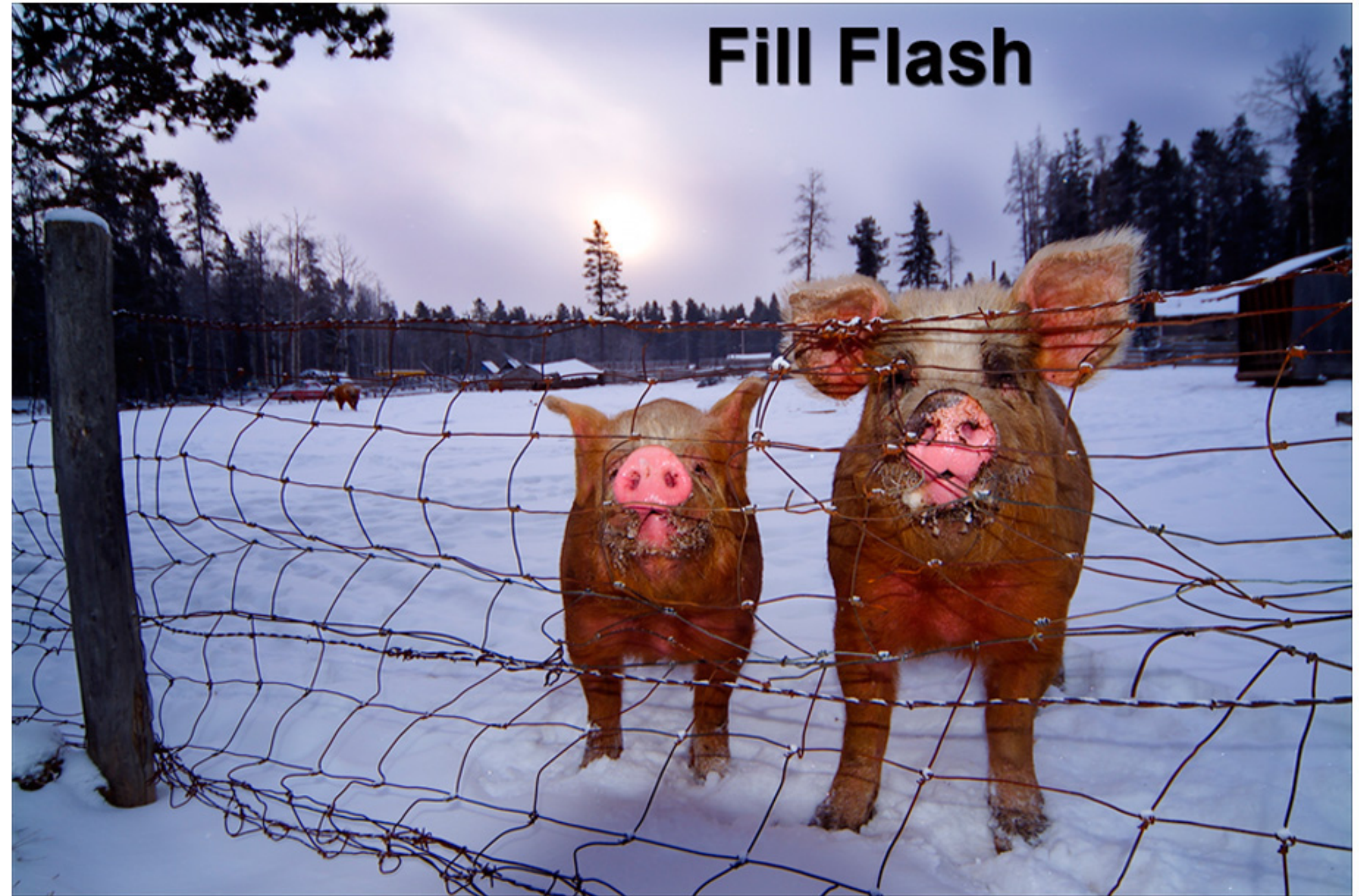
The flash fires just before the shutter curtain closes and with moving subjects and lights, the light streams behind the subject.



Red-eye
reduction

The flash fires a burst of low intensity flashes about 1 sec before the main flash fires. This is used primarily in low light and with a built in camera flash. If a flash is moved away from the axis of the lens i.e. above or to one side of the camera, red eye reduction is rarely required. Red eye can also be easily fixed in most image editing programs.

Using your Camera Flash with Backlighting



Shooting into the Sun and using a Fill Flash





10.5 mm F8 1/320 sec ISO 200

Autofocus Settings & Drive Modes

- S** - single servo focuses when the shutter is pressed half way, camera will not permit you to shoot unless subject is in focus.
- C** - continuous servo focuses continuously when shutter is pressed half way - release priority - means it will shoot even if subject is not in focus.
- M** - manual focus - use this method if camera can not focus on subject, e.g. if F-stop of lens exceeds F5.6 or subject low in contrast.

Self Timer - use to reduce shake or take self portraits

Moving Subjects

Nikon - use Dynamic Area autofocus to track moving subjects.

Canon - use AI Servo focuses continuously while shutter button is held down.



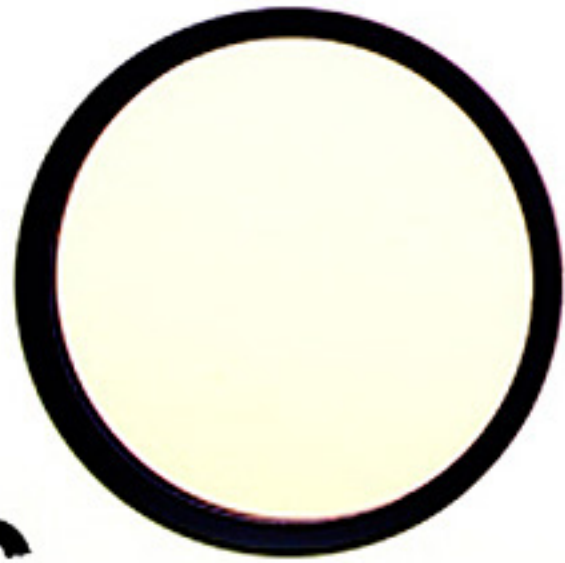
A



B



C



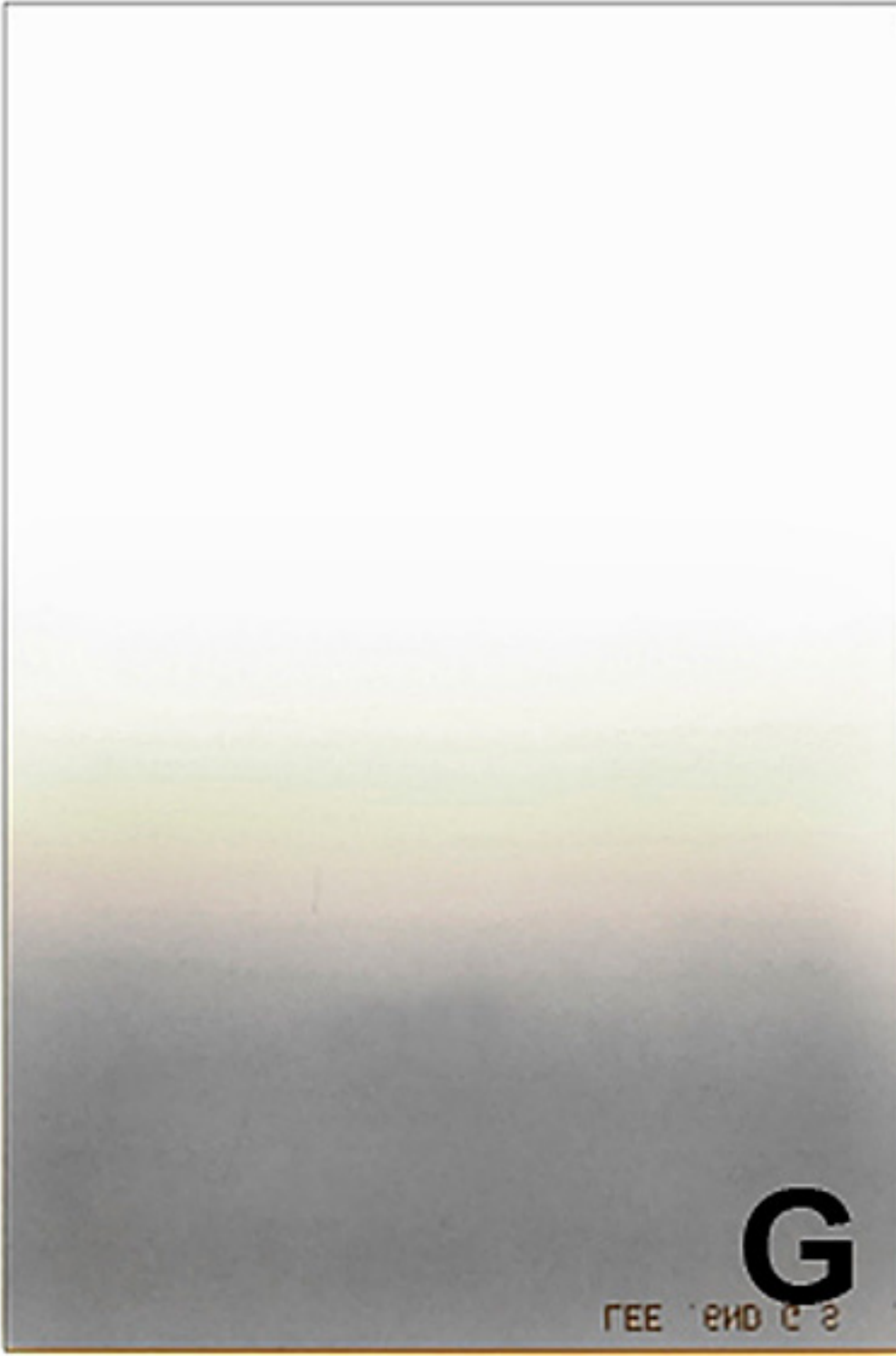
D



E



G



F





20 mm Lens Velvia No Filter

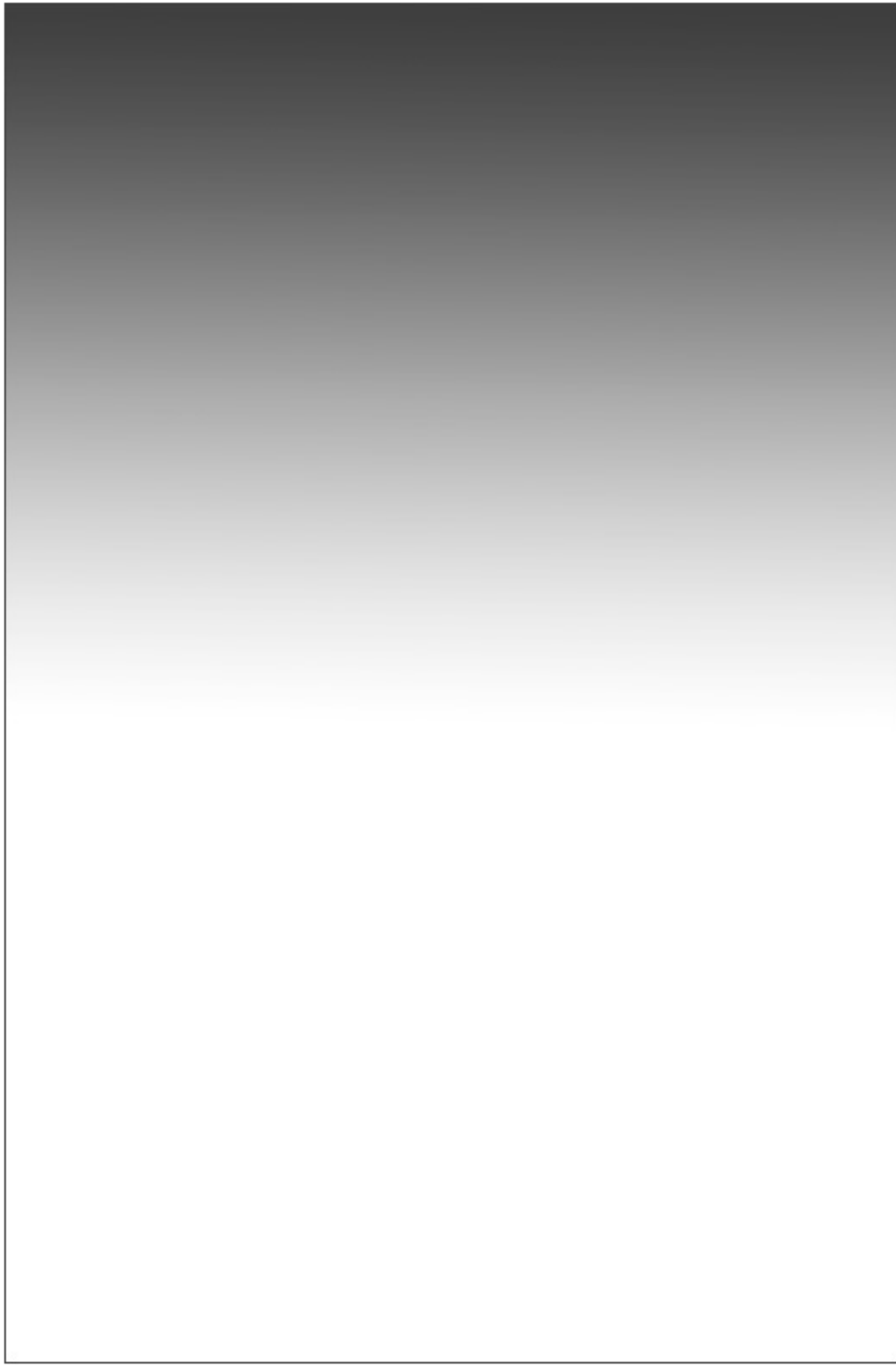


20 mm Lens Velvia Polarizer



Blue\Gold Polarizer

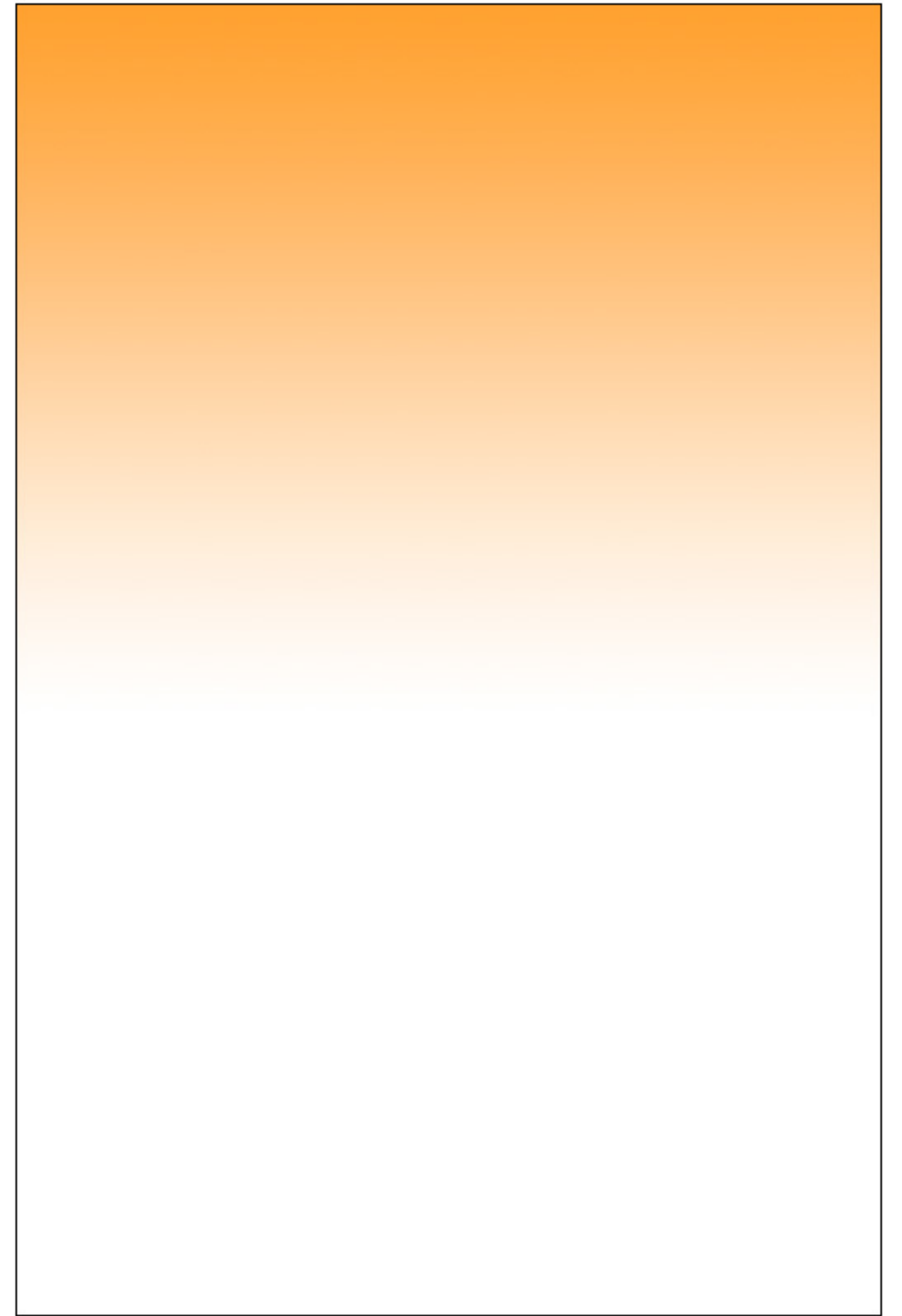
Neutral Density Grad Filters



0.6 ND Soft Grad



0.6 ND Hard Grad



Sunset Soft Grad

Neutral Density Graduated Filters



without



with

Photoshop can simulate a neutral density grad filter but it's always best to use one when possible - to darken skies and lighten foreground elements



Choosing a Tripod and Head



Carbon fiber construction
legs should go flat to the ground
legs should have rubber grips
No center post or remove existing one
Rubber tipped feet with metal points
Legs should not lock up when wet



3 - geared head good
for slow deliberate
compositions - landscapes



Really right stuff Ball Head
Quick release - arca swiss
plates



Wimberly for
Large Telephoto
Lenses



Monopods are good for photographing birds and fast moving subjects

Shooting in the Rain









10.5 mm Wide Angle lens
F22 1\13 sec ISO 100



Panorama Heads
Set Camera to Manual - lock exposure



Kananaskis Upper Lake
Stitched Panorama

360 PANORAMAS



Carrying your Camera Gear



Summary - Photography Recommendations

1. Select Aperture priority mode and matrix metering most of the time.
2. Set ISO speed to lowest setting the available light permits with a shutter speed of $1/60$ of sec or faster - use vibration reduction\image stabilization if your have it.
3. For highest quality and flexibility use RAW, Adobe RGB color space & Auto WB.
4. For moving subjects and wildlife use Continuous shooting mode and your widest aperture with the fast shutter speed available.
5. For landscapes select F11-22, focus on hyperfocal distance and use a tripod.
6. Most useful filters to own are circular polarizer and neutral density grads.
7. Know your camera - read your manuals & use your gear frequently.

