Digital Photography

The Basics: Cameras, Lenses, Focus, Exposure, White Balance, Image Files, and Composition

Goals – Understand the Camera and Functions

- Camera
  - Attributes of different kinds
- Lens
  - How to choose the right lens
- Exposure
  - Controlling the right amount of light
- Focus
  - How to focus and control depth of field
- Composition
  - Some traditional rules of composition

More Goals and Tools

- Managing and Editing Images
  - Metadata
    - Used to keep paper notes about images
    - Now the information about your images is attached to the image file
  - Editing Images
    - Editing is important
      - Cropping, colors, exposure, noise, …
  - Software
    - Lightroom and Photoshop
    - Photoshop Elements (not the same as Photoshop)
    - ACDSee
    - Corel Paintshop Pro
    - Cyberlink PhotoDirector
    - Google Photos (replaced Picasa)
    - Others

Wrong Things (Don’t do!)

- Wrong focus mode or spot location
- Automatic Mode (use Av, Tv, Manual)
- Wrong exposure, over/under, and/or ISO
- Jpg instead of Raw
- Auto white balance
- Holding the camera incorrectly

Class Questions

The agenda is flexible! This isn't a credit class.

- Feel free to ask questions, if you are confused you are likely not the only one
- We will take the time to make sure that concepts are well understood

Class Activities

- Cover the basics this week
  - Email questions if we don’t cover in class
- Next week we will take some pictures
  - Red Hills Desert Garden

Computers and OS's

- Apple/Macs
  - OSX
- PC's
  - Windows
  - Linux
- Tablets
  - iOS
  - Android

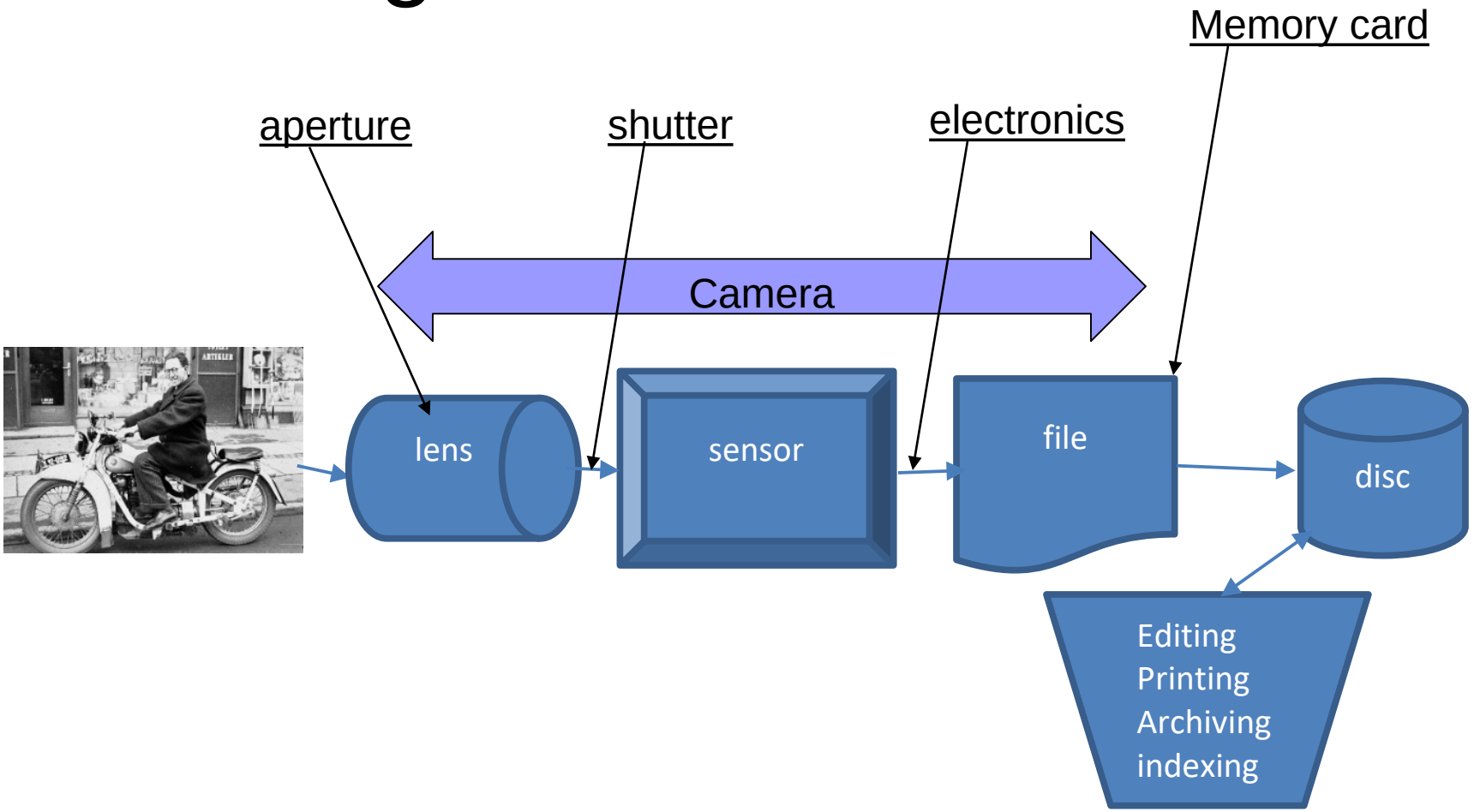
- Yes, they are different, but not as much as people think
- Me:
  - Windows 10 notebook and desktop
  - MacBook Pro Air
  - iPad, and iPhone
  - Android phone and tablet
- They all get the job done
  - Tablets aren't as good for editing

Camera Brand Comparisons

- Nikon
  - Fine lenses
  - Fine bodies
  - Many accessories
- Canon
  - Fine lenses
  - Fine bodies
  - Many accessories

- Many other excellent cameras
  - Pentax/Ricoh, Fujifilm, Samsung, Olympus, Sony/Minolta, Panasonic, Leica, Hasselblad, etc.

From Light to File



Digital Advantages

- Free film! Easy to take and delete images
  - Instant gratification
- Metadata
- Easy sharing
- Archiving with multiple copies
- Amazing editing tools
  - Cropping and corrections
  - Combining multiple images for special effects

Why Edit Photos

- Improve colors, contrast, exposure
- Crop to remove extraneous “stuff”
- Straighten tilted images
- Add or remove objects
- Blur and sharpen elements
- Add text
- Fix lens problems
  - chromatic aberration, contrast issues, etc.
  - Distortions, pincushion and barrel

Simple Improvements

Crop, color, and sharpness

More Changes

Main Camera Types

- Point and shoot
  - The Brownie or Instamatic cameras of a few years ago, ok, quite a few years ago!
- Cell phone
  - Everybody has one
  - Many people learn photography on one
- DSLR
  - The ability to change lenses, major advantage
- Mirrorless
  - Lighter and quieter with lenses

Digital SLR

- SLR = Single Lens Reflex
- Look through lens with a mirror and pentaprism
- The sensor is behind the mirror and a shutter is in front of the sensor
- The mirror flips up and the shutter opens to let light hit the sensor
- The shutter is two curtains

Mirrorless - new

- Interchangeable lenses
  - No mirror or pentaprism
- Lighter bodies
- Very quiet
- Use a tiny display in the viewfinder
  - Not as good as looking through the lens
- Sony, Olympus, Canon, Nikon, Fuji, others

DSLR Comments

- Different lenses allow creative use
  - Really wide angles
  - Long telephotos to get up close
  - Excellent depth of field control

Cell Phone Add-on Lenses

- There are many little lenses to clip on
- Provide telephoto, wide, and macro
  - Even fish-eye
- Do not have the quality of real SLR lenses but are still interesting and fun
- Cost less than $30

What Kind of Camera for you?

- Fast sports, wild animals, interchangeable lenses, depth of field control, shutter speed control, sophisticated flash, astrophotography, big prints = DSLR
- Mostly wide to normal angle with some moderate telephoto = point and shoot
- Light weight, slightly wide angle, always with you, built-in close-ups = cell phone

Seeing the Image

The different ways cameras let you see what is about to be recorded

- Point and shoot
- Cell phone
- Mirrorless
- DSLR

- Mostly screen on back, a few have view finders
- The screen
- Screen on back or tiny screen as view finder
- View finder through lens or screen on back

View finder or screen

View Finder

- See what lens sees, on SLR only
- Easy to hold camera steady
- Setting information below image
- Must hold camera at eye level

Screen on back

- See what sensor sees
- Not as easy to hold steady
- Setting information often covers image
- Can hold camera at different heights

Pixels

Let’s explore the magical world of little picture elements

Notice each block has one color and brightness.

All you have to do is make them small enough so you can’t see them.

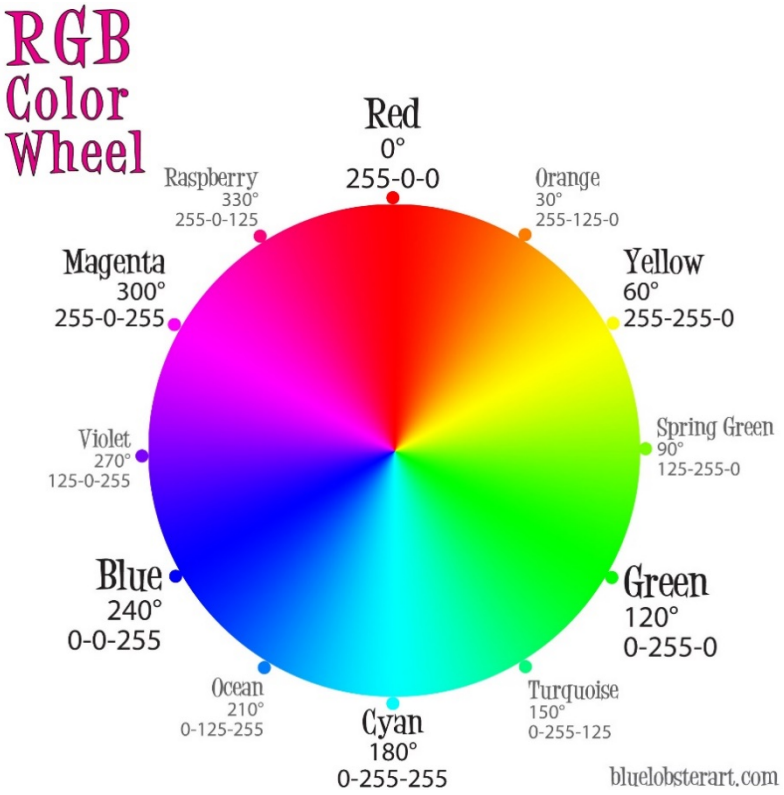
Pixels

- An image is made of little picture elements
- Each one has color and brightness
- If they are small enough you can’t see each individual element
- How many you need depends on how far your eye is away from them

Colors

- Any color can be made up by mixing varying amounts of primaries
- Two sets of primary colors are used in digital photography
  - RGB (red, green, blue)
    - Additive, things that glow, like monitors
  - CMY{K} (cyan, magenta, yellow, {black})
    - Subtractive, things that absorb, like paper
- Not the same as you learned in school with crayons!

RGB Color Wheel



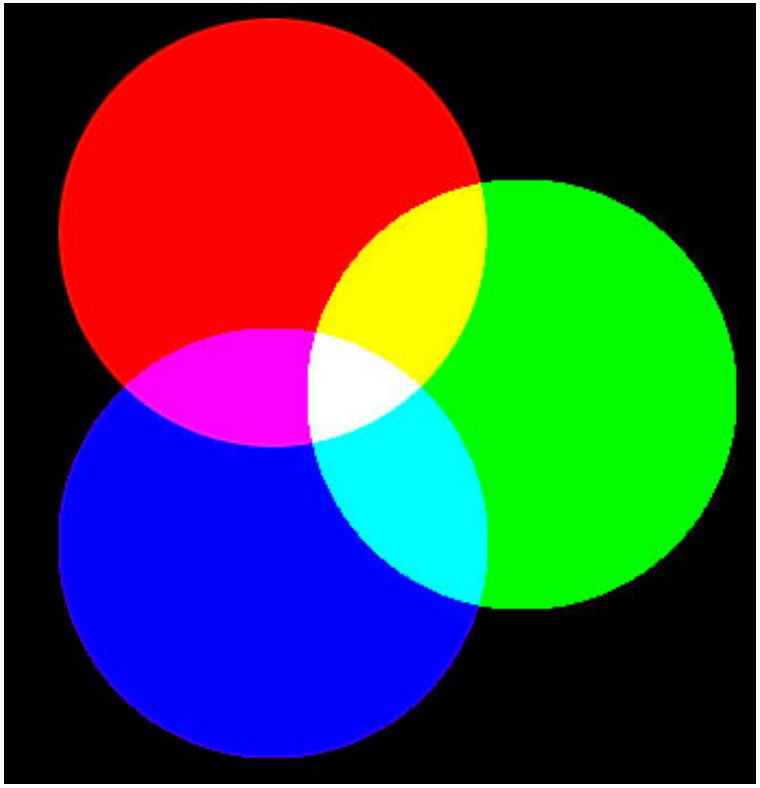
Color Relationships

- Understanding the color wheels will help you fix image color problems or to use colors creatively
- Learn the relationships
  - R+B=M
  - R+G=Y
  - B+G=C
  - Etc.

Opposites

- **R ~ C**
- **G ~ M**
- **B ~ Y**

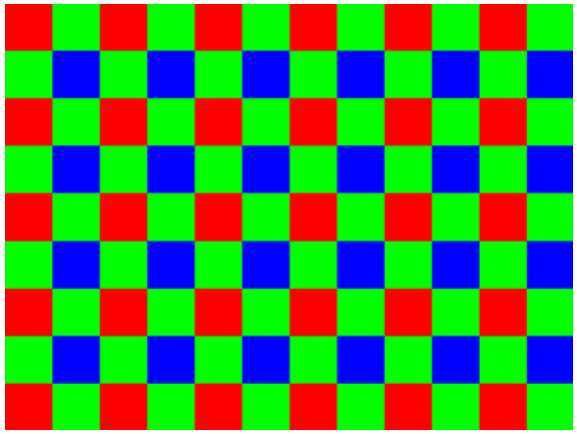
Combining Colors



Sensor

- Red, green, and blue sensitive areas, done with color filters
- Notice there are twice as many G's. Why switched from blue screen to green screen
- Color Channels (typically)
  - R has contrast
  - G has details
  - B has noise
- De-mosaicking maps this to RGB pixels

Bayer pattern sensor



Sensor Noise

- Smaller sensors have more noise
- Luminance and Chrominance
- Temperature affected, cold is better
- Shooting “raw file format” gives more control and better images

What Noise Looks Like

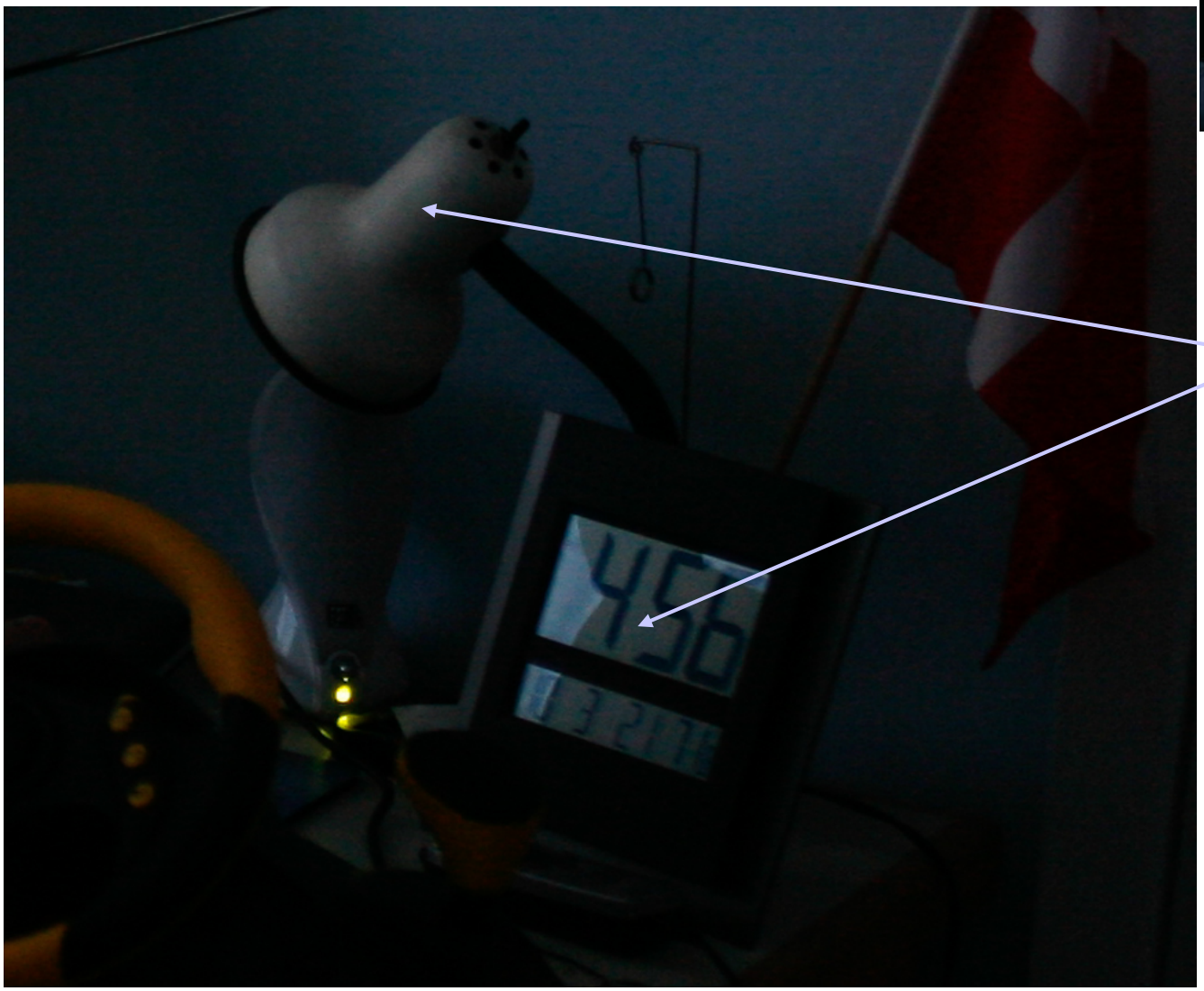
See the “sand”? Especially in the darker areas.

Fixed in Lightroom

ISO 12800

Note that the sandy look is not caused by pixels, it is sensor noise.
This one shows mostly luminance noise.

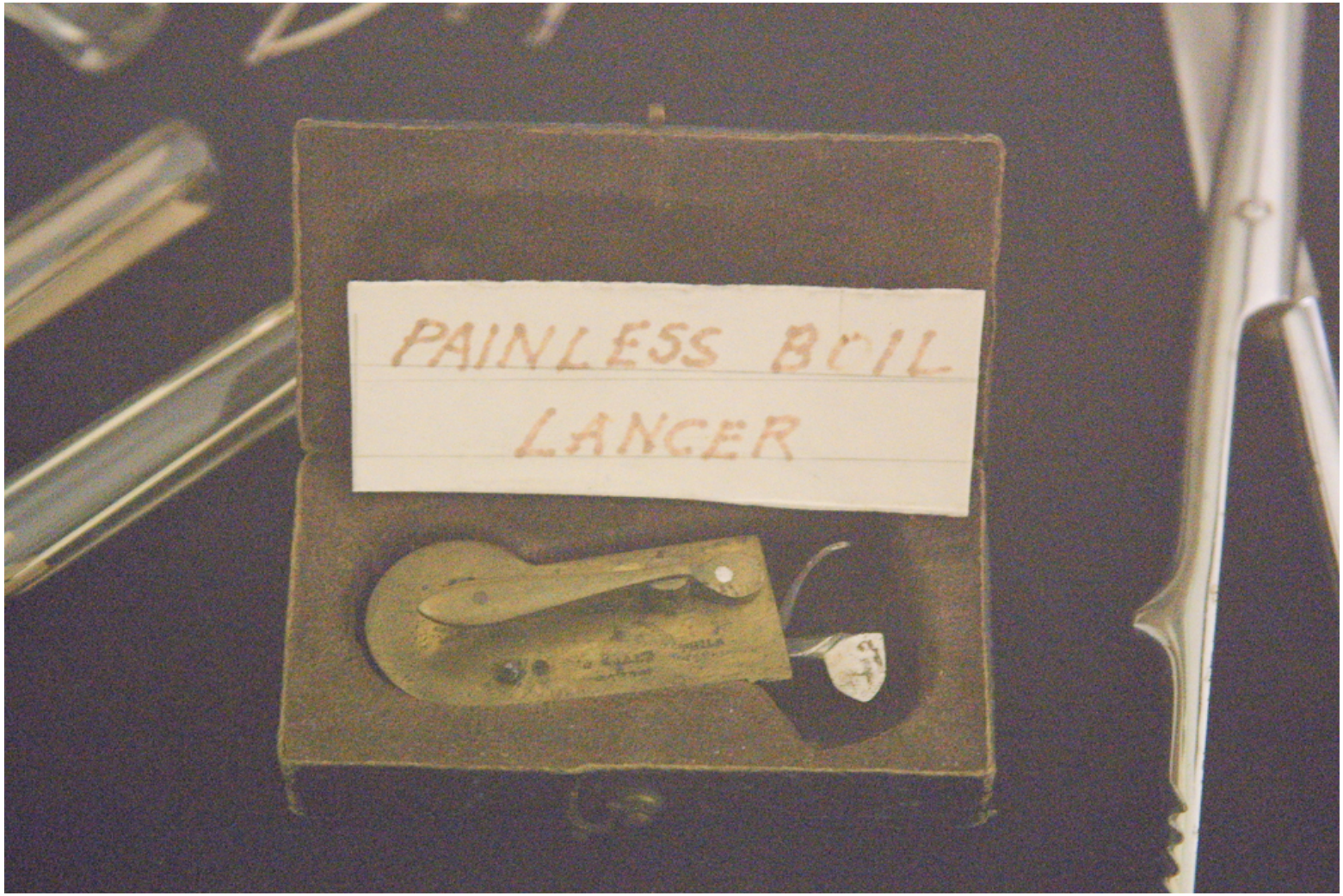
Color Noise



See the purple and green blotches?

Lightroom and other editing software can improve this.

Another Color Noise Example



Label is wrong, this is actually a fleam.

After a Makeover in Lightroom

Dynamic Range

- The range of dark to light that can be recorded without losing:
  - Highlights (blown out)
  - Shadows (blocked)
- Eye sees about 16 stops (doublings)
- A few digital sensors up to 14 stops
- Sensor design and bit resolution affect this

Notice no sky detail, and no shadow detail.
You sometimes have to choose one.

The Moon is Challenging

The Histogram

Show me how I’m exposed, and don’t get hysterical

Histogram

- One of the most important tools you need to understand
- It's a bar graph showing the count of pixels at each brightness level
  - Black on left
  - White on right
- A glance will tell you much
- Keep your eye on it while editing

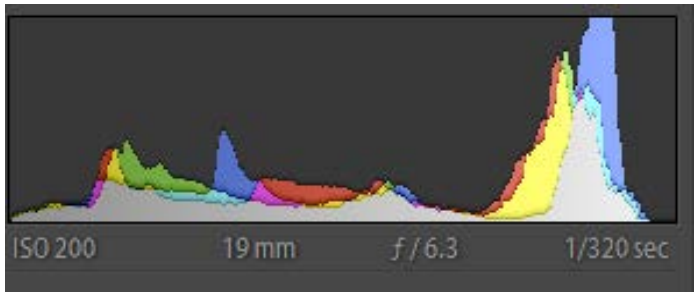
More Histogram

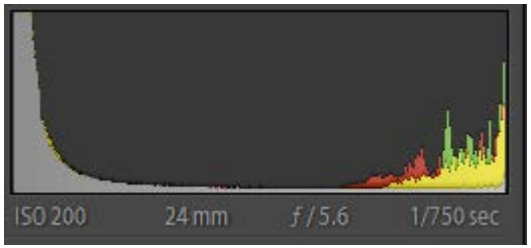
- Some cameras also show the RGB values
- Can see shadow and highlight issues
- Can see overall exposure
- A very important tool to analyze exposure
  - Learn how to read it!

Histogram Analysis

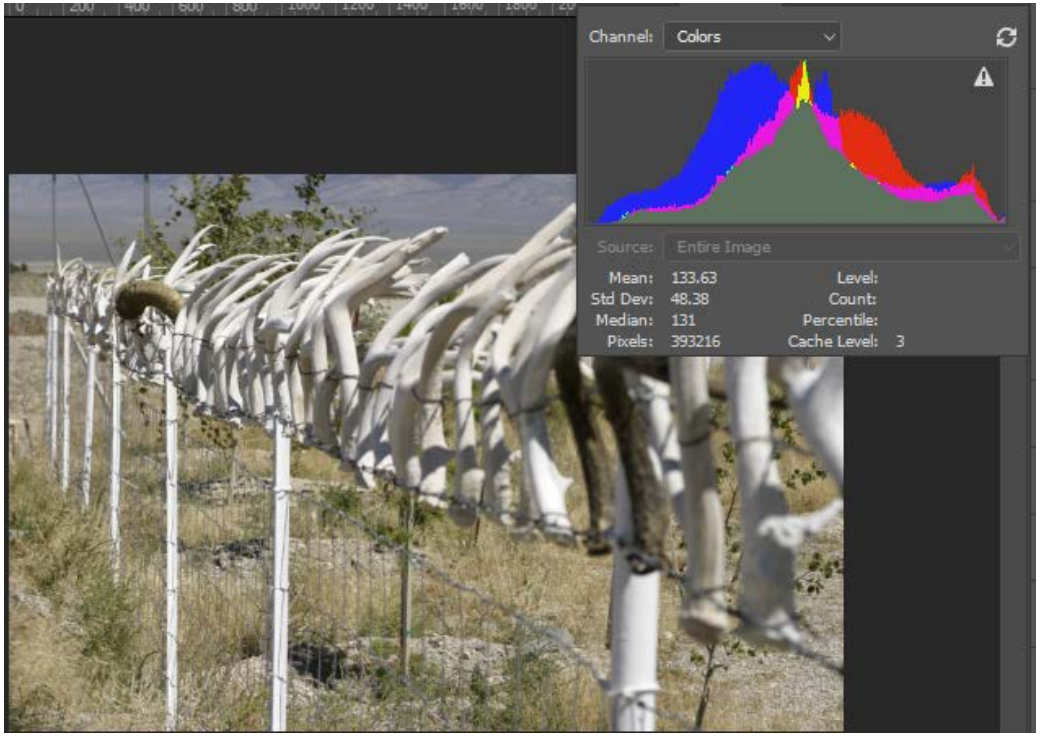
- Spikes show loss of data when adjacent pixels combined
- Holes show loss of data when pixels spread
- Crowding on black side shows poor shadow detail
- Crowding on white side shows poor highlight detail

Histogram example 1

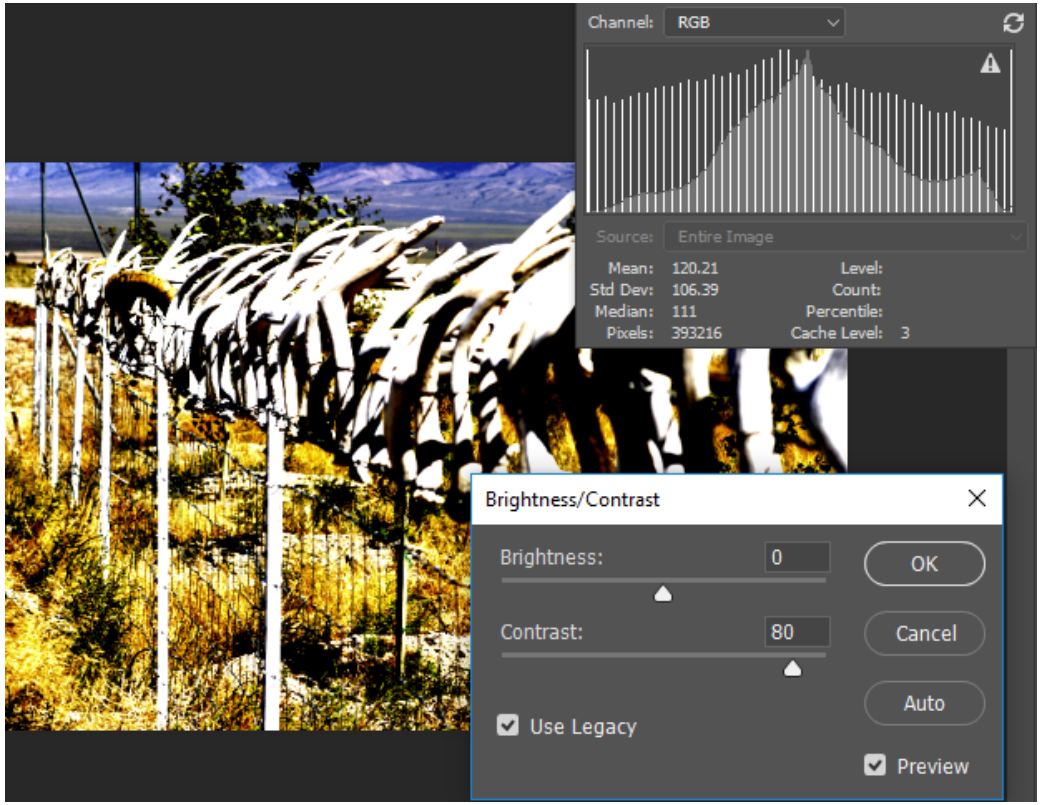




Histogram example 2



Histogram example 3



Computer Image Files

How are images stored

Most Important File Formats

- JPG or JPEG
- GIF (pronounced like JIF Peanut Butter)
- TIFF
- PNG
- PSD
- DNG
- Raw (many formats)

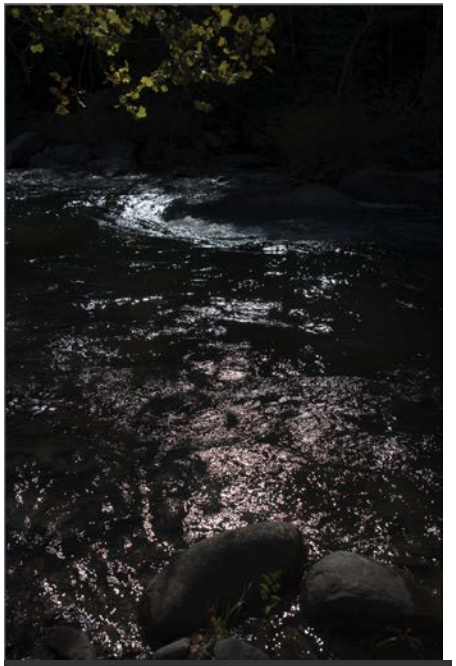
File Data Compression

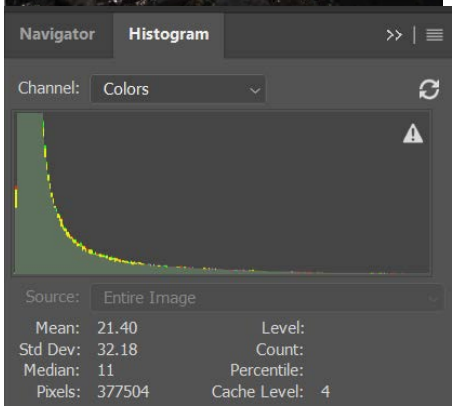
- File size is reduced by eliminating redundant information
- Lossy
  - Some information is removed
  - JPEG, JPEG2000
- Non-Lossy
  - Nothing is lost
  - Tiff (mostly), PSD, RAW

RAW vs JPEG

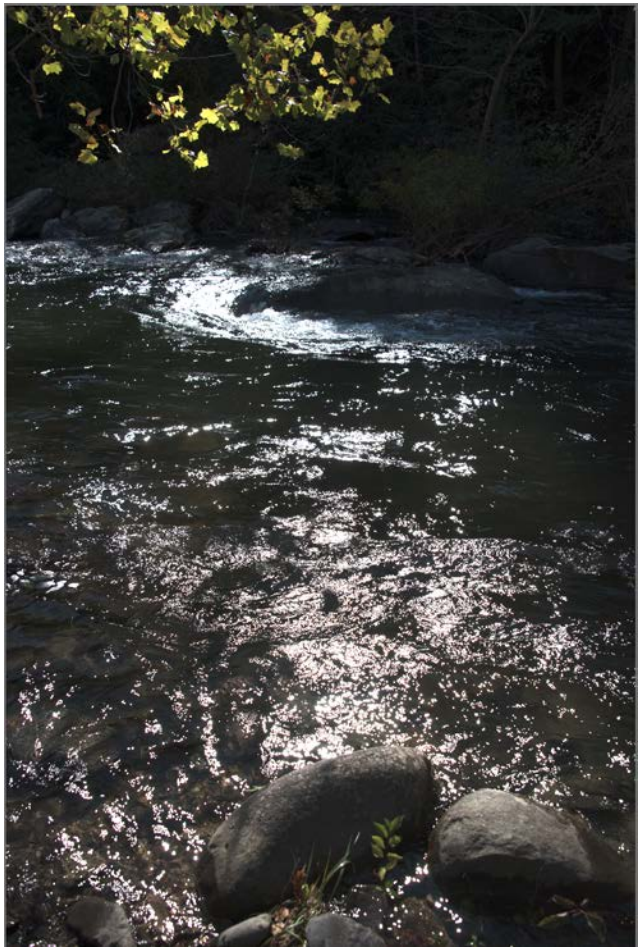
- If your camera supports RAW, use it!
- It saves all of the sensor data
  - Usually 12 to 14 bits of resolution
- JPEG reduces resolution to 8 bits
  - This loses data that can NEVER be restored

Original, 16 bit resolution

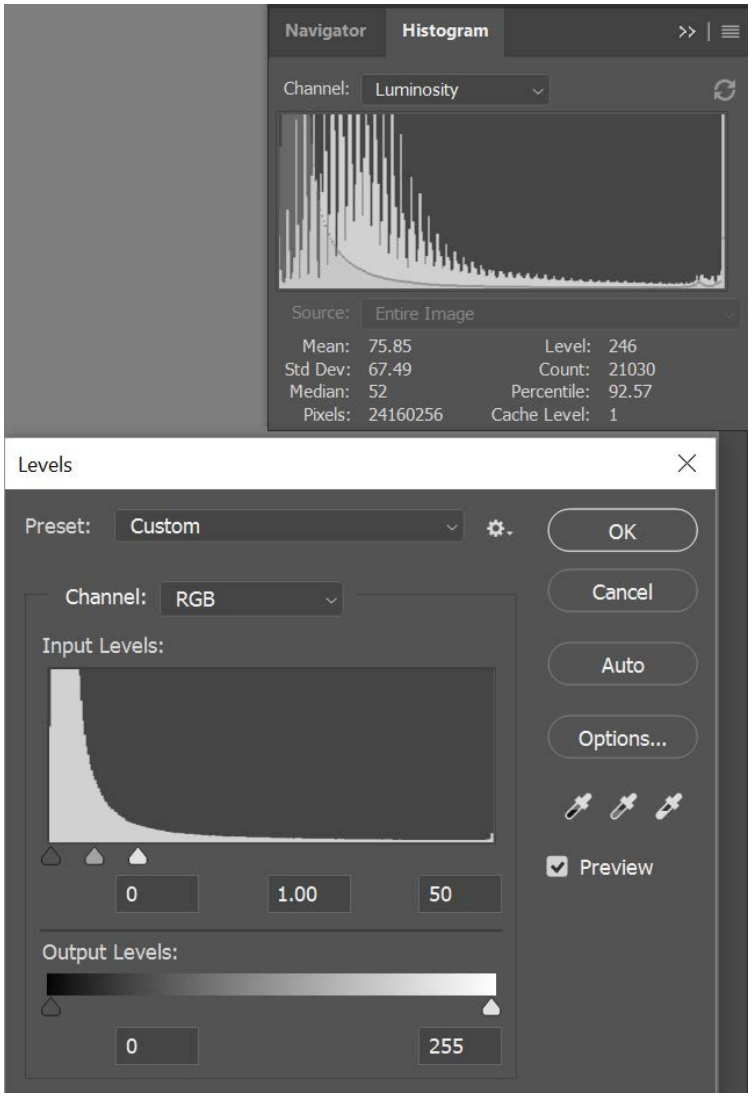


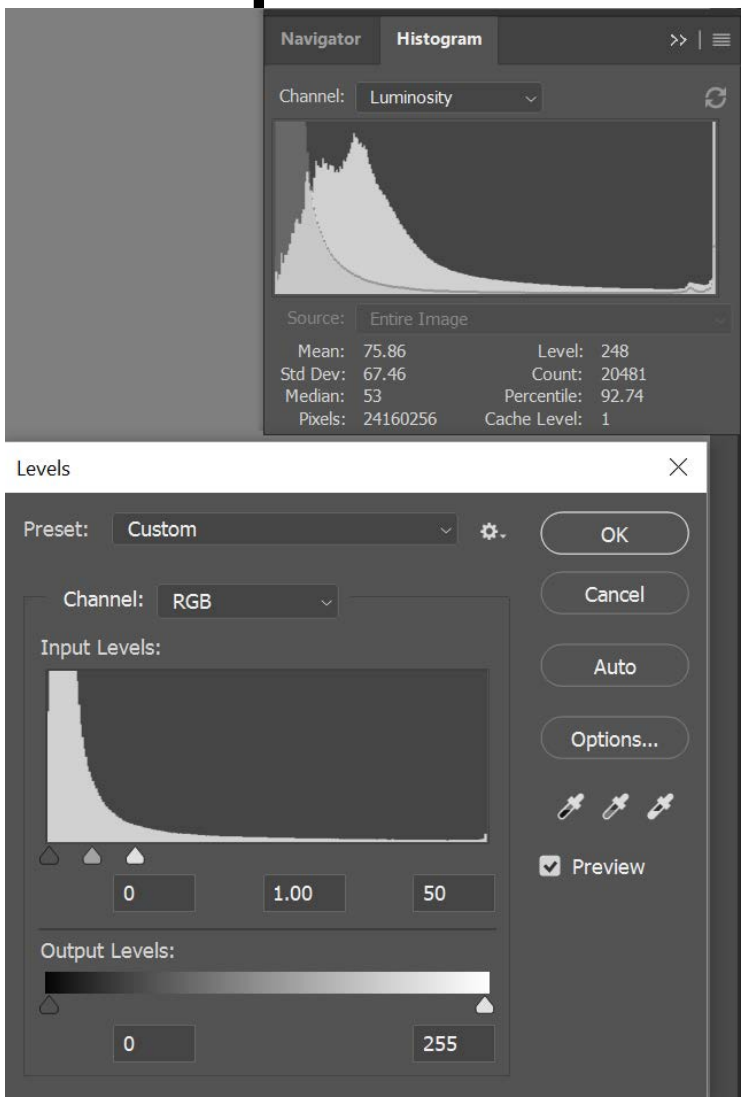


Use levels to brighten



8 vs 16 bit, notice spikes



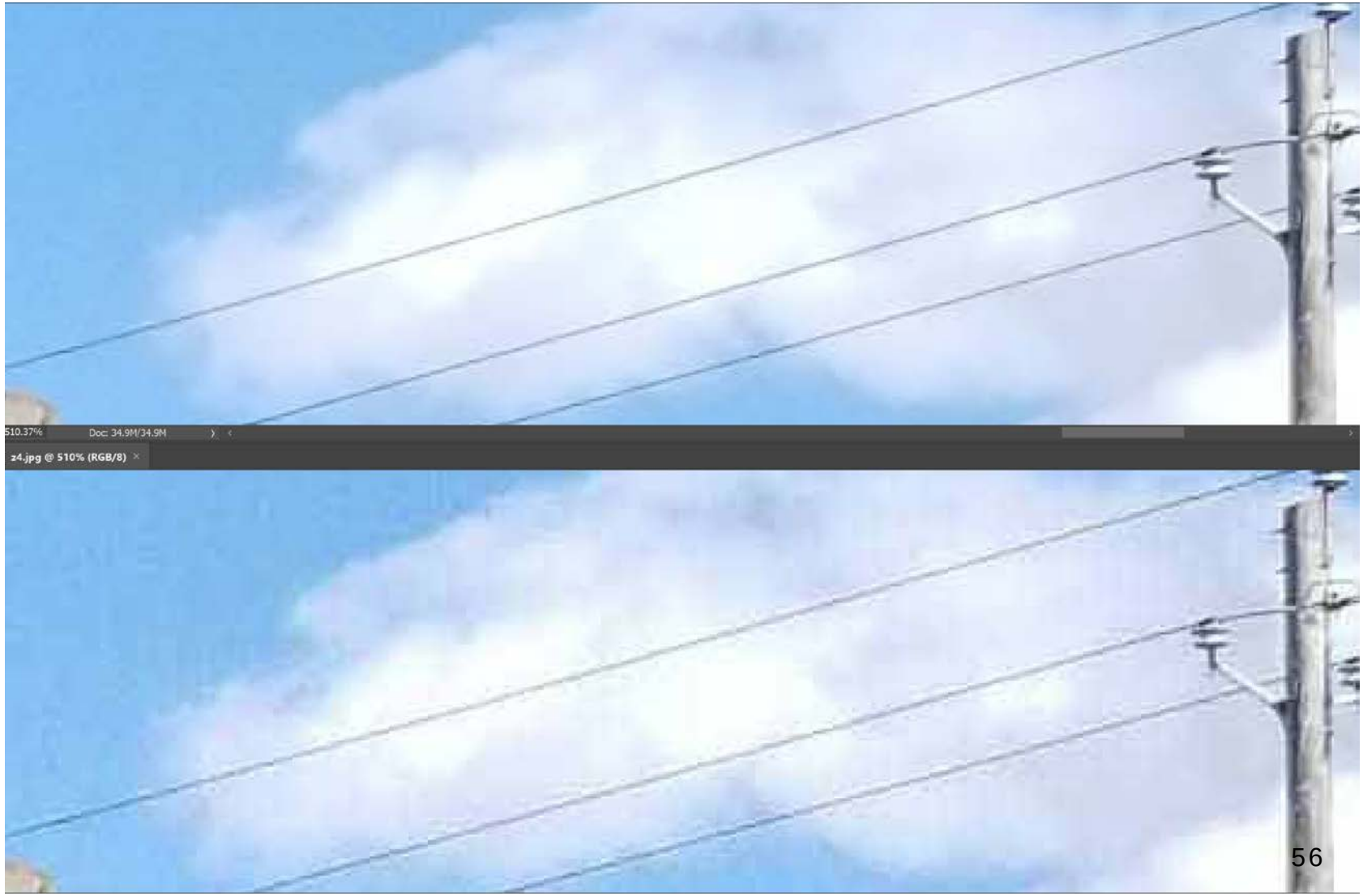


JPEG compared to Raw

- JPEG
- 8 bits/pixel
- Color resolution loss
- White balance fixed at shot time
- Should NEVER be re-saved, image rot (generation loss)

- RAW
- 16 bits/pixel
- No loss
- White balance adjustable later
- Save in PSD or other non-lossy format

- re-compression causes problem, happens on cropping or quality settings etc.
- IF you don’t change size or jpg settings the quality loss can be minimal
- Top is original, bottom is 6 pixel crop and save 4 times



RAW Attributes

- Large files
- No standard, each vendor is different
  - Vendors even have more than one format
    - Nikon is NEF, but there are variations
    - Canon has CR2, CRW, and others
  - Adobe released common DNG standard, a few cameras have adopted it
    - Hasselblad, Pentax, Phase 1, others?

Metadata

- Data that is attached to the image file
  - Automatically contains date, camera, lens, flash, F-Stop, shutter speed, ISO, and others
- No more little notebooks to record exposure and other details
- Can add keywords, copyright, etc.
- Either stored in image file or as “sidecar”
  - Jpeg and tiff store in file
  - Raw in file and more in sidecar file (xmp)

Lenses

- Focal length
  - Normal is diagonal of the squared sensor
  - Telephoto is longer than normal
  - Wide angle is shorter than normal
- F-Stop
  - “Hole” size through lens
  - Bigger allows more light
  - Focal length/hole is F-Stop number
    - Allows F numbers to always indicate light amount

More Lens Properties

- Depth of Field
  - The range of distance that looks “sharp”
  - Larger F-Stop numbers make this longer
    - Up to the diffraction effects anyway
  - Longer focal lengths make it shorter
- Bokeh
  - What out of focus highlights look like
    - Halos, donuts, weird shapes…
- Sharpness and Contrast

Depth of Field

F4

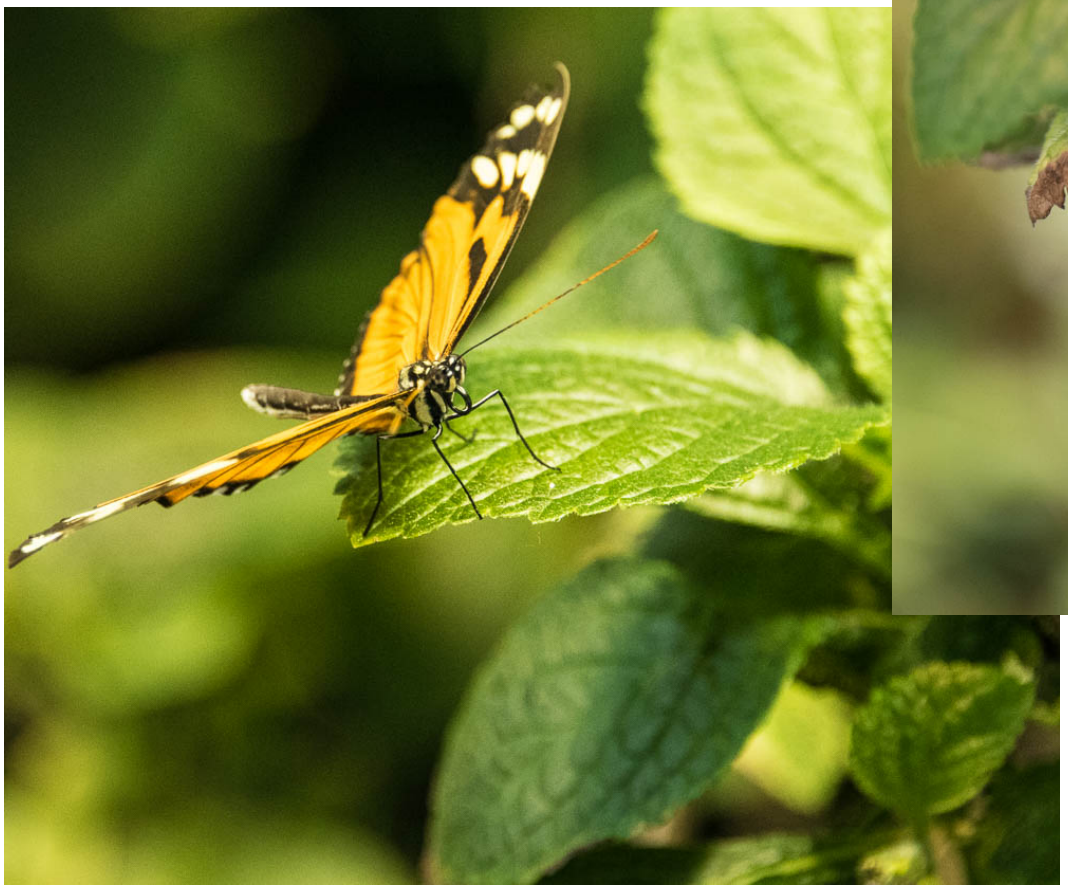
F8

F22

Shallow Depth of Field

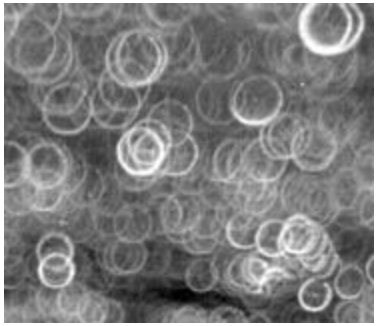
Notice how your eye goes to the sharp parts and tends to ignore the fuzzy parts

Depth of Field Isolation

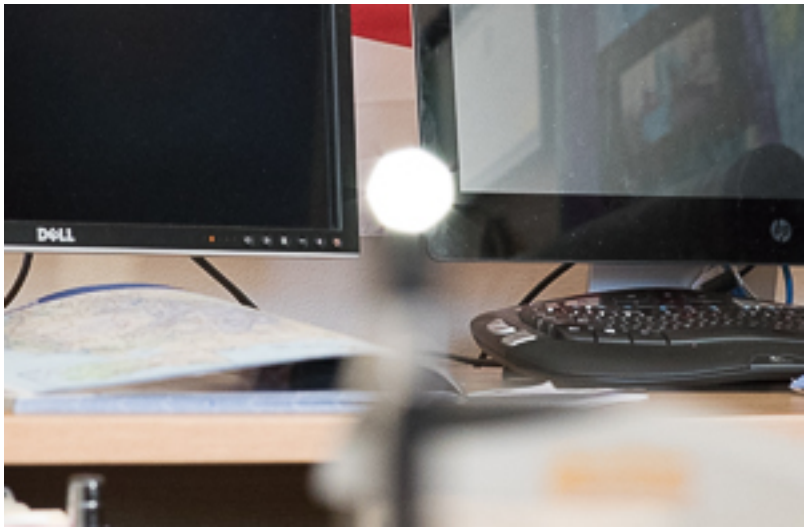


Everything Sharp

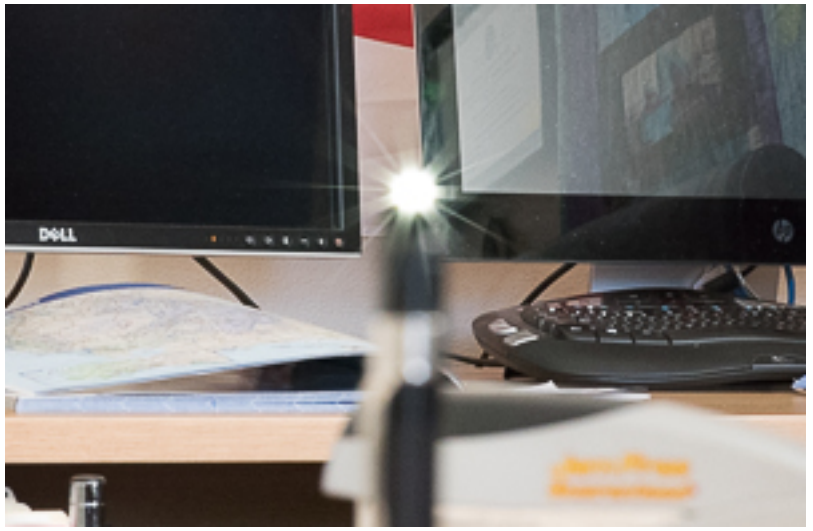
Bokeh



Soap bubble
from mirror lens



F5



F14

Smooth Round Bokeh

Lens Resolution

- Lens quality can affect image detail as much or more than the number of megapixels
  - Really good lenses cost $1000 >$20,000
- Image quality largely determined by lens quality today, we have plenty of Mpixels, better than 35mm film
- 3MP with a good lens makes a better image than 8MP with a poor lens
- Spend your money on good glass!

Chromatic Aberration

See the green fringes on the left and the red ones on the right?

Fixed in Lightroom

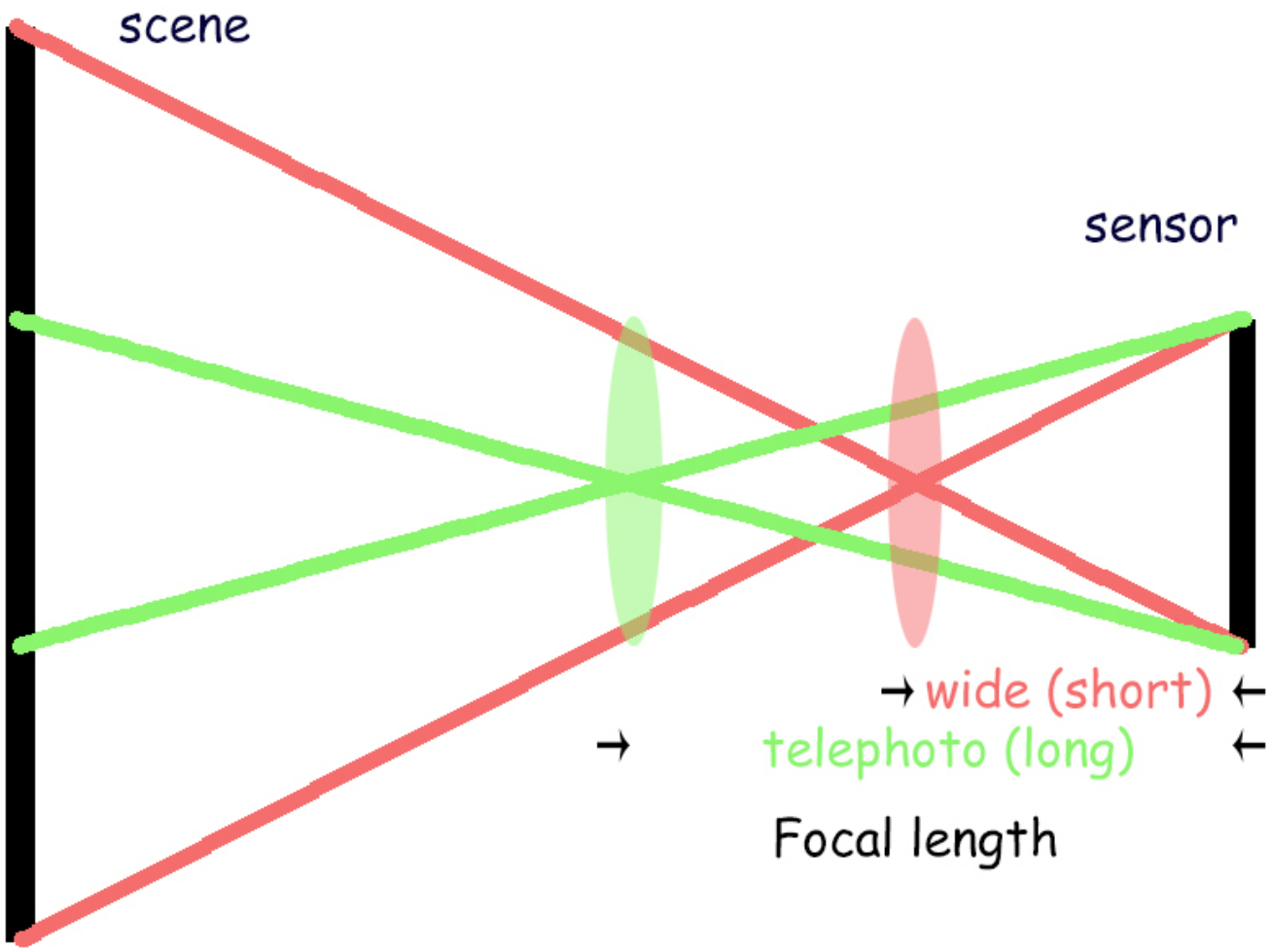
Lens Classifications

- Prime – Single Focal Length
- Zoom – Adjustable Range of Focal Lengths
  - Digital Zoom is phony, it just throws pixels away
- Normal
- Wide
- Fish-Eye
- Telephoto
- Macro/Micro
- Portrait
- Specialty Lenses

Focal Length Effects

- Long (telephoto) lenses
  - Get you closer to the subject
  - More sensitive to shake
  - Compress perspective
  - Have short depth of field
- Short (wide angle) lenses do the opposite

Focal length affects field of view



Sensor Sizes/Lens Designations

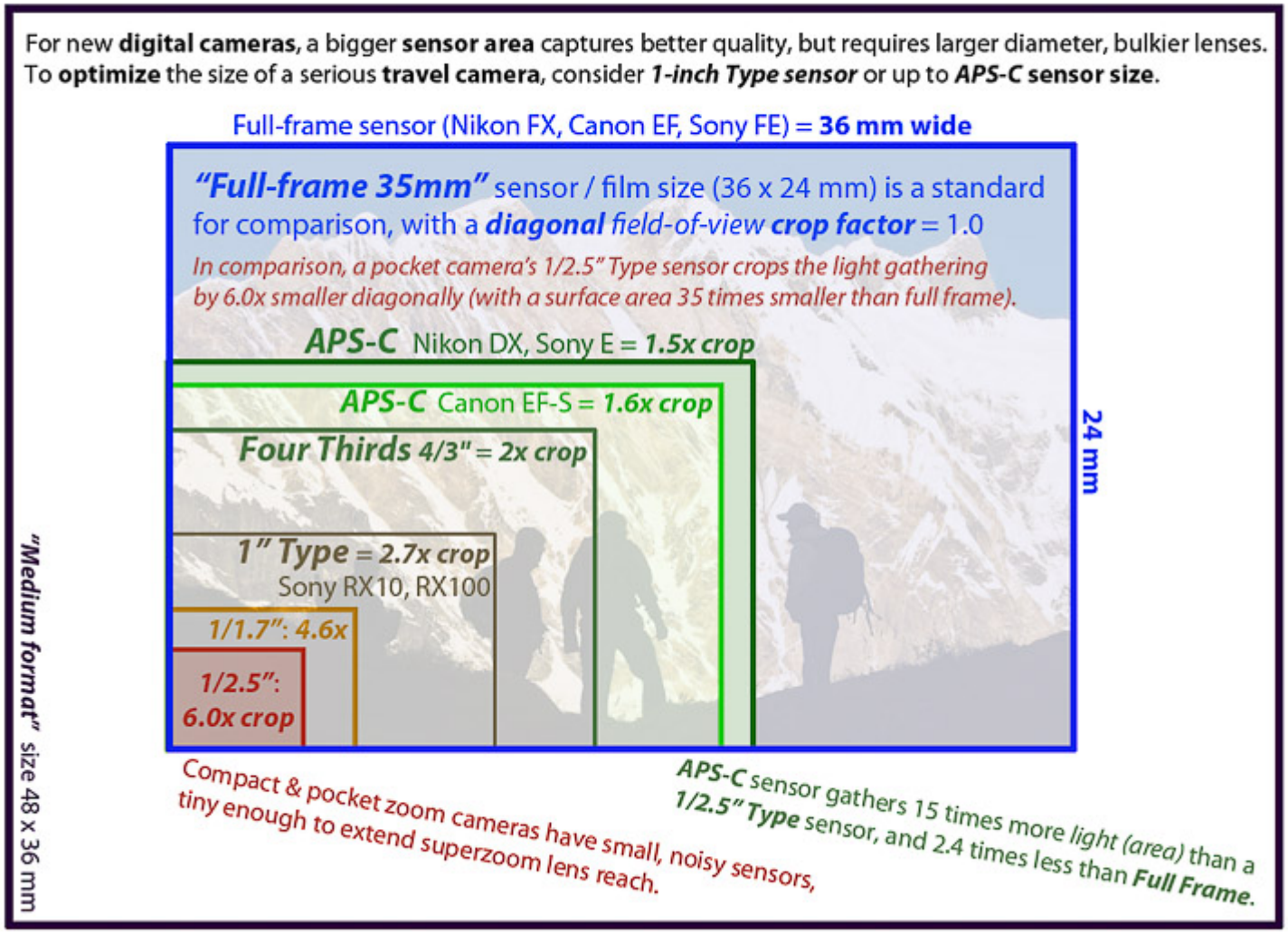
- Full-frame is same as 35mm film
  - 24 x 36 mm
- APS-C – Canon name for small sensor
- Nikon uses FX and DX for full and smaller
- Canon uses EF and EF-S on lenses

Sensor Size Effects

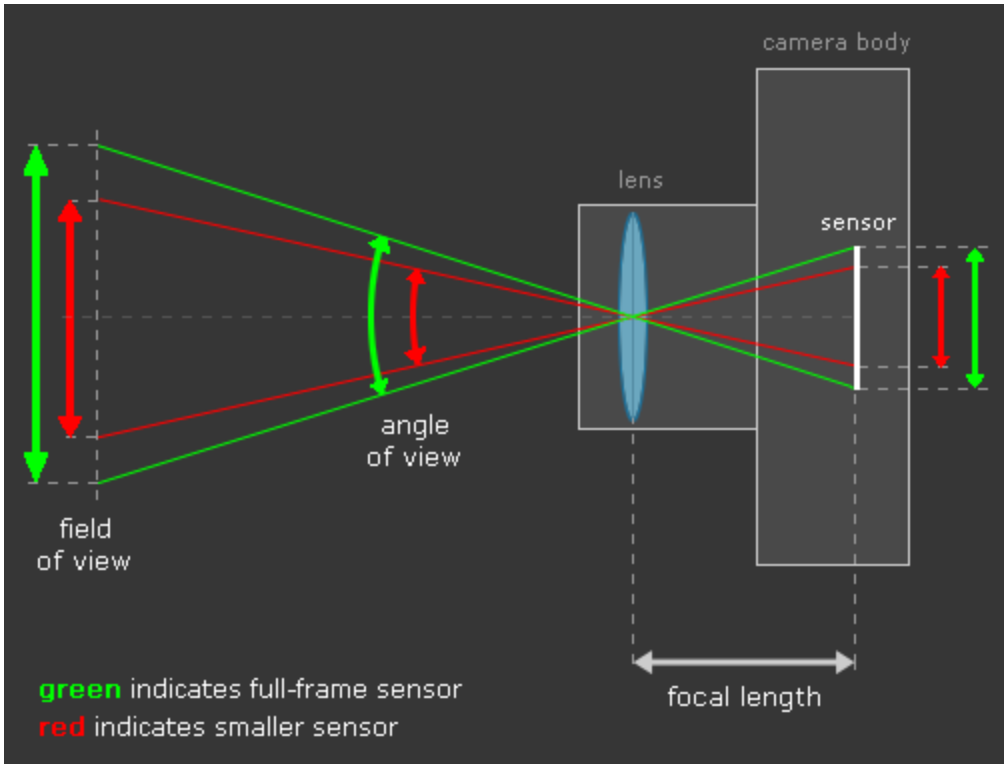
- Normal focal length is 1.414 times the longest side of the sensor
  - ~50mm for a full frame sensor 24x36 mm
- Smaller sensors
  - 50 mm normal lens acts like a slight telephoto
  - ~1.6 for APS-C sensors, 100mm acts like 160
  - Easy to get longer lenses
  - Harder to get really wide angle lenses

Sensor size comparisons for digital cameras.

PhotoSeek.com



Smaller sensors make lenses act longer



Wide Moves Background Away

300mm

28mm

Wide Angle Brings Log Closer

Choosing a Lens Length

	Wide Angle (short)	Normal	Telephoto (long)
Perspective	Spreads things apart	Normal	Makes things appear closer
Depth of Field	Deep (long)	Normal	Shallow
Shake sensitivity	Low	Normal	High, tripod
Size	Short and wider	Normal	Long and often heavy
Vertical lines	Tend to tilt and curve	Normal	Tend to stay straight

More Lens Thoughts

Shorter (wide angle)

- Include lots of elements
- Emphasize close objects
- Separate object from background by distance

Longer (telephoto)

- Exclude objects
- Narrow field of view
- Blur background to isolate subject
- Compress distances

Modern Lens Features

- Auto/manual focus
- Anti-shake
  - VR (vibration reduction) by Nikon
  - IS (image stabilization) by Canon
  - It may be known by other names

Filters

- UV is often recommended to protect lens
  - Lens hood is also useful for this
- Skylight can darken sky
- Warming and cooling filters
  - Easily done in editing now

Circular Polarizer

Can’t simulate later in Photoshop

- Rotate to see effect
- Works best at 90° (± ~15°) to light source
- Removes glare and reflections, good on shiny things, water, leaves and rainbows

Polarizer Example

With polarizer

Polarizer Example

With polarizer

More Filters

- Close up, actually more of a lens
- Graduated and normal ND
  - Useful in landscapes to darken sky
- Special effects
  - Stars
  - Prism effects

The Shutter

Open the curtains and let the sunshine in

Types of shutters

- DSLR's use focal plane shutters
  - Two curtains in front of sensor
  - First one moves to let light in
  - Later the second one moves to stop the light
  - High speeds will be a slit crossing the sensor
  - Both vertical and horizontal versions exist

Shutter Speed

- Shown as an inverse number
  - 125 means 1/125 of a second
- Safe handholding rule of thumb
  - 1/focal length
    - 50mm lens – about 1/60
    - 135mm lens – about 1/125
  - IS/VR makes this better by at least 2 stops

Effect of Shutter Speed

Fast

- Allows less light, use when lighter
- Stops motion
- Easy to handhold

Slow

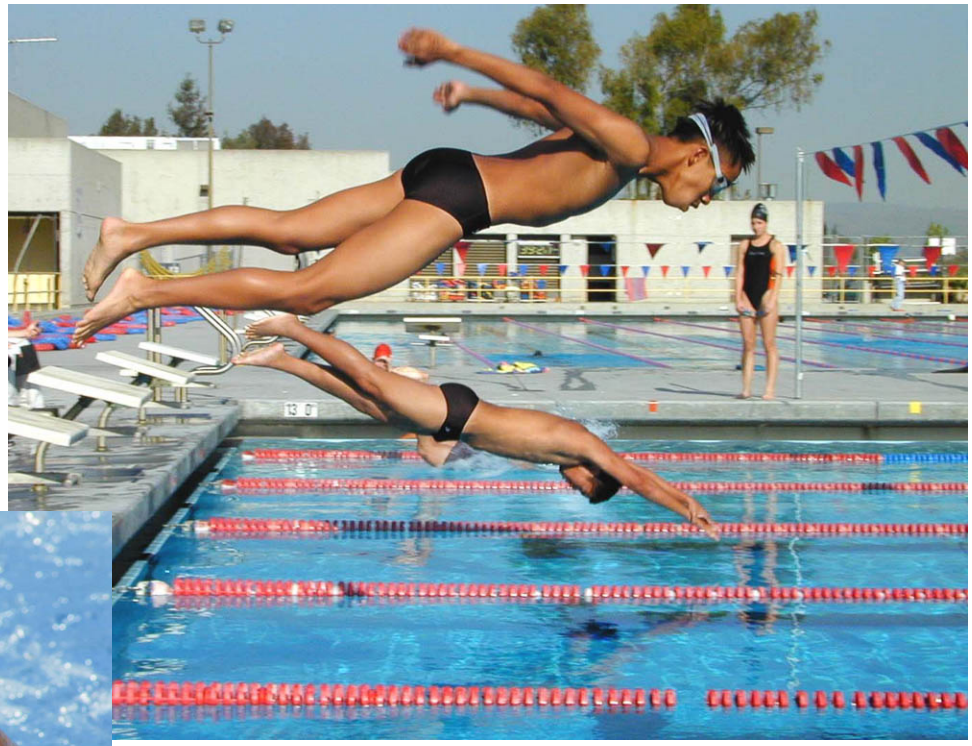
- Allows more light, use when darker
- Shows motion
- Steady hand or tripod





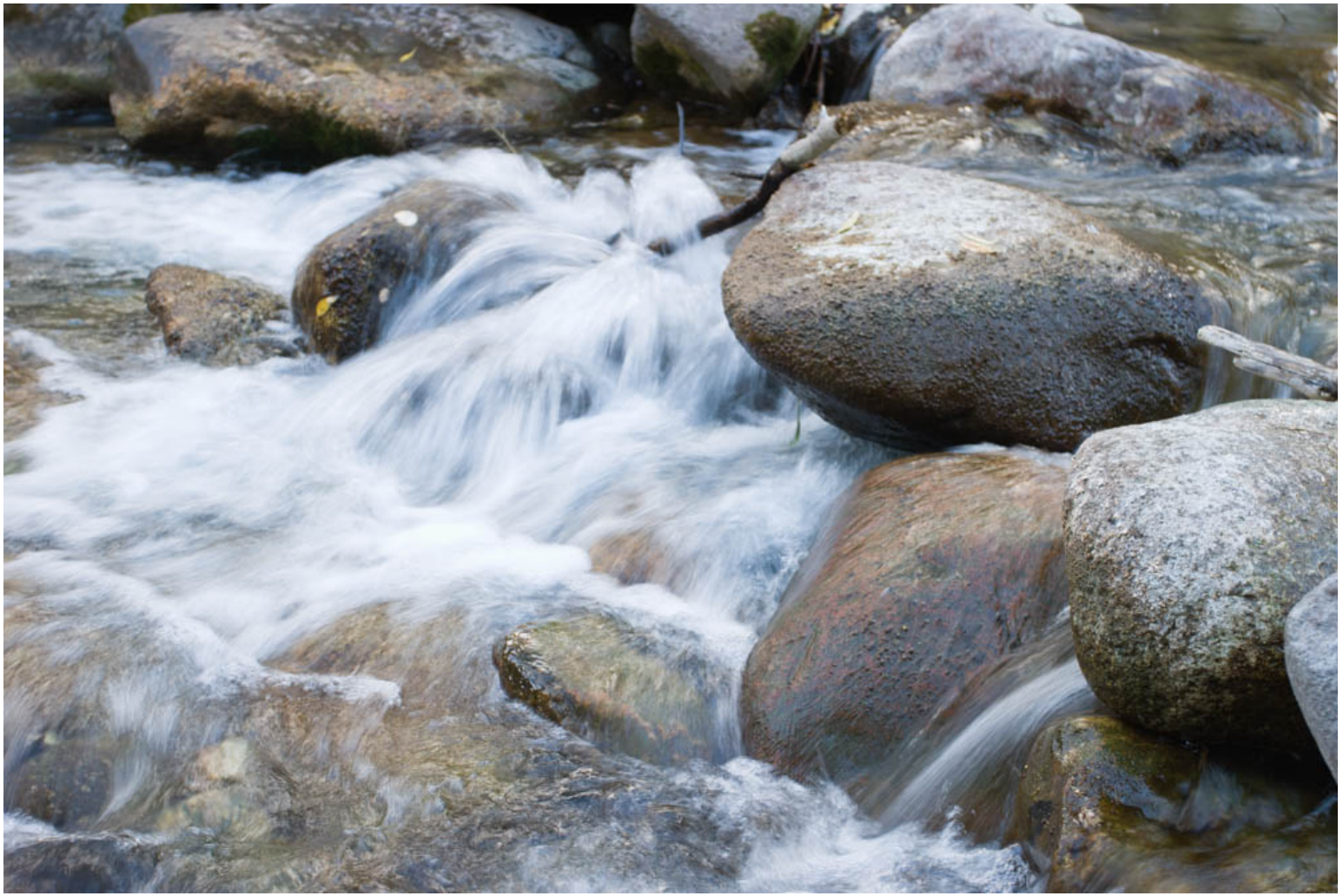

Slow Shutter Shows Motion

Freeze Motion



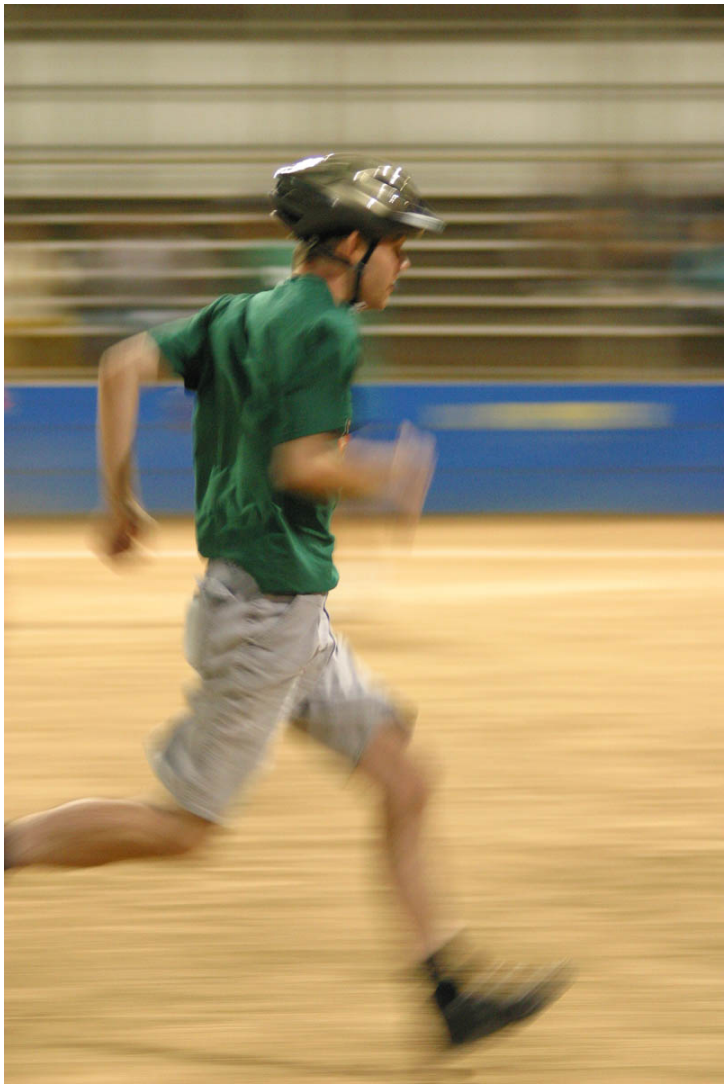
Imply Motion with Blur

Slow Show Motion



Panning

Pan and Slow Shutter



Handling Slow Shutter Speeds

- Wall
- Strap
- Stand/kneel
  - Avoid crossing legs, use both knees
- Hand positions
- Monopod/Tripod
- IS/VR lenses

ISO

Give me light, but not too much or too little, just the right amount please, I’m sensitive, but adjustable

ISO

- In the past was DIN and ASA were used, ISO is the universal standard now
- Higher values have more noise
  - Best to stay below 800, but it depends on the camera

Exposure

Getting the correct amount of light to the sensor

3 Things Affecting Exposure

Exposure

- ISO +

+ F-Stop -

- Shutter Speed +

Exposure

- Correct exposure is controlled by
  - ISO, how much light each element needs
  - Shutter speed, how long the shutter is open
  - F-Stop, how much light the lens lets through

Sensor needs right amount of light

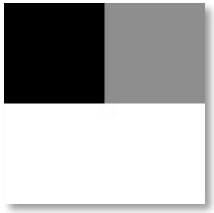
- Too much = highlight detail loss
- Too little = shadow detail loss
- Sometimes you have to accept one or both of the above

4 shades of gray over-exposed

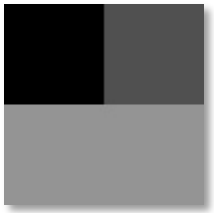
$$\begin{bmatrix} 0\% & 25\% \\ 50\% & 100\% \end{bmatrix}$$

Over expose by 1 stop, I.E. a doubling of light
This results in these new values

$$\begin{bmatrix} 0\% & 50\% \\ 100\% & 100\% \end{bmatrix}$$

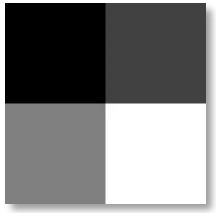


Note that the difference between the two spots on the bottom is now lost.
And there is no operation that can bring back that detail!
All you can do is make everything a bit darker, the detail is lost.



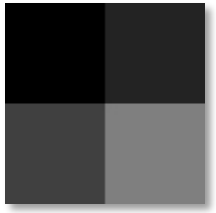
4 shades of gray under-exposed

$$\begin{bmatrix} 0\% & 25\% \\ 50\% & 100\% \end{bmatrix}$$



Under expose by 1 stop, I.E. a halving of light
This results in these new values

$$\begin{bmatrix} 0\% & 12.5\% \\ 25\% & 50\% \end{bmatrix}$$



Now we see that we can recover by multiplying by 2 again!
But… noise and other artifacts might also be increased.

This shows why it is often preferable to under-expose slightly.

Grey Card

- 18% reflectance
- Your palm is ~36% (your results may vary)
- The world is gray?
  - The camera looks at the world as if it is gray when deciding the exposure, this will result in some pictures not being exposed correctly
    - Consider a black cat in a coalbin or a white cat in a snowstorm!

Rule for Exposure

It depends on the scene!

- Expose for the most important dark or light areas when the dynamic range is exceeded

F-Stop Shutter Variations

- These all give the same amount of light
- Choose the combination that is the best compromise for artistic or technical need
- Note: shutter speeds directly affect the amount of light, but F-Stop is a diameter, so the amount of light is a squared value
  - ½ shutter speed matches ~1.4 larger F-Stop

Aperture	F16	F11	F8	F5.6	F4	F2.8	F2	F1.4
Shutter	1/15	1/30	1/60	1/125	1/250	1/500	1/1000	1/2000

Summary - Choosing Settings

Setting	Effect	Comments
ISO	How much light is needed by the sensor	Higher values result in more image noise but let you use faster shutter speeds and/or slower lenses. Use 100-200 outside and 1200+ inside. This setting is fine to use in automatic mode.
F-stop **Av or A**	The amount of light the lens allows through	Smaller numbers give a smaller depth of field. Should also be used in low light. Larger numbers create more depth of field, but require more light or a slower shutter or higher ISO.
Shutter speed **Tv or S**	How long the shutter lets light through to the sensor	Slower speeds show motion and blur. Higher speeds can be used to stop motion.

Summary of exposure effects

- ISO
- Shutter speed
- F-Stop/Aperture
- Noise
- Motion blur
- Depth of field

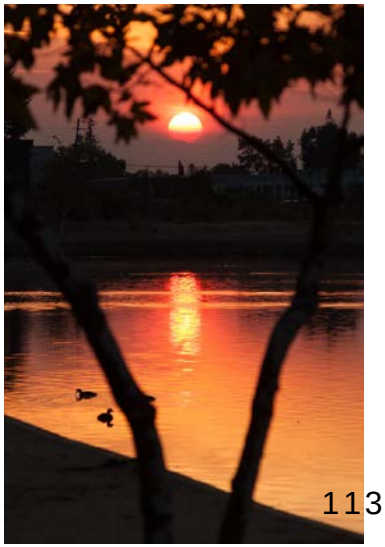
What is ‘Correct’ Exposure?

- Technical intent
  - At least 6 “correct” values
    - F stop/shutter combinations
    - Camera will pick one for you in automatic
- Artistic intent
  - Depth of field to isolate subject or include all
  - Shutter speed for motion, blur or freeze

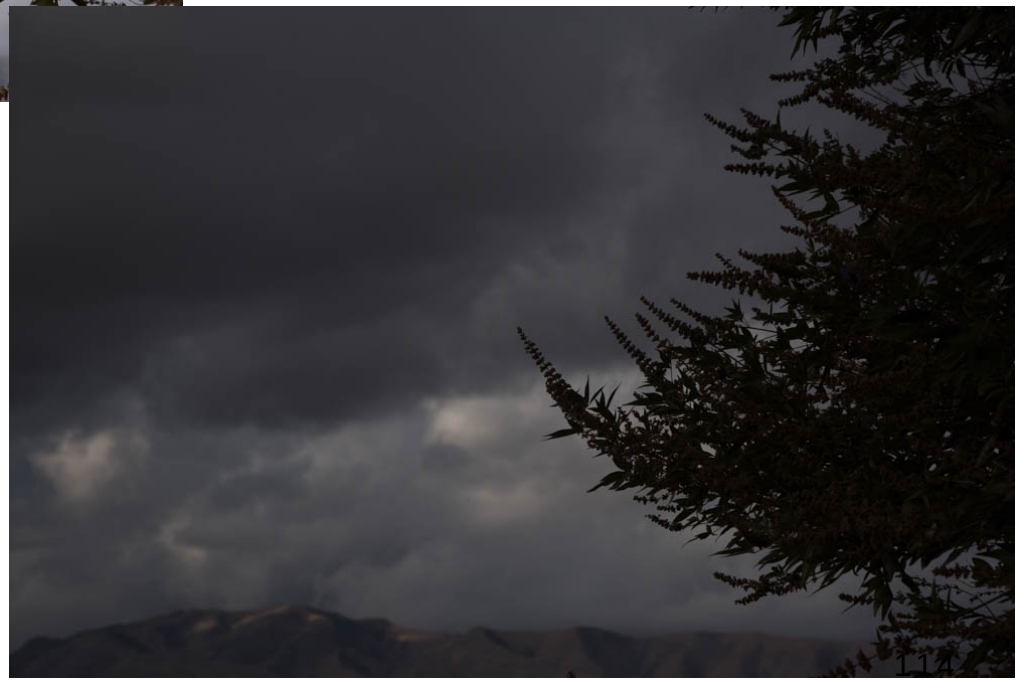
Artistically Correct Exposure

- Isolate subject with DOF
- Make everything sharp
- Freeze motion
- Show or imply motion with blur
- Show motion with panning
- Darken or lighten for mood or atmosphere

Dark and Light Mood



correct exposure
according to the camera



-2 stops conveys
the mood better

Camera Controls

Unless you tell me what to do, I will make all the decisions for you

Camera Controls Summary
On dial, menu, or button

- ISO
- Shutter speed
- Aperture (F-Stop)
- Exposure comp
- Metering mode
- Focus Modes
- Flash modes
- White balance

- ISO
- S Nikon, T Canon
- F
- +/-
- Often a rectangle
- Description
- Icons
- Icons

Other Camera Controls

- There are usually many options in menus
- Programmable buttons
- User settings
- Exposure lock modes
- Focus locations
- Flash controls
- …

Fully Automatic Modes

- Auto, the camera decides everything
- Creative Zone or Scene, giving a hint
  - Flowers
  - Landscape
  - Portrait
  - Night
  - Stage
  - Sports
  - Etc.

Metering

- Where to look for light in the image
  - Matrix
    - Uses AI to figure out what kind of scene this is
  - Center weighted
    - Looks mostly at the middle
  - Average
    - Looks everywhere and takes an average value
  - Spot
    - Looks only at a tiny spot, usually where the focus is

Where Automatic Metering Fails

- Backlight and sidelight
- Dark areas
- Light areas
- Low contrast
- High contrast

Exposure Modes

- How much light is allowed on the sensor
  - Shutter priority, you set shutter, it sets F-Stop
  - Aperture priority, set F-Stop, it sets shutter
    - What I mostly use
  - Program, it sets F-Stop and shutter, you can choose different combinations
    - Seems useless, works like picking F or shutter
  - Manual, you pick F-Stop and shutter
- Bracket
  - The camera takes 3 or more at different values

Camera ISO Settings

- Manual
  - You decide what to use
- Automatic
  - The camera decides
    - Usually has a maximum value and often a minimum value
- Higher values give more noise
- Why use higher or lower values?

Manual Exposure

- You choose the F-stop and shutter
  - If auto ISO is then the camera will still try and get the exposure it thinks is correct, so you can’t really control the actual exposure value until the ISO is also set manually (fixed not auto)

Exposure Compensation

- Unless full manual is set, the exposure compensation control can be used to lighten or darken the image to your creative decision.
- Either a button or a menu on your camera

Completely Manual

- Set aperture/shutter to M
- Turn off auto ISO
- You can use the meter to see how close you are to what the camera thinks is correct
  - The viewfinder only shows the effect partially and “exposure preview” must be on
  - Examine the histogram to discover the truth

Focusing Area

- Manual, you choose
- Autofocus
  - Spot
  - Auto
  - Group
  - 3D
  - Others

Focus Modes

- Press shutter release halfway down
  - Useful to focus on something, then reframe
- Single
  - Focus stays, even if camera is moved
- Continuous
  - Keeps adjusting focus constantly
- Auto
  - Focus will try and track the object it was focused on if it moves

Where Automatic Focus Fails

- Low light
- Low contrast
- Many potential objects to focus on
- Fast moving objects

White Balance

What color is that really?

White Balance

- Light sources have some color
  - Sunlight and shade are different
  - Incandescent and fluorescent are different
- Many cameras can measure from a gray or white card: custom white balance
- Shooting “raw” images allows adjustment later

To Make Things Even Harder

- Color monitors must be calibrated to display colors correctly
- Few of them are correct ☹
  - The controls can also be set incorrectly

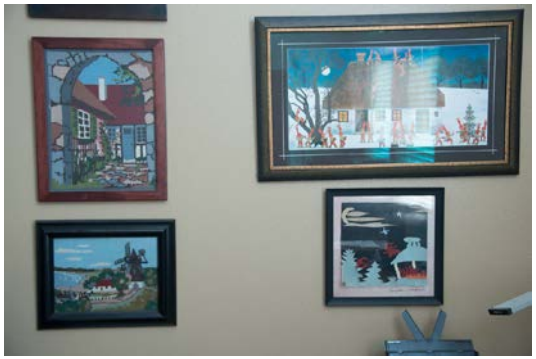
Color Test Photo – Test Display

Color Card – Shoot on site
Use later to correct colors

White Balance Example

- Left is original, has too much orange light, right is corrected
- Strangely our eye/brain system corrects when we are there, but not looking at a picture, that is why we must correct the images

Camera White Balance Settings



incandescent

fluorescent

cloud

shade

Sun (this one is closest)

auto

Camera White Balance Settings

incandescent

fluorescent

cloud

shade

sun

auto

Note how auto desaturates the colors!

Auto White Balance challenges

- Camera will try to make grey!
  - Dominant colors will get muted
  - I.E. Do not use automatic setting
- Mixed light
- Different fluorescents
- Use gray card

Try at home

- Take images of the same scene with different white balance settings
- Notice how the colors change
- This can be used creatively

Types of Light

- Sunlight
  - Overcast
  - Shade
  - Direct
- Artificial
  - Incandescent
  - Flourescent
  - led

Panoramas

Really wide or tall or both pictures

Shooting Panoramas

- Take multiple pictures and stitch together
- Really needs tripod and special head
  - Can turn on foot if careful
- Cell phones do a wonderful job

Better Pictures

Photography as Art and Visual Fun

Some people feel the rain while others just get wet

- Bob Marley

Camera as Artist Tool

- Even cell phones can be great tools
- It's a poor artist who blames his failures on his brushes!
  - Your tools may limit the kinds of art you do, you can't do watercolors with oil paints!
- Many people look, but not all see
  - Practice the art of seeing

Let the Camera Decide!

Using what it learned about quality photos, the Prosthetic Photographer AI identifies scenes worth capturing and trains the human behind the camera to recognize them. To do this, the AI triggers a small electric shock delivered through electrodes on the handgrip, which forces the photographer's finger to press a button and capture said ideal scene.

First Some Excuses

- I’m just an amateur
- I’m not creative
- I don’t have the right equipment
- This has been done before, I’ll never be as good as those
- I don’t do portraits, or I don’t get up early, or I can’t stay up late, or I can’t can’t can’t

Portraits and Posing

- Not in this class! Not enough time
- Many books available
  - Picture Perfect Posing
  - Master Posing Guide for Photographers
  - The Portrait Photographers Guide to Posing
  - From Snapshots to Great Shots
- Look on Amazon

Portrait Technical Advice

- 80mm (50mm on smaller sensor)
- Spot focus on eyes
- Aperture priority (or manual)
- Open F-stop (smaller number)
- Mostly don’t put face in middle of picture
- Turn off the flash on top of your camera
- Be friendly and relaxed
  - Even though you might be terrified inside!

Don’t Worry, be Happy

- Don’t worry too much about what others think of your work, please yourself first
- It’s great if others like your work, but don’t stop taking pictures the first time somebody doesn’t like one of your images

Vision & Technology

- Easy to teach mechanics of focus and exposure and white balance
- Teaching the ‘eye’ is different
  - Many people look, but only some see
  - Consider what children see
    - Example: Rain!
      - We see mud, mess, inconvenience, they see rain drops, puddle, rainbows, fun. Learn to think like a child again!
- Miksang

Left and Right Brain

- Left – Logical
- Lens choice
- Exposure
- Position

- Right – Emotional
- This is the “art” part
- Feelings about the image

Location

- Exotic locations can be easy
- Interesting images can be taken close to home
  - You may need to travel the same road many times to see the beauty and interest
  - Sometimes you will see what others miss

Taking Better Pictures

- Your picture tells a story, or maybe it is fun to look at, or maybe it is just beautiful
  - Topic – example nature scene
  - Subject – example a tree
  - Composition – how elements are arranged
  - Technique – the mechanical stuff, exposure, focus, lens, etc.
    - This is where manual exposure control is important

Topics

- Portrait
- Landscape
- Sports
- Flowers
- Trees
- Abstract
- Insects
- Weddings
- Events
- Weather
- Adventure
- Travel
- Animals
- Etc.

Elements of Composition

- Lines
  - Thick or thin
- Shapes
  - Polygons, circles, etc.
- Colors
  - Contrasting and complimentary
- Textures
  - Often need sidelight to see

Composition

- Light and dark areas
  - Light areas attract the eye, so do dark ones if surrounded by light
- Colors
  - Bright saturated colors attract the eye
- Lines and shapes
  - Leading lines, circular, diagonal, patterns
  - Direct the eye
- Rule of thirds, golden mean, golden spiral

More Composition

- Point of view, don’t stick to eye-level
  - Low is often good for children and animals
  - Flowers against sky are good
- Don’t be afraid to walk around looking for a better angle
- Pay attention to background
- Look at all the elements in the photo
- Framing, use something as a frame
- Use light and shadows

More Composition Rules

- Triangles are everywhere
  - Family portraits use stable triangle
- Don’t divide the image in half, the eye doesn’t know where to settle down
  - Common problem in landscapes

So What?

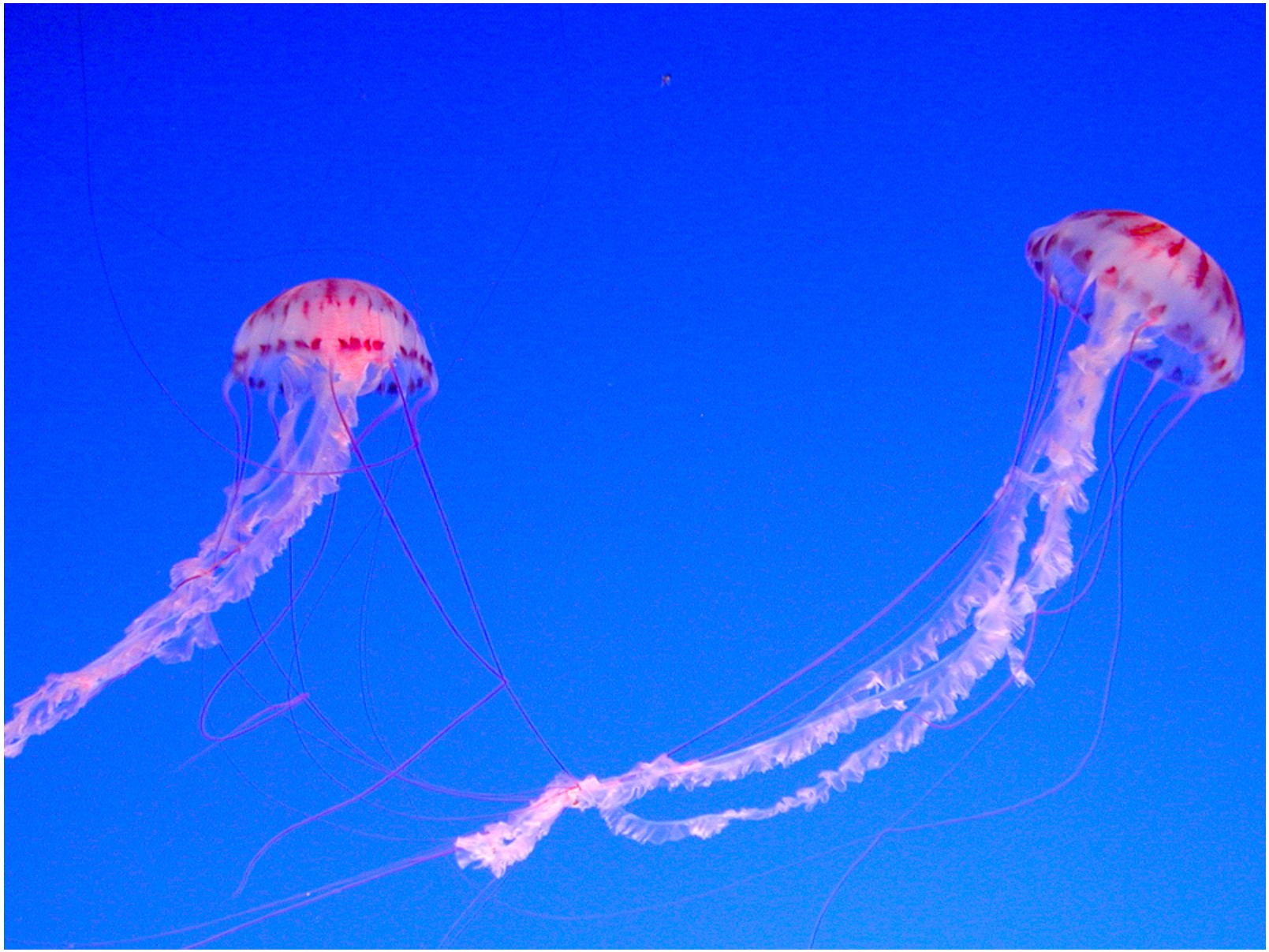
- Ultimately images are less about technique than they are about the feelings they invoke
- Techniques are necessary but don’t think that technique alone will make an enjoyable image
- Practice techniques so you don’t have to think about it while creating images

Inspiration and Creativity

- They ebb and flow, even great artists have “dry” periods where they aren’t inspired
- Try “jump-starting” with a challenge
  - Take 12 pictures from the same spot
  - Make 12 abstracts from the same object
  - Limit yourself to 24 exposures on a day trip
  - Walk around with no camera looking for art
  - Etc etc

Colors in Composition

- Reds and oranges pop out at you
- Blues and greens recede
- Contrasting colors isolate objects
  - Look at the opposites on the color wheel

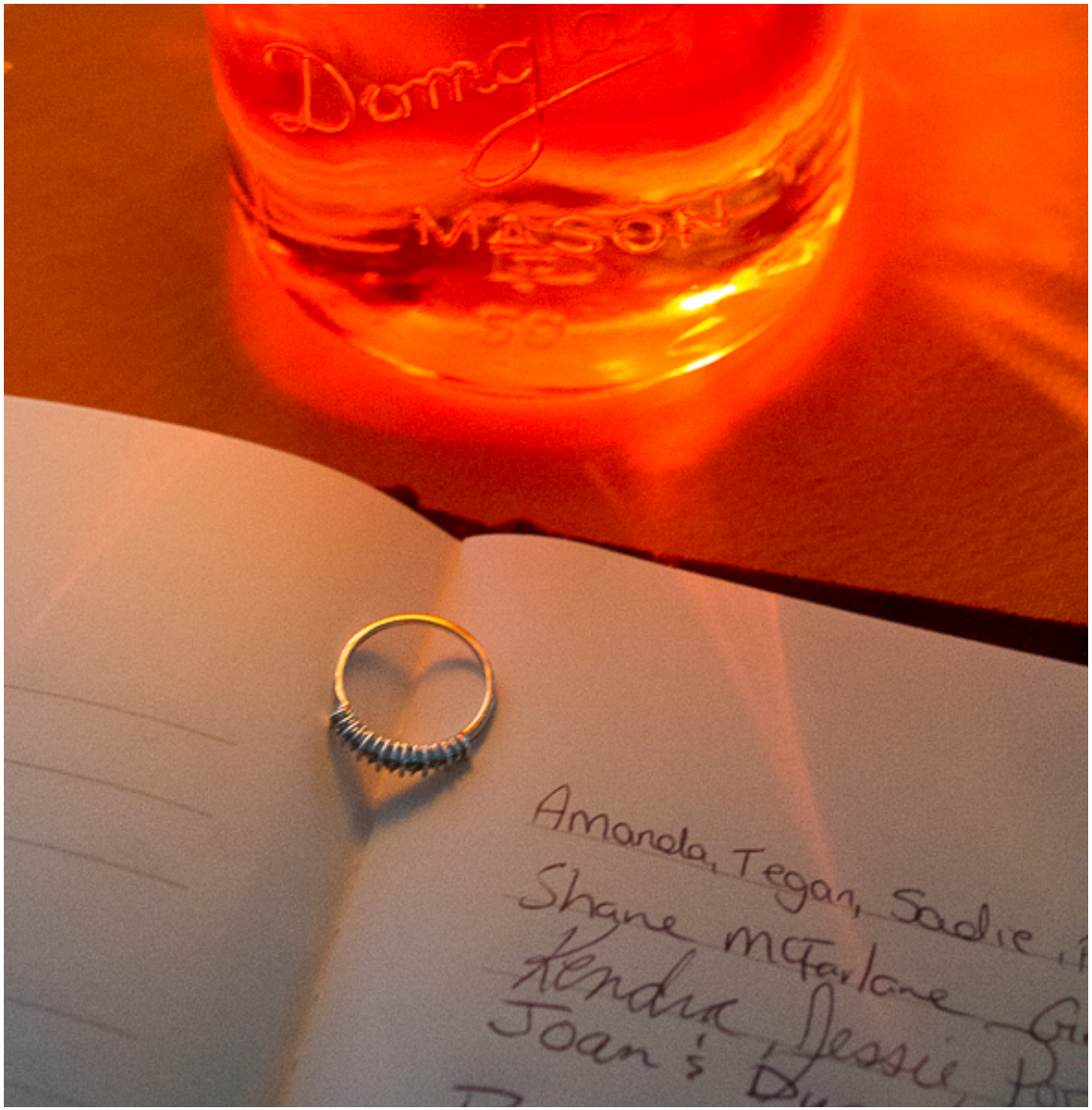



SCOTLAND

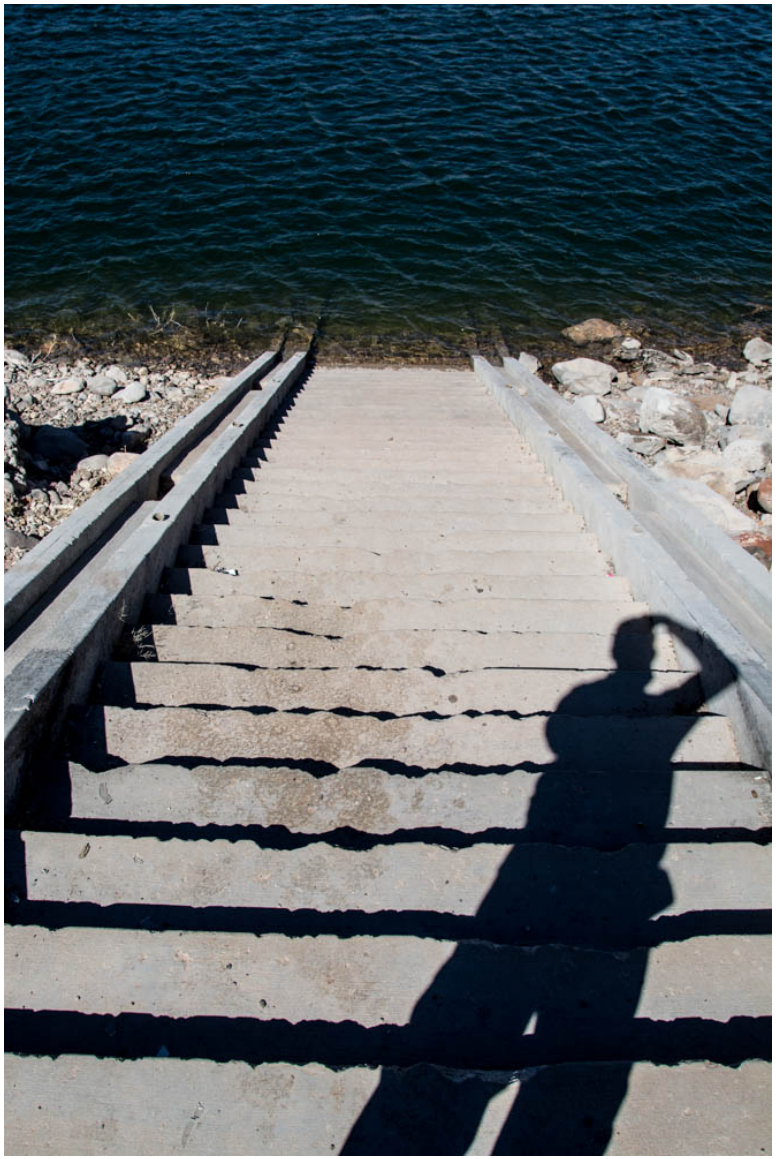

GERDA III

Notice how changing the background to dark muted colors makes the doll colors more interesting?

Shadows

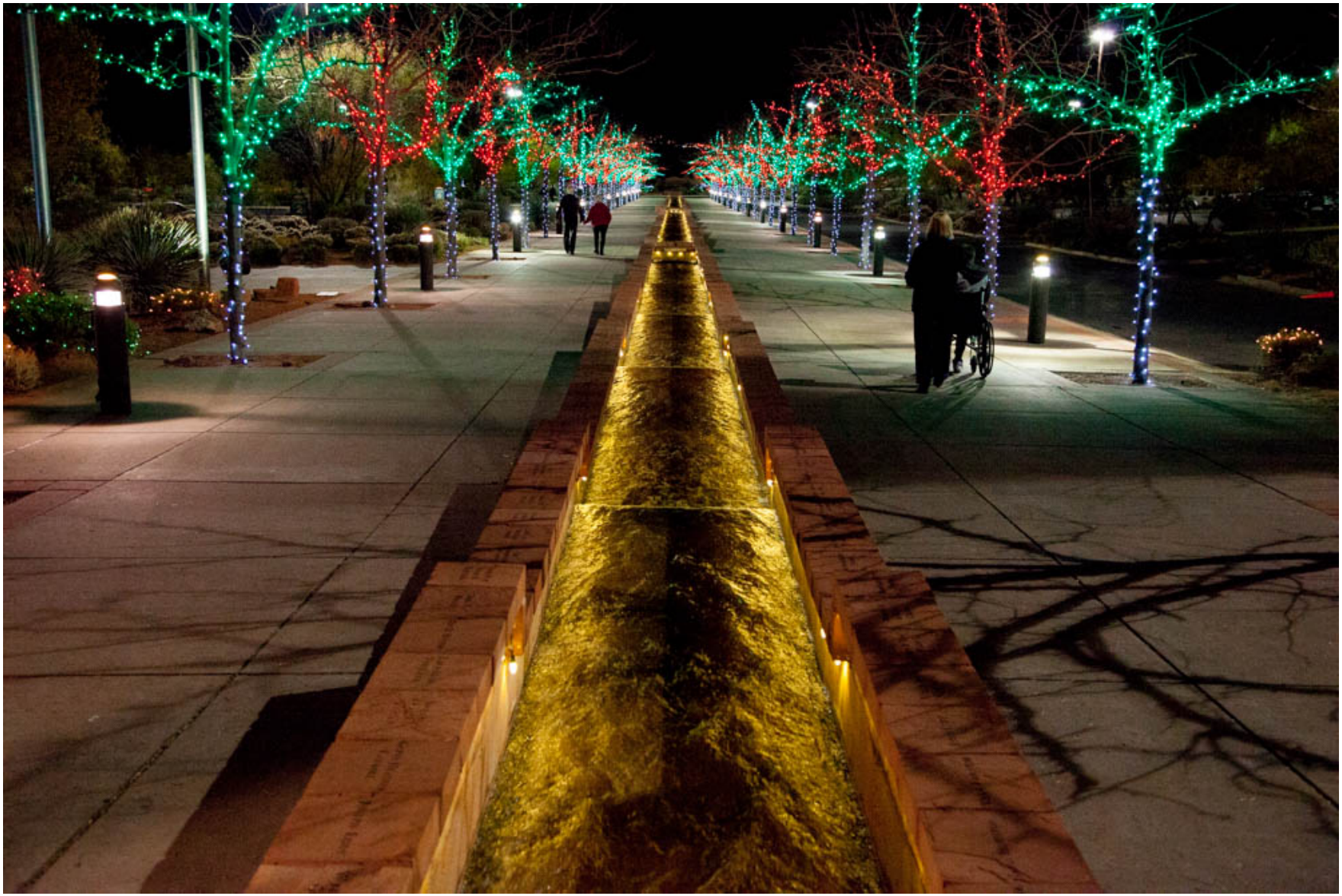


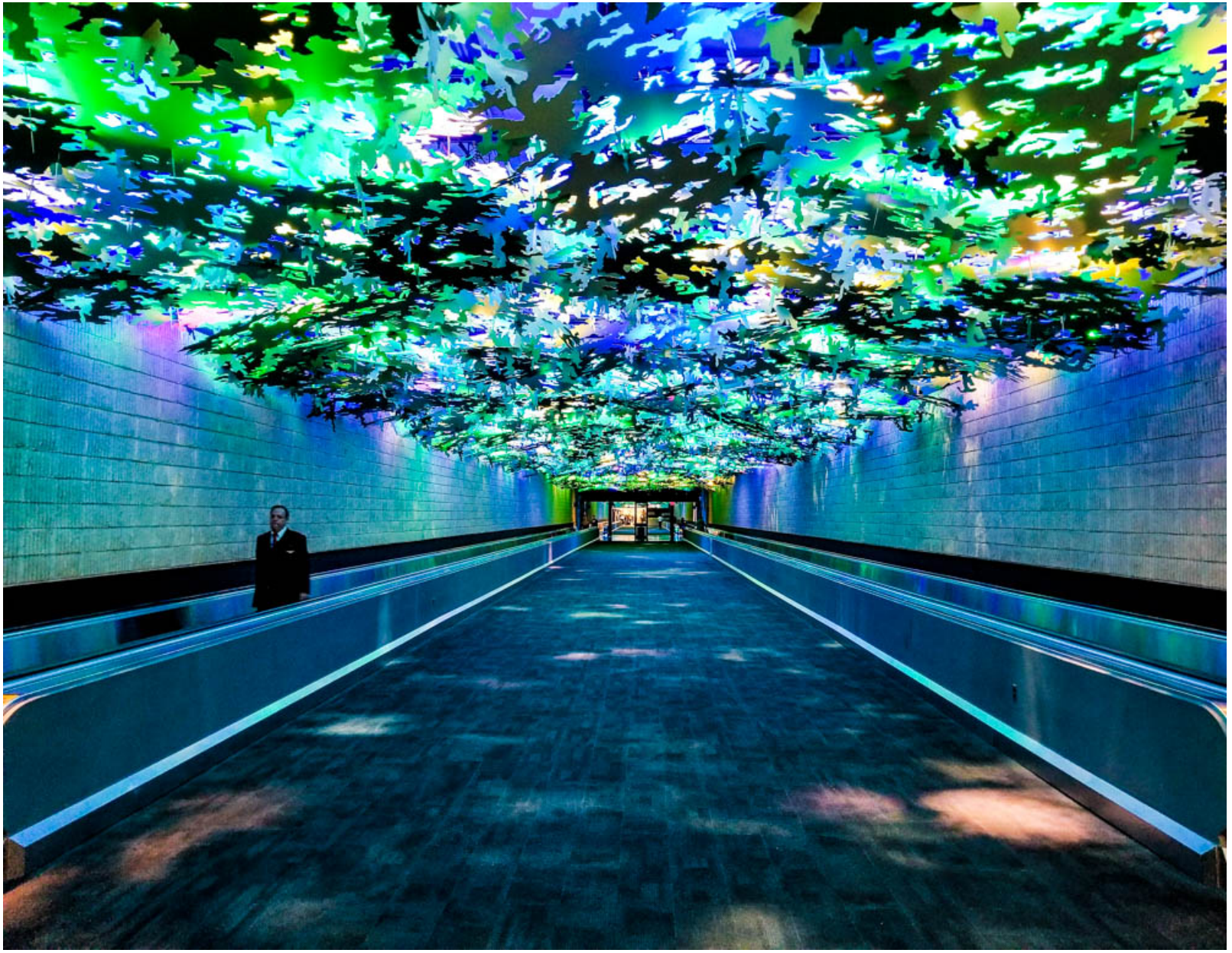
Shadows are often interesting, notice the wedding ring shadow



Sometimes you need to add shadows

Leading Lines





Silhouettes - Shapes

Reflections

Rule of thirds, put objects at intersections of thirds

Center and thirds example

Thirds Help from Camera

- Some cameras display a grid showing the thirds lines on the screen

Change your position just a little

Look for different views

Techniques 1

- Selective focus
  - F-Stop and the correct focal length
- Exposure
  - Dark, light
- Lens choice
  - Wide, tele, normal, fish-eye
- Vignettes
- Adjusting colors

Techniques 2

- Shutter speed
  - Slow to let things blur, fast to freeze them
  - Water is usually good with slow shutter
  - Sports sometimes needs fast shutter
- Panning can blur background while letting a moving subject remain sharper

Panning, choose shutter speed

Selective focus

A strong line leads your eye right up to the subject. The blue sky and green trees are receding colors so they help keep the dragonfly in the foreground.

Radial with vignette

Contrasting Shapes

Patterns Juxtaposition

Contextual Dichotomy – Extinguisher and Flammables

How Many Locks to Keep Cows In?

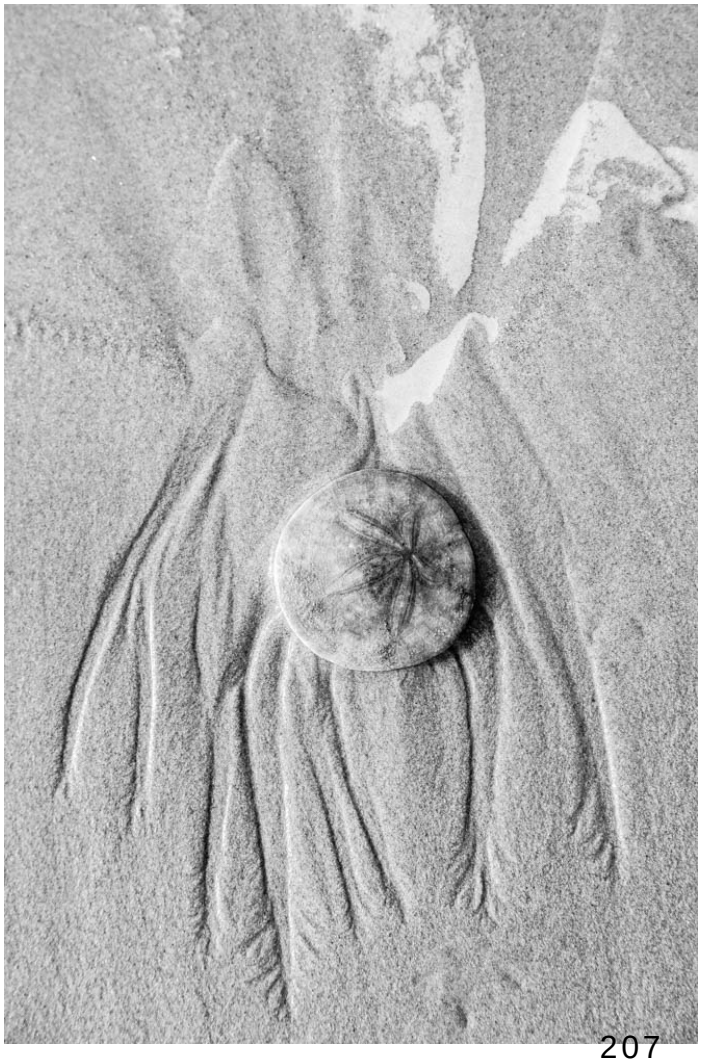
Out of Place

Old & Experienced

Wide angle, front flowers pop

Backlight

Sand Patterns – Side Light

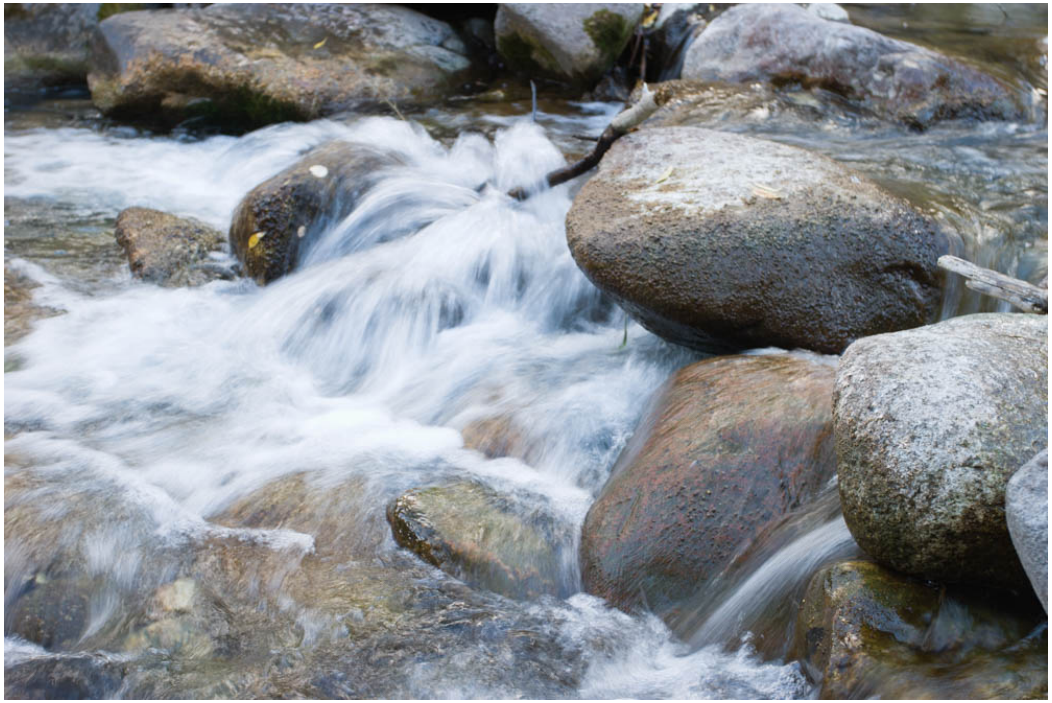


Sidelight to Show Texture

Texture of screen isolates the man, combined with the grill seem to show that his life is blocked.
Color of corn makes it pop out.
Contextually both man and corn represent autumn of their lives.
Corn is at one of the thirds intersections to get your attention.
Man's face is at another third for the same reason.

Plan your photos, don't just take snapshots!

Water with slow shutter



Try at home

1. Take several images at different shutter speeds of something moving, like a fan
    1. Notice how the blur amount changes
2. Use a really slow speed to see how steady your hands are
    1. Try holding the camera in different ways
3. Try panning a passing car at different shutter speeds
    1. Don’t do with police cars!

Night Photography

- Tripod
  - Use self-timer to avoid shake
- Meter from sky for starting values
- Long shutter speeds
- Extreme dynamic range
- More image noise

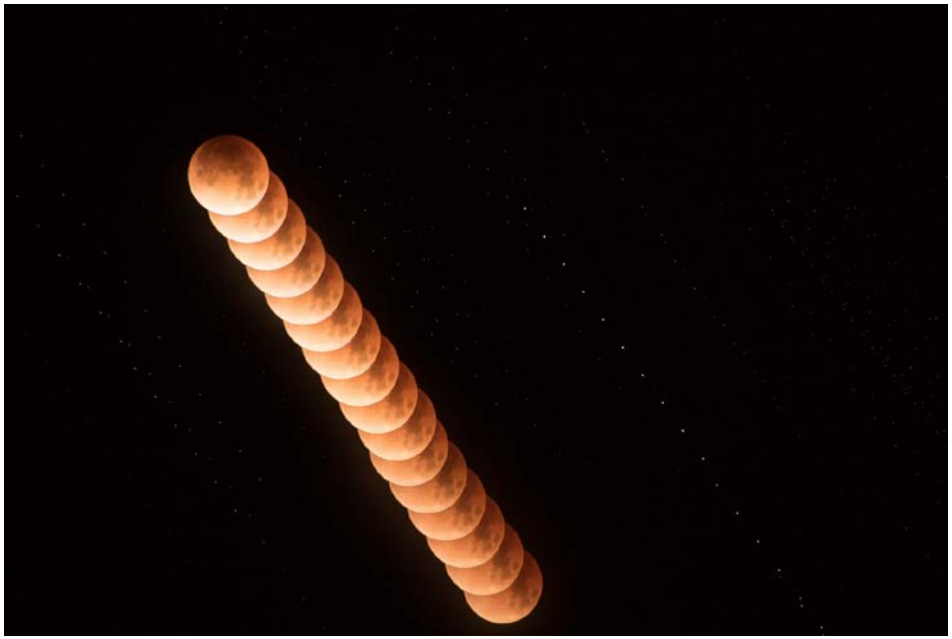
Dusk, almost night

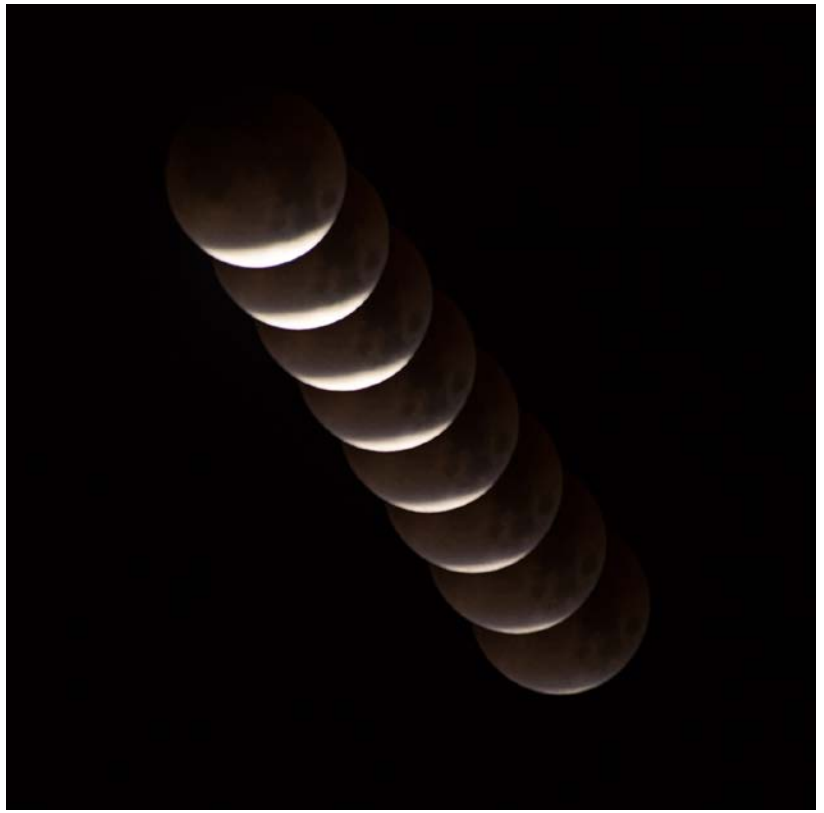
Extreme Dynamic Range

Clipped shadows and blown-out highlights (the moon and sun)
But does this really matter?

Night Sky, Multiple Exposures

Shot with 3 exposures, +- 2 stops.
Combined as HDR in Lightroom.
It is usually best to use a fixed f-stop and vary the shutter speed to keep edges the same between images.
It is also possible to change the ISO instead of the shutter speed.
In general moving objects are problematic and should be avoided, except water of course.





Lunar Eclipse 31JAN2018

Landscapes

- Tripod sometimes, lets you concentrate
- Foreground
  - Usually need something to establish scale
- Background
- Middleground
- Often has wide dynamic range sky & ground

Foreground, middle, and background

Forests

- Often need to ignore the ground, cluttered
  - Unless the ground is the subject!

In this example the forest floor is important.

Also watch the background very carefully, you don’t want any trees growing out of their heads.

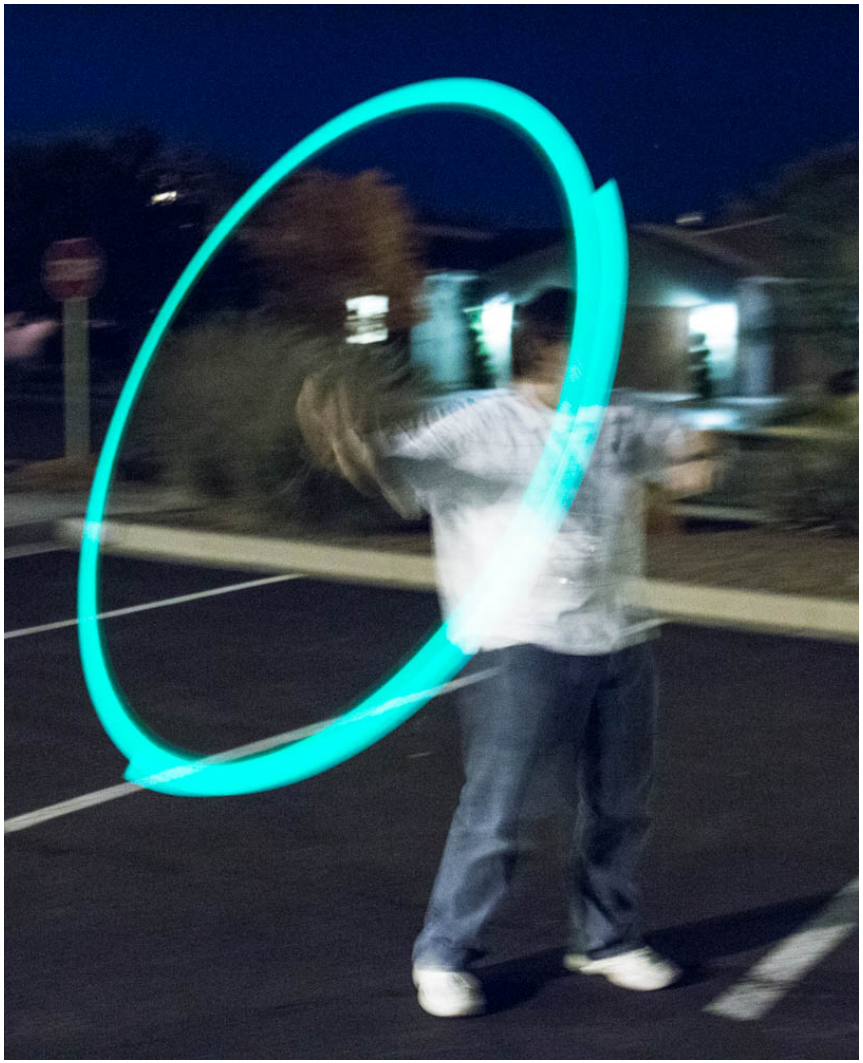
Look up

Don’t be afraid to experiment

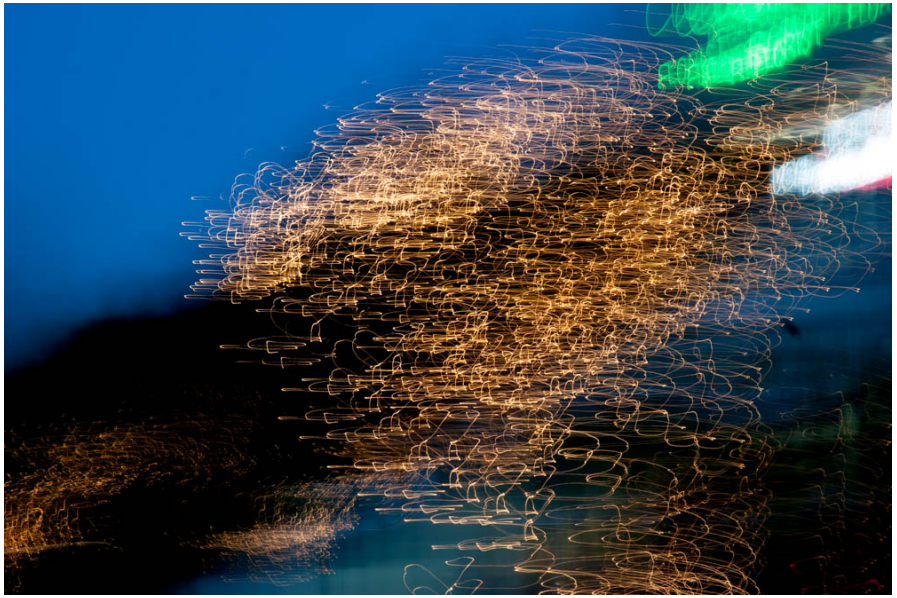
Multiple Exposures Show Motion

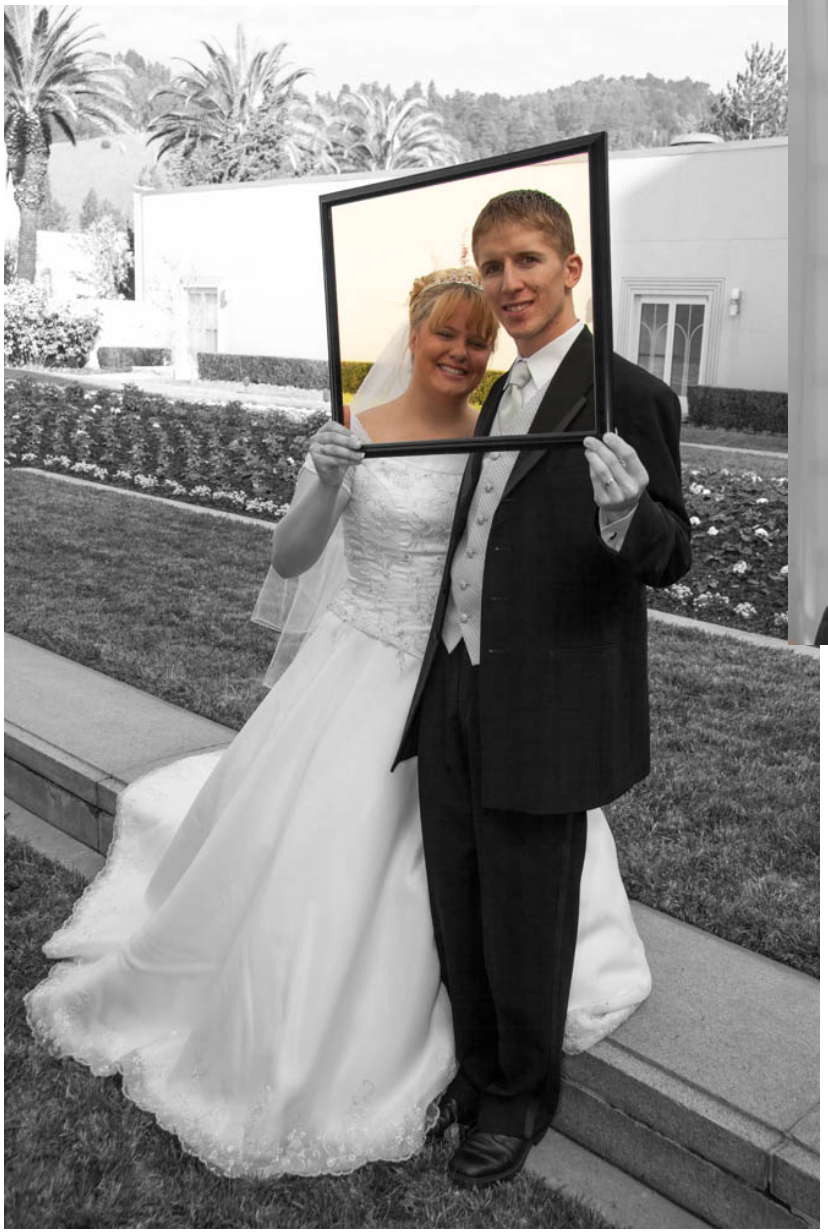
10 images 15 seconds apart. Stacked in Photoshop with lighten blend mode.

Lens Flare



In automatic mode the camera won’t let you do things like this.
It will try to pop up the flash because there isn’t enough light!





Isolate color to focus interest

Flowers

- Always popular (look at anybody's photos!)
- Try different angles
  - Against sky is often good
- Use depth of field to blur background
- Use colored backdrop, reflector or cardboard
- Get close, sometimes really close!
- Look for bees and other insects
- Carry spray bottle for moisture droplets
  - Water or glycerin

People

- Eyes in focus if face is seen
- Doing interesting things
- Sometimes need reflector or flash to keep face from being too dark

Children

- Get down to their level
- Catch their expressions and activities
- Place in interesting surroundings
- Getting cooperation can be challenging

Pets and Animals

- Focus on eyes
- Sometimes need room in front so they don’t looked trapped in the image

Sharp Not Always Necessary

Give them room to fly

Get close

Interesting background and lines

Fast moving animals are fun

Sunset/Sunrise

- Silhouettes always interesting
- Underexpose and warming can improve
- Editing can also improve
- We saw some examples earlier

Sports

- Get close, see the face
- Show movement, panning, shutter speed
- Or, freeze the important moment
- Mostly need long lenses


SAINT MARY'S
2


STANFORD


CalMan

Even shoes can tell a story

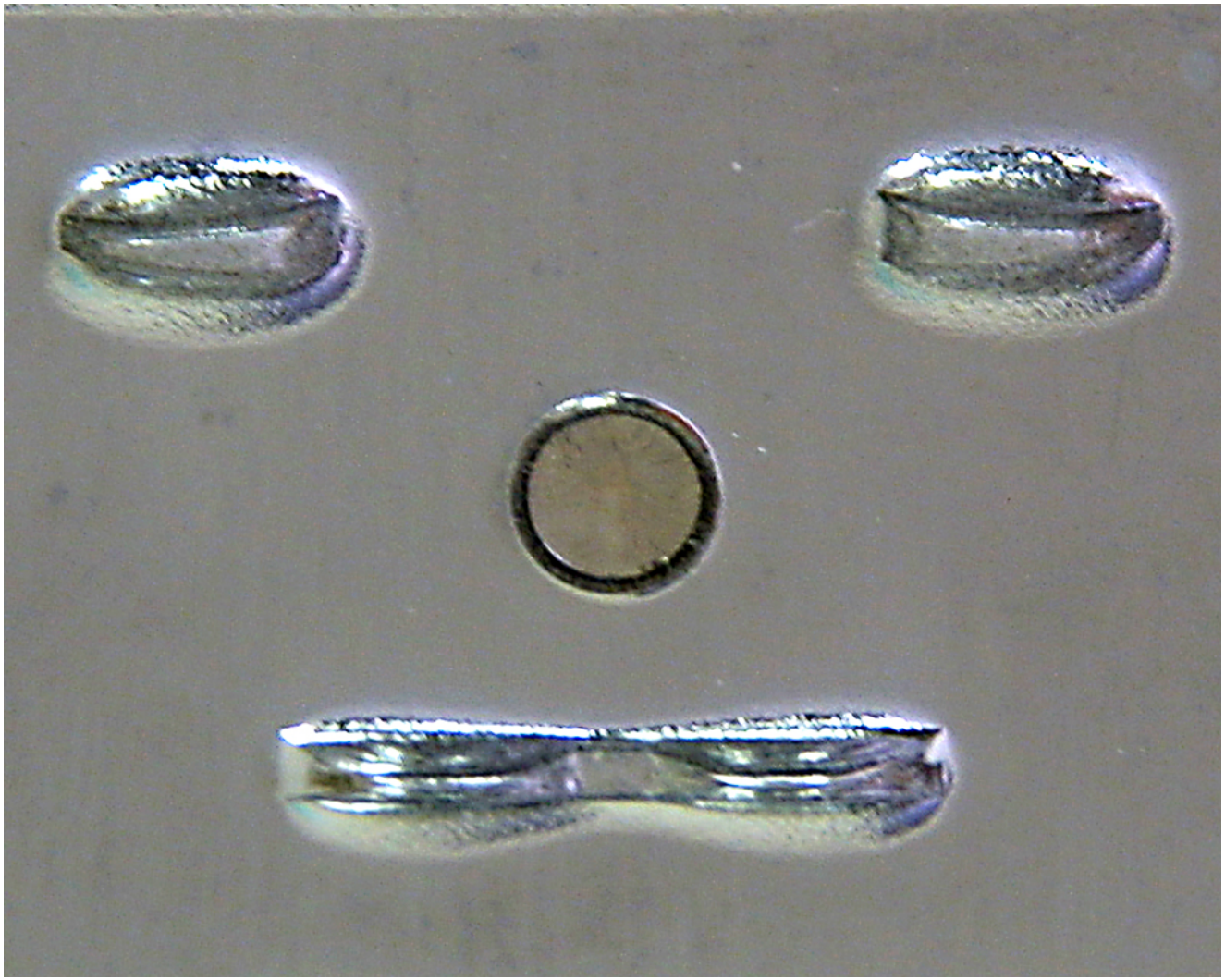
Backlight

- Silhouettes and semi-transparent things

Close-ups

- Many things look interesting up close

Smile



Sausages and Balloons?

Framing – Old but still good

Buildings

- Architecture is always interesting
  - Interiors can be challenging
  - Extreme light and dark
  - Sometimes no flash or tripods allowed
  - Restrictions on standing locations
  - Don’t forget about exterior details

Soft lighting, fog.

Perspective Corrections

Creative Copying

Travel

- Keep record of where you've been
- Try and find angles or lighting that you haven't seen before

Look Around You

- Look around for interesting things
- Look in books and magazines for what has been done and what is popular

Common Mistakes

- Putting the face or other subject in the middle of the image, sometimes ok
- Take time to think about what the image story is, don’t rush
- Don’t try to cram too much in the image, simplify, declutter, figure out what belongs
- Improper exposure, get it right! Don’t always trust the camera

More Common Mistakes

- Watch the background
  - Trees growing from head
- Blurry images, focus or shutter speed
- Try other viewpoints
  - Like eyelevel, experiment
- Edit too much, a little might be good
- Cutting subject parts off

How to get better images

- Practice practice practice
- Take lots of picture, digital has almost no cost per image
- Edit photos and impress your friends

Sharing Photos

Online is popular and easy

Places to Share

- www.eyefi.com
- www.facebook.com
- www.flickr.com
- photos.google.com
- www.Instagram.com
- www.photobucket.com
- www.pinterest.com
- www.smugmug.com
- www.thislife.com

Photo Managers

It should be easy to archive, sort, edit, and find images

Image Managing Software

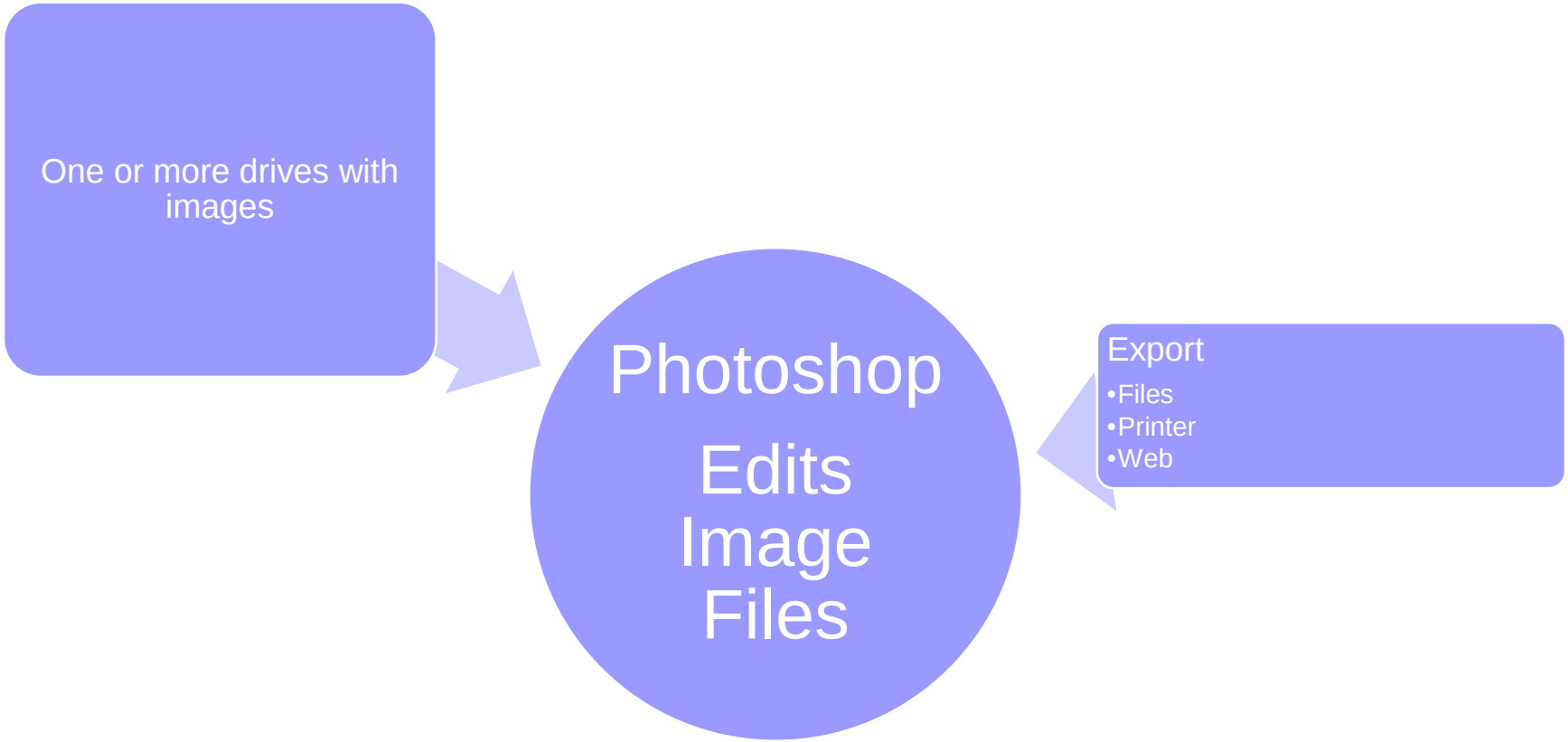
- ACDSee
- Lightroom Classic CC
- Google Photos (replaced Picasa)
- Cyberlink PhotoDirector
- Corel Paintshop Pro
- Many others
  - Easy searching and browsing
  - Editing and printing

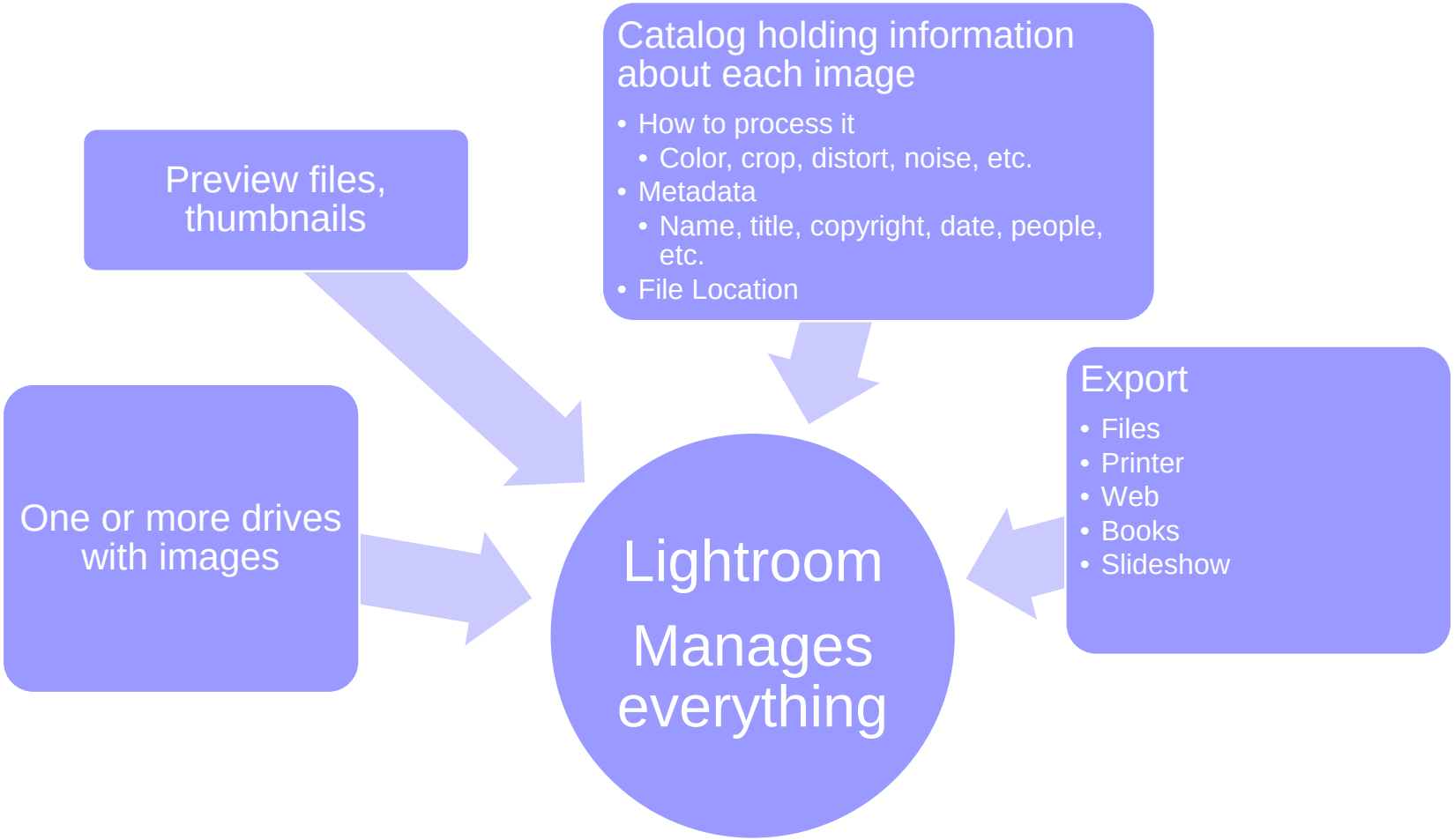
Google Photos

- Replaces Picasa
- Automatic tagging
  - Works amazingly well
  - Matches faces
- Non-destructive image editing
- Excellent price! Free

Lightroom Tour

LR is an excellent tool available on both Mac and PC


One or more drives with images
Photoshop
Edits
Image
Files
Export
•Files
•Printer
•Web


Catalog holding information about each image
• How to process it
• Color, crop, distort, noise, etc.
• Metadata
• Name, title, copyright, date, people, etc.
• File Location
Preview files, thumbnails
One or more drives with images
Lightroom
Manages everything
Export
• Files
• Printer
• Web
• Books
• Slideshow

Adobe Lightroom

- Great tool for managing photo collection
- Keyword/metadata searching
- Never modifies the original image file
  - Excellent tools for editing the image
  - This is a really big deal! The originals are treated like negatives and will never be damaged by editing, editing can instantly be undone, even after saving
- Virtual copies, tiny disc space

Lightroom

- Can get Photoshop and Lightroom for $9.99/month
- LR is a great image management tool
  - Import, export, store, tag, locate, display, compare, edit, print, map, web, photo book, slide shows, and much more
- Runs on OSX and Windows

Non-destructive Editing

Instructions
Stored in Lightroom
Can be changed anytime

Original - it is never modified

- **Crop**
- **Correct Perspective**
- **Make Black and White**

Final Result

Websites

- www.uglyhedgehog.com
  - Great photography blog site
- www.bhphotovideo.com
  - Videos and equipment
- www.ppsop.com
  - Videos and classes
- www.asa100.com

More Websites

- www.eyeem.com
  - Photo sharing
  - Phone app

Popular Sites

- www.eyefi.com
- www.facebook.com
- www.flickr.com
- photos.google.com
- www.instagram.com
- www.photobucket.com
- www.pinterest.com
- www.smugmug.com
- www.thislife.com

NOTE: some sites don’t store full resolution images