

09 Lighting and Cameras

Monday, September 11, 2023 3:27 PM

Mike Olbinski - storm chaser, incredible time lapse
[Ambient Storms // Storms, Lightning and Sunsets for your 4K TV](#)



Admin

Minute paper

- Did you get useful feedback during critique?
- Did you capture it for future use in your report?
- Did you give useful feedback during critique?

Lighting

Continuous vs Strobe

Continuous: Good for video or long time exposure, particle tracks

Sunshine

Almost parallel light rays. Various availability. Hot.

Incandescent light bulbs: Hot, smooth, no flicker, continuous spectrum

- A) I have owned or purchased incandescent light bulbs
- B) I have seen them
- C) I'm not sure, it's hard to tell them from LEDs
- D) No, I've always had either LEDs or CFL/fluorescents



Fluorescents:

flicker @120 hz, specific wavelengths blended to look white-ish. Cool.
Hazmat to dispose of.

LEDs:

Need a high quality power supply to avoid flicker

Laser:

Diode lasers give single, pure color. Coherent, narrow beam, can be spread into sheet with a cylindrical lens.
SAFETY IS A BIG ISSUE. Eyes are easy to damage permanently. Training available.

Strobe = Flash: Good for still images

"Freezes" motion

Strobes and Speedlights

AKA 'electronic' flash.
Xenon flashtube technology 1931.
Common in studios and built into cameras (but NOT cellphones)
Durations: 1 to 10 microseconds (1/100,000 to 1/10,000 sec)
More powerful than cellphone flash

LED Strobes

Found on cellphones. Low power, small size. Specs not available.
Big LED strobes in red and blue are used on emergency vehicles.

Pulsed Lasers

Durations as short as femtoseconds (10^{-15} , a millionth of a billionth of a second).
Picosecond (10^{-12}) common for tattoo removal, but low power.
Nanosecond (10^{-9}) common for micromachining and flow vis, good power, 100mJ per pulse. Very dangerous...

OVERVIEW Choice 4: Image Acquisition.

We'll do this section in more depth than in the rest of our Overview.

RTFM

Good digital photography references:

Thousands of books and videos are out there.
 LinkedIn learning: online video tutorials for photography and video production
 CU has a site license. Access from MyCUInfo > CU Resources > Training > LinkedIn Learning

We'll cover basics here to get you started.

4.1) Workflow - Framing/Composition

- a. #1 rule of photography: **Make The Subject Fill The Frame**
 Yes, you can crop to achieve this, but image dimensions of less than 700 pixels won't be accepted.
 Use your real estate well.
- b. Know your scale. Take an **extra** image with a ruler in it.
 You'll need to specify your FOV = Field of View
 i.e. "top to bottom was 10 cm"
 Sometimes the image will supply the scale, such as the diameter of a jet or jar.
- c. **Work it.** Take many images, from varied POV = Points of View
 - Get close, pull back. Move around the sides.
 - Try a mirror to see the back.
 - Consider making a stereo image: 3D!
 - Try video, a few seconds or minutes
 - Change the lighting.
 - Try time lapse (smartphone camera app is easy to use)
 - Consider the motion: Capture the whole track, and also zoom in on a particular moment/location
 - Plan lots of attempts. **Look at results at full resolution first**, not just on camera LCD. Takes time.

Don't forget to also make copious notes on your experiment. What fluids, dropped from how high. Photograph your setup, measure distances to camera, to lights, everything you can think of so you could do it again.

4.2) Cameras: Roughly 4 common types, but technology is changing quickly

All have

- AE = Auto Exposure. Automatically sets shutter time, aperture, ISO (sensor sensitivity) according to varied programs
- AF = Auto Focus. May be contrast focus and/or phase detection technology. See <https://www.jmpeltier.com/2017/12/08/difference-phase-detection-contrast-detection-autofocus/>

Who has what? Clicker poll:

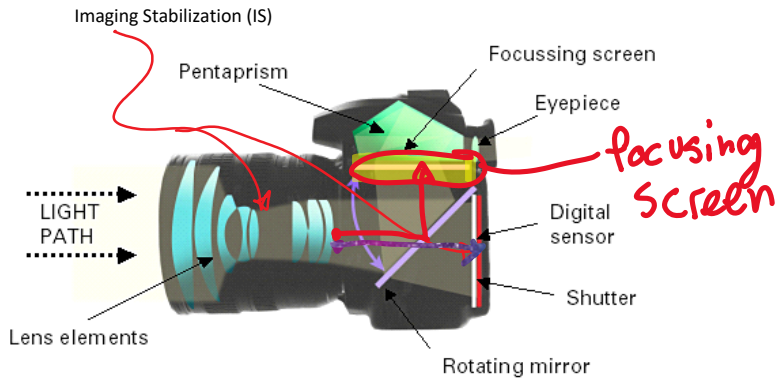
A - DSLR	B - Mirrorless	C - Compact, Point and Shoot	D - Film	E - Phone camera only
Digital Single Lens Reflex Optical viewfinder	Interchangeable lens but no viewfinder, just LCD	PHD Push Here Dummy. LCD viewer, fixed lens		

2020	2022	2023
A - 54%	73 %	77%
B - 21%	17%	23%
C - 14%	7%	0
D - 4%	0	0
E - 7%	3%	0

DSLR



https://www.ephotozine.com/articles/nikon-d5-dslr-hands-on-preview-28654/images/highres-Nikon-D5-Internals-Cross-Section-1_1452055157.jpg

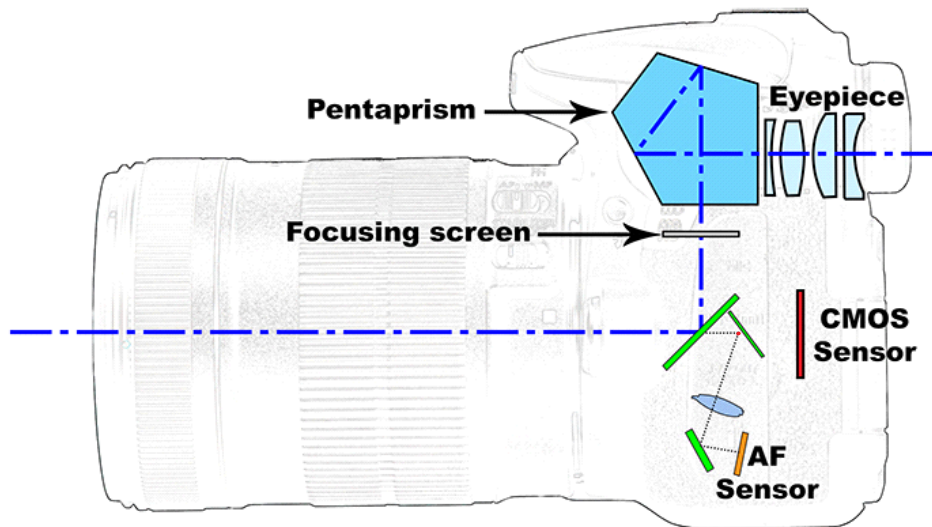


<https://george12johnson12.files.wordpress.com/2015/03/slr02.jpg>

Mirror flips up when shutter triggers = REFLEX.
For long exposures, lock mirror up to prevent vibration.

DSLR animation:

https://commons.wikimedia.org/wiki/File:SLR_-_DSLR_optical_diagram_07.gif



<https://2dhnizrxqv1awj231eodq1-wpengine.netdna-ssl.com/wp-content/uploads/2017/03/AFSensor.jpg>

Use circular polarizers on lens front to get past partial mirrors into AF and AE sensors. Why use a polarizer? Darker skies, no glare, keeps colors for the most part.

However, Ansel Adams used yellow or red filter to get beautiful black skies in B/W:



Ansel Adams, Clouds, Sierra Nevada, California, 1936

<https://www.moma.org/collection/works/58296>

https://en.wikipedia.org/wiki/Ansel_Adams

Probably the most famous landscape photographer ever. Shaped the evolution of photography and influenced technology

Mirrorless

Same capabilities as DSLR, but no optical viewfinder; LCD display only. Lighter weight as a result. Image composition in varied lighting conditions can be difficult, harder for folks with glasses, less focus resolution. Maybe electronic shutter only?

PHD:

Small sensors; lower resolution even if mpx the same; diffraction limits approached?

Often no lens choices. Can still add close-up lens.

Composition is harder. LCD screens tough to use in sun, don't show fine focus (on low end cameras). Usually can't preview depth of field.

Much lighter, more portable.

Comparable performance at prosumer level.

Often excellent macro (close up) imaging due to small sensor and short focal length lens.

Becoming rare because

Phone cameras

Very small sensors, very short focal lengths but reasonable MPx. Often good macro imaging. Can add lenses. Often dirty or damaged lens surface. Fixed aperture size, electronic shutters only. Difficult to specify exposure or focus; specialized apps may help. Unknown image processing.

Modern phones provide multiple sensors with various lenses. Transparent to the user.

CAMCORDERS:

primarily for video, now only professionals use; prosumers use DSLRs, everybody else uses phones. Records to disk or solid state memory. Usually longer record time than still cameras. Built-in effects, maybe editing, quieter mechanisms, set white balance, better microphones

Action cameras: GoPro Hero series. Tiny, rugged, waterproof, good resolution, image stabilization. Fixed wide angle lens.

High Speed Cameras

In the ITLL Electronics shop ECEE 167 for checkout. See Jonah.

Phantom Miro C110

- Maximum Frame Rate: 900fps at 1280 x 1024 resolution
- Maximum Resolution: 1280 x 1024
- Up to 52,200 fps at reduced resolutions.
- Allow time to transfer to your data storage

PHANTOM AMETEK PRODUCTS INDUSTRIES APPLICATIONS RESOURCES NEWS CONTACT US

Home > PRODUCTS > Miro C and N > C110

C110

The Phantom Miro C110 is our most basic and easy to use camera. It includes the same Phantom features and quality as other Phantom cameras in a cost effective and flexible option. Small pixels make it perfect for microscopy.

- 900 fps at 1280 x 1024
- Exposure Index Range:
 - Mono 2,500 - 12,500
 - Color 640 - 3,200
- 8GB (16GB optional) RAM
- 1.3 Mpx, 5.6 micron pixel size

Manual: See Class Info, left menu.

Also <http://colorado/workshopresources>

Sony NX80



- Maximum Frame Rate: 1000 fps
- Maximum Resolution: 3840 x 2160 px

Manual: TBD

Camera technology is changing rapidly. Lines between designs are shifting. Superzooms, for example.

1. LENSES

Minute paper. Compare in your groups. What are the numbers on your lens? What do they mean?

18-55 (1:3.5-5.6)

focal length
mm

aperture range
f/#