



Exposure

- 3 elements
- depth of field
- shutter speed
- iso
- noise
- strategies



What settings should I use?

Well...

Photo by Alex E. Proimos

It depends.

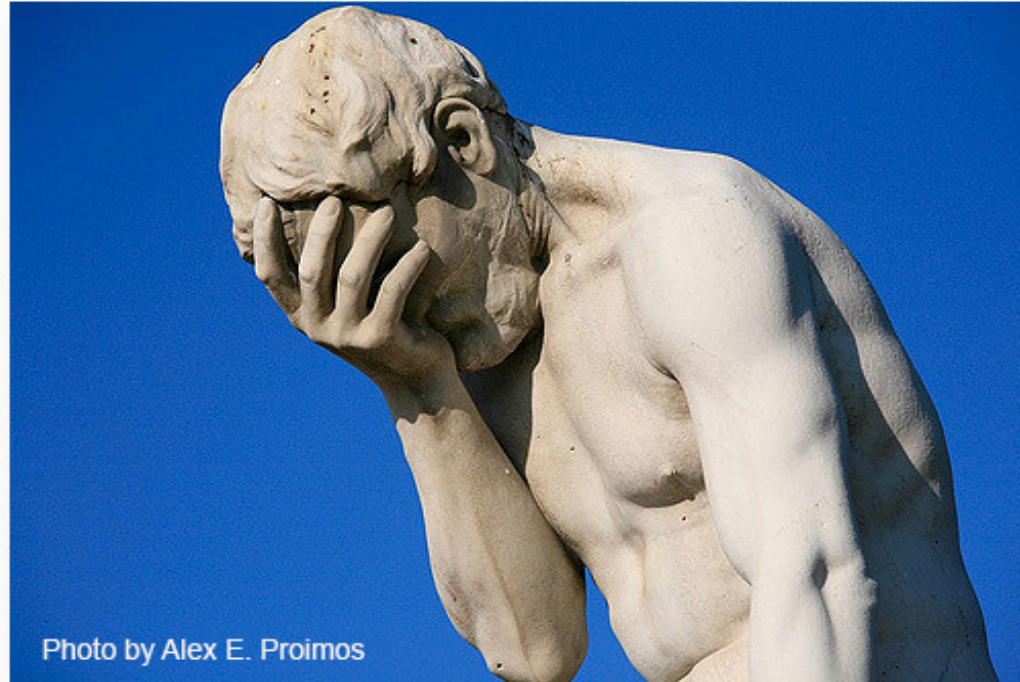
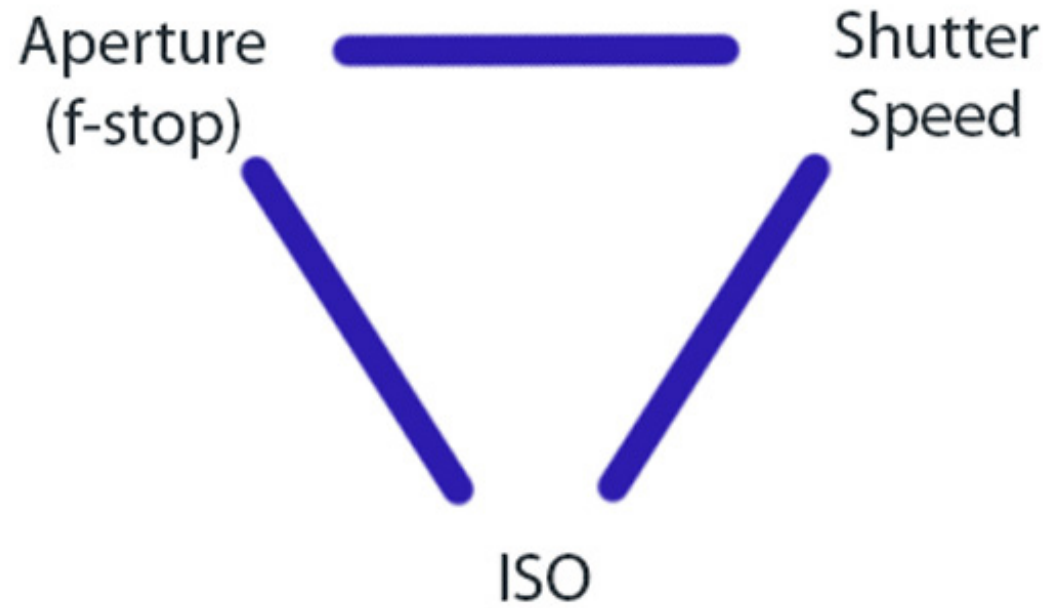


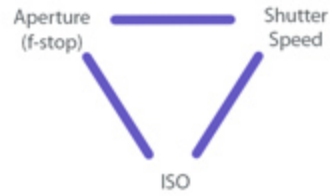
Photo by Alex E. Proimos

Sorry.

3 Elements of Expoure



3 Elements of Exposure



Aperture

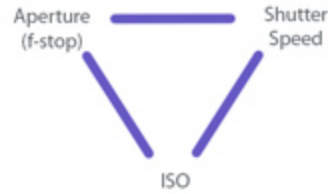


Small diameter
High f-stop (f_{11+})
Less light



Large diameter
Low f-stop ($<f_{5.6}$)
More light

3 Elements of Exposure



Aperture

$$N = \frac{f}{D}$$

Focal length (f)

divided by the diameter of the entrance pupil
equals the f number (N) or the f -stop.

Common f-stops

2.8, 4, 5.6, 8, 11, 16, 22, 32



Each increase in f-stop reduces the size of the aperture by 50%,
cutting the amount of light by half

Each decrease in f-stop increases the size of the aperture,
doubling the amount of light

Aperture and Depth of Field



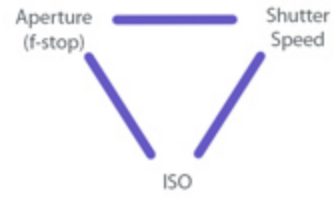
Low F-Stop = Shallow Depth of Field
(some of the time)



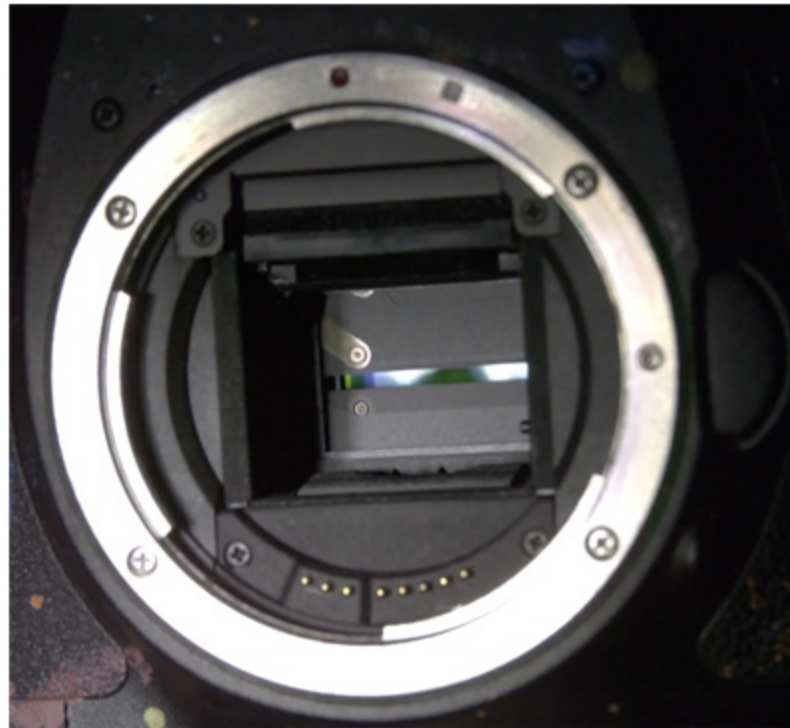
High f-stop (f11+)
= Large DOF

The higher the f-stop, the greater the depth of field

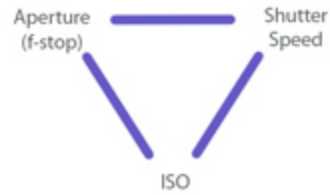
3 Elements of Exposure



Shutter Speed



3 Elements of Exposure



Common Shutter Speeds

1/8

1/15 Tripod

1/30 Hand Held*

1/60

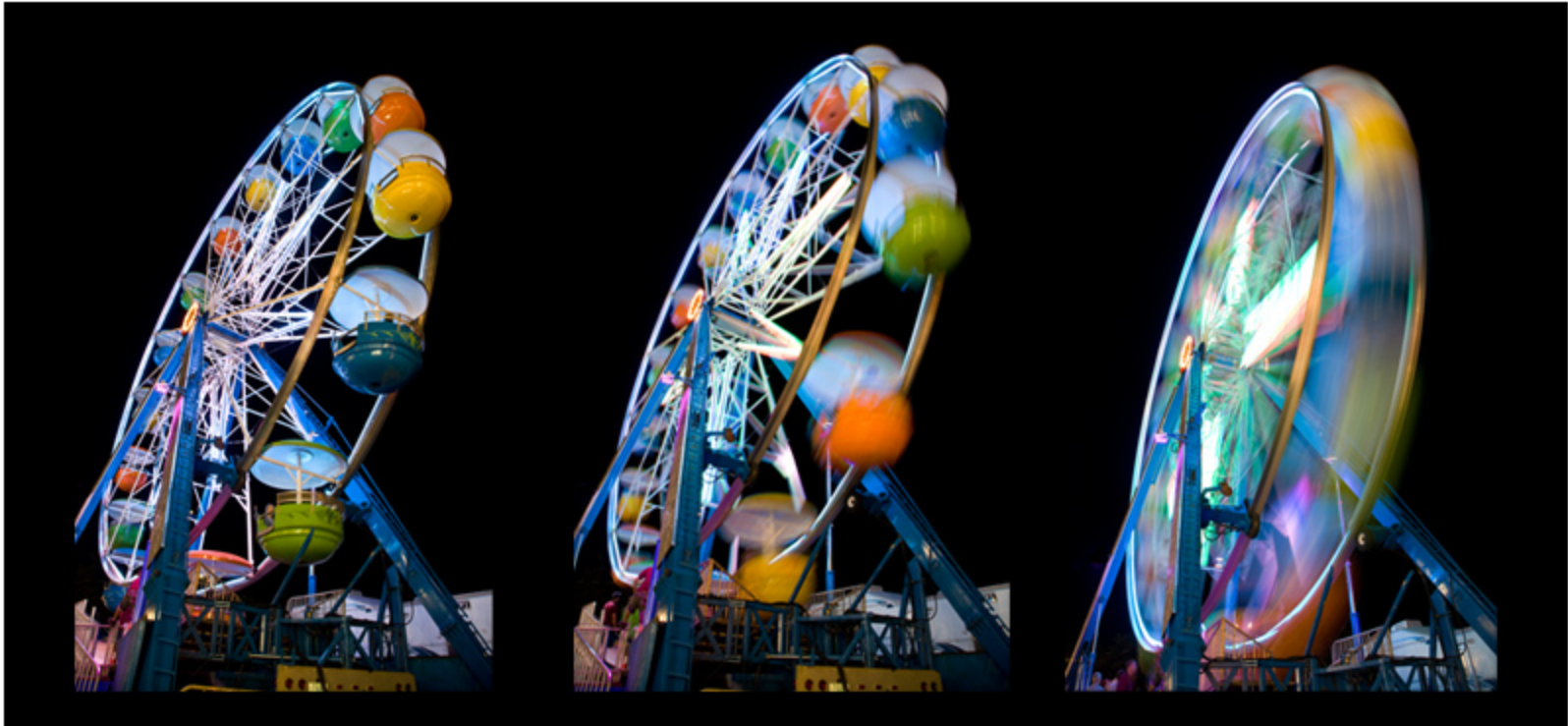
1/125

1/250 Stop Action

1/500

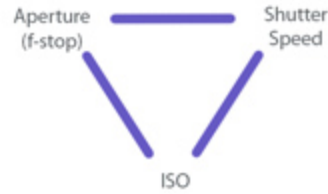
1/1000

Composing with Time



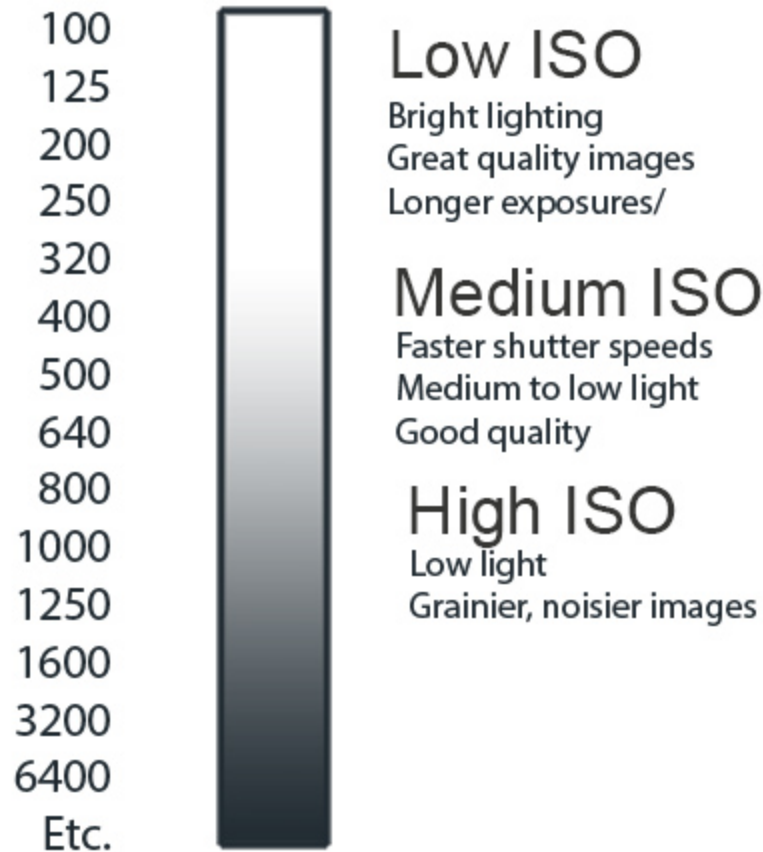
Using shutter speed as a compositional tool
to stop or blur the action

3 Elements of Exposure

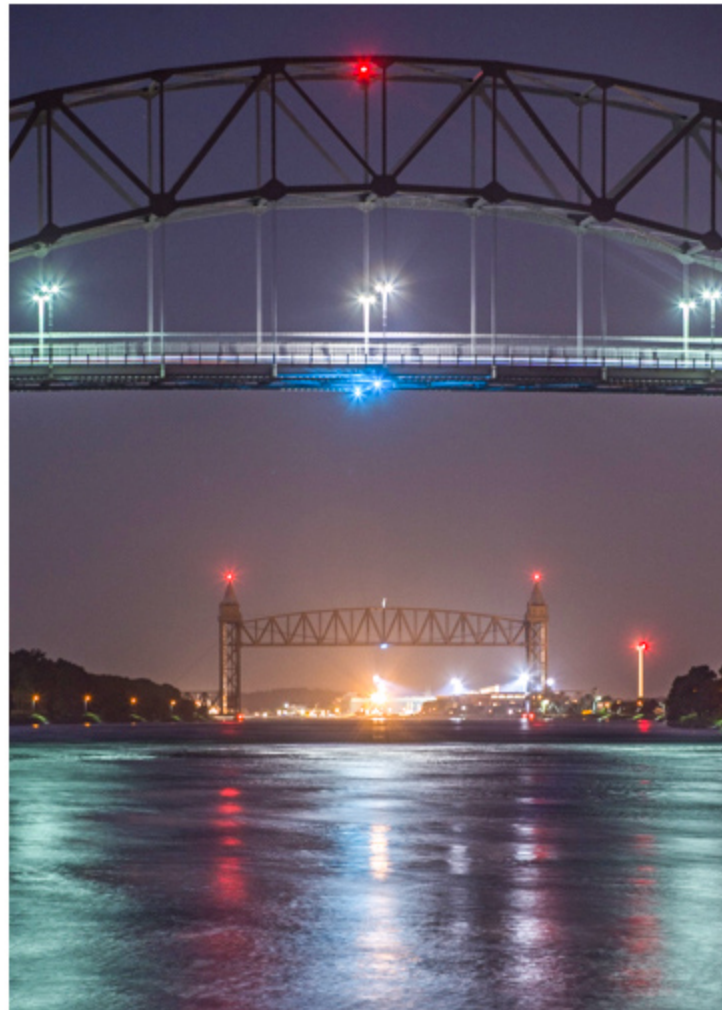
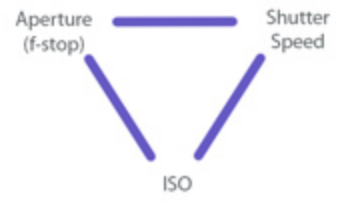


ISO

Controls sensitivity of sensor to light (sort of)

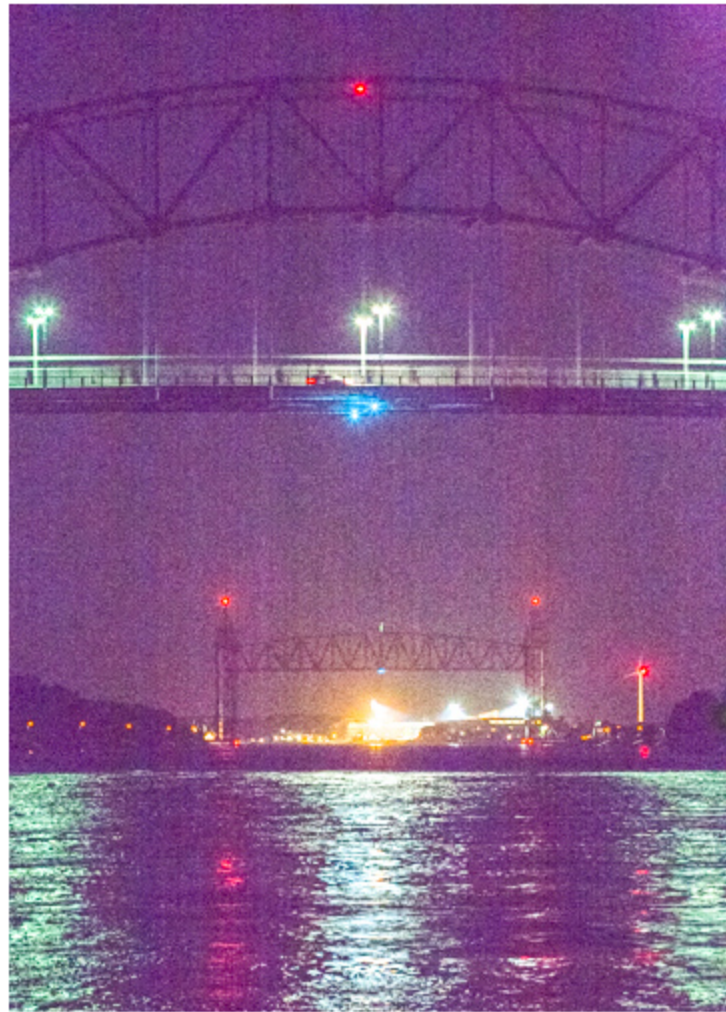
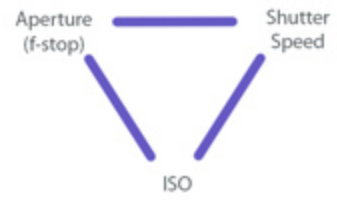


3 Elements of Exposure



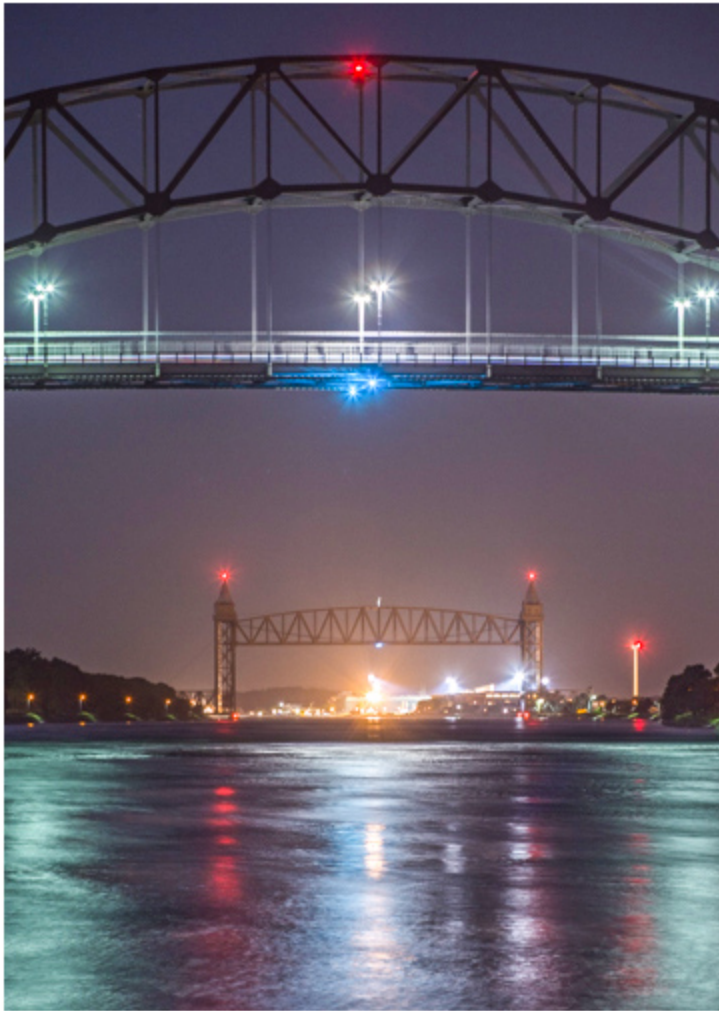
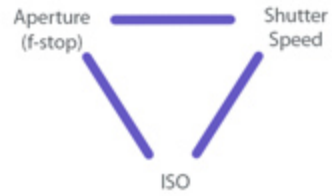
ISO 320, F8, 8 secs.

3 Elements of Exposure



ISO 25600, F8, 8 secs.

3 Elements of Exposure



ISO 320, F8, 8 secs.



ISO 25600, F8, 8 secs.

NOISE

Noise results from low signal-to-noise ratio.

The “signal” is created by light.

More light, greater signal, less noise

Things That May Increase Noise

Low light/shadows

Sensor Size

- Small sensors (eg phones) gather less light, resulting in lower signal and more less noise

Pixel Density

- The more pixels packed onto a sensor, the greater chance for increased noise

High ISOs

Long Exposures

How to Reduce Noise

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Use lower ISOs

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Shoot in better light

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Noise reduction software

(Lighroom, Adobe Camera Raw,
NIK Dfine, Topaz DeNoise)

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Long exposure noise reduction

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Long exposure noise reduction

Bracket for exposure blending (HDR)

Long Exposure vs High ISO



ISO 100
f4
10 secs.



ISO 100
f4
10 secs.



ISO 3200
f4
1/6 sec.



ISO 100
f4
10 secs.



ISO 3200
f4
1/6 sec.



ISO 5000
f4
1/25 sec.



ISO 100

f4

10 secs.



ISO 3200

f4

1/6 sec.



ISO 5000

f4

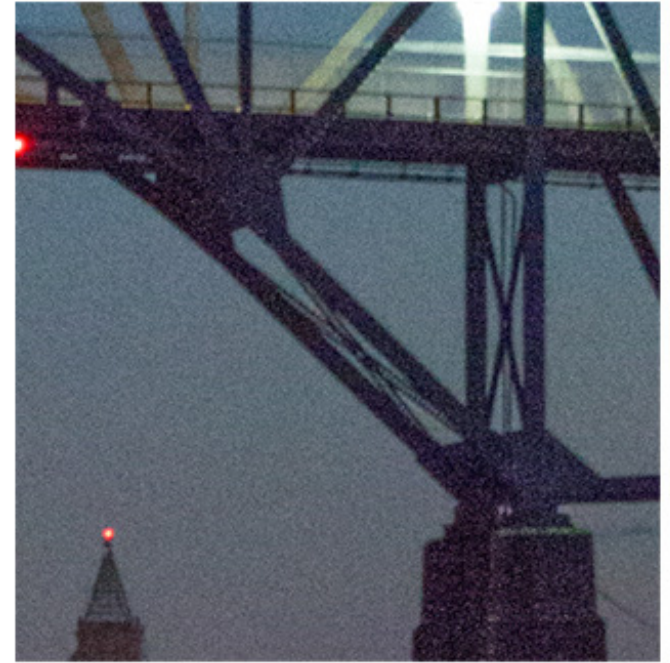
1/25 sec.



ISO 100
f4
10 secs.



ISO 3200
f4
1/6 sec.



ISO 5000
f4
1/25 sec.

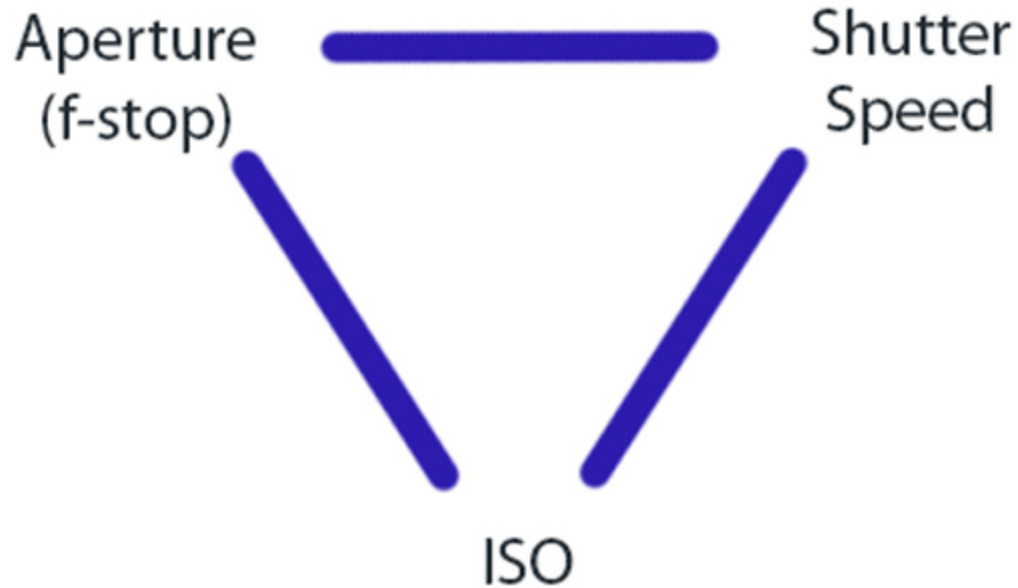
ISO Invariance

Brightening in post produces
same result as increasing ISO

Not available in all cameras

To test: Set shutter and aperture. Take several
shots at different ISOs. Process.
Do they look the same?

Reciprocity



Aperture, shutter speed and ISO work together to create a balanced exposure.

If one goes up, then another one must go down to maintain a balanced exposure.

Reciprocity

Shutter Speed	Aperture	Shutter Speed	Aperture
1/8	1.4	1/8	1.4
1/15	f2, f2.8	1/15	f2, f2.8
1/30	f4	1/30	f4
1/60	f5.6	1/60	f5.6
1/125	f8	1/125	f8
1/250	f11	1/250	f11
1/500	f16	1/500	f16
1/1000	f22	1/1000	f22

1/30 sec. at f11 is the same basic exposure as 1/250 sec. at f4
as long as the ISO hasn't changed.

Reciprocity*



f4, 1/250



f8, 1/60



f11, 1/30



f16, 1/15

Reciprocity may break down in extreme conditions -
ultra high ISO, long exposures, etc.

Metering

Reflective metering measures light reflecting off of subject

Incident light meter measures light hitting subject

Cameras use reflective metering

Metering: How it works





This is how your camera's light meter thinks the world looks all the time.



18% Gray



18% Gray

Metering and the Metering Modes

Camera meters exposure for 18% grey

Halfway between black and white

Consequently:

Mostly bright scenes will be under exposed (too dark)

Mostly dark scenes will be over exposed (too bright)

Metering Modes

1. **Evaluative/Matrix Metering**
2. **Spot/Partial Metering**
3. **Center-Weighted Averaging**

Metering Modes

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Divides scene into zones. Gives weight to zone w/focus point.

Plus: Works well in most situations.

Minus: Bright (or dark) object may skew averaging

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2. Spot/Partial Metering

Takes reading from focus point (Nikon)/center point (Canon)*

Plus: Gives correct exposure of subject in complex lighting

Plus: Can take reading from middle grey area
in complex lighting

Minus: May not expose rest of scene properly

*Canon users: Focus on subject, press Exposure Lock, then
recompose if needed.

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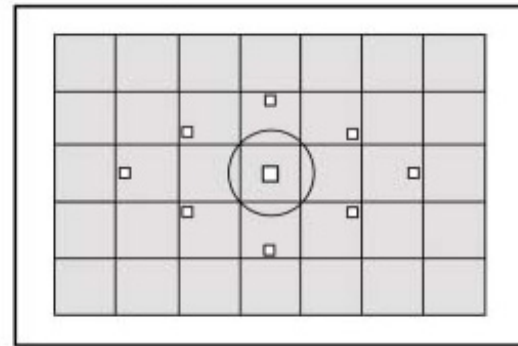
3. Center-Weighted Averaging

Gives weight to center of frame

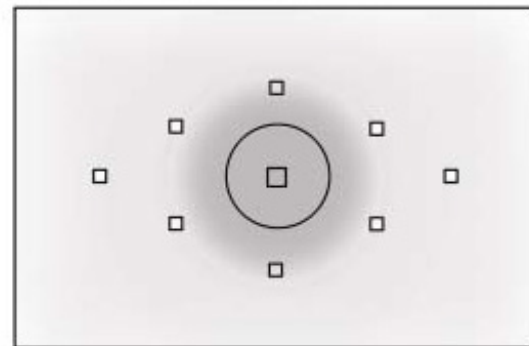
Plus: good for backlit subject (beach portrait)

Minus: May not expose rest of scene properly

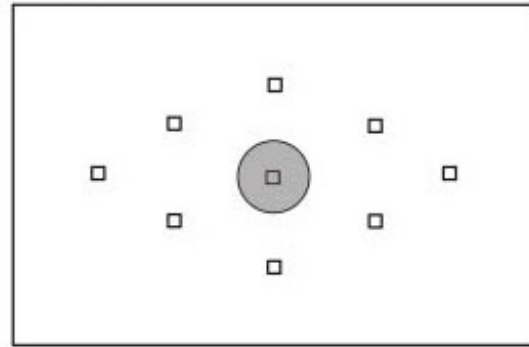
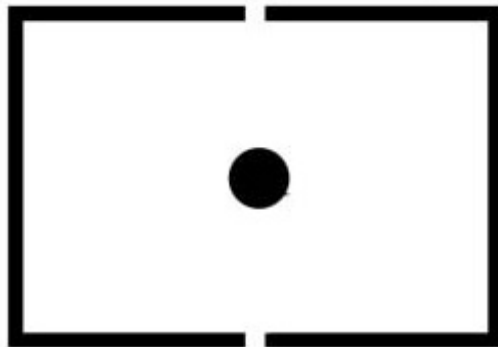
Evaluative metering



Center weighted average metering



Spot metering





Evaluative/Matrix



Evaluative/Matrix



Center Weight Averaging



Evaluative/Matrix



Center Weight Averaging



Spot



Evaluative/Matrix



Center Weight Averaging



Spot



Partial (Canon)



Evaluative/Matrix



Evaluative/Matrix



Center Weight Averaging



Evaluative/Matrix



Center Weight Averaging



Spot



Spot



Evaluative/Matrix

So what should you do?



So what should you do?

Whatever.

Don't worry

Be happy.

Fix it later?

So what should you do?

Evaluative/Matrix metering is fine for most situations

Use Spot Metering for . . .

- Backlit subjects when you want to see detail on subject
- When subject is against dark or light background
- When possible lock exposure on something in the scene that is neutral grey, then re-compose*

*Canon users remember to meter off of center focus point

Tools

Exposure Lock

Histogram

Exposure Compensation

Exposure Lock

Let's you lock exposure and then re-compose

Evaluative/Matrix meter mode

One Shot shutter mode

- Press shutter halfway and hold
locks exposure and focus

Spot and Center-Weighted metering and other shutter modes

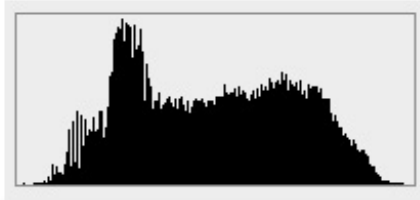
- Press shutter halfway, hold,
press * button for Canon, AE-L button for Nikon
Locks exposure for one shot.

For multiple shots:

- continue holding * or AE-L button
- AE-L lock and hold (Nikon custom setting only)
- check the settings and then switch to manual

Check Your Exposure

- Histogram



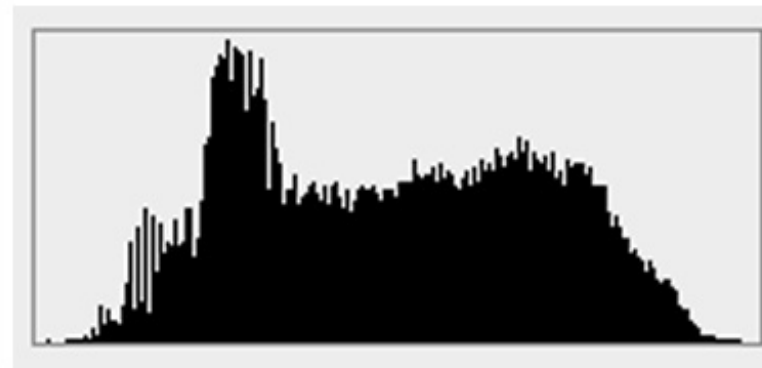
- The Blinkies (aka highlight clipping warning)

Histogram

Represents exposure level

Indicates over- and/or under- exposure

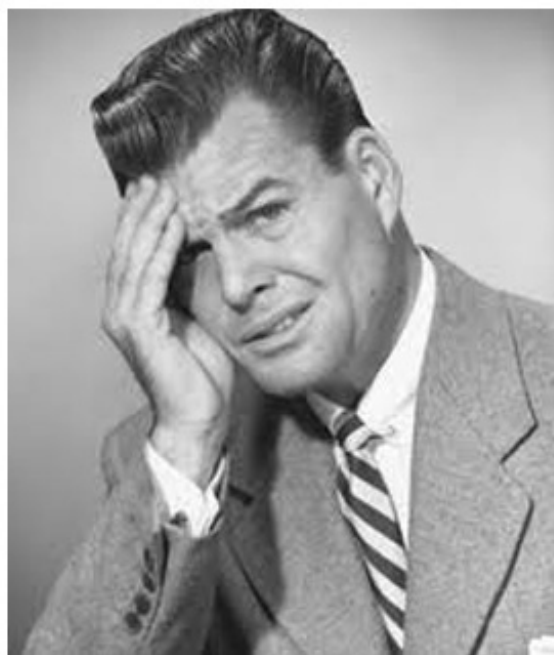
Number of pixels



Black

Tonal Range

White



*Okay, so my histogram looks weird.
Now what do I do?*



Exposure Compensation



Under Exposed



Over Exposed



Correctly Exposed



Exposure compensation lets you override the exposure



F8, 30 seconds, ISO 160

Exposure Strategies



F8, 30 seconds, ISO 160

Exposure Strategies

Shoot in Aperture Priority



F8, 30 seconds, ISO 160

Exposure Strategies

Shoot in Aperture Priority

Adjust f-stop for depth of field and shutter speed.



F8, 30 seconds, ISO 160

Exposure Strategies

Shoot in Aperture Priority

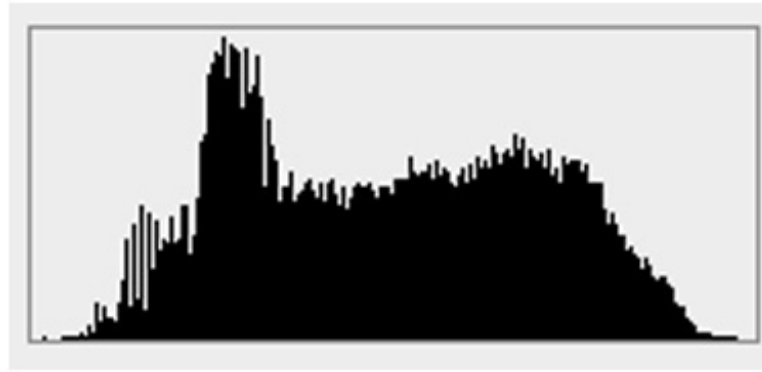
Adjust f-stop for depth of field and shutter speed.

Adjust ISO as needed.



Exposure Strategies

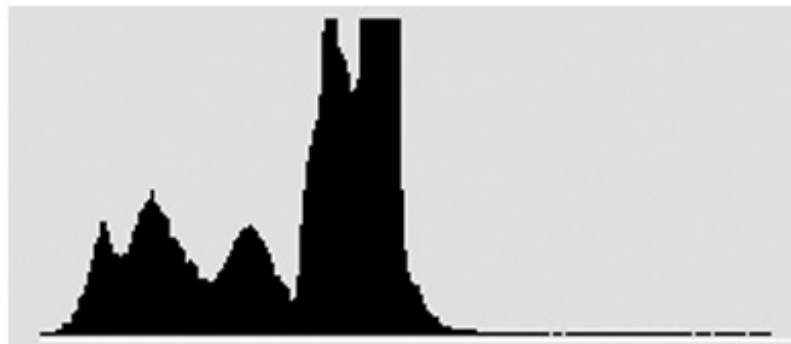
Switch to Shutter Priority or Manual if you need to maintain a certain shutter speed.



Exposure Strategies

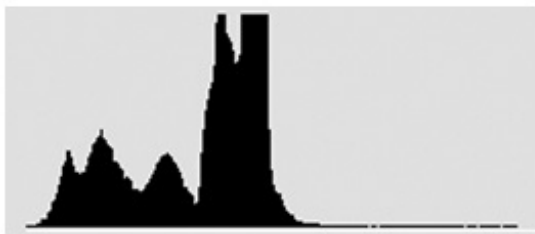
Check your histogram.

Use Exposure Compensation to make adjustments.



f11, 1/125 sec.

Expose to the Right (ETTR)



Expose to the Right (ETTR)

Advantages

- Greater tonal range in dark areas
- Less noise
- Improved color range

Disadvantages

- Histogram may not be precise
- More editing

Bracket for ...

Better Lightroom/Photoshop
adjustments

Exposure blending
in Photoshop

HDR

Experimentation

-1



+/-0



+1



Proper Exposure



Straight from the camera.



Levels adjustment and cloning.

Sometimes the correct exposure
isn't the best exposure.

Most pictures need some editing.



F8, 13 seconds, ISO 125

Post processing can help...



F8, 13 seconds, ISO 125

Post processing can help...



Editing

Learn to use Photoshop, Elements and/or Lightroom

Sliders: Exposure, Highlights, Shadows, Whites and Blacks

Adjustment brush

Masking

Dodge & Burn

So what do you do?

Evaluative/Matrix metering is fine for most situations

Use spot for backlit subjects (when you want detail)
or when subject is against dark background

Or when you can lock exposure on something
in the scene that is neutral grey, then re-compose

Or use manual mode and chimp (check the results)

5 Tips



f11, 5 secs., ISO 800

1. Pay attention to the light-
Direction and intensity



f25, 1/20 sec., ISO 400

2. Think before you shoot.

What are you trying to create?

- Just a well exposed standard image
- Creative use of depth of field - shallow or deep?
- Creative use of shutter speed to freeze or blur motion?



3. Pick a Mode, Any Mode:

Aperture Priority

Use it most of the time for technical and creative control.

Shutter Priority

Use it when you need to maintain a certain shutter speed.

Manual

Use it whenever you want to.



4. Learn to use your camera

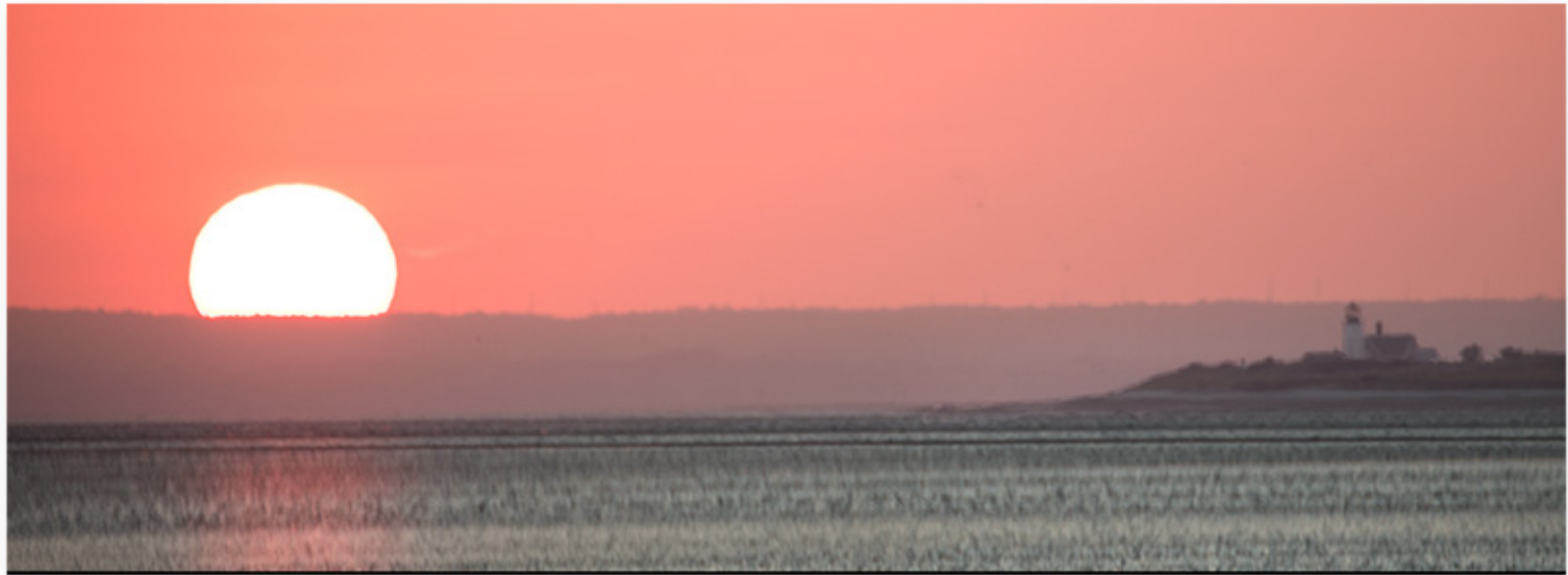
Use the camera's built-in tools:
Histogram, Exposure Compensation, etc.



5. Edit to optimize your image

(...but don't expect software to fix every problem)

Two more tips...



Exposing for Sunsets and Sunrises

Exposing for the sun will result in under exposed image

Spot meter away from the sun
and/or off of something neutral grey



ISO 100, f5.6, 1/80 sec.

Exposing for the Full Moon at Night

Start with Sunny 16 Rule
(At F16, shutter speed should match ISO)

Then adjust as necessary