Today: Focus, Exposure, shutter speeds, 
ISO/Sensitivity
Motion blur calculation

Please do your ratings for Best of Web by 5 pm

Minute paper:
1. Have you been taught to count in binary or base 8 or 16? When?
2. What is a pixel? What is it made of (for software purposes)?

Monday, no class. Weds: Intro Photoshop/gimp

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http://media.wiley.com/assets/1007/41/0-7645-9802-3_0213.jpg


Aperture (iris) mechanism made from overlapping pivoting leaves.

Aperture has impact on exposure too, how much light total hits the sensor.
Units: 1 stop = 1 EV Exposure Value = factor of 2 in area, light.
Camera adjustments in 1/3 stops

Stop used to be a metal plate with hole punched in it.

Ansel Adams founded f/64 club. Tiniest hole, maximum DOF. Modern lenses often best sharpness at f/5.6 or design point.

Exercise: Make the same image with three f/stops: max, min and low medium. (Keep ISO the same, and use tripod or keep shutter time short.) Inspect the three images closely. What happened?

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4. EXPOSURE
For a given light intensity, exposure = (aperture area) X (time shutter is open)
Shutter speeds: 30 = 1/30th of a second etc.
5 = 1/5th of a second
30″ = 30 seconds
T = time, click to open shutter and again to close
B = bulb, shutter stays open as long as button is pressed (or bulb is squeezed)

Check your camera shutter speed options. What is the range?
Tv or S = Time priority; you set the shutter speed and ISO, camera AE will choose the aperture.
Av = aperture priority. You choose the aperture, camera will choose shutter speed.

Equivalent exposures: f/5.6, 1/100 sec
f/8, 1/50 sec
f/11, 1/25 sec

ISO = sensor sensitivity, gain
1 EV = 1 stop = factor of 2 in ISO
100 200 400 800 1600 3200 6400 12800 25600

Used to be called ASA for film.
From American Standards Association (now named ANSI)
ISO = International Organization for Standardization


Digital camera response database
Don't worry, images come from camera with compensation done automatically (mostly); color management again.

Same image density f/5.6, 1/100 sec, ISO 200
  f/8, 1/100 sec, ISO 400
  f/4, 1/200 sec, ISO 400
The word pixel is based on a contraction of pix ("pictures") and el (for "element");

Pasted from http://en.wikipedia.org/wiki/Pixel

On a screen, = 1 red, 1 blue, & 1 green light emitter.

BYTE = 8 bits

With 12 bit $2^{12}=4,096$ levels

Digital dynamic range = 8 (bits, equivalent to EV) in PS for full functionality, but can do up to 32.

Camera A/D is likely 10-14 bits

Use of 12 bit 2^12=4,096 levels

Used to be hard to change sensitivity, ISO: change film or go into menus.

Now is becoming easier; single button or thumbwheel select.

Check your camera ISO settings. How easy to change?

Human eye sensitivity, dark adapted ~ 800 ISO

http://clarkvision.com/imagedetail/eye-resolution.html

Human contrast range detection: 24 EV, but is dynamic.


ISO 100

ISO 200

saturation

With 12 bit 2^12=4,096 levels in the image

Pixel off = 0

Pixel on = 255

1600

3200

6400

12,800

25,600

0

1

= BIT BASE 2

8 bit = 1

Value

0  256

BYTE = 8 bits

With 12 bit $2^{12}=4,096$ levels

Light, log scale

Dark

Bright

With 8 bit depth on a pixel, can count up to $2^8=256$ different brightness levels in the image

$0 \rightarrow 256$

Different brightness levels in the image

$0^8 = 255$

As FF in hexadecimal (base 16)

$\begin{array}{c}
\text{R} \\
\text{G} \\
\text{B}
\end{array}$
R,G,B = 0,0,0 = black, off.
R,G,B = 255, 255, 255 = all full on = white  (8 bits = 2^8 = 256 possible levels)
R,G,B = 0,0, 256 = blue