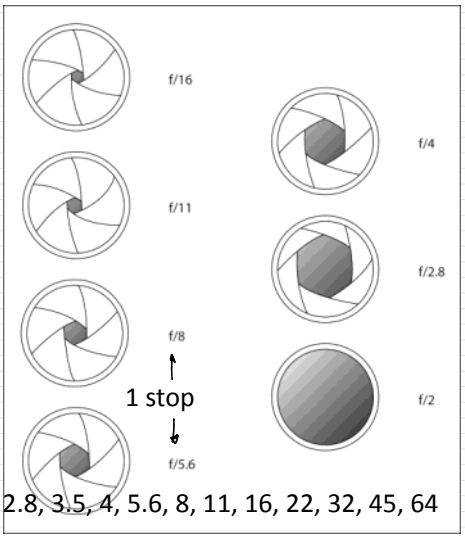
Today: Focus, Exposure, shutter speeds,
ISO/Sensitivty
Motion blur calculation

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



2.8, 3.5, 4, 5.6, 8, 11, 16, 22, 32, 45, 64

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.

$\frac{f}{D}$

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

http://www.lavideofilmmaker.com/cinematography/f-stops-focal-length-lens-aperture.html

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?

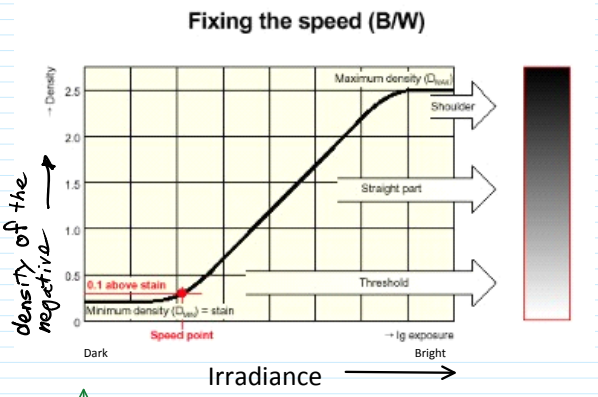
4. EXPOSURE
For a given light intensity, exposure = (aperture area) X (time shutter is open)

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)

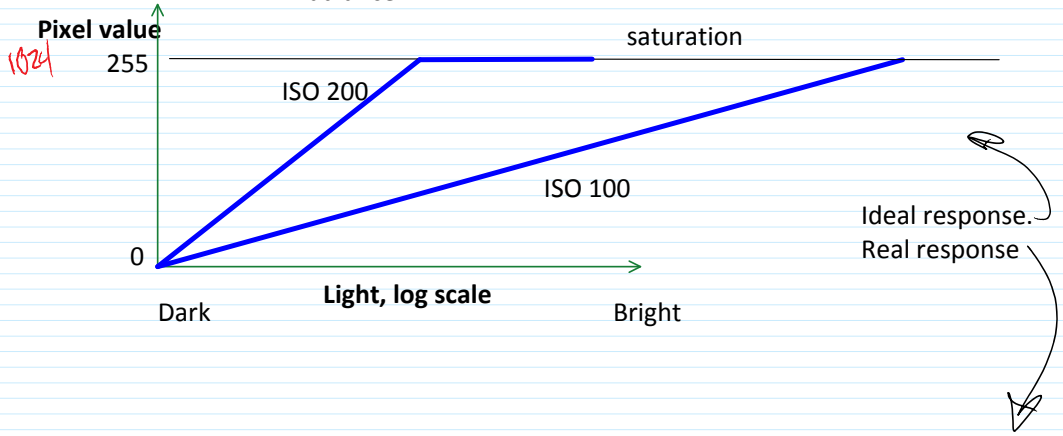
Check your camera shutter speed options. What is the range?
Tv or S = Time priority; you set the shutter speed and ISO, camera AE will choose the aperture.
Av = aperture priority. You choose the aperture, camera will choose shutter speed.

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

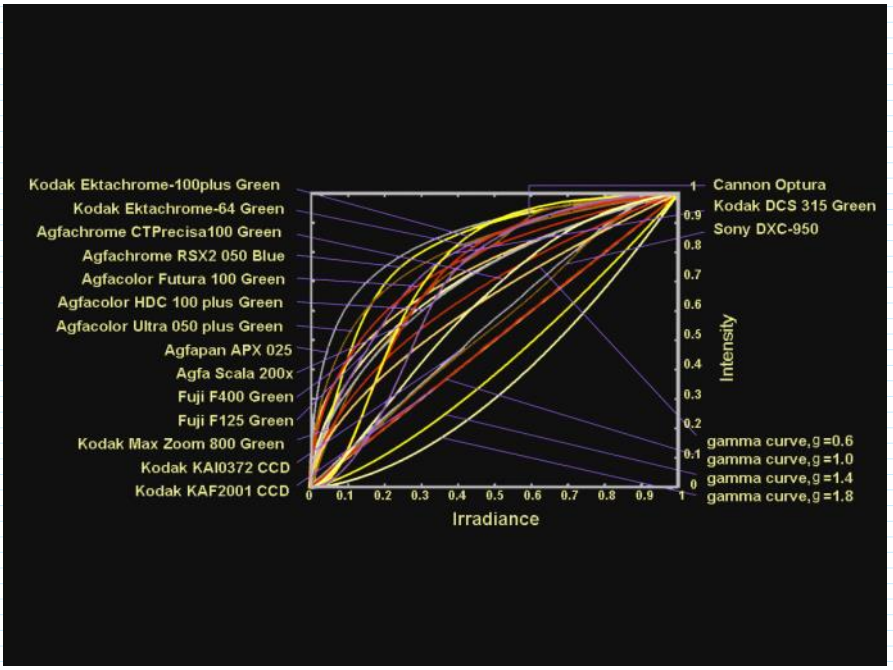
ISO = sensor sensitivity, gain
1 EV = 1 stop = factor of 2 in ISO
100 200 400 800 1600 3200 6400 12800 25000
Used to be called ASA for film.
From American Standards Association (now named ANSI)
ISO = International Organization for Standardization



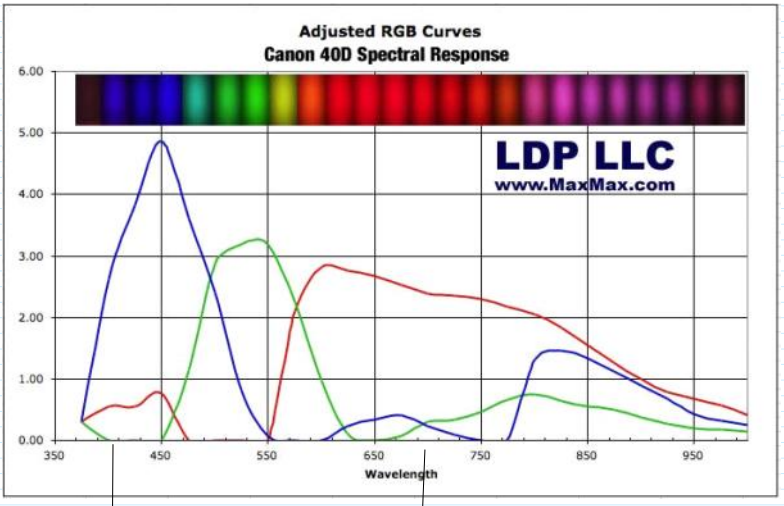
http://www.sapiens.itgo.com/documents/foto/photographic_terms8.htm



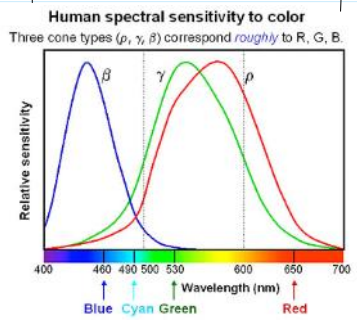
Digital camera response database



http://www.cs.columbia.edu/CAVE/projects/rad_cal/



http://www.maxmax.com/spectral_response.htm



http://pixinsight.com/forum/index.php?topic=2542.0

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

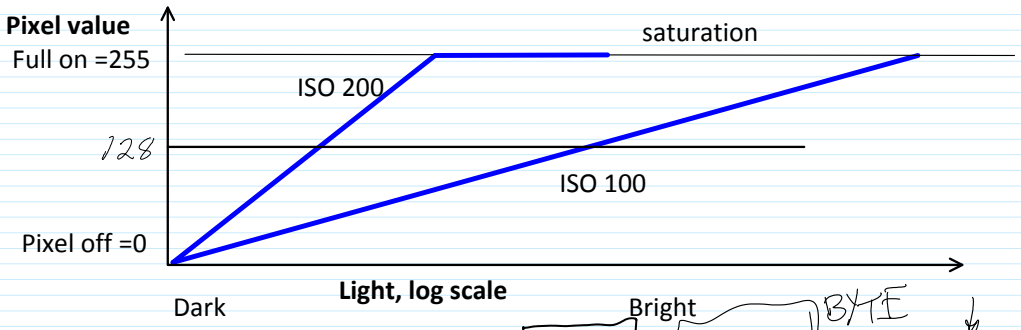
Used to be hard to change sensitivity , ISO: change film or go into menus.
Now is becoming easier; single button or thumbwheel select.

Check your camera ISO settings. How easy to change?

1600
3200
6400
12800
25,000

SKIP TO choices here

Human eye sensitivity, dark adapted ~ 800 ISO
http://clarkvision.com/imagedetail/eye-resolution.html
Human contrast range detection: 24 EV, but is dynamic.
http://www.luminous-landscape.com/columns/eye-camera.shtml
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



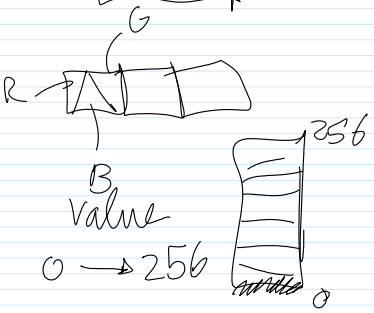
With 8 bit depth on a pixel, can count up to 2^8=256 =11111111 in binary = FF in hexadecimal (base 16) different brightness levels in the image

BYTE

NIBBLE

0 1 = BIT BASE 2

BASE 10



BYTE = 8 bits

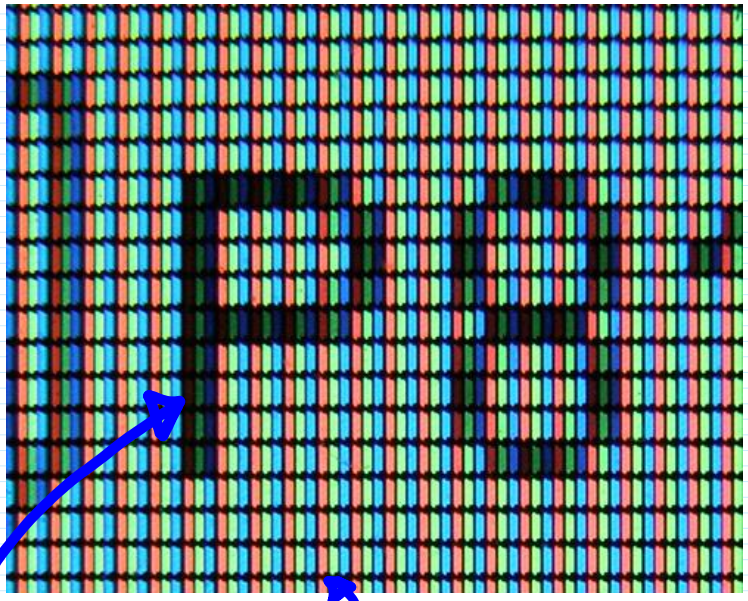
With 12 bit 2^12=4,096 levels

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.

1 PIXEL



http://en.wikipedia.org/wiki/File:Closeup_of_pixels.JPG

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