Today: Focus, Exposure, shutter speeds, ISO/Sensitivity

Best of Web votes due today
Monday in class: Meet your Team. Also facilities descriptions
Monday at 4: Get Wet image due.

Office hours ECME 220
Fridays at 3, Tuesdays at 2

Exercise: Can you get the most magnification by zooming out and moving close, or by zooming in and moving back? At which extreme can you focus closest?

zooming out and moving close

Cell	PHD	DLSR
8	∅	8

by zooming in and moving back?

Cell	PHD	DLSR
8	6	12

last year:

2016

zooming out and moving close

Cell	PHD	DLSR
	3	2

by zooming in and moving back?

Cell	PHD	DLSR
10	1	12

2015

More Magnification WITH
Wide, focus close
Cellphone   PhD   DSLR
  || ‖‖‖   ‖‖‖
            |

Tight, far focus
Cell   PhD   DSlR
            |||

Close focus distance   3-4   2"   4-5"   5-6"
                            ½"   2-3"

OUT OF FOCUS

FOCAL plane

optical axis

sensor plane is not at the FOCUS plane

Not a point; looks like a circle; Circle of Confusion

Depth of Field

FOCAL plane

f

I

Image plane, sensor plane, FOCUS plane

OK range, circles are small enough to be ignored
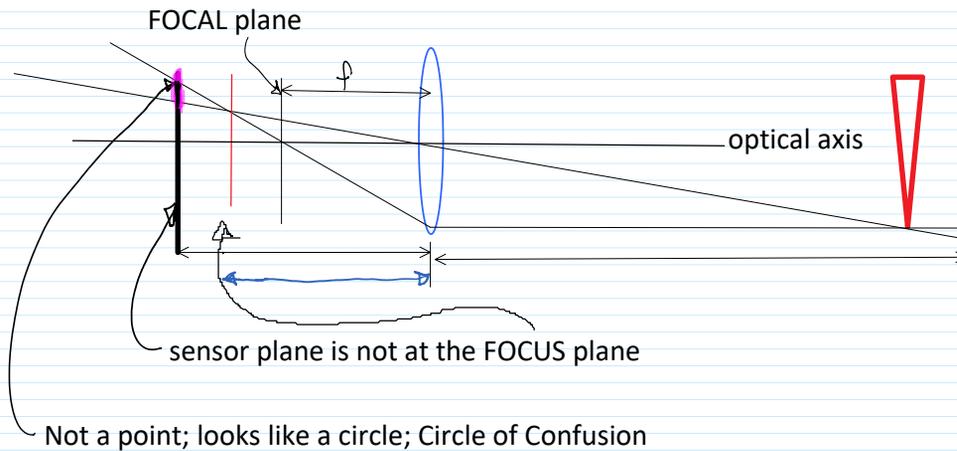
Depth Of Field = DOF
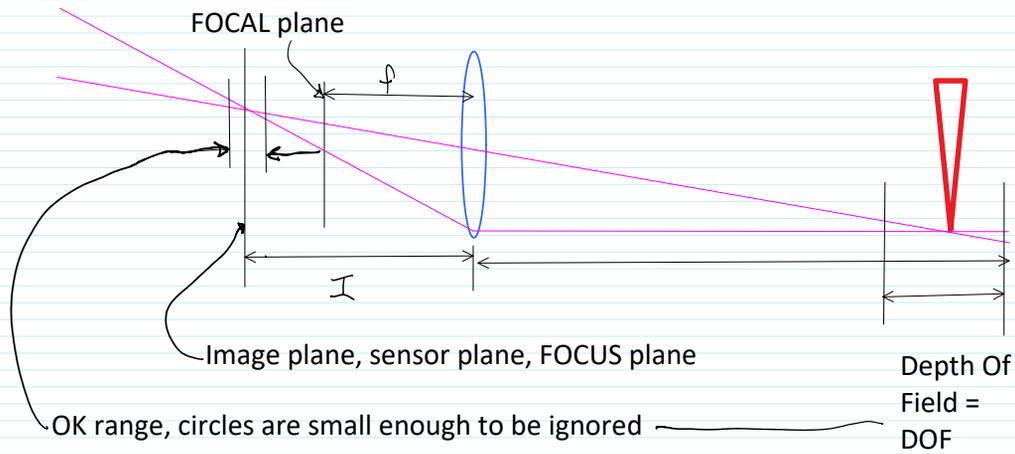
LensBaby: lets you angle the lens axis compared to the camera body axis. Effectively makes the object plane not parallel to the sensor plane. Same as 'swing' of field view camera
http://lensbaby.com/lenses

focus plane   LENS   object plane

Improve DOF by reducing aperture diameter: smaller hole, smaller circles of confusion, better depth of field

FOCAL plane

f

NEW   OLD

Aperture, iris, stop

optical axis

More DOF behind point of focus than in front

I O

Image plane, sensor plane, FOCUS plane

OK range, circles are small enough to be ignored

Depth Of Field = DOF
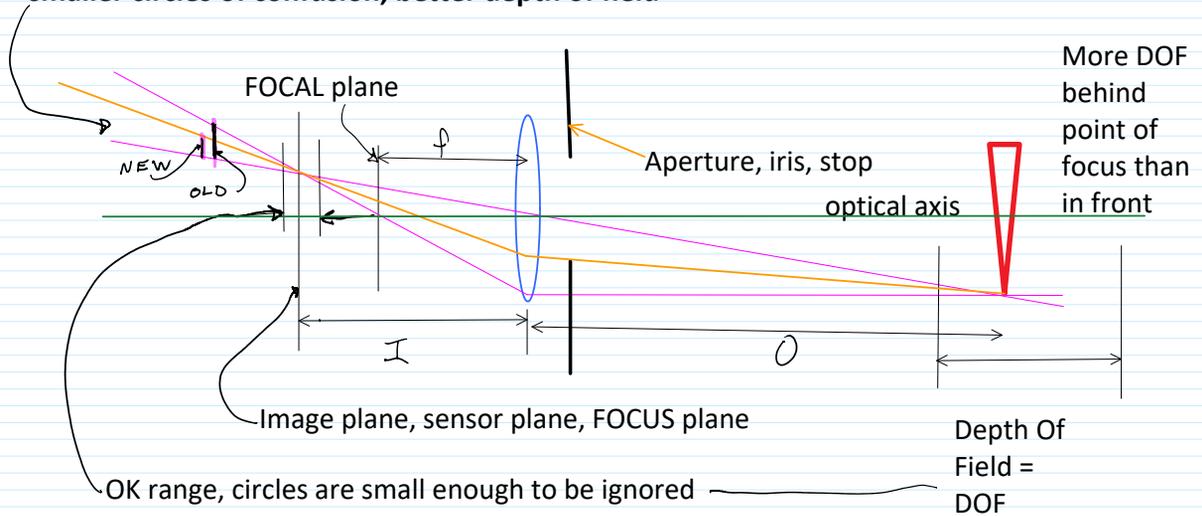
BUT, what else happens as aperture gets smaller? What is the problem with tiny apertures?
Think, pair, share

DOF @ f/4

5   7   10 15 30   ft
1.5   2   3   5   10 ∞   m
22 16 11 8 4   4 8 11 16 22
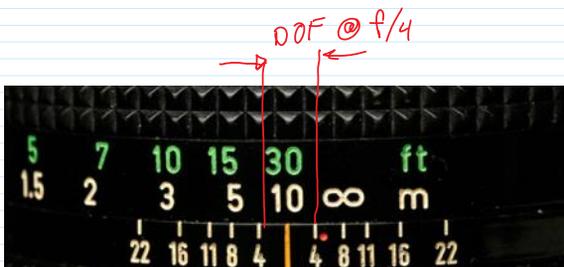
http://jimdoty.com/learn/exp101/exp_big3/exp_big3.html

More DOF behind best focus because of nonlinear lens equation

More DOF behind best focus because of nonlinear lens equation

f/ Aperture

© Jim Doty, Jr.
www.JimDoty.com

Worse autofocus at small apertures. Use a large diameter lens/ large aperture for low light levels.

Lens with smaller max. aperture

Lens with larger max. aperture

Small differences AF has to work with . . .

Larger difference for AF

No good attribution.

f/16

f/11

f/8

1 stop

f/5.6

f/4

f/2.8

f/2
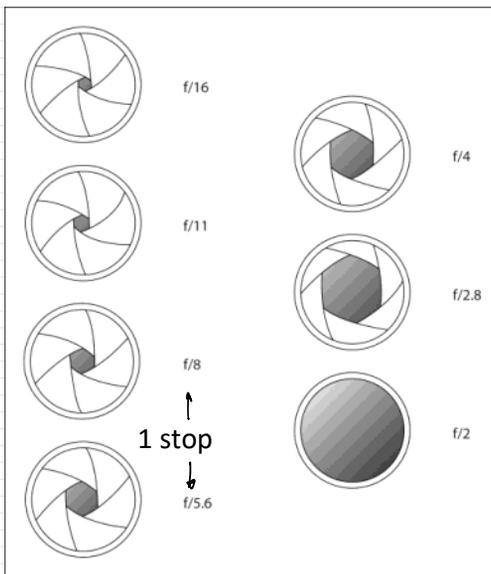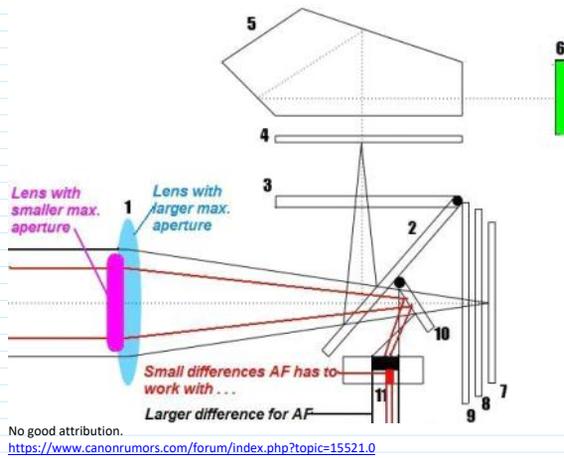
Aperture (iris) mechanism made from overlapping pivoting leaves.

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. It stopped light.

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

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

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

or
f#

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

Fixing the speed (B/W)

density of the negative →

2.5
2.0
1.5
1.0
0.5
0

Maximum density (D$_{max}$)
Shoulder
Straight part
0.1 above stain
Threshold
Minimum density (D$_{min}$) = stain
Speed point
Dark   Bright
→ lg exposure

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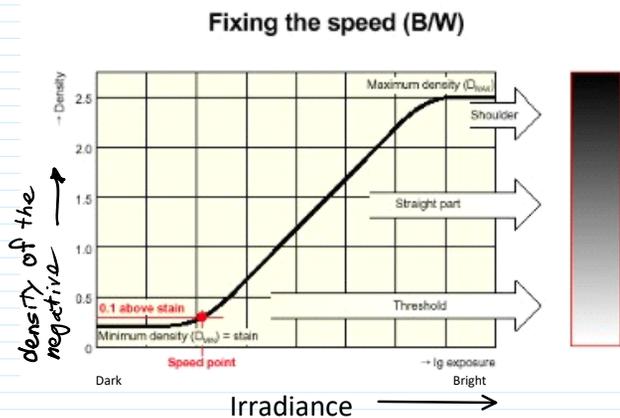
http://www.sapiens.itgo.com/documents/foto/
photographic_terms8.htm

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)?