

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

Admin: Initial assignments

Signatures: Syllabus, Copyright/use

CATME survey

Fluids Perception Survey

Interviews

Best of Web voting: rating stars now enabled

Get Wet, Clouds 1

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?

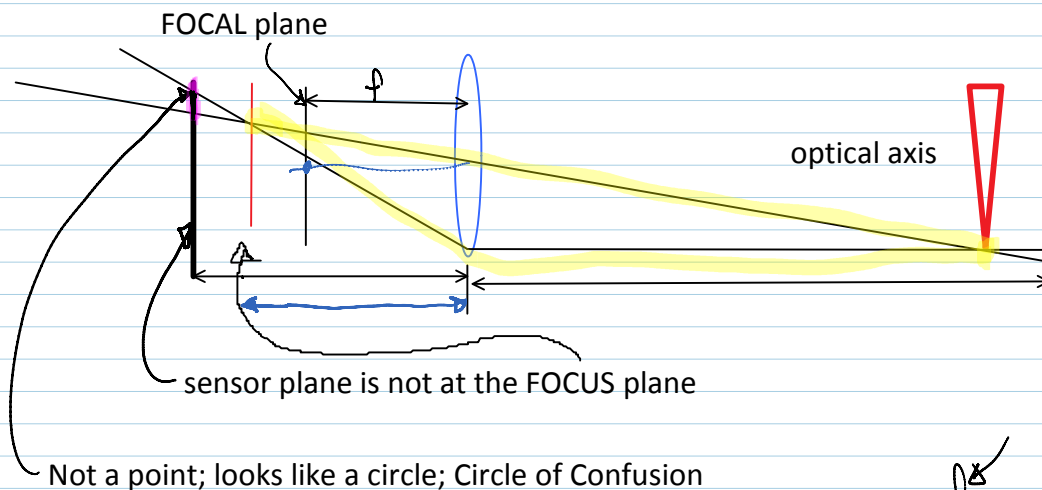
Zoomed out, near	Zoomed in, far
DSLR 1	DSLR 8
PHD 4	PHD 2

Depends on specific lens design. Your mileage may vary.

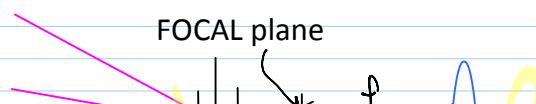
PHD cameras

Wide angle, close vs zoomed in, far

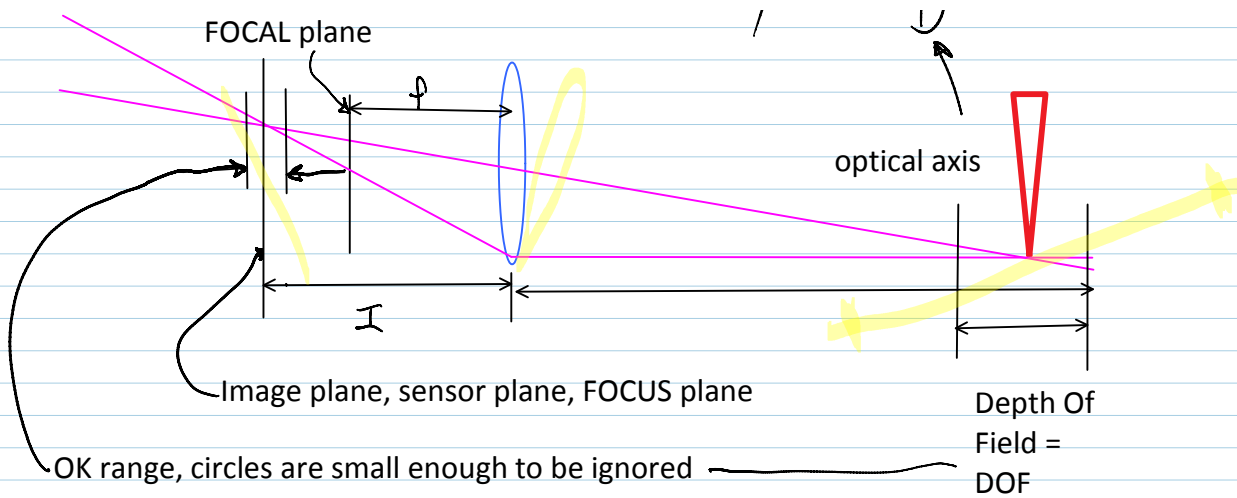
OUT OF FOCUS



Depth of Field



$$d = \frac{f^2}{D}$$

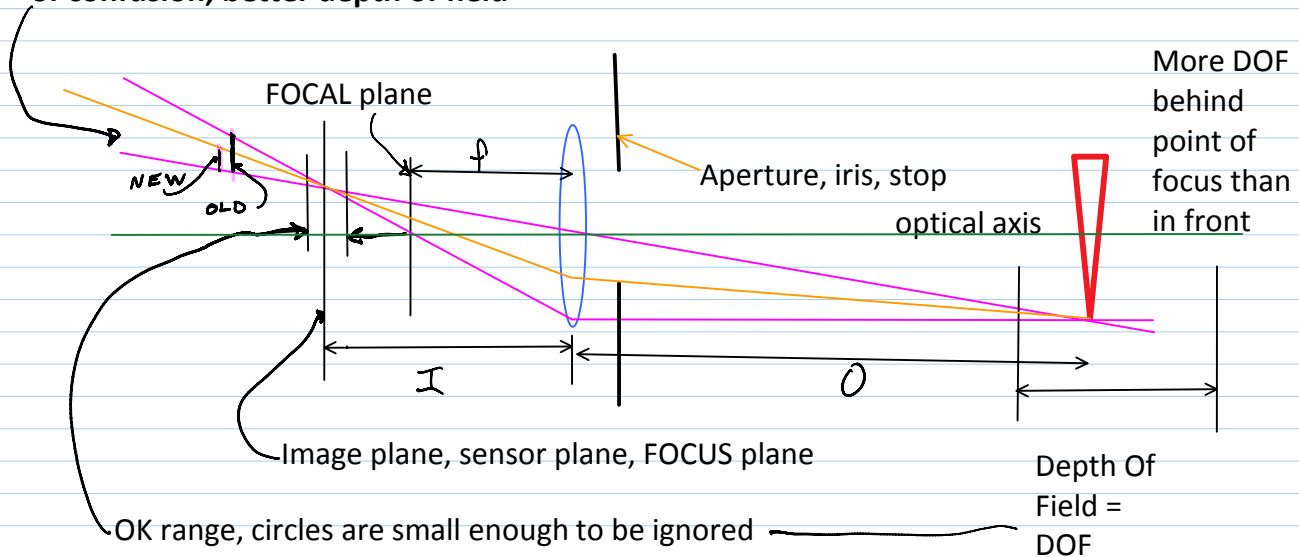


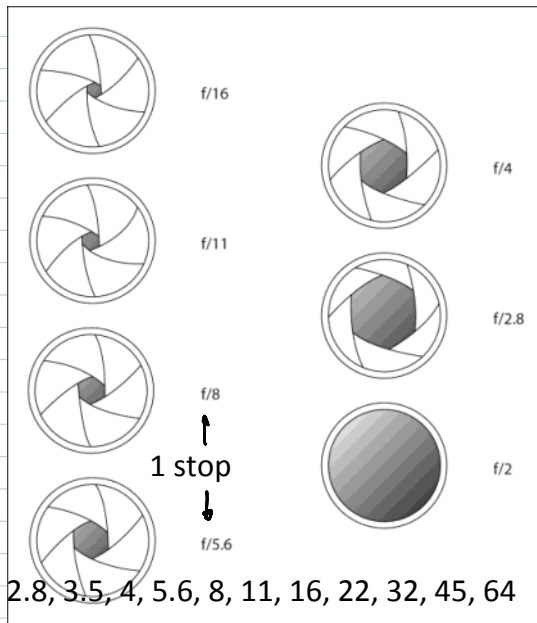
LensBaby: lets you angle the lens axis compared to the camera body axis. Effectively makes the object plane not parallel to the sensor plane

<http://lensbaby.com/lenses>

Focus plane
LENS
object plane

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





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.lavideofilmaker.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

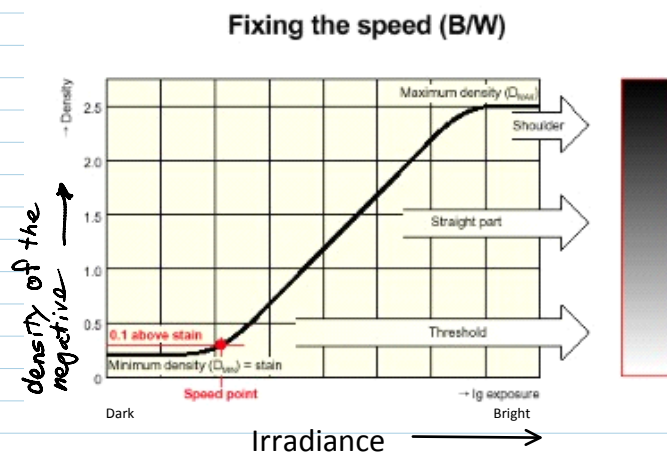
1 EV = 1 stop = factor of 2 in ISO

100 200 400 800 1600 3200 6400 12800 25000

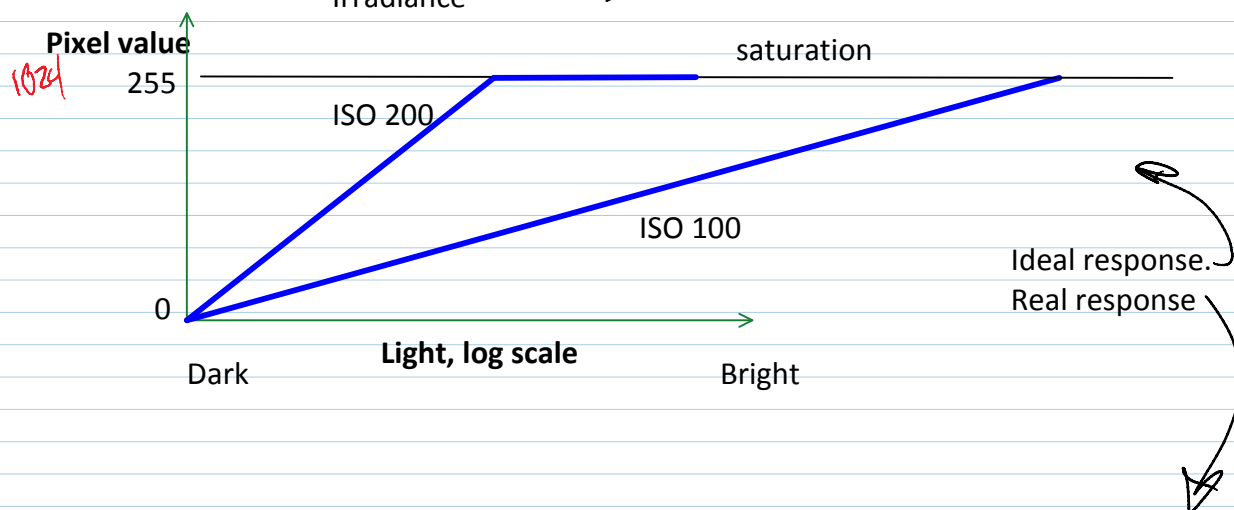
Used to be called ASA for film.

From [American Standards Association](http://www.sapiens.itgo.com/documents/foto/photographic_terms8.htm) (now named [ANSI](http://www.sapiens.itgo.com/documents/foto/photographic_terms8.htm))

ISO = International Organization for Standardization

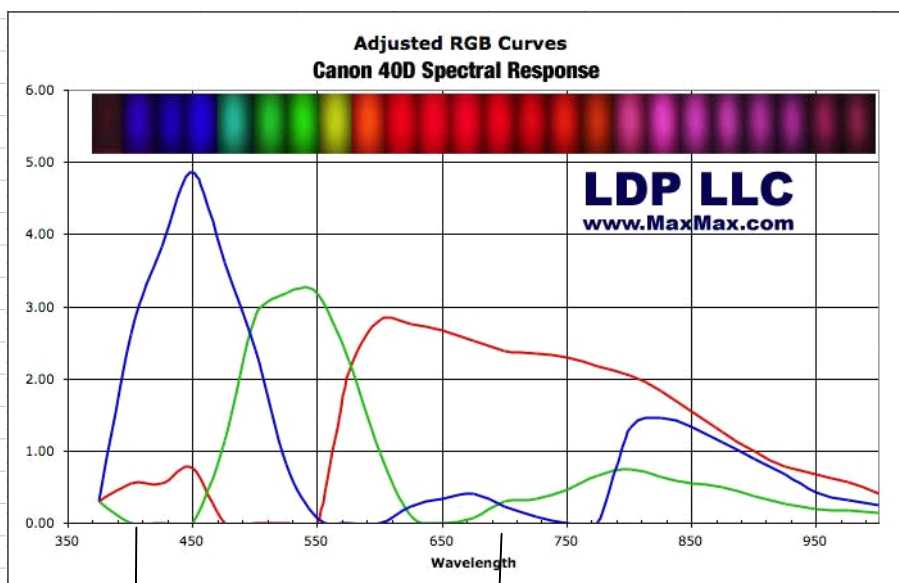
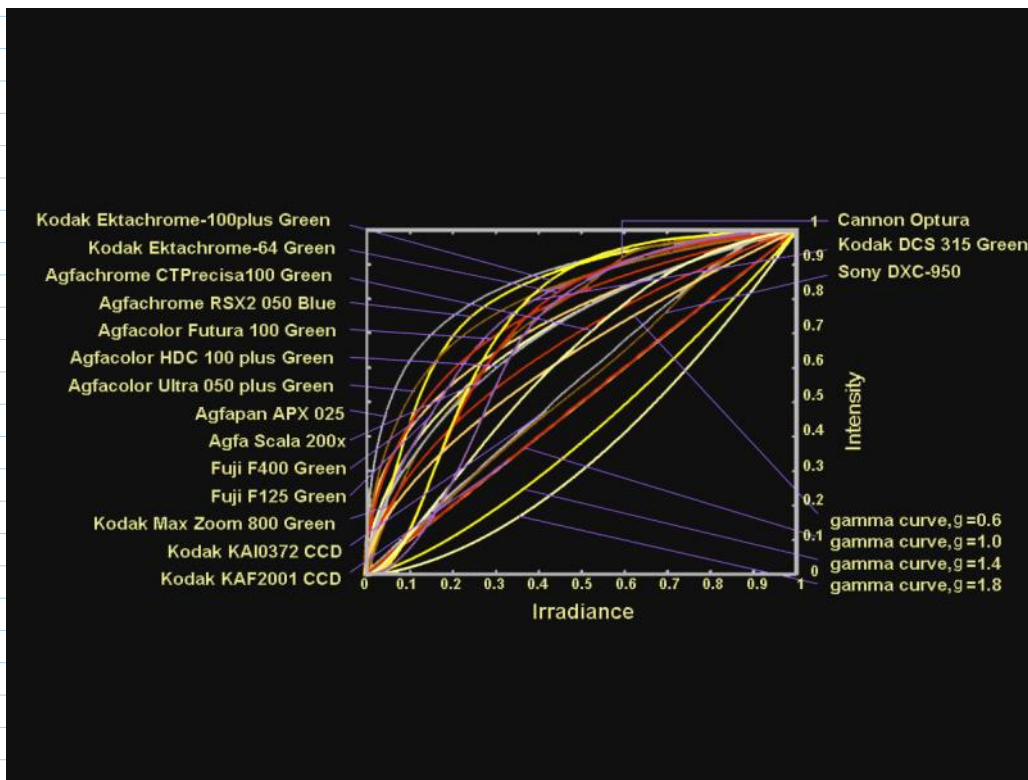


http://www.sapiens.itgo.com/documents/foto/photographic_terms8.htm

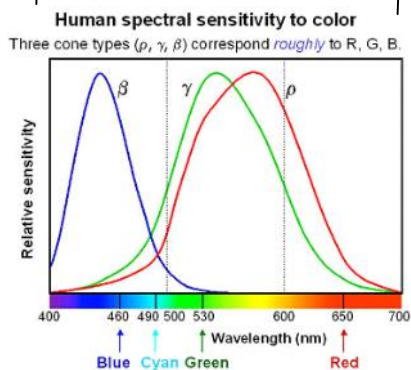


Digital camera response database

http://www.cs.columbia.edu/CAVE/project/s/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

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