Computer Science E-7
Exposing Digital Photography

Lecture 5: Optics
October 3, 2011

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The following will be purged on Oct 10:
- **1-Keep An ISO Out**
- **Pset 1**

Dropbox | Purge

Exposure | Metering

1/13s, ISO 200, f/3.3, 0ev at 6.3mm (38mm equiv)

Photo by Larry Woods, 2009
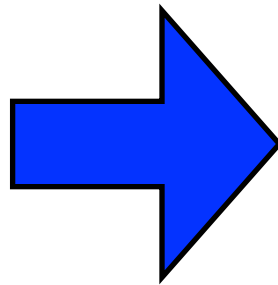
Exposure | Metering

Image from http://www.dpreview.com/reviews/CanonEOS5D/page6.asp

Metering | Camera Modes

Left image: http://www.dpreview.com/reviews/CanonEOS30D/page5.asp, Right image: http://reallyrightstuff.com/flash/04.html

When Flash Goes Wrong | Shadows

Flash | (Lack of) Fill Flash

1/250s, ISO 100, f/4.5, 0ev

Photo by Dan Armendariz, 2007

Flash | Fill Flash
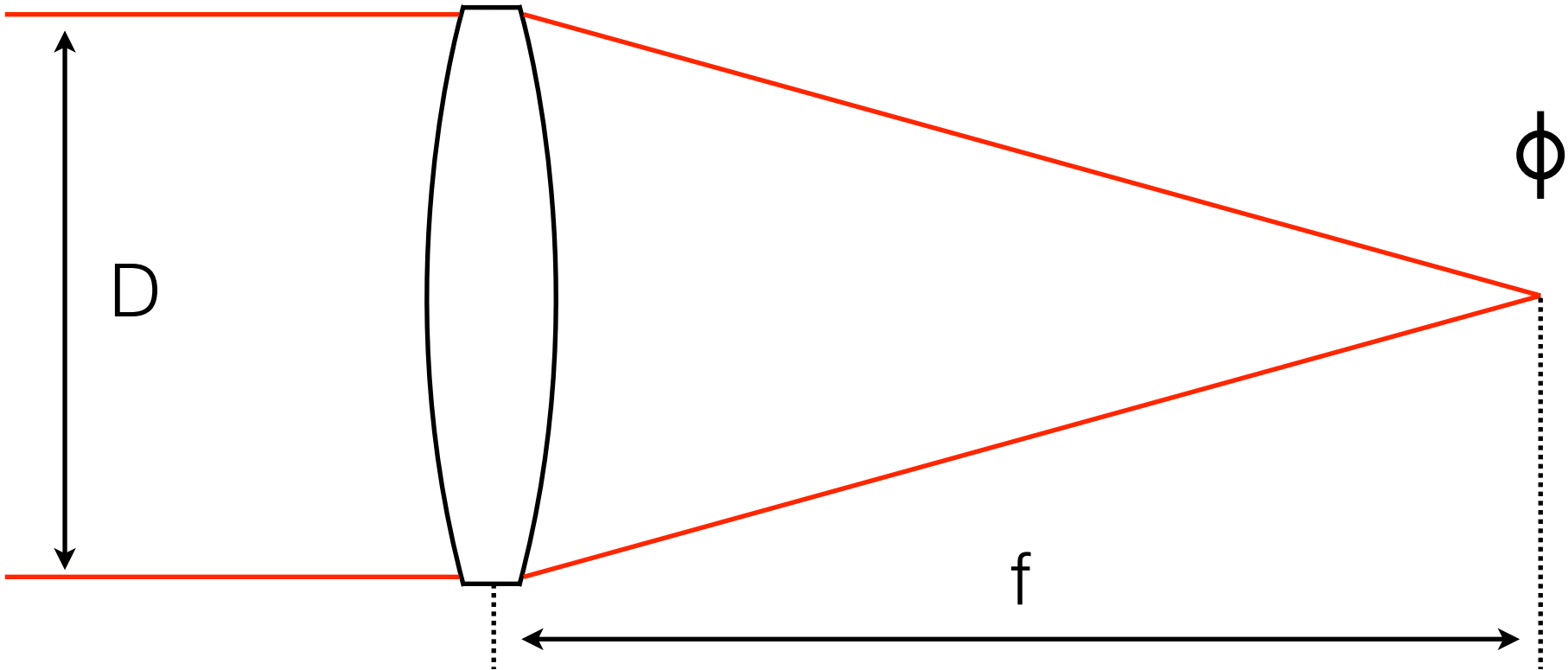
1/200s, ISO 160, f/5.6, -2/3ev
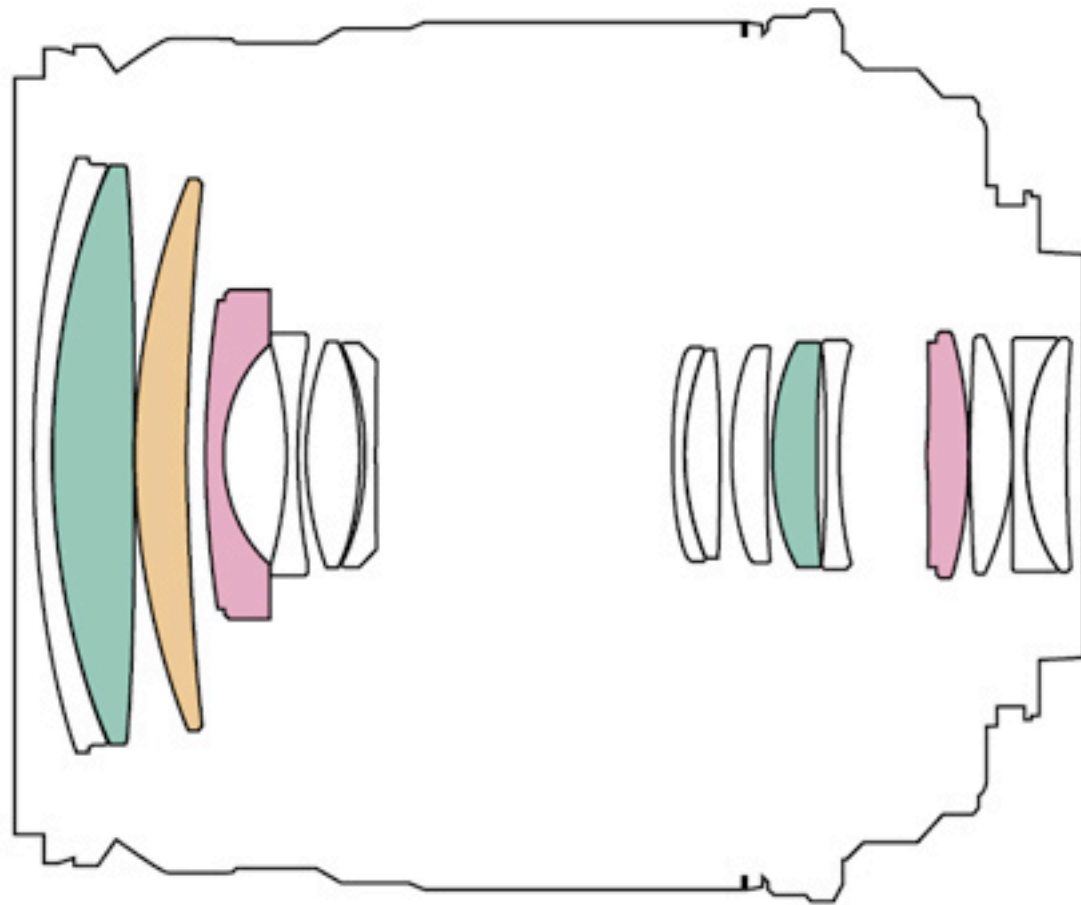
Flash | Fill Flash

Optics | Lenses

D

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f

Lenses | F-number = f/D

Lenses | Many glass elements

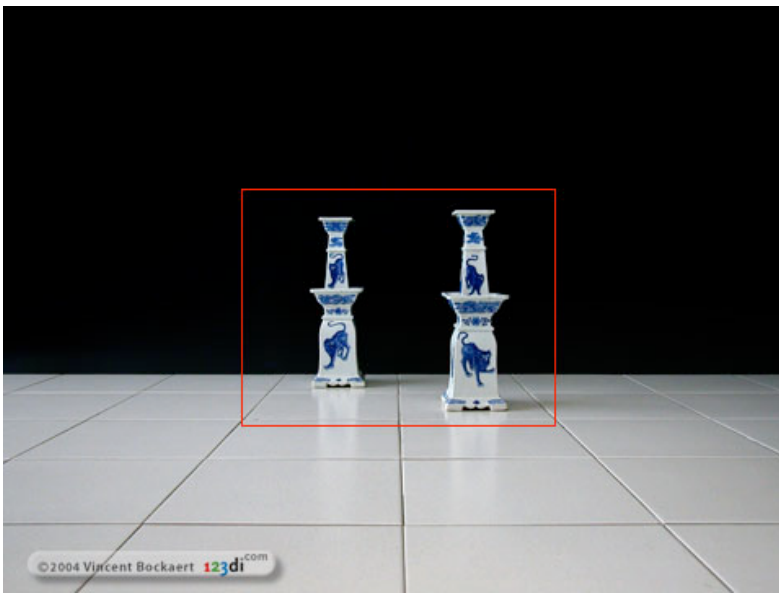Left: 1/320s, ISO 800, f/2.5, 0ev at 80mm Right: 1/40s, ISO 1600, f/3.5, 0ev at 16mm

Photos by Dan Armendariz, 2005

Lenses | Focal Length and Perspective

1. 33mm. 2. Crop of #1. 3. 80mm from same distance. 4. 33mm & closer

Images from http://www.dpreview.com/learn/?/Glossary/Optical/Perspective_01.htm

Perspective | Focus Length

Left: 1/60s, ISO 1600, f/3.5, 0ev at 16mm Right: 1/50s, ISO 400, f/4, 0ev at 16mm
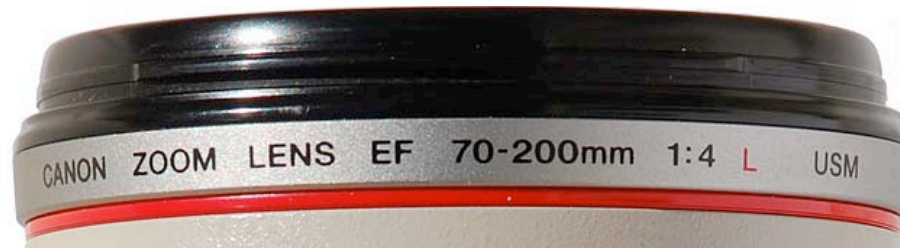
Perspective | Wide-Angle Distortion

Image from http://www.the-digital-picture.com/Reviews/Canon-TS-E-24mm-f-3.5-L-Tilt-Shift-Lens-Review.aspx

Perspective | Correcting with Tilt-Shift

SMC PENTAX-DA 1:4(22) 16-45mm ED -AL- ø67mm

CANON ZOOM LENS EF-S 18-55mm 1:3.5-5.6 IS Φ58mm CANON LENS MADE IN JAPAN

CANON ZOOM LENS EF 70-200mm 1:4 L USM

Images from http://dpreview.com and http://www.kenrockwell.com/

Lenses | Data

Left to Right: 24-70mm f/2.8, 70-200 f/4, 70-200 f/2.8 IS, 70-200 f/2.8 IS, 500 f/4 IS

Images from http://www.the-digital-picture.com

Lenses | Short to Long

Optics

Background Blur
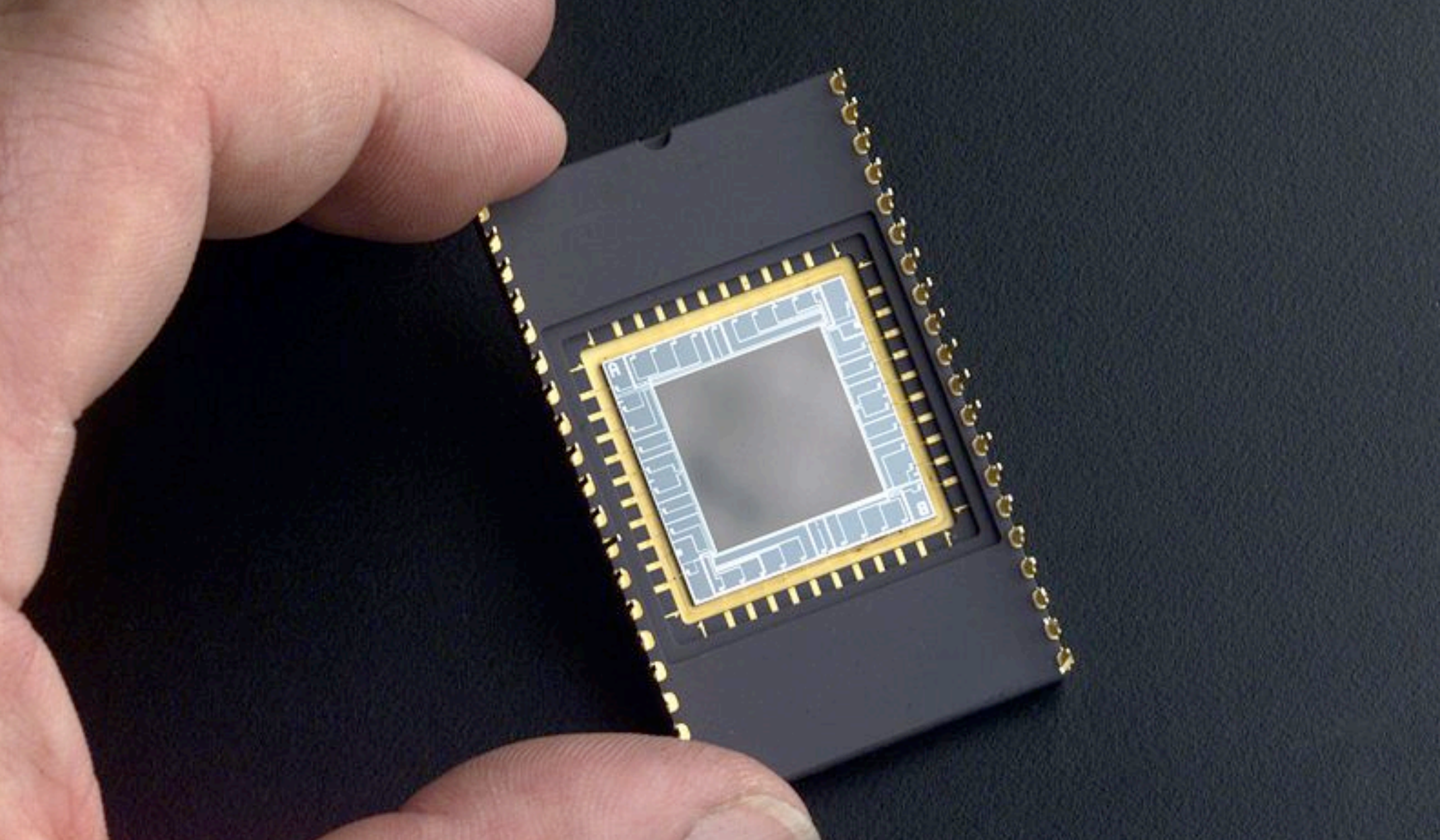
Photo by Dan Armendariz, 2004
1/1250s, ISO 200, f/2.8

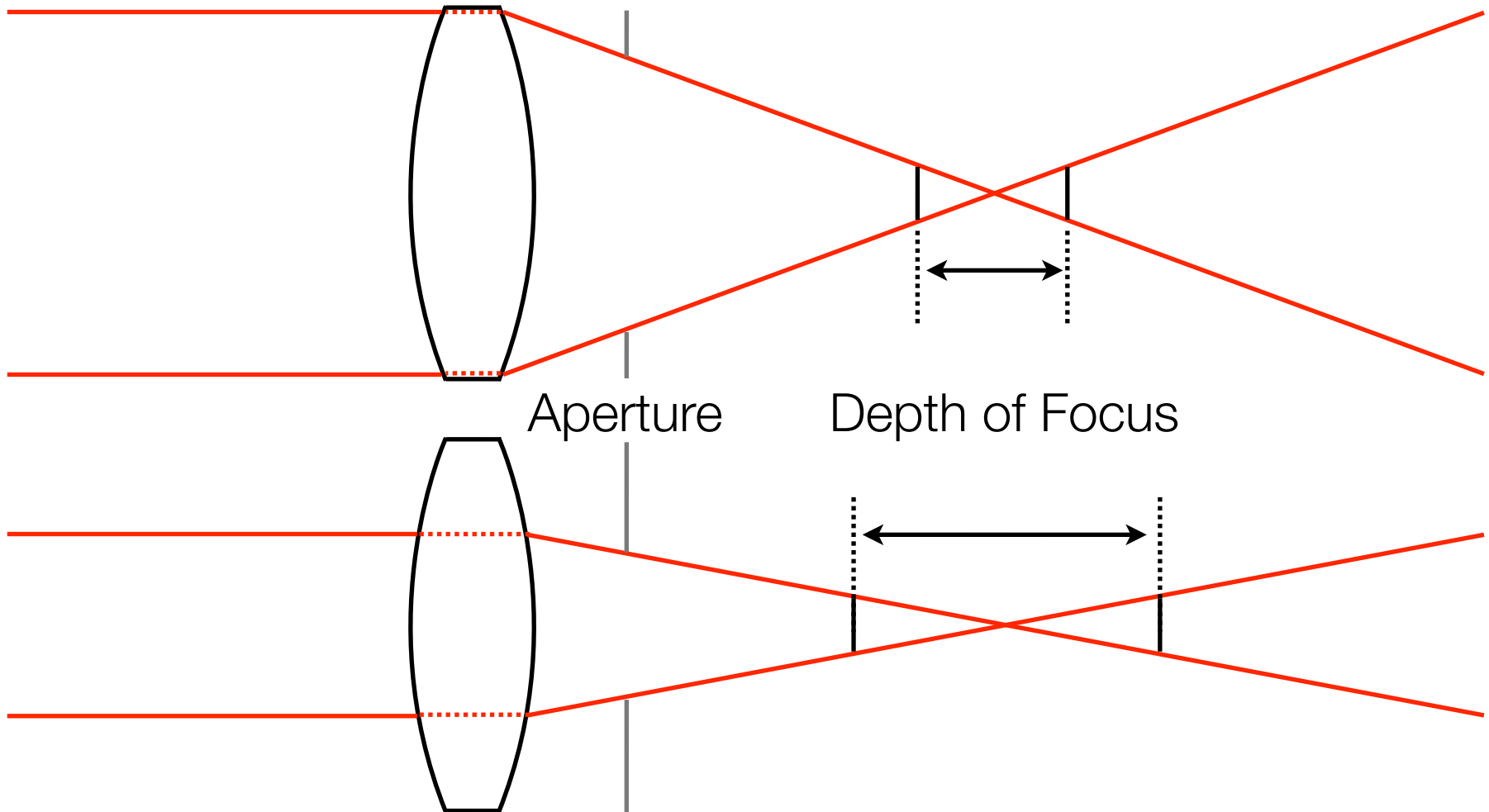Image from http://en.wikipedia.org/wiki/Charge-coupled_device
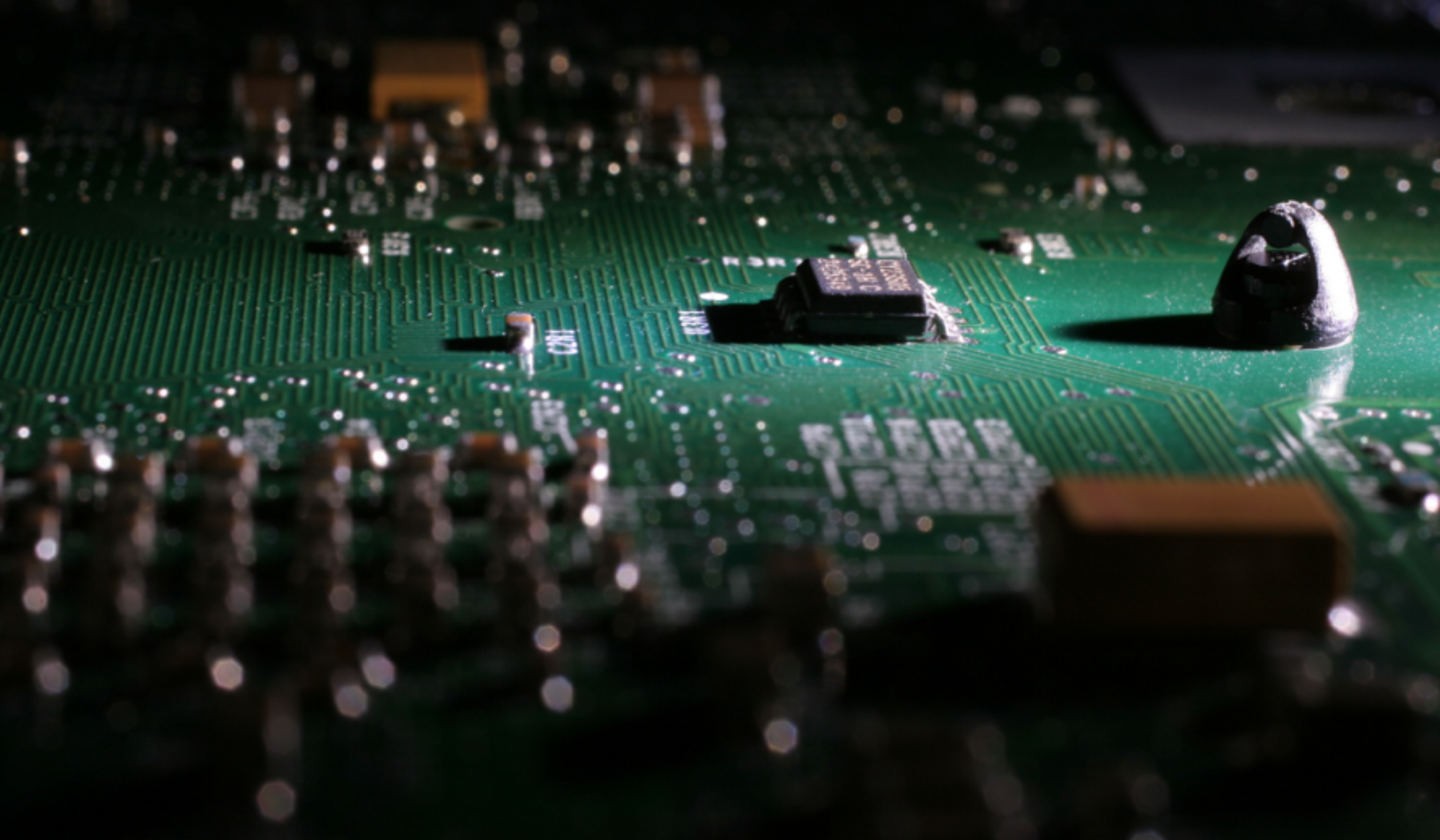
Background Blur | Sensor

CoC

Depth of Focus

Background Blur | Circle of Confusion
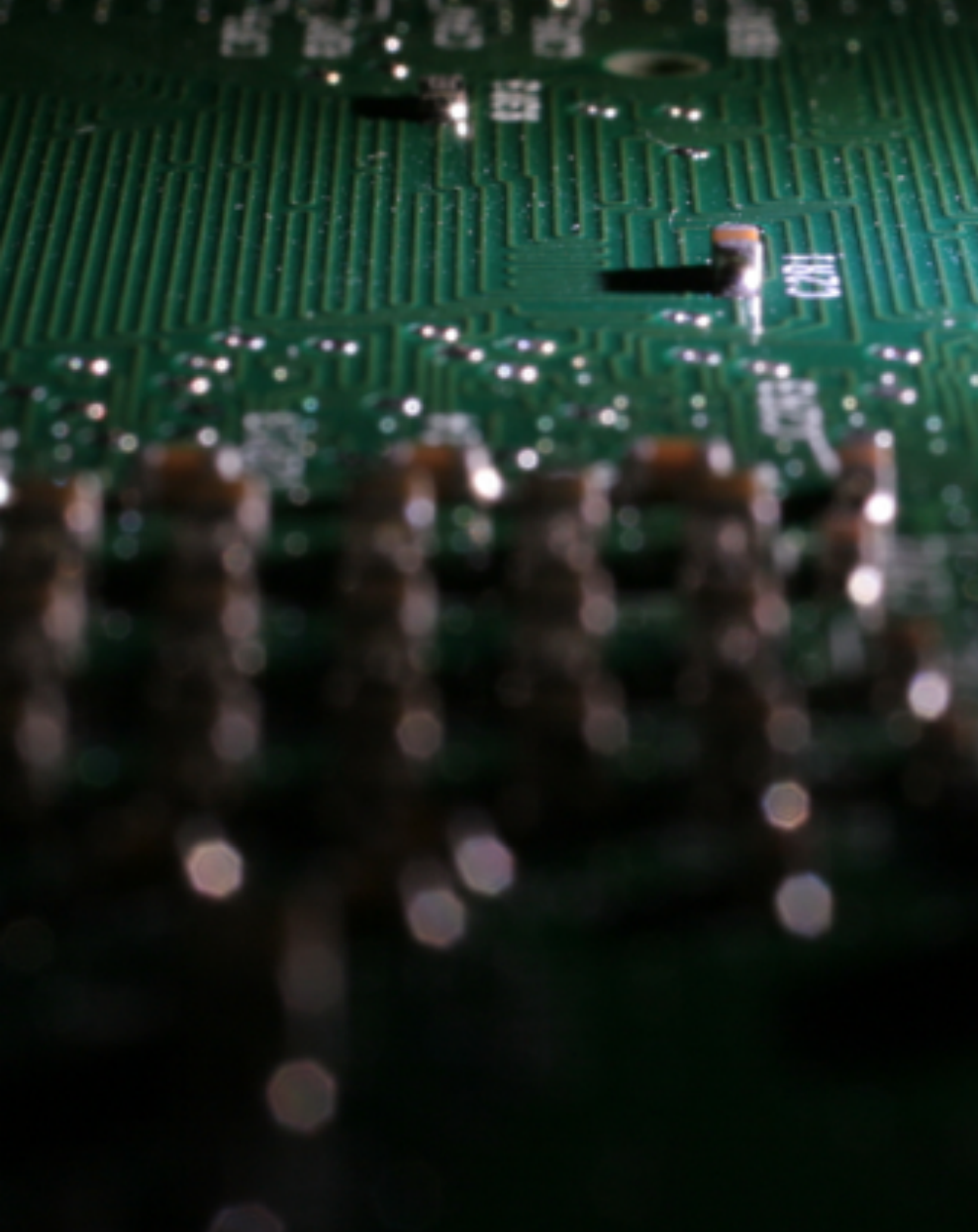
Aperture   Depth of Focus

Background Blur | Affect from Aperture

6s, ISO 100, f/16, -2ev @ 50mm

Background Blur | Depth of Field

Left: 6s, ISO 100, f/16, -2ev @ 50mm Right: 0.6s, ISO 3200, f/10 @ 2000mm

Photo by Dan Armendariz, 2005
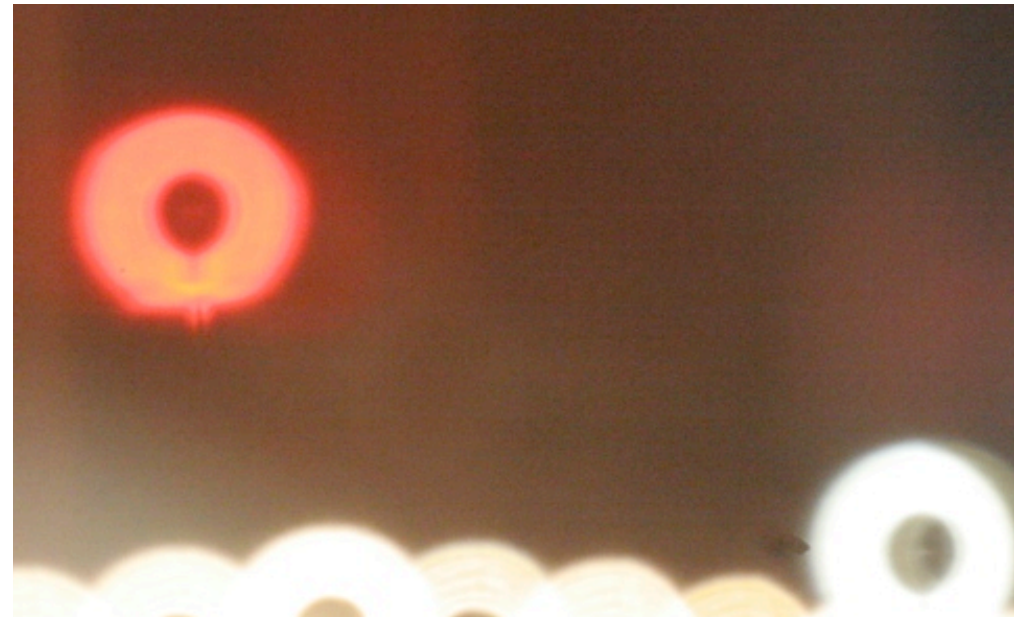
Background Blur | Bokeh

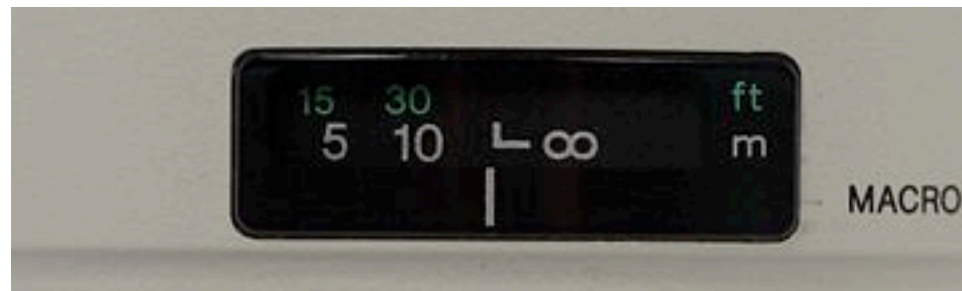Photo by Dan Armendariz, 2004
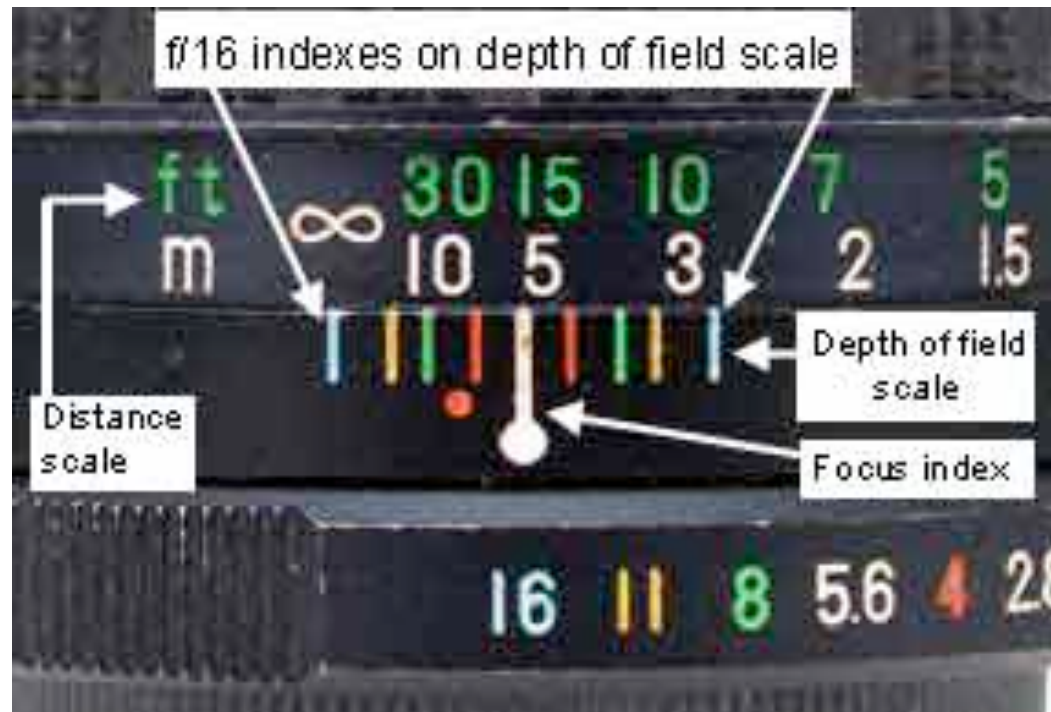
Background Blur | Hyperfocal Distance

$$H = \frac{f^2}{Nc}$$

f = focal length, *N* = F-number,
c = minimum circle of confusion diameter

Background Blur | Hyperfocal Distance

Images from http://www.dofmaster.com/hyperfocal.html and http://en.wikipedia.org/wiki/Canon_EF_lens_mount
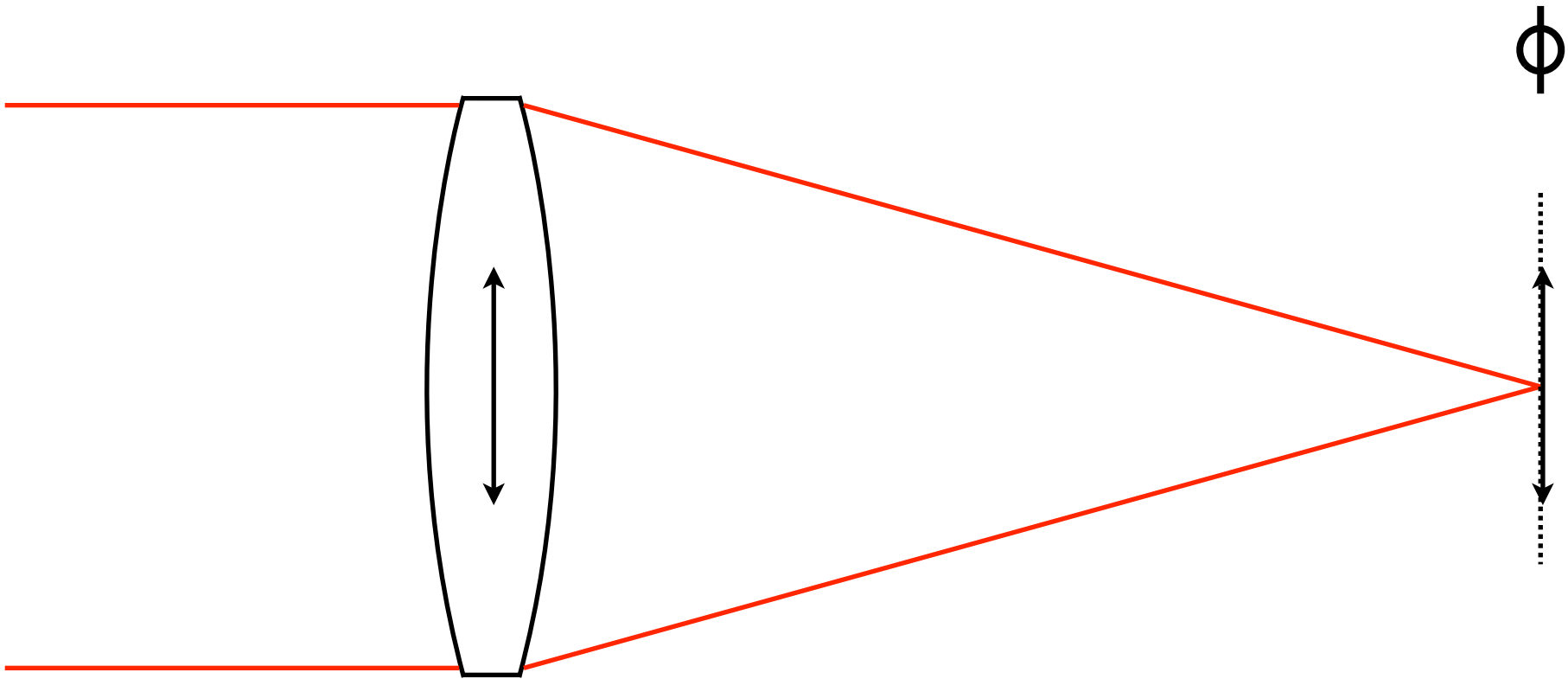
Background Blur | Hyperfocal Distance

IS Off

IS On

Images from http://en.wikipedia.org/wiki/Image_stabilization

Optics | Image Stabilization

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Optics | Image Stabilization

Images from http://www.bentimagelab.com/sg/pages/Smallgantics.htm

Optics | Tilt-Shift Lenses

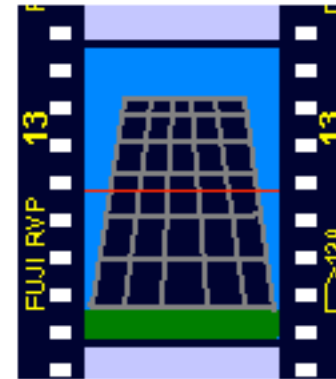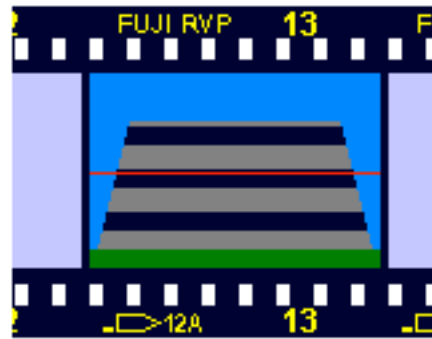(the red line shows exactly where the camera is aimed)

Image 1: Bad Perspective with Normal Lens

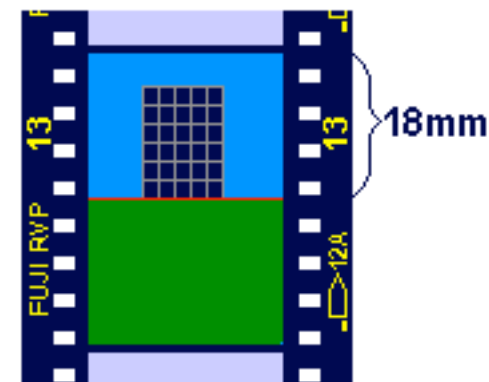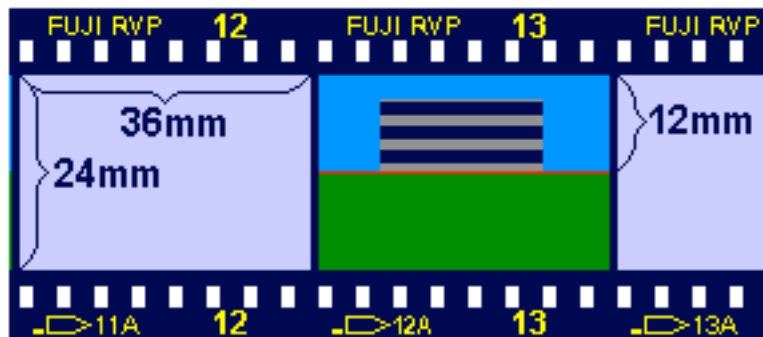(the red line shows exactly where the camera is aimed)

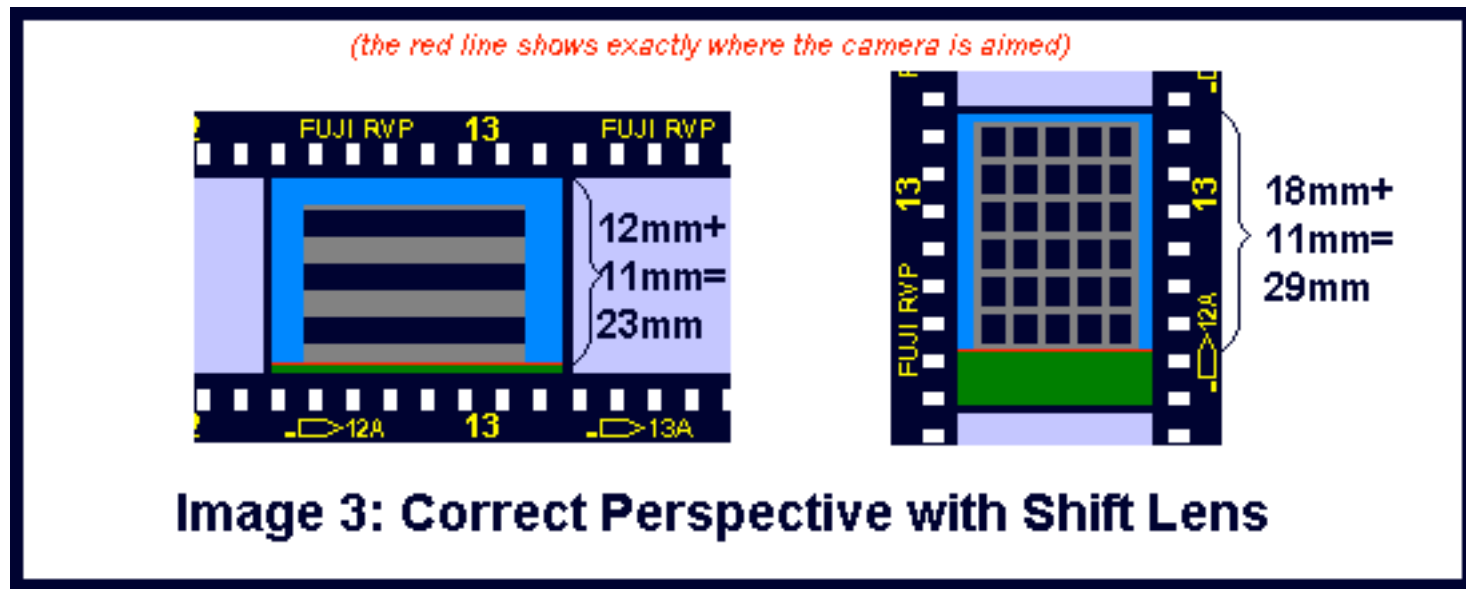**Image 2: Correct Perspective with Normal Lens**

Images from http://photo.net/equipment/canon/tilt-shift

Tilt-Shift Lenses | Shift

(the red line shows exactly where the camera is aimed)

Image 3: Correct Perspective with Shift Lens

Image from http://photo.net/equipment/canon/tilt-shift

Tilt-Shift Lenses | Shift

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Tilt-Shift Lenses | Shift

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Tilt-Shift Lenses | Tilt

Images from http://www.bentimagelab.com/sg/pages/Smallgantics.htm

Tilt-Shift Lenses | Tilt

Filter size symbol: Ø

Image from http://dpreview.com

Optics | Filters

2s, ISO 100, f/13

Filters | Neutral Density

1/500s, ISO 400, f/8

Filters | (No) Polarizer

1/125s, ISO 400, f/8

Filters | Polarizer

Left: 1/400s, ISO 400, f/8, -2/3ev Right: 1/200s, ISO 400, f/8, -2/3ev

Photos by Dan Armendariz, 2004

Filters | Polarizer affects reflections

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