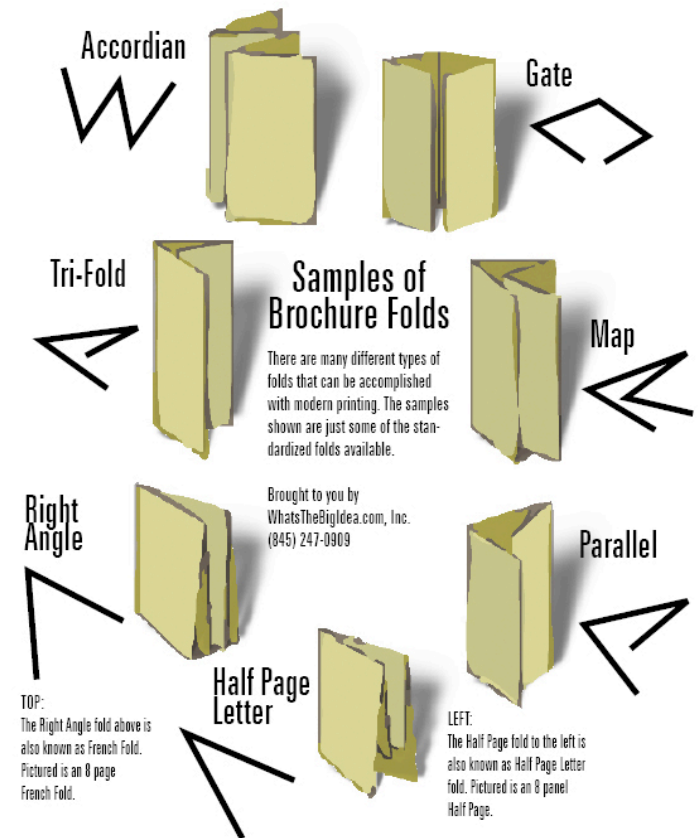# Computer Science E-7
Exposing Digital Photography

Lecture 9: Digital Cameras
November 7, 2011

danallan@mit.edu

Final Project | Ideas
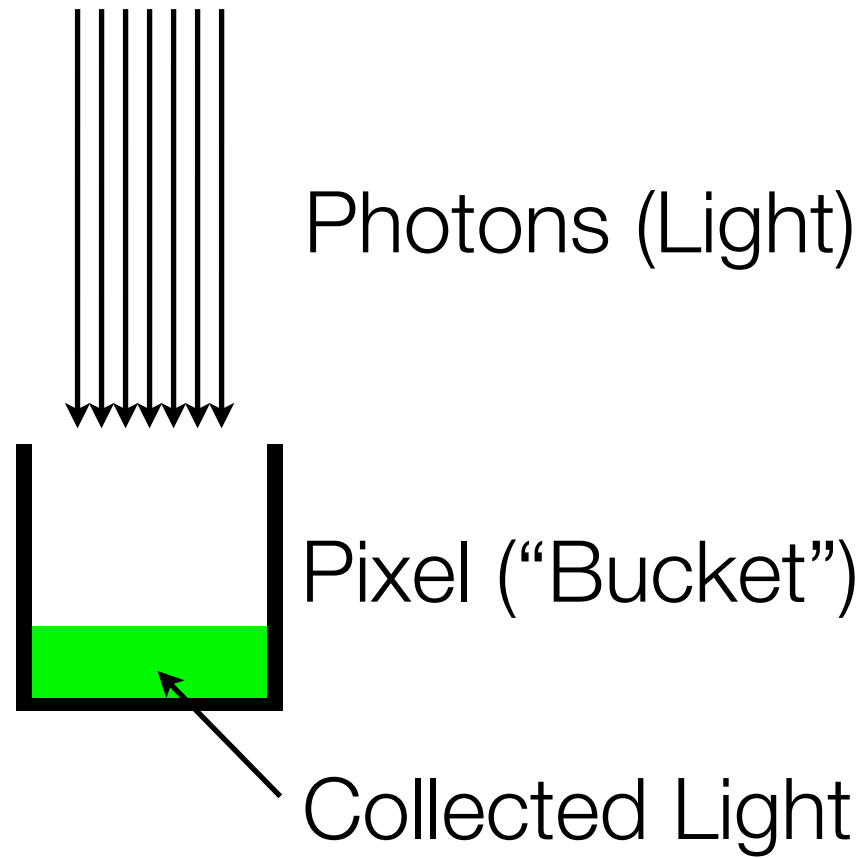
1/80s, ISO 400, f/10

Digital Cameras | Dynamic Range
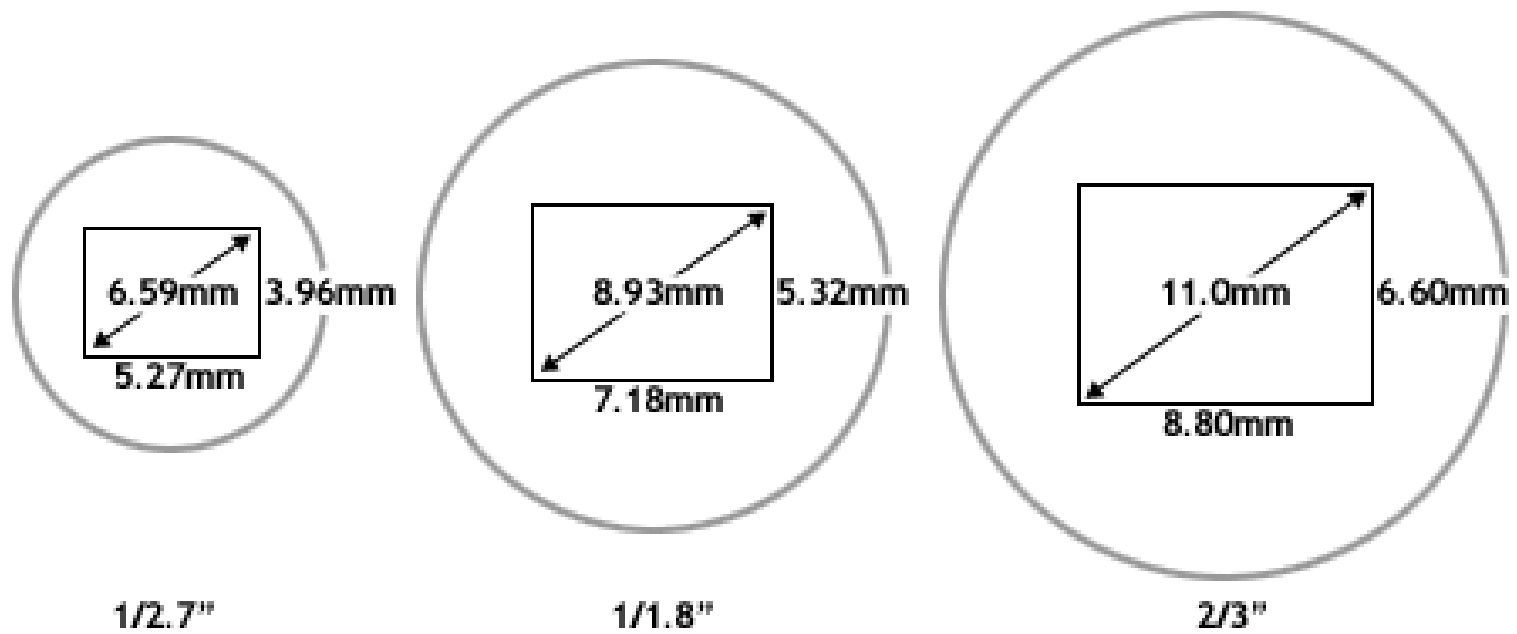
Photons (Light)

Pixel ("Bucket")

Collected Light

Digital Cameras | Dynamic Range

6.59mm 3.96mm 5.27mm 1/2.7"

8.93mm 5.32mm 7.18mm 1/1.8"

11.0mm 6.60mm 8.80mm 2/3"

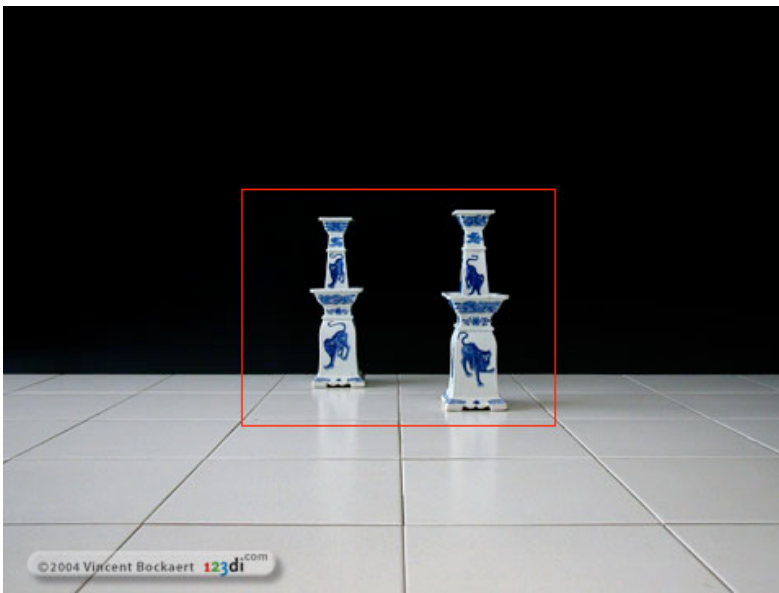# Digital Cameras | Sensor Sizes

5mm

7mm

16mm

24mm
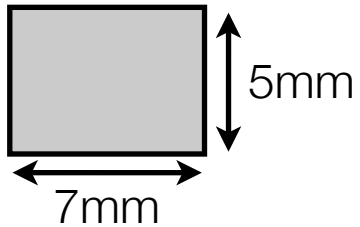
1/2.5"
6 MP
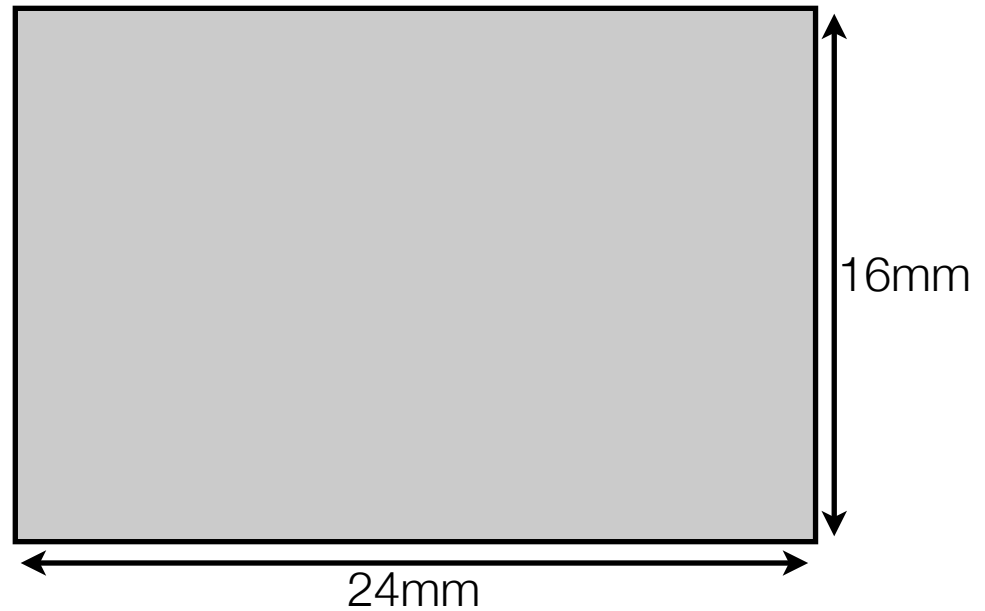
APS-C (SLR-sized)
6 MP

Sensor Sizes | Size of the pixels in each?

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
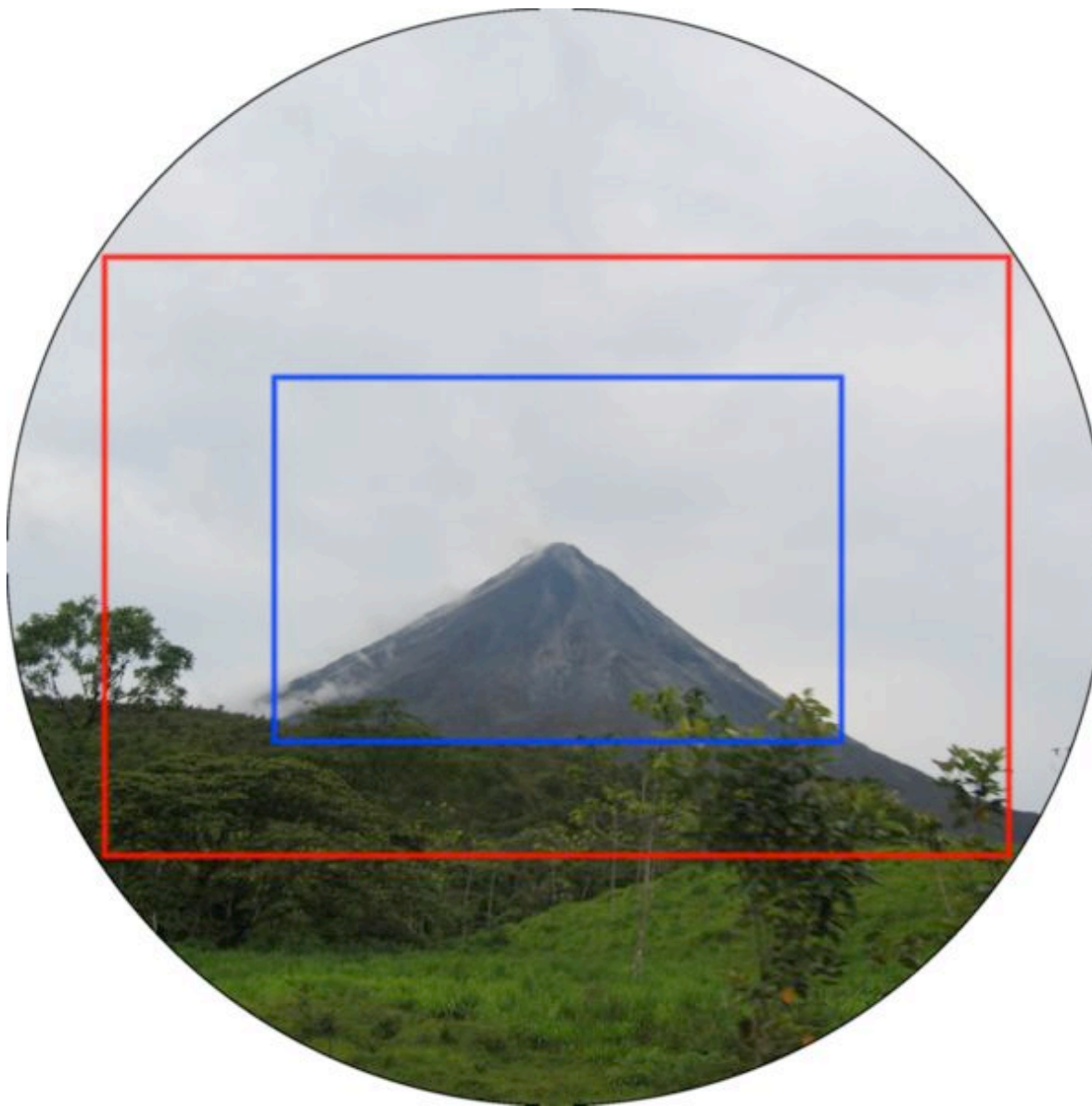
Sensor Sizes | Focal Length and Perspective

Image from http://en.wikipedia.org/wiki/Crop_factor
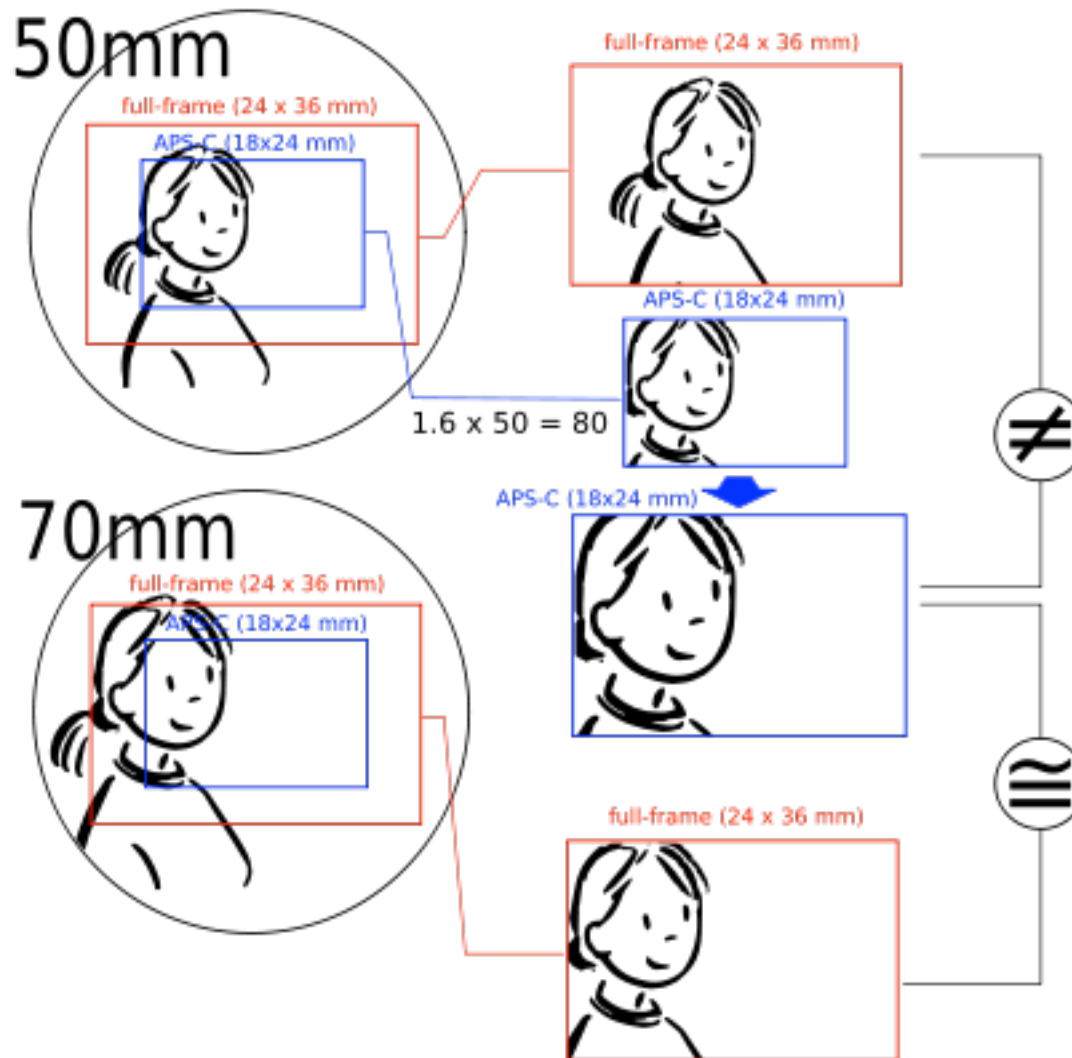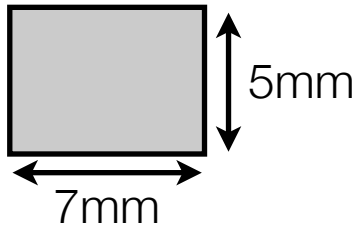
Sensor Sizes | Focal Length and Perspective

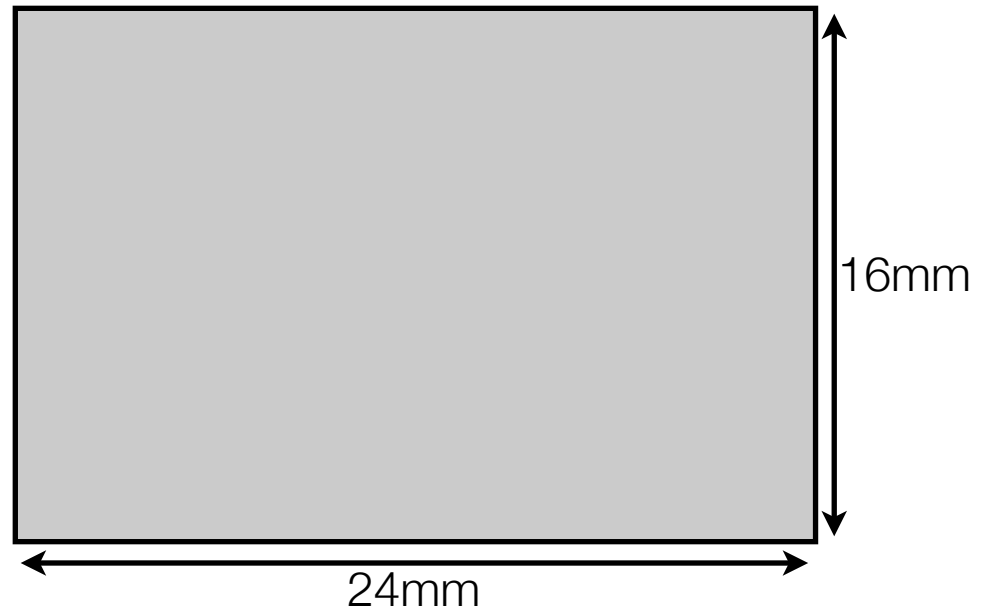# Sensor Sizes | Focal Length and Perspective

Image from http://en.wikipedia.org/wiki/Crop_factor

Sensor Sizes | Focal Length and Perspective

5mm

7mm

16mm

24mm

1/2.5"
0.5 MP

APS-C (SLR-sized)
6 MP

Sensor Sizes | Same size pixels.. still dark?

Canon 1D Mark II, 28mm f/13 1/8 sec, ISO 640

Canon S70, 8mm f/3.5 1/8 sec, ISO 50
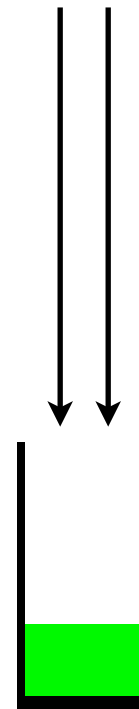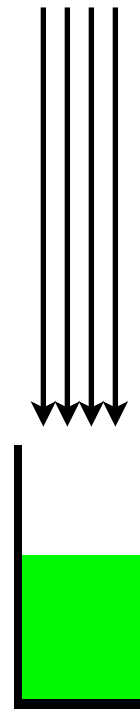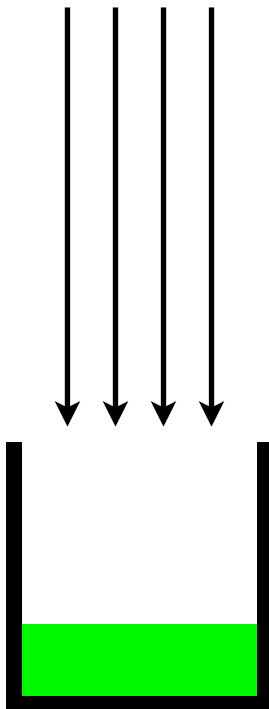
Canon 1D Mark II, 28 mm f/3.5 1/100 sec, ISO 640

© Roger N. Clark
www.clarkvision.com

Image from http://www.clarkvision.com/photoinfo/dof_myth/
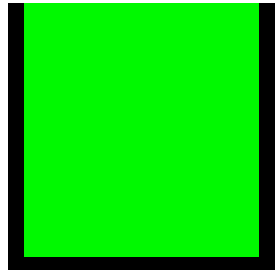
Sensor Sizes | Depth of Field
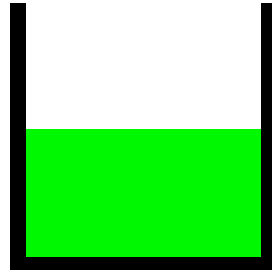
Sensor Sizes | Pixel Size

$$\text{Dynamic Range} = \frac{\text{Biggest Signal (full ``bucket'')}}{\text{Smallest detectable signal}}$$

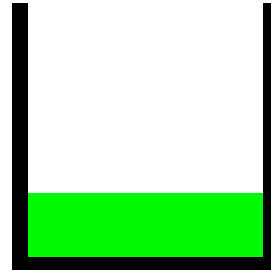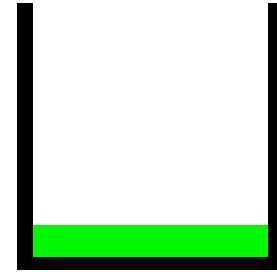Dynamic Range | Simplified Calculation

100   200   400   800

Dynamic Range | Full capacity of pixels at ISOs

Passive Pixel Sensors

Active Pixel Sensors

CCD

CMOS

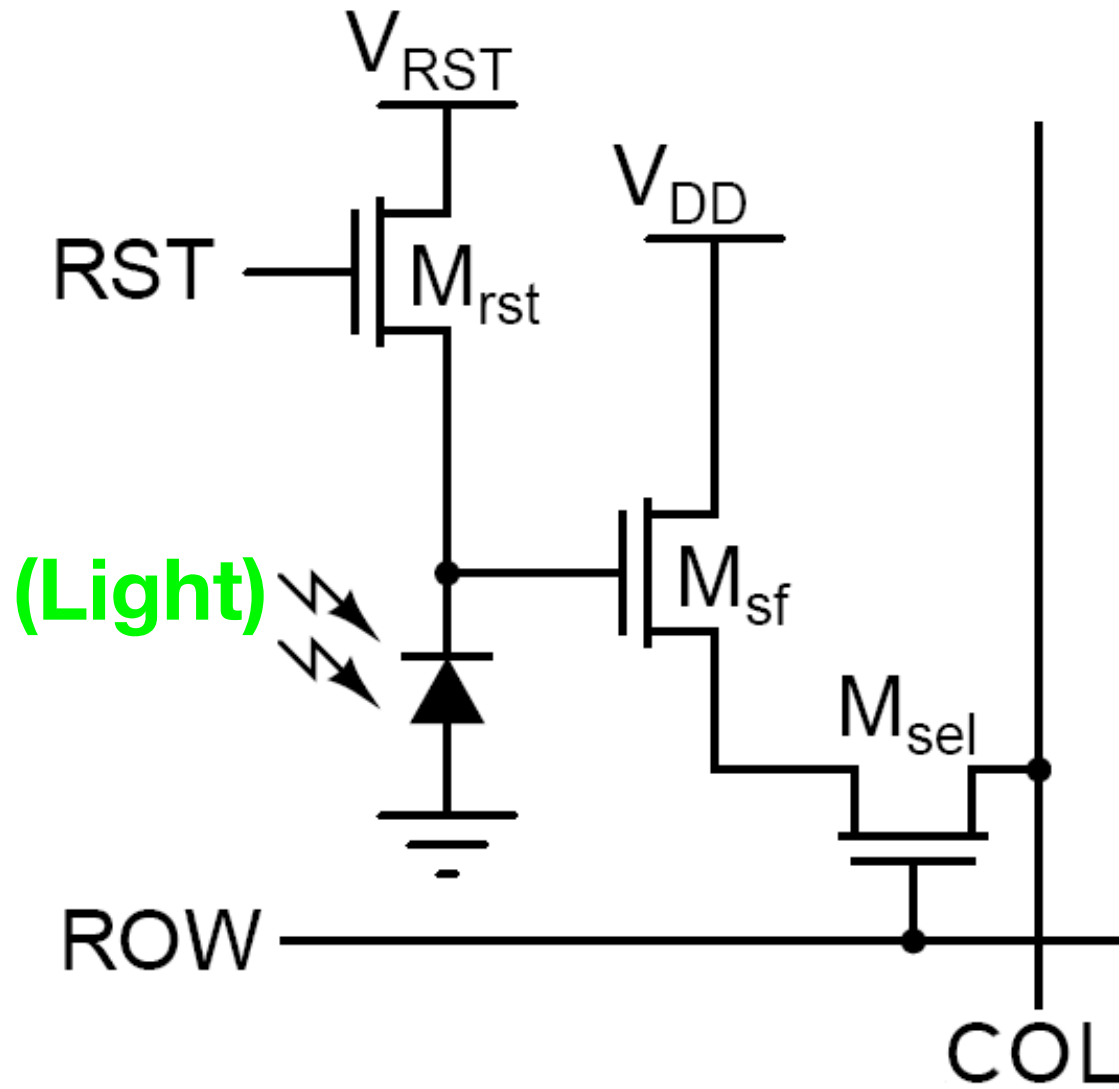JFET LBCAST

Digital Cameras | Sensors

Image from http://en.wikipedia.org/wiki/Active_pixel_sensor
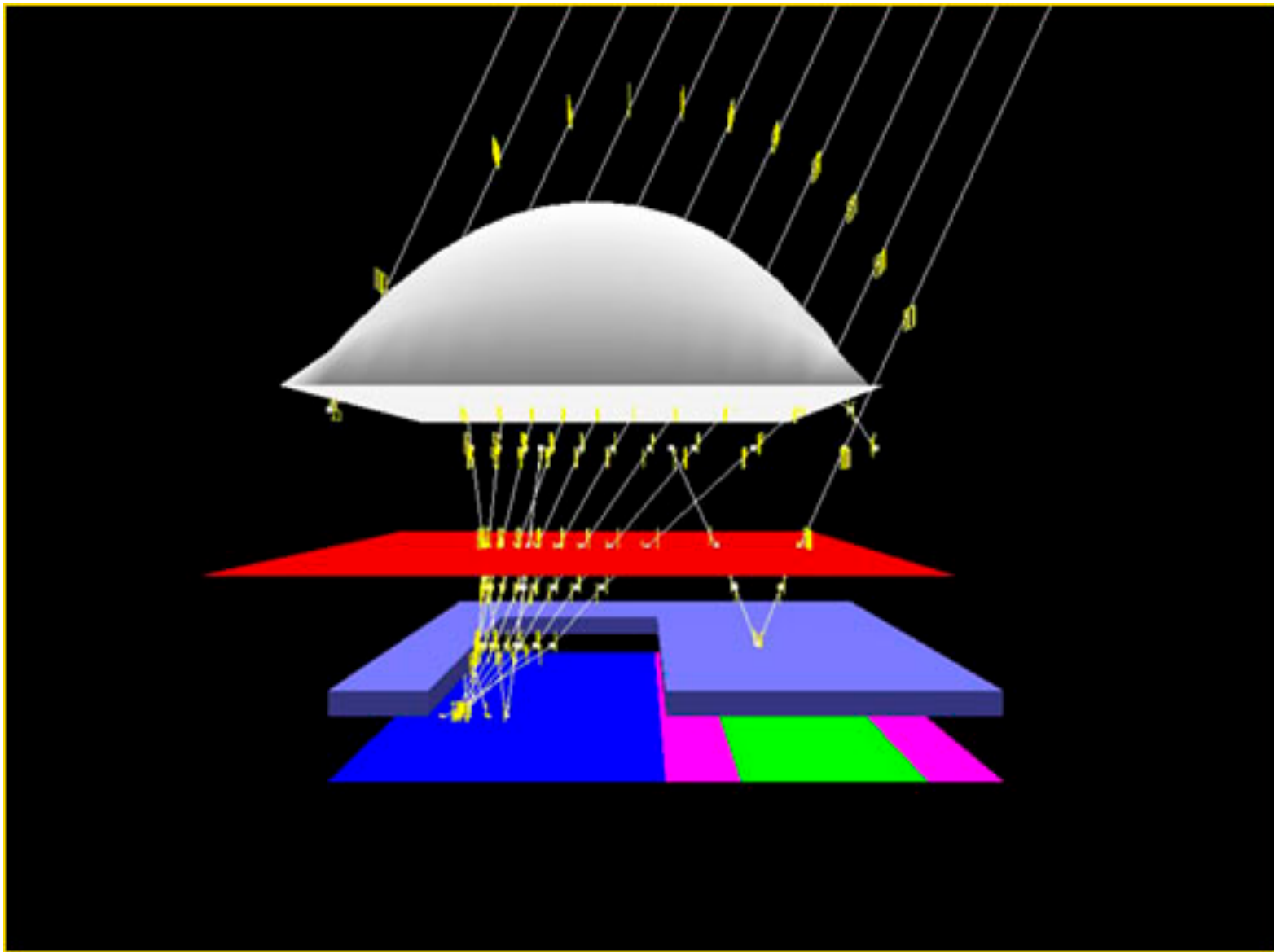
Sensors | Pixels

Image from Eastman Kodak, from http://www.luminous-landscape.com/essays/kodak-iss.shtml

Sensors | Microlens

Computer Science E-7
Exposing Digital Photography

Lecture 9: Digital Cameras
November 7, 2011

danallan@mit.edu