

# Computer Science E-7

## Exposing Digital Photography

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Lecture 9: Digital Cameras  
November 9, 2009

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**Final Project**

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**Resources**

**Syllabus**

Welcome to Computer Science E-7: Exposing Digital Photography! This is a course offered in Spring, 2008 at **Harvard University's Extension School**.

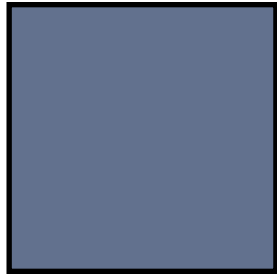
The course strives to offer students a more thorough understanding of digital photography through an exploration of technical, rather than strictly artistic, details. With a better understanding of the limitations and compromises behind digital photography, students will be better prepared for unexpected and dynamic photographic situations.

Find the **syllabus** and much more on the menu at the left!

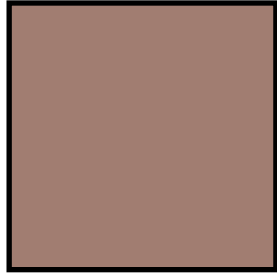
(cc)2008 Dan Armendariz, some rights reserved: Creative Commons BY-NC-SA.

## Assignment 4

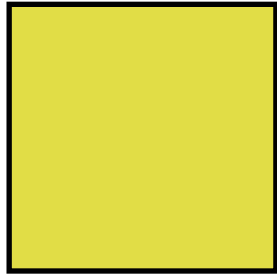
Website Theme



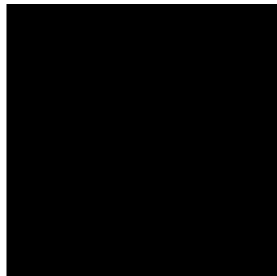
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content: A17D71



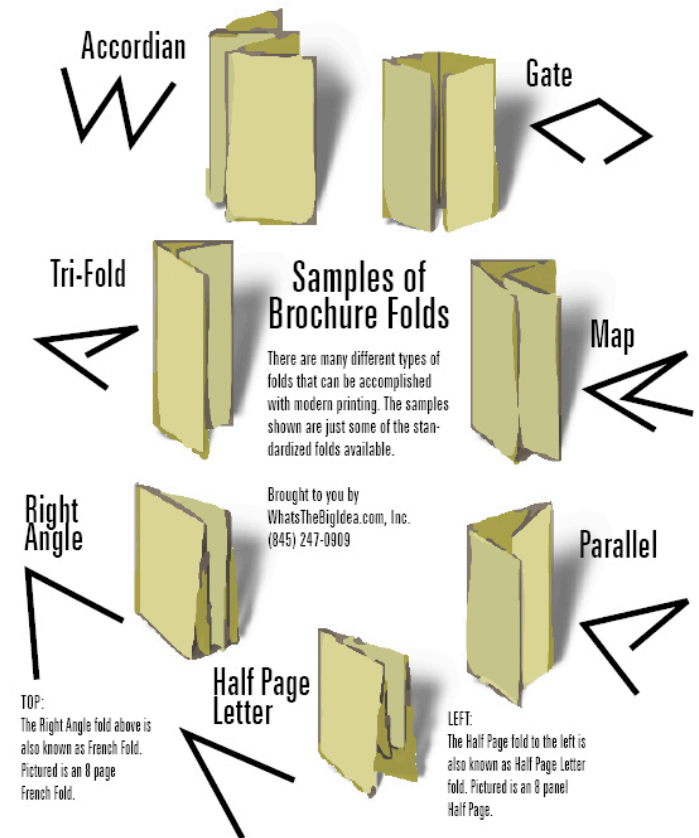
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text: 000000

Assignment 4

Color Scheme



Final Project

Ideas



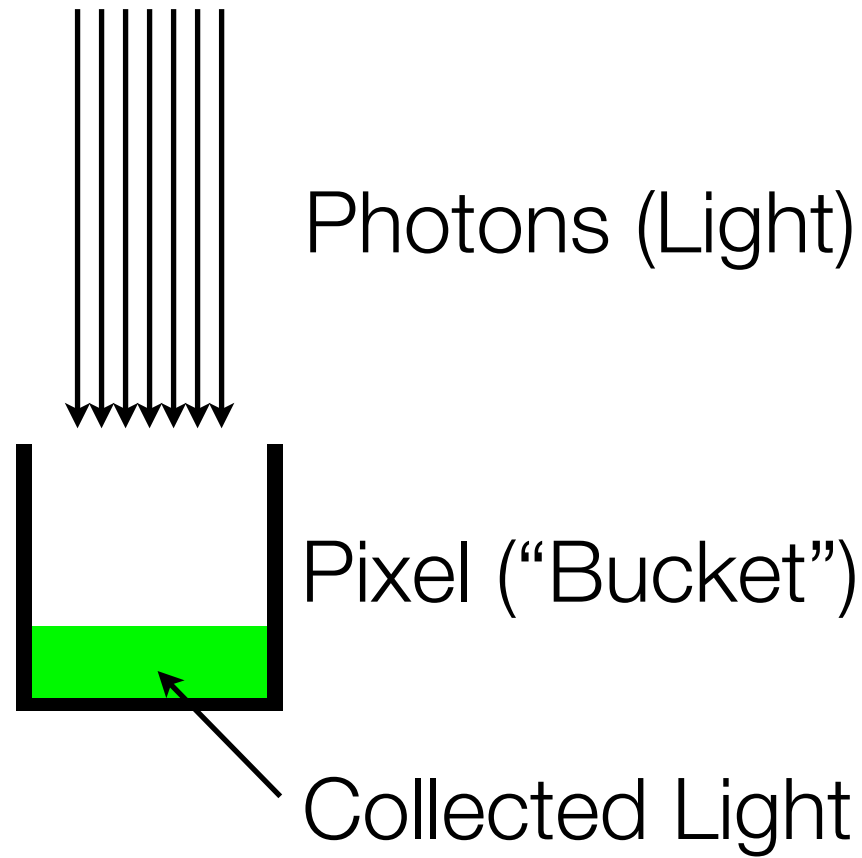


1/80s, ISO 400, f/10

Photo by Dan Armendariz, 2006

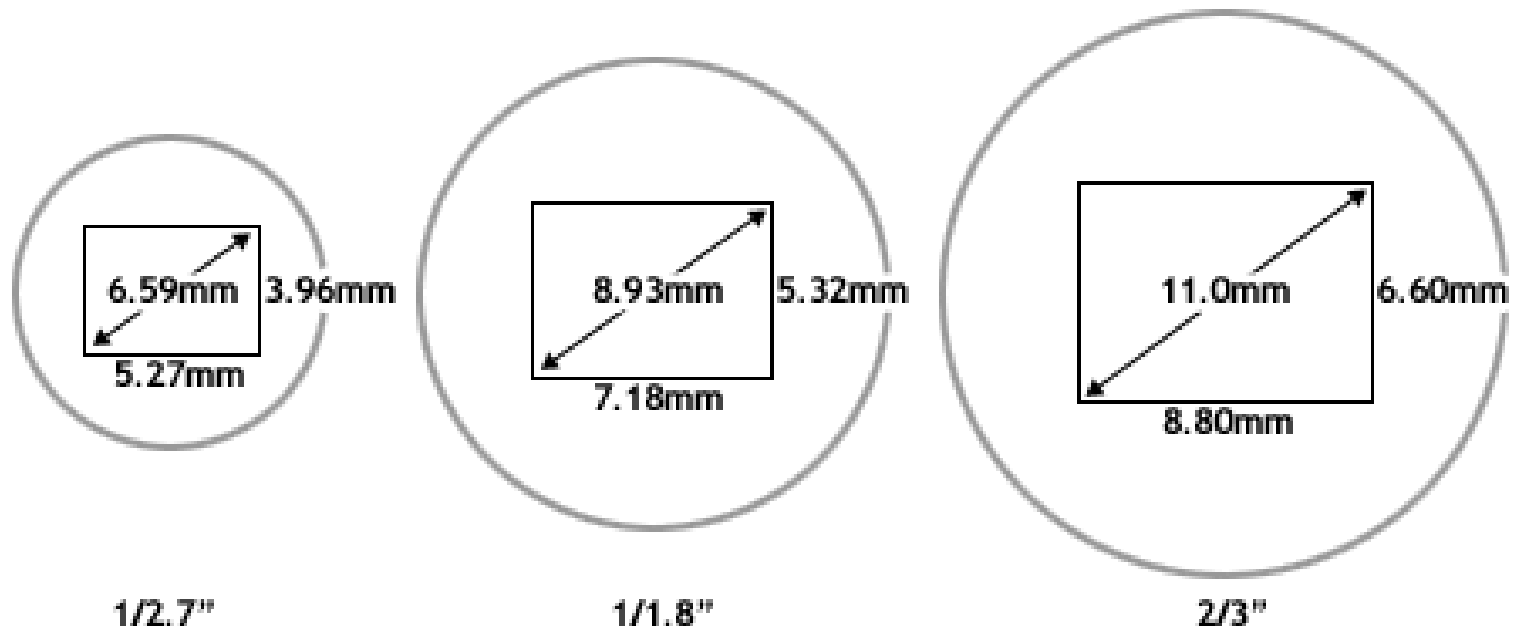
# Digital Cameras

## Dynamic Range



Digital Cameras

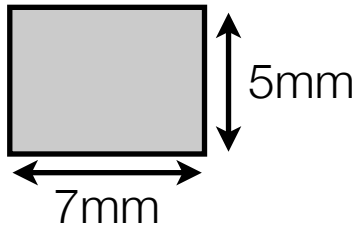
Dynamic Range



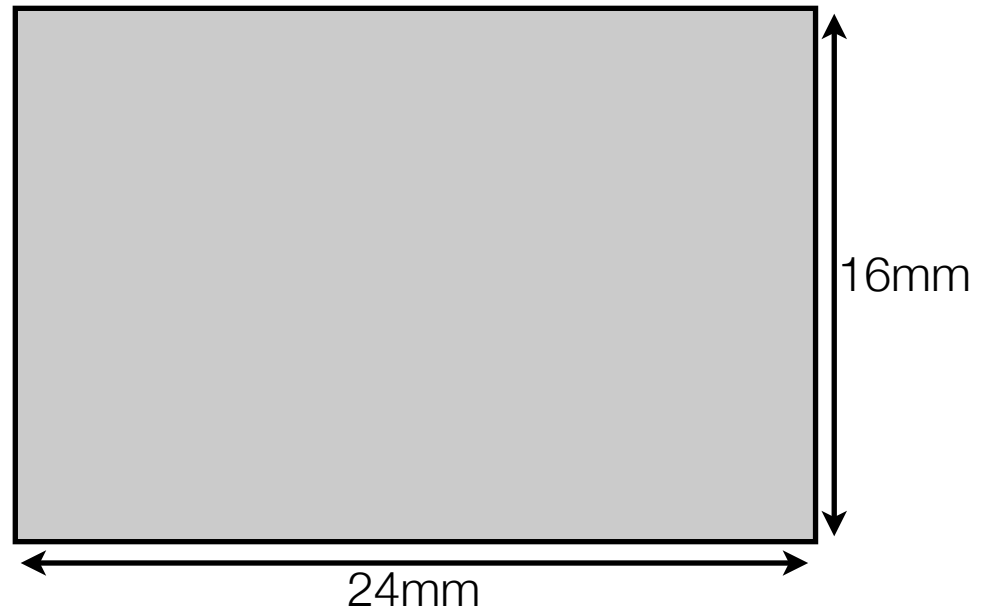
Modified image from <http://www.dpreview.com/news/0210/02100402sensorsizes.asp>

# Digital Cameras

## Sensor Sizes



1/2.5"  
6 MP



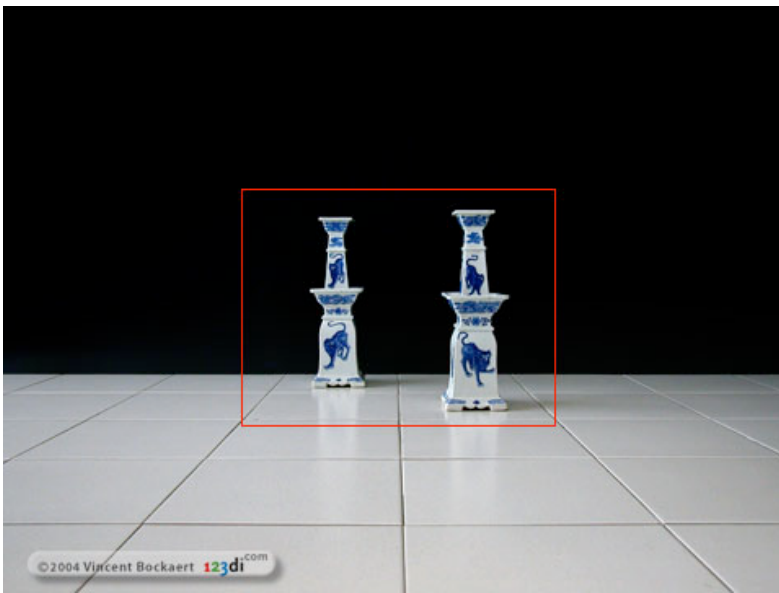
APS-C (SLR-sized)  
6 MP

Sensor Sizes

Size of the pixels in each?



1.



2.



3.



4.



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](http://www.dpreview.com/learn/?/Glossary/Optical/Perspective_01.htm)

# Sensor Sizes

# Focal Length and Perspective

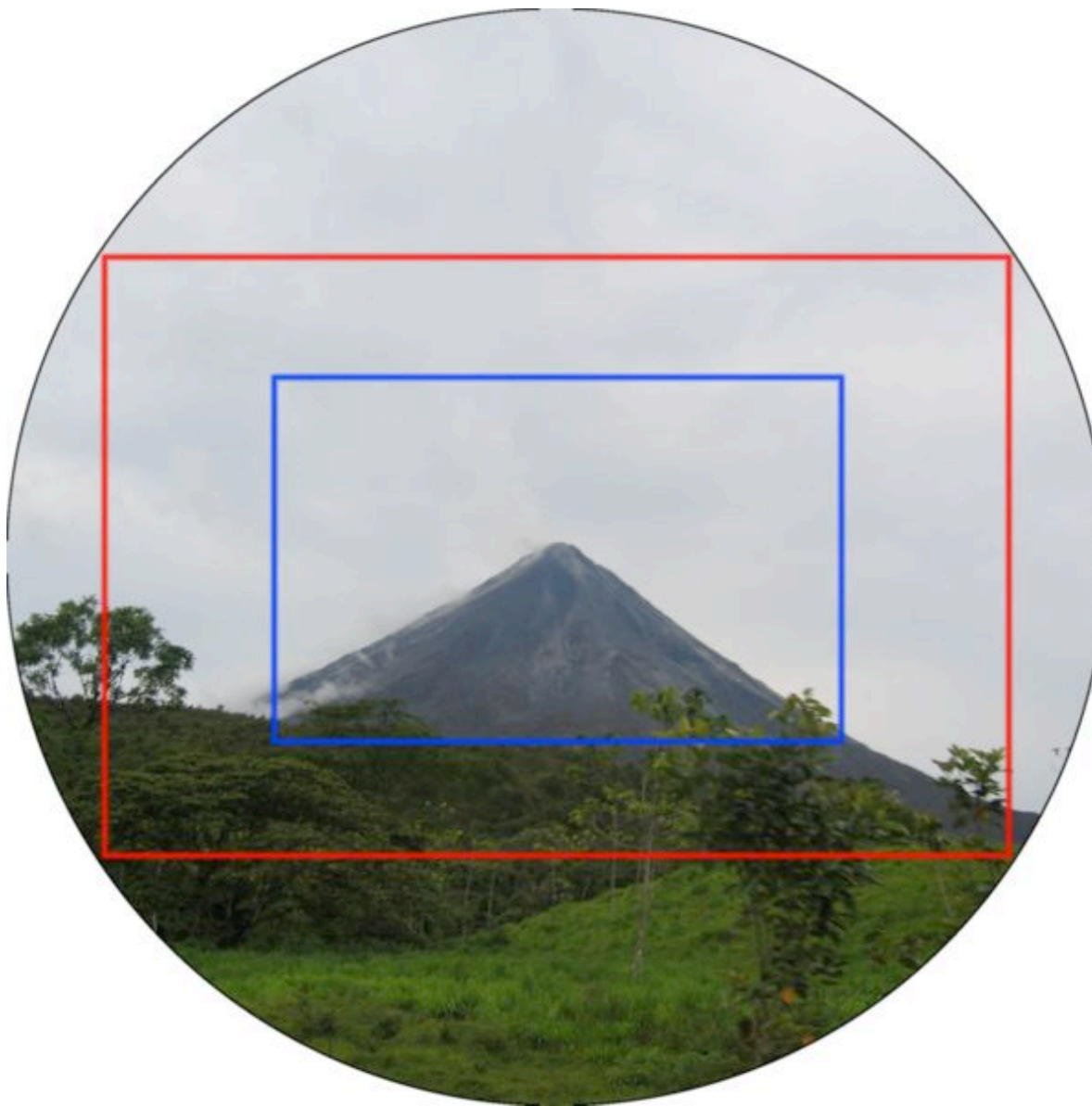


Image from [http://en.wikipedia.org/wiki/Crop\\_factor](http://en.wikipedia.org/wiki/Crop_factor)

# Sensor Sizes

## Focal Length and Perspective

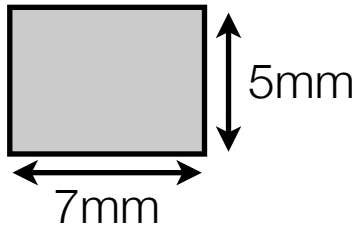




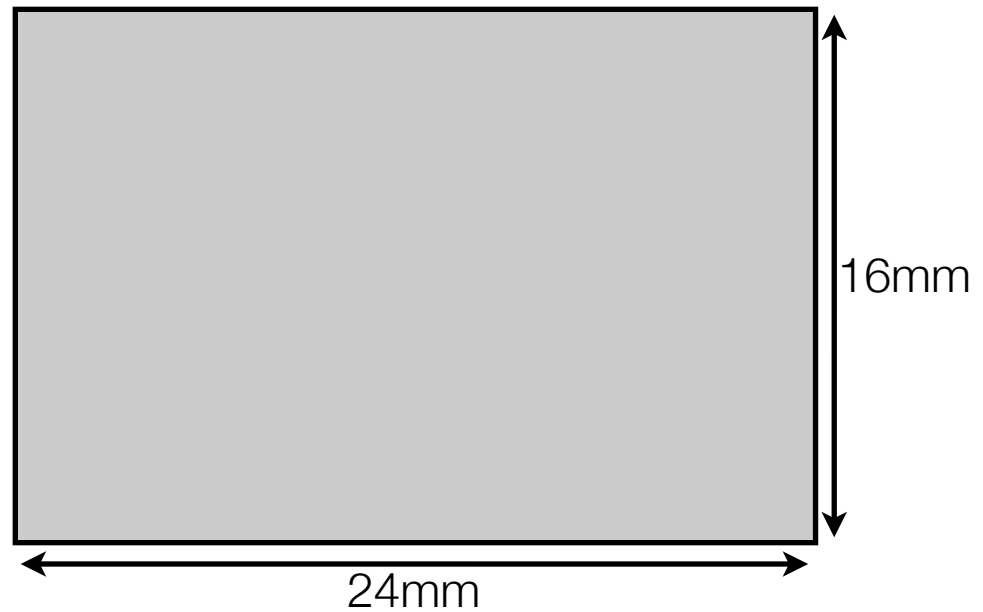
Image from [http://en.wikipedia.org/wiki/Crop\\_factor](http://en.wikipedia.org/wiki/Crop_factor)

## Sensor Sizes

## Focal Length and Perspective



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

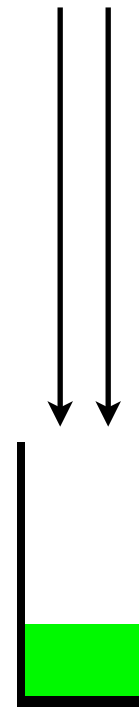
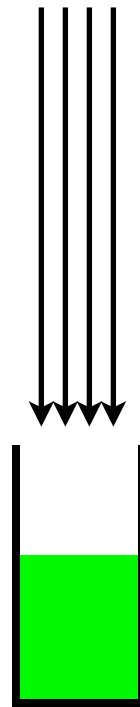
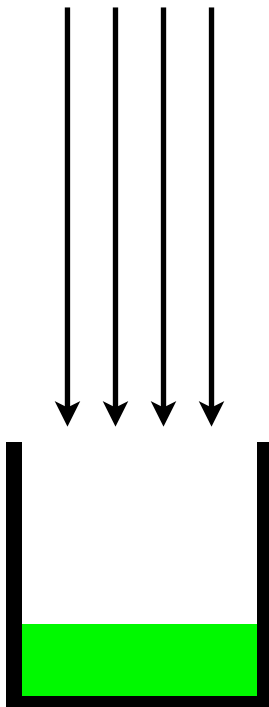
© Roger N. Clark

[www.clarkvision.com](http://www.clarkvision.com)

Image from [http://www.clarkvision.com/photoinfo/dof\\_myth/](http://www.clarkvision.com/photoinfo/dof_myth/)

# Sensor Sizes

# Depth of Field



Sensor Sizes

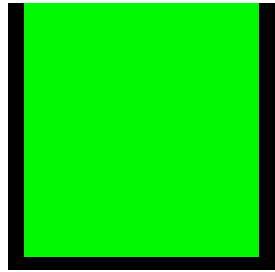
Pixel Size



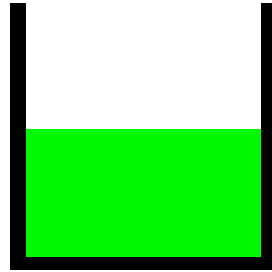
$$\text{Dynamic Range} = \frac{\text{Biggest Signal (full "bucket")}}{\text{Smallest detectable signal}}$$

Dynamic Range

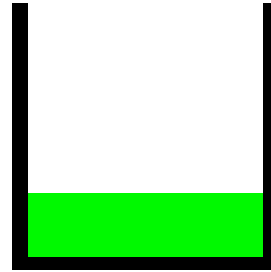
Simplified Calculation



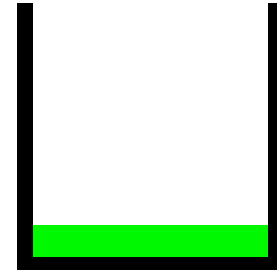
100



200



400



800

Dynamic Range

Full capacity of pixels at ISOs

Passive Pixel Sensors

CCD

Active Pixel Sensors

CMOS

JFET LBCAST

Digital Cameras

Sensors

# Computer Science E-7

## Exposing Digital Photography

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