

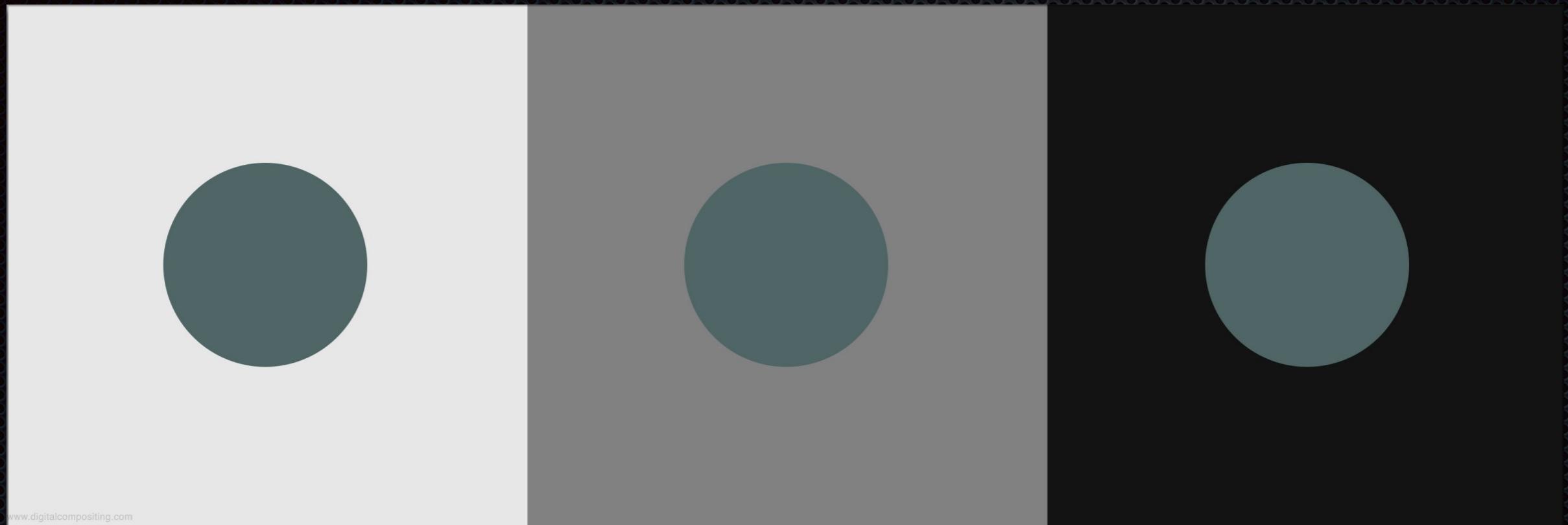
# Perception, Representation, & Manipulation of Visual Information

Brinkmann's *Art and Science of Compositing*  
(Ch. 2-5, 8, 9, 11).

I see no more than you, but I have  
trained myself to notice what I see.

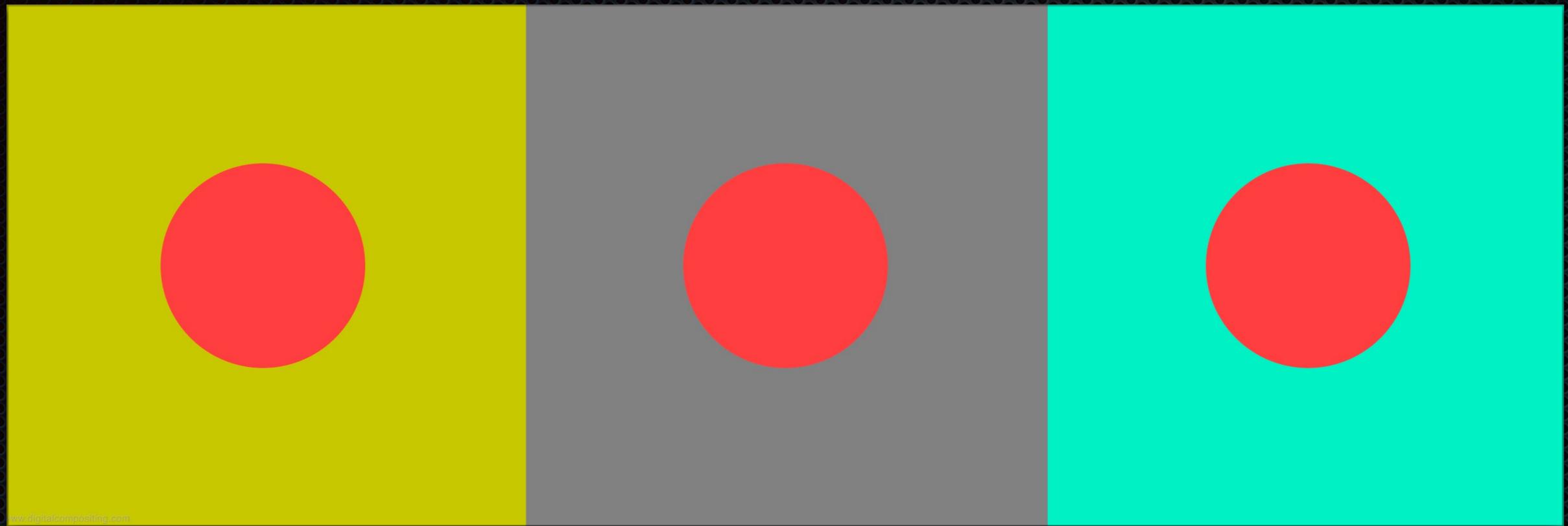
Sherlock Holmes in Arthur Conan Doyle's  
*The Adventure of the Blanched Soldier*

# Perception



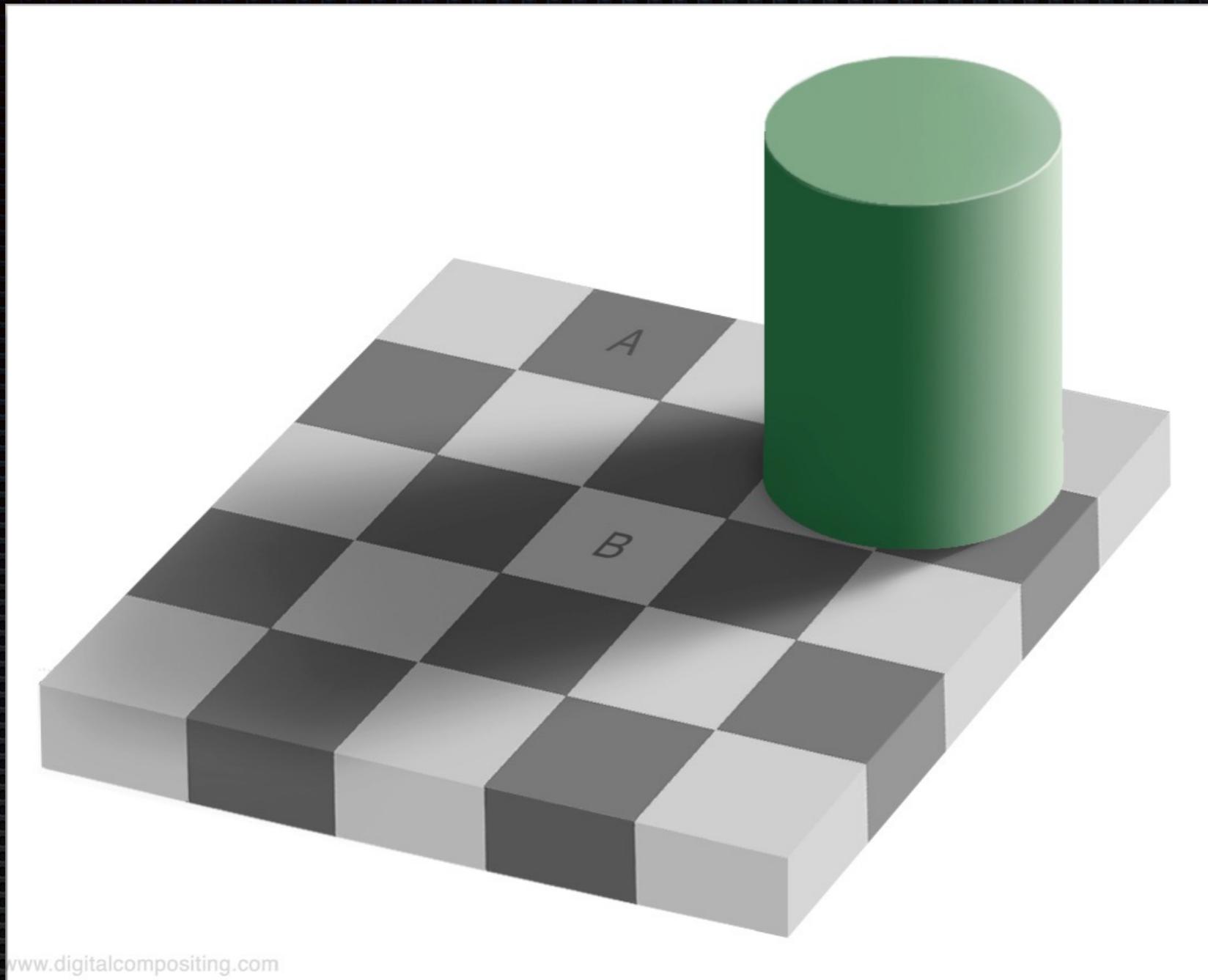
www.digitalcompositing.com

Perception  
affects our interpretation of *brightness* and  
*contrast*.



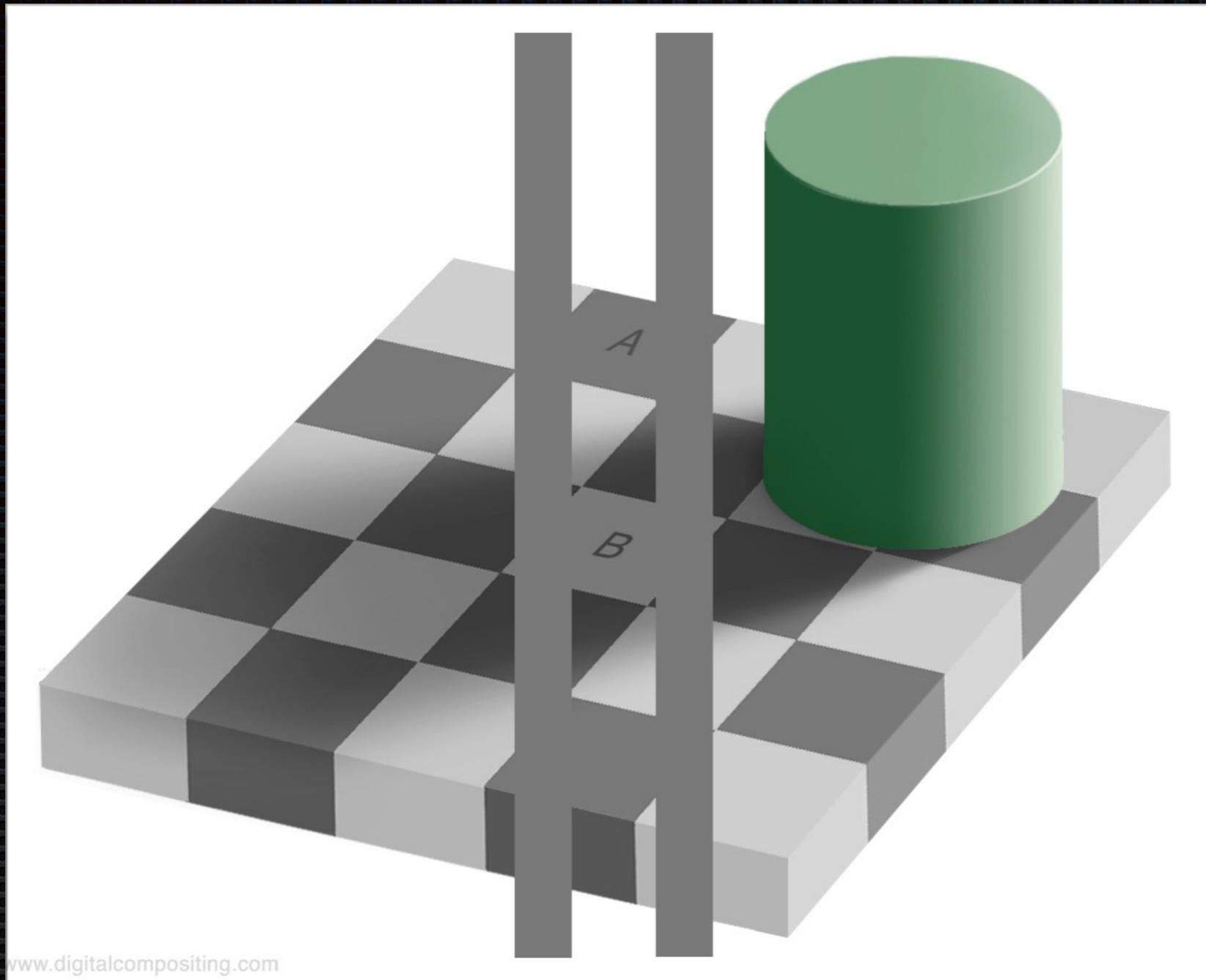
www.digitalcompositing.com

Perception  
affects our interpretation of color.

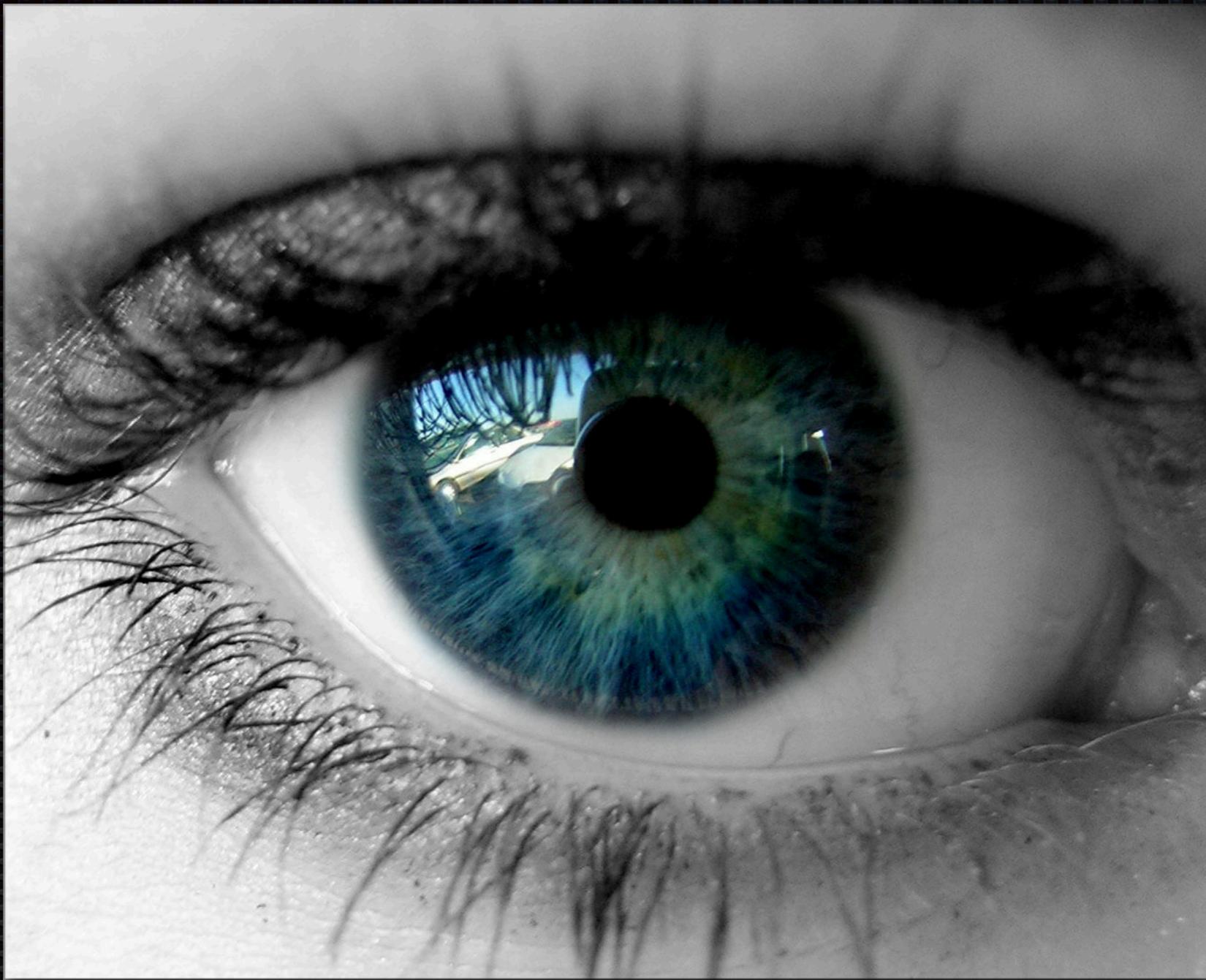


[www.digitalcompositing.com](http://www.digitalcompositing.com)

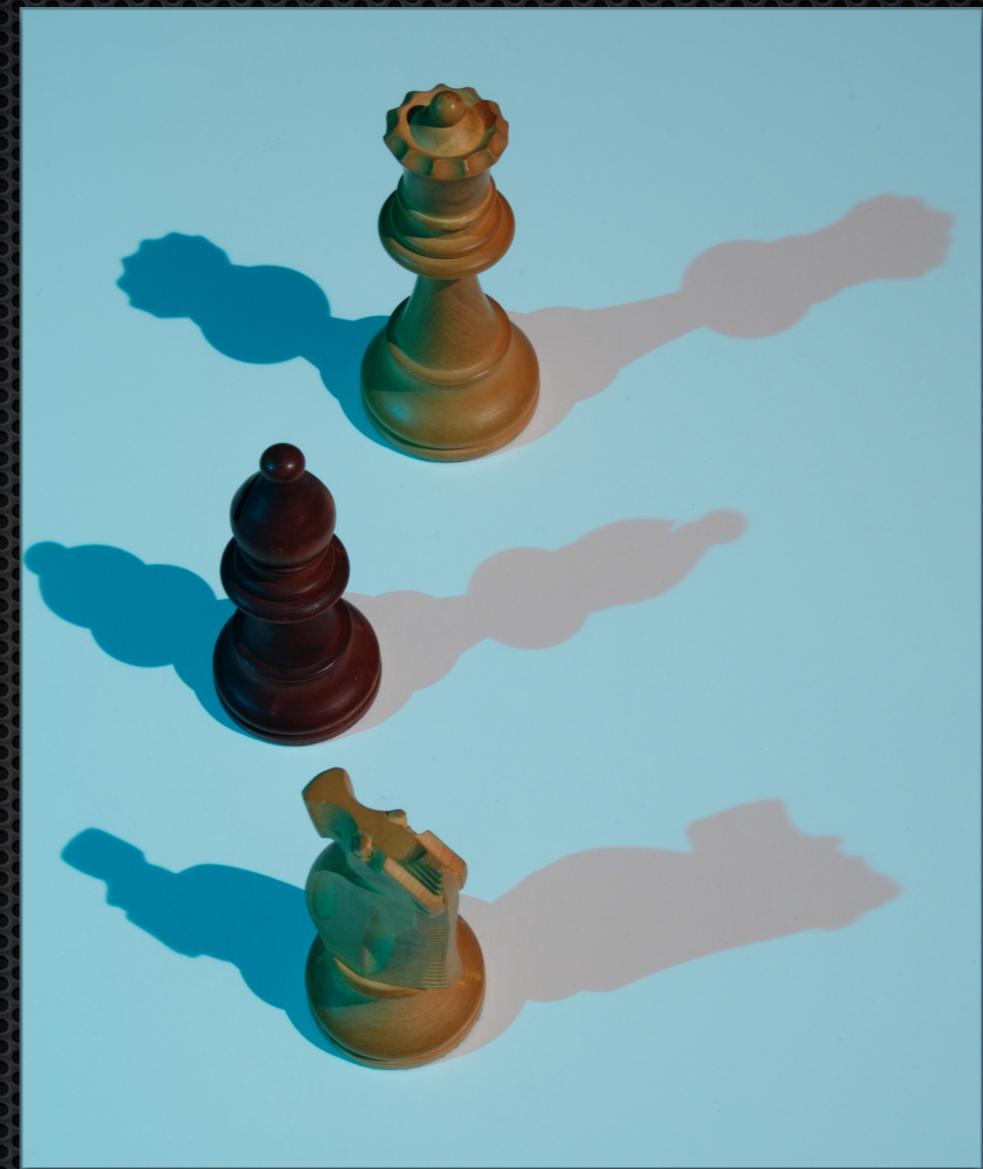
Perception  
affects our interpretation of *brightness* and  
*contrast*.



Perception  
affects our interpretation of *brightness* and  
*contrast*.



Human Visual System  
should be considered during our work.



# Light and Shadow



# Light and Shadow



# Light and Shadow



Light and Shadow



# Light and Shadow

High-key and low-key lighting and exposure.

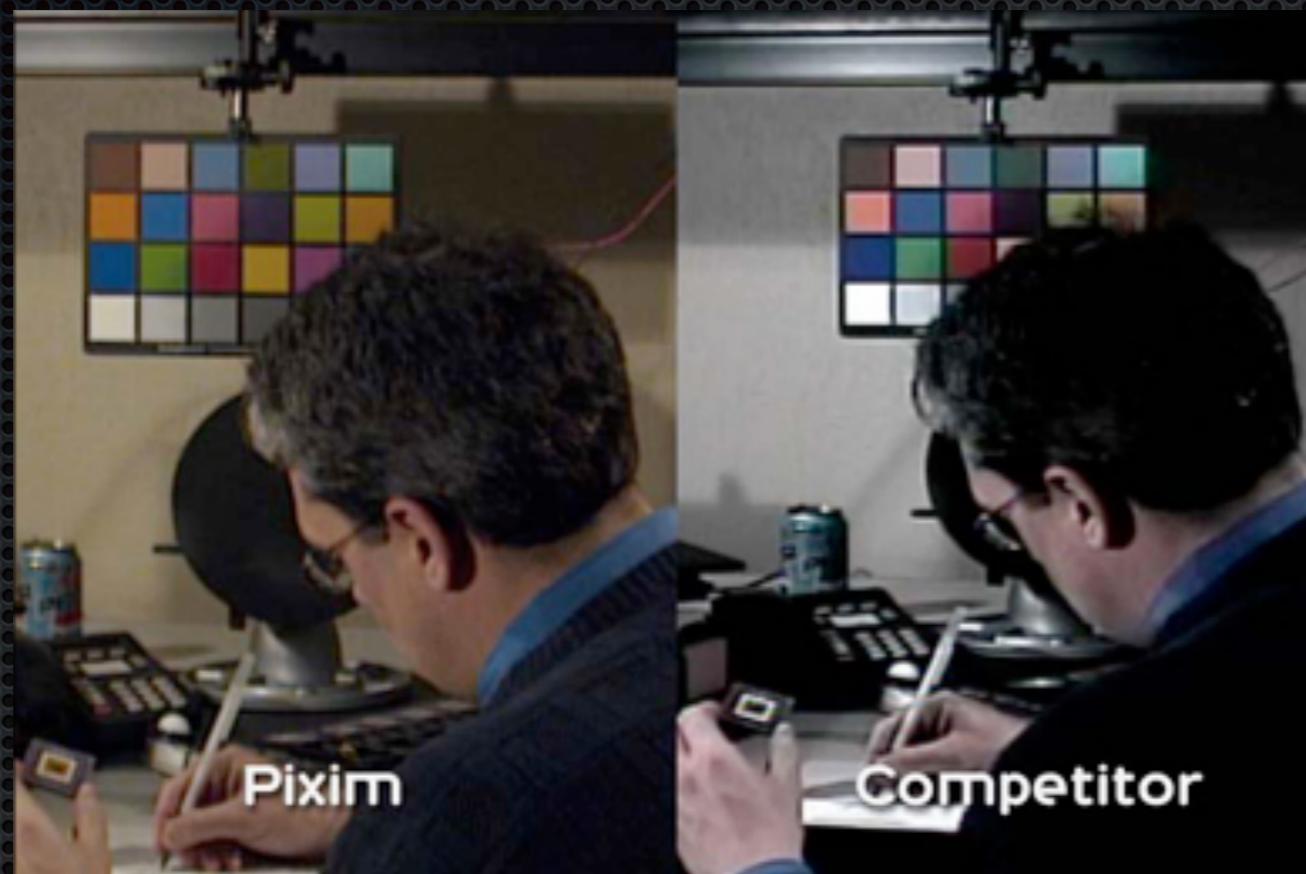


Sunny

Overcast

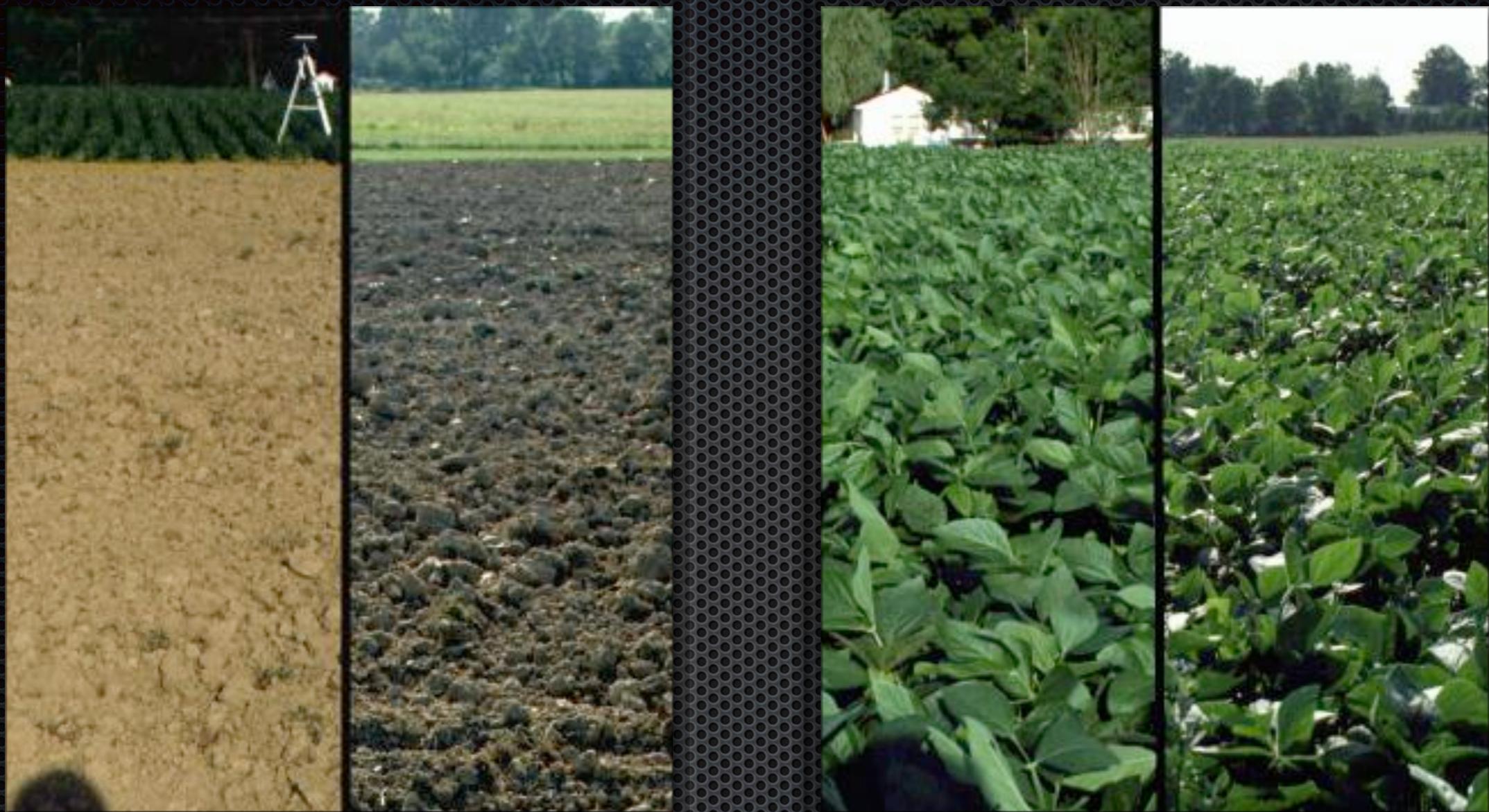
# Light and Shadow

“Soft” and “hard” light; diffuse and specular.



# Light and Shadow

## Color Temperature



# Lighting & Materials

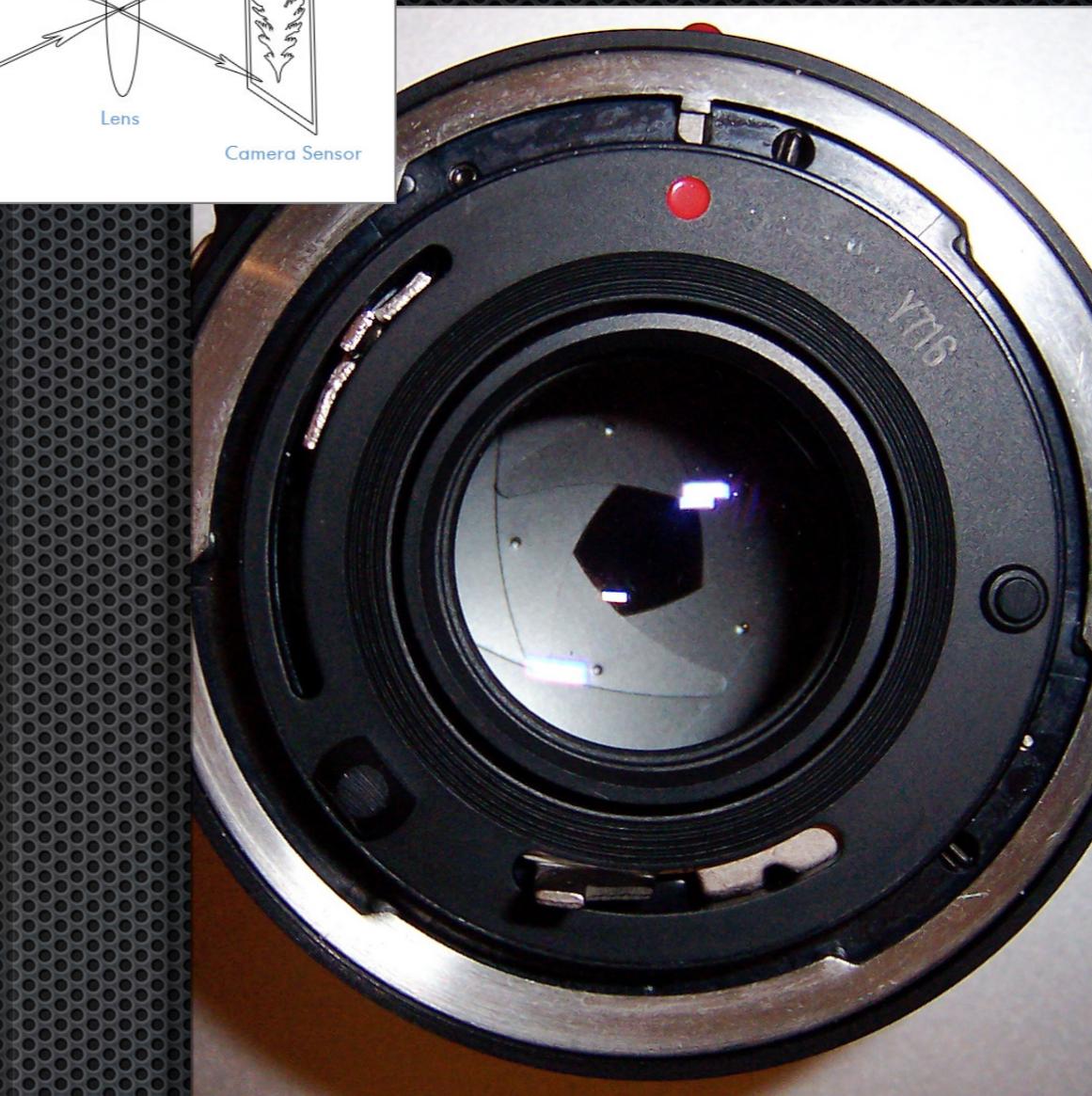
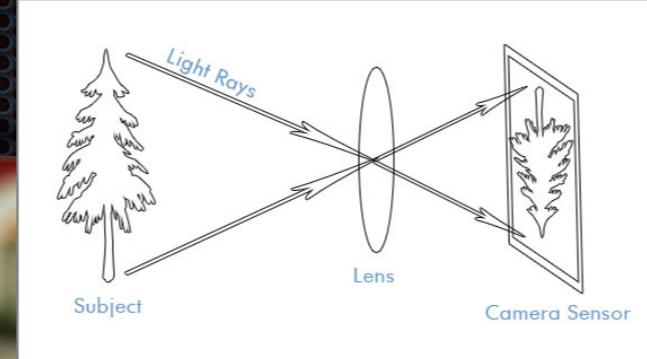
*Bi-directional Reflectance Distribution Function.*



# Light and Contrast

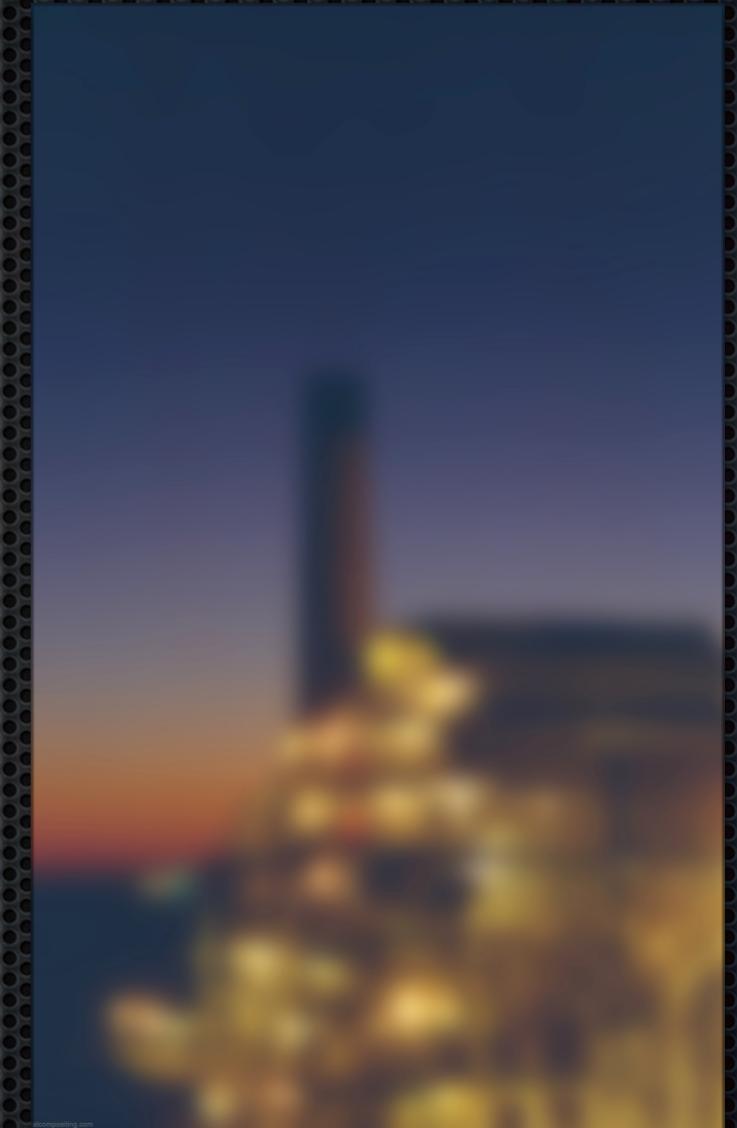
# Representation

Properties of cameras & displays.



# Pinholes and Lenses and Rays

# Focus



f/5.6



f/8

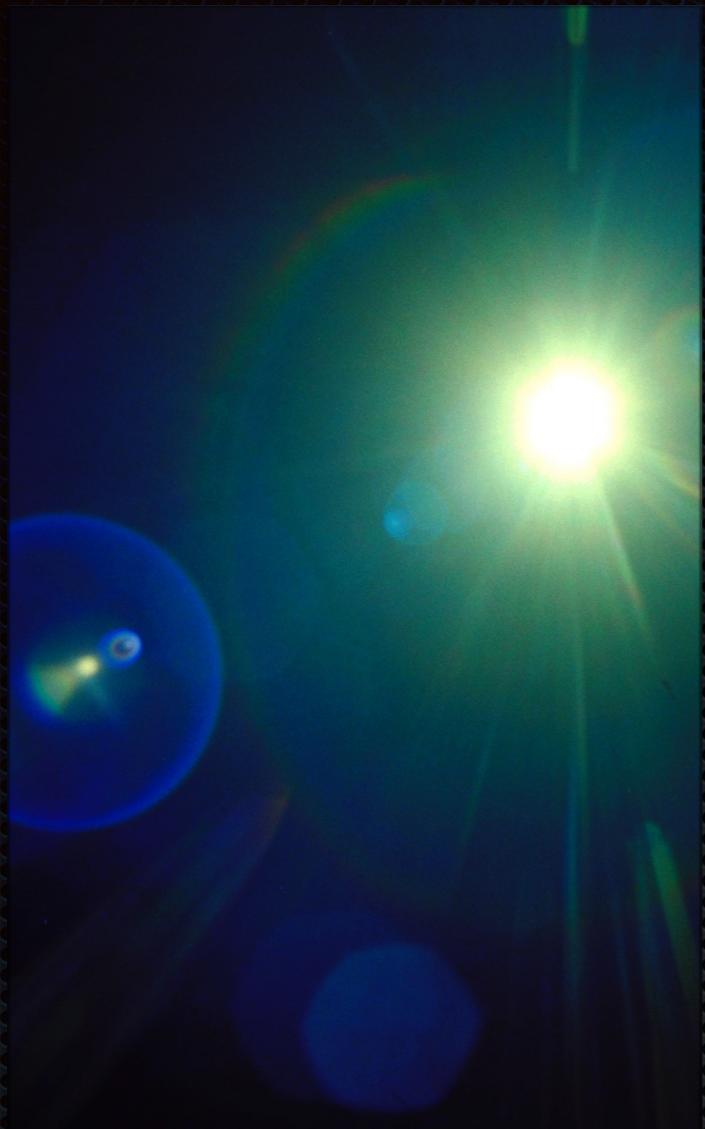


f/22

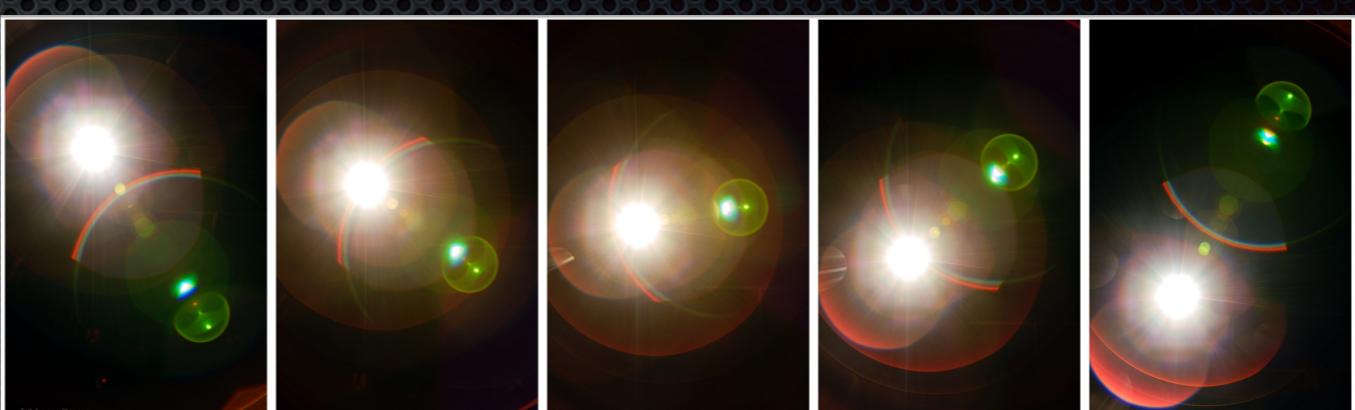


# Depth of Field





# Flare





# Distortion

## Barrel and Pincushioning





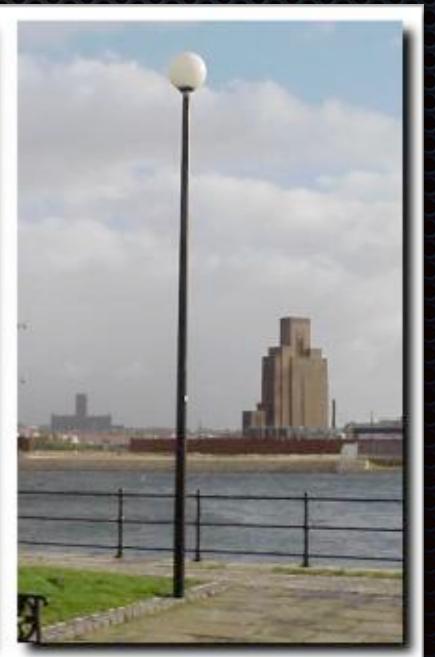
# Focal Length

Use, effects,  
and distortion.

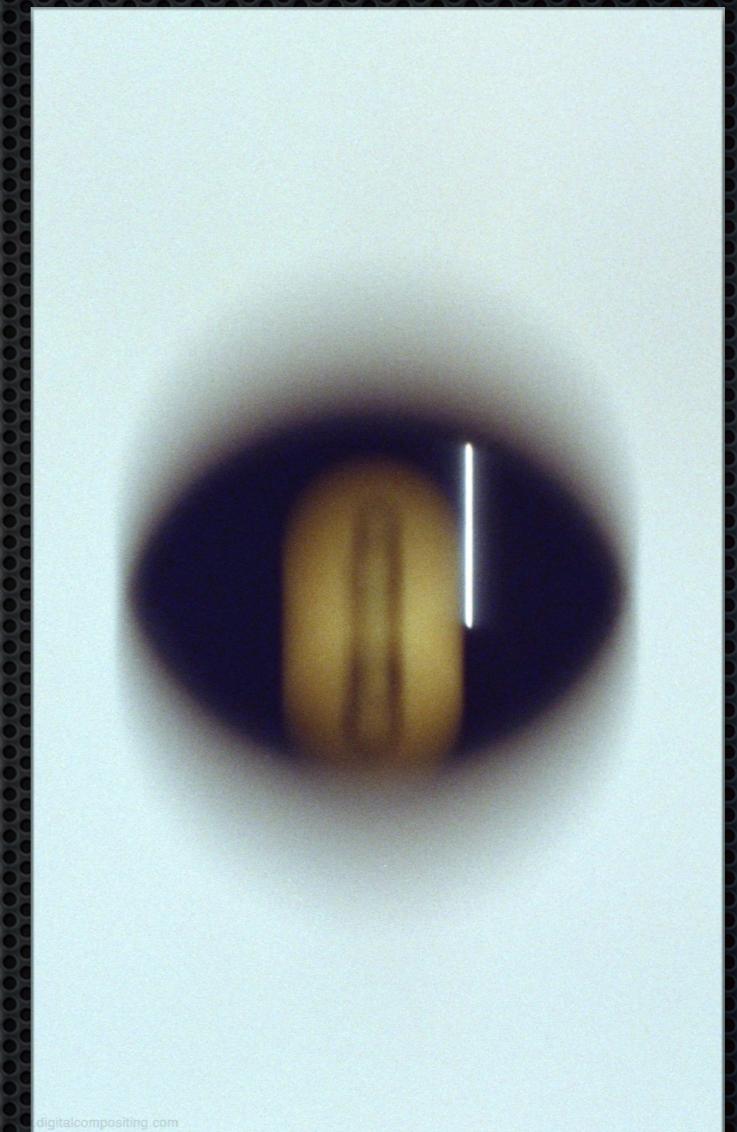




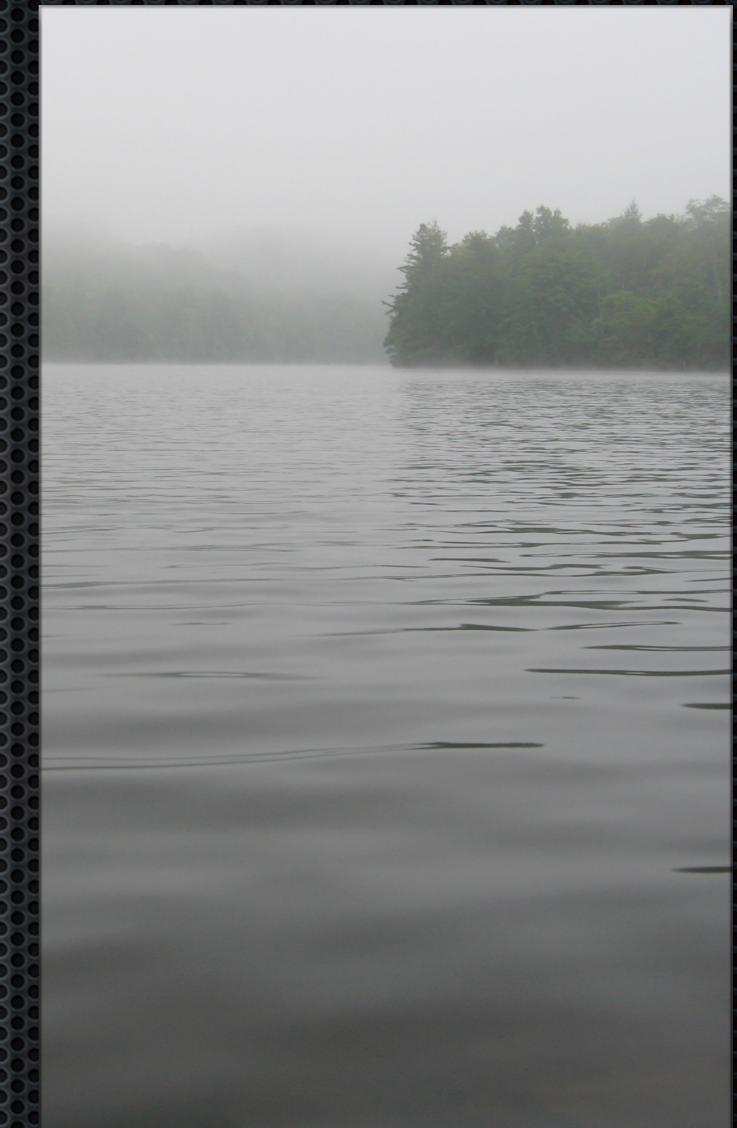
# Perspective & Parallax







# Motion Blur



# Atmospheric Effects



# Stereoscopy



# Stereoscopy

4K - 2304 x 4096

2K - 1152 x 2048

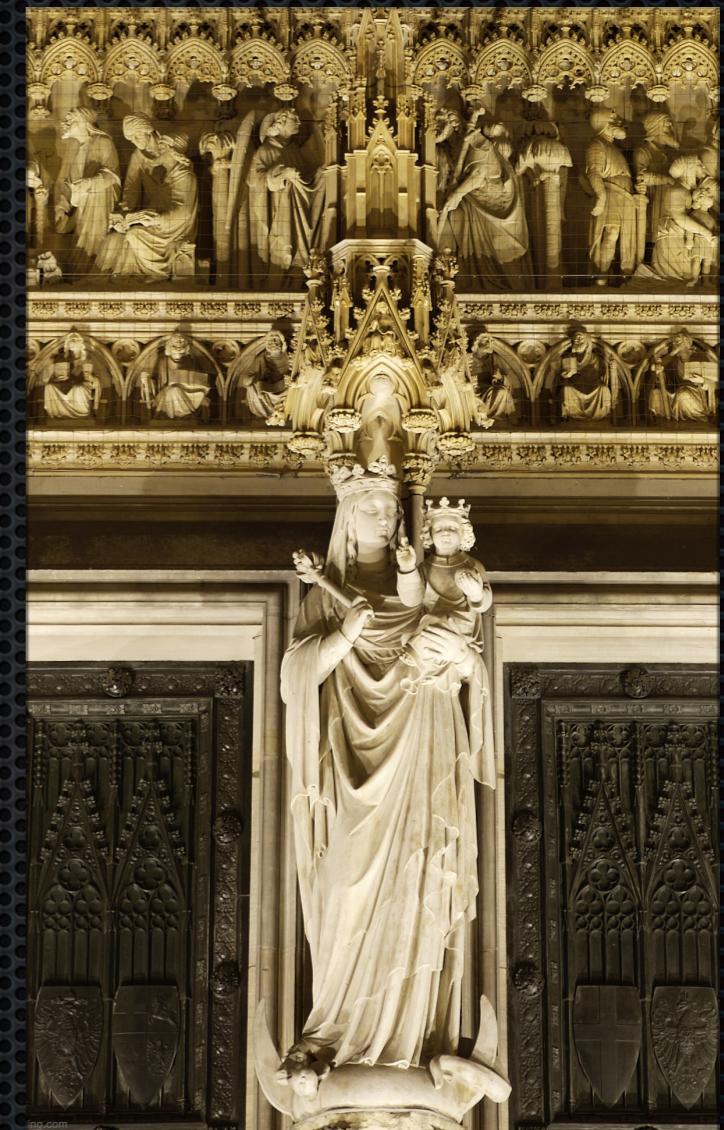
1080p - 1080 x 1920

720p - 720 x 1280

DV - 480 x 720



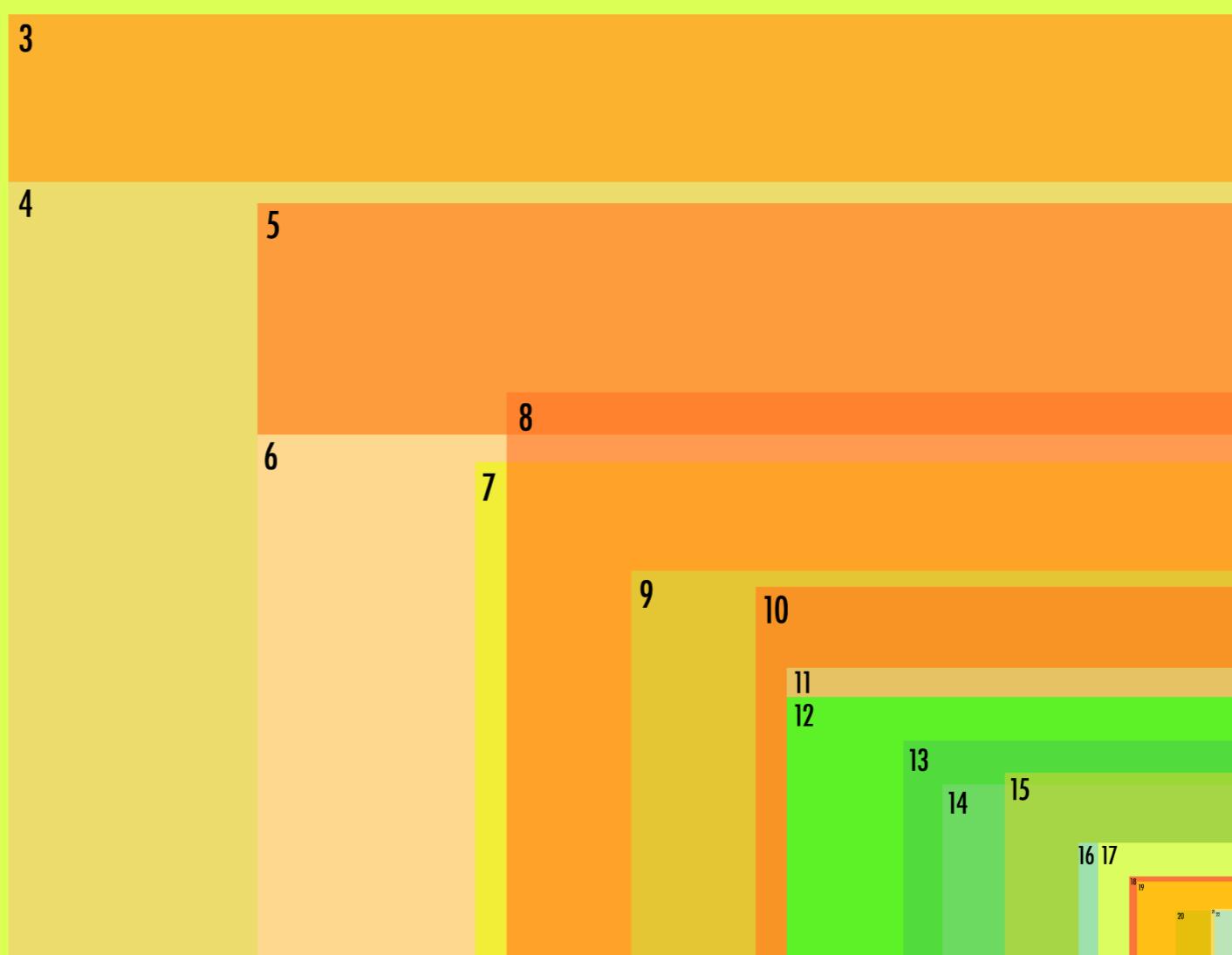
# Capture Resolution



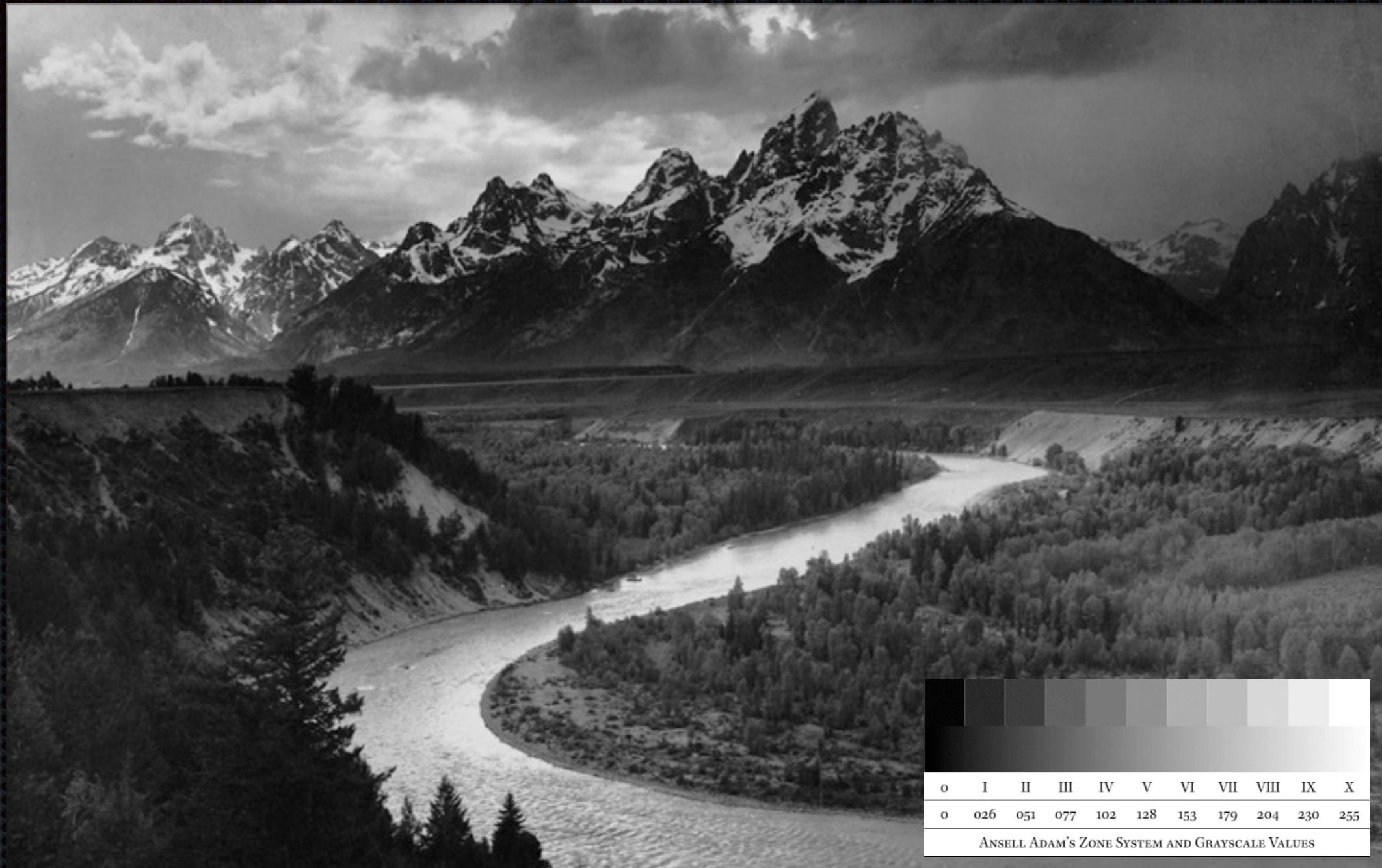
# Capture Resolution

1. WHUXGA (7,680 x 4,800)
2. WHSXGA (6,400 x 4,096)
3. 5K (estimated) (5,120 x 3,890)
4. WHXGA (5,120 x 3,200) 2
5. Full Aperture 4K (4,096 x 3,112) 3
6. Sony 4K (4,096 x 2,160)
7. WQSXGA (3,200 x 2,048)
8. 3K (estimated) (3,072 x 2,334) 4
9. WQXGA (2,560 x 1,600)
10. Full Aperture Native 2K (2,048 x 1,536) 5
11. WUXGA (1,920 x 1,200)
12. 1080p (1,920 x 1,080)
13. WXGA+ (1,440 x 900)
14. 720p (1,280 x 720)
15. XGA (1,024 x 768)
16. DVD (NTSC) (768 x 480)
17. VGA (640 x 480)
18. Macintosh (512 x 342)
19. iPhone (480 x 320)
20. CGA/Atari ST/Amiga OCS (320 x 200)
21. Nokia Series 60 (Original) (176 x 208)
22. IBM PCjr (160 x 200)

<http://gadgets.boingboing.net>



# Display Resolution



0	I	II	III	IV	V	VI	VII	VIII	IX	X
0	026	051	077	102	128	153	179	204	230	255

ANSELL ADAM'S ZONE SYSTEM AND GRayscale VALUES

# Latitude

Both capture and display devices have a finite *dynamic range* of light representation.



# Latitude

Both capture and display devices have a finite *dynamic range* of light representation.

# Scientific Visualization:

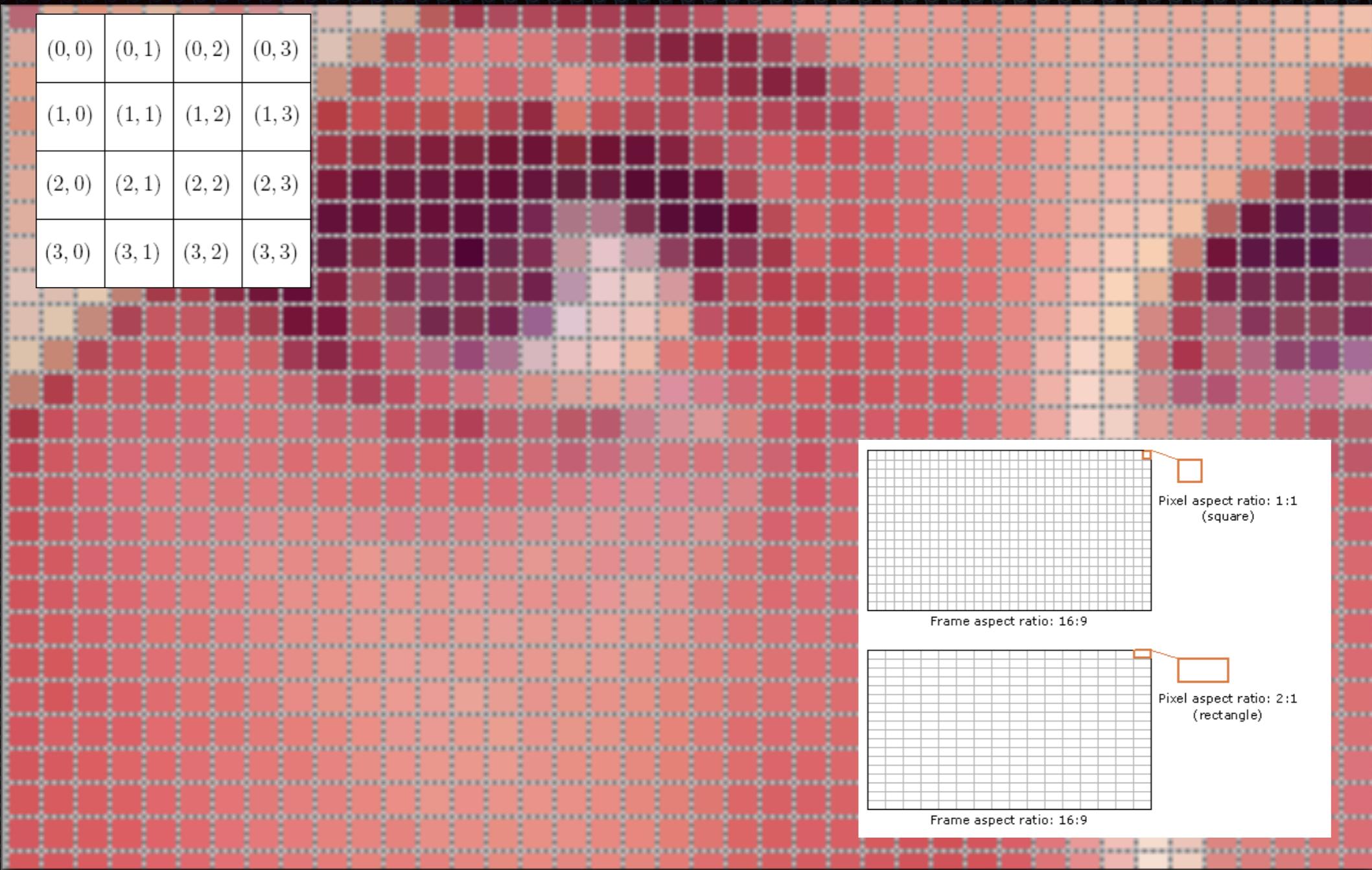
*It needs to be correct.*

# Visual Effects:

*If it looks correct, then it is correct.*

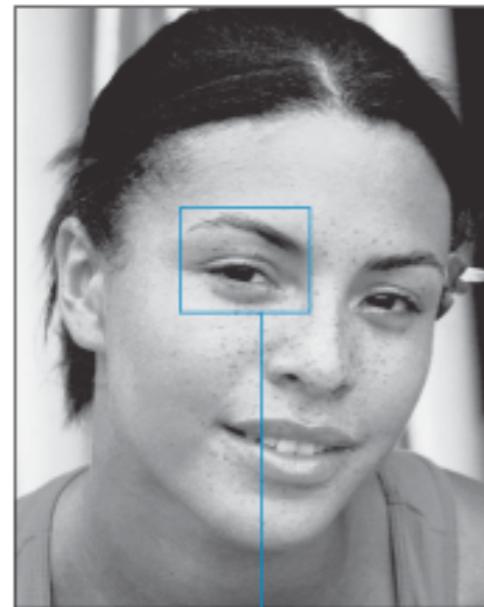
# Digital

Pixels, bits, formats, & standards.



# Pixels & Bits

Building blocks of images.



1 bit  
2 possible values



2 bits  
4 possible values



4 bits  
16 possible values



8 bits  
256 possible values

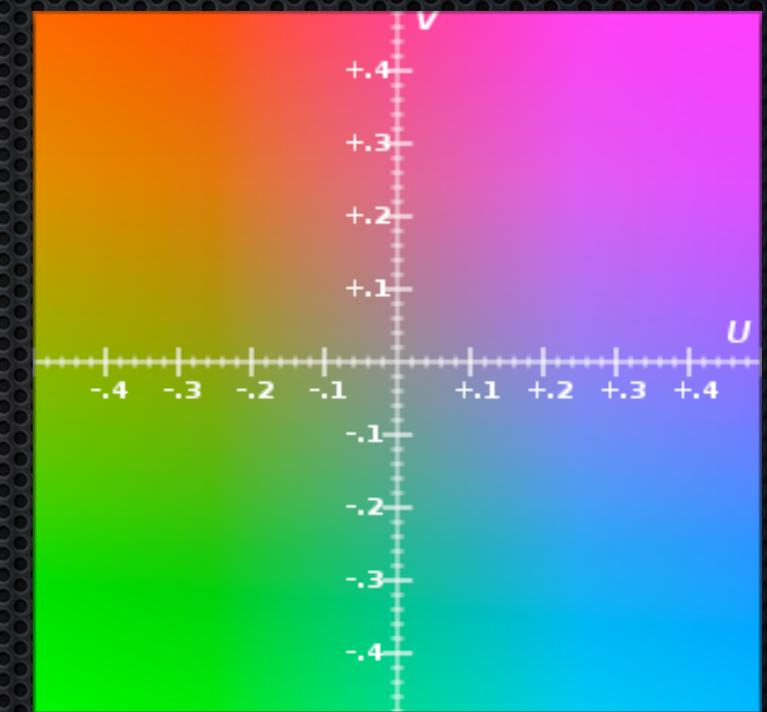
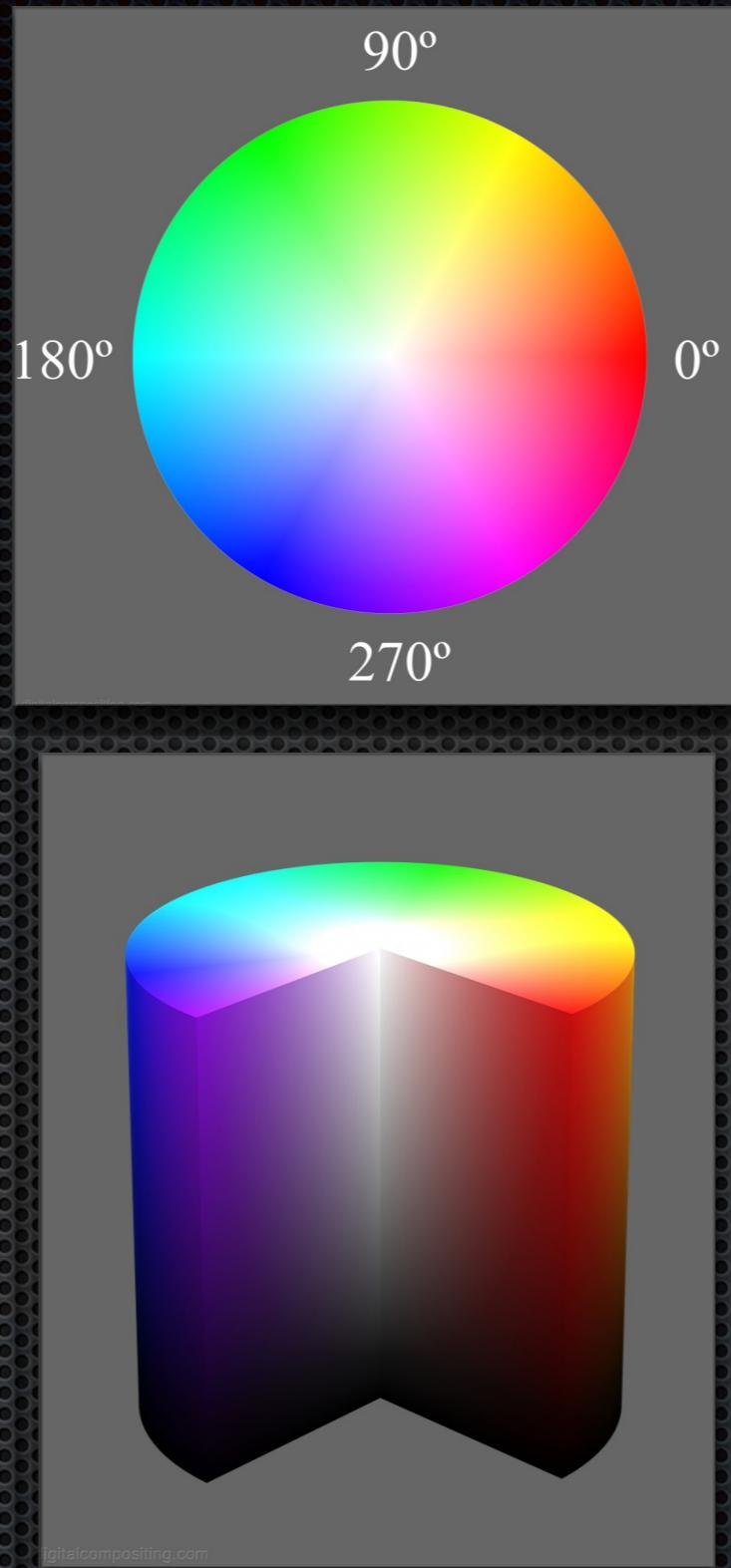
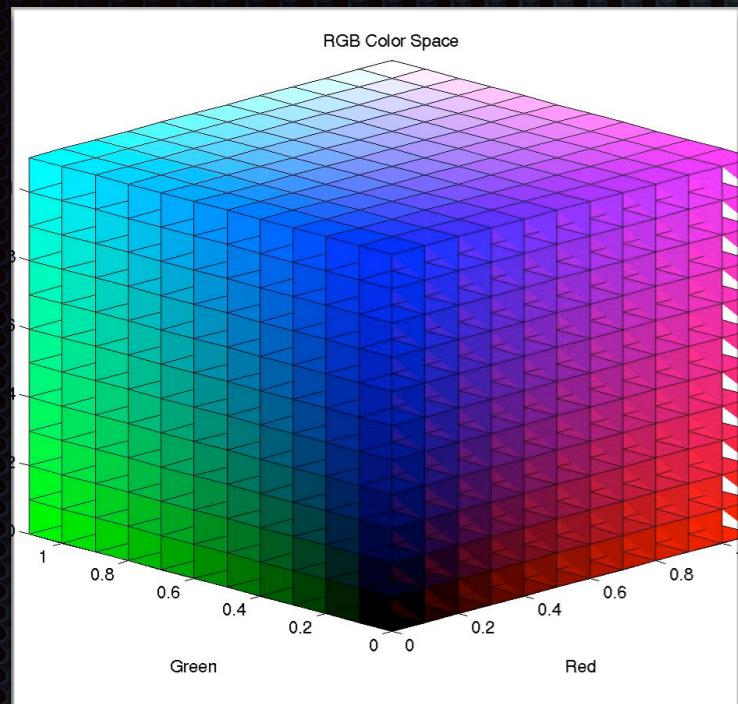
© Apple Computer, Inc.

# Pixels & Bits

# Bit-depth.

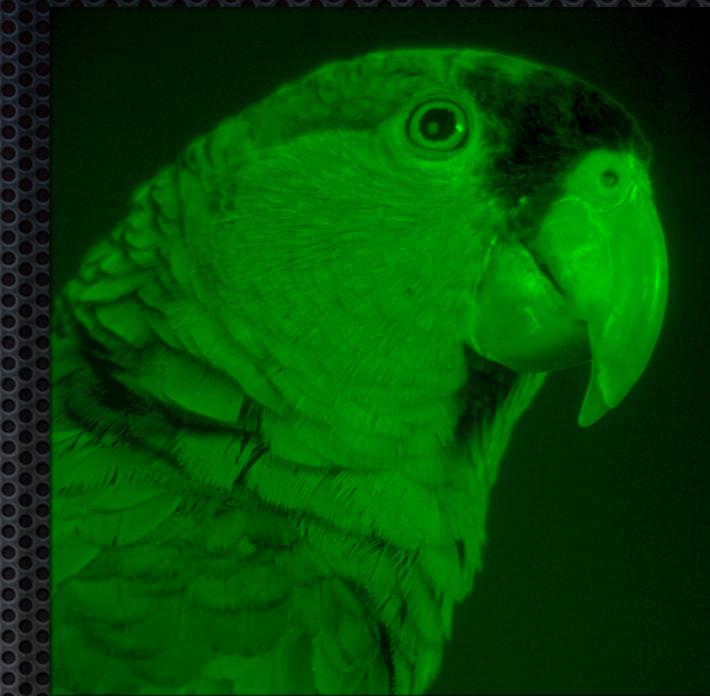


Pixels & Bits  
Bit-depth with color.



# Color

RGB, HSV, YUV, & more...



RGB  
Color  
Channels





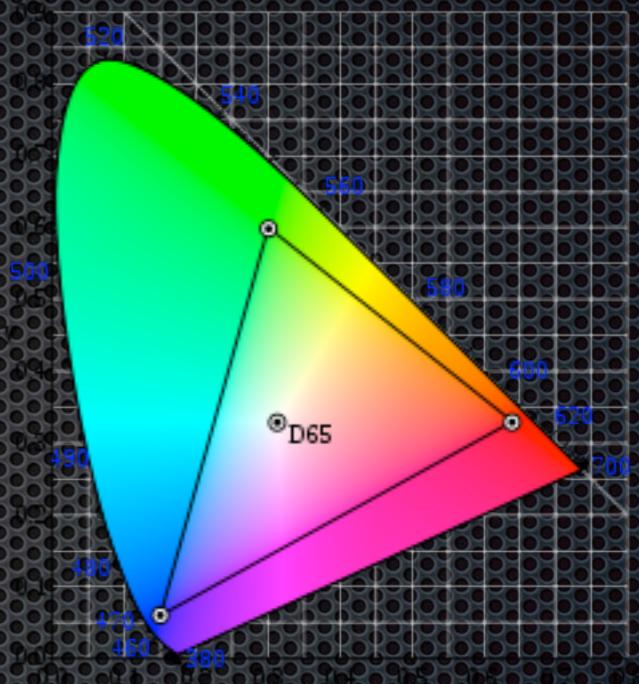
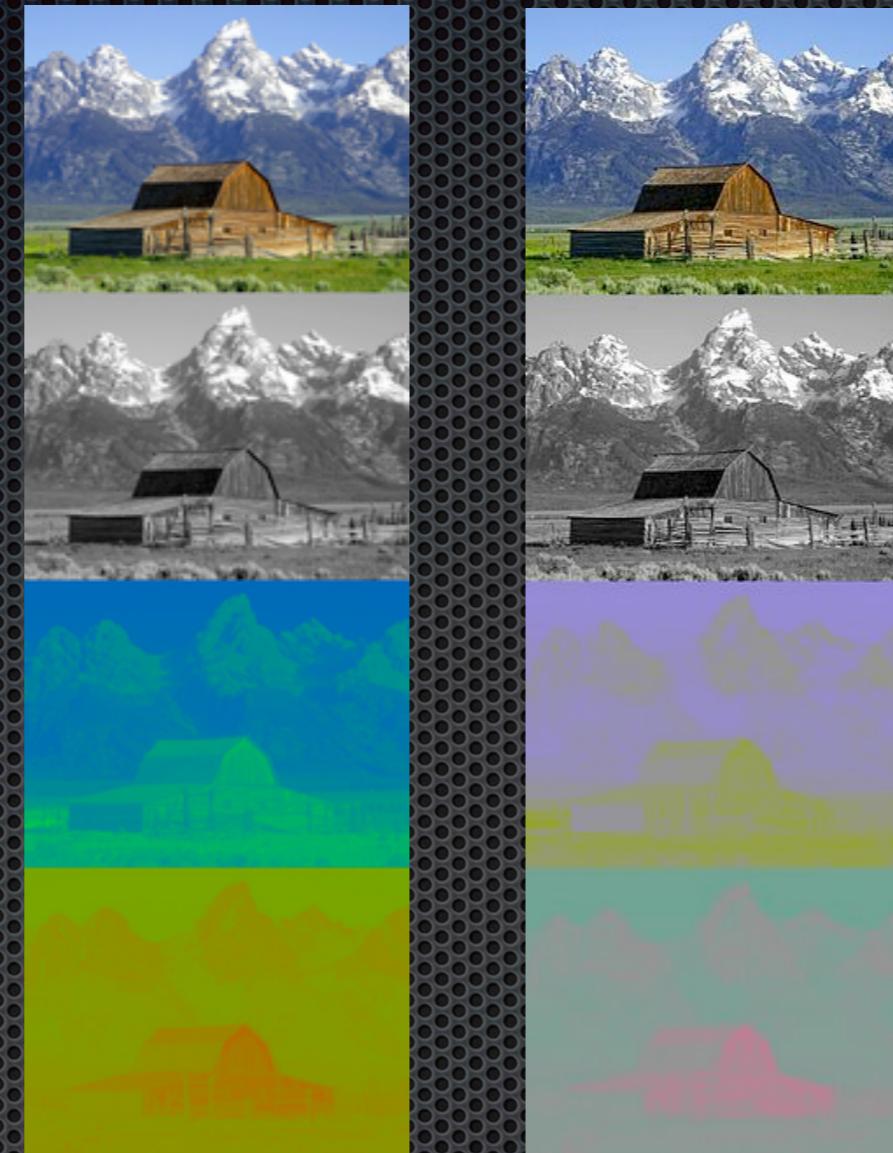
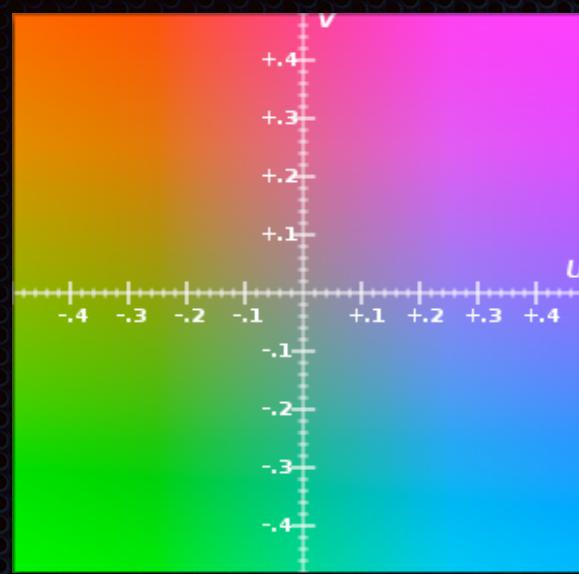
HSV  
Color  
Channels



# YUV Color Channels



YUV (analog), YCbCr (digital, luminance: sum of linear components), Y'CbCr (digital, luma: sum of log components)

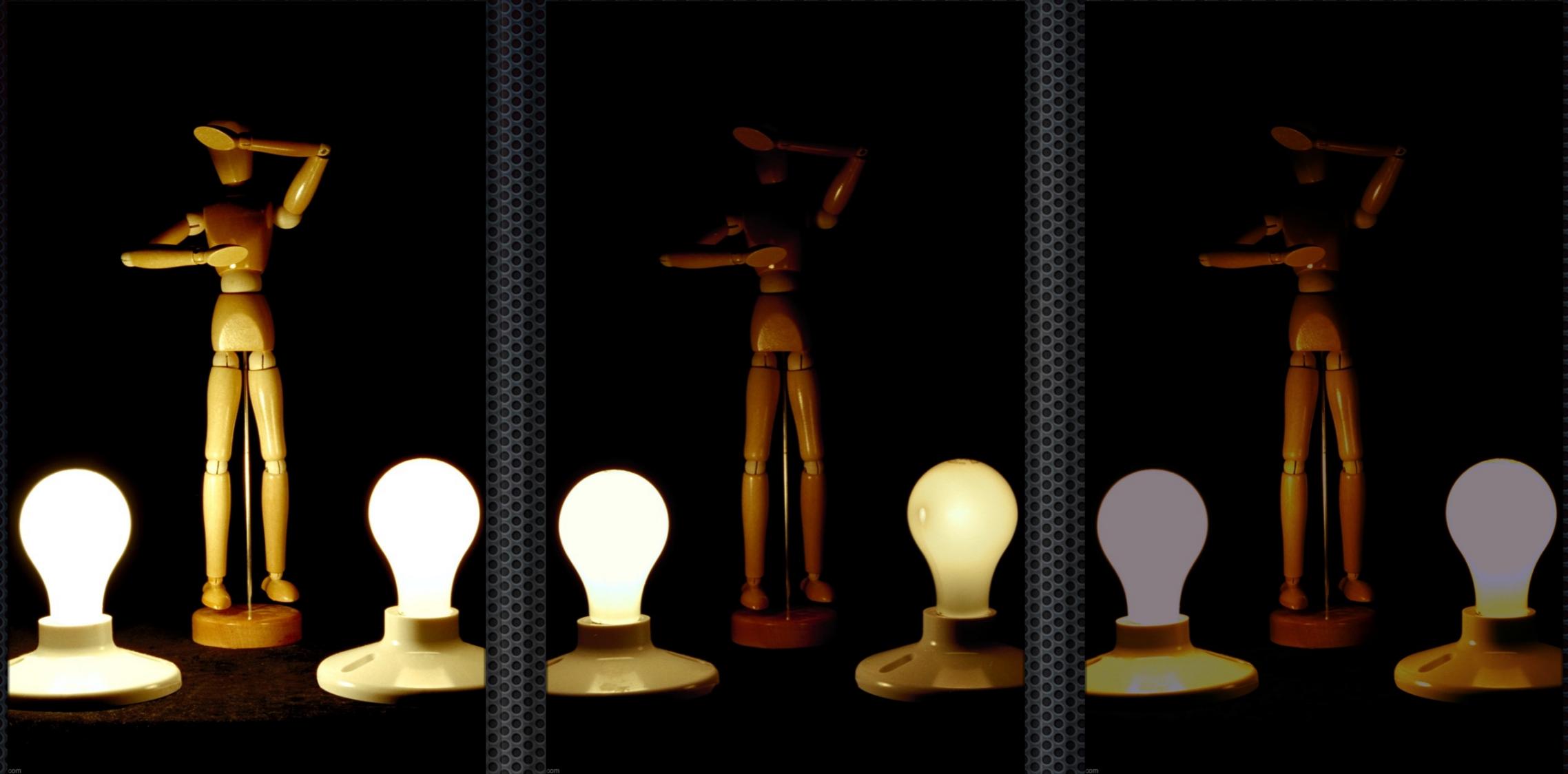


YUV,  
YCbCr,  
Y'CbCr,

Chroma subsampling --- 4:4:4, 4:2:2, 4:1:1

ITU-R Rec. 709 (1990 HDTV standard)

YUV (analog), YCbCr (digital, luminance: sum of linear components), Y'CbCr (digital, luma: sum of log components)

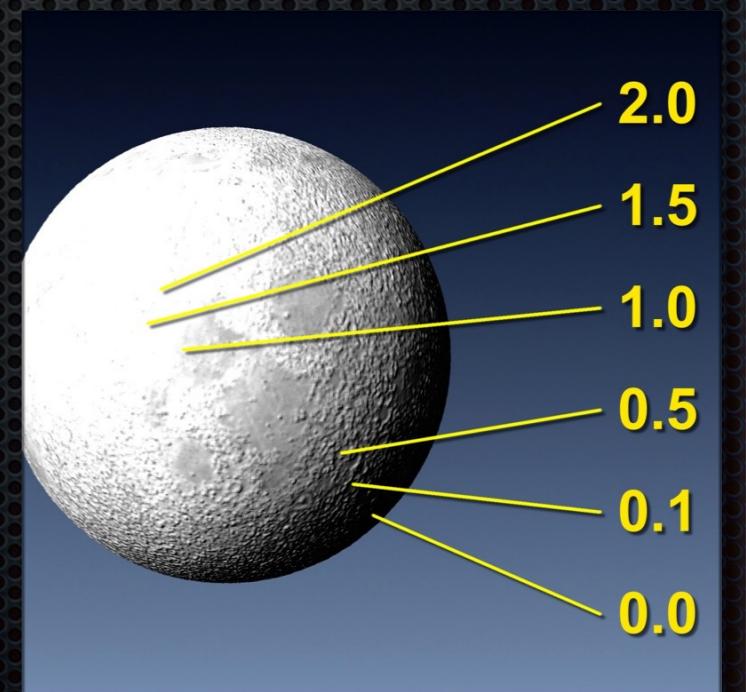
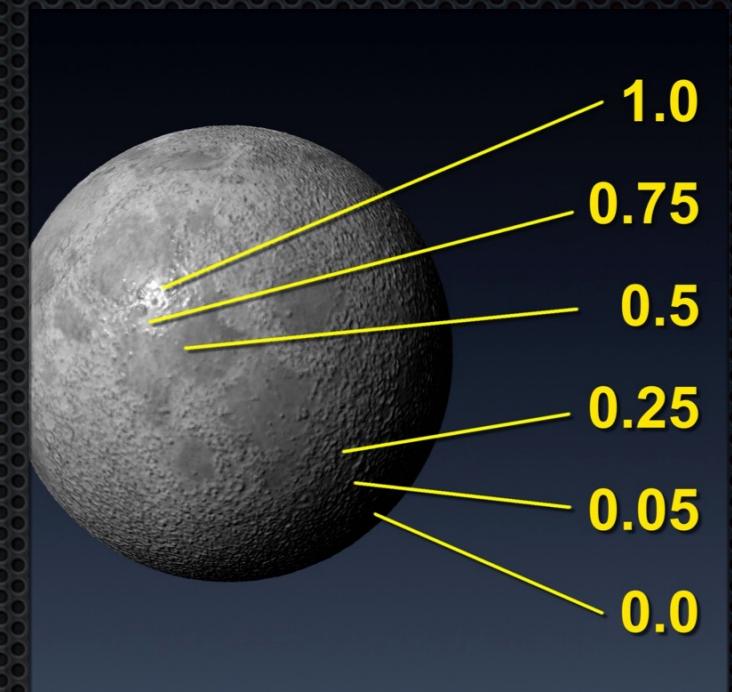
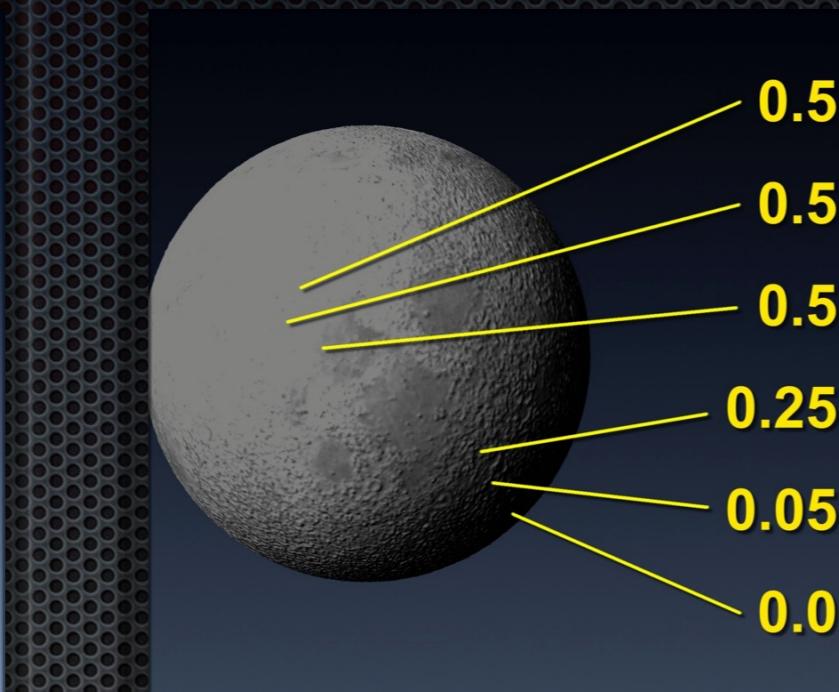
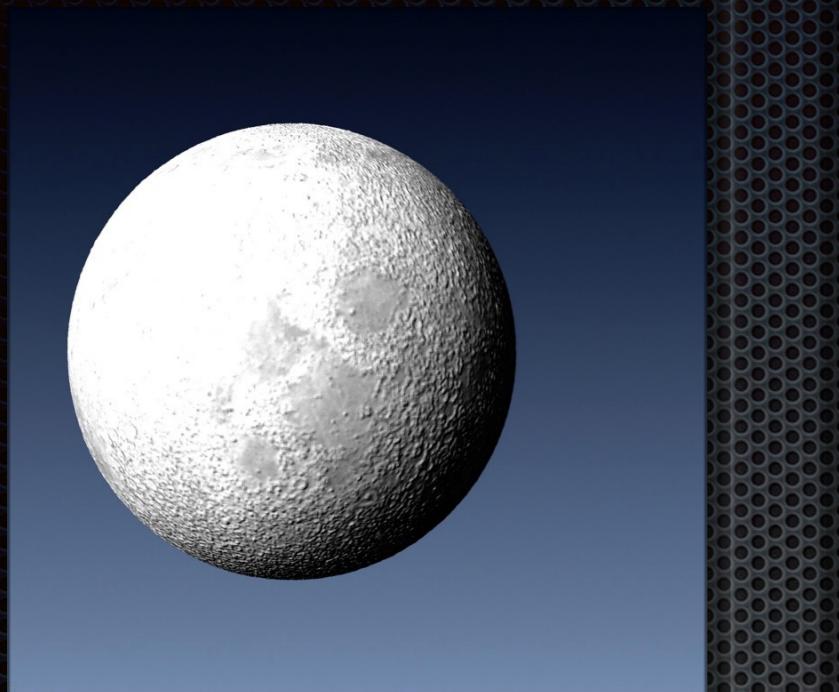


Exposure, Brightness, and Numerical Representation

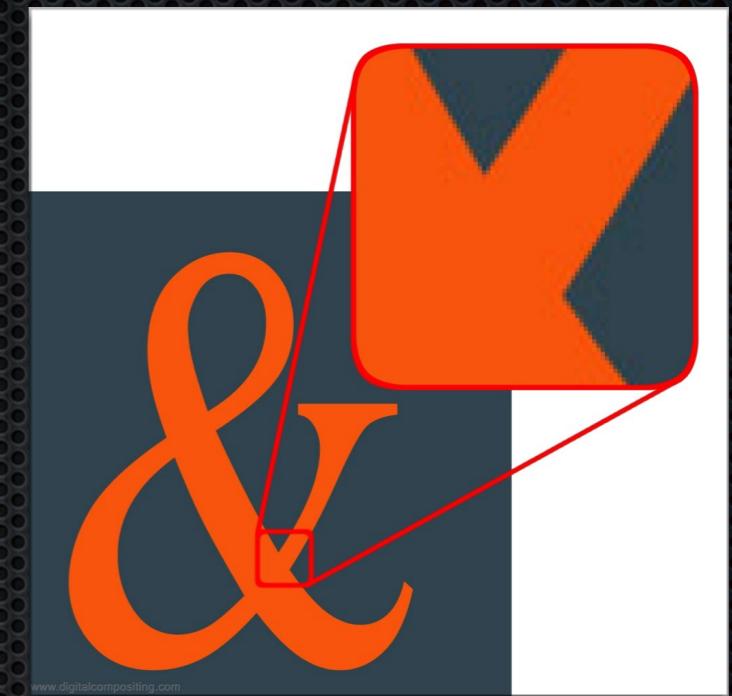
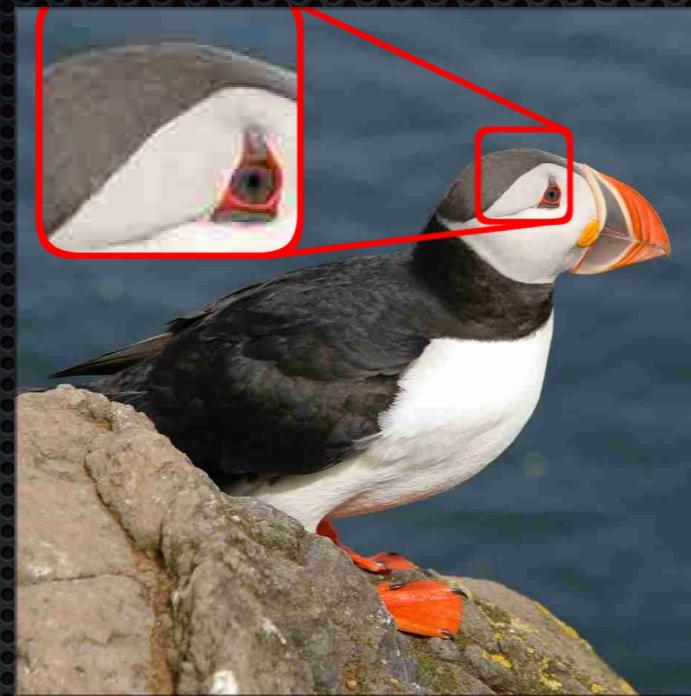
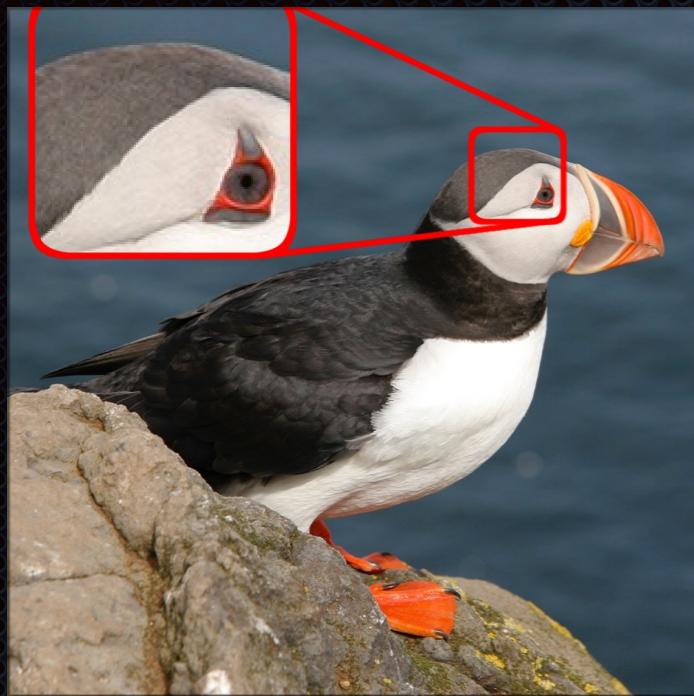


Exposure, Brightness, and Numerical Representation





Exposure, Brightness, and Numerical Representation



Quantization, Encoding, &  
Compression