

12 Exposure Review

Friday, October 4, 2024 5:08 PM

Today:

- ISO side effects
- Exposure Conclusion

Admin:

- Reading assignment.
- Up through Clouds 1, 2 and 3.
- Clouds First post: Edit your post date and time = your cloud image date and time

Exposure: ISO continued

Digital colors are usually expressed in hexadecimal, base 16:

Decimal 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
 Hex 0 1 2 3 4 5 6 7 8 9 A B C D E F

- Bit = 0 or 1
- Byte = 8 bits.
- One digit in hexadecimal is $2^4=16$ = a nibble
- Byte = $2^8 = 256$, FF in hexadecimal

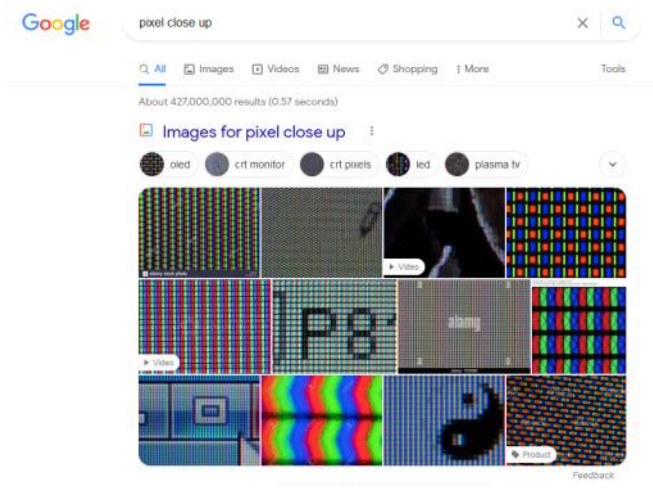
Hex decimal
 0F = 16 - 1=15
 10 = 16
 1F = 16+15 = 31
 23 = $2*16 + 3 = 35$
 FF = $16*16 - 1=255$ = highest we can count using 2 digits/nibbles. 0 to 255 = range of 256 levels.

What color does a pixel value of FF FF FF correspond to?

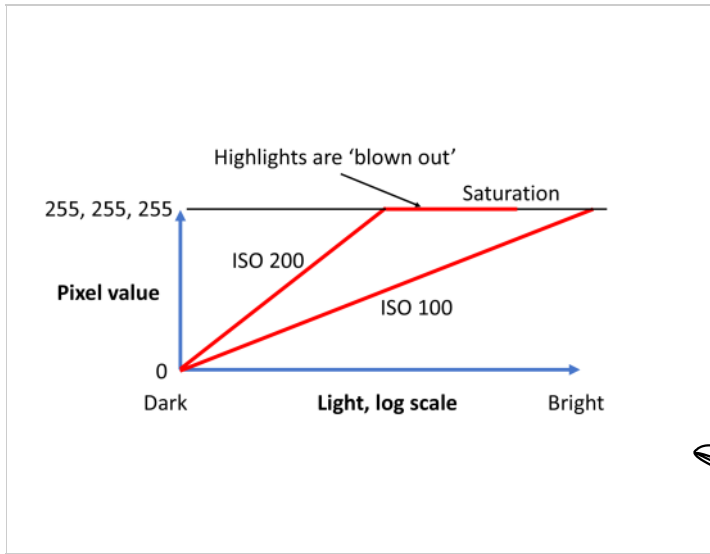
1. Black
2. White
3. Neutral gray
4. Pure red
5. No idea

Handwritten: 100%

	2024	2023	2022
20%	43	14	
53	52	67	
0	0	5	
7	0	0	
20	4	14	

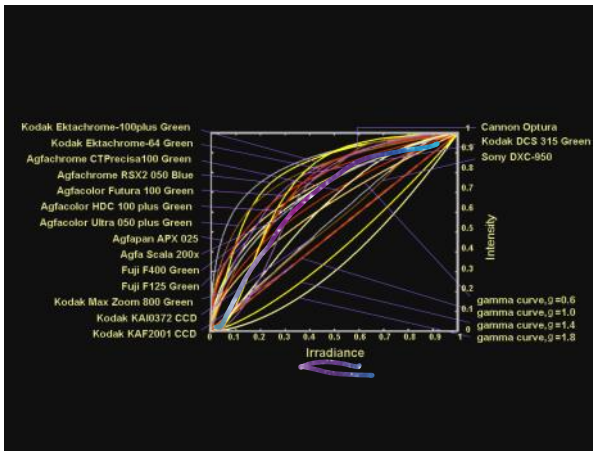


Applies to outputs - screens, and inputs - sensor pixels



Ideal response.
Real response

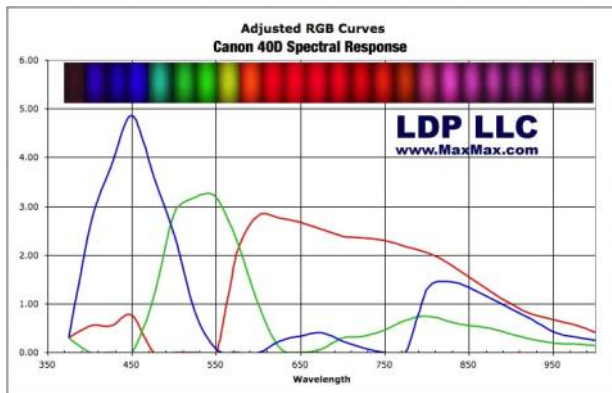
Digital camera response database



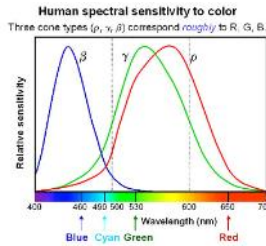
http://www.cs.columbia.edu/CAVE/projects/rad_cal/

Don't worry, images come from camera with compensation done automatically (mostly); color management again.

That was overall response. Here's what it looks like broken out by color channel:



http://www.maxmax.com/spectral_response.htm

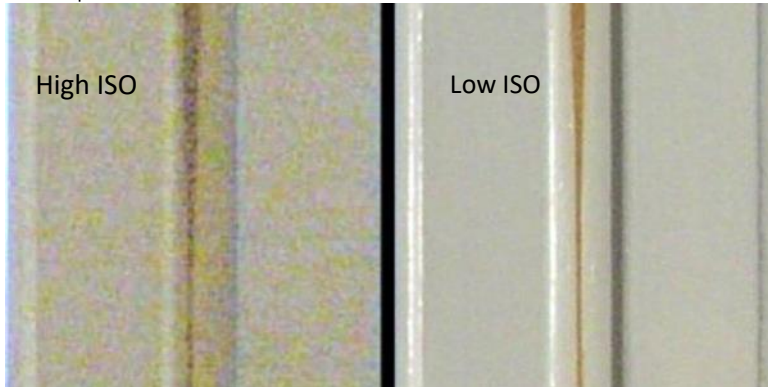


Flir

<http://pixinsight.com/forum/index.php?topic=2542.0>

Excellent book on how human eyes work, for nonspecialists: Livingstone, Margaret S. Vision and Art: The Biology of Seeing. Abrams, 2008.

Other implication of ISO: Noise



http://en.wikipedia.org/wiki/Image_noise#Low_and_high-ISO_noise_examples

\$\$\$\$ in camera buys less noise at high ISO

Proper exposure = middle value on an average pixel

Same image brightness
f/5.6, 1/100 sec, ISO 200
f/8, 1/100 sec, ISO 400
f/4, 1/400 sec, ISO 400

OK, many combinations lead to the same overall brightness. How to choose?

Autoexposure programs (AE)

Metering choices:

- Average all pixels equally
- Center-weight; expose for center pixels, mostly
- Choose location, sometimes goes with focus lock.

Wide variety. Stay away if you can: Portrait, sports, night, etc. Makes all the choices for you. Often mysterious.

Semi -automatic programs are better.

Av = aperture priority. You choose the aperture, camera will choose shutter speed. ISO might be automatic too.

Tv = Time priority; you set the shutter speed and maybe ISO, camera AE will choose the aperture.

M = Manual (maybe). You choose both aperture and shutter speed. Meter will tell you if exposure is OK.



To set over/under exposure

Lighten image, overexpose compared to AE suggestion +++
Darken, underexpose compared to AE, -----

★ Does your camera have a +/- button?

Deliberate under/over: Camera will change one or more of the other three settings, with attendant side effects. With underexposures, get loss of detail in shadows. Worse, at high overexposure, lose detail in highlights.

I leave my camera set to underexpose by 2/3 stop. Shadow detail is usually not important to me but highlight details are. Easier to pull details up out of shadows in post. Highlights lost to overexposure are not recoverable.

High Dynamic Range (HDR): Takes 3 to 5 images, bracketed: over, neutral and underexposed, and averages them together to retain detail in highlights and shadows.

Exposure Conclusion

Proper exposure = middle value on an average pixel

Same image brightness
 f/5.6, 1/100 sec, ISO 200
 f/8, 1/100 sec, ISO 400
 f/4, 1/200 sec, ISO 400

OK, many combinations lead to the same overall brightness. How to choose?

clickers

In groups, what are the side effects of each choice?

Side Effects	If you want your photo		Side Effects
	Darker	Brighter	
	<p>Aperture</p> <p>f/8 f/5.6 f/4 f/2.8 f/2.0 f/1.4</p>		
	<p>Shutter Speed</p> <p>Fast 1/1000 sec Medium 1/250 sec Slow 1/30 sec</p>		
	<p>ISO Sensitivity</p> <p>Low gain ISO 100 High gain ISO 6400</p>		

Side Effects	If you want your photo		Side Effects
	Darker	Brighter	
Deep depth of field Maybe lose overall sharpness	<p>Aperture</p> <p>f/8 f/5.6 f/4 f/2.8 f/2.0 f/1.4</p>		Shallow depth of field Bokeh
Rolling shutter artifacts	<p>Shutter Speed</p> <p>Fast 1/1000 sec Medium 1/250 sec Slow 1/30 sec</p>		Motion blur
Maybe lose details in quantization	<p>ISO Sensitivity</p> <p>Low gain ISO 100 High gain ISO 6400</p>		Noise

Last topic in photography: Resolution - Temporal and Spatial. Will come back after Clouds