LEBANON CAMERA CLUB

Exposure:
The Histogram

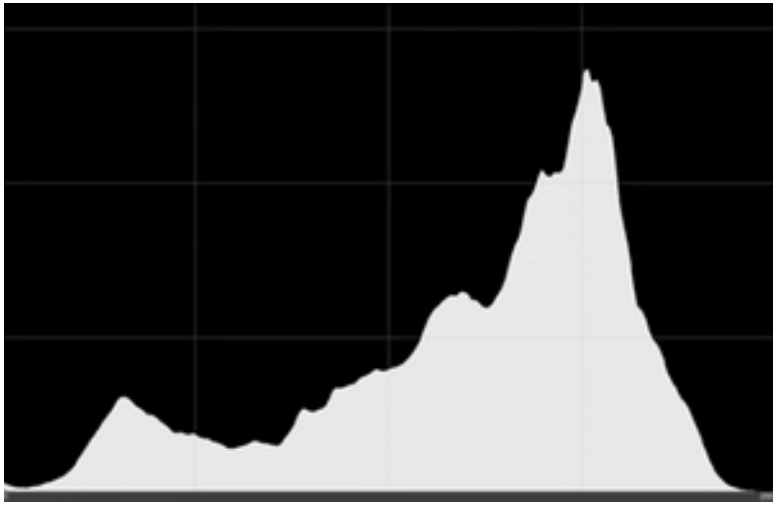
9/3/2019

Exposure: The Histogram

Exposure

Note: Automated exposure modes include aperture priority (A), shutter priority (S), and program (P)

- Photography: "light drawing"
  - Photographer needs to know amount of light in scene
    - Manual exposure → photographer needs to know before the shot
    - Automated exposure → photographer should check after the shot



histogram display

Exposure: The Histogram

Exposure

- History
  - Trial and error
    - Glass plates were made by hand → sensitivity could vary
    - Amount and quality of flash powder affects exposure
  - Tables and rules of thumb
    - Sunny 16 rule → sunny day, f/16, shutter speed = 1 / ISO

STATE OF THE WEATHER	HOURS OF THE DAY						
	8	9	10	11 to 1	1 to 2	2 to 3	3 and after
	MINUTES.	MINUTES.	MINUTES.	MINUTES.	MINUTES.	MINUTES.	MINUTES.
Very brilliant and clear, wind steady from W. or N.W., very deep blue sky, and absence of red rays at sunrise or sunset. Time employed	15	8	6	5	6	7	12 to 30
Clear, wind from S.W., moderately cold, but a slight perceptible vapor in comparison with above. Time employed	16	12	7	6	7	8	15 to 40
Sunshine, but rather hazy, shadows not hard, nor clearly defined. Time employed	25	18	14	12	14	16	25 to 40

Exposure: The Histogram

Exposure

- History
  - Actinometer
    - Time needed for light sensitive paper to darken to a reference tone
  - Extinction meter
    - Set of neutral density filters → see which one passes no light

Exposure: The Histogram

Exposure

Note: Ansel Adams used the Pentax spot meter to implement his Zone System for exposure

- History
  - Handheld light meter
    - Set three exposure parameters, needle indicates proper exposure
    - Set three exposure parameters, display indicates exposure value (EV)
    - Set two exposure parameters, meter shows the third parameter
    - Example: user sets ISO and shutter speed, meter indicates f-number

needle meter


spot meter

digital meter

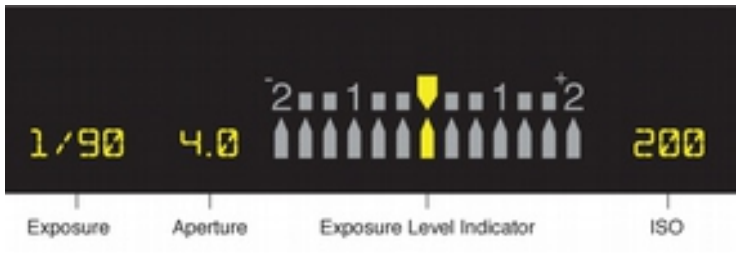
Exposure: The Histogram

Exposure

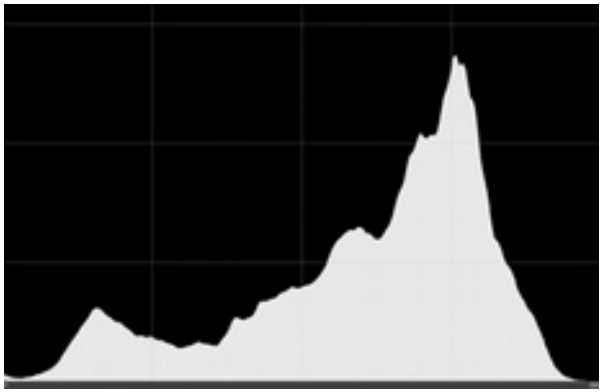
Note: A modern in-camera meter can function like a needle meter in manual mode, or indicate values determined by the camera in other modes

- History
  - In-camera light meters
    - Needle → indicates ideal exposure, and +/– deviation
    - Modern → function depends on exposure mode: M, A, S, P
    - Histogram → graph of pixel exposure data

in-camera needle meter
(used in early film cameras)



modern viewfinder meter



histogram display

Exposure: The Histogram

Histogram

Note: The sensor is always exposed to light in a mirrorless camera, so the histogram can always be shown

- Where do you see it?
  - DSLR camera
    - When reviewing a photo already taken
    - In live-view mode when taking photos
  - Mirrorless camera
    - When reviewing a photo already taken
    - When taking photos (if selected in the display mode)
  - Image editor
    - Shows pixel intensity data as image is edited

image review histogram

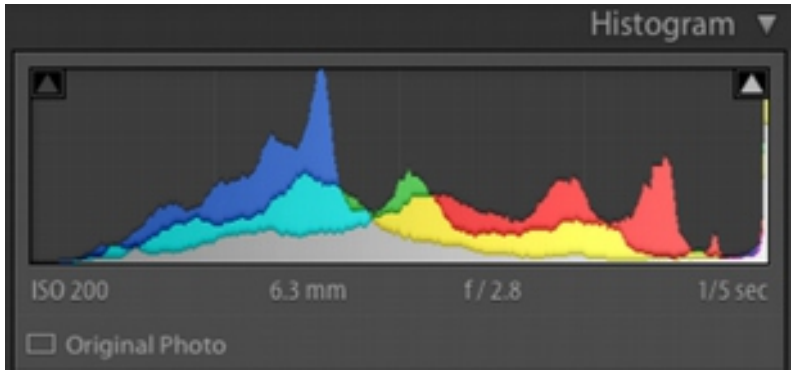
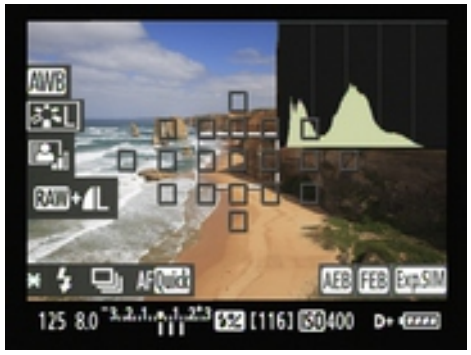


image editor multi-color and greyscale histograms



shooting histogram

Exposure: The Histogram

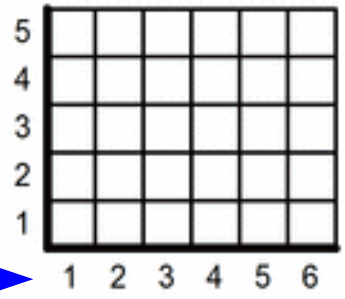
Histogram

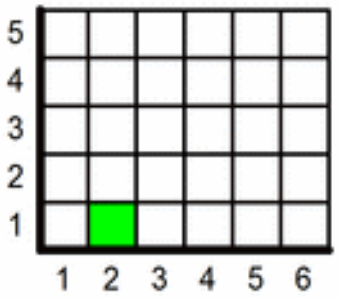
Note: Each possible value in a histogram is referred to as a 'bin'

- What does it mean?
  - Graph which represents the distribution of numerical data
  - Example: rolling a die

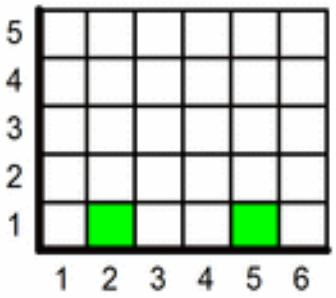
number of times each value was rolled

possible values for each roll

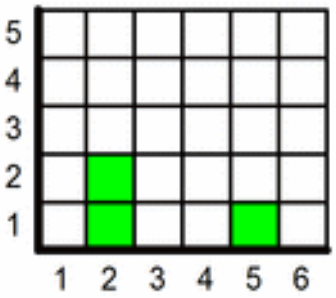




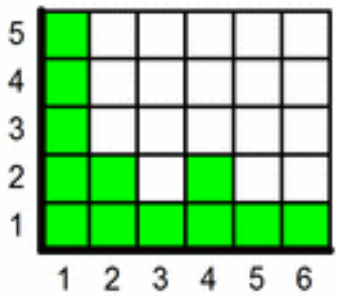
first roll: 2



second roll: 5



third roll: 2



after 12 rolls

Exposure: The Histogram

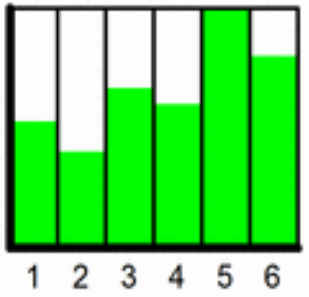
Histogram

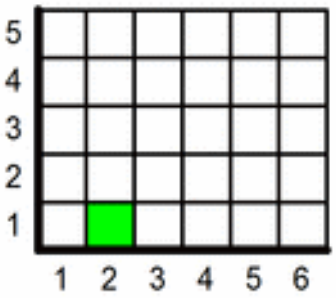
Note: Histograms are usually more concerned with the relative distribution of values, not the absolute number in each bin

- What does it mean?
  - Graph which represents the distribution of numerical data
  - Example: rolling a die

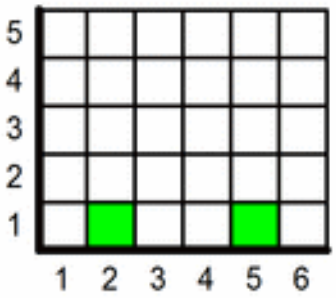
problem: more rolls = taller histogram

solution: scaling, which fits all columns into the available space → now only shows relative height of each column

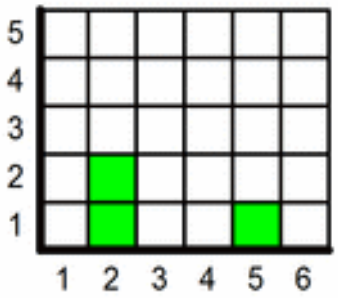




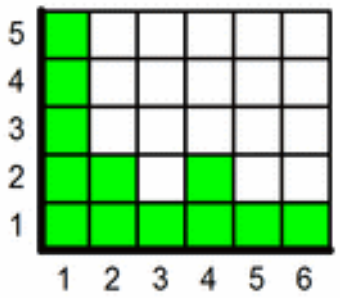
first roll: 2



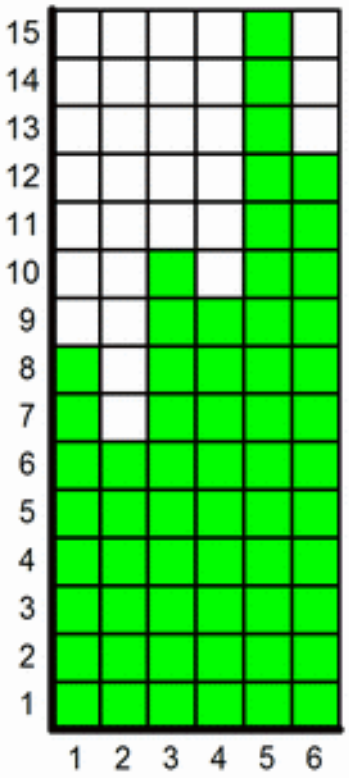
second roll: 5



third roll: 2



after 12 rolls



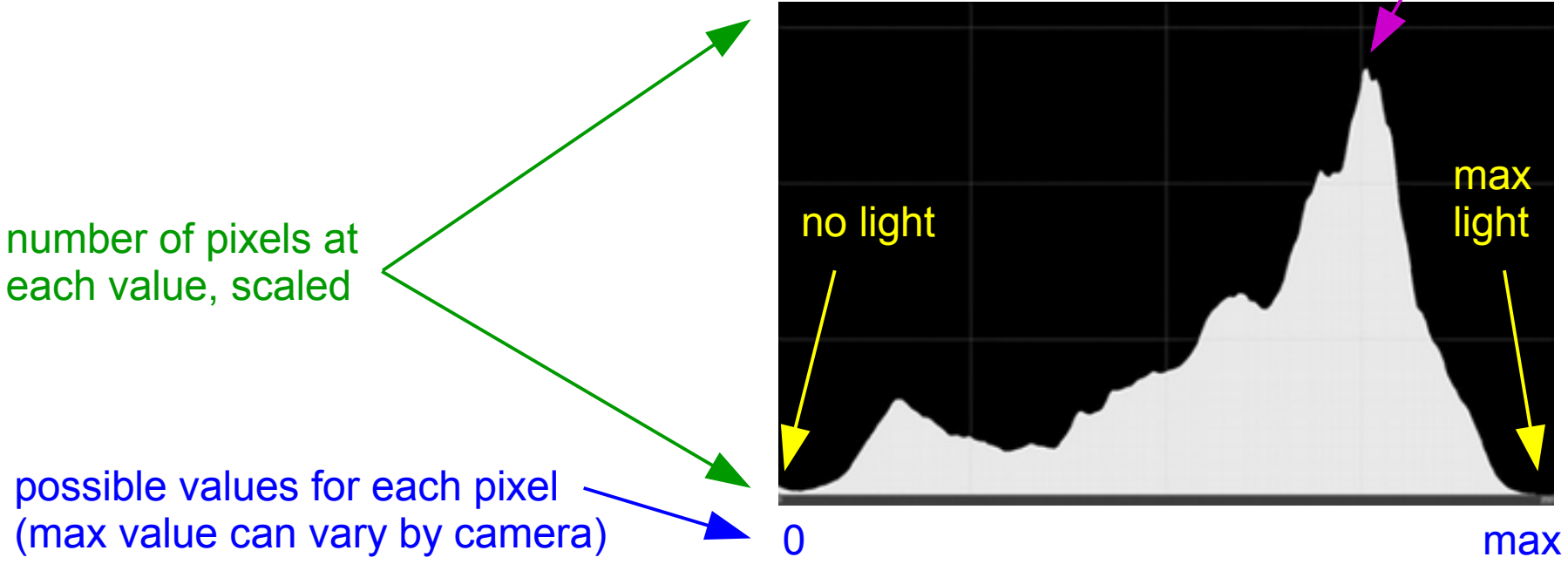
after 60 rolls

Exposure: The Histogram

Histogram

Note: Camera histograms are not always scaled to the full height of the graph when the distribution is fairly even—but when most of the pixels are concentrated in a small section the bars can be full height

- What does it mean?
  - Graph which represents the distribution of numerical data
  - Example: rolling a die
  - Camera histogram
    - Displays light intensity data for every pixel

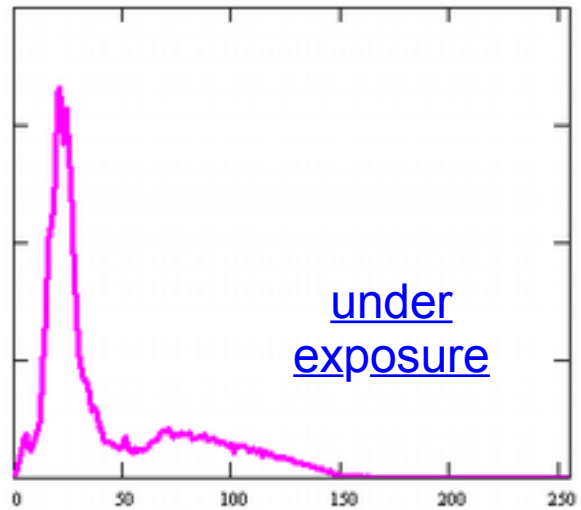


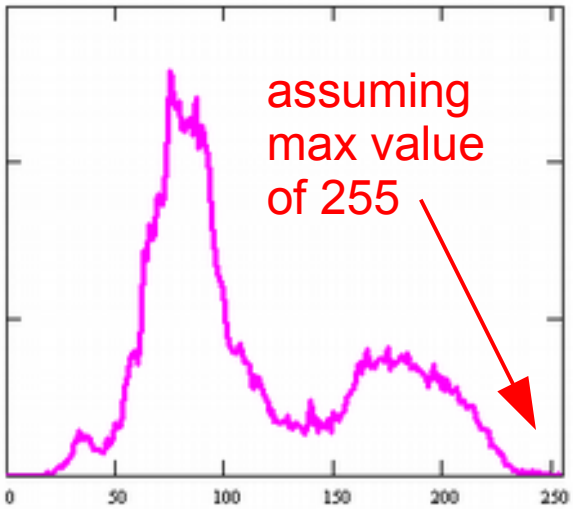
Exposure: The Histogram

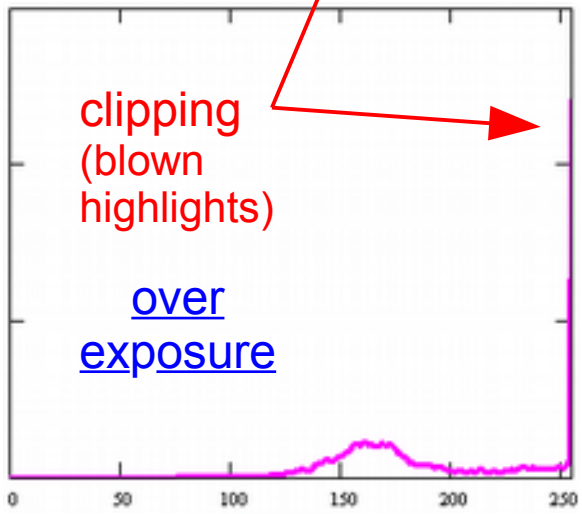
Histogram

- Proper exposure

Note: 'Clipping' may occur when pixels are in the 0 or max columns → the true values in the scene may be less than 0 or greater than max, beyond what the sensor can record



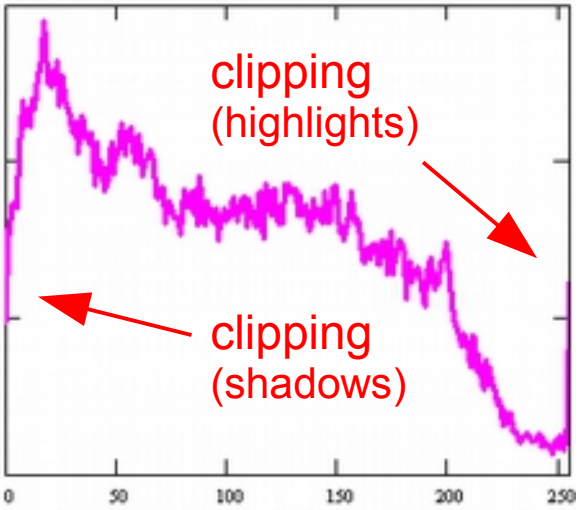




Exposure: The Histogram

Histogram

- Proper exposure



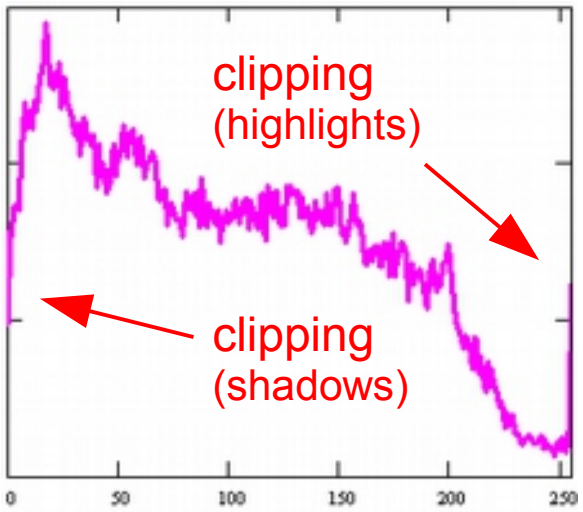
Note: If an image clips in both highlights and shadows, the scene has more 'dynamic range' than the sensor can capture → either (1) expose to preserve highlights, or (2) use the High Dynamic Range (HDR) technique by shooting multiple images at different exposures and combining them in an image editor

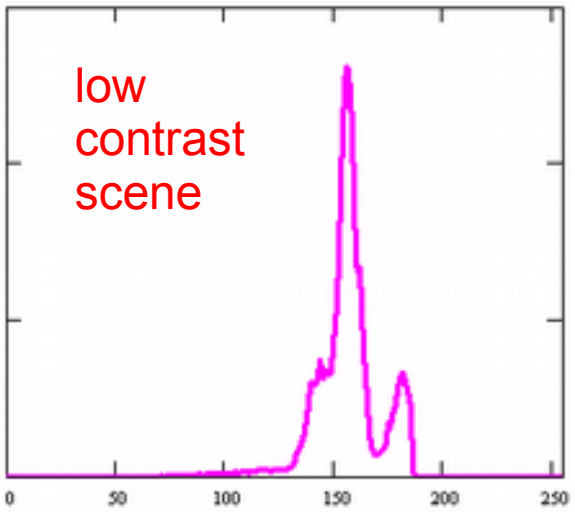
Exposure: The Histogram

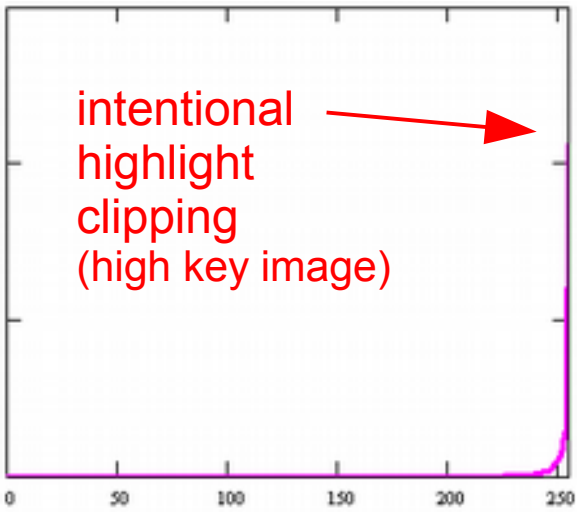
Histogram

- Proper exposure

Note: A 'high key' image consists mostly of bright tones, often with intentional clipping to render parts of the image as pure white







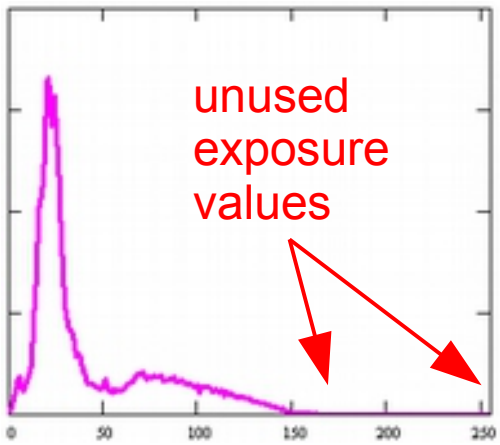
Exposure: The Histogram

Histogram

- 'Shoot to the right'
  - Exposing toward the right of the histogram, without clipping
    - Less noise → "noise lives in the shadows"

Note: 'Shoot to the right' is the proper technique when using RAW mode and editing the images on a computer—if shooting JPEG capturing a realistic image is more important

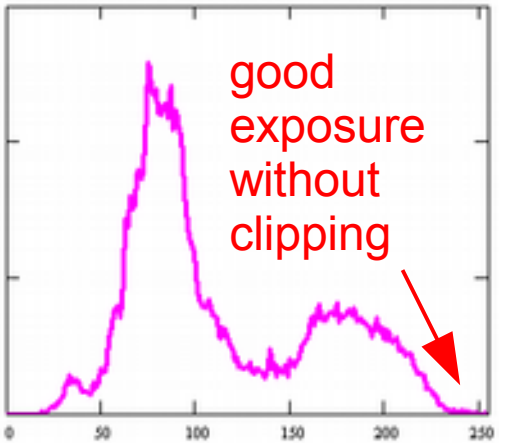
no clipping in either image, but a dark image must be boosted in postprocessing, which also amplifies any noise in the image



increasing exposure shifts the histogram to the right

higher ISO

slower shutter speed
wider aperture (lower f-number)

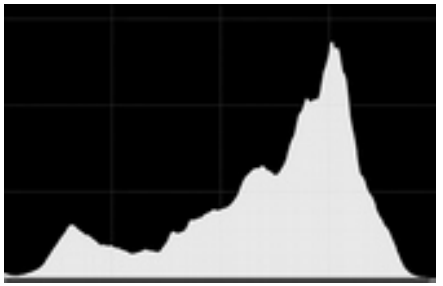


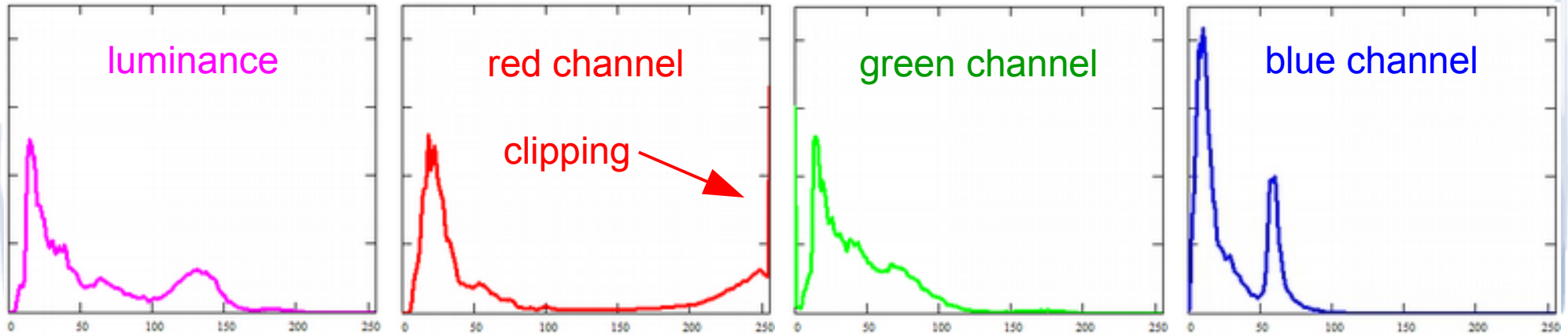
Exposure: The Histogram

Histogram types

Note: Digital image pixels are composed of red, green, and blue values which compromise the hue, saturation, and brightness of the pixel

- Luminance (greyscale)
  - Combines R,G,B pixel values into a single brightness value
    - Usually shown as a white histogram
    - Luminance = 0.21R + 0.72G + 0.07B
    - Individual R, G, or B values may be clipped even if luminance is not



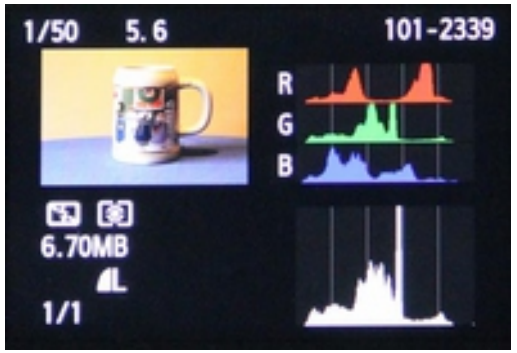


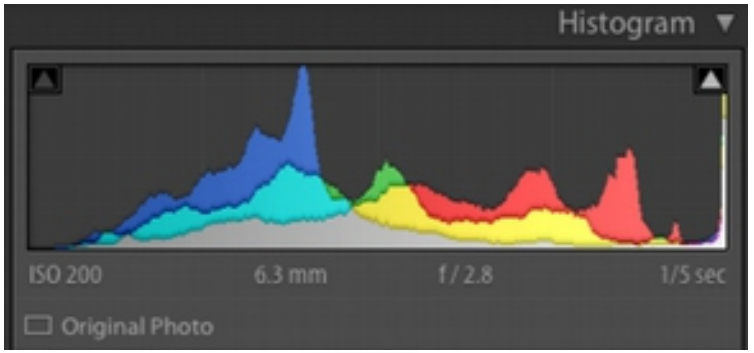
Exposure: The Histogram

Histogram types

Note: Camera RGB histograms are only available in image review mode

- Luminance (greyscale)
  - Combines R,G,B pixel values into a single brightness value
    - Usually shown as a white histogram
    - Luminance = 0.21R + 0.72G + 0.07B
    - Individual R, G, or B values may be clipped even if luminance is not
- RGB
  - Shows a histogram for each color channel
    - Clearly shows if any clipping has occurred
    - Particularly important for red and yellow colors
- Image editor
  - May show additional colors
    - Can choose what colors to display
    - Can resize to show more detail





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