

# Ron Mayberry



## Histograms & Exposure

# What is a Stop?



- **Shutter Speed, Aperture and “ISO” are measured in values called “Stops”**
  - In all cases each full “Stop” indicates a halving or doubling of the amount of light striking the image sensor.
    - **Shutter speed** is how long the shutter is open and is indicated in fractions of a second
      - Examples of full stops are: 1/125, 1/250, 1/500 or 1/1000
      - Faster shutter speeds = less light, slower shutter speeds = more light
    - **Aperture** is the size of the lens opening and is referred to as an “F stop”
      - Higher values represent a smaller aperture, lower values represent a larger aperture
      - Examples of full stops are: F5.6, F8, F11 or F16
      - Smaller aperture = less light (LDOF), larger aperture = more light (NDOF)
    - **ISO** is the film or digital sensors “sensitivity” to the light entering
      - Each stop in ISO will double or halve the sensitivity
      - Examples of full stops are: 100, 200, 400 or 800
      - Lower ISO = less sensitive, Higher ISO = more sensitive



# Shutter Speed, Aperture and ISO

- Shutter Speed, Aperture are the two components that determine the amount of light that strikes the digital imaging sensor.
- Combined with the ISO setting, the amount light striking the digital sensor, “CCD”, is what determines “Exposure” (or the resulting TONAL VALUES of the final image)



*The lower the ISO speed, the finer the image grain. And the higher the ISO speed, the rougher the grain. Keep this in mind when setting the ISO speed to match the scene or lens.*



# Exposure

- **Exposure:**
  - The amount of incoming light used to create the image
    - More light = more exposure = lighter image
    - Less light = less exposure = darker image
- **Exposure is determined by the relationship between the Shutter Speed, Aperture size and ISO setting and is what ultimately controls the brightness of tones in the image.**
  - Rough guidelines for the following outdoor lighting condition @ ISO 400 – f/8
    - Sunny day outdoors — 1/2000 sec
    - Hazy bright day — 1/1000 sec
    - Bright cloudy day without shadows — 1/500 sec
    - Overcast day, or open shade on a sunny day — 1/250 sec
    - A heavily overcast day — 1/125 sec Deep shade.
    - Woods on an bright overcast day — 1/60 sec
    - Just before a thunderstorm or late on a heavily overcast day — 1/30 sec



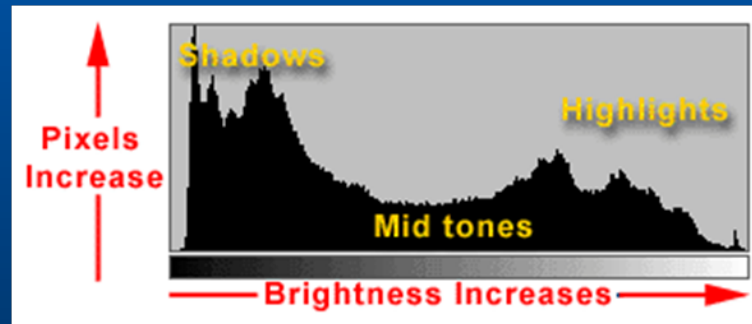
# Exposure Cont.

- **When Sun is out**
  - Scenes that are average to lighter than a middle tone the meter is accurate.
  - Lower light +  $1/3^{\text{rd}}$  stop
  - Scenes that average to darker than a middle tone -  $1/3^{\text{rd}}$  to - 1 full stop
  - Scenes with middle-toned or darker backgrounds and white or light highlights -  $1/3^{\text{rd}}$
- **Sun not out**
  - Add  $1/3^{\text{rd}}$  to  $2/3^{\text{rd}}$  stop of light for scenes that average a bit lighter than a middle tone
  - 1 to  $1\ 1/3^{\text{rd}}$  stops for very light scenes,
  - $1\ 2/3^{\text{rd}}$  to 2 stops for scenes that average to white
- ***Remember, to move the histogram data to the left, subtract light. To move it to the right, add light.***



# Tonal Range (histogram)

- Each pixel in an image has a color which has been produced by some combination of the primary colors red, green, and blue (RGB).
- Each of these colors can have a brightness value ranging from 0 to 255.
- A RGB histogram results when the camera logic scans through each of these RGB brightness values and counts how many are at each level from 0 through 255.

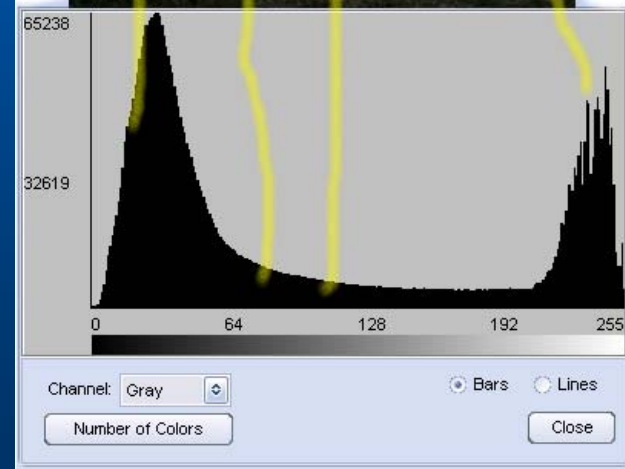


Technically the histogram simply tells you if your image is properly exposed. It provides an indication that some part of your image *may* be under or over exposed, but that determination is yours to decide.



# Tonal Range (histogram) Cont.

- This Image contains a very broad tonal range.
- The Image contains very few mid tones, but does have shadow and highlight regions. This translates into a histogram which has a high pixel count on both the far left and right-hand sides.

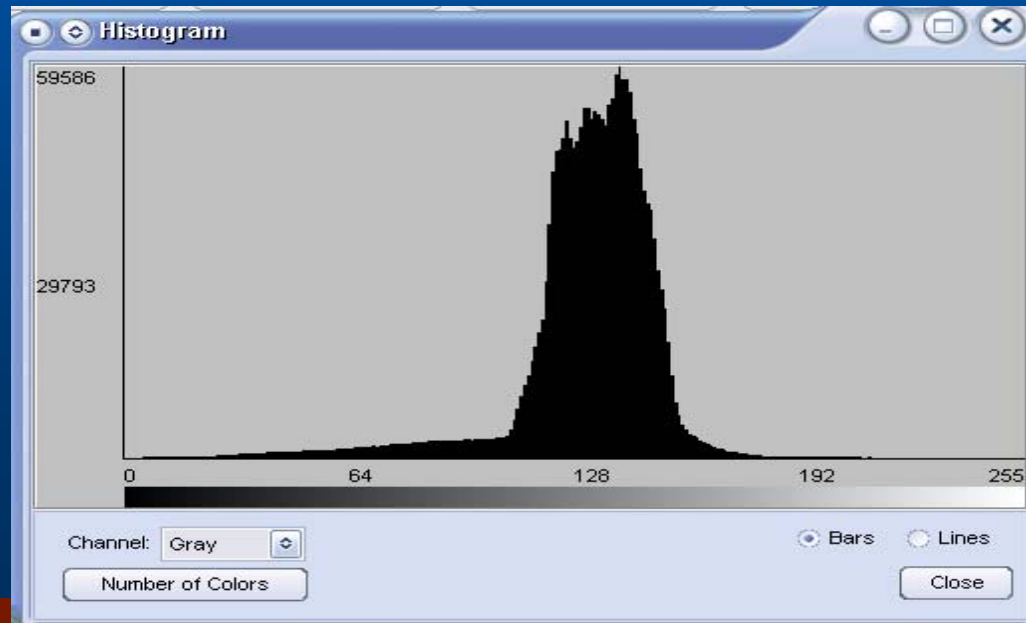


## Tonal Range (histogram) Cont.

- Conditions of ordinary and even lighting, when properly exposed, will usually produce a histogram which peaks in the centre, gradually tapering off into the shadows and highlights.



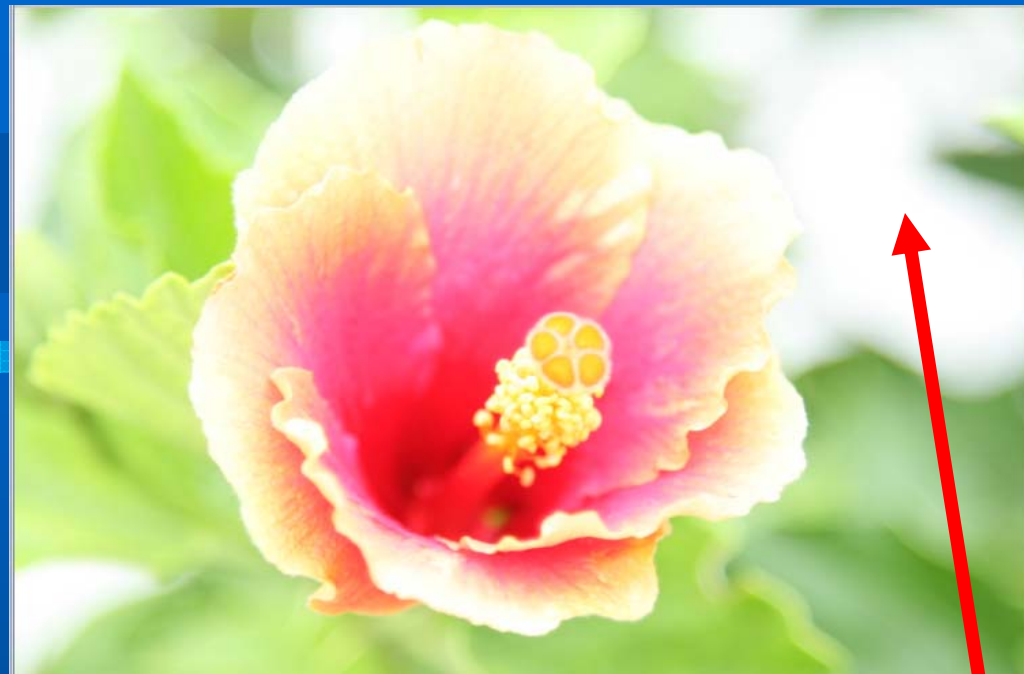
1/100 s f/9 ISO 200



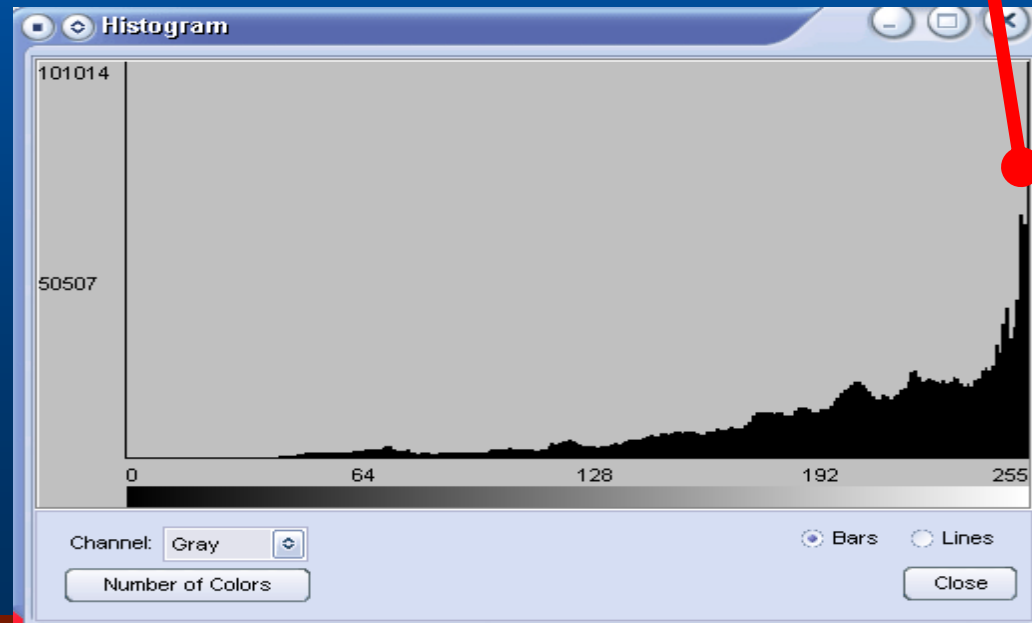


## Tonal Range (histogram) Cont.

- Image over-exposed, blown out highlights (blinking whites).
- Once the highlights are blown (past the right-hand edge of the histogram) you are basically sucking wind for data.



1/250 s f/4 ISO 200

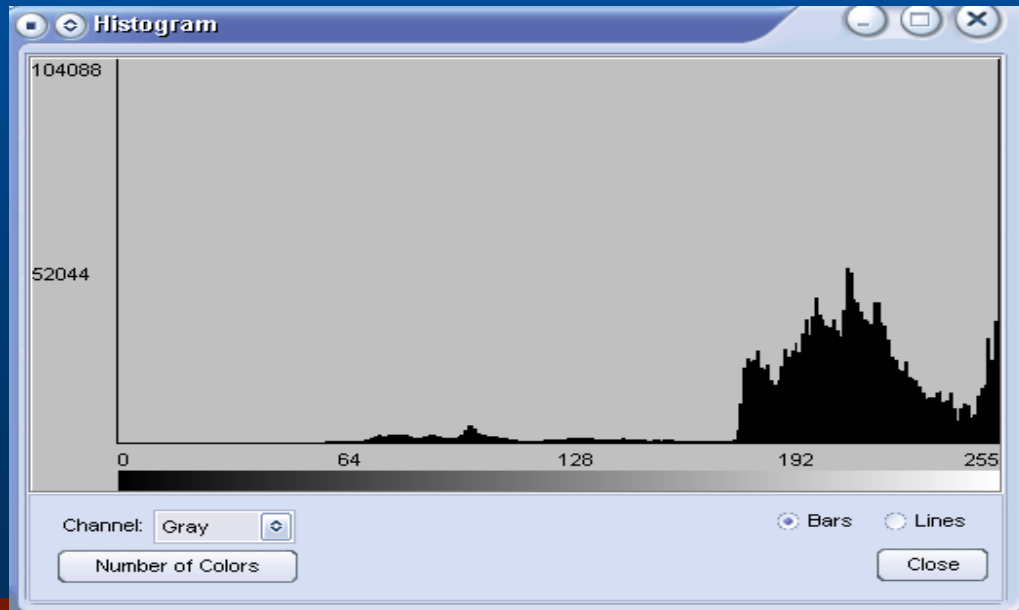


## Tonal Range (histogram) Cont.

- But, maybe that's what you wanted.



1/2500 s f/8 ISO 200

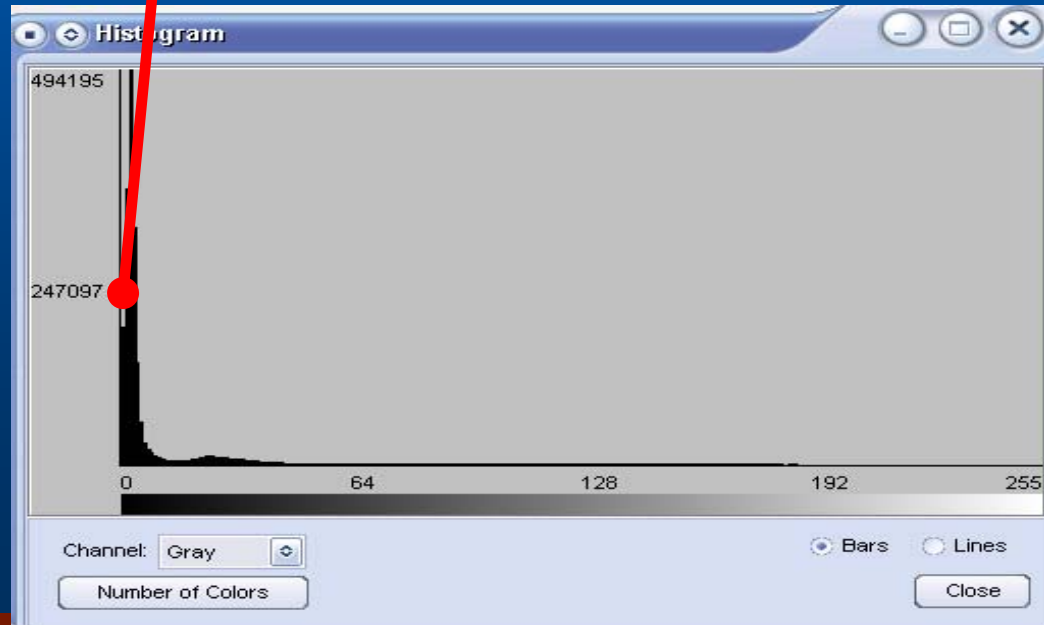


## Tonal Range (histogram) Cont.

- Low-key lighting means an overall darker picture.
- By design no dark detail (JPI studio lighting).



1/40 s f/4 ISO 3200

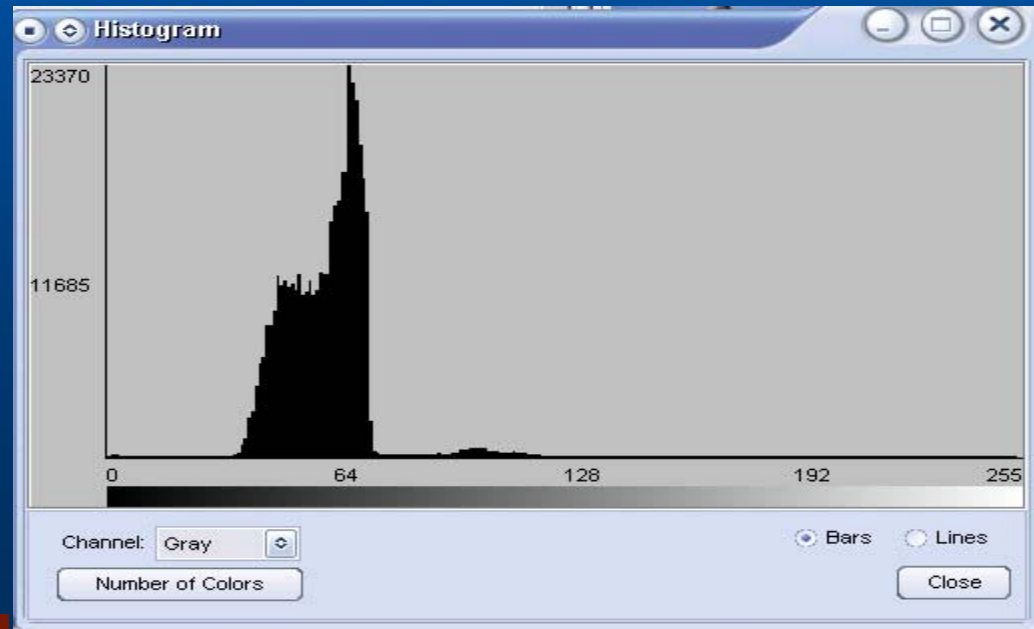


## Tonal Range (histogram) Cont.

- This low key image's histogram shows that almost all of the data in the image is down in the darkest areas with just a small amount of data showing the moon. But since the dark areas aren't right up against the left hand side and the light areas aren't up against the right hand side of the histogram, the subject falls within the tonal range that can be captured.



1/4000 s f/4 ISO 400

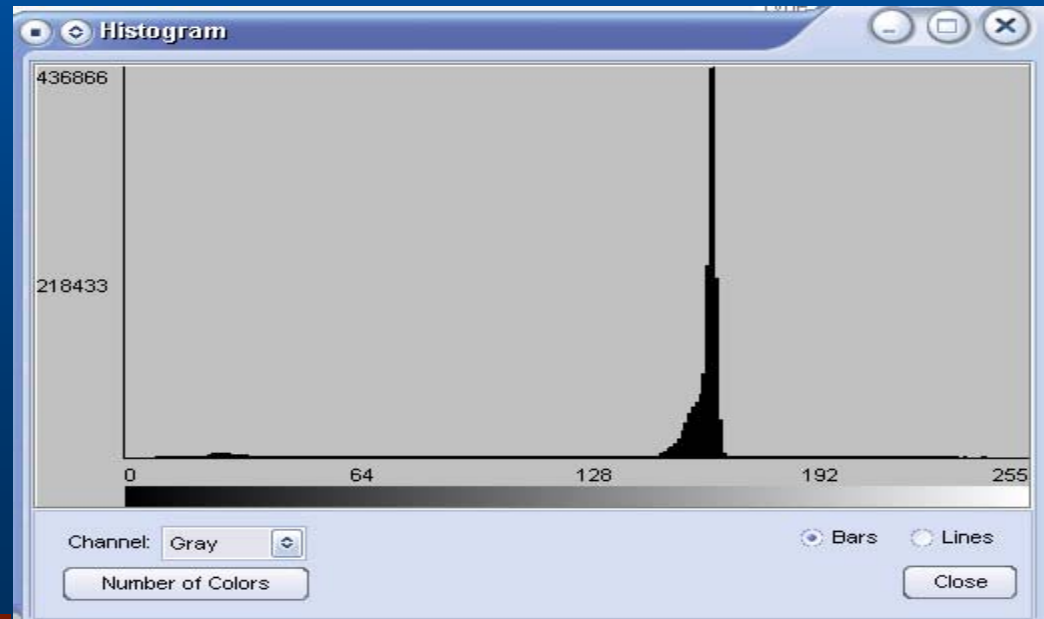


## Tonal Range (histogram) Cont.

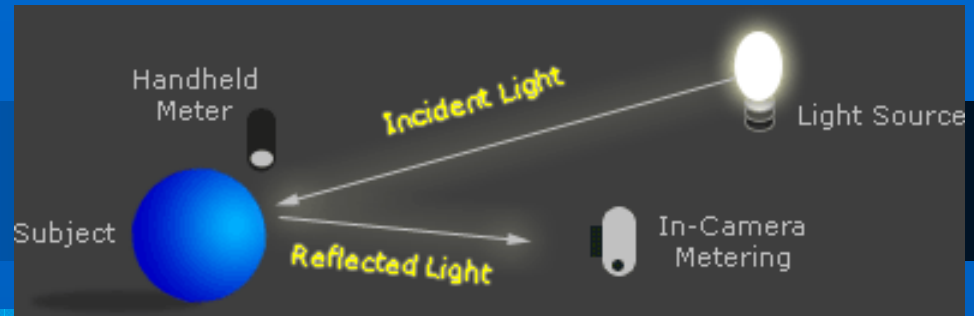
- High-key lighting means an overall brighter picture.
- Most values are toward the right side of the histogram.



1/1600 s f/5.6 ISO 400



# In-camera Reflective meters



- **Reflective meters** respond based on how much light is reflected back from them (*i.e.* 18% grey from a middle tone)
- **Spot Meter**
  - Covers center “spot” (typically 3% of the frame)
  - Can sometimes be moved around the viewfinder linked to a focus point
  - *Designed to render whatever it meters middle tone*
- **Partial Meter**
  - Same as spot meter but covering a larger area (typically 10% of the frame)
- **Center-weighted Average Meter**
  - Covers a larger area (depends on camera) but puts emphasis on the center and bottom of image
  - Designed to “average” the metered area to a middle tone
- **Multi-Segmented Metering (Evaluative, Matrix, Honeycomb)**
  - Covers a larger area and tries to determine the “proper” exposure for *any* tone based on light values of different segments of the image
  - Is not designed to render everything a middle tone but instead tries to render the image “as seen”.
  - Generally very accurate but can be unpredictable in difficult lighting



# Metering Modes VS Shooting Modes

- Metering modes control the meter pattern used to meter the scene
- Shooting modes control the relationship between shutter speed and aperture
- Metering modes
  - “Spot”
  - “Partial”
  - “Multi-segmented” (evaluative, matrix)
- Shooting modes
  - “Manual” (“M”) – Total control – use with in-camera or handheld meter
  - “Aperture Priority” (“A/V” (Canon) or “A” (Nikon))
    - Gives priority to the Aperture – Exposure determines shutter speed
  - “Shutter Priority” (“T/V” (Canon) or “S” (Nikon))
    - Gives priority to Shutter Speed – Exposure determines aperture
  - “Program” (“P”) Adjusts shutter speed and aperture automatically



# Multi-segmented Metering (Evaluative – Matrix)

- Today's segmented metering systems are designed to read and evaluate the **entire scene** in the viewfinder
- They are designed to render the final image “**as seen**” at the “suggested” meter reading
- Do an excellent job with **overall** middle-toned scenes (to **somewhat lighter** than middle toned and **somewhat darker** than middle toned scenes - **when the sun is at full strength**)
- They are not as accurate when used:
  - In the shade
  - In dappled light (part sun / part shade)
  - Under cloudy conditions
  - When there is extreme contrast, particularly between the subject and the background



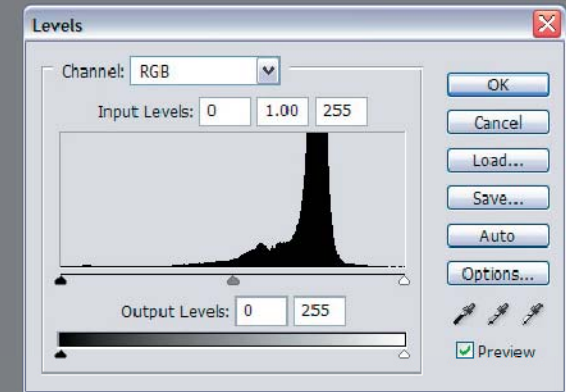


# Sunny F16 Rule

- When the sun is out and at full strength (2 hours after sunrise and 2 hours before sunset) the proper exposure for a middle-toned scene is achieved by setting your shutter speed equal to your ISO setting at F16 (or any equivalent exposure)
  - Examples:
    - 1/200 sec at F16, ISO 200
    - 1/400 sec at F11, ISO 200
    - 1/800 sec at F8, ISO 200
- When to use:
  - When the sun is out and at full strength
- Special considerations:
  - Adjust for white subjects (suggest -2/3 to -1 stop of compensation)
  - Adjust for black subjects (suggest +1/3 compensation)



# Summary



- The histogram is a graph that represents the various tonalities in an image.
- The dark tones are normally to the left of center, the light tones to the right, and the middle tones in the middle.
- *If your data is too far to the left, you add light by putting in + (plus) exposure compensation.*
- *If your data is too far to the right, you need to subtract light by putting in – (minus) exposure compensation.*
- Expose to the left and then lighten the image in Photoshop. (1 way)
- Arthur Morris says “when working with front-lit subjects always want some data spilling into the Fifth box on the right”

