

# High Dynamic Range Photography

A SHORT INTRODUCTION

# What is Dynamic Range?

- ▶ Dynamic range is a ratio between two luminance values.
- ▶ The human eye can accommodate a dynamic range of approximately 10,000:1 in a single view.
- ▶ The scanline below represents the log base 10 of the luminance, so going from 0.1 to 1 is the same distance as going from 100 to 1000, for instance.



- ▶ A scene showing the interior of a room with a sunlit view outside the window, for instance, will have a dynamic range of approximately 100,000:1.
- ▶ The dynamic range for all films or digital sensors have historically not been broad enough to capture all the information contained within a highly dynamic scene (100,000:1).

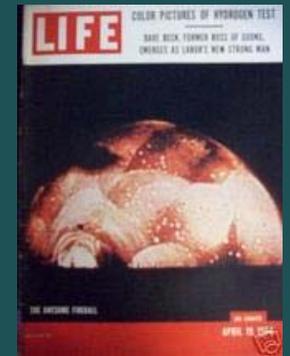
# HDR History

- ▶ Also known as “Tone Mapping” the technique involves taking two or more images at different exposures and blending them to produce one image with the dynamic range compressed to not exceed what the human eye can see (10,000:1) and has a more consistent exposure overall.
- ▶ The concept is known to go as far back as 1850 when French photographer Gustave Le Gray combined a short exposure and a long exposure to create a seascape image that had even exposure for both the sea and the sky.



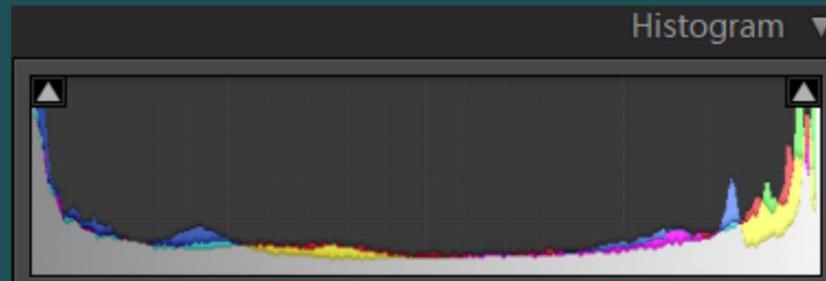
# HDR History

- ▶ Charles Wykoff developed a special film composed of 3 layers, each with a different ASA speed rating. The film was used to record a nuclear bomb explosion at three different exposures, simultaneously. The picture later appeared in the April 19<sup>th</sup> 1954 cover of Life magazine.
- ▶ In 1985 the first HDR file format was created by Gregory Ward.
- ▶ “Merge to HDR” function was added to Photoshop in 2005.



# Principles of a HDR Picture

- ▶ All information is retained in the highlights with no loss, no pure white “clipping”.
- ▶ All information is retained in the shadows with no loss, little to no pure black.
- ▶ The histogram below is from an image with most of its content either in dark shadows, or in bright highlights. A scene with a histogram like this is a good candidate for HDR processing to properly record and recover the information in the shadows and highlights. Use your camera’s histogram display to check for this during shooting.



# Taking a Digital HDR Picture

- ▶ Frame and focus your subject. Modern HDR software can perform an auto-alignment so that the camera can be handheld, but a tripod is always best.
- ▶ Set the aperture to your desired depth of field and, if possible, do not change it later when you are bracketing your shots.
- ▶ Decide how many exposures in your bracket you wish to take: 3, 5, or 7
- ▶ Decide how many stops between each exposure you wish to have.
  - ▶ 1 stop min is recommended for any digital camera ~>2 years old.
  - ▶ 2 stops is ok for any new digital camera ~<2 years old.
  - ▶ If you are hand-holding, take care to calculate what your lowest shutter speed will be and increase your sensor's ISO value if necessary to prevent a loss of sharpness from camera shake.
- ▶ Take your bracketed exposures, using different shutter speeds, or ISO values, or combination of the two.
  - ▶ If the subject involves long (>1/4sec) exposures of moving water, and you plan on underexposing by 2 stops or more, I suggest keeping the shutter speed the same and adjusting your camera's ISO setting.

# Taking a Digital HDR Picture

- ▶ If your scene has a lot of shadow detail to capture and *no* bright highlights to that would otherwise be blown out, you can purposefully over-expose your entire bracketed sequence and capture more shadow detail with three shots  $-1/3, +2/3, +2\ 2/3$ , than if you took 5 in the traditional  $-2, -1, 0, +1, +2$ .
  - ▶ Application Example: A dark alley
- ▶ Likewise, if your scene does *not* have dark shadows you wish to recover, but has very bright highlights, you can purposefully under-expose your entire bracketed sequence.  $(-3, -2, -1, 0, +1)$ 
  - ▶ Application Example: A real estate agent is taking a home interior shot with a window that has a pretty view
    - ▶ May require under-exposing by as much as 5 stops!
- ▶ If your scene has BOTH but you can only take two or three images, your camera's sensor has more dynamic range latitude in the shadows than in the highlights. Therefore, focus on capturing highlight detail with the exposures you can take.

# Taking a Digital HDR Picture

$-2\frac{1}{3}$



$-1\frac{1}{3}$



$-1/3$



$+2/3$

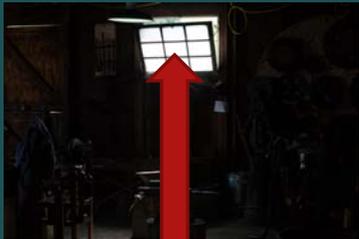


$+1\frac{2}{3}$



# A Digital HDR Picture Done Wrong

-2



-1



0



+1



+2



Fastest exposure failed to achieve a non-clipped exposure for the window. No information was recorded. Note the LR highlight warning below:



Resulting tone-mapped image will also have clipped information in the window because none of the images contained information that could be used.

A check of the -2 image's histogram would have shown the problem at the time of the shoot.

# Processing Options for HDR Pictures

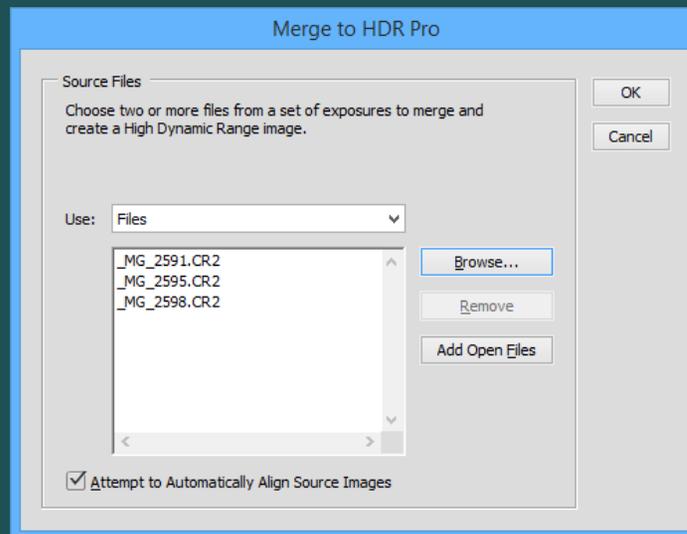
- ▶ Lightroom
  - ▶ PRO: Performs photorealistic HDR against your RAW images with a push of a button
  - ▶ CON: No artistic controls
- ▶ Photoshop
  - ▶ PRO: Flexible from push-button easy, to ultimate manual control
  - ▶ CON: Requires a copy of Photoshop, or subscription to Adobe CC.
- ▶ Photomatix ([www.hdrsoft.com](http://www.hdrsoft.com))
  - ▶ PRO: Easy with lots of artistic controls; stand-alone software
  - ▶ CON: Does not use camera RAW or DNG images (uses 8bit and 16bit TIFF)
  - ▶ CON: Stand-alone software

# HDR In Lightroom

- ▶ Import your images
- ▶ Stack them in your library if you like (not required)
- ▶ Select your bracketed shots
  - ▶ Easiest from the Library module
  - ▶ Turn on "Exposure Bias" in the Expanded Cell Extras (View-> View Options->Grid View)
- ▶ Select "Photo" from the upper menu
- ▶ Select "Photo Merge"
  - ▶ Select "HDR"
- ▶ Ensure Auto Align is selected for handheld shots
- ▶ Select a Deghost Amount appropriate for your image
  - ▶ Objects that moved in frame during the bracketed exposures should be "deghosted"
    - ▶ Waving Flags, Water Splash, Cars, Birds
- ▶ Click "Merge"
- ▶ An new Digital NeGative file (DNG) will be generated and added to your library
- ▶ I suggest using color labels to easily see your HDR images in a sea of bracket shots

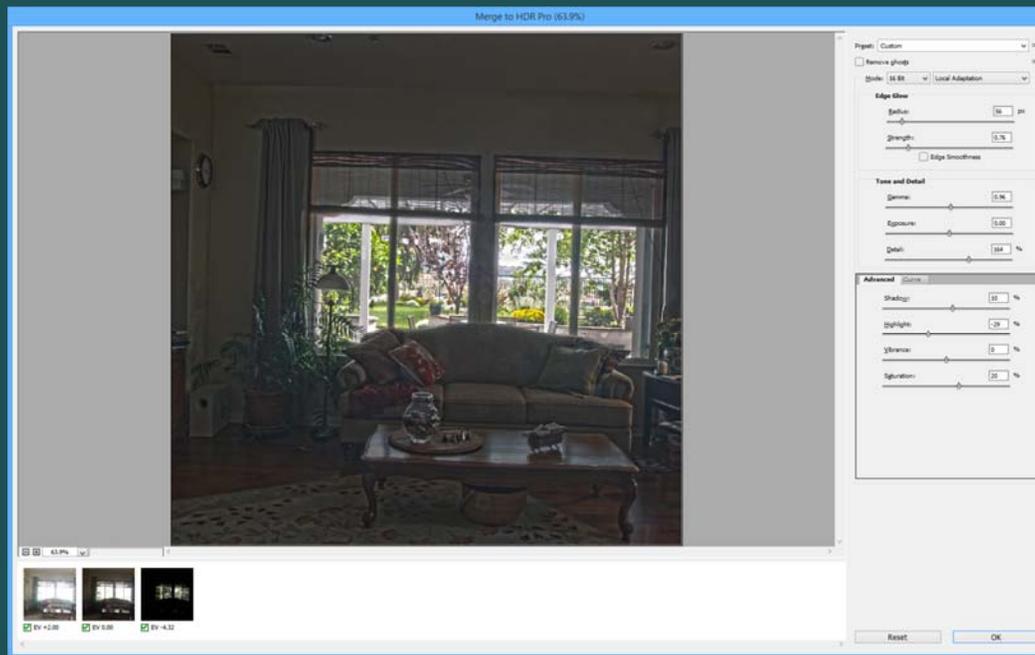
# HDR In Photoshop

- ▶ Choose File>Automate >Merge to HDR Pro
  - ▶ Works in CS2 to CC
- ▶ Select desired images (RAW is best but jpg works)
  - ▶ Make sure "Attempt to Automatically Align Source Images" is selected CS3+
- ▶ Click OK



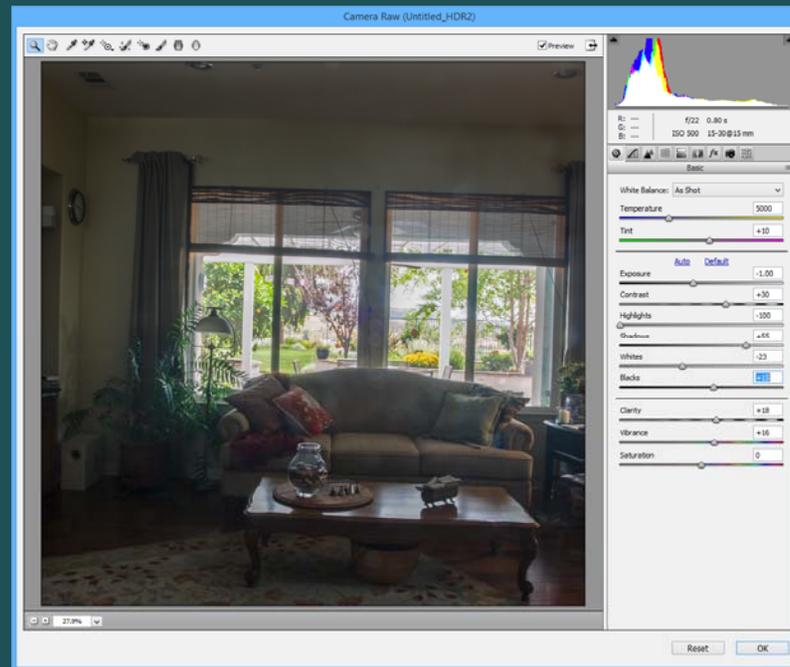
# HDR In Photoshop

- ▶ Choose the 16 bit mode (There is also a 32 bit mode once you have practiced)
- ▶ Adjust the sliders and see what each one does. Create the picture you wanted



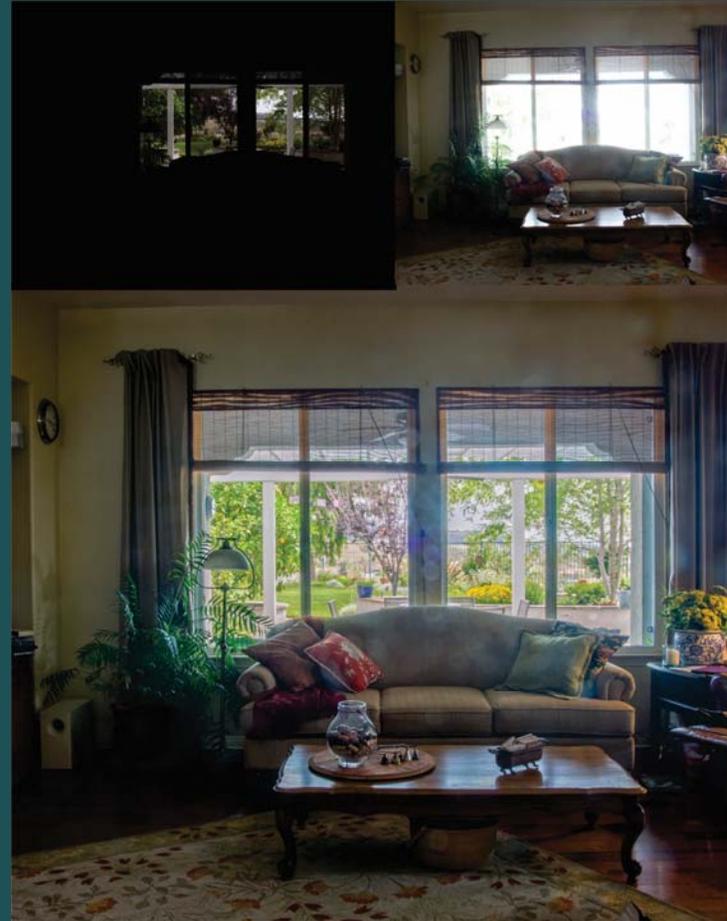
# HDR In Photoshop

- ▶ If you have succumbed to Photoshop CC you can tone the image in the 32 bit mode in Camera Raw.



# HDR In Photoshop

- ▶ Example



- ▶ [http://photoshopcafe.com/tutorials/HDR\\_ps/hdr-ps.htm](http://photoshopcafe.com/tutorials/HDR_ps/hdr-ps.htm)

# HDR In Photomatix via LR Plug-in

- ▶ Select your bracketed shots in Lightroom
- ▶ Verify you are not applying lens corrections to the images
- ▶ From the upper menu bar, select:
  - File -> Plug-In Extras -> Export to Photomatix Pro
- ▶ Select Align Images if your bracketed exposures were hand-held
- ▶ Choose to remove ghosts if required
- ▶ Choose to reduce noise (I suggest this for the underexposed shots)
- ▶ Do not reduce chromatic aberrations if you've already instructed LR to do so
- ▶ Add file name suffix "tonemapped"
- ▶ Output file should be a 16bit TIFF

# HDR In Photomatix via LR Plug-in

- ▶ There are three main internal windows:
  - ▶ Adjustments
  - ▶ Preview
  - ▶ Presets
- ▶ Adjustments window has lots of options/sliders to get a results that range from natural looking to super stylized.
- ▶ Walking through all the presets gives a quick summary of all the looks you can shoot for.
- ▶ Pick a preset that is close to what you want and tweak it further manually.
- ▶ Press the "Save and Re-Import" button in the Adjustments window to make your TIFF image and have it auto-added into your Lightroom library.
- ▶ Use color labels to easily see your HDR images in a sea of bracket shots

# HDR Alternatives

- ▶ When the bright area of an image is demarcated from the dark area through a straight edge to edge line, a neutral density gradient filter can be used.
  - ▶ Example: A landscape with a bright sky, but dark land.
    - ▶ Attach a neutral density gradient filter to the lens and align it to match the horizon line.
    - ▶ Choose a different density filter if more or less exposure of the sky is needed to appropriately match the land.



# HDR Alternatives

- ▶ Purposefully under-expose by enough to preserve details in the highlights, then bring up the exposure in the desired dark areas using dodge tools and/or Lightroom's "Shadows" slider.
- ▶ This technique is limited by your camera's sensor sensitivity and noise performance. Some cameras, such as the Sony A7, have up to 4 stops of light sensitivity in underexposed areas before introducing noise into the image. Photorealistic HDR can often be achieved from 1 RAW image if the sensor performance is sufficient to support it and the scene's dynamic range is not *too* great.
- ▶ You can stack gradients in Lightroom to bring out more and more shadow detail (usually at a cost of added noise)
  - ▶ If you are willing to loose some sharpness, noise can be reduced with de-noise filters like the Luminance slider in Lightroom.

# HDR Alternatives

Original Sin



# HDR Alternatives

Pushed RA

