All About HDR
From Real to Surreal

Tripod Camera Club
Photography Academy
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Nancy Clements Beasley, nancycb@mac.com
What we will cover

• Definitions
  • Dynamic Range (DR) and HDR
  • Scene DR, Camera DR, Output DR
• How do you know if you have a HDR scene
• What is HDR Photography and what is the Goal of HDR Photography
• What you need for HDR
• Tips on shooting for HDR
• Producing HDR images using Computer Software
  • Photoshop, Lightroom, Photomatix and Nik HDR Efex
Dynamic Range and HDR

• There are actually different types of dynamic ranges to consider:
  • Scene
  • Camera
  • Output (screen, print)
  • Human vision

• During the photographic process the dynamic range gets transformed twice:
  • Scene > Capture Device (here we think of cameras)
  • Capture > Output (monitor or print)

• It's important to remember that any detail that gets lost during Capture can never be recovered, but in the end it only matters that the final output image pleases your vision.
Scene Dynamic Range

• First Dynamic Range:

• In photography and imaging, the dynamic range represents the ratio of two luminance (Darkest/Brightest) values of a scene

A Scene of an interior room with a window showing outdoor sunlight Has a Dynamic Range

$$\text{Dynamic Range} = 1 : 100,000$$

This is a HDR Scene
Dynamic Range Captured by the Camera

- A camera doesn’t have the ability to hold/capture as much dynamic range as your eye can see.

  - The human eye can see over 20 f-stop equivalents* in a scene because the eye constantly adjusts (DR = 1 : 1,048,576).

  - Assuming our eyes are constantly moving over different parts of the scene and adjusting accordingly.

- A camera works differently. It has one setting for the entire scene. As a result, the camera can only record around 7 -10 f-stops in any one scene (1:128 to 1:1024).

  - Slide film 6-7 f-stops
  - Negative film about 10-12 f-stops
  - Highlight recovery in some RAW converters can gain up to +1 extra f-stop

* F-stop equivalents describes the ratio between the lightest and darkest recordable regions of a scene, in powers of two. A scene with a dynamic range of 3 f-stops therefore has a white that is 8X as bright as its black (since $2^3 = 2 \times 2 \times 2 = 8$).
Output Dynamic Range

- Of all the stages in the digital photography process, the output normally shows the lowest dynamic range.
  - Today's Monitors: 1:300-1:1000
  - Printers on glossy media: about 1:200
  - Printers on matte fine art papers: below 1:100

**Why capture the higher dynamic range of a scene if the output DR is so limited?**

- The answer is dynamic range compression - tone mapping.
  - Tone mapping algorithms compress a high dynamic range image down to an image we can view on a monitor or in a print.
  - There are an infinite number of ways to tone map an HDR image which can give very different results, from a realistic scene view to a very artistic view.
What is HDR Photography

• HDR photography is a process to capture more luminance (light) than your camera is capable of.

  • Digital Cameras have a problem with dark darks and bright brights in the same scene.

• An HDR (High Dynamic Range) image stores pixel values that span the whole tonal range of real-world.

Goal of HDR Photography is to get
  Detail in the Highlights
  And
  Detail in the Shadows
How Do you know if you Have a High Dynamic Range Scene

Look at Your Camera’s Histogram

Typical Scenes that cause problems:
Backlighting, Interiors/Exteriors, Bright Skies
Basic Steps to HDR Photography

• Capture the full dynamic range of the scene by taking two of more images

• Combine those images into one HDR image
  • Typically called “Merge to HDR”

• Convert the HDR image to a LDR image based upon your preferences (realistic, grungy, surreal, artsy, etc)
  • Typically called “Tone Map”
Which One?

Three Low Dynamic Range (LDR) Images

LDR Image 1

LDR Image 2

LDR Image 3

Under Exposed

Middle Exposure

Over Exposed
One More Advantage to HDR Processing
Noise reduction in the shadows

If You adjust the Exposure
To get Detail in the Shadows
Noise introduced
One More Advantage to HDR Processing
Noise reduction in the shadows

Same Scene but overexposed
Results in less noise in shadows
Combining the True Dynamic Range

- Overexposed
- Middle
- Underexposed

High Dynamic Range Notional Combination
What Is The Workflow of HDR Photography?

• HDR starts out with 2 or more photos each with different exposure settings.
  • One or more to capture details in Highlights
  • One or more to capture details in Shadows
• Software is used to Combine the photos to bring out the maximum amount of detail in the Final Image
  • First a HDR image is created from multiple images
  • Second the HDR image is “Tonemapped” to a LDR image so that it can be view or printed
HDR Workflow

1. Create HDR File
2. Tone Map to get LDR Image
3. Finalize Image

Digital Camera’s Sensor Captures Image(s)

Image File(s) Transferred to Computer

Image File Editing Using Computer Specialized HDR Software
What You Will Need For HDR Photography?

- Camera: preferably a Digital SLR but pro-consumer point and shoots will work.
- Sturdy Tripod (Although not necessary)
- Remote Release switch. This is possibly the least important as you can always set the timer or the camera.
- Computer with HDR Software and photo editing software.
- For the Purpose of this Tutorial we will cover:
  - Producing a High Dynamic Range image
  - Tone mapping the HDR Image to a Low Dynamic range Image using PS, LR, Photomatix, Nik SW
How Do You Shoot Photos for HDR?

• Auto:
  - Most of today’s digital SLR’s have build in auto-exposure bracketing (AEB) feature
  - Turn this on and your camera will take several shots with different exposures
    - First shot is usually a middle exposure using settings you deemed correct for the scene
    - The following frames will capture details in the highlight and shadow areas
Canon 5D AEB Example
How Do You Shoot Photos for HDR?

• Manual:
  • If your camera does not have an Auto Exposure Bracket Feature you can do it manually
    • Take a photo with middle/correct exposure - one that is the best the camera can do with one shot
    • Take one or more underexposed shots to get detail in the highlights
    • Take one or more overexposed shots to get detail in the shadows
Tips for Shooting HDR

• **Tip 1 – Constant Aperture**
  
  • This is the most important step in Shooting HDR
  
  • Only vary the shutter speed not the aperture when taking your underexposed and overexposed shots
  
  • If taking Auto (AEB) make sure camera is set on Aperture Priority
  
  • If manual – set camera on manual mode, select the aperture you want then just vary the shutter speed
    
    • Shorter shutter speeds will capture details in the highlights
    
    • Longer Shutter speeds will bring in more light and provide detail in shadows.
Tips for Shooting HDR

• **Tip 2 – Use a Tripod**
  
  • You can hand hold if you have fast shutter speeds and your camera is capable of shooting high burst rates but
  
  • For Tack Sharp Images Use a Tripod
Tips for Shooting HDR

• **Tip 3 – Separate your HDR images**

  • Before taking your series of shots, take a shot with hand in front of the camera

  • This will allow you to know which photos go together and ones that you will have to process
Tips for Shooting HDR

• **Tip 4 – Turn off Auto Settings**

  • Usually good to turn off Cameras auto settings such as Auto White Balance and Auto Focus

  • This will give you Predictable Results

  • You don’t want these features to change during the series of shots
Tips for Shooting HDR

• **Tip 5 - Exposures (Auto Bracketing or Manual Bracketing)**
  
  • Expose your primary shot for the part of the scene that is most important, and bracket other exposures from there.
  
  • Try to capture fewer exposures at first, and study your final products to figure out what you need to do better.
Does Merge to HDR Only Work With Raw Images?

• Nope – Will also work with JPEG - for best results shoot in RAW, BUT:
  • You will get the most dynamic range if you use the software to combine RAW files.
  • It is worth repeating the point — if you try to merge to HDR with anything other than RAW data you are not getting the maximum possible dynamic range.
How Many Shots and How Many Stops Apart Should They Be?

• At Least 3 Shots:
  • One Middle Exposed
  • One Overexposed
  • One Underexposed
• Start With Increments of + and − 2 F Stops
Once You Have Taken your Shots and loaded in computer – What Next?

• Depends upon what software you have:

  • With the Photoshop 5/6 or Lightroom (4.1) versions:
    • You can easily Merge Photos to one large 32 bit file and then process it in Adobe Camera Raw (ACR) or Lightroom (LR) using ACR/LR familiar user interfaces
    • The new process does something pretty radical - It completely bypasses the ‘tonemapping’ stage

  • With older PS or Lightroom versions:
    • One Step Process:
      • Process Using HDR Specialized Software Programs such as Photomatix standalone or Nik HDR Efex plugins for PS, LR and Aperture
    • Two Step Process:
      • Merge Images into a HDR file (Merge to HDR using PS)
      • Tone Map HDR file using PS or PS/LR Plugins
HDR Process with CS5/6 or Lightroom 4.1

- Process allows you to completely bypass the ‘tonemapping’ stage
- Takes bracketed photos, combines them into a 32 bit file
- Develop like you would a RAW image right in Lightroom or in Adobe Camera Raw.

- Advantages:
  - Do not have to learn new terminology or techniques as required in various tone mapping software
  - Lends itself to a natural looking (realistic), not overprocessed photo
  - The noise reduction this process provides seems to be an improvement over tone mapping.
Photoshop Process Steps

• Step 1:
  • Select 2 or more bracketed files and “Merge to HDR Pro”
    • Can be executed from Bridge and if you have PS and LR 4.1, “PS Merge to HDR Pro” can be executed from LR
  • Save image as a 32 bit TIFF file.

• Step 2:
  • Open 32 bit TIFF file in Camera Raw, and process with your normal workflow.
  • OR – Tone Mapping using either PS Tone Mapping or Plugins
Step 1: PS Merge to HDR Pro
32 Bit Image

- The PS Merge to HDR Window has a Floating Point Control slider Monitor

- The Floating Point slider controls what part of photo you are viewing at any one time since monitors cannot actually show 32 bits

- Save the 32 bit file before process (in raw convertor or Tonemapping)

  - This way you will always have the HDR negative to work on in future

- You Can then Process Image in ADC or LR 4.1 or Tonemap the image Using PS or PS/LR Plugins
Change 32-bit Preview Option and Save as 32-bit TIFF
Step 2: Process in Adobe Camera Raw

Process In ACR
From Bridge
Step 2: Process ACR
Step 2: Processing in Lightroom 4.1
What if You just have Lightroom 4.1 (not PS)

- Merge to 32-bit HDR Plug-in for Lightroom
  - [http://www.hdrsoft.com/download.html](http://www.hdrsoft.com/download.html)
  - $39
- Developed by same company that sells Photomatix
What if you just have Lightroom 4.1 (not PS)
If you choose to Tonemap

• This is where you will tell the software how to go from a HDR image you created to a Lower Dynamic Range Photo

• Tone mapping is the process in which the colors of an HDR image are mapped to a normal image (LDR). In other words the dynamic range of an HDR image is reduced to fit into a normal image (LDR)

• This is where the magic occurs
  • You can Create a Natural, Real – World – Look
  • Or a Surreal, Grungy, Painterly Look
  • By saving your 32 bit file first allows you to have more than one tonemapped version.
PS HDR Toning
PS HDR Toning Window

- Change the Method to Local Adaption
  - There are 4 available methods, but these are the only 2 with user input
  - Local Adaption provides advanced Tone Mapping sliders and you can adjust the curves.
  - The use of curves is optional as they allow you to fine tune the other settings.
    - Bring out the detail in the image, but don't forget to put some shadow in there or it will look washed out and fake.
- Edge Glow - Once your happy with the curve, adjust the radius and strength sliders to make sure there are no halos in the photo.
  - Badly converted HDR images have a glow around the areas of contrast.
  - The radius controls the mask blur while the strength decides how strong to apply the effect.
PS HDR Toning Window

- Tone and Detail
  - Gamma: This is where you control the contrast. Extremes are washed out or super punchy.
  - Exposure: Controls the overall brightness.
  - Detail: This sharpens or softens the appearance.

- Advanced
  - Shadow: Opens up details in darkest parts of the photograph.
  - Highlight: Recovers detail in the brightest areas of the photograph.
  - Vibrance: This makes the photo more colorful without over saturating areas that are already colorful. (It's smart).
  - Saturation: Increases or decreases the overall amount of color. Be careful not to over saturate the colors as a rule. (Of course all rules can be broken on occasion).
## Plugins and Standalone SW

<table>
<thead>
<tr>
<th>Software (SW) Company/Website</th>
<th>SW Name</th>
<th>Version</th>
<th>HDR Feature</th>
<th>Costs</th>
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<tr>
<td>Adobe/</td>
<td>Photoshop</td>
<td>CSS, CS6</td>
<td>Merge to HDR PRO</td>
<td>Upgrade $199</td>
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<td><a href="http://www.adobe.com">www.adobe.com</a></td>
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<td></td>
<td>Lightroom</td>
<td>LR4.1 or greater</td>
<td>Have to &quot;Merge to HDR Pro&quot; with PS OR use Plug-in</td>
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<tr>
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<td>LR Merge to 32 bit HDR</td>
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Photomatix Pro Standalone
Photomatix Pro Standalone

http://www.hdrsoft.com/videos/tonemapping_tutorial_rsammon.html
Photomatix Pro Standalone
Nik HDR EFEX Pro Plugin - Default
Nik HDR EFEX Pro Plugin – Surreal
Summary

• Producing high quality HDR images is primarily in the exposures you make of the scene.
  • Expose your primary shot for the part of the scene that is most important, and bracket other exposures from there.
  • Try to capture fewer exposures at first, and study your final products to figure out what you need to do better.
  • Experiment with exposure bracketing. Try different spacing, and with time you will find what works best for you.

• Whatever Software you use – Learn from the presets
  • Start with the Presets and see how the sliders change the image