

High Dynamic Range (HDR) Capture and Processing

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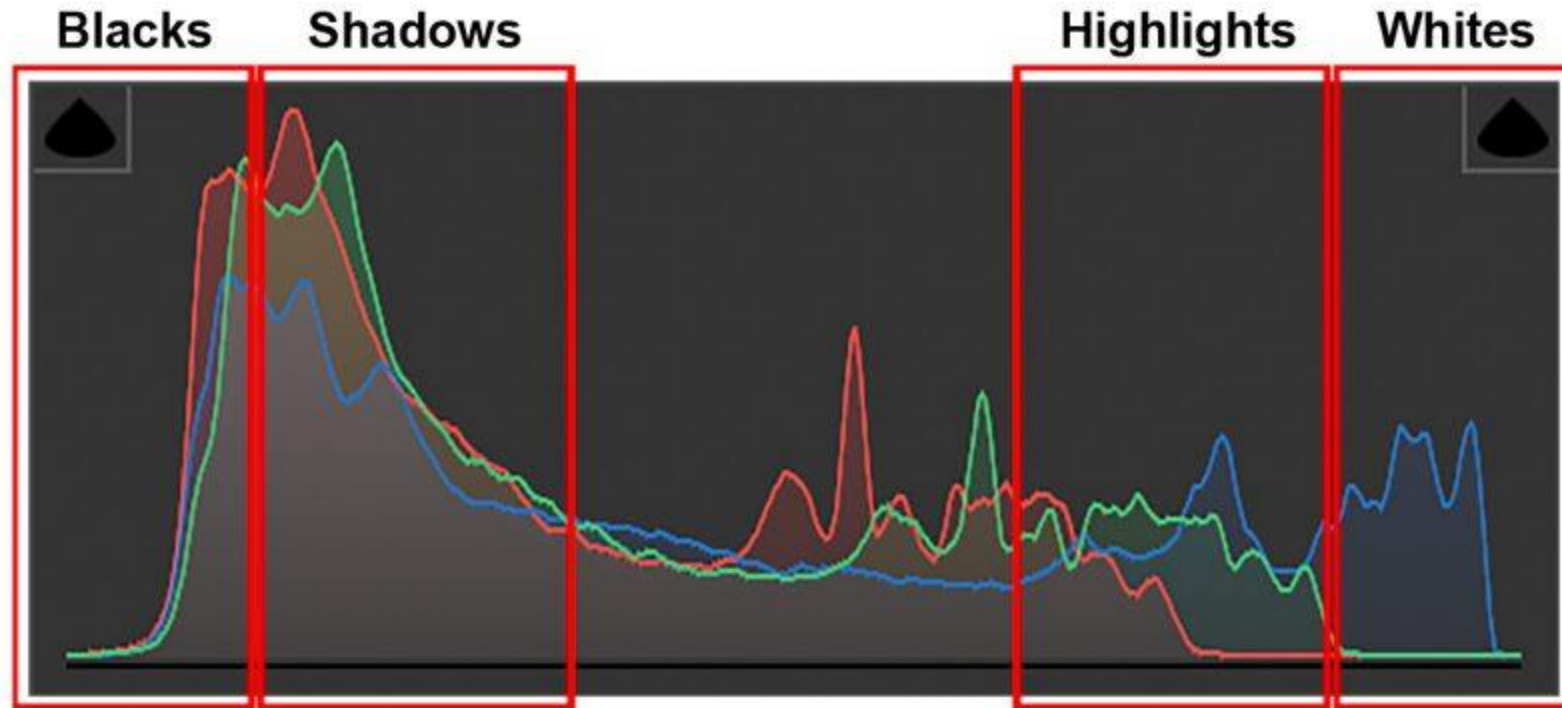
With Material from Frank Richards

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HDR (High Dynamic Range) Images

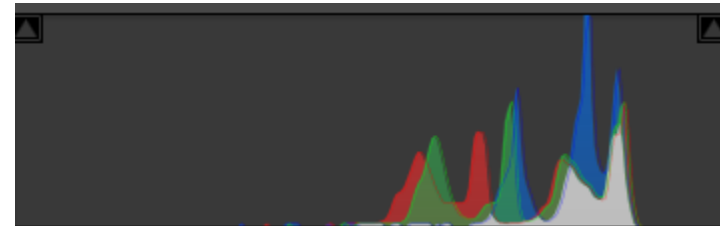
- HDR capture and processing allows us to combine several images in order to show the full tonal range of a scene even if the scene exceeds the dynamic range of the camera.
- Bracket exposures to cover full brightness range of the scene.
- Combine images so that all brightness levels are included (HDR),
- This process has two major advantages:
 - Detail in brights and darks is maintained.
 - Noise in darks is lessened compared to just raising the shadows or blacks.
- With today's camera sensors and software noise reduction, this technique is not as necessary as before.

Histogram – The Distribution of Tones in an Image

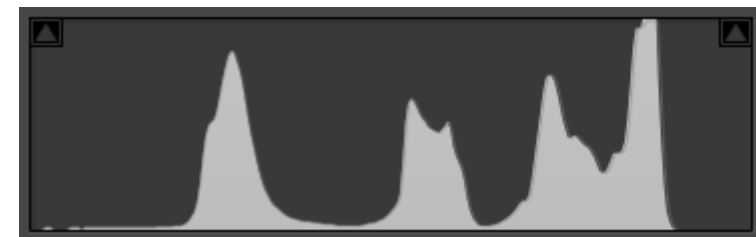


A Flat Image

Small tonal range and no shadows or highlights.
Must process to expand the range.

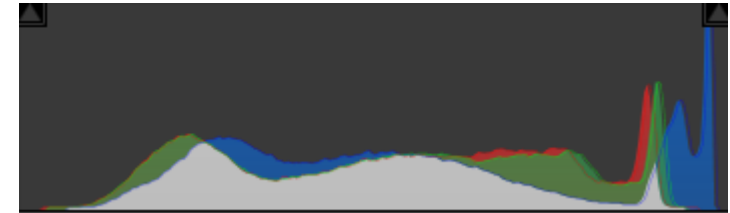


After Expanding the Tonal Range



Full Tonal Range Image

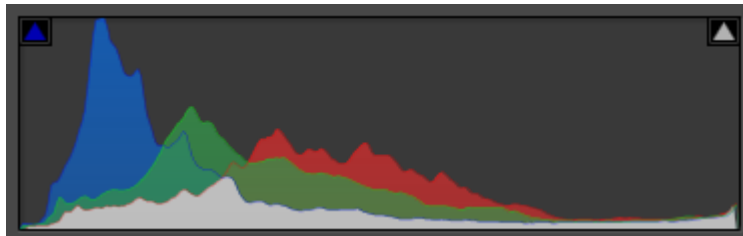
Covers the entire tonal range
No black or white clipping



A High Dynamic Range Image

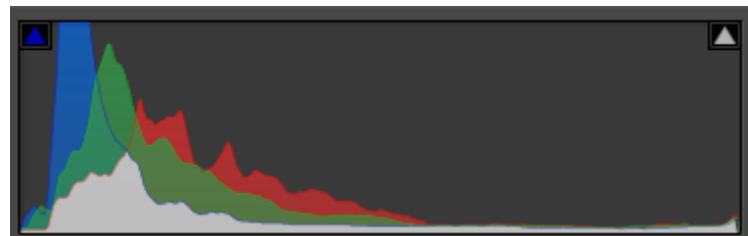
No Single Image is a Full Tonal Range Image

Over Exposed



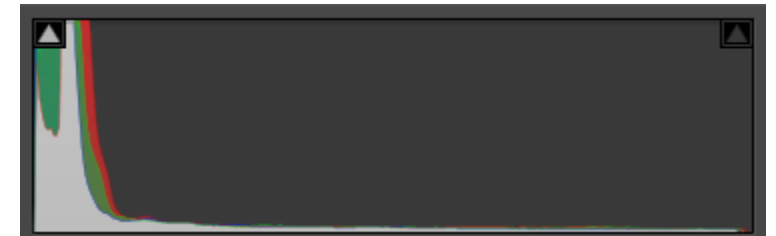
Detail in Blacks and Shadows
No Detail in Highlights

“Optimally” Exposed



Some Detail in Blacks and Shadows
No Detail in Highlights

Under Exposed



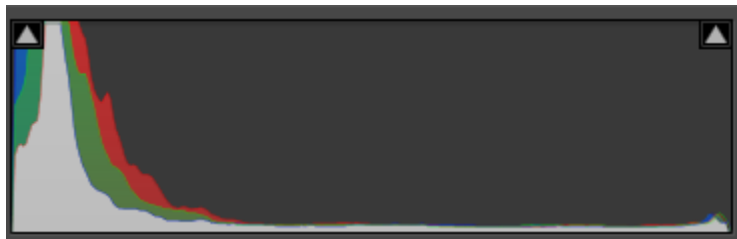
No Detail in Blacks and Shadows
Detail in Highlights

HDR Processing

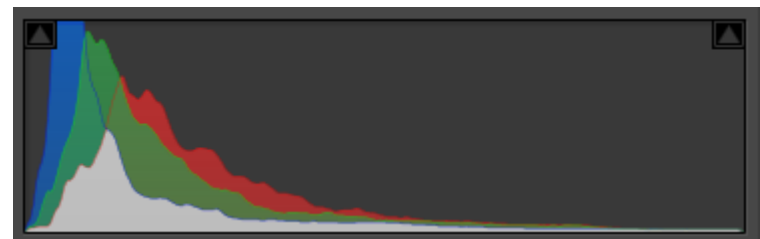
- Software combines the over and under exposed images into a single image.
- Many software packages. I use Lightroom (Adobe Camera Raw).
- The bit depth is increased from 16 bits to 32 bits giving more adjustment range.
- The returned image is flat and must be processed.
- The Lightroom approach yields realistic images.
- Other packages can return images with the “HDR-look”.
- Note: Today’s sensors have such good dynamic range that often, the “optimal image” can be processed with success. However, there is likely more noise in the shadows and highlights might not be ideal. (But new noise reduction software might mitigate that.)

Combined Images

After HDR Processing – No Processing



After HDR Processing – With Processing



HDR Processing - notes

- If you feel you need to apply noise reduction such as Lightrooms Noise Reduction AI, apply to each image in the sequence before the HDR processing. Noise Reduction AI can only be applied to a original RAW file.
- Evaluate the scene to determine if some blocked up blacks are acceptable. (For instance, under a rock.) In that case expose to save the highlights.

Show Examples

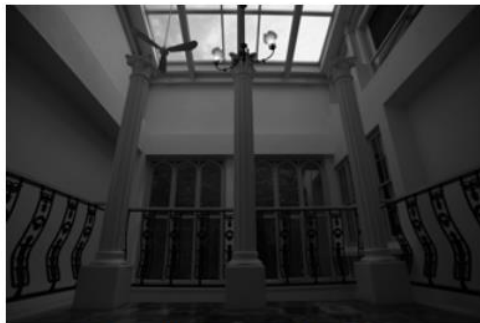
The Capture Process

- Take a sequence of images that have full detail in the shadows and the highlights.
- This is called exposure bracketing.
- Most cameras can do this automatically.
- This can also be done manually.
 - If in aperture priority, vary the exposure compensation.
 - If in manual, vary the shutter speed.
 - Key is to keep the aperture constant.
- As always, better on a tripod but easily done handheld.
- Movement is an issue. Software can correct for some, but not all movement.

From Nikon Documentation



Exposure modified by: 0 EV



Exposure modified by: -1 EV



Exposure modified by: +1 EV



"Number of shots"	Bracketing indicator	No. of shots	Bracketing order (EVs)
0F	-.....0.....+	0	0
+3F	-.....0:~.....+	3	0/+0.3/+0.7
-3F	-.....0:~.....+	3	0/-0.7/-0.3
+2F	-.....0:~.....+	2	0/+0.3
-2F	-.....0:~.....+	2	0/-0.3
3F	-.....0:~.....+	3	0/-0.3/+0.3
5F	-.....0:~.....+	5	0/-0.7/-0.3/+0.3/+0.7
7F	-.....0:~.....+	7	0/-1.0/-0.7/-0.3/+0.3/+0.7/+1.0
9F	-.....0:~.....+	9	0/-1.3/-1.0/-0.7/-0.3/+0.3/+0.7/+1.0/+1.3

Recommendations for Automatic Bracketing

- Method 1
 - Start at the “optimal exposure”, i.e., the one the camera recommends.
 - Set to 1 or 2 stop increments and 3 or 5 shots are usually sufficient.
 - If my Nikon is in continuous firing mode, press once and the camera completes the sequence.
 - You now have have 3 or 5 shots to combine in software
- Method 2
 - Start with exposure for the brightest part of the scene
 - Set to 1 or 2 stop increments and to – 3.
 - You have one shot exposed for the brightest part and two that with less exposure by 1 or two stops each.
- Note: Turn bracketing off when you are finished, or your exposure will jump all over as the camera is doing the sequence.

Processing Process

- Photoshop Layers: Applicable if you have a simple scene.
- Software combining bracketed images.
- I use Lightroom (Adobe Camera Raw – ACR) merge to HDR.
 - Highlight all the images in the sequence.
 - Choose Merge to HDR
 - Fill in dialog boxes
 - HDR image returned as a DNG.
 - Process normally taking care not to make it look unreal.

Processing Examples

Reference

Expanding the Capability of Your Camera - Frank Richards

Part 1 - Panoramas [PDF](#)

Part 2 - HDR (High Dynamic Range) [PDF](#)

Part 3 - Focus Stacking (Expand Depth of Field) [PDF](#)