

The Basics of HDR Imaging

by Photographer Raymond Klass

So what exactly is HDR imaging?

HDR quite literally stands for High Dynamic Range. Dynamic range meaning the range in tonality between the darkest and lightest levels that a particular device (in this case a digital camera) can capture with appreciable detail. In practical application, what we're talking about here are the limitations of our camera.

Imagine taking images on a bright sunny day with some objects brightly lit and other objects in full shadow. Chances are that your camera wouldn't be able to capture details both in the lightest and darkest areas of the scene. This is what happens when a scene has tonality outside the dynamic range of your camera. If you encounter a situation like this, there are two basic choices. The first is to choose which pieces of information are the most critical, and set your exposure to ensure that these are recorded. The second is to use multiple exposures to capture the full range of detail, then use the computer to put the images back together into one cohesive composite exposure - this is the idea behind HDR imaging.

The Situation

This is a typical noon image - deep, dark shadows underneath the tables, and bright highlights on the windows of this greenhouse. The exposure to the right is what my camera's meter recommended, and is probably the best single exposure I could make of the scene.

Looking at the camera's histogram, I begin bracketing in pairs. If I take a shot one stop lighter than the camera's recommendation, I also take one exposure one stop under. I typically bracket in full stops. Most scenes can be done with an exposure one-stop under, one shot on the camera's recommendation, and one exposure one-stop over. Some scenes benefit from an additional set of exposures 2 stops off of the camera's recommendation.

Make sure to check your camera's histogram to see if you're getting that critical detail. Once you see the detail in the highlights and shadows present, you know you've gone far enough.



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For this scene, I chose to make 3 exposures. One at the camera's recommendation, one a stop underexposed, and one a stop over-exposed. By checking the camera's histogram, I made sure that the overexposed image got me detail in the darkest areas, and that the underexposed image got me detail in the lightest areas. When I bracket, I am careful to change my shutter speed and not my aperture, as it makes the scene easier for the software to put together without changes in depth of field.

Step 1. Bracket your exposures using the shutter speed to capture all the detail from both the lightest and darkest areas of the image. My recommendation is also to shoot in RAW. HDR can work with JPEG or TIFF images, but you have the best chances of success shooting in your camera's RAW format.

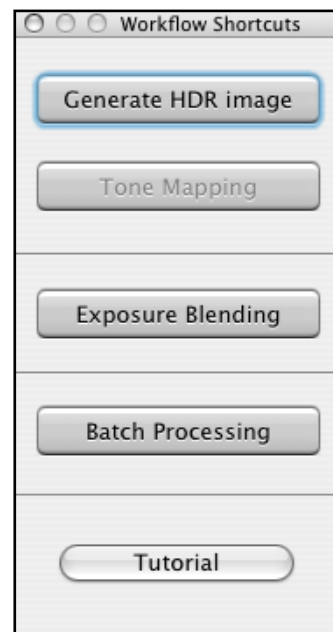
Step 2. Download the RAW images and view them with your choice of application - I am using Adobe Bridge CS4 (Pictured above). Find the images you shot and write down or remember the numbers.

There are many software solutions for creating HDR images. Adobe Photoshop offers their own built in method, and there are several third-party solutions. I've tried many of them, and the results vary depending on the type of images, number of exposures, and particular strengths of the software. I've found Photomatix Pro to be the simplest and have the best quality results. For this example, I'll be using the latest version of Photomatix's software, version 3.

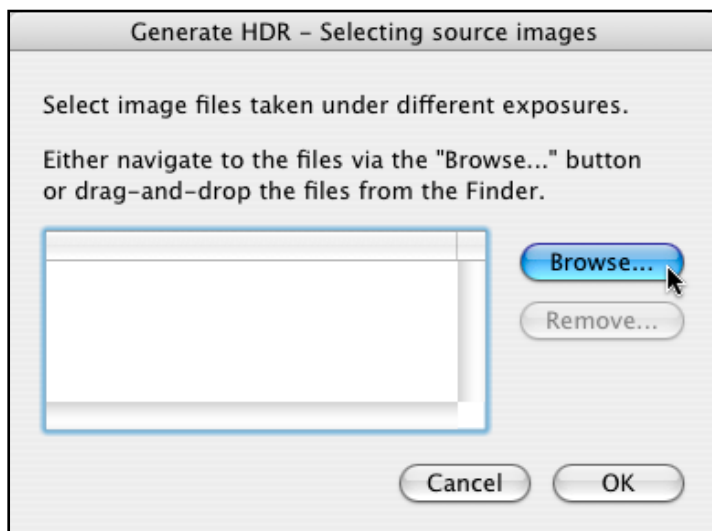
This software can be downloaded at <http://www.hdrsoft.com>, and offers a free unlimited trial, though they add a company watermark to each image - this disappears when you purchase the software. This way you'll be able to try these techniques without having to commit to buying anything.

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Step 3. With the picture set picked out, you can close the browser software and click to open Photomatix Pro. A large menu will appear on the left of the screen - click the option to **Generate HDR Image**.

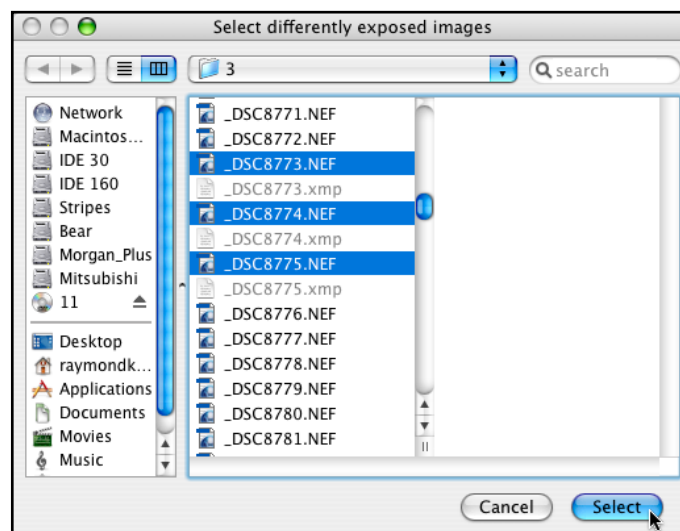


Step 4. When the box appears to select the files you would like to use for the HDR Merge, click the **Browse** button.



Step 5. A file browser window appears, and you can use the command (control -PC) key to click and select multiple images to go into your HDR merge. I have selected the images that I looked at in Bridge's browser window. When you've selected the images you want to use, click the **Select** button.

If you're unable to select all the images in one step, or the images are in multiple folders, you can select additional images by click the **Browse** button again.



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Step 6. After all the files for your HDR appear in the dialogue box, click the **OK** button to go ahead with the selected images.

Step 7. Next you get a box with several options for the generation of the HDR image.

The first, **Align Source Images** has to do with Photomatix's software trying to align images should the camera have moved between exposures. I would recommend using the faster **By Correcting horizontal and vertical shifts** if you were on a tripod, otherwise, use the **By Matching Features** option if you were shooting hand-held.

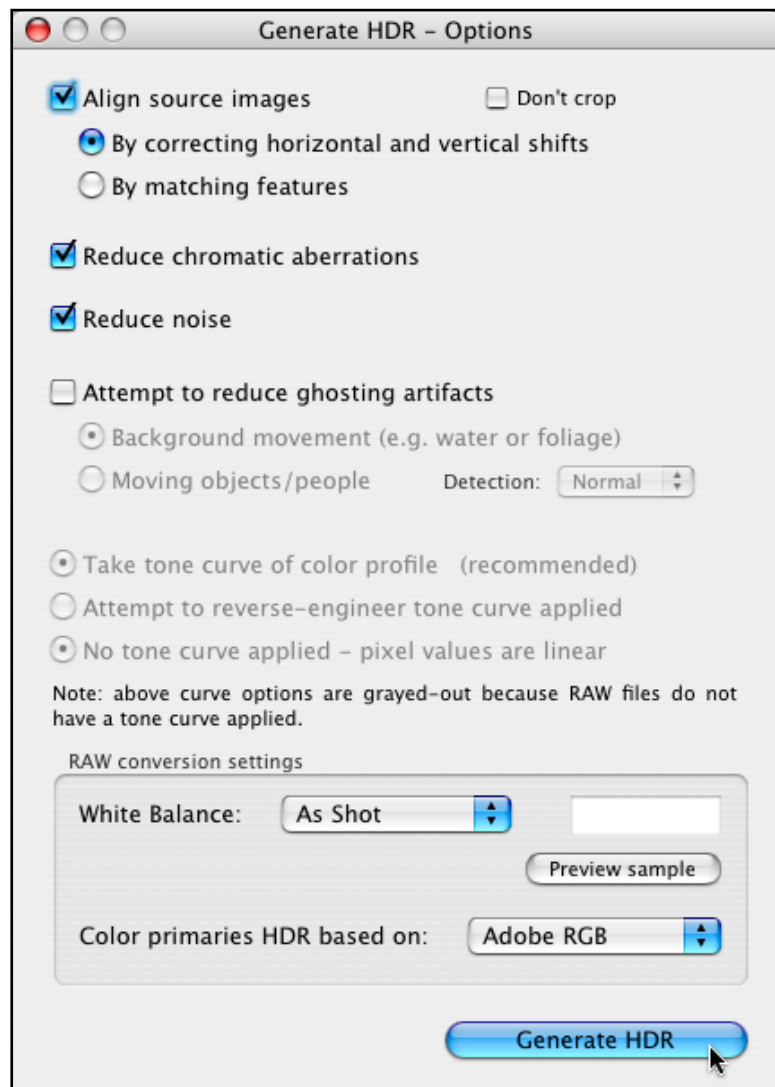
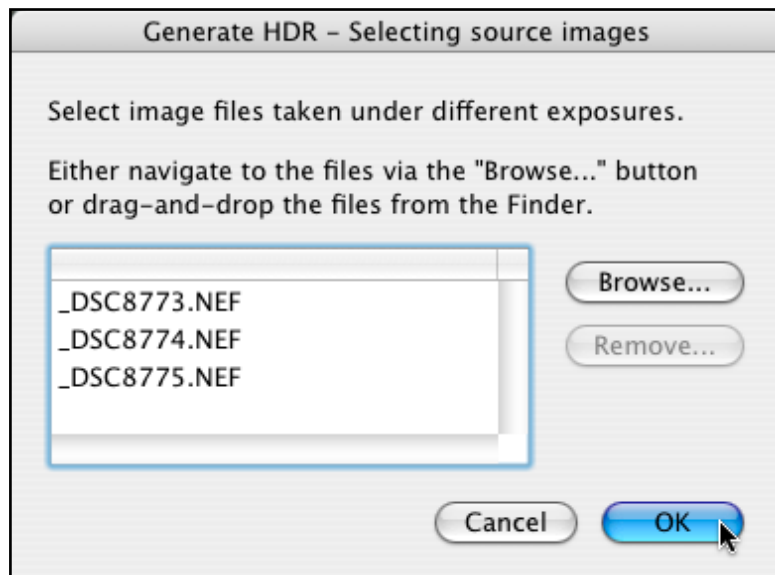
I always leave **Reduce Chromatic Aberrations** on, as HDR images tend to have high contrast, and therefore are quite prone to chromatic aberration (typically this shows as a color fringe around objects of high contrast).

I also leave **Reduce Noise** on all the time, as the dark areas of the underexposed images tend to have noise, and this attempts to reduce it.

Check **Attempt to reduce ghosting artifacts** if you have objects that are moving in your scene. I didn't check it this time, as my photo was taken in the relatively still environment of a greenhouse. If you have water, foliage, or clouds etc. that were moving, check the first option for **Background Movement**, otherwise you can try **Moving objects**.

Finally, because we're using RAW images, the last third of the box is grayed out - this has to do with using images that have already been processed. You can change the white balance, or leave it as shot. I always base the images on **Adobe RGB** for the last step.

When you've set your preferences, click **Generate HDR**.



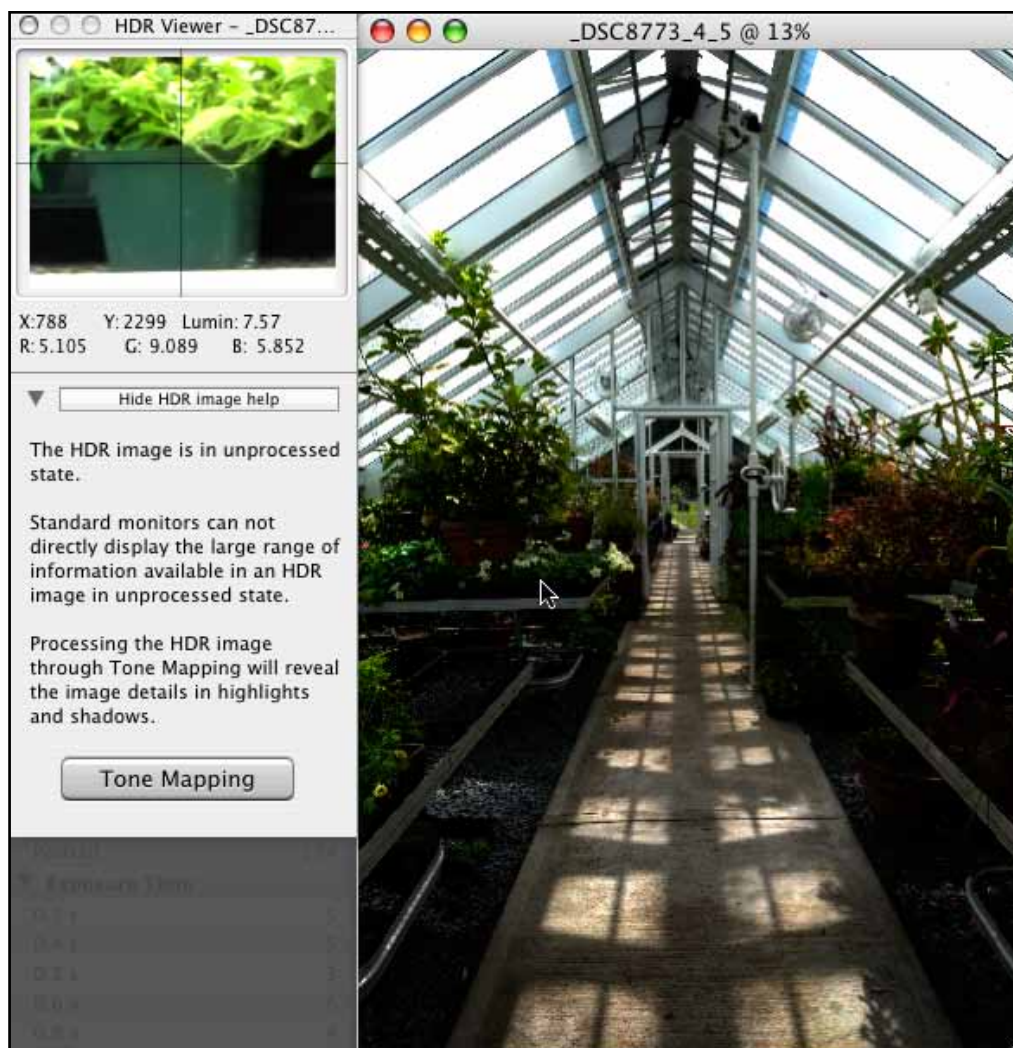
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Step 8. HDR is really a two step process. The first step is for the computer to bring together the images - in this case three of them, and create a composite. This merged image brings the file from a 16 bit original, to a 32 bit HDR image. The doubling of bit depth here allows the computer to store many more tones than it could before - accommodating the now larger tonal range of the HDR image.

But, the image doesn't look any better...

Yes, the image actually looks worse than before, but remember I said this is a two step process. The computer monitor cannot display a 32 bit image, nor can printers reproduce the image yet - it has to be converted into something that can be utilized. The power of Photomatix is in its ability to convert from this 32 bit image back into a 16 bit image.

When the preview box (shown below) comes up after the HDR has been generated, click the **Tone Mapping** button at the bottom of the palette to bring the HDR into Photomatix's tool for converting the image into something we can use.



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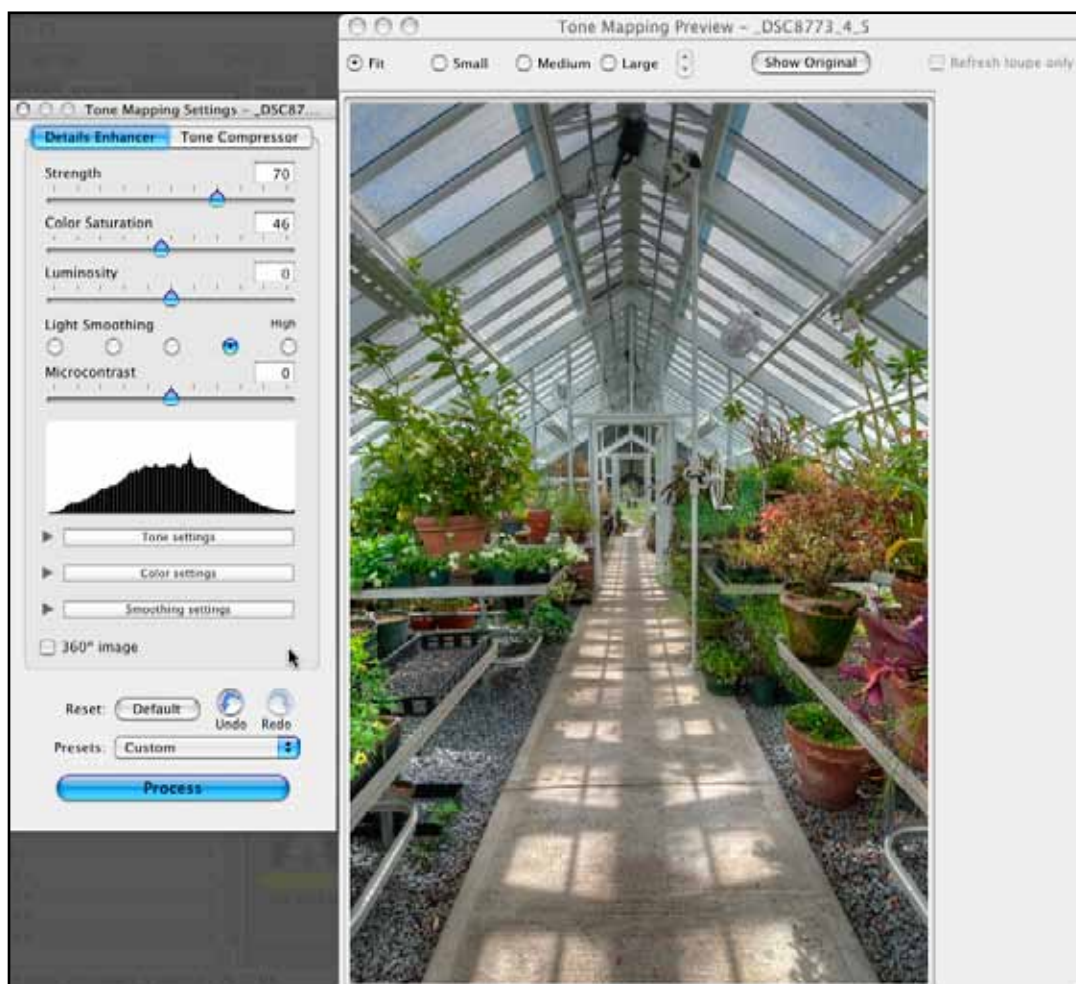
Step 9. If this is the first time you're using Photomatix, then likely the display of the image is set to the default size of **small**. Do yourself a favor and click the **Fit** option in the upper-left side of the **Tone Mapping Preview** box. This will make the image as large as it can be while not exceeding the size of your computer monitor.

There are two basic choices you'll begin with - whether to use the **Details Enhancer** or the **Tone Compressor** tool to do the conversion. Below, you'll see the blue highlighted **Details Enhancer** tab - this is the default selection for images, to switch to the **Tone Compressor**, all you need to do is click the tab.

The two methods handle images in different ways.

The **Details Enhancer** works on the idea of local contrast. It processes the image so that objects stand out from their immediate surroundings, with little consideration for their tonal value in the overall scheme of the image. This can produce more illustrative looking images, as objects tend to develop a "glow".

The **Tone Compressor** option works on a global scale, keeping the original tonal relationships, and only minimally working on local contrast. This tends to produce a more realistic image with deeper shadows and more pronounced highlights.



The Details Enhancer Method

The details enhancer works on both local and global contrast. This means that it looks not only at an objects relationship to the entire scene, but also to its immediate surroundings.

The **Strength** slider controls the amount of HDR enhancement. It works on both the global and local enhancements. The farther to the right you slide it, the stronger the contrast enhancements will be. Compared to the original image, Photomatix typically makes light areas darker, and dark areas lighter - to bring out their detail and compress them into the final image.

The **Color Saturation** slider is fairly self-explanatory. It controls the overall saturation of color. Just a word of caution - a little goes a long way.

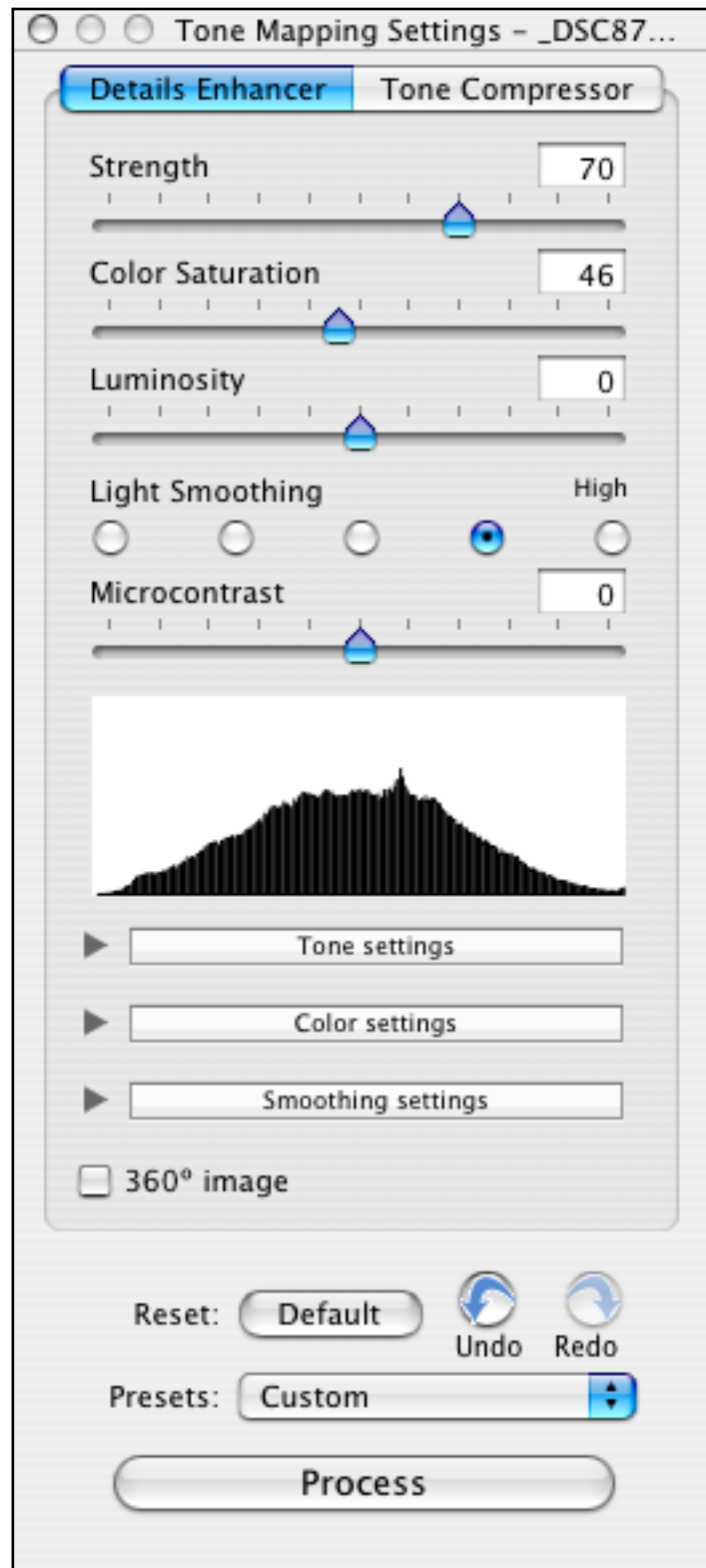
The **Luminosity** control works to control the global contrast adjustments Photomatix is making. Sliding it to the right lightens the image by increasing the brightness of the shadow areas, while dragging it to the left darkens the image for a more realistic look.

The **Light Smoothing** controls the way Photomatix renders the local tonal adjustments. A higher setting will yield a more realistic image, while a low setting will tend to make individual objects and areas glow for a more illustrative look.

The **Microcontrast** slider adjusts the amount of local contrast adjustment made. Sliding it to the right increases this local contrast for a more illustrative look, while dragging it to the left lessens the localized adjustments for a more realistic look.

The histogram can be helpful in making sure that you're gaining all the detail possible throughout the process.

If you're satisfied with the result, click **Process**, otherwise you might try the **Tone Compressor** by clicking its tab at the top.



The Tone Compressor Method

This method tends to produce a more realistic image, as objects within the images are adjusted on a global scale, without losing their tonal relationship to either their surroundings, or the image as a whole.

The **Brightness** slider is fairly self-explanatory - it adjusts the overall brightness of the image.

The **Tonal Range Compression** slider adjusts the compression of the image. This means that as you slide it to the right, it is bringing both the shadows and highlights more toward a middle tone - making both the shadows lighter, and the highlights darker.

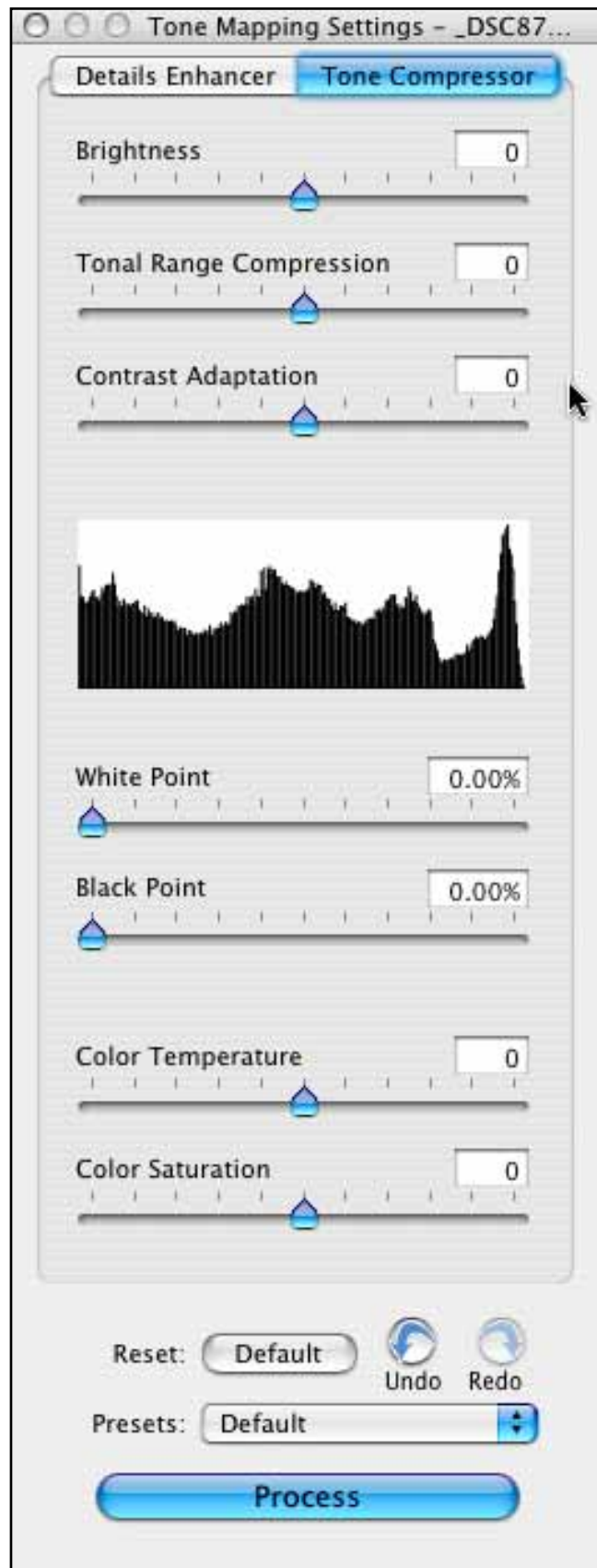
The **Contrast Adaptation** slider controls the “punch” of the image - further to the right creates more pronounced pixels, while sliding it to the left produces a more natural look.

The **White Point** and **Black Point** sliders control which areas of the picture are pure white, or pure black - they are roughly equal to the black and white sliders in Photoshop's **Levels** command.

The **Color Temperature** slider adjusts the color temperature of the image. This is best done roughly with the RAW files white balance, or then corrected later in Photoshop. Photomatix's control is quite rough, and so I don't recommend using it.

The **Color Saturation** slider adjusts the intensity of the color throughout the image. It is also a rough control, and good for a quick boost, but be careful - often less is more.

If you're satisfied with the resulting image, click the **Process** button, otherwise you might try the **Details Enhancer** method by clicking its tab at the top.



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Step 10. After pressing the **Process** button, Photomatix goes through several steps on its own to process the HDR image into something we can use to print or view.

The file then opens in a new window alongside that initial menu we saw to generate the HDR image. The last step in the process is to save the resulting image. Click **File: Save** to save the image.

After creating the HDR image in Photomatix, it is often still necessary to bring the resulting image back into Photoshop and do some fine tuning on the colors and tones. The image below is a result of Photomatix's process, the controls were set to produce a somewhat realistic image, with a bit of that illustrative look still there. This file would then be brought into Photoshop for some overall and localized tonal corrections.

These are the basics of HDR processing. In my next HDR article, we'll explore some of the more advanced techniques, controls, and how to achieve that illustrative look in an even more pronounced way. The best method to get better at Photomatix and learn what the different sliders really do, is to simply sit down and play. It takes some learning to begin recognizing which scenes will make good candidates for HDR imaging, and which ones won't benefit from the process.

