Focal Point

EXHIBITED AT THE BALTIMORE CAMERA CLUB, INC.

January — February 2008

Don Vetter's fabulous HDR Print. How can I do that?

How to Create High Dynamic Range Images

So how do you get started creating your own HDR images? This step-by-step tutorial will help you get started using either the popular HDR software from Photomatix or the built-in HDR features found in Photoshop CS2 and Bridge.

The problem: the houses on East Battery face east, the sun was setting in the west, and the mansions were all in shadows. There were some nice sunset-colored clouds on the eastern horizon, but the exposure difference between the house (to achieve a nice, vivid pink) and the twilight sky was at least 5 full stops apart. If I exposed for the mansion, I'd lose the sky. If I shot for the sky, all but the sky was a silhouetted mess of shadows. Splitting the distance between the two extremes did neither dramatic element justice.

Briefly, the HDR process involves merging several exposures of a given scene into a 32-bit HDR source file, which is then "tone mapped" to produce an image in which adjustments of qualities of light and contrast are applied locally to the HDR source image (not globally), resulting in an image with amazing detail throughout the tonal range -- capturing highlights and shadows that would otherwise be lost in a traditional Low Dynamic Range (LDR) image.

Depending on the source images, and depending upon the settings used in tone mapping, the results you can achieve range from photorealistic to images that have a wealth of detail, but look illustrated or overworked and cross the line from photographic to photograph-based graphic. For this story, we're sticking with photorealistic images and results. We'll explore how to make HDR images in HDRSoft's **Photomatix** ($99, free demo available), and **Adobe Photoshop CS2 and Bridge** ($649, free trial available). Be warned: even with a fast computer, we're dealing with huge files, and tons of processing time, especially with full-size images. We strongly suggest that if you wish to try HDR imaging out, practice on screen-sized images. Fortunately, both of the programs we're exploring allow you to save tone mapping settings and re-apply them to other images (such as a full-size version of your low-resolution tests.)

HDR imaging involves multiple files, multiple steps, and sometimes less-than-intuitive program paths from start to finish. It is easy to miss a step and get frustrated and confused (believe me, I know this all too well). But with a little practice, experimentation, and learning the HDR workflow, you may find yourself rewarded with great HDR images. We're going to take a look at the standalone program Photomatix first.

Photomatix by **HDRSoft** is a $99 standalone program that creates and processes HDR images. (The Tone Mapping feature is also available as a plug-in for Photoshop CS2 for $69). Photomatix is solely dedicated to merging images. We're going to start off by walking through my process, which yields the lead image for this story. I chose three shots from this bracketing, (1/640, 1/60 and 1/15 at f/5, ISO 400, on the Canon 5D, with a 17-35 f/2.8L at 17mm) to resize and save, and open into Photomatix. Your images can be either 8-Bit or 16-Bit JPEGs or TIFFs; both formats will work with this method. (See right)

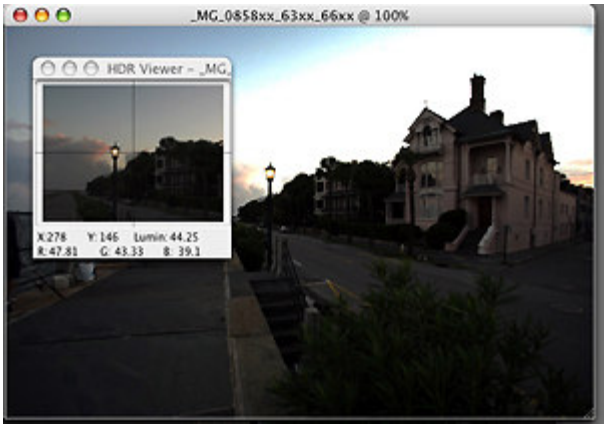
Once the source LDR images are opened in Photomatix, choose HDRI from the top menu, and select "Generate HDR." A pop-up window will tell you which images it will merge, which should be all of the opened images, so be careful that you only have one series open in the program at a time. Click OK, and another pop-up will ask about response curve options. I chose "Use Standard Response Curve (Recommended)."

Click OK and Photomatix goes to work, merging your

bracketed Low Dynamic Range photos into a High Dynamic Range image. After a while, the status bar will fill up, and Photomatix will launch a new window displaying your HDR image.

And it looks awful. Posterized, thresholded, dithered and bandy. It looks nothing like those amazing HDR images that you've seen. Don't panic. Nothing is wrong. It is just part of the process. You're only halfway there. (See right, below)

Now for a confusing bit of information: your monitor cannot properly display HDR images, and your printer cannot properly print them out. You've got to Tone map the HDR image, and crunch it back down into a Low Dynamic Range format that your computer and printer can handle for final output. This particular LDR image will maintain the expanded tonality and detail of an HDR image. Let's call this HDR file, with its massive 32-bit depth, the HDR "negative." In order to view it, it must be "developed" in the tonemapping tool. The computer cannot display the true HDR image correctly, because a massive number of potential color values for every pixel is assigned to each pixel, but each pixel's final value is dependent upon the values of its local pixel neighborhood, each of which also has an enormous amount of potential color values dependent upon the pixel values of the first pixel we mention. Got it? So, until the HDR is "developed" in the tone mapper, none of the pixel values are locked in, and thus, it is not able to be displayed properly.



So, now we've got this HDR "negative" image that our screen cannot display properly; but notice that little navigator window that opened when your HDR image was generated? This window will give a preview of how the Tone mapping tool can develop your HDR "negative." (See right)

Now for the fun part. Under the HDRI dropdown menu, select "Tone mapping." (See right) A preview window opens, showing you what your HDR will look like once it is Tone mapped and crunched back down into Low Dynamic Range space for printing and display. I played with the sliders, and decided I really liked the saturation boosted way up. I pushed various sliders around and decided I was ready to lock in the pixel values, and turn the 32-bit HDR into an 8-Bit (LDR) TIFF to bring back into Photoshop for final image adjustments. Under Image>Adjustments>Hue/Saturation, I added +35 Saturation, and then under Image>Adjustments>Curves, I added an S-Curve to increase contrast. A quick UnSharp Mask, and I'd made an image that looked much better than any of the original Low Dynamic Range photos. (See just above)

It didn't. It simply Tone mapped my active image.

I liked what I saw, so I saved the image and imported it into Photoshop to add a bit more saturation and contrast and saved my image. It really pulled up the color and had great detail in the trees and clouds.

But it wasn't what I was trying to do, which was merge the three exposures into one HDR "negative" to be tone mapped.

So, keep this in mind: Photomatix will allow you to tone map a single 16-bit image, and it will not automatically merge your Open 16-bit images if you select "Tone mapping" rather than "Generate HDR." Depending on your source image, this may actually be a better option, in some cases.

I think this underscores an important point about HDR imaging, regardless of the program: It is not an exact science, there is no simple formula to follow, and your results may vary wildly from one image to the next. But if you don't get discouraged, and keep experimenting, you can continue to learn how to best use this tool, as we'll see in the next section.

In addition to the Powerful Tone mapping tool, which works on true High Dynamic Range images, Photomatix includes a handful of "Exposure Blending" tools, which also combines LDR images, but in a more traditional way of merging the shadows and highlights from two or more source images, without generating a true High Dynamic Range "neg" to be tone mapped. After my initial experiments with the waterfront mansion images that opened this story, I was unimpressed with the results of the tools offered under the Photomatix "Combine" menu. None of the H&S (Highlights and Shadows) combining methods produced results that I'd willingly share with other photographers -- the results looked like awful dodging and burning jobs or bad layer mask compositing! (See right)

I tried to salvage one of the Combine menu Exposure Blending methods (H&S Auto) in Photoshop by adding saturation to give the ultra-vivid look I was trying to obtain, and added an S-Curve for improved contrast. The final image is noisy, and the sky shows noticeable banding. It's safe to say I was not at all impressed with these "Combine" methods. Sure, they are a lot easier, but the results didn't come close to tonemapping a merged HDR image, at least in my initial experiments.

Not being one to give up easily, I decided to test out as many merging options as I possibly could, using the Photomatix Batch Processing function under Automate. In the Batch Processing window, I selected "Average," "Highlights & Shadows - Auto," "Highlights & Shadows - Adjust," and "Highlights and Shadows - Intensive (Light)." I selected my source folder, and used "Same as Source" for the Destination folder. I chose to save as JPEG, Quality 100, and clicked OK.

The computer chugged away for a few moments, updating me on the progress of the processing.

When it was finished, I opened my merged images into Photoshop. None was truly what I was hoping for, but the H&S Intensive-Light was very close. All I needed to do was adjust the levels to darken the sky, and the final image is very much like what I'd pre-visualized months earlier.

The batch processing feature of Photomatix has its strengths for certain operations. If you want to test several of the LDR methods with Highlights and Shadows, this is the way to do it. Also, it will process your LDR images into an HDR image, to be Tone mapped. I suggest leaving the "Apply Tone Mapping to HDRI" unchecked, since you do not get a preview of what the Tone mapping will do to each HDR image. You can select the number of images to be combined at a time -- and files are selected alphabetically, so make sure you keep each series you wish to automate equal in number of source LDR images, and also choose a naming scheme that will yield you the outputted files you are expecting.

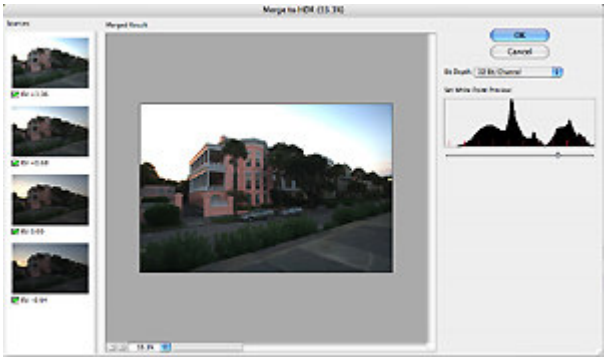
We're going to leave St. Lucia and Photomatix for a few minutes, and look at the High Dynamic Range features of Adobe Photoshop CS2 and Bridge. Afterwards, we'll do a comparison of the strengths and weaknesses of each program, to help you decide, which, if any HDR program is right for you.

If you own Adobe Photoshop CS2 and Bridge, you already have a High Dynamic Range Processor at your fingertips. You can merge photos to HDR either directly through Photoshop CS2, or through Bridge. We're going to explain the Bridge route, since the thumbnail views make it easier to select your images to merge to HDR. It is not very intuitive, and again it involves multiple steps, and it is easy to want to give up, thinking that you're doing something wrong, when you've probably just inadvertently missed a step.

Make sure both Bridge and Photoshop CS2 are launched. Select the images in Bridge that you want to merge into an HDR image. Under the Tools Menu, select "Photoshop," and then select "Merge to HDR." Leave any option boxes that pop up set to default and click OK.

Photoshop and Bridge will chug away for a few moments, and eventually, you will get a window that shows a preview of your merged HDR "negative." (See below) You've only got one option at this point: Set White Point Preview. Slide it to the right, and your preview gets lighter. To the left makes it darker. You're mostly guessing as to what this

will do to your overall HDR image once you get to the Tone Mapping stage, so just leave it where it is, for now. Once you click OK, Photoshop will output an HDR file. Again, it's not going to be pretty -- nothing like the HDR images you've seen on Flickr or other photo sharing sites. Again, this is because of the limitations of monitors to properly display the 32-bit depth information. Your Photoshop HDR "negative" must be developed and crunched back down to a smaller bit-depth, low dynamic range space; but hopefully, we'll preserve all those rich shadow details, and great highlights along the way. (See next page)



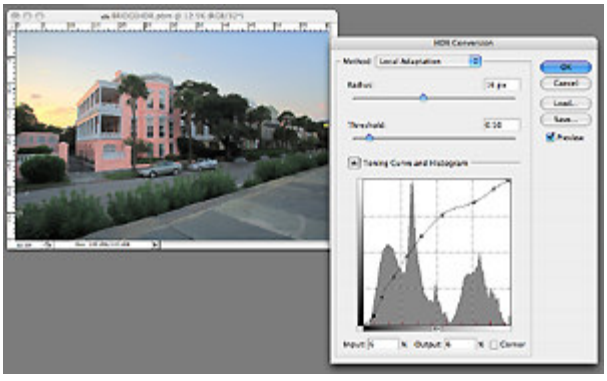
When you bring your 32-bit HDR image into Photoshop, you do not have many image-editing options. Under the Image>Adjustments Menu, you can adjust Exposure, and you can apply a Photo filter, but for the most part, you are extremely limited with what you can do to make image adjustments.

i have the feeling that many users may bail out at this point, disappointed with the results they've achieved, thinking that Photoshop CS2 isn't all that advanced in HDR processing. Don't let this happen to you. Photoshop offers a

Powerful HDR processor, with Curves controls.

But there's no button or menu option to directly pull it up, which is confusing. To Tone Map your HDR file, first select Image Menu> 8 bits, which will crunch your HDR image into LDR space. But before it does its crunching, it opens up the HDR Conversion window, complete with preview and Curves Control. Make sure you click the arrow button to expand the Toning Curve and Histogram display. (See below)

This first image shows the HDR file with no adjustments made. There are some slider options under the first three drop-down menu options, which offer some degree of acceptable image "developing." But the fourth, Local Adaptation, unleashes the full power of the Curves control. Using the super-techical "eyeballing" method, I made a 10-point Curve and was satisfied with the initial HDR "developing." Final image enhancements would again be applied globally in the 8-bit compressed space of Photoshop. (See below)



I clicked OK and Photoshop opened up an 8-bit version of my image, showing the HDR adjustments. The colors and contrast were a tiny bit flat, and my feeling was that this image needed increased saturation (Image>Adjustments>Hue/Saturation) to really make the pink building and the turquoise sky pop. A simple S-curve kicked up the contrast, and I'd manage to make an image that had a tonal range wider than the shooting conditions allowed, with a playful, vivid color palette. Attentive viewers may be able to discern how many frames were combined in this image, by counting the number times the ghosted car appears, in whole or part. I chose this series deliberately to illustrate what happens when there is a moving subject in the frame. (And if you look very closely at the lead photo, you'll also notice that the fisherman has ghosted edges.) You can use it as an image element for interesting effect, or you can be careful about making sure there are no mobile objects in your frame as you make your bracketed exposures.

As with Photomatix, there are a number of steps that can be confusing and counterintuitive, but with some practice and experimentation, you may find that the HDR tools in Photoshop CS2 work for you and your High Dynamic Range visions.

If you listen to some of the chatter on the internet about the HDR Processing capabilities of Photomatix versus Photoshop CS2, you may be led to believe that Photomatix is far superior. My research and experimentation disproves this premise to my satisfaction. Beginning with the same three source images, and following the suggested workflow for each program, and then applying very similar final global adjustments in Photoshop -- increased saturation and added S-Curve -- I was able to achieve very similar results.

The first image was processed in Photomatix. (See next page)

The second was processed in Photoshop CS2. The two images are not identical, but are extremely similar in overall color palette and detail. Any slight differences between the two should be chalked up to my processing. That being said, both programs have their strengths and weaknesses, but neither is far and away superior to the other in HDR Tone Mapping capabilities. If you want to consider either of these programs, here are our final thoughts on both HDR processing methods.

Photmatix Strengths:

• As a stand-alone program, it can process HDR images from any type of source image, with or without a separate image editing program. You can create HDR images and import them into any version of Photoshop or Photoshop Elements, or any other image editing programs.
• Price: At $99, it is significantly less than Photoshop CS2.
• Automation: Using a logical naming scheme can speed up some of the initial processes.
• Slider controls for Tone Mapping are easy to experiment with.
• Exposure Blending methods sometimes prove to be better than Tone mapping.
• HDR Preview window.

Photomatix Weaknesses:

• Exposure blending methods are frequently disappointing.
• Is easy to accidentally Tone map a single 16-bit image when you really wanted to create an HDR to Tone Map.
• Extremely limited Non-HDR image editing options.
• Non-intuitive workflow.

Photoshop CS2/Bridge Strengths:

• Built into Photoshop CS2.
• Offers Powerful adjustable Curve Controls.

Photoshop CS2/Bridge Weaknesses:

• Price: Photoshop CS2 is expensive ($649).
• No preview available for high-bit image adjustments. You're stabbing in the dark if you change gamma or exposure.
• Workflow can be confusing.

rive space to save HDR-format files. A full-size HDR "negative" file from 4 Canon 5D RAW images yielded a 145.6 MB HDR image!

In the field:

1) Use a tripod. Even the slightest movement of the camera between exposures will be noticeable.

2) You can autobracket if you want, but make it in the biggest EV increment your camera allows.

3) If you want more than three source images, choose your aperture and ISO speed, and keep these locked. Change your shutter speed in full-stop increments from a virtually black frame to an almost completely white frame.

4) Moving objects will be "ghosted" in the Merged/Tonemapped HDR. Still subjects work best. Make sure there are not cars, pedestrians, etc., moving in between exposures.

5) Dramatic differences in colors and "textures" seem to work well in HDR. Choose subjects that have good color differences, and good contrast between natural and/or manmade textures

6) For very long exposures past 1/15 sec, consider using Mirror Lock-up if your camera offers it, to minimize camera vibration during the exposure.

In the Digital Darkroom:

1) These processes can take a long time, even on a new, fast computer. Consider doing some tests and experimentation on small, screen-sized images first, to get a feel for HDR. Your scratch disk will thank you.

2) Don't panic when you first do a merge to HDR and see the weird, thresholdy HDR "Neg." It has to be tonemapped and adjusted before it looks OK. You're only halfway there so far.

3)) Be patient when making Tonemapping adjustments, especially on a print-sized image. Let the preview update itself before making another adjustment (did I mention that these are big, slow processes?)

4) You can cheat a bracketing sequence of one image by playing with exposure controls to make a series to merge to HDR; but this does not work with RAW files in Bridge, using Bridge/Photoshop to merge to HDR, because the program is crunching the RAW information, and even if you apply exposure changes to import to Photoshop, the RAW info remains the same. Convert the RAW files to 16-bit TIFFs and this should work.

5) Experiment! Use different settings and curve controls to see what each adjustment does to your image. Since the Tonemapping process outputs a non-HDR file, you can go back to your HDR "negative" and apply different settings and save your results without affecting your HDR "negative," provided you save a copy of your HDR-format image prior to Tonemapping.

6) There's no real "formula" or specific set of numbers that will work for every HDR image. The numbers and curves I've used for one image don't necessarily work for a similar image. You've just got to play with it.

7) Make sure you've got a fair amount of free hard-d2) Don't panic when you first do a merge to HDR and see the weird, thresholdy HDR "Neg." It has to be tonemapped and adjusted before it looks OK. You're only halfway there so far.

8) Try before you buy! Give Photomatix and Photoshop CS2 a test run with their free demos. If you get a result you like, save the settings, and you can go back and reapply the setting to your source HDR image after you've purchased a license for the software.

EDITOR'S NOTE

The previous pages were reprinted from www.popphoto.com. from an article titled and written by Jack Howard. The original article was titled

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but has been heavily edited by your editor. Therefore any errors in continuity are the fault of the editor. For a full reprint go to the above website and key in the title.

—ED