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Creating HDR Images by Hand: Part I

Creativity in the Photoshop Darkroom by [Harold Davis](#)

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In my article [Advanced Photoshop Tutorial: Multi-RAW Processing](#), I explained that photographers can use more than one RAW processing pass to access the extended digital information contained in a single RAW photo file.

A great many of my images involve captures at varying exposures in a hand HDR (High Dynamic Range) process, and I often get asked to explain the details of the process. The article lays the foundation for understanding my approach to hand HDR. By the way, many people think that HDR can apply primarily to subjects like landscapes. Actually, I use the technique on all kinds of subjects—for example, the variegated rose image shown at the top of the article.

This is a simple idea with huge implications for digital photographers. I explained in the article on Multi-RAW processing that if you don't multi-RAW process, you can take photos with immediacy—but will lose out on a great part of the richness of digital photography: “Essentially, a RAW file is a potentiality rather than a final rendition.” Ansel Adams said of his work that “a negative was a score, and the print the performance.” In much the same way, a RAW file is the score, and what you do with it in the digital darkroom is the performance.

A significant—but far from the only—implication of multi-RAW processing is that in the Photoshop darkroom you are not stuck with your original exposure. There is a vast potentiality of exposures embedded within each and every RAW file.

The news gets even better. You can use multi-RAW to process different parts of a photo to expose properly for each part—a life saver when some areas of an image are too dark and other areas are too bright.

For example, I shot the photo you see in Figure 1 in the dark back stair of a crumbling but magnificent art deco apartment building in Havana, Cuba.

Figure 1: A staircase in Havana, Cuba, image improved with multi-RAW processing.

The stairway was lit by a few bulbs and with a default conversion from RAW the areas of the photo close to these lights seemed too bright. At the same time, the conversion lost portions of the railing in the deep gloom of the shadows.

Using multi-RAW processing, I was easily able to “fix” the photo shown in Figure 1. See my book [The Photoshop Darkroom](#) (Focal Press) and here on Photo.net [Advanced Photoshop](#)



Edificio Rubio Cuervo

[Tutorial: Multi-RAW Processing](#) for a detailed explanation of the process and my workflow.

By the way, the goal of digital post-processing is not always—or even most of the time—to even out lights and darks. You'll notice that the image in Figure 1 has considerable remaining areas of darkness and brightness even after my work in ACR (Adobe Camera RAW) and Photoshop, and this was done intentionally.

Ultimately, if you want to come up with a dramatic image, you'll probably need a big contrast range from light to dark. Everything in this world is relative: excitement is greater when compared with boredom, and so it goes with photos as well. The goal should never be to completely flatten the apparent light levels in an image.

So multi-RAW processing is great, but there are limits to the exposure range incorporated in a single RAW file. At the darker (underexposed) range of exposure values within a RAW file, increased noise is usually a very serious issue. But there's absolutely no theoretical limit to the exposure range you can capture using multiple in-camera exposures.

Understanding HDR

Think of it this way: a camera that can save RAW files probably has an ISO range of something like 100 to 3200, a shutter speed range from hours (using a Bulb setting) to 1/5,000 of a second, and (depending on the lens) and aperture range from f/2.8 to f/22. A back of the envelope calculation, from letting in the least light (1/5,000 of a second at f/22 and ISO 100) to letting in the most light (1 hour at f/2.8 and ISO 3200), shows that this is an exposure range of 184,320,000,000 times: far, far more than the comparatively picayune 256 times exposure range within a single RAW file.

Subject to the realities of the physical world and the practicalities of photography (see "Shooting for HDR" later in this article), this vast exposure range can be tapped. This is the idea behind HDR—High Dynamic Range—photography.

Keep in the back of your mind the thought that multi-RAW processing can be combined with HDR to even greater effect than either technique alone. HDR means combining multiple captures with different exposure settings. Multi-RAW means combining versions of a single capture that have been processed for exposure differently. The two techniques can be combined for greater effect.

HDR is a term that is widely misused and misunderstood. For one thing, the term is somewhat opaque. If you said CBER—Combined Big Exposure Range—people might be more likely to know what is meant. HDR isn't really "High"—it is big, or wide. And the technique doesn't really refer to a "dynamic range"; rather it is an exposure range used to create a combined—or composited—image in post-processing.

Leaving words aside, many people have come to believe that HDR means the specific combination of different exposures accomplished by automated software such as Photomatrix or the Merge to HDR command in Photoshop (see "Automated HDR Tools" later in this article).

This is simply not the case. In fact, HDR is a general term that refers to the theoretical idea of combining multiple captures to extend the exposure range, and is implementation independent.

Automated HDR software can be useful. But a problem with it is that images processed with this software tend to look artificial. There's a specific look and feel you get when you run a series of captures through automated HDR software. I've sometimes used this software as a starting place for my HDR imagery, but mostly I prefer to have more creative control over my imagery—and I don't always like the obviously artificial appearance of automated HDR.

Shooting for HDR

However you plan to process your series of captures intended for HDR, the first step is to shoot the series at different exposures.

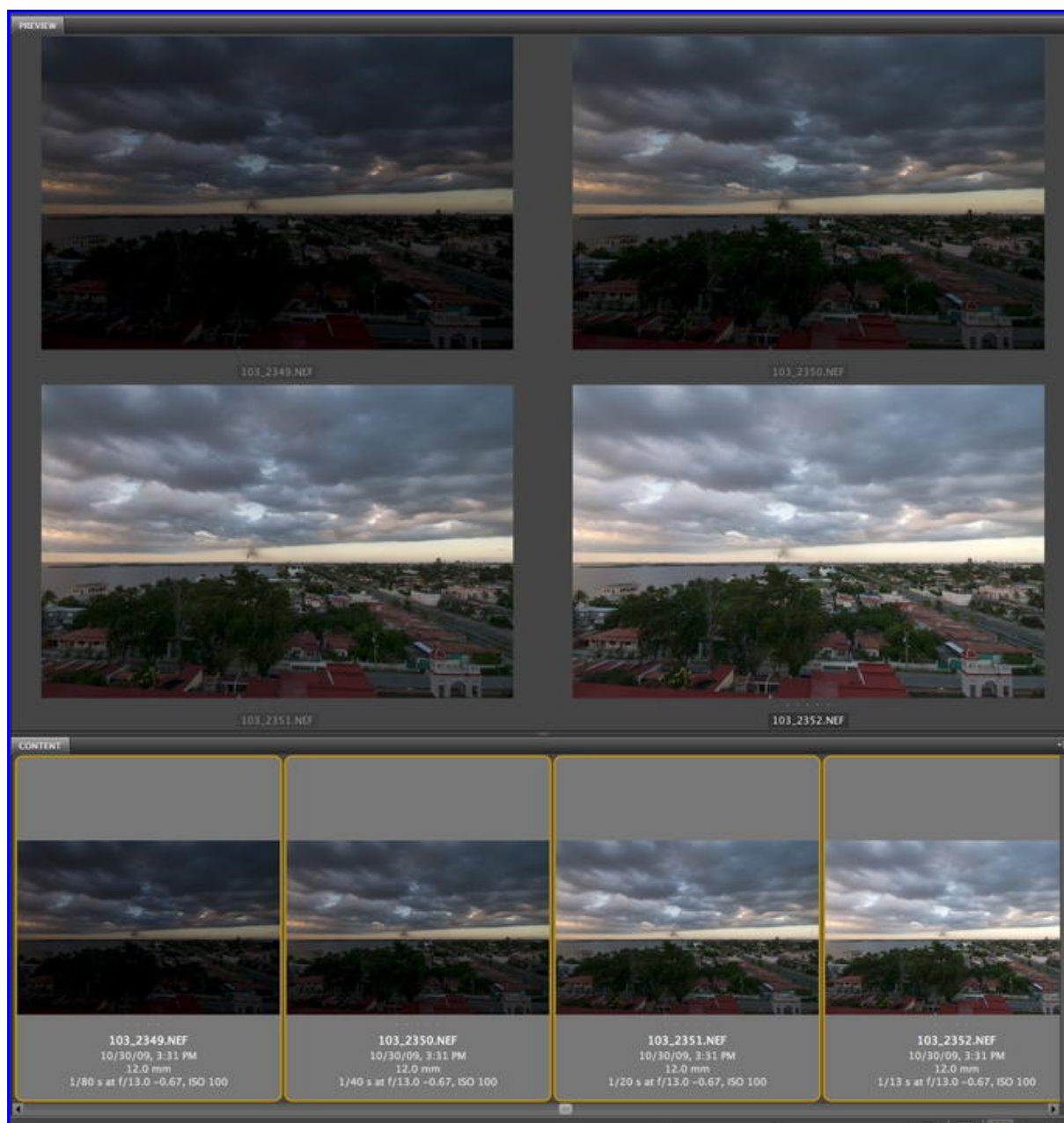
I've already mentioned the vast potential exposure range possible if you ignore the real world. It's a range in the billions!

However, photography involves creating two-dimension design within the constraints provided by the world. As a practical matter, only a relatively small range of exposures will

apply to any given situation. Although there's a great deal of variability in HDR shooting scenarios, the following guidelines usually apply:

- The camera shouldn't move between captures. It's simplest if you use a tripod. You can try using software to align individual captures if there was camera motion, but at best this adds another level of complexity to the post-processing—and doesn't work as well as having a motionless camera in the first place. Another possibility is to have your HDR exposures accomplished using high-speed strobe bursts—so close to each other in time that there is little camera or subject motion.
- Keep the ISO to something reasonable, in the 100-400 range. Otherwise, your HDR composite is likely to get noisy, which kind of defeats the purpose of HDR.
- It's better to vary the shutter speed than the aperture. If you change apertures between captures, you risk impacting each individual capture by varying depth-of-field—which could jeopardize the final HDR composite.
- If your subject is in motion while you are making your HDR captures—depending upon the relative rate of subject motion compared to elapsed camera time—you may end up creating a stacked composite in which the subject motion is visible. I'll be writing more about stacking in a future column, and the effect can be interesting—but you should be aware that subjects that are moving may simply not be suitable for HDR.
- Assuming you are bracketing the shutter speed, you should have no fewer than three captures. HDR works better with more captures, so between 5-10 captures is a good idea.
- I tend to bracket at about 100% shutter speed increments, calculating my exposures manually rather than using an in-camera bracket program. For example, I shot the four images of a sunset in Cienfeugos, a provincial city in Cuba, shown in ACR in Figure 2 with hand HDR in mind at ISO 100 and f/13 and shutter speeds of 1/80 of a second (dark sky), 1/40 of second (intermediate sky), 1/20 of a second (light sky) and 1/13 of a second (foreground cityscape).

Figure 2: Bracketed captures intended for HDR shown in ACR.



Automated HDR Tools

Before turning to hand HDR, which I accomplish using layers and masking in Photoshop, it's worth taking an automated HDR tool for a quick spin. This "test drive" accomplishes two purposes:

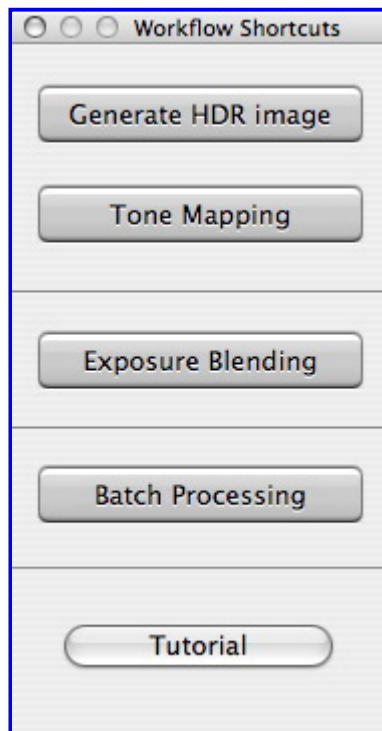
1. Automated HDR can be a good starting place for a portion of a hand HDR image. In particular, software can handle HDR blends of complex areas like the undergrowth of forests with a great deal more ease than if you have to individually painting in branches. Sometimes I'll start with an automated HDR blend then layer in specific areas by hand.
2. It's easier to grasp the full powers and capabilities of hand HDR if you have a better sense of what HDR software can—and cannot—do for you.

Photomatix, found at www.hdrsoft.com, is probably the most capable HDR software. Because Photoshop's version of automated HDR (File > Automate > Merge to HDR) is essentially similar to Photomatix, I won't be showing its interface in this article.

There are two parts to Photomatix: the initial HDR blend, and an adjustment step that is called "applying a tone curve." Note that a tone curve can be applied using Photomatix as a Photoshop or Lightroom plug-in.

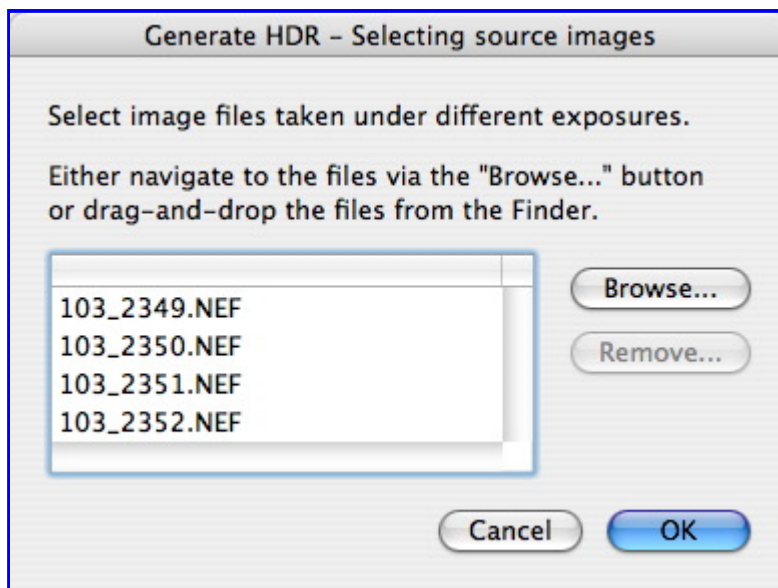
Using the first part of Photomatix couldn't be simpler. You fire up the application, and the small window shown in Figure 3 opens.

Figure 3: To get started with Photomatix, simply click Generate HDR image.



To get started, click Generate HDR image. The next window, shown in Figure 4, lets you choose the captures you want to include.

Figure 4: Select your images taken using an exposure range.

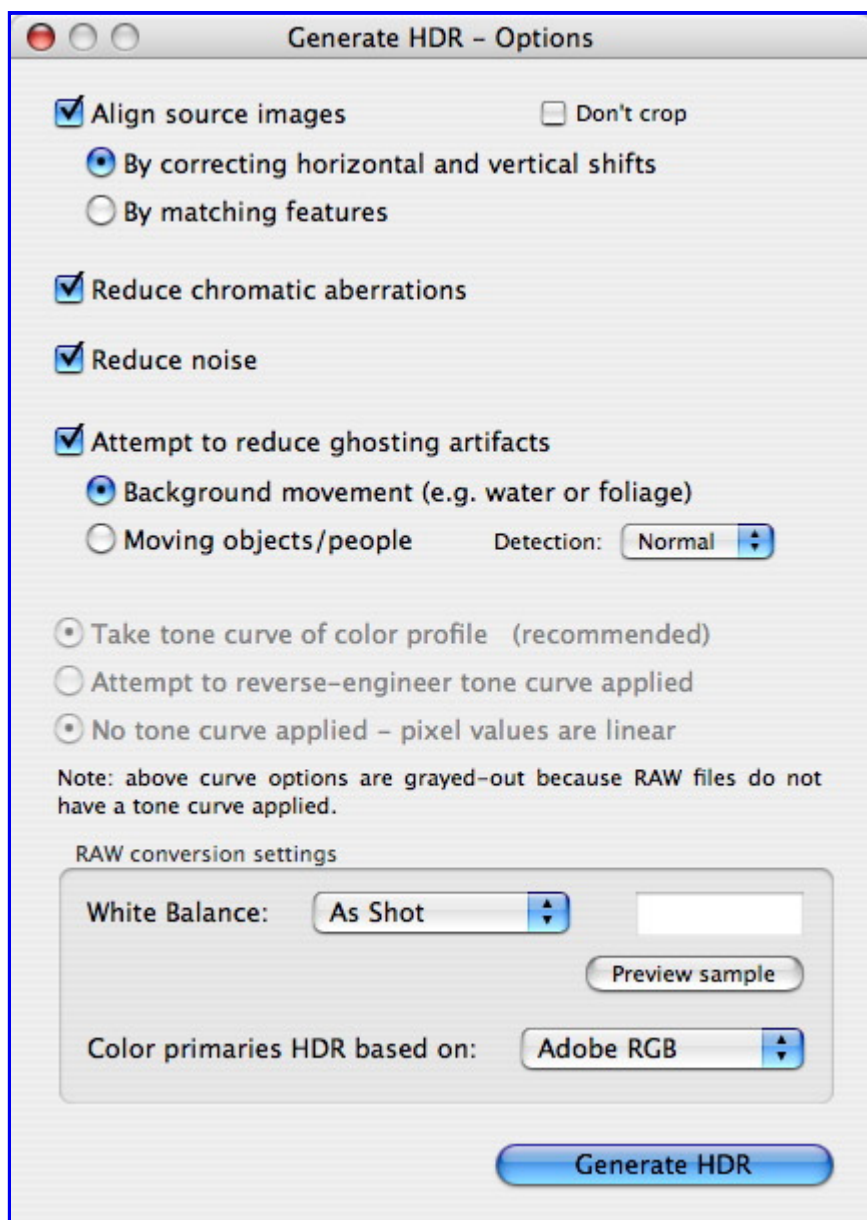


The interesting point here is whether or not you decide to have Photomatix read the RAW files directly (as in the example shown). Photomatix has the most power when it is working from RAW because it can access the full range of the RAW potentialities.

As an alternative to RAW files, Photomatix will process JPEGs and TIFFs. If you convert the captures yourself before choosing them in Photomatix, you get more pinpoint control of the conversion, and you can include different RAW versions of the same capture—but the resulting HDR image has less range. In other words, the conversion is a great deal closer to what you'd get converting to HDR by hand.

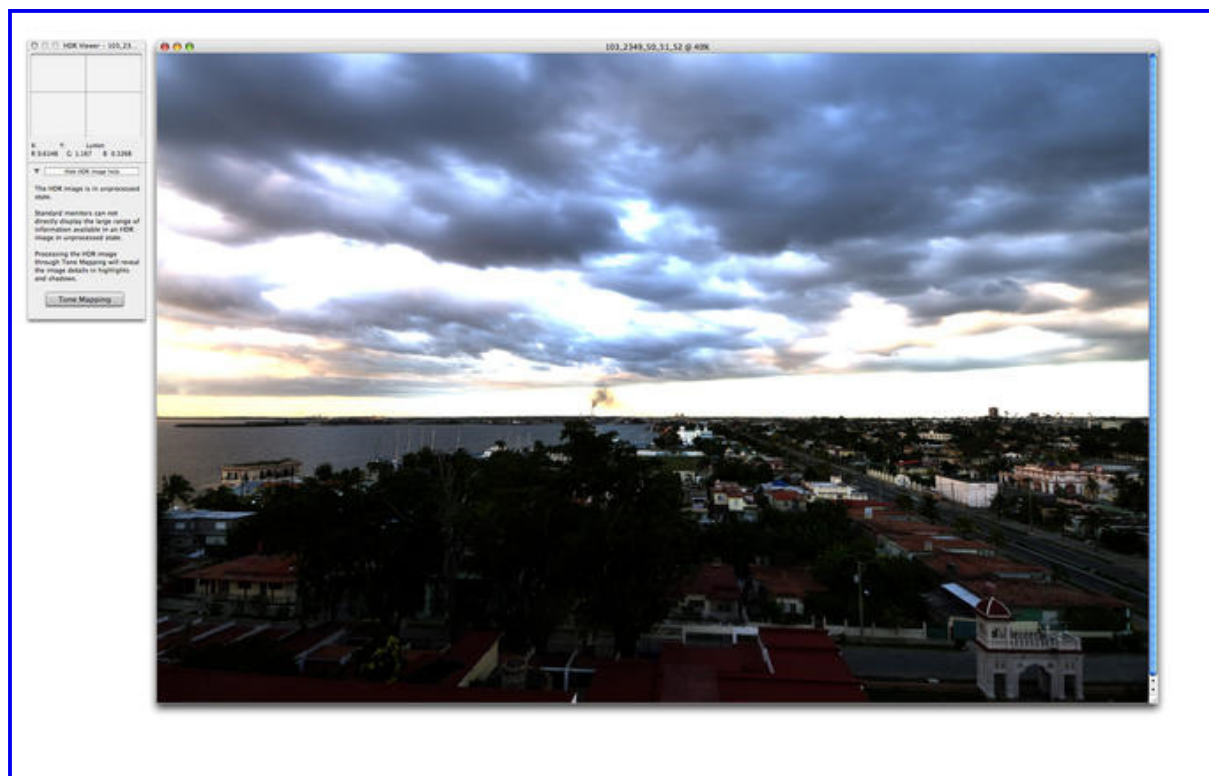
After you've chosen the files to include in your HDR, you can choose from options as shown in Figure 5.

Figure 5: Photomatix will attempt to align images if you didn't use a tripod, with mixed results.



When you click Generate HDR, the blending process begins. This may take a while, even on powerful hardware. When the blending is complete, a window like the one shown in Figure 6 opens.

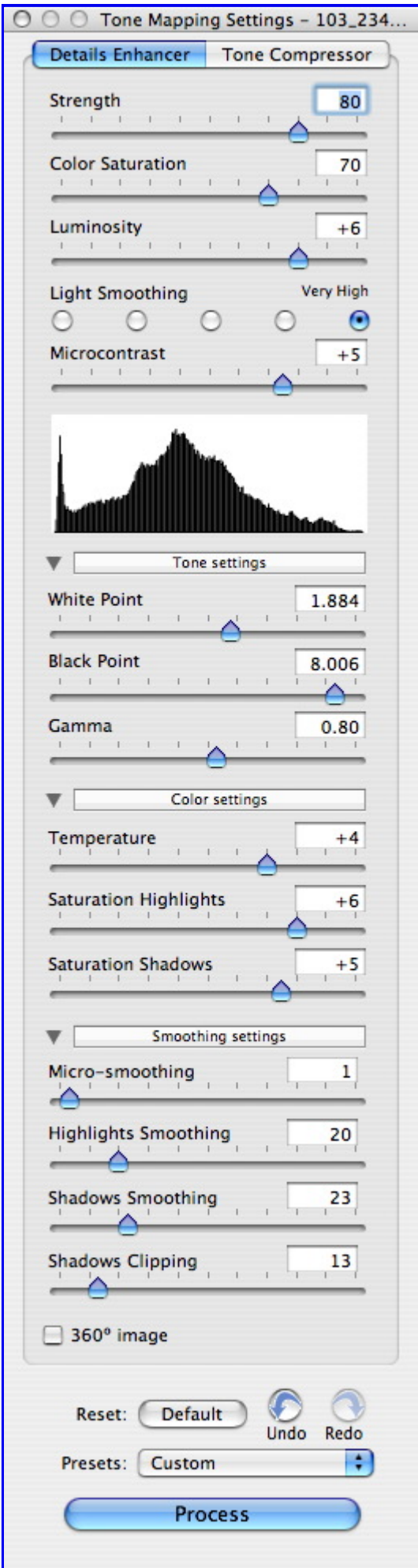
Figure 6: With HDR blending complete, it is time to tone map.



Photomatrix documentation warns that you should pay no attention to what the image looks like at this point, supposedly because the dynamic range of the HDR blend cannot be reproduced on a standard monitor.

In any case, the thing to do is to click the Tone Mapping button shown in Figure 6. The Tone Mapping window shown in Figure 7 will open.

Figure 7: Tone mapping gives you considerable control over the finished HDR image.



Tone mapping gives you a fair amount of control within the parameters of the Photomatix

HDR aesthetic. (As I've noted, you can alternatively access Photomatix tone mapping as a Lightroom or Photoshop plug-in.)

A full discussion of the tone mapping controls is beyond the scope of this article. Expert Photomatix users will mostly tell you that the secret to successful HDR imaging is to master the tone curve—and to apply custom Photoshop layers on top of Photomatix conversions. You should by all means experiment by adjusting White Point, Black Point, and Gamma.

With very little alterations from the default, the Photomatix generated HDR image is shown in Figure 8.

Figure 8: The out-of-the-box Photomatix HDR image is pretty remarkable as an image processing accomplishment, but it looks nothing like the scene did in "real life."

Looking at Figure 8, I'm impressed with how little effort the process took. There's a wide range of tonal values, and color saturation is excellent. However, the image looks nothing like the scene I saw while taking the photo—and is not the image I want.



Figure 8: Cienfuegos
Photomatix

I shot four images of the sunset scene in Cienfuegos because I knew I would need to extend the dynamic range of the individual captures. An exposure that was correct for the foreground made the sky too bright, and an exposure that captured the drama of the sky would significantly underexpose the foreground.

This kind of exposure problem can often be solved with two captures. The captures are then opened as layers in Photoshop, one capture is masked, and the two are combined using a gradient. The gradient allows the sky to show in the layer exposed for the sky, and the city to show in the layer exposed for the foreground, with a smooth transition between the two layers. Once you get the hang of it, this kind of processing can be accomplished in a matter of minutes. There's a step-by-step case study of using this technique to combine a sky and earth layer on pages 31-39 of [The Photoshop Darkroom](#).

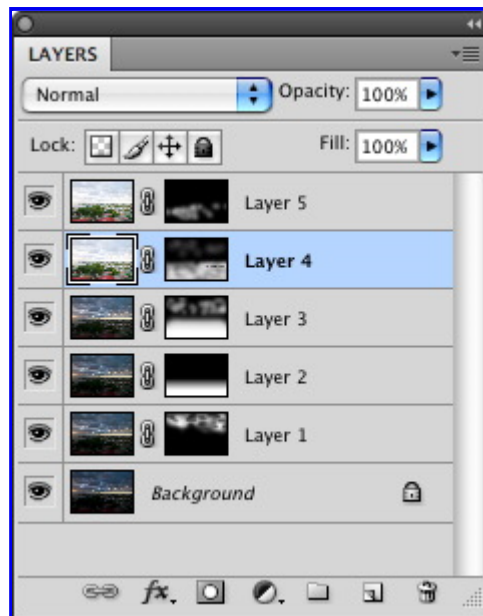
In the case of the Cienfuegos sunset, I shot 4 (rather than 2) versions so when it came to hand HDR I'd have more rather than less information to play with.

The general process goes like this:

- For each capture to be used in the hand HDR blend, make one or more RAW conversion(s).
- Each RAW conversion will become a layer in the layer stack that will make up the hand HDR image.
- Care must be taken to precisely align each layer.
- Layers are combined using Layer Masks. I usually use Hide All Layer Masks. A Layer Mask that hides the layer it is associated with is black. Regions of the mask that are painted in white are associated with the parts of the layer that display in the final blend. Portions associated with gray areas in the mask blend into the display at lower opacities.
- Once the layer stack of HDR captures and multi-RAW versions is assembled, it can be used as the basis for further refinements in Photoshop.

Since you can include more than one multi-RAW processed version of a capture in a hand HDR layer stack, it is not unusual for one of these stacks to have more layers than there are captures.

For example, the stack in the Cienfuegos Sunset image has six layers (including the Background layer), as you can see in the Layers Palette shown in Figure 9.



To open a single image multiple times in ACR for multi-RAW processing, my workflow includes opening ACR from Adobe Bridge, converting the RAW image, opening it in Photoshop, then going back to Bridge and repeating the process on the same image as many times as I need to (see [Advanced Photoshop Tutorial: Multi-RAW Processing](#) for the detailed steps).

To align the layers created this way, in Photoshop hold down the Shift key and use the Move Tool to drag the lighter version on top of your saved background. Holding down the Shift key constrains the move operation so that the two layers are exactly aligned. Don't release the shift key until after you release the mouse button.

Aligning layers from different captures that are part of the same hand-HDR blend works in exactly the same way—provided you shot the images so they line up precisely in the first place.

There are a number of viable alternatives to my preferred workflow, but they all ultimately involve using a layer stack, masking, painting and the gradient tool to combine the different layers exactly as you'd like.

If you plan to use the same ACR settings on all the captures in your hand HDR stack, you can select them all in Adobe Bridge, then choose Tools > Photoshop > Load Files into Photoshop Layers. If you are using Lightroom, multiple images, including copies that have been processed in alternative ways, can also be loaded into Photoshop as layers.

Figure 10 shows my finished version of the Cienfuegos Sunset. Perhaps I went a bit overboard in my interpretation of the wild colors in the clouds, but I really do prefer my hand-processed HDR version to the automated HDR.

Figure 10: Compared to Figure 8, I was able to completely control the processing of this hand-HDR version.

Conclusion

This article started with a brief discussion of how to process a RAW file multiple times—important both because many hand HDR conversions involve multiple RAW layers from the same capture as well as different captures, and because the techniques used in combining layers in Photoshop are the same for multi-RAW and hand HDR image processing.



Cienfuegos Sunset

Next, I explained the correct meaning of HDR—the term refers to the concept of extending the exposure range used to capture a scene using multiple captures. It does not mean specific software used to blend the different captures, or a specific aesthetic of blending images with differing exposure values.

I provided some important information about shooting multiple images for HDR processing. To be successful with any form of RAW processing you want to think carefully about how you create the underlying captures.

Walking through the Photomatix software was significant—both because the example shows you how results contrast with hand HDR processing, and because the similarities and differences with the hand HDR process become clear.

As I explained, hand HDR means placing the RAW conversions of different exposures of a scene as layers in a Photoshop layer stack. Once you have these layers combined in Photoshop, the techniques used to integrate the stack are the primitives of Photoshop: layers, masking, painting on masks, and blending modes.

Many of the techniques used for dealing with stacks of layers are explained in [Advanced Photoshop Tutorial: Multi-RAW Processing](#). You'll also find a detailed case study of these methods on pages 106-117 of [The Photoshop Darkroom](#) (Focal Press). A subsequent article in my Creativity in the Photoshop Darkroom series will also look at various common layer and layer stack scenarios.

More

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About the Author



Harold Davis is a photographer and author. His photographs have been widely published, exhibited, and collected. Many of his fine art photography posters are well known. Harold's images have won a Silver Award in the International Aperture Awards 2008 competition, and inclusion in the 2009 North American Nature Photography Association Expressions Showcase. Harold is the author of *The Photoshop Darkroom: Creative Digital Post-Processing* (Focal), *Creative Composition: Digital Photography Tips & Techniques* (Wiley), *Creative Night: Digital Photography Tips & Techniques* (Wiley), *Creative Close-Ups: Digital Photography Tips & Techniques* (Wiley), *Practical Artistry: Light & Exposure for Digital Photographers* (O'Reilly Digital Media) and other books. Harold gives frequent digital photography workshops, many under the auspices of the Point Reyes National Seashore Association. [More »](#)

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