

# Put a Fine Edge on Your Sharpening Skills

## *Professional Techniques for Sharpening Your Photos*

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Professional advice about how and when to sharpen has been undergoing change the last couple of years. The traditional advice was to sharpen as one of the very last steps in your workflow.

Bruce Fraser, one of the authors of the “Real World Adobe Photoshop” series of books and a highly respected Photoshop pro, has been advocating sharpening as an ongoing process during image editing rather than a single activity. Sharpening in his opinion is best implemented both early and late in your digital image workflow, and if done with care, you can also do additional rounds of creative sharpening on particular features of your photographs.

Sharpening is an essential part of image editing. All images captured by a digital camera or a scanner can benefit from digital sharpening.

When you convert the continuous tones and colors of a subject into a digital file, you are certain to lose sharpness. Digital input devices, such as cameras and scanners, have limits in their resolution. A CCD or CMOS imager has a fixed number of pixels and those continuous tones and colors you see in the subject will get converted into a set of discrete pixels. Imagine the scene divided up into thousands of photosites, horizontally and vertically. Any detail smaller than a pixel will be lost. All DSLRs process the image before you see it. They detect transitions in tone and color and then sample on both sides of those transitions to make more gradual transitions, especially diagonal details.

Softness is also introduced by the anti-alias filter used on DSLRs. Without it, images from DSLRs tend to produce moiré patterns and other color artifacts. The anti-alias filter blurs the image slightly, so that fine details are partially spread over multiple photosites.

More softness is added when you output your digital file. Output devices, like printers and film recorders, also have limited resolution.

When you sharpen, you also need to consider the effects of noise. The conversion of light into digital signals is an imperfect process. There will be minor fluctuations in the sensitivity of individual pixels in a CCD or CMOS imaging chip. Most digital cameras use alternating red, green, and blue pixels and complex algorithms to look at neighboring pixels to interpolate RGB values for each and every pixel. We get more noise and more softness as a result.

Noise comes in two important variations: luminosity noise and chromatic noise. Luminosity noise occurs when the pixels are not uniform in their sensitivity to light. This is the sort of noise you are likely to see in the shadows of an image, making them look

muddy or splotchy or grainy. Blue skies are also among the usual suspects for evidence of luminosity noise. Chromatic noise affects the color of pixels and typically looks like little colored speckles.

## Careful Sharpening Starts with Masks

You can limit the effects of noise by reserving most of your sharpening efforts on the edges of your image and keeping the sharpening away from the extreme shadows and highlights.

Most of the sharpening tools and most of the recent discussions on sharpening emphasize edge sharpening. Apparent sharpness increases when the contrast along edges increases. If you limit the sharpening to the edges, you can avoid sharpening a lot of the noise in an image.

Creating an edge mask in Photoshop is relatively easy, when you define your edges solely in terms of luminosity. You can use something like the Find Edges filter followed by Invert and a Levels or Threshold adjustment to increase the definition of the edges and then a Gaussian Blur to soften the selection.

Differences in luminosity are not the only way to define edges, however. Sometimes the edges in an image can involve significant differences in color *where those colors have the same tone*. In that case, we need a color edge mask. Color edge masks require more effort.

My preference is to work nondestructively. So I do my sharpening on layers and I make my masks on duplicates of my images. Then I copy them back to my working image. I typically set the opacity for my sharpening layers to 65%. This lets me dial the sharpening in or out later.

To make a color mask, start with a color separation. Here are the steps for a color separation:

1. Copy the layer and rename it to “Color”
2. Create another copy of the layer. By default, it will be named “Color copy”
3. Select the “Color” layer. And fill it with midtone gray (RGB = 128,128,128)
4. Select layer “Color copy” and set the Blend Mode to “Color”
5. Merge the two layers. The layer will automatically be renamed “Color”

The layer will look like a gray fill layer will color details faintly visible. The next step is to make a color mask from the color separation layer. These are exactly the same steps for making a luminosity edge mask.

1. Run the Find Edges filter
2. Invert the image for an edge mask

3. Use Threshold to boost the contrast in the mask (You can use Levels, if you prefer. I find Threshold works better with color masks and Levels with luminosity masks.)
4. Apply a slight Gaussian Blur to feather the selection

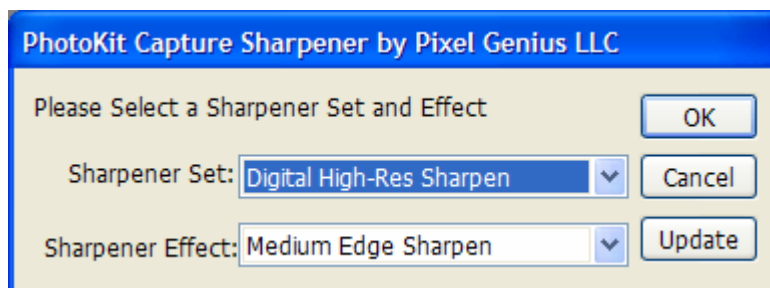
You will likely find that a color mask and a luminosity mask will find many of the same edges but each will also find some edges unique to just one of them. My preference is to combine both masks into an enhanced edge mask.

1. Copy each mask to a separate layer
2. Open the Layer Styles palette for the topmost layer
3. Set the Blend Mode to “Screen”
4. Adjust the opacity of the layer
5. When you are satisfied with the composite, merge the two layers

## Taking Control of the Sharpening Process

Some photographers prefer automated tools for sharpening. When you need to process several hundred images from a wedding, for example, automated workflows are essential to your profits.

Automated tools trade precise control over the sharpening process for ease of use. You select a level of sharpening, perhaps also selecting the type of input or output device. Then the sharpening tool runs, using some preset sharpening parameters.

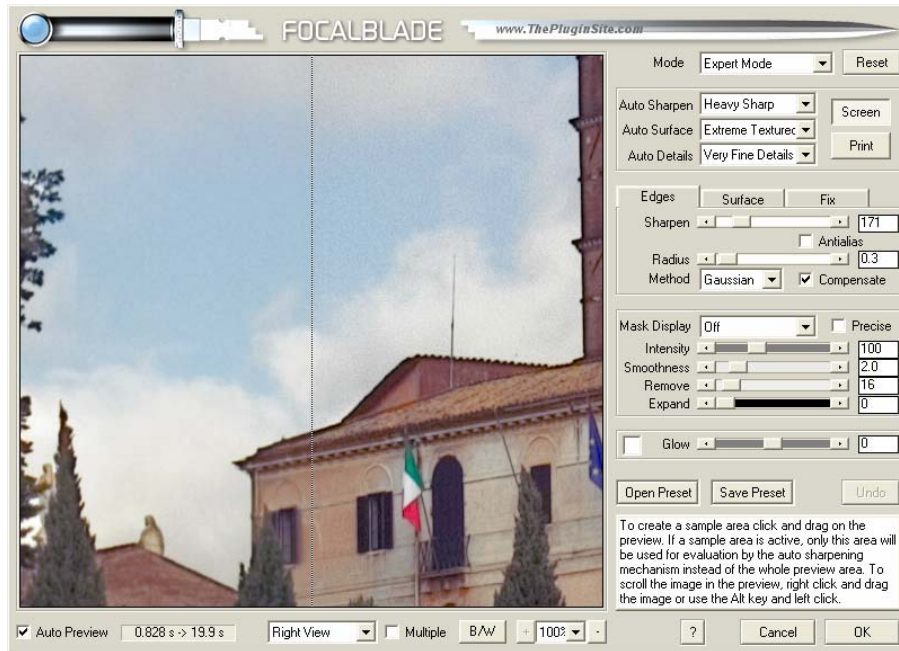


**Figure 1.** PhotoKit Sharpener is a popular sharpening tool. Rather than setting values for various sharpening parameters, you instead select a preset sharpening level to apply.

I am admittedly obsessive about my photography. I always strive to craft the finest image that my skill and experience will allow. I avoid solutions that apply sharpening as a series of preset levels, favoring instead tools that leave the photographer in full control.

Some tools give you both features: quick and easy presets as well as manual control when you want it.

Most sharpening tools use a variation of Unsharp Mask (USM) or Highpass Filter sharpening combined with edge or surface masks and various layer blending options.

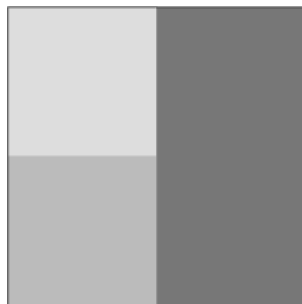


**Figure 2.** Focal Blade is another popular sharpening tool. You can select from various levels of sharpening or take full control over the settings.

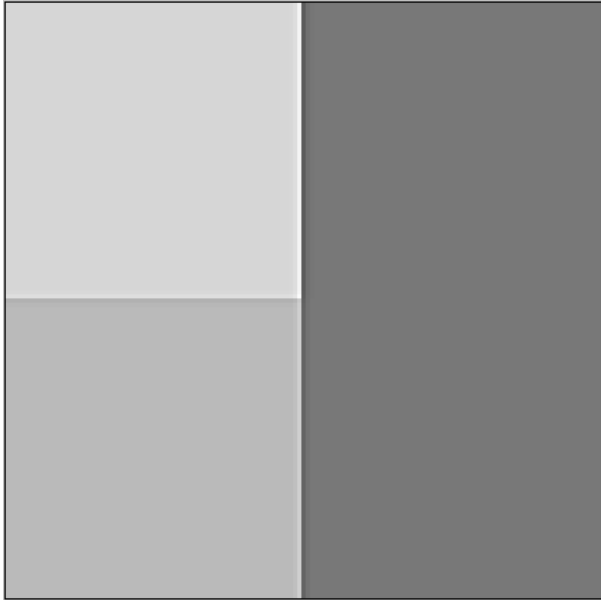
USM sharpening uses three parameters: Amount, Radius, and Threshold. One of the reasons that some photographers prefer automated tools is the amount of experience that is required to make effective use of USM sharpening. You need to understand what is going on and how various settings are likely to affect different images.

USM relies on creating light and dark halos along edges of an image in order to create more contrast. The *Amount* setting controls how intense the halos are. It has no effect on the width of the halos. The widths of the halos are controlled by the *Radius* setting. The *Threshold* setting is used to reduce the amount of noise that is sharpened.

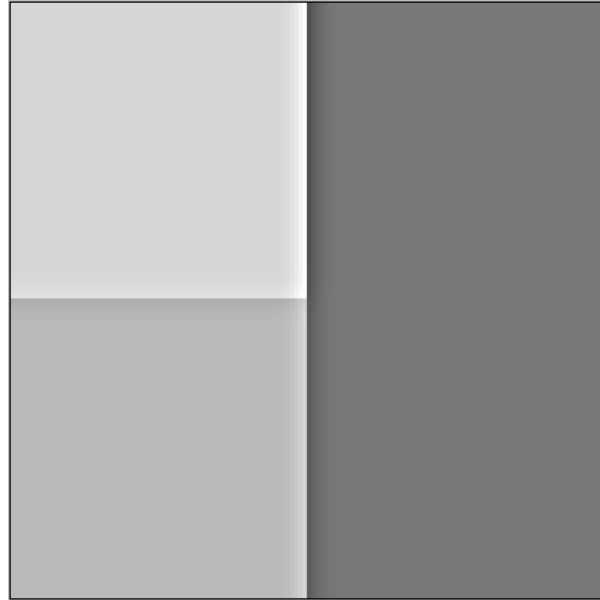
To demonstrate the effects of the *Amount* and *Radius* settings, a simple test target was sharpened nine times. The patches are 15%, 25%, and 50% neutral gray.



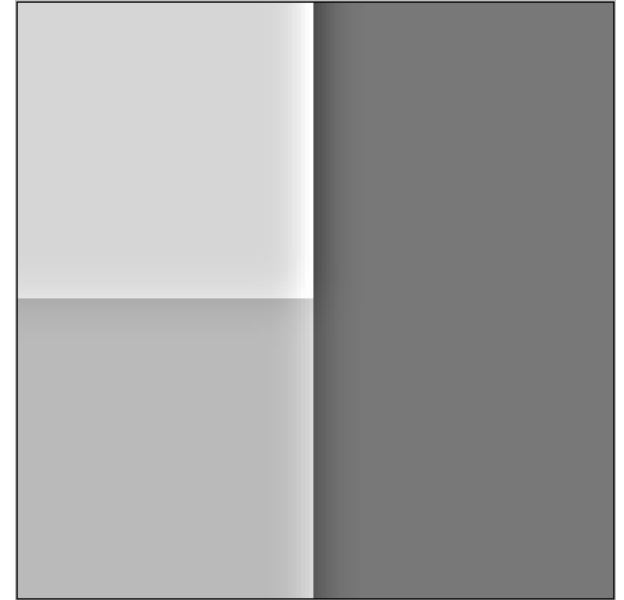
**Figure 3.** A simple test target for assessing the effects of sharpening.



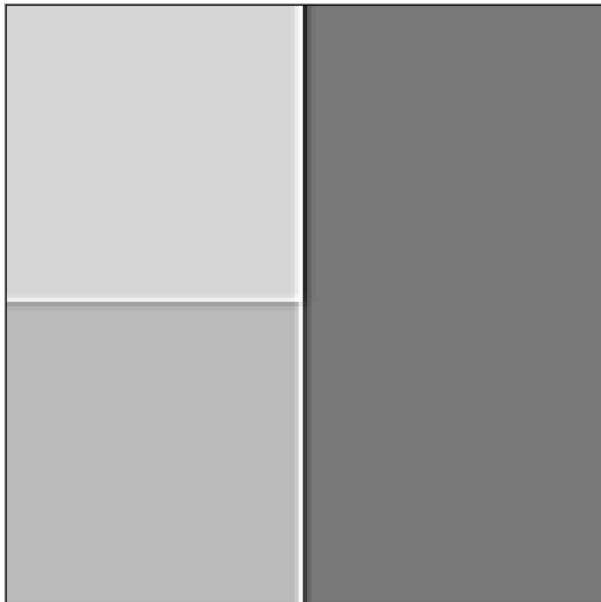
**USM 100, 1.0, 0**



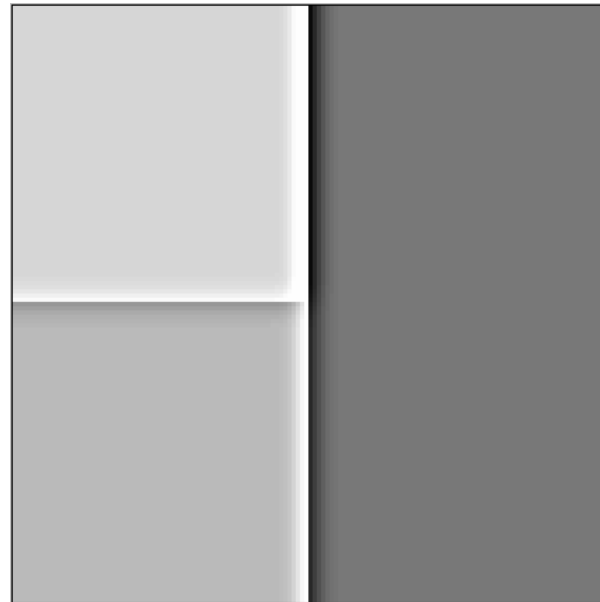
**USM 100, 3.0, 0**



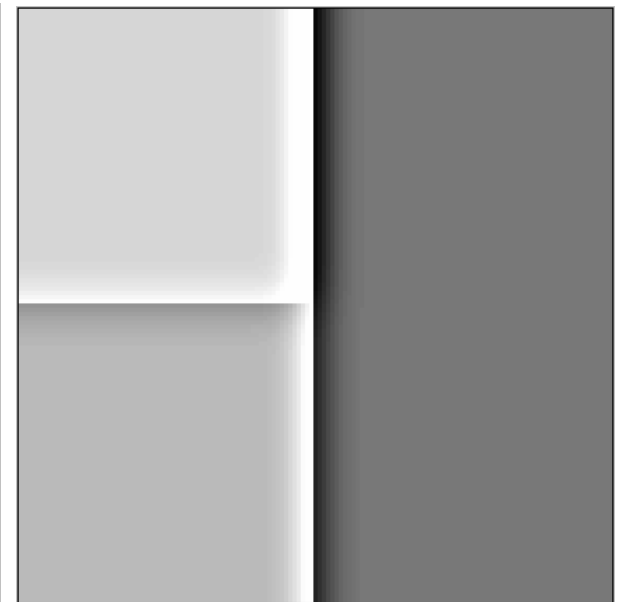
**USM 100, 5.0, 0**



**USM 300, 1.0, 0**



**USM 300, 3.0, 0**



**USM 300, 5.0, 0**



*Figure 4.* 300% enlargements of the test patches at various USM settings.

Increasing the *Amount* setting and keeping the *Radius* setting constant increases the contrast along the tone boundaries. The sharpening effect is most noticeable where contrast is highest to start. Increasing the *Radius* setting and keeping the *Amount* setting constant increases the width of the halos. Wider halos also make the sharpening effect more obvious, but in a different way. Push the *Amount* setting too high and lots of pixels will get pushed to black or white. Overdo both, and the image will take on a chiseled, 3-D appearance.

One important point about the *Radius* setting. . . A *Radius* setting of 1.0 does not mean the halo will be one pixel wide. Even with a *Radius* setting of 1.0, the width of the halo will likely span multiple pixels. This is one of the annoying features about the USM settings. They are not as intuitive as one might expect.

The patches in *Figure 4* were neutral gray tones. Another visual indicator of over-aggressive *Amount* and *Radius* settings is hue and saturation changes. Pros avoid significant color changes with USM by using one of three techniques:

1. Converting to L\*a\*b and sharpening the Luminosity channel and then converting back to RGB or CMYK. This causes color space conversions that can have their own effects on the colors of your image.
2. Perform USM and then immediately after invoke Edit|Fade Unsharp Mask. Set the Blend Mode to Luminosity.
3. Sharpen on a layer, using something like Merge All Visible, and then set the Blend Mode for the layer to “Luminosity.”

The difficulty with USM filtering is that the same settings can have very different effects on images. Images with lots of tiny details (often referred to as “high frequency” images) often benefit from more aggressive *Radius* settings, because the wider halos have a tendency to widen those fine details. Get aggressive with the *Radius* setting on portraits, however, and subject’s skin will likely look mottled.

There is no single formula for the USM settings. It takes considerable experience to know where to start with the USM settings and even pros typically need to make a few attempts before they find the optimal USM settings for a particular image. Make sure the Preview box is checked and watch the preview of the image as you move the sliders for the USM settings. Look at the image at 100%, then 200% or 300% to view the halos in more detail. You can always press ctrl-z (cmd-z on the Mac) and try again.

It is usually best to start with adjustments to *Amount*. High resolution images can take relatively high settings. Then adjust the *Radius* setting. If noise becomes visible, adjust the *Threshold* setting.

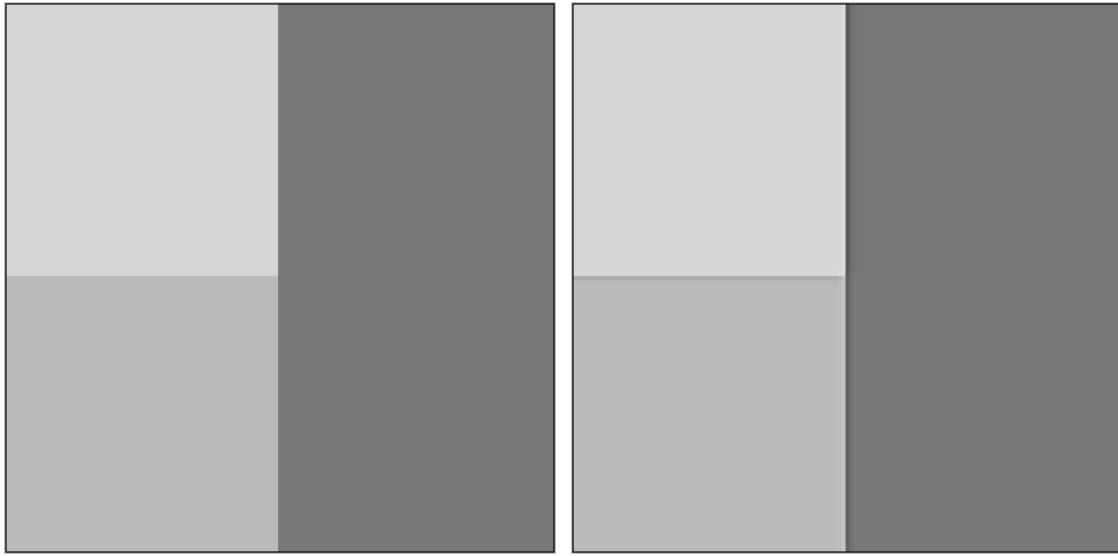
More sophisticated variations of USM sharpening are possible. Refinements popular among the pros include the following:

1. Layer masks can be used to confine USM sharpening to major edges and away from shadows and large areas of relatively undefined color, like blue or overcast sky.
2. Edge masks can be duplicated and inverted. This allows you to sharpen surfaces separate edges. Surface masks are also helpful for noise removal. Instead of applying a sharpening filter, you can employ a blur filter to smooth the effects of luminosity noise.
3. The intensity and width of the black and white halos can be separately controlled by using two sharpening layers. One is set to “Darken” blend mode and the other is set to “Lighten” blend mode. I like to name these “Dark Contours” and “Light Contours” respectively.
4. The Blend If sliders on the Layer Styles palette are also helpful for more precise control of the USM sharpening effect. You can use them to make sure sharpening does not completely burn out the lighter edge pixels or stop up the darker edge pixels. Keep your sharpening effects limited to the quarter tones, middle tones, and three-quarter tones.
5. Sharpening just one or two channels can reduce the amount of noise that gets sharpened. The Blue channel is often noisy in RGB images. So sharpening just the Red and/or Green channels sometimes makes it possible to use more aggressive sharpening settings without making the noise more noticeable.

Many pros now prefer the Highpass Filter for sharpening. One reason is simplicity. There is only one setting to fuss with: *Radius*. Highpass sharpening isolates luminosity edges. So, like using an edge mask with USM, you can avoid sharpening the noise in large areas of solid color.

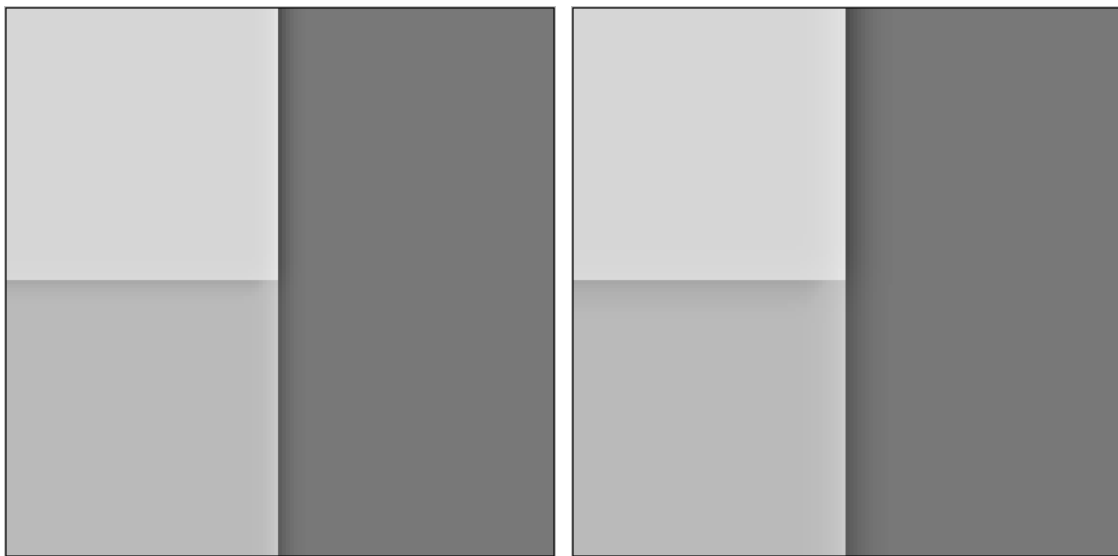
To work with Highpass Filter sharpening, you have to work with a new layer. So, either flatten your image and duplicate the Background layer or make a new layer at the top of the Layers palette and then merge all of the visible layers using alt-ctrl-shift+e (or option-cmd-shift+e on the Mac). After you run the Highpass Filter, you then set the Blend Mode for the layer to “Hard Light,” “Overlay,” or “Soft Light.” You get progressively more intense effects as you use “Overlay” or “Hard Light” blending. I usually set opacity to 65% for the layer, to allow some flexibility for dialing the effect back or increasing it.

You can use layer masks with Highpass Filter sharpening, just as with USM sharpening. Again, this is an excellent technique to keep noise from being noticeable.



**No Sharpening**

**Radius 1.0**



**Radius 3.0**

**Radius 5.0**

*Figure 5.* Highpass Filter sharpening, using a Hard Light blend mode.

### **Capture Early**

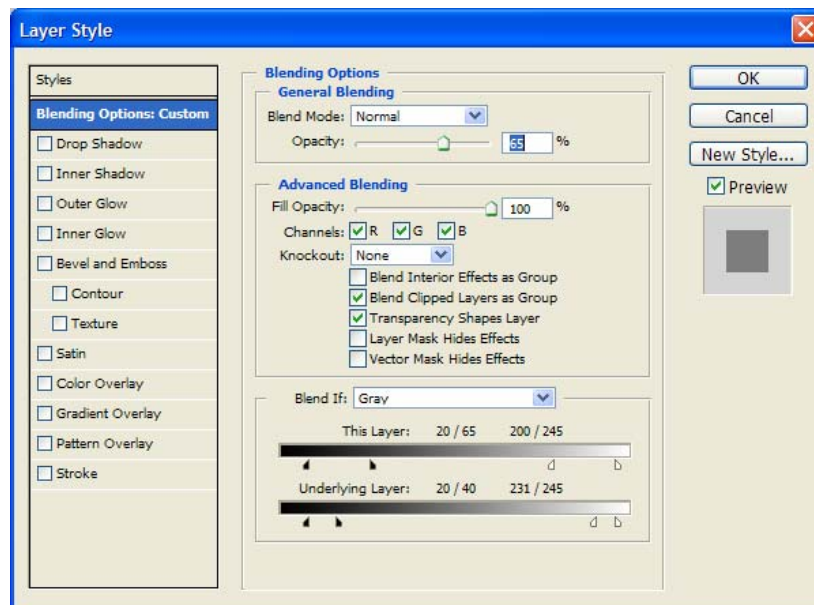
An early round of sharpening right after digital capture can increase image detail without making noise more evident.

Be warned right from the start, if you are the sort of photographer who rushes through image editing, stay away from capture sharpening! You can do more harm than good by

making quick adjustments. If you over-sharpen or end up sharpening a lot of noise early in your workflow, the effects will compound as you do further work on the image.

Sharpening early in the workflow must be done with great care. You want to avoid stopping up the shadows and burning out the highlights. So make sure to use Blend If settings. My preferences, which I borrowed from “Real World Adobe Photoshop CS” by David Blatner and Bruce Fraser, appear in **Figure 6** below. Their Blend If settings keep the sharpening limited to the middle tones. Sharpening extreme highlights and shadows contributes little to perceived sharpness and risks obvious sharpening artifacts.

You also want to be judicious in how much sharpening you apply. You just want to restore the sharpness lost during digital capture and nothing more. Save the output sharpening for later in your workflow. It cannot be stressed enough. If you are too aggressive in your capture sharpening, you will likely get terrible results when you later apply a second or third round of sharpening.



**Figure 6.** Blend If settings to use with capture sharpening.

The image in **Figure 7** is from Rome, Italy. The original was a 6 million pixel image from a Canon 10D camera, using a Canon 17-40mm f/4 “L” lens. The softness is typical of DSLR images.



*Figure 7.* An image from Rome, Italy. No sharpening.

The goal of capture sharpening was to restore the sharpness that was lost by Canon 10D. The softness is particularly noticeable in the details of the buildings and the line of conifers in front of those buildings. The bark of the trees would also benefit from a bit of sharpening.

Care was needed with the sky, shadows at the top of the image, and the fine conifer needles contouring the sky at the center of the image. Aggressive sharpening would add halos to those conifer needles.

Capture sharpening occurred after the RAW image was loaded into Adobe Photoshop via Adobe Camera Raw II. The Background layer was duplicated. Then the Highpass Filter was applied to the new layer using a *Radius* setting of 3.0. The Blend If settings were identical to those in *Figure 6*. A Hard Light blend was used. *Figure 8* shows improvement. The buildings are sharper. More detail is evident in the conifers. Etc.



*Figure 8.* Highpass sharpening applied.

*Figure 9* shows 1000% enlargements of a portion of the image in *Figure 8*. The enhanced contrast along the edges in the sharpened version is obvious, especially the black contour. Because the Highpass Filter was applied to the entire image, some sharpening of noise is also evident in the sky.



*Figure 9.* 1000% enlargements of the presharpened and sharpened images.

**Figure 10** shows the result of the same sharpening setting with a luminosity edge mask used as a layer mask.



**Figure 10.** Using a luminosity edge mask keeps the sharpening away from the sky.

The sharpening is kept away from solid areas of color, like the sky. As with all masks, white reveals and black conceals. Masks are essential to capture sharpening.



**Figure 11.** A luminosity edge mask, used during capture sharpening to avoid sharpening noise

## Capture Occasionally

Creative sharpening is optional. Some images can benefit from some selective sharpening (or blurring) to accentuate certain features. Flower stamens can often benefit from extra sharpening. Eyes in a portrait can gain extra emphasis when the lashes and brows get a little extra attention.

The result of the capture sharpening in *Figure 8* were pleasing overall, but the buildings and the conifer trees in front of the buildings would benefit from a little more sharpening. I was hesitant to apply any more overall sharpening early in the workflow. I was concerned that the bark of the trees in the foreground and conifer needles along the contour of the sky would show sharpening artifacts.



*Figure 12.* Creative sharpening was brushed in. The buildings in the background and the line of conifers in front of them have added sharpness.

Michael Kieran devotes considerable attention to localized sharpening in his excellent book, “Photoshop Color Correction.” Creative sharpening = localized sharpening.

If you have sufficient RAM, you can merge the visible layers for your image into a new layer. Otherwise, save the image, duplicate it, and flatten it. Then make a duplicate layer.

You need to use a layer for creative sharpening. You can set the opacity to something like 65% and leave yourself some flexibility. You should slightly over-sharpen the features you want to emphasize. Apply a Layer Mask using Hide All. Your sharpening results will

disappear! A soft paintbrush, set to white, with a low opacity, lets you brush sharpening back in precisely where you want it.



*Figure 13.* Mask used for selective sharpening of the image in *Figure 12*.

You need to use good judgment with your creative sharpening. As with capture sharpening, you want to avoid over-sharpening. The image will still need to be sharpened for the intended output device. I used USM sharpening (350, 0.3, 0) in *Figure 12* and a brush with 35% opacity. Low opacity lets you build up the sharpening slowly.

If you want to selectively blur features of the image, you can use the same technique with something like Gaussian Blur instead of a sharpening filter. Selective blurring can give added emphasis to sharper features.

The RAW image for *Figure 14* had a wide depth-of-field. I wanted to emphasize the old street woman, not the obelisk or the rest of the activity in the Roman market. Judicious brushing on a Gaussian Blur layer provided extra emphasis to the old woman. The man behind her received a stronger blur effect, the obelisk less. With a low opacity, it is easy to brush in more effect here, less there.



*Figure 14.* Creative blurring can also provide added emphasis.

### **Capture Late**

The important point to remember about sharpening in the early stages of your workflow is to avoid obvious sharpening halos. As you edit the image, those halos will almost certainly become more and more obvious.

Some photographers try to avoid halos during output sharpening. If your image is destined for the Web, you do want to avoid noticeable halos. However, if your output is destined for a printer or a film recorder and you avoid halos, your image will not appear as sharp as it otherwise might.

The trick is to apply sharpening so the halos are sharp enough that they provide the maximum in contrast without being so wide that they attract attention. Bruce Fraser's advice is excellent on this point. You want sharpening halos that are 1/50 to 1/100 of an inch in width.

If you applied capture sharpening, the amount of output sharpening you are likely to need is slight. Crop and resize the image, if necessary, before you proceed to output sharpening. If you need to resample, upward, the image will likely lose sharpness. So it is best to wait.



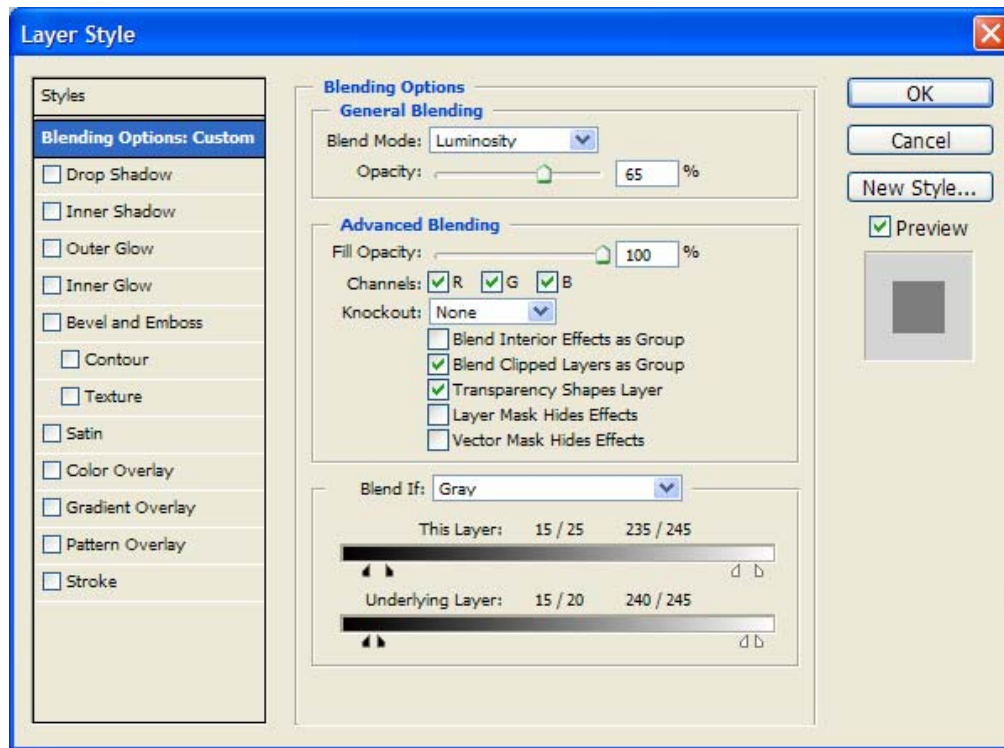
**Figure 15.** 1000% enlargement to emphasize halo widths.

**Figure 15** shows sharpening halos that are well-suited to something like an Epson 2200 printer for 300 dpi. The sharpening halo is 3-4 pixels wide. Images optimally sharpened for print will tend to look slightly over-sharpened, especially when viewed at 100% in Photoshop.

1/50 to 1/100 of an inch is a good guideline for halo width, but the obviousness of the halos will depend on image details. There is no substitute for a hard proof, if your image is destined for the printer. If you do your sharpening on layers, it is easy to finesse your final output sharpening by reviewing test prints.

Layer masks are generally unnecessary with output sharpening, if you also use capture sharpening. It is still a good practice to use Blend If settings to prevent blowing out highlights or stopping up shadows. My preference for Blend If settings during output sharpening appear in **Figure 16**. Capture sharpening is limited more to the middle tones

with Blend If, output sharpening extends further into the one-quarter and three-quarter tones.



*Figure 16.* Blend If setting preferences for output sharpening.

## Concluding Thoughts

Sharpening advice from Photoshop pros continues to evolve. For years, the recommendation was to sharpen once, at the end of your workflow, after you cropped and resized your image. If you have the requisite time and patience, have some experience sharpening in one pass, and are comfortable with generating masks, your images can appear even sharper if you sharpen early and then again later in your workflow.

Some other reading on sharpening to consider . . .

“Photoshop Color Correction” by Michael Kieran.

[http://www.amazon.com/exec/obidos/tg/detail/-/0321124014/qid=1086666334/sr=1-1/ref=sr\\_1\\_1/002-9150543-6415249?v=glance&s=books](http://www.amazon.com/exec/obidos/tg/detail/-/0321124014/qid=1086666334/sr=1-1/ref=sr_1_1/002-9150543-6415249?v=glance&s=books)

“Photoshop Restoration and Retouching, Second Edition” by Katrin Eismann.

[http://www.amazon.com/exec/obidos/tg/detail/-/0735713502/ref=pd\\_sim\\_books\\_1/002-9150543-6415249?v=glance&s=books](http://www.amazon.com/exec/obidos/tg/detail/-/0735713502/ref=pd_sim_books_1/002-9150543-6415249?v=glance&s=books)

“Out of Gamut: Thoughts on a Sharpening Workflow” by Bruce Fraser.  
<http://www.creativepro.com/story/feature/20357.html>

“Out of Gamut: A Two-Pass Approach to Sharpening in Photoshop” by Bruce Fraser.  
<http://www.creativepro.com/story/feature/12189.html>

“Real World Adobe Photoshop CS” by David Blatner and Bruce Fraser.  
[http://www.amazon.com/exec/obidos/tg/detail/-/0321245784/qid=1086666208/sr=8-1/ref=sr\\_8\\_xs\\_ap\\_il\\_xgl14/002-9150543-6415249?v=glance&s=books&n=507846](http://www.amazon.com/exec/obidos/tg/detail/-/0321245784/qid=1086666208/sr=8-1/ref=sr_8_xs_ap_il_xgl14/002-9150543-6415249?v=glance&s=books&n=507846)

“Sharpening 101” by Thom Hogan.  
<http://www.bythom.com/sharpening.htm>