Sharpening Images Notes

===== Slide 3
The fact of the matter is that all images from a digital camera need, at the minimum, to be sharpened. So if you take away or learn nothing else from this class, learn this: any photo that you take with your digital camera (or smart phone) will need to be sharpened.

Resolution in the world of photography is based upon line pair per millimeter (lp/mm). A line pair is simply a white line and a black line side by side. Most lenses have a resolution of around 100 lp/mm (a millimeter is approximately the thickness of a dime) and high resolution film that is commercially available had a resolution of around 150 lp/mm. In the days of making photographic prints (and still currently for those who make prints from negatives), the paper also had a resolution of around 75 lp/mm. The end result was that sending a higher resolution image to a lower resolution medium meant that, unless you intentionally blurred the image, it would be a sharp image on the print.

===== Slide 4
Today with digital cameras and printers, the situation is generally reversed. While the lenses still provide around 100 lp/mm (this hasn't changed much due to the optics and materials that make up the lenses), the medium that you print on (paper) and the devices that you use to print with (photographic inkjet printers) can produce a higher lp/mm resolution that what the camera can provide. This end result is that even if the image is tack sharp on the screen, when you go to print it out it will be blurry or slightly out of focus. Hence you need to sharpen (increase contrast along edges within the image) the image.

Paper, because it is made up of fibers, will cause ink to spread. This spread is called bleed, and different papers have different levels of bleed. Glossy paper actually has a very thin layer of clay as a barrier between the paper and the ink, and this layer will cause the ink to bead up and remain very small drops. Watercolor paper, on the other hand, will case ink to spread out, which may or may not be an effect that you're looking for. Rice paper will bleed even more than watercolor.

Here is a tip. If you have an image that you like and you want to print it out, but it is just slightly out of focus, print it on watercolor paper. The fibers of the watercolor will cause the ink to spread out and the image will become soft / out of focus anyway. If you do this then you can tell people that you wanted the print to appear in this manner, that it was your intent as an artist.

===== Slide 5
In Photoshop, sharpening is no more than adding contrast to the edges within an image. A higher contrast along edges equate, to the human brain, that the image is sharp and in focus. Essentially what you're doing is an optical illusion. This is all what sharpening is in Photoshop - an optical illusion because you are not in any way redoing the focus of the image.

Now, there are third party plug-ins that you can buy for Photoshop that do attempt, with varying success, of re-doing the focus of an image after the fact. The algorithms used are similar to the ones that NRAO uses for their image deconvolution programs. In my use the applications are hit or miss - if the image is just slightly out of focus it'll work to some extent, but if it is greatly out of focus there really is no hope for recovery.

===== Slide 6
There are three types of sharpening: Capture sharpening, selective sharpening, and output (global) sharpening.

Capture sharpening is what is done in camera when the camera processes the JPG image. Each camera manufacturer has their own formula for image adjustments of the JPG images in camera. If you want to avoid having the camera do things for you, you then need to shoot in RAW file format which, for most cameras, is accessible through the Aperture priority / Shutter priority / Manual priority exposure modes. Many of your point and shoot cameras don't have these modes, so they will always produce a JPG image.

If you do have a RAW format image, note that you do not have to run capture (also a global) sharpening on the image, but it is an option that is available. And yes, when I process my RAW file images I will do a capture sharpening.

===== Slide 7
Selective sharpening is done while you're working on the image in Photoshop. You may decide to add (or not) some selective sharpening to portions of the image either by using the sharpen tool (be very careful of oversharpening) or using the Smart Sharpen / Unsharp Mask filters and apply a layer mask to paint in/out sharpening levels.

Things that may need to be sharpened are anything with any kind of texture or detail: hair, fur, grasses, tree bark, eyes (no texture but detail), patterns on clothing, jewelry, etc. If it isn't smooth it may need to be sharpened. When working with people, please note that skin should be slightly softened on women to blend in some of the minor blemishes (wrinkles, age spots, etc.); men will also need some softening but not as much, especially if they have a beard.

You do not need to do selective sharpening - it is an option that is available to you in your workflow.

===== Slide 8
Output sharpening will need to be done - capture and selective are optional. Once you've done with your image, you've made all the corrections and changes, you will then create a merged visible layer (aka The Claw: shift - alt/option - command/control - e) at the top of the layer stack. You will then duplicate this layer (command/control - j). You will then run the sharpening filter (Smart Sharpen / Unsharp Mask) on this duplicate layer and, if the

sharpening effect is too much either Fade the filter (under the Edit menu) or adjust the opacity of the duplicate layer. Towards the end of this presentation I have a couple of additional sharpening techniques that you can use other than the Unsharp Mask / Smart Sharpen filters.

===== Slide 9
Flow chart of the sharpening workflow. You open an image in Photoshop and the program does a quick analysis of the image type. If it a RAW format image, Photoshop will drop it into Adobe Camera Raw, which is a separate processing engine that is part of Photoshop. In Adobe Camera Raw (ACR) you can do many things to non-destructively edit your image, but there are some drawbacks in that ACR doesn't know layers, filters, or text. You can do something similar to a layer mask with the Adjustment Brush, but it isn't quite the same. Typically here you would run capture sharpening, then open the image in Photoshop.

===== Slide 10
Once you have the image open in Photoshop you need to decide if the final destination is for web / email which means a low resolution image (72 - 96 pixels per inch (ppi)) or print which means a high resolution image (180 - 300 ppi). If you're not sure, always go with the high resolution as you can always go down in resolution when done far more easily than up scaling the image. As you set the resolution you also want to set the image size in either pixels or inches.

Once you've set the resolution and size, you make all the adjustments needed which may include skin softening, color adjustment, cloning out (or in) information, etc. Somewhere along this path you may decide to do selective sharpening, again with either the sharpening tool or using the Unsharp Mask / Smart Sharpen filters with layer masks to adjust how much of a sharpening effect to have.

===== Slide 11
You will do output sharpening on a global (everything on the image is sharpened equally) scale using Unsharp Mask / Smart Sharpen / HDR Toning sharpening / High Pass sharpening. You will do this output sharpening on its own layer so that you have the ability to adjust the opacity if the sharpening effect is too much.

===== Slide 12
The amount you sharpen the image will be determined by where you expect the final image to go - web / email or print. Web/email sharpening is less than print simply because the resolution of most screens is between 72 - 96 ppi and a highly sharpened image on these do not look good. The exception here is that if you know your image is going to be put on a high resolution (i.e., Retina) display that has a resolution of > 250 ppi; these devices can handle a highly sharpened image.

===== Slide 13
Sharpening for print is more or less subjective: you sharpen the image until it doesn't look good on the screen (it looks over sharpened), at which point it will probably print out OK, so make a print. Remember that different papers will affect the sharpness of the image due to bleed; the sharpness of papers generally go (highest to lowest): Glossy, Semi-Gloss, Matte, Canvas, Watercolor, Rice. Between Glossy and Semi-Gloss you might find papers listed as Luster or Exhibition Fiber, etc. Different paper companies have different names, and there are many paper companies out there. To reduce the confusion, stick with the papers made by the company that made your printer - the big three are Canon, Epson, and HP. There is really very little difference between the three manufacturers other than when it comes to inks. Here in New Mexico Canon inks dry up the least between printer use (you should print at least one image per week), then Epson, and finally HP. You can help this out by putting a damp (not soaking wet) sponge on a small plate in the printer body to keep the humidity up. You will waste less ink trying in cleaning the head this way.

===== Slide 14
The first - and easiest filter to use for sharpening - is Unsharp Mask. It only has three sliders to worry about: Amount, Radius, and Threshold.

Amount: how strong the sharpening effect should be
Radius: how many pixels around an edge should be affected
Threshold: the difference in tonal value to be affected (smaller = less tonal value)

According to Adobe, the values for printing an image should be as follows:
Amount: 150 - 200%
Radius: 1 - 2
Threshold: 2 - 20

My values when printing are usually 175%, 1.5, 10 (essentially the midrange of the three values).

===== Slide 15
The second - and more complex filter to use for sharpening - is Smart Sharpen. This image shows the expanded Shadows and Highlights panels. It has two of the same sliders are Unsharp Mask - Amount and Radius - but Reduce Noise for the third slider (to reduce noise in Photoshop you blur pixels together - basically doing anti-sharpening). You also have three types of blur to use: Gaussian, Lens, and Motion. Applying Gaussian Blur is the equivalent to Unsharp Mask. Lens blur will reduce any blurring caused by the lens, most commonly seen on the edges. Motion blur will reduce any blurring cause by motion of the camera when the image was taken.

For print, use the values above with Reduce Noise replacing Threshold.

===== Slide 16
There are two alternative ways to sharpen an image in Photoshop. The first is to use HDR toning adjustment to sharpen an image. Once you have your image finished, duplicate it using the Image -> Duplicate command. When the Duplicate box appears, check the Merge Layers to result in a new image with a single layer. Click on OK and the single layer duplicate will appear in a new tab window.

===== Slide 17
On the duplicate image run Image -> Adjustments -> HRD Toning… Yes, this is a destructive edit but you are doing it on a copy of the image. You may be asked to flatten the image, just click OK.

===== Slide 18
The two panels you are to be concerned with are the Edge Glow and Tone and Detail panels. In the Edge Glow there are two sliders, one for Radius and one for Strength; these are similar to Radius and Amount in the filters. Set the Radius to no more than 10 pixels and the Strength to 1.00. (In HDR images, edges can become dark due to the processing, so they need to be lightened which is what these two sliders do.)

In the Tone and Detail panel you are only concerned with the Detail slider, and this equates to the Threshold slide in the filters. Set this value to between 0 - +50. (Note: if you go negative you will soften the image, which might be an interesting effect on its own to do.) Click OK to apply the change. Copy and paste this layer back to your original Photoshop document where it will be on its own layer. Adjust opacity as needed.

===== Slide 19
Here is a side-by-side comparison of the original image and the one sharpened by HDR Toning. Notice that the HDR Toned image is a little brighter than the original. This is the result of the edge glow being 10 pixels. To reduce this, use a lower pixel value such as 1 or 2.

===== Slide 20
Last spring break I took a workshop session up in Santa Fe with Mac Holbert on Digital Fine Art printing. Mac has been doing this for over 27 years and is one of the founding fathers, along with Graham Nash (of Cosby, Stills, and Nash), of digital fine art printing. Mac has developed not only a workflow for Photoshop to more quickly edit images, but an alternative to sharpening that I'm sharing with you.

===== Slide 21
We start with the finished image that needs to be sharpened. You will first make a merged visible (shift - alt/option - control/command - e) layer of your image. You will then duplicate this merged visible layer twice using command/control - j.

===== Slide 22
Make the top layer invisible (toggle the eye icon) and make the first layer copy the active layer.

===== Slide 23
On this layer run Filter -> Other -> High Pass…

===== Slide 24
Set the radius value to 50 and click OK. This high value causes all the coarse lines to blur out, leaving detail in only the very fine lines. This is called micro-contrast boost. Your image will probably have some colorization to it and this will be resolved in the next step.

===== Slides 25 & 26
To remove the color you will desaturate it. Do menu Image -> Adjustments -> Desaturate or use the keyboard command sequence of shift - command/control - u. You are left with a completely grayscale image.

===== Slide 27
Change the layer blend mode of this layer from Normal to Soft Light and Opacity from 100% to 50%.

Now make the top layer visible and active and repeat the steps in slides 23 - 27. In slide 23 you will change the value of the high pass radius from 50 down to the point where you will barely see lines. This is very image dependent, and for this image I set the value to 2.

You have now completed high pass sharpening.

===== Slide 28
Why do these steps? By doing sharpening in this manner you have a wide variety of options that you can exercise in tweaking the sharpening of the image. Don't like soft light mode? Use Overlay. Don't like opacity of 50%? Use 25%, or 75%, or 37%. Between these two layers you have two blend options (Overlay and Soft Light) and 100 levels of opacity for each layer. You end up with, just across these two layers:

(Soft Light x 100 levels) + (Soft Light x 100 levels)
(Soft Light x 100 levels) + (Overlay x 100 levels)
(Overlay x 100 levels) + (Soft Light x 100 levels)
(Overlay x 100 levels) + (Overlay x 100 levels)

800 options. And this even introducing adjusting the Fill of the layer or adding in Layer Masks…

===== Slide 29
Original image and the image done with high pass sharpening.

===== Slide 30
Finally, a side-by-side-by-side comparison of the original image, HDR Toning sharpening, and high pass sharpening. HDR is slightly brighter, high pass keeps more of the same tonality as the original. Just a couple of additional options to sharpening to add to your tool box of Photoshop skills.