Sharpening

by David Jenkins

Digital images by their very nature are slightly soft, or out of focus. It is an inherent part of both the input, and output devices we use.
One of the first tools a beginner to Photoshop learns to use is the "Sharpening" tool. But, also just as quickly they learn that it does not make unsharp pictures appear sharper, and applying too much sharpening affects the result with a range of edge, noise and colour distortions.

Sharpening is a tool that has been used in the graphic arts and prepress industries from around the early 1920s. In those far-off days, the sharpening was preformed by photographically making a duplicate of the film, and binding the two together in register. It is where the term "Unsharp Mask" in Photoshop gets its name.

What does sharpening do? Essentially it adds some shading around edges. A technique that artists have been using since at least the mid-1600's, and even earlier for mosaic patterns. The lighter edge against the darker edge give a extra contrast and the human eye/brain sees the illusion of sharpness.

When we turn to the sharpen tool in Photoshop or Lightroom, the same illusion is created using different algorithms in the software. In the prepress unsharp mask a 'halo' was created around the edges. Photoshop's arithmetic makes a similar 'halo' along edges. It does this by first detecting all the edge areas, and increases the contrast between the pixels in those areas. It will make the darker pixel values lower, say 40 down to 20, and the lighter pixel values higher, say 190 to 230. All this is done behind the scenes and we just have to make adjustments to sliders, being careful not to over emphasise any edges.

Photoshop has come along way with sharpening. These days the options are many. From Edge sharpening, to Smart Sharpening. Pre sharpening, Post sharpening, and a range of add on, or "Plug-in" products to better assist us to achieve just the right amount of sharpening.
Let's start with "Unsharp Mask" and see what the controls do, and then better understand how Lightroom and its plug-ins can help.

It is really useful when applying any masking that the image be viewed at 100% or more. (Ctr-Alt-0 for Windows. Cmd-Alt-0 for Mac)
Photoshop Unsharp Mask offers three controls. And they are mimicked in other programmes and plug-ins often with different names. The three controls are Amount, Radius, and Threshold. They are the same terms used in prepress sharpening.

The usual technique to apply them is to move the sliders back and forth, peer at the screen and when its looks "about right" or you get a headache, move on to the next image. Let's apply a small amount of time to learn the use of the three settings and the mystery will disappear, and hopefully less headaches.

Unsharp Mask: Amount
It determines the intensity of the Halo. High settings produce high contrasts, some pixels may go to black and white. White halos can be very distracting, so we don't want to go too far.
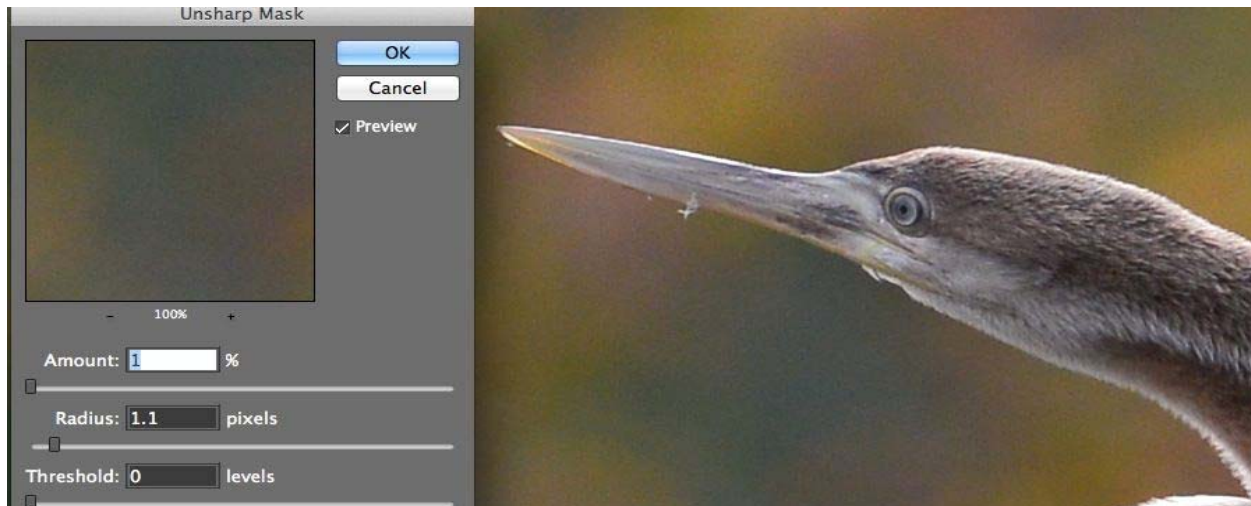
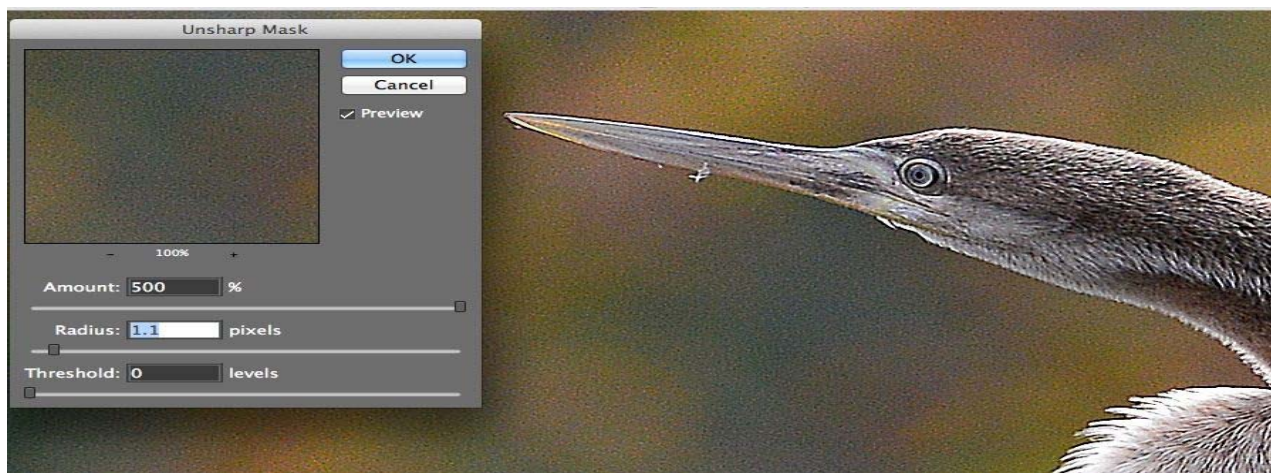Figure 1 Amount setting of '1'

Figure 2 Amount setting of '500'

Figure 3 The third image is at 400% so that you can see it along the Darter's beak line as a black and white line. Or Halo

Unsharp Mask: Radius

This slider controls the Width of the Halo. Many workers prefer to set this Radius first, and I just happen to be one of those. Contrary to popular, and webculture belief, a Radius

value of 1.0 does not affect a Halo 1 pixel wide. It's part of the algorithm in Photoshop and varies depending on the detail its working on. My best guess is that at a setting of 1.0 the effect is as many as 2 to 3 pixel wide.

Usually start with a value of between 0.5 and 1.5. for fine detail such as feathers etc. A danger of too high a value is that it gives an increase to the size of tonal details in the image and may make a feather or beak or eyelashes appear larger.
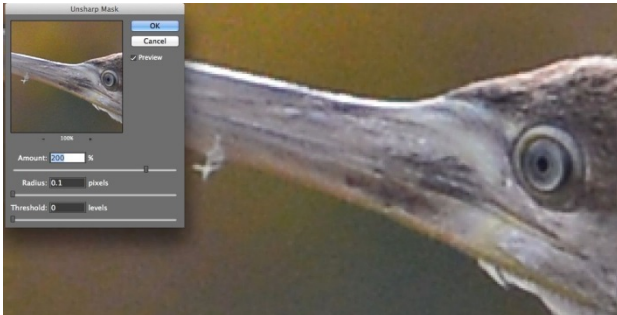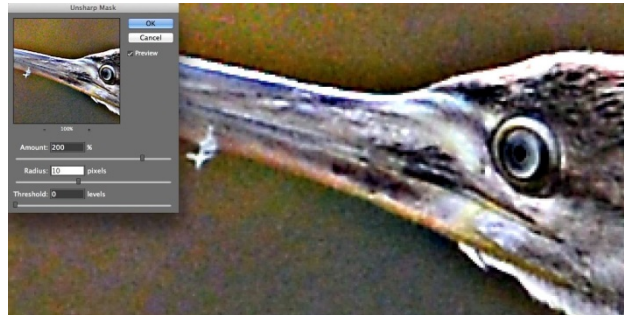

Figure 5 a radius of '0.1'

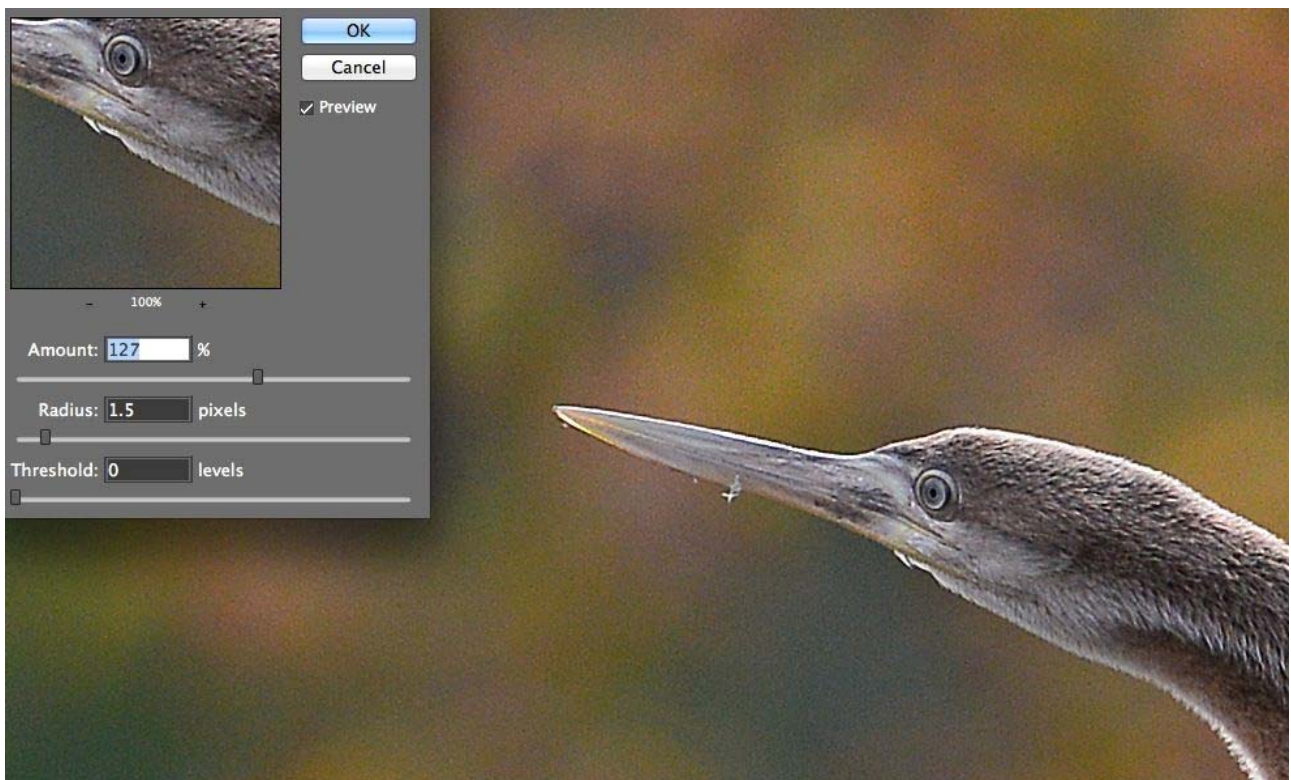Figure 4 a radius of 10 and the thickness of the halo is evident

Figure 6at 100% shows a Radius of 1.5 and I've reduced the Amount to 127, just so the Halo is showing

Unsharp Mask:Threshold

So Intensity Slider controls the Intensity of the Halo. Radius controls the width. What does Threshold do?

Subtle man, Subtle! It dampens down or suppresses the noise in the image.

It tells Phostohop how far apart in value two adjacent pixel's values have to be before the unsharp mask affects them. So if we set a value of Threshold 5, then two adjacent pixels

of say, 190 and 194 won't be affected and sharpening is not applied. But 190 and 196 would be, and a halo would be visible.
Given it works from Black (0) to White (255), the slider has a range of 0 to 255.

Figure 7 at 100% shows a Threshold of 1 with every pixel interacting with its adjacent pixel
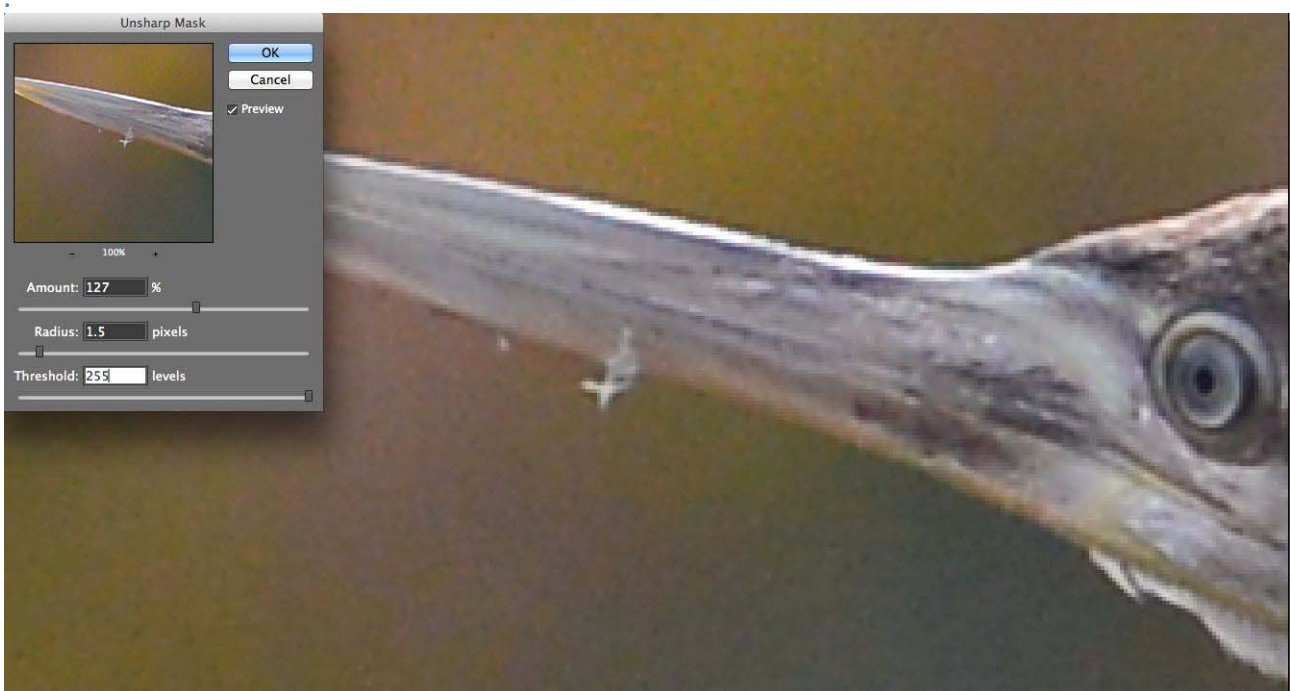
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Figure 8 shows a Threshold of 255 for no effect at all as it has no adjacent pixel to halo.

While everyone wants a recipe, and again pop or webculture will provide any amount of recipes, in the long run it's not a push button operation. A falcon in bright sunlight will need a different settings than a wader in the shade.

Like a recipe you can modify? In this next shot of a Eastern Yellow Robin (it has just had a bath), we have lots of great detail around the beak and eye.

Needing to enhance that detail, suggests a small Radius value. I used 0.7. With such a small radius the Amount will need to be quite large, so an I used 200 as a starting point. The white feathers and eye feathers are full of detail.
So increasing Threshold to 10 tell Photoshop to ignore value differences of 10 or less so that only the more defined edges are sharpened.

Is it perfect? Perhaps not for a printed image, but fine for use on the web. And that leads to a new discussion of sharpening. What is the final output to be used for?

When it comes to applying these controls in Lightroom, the controls are the same. I use Nik Sharpener Pro 3.0 as a plug-in, and while the names on the controls are different, the pixels are effected the same way.
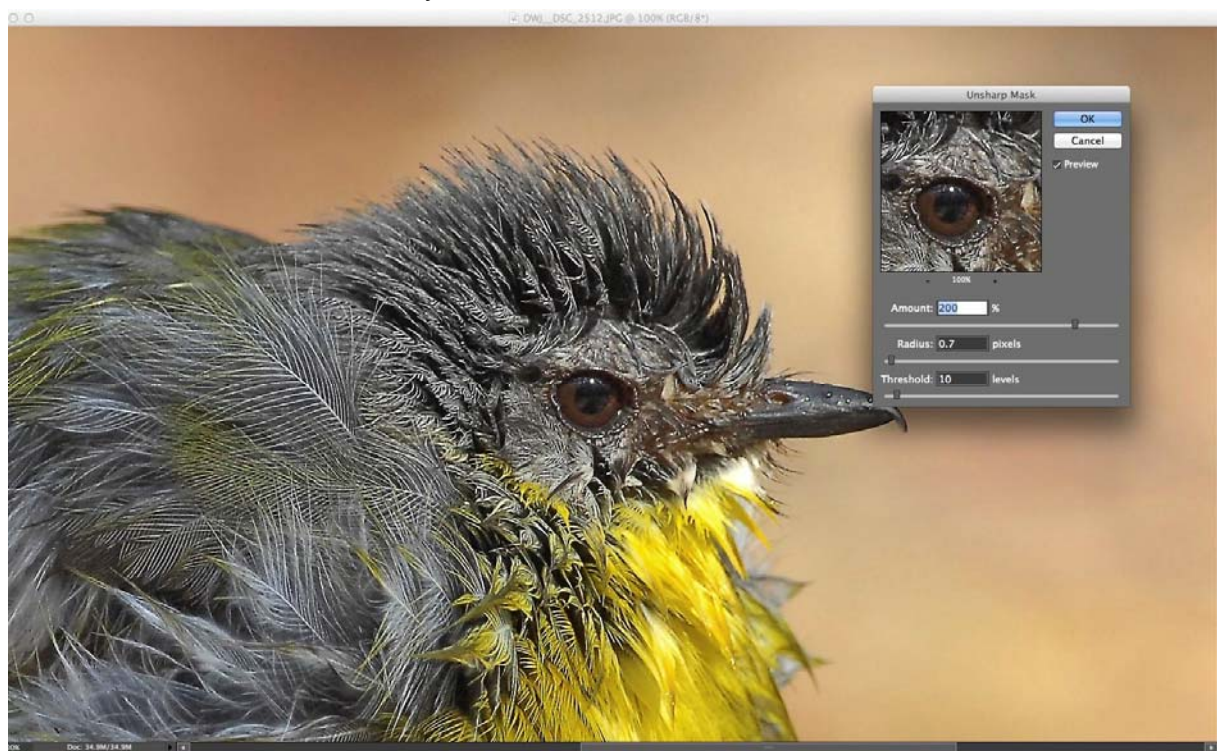
I like Nik, as it has two pass sharpening, one at the beginning of the enhancement process, and another at the end, when I can choose the output required.

I also use a masking technique to apply local sharpening using Unsharp Mask, and again its because of the absolute control that a Layer Mode gives me. But rather than explore that, let's look at sharpening in Lightroom.

Sharpening in Lightroom
Lightroom adds an automatic 25% sharpness to the image when you open it. This is a default setting and can be turned off. But I'd recommend that you leave it as is. The clever sharpening algorithms that Mr. Adobe has built in would suit most of us most of the time.
Lightroom offers a real step forward in the way that Sharpening can be applied from a mask. This allows you to sharpen just the few areas that need attention.   The eye, the beak, the chest feathers, etc.

There are several ways to work with sharpening in Lightroom, but it still uses the same process we've already discussed.

1. In Filmstrip select the photo to work with.
2. Set the Zoom level to 100%
3. On the righthand Panel scroll down and select the Detail Panel.
4. To compare the 25% default with and without, switch the Detail controls on and off by clicking on the switch on the left of the panel.
5. When working to add sharpening, it's useful to set up or add a mask that will work only on edge detail. That way you can avoid emphasising any image noise.
6. Move the image in the Loupe view to see the area of detail you are working with e.g. the bird's face.
7. Hold down the Alt/Option key and drag the Masking slider to the right. As you do this the finer details, and the large open areas will gradually disappear in the black, leaving you with the distinct lines of the main edges. They are outlined in white.
8. The black areas are not going to be affected by the sharpening, they are 'masked' out.
9. Release the Alt/Option key. The image returns to normal.
10.   Move the Amount slider to the right. You can afford to be quite aggressive with this slider at this stage.
11.   Radius is next, and works the same as in Unsharp Mask. Increase and Decrease until the Halo is just visible. 3 might be a good number
12.   Use the Detail, (same as Threshold), to fine tune the sharpening effect. 45 or 50 could perhaps suit your image.
13.   Now drag the Masking Slider back to 0.
14.   You'll be able to see the change from the Sharpening you've just applied.
15.   I always over-sharpen a little and then bring the Masking Slider back to about 90% (on average), just so I have a little head room available if needed.
An advantage Lightroom sharpening offers it the ability to fine tune the changes using the Masking Slider.

One part of the process is complete. But as we add the effects of sharpening, we also run the risk of increasing the noise in the image. So the next stop should be the Noise Reduction panel, and address the Luminance (controls detail), and Colour or chrominance sliders to keep areas uniform and free from annoying noise artefacts.

To sum up
Sharpening builds a "Halo" around an edge. We control the size and density of the Halo and its affects with Amount, Radius, and Threshold.
There isn't a 'right' setting for every image.
The end use of the picture, for web or print, or a book is a determining factor on how much Sharpening we might need to apply.
Lightroom adds an additional control with the ability to fine tune the overall changes from the Masking Slider.

Now, rather than sit behind the keyboard, time to go and make some great photographs.
Enjoy photography. We do.