

Super Resolution Shooting Post Processing Steps:

Post Processing:

There's a specific order of operations in processing that will allow us to combine our stack of photos into a final image with noticeably finer detail. We'll import our photos into a stack of layers in Photoshop, **up sample** the photo (usually 200% width/height) with a simple **nearest neighbor algorithm**, re-align the layers, and then **average the layers together**.

- Import all photos as stack of layers
- Resize image to 4x resolution (200% width/height)
- Auto-align layers
- Average layers

Importing all photos as layers:

From Photoshop: File>Scripts>Load Files into Stack...

From Lightroom: Select All Photos. Right Click and choose Edit In>Open as Layers in Photoshop

- a. Click Browse... to navigate to your photos
- b. Make sure "Attempt to Automatically Align Source Images" is unchecked (This is essential. If you align first it won't work.)
- c. Click OK

Resize Image:

Choose Image>Image Size...

- Set Width/Height to 200%
- Use the "Nearest Neighbor" resample algorithm. You can also use "Preserve Details" but I prefer "Nearest Neighbor" as it does not over sharpen
- Click OK

Auto Align the layers:

- Select all the layers in the Layers Palette
- Choose Edit>Auto-Align Layers...
- Use the "Auto" Projection Setting and uncheck "Geometric Distortion" and uncheck "Vignette Removal"
- Click OK
- Once aligned, check that each layer looks properly aligned with the bottom layer. If there's one or two that didn't align as well as the others, consider deleting them. You can turn on and off the visibility of each layer with the eye icon to the left of the layer. Just remember to turn them all back on before you continue.

Average the Layers:

The fastest way to do this is to change the opacity of each layer from bottom to top such that the opacity = $1/(\text{layer number})$. For example, if you have 20 layers, make the bottom $1/1 = 100\%$, the second from the top should be $1/2 = 50\%$, the third $1/3=33\%$, the fourth $1/4=25\%$ and so on until the top layer which is $1/20 = 5\%$. Photoshop can only do integer opacities so there will be some rounding error and repeat integers as you get close to the last layer but it won't matter too much.

- With 20 layers, opacities from bottom to top are roughly: 100%, 50%, 33%, 25%, 20%, 17%, 14%, 12%, 11%, 10%, 9%, 8%, 8%, 7%, 7%, 6%, 6%, 6%, 5%, 5%
- Once opacities are set, select all the layers, right-click and choose Flatten Image

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Averaging can also be performed by selecting all the layers and turning them to a Smart Object and setting the Smart Object's stack mode to "Mean" or "Median" but this is can be slow when working with a stack of twenty 90+ megapixel photos just as a warning. The "Median" stack mode is particularly good for removing ghosting in moving objects. Smart Object stack modes are only available in CS6 Extended and CC versions of Photoshop.

Optional: Apply Smart Sharpen

I usually like to use a smart sharpening filter of about 2px radius and about 200% to 300%. Because of the nature of our method, hard edges will likely look a little soft and will need some sharpening up.

A two-pixel radius works well with our 4x increase in resolution and should keep everything looking natural without noticeable halos. You might find that some alternate settings could work better depending on the content of your photograph.

- Filter>Sharpen>Smart Sharpen...
- Amount: 300%
- Radius: 2px
- Reduce Noise: 0%
- Click OK