

High Pass Filter Sharpening in Photoshop CS

Sharpening of details is one of the most used techniques in astronomical image processing. Those new to image processing, and some not so new, often over-sharpen or otherwise inappropriately apply sharpening tools to their images. When misapplied, sharpening will create dark halos around stars, create false details, and increase noise in an image. The most common method of sharpening an image is to apply an "unsharp mask". This can be a useful technique but when applied to the image as a whole may affect areas of the image that do not require sharpening. Using the lasso tool is one method of selecting portions of the image to be sharpened. This, however, is time consuming and often produces less than satisfactory results. Using a layer mask in conjunction with a high pass filter is a technique for very precisely applying sharpening to selected areas of the image. Don Goldman and Ken Crawford popularized this technique when they presented it at the 2004 Advanced Imaging Conference. This technique, when applied appropriately, avoids the usual pitfalls often associated with image sharpening techniques.

Fig. 1 is an image of the core of M-31. The image is acceptable, but I will demonstrate the High Pass Filter technique to selectively sharpen, and bring out detail, in the dust band areas of the image.



Fig. 1 (M-31)

To apply High Pass sharpening to the image, follow the steps outlined here.

Step 1

Make a duplicate layer of the image by selecting the dropdown menu choice "Layer/Duplicate Layer". Name the layer however you wish. I used "High Pass" to designate the layer. Set the blend mode for this layer to "Overlay". The Overlay blend mode will darken and increase the contrast of the layer. Do not be concerned about this. A layer mask will be applied to the layer and the overall effect will be hidden. Only the areas of the image we choose will be enhanced.

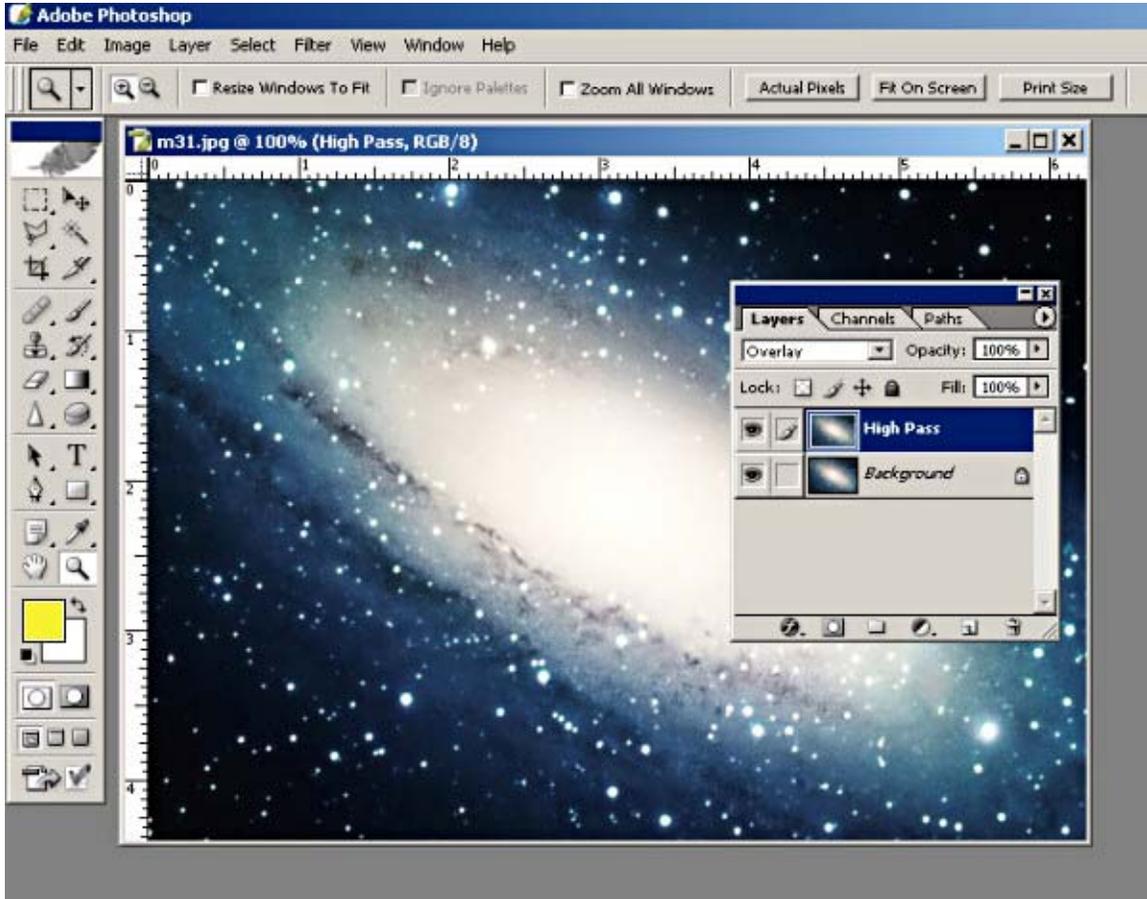


Fig. 2 (Duplicate Layer)

Step 2

Apply a high pass filter to the layer. To do this, use the dropdown menu choice "Filter/Other/High Pass". You can vary the strength of the filter by setting the radius size. Settings between 4 to 8 pixels are usually the best. For this image, I used a setting of 8 pixels, as I want to bring out as much detail as possible in the faint dust band areas. After the application of the High Pass filter, the entire image will be sharpened. A layer mask must be used to "hide" the sharpening effect of the filter from those areas that it is not desired.

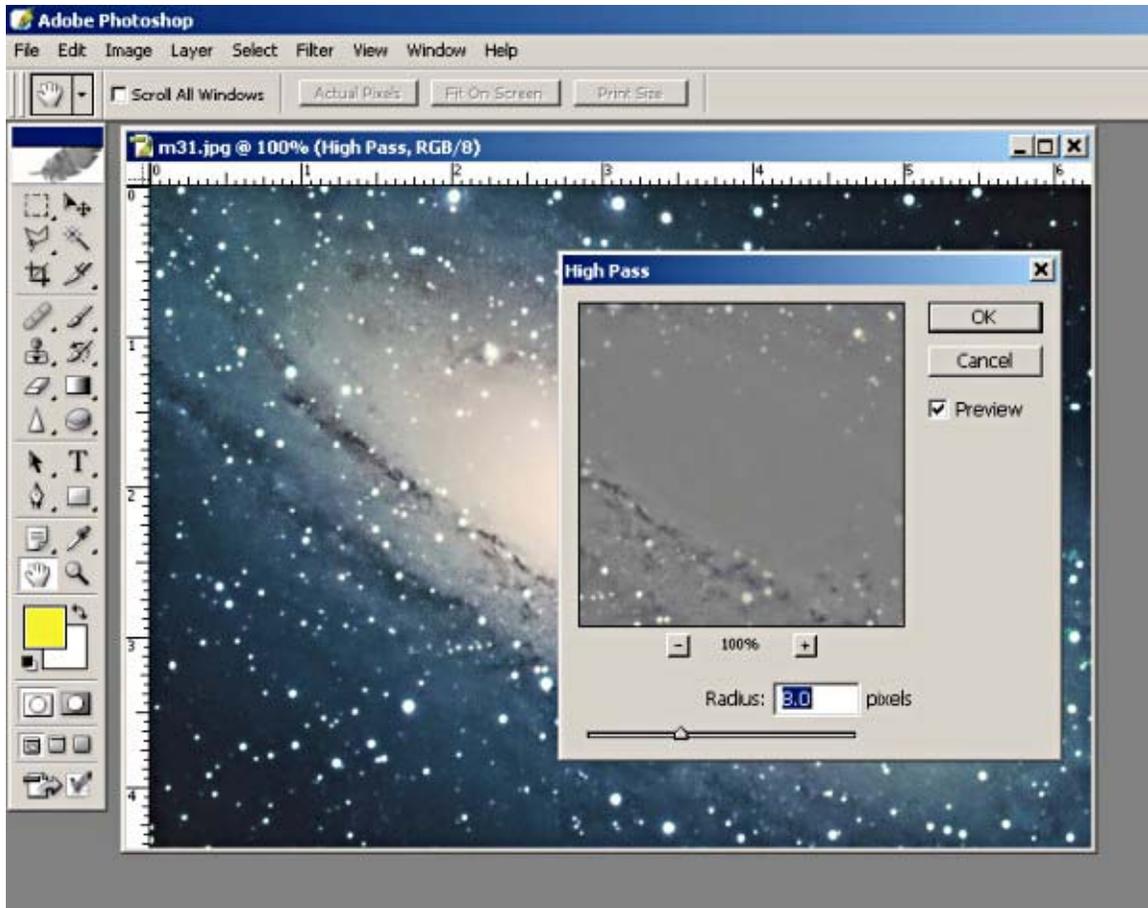


Fig. 3 (High Pass Filter Settings)

Step 3

Create a layer mask. Use the dropdown menu choice "Layer/Add Layer Mask/Hide All". This will create a black mask over the layer and have the effect of "hiding" the entire layer. Another way of looking at this is to consider any area of the layer covered by the black portion of the mask as being transparent. The underlying Background layer will show through unaffected by the High Pass layer. This is key to using the mask. Sections of the black mask may be removed by applying white "paint" to selected areas. In these areas, and only these areas, the High Pass layer will be visible. Since the mask is "grayscale", varying the "shade" of white, i.e. gray, the "strength" of the mask may be controlled. Pure white is the "strongest". The darker the gray, the "weaker" the effect. In practice, using pure white is usually the best. The overall strength of the High Pass layer may be controlled by varying the opacity of the layer. I find this easier than trying to use different shades of gray.

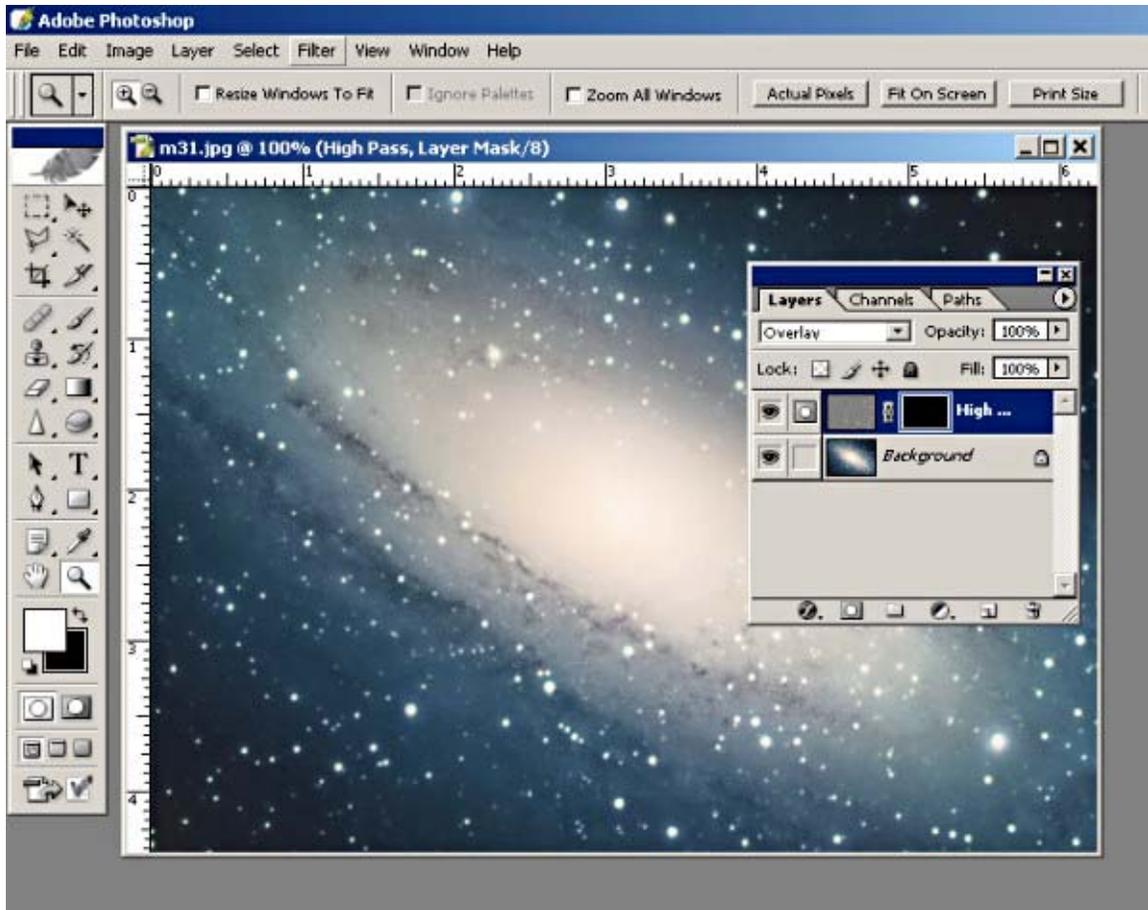


Fig. 4 (Layer Mask)

Step 4

Select the brush tool and set the size to a relatively small diameter. This tool is used to "paint" white over the mask. Making it a small diameter will allow you to exercise a great deal of control over the areas you wish to sharpen. I usually set the opacity and flow to 100% but this can be varied. Setting these parameters to a lower value will lessen the sharpening effect. You may wish to experiment with these settings. Before using the brush tool to "paint" over the mask, make sure that the mask (the black window on the right of the High Pass layer) is selected. Click on it to make sure. Also make sure that white is selected for the foreground color. (See Fig. 5) With these selections made, the areas to be sharpened may be selected simply by painting with the brush tool. Should an area be selected, or painted, by error, simply change the foreground color to black and paint over it. This will remove the sharpening from that area. Change back to white and continue sharpening until the entire image is completed. I usually zoom the image to at least 200%, and sometimes more, while painting the mask. This will allow for even more control over the process.

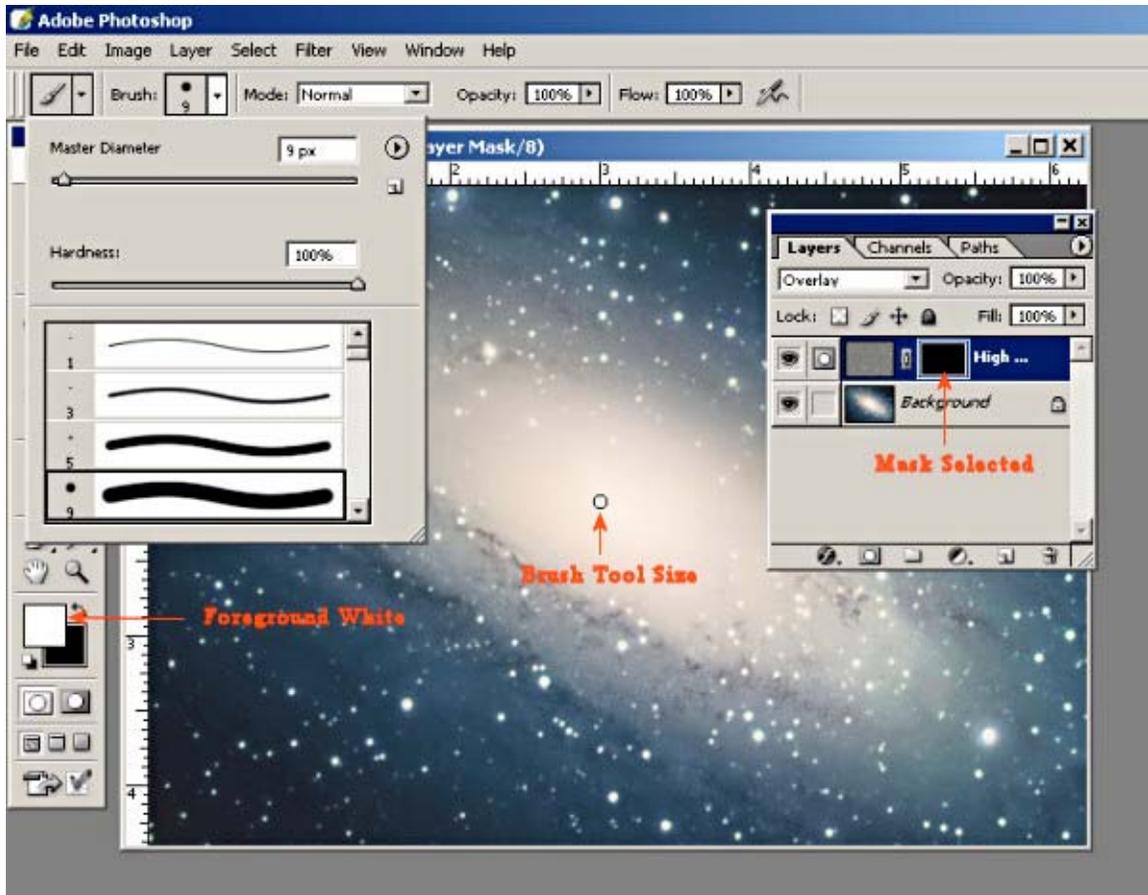


Fig. 5 (Filter and Brush Tool Settings)

The final results of the procedure can be seen in Fig 6. This is a close up "Before" and "After" side by side comparison of the dust band area.



Fig. 6