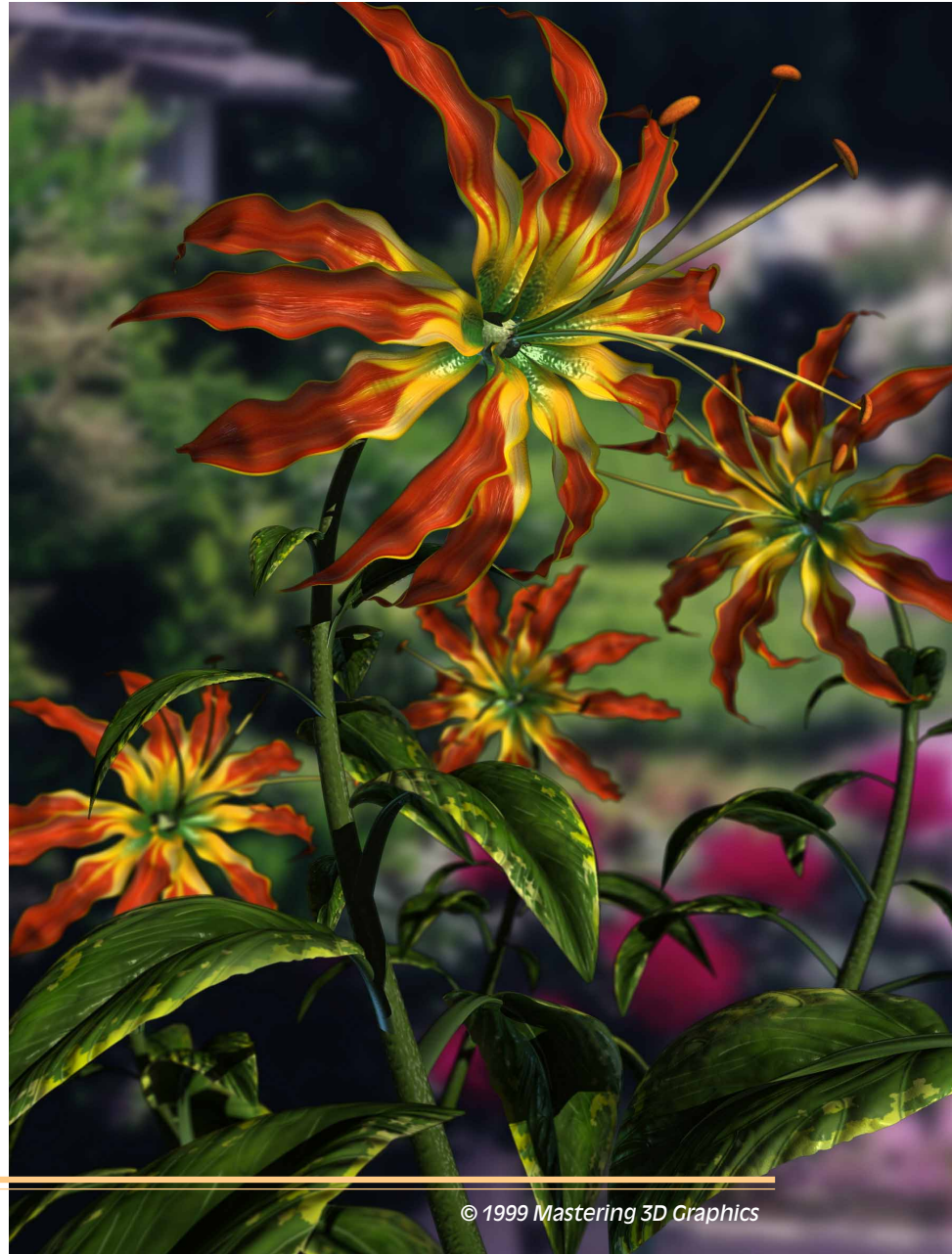


Surfacing - half the battle

Mastering 3D Graphics ~ issue #1

with Photoshop Frank Vitale

As this issue of Mastering 3D Graphics is devoted to gaining an understanding of “digital botany” - not stale biological textbook style, but vibrant realism, we had to set aside a spot for a purely surfacing tutorial. There is so much to cover when it comes to creating realism no matter the topic; this is especially true when creating plant life. That is why it is necessary to narrow the focus a bit and talk about surfacing specifically. Surfacing is such an important aspect of any 3d illustration or animation; it really requires a great deal more attention than most people are willing to give. For me it's 25% modeling, 25% lighting and 50% surfacing. Nothing captivates the viewer more than an image that has them second guessing if it's real or manufactured. Quality surfacing is one of those areas where you really can create absolute realism. It's more than just creating the perfect texture map. It's creating the perfect combination of texture maps and knowing how to adjust the material attributes.



This article is going to focus on using Adobe Photoshop 4.0 (tm) to develop texture maps, but we will also touch on how to set the material attributes. My 3d app of choice is Strata StudioPro, but these principles carry over to any and all applications. Specularity is specularity no matter if you use Ray Dream (tm) or Houdini(tm).

The flower I've created here will hopefully have florists around the world scratching their heads. It's based loosely on a "Gloriosa Lily" but I've taken several "artistic liberties" to create a more thorough surfacing lesson. There are basically 4 parts we will develop textures for: the stem, leaves, petals and the pod which includes the pistols. We will start with the leaves. A few things need to be taken into consideration while developing the textures for the leaves. Whenever possible I opt to use a scan of the real thing. I am a firm believer in the best way to achieve realism is to start with realism. The leaf is a perfect example of this. Easily acquired fairly flat, just slap it down on the flatbed and scan away. But not everybody has access to a scanner, and you might have a very specific look in mind that either does not exist or can't be found. So for the sake of this tutorial we will paint the leaf textures. Another important thing to think about is the edge of the leaf. You might have created the perfect model, the perfect textures and your render still looks unreal. Leaves do not have perfect smooth edges; unfortunately, most models do have perfect edges, nice and smooth, no flaws. The way around

this is through the use of a Stencil or Clipping map, basically a texture map that cuts away at your shape giving you the freedom of any edge treatment you like.

So having said all that we can get started. If you haven't already, launch Photoshop(tm) and make a new file 700 pixels high by 400 pixels wide and save it as "Leaf1.psd". Within this document we will create all the different texture maps necessary for the leaf shader. I'll be using rather straight forward colors here. Mostly green and a bit of yellow, but feel free to experiment with color or value. Subtle adjustments to value and hue can make a great difference in the final render. Pick foreground and background colors by clicking on the color squares at the bottom of the tool bar. For foreground, choose something like R-91, G-150, and B-31 and for the background 54, 78, 32. These will give you a nice light and dark green. Now go up to Filter/Render/Clouds, this will give you a natural looking break up to the base color for the leaf. I use the clouds filter a great deal in all sorts of situations. It is much better than using a solid color. Next we'll darken the center of the texture to further break up the color. Keep in mind that there is practically an infinite variety of leaf types so there are no wrong decisions, within reason. Make a rectangular selection that runs the length of the texture vertically and occupies the center 1/3 of the horizontal. Go to Select/Feather... and type 50. Now bring up the Levels control, Image/Adjust/Levels and

move the Output level's black arrow to about 144, about in the middle and move the Input level's black arrow to about 10. Your textures should now look something like this (Figure 1).

Next we'll add some yellow to the edges of the leaf. For this and the rest of the lesson we will make use of Photoshop's Layers. Bring up the layers window now and you'll see you've been working on the background layer up to this point. Click on the background layer within the layers window and drag it to the little page icon at the bottom of the window, this will duplicate that layer. Now double click on the layer you just created, background copy, and name it "Yellow". Double click on the background layer as well and name it "Green". It's easy to blow off naming your layers and channels, but I highly recommend doing so, it will make your development process much smoother. Next select the yellow layer and go to Image/Adjust/Hue Saturation. Set the value to -25, +53 and +35 respectively to turn your layer from green to yellow. If you decide later to change this color further it is very easy to do - that's the beauty of working with layers. Now is a good time to save your file again; actually, anytime is a good time to save your file, do it often. Now we need to

remove or in this case mask off most of the yellow on this layer so that it only appears on the edges and in a natural way. Use the rectangular marquee tool to select about 1/4 inch on each side of the texture, running the full length in the vertical. First select the left side of the file then use the Shift key to add to your selection and select a similar region on the right side. Now with that selection active make sure your Channels window is open and at the bottom of that window click on the Save selec-

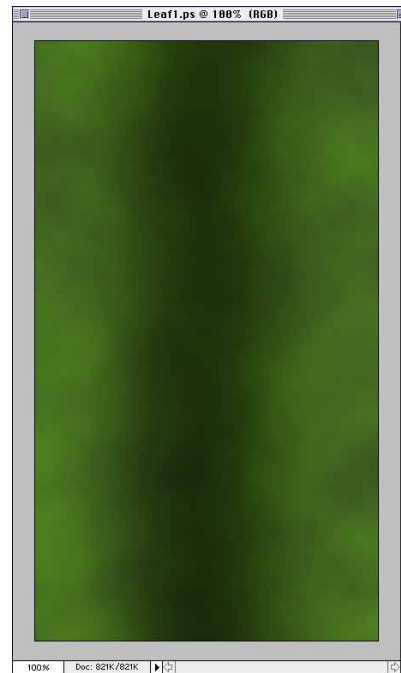


Figure 1: The underling color layer.

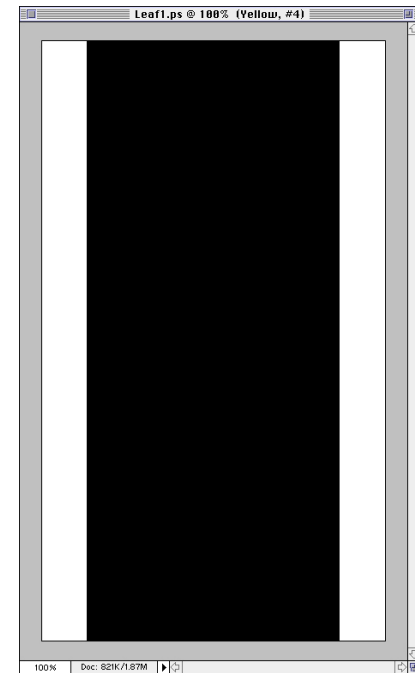


Figure 2: The saved channel.

tion icon, it's the second one, the grey square with the white circle in the center. This saves our selection as Channel #4 and should look something like this (Figure 2). Clicking on Channel #4 on the Channels window will bring it up. Then clicking back on RGB at the top of the Channels window will bring you back to your color layer.

Now to break up the image. There are several ways to do this, but 2 favorites are by using either Spatter or EyeCandy 3.0 Jiggle. Both are found under the filter menu. I'll use Spatter here as it ships with Photoshop(tm). With Spatter you'll need to break the surface up a bit manually first using the paint brush. Select the paint brush and using 2 different sized brushes, one 20 pixels and one around 40, and alternating between black and white, paint away at Channel #4 until it looks something like this (Figure 3). Next go to Filter/Gaussian Blur and blur the channel about 5. Now go to Image/Adjust/Brightness Contrast and set it to 49, 93. This tightens up the blurred image and is an effect I use a great deal. It takes our hard edged painted image and makes it look much more natural; at this point your image should look like this. (Figure 4) To break the image up further we'll now use spatter. First, blur the image a bit as we did before again using 5. Then go

to Filter/BrushStrokes/Spatter... set it to a spray radius of 20 and a smoothness of 7. Move the cursor into the black preview window and drag the hand around until you can see your image, it defaults to center. Your image should now look like this (Figure 5). Again you can run Brightness Contrast on it to tighten it up a bit.

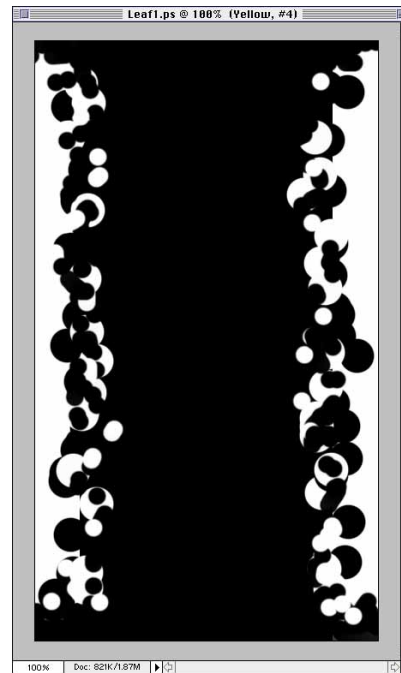


Figure 3: The channel broken up by painting.

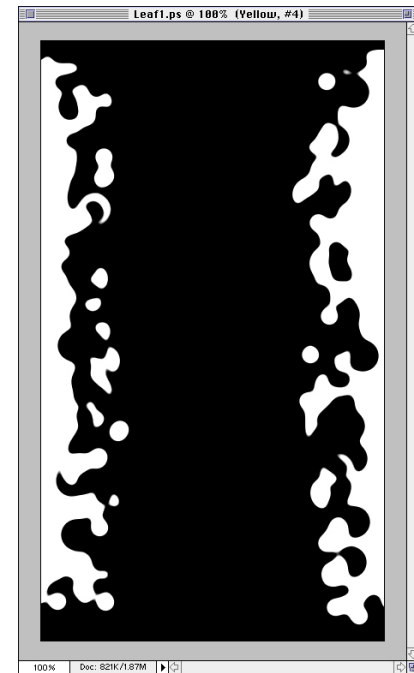


Figure 4: The channel blurred and then tightened up.

The next step is to add a layermask to the Yellow layer. If you are not familiar with layermasks it's a good idea to read up on them in the Photoshop(tm) manual or in "The Photoshop(tm) 4 Wow! Book, a highly recommended book by Peachpit press. Be sure to check out page 190, Windows version. The first thing to do is to load the selection from the channel #4. Do this by selecting channel #4 so that you can see it and then clicking on the load selection icon at the bottom of the channels window. It's the first icon in the row, a simple circle on white. If you hold your cursor over the icon its function will appear in a small window above. Click this icon to load the selection. Then click on the RGB channel within the channels window, click the Yellow layer within the layers window to make it active and then click the first icon at the bottom of the layers window, the add layermask icon. Your yellow layer now has a layer mask associated with it. The black regions of the mask allow the layer below (green layer) to show through. This is the most flexible way to work with multiple layers, you can add or subtract from the layer mask at any time (Figure 6). Next to the layer swatch for the yellow layer you'll see a paint brush; this tells us that we are on the RGB value for that layer, the swatch also has a black outline around it. If we click on the layermask swatch directly to the right that icon changes to a square with a circle in the center, the layermask icon. This tells us that we are on the layermask portion of this

layer. Fully understanding channels, layers and layermasks will go a long way toward your ability to create textures in Photoshop.

Now we'll further affect the values of the colors within both layers using the burn and dodge tools. Burn/Dodge/Sponge are all accessed through the 6th icon down on the right side of the tool bar. Using a large soft brush, around 75 pixels, use these 3 tools on both layers to make your image look something like this (Figure 7). I like to use a light exposure setting, around 10 or 15% set at the Options window where you can also switch tools and set the effect. Dodge will lighten and remove



Figure 6: The layers window.

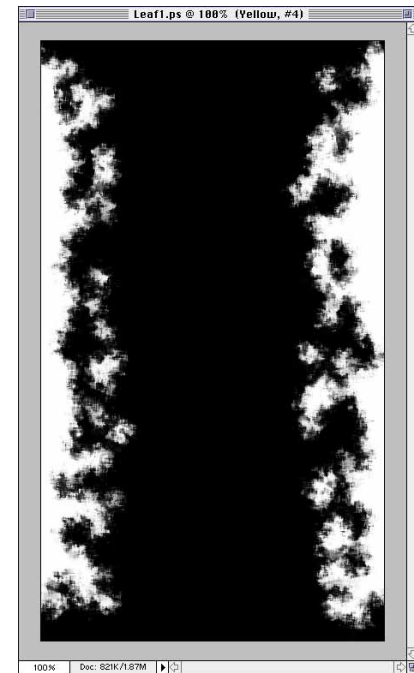


Figure 5: The channel with the Spatter Filter effect.

color from the image. Burn will darken and add color to the image, and saturate will either increase or decrease the saturation of the image, the default is saturate so be careful. Also, at this point I further blurred and ran Brightness Contrast on the layermask to smooth out the edges a bit. I used the airbrush tool as well to paint black over some of the white areas within the mask using a low opacity setting to allow the green to show through a bit more.

Now we will make the veins that run through the leaf. The trick to making these look real I believe is keeping them very thin. To create them we will use the Pen tool, stroking the path. We will be using the Pen tool to create a path which will show up in the Paths window so make sure that window is open, generally if it is open it will be under the Layers window. Layers, Channels and Paths windows can be combined by dragging their tabs to the same window. If you like you can drag the Paths tab out of the Layers window to create its own window. The Paths or Pen tool is 7 down on the left of the tool bar and expands to reveal several options. The first option is the Pen tool itself, this is what you'll use to lay down the paths. The second option, the white arrow, is the adjust tool, you'll use this one to deselect a

finished path and adjust the vertices position and curve. These are the only 2 options you need to worry about at this time. See [Figure 8](#), each line is a separate path. The idea is to lay down a path (single line) using the pen tool, then using the adjust tool click off the path to deselect, then using the pen tool again lay down a second path and so on. It's a tedious process, but one that works well. Another option would be to go into illustrator to do this or simply to use the paint brush with a very small brush.

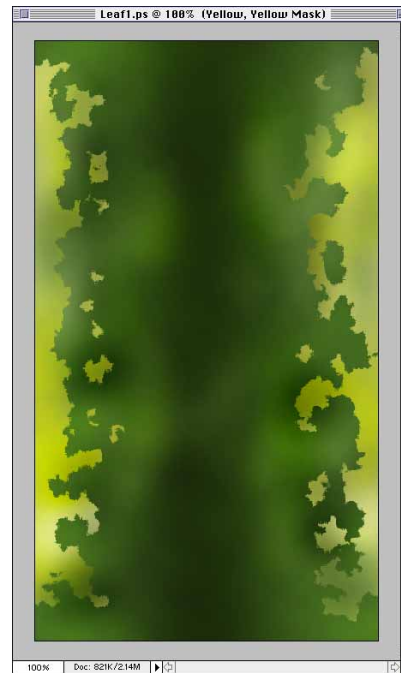


Figure 7: The yellow and green layers.



Figure 8: Green, Yellow and veins layers.

The brush technique will work well if you have a tablet; however, if you are using a mouse you might find it difficult. For the sake of this lesson I'll use the pen tool. After you've created all the veins for one side of the leaf go back to your layers window and create a new layer, (page icon at the bottom of the window) and name it veins. Make sure it is active as it is in this layer which we will stroke our paths. Using the adjustment tool under the Pen tool pop out drag a selection marquee around all the paths. With all the paths selected go to the Paths window and click on the Stroke paths icon at the bottom of the window, 2nd one from the left. You've just stroked the paths with your foreground color in the layer you created, veins.

Now to save that layer as a channel or selection. On a Mac Command click directly on the layer in the layers window, the icon should change to a hand with a small outlined box on top. If you're on a PC, I believe it's control. This action will load a layers' contents as a selection - a very handy feature. Now on the bottom of the Channels window, click the save selection icon, 2nd from left. You now have a saved selection of the vein pattern we will use. Now we need to duplicate it to fill both sides and adjust its thickness as it is way too thick at this point. To duplicate it use the

rectangular marquee tool to select just the right side of the channel; then using the layer move tool drag a copy horizontal. With the copies marquee still active go to Layer/Transform/Flip horizontal. Your image should now look like this (Figure 9).

Next, we need to thin up the lines a bit. We do this by blurring them with Gaussian Blur and then using Brightness Contrast or Levels to tighten them back up. This

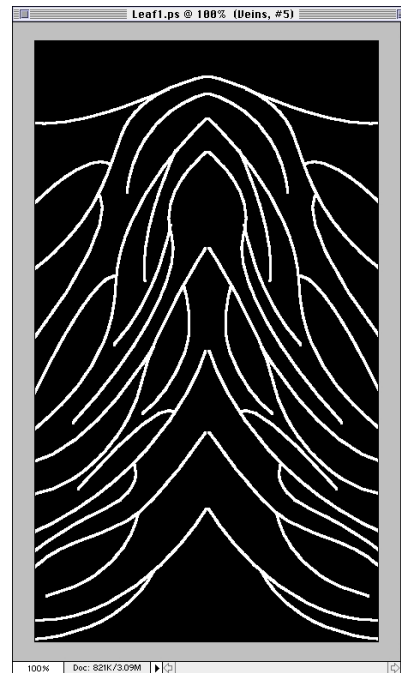


Figure 9: The veins saved channel.

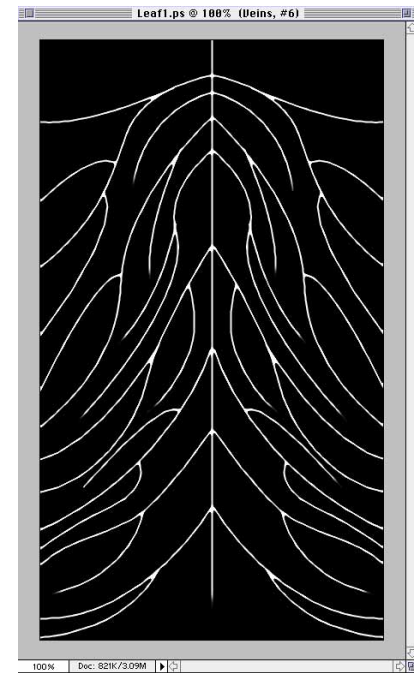


Figure 10: The thinned up and faded veins.

needs to be done slowly about 3 times blurring only about 1-1.5 pixel each time. If we don't do it this way, some of the lines will break up. After you've thinned up the lines, the ones that end abruptly need to be faded out. Use an airbrush about 20 pixels in diameter set to about 50% and paint black over these sections to soften the ends of the veins. Your finished image should look something like this (Figure 10).

Now that you've got your Channel set, go back to the layers window and to your Veins layer. Select all and hit delete to delete the original veins we created with the pen tool. Now load the selection from the channel you just created, (command click directly on the channel in the channels window to quickly load any selection). Pick two shades of green using the eye dropper tool, (option click to select background colors) and run the clouds filter. This will fill your selection with the clouds texture. Veins in leaves come in all colors and values, sometimes darker and sometimes lighter than the leaf. In this case I'll use both. I've used the Dodge, Burn and Sponge tools to darken the veins where intersections occur and lighten them toward the ends, how you do this is really up to you. Also, I duplicated the veins layer (drag it down to the page icon at the bottom of

the window) and applied a blur to it of about 3. This gives the effect of more depth and is optional. After all those adjustments your image should look like this (Figure 11). That

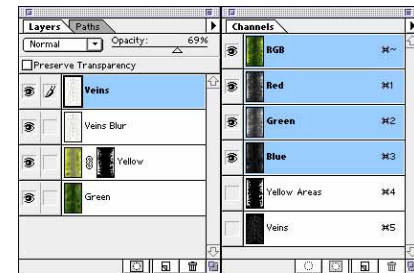


Figure 12: The layers and channels windows.

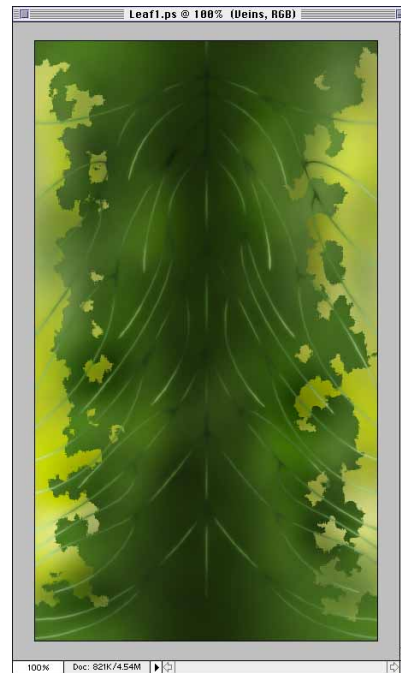


Figure 11: The 3 color layers.

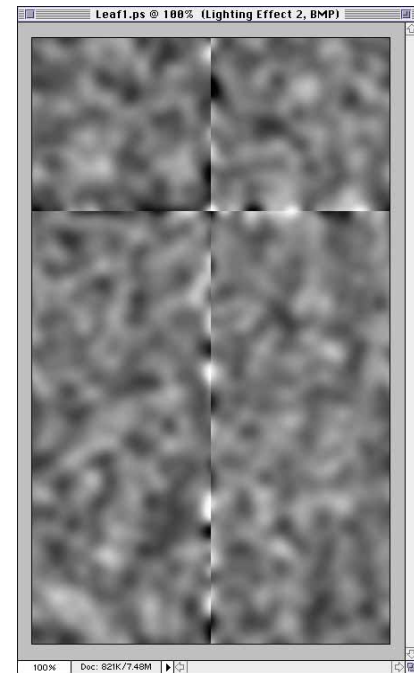


Figure 13: The blurred noise showing harsh seams.

about wraps it up for the RGB value of the leaf texture. Your Photoshop(tm) file should have 4 layers and 2 extra channels that look like this (Figure 12).

The next step is to create Specularity and Bump maps which we will do using channels. First we'll work on the bump map. The idea here is to create a sort of pillowy effect around the veins as well as have a smaller bumpy effect across the entire surface. Make a new channel by clicking on the new channel icon at the bottom of the channels window, name it Bump. In this new window add noise in the amount of 175, Filters/Noise/Add Noise. Next apply a Gaussian blur to the noise of 8 pixels. Now bring up levels, Image/Adjust/Levels and set the input values to 52, 1, 82 and blur again 2. Next go to Filter/Other/Offset and offset the image 200 x 200 making sure it is set to Wrap Around, your image should look like this (Figure 13).

This is the beginning of the process of making a texture wrap with no seams. Now use the Rubber Stamp tool (5th down on left side of tool bar) to eliminate the seams. Option click sets the tools reference spot and then painting with the tool will clone that spot's pixels to the area you are painting. Use a large soft brush about 50-70

pixels. After you've finished, Offset the texture again. You should see a faint seam caused when you painted on the edges, remove that as well. You might need to repeat this a couple times to totally remove the seam. Now

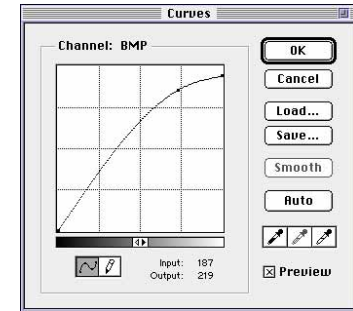


Figure 14: The curves window.

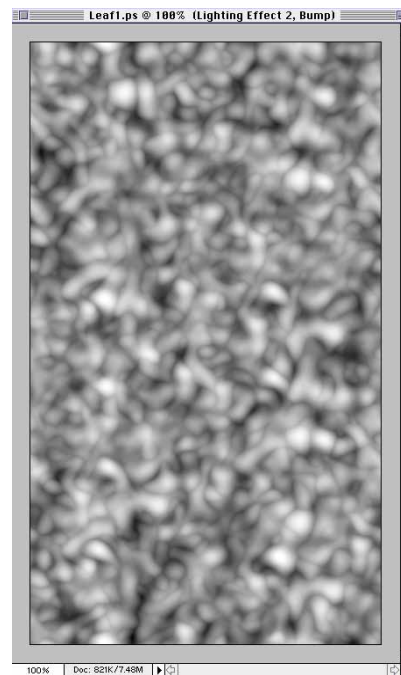


Figure 15: The pillowy effect.

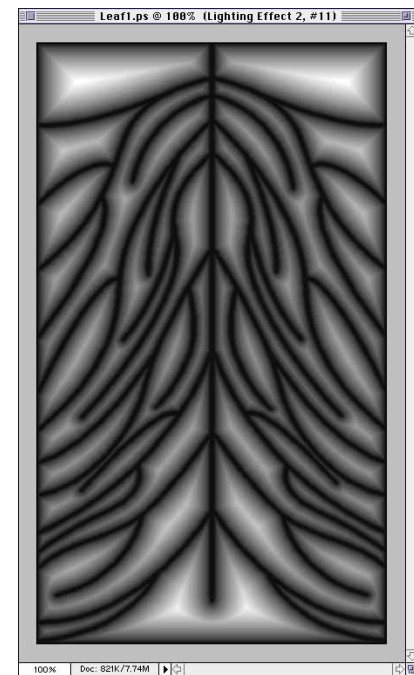


Figure 16: Gradient Designer run on the inverse of the veins selection.

you'll need to run Curves on the image so the bump created nice and rounded, Image/Adjust/Curves (Figure 14). Run levels once again setting the input values to 66, 1, 231. This gives us a good range of value to work with for the bump map. This next process is what will give us a good pillowy effect which is also great for making bumpy animal skins. At the Bump Channel select all and copy to the clipboard. Then offset the channel and past the clipboard back down on top. While the selection is still active go to the layers window; set the blending to lighten only. Continue to do this pasting of the clipboard contents, setting to lighten and offsetting 4 or 5 times and then run levels on it again for a good range of value. Your images should look something like this (Figure 15).

That last process built for us the small raised surfaces you often find on leaves. This next process will build the pillowing that occurs between the veins of the leaf. It requires the use of KPT Gradient Designer(tm) so if you do not have that plug-in you can skip this step. Make a new channel and load the veins selection. Select the inverse so that everything but the veins are selected and run Gradient Designer on the selection. Your blend should be white to black and you should choose "circular shape burst" for the mode. Your

results should look something like this (Figure 16). Now give it a Gaussian blur of 5 and run curves on it to round out the blend. Go back to the channel Bump and run levels on it setting the output levels to 0 and 45, it should look quite dark. Then load the channel you created using the KPT Gradient Designer and lighten, see Figure 17 for reference. Now duplicate the veins channel and blur 1 pixel. Next load that channel into the Bump channel and lighten (Figure 17). There you have it. Your bump

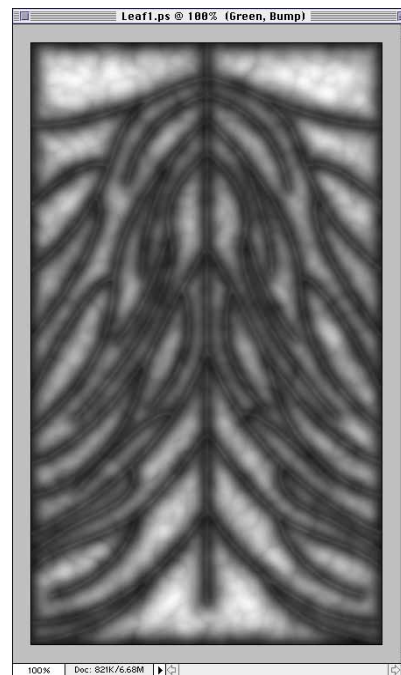


Figure 17: The completed bump map.

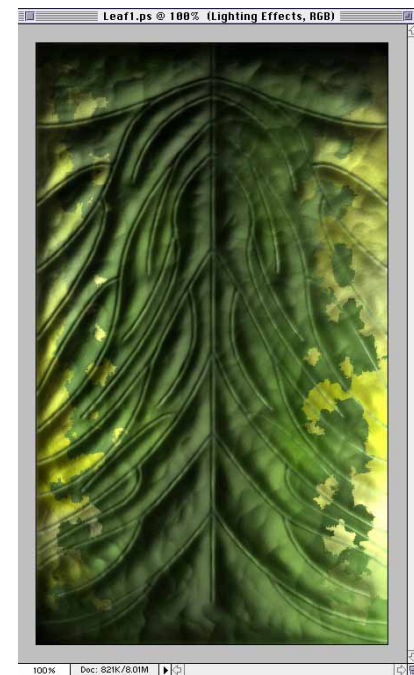


Figure 18: Testing the bump map with lighting effects.

map is complete. See [Figure 18](#) for a layer with lighting effects run to test the map.

Now for the Specularity map, don't worry this is a quick one. The leaf itself will be quite shiny, but the veins will have little specularity. All you need to do is make a new channel, name it SPC load the veins selection, fill it with black or delete to black (option delete, deletes to foreground color). Then you blur it about 3 or 4 load the veins again fill with black again and blur just a bit, something like .5. Now lighten the whole channel a little using levels and your done ([Figure 19](#)).

The final map to create is the stencil or clipping map. It takes about 2 seconds to make but would be worth it if it took 2 hours. Make a new channel and name it Stencil or Clipping whatever your software of choice calls it. Using the lasso tool create a selection that runs the length of the map in the vertical with rough edges and fill with white. ([Figure 20](#)). This map will be loaded into the stencil channel in StudioPro or the Clipping channel for 3dStudio Max. It will cut away at the shape giving it a rough asymmetrical edge - much more natural than a perfect clean mesh.

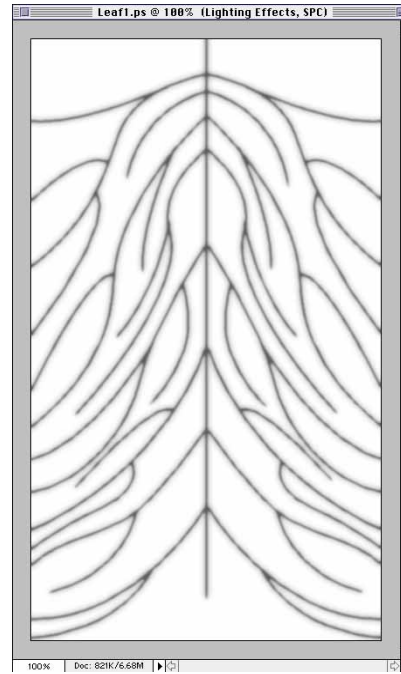


Figure 19: The Specularity Map.

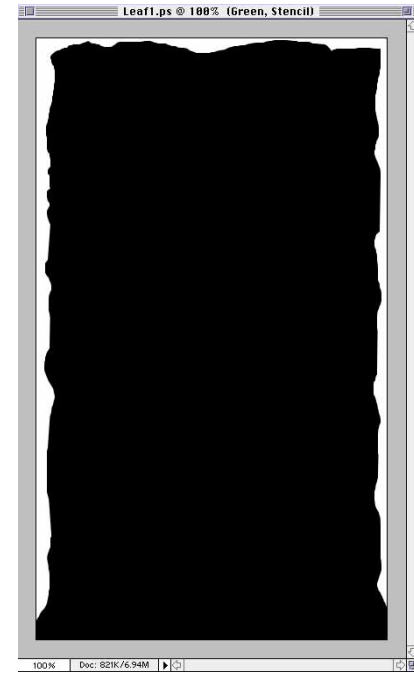


Figure 20: The Clipping Map.



Figure 21 and Figure 22: The Rendered Leaf.

That does it. [Figure 21](#) and [Figure 22](#) are renders of my final leaf. I created it as a shape object in StudioPro so that I can insert as many instances as I like into my scene. With more time I would create several leaves for more realism. There is enough going on in this scene that the use of a single leaf is not that detrimental, but I certainly recommend doing more than just one. Unfortunately, we don't have the time or the space to cover each texture map in this article. The same basic technique is used for all of these textures. The most important thing to remember when developing texture maps is to keep your Photoshop file layered. I am constantly making changes to the layer masks to get to the desired effect. After you apply your maps to objects in your scene you'll likely find that they don't fit quite the way you want them to and you will need to come back to Photoshop to make changes. If you've not saved layered files this will be very difficult.

Finally, below you'll see a few of the textures used on the other parts of

the flower. Notice the specular map for the petals. The streaking creates an effect similar to the way light reflects off of real flower petals. If I were to use these flowers in an animation I might even use a reflectivity map that creates a similar effect. That is an effective way of creating a colorful sheen to the surface similar to the feather of a



Figure 23: This is the RGB value for the petals of the flowers.

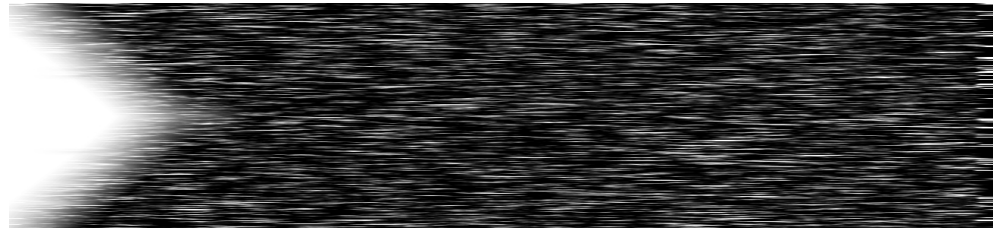


Figure 24: This is the Specularity map for the petals.

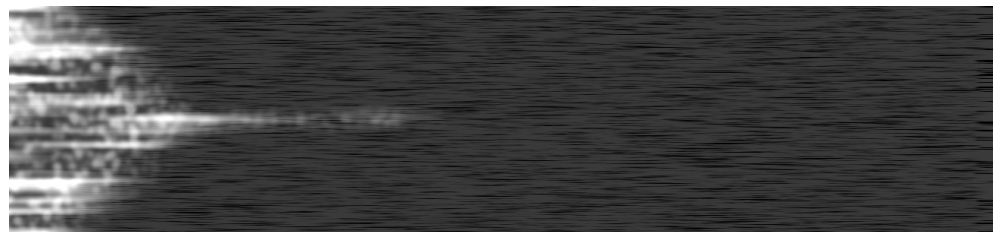


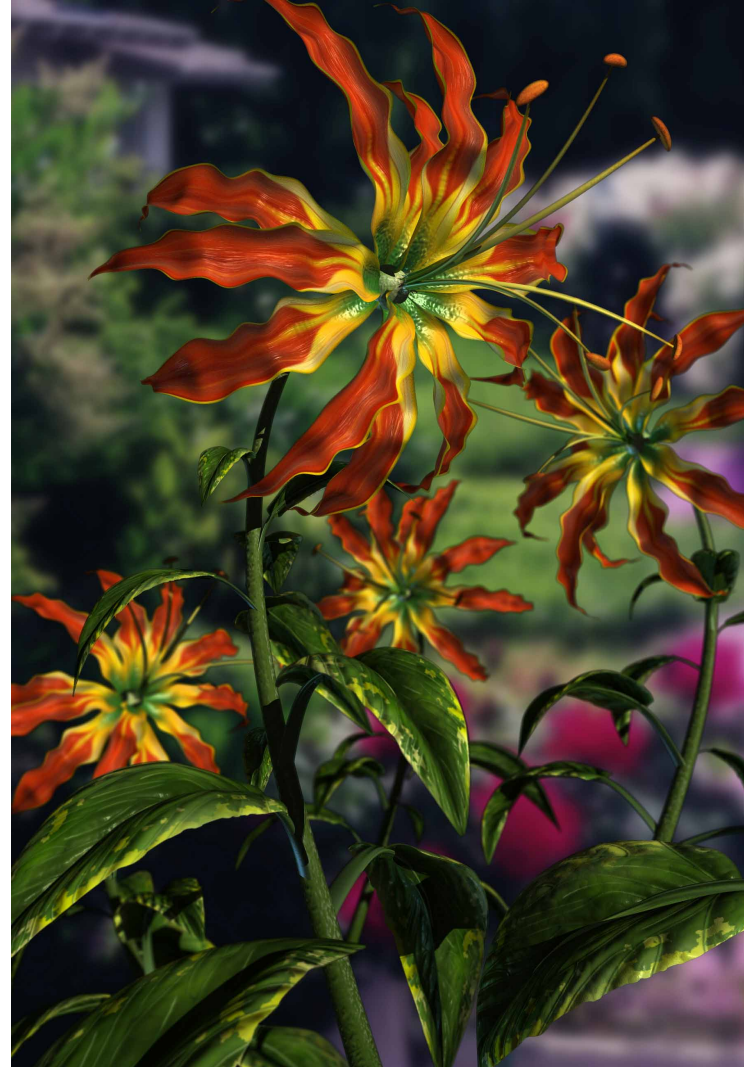
Figure 25: This is the Bump map for the petal.

humming bird. Have fun and experiment, all those channels are there for a reason, use them.

Figure 23 - This is the RGB value for the petals of the flowers. Again in a perfect world you would want to create more than just one color map for the petals.

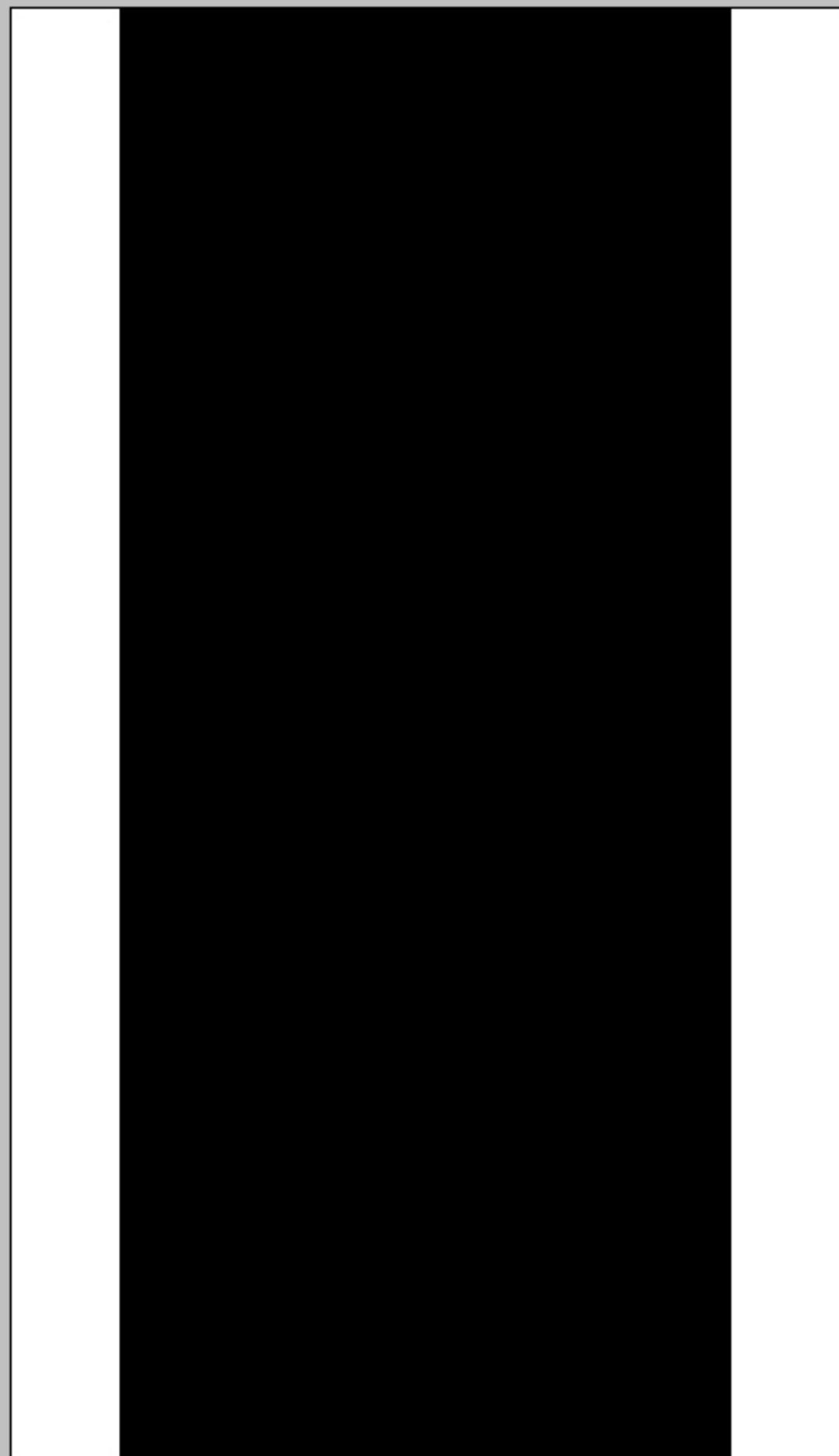
Figure 24 - This is the Specularity map for the petals. With this map the green on the petals is quite shiny and the petal itself has a sheen to it, similar to a real flower petal.

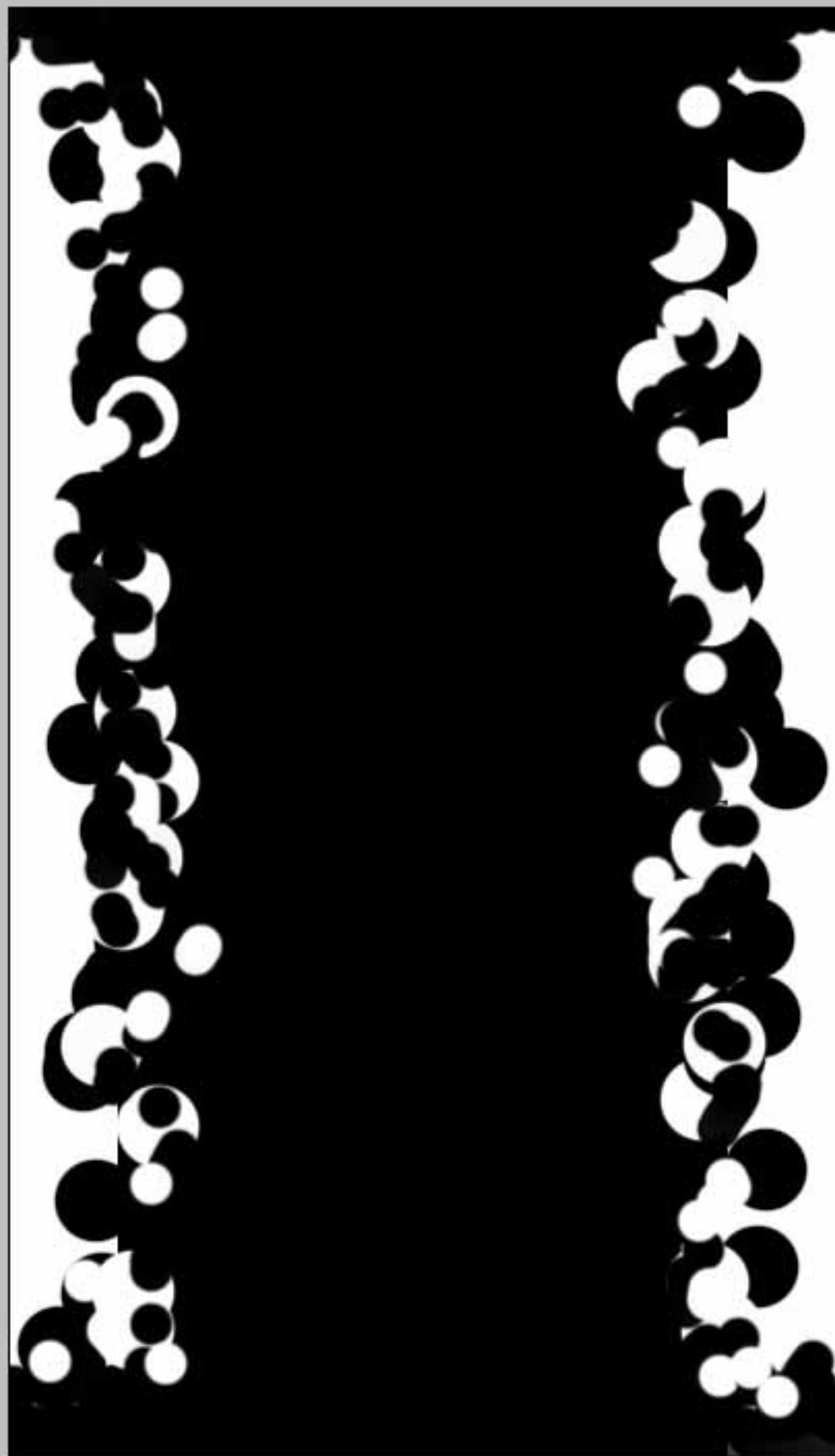
Figure 25 - This is the Bump map for the petal, it creates a bit of relief at the base of the petal and then works with the specularity map to emphasize the sheen.

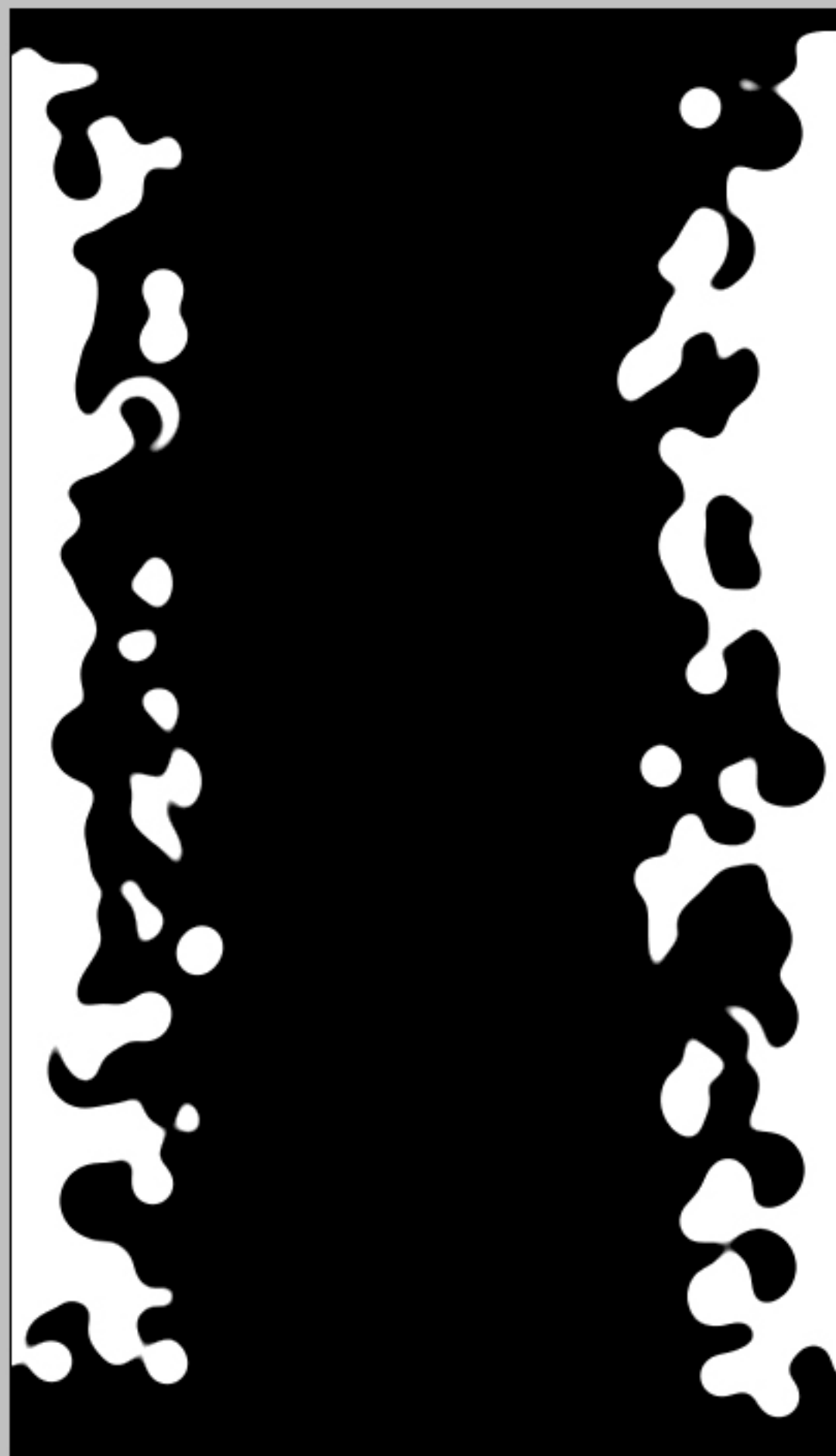


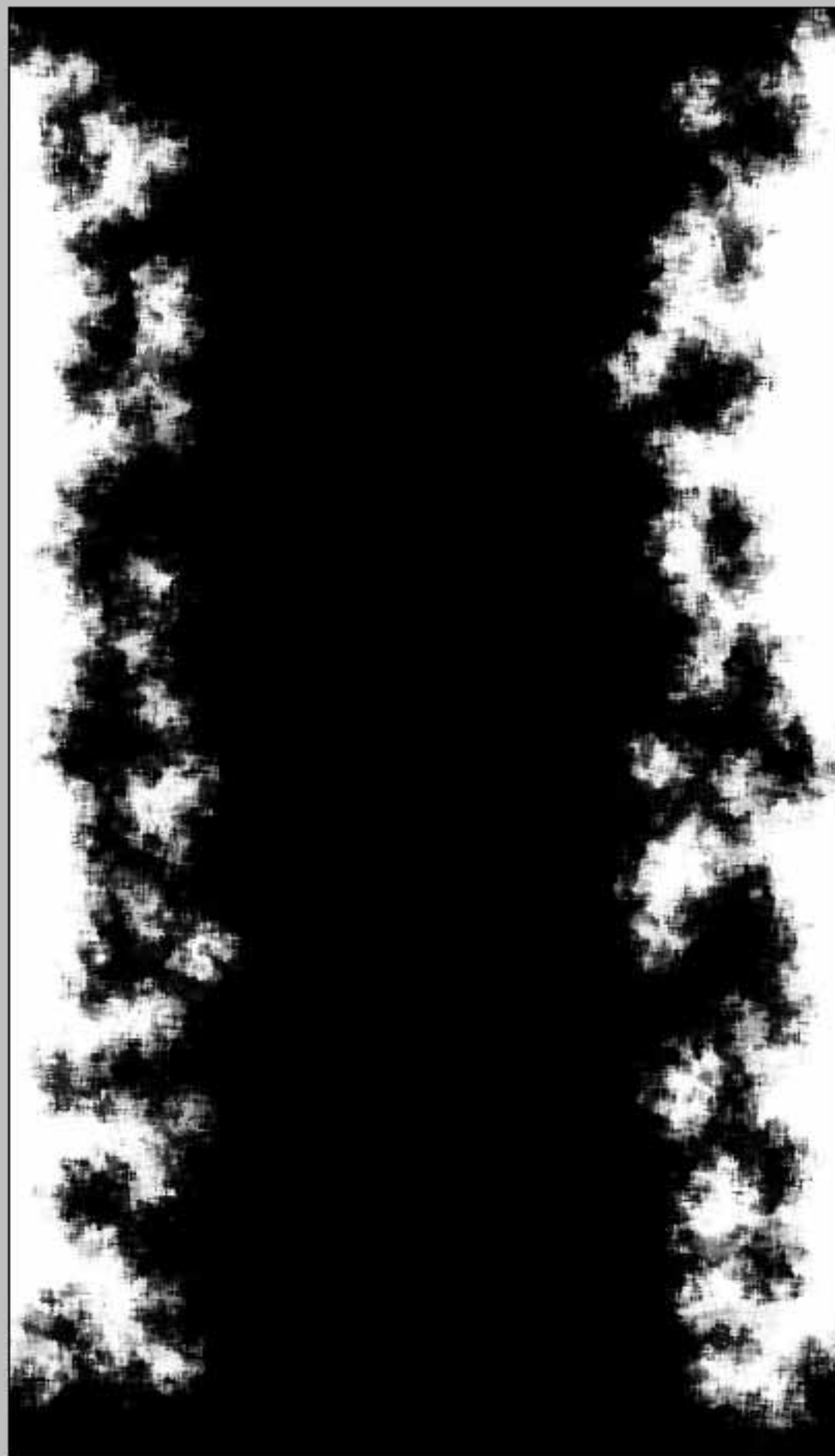
FlowersComp.jpg: The completed Flower.











Layers

Paths

Normal

Opacity:

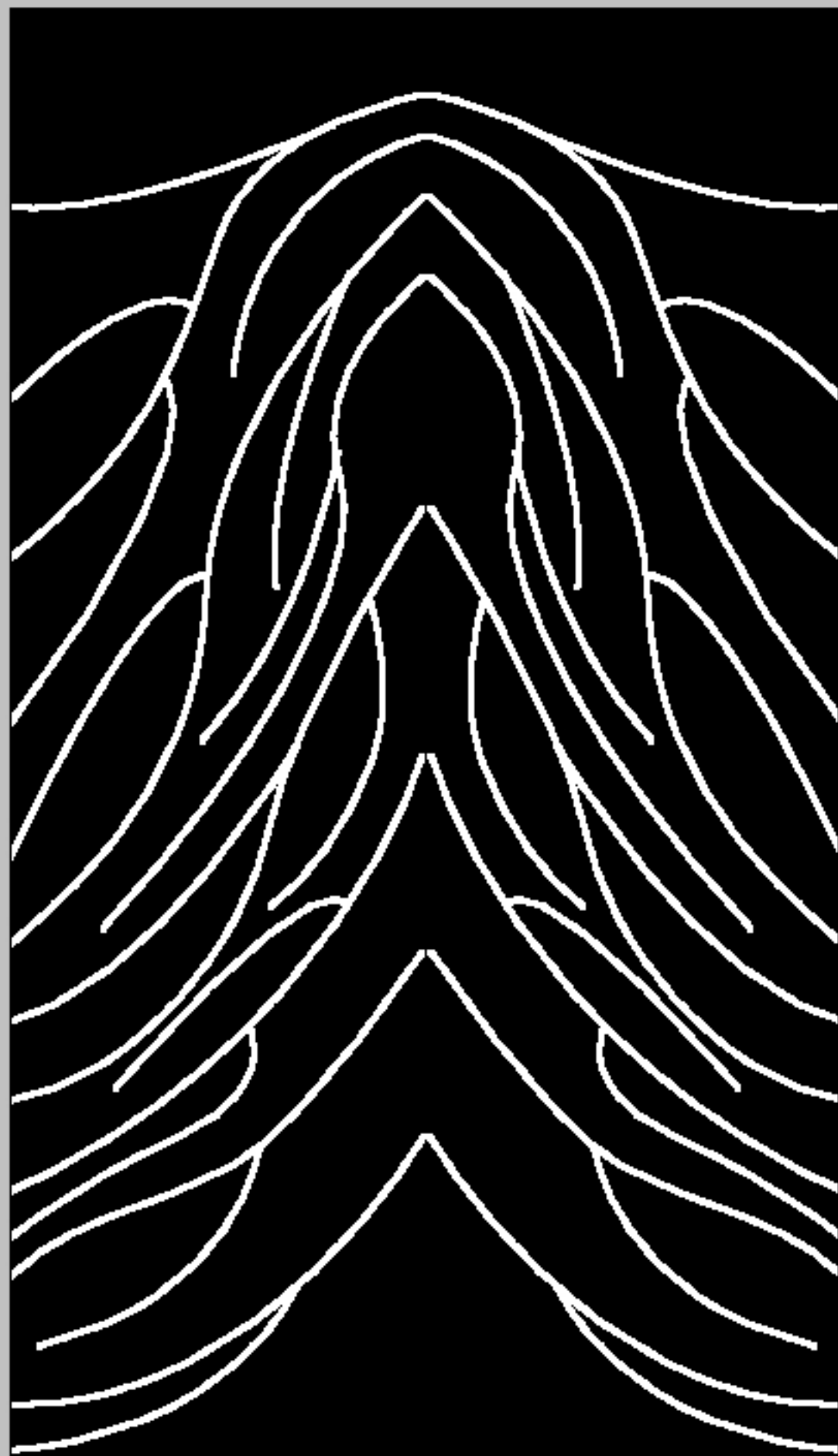
100%

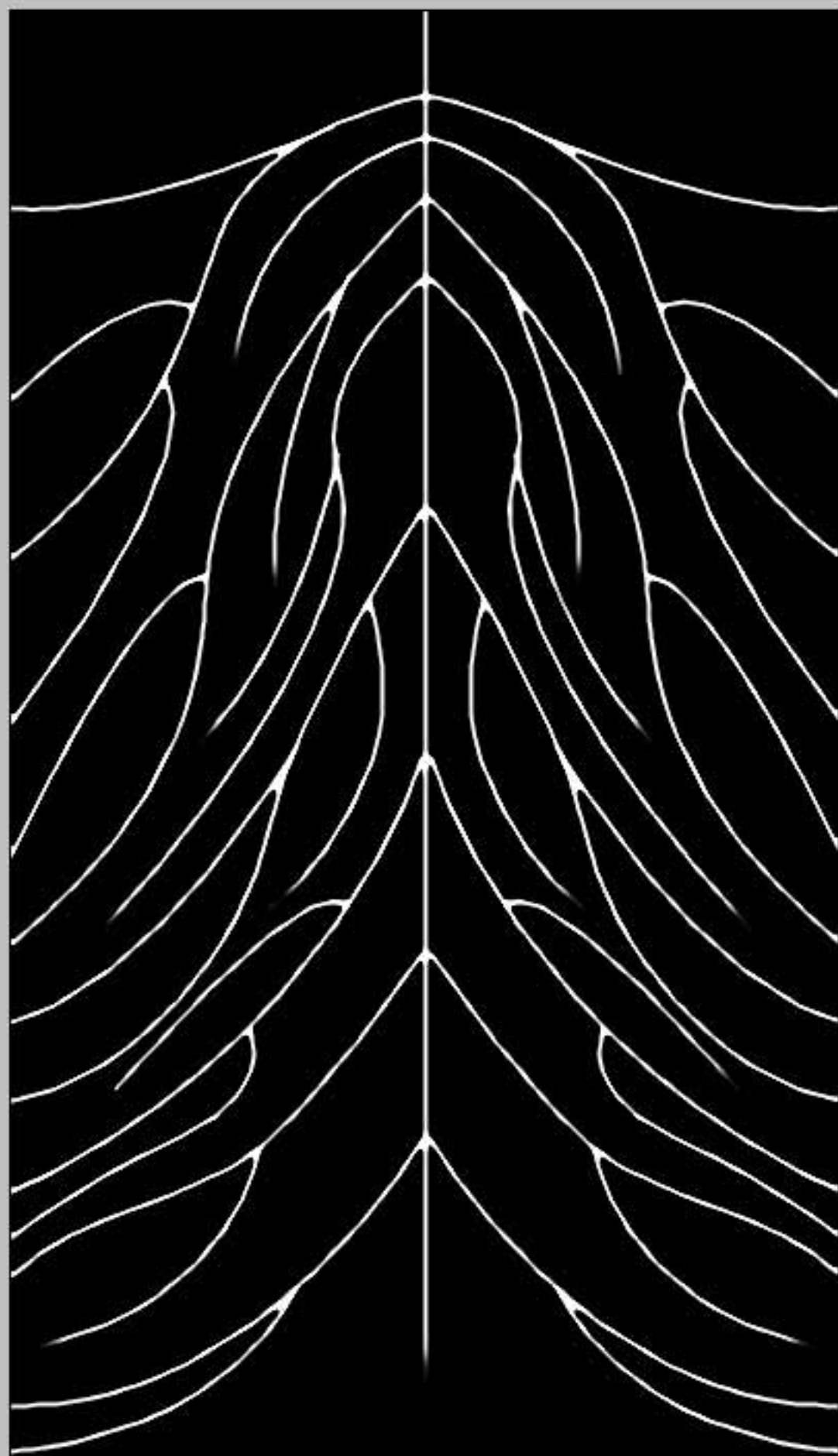
☐ Preserve Transparency



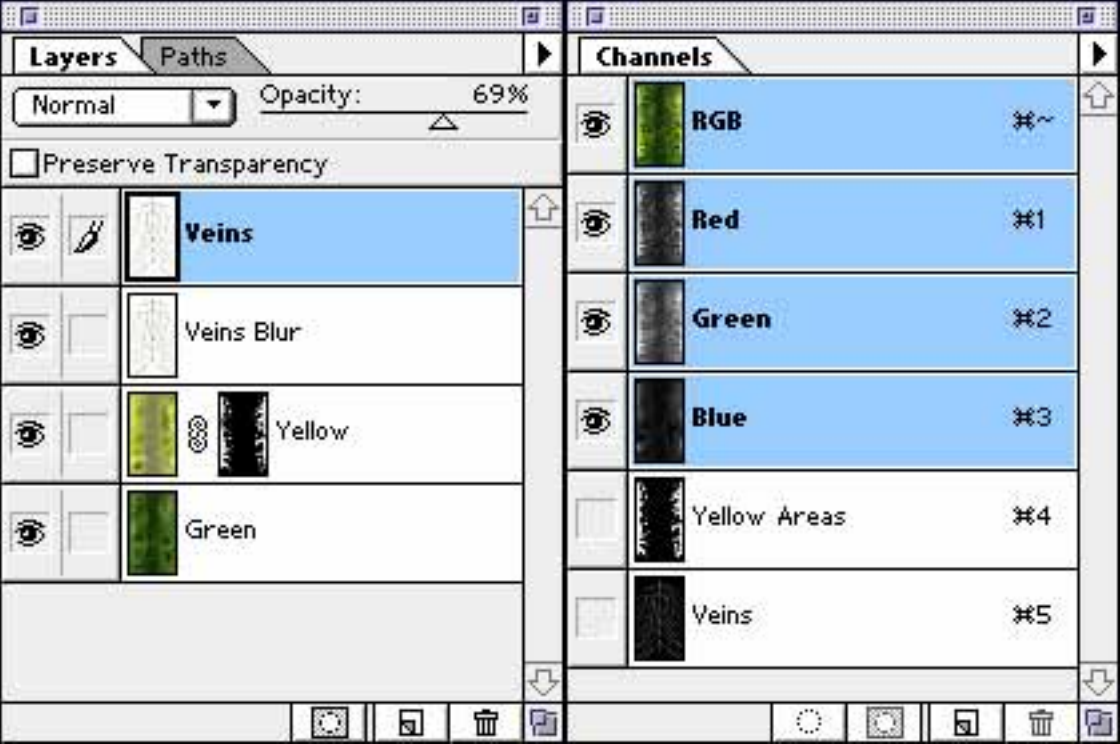


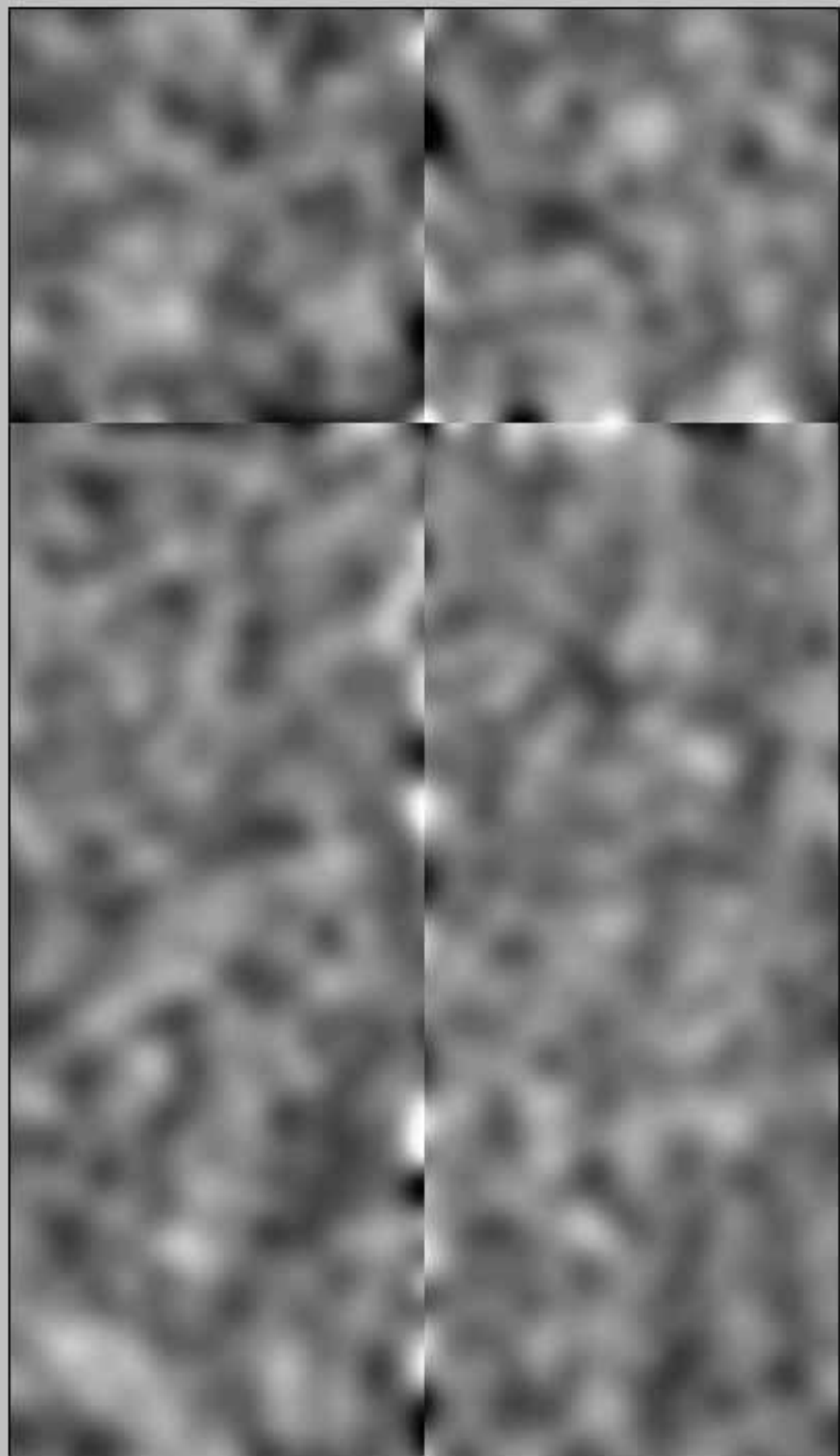






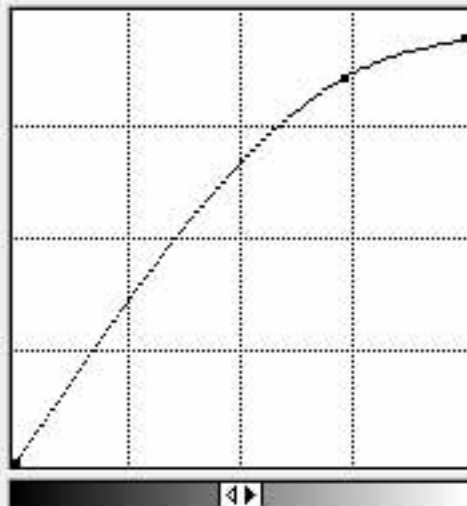






Curves

Channel: BMP



Input: 187
Output: 219

OK

Cancel

Load...

Save...

Smooth

Auto



☒ Preview

