

Sub Surface Scattering (SSS) in RenderMan for Maya

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Before you read this tutorial, please read about SSS in the RfM docs at:

http://www.it.ringling.edu/CAdocs/RfM_1.0/Recipes_and_Tutorials/Subsurface_Scattering.html

SSS simulates light scattering under the surface of an object. Done right, it can have very convincing effects on many materials such as skin, stone, milk, etc.

The downside is that it can be very expensive to render and takes a bit of tweaking to get right. If SSS is too expensive, there are multiple ways to fake the effect.

This tutorial will explain how to set up SSS and what each setting means. The information here is what I have figured out and what works for me. I might be totally wrong about some of this stuff, but it will give you a good starting point.



SSS with multiple painted maps

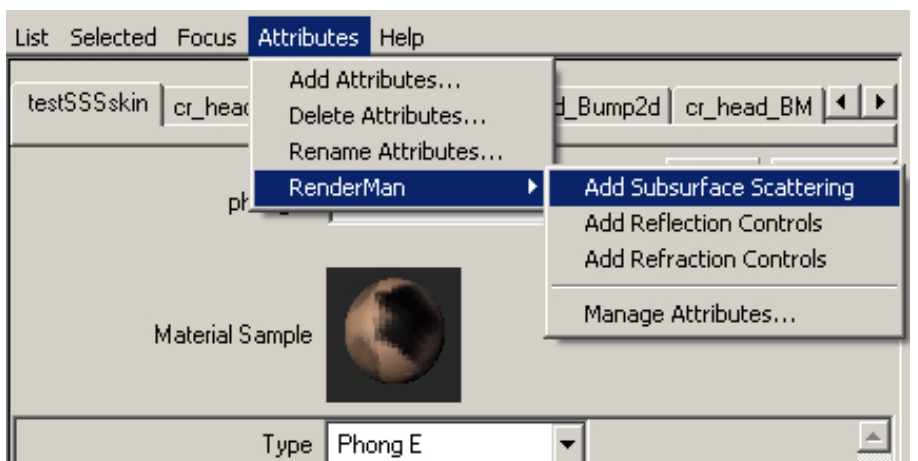


Color and Diffuse maps. No SSS
(And bad shading)



1. Make a new shader and assign it to the model that you want SSS on. I chose a PhongE for skin. Set up a 2 point lighting scheme with the key on the opposite side of the face from the camera and a strong back light to illuminate behind the ears. This will show off the SSS effect.

2. With the shader selected, go to Attributes > RenderMan > Add Subsurface Scattering

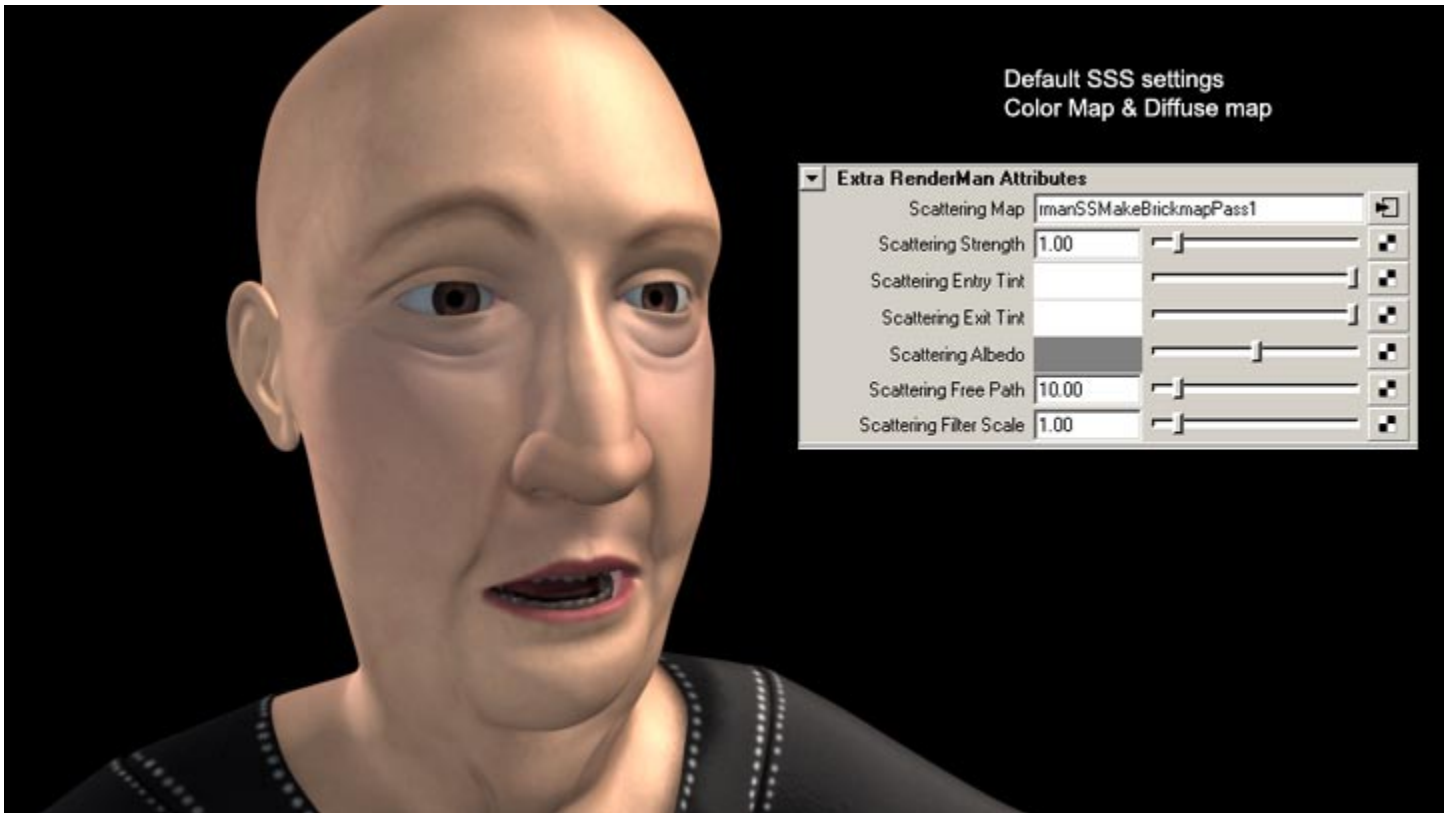


3. Render a frame to see the effect.

You will notice that it takes a lot longer to render and that it renders multiple images.

The first image that is rendered is the Diffuse Pass for the object. Second, it renders a point cloud file that includes information about the SSS. The point cloud file is not shown on screen. Once it is rendered, you will see the messages “Filtering octree” in the feedback line.

Finally, the frame is rendered. The render time that is shown is for the final rendered image only and does not take into account the initial passes.



SSS Attributes

Scattering Map links to the precomputed scattering pass in the passes tab of the render globals, which will be covered later.

Scattering Strength is the amount of the effect.

Scattering Entry Tint is the color of the light once it enters the skin. This should be set to a fleshy color.

Scattering Exit Tint is the color of the light once it exits the skin. The light will be colored by the fleshy parts under your skin, mostly blood. Paint a general color map for this attribute.

Scattering Albedo is what is under the skin. It is a good place to paint a vein map and to paint what is under the skin. Try mapping a 3D Granite texture to the Scattering Albedo to see how it works.

Scattering Free Path is the distance in world units that the light will travel under the surface. Play with different settings. Use the Measure Tools > Distance tool to find a good starting distance.

Scattering Filter Scale can filter to the effect if there is any banding.

4. Set the Scattering Free Path



Set the Scattering Free Path to fit the scale of your model. The images above are at 1 and 2. The light should feel like it is coming through the thin parts of the skin, but not the thick parts.

4. Set the Scattering Entry Tint



The Scattering Entry Tint should be around the color of the skin. Try mapping your color map in here. The image above has an orange color that roughly matches the skin tone.

4. Set the Scattering Exit Tint



Set the Scattering Exit Tint to the color of the light as it exits the skin. In the image on the left, the Exit Tint is taken from the Entry Tint and made more red. This looks good on the sides of the face but not everywhere.

The image on the right has a ramp from red to light blue to red. The ramp matches up with the UV map so that the red parts are on the ears and the middle of the face has a blue cast to it.

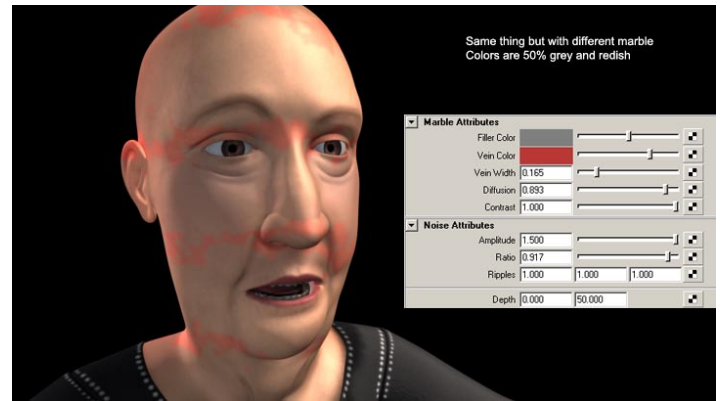
Eventually, you should paint a map for the Exit Tint to better simulate the colors under the skin.



5. Set the Scattering Albedo



Marble texture on a Lambert



Marble texture mapped to the Scattering Albedo



Adjusted marble texture



Rough Albedo map



Rough Albedo map and shader tree



More detailed Albedo map. The veins are still a bit heavy, but its getting there.

6. Set the Scattering Strength

(I'm not totally sure about the info here)

If you want to, you can paint a map for the Scattering Strength. The map will get connected to the `rman__SSMult` attribute.

Here is a quick test. White is painted around the ears, lips and nose where the scattering is greatest. The dots on the head are 10% to 100% brightness in 10% steps.

Once the map is painted, you can connect it to a `multiplyDivide` node or a `Contrast` node to get the look you want. This map acts a bit like a diffuse map. Paint it darker around the shoulders and scalp so that the SSS effect isn't so strong there.



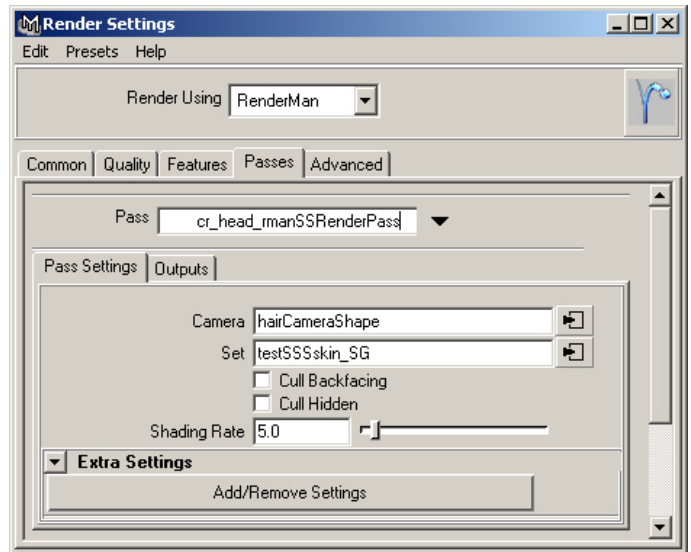
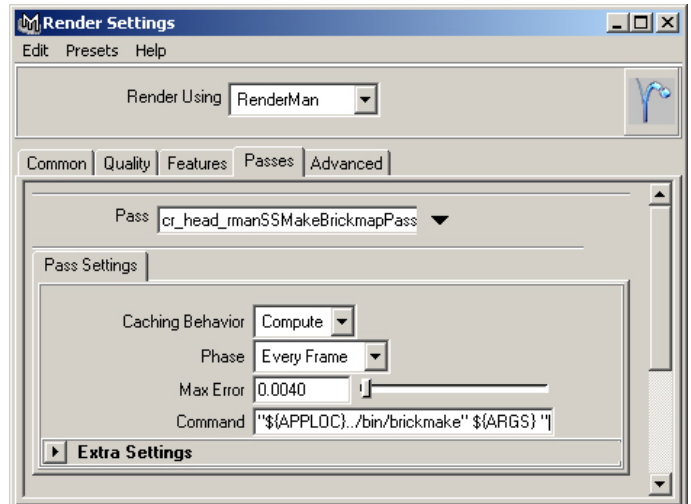
Somebody call a doctor!

One more thing:

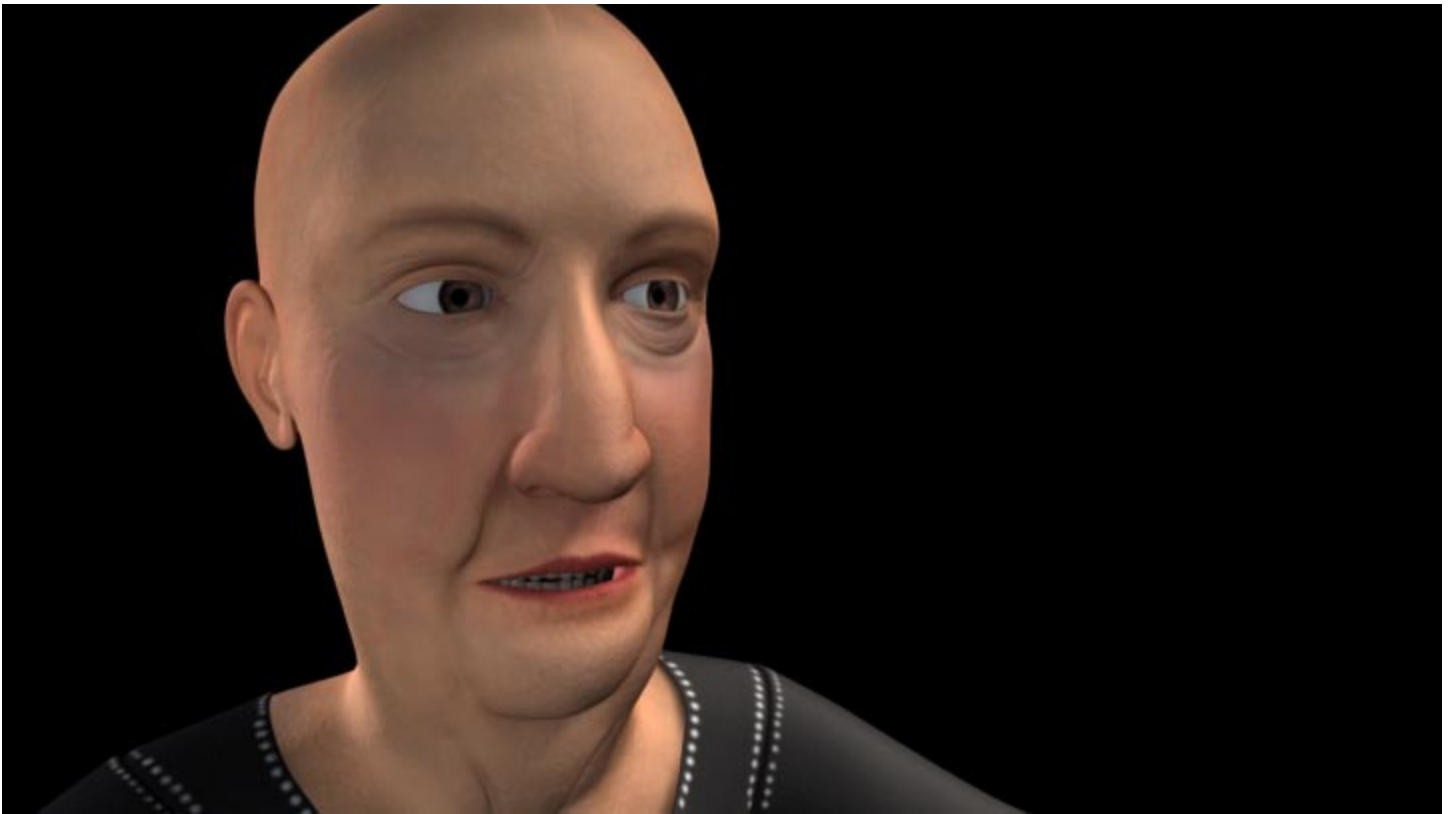
SSS is calculated from a camera. When you add SSS to a shader, it adds a pass in the render globals called rmanSSMakeBrickmapPass1. Once you have everything set, you can set the Caching Behavior to Reuse so that it does not have to calculate the SSS every time you render. However, you can not move the camera in Reuse mode. Disable will turn off the pass.

There are two subPasses under the rmanSSMakeBrickpapPass. The third pass is the important one. You must set the camera that you are rendering from in the camera box. RMB in the box for a list of cameras.

The Set box should be set to the shader that is on the character. Make sure Cull Backfacing and Cull Hidden are off.



SSS pass set to cameraA but rendered from cameraB. OOPS!



Final render with Exit Tint, Albedo and Scattering Strength maps

One last note:

Thank you for reading this tutorial. Hopefully it was helpful. This is not the easiest thing to set up. It took me easily 15 hours to get this working nicely. Spend some time working on it. Work on one attribute at a time and save your renders to compare. Tweaking this stuff is much like the scientific method. Only change one thing per render.

Besides being expensive, something that people notice is that when you have SSS on the skin, you need to have it on the eyes and teeth to get a more believable effect. This probably does not apply to what we are doing here, but it is something to think about. You will need it on your hands so that the character looks the same all over.