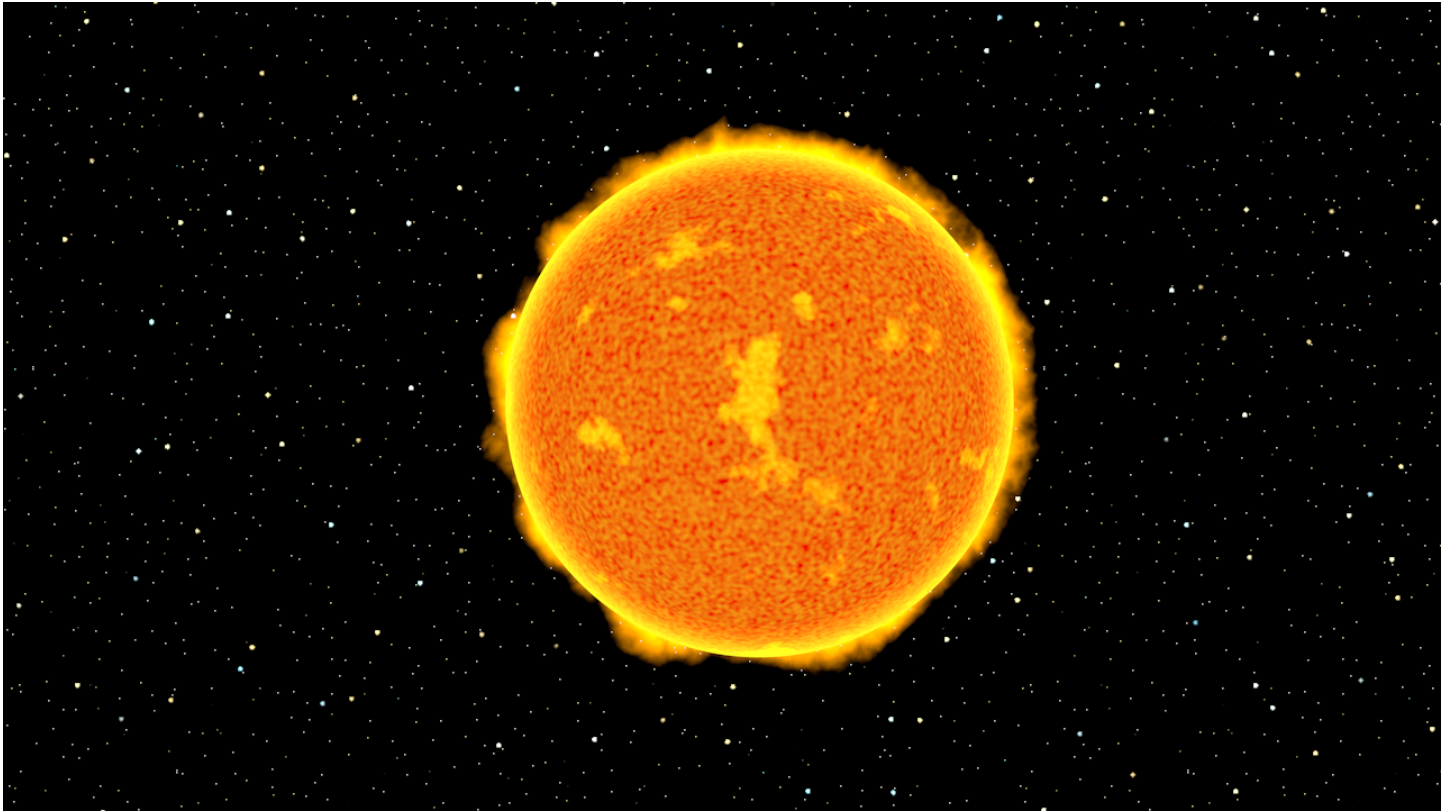


Sun Shader

Two shader plugins for Cinema 4D



Sun Surface Shader: Introduction

This is one of two shaders intended to be used together to simulate a close-up image of the sun (or any star, really). This shader is for the sun surface; the other is for its corona.

Using the Sun Surface shader

This shader is intended to be added to the luminance channel of a material. You can disable the colour channel, and should certainly disable the reflectance channel (a specular highlight on the sun looks really odd, because the sun is so bright it can't show a brighter highlight). This will be done automatically if the 'Disable Reflectance' switch is checked.

Once in the luminance channel, you can alter the settings as required. However, you will notice that increasing the luminance channel 'Brightness' setting has no effect. This is easily remedied. Change the 'Mix Mode' setting to 'Multiply' and the brightness setting will work as normal, assuming the luminance channel colour is the default white. For the default colour settings in the shader, a brightness of 150% to 200% works well.

The shader will contribute to global illumination but will cast very little light. To fix this, see the 'Hints and tips' section at the end of this manual.

Reference

The following controls are available.

1. Surface Color 1 and Surface Color 2

These are the two colours which are used for the sun surface. They can be anything you like depending on the colour of the star you want. Star colours reflect their temperature; blue stars (for example) are hotter than red stars. For more information, see <https://online-learning-college.com/knowledge-hub/gcses/gcse-physics-help/>

[classifying-stars-colour/](#).

2. Surface Scale

This is the scale of the noise which generates the surface detail. The lower this value, the smaller the surface detail. In these images, the surface scale is set to 10%, 20% (the default) and 30% from left to right:

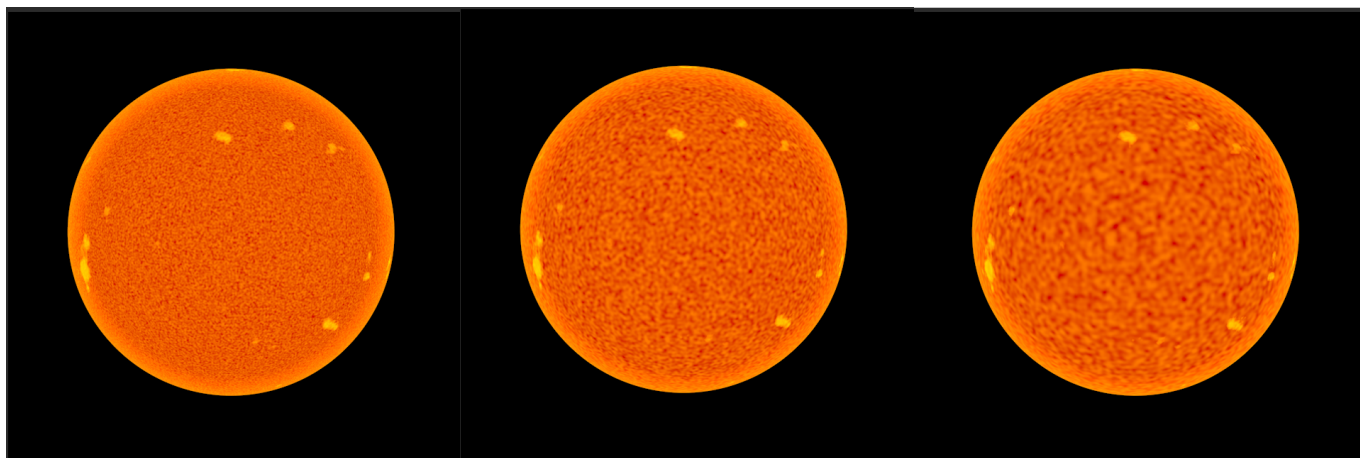


Figure 1. Different surface scale values

3. Flares Color

The colour of any flares the star produces. To see them, make this colour a little brighter than the two surface colours. If it is too dark, you won't see any flares.

4. Flares Scale

Increasing this value increases the size of any flares, but reduces the number of them. If you increase this value, you may also need to increase the 'Flares Extent' value to see them.

5. Flares Extent

The extent to which the flares cover the surface - or to put it another way, the number of flares.

6. Rim Brightness

Many images of the sun show a rim around the edge of the sun sphere, which is bright in some images but dark in others. By altering this value, you can change rim brightness, making it brighter (by increasing the value) or darker (by decreasing it). Setting it to zero removes the rim effect completely.

7. Rim Extent

This is the width of the bright (or dark) rim. Setting it to zero will remove the rim altogether.

Important: the rim brightness and extent have no effect in Redshift, and therefore the controls are disabled. To see the rim in a Redshift render, you need to take an extra step as explained below.

The images in Figure 2 show on the left a rim brightness of 150% while on the right brightness is set to -90%. In both cases extent is set to 75%.

8. Animation Speed

The surface noise can be animated to give the impression of an ever-changing sun surface. The higher this value, the greater the speed of change. A value of around 1.0 seems satisfactory for most purposes.

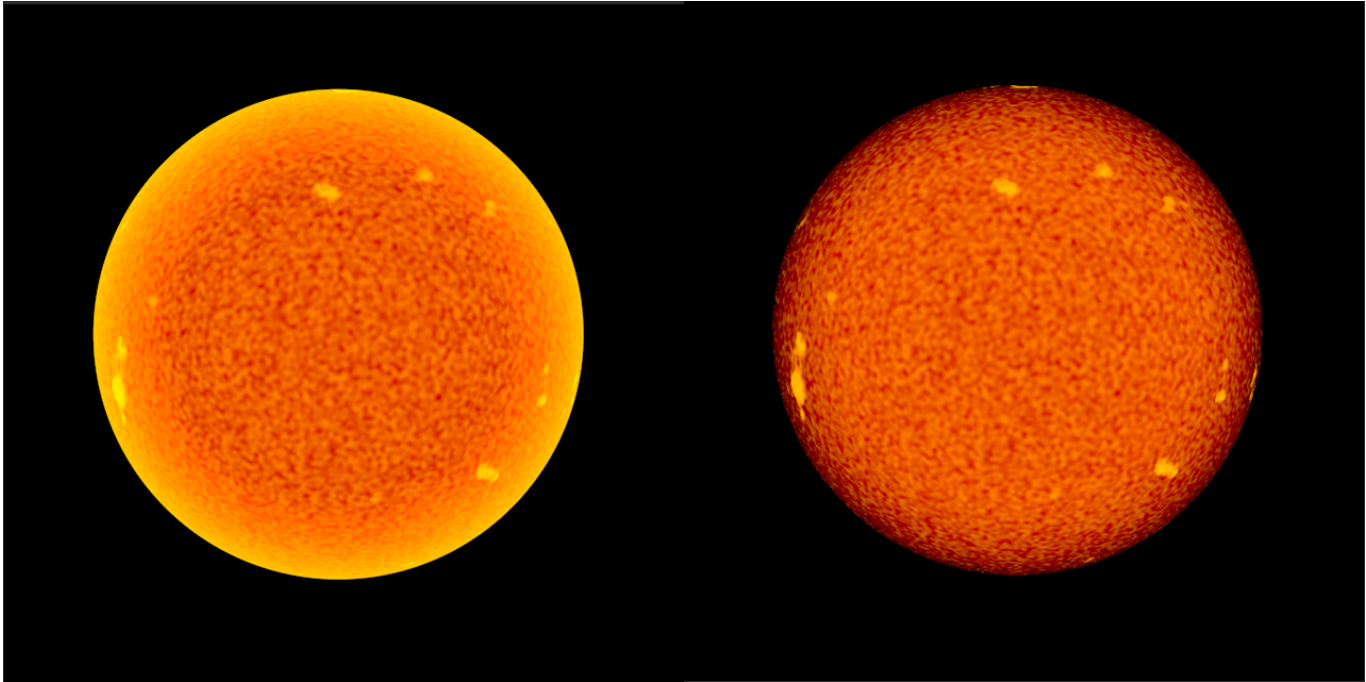


Figure 2. Different rim brightness and extent values

9. Disable Reflectance

Because the sun wouldn't normally be reflective, if this switch is turned on the material reflectance is automatically turned off. If you really do need reflectance, turn this switch off. The default is for the switch to be on.

Note: this has no effect in Redshift and is therefore disabled. To reproduce the rim effect in Redshift, see the 'Hints and tips' section below.

10. About... button

Click this button to see the version number of the shader.

11. Open Manual button

To view this manual, click this button. To work, the manual must be in the same folder as the plugin binary file (the one with .xdl64 or .xlib extension).

Hints and tips on using this shader

1. Using in Redshift

This shader works fine in Redshift but there are one or two additional points to note.

First, you need to create a C4D Shader material in Redshift. Since it isn't possible to write a native Redshift node to reproduce this effect, you must use the C4D Shader material. It's not difficult but there are a few steps to follow. Because this applies to all the shaders I've written, there is an article on my website with full details of how to use standard Cinema 4D shaders in Redshift. You can find it at https://www.microbion.co.uk/html/blog31_01_25_c4dshader_redshift.php.

However, for this shader, when you follow these steps, the node tree should use an 'RS Incandescent' node, NOT an 'RS Material' node. This is the equivalent of using the luminance channel in the standard renderer material. You can then increase the brightness in the incandescent node's illumination tab with the 'Intensity Multiplier' setting. Using this node you don't need to worry about reflections since the incandescent node doesn't use them.

You will almost certainly need to reduce the 'Surface Scale' parameter. The default is 20%, but in Redshift a value of 5% is better.

Secondly, as mentioned above, the rim brightness and extent don't work in Redshift. To reproduce this, you can add a Fresnel node between the texture and incandescent nodes. Link the 'outColor' port of the texture node to the 'Falloff Color Facing Color' port of the fresnel node. In the fresnel node, set the 'Perpendicular Color' to whatever you want. Use a light colour for a bright rim and a dark one for a dark rim. Also, very importantly, turn off the switch 'Use Index of Refraction' in the fresnel node.

You can alter the extent of the rim by changing the 'Curve Falloff' value in the fresnel node. A smaller value gives a wider rim, higher values give a narrower rim.

The final node tree would look like this, also showing the Fresnel node settings:

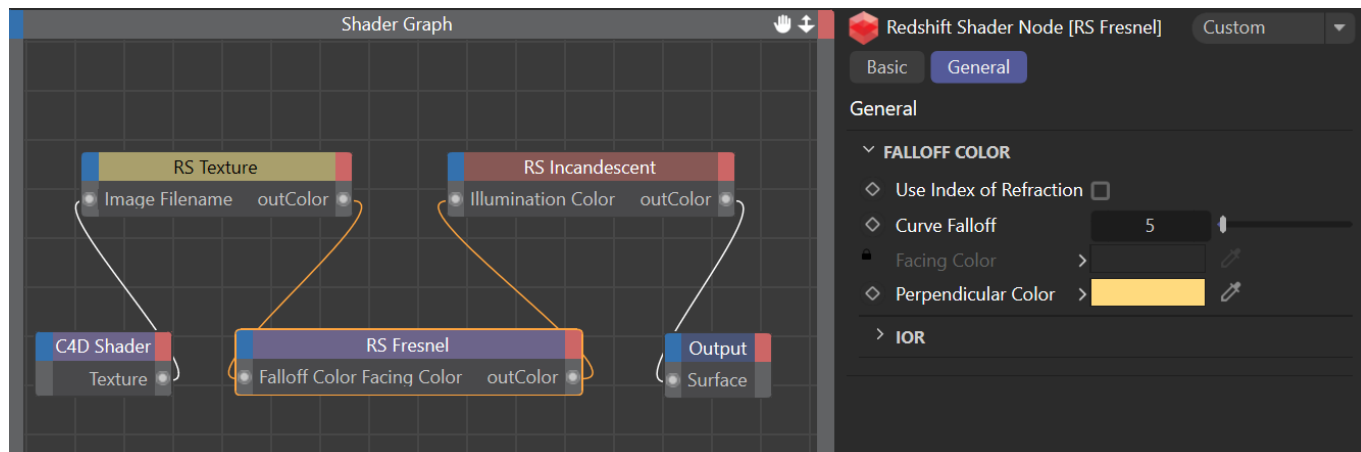


Figure 3. Redshift shader graph for the Sun shader including a Fresnel node

A sample file using this node tree is included in the download archive.

2. Light emission

Using the shader in the luminance channel (or as input to a Redshift incandescent node) will contribute to global illumination, but that isn't the same as the light emission you would expect from a star. To do this you need to use an actual light.

2.1. Standard renderer

For the sun to emit light, add an omni light to the scene and turn on shadows (hard shadows are more realistic). Place the light at the same position as the centre of the sun sphere. The sphere will now block the light, so drag the sphere into the light's Project tab 'Objects' list, ensuring that 'Mode' is set to 'Exclude'. Then the light illuminates the scene even though it's inside the sphere.

2.2 Redshift

For Redshift, the same process applies except that you should create an area light, not a point light, which doesn't work in this scenario. Make the area light a sphere, and to get hard shadows set the size to be very small (5 scene units works fine) but not zero. You can also set the decay to 'None', or if you need to use falloff it can be set to 'Linear' and the start and stop settings adjusted accordingly. In both cases the light intensity can be adjusted as required.

Example files for the standard renderer and Redshift are included in the download archive.

Corona shader

This is a companion shader to the main Sun surface shader. It is intended to show the corona, the bright halo of plasma around the sun which is especially visible during a solar eclipse.

Using the shader

This shader is slightly unusual in that it is intended to be added to the alpha channel of a material and not to the colour, luminance or other channels. The way to use it is as follows:

1. Create an object to display the corona. A disc is the obvious choice.
2. Make the disc a child object of the sphere which will be the sun, so that the two objects move together.
3. Add a Look At Camera tag to the disc. This ensures that the corona is always seen face-on.
4. Create a material and add the Corona shader to the alpha channel, then apply the material to the disc.
5. Finally, in the Luminance channel (you can turn off the Color channel and should certainly turn off the Reflectance channel) set the colour of the corona to whatever you like.
6. For the corona to appear bright enough, if necessary you can increase the brightness value of the luminance channel. You can increase this well above 100%; the banner image at the top of the first page used a brightness of 500% for the corona.

That's basically it. You can adjust the size and other parameters of the corona in the alpha channel.

Reference

1. Width

To demonstrate what this does, the following images use a second disc the same size as the corona disc but coloured blue located just behind the disc with the corona shader. This lets you see what happens when the width parameter is changed.

In this image, on the left you can see the corona (using a default white colour) against the blue disc. With the Turbulence at its default 5% setting you could increase the width to 100% without problems, as seen on the right:

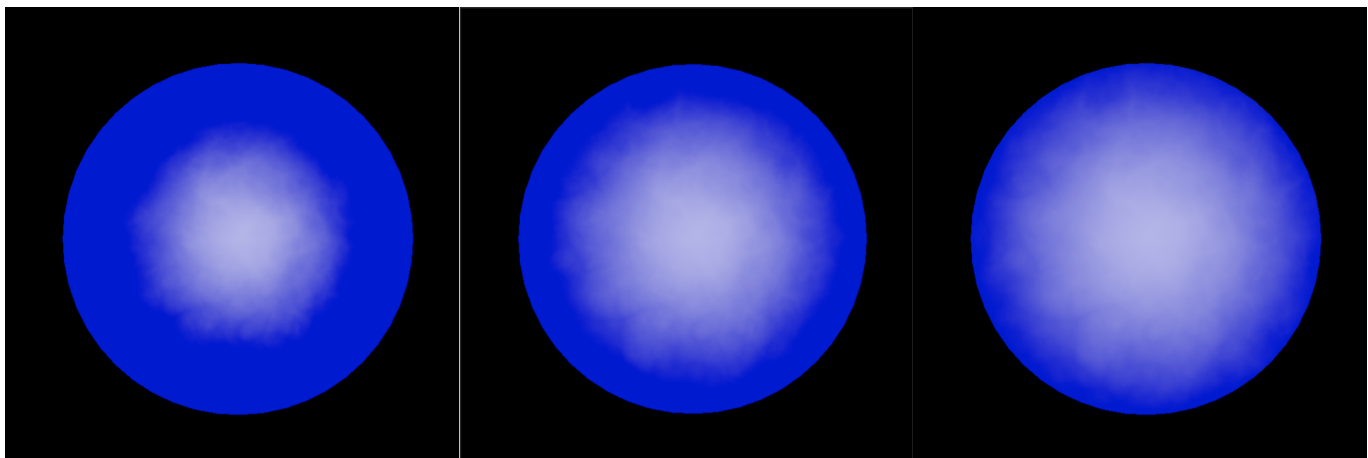


Figure 4. Corona width values of 65%, 85% and 100%

However a Turbulence of 25% or more produces such a distorted effect that the corona may show a hard circular edge at some points, which is where the edge of the corona disc is located. With 50% turbulence, the effect is very apparent, as shown in Figure 5:

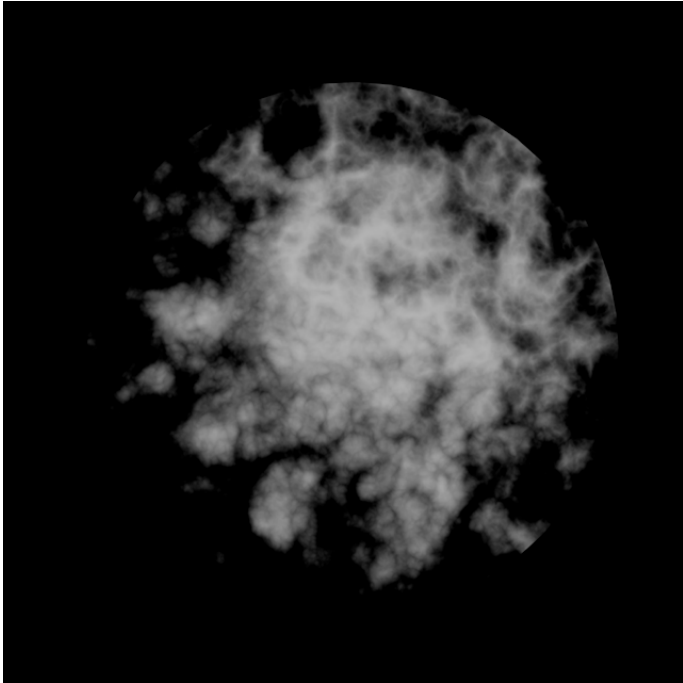


Figure 5. Corona with hard edge in the top right quadrant

To get rid of that edge, reduce the Width - in this case, probably to about 50%. That removes the edge but now you have a small corona which may not be visible as the sun sphere might obscure it all. The solution is simple: just increase the size of the corona disc. Now you have a corona with a lot of turbulence, and can get the size required by reducing the Width parameter and increasing the disc radius.

2. Turbulence

This parameter changes the level of turbulence in the corona. A value of zero produces a circular, smooth outline. In most cases a small amount of turbulence to break up the smooth corona is a good idea. The default value is 5%, which is quite realistic for most purposes. But if you want a violently ravaging star, throwing off lots of material from its surface, you can turn this up to 50% or more. Just remember that as you increase the turbulence, you will probably need to reduce the 'Width' parameter, which in turn may require increasing the disc radius to maintain the size of corona you want.

3. Scale

This is the scale of the noise function used to generate the corona. The higher it is, the more detailed the corona will be. Too high and it starts to look unrealistic.

4. X Offset and Y Offset

Sometimes, depending on the other parameters, when you render the scene the corona may appear to be off-centre. It isn't really; it's just the way the parameters interact to produce a noise setting in the alpha channel which is more apparent in one part of the disc than another. For example, see the image on the left in Figure 6, where the corona position doesn't look quite right.

You can try fixing this by altering the Width, Turbulence and Seed settings but that may not be desirable or it may not work. In that case, you can offset the corona by using these settings. The X Offset will move the corona horizontally and the Y Offset vertically. In Figure 6 in the image on the right, setting both values to -3% will correct the position.

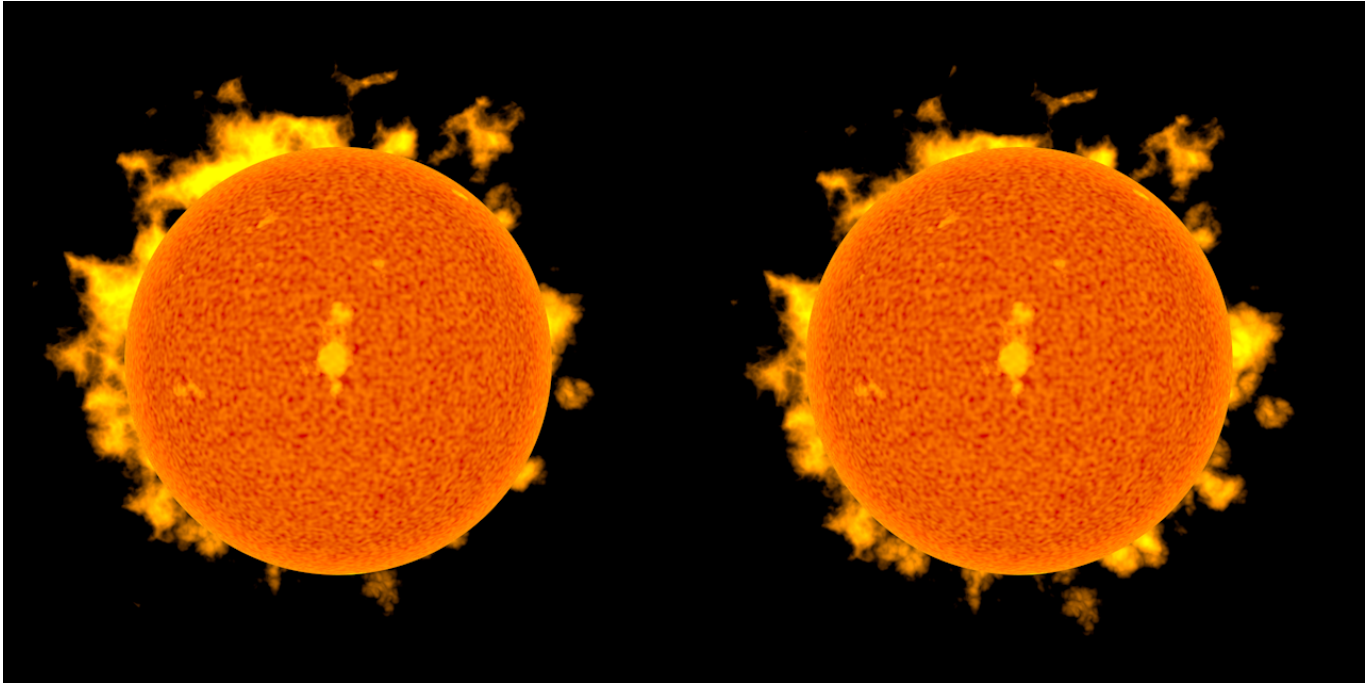


Figure 6. Using the X and Y offset values to correct the corona position

5. Animation Speed

The noise which generates the corona can be animated. Change this value to alter the speed of the animation. Set to zero, the corona will not be animated.

6. Seed

The seed value for the noise used to generate the effect. You can change this if you don't like the effect you get.

7. Disable Reflectance

Because the corona wouldn't normally be reflective, if this switch is turned on the material reflectance channel is automatically turned off. If you really do need reflectance, turn this switch off. By default the switch is on.

Note: this has no effect in Redshift (it isn't required if an incandescent node is used) and is therefore disabled.

Hints and tips on using the Corona shader

There are few of significance, the shader is so simple.

1. Using a gradient in the luminance channel

Most of the time you can simply change the colour of the luminance channel then increase the brightness setting. But if you want to use (for example) a gradient in the luminance channel, you will find that increasing the channel's brightness setting now has no effect. To fix that, in the luminance channel change the 'Mix Mode' to 'Multiply'. Now you can increase the brightness and it will work as expected. This assumes that the 'Color' parameter in the luminance channel is the default pure white.

2. Using in Redshift

This shader works fine in Redshift but there are one or two additional points to note.

First, you need to create a C4D Shader material in Redshift. Since it isn't possible to write a native Redshift

node to reproduce this effect, you must use the C4D Shader material. It's not difficult but there are a few steps to follow. Because this applies to all the shaders I've written, there is an article on my website with full details of how to use standard Cinema 4D shaders in Redshift, you can find it at https://www.microbion.co.uk/html/blog31_01_25_c4dshader_redshift.php.

However, for this shader, when you follow these steps, the node tree should use an 'RS Incandescent' node, NOT an 'RS Material' node. This is the equivalent of using the luminance channel in the standard renderer material. You can then set the corona colour in the incandescent node and increase the brightness in the node's illumination tab with the 'Intensity Multiplier' setting. Using this node you don't need to worry about reflections since the incandescent node doesn't use them.

Finally, when you connect the texture node's 'outColor' port to the incandescent node, be sure to connect it to the 'Illumination/Alpha' port. Remember that this shader is designed to be used as an alpha, not as a colour. The final node tree would look like this, also showing the incandescent node settings:

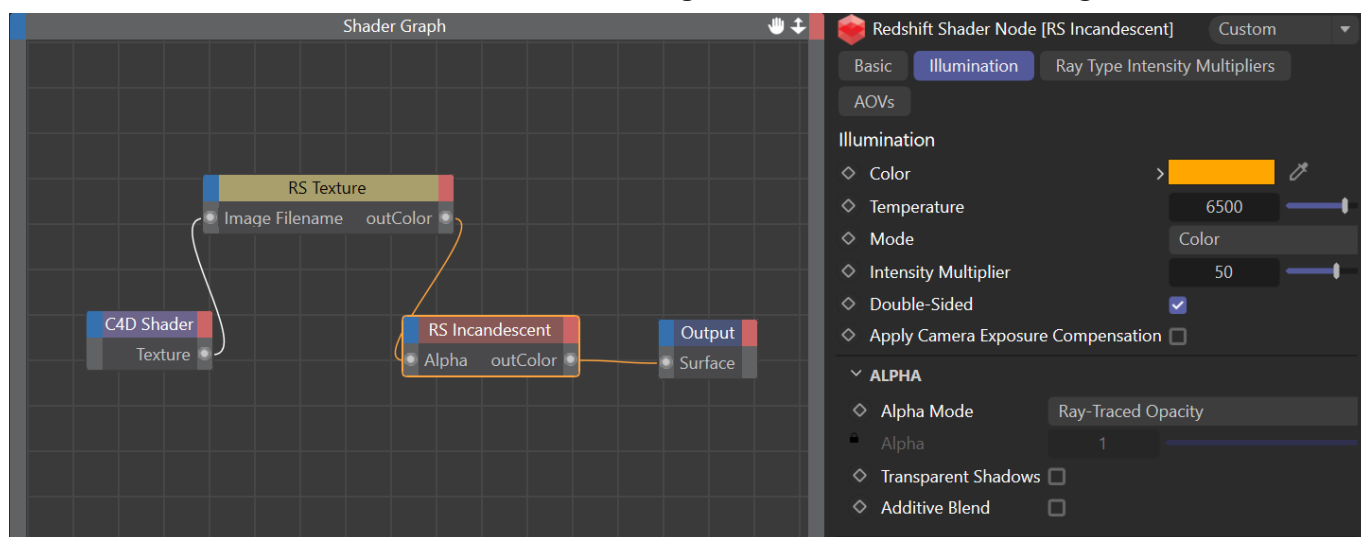


Figure 7. Using the Corona shader in Redshift

An example file for Redshift is included in the download archive.

Summary

I hope you like these two shaders and find them useful. If you need to contact me about either shader, please go to <https://www.microbion.co.uk/html/contact.htm> and I will respond as soon as possible.

Steve Pedler
May 2025