

Red Planet

A shader plugin for Cinema 4D

Introduction

This shader simulates a 'red' planet, rather like Mars in this solar system. It's not a replica of Mars but produces a Mars-like result.

Using the shader

Typically the shader would be applied to a Sphere object. For best results, displacement as well as colour are needed, so remember to turn off 'Render Perfect' in the sphere or no displacement will be seen.

The shader parameters

The user interface looks like this:

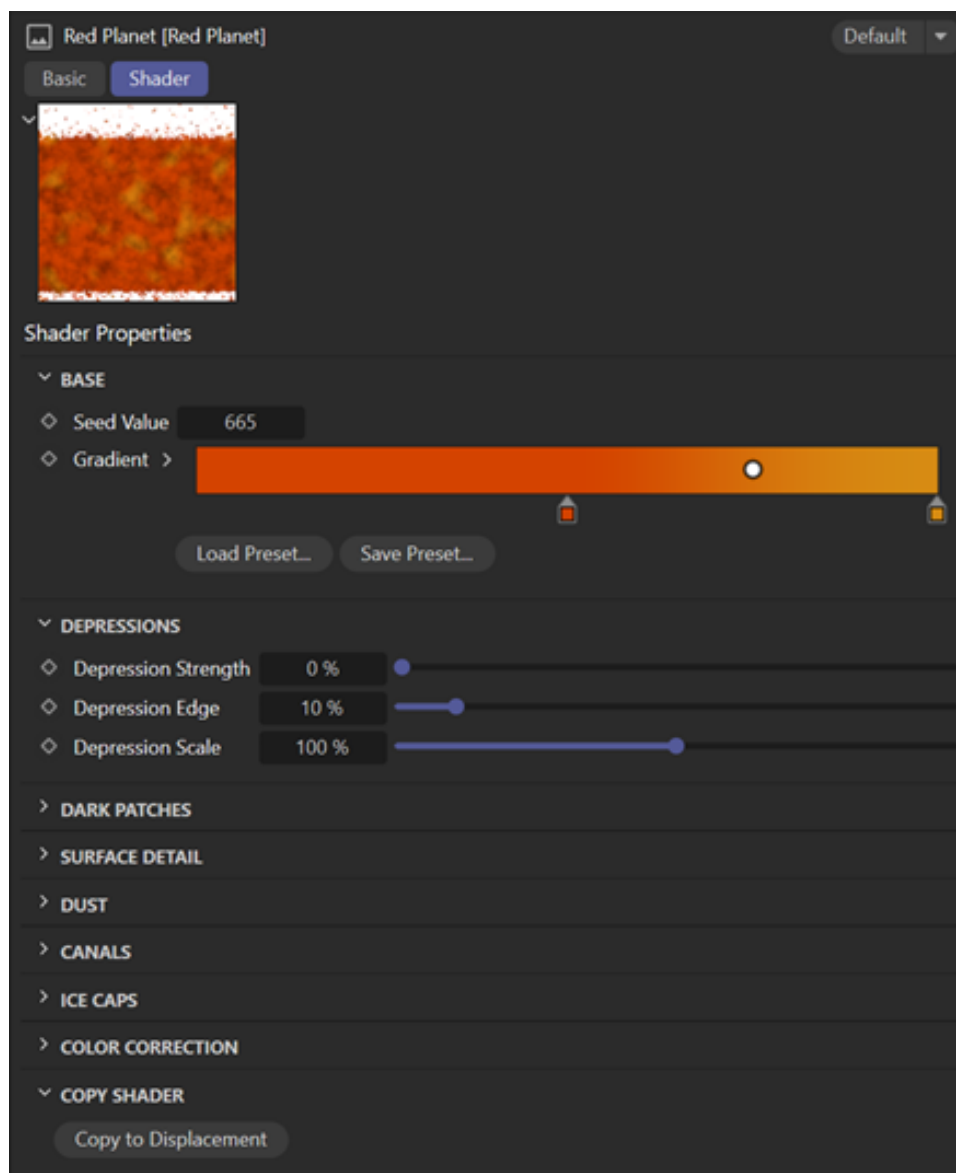


Figure 1. User interface

Seed Value

The seed for the underlying noise functions used to generate the appearance. You can change this if you don't like what you see with the default value. Bear in mind though that changing the seed affects all these features:

- Depressions
- Dark Patches
- Surface Detail
- Canals
- Ice Caps

Gradient

The basic colour of the planet surface, selected from the colours in this gradient. By default, this is set to an orange-red colour. You can change this to anything you like (doesn't have to be red) or you can keep the colour and make it lighter, for example, if other features make the surface too dark.

Depressions

This set of controls is used to produce lowered areas on the planet surface. It is mostly used in the displacement channel but can be used in the colour channel as well, when it will produce very dark areas on the surface. You can use either or both channels to get the desired effect. These three images show the depressions at 60% strength used in colour only, displacement only, and both channels:

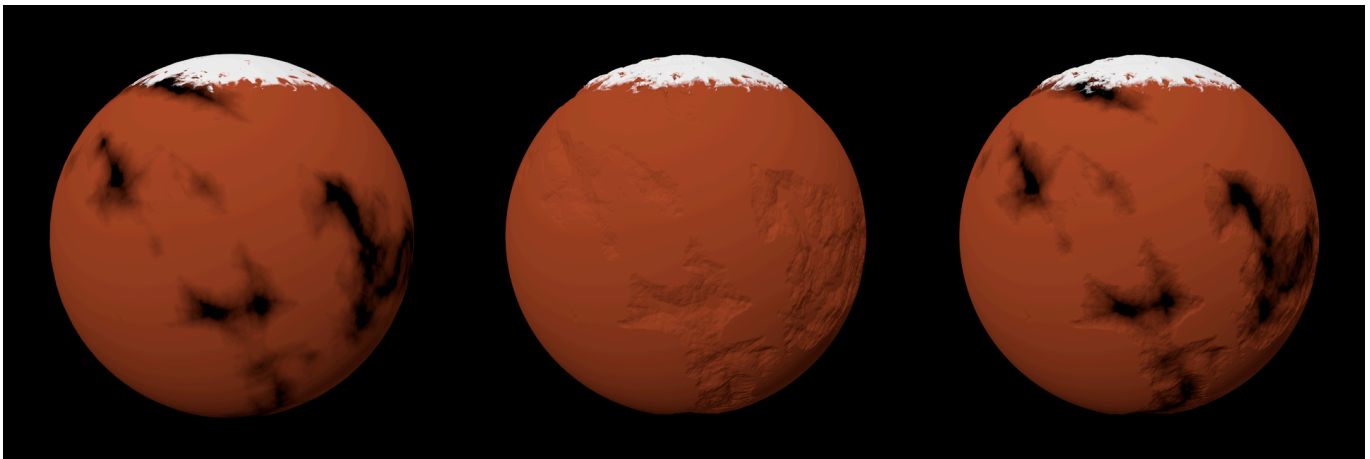


Figure 2. Depressions shown in colour only, displacement only and both channels

Depression Strength

In this setting, higher values produce more depressions and they are darker, which will give stronger displacement. Note that low values may not produce visible results on the surface, so don't be afraid to turn up the strength until you see something. The setting is quite sensitive around the values of 55-65%, so small adjustments may make large differences.

Depression Scale

Changes the size of the depressions. As with the 'Patch Scale' setting, larger values increase the size but reduce the number of depression areas.

Depression Edge

This controls the 'softness' of the edge of the depression. When it is increased, the edge becomes softer with more slope. The images in Figure 3 show the different results which are possible. The images use respectively a depression strength of 5%, 12%, and 20%. Only displacement is shown, for the sake of clarity:

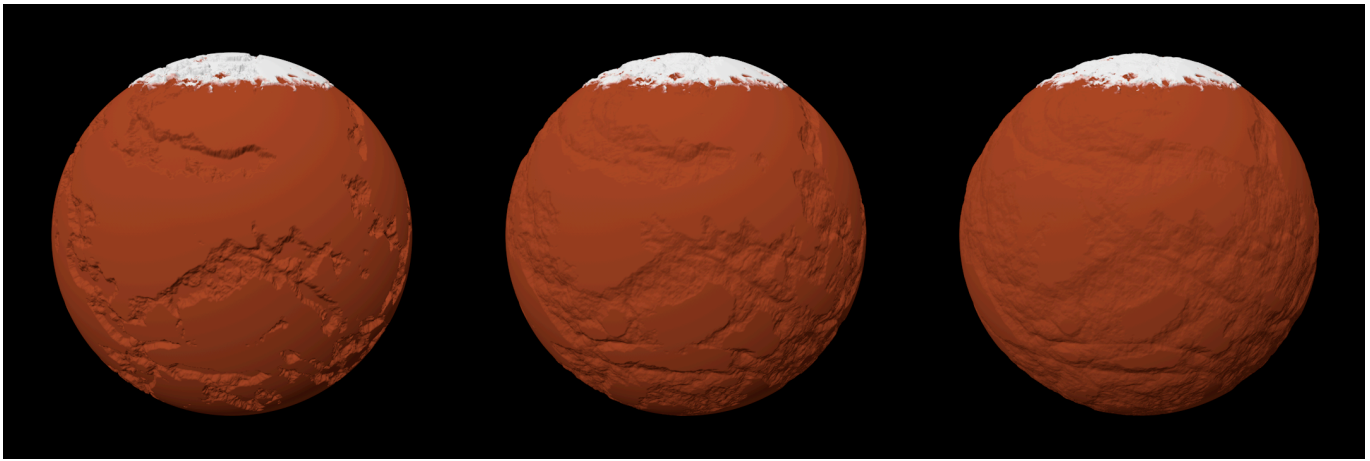


Figure 3. Depression edge settings of 5%, 12% and 20% showing increasing softness of the edge

Dark Patches

This effect produces soft darker patches on the planet's surface, shown here with the default settings;

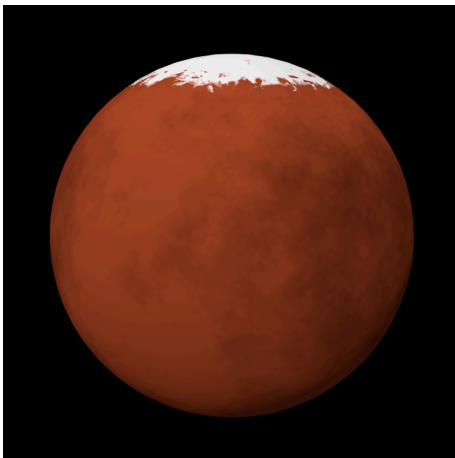


Figure 4. Default dark patches

These patches are only used in the colour channel and are not available in displacement. You can alter the following parameters:

Patch Darkness

Increasing this value makes the patches darker. All patches are darkened so the effect is to increase the noticeably darker areas on the surface, as seen here with 60% darkness:

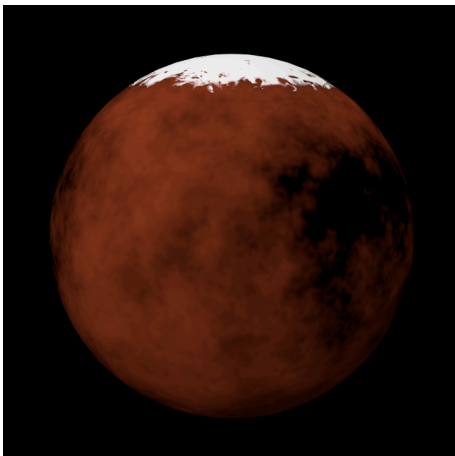


Figure 5. Dark patches, 60% darkness

Patch Scale

Changes the size of the patches. Note that increasing the scale increases the size of individual patches but decreases the number of them. Values above 200% or so have little obvious effect because of this.

Absolute Values

The algorithm used in the underlying noise function which generates the patches normally returns a value between -1 and 1. Turning on this switch causes it to return values from 0 to 1, which produces a different appearance. You can choose whichever gives the effect you want; by default, the switch is off. Compare this image with the default settings in Figure 4 and note the difference in pattern:

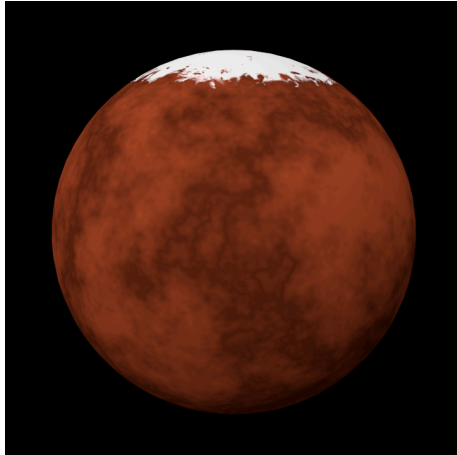


Figure 6. Absolute values turned on

Surface Detail

This is a simple noise function which adds some fine detail to the planet surface. Only used in displacement and not available in the colour channel.

Dust

What would happen if the planet was covered in a layer of dust? The dust would be the same colour as the planet surface, so more dust would obscure features such as dark patches, depressions and canals. A value of zero has no effect, and that is the default setting, while a value of 100% will obscure all the other features. Note that if used in the displacement channel, the dust will reduce and soften the displacement.

Canals

The 'canals' of Mars are long straight lines first described in 1877 and later assumed to be artificial constructs built by the Martian inhabitants. They are in reality probably an observational artefact since modern astronomy does not show them. Nevertheless, you can add canals to your planet if desired. With the default setting they are as shown in Figure 7 below (dark patches are turned off for clarity). Canals are only used in the colour channel and are not available in displacement.

Canal Strength

Higher values darken the canals and make them more visible. The default setting of 65% shows them as fairly faint but they can be enhanced with this setting.

Canal Scale

Higher values make the canals larger, but as in other scale settings, reduces their number.

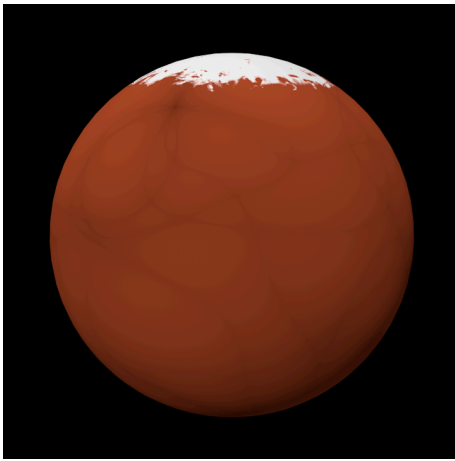


Figure 7. Default 'canals' settings

Ice Caps

Mars has north and south polar ice caps and these settings enable the ice caps on this surface. The settings are as follows:

Extent (North) and Extent (South)

These settings control how far the ice caps extend southwards or northwards, respectively. The effects are shown in these images (for the northern ice cap) using settings of 10%, 20% and 30% respectively:

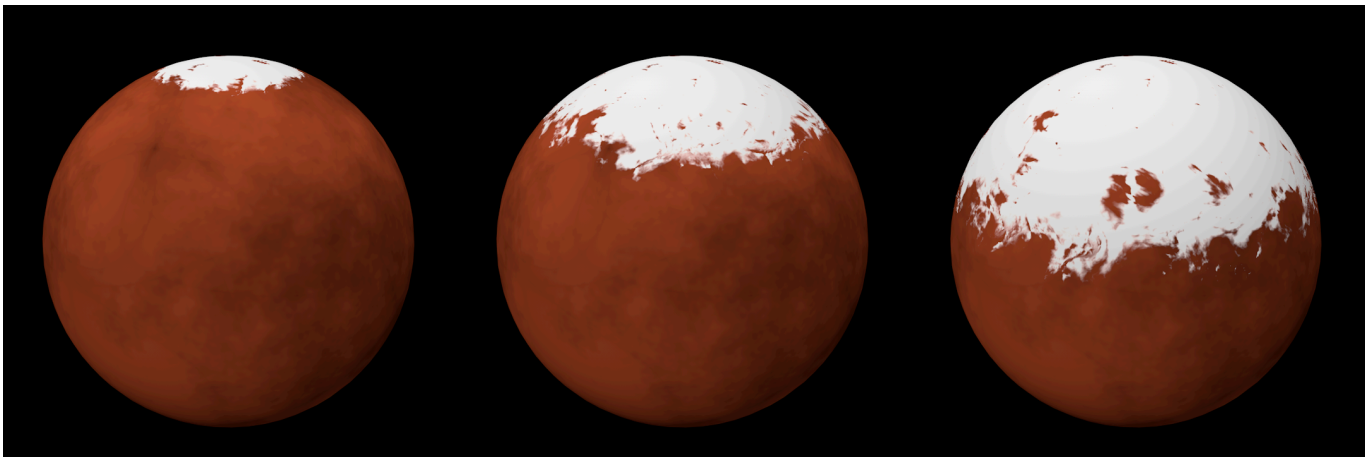


Figure 8. Northern ice cap extent set to 10%, 20% and 30%

By default the southern ice cap is much smaller than the northern one because that is the case on Mars. On the real-life planet, the caps expand and shrink again during the Martian year, and this can be simulated by animating these controls.

Coverage (North) and Coverage (South)

These controls don't affect the extent of the ice cap but they do affect how much of the land underneath them is covered. The more that is covered, the thicker the cap appears to be, as shown in the images in Figure 9 below, which use coverage settings of 10%, 20% and 30% respectively:

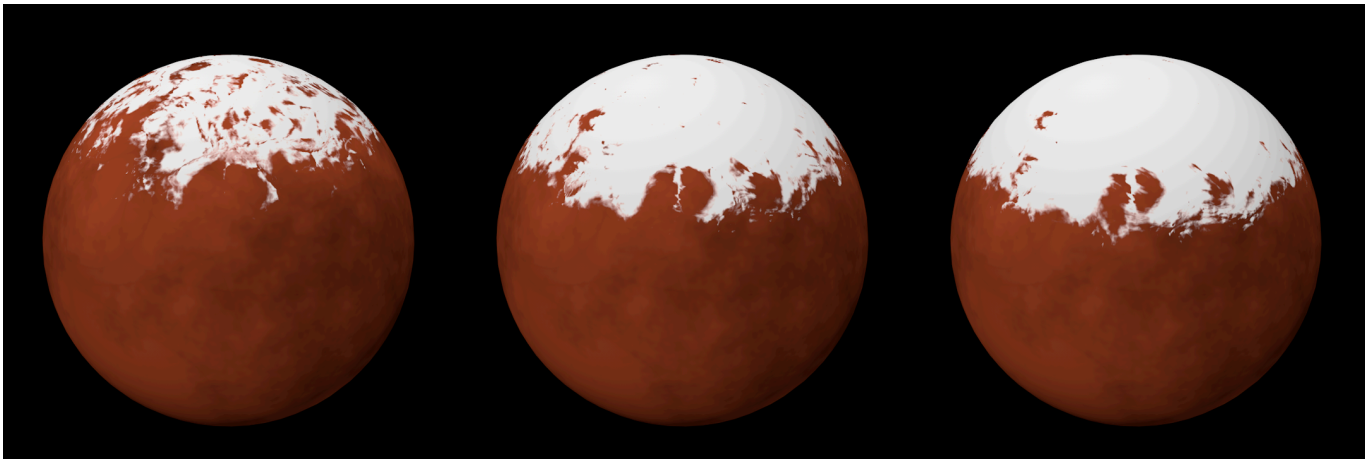


Figure 9. Ice cap coverage of 10%, 20% and 30% (the extent value is unchanged)

Roughness

This parameter affects the irregularity at the edge of the ice cap. We wouldn't expect the edge of the cap to be a perfectly smooth line but to break up to some extent. This setting controls the edge roughness of both ice caps and the result is shown here using settings of 15%, 30% and 45% respectively::

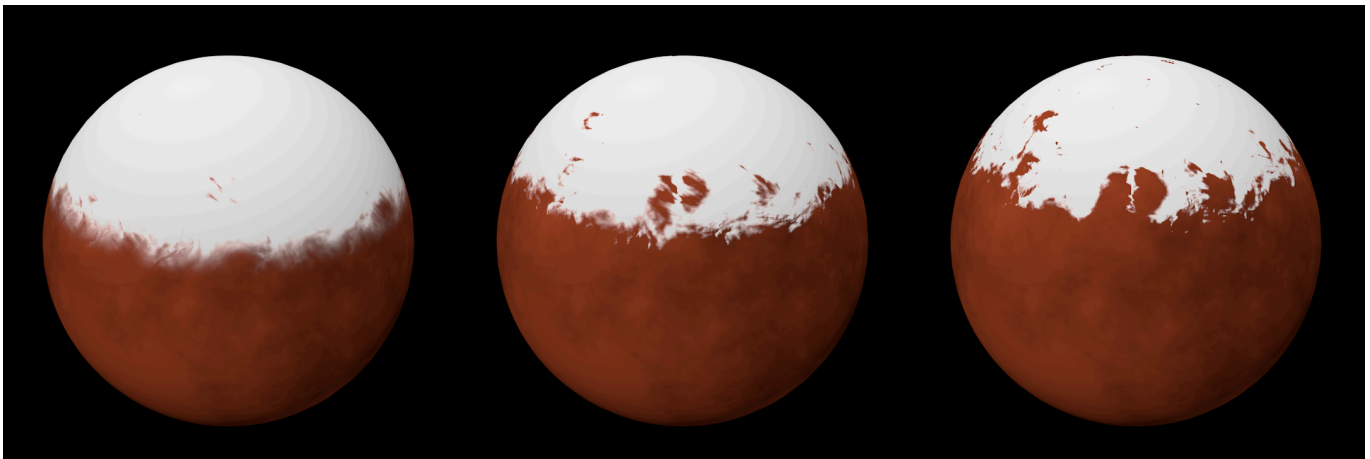


Figure 10. Roughness settings of 15%, 30% and 45%

Displacement Modifier

This setting is present to deal with a problem when using displacement. Displacement is controlled by a greyscale texture and the brighter the texture, the more it is displaced. Because the caps are white, and the rest of the surface is much darker, the ice caps are disproportionately affected by displacement and the results look odd, as shown below. In this image, the displacement setting is by 3 scene units and this is what we see:

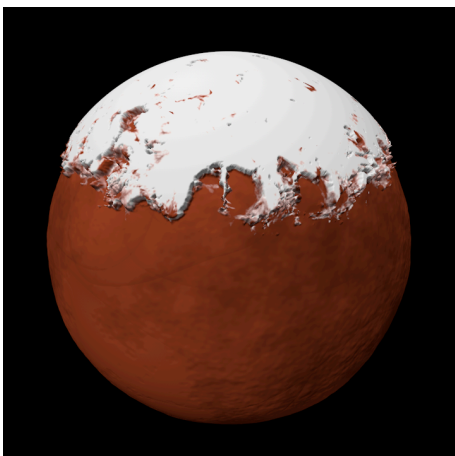


Figure 11. Maximum ice cap displacement

We might not want to change the displacement amount for the rest of the surface, only the ice cap, so we need to dial down the displacement of the ice caps relative to the rest of the surface. That is what this setting does. The default is 25% and turning it down to 0% will remove all the ice cap displacement; a setting of 100% gives maximum displacement as shown above. You can even increase the amount of displacement (for the ice caps only) using this parameter. Figure 12 is the same image as Figure 11 but with the displacement modifier set to 25%:

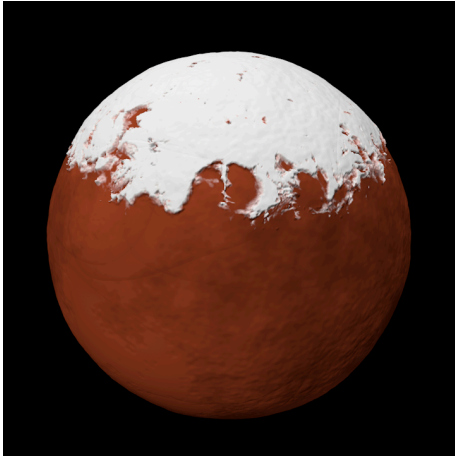


Figure 12. Same image as Figure 11 but with the displacement modifier reduced to 25%

Colour correction

The next four controls are colour correction settings which are the same as used in any other software. Very briefly they are:

- Brightness: alters the brightness of the surface; 100% gives white, and -100% results in black
- Contrast: alters the contrast between different colours
- Saturation: alters the colour intensity; the brightness is unchanged but the colour looks more or less vibrant depending on the setting
- Gamma: alters the gamma value applied to the output colour

Copy Shader

The button in this section - 'Copy to Displacement' - is for convenience only. When clicked, the shader in the colour channel (or indeed any channel other than the displacement channel itself) will copy the shader to the displacement channel. Any existing shader in that channel will be removed and deleted, then replaced by the copied shader. This lets you match the two channels, so that the settings are not so different that there appears to be a mismatch. You may of course still need to adjust settings within the copied shader.

Note that it is not essential that the shaders in the colour and displacement channels match exactly. For example, you could set the depression strength to zero in the colour channel but increase it in the displacement channel. This would give you surface depressions without the dark colour you would otherwise see. It is recommended though that if you change the seed value in one channel you change it to be the same in any other channel in the same material using the shader.

Using the shader in Redshift

Since it isn't possible to write a native Redshift node to reproduce this effect, you must use the C4D Shader material to use this shader in Redshift. 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.

Unfortunately this shader does not work as well in Redshift as it does in the standard renderer. The problem is that there are seams in the texture when applied to an object, and these can't be removed. This happens because the shader uses the C4D Noise shader (not the Redshift Maxon Noise node) as the method of noise generation, and in Redshift this node only works in 'UV (2D)' space. You can see this if you try the Noise shader itself, or any other noise-based C4D shaders such as 'Rust'.

The seam may or may not matter to you - you can always rotate the object so that the camera doesn't see it.

Another possible solution is to create the object in the standard renderer, then when it is as you need it, bake the textures to bitmaps and use them in a standard Redshift material. In some cases, this will remove seams or reduce the visibility of them.

And finally...

I hope you enjoy using the Red Planet shader. You can get the latest version from my site at <https://microbion.co.uk/html/redplanet.htm> and if you have any comments (or find any bugs) you can contact me at <https://microbion.co.uk/html/contact.htm>.

Steve Pedler
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