**Ice Material with Icicles**

Use 2 normal maps provided that looks like cuts and lumps Rock\_N\_T & Snow\_N\_T. Create a material called Ice\_Mat. Open it and on the left-hand window change the shader model to Subsurface. Under the Tessellation set the Tessellation mode to Flat Tessellation and check the Crack Free Displacement option. This allows us to move the vertices of the material without breaking it.

Next to add color add 2 constant3 nodes (hold 3 and left-click). Right click on them and convert them to parameter. Name the first to Light Tone and the second to Dark Tone. For the light tone set the RGB values to 0.398,0.57,0.83. For the dark tone set RGB values to 0.079, 0.165, 0.215. We need the material to blend between these 2 colors based on the way we look at it or the way light shines at it and reaches us. To do that add a lerp node and hook the Light Tone to A pin and the Dark Tone to the B pin and hook the output node to the base color. The Alpha is a grayscale value. Add a Fresnel node and right-click on it and select the start previewing option and look at the output window to see what Fresnel is. It gives us a dark and light color based on the angle of the light. Right-click on it again and select the stop previewing option. Add a 1- node (Press O and left-click). Hook the output pin of the Fresnel node to the input pin of the 1- node. Hook the output pin of the 1- node and hook it to the alpha pin of the lerp node. We use the 1- pin as we need the light tone to be used where there’s light and as the lerp points to light if it’s closer to 0 we need to invert the output of the Fresnel node.

Add a constant node and hook it to metallic and set the value to 0. Instead of using a constant roughness throughout the material which would make it look the same we will use a variable roughness to make it look shiny in places. Add a constant node and set the value to 0.3. add a noise node and add an add node. Hook the constant node to the B pin and the output of the noise node to the A pin and hook the output node of the Add node to the Roughness pin. The noise node will give various positions different brightness.

Drag in a reference of both the normal maps and add an add node. Hook the Snow\_N\_T to the A pin and the Rock\_N\_T to the B pin. You can preview each of the texture separately to find one is wavy while the other is rocky and preview the Add node to see the added textures. Hook the output pin of the add node to the Normal pin of the material node. Add a texture co-ordinate node and add a scalar parameter node and name it to scale and set the default value to 1. Add a multiply node and hook the texture co-ordinate node to the A pin and the scalar parameter node to the B pin. Hook the output pin to the UV pins of both the normal maps. This allows use to set the scale of the normal map.

Add a Fresnel node to determine where the colors change. Add a 3 vector node with RGB values 0.075, 0.376, 0.47. Right-click on it and convert it to a color parameter node and name it as Subsurface. Add an add node and hook the output pin of the Fresnel node to the A pin and the output pin of the Subsurface to the B pin and hook the output pin of the add node to the Subsurface color pin of the material node.

Now on previewing the material has the appropriate color and texture. Next, we have to give it tessellation to get the icicles.

Add a texture sample node and on the left-hand window in the select texture option right-click and if you have to, check the show engine content option. Select the Tiling Noise 05 texture. Next we need to create a mask. We only want the tessellation to work downwards. Add a VertexNormalWS node which gives the vertices in the world space preview this node and we see that the whole object is white i.e., it gives all the vertices. We don’t want all the vertices we only want the ones facing down. For that add a mask node and hook its input pin to the output pin of the VertexNormalWS node. Select the Mask node and on the left-hand window uncheck the R and G and check only the B channel. Now preview this node and only the top portion will be white. This is because RGB refers to the 3 co-ordinate axes and by checking B we only get the Z axis. So only the points with a +ve Z value will show up and the intensity depends on the extend of the value. We want the icicles to on the bottom portion so extend the output pin of the mask node and add a multiply node and to the other pin set the value as -1 and on previewing that node now the white is underneath. Extend the output pin of the multiply node and add a clamp node as we can have greater control over the extent of the region. Add a multiply node (Hold M and left-click) and hook the output pin of the texture sample node to the B pin and hook the output pin of the clamp node to the A pin of the node. Extend the output pin of the multiply node and add another multiply node. Add a 3 vector and set the RGB to 0,0,50. Right-click it and make it a parameter and name it to tessellation amount. We only need a blue value because it corresponds to Z and that value when multiplied with the other result gives us a displacement in the Z direction. But B channel refers to the positive Z axis but we need the displacement to be downward. So extend the result pin of the 3 vector node and add a multiply node and set the other pin to -1. Hook the output pin of the multiply node to the B pin of the other multiply node and hook the result pin to the world displacement pin of the material node.

Now on previewing the material a tessellation can be seen underneath the object. To increase the tessellation, add a scalar parameter node and name it as TessMult and set the default value to 2 and hook its output pin to the Tessellation multiplier pin of the material node.

This is the main material. Once we make the main material if you want different objects to have different parameter values, just right click on the material and make a material instance. Open it and in there you can find all the parameters that you used in the original material and you can tweak them as needed without making any changes in the base material. If you want any extra parameters just go back to the original material and make the node into a parameter if possible. To increase the extent of tessellation, tweak the tessellation amount, make it bluer and to change the sharpness of the icicles tweak the tessellation multiplier.