III - Textures, Surfaces and Materials

The Wonderful World of Color

3.1 - Introduction

In many 3D applications, when a model is created, by default that model will be a single color - usually gray. A real world analog to this would be sculpting in clay. When a clay sculpture is created, the color of the sculpture is the color of the clay. It is only after the artist paints or glazes the sculpture that it takes on a unique color. The same is true when modeling in 3D; the 3D “clay” is a single color determined by the modelling application. Instead of painting directly on to the model in DAZ Studio we apply “Textures” or “Image Maps” to give the model color.

Note: Most models purchased from DAZ 3D will load with a texture applied to them. That doesn't mean you won't be able to customize the surface.

Chapter 3 is devoted entirely to the surface of your model. We will go over the tools available in DAZ Studio which allow you to change your object from its default gray state to something more interesting. The possibilities are endless; you can focus on hyper-realism and try to get your surfaces to mimic those in the real world as closely as possible, you can stylize your surfaces giving your render a cartoon look and feel, or you might choose something somewhere in between. With DAZ Studio the power is in your hands.

3.2 - Surfaces

Before we jump into the process of applying textures to your figure there are a few concepts we will cover as a foundation. We'll cover these in the next few sections. The first concept to understand - what a “Surface” is. It isn't a terribly difficult concept to master, and you don't need a vast knowledge of the subject to be successful in DAZ Studio.

A “Surface” is a specific subsection of the 3D model, a group of specific polygons, that share common properties to describe what the surface of the model looks like. When an artist models an object, he or she will assign specific sections of the model to a named surface. When they are finished, every polygon of the model will be assigned to one surface or another. A simple model may have only one surface, while a complex model can have multiple surfaces. The Genesis figure, for example, has 26 surfaces.

Note: You can view a complete list of a model's surfaces in the Surfaces pane. More on this in Section 3.5.

The concept may be easier to visualize with an example. Imagine you have modeled a jacket. Most jackets will have buttons, zippers, buckles, rivets, etc as well as the cloth material for the jacket. Each of these parts of the jacket is different, and look different. A 3D modeler would be wise to assign the
buttons to their own surface, the zipper to its own, etc. This allows the user to customize the look of each part individually. In this scenario a user would be able to give the cloth a matte look, while making the buttons and buckle shiny. In DAZ Studio the user can customize each surface individually rather than having the settings apply to the surface of the entire model.

### 3.3 - Image Maps

Now that you know what a surface is, the next logical concept to introduce is image maps. An “Image Map” is a 2 dimensional image that “wraps” around a surface. The majority of surfacing is done with image maps. They provide the easiest way to get results that don't look uniform across a surface (e.g. skin with freckles). Essentially, they add detail to the surface of the model.

**Note:** Image maps are occasionally referred to as “Texture Maps”, especially when designed to be used in the 'Diffuse Color' property. See Section 3.5.1 below.

Image maps can serve a variety of purposes, and we will discuss those more in Sections 3.4 and 3.5. For now, however, just think of an image map as the wrapping paper for your model.

The way the the image map wraps around the model is determined by a “UV Set” - a set of 2 dimensional coordinates that correspond to 3 dimensional point on a model. The intricacies of UV mapping won't be covered in this guide. However, DAZ Studio allows multiple UV sets for a figure. We will cover changing the UV set of a figure in Section 3.5.8.

Above you'll find an example of image maps for the 'Face' and 'Torso' of Genesis as well as an example of those image maps applied to the model. Hopefully this will help you visualize how 2 dimensional image maps work in 3 dimensional space.

### 3.4 - Surface Shaders

The last foundational concept we need to cover before getting into the meat of this chapter is that of a “Surface Shader.” The concept of a surface shader is a little more abstract than that of a surface, or an image map. The reason being that you can't really see a surface shader in your scene, you can only see the results of one. The simplest way to describe a surface shader is to say that it is a program that is run, by the “Render Engine”, for every visible/sampled point on a surface in order to describe what the final color and opacity of that surface should be. It calculates how a surface reacts to light, how or whether it reflects, or refracts etc. A surface shader ultimately determines the RGB value for every pixel in the scene.

If we take this a step further, we can say that a surface shader is a “Shader” that is specific to a surface or multiple surfaces. In DAZ Studio there are 5 different types of shaders including Surface, Light, Volume, Imager and Displacement - with [custom] surface shaders being the most common. For the scope of this User Guide, we will only cover surface shaders. Other shaders are covered in online documentation.

Fortunately, as complex a topic as shaders are, DAZ Studio comes with several ready-made shaders
so that you don't need to worry about creating or writing your own - we'll leave that to those with advanced degrees in computer science and physics. All you need to know is that the surface shader that is applied to a surface determines what properties are available for that particular surface in the Surfaces pane. We'll cover how to find out what surface shader you are using later on in this section.

The most common type of custom shader is a surface shader - custom meaning it is not a DAZ Studio default shader. You may encounter instances where people will refer to a surface shader simply as a shader. As discussed previously there are different types of shaders. While this isn't incorrect (a surface shader is one type of shader), it is good practice to include the type of shader when referring to it. You may also encounter instances where people refer to a “Shader Preset” as a shader - this is incorrect.

**Note:** The 3Delight render of a surface with a custom surface shader applied may be dramatically different than the “Viewport” preview.

### 3.5 - The Surfaces Pane

So far in this chapter we've covered surfaces, image maps and surface shaders - all to prepare you to use the Surfaces pane. The Surfaces pane is where you will customize the surfaces of your objects in DAZ Studio. In the Hollywood Blvd layout, the Surfaces pane is located on the left hand side of the interface, in the ‘Actors, Wardrobe & Props' activity.

The Surfaces pane is divided into three “Pages.” You can access each of these pages at the top of the pane. They are the Presets page, the Editor page and the Shader Baker page. We are going to focus on the Editor page in this section. If the Editor page isn't selected, go ahead and click on the 'Editor' label at the top of the pane to bring the Editor page forward.

The Editor page of the Surfaces pane is organized similarly to the Parameters pane. On the left hand side you will see your current scene selection, as well as any items associated with the current scene selection such as clothing, hair or props. You can expand any of the objects in this list to reveal their surfaces.

**Note:** The current scene selection must have geometry in order for it to show up in the Surfaces pane Editor page. Objects without geometry such as “Lights” and “Cameras” won't show up in the Surfaces pane.

If you still have the Genesis 2 Female figure loaded in the scene you should see it listed in the Surfaces pane on the left hand side. If Genesis 2 Female isn't in the scene go ahead and load her into the scene now. If you still don't see her in the Surfaces pane check the Scene pane to make sure that Genesis 2 Female is your current scene selection.

**Note:** For instructions on how to load content into the scene see Section 1.5.1.

Now that Genesis 2 Female is in your scene and you have her selected you should see her in the Surfaces pane on the left. Click the arrow next to Genesis 2 Female to reveal her surface selection sets and her surfaces. A “Surface Selection Set” is just a predetermined group of surfaces. They allow
you to edit surfaces that are commonly edited together, such as the face head and lips, without having to select the individual surfaces yourself. Genesis 2 Female has several surface selection sets. You can browse through them by clicking the arrows next to 'Default Templates' or 'Legacy Surfaces.'

Clicking the arrow next to 'Surfaces' will reveal all of the surfaces for Genesis 2 Female. This is where you can select individual surfaces to edit. To select a surface, simply left click on the surface. You can select multiple surfaces at the same time by holding the Ctrl key and left clicking on the PC, or holding the Cmd key and left clicking on the Mac.

The left column of the Surfaces pane also gives you the option to display all properties in the right hand column. To do this left click on the 'All' "Filter." You can also choose to display only properties that are currently in use. To do this left click on the 'Currently Used' filter.

When you select a surface, surfaces, a surface selection set, surface selection sets, or an entire object you will see the properties associated with these surfaces on the right hand side of the pane. Remember, from our discussion about surface shaders (Section 3.4), that it is the shader that determines which properties are available for the selected surfaces. The shader that is applied to the current selection will be listed at the top of the Surfaces pane. The 'DAZ Studio Default' surface shader is the most common as it is the default surface shader for DAZ Studio, but you will also see the 'omUberSurface', the 'AoA_SubSurface' and other custom surface shaders on occasion.

Regardless of the surface shader that is applied to the surface there are a few properties that are fairly common among a majority of surface shaders. They are:

- **Diffuse Color and Strength**
- **Specular Color and Strength**
- **Glossiness**
- **Ambient Color and Strength**
- **Opacity Strength**
- **Bump Strength**
- **Displacement Strength**

The following sections will briefly describe each of these properties and what they do.

### 3.5.1 - Diffuse Color and Strength

**Diffuse Color**

In the real world, the surface of an object absorbs certain wavelengths of light and reflects others. The color we see is determined by the wavelength of light that is reflected by the surface of the object. A diffuse reflection is scattered, meaning a beam of light hitting the surface is reflected simultaneously in multiple directions. The “Diffuse Color” of an object represents this scattered, diffused, reflection of light. The simplest explanation for diffuse color is that it is what we perceive as the [matte] color of the surface.

There are a couple of ways you can define the diffuse color of a surface in DAZ Studio. The simplest way is to change the RGB color value using the 'Diffuse Color' property. This will affect the entire surface uniformly. To change the RGB value you can left click and drag any of the numbers. You can also left click directly on the color, between the numbers, to open the 'Select Color' dialog. This dialog
allows you to pick a color from a color palette.

The second way to edit the diffuse color of a surface is to load an image map - sometimes referred to as a "Texture Map." If you have an image map that matches with the current UV set for the surface, you can load it by clicking the "Image Menu Button" on the 'Diffuse Color' property. The image menu button is on the left side of the property and is decorated with a downward pointing arrow. Clicking the image menu button will open a drop down menu with a list of recently used textures as well as a few other actions. Click 'Browse...' to open a Windows Explorer window or an OS X Finder window that will allow you to browse your hard drive for the desired image map. Image maps allow for a more realistic look because they allow you to have more than just a single color applied across the entire surface.

**Diffuse Strength**

"Diffuse Strength” determines the amount to which the diffuse color contributes to the overall appearance of the surface. You can think of it as the percentage of light that is reflected by the surface. When the 'Diffuse Strength' property is set to a value of 0%, all light hitting the surface will be absorbed and the surface will appear black. When the 'Diffuse Strength' property is set to a value of 100% all light with a wavelength matching the diffuse color will be reflected, giving the color full strength.

The 'Diffuse Strength' property can be controlled in two ways. The first is through the slider. This will affect the entire surface uniformly. You can adjust the slider to a value anywhere between 0% and 100%. As with the 'Diffuse Color' property, you can also add an image map to the 'Diffuse Strength' property. The difference is that a diffuse strength image map will be a grayscale image. Pixels in the image that are white correspond to a 100% value. Pixels in the image that are black correspond with a 0% value. Gray values fall somewhere between; the darker the gray the lower the value. Using a grayscale image map allows you to vary the value across a surface. The image map can be loaded using the 'Diffuse Strength' property's image menu button. When an image map is applied, the value of the 'Diffuse Strength' slider acts as a multiplier for the value in the map.

**3.5.2 - Specular Color and Strength**

**Specular Color**

When a beam of light hits a surface and is reflected in a single direction that reflection is referred to as a specular reflection. In DAZ Studio, “Specular Color” refers to the highlights caused by this direct reflection of light. This property isn't used to create a mirror like effect. It merely represents the color of the highlight on the surface. You can change the 'Specular Color' property in the same way that you can change the 'Diffuse Color' property - with either an image map, or with the RGB value for the surface.

**Specular Strength**

“Specular Strength” is similar to diffuse strength in that it represents the percentage of light that is reflected from the surface. In this instance however, it only applies to specular reflections. At a value of 0%, there is no specular reflection, and thus no highlights. At a value of 100%, the specular value is
at full strength and all light that matches the wavelength of the specular color is reflected directly from the surface. The 'Specular Strength' property can be adjusted in the same manner as the 'Diffuse Strength' property. When an image map is applied, the value of the 'Specular Strength' slider acts as a multiplier for the value in the map.

### 3.5.3 - Glossiness

"Glossiness" determines the size of the specular highlight on a surface. The shinier, or more glossy, a surface is the smaller and sharper the specular highlight will be. A surface with a low glossiness value will have its specular highlight diffused across a larger surface area. Glossiness does not affect how strong the highlight is (that is handled by the 'Specular Strength' property) just the size of the specular highlight. However, larger specular highlights are perceived as being less intense since they are diffused across a larger surface area. You can see examples of how the 'Glossiness' property affects the size of the specular highlight in the images below.

The 'Glossiness' property can be manipulated just like the 'Specular Strength' property, or other strength properties. You can adjust the slider to change the glossiness of the entire surface - the higher the glossiness value, the more concentrated the highlight. You can also apply a grayscale image map to the 'Glossiness' property. When an image map is applied, the value of the Glossiness slider acts as a multiplier for the value in the map.

### 3.5.4 - Ambient Color and Strength

#### Ambient Color

In the real world, rays of light are constantly bouncing around. Ambient light is the term used to describe the uniform effect that the bounced light has on a scene - instead of direct light that comes from a defined source. DAZ Studio mimics this effect, but instead of providing a single point of control in the form of a light that affects all surfaces in the same way, DAZ Studio provides a more flexible means whereby each surface has its own controls that can be set independently to produce various effects. It is the ambient light that affects the color and value of core shadows on a surface. The 'Ambient Color' property determines the color of the core shadows created on a model's surface as a result of the light in the scene.

By default the 'Ambient Color' property is set to an RGB value of 0, 0, 0 or black. This mimics the way ambient light behaves in most real worlds settings. However, changing the Ambient Color property can create some really cool effects, the most common of these would be to get a surface to "glow" in a low light area. The surface isn't actually glowing (it doesn't emit light), but in a low light area it can appear to glow if the value of the 'Ambient Color' property is set to something lighter than the rest of the scene.

#### Ambient Strength

"Ambient Strength" determines the amount of simulated ambient light that the surface will receive. Remember that the ambient light effect is not propagated to the rest of the scene. The value of the 'Ambient Strength' property will only affect the surface(s) you have selected. You can change ambient light...
strength the same way you change diffuse or specular strength. When an image map is applied to the property, the value of the slider acts as a multiplier for the value in the map.

### 3.5.5 - Opacity Strength

“Opacity” refers to the transparency, or rather lack of transparency, of the object. If you remember way back to primary school - transparent means completely see through, translucent is partially see through, and opaque isn’t see through at all. When opacity is at 100% the surface is 100% opaque. When opacity is at 0% the surface is 100% transparent or 0% opaque. Values between 0% and 100% make the surface translucent.

‘Opacity Strength’ can be adjusted in a manner similar to the other strength values we’ve discussed. You can use the slider of the ‘Opacity Strength’ property to affect the opacity of the entire surface.

In many cases you will only want part of a surface to be transparent. This is done using an opacity map. An “Opacity Map” is a grayscale image map. Black in the image corresponds to an opacity value of 0%, and thus a fully transparent surface. White corresponds with an opacity value of 100% and thus a fully opaque surface. An opacity map allows you to clip out sections of your surface. You can load an opacity map the same way you would load other image maps - with the image menu button for the Opacity Strength property. When an image map is applied, the value of the Opacity Strength slider acts as a multiplier for the value in the map.

**Note:** Opacity maps are commonly referred to as transparency maps. The term “Transparency Map” is a misnomer, as image maps are typically named according to the meaning of their full value. Technically speaking a transparency map would be the inverse of an opacity map. However, the two terms are used interchangeably.

### 3.5.6 - Bump Strength

When someone creates a 3D model, the surface of the model is usually smooth. In the real world however human skin, walls, and other surfaces are rarely perfectly smooth. Human skin has pores and other imperfections, most walls have spackle or other texture to them. “Bump” allows you to simulate these imperfections without actually changing the mesh of the object.

DAZ Studio simulates these imperfections through a specific type of image map called a bump map. A “Bump Map” is a grayscale image that indicates the strength of the bumps to be simulated. By default an RGB value of 128, 128, 128 corresponds to a neutral bump. Anything lighter indicates bump simulated in a positive direction, anything darker simulates a bump in the negative direction. Once an image map is loaded for the ‘Bump Strength’ property a slider to adjust overall “Bump Strength” will become available.

You can load a bump map using the image menu button for the ‘Bump Strength’ property. When an image map is applied, the value of the ‘Bump Strength’ slider acts as a multiplier for the value in the map. Most surface shaders will offer two additional bump related properties labeled ‘Bump Minimum’ and ‘Bump Maximum.’ These values determine the simulated bump minima and maxima. ‘Bump Minimum’ and ‘Bump Maximum’ can also shift or scale the values from a bump map.
Note: Bump will not be seen until the image is rendered.

3.5.7 - Displacement Strength

“Displacement” is similar to bump in that it allows you to add details to the surface of the model without having to actually model the details in. The difference is that bump is a simulated effect, while displacement actually changes the shape of the mesh. To explain the difference, let's use an example. Think of a brick wall. One might use bump to simulate the roughness on the surface of each brick. To simulate the gaps caused by the mortar one would use displacement.

Just as with ‘Bump Strength’ you must load an image map to use the ‘Displacement Strength’ property. An image map used for displacement is called a “Displacement Map.” A displacement map is also a grayscale image and can be loaded using the ‘Displacement Strength’ property's image menu button. By default an RGB value of 128, 128, 128 indicates no displacement. Anything lighter than this is considered positive displacement (i.e. the mesh will be displaced outwards) while anything darker is negative displacement (i.e. the mesh will be displaced inwards).

Some surface shaders will allow you to set the minimum and maximum values for displacement. This determines how far the displacement of the mesh will go when maximum values are reached. The ‘Minimum Displacement’ value corresponds with negative displacement while ‘Maximum Displacement’ corresponds with positive displacement. The ‘Minimum Displacement’ and ‘Maximum Displacement’ properties can be used to shift or scale the values of a displacement map.

Note: 1 unit in DAZ Studio equals 1 centimeter. Keep this in mind when setting minimum and maximum displacement values.

Note: You will not see the effects of displacement until the image is rendered.

3.5.8 - UV Set

As explained in Section 3.3, a “UV Set” is a set of 2 dimensional coordinates that correspond to a 3 dimensional point on a model. The UV set determines how a 2 dimensional image will “wrap” around the 3 dimensional model. A good UV set will minimize stretching and compression while placing seams in logical or hidden locations of the model.

Because the Genesis and Genesis 2 figures have incredible morphing capabilities, DAZ Studio allows for multiple UV sets. If an artist creates an extreme morph for Genesis or one of the Genesis 2 figures they can include an additional UV set that will account for any distortions caused by the changes in the morph. Support of multiple UV sets also increases texture compatibility across figures.

The ‘UV Set’ property on a surface determines which UV set is used for that surface. It is important that the UV set and image maps for a particular surface match. If they don't you are likely to get distortion and seams.

You can change the UV set for a single surface, for multiple surfaces, or (more commonly) for an entire figure. To switch the UV set for your current selection in the Surfaces pane click the UV set selection list and choose a UV set from those that are listed.
3.6 - Loading Material(s) Presets

Getting all of the settings right for each surface, loading image maps, setting values etc. can be tedious. Most products you purchase from the DAZ 3D store will come with presets that set values and load image maps onto the properties that, together, describe the surface(s) of a figure or object - collectively referred to as a “Material.” These presets are called “Material(s) Presets” and are by far the easiest way to set the properties for the surface(s) of your model.

Material(s) Presets can be loaded through the Presets page of the Surfaces pane as well as through the Smart Content pane and the Content Library pane. To access the Presets page first make sure the Surfaces pane is open. At the top of the pane you will see all of its pages (Presets, Editor, and Shader Baker). Click the 'Presets' label to bring the Presets page forward.

The Presets page of the Surfaces pane is organized and functions very similarly to the Smart Content pane. On the left hand side you have a list of categories, or the “Category View”, which can be expanded or collapsed. On the right hand side, in the “Asset View”, you will find icons for each file in the selected category. Remember, since the Preset page works like the Smart Content pane you must have a figure selected before you will see any of the presets.

If you still have Genesis 2 Female in your scene make sure she is your current scene selection. If she is not, select her in the Scene pane. Once she is selected all of the Material(s) Presets available for her can be accessed. By default she comes with several eye and make up options. As well as one texture for the whole body named 'Bree All.' If you double click any of the icons it will load that Material(s) Preset on to the figure. Feel free to try out some of the eye or make up options. If you use the 'Bree All' preset, it will restore the materials for Genesis 2 Female back to their original state.

You can also load Material(s) Presets from the Smart Content pane and the Content Library pane. Any Material(s) Preset available in the Smart Content pane will be available in the Presets page of the Surfaces pane. Keep in mind that this type of preset must apply to an object in your scene - meaning Material(s) Presets won't load unless you have an object selected. Make sure you that you select your target object before loading a Material(s) Preset for it.

Material(s) Presets are great. They can save you a lot of tedious work, and can cut time out of your workflow. However, many artists view Material(s) Presets as a starting point. Don't feel limited by the presets available to you. Once you have loaded a Material(s) Preset feel free to play around with any of the properties on the Editor page of the Surfaces pane. This will help you learn how each property affects the surface of your object. Remember, you can always purchase additional textures and Material(s) Presets in the DAZ 3D store. In fact one of the best ways to learn about surface properties and what they do is to dissect Material(s) Presets purchased from the DAZ 3D Store.

3.7 - The Surface Selection Tool

In addition to selecting a surface within the Surfaces pane, you can also select a surface directly in the “Viewport” using the Surface Selection Tool. This offers a few advantages. The first is that it allows you to see exactly what areas of the model are part of each surface. The second is that it gives you the ability to select a surface, even if you don't know what the name of the surface is.

To use the Surface Selection Tool, first activate it in the toolbar by left clicking on the tool icon. Once the tool is activated you can hover your cursor over the figure in the viewport - the surface you are
currently hovering over will be highlighted and its name will be displayed next to your cursor. If you left click while a surface is highlighted that surface will become selected in the Surfaces pane. Multiple selections can be made by holding the Ctrl/Cmd key.

### 3.8 - Saving Material(s) Presets

So now you've done the work to set up your materials. It doesn't matter if you've only tweaked a few surface properties from a Material(s) Preset, or set up all of the materials yourself - you should be proud of your work, and it shouldn't go to waste. DAZ Studio allows you to save Material(s) Presets that preserve all the hard work you've put into the materials of your model.

To save a Material(s) Preset you must first make sure the object you want to save the preset for is your current scene selection. If it is not, select that object in the Scene pane. Once the desired object is selected, navigate to the File > Save As > Material(s) Preset... action and click it. This will open the 'Filtered Save' dialog where you can choose a save location, and name your preset. Once you are happy with the name and location, click 'Save.' Take note of the location you've saved to so that you can find the preset later.

You should now see the 'Material(s) Preset Save Options' dialog. This dialog allows you to choose which materials of the object to include in the preset - you may only want to include a few materials, for example if you are saving a preset that only affects the eyes of a figure. Each surface to be included will have a checkmark. If you don't want a surface included then uncheck the box next to that surface. You can also choose which properties are included for each surface. Click the arrow next to a surface and you will see each property used to define the material. You can check or uncheck properties as desired. Once you are satisfied, click “Accept” to save the preset.

You will be able to find your newly saved preset in the Presets page of the Surfaces pane, in the Smart Content pane [or in the Content Library pane]. If you have the object you saved the preset for selected, you will find your preset under the 'Unassigned' category. Just double click the preset or drag and drop the preset onto your object to load it.

### 3.9 - Spot Rendering

The preview in the viewport often isn't sufficient to see exactly how the materials you've set up in the Surfaces pane will look. Many of the surface's properties don't take effect until after you've rendered the scene. Unfortunately, rendering is a very resource intensive process, and it can take a long time to render an entire scene.

DAZ Studio provides a Spot Render Tool that allows you to render only part of a scene. You can use the Spot Render Tool to quickly check what your materials look when rendered. To use the Spot Render Tool simply click on the Spot Render Tool icon in the toolbar. Once the tool is activated you need only to left click and drag in the viewport. When you do this a rectangular marquee will be drawn and DAZ Studio will render everything within the marquee using your current render settings. The render will appear directly in the viewport.
3.10 - Wrap-Up

That's it for surfaces and materials. We hope you're not overwhelmed and instead see the opportunities they provide. Creating realistic looking materials takes practice and experience. The best way to get good at setting up materials is to practice and experiment. Things get a bit more fun and a lot less technical in the next chapter where we talk about shaping your figure.