

## STATION 1 - TEXTURE OVERVIEW

The word, "texture" in Second Life refers to two different things.

On the one hand, it's a file, normally in .tga or .jpg format, that's found in the Textures folder of your Inventory. For clarity, we'll refer to those picture files as Texture Images. (Please see Working with Texture Images for more information.)

It can also mean the entire "look" of a prim, including the Texture Image (which can be rotated or scaled,) the Color, and the Transparency, Shine, and Bump values. All of these things can be found on the Texture tab of the Edit window. (Please see Using the Texture Tab for more information.)

For the purposes of these tutorials, Texture will have the latter meaning, and refer to the combination of all texturing components.

Each Prim has a number of sides, or Faces, which can be textured singly, in combination, or all at one time. (Please see About Faces for more information.)

The Default Texture Mapping method applies textures according to a UV Map. (Please see the UV Map section for more information.)

With UV Mapping, different Prims accept textures in different ways. We'll be discussing that, as well as exploring how to make clothing, in these tutorials. (Please see the sections on Prims and Clothing.)

As of SL 1.9, on March 15, 2006, another Mapping method, Planar mapping, became available. This method applies textures using Planar Projection. There will be an additional station discussing Planar Mapping as soon as I have a chance to explore it, and put one together. So check back; with any luck it will be here very soon.

For those discussions, we'll be using a Test Pattern texture image, which shows a numbered, colored checkerboard. Such images are very handy, since they let you see if an image needs to be flipped, check for distortion, figure out where a spot on the map lands on the object, and so on. The texture image itself is here, so you can conduct your own experiments.

You can download a .jpg of the same image, which you can use in your favorite Graphics program, from the Second Life Tutorials section of Robin (Sojourner) Wood's website, found at

<http://www.robinwood.com/Catalog/Technical/SL-Tuts/TestPattern.jpg>

Textures are important. They can add life and dimension to things, save Prims, and make an ordinary object look extraordinary. While they can easily consume more time than any other facet of a project, they are well worth the extra effort.

Shall we begin to explore the possibilities?

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## STATION 2: WORKING WITH TEXTURE IMAGES

Your Texture folder is really a collection of images, not complete textures. (Yes, I know it's confusing, but we're stuck with it.) Inside it you may find two kinds of Texture Icons.

The first shows a rainbow checkerboard pattern, and denotes textures that have been Uploaded. The second shows a tiny landscape picture, and denotes textures that have been "snapped" using the Snapshot feature. You can use either one on objects.

-  - this is a Snapshot icon
-  - this is a Texture Image icon

You cannot, however, edit the textures inside Second Life in any substantial way. What you upload is what you have. So make sure that things like the Alpha channel, gamma, contrast etc. are what you want BEFORE you upload.

It costs L\$10 to upload images. Uploaded images will automatically appear in your Textures folder. (You can also find a great many images that others have prepared and uploaded, some of which are offered for free by vendors and libraries here and there. And don't forget the texture images in your Library folder!)

I highly recommend organizing your Texture folder, using nested folders. If you don't, the list in the Pick Texture dialog (where you chose images,) can grow to unmanageable length very quickly. (Indeed, it's a good idea to organize your entire Inventory using nested folders. The Search feature is great, but it's even quicker to just know where things are.)

Before you upload an image, though, you need to have something to upload. (If you don't have a graphics program, and have no intention of making your own textures, you can skip this part, and move on to the next station.)

## PREPARING IMAGES FOR USE IN SECOND LIFE

There are a few important things to know, when you're getting Texture Images ready to upload.

All images are square, internally. All pixel dimensions are a multiple of 16, internally. Small and plain will load faster than big and busy on most clients (the computers people are using to play SL.)

Images can be uploaded as .jpg, targa (.tga) or 24 bit .bmp files. No matter how you upload them, they will be converted to JPEG2000 internally. There is some disagreement regarding what format the initial upload should take, but I recommend using 24 bit .tga for opaque images. My reasoning is that double compression often leads to image degradation. So I prefer to use the highest possible quality (NOT SIZE) to begin with. In my tests, there is no difference in the rezzing time of the resulting texture.

Images with transparency MUST be uploaded as 32 bit targa (.tga) files. DO NOT use 32 bit targa files if you don't have transparency. There's an Alpha Sorting problem in SL that it's best to avoid if possible. See "Transparency in SL" for more.

You can upload an image with just about any ratio or dimensions you want, even if the number of pixels on a side are no where near a multiple of 16. You can also upload 32 bit .bmp files. But you might experience some image degradation, or lag, or unexpected opacity, or odd color overlays, or all of the above. It's worth it to understand the limits and capabilities of the program, since we have to work with it.

Images that are intended for certain shapes might need special treatment.

So let's take a look.

\*\*\* Square is where it's at.

First, Second Life likes images that are 512x512 or 128x128 pixels best. If the image needs to be clearly focused, on a very large object, you can go as high as 1024x1024; but higher isn't recommended. 128x128 is fine, if the object that texture will be on is small. In fact, if it's tiny, you can go as small as you like!

It's not recommended to make the image large enough that it appears clear at high zoom levels. Faster rezzing at normal sight levels is much better.

Now, you may ask, "Why should an image be square? My picture isn't square at all, and neither is the object I'm going to put it on!"

The answer is that all the objects in Second Life, from the simplest Box primitive to the avatars themselves, are UV Mapped. And all UV maps are, by definition, square. Not just in Second Life, but everywhere in the 3D Universe, the points in a UV Map have a value between 0 and 1 on the U and V axes, and nothing else. Which makes a square. (For more information, see the section on UV Maps.)

So, since it's going to be placed on a square in any case, it's a good idea to change the ratio using the tools in your favorite graphics program. You'll get better results, and sharper textures.

It also makes it easier to scale, if both dimensions are the same to start with. (See "Putting it All Together" for tips on how to do that.)

### \*\*\* Multiples of 16

If you've done much with graphics, you're probably already familiar with this sequence. It's 16, 32, 64, 128, 512, 1024. (It's probably best not to go beyond 1024.)

It has to do with the way that all computers store things internally, in a hexadecimal format. If you are a computer guru, you already know all about that. If you're not, it's all going to be Geek to you anyway. So, for now, just take my word for it.

Once again, since it's going to be like that, it makes sense to use the superior tools offered by your graphics program to make the change.

### \*\*\* Small and Plain vs Big and Busy

If your image is larger than you really need it to be, you are almost certain to experience some extra time while Second Life tries to focus on it. So is everyone else who tries to look at it.

Texture images that are too large, or a place with too many of them, also contribute to lag. That's why malls tend to be laggy; there are hundreds of textures there. So, if you can make one texture serve in several places on your object, it's a good idea to do that.

Textures that are "busy" take longer to come into focus than textures without as many small, high contrast areas. Basically, if it's going to make a large .jpg image, it's going to load slowly in SL.

So, just like a web page, it's a trade off. Is having an area with a lot of perfect, high resolution images worth it, if no one hangs around long enough to see it?

You have to decide.

### \*\*\*Special Treatment for Special Shapes

Prims in Second Life come in a number of shapes; Box, Cylinder, Prism, and so on. You can change certain parameters of those shapes, such as Top Size, to make other shapes. For instance, you can make a Pyramid from a Box, a Cone from a Cylinder, and a 3 Sided Pyramid from a Prism.

However, when you do that, image textures on the shape will warp, because of the nature of the UV Maps here.

It is possible, however, to compensate for that warping when you prepare the Texture Image in your Graphics Editor. It takes a little extra time, but you might find that it's well worth the effort.

For more information, see Section 6. UV Maps 101, as well as the information on using Maps on specific Prims.

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### STATION 3: USING THE TEXTURE TAB ON THE EDIT DIALOG - OVERVIEW

If all you want to do is place an Image on one face of a prim, you can just drag it from your inventory onto that face. (See About Faces if you don't know what I mean by Face.)

But, for anything more complicated than that, you will need to use the Texture Tab of the Edit Panel.

To get it, right click on an Object, and choose Edit from the five o'clock position on the Pie Menu.

☐ Picture of Pie Menu

This will open the Edit window. Click the blue More button in the lower right corner to show the tabs.

☐ Picture of Edit Window

The one you want, of course, is the Texture tab, which is shown here, and on the main Prim for this station.

☐ Picture of Texture Tab

As we have seen, There are several components to each Texture, all of which can be found here.

NOTE: This station needs to be rewritten to reflect recent changes in the Texture Tab. The things noted will still work as shown, but some things aren't yet addressed, and the Tab has also been rearranged. So you'll have to actually look at it for now. Hopefully, this will be fixed soon.

First are: Texture image, Color, Transparency, Shininess, and Bumpiness, all of which together determine the texture that goes on the prim.

Below that are: Repeats per Face, Offset, Rotation, and Align media texture, all of which together determine the placement of the texture on the prim.

For more detailed information about each one, click on the satellites around this station.

NOT YET ADDRESSED:

Full Bright; which makes a prim behave as if it's fully illuminated by a bright white light, but doesn't make it actually cast light (saving render time.)

Mapping; which now has two types, Default (which is what the rest of this place is talking about,) and Planar (which is recommended ONLY for tapered cubes, and is addressed at the UV Mapping station, Station 6, in the "Maps on Cubes and Prisms" portion.

The rest is explained, although the positions have been rearranged.

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#### 4 - WORKING WITH TRANSPARENCY IN SECOND LIFE

You are likely find yourself working with Transparency and Alpha Maps quite a bit here in Second Life; but you'll find that the rules are a little different than you might be accustomed to, especially if you are used to other 3D programs.

First, there is no Refraction. Increasing transparency increases the ability to see whatever is behind the object, and nothing more. When viewed from the end, an object that is 1 cm thick (the thinnest possible in SL) and one that is 10 M thick will appear to be identical. The workaround is to use hollow shapes; but that can lead to other problems, as noted below.

Secondly, if you use any transparency or alpha at all, even 1%, it will disable the Shininess and Bumpiness values. If you want what appears to be a shiny, bumpy glass surface, you will have to use a texture that has the illusions of shine and bump built in. I've provided an xample of such glass. Try putting it on your own objects, to see how it works.

□

Thirdly, there are Alpha Sorting problems in the render engine here. Depending on angle, when an object that uses transparency or alpha is behind another that does as well, it can appear to be in front.

In other words, if you have an alpha map on a window, and a transparent glass sitting in front of it, sometimes you'll see the window behind the glass, and sometimes the portion of the glass that "overlaps" the window will appear to vanish, and you will see only the window, depending on the angle you are viewing it from. There's nothing that can be done about this; but you will want to be aware of it when setting things up.

This will happen with all textures that have an Alpha Channel, even if there is nothing in that channel. So DO NOT upload your textures as 32 bit .tga files unless you need to.

It will also happen with all textures that have any transparency, even 1%, set in the Transparency field of the Texture Tab of the Edit dialog. So be aware of that, and don't use it unless you really need it.

Particles with alpha maps, or animated textures that use alpha, can also have the same problem. So a glass fire screen might not give you quite the effect you were expecting, when you put it in front of the Alpha-mapped fire.

#### ☐ Image of Fire Screen and Fire

Since each face of the prim can be textured differently, it's also possible to have transparency on one side of a prim, while the other is completely opaque. Unlike Real Life, there's no reason to use one-way glass or mirrors. A wall can be solid stone on one side, and completely transparent on the other. This is often used for privacy; rooms where the inhabitant can see out, but no one can see in without using the camera tools. (There is no way to protect against those that I'm aware of, except to build your private rooms where no one can get close enough to use them.)

A common practice in SL is to use a texture with an alpha map to "fake" an object with an irregular silhouette that would be prohibitively prim-heavy to build. You'll see it a lot with vegetation, furniture, railings, etc.

If you want to do this, and you are very likely to at some point, be sure to leave several pixels of empty space around the edges that you want to "disappear." SL will always wrap a bit of the opposite edge of the texture onto the prim.

So your choice is to set all your textures to 0.9 repeats, or to build them with a bit of "slop" in the first place. The latter is not only easier, it will give you cleaner textures. (See below for instructions about how to make images with Alpha Channels.)

Also be aware that, because the width of the prim cannot be less than 1 centimeter (0.01 meters) there will be a fairly wide edge between what appears to be one side of the object, and the other. You will need to use a Transparent texture on this edge, or it will be visible. (You cannot set the Transparency value higher than 90%). I have provided one here, for that purpose.

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There is one exception to the "make sure the edges are transparent" rule. If your texture has a number of points that come to the edge, such as the spikes on a fence, and the holes in the texture are tiny, you might want to fake the top and sides of the fence, too. (Or you might not, depending on your particular needs, the scale, placement, etc.)

To do that, unless the fence tiles seamlessly (like chain link or lattice,) leave the slop room when you make and upload the image, but use the Repeats per Face and Offset fields to run the spikes

right to the top. Then use another texture to form the tops of the spikes.

Doing it this way will keep the bottom of your picket fence, which is more-or-less solid, from showing up at the top, where you want only the tips of the pickets. (Remember, the problem is wrapping, so a row of pixels from the bottom will appear at the top of the texture, and vice versa.)

### \*\*\*Creating an image with a transparency

Now that you know the hazards and rules of transparency in SL, how do you make such an image, and what's an Alpha Channel anyway?

All color images have at least three channels; Red, Green, and Blue, which give them their color. They may also have more channels, that do other things. If you are used to using Adobe Photoshop, you may know of them as the places where you can store selections.

In Second life, you can upload 32 bit targa (.tga) files, which have a single Alpha Channel that stores information about transparency.

All pixels that are black in that Alpha Channel will be "read" as completely transparent. White pixels will be read as opaque. Gray pixels will be read as degrees of transparency. Since you have a possible 256 levels of gray, you have a wide range of transparency at your command.

The technique to make an Alpha Channel varies depending on what program you are using. I have a video tutorial showing the process using Photoshop CS2 on my site, at <http://www.robinwood.com/Catalog/Technical/SL-Tuts/SLPages/SLTranspStart.html>

The easiest way to do it in Photoshop is to make your image, using Masks to get your transparency. (Using the Eraser tool isn't recommended, because whatever you erase is gone. If you use a mask, and find that you erased too much, you can easily recover it.)

If you are making an irregularly shaped object, such as a bunch of flowers or a fence, don't forget to leave some empty pixels around the edge for "slop." I usually leave 6 on a side for a 512x512 image, 4 for one that's 256x256, and 4 again for 128x128. (Yes, the slop is proportionally larger in the smaller images; but it seems to wrap by pixels, not proportion. I've found that with less than 4, I sometimes still get those nasty opaque wrap lines.)

When you are happy with it, hold down the Command/ctrl key, and click on the thumbnail image in the Layers palette to select the non-transparent pixels. Save the selection, and your Alpha is made.

To upload to Second Life, make sure that the black pixels are really black. 99% black cannot be distinguished from Black by the human eye, but the program will see it as a haze which is easily seen. So use the Info palette to check.



Once your alpha is made, create a layer behind the image, and bleed the color into it. This will prevent a white line, or "ghost" from appearing around your object in SL.

Then upload the image, taking care to check it carefully in the Preview panel of the Upload dialog. Transparent areas will have a checkerboard pattern in them, much as you might be used to seeing in Photoshop and other graphic editors.

If you are uploading clothing, be sure to check it on the appropriate model. (The Preview As... field contains a drop-down menu with standardized body parts and a skirt.)

When you are satisfied, go ahead and upload, and pay your L\$10, and enjoy your semi-transparent object!

Transparency can be your friend, but use it judiciously, and use it wisely. (Although it's true that most SL residents are so used to the problems that they barely notice them, there's no point in making it worse than it needs to be.)

## 5 - ABOUT FACES

Each Prim has different faces, numbered from 0 to 9 (depending on the shape of the Prim.)

Each face can have a different texture; so you could make a hollow cube with seven different colors - one for each side, and a seventh for the walls of the hollow. (All hollows in Second Life are a single face, even if they look like they should be more.)

If you cut the cube, you'll have two more, one on each side of the cut, for a total of nine.

### ☐ Image of Nine Faces on a Cube

To place a texture image on one face only, simply drag the texture from your Inventory onto the desired face.

To place a texture on all the faces of a prim, use the Texture Tab. (See The Texture Tab at Station 3.)

To give different faces different textures when you are using the Edit window, simply click on the Select Texture radio button. The edges of each Texture will be highlighted in white, with a white circle and cross-hairs in the center.

This enables you to easily see the scale, offset, and rotation of the texture on each face of the object. Just look for the angle and number of the outlines, and where the cross-hairs are in relation to the center.

To change the Texture on a single face only, simply click on it. The white guides will vanish from all the other faces, highlighting the face you are working on. You can now edit to your heart's content, leaving all the other faces untouched.

☐ Image Comparing Selection of All Faces, and One Face..

~~~Tip: If you are trying to match the scale on a narrow edge to the main surface, use the spinners to roughly match the dimensions of the cross-hairs. Then tweak by typing the numbers into the text field, until the two textures match as closely as possible. (This is only necessary if the built in scale of the two faces doesn't match, of course. So you won't need it with a cube, but you might with a cylinder, depending on what faces you are texturing.)

When using the Texture tab, it's not important to know which face is which; you just click on the one you want. However, when you get into Scripting and start assigning textures and colors that way, you might need that information.

So, here's a simple script that will help.

☐

Just drop it onto any Prim, and touch the Prim.

A dialog will appear in the upper right corner of your screen, asking if you want to Color the faces, or Remove the Color.

If you click "Color", the faces will be colored according to their number, in spectral order starting with Red as Zero, Orange as 1, Yellow as 2, Green as 3, Cyan as 4, Blue as 5, Purple as 6, Black as 7, and Gray as 8. (This is also shown on that dialog.)

If you click "Remove", all the faces will be colored White.

If you click "Ignore", the prim will be untouched, but the dialog will close, and the script will stop running. To arm it again, open it, and Reset it. (That way, it won't keep popping up when you don't want it to.)

You will get better results if you use a Blank Texture Image. The Default wood grain is yellow, and obscures some of the face colors. But you'll have to do that manually, since I didn't want to force it in the script, possibly causing you to lose a texture you didn't want to change.

Each time you change the Prim Type, cuts, and so on, you will need to touch and click "Color" again, because the face numbers change, as the faces appear and disappear. It's fun (and educational) to cut and twist the prims while the script is in place. But don't forget to remove it when you are done. (Unless you want to risk losing your colors.)

## STATION : UV MAPS 101

### WHAT ARE UV MAPS, ANYWAY?

All textures in Second Life are UV mapped. "Great. So what does that mean?" I hear you asking.

#### ☐ Image Showing UV Axes with AV Top Material (Shown in LightWave.)

It's really quite simple. As you already know, all the points on a 3D object are described in terms of the spatial axes, X, Y and Z. U and V are two additional axes, which describe the Horizontal and Vertical position of the point on a flat map, used to put a texture on the object.

Think of the map as a sheet of extremely stretchy spandex with a picture on it. The points are like thumbtacks that are used to hold the picture in place on the model. The model can move, and stretch, and twist; but the thumbtack keeps that tiny bit of the map in place, and the rest adjusts between the tacks.

#### ☐ Image Showing the Difference Between Points and Polygons

The web of lines you see when you look at a UV map show the polygons in the model. Wherever the lines cross, you have a point. There aren't any points anyplace else.

That's important to remember, because the ONLY place where the map is really fixed is right under a tack, or point. The rest is simply extrapolated between those points.

In Second Life, there aren't many tacks. There are points at the corners of the Box, and points at the top and bottom of the Cylinder, but no points at any intermediate place on those two objects.

Now, as we've seen, Wedges and Pyramids are really Boxes, and Cones are really Cylinders. And that makes a difference because the maps split on those shapes, since there aren't enough points to hold the map in the middle of the object.

They can also split when any of the other shapes are twisted, tapered, pulled, or otherwise deformed.

Since this cannot be avoided, it's best to accommodate it. If you are aware of what is likely to happen when you are designing the textures, you can come up with much more successful models.

### WHAT DO YOU MEAN, SPLIT?

Let's take a look at what this means, on an ordinary Cylinder. (The images here are from LightWave. I think the Second Life cylinder probably has fewer sides than this.)

#### □ Image Showing Good Map on a Cylinder with Few Points

In this first image, we see the cylinder, with the UV Map on the left. In the middle is an Orthogonal view, and at the right we see the cylinder in perspective. As you can see, the only points are on the edges; but it doesn't matter. The map "fits" perfectly, since the polygons are all rectangles, which is exactly the shape shown on the map.

#### □ Image Showing Split Map when the Cylinder is made into a Cone

In this image, we can see the top points of the cylinder have been drawn together into a cone. The map, of course, hasn't changed; but the relationship of the top to the bottom points on the model has.

The polygons between them, instead of being simple rectangles, are now wedges that are almost triangles.

Since this isn't the shape shown on the map, the extrapolation chooses the smoothest transition; and the map is split. It's as if there aren't enough thumbtacks for the fabric to be held in smooth gathers, so it simply folds along the lines between the existing tacks.

#### □ Image Showing How Map Looks the Same on a Cylinder with Extra Horizontal Points.

Here I've divided the cylinder, and given it 9 extra rows of points (which make extra rows of polygons, too, of course.) You can see them in the map on the left. The perspective view looks exactly the same, though; the shape of the polys is still exactly the shape on the map, so it still fits perfectly.

#### □ Image Showing Map Tapering when that Cylinder is made into a Cone.

However, when I draw this cylinder into a cone, the difference is obvious! All the extra points, like the extra tacks on the fabric, hold the map to the model. The rectangles are still narrower at the top than the bottom; but the difference isn't as severe, and the fabric "fits" much better. Only at the very top, where the rectangles become nearly triangles again, do the maps split.

However, in Second Life, we don't have the luxury of cylinders with all those polys. (Although we have more than we did when I originally wrote this card, because of the introduction of Flexi-Prims, which have more points.

So, when making cones or pyramids, it's best to avoid vertical lines on the maps, so the splitting (which must occur) won't be as noticable.

### MAPS ON THE INSIDE OF HOLLOWS

The other thing that you need to know about the UV Maps here in Second Life is that the UVs on

the Inside of a Hollow are REVERSED. In other words, both the image and the map are Flipped Horizontally. Any writing will show up as a mirror image, and any warping of the map to compensate for the splitting will make it twice as bad, not better.

To overcome that, of course, all you need to do is Flip Horizontal in your Graphics Program before you import the image to Second Life, and all will be well.

You can do a lot with the textures here in Second Life; but you are likely to waste \$L on useless uploads if you don't understand what happens when you put that image on a Prim.

## ANIMATED TEXTURES ON PRIMS

Animated textures are used for a number of things here in Second Life. The most common use you'll see is for water, and water falls. But, of course, there are many more uses you can find, especially if you branch out and use Animated .gif files; fluttering curtains in a window, screen savers on a computer, flashing heels on your shoes, hypnotic disks at a sideshow.

The uses are endless, and the best part is that animated textures are entirely client side. Which means that each user only has to upload it once, and a running animated texture doesn't affect server speed or performance.

There are five ways to animate the textures on your prims.

You can animate the offset, so the texture appears to slide across the face of the prim.

You can animate the rotation, so the texture appears to spin on the prim.

You can animate the scale, so the texture appears to grow larger, and then shrink.

You can use an animation, prepared in a different program, and "show" it on the side of a prim.

If the prim is on your property, you can link to a .mov file, and the streaming media will replace a texture for people who have enabled that in their Preferences.

The first four are all accomplished by using scripts.

To SLIDE the texture across the prim, open the Edit dialog, click on the Contents tab, and drag this script from your inventory to the window. (Or just drag the script onto the Prim.) The second script will cause the texture to Ping-Pong; that is to run to the end, reverse and run backwards to the beginning, reverse again, and so on.

To ROTATE the texture across the prim, do the same thing, but use this script.

To SCALE the texture on the prim, use this script.

If you want to tweak the scripts, just open them and go ahead. There are instructions included as comments in each one.

To use an animated .gif as a texture, you will need to prepare it as a grid, in a graphics program, and then use a script so Second Life will run through the images on the grid and animate them.

FlipperPA Peregrine has an excellent tutorial explaining how to do this at Second Life Boutique. Since it seems silly to me to repeat everything he says, I recommend that you take a look at it.

You can find it here.

<http://www.slboutique.com/index.php?sid=&p=content&contentid=3>

It includes a link to a script that will automate the whole process for you; so all you need to do is browse your hard drive for the .gif file you wish to use, and click a button.