ZBrush 2 Practical Guide

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Introduction

How the manual is laid out and how to gain the most benefit from it.

Welcome to the ZBrush 2 Practical Manual.

We know that people tend to learn best by doing, and so this manual is written to give you an introduction to ZBrush 2's features in a tutorial-based format. A series of brief projects will introduce you to the ZBrush interface, as well as how to perform the most common tasks. This manual is also supported by the many forms of help that are built directly into ZBrush.

Careful attention has been given to accommodate a variety of learning styles and objectives. If you are an experimental learner who learns best by doing, simply follow the steps in bold text.

- **Reading just the bold sentences will allow you to proceed through the steps of a tutorial.**

Directions to interface items will often be given as a path, from the highest-level element to the lowest. For example, Tool>Deformations>Smart ReSym would lead you to the Smart ReSym button, which is located in the Deformations menu within the Tool palette.

After completing each tutorial, you will then have enough information to begin exploration in that area on your own.

To accommodate people who learn best through reading, each bold step is followed by supplemental information. Here we will explain why the particular step was taken, as well as other options that might be available. This text is meant to give you a comprehensive understanding not just how to do things in ZBrush, but why.

People who learn best by lectures are also taken care of. Many of the tutorials are complemented by ZScripts. In these cases, the text will tell you what ZScript to run and where to find it:

> Look for sentences such as this one to learn where to find the accompanying ZScript.

This is an example of what an important note will look like. These will call attention to special circumstances or potential problem areas, as well as providing useful tips.

There are also many places where very important or useful information might be mentioned. These will be found to the left of the main text.

While the overall layout of this book builds in complexity, it is not essential that you follow the tutorials in any particular order. Wherever possible, we have provided the work files for previous steps so that you can dive right into an area that strikes your interest. However, if you are new to ZBrush it is highly recommended that you do follow the tutorials in the order in which they are presented. Later tutorials assume knowledge that is covered in earlier chapters.

Also, it is important to bear in mind that there are usually many ways to do accomplish a task. The techniques taught in the tutorials are meant to illustrate specific approaches or features. This is necessary in order to ensure a comprehensive understanding of ZBrush's tools. As you become more familiar with the software, you will learn what works best for your particular needs and style.

Be sure to visit www.ZBrush.com and www.ZBrushCentral.com for additional tutorials and documentation as they are made available. The online help system has been created specifically to be expandable, and we will regularly be releasing updates to it.

Macintosh Users

Wherever possible, this manual has been written to avoid being specific to any particular platform. The exception is in the use of certain keyboard combinations. Wherever this manual refers to the Ctrl key, simply use the Cmd key instead.

If you're upgrading…

If you have used an earlier version of ZBrush, there are many changes to the interface as well as several new tools and features. We will call these areas out with the use of the new Z logo to the left of the text.

Basic Concepts

This section introduces the fundamental principles on which ZBrush is founded. New users should pay special attention to this information!

ZBrush 2 represents a fundamental breakthrough in computer graphics technology in that it offers features that will enhance nearly any artist's workflow.

Illustrators can use ZBrush as a start-to-finish painting solution. The depth-enabled canvas enables you to paint with less emphasis on the mechanics of depth and lighting, freeing up more time for pure creativity. The fact that ZBrush uses a 3D rendering engine makes it possible to create illustrations that look like they're ready to come right off the page.

Artists working in an animation field such as the game and motion picture industries will be attracted to other parts of the ZBrush toolset. ZBrush 2 offers a powerful suite of mesh editing tools, the ability to paint textures directly onto the 3D mesh, innovative UV mapping techniques (along with support for other mapping), optimization to work with millions of polygons in real time for ultra high-resolution sculpting, and the ability to create displacement or normal maps for use in a rendering engine that supports them.

Regardless of what area of computer graphics you work in and whether you are a professional or a hobbyist, in the end it's all about speed. The faster you can work, the more productive you can be, and the more freedom you will have to experiment. ZBrush 2 offers the power to deliver that speed.

ZBrush has been highly optimized to make real time rendering possible even with extremely dense mesh resolutions or the most complicated of scenes. At the heart of ZBrush's methodology lies the "pixol."

The Concept of the Pixol

Most art software uses the pixel as its basic building block. These pixels each contain information about their X and Y positions, as well as their RGB (Red, Green and Blue) color values. ZBrush takes this a step farther by adding depth, orientation and material to the equation – thus producing a smart pixel, which we call the "pixol." These pixols are saved with your document so that when you open the scene back up again the depth is still present. Exporting an image, however, finally flattens the pixols and turns them back into pixels so that other software can read the image.

Most of ZBrush's painting tools are designed to add pixols to the canvas. A few are only capable of altering pixols that are already present. You can also turn the addition of depth on or off, sometimes painting with depth and sometimes without. As you might imagine, pixols enable a lot of power when you're painting!

3D objects are a little bit different. They begin life as polygons – small planes formed by interconnected points. Usually, there are relatively few polygons which are then smoothed by the rendering engine to make the model look like it has more than are really present. While a model is in a polygonal state, you can sculpt it in 3D to change its shape and add details. When you actually incorporate the model into your scene, though, it becomes "snapshot" to the canvas. At this point, ZBrush converts the model from polygons to pixols and in the process culls anything that is not visible to the camera. Since non-visible information is discarded, ZBrush resources are free to be devoted to the next 3D object that you wish to work with. This is a critical concept to understand! Only one object is allowed to be fully 3D at a time. This means that no matter how complex your scene becomes, you are still able to work with the next model in real time.

Polygons can become pixols, but pixols cannot normally be converted to polygons. The exception to this rule is when you are using Projection Master, which allows you to sculpt a high-resolution model by painting displacements onto it.

Even though a model is snapshot to the canvas, it is not actually lost as a polygonal object. What is snapshot is in reality an instance of the model. The original remains in the Tool palette and can be drawn again on the canvas. It can then continue to be edited until you snapshot it again.

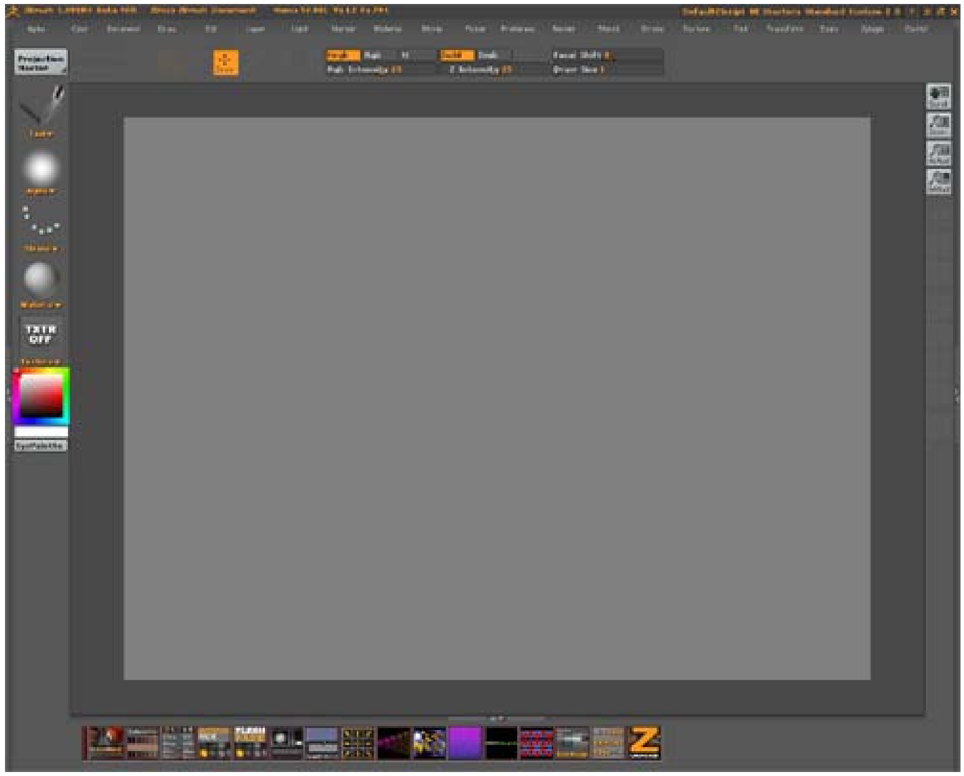
Another time that this distinction between polygons and pixols is important is when you are saving your work. Saving the document saves the pixols that are currently on the canvas. It does not save any custom items in any of the palettes, such as models. If you have a 3D object on the canvas and are editing it, saving the document will actually save a snapshot of the model rather than the model itself. Each palette that can hold custom items has its own inventory controls. So if you wish to save your model as polygons it must be saved from the Tool palette.

In Conclusion

ZBrush 2 offers a unique and powerful blend of 2D painting with 3D sculpting, texturing and rendering. The program is highly optimized to allow tremendous levels of detail, both in terms of extremely high polygon counts for your models and also for your finished scenes.

The ZBrush 2 Interface

The key to getting the most out of ZBrush is to be able to get around the interface quickly and easily. ZBrush 2 has introduced many enhancements to be more intuitive and faster than ever to use. It is well worth taking the time to explore this chapter before proceeding to the other tutorials.



In its standard configuration, the ZBrush window is mostly taken up by the canvas. This area is where you will do your painting and modeling. Immediately below the canvas is the ZScript area, where ZScripts load unless they are designed to embed their components within the interface. Completely surrounding the canvas and ZScript window is the **Shelf**. This provides a handy space to keep the most commonly used interface items.

- **To hide the Shelf, press the Tab key on your keyboard. Pressing the Tab key again will bring it back.**

By hiding the Shelf, you are able to reclaim almost the entire interface for your canvas, providing a great amount of room to work in. The Shelf, like much of the rest of the interface, can be customized to suit your needs. We will deal with this in detail in a later section.

Beneath the title bar, there is a row of words that spans the top of the screen. This is the **Palette List**.

❑ **Move your pointer over one of the palette names to open the palette.**

All of ZBrush's functions are contained within palettes. Each palette contains a group of related functions. Within the palette, these functions are further broken down into groups in order to help make it easier to locate the particular control that you need.

Buttons are shown as a light gray raised object. Pressing a button causes something to happen.

Switches are interface items that can be turned on and off. When off, the switch is shown as dark gray. When on, it is orange.

Sliders allow you to set a ranged value. They show the current setting as a number next to the slider's title, and also show where it fits within the range by a small indicator at the bottom of the slider. The minimum value is to the left, and the maximum value is to the right.

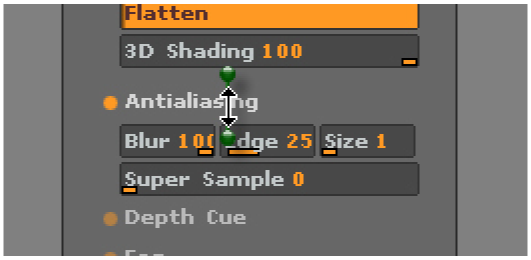
❑ **In the Render palette, click in the 3D Shading slider and drag to the left to set a value of 50.**

The slider value will update as you move the slider.

- **Click the 3D Shading slider and type 100.**

You can also set a slider value without dragging simply by clicking in it and then typing the value that you want.

- **Also in the Render palette, click the word "Antialiasing".**



In order to further help with organization, many palettes contain menus, also known as sub-palettes. These menus contain controls that are all related to a specific task within the palette's more generalized categorization.

Clicking on a menu's name will expand or collapse it.

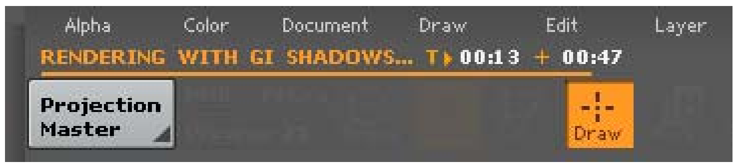
- **Open all of the menus within the Render palette. Move the pointer into any blank space within the palette. When it changes to up-and-down arrows, click and drag up.**

Depending on your system's display settings, palettes can sometimes get to be so long that they go off the bottom of the screen. By dragging within empty space in the palette, you can slide its contents to reveal the hidden items.

- **Move your pointer off of the palette to close it.**

Palettes only remain open as long as you keep the pointer over them. In most cases clicking on an element within the palette will not close the palette. This allows you to change several settings without having to constantly pull the palette down again. However, there are times when modifying a setting causes the palette to close. This happens when you are using the Best Renderer and the change that you made requires ZBrush to render the scene again and is meant to allow you to see the effects of your changes without the palette getting in the way.

- ❑ **Move your cursor over any interface item and watch the area beneath the palette list.**
- ❑



The area between the palette list and the top part of the Shelf is called the **Note Bar**. This area is meant to provide helpful feedback while you work.

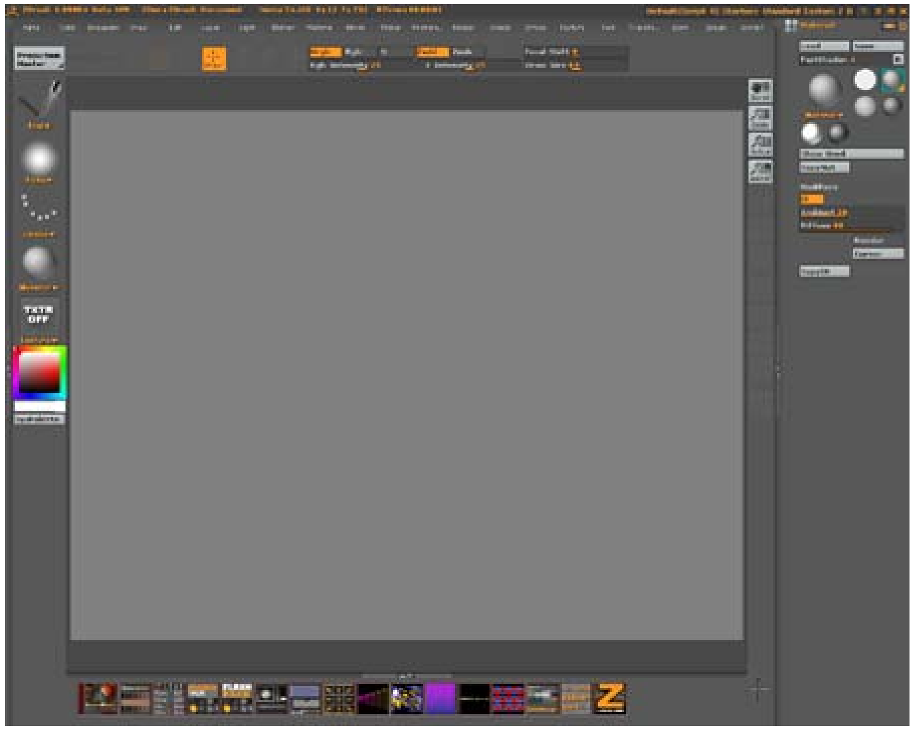
In most cases, the note bar will show you the name of the current interface item. Other times, it will provide helpful suggestions for what to do next. Also, when ZBrush is performing a complex action such as a best-quality render, the note bar will provide several kinds of feedback at once. In the example shown above, it informs us of the type of action being performed, how long it has spent on that action already, how long it estimates will be required to complete the action, and finally an orange bar showing a graphical representation of its progress.

In Conclusion

You should now have a good understanding of where to find the major interface components, and a broad feel for how the palettes work. You will get more practice working with palettes as we proceed through the following sections.

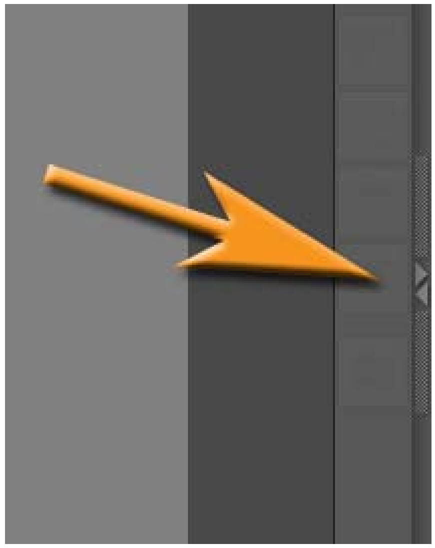
More With Palettes

Now that the basics of working with palettes have been covered, we proceed to more advanced operations to make your work easier.



ZBrush provides many ways to make your workflow easier. When working with palettes, you will normally find that they are more convenient as pull-down menus. However, there will also be times when you need to repeatedly return to a particular palette. For example, if you are sculpting a model, you might find that you return to the Tool palette frequently. ZBrush accommodates this need by providing **Trays** on the left and right sides of the interface. These trays are used to keep palettes open continuously.

- **To open a tray, click along its outside edge. To help you find the right spot, there is a pair of arrows at the vertical center of the interface.**



Clicking this separator will expand the tray. In the default configuration, both trays are empty. This allows you to use them however you see fit.

- **To move a palette to the tray, open it and look in the upper left corner. Click on the orange circular icon.**

This orange icon is called the palette's handle. Clicking on it now moves the palette to the top of the open tray. It will now stay open while you continue to work on the canvas.

Each palette has a preferred tray. If neither tray is open, clicking on the handle will open the preferred tray and move the palette there automatically. If both trays are open, the palette will automatically go to the top of its preferred tray.

You can also drag the handle to move the palette where you want it. This is handy when you have both trays open and want to put the palette in its non-preferred tray, or if you wish it to be below other palettes that are already in the tray.

When a palette is in a tray, its appearance changes slightly. Its icon appears to the left of the palette's name and the handle moves to the right. Next to the handle, there is also now a small icon with a triangle in it. Clicking the icon will toggle between the palette's **basic** and **advanced** states. If you would like to simplify the palette so that only its most basic features are available, click this icon.

A palette that is in the tray can be expanded and collapsed by clicking on its title. This conserves room when several palettes are in a tray.

When several palettes are in a tray, it is not uncommon for them to scroll off of the screen. To bring items back into view, simply click in any empty space within the palette and drag up or down.

A palette can only exist in one place at a time. If you have a palette in the tray, you can still access it as a pull-down menu from the palette list. If you do this, it will temporarily disappear from the tray and will reappear once its pull-down counterpart closes.

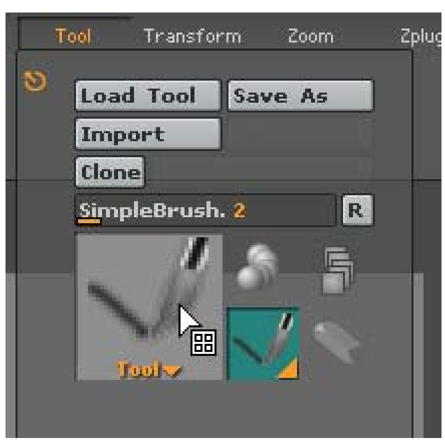
- **To collapse a tray, click its separator bar.**

Doing this leaves the palette in the tray. It will still be waiting for you if you expand the tray again.

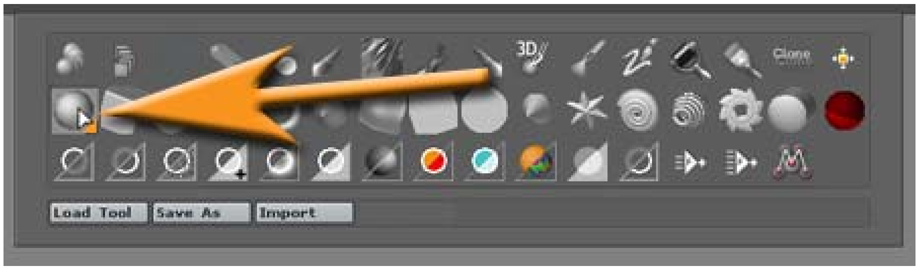
- **To remove a palette from the tray, click its handle.**

You can also use the handle to move a palette from one location to another within the tray.

- **In the Tool palette, click the large thumbnail.**



- **In the popup menu, select the Sphere3D.**



We have now changed the active tool from the Simple Brush to the Sphere3D.

Several palettes use this thumbnail system to select from. For your convenience, their large thumbnails are also located on the left side of the shelf.

Once an item has been selected the first time using the large thumbnail, a small thumbnail of it is added to the palette next to the large thumbnail. These small thumbnails provide shortcuts to recently used items. You can reselect that item by clicking on its small thumbnail rather than going through the popup menu. The active item will always be highlighted with a teal background and a small triangle in its lower right corner.

Double-clicking on a small thumbnail will allow you to replace it with a different item from the popup menu.

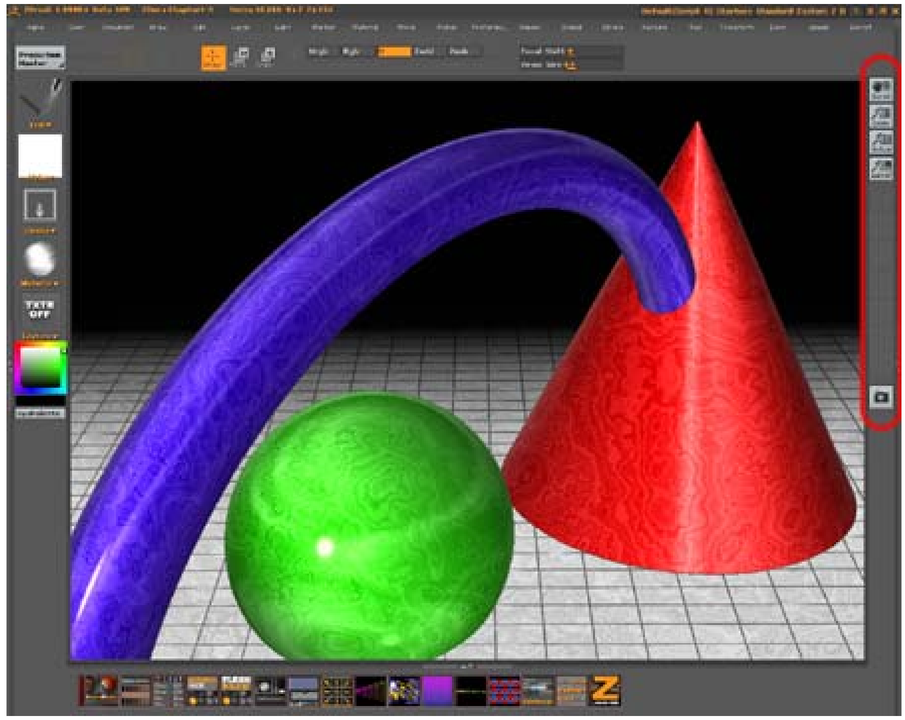
As more items are selected, more small thumbnails will appear. To restore the palette to its starting number of small thumbnails, click the R button just above all the thumbnails to the right.

In Conclusion

We have now covered several additional features of the palette system. You now know how to select items using the thumbnails, as well as how to capitalize on the trays to keep palettes open when the pull-down version would be an inconvenience.

Getting Around the Canvas

ZBrush 2 provides convenient ways to change your view of the canvas. There are also controls to change your view of objects while editing them.

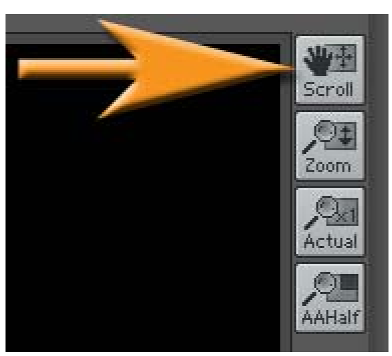


In order to accommodate ZBrush's 2D functionality, the camera system operates much like a paint program with the ability to pan across the canvas and zoom in for a closer look. You can use the icons in the tray to accomplish this, or you can use keyboard shortcuts.

- ❑ **Press Document>Open and then browse to the document titled Chapter1-3.zbr.**

The document that loads is very large, with a few objects on it. We'll now look at several ways to move around the document.

- ❑ **On the right shelf, place your pointer over the Scroll button. When it changes to the four-way arrow, click and drag.**



As you drag, you'll be able to move the canvas around. When you release the mouse button, the movement stops.

Like with a paint program, the camera is restricted to movement along the XY plane.

Rather than using the Scroll button, you can hold down the spacebar. The pointer will change to the four-way movement arrow, allowing you to click and drag to move the canvas.

- **The next button down is the Zoom button. Click and drag on it to zoom in and out of the canvas.**

Zooming the canvas resizes the pixols. As a result, when you enlarge the canvas beyond 100%, it will become pixilated.

Bear in mind that when you zoom the canvas you are not moving the camera closer to it. The camera cannot be moved along the Z axis. Instead, you are changing its focus to show more or less of the canvas.

The plus and minus keys (+ and -) on your keyboard will step your magnification up or down by 10% increments.

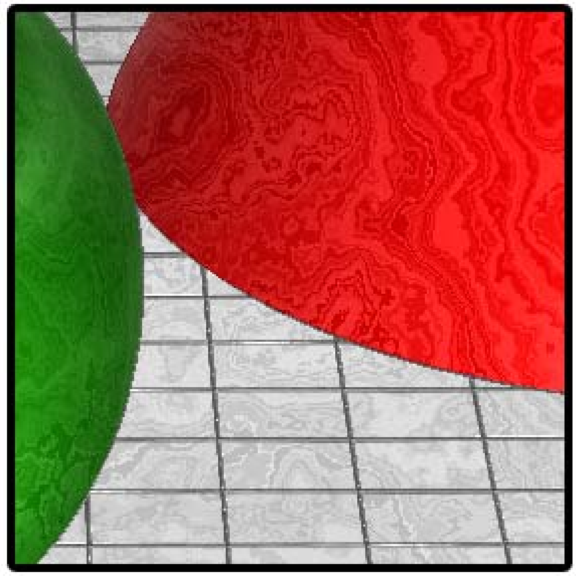
- **After zooming into or out of your document, press the Actual button to return to 100% magnification.**

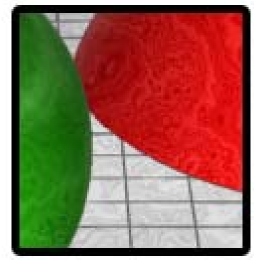
This immediately sets the zoom level back to its start of 100%.

The keyboard shortcut for this is 0.

While the view is at this level, look closely at the edges of objects. You'll see that curved edges have a tendency to pixelate. This is because pixols, like pixels, are square. ZBrush provides a way to compensate for this, however.

- **Press the AAHalf button.**





A good rule of thumb is to always create your images at twice the size that will ultimately be exported. Not only does this make it easy to add greater detail, but when combined with AAHalf mode it ensures that your images will always have the highest quality edges.

The zoom level of your canvas will change to 50%. This immediately causes all edges to become averaged, which removes the jaggies. However, ZBrush's AAHalf mode is more than simply resizing your image. If you were to change the zoom level to 50% via regular zooming, your exported image would be the full size. Using the AAHalf mode allows you to export exactly what you see.

Many artists actually prefer to work in AAHalf mode, and only use actual size when they wish to zoom in for greater detail.

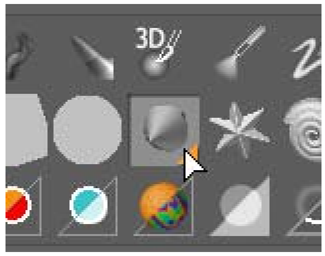
Working with 3D Objects

Now that we have covered how to control the camera and move about the canvas, let's examine how to work with a 3D object while it's being edited. Since the ZBrush camera operates like a paint program, you are provided with ways to rotate, move and scale the object itself.

- **Press Preferences>Init ZBrush.**

This command restores ZBrush to its startup configuration, clearing all custom data.

- **From the Tool palette, select the Arrow3D object.**



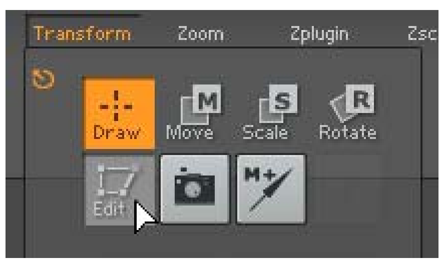
We'll use this tool since, when drawn, it is very easy to see its orientation.

- **Click and drag on the canvas to draw the object.**

All objects are drawn with their Z axis pointing toward the camera.

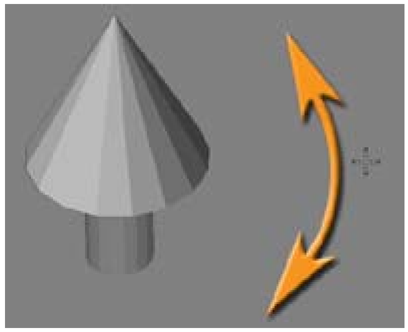
At this moment right after it has been drawn, the object exists in a kind of transitory state. It has been drawn as pixols, but you still have the opportunity to work with the object on a polygonal level instead. You do this by entering Edit mode:

- **In the Transform palette, press the Edit Object switch.**



The circles surrounding the pointer will turn red. This indicates that you are in Edit mode, and the object can be sculpted as polygons. At the same time, several more buttons on the shelf to the right of the canvas become active. We'll cover them in a moment.

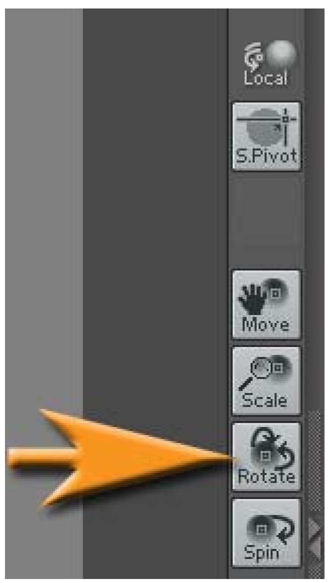
- **Rotate arrow by clicking on a blank part of the canvas and dragging.**



If you hold the Shift key while rotating the object, it will snap to 90 degree rotations. Bear in mind that only the object is rotating. The camera is not moving.

This form of rotation is the same as using the Rotate icon on the shelf.

These icons are used to manipulate an object while it is being edited.



Below that icon is the Spin icon. This icon provides two kinds of rotation, depending upon which way you move your mouse after clicking on it:

- **Click on the icon and drag to the left or right. The object will spin about its Z axis.**

- **Click on the icon and drag up or down. The object will move in relation to the canvas.**

By combining the two forms of rotation, you can easily maneuver it to any angle that you desire.

- **Click and drag on the Move icon. The object will move around the canvas without rotating.**

This movement can be duplicated by holding down the Alt key while clicking and dragging on any blank portion of the canvas.

- **Click and drag on the Scale icon. The object will be resized larger or smaller.**

Scaling the object is NOT the same as zooming into it. The camera does not move. Remember that when zooming the camera, the scene becomes pixilated as you zoom into it. When scaling the object, it is redrawn at the new size and so no pixilation occurs. This is an important distinction.

There is a keyboard shortcut for scaling, as well. Hold the Alt key and click on a blank part of the canvas. Now, without releasing the mouse button release the Alt key. When you then drag up and down, the object will be scaled.

By default, all rotations are performed around the object's geometric center. There are two ways that you can change the pivot point:

- **Change the Draw>Draw Size setting to 10.**

This changes your cursor to a smaller size, so that you affect a smaller area on the model.

- **Click anywhere on the model itself.**

This causes the model to be edited. For our illustration, it really doesn't matter what you do; we just want to change a point or two.

- **Click the Local icon on the right shelf.**

This tells ZBrush to use the last edited point as the model's new center of rotation. Now, when you rotate the model, it will spin around the last point that you clicked.

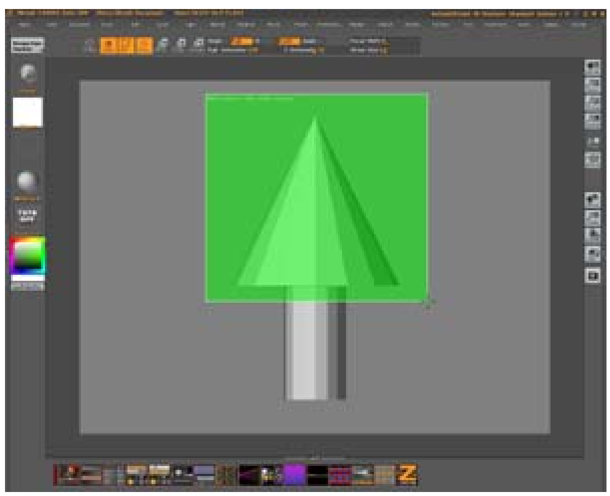
This is extremely useful when you have scaled the model large so that you can work on a small part of it. At that scale, any rotation can easily cause the model to spin right off the canvas and disappear. By activating the local transform mode, your model will always rotate around the area that you are currently working on.

- **Hold down the Alt key and click on any blank part of the canvas.**

This keyboard shortcut immediately scales the model to fit the canvas, and centers it on the canvas. This works even if the model has been moved or rotated out of sight!

- **Now that the model fills the canvas, rotate it so that it points straight up.**

- **Hold down Ctrl+Shift, then drag from above the model to the left to below the arrow's point on the right. The green selection box should fully cover the point. When it does, release the mouse button.**



The polygons that are not completely encompassed by the selection rectangle will become invisible.

- **Press S.Pivot on the shelf to the right of the canvas.**

Local Transform overrides the model's regular pivot point. This holds true even for one that you have set yourself.

- **Turn off Local.**

- **Rotate the model.**

The S.Pivot button resets the model's pivot point to be the center of the currently-visible polygons.

- **To make the model fully visible again, hold Ctrl+Shift and click on any blank part of the canvas.**

Even though the model's visibility is restored, the new pivot paint remains active.

- **Click the C.Pivot button to clear the new pivot point.**

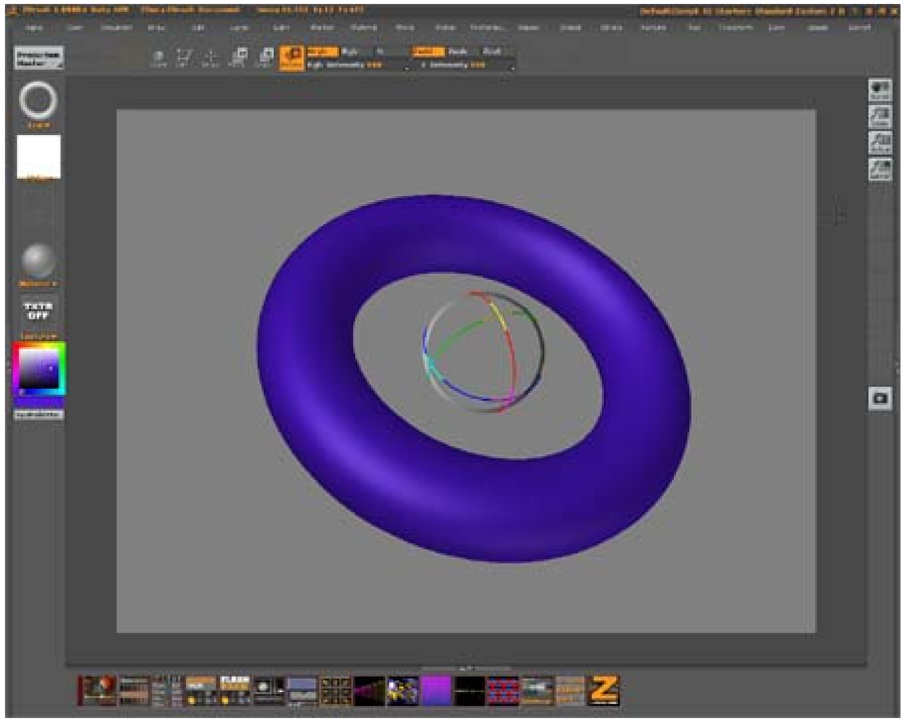
The model's pivot point returns to being the geometric center of the object.

In Conclusion

In this section, we have covered several ways to get around the canvas, as well as how to control your view of a model while it is being edited. It will help you to always remember that ZBrush's camera system is that of a paint program. ZBrush provides many ways to help with your work. The AAHalf mode provides a sure-fire way to get crisp edges in your work. The ability to change a model's pivot point helps you keep an area of interest centered on the canvas.

The Gyro

In the previous section, we looked at how to rotate your view of a 3D object while it's in a polygonal state. In this section, we'll work with the options that are available as pixols.



ZBrush provides an extremely useful tool for any time you wish to change something that you have just painted on the canvas. It is called the gyro because of how it looks somewhat like a gyroscope. In this tutorial, we'll show several ways to use the gyro.

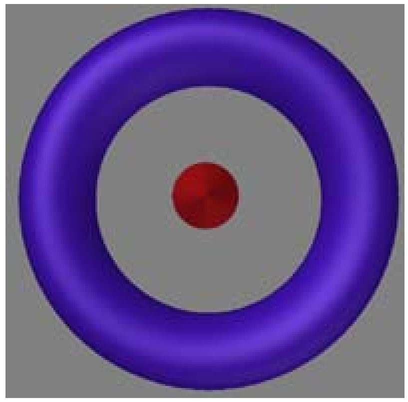
- **Choose Document>New Document to begin with a fresh scene.**

- **Create a torus by clicking the Tool thumbnail on the shelf and selecting the Ring3D from the popup menu.**

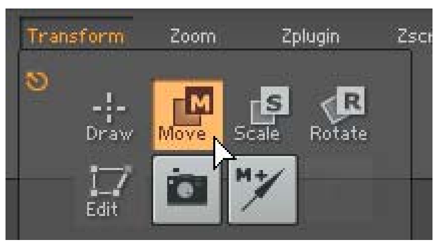
You can also select any color and material that you would like to use.

- **Draw the ring on the canvas. Make it pretty large, occupying most of the screen.**

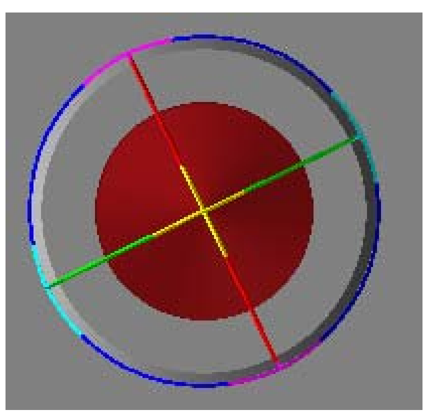
- **Now select the Cone3D object. Draw it in the center of the ring, but not too large.**



- **In the Transform palette, click the Move button. This will activate the gyro, in move mode.**



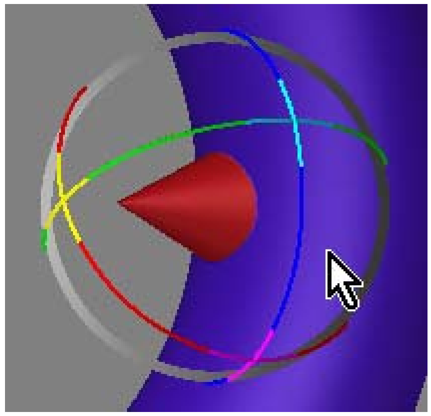
You will now see the gyro surrounding the center of your cone. Activating the gyro always affects the last stroke that you made on the canvas; an object can only be transformed immediately after it has been drawn, before you do anything else (including selecting another tool).



The gyro is made up of four different-colored rings. (In the example above, the gray and blue rings are currently occupying the same plane.) There are also differently-colored sections wherever the rings intersect.

Different things can happen, depending upon how you manipulate the gyro, and which mode you are currently in (Move, Scale or Rotate). We will cover each of these in turn.

- **Click inside the gyro (but not on any of the rings) and drag to the right until your pointer moves over the torus.**



Dragging inside the gyro moves the object across the canvas. However, it continuously orients the object to the pixol that is immediately below its geometric center. As a result, when you drag the cone across the torus, its orientation changes so that it's always pointing away from the surface below.

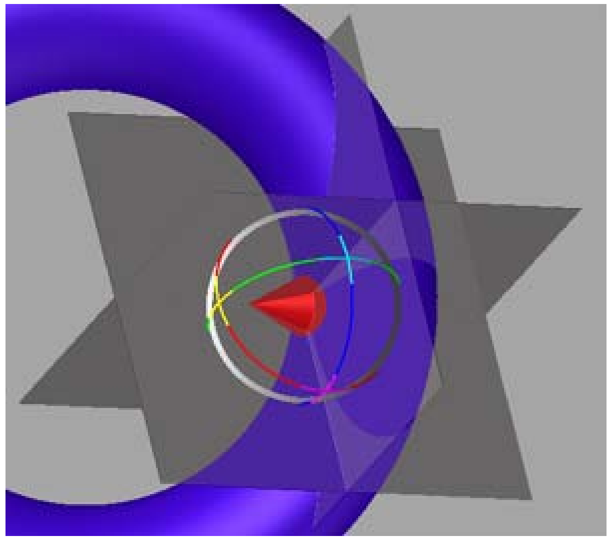
Stop dragging when you have something similar to the image above. You can now see that the gray and blue rings have found their own planes, and all four rings that make up the gyro are clearly visible.

- **Click and drag on the gray ring. The cone will move across the XY plane without changing orientation.**

The gray ring allows you to move the object without changing its depth, which can easily be seen by moving the cone through the torus. The direction that the cone is pointing also will not change. In fact, when using Move the only thing that will change the orientation of the object is clicking inside the gyro.

- **Now click on any of the colored rings (but not an intersection) and drag.**

Clicking on a ring constrains your movement to the invisible plane that the ring rests upon. The example below shows these imaginary planes so that you can more clearly see what we mean:



- **Click on one of the differently-colored intersections and push toward the center of the gyro.**

The intersections restrict movement even further. The object will now move in a straight line that goes through the intersection that you're clicking on, the center of the object, and then back out the matching intersection on the other side of the gyro.

- **Once again, click inside the gyro and move the object so that it is over the torus.**

Notice that when you drag inside the gyro, the object once again immediately snaps back to the pixols on the canvas regardless of what depth it is currently at. This is a fast way to undo your movements, restoring the object to a freshly-drawn position.

- **Click outside the gyro and drag up or down.**

While the gray ring allows you to move the object across the canvas, there isn't a ring for depth. That's because such a ring would be edge-on toward the camera, and impossible to select. Instead, you can move the object along the Z axis by clicking and dragging outside the gyro. Up movement will push the object deeper into the canvas and down movement will pull it out toward the camera.

If you move the object too deep, it will vanish. ZBrush's maximum depth is a function of the canvas size. The maximum depth is referred to as the **clipping plane**, since anything behind it is "clipped" and disappears.

Now that we have examined the various functions of the gyro in Move mode, let's take a look at how it behaves with Scale and Rotate.

Since the Transform palette is used to modify anything that has just been drawn on the canvas, several of its functions are used constantly. For your convenience, these have been placed on the shelf for you.

- **On the top shelf, activate the Scale switch.**

The gyro will not appear to change at all, but its effects will change dramatically.

- **Click anywhere around or in (but not on) the gyro and drag.**

The entire object will be scaled larger or smaller, depending upon the direction of drag. If you drag toward the center of the gyro, the object will be scaled smaller. If you drag away from the center, the object will be scaled larger.

- **Click and drag on one of the colored rings.**

The object will now scale larger along the two axes that the ring rests upon. The third axis will not be affected. This flattens the object our along the plane that the ring lies upon.

The gray ring has no effect when in Scale mode.

- **Click and drag on one of the intersections.**

This scales the object, but only along one axis.

In short:

Dragging on an intersection scales the object in one direction.

Dragging on a ring scales the object in two directions.

Dragging anywhere else scales the object in all directions.

The QWERT keys on your keyboard correspond to the transform modes as they are laid out in the palette. Q switches to Draw mode, W to Move, E to Scale, and R to Rotate. T switches into Edit mode.

- ❑ **Press the R key on your keyboard to switch to Rotate mode.**

Once again, the gyro does not change in appearance, but changes radically in function.

- ❑ **Click inside the gyro and drag in any direction.**

This tumbles the object, just the same as if you were in Edit mode and rotating it. To snap the rotation to the closest 90 degree increment, hold down the Shift key while rotating.

- ❑ **Click on any ring and drag.**

This rotates the object around a single axis.

The intersections have no effect when in Rotate mode.

- ❑ **Click outside the gyro and drag up or down to move the object along the Z axis.**

This is exactly as if you were in Move mode.

- ❑ **Place the Transform palette in either tray and open the Info menu. Use the gyro in any mode and see the results in the Info sliders.**

The Info sliders correspond to the X, Y and Z axis for the current transform mode. If Move is active, they show the current position of the object. If Scale is active, they show its size and if Rotate is active they show its orientation.

Like with any slider, you can change these values manually. Doing so updates the object on the canvas. Precise positioning is therefore very easy.

In Conclusion

The gyro makes it easy to precisely place any object, anywhere on the canvas. Remember that only the last item drawn can be transformed in this manner. When a new object is drawn or a new tool is selected, the current object becomes fully incorporated into the scene and can no longer be modified as a discreet object.

Curves

ZBrush graphs, also known as curves, provide a visual way to modify a range of values. Due to their versatility, curves are found throughout the ZBrush interface.

A **curve** in ZBrush is simply a graph showing a range of values. They can be found in nearly every part of the ZBrush interface: material modifiers, defining the falloff of the sculpting tool, defining how fog or depth cue acts throughout a scene, etc. In this tutorial, we'll work with one of the curves that has been introduced in ZBrush 2: the Alpha Adjust Curve. As you will see, this curve makes it possible to modify the current alpha – and with it, your paint brush -- "on the fly."

- **Begin by reinitializing ZBrush. (Preferences>Init ZBrush)**
- **For convenience, place the Alpha palette in either tray.**

We'll be adjusting the curve constantly while working through this tutorial, so it will be easiest to keep it open rather than having to pull it down again each time.

- **Click where it says Alpha Adjust.**

In order to conserve screen real estate, curves are normally displayed in a compressed state. Clicking on the curve opens it for editing, simultaneously closing any other curve that might already have been open elsewhere in the interface. Only one curve can be open at a time.

So that we can better see the results of our edits, we'll draw an example of the alpha on the canvas. Use the thumbnails on the left shelf to work faster:

- **Select the Simple Brush.**

- **Select the DragRectangle stroke type.**

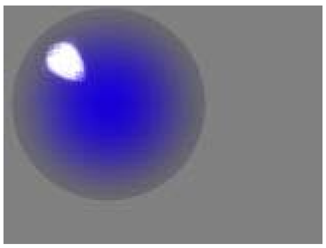
❑ **Select the Toy Plastic Material.**

❑ **Press Ctrl+F to fill the canvas with the current material and color.**

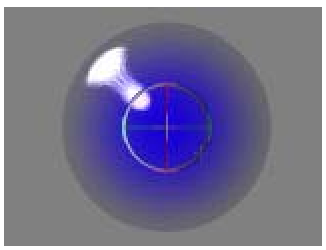
❑ **Select another color (such as blue).**

❑ **Also set the Z Intensity (on the top shelf) to 100.**

❑ **Drag a large stroke on the canvas.**



❑ **Press W to activate the Move gyro, then position the stroke so that it's pretty well centered on the canvas.**



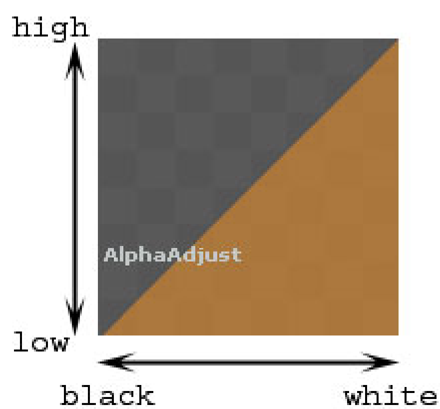
ZBrush uses 16 bit grayscales, which give a far greater range of values than the standard 0-255 range of an 8 bit image. When exporting a displacement map, it is crucial to use the TIFF format, which also supports the 16 bit range.

While the gyro is active, our changes to the Alpha Adjust Curve will also update the example on the canvas. This is an important principle of the gyro: it allows you to make changes to many of the components that were used to draw the most recent stroke.

Now we'll go back to paying attention to the curve:

First, let's clarify what an alpha is. An alpha is simply a grayscale image. More precisely, an alpha is an array of pixels, each ranging somewhere between white and black.

The Alpha Adjust Curve provides a way to interact with those values, which in turn changes the alpha. The horizontal portion of the curve represents the current grayscale values of the image, with black on the left and white on the right. The vertical portion determines how those values are output, with black at the bottom and white at the top.

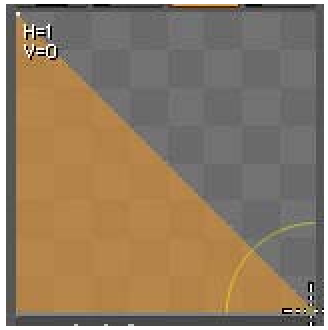


At this point, the curve simply shows a straight line from the lower left corner to the upper right. That means that any alpha values that are black will be output as black (lower left) and any values that are white will be output as white (upper right). Anything falling in between is also output exactly true to the alpha.

Let's put it to work.

Any point on a curve can be moved. Right now, the curve is made up of only two points. Since they are the end points, they can only be moved vertically.

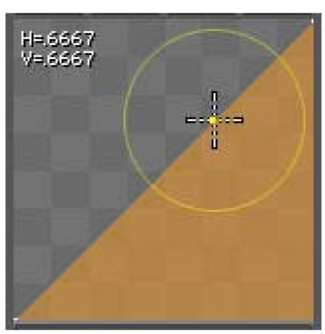
- **Move the lower left point to the upper left by clicking on it and dragging. Move the upper right point to the lower right.**



What this did is tell ZBrush to output black (left side) as white (top) and white (right side) as black (bottom). In effect, the curve has been reversed, and the current alpha has been modified along with it. You can see the changes both in the alpha large thumbnail and on the canvas.

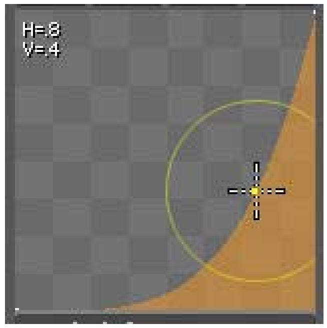
- **Click the Reset button to restore the alpha to its original state.**

- **Click any point along the line between the two existing points.**



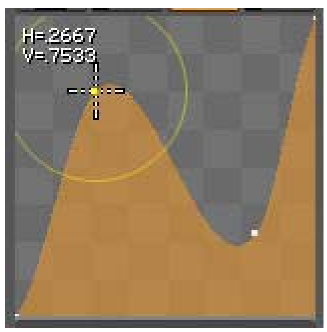
This adds a new point to the curve. The yellow circle surrounding it represents the point's area of influence on the curve.

- ❑ **Drag the new point around to see how the curve is adjusted by it, then finish with something like the example below.**



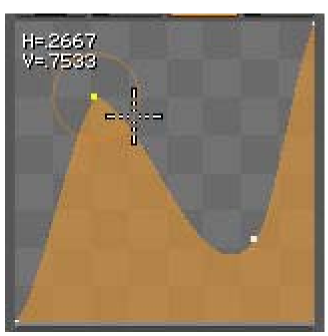
As you move the point, watch how it affects the alpha and what you've drawn on the canvas.

- ❑ **Now add another point, moving it above and to the left of the last one.**



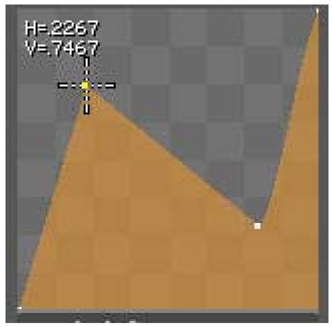
If you move the point too far to the left, you'll notice that the curve can end up shooting way up off the top of the graph. That's due to the point's radius.

- ❑ **To tighten the point, click on the circle surrounding it. When it turns orange, drag to resize the circle.**



Any point can be modified at any time. Simply click on it to make it the active point, and then adjust its position or radius.

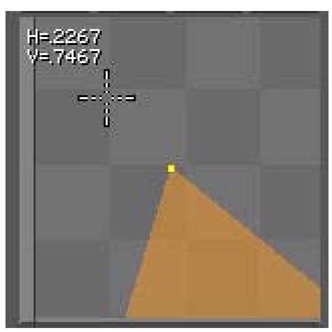
- **Now drag the point off the curve and – without releasing the mouse – back on again.**



When the point comes back into view, it will be a sharp angle instead of a soft curve. Radius no longer applies, so the circle won't be present. You'll also notice that any points adjacent to it become "split." The line coming out will be a sharp point on the side leading toward the angular point, and the line going out the other side will still be curved.

To make a point soft again, simply drag it off the curve and back on.

- **Now click on the point to make sure it's active, then click on it again.**



This zooms in on the point, allowing you to make fine adjustments. To return to a normal view of the entire curve, move your mouse anywhere off the graph.

- **Remove the sharp point by dragging it off the graph and releasing the mouse.**

You'll now be left with the three point curve. Go ahead and play around with the curve a little bit, adding points and moving them around. Watch how it affects the alpha and the canvas. Make sure that you have a few of them before you move on to the next step.

- **Immediately beneath the curve is a slider called Focal Shift. Drag it to the left and right.**

When you move the slider, watch what happens to the curve. The points on the curve will shift horizontally, but not vertically. This compresses the curve toward one side or the other.

The purpose of this slider is to make it easy to quickly modify the curve without the need to move points around. Even with the simplest possible curve (the straight line that we started with), the focal shift can dramatically alter the alpha.

- **Adjust the Noise slider to .25**

This slider affects the curve without actually changing any points. At this low value, you can see on the canvas how the noise was added, but the overall shape of the alpha remains essentially the same.

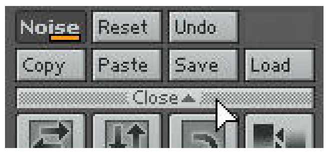
- **Click Undo a few times.**

As you can see, Undo affects all edits made to the curve. This includes changes to the Focal Shift slider, and also the Noise slider. Redo behaves the same way.

- **The remaining controls are for inventory.**

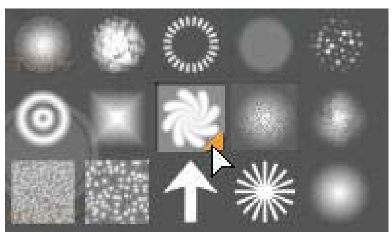
You can save a graph to disk for use in another project or for sharing with other users. I say "graph" here because any graph can be loaded into any curve, anywhere within the ZBrush interface. If you create one that you really like, save it for later. Feel free to experiment, also, with copying graphs and pasting them into other places. One area in which this is extremely useful is when you're working with materials. The Material palette has many curves, and sometimes it is useful to place the same graph into several of them.

- **To close the curve, click the Close button at the bottom.**



This helps keep the interface from becoming cluttered. Of course, the curve would also close automatically if you opened one somewhere else.

- **Now switch to alpha 19.**



Notice how the new alpha is immediately modified by the Alpha Adjust Curve. That curve affects the current alpha, regardless of which one is selected. Also, if you look at the popup menu again, you will see that the previous alpha now looks exactly like it did when we started. By default, modifying the Alpha Adjust curve does not permanently change any apha.

- **To convert the modified curve to a permanent alpha, click the Make Modified Alpha button.**

Two things will happen:

First, a new alpha will appear at the end of the thumbnails. It is automatically selected. The original alpha #19 is now shown in the thumbnail list in its unmodified state, and is no longer selected. This new alpha will not remain if you initialize or restart ZBrush. If you want to save it for another session, use the Export button at the top of the Alpha palette.

Second, the new alpha is also modified by the same Alpha Adjust settings!

- **Open the Alpha Adjust curve again and click Reset.**

This restores the newly-created alpha to exactly what you saw before you clicked the Make Modified Alpha button.

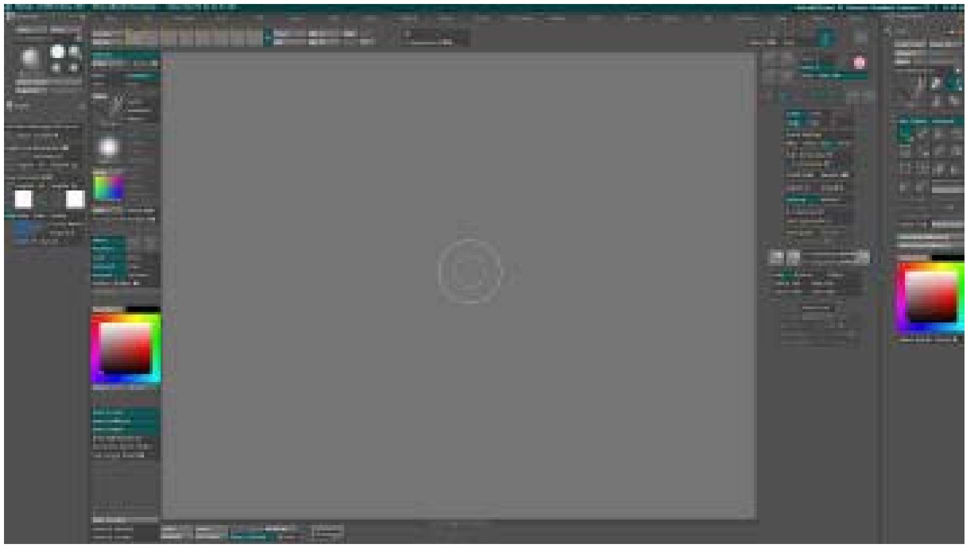
In Conclusion

This section has shown the many ways that you can modify a curve, no matter where that curve may be found within ZBrush. The results that can be achieved are nearly limitless, even within a single curve. ZBrush 2's new curve features and inventory controls also make it easy to modify a curve without editing points or to reuse a curve that you like.

Lastly, we have looked at a few features that are unique to Alpha palette. Since saving a tool also saves the currently-selected alpha, this feature makes it possible to build a library of custom paint brushes.

Customizing ZBrush

Every artist has unique tastes, interests, needs and ways of working. ZBrush accommodates this diversity by providing many opportunities for customization.



During this section, we'll go through the various ways that you have available to tailor ZBrush to your needs. In the process, we'll create a custom environment that will automatically load every time you launch ZBrush.

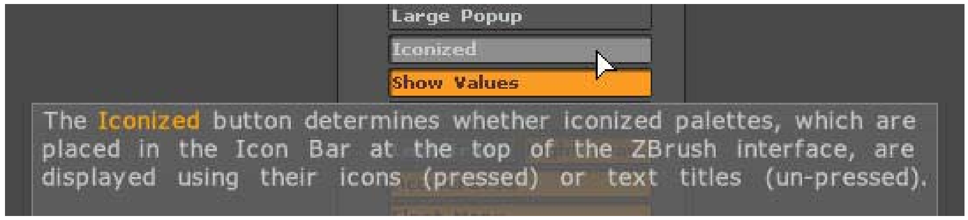
- **We need to begin by initializing ZBrush.**

If you are starting this section immediately after any of the other tutorials, you might have settings that you would not wish to keep. Therefore, it's best to begin with a fresh slate.

- **Open the Preferences>Interface menu.**

This part of the palette contains many settings that govern the overall way that the interface appears and behaves.

- **To learn more about any setting, hold down the Ctrl key as you move your pointer over it.**



ZBrush's online help system is comprehensive. It's like having a reference manual built directly into the software! This also brings us to the first item in the list: Popup Info. Turning this off will also disable the online help text. It is not recommended that you do this until you are very familiar with ZBrush!

Most of the settings in this section should be left alone until you have become more accustomed to ZBrush and begun to get a feel for how it works. However, there are a few items that can be changed even now.

- **Turn on Iconized.**

This changes the list of palettes from text to icons. Some people feel that icons are easier to learn with than text, or just like the look better. Try both settings, and decide which you like best.

- **Turn off Float Menu.**

This is the same as pressing the Tab key. It hides or unhides the shelf along with any custom palettes that you might build over the canvas. If you would like ZBrush to launch with the shelf hidden, leave this off. Otherwise, turn it back on (recommended).

- **Turn off Auto Pulldown.**

This is a highly personal preference. Some people find that having the palettes open automatically when you mouse over their names (or icons) is the fastest and most convenient. Other people prefer that the interface to work more like your operating system's menus, requiring you to click on a palette to open it. Set this to suit your own liking.

- **PulldownMenuOpacity and DisabledItemsOpacity both control the "look" of ZBrush. Set them however you like.**

PulldownMenuOpacity makes the background for each palette more or less transparent when it's pulled down. At a setting of 0, each palette would only consist of the interface items – the palette background would be gone. At 100, the palette would be completely opaque.

DisabledItemsOpacity applies to interface items that require something else to be active before they become available. By default, ZBrush makes these items nearly invisible, which calls more attention to the actions that ARE available at the time. You can change this to anything you prefer, however.

- **Open the Icolors menu.**

This section of the Preferences is for controlling the colors of the interface. The color patches each correspond to a different part of the interface and can all be set individually.

Below the color patches are several sliders. These allow you to modify the interface as a whole. Not only does this make it faster to update, but it is also easy to keep a unified and consistent look throughout the interface with enough contrast between item types to easily tell the types of elements apart.

- **Adjust the various sliders to create a color scheme that you like.**

❑ **When finished, press Apply Adjustments.**

This resets all sliders, with their 0 values now being the new color scheme.

❑ **Open the Mem menu.**

This section of the Preferences controls how ZBrush utilizes your system's resources.

❑ **Set Compact Mem to a value near (but not above) the amount of RAM that your system has.**

ZBrush utilizes its own memory management system, which is independent of your operating system's virtual RAM. Basically, when you exceed the amount of RAM that is indicated by this slider (in megabytes), ZBrush will write all extra data to disk. When this happens, ZBrush will temporarily pause and you will see a "compacting memory" message in the note bar. When ZBrush finishes writing to disk, you can then continue working.

The more RAM that your system has, the higher you can set this slider. In turn, that means that ZBrush doesn't have to write data to disk as often, which enables a more fluid workflow.

If you set this slider above your available RAM, ZBrush would never write to disk. While this might seem like a good thing (since virtual memory is slower than RAM), it's not. Such a setting would limit the scenes that you could create with ZBrush, since anything requiring more RAM than your system has available would be impossible.

- **Increase the Doc Undo and Tool Undo settings.**

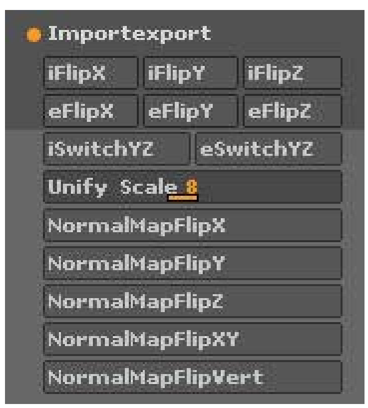
Document undo negates actions that have been performed on the canvas (in pixols). Tool undo does the same, but on a polygonal level (normally when the model is in Edit mode).

The more undo levels you have available, the farther back in time you go if you decide that you don't like something. New users will usually want these settings to be fairly high. Bear in mind, however, that undo levels require memory. Therefore, the more of them you have available, the more often your system will have to compact memory.

The last setting here is MaxPolyPerMesh. Its default setting is calculated by ZBrush based upon your system, and is meant to ensure smooth interaction with your model. You can raise this value as you become accustomed to working with high resolution models, but should **never** set it to more than twice the default value.

Smart workflow can make it possible to achieve extremely high polygon counts on even average systems without unduly taxing your system. The key lies in using a lower subdivision level when you wish to rotate the object, and selectively hiding everything except the portion of the mesh that you wish to edit.

- **Open the Importexport menu and take a look at the settings.**



ZBrush 2 has many settings to streamline its integration with other software. These settings are automatically applied whenever a model is imported into or exported form ZBrush. "i" settings are applied on import and "e" settings on export.

Every program has its own world coordinate system. The first cluster of switches are designed to manipulate your model so that it corresponds with ZBrush. If you have a human figure facing the camera in your other application, you will want to adjust these switches so that the figure faces "down" in the

Tool>Preview window (the top of his head would be pointed directly toward the camera). You will also want to set the export switches so that the model is returned to your other software facing the same direction. Experimentation will tell you which settings are necessary for your software.

An added benefit to having separate settings for import and export is that ZBrush fits into any workflow. You can import from one application and export back to it, or export to a third application.

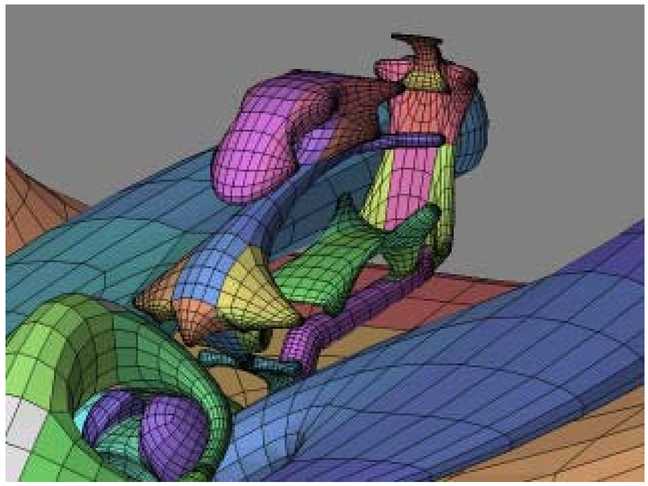
The Unify Scale slider determines how a model is scaled when it is imported and exported. At the default setting of 8, an imported model will be 8 times the size of a native ZBrush object. The same factor will be applied in reverse when the model is exported.

The final switches all apply to normal maps. Activating them causes ZBrush to output a normal map using different color systems. Experimentation or your rendering engine's documentation will tell you what settings are appropriate for your needs.

- **For the moment, just leave all of these settings as they are.**

- **Open the Preferences>Draw menu.**

Most of these settings are for how ZBrush displays polyframes. This display option provides a way to see the wireframe of your model superimposed over the shaded geometry. Mesh grouping is also shown by default, which is useful for selecting portions of the mesh to edit.



Max Brush Size allows you to increase the Draw>Draw Size setting to a very large value. You can increase it now, or leave it for if you ever need it.

Adots tells ZBrush when to switch from a shaded view of the model to a wireframe view. At the default setting, this will happen when the model reaches 800 pixols in size (larger than the default canvas), and is meant to help ZBrush continue to operate in real time. Faster systems can increase this setting. Note that the wireframe only displays while the mesh is being manipulated. As soon as the mouse button is released, the view will return to the regular shaded display.

- **The Tablet section will only be active for people with a connected graphics tablet. If you do, then use the help text to learn more about each setting and adjust it to suit your style.**

Remember, to view the help text simply hold down the Ctrl key and mouse over each item.

❑ **Open the Performance menu and take a look at the settings.**

These settings are all meant to maximize ZBrush interactivity, especially when working with high polygon models.

❑ **If you have a multiprocessor system or a hyperthreading-capable processor, click the Test Multithreading button.**

ZBrush will take a few minutes to perform a test of your system's performance with and without multithreading enabled. When it completes, it will tell you what kind of performance increase (if any) you can expect from this feature, and gives a recommendation of whether or not to activate it. If the recommendation is positive, you can activate the MultiDraw and MultiRender switches.

The other settings should generally be left alone, but you can modify them if you feel the need to maximize ZBrush performance. Use the online help system to learn more about each.

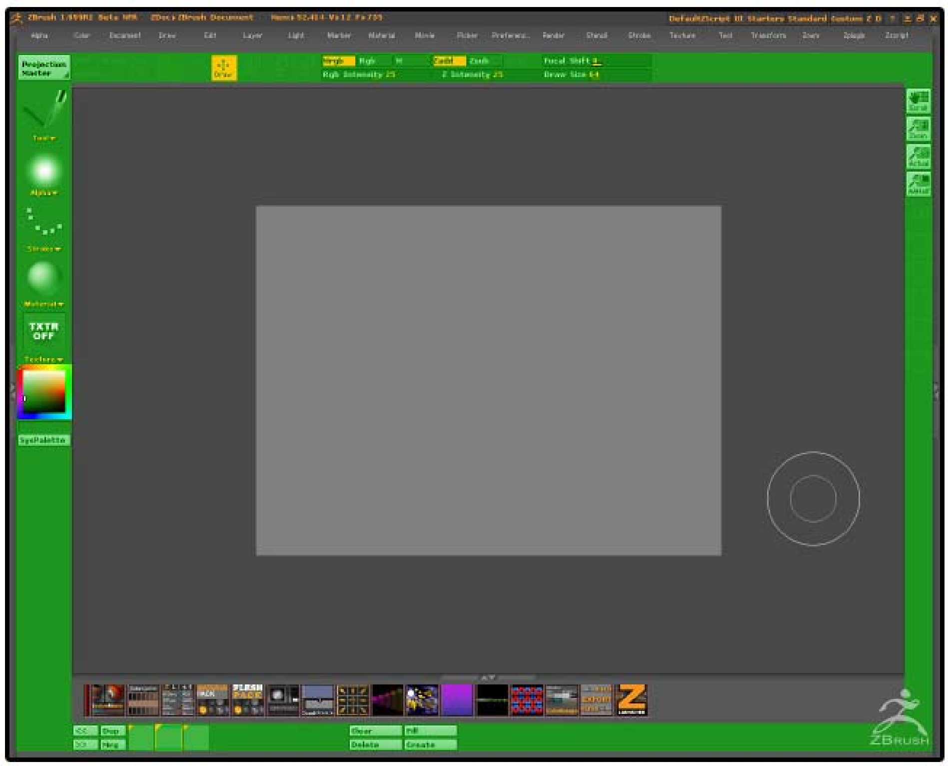
❑ **Open the Misc section and decide whether or not to use ZFolders.**

ZBrush comes with several pre-made folders in its directory for various types of content (ZTools, ZMaterials, etc.). When Use ZFolders is active, ZBrush will default to these folders every time you use an inventory command. For example, pressing Tool>Load Tool will always open the ZTools folder.

If this setting is off, ZBrush will instead open the last folder that you browsed to. This is especially useful if you keep your 3D content on a different hard drive from your programs, or if you are using ZBrush as part of an animation workflow where you are modifying content that will be rendered elsewhere.

More Modifications

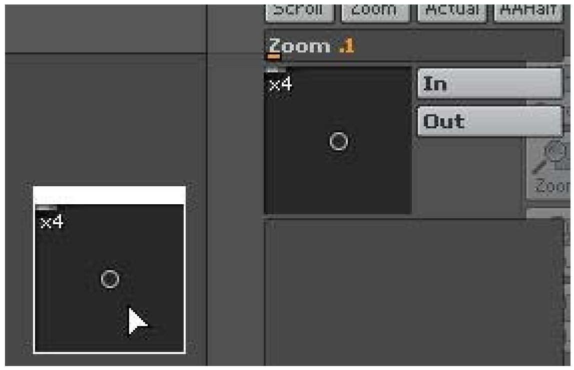
The Shelf



In addition to the preferences, ZBrush has other ways in which it may be customized. The most obvious of these is the Float Menu, of which the shelf is a part. These instructions will explain how to customize the shelf, but bear in mind that you can also place elements on the canvas itself should you choose.

Any permanent part of the interface can be added to the shelf. In other words, any elements that are present when ZBrush launches or is initialized. Elements that cannot be added are those which only appear after something else has been selected. Such elements quite literally do not exist at any other time, and so cannot be added to the shelf. Since we started this section by initializing ZBrush, we know that everything present in any of the palettes right now can be added to the shelf.

- **While holding down the Ctrl key, drag any element out of any palette.**



A copy of the element will be created, which you can place anywhere on the canvas. For the moment, we'll leave it somewhere on the middle of the canvas.

- **Drag from the color selector on the left shelf to any empty portion of the shelf below it.**

When you drag out of any color box, including the large thumbnail from the Color palette, the cursor becomes a picker. When you release the cursor, the color that is beneath the picker will be selected. This is like an eyedropper tool.

- **Click on the white tab above the interface element that you've dragged onto the canvas.**

- **Click Preferences>Interface>Colorize**

This colors the white tab to match the current color. Since we just set the color to match the shelf, the element now matches it as well.

- **Again holding the Ctrl key, drag a few more elements from the interface.**

When you bring one of these new items close to the one you already have on the canvas, they will attempt to dock with it. This makes it easy to build blocks of elements.

If you hold down the Shift key while dragging, the element will still dock, but with a small space between itself and the other element(s). You can use this technique to build groups of related items.

You can also change the way the organization of docked elements by holding the Ctrl key again and moving them around individually.

- **Without holding down the Ctrl key, click on the bar above the block of elements. Use this bar to move the block around as a group.**

When you move close to a part of the shelf, a line will appear around that area. This is meant to make it easy to spot the shelf regions. There are four of them – to each side of the canvas, above it, and below the ZScript window at the very bottom of the interface. This fourth area is initially empty.

When anything is placed in any portion of the shelf, it will automatically expand to accommodate the new item(s). There is a limit to how much it will expand, but by the time you reached it you would be seriously cutting down on the amount of space available for the canvas.

- **To remove an item from the shelf, hold down the Ctrl key and click it.**

Using these techniques, the items that you find that you use the most will always be able to be within easy reach, and in a method of organization that makes the most sense to you.

The Trays

As you've already learned, palettes may be placed in the trays, in any order that you desire. These trays may be kept expanded or collapsed. Several modifiers within the Preferences>Interface menu control the behavior of palettes when they are in the trays. Whatever arrangement you create will be saved with your configuration.

Saving the Configuration

At this point we have covered all of the settings and layout features that will be saved with your configuration. We have also made several settings adjustments that are meant to tailor ZBrush to your system and personal tastes. It's now time to save everything so that ZBrush will recall it the next time you start.

- **Click the Preferences>Config>Store Config button.**

ZBrush will give you a message that your settings have been saved successfully.

The keyboard shortcut for this action is Ctrl+Shift+I.

What you have just saved is called the **Custom** configuration. It will be loaded every time ZBrush launches.

Layouts

On the right side of the title bar, you will see several buttons for switching between layouts.

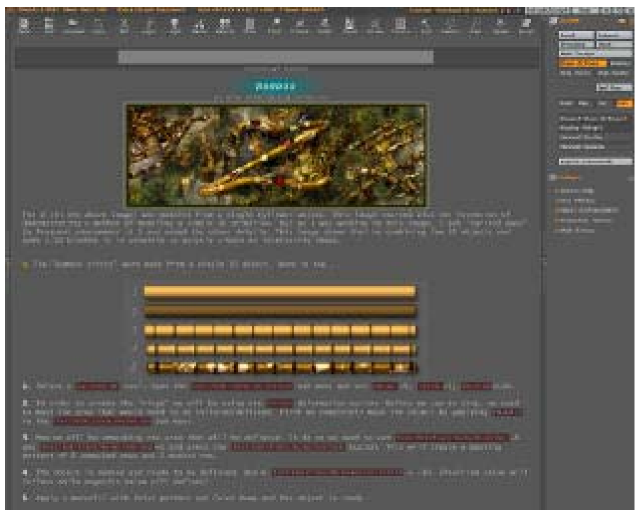
- **Click Standard**

This returns you to the same layout that ZBrush shipped with. Any colors and special settings within the palettes (such as memory management) will not be changed. In other words, only the positions of elements are changed by clicking on any of these layout buttons. Your personal settings will remain unaffected regardless of the layout.

- **Click on Custom**

You are now returned to the custom layout that you just built.

- **Click on Z**



This layout is meant for ZScripts that take up a lot of window space, such as some of the built-in tutorials or threads that you might have downloaded from ZBrushCentral. In this layout, the canvas is tucked away above the ZScript area.

- **Click on D**

This final layout was created to maximize your canvas space. The ZScript window is collapsed, and the shelf is empty.

You might also like to use this layout as a base for when you build more configurations.

Additional Configurations

While the custom configuration is the one that will load automatically when ZBrush launches, you are not limited to it. The Preferences>Config>Save Ui and Load Ui buttons make it possible to create a variety of specialized configurations for various purposes.

For example, you might prefer to have one configuration for sculpting, another for texturing, and a third for lighting and rendering. There is no limit to the number of configurations that you may create.

Each of these configurations saves the current color settings. However, by default, those settings are not loaded. If you would like to load the saved color scheme along with the layout, hold down the Shift key when you click the Load Ui button.

The Startup Document

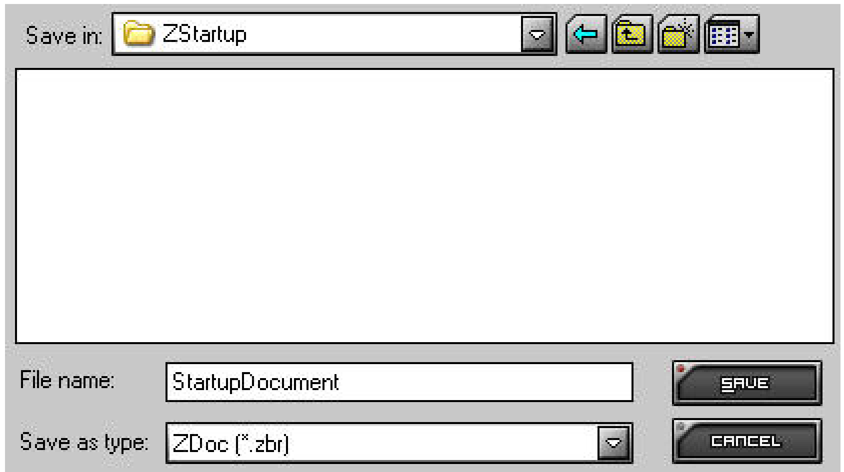
While the configuration files store many settings, there are many others that are not saved. These additional settings are all an integral part of your document (such as the background color or lighting setups).

All document-related settings can be saved as part of a startup document. This document will be loaded every time ZBrush launches.

- **To create a startup document, click Document>Save As**

- **Navigate to the ZBrush\Zstartup folder**

- **Save the file as in the ZStartup folder as StartupDocument.zbr**



ANY document can be saved as your startup; even one where you have already begun painting on the canvas.

Since ZScripts rely on many of these settings, automatic ZScript recording is turned off if you use a startup document. You will need to manually begin recording if you wish to record your session. Bear in mind that unless you initialize ZBrush before beginning recording, you would also need to distribute your startup document if you wish to share the ZScript with any other users.

Settings that will be recalled by the startup document include:

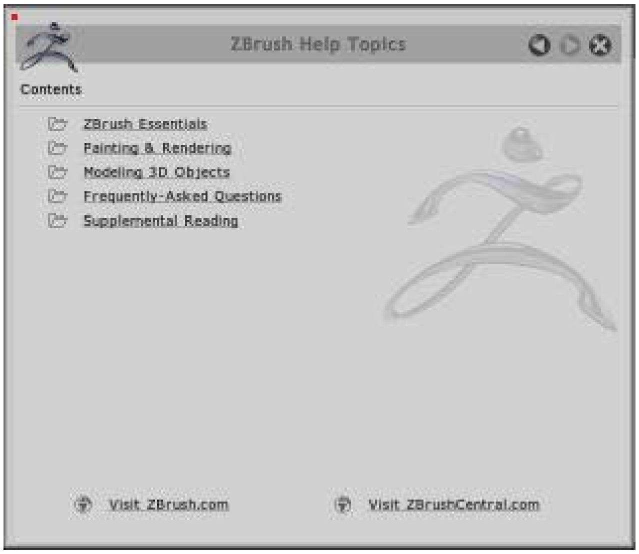
Canvas size
Background color and Border color
Layers
Lighting
Render settings

In Conclusion

This section has been lengthy, but that is only because ZBrush offers MANY ways in which to customize your working environment so that it suits your own needs and style. As you become increasingly experienced with ZBrush, you will no doubt find many ways in which these customization features can assist you. Since they can all be overwritten at any time, ZBrush will also be able to evolve with your skills.

Finding Help

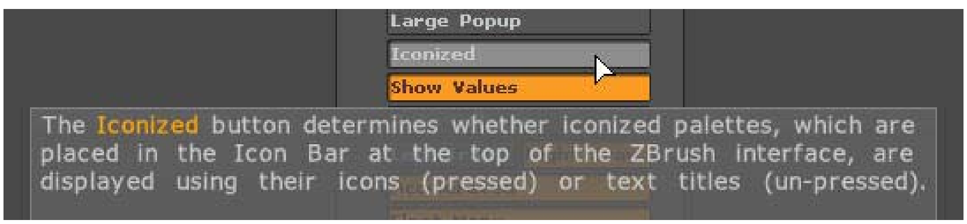
No single manual or other source can possibly cover every nuance of ZBrush and its usage. To that end, there are many places that you can look to for answers.



ZBrush help is available from several online sources, and has also been built directly into the software. We'll take just a few minutes to introduce you to the best places to find more information as you need it.

Autonotes

- **To learn more about any ZBrush feature, place the pointer over it and press the Ctrl key.**



A popup window will appear near the pointer, containing detailed information about that item and its usage. This is like having an entire reference manual built directly into the software.

The ? Button

- **For the most comprehensive online help, click the question mark near the right end of the title bar.**

When this button is active, ZBrush will automatically display detailed text as you work. In many ways, this is as if you're working with the Ctrl key pressed. However, there are also times (such as mousing over a palette) when information will be displayed that is not shown by the autonotes.

The Help Button

- **In the Title bar, click the Help button.**

ZBrush 2 includes a comprehensive library of online help topics. This help browser includes sections on nearly everything that you could wish to do in ZBrush, whether it be painting, modeling, texturing or rendering. Many topics also include tutorial ZScripts, along with links to associated topics.

There are also sections for Frequently-Asked Questions and ZBrush Essentials, along with links on the main page to ZBrushCentral and the Pixologic website.

Updates to this help system will be made available for download at various times in the future. Watch www.ZBrushCentral.com for when they are announced.

ZBrushCentral

- **On the Help Topics main page, click Visit ZBrushCentral.com.**

This button launches your web browser and takes you to www.ZBrushCentral.com. The official online ZBrush community, ZBC provides a forum in which to interact with other ZBrush users from around the world.

The F.A.Q. Forum provides answers to many of the most frequently asked questions about ZBrush.

The QuickLinks (accessed from the F.A.Q. Forum or the top right corner of every page at ZBC) contains many of the most pertinent topics concerning ZBrush usage. There are also a great many tutorials that have been created by other ZBrush users or by Pixologic.

Pixologic

- **Click Zplugin>Web Access>Go to ZBrush.com**

The Web Access ZPlugin provides another way to reach both helpful websites.

The Pixologic website contains the latest information concerning ZBrush, as well as resources such as a library of useful ZScripts. Additional content will be added in the future.

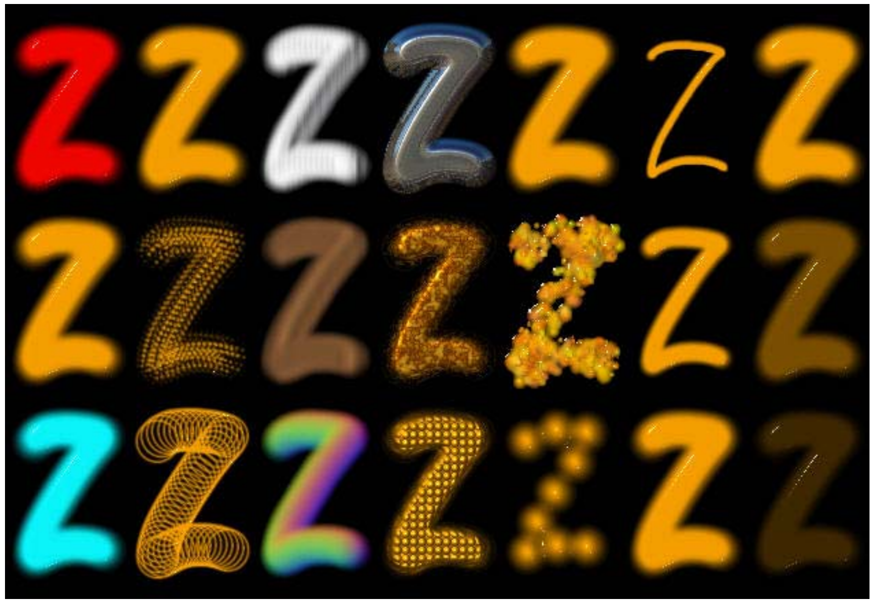
The Support page provides ways to contact Pixologic directly for assistance should the other resources covered above not be able to help you.

In Conclusion

ZBrush offers a variety of ways to learn about the software – without ever needing to leave the program! Every feature is documented in several ways. Basic facts can be found by holding down the Ctrl key, while more comprehensive reading is available from the Help Topics browser. Last of all, www.ZBrush.com and www.ZBrushCentral.com provide still more resources.

Painting Basics

In this section, we'll cover the basic principles of what 2.5D painting is all about, and how several palettes work together to create a wide variety of effects.



ZBrush operates as a paint program powered by a real-time 3D rendering engine. At its core, it utilizes "pixol" technology. Every dot on your canvas not only contains information about its XY coordinates and color values, but also its depth, orientation, and material. What this means is that you can "paint" a 3D object onto the canvas (or paint a brush stroke with depth enabled) and ZBrush will automatically shade what you've painted with the scene's lighting and other 3D-type settings. Rather than spending time trying to make shadows and highlights look real and consistent (and possibly having to redo work if you decide that you'd like to try something else), you can allow ZBrush to handle the details so that you can spend more time simply being creative!

We'll begin by examining how the interface elements work together to produce what you paint on the canvas. This is critical to your mastery of ZBrush, so don't give in to the temptation to skip ahead!

As covered previously, all of ZBrush's functions are grouped together in palettes, each aimed at a specific type of task. ZBrush's flexibility comes from the fact that these palettes do not operate in a vacuum. Instead, they work together to create or modify everything that goes on the canvas. The default interface configuration has been specifically designed to make these interactions as intuitive as possible.

On the left side of the interface, there is a column of large thumbnails. Each of these corresponds to a single palette. To make things easy, all but the color selector also shows its palette name.

These palettes directly interact to affect what is painted on the canvas:

Tool – The Tool palette is at the very heart of it all, which is why its thumbnail comes first. Every tool provides a different unique way to draw or modify pixols on the canvas. Tools fall into three unique categories:

Pixol-adding brushes. These are paint brushes, which add pixols to the canvas when you paint with them.

Pixol-changing brushes. These are also brushes, but they require pixols to already be on the canvas. For example, the Snake Hook can draw pixols out into a tendril while the Shading Enhancer can accentuate the bright or dark parts of your scene.

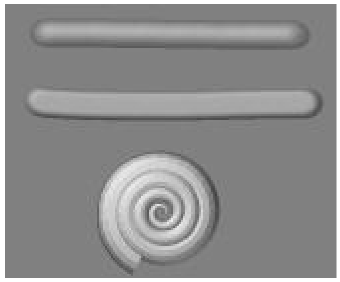
Objects. All 3D objects are also present in the tool palette. When first drawn on the canvas, they can be modified on a polygonal level. They will normally be snaphot to the canvas, becoming pixols within your scene.

- **With the Simple Brush selected (it is the default brush when ZBrush launches, and is shown in the illustration above), draw a horizontal line across the top of the canvas.**

When you chang tools, you may notice that the thumbnails below also change. This is because each tool has default settings in the other palettes, and is yet another reason why the thumbnails are presented in this particular order.

- **Click the Tool thumbnail, select the Single Layer brush and draw another horizontal line beneath the first.**

- **Now select the Spiral3D object and draw another horizontal line beneath the second.**



As you can see, the results are radically different depending upon what tool is being used. Tools are the most fundamental building blocks for everything that you will paint on the canvas.

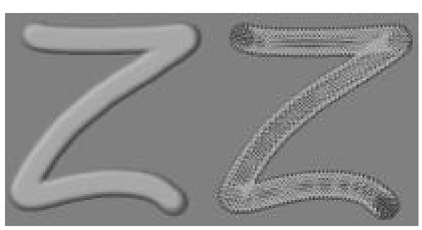
Alpha – These are grayscale images that can be used in a variety of ways. The most common use is to change the shape of your paint brush. However, alphas can also be used for masking 3D objects, creating stencils to paint through, modifying fog and depth cue during a render, and much more. They can even be skinned and converted into 3D objects. All displacement maps are alpha images.

- **Clear the canvas by pressing Ctrl+N.**

- **Select the Single Layer brush and then with the Stroke thumbnail select Freehand.**

- **Draw a stroke on the canvas.**

- **Select any other alpha and draw another stroke.**



As you can see, the Alpha palette provides a simple way to radically change the nature of your brushes.

Stroke – Every time you click and drag on the canvas, a stroke is painted. The Stroke palette provides different things that can happen during that stroke – from drawing a single instance of an object to spraying down a chaotic “splatter.”

In the previous example, we changed from the Dots to Freehand stroke type. They are different in that Freehand ignores the speed of your cursor as it moves across the canvas, painting instances of the alpha at precise intervals.

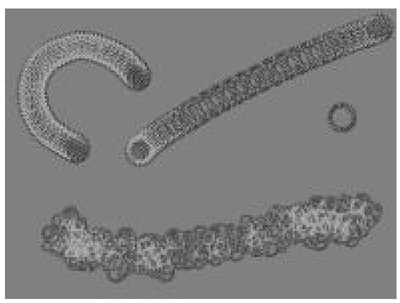
- **Change to Dots again and draw a stroke on the canvas.**

This stroke type determines the distance between alpha instances based upon the speed of the cursor. The master you move your mouse or pen, the farther apart the alphas will be placed.

- **Change to DragDot and draw another stroke.**

Only one instance of the alpha is placed, at the point that you ultimately end the stroke.

- **Now draw a stroke using the Spray type.**



By providing you with a variety of stroke types, ZBrush makes it easy to get exactly the results that you need with a minimum of effort. For example, the Spray stroke can be used with a 3D pebble to paint a stream bed, with the scattered pebbles drawn in various sizes and shades of color.

Material – The 3D rendering engine interprets how light interacts with the pixols that are present on the canvas. A significant element in that process is the material used to paint each pixol. Simply put, materials tell the rendering engine how to shade the colors on the canvas. Materials can be used to simulate metal, glass, stone, plastic, and more.

- **Clear the canvas.**

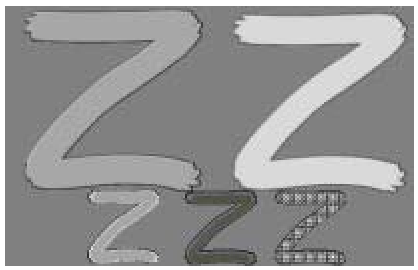
- **Select the Single Layer brush along with any alpha and stroke that you wish.**

- **Paint a stroke on the canvas.**

- **Now select the Toy Plastic material and draw another stroke.**

This material has specularity settings that are very different from the default Fast Shader. Even though you haven't changed the color that is being painted, the colors of the new stroke appear different from those of the first stroke. This is because the Toy Plastic material tells the rendering engine to shade the colors differently than the Fast Shader.

- **Draw a few more strokes using different materials.**



A single scene can have many materials, up to the number of small thumbnails that are visible in the material pop-up menu.

Texture and Color – Every pixol on the canvas has color. The Color palette is used to give a single color to your brush stroke. The Texture palette is used to give several colors to the stroke by means of another image. Textures can also be wrapped onto the surface of a 3D object. The Color thumbnail is underneath the Texture thumbnail because a texture will automatically override the currently-selected color.

- **Clear the canvas.**

- **Select the Sphere3D tool.**

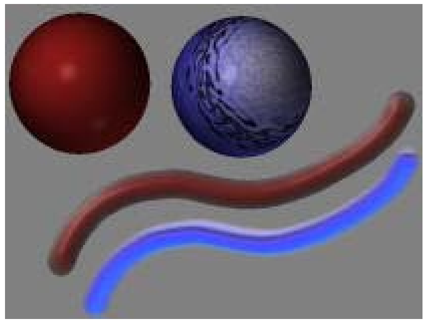
- **Select any color and paint a sphere on the canvas.**

- **Now select a texture from the Texture palette and draw another sphere.**

Even though your color of choice is still selected, you don't see it. This is because the texture overrides the color.

- **Change to the Simple Brush and draw another stroke.**

- **Click the Texture thumbnail and select your texture again, then draw another stroke.**



Color and texture provide different – and mutually exclusive – ways to add color to anything that you draw on the canvas. These colors are then modified by the material.

Now that we have covered the six palettes that are used to create your brush strokes, let's take a look at two more very important palettes: **Draw** and **Transform**.

For your convenience, the most commonly used elements from each palette are provided on the top part of the shelf, above the canvas.

The simplest way to explain these palettes is this:

The Draw palette is normally used to modify a stroke before it is drawn. The Transform palette is used to edit something immediately after it has been drawn.

This is a generalization, since Draw settings can also be changed while something is being transformed after it has been drawn.

Let's put this to work so that you can see it in action.

- **Press Preferences>Init ZBrush to restore ZBrush to its launch state.**

- **Press Ctrl+F to fill the canvas.**

- **Select the Toy Plastic material and any color, then paint a stroke on the canvas.**

This is a standard brush stroke, using the default settings. Take a look at the top shelf to see what we mean. The Draw palette elements are arranged in groups to make things easier.

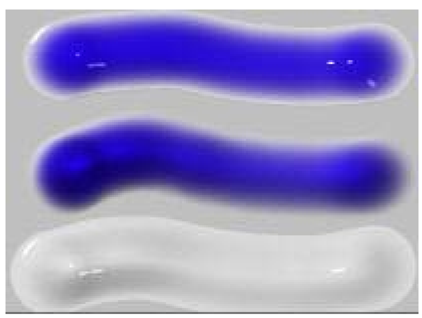
Mrgb/Rgb/M – These three switches are related, since only one can be active at a time. Mrgb is the default, and the stroke that you just drew painted both material and color onto the canvas.

- **Press Rgb, then draw another stroke below the first.**

Notice how this time there is none of the Toy Plastic's distinctive shininess. This is because the Rgb setting tells ZBrush to ignore the selected material, and only paint color.

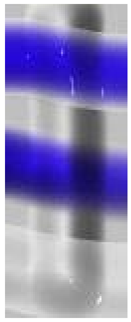
- **Press M and draw another stroke below the second.**

No color at all has been painted. Only material has been added to the canvas.



Only one of the three switches can be active at a time. Activating one deactivates the others. However, you can also turn them all off.

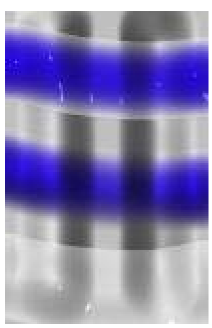
- **Press M to turn it off. Draw a vertical stroke down the middle of the canvas.**



No color or material has been painted on the canvas. Only the depth has been changed.

Zadd/Zsub/Zcut – These three switches operate similarly to the previous three, but affect depth instead. When Zadd is active (like we have used so far), depth is added to whatever is already present on the canvas. Notice how with the last stroke that you painted, the pixols built up depth on top of what was already there when your stroke crossed the three that you'd painted earlier.

- **Activate Zsub and paint another stroke to the right of the last.**



The dark shading is now on the left of the stroke. This is because your stroke just subtracted depth from what was already in the scene rather than building up on top of it.

The third option, Zcut, is currently disabled. It is only available for 3D objects and is beyond the scope of this tutorial. Like with the Mrgb switches, these three can also be turned off to protect the current depth on the canvas. (In fact, painting a 3D object with depth turned off is a handy way to create shapes.)

There are also **RGB Intensity** and **Z Intensity** sliders. The first controls how much color will be added to the scene when you paint. At a value of 100, new colors will completely overwrite existing color on the canvas. At 25 the color is very transparent, which works well for building up detail within a scene or texture.

Z Intensity specifies how much depth is added. A value of 0 is the same as turning Zadd and Zsub off.

Draw Size is used to change the diameter of your brush.

Immediately after something has been painted on the canvas, it can be edited using the Transform palette.

- ❑ **Clear the canvas.**

- ❑ **Draw a brush stroke using the Single Layer brush.**

- ❑ **Activate the Move gyro by pressing the Move icon or the W key on your keyboard.**

The gyro will appear at the starting point of your stroke. You can now use it to move your stroke around the canvas. You can also use Scale and Rotate.

- ❑ **Select a new alpha, material, and color.**

- ❑ **Change the RGB Intensity and Z Intensity.**

All of your changes take place immediately. The only changes that you cannot make are for the tool and stroke. If you wish to change either of them, you would have to undo the current stroke and draw a new one with the new tool or stroke type.

- ❑ **Press Q to deactivate the gyro, then clear the canvas.**

- ❑ **Draw a new stroke.**

- ❑ **While holding down the Ctrl key, draw a few more strokes.**

- **Release the Ctrl key and activate the gyro again.**

This time, the gyro will appear at the starting point for the last stroke drawn. However, you will be able to transform all of the strokes together. The Ctrl key provides a way for you to chain multiple strokes so that they can be edited as a group.

In Conclusion

In this section, we have examined how several palettes in ZBrush work together to create everything that is painted on the canvas. We have also seen how the interface is laid out to make your work easier. The thumbnails to the left of the canvas each correspond to one of the “building block” palettes, and are used to build your strokes. The elements on the shelf above the canvas are then used to affect what will be drawn on the canvas or change it immediately after it has been drawn.

Rusted Golden Idol

In this section we'll put the theory behind ZBrush's 2.5D painting techniques to work.

In the last section, we learned the basic principles behind 2.5D painting. Now we'll apply those principles to create a simple – but fun – project.

We'll begin by creating the idol out of simple primitive shapes. Color and material will then be used to paint the rust onto it. Lastly, we'll create a background and use some ZBrush trickery to paint the shadow.

- **Press Preferences>Initialize ZBrush to return to the startup state.**

- **Select the Ring3D tool.**

- **Select the Basic Material, and a Brown color.**

This material will be modified later to suit our needs. We're using it instead of the default Fast Shader because the Basic material has many more modifiers.

- **Set the Tool>Initialize values.**

Use SRadius 39, Coverage 180, Scale 1, Twist 0, SDivide 32, LDivide 64, and ITwist 0.

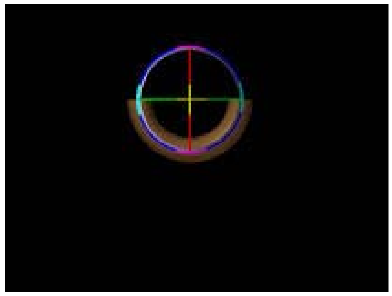
Every native ZBrush object is parametric in nature. This means that you can use the Initialize menu to set various parameters that influence the object's shape.

- **Draw the object on the canvas.**

- **Activate Rotate.**

This turns on the rotate gyro.

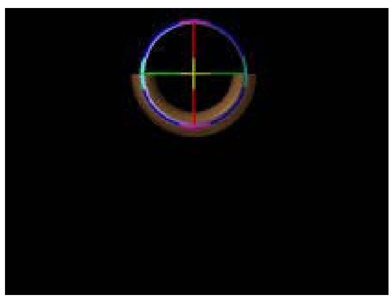
- **Rotate the half ring so that it curves up.**



When close to the desired rotation, press Shift to snap it the rest of the way.

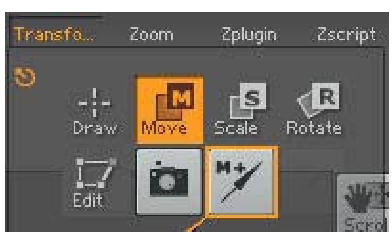
- **Activate Move.**

- **Position the ring near the top center of the canvas as shown.**



Use Scale if necessary, to match the illustration.

- **Press Transform>Place Marker.**



You'll see a small animation as the marker flies from the button to the center of the object on the canvas.

Markers are a very powerful feature of ZBrush. They are able to remember many details about a 3D object, including its position on the canvas, scale, orientation, material, color and more.

Markers must be placed while the current object is active. Once you have switch to a new tool, it is too late to place a marker without redrawing the object.

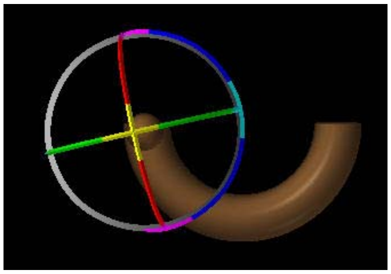
Also, only one marker can occupy any part of the canvas. If you try to place a marker too close to another one, the first will be replaced by the new one.

We'll use this marker to assist with positioning the rest of the 3D elements in the scene.

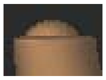
- **Select the Sphere3D tool.**

If you receive help message, select "Switch Now."

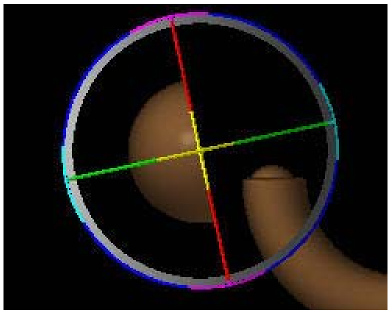
- **Draw it at one end of the arc on the canvas.**
- **Activate the gyro.**



- **Position this small sphere so that it is embedded in the Ring object.**

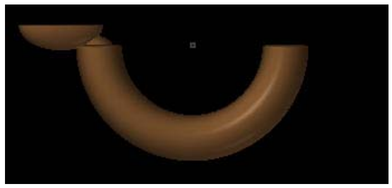


- **Draw another sphere.**
- **Activate the gyro.**
- **Set Tool>Initialize>Coverage to 180.**

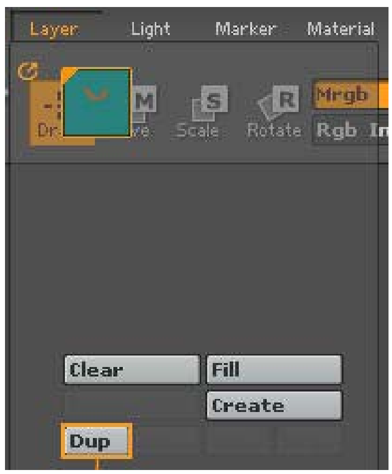


While the gyro is active, the object is in a transformable state. This means that adjusting the Initialize settings will also affect the sphere on the canvas, making it into a hemisphere.

❑ **Use Move, Scale and Rotate to flatten out the hemisphere and position it as shown.**



❑ **Press Layer>Dup to clone the layer.**



This new layer will be an exact copy of the first.

❑ **Press Layer>Flip H to flip the layer horizontally.**

❑ **Move the duplicated layer so that the two arcs merge.**

You can use the Displace H slider to move the layer, or hold down the tilde (~) key and click+drag within the canvas.

❑ **Merge the layers by pressing Layer>Mrg.**

This combines the current layer with the one to its left (the original one). The result is one layer again.

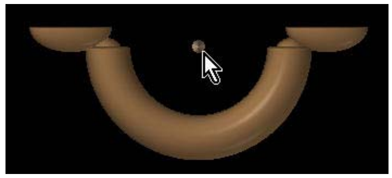
Always be sure that Zadd and Mrgb are active before merging layers. Otherwise, you can get strange effects.

❑ **Duplicate the layer again and flip it vertically.**

❑ **Use Displace V to move the layer down, forming legs.**

❑ **Merge the layers.**

- **Select the Sphere3D and move the pointer so that it is where the marker was placed.**



The marker will appear when you get close to it, and will enlarge when your pointer is directly on top of it.

- **Click the marker.**

The sphere will be drawn with the exact scale, orientation and position of the ring.

- **Use the gyro to scale it smaller.**

- **Select the Cylinder3D and click the marker to draw it.**

- **Use the gyro to rotate and move it into position. Use scale to lengthen it.**

Remember that clicking on the intersections of the gyro makes it possible to constrain your transformations. For example, the yellow intersection is used to lengthen the cylinder without changing its diameter.

- **Add several Ring3D objects.**

The one around the head is added by clicking the marker and then scaling and rotating the ring appropriately. Snapshot was pressed to copy the ring at its current position before moving the ring down the body and scaling/rotating it. The ring was snapshot three times here before moving and rotating it into place for the arm band and ankle.

Note that the right side is left alone.

- **Duplicate the layer, flip it horizontally, and move it into position.**

- **Merge the layers.**

- **Create a new layer for the background.**

While the simplest way to color the background is to change the Document>Back color, we will want to paint on ours. To make this possible, we will use a different technique involving a second layer and a 3D object.

❑ **Select the Plane3D tool.**

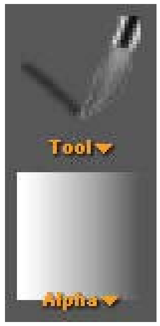
❑ **Select the Flat Color material.**

This material is unaffected by the rendering engine, and so will not receive shadows from it. While ZMode shadows with good Rays and Aperture settings will produce an excellent shadow, we have chosen to paint the shadow manually in order to illustrate other ZBrush features.

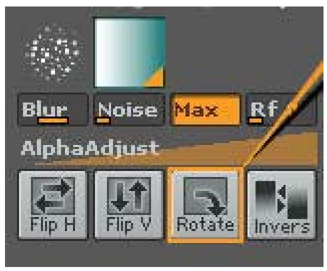
❑ **Draw the plane on the canvas and use the gyro to scale it to fill the screen. Also, move it back behind the idol.**

Remember that you can change an object's depth while Move or Rotate are active by clicking and dragging anywhere on the canvas surrounding the gyro.

- Select alpha 27 and the Simple Brush.



- Rotate the alpha by pressing the Alpha>Rotate button.



- Select the Drag Rectangle stroke type.

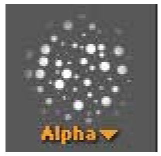
This stroke will allow us to paint a single instance of the alpha.

- Choose a darker color, turn off Zadd, and paint a stroke on the canvas so that the gradient fills it completely.

You can use the gyro after drawing the gradient to move and scale it if necessary.

- **Switch back to layer 1 so that we can paint on the idol.**

- **To begin painting the rust, use the Simple Brush and alpha 23.**



- **Using the Drag Rectangle stroke and various shades of color, paint multiple copies of the alpha all over the idol.**

You could also use the Spray stroke type for parts of this.

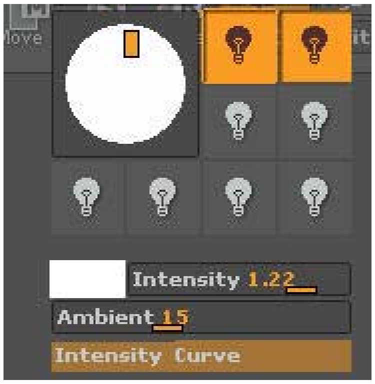
Since the background is on a different layer, it is completely unaffected by these strokes. With ZBrush, there is no need to “color within the lines.”

- **Change the Draw>Width to 50%**

This changes the width of the alpha, which in turn will affect the strokes being painted on the canvas.

- **Continuing to vary the colors, add still more rust to the idol.**

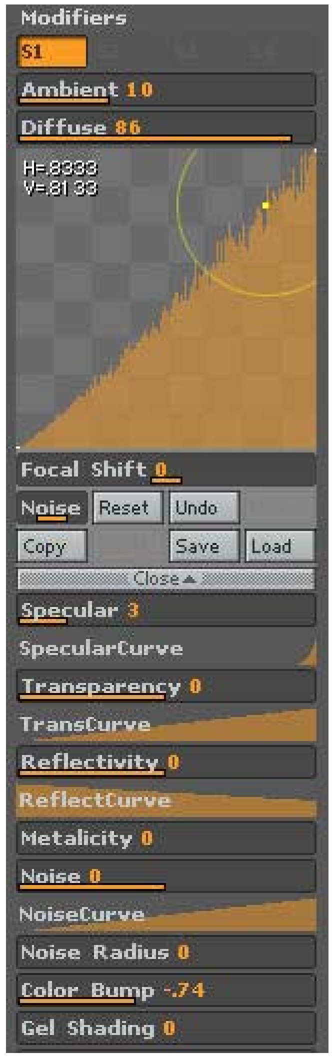
- **Adjust the direction and intensity of the primary light.**



To adjust the direction, click and drag on the small square located on the thumbnail. You will be able to see the lighting update on the canvas in real time.

Set the intensity to 1.22.

- **The next step is to adjust the material properties to look more like rusted metal.**



Use the settings shown to the right.

Diffuse should be 86

The Diffuse Curve should be modified slightly, and given about 50% noise.

Also pay attention to Specular to modify the shininess of the metal and Color Bump to make it rougher.

The material now looks a lot more like rusted metal, but it's still missing something. Rusted metal doesn't only contain variations in color, but also variations in specularity, diffuse, reflections, etc.

- **Press the CopyMat button located above the material modifiers.**

- **Select another material such as Fast Shader 5.**

- **Press the PasteMat button.**

This replaces the Fast Shader 5 material with a duplicate of the Basic material.

- **Set the material's Diffuse to 60.**

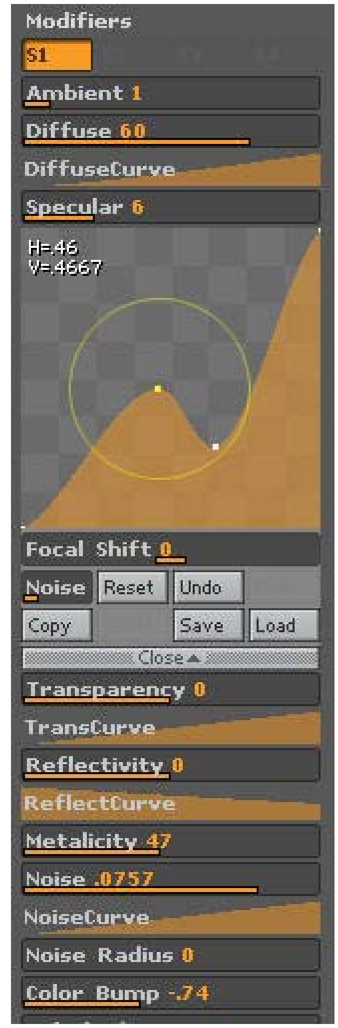
This will make it possible for us to see where we are painting this new material because it will stand out against the existing one.

- **Activate M on the top shelf.**

This instructs ZBrush to ONLY paint with material. Colors and depth will not be changed.

- **Paint the new material in scattered places across the idol.**

Because this material is a copy of the original, it still has the same rust quality that we had built previously. This is a real time saver. It's simply darker than the first because we adjusted the Diffuse before painting the new material.



- **Adjust the other material modifiers.**

Raise the specular setting.

Adjust the Diffuse Curve.

Add a little noise to the material itself, etc.

- **At this point, tweak the colors on the idol a bit by switching to Rgb and painting with just color.**

Three are several methods by which a drop shadow can be added to the scene. As previously mentioned, we could simply tell the rendering engine to render shadows. The drawback to that is due to the fact that our background is a vertical plane located just behind the idol. Rendered shadows would give it away immediately. Since we wish to give the impression that the idol is standing on a vast plane, we'll use a different technique.

For purposes of this manual, "Tool" always refers to an item found in the Tool palette.

- **Select the MRGBZGrabber tool.**

This complicated-sounding tool is used to grab a kind of snapshot of the canvas. It can capture the materials (M), colors (RGB), or depth (Z) – hence its name.

- **In the Tool>Modifiers, turn Auto Crop off.**

With Auto Crop active, the grabbed area would automatically be cropped to the size of the objects on the layer. We want to capture the entire canvas, instead.

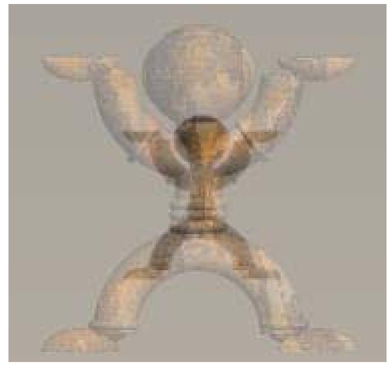
Note: The Alpha>GrabDoc button could also have been used. We chose the MRGBZGrabber simply to illustrate the capabilities of this tool.

- **Click and drag on the canvas to capture the entire scene.**

Two things will happen when you release the mouse. A capture of the canvas will be placed in the Texture palette. At the same time, a depth map of the canvas will be placed in the Alpha palette.

This alpha is a precise representation of the canvas with the grayscale values representing relative depths. White is the highest depth while black is the lowest.

- **Press Alpha>Make St to convert the alpha into a stencil.**



The stencil will immediately be activated on the canvas. Dark areas can be painted through, while light areas will block paint.

- **Activate Stencil>Elv.**

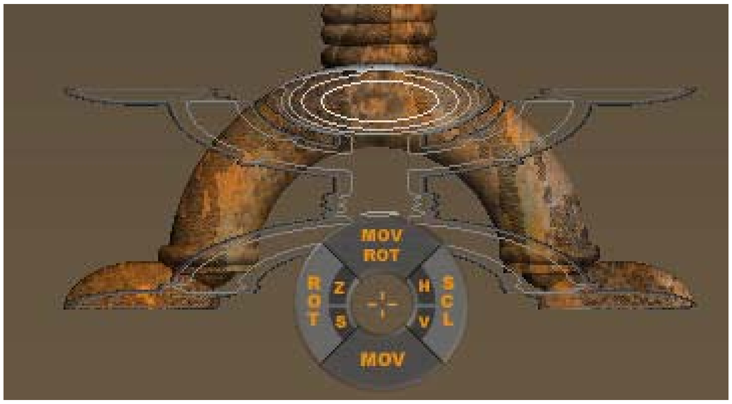
This displays the stencil as an outline, making it easier to see the rest of the scene. It does not change the stencil's effect at all.

- **The stencil is too small. Press Stencil>Stretch to match the size of the stencil to the size of the canvas.**

❑ **Hold down the Spacebar to activate the stencil's Coin Controller.**

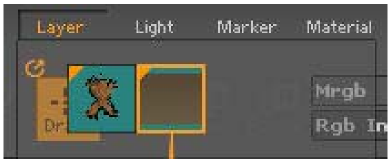
This controller will appear at the pointer location, and has several controls built into it.

❑ **Click V on the controller and drag to reduce the height of the stencil.**



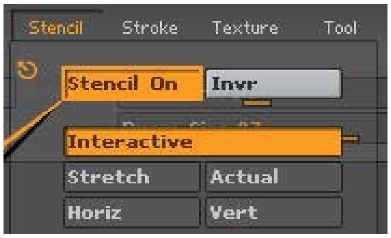
❑ **Release the Spacebar to dismiss the controller.**

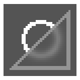
❑ **Select the background layer from the Layer palette.**



❑ **Use the Simple Brush and a dark color to paint the shadow through the stencil.**

❑ **Once the shadow has been painted, you can turn off the Stencil>Stencil On switch.**





❑ **Use the Blur brush (found in the Tool palette) to soften the shadow edges.**

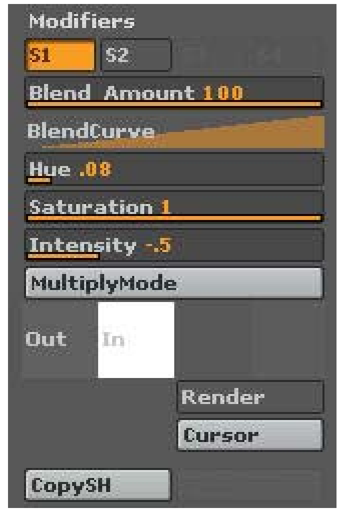
❑ **Return to layer one (the idol layer).**

❑ **Select the Colorizer1 material.**

❑ **With Draw>M active, paint this material onto the figure.**

- **Modify the material properties.**

This material has two shader channels that must be modified. You switch between them using the S1 and S2 buttons at the top of the modifiers.



Match the images at the right.

- **Add a few more brush strokes of color, only to complete the scene.**

In Conclusion

In this project, we've combined 3D objects with traditional painting techniques to create an extremely detailed figure. By using ZBrush's materials and real-time rendering engine, we can quickly duplicate real-world materials. The ability to switch between painting with or without depth and combinations of color and materials gives great flexibility to your workflow.

We have also seen the strengths of such features as the MRGBZGrabber and the Stencil, as well as experimenting with Blur – one of ZBrush's effects brushes.

This tutorial is also available as a ZScript, found in the ZScript list under the name of Materials: Rusted Golden Idol.

Bamboo Part 1 -- Background

In this section, we'll create the ground for our bamboo scene.

This section covers the first of four parts to create the "Bamboo" scene. We'll begin by creating the ground layer, which in the following sections will be used as a base to paint vegetation onto, as well as the bamboo itself. The last section will deal with creating the beetles that will be used to add interest to the scene.

While working, you'll quickly begin to see the advantages of being able to work in a hybrid 2D/3D environment.

To begin, resize your document.

- **Turn off Document>Pro**

The Document palette contains everything to control your document's basic properties. This includes its dimensions, background color, and border color.

The Proportional button keeps the relative dimensions of your document the same. When it's active, adjusting the width will also adjust the height and vice versa. Since we want a canvas that is wider than it is high, we need to disable this feature.

- **Set Width to 1280**

- **Click Resize, and then say OK to the confirmation dialogue.**

We're creating a document that is considerably wider than it is high. In addition, we're creating it at twice the actual size that will be exported from ZBrush. This will provide us with very clean, antialiased edges when we do our final render. Working at a larger canvas size also makes it easy to add extra detail.

- **Select the Plane3D tool.**

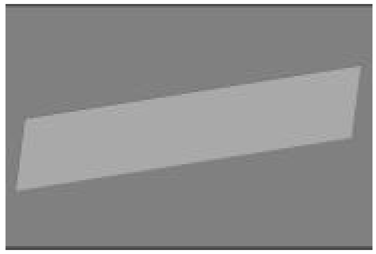
- **In the Initialize menu, set V Radius to 40.**

All native ZBrush objects ending in "3D" are parametric tools. This means that you can modify the object by changing several parameters associated with it. All of these parameters are found in the Initialize menu, and will vary from object to object.

In the case of the Plane3D object, we have settings for its width and height, as well as for its resolution. Since this plane will provide our background, we're setting the V Radius so that the object's dimensions are similar to the canvas dimensions.

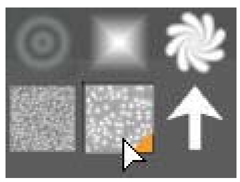
- **Draw the plane on the canvas, and then press T to enter edit mode.**

- **Rotate the plane a little.**



From this angle, it will be easy to see the effects of the deformations that we're about to perform.

- **Select alpha 32.**



This particular alpha has a bumpy sort of appearance. It will make it easy for us to transform the plane into bumpy ground.

- **Press Tool>Masking>Alp**

This applies the alpha to the plane as a mask. You'll see that the plane on the canvas now has a grayscale pattern that matches the alpha.

Masking applies to a model based on its polygons. Since we have relatively few polygons at this point, the masked pattern is blocky. That's ok for our purposes.

- **Open the Tool>Deformations menu. In the offset slider, make sure that only Z is active.**

Each deformation has X Y Z settings. These correspond to the model's coordinate system. By turning off X and Y, and turning Z on, we're telling ZBrush to apply the deformation only along the model's Z axis. In the case of the plane, that means the flat side.

If you ever want to know what the model's coordinate system is, open its **preview**. X will be horizontal, Y will be vertical, and Z will be the direction pointing directly toward you. All deformations operate along the coordinates seen in the preview, which will not necessarily match the scene's coordinate system.

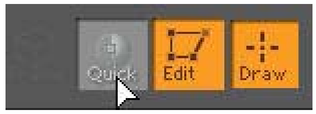
- **In the Offset slider, enter a value of -20.**

This tells ZBrush to offset points, creating raised bumps. A value of 100 is equal to 1 ZBrush unit, so -20 is equal to 1/5 of a ZBrush unit toward the preview camera (+20 would have been away from the camera).

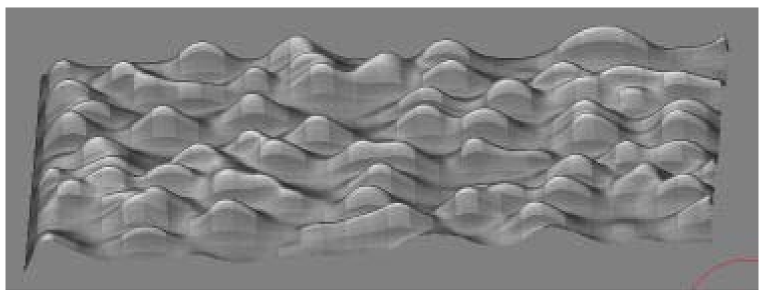
The offset is restricted by the masking that has been applied to the model. Areas that are completely masked (dark gray) won't be offset at all. Areas that are completely white will be offset the most.

By combining masking with deformations, it is truly amazing what can be created from the primitive 3D objects!

- **Turn off Quick 3D Edit on the top shelf.**



Quick3D disables ZBrush's smoothing routines. This allows a model to render faster while you work on it, but it also makes the model appear angular. By turning Quick3D off, we are telling ZBrush to render many polygons for every real one. This results in a much smoother model.

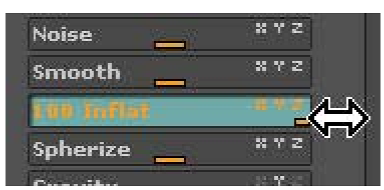


Your model should now look something like the image above. It still has a checkered pattern caused by the masking.

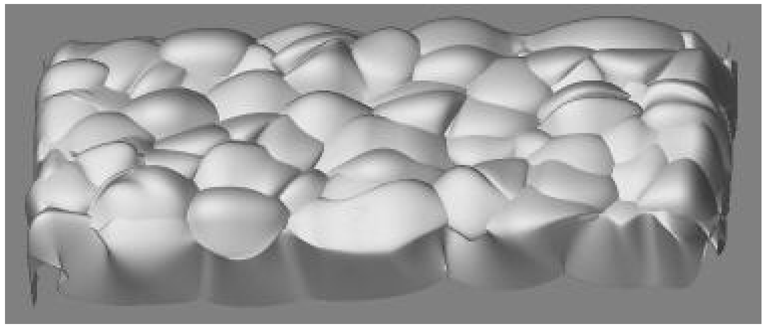
- **Press Tool>Masking>Clear to remove the mask.**

Now that the model has been deformed, we no longer need the mask.

- **Do an Inflate deformation at a value of 100.**



Since the masking has been removed, this deformer now applies to the entire model. Every point gets moved by this deformer according to its surface normal. This has the effect of inflating the features.

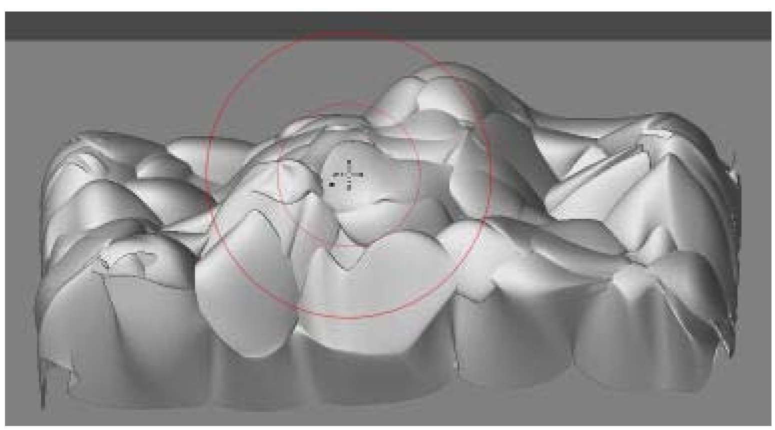


Here we have the results. The bumps created by the offset deformation have now been inflated to create a surface that is ideal for our needs.

- **In the Transform>Modifiers, turn off Xyz. Then change the X Y Z switches beside it so that only Z is active.**

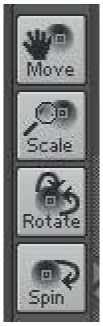
Normally, when you sculpt on a mesh your editing tool will affect the model in all three directions. What we want to do next will be to only sculpt depth details into the model. These settings will force ZBrush to only sculpt along the Z axis.

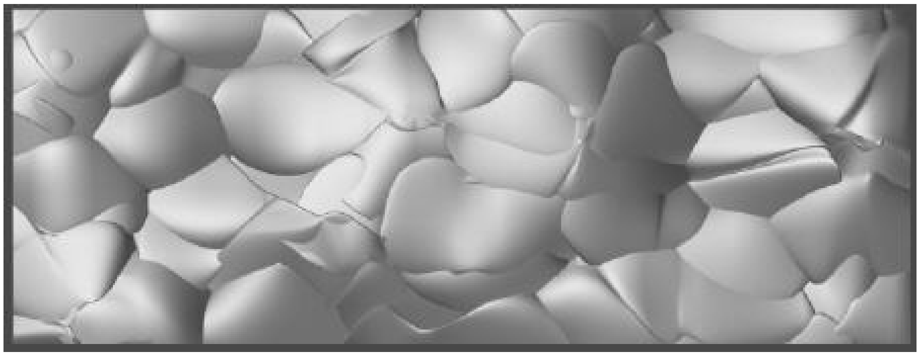
- **Now sculpt some extra depth onto parts of the model by simply drawing on it. Create a higher area in the center of the mesh, with a few other bumps surrounding it.**



Whenever you click the mouse, the model will temporarily become very angular. This is because ZBrush needs to switch back to Quick 3D Edit while you are applying an edit. As soon as you release the mouse, ZBrush switches back to the rendered view, allowing you to see the finished results of your work.

- **Now use the move, scale and rotate features to fill the canvas with the ground that you have sculpted.**





The canvas should now look something like the image above. You may find that you need to switch to the AA Half zoom level in order to be able to see the entire canvas.

- **From the Materials, select NoisePattern1.**

- **Use the color selector to choose a yellowish-brown color.**

Since the model is still in edit mode, changes to the color and material affect it immediately. You should now have something like this:

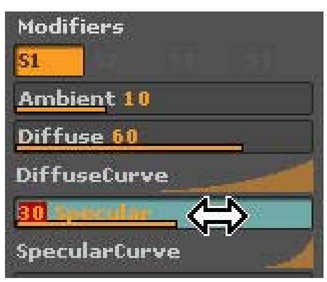
- **Press T to exit edit mode and return to normal draw mode.**

Even though the object has been converted to pixols, a copy of it remains as polygons in the Tool palette until the end of the ZBrush session. You could therefore save it for use in another scene or clear the canvas and redraw it if you decided that it needed further sculpting on a polygonal level.

Since the ground is placed how we want it, and has had material and color assigned, we no longer need to keep it editable. At this point, we can convert it from a 3D object made up of polygons to a 2.5D object made up of pixols. This gives us much more room for creative freedom than polygons could offer, with the trade-off being that the object will no longer be able to be picked up from the canvas again.

This is very close to what we want, but too shiny metallic-looking to be ground. We can remedy that by changing the material's modifiers.

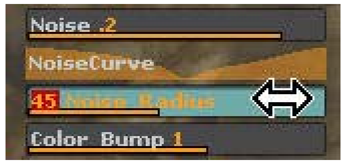
- **Pull down the Material palette and change the Specular setting to 30.**



The canvas will immediately update to reflect the change. This is because materials remain "live" on the canvas, even after the model has been snapshot.

While we're at it, let's change some other modifiers for a more dramatic effect.

- **Set Noise Radius to 45.**



This increases the scale of the noise pattern.

- **Set Color Bump to -5.**

Color bump tells the rendering engine to make a surface appear less smooth based upon its color values. With a negative value, darker areas will be raised. In this case, that gives the appearance of smooth stone with dirt caked on top of it.

- **Edit the NoiseCurve to match the image below. Once you have created the overall pattern, you can fine tune it with its Focal Shift slider.**

What we want is for there to be a few lightly-colored smooth areas, surrounded by lots of caked-on grunge.

When finished, you should have something like the image above.

- **Select the Simple Brush tool, select alpha 8, and the Spray stroke type.**

From this point forward you might prefer to work with the AA Half zoom level active, and only switch to full size when precision is required. This will allow you to work with the image as it will actually be seen when complete.

These settings combine to create a randomized spray paint effect using the selected alpha and variations of the current color.

- **On the top shelf set a Draw Size of 80, and an RGB Intensity of 50.**

We want our new color to blend nicely with the existing canvas color, which is why the intensity is set where it is.

- **Now paint a few strokes on the canvas to break up the pattern created by material.**

Nature is very chaotic. The Spray stroke is an invaluable tool for replicating that randomness with minimal effort. In fact, let's take things a step farther by modifying the stroke settings:

- **First, select the FastShader material.**

We change to a different material because otherwise the strokes that we're about to paint would blend too much with the existing noise pattern material.

- **Select alpha 23, and set the RGB Intensity to 100.**

- **In the Stroke palette, change Placement to 100 and Color to 100.**

A high placement setting will give the maximum scatter as we paint our strokes. A high color setting will cause the greatest randomness in color variation while we paint.

- **Changing colors to yellows and greens, paint a few random strokes across the canvas.**

The random effects of the spray stroke give us the look of mosses and other stuff growing on the rocky surface. The effect is very realistic.

- **Save your work using Document>Save As. If you wish, you can also save your ground plane as a 3D object using Tool>Save As.**

Always remember that saving your document saves the pixols that are on the canvas. It will not save any models as 3D objects. To save them, you MUST use the inventory controls in the Tool palette.

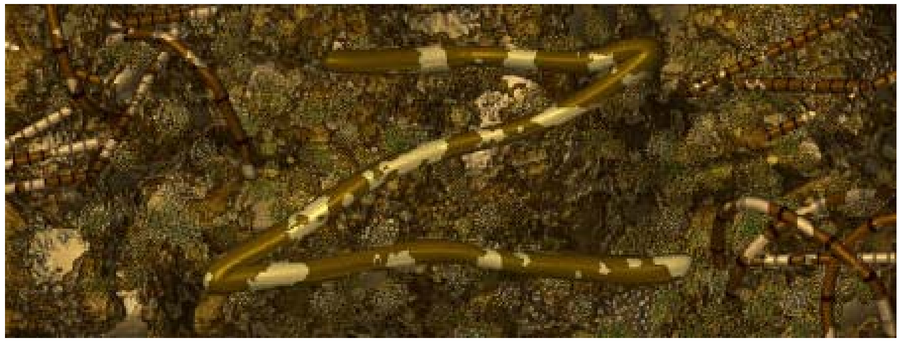
Saving the document also saves any materials that are in use on the canvas. We therefore have no need to save them separately unless you would like to use the ground material again in another project. If you do, then select the NoisePattern1 material again and press Material>Save.

In Conclusion

In this section we have seen how deformations and masking can be used to transform simple parametric objects into much more complex models for use in your ZBrush scenes. We've also experimented with materials and the Spray stroke type to mimic the randomness of nature with hardly any time or effort. In the next section, we will incorporate more 3D elements into our scene.

Bamboo Part 2 -- Modeling

In this section, we'll continue the "Bamboo" project by adding the bamboo itself. This will be accomplished by deforming parametric objects to be snapshot onto the canvas.



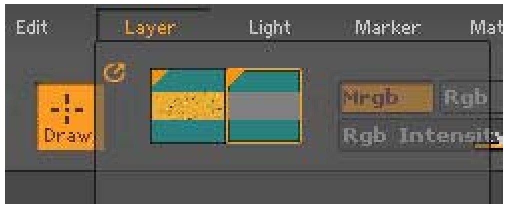
In the previous section we used the very simplest of primitive objects – a plane – to create the background for our scene. In this section, we'll take things a step farther by using more complicated objects to add visual interest. While the objects themselves are more complex, the basic techniques are still the same.

If this is a new ZBrush session, load your scene file from the previous section by pressing Document>Open. If you have not yet followed that tutorial, you can load the source file that we have provided. It is called Chapter3-1 and is located in the Documentation\SourceFiles\Chapter3 folder.

- **Begin by pressing Layer>Create to create a new layer.**

ZBrush layers can best be thought of as parallel universes. Each layer contains the entire 3D space of the ZBrush canvas. This means that objects on one layer can literally exist inside of those on another layer. In short, while some features (such as material-based transparency) require multiple layers, their most common purpose is to provide a means for organizing your scene. For example, you can place objects on different layers and then paint on one object without worrying about affecting what lies on the other layers.

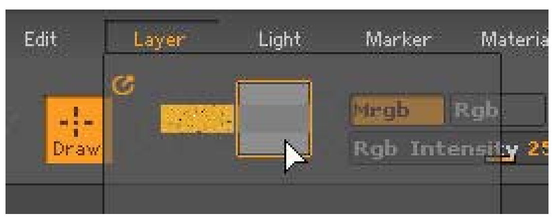
In this tutorial, we'll use the new layer to contain our bamboo.



When the new layer is created, it appears next to the first one in the small thumbnails at the top of the Layer palette. Each thumbnail shows a continuously-updated view of the unshaded colors that are present on that layer. This makes it easy to tell what's on a particular layer without bogging the computer down with more rendering than is necessary.

Layers can be turned on or off. Visible layers are identified by a teal background and a triangle in the upper left corner. Invisible layers have a gray background and no triangle. The currently-active layer has a box around it. By default, the layer that you just created is active. To make a layer active, click on it. To turn it off, click on it a second time. To turn it back on, click it again.

- **Hold down the Shift key and click on the active layer.**



The shift key provides a shortcut to toggle visibility for all layers at the same time. We have just turned all layers off. This hides the background layer, so that it will not distract us while we begin modeling on this layer, as well as freeing up system resources.

Incidentally, the active layer will always be visible on the canvas, even if it is turned off. In this way, you can switch from one layer to another without having to turn them on and off individually. They can all be turned off, so that switching from one to another will hide the former while unhiding the new.

- **If you have AA Half view active, press 0 to switch to actual size.**

While modeling, it is almost always easiest to view actual size. We'll switch back to AA Half when we start placing objects.

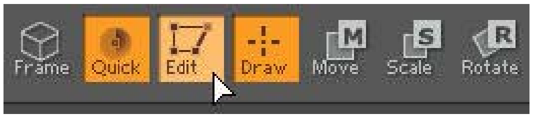
- **Select the Cylinder3D tool.**

- **In the Initialize menu, set X Size and Y Size to 5, and VDivide to 128.**

This changes the cylinder so that it is 20 times longer than it is across, and also has 8 times more polygons along its length than the default value.

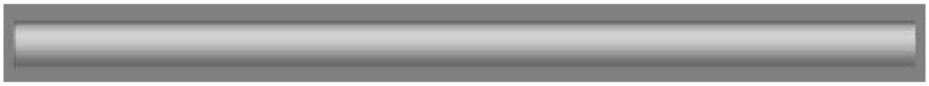
- **Draw the cylinder on the canvas.**

- **Activate edit mode by turning on the Edit Object switch.**



- **Rotate the model so that it is seen from the side. When close to the angle that you wish, hold down the Shift key to snap the model into position.**

- **Press Alt and click once on any empty part of the canvas.**



The Alt+click combo is a shortcut to center the object on the canvas and resize it to fit. In short, it provides a "fit object to screen" function. You can also accomplish the same thing by clicking once on either the Move or Scale button.

To create bamboo-like ribs, we'll be using the Inflate deformation. Before we can do that, though, we must use masking to specify where we want the deformation to take place.

We *could* accomplish this by holding down the Ctrl key and tediously dragging the mask across the particular polygons that we want. Since this is a parametric object, there is an easier way which makes it easy to unmask by letting ZBrush count polygons.

- **Press Tool>Masking>MaskAll**

This masks the entire object, which must be done before the next step can be possible.

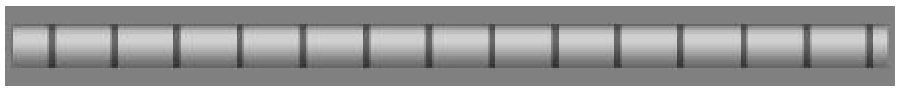
The Select and Skip sliders are used to specify how the unmasking will take place. Select specifies how many polygons will be unmasked. Skip specifies how many will be remain masked. This pattern will be continued across the entire model.

- **Sel is already at 8. Leave it alone. Set Skp to 1.**

This tells ZBrush to unmask 8 polygons, leave 1 masked, then repeat the pattern. Now we need to tell ZBrush whether we want the pattern to be applied to Rows, Columns, or both (in a Grid).

- **Press Row**

ZBrush now immediately unmasks the entire cylinder in the specified pattern.



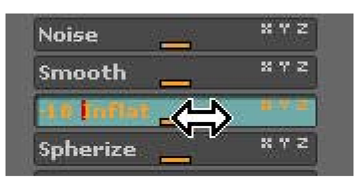
At this point, it would actually be possible to continue unmasking by column instead, to turn each ring into a series of segments. By applying overlapping unsmask routines, very complicated patterns can be created if your work calls for them. This project only needs the rings as they are, however, so we will stop here.

You will notice that one end has more unmasked polygons than the other. This is because the total length of the object is not evenly divisible by 9 (the total of the Select and Skip values). If it was a case that mattered, we could have used an initialize value that would have allowed the ends to be even, but this is nature that we're modeling, where nothing is truly perfect.

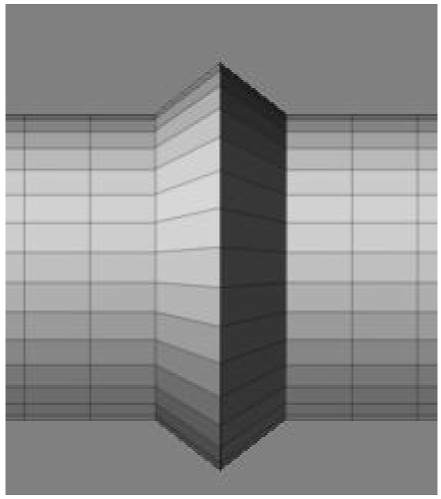
We're now ready for the deformation.

Important! Changing the initialize settings for any object will immediately undo any work that has been done on that object. Therefore, when working with a parametric object you should always set the initialize settings first.

- **Tool>Deformation>Inflate at -10. There is no need to change the X Y Z settings for this operation.**



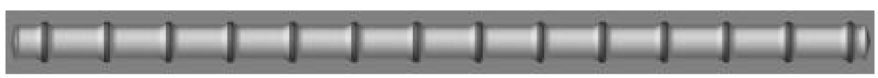
A negative value causes shrinkage rather than inflation. If we had used a positive value here, the model would have been given a series of rings cut into its length rather than protruding from the surface.



Take a close look at the image above. Here you can see that while masking applies to an entire polygon, deformation actually take place at the points. When a polygon is masked, two of its points will be masked while two will be left unmasked. This is an important distinction to keep in mind while you are modeling, as it allows more precision than if all four points were masked.

- **Turn off Quick 3D Edit.**

This enables ZBrush's smoothing routines.



The bamboo is now ready for a material and color to be applied.

- **Select a nice yellowish-orange color and the NoisePattern2 material.**

- **Modify the material as follows:**

  Diffuse 56
  DiffuseCurve Focal Shift -62
  Specular 50
  NoiseCurve to match the graph:

Noise Radius 40
Color Bump 5
Colorize Specular 100
High Dynamic Range 1.1

- ❑ **Lastly, drag from the Spec color patch at the bottom of the material modifiers to a yellow-gold color on the color thumbnail.**

All color patches in ZBrush can be set by selecting a color and then clicking on the patch or by dragging from the patch onto any part of the interface or canvas. Since the color of the model is still "live" because it's in edit mode, we don't want to use the first technique.

The model should now look something like the image above. We'll actually leave the masking in place, since it helps make the rings stand out realistically.

- ❑ **Save the model using Tool>Save As, and name it bambooStick.**

- ❑ **Press T to exit edit mode, then Ctrl+N to clear the layer.**

Now that we've created the stick, we'll also create a bamboo ring.

- ❑ **Select the Ring3D tool.**

❑ **Draw it on the canvas, enter edit mode, and center the object on the canvas.**

❑ **For the Initialize values, set SRadius to 0 and LDivide to 128.**

This gives us a very thin ring with 128 rows of polygons around its circumference.

❑ **Enter Edit>Move mode by activating the Move switch.**

This allows us to move points around by dragging them. The default Draw Size of 64 allows us to move several points at once. This is also why we've made the ring so thin.

❑ **Reshape the ring a little by moving parts of it around.**

You will get the best results by moving in short steps rather than making long drags.

❑ **Apply the Smooth deformation 3 or 4 times to soften the edits and get rid of any irregularities.**

This is important, since our next step would magnify any irregularities in the mesh.

- **Perform the Inflate deformation with a value of 50.**

You'll now have a fatter ring, which is nicely smoothed.

Now all we have to do is use the same technique to create the ribs that was used for the stick:

- **In the Masking menu press MaskAll**
- **Set Skp to 1**
- **Press Col**

For the Ring3D object, the columns wrap around the model while rows form its circumference.

- **Inflate -10**

- **Save the model as BambooRing**

- **Press T to exit Edit mode, then Ctrl+N to clear the canvas.**

Last of all, we need to create the Z. This will be created from a cylinder using a combination of the techniques that were used on the stick and ring.

- **Select the Cylinder3D.**

- **Set X Size and Y Size to 1. Set VDivide to 128.**

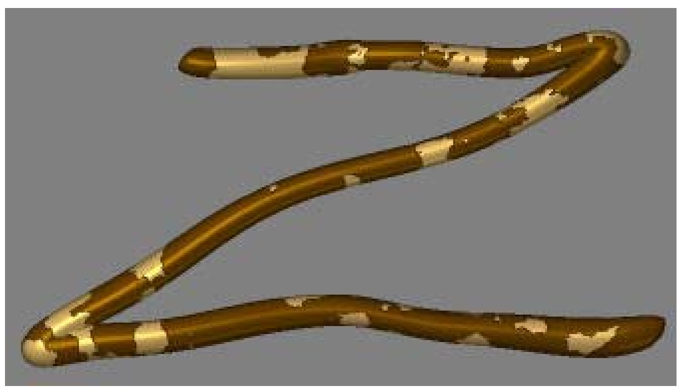
- **Draw the object on the canvas, enter Edit mode, and center the object.**

Press W to activate Edit Move mode. Working in small increments, reshape the cylinder into the letter “Z”.

❑ **Use the Smooth deformation several times to relax the shape.**

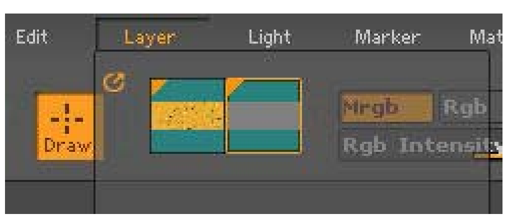
❑ **Edit the shape a little more if you like, then Smooth again.**

❑ **When you are satisfied with the shape, Inflate it with a value of about 8.**



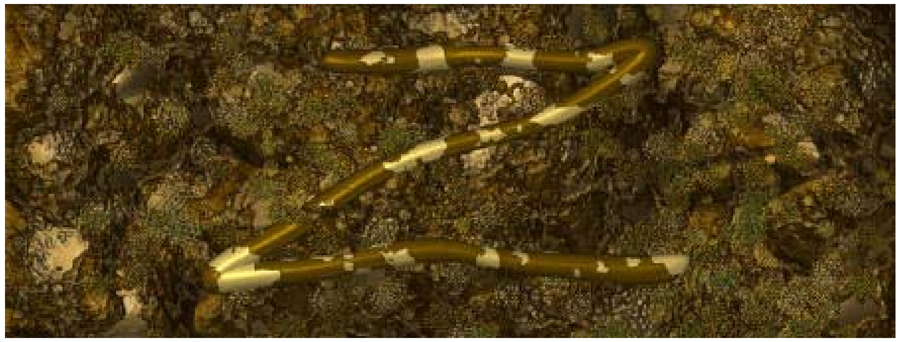
❑ **Save the model as bambooZ, then exit Edit mode and clear the canvas.**

❑ **Shift+Click on the active layer's thumbnail to toggle layer visibility back on again. Make sure that the active layer is the empty one.**



❑ **Return to the AA Half zoom level.**

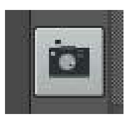
- **Now select a slightly lighter shade of yellow and draw the Z on the canvas. Use the gyro to move, scale and rotate it into position.**



Make sure that the Z is positioned so that it's resting on the ground layer. The easiest way is to draw the object and move it into position, then rotate it. Remember that you can adjust the object's depth while the Rotate gyro is active.

- **Select the stick object and choose a more orange-gold color to provide contrast with the Z.**

- **Draw several copies of the stick around the edges of the scene.**



After drawing the first, it is easiest to press the Snapshot button (or Shift+S) to leave a copy of the stick at its current location without having to deactivate the gyro. This makes it easy to place instance after instance of the object without the need to redraw it every time.

- **Save your document as Chapter3-2.zbr**

In Conclusion

In this section, we have learned about how layers can be used to separate your work, along with more techniques for masking objects and using those masks to control deformations. The advantage of being able to paint with 3D objects can clearly be seen: even with the time spent sculpting our shapes and fine tuning our material, it has still taken very little time to create an image with all of the shadows and realism of a 3D scene.

While the techniques described here provide one way to create this type of object, there are certainly others! Another approach would be to use ZSpheres. An excellent tutorial on the subject is located at ZBrush Central. Click Here

This section is also available in ZScript format. Please see the Help Topics\Supplemental Reading\Bamboo.

Bamboo Part 3 -- Creating Grass

In this section we'll explore two different ways to add vegetation to a scene, using the Fiber brush and ZBrush's new Fibers material shader.

In this section we'll bring life to the scene by painting grass. There are actually two ways that this can be done: using the Fiber brush, or by using a Fibers material shader. Each technique has advantages and disadvantages:

With the Fiber brush, you can paint fibers exactly where you want them. If you don't like the effect, you undo, change the settings slightly, and paint again. This can be faster than repeatedly re-rendering the scene to get the exact fibers that you wish. The disadvantage to this technique is that you must usually bake the layer's lighting before you can get the best results from the brush. This can be gotten around by using a dual-layer system for painting the fibers, which has the added benefit of allowing the fibers to cast shadows on their surroundings (if not on each other). Also, if you are using fibers on a figure, you must re-paint them for every pose of the figure.

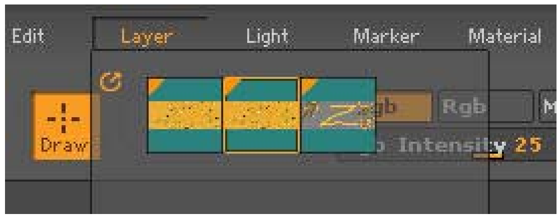
With the Fibers shader, you are dealing with a render-time effect. This means that there is no need to bake the layer. You can therefore paint fibers at any time; even before you have finalized the scene's lighting. Also, you can apply a fibers-enabled material to a figure, then repose the figure. The fibers will adapt to the new pose. The disadvantage is that the only control you have over the fibers is through the shader modifiers. This means that fibers can "poke through" other objects that are present within a scene. Also, because fibers are rendered last, they cannot cast shadows on the scene (although they can cast shadows on themselves).

It is up to you to determine which approach will work best for your needs. In this tutorial, we will introduce you to both. We'll begin with the Fiber brush method.

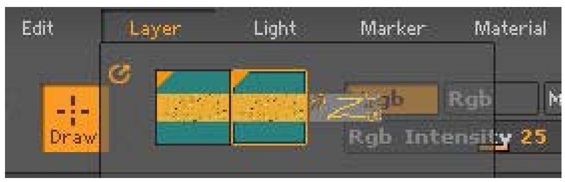
- **If it is not already open, load your document from the previous chapter.**

- **Make sure that the first layer is active, then click Layer>Dup.**

This duplicates the current layer, placing the duplicate immediately to the right of the original in the thumbnail list. The new layer will be the active layer.



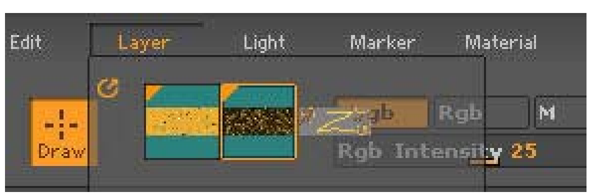
- **Turn off layer 3 by double-clicking on it, then reselect layer 2.**



The bamboo will disappear from view. This is one of the reasons why we created the bamboo on a second layer in the first place.

- **Click Layer>Bake**

What this does is change the layer to the Flat Color material. In the process, all coloring that has been created by the materials and lighting gets converted to unshaded RGB color. You can see the result in the layer thumbnail, which now matches the canvas exactly.

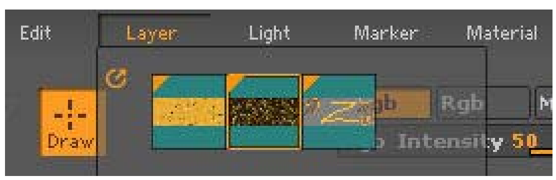


We took this step because the Fiber brush works best with the Flat Color material. In order to resolve any conflicts between the material properties of the fibers and the properties of the background, we convert the background to the same material that the fibers will use.

- ❑ **Click Layer>Displace Z and set the slider to a value of 1. Press Enter.**

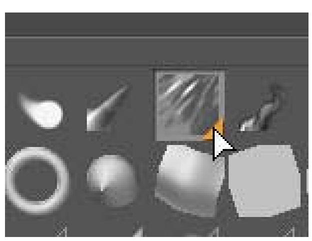
This moves the current layer 1 pixol away from the camera. The result is that its surface now lies immediately behind the original background layer. The Flat Color material cannot receive any new shading information, including shadows. If we just painted our fibers onto a baked layer, then we couldn't change the lighting later, nor would the fibers cast shadows onto the background. However, since the original background layer has not been baked and now rests one pixol in front of the baked layer, we can change the lighting later and it will receive shadows from the fibers that we're about to paint!

- ❑ **Turn layer 3 back on, but keep layer 2 as the active layer.**

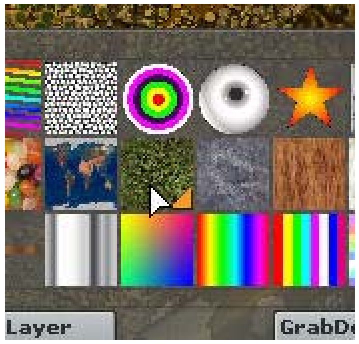


In order to properly place our fibers, we'll need to see the bamboo.

- ❑ **Select the Fiber brush from the Tool palette.**



- ❑ **Select the Flat Color material. Then select the grass texture.**



The Flat Color material is essential for high quality fibers. The grass texture will be applied to each fiber, resulting in very nice-looking vegetation.

- **Select alpha 23**

Grass tends to grow in clumps. This alpha will simulate that.

- **Set Rgb Intensity to 100.**

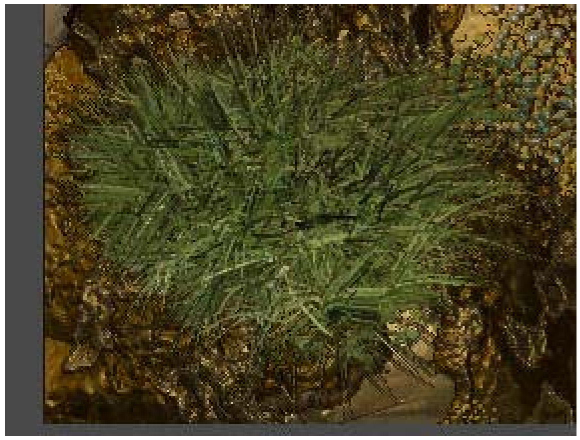
We don't want transparent grass.

- **Click Document>StoreDepthHistory**

Note: Because the depth history buttons are a part of ProjectionMaster, they should never be used when you have used ProjectionMaster to drop a model for texturing or painting displacement. It is perfectly ok to use them at any other time, however.

This step is a nifty and very useful trick, which borrows a feature embedded in ZBrush by the ProjectionMaster plugin. Ordinarily, every stroke that is painted on the canvas will interact with every stroke that has come before it. In the case of the Fiber brush, fibers would quickly be drawn on top of teach other, resulting in a jumbled mess. By storing the depth history, we're taking a snapshot of the current depth in the scene. All new depth that is added will be ignored until the depth history is deleted again.

In the lower left corner of the scene, paint a few strokes.



Not bad, but the fibers are a bit fine. Press undo a few times to remove them again.

- **In the Tool modifiers (which change to match the currently-active tool), set Thickness to 2.**

This will make the fibers a little thicker.

- **Paint a few strokes again.**

This is now very close to what we want. A few more modifications will finalize our settings.

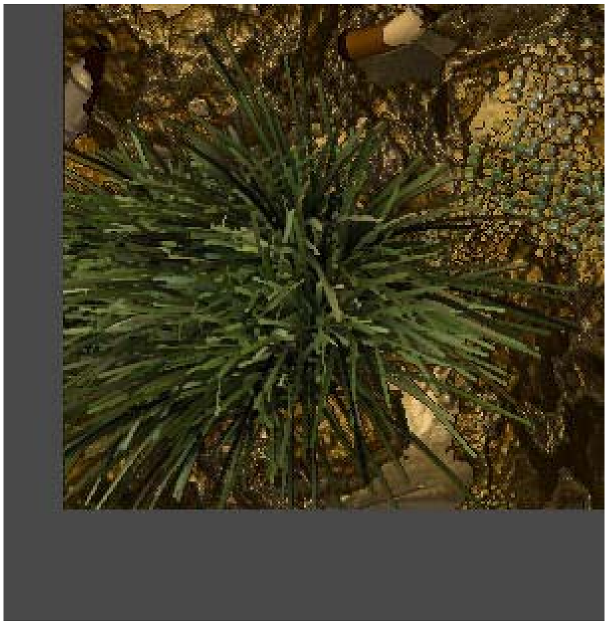
- **Set Grooming to 0, and activate Back C.**

No grooming tells ZBrush to ignore the direction of your brush strokes. All fibers will be painted solely based on the orientation of the pixols that the fibers are painted on. Back Color active tells ZBrush to blend the background color (which is black by default) with the foreground color (set by the texture). This gives fibers that are a little darker at the base.

- **Lastly, set Draw>Depth to 4.**

This doubles the length of the fibers that will be painted.

- **Draw a few more strokes on the canvas.**



Now that you have a brush that paints high quality grass, you might want to save it using Tool>Save As. That way, you won't need to recreate your settings in the future.

Perfection! This is exactly what the scene calls for, so go ahead and paint grass to your heart's content. As you work, remember that you can modify the fiber length at any time using Draw>Depth.

Also, you will notice that changing the Draw Size also changes the length of the fibers. Again, use Draw>Depth to compensate.

- **When finished, save your document as Chapter3-3a.zbr**

Next, we'll redo the grass, this time using the Fibers material shader.

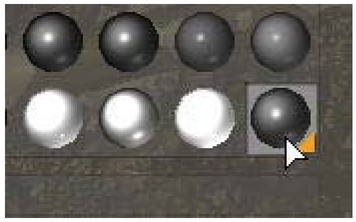
- **Click Preferences>Initialize ZBrush**

ZBrush will revert to the startup state.

- **Open the Chapter3-2 document again.**

We're now back to where we were before we started adding fibers.

- **The first thing that we need is a Fibers material. There is already one at the end of the thumbnails, so select it.**

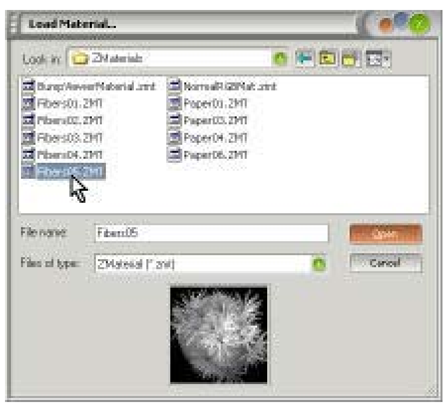


- **Place the material palette in a tray, so that it stays open while working.**

This makes modifying the materials a little easier.

The fibers material is actually a shader, which must be in the S1 channel of any material that uses it. Take a look at the modifiers with S1 active. These are "raw" values for the Fibers shader. As you can see from the thumbnail, there's nothing going on. This is because several key modifiers have not been set.

- **Click Material>Load, and select the Fibers05.ZMT material from the ZMaterials folder.**



We have provided five fibers materials to get you started in your exploration of this feature. Clicking on any material name will show a preview of the material in the dialogue box. Fibers05 is the closest to grass.

When it's loaded, the material thumbnail immediately updates to reflect the settings.

- **On the top shelf, activate M and turn off Zadd.**

We want to paint just the material. No color or depth. You might also want to select alpha 8 again.

- **Paint the material strategically throughout the scene.**

As you work, you will be able to easily see where you're painting. This is because the Fibers shader works in conjunction with the material's S2 shader. In short, the S1 channel paints the fibers and the S2 channel paints the background. Since the S2 shader for this material is by default very generic, the base color becomes visible again. At this point, that's a good thing, because otherwise it would be very hard to tell where we've painted anything!

Also, you don't need to worry about the bamboo at all. That lies on a different layer, so might as well not even exist as far as the paint brush is concerned.

- **Drag from the Material thumbnail onto some of the original background of our scene, then release.**

Like the color patches, the Material thumbnail can be used as a Picker. We have now selected the NoisePattern1 material, which gives our scene its background colors.

Notice in the Material modifiers that this material only has one shader channel.

- **At the bottom of the modifiers, click the CopySH button.**

ZBrush makes it easy to mix materials by providing these copy and paste functions.

- **Switch back to the Fibers material, and select the S2 channel.**

- **At the bottom of the channel, press the PasteSH button.**

The preview of the material will change slightly, along with all of the modifiers in this channel. At the same time, the scene itself will update. Everything that was just painted will seem to vanish. By copying the NoisePattern1 settings into this channel, we have created a background that exactly matches the rest of the scene.

- **Place the Render palette in the other tray.**

- **In its settings, activate Fibers.**

Since Fibers are a render-time effect, they can be activated or deactivate at will. The ability to turn them off can be very useful at times. It also conserves system resources.

- **Activate the Best renderer.**

All of the Render palette special effects only become active when a Best render is executed. On the canvas, you'll see the scene render, and then the fibers will be added.

This looks really great – for an autumn scene. What is happening is that the fibers are getting their colors from what is already present on the canvas. Since the canvas is all shades of brown, so are the fibers.

There are several ways that we can override this, however.

- **Switch back to the Fibers S1 channel.**

- **Select a grassy green color using the Color thumbnail, then click the Tip swatch in the Material modifiers.**

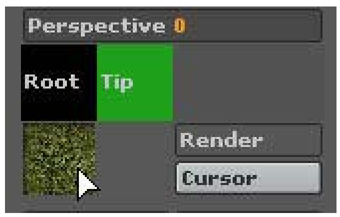
The scene will render again, but won't appear to be any different. Every time a change is made to the modifiers, the scene will re-render.

- **To allow the material to use this new color, we must activate the TipColor blend modifier. Set it to about 50.**

When the scene renders again, the green color will blend with the colors from the canvas.

Well, we have green grass, but if you ask me, it's a bit much. Let's try the other way to override the color.

- **Click on the Texture patch at the bottom of the shader, and choose the grass texture.**



- **Set ReflectColor blend to .75**

This tells ZBrush to blend the texture with the other colors already present in the fibers. Each fiber will now be 25% what it was in the last render, and 75% grass texture.

Here's the result. Just the right shade!

Now that the color is perfect, it's time to tweak the rest of the modifiers so that we have tufts of grass rather than a bunch of bushes.

- **Set Density to 10**
- **Set Length variations to 25**
- **Set Density variations to 25**
- **Set Direction variations to 35**
- **Set SelfShadows to 25**
- **Set DarkenEdge to .25**
- **Set Strand Width to 3**

A Best render now should give results like what you see in the picture below:

- **Save your document as Chapter3-3b**

You will be able to compare the two versions and use the one you like best for the next section.

In Conclusion

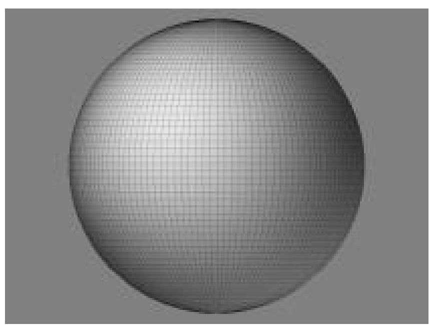
In this chapter, we have explored two unique ways to add fibers of all kinds to a scene. The Fiber brush is a power 2.5D paint tool that adds fibers to the canvas as pixols that can then be modified later in your work. The Fibers material shader adds the fibers as a post-render effect. A variety of modifiers are available for either approach, which can be used to create anything from grass to hair to waterfalls.

Bamboo Part 4 -- Finishing Touches

In this section we will finish the scene by creating a few beetles, and also adjusting the scene's lighting and rendering options.

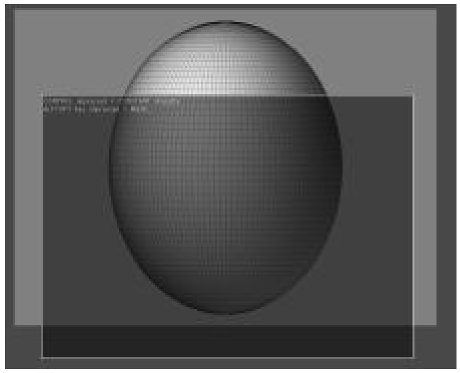
We'll begin this section by doing a little bit more modeling, and touching on texturing for the first time. We'll then modify the scene's lighting and rendering options to tie everything together and bring it to life.

- ❑ **Draw a Sphere3D on the canvas. Enter Edit mode and rotate the sphere so that the poles are at the top and bottom. Hold down the Shift key to snap the model into position.**



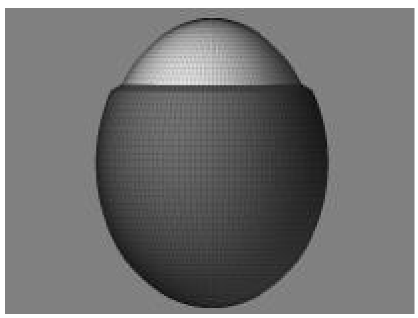
- ❑ **Set the Tool>Initialize>X Size and Y Size values to 80.**

❑ **Holding down the Ctrl key, drag a bounding box across the bottom ¾ of the sphere.**



The Ctrl key by itself activates ZBrush's masking mode.

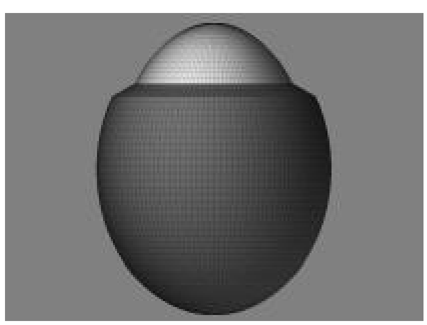
❑ **In Tool>Deformation, perform an Inflat XY at a value of -50**



Remember that you can click on the Z next to Inflat to deactivate that axis.

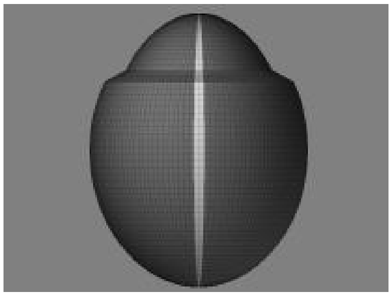
❑ **Mask one more row of polygons.**

❑ **Do a Squeeze XY at -10.**



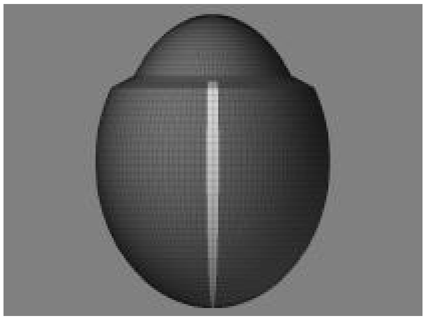
❑ **Press Tool>Selection>Masking>MaskAll**

- **Also in Masking, set Sel 2 and Skp 30. Press Col.**



- **Mask the remaining head polygons by holding Ctrl to paint a drag-rectangle.**

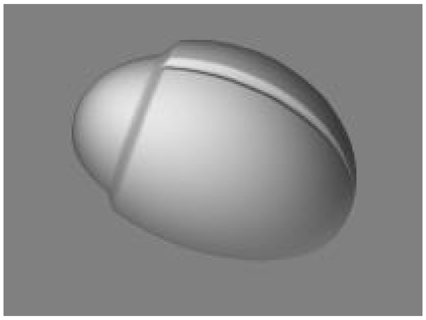
- **If you rotate to the side, you'll see that there are other groups of unmasked polygons. Mask them, as well, so that only the double row on the back remains unmasked.**



- **Perform an Inflat XY at a value of -30.**

- **Unmask the model.**

- **Again in Deformation, do a Flatten Y at a value of -80.**



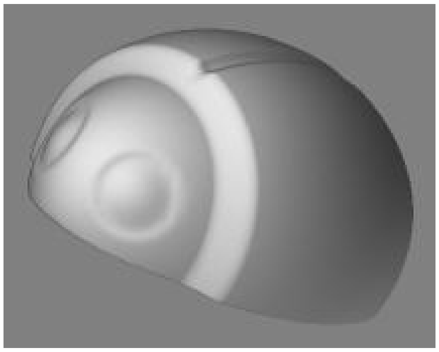
Your model should now look like the image above. Depending upon the orientation of the model when you were masking it, you might have to use the X axis for Flatten or a positive value instead of the negative 80. If that's the case, simply undo and use the different settings.

- **Activate Transform X to turn on symmetry.**

- **Turn on Transform>StdDot, and set Z Intensity to 80. Change the Draw size to 40.**

- **Hold down the Alt key to switch to Zsub. Place a pair of eye sockets on the model.**

- **Let go of the Alt key and set Draw>Focal Shift to -40. Place eyes inside the sockets.**



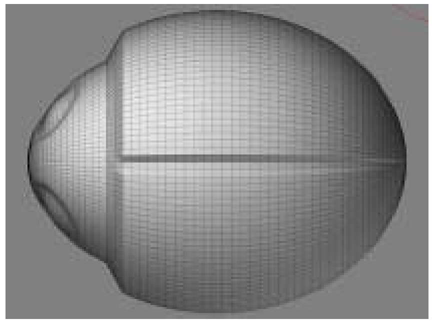
Now that the stylized beetle has been created, it needs a texture. We'll use Projection Master to do the job.

Since the model is a parametric object, it already has the most appropriate UV mapping assigned. In this case, that's spherical mapping.

- **Create a blank texture by setting Texture>Width and Height to 1024. Click New.**

Although the texture can be any dimension you like, ZBrush is optimized for powers of 2. Therefore, the best options are 256x256, 512x512, 1024x1024, 2048x2048, or 4096x4096.

- **Rotate the model so that its back is to the camera and click the Projection Master button on the top shelf.**



The Projection Master panel will appear in front of the canvas.

- **Turn on Material and Double Sided, turn off Fade, then click Drop Now.**

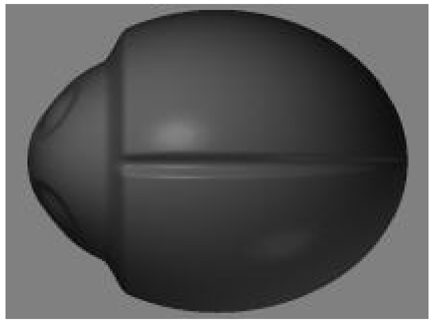
Double Sided tells PM to texture the side facing the camera and the opposite side of the model at the same time. Fade means that the colors being applied will not be faded as the polygons angle away from the camera. (For most texturing, you would leave this on, since it allows even blending as you rotate the model over the course of several drops.) Material tells ZBrush to also embed any selected materials as a part of the texture.

Now that the model has been dropped, you can use all of ZBrush's tools to texture it.

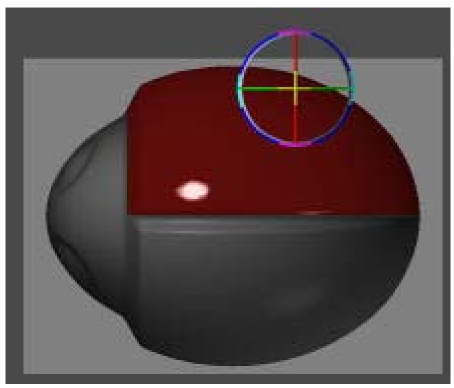
- **Set Rgb Intensity to 100.**

- **Select Alpha 00 and the Basic Material.**

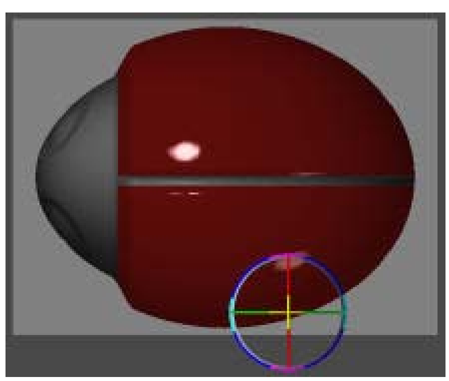
- **Paint a stroke to cover the entire model.**



- **With the Toy Plastic material and a dark red color, paint another stroke. Move and scale it to cover one half of the shell.**

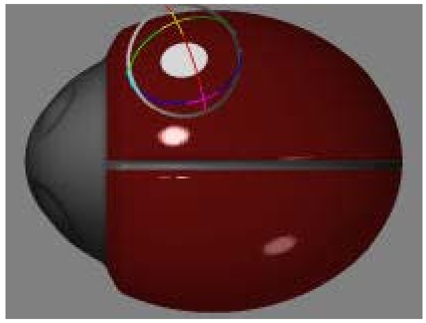


- **Click the Snapshot button on the right shelf, then move the painted stroke down to the second half of the shell.**



- **Press Q to dismiss the gyro.**
- **Select the Circle3D tool and a white color.**
- **Activate Rgb and turn off Zadd.**

- **Paint a spot on the beetle's back and press W to activate the move gyro.**



3D objects can be used to draw all kinds of shapes when Zadd is turned off. No depth is applied, so all that you get is the object's filled shape.

- **Using move, scale and snapshot, paint several dots on the shell.**

When move is active, it's best to click inside the gyro (without clicking on one of the rings). This keeps the circle object aligned to the surface beneath it.

- **Click the Projection Master button and then the Pickup Now button.**

The model is now fully editable again, and can be rotated to a new angle. You'll also see that the Texture thumbnail has updated to reflect the painting that you just did.

- **Rotate the model so that its bottom is facing the camera.**

- **Activate Projection Master and turn off Double Sided before clicking the Drop button.**

We don't want the shell pattern on the beetle's belly, so we'll remove it.

- **Select the Simple brush, Alpha 14, and the Dots stroke type.**

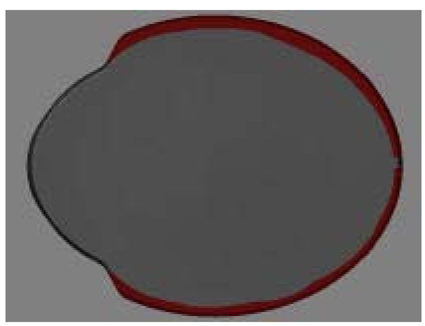
- **Drag from the Material thumbnail onto the grey part of the beetle. Release the mouse.**

This selects the Basic Material again by sampling it from the canvas.

- **Do the same with the foreground color patch to match the grey of the head.**

Any of the color patches in the ZBrush interface can be used as pickers by dragging from them onto the canvas. Whatever color the picker is over when the mouse is released will be the selected color.

- **Turn off Zadd, make sure that Rgb Intensity is at a value of 100, and paint the belly except for a bit of shell around the edges.**



There's no need to be really accurate with this, since the underside will probably never be seen.

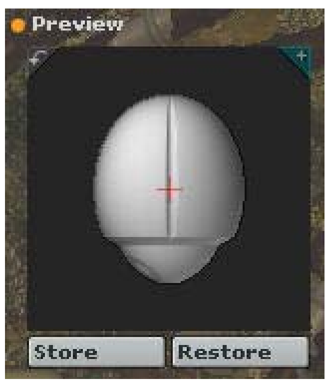
- **Press G to pick the model up from the canvas again, and then rotate it so that the eyes are facing forward. Press G again to drop it in this new position.**

- **With the Circle3D tool again, DoubleDotsMetal material, and a dark shade of grey, paint the eyes.**

❑ **Press G to activate Projection Master, and pick the model up.**

❑ **It's still a little fat, so do Tool>Deformation>Size Y at -20.**

❑ **If you wish, you could also rotate it in the Tool>Preview so that it faces down.**



This will make it easier to draw the model in the scene.

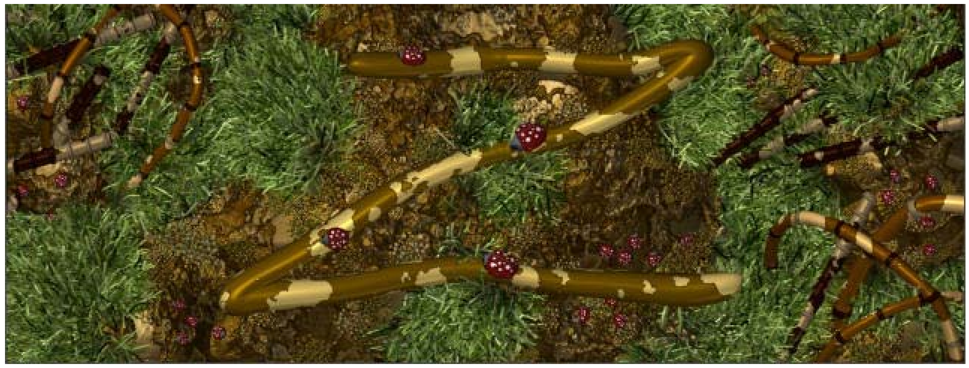
❑ **Use Tool>Save As to save this model as Ladybug.ztl**

❑ **When asked if you would like to include the texture, click Yes.**

Now that our little ladybug is finished, it's time to put it in the scene.

- **Click Document>Open, and load your favorite version of the scene from the last section.**

- **Paint several beetles in strategic locations.**



Now it's time to make the scene more dramatic. We'll do this with lighting and render effects, which will bring out the detail.

- **In the Light palette, set Ambient to 0.**

This removes ambient light from the scene, so that all the lighting comes from the lights themselves.

- **Set the Intensity to 1.2**

- **Adjust the Focal Shift of the Intensity Curve to 86.**

This makes the light slightly more focused.

- **Drag the orange square in the light thumbnail so that it's positioned as shown.**

Lights can be moved around the canvas using this thumbnail. Some light types can also be precisely positioned by dragging Light>Placement>P onto the position in the scene where you want the light.

Clicking on the square in the light thumbnail changes it from a front light to a back light. Clicking again turns it into a front light once again.

- **Select the second light and give it an orange color by choosing that color in the Color palette and then clicking on its color patch.**

- **Select the first light again, and open the Shadow menu. Set Intensity to 1.5, Length to 200, and turn on ZMode.**

ZMode is a special way of rendering shadows that takes the depth of the pixols at the edges of objects into account. It results in more accurate shadows.

- **In the Render palette, turn off Fibers (if your scene is using materials to create the grass), and turn on Shadows.**

This cluster of switches is used to activate ZBrush's render effects. They are only used during a Best render. While basic shadows are generated by the Preview renderer, you need to activate the render setting and do a Best render to see the high quality shadows controlled by the Light>Shadow menu.

- **Click the Best button to render the scene.**

Pay close attention to the shadow outlines. If the shadows look right, your shadow length setting is good. If parts of the shadows seem to be missing where the model is farthest from the surface that the shadow is being cast on, you'll need to increase the setting.

You may find holes in the shadows in places that obviously have nothing to do with the shadow length. This is because 1 ray is not enough for high quality ZMode shadows. We don't want to increase the number of rays until necessary, however, as that also increases render time.

- **When satisfied with your other light settings, set Light>Shadow>Rays to 100 and Aperture to 20.**

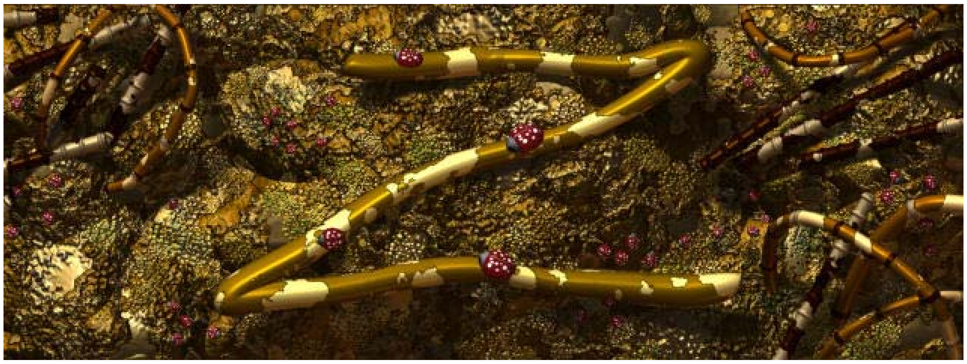
- **Render the scene.**

The render will take longer this time because more rays are being cast.

The shadows are probably too indistinct now. This is because the shadow-casting objects in the scene are very narrow in diameter and we're using quite a lot of rays in order to get really good shadow accuracy. Lowering the Aperture setting further "tightens" each ray, making the shadow edges more distinct while still retaining the softness of Global Shadows.

The more rays that you use and the more distinct you wish your shadows to be, the lower you will need to set the Aperture.

- **Set Aperture to 10 and render again.**



The play of light and shadow should now be pretty dramatic.

❑ **You can make it even more dramatic by turning on Render>Adjustments>Adjust and setting the Contrast to 20.**

The Adjustments menu gives several controls for manipulating the overall appearance of a scene without the need to render it again.

❑ **Turn Shadows off, return to the Preview renderer, and then activate Fog.**

Fog is another render effect that can be used for a variety of purposes. It has several controls, found in the Render>Fog menu.

The two color patches are used to set the near and distant fog colors. We'll leave them alone.

The Depth1 slider sets the closest fog depth, while Depth2 specifies the farthest depth.

❑ **Click on Depth1 and drag it onto the canvas to a high ground point just behind the Z.**

This sets the near depth to the point at which the cursor was released. Now the fog is localized so that it won't obscure the Z at all.

❑ **Change the fog curve's Focal Shift setting to something like -55.**

This makes the fog reach its maximum intensity sooner.

There are two special patches between the color patches. These are used to give the fog a texture and an alpha.

❑ **Click the alpha patch and select the shown texture from the popup menu.**

Nothing will change in the document, since we're using the Preview renderer.

❑ **Do a Best render now.**

The while the curve and depth settings determine the fog intensity at various depths, the alpha determines its intensity at various XY values across the canvas. The closer to white the alpha is, the more intense the fog will be.

Now we'll tie everything together, doing the final render.

❑ **Switch back to Preview for a moment.**

This keeps the engine from doing a new Best render for each setting change.

- **Turn on Shadows and Fibers (if you're using Material fibers).**

- **Click Best again.**

If the results are to your liking, there is one last step to take:

- **Activate Zoom>AAHalf.**

This turns on ZBrush's special antialiased display mode. The document is not resized, but any exported image will be.

- **Save your document as Chapter3-4.ZBR, and then Export the document.**

In Conclusion

Congratulations! You've just completed a 2.5D project. In this section, we've covered a lot of ground. We used a parametric object to sculpt a simple beetle, which was textured using Projection Master. We then worked with ZBrush's lighting and rendering effects to make the image more dramatic.

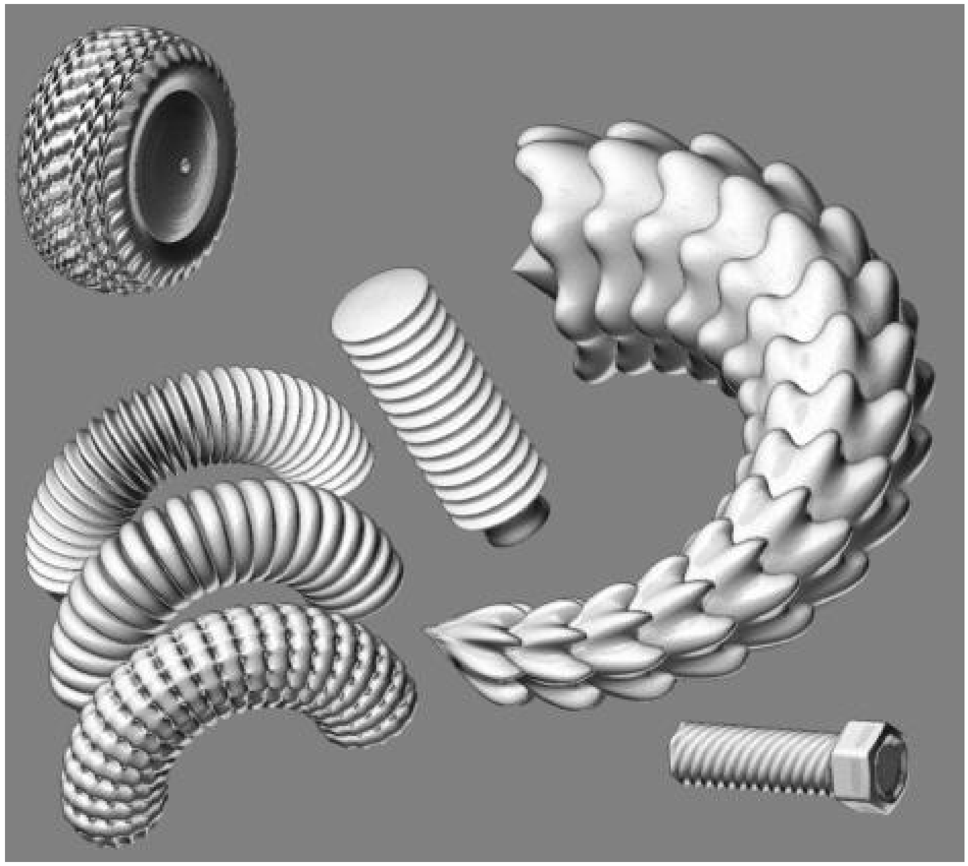
These same techniques can be used to sculpt/paint far more impressive scenes that what was created in this tutorial. While the bamboo may not be incredibly dramatic, it was chosen as a project specifically for the wide variety of techniques that are employed. You should now be able to sculpt a variety of shapes from primitives, understand the difference between an editable object and a snapshot, and be able to create custom materials. You should also be able to texture using Projection Master, and be comfortable with painting using various combinations of material, color, and depth.

Remember that there are MANY ways to accomplish various tasks in ZBrush. As you become more familiar with the software, you will come to learn the techniques that work best for your personal style and needs. This tutorial has been meant to give you a broad understanding of 2.5D painting, which you will then be able to expand upon during your own sessions.

Now that you have the basics down, the remaining chapters of this manual will cover more specialized portions of the ZBrush software.

Not So Primitive

In this section we'll introduce some basic modeling principles by using masking and deformations to transform primitive objects.

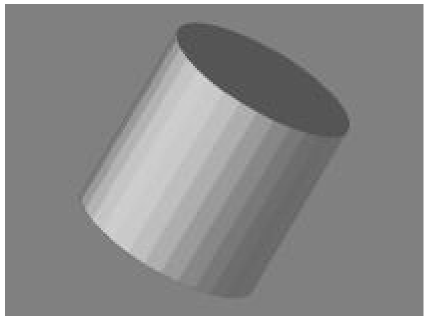


One aspect of ZBrush's workflow is the ability to create extremely complex scenes by combining a bunch of smaller objects. Ultimately, a scene could be composed of millions or even billions of polygons, yet still render in real time! This is because only one object ever exists as polygons at a time. But where to get those building block objects in the first place?

ZBrush provides a very powerful masking and deformation system that is unique to parametric objects. (Both are available for polymeshes, but the more specialized selection functions that we'll make heavy use of here are only available for primitives.) In this section, we'll explore a few of the possibilities inherent in this system by creating several complex objects.

Plastic Pipe

- **Select the Cylinder3D tool. Draw it on the canvas and enter Edit mode by pressing T.**



It is possible to do the effects in this tutorial while the model is still in the Tool palette, but it's much easier to see your results when the model is on the canvas.

- **In the Tool>Initialize menu, set X Size and Y Size to 20.**

The Initialize menu has settings that change from one primitive to the next. These are the parameters that you set to control the model on its most basic level. In this case, we've changed the model's cross section to be 20% of a ZBrush unit. As a result, the cylinder is not five times longer than it is wide.

It is important to adjust the Initialize settings before you modify the model through sculpting or deformations. Any change in this menu causes the model to revert to its primitive state.

- **Press Tool>Masking>MaskAll**

The object becomes completely dark to show that it's fully masked. You could also hold down the Ctrl key and paint your mask onto the surface of the model, but this is faster for our purposes.

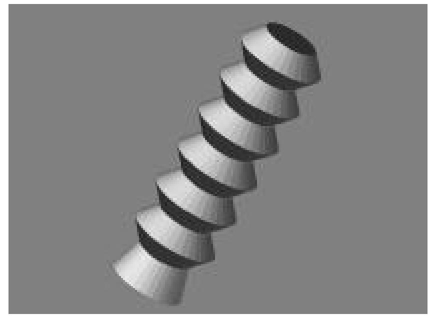
- **Set Tool>Masking>Sel to 1.**

This tells ZBrush how to deal with the unmasking process. By leaving the Skp value alone, we're actually telling ZBrush to use the same value as for Sel.

- **Press Row.**

At this point, the model is unmasked in alternating rows of 1 polygon each (the Skp value). All masked areas will be left alone when deformations are applied.

- ❑ **Apply Tool>Deformation>Inflate at a value of 100.**



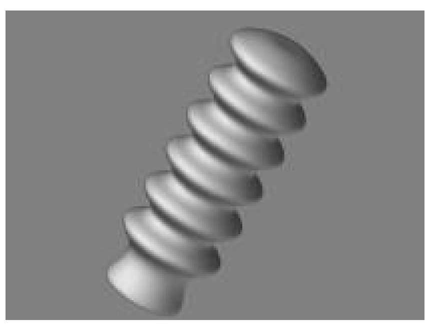
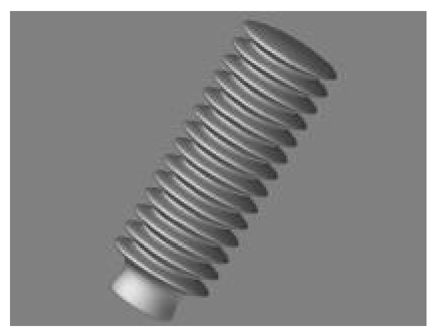
As you can see, the deformations affect a model's points, while the masking affects its polygons. This is perfectly normal.

- ❑ **Perform the Inflate a second time.**

- ❑ **Clear the mask by pressing Tool>Masking>Clear.**

- ❑ **On the top shelf, turn off Quick 3D Edit.**

This activates ZBrush's smoothing algorithims. The effect is that while the model is stationary (not being edited or rotated), it will be displayed with many more polygons than it really has.

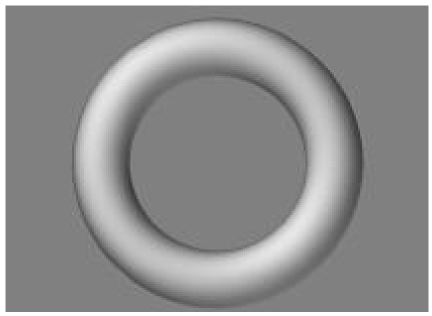
If we had used a Tool>Initialize>VDivide value of 32 at the outset, the result would have been more tightly-packed ribs. Go ahead and try that now.

Round Plastic Pipe

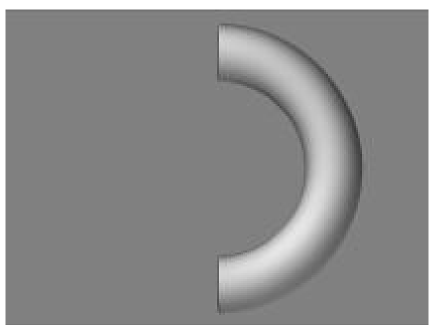
The next object that we'll create is very similar to the regular pipe. We'll use the Ring3D primitive instead, though.

- **Exit Edit mode (T) and clear the canvas (Ctrl+N).**

- **Select the Ring3D. Draw it on the canvas and enter Edit mode.**

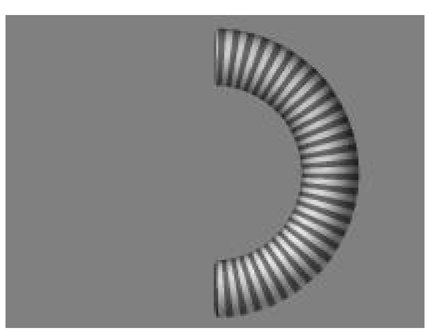


- **Set the Initialize>Coverage value to 180.**



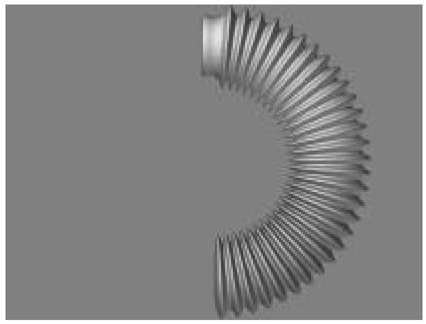
This turns the ring into a half ring.

- **Press Masking>MaskAll, then set the Sel value to 1 before pressing Col.**



For the Ring3D object, rows run along the large circumference while columns ring the small circumference.

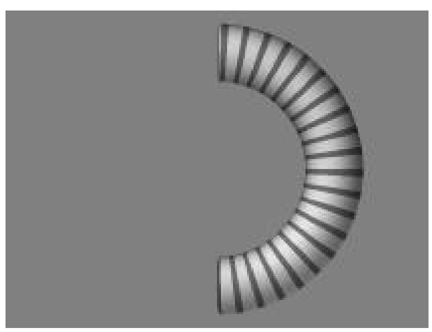
- **Perform the Inflate deformation at a value of 100, then clear the mask.**



And there we have our curved pipe.

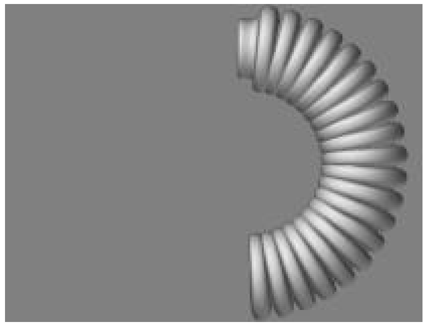
Round Metallic Spring

- **For this object, repeat the steps above for the Ring3D object. But this time, use a Masking>Sel value of 2 and a Skp value of 1.**



This tells ZBrush to unmask 2 columns for every 1 that it leaves masked.

- **When you get to the Inflate step, use a value of 50 twice.**

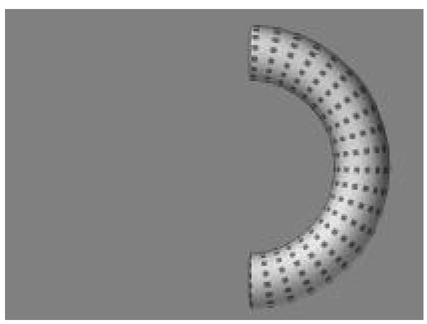


Deformations are cumulative. Sometimes it's best to do a series of smaller deformations rather than try to accomplish everything in one.

Webbed Pipe

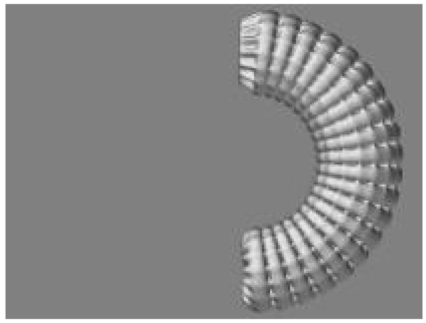
- **Repeat the steps for the spring, stopping when you have unmasked the rings.**

- **Set Sel to 1 and leave Skp at 1. Press Row.**



Unmasking is also cumulative. So the unmasking by row now gives us a checkered pattern.

- **Do two Inflate routines at 50, and then clear the mask.**

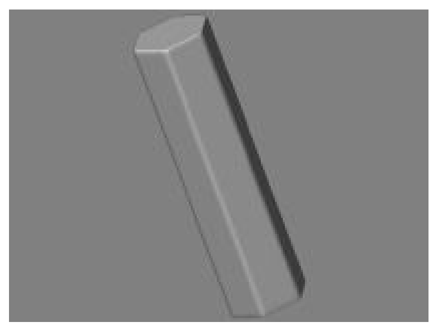


As you can see, by creating more complex masks we are in turn able to create more complex models! And we did all of this with just a few very simple steps.

Bolt

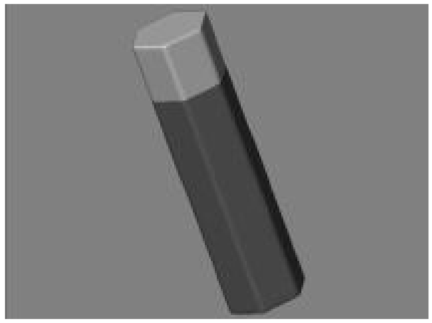
- **For this one, we're going to start with the Cube3D primitive.**

- **In the Initialize menu, set X Size and Y Size to 20. Set Sides Count to 6, HDivide to 30 and VDivide to 45.**



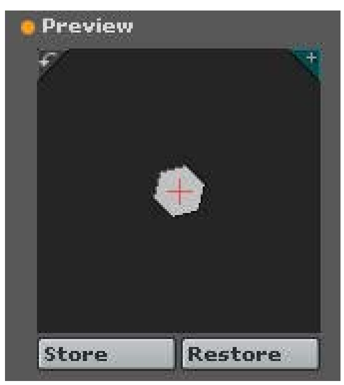
The cube can actually become a cylinder with enough sides! It has slightly different parameters than the Cylinder3D, though, which is why we're using it for this example.

❑ **In the Masking menu, MaskAll and then set Sel to 32. Press Row.**



❑ **In the Deformation menu, click on the Z in the Size slider to turn it off.**

Each deformation has XYZ settings to control the axis that the deformation will operate on. By turning Z off, we're telling ZBrush not to change the length of the unmasked polygons when we perform this deformation.



Note that the axis is NOT in relation to the canvas (world coordinates). Deformations use an object's local coordinates. If you ever wonder what the local coordinates are, open the Tool>Preview menu. You can also change the local coordinates on the fly by rotating the figure in the preview.

- **Apply the Size deformation at a value of 50, followed by SFlatten at 5.**

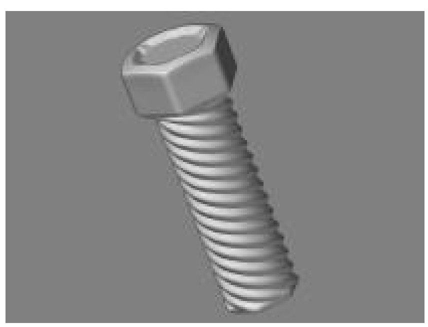
- **Now that the head of the bolt is complete, reverse the mask by pressing Masking>Inverse.**

This protects the head that we just created, and allows subsequent deformations to only affect the bolt's shank.

- **Apply Twist 6 times at a value of 100. Follow it with Inflate at 30.**

There's no need to adjust the XYZ settings for the twist, since it's set to Z by default.

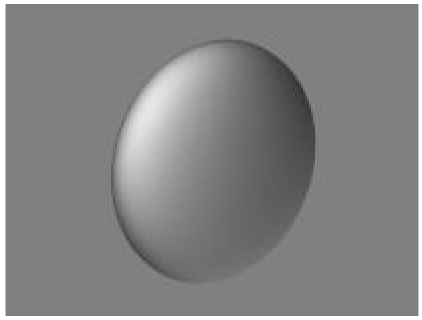
- **Clear the mask.**



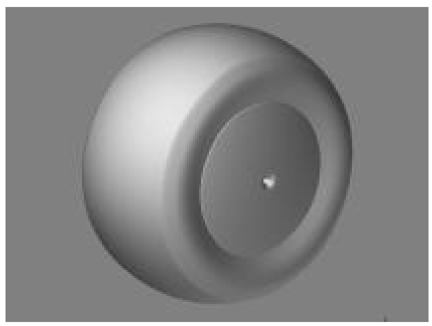
A Tire

- **Select the Sphere3D.**

- **Set Initialize>Z Size to 50.**



- **Use the SFlatten deformation at a value of 25, followed by Inflate at 100.**



The combined effect creates a rim and rubber.

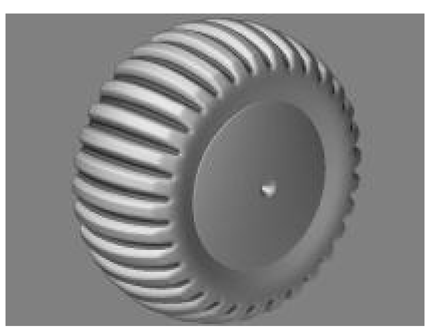
- **MaskAll. Set Sel to 32, then press Row.**

This unmasks everything but what will become the tread.

- **Set Sel to 3 and Skp to 1. Press Col.**

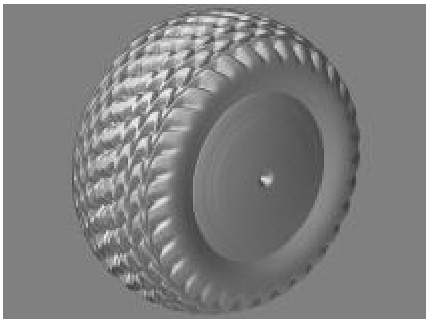
Now there will be just a few masked lines.

- **Apply Size XY at a value of 10.**



- ❑ **Press MaskAll, followed by Row.**

- ❑ **Apply Twist at a value of 40, then clear the mask.**



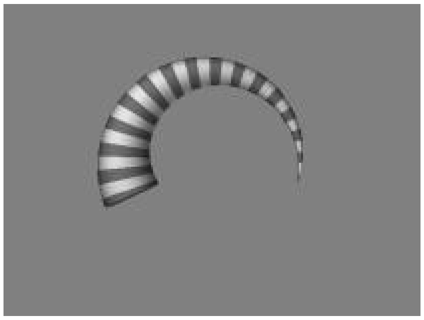
Creature Tail

- ❑ **For this object, we'll return to our old friend, the Ring3D.**

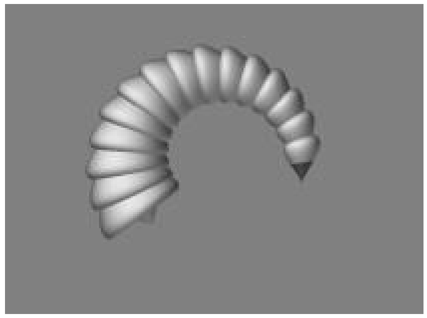
- ❑ **In the Initialize menu, set SRadius to 50, Coverage to 220 and Scale to .01.**

SRadius thickens the torus a bit, and Scale causes it to taper down to almost nothing.

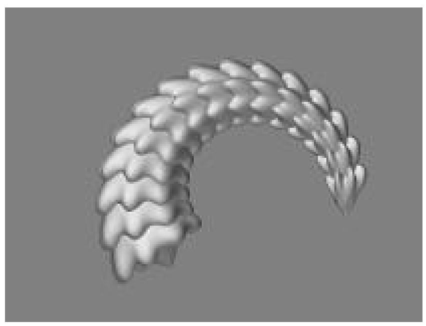
- ❑ **MaskAll, then set Sel to 2 and press Col.**



- **Apply Inflate at 100, followed by Rotate Z at -20 and then another Inflate at 50.**



- **MaskAll, then press Row.**
- **Inflate 25, then Smooth 100.**
- **Clear the mask.**

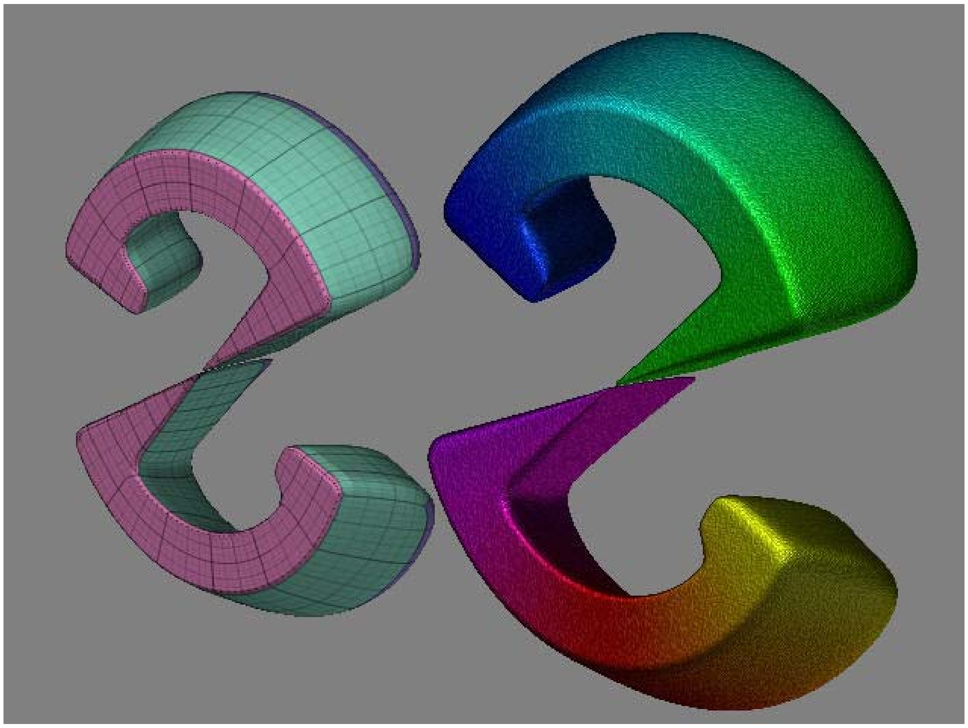


In Conclusion

Masking can easily be combined with a variety of deformations to create one complicated-looking shape after another. These various shapes are then able to be combined with other scene elements to build incredibly detailed scenes. In fact, some ZBrush artists use these techniques almost exclusively in the creation of their artwork. It should be noted that Row, Column and Grid are only available for parametric objects. The remaining masking options are available for both primitives and polymeshes. To learn more about them, use the online help system.

Z Logo -- Creases

In this section we'll use the Create Difference Mesh feature to quickly create a custom 3D shape, then modify the subdivision smoothing via ZBrush 2's Crease feature.



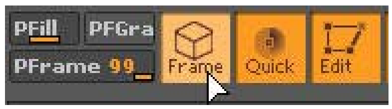
ZBrush 2 has the ability to create a 3D mesh by comparing a model's current state to its stored morph target. We'll put that to work here by creating a 3D letter "Z" from a Circle3D primitive. Along the way, we'll also make use of ZBrush's mesh visibility features.

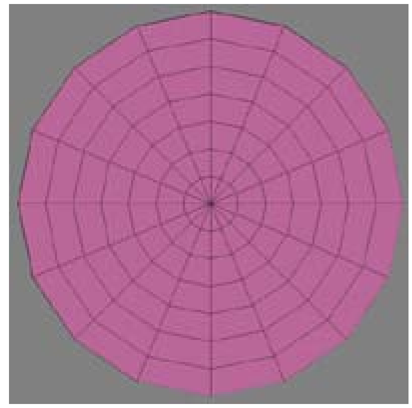
- **Begin by selecting the Circle3D primitive.**
- **Press the Tool>Make Polymesh button.**

Since the Difference Mesh feature uses a stored morph target, and only polymesh objects can store one, we need to convert the primitive into a polymesh.

- **Select the new polymesh and draw it on the canvas.**

- **Enter Edit mode and activate the Polyframe view.**

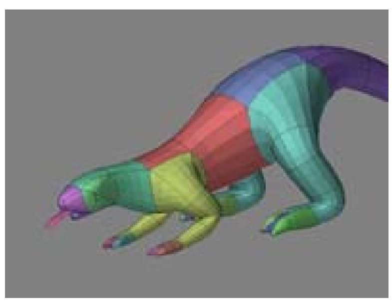


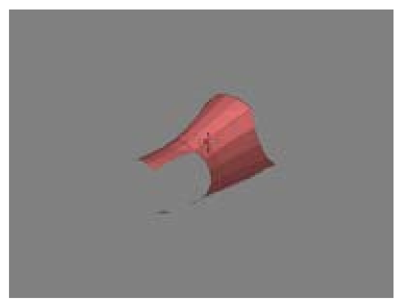


We'll need to be able to see the polygons in order to selectively hide some of them.

Before proceeding, let's quickly go over the selection features. The core of these features is the Ctrl+Shift key combination. All mesh visibility options involve those two keys.

When a mesh is completely visible, Ctrl+Shift+Clicking on any group will hide everything except that group.

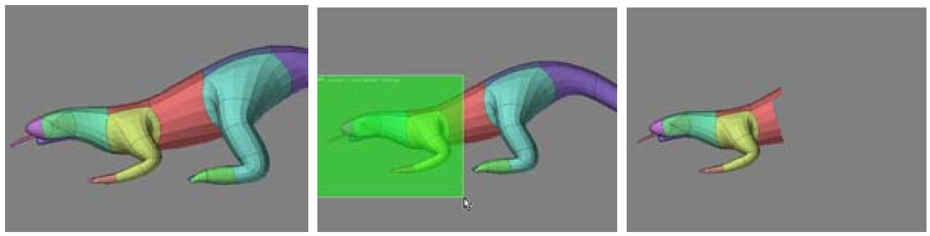




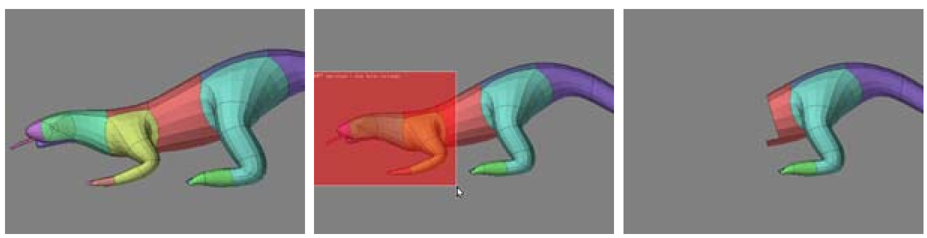
When a mesh is partly visible, Ctrl+Shift+Clicking on a group will hide that group.

When a mesh is partly visible, Ctrl+Shift+Clicking on the blank canvas will restore full visibility.

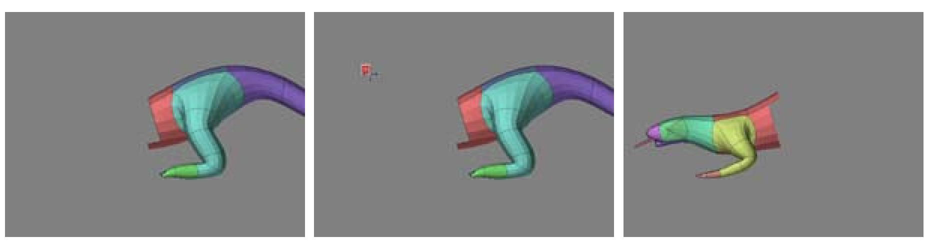
At any time, holding Ctrl+Shift while dragging across the model will activate a green selection box. Any polygons within that box when the mouse button is released will remain visible. All other polygons will be hidden.



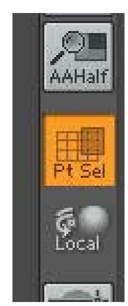
If the keyboard is released before the mouse button, the box turns red. Any polygons within the box will be hidden while the rest of the mesh remains visible.



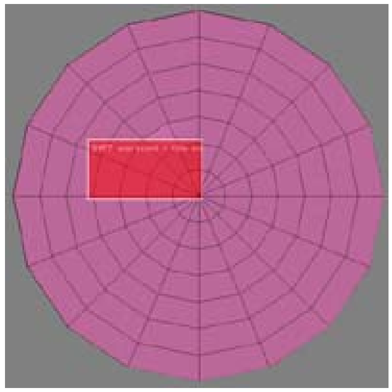
Dragging a small box (of either color) on any empty part of the canvas will invert the visibility.

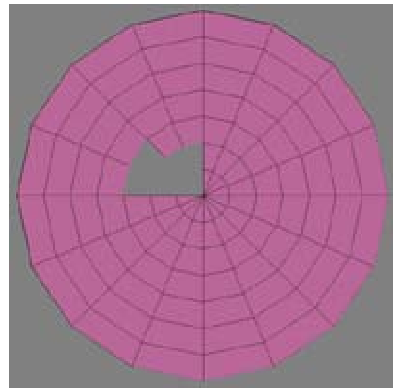


The drag-rectangle selections use a "smart" system. If the drag rectangle encloses an entire polygon, then the system will select by polygons, only. In other words, a polygon must be fully enclosed by the box to be selected. If no polygon is completely enclosed, then the system will select by points instead. You can also force point selection by activating the Pt Sel switch on the right shelf.

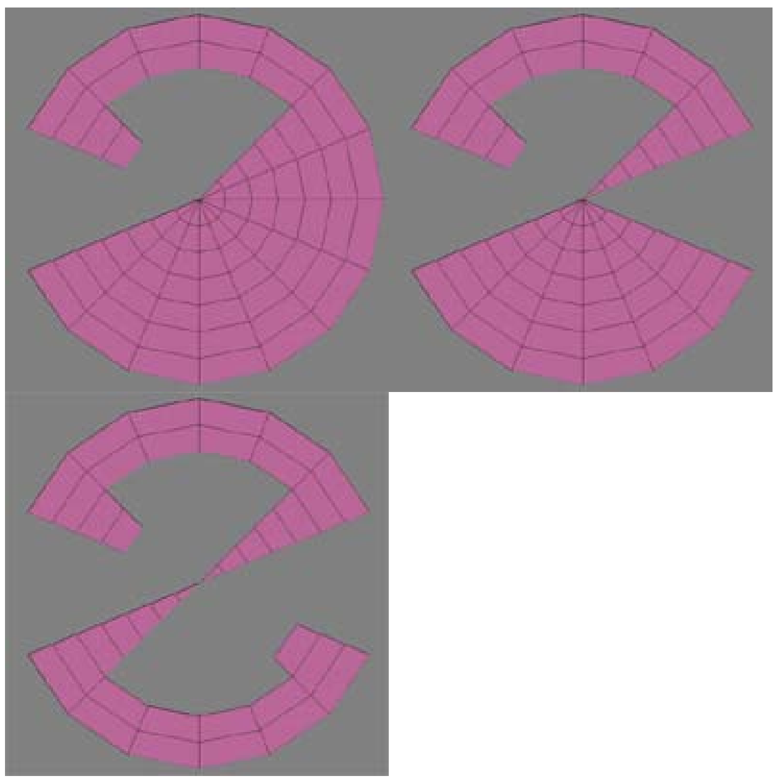


- **Using a red drag-rectangle, hide several polygons.**





- **Continue to hide polygons, creating a simple “Z” shape.**



As you work, you will find that sometimes it’s beneficial to use polygon selection and other times it’s easier to use points. If you want to use points, the fastest approach is generally to just make sure that your selection box doesn’t fully enclose a polygon.

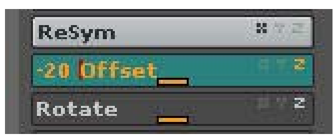
❑ **Press Tool>Geometry>Delete Hidden**

We no longer need the hidden polygons, so we'll delete them.

❑ **Press Tool>Morph Target>StoreMT**

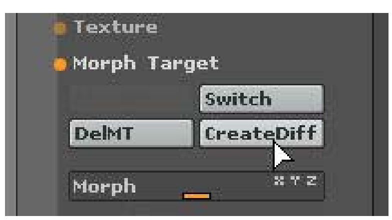
This stores the current geometry so that it can be referenced later.

❑ **In the Tool>Deformations menu, set Offset to Z and then enter a value of around -40.**



This moves all of the visible points toward the camera by 40% of a ZBrush unit, or 2/5 the size of the object.

❑ **Back in the Morph Target menu, press CreateDiff.**



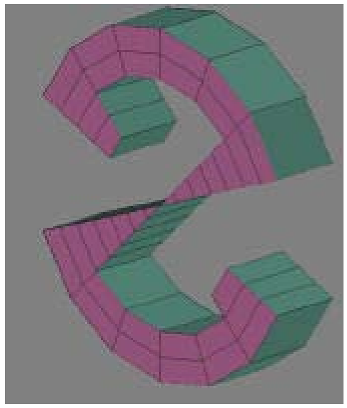
At this point, ZBrush compares the current mesh to the stored morph target and creates a brand new mesh.

❑ **Exit Edit mode and clear the canvas.**

❑ **Select the MorphDiff_PM3D_Circle3D tool.**

ZBrush automatically names models in a way that makes it easy to tell how they were derived. From the name alone, we can tell that it's a difference mesh generated from a polymesh3D object that was in turn derived from a Circle3D primitive. Of course, you can rename the model to anything you'd like by saving it.

- **Draw the new model on the canvas and enter Edit mode.**

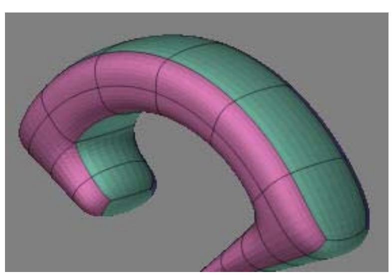


As you can see, the new model is a fully-enclosed 3D figure. ZBrush used the stored morph target as one group, the offset position as a second group, and the polygons filling the difference between the two as a third group.

This technique can be used in a remarkable variety of ways. For example, form-fitting clothing for a figure could be created very quickly and easily.

Now let's take a look at what happens when the mesh is divided a few times.

- **Press Tool>Geometry>Divide three times.**

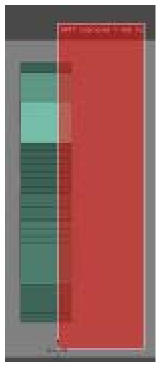


By default, when the mesh is divided it is also smoothed by averaging the new points with the pre-existing points. This behaviour can be overridden by turning off Tool>Geometry>Smt, but the result would be that the mesh remains very faceted. What if you want partial smoothing instead?

ZBrush 2 provides a way.

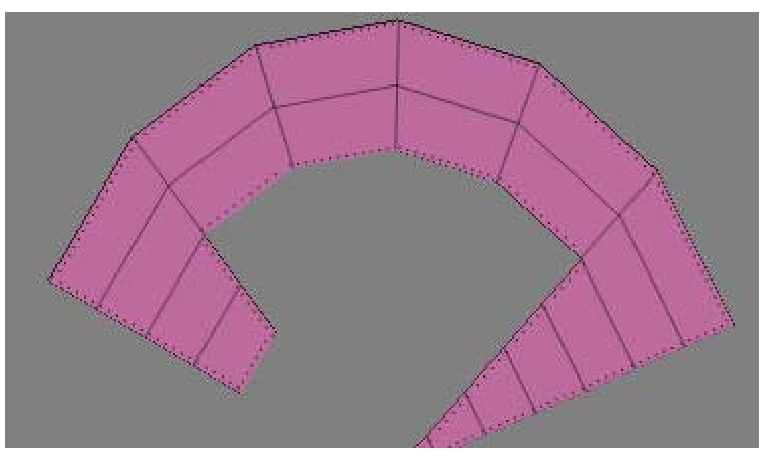
- **Press Ctrl+Z three times to return to the original mesh.**

- **Rotate the model to the side, activate Pt Sel, and draw a red rectangle to hide all but the front of the model.**



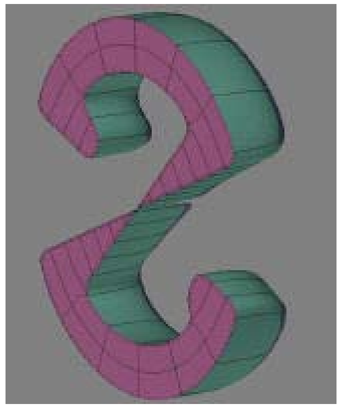
- **Press Tool>Geometry>Crease.**

The polyframe view will change to show a fine dotted line around the edges of the visible area.

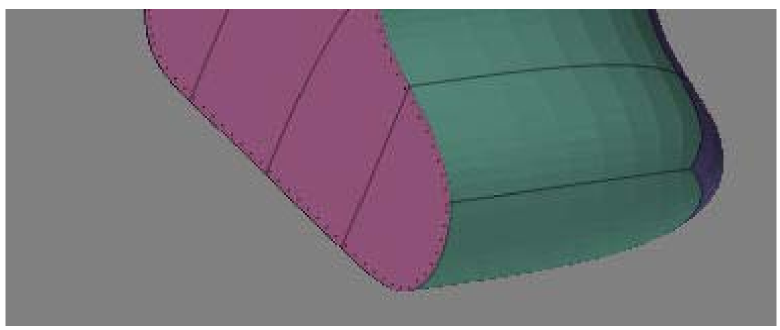


- **Restore full visibility by holding Ctrl+Shift and clicking on any blank part of the canvas.**

- **Divide the mesh three times again.**



This time, the front surface of the mesh remains flat. The crease tags serve as weighting to prevent their adjacent edges being smoothed when the geometry is divided.



When you look closely at the polyframe, you will see that the hidden polygons remain uncreased. So the edges where the front and side groups come together are only creased along one side. Let's crease the other side, as well.

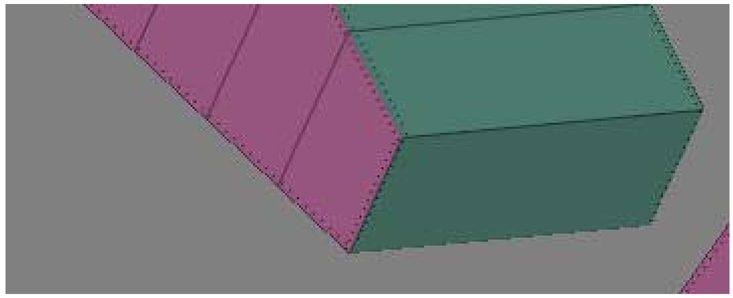
- **Press Ctrl+Z to undo the mesh subdivision.**

- **With Pt Sel off, rotate to the side view and use red drag-rectangles to hide the front and back surfaces.**

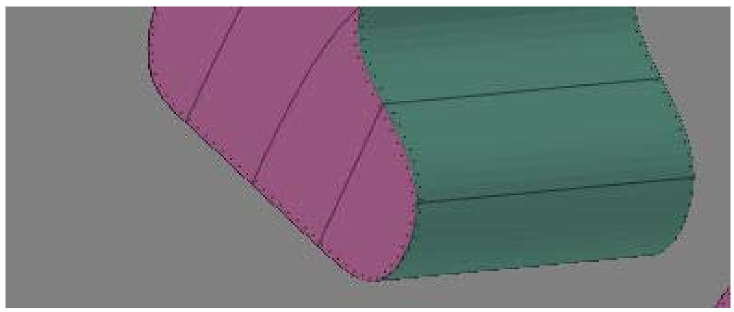
- **Press Crease.**

- **Restore full visibility.**

Now you will see that the edges common to the front and side surfaces have two rows of dotted lines.



- **Divide the mesh three times again.**



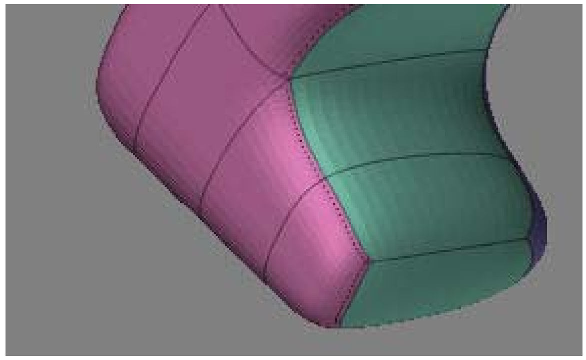
The edge is now sharper than ever, but the mesh does not have a faceted appearance. This is because the non-creased edges are still being smoothed. Creases are very useful for creating mechanical objects!

- **Undo several times until only the front surface is creased.**

- **Restore full visibility.**

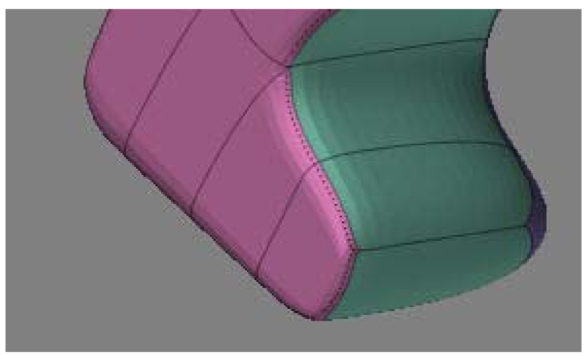
- **Set Tool>Geometry>CreaseLvl to 1.**

- **Divide four times.**



The crease level tells ZBrush the maximum level at which to apply the crease tags. With a value of 1, the crease is only applied the first time the mesh is divided. For each subdivision after that, the crease is ignored and the mesh is smoothed. The result is a front edge that is slightly harder than the back edge.

- **Undo the division and set the CreaseLvl to 2.**
- **Divide the mesh four times.**



Now the crease is used for the first two subdivisions, and ignored for the second two. The result is an edge that's harder than the back surface, but still somewhat soft.

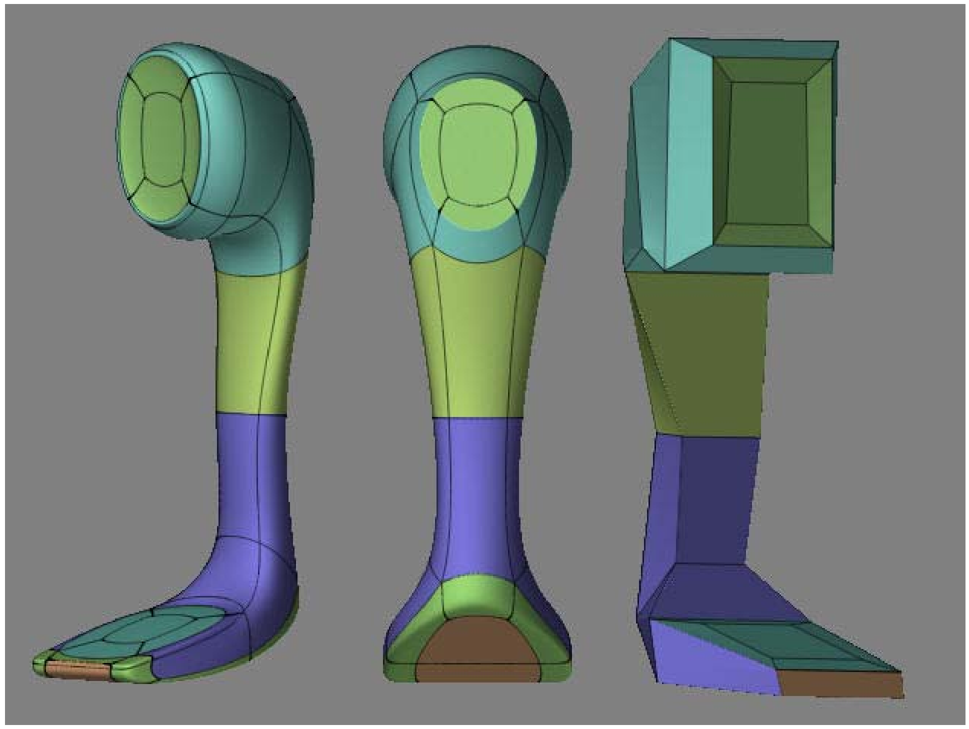
In Conclusion

In this chapter, we've taken a look at how ZBrush 2's mesh visibility controls operate and can be used to interact with the mesh. We've also used morph targets to store a base level for a mesh that was then modified. By comparing this modified mesh to the stored morph target, ZBrush was able to quickly create a shape that would have been very difficult to model by other means. Finally, we've examined how creases can be used to modify how ZBrush subdivides a mesh, giving you control over the sharpness of your model's edges.

A tutorial on this subject is also available in ZScript format in the Help system. Go to Modeling 3D Objects\Creases to view it.

Telephone Part 1 -- Edge Loop Modeling

In this section, we'll cover basic Edge Loop functionality, demonstrating the Crisp function.

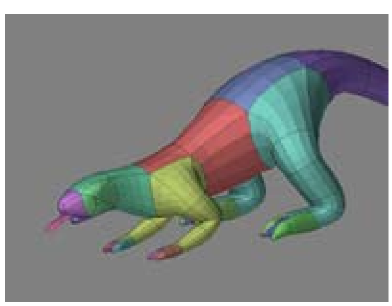


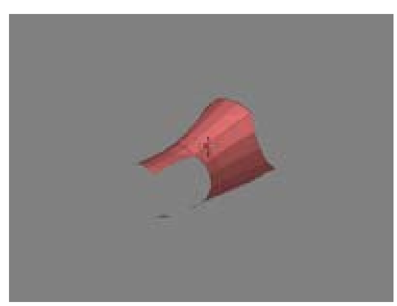
ZBrush 2 offers two ways to create sharp edges in a model. In this tutorial, we'll use the Crisp feature, which is a part of the Edge Loops command. Along the way, we'll work with partial mesh visibility.

This tutorial is part 1 of 3. It should be done before you continue to the other two Telephone tutorials.

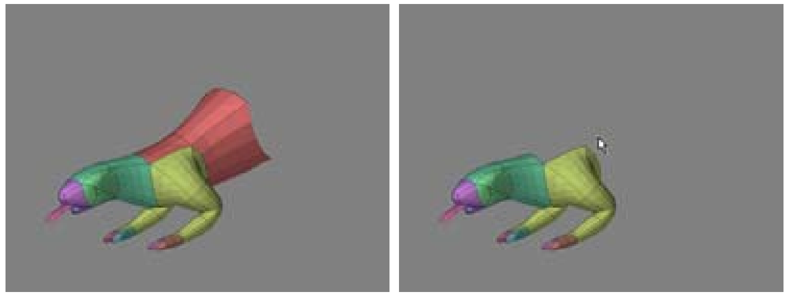
Before proceeding, let's quickly go over the selection features. The core of these features is the Ctrl+Shift key combination. All mesh visibility options involve those two keys.

When a mesh is completely visible, Ctrl+Shift+Clicking on any group will hide everything except that group.



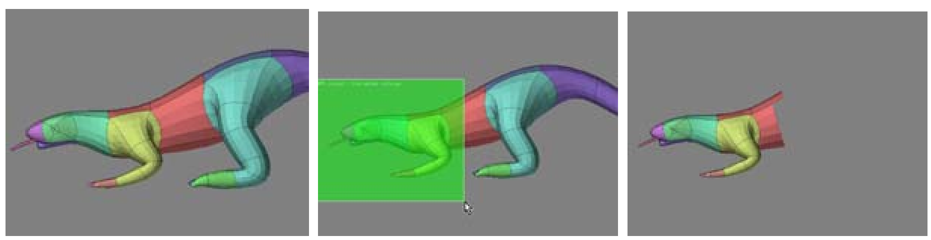


When a mesh is partly visible, Ctrl+Shift+Clicking on a group will hide that group.

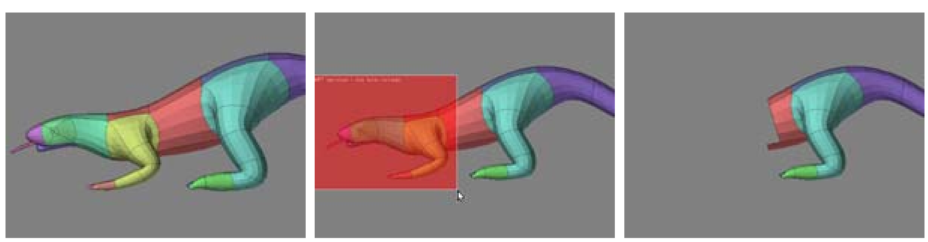


When a mesh is partly visible, Ctrl+Shift+Clicking on the blank canvas will restore full visibility.

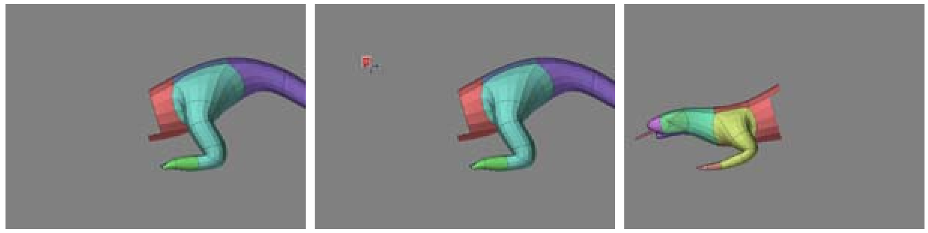
At any time, holding Ctrl+Shift while dragging across the model will activate a green selection box. Any polygons within that box when the mouse button is released will remain visible. All other polygons will be hidden.



If the keyboard is released before the mouse button, the box turns red. Any polygons within the box will be hidden while the rest of the mesh remains visible.



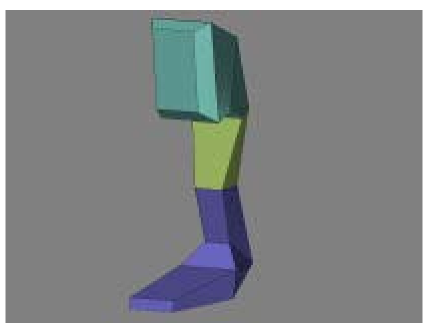
Dragging a small box (of either color) on any empty part of the canvas will invert the visibility.



The drag-rectangle selections use a “smart” system. If the drag rectangle encloses an entire polygon, then the system will select by polygons, only. In other words, a polygon must be fully enclosed by the box to be selected. If no polygon is completely enclosed, then the system will select by points instead. You can also force point selection by activating the Pt Sel switch on the right shelf.

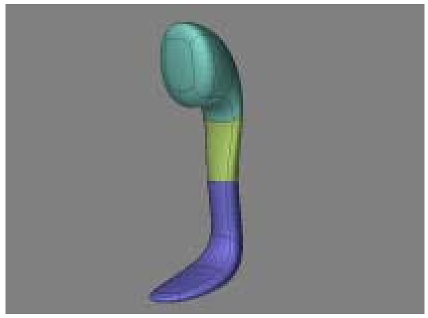
- **Begin the tutorial by loading phone.ztl from the Resources folder.**

- **Draw the phone on the canvas and press T on your keyboard to enter Edit mode.**



This basic mesh was created using ZSpheres with only 1 resolution level. The skin was then sculpted to block out the shape of the phone.

- **Press Tool>Geometry>Divide 3 times.**

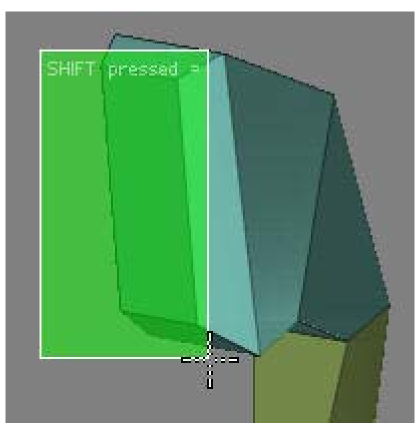


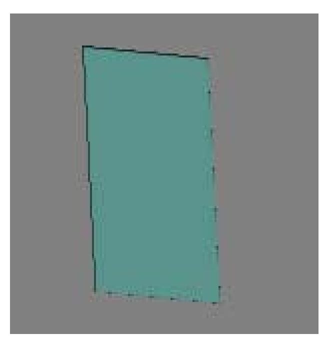
The divided and smoothed model now has a fairly sleek appearance. It's a little *too* smooth in places, though, such as where the ear and mouthpieces would go. The Crisp feature will be used to create these edges.

- **Press Ctrl+Z three times to return to the original model.**

In order to use any of the Edge Loop features, we must be at subdivision level 1. We're using undo here instead of Multi-Resolution Subdivision Editing because we want to work with the original, unmodified mesh. MRSE would reshape subdivision level 1 to more closely match level 4, which in this case is an effect that we don't want.

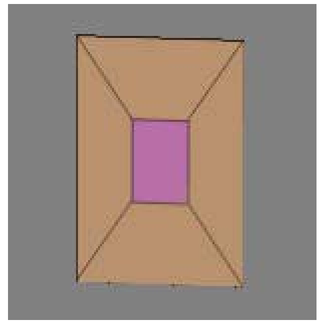
- **Hold Ctrl+Shift and drag a green rectangle over the polygon that makes up the earpiece.**





If you do it right, you'll be left with just the one polygon. If you accidentally are left with more than one, use any visibility control that you prefer to isolate the single polygon.

- **Press Tool>Geometry>Edge Loop.**

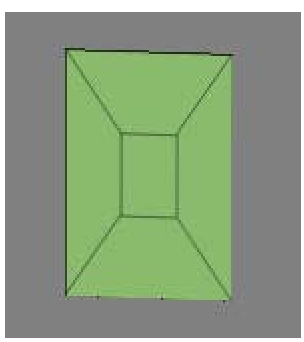


This adds a row of polygons around the outer perimeter of the visible area. With just one polygon visible, the result is an inner extrusion.

With the I-Grp and O-Grp modifiers selected, the new polygons are also assigned to new groups. One group is created for the center of the loop, and another is created for the outer row. (Note: Your colors may be different from what's shown here.)

- **Activate the Crisp modifier.**

- **Press Edge Loop again.**

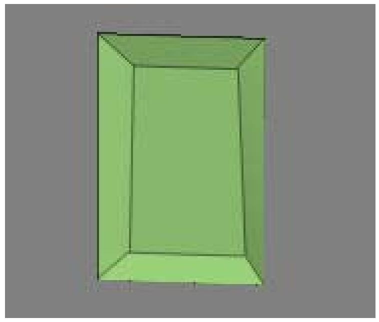


Another edge loop has been added, but thanks to the Crisp modifier, it is so narrow that you can't really see it.

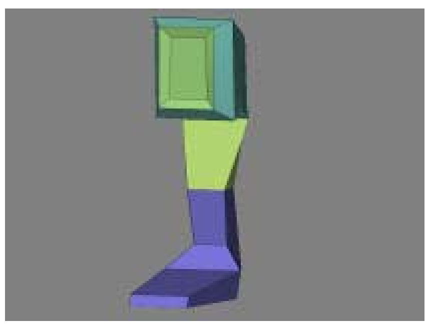
- **Activate Move on the top shelf, and set the Draw Size to a low value like 20.**

- **Press X on the keyboard to activate X symmetry.**

- **Move the points for the center polygon to enlarge and recess it.**

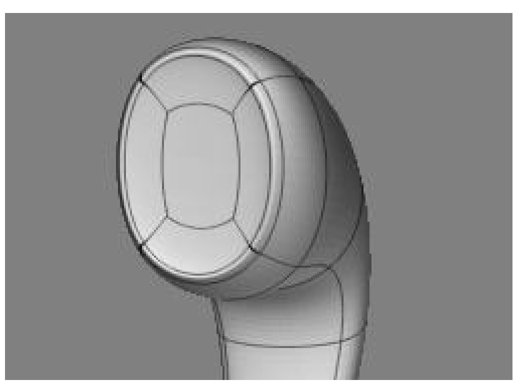


- **Now Ctrl+Shift+Click on a blank part of the canvas to restore full visibility.**



- **Press divide four times to subdivide and smooth the mesh.**

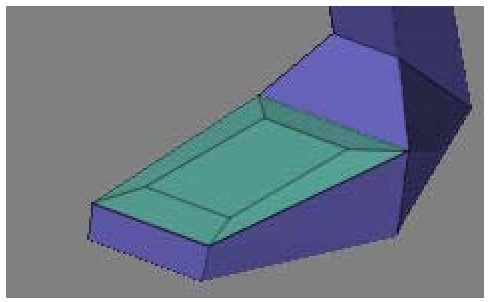
- **Set PFill on the top shelf to 0 in order to hide the polyframe group coloring.**



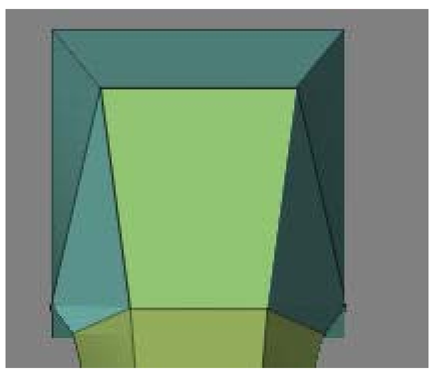
The row of very thin polygons prevents the mesh from being smoothed in that area. The result is a nice, crisp edge. One advantage to this technique is that the low resolution mesh can be exported from ZBrush and the crisp edge will remain. Crisp edge loops are a truly cross-application edge weighting method!

- **Undo to return to the low resolution mesh.**

- **Repeat the process for the mouthpiece polygon and what will be the number plate on the back.**

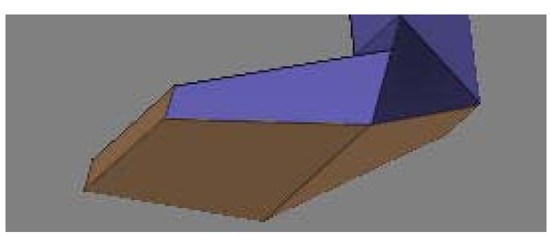


- **For the mouthpiece, use a regular Edge Loop followed by a Crisp one.**

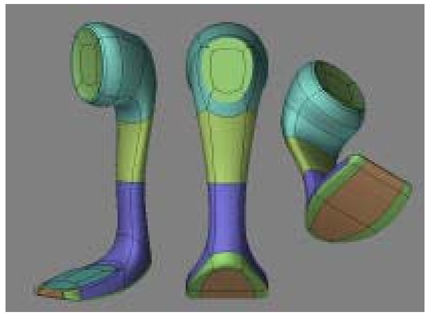


- **For the number plate, use just the Crisp loop.**

- **Also perform a Crisp loop on the three polygons making up the base of the mouthpiece area.**



- **Divide the mesh four times.**



The phone is now smoothed overall, but is also still sharp exactly where we want it to be.

- **Undo to remove the higher subdivision levels, and save this model as phone2.ztl.**

There's no point in wasting disk space by saving extra polygons when we can quickly add them later. In this state, the model is a mere 64 polygons, and could also be taken into another program for use in an animation.

In Conclusion

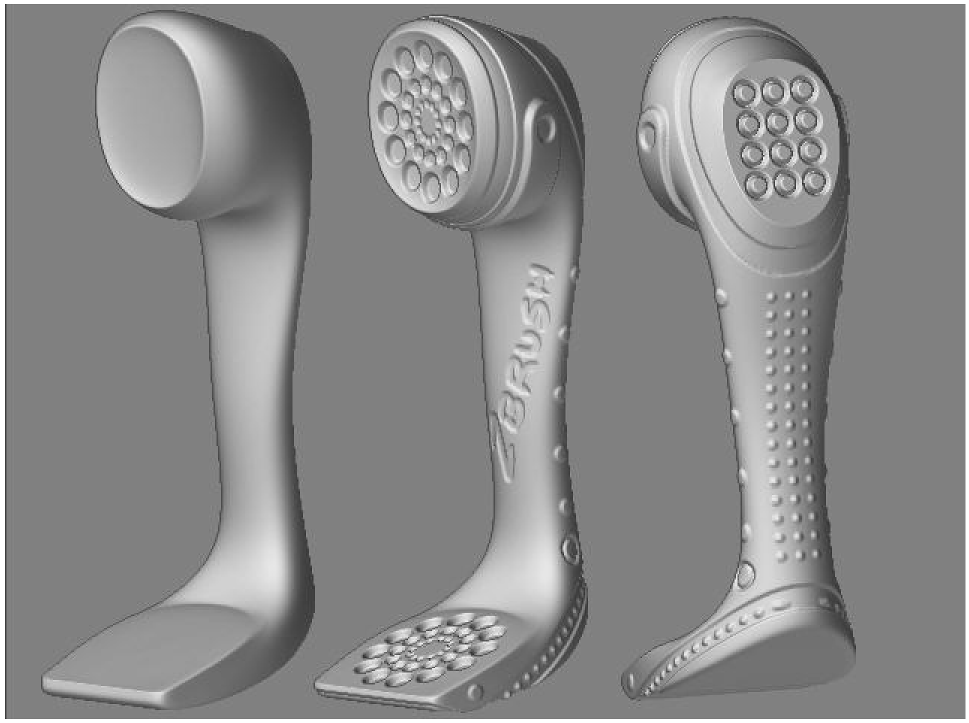
This section has given a brief introduction to one of ZBrush 2's advanced geometry tools – the Edge Loop. Combined with the partial mesh visibility controls, edge loops provide a very quick and simple way to modify your mesh on a polygonal level. When the Crisp modifier is activated, the result is an edge weighting system that controls subdivision smoothing in any application.

This section will be continued in Telephone Part 2, where we will use Projection Master to "sculpt" high resolution details. We'll finally conclude with Telephone Part 3, in which we'll generate displacement and normal maps.

> This tutorial is also available as the "Displacement Mapping Tutorial" ZScript, found in the Modeling 3D Objects\Displacement Maps chapter of the Help browser. Part 1 of that ZScript shows the original ZSphere modelling of the phone, while part 2 shows the material covered in this section of the manual.

Telephone Part 2 – Projection Master

Here we'll cover the use of Projection Master to paint displacements onto a high resolution mesh.



ZBrush 2's ability to work with exceptionally dense meshes in real time provides a powerful way to detail your models – whether they will be incorporated directly into a ZBrush scene, or ultimately used in an animation package. While the sculpting brushes found in the Transform palette provide a powerful way to freehand-sculpt details, they aren't sufficient for all purposes. This is where Projection Master comes in.

Projection Master provides a way to paint textures directly onto the surface of your models. It can also be used to paint depth-based details that will then be incorporated directly into the mesh via displacements. You can even paint texture and depth at the same time!

In this tutorial, we'll only deal with the displacement side of the equation, illustrating how Projection Master makes it possible to edit your meshes using any or all of ZBrush's brushes and 3D objects. Along the way, we'll explore the uses of alpha's, various stroke types, and even the ability to transform strokes after they have been painted.

Note: This chapter continues where Telephone Part 1 left off, and requires the model that was saved at the end of that section. If you have not yet worked through Part 1 (or at least run the associated ZScript and saved the tool at the end of it), please do so now.

- **Begin by loading the phone2.ztl file that you saved at the end of Part 1. Draw it on the canvas and enter Edit mode.**

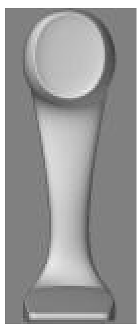
Helpful tip: Even as highly optimized as ZBrush is, it is still possible to reach a number of polygons that will make it hard for your computer to keep up. If you find ZBrush acting sluggish while you rotate the model, there are two things that you can do to speed up your workflow. First, press Shift+D a few times to go to a lower subdivision level, then D to return to the higher level once the model has been rotated into its new position. Lower subdivision levels are also an ideal time to hide parts of the mesh.

- **Divide the mesh several times until you have 7 subdivision levels.**

The model will now be comprised of 262,144 polygons, which is sufficient for our demonstration. When using Projection Master to paint mesh displacements, the quality of your work will be directly influenced by the size/number of polygons.

- **Turn off the Polyframe view by pressing Shift+F.**

- **Rotate the model so that it is squarely facing the camera and scale it to fit the screen.**



Remember that when the phone is close to the desired orientation, you can press Shift to snap it into position.

- **On the top shelf, press the Projection Master button.**

The Projection Master (PM) control panel will pop up. You can use this panel to tell ZBrush what you want to do.

❑ **Turn off Colors and Fade. Turn on Deformation.**

When settings are changed, the thumbnails next to the buttons update to show the effects of your changes.

❑ **Press the Drop Now button to drop the mesh onto the canvas, ready for projection painting.**

❑ **PM will display a note asking if you'd like to create a texture. Say yes.**

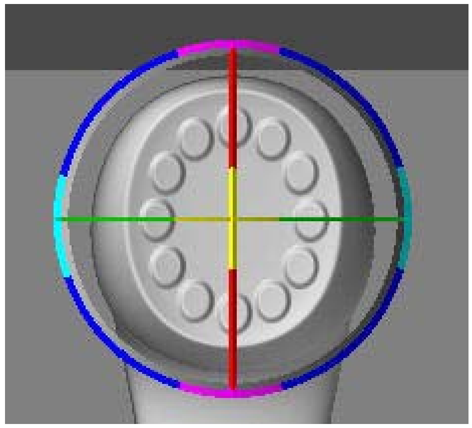
By default, when PM is first used in a session it selects the SingleLayer brush. That's perfect for our needs.

❑ **Select the Radial stroke type.**

❑ **Select Alpha 06 (a hard-edged circle).**

❑ **With a Draw Size of 32, draw a ring of dots on the earpiece.**

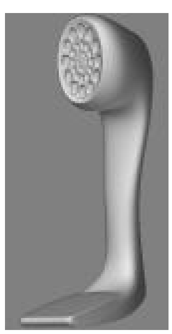
- **Use Scale and Move to position the ring as shown.**



- **Switch to Zsub and set Z Intensity to 50. Press Shift+S or use the Snapshot button on the right shelf to make an instance of the holes.**

- **Use Scale and Snapshot to add two more concentric rings.**

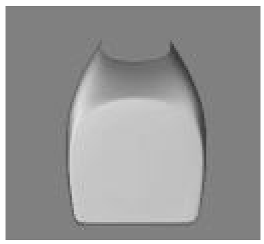
- **Activate Projection Master and press the Pick Up button.**



While the PM panel is showing, you have a final chance to change your settings. This is useful if you were planning to do one thing before dropping the model, but changed your mind and did something different while working with the dropped model. If you wish to skip the PM panel, simply press G to pick up the model. (This keyboard shortcut can also be used to drop the model.)

After pressing Pickup, the model will become editable again. At the same time, the depth that was just painted onto the dropped model is now incorporated into the actual geometry of the phone. You can clearly see this when you rotate the mesh.

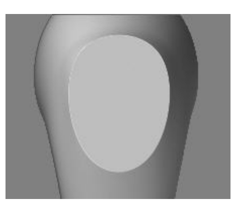
- **Hide all but the lower ¼ of the model, and then rotate it so that the mouthpiece area is squarely facing the camera.**



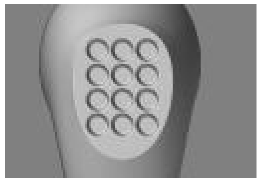
- **Repeat the Drop/paint/Pick Up steps to add another group of holes for the mouthpiece.**

- **Restore full visibility to the mesh.**

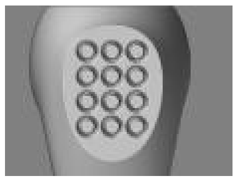
- **Rotate the model so that the number panel is squarely facing the camera. Drop the mesh again.**



- **This time using the Grid stroke with repeat settings of 3 x 4, add 12 indentations to the number pad.**



- **Snapshot them in place, then change to Zadd and a Z Intensity of 90. Modify the Draw Size to place buttons within the indentations.**



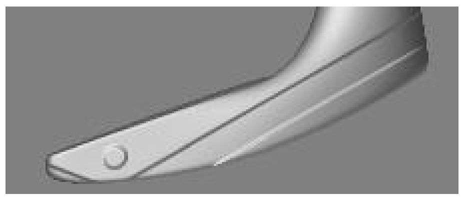
- **Use PM to pick the mesh up again, then rotate to a side view.**

- **Drop the mesh. Use the Line II stroke and Zsub to paint four lines onto the side – two for the base, and two for the ear/number pad area.**

Choose the Z Intensity that you like best as you go. Remember that you can transform your strokes after the fact to modify the Draw Size.

Any place that the line touches the side of the mesh, be sure to extend it past the sides. This even applies later when using Zadd. Projection Master will ignore anything that it doesn't need when the displacements are calculated, and going off the edges ensures a nice, uniform projection that wraps all the way around to the other side.

- **Using the DragRectangle stroke and Zadd with a Z Intensity of 27, paint a dot on the base.**



- **Snapshot the dot, then use the Move gyro to place more along the side of the handle.**

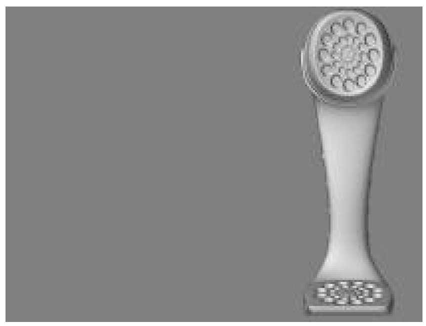
- **Switching between stroke types and Zadd/Zsub, add a few more details, as well (as shown above).**

- **Before picking the mesh up again, activate the Double Sided option in Projection Master.**

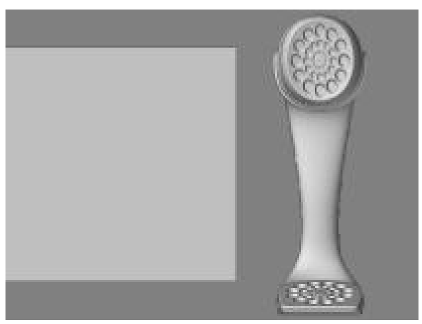
This tells ZBrush to apply the displacements to the back of the mesh (the side facing away from the camera), as well as the front. When a symmetrical model is positioned squarely along the axis of symmetry, Double Sided provides a quick and easy way to maintain the symmetry while using Projection Master.

At this point we can also easily see the effects of the Normalized option. Any place that our painting went off the edges of the mesh, the displacements wrapped nicely around to the opposite side.

- **Rotate the model so that it faces front again and move it off to one side of the canvas.**



- **Drop the model, and then draw a Plane3D to the left as shown.**



For the next step, we need a surface to paint on. The plane will provide that surface, and will be ignored by Projection Master when the phone is picked up again.

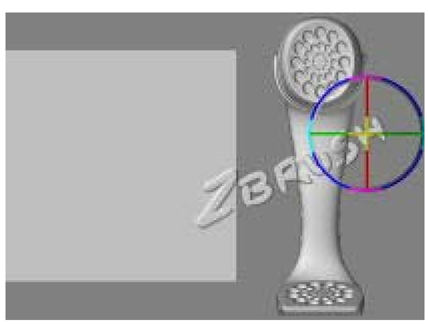
- **Using the PaintBrush tool and Zadd with a Draw Size of 14 and alpha 01, paint a Z on the plane.**

You can use Stroke>Mouse Avg to steady your hand and ensure that the letter turns out nice.

- **While holding down the Ctrl key, add "Brush".**

Ordinarily, only the last stroke drawn can be transformed. Holding the Ctrl key allows us to chain several strokes together so that they can be transformed as a unit.

- **Activate the Move gyro and move the word over onto the phone.**



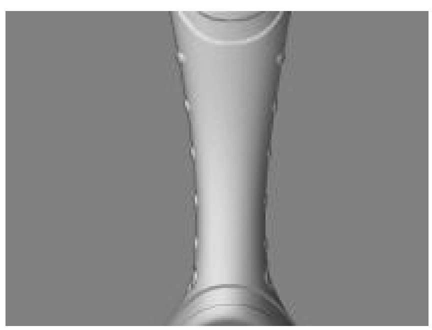
- **Rotate and scale the word into position, then switch to Zsub.**

- **If you're happy with the result, press Q to return to regular draw mode, which makes a snapshot of the word.**

- **Pick the mesh up again.**

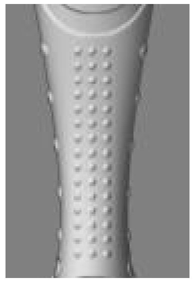
The plane will disappear from the canvas while the word is projected onto the phone.

- **Rotate the model so that the back is facing the camera, and drop it.**



Incidentally, it is not necessary to keep the entire model within the canvas when using Projection Master. Only the portion that you wish to work on needs to be visible.

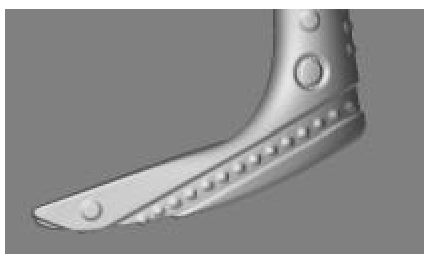
- **Use the Grid stroke and SingleLayer brush to add several rows of bumps on the back.**



In our example, we used an array of 3 x 15. Remember that while the gyro is active for transforming the stroke, you can also change the alpha that is being used, as well as the Draw Size and Z Intensity.

- **Pick up the model and rotate it to the side. Drop it again.**

- **Using the Line II stroke, add a row of dots.**



- **Pick up the model.**

- **You're done! Save the completed model as phone3.ztl so that you can use it for the final part of this tutorial.**

In Conclusion

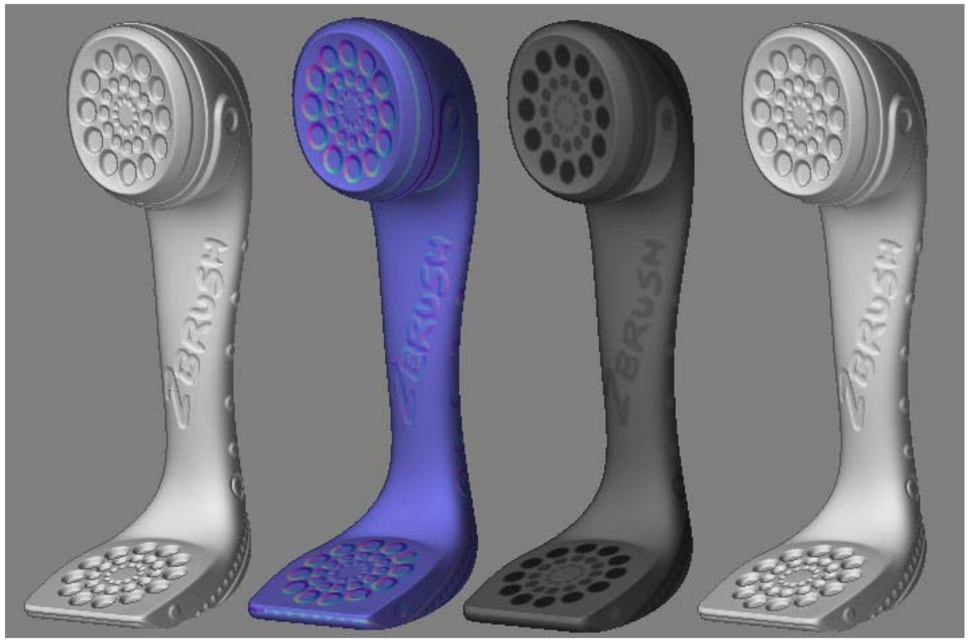
In this section we've tapped into the awesome power of Projection Master to sculpt a variety of high resolution details by simply painting them on using ZBrush's many tools and other features. This process makes it very easy to create details that would be extremely tedious – or even impossible – with traditional sculpting methods.

The final part of this tutorial will show how to compare this high resolution model to the original "cage" model in order to create displacement and/or normal maps. We'll also cover how to apply displacement maps within ZBrush.

This tutorial is also available as the "Displacement Mapping Tutorial" ZScript, found in the Modeling 3D Objects\Displacement Maps chapter of the Help browser. Part 3 of that tutorial shows the material covered in this section of the manual.

Telephone Part 3 – Difference Maps

This section concludes the telephone project by showing how to use ZBrush to process Displacement and Normal maps.



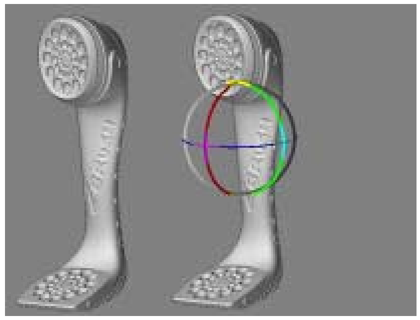
While ZBrush 2 is highly optimized to work with figures of up to ten million polygons, animation packages can't handle nearly that many. Also, real time game engines require extremely low numbers of polygons. ZBrush 2 provides the tools to compare your high resolution and low resolution models, and generate a difference map. Displacement maps can be used with many animation programs, while normal maps are useful in the game industry. Some animation packages can also combine displacement and normal maps.

This tutorial will not explain how to use these maps in your other software. You should consult your software's documentation for that information. Instead, we'll show you how to generate the maps. We'll also show you how the maps can be used in ZBrush.

It should be noted that there is no need to create difference maps if you'll be using the model in a ZBrush scene. ZBrush will incorporate the high resolution version as-is.

- **Begin by loading the phone3.ztl from the previous part of this tutorial.**

- **Draw it on the left side of the canvas, snapshot it, and then move another copy over to the right.**

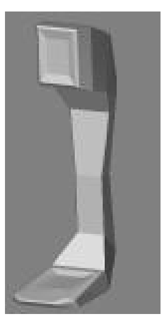


It is not necessary to have two copies on the canvas. We're simply doing that here for demonstration purposes, so that you can clearly see how similar the high resolution version is to the displaced low resolution version that we'll end with.

- **Press "T" to enter Edit mode.**

- **Lower the Sudivision level to 1.**

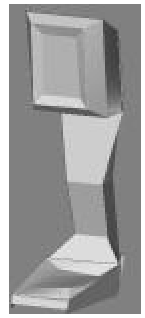
Sometimes you might want to use a different subdivision level. If you're using a model that is already being animated in another program, though, you will absolutely need to use level 1, however, so that is what we're going to show in this tutorial.



Here we see the model at level 1. If you remember what our original model looked like, it was quite a bit different. This is because ZBrush interpolates changes made at one subdivision level across the other levels. Under normal circumstances, that would be exactly what we want, but for making a difference map we need the original, unmodified mesh.

We have three options available. Let’s look at each of them in turn.

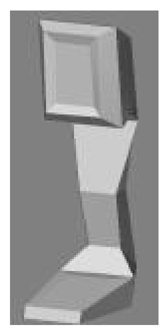
- **Press Tool>Geometry>Cage.**



This calculates a cage object that you could export to another program. This option is normally the least desirable of the three, however, and should only be used if neither of the next two is available to you.

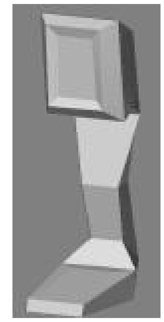
- **Turn off Cage.**

- **Press Load Tool and load the phone2.ztl model.**



By loading the original model back into subdivision level 1, the level is replaced by the original geometry. This is particularly useful in a production environment where your animation team has already begun working with a model and it cannot be changed.

The third option requires some pre-planning. While at subdivision level 1, before beginning the high resolution modelling, you would press Tool>Morph Target>StoreMT. This stores the unmodified low resolution geometry so that it can be retrieved later.



Now when you wish to reuse that geometry, you would simply press the Switch button to return to it. In fact, this technique is what you will see illustrated if you run the ZScript companion to this tutorial.

- **Set Texture>Width and Height to 1024. Press the New button.**

Displacement mapping requires that the mesh has properly-assigned UV coordinates. If it doesn't, you can apply any of ZBrush's mapping methods or export the base mesh to another application for mapping. When the mesh is imported back into subdivision level 1, the mapping will be retained.

Since this model does not already have mapping assigned, we'll do that now. To give the best quality mapping, you should first assign a texture to the mesh. The best sizes to use are powers of 2 such as 256x256, 512x512, 1024x1024, 2048x2048 or 4096x4096.

- **Press Texture>GUVTiles.**

GUVTiles is new to Z2, and is an automated mapping system designed to let you see details on the unwrapped map. Like AUVTiles, it is a virtually distortion-free mapping method. Since it unwraps the model in the largest polygon groups possible without introducing distortion, this mapping method has the advantage that you can often do some painting on the unwrapped texture should you need to.

If a texture is not already applied to the model when AUVTiles or GUVTiles is pressed, ZBrush assumes a size of 1024x1024. Since that is the size of our texture, it wasn't really necessary for us to assign a texture to this model, but it's good to get in the habit.

We're now ready to create our maps.

- **Set Tool>Displacement>DPRes to 2048.**
- **Activate Adaptive and SmoothUV, if you wish.**

These are not necessary in our example, but are important to use if any of your sculpting has used the Nudge or Pinch editing brushes from the Transform palette. It takes slightly longer to calculate than a map created without it.

- **Click the Create DispMap button.**

The new map will be added to the Alpha palette.

- **Open the Tool>NormalMap menu and activate Tangent.**

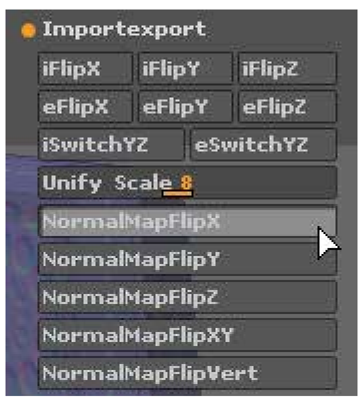
Again, Adaptive and SmoothUV may also be activated.

- **Set NMRes to 2048.**

❑ **Click CreateNormalMap.**

The normal map will be generated, added to the Texture palette, and assigned to the model.

ZBrush provides a variety of options for normal maps, to accommodate your particular rendering engine. For example, if the Tangent switch had not been activated, then the map would have been calculated for World space instead.



Also, the Preferences>Importexport menu contains five switches for flipping maps when their generated. Use these to make sure that ZBrush's maps match your rendering engine's needs.

If you're going to be using another program to render your model, then you'd now be done!

❑ **Press Texture>Export to export the normal map if you need it.**

You have a choice of formats, including BMP, PSD, TIFF, and (for Mac users) PICT.

- **Select the displacement map from the alpha popup menu.**

The popup is structured so that your custom content appears in a separate section beneath the other thumbnails.

- **Export the alpha.**

That's all there is to creating difference maps for use in other programs! The rest of this section will show how to use a displacement map in ZBrush.

If ZBrush 2 can work with extremely dense models, why would you wish to use displacement maps? Well, there are a few reasons. Maybe you are importing a displacement-mapped model from another program for use in a ZBrush scene. Maybe you wish to refine a map that you've already created. Or maybe you simply wish to conserve disk space, and so prefer to only keep the low resolution versions of your models, with their displacement maps. Along the same lines, you might have a friend who wishes to share his model with you; it's easier to send a level 1 model with a displacement map than a level 7 model.

Whatever your reasons, ZBrush provides an easy way to use displacement maps, which we'll cover here:

- **If you would like to see what the alpha looks like on the model, press Alpha>Make Tx.**

The new texture will automatically be applied to the model. There's not really a need to do this, but sometimes it's nice to see.

- **Press Texture>Clear.**

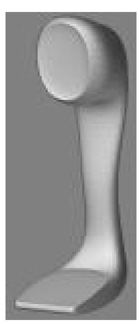
In order for a displacement map to be viewed in ZBrush, the model must have a texture assigned to it. We've cleared the texture because we wish to demonstrate how displacements alone can allow a low resolution model to match its high resolution "brother."

- **Press Tool>Geometry>Del Higher.**

We now have the exact model that you would be working with if you'd imported it from another program or were starting fresh without having saved the high resolution version.

In other programs, you'd use this model as a subdivision surface. The cage object would then appear to have more polygons than it really does. We need to simulate that effect.

- **Press Tool>Geometry>Divide three times.**



The model is now comprised of 4096 polygons, which is probably equal to what an animation package would use.

❑ **Make sure that the displacement map is the current alpha.**

❑ **Turn off Quick 3D Edit.**

ZBrush's displacement rendering requires render-time mesh smoothing, which is disabled by Quick mode.

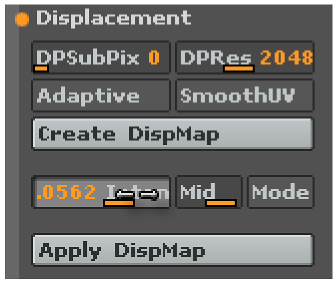
❑ **Set Tool>Display Properties>DSmooth to 1.**

This activates render smoothing. Each of the polygons is divided a few times when the model is rendered. How many times is determined by the Dres setting.

❑ **Note the value of the Alpha Depth Factor slider, found at the bottom of the Alpha palette.**

In this case, the value is .0562. This number will only have relevance if the displacement map was created by ZBrush. For maps imported from other applications, you'd have to experiment to find the correct value to use in our next step:

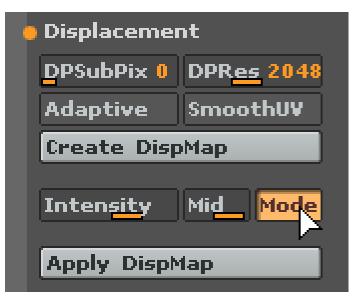
❑ **Back in the Tool>Displacement menu, set Intensity to the Alpha Depth Factor value.**

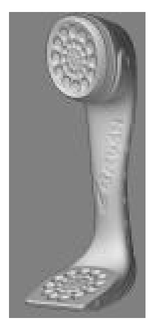


This slider tells ZBrush how strongly to apply the map. At the moment, it's only being applied as a bump map, however. This means that pixols are only being displaced along the world Z axis. This changes the appearance of the model, but does not change its profile.

In short, ZBrush 2 offers two ways to add bump to your models. The first is the Color Bump material modifier, already familiar to experienced ZBrush users. Alternatively, a bump map can be used that will operate independently from the model's colors or texture. This lends even greater realism to your work.

❑ **Also in the Displacement menu, activate the Mode switch.**





This switches ZBrush from rendering the displacement map as bump to full displacement.

If you look closely at the model, you will see that the quality of the displacements is good, but not perfect. This is because the number of rendered polygons is still lower than the high resolution model that was used to create the map. It's also easy to compensate for.

- **Set Tool>Display Properties>DRes to 6.**

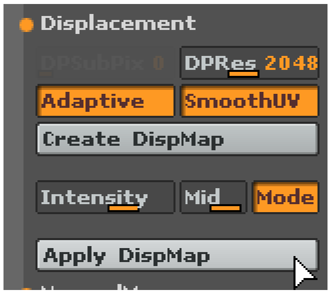
This subdivides the mesh a few more times at render time, resulting in a finished render that is almost indistinguishable from the high resolution model.

Obviously, what you're seeing here is a render-time effect applied to a low resolution model. What if you wanted to continue to sculpt this model as a high resolution figure? After all, every time you click on the model, the smoothing is deactivated and the displacement effect along with it.

- **Divide the mesh three more times to reach subdivision level 7.**

The model is now comprised of as many polygons as the original high resolution version.

- **Click Tool>Displacement>Apply DispMap.**



This button converts the details created by the displacement effect back into being a part of the actual mesh. It's sort of like applying Projection Master to your entire model, all at once. It also sets the displacement intensity back to 0, but your mesh will not appear to change.

- **Activate Quick 3D Edit again.**

This turns off all smoothing. Your mesh still looks exactly like the high resolution version still on the left side of the canvas. The displacement map has been applied as actual geometry, and you can now continue to sculpt on the mesh or use Projection Master, just as if you'd never gone through the displacement process to begin with.

In Conclusion

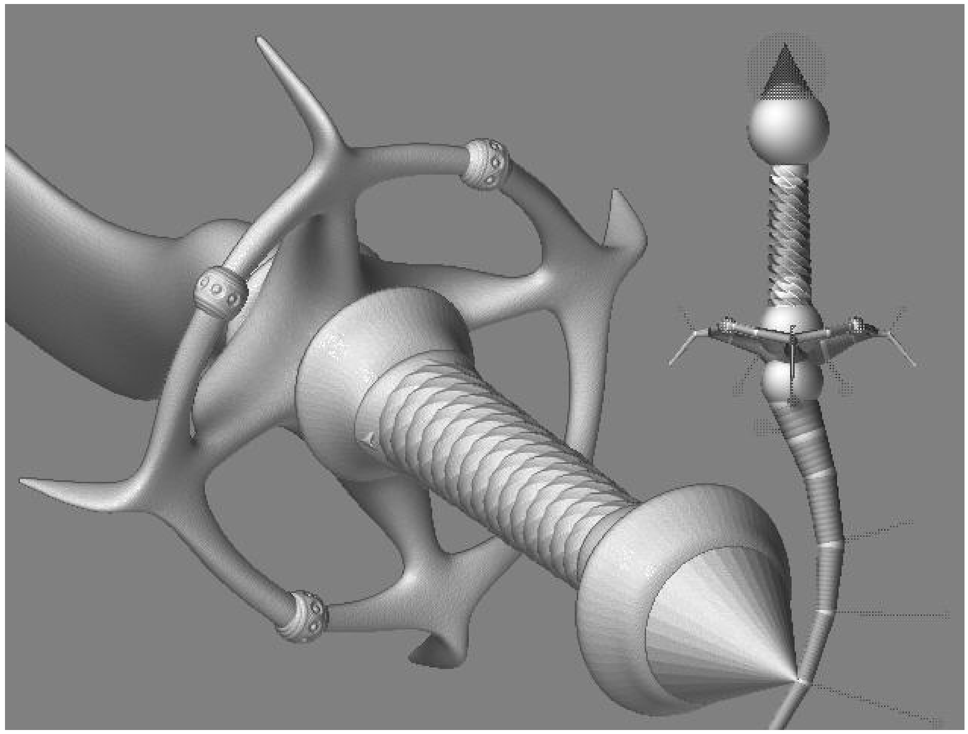
ZBrush 2 provides an incredibly fast and efficient method to create high resolution versions of your models and generate difference maps from them. This technique eliminates the need to create and scan clay sculptures in order to create high quality maps, thus saving tremendous time and money.

Modifiers are available to fit the needs of your rendering software. In addition, ZBrush 2 can not only render displacement maps, but can actually transform their detail back into being a part of the high resolution mesh. This makes it possible to edit the high resolution model further, and provides an alternative to having to fill up hard drive space by always saving the high resolution version of your models.

This tutorial is also available as the "Displacement Mapping Tutorial" ZScript, found in the Modeling 3D Objects\Displacement Maps chapter of the Help browser. Part 4 of that tutorial shows the material covered in this section of the manual.

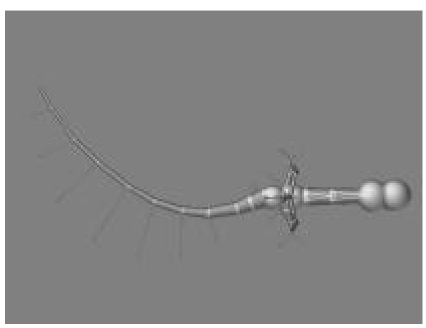
ZSphere Insertions

ZBrush 2 provides ways to insert other meshes into a ZSphere figure. This provides yet another way to easily build complex figures from simpler parts.



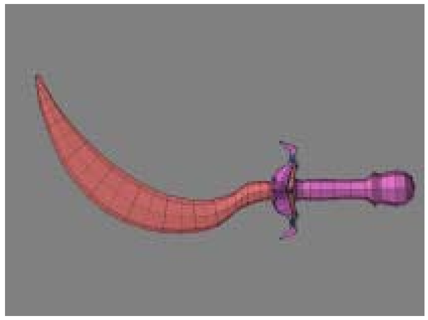
In this section, we'll work on a ZSphere model of a scimitar. While the overall shape has been defined by the ZSpheres, and it would be a relatively simple matter to sculpt certain details into the skinned mesh, Z2 offers a different method. What we will do is create a few elements from primitives, then insert them into the ZSphere figure.

- **Begin by loading the Scimitar.ztl from the manual resources folder, and draw it on the canvas.**



This figure uses a combination of regular ZSpheres to build the base shape, which is then modified by Attractor ZSpheres to pull the mesh in places (such as to create the blade).

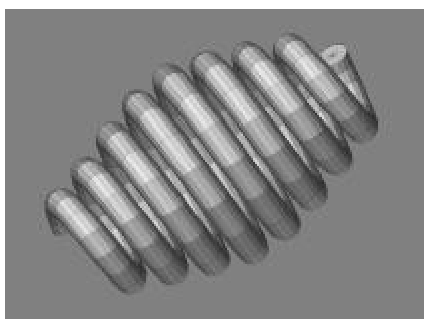
- **While in Edit mode, press A on the keyboard to preview the mesh.**



This is what we'd get if we simply skinned the mesh right now. What we'd like to do though is create a fancier hilt and details for the hand guard.

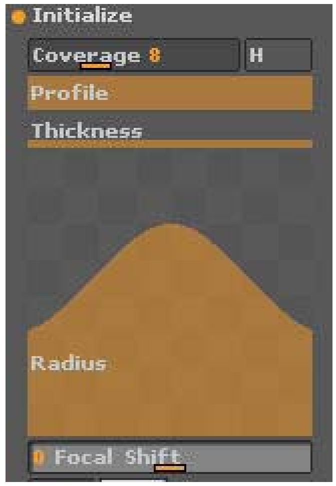
- **Press A again to deactivate the preview. Exit Edit mode, and clear the canvas.**

- **Select the Helix3D tool and draw it on the canvas. Enter Edit mode.**



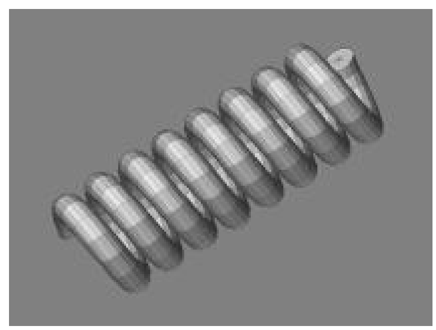
We're going to use this tool to create a hilt.

In the Initialize menu, open the Radius curve.

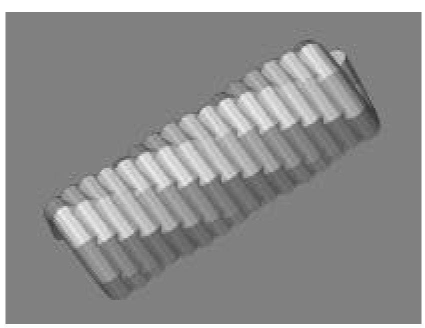


This curve is what causes the bulge in the middle of the helix.

- **Remove the center point.**

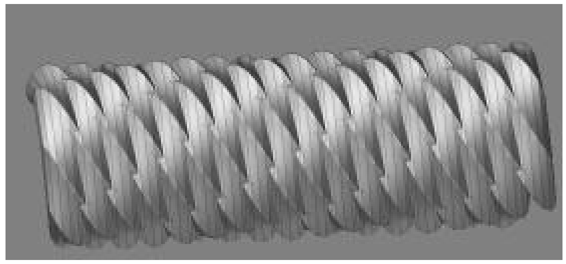


- **Change Coverage to 16.**



The path of the helix now makes 16 rotations rather than 8 along the same length. This packs them more tightly and creates and interesting "wrapped" effect.

- **Apply a Twist deformation three times at a value of -100.**



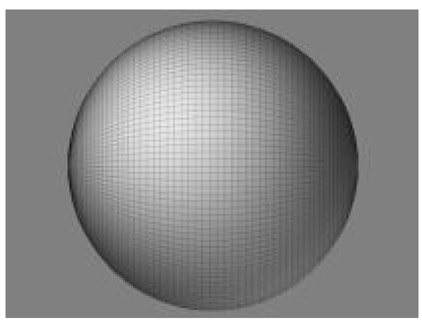
We now have what looks like very intricate wrapping with leather or cord.

- **Save the model as Hilt.ztl**

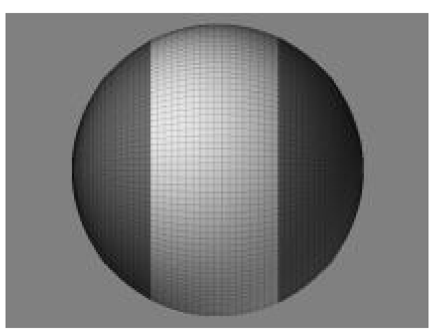
Our hilt is now complete.

- **Draw another Sphere3D and enter Edit mode.**

- **Rotate it so that the poles are to the left and right.**



Hold down the Ctrl key and drag two rectangles to mask the poles.

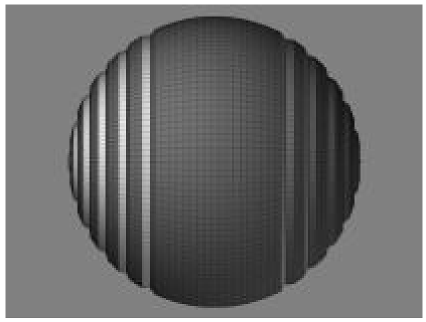


- **Press Masking>Create Alpha to store this mask.**

We'll want to return to the unmodified mask later. Rather than trying to exactly duplicate it by hand, it's much easier to turn it into an alpha.

- **Also in the Masking menu, set Sel to 3 and Skp to 1. Press Row, then Inverse.**

- **Apply an Inflat deformation at -20.**



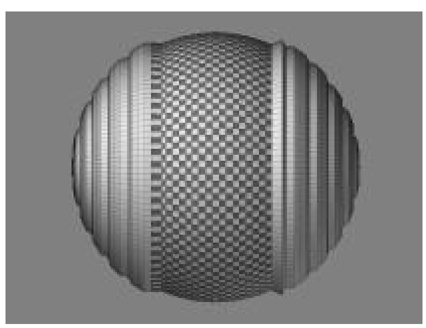
- **Press Masking>Alp to apply the currently selected alpha as a mask.**

This is the alpha that we just created a few steps ago.

- **Apply Inflat at -50.**

- **Invert the mask.**

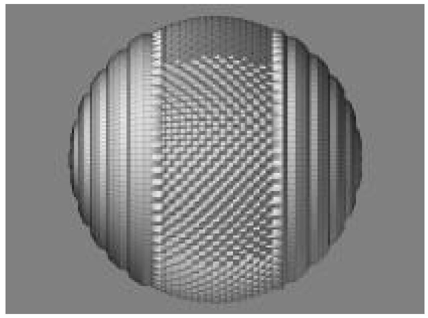
- **Set Sel to 1, then press Grd.**



This creates a checker pattern.

- **Invert the mask again, then do a Size XY deformation with a value of 5.**

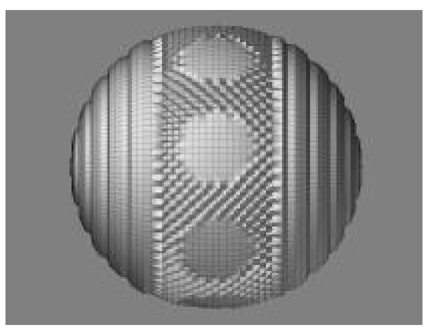
- **Clear the mask.**



- **Activate Transform>Z to turn on symmetry along the Z axis, then press R to make it radial.**

The default RadialCount of 8 will work fine.

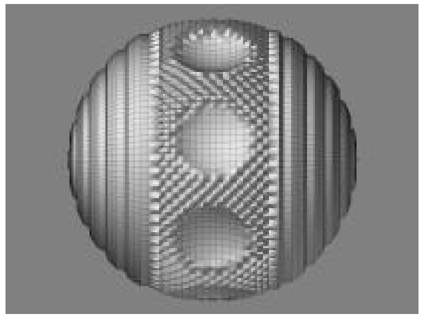
- **Activate Transform>Smooth.**
- **Set the Draw Size to 60.**
- **Smooth out a portion of the mesh around the equator.**



Due to symmetry, you'll get 8 small patches, equally spaced.

- **Change to Transform>StdDot.**
- **On the top shelf, change Focal Shift to -60. Activate Zsub, and change the Z Intensity to 100.**

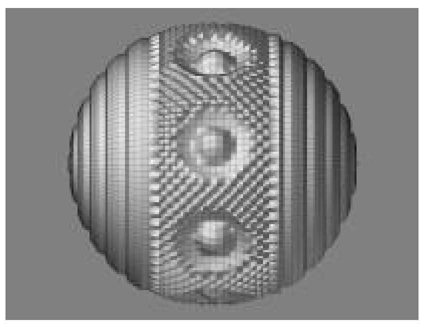
❑ **Click on the sphere and drag your indentation to the center of the smoothed area.**



The great thing about StdDot is that you are able to place your edit with great precision.

❑ **Change to Zadd and a Draw Size of 30.**

❑ **Place a dot in the center of each indentation.**



❑ **Save your model as Bead.ztl.**

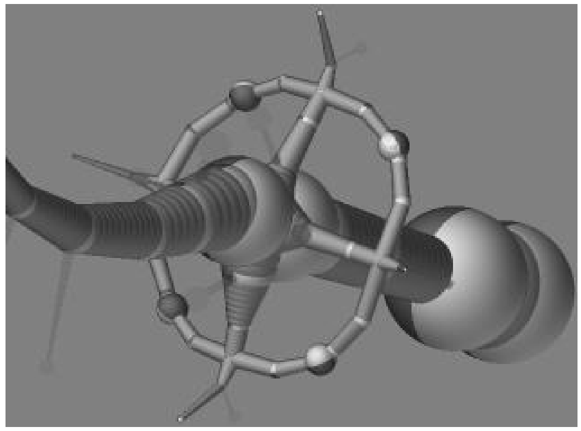
Now that we've finished the various elements that will be incorporated into the scimitar, we're ready to return to the ZSphere model.

❑ **Draw the scimitar on the canvas and enter Edit mode.**

❑ **Make sure to set the Focal Shift back to 0. Also, since we're working with ZSpheres change the Draw Size to 1.**

❑ **Press X and Y on the keyboard to activate XY symmetry.**

- **Place your model so that you can easily see the basket.**

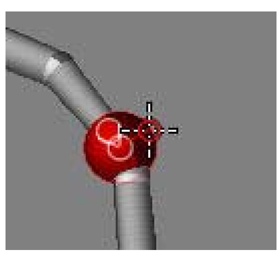


What we want to do is replace the four beads along the edge of the basket with our Bead.ztl model.

- **Press W to switch to Move mode.**

This allows us to select an individual ZSphere by clicking on it, rather than adding a new ZSphere to the model.

- **Move the pointer close to one of the beads. When a red circle outlines the ZSphere that you want, click once to select it.**

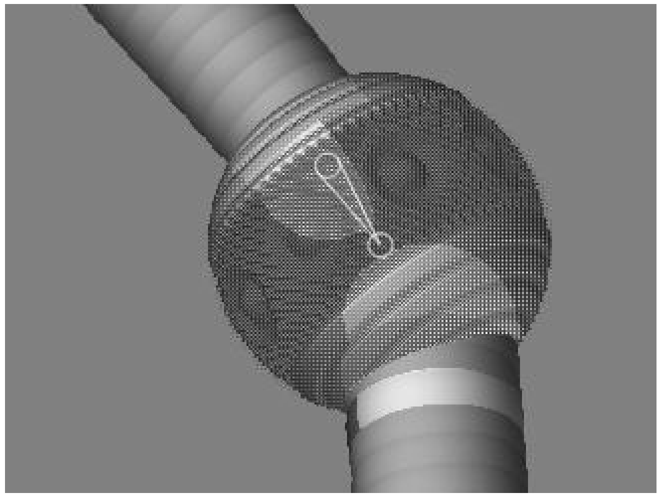


The selected ZSphere will turn red.

- **Press Tool>Adaptive Skin>Insert Local Mesh.**

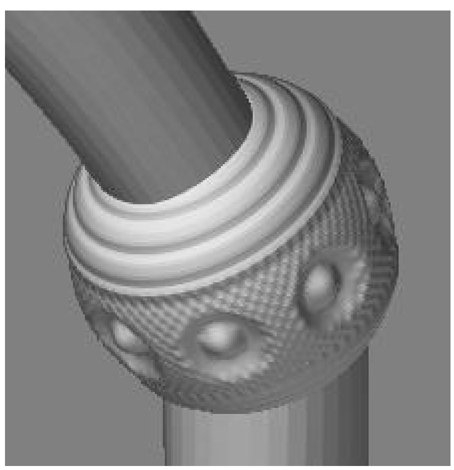
You’ll be given a popup menu that contains all of the currently-available 3D objects.

- **Select the Bead.ztl model.**



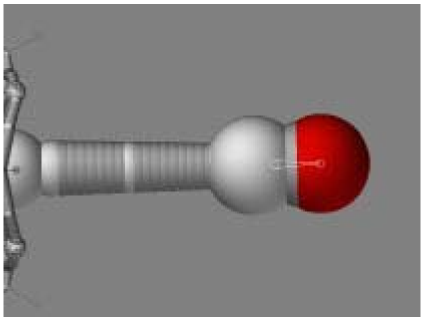
The selected ZSphere is immediately replaced by the model. The bead will be oriented so that its Z axis passes through the ZSphere’s Z axis (the line connecting the ZSphere to its parent.

You can now move, scale and rotate the inserted mesh just as you would any ZSphere.

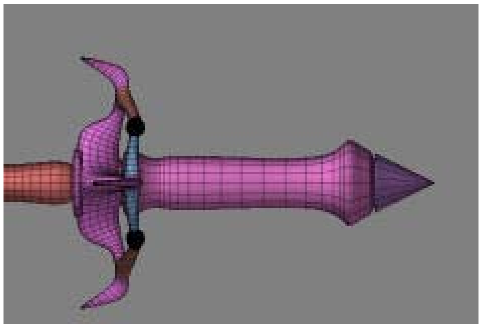


Here is a preview of the model with the inserted mesh.

- **Select the pommel ZSphere.**

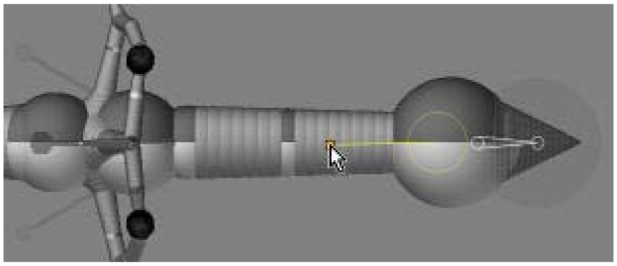


- **Insert another local mesh, this time selecting the Cone3D primitive. Preview the mesh.**



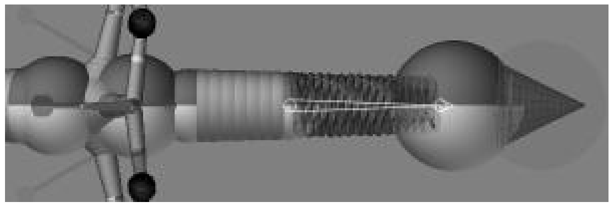
Each inserted mesh is given its own group. This will make it easy later to select just this part if we wish to further modify it after the model has been skinned.

- **Point to the linking spheres in the second hilt segment.**



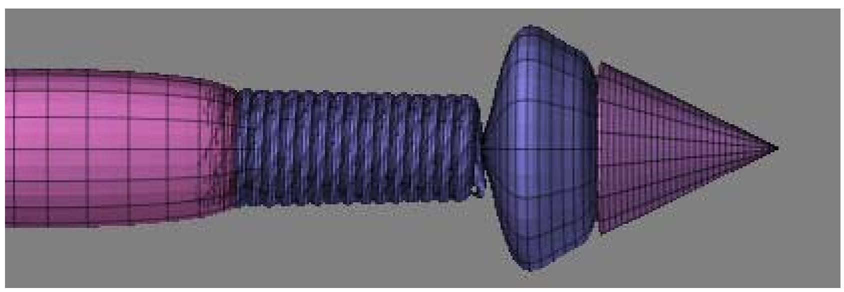
There will be an orange square at the pointer, to indicate that you're about to affect a linking sphere. There is also a yellow line going from the pointer to a yellow circle. This is meant to point out the ZSphere that will be selected if you click the mouse. This is extremely useful in instances like now, because the ZSphere that we wish to select is inside another one!

- **Click to select this ZSphere.**
- **Click Tool>Adaptive Skin>Insert Connector Mesh.**
- **Select the Hilt.ztl object.**



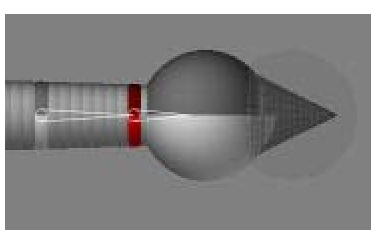
The Insert Connector Mesh option allows to insert a model into the selected span of linking spheres. It stops at the next ZSphere, which in this case gets us only halfway up the hilt.

- **Preview the mesh.**

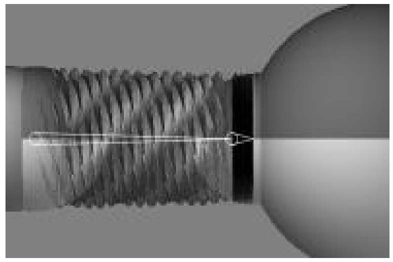


There is a problem where the hilt joins to the pommel. This is easily resolved by changing the ZSphere structure slightly.

- **Turn off the preview, then press Ctrl+Z to undo the mesh insertion.**
- **Add another ZSphere along the chain of linking spheres.**

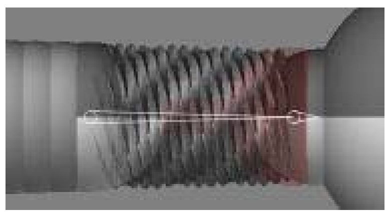


- **Insert your connector mesh.**

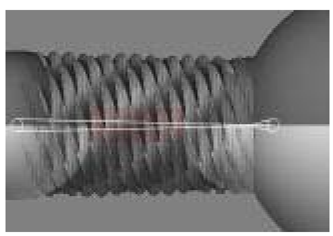


You'll actually get two copies of it inserted – one on either side of the selected ZSphere.

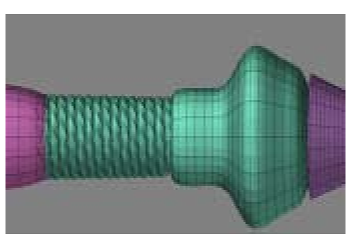
- **Delete that second one by switching to draw mode and Alt+clicking on it.**



- **Now move the ZSphere forming the end of the connecting mesh up into the large ZSphere.**

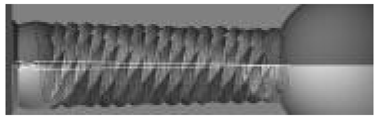


The connector mesh will overlap the smaller ZSphere that is still there.



The preview should look something like what you see above.

- **Delete ZSphere halfway along the hilt by switching to draw mode and Alt+clicking on it.**

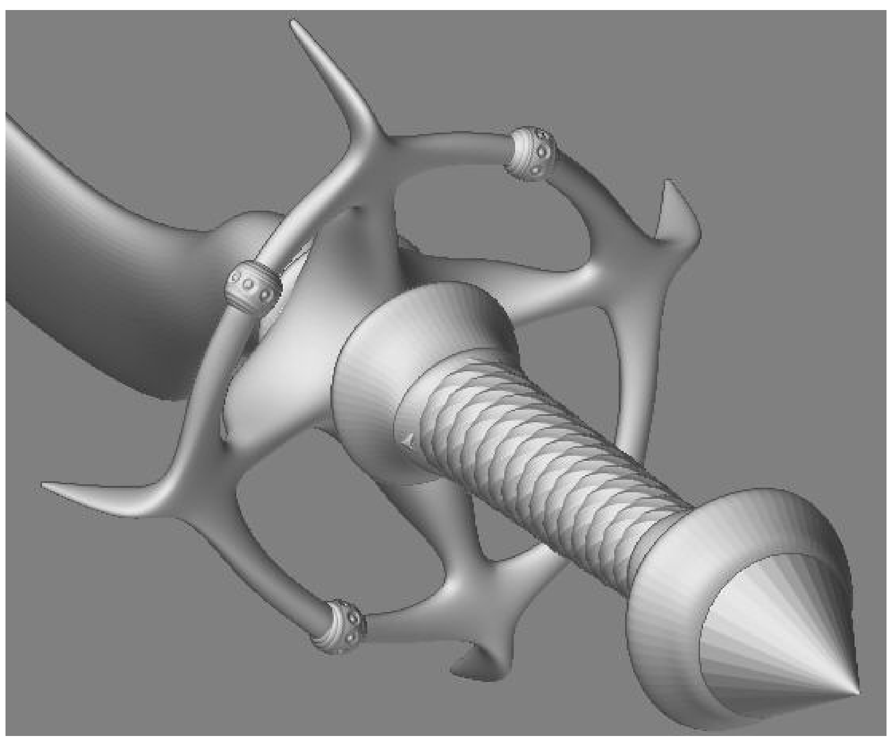


This extends the connector mesh along the length of the hilt.

Now all that's left is to clean things up a bit. You can do this by resizing the hilt ZSpheres a bit so that the inserted mesh is more proportional to the rest of the model.

One thing that you may notice is that the inserted meshes have a much higher resolution than the parts created by ZSpheres. The pre-divide feature is meant to compensate for this.

- **Set Tool>Adaptive Skin>Pd to 3.**
- **Preview the mesh.**



The pre-divide feature does not modify the density of the inserted meshes. It only increases the density of the parts specifically created by ZSpheres.

In Conclusion

ZSpheres – already a powerful modelling tool before ZBrush 2 – have been made even more versatile by including the ability to insert meshes that replace either ZSpheres or linking spheres. Any 3D object can be inserted into your mesh; even imported meshes or skins created by other ZSpheres. Once inserted, each mesh can be modified as if it was a part of the ZSphere structure. This includes rotating, scaling and moving models.

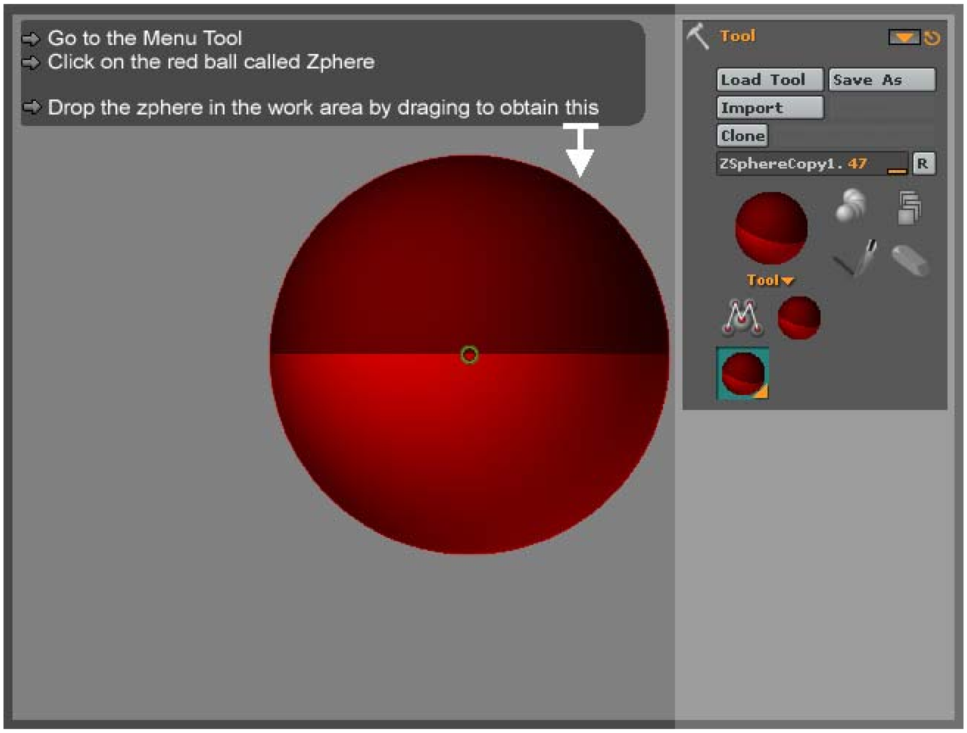
For a ZScript tutorial on this subject, activate the Help browser and go to the Modeling 3D Objects\ZSpheres: Adaptive Skinning section. Run the ZSphere Insert Meshes tutorial found at the bottom.

Warrior Part 1 - ZSpheres

By J.S. Rolhion

In this section, we'll use ZSpheres to create a base mesh that will be refined in the following sections.

- **If this is not a fresh ZBrush session, initialize ZBrush (Preferences>Init ZBrush).**
- **Select the ZSphere tool.**
- **Holding down the Shift key, draw the ZSphere on the canvas.**



By holding down the Shift key, you constrain ZBrush to draw the object "squarely" on the canvas. It will be oriented so that X is perfectly horizontal, Y is vertical, and Z is directly facing the camera.

- **Press Transform>Edit Object.**

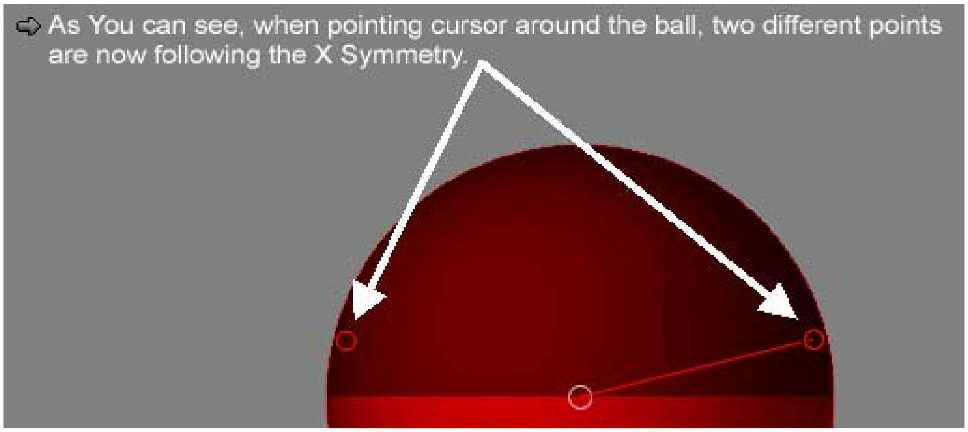
This allows you to sculpt the most recently drawn object – in this case, the ZSphere.

- **Press S and change the Draw Size to 1.**

This step is very important when working with ZSpheres. Larger draw sizes can cause you to affect more than one ZSphere at a time, which is usually undesirable.

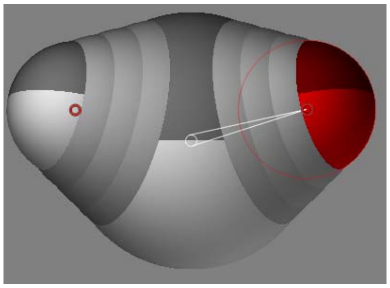
- **Also in the Transform palette, click on X Symmetry.**

Now all edits made to one side of the model will be duplicated on the other side.



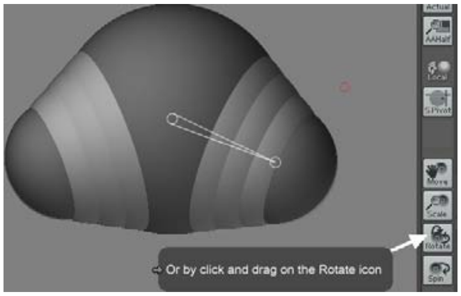
The small circles indicate the future positions of ZSpheres. They turn green when the positioning is ideal, but that is not always important. Don't worry about it for the purposes of this tutorial. Also, the red line is drawn from your pointer's position to the center of the ZSphere that would be affected by clicking at the pointer's current location.

- **Click and drag to add two new ZSpheres as shown:**



The red ZSphere is the one that you actually draw, while symmetry also draws an identical ZSphere on the other side. White lines show the parent/child relationships for the currently-selected (red) ZSphere.

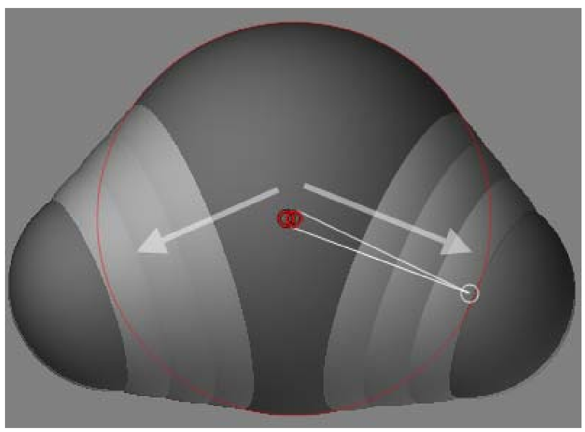
- **Rotate the object by clicking and dragging on a blank part of the canvas.**



❑ **Switch to Edit>Move mode.**

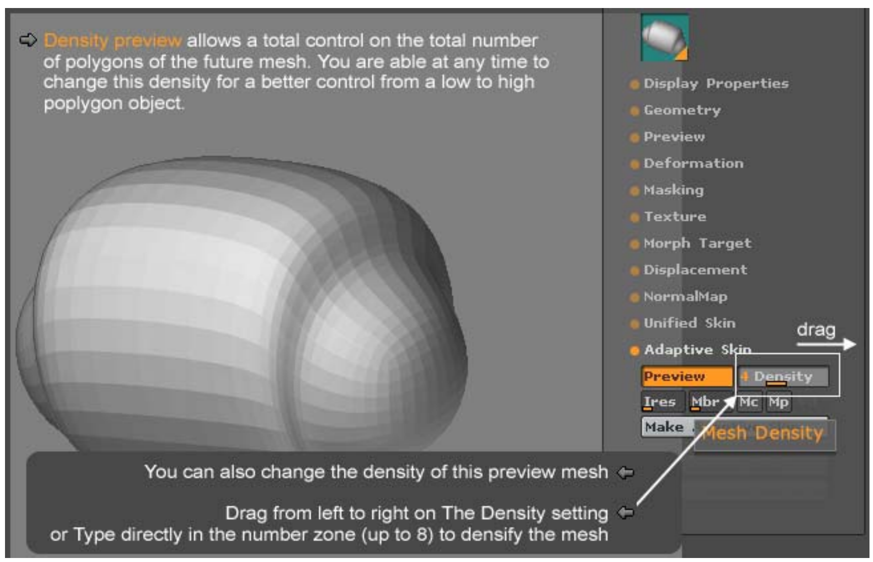
The keyboard shortcut for this is W.

❑ **Click and drag on the new ZSphere to move it slightly away from its parent.**



❑ **Activate the mesh preview by pressing A.**

- **Change Tool>Adaptive Skin>Density to 4.**



This greatly increases the number of polygons in the preview mesh. It also increases the number of subdivision levels that a skin created from this model would have. Density of 4 means that the skin would have 4 subdivision levels.

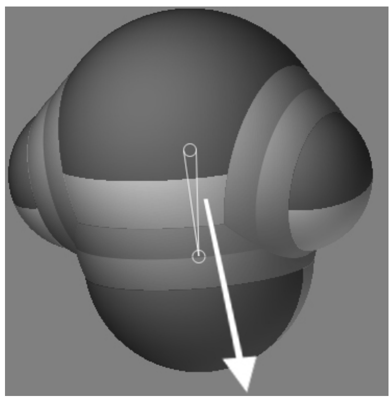
- **If the preview looks like the image above, your ZSpheres are positioned correctly. If not, adjust them as needed by pressing A, moving ZSpheres, and then reactivating the preview until the mesh looks correct.**

- ❑ **Press A to return to the ZSphere view.**

- ❑ **Activate Edit>Draw mode by clicking on the Draw Pointer button or pressing Q.**

You must be in Draw mode to add ZSpheres to the model.

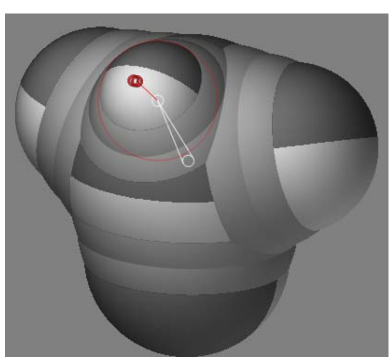
- ❑ **Create a new ZSphere for the armor's torso.**



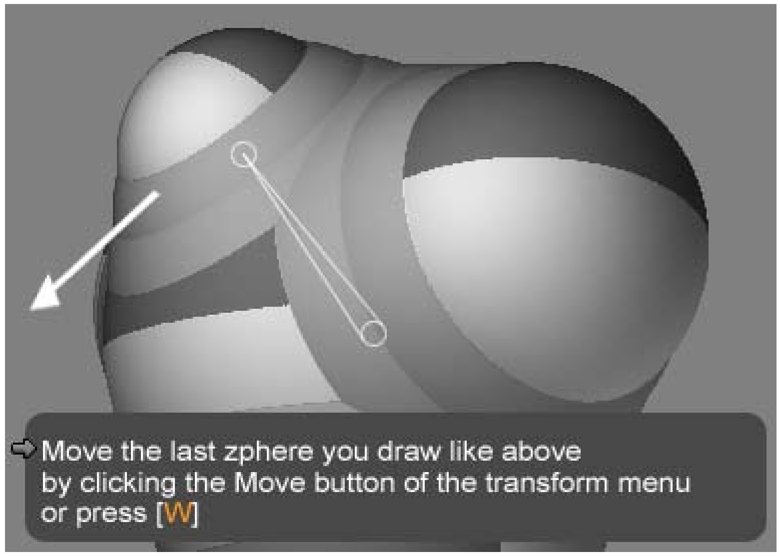
To draw a single ZSphere, move your pointer so that the two red circles overlap. When they become one circle, this indicates that a single ZSphere will be created, exactly centered along the model's axis.

For this ZSphere, try to get the circle to turn green before you click and drag.

- ❑ **Create another small ZSphere for the neck.**



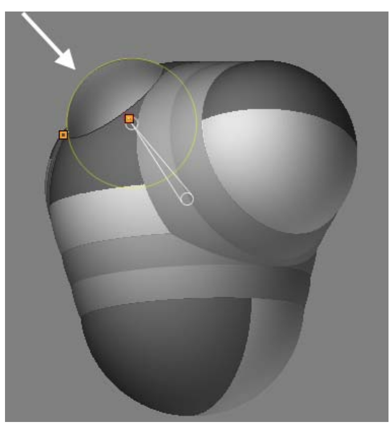
- **Move the ZSphere slightly forward of center.**



You can try different moves and then see the result by pressing A to activate the preview.

To help get the proper positioning, don't hesitate to rotate your model. You will often find that it is beneficial to work from one of the "planar" views. Rotate the object so that it is close to the planar orientation, then hold down the Shift key to snap it into position.

- **Move the neck ZSphere into the main structure. You'll know that its position is correct when it becomes semi-transparent.**

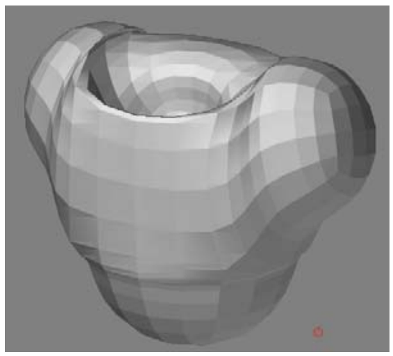


When a ZSphere is inset into its parent, its effect on the mesh changes. Instead of adding to the mesh's mass, it creates an indentation.

- Activate the preview, then set the density to 3.

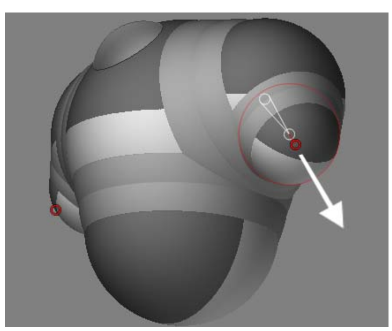
While ZSphere meshes can be created with any density up to 8, lower numbers of polygons are usually better, as they allow broader-scale control over your mesh.

Your preview should be close to this:

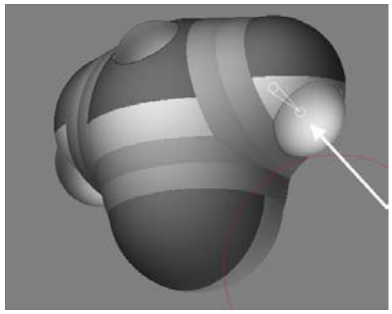


- When satisfied, deactivate the preview and then return to Edit>Draw mode so that more ZSpheres can be added.

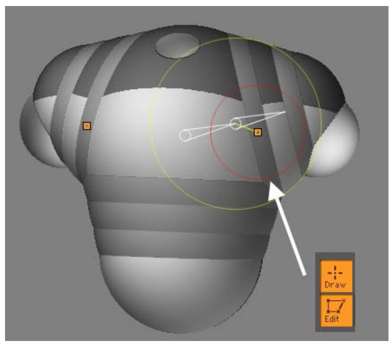
- Draw arm ZSpheres from the base of the shoulders.



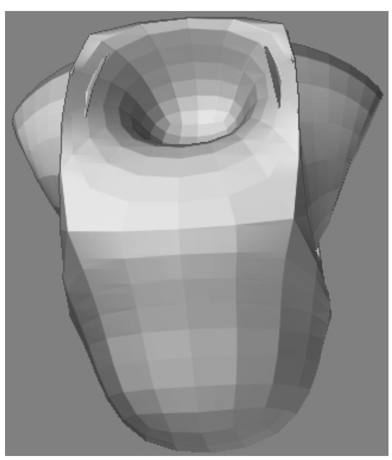
❑ **Like with the neck, press W to switch to Move mode and then inset these new ZSpheres into their parents.**



❑ **Return to Draw mode. Click on the first linking sphere connecting the chest ZSphere to the shoulder.**



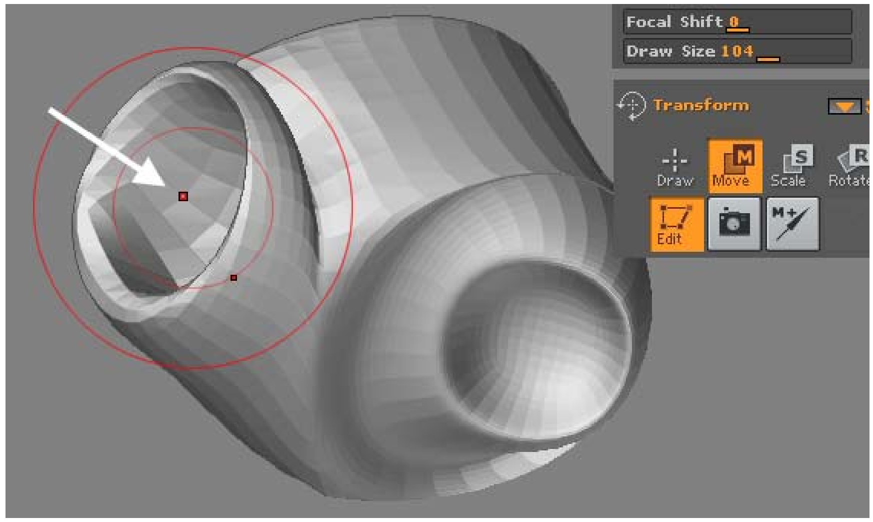
Clicking on a linking sphere while in Edit>Draw mode converts it into a ZSphere. By adding a new ZSphere so close to its parent and child, we force a crease to appear in the mesh as shown:



❑ **With the preview active, change to Move mode.**

❑ **Increase your Draw Size to about 100. The cursor should be slightly larger than the waist ZSphere.**

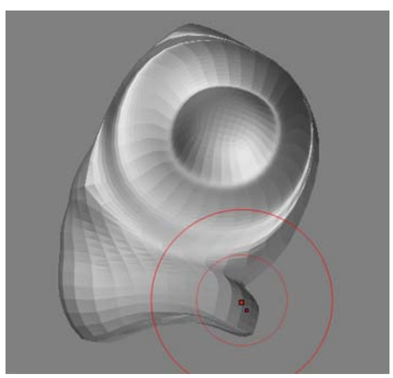
❑ **Click on the bottom of the mesh and drag to move the center polygons up inside of the figure.**



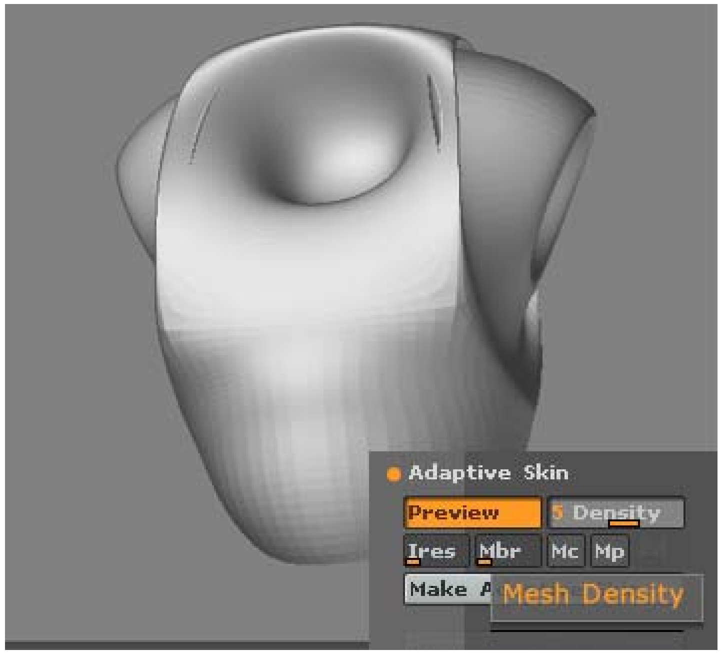
There are other ways that you could achieve this same result, such as by adding another inset ZSphere. We're using this technique instead to show that you can sculpt the preview mesh, even without skinning the model.

While the preview mesh can be sculpted, it is important not to do so until you are sure that you will not be adding additional ZSpheres or otherwise changing the structure of the ZSphere figure. If you were to make a change to the ZSphere structure that caused the number of vertices in the preview to change, your sculpting would be lost.

❑ **Rotate to a side view and refine the shape further.**



❑ **Now increase the mesh density to a value of 5.**



Now that the basic shape of the mesh is finished, it's ok to add more polygons to it. This will allow finer detail to be created in the next section.

- **Press Tool>Save As and save your model as ArmorPart1.ztl**

In Conclusion

ZSpheres provide a very fast and easy way to create a wide variety of shapes. All you need to do is block out the shape that you want by creating a skeleton of linked ZSpheres, and ZBrush will then create a nicely-organized mesh around the structure. You can preview this mesh at any time, and even sculpt the preview on a polygonal level. For more information on ZSphere modeling, including the use of Attractors (magnet ZSpheres), be sure to review the ZScript documentation and tutorials included with ZBrush.

In the next section, we will add details to the armor using the mesh-level editing tools that are at our disposal.

Warrior Part 2 - Sculpting

By J.S. Rolhion

In this section, we will explore ZBrush 2's new editing tools to further refine the shape of our mesh.

The Transform Brushes provide a really powerful way to obtain precise results when adding details to a mesh figure. You'll find them in the Transform palette.

Std is the Standard brush. It moves points away from the surface along a single direction. This direction is determined by the surface normal at the center of the brush's area of influence.

StdDot is similar to the Std brush, except that it only draws a single "bump." This bump can be dragged across the surface until you are satisfied with its position.

Inflat has an effect that can be very similar to Std, or very different depending on where you use it. Every point within the brush's area of effect is moved according to its own normal. On mostly flat areas, this effect is indistinguishable from Std, but in places where the polygons have very different orientations this brush has the effect of infating the edited area.

IflatDot allows precise placement of an inflated bulge by allowing you to drag the inflated area around before releasing the mouse.

Layer raises the polygons in a single hard-edged layer. The effect is similar to the Single Layer tool when painting in 2.5D, but works on a fully 3D polygonal level.

Pinch pulls nearby polygons toward the center of the edited area. This is very useful for creating creases or sharpening edges.

Nudge pushes vertices along the object's surface. This is useful for refining edge loops and the overall "flow" of polygons.

Smooth is used to soften edits that have been made to the surface of a model by averaging the points within its area of influence. Taken to an extreme, it can erase edits that have been made to portions of a mesh.

Many brushes can also be reversed by holding down the Alt key. For example, Std normally adds depth to a surface but by holding down Alt it can cut into the surface instead.

Each brush has its own Z Intensity settings.

Last of all, the Shift key by default activates the Smooth brush. You can change this by holding Shift while activating any of the other editing brushes. Shift will then activate that brush instead.

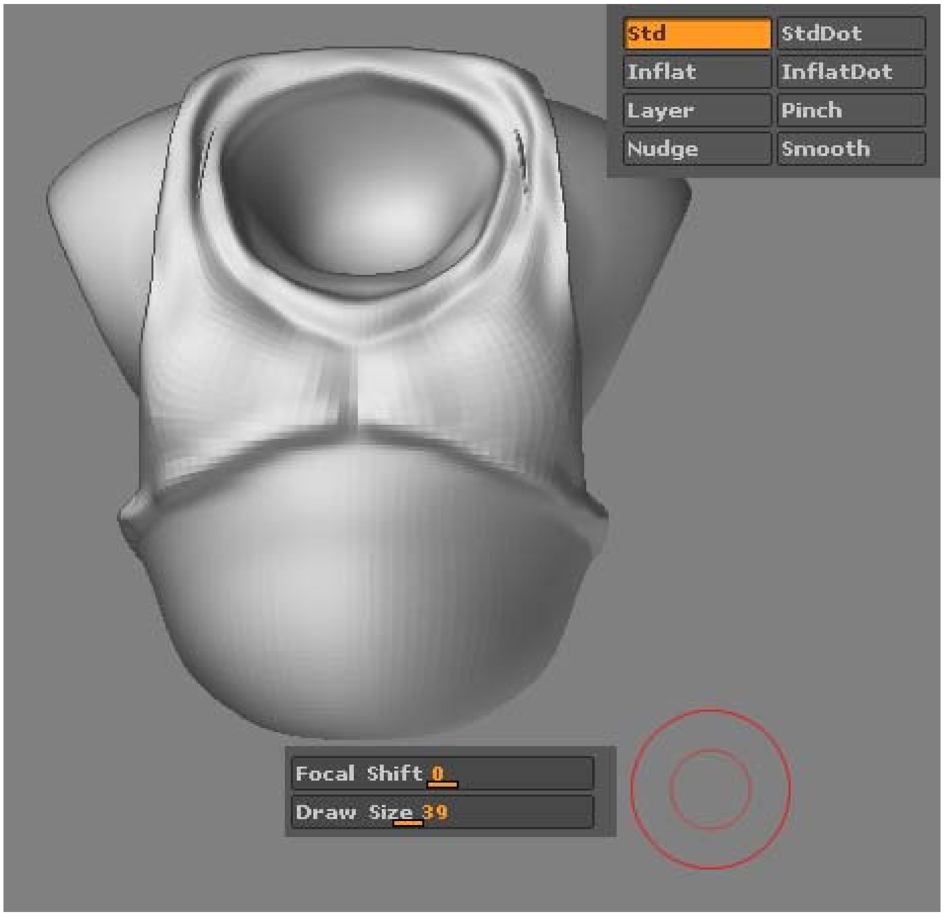
Let's start putting this into practice.

- ❑ **If you are starting a new session, press Tool>Load Tool and select ArmorPart1.ztl. Draw it on the canvas and press T to enter Edit Mode.**

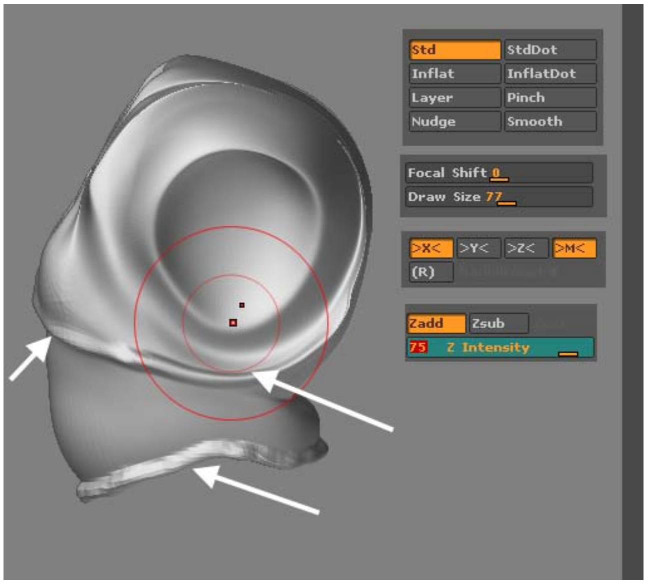
Make sure that Edit>Draw is active, like in the illustration above. Also make sure that X Symmetry is still active.

- ❑ **Set your Draw Size to 39, and Z Intensity to 25.**

- ❑ **Paint additional detail onto the model to build up the neck and chest.**

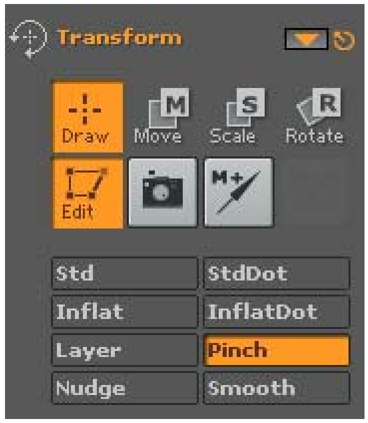


While working, you can change your Draw Size and Z Intensity. Be sure to add details to every side of the mesh. You may also at times want to hold down the Alt key to chisel into the mesh rather than building up detail.



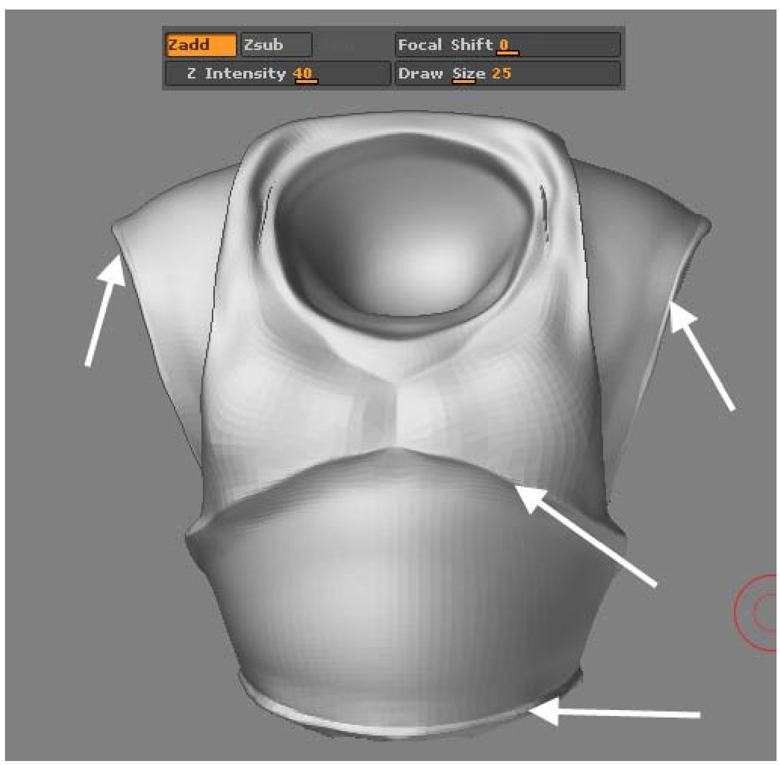
These tools are very intuitive, since they are much like traditional sculpture. They are extremely useful for organic shapes. Of course, armor is usually very sharp along edges and intersections. ZBrush can accommodate this need, as well.

- **Activate the Pinch brush.**



- **Choose a Z Intensity of 40 and a Draw Size of 25.**

- **Draw on the areas where you wish to make harder edges.**



As you can see, this brush directly sharpens area where we originally had an organic look that was not realistic enough for this armor.

You should experiment with different Z Intensity and Draw Size settings to really get a feel for this brush, or to achieve different results. Feel free as you work to alternate between Std and Pinch.

- **Press Tool>Adaptive Skin>Make Adaptive Skin.**

This creates a new object in the Tool palette, which starts with “Skin” for the object name. This new mesh is no longer tied to the ZSpheres that were used to generate it, and is a discreet polymesh object.

You could actually continue to work with the model while it’s connected to the ZSpheres. While this is useful if you plan to animate the finished figure in ZBrush, it’s not necessary for a project such as this still scene.

- **Save the model as ArmorPart2a.ztl.**

It's always wise to save your work in case you wish to return to the ZSphere model later for some reason.

- **Press T to exit Edit Mode, then Ctrl+N to clear the canvas.**

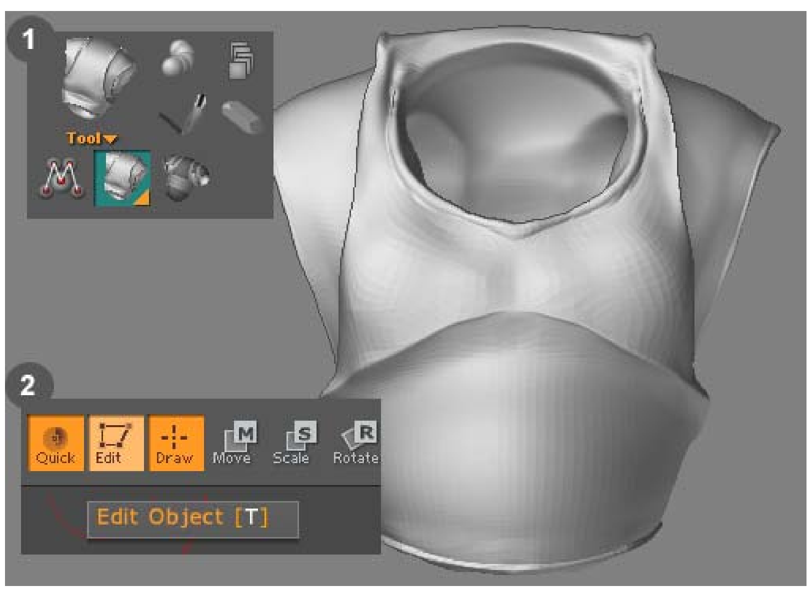
We do this because the ZSphere version of the model is still on the canvas. ZBrush is programmed to work this way, since it allows you to change the model and create additional skins if you wish. For our purposes, though, we want to switch to the skin object instead of the ZSphere model, so we need to remove the ZSphere figure from the canvas.

Place your pointer over the thumbnail for the skin object. A popup will appear with information about the mesh, including the number of polygons, points, groups, etc. This information can be very useful.

When creating a skin using the Make Adaptive Skin button, ZBrush also keeps the mesh's subdivision levels. This means that you could actually make broad-scale changes to your mesh by going to a lower subdivision level and moving a few points, then return to the higher level without losing the detail that has been sculpted so far. We'll make use of this feature later.

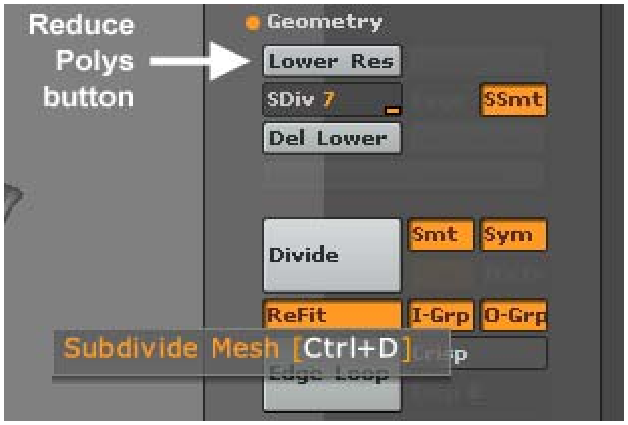
- **Select the skin object and draw it on the canvas.**

- **Press T to enter Edit Mode.**



- **In Tool palette, click on Geometry to open the Geometry menu.**

- **Press Divide.**

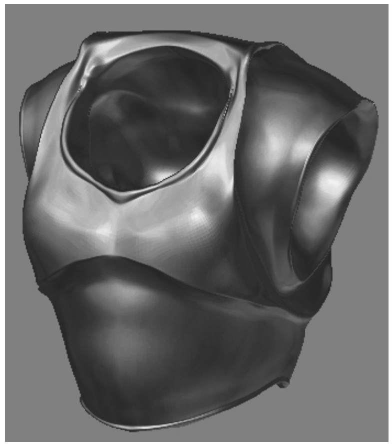


Dividing the mesh quadruples the number of polygons. More polygons make it possible for finer details to be added to the mesh. The number of times that you can divide the mesh is ultimately dependent on the amount of RAM that your system has and the processor speed.

Dividing also adds a new subdivision level in the top section of the Geometry menu. You can then use the Lower Res button to temporarily decrease the number of polygons and Higher Res to increase it again.

- **Select the Intensity Metal material.**

While the Fast Shader material allows slightly faster mesh interaction (especially at really high polygon counts), it is also beneficial to be able to see what the figure will look like with a metallic material.



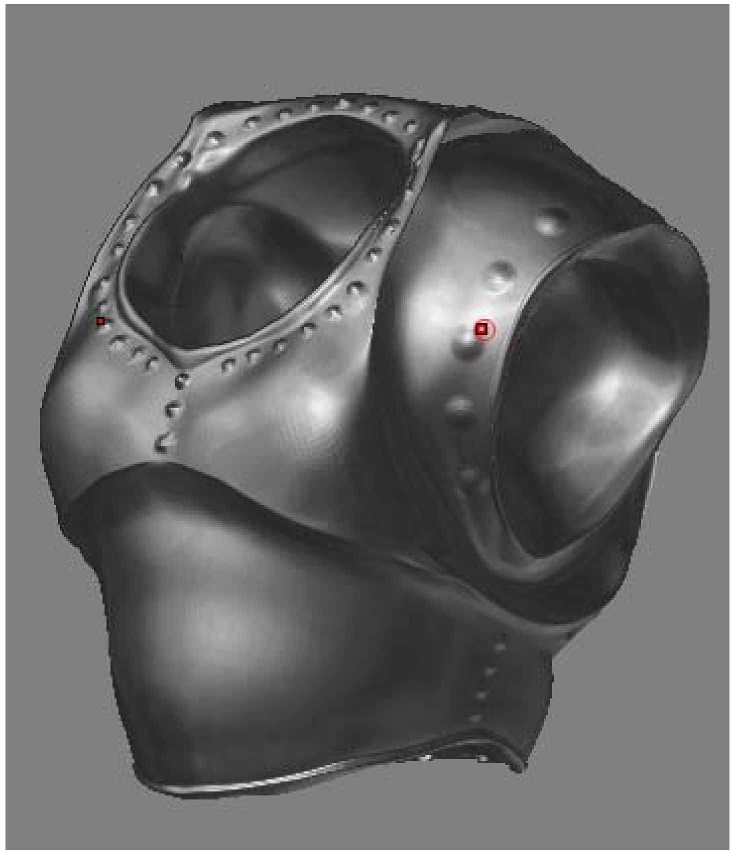
You can create your own material by changing the modifiers, but for this tutorial the standard Intensity Metal is perfect.

- **Select Transform>InflatDot**

- **Set the Draw Size to 10.**

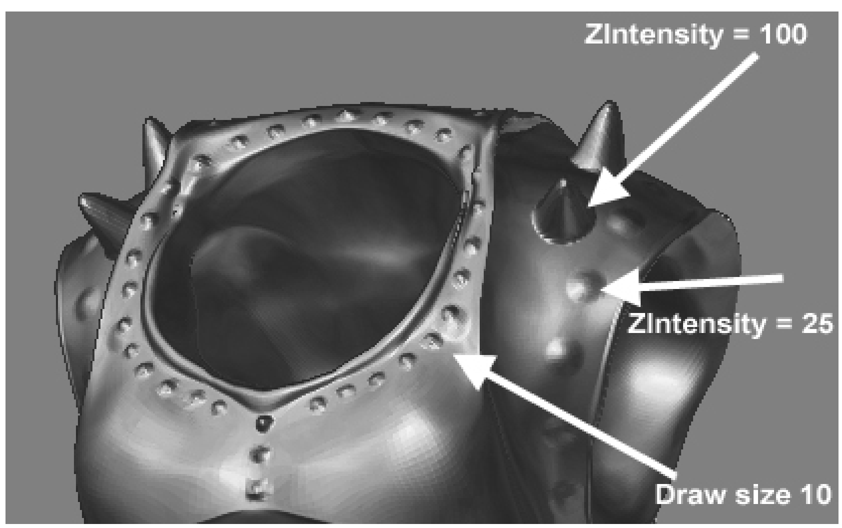
- **Click on the surface of your model. Drag the raised dot to where you want it, then release the mouse.**

Feel free to put these dots anywhere you like to add visual interest to the armor.

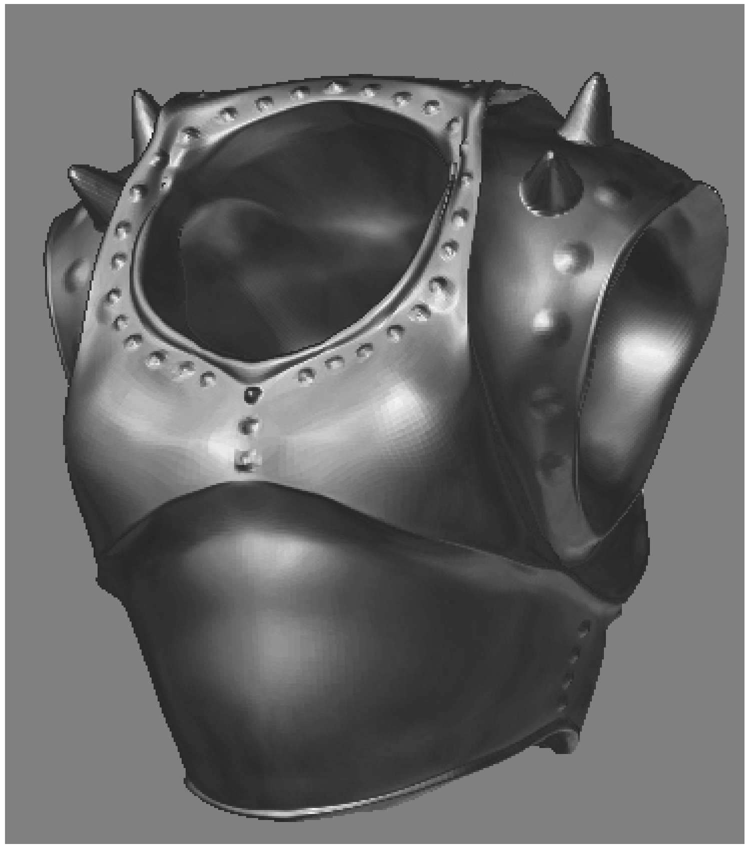


As you can see, this is a very fast and easy way to create detail!

- **Use varying Z Intensity settings to modify achieve different effects.**



When you're done, the armor should look something like the image below (depending on how much detail you've chosen to add).



- **Save the tool as ArmorPart2b.ztl**

In Conclusion

In this section we've created a skin from our ZSphere model and experimented with several of the sculpting brushes to refine the look of our armor. These techniques allow us to sculpt the figure in a very intuitive way, working with the model as if it's made of clay.

In the next section, we'll add more details in a different way: using Projection Master.

Warrior Part 3 – Projections

By J.S. Rolhion

In this section we'll finish the armor chest plate by using Projection Master to paint detail onto the model. We'll also cover the subjects of texturing, lighting and rendering.

In part 2 we saw how to create the base mesh for the armor through modelling. But what about when you wish to add detail that cannot be achieved through the editing brushes?

ZBrush offers an innovative solution called Projection Master. Using this utility, you can literally paint details onto the model, using any or all of ZBrush's 2.5D painting tools – even other 3D objects!

UV mapping will also be assigned to the model, which can be used for texturing or for export to other applications.

- **If it is not already active on the screen, load ArmorPart2b.ztl and draw it on the screen. Enter Edit Mode by pressing the T key.**

- **Hold down the Shift key and rotate the model so that it is exactly facing you.**

- **Ensure that the model is at least subdivision level 7. If you don't have enough subdivision levels, add another by Dividing the mesh.**

Projection Master will project anything you paint directly onto the mesh below. Because of this, it is important to position your model so that the area that you will be working on is facing the camera as directly as possible.

- **Click the Projection Master icon on the top shelf.**

The following popup menu will open:

You are presented with a panel showing the various Projection Master options. The top section is for painting textures while the bottom section is for projecting displacements. As you click on the check boxes, the preview to the right will update to show the effect that your selection will have.

- **Activate the options shown above (Colors, Material, Fade, Deformation and Normalized).**

- **Click Drop Now.**

ZBrush will snapshot the model to the canvas. This prevents the model from being rotated until you use Projection Master to pick it up again, but it also enables all of ZBrush's other tools. This opens up possibilities beyond what can be achieved with the Transform palette alone.

Since a texture has not yet been created for this model, Projection Master will prompt you with a warning window.

- **Click the "Create a texture and continue" option.**

This instructs ZBrush to create a texture at the default size of 1024x1024.

Projection Master functions best when the texture dimensions are a power of 2. These include: 256x256, 512x512, 1024x1024 (the default), 2048x2048, or 4096x4096.

If you wanted to work with a different size, you would cancel projection instead and create a texture. First, you would need to set the desired width and height in the Texture palette. Next, click New. Finally, open Tool>Texture and select the UV mapping that you would like to use (unless you're working with an imported model that already has mapping applied).

Since the model cannot be rotated while you are working on it, a full mesh texturing needs to be done in parts, over the course of several drop and pick cycles. You will usually find that it works best to paint the entire model with one step before moving on to the next. For example, paint a base texture across the entire model (using several drops and picks). Next paint the next level of detail onto the entire model. Then proceed to the next level of detail, etc. This makes it easy to keep your work consistent across the entire model.

- **Choose the Single Layer brush.**

- **Choose alpha 08.**
- **Choose the Spray stroke.**

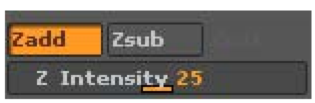
- **Set Zsub with a Z Intensity between 5 and 10, and a Draw Size between 10 and 15.**

- **Begin texturing by painting details like you see on the example below.**

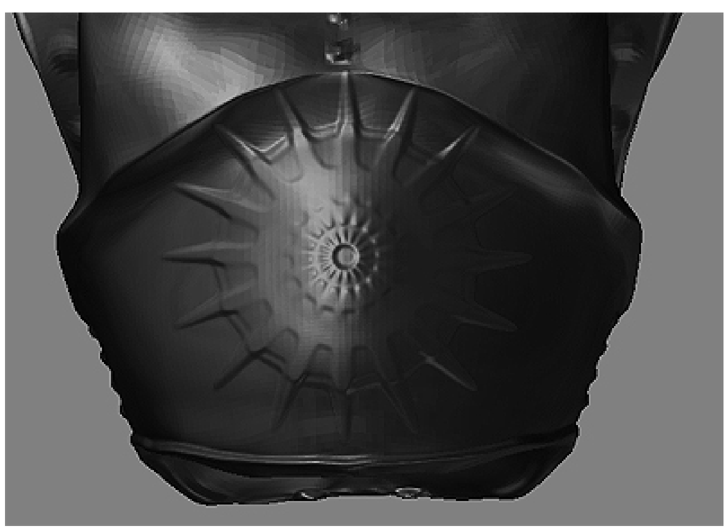
Feel free to experiment with different alphas, Z Intensity settings, and Draw Sizes to create naturalistic results.

- **Choose the Simple Brush**
- **Select alpha 52**
- **Choose the DragRect stroke.**

- **Activate Zadd and set the Z Intensity to 25**



- **Click and drag on the mesh to create a large sunburst.**



Remember that after drawing the stroke, you can use the gyro to move and scale it for the best positioning.

Note that for this tutorial, we are using the alphas that have been included with ZBrush. If you wish, you can modify them using the Focal Shift slider and Alpha Adjust curve. You can also create or import your own to create custom brushes and personalize the armor.

As you can see, you can obtain a very high level of detail using the various brushes, alphas, and stroke types. Feel free to add as many details as you wish.

- **Click the Projection Master button again.**

The Projection Master panel will open once more. It will be exactly like you last saw it, except that Drop Now has changed to Pickup Now.

At this point, you can change your settings if you find that your creativity took you in a direction that you hadn't anticipated. In our example, we did not paint any colors or materials onto the model.

- **Deselect Colors and Material.**

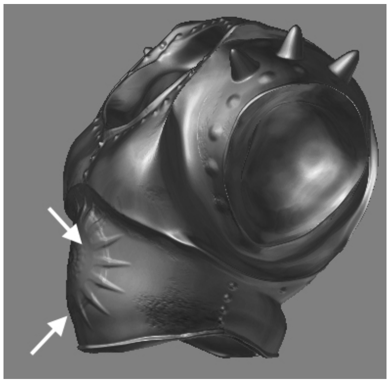
Of course, your own experimenting might have led you to use color and/or material. If that's the case, then you should modify the settings appropriately.

- **Press Pickup Now.**

At this point, ZBrush will return the model to Edit Mode, ready for you to rotate it to a new position or do anything else that you like. In the process, all of the details that you have painted while it was dropped will be transferred onto the model. In the case of depth details, they will be incorporated directly into the mesh geometry.

The quality of this projection displacement will depend upon the number of polygons that your model has. More polygons mean the ability to paint finer levels of detail.

- **Rotate the model to take a look at your work.**



As you can see, all painted depth has literally become a part of the mesh.

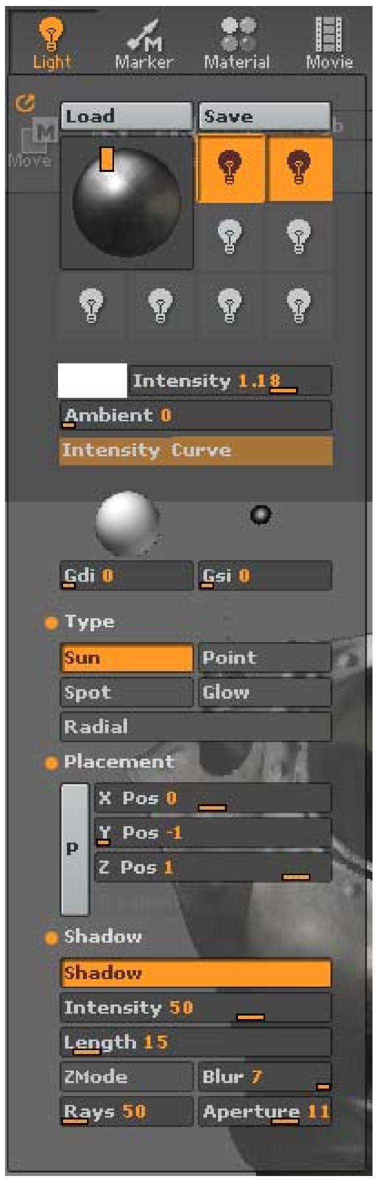
- **Repeat the Projection Master steps from several different angles to add details to the entire mesh.**

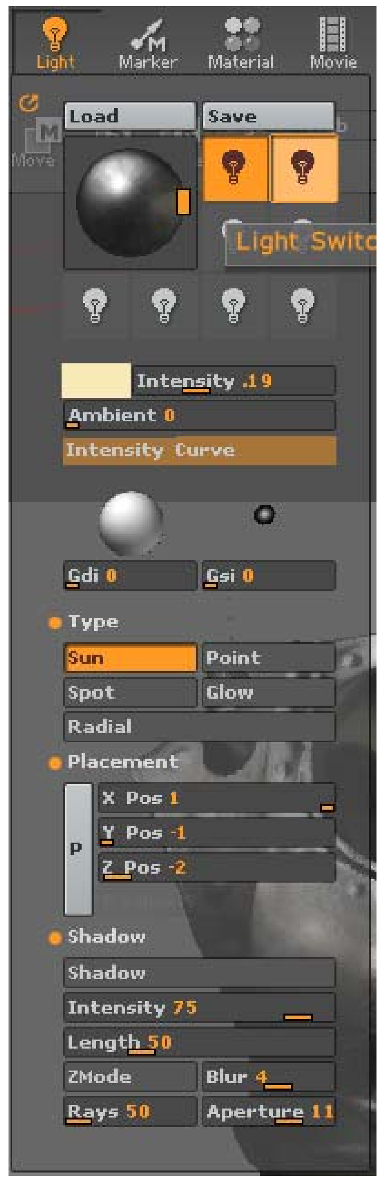
Feel free to use different colors and alphas to get a variety of rust effects and produce a truly aged, beaten look. Various Z Intensity and Rgb Intensity settings will also lend realistic randomness to your work. The more time you put into this step, the more compelling your finished scene will be!

Now that texturing and painted displacements are complete, we are ready to take a look at some of ZBrush's lighting and rendering options.

Lighting in ZBrush is very powerful. Different options are available, such as colored lights, light intensity, light type (Sun, Point, Spot, Glow, Radial), very precise placement, and raytraced shadow options.

- **Duplicate the settings below, or feel free to modify them.**





Regarding Rays and Aperture: The more rays you use, the more realistic your shadows will be (at the price of longer render times). More rays also makes the shadows softer, and you should lower generally lower the Aperture setting to compensate.

If you wish to learn more about any setting, hold down the Ctrl key and place the pointer over it.

- **Rotate the model into a position that you like, then exit Edit Mode (press T).**

While ZBrush can do a Best render while a model is in Edit Mode, ZBrush will only render the model and a bounding box surrounding it. To render the entire scene, Edit Mode must be off.

- **Turn Render>Shadows on.**

This tells ZBrush to render shadows when a Best render is performed.

- **Turn SoftZ and SoftRGB on. Set the Antialiasing adjustments as shown.**

This will give a higher quality to the Best render.

- **Press the Best button to render the scene.**

While it certainly took you longer to work through this tutorial because you are still learning ZBrush and also had to read and follow the steps, I'd like to say that I created this whole breastplate in 30 minutes, including rendering. A "classic" workflow (using the other modeling packages on the market) would have taken a little bit longer. ☺

If you are using the model within a ZBrush scene (like we will do later in this tutorial), there is nothing more that you need to do.

- **Save your model as ArmorPart3.ztl.**

However, if you are planning to use the model in an animation package, it would be a simple matter to create a displacement and/or normal map, and then export a cage object from ZBrush as an OBJ. Displacement and normal maps are really powerful when exported to other applications, and enable you to keep all these wonderful details while working with a much lower resolution mesh. Bear in mind that the quality of the finished work will depend on how your rendering engine implements such features.

Creating displacement and normal maps is covered in another chapter of this manual.

In Conclusion

This section of the armor tutorial has given us hands-on experience with texturing and painting displacements onto a mesh. Once a model has been dropped to the canvas, ALL of ZBrush's tools become available for use, including meshes that have been imported from other sessions or programs. This provides an extremely fast and powerful approach for adding high resolution detail to your meshes, which in turn results in far more compelling renders.

Part 4 of this tutorial will practice the techniques that have been learned in these three lessons by creating an upper arm to go with the breastplate.

Warrior Part 4 – Upper Arm

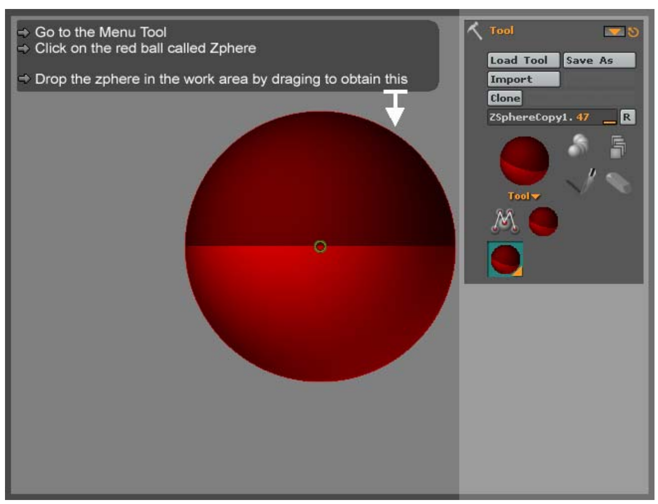
By J.S. Rolhion

In the last three sections, we learned how to use ZSpheres to create a simple mesh and then detail that model through the combined use of ZBrush's editing brushes and Projection Master. In this section, we will practice those techniques by creating another piece of armor to be used in the finished scene.

In this section, we'll begin with ZSpheres, and then go all the way through mesh sculpting and projection painting. Let's dive right in!

- **Initialize ZBrush or clear the canvas.**

- **Select the ZSphere tool and draw it on the canvas.**



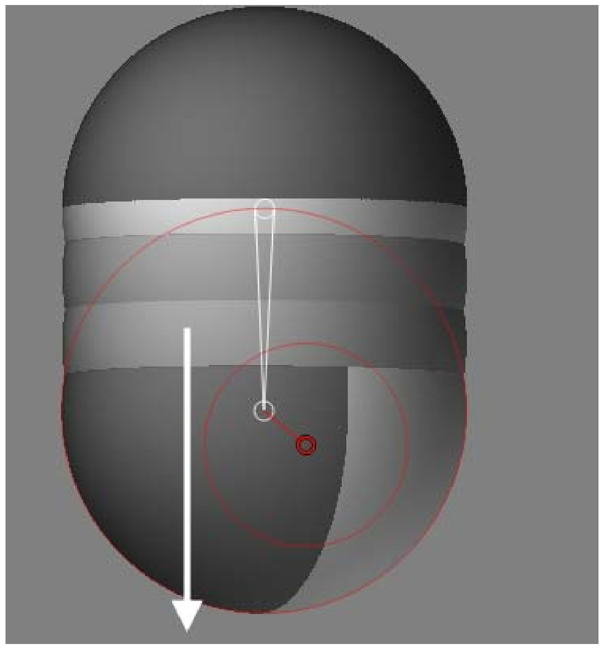
- **Enter Edit Mode and set the Draw Size to 1.**

- **Activate X symmetry.**

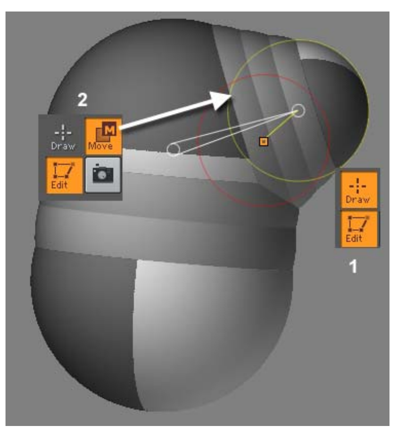
- **Hold down the Shift key and move the pointer over the ZSphere until the two red circles become one and turn green. Click to add a new ZSphere.**

By holding down the Shift key when adding a new ZSphere, we tell ZBrush to make the new ZSphere identical in size to the first one. Making the ZSphere when the cursor is green means that the ZSphere will have the optimal placement for a clean mesh.

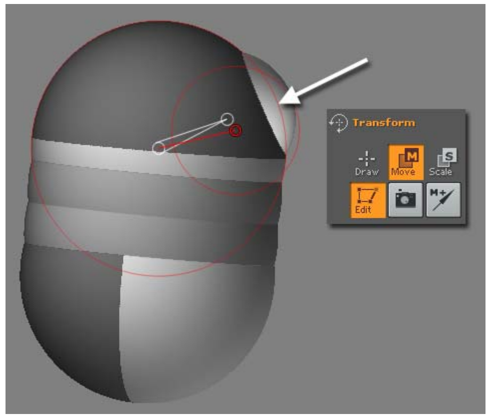
- ❑ **Press W to switch to Move mode, then rotate the model and move the new ZSphere down a little as shown.**



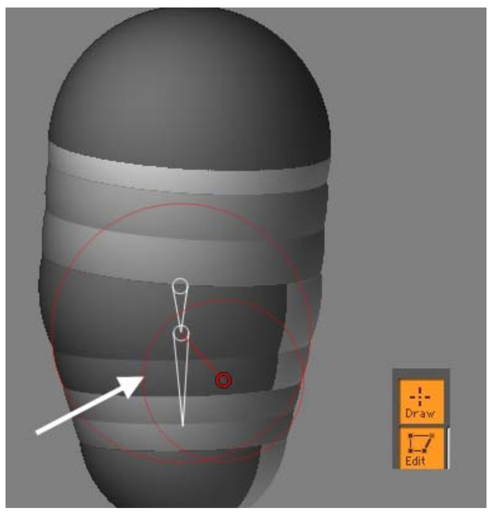
- ❑ **Press Q to return to Draw mode, and add another ZSphere.**



- ❑ **Move the new ZSphere back into the first one until it changes to show that it will create an indentation in the mesh.**



- **On the opposite side of the root (first) ZSphere from the ones that you have added thus far, create two more ZSpheres.**

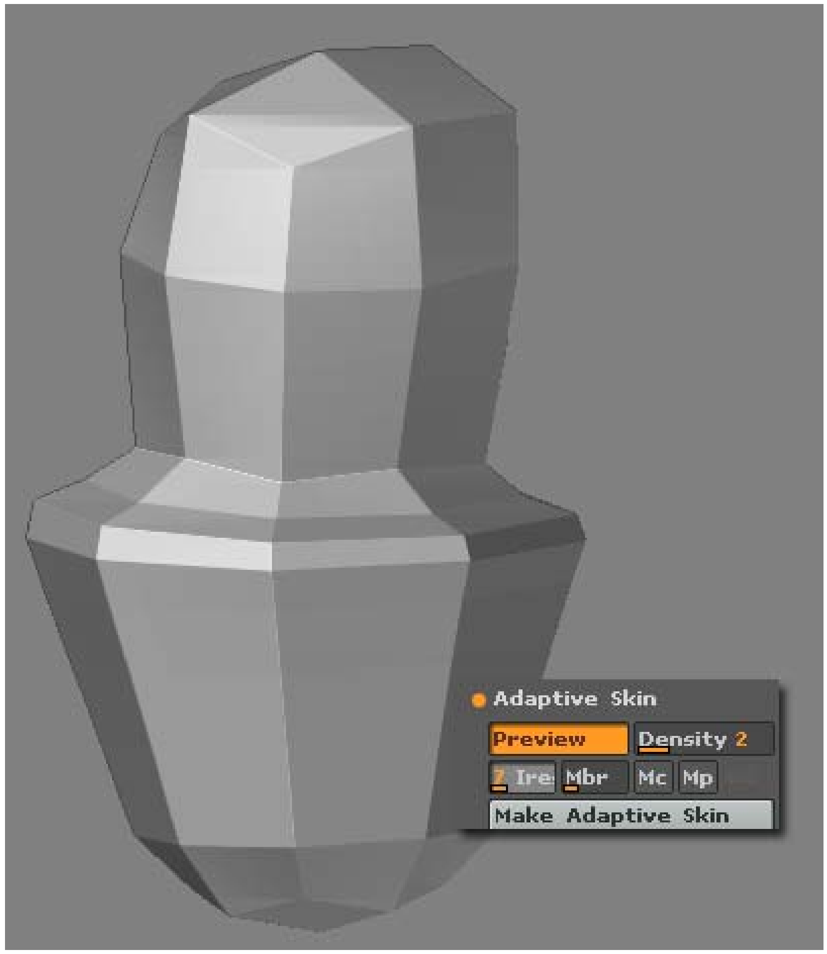


The easiest way is to create one, move it down so that it is connected to its parent by three linking spheres, then convert the first linking sphere to a ZSphere by clicking on it while in Edit Draw mode.

- **Preview the mesh by pressing Tool>Adaptive Skin>Preview (or A on your keyboard).**

- **Set Tool>Adaptive Skin>Ires to 7.**

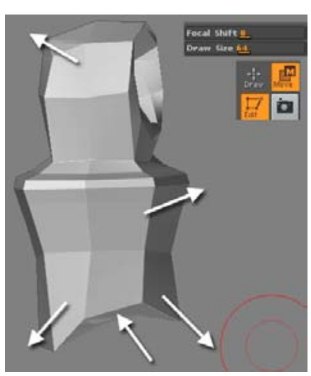
Ires is an advanced feature covered in the online users guide and by holding the Ctrl key while moving your pointer over the slider. It affects the way that skins are created.

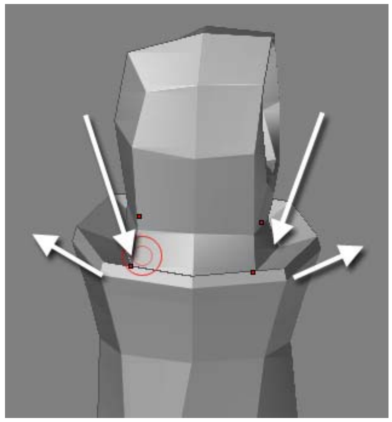


The mesh should look similar to what you see above. If necessary, you can adjust the ZSpheres by pressing A and then moving or scaling them as appropriate.

- **Make sure that Density is set to 2.**

- **With the preview active, press W to switch to Edit Move mode. Using a Draw Size of between 50 and 70, move polygons around to refine the shape as shown.**





Feel free to change the Draw Size as necessary while you work.

- **Once you are satisfied with the base mesh, increase the Density to 3, and click the Make Adaptive Skin button.**

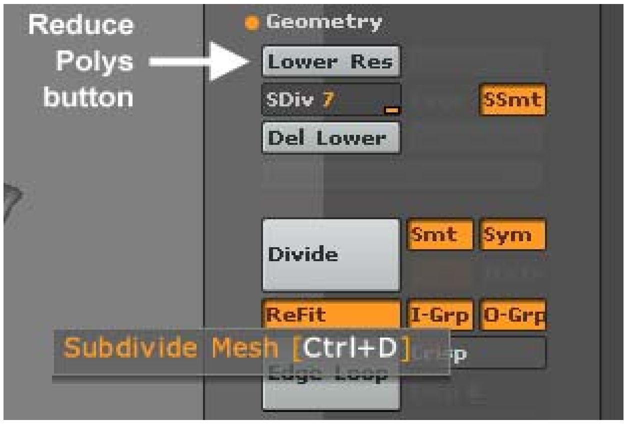
This operation creates a new polygon mesh in the Tool palette. This new mesh has three subdivision levels, so you can return to the lower resolution later if you wish to make large-scale adjustments to the mesh.

- **Press T to leave Edit Mode, then Layer>Clear (Ctrl+N) to clear the canvas.**

- **Select the new mesh in the Tool palette.**

❑ **Draw the new mesh on the canvas and press Transform>Edit Object to return to Edit Mode.**

❑ **Press Tool>Geometry>Divide a few times until you have 7 subdivision levels.**

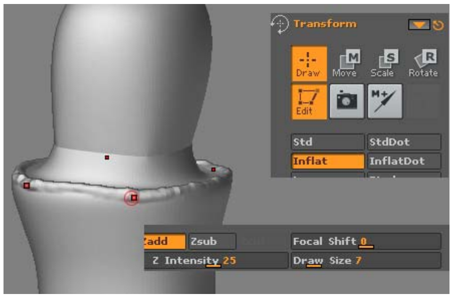


This step can also be avoided by setting Tool>Adaptive Skin>Density to 7 before skinning the ZSphere model.

From here forward, the mesh will be edited at an extremely high resolution using the various Transform brushes. However, if you would like to make large-scale changes to the mesh, you can use the Lower Res button to temporarily reduce the number of polygons. It is then a matter of moving a few points to make major changes to the mesh. When you return to subdivision level 7, the mesh will adapt to the new shape without losing any details that you have sculpted at this higher level.

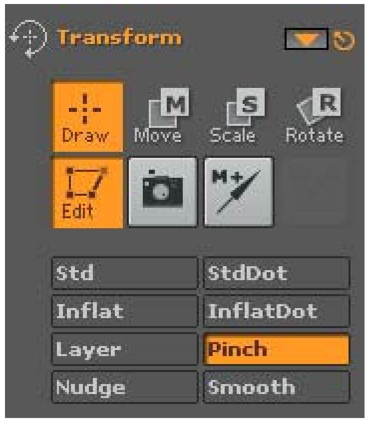
Multi-resolution mesh editing enables you to sculpt any level of detail at any time. This frees your creativity by letting you work in a non-linear fashion.

❑ **Use Transform>Inflate to exaggerate the ridge. A Draw Size of 7 and Z Intensity of 25 are appropriate to begin with.**



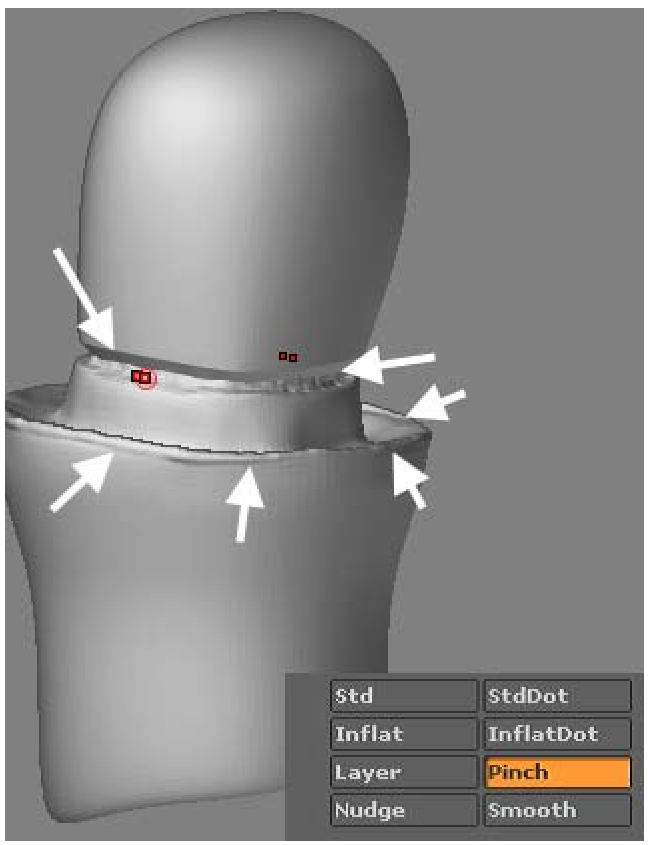
Feel free to experiment with different sizes and intensities as you work.

- **Use Pinch to sharpen these inflated edges.**



Z Intensity of 40 and Draw Size of 25 are probably what you'll need.

- **Switching between Inflate and Pinch, chisel a ring around the mesh.**

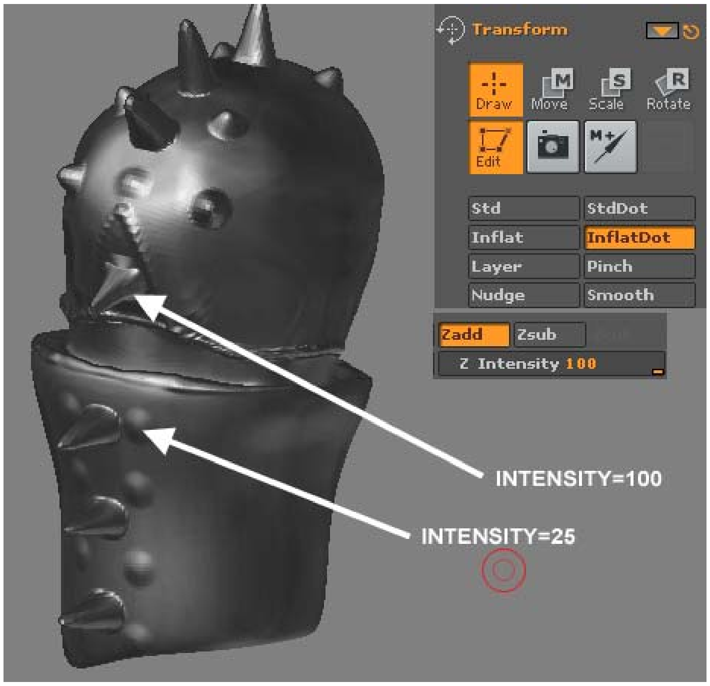


Remember that you can switch between Zadd and Zsub by holding down the Alt key. This turns Inflate into Deflate, allowing you to cut the ring. The edges can then be sharpened using Pinch.

- **Select the Intensity Metal material.**

As with the breastplate, it is nice to be able to see a material applied to the model while working, so as to have a better impression of what the finished result will be.

- **Using InflatDot and various Z Intensity settings, add bumps and spikes to the armpiece.**



- **Using a very small Draw Size and a high Z Intensity, add small spikes to the edges.**

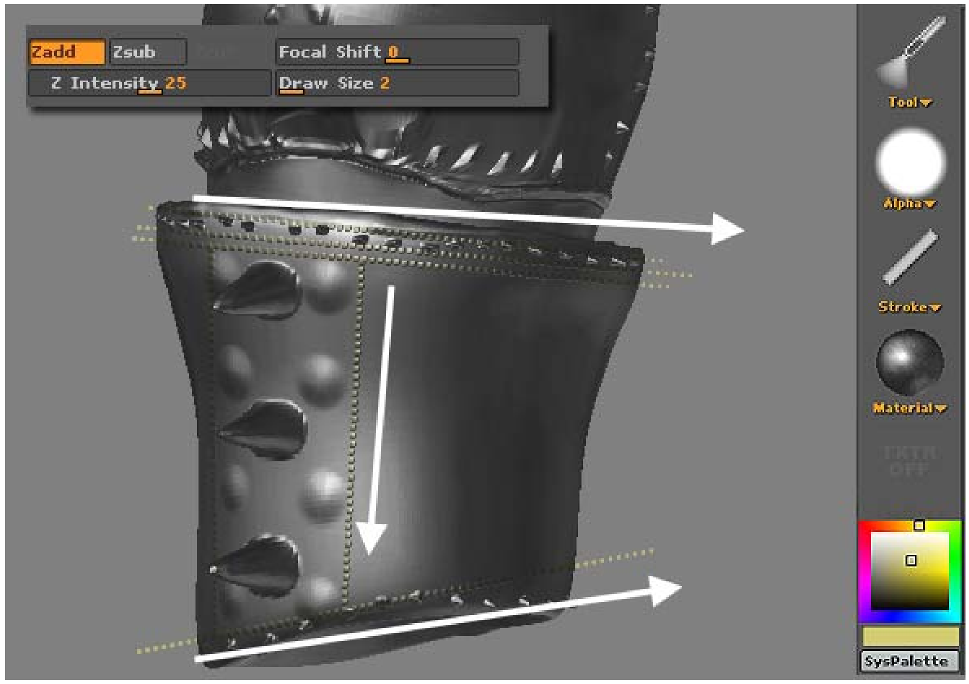
- Rotate the model to the position shown in the next illustration.

- Activate Projection Master. Make sure that Color, Fade, Deformation and Normalized are active, then click the "Drop Now" button.

- Click the "Create a texture and continue" button in the help dialogue box that will appear.

- Select a pale yellow color, the Single Layer brush, alpha 6, and the Line stroke.

- Paint several lines as shown.



- **When finished, press the Projection Master button, then pick up the mesh.**

- **Rotate the model to new positions and continue adding details.**

The Fade setting in Projection Master helps with this. What it does is apply the strongest projections to polygons pointing directly toward the camera and no projections to polygons pointing to the side. This fading effect makes it much easier to blend the details together over several Drop and Pick operations.

Remember that you can also return to using the Transform brushes at any time. Feel free to experiment, using each form of mesh sculpting to add different kinds of details. (For example, cracks can be added most easily using Transform>Std rather than Projection Master).

Also feel free to use color variations and even materials to really “rough up” the armor.

Here is where we finished. You can duplicate our work, or try new ideas of your own. Since this section is meant to refine your skills with the various techniques employed, you should experiment as much as you like!

- **Save your model as ArmorPart4.ztl**

In Conclusion

While no new ground has been covered in this section, you should already be seeing an increase in your working speed. It undoubtedly took you less time to create this upper arm piece than it did to create the breastplate.

In the next section, we'll sculpt the head of the man who will be wearing our armor.

Warrior Part 5 – The Head

By J.S. Rolhion

Since this section builds upon techniques taught in the previous parts of this tutorial, it is highly recommended that you complete those first.

Many people consider realistic heads to be one of the most difficult modeling tasks. It doesn't need to be! Through the use of ZSpheres, multi-resolution mesh editing, the various sculpting tools, and Projection Master, you can sculpt a believable head nearly as easily as the armor pieces that have been done thus far.

Since this tutorial builds upon the techniques already covered in the earlier sections, we will not go over many of the basics. It will generally be assumed that you know how to do many of the steps.

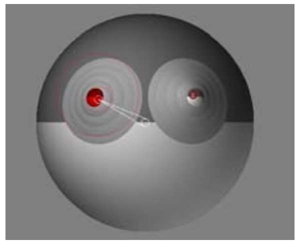
- **Initialize ZBrush.**

- **Select the ZSphere tool and while holding down the Shift key, draw it on the canvas.**

- **Activate Transform>Edit Object, and then press the X key to turn on X symmetry.**

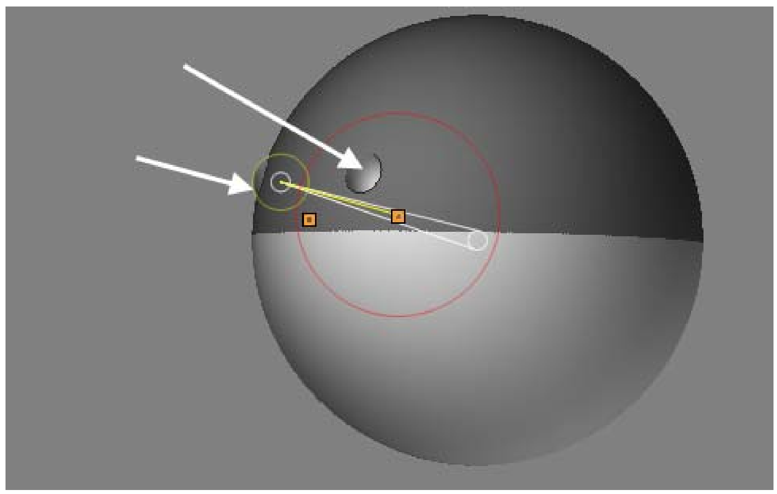
- **As always when working with ZSpheres, change the Draw Size to 1.**

- **Add two new ZSpheres as shown below.**

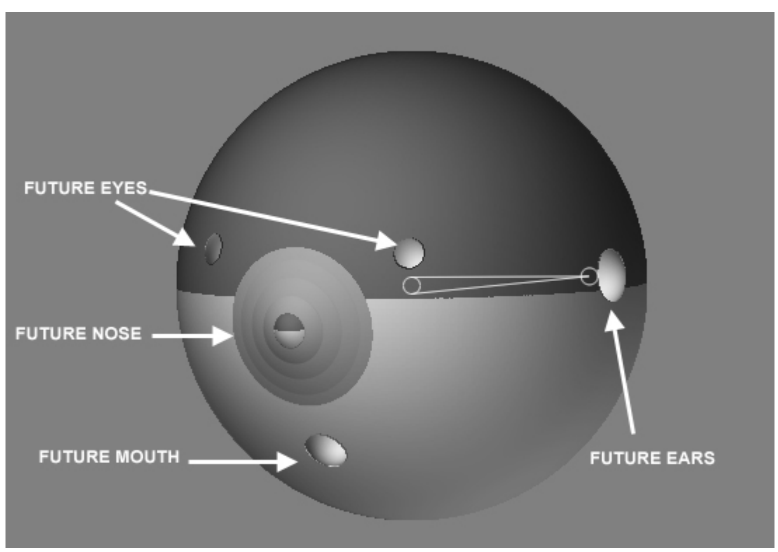


- **Rotate the model to the side, and hold down the Shift key to snap to a perfect side view.**

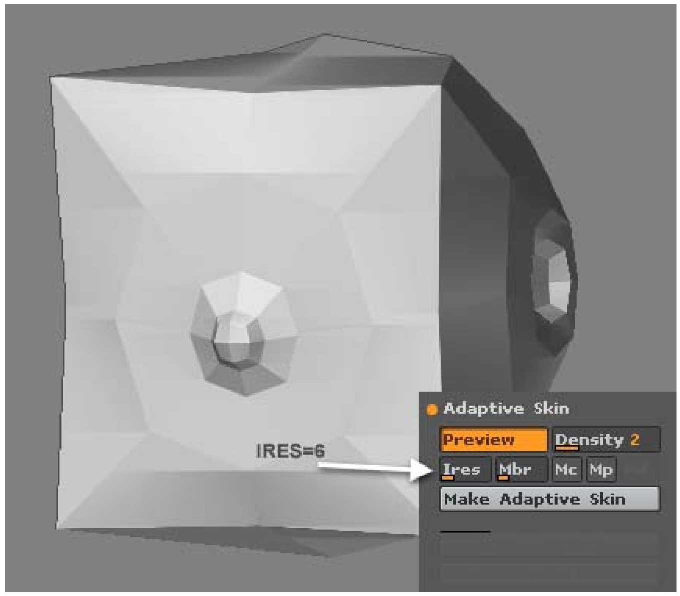
- **Move the ZSpheres into their parent so that they will create indentations.**



- **Add more ZSpheres for the ears, nose and mouth. Move the mouth and ear Zspheres into the parent, as well.**

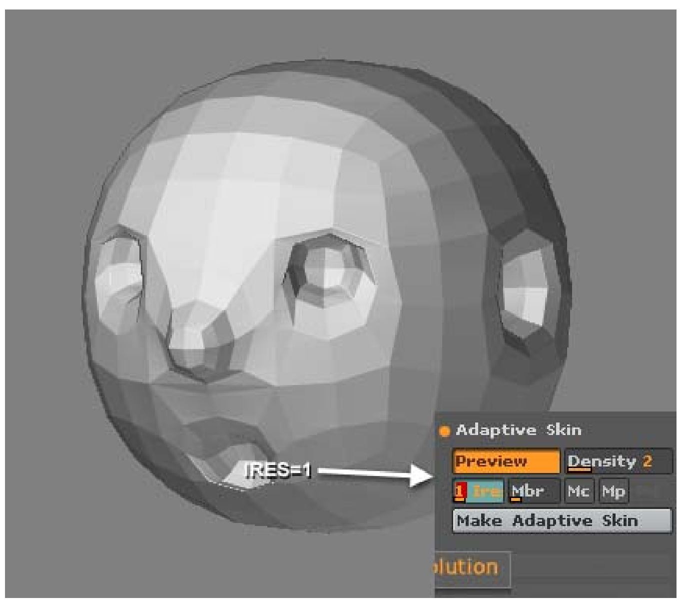


- **Activate the mesh preview.**



The problem here is caused by the fact that ZSpheres are treated as cubes for skinning purposes. Each face of the cube normally can have one child in order to create a clean mesh. However, in this case we have four children on the same side. This can be resolved by changing the Ires setting from its default of 6.

- **Set Ires to 1.**



The mesh now looks much more like a face.

- **Make an Adaptive Skin, and draw it on the canvas.**

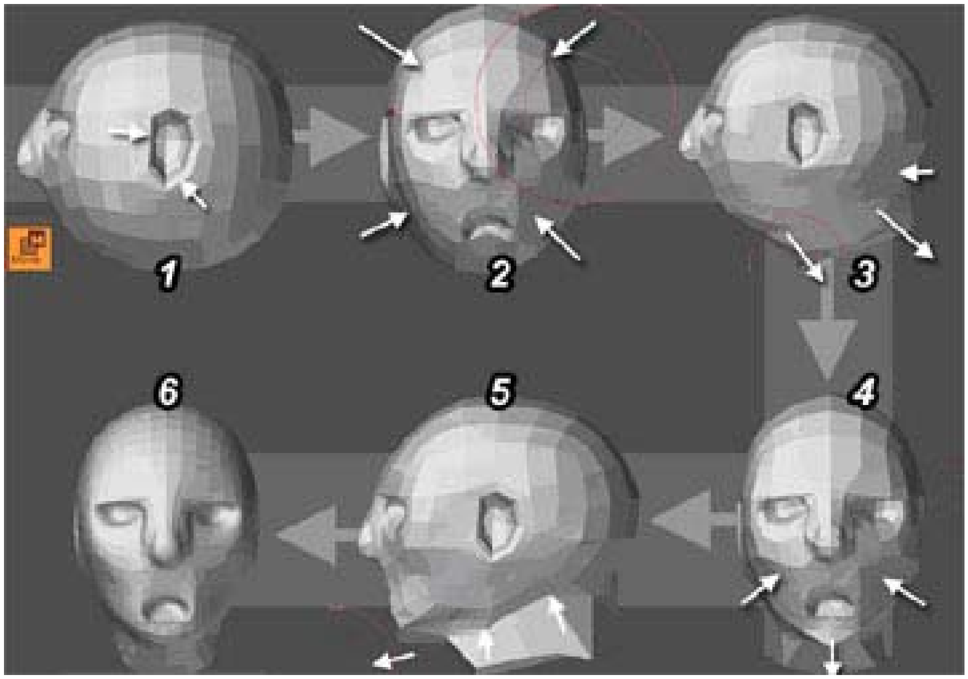
We no longer need the ZSphere model. Its sole purpose was to give us a basic face shape that we can then refine using mesh editing tools.

- **Enter Edit mode and make sure that X Symmetry is active.**

- **Using the Move tool and medium Draw Sizes (between 30 and 50), move points around to begin refining the shape.**

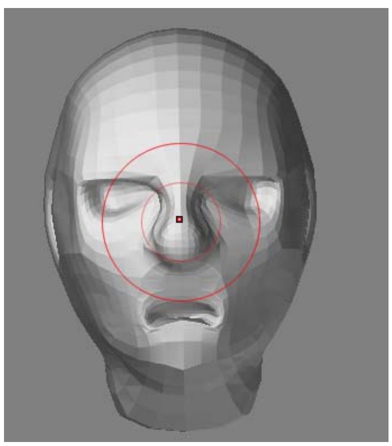
The following steps are a general guideline, only. Be creative as you move points around. The important thing is to block out the overall shape of the head while there are few polygons to contend with.

Use different Draw Size settings while you work, depending upon how many points you wish to affect at a time. For example, when adding the neck you will probably want to use a large Draw Size. Alternatively, you can use the Geometry menu to go to Subdivision Level 1, move just a few points to create the neck, then return to Level 2.



Notice that for step 6, the mesh resolution has been increased. For this step, we divided the mesh once, adding a third subdivision level.

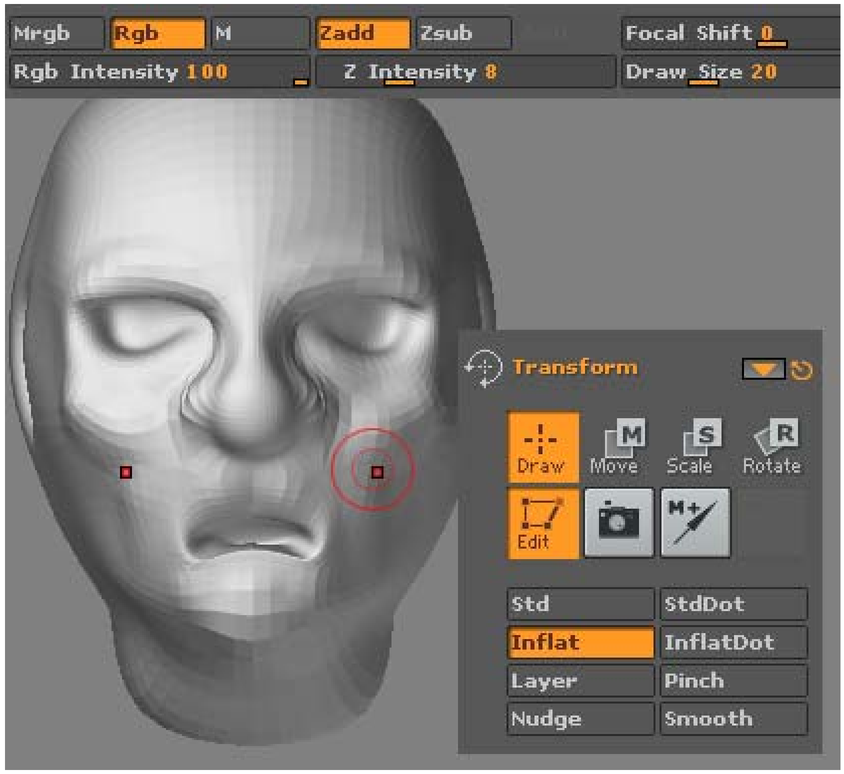
- **Continue to refine the face.**



From this point on, different artists have different preferences. Some like to sculpt as much as possible by moving a few points at a low subdivision level. They only add a new level after they have accomplished as much as they can at the current level. Other artists prefer to jump to a high level and sculpt. Ultimately, you should try both approaches and decide which works best for you. There is no “right” or “wrong” way.

- **Divide once more.**

- **Using the Inflat brush, begin adding brows, cheek bones and nostrils.**

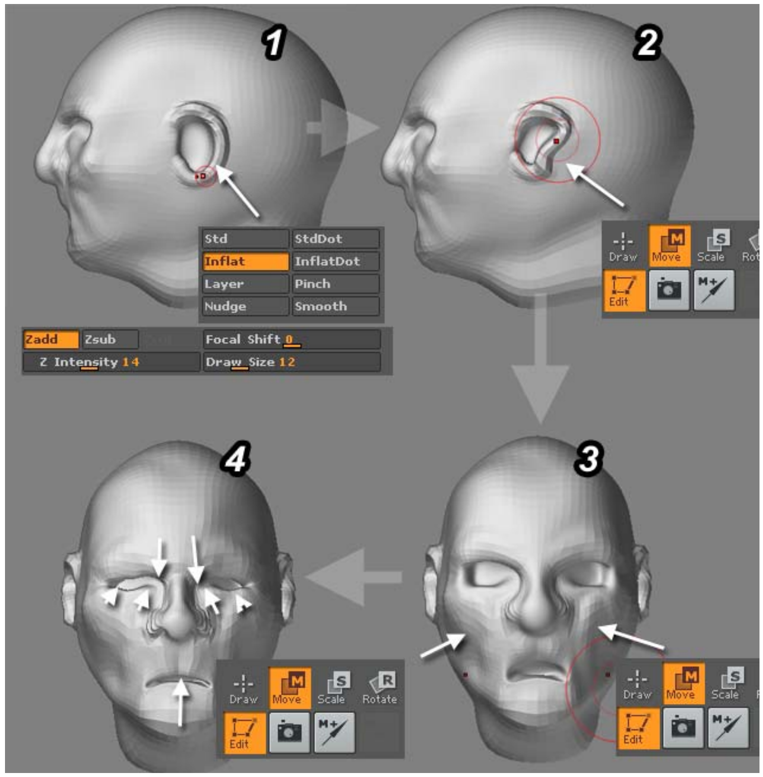


Change Draw Size and Z Intensity as necessary to get the results that you're looking for.

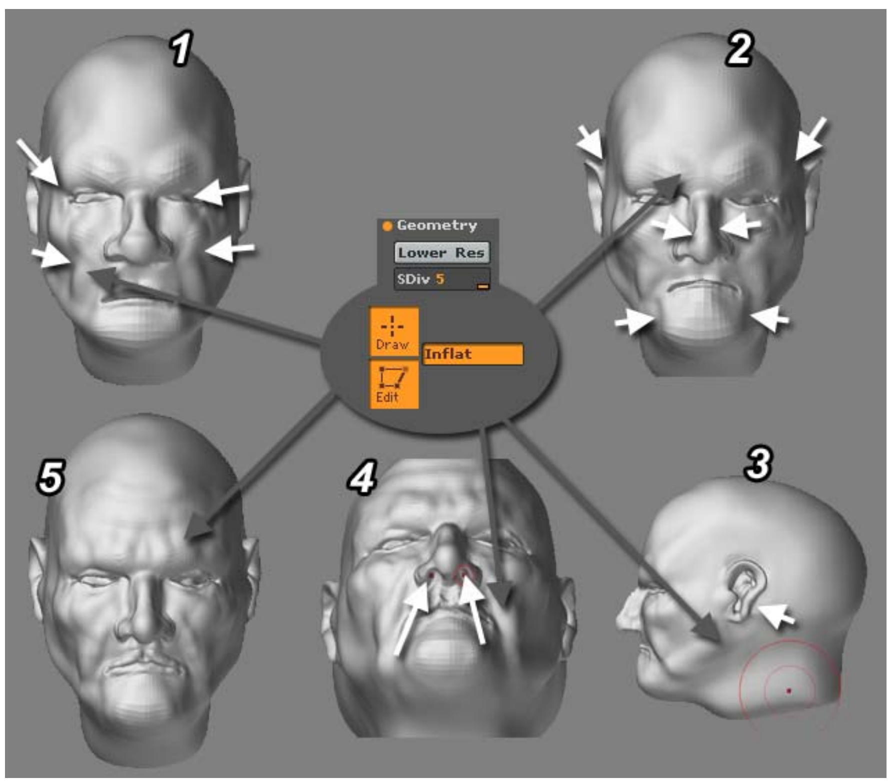
- **Add ears by using Inflate to create the raised ring of the ear (1), followed by Move mode to push it into shape (2).**

- **Move can also be used to refine the cheek shape (3) and the eyes (4).**

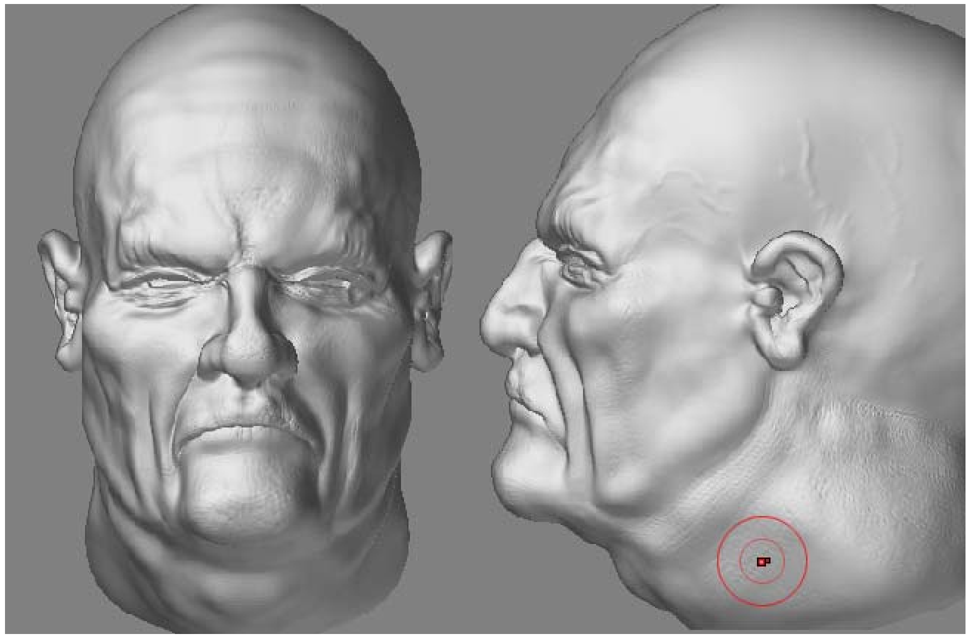
These steps are all illustrated in the image on the next page:



❑ **Divide the mesh once more. Continue using Inflat to add details such as fatty tissues and lips, nostrils, etc.**



- **Continue work, dividing as necessary to add finer levels of detail.**

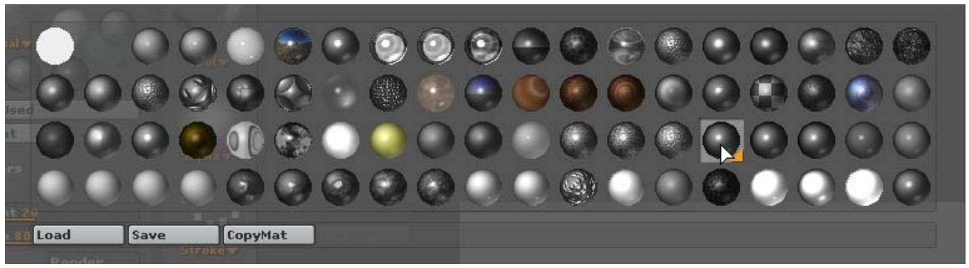


Remember as you work that even after you have divided the mesh, you can always return to a lower subdivision level. Also, remember that Inflat can be reversed by holding down the Alt key.

At some point, you will want to turn off symmetry and Move large parts of the mesh around a bit to keep the face from being unnaturally symmetrical. At this point, you can also add character to your figure by sculpting details such as veins and scars. You might even rough up the nose and chin a bit to create pores or places for stubble. A lot is possible when you can work with hundreds of thousands of polygons in real time!

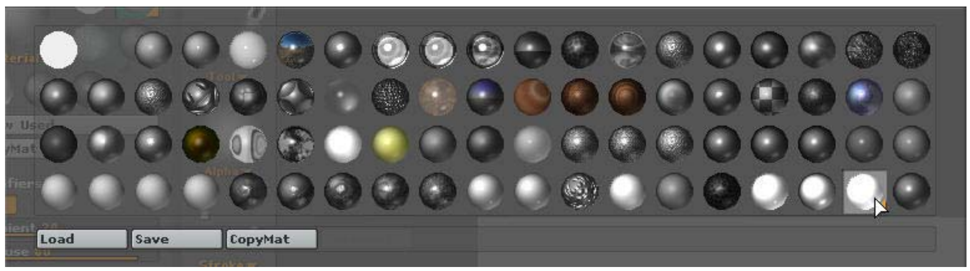
Once the face has been sculpted, it's time to apply a material. We'll build a skin shader by using ZBrush's copy and paste features for the Material palette.

- **Begin by selecting the Colorizer 1 material.**



- **Select the S1 channel and press CopySH to copy this shader.**

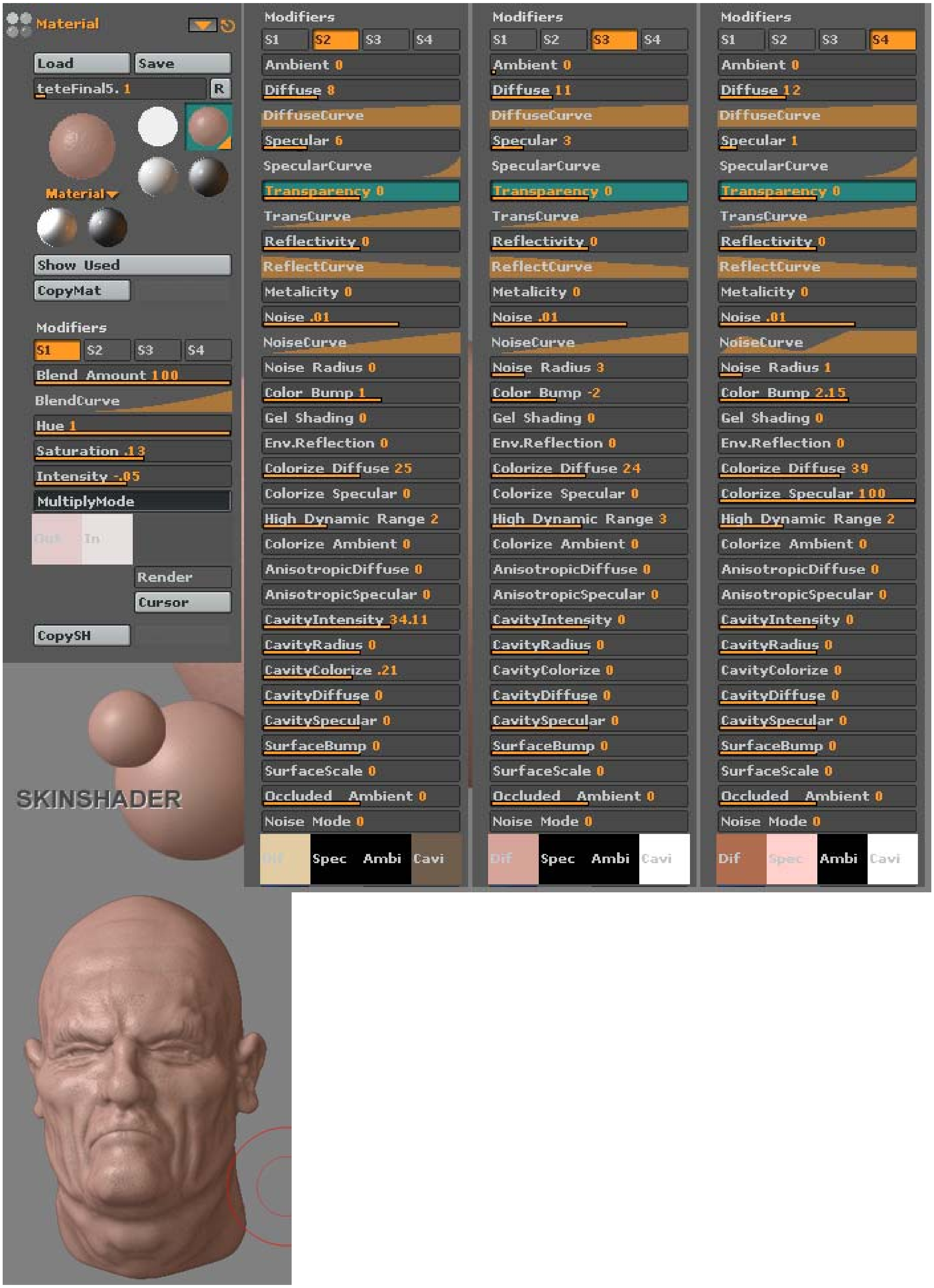
- **Select the QuadShaders material.**



- **Select the S1 channel again and press PasteSH.**

What we have done is create a material with four shader channels, the first of which is from the Colorizer1 material. We can now easily modify this to create a complex, four-layered material effect that will appear to be somewhat translucent.

The images on the following pages show the settings that you should use for each channel.


Material
Load
Save
teteFinal5. 1
R
Material
Show Used
CopyMat
Modifiers
S1 S2 S3 S4
Blend Amount 100
BlendCurve
Hue 1
Saturation .13
Intensity -.05
MultiplyMode
Out In
Render
Cursor
CopySH
SKINSHADER
Modifiers
S1 S2 S3 S4
Ambient 0
Diffuse 8
DiffuseCurve
Specular 6
SpecularCurve
Transparency 0
TransCurve
Reflectivity 0
ReflectCurve
Metalicity 0
Noise .01
NoiseCurve
Noise Radius 0
Color Bump 1
Gel Shading 0
Env.Reflection 0
Colorize Diffuse 25
Colorize Specular 0
High Dynamic Range 2
Colorize Ambient 0
AnisotropicDiffuse 0
AnisotropicSpecular 0
CavityIntensity 34.11
CavityRadius 0
CavityColorize .21
CavityDiffuse 0
CavitySpecular 0
SurfaceBump 0
SurfaceScale 0
Occluded Ambient 0
Noise Mode 0
Dif Spec Ambi Cavi
Modifiers
S1 S2 S3 S4
Ambient 0
Diffuse 11
DiffuseCurve
Specular 3
SpecularCurve
Transparency 0
TransCurve
Reflectivity 0
ReflectCurve
Metalicity 0
Noise .01
NoiseCurve
Noise Radius 3
Color Bump -2
Gel Shading 0
Env.Reflection 0
Colorize Diffuse 24
Colorize Specular 0
High Dynamic Range 3
Colorize Ambient 0
AnisotropicDiffuse 0
AnisotropicSpecular 0
CavityIntensity 0
CavityRadius 0
CavityColorize 0
CavityDiffuse 0
CavitySpecular 0
SurfaceBump 0
SurfaceScale 0
Occluded Ambient 0
Noise Mode 0
Dif Spec Ambi Cavi
Modifiers
S1 S2 S3 S4
Ambient 0
Diffuse 12
DiffuseCurve
Specular 1
SpecularCurve
Transparency 0
TransCurve
Reflectivity 0
ReflectCurve
Metalicity 0
Noise .01
NoiseCurve
Noise Radius 1
Color Bump 2.15
Gel Shading 0
Env.Reflection 0
Colorize Diffuse 39
Colorize Specular 100
High Dynamic Range 2
Colorize Ambient 0
AnisotropicDiffuse 0
AnisotropicSpecular 0
CavityIntensity 0
CavityRadius 0
CavityColorize 0
CavityDiffuse 0
CavitySpecular 0
SurfaceBump 0
SurfaceScale 0
Occluded Ambient 0
Noise Mode 0
Dif Spec Ambi Cavi

As you can see, a lot has been accomplished toward a "textured" appearance for the model without having to use any texture at all! The ability to create custom materials by copying and pasting channels together is truly powerful.

Even so, there is only so far that the material will take you. For more detail, it is necessary to paint a texture.

- ❑ **Activate subdivision level 1.**

New UV mapping can only be assigned at the lowest subdivision level.

- ❑ **Create a new texture by setting Texture>Width and Height to 2048, each, and then pressing New.**

- ❑ **Assign UV coordinates to the model by pressing Tool>Texture>GUVTiles.**

This assigns the Group UVTiles mapping method that is unique to ZBrush 2. It is as distortion-free as is mathematically possible, while still keeping the groups of polygons as large as possible. It is ideal for painting on using Projection Master.

- ❑ **Return to the highest subdivision level.**

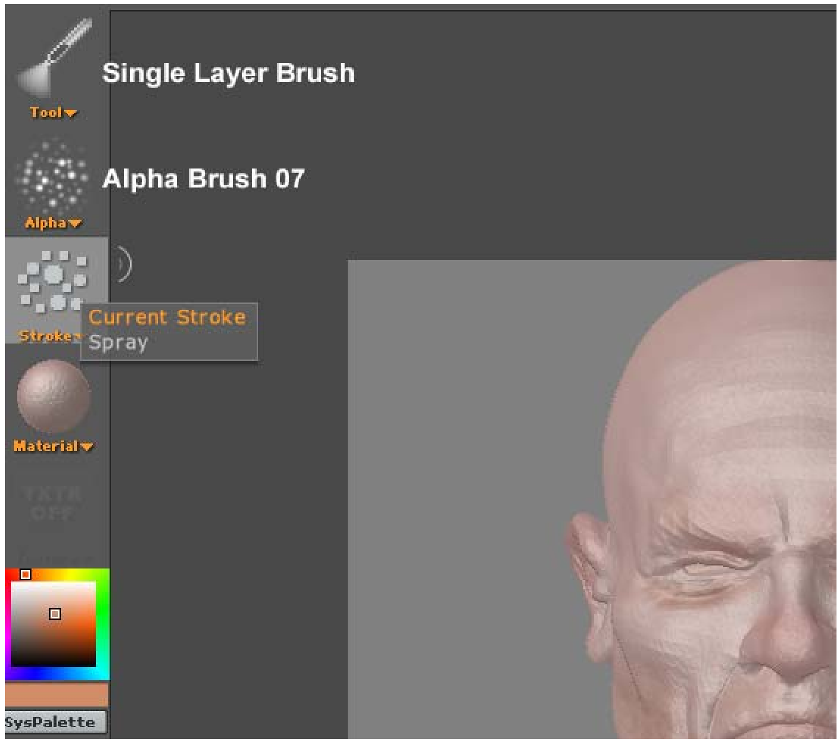
- ❑ **Rotate the model so it faces the camera squarely.**

Remember that you can press Shift when near the desired orientation to snap the model into position.

- ❑ **Press the Projection Master button, select Colors and Fade, then press "Drop Now".**

- **Use your choice of brushes, alphas and stroke types to begin texturing.**

In our example, we began with the Single Layer brush, alpha 7, and the Spray stroke.



The nice thing about the Spray stroke is that it has a random quality that is very suitable to texturing natural objects.

Turn off Zadd, and activate Rgb instead of Mrgb.

- **This allows us to paint with color, alone. No depth or materials will be added while we work.**

Vary your colors, draw size, RGB Intensity, etc. Low Rgb Intensity settings are essential for realistic texturing, since they allow you to build color up gradually, blending it together as you go.

- **When ready, use Projection Master to pick up the model and rotate it to a new angle.**

Remember that in order to keep your texturing consistent across the entire surface of the model you shouldn't try to do everything at once! Instead, it is best to repeatedly pick up the model, rotate it to a new angle, and drop it again so that you can texture every part of the head that can benefit from the current settings before you changing them to add a different kind of detail. This process of dropping and picking will quickly become second nature to you.

Here is our texturing in progress:

Many details will be added by the material's cavity settings. These will not appear, however, until a Best render is performed. Check your work occasionally by doing one while the model is dropped.

The next page shows our finished result.

- **Save this head as Head.ztl. When prompted to save the texture with the model, say yes.**

- **In addition, you should save your material by pressing Material>Save. Call it skin.zmt.**

In Conclusion

Using ZSpheres, a very basic mesh complete with edge loops can quickly be blocked out. This mesh can then easily be modified by using the many sculpting brushes available from the Transform palette. More and more polygons are added to the mesh as necessary for the details that we wish to add. When modeling is finished, a complex material can be built by combining elements from other materials. Projection Master then provides an easy way to paint textures directly onto the model without the need to compensate for UV mapping distortions. What's more, ZBrush offers several UV mapping methods including the new GUVTiles.

Warrior Part 6 – Composition

By J.S. Rolhion

This is where it all comes together! The various elements from the previous five sections will now be used to build a scene, which will be finished and rendered.

Something that you may have noticed in the course of working on this project is that we did not attempt to create a single character but instead created a few pieces. This is because our figure is going to be used within ZBrush and so each piece can be added to the canvas one at a time.

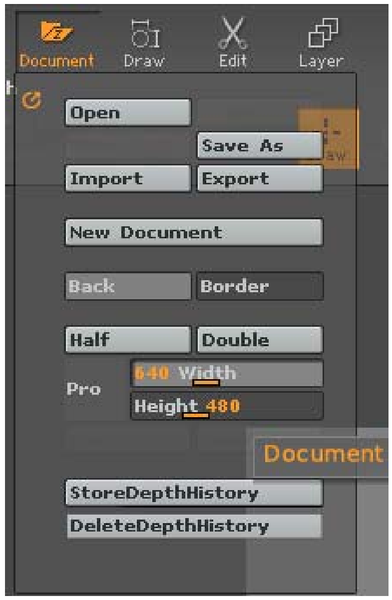
This feature of ZBrush has several strengths. First, we at this point have four very “heavy” pieces in terms of polygons. If all four of them were active in a scene at the same time, your system might very well begin slowing down. But since ZBrush makes it possible to snapshot each piece to the canvas, you actually only have one that exists as polygons at any given moment. You could actually build scenes with figures totally billions of polygons, yet never sacrifice real-time interactivity.

The second advantage to building one piece at a time is that these pieces can be posed any which way you please without the need for skeletal rigs or anything else. Place each part where you want for the scene and you’re done!

The third benefit is that pieces can be recycled from one scene to the next. The Smooth brush can be used to remove details, making room for fresh detailing without the need to build a whole new model. The other editing tools make it easy to reshape elements; for example to change the shape of a face and give him a new expression. By building a relatively small library of reusable parts, you can create an endless variety of scenes while saving hours off the time required creating each one.

Before putting together the final composition, you'll need to define the size of the final image.

- **Click Document>New Document.**



- **Turn off Pro, then set the Width to 1400 and the height to 1200.**

With Pro turned off, we can change the width and height values independently, creating documents with different relative dimensions.

The size of your document should be double the size of the image that you plan to export from ZBrush. Ours will be 700x600, so we create it at 1400x1200. This allows us to take advantage of ZBrush's antialiasing zoom level for the best quality render.

- **Click Resize**

Your document is now probably too large to fit within the viewable area. This is not a problem, as you can zoom out to get a full view when you need it (such as when blocking out the scene), then return to actual size when you wish to add detail.

- **Press the AAHalf button on the right shelf.**

The Half-Sized antialiased view is now active, and depending on your display resolution, the entire canvas could well be visible again. The advantage to working in this view is that you can see exactly what the final image will look like while you work.

- ❑ **Using the Tool palette, Load ArmorPart1.ztl**

The model is selected as soon as it's loaded.

- ❑ **Select the Intensity Metal material.**
- ❑ **Draw the model on the canvas.**
- ❑ **Move, scale and rotate it into the position shown.**

There are two ways that you can do this, depending on your preferences. In the example above, we entered Edit Mode and used the Move, Scale and Rotate icons from the right shelf to position it. That was fine for this piece since there was no need to change the depth.

Alternatively, you could use the gyro. The main difference is that you can change the object's depth with this method. Also, you can use the sliders in Transform>Info to achieve very precise placement should you need it for a project.

❑ **Load the Head.ztl model.**

At this point, the breastplate is now snapshot to the canvas and cannot be moved without clearing the layer and drawing it again.

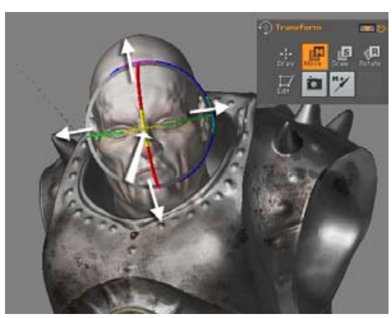
❑ **Press Layer>Create to add a new one and make it active.**

❑ **Select the Skin material.**

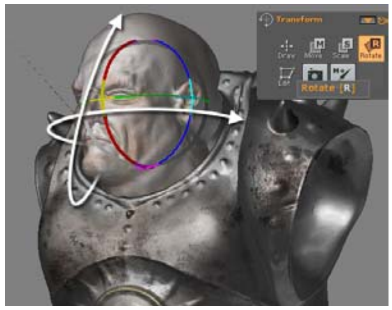
If this is a new session, the material will not be in the palette. In this case, select any material that you do not plan to use in your scene (Fast Shader 5 is a good one) and then load the Skin.zmt that you saved in section 5. The skin material will replace the other.

❑ **Draw the head on the canvas.**

❑ **Activate the Move switch. Use the gyro to move the head into position.**

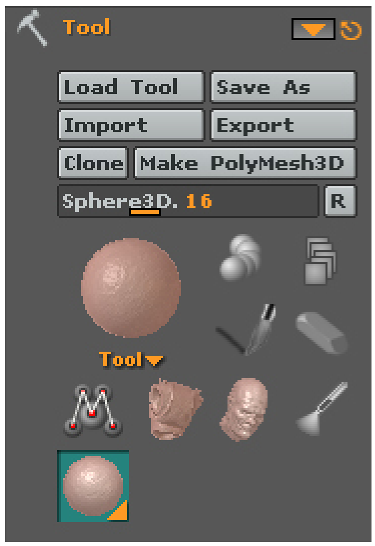


❑ **Use Move, Rotate and Scale as necessary to get the best placement.**



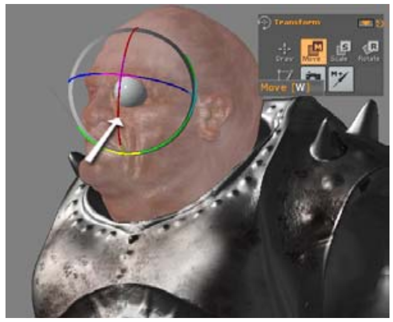
- Create another layer.

- Select the Sphere3D tool.



- Choose the Toy Plastic material.

- Draw the Sphere3D. Use the gyro to move it into position within the head's eye socket.



- **When it is positioned right, press Shift+S to snapshot it to the canvas.**

- **Use the gyro to position the second eye.**

Snapshot lets us create an instance of the object without having to turn off the gyro and draw a second copy. This means that both eyes will be the same size.

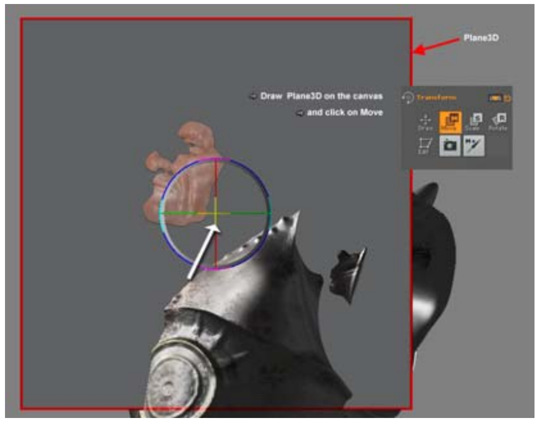
We now have one layer with armor, one with the head, and one with the eyes. There are several advantages to placing intersecting elements on their own layers. For example, if we decided that we weren't happy with the head we could clear that layer and draw it again without affecting anything on the other layers. Also, we will be able to paint on the eyes or armor without worrying about affecting the head in any way. Layers are far more than an organizational tool!

- **For the background, select the Plane3D.**

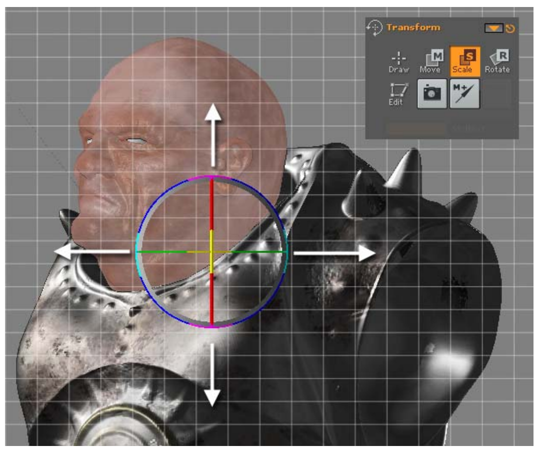
- **Create a new layer.**

- **Select the Basic Material.**

❑ **Draw the plane on the canvas and use the gyro to move it into a background position.**



❑ **Use Scale to enlarge the background so that it fills the canvas.**



❑ **Paint your background using any method that you like.**

We used the Single Layer brush, alpha 01 and the Spray stroke to do the majority of the painting.

Because the background is on a separate layer, it can be painted on without affecting the rest of the scene.

Modify the material properties if you like to make the background more visually interesting. For example, you could use a little bit of color bump, and even slightly increase the High Dynamic Range modifier to realistically brighten the sky.

- **When you are satisfied, press Layer>Bake.**

This changes the layer to the Flat Color material and converts the colors that are generated by the material on this layer to unshaded colors. There are two important reasons for doing this:

You could now use the correction brushes (such as Highlighter II, Smudge and Blur) to add even more detail to the background. Since these brushes affect unshaded color, you will get the most dramatic results from them when working on a layer that has been baked.

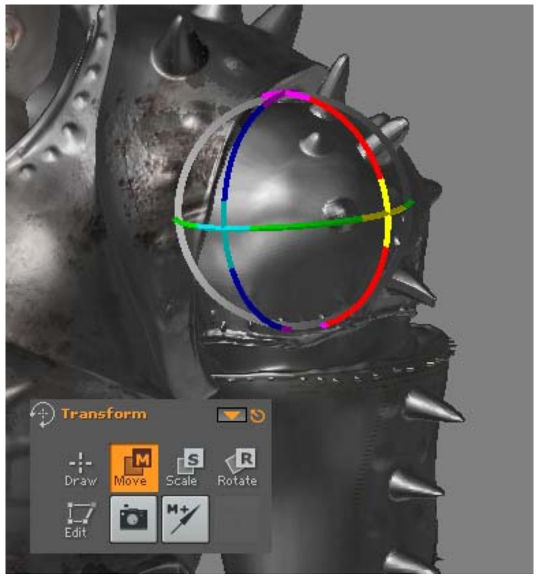
The Flat Color material is impervious to shadows. This means that when we set up our lighting and render the scene with shadows, the man in his armor will not cast shadows on the sky (which wouldn't be very believable).

- **Load the ArmorPart4.ztl tool.**

❑ **Select the layer that the breastplate is on.**

We'll keep both armor parts on the same layer so that we can paint additional details and keep them consistent across the figure.

❑ **Draw the arm on the canvas and use the gyro to move, scale and rotate it into position.**

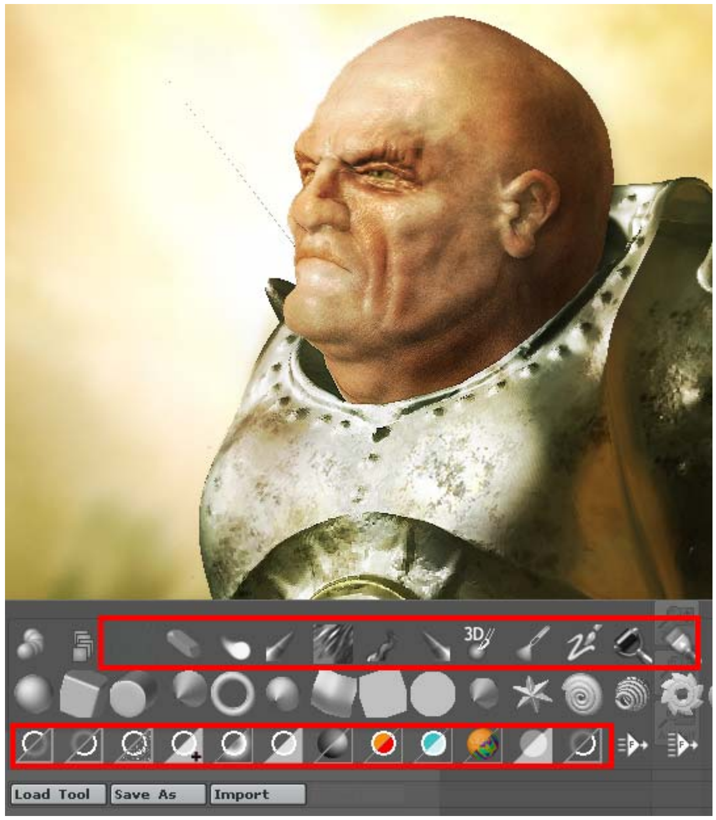


❑ **Snapshot the arm, then move and rotate the second one into place.**

You may find that the second arm becomes partly submerged in the background layer. This is easily corrected by selecting the background layer and increasing the Layer>Displace Z slider by small increments until the background is completely behind the figure.

Now that the scene is blocked out, it's time to bring it to life.

- **Use the various paint tools, alphas, and stroke types to paint character onto the head and armor.**



You can also add soft details using different Draw Size, Z Intensity and Rgb Intensity settings, as well as toggling between Rgb and Mrgb. Activate Zadd or Zsub when you wish to paint depth, but otherwise turn them off.

Change layers as necessary to paint the part that you wish.

Don't forget to add details such as iris and pupil on the eyes. Also, the Shading Enhancer brush is great for adding shadows on the eyes caused by the eyelids. All brushes with the split thumbnail can be reversed by holding down the Alt key. For example, the Blur brush can become Sharpen and Highlighter can be used to darken instead.

Simulate rust on the armor, and in general have fun with the image.

- **Adjust the scene's lighting.**

You might want to reuse the settings from part 5, but this time activate ZMode in the Light>Shadows menu.

- **Adjust the Render settings to match those from part 5.**

- **Press Render>Best Renderer.**

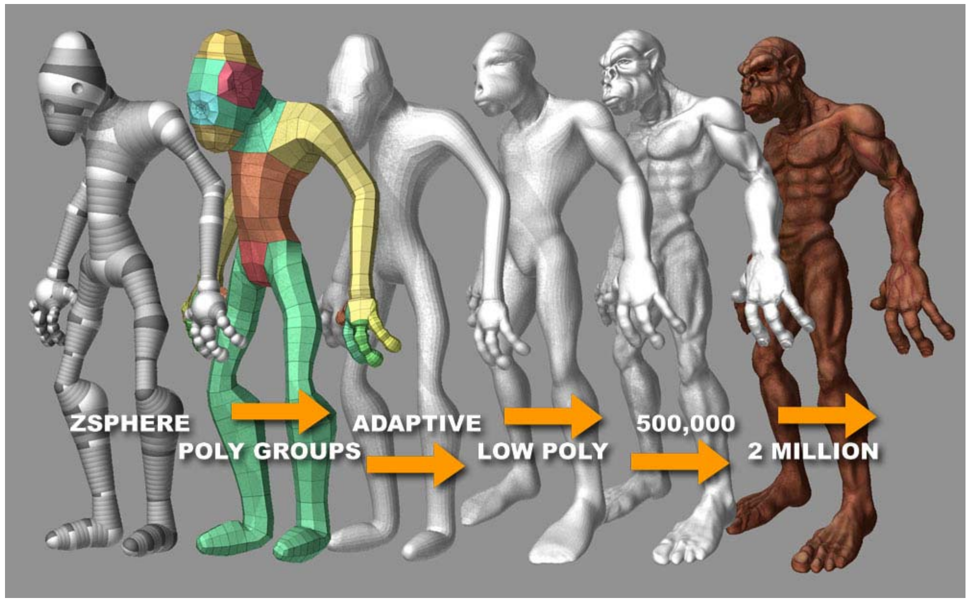
In Conclusion

ZBrush is really powerful when editing your image to get the best effects using a combination of 2D tools, 2.5D tools and 3D tools in one integrated environment. And all of that in real time! This gives artists the freedom to experiment a lot more than could be accomplished with either a 2D or a 3D program.

Character Modeling Part 1 -- ZSphere Modeling & Adding Geometry

By Glen Southern

In this tutorial we'll work with ZSpheres to create the base mesh, and become acquainted with the geometry tools that are available in ZBrush 2.

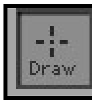
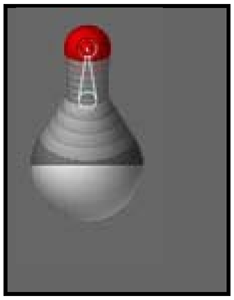
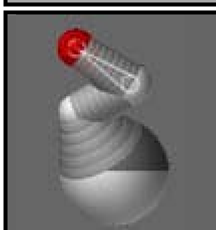


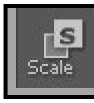
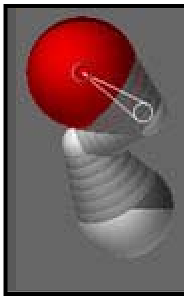
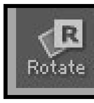
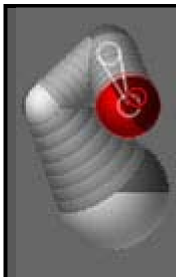
Over the course of this three part project, we will create a full-body mesh from the ground up. In this first section, we'll begin by creating the ZSphere figure and skinning it. Low resolution shaping of the mesh will be performed.

Part 2 will continue the project by sculpting medium and high resolution details. These are the details that really bring a model to life. They are also what you will be focusing on if you intend to create displacement or normal maps for your work.

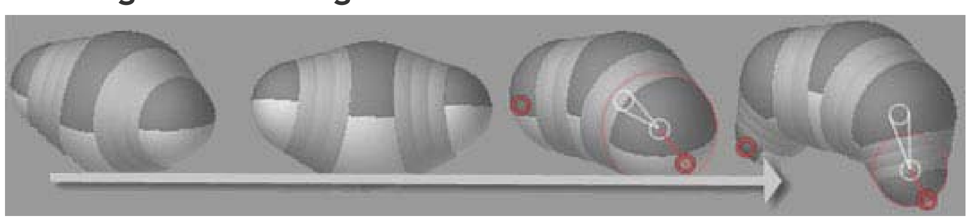
Finally, in part 3 we will touch on texturing and materials. While these topics could fill up a book on their own, we will at least cover the basics.

This tutorial can't hope to teach you all aspects of ZBrush, but you will need a good understanding of ZSpheres. The following is a quick guide to get you started. The idea behind ZSpheres is that you can use them as "place markers" or a "skeleton" to indicate to the program where you would like geometry placed in a model.

ZSphere Reference Table	
	▶To add a ZSphere, select ZSPHERE from the tool menu and draw it into the document window. ▶Hit `T` to enter EDIT mode. ▶You can now add child ZSphere's with DRAW mode selected from the top menu bar then move , scale and rotate them and keep adding more and more to construct the basic shape that you require.
	ADDING ZSPHERES– DRAW POINTER MODE
	▶Add another ZSphere
	Click on the ZSphere to add a "Child" ZSphere
	▶Delete a ZSphere
	ALT+Click on a ZSphere to remove
	▶Insert a ZSphere in the chain
	Click on a gray link chain between ZSphere's
	MOVING – MOVE MODE
	▶To move a ZSphere
	Click and drag a ZSphere
	▶To move the Link-ZSphere
	Click and drag a link ZSphere to move all child ZSphere's
	▶Move without stretching Links
	ALT+Click a Link ZSphere to move without stretching links

ZSphere Reference Table, Continued	
	SCALING – SCALE MODE 
	▶ To Inflate or Deflate a ZSphere
	Click on a ZSphere and drag to inflate or deflate
	▶ To Inflate/Deflate all Child ZSphere's
	ALT+Click and drag on a Link-ZSphere
	▶ Linked Re-Size
	Click on a Link-Sphere and drag to resize
	ROTATING – ROTATE MODE 
	▶ To Rotate a ZSphere
	Click and Drag on a Link-ZSphere to rotate
	▶ To do a constrained Rotate
	Click and Drag on a ZSphere to rotate around its Parent.
	▶ To twist a ZSphere (change its up/down direction)
	ALT+Click and drag on a ZSphere

Building the Basic Figure



- **To jump right in and start a ZSphere model you need to select the ZSphere icon from the TOOL palette.**

"Tool" in ZBrush is a generic term to describe everything that can be used to paint on the canvas. This can include models and brushes, both.

It is the two-tone red ball. If you can't see it at first click on the biggest icon in the TOOL panel and it will show you everything that is available as a tool.

- **With your stylus draw a small ZSphere out in the center of the document window.**

Start with the pen in the middle of the screen and on your first stroke drag outwards very slowly. This is the "root" ZSphere, and will form the figure's hip.

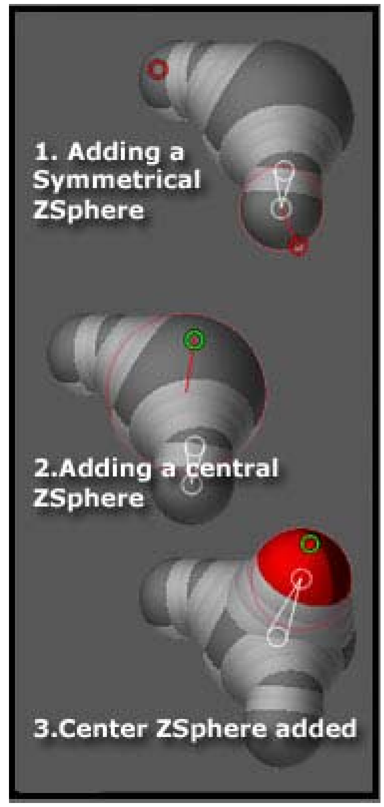
- **To start using the ZSpheres we need to activate EDIT mode. Press "T" on the keyboard.**

You should now see a red ring indicating the current size of your brush. This will become more important later in the tutorial.

- **Go to the TRANSFORM palette and click X.**

See the image to the right.

As we intend to model a humanoid character that is essentially symmetrical we need to turn symmetry on across the X Axis. You will now notice two red dots; one on each side of the Red ZSphere. This will now add child ZSpheres in a symmetrical manner.



When symmetry is active, the circles will show you what to expect when adding ZSpheres.

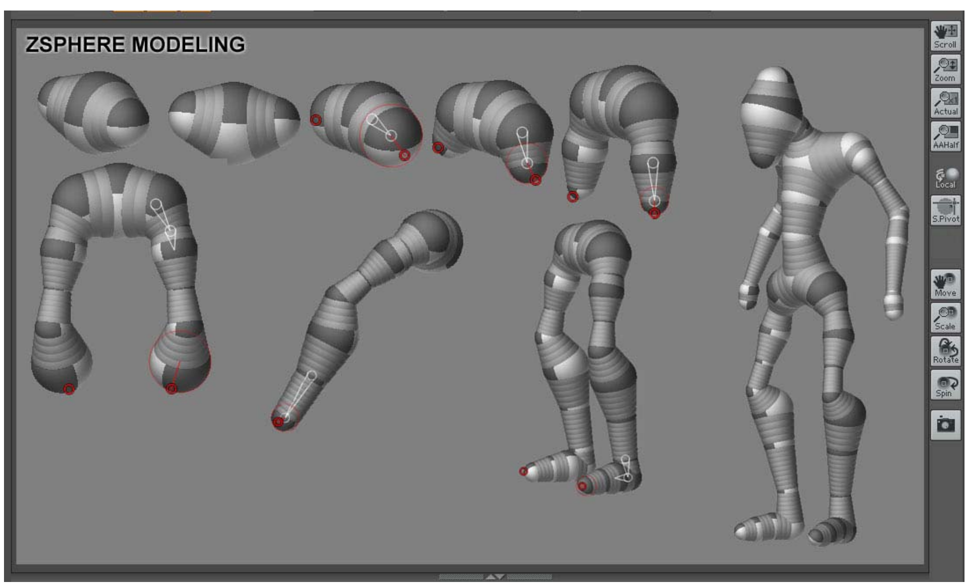
When you see two circles, two ZSpheres will be added.

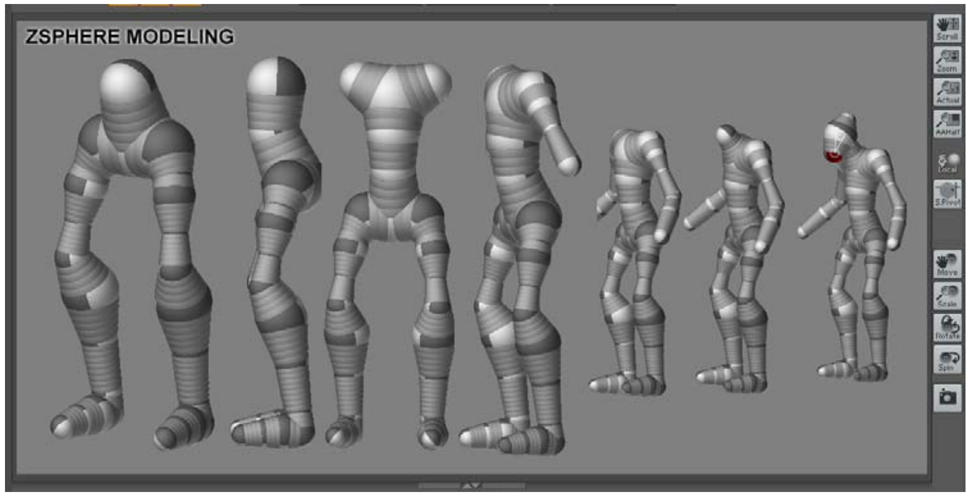
When the two circles merge into one (which happens at the axis of symmetry), only one ZSphere will be added.

Green circles indicate ideal placement, directly on one of the ZSphere's "faces." (For skinning purposes, each ZSphere is actually treated as a cube with six potential faces that can be connected to.) Red circles indicate that the placement is close to an edge between faces. ZSpheres can still be added, but you should check the mesh preview to make sure that you get the desired result.

- **To preview your mesh at any time, press the "A" key on your keyboard.**

The next steps refer to the following image. Use it as a reference while you work.





- **Add a child ZSphere and reposition it away from the hip ZSphere.**

Get used to rotating the ZSphere model to look at it from all angles.

- **Add three more child ZSpheres and reposition them using MOVE.**

You are creating a leg at this stage and these first few ZSpheres are the thigh. The last one is the knee joint.

- **Looking form the side, angle the thigh forward as a leg would be for a figure with slightly bent knees.**

- **Add a slightly larger one for the calf and a further one for the ankle.**

- **Add an additional three ZSpheres for the feet and check the reference image to see how things are looking.**

With the legs complete, we'll return to the hip and build the torso.

- **Add a ZSphere in the center of the hip ZSphere.**

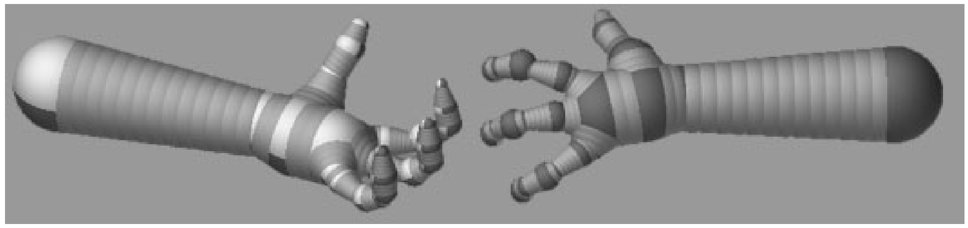
This will become the bottom of the spine.

- **Carry on creating ZSPheres up the spine and then create a large shoulder ZSphere.**

Refer to the images as necessary to ensure proper placement.

- **From the shoulder create the bicep, elbow, forearm and wrist.**

To create the hands:



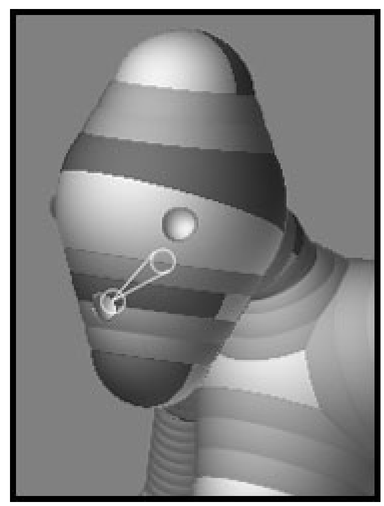
- **In the same way that the figure was created, we need to add smaller ZSpheres as children to the final arm ZSphere. These new ZSpheres will make up the fingers and a thumb.**

Keep rotating the model to get a rough shape for the fingers. Make sure that you have a ZSphere at each bend in the fingers.

- **Add ZSpheres for the neck and head.**

- **Add child ZSpheres to the main head ZSphere. Move them so that they become indented into their parent.**

These ZSpheres will become the eye sockets. Whenever a ZSphere is moved far enough into its parent, its appearance changes to show that it will have a subtractive effect on the mesh. Edge loops will also automatically be created around these indentations.



- **Add a single indented ZSphere to the middle part of the lower face.**

This will become the figure's mouth.

- **Save your model using Tool>Save As.**

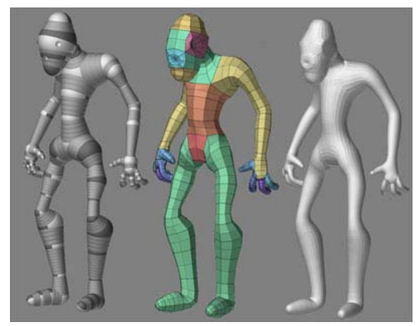
This saves the figure in ZBrush's native format (with a .ZTL extension).

Prior to skinning, a ZSphere model is not exportable. If you wanted to export the mesh, you would need to skin the model first. However, there are many advantages to not skinning a ZSphere figure. The preview mesh can actually be sculpted and textured, and then the figure can be posed by moving the ZSpheres that are used to create it. This is very useful for creating figures to be used within ZBrush scenes.

Working with the Adaptive Skin

We will be continuing the session using the figure that was just created from ZSpheres. If you wish to skip the ZSphere process, you can load the figure_zspheres.ZTL model from the Southern folder in the Resources.

- **Make sure that Edit, Quick, and Frame are all active on the top shelf.**

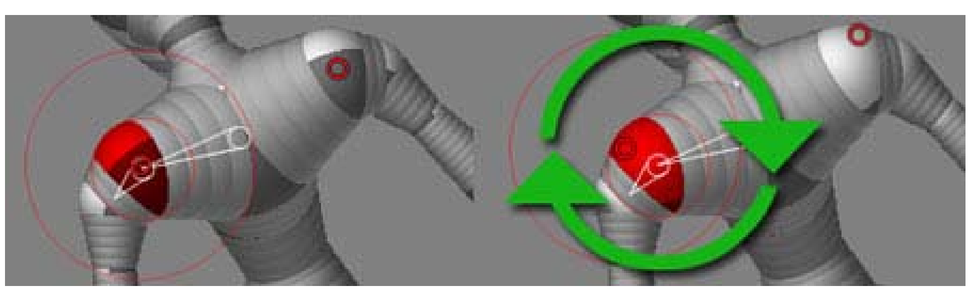


Quick will normally be on by default, and speeds up working with a high density mesh by disabling ZBrush's render smoothing routines. When it is active, the Polyframe display mode also becomes available. With this display style, we can see the wireframe superimposed onto the shaded model.

ZBrush assigns automatic grouping to a ZSphere-created model. By default, this grouping will be displayed as colors on the polyframe. You can change the display to grayscale in the Preferences, or even turn off the group display entirely.

The figure at right shows three versions of the same model. On the left is the ZSphere figure. In the center is the polyframe showing the grouping. On the right is the smoothed version that you would see with Quick 3D turned off.

- **ZSpheres in a mesh should all face the same way.**



The ZSpheres in ZBrush 2 are two-tone red, which helps you understand which direction the ZSphere is facing. If a mesh becomes twisted at any point, you can use ROTATE while holding keyboard ALT and rotate a ZSphere and its Children.

Up to this point, we have only been working with a preview. Now we need to turn the ZSpheres into polygons. Before we skin it, though, there are a few settings in the Tool>Adaptive Skin menu that should be adjusted to help ZBrush create the best mesh possible.

Density	This will allow you to increase the density of the polygons in the mesh. For our example we will leave the setting at 2.
Ires	Intersection Resolution: Used to improve the mesh when more child ZSpheres are added to a single ZSphere. Set it to 30.
Mbr	Membrane Curvature: Defines how membranes will be created at L and T intersections. We can use a setting of 40.
MC	Minimal skin to Child: Affects how polygons are created at intersections. We need to set this to active (selected).
MP	Minimal skin to parent: This setting makes for a more rounded intersection. We will leave this setting inactive (unselected).
NOTE: These settings are only a guideline. To get experience, try changing the settings I have given above and see the model update (if it is still in EDIT mode)	

- **You can turn it into polygons using the MAKE ADAPTIVE SKIN button.**

The ZSphere figure will not change. Instead, a new model is created in the Tool palette. To work with this model, you will need to clear the canvas (to remove the ZSphere figure), and draw the skin on the canvas in its place.

Polygroups

You've already seen how ZBrush gives an Adaptive mesh a set of defined colours to each body part. This auto grouping is done at major intersections in the mesh based on the ZSphere model that it came from, or in the case of a third party imported models they can be assigned based on UV maps. These polygroups become very important later in the exercise where you will see how to hide areas of the mesh while editing the visible section. By using SHIFT+CTRL and clicking a polygroup, it is possible to hide the selected poly group (or colored area).

Adding Geometry

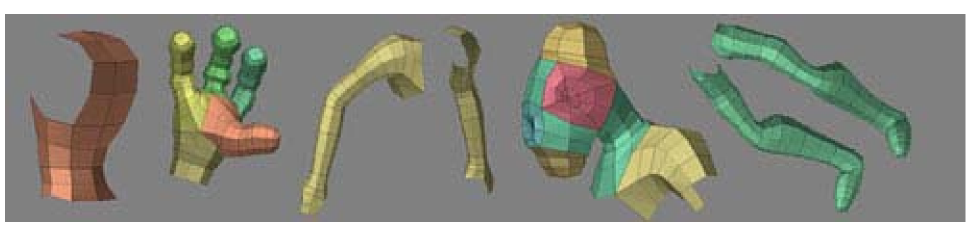
One of the fantastic new features of ZBrush is its ability to handle and manipulate polygon meshes with polycounts into the low millions. Not many other programs on the market today can handle even a small fraction of that without bringing the computer to a near standstill. The next part of the tutorial introduces some of the steps that will enable you to take a low resolution polygon mesh and subdivide it and then detail the polygon surface.

HIDING PARTS OF YOUR MODEL - BASICS

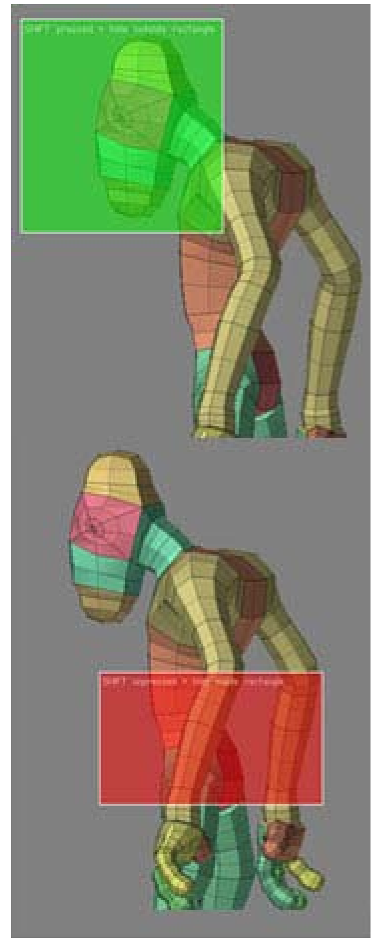
In the next section we will be subdividing the polygon mesh and will end up with a model that has over 2 million polygons. While this density of mesh is fine on higher spec machines it is still advisable to hide parts of the mesh at certain times in the modeling process.

- **Draw the Polygonal model into the document window from the TOOL palette. Press `T` for EDIT mode.**

- **To hide a polygroup use CTRL+SHIFT and click onto the group you want to remain visible.**



- **To reveal the hidden parts CTRL+SHIFT and click on the canvas away from the model.**



- **You can hide portions of the model based on a drag rectangle. Use CTRL+SHIFT and left mouse button to drag out a GREEN rectangle over the area you wish to keep visible. Release the mouse button and anything outside the rectangle is hidden**

- **To hide everything inside the rectangle use CTRL+SHIFT and left mouse button to drag out a GREEN rectangle but release the SHIFT key and the rectangle goes RED. Then release the mouse button, and everything inside will be hidden.**

- **To reverse mesh visibility, drag a small rectangle anywhere on the blank canvas without selecting any part of the model.**

Try this a few times as it can be difficult at first. Get used to hiding and revealing mesh using polygroups and the drag rectangle methods as both will be needed later. The techniques will quickly become second nature to you.

Edge Loops

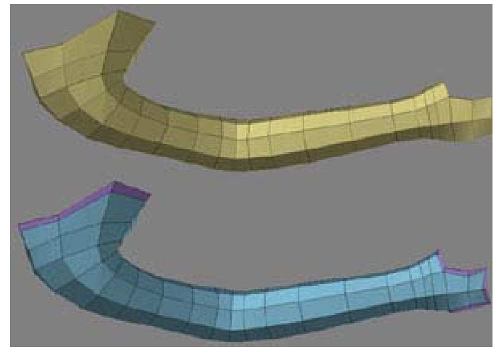
Yet another powerful feature in the ZBrush tool kit is the ability to add edge loops to your mesh. Before we divide the mesh in any way we can give the model extra polygons in areas that may need more detail later in the process.

- **Press Tool>Geometry>Del Lower.**

The Edge Loops feature needs a mesh to be at the lowest subdivision level. Since the model already has a more basic level below this, we need to delete it before we can proceed with the detailing.

- **Hide all but the arms polygroup.**

- **Click the Edge Loop button.**



You will notice that an edge loop has been created at the two open ends of the revealed mesh. When the mesh is subdivided later, these areas will have a higher resolution.

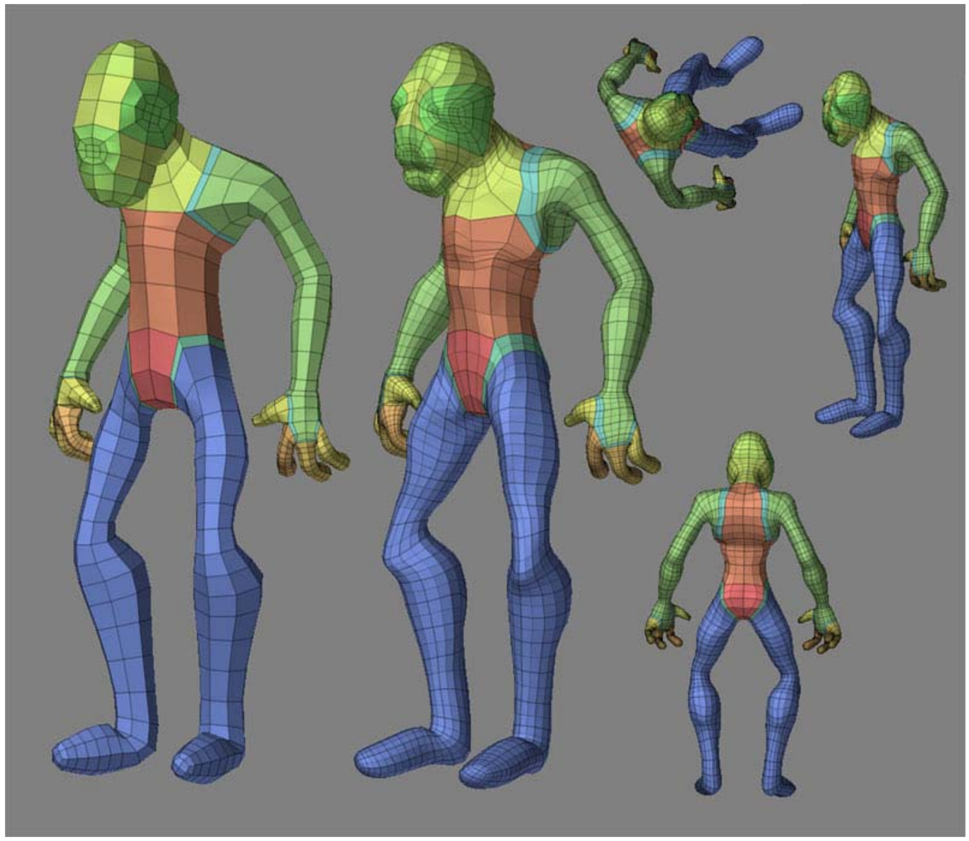
Subdividing Your Model

This next stage is where we actually add more geometry to our model using the Divide button in the Geometry menu. One principle that I like to adopt when modeling in this way is to do as much as possible in the way of sculpting on a model at each subdivison level. That is to say, our model is currently made up of 1608 polygons. Before dividing the model it is always best to get the model as near as possible to the final shape that we require. If this is done at each suddivide, the very high resolution work at the end is limited to fine detail only.

- **Click Divide once.**

If you hover your cursor over the model thumbnail in the Tool palette you will see the poly count is now 6432 polygons. (4x1608)

At this stage we can tweak the figure using MOVE with symmetry still turned on across the X axis. To shape the body, use varying brush sizes and remember to rotate the model frequently to check its proportions.



For now try to add volume to places where the mesh has gone a little flat such as the thighs, the shoulders, the calves etc. Once the mesh looks like the image above, we can move on to subdividing further.

Each time you hit the Divide button, the mesh will quadruple its polygon count so 1608 becomes 6432. Divide again and it will become 25,728 etc...

The current Subdivide level is 2. Each time we press Divide that level goes up by 1.

A point to note is that when ZBrush does this subdivide it retains the information about the lower resolution mesh and you can come back down at anytime by using the LOWER RES button.

- **For now hit the DIVIDE button twice.**

The mesh should now be over 100,000 polygons in size and be sitting at Sub-D level 4.

As with most types of modeling or sculpting it is better to work from some sort of reference rather than making it up from memory. As we can get a great deal of detail into these ZBrush models it is advisable to work from some sort of photograph or sketch.

We can now do some more tweaking and refine the shape some more. Make sure the feet are flat to the ground and are indeed feet shaped. See that the chest has enough volume. Start to think how the muscles will look in the arms and legs.

In Conclusion

In this part of the tutorial, we have studied how to manipulate ZSpheres in the construction of a full-body figure. We've also covered the basics of ZBrush's mesh grouping and partial visibility features, Edge Loops, and other geometry tools. The figure is now at a medium level of resolution and ready for further detailing. We'll do the medium and high resolution sculpting in the next part.

Character Modeling Part 2 – Medium & High Frequency Sculpting

By Glen Southern

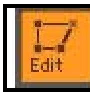
In this tutorial we'll learn how to use ZBrush 2's many mesh sculpting features to detail the model from Part 1.

Now to add some specific muscle detail to the chest and arms. One of the much awaited features Z2 is the ability to manipulate and edit polygonal meshes with polygon counts in the low millions. To be able to follow this tutorial make sure you are confident in hiding and un-hiding parts of your model.

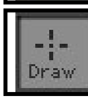
Sculpting Basics

Sculpting or painting depth onto a model in ZBrush can be done in a number of ways. The most basic technique, which will already be familiar to experienced ZBrush artists was the Draw Pointer:

▷The basic way is to put the ZTool (Your model) into EDIT mode (T),



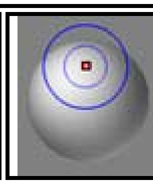
▷Use the DRAW POINTER mode with ZADD activated to build up the surface of the mesh



▷Set the BRUSH SIZE and Z INTENSITY to suit the type of modeling you want to achieve. With this new version there is also the FOCAL SHIFT slider which helps you to refine your 3D painting by adjusting the falloff curve.

▷Use the DRAW POINTER mode with ZSUB activated indent the mesh

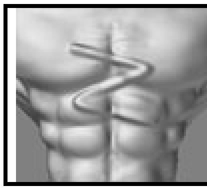
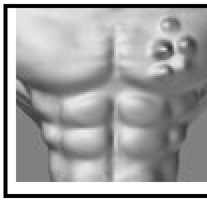
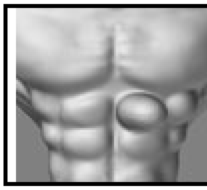
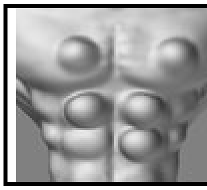
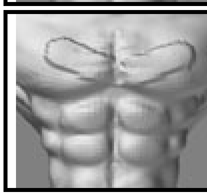
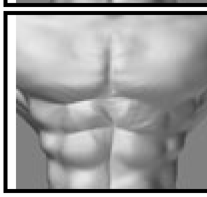
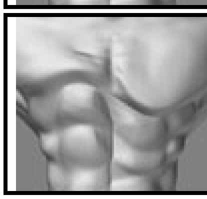
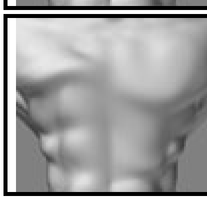
▷Use DRAW POINTER + SHIFT KEY to activate the new SMOOTH BRUSH. This new tool is invaluable for create smooth, organic meshes.



By default, the Shift key activates the Smooth brush. You can change it to any of the other brushes by holding down Shift and clicking on the sculpting brush of choice. From then on, Shift will activate that brush instead of Smooth.

New Sculpting Brushes

ZBrush 2 has a range of new brushes in the Transform palette that build on the above toolset. Again, these brushes are used with the Draw Pointer tool and are simply 'painted' onto a mesh in EDIT mode.

▷STANDARD - As described above, the standard mode simply raises mesh off the surface of the model based on brush size and Z-Intensity. All polygons move in the same direction.	
▷STANDARD DOT - This is the same effect however the effect is a one off at the point your stylus hits the model. After clicking you can drag the bump effect around before placing it.	
▷INFLATE - Applied in the same way as the standard brush, but inflate lifts each polygon along its own surface normal.	
▷INFLATE DOT - See inflate, but the effect is a one-off at the contact point as per standard dot.	
▷LAYER - Applies an even layer of raised mesh defined by the brush size.	
▷PINCH - This brush pulls geometry together to a point at the center of the brush.	
▷NUDGE - Nudge displaced mesh in the direction that the brush stroke is applied.	
▷SMOOTH -This brush (same as holding down shift while painting) smooths out the mesh under the brush radius.	

Sculpting the Figure

With a basic understanding of the tools in the new version we can start work on detailing the figure. The subdivide level should be at 4 giving the mesh 100,000+ polygons to work with. We can now start to add the next level of detail to the model.

- **If you haven't already, hide everything but the torso and upper arms.**

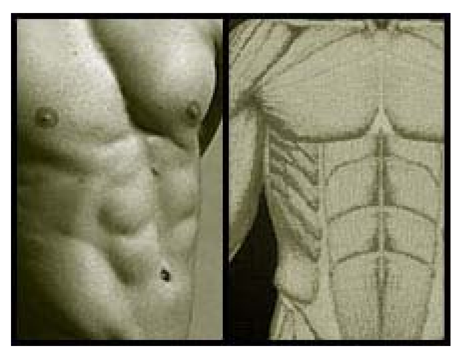
- **Turn POLYFRAME and QUICK off to allow surface smoothing. Set Tool>Display Properties>DSmooth to 1.**

This activates a render-time smoothing effect where ZBrush will further divide the model whenever it's not being edited. The effect will be that when you are rotating or sculpting the mesh, you will see the true number of polygons that the model has. When you release the mouse button, the mesh will become smoothed to show the high-quality effects of your work.

- **Using the standard brush on the torso start to build up the chest and abdominal muscles.**

Use reference material where needed and try to match the muscle groups.

Keep turning the model to make sure the silhouette is correct.



- **For the abdominal muscles switch to the nudge brush and push the edges outwards to give a more defined look to the muscle edge.**

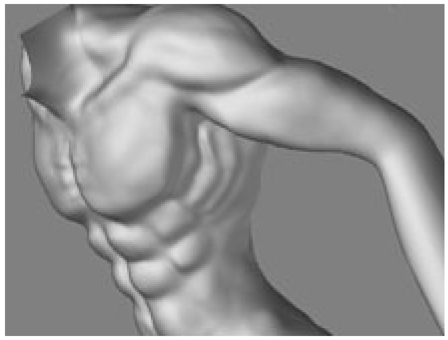
Remember that if you go too far you can CTRL+Z to undo or use SHIFT+standard brush to smooth the mesh out.

- **Build up the muscles around the lower abdomen, under the arms, around the pelvis.**

- **Rotate the model and work under the armpits and onto the shoulder blades and onto the spin.**

For the shoulder blade you may find that the layer brush is useful to create a wide flat area.

- **When you have completed the bulk of the torso start to work down one of the shoulders and onto the biceps.**

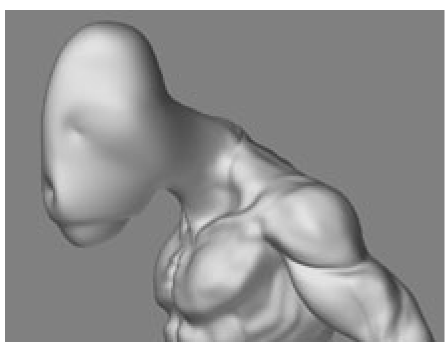


We will finish the arms and hand later but for now we will move on to the neck and head.

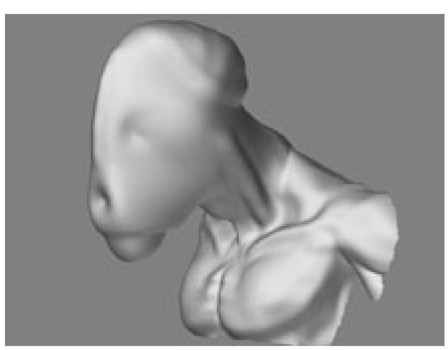
- **To unhide the model, SHIFT+CTRL+Click away from mesh.**

- **Hide everything but the chest, shoulders and head.**

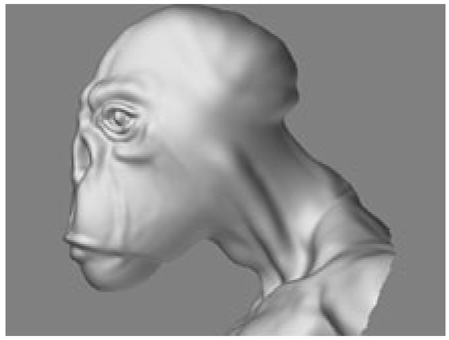
- **Using the standard brush build up and define muscles around the neck up to the ear and bring out the adam's apple. Using the Inflate brush can help underneath the chin.**



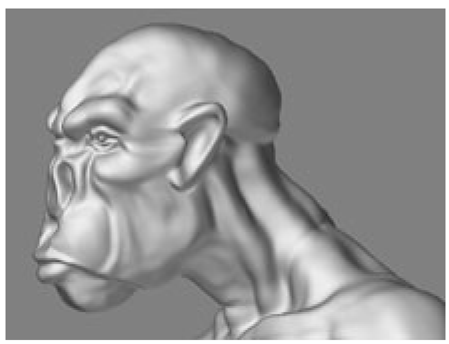
- **Add some bulk to the back on the skull.**



- With the standard brush start to shape the facial features. Swap back and forth between standard, inflate and nudge to manipulate the mesh into the shape you require. Use nudge to make creases around the mouth and cheeks.



- Bulk up some mesh for the eyeball, and then using inflate bring the lids out around it. Move on to the eyebrow, again inflating if needed.



- Hide everything but the legs and feet.

- Work your way down the legs with the standard brush and bulk out all the major muscle groups as we did for the chest.

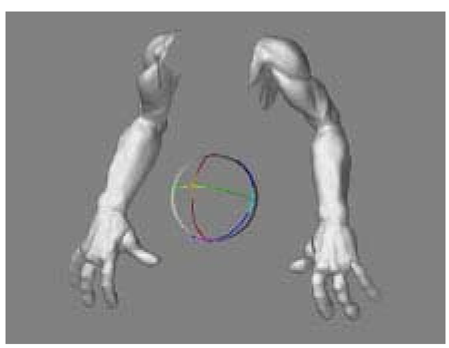
The nudge brush is useful here to help push the muscles back together once you have given them enough volume. Don't forget to change your brush size and Z-Intensity to model different parts of the leg.

You will need to use standard+ALT a lot here to indent the back of the legs and define the calf muscle.

- **When you reach the feet you can hide everything but the feet and detail the toes and nails with standard, layer, nudge and inflate.**

Pinch can help get between the toes and for pulling the nail back into the skin and use Layer to draw the nails on.

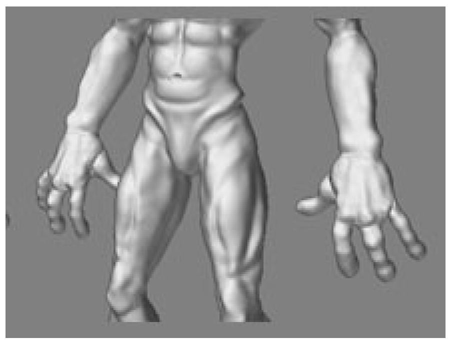
- **Hide all but the arms for the next section.**



- **As with the rest of the figure use a combination of the new brushes to build up muscles and indent areas of the figure.**

The fingers need to be done with a very small brush and a low Z-intensity. The finger nails can be achieved with the layer brush.

However, to get really fine details on the hands and feet we need to go to an even higher density mesh.



High Resolution Modeling

The next stage in the modeling process takes the mesh to extremely high resolution (polygon count) and gives us the opportunity to add details to the figure that would be difficult if not impossible in any other 3D package on the market. A fast processor and lots of RAM will help you to work faster.

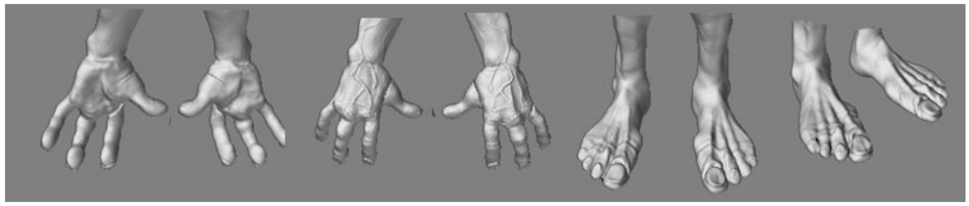
Even with a fast machine, use hide and unhide as much as possible. Get into the habit of hiding all but the area you are detailing as this dramatically improves the speed.

While it is possible to complete the tutorial on machines with lower amounts of memory it can become difficult to rotate and move the model. This is where hiding the mesh becomes really crucial and the ability to step up and down the resolution is absolutely necessary. A good workflow is to go down a couple subdivision levels every time you need to see a large portion of the model. Hide all but the area that you wish to detail before returning to the highest subdivision level to continue your work.

Use the new Focal Shift setting to your advantage. When it is set to its highest you can achieve some interesting detail effects on the model's surface. Combine this with different Brush Size and Z Intensity settings, and it becomes an invaluable tool for detailing the mesh.

- **Go to Tool>Geometry and hit DIVIDE twice more.**

This will take the mesh to level 7 which is the highest level we can go in this project. Depending on which ZTool you are using you will now have anywhere from 1.6 to 2 million + polygons. With that number of polygons in a mesh we can now add very small details to the model that would only be possible in other programs by using bump maps and displacements of some type.



Using Projection Master for Modeling

Although adding detail to the mesh in EDIT mode alone is acceptable, there is another way to refine the detail even more. With PROJECTION MASTER you can drop the mesh to the canvas and paint depth and color onto the 2.5D model then pick it back up as 3D with the changes. This allows you to use some of the 3D brushes and any number of ALPHA BRUSHES to add detail.

- **Hide everything but the head of the figure.**

- **Rotate the model so that it is viewed exactly from the side.**

Hold down the Shift key when you are close to the right angle to snap the model into position.

- **Click the Projection Master button on the interface or use “G” on the keyboard.**

This brings up the Projection Master panel in front of the canvas. Here, you can change the settings that PM will use. As settings are turned on or off, the thumbnails will update to show how they work together.

- **Turn off all three of the settings in the top section.**

We will only be painting displacements at this point, so don't want to use color or material effects.

- **Turn on Double Sided.**

This is why it was important to snap the head to the Z axis. Projection Master will make our work easier by painting both sides of the model at the same time.

- **Turn on Deformation and leave the Normalized setting active.**

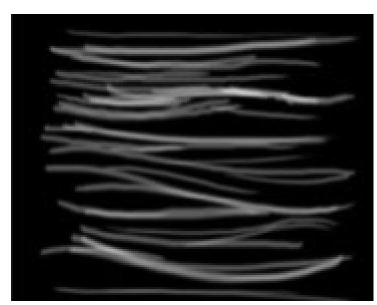
- **When the settings are correct, click the Drop Now button.**

- **Using a stippled alpha brush add some detail around the eyes, cheeks and mouth and down onto the neck.**

It is possible to use any alpha images as brushes at this point. These can be imported into the Alpha palette using Alpha>Import.

For the neck area I used a wrinkled alpha that allows me to stamp wrinkles onto the neck without having to paint each one on.

This alpha is provided in the Resources as neck_wrinkle_alpha.jpg.



- **Next, pick the model back up off the canvas using “G” again and select the PICK UP option.**

The model is now back into EDIT mode and should have been changed according to your alpha painting.

- **Rotate the head back to the front, using SHIFT again so that the model looks straight out of the canvas.**

- **Hit “G” again and drop it back down to canvas.**

Make sure that you don’t have “Double Sided” checked, or the changes that you make to the front of the head will be reflected on the back.

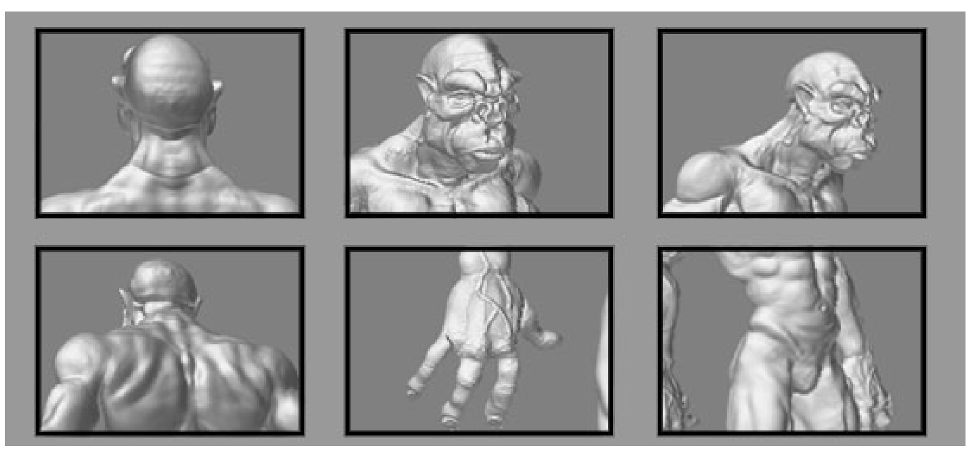
- **Now using more ALPHA BRUSHES make any changes that you see fit.**

Use different brush sizes and Z-INTENSITY settings to vary the effect. Remember that this part is not symmetrical so you will need to do the changes to both sides of the face.

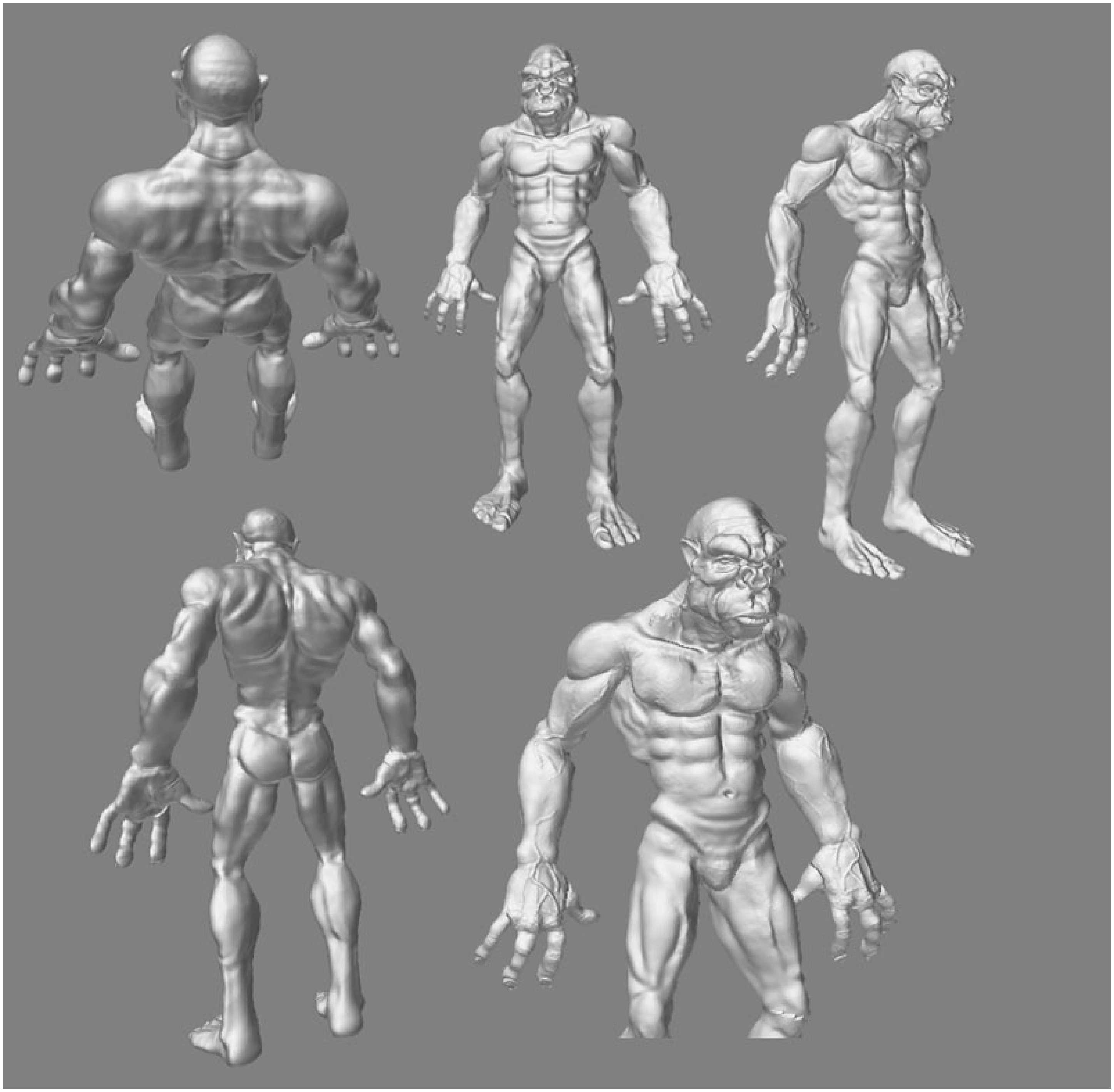
- **When you are done, use Projection Master to pick the model up again.**

You will see your painting transferred to the model.

- **Using these methods, reveal and re-hide parts of the model and use Projection Master over and over again, changing the rotation of the model each time until you have added enough detail to suit.**



Use this image as a reference while you work on detailing the rest of the body.



Character Modeling Part 3 – Texture & Material

By Glen Southern

Now that the model has been fully sculpted, it's time to finish the figure by painting texture and applying materials.

AUVTiles is incomprehensible to the naked eye, but easily recognized by the computer. It offers a zero distortion form of UV mapping, and so is ideal for painting via Projection Master.

Because AUVTiles unwraps each polygon to its own square, it should not be used on a model with triangles.

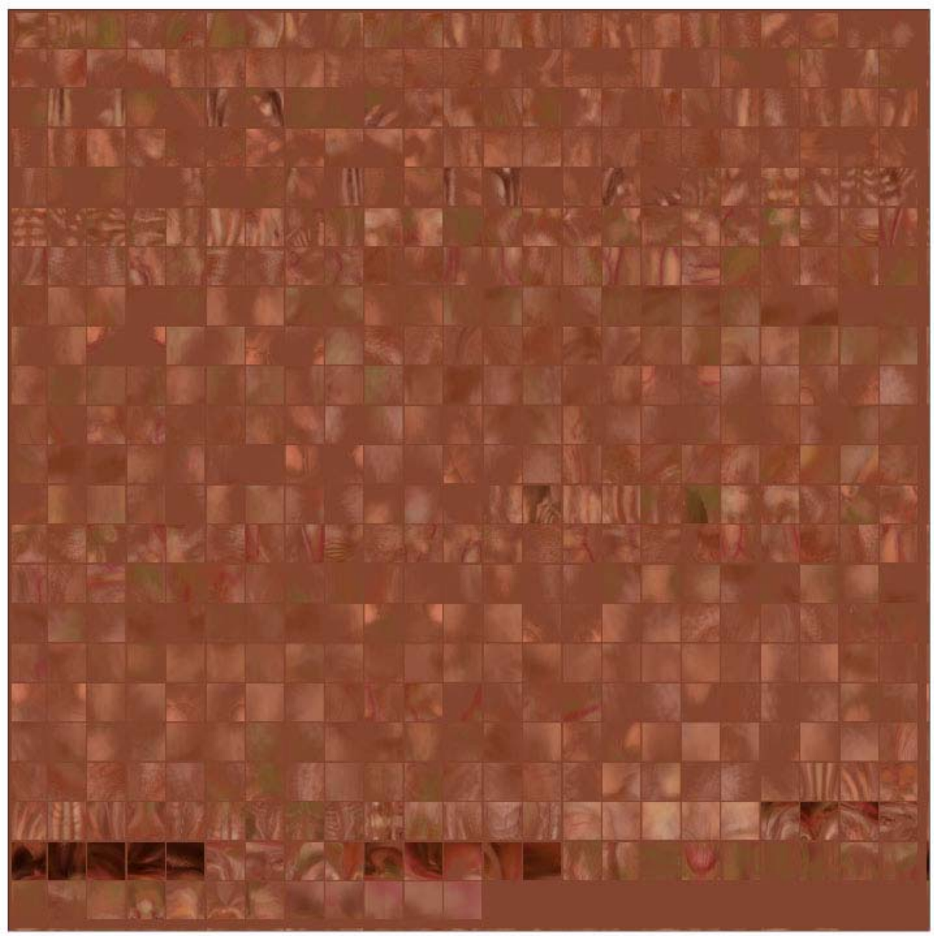
An alternative to AUVTiles is the new GUVTiles. This method unwraps groups of polygons as a unit. It attempts to keep the polygon groups as large as possible while still maintaining distortion-free mapping. It is also ideal for models with triangles.

The third and final part of this tutorial is to add some color to the figure using a texture map and some material properties. This section deals with a few choices I made to texture this model and serves only as an introduction to the Material and Texturing potential of ZBrush.

Creating a Texture Map with Projection Master

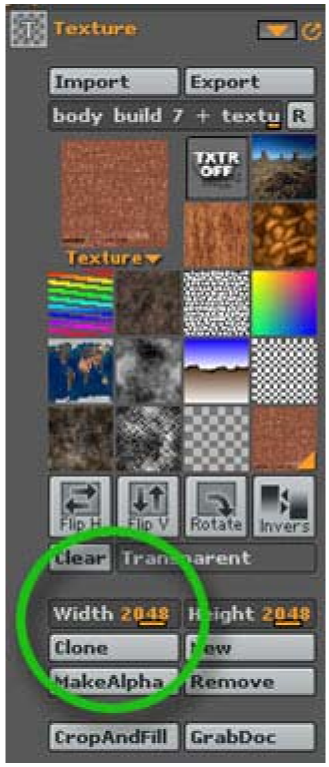
AUVTiling

Once the model is complete we can start to work on a texture for it. ZBrush has a number of different UV modes but for this exercise we will be using AUV tiling.



Adaptive UV Tiling maps the selected texture onto an object by assigning a small rectangular area of the texture to each polygon. The portion of the texture map assigned varies according to the polygon's relative size. Larger polygons are assigned larger areas of the texture map, based upon the AUV Ratio setting.

ZBrush is optimized for texture dimensions that are a power of two. You will get best results with the following sizes: 256x256, 512x512, 1024x1024, 2048x2048 or 4096x4096.



- **In the Texture Palette enter a new size for the texture map that you wish to create.**

As we want to create a detailed map for the whole body create it at 2048x2048 (or 4096x4096 if you have a lot of RAM).

- **Select a dark skin tone in the Color Palette.**

This will become the base color for the texture map.

- **Click new and a texture map will be created using the base color.**

- **Click Tool>Texture>AUVTiles to assign the mapping.**

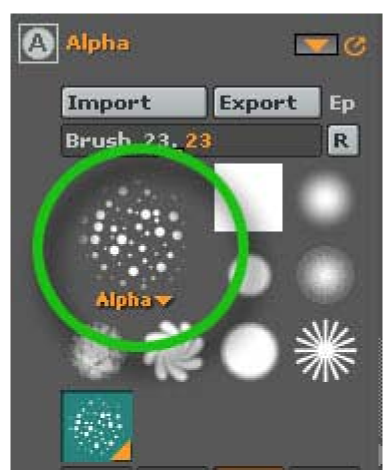
ZBrush also supports Cylindrical, Planar, Spherical and group UV tiles in addition to the Adaptive tiling that we are using here. It will also use UV coordinates given to an imported model from other programs.

- **To detail the texture map we can use the Projection Master function again but this time we will leave DEFORMATIONS turned off and work solely with color.**

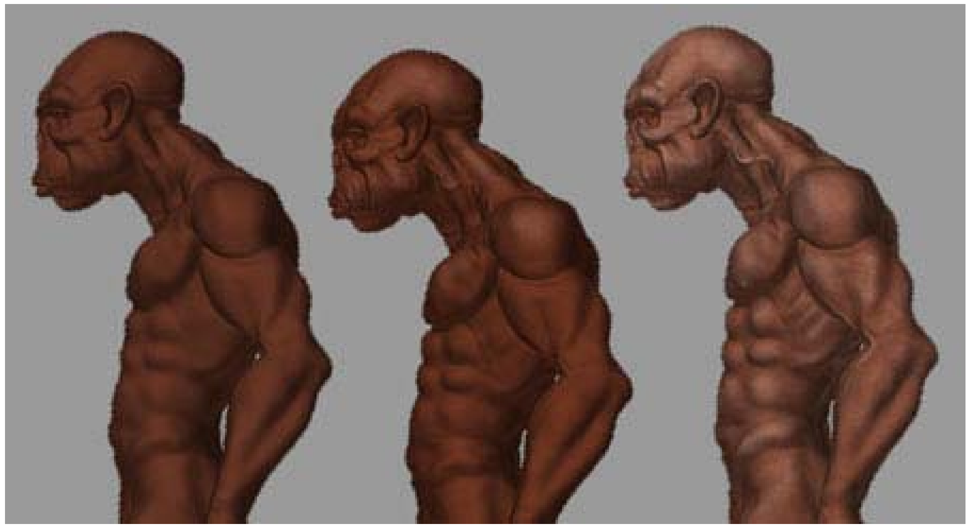
- **Using the GYRO and SHIFT, spin the model to a side profile.**

- **Use 'G' to activate Projection Master. Make sure that Color, Fade, and Double Sided are turned on, then press Drop Now.**

- **Use Alpha brush 23 and a slightly lighter shade of your base color and start to paint areas of the model that are not in a recess or fold.**



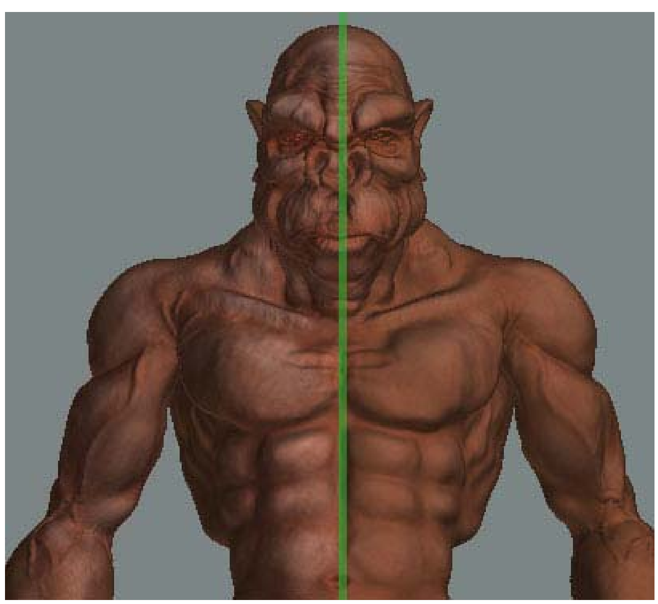
Use a small Brush Size and a low Z-intensity and build up the color slowly. Don't be tempted to change the color yet as we need to apply this first coat all over the mesh to give consistency. The idea will be to build up layer upon layer of color dropping and picking up the model as you go.



- **Pick the model up (G) and rotate it to the front using SHIFT to lock it to Z. Continue texturing in the same way, adding more and more detail.**

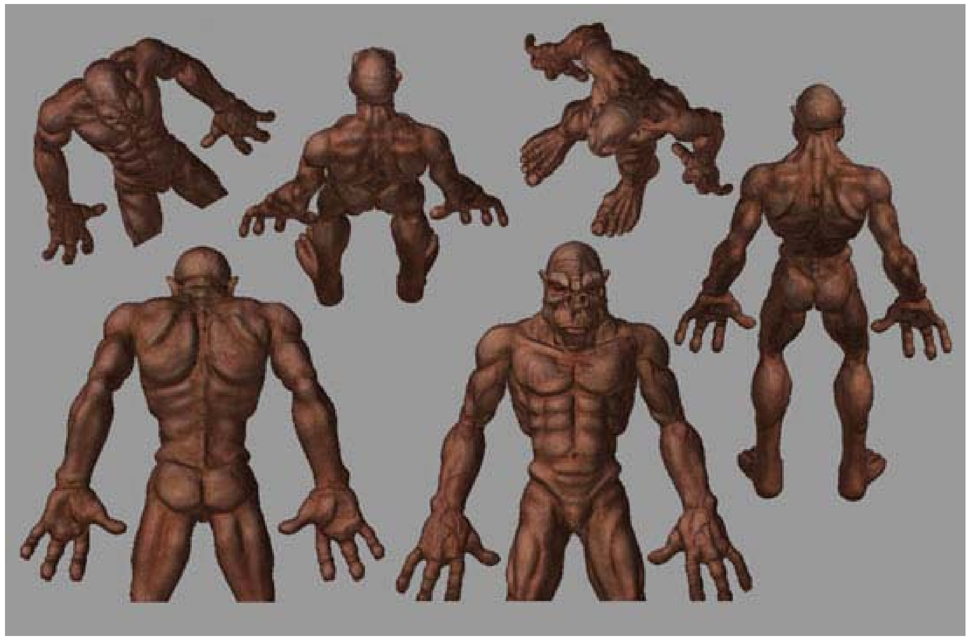
Don't forget to turn off Double Sided!

- **Apply the same principle as you did on the side, slowly building up some color on areas that are not recessed.**



You can select a new Alpha brush from the Alpha palette or use one of your own but this initial stage is really laying down a base layer so it shouldn't matter too much for now.

- **Pick it up again. Rotate it forward so that the top of the models head is facing you and do the same for his skull and shoulders.**



You may find that you have to drop the model to canvas in some odd angles to get the texture map right. This is fine, but remember that what ever angle it is you will have to do the same on the other side of the model.

Creating a Material

This section could be a whole tutorial by itself. The material Palette of ZBrush 1.55b was a huge area to discover and version 2.0 just adds more. I will simply create a material and use some of the new settings available in the new version.

Materials basically tell the rendering engine how to deal with light. They can also achieve special effects such as creating fibers or cavity shading.

The finished model (shown on the next page) uses our texture map and a modified Basic Material.

- **Place the Material palette in a Tray so that you can work with it more easily.**

- **Select one of the Basic materials.**

ZBrush 2's main addition in most of the shader channels is the section containing the Cavity settings. This new set of sliders lets you add color to recessed areas on a model (or raised areas, depending on your settings).

The first of these settings is the Cavity Intensity. It can be set from -1000 to +1000.

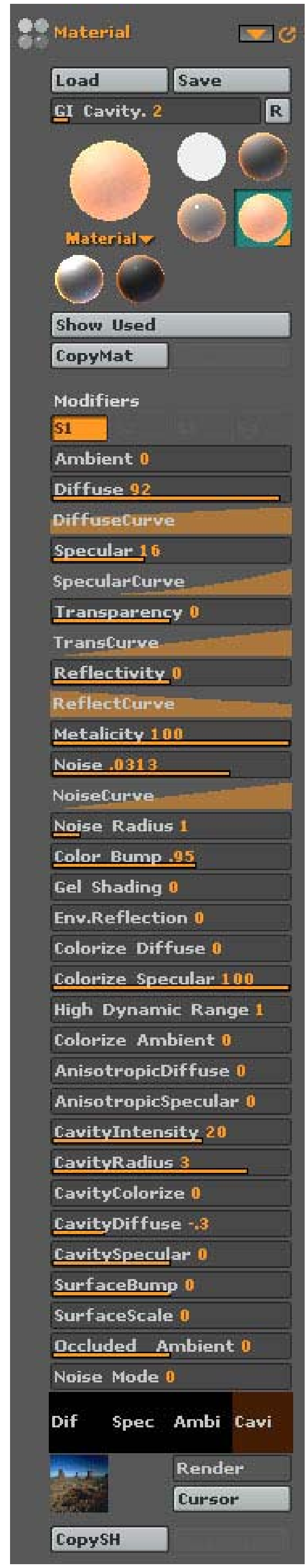
The second, Cavity Radius, sets how far color will be applied away from the cavity's deepest point.

Cavity Colorize controls the color of the cavity shading based on the chosen color in the Cavity patch (at the bottom of the palette).

For example, our model needs a dark skin tone in the cracks, but if we chose a red color this would happen:

And finally, there are Cavity Diffuse and Specular, which control those settings within the cavity area of effect.

For this model I have chosen to give it a small amount of color Color Bump as well, which will raise up the lighter areas of the texture map.



For your convenience, the material is also provided in the Resources as CavitySkin1.ZMT.

- **When the settings are done, click Render>Best.**

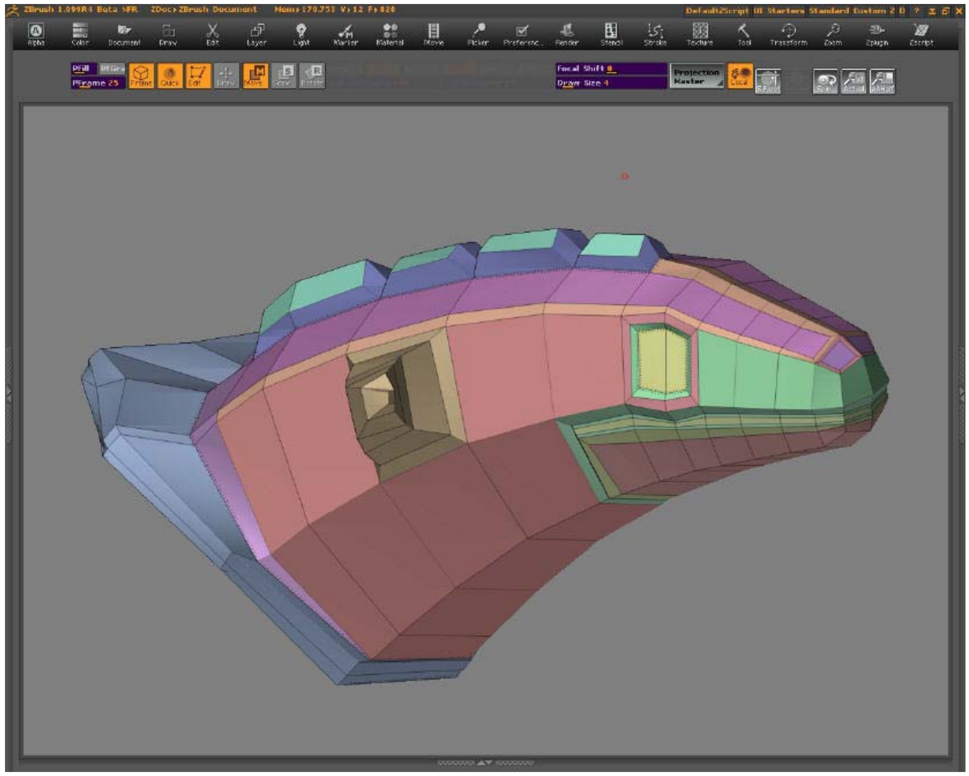
Cavity shading only appears during a Best render.

Feel free to experiment with the lighting and render settings. The images above were done with a single light.

Box Modeling Part 1 - Modeling

By Lonnie Sargent

This section of the multipart tutorial covers how to use ZBrush 2's Edge Loops feature for modeling detailed meshes.



With the introduction of Edge Loops and many other exciting new features in **ZBrush 2.0** we now have more flexibility than ever in our approach to building models. A common method in the 3D world for building models is called "Box Modeling." A simple cube is taken and formed into a basic shape to which additional detail and form is added. This can be done in **ZBrush 2.0** now as well, but **ZBrush** offers its own unique base modeling methods which greatly simplify the Box Modeling technique. In Part 1 of this tutorial we shall use **ZBrush** box modeling techniques to build and define a low-density mesh. Part 2 of the tutorial will explore refining and detailing the model using new techniques and features found in **ZBrush 2.0**. Part 3 of the tutorial will cover texturing, painting, rendering and post work.

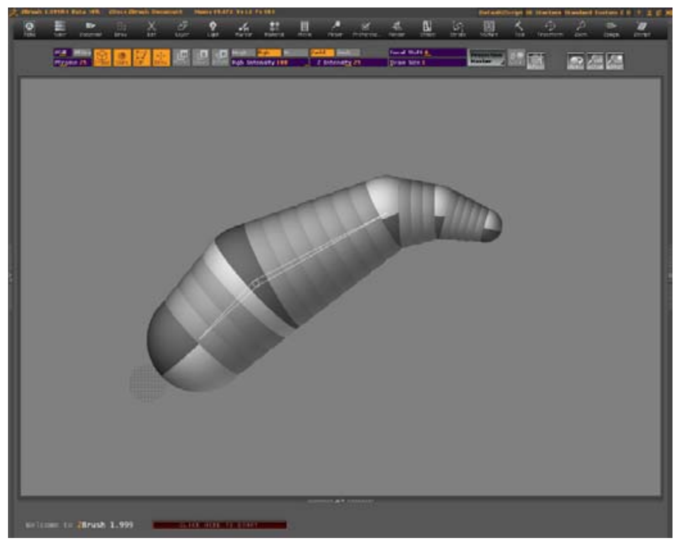
The two alphas that are used in this tutorial are available in the Resources\Sargent folder.

These tutorials are of an intermediate level. It is assumed you have a basic understanding of **ZBrush** and its features. If you have not done so, please go through the starting sections of this manual and the ZScripts that were included with **ZBrush 2.0** in order to familiarize yourself with all the new features. Of immediate importance is that you understand and are comfortable with the new polygon selection capabilities presented in **ZBrush 2.0.**

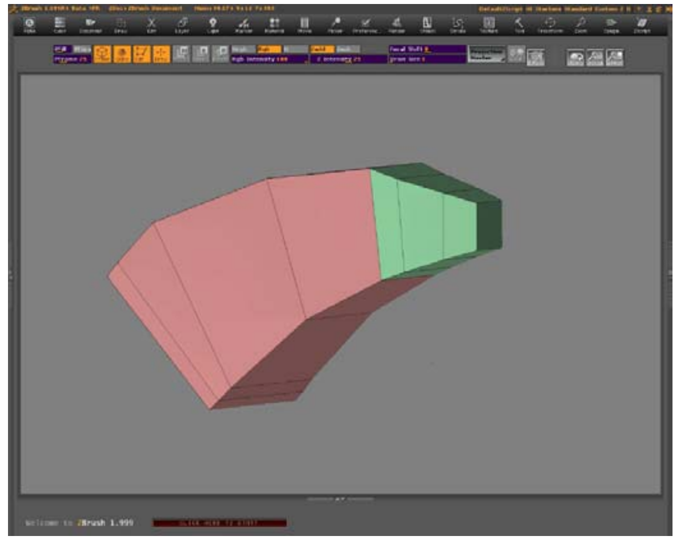
During the course of the tutorial I work in a document size of 1280 x 960. At the end of each of the steps of the tutorial I highly advise you to save your tool. In the event something happens you can always load the last saved tool without fear of having to start the tutorial from the beginning again. *Save your tool and save often!*

Now without further ado let us begin our journey.

- **Create a basic ZSphere object that looks similar to the one I have created.**



You will notice as you create the object that the spheres are different from earlier versions of ZBrush. The spheres are two-toned and you will see triangular vectors within it. The dual colors allow easier manipulation of the spheres and indicate the orientation of the mesh (press **A** on the keyboard to preview the mesh). The triangular vector inside the spheres indicates the child/parent relationship of the currently selected sphere. The benefits of this feature become more evident when dealing with larger ZSphere objects containing hundreds of branching sphere chains.



- **We will be using an Adaptive Skin for modeling so set the Density of the Adaptive Skin to 1 and skin it.**

- **Clear the document and draw the new skin out onto the document.**

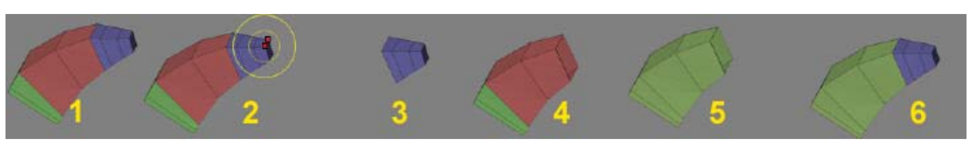
- **Enter Polyframe mode.**

We will be working in this mode through the rest of this chapter.

It is possible that your base mesh may not look like the image on the right. If this is the case you may use the selection features in **ZBrush 2.0** to isolate the mesh as shown in the six steps below to reassign **polygroups.** This is not entirely necessary in this tutorial, as it will not affect the final outcome of the model we are working on but for purposes of following the tutorial you may find it helpful to match your mesh to the mesh I have created in the image on above.

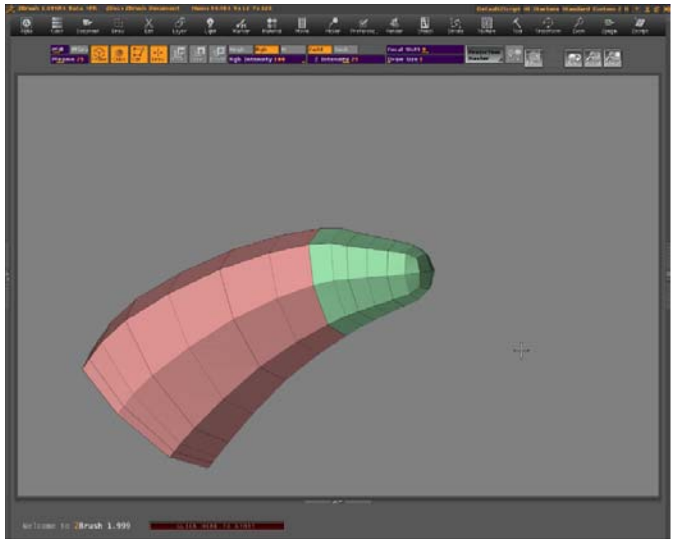
- **You may find it necessary to tweak the model a bit by entering EDIT>MOVE and moving the vertices around. Make sure you are in X-Symmetry mode when doing this by pressing the X key on the keyboard.**

You should see two red dots appear in symmetrical relation to one another on the model. Move the vertices around until you are satisfied.



1) The default **polygroups** generated; **2)** Select the blue **polygroups** (your actual colors may differ); **3)** The blue **polygroup** is selected and the remaining mesh is hidden; **4)** Invert the selection; **5)** Assign the selected area to a new **polygroup**; **6)** The final grouping.

- **Subdivide the object once by pressing Divide located in the Tool>Geometry pallet.**



You should now have two subdivision levels. By subdividing we are generating additional polygons, which will help us to further define groupings and place additional **Edgeloops** as we model. Before we place the **Edgeloops** we must delete the lower subdivision level first.

- **Go to TOOL>GEOMETRY and DEL LOWER.**

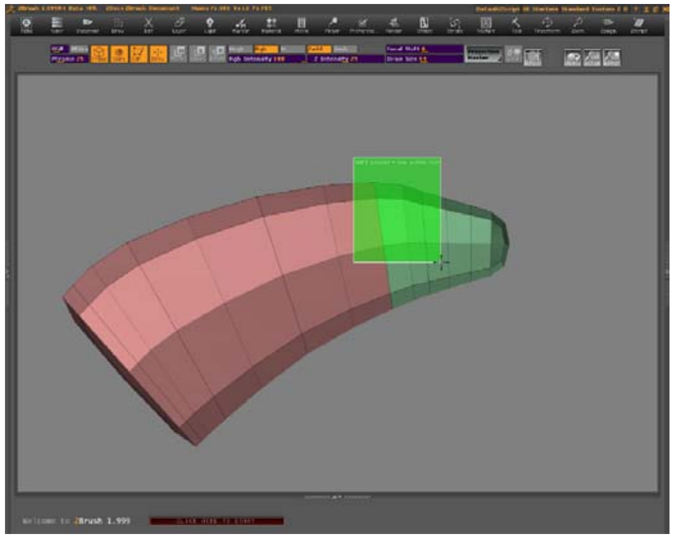
It is located in the same pallet as the Divide command.

Edgeloops may only be created on the lowest subdivision level thus for our purposes this step is necessary.

Now we will create the eyes.

- **While holding the Shift key rotate the object on the workspace until it snaps into a full side view.**

CTRL+SHIFT DRAG to select the two rows of polygons depicted in the image below.



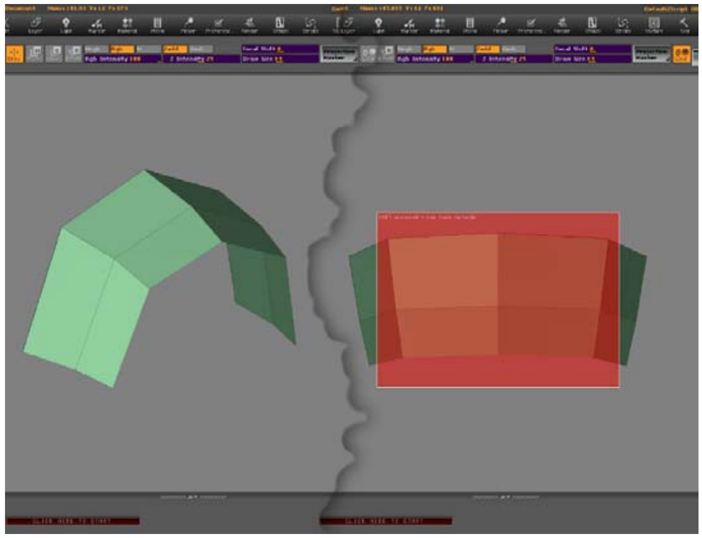
With the object at a full side position we will be able to select the polygons needed on both sides of the head at the same time.

We need to further isolate the polygons we wish to work on. To do this we will use the constrained **HIDE SELECTION** feature.

- **Rotate the rows of polygons while holding the SHIFT key so that they snap into a top view.**

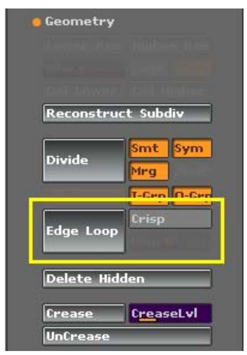
- **Then press CTRL+SHIFT and begin dragging the selection box across the top polygons. Release both CTRL and SHIFT but continue to drag the selection box.**

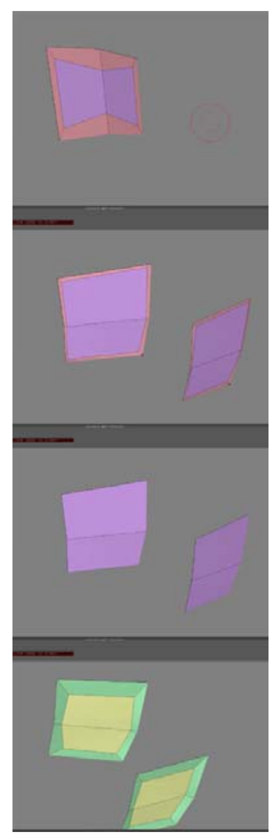
You will notice it will turn from green to red. This indicates that any selection made with the red selection mode enabled will remove polygons from the currently selected group. This is the opposite of the green selection mode which selects polygons. This is a handy feature but can be a bit tricky to get accustomed to at first.



You should now have two polygons on each side of the head selected.

- ❑ **Create an Edgeloop on the selected polys.**





It will be necessary to move the vertices around so they conform more to the shape of the original polys.

- ❑ **Enter EDIT>MOVE mode to do this.**

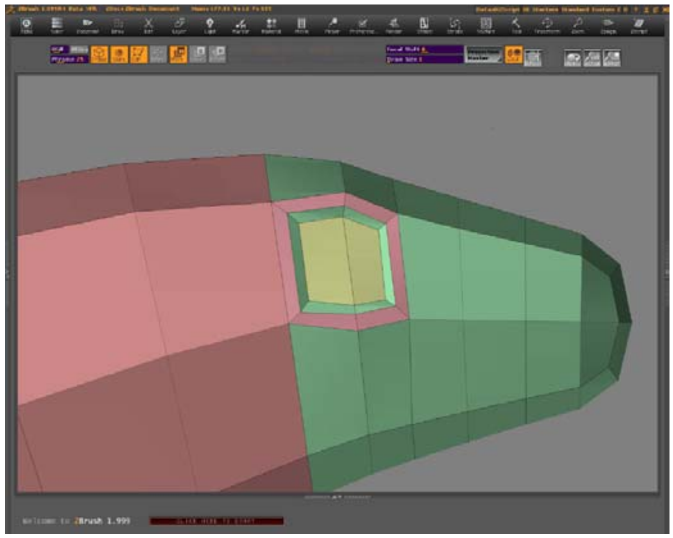
Ultimately when the model is subdivided several times this “square” area will become rounded.

- ❑ **Hide the outside edgeloop of polygons by CTRL+SHIFT+LMB Clicking on them.**

- **Create another Edgeloop and move the vertices once again. This time move the vertices inward to create depth.**

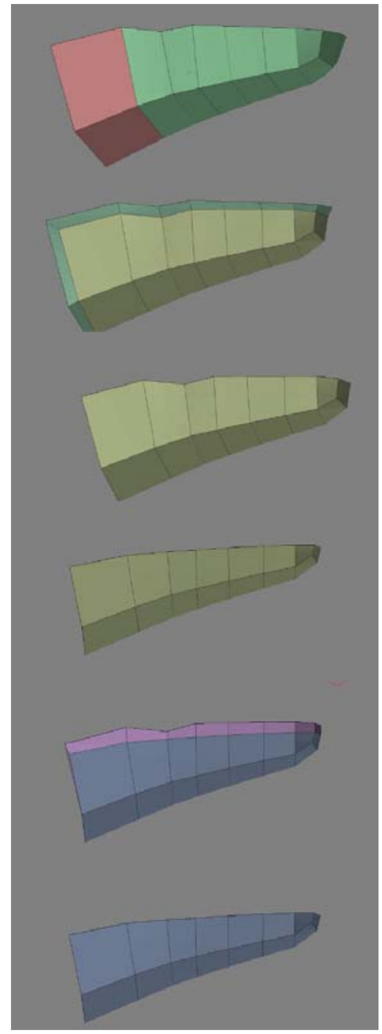
This will become the basis of the eye socket later on.

Once you have completed cutting in all the additional **edgeloops** for the eyes and moving the vertices accordingly you should have something similar to the picture below.



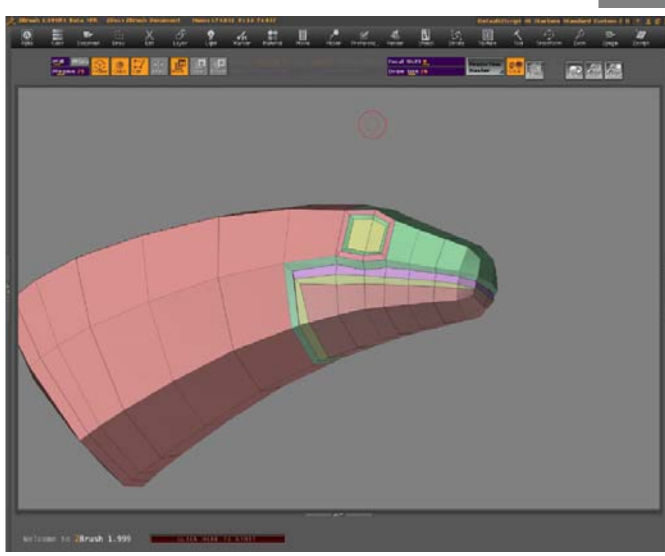
It is important to cut in all the **edgeloops** that we need at this stage. If you wait until after you have modeled in details to add **edgeloops** you will be in for a nasty surprise. **Edgeloops** add geometry and if you add geometry after you have detailed your model you will find the change in mesh topology will destroy much of the detail you created. So it is a good habit to train oneself to think ahead and get those loops in early on during the initial model development.

Next we will select the jaw area and begin to add **edgeloops** using the same method we used for the eyes.



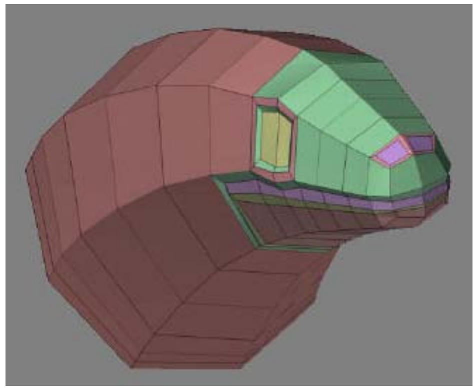
- **Select the polygons just below the eyes all the way through the first row just behind the eyes.**
- **Create an edgeloop and move the vertices if need be.**
- **Hide the edgeloop of polygons you just created.**
- **Clean up the vertices by moving them.**
- **Create another edgeloop.**
- **Hide the outer edgeloop once again and create another edgeloop (not shown here).**

Your model should now look similar to the image below.



Move vertices around a bit and make any final adjustments that beg for attention.

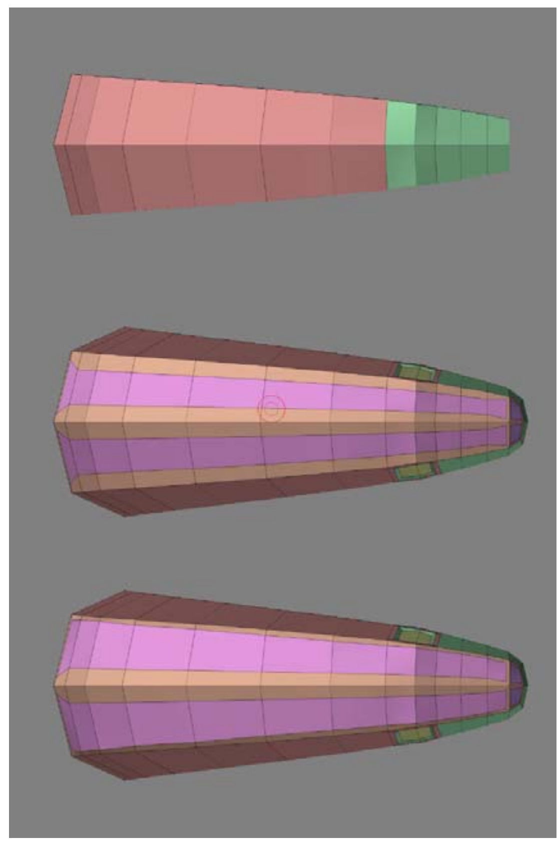
- **Use the same procedure to create edgeloops for the nostrils.**



Next we shall create the top ridge of plates that run along the top of the head.

- **Select the polygons that run along the top of the base of the nostrils all the way to the back edge of the neck as shown in the image at the right.**

- **Next you will create an Edgeloop.**



It should look similar to the image at the right.

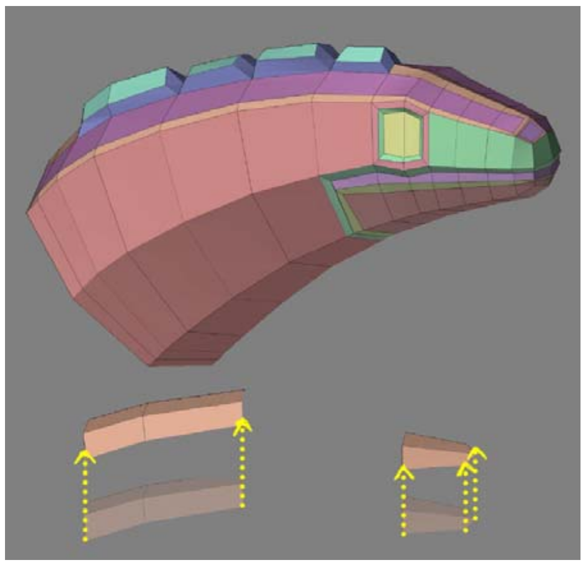
- **Make sure to move the vertices on the outer edge out closer to those edges.**

Now we are ready to move on to making the actual ridges.

To create the ridge polygons on the back of the head we will use **Edgeloops** to extrude and make new polygons for us.

- **To do this we first select the polygons that will become the tops of the ridges.**

The front three polys will each become a separate ridge and the back two polys near the base of the neck will form the largest ridge.



- **Select just the tops of the polys (see bottom of image) then enter EDIT>MOVE and move the vertices upward.**

- **Next click on the EDGELOOP button.**

New polygons will be created between the original position and the new position of the vertices. The blue **edgeloop** in the image shows what this would look like when done correctly. The last step would be to move any vertices around that might need tweaking to get the final form.

Following this same procedure we will create a set of horns for our dragon creature.

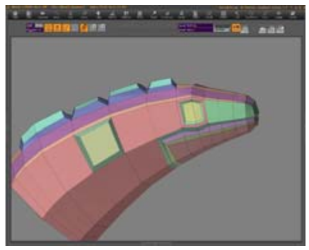
- **Select the polygon that is about midway between the jaw and the base of the neck.**

Make sure to select it on both sides of the head and be certain you are in symmetry mode.

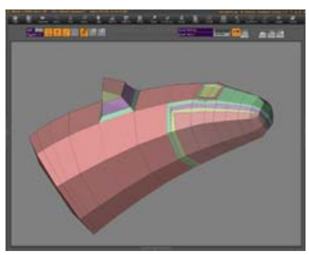
- **Create an Edgeloop around these selected polygons.**

- **Then select the inside polygon and using EDIT>MOVE move the vertices out and away from the head.**

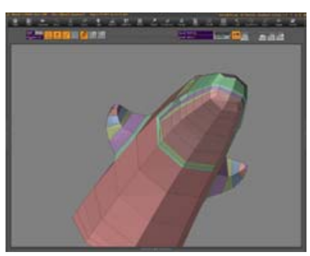
- **Create an Edgeloop and you should have the first building block of your horn.**

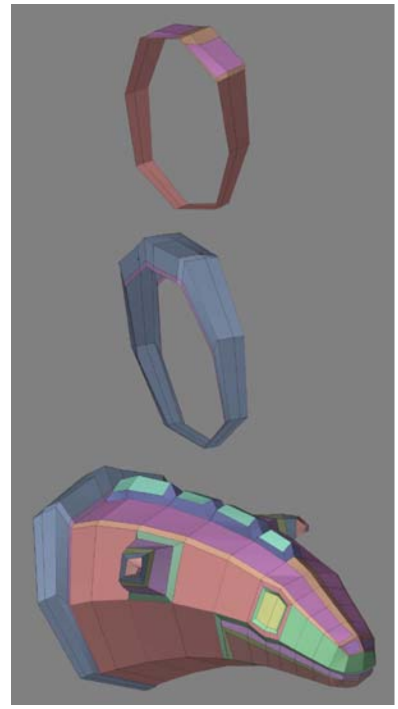


- **Repeat the process and while you are moving the vertices about make sure to turn them ever so slightly as you proceed so the horn has a gradually twist toward the front of the face.**



- **Finish off by moving the vertices to give the horns final shape.**





Creating the neck plate at the base of the neck involves the same **Edgeloop** extrusion process.

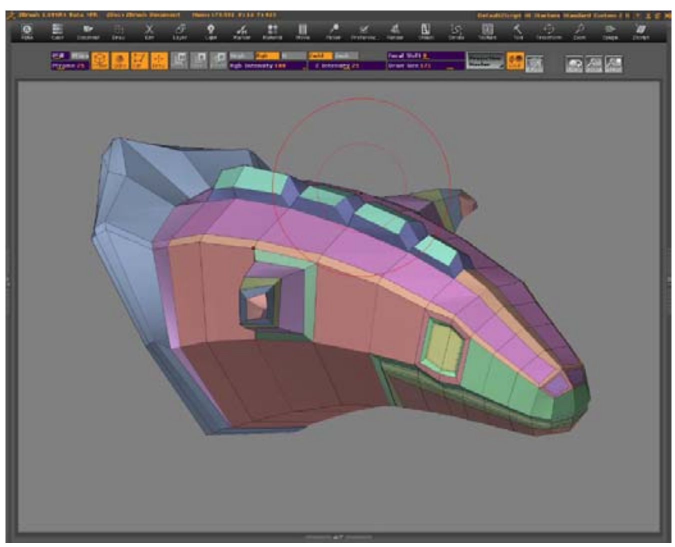
- **Select the last two rings of polys on the base of the neck.**

- **Using Edit>MOVE, move the vertices up and outward away from their original position.**

- **Use the Edgeloop command to generate the additional polys. Then immediately follow it with another Edgeloop command.**

You should get results similar too the image on the right. We are after that small ring of polys on the inside edge so make certain you generate them with the **Edgeloop** command.

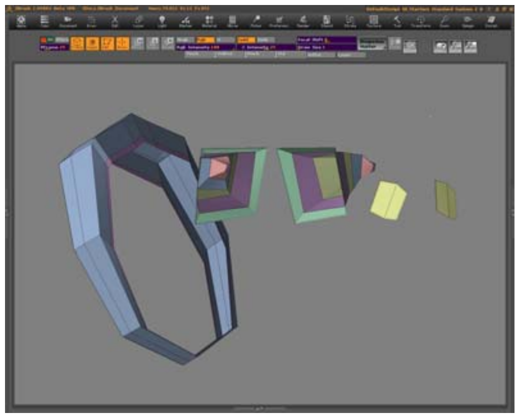
- **To finish off the neck plate, move the vertices to form a nice sweeping form. Flare it out near the top and tighten it up near the bottom of the neck.**



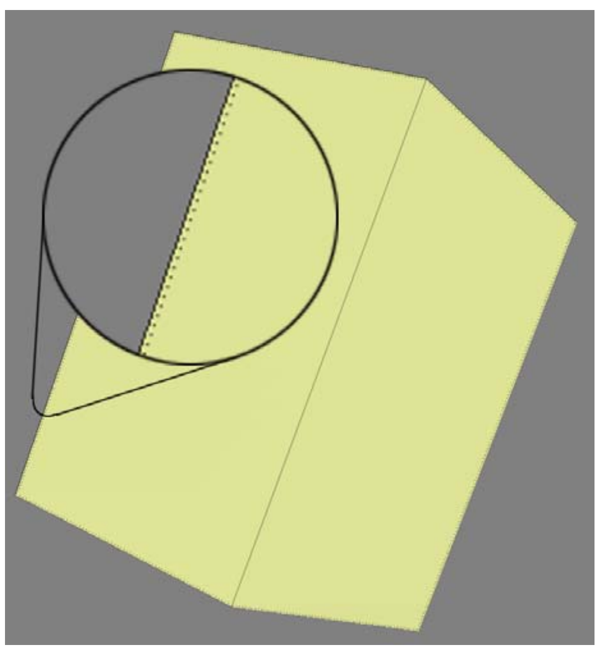
Don't be afraid to exaggerate the form a bit. However, be careful to keep the vertices in a neat and orderly fashion. If they become jumbled up now, then they will be all the more messy to work with once you have subdivided the mesh several times. It is much easier to set things correctly now than to fix them later.

The last step in creating our base mesh will be to determine areas that should have sharp edges. We will do this around the eye socket, the base of the horns, and the base of the neck plate.

- **Simply select the yellow eye polygons, all the polygons that comprise the horns, and the blue and purple polygons that make up the neck plate.**

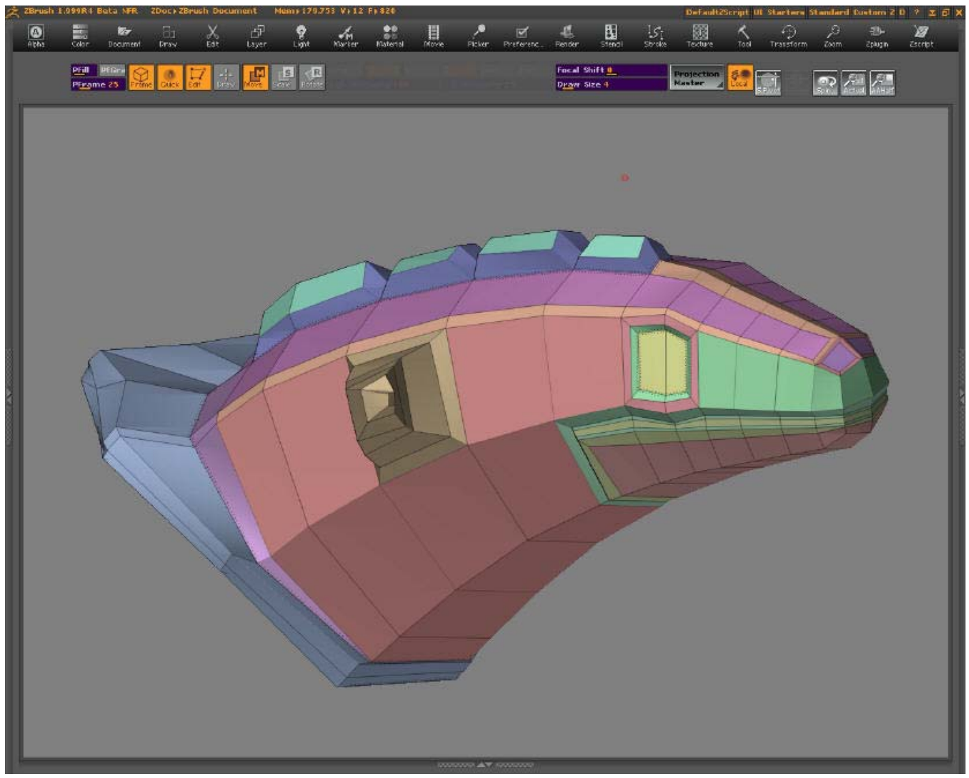


- **Next simply press the Crease button located in TOOL>GEOMETRY menu.**



Small dotted lines will appear around the edges of your selected polygons. When subdivided, these edges will remain weighted or crisp and will not be smoothed. The **CreaseLvl** setting next to the **Crease** button tells **ZBrush** how long the crease will be propagated when subdividing. If left at the default value of three then the crease will remain in effect through three subsequent subdivisions after which it will begin to smooth. **Crease** is a very powerful tool that can aid you in both organic and mechanical modeling.

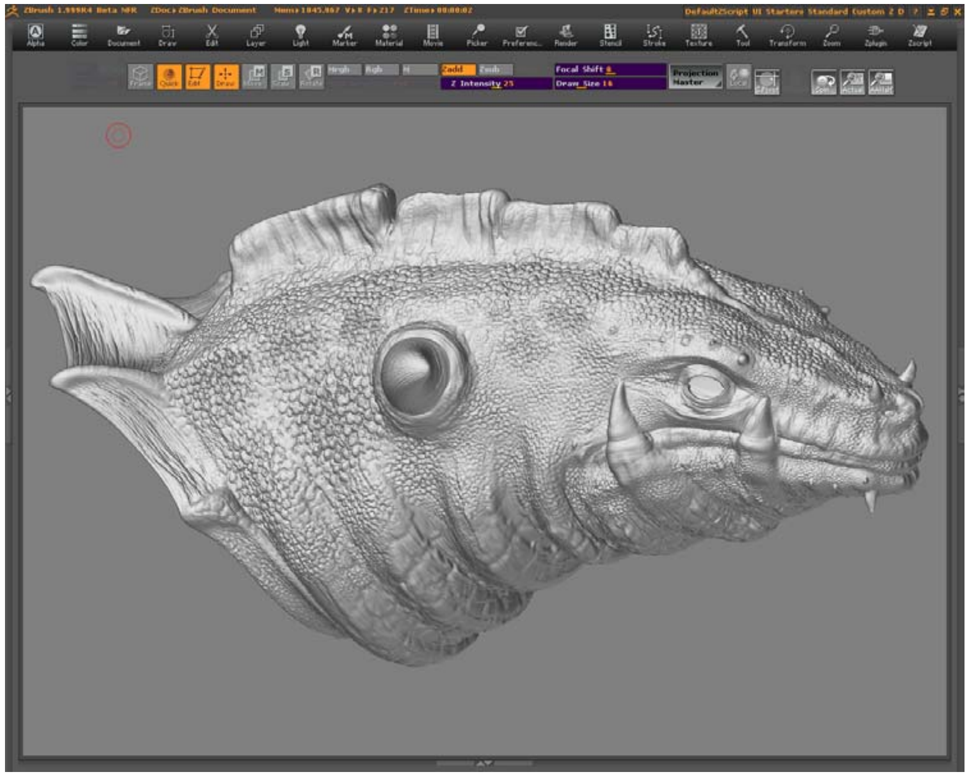
The final model should look similar to the image depicted below. If you feel confident enough about the tools I encourage you to experiment and make alterations. Experiment and have fun.



Box Modeling Part 2 – Creating Details

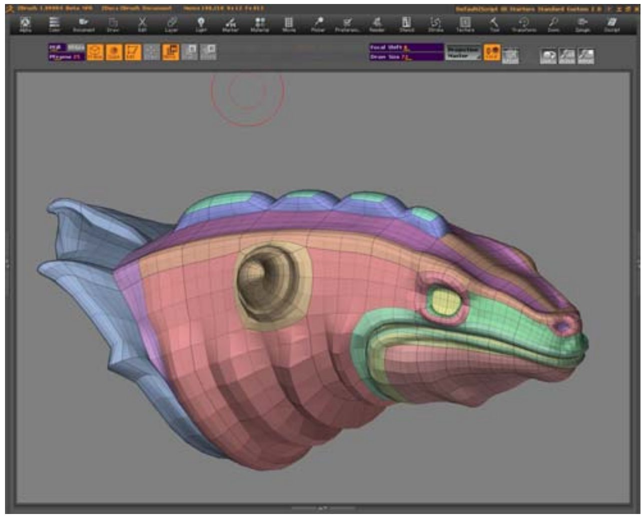
By Lonnie Sargent

With the base modeling complete, the tutorial now moves to the subject of high resolution details.



In this second chapter we shall be focusing entirely on detailing our model using many of the new features to be found in **ZBrush 2.0**. We will take a look at how alphas can be adjusted and put to good use, how to create custom alphas on the fly while modeling, and how to use **Projection Master** to advantage painting in details. So fire up ZBrush 2.0 and load the model you created from Chapter 1 of the tutorial if you haven't already done so. Let's have fun.

- **The first step will be to Divide the mesh twice.**



This should place the mesh at three subdivision levels.

During this "roughing out" phase I like to use several **TRANSFORM>EDIT BRUSHES**. These can be found in the **Transform** pallet. My particular favorites at this stage of the modeling are **Standard** and **Inflate**.

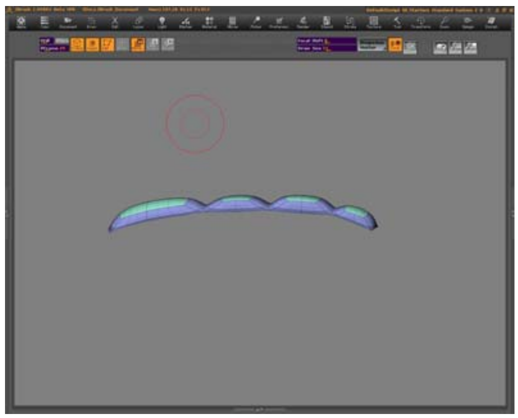
I switch back and forth on brush sizes – large sizes to cover large areas and small sizes to do finer edge work.

Generally a **Zadd** setting of around 8 to 12 will suffice. It is at this point where all the extra edge loops we created around the eyes and mouth will come in handy. With the added geometry in those areas we can inflate and add detail much easier without fear of stretching too few polys over a wide surface area. Should you run into a situation where an area has become overworked and looks a bit nasty then just use the **Transform>Edit Smooth Brush** and smooth out the polys. This edit feature is ideal for fixing mistakes, smoothing rough spots, or even flattening the surface of an area. You can also store a morph target and then use the Morph brush to revert to the stored geometry.

After you have worked over the model use **Edit>Move** to move large areas like the neck flab into a more natural-looking state.

You will want to take the opportunity to shape the eye at this point. Move the polygons around the eye area to create a round socket. You can clean up afterwards if need be with the **Smooth Brush.**

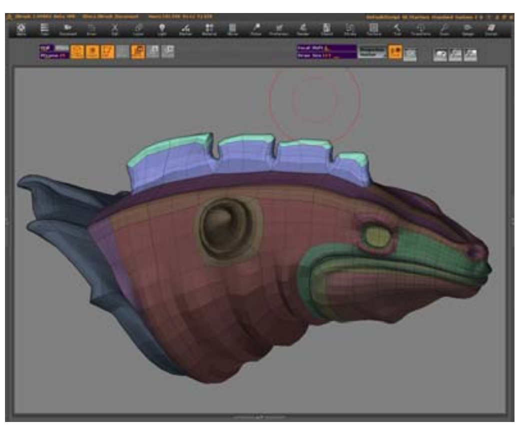
- **The ridges on top of the head need to be a bit larger so CTRL+SHIFT+LMB CLICK to select them then perform an inverted selection by SHIFT+CTRL+LMB Dragging across the document area away from the model.**



This in effect hides the area you selected first and reveals the areas that were hidden.

- **CTRL+LMB CLICK anywhere within the document window but not on the model itself. This will mask the visible area.**

- **You can now reveal the entire model and as you can see the entire model save for the tops of the head ridges has been masked.**



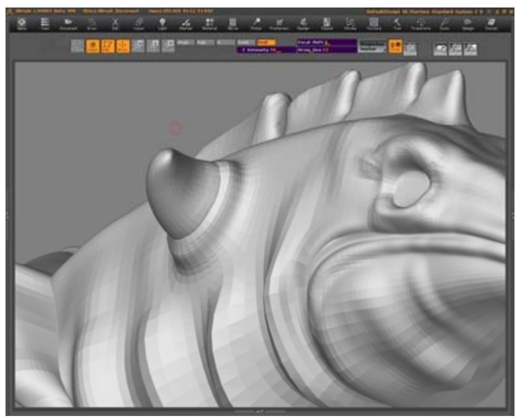
Set your brush size to a large size (around 50) and proceed to **EDIT>MOVE** the vertices until you get the shape and form you are after.

The masking ensures that the rest of the model will remain unaffected when we use our large brush size to move the vertices of the head ridges.

- **We need to tighten up a few lines so let's use the Pinch Brush.**

- **Set ZAdd to 50 and set the brush size to about 8 or 10.**

- **Use it on the line between the lips and also near the base of the horns where the horn meets flesh.**



This will tighten the lines and give a nice sharp form. I often use **Pinch** on eyelids, lips, teeth, and around the nostrils. It is also a very handy tool for making scars.

Let's add a little more detail around the mouth.

- **First Divide the mesh two more times.**

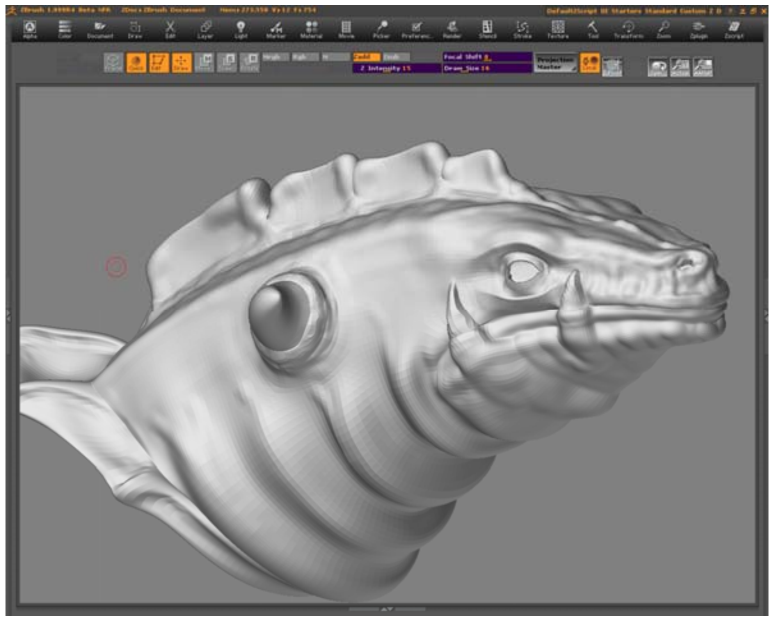
You should be at five subdivision levels now.

- **Using the Standard Brush turn on Zsub with a setting around 10 and a small brush size and sub out the areas where the two teeth will be placed.**

Use the **Smooth Brush** to smooth out areas that get a little rough and continue.

- **Next use Zadd with the Standard Brush and begin working in some basic teeth shapes.**

- **Use Inflate Brush and Pinch Brush to punch the details, especially around the edges of the teeth.**



There is no need to overwork it at this point since we will be coming back to the teeth once we have subdivided again.

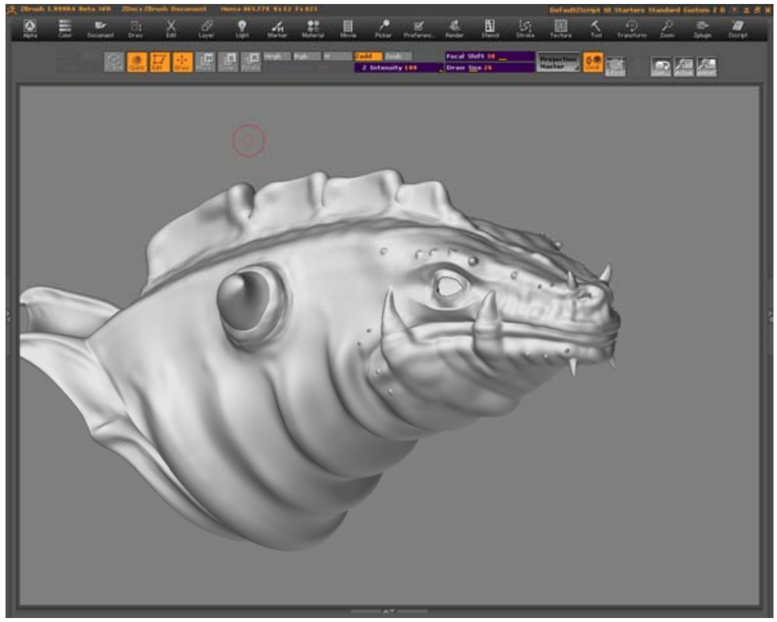
- **Use the Inflate Brush to add in some detail around the snout area.**

- **Use Edit>Move to push some of the polys around to get a more pleasing shape.**

I did that with the nose to get more of a slope on top.

Now let's add some bumpy bits to the model.

- **Use both Standard Dot Brush and Inflate Dot Brush to place some bumps and warts around the face area.**



I used the **Standard Dot Brush** with a high setting to create the little horns near the mouth opening.

Now it is time to roll out the big guns and get **Projection Master** cranking.

- **Divide the mesh two more times.**

This should put it at seven subdivision levels. Be warned, at this level the mesh will most probably be around 1.5 million polygons. If your system has limited resources you may want to limit the subdivision to 6 levels instead of 7. Remember that you can speed up interaction with a high polygon mesh by going to a lower subdivision level before rotating it, hiding all but the area that you wish to work on, and then returning to your highest level.

- **Rotate the model so it is in a side viewing position.**

- **Activate Projection Master.**

- **Turn off Colors and make sure Double Sided, Fade, Deformation, and Normalized are all marked. Click the Drop Now button.**

- **You are now ready to begin displacement painting.**

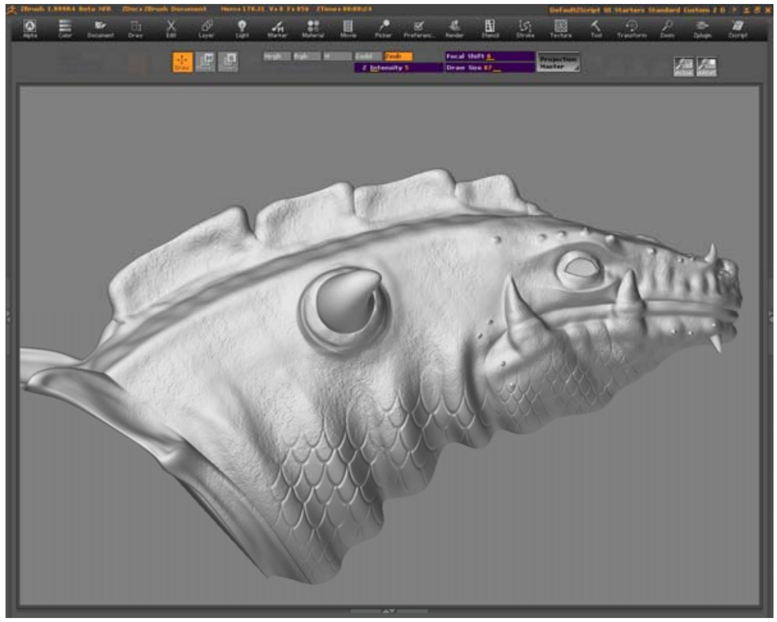
I used **Alpha Brush 03** with a **Focal Shift** setting of 70 in conjunction with the **Simple Brush** using **DragRect** stroke to lay in the rough areas on the skin.

- **Use small values of Zsub and Zadd.**

I generally use a setting of 1 or 2. When working in **Projection Master** at this point we are only concerned with creating surface detail so we will be working with **Zadd** and **Zsub** exclusively. You should not at this time have any other **Drawing** features enabled such as **RGB** or **Material**.

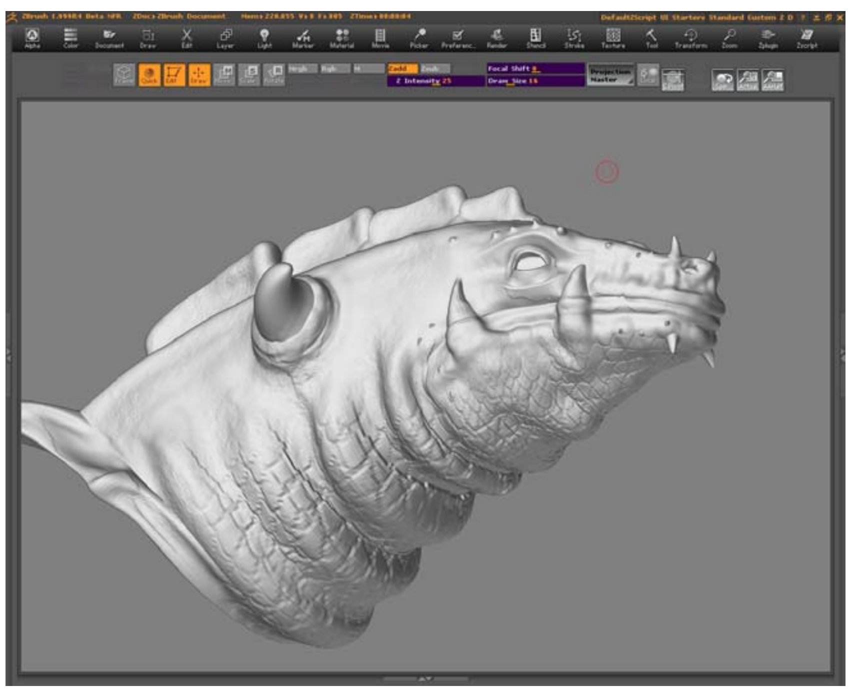
The scale texture on the bottom of the neck was created using a custom **Alpha** that I created on another layer while working on the model. The Resources\Sargent folder contains the two alphas that were used.

❑ **I used the Single Layer brush with ZAdd and DragRect stroke to lay in the scales.**



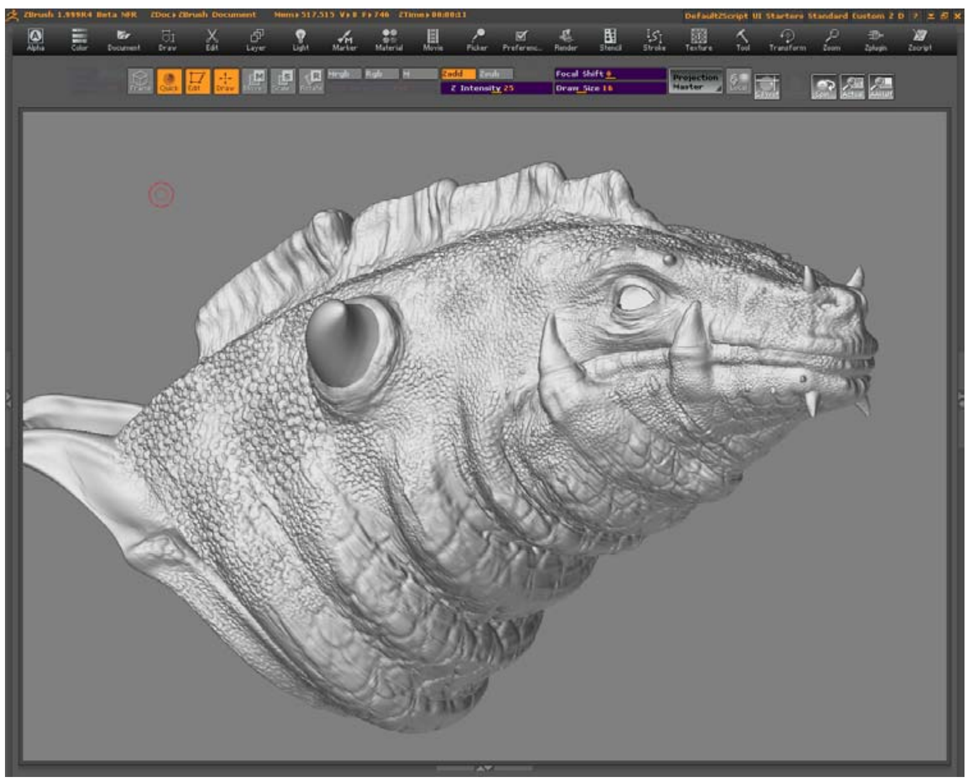
❑ **Once we are done with this level of detailing, activate Projection Master again and click on the Pickup Now button.**

The detailing we painted will be picked up and the displacement will be calculated and applied to the mesh.



You may notice the detail is a little less defined and not as sharp as it was when we were painting it on. The crispness of the detail is completely dependent on the mesh density of the model you are applying it to. To retain high levels of fine detail it will be necessary to create models with polygon counts in excess of one million polygons. If your computer has the resources you can go significantly higher. If you are having difficulty working on the entire model in this manner you can select portions of it and hide the remaining mesh. **Projection Master** can be used on selections just as easily as the whole model. Working on small select areas will help to optimize computer performance and make it easier to manipulate large polygon meshes.

- **Now, using Projection Master and various alphas, continue to paint in details.**



I specifically like to use **Alphas 7** and **8** with **Focal Shift** set to around 90 or 95. These alphas in conjunction with the **SimpleBrush** and **SingleLayer Brush** make good work of laying in lines and creases.

- **Use a Zadd or Zsub setting of 1 or 2 and set the stroke to Freehand with Zero spacing.**

- **You can also at this stage accent certain areas of detail by adding to them.**

For example the scales on the neck of our dragon creature could use a little more definition.

- **Use the SimpleBrush and Zadd to accentuate some of the larger scales.**

- **Do the same on the ridges on the top of the head and the lips around the mouth.**

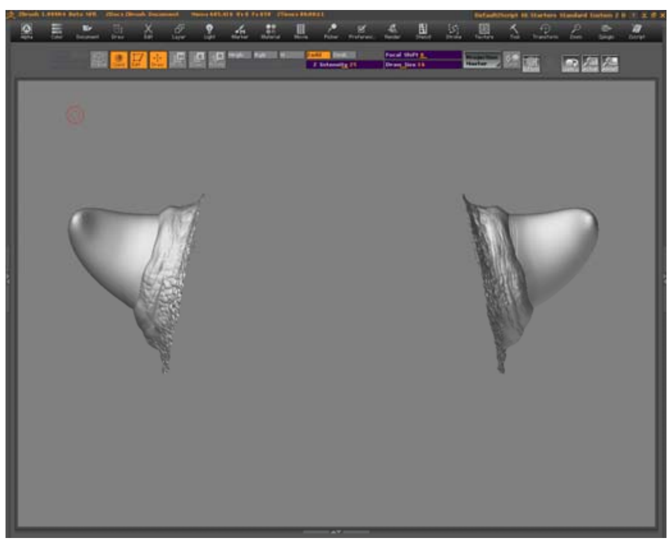
- **Put lines and creases around the eye socket.**

Another custom alpha was used for the bumps on the head. It is also found in the Resources\Sargent folder.

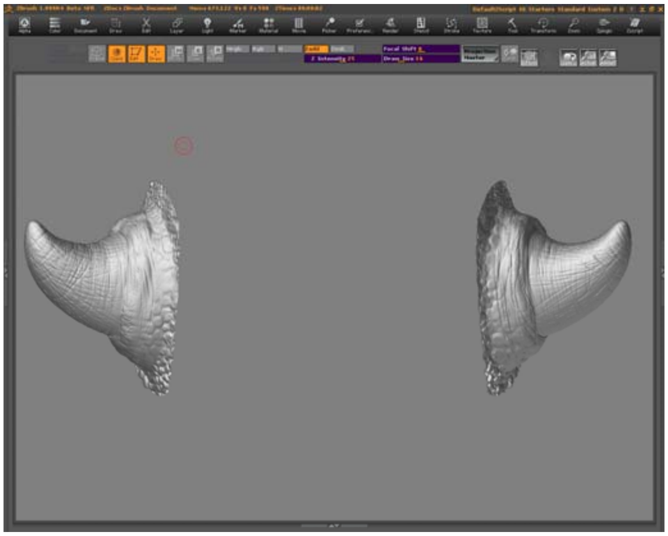
- **Activate Projection Master and Pickup the model.**

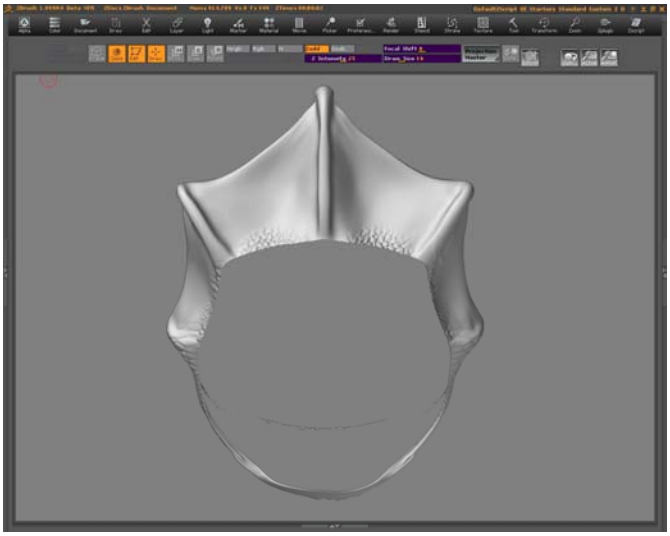
The details will be applied to the mesh.

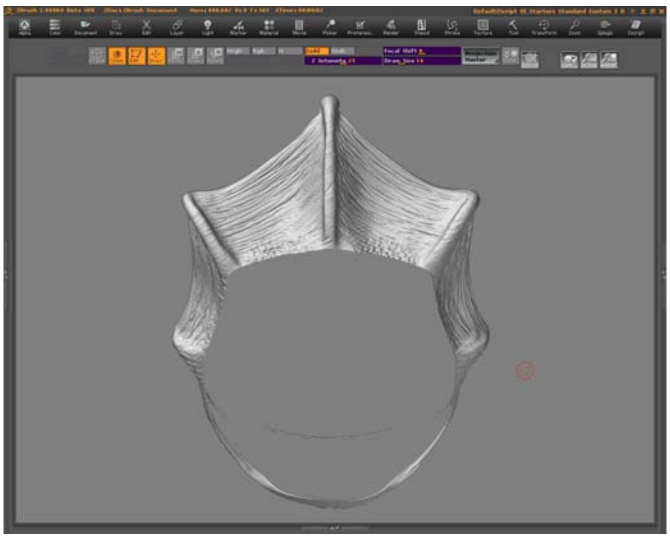
- **We repeat the process to detail the horns and the neck plate.**



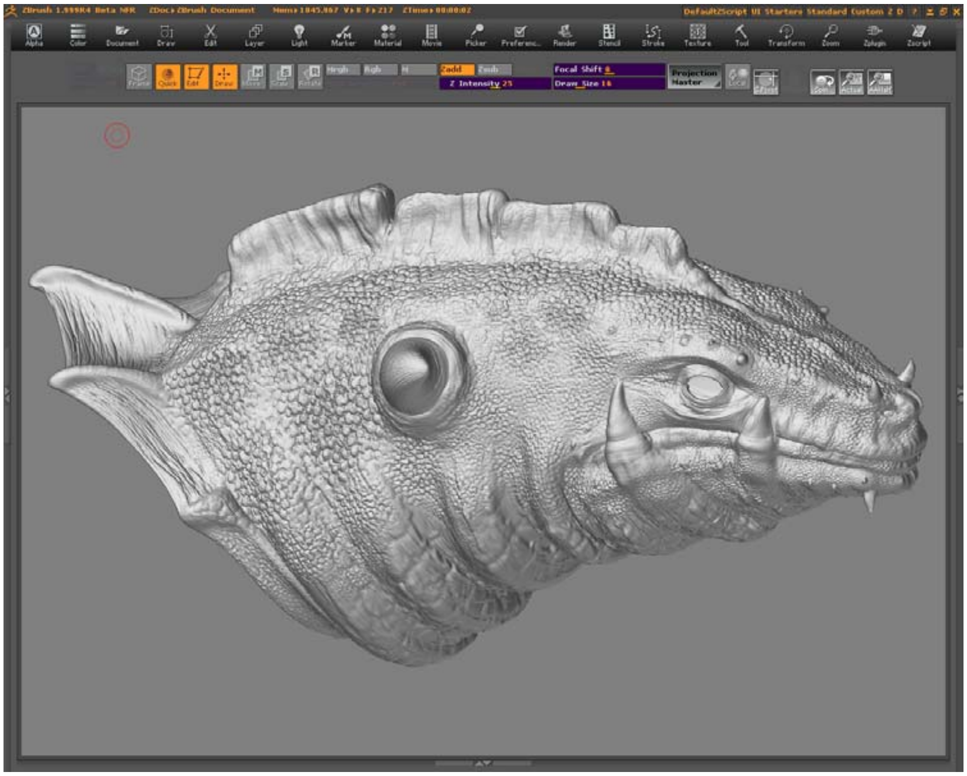
Notice I selected the horns and neck plate and worked on them individually. This makes it much easier to get into tight hard to reach areas. It also takes the strain off system resources.







Here we have the final result.

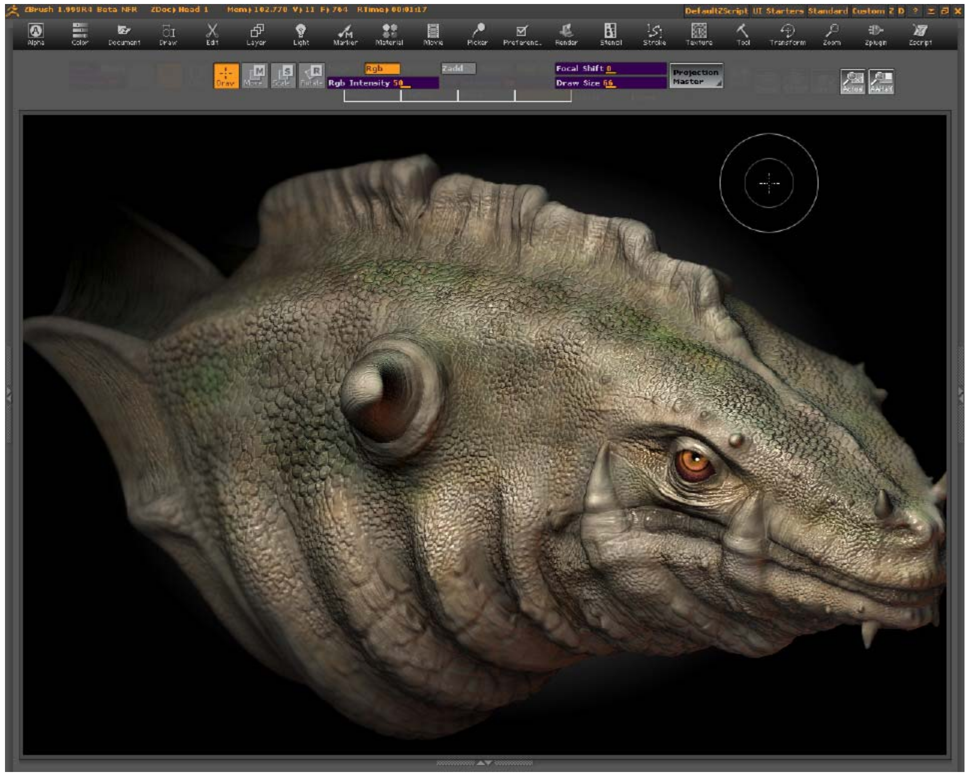


I encourage you to experiment with detailing in **Projection Master** using your own custom alphas and settings.

Box Modeling Part 3 – Finishing Work

By Lonnie Sargent

With high resolution detail sculpted, we'll complete the project by focusing on 2.5D painting, lighting, materials and rendering.



- **If you do not already have it available go ahead and load the Dragon Head you created in the previous chapter.**

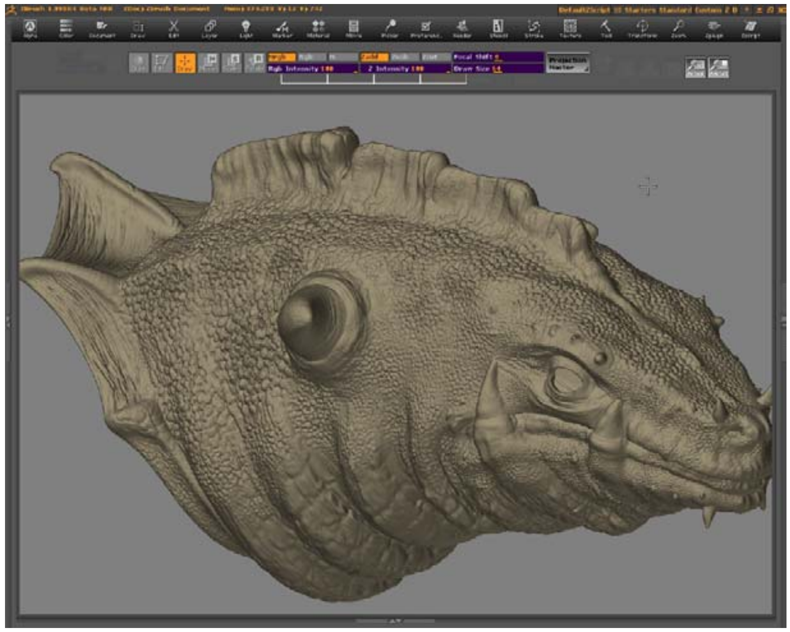
- **Draw it on the workspace and move it into final position.**

- **Enter Edit mode by pressing the T key on the keyboard and choose a light sandy brown color from the Color menu.**

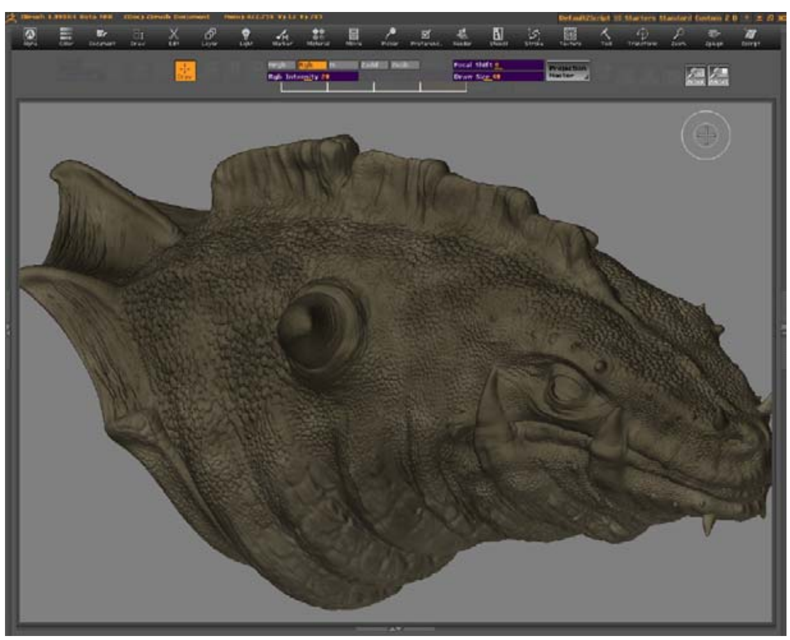
- **Fill the object with this color (Color>Fill Object) and drop it to the workspace by pressing the T key again.**

It is not necessary to choose a material at this time. We will be creating custom material later on. The default **Fast Shader** material will suffice for now, and the model will not be moved again.

Now we will begin to paint in darker and lighter values of color.



- **Select the Paintbrush, SprayStroke, activate RGB mode and set RGB value to 20.**
- **Select a darker brown and choose a Draw size of around 80.**
- **Begin making strokes across the model and darken areas to suggest shadow.**

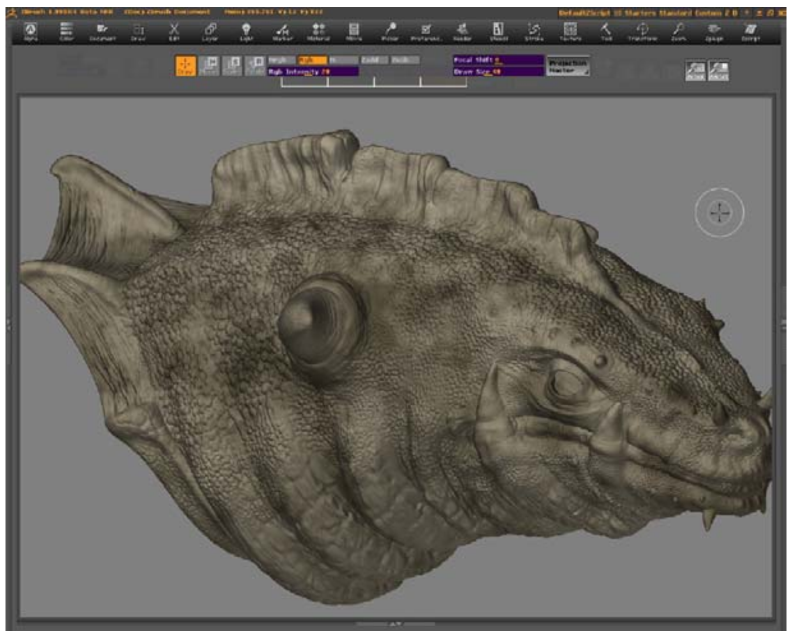


The paintbrush allows you to lay increasing values of color with each stroke so apply it in short overlapping strokes. This will keep the color from looking too uniform.

We will do the same for adding lighter areas of color.

- **Using the same technique as before select a light crème color but change the brush size to 40 and apply it with the Dots stroke.**

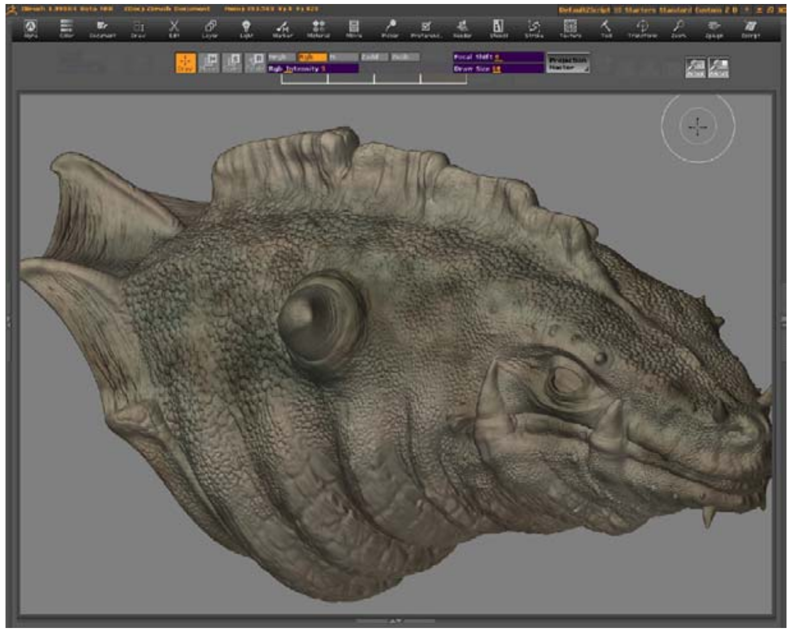
- **Work in light areas around the face and surface areas that should be emphasized.**



- **Change the color to a medium red and set the brush size to 80.**

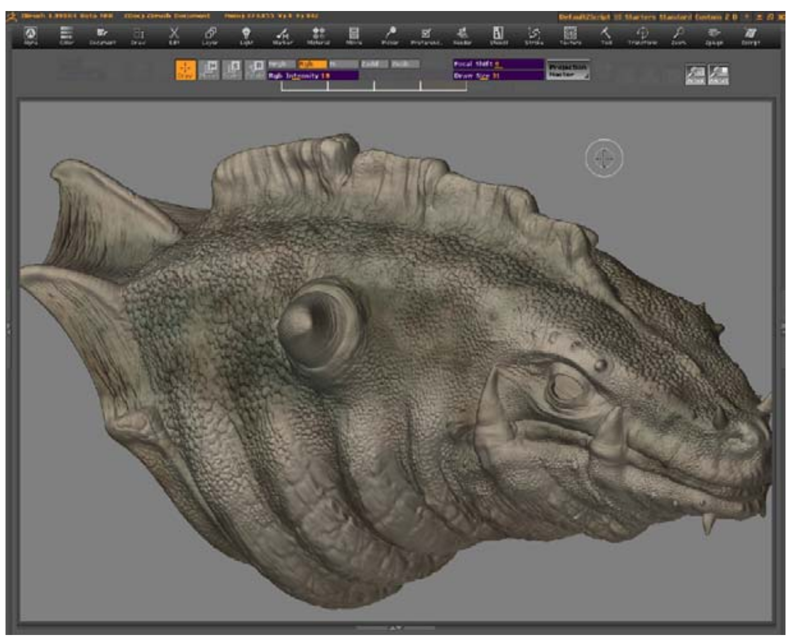
- **Change the RGB setting to 5 and paint in some red to give the color work a little more impact.**

❑ **Switch to a light Cyan color and do the same.**



❑ **Select the Shading Enhancer tool. Set RGB value to 10 and select the Dots stroke.**

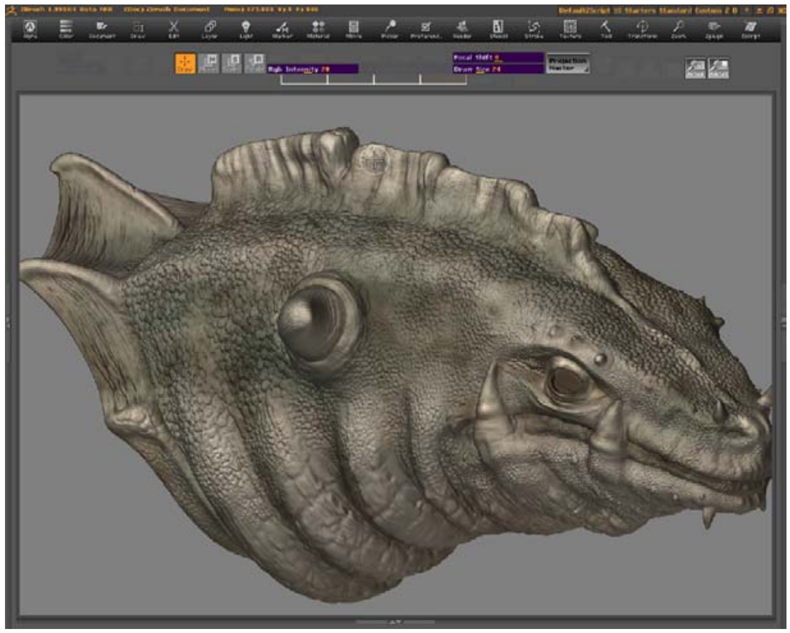
❑ **Set the brush size to about 20 and use the Shading Enhancer tool to lighten up areas that should be highlighted.**



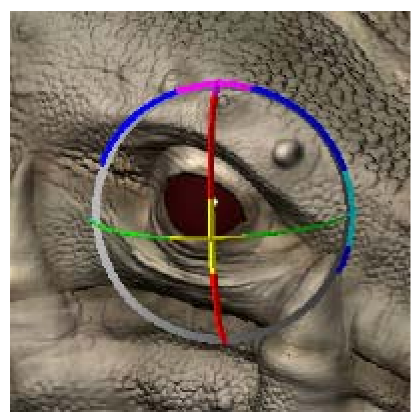
This includes raised features such as the brows and head ridges, areas around the mouth and neck folds etc.

- **Use the Shading Enhancer tool to darken in recessed areas by holding the ALT key.**

- **Paint darker areas where the facial features recede into shadow.**



We will now add an eye.



- **Begin by selecting the Sphere3d tool from the Tool menu.**

- **Select a dark red color and choose the Toy Plastic material.**

- **Create a new layer in the Layer menu.**

- **With this layer selected draw the Sphere3d into the eye socket.**

- **Press the W key on the keyboard to bring up the Gyro. Move the eye into position. When done press the W key again.**

- **To texture the eye choose the Shading Enhancer brush. Set RGB intensity to 10 and the brush size to 18. Select Alpha 01.**

- **Start by working on the area of the Iris.**

Lighten it up until you are satisfied with the results.

- **Decrease the size of the brush to get sharper highlights.**

- **To paint in the pupil choose the Simple Brush from the Tool menu. Set RGB to 100 and select black from the Color menu.**

- **Select Alpha 12 from the Alpha menu and set stroke to DragDot with a size of 8 and place the pupil on the eye. Next select Alpha 09 from the Alpha menu and set the brush size to 22.**

- **Position this dark circle as shown in the above image.**

- **Select the Shading Enhancer brush again and set RGB intensity to 5 with a brush size of 15.**

- **Add additional highlight around the darker area outside the pupil to give it additional interest.**

- **Change brush size to 8 and the RGB intensity to 20.**

- **While holding the Alt key draw in dark areas around the outside edge of the pupil and around the top edge of the eye just under the top eyelid.**

- **Select the Simple Brush, set RGB intensity to 20, select the Dots stroke, and set brush size to 4. Choose a golden yellow color from the Color menu.**

- **Add a few bits of color to the iris area.**

- **Select the Shading Enhancer brush and set the brush size to 8 with RGB intensity of 20 and darken the middle part of the iris slightly.**

- **We are ready to apply lighting, materials and render settings.**

I have provided snapshots of all the settings to help you in setting up your final render.

Light Settings

Light 1: Sun
Intensity: 1.21
Color: White
Shadows: 50 with intensity 100 blur 2

Light 2: Sun
Intensity: .45
Color: 255, 143, 106
No shadows

Light 3: Sun
Intensity: .40
Color: 197, 250, 247
No shadows

Material Settings

I used two materials, which are identical except Material 2 has a specular value of 20.

- **Created from the BasicMaterial**

Ambient: 0
Diffuse: 75
Cavity Intensity: 15
Cavity Colorize: .3
Cavity Color: 236, 223, 206

- **Apply the new material to the model by Copying the material and Pasting it into the Fast Shader material slot.**

The entire model will now be covered in the custom material we created.

- **Paste the material into another material slot and increase the specular value to 40.**

- **Using the Simple Brush with only Material selected (Rgb, Zadd etc turned off) paint in the specular material around the eyes, mouth, nose, and skin folds.**

Render Settings

Fog enabled with Intensity 100 and Depth 2 of .7
Alpha used in Fog Alpha
Contrast Adjustment: 25
See Adjustment graph in picture

- **To create the fog alpha select Alpha 01 in the Alpha palette and press Alpha>Make TX.**

- **Go to the Texture palette and select the newly created texture. Click on the Invert button to invert the texture.**

- **In the Render>Fog menu click on Fog Alpha and select the fog texture we created.**

- **Click on Best render to generate the rendered image.**

- **Once it is rendered, press Texture>Grab Doc.**

This is a fast way to capture the entire document as a texture.

- **Next create a new layer from the Layer palette.**

- **Deactivate the other layers and make sure you select the newly created empty layer.**

- **Turn off Fog in the Render palette.**

- **Select the rendered image we grabbed in the Texture palette. Select the Flat Material in the Material palette. Fill the empty layer with the grabbed image and flat material.**

You can do this from the **Texture** palette by pressing the **Crop And Fill** button. Alternatively, you can press Ctrl+F.

We are almost done.

The color is looking a little flat so let's liven it up a bit with the **Saturation Brush**.

- **Select the Saturation Brush from the Tool palette. Set the RGB value to 2 and the brush size to 60.**

- **Now paint over areas of the model to increase the color levels.**

Be careful not to overdo it.

- **After adjusting the color in this fashion select the Contrast Brush from the tool palette. Set RGB intensity to 5 and choose Alpha 07 from the Alpha palette. Make sure you are using Dots stroke.**

- **Drag the brush across portions of the image to increase contrast.**

A little goes a long way so don't overdo it.

- **Finally choose the Blur Brush from the Tool palette and blur some of the farther edges of the image.**

Feel free to experiment with the other 2d brushes in the **Tool** palette.

We have now completed our image.

This tutorial has touched upon several key elements used when working with **ZBrush 2.0**. There are numerous other techniques that can be used to accomplish the same results we arrived at here. I encourage you to play and have fun with all the various tools. You will be surprised at just how many ways there are to skin the proverbial cat within **ZBrush 2.0**.

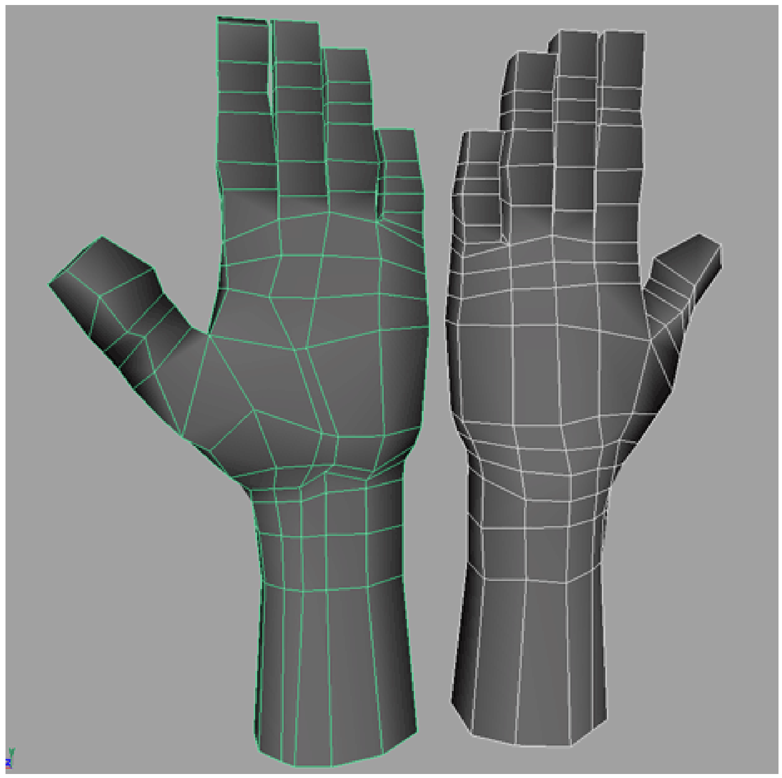
The Hand

By Francois Rimasson

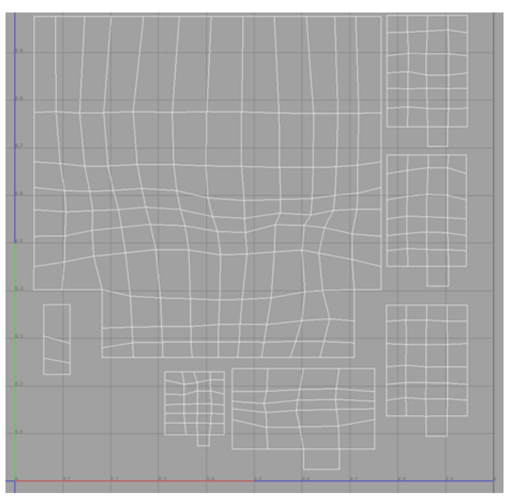
In this tutorial we'll cover a workflow between Maya and ZBrush, such as would be used in animation. In this part, we begin with a box model that has been sculpted in Maya.

Step 1 - Maya

- **First, build in Maya a simple model, without any triangles.**

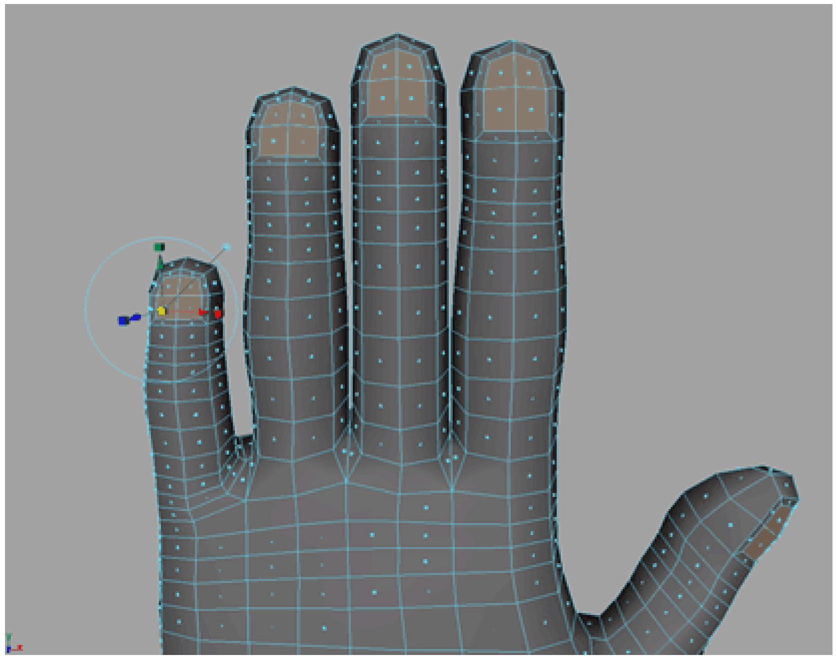


- **At this time, we create UV coordinates.**



Personally, I'm used to creating straight UV borders.
You can use any layout that you like, so long as the coordinates don't overlap. ZBrush can also assign coordinates automatically.

- **Smooth the model, using the Smooth UVs option, and extrude some faces to rough out the nails.**



- **Select groups of faces, and create Selection Sets.**

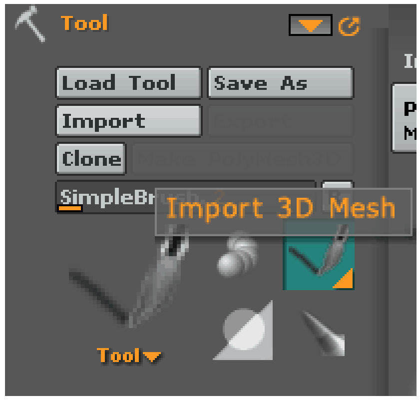
Polygroups will be automatically created from these sets in ZBrush, to help hiding parts of the model.

- **Now, it's time to export the model into ZBrush as an .OBJ file.**

Note: In the Resources\Rimasson folder, you'll find the hand model, custom Alphas specially created for use with the Deco Brush, and the skin and cavity materials I used on the model.

Step 2 -- Import, sculpt and detail

- **Expand the Tool palette, and import the model.**

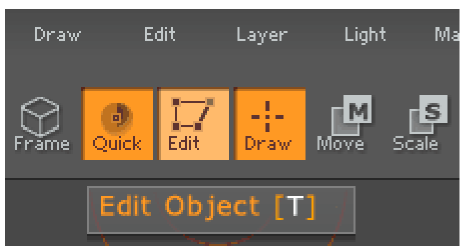


The model is now a ZBrush polymesh tool that we can edit.

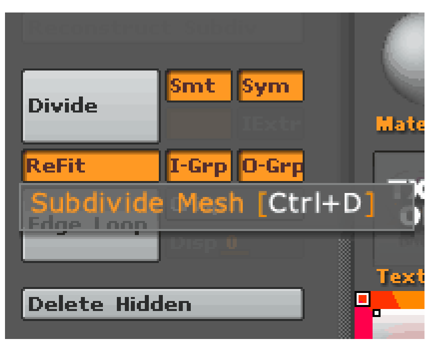
- **Drag on your document to draw the model.**

While drawing, you can press the Shift key to snap to object axes.

- **Press the Edit button.**



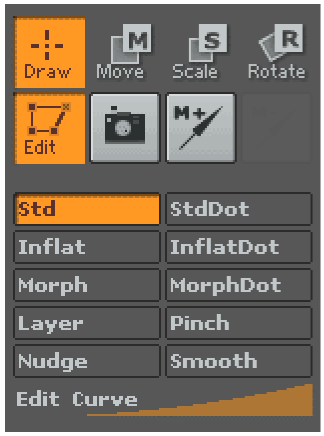
- **Press Tool>Geometry>Divide a few times to increase the mesh resolution.**



- **At this high subdivision level, press Tool>Morph Target>StoreMT.**

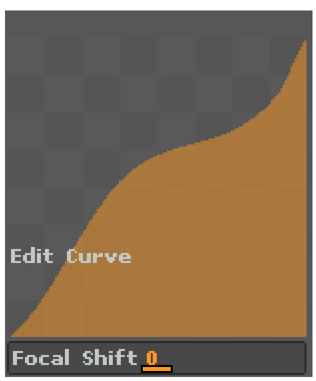
We can then use the Morph and Morph Dot editing brushes to return to the original model in places if necessary.

Once the morph target is stored, all of the sculpting brushes become available in the Transform palette.

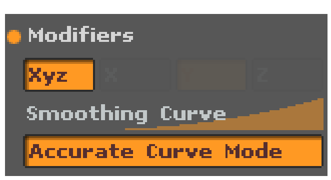


- **Sculpt details such as veins, creases, etc.**

To create good-looking creases and folds, we can precisely control the shape of the strokes with the Edit Curve and the Focal Shift slider.



When modifying the brush profile, it is good to activate the Accurate Curve switch, which yields the best results.



Also, while editing the model we can switch between subdivision levels. If we move some vertices at a lower level, the deformation will be interpolated across the higher levels as well.

- **Try to sculpt as much as you can at each level before adding a new one.**

- **When the model becomes too dense to easily manipulate, hide parts of the model by pressing Ctrl+Shift and dragging a selection around the part you wish to work on.**

- **We can also mask parts of the model by pressing Ctrl and dragging a selection around the part that we wish to protect.**

We can store the mask selections as Alpha maps, which can be applied later using the Tool>Masking>Alp button.

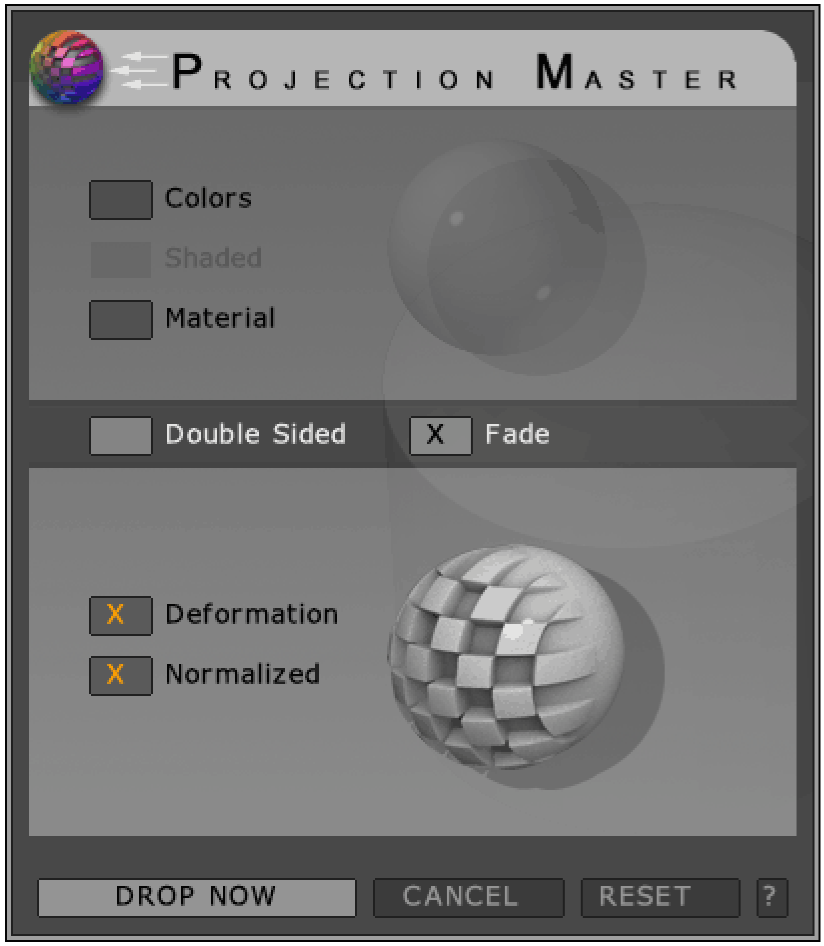
Polygroups are another great way to control mesh visibility. They were assigned when the model's selection groups were created in Maya, but you can modify them here using the Polygroups menu.

Once the model is at its highest subdivision level, it's time to bring in Projection Master.

- **Rotate the model to the angle that you wish to work from and press the Projection Master button.**

It's important to select the angle first, since you won't be able to rotate the model again until you pick it up again.

- **In the Projection Master palette, deactivate everything in the top section, leave Fade on, and activate the two Deformation buttons in the bottom section.**



- **Press Drop Now.**

At this point, you can use all of ZBrush's other tools – including 3D objects – to add detail to your mesh.

- **One of the best ways to create fine wrinkles is with the Deco brush.**

You can use the provided alpha02.psd or alpha03.psd textures with the tool.

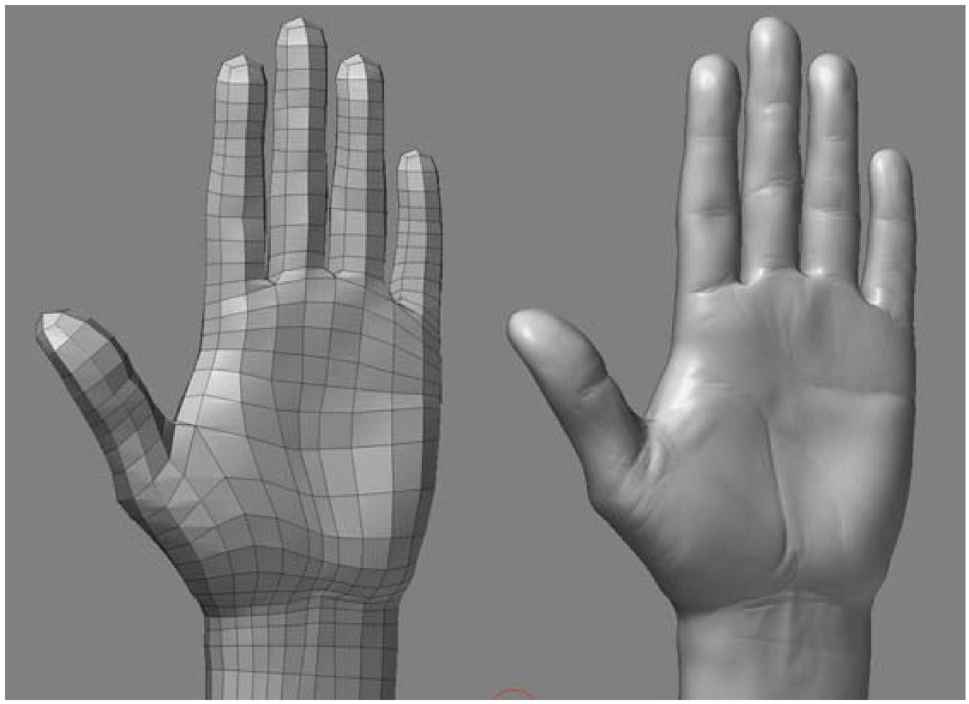
- **When you're happy with the result, press the Projection Master button again and pick your model back up.**

The model will now be able to be rotated to a new position for additional detailing.

- **When you have finished sculpting, save your model.**

Step 3 – Displacement

Now we'll generate two maps: a bump map and a displacement map.



First and sixth subdivision levels.

- **Our model has 6 levels of subdivision. Go to the fourth.**

- **Activate Tool>Geometry>Cage.**

This tells ZBrush to construct a cage model that is similar to the high resolution model and can be exported for use in Maya.

- **Set Tool>Displacement>DPRes to 2048 and activate Best.**

We'll generate our displacement map at 2048x2048. The use of Best mode allows ZBrush to create an accurate map even if the Pinch editing brush has been used.

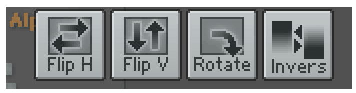
- **Delete the higher levels with Tool>Geometry>Del Higher.**

- **Go to the lowest subdivision level and generate another displacement map.**

This second map will serve as our displacement map, and will serve to make medium-frequency changes to the model in Maya. The first map provides the high-frequency detail, and will be used as our bump map.

The generated maps will appear in the Alpha palette and should be saved for use in Maya.

- **Press Alpha>Flip V for each map, then export it.**



It is really important that you save the displacement map out as a TIFF file so that it retains its 16 bit depth. Unlike bump maps, an 8 bit depth displacement map would create a “staircase” or “step” effect because it has fewer levels of gray to make smooth displacements with.

- **Export your cage mesh at level 1 as an OBJ.**

Step 4 – Color and Material

- **Select the Fast Shader 5 material, then load the Cavity.zmt from the Resources\Rimasson folder.**

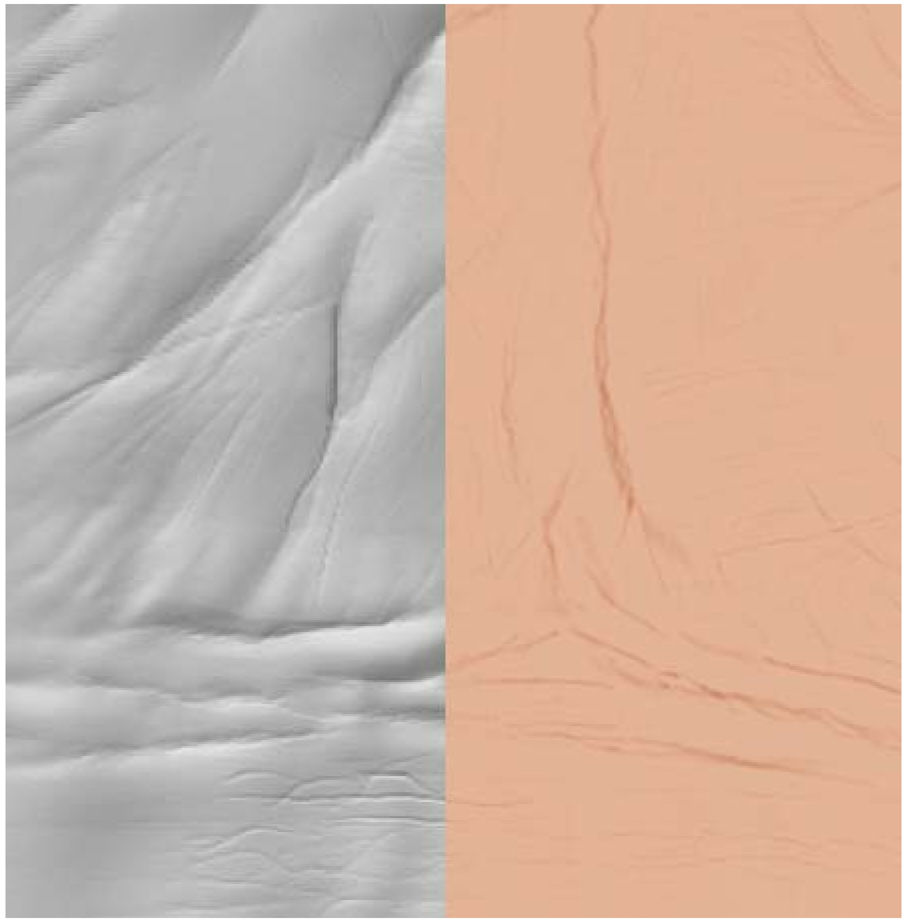
The new material replaces the selected material. It’s therefore best to always select a material that you know will not be used for your project before loading a new material. The Fast Shader materials are usually a good candidate for this.

- **Select the second alpha that we created. In the Color palette, choose a pink color.**

- **Press Alpha>Crop and Fill.**

Unlike with the Texture palette’s Crop and Fill, the pixols drawn on the canvas will retain depth based upon the alpha’s grayscale values. This makes the next step possible.

- **Press Render>Best Renderer.**



The cavity effect requires a Best render to be seen. In this case, what it does is darken the wrinkles sculpted into the model's skin.

- **Press Texture>GrabDoc to capture the canvas as a new texture.**

We now have a basic color texture.

At this point, let's take a look at the hand in ZBrush.

- **To create the skin material, use the ColorizerTriShaders material.**

The skin translucency is simulated by using 2 shaders and wrapping the light diffusion around the model on the second shader using the Anisotropic Diffuse parameter.

A bluish specular color also helps to create a realistic rendering.

Now let's detail the texture a little bit.

- **Create a new document, reload the hand model, the skin material, and the texture.**
- **Activate Projection Master and drop the model.**
- **Select the Simple Brush with a very low Rgb Intensity setting and start by adding color variations for the finger tips, the palm, and the veins.**
- **To add finer details, we'll use the HighlighterBrush II with a Freehand or a Spray stroke.**

Another way of adding details is to use a Stencil.

- **Load the skin_text.psd picture from Resources\Rimasson into the Alpha palette.**
- **Press Alpha>Make ST to convert the alpha into a stencil.**
- **In the Stencil palette, activate Wrap.**

When working with the stencil, you can access the interactive coin controller by holding down the spacebar.

At this point, you can paint through the stencil to add still more detail to your texture.

- **For the nails, duplicate the skin material and modify it to have sharp specular properties.**
- **Paint this new material onto the nails.**

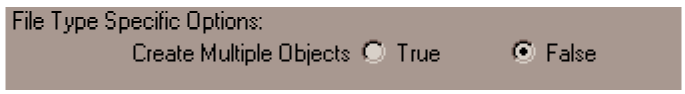
You now have a great hand in ZBrush!

Step 5 – Back in Maya

If you're working on a big production, your model may have already been skinned and animated by other people. That's why Vertex order is important and shouldn't change.

- **Open your original model in Maya and import the new one.**

- **In the import options, don't forget to uncheck Create Multiple Objects.**

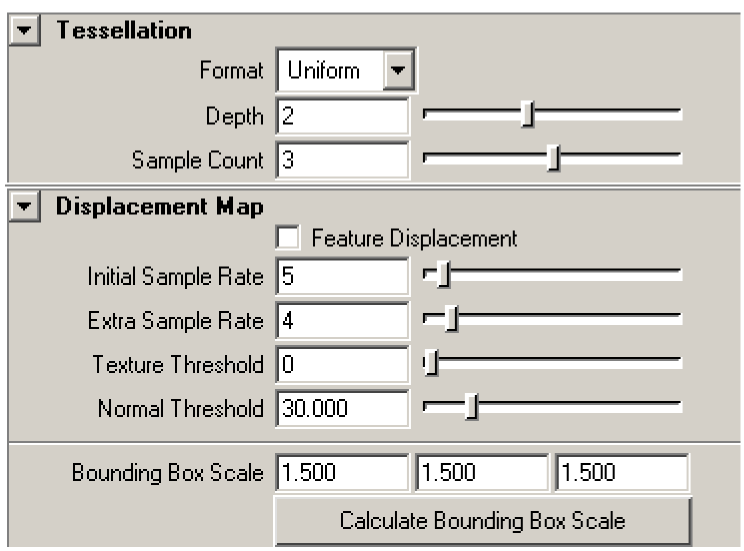


If everything worked fine, you can create a blendshape between the two models.

- **Convert your model into a Subdiv Surface.**

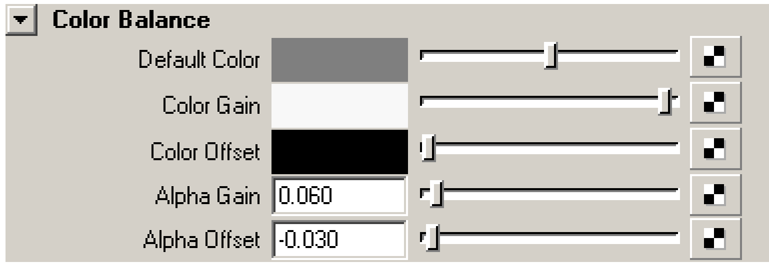
Displacement in Maya is best handled by Subdivision Surfaces, so you should use them.

- **Set the Tesselation attributes of your model and uncheck the Feature Displacement.**



- **Assign the bump, displacement, and color maps.**

- **Now set up your displacement. Adjust the intensity with the Alpha Gain slider. As a 50% gray value shouldn't produce any displacement, notice how the Alpha Offset is used to correct intensity.**



- **Render your model.**

Now let's imagine that your production manager wants you to modify the displacement map. ZBrush makes it easy to restore your high resolution model from the displacement map itself!

- **Re-import your model in ZBrush.**

- **In the Alpha palette, load your displacement map and flip it vertically.**

Since you flipped it vertically before exporting, you need to flip it again on import.

- **Divide the model several times so that you're back at subdivision level 6.**

- **Turn off Quick 3D Edit, then set Tool>Display Properties>DSmooth to 1.**

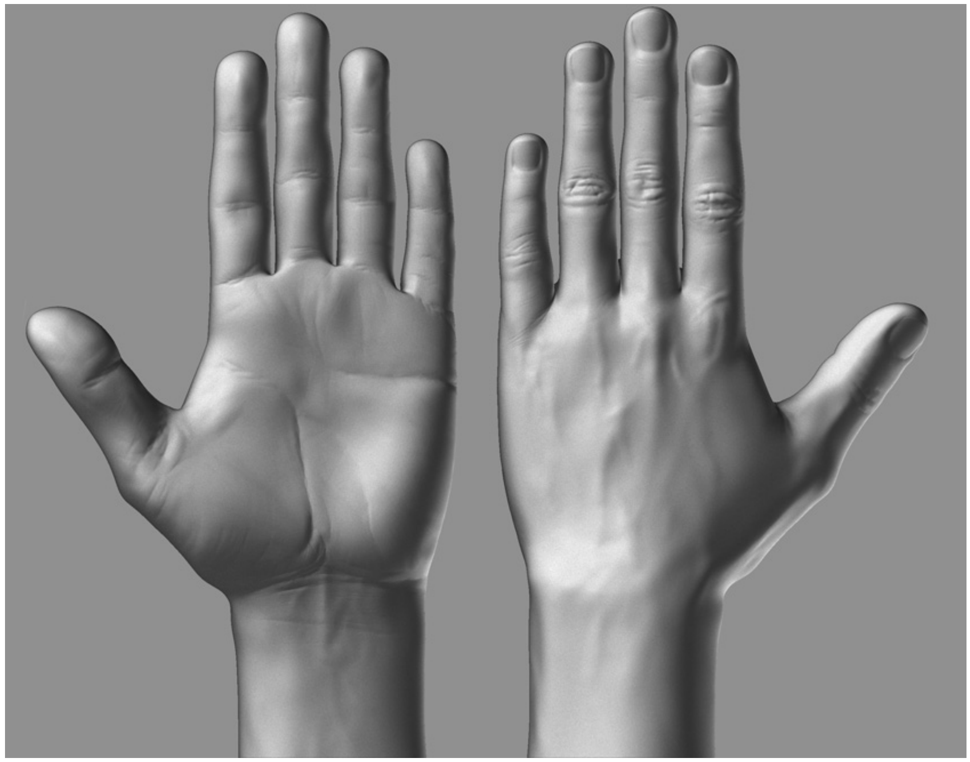
This activates ZBrush's render smoothing.

- **Activate Tool>Displacement>Mode.**

- **Assign a texture.**

I used a white texture in my example, so that you can see the displacements.

- **Modify the Displacement>Intensity value until the model looks right.**



- **Press the Apply DispMap button.**

The detail created by the displacement map is now transferred to the model itself, and you can continue sculpting.

- **When finished, create a new displacement map.**

Quick Starters Guide

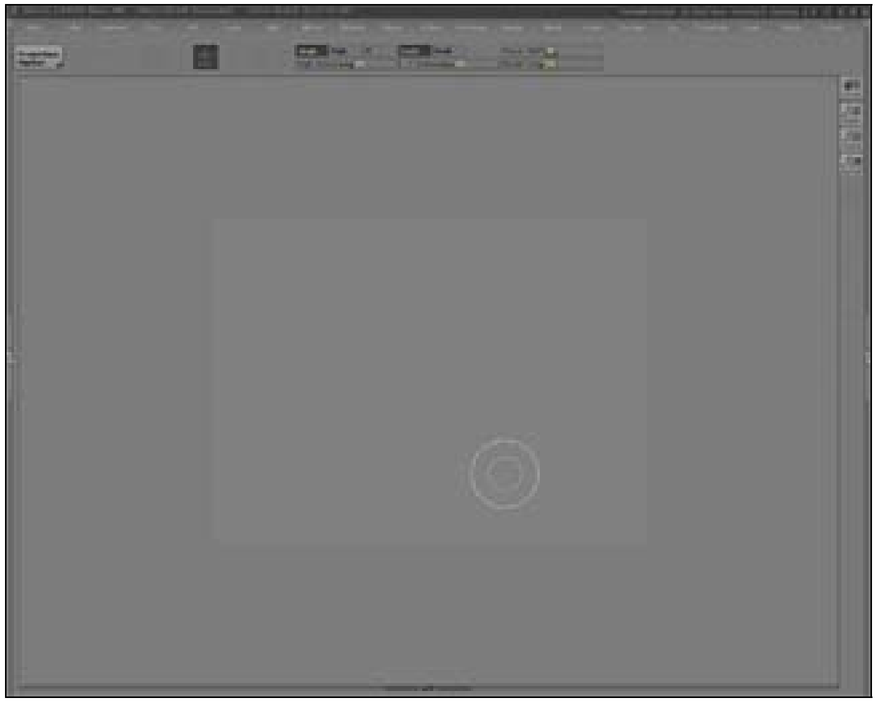
By Martin Krol

In this tutorial, Martin explains his workflow for an animation pipeline.

Introduction to ZBrush, and ZSpheres

In this Tutorial we will create a full figure character. We will first start inside ZBrush, creating a prototype model out of ZSpheres, then make an adaptive skin out of it which will be taken into another application to give detail to the cage and wire it in a way that will make ZBrushing details into the model easier down the road. To finish off, we will add color to the model. This tutorial is written with new users in mind. Expect lots explanations, so make sure to read carefully

When launching ZBrush, you will right away notice changes made to the interface from the last commercial version. Most notably are the trays being hidden away. This is because you can now more easily access the separate menus and properties from drop down menus at the top of the screen.

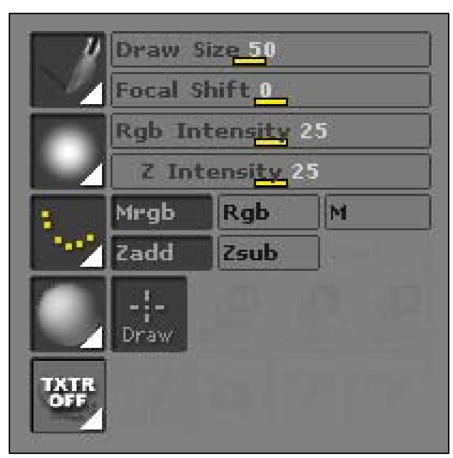


An Interface Layout

Start with increasing the document size from the default 640 x 480 resolution to 1280 x 960.

- **Go to the document menu that is found near the top left section of the interface, and simply press the "double" button.**

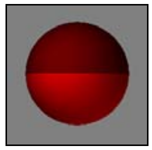
(Note: Making your document size smaller gives you better refresh while working on your model and having it zoomed in, so it's really up to the user to decide what kind of document size is optimal to him.)



To place a ZSphere (or any tool that you will be working on), there are several ways to go about it. One direct method is to right click on the canvas to bring up the QuickMenu (figure 1.2), left click on the paintbrush, and choose your new tool. The other way is to go to the "Tool" drop down menu, near the top right side of the interface, and once again click on the paintbrush button. Personally I use the

QuickMenu more often just because I don't like to travel too much around the interface. So I grab things from where my cursor is currently at. After clicking on the paintbrush button:

- **Select the ZSphere tool (it looks like a red pokeball.)**



- **Draw it on the canvas.**

Click and hold, while dragging mouse in any direction, and release.

- **When you draw any 3 dimensional item, the first thing you want to do is right-click to bring up the menu and select the Edit button.**

This will make sure that you can manipulate the geometry, and not have to worry about ZBrush converting your model to Pixols.

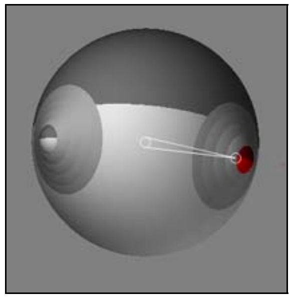
With the ZSphere in edit mode, we can begin to work on it. (Note: At this time I recommend changing the draw size to 1. if you have your draw size set higher when working on ZSpheres, you will get a sort of "magnet effect" when you have more limbs in place. At the moment we don't want this, so make sure to use draw size = 1.)

- **Go to the Transform palette, and about ½ way down the menu you should notice a number of buttons that say X, Y, Z.**

These buttons toggle Dynamic Symmetry, which you will see update as you draw.

- **Press the X button, and when you go back to the ZSphere, notice that you now have 2 cursors over the model.**

- **Draw a single ZSphere on top of the model to get something similar to the image.**



- **Right click to bring up the menu, and switch from Draw to Move.**

What we have so far is what we will use for the chest and the shoulders.

- **Use move to position the shoulders how you like.**

- **Switch back to Draw.**

- **Draw more ZSpheres coming out of the shoulder.**

- **Switch to move, and position them so you have a full arm.**

You can click on the ZSpheres/joints or the bones while manipulating the model to get different effects (same when using scale and rotate). Try out both methods. If at any time you feel that you need to add new spheres between joints, use the draw command and click on the bones to split them.

Navigation

At this point, you might want to know how to navigate in ZBrush.

To rotate: Click and hold the left mouse button outside the model and drag the mouse around. While working on models you will most likely want to snap the viewport into views such as the side view or the top view. To do this while you are rotating around a model, press and hold shift. You can also press the “Rotate” button on the right shelf.

To Pan: Press and hold alt, and then use the left mouse button outside the model. You can also press the “Move” button on the right shelf.

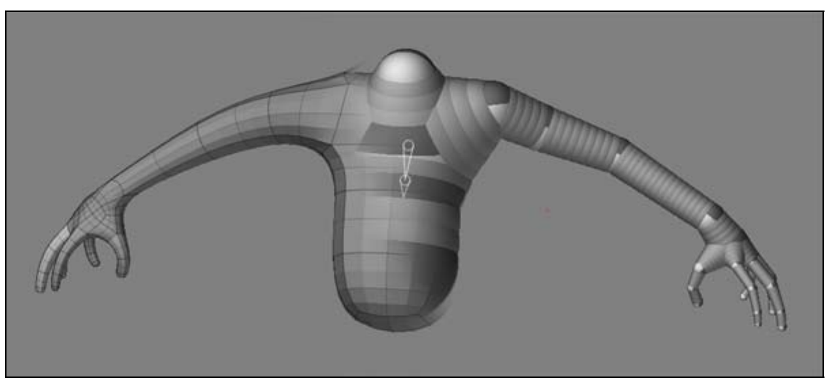
To Zoom: Zooming is similar to panning because you start off by pressing and holding alt, then left-click. This activates panning. To go into zoom mode, release alt. You can also press the “Scale” button on the right shelf.

The top buttons (Scroll/Zoom/etc.) relate to *document* navigation that is meant for when painting, when using the 2d toolset, or when texturing models.

One useful command when modeling inside ZBrush is the “local” button that is found on the right shelf of the interface. How this works is, every time you make any edit this command moves the rotational center onto the last spot you pressed your mouse on.

This makes rotating around a model much easier, so I suggest keeping this button turned on.

When you get far enough along making the ZSphere model, you might want to start to preview the mesh. You can do this in 2 ways. The fastest way is to press the “A” hotkey. The other way is to go into the Tool palette, open up the Adaptive Skin sub menu, and press the preview button.



ZSpheres and Preview modes.

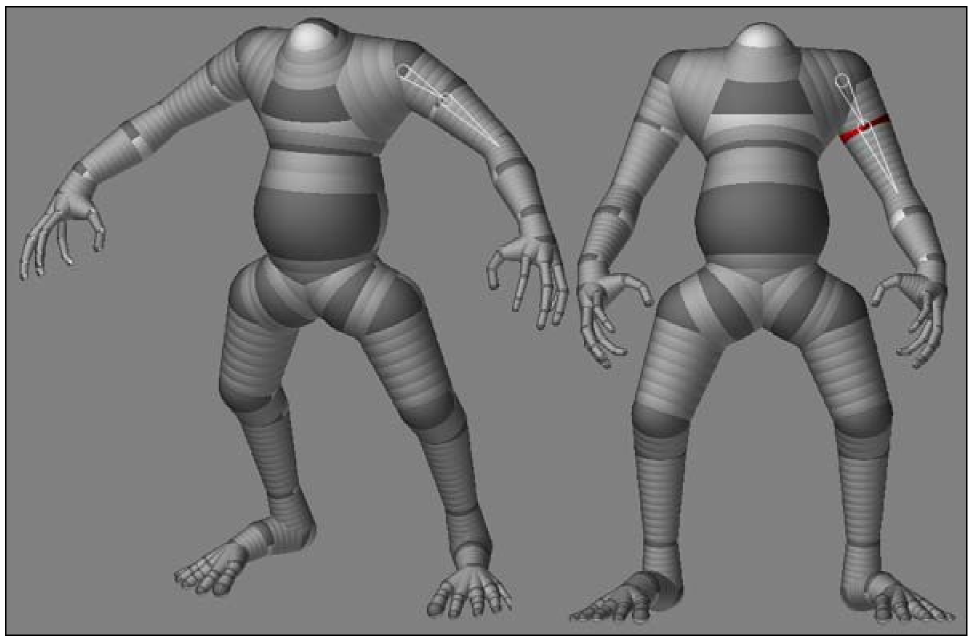
If you are not getting wanted results, try these settings (that I used for this particular model).

- **Go to the Adaptive Skin menu:**

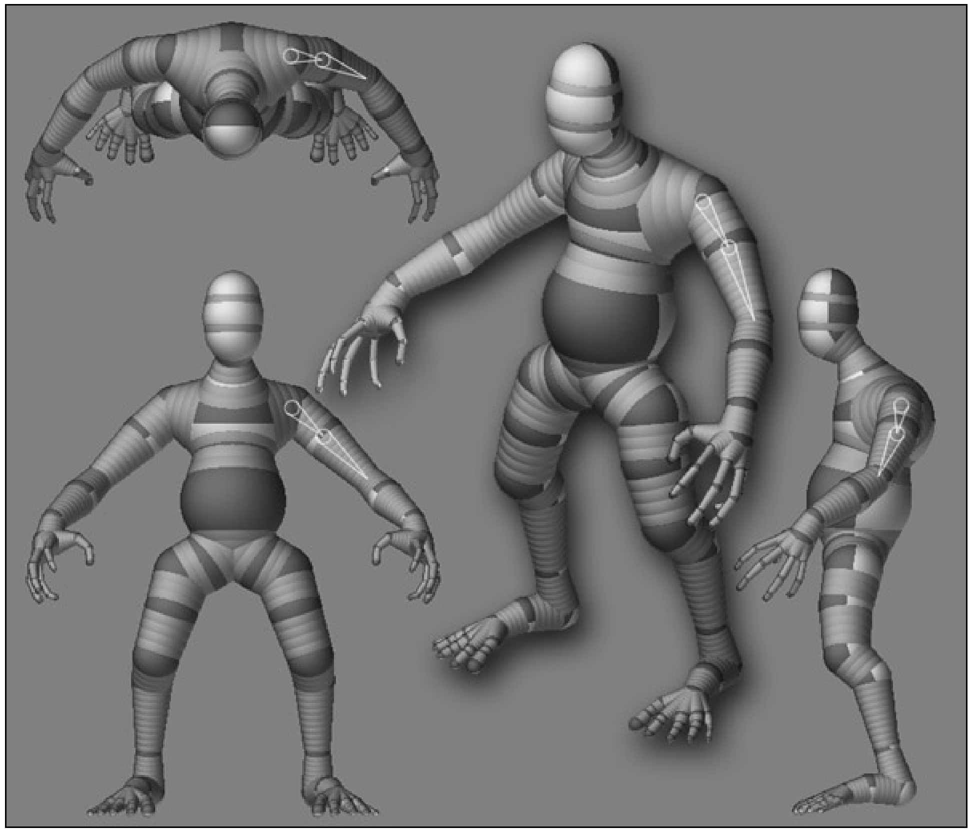
Make sure the “Mc” and “Mp” buttons are checked on.

Set the Intersection Resolution (Ires) slider to something low, like 4

Set the Membrane curvature (Mbr) slider to something high, like 90+



Fuller body.


ZSpheres done

Saving
When you work for a while and you feel that you need to save your model, the most common mistake for new users is that they try to go to save document. This is not the same as saving the 3d model. In ZBrush, what you do is save elements that you can reuse for later. This includes tools, (such as in this case where we want to save your model). You will find save and load buttons under a number of the palettes.

- **Go to the Tool palette and save your tool.**

Adaptive skin and moving on.
The ZSphere creation process should have been rather painless, as all you do is draw new ZSpheres, scale them up or down, and move them into place. One advantage of using ZSpheres for starting a character's skin is that you can decide the proportions of the character, and pose them with great ease.

Now that we are done with the ZSpheres however, it is time to commit to a mesh.

- **Make sure to preview your model, and that you like your current look.**

Don't be too picky if not everything is perfect, because we will use some vertex-level editing to fix up the form of the character.

- **If the model is to your satisfaction for this step, press Tool>Adaptive Skin>Make Adaptive Skin.**

When you press the "Make Adaptive Skin" button, ZBrush makes a new object/tool with the mesh we will work on. Before we work on this new tool however, we need to clear the canvas with the current tool we have.

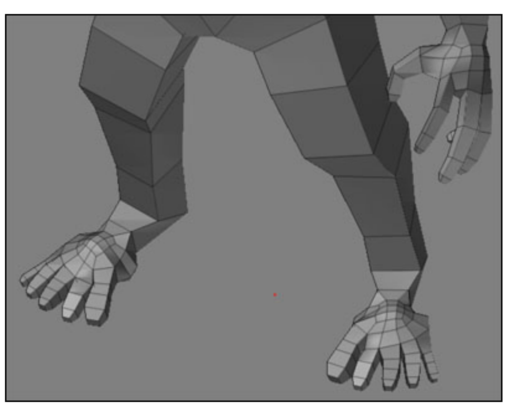
- **Turn off the edit button, then press undo.**

This should clear the Tool you used for building. The reason the model disappeared was that there was only a single action that we used on the actual "canvas mode", and that was to draw the ZSphere tool onto the canvas.

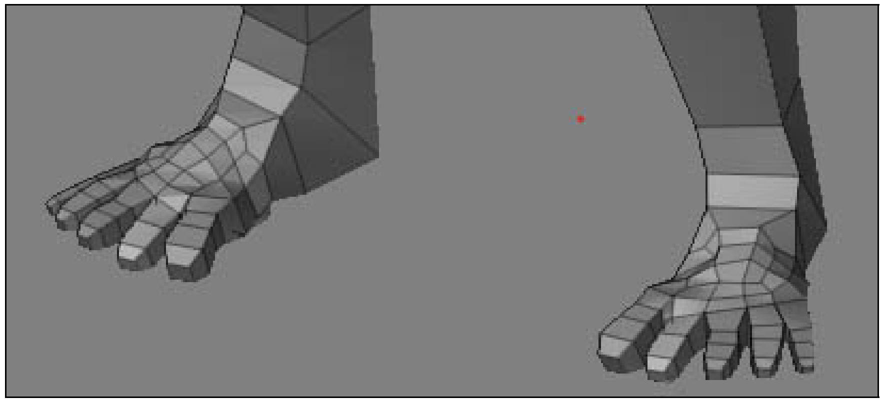
- **Right click on the canvas to bring up the QuickMenu, and then choose the tool icon (currently the ZSphere) on the top left.**

- **You should notice that the menu has a new object by the name of "Skin_ZsphereCopy". Pick it, draw it onto the canvas, and go into edit mode.**

On my particular model I don't like how the feet came out. Usually I could spend time in the adaptive skin submenu and try to play with the switches/sliders to get more acceptable results. But sometimes it might take too long to try and achieve a perfect result, when we could just move a few points later down the road to get what we wanted all along.



- **For tweaking we will set the brush to Move, and draw size still at 1.**



This will let us work on single vertices, and move them into place. For tweaking Volume you might want to use a larger radius than draw size 1.

- **When you are done with the tweaks, Save your model.**

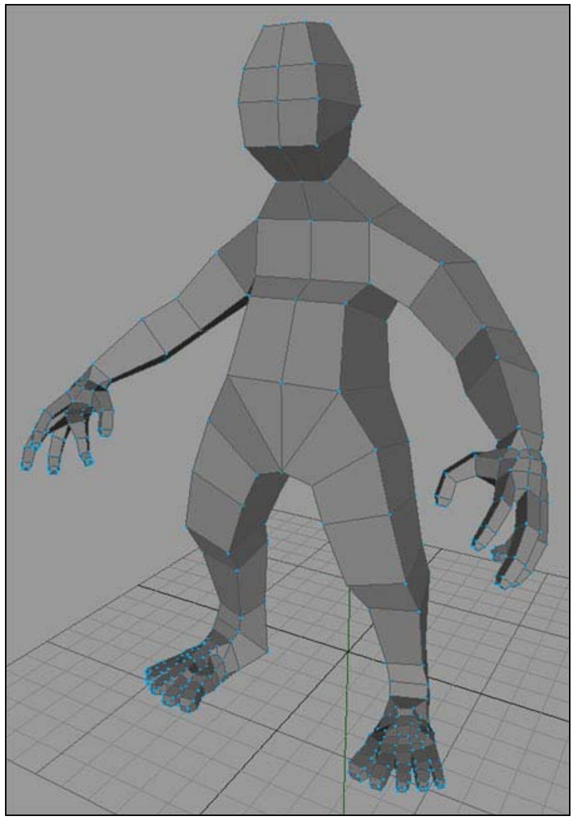
Exporting, and Continuing the Model

For this model I will be working outside of ZBrush to work on the animation cage. I will be using Clay for the task. Since this quick starters guide focuses on how I make this model and work within ZBrush, I won't explain how to use clay, but rather a few notes on polygon distribution.

- **Click Tool>Export.**

Before we can work on the model inside our application of choice we have to export the model. At the moment we don't need any particular properties for the object file, so a straight export by clicking the Export button is all we need.

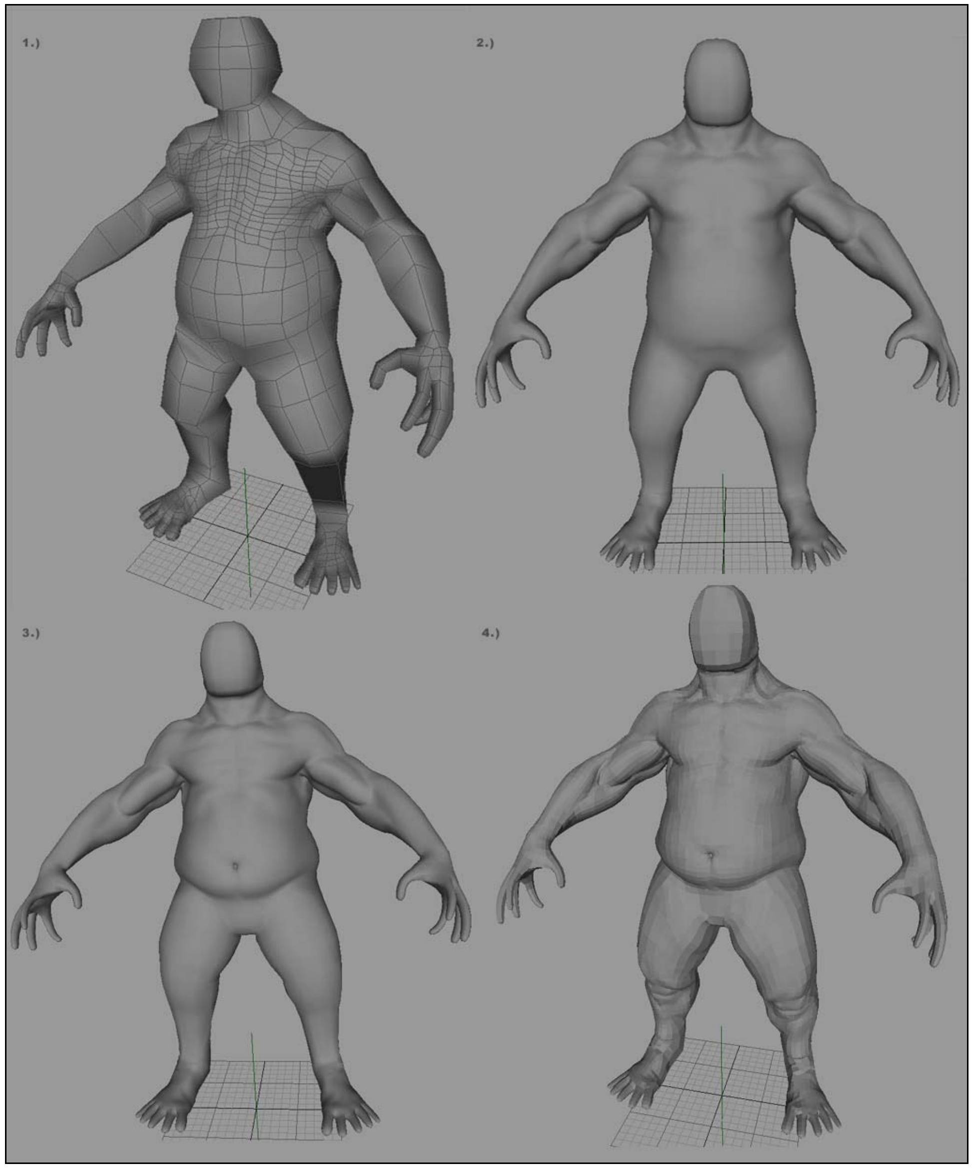
I shaped the model inside clay until I came to a good enough mesh for this tutorial.



Imported model

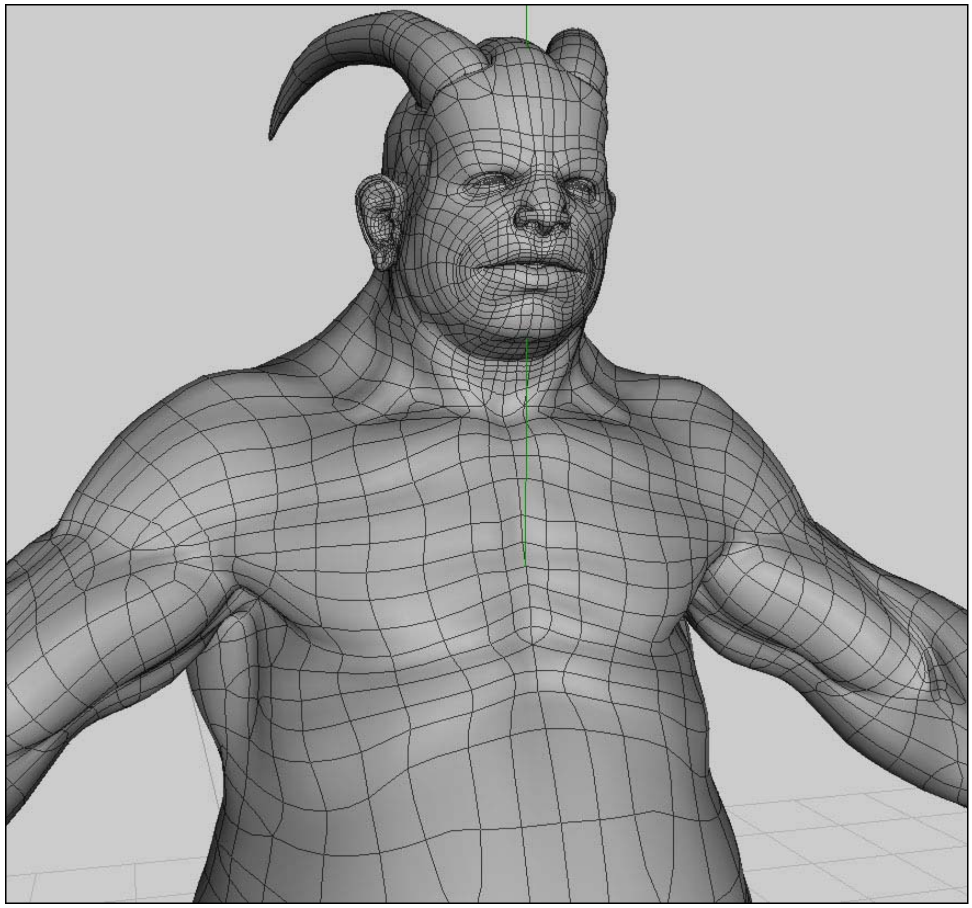
When modeling your characters that you plan to do high detail modeling on, there are a few things you need to always keep in mind if you want to get good results.

The biggest thing is poly distribution. When placing edges/polygons on your model, make sure you have enough detail on the areas you plan to do your heavy detailing. The reason this is important is because your computer will only accept so many polygons before it gives up. When you arrive at a polygon count that your computer can barely handle, you don't want to be in a situation where you won't be able to put the detail that you'd like to because you would need another subdivide to achieve it. So before you import your model back into ZBrush, make sure that you are happy with the polygon distribution.



One common rule when subdividing modeling organic objects is that you should only add detail where you need it. (Mostly for animation purposes.) So areas like the back of the head, or the characters back as a whole, won't receive as much attention as the face. Of course if you plan on detailing the back, then for better results I suggest you add more edges to the areas that you will be working on (and spread evenly.)

When dealing with man-made objects, a common problem that I've come across is when they contain creases; those objects often also are associated with very rectangular-shaped polygons. Rectangular-shaped polys can be rather troublesome when you want to paint details such as cracks (or just standard wear and tear) around the crease. So the best thing you want to do is try to eliminate any rectangular polys by adding an extra edge loop or two. On the example below you can notice some rectangular-shaped polys around the belly area. I won't be adding any really heavy detail to that area so it is fine in this case.



Poly distribution

Important Geometry Cleanup

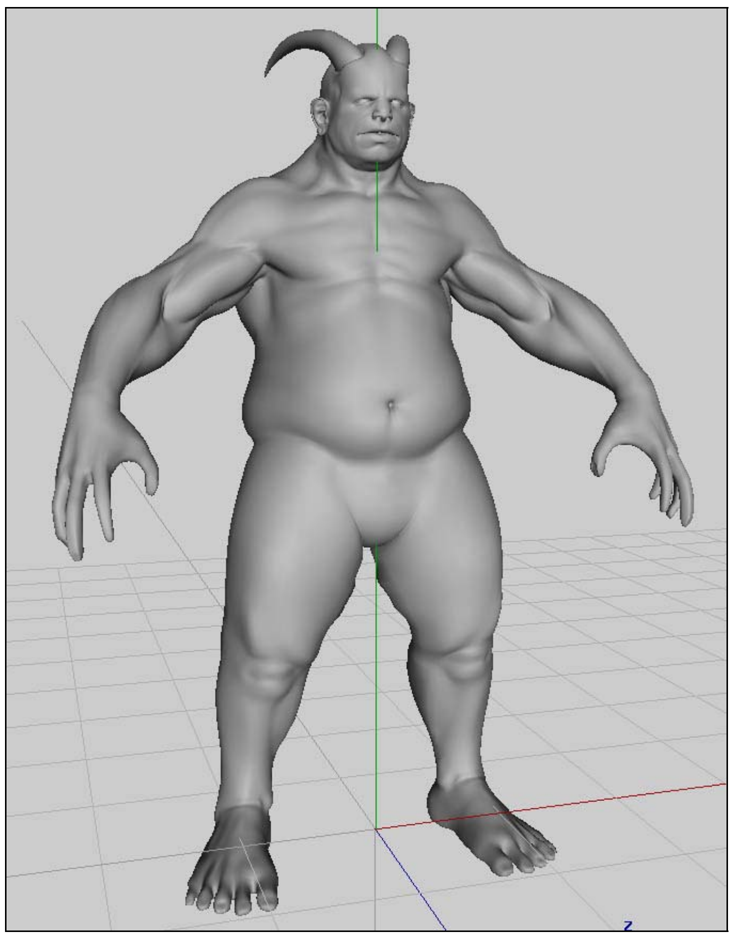
Before exporting back to ZBrush, you might want to try to optimize your mesh, if it isn't already. ZBrush will let you import geometry with Ngons, but it will triangulate all of them. This is usually not wanted, especially if you plan on using symmetry. You will still be able to use symmetry regardless, but only the dynamic symmetry mode that is found in the transform menu (in ZBrush) will work effectively. The down side to the dynamic symmetry is that it forces you to have both sides of the model visible if you want it to work.

This means you need twice the visible amount of polygons visible at all times, and can slow down the update of your strokes while you are painting. As a result you will get a "bubbly" effect of your strokes. So to setup your model to be able to use the "smart resym" tool (Tool>Deformation>Smart resym) you want to make sure the model is 100% symmetrical. What I like to do is go either into Wings 3d or Mirai, and go to "Select>By>Faces With>5 or more" and then use "Tessellate>Quadrangulate."

If you were working within an application that allows isolated vertices placed in 3d space, then you might want to use a cleanup tool to get rid of any floating verts.

On slower machines expect to use Smart Resym more so than the dynamic symmetry. These steps are then especially important.

After you quadrangulated and deleted any unwanted verts, make sure the model is 100% symmetrical. If you were using symmetry while quadrangulating, then you "should" have nothing to worry about, but if the model had frozen symmetry then you can expect that the application didn't keep symmetry in mind when placing the triangles inside the Ngons. To solve this, delete ½ the model and re-symmetrize it.



Smoothed test

Smooth the model to see if any of the new edges cause pinching. If it smoothed ok then export an object file.

Note: if you are going to want to use Photoshop for painting/editing textures, make sure to setup the models UV's before exporting. I will be using AUTO UVs

Back in Z, and Ready to Roll.

For the remaining work I recommend using a Wacom tablet.

Finally we get to the good stuff. The model is all ready to do the detail work.

- **Once again, set your document size before you begin working.**

- **Go to Tool>Import, choose the model, draw it onto the canvas, and enter edit mode from the right click menu.**

Hiding and Polygroups
Before sculpting on the model, it would be a good idea to establish different groups on the model for areas like the arms, the front of the head, chest, etc. To do this we will need to isolate polygons on the model, and assign a group to the area.

To start, I like to first hide a large part of the model, so I can focus on a smaller area.

- **Start by moving the mouse outside the model, press and hold "Shift+Ctrl+left click" while dragging over an area on the model.**

This will give you a green rectangle meaning that anything inside it will be visible, and everything outside it will disappear. Once you let go of left click you will see only what you chose.

Now that we have our general area we want to keep for our group, we should define it further so we get exactly what we want. To do this, instead of hiding what's outside the rectangle, we will want to hide the contents inside.

- **This procedure starts off exactly like what we did a second ago (by pressing "shift+ctrl+left click" to get the green rectangle), but this time while we drag the rectangle, let go of shift.**

This will turn the rectangle to a red color. (If you press shift again while doing this operation it'll toggle the green rectangle back on again.).

You can hide by points or by polygons. By default, if your rectangle contains an entire polygon it will only hide polygons that are fully contained within the box. If your rectangle does not contain an entire polygon, it will hide all polygons connected to the points within the box.

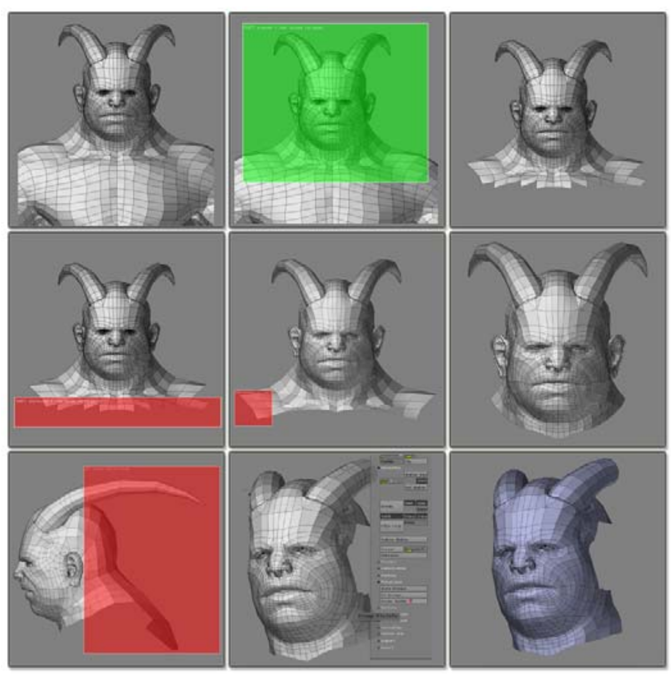
Keep using the red rectangle to hide polygons that you don't want until you reach a point that you are satisfied with what will become a group.

- **To Define a Polygroup, click Tool>Polygroup>Group Visible.**

In case you want to see the group colors while defining groups, make sure to turn on the "Frame" button (or press the Shift+F hotkey).

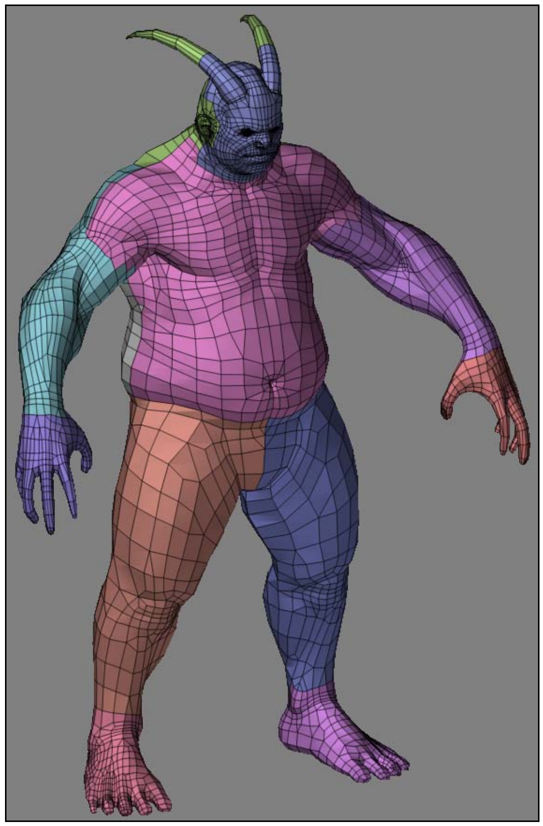
- **To unhide the model, press, "shift+ctrl+left click" anywhere on the empty space on the canvas.**

- **Continue defining groups until you are satisfied, and have all the general areas of the model defined.**



Hiding and Grouping

To make grouping easier, once you have a number of groups made and you are trying to deselect polygons that are visible from previously generated groups, simply “Ctrl+shift+left click” on any polygon from a visible group and all the polygons that belong to that polygroup will disappear. (If the full model is visible, doing this hides everything but what you clicked on)



Grouped Model

Sculpting at Last

In order for us to do any fine details to the model, we must first subdivide the mesh a few times. Good practice is to start off with 2 initial divisions, and do as much as you can for that level. Then subdivide again and refine details until you’ve reached a point that you are happy with.

❑ **Click Tool>Geometry>Divide twice so that you are at SDiv level 3.**

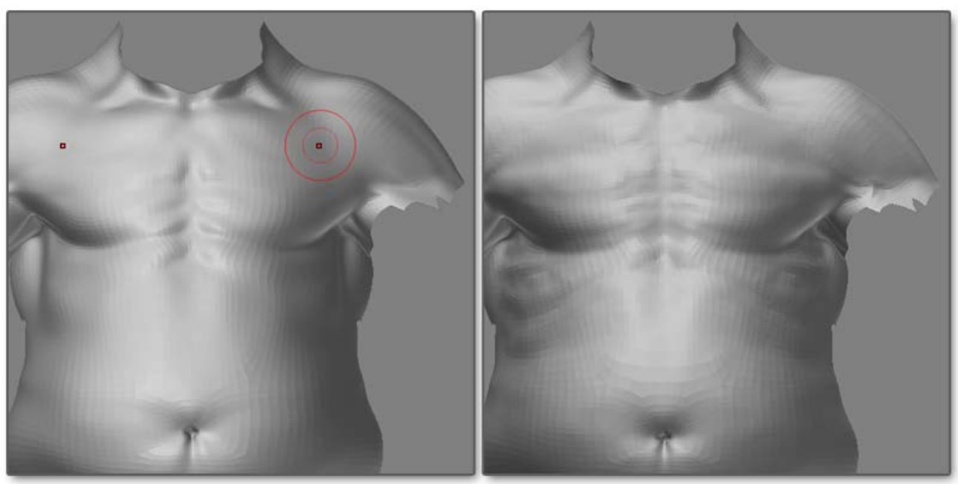
You can jump up and down levels by using the SDiv slider just above the Divide button (or using the D or shift+D hotkeys).

❑ **The first thing I do is set my brush radius to about 30-40, and the Z intensity to about 6-8.**

When sculpting I always like to rough out any volumes first, or rather work starting a broad area, and refine as I go

At this time, since our model is not yet so dense that performance lags, it's good to turn on the dynamic symmetry from the Transform palette.

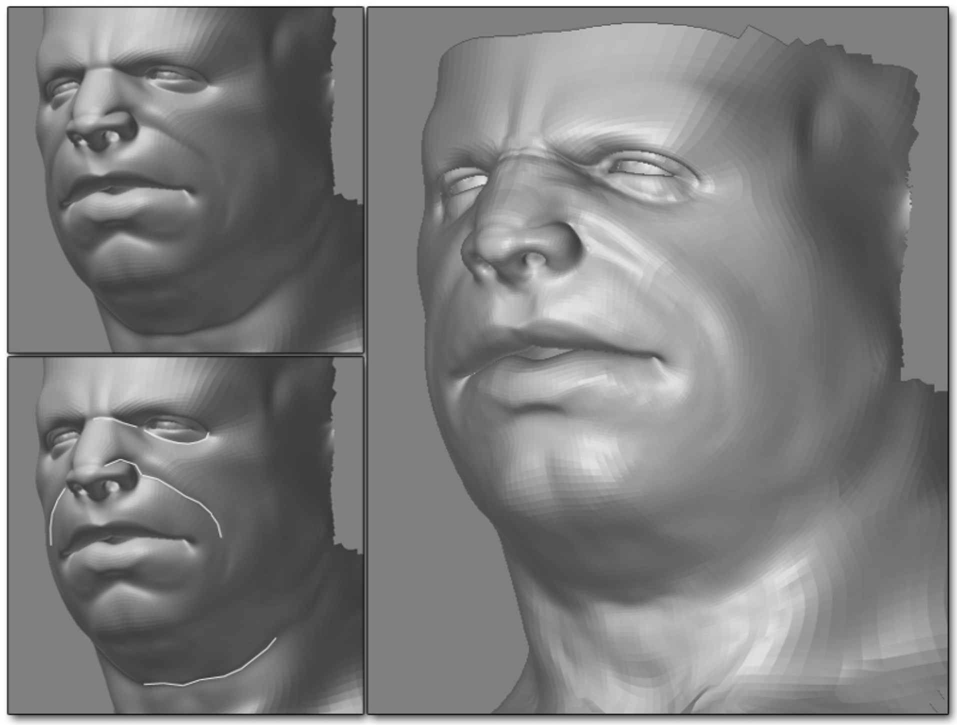
❑ **Just like you did back when making the ZSphere model, click Transform>X.**



Symmetry painting

❑ **Choose a part you would like to work on by "Ctrl+shift+left clicking" on any of the defined polygroups.**

I start by painting subtle volumes. Usually I perform strokes along the muscles if I want to bulge them up a bit, or paint in a circular fashion (especially on fuller areas like the belly). I then work along the creases with a smaller brush. I use a draw size of about 10-20 for this. I do this because smoothed CG models tend to have this very clean/sleek look to them, so I add irregularity to the creases. This also gets rid of that statue look, and makes the model look as if it has skin verlaid on top of bone, muscle, and or fat. While painting along the creases, I smooth the area out by using the smooth brush. To toggle on the smooth brush you can press and hold the shift button. You should notice your brush radius turn blue.



Getting Rid of Clean Creases

While on the topic of using the "Smooth Brush" if you go to the Transform palette, you should immediately notice the words "Std" (standard edit brush), "Inflat" (inflate edit brush), and so on. These are the 10 brush modes available to you to use at any time during the modeling process. You can change your standard brush to any of these, or you can hold shift and should notice that your brush mode in the transform menu changes to "Smooth". This allows you to change the toggle brush inside ZBrush when you hold shift at any time. If you want to have "Shift" activate a brush other than Smooth, hold "Shift" and click on the desired brush.

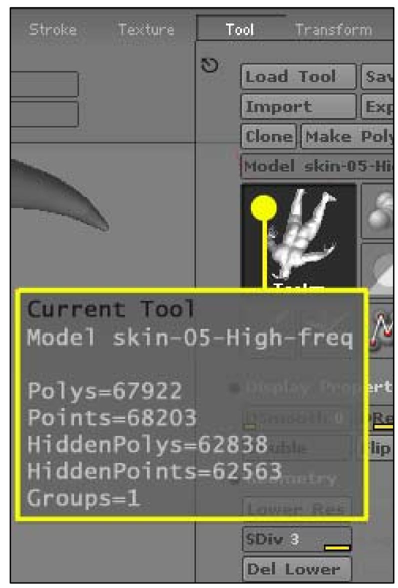
Remember that if you eventually plan to take a displacement map generated within ZBrush and use it for rendering in an outside application which uses standard subdivision algorithms, you may

Displacement>Best mode compensates for most of these differences.

find that some details will not render as sharp as they were while rendered in ZBrush. The more disproportional difference you have between the high-resolution mesh and the low-resolution mesh in ZBrush, the more likely it is that the outside application will not be able to reproduce the details faithfully. I recommend that while initially experimenting with displacement maps you limit yourself to using the standard ZBrush editing tools. Only when you feel comfortable with the process should you venture forth and experiment with other editing modes such as Pinch.

On to the next level

- **When you get to the point where you think you've done as much as you could for the current subdivision level, go back to the Tool>Geometry section and hit divide so you can refine further.**



When you start to reach 4-5 subdivision levels, you might want to check how many polygons your model is made out of. To do this, open up the Tool palette and put your mouse cursor over the model icon.

Generally you should work within your computer's ability. Performance is greatly affected by the amount of RAM you have in your machine. For example: On my Pentium 4 machine with 1 GB RAM I am able to push over 2.5 million polygons at a workable rate (obviously I have to hide a lot to get better frame rates and that's where grouping comes in handy). On my Pentium 3 with 768 Ram usually I want to stop at around 2 million. (I'm using the P3 to make this model.)

At the Fourth subdivision level, you should notice a considerable performance drop.

- **At this moment it is a good idea to go into the Transform menu, and turn off the Dynamic Symmetry, because Transform>X won't be as responsive as it was on lower levels.**

Since at this point you have a lot more detail in the mesh, you should notice that if you paint with it on, you often start to get “blobs” showing up instead of smooth strokes. To solve this we will use a post-process symmetry tool after we are finished with painting on this level.

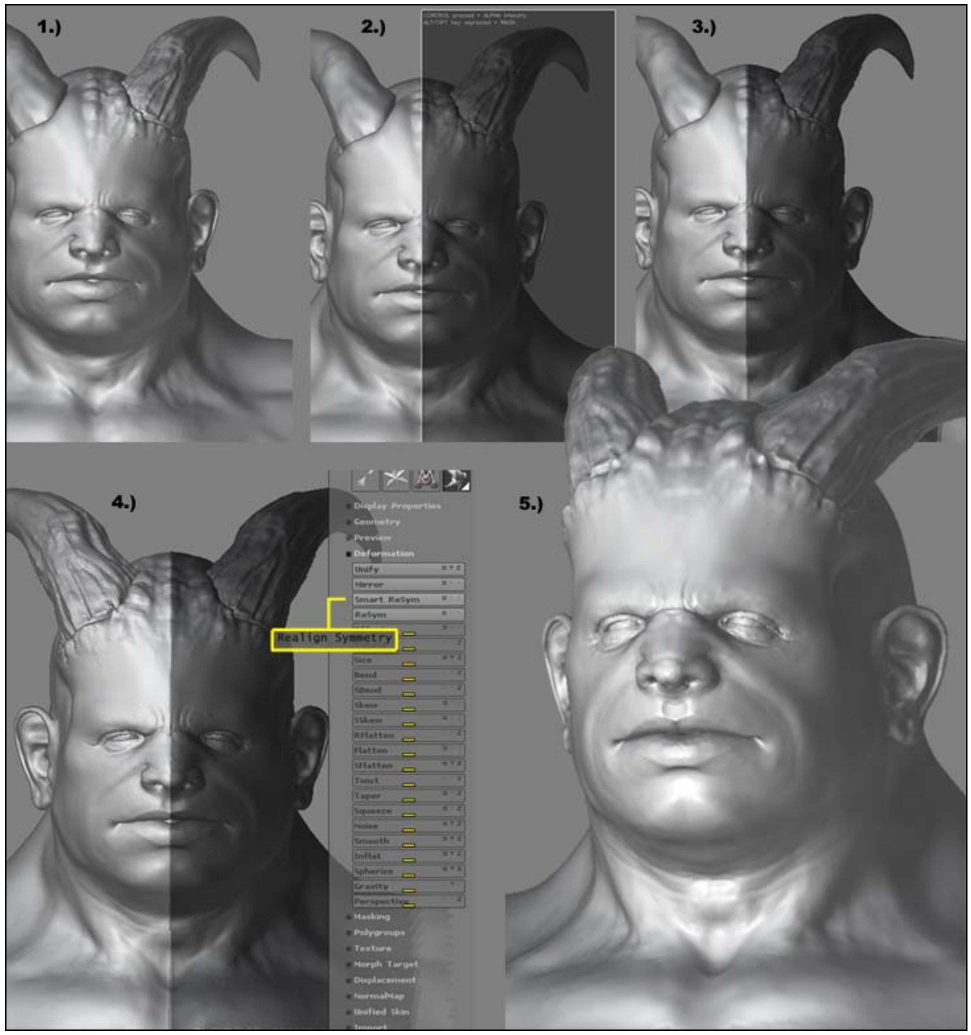
Because we are going to use a post-process symmetry tool, we don’t need to have both sides of the model visible anymore.

- **From now on make sure to hide ½ the model when you work, and refine visibility from there.**

The higher you go in levels, the less broad-scale work that you should do. You should be just refining your model, and adding small details such as small wrinkles while using a smaller and smaller brush as you go along. Since you’re no longer working on broad areas, you can have more hidden away, which in turn brings up performance.

After painting all the details that you need for this level, it is time to apply symmetry onto the other side using the “Smart Resym” tool. The way this tool works is that it averages both sides of the model and makes changes so both sides are identical. We don’t want to change both sides of the model; that would waste our time that we spent on painting details to the one side. We can use this tool in another way however, that enables us to completely retain the work that was made on one side and apply those changes to the other side of the model.

To do this, we will have to mask all the details that we want to stay where they are, and then use the smart resym. This will lock the details from one side when trying to re-symmetrize the model.



Smart Resym

To symmetrize both sides using “Smart resym” do this:

- **Move your cursor outside your model, press and hold CTRL+left click.**

- **Drag the mouse to create a black mask rectangle over all the areas that you added detail to.**

- **When all seems to be covered, let go of the mouse button to apply the mask.**

- **Click Tool>Deformation>Smart Resym.**

- **To get rid of the mask, you can go about it in a few ways. Click Tool>Masking>Clear mask button, use the hotkey "Ctrl+Shift+A", or you can do it right from within viewport by dragging a mask rectangle over an empty area of the canvas. The mask should clear.**

Projection Master
If you want to go even further in detailing your model, you can subdivide your model one more time. This could bring you over 2 million polygons. By default, ZBrush will not allow you to go over 2 million. This default is only there to protect users with slower computers, or with computers that don't have lots of RAM. If a user chooses to go over what his PC will be able to handle, then he could end up having to close down ZBrush. If, however you have a faster machine with plenty of RAM then you could go into the Preferences>Mem menu, and change the Max poly per mesh slider from 2 to something higher like 3 or 4.

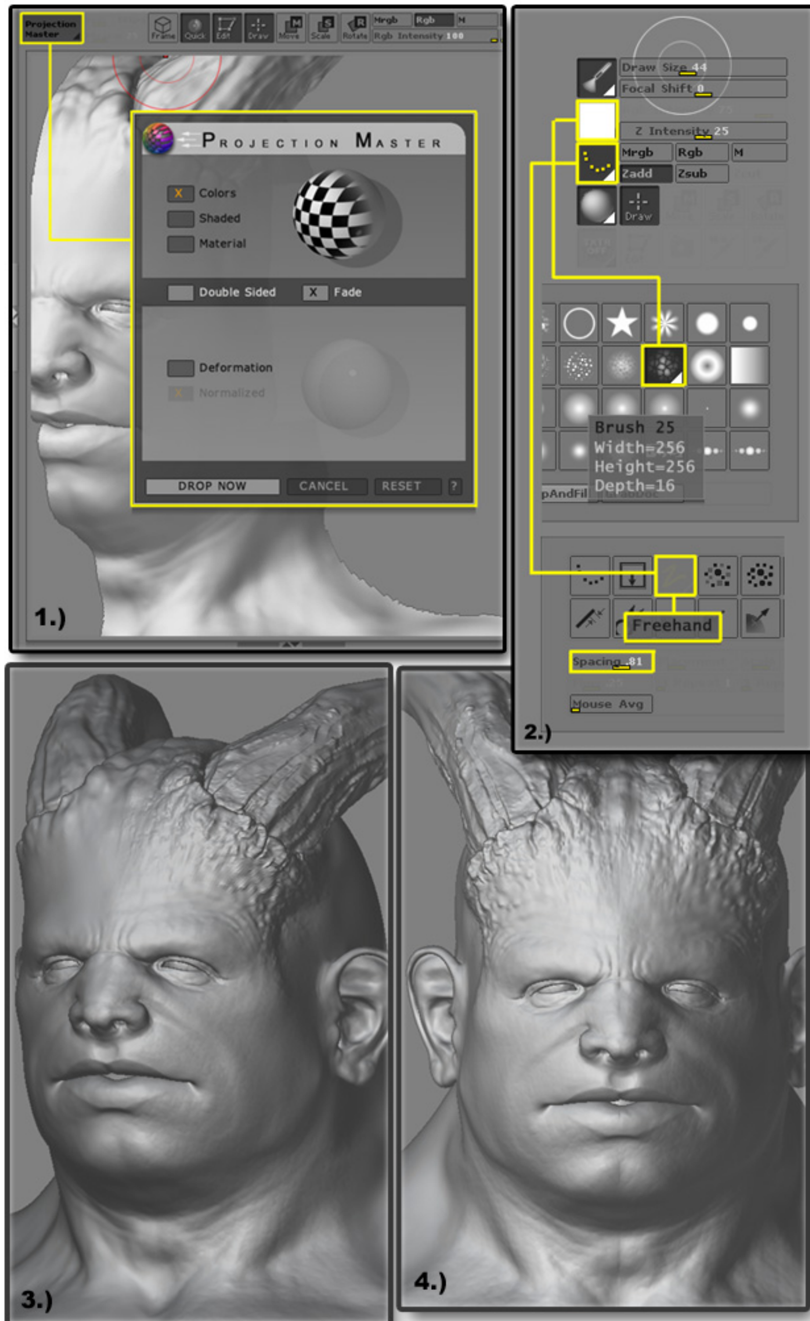
While we are talking about the "Mem" submenu, you should be sure to set your Preferences so that ZBrush doesn't switch to virtual memory as quickly. (See the "Customizing ZBrush" chapter of this manual.) Another word of caution: You should make sure that the partition where you have ZBrush installed has at least 1-2 GB of hard drive space free. ZBrush uses its own virtual memory, which is written to the main ZBrush folder. If ZBrush runs out of Virtual Memory it could be forced to shut down, losing your work. Make sure you have enough hard disk space before subdividing.

- **Before moving ahead, I would suggest saving your mesh.**

At this point, saving can take some time and your files will be large. To make files smaller and save faster you should lower your subdivision level back to 1. This will also make it easier to draw your model back onto the canvas in future sessions.

- **Now that you are sure that you'll be able to handle the last subdivision, go ahead and divide your model once more.**

On this last level your feedback should be very slow. If we were to sculpt the detail on this level, it would be very time consuming, and very tedious. To solve this however we have another part of the application that has not yet been explored in this tutorial, and that is Projection Master. Using Projection Master will let us work in real time, and will let us use tools that were not available to us earlier while sculpting. The reason why I left it to the end is that while in Projection Master your strokes give you real time feedback with no lag, but you cannot tumble the view while using it. Also, Projection Master is meant to be used when your model has enough resolution to support high quality displacements. So for modeling purposes it is most effective when left to last.



Projection Master

- **In order to use Projection Master, you will have to press the “Projection Master” button that is found on the upper left of the interface.**

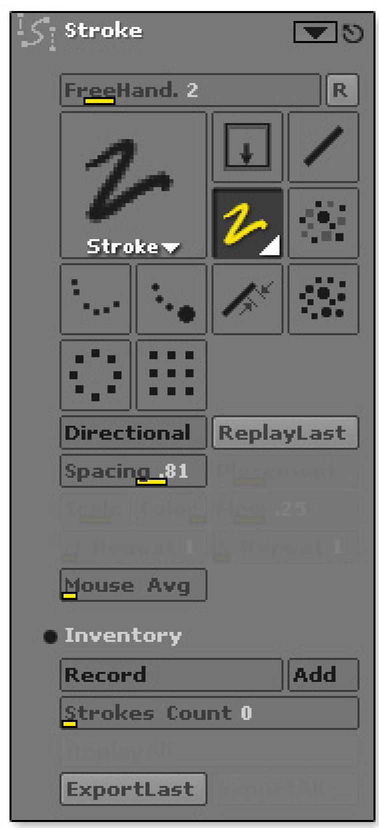
When you press the button, ZBrush will show a popup with a number of options. Here you can choose which defaults you want to start with for when you enter Projection Master. I usually start off by turning off color, and then turn on Fade, Deformation and Normalize.

- **To fully activate PM, press the “Drop Now” button.**

What this does is put you into a canvas mode in which you can paint detail in a 2.5d mode, and then bake that detail into the mesh below when you’re done. This means you can texture your model inside Projection Master, and paint displacements at the same time. It’s great for having your geometry and the color channel match up perfectly.

Projection master Brushes
Inside Projection Master we can do a number of things we weren’t able to do while in Edit mode. While using standard edits outside of projection master is good for volume, it doesn’t quite work well for small details that you could use to define bump map like details. This is where Projection master comes handy.

The properties that we can now access that affect the look of our strokes are, Tool, Alpha, Stroke, and Texture. Some of these are affected by which tool you use however. For example, Texture is grayed out in Layer brush. In order to use Texture you have to use Paintbrush, Roller brush, etc.



Stroke controls the way that ZBrush will draw samples (instances of your selected tool) onto the screen in a number of ways. The Default method is the Dots Stroke. It has no properties that you can access. If you draw in quick strokes and are not satisfied, you should use the Freehand Stroke and adjust the spacing property to your liking. I particularly use the Freehand stroke a lot with a higher spacing (0.8-1.2) when painting bump maps with specific Alphas. There are other useful strokes such as Draw Rectangle, which places a single instance of your brush, and strokes like Spray, which randomizes your samples. I would suggest experimenting with each (press ctrl while having your cursor over each icon to get more information on each stroke).

Stroke Edit, and Refinement
One useful ability with Projection master is that your last stroke that you made is in an active state. Right after you complete a single stroke, you can then do things like move, scale, and rotate the stroke by using the Move, Scale, Rotate buttons. You can also do things like duplicate your strokes using the Snapshot button, or go into the Alpha palette to change the alpha that was used in your stroke, or change any other setting that was used to make up that stroke such as: Zadd, Zsub, Intensity, Draw Size, Focal Shift, or the material buttons.

Alpha palette gives you control of the samples that are made while painting strokes (in other words, the brush shape). There you can import your own custom black and white images to get more specific patterns that you're looking for. You can Flip, Invert, Rotate, make textures out of the alphas (and vice versa), adjust the falloff, etc, etc.

The Alpha palette is also where your displacement maps will be sent off to after they are calculated.

Pick up
When you reach a point that you are satisfied with the painted details, you will want to pick up the information from the canvas, and apply it to displace on the actual model.

- **To apply these changes we made, press the Projection Master button to get the popup window.**

- **Make sure the properties/modes that you want to apply are checked, and then press Pick Up.**

Since Projection Master doesn't add polygons, you will only get as much detail transferred to you model as its resolution/detail can show. The more polygons that the area where you applied the PM job to has, the better-looking the results will be. The same can be said of texturing in Projection Master. The higher resolution your texture is, the more details will be picked up from Projection Master. Usually to finish off after using Projection Master, I go in and manually edit or smooth areas to my liking.

And that about does it for this Tutorial. Hope it helps, Cheers!

ZBrush 2: Digital Clay

By Meats Meier

This tutorial presents guidelines for working with ZBrush and other applications. Rather than being specific to any particular application, the instructions can easily be applied to any package.

ZBrush 2 is a revolutionary program that can be used to create a high level of detail for your geometry. With its excellent sculpting tools and fall-off manipulators, ZBrush is the closest thing to digital clay that you will experience. The only limitations will be your imagination.

ZBrush is not meant to be a replacement for your usual 3D application, but as a complement to it. It is a specialty program, specializing in modeling and texture mapping. Z2 has an excellent low polygon model creator in the ZSphere tool, or you can start with your own optimized model created in the program of your choice and detail it from there. This overview will focus on the path from your 3D application to ZBrush and back again.

Game developers and people familiar with the rules and techniques of Low Polygon modeling have the upper hand in the beginning steps. In order to take best advantage of its capabilities, care must be taken to start with well laid out low polygon models before they go into Z2.

Some things to remember when creating the optimal low polygon model for use in ZBrush:

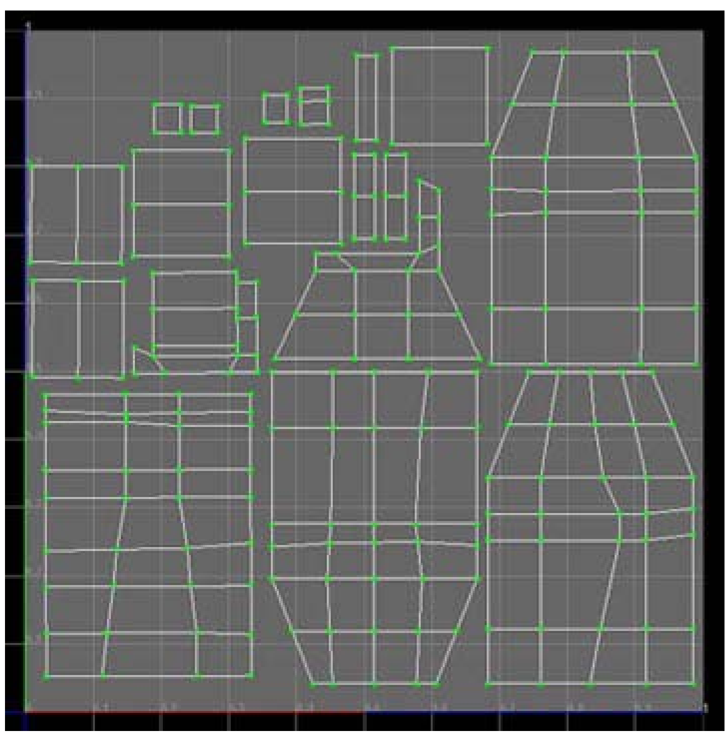
- **Create low resolution geometry; usually under 1000 polygons, but there is no upper or lower limit. The higher it begins, the fewer times you will have to subdivide it.**

- **Concentrate on just the main form. You need to only model in details such as holes or extrusions. The form that you describe early on will greatly aid in the success of the model later on in the process.**

- **Aim for evenly spaced polygons.**

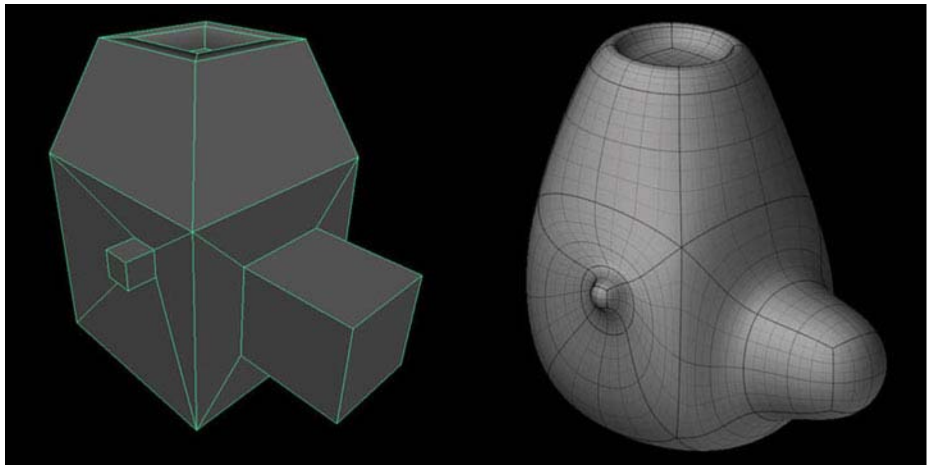
- **Must be a clean model with no holes (water tight).**

- **Texture in 0 to 1 UV coordinates leaving a small space between individual shells.**

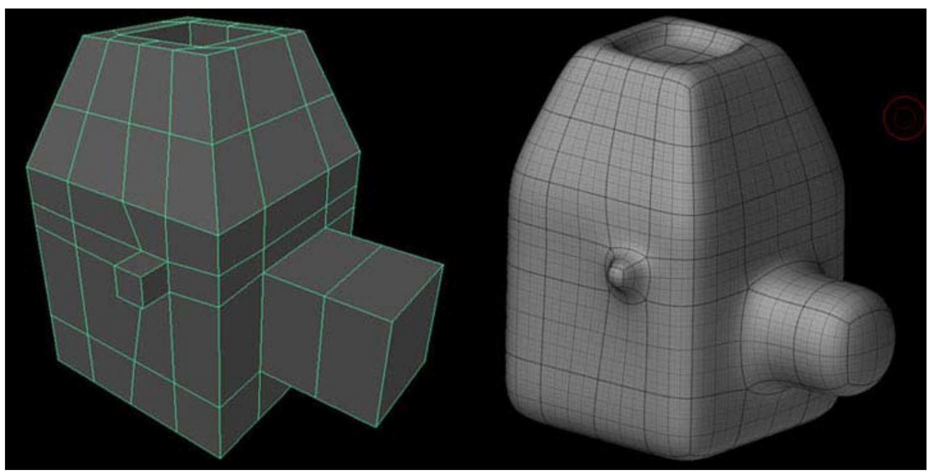


- **No need to assign a texture as you will do that in ZBrush.**

- **Export as obj.**



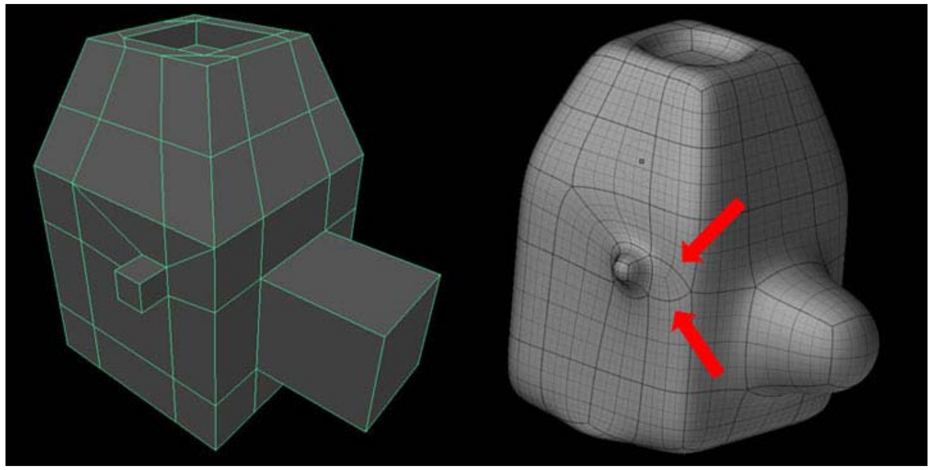
Subdividing the geometry layout on the left results in both a high concentration of polygons in localized areas, and in an overall smoothing effect.



Evenly spaced polygons within a model will hold its original form better when subdivided.

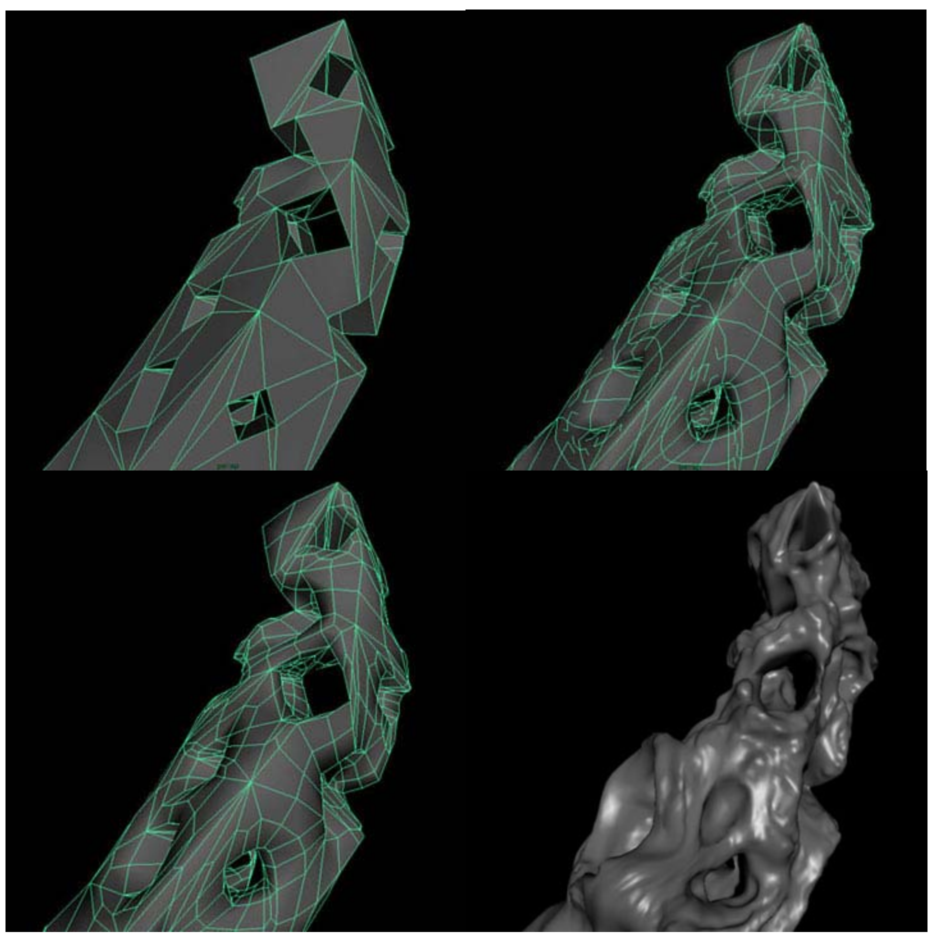
The spacing also ensures that polygons are evenly distributed, giving you more control over later deformations as well as less wasted density in the minute details.

When Z2 subdivides a triangle, it is converted into three quadrangles.



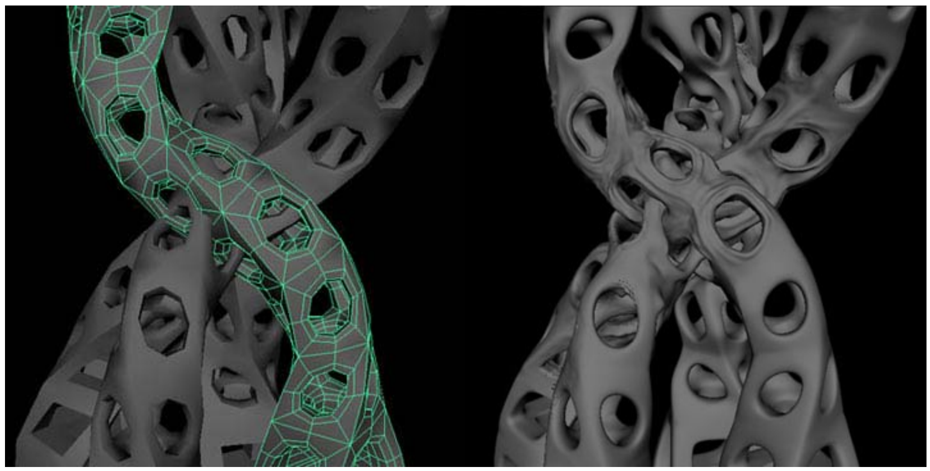
ZBrush will accept both four and three sided polygons (no N-sided), although using triangulated geometry results in an unclean subdivision, which can result in artifacts after later deformation.

A tip for working with triangulated geometry:



In times when properly quadrangulating your geometry would be too time consuming, converting to subdivision surfaces and back again to polygons can save effort and gives you a nice model that will yield decent results in ZBrush. The conversion back to polygons produces all 4 sided geometry, which is preferred in ZBrush.

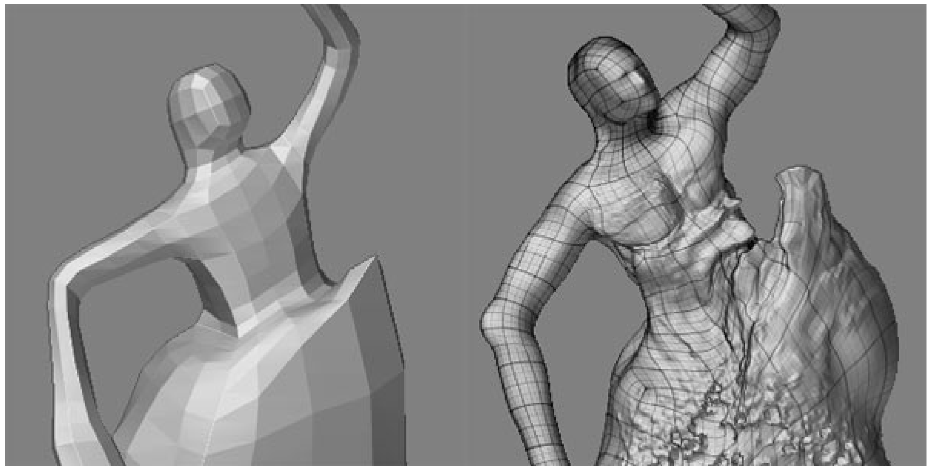
Working with multiple objects



When you are working with more than one piece of geometry, it is usually more efficient to work on them one at a time in ZBrush. Models are easier to work on separately and require less memory, allowing ZBrush to work more smoothly.

Once all the displacement maps are created for the separate pieces, import them back into your 3D program. Select all intertwining objects and export once more into ZBrush to adjust interactions and once more export back into your application to render or animate.

Working in ZBrush



ZBrush can be a very powerful tool for any digital sculptor that is willing to learn. Although it is an easy to use program, many hours will have to be spent in mastering the tools and to a lesser extent the interface. One of the bigger challenges comes from the amount of detail that you are able to add - you will find that a lot of time must be put into properly detailing the entire surface. Once you get the hang of it, your models will be putty in your hands...

One of the first things that you should do after exploring ZBrush a little bit is to set up your work space and save it so that you will be able to feel at home a little quicker each time you enter the program. (**Preferences>Config>Store Config**)

Zscripts are by far the best way to learn ZBrush; you can just sit back and watch as the program describes and illustrates all of the features for you. Look for the "Help" button in the title bar, which activates ZBrush’s online help browser. This contains a section that is filled with ZScripts on nearly every subject.

ZBrush isn't like any other modeling program out there, so don't expect it to act like them. One of the things to get used to is that it's not scene-based, but tool-based. This means that items get imported in and back out instead of saving complete scenes. (Although, of course you can save individual tools and use them in the construction of other tools.)

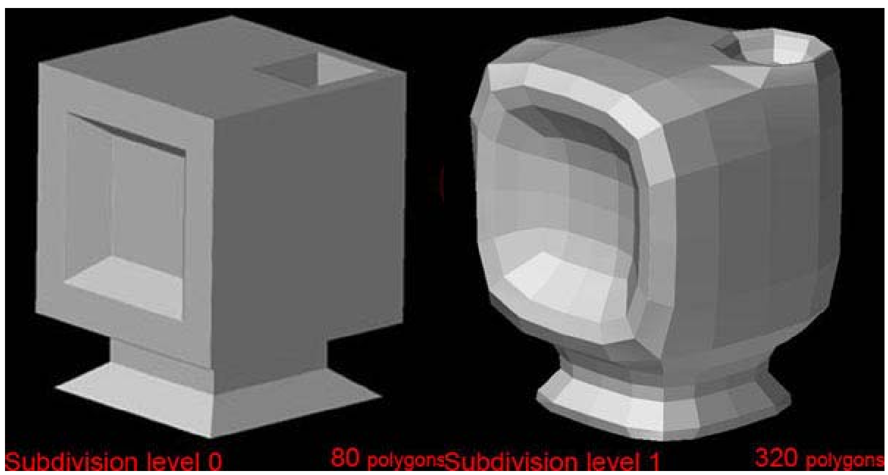
There is no one way to sculpt with ZBrush, but approaching it much like traditional sculpting is a great way to work - throw down the clay, give it form, and then create the details.

Working theory: Do your main shape sculpting first, followed by medium details with brush edit tools, and then the fine, high resolution details within Projection Master (the plugin that lets you use the 2D tools to sculpt the surface).

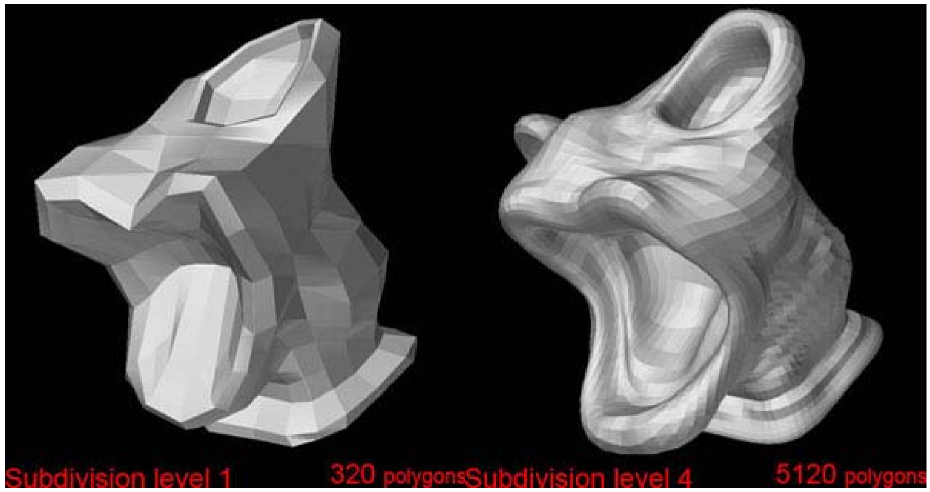
ZBrush works best with at least one gig of ram and a fairly up to date CPU. I highly recommend a pressure sensitive tablet for the best sculpting experience.

Overall working strategy

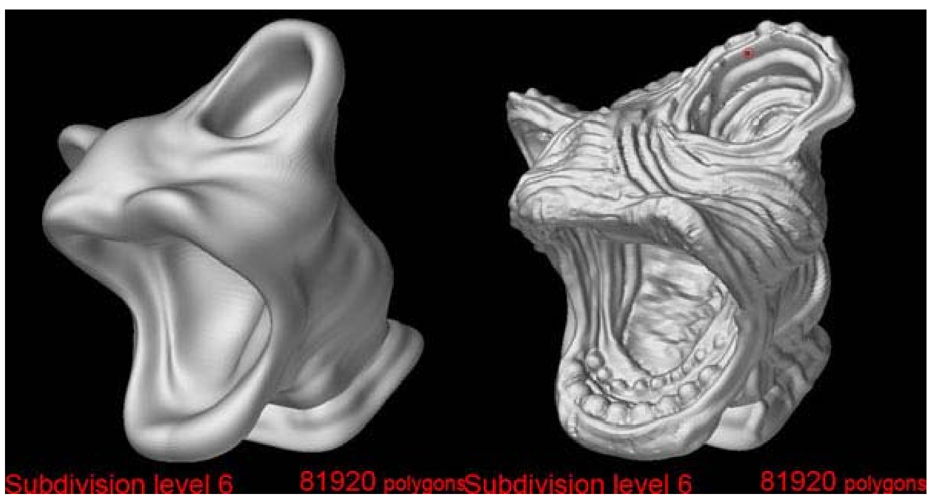
- **Import an OBJ using Tool>Import**
- **Subdivide the model once with Tool>Geometry>Divide.**



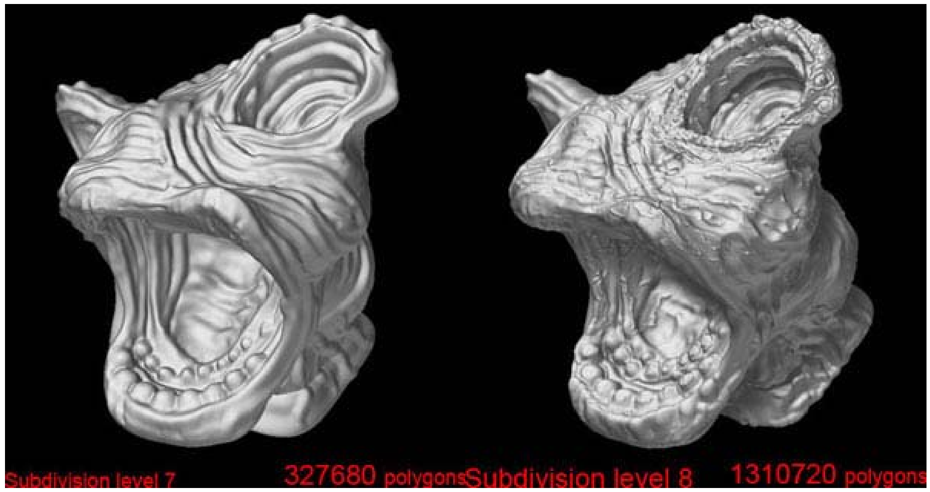
- ❑ **Manipulate the geometry using Move (W) and Scale (E), then divided a few more times (giving more detail to work with).**



- ❑ **Once there are sufficient polygons to manipulate, medium resolution details are drawn using the Transform brushes.**



- **Subdividing the geometry above a million polygons allows you to project fine details such as skin pores using Projection Master.**

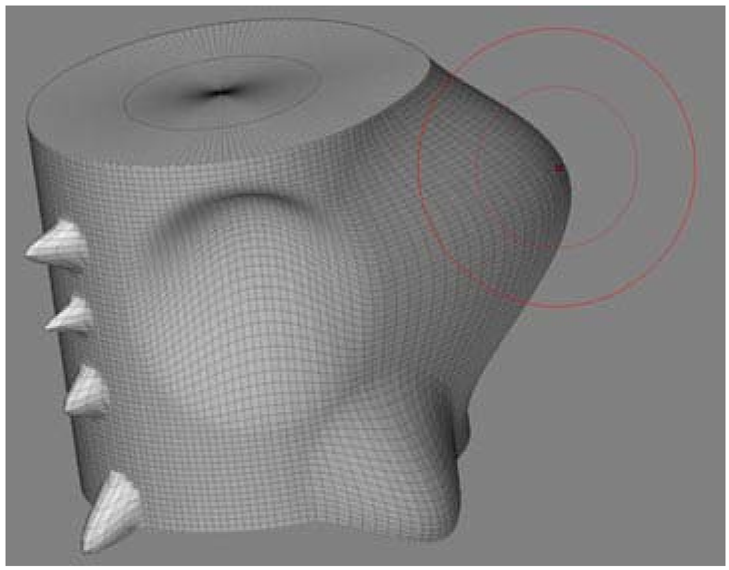


I'm not sure what it is, but it only took 15 minutes to complete.

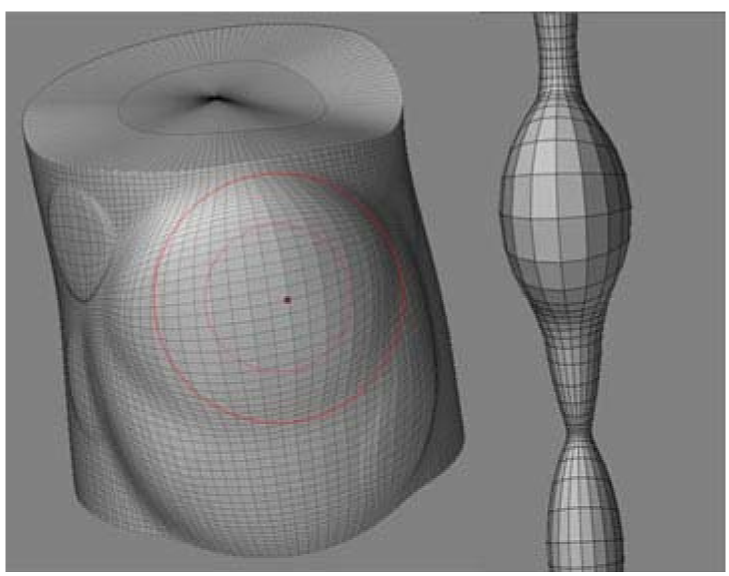
Main Shape Changes

ZBrush's Move and Scale tools can be used to finesse the shape.

If you find yourself making changes that are too large, consider modeling it into the original geometry. You can also use the Smooth tool by pressing the Shift key while in Edit mode to redistribute the polygons. Overly stretched polygons will deform badly and also warp the UV map.



The object above was deformed using the Move tool. The objects below were deformed using the Scale tool.

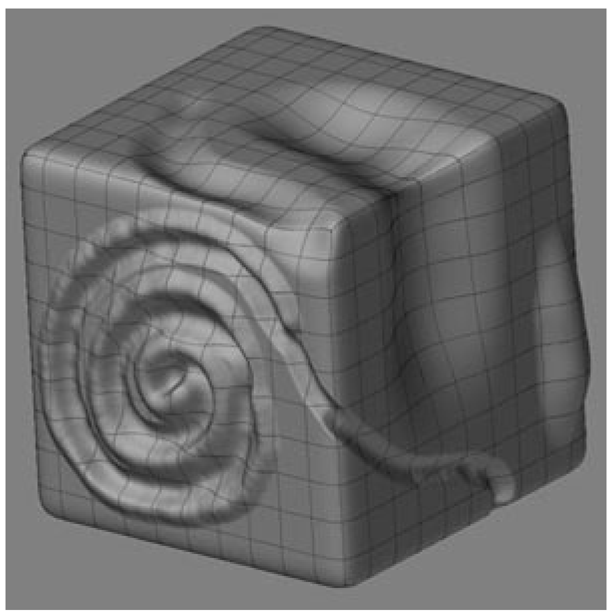


- **Use the Focal Shift slider to control brush fall-off.**

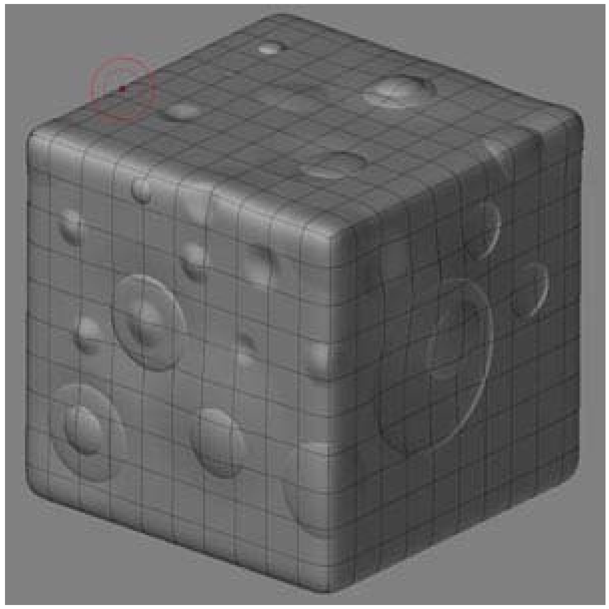
Negative numbers give hard brushes while high numbers result in a smooth blend.

Medium Detail

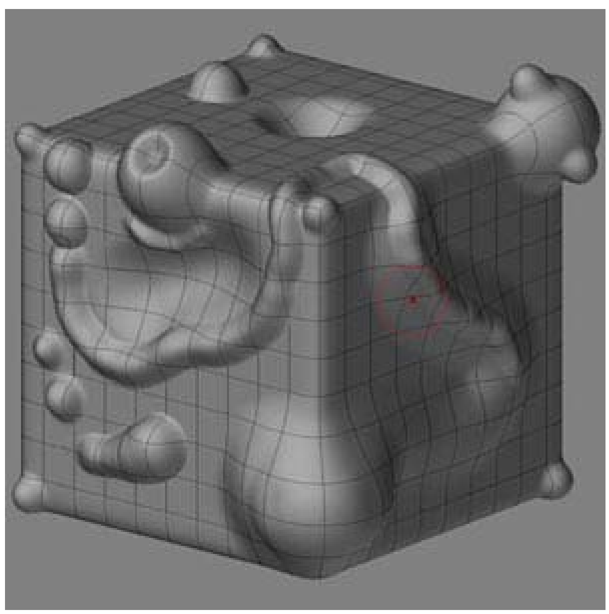
Paint details directly in the viewport with the various Transform brushes.



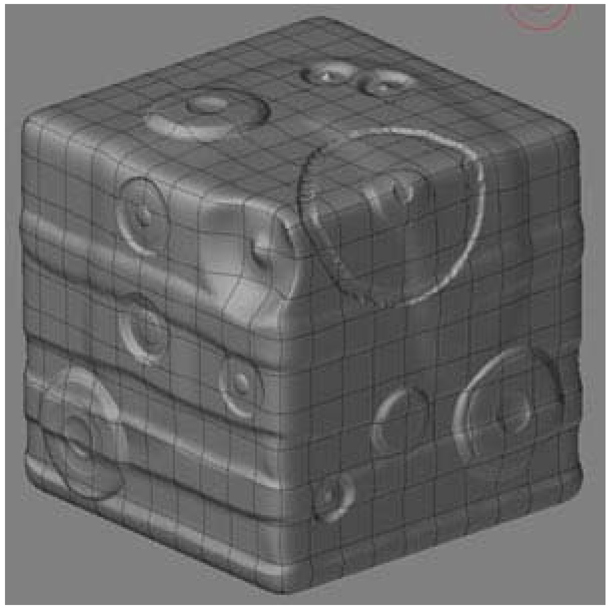
Standard pushes and pulls geometry. All polygons are moved in the same direction regardless of their surface normal. I consider this to be the most useful brush.



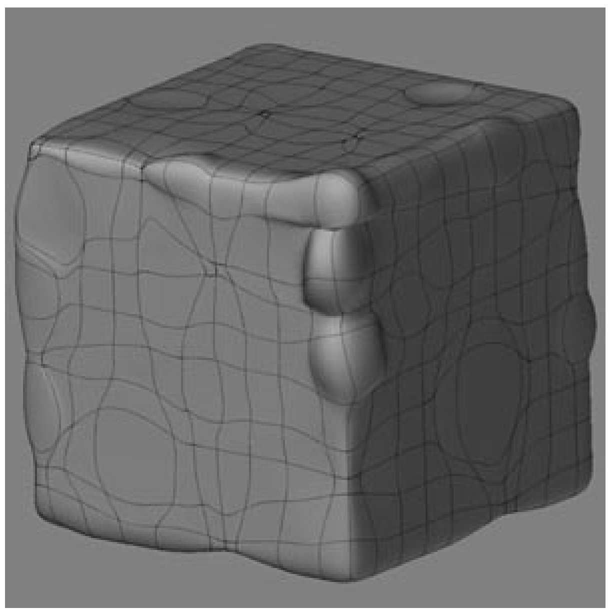
Standard Dot drags a single dot across the surface, which isn't placed until you release the mouse button.



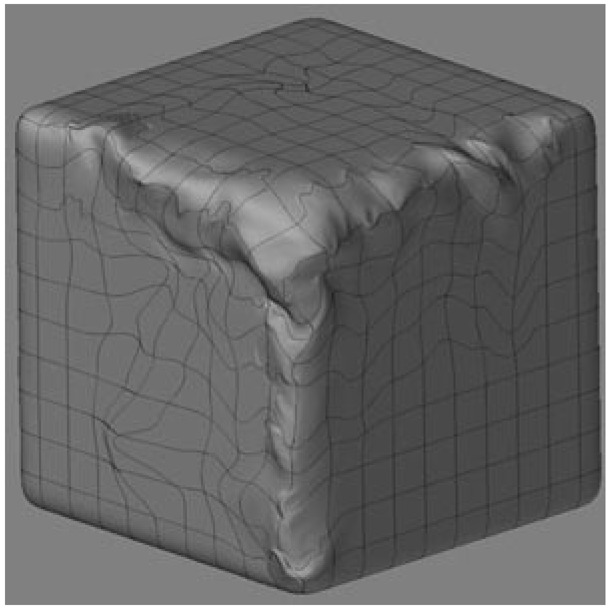
Inflate expands or contracts geometry. All points within the brush's area of influence are moved according to their individual normals. Inflate Dot works the same way, but doesn't finalize the edit placement until the mouse button is released.



Layer deforms a uniform layer as you paint across the surface.

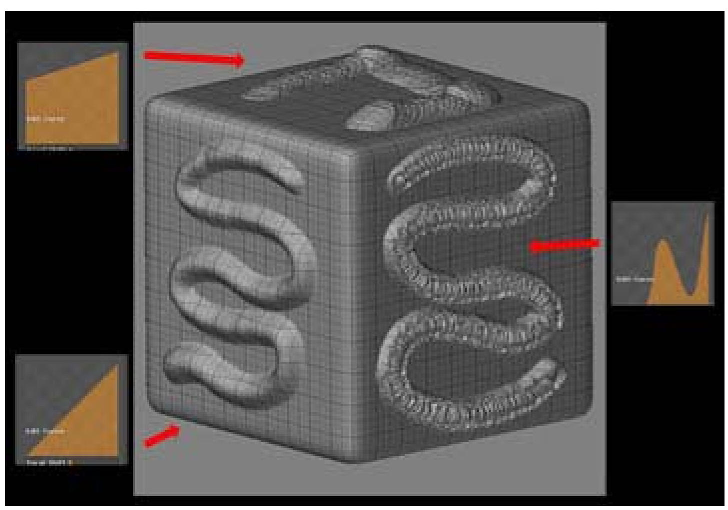


Pinch squeezes geometry toward the center of the edit, or pushes it away (the effect of most brushes is reversed by holding down the Alt key). This is very useful for sharpening an edge created by the Layer brush.



Nudge turns your geometry into digital liquid clay. It's cool! Generally, it will try to move polygons across the surface of your object.

Two brush types not shown here are Morph and Morph Dot. These require you to first store your model's current state as a morph target (Tool>Morph Target>Store MT). You can then use these brushes to selectively restore parts of your mesh to the stored state (effectively undoing your edits, but only to portions of the mesh).



Adjusting the fall-off curve on the Edit brush (Transform>Edit Curve) can provide some interesting effects.

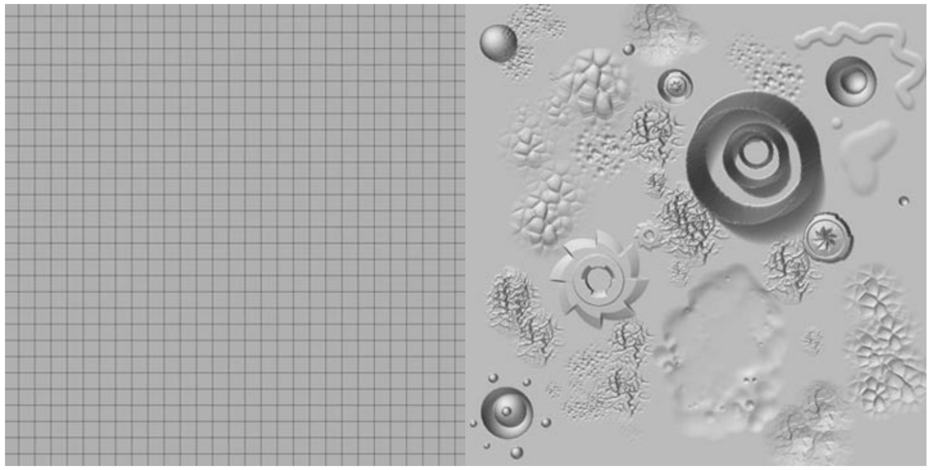
Fine Detail

Projection Master can be used to transfer 2.5D painted effects onto your 3D geometry.

- **If you plan to project color (painting displacements and texture at the same time), you should assign a texture at this point.**

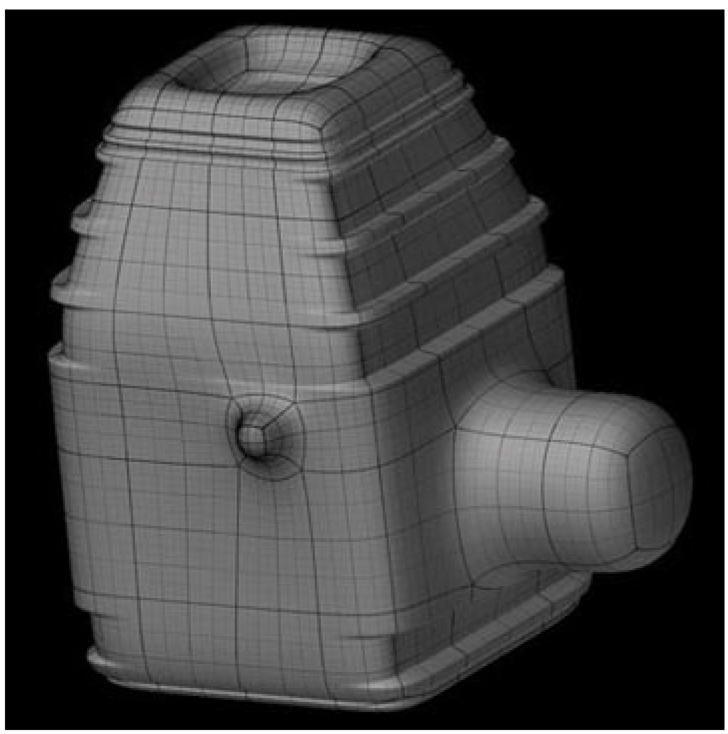
- **Press the G key to launch Projection Master.**

At least one million polygons are recommended for nice results. Any resolution can be projected, but the lower the resolution the lower the quality of the projection.



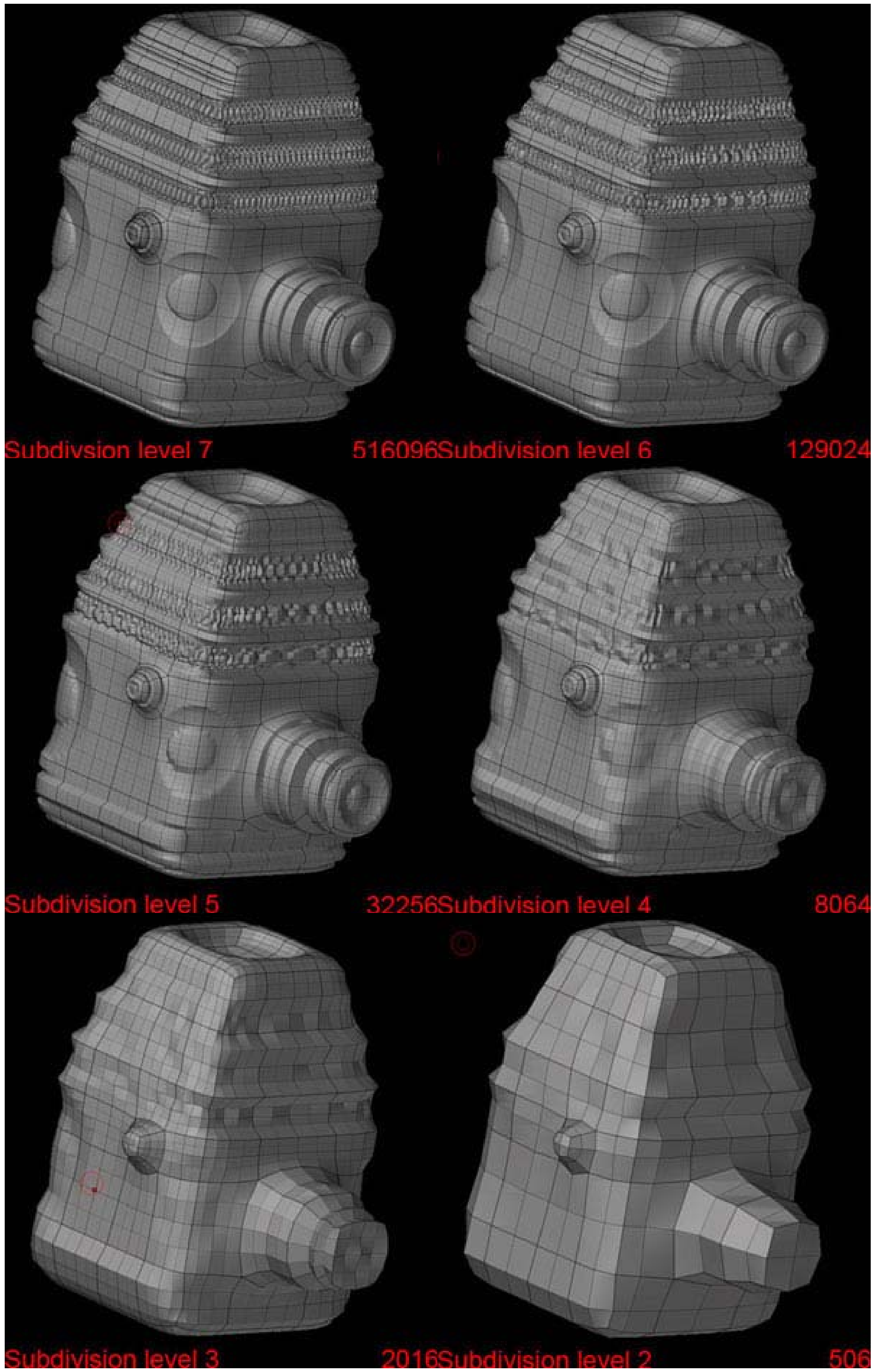
The image above shows a one million polygon plane before and after using Projection Master.

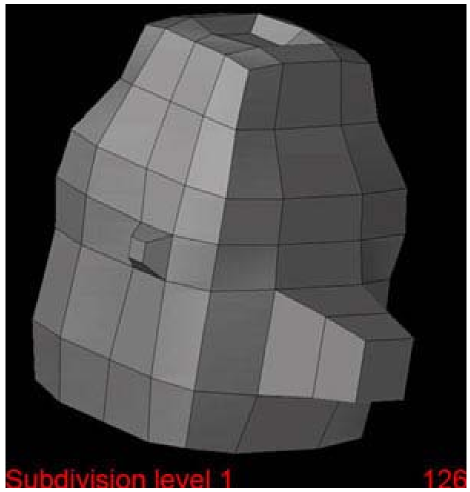
Since all projections transfer directly along the Z axis to the model beneath, you will get the cleanest depth changes by orienting your mesh to face the camera squarely before dropping it using Projection Master.



Here, horizontal lines have been projected with the Fade button active. This blends the effect at the edges, permitting smooth transitions as you rotate your model through several drops.

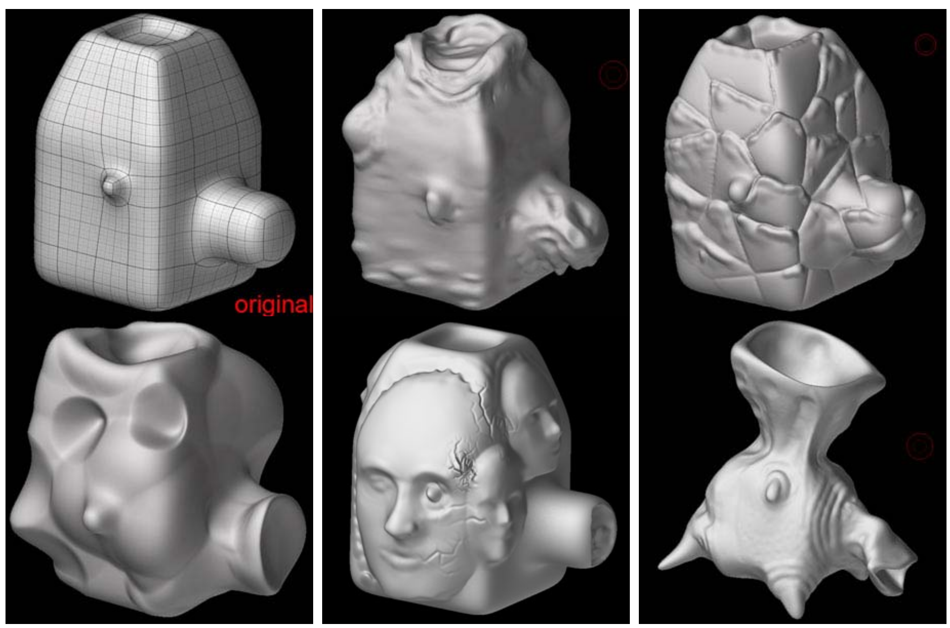
The following series of images shows the effect of polygon resolution when using Projection Master:

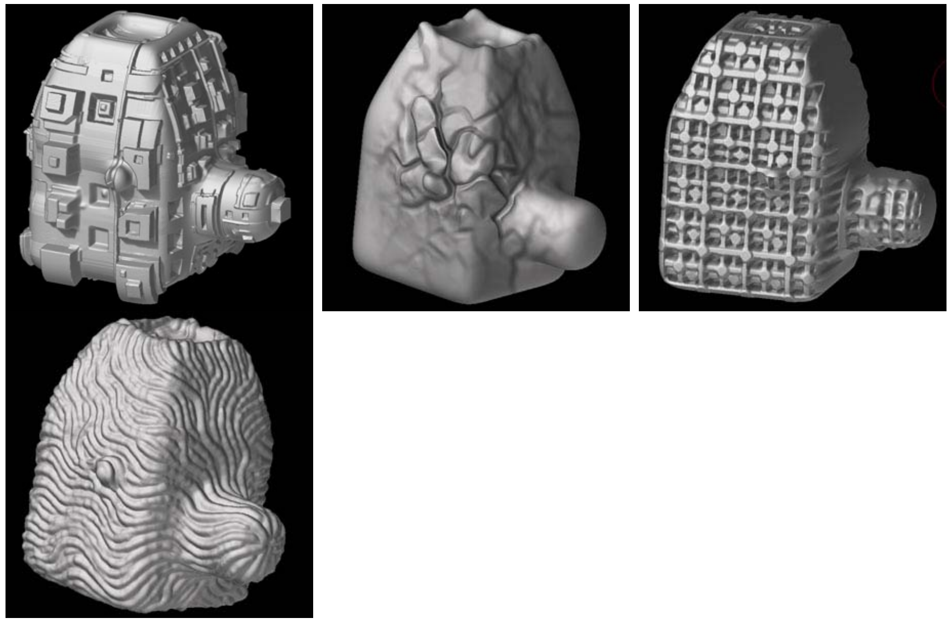




As you can see, Projection Master does its best to transfer detail as subdivision is lowered, but the highest quality comes from the highest polygon count.

Let's take a look at some of the many possibilities available when starting from a single, well-laid-out piece of geometry:

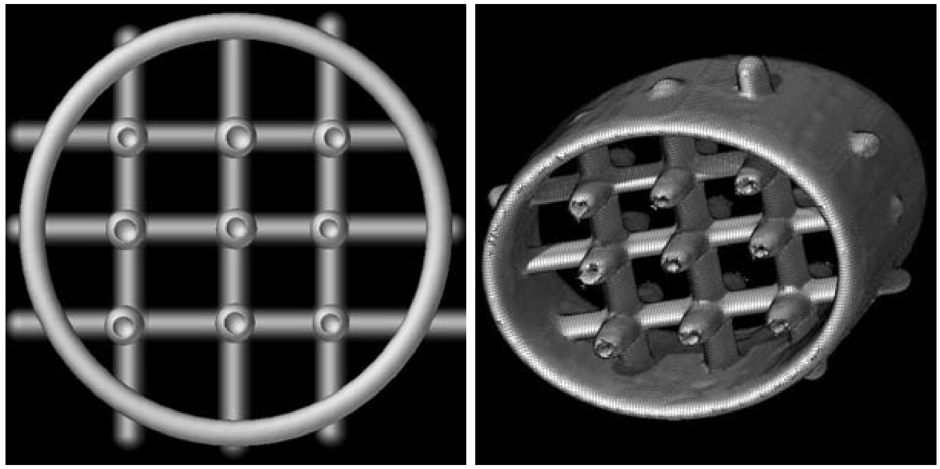




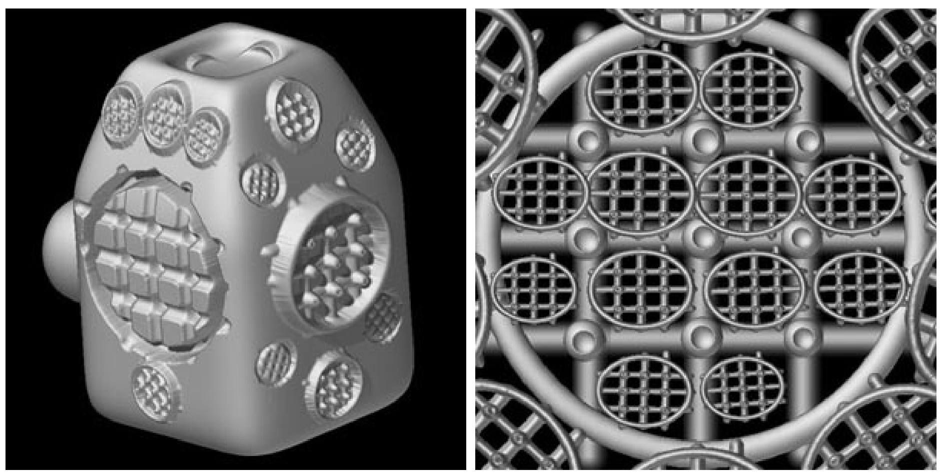
Creating tools to project using Z depth

A 2.5D image painted on the canvas is captured using Alpha>Grab Doc and projected onto geometry using Projection Master.

A depth grab such as this can also be used to create new geometry (Alpha>Make 3D Mesh)…

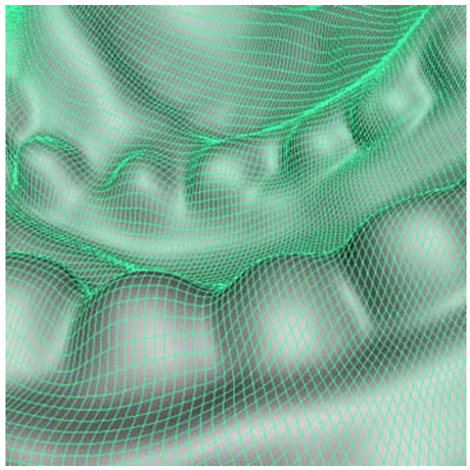


…which can then be used as a tool to be projected or used to create even more complex tools.

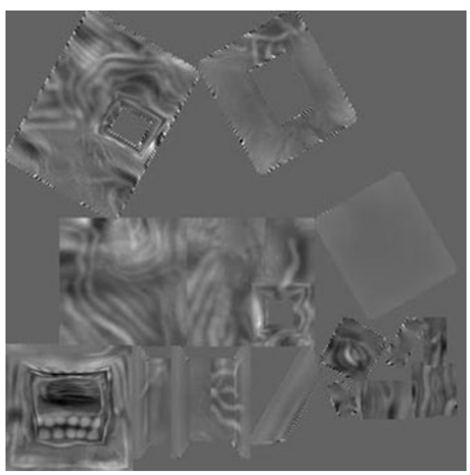


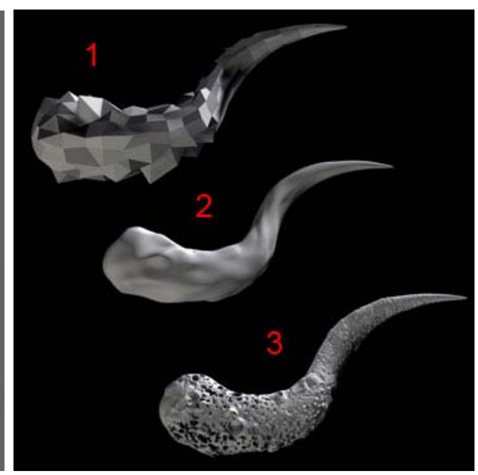
Exporting from ZBrush 2

With all of these easy methods to create great-looking images and polygon models, ZBrush thankfully also includes many ways to export them for use in other programs such as Maya or Photoshop.



Here we have a close-up of an exported high-resolution OBJ, and also the entire geometry as seen in Maya's viewport.



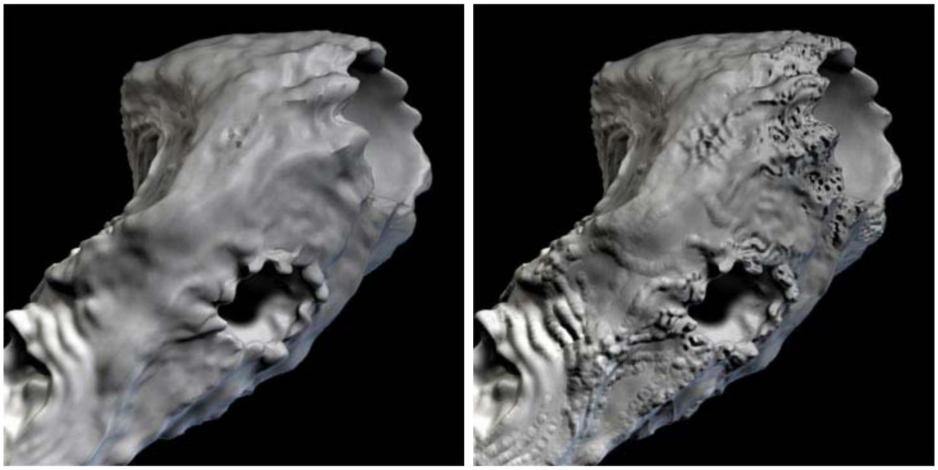


Low resolution geometry can be converted to subdivision surfaces and rendered with a displacement map for high quality, memory-efficient results.

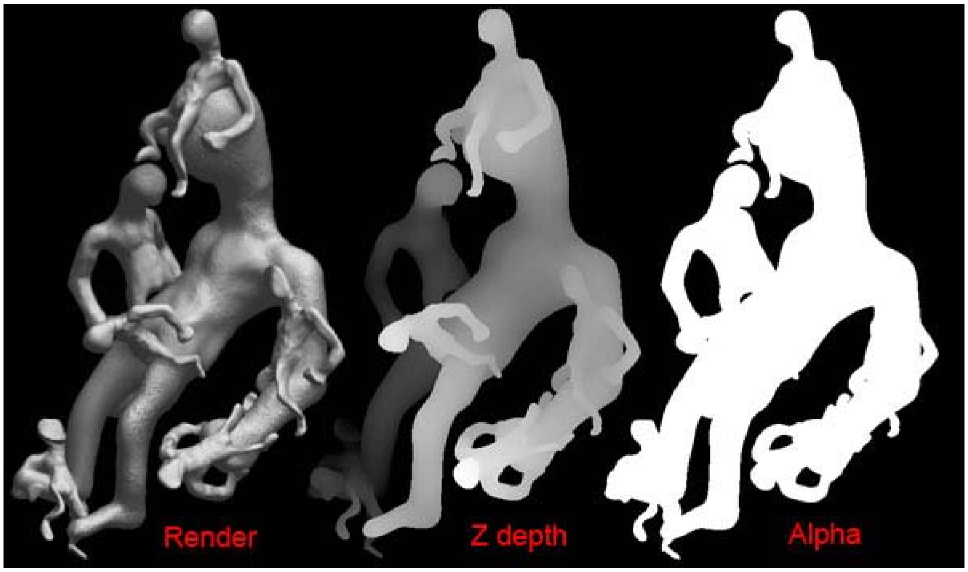
Export the low polygon cage.

Convert to a subdivision surface.

Render with displacement.



For rendering engines that don't support subpixel displacement, an excellent approach is to use displacements for medium-frequency detail (as shown on the left) combined with a bump map for high-frequency detail (the combined render is on the right). This combination will closely resemble the ZBrush sculpture, even with folded geometry that wouldn't hold up using a displacement map (which can only push the surface directly in and out).



Rendered ZBrush images and alpha masks can be brought into Photoshop for further editing. Use Alpha>Grab Doc to capture, and Alpha>Export to bring the z-depth into Photoshop or another image manipulation program. Changing the levels then yields a perfect alpha mask.

Let’s not forget that ZBrush also has a very fast, high quality renderer complete with material editors and lights. And that’s not even counting the fact that once an object has been incorporated into the canvas you can use the other excellent 2D and 2.5D tools to manipulate the image. A whole book could be written on that subject alone. (Be sure to read the earlier parts of this manual, which deal with 2.5D painting.)

Have fun with ZBrush!

Posing Characters for Rendering in ZBrush

By Rob Skitt

This tutorial covers a technique for bringing figures into ZBrush from other applications for rendering.

Here's a really nice and simple new method I discovered while beta testing, which will enable you to pose your model using your favorite external animation package for use in a ZBrush scene.

Since animating is application-specific, I'll not be dwelling on the various animation posing methods. I'll leave that to your own devices.

This method offers a new alternative way to repose a model at any stage in the modeling process (rather than the usual adaptive preview mode way). With adaptive preview posing you're limited to only posing a pre-skinned ZSphere-based model. Using this new method, the model source can not only be a natively Skinned ZSphere mesh, but also any ZBrush models that are converted to PolyMeshes, and even custom base meshes that have been imported from other modeling packages. This means you can make use of the whole modeling toolset on any mesh and still repose a multi-million-poly model in any fashion (e.g. FK/IK) for use in a killer ZBrush image!

OK, here we go.

POSING THE CHARACTER

- **The first step is to create an adaptive skinned ZSphere model or import a base mesh from another modeling package.**

This base should be in a nice default pose with enough detail in the joints, etc. to make later posing pain free.

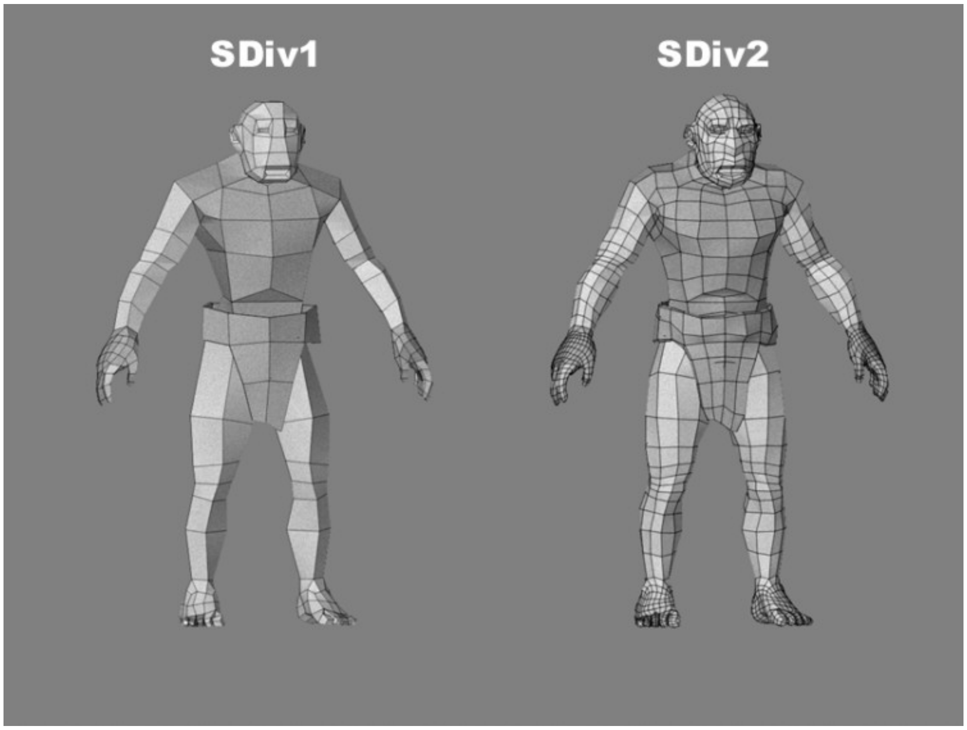
- **Then detail out your model using as many SDiv levels that you need.**

In this example I'll be using this 700,000 poly (approx.), multi SDiv level caveman character below, which I created using ZSpheres. He's textured in ZBrush with AUV tiling, and furred up with the new fibers material shader.

We now need to prepare our model for export.

- **Load up your multi SDiv tool and Switch to SDiv level 1.**

If the model was initially created using ZSpheres as in this case, usually the first base SDiv level (SDiv1 below) is a bit too lowpoly for posing, it's best to delete the first level so level 2 will become your base (SDiv 2 below).



- **In the Tool palette open the Export menu.**

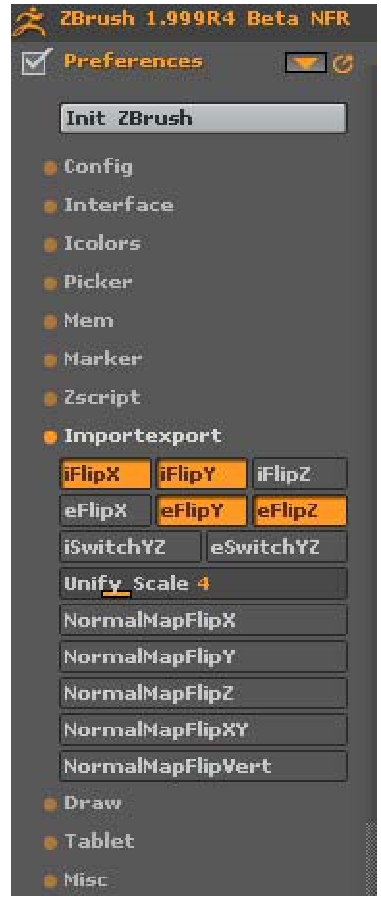
- **Check that Txr (texture) button is active.**

This is important otherwise the assigned UV co-ordinates will be lost on export.

- **Also check that the scale slider is set at 1.**

The scale has to remain the same in order for this method to work correctly.

- **Now open up the Preferences palette.**



Go to the Importexport options menu where you'll see there are various switch settings for importing and exporting objects. If your animation package's default axis orientation is different from ZBrush's, you'll want make sure you set up the right import/export flip switches so you don't have to keep on reorienting your model all the time.

Also make sure the Unify Scale slider is set at 4 (the default is at 8). This is very important since any other setting will either enlarge or shrink your model on export/import (which has the effect of inflating or flattening out your models detail levels when importing back later).

On the right are the preferences settings I use for exporting to and back from Lightwave, flipping the x and y-axis on import, and flipping the y and z on export. (Obviously if you're not exporting to Lightwave these settings will need tweaking to suit your particular package)

- **When you're set, export your model out as an .obj file.**

- **Import the file into your choice animation package, where you can then bone and rig up your model.**

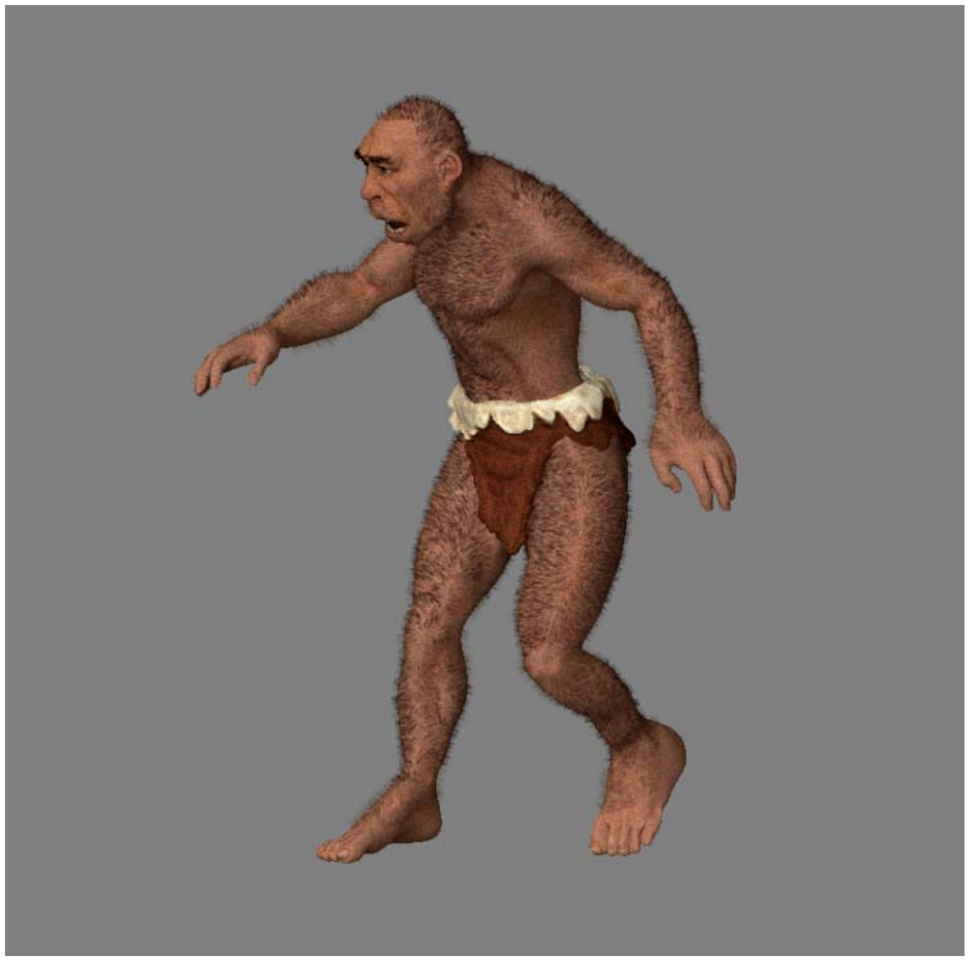
How you do that is up to you. For this tutorial I made a simple rig with Lightwave, and then posed the model. It's important to note that you should make sure that after posing, the model maintains its original position. In other words, if you move the model from it's spot to, say 0,10,0 from it's original position at the origin (0,0,0) move it back before exporting or you'll get distorted results later.

- **When you're done export your new pose out to an .obj format and return to ZBrush.**

- **Make sure that your original ZBrush model is active in the tool menu and set the SDiv slider at the first level.**

Hit the Tool>Import button to locate and load in your new posed model. This model will replace your base level mesh just like a morph target, and all the higher SDiv levels will adjust accordingly.

- **Switch to the highest SDiv level, to see how the new pose looks with all the details and texture co-ordinates intact!**



You can repeat this process any number of times you like and if you store a morph target before you import your new pose, you can swap between two poses.

ZBrush and Maya

By Shaun Absher

Another artist's approach to using ZBrush-created displacement maps in Mental Ray for Maya.

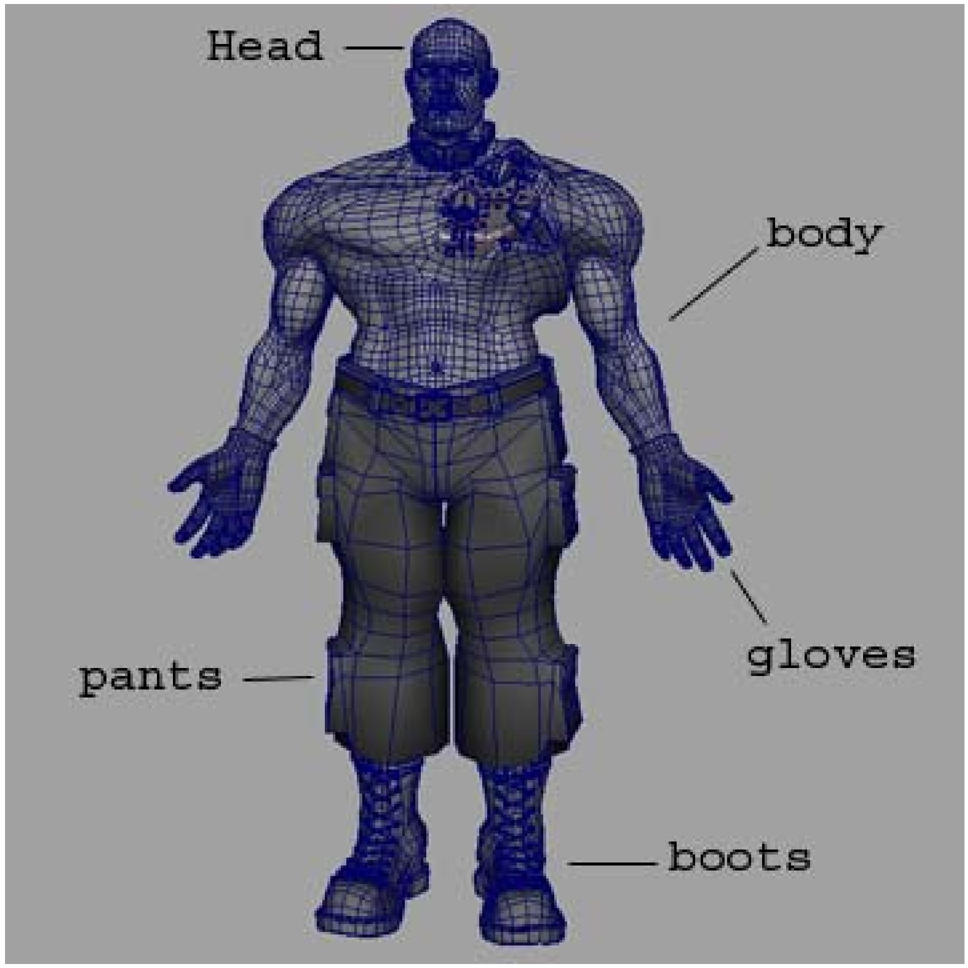
Here is a tutorial of my workflow to render Zbrush made displacement maps in Maya with Mental Ray.

- **First I modeled this in Maya making sure it was ALL QUADS.**

Anything else well crash mental ray when using the subdivision approximation editor.

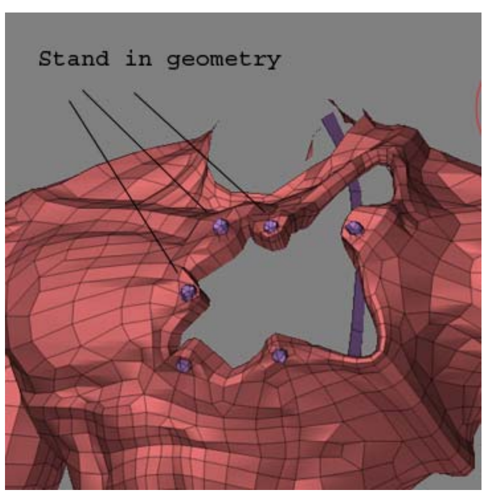
- **I have also divided the model into 5 sections to individually detail them in ZBrush.**

This allows for greater detail.

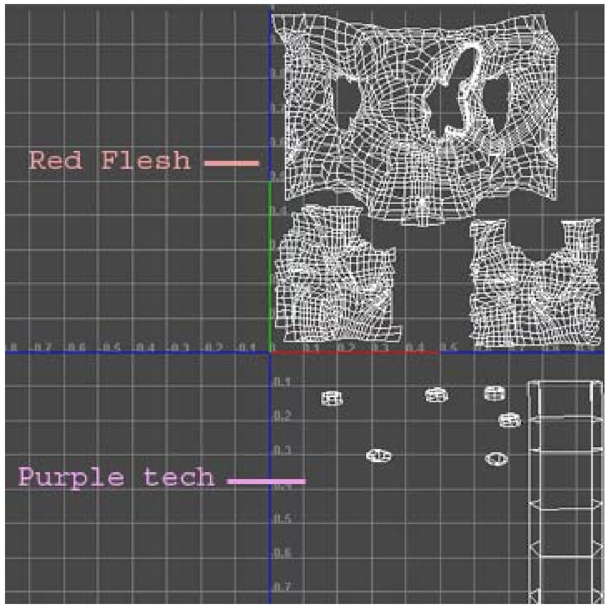


- **I then export out each object separately as an OBJ.**

In order to make this character I needed to sculpt stress wrinkles around bolts in flesh. Some of the OBJ's have stand in geometry.



I laid out the UV's in Maya so I could use ZBrush's color groups to make things easier when sculpting. The colors are determined by what quadrant you put Maya's texture coordinates in.

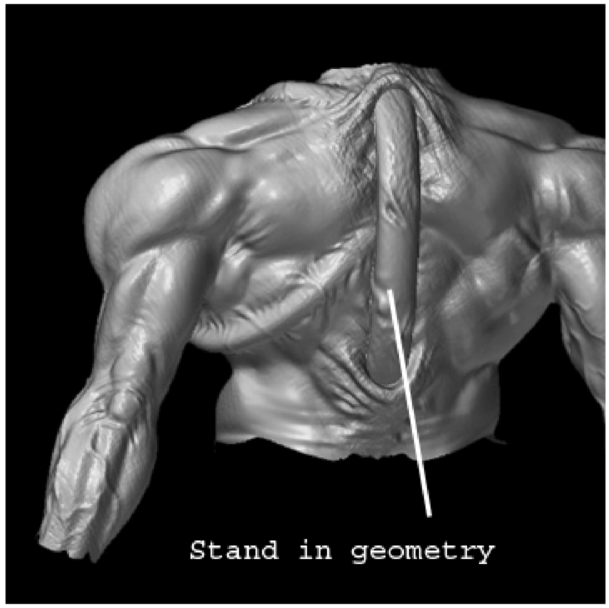


- **When you import your OBJ, just hit the Tool>Polygroups>Uv Groups button to create the color groups.**

- **Next, I subdivide the model and then sculpt in ZBrush.**

If you use the Pinch brush for detailing, be sure to use Best mode when calculating the displacement map.

- **When you are done sculpting hide all your stand in geometry or your displacement map won't render correctly.**

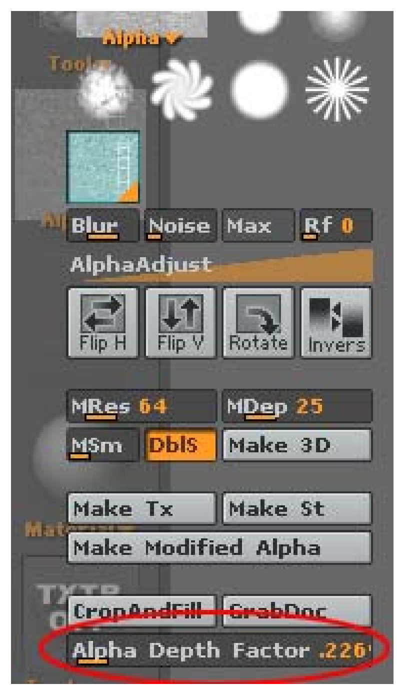


- ❑ **Render out a displacement map with Dsubpix 4 (or Best mode) and your desired image size.**

The higher the Dsubpix size the more accurate the map will be.

- ❑ **After it renders select the displacement map in the Alpha tab and look at its ALPHA ADJUST FACTOR.**

In my case it was at about .226. Write this down we will need it later.



- ❑ **Export this map as a TIFF.**

We will call it mid.tif

- ❑ **In the Alpha palette maximize the Alpha Adjust curve.**
- ❑ **With your displacement map selected load the NegativeDisplacement.ZCV.**
- ❑ **Export this map as a tif. (Neg.tif)**

Make sure the EXP button is pressed when exporting this map.

- **Now load the PositiveDisplacement.ZCV and export this map.(Pos.tif)**

Make sure the EXP button is pressed when exporting this map.

- **Open the DOS command prompt and use the command "imgcvt" to convert the tif's to iff's.**

Example command: imgcvt pos.tif pos.iff

You should now have three 16 bit .iff maps. It's important to keep them 16 bit as it will contain more grayscale information then 8bit.

These maps can be applied to the original Maya geometry.

Rendering in Maya

- **Open your Maya scene.**

ZBrush creates displacement maps where 50% gray equals no displacement. The darker values push in and the lighter values push out. Maya's displacement maps work where black equals no displacement and the lighter the value the more it pushes out.

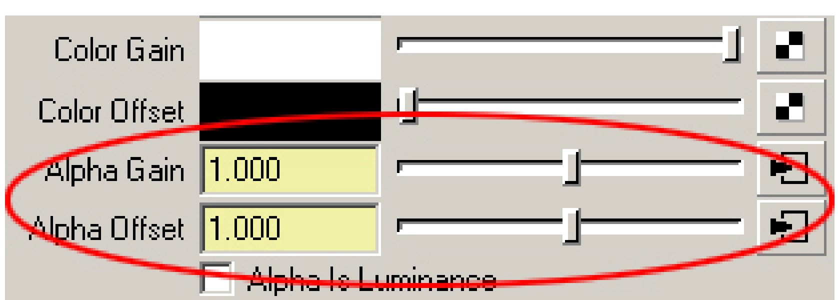
The following hypershade network, with the three displacement maps we created will compensate for this difference.

- **Assign a shader to the geometry. Assign the mid.iff to the shader as a displacement.**

Note a 50% gray texture works fine too.

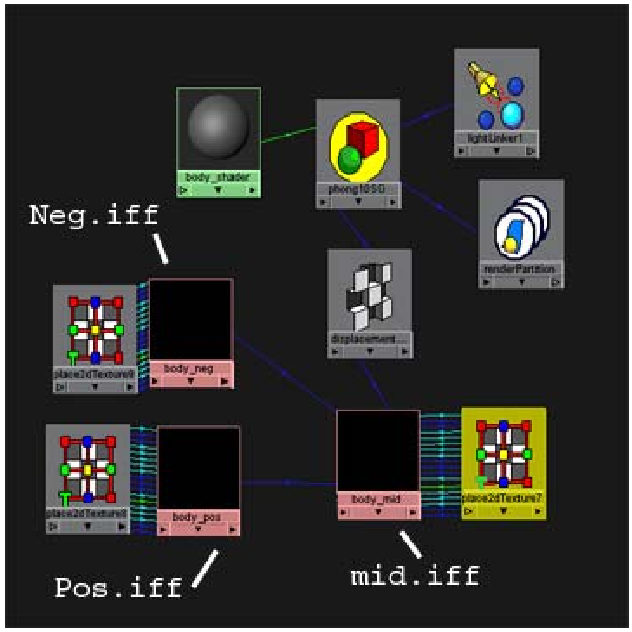
- **Assign pos.tif to mid.tif's alpha gain.**

- **Assign neg.tif to mid.tif's alpha offset.**

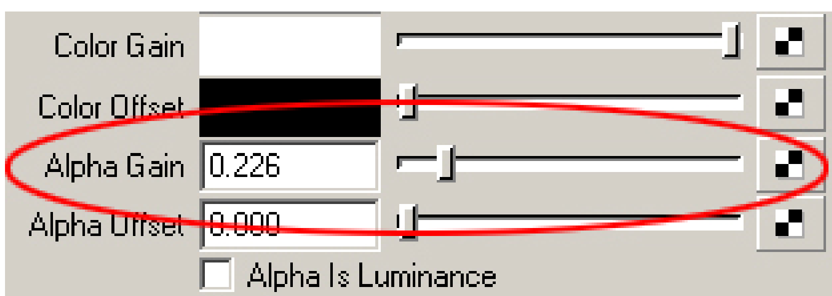


❑ **All three images should have their Repeat UV settings set to 1 / -1.**

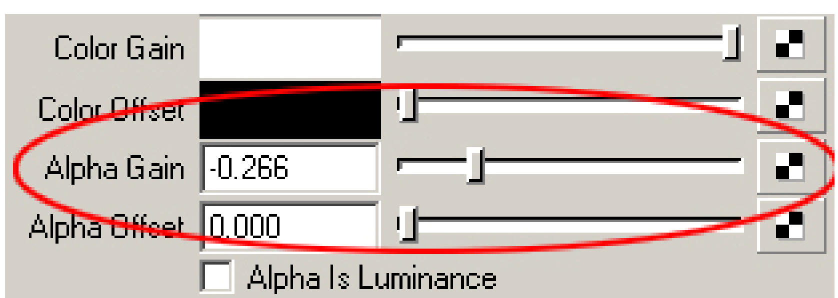
This will flip the maps to the correct orientation.



❑ **Set pos.iff's alpha gain to that ALPHA ADJUST FACTOR we wrote down earlier. (In this case .226.)**



❑ **Set neg.iff's alpha gain to the same value as pos.iff but make it negative. (Ex: -.226.)**



Now our shaders are set up correctly.

- **Next you will want to use the Maya approximation editor to assign a displacement approximation and a subdivision approximation to your geometry.**

- **Displacement approx settings: Spatial / Fine. The more you crank the numbers the better things look.**

- **Subdivision Appox settings: Parametric. With N Subdivisions at 5.**

- **Set up your lighting and Render out the images.**

Here are the images rendered in Maya with Mental Ray.

Here is the character assembled in ZBrush.

ZBrush Displacement Maps in Maya 5/Mental Ray

By Paul Hourmouzis

This tutorial only spends enough time in ZBrush to create the high resolution model and displacement map. Instead, it focuses on the necessary steps to take in Maya in order to prepare a model for ZBrush and make use of the displacement map after it has been created.

STAGE 1 - PREPARATION

- **If you are not already within Maya, import your model and orient so that it's standing on the ground plane.**

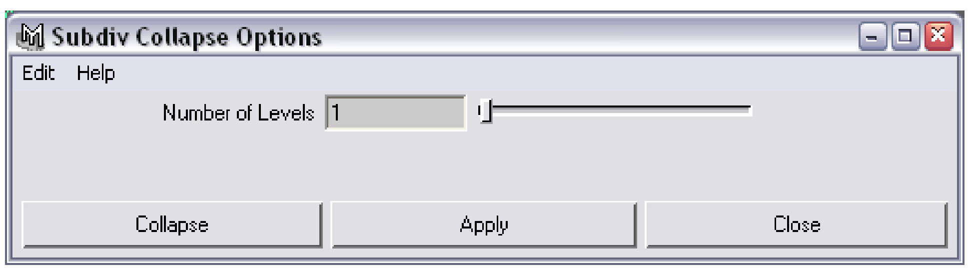
For this tutorial, I am using the head of a character freely available from www.cgnetworks.com.

- **If you have any triangles in your object, you need to remove them.**

To do so:

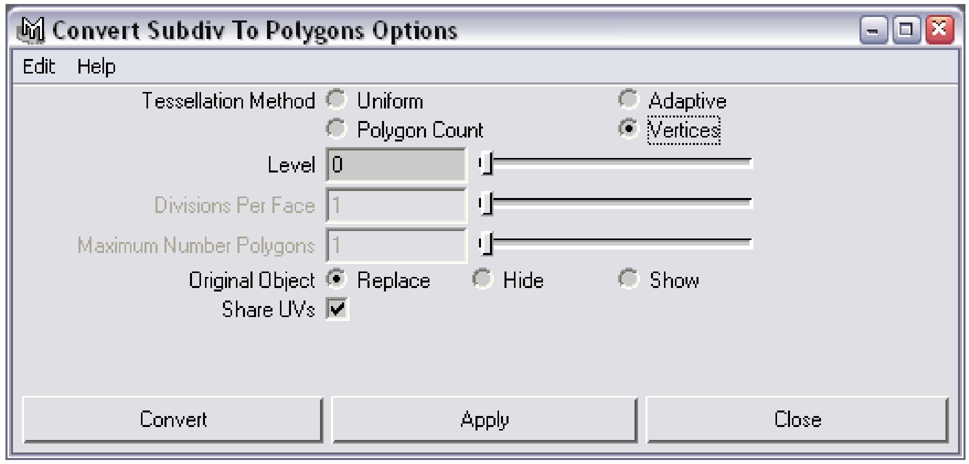
- **Convert your object to a Subdivision Surface *(Modify -> Convert -> Polygon to Subdiv)*, then**

- **Collapse the Subdivision Surface Hierarchy *(Subdiv Surface -> Collapse Hierarchy)*, setting Number of Levels to 1:**



This will create a denser Subdiv object, but that's fine, as we will be subdividing this even further within ZBrush. Your object should now be made entirely of quads.

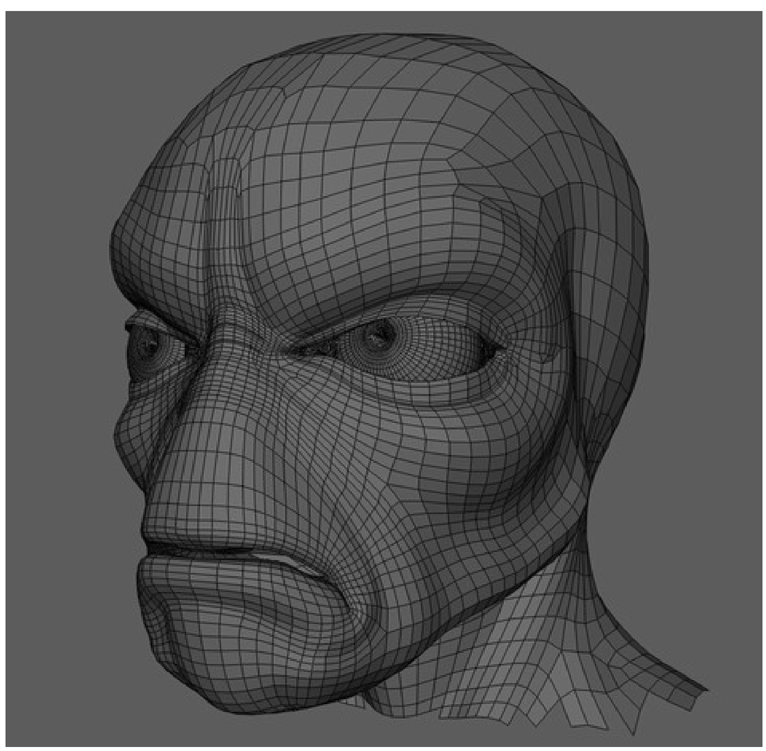
- **Convert your object back to a polygon *(Modify -> Convert -> Subdiv to Polygons)* using the following options:**



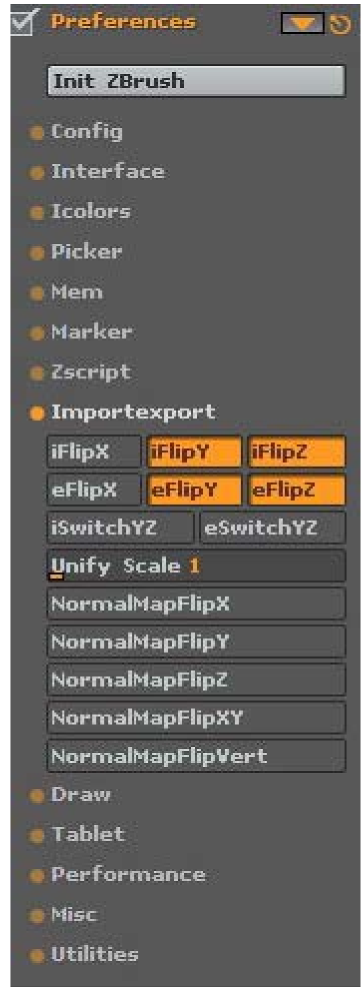
- **Center the pivot of your character *(Modify -> Centre Pivot)*, then place the pivot point at the origin.**

- **Export your object as an OBJ file.**

Here's a view of the character in the Maya view port:



- **Start ZBrush and modify your Import/Export Preferences. Activate *iFlipY and iFlipZ*, *eFlipY and eFlipZ*.**



This will ensure the orientation of your object is correct when imported and exported out of ZBrush. I also usually set ***Unify Scale*** to 1, but this depends on the scale of your object when you exported it from Maya.

- **Now import your object into ZBrush *(Tool -> Import)*.**

Before you begin detailing, you may want to store a morph target. This allows you to return to your original geometry shape at any time in the future. To store a Morph Target, press ***Tool -> Morph Target -> StoreMT***.

- **If you don't already have UV's assigned to your object, you can assign UV's within ZBrush. Select *Tool -> Texture -> GUVTiles*.**

This will layout all polygons in 0 to 1 texture space in a tiled fashion and will group then as best as possible.

This tiled layout produces absolute minimal distortion of your textures.

- **To speed things up, switch off one of the two default lights, and go into *Fast Render* mode.**

STAGE 2 - DETAILING

You are now at a stage where you can begin subdividing and detailing your object.

- **Draw your object onto the canvas by holding the shift key and dragging the mouse/tablet.**

Holding the shift key has the effect of snapping your object to its local axis.

- **To sculpt your object, you need to be in *Edit Mode (Transform -> Edit)*, or simply hit the T key to enter this mode.**

You may also want to enable ***Local Transformations***, which temporarily centers rotation around your most recent edit, which is useful when you tumble your object in the view.

For the purpose of this tutorial, we will only make changes to this characters face. To speed things up, we want to hide parts of the model we are not working on.

- **Press and hold the CTRL and SHIFT keys, then drag a rectangle over the parts of the model you want to show. The rectangle will be green in color.**

Everything outside the green rectangle is hidden when you release the mouse button. If you make a mistake, simply press and hold the CTRL and SHIFT keys and press the left mouse button on an empty section of the canvass (outside your model). The complete object will re-appear again.

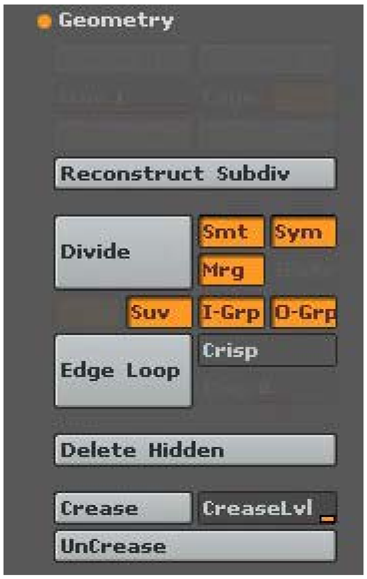
This process of hiding geometry is very important, especially when your character reaches several millions polygons, and you will find that you continually hide and unhide portions of your model as you detail it.

- **To automatically maximize the zoom, press ALT and the left mouse button on a blank part of the canvas.**

You can also manually zoom by pressing and holding ALT key, then the LMB, releasing ALT key and then moving the mouse around.

- **Subdivide your object by pressing the *Divide* button *(Tool -> Geometry -> Divide).***

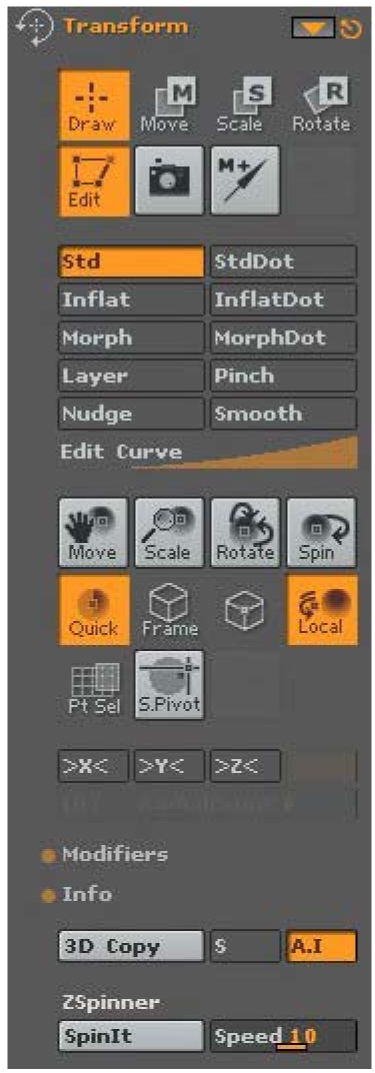
Also ensure ***Suv*** is enabled - this smoothes UV's as you further subdivide your object. You can move between different levels of subdivision by pressing the D key (higher level) and Shift-D (lower level).



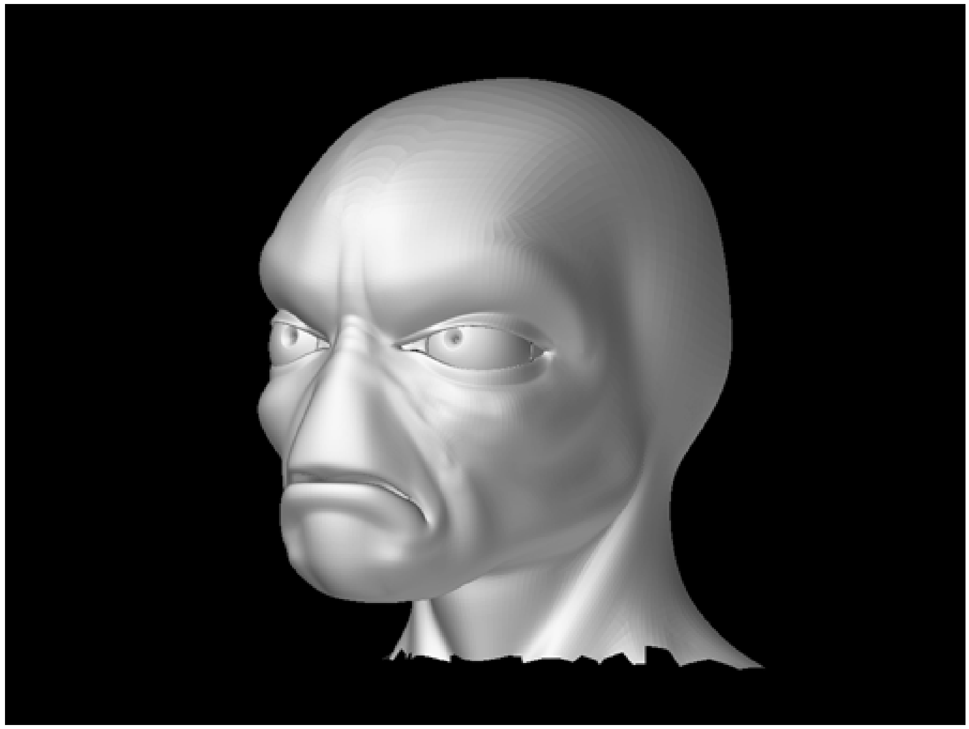
While in Edit mode, you have several draw modes available to you. These are Standard, StdDot, Inflate, InflateDot, Morph, MorphDot, Layer, Pinch, Nudge and Smooth. You also have Move, Scale and Rotate edit modes.

Each of these modes is located in the Transform palette. Take the time to explore how each of these modes work.

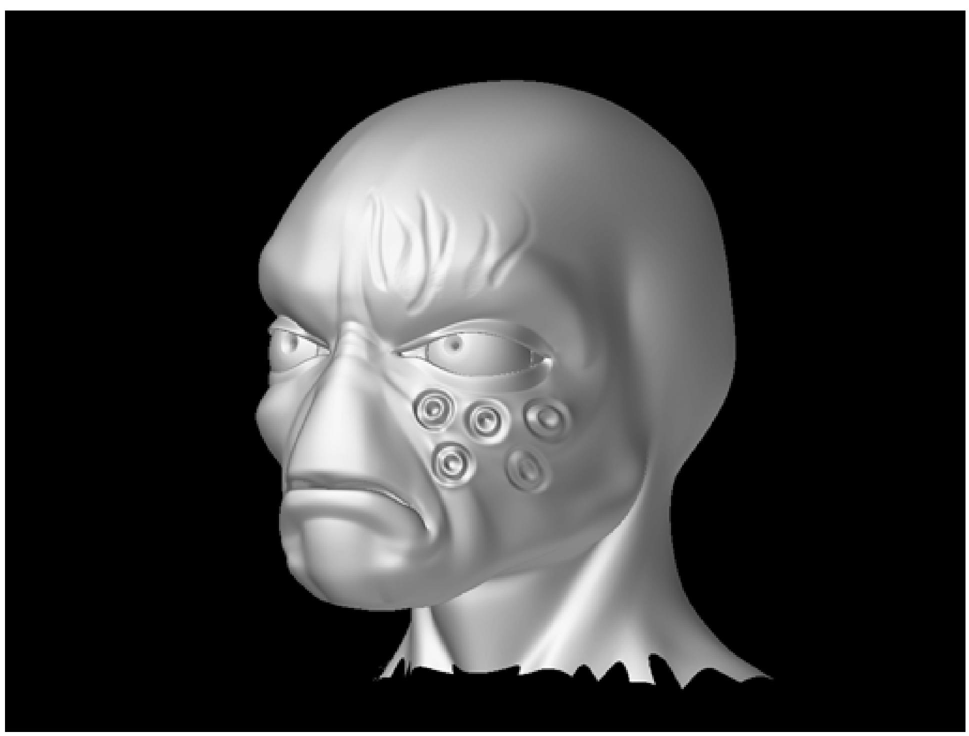
For the purpose of this tutorial, I am going to add some rather obvious details around one of the eyes of this character, using various tools such as ***Projection Master*** and the Edit Tool and its various modes.



Here's a screen shot before any editing:



And here's a screen shot after adding some detail around the eye:



To achieve this level of detail, my original model was subdivided four times and weighs in at ***808,192*** polygons.

STAGE 3 - GENERATING DISPLACEMENT MAPS

We will now calculate the displacement map for this character.

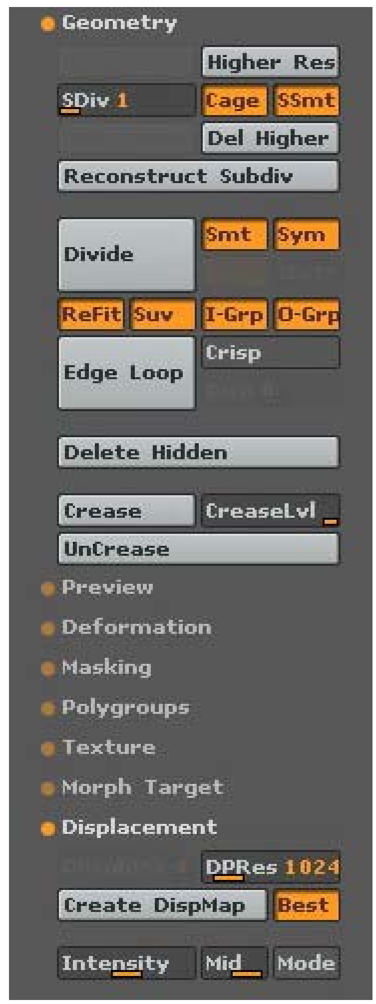
Switch to the lowest level of subdivision (Level 1) and either press the ***Cage*** button ***(Tool -> Geometry -> Cage)***.

Alternatively, if you stored a Morph Target earlier, you can recall the original shape of your object by pressing ***Morph Target -> Switch*** from the Tool rollout. If you did not use ZBrush UV's, you can also import your original model back into subdivision level 1.

Do not switch to any other level of subdivision.

- **In the *Displacement* section, set *DPSubdPix* to *4*, *DPRes* to *4096* and press the *Best* button.**

- **Finally, press the *Create DispMap* button. ZBrush will then calculate your displacement map.**



Depending on various factors, such as the complexity of your model, and these displacement quality settings, your map will take a few minutes or longer to calculate.

When complete, your displacement map is stored in the Alpha palette. You want to export it from ZBrush for use in Maya, but before doing so, you need to flip it vertically.

- **Press the Alpha -> *Flip V* button to invert your map.**

- **Export your map as a TIFF file by clicking on *Export* in the Alpha Palette and giving it a file name.**

It will be exported as a 16 bit TIFF grayscale image.

Convert it from a grayscale image to an RGB image in your favorite image editing package.

Note the ***Alpha Depth Factor*** value, found at the bottom of the Alpha Palette. This is an important value to recall when using the map in Maya.

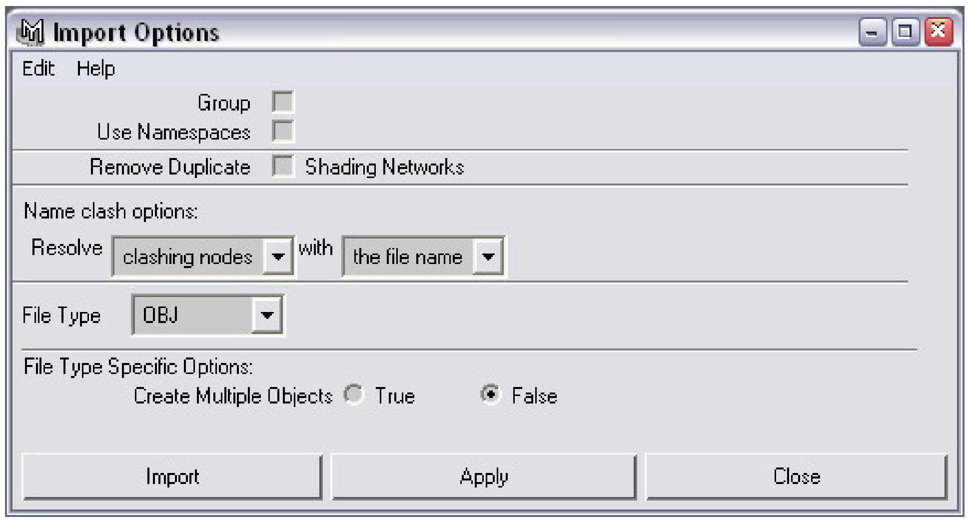
- **If you used ZBrush to assign the UV's, export your model from ZBrush.**

Ensure that ***Mrg*** is on and ***Grp*** is off.

STAGE 4 - RENDERING IN MAYA

You now need to import your model back into Maya. If you work in a production studio, you may be in the situation where your original model has been skinned for animation. If this is the case, the order of vertices is important and must not change.

- **When importing, you need to disable *Create Multiple Objects* by selecting *False* in the Import Options box to ensure the vertex order doesn't change.**

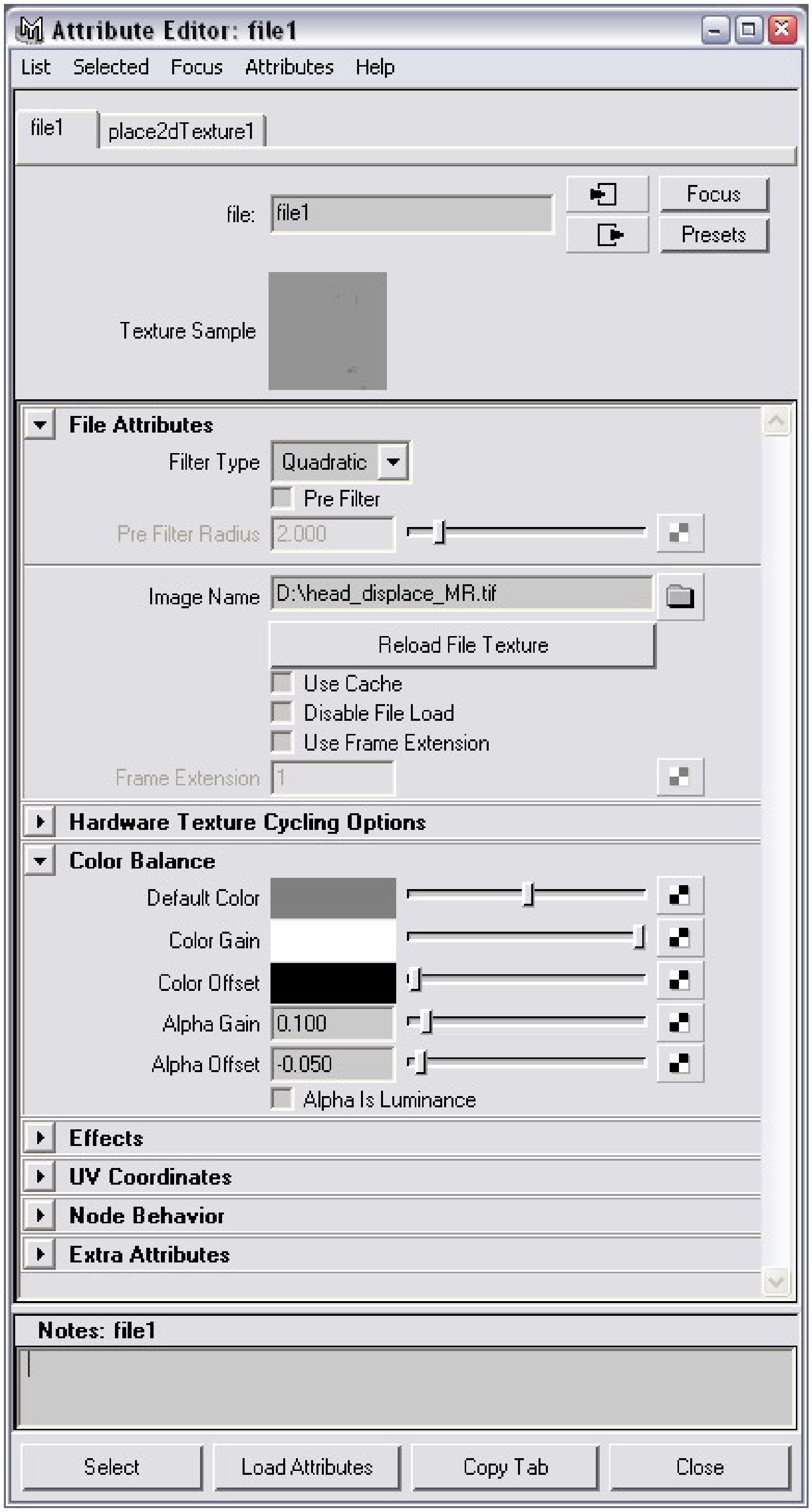


You can now import your modified object and the vertex order will be the same as your original object.

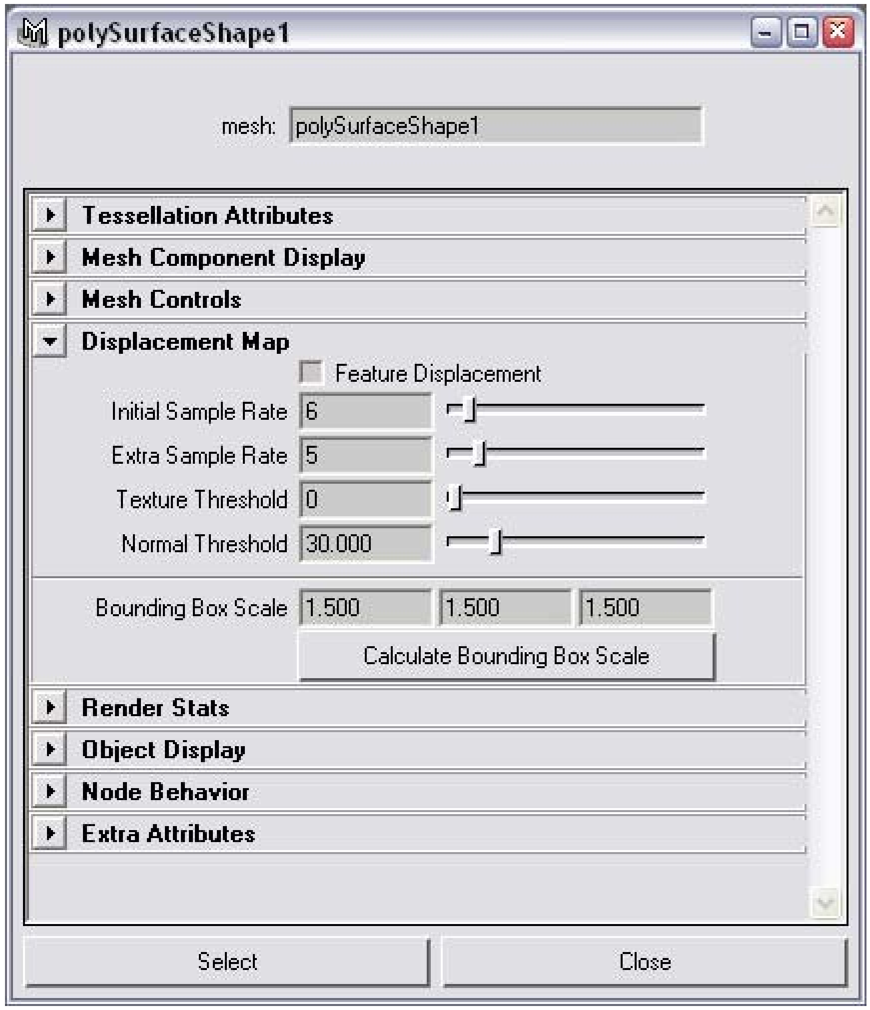
- **Add a displacement shader to your object and load the displacement map.**

- **In the *Alpha Gain* section, input the number you obtained from the *Alpha Depth Factor* from within ZBrush. Enter a value of half that of Alpha Gain in *Alpha Offset* and make it negative.**

In this example, my Alpha Gain is 0.1, and my Alpha Offset is -0.05. If you scale your object, either during the export from ZBrush, or while in Maya, you will need to change these values accordingly.

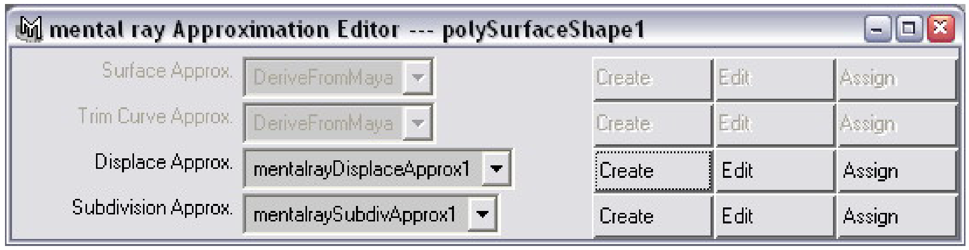


❑ **In the Attribute Editor, select your objects Shape node tab and ensure *Feature displacement* is *off*.**



As we are rendering with mental ray, it is best to add its own tessellation attributes to your object.

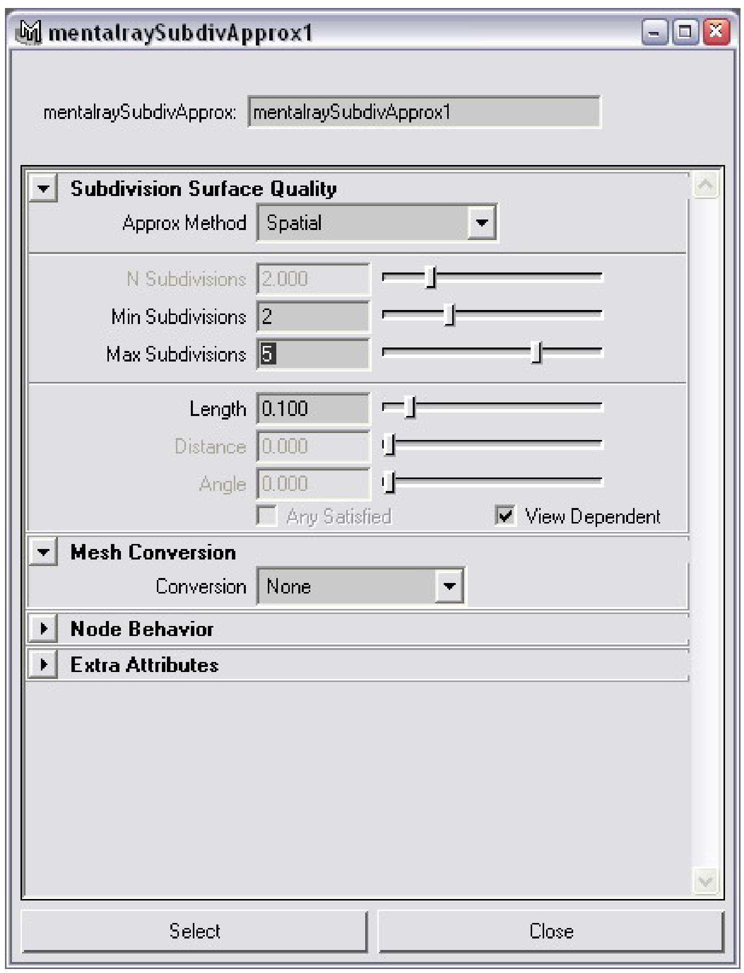
❑ **Open the mental ray Approximation Editor (Window -> Rendering Editors -> mental ray -> Approximation Editor), and create both a Displacement Approximation and a Subdivision Approximation for your object.**



You will now have two additional nodes connected to your object. These will appear in the Attribute Editor under separate tabs.

- **In the mental ray Subdivision Approximation settings, set the following variables:**

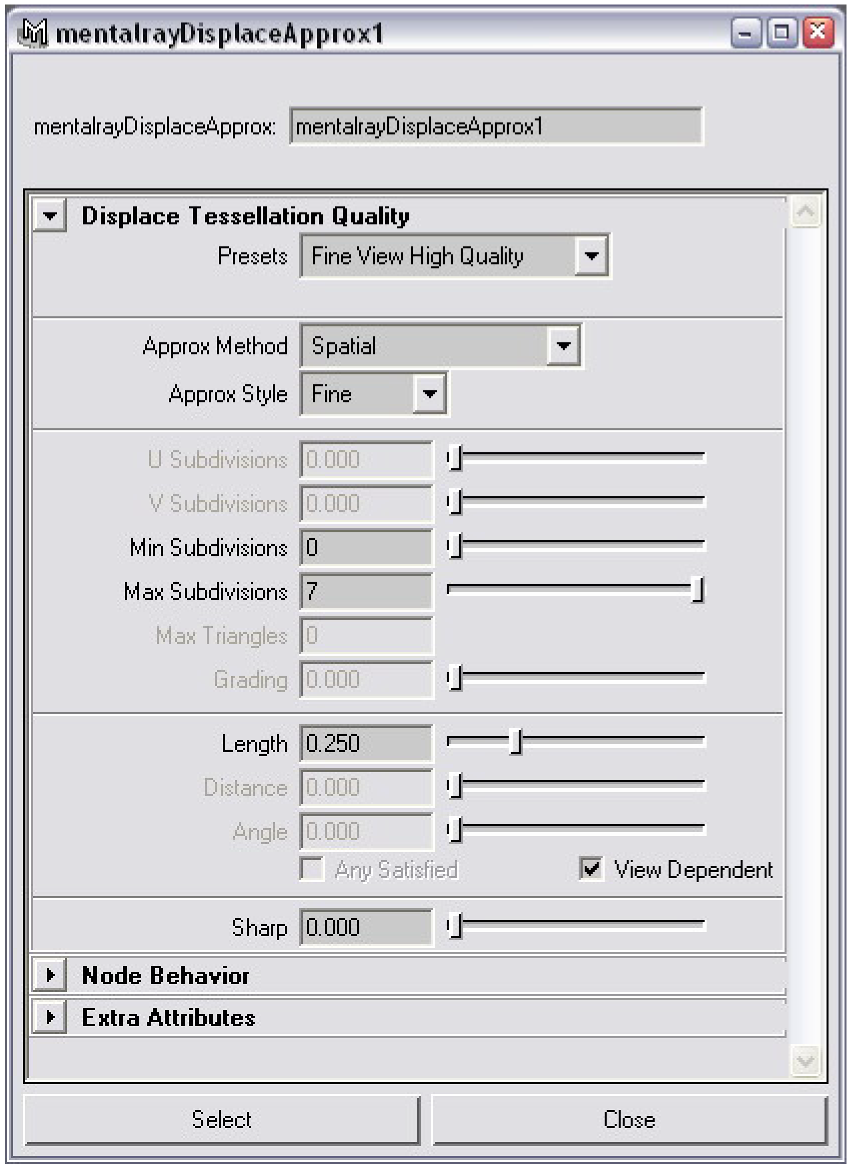
  Approx Method = Spatial
  Min Subdivisions = 2
  Max Subdivisions = 5
  Length = 0.100
  View Dependant = On



❑ **In the mental ray Displacement Approximation settings, set the following variables:**

Presets: Fine View High Quality

This preset adjusts the other variables below it.

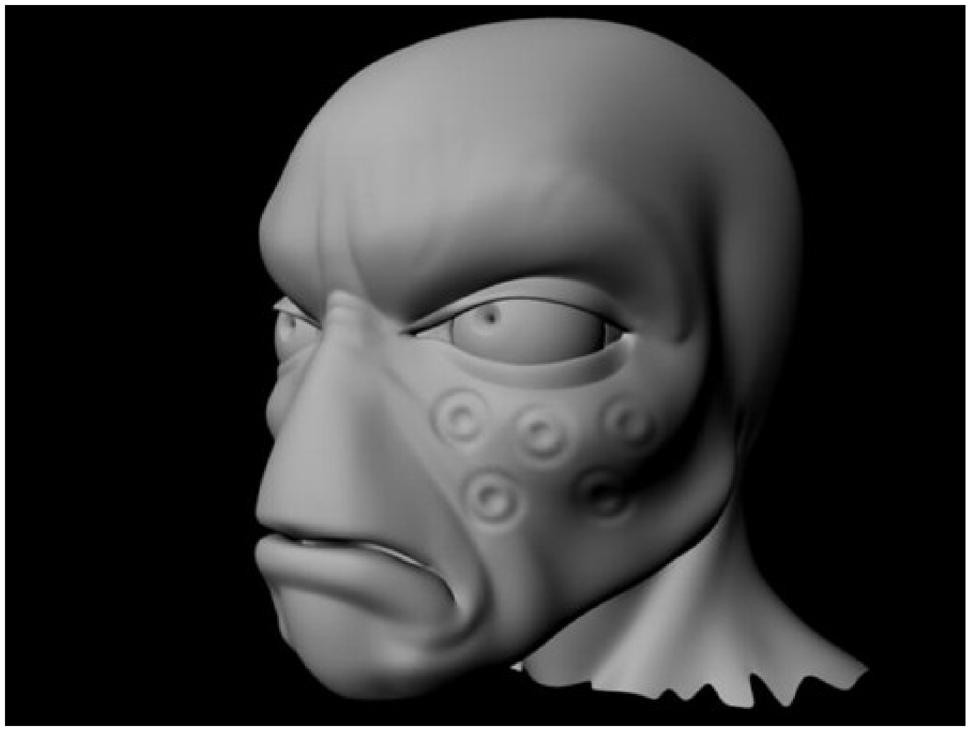


The quality of rendered displacement is reliant on both the settings for Displacement and Subdivision Approximation. Also, if you don't allow for enough subdivisions, your displacement detail may not appear no matter how high your displacement settings are.

The settings given here worked reasonably well for this example; however, you will need to experiment with these settings to find an optimal balance between render speed, quality and memory consumption.

- **Render your object.**

Here's my render:

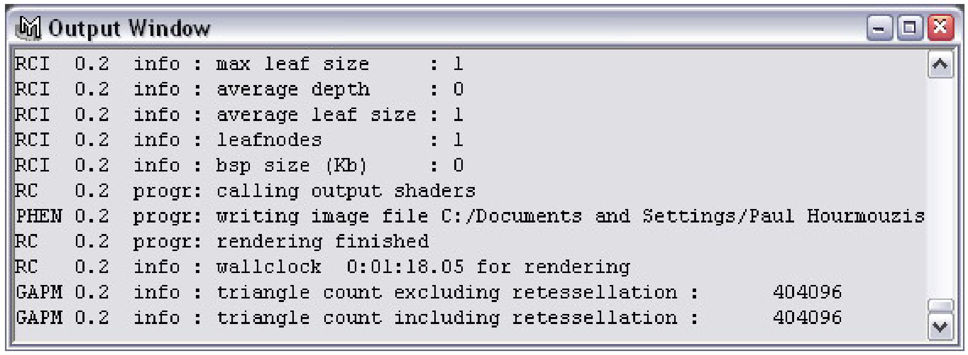


As a final note, when adjusting your displacement and subdivision settings, you can get a good indication of how your object is being tessellated.

- **In the mental ray Render Globals, select Translation -> Export Verbosity -> Progress Messages.**

- **At the end of each render, check Maya's Output Window to see how many triangles your object was tessellated to.**

In this example, my object was tessellated to 404096 triangles. Quite amazingly, this number is exactly half of the number of polygons my object is made of when in ZBrush.



Output Window

```
RCI  0.2  info : max leaf size     : 1
RCI  0.2  info : average depth     : 0
RCI  0.2  info : average leaf size : 1
RCI  0.2  info : leafnodes         : 1
RCI  0.2  info : bsp size (Kb)     : 0
RC   0.2  progr: calling output shaders
PHEN 0.2  progr: writing image file C:/Documents and Settings/Paul Hourmouzis
RC   0.2  progr: rendering finished
RC   0.2  info : wallclock  0:01:18.05 for rendering
GAPM 0.2  info : triangle count excluding retessellation :      404096
GAPM 0.2  info : triangle count including retessellation :      404096
```

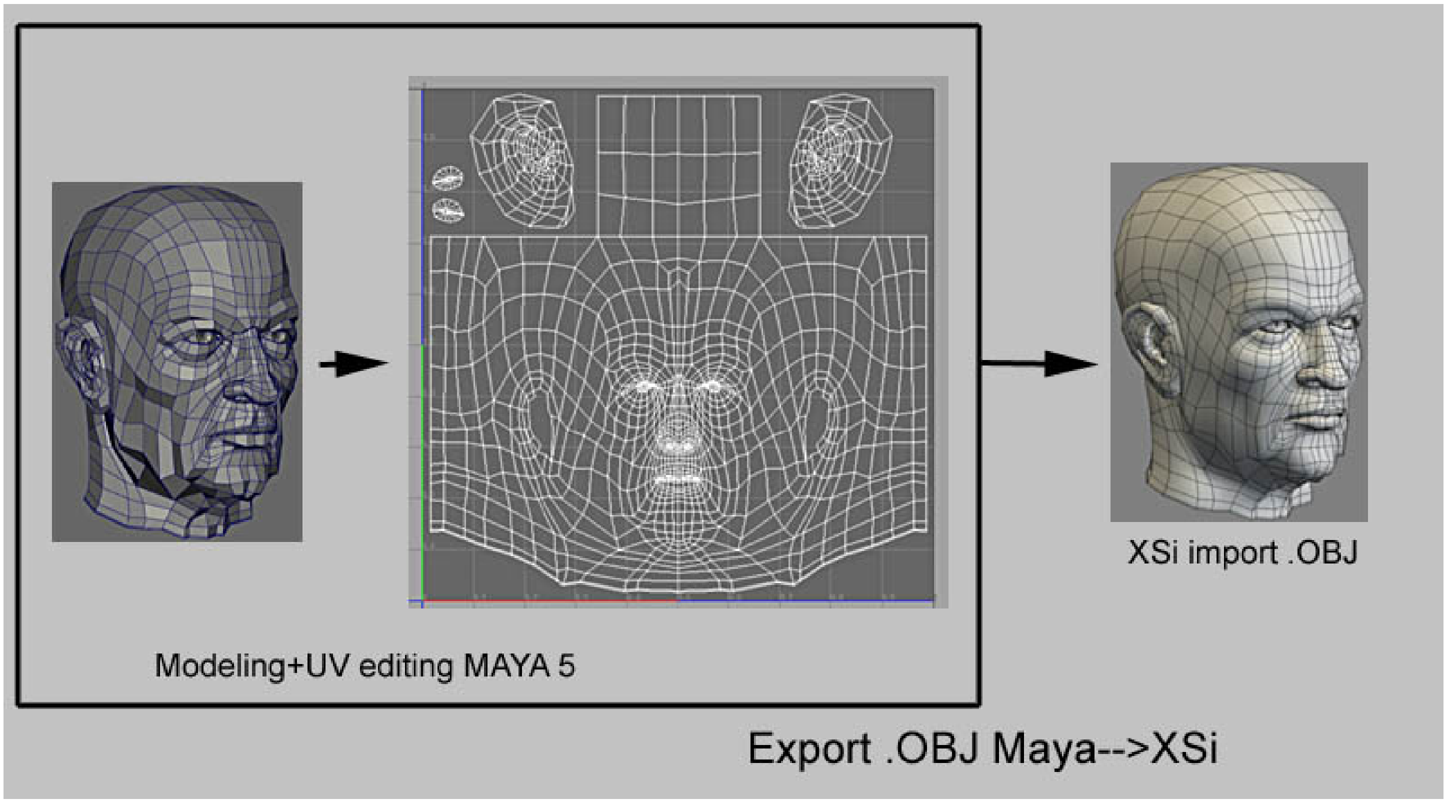
ZBrush, Maya & XSI

By Michel Roger

While this tutorial covers bringing a model from Maya to XSI and ZBrush, the real meat of it is in how to apply the ZBrush-generated displacement map in XSI.

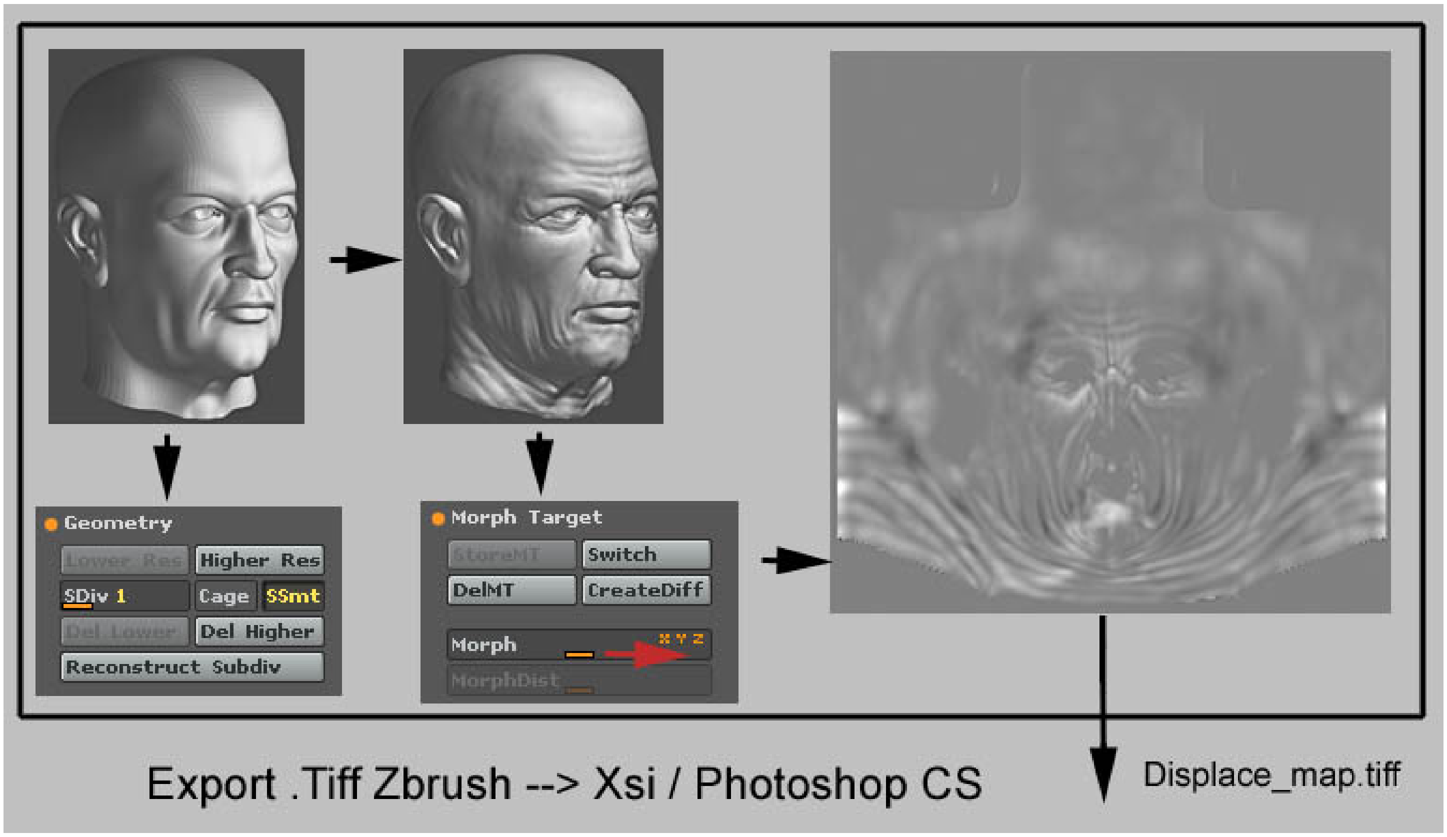
This tutorial shows a workflow that I use for going between Maya, ZBrush and XSI. It works well for me, and I hope that you find it useful.

Please pay careful attention to the illustrations; especially for the render tree setup near the end.



I begin by doing my modeling and UV editing with Maya 5, then export the model in OBJ format to XSI 3.5 and to ZBrush.

The particular program that you use to do your modeling and UV layouts is entirely a matter of personal preference. You could even do it all in ZBrush. The nice thing about ZBrush, though, is the fact that it can be used with whatever workflow you're already comfortable with.

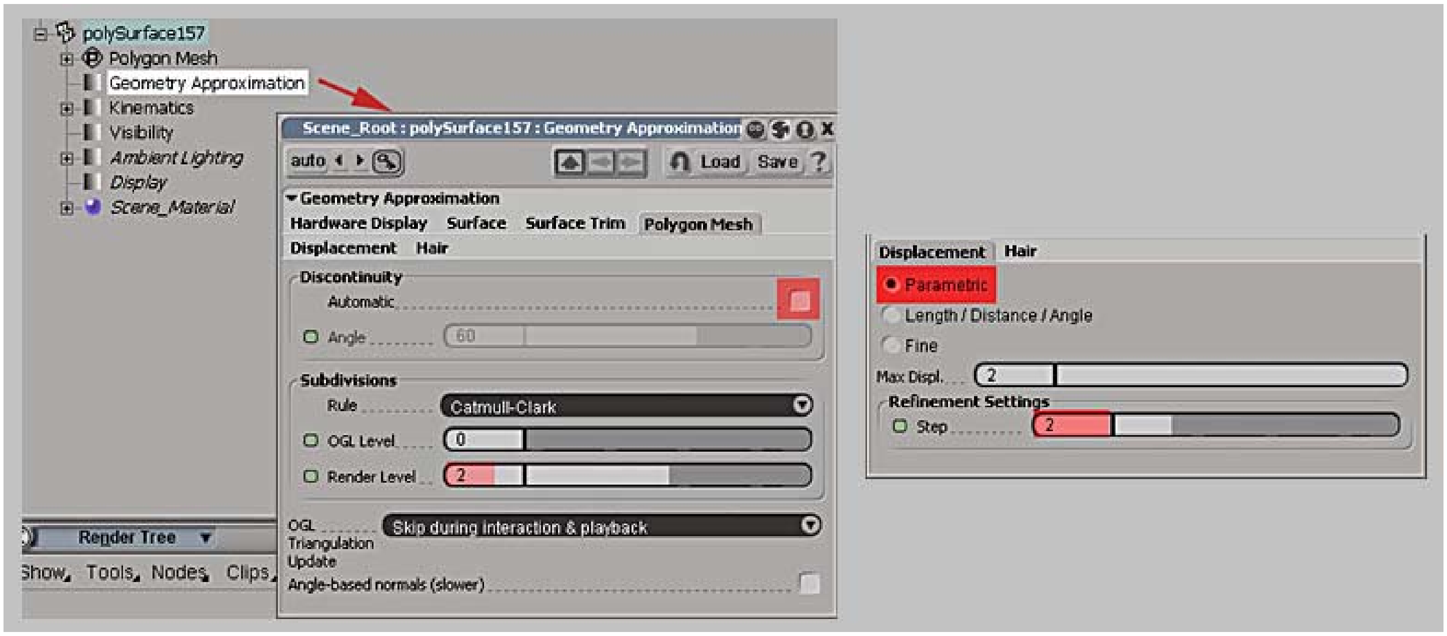


Here is the work in ZBrush. Notice that you must store a morph target of the model at subdivision level 1 before dividing the model and sculpting high resolution details. When subdividing the mesh, be sure that Tool>Geometry>Suv is active so that the mesh UV's will be smoothed along with the model.

Before generating the displace map, you recall it with the morph slider (100%). Alternatively, you can click the Switch button.

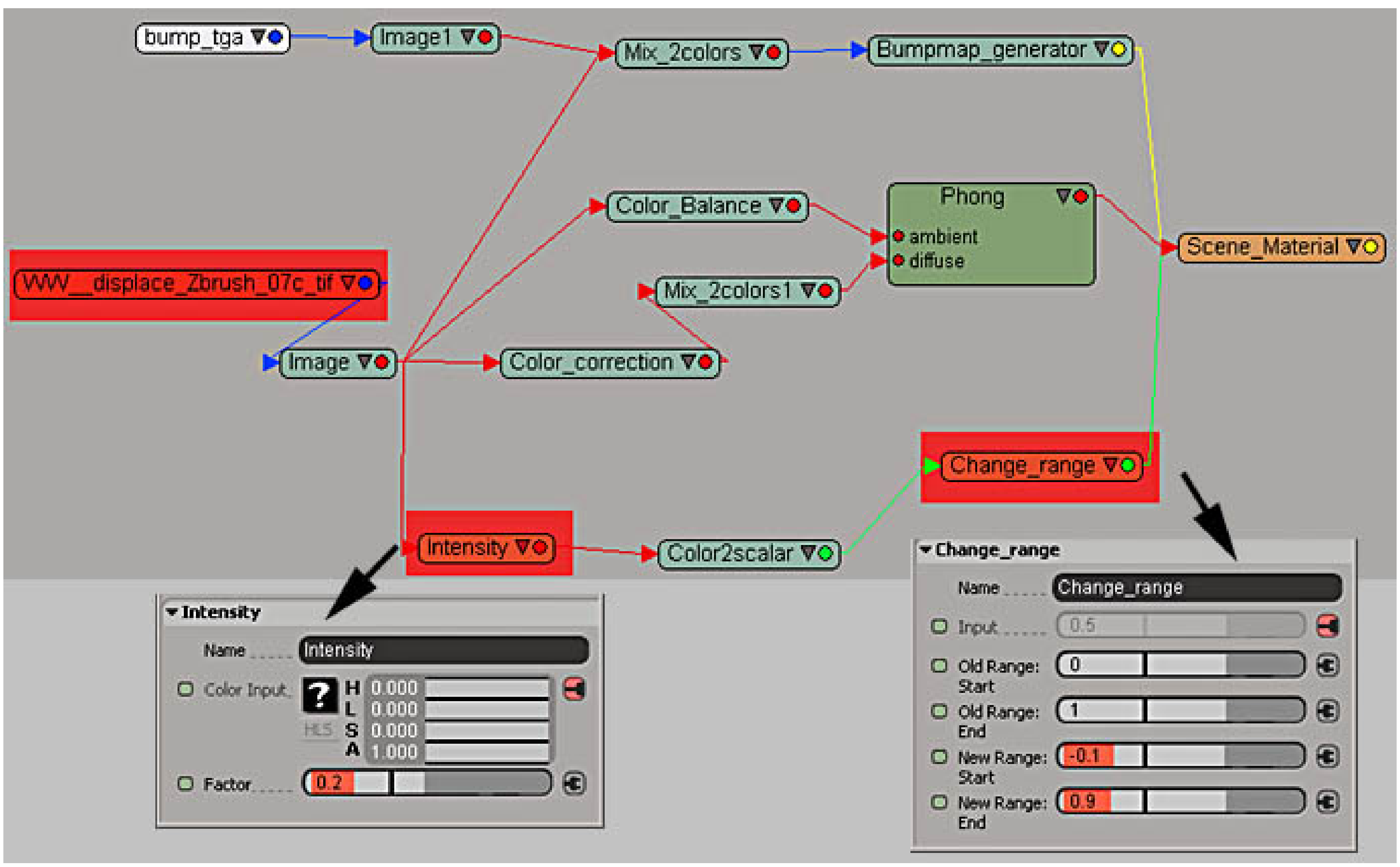
What this does is ensure that the displacement map is relative to the original model. For more information on this process, see the Phone – Part 3 tutorial in this manual.

Before importing in XSI, you must convert the 16 bits greyscale Tiff to a 48 bits rgb Tiff because XSI doesn't seem to like the 16 bits one. You can easily do this in Photoshop.



Here is the setup for the model in XSI, with the render level at 2 and no Automatic Discontinuity.

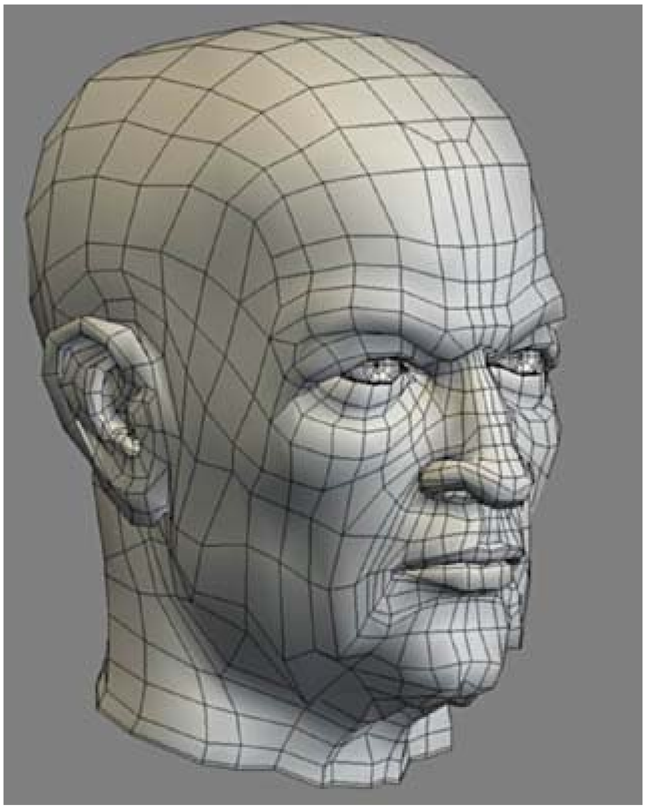
In the displacement params, choose parametric and two steps.



In the render tree, notice that you must add an intensity node (0.2 here) and a change range node to tweak how the model is inflating.

On the ZBrush map, 50% grey is no displacement. XSI is different, however but the change range node compensates for that.

You're done!



ZBrush Normal Maps in LightWave

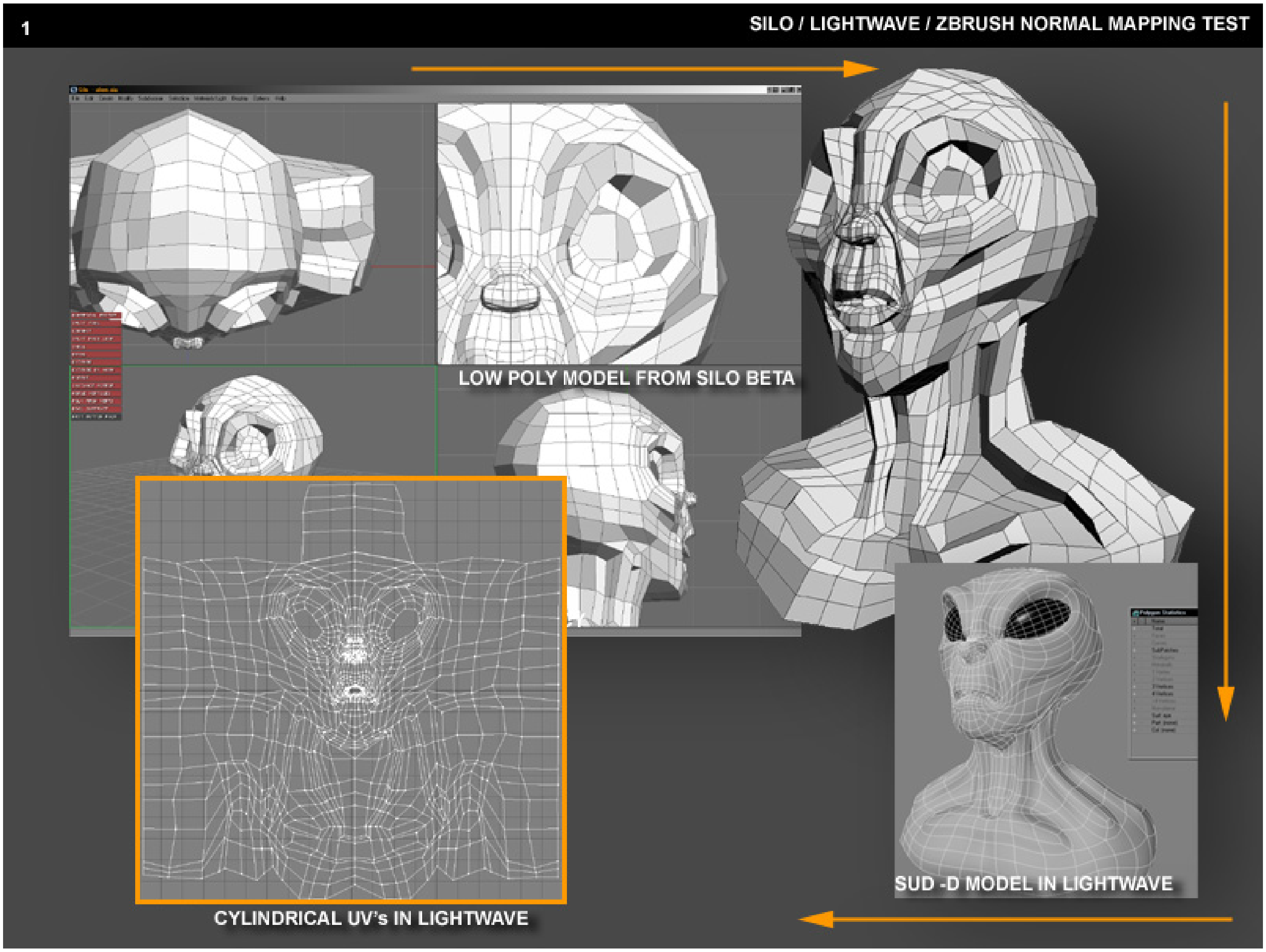
By Glen Southern

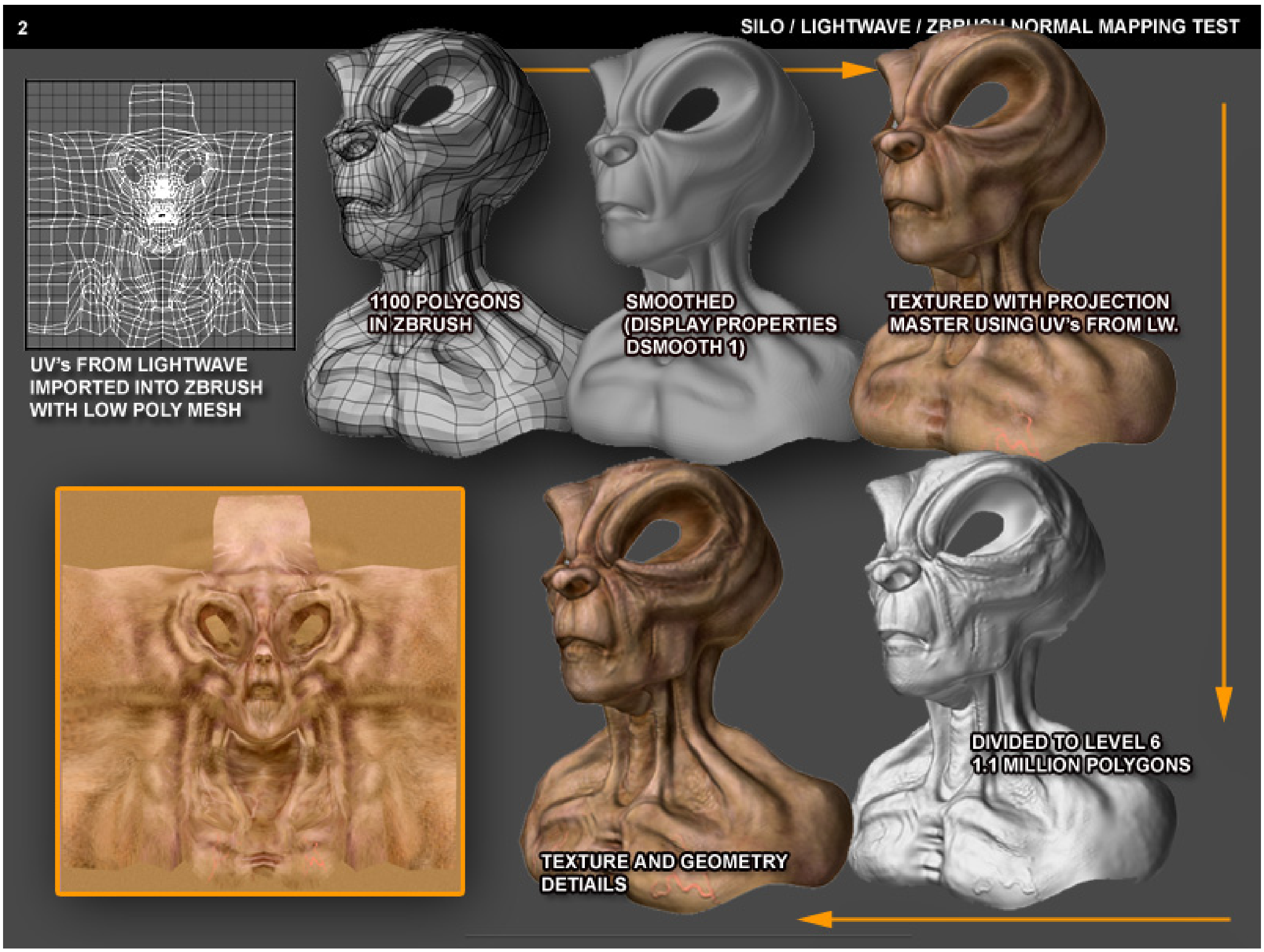
What this tutorial lacks in text it makes up for in illustrations. All of the steps are covered to apply a ZBrush-generated normal map in LightWave.

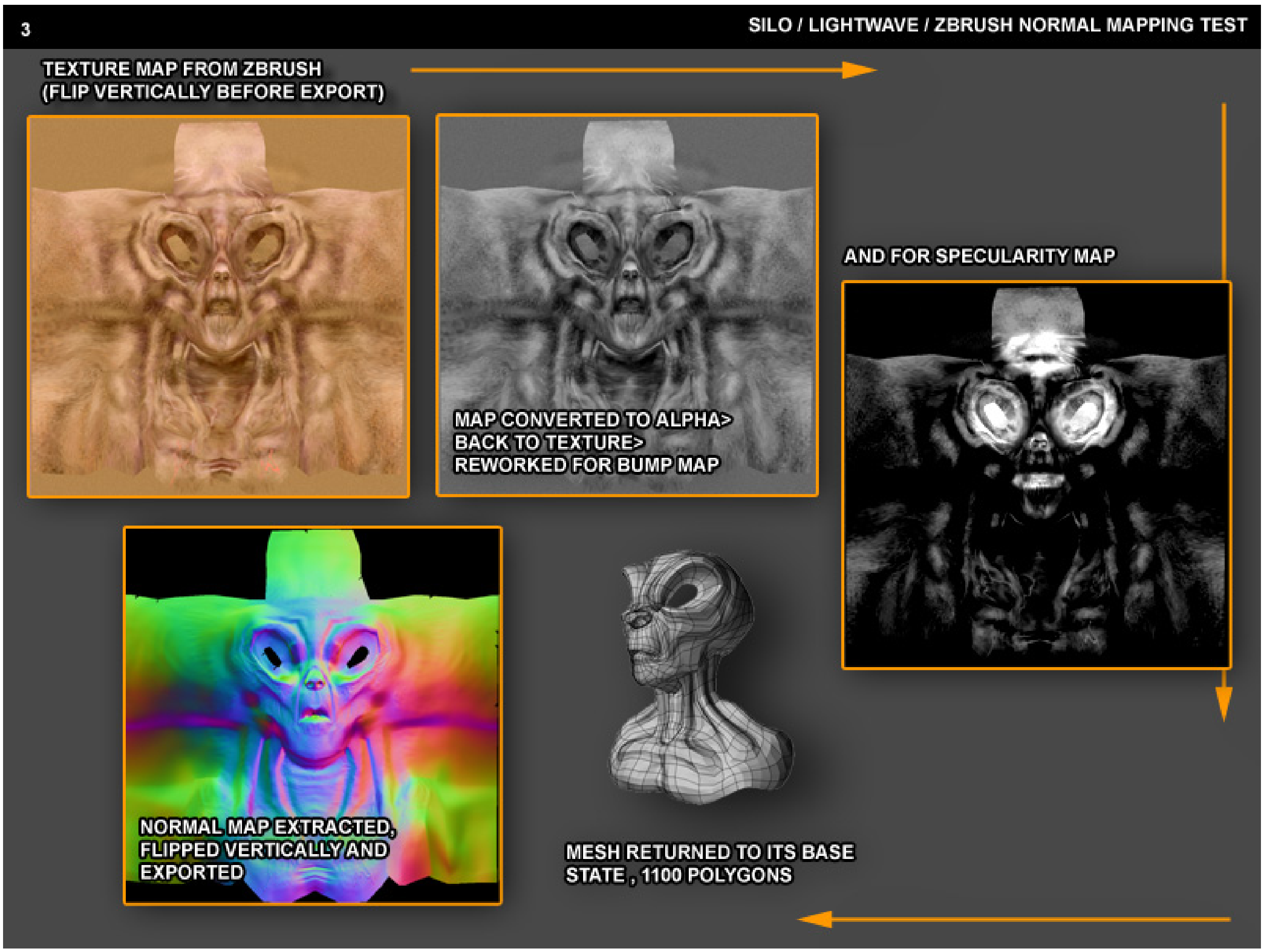
At the time of this writing, LightWave is still working on subpixel displacements (which is where the highest level of displacement quality is to be found). That doesn't keep ZBrush from being able to enhance my LightWave work, however!

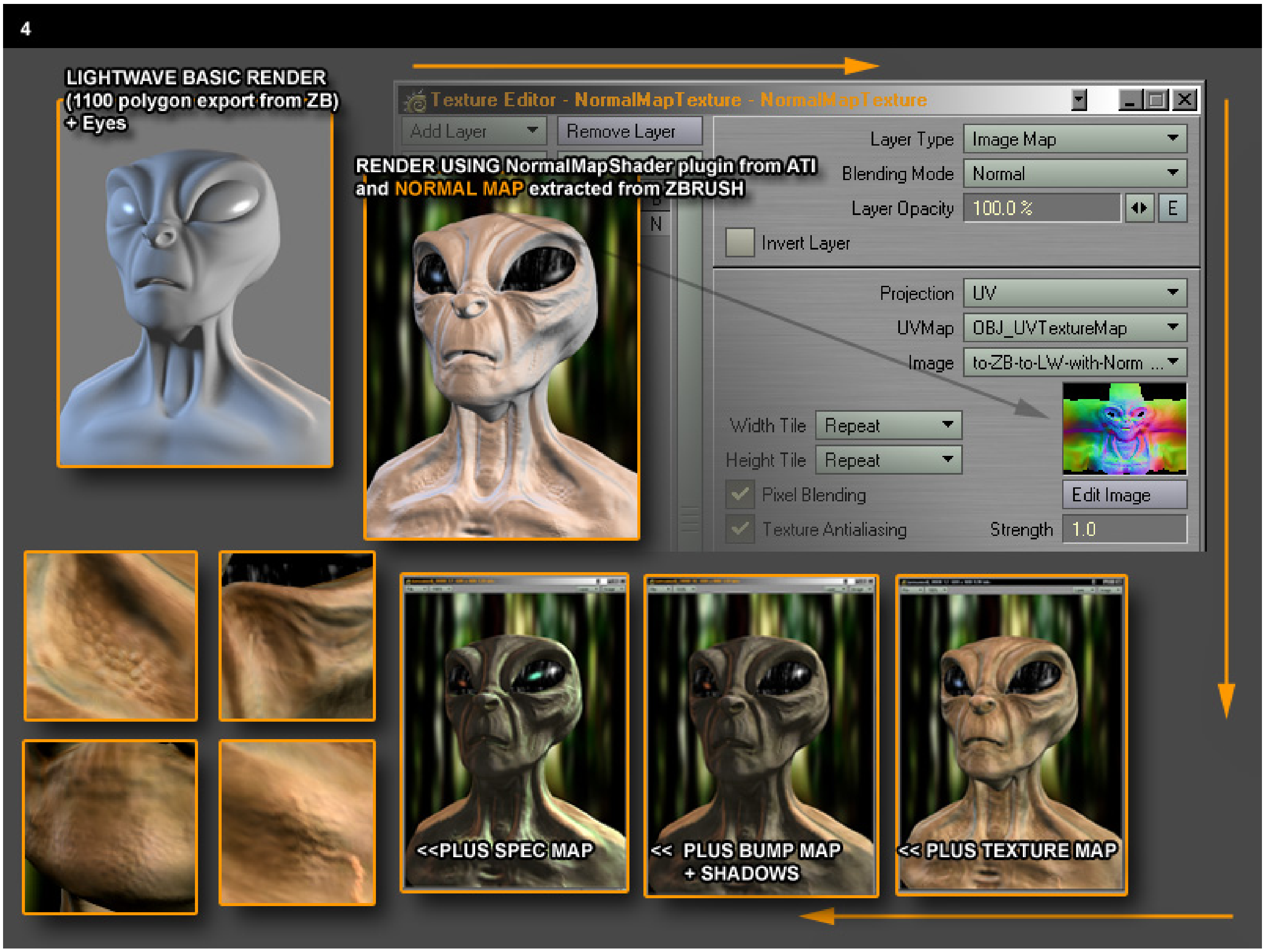
In this tutorial, I have created a low poly model in another application, which was then UV mapped in LightWave. The model was taken into ZBrush, where it was subdivided to 1.1 million polygons and then detailed. ZBrush then generated a normal map, which was applied in LightWave using the NormalMapShader from ATI.

The panels on the following pages show the entire process.


1
SILO / LIGHTWAVE / ZBRUSH NORMAL MAPPING TEST
LOW POLY MODEL FROM SILO BETA
SUD -D MODEL IN LIGHTWAVE
CYLINDRICAL UV's IN LIGHTWAVE


2
SILO / LIGHTWAVE / ZBRUSH NORMAL MAPPING TEST
UV's FROM LIGHTWAVE
IMPORTED INTO ZBRUSH
WITH LOW POLY MESH
1100 POLYGONS
IN ZBRUSH
SMOOTHED
(DISPLAY PROPERTIES
DSMOOTH 1)
TEXTURED WITH PROJECTION
MASTER USING UV's FROM LW.
DIVIDED TO LEVEL 6
1.1 MILLION POLYGONS
TEXTURE AND GEOMETRY
DETAILS

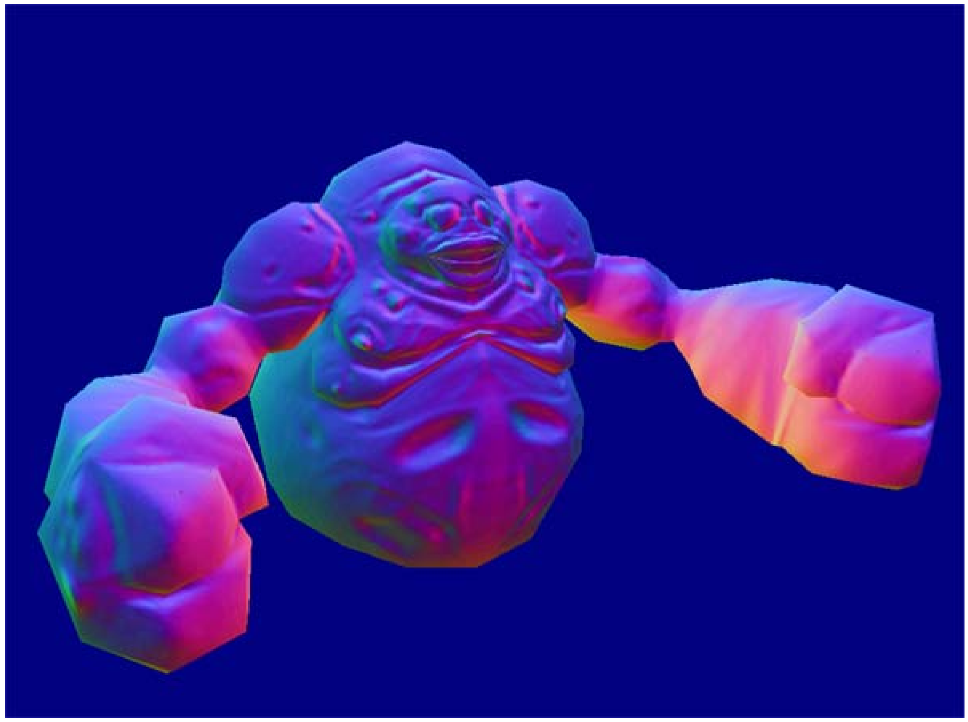

3
SILO / LIGHTWAVE / ZBRUSH NORMAL MAPPING TEST
TEXTURE MAP FROM ZBRUSH
(FLIP VERTICALLY BEFORE EXPORT)
MAP CONVERTED TO ALPHA>
BACK TO TEXTURE>
REWORKED FOR BUMP MAP
AND FOR SPECULARITY MAP
NORMAL MAP EXTRACTED,
FLIPPED VERTICALLY AND
EXPORTED
MESH RETURNED TO ITS BASE
STATE , 1100 POLYGONS


4
LIGHTWAVE BASIC RENDER
(1100 polygon export from ZB)
+ Eyes
RENDER USING NormalMapShader plugin from ATI
and NORMAL MAP extracted from ZBRUSH
Texture Editor - NormalMapTexture - NormalMapTexture
Add Layer
Remove Layer
Layer Type
Image Map
Blending Mode
Normal
Layer Opacity
100.0 %
E
Invert Layer
Projection
UV
UVMap
OBJ_UVTextureMap
Image
to-ZB-to-LW-with-Norm ...
Width Tile
Repeat
Height Tile
Repeat
Pixel Blending
Edit Image
Texture Antialiasing
Strength
1.0
<<PLUS SPEC MAP
<< PLUS BUMP MAP
+ SHADOWS
<< PLUS TEXTURE MAP

ZBrush and 3D Studio Max – Normal Mapping

By Kip Malek

This tutorial shows one way to use ZBrush to create normal maps for use with 3D Studio Max models.



In this tutorial, I will explain how to go from Max to ZBrush to Max, and then how to view the normal-mapped object in Crytek's Polybump Previewer. Alternatively you could use Max's metal bump.

Besides ZBrush and Max 5.1, you will also need to download and install Habware's MAX2OBJ and OBJ2MAX plugins, the Polybump Previewer, and Nvidia's DDS Photoshop plugin. These plugins/apps are to be found at:

http://www.habware.at/duck4.htm

http://www.crytek.com/downloads/index.php?sx=polybump

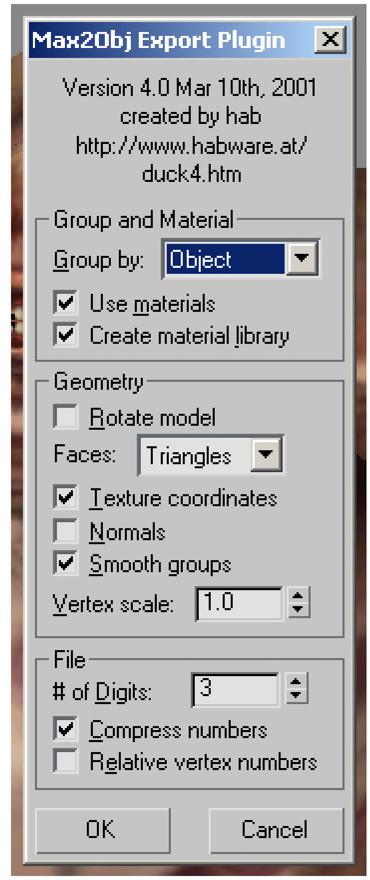
http://developer.nvidia.com/object/nv_texture_tools.html

I've taken some screenshots of the processes I go through. Here goes:

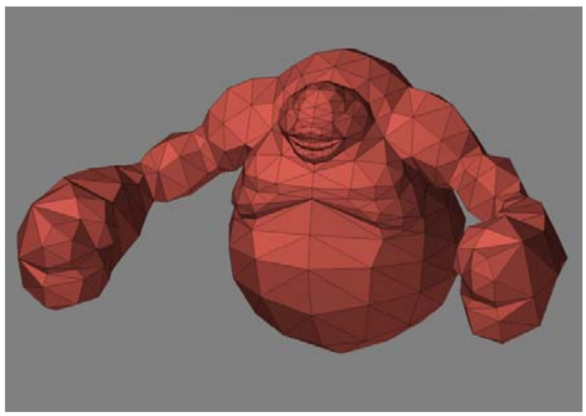
- **Load up your model in Max.**

In the attached images I'm going to use a monster I modeled, unwrapped, and textured for the PS2 RPG “Summoner 2” (developed by Volition, published by THQ).

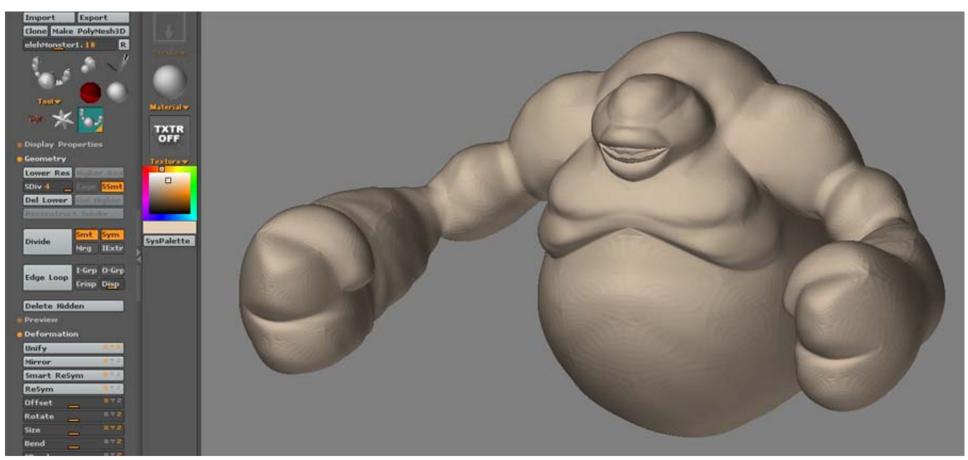
- **Export the model as an OBJ.**



Use the settings in the screenshot image I've attached. You would want to change the faces setting to "quads" if your object is mostly quads. However, this monster model was not built in the Bay Raitt quad method, and as such it was better to export it as triangles.



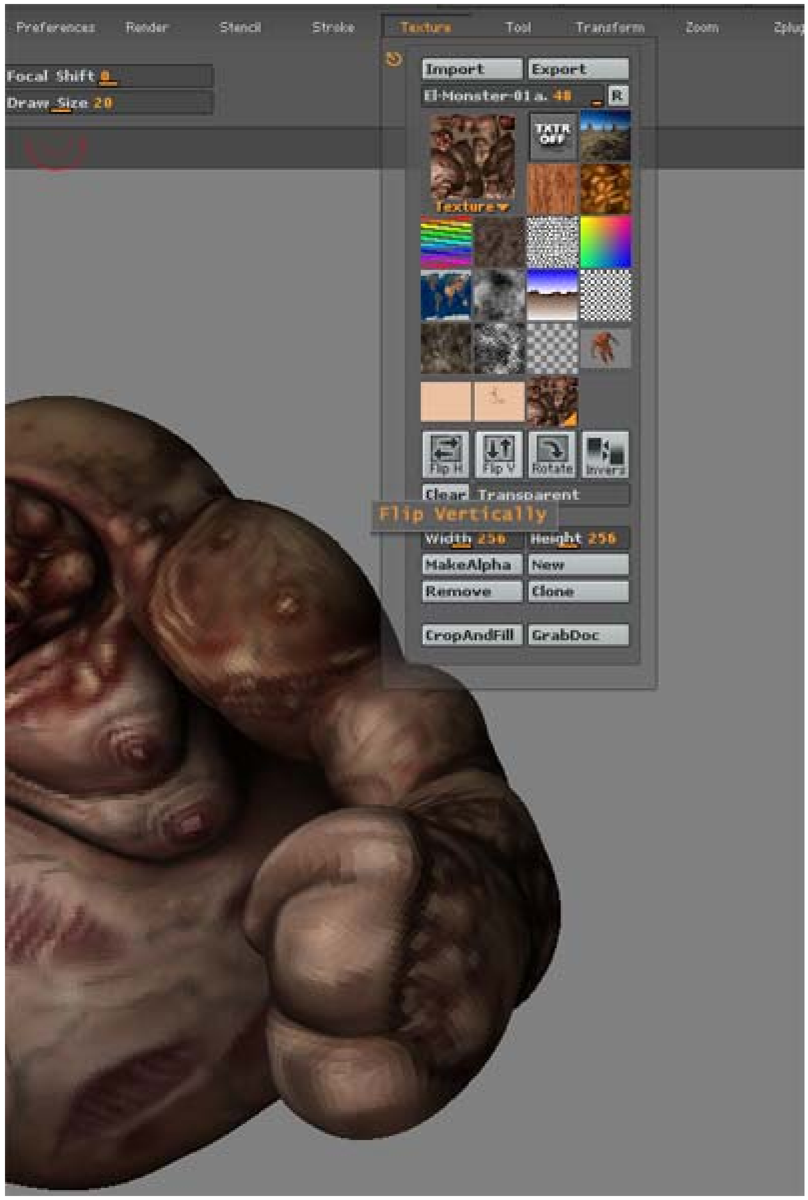
- **Open ZBrush and import your model using Tool>Import.**
- **Add some subdivisions to it using Tool>Geometry>Divide.**



I imported the original texture as a guide using Texture>Import.

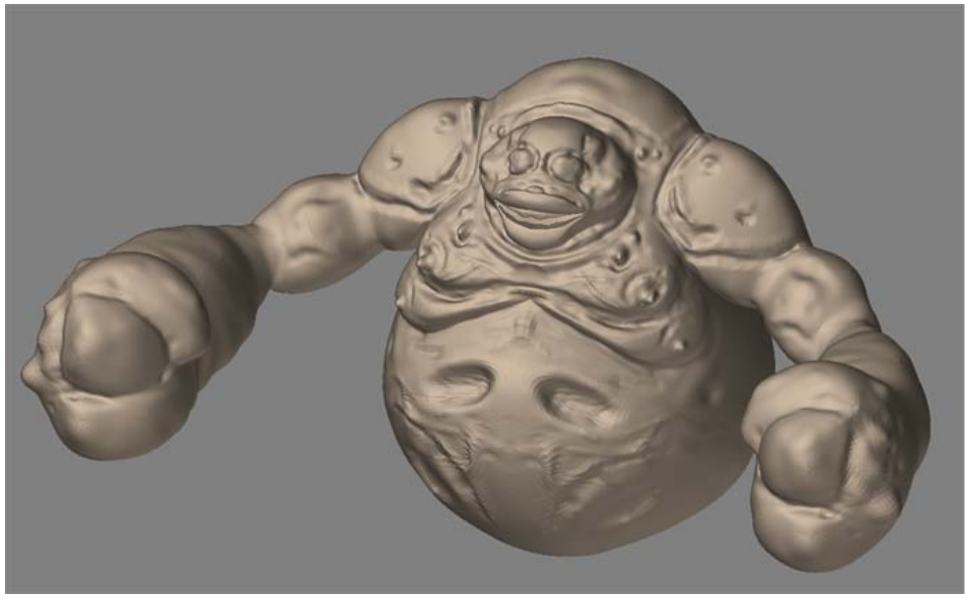
Since ZBrush and Max have different coordinate systems, it's necessary to flip the texture vertically after importing.

- **Press Texture>Flip V.**



ZBrush flips bitmap textures automatically, so this is only necessary for formats other than BMP. Also, remember to flip your textures (including your normal map) vertically again before exporting them from ZBrush.

- **Model, texture, and do whatever you wish to your model.**



To do this sculpting, you can use any of the sculpting brushes found in the Transform palette, or (if your model has been subdivided to sufficient resolution) you can use Projection Master to paint displacements. You can even paint texture and displacements at the same time!

- **Once you are done, follow the methodology to create a displacement map, but click Tool>Normal Map>Create Normal Map rather than the Create Displacement Map button.**

This methodology is explained in detail in the Phone – Part 3 section of this manual.

I choose a size of 1024x1024. For more detailed maps, you would obviously use larger textures. As far as game development goes, you usually create maps which are powers of 2 (32x32, 64x64, 256x256, 128x256, etc). This is perfect for ZBrush, since it is also optimized for the same dimensions.

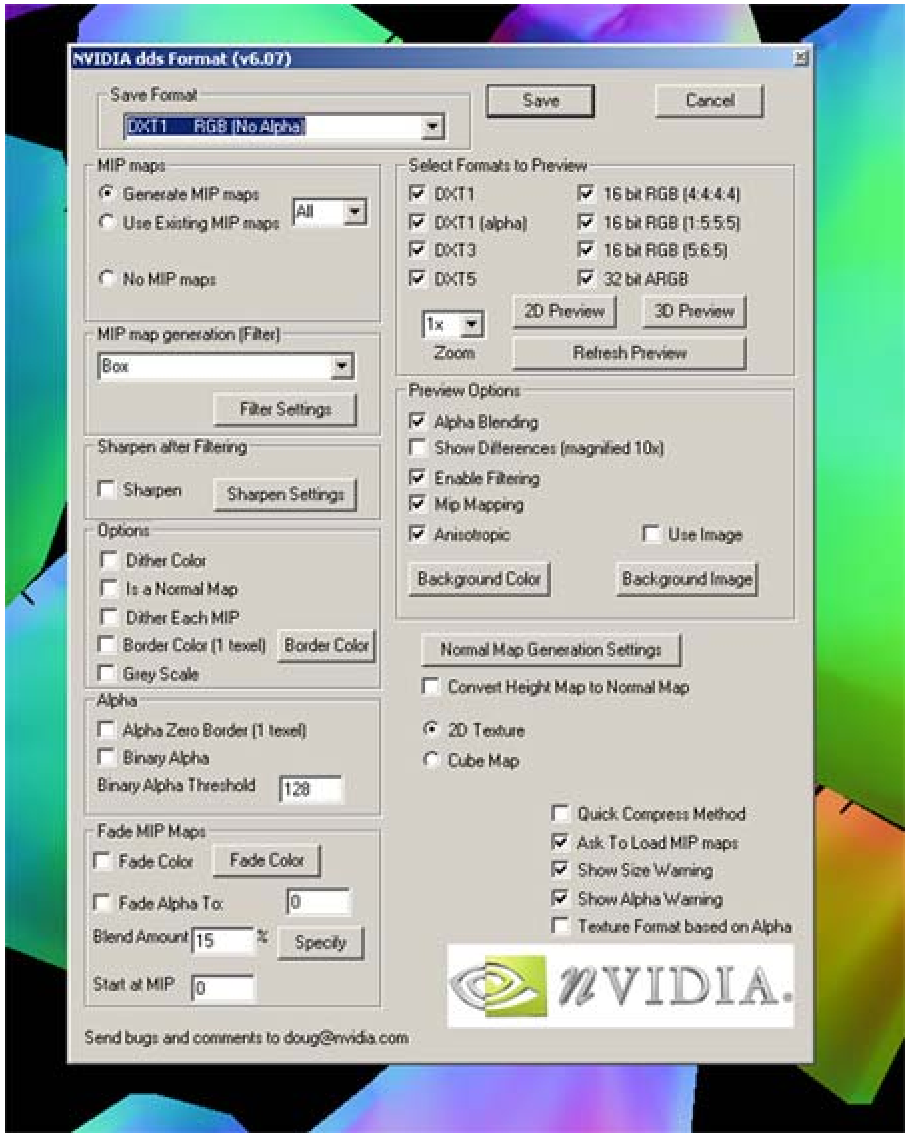
- **After the normal map has been created, go to the Texture palette and export the map.**

Remember to flip the map vertically if you export it as anything other than a BMP.

There is no need to export your model again, and you only need to export the texture if you have modified it in ZBrush.

- **Open your normal map in Photoshop and save it as the .dds file format.**

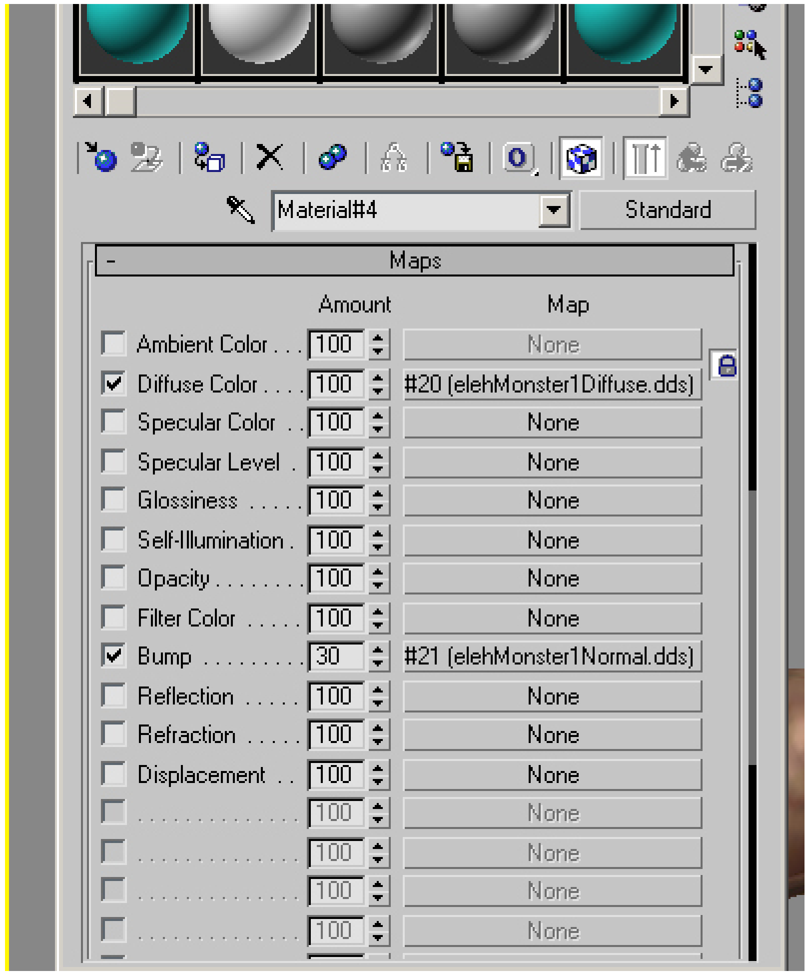
- **Within the save format dropdown of the Nvidia exporter that opens, choose dxt1 RGB(no alpha).**



- **If you have a diffuse (color) map save it as a .dds as well.**

You can read an explanation of the dxt format at the nvidia website. http://developer.nvidia.com/object/General_FAQ.html

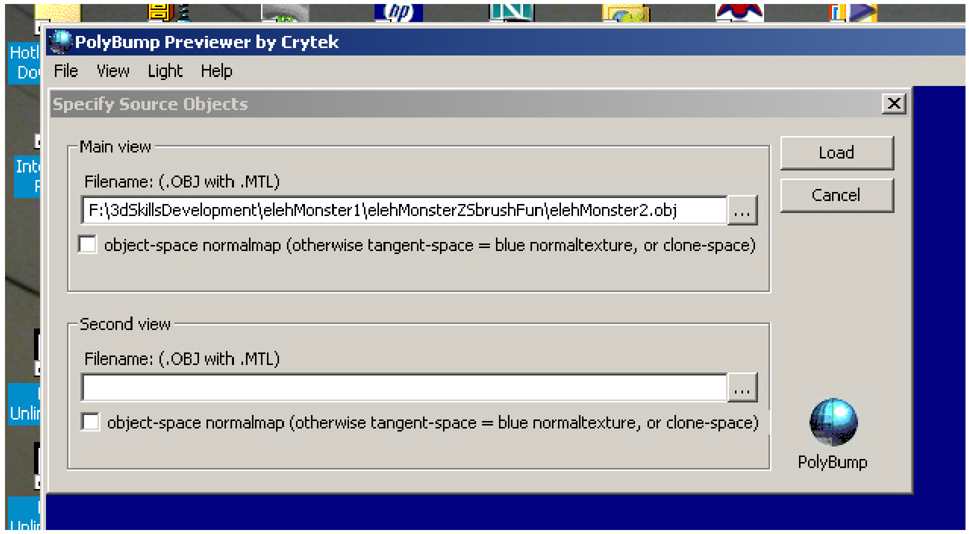
- **Return to Max and within a new texture load up your .dds diffuse map in the diffuse color slot and your .dds normal map in the bump slot.**



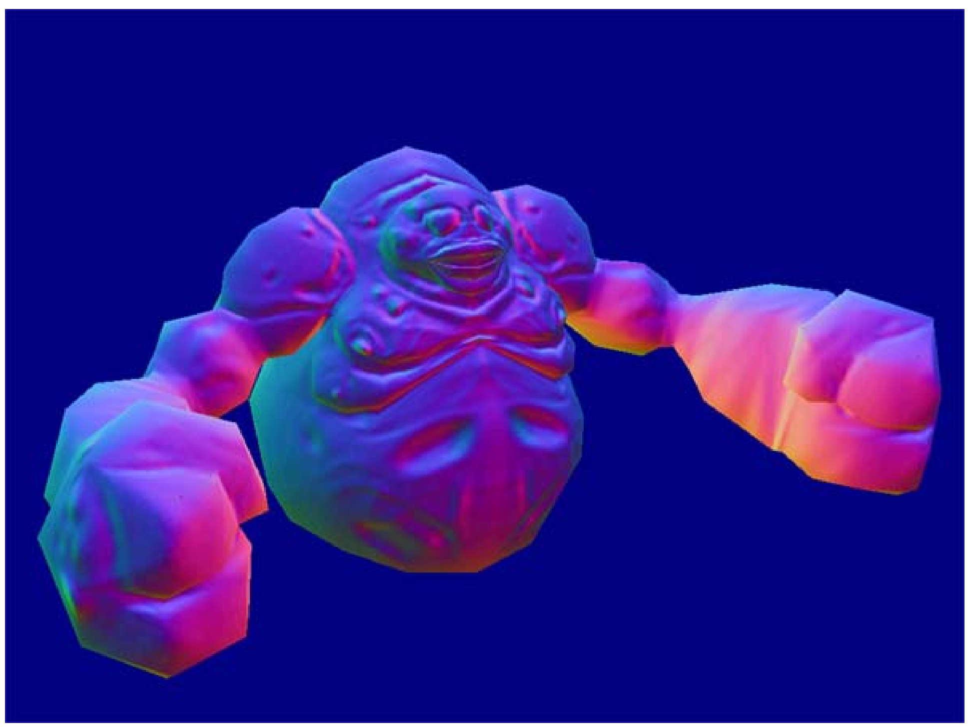
- **Export the model as an .obj again.**

- **Open the Crytek Polybump Previewer.**

- **Load your .obj file.**



- **You can cycle through the different rendering options by pressing the f2 key.**



Woo hoo! That's it! Alternatively you could use a version of the normal map previewer. That uses a different method though, which is beyond the scope of this tutorial.

Max to ZBrush & Back

By Glenn Melenhorst

This section gives a good workflow for incorporating ZBrush, Max 5.1 and Vray together into your workflow.

This tutorial is meant to give a brief explanation of how I create models using ZBrush 2 with Max 5.1 and Vray.

Here is a sketch that I'm using as my guide in this tutorial.

Step 1 – Rough Out

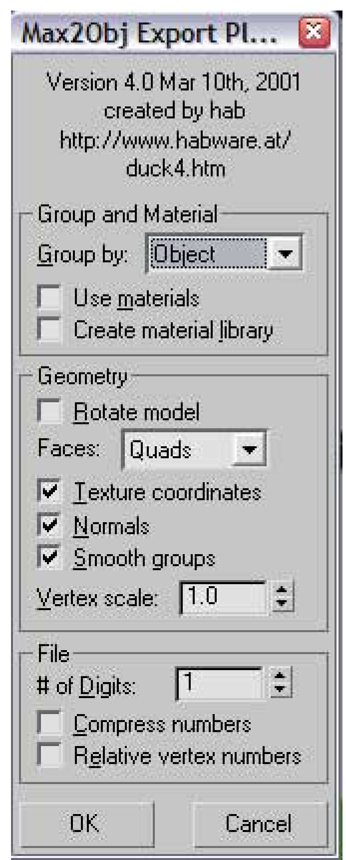
Inside max I roughly model the character using edit poly and meshsmooth. I use simple shapes and avoid tiny details. I also work to keep my mesh completely built from quads and no tris.

I'm going to use ZBrush to apply the texture coordinates, so I won't bother applying a map or UVW coordinates just yet.

Step 2 – Export

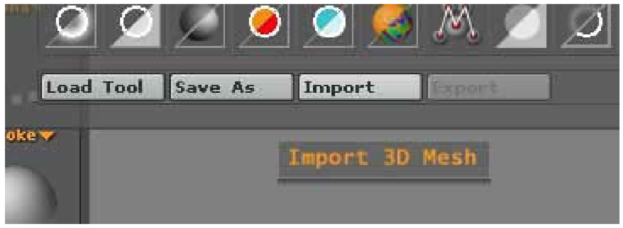
I export the mesh as an .OBJ file because OBJ's retain mapping coordinates and can export quads. This is done with an OBJ importer/exporter built by Habware and can be found at http://www.habware.at/duck4.htm.

When exporting, I use the settings shown at right.



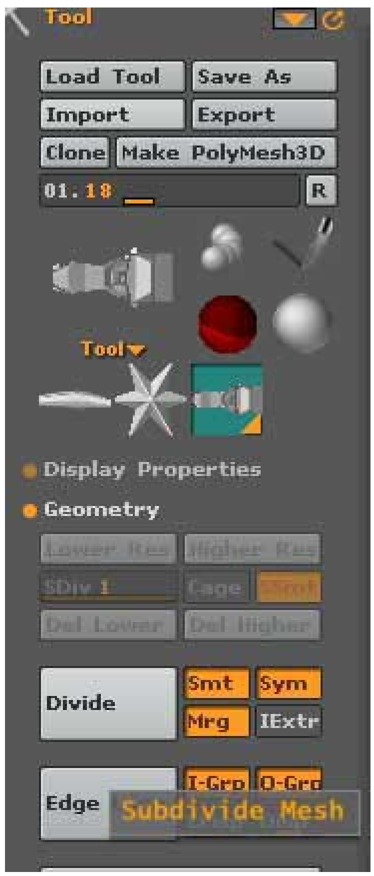
Step 3 – Import and Sculpt

Load the OBJ into ZBrush and you're ready to get sculpting.

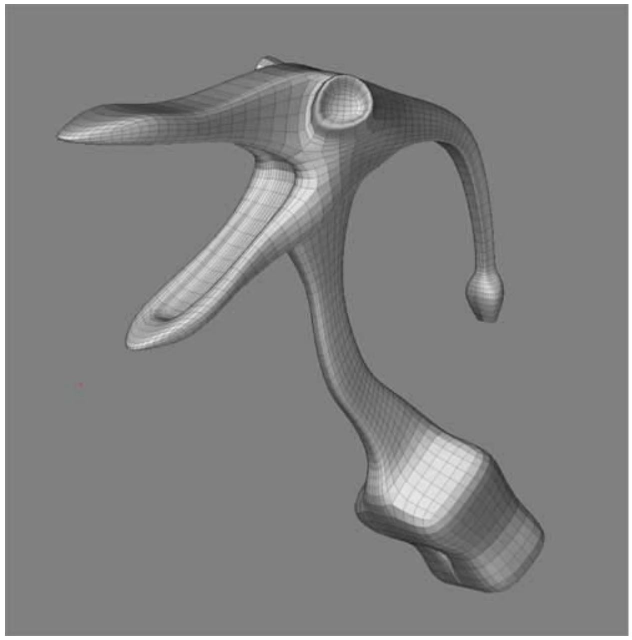


In the example above, I clicked the Tool thumbnail on the left shelf. The Import button appears at the bottom of the popup.

Once loaded, you can sculpt the mesh to your heart's desire adding detail by dividing the mesh to create a subdivision surface. The button to use is Tool>Geometry>Divide.



The beauty of this technique is that it takes a simple blocked out character and makes it quite sculptural and natural.



As you reach the limit of detail that can be achieved with your current subdivision level, divide the mesh again to add more polygons. Keep detailing until you're satisfied with the character.

Refer to other sections of this manual or the excellent tutorials built into ZBrush and online to learn the finer points of sculpting in ZBrush. For the focus of this tutorial, I'm more concerned with getting between the two applications.

Step 4 – Texture

Create a high resolution texture map. It will be a blank canvas for your paint work.

A blank texture at the desired resolution should be created before the UV mapping is assigned. If no texture is present, ZBrush assumes a size of 1024x1024. But if you create the 2048x2048 or even 4096x4096 texture and then assign the mapping, you will get the most precise results.

Choose your base color, set the dimensions, and then click the Texture>New button.

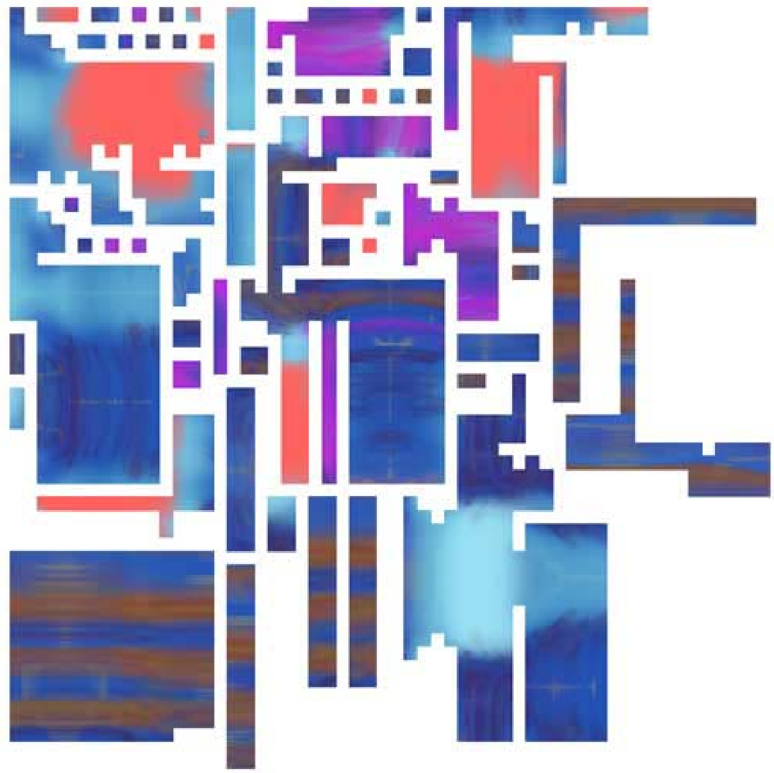
Next create your mapping coordinates in ZBrush using GUV tiles. It's like unwrap in max and does an excellent job of creating distortion-free maps. Unlike the similar AUVTiles, this mapping method keeps polygons together where necessary and so works well even if your model has triangles.

Note that you must be at Subdivision level 1 to assign the mapping. You can then return to the higher subdivision level after.

Use Projection Master to paint the texture. At the same time and if your mesh has a high enough resolution, you can also paint displacements for use in creating a displacement or normal map.

The picture on the previous page shows rough painting. Refine your texturing to whatever level of detail you prefer.

After painting, your texture will look like a patchwork or mosaic.



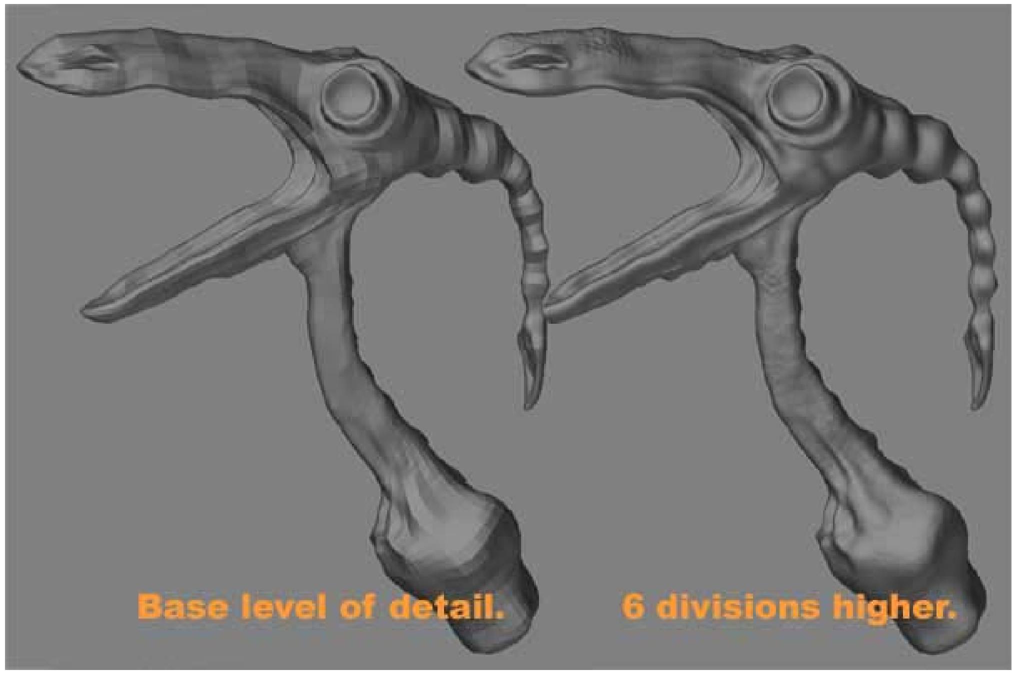
Now you're ready to export the texture map for use in MAX.

Press Tool>Texture>Fix Seams to make sure that there are no seams at the edges of UV regions.

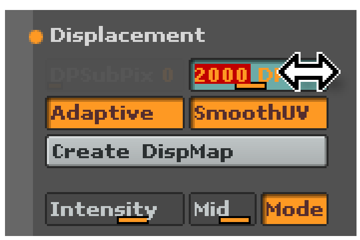
The other option is to let ZBrush export the map when you export the OBJ. ZBrush performs the fix seams operation automatically, flips the texture, and saves it as a BMP of the same name if you have the texture wrapped onto it when you export the model. It's only necessary to do the steps manually if you are exporting a TIFF from the Texture palette.

Step 5 - Displacement

Next we need to generate a displacement map which denotes the difference between the low resolution and highest resolution subdivisions of the model.

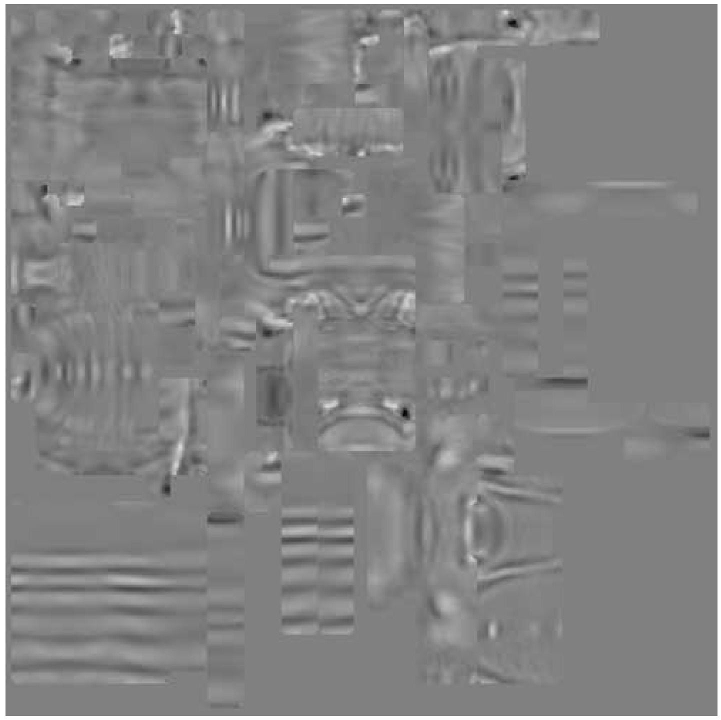


I usually make a displacement map of about 2000 pixels.



The generated displacement map will appear in your Alpha palette and should be saved for use in Max.

The displacement will look a little like this:



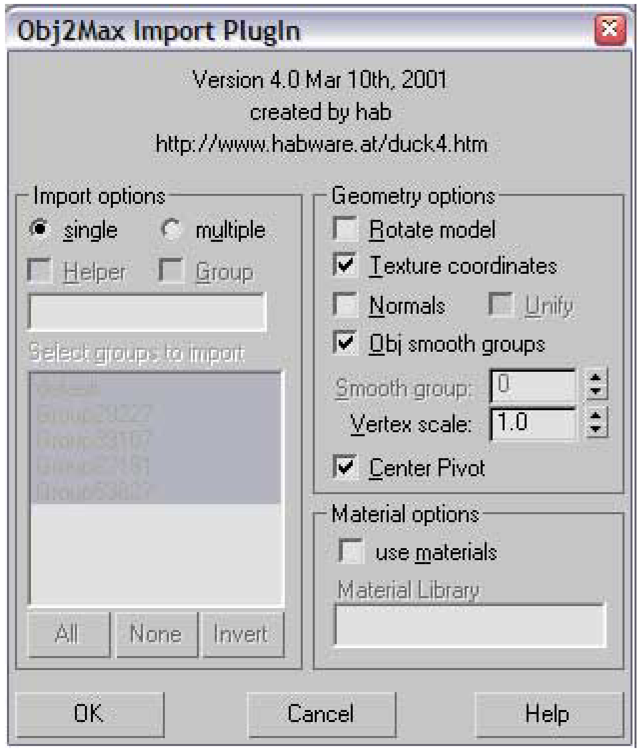
It's really important that you save it out as a TIFF file so that it retains its 16 bit depth. An 8 bit depth image will 'staircase' or 'step' because it has fewer levels of gray to make smooth displacements with.

All that's left to do in ZBrush now is export your mesh at the lowest subdivision level as an OBJ…

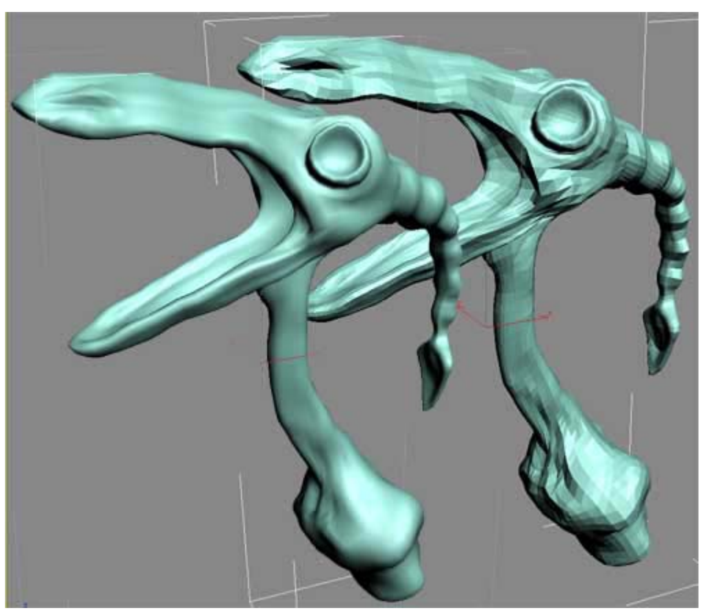
Step 6 - Max and Vray

...and import it into max using Habware's OBJ importer mentioned at the start of this tutorial.

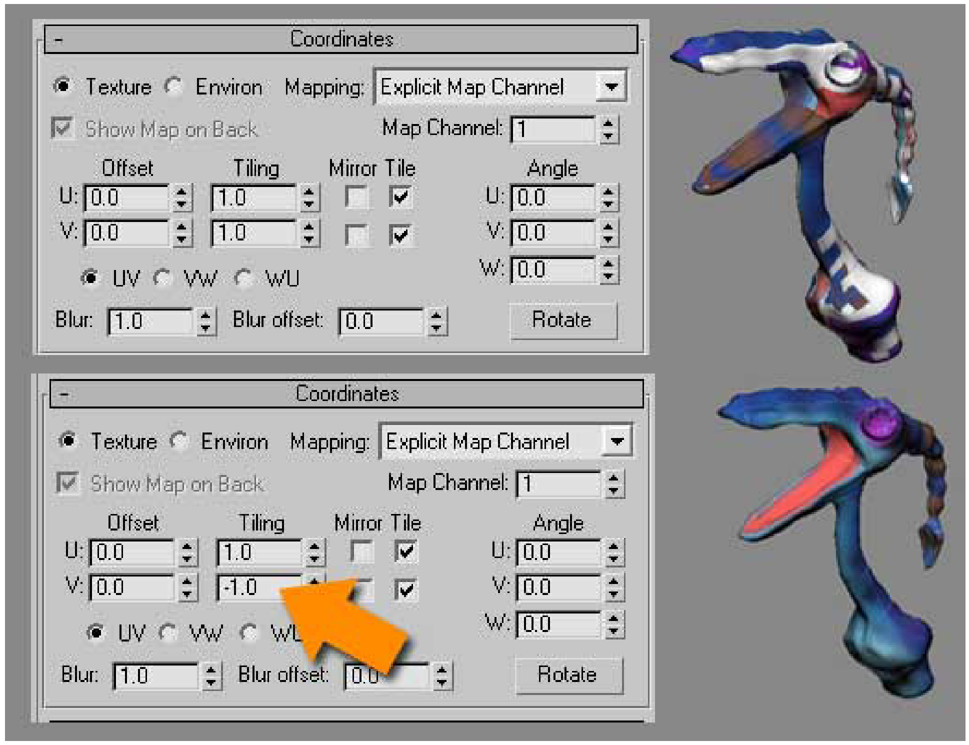
Be sure to set your Vertex scale to 1.



I add a layer of meshsmooth to the model to smooth out the faces. I sometimes set it to one or two levels of subdivision if the base model is really low. I found it doesn't pay to have the base model too low. I try to keep it and the final relatively close together in terms of topology.



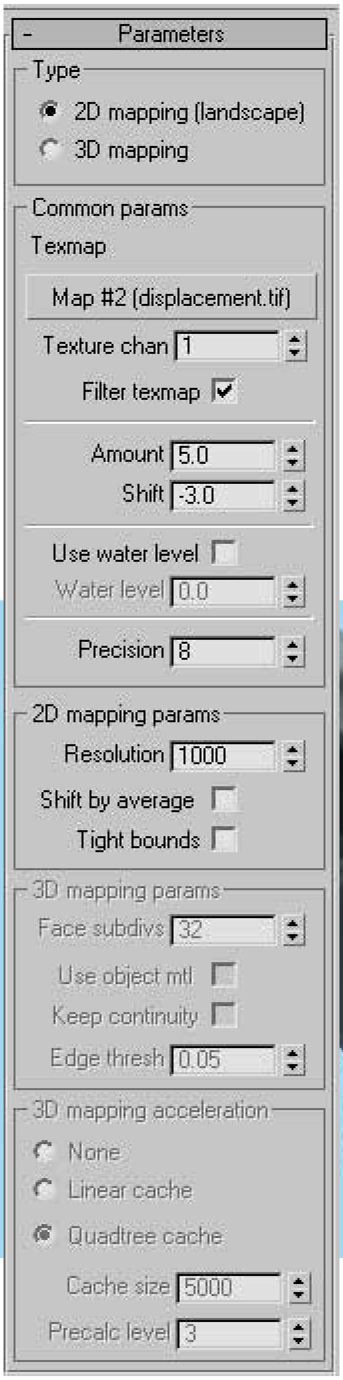
If you just apply the texture map from ZBrush to your model, it looks wrong. Simply set your v tiling to -1 and it'll look a lot better :)



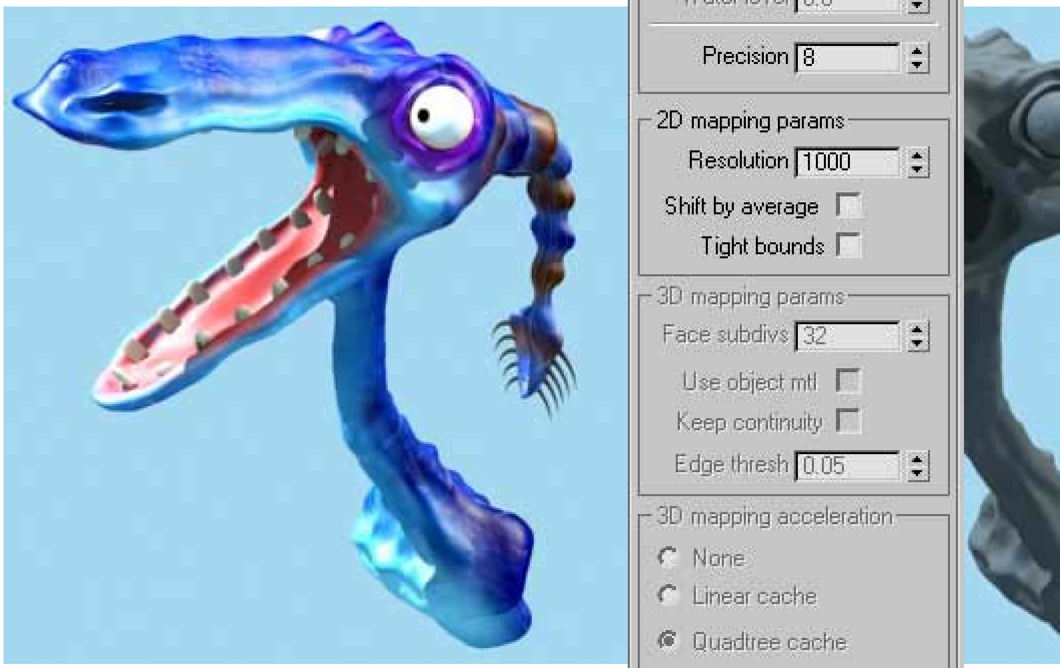
The other option here is to set Texture>Flip V in ZBrush. This will correct the map flipping so you don't have to adjust it in Max.

Again, ZBrush performs this operation automatically and saves the texture as a BMP of the same name if you have the texture wrapped onto it when you export the model, so it's only necessary to do the steps manually if you are exporting a TIFF from the Texture palette.

Now setup your displacement. I use Vray so here is a snapshot of my settings. Notice I compensate for inward displacement as well as outward displacement. I have no hard and fast rule for this as the amount of displacement depends on the height of the peaks and valleys you have painted in ZBrush. If you painted high lumps, you need a greater value in your displacement than if you painted fine details.



The render:



I know it's not great but that's me rushing through to get a point across. You can make anything of any detail in this method while keeping a mesh light enough to animate easily. Look into ZBrush's cavity material (it helps bring out the detail of the models) as well as using ZBrush for painting secularity maps, bump maps and anything else you might require.

ZBrush & Poser 5

By Michael Melnik

Poser 5 offers a low cost rendering engine that supports subpixel displacements. This tutorial shows techniques for using the two packages together.

Have you ever wanted to make ultra highly-detailed 3D models for Poser5 without losing system resources? Well, now you can. ZBrush 2 allows you to create 3d models with up to ten million polygons. Yes, you read that right, I said ten million polygons! This would bring most other 3D programs to their knees, even the high end programs. Ok, you can quit drooling now! Now imagine this: you can make a ten million polygon displacement map for use on your standard Poser characters. This will also work if you like to create your own figures and props for Poser.

This tutorial is broken up into three steps. First, in step number one, I will describe how to make highly detailed displacement maps with ZBrush. In the second step, I will explain how to export them correctly for use in Poser5. Finally, I will explain how to apply the displacement maps in Poser5.

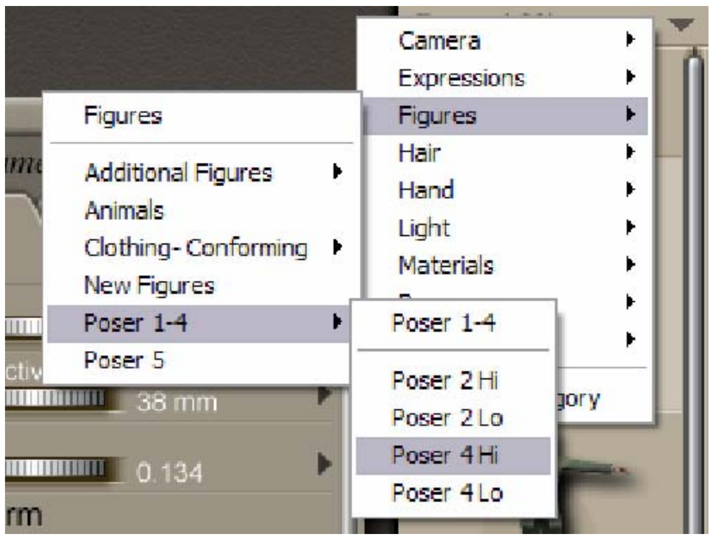
NOTE: This tutorial uses Poser5 with Service Pack 4.

Step 1: Creating Displacement Maps with ZBrush

To start things off, we have to export the figure out of Poser5. In this case we will use the good old Business Man figure.

- **Open Poser5, delete the default figure and locate the Business Man figure.**

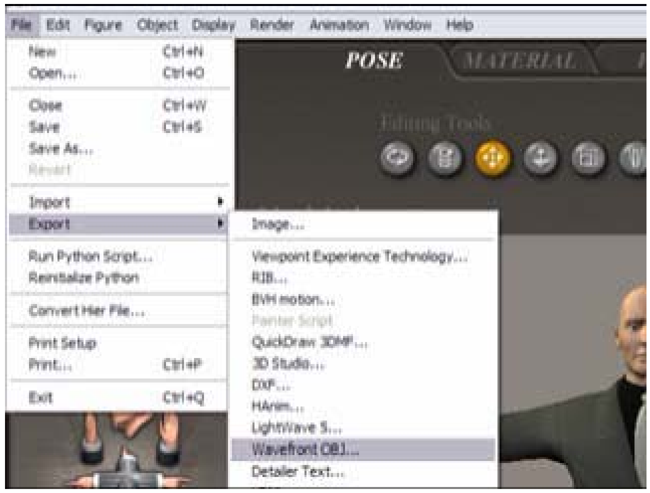
You will find him in the Poser Library under Figures\Poser 1-4\Poser 4 Hi.



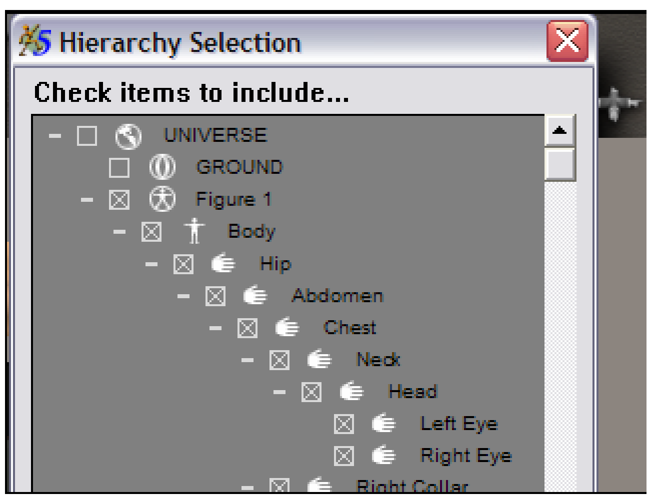
- **Once you've located the figure then double click on his icon to "Create the figure" or in other words, bring him into the current scene.**

Now that the figure is created we can export him as an OBJ file for use in ZBrush.

- **To do this click on the File pull down menu, select Export, then select Wavefront OBJ.**



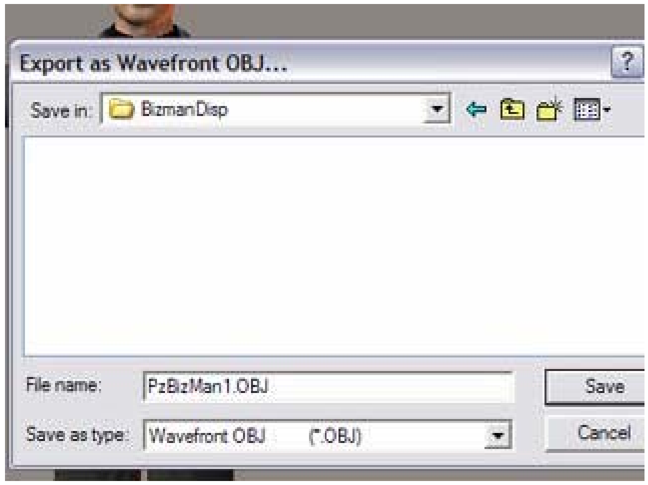
- **In the Hierarchy Selection window that pops up uncheck Universe then put a check on Figure 1.**



- **Click “Ok”.**

This way we only export the figure and nothing else.

❑ **The Save dialog box now opens and we will save our figure as PzBizMan1.OBJ.**



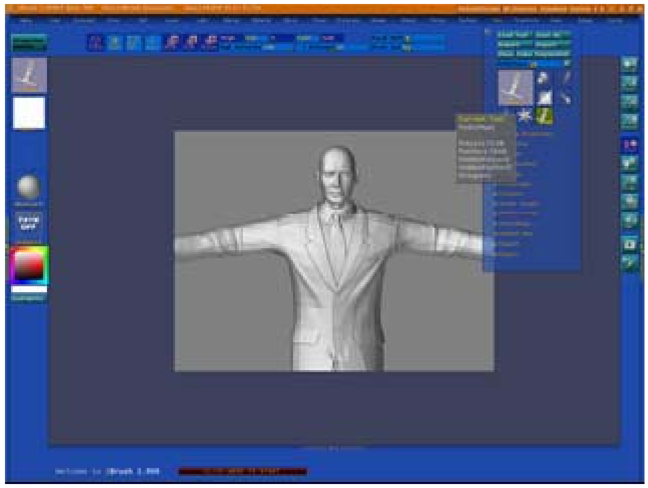
NOTE: While saving the OBJ file you need to create a special folder titled BizManDisp for the files of this tutorial. It will make it easier to keep track of everything.

Now that our model has been exported from Poser it is time to bring it into ZBrush. This is easy enough to do.

❑ **First let's open ZBrush and click on the Import 3d Mesh button found in the Tool palette. Locate the PZBizMan1.OBJ file that we created and open it.**

❑ **Now that the model is in ZBrush make sure it is selected then go ahead and click-drag anywhere in the canvas.**

As you can see, this action will let us add our model to the ZBrush workspace, or Canvas area.



You should already know these five shortcuts, but in case you don't, here's a brief explanation on how they work:

1. Click and drag in the space outside of the object to rotate it freely.

2. Click and drag while holding down the “Alt” key on your keyboard to pan the object side-side or up and down.

3. Click and drag while holding the “Alt” key on your keyboard then let go of the “Alt” key while still click-dragging to scale the object up and down in size.

4. Hold the “Alt” key on your keyboard and just click once on the canvas to automatically resize and scale your object to fill the canvas.

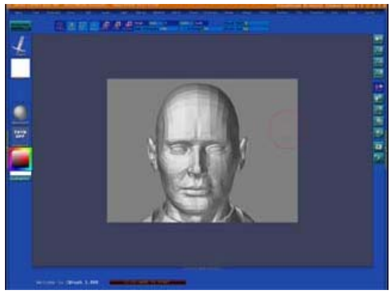
5. Hold down the “Shift” key to constrain the rotations to forty-five degree 45° increments.

You can also perform these actions by using the icons on the right shelf.

Ok, let’s move along…

- **Press the “T” Key to enter Transform/Edit/Draw mode.**

❑ **Scale the object up in size and reposition it so that we can work on the forehead area of our model.**

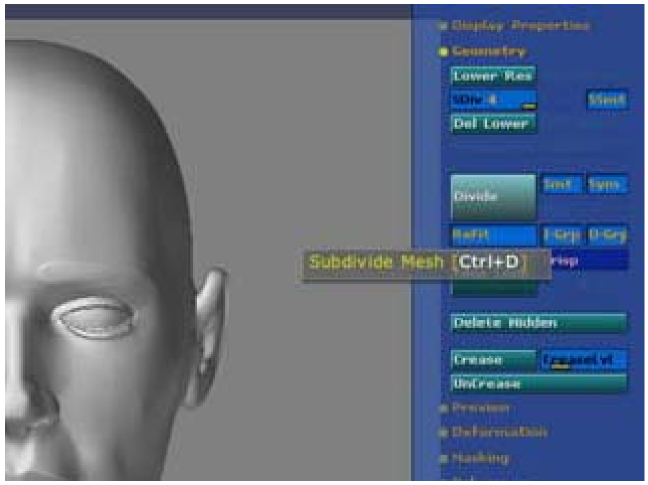


❑ **Press the Tool>Morph Target>StoreMT button to store the current mesh for later use.**

This will store a perfect copy of our model that we can switch back to at any time.

Now we are prepared to add more polygons. We want to make a high poly model for the displacement map.

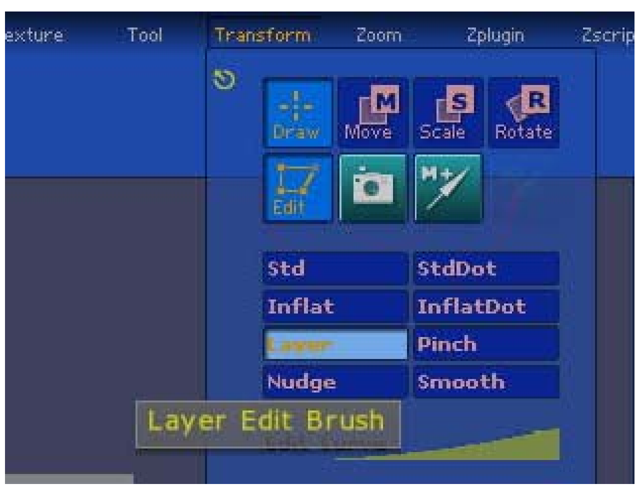
- **Go into the Tool>Geometry sub-palette and click the Divide button four times.**

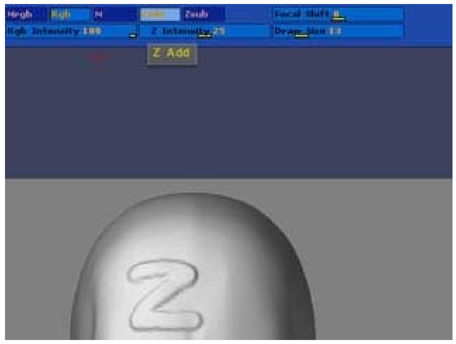


This action will subdivide the object four times bringing us to a level four subdivision. Mesh density increases from 17,138 to 1,060,262 polygons. We now have plenty of polygons for our displacement map, though if you have a powerful enough system you could subdivide one more time if you wanted to. We'll just keep it at level four for this tutorial.

Ok, time to add some high resolution details for our displacement map.

- **For this demonstration we will use the Layer Edit Brush. Click Transform>Layer, make sure you have Zadd selected, then draw a "Z" on the forehead of our model.**



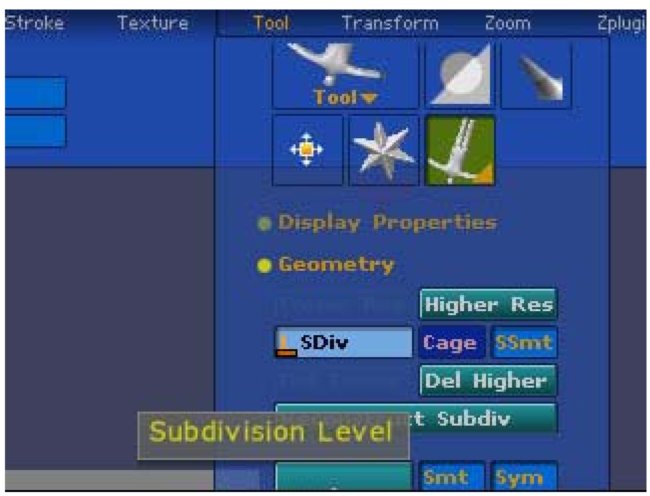


- **Change to Z-Sub and draw a "B" on the other side of his forehead.**

I know, I know… at this point all of the major Poser fans are saying to themselves "What is this guy thinking? It's intolerable!" LOL… please bear with me!

That is all the detail I will be adding for this tutorial. You can, of course, add as much detail as you want. It is time for us to make preparations for creating a displacement map.

- **First, let's set the subdivision to level 1.**



You may notice that the original mesh has been slightly altered, which we don't want. Remember the Morph Target that we saved earlier? We will use it as the level one base mesh of our displacement map.

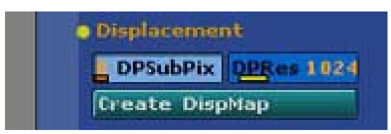
- **Click on the Tool>Morph Target>Switch button.**

You will notice now that we have switched back to our original imported geometry.

The previous few steps are very important, as they allow ZBrush to compare the original unmodified mesh to the high resolution model that you created. This in turn means that the displacement map will be true to your original model.

You may want double check and make sure you followed them correctly.

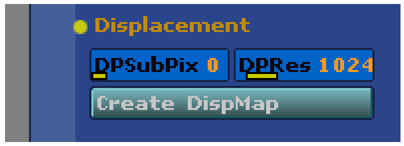
Ok, let's look at the big picture. Here is what we have so far: A level one base mesh with the original geometry intact and a level four altered high poly mesh. We want to create a displacement map using these two levels of subdivision. So, open the Tool>Displacement sub-palette and have a look.



Instead of DPSubPix, you can use the Best button (not shown in this example).

See the slider that says DPSubPix? This slider lets you increase the displacement map SubPixel Accuracy. The higher the level the more accurate the displacement map will be. In conjunction, the higher the level the longer it will take to create the displacement map. For this tutorial we'll just keep the slider level at zero. Also, you can determine the actual size of the displacement map by inputting a value into the DPRes(displacement map resolution) slider located right next to the DPSubPix slider in the palette. We'll just keep it at the default value of 1024x1024 pixels.

- **Finally it is time to make the displacement map. Click on the Create Displacement Map button.**



ZBrush automatically calculates the difference between the current level of subdivision and the highest level of subdivision (in this case, level four) when creating the Displacement map. You should always be at the level that you wish to create the map for before creating the map. In most cases, that will be subdivision level 1.

We have just created a displacement map for our object. You can see the displacement map in the Alpha palette. It is represented by a small icon titled PzBizMan1.

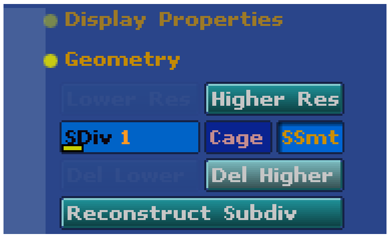
Now that we have our displacement map created we should take a look at it on our base mesh to make sure it works. This is an important part of the tutorial. You don't want to export your displacement map and then find out that it didn't work.

In order to see the displacement map active on our model we must remove all the extra levels of subdivision then create new unmodified subdivision levels. We can then apply the displacement map to the newly subdivided mesh.

- **The first thing we need to do is look at the Alpha Depth Factor value.**

Our Alpha Depth Factor is .0157. Write this number down!

- **Ok, let's remove the upper levels of subdivision. Press Tool>Geometry>Del Higher.**



This will leave us with our unmodified base mesh (the same mesh that we exported out of Poser. Now that the old higher subdivision levels are deleted we need to activate smoothing to simulate Poser's smoothing.

- **Set Tool>Display Properties>DSmooth to 1.**

If the mesh isn't quite smooth enough, you can increase the DRes value next to it.

- **Turn off Transform>Quick.**

As long as Quick is active, ZBrush will ignore the DSmooth setting, preventing the displacement map from being applied.

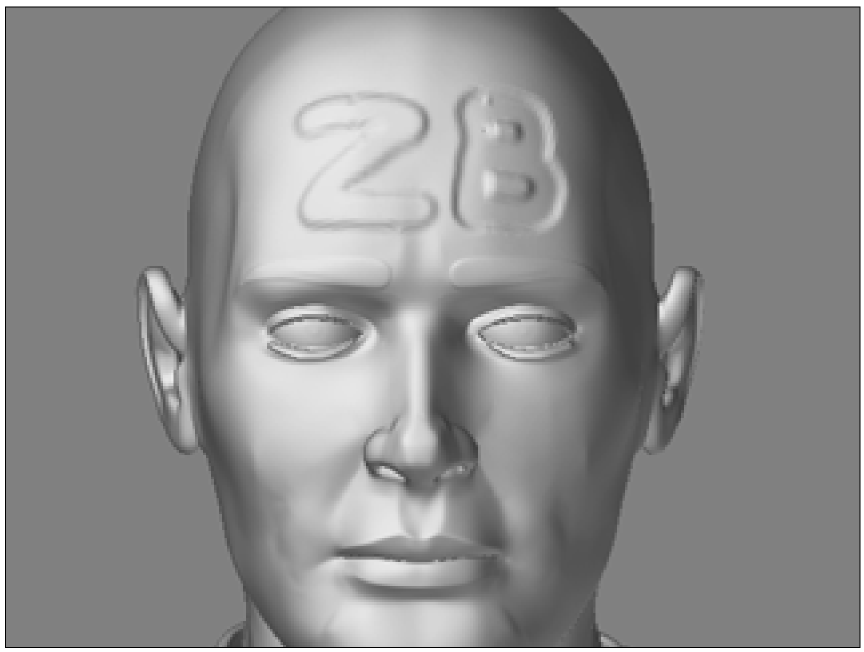
- **Activate Tool>Displacement>Mode.**

This switches ZBrush from displaying the map as bump to full displacement.

- **The last thing we have to do is to input the Displacement Intensity value. This slider is also located in the Tool>Displacement sub-palette. Use the Alpha Depth Factor as our value.**

In this case, the ADF = .0157. Enter this value into the Displacement Intensity slider.

Alrighty then, your mesh should look like this. It looks just like it did right before we created the displacement map. If it looks like this to you then go on to step two, if it looks messed up then you need to go back and figure out where you went wrong along the way.



Step 2: Exporting the Displacement Maps Correctly

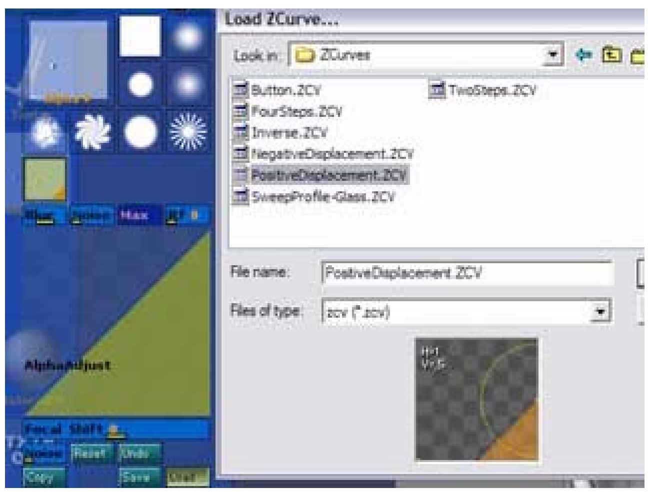
In order to export the displacement map correctly for use in Poser5 we must modify it with the Alpha Adjust curve and create separate displacement maps for both positive and negative displacement. We can then export each separate map.

- **Let's start by selecting our PzBizMan1 alpha map.**

It is in the Alpha palette of course.

- **Next, let's click open the Alpha>Alpha Adjustment curve box and then click on the Load button.**

Here we can load the settings for positive displacement. Find the ZBrush\ZCurves folder and open the PositiveDisplacement.ZCV file.



- **Once the Positive Displacement curve is loaded, press the Make Modified Alpha button.**

This will make a copy of the modified alpha/displacement map.

Now that we have created a texture map out of the positive modified alpha we need to do the same thing to create the negative displacement map. We'll use the same process as we did with the positive displacement map.

- **Let's start by reselecting the PzBizMan1 alpha.**

- **Open the Alpha Adjustment curve box and press the Load button. Find the file NegativeDisplacement.ZCV.**

Now that the negative adjustment curve is loaded we can press the Create Modified Alpha button.

- **Select each new map and flip it vertically using Alpha>Flip V.**

ZBrush and Poser use different coordinates for their texture mapping. Flipping the map vertically will ensure that it will work inside of Poser. We'll do this for both maps.

The last thing we need to do is export our displacement maps.

- **Select the positive displacement map and press the Export button located at the top of the Alpha palette. Locate the folder we created earlier titled "BizManDisp". Save the file as PzBizManDisp+.psd.**

- **Now export the negative displacement map and save it as PzBizManDisp-.psd.**

The ZBrush portion of this tutorial is now done.

Step 3: Using the Displacement Map in Poser5

Finally, we have come to the last step of this tutorial. Now we get to go back into Poser and put the displacement maps on our figure. This part should be a cakewalk. I, mean, relatively a cakewalk. LOL

- **Open up Poser and select the Business Man figure. Position him so that his head is in full view.**

I used the face cam to do this.

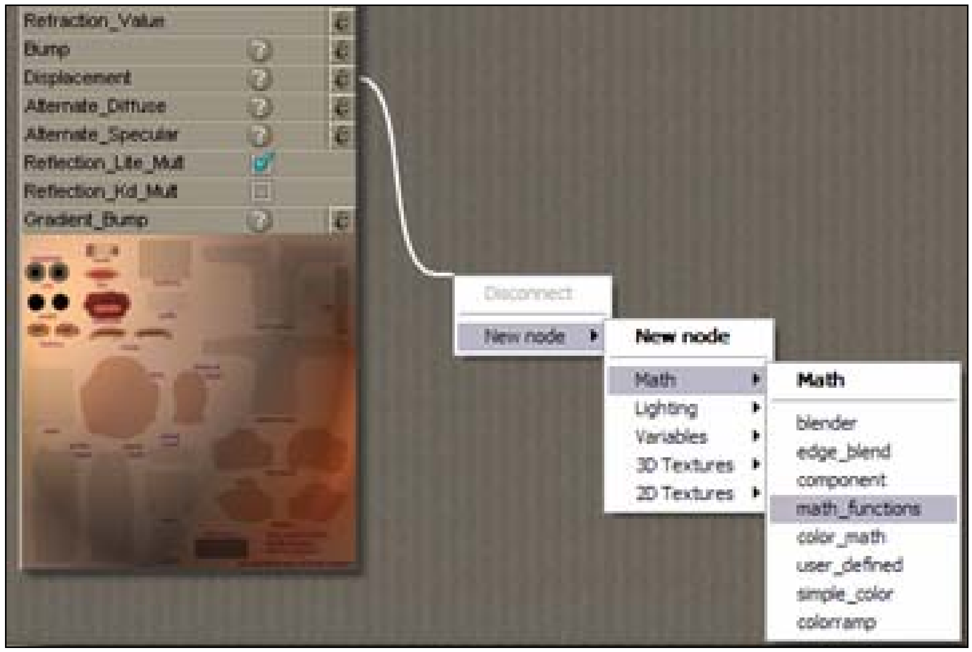
- **Open up the Material room and use the eyedropper to select the head of our figure.**

Using the eyedropper will bring up the nodes for the current skin shader.

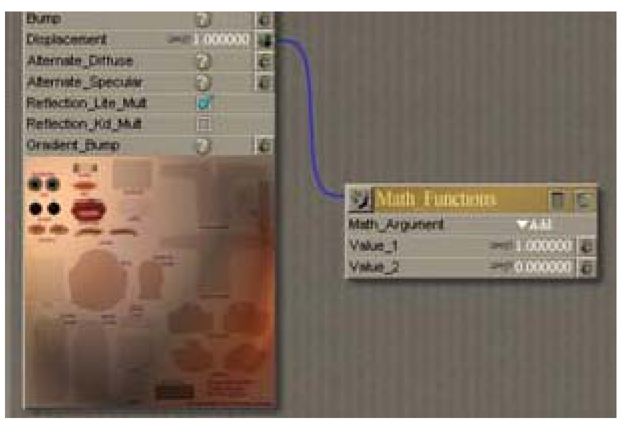
- **Look on the main node titled “Poser Surface”. Towards the middle of it you’ll see the word “Displacement”. Click on the little plug-in icon, drag it out and down a little then release.**

A popup menu will appear.

- **Select New Node/Math/Math_Functions.**

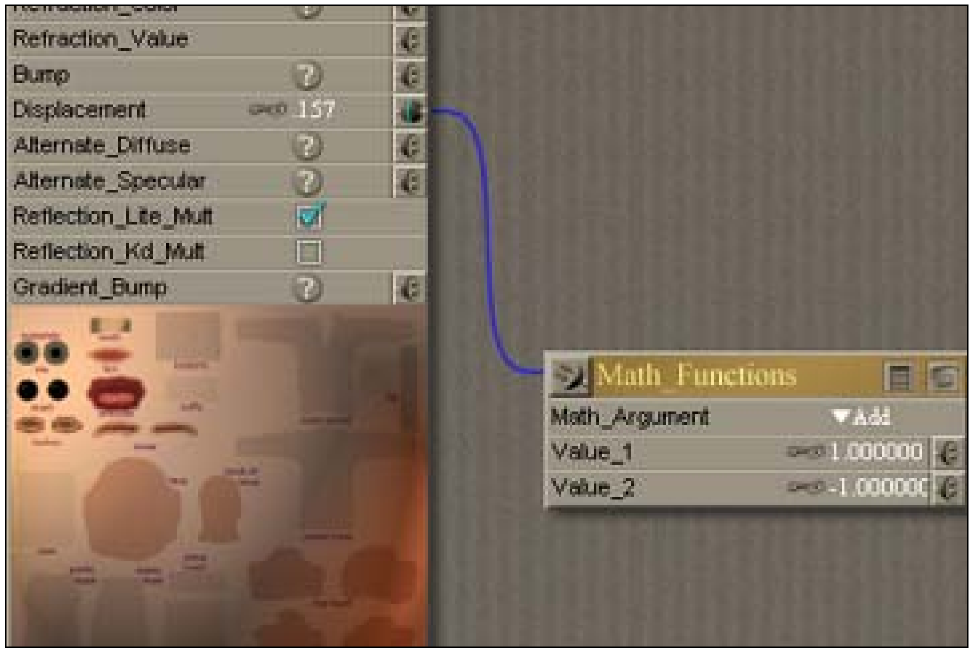


This will bring up a Math Function node. We’ll use this node to blend both the positive and negative displacement maps together.



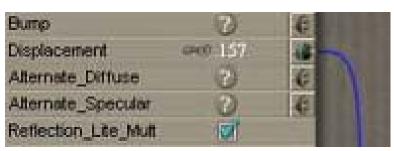
Since we want Value 2 to be negatively displaced we need to change its value to negative one (-1.0).

- **Click on the white numbers next the word "Value_2", type in -1 then click the Enter key on your keyboard.**



The next thing we want to do is set the amount of displacement. In this case it is .157.

- **Click on the values next to the words Displacement on the main Poser Surface node and input the value of .157**



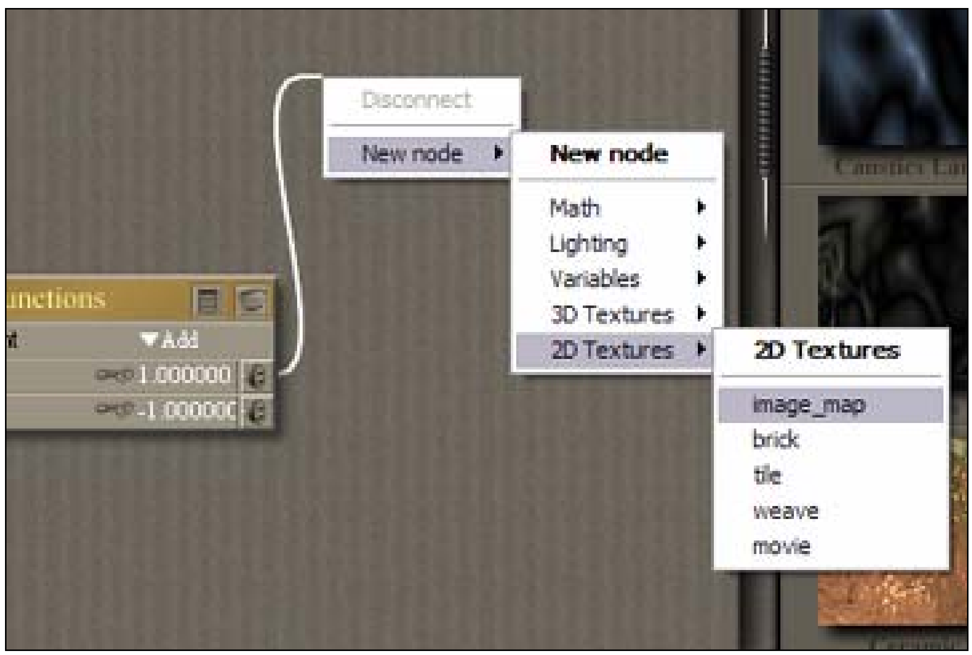
We acquired this value from ZBrush… remember? I know it's not quite the same value; for some reason, the decimal point needs to be moved up one place for Poser to do it correctly. Strange, but if it works, that is all that matters to me. Trust me everyone, everything else in this tutorial really does make sense! LOL

The next thing we want to do is to assign the texture maps to the values of the Math Functions Node. Value_1 is going to be the positive displacement map and Value_2 is going to be the negative displacement map.

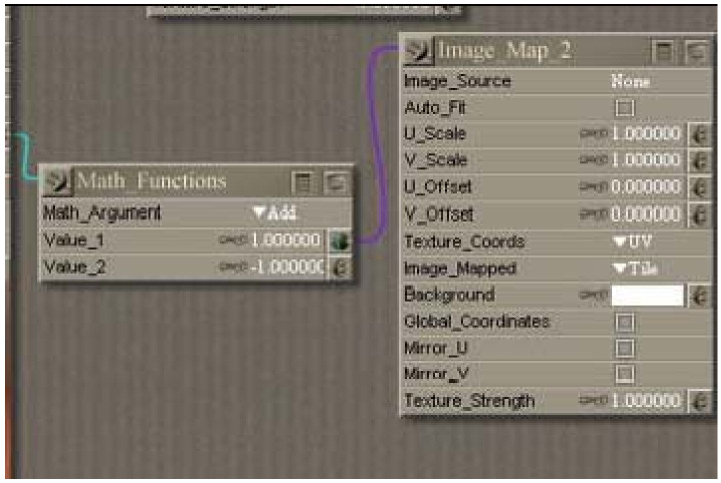
The Math_Argument option located in the Math Functions node will remain at "Add". This will add the two values creating one sum. Or, in other words, this will combine both the positive and the negative displacement maps into one map. Understanding how these nodes work can really open some creative doors and in my opinion makes Poser very powerful at creating realistic shaders. Poser5's Firefly render engine is very nice!

Well, it sure has been a long journey and we are getting very close to the end of the tutorial now, so, marching on. Let's import our displacement maps.

- **First we'll import our positive displacement map. Click and drag out the plug-in icon for Value_1 located in the Math Functions Node. Release the mouse button and select New Node/2D textures/image_map from the popup menu.**



You will now have a new node titled "Image_Map_2". Notice that this node has all sorts of options for your image map.



- **Click the word "None" next to the Image_Source option.**

- **This will bring up a Texture Manager window that will let you browse your PC for the source file. Click on the word "Browse".**

- **Locate the positive displacement map. You will find it in the BizManDisp folder that we created.**

The name of the file is PzBizManDisp+.PSD. Open this file then click the word "OK" in the Texture Manager window. Well, that will do it for the positive displacement map. Next we'll use the same steps as above for the negative displacement map.

- **Click and drag out the plug-in icon for Value_2 located in the Math Functions Node. Release the mouse button and select New Node/2D Textures/image_map from the popup menu.**

You will now have a new node titled "Image_Map_3". Notice that this node has all sorts of options for your image map.

- **Click the word "None" next to the Image_Source option.**

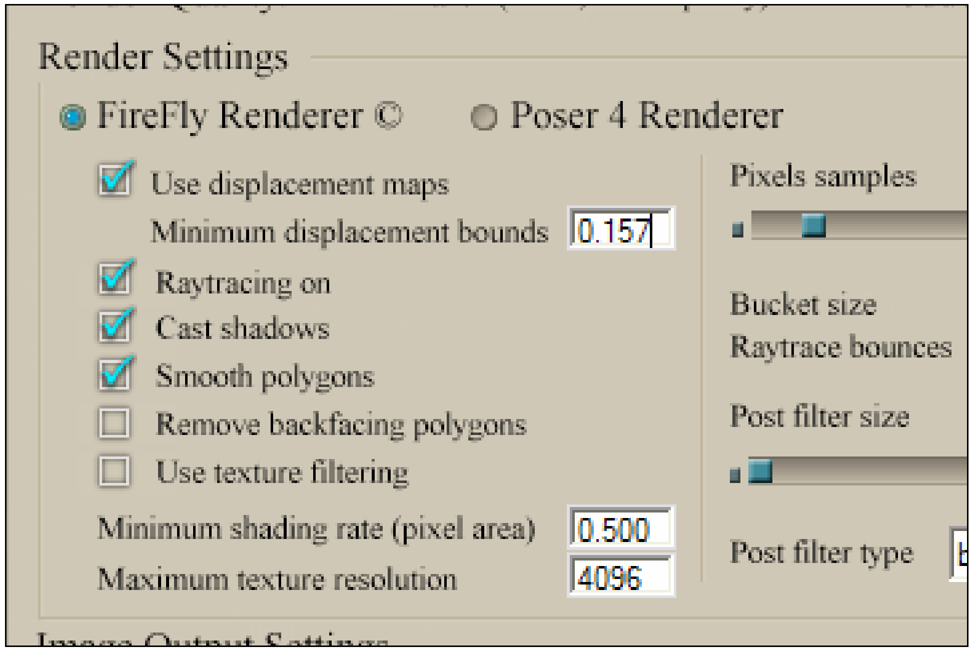
Same as before this will bring up a Texture Manager window that will let you browse your pc for the source file.

- **Click on the word "Browse"**

- **Locate the negative displacement map. You will find it in the BizManDisp folder that we created. Open this file then, click the word "OK" in the Texture Manager window.**

Well, that just about does it. Our displacement maps are now built into the current shader of our figure. All we have to do now is set the render options of the Firefly render engine.

- **Open the Render Options palette located in the bottom of the Render pull down menu.**



- **You can use either Draft or Production quality rendering.**

I chose Production quality.

- **Be sure that you have the FireFly renderer checked and also check Use Displacement maps, Raytracing on, Cast Shadows, and Smooth polygons.**

Using these options will make for a very nice render.

- **See the option called Use Displacement maps, underneath it are the words Maximum displacement bounds. We need to input our Displacement value here .157**

Once again, it is exactly the same value that we used earlier, the Alpha Depth Factor with the decimal dropped one place.

- **And finally, go back into the Pose room and…*gratuitous drum roll please* press Ctrl+R to render the image.**

Look at those beautiful displacement maps!

Well, it's been real fun. I'm sure you will get the hang of it real quick and start creating ultra-high detail displacement maps for your Poser characters. It's really a wonderful technology with amazing potential!

Keyboard Shortcuts

In order to make it as easy as possible to find a particular shortcut, the following list is laid out by palette name.

Alpha Palette (Alt+A)

Color Palette (Alt+Z)

C Selects whatever color is under the cursor
Ctrl+F Fills Layer with currently selected color
V Swaps the foreground and background colors

Document Palette (Alt+O)

Ctrl+O Open a Document
Ctrl+S Saves the Document

Draw Palette (Alt+D)

D Brings up Depth slider at cursor location
I RGB Intensity slider appears at cursor location
Shift+I Z Intensity slider appears at cursor location
L Lock RGB and Z Intensity sliders
S Brings up Draw Size slider at cursor location
ALT While held down, toggles between Zadd and ZSub

Edit Palette (Alt+E)

Ctrl+Z Undo
Ctrl+Shift+Z Redo

(Note that both functions are based on the mode that the user is in. If Transform>Edit Object is active, then will undo or redo the last change to the model. If it is not active, then they will undo or redo the last chnage to the canvas. Some changes, however, cannot be undone.)

Layer Palette (Alt+Y)

Ctrl+N Clears the active layer
Ctrl+F Fills the active layer with the currently selected material and color or texture.
Ctrl+B Bakes the layer shading
Shift+Click On any layer will toggle all layers on or off.
~+Click Selects the layer on which the clicked pixol resides
~+Drag Moves the layer contents. (Equal to Layer>Displace H and Layer>Displace V)
~+Alt+Drag Moves the layer content depth (Equal to Layer>Displace Z)

Light Palette (Alt+L)

Marker Palette (Alt+K)

Material Palette (Alt+M)

Movie Palette (Alt+V)

Ctrl+Shift+G Brings up Grab Frame slider at cursor position
Ctrl+Shift+O Starts continuous recording
Ctrl+Shift+P Plays ZMovie
Ctrl+Shift+W Select a Window
Ctrl+Shift+! Records a single frame

Picker Palette (Alt+I)

Preferences Palette (Alt+P)

F Quick 3D Edit
Shift+F Polyframe mode
Ctrl When Popup Info is turned on, hold down Ctrl to see even more detailed descriptions
Ctrl+Click On a Float Menu item, removes that item from the Float Menu
Ctrl+Drag Pull an item from the interface into the Float Menu. Items can be docked with otther items, or left floating separately
Ctrl+Shift+I Store Interface Configuration
Tab Toggles Float Menu on and off

Render Palette (Alt+R)

Ctrl+R Render area around cursor
Ctrl+Shift+R Render All

Stencil Palette (Alt+N)

Alt+H Turns Stencil on/off
Ctrl+H Hide/Show Stencil
Spacebar Bring up Coin Controller at cursor position

Stroke Palette (Alt+S)

Ctrl+1 Replay last stroke
Ctrl+2 Replay all strokes
Ctrl+3 Record brush strokes

Tablet Palette (Alt+B)

Texture Palette (Alt+X)

Tool Palette (Alt+T)

Ctrl+Shift+T Save the active tool

Transform Palette (Alt+F)

D Go up 1 subdivision level
Shift+D Go down 1 subdivision level
E Scale
Q Draw pointer
R Rotate
T Edit Object
W Move
(Note that the above shortcuts can work be used together. For example, when Edit Object is not active, W will bring up the Move gyro. When Edit Object is active, W will enter Edit>Move mode.)
M Create a marker
Ctrl+M Remove a marker
X X symmetry
Y Y symmetry
Z Z symmetry
Ctrl When Edit Object is active, hold down to paint a mask on the object
Ctrl+G 3D Copy
Shift Constrains object rotation when in Rotate or Edit Object mode
Shift+S Snapshot the current object
Ctlr+Shift Combine with click or drag to control partial mesh visibility.

Zoom Palette (Alt+W)

0 View actual size
+ Zoom In
- Zoom Out
Ctrl+0 Half-Sized, Antialiased view. After doing a best render, use this before exporting to save an antialiased image.
Spacebar+Drag Pans the canvas

ZScript Palette (Alt+Z)

H Show/Hide ZScript window
Ctrl+U Reload a ZScript
Ctrl+Shift+L Load a ZScript
Left Arrow Load last ZScript
Right Arrow Load next ZScript (only works if you have used Left Arrow)
Up Arrow Scroll ZScript Up
Down Arrow Scroll ZScript Down
Esc Halt ZScript execution

Special

Spacebar Brings up QuickMenu at cursor location