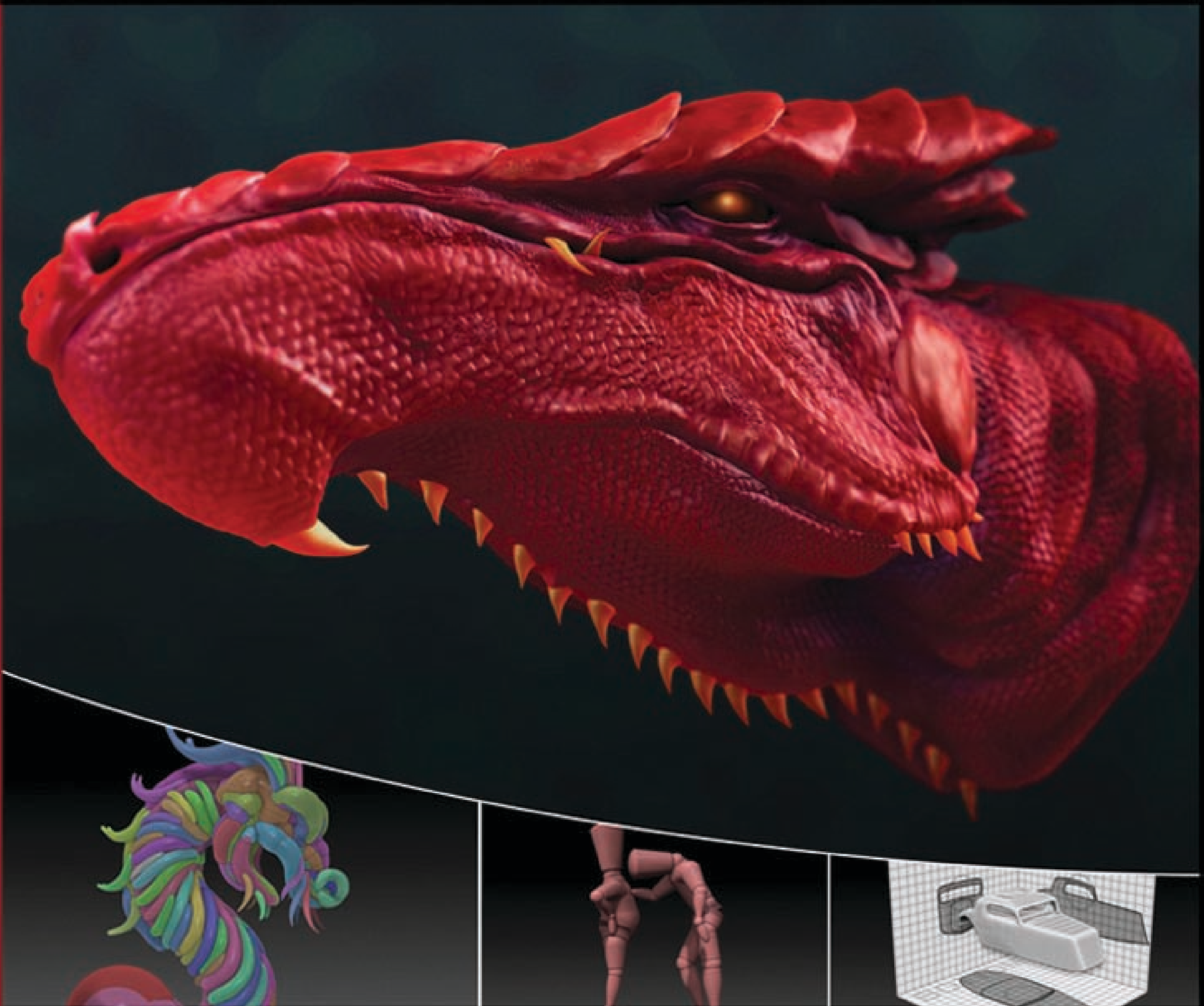

INTRODUCING ZBrush® 4

Eric Keller

Foreword by Scott Spencer

SYBEX | SERIOUS SKILLS.

Introducing ZBrush® 4

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ERIC KELLER

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For Sadhbh and Ruadhan, two dragon riders in training

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About the Author

Eric Keller is a freelance visual effects artist working in Hollywood. He divides his time between the entertainment industry and scientific visualization. He teaches the Introducing Digital Sculpting class at the Gnomon School of Visual Effects in Hollywood and has authored numerous animation and visualization tutorials for the Harvard Medical School course “Maya for Molecular Biologists,” taught by Gael McGill. Eric was hired by Pixologic to create over 20 video tutorials demonstrating the new features of ZBrush 4 and participated in the beta programs for version 3.5 and version 4.

Eric started out as an animator at the Howard Hughes Medical Institute, where he created animations for science education for seven years. In 2005, he and his wife moved to Los Angeles, where he could study and learn from the masters of visual effects. His goal is to bring the artistry and technology of Hollywood computer graphics to the field of scientific research in the hope that it can inspire and inform the scientific community and the general public.

Eric has worked at some of the best design studios in Los Angeles, including Prologue Films, Imaginary Forces, Yu and Company, BLT and Associates, and The Syndicate. Projects include feature film title animations for *The Invasion*, *Enchanted*, *Sympathy for Lady Vengeance*, and *Dragon Wars*. He has also contributed to numerous commercials, television shows, and design projects.

Other books by Eric Keller include *Maya Visual Effects: The Innovator’s Guide*, *Introducing ZBrush, Mastering Maya 2009*, and *Mastering Maya 2011*, all published by Sybex. He was a contributing author to *Mastering Maya 7*. He has authored the video series *Essential ZBrush 3.1* for Lynda.com as well as numerous tutorials and articles for industry magazines. Many of his tutorials are available online at `www.bloopatone.com` and `www.molecularmovies.org`.

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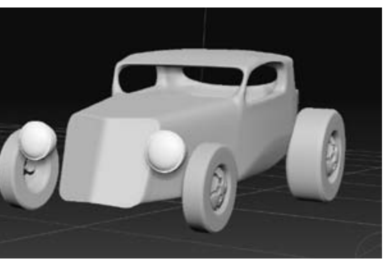
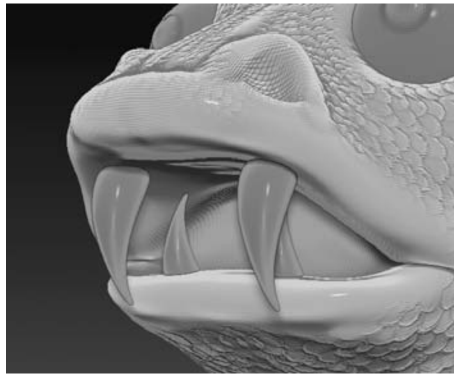




Foreword

Here we are at the second edition of *Introducing ZBrush* by Eric Keller. This one is *Introducing ZBrush 4*. Let me first say it is an honor to be asked by Eric to write the foreword to his exceptional book. I have had the pleasure of knowing Eric for several years now. We first met at the Gnomon School of Visual Effects in Hollywood where Eric has run several successful courses. I have learned much from his experience, and if it were not for his recommendation, I never would have had the opportunity to write my own ZBrush books. Based on Eric's previous titles and his experience as a teacher, I am confident you are in the best of hands with Eric as your guide to this amazing program.

It is amazing to realize that we have already come to the next edition of this landmark ZBrush book. In that relatively short period of time, so many new and exciting things have changed with the program. It seems to me the minds behind ZBrush are continually pressing the accelerator on innovation. Each new point update seems packed to the rafters with groundbreaking features and improvements on various tools. It has come to the point that we seem to expect Pixologic to revolutionize some aspect of the program with each release. If you are new to ZBrush, you are about to experience one of the most unique and liberating programs for artists on the market. If you have worked with previous versions, be prepared to see an entire arsenal of new tools and possibilities!

ZBrush is merely 10 years old, and in just over half that time it has gone from a unique painting program to the industry-standard digital sculpting software. It has changed how we create character models from initial design to final paint and detailing. Not only has Pixologic defined high-resolution brush-based sculpting for the film and game industries, ZBrush has opened up entirely new applications for digital sculpting tools. In the last five years, manufacturing has seen ZBrush enter the scene to be used as a highly effective medium for creating sculptures. Creators of fine art have begun to integrate ZBrush into their creative process. In just the past year, I have used ZBrush to create everything from prosthetic bodies to fine art public sculpture and collectable action figures. Anyone who seeks to become proficient as a sculptor in ZBrush will find they have a staggering number of opportunities to find an application for their skill set!

ZBrush has even gained a foothold in the world of concept design. Many directors are now eager to see their creatures and characters designed in three dimensions rather than on paper. This allows a new level of freedom because they can interactively see the character in 3D space and make changes on the fly. This level of freedom is always appealing to a director who wants to know they have explored every possibility in the design process. It also allows talented sculptors to take part in the initial conceptual phases of the project rather than replicating a completed design from a set of drawings.

This is truly an exciting time to be learning ZBrush, and I can think of no better guide than Eric to lead you into the world of digital sculpting. Eric's many years of experience as a working production artist has made him sensitive to the need for reliable and efficient workflows. He is also an accomplished artist with pixels and pencils. For this reason, Eric's instruction will go beyond how to use the program into how to approach ZBrush with an artist's sensibility. That's what makes each of you reading this book unique. You are all artists, and the vision, experience, and education you each bring to the program is what makes the work shine. ZBrush is a tool to liberate your creative power from the limits of technology. I have taken up too much of your time already—carry on with the path to learning this unique and powerful artist's tool. Enjoy the journey!

— Scott Spencer, character designer and sculptor

Introduction

In 2010, Pixologic celebrated the 10th anniversary of the debut of ZBrush. ZBrush was introduced to the world as an experimental art application with a unique technology that allowed users to create illustrations in two and a half dimensions. I remember seeing the Pixologic booth at a Macworld in New York in the summer of 2000. The booth was small but the presentation was remarkable. I grabbed a demo copy, installed it on my Mac laptop, and played with it on the train ride home from New York. At the time I was primarily interested in 3D modeling and animation, so after Macworld, my focus returned to LightWave and Maya and the demo copy of ZBrush collected dust on my shelf.

I remember reading an article in 2003 in *Cinefex* magazine on the making of *The Return of The King.* The author mentioned that the ghostly character of the King of the Dead, who confronts Aragorn, was created in ZBrush. Within seconds of reading that I was downloading the newer version of ZBrush and working my way through the tutorials. I could not believe that the little 2.5 dimensional painting program I had played with only a few years earlier could have created such an amazingly detailed and realistic character. From that point on I became a ZBrush user. Because much of my work at the time involved creating organic surfaces for animations in the fields of cell biology and medicine, ZBrush seemed to be the perfect solution. For many years before ZBrush, a number of 3D applications promised "digital sculpting"—an interface in which the modeling tools used to create virtual surfaces were so intuitive that it felt like working with clay. ZBrush was the first application to actually deliver this technology.

I was not alone in my realization of the potential of ZBrush. Over the years many other CG artists have discovered that ZBrush is the key to realizing their fantastic visions. Each update to ZBrush has included not only tools but technological innovations that are designed to make computer graphics less technical and more accessible to artists. In version 2 we had ZSpheres, which allowed us to create virtual armatures that could be converted into polygons and sculpted into organic shapes. Version 3 introduced SubTools, which made the task of creating sculptures with multiple, independent parts easy, and the sculpting brushes, which can be used to intuitively sculpt details into the surface. Version 3.5 introduced ZSketching, a process where strips of virtual clay are painted onto an armature and smoothed and sculpted into organic forms.

Version 4 is the newest release, and with it comes the most advanced tools yet. Shadowbox is a volumetric sculpting interface that generates a mesh at the center of a cube based on the profiles that you paint on the sides of the cube. Spotlight is an image editing and projection tool that can be used for advanced texturing effects. Numerous new brush types have been developed specifically for hard surface sculpting. A new rendering method has been added to give you the ability to render transparent surfaces, ambient occlusion shadowing, and subsurface scattering without the need to send your sculpts to another 3D application.

ZBrush version 4 has doubled the capabilities of the previous version, giving you a wide variety of approaches that you can apply to any sculpture that you can imagine. ZBrush 4 is a virtual sculpting studio. And this advanced and experimental technology is intended for artists. The tools are so new and so powerful that I had to completely rewrite this book (and I was happy to do so). The original version of this book, published in 2008, was written for beginners, even artists who had never touched computer graphics software before. It was a pretty good overview of the basics of illustrating and sculpting in ZBrush. This edition has also been written with the absolute beginner in mind. This book focuses primarily on the digital sculpting aspects of ZBrush with less emphasis on 2.5 dimensional painting techniques. This is because digital sculpting has become the most popular use of ZBrush.

The types of artists using ZBrush have changed in the past year or so. I have noticed that the students who take my Introduction to Digital Sculpting class at the Gnomon School of Visual Effects in Hollywood are not just interested in using ZBrush to design characters for feature films, broadcast, and video games. Recently, jewelry designers, toy sculptors, visual effects and environment designers, matte painters, illustrators, and fine art artists have all been joining the ranks of the growing army of ZBrush artists. I have tried to write this book so that the widest possible audience can adopt ZBrush into whatever discipline they currently practice.

This book is about getting you up to speed as quickly as possible so that you feel comfortable using the software. Hopefully, after reading this book you'll be eager to move on to more advanced instruction, such as the books recently written by my friend and mentor Scott Spencer. These include *ZBrush Character Creation: Advanced Digital Sculpting* and *ZBrush Digital Sculpting Human Anatomy.*

A variety of tools and techniques are described and the demonstrated using simple subjects such as fantasy dragons and a cartoon car. As you go through the exercises in this book, you should start to see that there are many ways to approach a particular problem. Over time you'll discover the approaches that you like the best, and by adopting them and perfecting them, you'll develop your own style of ZBrush art.

Who Should Buy This Book

This book is written for users who are new to ZBrush as well as new to digital sculpting. If you've never used ZBrush before, this book is meant for you. If you have used older versions of the software, you may find that this book brings you up-to-date with the newest developments. ZBrush has changed a lot in recent years so you'll find that even if you feel somewhat experienced as a user of older versions, there's a lot of new stuff in this edition. If you are a user of similar software, such as Autodesk Mudbox, this book will help you easily make the transition to ZBrush.

If you've never used digital art software before, you should still be okay with this book. However, you do need to be comfortable using a computer. This book can't help you solve problems that exist outside of the software itself. You should be comfortable working in your operating system. You need to be familiar with opening and saving files and the like. It is helpful to understand something about other image editing and painting programs such as Adobe Photoshop and Corel Painter.

Some sections of this book deal with working with other 3D applications such as Autodesk Maya and Luxology's Modo. However, if you don't intend to use ZBrush with other applications, you can skip these sections.

This book assumes that you are using a digital tablet and stylus while working in ZBrush. It's not absolutely necessary to have a tablet when using ZBrush, but it will make your life a lot easier. Using ZBrush with a mouse is like sculpting clay while wearing mittens.

What's Inside

Most of the lessons in each chapter are accompanied by example scenes from the DVD included with the book. In addition, bonus movies are included to help illustrate some aspects of the examples in the text of the book.

Chapter 1: Digital Art Basics An overview of the fundamental concepts of working with computer graphics. Concepts such as resolution, color depth, compression, and anti-aliasing are explained. Also, some of the history behind ZBrush as well as special ZBrush technology such as the pixol is introduced.

Chapter 2: Facing the ZBrush Interface A tour of the ZBrush interface. This chapter is very important for understanding how to get around in ZBrush. Even if you have used older versions of ZBrush, it's a good idea to read this chapter so that you understand the changes that have been made as well as how to find the controls for newer features.

Chapter 3: Basic Digital Sculpting This chapter is meant to get you started with your first basic digital sculpt. The subject for the first exercises is a simple fantasy dragon head.

Chapter 4: SubTools, ZSpheres, and ZSketching This chapter introduces the concept of SubTools, which allow you to create complex sculptures that use multiple independent parts. The chapter also demonstrates how to create a simple Chinese-style dragon using ZBrush's unique ZSphere tool. Finally, you'll learn how to use the extremely intuitive ZSketching brushes to create complex organic sculpts quickly and easily.

Chapter 5: ShadowBox and Clip Brushes ShadowBox is a brand new ZBrush innovation that is perfect for creating hard surface models. In this chapter, the exercises demonstrate how to use ShadowBox to create the body of a hot rod. The clip brushes are another new feature that can be used to create hard edges on a surface. In this chapter, you'll see how to use clip brushes to clean up the surface of the hot rod body.

Chapter 6: Remesh and Projection In this chapter, you'll learn how remeshing can be used to generate a new surface based on your exiting sculpt. Projection is a way to transfer detail from one surface to another. The ZSphere mannequins are used in this chapter in conjunction with remeshing and projection to create a body for the dragon.

Chapter 7: Advanced Brush Techniques This chapter takes a detailed look at how the sculpting brushes in ZBrush work. You'll learn how to design your own custom brushes to accomplish specific tasks and effects. You'll learn how to save the brushes for use on future projects.

Chapter 8: Polypainting and SpotLight Polypainting is used to apply color detail to surfaces. In this chapter, you'll learn techniques for painting realistic color on a dragon's head. The new Spotlight image editing and projection interface is introduced as well.

Chapter 9: Rendering, Lighting, and Materials In this chapter, you'll learn how to create dramatic lighting and realistic materials that can be applied to your sculpture. You'll learn about the new BPR rendering technology, which can be used to add effects such as transparency, ambient occlusion, and subsurface scattering. These all make your models look spectacular.

Chapter 10: Morph Targets, Layers, and the ZBrush Timeline ZBrush 4 adds new animation capabilities to ZBrush. In this chapter, you'll learn how these features can help you test models designed for animation in ZBrush, store and animate camera views, record your ZBrush sessions, and create animated turntable movies. You'll see how layers can be used to create variations of your model's shape and color.

The following material is available in PDF format on the book's companion DVD:

Bonus Content 1: GoZ GoZ is a ZBrush plug-in designed to make it easier to send models from ZBrush to other animation programs such as Autodesk Maya, 3ds Max, Luxology's Modo, and Maxon's Cinema 4D. You'll also learn how to create texture, normal, and displacement maps for your ZBrush models.

Bonus Content 2: ZScripts and ZPlugins ZBrush has a number of free plug-ins available that can automate common ZBrush techniques and extend the capabilities of existing ZBrush tools. This chapter demonstrates how to install the free plug-ins and includes descriptions of the more commonly used plug-ins.

> The companion DVD is home to all the demo files, samples, and bonus resources mentioned in the book. See the Appendix for more details on the contents and how to access them.

How to Contact the Author

I enjoy hearing from the readers of my books. Feedback helps me to continually improve my skills as an author. You can contact me through my website, `www.bloopatone.com`, as well as see examples of my own artwork there.

Sybex strives to keep you supplied with the latest tools and information you need for your work. Please check the book's website at `www.sybex.com/go/introducingZBrush`, where Sybex will post additional content and updates that supplement this book should the need arise.

CHAPTER 1

Digital Art Basics

Any experienced artist knows that the composition of the tools they use—the chemistry of the paint, the ingredients of the clay—affects the quality of a finished work of art. When you are learning to become an artist, you spend a great deal of time studying how the tools behave. It is the same with digital art. This chapter reviews the fundamentals of digital art. Just as an oil painter needs to learn how the mixture of pigments and oils works with the canvas, a digital artist needs to learn how color depth, channels, file formats, and other elements factor into the quality of a digital masterpiece.

This chapter includes the following topics:

- **An introduction to ZBrush**
- **Understanding digital images**
- **Understanding 3D space**
- **Being a digital artist**

An Introduction to ZBrush

Imagine walking into a fully stocked artist's studio. Inside you find cabinets and drawers full of paints and brushes, a large canvas, a closet full of every type of sculpting medium imaginable, a lighting rig, a camera, a light box, a projector, a kiln, armatures for maquettes, and a seemingly infinite array of carving and cutting tools. On top of this everything has been neatly arranged for optimal use while working. This is ZBrush, a self-contained studio where you can digitally create paintings and sculptures—and even combinations of the two. Furthermore, you are not limited to what you find in ZBrush. Digital 3D models and 2D textures can easily be imported from other applications and used as tools within ZBrush. ZBrush can function as a self-contained digital art workspace or as an integral part of an animation production pipeline.

The most common use of ZBrush is for creating and editing digital models that are then animated and rendered in other 3D packages, such as Autodesk's Maya and 3ds Max, Maxon's Cinema 4D, and Luxology's Modo. Artists choose to create and edit models in ZBrush to use in another package because the unique technology behind ZBrush allows them to work with very dense models (literally millions of polygons) to create a stunningly rich level of detail on organic surfaces in a way that traditional 3D packages just can't. Fine wrinkles, fleshy folds, pores, bumps, scales, scars, and scratches can be easily sculpted into the model and then exported either as part of the geometry or as bump and displacement textures that can enhance the geometry of a model when the model is rendered in another package. The result is often an amazing level of detail and realism built into a virtual object (see Figure 1.1). Colors can also be painted directly on the model in ZBrush in an intuitive fashion and then exported as texture maps for use in shaders applied to the same model in other 3D packages. Production pipelines at studios such as ILM, Gentle Giant, Weta, and Sony Imageworks have used ZBrush in this way to create many of the characters, monsters, and set pieces seen in such films as *The Lord of the Rings*, *Pirates of the Caribbean*, and *Sky Captain and the World of Tomorrow*.

Figure 1.1
A highly detailed ZBrush model

In the past few years, ZBrush has become adapted for use in areas beyond animation and effects. These days artists are using ZBrush as a tool in the production of toys, game characters and environments, and scientific visualization; in jewelry design and concept design; and even to help in the creation of physical sculpture.

Artists are using ZBrush to design models on computers and then translating them into physical versions via 3D printing technology. As the 3D printing process becomes more common and less expensive, one can imagine how ZBrush can easily be integrated into a desktop fabrication pipeline in the near future.

ZBrush can also be used for the creation of digital illustrations: The program has digital sculpting and painting tools as well as its own unique rendering technology. Within ZBrush, artists can create custom virtual materials, which can be procedurally designed or captured from digital images. These materials can be applied to an artistic composition and, when rendered, react to virtual lights and shadows. Many artists have taken advantage of the flexible workspace and powerful tools to create amazing ZBrush compositions. In addition, ZBrush works very well with other 2D paint programs, such as Adobe Photoshop and Corel Painter. Digital 3D models and 2D images can be exported and imported freely between these programs, so there is no limit to what can be achieved when ZBrush is incorporated into the digital artist's toolbox.

Understanding Digital Images

Now let's take a brief look at several ways digital imagery can be created on a computer and displayed on a monitor. Computers display digital images using colored squares known as *pixels*. This section reviews the basics of working with pixels and related issues.

Anatomy of a Pixel

A pixel is a colored square that appears on the screen at a specified position—pretty simple, at least to begin with. A raster graphic is an image made up of thousands of pixels. A pixel is imbued with a certain amount of color and position information that is stored in memory. If you load a rasterized graphic into a digital viewing program and then scale the image up (or zoom in), you can actually see how the image is composed of these pixels (see Figure 1.2).

A digital image file stores the positional information of these pixels in terms of x- and y-coordinates. The y-coordinate is the vertical position and the x-coordinate is the horizontal position. It may seem obvious, but it's important to note that when you zoom in or scroll around on a digital image in the software, the position and size of each pixel changes relative to the screen. However, the software still needs to remember the position and size of each pixel relative to the digital image that is being viewed. You should be aware of this fact, but don't spend too much time thinking about it now; that's your computer's job.

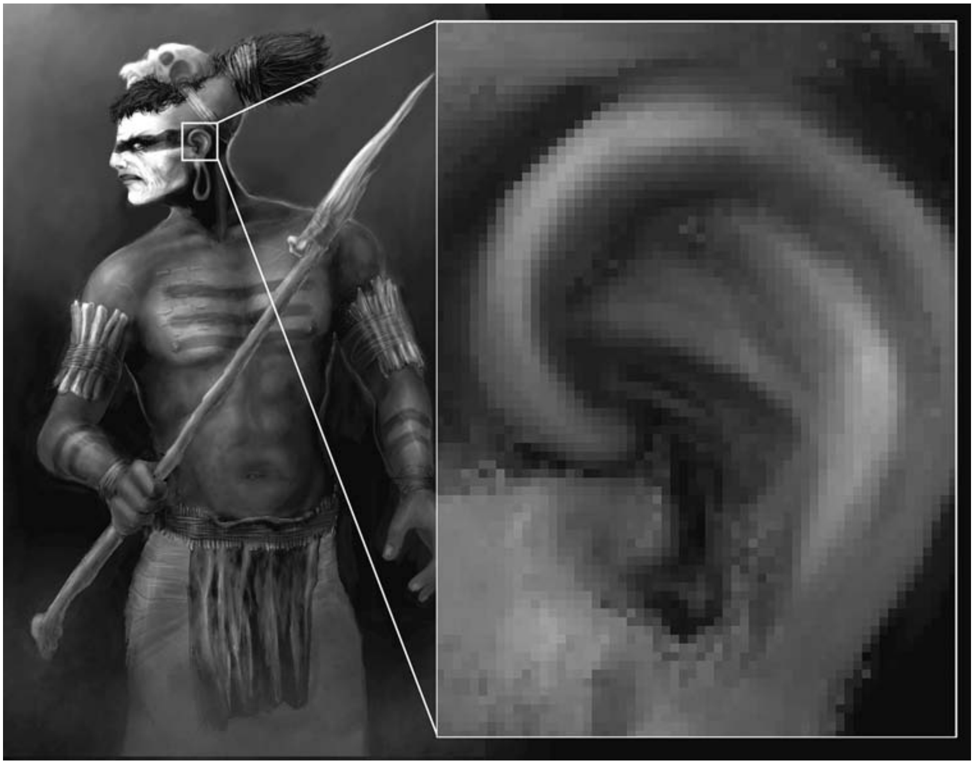


Figure 1.2
A digital painting created in Corel's Painter. The region around the figure's ear is enlarged to show how the picture is composed of thousands of tiny squares called pixels.

Creating Smooth Images with Anti-Aliasing

Aliasing refers to the situation in which a curving line or shape displayed on a computer screen appears jagged. This is because the image is composed of tiny squares. To correct this problem, graphic software employs *anti-aliasing*, which smoothes the edges of curving shapes by blending pixels along the edges with other pixels of similar hue but varying degrees of lightness or opacity. This fools the eye into perceiving the edges as being smooth.

In Figure 1.3, the letters in the word *jagged* appear jagged because the square pixels are visible along the curving edges of the letters; this image is *aliased*. The letters in the word *smooth* appear smooth because of the blending technique that mixes pixels of varying lightness along the curving edges of the letters. The image is *anti-aliased*.

Channels and Color Depth

Along with positional data, the pixel stores information about how to display colors. A computer screen creates color by mixing red, green, and blue light. If a pixel is 100 percent red mixed with 0 percent blue and 0 percent green, it looks red. If a pixel is composed of 50 percent red with 50 percent blue and 0 percent green values, the pixel will look purple. When all three values are 0 percent, the pixel is black, and when all three are 100 percent, the pixel is white.

Color depth refers to how much color information is stored for each pixel in the image. A grayscale image discards all color information except for black, white, and the range of gray in between; this usually comes out to 256 shades of gray. The result is a black-and-white image, like the images in this chapter. Since color information is limited to the 256 shades of gray, the image file has less information that needs to be stored.

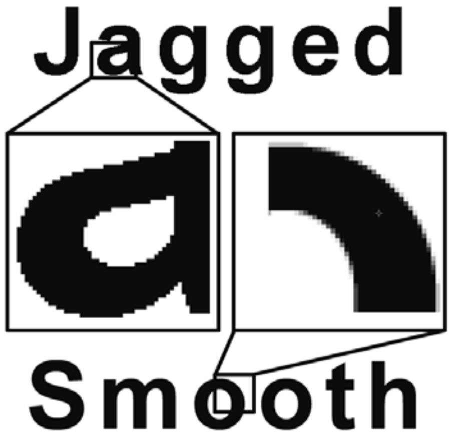


Figure 1.3

The letters in the word jagged are aliased. The letters in the word smooth are anti-aliased.

If you have studied painting, you may have learned that the primary colors are defined as red, yellow, and blue. The secondary color green, for example, is created when blue is mixed with yellow. This is true for paint but not so for colors created by a lighted computer screen. As far as computers are concerned, red, green, and blue are the primary colors. Red and green mixed together produce the secondary color yellow.

An RGB image stores red, green, and blue information. The information is divided into three channels (red, green, and blue) and each channel stores the values (or percentage) of red, green, and blue for each pixel. To see a demonstration of how this works, follow these instructions to view the RGB values of various colors using ZBrush's color chooser:

Figure 1.4

The numbers in the R (red), G (green), and B (blue) fields indicate the values for the red, green, and blue channels.

1. Start ZBrush.
2. Click Color on the menu bar to open the Color palette.
3. Drag your cursor around in the color selector area (see Figure 1.4).
4. Observe the changing R, G, and B numeric values below the color area. These values change depending on the mixture required to create the selected color. Notice that the highest value possible for each channel is 255 and the lowest is 0 (see Figure 1.4).
5. Click on the R, G, and B sliders to select them and type in numeric values. Set R to 255, G to 0, and B to 255. The resulting color is a bright fuchsia.

An image in an RGBA format has an additional, fourth channel known as the *alpha channel*. The alpha channel stores information on the opacity of individual pixels. This allows for an image to have regions of transparency. The left side of Figure 1.5 shows a basic scene rendered in a 3D program; the floating spheres are transparent. The right side of Figure 1.5 shows the alpha channel. White areas are 100 percent opaque and black areas are 100 percent transparent. The gray areas show the amount of transparency.

Color depth refers to how much information is used for each of these color channels. Computers use bits to store information. A bit is a series of 1s and 0s (known as binary because there are only two options, 1 and 0). A 24-bit RGB image uses 8 bits of information for each channel (3 × 8 = 24). Each 8-bit channel stores a range of 256 shades of color, allowing for an image to have a total of 16 million colors. A 32-bit RGBA image uses an additional 8 bits for the alpha channel.

The more bits you have, the more information you can store, and with more bits, the image can be displayed using a wider range of color. More memory is required to store and work with higher-bit images. An image that uses 16 bits per channel (48 bits total for an RGB image, 64 bits for RGBA) can be confusingly referred to as a 16-bit image (as in a 16-bit TIFF or 16-bit SGI).

Beware. This is not the same as a 16-bit or high color image that uses about 5 bits for each channel. Welcome to the confusing world of computer terminology. You will get used to these kinds of conflicts with some experience. Although computers are strictly logical, the humans that create and use them are not always so! If you are working as an artist in television or film production, you will be using 16-bit (per channel) images much more often than 16-bit (5 bits per channel) high color images.

Figure 1.5
The left side of the image shows the combined RGB channels; the right side shows the alpha channel.

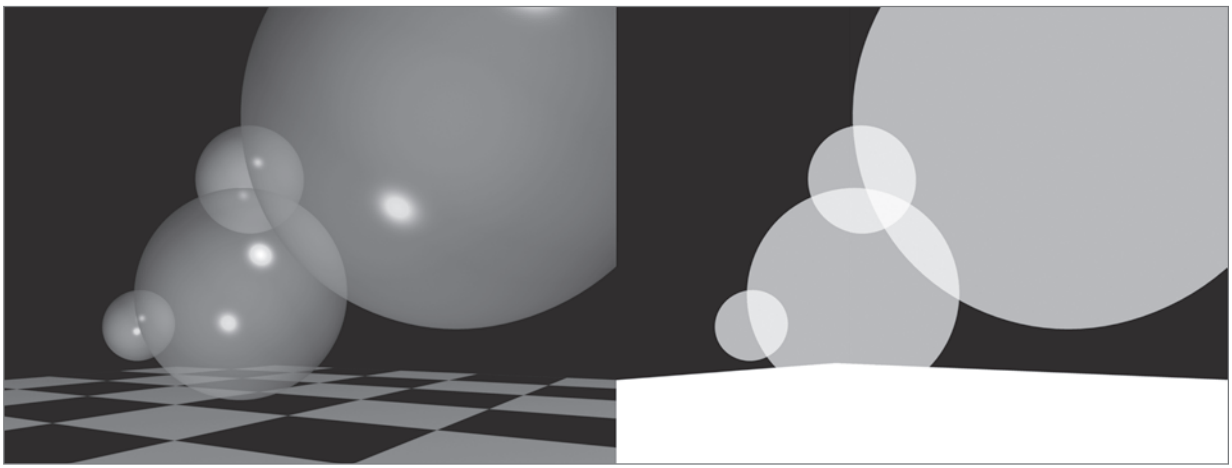


Image Formats

A digital image can be stored in a number of ways, known as formats. A format is simply the arrangement of information in a file. Typical image formats include Tagged Image File Format (TIFF), Joint Photographic Experts Group (JPEG), and Graphics Interchange Format (GIF).

Many programs have their own native document format. Photoshop can read many file formats but also has its own Photoshop Document (PSD) format. Likewise, Corel's Painter stores special information in a format called Resource Interchange File Format (RIFF). ZBrush has its own ZBR document format.

An image format can be compressed to conserve storage space. Some image formats have compression built in (such as JPEG and GIF), and some can exist with or without compression (such as SGI, or Silicon Graphics Image). Compression usually affects the quality of the image. If you look closely at a JPEG image from a typical website using a browser, you may notice that it is blurry or grainy or that the colors are not quite right. Image quality has been sacrificed to allow faster download for viewing images over the Internet.

When the quality of an image is diminished by the compression, it is said to be a *lossy* compression format. There are also *lossless* compressions that can reduce the size of an image without significantly affecting quality. These formats, such as Portable Network Graphics (PNG), result in file sizes that are larger than those for which lossy compression is used. Compression applied to sequences of images is also used for video.

In Figure 1.6, the image on the left is uncompressed and the image on the right is compressed. Look closely and you can see the distortion, known as *artifacts,* in the image on the right. This distortion is especially apparent in the squirrel's fur and on the edges of the fence posts.

Figure 1.6

The image on the left is uncompressed; the image on the right is compressed.

Understanding file formats and compression will become important as you work with computer graphics, not only with respect to images you create and share in ZBrush, but also with textures and alphas created in ZBrush and used on 3D models in other programs. If you use a compressed image as the source for a texture used to color a model or as a tool for sculpting, the resulting model can suffer due to low image quality. In addition, some 3D applications and rendering engines will prefer some formats more than others, which is important to understand when you export images created in ZBrush for use in other software packages. These aspects of working with images in ZBrush will be covered in more depth later in this book.

Vector Images

As stated earlier, computers can also use vectors to create digital images. A vector graphic is created from formulas and mathematical calculations performed by the computer and its software. The results of these calculations are smooth lines and shapes that are often filled with colors. Vector graphics are continually drawn and updated when the image is scaled, moved, or rotated, so the graphic is always of the same quality no matter what its size and position.

Adobe Illustrator and Adobe Flash are popular vector graphic programs. Vectors are used in a modeling interface to represent 3D objects in 3D packages such as Maya and 3ds Max, and these packages have special rendering engines that can create vector graphics as final output as well. You can't create vector images in ZBrush, so I'll end the discussion of vectors for now.

Understanding Resolution

It is hard to overstate the importance of understanding resolution when working with ZBrush. Unfortunately, computer resolution is kind of a tricky concept. There's a lot of confusing terminology as well as different types of resolution and different ways to measure and calculate resolution. This is a topic that I will revisit often throughout this book, so don't panic if you haven't mastered completely the concept of resolution by the end of this section.

Simply put, resolution refers to the density of information within a given area. Most often in computer graphics, resolution is applied to the number of pixels that can be squeezed into a portion of the screen. However, it can also refer to the number of polygons or points squeezed into part of a 3D model. The resolution of your computer screen can determine how the resolution of your images is displayed and created. In addition, when you apply a 2D image texture to a 3D model, the pixel resolution of the 2D image and the polygon resolution of the 3D model must be taken into account or the results achieved may be somewhat disappointing. You do this kind of work a lot in ZBrush, thus resolution is something you must always keep in mind.

Screen Resolution

Let's start with screen resolution. The computer you use to create your ZBrush images and models no doubt has a computer monitor attached to it (if not, your career in computer graphics may be getting off to a rocky start). The monitor displays text and images on the screen. Screen resolution refers to the number of square-sized pixels that appear on the screen, and this is measured horizontally and vertically. The physical size of the screen itself is usually described in diagonal terms. A 22-inch monitor refers to a screen size that measures 22 inches from one corner diagonally to the opposite corner.

Your particular screen should be able to display text and images in a number of different resolutions. The current resolution is set in the operating system's control panel or system preferences. Screen resolution is described in the number of pixels available horizontally times the number of pixels available vertically. Some typical resolutions include 640 × 480, which used to be the common standard in the old days when monitors were smaller; 720 × 486, which is the standard for broadcast television in the United States; and 1920 × 1080, which is used for high-definition television (HDTV).

Screen resolution will affect how ZBrush looks on your screen. When you have your screen set to a low resolution, less space is available to display both the ZBrush interface and the documents. This is one reason why computer graphics artists will invest a great deal of money on the largest computer monitor they can afford or even use two monitors connected to the same computer.

Document Resolution

Next, let's look at document resolution. In the earlier discussion on pixels, I mentioned that when you zoom in on a digital image using a graphics program, you can see the individual pixels that make up the image. Now, the actual pixels that display the image on the screen do not get any larger or smaller, and you do not affect the resolution settings in your computer's hardware. Rather, the graphics program allows you to see a visual representation of the image at a higher magnification than the document's native resolution.

If you take a document that is 320 × 240 in size and set the magnification to 200 percent, the document is now shown at 640 × 480 and each pixel on the document is using four times as many computer monitor pixels. Thus it looks blocky. Likewise, when you zoom out, or shrink the document, half the number of pixels is displayed. Zooming in and out of a document is a useful feature for graphics programs. It can allow you to work on the fine details of an image. But of course, here is where things get tricky: Because of the ability of computer software to zoom in and out of an image, document resolution can be different than screen resolution. When working with computer images, you must always keep in mind the resolution of your document regardless of how it appears on the screen.

Dots per inch (dpi) is typically used to describe document resolution (sometimes referred to as ppi or pixels per inch), even in countries such as France that have long used the metric system. An image that is displayed on a computer monitor at 100 percent of its resolution is usually 72 dpi. An image destined for the printed page needs to be at a higher resolution, at least 300 dpi and often between 600 and 1200 dpi for commercial printing.

Image Resolution

When speaking with 3D texture artists, you'll often hear terms like *2K texture map* thrown around. What they mean is an image that is 2048 pixels × 2048 pixels. The term *2K* means two thousand to normal people, but to computer graphics artists, 2K = 2048. This is because most texture images are set to a resolution that is a power of 2. Thus 1K = 1024 (2^{10}), 4K= 4096 (2^{12}), and 512 (2^9) means, well, 512 × 512.

Images of these sizes are always square, as long as you're talking to texture artists. However, if you walk into a production facility and they ask you to render an animation at 2K and you give them a square 2048 × 2048 image sequence, they may quickly toss you out the door. Why? Because to production people, 2K actually means 2048 pixels × 1556 pixels, which is not really 2K at all (or even square for that matter). In this context, 2K is shorthand for *2K Academy*, which is a standardized resolution for film. Again, not terribly logical or consistent terminology, but it all comes down to context. Since this book is focused on ZBrush, I'll be talking the language of texture artists. So 2K means 2048 × 2048. If and when you move to animation software such as Maya, you may need to be aware that 2K means different things to different people, depending on the context. The safest bet is to get the people you're talking with to be specific about what they want. Geeks love jargon, but it's more often a hindrance than a help.

> Some computer professionals use K as shorthand for kilobyte, or Kb, which refers to the actual storage size of a file on disk—yet another level of confusion.

Aspect Ratio

Aspect ratio refers to the dimensions of the image size as a ratio. When you create an image at 320 × 240 or 640 × 480, the aspect ratio is 4:3. If the aspect ratio is 16:9 or 1.85:1, the image size is widescreen. A typical 16:9 resolution is 1280 × 720. This is something you may be more concerned with when rendering an animation for final output from an animation package such as Maya. In ZBrush, aspect ratio may enter the conversation only when you're creating a composition that could be used as a matte painting in an animation or for another purpose.

Polygon Resolution

Finally, resolution can also be used to describe the number or points or polygons that make up a 3D model. I'll discuss polygons in more detail later on in this chapter, but for now you should understand that the surface of a 3D model is composed of geometric shapes defined by three or more points (polygons in ZBrush are restricted to three or four points, but in other modeling programs polygons can have more points). The polygons of a model can be subdivided, which increases its smooth appearance and allows for a higher level of detail to be sculpted into the surface.

In ZBrush, a model can consist of millions and millions of polygons, as you can see in Figure 1.7. Because of the special way ZBrush handles memory, these high-resolution models can easily be edited with much less of a performance slowdown than would be experienced using other 3D applications. Furthermore, ZBrush stores many levels of subdivision resolution within a single model file, so you can raise and lower the resolution of the 3D geometry while you are working as well as export the same model at several different resolutions for use in another 3D animation package.

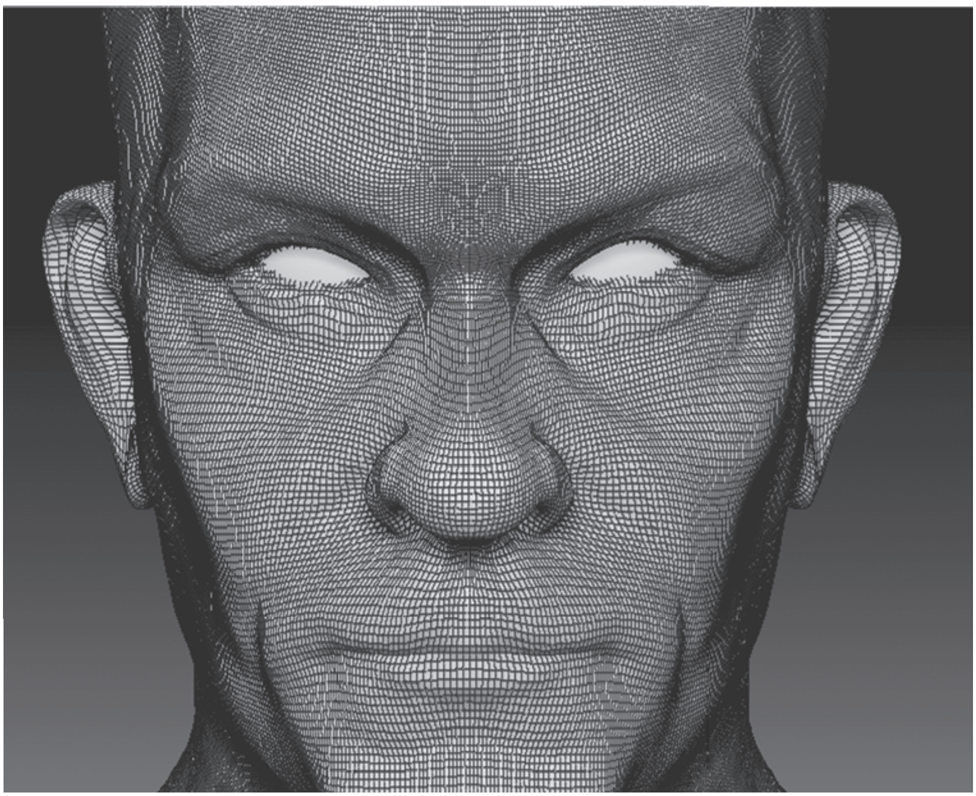


Figure 1.7

A high-resolution model in ZBrush. The lines on the surface show how the model consists of thousands of square polygons.

This ends our introduction to the concept of resolution. Rest assured that this topic will be popping up again throughout this book!

Understanding 3D Space

In a typical 3D software package such as Maya, 3D space is defined in terms of x-, y-, and z-coordinates. The horizontal dimension is usually described by the x-axis, vertical space is usually defined by the y-coordinates, and depth is usually defined by the z-coordinates (some packages reverse the meaning of the y- and z-axes). In Maya, the virtual world contains a grid. It's also crucial to understand that a point in 3D space, such as an individual vertex on a piece of 3D geometry, has an absolute position in the 3D world. The absolute position of a vertex in 3D space is defined using "world space" coordinates. It also has a position relative to the object it is part of; the relative position of a vertex in 3D space is defined using its "local space," or "object space" coordinates.

Think of it this way: You are wearing a pointy party hat. The point at the very tip of the hat exists in the world at the top of your head; the world space y-coordinates of this point is very high relative to the points that make up the rest of you. At the same time, the object space y-coordinates of the tip of the hat are also very high relative to the rest of you. However, if you decided to hang upside down while wearing the party hat, the world space coordinates of the tip of the hat would now be lower than the world space coordinates that make up the rest of you. Yet, in terms of object space, we understand that the tip of the hat is still the very top of the object, even when the hat is upside down. This is based on how we understand the object and its purpose in the world. If you were to model that hat using 3D modeling software, you would understand that the tip of the hat is the top, even when you rotate the hat upside down. The 3D software also keeps track of these ideas using the two sets of coordinates—world and object (see Figure 1.8).

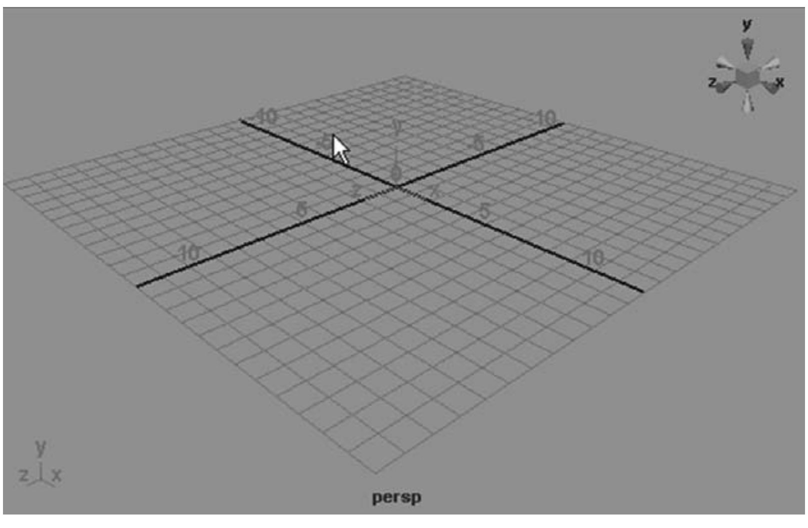


Figure 1.8

A typical 3D modeling environment: The grid and the 3D compass help the artist keep track of x-, y-, and z-coordinates in virtual 3D space.

Anatomy of a Polygon

There really is no such thing as a 3D object in computer graphics. Unless you are working with rapid prototyping machines that can fabricate a physical object based on data stored in a virtual 3D file, you will always be working with two-dimensional representations of three-dimensional objects on a computer screen. (Subsequent editions of this book will no doubt have to deal with rapid prototyping as the technology becomes cheaper and more accessible to artists. For now it's safe to say you'll mostly be dealing with what you see on a 2D screen.)

When we speak of 3D, we are using shorthand that assumes we are talking about a 3D virtual object that exists on a 2D screen. A typical digital painting program such as Photoshop plots pixels horizontally and vertically, along the x- and y-axis respectively. A 3D program stores information with additional coordinates along the z-axis, which gives the virtual image depth. A virtual object existing in the 3D space of the software is made of polygons. The polygons give the object a surface that can be deformed, translated, and animated.

A polygon is a geometric shape defined by three or more points (points are also referred to as vertices); examples of polygons are shown in Figure 1.9.

> ZBrush restricts the polygons to three or four points, but other software packages can have polygons with any number of vertices. This is important to remember when importing objects from another package into ZBrush. ZBrush will automatically split an n-sided (more than 4-point) polygon into 3- and 4-point polygons (or quadrilaterals) when it is imported.

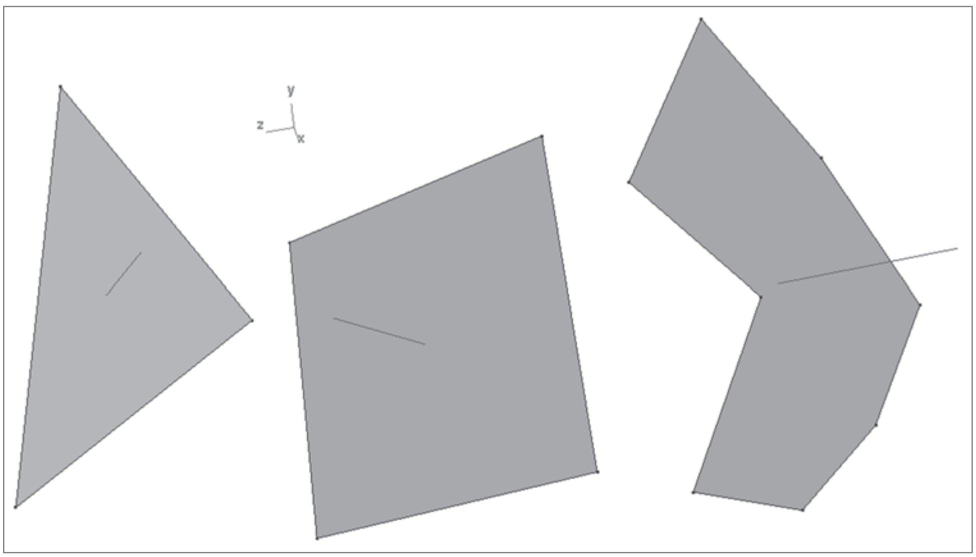


Figure 1.9

An image of a 3-point, 4-point, and n-sided polygon as displayed in Autodesk's Maya.

In other programs you may encounter other types of 3D geometry, such as NURBS (which stands for non-uniform rational basis spline) and subdivision surfaces. These are converted at render time to triangle-shaped polygons by the rendering engine; thus polygons are the standard currency of 3D software. When it comes to 3D models, ZBrush works only with polygon geometry.

As was discussed in the section titled "Understanding Resolution," the number of polygons an object has will affect how smooth the surface appears and how much detail can be modeled into that surface. The resolution of a 3D object is also referred to as its *density*. ZBrush is programmed in such a way that a 3D object can have millions of polygons and an astonishing level of detail while still maintaining a high level of response on the computer during the sculpting and editing process. This is what allows the ZBrush artist to feel as if they are sculpting digital clay in a very intuitive and artistic fashion.

> ZBrush does not actually use the Open Graphics Library (OpenGL) specification when it displays 3D objects on the screen. Pixologic has developed its own protocols for 2D and 3D images based on the *pixol*. This means that ZBrush is free from the polygon limits imposed by the OpenGL standard. It also means that ZBrush is not dependent on the power of your machine's graphics card. Instead, ZBrush requires a fair amount of RAM (a gigabyte or more) and lots of free hard disk space. For this reason ZBrush runs quite well even on a decent laptop.

A polygon appears in ZBrush as a shaded shape with three or four vertices. A virtual 3D object is made up of adjacent polygons that form the surface. (In ZBrush, the term *3D tool* is used to refer to a 3D object; the reason for this is explained in Chapter 2.) The surface of a polygon has an inside and an outside. The information regarding which side of a polygon faces out and which side faces in is known as the polygon's normal. A 3D tool made up of millions of polygons has millions of normals that describe how the surface appears when it reacts to virtual light and shadow (see Figure 1.10).

Normals are an important aspect of working with polygon geometry. Information about the direction of normals on a dense object can be stored in a special texture known as a normal map. Rendering engines for 3D software and video games can make a lower-density version of the same model appear to have more detail than its geometry will allow by using a normal map to help shade the object. ZBrush is an extremely popular tool in the gaming industry because of the ease with which normal maps can be created and exported from the software.

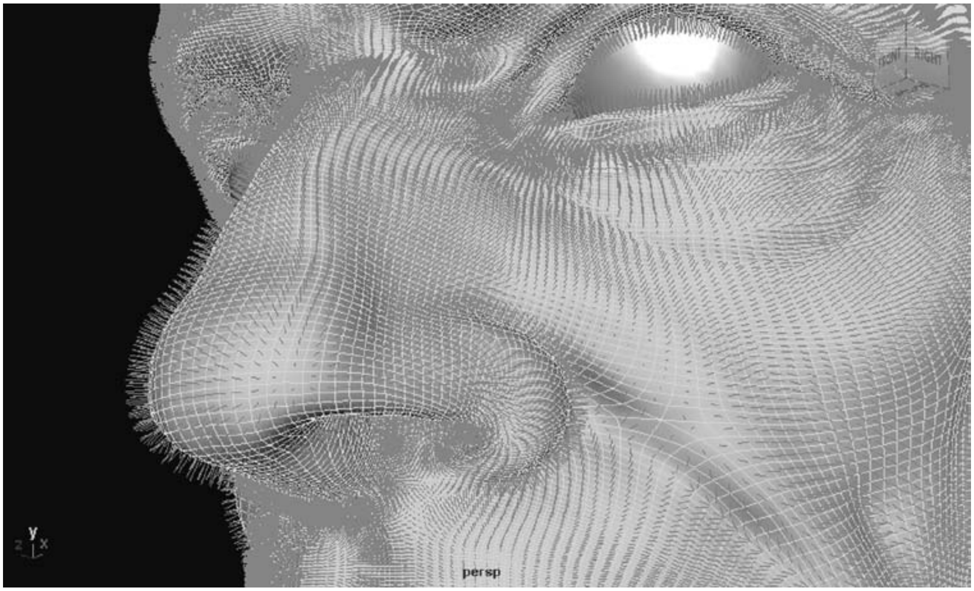


Figure 1.10
An image of a model in ZBrush with its normals visible. The normal is displayed as a line that shows which side of the polygon is pointing "out."

Pixols versus Pixels

As was stated earlier, an image created in a typical digital painting program is usually composed of thousands of pixels. A pixel is a square that contains information about color, transparency, and its location along the x- and y-axis. The unique innovation of ZBrush is the pixol, which is like a pixel with added information about its location along the z-axis. In other words, a pixol contains depth information as well as color, transparency, and x and y positional data (see Figure 1.11). Furthermore, the pixol also stores information on the material applied to it. This means each pixol knows how to react to the lighting, shading, and the environment of a ZBrush composition when it is rendered.

When Pixologic first introduced ZBrush, it began as a paint program that could create images in two and a half dimensions (known as 2.5D). A brush stroke in ZBrush is painted on the canvas and can then be rotated, scaled, and positioned anywhere on the canvas. This explains why the ZBrush interface does not use the typical 3D world with separate cameras and lights like you'll find in other 3D programs. Everything exists on a canvas. ZBrush added 3D objects that could be incorporated into 2.5 dimensional compositions as well as materials and lights that added shadow, reflections, and occlusion. Subsequent versions of ZBrush refined the sculpting tools and improved the portability of 3D objects with animation projects, which led to the overwhelming popularity of ZBrush as a digital sculpting program.

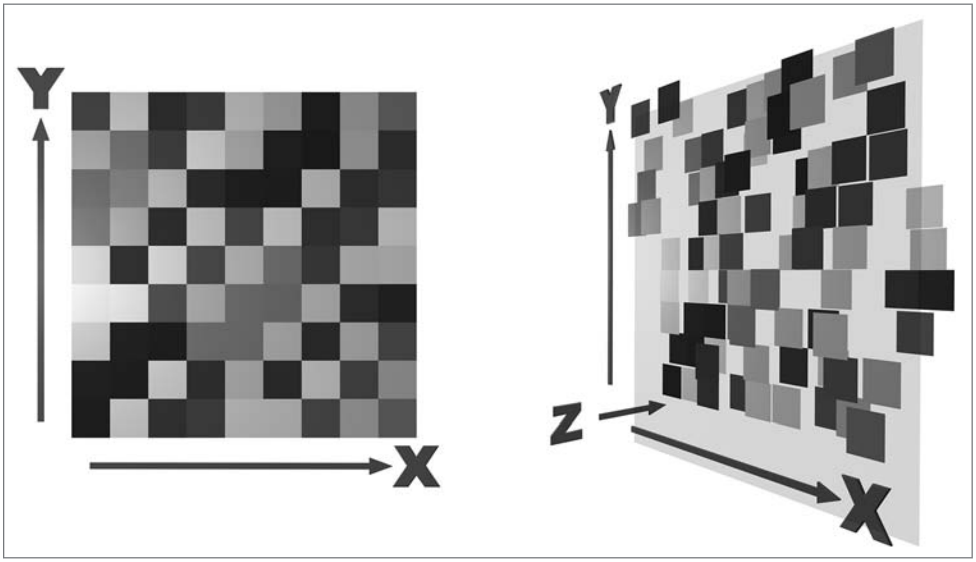


Figure 1.11
The left side of the diagram shows how standard pixels work using x and y information; the right side shows how pixols also store z-depth information.

If you're mostly concerned with sculpting 3D models, you may not worry too much about pixols, but it's good to have an awareness of what this term refers to, and it will help you understand the behavior of a model on the ZBrush canvas. If you'd like to create digital illustrations in ZBrush, then an understanding of pixols can become a powerful tool.

Being a Digital Artist

There is nothing inherent in the computer or the software that will turn you into a great artist. Becoming a good artist still must be achieved the old-fashioned way—through hard work, practice, and study. Nine times out of ten, when you see some jaw-dropping, amazing piece of digital art in an Internet forum or as part of a film, the artist who created it has spent a fair amount of time studying traditional art. Even if the artist has never held a real paintbrush, they still have studied what it takes to make a great work.

This book is concerned with making you feel comfortable using ZBrush. There will not be much discussion on the fundamentals of art or sculpting. That said, you should understand that composition, balance, positive and negative space, lighting, anatomy, form, and silhouette are just a few of the concepts a real artist (digital or traditional) must master. I strongly encourage you step away from the computer monitor, pick up a pencil or a brush, and attend some life drawing classes. Likewise, working with digital clay is much more meaningful if you've spent time sculpting with actual clay. Your digital artwork will reveal much about who you are as well as how much time you have taken to study and explore traditional art techniques and the natural world.

Resources

This book is just the beginning. While working through the exercises in this book on your way to mastering the ZBrush interface and its tools, you should also take the time to explore more using the resources on this list. In addition, *ZBrush Character Creation, Second Edition*, by Scott Spencer (Sybex, 2011) picks up where this book leaves off. His book will incorporate a deep level of understanding of the art of digital sculpture and the concepts behind creating great artwork into more advanced ZBrush topics and lessons.

The two most valuable sources for information regarding ZBrush are Pixologic's website (`www.pixologic.com`) and ZBrushCentral (`www.zbrushcentral.com`). You can check out `www.pixologic.com` for the latest information on updates, plug-ins, and new features for ZBrush as well as artist interviews and free video tutorials in the ZClassroom section. ZBrush users gather at ZBrushCentral to post their work, critique the work of fellow artists, ask questions, solve problems, and share their enthusiasm for ZBrush. Feel free to visit the site, create a free account, and post examples of your work. The members of ZBrushCentral come from all over the world and represent all ages and skill levels (see Figure 1.12).

Figure 1.12

ZBrushCentral is an online community for ZBrush users of all skill levels.

Here is a list of useful websites:

`www.pixologic.com`

`www.zbrushcentral.com`

`www.zbrushworkshops.com`

`www.cgchannel.com`

`www.gnomon3d.com`

`www.gnomononline.com`

`www.digitaltutors.com`

`www.lynda.com`

`www.3d.sk`

`www.conceptart.org`

`www.figuresandfocus.com`

I recommend the following books:

- *ZBrush Character Creation, Second Edition*, by Scott Spencer (Sybex, 2011)
- *The Artist's Complete Guide to Facial Expressions* by Gary Faigin (Watson-Guptill, 1990)
- *Constructive Anatomy* by George Bridgman (Dover, 1973)
- *Bridgman's Life Drawing* by George Bridgman (Dover, 1971)
- *Artistic Anatomy* by Dr. Paul Richer (Winston-Guptill, 1971)
- *Anatomy for the Artist* by Sarah Simblet (DK Publishing, 2001)

And finally, the Gnomon workshop has a large number of DVDs devoted to ZBrush as well as an excellent series of clay maquette sculpture DVDs by John Brown. These can be ordered online at `www.thegnomonworkshop.com`.

CHAPTER 2

Facing the ZBrush Interface

From the moment the ZBrush interface appears, its creative potential is obvious. Few other digital art packages boast such an elegant working environment. The ZBrush interface may seem a little intimidating, but once you grasp the philosophy behind the design, you'll find that it is a comfortable place for digital sculpting and painting.

This chapter walks you through the ZBrush interface; it's much like a tour of an artist's studio. If on a real studio tour, an artist pointed out various objects and tools without an explanation, you might get pretty frustrated. On the other hand, the artist could never adequately explain every tool in a short amount of time.

The situation is the same with this chapter. There's a lot to cover in the interface and only so much space to do it. In this interface tour, I will try to strike a balance between explaining where the ZBrush tools are and explaining what they do. The rest of the book will provide deeper explanations about the tools and interface features. To get the most out of this chapter, you may want to have ZBrush at the ready. There are a few exercises to help you make sense of all the information.

This chapter includes the following topics:

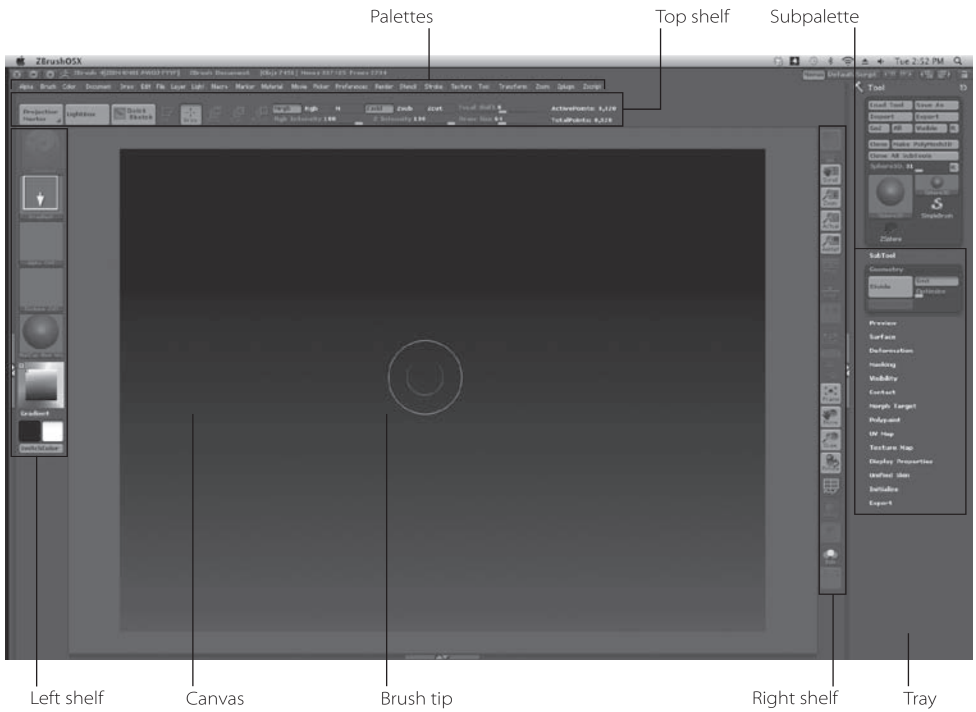
- **The ZBrush canvas**
- **The organization of shelves**
- **Palettes**
- **Using trays**

The Zen of ZBrush

If you've never done any 3D modeling or animation, you might actually be able to approach ZBrush with a slight advantage over someone who has spent a lot of time in programs such as Maya, 3ds Max, or XSI. This is because the tools in ZBrush are very different from the typical 3D modeling and animation tools. If you are an experienced 3D modeler, you may panic a little bit at the fact that ZBrush does not use a typical 3D space environment. Either way, the best thing to do when you first open ZBrush is to shed your preconceived ideas of how a 3D program is supposed to work. In fact, don't think of ZBrush as a 3D modeling program, a paint program, or even a texturing program. Instead, step back for a moment and accept the essence of ZBrush. It is a digital sculpting and painting workshop.

Figure 2.1 shows the ZBrush interface in all its glory. Our tour of the interface will start at the center and move outward, from left to right in a clockwise fashion.

Figure 2.1
The ZBrush Interface



The ZBrush Canvas

Let's start with the center of the interface; the canvas, and then work our way outward. Breaking the interface down like this will help to make it more accessible. The canvas is shown in Figure 2.2.

The canvas is the square that dominates the center of the program. It is where you create your art, whether it is a digital painting or a three-dimensional digital sculpture or any combination of paint strokes and sculpture. The canvas has some special properties that are part of what makes ZBrush so different. It's quite obvious from the outset that the canvas has height and width, which we refer to as the y- and x-axes. The ZBrush canvas also has a depth axis, or a z-axis. Hence the name, ZBrush. When you use a tool to paint a brush stroke on the canvas, you can move it backward and forward in space, placing it in front of or behind other brush strokes. The default gradient you see on the canvas is meant to suggest the depth dimension in the canvas.

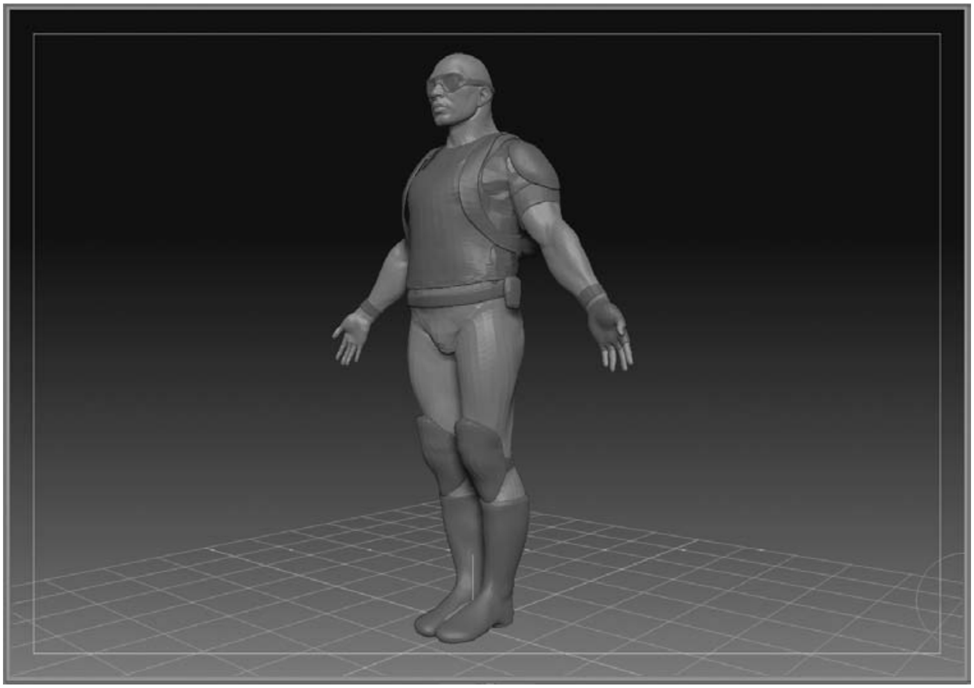


Figure 2.2
The ZBrush canvas is where you create your digital paintings and sculptures.

The canvas can be thought of as a place to create digital illustrations using digital brush strokes, or it can be thought of as a virtual sculpting stand where you can mold a lump of digital clay into anything you can imagine. And, in fact, the canvas can also be used to integrate your sculptures into your illustrations.

An illustration created on the canvas is referred to as a ZBrush document. Documents can be saved in the special ZBR format or exported in a number of other formats, such as the Adobe Photoshop format. A digital sculpture created on the canvas is referred to as a mesh or a 3D tool. You can save sculptures in the special ZTL format or export them in a number of 3D model formats, such as OBJ or Maya ASCII (`.ma`). And new to ZBrush 4, you can now save your document, tool, and many other elements all in a single file called a ZProject. ZProjects use the ZPR file format. As we continue the tour, I'll point out how to save documents, 3D tools, and ZProjects.

> **INTERFACE LAYOUT AND COLOR PRESETS**
>
> ZBrush ships with a number of interface layout and color presets. These allow you to change the look of the interface and rearrange the tools to fit your working style. You can change the colors and the layouts by clicking the buttons in the upper-right portion of the interface (shown below). To keep things simple, for this book I'm using the default interface layout, which is how ZBrush looks when you start the program. To make the images easier to see in
>
> 
>
> the black-and-white figures of this book, one of the lighter interface color presets has been selected.

Light Box

Light Box is a visual display of the files within the Pixologic directory structure of your computer's hard drive. The purpose of Light Box is to allow you to easily load the files you need to work on your ZBrush creations without having to navigate through your operating system's browsers. Light Box keeps all the files you need at your fingertips, whether they are the sample files that ship with ZBrush or your own creations.

To open Light Box, move the mouse pointer to the bottom of the screen; you'll see a light box appear (see Figure 2.3) Or click on the Light Box button at the top left of the interface. The name Light Box is meant to suggest the light tables photographers use when examining collections of their photographic negatives.

Figure 2.3
The Light Box interface appears as a strip when you move your mouse pointer to the bottom of the interface.

The menu at the top of Light Box is a link to the directories within the Pixologic folder on your computer's hard drive (in Windows, this folder is inside the `Program Files\Pixologic` directory; in Mac OS, this folder is in the `Applications/Pixologic` folder). The headings within Light Box link to the `ZBrushes`, `ZTools`, `ZAlphas`, `ZMaterials`, `ZTextures`, and `ZProjects` folders.

If you click on the Project link, you'll see an icon that represents each of the files within the `Pixologic\ZProjects` folder. If you save your own file to this folder, you'll see it appear in this strip under the Project heading the next time you bring up Light Box. Likewise, saving a file to the `ZTools` folder will make it appear under the Tool heading in ZBrush. You can drag the icons on the strip left or right to see all of the files in the `Project` folder. To do this, click on the space between two tool icons and drag to the left.

To load a file, double-click (or quickly double-tap your stylus on your digital tablet) on an icon. Try double-clicking on the `DemoSoldier.ZPR` icon to load this project onto the canvas.

If you'd like to search the contents of the folder displayed in Light Box, type a search term in the field at the top, next to the menu bar in the LightBox interface. Try typing in **Default***. Adding the asterisk will tell ZBrush to search for all files in the `Project` folder that start with `Default`. Click the Go button or press the **Enter/Return** key to start the search. You'll see the icons change so that now only the `DefaultCube.ZPR` and `DefaultSphere.ZPR` files appear (see Figure 2.4).

Figure 2.4

You can search for files within Light Box by typing text in the search field.

You can change the height of the Light Box display by clicking one of the four stack icons at the far right of the Light Box menu. The icons within Light Box will automatically rearrange themselves to fit the new height. This is useful when you have a lot of files in the folder.

The New button at the far right lets you stack an additional Light Box strip on top of the current one. Using this feature, you can have a number of Light Box strips open, each one displaying the contents of a different folder. Try clicking the New button and then switch to the `Tool` folder. Add a third strip and open the `Brush` folder (see Figure 2.5).

To remove a strip, just click the Close button.

Figure 2.5

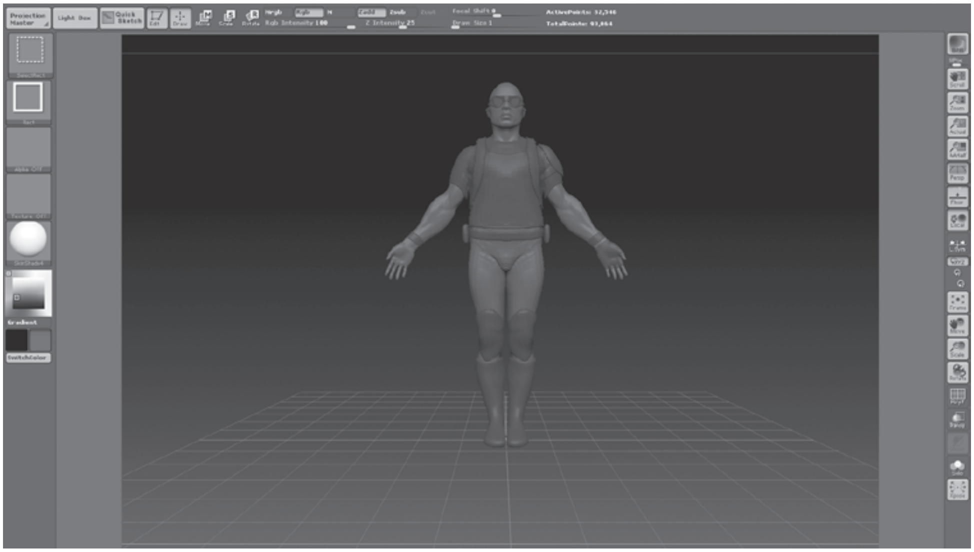
Additional Light Box strips can be added by clicking the New button. Each strip can display the contents of a different folder.

> **ADD FOLDERS TO LIGHT BOX**
>
> To add a folder to Light Box, you can create a shortcut for one of your own folders anywhere on your hard drive and then place the shortcut within the `Pixologic` folder. On the Macintosh, a shortcut is called an alias.

The ZBrush Shelves

On the top and either side of the canvas are *shelves* that hold the ZBrush buttons and controls (see Figure 2.6). We'll explore these shelves by moving from left to right around the canvas.

Figure 2.6
Shelves with various buttons and settings surround the ZBrush canvas on the left, top, and right.



The Shelf on the Left

The left shelf has buttons that open fly-out libraries of items that you will access often in a typical ZBrush editing session. The fly-out libraries (from the top of the left shelf, moving down) consist of the sculpting brushes, the stroke types, the alphas, the textures, the material shaders, the color picker, and the color 1 and color 2 swatches.

> **IN-LINE HELP**
>
> If you forget what a button or control in ZBrush does, you can hold the **Ctrl** key down while your mouse pointer hovers over the button in question. A little text box will appear with some explanatory notes about what the button does.

The sculpting brushes are a used for editing 3D meshes. To use these brushes, the mesh must be in Edit mode, otherwise the icon for the sculpting brushes is grayed out and the fly-out library of brushes is inaccessible. We'll go into detail about how to activate Edit mode and what it means to be in Edit mode later in this chapter. For now, follow these steps so that you can see the contents of the sculpting brush library:

1. Move the mouse pointer to the bottom of the interface to open Light Box.
2. Click the Project link.
3. Double-click the DemoSoldier.ZPR icon.

   This loads the DemoSoldier mesh onto the canvas. The mesh is in Edit mode already, so the Sculpting brush icon on the left shelf should be available.
4. Click the brush icon to open the sculpting brush fly-out library (see Figure 2.7)

Figure 2.7
The fly-out library of sculpting brushes

As you can see, there are a lot of sculpting brushes. The fly-out library is filled with the presets that come with ZBrush. These are used to shape, pose, and detail your meshes. In Chapter 3, "Basic Digital Sculpting," you'll learn the basics of using the brush presets, and throughout the book you'll gain insight into how you can make and save your own custom brush presets.

As you hold the mouse pointer over one of the icons, you'll see an enlarged view of the icon below the fly-out sculpting brush library. The name of the brush will appear along with information about its base type. Each preset is a variation of a few base brush types.

You can reduce the list of brushes in the fly-out library by typing the first letter of a brush name while the fly-out is open. Try typing **C**. All of the icons in the Brush palette will be dimmed except the ones that start with the letter *C*. As you learn the names of your favorite brush types, you can take advantage of this method of searching the fly-out brush library to quickly switch brushes. You'll notice that many brushes have two capital letters, such as ClayLine. If you type **C** and then **L** while the brush fly-out is open, the fly-out library will close and the brush icon on the left shelf will switch to the ClayLine brush. This is the only brush that has *C* and *L* capitalized in the name.

LIGHT BOX BRUSH LIBRARY

You probably noticed that there is a link called Brush in the Light Box interface. This is a link to a folder of even more brush presets! These are presets that Pixologic created and then decided could not fit into the fly-out library but included with ZBrush nonetheless. To load one of these extra brushes, just double-click its icon in Light Box and it will then appear in the brush library and remain there until you quit ZBrush.

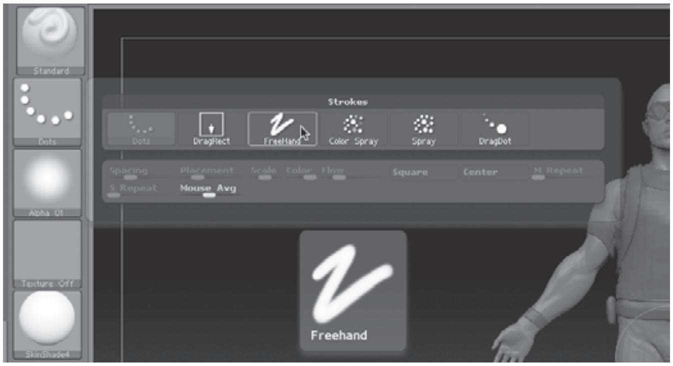


Figure 2.8
The fly-out library of stroke types

To continue with our tour of the left shelf, underneath the brush library you'll find the stroke type fly-out library.

The icon displayed for stroke type will be different depending on the current active sculpting brush. This is because the stroke type modifies the behavior of the current brush. If the Standard brush is loaded as the current active brush, the dots icon will appear as the current stroke type. Hover the pointer above the button to see an enlarged view of the current stroke type and click the button to open the fly-out library (see Figure 2.8). There are a few different stroke types available. The sliders at the bottom of the stroke type library change depending on the currently selected stroke type. The stroke type can be changed for the current brush by choosing one of the other stroke type icons. As you'll see in Chapter 3, you can greatly affect the way in which a brush behaves by choosing a different stroke type.

The icon below stroke type is the icon for the alpha fly-out library. If the Standard brush is chosen as the current sculpting brush, the alpha will appear as a fuzzy white dot with the label BrushAlpha. Hold the mouse pointer over the icon to see an enlarged view of the alpha. Click the icon to open the fly-out alpha library (see Figure 2.9). Alphas are grayscale images loaded into ZBrush. They can be used for many purposes, but most often they are used to add effects to sculpting brushes. Think of the different

Figure 2.9
The fly-out library of alphas

nozzles added to cake decorating tools to change the shape of frosting as its applied to the top of a cake. This is the basic concept behind alphas. At the bottom of the alpha fly-out library you'll see buttons that, among other things, enable you to import and export your own, custom alphas. To select a different alpha for the current brush, just click one of the icons in the library. I'll be discussing the many uses of alphas as well as how they work in great detail through the book.

Below the alphas fly-out button you'll see the textures fly-out library. When the Standard brush is selected as the active brush, you'll see no image and the label Texture Off, meaning no texture is applied to the current brush. Textures, like alphas, are simply two-dimensional image files, but unlike alphas, textures are color images. Hover the mouse over the texture icon to see an enlarged view (in this case, since the texture for the Standard brush is off, there is just a blank icon), and click the textures button to see the inventory of texture presets that come with ZBrush. When the fly-out library is open you can hover the pointer over a texture to see an enlarged view appear above the library (see Figure 2.10). Clicking again on the icon changes the current active Texture.

Figure 2.10
The fly-out library of textures

Textures have many uses. For instance you can apply a texture to a sculpting brush and use the colors of the texture to paint on your models. You can also convert the colors of a 3D model into a texture, which can then be exported for use in other 3D software packages. At the bottom of the library you'll find buttons for importing and exporting textures as well as for other specific functions. Just as with alphas, we'll be revisiting the many uses of textures throughout the book. I'll go into detail about working with textures in Chapter 8, "Polypainting and Spotlight."

At this point you're probably getting a good idea of how the buttons on the left shelf work; they all give you easy access to commonly used libraries. The last fly-out library is the material presets. Hover the mouse pointer over the materials icon to see a preview of the material as it looks on the current 3D mesh. Click on this to see the materials fly-out library (see Figure 2.11).

Figure 2.11
The fly-out library of materials

Materials determine the surface quality of the objects on the canvas. For example, a material might affect the shininess or the roughness of a surface or how the surface reacts to light effects on the canvas. Some materials add color to objects as well. As you hover the mouse over each of the icons in the materials fly-out library, you'll see a preview of the current 3D object in each of the materials. Click one of the icons to switch materials. Materials can be applied to the entire object at once or painted on specific areas using the current sculpting brush. Materials are explained in detail in Chapter 9, "Rendering, Lighting, and Materials."

Figure 2.12
The color picker

On the left shelf, below the materials library button, you'll find the color picker. This is not a fly-out library; instead, it's a mini-interface that allows you to choose different colors for a variety of uses in ZBrush. As you hold the mouse over the color picker, you'll see text that displays the RGB (red, green, and blue) values for the currently selected color (Figure 2.12).

The color picker has one square within another. You select the value and saturation of the current color from the inner square and you select the current hue with the outer square. Below the picker are two swatches for holding the main and alternate colors in memory The color picker has many functions in ZBrush. We'll use this interface throughout the book. We'll look at advanced uses of the color picker in Chapter 8.

COLOR SELECTION

You can select any color on the screen or applied to the 3D tool by dragging the mouse from the center square to any spot on the screen within the ZBrush interface. The picker will not select the colors of shadows on strokes or tools on the canvas, just the color applied to the stroke or tool. If you drag from the color picker to the canvas while holding the **Alt** key, the picker will choose the exact color that you see on the canvas, including coloring caused by shadows cast on the canvas.

The Shelf at the Top

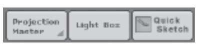


Figure 2.13
The three buttons on the top shelf for launching plug-ins

The top shelf appears above the canvas and contains a number of buttons. From left to right you can divide the buttons into four sections. The first section contains buttons for launching some special plug-ins. These buttons are labeled Projection Master, Light Box, and Quick Sketch (see Figure 2.13). The Quick Sketch and Projection Master plug-ins won't make much sense until you've learned a few more things about ZBrush. We'll return to them in Bonus Content 2. The Light Box button toggles the visibility of Light Box at the bottom of the screen.

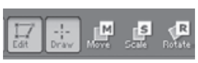


Figure 2.14
Five buttons on the top shelf are used to change the mode of the canvas and manipulate objects placed on the canvas.

The second section of the top shelf contains a series of five important buttons (see Figure 2.14). These buttons are labeled Draw, Edit, Move, Scale, and Rotate.

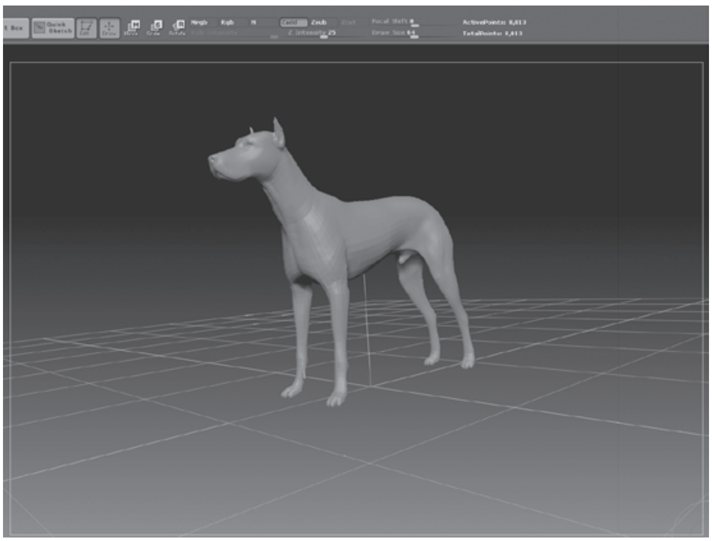
The Edit mode button enables the sculpting brushes so that you can alter a mesh on the canvas. If Edit mode is off, then ZBrush is in Paint mode and drawing on the canvas simply places copies of your meshes on it. This is useful when you want to use ZBrush to create illustrations.

UNDERSTANDING EDIT MODE

ZBrush actually started as more of an illustration software package rather than a digital sculpting tool. The unique thing about ZBrush, when it first appeared back in 2000, is that it was the only software that allowed you to paint in two and a half dimensions. This meant that you could paint a stroke on the canvas and then move the canvas up and down as well as back and forth—something that can't be done in other digital paint programs. In addition to paint strokes, the original version of ZBrush included simple 3D shapes that could be incorporated into the illustrations painted on the canvas. The idea was that switching to Edit mode allowed you to make changes to the shape of the 3D primitives and then you could switch out of Edit mode to place the altered primitives in your illustration.

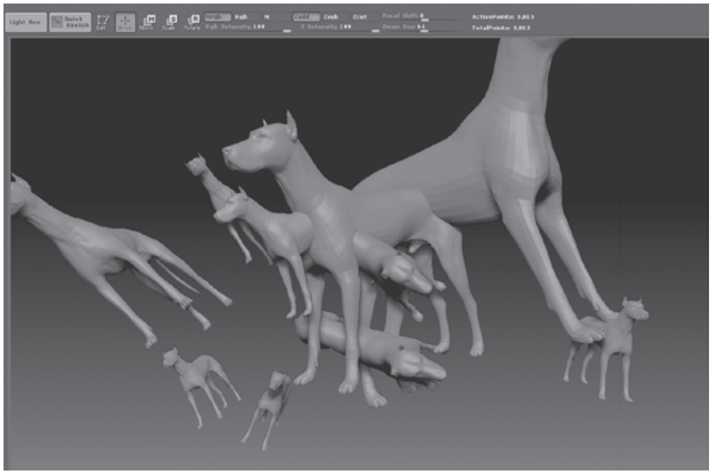
Over time, ZBrush added much more sophisticated sculpting tools and was quickly adopted as the standard for digital sculpting. In fact, ZBrush revolutionized the way digital artists model 3D objects. But the 2.5D illustration capabilities are still at the heart of ZBrush. And therefore, you have to remember that the paradigm of using Edit mode to alter 3D objects is still a big part of sculpting in ZBrush. To see how this works, try this simple exercise:

1. Open Light Box by holding the cursor at the bottom of the screen. When it appears, click the Project link.
2. Double-click on the `DemoDog.ZPR` project. If a dialog box appears asking you to save the current project, choose No. The dog will appear on the canvas along with a grid representing the floor of the 3D scene. Notice that the Edit button is activated on the top shelf.



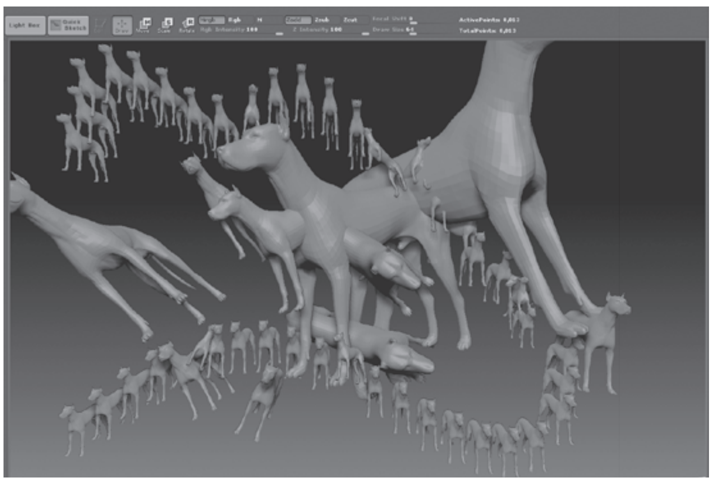
3. Drag the pointer on a blank part of the canvas. (If you're using a mouse, hold the left mouse button while dragging; if you're using a digital tablet, simply drag the stylus on the tablet.) You'll see the dog and the 3D grid rotate in 3D dimensions. This is the typical behavior of a 3D mesh in Edit mode.
4. Click the Edit mode button on the top shelf (or press the **T** hotkey) to turn off Edit mode. The grid disappears.

5. Drag on a blank part of the canvas again. Now you'll see another dog appear; the first dog remains frozen. Drag several more dogs on the canvas.



This is the typical behavior of ZBrush when Edit mode is off. In this case, you're essentially creating an illustration using the dog mesh. Beginners usually feel as though something has gone wrong with ZBrush when they experience this behavior, but it's simply a result of Edit mode being disabled. ZBrush is doing exactly what it's supposed to do.

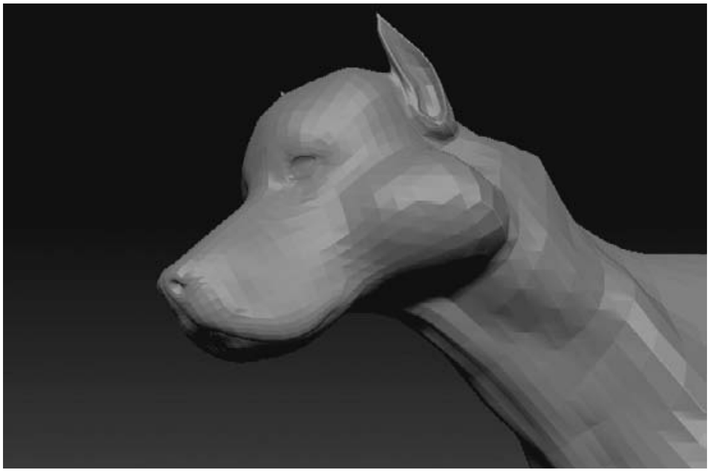
6. On the left shelf, click the DragRect button to open the stroke type fly-out library. Set the stroke type to Freehand.
7. Drag on the canvas; now you'll see a series of dogs appear.



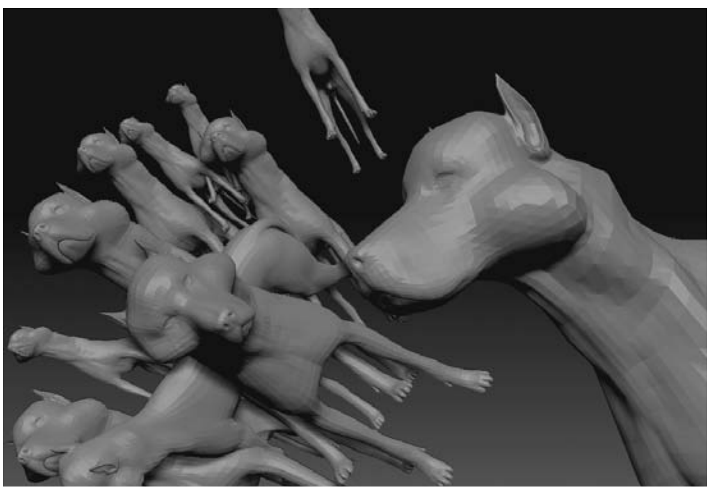
Hopefully a lightbulb is going off in your head. What's going on is that you've altered the dog tool so that now you're painting with dogs. Each brush stroke is made up of dog models. This is what Paint mode is all about in ZBrush.

8. Use the stroke type library on the left shelf to switch the stroke type back to DragRect. Drag on the canvas to add another dog to the illustration.
9. Turn Edit mode back on using the button on the top shelf (or press the **T** hotkey again). The grid reappears under the last dog drawn on the canvas.

   As you drag on the canvas, the last dog added to the canvas rotates around but the other dogs remain frozen. You're back in Edit mode, so now you can sculpt on the dog, thus editing the dog mesh.
10. To clear the other dogs off the canvas, press **Ctrl+N**. To center the dog mesh in the canvas view, press the **F** hotkey.
11. Drag on the surface of the dog to make some changes using the Standard Brush. Make the changes fairly obvious, such as a gross swelling in the poor dog's head.



12. Switch out of Edit mode and drag on the canvas gain. Now you'll see that the changes you made while in Edit mode are applied to every new dog added to the canvas.



As you switch in and out of Edit mode, you can continue to change the dog model, but the changes will appear only in subsequent dogs painted on the canvas when Edit mode is off. You are editing the dog tool, hence the term *Edit mode*.

It can be easy to switch out of Edit mode by accident when sculpting a 3D mesh. When this happens, don't panic; just press **Ctrl+N** to clear the canvas of any unwanted copies of the model. Drag on the canvas to create a new copy of the model and turn the Edit mode button on the top shelf on (hotkey = T).

Using the Move, Scale, and Rotate buttons, you can position, scale, and rotate 3D meshes and 2.5D paint strokes on the canvas to place them precisely in an illustration. You can also use these buttons to activate the transpose manipulator that is often used to create poses for character models. The way in which the Move, Scale, and Rotate operations behave is different depending on whether you're working on a 3D mesh in Edit mode or adding strokes to an illustration. We'll be using these buttons a lot throughout the book, so you'll get a clear understanding of the different way these functions can be used. For the moment, just think of them as ways to position objects drawn on the canvas. The hotkeys for these functions are W for Move, E for Scale, and R for Rotate.

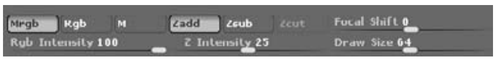


Figure 2.15
The third section of controls on the top shelf includes a series of sliders and buttons that control the size and behavior of the current brush.

The third section of the top shelf is a series of buttons and sliders (see Figure 2.15). If these buttons are grayed out, make sure that the Draw button on the top shelf is on. The buttons are labeled Mrgb, Rgb, and M. The *M* stands for *material* and the *Rgb* stands for *red green blue*, which to a computer is the same thing as saying *color*. So these buttons choose between painting modes. You can paint material and color (Mrgb), just color (Rgb), or just material (M). The slider below these three buttons controls the intensity of the color contribution of the current brush. If none of these buttons are activated, the brush will affect the canvas only according to the settings applied by the next set of buttons.

A similar triad of buttons follows. These buttons are labeled Zadd, Zsub, and Zcut, and they control whether or not a sculpting brush raises the surface of a 3D tool (Zadd), or pushes it down (Zsub), ZCut is only used for strokes or models that have been dropped to the canvas, not for sculpting. The Z intensity slider controls how much each stroke of the brush raises, lowers, or cuts into the surface of the 3D tool. If none of these buttons are activated, the brush may simply be set to paint color, material, or both without changing the 3D tool. These also affect how paint strokes behave when you're creating an illustration on the canvas.

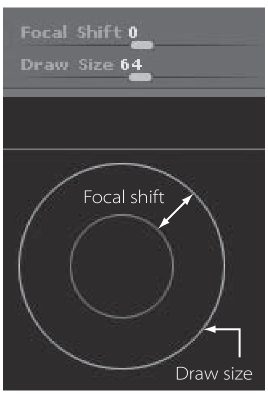


Figure 2.16
The Focal Shift slider controls the distance between the center circle and the outer circle in the brush display. This region is the intensity falloff of the brush.

Finishing off the third section of the top shelf are the sliders that control the focal shift and the size of the brush. The brush appears on the canvas as a circle within a circle (Figure 2.16). The Draw Size slider controls the diameter of both circles as a group, which in turn controls how much of the canvas or tool is affected by the brush. The Focal Shift controls the softness or falloff of the edge of the brush. Moving this slider back and forth will cause the inner circle to grow and shrink. If both circles are the same size, the brush will have a hard edge; if there is a large gap between the size of the outer circle and the inner circle, there will be a sizable falloff from the center to the edge of the area affected by the brush.

The final section of the top shelf is a numerical display that informs you as to how many points make up the current 3D mesh (Figure 2.17). Points (or vertices) appear at the corner of each polygon in the mesh. If a 3D mesh has many separate pieces, you can choose which piece of the mesh you want to edit. This number of points in the part of the mesh you're editing is displayed as ActivePoints. The total number of all the points of all the parts of the mesh are displayed as TotalPoints. For example, if you have the DemoSoldier in Edit mode on the canvas, the soldier's body is made up if 32,546 points, and this number is displayed as ActivePoints. If you add all the points of his body with all of the points for each part of his clothing, the total is 93,064, which is displayed as TotalPoints.

Figure 2.17
The last section of the top shelf reveals statistics about the number of points in the 3D mesh on the canvas.

The Shelf on the Right

The right shelf contains controls that are meant to help you navigate the canvas. From top to bottom this shelf can also be divided into four sections.

The first section at the top of the shelf contains six buttons that manipulate the display of the canvas (see Figure 2.18).

Figure 2.18
The buttons at the top of the right shelf control the display of the canvas in ZBrush.

The button at the very top activates the Best Preview Render (BPR) mode, which is one of the five render options available in ZBrush. When you activate BPR, the objects on the screen appear at a higher quality than they do in the default Preview mode. Your image will include shadows, higher-quality anti-aliasing, and effects such as ambient occlusion, transparency, and subsurface scattering. Creating a BPR render takes more time than creating a render in the default Preview render mode. The other render modes are Flat, Fast, Preview, and Best. These are all discussed at length in Chapter 9.

The SPix button below the BPR button controls the anti-aliasing quality of the render created in Best Preview Render mode.

The Scroll and Zoom controls move the canvas around. When you use the Zoom tool to move into the canvas, you'll see the edges of the strokes on the canvas become jagged. It's just like zooming into an image in a paint program such as Photoshop.

The Actual and AAHalf buttons will snap the canvas to 100 percent and 50 percent in size, respectively. By reducing the canvas to 50 percent, you increase the anti-aliasing quality of the image on the canvas. If you're creating a composition in ZBrush, you may want to work at double size and then export at 50 percent so that the edges look smoother than they otherwise might. Anti-aliasing is discussed in Chapter 1, "Digital Art Basics."

Figure 2.19
The Persp, Floor, and Local buttons affect the behavior of the canvas while you're editing a 3D tool.

The next section is made up of three buttons that control the display of objects on the canvas (see Figure 2.19). These are options that can be used as aids while you work on editing a 3D mesh. The Persp button turns on perspective distortion (hotkey = P). By default, 3D meshes are displayed in isometric view, meaning that the natural lines of perspective are ignored. This can be useful for aligning a 3D mesh with a 2D drawing. The perspective button augments the appearance of the mesh, which can make the appearance of the mesh more natural (see Figure 2.20).

The Floor button activates a 3D grid that is aligned with the 3D tool (hotkey = Shift+P). If you're used to working in other 3D programs, using this option may make you feel more comfortable because it gives you a better understanding of the 3D tool's position in 3D space. At the top of the button are the letters *X*, *Y*, and *Z*. Turning on any one of these buttons turns on the display of the grid along the corresponding axis. By default, the y-axis is activated (see Figure 2.21).

The Local pivot button will make the last area of an edited 3D tool become the center of rotation during editing. This is a very useful function and helps keep you from getting lost on your 3D tool as you spin it around.

The third section of buttons on the right shelf are the L.Sym and rotation axes controls (see Figure 2.22). To understand how these buttons work, imagine that when you are editing a 3D mesh, the canvas acts as a virtual sculpting stand. These buttons affect the relationship of the mesh to the stand as well as how to rotate the view of the mesh on the stand.

The L.Sym button controls how symmetry is calculated while editing a 3D tool. L.Sym is short for Local Symmetry.

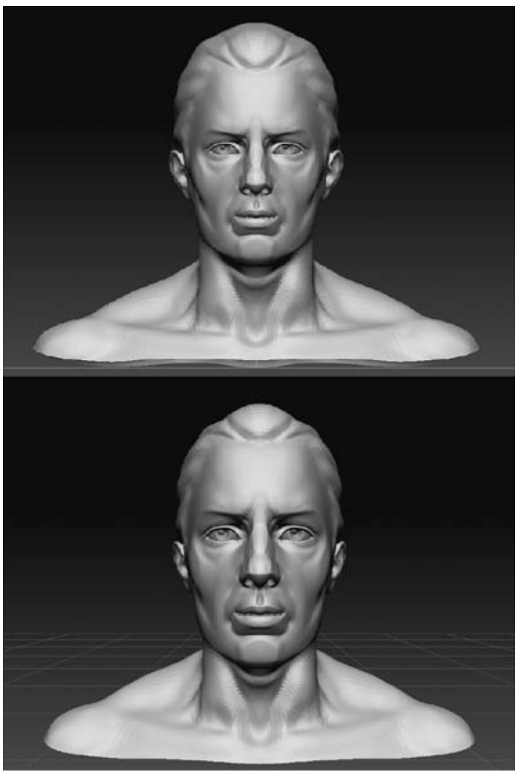


Figure 2.20
The image at the top shows a 3D mesh with the Persp button off; the image on the bottom shows the same mesh with the Persp button on.

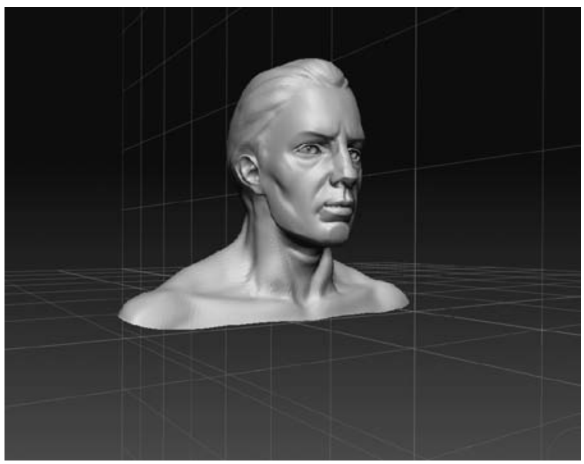


Figure 2.21
The Floor button activates the display of a grid for each axis. In this image, the x- and y-axes are displayed.

When it's off, symmetry is calculated in world space. In other words, symmetry is calculated based on the center of the virtual sculpting stand. When L.Sym is on, symmetry is calculated based on the center of the mesh, even if the mesh is not at the center of the stand. We'll revisit this concept in Chapter 3.

The three buttons below L.Sym control the axis of rotation as you change the view of the mesh. Think of these buttons as a way to control the rotation of the virtual sculpting stand. When the XYZ button is on, rotation of the view is not restricted to any particular axis when you drag left or right. When the Z button is activated, rotation of the view is restricted to the z-axis when you drag left or right on the canvas. When Y is active, the rotation of the view is restricted to the y-axis when you drag left or right on the canvas.

Figure 2.22

The L.Sym and rotation axes buttons make up the third section of buttons on the right shelf.

The fourth section of buttons on the right shelf control the display of 3D meshes on the canvas (see Figure 2.23). The Frame button centers the view of the 3D object in the canvas.

The Move, Scale, and Rotate buttons on the right shelf can be a bit confusing at first because there are also Move, Scale, and Rotate buttons on the top shelf. They do not do the same thing. The buttons on the right shelf are for use on 3D tools in Edit mode. They help you manipulate the view of a 3D tool while working. Think of them as controls for manipulating the virtual sculpture stand. When you use these buttons, you don't change the model, just what you're able to see on the model while working.

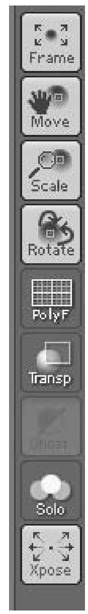


Figure 2.23

The fourth section of buttons on the right shelf control the display of the 3D mesh on the canvas.

Try this short exercise to understand how these buttons work:

1. Move the mouse pointer to the bottom of the screen to open Light Box (or click on the LightBox button on the top shelf).
2. Click the Projects link. Double-click the `DemoSoldier.ZPR` button to load the Demo-Soldier project.
3. On the left shelf, drag up to the left corner of the color picker to choose a white color. This will make it easier to see what is going on with the model.
4. On the right shelf, move the mouse pointer over the Move button and drag. You'll see the soldier model move around. Remember that you're actually moving the view of the soldier model, not the model itself.
5. Now hold the **Alt** key and the right mouse button (or, if you're using a digital tablet, hold the button on your stylus) and drag on a blank part of the canvas. This is another way to move the view.
6. Move the pointer over the Scale button and drag. The view of the DemoSoldier shrinks when you drag up or left and enlarges when you drag down or right. This is just like using the Zoom feature on a camera.
7. Hold the right mouse button and the **Ctrl** key and drag on the canvas. The soldier zooms in and out again. This is the same as dragging over the Scale button on the right shelf.

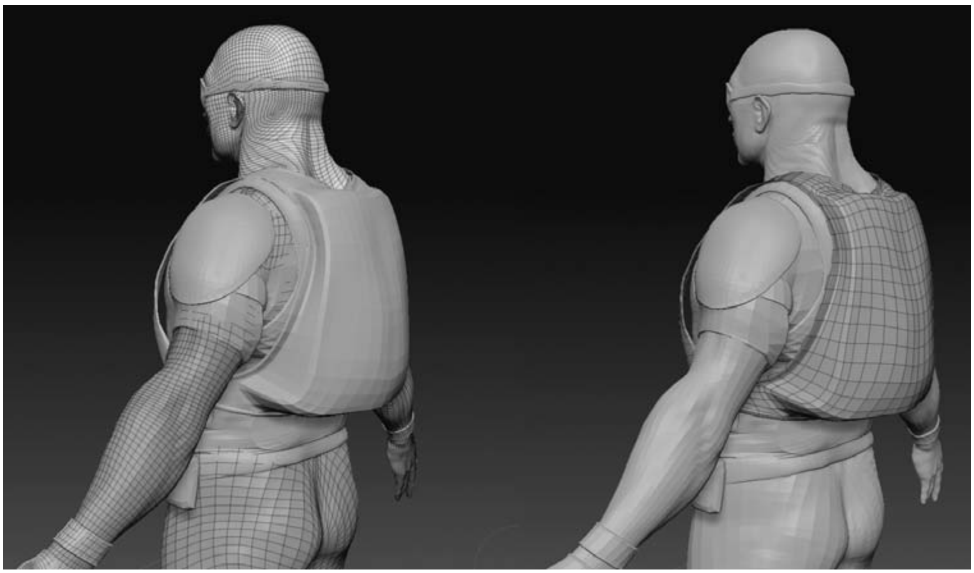
8. Move the pointer over the Rotate button and drag. The view of the soldier rotates.
9. Hold the right mouse button and drag on the canvas without holding any keys and you'll see the same behavior; this rotates the view of the soldier model.

As mentioned earlier, the axis of rotation buttons on the right shelf change the way the Rotate feature works. Switching to Z or Y restricts the rotation to these axes when you drag left or right.

The PolyF button turns on a wireframe display on the current 3D mesh. When PolyF is on, you can clearly see the individual polygons that make up the mesh. If the mesh is made up of multiple objects, the wireframe is visible for the current active object. To get a better sense of what this means, try this while the DemoSoldier project is still loaded:

1. Turn on the PolyF button. You'll see the wireframe display of the mesh's polygons. The wireframe display is divided into colored regions denoting polygroups. We'll get into polygroups in Chapter 3.
2. Rotate the view by dragging on a blank part of the canvas so that you can see the soldier's backpack.
3. **Alt+click** on the backpack. The view changes so that now you can see the wireframe of the backpack (see Figure 2.24).

Figure 2.24
The PolyF button displays the wireframe of the active parts of the mesh. Alt+click on the soldier's backpack to make it the active part of the mesh.



TOOLS AND SUBTOOLS

As I mentioned at the start of the chapter, a 3D mesh is also known as a 3D tool. A 3D tool that is made up of different parts can be split into subtools. This is the case with the DemoSoldier. His body is the main tool and his backpack is a subtool, as are his goggles, gloves, shirt, and so on. Working with subtools is covered in detail in Chapter 4, "Subtools, ZSpheres, and ZSketching." By **Alt+clicking** on different parts of the model, you're changing the active subtool. Once a subtool is active, it can be edited without affecting the other subtools of the mesh.

The Transp button activates Transparency, allowing you to see the active subtool through the other subtools (as long as the mesh has been divided into subtools). Transparency has two modes: Ghost and Standard transparency. Ghost is on by default, and you can toggle between the two transparency modes by turning the Ghost button on or off:

1. With the DemoSoldier still on the canvas, turn off PolyF to turn off the display of the polyframe.
2. Turn on the Transp button. Rotate the view. You can see the backpack through the other parts of the model.
3. Turn off Ghost to see how the Standard transparency mode behaves (see Figure 2.25).

The Solo button instantly hides all subtools except the current active subtool. This comes in very handy when working on a complex mesh that has been divided into many subtools.

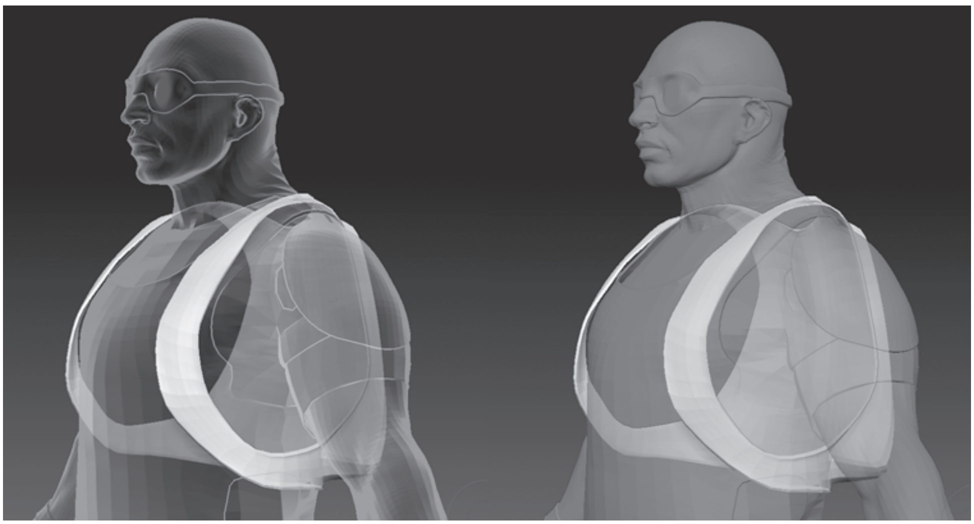


Figure 2.25

Transparency allows you to see a subtool through the other parts of a 3D mesh. The left image shows the Ghost mode of transparency; the right image shows the Standard mode of transparency.

The Xpose button temporarily moves all of the subtools out of the way while still leaving them visible. This way you can focus on editing a single subtool without having the others obscure your view. It's also a great way to get a sense of how a 3D mesh has been organized into subtools (see Figure 2.26).

Trays and Palettes

We'll continue working our way outward from the canvas another level. This takes us to the trays. On the right side of the canvas you'll see a section labeled *Tool* within a large gray area (see Figure 2.27). The large gray area is a tray. If you click the gray triangles (see Figure 2.28) nestled in the divider between the left shelf and the tray, the tray collapses, expanding the work area. Click one of the triangles again and it reappears. The tray is analogous to a drawer in an artist's toolbox. A tray exists on the right and the left sides of the canvas as well as below the canvas.

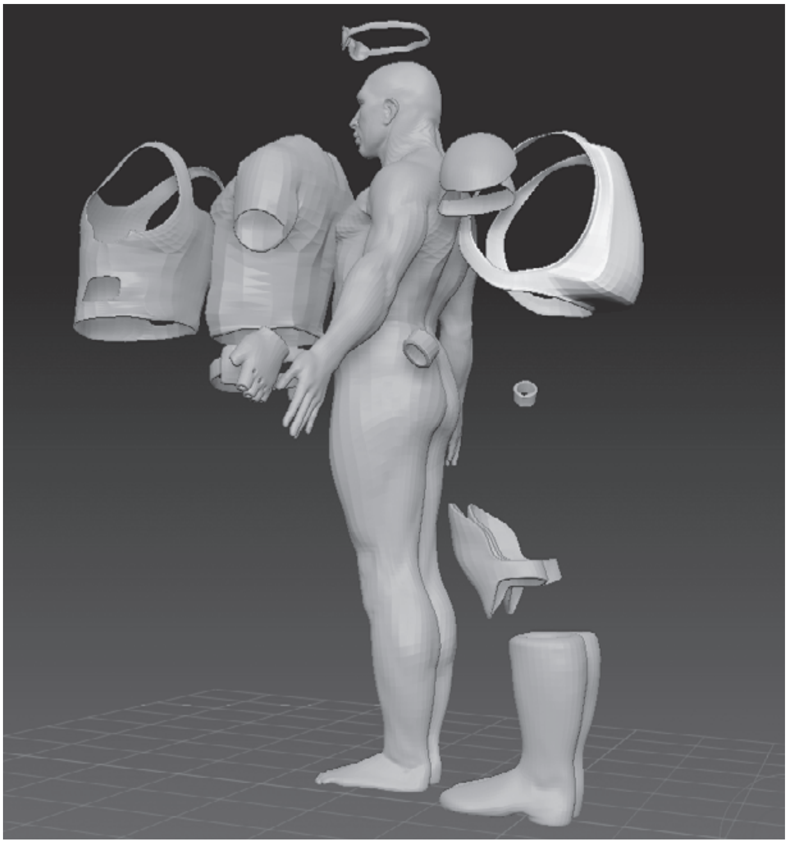


Figure 2.26

The Xpose button moves all the other subtools out of the way while you're working on the active subtool.

Figure 2.27

A tray on the right side of the ZBrush interface contains a set of buttons and controls under the heading Tool.

The palettes are sets of controls that are organized under the headings at the top of the interface. For example, the Document palette contains a number of settings that control the appearance and behavior of the canvas as well as buttons for saving, importing, and exporting images to and from the canvas. To see the settings in the Document palette, click the Document button at the top of the interface (see Figure 2.29).

The palettes are organized at the top of the interface alphabetically, starting with the Alpha menu at the upper left and ending with the ZScript menu on the upper right. You'll find that some palettes are accessed constantly during a ZBrush session and some you use only once in a while. This is where the trays come in. In the right tray, click the circular icon at the upper-right corner of the Tool palette (see Figure 2.30). The palette disappears from the tray.

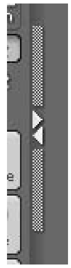


Figure 2.28

You can hide or show the trays on either side of the canvas by clicking the small triangles inside the divider.

Click on the word *Tool* in the bar at the top of the interface. Now the palette appears beneath the Tool heading like a menu in more conventional software packages. Click the circular icon again and it pops back over to the right tray. The palette will stay in the tray regardless of whether the tray is open or closed.

Make sure the Tool palette is in the tray and expand the Transform palette. Click its circular icon in the upper right. The Transform palette pops over to the right tray above the Tool palette. You can load the tray with all of your favorite palettes and remove them by clicking their circular icons. This action becomes very quick and natural after a little practice. Clicking on the title bar of a palette while it's in the tray will collapse the palette, freeing more room in the tray for other palettes while at the same time keeping the palette available in the tray (see Figure 2.31).

Figure 2.29

Clicking the Document button at the top of the interface reveals the contents of the Document palette.

The palettes load up the tray from top to bottom in the order in which you add them. By default, the palettes will automatically place themselves in the tray on the right of the screen when you click the circular button. If you decide you prefer a palette to be in the tray on the left side, you can grab the handle with your cursor and drag the entire palette to the tray. The cursor will turn into a crosshair when it's over the handle, indicating that you can drag the palette by the handle.

You can also drag palettes to different locations on the tray to rearrange them. It's easiest to do this by dragging from the top menu to a blank spot below the last palette in a tray. To remove a palette from a tray, drag its circular handle icon off the tray or click on it. Notice that a palette temporarily disappears from a tray when you click on its label in the top menu. This keeps you from being able to load multiple copies of the palette into a tray, which would be confusing for both you and ZBrush.

Figure 2.30

Click the circular icon in the upper right of a palette to move it out of a tray.

Make sure the Tool palette is in the tray on the right side of the canvas and that it is expanded so that you can see the contents. Click the large tool icon in the upper left of the palette to expand the tool inventory. Choose a 3D tool such as the Gear tool. The Tool palette has a large number of subpalettes. Subpalettes are groups of controls within rounded boxes that appear depending on what has been chosen as the current tool; some are collapsed by default to keep the palette from getting too long. You can expand them—try clicking on the word *Preview* in the Tool palette and you'll see the Preview settings expand in their own subpalette (see Figure 2.32).

If you expand a number of subpalettes, you'll see that the Tool palette gets so long that all of its contents can't fit on the screen. No problem; you can click on the side of the Tool palette and drag up and down. The palette scrolls up and down, giving you access to all the different settings.

Figure 2.31

The Transform palette has been added to the tray on the right of the interface. The Tool palette at the bottom of the tray has been collapsed to save room.

Figure 2.32

The Tool palette contains a large number of subpalettes. These can be expanded by clicking on their labels. In this image, the Preview subpalette has been expanded.

Figure 2.33

The Alpha palette contains controls and settings to adjust the alpha images you use in ZBrush.

Throughout this book I will describe the location of specific controls in relation to the subpalette of a particular palette. So for example, if I say "find the SDiv slider in the Geometry subpalette of the Tool palette" then I mean that you should expand the Tool palette, and then expand the Geometry subpalette within the Tool palette to find the SDiv slider. It's important to understand this because there are some subpalettes that use the same name as a palette. For example there is a Texture palette and there is a Texture Map subpalette in the Tool palette.

Now that you have some idea of how palettes and trays work, let's take a look at the settings available in each palette. These descriptions will be very brief. More detailed explanations will be found in the exercises of this book.

Alpha Earlier in this chapter you were introduced to alphas, which are grayscale image files used for a variety of purposes in ZBrush. If you recall, the alpha icon on the left shelf opens the alpha fly-out library. The Alpha palette (shown in Figure 2.33) interface has a large number of controls that are arranged in subpalettes and can be used for fine-tuning the appearance and behavior of the alphas you use in ZBrush. Clicking on the image of the alpha in the upper left of the Alpha palette is another way to access the library of alphas.

Brush The Brush palette has a very large number of controls that are arranged in subpalettes and can be used to modify the behavior of the sculpting brushes (see Figure 2.34). You can save the modifications you make to the brushes as your own custom presets, which can be used in future ZBrush sessions. Chapter 7, "Advanced Brush Techniques," explains how to use the controls in this palette and how to save your own brush presets. Clicking the brush icon in the upper left of the palette is another way to access the brush fly-out library.

Figure 2.34
The Brush palette contains settings for changing the way in which brushes behave. You can use the controls in this palette to create and save your own custom brush presets.

Color The Color palette has a copy of the color picker you see on the left shelf. It also has numerous additional pickers and controls found in the Modifiers subpalette (see Figure 2.35).

Document The Document palette is where you load and save ZBrush documents. You can also import Photoshop files and other supported formats, such as BMP, JPEG, and TIFF (see Figure 2.36).

The Document palette also has controls for setting the background gradient colors, the border colors, and, most important, the size of the document. The Pro button constrains the proportions of the document, maintaining the current aspect ratio. Set the document size when you are first starting a document. You can't resize the image while in the midst of creating a composition without dropping all the tools onto the canvas.

Change the background color of the canvas Here's a quick demonstration on how to change the background color of the canvas:

1. Open the Document palette, and click the circular icon in the upper left to move the palette into a tray. This will keep the palette from closing while you adjust the controls.
2. Click in the button labeled Back and drag all the way across the canvas to the color picker. As you drag, you may notice the color of the canvas change.

   The label *Back* in the Document palette is short for *background*. While you drag, ZBrush is setting the background color to match whatever color is directly below the mouse pointer. By dragging over the color picker on the left shelf, you can choose any color visible in the picker.
3. Select a light gray by dragging over the left side of the inner square of the color picker. Let go when you have a nice gray color selected.
4. In the Document palette, click and drag on the slider below the Range heading. Drag to the left to set Range to 0. Setting Range to 0 removes the gradient.

   If you'd like to store this gray background as the default setting whenever ZBrush starts, click the Save As Startup Doc button at the bottom of the palette.

Draw The Draw palette has controls that duplicate the brush controls in the top shelf as well as some of the buttons on the right shelf. These are size, focal shift, and the material and color settings as well as the brush depth controls (Zadd, Zsub, and Zcut). Below these controls is a subpalette that offers a preview of the brush stroke as well as more advanced controls. This subpalette is used for the 2.5D brush strokes created in Paint mode and not so much the brushes used to alter a 3D model in Edit mode.

Figure 2.35
The Color palette provides a number of different ways to set the current color.

The preview shows how the tip of the brush looks to the ZBrush canvas. You can rotate the image around to see a 3D view. The width, height, and depth of the brush tip can be adjusted as well how the brush stroke is embedded into previously existing strokes on the canvas. These settings will affect all of the brushes you use in a ZBrush session; they are global controls for how the strokes are drawn on the canvas.

The Draw palette also has a Persp button and a FocalLength slider (see Figure 2.37). The Persp and Floor buttons do the same thing as the Persp and Floor buttons on the right shelf, but there are some additional controls. The FocalLength slider controls the amount of perspective distortion applied to the object when the Persp button is on. The Align To Object button keeps the perspective distortion of the 3D tool relative to its location on the canvas. There are also controls for setting the position and colors of the grid display that is activated when the Floor button is on.

Edit This palette offers access to the Undo and Redo buttons as well as a running tab of how many undos are available in the cue. The undo hotkeys, as in many programs, are **Ctrl+Z** for undo and **Ctrl+Shift+Z** for redo.

File The File palette contains buttons for saving elements of your ZBrush session. You can choose to save a ZBrush project using the Save As button at the top of the palette (see Figure 2.38). Projects are saved in the ZPR format. This format contains the current active 3D mesh and its position on the canvas. The project file remembers if the tool is in Edit mode, the materials on the tool, and even the background color of the canvas. The Load button will load saved ZBrush projects and Revert sets the current project back to the last saved state.

Figure 2.36
The Document palette has controls for setting the size and the background of the canvas.

There are also buttons in the File palette that duplicate the save buttons found in other palettes. For example, the Save button under Canvas duplicates the Save button found in the Document palette—in other words, it saves strokes drawn on the canvas but not the current 3D mesh. The Save button under Tool Mesh will save the current 3D tool (as long as Edit mode is on) but not any strokes drawn on the canvas.

It can be a little confusing when you're first learning ZBrush to remember what to save or load. The safest bet is to use the Save button at the top of the File palette to save the current ZBrush project. This ensures that the next time you start ZBrush, you can open the project (using the Open button at the top of the File palette) and pick up right where you left off.

If you save the project in the `ZProjects` folder within the `Pixologic` folder, you'll find your saved files listed under the Projects setting in Light Box.

Layer ZBrush can create layers in a document, similar to layers in a paint program such as Photoshop. However, remember that ZBrush has depth, so unlike layers in a typical 2D paint program, where one layer will obscure all layers below it, ZBrush layers respect the depth of all strokes in all the layers equally.

Layers are used most often when ZBrush is used as an illustration program. This palette will be explained in more detail in Chapter 9, "Rendering, Lighting, and Materials."

Light In traditional art, rendering light is quite difficult. Attention must be paid to relative intensity, the consistency of the light's direction, how the shadows reveal form, and how they behave based on perspective, specular highlights, and reflective properties. In ZBrush, much of that work is taken care of with virtual lights.

The Light palette is where you adjust the settings for the current light, create additional lights, and adjust shadows and shadow type.

You can reposition a light by dragging the cursor over the material preview sphere (see Figure 2.39). The sphere will update to show the lighting position in the scene. The ability to easily change the lighting while you work in ZBrush is an important feature. Sculptors in the real world continually change the angle of the light while they work on a sculpture. Seeing the sculpture in a new light can reveal problems or open up areas of artistic exploration.

Lights and their settings will be explored more in Chapter 9.

Figure 2.37

The Draw palette has controls for changing the way strokes and 3D tools are drawn on the canvas.

Figure 2.38

The File palette has a number of buttons that allow you to save the various elements of a ZBrush session.

NOT ALL MATERIALS RESPOND TO LIGHT

Some materials, such as the Red Wax material, have the lighting effects built into the material itself so the model will not react to a change in lighting position if it has this material applied. If you click the material icon on the left shelf to open the material fly-out library, you'll notice that the materials are arranged into two major categories below the Quick Pick section. The materials listed under MatCap will not react to changes in lighting in the scene. The materials in the Standard Materials section, such as the Basic material, will react to changes in lighting.

If you adjust the controls in the Light palette and you don't see any change, open the material fly-out library and choose a standard material from the lower portion of the material inventory, such as the Basic material. The difference between standard and MatCap material is explained in Chapter 9.

Macro The Macro palette offers controls for recording and loading macros. A macro is simply a list of commands that tell ZBrush to do something. Let's say you find yourself constantly resetting the document size to a specific resolution. You can record a macro that performs this specific action and then it will appear in the Macro palette as a button. Click the button and everything you did while recording the macro will happen again; your document will be resized to your stored specifications. Creating your own macros is covered in Bonus Content 2, "ZBrush Plug-Ins."

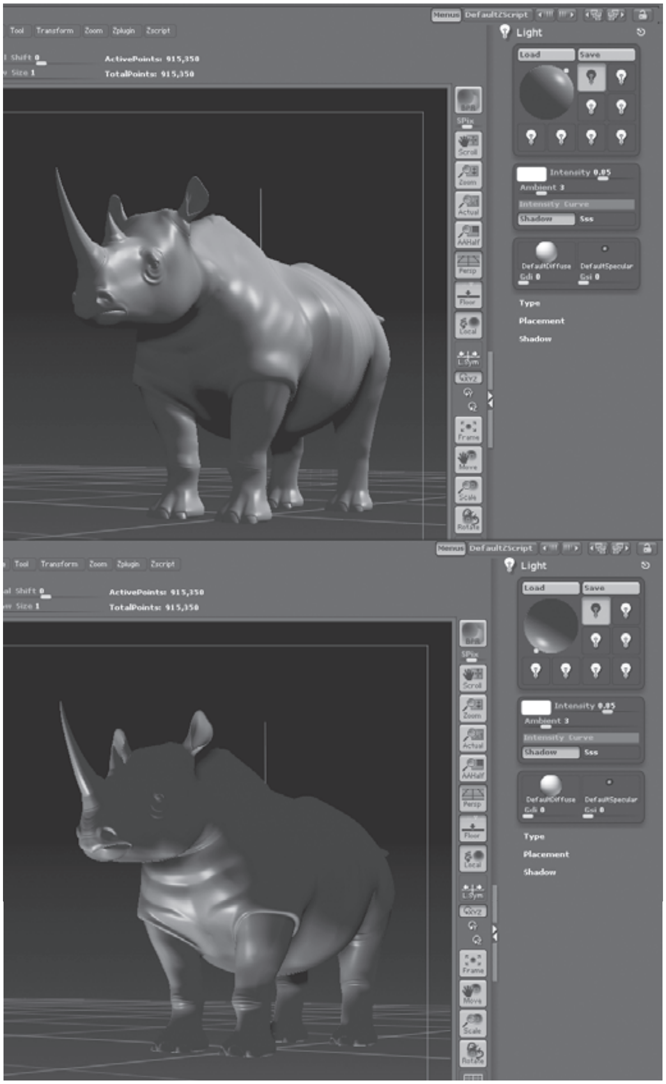


Figure 2.39
Use the controls in the Light palette to change the position of the lights. This will affect the appearance of 3D meshes and strokes placed on the canvas.

Marker You use markers to store information about a 3D tool's position on the canvas before it has been dropped. This way you can redraw the tool if you need to recall it later on after changes have been made to the composition. The buttons on the Marker palette determine what information is to be stored on the canvas. The markers themselves are hot spots on the canvas. Using the multi-marker tool, you can create groups of 3D tools that can be stored as a single tool. However, the introduction of subtools in ZBrush 3 replaced most of the usefulness of this feature.

Material In ZBrush, *materials* refers to the quality of a surface and how it reacts to light, shadow, and other strokes in the scene. Materials come in two main types, *MatCap*, which are materials that have lighting and shading built in, and standard materials.

Creating and using materials in ZBrush is a pretty big topic that will be fully explored in Chapter 9. For now, it's enough to say that the Material palette is where you can edit, load, save, and clone the materials you use in a scene. The controls listed under the Modifiers subpalette allow you to edit existing material presets to make your own custom materials. You can save these presets for use in other ZBrush projects (see Figure 2.40).

Figure 2.40

The Material palette and material inventory show the many materials that can be applied to ZBrush strokes. The settings in the Modifiers subpalette of the Material palette allow you to create and save your own custom materials.

Movie The Movie palette contains controls for recording movies from the canvas (Figure 2.41). You can make movies that show off your work or explain specific techniques or use movies as a means to present ideas to a client or director. The movies you record can be exported in the QuickTime format for easy sharing.

One of the most exciting features of the Movie palette is the TimeLine feature. It is enabled by expanding the TimeLine subpalette and pressing the Show button. The TimeLine interface then appears as a strip beneath the top shelf (see Figure 2.42). Using the TimeLine, you can animate the display, the movement, the color, and many other aspects of 3D meshes on the canvas. The TimeLine is covered extensively in Chapter 10, "Layers and the TimeLine."

Picker The controls in the Picker palette determine how brushes sample information as they interact with strokes and 3D meshes on the canvas. This has a big impact on how sculpting brushes behave. The Picker palette is fairly advanced and will be covered in more detail in Chapter 7, "Advanced Brush Techniques."

Preferences The Preferences palette is where you set the overall behavior of ZBrush. It contains settings for everything from customizing the interface to how 3D models behave when they are imported. We'll revisit this palette throughout the book to understand more about how the controls here can improve your interaction with ZBrush.

Render The Render palette is where you access the controls for the lighting, shading, anti-aliasing, and other qualities of your ZBrush composition. The controls in this palette are used in conjunction with the controls in the Light palette and Material palette. Rendering in ZBrush occurs right on the canvas as opposed to in a separate interface as with many other 3D programs. Depending on the settings, a render can take anywhere from a few seconds to a few minutes. You can choose between several render quality settings (see Figure 2.43).

- Preview is the default quality setting. It shows basic color and texture information with simple real-time shadowing.

Figure 2.41
The Movie palette has controls for recording movies from the canvas.

- The Fast setting removes material and shadow information from the scene to improve performance.
- Flat displays only the color of the strokes and 3D meshes on the screen.
- Best is the most computationally expensive. A number of settings in the Render palette affect how Best quality is calculated. Best quality renders the lighting, texturing, shadow, and materials of the strokes on the canvas and takes into account how they interact with each other in terms of reflection and light occlusion.

ZBrush 4 adds the new Best Preview Render (BPR) mode, which has many special features such as ambient occlusion shadowing, subsurface scattering, and subtool transparency. A BPR render is activated using the BPR button at the top of the Render palette or using the button on the right shelf (hotkey = Shift+R). The Render palette contains a number of settings for tuning a BPR render (see Figure 2.44).

Figure 2.42
When you enable the visibility of the TimeLine in the Movie palette, it appears below the top shelf.

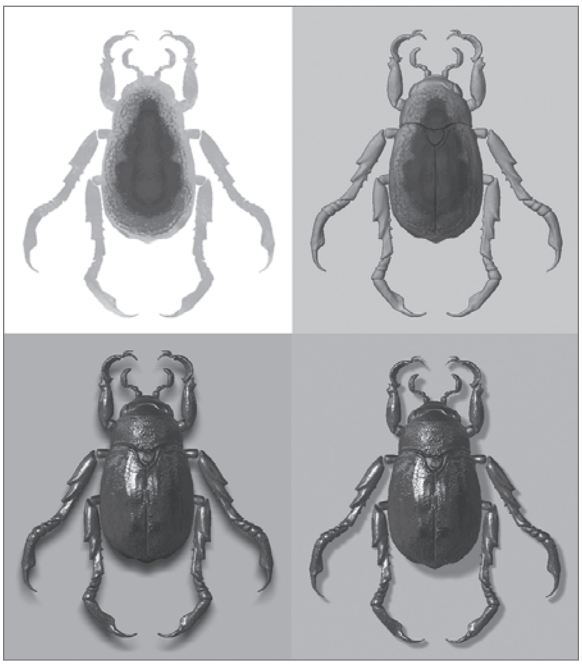


Figure 2.43
A 3D tool stroke rendered in the four different render qualities—Flat, Fast, Preview, and Best (from left to right)—using the Reflected Map material.

None of these render settings will affect a model exported from ZBrush. They only control how the model appears while it's displayed on the ZBrush canvas. The settings on the Render palette will be discussed further in Chapter 9.

Stencil The Stencil palette is related to the controls in the Alpha palette. A stencil masks out areas on the canvas where paint strokes will appear. Figure 2.45 shows how a stencil, created from an alpha, can be used to protect areas of a 3D mesh from changes made by a sculpting brush. A stencil can be created from an alpha and then moved about the screen as you work, allowing for some interesting texturing possibilities. The controls in the Stencil palette change the way the stencil behaves and how it is displayed. Using stencils is covered in Chapter 7, "Advanced Brush Techniques."

Stroke The Stroke palette allows access to the stroke inventory as well as a variety of settings for customizing the strokes (see Figure 2.46). Strokes affect how a brush stroke draws on the canvas. For example, the FreeHand stroke causes the brush to paint like a normal paintbrush would. If the FreeHand stroke is used with a 3D model tool, the copies of the model will flow out of the brush in a line. Other stroke types, such as DragRect, will allow for precise positioning of a stroke on the canvas. As you drag, the stroke will appear, scale, and rotate depending on how you move the cursor before releasing pressure on the digital tablet or letting go of the left mouse button. Additional settings such as LazyMouse and Backtrack help you precisely control how brush strokes are applied to a 3D mesh. These features are explored in Chapter 7.

Texture The Texture palette is similar to the Alpha palette in that the controls here allow you to load, save, and adjust textures. Textures are 2D color images that can be created in ZBrush or in other paint programs and used for a variety of purposes (see Figure 2.47). Textures can be used to paint 3D tools. You can also create a texture based on the colors applied to a painted 3D tool. The texture can be exported for use in a 3D animation and rendering program as a texture map in a shader. Textures are discussed in detail in Chapter 8, "Polypainting and Spotlight."

Figure 2.44

Controls for tuning effects such as subsurface scattering (Sss) in a Bpr render are found in the Render palette.

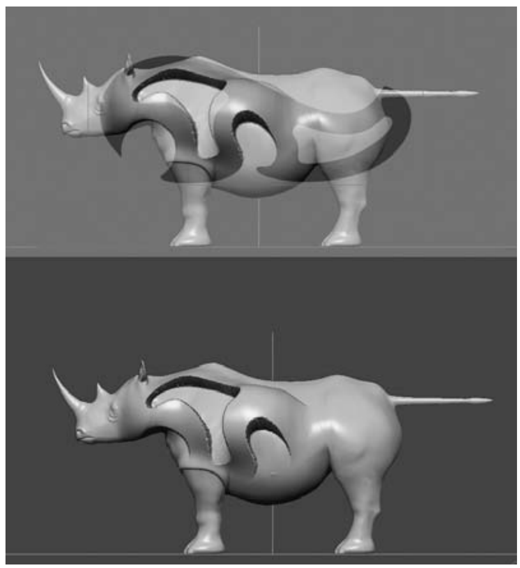


Figure 2.45

A stencil is used to protect areas of a 3D mesh from changes made with a sculpting brush.

Figure 2.46

The Stroke palette settings control how brush strokes behave on the canvas. These settings affect both the tools and the sculpting brushes.

Figure 2.47

The Texture palette contains controls for changing the look of the 2D color images used within ZBrush.

In addition to loading and saving textures, the controls in the Texture palette allow you to do the following:

- Flip a texture horizontally and vertically
- Invert the colors of a texture
- Adjust the colors using a gradient based on the main and secondary color buttons
- Resize and clone a texture
- Make an alpha based on a texture
- Fill the background using a texture
- Create a texture based on the current state of the canvas

Tool The Tool palette is the most essential palette in ZBrush; it is at the heart of digital sculpting and painting. Tools are what ZBrush uses to paint on the canvas. Some paintbrushes found in the Tool palette are tools, but so are 3D meshes. This is because you can use a mesh as a type of paintbrush that paints copies of the mesh on the canvas.

In the Tool palette, you'll find an inventory of the tools available for the current ZBrush session. Click the large icon in the upper left of the Tool palette to open the inventory (see Figure 2.48). The window is divided into three sections: Quick Pick, 3D Meshes, and 2.5D Brushes.

The Quick Pick section stores recently used tools for easy access.

Figure 2.48

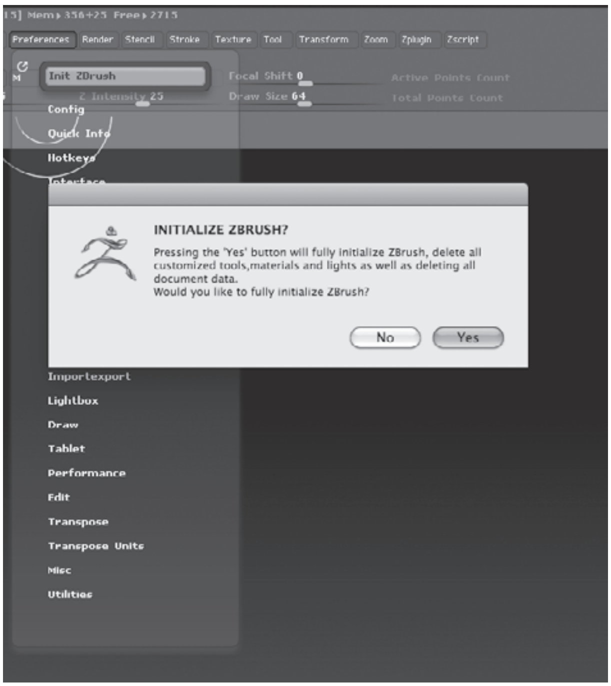
The inventory of tools in the Tool palette

The 3D Meshes section contains the models you have loaded into ZBrush as well as some 3D primitives and ZSpheres, which are a very special type of 3D tool discussed in Chapter 4, “Subtools, ZSpheres, and ZSketching.”

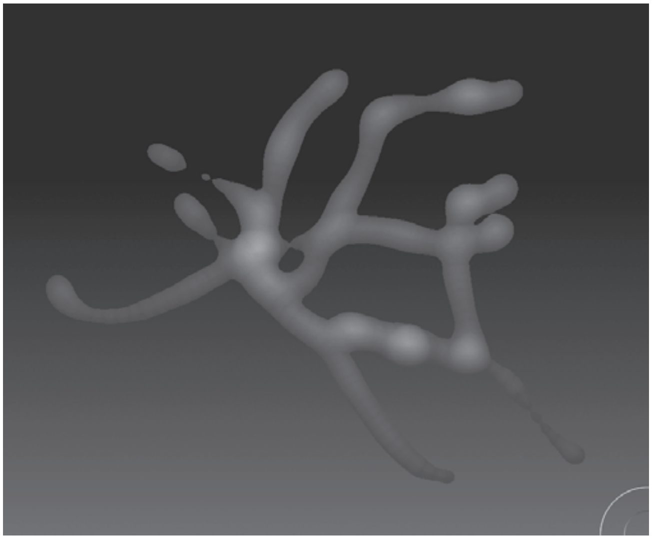
The 2.5D brushes are primarily used for illustrating. They are used to make marks on the canvas or alter what is already drawn on the canvas. In Bonus Content 2, you’ll use the 2.5D Brushes as part of the Projection Master plug-in.

Making 2.5D brush strokes The idea behind 2.5D brushes is that they combine the natural feel of digital painting with the ability to position strokes in three dimensions. Try this short exercise to get a sense of what this means:

1. Make sure ZBrush is open. Choose Preferences → Init ZBrush. This will clear the canvas and reset all tools (always make sure you save your work before using this feature!).
2. When you click the Init ZBrush button, a dialog box opens. It asks if you want to initialize ZBrush. Choose Yes.



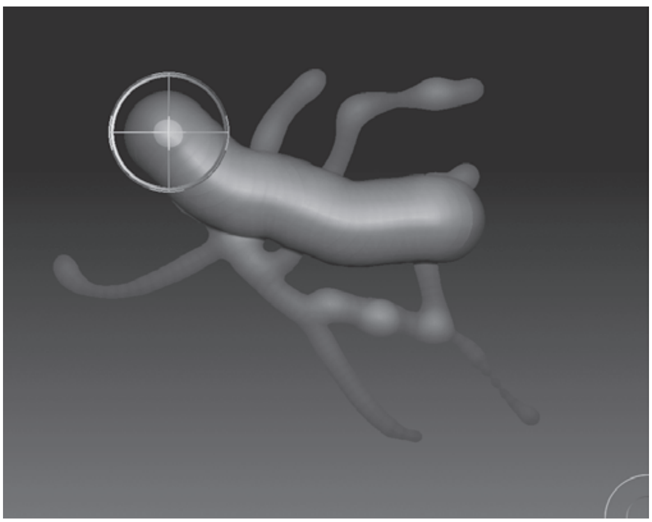
3. Make sure the Tool palette is in the tray on the right side of the screen.
4. In the Tool palette, click the large brush icon labeled SimpleBrush to open the tool inventory. From the 2.5D Brushes section at the bottom of the inventory, choose SphereBrush.
5. Drag across the canvas to make a mark with the SphereBrush. Make a few marks (see the following image).



6. On the top shelf, click the Move button or press the **W** hotkey.

   The last stroke you created disappears. Don't worry, it's not gone; it has just moved behind the back of the canvas.

7. Drag downward on a blank part of the canvas. You'll see the stroke appear but now it has moved above the other strokes, so you can clearly see the spheres that make up the stroke (as shown in the following image).



8. Drag on the edge of the Transform Gyro to move the stroke to a new position. Drag up or down on a blank part of the canvas to move the stroke back and forth.
9. Click the Rotate button on the top shelf or press the **R** hotkey. Drag on the Transform Gyro to rotate the stroke.

10. Click the Draw button on the top of the shelf or press the **Q** hotkey. Draw some more strokes with the SphereBrush.
11. Switch back to Move mode to activate the Transform Gyro (hotkey = W). Drag on the Gyro to move the last stroke.

    Unless you hold the **Ctrl** key while painting strokes, you can only move the last stroke placed on the canvas. If you do hold the **Ctrl** key while painting on the canvas, the Transform Gyro will let you move all the strokes you painted while holding the **Ctrl** key as a single stroke. The strokes that can no longer be moved have been "dropped" to the canvas, so now they have been embedded. This is the nature of 2.5D painting in ZBrush. It's not really like 3D modeling in a program such as Maya. Painting in 2.5D is more like painting in a digital paint program that lets you move strokes around on the canvas up and down as well as back and forth.

    Experiment with some of the other 2.5D brush tools and see how they add strokes to the canvas and how they affect strokes already placed on the canvas.

    Try using the Smudge brush to smear the strokes created with the SphereBrush. You can smudge the canvas around and then switch to Move mode to move the smudging effect around the canvas.

    Use the SnakeHook brush to pull parts of the image toward you. Some of the brush strokes, such as those created by the SnakeHook brush, can't be moved or rotated. It doesn't take long before you are able to make a mess on the canvas.

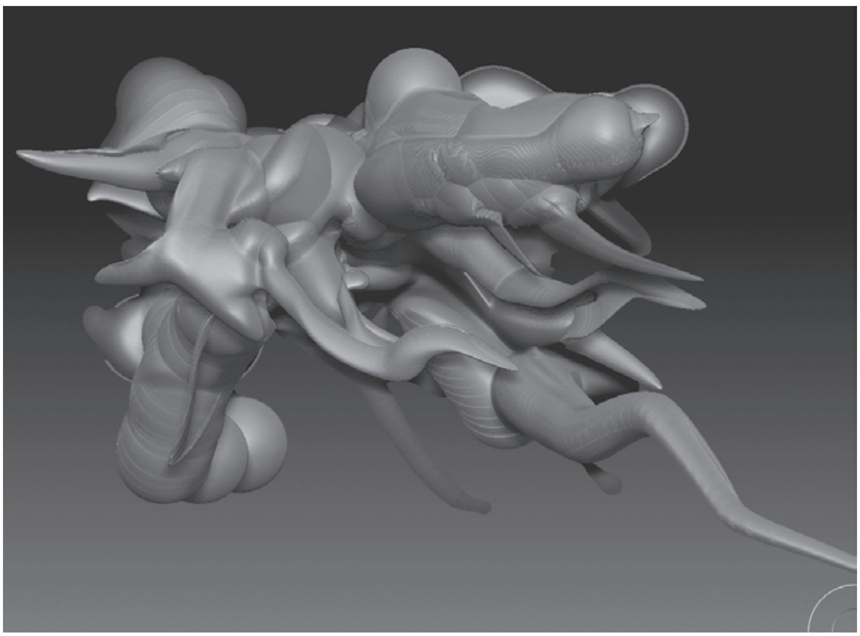


Figure 2.49

The Tool palette gets very complex when a mesh is in the process of being edited.

Figure 2.50

The Transform palette contains the symmetry settings.

The 2.5D brushes can be very powerful. They are most often used when creating 2.5D illustrations on the ZBrush canvas. When you are creating digital sculptures using 3D meshes, they are not used nearly as much.

The Tool palette has hundreds of controls and sliders. Using the controls found here, you can import and export 3D meshes for use in other 3D software, add additional parts to your meshes, paint colors onto your meshes, animate your meshes, create UV texture coordinates, extract normal and displacement maps, and duplicate, mirror, deform, and add surface noise. And the list goes on. As you'll see starting in Chapter 3, the Tool palette will quickly become your home in ZBrush. Figure 2.49 shows how complex the Tool palette can become when a working on a mesh in Edit mode.

Transform The Transform palette contains a number of buttons that exist on the shelves as well. These include the Draw and Edit buttons and the Move, Scale, and Rotate buttons found on the top shelf as well as the buttons located on the right shelf.

The most important feature of the Transform palette is the symmetry settings (see Figure 2.50). The symmetry feature is used when editing a 3D mesh. It can be used to speed up the sculpting process by allowing you to work on both sides of a 3D mesh at the same time. You'll learn how to use symmetry starting in Chapter 3.

Zoom The Zoom palette has controls that offer various ways to zoom in on the canvas. It also has a couple of mini windows that give you an alternate view at a higher magnification. This means you can zero in on fine details without having to change the magnification of the entire canvas. The mini windows follow the position of the brush. To change the magnification within a mini window, you can click in the window (see Figure 2.51).

Zplugin The Zplugin palette is where you can access plug-ins for ZBrush as well as links to important ZBrush-related sites. There is also an access point for editing your ZBrush license as well as a link to the help files.

ZScript ZBrush has a built in scripting language called ZScript. ZScripts can be simple macros, or they can be functional plug-ins with their own interface. ZScripts can be recorded through the interface using the controls on this palette or by typing commands into a text file.

The Title Bar

The final stop on our interface tour is the title bar. Here you will find useful bits of information on the upper-left side of the screen. These include the title of the document, the name of the person or company to whom this copy of ZBrush has been registered, and information regarding memory usage and time spent in the current session.

On the right side of the title bar are some useful buttons. Moving from left to right, the first button, labeled Menus, is a toggle for hiding the menus. The second button is the DefaultZScript button which can be used to load custom ZScripts.

Summary

In this chapter, I took you on a quick tour of the ZBrush interface. The goal of this tour was to get you comfortable enough with locating tools and settings in ZBrush so that you can easily work through the exercises in the rest of the book. Now that you have an idea of where everything is, you'll start learning about how the interface is a big part of the power of ZBrush.

Complete descriptions of all the tools and palettes can be found in the ZBrush documentation. The palettes are described in detail in the Palette Reference.

Figure 2.51
The Zoom palette has two mini preview windows that can be used to examine the canvas closely without having to zoom in on the whole thing.

CHAPTER 3

Basic Digital Sculpting

Digital sculpting refers to a brush-based approach to creating three-dimensional models on a computer. ZBrush revolutionized the computer game and entertainment industry as well as digital art by introducing its unique digital sculpting technology about 10 years ago. Since then, the older methods of pushing and pulling polygon vertices and faces has largely been replaced with digital sculpting. Digital sculpting in ZBrush offers a much more intuitive and artistic way to create models. This is what has made ZBrush so attractive to artists who are less interested in the technical aspects of computer software and more concerned with creating great artwork.

In this chapter, you'll be introduced to the basics of digital sculpting in ZBrush. By the end of this chapter, you'll understand the following fundamental ZBrush concepts:

- **Working with digital clay**
- **Subdividing a mesh**
- **Using sculpting brushes**
- **Activating and adjusting symmetry**
- **Masking**
- **Polygon selection and visibility**

Digital Clay

Digital clay is a term affectionately applied to a polygon mesh in ZBrush. This type of mesh is a surface made up of connected polygon faces. Each face shares vertices and edges with neighboring polygon faces (see Figure 3.1). ZBrush allows the polygon faces to be made up of three- or four-sided polygons. These meshes are called digital clay because of the way in which they are shaped by the sculpting brushes. Shaping polygon meshes with the brushes feels so intuitive that it's a lot like working with clay.

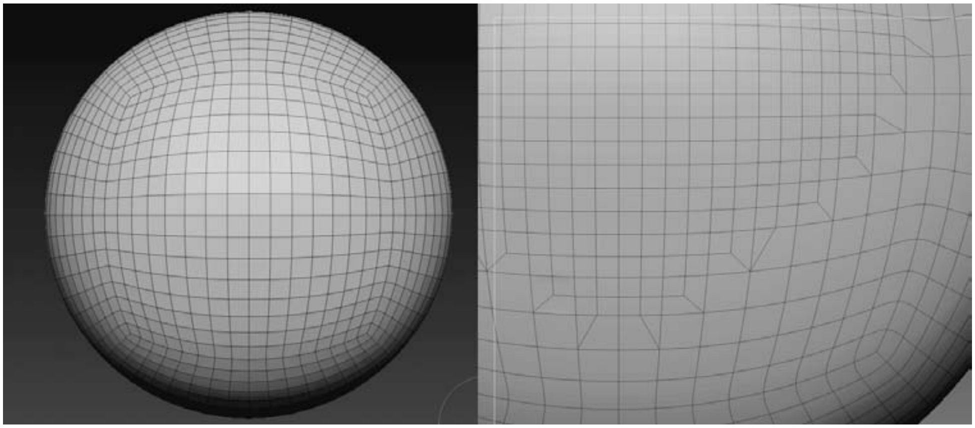


Figure 3.1
Digital clay is a polygon mesh made up of three- or four-sided polygons.

Digital clay is shaped directly on the ZBrush canvas while the mesh (also known as a 3D tool) is in Edit mode. Digital clay can be generated a number of different ways. You can use one of the premade models that comes with ZBrush, or you can import a polygon model created in another software package such as Modo or Maya. ZBrush can automatically "skin" an armature made of the special ZSphere tool, you can use a tool known as ShadowBox to create a mesh from a painted silhouette, and you can extract a new mesh from part of an existing model. *Skinning* refers to the process of wrapping a polygon mesh around ZSpheres; this is covered in detail in Chapter 4, "Subtools, ZSpheres, and ZSketching." Using ShadowBox and extracting meshes are covered in Chapter 5: "Shadow Box and Clip Brushes." Importing models from other software packages is covered in Bonus Content 1, "GoZ."

In this chapter, we'll keep it simple and use one of the preset models that come with ZBrush. You'll start a project using the humble PolySphere tool that comes with ZBrush. The PolySphere is essentially a rounded cube. It responds well to the sculpting brushes because, unlike a typical polygon sphere, the PolySphere does not have poles at either end which tend to become pinched and difficult to work with when using the sculpting brushes (see Figure 3.2). Because of the lack of poles, the PolySphere is said to have a good "topology" for digital sculpting.

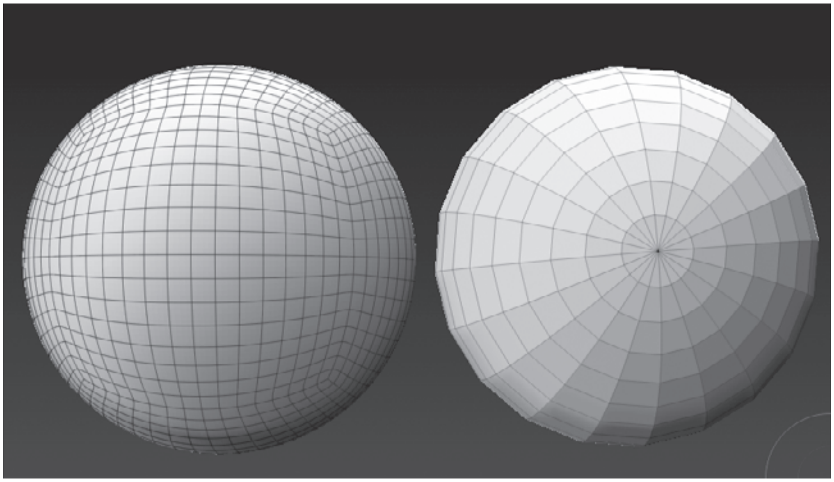


Figure 3.2
The PolySphere on the left has an arrangement of polygons better suited for digital sculpting than the sphere on the right.

TOPOLOGY

In the world of digital 3D modeling, the term *topology* is used to refer to how the polygon faces that make up a 3D mesh are arranged on the surface. There are different methods for creating topology. Some topologies are better suited for digital sculpting than others. To create the best possible motion for the creatures and characters they animate, animators working in 3D software have special requirements for the topology of the models they use. If you intend to create models for use in video games or in animation, you will need to become very conscious of topology. ZBrush even has tools to allow you to re-create the topology of a model after you have sculpted it.

Load the PolySphere

In this exercise you'll learn how to load the PolySphere tool onto the ZBrush canvas and how to prepare it for digital sculpting:

1. Start ZBrush if it's not open already.
2. To ensure that you are starting with a clean slate, go to the Preferences palette at the top of the screen and press the Init ZBrush button.
3. A warning appears asking you if you want to fully initialize ZBrush (see Figure 3.3). Click Yes.

Figure 3.3
A warning message appears when you initialize ZBrush.

The Init ZBrush button initializes ZBrush, ensuring that all the controls have been set to their default settings and all custom tools have been removed from the toolbox for the current ZBrush session. Make sure you save the work you want to keep before initializing ZBrush.

SAVING ZBRUSH FILES

When you're first learning ZBrush, you'll want to save your files as a ZBrush project. This ensures that the next time you load the project file, you can pick up where you left off and nothing is lost. Later on, you'll learn how to save individual elements such as 3D tools, textures, brushes, and more. To save a ZBrush project, use the Save As button in the File palette at the top of the screen. The project is saved in the special ZPR format. You can save the project anywhere you like on your hard drive. If you'd like the project to appear in the Project section of Light Box, save it in the `ZBrush 4.0\ZProjects` directory. On Windows, this is located in the `Program Files` directory. On the Mac, it is found in the `Applications` directory. For more on working with Light Box, consult Chapter 2.

Figure 3.4
Double-click the PolySphere icon in Light Box to load it into ZBrush.

4. Place the mouse pointer at the bottom of the screen to bring up Light Box. Click the Tool link to see the contents of the `ZTools` folder.
5. Scroll the Light Box icons by dragging the area between the icons to the left. Find the PolySphere icon and double-click it (see Figure 3.4).

You may notice that it looks as though nothing happens when you double-click the PolySphere. But take a look in the Tool palette that is docked in the tray on the right side of the canvas; the large icon in the upper-left corner has switched from the SimpleBrush to the PolySphere, indicating that the PolySphere is now the current ZBrush tool (see Figure 3.5).

Figure 3.5
The large icon in the upper-left corner of the Tool palette represents the current tool.

Light Box gives you a visual preview of the files located on your disk within the Pixologic subdirectories; this includes things such as 3D meshes. But these files may not be loaded into the current ZBrush session, at least not until you double-click them.

In the case of the files in the Tool section of Light Box, when you double-click them they will then be loaded in ZBrush. Once a tool is loaded, it means that it is ready for you to use and edit. All the tools available for the current ZBrush session are found in the Tool palette. The current tool is in the upper left and smaller icons of other tools that are available for quick access surround it. To see all the tools available for the current session, click the large icon in the upper left of the palette to open up the inventory of available tools (see Figure 3.6).

Figure 3.6
The tool inventory separates the available tools into three sections.

Recently used tools are found in the top section of the inventory listed under Quick Pick. The current tool will appear grayed out in the inventory. The other two sections are divided between 3D tools and 2.5D brushes. Clicking another tool icon will make that tool the current tool.

6. Drag on the canvas. You'll see the PolySphere appear and grow as you drag. Let go and drag on another part of the canvas—another PolySphere appears.

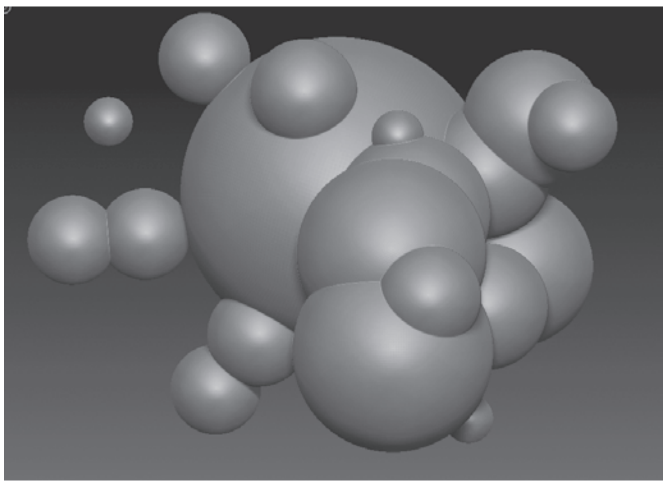


Figure 3.7
The PolySphere tool draws copies of PolySpheres all over the canvas.

Every time you drag on the canvas, a new PolySphere appears. If you drag on existing PolySpheres, new PolySpheres appear on top (see Figure 3.7). What's going on?

Currently you are in Draw mode, meaning that the PolySphere tool is drawing copies of itself on the canvas. This is why ZBrush uses the term *tool*. The PolySphere is a tool for painting PolySpheres on the canvas. So how do you sculpt the PolySphere? You have to switch to Edit mode.

7. Press **Ctrl+N** to clear the canvas.

8. Drag on the canvas to create a new PolySphere.
9. Press the Edit button on the top shelf (hotkey = T).
10. Right-click (or hold the button on the pen if you're using a tablet) and drag on the canvas. This time you'll see that the PolySphere rotates. When this happens, you'll know you're in Edit mode.

EDIT MODE

Edit mode has been known to trip up many new ZBrush users and it can cause some frustration at first. Often you'll find that you somehow accidentally move out of Edit mode (perhaps by inadvertently pressing the **T** hotkey) and when you try to sculpt on the surface of a model, a new copy of the model appears instead. And as you continue to draw strokes, more copies of the model appear. To stop this behavior, just remember these simple steps:

1. Press **Ctrl+N** to clear the canvas.
2. Drag on the canvas to add a copy of the model on the canvas.
3. Press the **T** hotkey to switch to Edit mode.
4. Continue working on your model.

What is the deal with Edit mode anyway? It makes more sense when you learn that ZBrush began as an innovative illustration tool. The 3D tools are special paintbrushes designed to paint copies of 3D objects on the canvas. Edit mode is used to change the shape of the 3D objects painted on the canvas. While in Edit mode, ZBrush stores the changes made to the 3D tool, keeping an update while you work. When you turn off Edit mode and paint on the canvas, the edited version of the object now appears.

As a digital sculptor, you may not be interested in painting pictures with your edited 3D objects. In this case, you're going to be working in Edit mode most of the time. But it's important to understand what Edit mode is in case you encounter a type of behavior you don't understand.

If you are working on a digital sculpture while Edit mode is active, save the project using the Save As option in the File menu. The next time you load the project, you'll find that your sculpture is saved in Edit mode.

Figure 3.8
The Standard brush is the current sculpting brush.

11. Look in the top of the left shelf. The Standard brush should be loaded as the current sculpting brush (see Figure 3.8). If the icon for the Standard brush is grayed out, it means you're not in Edit mode. Make sure you're in Edit mode.

12. Drag across the surface of the PolySphere. You'll see the surface raise up as you drag. Congratulations! You have just entered the world of digital sculpting! The result is shown in Figure 3.9.
13. Right-click drag on the canvas to rotate the model. As you are dragging, hold down the **Shift** key. You'll see the model snap to an orthographic view (orthographic views are side, top, and bottom views).
14. To get a better sense of this, turn on the Floor button on the right shelf so that you can see the grid. On the Floor button, click the small letters at the top of the button so that you can see the grid for each axis; that is, turn on x so you can see the grid for the x-axis, y so you can see the grid for the y-axis, and z to see the grid for the z-axis (see Figure 3.10) . You can also turn on any combination of the three letters.
15. Right-click drag again and press the **Shift** key while dragging. The view snaps to the closest orthographic view as you drag.
16. To center the view of the PolySphere in the canvas, press the Frame button on the right shelf (hotkey = F).

    While in Edit mode, you are working on a virtual sculpture stand. Right-click navigation will help you adjust the view of your model as you work (holding the button on your stylus is the same as right-clicking with your mouse):

    Right-click drag = rotate view

    Alt+right-click = move view

    Ctrl+right-click = zoom view
17. On the File palette above the top shelf, choose File → Save As. Save the file as `practiceClay.ZPR`.

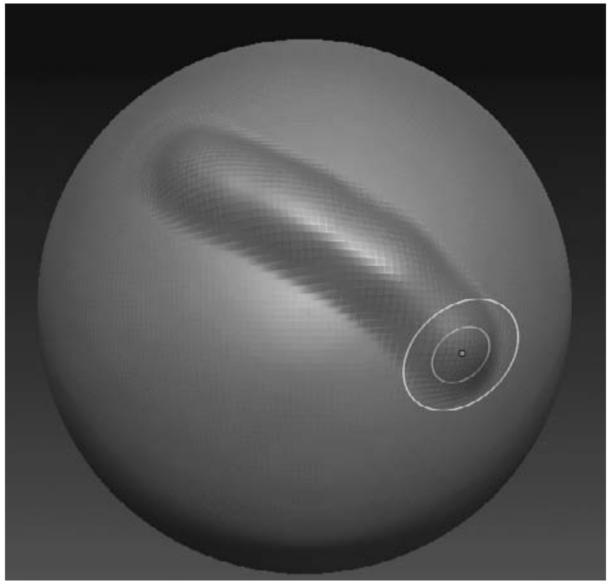


Figure 3.9
Dragging across the surface of the PolySphere creates a raised line.

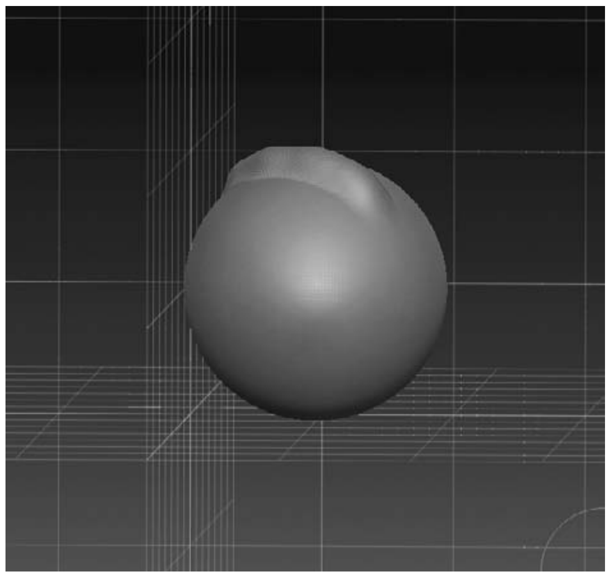


Figure 3.10
The Floor button activates the visibility of the grids.

Save the file in the `ZBrush 4.0/ZProjects` directory. This is found in the `Program Files` folder under Windows or in the `Applications` folder on the Mac (see Figure 3.11).

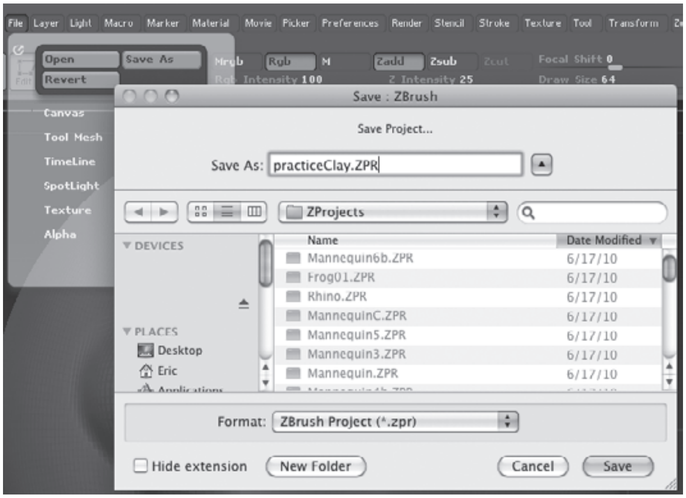


Figure 3.11
Save the project in the ZProjects folder.

Okay, you're on your way to digital sculpting. The first time you go through this it seems like a lot of steps, but before you know it this will be second nature for you. By saving the file in the `ZProjects` folder, you'll see the icon in the Projects section of Light Box.

Using Standard, Smooth, and Move Brushes

Sculpting brushes shape digital clay by moving the polygons around. The brushes do not add or remove polygons, they do not subdivide them, they just move the existing polygons in the mesh in different ways. That doesn't sound like much, but sculpting brushes are actually extremely powerful. Shaping a mesh through the use of sculpting brushes feels very natural. It is so intuitive it may make you wonder how any one created any kind of 3D digital model before ZBrush came along.

If you take a look in the sculpting brush fly-out library on the left shelf, you'll see that there are a lot of brushes (see Figure 3.12). Each has its own way of shaping digital clay.

In the following exercises, you'll learn the basics of using sculpting brushes starting with the three most essential brushes: the Standard, Smooth, and Move brushes.

Where to Find the Sculpting Brushes

The sculpting brushes are located in the fly-out library at the top of the left shelf, *not* in the Tool palette. Try not to confuse the sculpting brushes with the 2.5D brushes found in the lower section of the tool inventory. These are very different types of brushes used for drawing on the canvas, not for shaping digital clay.

Figure 3.12
The fly-out library contains a large number of sculpting brushes.

The Standard Brush

The Standard brush raises the surface of the digital clay. As you touch and drag on the surface of the clay with the Standard brush, ZBrush samples the direction of the normals underneath the brush tip, averages their direction, and then moves the surface in an upward direction based on that average. That explanation was very technical, so let's take a look at what this means.

The surface of digital clay is made up of a large number of connected polygon faces. Each polygon face is a square or a triangle. Imagine a line perpendicular to the center of each polygon face (see Figure 3.13). This line represents the face normal.

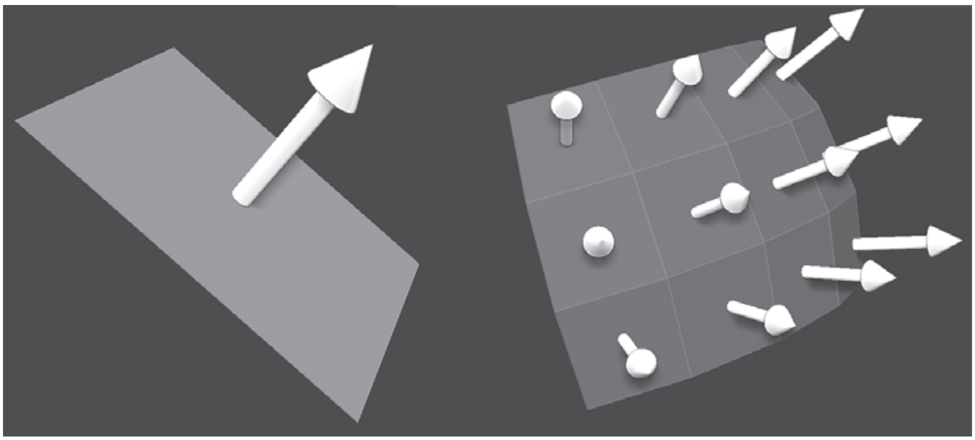


Figure 3.13
The left image shows a single polygon face. The white arrow represents the direction of the face normal. The right image shows a curved polygon mesh. Each polygon face in the mesh has its own face normal.

The direction of the face normal has a large impact on how the sculpting brush changes the surface. The brushes use a number of different algorithms that take the face normal direction into account when they modify the surface. It's not necessary to know anything about the specifics of these algorithms to use ZBrush. And ZBrush is not designed for math

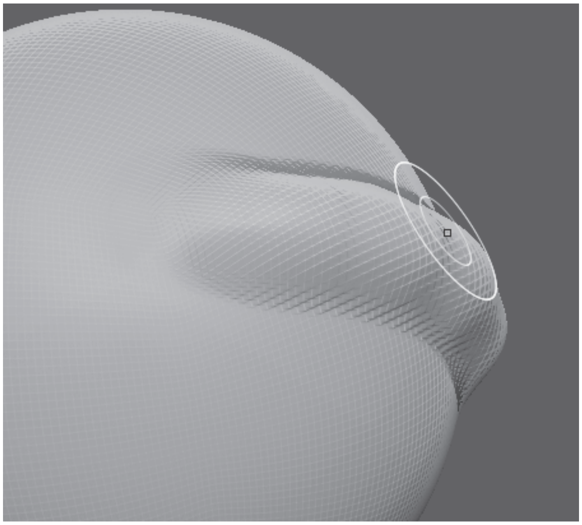


Figure 3.14
The tip of the sculpting brush is represented by a disc that orients itself to the surface of the digital clay.

geniuses; it's made for artists regardless of their level of math skill. However, it's a good idea to have a basic understanding of what a face normal is and that each brush has a different way of altering the surface based on the direction of the face normals.

As you apply the standard sculpting brush to the surface of digital clay, you'll notice a disc that hovers above the surface (see Figure 3.14). The orientation of the disc changes as you move the brush over the surface, even when you are not pressing down on a digital tablet.

Imagine a short conversation that takes place between the tip of the brush, represented by the disc, and the surface of the digital clay. The brush is asking the surface questions about the direction of the face normals, the number of polygon faces within the area of the brush tip, whether a mask has been applied to the surface, and so on. As you drag on the surface, the information is continually updated. The act of gathering information about the surface is known as sampling, and this is a big part of how the behavior of the sculpting brushes is determined. We'll return to the topic of sampling in Chapter 7, "Advanced Brush Techniques."

Figure 3.15
The brush controls on the top shelf

Let's take a look at how the settings on the top shelf affect the way the Standard brush behaves (see Figure 3.15).

Follow these steps:

1. Load the `practiceClay.ZPR` project that you saved at the end of the previous section or load a PolySphere on the canvas and switch to Edit mode.
2. Make sure the Standard brush is shown in the right shelf (Figure 3.16). If it is not, click the brush icon at the top of the left shelf to open the brush fly-out library and select the Standard brush.

   On the top shelf you'll see the Zadd and Zsub buttons, which indicate the brush drawing mode. For the Standard brush, when Zadd is on the brush will cause the surface to move outward toward the brush tip. When Zsub is activated, the brush will cause the surface to move inward away from the brush tip (see Figure 3.17).

   While sculpting a model, you'll most likely be switching between Zadd and Zsub a lot as you shape the surface. Rather than constantly move back and forth between the canvas and the top shelf, you can use the Alt key to switch modes.

3. Make sure the Zadd mode is activated on the top shelf. Drag across the surface of the PolySphere a few times to make some marks. The surface will move outward as you touch it with the brush.

Figure 3.16
The Standard brush is the currently active brush when its icon appears on the left shelf.

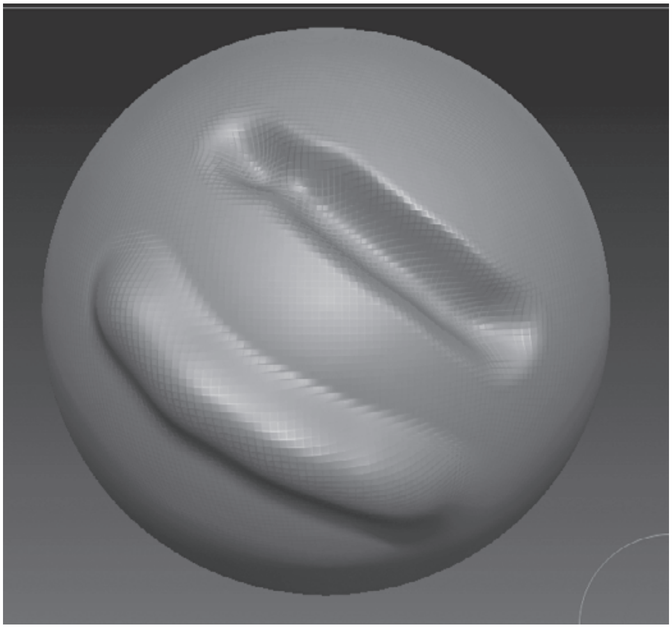


Figure 3.17

Zadd mode pulls the surface outward toward the brush tip, shown on the left side of the PolySphere. Zsub pushes the surface inward, shown on the right side of the PolySphere.

4. Hold the **Alt** key and make a few more marks. The surface now pushes inward away from the brush tip.

   The Alt key essentially switches to the opposite mode. In other words, if the Zadd button is activated on the top shelf, then holding the Alt key will activate the Zsub mode. If Zsub is activated on the top shelf, then holding the Alt key will activate Zadd mode (see Figure 3.18).

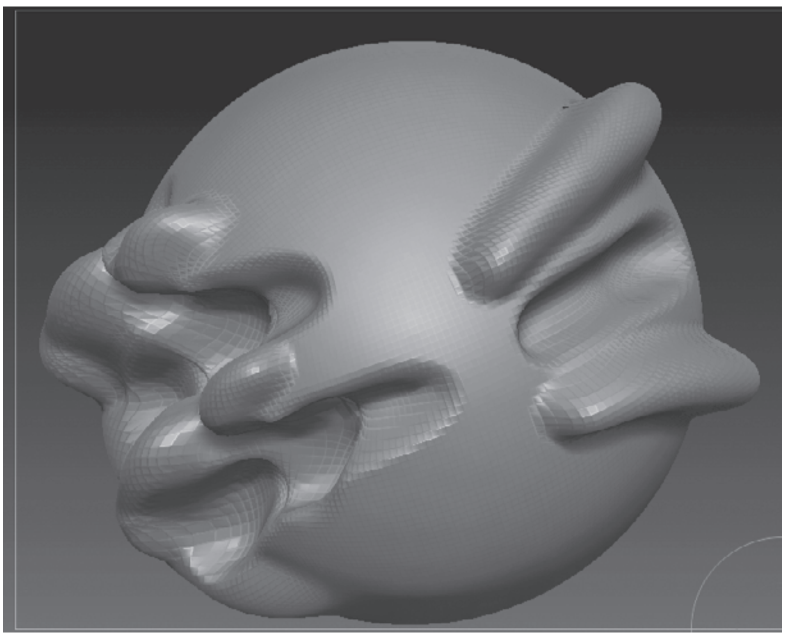


Figure 3.18

Hold the Alt key to toggle the Zsub mode while sculpting with the Standard brush.

SEARCH THE BRUSH LIBRARY

The brush fly-out library contains a large number of brush presets. If you know the name of the brush you are looking for, you can speed up your search by typing the first letter of the brush's name while the fly-out is open. For example, if you are looking for the Standard brush, just type **s**. You'll see all the brush icons become grayed out except those that start with *s*. This makes it easier to spot the Standard brush.

You'll also notice, as shown in the following image, that each brush has a letter in the upper-left corner of its icon. If you type this letter while the brush fly-out library is open, ZBrush will set the brush preset as the currently active brush. For example, typing **s** and then **t** while the brush fly-out library is open will automatically set the current brush to the Standard preset. Typing **c** and then **l** while the brush fly-out library is open sets the current brush to the ClayLine brush preset.

Below the Zadd and Zsub buttons, you'll see the Z Intensity slider. This slider sets the overall strength of the brush. When you lower Z Intensity while using the Standard brush, it takes more strokes to move the surface. A higher Z Intensity value increases the strength of the brush so that the surface deforms with only a few strokes.

5. Set Z Intensity to 5 by moving the slider to the left. (You can also select the slider in the interface and type **5** to set it to a specific number.)

6. Make some marks on the surface of the PolySphere. Use the Alt key to switch between Zadd and Zsub.
7. Set Z Intensity to 100 and make some more marks. Notice the difference; the higher Z intensity value creates a much more immediate change in the surface.

While sculpting with a brush, press the **U** hotkey to display a copy of the slider on the canvas near the brush tip (see Figure 3.19). This will allow you to adjust Z Intensity while you work without having to go up to the top shelf. Move the slider back and forth to adjust the intensity. The slider disappears from the canvas and Z Intensity is set once you release the slider.

Figure 3.19
Hold the U hotkey to display the Z Intensity slider on the canvas for quick access.

PRESSURE SENSITIVITY AND Z INTENSITY

The Standard brush is pressure sensitive, which will affect Z intensity. If you're using a digital tablet, pressing harder on the surface will cause the brush to meet the maximum value specified by the Z Intensity slider. Pressing lightly causes the stroke to have less of an effect on the surface. In Chapter 7, you'll learn how to use the pressure sensitivity controls in the Brush palette to change this behavior and design your own custom brushes.

The next slider on the shelf is the Focal Shift slider. This sets the hardness of the edge of the brush tip. If you take a look at the disc that represents the brush tip, you'll see that there are two concentric circles.

Figure 3.20
The Focal Shift slider controls the brush intensity falloff, illustrated by the space between the inner and outer circle of the brush tip.

The outer circle displays the outer edge of the brush. The surface of the digital clay is affected only within the area of the brush's outer edge. There is a falloff of strength that occurs between the center of the brush and the outer edge, which helps create a smoother deformation of the surface. The inner circle of the brush tip display represents the size of the falloff (see Figure 3.20).

Move the Focal Shift slider on the top shelf to the right to increase the distance between the outer edge and the inner circle. This gives marks made by the brush a softer edge. Move the Focal Shift slider to the left to decrease the space between the outer edge and the inner circle, giving the brush a harder edge.

8. Make some more marks on the PolySphere. Adjust the Focal Shift slider and note how this changes the style of the brush marks made on the surface.
9. Press the **O** hotkey to display the Focal Shift slider on the canvas near the brush. This makes it easier to adjust while you work.

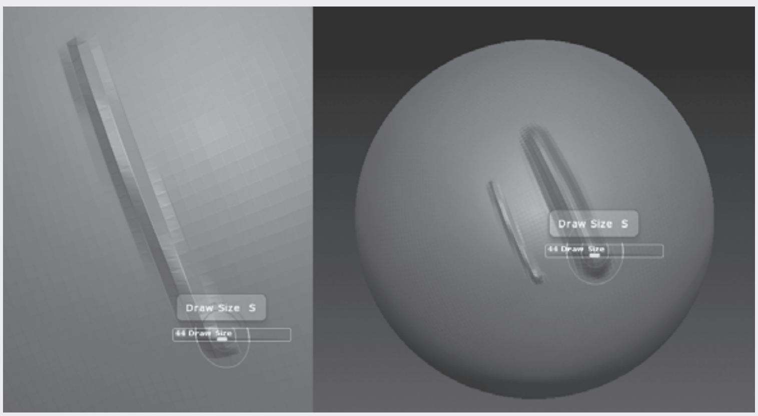
   The Draw Size slider adjusts the size of the brush's outer edge and thus the size of the brush tip itself. Using Focal Shift and Draw Size, you can fine-tune the size of the brush tip of the Standard brush as well as the other brush presets available in the brush fly-out library.

10. Experiment using the Draw Size slider to change the size of the standard brush.
11. Press the **S** hotkey to display the Draw Size slider on the canvas near the brush tip.

BRUSH SIZE AND VIEW SCALE

The draw size remains consistent regardless of the view scale of the mesh on the canvas. So if you hold the **Ctrl** key and right-click drag to scale the view up, the brush size will remain the same and affect a smaller part of the mesh. Likewise, if you scale the view down, the same brush size will affect a larger part of the surface.

The following screen shot illustrates how, even though Draw Size is set to 44, the amount of area affected by the brush is different if the view scale is large (left) as opposed to small (right).



The Smooth Brush

The Smooth brush evens out the area of a surface to create a smoother appearance. You can select the smooth brush from the brush fly-out library; however, since this brush is used a lot while sculpting, ZBrush has assigned the role of activating the smooth brush to the Shift hotkey. This way you don't have to constantly go into the brush fly-out library to switch to the smooth brush. To practice using the Smooth brush, follow these steps:

1. Load the `practiceClay.ZPR` project that you saved at the end of the previous section or load a PolySphere on the canvas and switch to Edit mode.
2. Use the Standard brush to make marks on the surface of the PolySphere.
3. Hold down the **Shift** key and drag the brush over the marks you've made with the Standard brush (see Figure 3.21).

   The marks in the surface seem to melt away as you brush over them while holding down the **Shift** key. The Smooth brush averages the distance between the vertices on the surface.
4. Increase the draw size of the brush and continue smoothing the surface. The smooth effect is stronger with a larger brush size because a larger area of the surface is being sampled as you brush.
5. Hold down the **Shift** key and adjust the Z intensity.

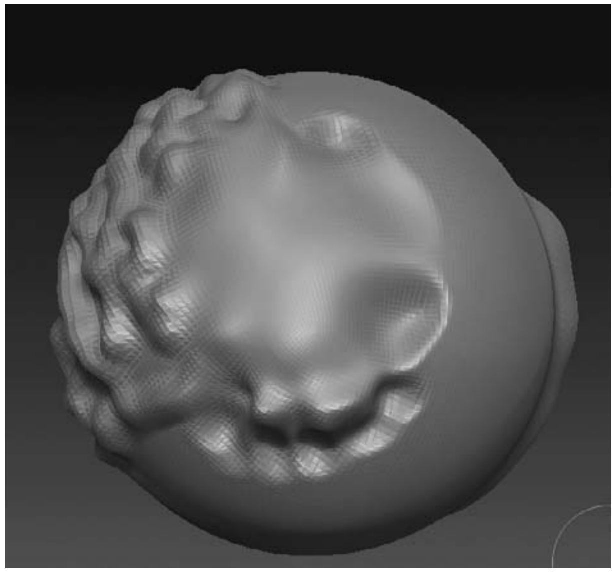


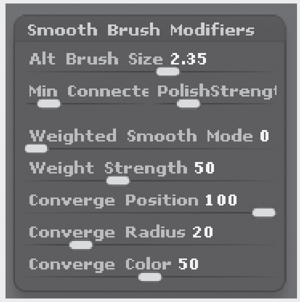
Figure 3.21
The Smooth brush evens out the surface creating a smooth appearance.

The Z intensity of the Smooth brush is independent of the current brush, meaning that the value changes when you switch to the Smooth brush. ZBrush remembers the Z intensity of the Smooth brush even when you release the Shift key and switch back to the Standard brush. This is also true of the Focal Shift setting but not Draw Size.

A high Z intensity, such as the default setting of 100, can quickly obliterate details sculpted into the mesh. It's good practice to set the Z intensity of the Smooth brush to somewhere between 20 and 40 while working.

There are a number of other smoothing brushes available in the brush fly-out library and in the Brush section of Light Box. If you choose one of these brushes, you'll get a message letting you know that the chosen smoothing brush will be active only while you are holding down the **Shift** key. The other smoothing brushes have unique properties that will make more sense after you've learned more about ZBrush.

SMOOTH BRUSH SIZE



The Brush palette contains a set of controls that are dedicated to the Smooth brush. These are found toward the bottom in the Smooth Brush Modifiers subpalette. This palette will be explained in detail in Chapter 7. For now it is useful to know that the Alt Brush Size slider adjusts the size of the Smooth brush. This value is a multiplier for the Draw Size setting. When you set Alt Brush Size to 2, every time you hold down the **Shift** key, the draw size of the Smooth brush will be twice the draw size of the current brush. A setting of 10 will make the Smooth brush 10 times the current brush size.

RELAX BRUSH

The Smooth brush has an alternate relax feature that is activated by releasing the **Shift** key while the Smooth brush is active. To use this feature, you need to hold down the **Shift** key to activate the Smooth brush, drag on the surface of the mesh, and then release the **Shift** key and continue to drag the brush across the surface. The difference between smooth and relax modes is often very subtle.

The Move Brush

The Move brush pushes and pulls digital clay just as if you were stretching and squashing real clay with your hands. It's one of the best ways to work out the basic shape of your sculpture, but it can be used to manipulate small parts of objects as well. To practice using the Move brush, follow these steps:

1. Load the `practiceClay.ZPR` project that you saved at the end of the previous section or load a PolySphere on the canvas and switch to Edit mode.
2. Click the brush icon at the top of the left shelf to open the sculpting brush fly-out library.
3. You can select the Move brush from the Quick Pick list at the top of the fly-out library or press **m** and then **b** while the fly-out library is open.
4. Click on the surface of the PolySphere and drag away from the center of the mesh. The Move tool pulls the surface and will continue to pull until you let go.
5. Increase the Z intensity to 100 and try pulling some more. The clay seems to stick to the brush tip until you let go.
6. When you lower the Z intensity, the result of using the Move brush becomes more like a nudge or smear. It takes more strokes to push the clay around.

7. Set the Z intensity to 50 and try adjusting the Focal Shift slider. At -100, the brush has a harder edge and you can move more of the clay. Using a Focal Shift of 100 adds a tapering effect to the movement. The effect of the Move brush is concentrated at the center of the brush tip.
8. As you drag out part of the surface, hold the **Alt** key. This causes the moved portion of the surface to move along the direction of the face normals (see Figure 3.22).

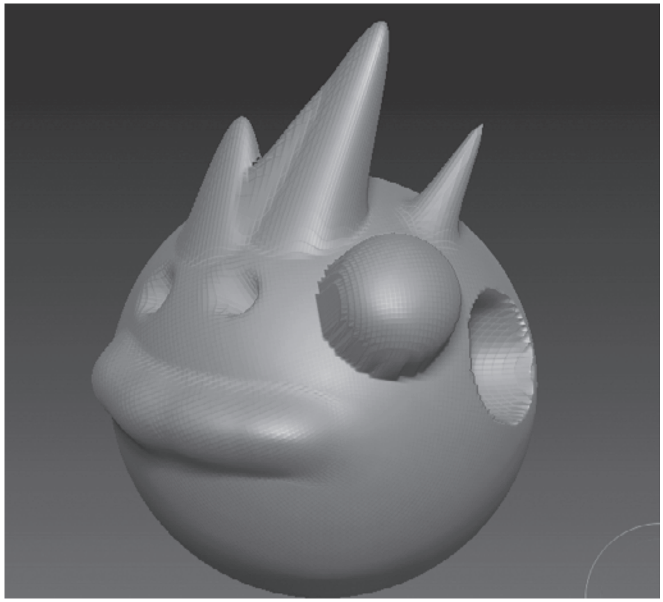


Figure 3.22
The Move brush allows you to push and pull on the surface of digital clay. Adjust the Z intensity and focal shift and use the Alt key to modify the behavior of the brush.

By holding the **Alt** key, you restrict the motion of the Move brush to the direction of the face normals. This is true when you push into the surface as well.

There's much more to learn about the brushes, and you'll get to explore many more types of brushes throughout this chapter. Before going on, spend some time making a mess out of the PolySphere in your `practiceClay.ZPR` project. Get a feel for using the Alt key to switch between Zadd and Zsub with the Standard brush. Adjust the Z Intensity, Draw Size, and Focal Shift settings. Experiment with the Smooth and Move brushes.

MOVE BRUSH PRESETS

There are a number of Move brush presets in the sculpting brush fly-out library as well as in the Brush section of Light Box. You'll learn more about how these presets work as well as how to make your own variations in Chapter 7.

Subdivide Your Mesh

As stated earlier, digital clay in ZBrush is a mesh made up of polygon faces. ZBrush can easily handle a mesh with millions of polygons. The more faces a mesh has, the more detail can be sculpted into it, which is why ZBrush has become so popular for creating realistic creatures and characters. But how do you get a mesh with millions of polygons? It's done through subdivision. ZBrush allows you to subdivide the mesh to increase the number of polygons in the surface, thus allowing for more detailed sculpting. ZBrush also keeps a history of the model at lower subdivision levels so that you can move back and forth between the original mesh and the subdivided mesh.

The ability to move freely between levels of subdivisions makes the task of modeling much easier. At lower subdivisions, you can rough out the major forms of a model; at higher levels, you can create fine detail. At any point during the sculpting process, you can move back down to a lower subdivision level and make changes, and the details at the higher subdivision levels will still be there.

To see how this works, try this exercise:

1. Place your mouse pointer toward the bottom of the ZBrush interface to open Light Box or click on the LightBox button on the top shelf. Click the Project heading.
2. Double-click the `DemoDog.ZPR` project to load it on the canvas. The DemoDog project consists of a basic dog model.
3. Click the PolyF button on the left shelf to display the wireframe on the surface of the dog. This allows you to clearly see the polygon faces that make up the mesh.
4. Make sure the Tool palette is loaded in the tray on the right side of the canvas. Hold the mouse pointer over the large icon of the dog in the upper-left corner. You'll see a small window pop up that displays statistics for the dog model (see Figure 3.23).

   The statistics indicate that the dog mesh currently has 7,984 polygon faces (abbreviated as Polys) and 8,013 points.
5. In the Tool palette, expand the Geometry subpalette and press the Divide button, shown in Figure 3.24 (hotkey = Ctrl+D).

   When you divide the mesh you'll see that it appears smoother and the lines of the wireframe become denser.
6. Hold the mouse pointer over the dog icon in the Tool palette again to see the statistics pop up.

   The dog model now has 31,936 polygons and 31,993 points. In the Geometry subpalette of the Tool palette, a slider labeled SDiv is now active. The slider is set to 2. This means that the dog mesh now has two levels of subdivision.

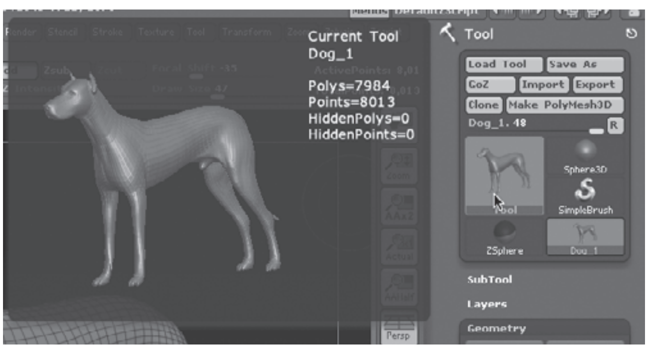


Figure 3.23

Hold the mouse pointer over the tool icon in the Tool palette to see mesh statistics.

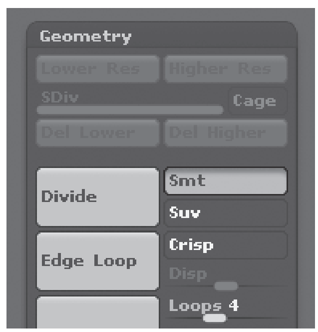


Figure 3.24

Press the divide button to add a level of subdivision to the mesh.

7. Move the SDiv slider to the left to set it to level 1. This brings the dog model back to its original state of 7,984 polygons.
8. Move the SDiv slider to level 2 and press the Divide button again (hotkey = Ctrl+D). This adds a third level of subdivision. At this level the dog mesh has 127,744 polygons and 127,857 points.

As you increase the subdivision level on a mesh, the number of polygons increases by a factor of four since each polygon is divided into four smaller polygons. A mesh that has 24 polygons at SDiv level 1 will have 96 polygons at SDiv level 2, 384 polygons at SDiv level 3, 1,536 polygons at SDiv level 4, and so on. It doesn't take very many subdivisions before a mesh reaches a million or more polygons.

SETTING SUBDIVISION LIMITS

In the Preferences palette, you can adjust the maximum number of polygons each mesh can have using the MaxPolyPerMesh slider in the Mem subpalette. This limit is specified in millions of polygons per subtool (a limit of 12 means 12 million polygons). At a certain point a model with millions and millions of polygons will start to slow down the performance of the software, but understand that ZBrush's unique programming allows it to handle many more polygons per mesh than another 3D application would be able to on the same computer!

The SDiv slider lets you move up and down through the subdivision levels. You can also use the **D** hotkey to move to a higher subdivision level and **Shift+D** to move to a lower subdivision level. These hotkeys only move through existing subdivision levels.

ADD LOWER LEVELS OF SUBDIVISION

If you want to add a lower level of subdivision, use the Reconstruct Subdiv button in the Geometry palette. This button is active only when the SDiv slider is at level 1. The Reconstruct Subdiv button works if the number of polygons in the model can be divided evenly by 4. Be careful when using this feature. Using the Reconstruct Subdiv button can sometimes adversely affect details sculpted into the higher subdivision levels.

The Del Lower button deletes all subdivision levels below the current SDiv setting and sets the current SDiv level to 1. So if you're on level 2 and you press the Del Lower button, all SDiv levels below 2 are removed and 2 now becomes 1.

The Del Higher button removes all subdivision levels above the current SDiv setting.

The Smt button is activated by default. This smoothes the mesh each time you press the Divide button. If this button is off, the hard edges of the model will be maintained as the model is divided.

Each time you subdivide the model using the Divide button, the SDiv slider should be at its highest setting, otherwise you'll get a warning. In addition, if it looks as though nothing is changing when you divide the model, check to see whether the Smt button is off.

Sculpt with Symmetry

The symmetry feature copies changes you make on one side of a model to the opposite side. This is helpful when you want to sculpt a symmetrical object such as a face. What's more, you can sculpt using multiple axes at the same time and use radial symmetry to quickly create ornate designs. The following steps demonstrate how to use symmetry in ZBrush:

Figure 3.25

Use the cursor in the central square of the color picker to choose white.

1. Place your mouse pointer toward the bottom of the ZBrush interface to open Light Box. Click the Project heading.
2. Double-click the `DefaultCube.ZPR` project to load it on the canvas.
3. Open the sculpting brush fly-out library on the left shelf and press **s** and then **t**. This will set the current brush to the Standard brush.
4. In the color picker on the left shelf, move the cursor within the central square to the upper-left corner to select a white color. This will make it easier to see the cube (see Figure 3.25).
5. Dock the Transform palette in the right tray.

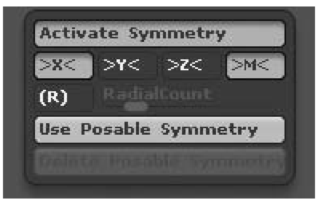


Figure 3.26

Turn on Activate Symmetry in the Transform palette.

6. In the Transform palette, turn on the Activate Symmetry button (see Figure 3.26). The hotkey to activate symmetry is X.
7. Hold the brush tip over the front of the cube. You'll see a second red dot. This dot indicates the position of the symmetrical stroke (see the top image in Figure 3.27).
8. Make some marks on the front of the cube. The marks you make are mirrored on the other side of the cube (see the bottom image in Figure 3.27).

By default, the symmetry is set to mirror strokes across the x-axis of the mesh. In the Activate Symmetry subpalette of the Transform palette, you'll see that there are buttons for >X<, >Y<, and >Z<.

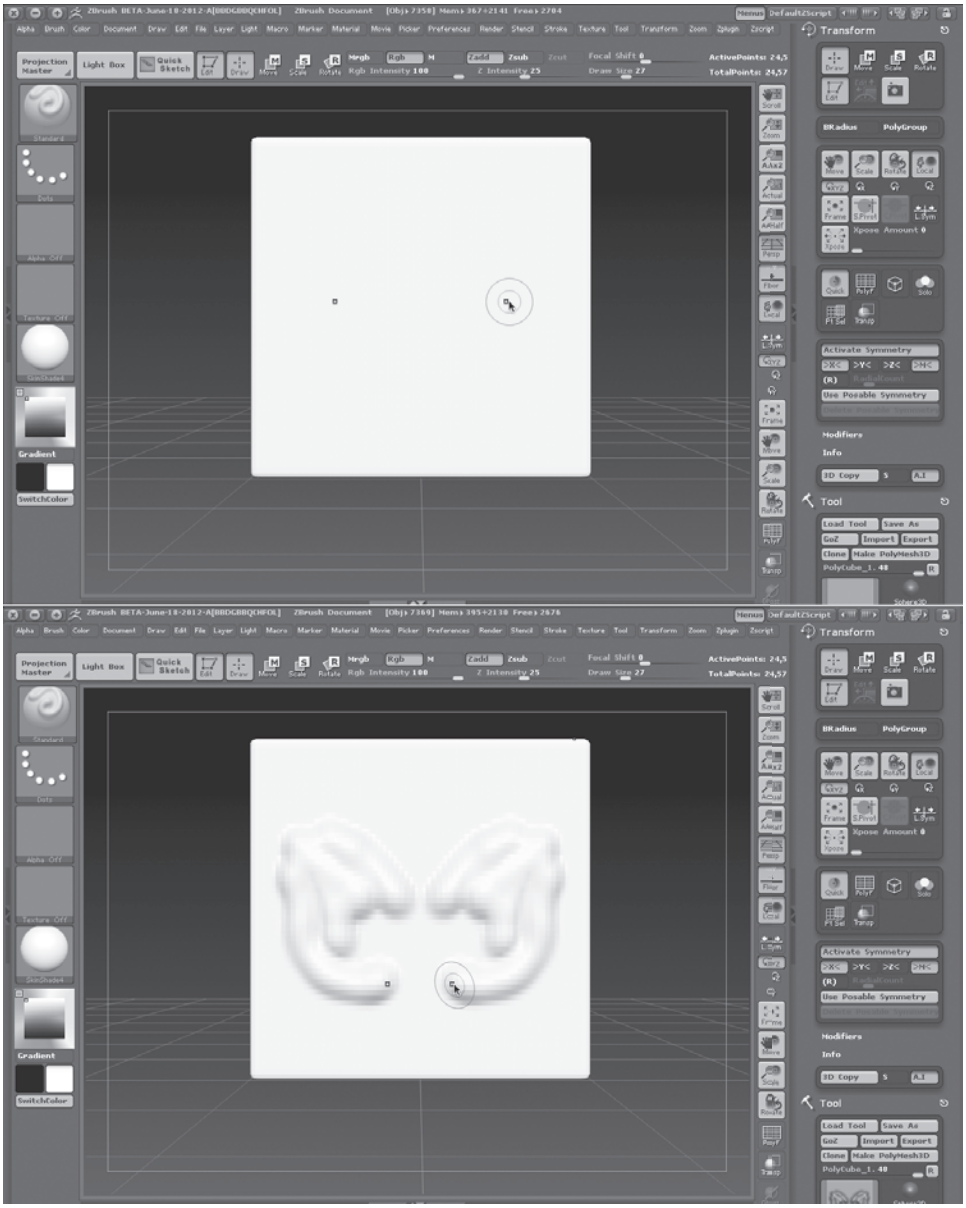
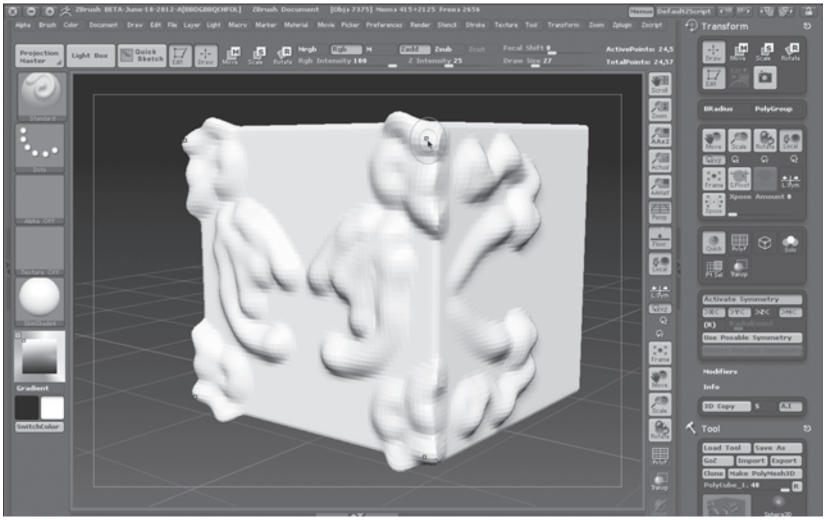


Figure 3.27
When symmetry is activated, you'll see two red dots appear on the model (top image). Symmetry mirrors marks made with the sculpting brush across a specified axis (bottom image).

9. Turn on the >Y< button and make more marks on the cube. Now there are four red dots indicating that strokes are mirrored along both the x- and y-axes (see Figure 3.28).

   You can use any combination of >X<, >Y<, and >Z<, or all of them together. This can be a great way to create elaborate designs. The >M< button mirrors the symmetry so that if you move to the right on one side, the symmetrical stroke moves to the left. If this is off, both strokes will move to the right.

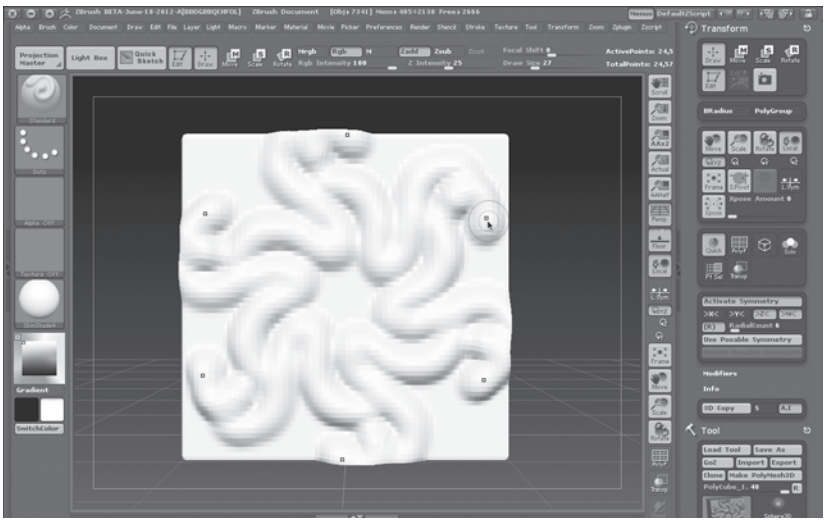
Figure 3.28
Marks made on the surface of the cube are mirrored across both the x- and y-axis at the same time.



10. From the File palette, choose Revert to undo all the changes you have made to the cube. Set the color to white again.
11. In the Transform palette, turn on Activate Symmetry (hotkey = X) and turn on the (R) button. This activates radial symmetry.

    Radial symmetry creates a ring of strokes, which can lead to some really interesting designs. The RadialCount slider sets the number of strokes.
12. Turn off the >X< button, turn on >Z<, and set RadialCount to 6.
13. Make some marks on the front of the cube (see Figure 3.29).

Figure 3.29
Radial symmetry is a great way to create elaborate patterns.



Radial symmetry is a great way to create interesting patterns on surfaces. Try combining radial symmetry with more than one axis (x, y, and z) and see what kind of shapes you can create.

Sculpt a Dragon's Head

Now that you have some fundamental ZBrush concepts down, it's time to actually make something. In the following sections, you'll build on what you've learned through the process of sculpting a dragon's head. You'll start with a simple lump of digital clay and shape it into the head of the classic fantasy beast. Along the way you'll add to your repertoire of sculpting brushes and learn about masking, polygroups, and subtools.

Exploring Shapes

The first task is to find the shape for the dragon's head. ZBrush is an organic medium, ideal for testing out ideas. In this exercise, you'll see how you can play in ZBrush as you search for a shape that inspires your imagination. Digital sculpting is not about moving *x* number of vertices to such and such coordinates; it's more about feeling your way toward a general goal. In this respect, I do not expect your dragon to look exactly like the example created in this book. In fact, at this point I have no idea what form the dragon I create will take. You may want to take a few minutes to research images of dinosaurs, lizards, snakes, and art created by fantasy masters. In particular, I find the fantasy art of John Howe very inspiring. Obviously, dragons are not real creatures, and the rules for creating them are pretty loose: If it looks like a dragon and breathes fire like a dragon, then it's a dragon.

To create the basic head of the dragon you'll start with a PolySphere. It's a good idea to keep the mesh at a low subdivision level when you're creating the initial shape. This helps you avoid the temptation of jumping into detail too early. Just as with any traditional medium, such as clay sculpture or drawing, the best approach is to focus on the primary forms such as the skull and bony parts first and then add secondary details such as the muscles and tertiary details such as scales and wrinkles later on.

Prepare for Sculpting

You'll focus on the silhouette of the form as you find the shape. Keep away from working on details at this point; there will be plenty of time for that later on. The following steps demonstrate a good way to prepare for sculpting:

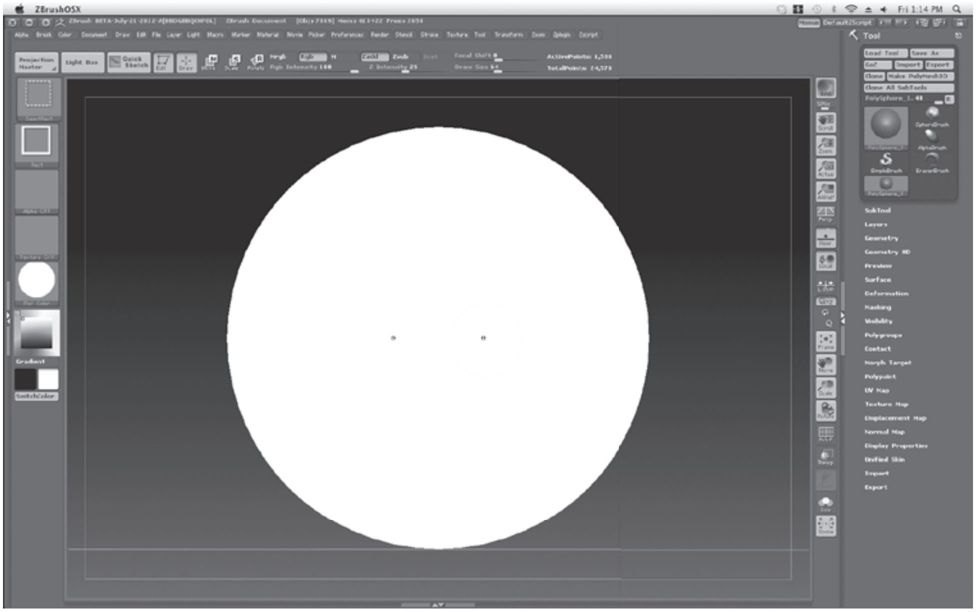
1. Open ZBrush and make sure the canvas is clear.
2. Open Light Box by moving the mouse pointer to the bottom of the screen. Click the Tool link and double-click the PolySphere.ZTL tool.
3. Drag your stylus across the canvas to create the PolySphere.
4. Press the **T** hotkey to switch to Edit mode.
5. Press the **F** hotkey to frame the PolySphere.
6. Make sure the Tool palette is docked in the right tray.
7. Press **Shift+D** twice to move down to the lowest subdivision level.
8. Press the **X** hotkey to turn on symmetry along the x-axis.

9. In the material fly-out library, select the Flat Color material. This will make the PolySphere appear solid white.

10. Rotate the PolySphere by right-click dragging on the canvas (hold the button on the stylus if you're using a tablet). Hold down the **Shift** key as you drag to snap the view to the front. You'll want to see two dots on the front of the sphere as shown in Figure 3.30. If you're having trouble figuring out which is the side view, try turning on the Floor button on the right shelf. The grid display will help keep you oriented.

Figure 3.30

The PolySphere is placed on the canvas and is ready for shaping.



That seems like a lot of steps, but it actually becomes second nature fairly quickly. Now you're set up and ready to sculpt. At this point you can save this as a project to avoid having to repeat these steps in the future.

11. Go to the File palette and choose Save As. Save the file as `dragon_v01.ZPR` in the `Pixologic\ZProjects` folder. This way it will appear in Light Box under the Projects heading, saving you the trouble of having to hunt for it later on.

THE FLAT COLOR MATERIAL

The Flat Color material is ideal when you're just starting to explore shapes because it displays only the color of the surface and none of the contours. This keeps you focused on the silhouette of the object. A strong silhouette is the hallmark of good design; the eye perceives the shape first before all other details. In evolutionary terms, this makes sense because the brain may only have a split second to decide whether an approaching creature is a friend, foe, or lunch.

The Move Elastic Brush

Earlier in the chapter you were familiarized with the Move brush, which works well for shaping digital clay. The Move Elastic brush is a variation of the Move brush, but it is designed to help minimize polygon stretching. In this example, you'll use the Move Elastic brush to shape the dragon's head:

1. Set the draw size to around 100. Remember that draw size is relative to the size of the object on the canvas so an exact value is not crucial. Just make it large enough to grab a sizeable chunk of digital clay.
2. Click the sculpting brush icon at the top of the left palette. Type **m** and then **e** to select the Move Elastic brush.
3. You should be looking at the front of the PolySphere. You'll know this is true if you can see two dots indicating that the brush is mirrored along the x-axis. Use the brush to pull some of the PolySphere out from the center.

   You may notice that the PolySphere's reaction to the Move Elastic brush is slightly different than its reaction to the Move brush. This is because the PolySphere adjusts its topology automatically as you use the Move Elastic brush. It is updating automatically to minimize polygon stretching. This may appear as a slight jittering while you use the brush, but don't worry. It's not a bug; it's is just the mesh adjusting itself while you work.
4. As you pull outward from the center, try reversing direction—push back in toward the center without letting go. This creates a taper in the pulled section. Experiment pushing and pulling to get a sense of how the PolySphere responds to the Move Elastic brush (see Figure 3.31).

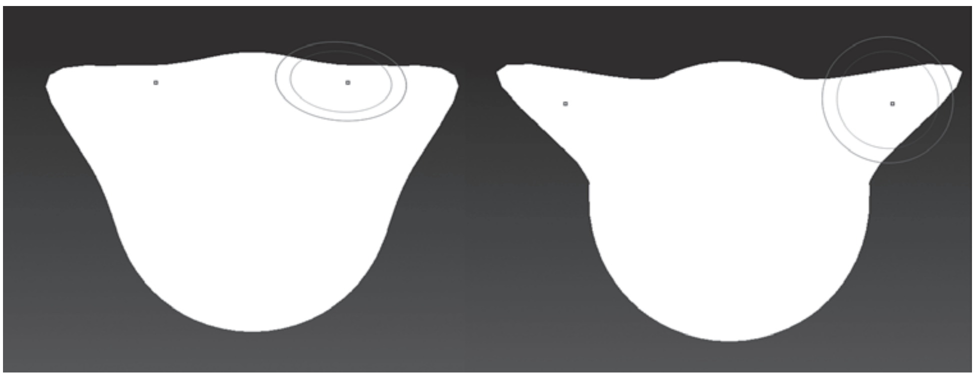


Figure 3.31
Pull out from the center using the Move Elastic brush (left image). Push back in without letting go to create a tapering in the surface (right image).

5. Right-click drag on the canvas to the right. Hold down the **Shift** key as you drag to snap to the side view. Experiment with shapes as you work—elongate the PolySphere in the side view to try to create something that looks dragonlike. Figure 3.32 shows how I developed the initial shape of my dragon head.

Figure 3.32
The head of the dragon is shaped from the side view.

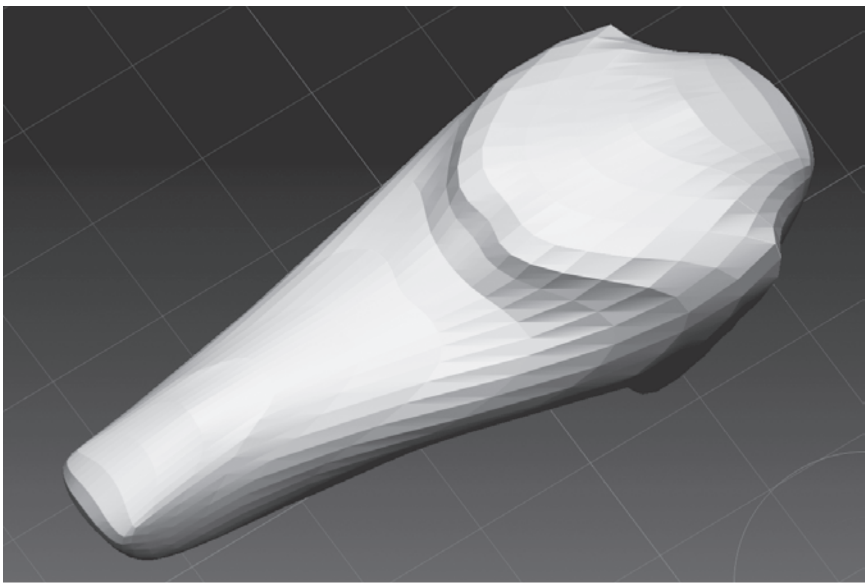
6. Right-click drag on the canvas to rotate to a top view and continue to shape.
7. After a few moments, you should get something fairly interesting. At this point, go to the material fly-out library on the left shelf and choose the BasicMaterial (see Figure 3.33).

Figure 3.33
Choose the Basic-Material from the material fly-out library.

Now you can see how the shape looks in three dimensions. Chances are it will look a little stretched, but that's okay; you're still working out the shape.

8. Hold down the **Shift** key to activate the Smooth brush. While you're holding down the **Shift** key, set the Z Intensity slider to 20.
9. Hold down the **Shift** key and brush over the stretched portions to smooth the surface.
10. Continue to shape the surface, alternating between the Move Elastic brush and Smooth brush (see Figure 3.34).
11. As you use the Move Elastic brush, move your brush strokes back and forth to play with interesting shapes. You'll find that you can create interesting contours in the surface that would be difficult to achieve with the regular Move brush.

Figure 3.34
Continue to shape the surface using the Move Elastic and Smooth brushes.



USE MOVE ELASTIC ON LOW-DENSITY MESHES

Due to the fact that ZBrush is constantly updating the mesh as you use the Move Elastic brush, it is best suited for working on low-density meshes—meshes with 25,000 or fewer polygons. Using Move Elastic on meshes higher than 25,000 will cause the brush to behave more like the regular Move brush. ZBrush has built a polygon limit into the Move Elastic brush to prevent the software from slowing down too much while working on high-density meshes. You can raise the limit by increasing the Elasticity Auto Off slider in the Brush palette, but it's a better idea to leave the limit set at its default value of 25 (meaning 25,000) and use the brush on lower subdivisions of the model.

12. Be sure to rotate to see the bottom of the mesh. You can pull the jaw out by dragging the polygons at the bottom of the PolySphere forward (see Figure 3.35).

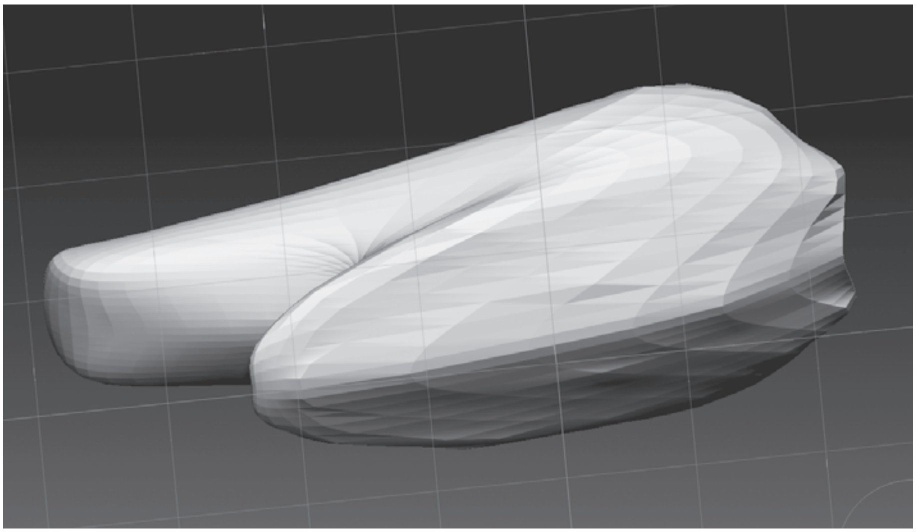


Figure 3.35
From the bottom view, the jaw is created by pulling the bottom of the mesh toward the right.

13. Continue to shape the head from every angle. Pull and push and then smooth to even out the topology. Adjust the draw size as needed to create different details, but try to work in broad strokes. You are just roughing out the overall size of the head. Don't worry about small details; the goal at this point is not a perfect dragon head, but something interesting that you feel you can work with.

    If you can build personality into the dragon at this early, low-polygon stage, your final design will be much more successful. Keep your mind open to possibilities. Is your dragon fierce? Comical? Intelligent? What can you add to your design to make the dragon more or less terrifying?

14. When you arrive at a shape you like, use the File menu to save the file as `dragon_v02.ZPR` (see Figure 3.36).

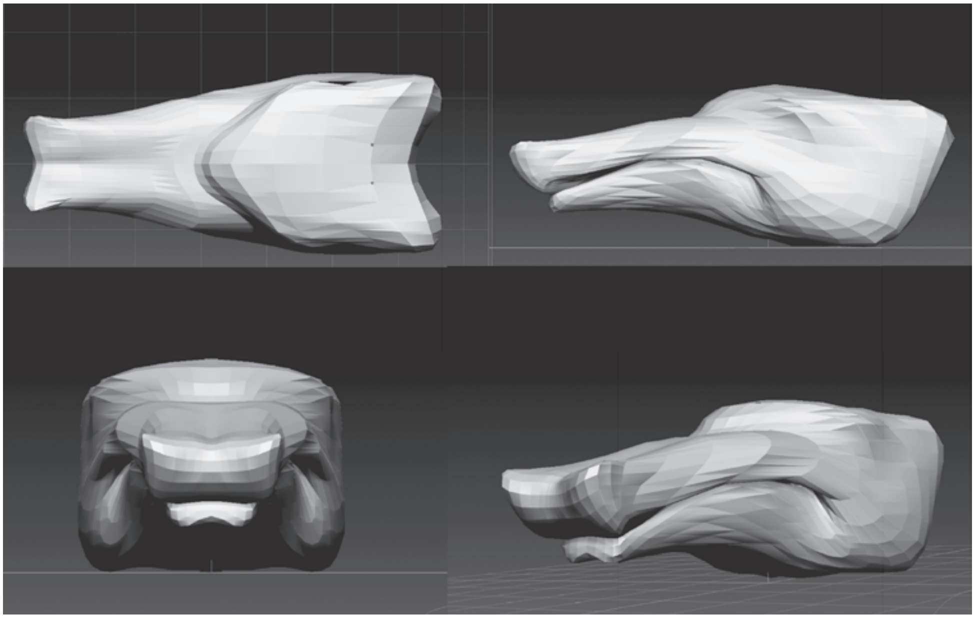


Figure 3.36
The basic shape of the dragon head from the top, side, front, and perspective view

You may want to create several versions of the dragon head and decide which one you like best. In Figure 3.37 are a few variations I created using these same techniques. Avoid detail. In some cases it can be difficult to know when to stop. Always save when you come up with something you like. The dragon head I created can be found in the Chapter 3 folder of the DVD that comes with this book. I've included the alternate dragon heads as well.

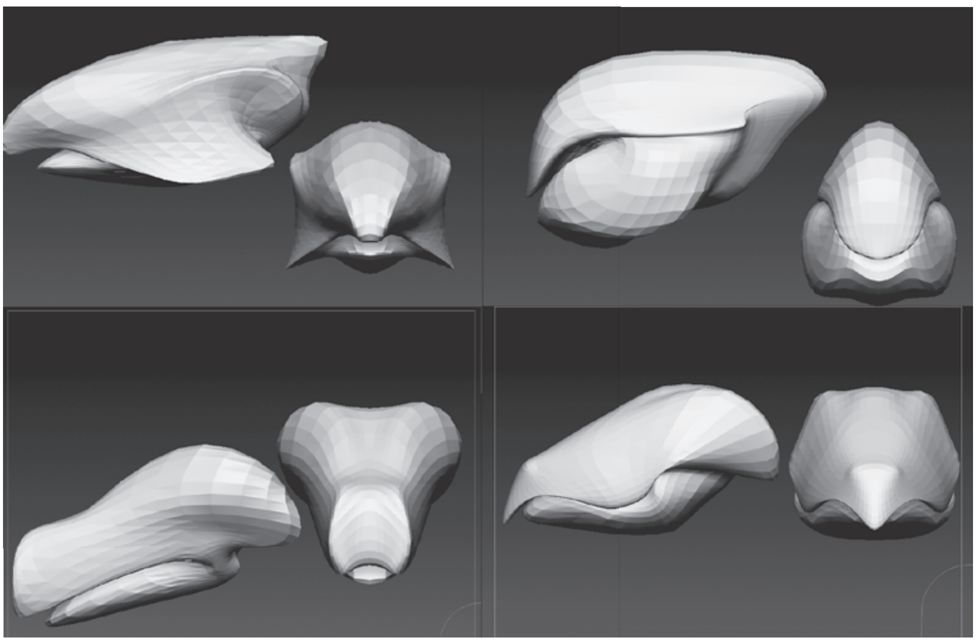


Figure 3.37
Alternate versions of the dragon head are quickly realized using the Move Elastic and Smooth brushes.

The Move Topological Brush

The Move Topological brush can be used to shape the lower jaw of the dragon's head without disturbing the shape of the upper lip. This is because, rather than affect the polygons within the overall area of the brush tip, the Move Topological brush makes a calculation to see how the polygons are connected through shared vertices and affects only those that have a connection. Even though the upper lip may be close to the lower in 3D space, the polygons of the upper lip are topologically far away from the upper lip because they have been pulled out from another part of the surface, and thus they are not affected by the brush.

This brush comes in very handy for adjusting lips, eyelids, fingertips, and other tight spots that might be difficult to sculpt with the regular Move brush. Follow these steps to shape the lower jaw:

1. Continue with your own dragon head or use the Open button in the File palette to load the `dragon_v02.ZPR` project. This project can be found in the Chapter 3 folder on the DVD that comes with this book.
2. On the left shelf, open the sculpting brush fly-out library and type **m** and **g** to select the Move Topological brush.
3. Rotate the view of the dragon head so that you can see the lower jaw.
4. Press **Shift+D** repeatedly until the mesh is set to the lowest subdivision level.
5. Increase the draw size to around 80 so that it's large enough to grab a fair amount of digital clay.
6. Make sure symmetry is still active.
7. Pull the polygons on the bottom of the lower jaw downward to add some volume. Dragons should have powerful jaws, so you may want to thicken the jaw a fair amount.
8. While you pull at the surface, you'll want to smooth it out as well by holding down the **Shift** key while brushing over the surface.
9. Feel free to shape other parts of the head as you work as well. Figure 3.38 shows how I used the Move Topological brush to increase the size of the lower jaw.

SMOOTH BRUSH Z INTENSITY

When working with a mesh set to a low subdivision level, you'll want to lower the Z intensity of the Smooth brush; otherwise, you may find that it's so strong that the shape of the model becomes quickly obliterated. To do this, hold down the **Shift** key and lower the Z Intensity setting.

ZBrush also has a Move Topological Elastic brush, which combines the properties of the Move Elastic brush with the Move Topological brush.

10. When you are happy with the overall shape of the dragon's head, use the Save As button in the File palette to save the project as `dragonsHead_v03.ZPR`.

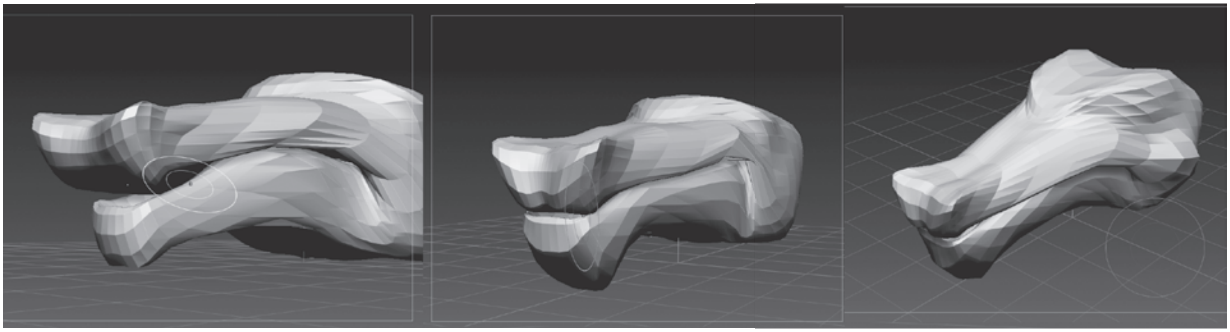


Figure 3.38
The Move Topological brush allows you to shape the lower jaw without affecting the upper lip.

Refine the Shape of the Dragon's Head

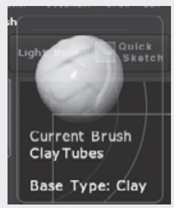
Once you have established a basic shape using the Move and Smooth brushes, you can start to refine it using other types of sculpting brushes.

The Clay Brush

The Clay brushes work well for both building areas up and scraping other areas away. Clay brushes use an algorithm that has a stronger effect on the recesses of a surface than on the more level areas. This makes it feel as if you're wedging clay into the surface, making the brushes feel very natural.

BRUSH BASES

The sculpting brush presets listed in the sculpting brush fly-out library are all variations on a few base brush types. For example Clay, Clay Line, Clay Tubes, Rake, and Form brushes are just a few of the presets that use the Clay brush as a base. When you hold the mouse pointer over the icon for a preset, a little preview pops up. At the bottom of the preview the Base Type listing tells you what that particular preset is based on. In Chapter 7, you'll learn more about creating your own brush presets from a base type.



In this exercise you will use the Clay brush to rough out the forms of the head. At this point you should still be thinking of the overall shape of the head and not the details.

1. Continue with your own dragon head or use the Open button in the File palette to load the `dragon_v03.ZPR project`. This project can be found in the Chapter 3 folder of the DVD that comes with this book.
2. On the left shelf, open the sculpting brush fly-out library and type **c** and then **a** to select the Clay brush.

3. The Clay brush works best when used on a mesh at a higher subdivision level. Press the **D** hotkey two or three times to set the mesh to the highest subdivision level. Another way to do this is to open the Geometry subpalette of the Tool palette and set the SDiv slider to the highest level. On my version of the mesh, this is level 3.
4. Press the **Ctrl+D** hotkey to divide the mesh again. This adds another SDiv level above the highest one. In my example model, this adds a fourth level of subdivision. At SDiv 4, the mesh now has 98,304 polygons.
5. Set the draw size to around 20 or 30 and use the Clay brush to add form to the dragon's head (see Figure 3.39). At this point, you shouldn't worry about detail. Instead, try to refine the forms you created with the Move brushes.
6. Remember to hold the **Alt** hotkey when you want the Clay brush to dig into the model. Use the **Shift** hotkey to smooth the surface while you work. Repeated strokes over the surface will help you discover interesting shapes for the head.
7. You may want to increase the Z intensity of the Smooth brush when working at higher subdivision levels.

Keep your strokes fast and fluid while you work at this stage, kind of like sketching. Try to figure out where you want to place details such as eye sockets and nostrils.

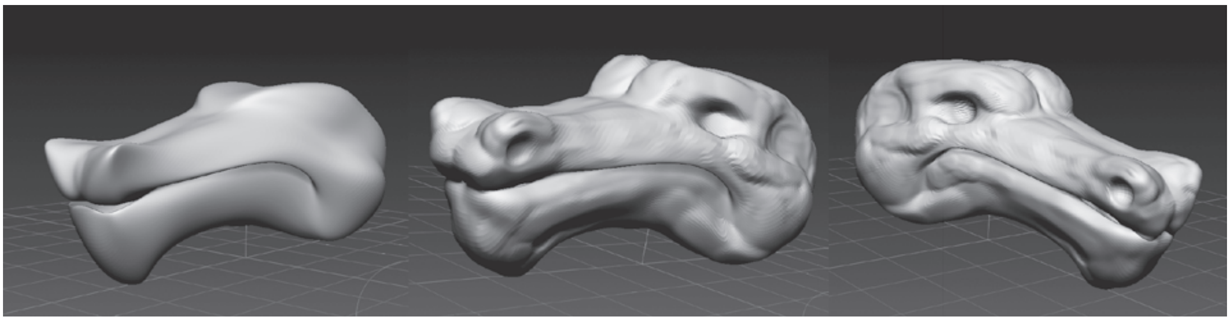


Figure 3.39
The Clay brush is used to refine the shape of the head.

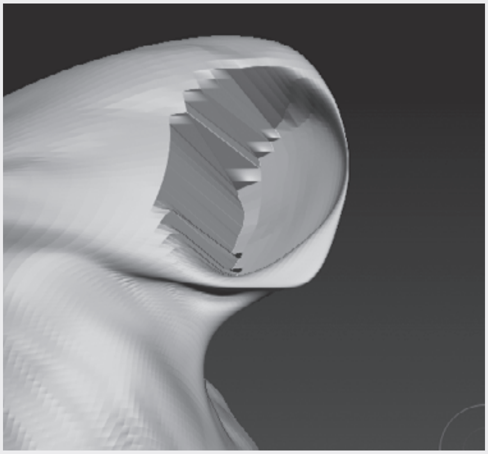
Often when I'm using this approach to sculpting, I find that some areas get too thin or flattened. When this happens, I switch to a lower SDiv level, smooth the area with the Smooth brush, and then use the Inflate brush to add volume to that area. Once the problem spot is repaired, I go back to a higher SDiv level and continue working with the Clay brush.

The Clay Build Up Brush

The Clay Build Up brush is a variation of the Clay brush. It has a few differences in the settings, which give it a slightly different feel. One notable difference is that an alpha texture is applied to the Clay Build Up brush.

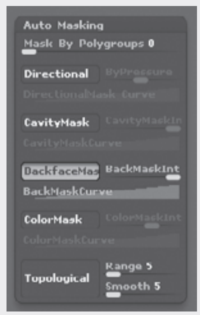
BACKFACE MASKING

You can have problems with the brushes when sculpting thin areas of a surface, resulting in stretched polygons on the opposite side, as shown here.



Here are the steps to take to help alleviate this problem:

1. While the Clay brush is active, open the Brush palette and expand the Automasking subpalette.
2. Turn on Backface Masking.



You can use the BackMaskInt Intensity slider to adjust the amount of masking applied to the brush. In some cases if the BackMaskInt Intensity setting is too high, it may cause the brush to be ineffective when sculpting the surface. In most situations the best course of action is to take care when using any of the clay-type brushes on the thin parts of a model. Rotate the view of the model frequently as you work to make sure that polygons are not being stretched or mangled on the opposite side.

An alpha texture is simply a grayscale image (an image with no colors) that the brush uses to control the shape of the brush tip. Alpha textures have many uses and applications throughout ZBrush, but the most common use is as a modifier for brush tips. Let's take a look at how you can use this brush to continue to shape the dragon's head:

1. First, this is a good point to add another level of subdivision to the surface. Open the Geometry subpalette of the Tool palette and make sure the SDiv slider is at the highest possible level. On my dragon model, this is level 4 (see Figure 3.40).

2. Press the Divide button to add a fifth SDiv level (hotkey = Ctrl+D).
3. Open the sculpting brush fly-out library and press **c** and then **b** to select the Clay Build Up brush.

   Take a look at the shelf on the left. You'll see that a white square appears in the BrushAlpha button below the Stroke Type button (which currently shows the Freehand stroke) (Figure 3.41). This white square determines the shape of the brush tip on the surface.
4. Sculpt across the surface of the dragon head. Use the brush to build up the form in areas as you refine the shape. Remember to hold down the **Alt** key when you want to dig into the surface.
5. Hold down the **Shift** key to smooth the strokes as you work. Again, work in a sketching-like fashion, don't worry too much about precision at this point (see Figure 3.42).

   You can also try to experiment with the Clay Tubes, Form, Inflate, and Form Soft brushes to work out the overall shape of the head.
6. Once you have a shape that you think is looking sufficiently fearsome and dragon-like, use the Save As button in the File palette to save the file as `dragon_v04.ZPR`.

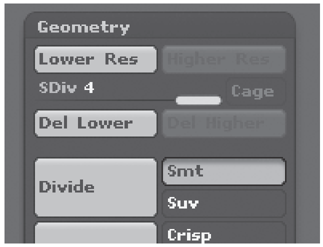


Figure 3.40
The SDiv slider in the Geometry subpalette of the Tool palette is set to level 4.

Figure 3.41
A square-shaped alpha is applied to the Clay Build Up brush. This is indicated in the alpha icon on the left shelf.

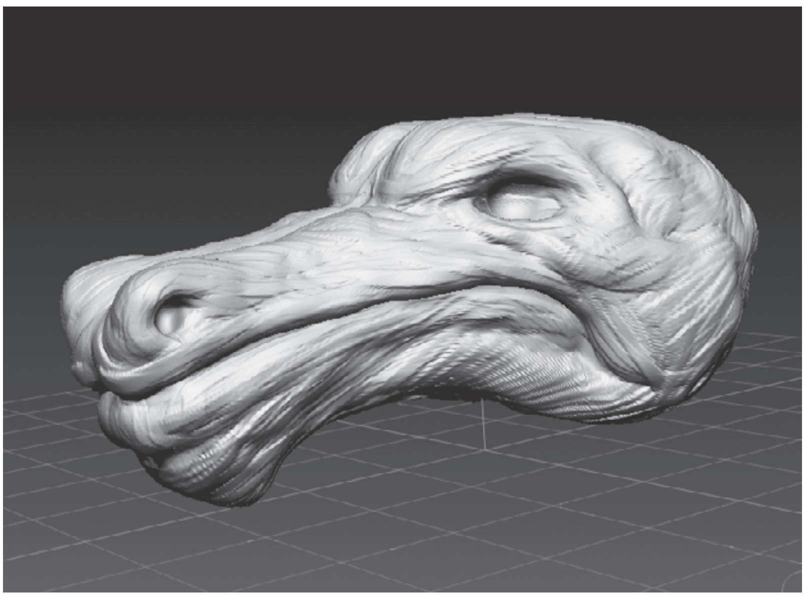
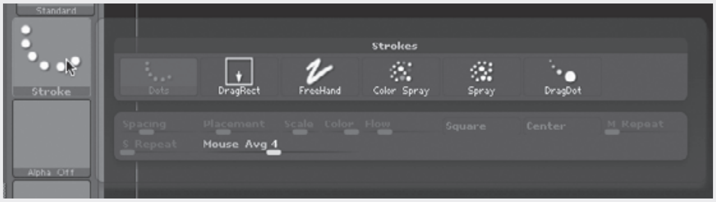
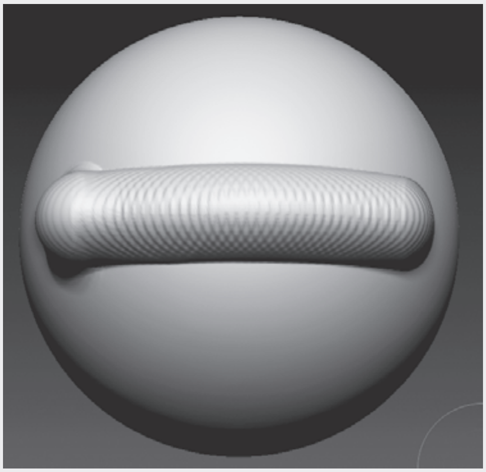


Figure 3.42
The Clay Build Up brush add layers of clay to the surface, which helps to define the forms.

STROKE TYPES

There are six stroke types that you can choose from for your sculpting brush. They are found in the stroke type fly-out library on the left shelf. Each stroke type changes the way the brush applies a stroke to the surface of the mesh. The Modifier sliders at the bottom of the stroke type fly-out library changes the behavior of each stroke type preset.





You can choose from the following stroke types:

Dots As you drag across the surface, the Dots stroke type creates multiple instances of the brush tip in a line. These instances are blended together to create what appears to be a smooth stroke. Increasing the Mouse Average (Mouse Avg) slider at the bottom of the stroke type fly-out library creates a smoother stroke. In the following image, a circular alpha is applied to the stroke to make the behavior of the Dots stroke type more obvious.

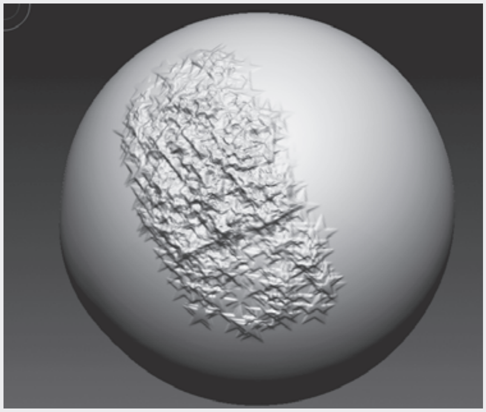
DragRect Instead of drawing a line, the DragRect stroke type lets you pull out an instance of the brush tip on the surface. As you drag out, you'll see the mark created on the surface grow in size and in intensity, starting from the point where you first touch the surface. If you the drag back toward the center of the stroke, you can resize and set the orientation of the stroke. Once you are satisfied with the stroke's placement, you can let go and the mark is made permanent. The DragRect stroke type is very useful when

continues

an alpha is applied to the stroke. In the bottom image on the previous page, the star-shaped alpha is used. It's a great technique for adding details to a surface.

FreeHand This is just like the Dots stroke type, but there is a higher degree of blending between the instances of the brush tip on the surface, creating a very smooth stroke. This stroke can cause ZBrush to slow down a little when used on meshes with a high number of polygons.

Color Spray The Color Spray stroke type creates multiple instances of the brush tip spread out on the surface. You can increase the amount of variation in size of the instances by increasing the Scale slider in the modifiers at the bottom of the stroke type fly-out library.



When you use this stroke type on a brush that paints colors on the surface of the mesh, you can use the Color slider in the stroke type modifiers. This increases variation in the hue of the color applied with each instance of the stroke. Painting models is covered in Chapter 8, "Polypainting and Spotlight."

Increasing the value of the Placement slider can increase the variation in distance from the center of the brush tip for each mark made by the Color Spray stroke type. Density of the marks is controlled using the Flow slider. In the following image, the star-shaped alpha is applied to a brush that uses the Color Spray stroke type. Color painting (known as *polypainting*) is not enabled for the mesh in this image; just Z Intensity so you can see how the surface is changed using this stroke type.

Spray This type is just like Color Spray except the that Color slider modifies the variation in color intensity of each mark made by the brush tip instead of the color hue.

DragDot This stroke type creates a single instance of the brush tip on the stroke. You can precisely place the mark the instance creates by dragging on the surface. Let go to make the mark permanent. The size of the mark is determined by the Draw Size setting.

THE CREATIVE PROCESS

Designing forms in ZBrush, much like in mediums such as clay sculpture and sketching with a pencil, is not necessarily a linear process. The joy of ZBrush is that it lets you explore as you go. While working on models like the dragon head used in this exercise, I like to play with ideas. Many of the decisions you make can be changed later on or developed into different ideas as you work.

Masking

Masking protects a specified part of the mesh as you make changes. Masks give you more precise control over the mesh, and there are a number of ways to create masks. Masks are created using the masking pen, which is activated when you hold down the **Ctrl** key while the Draw button is active on the top shelf.

Mask Controls

In this exercise you'll use masking to control which parts of the dragon's head model can be edited with the brushes.

1. Continue with the file from the previous section or open the `dragon_v04.ZPR` project from `the chapter 3` folder on the DVD that comes with this book.
2. Open the sculpting brush fly-out library on the left shelf and press **s** and then **t** to choose the standard brush.
3. Make sure symmetry is activated along the x-axis. If you rotate the view of the head to the top, front, or bottom, you should see two red dots as you hold the brush tip over the mesh. This means symmetry is on. If you don't see two dots, press the **X** hotkey to turn symmetry on.
4. Hold down the **Ctrl** key and brush along the bottom of the head around the bottom of the jaw, as shown in Figure 3.43. The masked area appears as a dark gray color on the surface.
5. Release the Ctrl key and try painting on the dark area with the sculpting brush. Nothing happens. Try painting on the white areas and you'll see that the surface is raised under the brush just as you would expect using the Standard brush. The darker areas are protected from the brush.

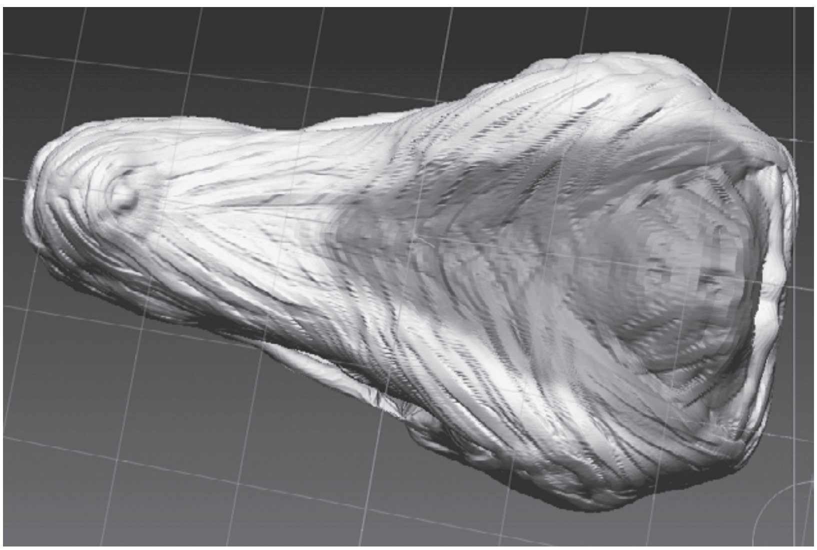


Figure 3.43

A mask is painted on the bottom of the surface, indicated by the dark gray area.

When you press the **Ctrl** key while the Draw button is on in the top shelf, you activate the MaskPen brush. As you hold down the **Ctrl** key, note that the brush icon on the left shelf displays the MaskPen brush (see Figure 3.44).

Figure 3.44
Pressing the Ctrl key activates the MaskPen brush.

6. Undo any changes you made with the Standard brush.
7. In the Tool palette, expand the Masking subpalette (see Figure 3.45). There are a number of controls here for changing the behavior of the mask as well as for creating different types of masks. Let's look at some of the more frequently used controls.

Figure 3.45
The mask controls are found in the Masking subpalette of the Geometry palette.

ViewMask (hotkey = Ctrl+H) enables the visibility of the mask—the dark area on the surface. If this button is off, the mask will not be visible but it will still prevent changes from being made to the masked area of the surface. Sometimes the dark area of the mask can be distracting while you work on the surface, so ZBrush gives you the option of turning mask visibility off. If you ever encounter a situation in which it seems as if a sculpting brush is not working properly, double-check to see if the ViewMask button is off. It may be that you have accidentally applied a mask that you can't see.

Inverse (hotkey = Ctrl+I) swaps the masked and unmasked parts of the surface so that the masked parts become unmasked and the unmasked parts become masked (see Figure 3.46). You can also invert the mask by holding the **Ctrl** key and clicking in a blank part of the canvas.

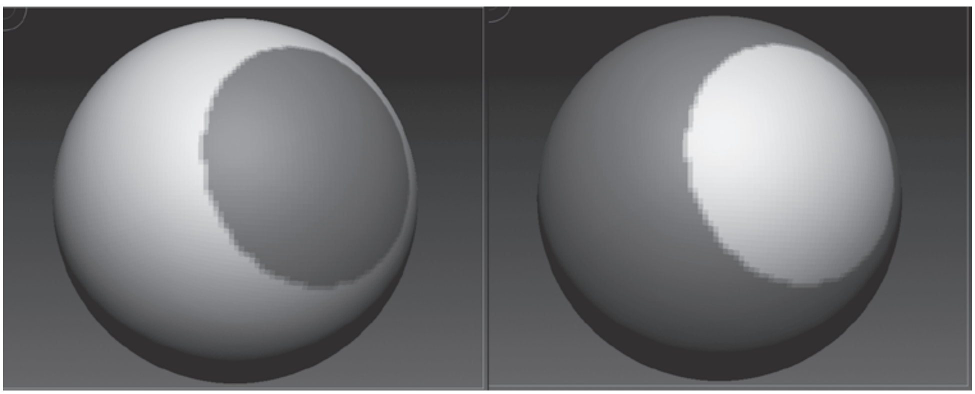


Figure 3.46
Inverting the mask swaps the masked and unmasked portion of a mesh.

Clear (hotkey = Ctrl+Shift+A) removes all masks from the surface. You can also clear the mask by holding down the **Ctrl** key while dragging on a blank part of the canvas. When you release the brush, all masks will be cleared.

MaskAll (hotkey = Ctrl+A) applies a mask to the whole surface. You can also hold down the **Ctrl** key and click on a blank part of the canvas to mask everything, provided nothing is masked already.

BlurMask blurs the edges of the mask. The mask is still present but not as intense along the blurred edges. Another way to blur the mask is to **Ctrl+tap** on the masked area (see the left image in Figure 3.47).

SharpenMask sharpens the edges of the mask, making them more defined. Another way to sharpen the mask is to **Ctrl+Alt+tap** on the masked area (see the right image in Figure 3.47).

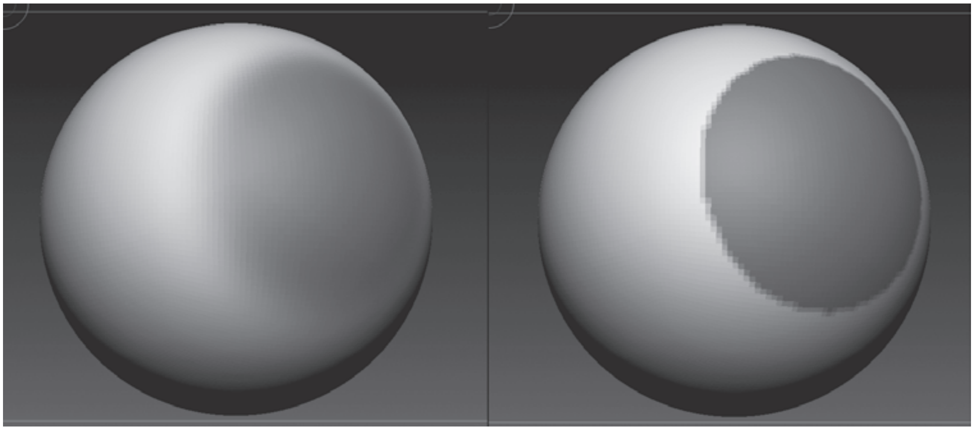
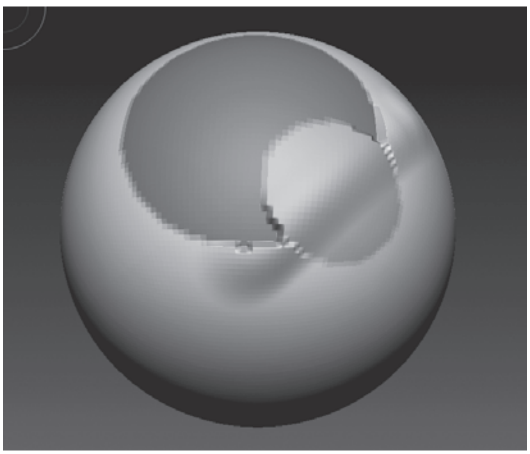


Figure 3.47
The edges of the mask can be blurred (left image) or sharpened (right image).

Figure 3.48
A low-intensity mask is painted on top of a higher intensity mask.



Hold the **Ctrl+Alt** keys together to erase part of the mask.

Toward the bottom of the Masking subpalette you'll see a slider labeled Intens. This controls the intensity of the mask. The value of this slider is applied to the next mask painted on the surface; it does not affect any masks currently applied to the surface. If you set this to 50, the next mask you create will be at half the normal strength. This means that the surface will still be affected by changes you make with the sculpting brushes but only at half strength.

Next to the Intens slider, you'll see a slider labeled Blend. This controls how the next mask you create is blended with any masks currently applied to the surface. At 100, new masks will overwrite existing masks (see Figure 3.48), and at lower values they will be blended. At 0, new masks will not affect any masks painted on the surface.

8. Press **Ctrl+I** to invert the mask applied to the dragon's head.
9. Hold down the **Ctrl** key and tap on the masked portion of the dragon's head three times to add a blur to the edges of the mask. Each time you tap on the masked area, ZBrush increases the blurring of the mask's edge.
10. Open the brush fly-out library, and press **m** and then **e** to choose the Move Elastic brush. Use the brush to pull the area under the jaw downward away from the top of the dragon's head. This will give the dragon more of a throat below the jaw (see Figure 3.49).
11. Remember that if you want to smooth the surface while you work, just hold down the **Shift** key and paint over the surface.
12. Use the Save As button in the File menu to save the file as `dragon_v05.ZPR`.

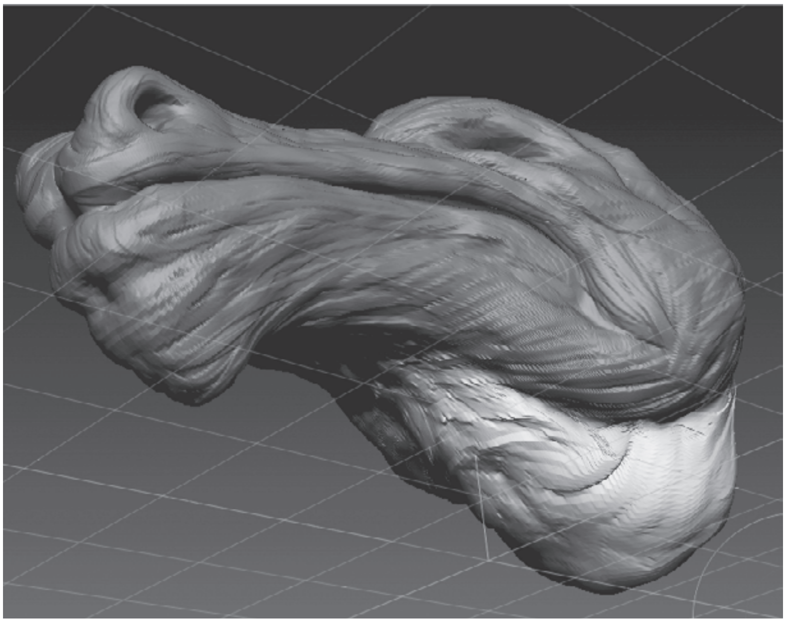


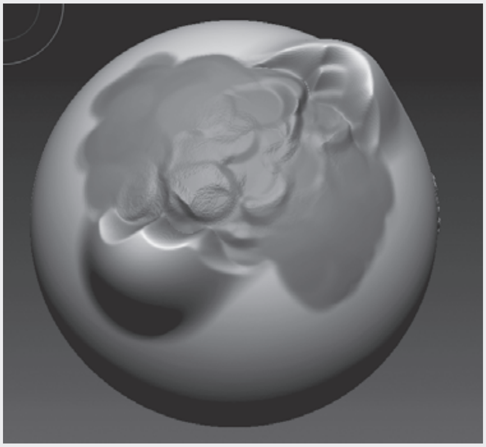
Figure 3.49
The unmasked portion of the dragon's head is pulled downward to create a throat.

MASKPEN STROKE TYPES

The MaskPen brush can use all of the stroke types that a regular sculpting brush uses and a few extra. To change the MaskPen brush's stroke type, hold down the **Ctrl** key and then open the stroke type fly-out library and click one of the stroke type icons.

continues

You can use alphas with the MaskPen brush, and when you use the Color Spray stroke type, the variation in color varies the intensity of the mask. In the following image, a mask was created when a circular alpha was applied to the MaskPen brush while using the Color Spray stroke type.



The following image shows the additional stroke types available for the masking pen.

When you choose the Rect stoke type, you can use the MaskPen brush to define a rectangular-shaped area to be masked. As you hold the brush down and drag, you can set the size of the masked area. The center of the mask is indicated by a white plus sign. If you want to reposition the mask, let go of the **Ctrl** key and hold down the **spacebar**. As long as you hold down the spacebar, you can position the rectangular mask anywhere over the surface. Let go of the brush to apply the mask to the surface.

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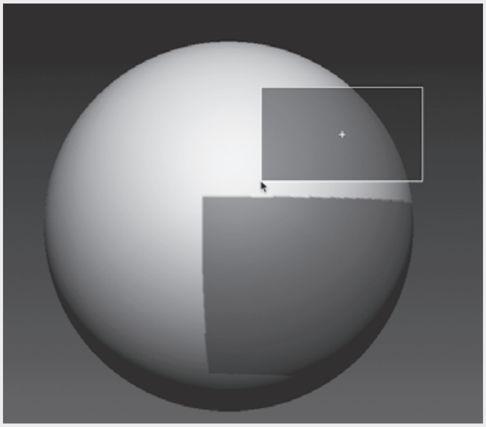
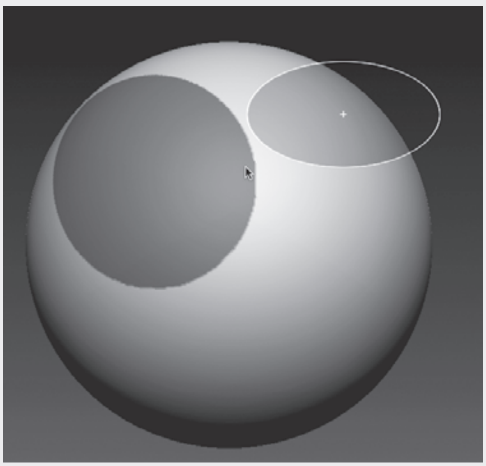


At the bottom of the stroke type fly-out library there are two options: Square and Center. When Square is enabled, the masked area is always a perfect square. When the Center option is enabled, the center of the masked area is determined by wherever you initially click on the canvas. As you continue to drag, the mask is sized relative to the center. When Center is off, dragging out a corner of the rectangular area creates the mask.

If you create a mask on a side of an object, the mask goes all the way through the surface and masks the opposite side as well. Using symmetry together with the Rect stroke type is a great way to create intricate designs with your mask.

The Circle stroke type behaves just like the Rect stroke type except that the selected area is an oval and not a rectangle. If you activate the Square option in the modifiers, the masked area will always be a perfect circle.



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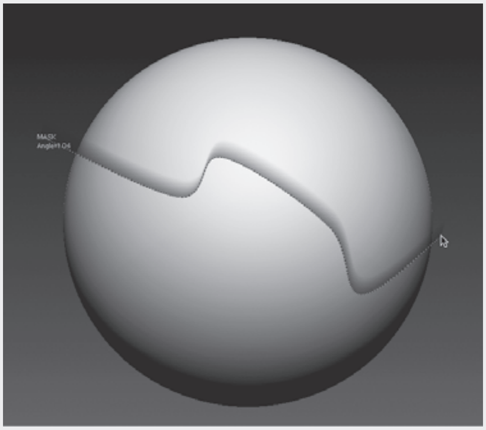
continued

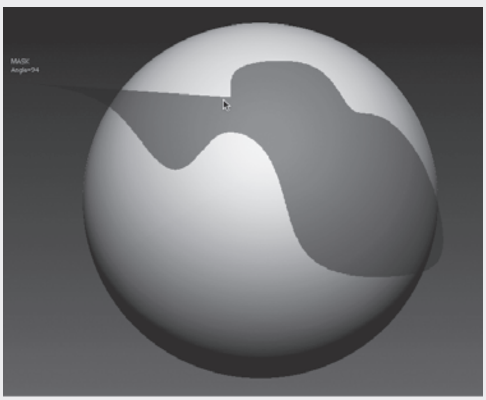
Use the Curve stroke type to define a masked area by drawing a curve on the canvas. While holding down the **Ctrl** button, click on the canvas to start the curve. You can release the Ctrl button while drawing out the initial line. Each time you want to add a point in the curve to change directions, just tap the **Alt** key. The display on the canvas shows that one side of the curve is shaded. This indicates which side of the line will become the masked area. Hold down the **spacebar** while dragging on the canvas to reposition the curve. To apply the mask, just let go of the brush, either by releasing the left mouse button or by lifting the stylus of your digital tablet.



The shape you make with the curve can't be a closed shape, and the curve can't double-back on itself. This will confuse ZBrush and the mask you get will not be what you expect.

To make a hard corner in the curve, double-tap the Alt key.

The Lasso stroke type lets you define a free-form area for the mask by drawing on the canvas while holding down the **Ctrl** key. You have more freedom to create closed shapes than you do with the Curve stroke type but not as much precise control. Hold down the **spacebar** to reposition the masking area.



Polygroups

The polygons of a mesh can be organized into groups known as *polygroups*. This is useful when you need to isolate a particular part of a surface area over and over again. Rather than try to create the same mask every time you need to work on one part of your mesh, which can be very tricky on complex surfaces, you can create a polygroup, which is saved with the mesh. The grouped area of the mesh can be isolated for masking and other operations as often as you like for as long as you keep the polygroup.

Polygroups are displayed as colors applied to the polygons. You can see these colors only when the PolyF button is enabled on the right shelf (hotkey = Shift+F). The color of the polygons do not affect any colors painted on the surface. They just provide a visual indication of how the polygons of the mesh have been arranged into groups (see Figure 3.50).

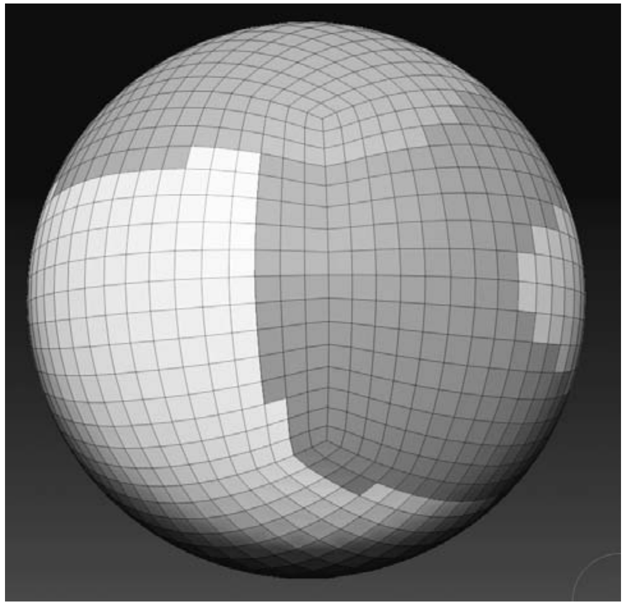


Figure 3.50

The polygons of a mesh have been arranged into polygroups indicated by the colored regions.

An individual polygon can't be a member of more than one group at a time. Polygroups are saved as part of the mesh. You can rearrange the mesh into different polygroups as often as you like. You can create a polygroup when the mesh is at any subdivision level, but results are more predictable when you create polygroups at the lowest subdivision. If you create a polygroup at a high subdivision level and then move the SDiv slider down to a lower level, the polygroups can get a little confused, which may alter the membership of the polygons in the polygroup.

There are a number of ways to create polygroups. The following sections cover the more common techniques for arranging a mesh into polygroups. Before creating polygroups, it is important to understand how to select the polygons of a mesh in ZBrush.

Select Polygons

To select the polygons of a mesh, press and hold the **Ctrl+Shift** key combination and drag over part of the surface. This activates the selection brush. The selected polygons remain visible while unselected polygons are hidden. Here is a short example that demonstrates how this is done:

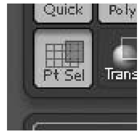


Figure 3.51

Turn on the Pt Sel button in the Transform palette to make polygon selection easier.

1. Place the mouse pointer toward the bottom of the ZBrush interface to open Light Box. Select the Project heading and double-click DefaultSphere to open the DefaultSphere project. This project has a gray PolySphere in Edit mode ready for sculpting.
2. In the color picker on the left shelf, set the color to white. This changes the color of the PolySphere to white, making it easier to see what's going on while you work.
3. Make sure symmetry is enabled for the PolySphere; it should be on already.

4. On the right shelf, turn off the Persp button.
5. In the Transform palette, turn on Pt Sel. This enables point selection, which means that if a vertex of a polygon falls within the selection area, the entire polygon will be selected. I find this makes selecting polygons much easier.
6. Rotate the view of the PolySphere while holding down the **Shift** key so that you're looking at it straight on from the front. If you see two red dots on the mesh when you hold the mouse pointer over the mesh, you'll know you're looking at the front.
7. Hold down **Ctrl+Shift**. Notice that the sculpting brush icon on the right shelf turns into the SelectRect selection brush (see Figure 3.52). This is one of the two selection brush presets.

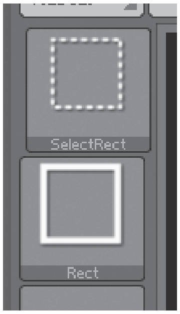
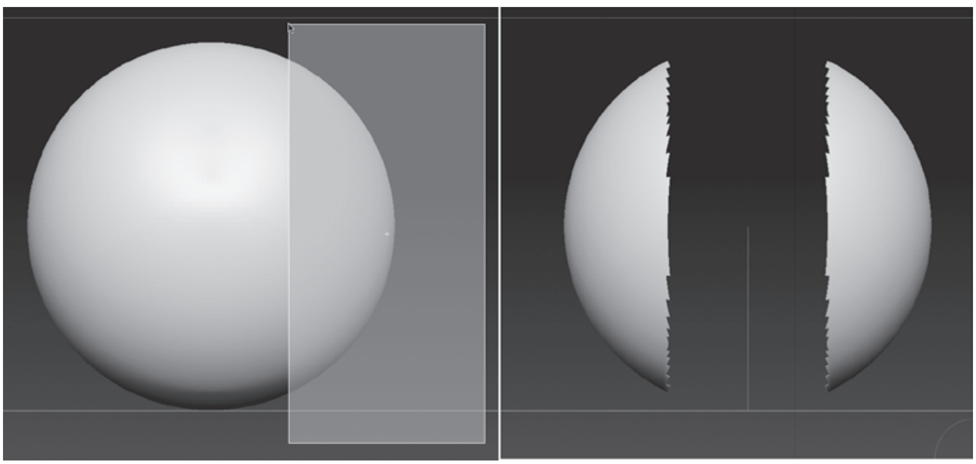


Figure 3.52
The SelectRect brush is activated by holding the Ctrl+Shift key combination.

8. Drag across the surface of the PolySphere. You'll see a large green rectangle appear. Drag so that you are covering about one-third of the side of the PolySphere (left image in Figure 3.53).
9. Let go by releasing the left mouse button or lift your stylus from the surface of the digital tablet. You'll see two sides of the PolySphere left on the canvas; the center has disappeared (right image in Figure 3.53).

   The two sides are visible because symmetry is enabled for the selection brush. This means that the area on the opposite side of the PolySphere has been selected as well. The polygons in the center have not been deleted; they are just invisible for the moment.
10. As you rotate the view, you'll notice that the back side of the polygons are not visible (left image in Figure 3.54). In the Tool palette, scroll down to the Display Properties subpalette. Click Double to enable double-sided display. Now you should be able to see the back side of the polygons (right image in Figure 3.54).

Figure 3.53
The area behind the green rectangle is selected using the SelectRect brush (left image). The visible portion that is left after releasing the brush is considered selected. Because symmetry is enabled, the selection is mirrored to the opposite side (right image).



11. To restore the visibility of the PolySphere, hold down **Ctrl+Shift** and click on a blank part of the canvas.
12. Hold down **Ctrl+Shift** again and drag across the surface to select a part of the side of the surface; another green rectangle appears. Before releasing the brush, let go of the **Ctrl+Shift** keys and press the **Alt** key. The rectangle now turns red (left image in Figure 3.55).
13. Let go of the brush, and this time, any part of the mesh within the area defined by the selection is hidden (right image in Figure 3.55).
14. **Ctrl+Shift+click** on the visible part of the surface; this inverts the visibility, unhiding the hidden parts and hiding the visible parts.
15. Hold down **Ctrl+Shift** and click on a blank part of the canvas to restore the visibility of the whole PolySphere mesh.

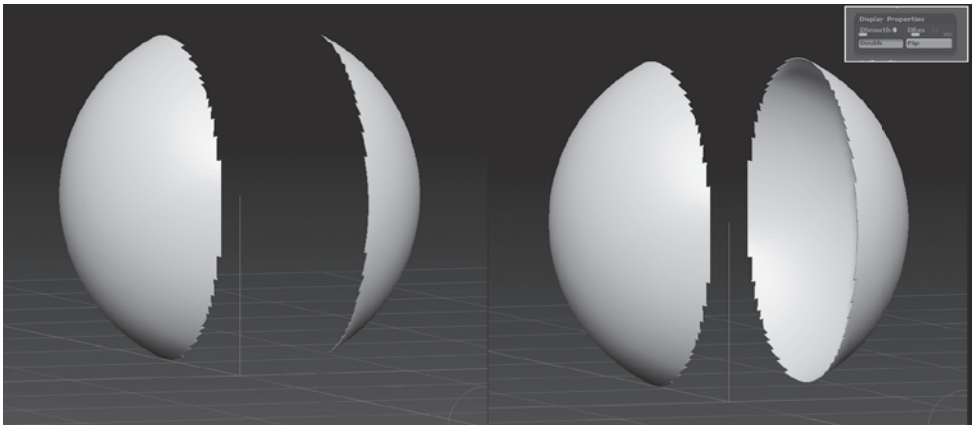


Figure 3.54

The backsides of the polygons are not visible unless the Double button in the Display Properties subpalette of the Tool palette is enabled.

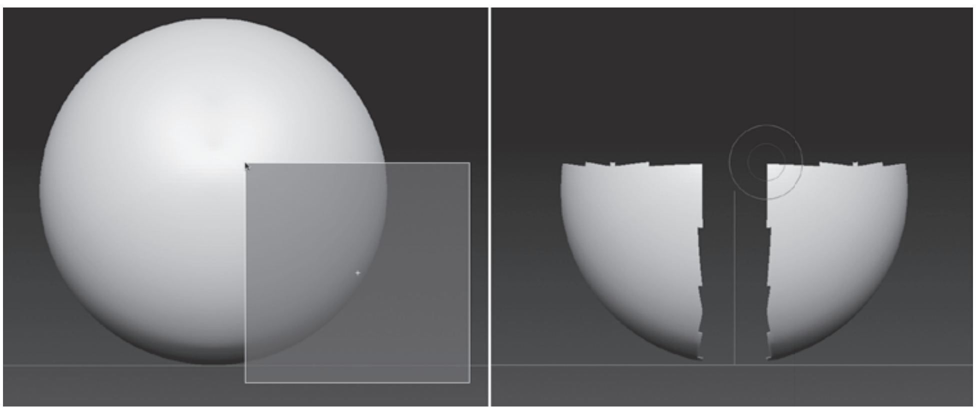


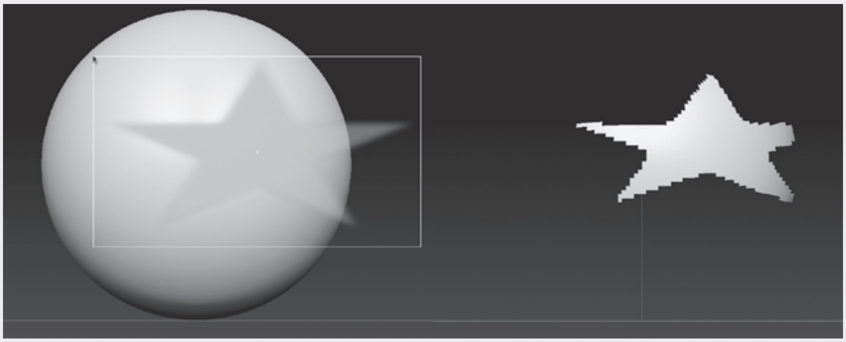
Figure 3.55

The Alt key is used to invert the selection (left image) so that all polygons within the selection area are hidden (right image).

TIPS FOR WORKING WITH THE SELECTION BRUSH

While you're holding down the **Ctrl+Shift** key combination, the Select brush is activated. Like the MaskPen brush, this brush type has some special properties.

The Select brush is always mapped to the **Ctrl+Shift** key combination. While holding down **Ctrl+Shift**, you can change the properties of the brush. For example, you can choose an alpha texture from the alpha fly-out library on the left shelf. This will cause the shape of the selected area to be determined by the shape of the alpha.



There are four stroke types that can be applied to the Select brush: Rect, Circle, Curve, and Lasso. They behave the same way with the select brush as they do with the MaskPen brush. See the sidebar titled "MaskPen Stroke Types" earlier in the chapter for more information on these stroke types.

In the sculpting brush fly-out library, you'll see the SelectLasso and SelectRect brush types. Choosing one of these brush types automatically maps one or the other to the Ctrl+Shift key combination. The only difference between the two selection brush presets is that one has the Lasso stroke type applied and the other has the Rect stroke type applied. You can change the stroke type by choosing from the stroke type fly-out library while holding down **Ctrl+Shift**.

If you want to reposition the selection, let go of the Ctrl+Shift keys without releasing the brush, and then hold down the **spacebar** and drag the selection to another part of the canvas.

If you want to permanently delete part of a mesh, use the selection brush to hide the area you want to remove and then press the DelHidden button in the Geometry subpalette of the Tool palette. This can be done only when the model is at the lowest subdivision level.

If you're using the SelectLasso brush, be careful not to Ctrl+Shift+click on a polygon edge. This hides all the polygons along the row perpendicular to the edge. This can be helpful sometimes, but it can also start to drive you crazy after a while. If this keeps happening, try switching to another stroke type for the selection brush.

Create a Polygroup from a Selection

Once you have a handle on how you can select polygons using the selection brush, you can easily create polygroups:

1. With the DefaultSphere project loaded, press the **Shift+D** hotkey combination twice to move to the lowest subdivision level.
2. Turn on the PolyF button on the right shelf to display the wire frame on the mesh (hotkey = Shift+F).
3. Press the **X** hotkey to toggle symmetry off.
4. Hold down **Ctrl+Shift** to activate the selection brush. Drag a green rectangle over part of the surface and then let go. The unselected part of the surface disappears.
5. In the Polygroup subpalette of the Tool palette, click Group Visible (see Figure 3.56). You'll see the polygons change color. You have just created a polygroup for the visible polygons.

   Group Visible creates a polygroup for all polygons visible on the canvas regardless of whether they are already in a polygroup. The color applied to the polygroup is visible only when PolyF is on and does not affect the color of the model. The colors chosen for the polygroups are selected at random by ZBrush. If you don't like the color of the polygroup, just press Group Visible again until you find a color you do like.

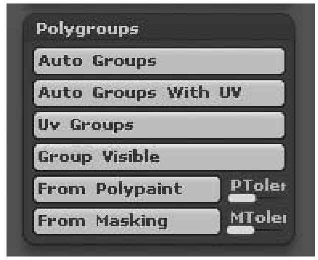


Figure 3.56
The Group Visible button creates a polygroup for all visible polygons.

6. Hold down **Ctrl+Shift** and click on the canvas to unhide the rest of the PolySphere. The color of the polygons indicate that the polygons of the mesh have been arranged into two polygroups (see Figure 3.57).
7. Hold down **Ctrl+Shift** and click the center of one of the polygons within the polygroup. This will hide all parts of the mesh that are not in the polygroup.
8. Hold down **Ctrl+Shift** and drag out a selection rectangle over half of the remaining visible polygons. This will hide part of the polygroup.
9. In the Polygroup subpalette of the Tool palette, click Group Visible again. The visible polygons change color.
10. Hold down **Ctrl+Shift** and click on a blank part of the canvas to restore the visibility of the entire mesh. You should see that the PolySphere now has three polygroups, indicated by the colors of the mesh (see Figure 3.58).

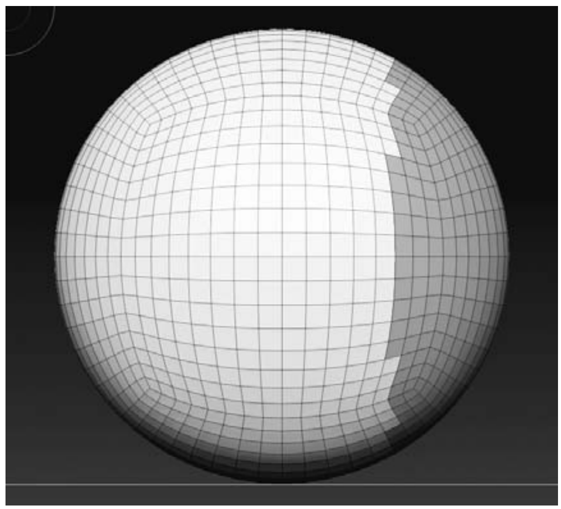


Figure 3.57
The polygons of the Polysphere have been arranged into two polygroups.

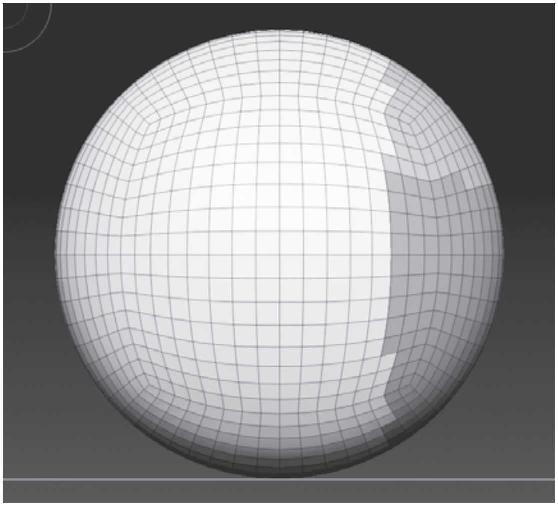


Figure 3.58
The polygons of the PolySphere have been arranged into three polygroups.

TIPS ON WORKING WITH POLYGROUPS

Here are some tips for working with polygroups:

To hide everything outside of the polygroup, **Ctrl+Shift+click** the center of a polygon within the group.

To invert the visibility of the mesh, **Ctrl+Shift+click** again the center of one of the polygons within the polygroup.

After inverting the visibility of a polygroup, each time you **Ctrl+Shift+click** a polygon within a polygroup, that polygroup will become hidden.

If you click a vertex shared by polygons in two or three adjacent polygroups, everything outside of those polygroups will be hidden.

Create a Polygroup from a Mask

You can create a polygroup from any masked area. This means you can paint a mask on the surface and then convert the painted area into a polygroup, which gives you more control over how you create polygroups.

This should be done at the lowest subdivision level. It's tempting to paint an intricate mask at the highest subdivision level and then convert the mask into a polygroup. This will work, but if you move the SDiv slider down to a lower level and then back up again, the polygroup will be rearranged.

To create a polygroup from a mask, follow these steps:

1. Create a mask on the surface using any of the MaskPen brush's stroke types and settings.
2. In the Geometry palette, expand the Polygroups subpalette.
3. Click the From Masking button to create the polygroup.
4. Turn on the PolyF button to see the mask (see Figure 3.59).

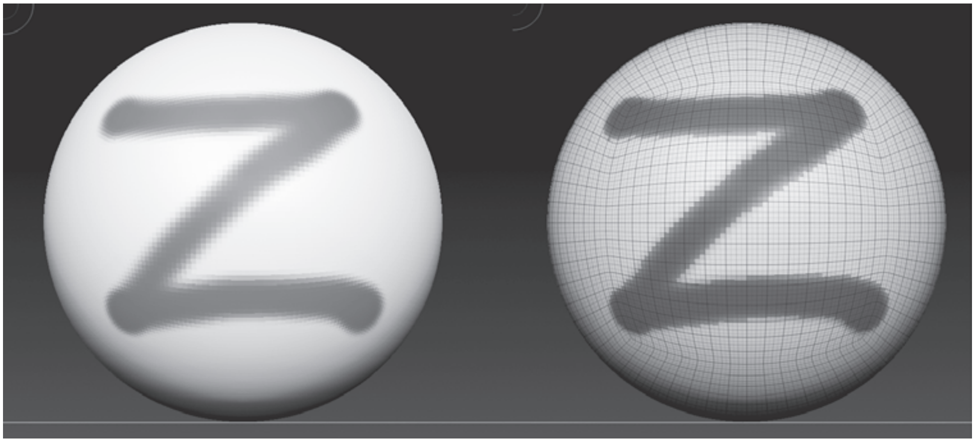


Figure 3.59
A polygroup is created from a mask painted on the surface of a mesh.

Create a Polygroup for the Dragon's Jaw

Some areas of a mesh can be hard to select directly. In this example, you'll learn how to creatively apply section techniques to create a polygroup for the dragon's jaw:

1. Continue with your own version of the dragon head or use the File palette to open the `dragon_v05.ZPR` project from the `chapter 3` folder on the DVD.
2. Expand the Geometry subpalette of the Tool palette and set the SDiv slider to 1.
3. Rotate the view of the dragon's head so that you can see it from the side.
4. Make sure the Pt Sel button in the Transform palette is activated. In the Tool palette, make sure Double is activated in the Display Properties subpalette.
5. Scale the view of the mesh up so that you can clearly see the side of the chin.
6. Open the sculpting brush fly-out library. Press **s** and then **l** to select the Select Lasso brush. You'll see a warning indicating that this brush will be mapped to the Ctrl+Shift hotkey combination. Press the OK button.
7. Hold down **Ctrl+Shift** and draw a lasso selection around a few of the polygons at the end of the chin. You want to select just part of the front of the jaw. This may take a couple of tries (see Figure 3.60).
8. Rotate the view of the model; you should see just two polygons. If more are visible, use the selection brush to hide the rest (see the left image in Figure 3.61).

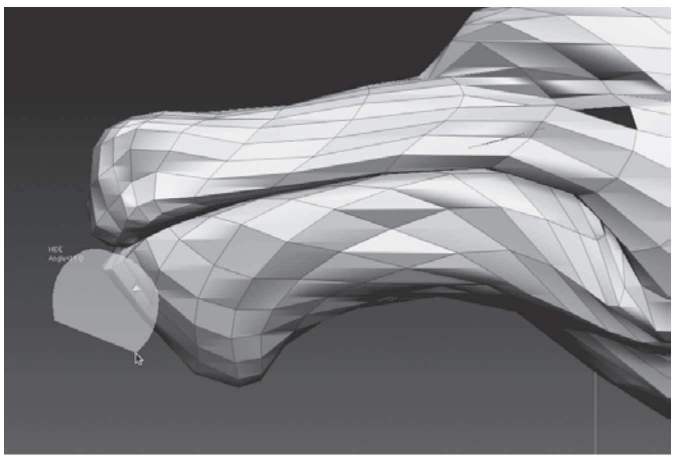


Figure 3.60
The SelectLasso brush is used to select the polygons on the front of the dragon's chin.

9. In the Visibility subpalette of the Tool Palette, press the Grow button (hotkey = Ctrl+Shift+X). This expands the visibility of the polygons by one row (see the center image in Figure 3.61).
10. Press the Grow button several times to gradually reveal the polygons of the jaw. The idea is to select the parts of the jaw on the inside that are hard to reach using other selection techniques (see the right image in Figure 3.61).

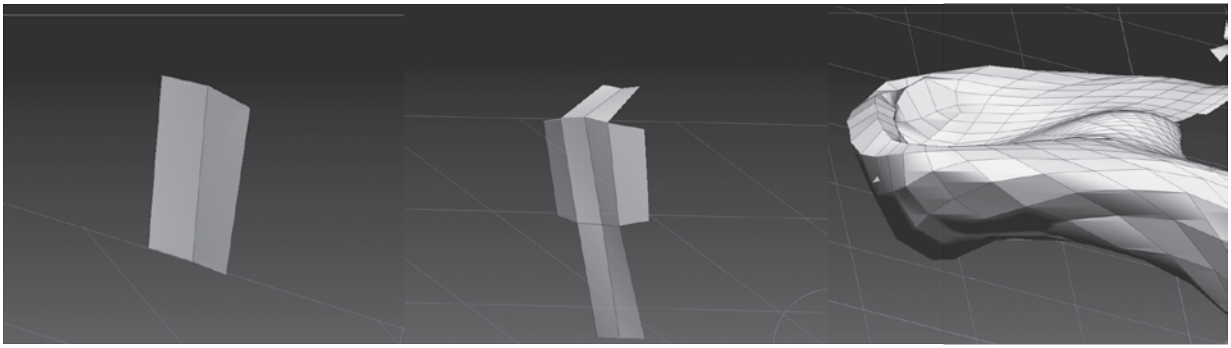


Figure 3.61
The visibility of the polygons of the chin is expanded by repeatedly pressing the Grow button.

11. If you select too much, you can use the Shrink button in the Visibility subpalette of the Tool palette to reduce the size of the selection.
12. Once you're happy with your selection, press the **Ctrl+A** hotkey combination to mask all of the visible polygons.
13. Hold down **Ctrl+Shift** and click on a blank part of the canvas to unhide the rest of the mesh.
14. Press the **Ctrl** key to activate the MaskPen brush. While holding down the **Ctrl** key, set the stroke type to Freehand.
15. Hold down the **Ctrl** key and paint on the surface of the model to add to the mask; the idea is to extend the mask to the rest of the jaw (see Figure 3.62).

    Remember that you can hold down **Ctrl+Alt** and paint on the surface to erase parts of the mesh if you need to. Rotate the view of the model as you edit the mask, and make sure the polygons on the bottom and at the back of the jaw are masked as well.
16. Once you're happy with the mask, expand the Polygroup subpalette of the Tool palette and press the From Masking button to create a polygroup from the masked portion.
17. Make sure the PolyF button is activated on the right shelf so that you can see the colors of the polygroup. The polygons of the jaw should be a different color than the rest of the mesh, indicating the polygroup arrangement (see Figure 3.63).

It may take a couple tries to get the group right. You can always use the Undo button in the Edit palette (hotkey = Ctrl+Z) to undo the polygroup arrangement and try again. Just try not to remove the mask completely until you have the jaw grouped the way you want it to be.

18. Use the Save As button in the File menu to save the project as `dragon_v06.ZPR`.

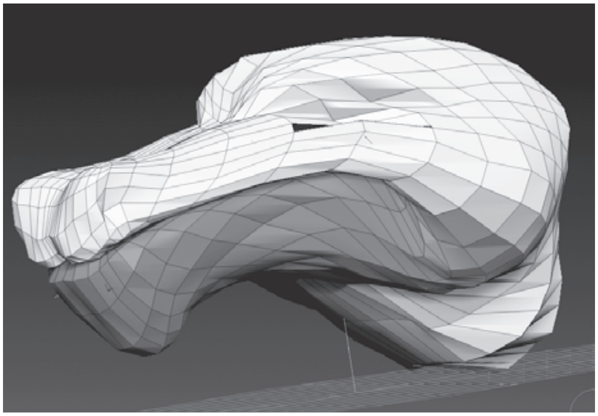


Figure 3.62

The mask is expanded to the rest of the outside of the jaw using the MaskPen brush.

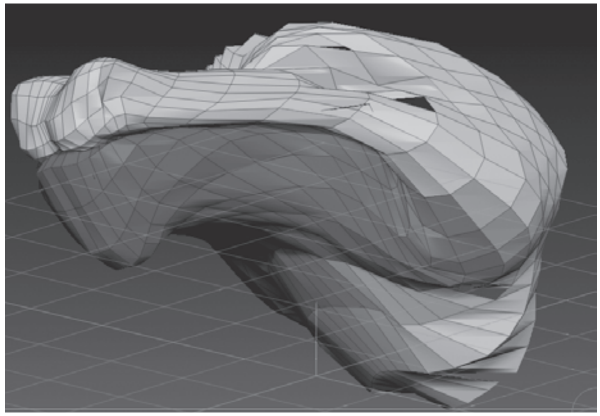


Figure 3.63

The mask is converted into a polygroup. Now the mesh is organized so that the jaw can easily be selected in the future.

Add Geometry with Edge Loops

As you are aware by now, the sculpting brushes do not add polygons to the mesh; they only move the existing polygons around. So how do you add new polygons to a mesh? This can be achieved with edge loops.

The term *edge loops* refers to a band of polygons that loop around a surface. A good example would be the polygons that go around a character's lips or eye sockets. Figure 3.64 shows a simplified character that has edge loops around the area of the mouth and each eye socket.

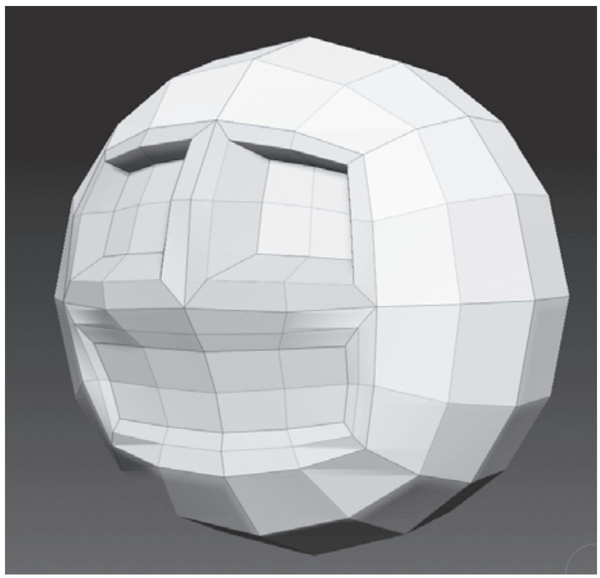


Figure 3.64

The arrangement of polygons surrounding the mouth and each eye are referred to as edge loops.

When you create edge loops in ZBrush, polygons are added to the surface. You can use this as a way to extend part of the surface. In this example, you'll add edge loops to the back of the dragon's head to create part of the neck:

1. Continue with your own version of the dragon head or use the File palette to open the `dragon_v06.ZPR` project from the `chapter 3` folder on the DVD.
2. Expand the Geometry subpalette of the Tool palette and set the SDiv slider to 1.
3. Press **Ctrl+Shift+A** to clear all masks applied to the surface.
4. Rotate the view of the dragon so that you can see the back of the head. **Ctrl+Shift+click** on the back of the head to isolate the visibility of the head; the jaw should become hidden.
5. From the sculpting brush fly-out library, choose the SelectLasso brush.
6. Hold down **Ctrl+Shift** and drag around the polygons on the back of the head to select them. Release the brush to hide the rest of the dragon's head.
7. Continue to use the selection brush to pare down the visibility of the polygons on the back of the head so that it resembles what is shown in Figure 3.65.

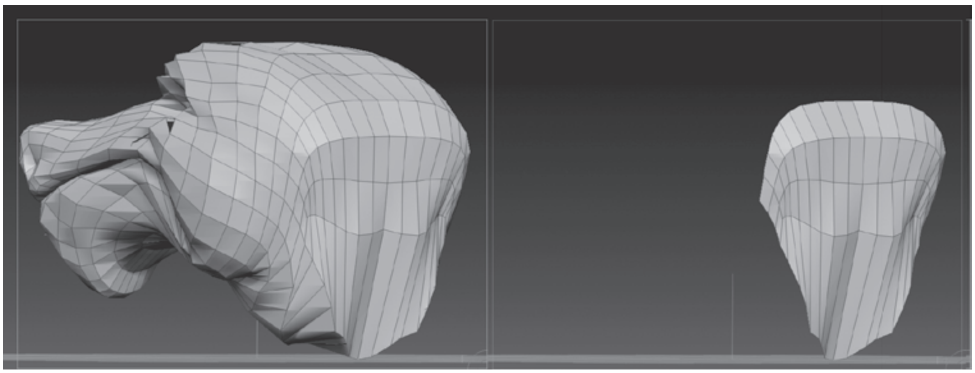


Figure 3.65
The polygons on the back of the head are isolated.

8. Rotate the view of the head and double-check that only the polygons on the back of the head are visible. It's a good idea to make sure Double is activated in the Display Properties subpalette of the Tool palette. This ensures that you can easily see both sides of the polygons, making it easier to spot polygons that should be hidden.

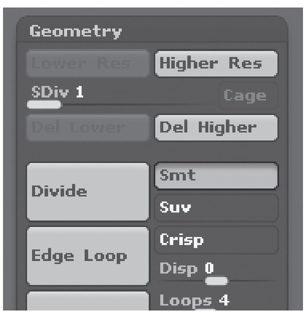


Figure 3.66
The Edge Loop button is in the Geometry subpalette of the Tool palette

9. When you are satisfied that only the polygons on the back of the head are visible, expand the Geometry subpalette of the Tool palette and click the Edge Loop button (see Figure 3.66). This adds an edge loop of polygons around the selected polygons. Note that the polygons of the edge loop are added to a new polygroup, indicated by the color coding (see Figure 3.67).
10. Open the sculpting brush fly-out library. Press **m** and then **e** to select the Move Elastic brush.

11. Use the Move Elastic brush to pull the polygons of the back of the head out to form part of a neck (see Figure 3.68).
12. Hold down the **Shift** key and paint over the polygons to smooth them out a little.
13. Hold down **Ctrl+Shift** and click on a blank part of the canvas to unhide the rest of the dragon's head.
14. Hold down **Ctrl+Shift** and click on the polygons at the center of the back of the head to isolate their visibility.
15. Create another edge loop by clicking the Edge Loop button in the Geometry subpalette of the Tool palette.
16. Use the Move Elastic brush to pull these out as well.
17. Repeat this process until you have about four edge loops and the start of a neck coming out of the back of the dragon's head.
18. **Ctrl+Shift+click** on a blank part of the canvas to unhide the whole mesh. Spend a few minutes using the Move Elastic and Smooth brushes to shape the neck and fix any problems with the back of the head (see Figure 3.69).
19. Once you are happy with the basic shape of the neck, use the selection brushes to isolate the polygons of the neck, and create a single polygroup for the neck using the Group Visible button. Arrange the polygons of the surface so that there are three groups: one for the head, one for the neck , and one for the jaw (see Figure 3.70).
20. Use the Save As button in the File palette to save the project as `dragon_v07.ZPR`.

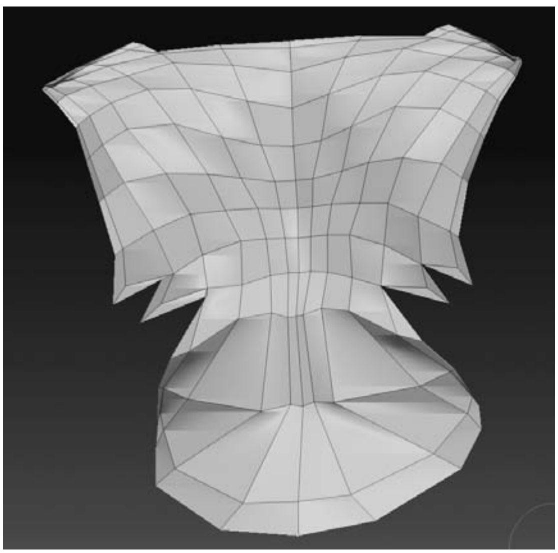


Figure 3.67

An edge loop is created around the polygons on the back of the head.

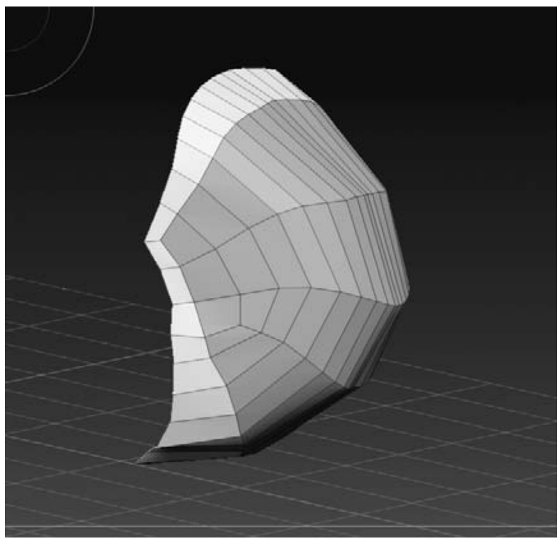


Figure 3.68

The Move Elastic and Smooth brushes are used to pull the polygons out to create a neck.

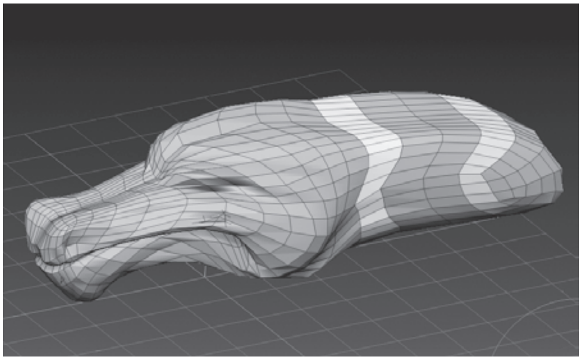


Figure 3.69
After several edge loops are added, the head is unhidden and the neck is shaped and smoothed using the sculpting brushes.

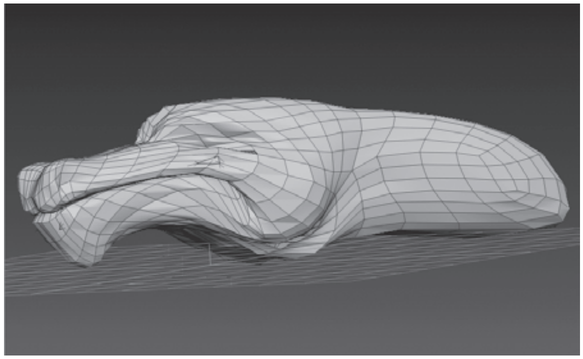


Figure 3.70
The mesh is reorganized into three polygroups for the head, neck, and jaw.

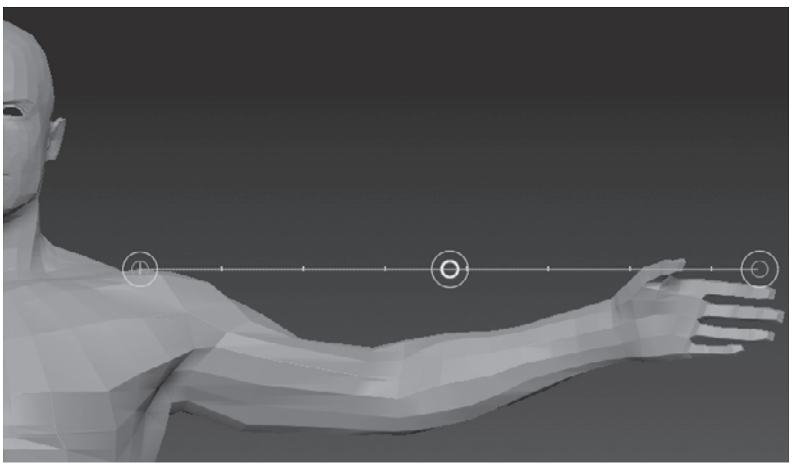
Open the Dragon's Jaw with Transpose

The Transpose control is a special mode of the Move, Rotate, and Scale buttons found on the top shelf. Using the Transpose control, you can pose the limbs of your sculpture as you work, twist a figure around, move individual pieces of a multipart object, and more. In this example, you'll use the Transpose control to open the dragon's jaw, making it easier to sculpt the inside of the mouth.

The Transpose Control

The Transpose control appears when you press the Move, Scale, or Rotate button on the top shelf while a mesh is in Edit mode. The controller itself looks like a line with three pairs of concentric circles (see Figure 3.71). One pair of circles is at the center and the other two are at either end of the line. The line that connects the three pairs of circles is known as the action line and it determines the central axis of the control.

Figure 3.71
The Transpose control looks like a line connecting three pairs of concentric circles.



Along the action line are tick marks that can be used as a guide to measure distances in ZBrush. You can adjust the distance between each of the marks using the settings in the Transpose Units subpalette of the Preferences palette.

The three pairs of circles along the action line are the handles. The outside circle of each pair is used to position the control, and the inside circle of each pair is used to pose the mesh. It takes a little practice, but after some experimentation, you'll find that using the control becomes easy.

The following demonstrates how the Transpose control can be used to open the dragon's jaw.

The first step is to create a mask on the surface that you want to pose. The mask should be carefully created; the Transpose control will alter any part of the surface that is not masked:

1. Continue with your own version of the dragon head or use the File palette to open the `dragon_v07.ZPR` project from the `chapter 3` folder on the DVD.
2. Expand the Geometry subpalette of the Tool palette and set the SDiv slider to 2.
3. Press **Ctrl+Shift+A** to clear all masks applied to the surface.
4. Hold down the **Shift** key and smooth out any stretched or creased areas of the neck. Using the edge loop feature described in the previous section can add some creases to the surface (see Figure 3.72).

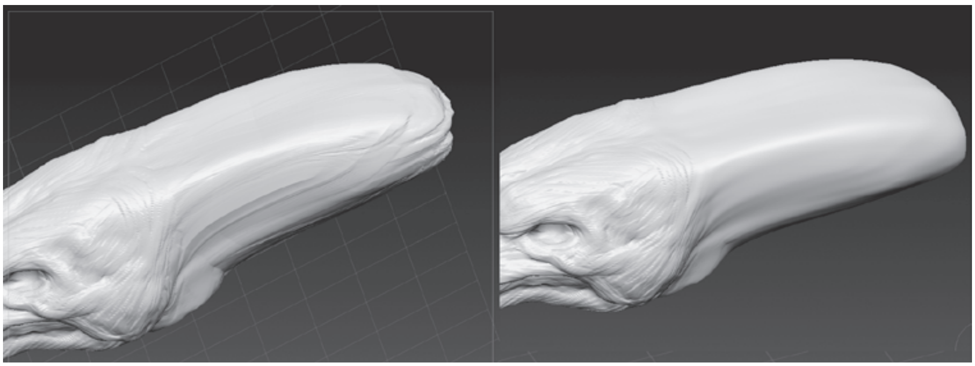


Figure 3.72

Creases in the neck at higher subdivision levels were created when the edge loops were added in the previous section (left image). They can be removed using the Smooth brush (right image).

5. Move up each level of subdivision and continue to smooth the surface of the neck at each SDiv level. Eventually the SDiv should be set to subdivision level 5.
6. Once you have the mesh at SDiv level 5, **Ctrl+Shift+click** on the jaw to isolate the visibility of the jaw polygroup.
7. Press **Ctrl+A** to mask the jaw.
8. Hold down **Ctrl+Shift** and click on a blank part of the canvas to unhide the entire mesh.
9. Press **Ctrl+I** to invert the mask.

10. Use the Mask brush with the Freehand stroke type and paint on the surface to clean up the mask. You want to make sure everything except the jaw is masked (see Figure 3.73).
11. **Ctrl+click** on the masked area of the surface a couple of times to blur the edges of the mask.

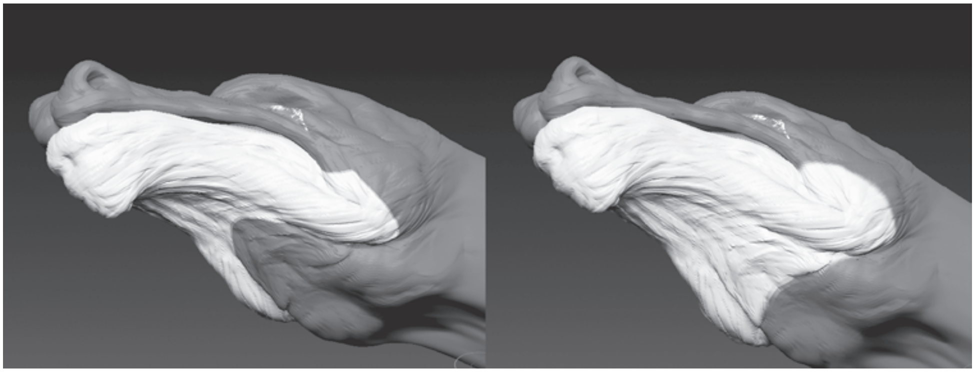


Figure 3.73
The head is masked except for the jaw. The mask is then edited using the MaskPen brush.

Once the surface has been carefully masked, the next step is to position the Transpose control. In this example, you want to use the handle of the control to rotate the jaw to an open position:

1. Rotate the view of the dragon's head so that you are looking at it from the side. Hold the **Shift** key as you rotate the view so that it snaps to a side view.
2. On the top shelf, press the Rotate button (hotkey = R).
3. Drag on the surface to draw out the Transpose control. Drag from the largest area of the jaw at the back of the head toward the front of the chin. Drag all the way off the surface to a blank part of the canvas in front of the chin (see Figure 3.74).

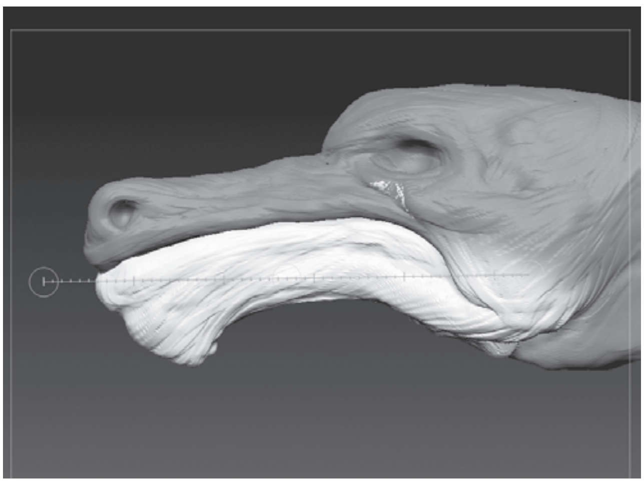


Figure 3.74
The Transpose control is drawn on the surface of the mesh and extended past the front of the chin.

As you drag on the surface, the action line and the handles of the Transpose control appear. Notice that while you are dragging on the surface, the end of the transpose handle snaps to the polygons of the surface. This is meant to help you position the control.

If symmetry is activated on the mesh, you'll see a second transpose control on the opposite side of the dragon's head. This can be useful when posing parts of a symmetrical body such as arms and legs, but sometimes it can cause problems when posing parts of the body such as the head. The safest course of action when posing the jaw is to turn symmetry off.

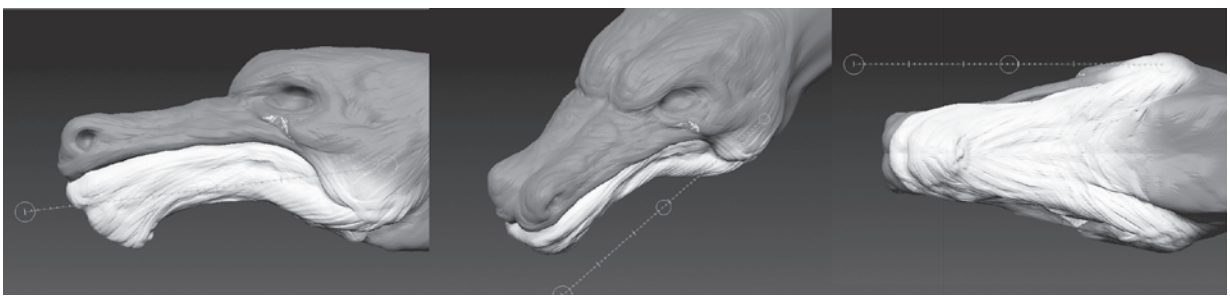
4. In the Transform palette, make sure the Activate Symmetry button is off.

   To position the Transpose control, drag on the outer circles of each handle. You want to place one end of the Transpose control at the pivot point of the jaw; you'll have to figure out where that is on the side view of your version of the model. Usually it's around the center of thickest part of the side of the jaw.

5. Hold the mouse pointer over the circle at the end of the action line nearest the pivot point of the jaw. You'll see the inner circle of the handle displayed in red and the outer circle displayed in yellow. Click on the outer, yellow circle and move it to position that end of the Transpose control (left image in Figure 3.75).
6. If you want to move the entire control, click on the outer circle at the center of the action line. You can also do this by clicking and dragging on the parts of the line that are between the circular handles.
7. Click and drag on the outer circle on the end of the Transpose control that is in front of the chin to position this end of the Transpose control.
8. Rotate the view of the dragon's head so that you can see the control from other angles. The handles of the control should be parallel to the dragon's head. If it is at an angle, it may cause the rotation of the jaw to be off center. Remember to check the position of the Transpose control from all angles to ensure that the changes you make are accurate (see center and right images in Figure 3.75).

Figure 3.75

The Transpose control is positioned by dragging on the outer circle of the handles at either end. The position of the handle is checked by rotating the view of the mesh.



When you are satisfied with the position of the handle, you can use it to actually rotate the jaw:

1. Rotate the view of the mesh back to a side view. Hold the mouse pointer over the circular handle of the Transpose control that is in front of the chin. You'll see the inner, red circle appear.
2. Click and drag on the inner, red circle; drag downward to open the jaw (left image in Figure 3.76).

   Usually you'll need to reposition parts of the mesh after you use the Transpose control to pose it. The trick to mastering the use of the Transpose control is patience and practice.
3. Click the Move button on the top shelf to switch to Move mode, or press the **W** hotkey.
4. Hold the mouse pointer over the circular handle at the middle of the action line. A white inner circle appears. Click and drag on this to move the jaw. Move it up a little to bring it closer to the head (center image in Figure 3.76).
5. Alternate using Move and Rotate to position the jaw. Rotate the view while you work to make sure the jaw is not rotated off center (right image in Figure 3.76).
6. Once you feel that the jaw is sufficiently open, use the Save As button in the File menu to save the project as `dragon_v08.ZPR`.

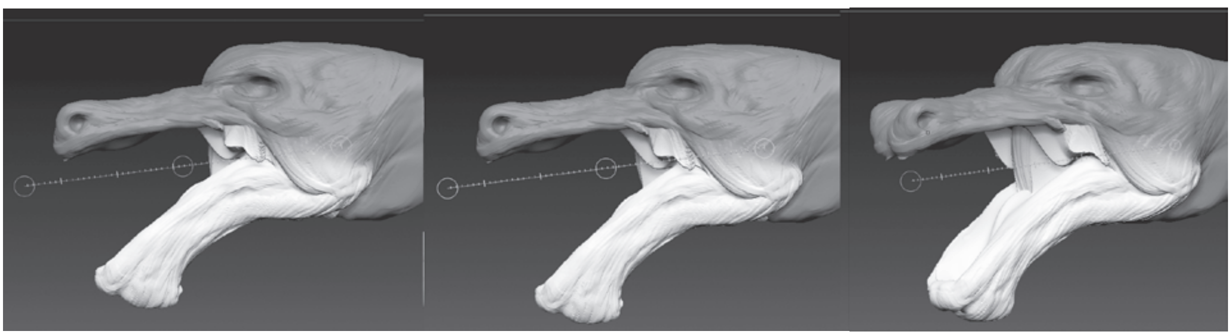
Clean Up The Dragon's Head

You'll almost always have to spend some time touching up the model after posing it with the Transpose control. This involves using the sculpting brushes to repair areas that have become stretched or squashed. In the case of the dragon, the polygons inside the mouth are stretched pretty badly, but it doesn't take much work with the sculpting brushes to fix this:

1. Continue with your own version of the dragon head or use the File palette to open the `dragon_v08.ZPR` project from the `chapter 3` folder on the DVD.
2. Press **Ctrl+Shift+A** to clear all masks applied to the surface.
3. Expand the Geometry subpalette of the Tool palette and set the SDiv slider to 5. Press the Divide button to add a sixth level of subdivision.

Figure 3.76

The jaw is opened using Transpose in Rotate mode (left image). It is then moved upward using Transpose in Move mode (center image). The changes are checked in other views of the mesh (right image).



TIPS ON USING TRANSPOSE

The behavior of the circular handles at each end of the Transpose control is different depending on whether you're using the control to move, rotate, or scale the unmasked parts of the surface. The best way to get comfortable using Transpose is to practice. Open the SuperAverage man model in the Tool section of Light Box and experiment with different ways to pose the model. Remember to mask parts of the model that you do not want to move. Some models will be easier to pose at lower subdivision levels.

When in Move mode (hotkey = W), drag on the inner circle of the circular handles at each of the far ends of the control to stretch the surface. The circle at the opposite end from the one you are dragging is the pivot point for the stretching action. Drag on the center circle of the handle in the middle of the action line to move the entire unmasked portion.

When in Scale mode (hotkey = E), drag on the inner circle of handles at the ends to create a uniform scale, The circle at the opposite end from the one you are dragging is the pivot point for the scaling action. Drag on the center circle of the handle in the middle of the action line to create a nonuniform scale. The direction of the scaling is perpendicular to the angle of the action line.

When in Rotate mode (hotkey = R), drag on the inner circle of handles at the end to rotate the unmasked portion. The circle at the opposite end from the one you are dragging is the pivot point for the rotation. Drag on the center circle of the handle in the middle of the action line to rotate around the axis of the action line.

Hold down the **Ctrl** key and drag on the surface while the Transpose control is active to create a topological mask. This is a type of mask that follows the topology of the mesh based on the direction the tool is dragged. This can be useful for masking in tight areas such as the tips of fingers curled into a fist. It takes a little practice to get used to how topology masks are generated. When you release the Transpose control, the surface becomes masked and the edges of the mask are automatically blurred.

4. Select the Move brush from the sculpting brush fly-out library. Use the brush to pull the geometry on the inside of the mouth back toward the throat to form a cavity. Smooth the geometry as you work.
5. Try using the Inflate brush and the Form Soft brush to smooth the geometry inside the mouth. Hold down the **Alt** key while using these brushes so that the form is pushed inward (see Figure 3.77). Sometimes it's faster and easier to use these brushes while the model is set to a lower SDiv level.

Chapter 7 will go into detail about how the sculpting brushes work, but feel free to experiment with trying out the different brush presets on your dragon's head. Some of the brushes may appear to behave strangely or seem to do nothing at all. That's okay. The mystery of these brushes will be revealed later in the book. Don't let it bother you for the moment if something seems really odd; just make a mental note of which brushes you like and which seem very weird while you are experimenting with your project.

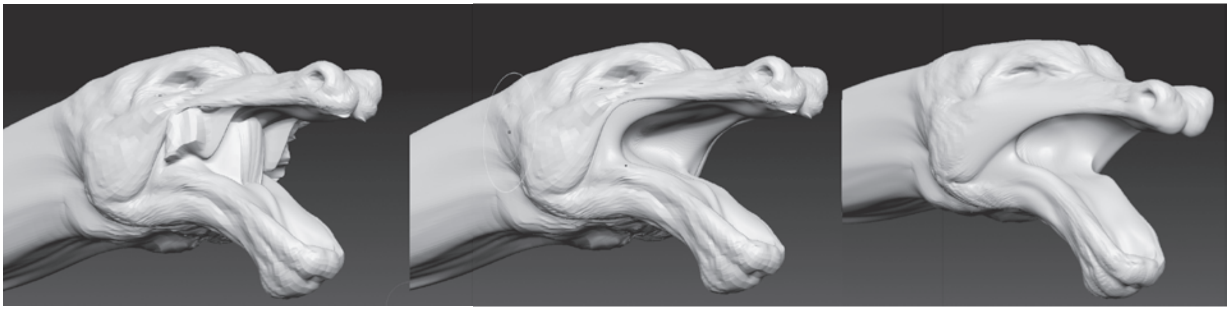


Figure 3.77
The inside of the throat is shaped using the Move, Inflate, Smooth, and Form Soft brushes.

Refine the Forms

Now that the basic shape of the head has been established, you can use the sculpting brushes to refine the forms. Don't worry about details like scales and bumps just yet. There's still a way to go in the next chapters before you get to that point. I sculpted my dragon head using the Move Elastic, Flatten, Move, Inflate, Clay Build Up, Form Soft, and Medium Polish brushes. You can open a movie I recorded of this sculpting session from the `chapter movies` folder on the DVD. The movie file is named `dragonSculpt1.mov`. Watching the movie is helpful because you'll see how I experiment while I work. Figure 3.78 shows some of the stages of the model as I worked. Overall it took me about 40 minutes to refine the forms.

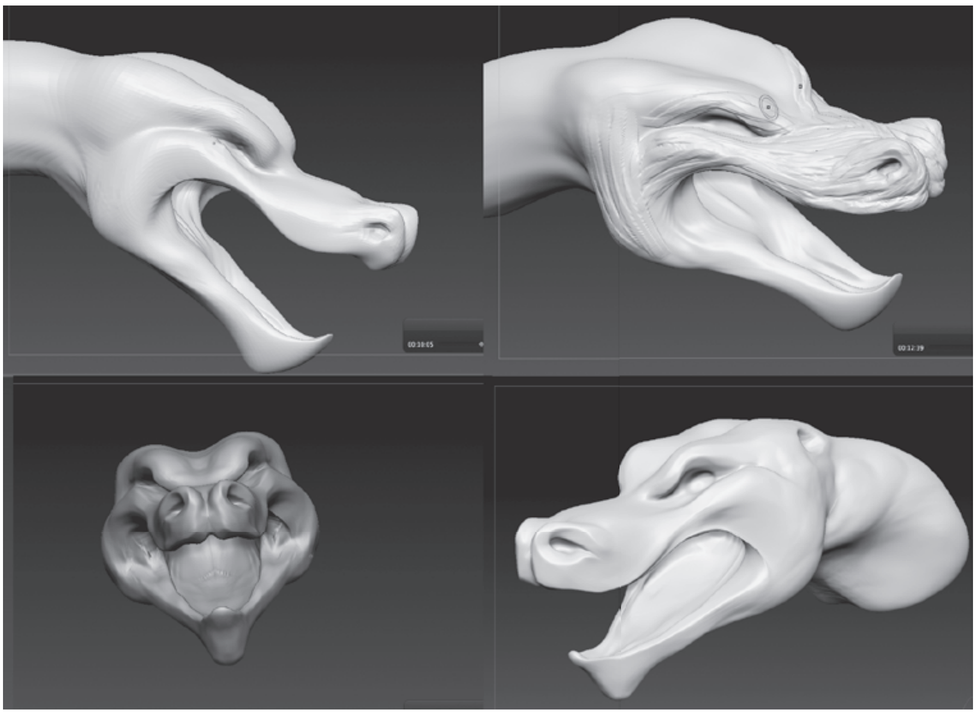


Figure 3.78
Using a variety of brushes, I shaped and refined the forms of the dragon's head.

The Medium Polish (mPolish) brush uses the Polish algorithm, which is similar to how the Smooth brush works in that it removes lumpy spots on the surface, but unlike the Smooth brush, the Polish brushes will not remove hard edges. In fact, they can be used along an edge to help accentuate it. The Medium (mPolish) and Hard Polish (hPolish) brushes are excellent choices when you want to define a hard surface. Use them for armor, metal, or any type of hard surface. On my dragon head, I used the mPolish brush to remove the lumps created by the Clay Buildup and Form Soft brush.

I did not add teeth or eyes to the dragon. In Chapter 4, you'll learn how to add parts to the dragon using subtools. You can open the example file named `dragon_v9.ZPR` from the `chapter 3` folder on the DVD.

CHAPTER 4

SubTools, ZSpheres, and ZSketching

As you become more comfortable shaping your creations using the sculpting brushes, no doubt your projects will become more ambitious. You'll want to add details such as teeth, eyes, armor, horns, clothing, and more. ZBrush gives you the power to append other three-dimensional objects to your initial digital sculpt. This is done through the SubTool subpalette of the Tool palette. A SubTool is simply a 3D tool that is parented to another 3D tool.

In addition to SubTools, this chapter introduces the ZSphere, ZBrush's unique armature, and ZSketching, which is a mesh creation method that can be applied directly on a ZSphere armature or an existing mesh using special sculpting brushes.

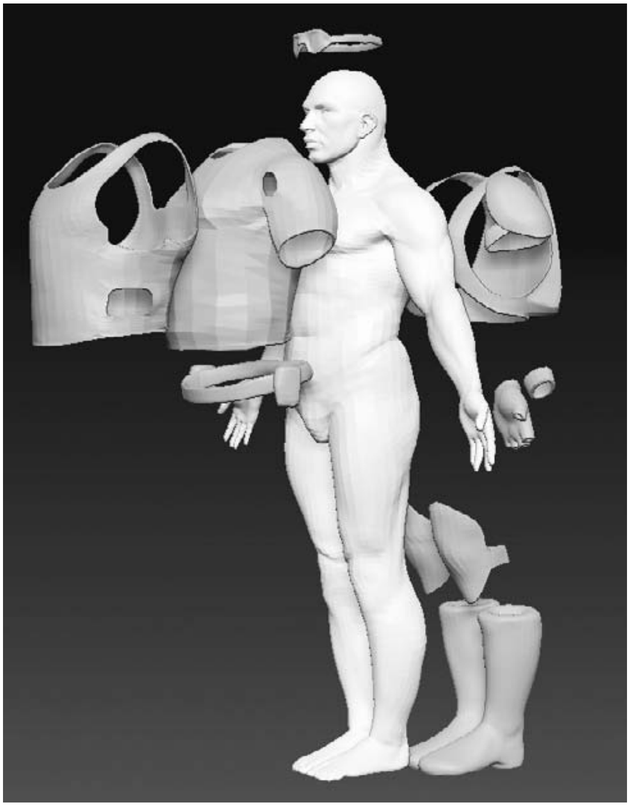
This chapter includes the following topics:

- **Append SubTools**
- **Use SubTool Master**
- **Work in the SubTool subpalette**
- **Create an armature using ZSpheres**
- **Create a ZSketch**

Append SubTools

As you may recall from Chapter 2, a 3D mesh in ZBrush is also known as a 3D tool. This is because ZBrush considers tools to be anything that makes a mark on the canvas itself. For example, a 3D dragon tool can be used to paint copies of 3D dragons on the canvas. The term *SubTool* is used to describe a 3D tool that has been parented to an initial 3D tool. There's no technical difference between the types of meshes that become SubTools and the tools themselves. A SubTool can have multiple levels of subdivision independent of the main tool, and they can be sculpted using the sculpting brushes. You can add hundreds of SubTools to your initial mesh, making your sculptures as complex as you'd like. The DemoSoldier example tool that comes with ZBrush is an example of a model that is made up of many SubTools (see Figure 4.1).

Figure 4.1
The DemoSoldier tool is made up of many SubTools.



The relationship between tools and SubTools is extremely simple. It is not meant to be a complex hierarchy like you might find in other 3D packages; a SubTool is a 3D tool that is chosen and appended to a main tool, and that's pretty much all there is to it. Using the SubTool interface in the Tool palette, you can rearrange the order of SubTools, control their visibility, and add, delete, and even merge SubTools together into a single tool. If you've used Adobe Photoshop, you may find that the concept of the SubTool interface is reminiscent of Photoshop's Layers palette.

In this example, you'll use SubTools to add eyes to your dragon sculpt.

Create an Eye

ZBrush's SubTool workflow is very flexible. You can append a raw lump of digital clay to an existing tool and sculpt it into shape, or you can append a fully sculpted object. In this example, you'll append a PolySphere and place it in the dragon's eye socket:

1. Continue with your own version of the dragon's head created in the last chapter or use the open the `dragon_v09.ZPR` project found in the `Chapter 4` folder on the DVD.
2. Make sure the head of the dragon is on the canvas and the Edit mode button on the top shelf is on.

The eye will be created from a PolySphere. Before this can be appended to the dragon's head it must be loaded into the current ZBrush session.

3. Open the Light Box interface at the bottom of the ZBrush interface and switch to the Tool heading. Double-click the PolySphere.ZTL tool (Figure 4.2).

Figure 4.2
The PolySphere is selected in the Tool section of Light Box.

The dragon head will disappear and you'll see the PolySphere appear on the canvas. Don't panic; the dragon is just fine. All that has happened is that you have added the PolySphere to the current ZBrush session and switched from editing the dragon model to editing the PolySphere. Imagine that you have just moved one sculpture off of your virtual sculpting stand and replaced it with another. If you open the tool fly-out library in the Tool palette, you'll see that the dragon head is still there loaded into ZBrush (see Figure 4.3). It may be labeled PolySphere_1. This is because the dragon head was created originally from a PolySphere in the last chapter.

4. Click the large icon in the upper-left portion of the Tool palette to open the tool fly-out library. Click the icon of the dragon's head (labeled PolySphere_1) to switch back to the dragon head SubTool.

Figure 4.3
The dragon head is still available in the tool fly-out library even though the PolySphere is on the canvas.

Figure 4.4
The dragon head is listed at the top of the SubTool subpalette. It is currently labeled PolySphere_1.

5. In the Tool palette, click the SubTool heading to expand the SubTool subpalette.

You'll see the dragon's head at the top of the SubTool subpalette (see Figure 4.4). Before appending the PolySphere, it's a good idea to rename the dragon's head. Naming your SubTools keeps your tools and SubTools organized, especially as your digital sculptures get more complex.

6. Below the list of SubTools you'll see a button labeled Rename. Click the button. A small pop-up window appears with white text highlighted in red (see Figure 4.5). Type **Dragon Head** to replace the text, and then press the **Enter/Return** key. In the SubTool palette, you'll see that the mesh at the top has been renamed.

Now you're all set to append the PolySphere and position it.

7. At the bottom of the SubTool subpalette, click the Append button. You'll see the tool fly-out library open up. Click the PolySphere in the Quick Pick section of the library. It may be labeled PolySphere_2 or PolySphere_3, depending on how many instances of the PolySphere have been opened while you have been working in this project (see Figure 4.6).
8. Once you click the PolySphere, you'll see that it appears below the dragon head in the SubTool subpalette. On the canvas you may notice that the PolySphere appears at the center of the dragon head (see Figure 4.7).
9. If you don't see the PolySphere, it may be that it is inside the dragon's head. On the left shelf, turn on the Transparency button. In the SubTool subpalette of the Tool palette, click the PolySphere box below the dragon head. This switches the current SubTool to the PolySphere. The dragon will appear transparent and you'll see the PolySphere at the center of its head (see Figure 4.8).

10. Use the Rename button in the SubTool subpalette to change the name of the PolySphere to **Left Eye**.
11. On the top shelf, click the Scale button (hotkey = E) to switch to Scale mode. Hold the **Alt** key and drag over the eye to scale it. Drag it up to reduce the size; drag down to increase the size.

Figure 4.5
The Rename button is used to change the name of PolySphere_1 to Dragon Head.

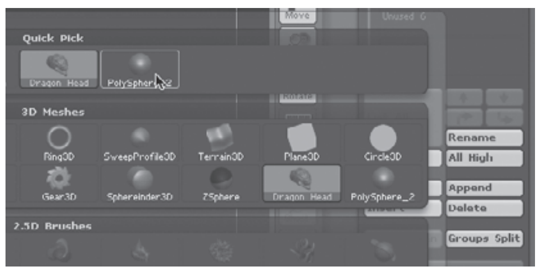


Figure 4.6
The Append button opens the tool library so that a tool can be selected and added to the SubTool palette.

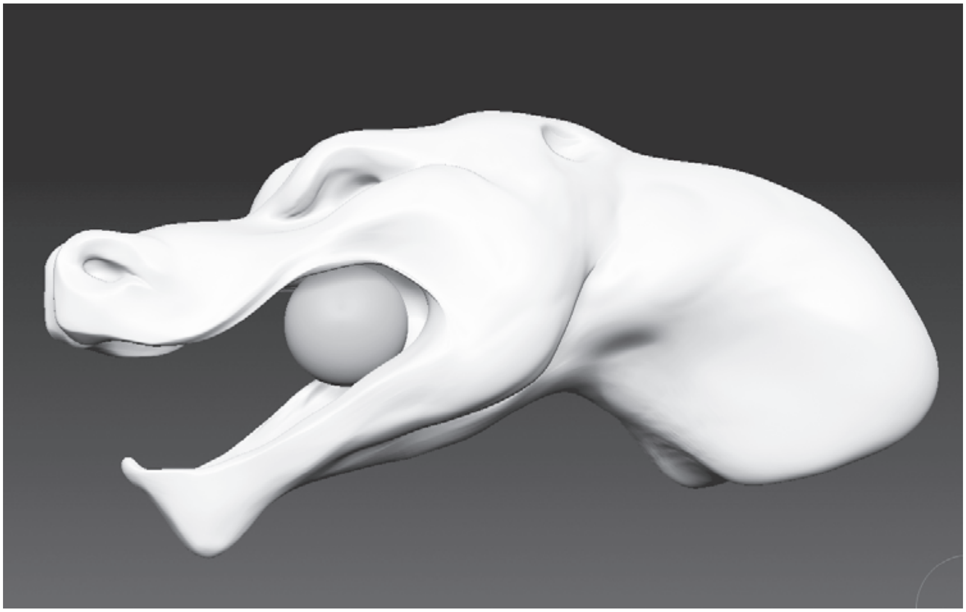


Figure 4.7

The PolySphere has been added as a SubTool in the SubTool subpalette. On the canvas it appears at the center of the dragon's head.

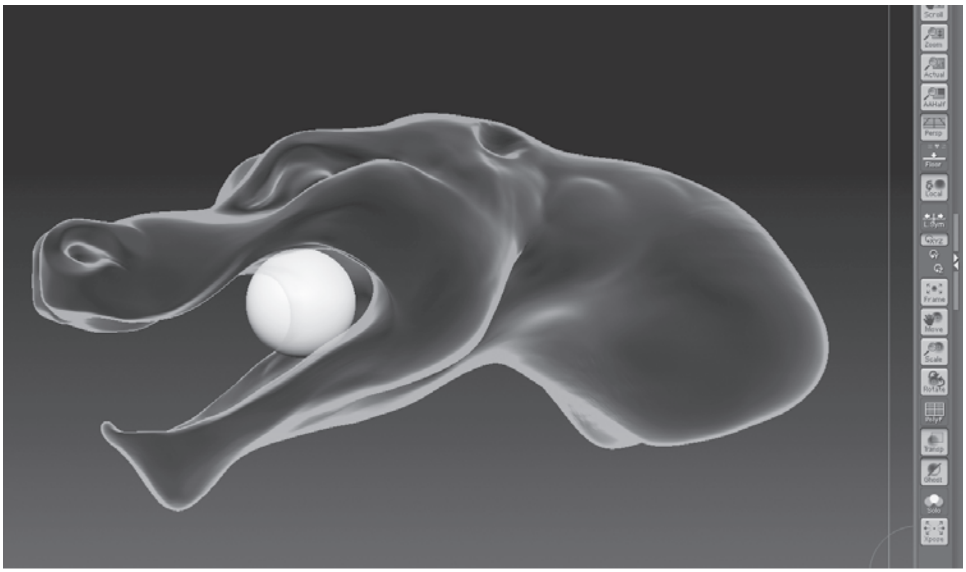


Figure 4.8

With transparency enabled and the PolySphere selected in the SubTool subpalette, the PolySphere can be seen inside the dragon's head.

ACTIVE AND INACTIVE SUBTOOLS

The SubTool subpalette lists all the SubTools associated with the main tool. To work with a SubTool, it must be active. An active SubTool is indicated by the coloring around the boxes listed in the SubTool subpalette; in the default color scheme, the active SubTool is indicated by a dark outline. Other color scheme presets, such as the one used in this book, use a light-colored highlight to indicate the active SubTool.

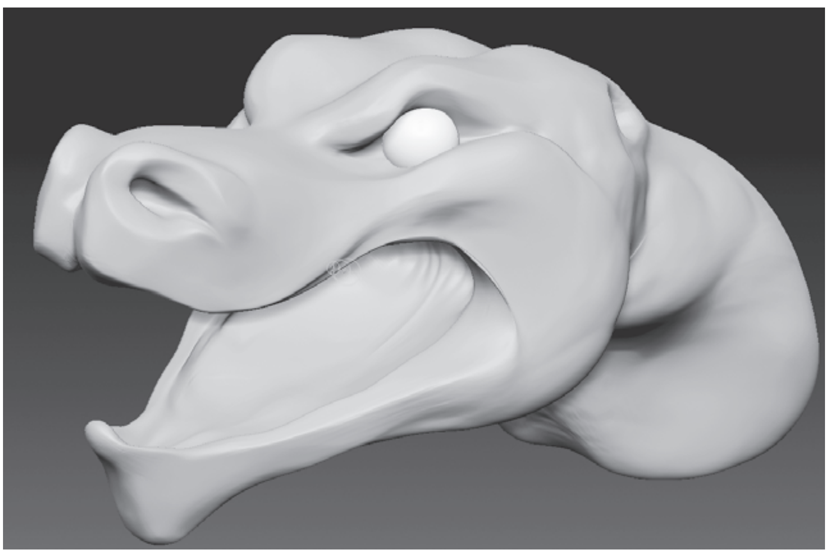
Only one SubTool can be active at a time. To make a SubTool active, you need to click its box in the SubTool subpalette or hold the **Alt** key while clicking on part of the object on the canvas.

On the canvas, the inactive SubTools will be shaded in a slightly darker color than active SubTools. If Transparency is enabled on the right shelf, all the SubTools except the active SubTool will appear transparent. The Ghost button changes the look of the transparent objects on the canvas.

On the right shelf, you can click the Solo button to temporarily hide all of the SubTools except the active one. As you click on different SubTools in the SubTool subpalette, you'll see the visibility of the current SubTool on the canvas change as well.

12. On the top shelf, press the Move button (hotkey = W). This button switches the mode to Move mode, allowing to you reposition the eye. Hold the **Alt** key and drag over the PolySphere to move it. Rotate the view as you work by letting go of the **Alt** key and right-click dragging on the canvas. Try to position the eye close to the dragon's eye socket. (see Figure 4.9)
13. Use the Save As button in the File palette to save the project as `dragon_v10.ZPR`.

Figure 4.9
The Left Eye SubTool is scaled and positioned in the dragon's eye socket.

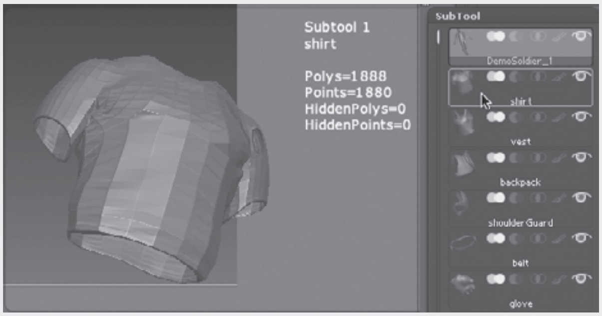


TIPS ON WORKING WITH THE SUBTOOL SUBPALETTE

The SubTool subpalette has a range of options for working with SubTools. Here are some tips on the more common controls of this subpalette. More advanced options are described later on throughout the exercises in this book. Some of these options, such as Remesh and Project All, won't make a lot of sense until you learn more about working in ZBrush, so I'll save these features for a later discussion in Chapter 6, "Remesh and Projection."

The SubTools are listed in the SubTool subpalette as a vertical stack. Each SubTool has its own box with a preview icon, its name, and a number of other buttons.

- Hold your mouse over the SubTool's box to reveal a pop-up window with information about the SubTool, such as the number of polygons and points in the SubTool at its current subdivision level.



- To the left of the stack of SubTools is a scroll bar that becomes active when the list of SubTools become too long to display in the SubTool subpalette.
- On the right side of the box for each SubTool is an eyeball icon. This toggles the visibility of the SubTool on the canvas. Click the eyeball icon of an inactive SubTool to turn it off.
- The currently active SubTool will remain visible regardless of whether or not the eyeball icon is on.
- To turn off the visibility of all the SubTools except the currently active SubTool, click the eyeball icon of the currently active SubTool so that it turns off. This can also be achieved by clicking the Solo button on the right shelf.
- To turn on the visibility of all of the SubTools at once, click the eyeball icon for the currently active SubTool so that it turns on.
- To switch from one SubTool to another, select the SubTool's box in the SubTool subpalette.
- The three pairs of circular icons above the name of the SubTool control how a SubTool is remeshed. This is explained further in Chapter 6.
- Below the stack of SubTools you'll see a button labeled List All. This button opens up a small display that shows all of the SubTools in a panel. This is helpful when working with complex

continues

continued

tools that have more parts than can be shown in the SubTool stack. This feature works only when the current tool has three or more SubTools.

- You can filter the display of the SubTools in the List All pop-up box by typing the first letter of the SubTool you are looking for. So, for example, if you want to quickly switch to a SubTool named Goggles, just type **g**. If no other SubTools start with *g*, the Goggles SubTool will automatically become selected in the SubTool stack. If more than one SubTool starts with *g*, you'll see all the SubTools that start with *g* in the List All pop-up. Other SubTools will be grayed out. Type the second letter of the SubTool to switch to that SubTool. For example, type **g** and then **o** to switch to the Goggles SubTool while the List All pop-up is open.
- The List All pop-up underscores why it is helpful to name your SubTools. If all of your SubTools are named PolySphere, then the List All feature will not be not helpful.
- Next to the List All button are four arrow buttons. The top two arrow buttons can be used to move up or down through the list of SubTools in the stack. The bottom two arrows change the position of the active SubTool in the stack. The bent-upward arrow moves the SubTool up one position in the stack, and the bent-downward arrow moves the active SubTool down one position in the stack.

- The Duplicate button makes a copy of the active SubTool and adds it to the stack of SubTools.
- The Append button adds a tool selected from the tools available in the tool fly-out inventory to the bottom of the SubTool stack; the Insert button does the same thing but the appended SubTool is placed just below the active SubTool in the SubTool stack.
- The Delete button deletes the currently active SubTool. When you click this button, a warning message appears letting you know that deleting a SubTool is not undoable.
- The Split Hidden button splits a tool into SubTools based on which parts of the mesh have been hidden. Hiding parts of the mesh with the selection tools is covered in Chapter 3. This button is available only if parts of the mesh are hidden and the mesh is set to subdivision level 1.
- The Grp Split separates a tool into SubTools based on how the mesh has been arranged into polygroups.

That covers some of the basics of working with SubTools. Other common SubTool operations can be accomplished using the SubTool Master plug-in, which is described later in this chapter.

Sculpt SubTools

An appended SubTool is a sculptable mesh just like the main tool. You can subdivide SubTools and use the sculpting brushes to change their shape. Any changes you make are restricted to the active SubTool only. All inactive SubTools are masked and cannot be changed unless you switch SubTools by selecting one of them in the SubTool subpalette.

The SubTool subpalette also has controls for hiding and revealing SubTools. This can make working on complex objects easier. The exercises in the following sections will help you to become familiar with how to sculpt SubTools and control their visibility.

Sculpt the Eye

In this section you'll switch to the Eye SubTool and sculpt the basic shape of a pupil.

Figure 4.10

The Left Eye SubTool is selected in the SubTool subpalette.

1. Continue working on your own version of the dragon's head or open the `dragon_v10.ZPR` project from the `Chapter 4` folder on the DVD.
2. In the Tool palette, click the SubTool heading to expand the SubTool subpalette. Click the Left Eye SubTool (see Figure 4.10).
3. Scroll down in the Tool palette and expand the Geometry subpalette. Make sure the SDiv slider is set to 3. Click the Divide button twice to add a fourth and fifth level of subdivision (hotkey = Ctrl+D).
4. On the left shelf, open the sculpting brush fly-out library and press the **S** key and then press the **T** key to switch to the Standard brush.
5. On the left shelf, open the stroke type fly-out library and choose the Drag Rect stroke type.

Figure 4.11

Alpha 14 is chosen from the alpha fly-out library.

6. On the left shelf, open the alpha fly-out library and select Alpha 14 (see Figure 4.11).
7. On the top shelf, set Intensity to 50 and Focal Shift to 40.
8. Hold the right mouse button (or the button on your stylus) and drag while holding the **Ctrl** key to scale the view of the dragon's head on the canvas so that you can zoom in on the eye. Drag on the surface of the eye to create a bulge for the pupil.
9. Hold the **Shift** key and paint over the bulge to smooth the front of the bulge created by the Standard brush (see Figure 4.12).

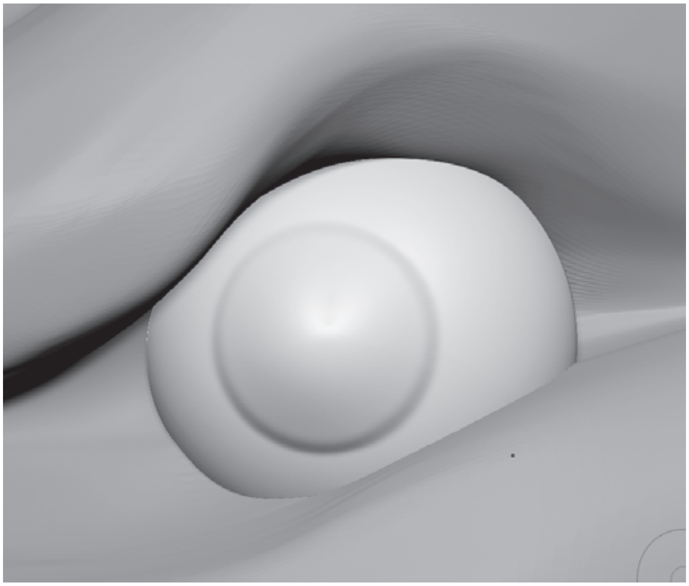


Figure 4.12
A bulge is created on the eyeball of the dragon using the Standard brush.

SubTool Master

Once you have the eye positioned on the dragon's left eye socket, you'll want to mirror it over to the other side. The easiest way to do this is to use the SubTool Master plug-in. SubTool Master is one of the many free plug-ins available for ZBrush. You can download the plug-in for both Mac and Windows from `www.pixologic.com/zbrush/downloadcenter/zplugins`. The plug-ins are very easy to install. See the sidebar "ZBrush Plug-Ins" for instructions on how to install SubTool Master.

ZBRUSH PLUG-INS

Pixologic uses plug-ins to extend the power of ZBrush. Pixologic occasionally releases new plug-ins that can be used to tailor ZBrush to fit into your current production pipeline. These plug-ins are free and available from Pixologic at this web address: `www.pixologic.com/zbrush/downloadcenter/zplugins`.

The plug-ins come with simple installation instructions, and most can be installed by copying the contents of the downloaded zip archive into the `Pixologic\ZStartup\ZPlugs` folder. However, you should make sure you read the instructions enclosed in the readme file that comes with each plug-in.

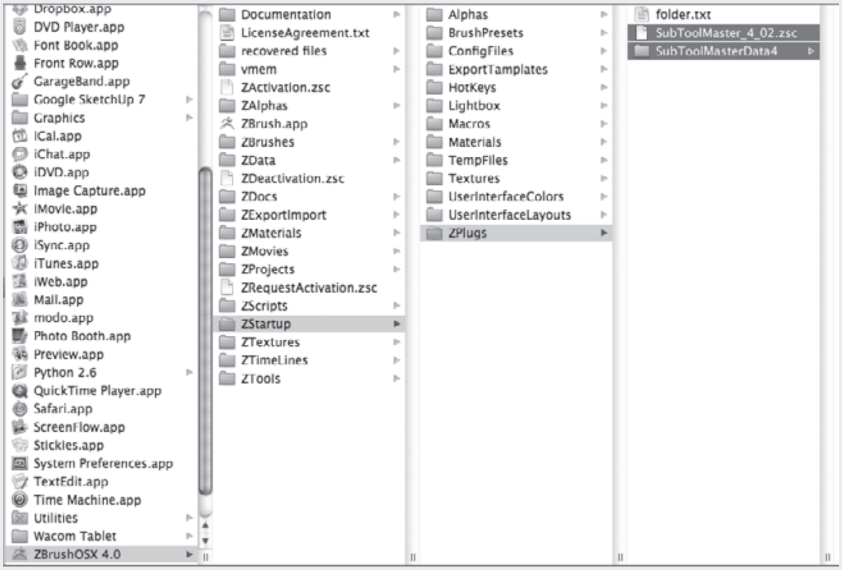
On the DVD that comes with this book you'll find a bonus chapter in PDF format. This is a bonus chapter called "ZBrush Plug-Ins," and it discusses many of the other free plug-ins you can use with ZBrush.

To install SubTool Master, follow these steps:

1. Go to `www.pixologic.com/zbrush/downloadcenter/zplugins`.

2. Scroll to the bottom of the page to find SubTool Master. Click the link appropriate for your operating system. The file will download as a zip archive named `SubToolMaster_4_02`.

3. Once the file has downloaded, unzip the archive by double-clicking it. Select Open the `SubToolMaster_04_02` folder and **Shift+select** the `SunToolMaster_04_02.zsc` file and the folder named `SunToolMaster-Data4`. Copy or move these files to the `ZPlugs` folder. On the Mac, this folder is found in the `Applications\ZBrushOSX 4.0\ZStartup\ZPlugs` directory. In Windows, it is found in the `Program Files/Pixologic/ZBrush 4.0/ZStartup/ZPlugs` folder.



4. Use the Save As button in the File palette to save your current project. Save the file as `dragon_v11.ZPR`. Close and restart ZBrush.

5. Once ZBrush is loaded, you'll find that the SubTool Master plug-in appears as a subpalette in the ZPlugin palette.

Figure 4.13
The interface for the SubTool Master plug-in

In this exercise, you'll use SubTool Master to mirror copy the left eye from one side of the head to the other:

1. Use the Open button in the File palette to load the `dragon_v11.ZPR` project. Make sure that Left Eye is the currently active SubTool in the SubTool subpalette of the Tool palette.
2. Click the SubTool Master button in the ZPlugin palette to open the plug-in. SubTool Master is a collection of common SubTool actions. It appears as a menu on the left side of the canvas (see Figure 4.13).
3. Click the Mirror button. A dialog box opens and offers options for how the eye will be mirrored. Check the Merge Into One SubTool box and set the mirror axis to x. These are the default options and should be already set (see Figure 4.14).
4. Click the OK button to mirror the eye. A second dialog box opens informing you that the combined mesh will be 786,432 polygons (see Figure 4.15). Click OK to accept this.

Figure 4.14
The options for the Mirror operation

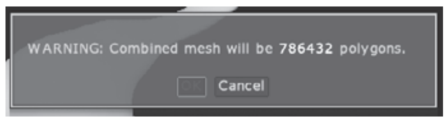


Figure 4.15
A dialog box informs you of the number of polygons that will result when the eye is mirrored and merged.

You'll see ZBrush go through the process of mirroring the eye. Once the left eye is duplicated, the duplicate is mirrored to the dragon's right side and the mirrored duplicate is combined into the existing Left Eye SubTool. If you activate Transparency, you can see both eyes in the dragon's head (Figure 4.16).

5. In the SubTool subpalette, use the Rename button to change the name of Left Eye_1 to **Eyes**.

The SubTool Master plug-in automates many common tasks that normally take several steps. This saves you a lot of trouble and makes working in ZBrush faster. To mirror a SubTool, the plug-in makes a clone of the active SubTool, mirrors it across the x-axis, appends the mirrored clone as a SubTool to your mesh, and then merges the mirrored clone to the active SubTool. You can see ZBrush go through each of these steps while the plug-in is working.

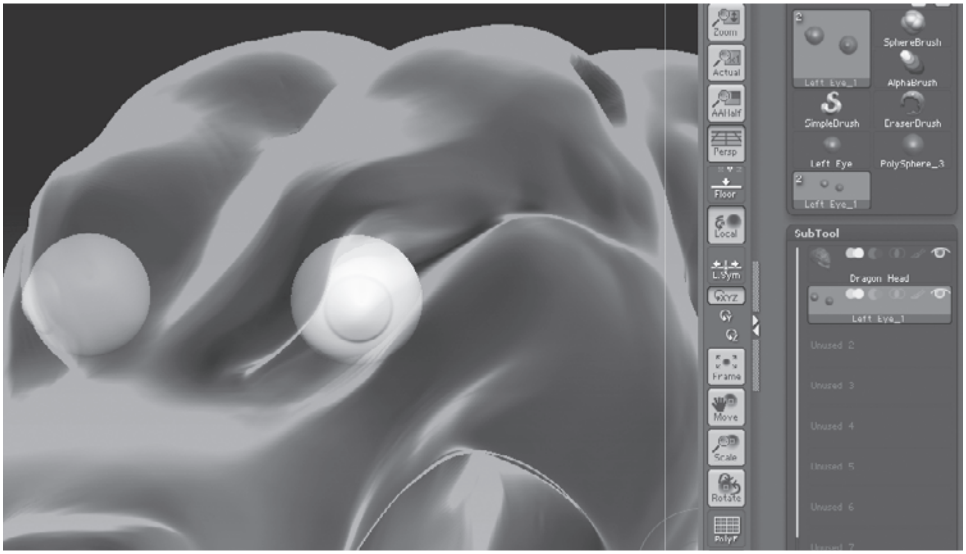


Figure 4.16
The left eye has been duplicated and mirrored to the right side of the dragon's head. In the SubTool subpalette, the eyes have been merged into a single SubTool.

A clone is a copy of the active SubTool that is placed in the tool inventory. You can see the clones when you open the tool fly-out library in the Tool palette. If you need to make your own clone at any time, just select the SubTool you want to clone and press the Clone button at the top of the Tool palette (see Figure 4.17).

Figure 4.17
The Clone button appears in the collection of buttons at the top of the Tool palette.

So how do you clear the clones out of the tool inventory? Follow these steps:

1. Open the Tool fly-out library by clicking the large icon in the upper left. It will be labeled Eyes if the dragon head is still the current tool on the canvas.
2. In the library, select the tool you want to remove; in this case it will be labeled Left Eye. This is the cloned version of the eye created by SubTool Master. The dragon head model will be replaced by the left eye. This just means that ZBrush has switched tools.
3. Open the SubTool subpalette in the Geometry palette. The Left Eye SubTool will be selected at the top.
4. At the bottom of the SubTool subpalette, press the **Delete** button to delete the top SubTool. Press the OK button in the warning box that appears. This removes the tool from the tool inventory.
5. Open the tool fly-out library to switch back to the dragon. You may not see the dragon's head in the tool inventory icons; instead, you'll see the a pair of eyes labeled Eyes. This is because the tool inventory displays an icon for the currently active SubTool, which in this case is the Eyes SubTool (see Figure 4.18).
6. Use the File menu to save the project as `dragon_v11.ZPR`.

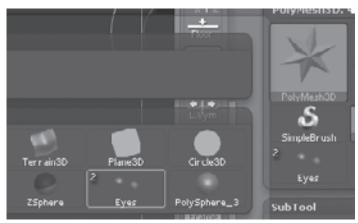


Figure 4.18
The dragon head tool is labeled Eyes in the tool fly-out library because the Eyes SubTool is the currently active tool. Click the Eyes icon to switch back to the dragon head.

SUBTOOL MASTER OPTIONS

The interface for SubTool Master appears as a long strip of buttons on the left side of the canvas. You can close the plug-in by clicking the x button in the upper-right corner or by clicking on one of the buttons that will perform an action. Here's a quick description of what each button does.

- Multi Append lets you append more than one tool at once or append all the SubTools of another tool. This button opens up your computer's file browser, which lets you select one or more tools that have been saved to your hard drive. To append more than one tool, hold the **Shift** key as you select them in the file browser.
- Mirror creates a duplicate of the active SubTool and copies it to the other side of a specified axis. For example, you can mirror a glove from one hand to the other. When you click the mirror button, a smaller dialog box opens asking you if you want to merge the mirrored object into the existing SubTool or append it as an independent SubTool. You can also specify the axis the SubTool will be mirrored across.
- Merge combines all the visible SubTools into one SubTool. When you select this button, a smaller dialog box opens up asking if you want to preserve existing polygroups and if you want to delete duplicate SubTools created during the merging process. There are also buttons for merging SubTools in the SubTool subpalette. These are the Merge Visible and Merge Down buttons.
- Fill colors all of the visible SubTools with the currently selected color in the color picker. When you click the button, a dialog box asks you to choose whether you want to fill the SubTools with the current color, the current material, or both the current color and the current material. These options will be explored more in Chapter 8, "Polypainting and Spotlight."
- Export lets you export all the visible SubTools in a specified 3D file format. The file format can be chosen in the dialog box that opens up when you click the button. Exporting objects for other 3D packages is explored in Bonus Content 1, "GoZ," which you'll find on the DVD as a PDF document.
- Delete Invisible deletes any of the SubTools that are hidden.
- Scale Offset will set all visible SubTools to a scale of 1 and the offsets to 0.
- Do Visible opens a dialog box that automates common functions for all of the visible SubTools. These include subdividing the mesh, reconstructing the subdivisions to help eliminate stretching, correcting duplicate SubTool names, creating new layers, and turning off layers. Layers are explained in detail in Chapter 10, "Morph Targets, Layers, and the ZBrush Timeline."
- Shift Up moves the current SubTool up in the SubTool stack. This function has been replaced by the arrows in the SubTool subpalette.
- Show/Hide All controls the visibility of the SubTools. This function has been replaced by the Solo button on the right shelf.
- Invert Visibility swaps the visibility status of hidden and visible SubTools.

Create the Eyelid Using Mesh Extraction

There are countless ways to create eyelids for creatures and characters. The approach you take depends on what you're trying to achieve. The dragon head I have created has very deep-set eyes, so I've decided to use mesh extraction to create a new mesh that conforms to the shape of the eyes. This new mesh can be blended in with the rest of the head geometry.

Mesh extraction is a simple process where a mask is painted on to the surface of a mesh and then ZBrush creates a new polygon mesh based on the masked areas. This new mesh is automatically appended as a SubTool. ZBrush artists often use this technique for creating clothing for their characters because the extracted mesh conforms to the shape of the original mesh. Follow these steps:

1. Continue with your own version of the dragon or open the `dragon_v11.ZPR` project from the `Chapter 4` folder on the DVD.
2. In the Tool palette, open the SubTool subpalette.
3. Click the box for the Eyes SubTool to select it. Turn on the Transp button on the right shelf so that the dragon's head is transparent.
4. Press the **X** hotkey to activate symmetry.
5. Hold the **Ctrl** key to activate the masking pen, and make sure the stroke type for the masking pen is set to Dots as shown in Figure 4.19.
6. Set the Draw size to around 40, and scale the view of the eyes so that you can clearly see them.
7. Hold the **Ctrl** key and paint a mask on the surface of one of the eyes. Since symmetry has been activated, the mask will be painted on the other eye while you work.
8. Paint a mask that surrounds the eyeballs; the mask should roughly resemble an eyelid. You don't need to paint on the back of the eyeball since this part will be inside the dragon's head.
9. The shape of the mask does not need to be overly precise; remember that you can erase parts of the mask by holding the **Alt** and **Ctrl** keys while painting (see Figure 4.20).

If you want to clear the mask and start over, just hold the **Ctrl** key and drag on a blank part of the canvas and let go. This erases any mask painted on the surface just as if you used the Clear button in the Masking subpalette of the Tool palette.

Figure 4.19
Set the stroke type for the masking pen to Dots

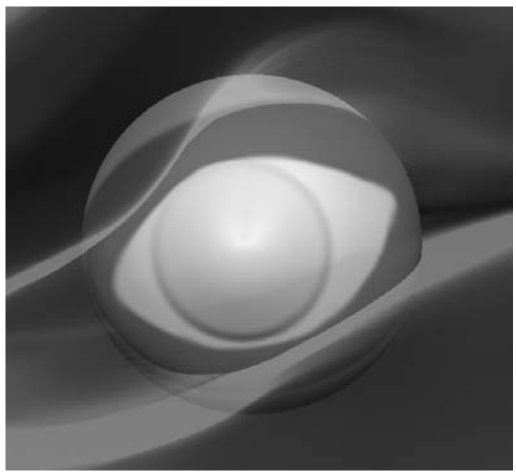


Figure 4.20
Paint a mask on the surface of the eyeballs in the shape of an eyelid.

10. Once you are happy with the mask, expand the Geometry subpalette of the Tool palette and set the SDiv slider to 1. This sets the tool at the lowest subdivision level.

Figure 4.21

The sliders control how the resulting extracted mesh will look.

At the bottom of the SubTool palette you'll see the Extract button. Pressing this button will generate a new mesh extracted from the masked areas of the surface. The sliders to the right of the button control the properties of the extracted mesh (see Figure 4.21).

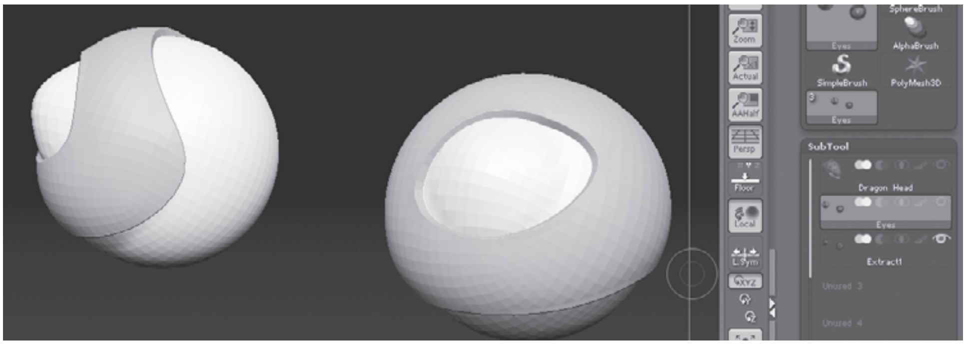
- The E Smt button sets the smoothness of the edges of the extracted surface.
- The S Smt button sets the smoothness of the surface.
- The Thick slider controls how thick the extracted surface will be. This slider can be sensitive, so it should be changed in small increments.

11. Set Thick to 0.5 and click the Extract button.

After a few seconds, the eyelid geometry will appear. It has been appended as a SubTool to the dragon tool. The new SubTool is named Extract (see Figure 4.22).

Figure 4.22

The extracted mesh is created from the mask painted on the eyeballs.



It usually takes a few tries to find the right settings for smoothness and thickness. If you decide you don't like the mesh generated from the extraction, you can select the Extract SubTool and press the Delete button in the SubTool palette, adjust the settings, and press the Extract button to try again.

You extract a mesh from a tool at any subdivision level. The extracted mesh matches the number of polygons in the original mesh. By setting the mesh to a low subdivision level before extracting, you ensure that the extraction is also at a low resolution, which will allow you to add levels of subdivision to the extraction by pressing the Divide button in the Geometry subpalette of the Tool palette. If you create an extraction that is very dense, it may limit your flexibility when modeling later on.

12. In the SubTool subpalette, select the newly created Extract SubTool.

Occasionally when you create a mesh from an extraction, the newly created mesh may have a mask applied that is not visible.

13. In the Tool palette, expand the Masking subpalette and turn on ViewMask (hotkey = Ctrl+H). If a mask is visible on the new mesh, press **Ctrl+Shift+A** to clear it (see Figure 4.23).

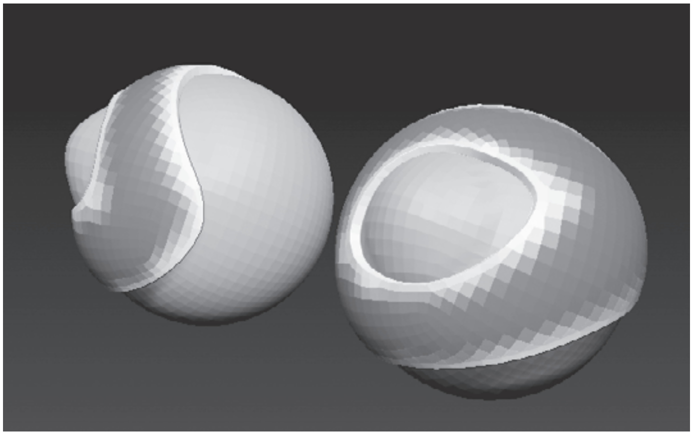


Figure 4.23
Clear any masks that may be applied to the eyelid surfaces.

14. Turn on the visibility of the Dragon Head SubTool.
15. Rename the Extract SubTool **Eyelids**. Press **Ctrl+D** twice to add two levels of subdivision above the current level for a total of three subdivision levels.
16. Turn on Transparency and press the **X** key to turn on symmetry.
17. Use the Move brush to pull the eyelids into a shape that fits around the eye and within the eye socket. Use the Smooth brush (hold the **Shift** key while painting on the surface) to smooth the mesh as you work (see Figure 4.24).
18. Remember to rotate the view as you work. Look at the eyelid from all angles so that you can be sure it remains close to the eyeball geometry. It's helpful to toggle transparency on and off while you work to see how well the eyelid fits within the dragon's head.
19. Use the Inflate brush (open the sculpting brush fly-out library and press **i** and then **n** to switch to the Inflate brush) to add volume to the eyelid. Set Z Intensity to 20. Use the Inflate brush to create a slight overhang in the upper eyelid toward the back of the eye (see the right image in Figure 4.24).

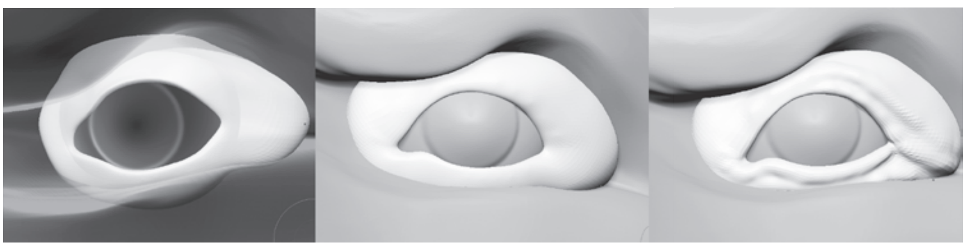


Figure 4.24
Use the Move, Smooth, and Inflate brushes to shape the eyelid surfaces.

You don't have to add too much detail just yet. In the next section, you'll merge the eyelids with the dragon head so that they can be blended together.

20. Use the Save As button to save the project as `dragon_v12.ZPR`.

Merge SubTools

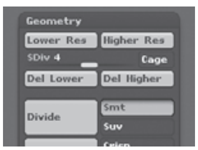
Separate SubTools can be merged into a single SubTool using controls in the SubTool subpalette or by using the SubTool Master plug-in. When two SubTools are merged, they are still separate meshes but they are treated as a single object, which means you can sculpt on them together. The merged SubTools will retain their polygroup arrangement and can be separated again later on. In this example, you'll merge the eyelid and the head so that the meshes can be blended together using the Clay brushes.

When merging SubTools you'll want to keep a few things in mind so that blending the geometry of the merged surfaces can be easily accomplished. The two SubTools should have the same number of subdivision levels so that after they have been merged you can continue to use the Sdiv slider in the Geometry palette to move between levels of subdivision. Also, for best results, the overall size of the polygons in the merged SubTools should be about the same so that you can blend the surfaces together seamlessly with the sculpting brushes. This means you'll have to develop a strategy for ensuring that the two tools have the same number of subdivisions and that the size of the their polygons is similar.

In the example scene, the dragon head has six levels of subdivision and the eyelid surface has three. You could divide the eyelid surfaces three more times, but this would make them very dense and the polygons of the eyelid surface would be much smaller than those on the head. A better solution would be to delete some of the lower subdivision levels of the head. To do so, follow these steps:

Figure 4.25

Press the Del Lower button to delete the lower levels of subdivision.



1. Continue with your version of the dragon or open the `dragon_v12.ZPR` project from the `Chapter 4` folder on the DVD.
2. In the SubTool subpalette of the Tool palette, select the Dragon Head SubTool.
3. Expand the Geometry subpalette and set the SDiv slider to 4.
4. Press the Del Lower button (Figure 4.25) to delete all of the subdivision levels below level 4. This means that what was previously level 4 now becomes level 1 and the Dragon Head SubTool now has three levels of subdivision instead of six.
5. Set the SDiv level to 3. This sets the dragon head back to the highest subdivision level.
6. Open the material fly-out library on the left shelf and choose the Framer01 material (see Figure 4.26). This material makes it easy to see the polygons on the surface. You should be able to tell that the polygons of the eyelid surface and the dragon head are about the same size (see Figure 4.27).

Figure 4.26

Choose the Framer01 material from the material fly-out library.

Next you'll use the Merge Down button to merge the dragon head with the eyelids. The Merge Down button will cause the selected SubTool to be merged with all SubTools below it in the SubTool stack. You don't want the eyes to be merged with the other parts, so you can change the order of the SubTools in the stack.

7. In the SubTool subpalette, select the Dragon Head SubTool.

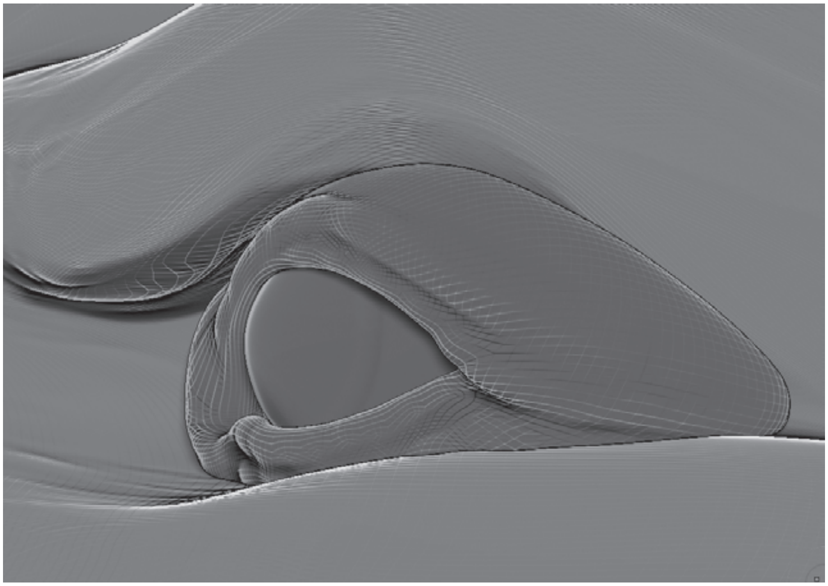


Figure 4.27
The Framer01 material makes it easy to see the size of the polygons on both SubTools.

Figure 4.28
Use the bent arrow button at the bottom of the SubTool stack to change the order of the SubTool.

8. At the bottom of the SubTool stack, press the arrow that points downward and to the right (Figure 4.28) or press the **Ctrl+down arrow** hotkey combination. This moves the Dragon Head SubTool down in the stack and also moves the eyes up.
9. Make sure the Dragon Head SubTool is selected. In the SubTool subpalette, turn off the Weld button and press the Merge Down button (see Figure 4.29).

Figure 4.29
Turn off the Weld button and press the Merge Down button.

When the Weld button is on, any two vertices that are at the same position will be welded together into one vertex. This can be useful in some situations, but in this case it could interfere when shaping the eyelids after they have been merged with the head.

10. When you press the Merge Down button, you'll see a warning telling you that this is not an undoable operation (see Figure 4.30). Press OK to perform the action; after a few seconds, the two surfaces will be welded together (Figure 4.31).
11. Use the Save As button in the File palette to save the project as `dragon_v13.ZPR`.

The two SubTools have been merged together. In the next section you'll use the sculpting brushes to blend the two surfaces.

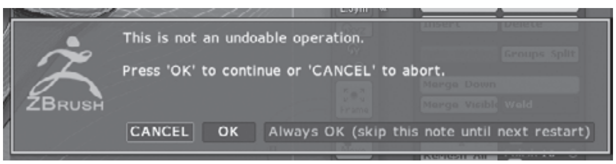


Figure 4.30
A warning appears telling you that merging is not an undoable operation.

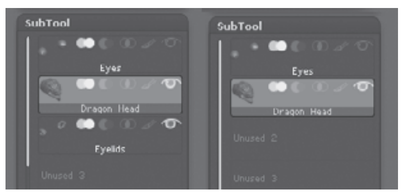


Figure 4.31
The Dragon Head SubTool and the Eyelids have been merged into a single SubTool named Dragon Head.

Blend Merged Surfaces

The surfaces have been merged together, but they are still two separate meshes. They should also still have their polygroup information. At this point, you'll use the Clay brush to blend the surfaces together. In some cases, such as with the dragon's eye, if you start hacking away with a sculpting brush, you'll find that the surfaces become mangled fairly quickly and you'll get frustrated. It's a good idea to proceed slowly and carefully at first. Take advantage of masking and use a low Z Intensity setting for your brush. Before starting, you can mask the inside edge of the eyelid:

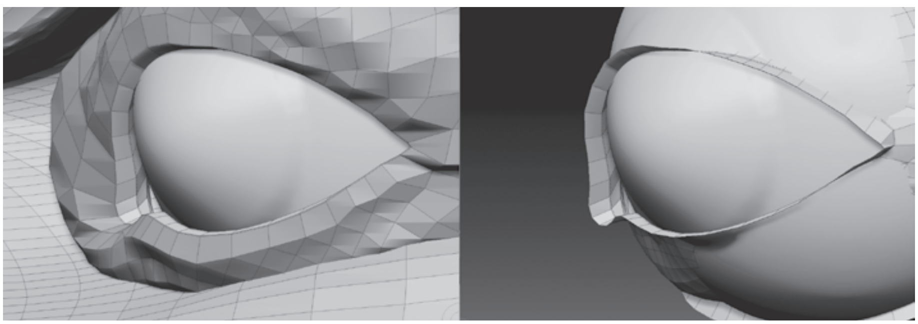
1. Continue with your version of the dragon or use the Open button in the File palette to open the `dragon_v13.ZPR` project from the `Chapter 4` folder on the DVD.
2. In the Geometry subpalette of the Tool palette, select the Dragon Head SubTool, and set the SDiv slider to 1.
3. Scale the view so that you can see the eye and eyelid. On the right shelf, turn on the PolyF button (hotkey = Shift+F) to display the wireframe on the surface of the model. Select the SkinShader4 material from the material fly-out library.

You can see that the surface is still organized into polygroups indicated by the various colors (left image in Figure 4.32). The inside of the eyelid should be a different polygroup than the rest of the surface. These polygroups were created automatically when the eyelid mesh was extracted from the eyeball.

4. Hold **Ctrl+Shift** and carefully click on one of the polygons of the inner eyelid to isolate its visibility. This may take a couple of tries since this is a very small polygroup. If you don't get it right the first time, undo (**Ctrl+Z**) and try again (right image in Figure 4.32).

Figure 4.32

The merged dragon head still retains its polygrouping (left image). Hide all of the surface except for the inner eyelid (right image).



5. **Ctrl+click** on a blank part of the canvas to mask the visible eyelid surface.
6. Hold **Ctrl+Shift** and click on a blank part of the canvas to unhide the rest of the surface.
7. Press the PolyF button again (hotkey = Shift+F) to turn off the polyframe display. The inside of the eyelid should be masked.

Even though the surfaces have been merged, you can still manipulate their shapes independently using the Move Parts brush. Unlike the Move brush, the Move Parts brush understands that the two meshes are separate. However, every time you touch the surface with the Move Parts brush, ZBrush has to make a calculation, which can slow down your performance. For this reason it's best to use the Move Parts brush when the tool is set to a low subdivision level.

8. Open the sculpting brush fly-out library and press **m** and then **”** to switch to the Move Parts brush.
9. Use the Move Parts brush to shape the eyelid a little more so that the parts fit together nicely (see Figure 4.33).

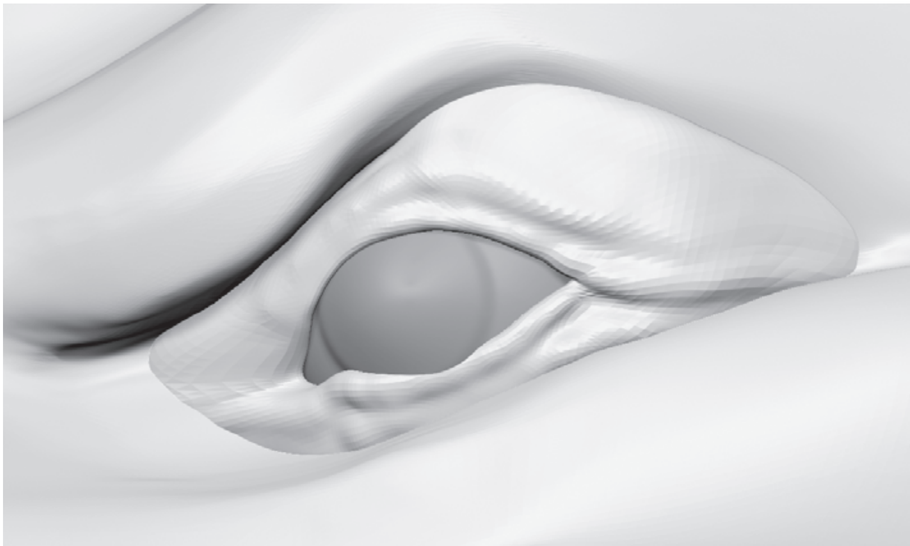


Figure 4.33
Use the Move Parts brush to shape the arc of the eyelid below the eye.

10. As you make changes, hold the **Shift** key and lightly brush over the surface to smooth any lumps you may create.
11. Set the SDiv slider in the Geometry subpalette of the Tool palette to 3.
12. Open the brush fly-out library and press **c** and then **a** to switch to the Clay brush.
13. Lower Draw Size to about 60 and set Z Intensity to 10. Lightly brush around the area of the seam between the eyelid and the head. The Clay brush will help blend these parts together.
14. Work on the surfaces carefully and deliberately to blend them together. Use the Smooth brush to smooth the area, but use it sparingly because this will make the seam visible again.

15. Some parts of the surface may not blend perfectly, but that might be okay. Later on you can strategically place wrinkles here to hide the seams. Use the Move brush to correct the form as you work (see Figure 4.34).

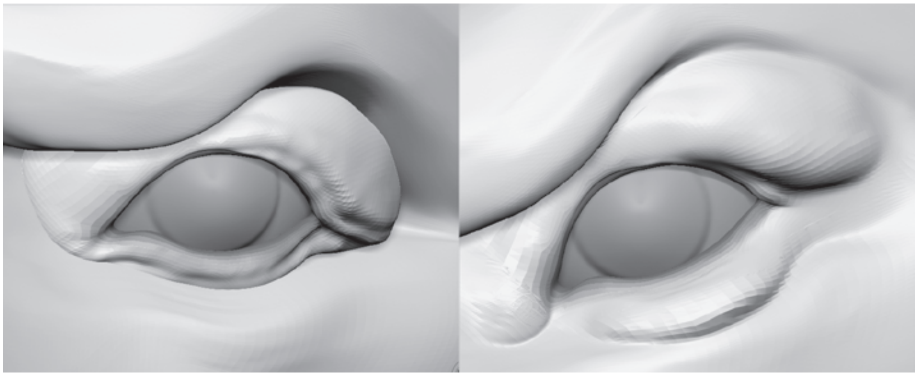


Figure 4.34
The Clay brush is used to blend the eyelid with the head.

The Clay brushes (Clay, Clay Tubes, Clay Line, Clay Build Up, Form Soft, Rake, and any of the brushes that use the Clay base type) are the best brushes to use when blending merged surfaces. If you find you're getting a "lumpy" looking surface, you can try switching to the mPolish brush and lightly paint over the lumpy areas with a low Z intensity.

16. When you are happy with your work, use the Save As button in the File menu to save the file as `dragon_v14.ZPR` (see Figure 4.35).

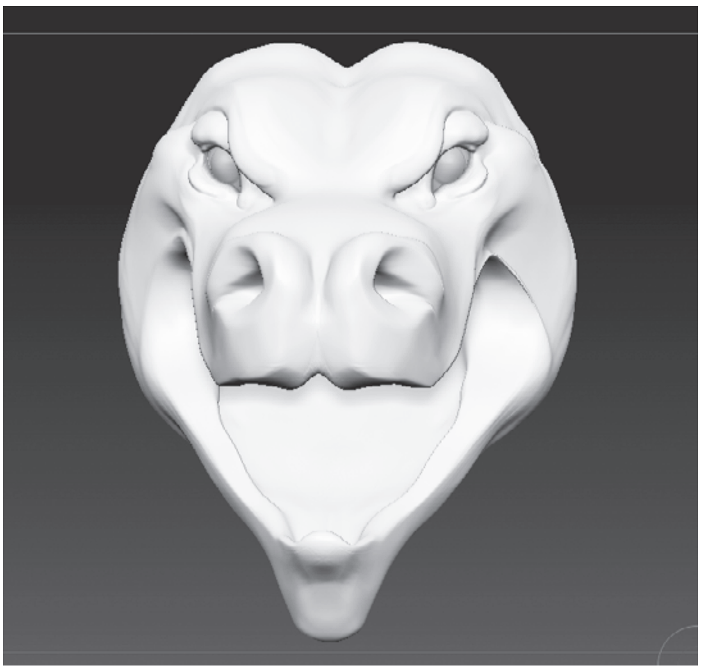


Figure 4.35
The eyelid area of the head is complete.

Create Teeth

Nothing is sadder than a toothless dragon. Now that you understand how to work with SubTools, you can add some teeth to your dragon's head. There are numerous ways to create teeth in ZBrush. As with the head, you could shape a PolySphere into a narrow point. However, this task seems like a good opportunity to introduce parametric 3D objects.

Parametric Primitives

While working in ZBrush you may have noticed that in the middle portion of the tool inventory shown in the tool fly-out library there are a number of 3D objects. These include the Sphere 3D, Cube 3D, Cone 3D, Ring 3D, Terrain 3D, Plane 3D, Circle 3D, Arrow 3D, Spiral 3D, Helix 3D, Gear 3D, and Sphereinder 3D. If you select one of these tools and try to use the sculpting brushes to edit them, you get the strange warning shown in Figure 4.36. This warning is telling you that you need to convert the 3D primitive to a PolyMesh3D object in order to edit it using the sculpting brushes.

What does this mean? These primitive 3D objects are known as *parametric primitives*. They are not shaped using the sculpting brushes; rather they are edited using a number of settings found in the Initialize subpalette of the Tool palette. The general idea is that when you want to use one of these tools, you use the Initialize settings to establish a basic shape, and then, when you're ready to sculpt the surface, you must first convert it to a Polymesh3D object, which creates a sculptable copy, and then edit the polymesh version using the sculpting brushes. Sounds complicated, but it's actually quite simple. You'll use this workflow to create teeth for the dragon head:

Figure 4.36

A warning appears when you attempt to use a sculpting brush to edit one of the 3D primitives.

1. In ZBrush, open the tool inventory fly-out library and choose the SweepProfile3D object from the 3D meshes section (see Figure 4.37). If you have the dragon head project open, the dragon will disappear and the sweep profile will appear on the canvas. Don't panic. This just means that you have switched tools; the dragon head still exists within the tool inventory.

If you're starting a new session of ZBrush, you may have to draw the SweepProfile3D tool on the canvas and switch to Edit mode (hotkey = T) to start working with this tool.

2. Once you have the tool on the canvas, zoom in so that you can see it clearly (press the **F** hotkey to frame it on the canvas). Open the Tool palette and expand the Initialize subpalette toward the bottom (see Figure 4.38).

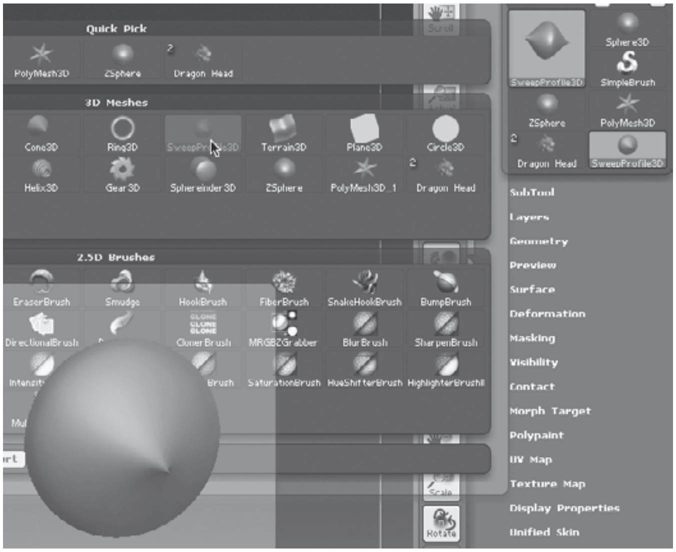


Figure 4.37

Choose the Sweep-Profile3D object from the tool inventory.

Figure 4.38

Expand the Initialize subpalette at the bottom of the Tool palette.

The Initialize subpalette is available only for the parametric 3D primitives, and the settings within this palette are different depending on which primitive you're using.

3. Click on the area labeled S Profile at the top of the Initialize subpalette. This section displays the curve that determines the shape of the sweep profile (see left image in Figure 4.39).

The curve shape of the S Profile is made up of three points. By dragging these points around, you'll see the shape change automatically. Clicking on the curve adds a point.

4. Drag the point at the bottom out toward the right so that it's a third of the way across the bottom of the box.

5. Drag the top point on the curve out a little to the right so that the top is not too pointy (see the right image in Figure 4.39). This will help with sculpting later on.

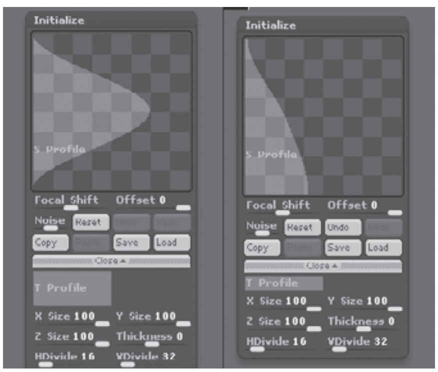


Figure 4.39

The S Profile curve determines the shape of the Sweep-Profile3D parametric primitive.

EDIT CURVES

The edit curve interface used in the Initialize palette is found throughout the ZBrush interface to control a wide variety of settings. Edit curves are used to edit light intensity, material properties, tablet sensitivity, and more. Even though the curves are used to adjust a wide variety of settings, the curve interface works the same for all of them.

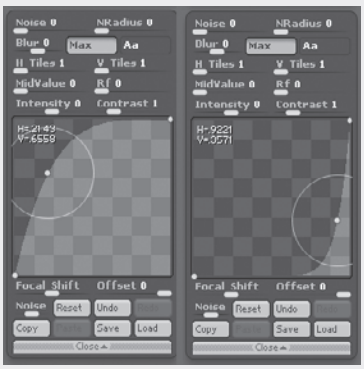
The Curve Editor is a visual control that uses a graph to indicate how the settings are applied. You can edit the graph by moving control points up and down and back and forth, which changes the shape of the graph. To understand better how this works, try the following steps:

1. Expand the Alpha palette.
2. Click the Alpha icon and choose Alpha 01 from the menu. It's a fuzzy white dot.
3. Click the box labeled Alpha Adjust to expand the graph.

   You'll see a line graph with a diagonal moving up to the right. The graph represents the intensity of values applied to the alpha. Intense areas are light or white; less intense areas are dark. In the case of Alpha 01, the alpha is most intense at the white center of the circle and less intense toward the edges. Outside of the fuzzy white dot, the intensity is zero.

   The left side of the graph is where the alpha intensity is zero; the right side is where the intensity is 1.

4. Click on the graph to add a control point. Move it up and down, left and right; note the difference in the alpha icon. Add several control points and experiment with their effect on the alpha.



5. To remove a control point, drag it all the way up to the top of the graph and outside the graph box.
6. To make the in and out points of a particular control point straight, drag the control point up and off the graph and then back down on to the graph. Doing this repeatedly

continues

continued

will alternate between straight and curved-in and -out points. Drag on the edge of the circle surrounding the control point on the curve to adjust the weight of the point on the curve.

7. You can shift the entire graph left or right without moving the control points using the Focal Shift slider.

8. You can offset the graph, add noise, reset, copy, save, and load the graph using the buttons below the graph.

   When you press the Copy button, ZBrush stores the shape of the edit curve in memory. Open any other edit curve in ZBrush and press the Paste button to replace the existing curve with the stored version. Using this technique, you can have two different curves match perfectly. This can come in handy when you're editing lighting or material attributes. You'll learn more about these techniques in Chapter 9.

9. To collapse the graph, click the Close bar below the graph. The graph will still be active, but it will be collapsed to save space on the palette.

10. If you change alphas, the settings will be applied to the new alpha. The settings may not be reflected in the large icon that appears when you hover the cursor over an alpha icon, but they will be applied to that alpha.

To find out how a control curve affects a setting or tool, press the **Ctrl** key and hover your mouse cursor over the graph. You'll notice that some curves use the horizontal axis and some use the vertical axis. Other than that, all of the edit curves throughout ZBrush have the same basic controls.

The T Profile edit curve in the Initialize subpalette controls the shape thickness of the surface. Changing the shape of this curve doesn't do anything at the moment since the surface has no thickness. At the bottom of the Initialize subpalette are a number of sliders which control the properties of the surface.

6. Set Thickness to -100. This closes off the top and bottom of the surface.
7. Press **Shift+F** to display the wireframe so you can easily see how the mesh is affected by the HDivide and VDivide sliders.
8. Set HDivide to 20 and VDivide to 24. This establishes the number of divisions along the horizontal and vertical axis of the tool.
9. Set Y Size to 70 to flatten the surface a little (see Figure 4.40).

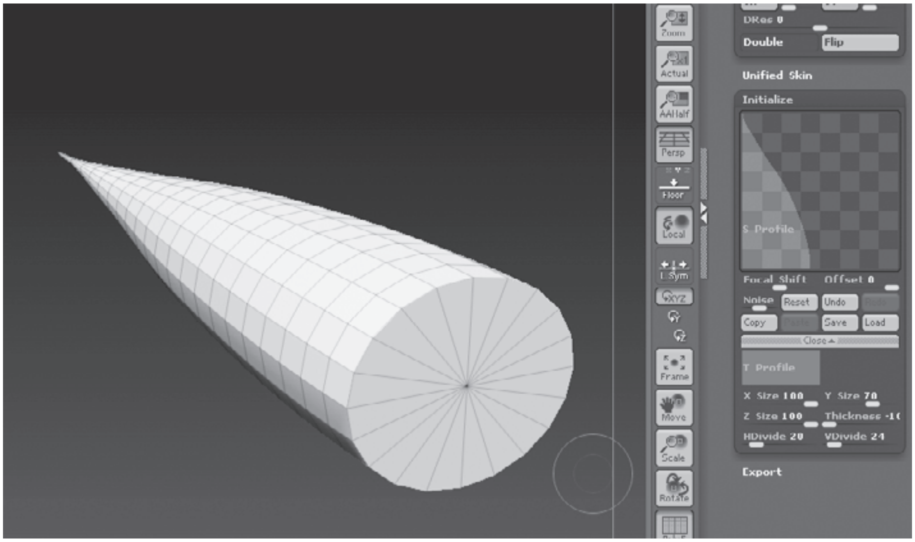


Figure 4.40

The settings are used to shape the SweepProfile3D primitive into a tooth.

Apply Deformations

The Deformations subpalette contains a large number of sliders. These are deformers, which can be applied to 3D objects to change their shape. The Deformers each have a different way of affecting a surface. You can hold your mouse over any one of the sliders and hold the **Ctrl** key to get a description of what the deformer does. Pushing the slider to the right creates positive values for the deformer; pushing it to the left creates negative values. You'll use the SBend (Smooth Bend) deformer to add a slight bend to the tooth:

1. In the Tool palette, expand the Deformation subpalette. Find the SBend slider.

To the right of the SBend slider are three small letters—x, y, and z. These letters are buttons that determine the axis of deformation. You can use any combination of axes by clicking these letters. When the letter is a light color, it means that the axis has been activated (see Figure 4.41).

Each time you move a deformer slider, the effect is applied, so repeatedly nudging a slider to the right increases the amount of deformation. To set a specific value, click the deformer's label; you'll see a zero highlighted in red. Type in a specific value and press the **Enter** key while the zero is highlighted. If you don't like the result of a deformation, just undo the operation to return back to the undeformed state (**Ctrl+Z**).

2. Click the z button to the right of the SBend slider to turn off the z-axis, and click the y button to turn on the y-axis.

Figure 4.41

The x, y, and z buttons to the right of the Deformer name sets the axis of deformation.

3. Move the slider to the left to create a bend in the sweep profile (see Figure 4.42).

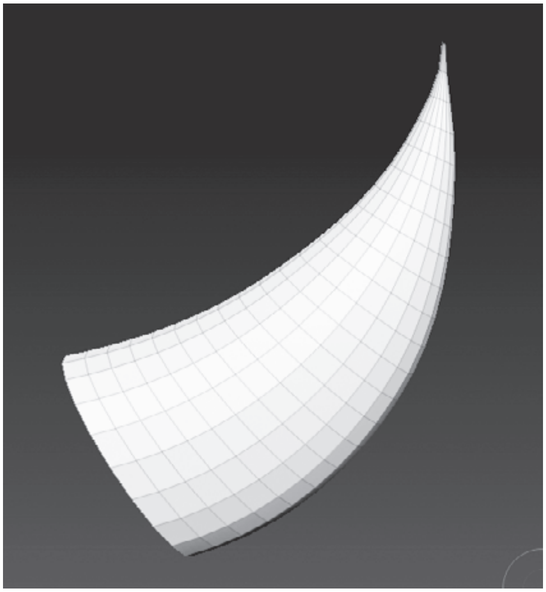


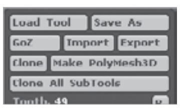
Figure 4.42
The SBend deformer creates a bend in the shape of the tooth.

USE MASKS WITH DEFORMERS

Use masks to protect areas of a surface that you don't want a deformer to change. Masks are explained in Chapter 3.

4. Once you have a nice curved, pointy tooth, you're ready to add it to the dragon. Scroll to the top of the Tool palette and click the Make PolyMesh3D button (see Figure 4.43).

Figure 4.43
Press the Make PolyMesh3D button at the top of the Tool palette to convert the parametric 3D object into a sculptable mesh.



When you convert a parametric 3D primitive into a polymesh, the converted version appears in the Tool inventory and the PM3D prefix is added to the name. So now you'll see an object named SweepProfile3D and a second named PM3D_SweepProfile3D. The two objects look the same, but the one that you want to append to the dragon is the PM3D_SweepProfile3D object.

Add Teeth to the Head

Now that you have a tooth, you need to append it to the dragon's head and duplicate it to make rows of teeth for the jaw and for the upper part of the mouth. The teeth will then be merged so that they can be easily sculpted.

1. In the Tool inventory, click the Dragon Head tool to switch back to the dragon head model.

2. Click the Append button and choose the PM3D_sweepProfile3D tool to add it to the dragon as a SubTool.
3. Rename the appended SubTool **Tooth** (see Figure 4.44).

Figure 4.44
The PM3D_Sweep-Profile3D object has been appended to the dragon head and renamed Tooth.

4. Select the Tooth SubTool and click the Transp button on the right shelf to activate Transparency.
5. Click the Move button on the top shelf (hotkey = W) to activate the Transpose handle. Use the Transpose handle to move, scale, and rotate the tooth into position in the mouth. Place the tooth toward the front of the dragon's jaw (see Figure 4.45).
6. Switch to Draw mode (hotkey = Q). Use the Move and Smooth brushes to shape the tooth. At this point, you only need to create a general toothlike shape. Later on you'll add more detail.
7. Once you have a basic tooth shape, press the Duplicate button at the bottom of the SubTool stack in the SubTool subpalette of the Tool palette. This creates a copy of the tooth.
8. Use the Transpose control to position the second tooth next to the first. Scale and rotate as needed.
9. Repeat steps 7 and 8 until you have a row of teeth on the right side of the dragon's jaw (see Figure 4.46).

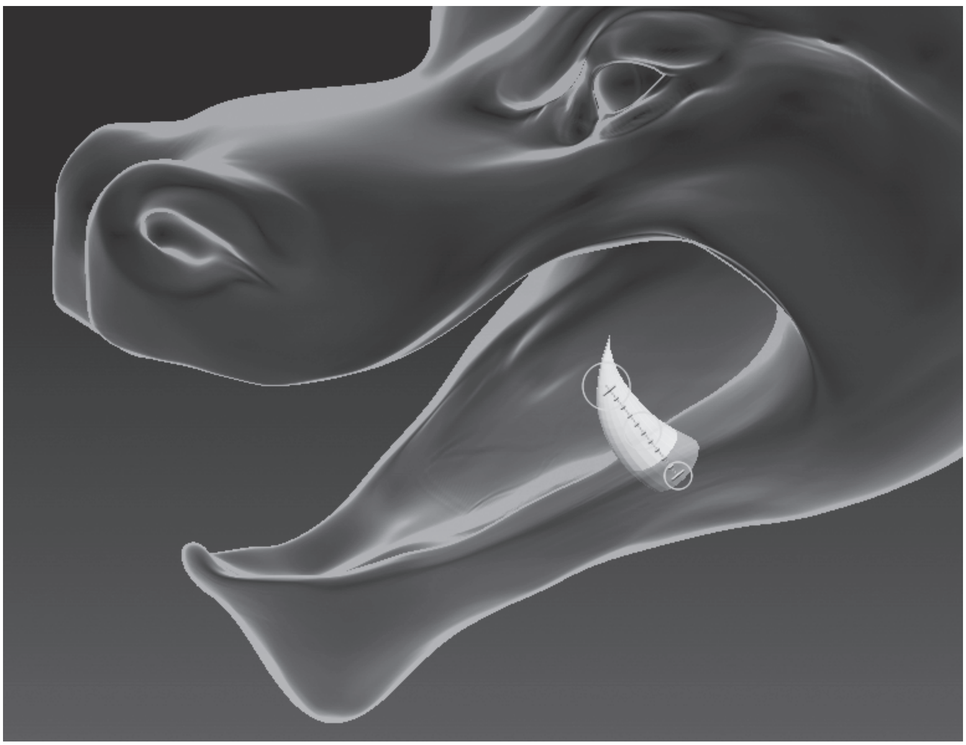


Figure 4.45
The Transpose tool is used to position, scale, and rotate the tooth at the front of the dragon's jaw.

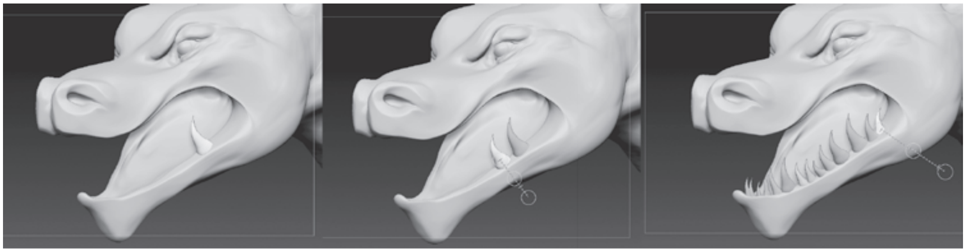


Figure 4.46
The other teeth are created by duplicating and the first tooth and then positioning the duplicate. Create teeth for the right side of the jaw.

10. Once you have enough teeth, select the tooth toward the top of the stack and use the Merge Down button to merge the teeth into one SubTool. Keep pressing the button until all the teeth are merged together.
11. Once the teeth are merged together, open the SubTool Master plug-in in the ZPlugin palette (SubTool Master is explained earlier in this chapter). Press the Mirror button. Choose the x-axis and check the Mirror Into One SubTool option. The lower jaw now has a full set of teeth (see Figure 4.47).

Figure 4.47
The teeth on one side of the jaw are mirrored to the other.

12. Append another copy of the PM3D SweepProfile tool to the dragon's head and position it in the roof of the dragon's head. Repeat steps 7 through 11 to create teeth for the top of the dragon's mouth.
13. Once you have all the teeth in place, name the SubTool for the teeth in the jaw Lower Teeth and the SubTool for the teeth in the top of the head Upper Teeth.
14. Switch to Draw mode (hotkey = Q) and use the sculpting brushes to shape the teeth a little more to give them character. Use the brushes to sculpt the basic shape of the lips and gums.
15. Use the Save As button in the File menu so save the project as `dragon_v15.ZPR`.

At this point, you can subdivide the teeth and use the sculpting brushes to shape them. Feel free to sculpt the dragon's head as well to accommodate the teeth (see Figure 4.48). If you need to move a single tooth into another position, try using the Move Parts brush.

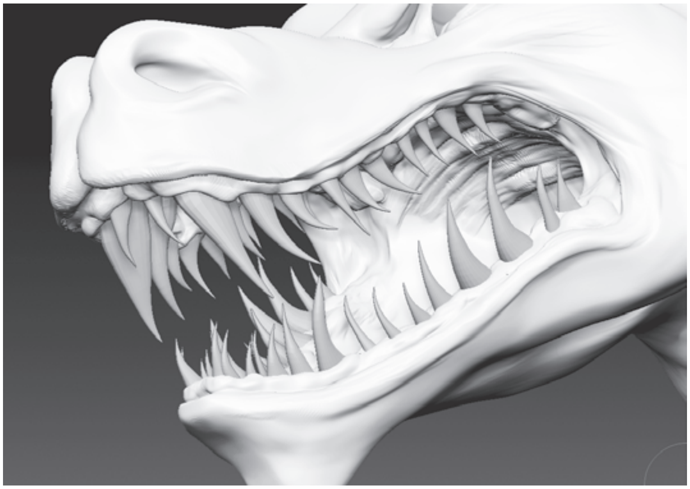


Figure 4.48

The dragon now has a full set of teeth.

Add Horns and Ears

Using the techniques described in the earlier sections, try adding horns and ears to the dragon head. To make the horns, start with the Spiral3D tool and edit its shape just as you did with the tooth. To create an ear, try sculpting a PolySphere into an earlike shape and then append it to the head. Figure 4.49 shows the head with horns and ears. To see how I added the horns and ears, watch `dragonMovie_2.mov` in the `movies` folder on the DVD. Use the Save As button in the File palette to save your version of the head as `dragon_v16.ZPR`.

Figure 4.49

The dragon with ears and horns

ZSpheres

ZSpheres are unique ZBrush modeling tools unlike anything you'll find in other 3D modeling programs. ZSpheres act as an armature for digital clay. Think of the wire skeleton a sculptor uses as the underlying structure for a sculpture. The wire armature is built and posed and then the sculptor adds clay to the armature to create the final figure. The armature acts as a support for the clay, but it can also be used to establish the initial pose.

ZSpheres are special spheres that can be connected into a network. The network of ZSpheres is then converted to a polygon mesh known as an adaptive skin.

The polygon mesh that results from the skinning process is placed as a copy in the Tool palette. The new mesh is just like any other 3D tool and can then be sculpted using the sculpting brushes.

You can form anything you want out of ZSpheres, but they are particularly useful for things such as figures, trees, and creatures. Because a copy is made, you're left with both a mesh and the original ZSphere armature, which can be reused as the basis for similar meshes in future projects. Let's take a look at how to use ZSpheres.

ZSphere Basics

In this section, you'll learn how to create and manipulate a basic ZSphere armature. Follow these steps to get started:

Figure 4.50
The ZSphere tool in the Tool palette inventory

1. Save any projects you may have open and select the ZSphere 3D tool from the Tool palette. This is the red sphere that is colored in two different shades of red (see Figure 4.50). When you select the tool, it should appear on the canvas in Edit mode. If not, draw it on the canvas and switch to Edit mode (hotkey = T).
2. Make sure the Draw and Edit buttons are on the top shelf. Move the brush over the surface of the ZSphere; you'll see a red circle connected to a line that starts at the center of the ZSphere (see left image in Figure 4.51). The red circle will turn green as the brush appears over specific parts of the ZSphere.
3. Click and drag on the surface of the ZSphere. You'll see a new ZSphere grow out of the first as you drag (see right image in Figure 4.51).

You can add a new ZSphere to any existing ZSphere while the Draw button on the top shelf is active. The cursor will turn green to indicate the best place to add a new ZSphere. The position of one ZSphere relative to another affects the topology of the final mesh, making it more or less easy to sculpt. ZBrush gives you hints, such as the green color of the cursor, to help you decide where to add new ZSpheres. In some cases you can bend the rules and place a ZSphere when the cursor is not green; it depends on what your final objective for the mesh is going to be. In general, when learning how to use ZSpheres, try to follow the hints suggested by the color changes.

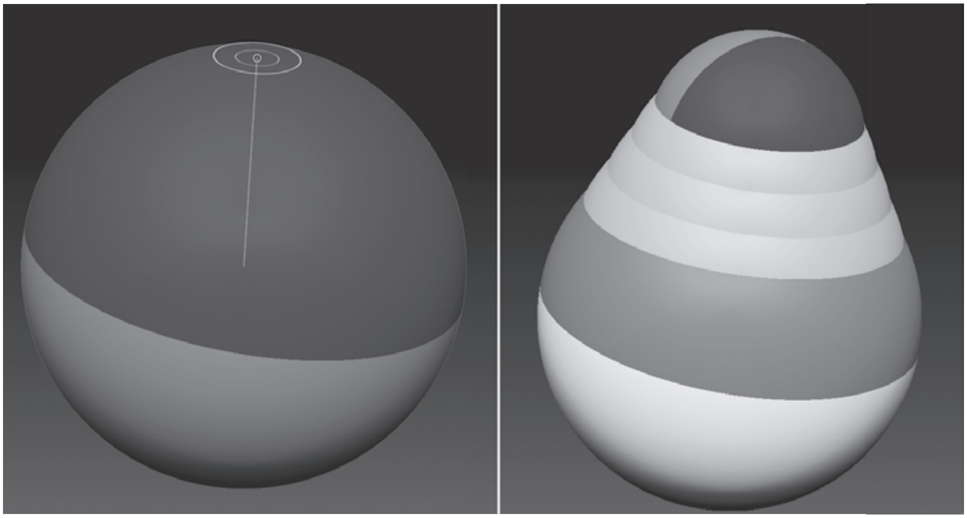


Figure 4.51
As you hold the brush tip over the ZSphere, a line appears from the center of the ZSphere (left image). To add another ZSphere to the first, click and drag on the surface while the Draw button is active on the top shelf (right image).

4. Click the Move button on the top shelf (hotkey = W). Select the newly added ZSphere and move it away from the original ZSphere. You'll see a number of gray spheres appear between the original ZSphere and the newly added ZSphere. You'll also notice a triangle indicator that starts at the center of the first ZSphere and ends at the center of the second. This indicator resembles the way bones are drawn in other 3D applications.

You currently have a very simple ZSphere chain on the canvas. You've also established a simple hierarchy: The triangular icon indicates the relationship. The wide end of the triangle is at the center of the parent ZSphere, and the pointed end is at the center of the child ZSphere. The gray spheres in between are the connecting ZSpheres. These connecting ZSpheres act as a bridge. They can't be directly manipulated unless you convert them to a ZSphere.

5. Click the Draw button on the top shelf to switch to Draw mode (hotkey = Q). Click one of the connecting gray ZSpheres between the child and the parent. This will convert a connecting ZSphere to a standard ZSphere. You'll notice now there are two bones drawn between the three ZSpheres (see Figure 4.52).
6. Click the Move button and try moving the ZSpheres around. If you drag on a ZSphere, it will move the ZSphere independently of the other two. If you drag on the connecting gray spheres, you'll move all of the child ZSpheres together.

Hold the **Alt** key and drag on the last ZSphere while in Move mode. The other ZSpheres follow the movement.

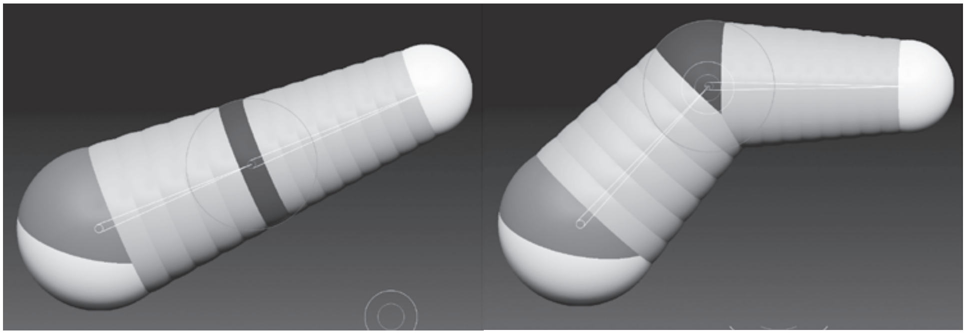


Figure 4.52
Click a connecting ZSphere while in Draw mode to add a ZSphere between the two original ZSpheres. Drag on the ZSphere while in Move mode to change its position.

The Rotate (hotkey = R) and Scale (hotkey = E) buttons work in a similar fashion. When you have the Rotate button activated, dragging on a ZSphere will cause it to pivot about its center, and dragging on the connecting sphere rotates all of the child ZSpheres. The Scale button allows you to scale individual ZSpheres by dragging on them or all of the child ZSpheres by dragging on the connecting ZSpheres.

7. Spend a few moments experimenting with adding, rotating, and scaling ZSpheres.
8. To delete a ZSphere, switch to Draw mode and **Alt+Click** on the sphere.

TIPS FOR WORKING WITH ZSPHERES

Keep these tips in mind as you experiment with ZSpheres:

- In Draw mode, drag on a ZSphere and then hold the **Shift** key to add a second ZSphere that matches the size of the first.
- Lower your draw size to more precisely select and manipulate individual ZSpheres.
- ZSpheres can be added to existing tools as a SubTool, so you can use them to create additional props such as clothing or equipment for characters.
- ZSpheres work with symmetry; you can turn on radial symmetry to quickly create elaborate designs such as trees or cephalopods.

Skin ZSpheres

Skinning is the process of converting a ZSphere armature into a polygon mesh that can then be sculpted. ZBrush has two skinning methods: adaptive and unified. Usually a ZSphere armature uses adaptive skinning. Later on in the chapter, you'll learn about how a ZSketch is converted into a mesh using unified skinning.

Adaptive Skinning

Adaptive skinning creates a polygon mesh based on the ZSphere armature. Think of wrapping the armature with a membrane made up of polygons. When you convert a ZSphere armature into an adaptive skin, the skin itself is stored as a copy in the Tool palette and you can then continue to sculpt. While you are working with the ZSphere armature, you can preview the adaptive skin very easily, which can help you make decisions about the position of ZSpheres while you work, up until you are ready to convert the armature into an adaptive skin.

When starting a ZSphere model, you'll need to create a simple chain of at least three ZSpheres in order for the skinning process to work correctly. There is a simple workflow that ZBrush artists use when starting a typical ZSphere armature:

1. In ZBrush, select the ZSphere in the Tool palette library to start a new ZSphere armature. The ZSphere should appear on the canvas in Edit mode.

You're going to add two ZSpheres, one on each side of the original ZSphere, to start the ZSphere armature. You can use this trick to help precisely position the two child ZSpheres.

2. Press the **X** key to activate symmetry.
3. As you hold your brush over the ZSphere, you'll see two cursor icons. Position the icons so they meet at the center and both turn green (see the upper-left image in Figure 4.53).
4. Create a new ZSphere by dragging from the center where the two brush tips meet (see the upper-right image in Figure 4.53).
5. Drag on the canvas to rotate the view to the opposite side of the ZSphere. Repeat step 3 and 4 to add a second ZSphere to the original. The simple three-ZSphere chain should look like the lower-left image in Figure 4.53.
6. Press the **A** hotkey. You'll see the ZSphere chain turn into a polygon mesh; this is actually a preview of the mesh.
7. To switch back to ZSphere mode, press **A**. Spend some time adding ZSpheres to these original three ZSpheres; move them around and press **A** to see the preview.

If you start with fewer than three ZSpheres, you'll end up with a hole at one end of the skin that will look strange and produce unpredictable results. You can actually sculpt the preview mesh while you work, but it's generally not a good idea. If you sculpt the mesh while in Preview mode and then make a change to the armature by adding additional ZSpheres, your changes will be lost, and in some cases it can really mess up the model.

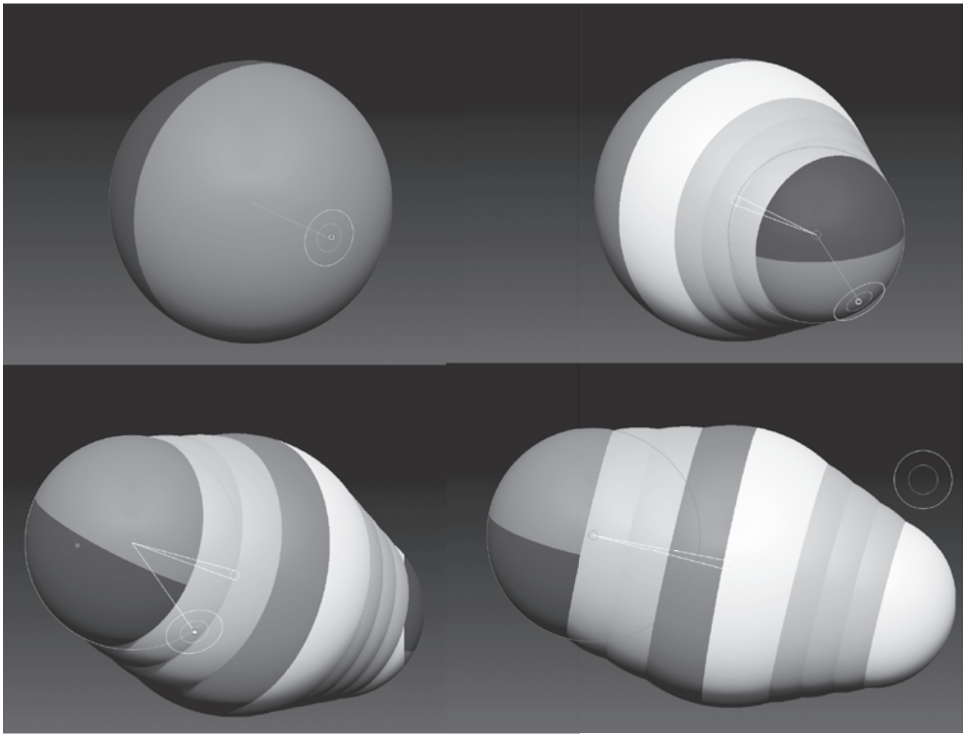


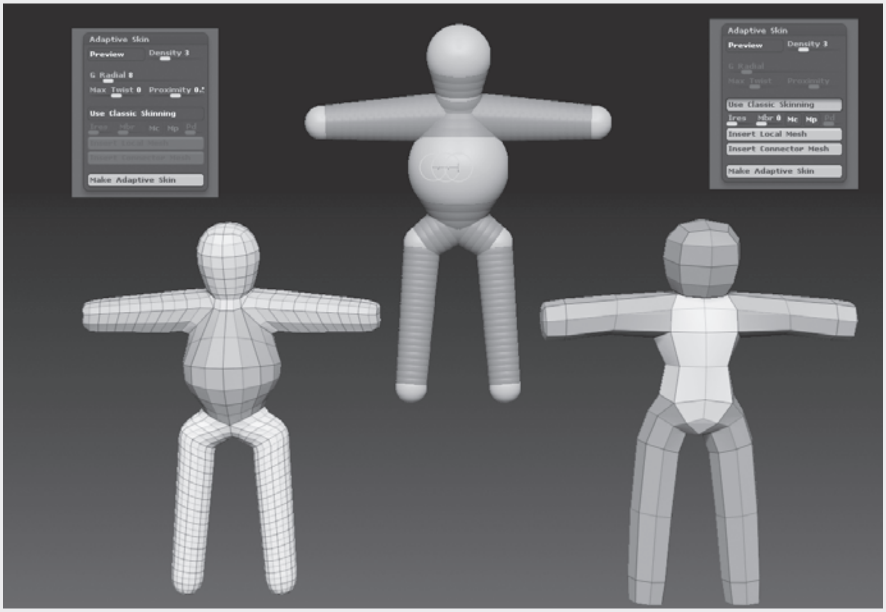
Figure 4.53
The basic approach to starting a ZSphere model involves creating a simple chain of three ZSpheres.

Figure 4.54
The Make Adaptive Skin button converts the armature into a mesh that you can sculpt.

The best approach is to create your ZSphere armature, pose it, and preview often while you work. When you have a satisfactory ZSphere chain, you can then press the Make Adaptive Skin button in the Tool palette (this button appears only when you're working with ZSpheres; see Figure 4.54) and you'll find that the mesh is placed in the Tool palette library. The prefix skin_ is added to the name of the mesh to distinguish it from the original ZSphere armature. Once you create the skin, you can append it to another tool as a SubTool or draw it on the canvas and sculpt away. It's a good idea to save the skin to your local disk once you create it. You may want to save the original ZSphere armature as well. After a while you can quickly build a library of ZSphere armatures to use as a starting point for other models.

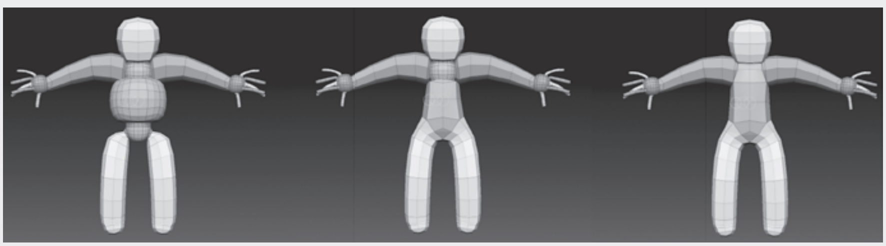
CLASSIC ADAPTIVE SKINNING

The adaptive skinning process was upgraded with the release of ZSphere 3.5. The new adaptive skin created by ZSpheres more closely resembles the armature than the skin that was created using the original skinning method. This new type of adaptive skinning was named ZSpheres 2. However, there are advantages to using the old adaptive skinning method, and therefore ZBrush has an option for switching to classic skinning.



There are a number of options that become available when you press the Use Classic Skinning button. These options can change the way the mesh is generated when you make the adaptive skin. You can see how these changes affect the mesh while the ZSpheres are in Preview mode.

When ZBrush creates an adaptive skin in classic skinning mode, it determines how many polygons each ZSphere will create. This is known as the mesh resolution. Some parts of the mesh are at a higher resolution than others: ZSpheres that have a number of child ZSpheres attached to them generate a higher resolution. The Ires slider determines how many child ZSpheres are needed before a parent ZSphere generates a high resolution mesh.



Raising the MC slider increases the amount of curvature in the membrane profile at intersections.

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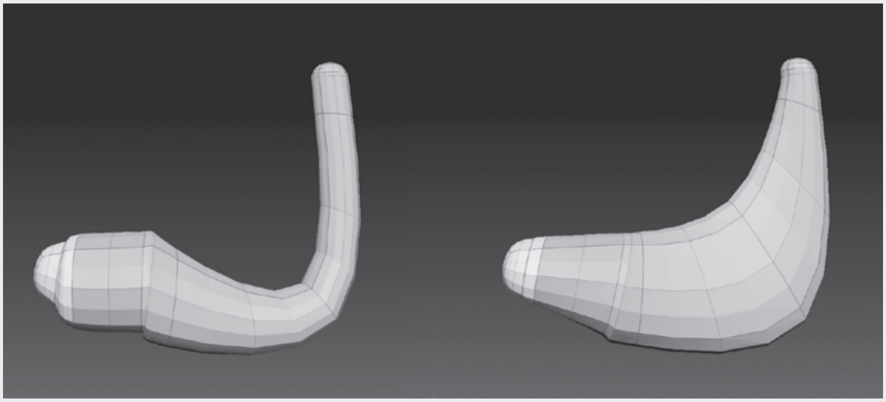
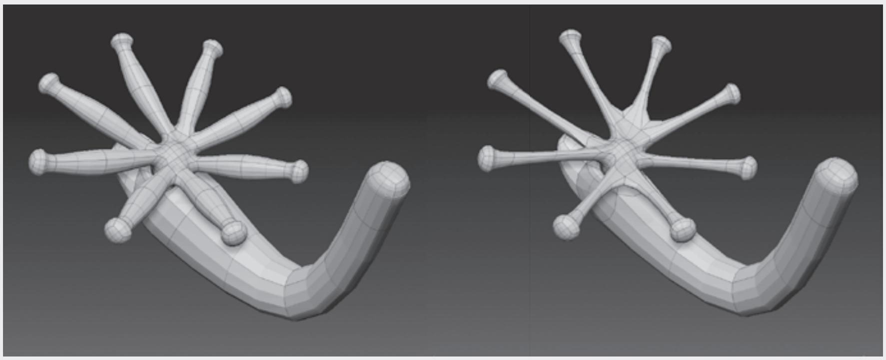
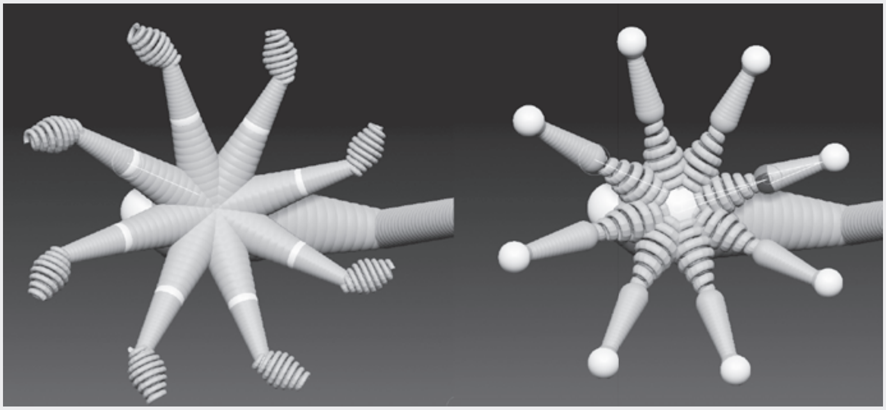


The Minimal Skin To Child (Mc) button reduces the resolution between a child ZSphere and its parent, which can create a kind of webbing between the ZSpheres. Minimal Skin To Parent (Mp) does the same thing but in reverse.

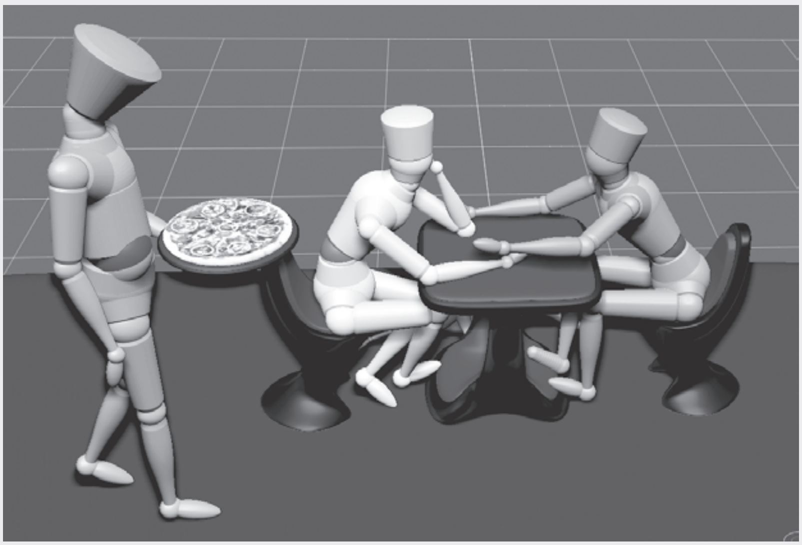


The Insert Local Mesh button lets you replace a selected ZSphere with a polymesh object. When you click this button, the tool inventory appears. If you select one of the polymesh objects in the inventory (non-polymesh objects are grayed out in the inventory) the selected ZSphere will be replaced by the mesh.

The Insert Connector Mesh button also opens the tool Inventory. The selected polymesh object replaces the connector ZSpheres between the selected ZSphere and its parent.



If you open the mannequin projects available in the Project section of ZBrush, you'll see a number of ZSphere mannequins that were created by replacing parts of a ZSphere armature with simple primitive shapes. These mannequins were created using the Insert Connection Mesh feature, which is only active when the Use Classic Skinning button is on. Mannequins are discussed in more detail in Chapter 6: "Remesh and Projection."



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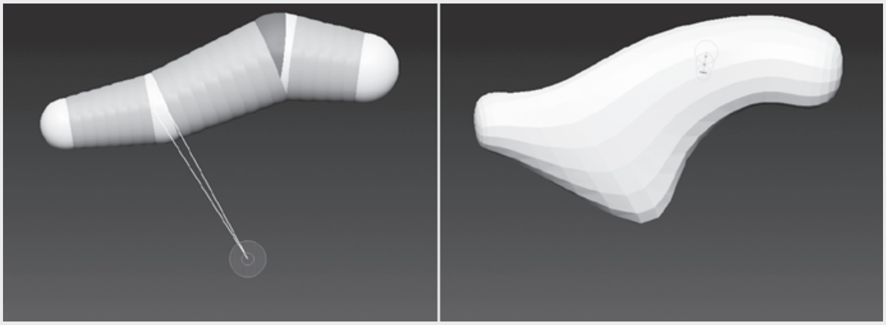
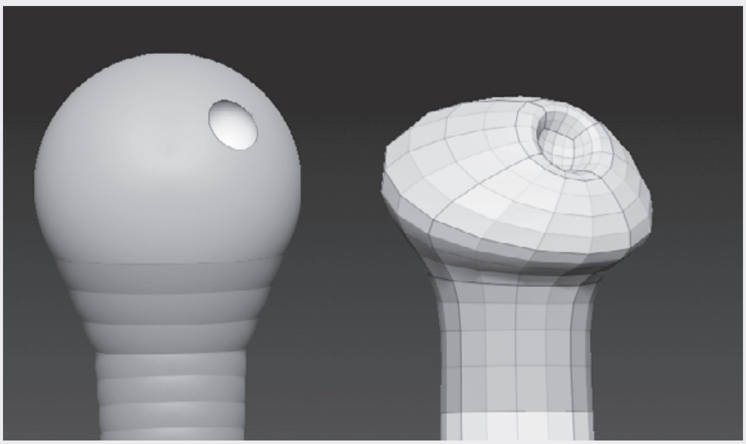
Magnet ZSpheres can be used as a way to deform the skin when Use Classic Skinning is active. To create a magnet ZSphere, add a child ZSphere to the chain, pull it away from its parent, switch to Draw mode, and hold the **Alt** key while clicking the gray connecting ZSpheres. Press the **A** key to see how the magnet ZSphere influences the adaptive skin.



Negative ZSpheres create an edgeloop in the surface but only when using classic skinning. To create a negative ZSphere, use Draw mode to add a child ZSphere and then use Move mode to push it into the parent ZSphere. The ZSphere will become semitransparent, indicating that it has a negative ZSphere. Press the **A** hotkey to see the effect on the topology of the adaptive skin preview.



Create a ZSphere Dragon

In this section, you'll learn how to create an entire dragon using ZSpheres. This time it might be fun to try to create something along the lines of a Chinese-style dragon. You'll find that ZSpheres are perfect for creating this type of model. Follow these steps to begin:

1. Start a new ZBrush session. In the Tool palette, open the inventory fly-out library and select the ZSphere tool.
2. Drag on the canvas to create a ZSphere. Press the Edit button on the top shelf (hotkey = T) to switch to Edit mode.
3. Press the **X** hotkey key to activate symmetry. Hold the brush tip over the ZSphere until you see two green circles. You may need to rotate the view of the ZSphere to find the x-axis where the two circles meet.
4. Drag on the ZSphere where the two green circles snap together to create a child ZSphere on the original ZSphere.
5. Rotate the view of the ZSphere to the opposite side and add another child ZSphere to the original ZSphere. You should be left with a short chain of three ZSpheres; the original ZSphere is at the center.

The original ZSphere will be the belly of the dragon about halfway down his body. Next you'll create the neck.

6. Switch to Move mode (hotkey = W), and drag one of the ZSpheres on the end away from the original ZSphere (middle of Figure 4.55).
7. Switch to Draw mode (hotkey = Q). Create four evenly spaced ZSpheres between the first and second ZSpheres. To do this, click one of the gray connecting ZSpheres between the original two (see the bottom of Figure 4.55).

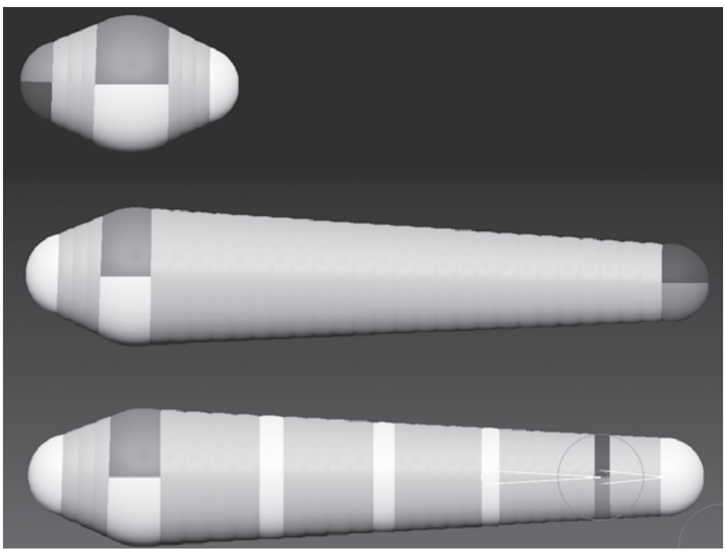
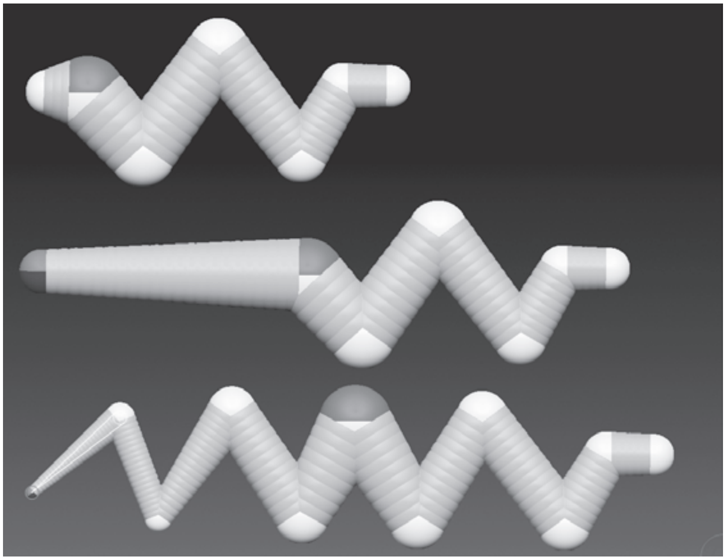


Figure 4.55

Start with a chain of three ZSpheres. Pull one out and add four more in between the first two.

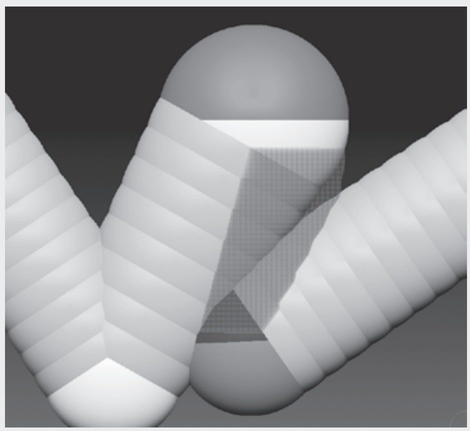
8. Switch to Move mode (hotkey = W), and drag on the new ZSpheres. Pull them up or down to create a *w*-like shape as shown in the middle of Figure 4.56.
9. Repeat steps 6 through 8 to create a tail on the opposite side of the original ZSphere.
10. Switch to Scale mode and drag on each ZSphere to scale it up or down. Try to create a taper so that the ZSpheres in the tail get gradually smaller as they get closer to the end (see the bottom of Figure 4.56).
11. Scale the view up so that you can see the head up close. Add two ZSpheres at the head above and below. Use X symmetry and look where the green circles meet to find the center of the ZSphere as you add the two children.

Figure 4.56
Switch to Scale mode and scale down the ZSpheres in the tail.



ZSPHERE ERRORS

If it looks as though part of the ZSphere chain turns transparent while you are posing your armature or adding new ZSpheres, this is just ZBrush letting you know that the position of the ZSpheres may cause problems in the topology of the mesh that will be generated by the skinning process. Try repositioning the ZSpheres until the display returns to normal.



12. Add another ZSphere to the two created in step 11. Use Move mode to pull them out to form the upper and lower part of the mouth (see Figure 4.57).

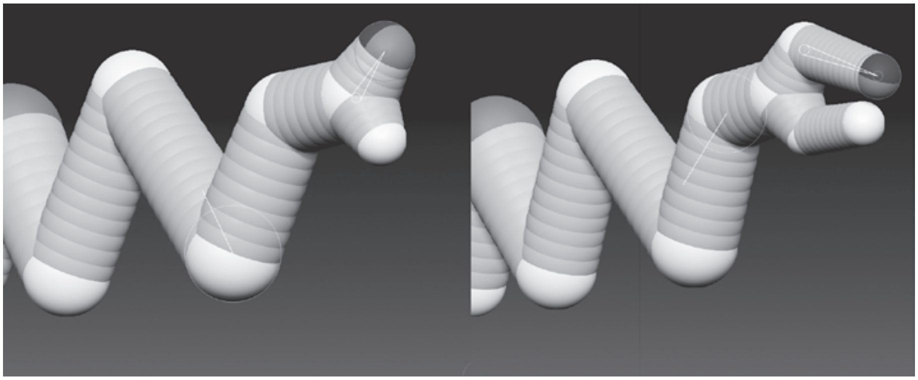


Figure 4.57
Add ZSpheres to create the top and bottom of the jaw.

13. With symmetry enabled across the x-axis, it should be easy to add additional ZSpheres on either side of the head to create eyes, nostrils, and horns.
14. As you add ZSpheres, turn on the PolyF button on the right shelf (hotkey = Shift+F). and press **A** to preview the mesh. Don't sculpt the mesh just yet, but pay attention to how the position of the ZSpheres you add affect the topology of the mesh (see Figure 4.58).

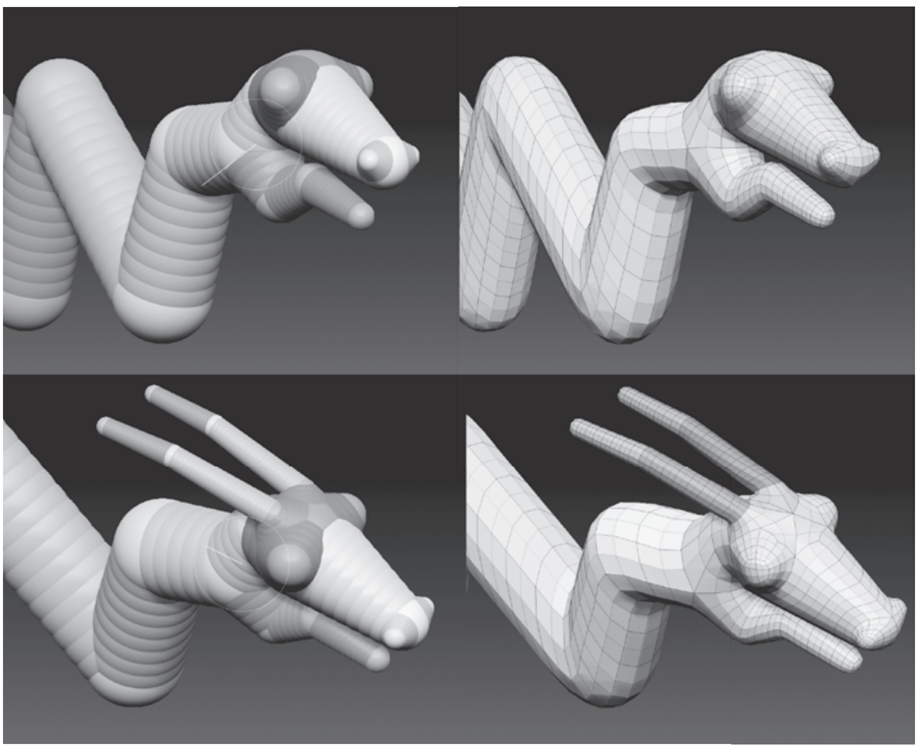


Figure 4.58
Add ZSpheres to create the eyes, nose, and horns. Press the A hotkey to view a preview of the adaptive mesh as you work.

15. Use the techniques described in step 11 through step 14 to add legs and feet (see Figure 4.59).

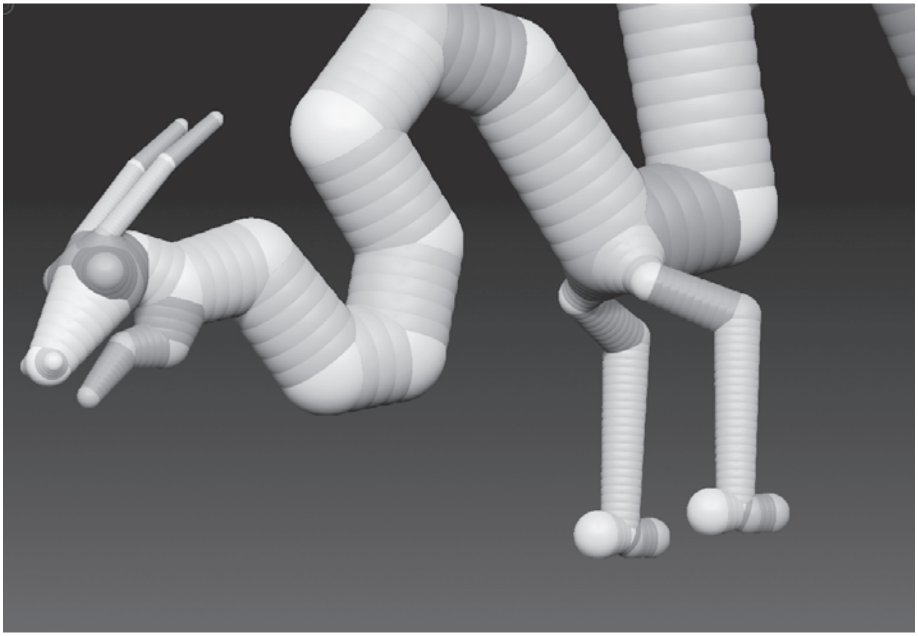


Figure 4.59
Add legs and feet to the dragon's body.

16. To add toes, create a small ZSphere on the foot, and then drag on the small ZSphere to create a second but hold the **Shift** key after you start dragging. The new ZSphere will snap to match the scale of its parent (see the top image in Figure 4.60).
17. Set your draw size to 2 and switch to Move mode. Pull the ZSphere at the end of the chain outward to form a toe (see the middle images in Figure 4.60).
18. To add joints, switch to Draw mode and click the connector spheres between the small ZSphere on the foot and the end of the toe. This technique works well for creating fingers and toes and produces a mesh that will be easy to sculpt (see the bottom image in Figure 4.60).

In this example, I've added ZSpheres to the body and tail (see Figure 4.61). You should keep the armature fairly simple for now.

19. When you are happy with your armature, use the Save As button in the File menu to save the project as `chineseDragon_v01.ZPR`. You can open the example ZSphere Chinese dragon in the `Chapter 4` folder on the DVD.

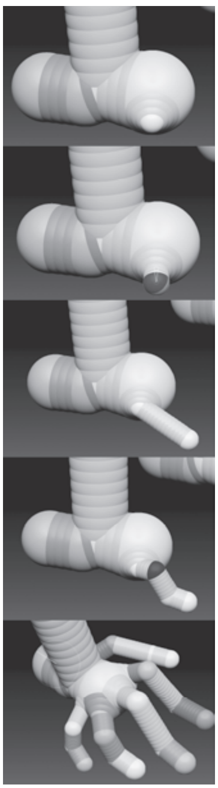


Figure 4.60
Toes are added to the feet using small ZSpheres.

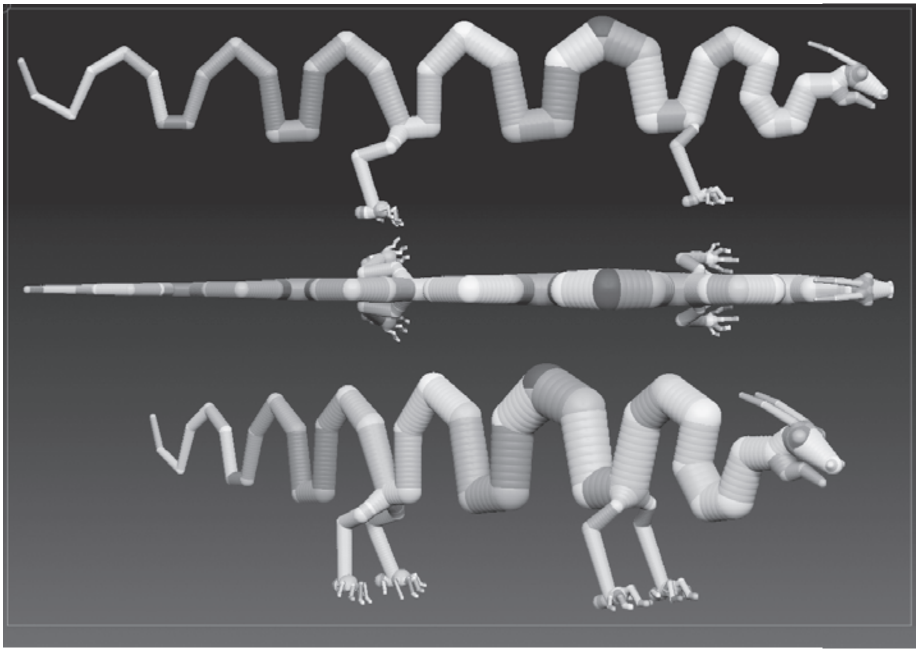
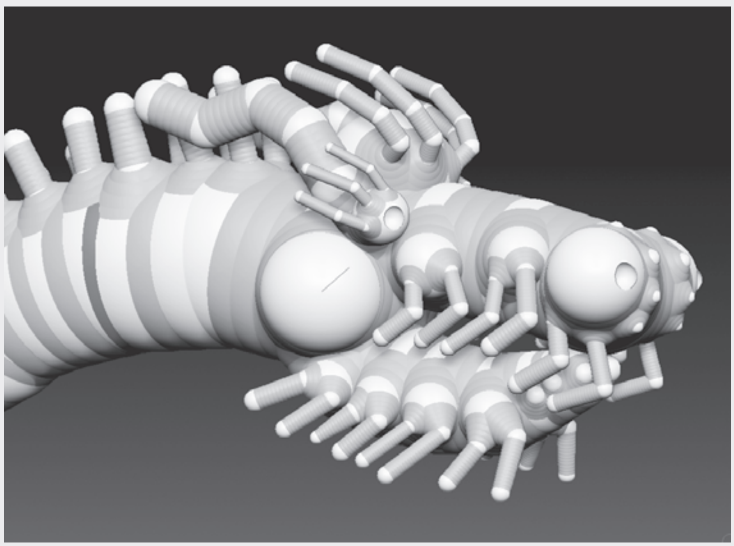


Figure 4.61
The complete ZSphere armature

ZSPHERE STRATEGIES

When creating a ZSphere armature, how many ZSpheres should you use? Should you pose the armature or should you make sure the limbs are symmetrical along the x-axis? Should you use adaptive or classic skinning? The answers to these questions depend on the situation or your own personal style of working.



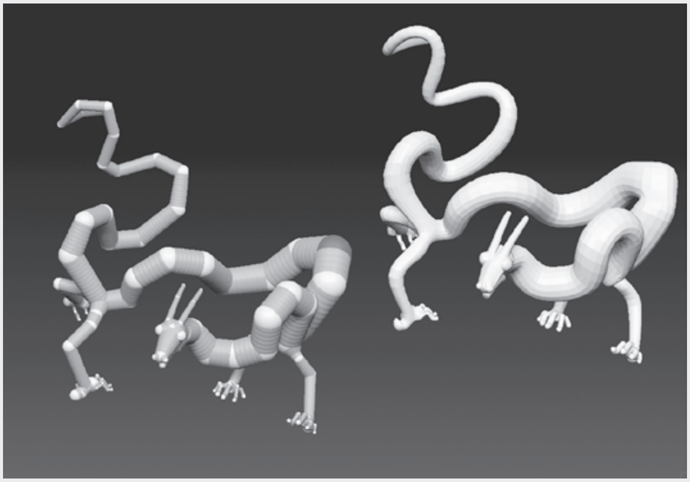
Some artists prefer to keep things as simple as possible and add detail to the adaptive mesh after it's been converted or add detail using ZSketching techniques (described in the next section). Other artists like to add a lot of detail in the ZSphere armature before skinning.

The same is true when deciding whether or not to pose the ZSphere armature. For sculptors who work in clay, the pose is usually established at the very beginning when creating the wire armature. However, clay sculptors don't have the benefit of automated

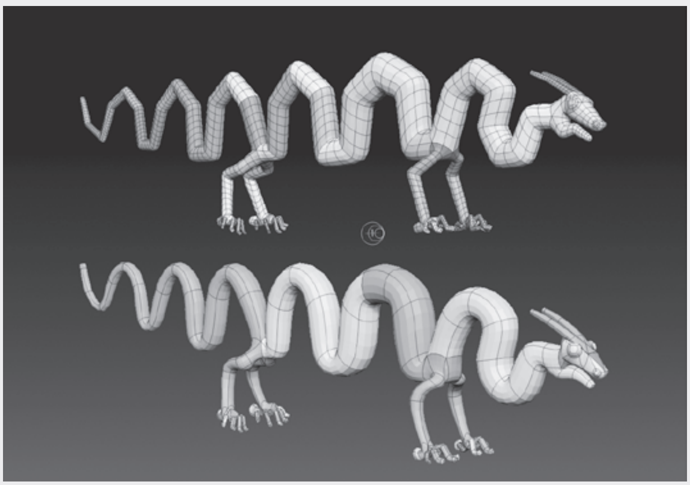
continues

continued

symmetry that ZBrush sculptors enjoy. You may want to keep the ZSphere armature as symmetrical as possible so that when you create an adaptive skin you can easily sculpt on both sides at the same time and then use the transpose tools or other methods to pose the mesh.



The choice to use classic adaptive skinning or to use the newer ZSpheres 2 adaptive skinning method (the default setting for ZBrush 4) will probably be made based on the situation. Use the A hotkey to toggle on and off the adaptive skin preview and experiment with the settings to see what skinning method suits you the best. The following image compares the ZSphere 2 adaptive skin (top) with classic adaptive skinning (bottom).



As you become more experienced with ZBrush, you'll develop your own strategies for modeling with ZSpheres. While you're first learning, it's probably a good idea to keep things simple. This will ensure that it will be easier to sculpt the meshes that you generate from your ZSphere armatures. That said, you should also take time to experiment and try making complex ZSphere armatures and try posing them as well.

Sculpt the Adaptive Skin

Once you create a ZSphere armature, you can convert it to an adaptive skin and then sculpt the mesh using the sculpting brushes or you can uses it as a basis for a sketch. In the next section, you'll learn how to create and edit a ZSketch. Here's a quick demonstration on how to sculpt the adaptive skin created from the ZSphere armature:

1. Continue with the dragon armature created in the last section or use the Open button in the File palette to open the `chineseDragon_v01.ZPR` file from the `Chapter 4` folder on the DVD.
2. The dragon should be on the canvas and the Edit button on the top shelf should be on, indicating that the model is in Edit mode. Open the Tool palette and expand the Adaptive Skin subpalette.
3. Make sure the Use Classic Skinning button is off and Density is at 2. Press the Make Adaptive Skin button.
4. In the Tool palette inventory, a new tool named Skin_ZSphere_1 appears (see Figure 4.62). This is the mesh that you will edit with the sculpting brushes. Select this tool in the library to switch to the adaptive skin.

Figure 4.62

The new mesh is added as a new tool in the tool inventory.

5. Expand the SubTool subpalette of the Tool palette and use the Rename button to rename the tool **Chinese Dragon Mesh**.
6. This is a good point to save the project. By saving the project, you'll ensure that the original ZSphere armature and the adaptive skin are both saved in a single file. Use the Save As button in the File menu to save the project as `chineseDragon_v02.ZPR`. This file is also found in the `Chapter 4` folder on the DVD.
7. Expand the Geometry subpalette and press the Divide button twice to add to levels of subdivision (hotkey = Ctrl+D).
8. Press the **X** key to activate symmetry across the x-axis.
9. Use the Smooth and Move Sculpting brushes to create a smoother shape for the bends in the body and legs. This is easier if you set the body at the lowest subdivision level and set the Z Intensity setting of the Smooth brush to a low value such as 5.
10. Use the Inflate brush to add volume to any parts of the body that seem thin.
11. Set the SDiv level to 3 and use the Form Soft and Clay brushes as well as Smooth to further refine the overall shape of the body and legs.
12. When you are happy with the way the body looks, set the SDiv slider to the highest level. Try using Clay Build Up, Smooth, and mPolish brushes to build up muscles and add some realism to the form. Figure 4.63 shows how the dragon is smoothed and shaped using these sculpting brushes.
13. Save the project as `chineseDragon_v03.ZPR`.

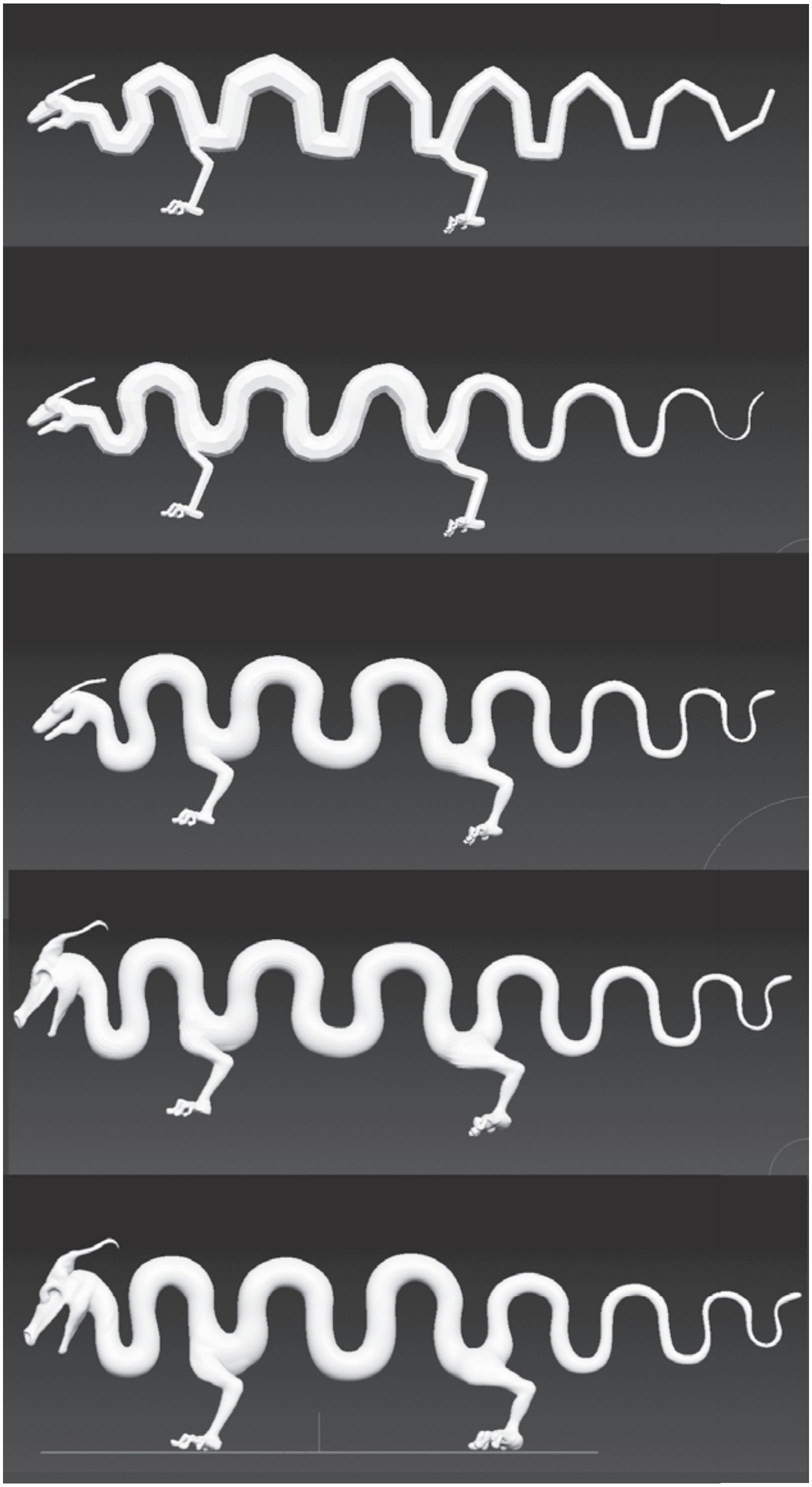


Figure 4.63
The body of the dragon is smoothed and shaped.

To see how I sculpted the dragon shown in the book watch the `ChineseDragon_1.mov` movie in the folder called movie of the DVD.

You can use the techniques described in the first half of the chapter to add horns, flames, ears, and eyes to the dragon's head. Techniques for adding scales and details are discussed in Chapter 7. Figure 4.64 shows the dragon with eyes and teeth added.

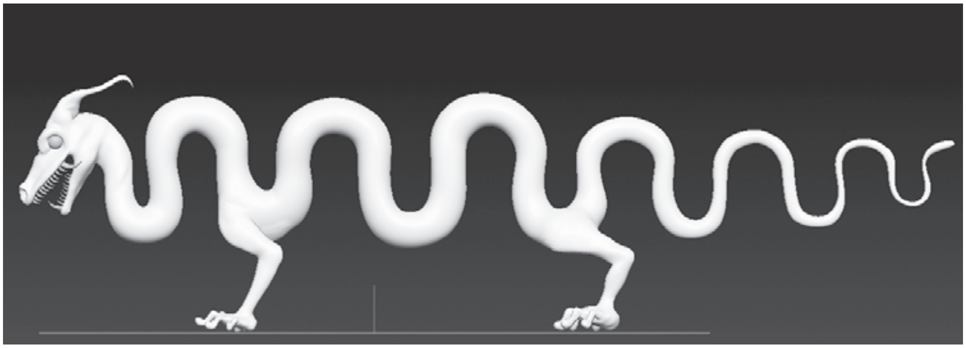


Figure 4.64
Eyes and teeth are added to the Chinese dragon

ZSketching with ZSpheres

ZSketching involves painting ZSpheres on top of an existing ZSphere armature or mesh object. It's an amazing process that feels just like adding strips of clay to a model. The ZSketch can then be skinned using unified skinning. The unified mesh creates a sculptable object made up of square and triangular polygons that evenly cover the surface. This differs from an adaptive mesh introduced earlier in the chapter, which adapts the size and number of polygons based on the size of the ZSpheres (see Figure 4.65). Think of ZSketching as yet another tool in your arsenal that you can use to start a digital sculpture.

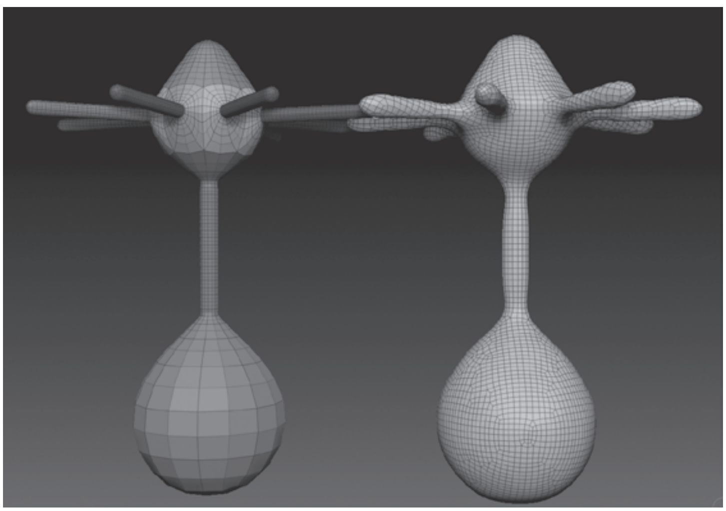


Figure 4.65
A ZSphere armature has been converted to an adaptive skin in the left image. The same armature has been converted to a unified skin in the right image.

Create a ZSketch

In this example, you'll learn how to create another style of dragon head using ZSketching. ZSketching can be applied to an existing ZSphere armature, or you can simply start with a single ZSphere and then use the special ZSketch sculpting brush to create forms in empty space. Since this is the easiest way to ZSketch, you will use this method:

1. Start a new ZBrush session on a blank canvas.
2. In the Tool palette fly-out inventory, select the ZSphere. Draw it on the canvas and switch to Edit mode (hotkey = T).
3. Expand the Tool palette and find the ZSketch subpalette toward the bottom. This subpalette is available only when ZSphere is the current tool.
4. Click the EditSketch button (see Figure 4.66). You'll see the ZSphere turn to a single color.

Figure 4.66

The EditSketch button is enabled.

The sculpting brushes in the library switch to a subset of the sculpting brushes designed to work only when ZSketching (see Figure 4.67). These brushes can be divided into several groups:

Sketch brushes Armature, Sketch 1, Sketch 2, and Sketch 3. The Sketch brushes draw the ZSpheres on the original armature as well as on the canvas.

Smoothing brushes Smooth 1, Smooth 2, Smooth 3, and Smooth 4. The Smooth brushes smooth the position and size of the sketched ZSpheres. Each smoothing brush has a slightly different quality to the way it smoothes the surface. Just as with sculpting brushes, the smoothing brushes are mapped to the Shift key. If you choose one of these brushes, you'll see a reminder at the top of the screen letting you know that the chosen Smooth brush is only active when you are holding the **Shift** key while in Draw mode.

Manipulation brushes Bulge and Flush, Bulge, Float, Flush, Flush Dynamic, Flush Resize, and PushPull. The manipulation brushes help you fine-tune the position and size of the sketched ZSpheres.

5. From the fly-out material library on the left shelf, select the SketchGummyShiny material. This is one of several materials designed to help you see your ZSketch as you create it.

Figure 4.67

The ZSketch brushes

6. Reduce your brush size and select the Sketch 1 brush. Press the **X** hotkey to activate symmetry if it is not active already (you should see a red circle on the left and right side of the ZSphere if symmetry is on).
7. Start drawing on the ZSphere. You'll see a series of spheres follow the stroke. Extend the stroke out into empty space.
8. Rotate the view of the ZSketch (see top image in Figure 4.68).

The ZSpheres you add with the ZSketch brush are unlike the ZSpheres you used to make the dragon armature. These ZSpheres can only be added using the special ZSketch brushes when ZSketch mode is on. You need to have at least one ZSphere on the canvas, and the sketch has to start on a ZSphere, but after the initial stroke you can continue to add more ZSpheres and build up the model by drawing on existing strokes.

The difference between the three sketch brushes used to add ZSpheres to the sketch is how deep the sketched ZSpheres are embedded into the original ZSphere. Sketch 1 embeds the ZSpheres deeply into the surface, Sketch 2 embeds them halfway, and Sketch 3 keeps the ZSpheres floating on the top. The ZSketch A, ZSketch B, and ZSketch C brushes are very similar.

ONE UNDO TOO MANY

Sometimes you may find that if you press **Ctrl+Z** to undo the last ZSketch stroke, the ZSphere turns red and it seems like the ZSketch brushes no longer work. What has happened? This is simply a result of going back too far in the undo cue. You've basically stepped out of ZSketch mode. To fix this, simply turn the Edit ZSketch button in the ZSketch subpalette back on and continue working.

9. Hold the **Shift** key and paint over the surface of the newly sketched ZSpheres. This activates the Smooth 1 brush, which helps to straighten the position of the sketched ZSpheres. It also scales the ZSpheres at the ends to match the original ZSphere (see bottom image in Figure 4.68).

The Smooth 2 brush will push the end ZSketched ZSpheres into the armature but it will not change the radius of the ZSphere.

The Smooth 3 brush will not change the radius of the ZSketched ZSpheres. It applies a global smoothing to the sketch, which can help straighten the line of the ZSketch.

The Smooth 4 brush scales the end ZSpheres down and embeds them deeper onto the other ZSpheres.

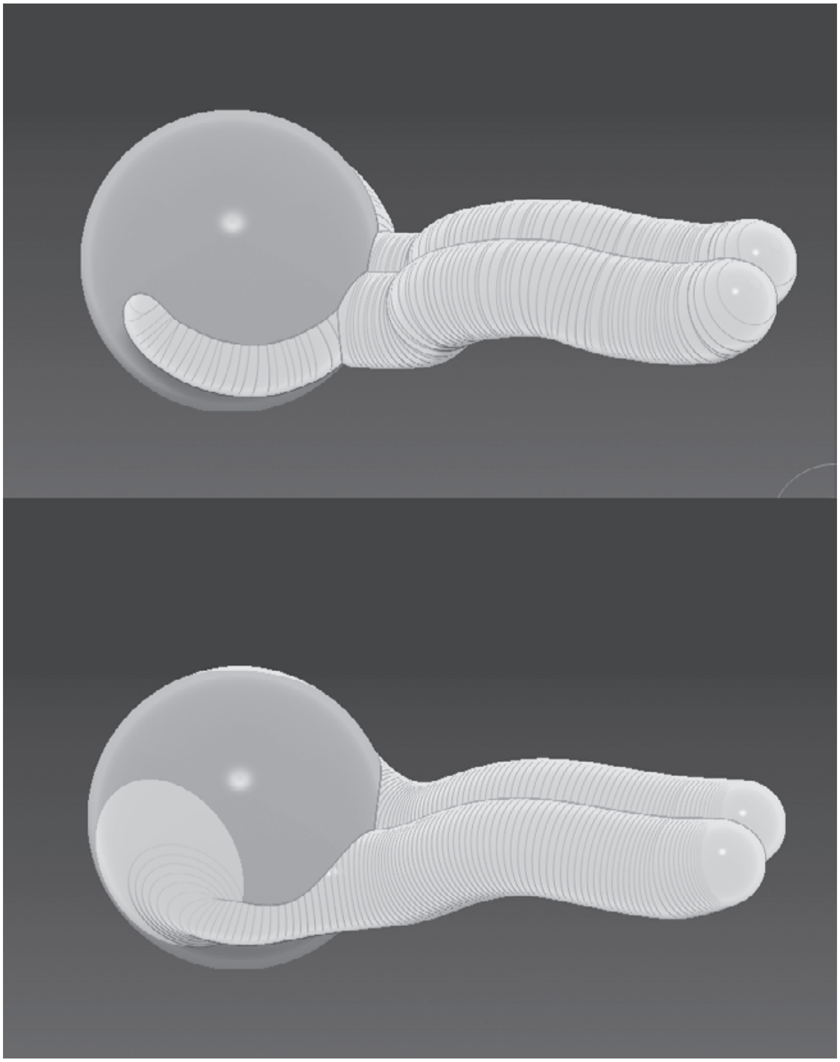


Figure 4.68
New ZSpheres are sketched onto the initial ZSphere (top image). The ZSpheres are smoothed into the surface when you brush them with the Smooth brush (bottom image).

The typical method for adding ZSketched ZSpheres to an armature is to draw out a single line using the ZSketch ZSpheres on the armature and then smooth the newly added ZSpheres using whichever Smooth brushes you prefer. Do this each time you sketch on the armature to ensure that the model is neat and easy to use. Think of it as adding strips of clay to your model. Each time you add a strip, use a smoothing brush to push it into the rest of the models, just as if you used your thumbs to smooth out the strip of clay on a real model.

10. Hold the **Alt** key and draw on top of the ZSketch. Holding the Alt key deletes parts of the ZSketch, so use this to erase what you have drawn so far.

11. Click the Floor button on the right shelf to turn on the grid. Make sure Persp is off. Rotate the view so that you can see the ZSphere from the side.
12. Starting from the ZSphere, paint an S shape that moves up toward the right. This will be the neck for this version of the dragon head (left image in Figure 4.69).
13. After you draw out the neck, hold the **Shift** key and paint over the ZSketch to smooth their position and size (center image in Figure 4.69).
14. Rotate the view of the model. You'll see that since symmetry is enabled, you have drawn two lines of ZSpheres. Using the Smooth brush has caused these lines to converge toward the end of the neck. That's okay. In fact, that's a big part of how ZSketching works. Overlapping lines of ZSpheres will become the basis for the model's form (right image in Figure 4.69).

Figure 4.69

The dragon's neck is started by painting an S shape. The Smooth brush is used to refine the shape. In perspective view, you can see how two lines of ZSpheres overlap to form the neck.

15. Rotate back to a side view. Activate the Move button on the top shelf (hotkey = W). Drag on the ZSpheres to adjust the shape of the neck if you need to (see the left image in Figure 4.70).
16. Switch to Scale mode (hotkey = E) and drag upward on the ZSpheres at the end of the neck to scale them down. This adds a taper to the neck (see the right image in Figure 4.70).

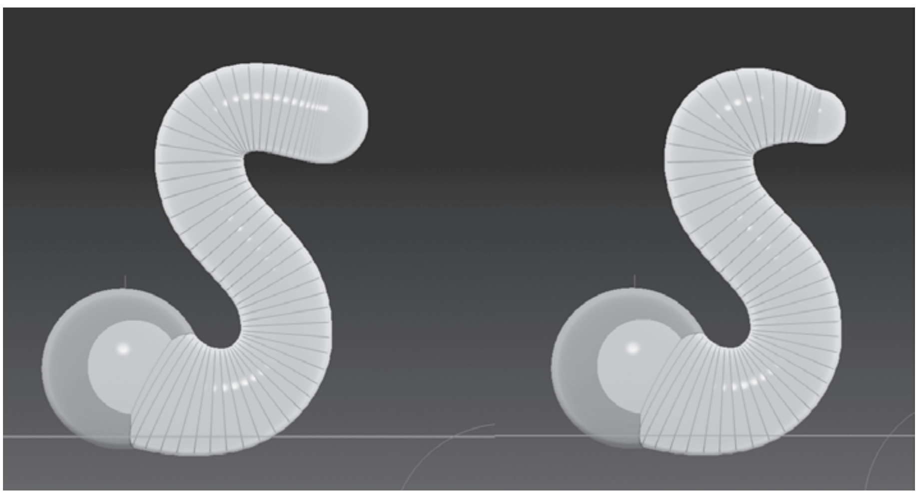


Figure 4.70

Use Move and Scale mode to adjust the position and size of the ZSketch.

17. Switch back to Draw mode (hotkey = Q). Use the ZSketch 1, ZSketch 2, and ZSketch 3 brushes to form a triangular head at the end of the neck. Draw a few lines at a time and then hold the **Shift** key while painting over the ZSpheres to smooth the shape. Rotate the view and adjust your draw size as you work. Remember that you can erase ZSpheres by holding the **Alt** key and you can move and scale ZSpheres by switching to Move or Scale mode. Figure 4.71 shows how I created the head for my dragon.

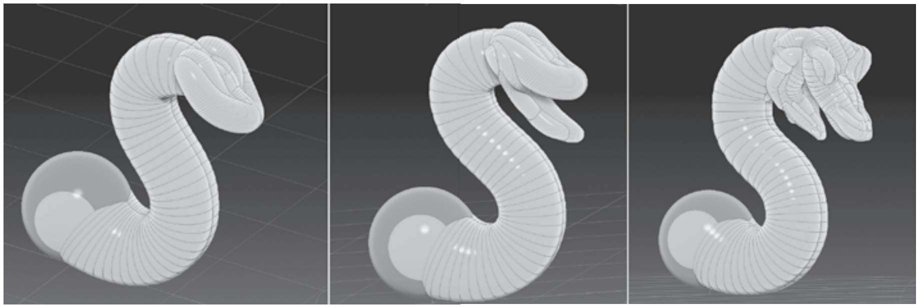


Figure 4.71
A basic head is created at the end of the neck using the ZSketch brushes.

When you're smoothing multiple lines of sketched ZSpheres, the smoothing brushes work on whichever sketched line of ZSpheres you touch with the smoothing brush first and then any lines sketched after that. For example, if you sketch three lines of ZSpheres on top of each other and then use the smoothing brush to straighten them, if you touch the third line first with the smoothing brush, only the third line will be smoothed. However, if you touch the second line first with the smoothing brush, both the second and third line will be smoothed. Touching the first line with the smoothing brush will smooth all three. This feature gives you precise control over how the smoothing is applied.

18. When you are happy with the look of the head and neck, use the Save As button in the File menu to save the project as `ZSketchDragon_v01.ZPR`.

Absolute precision is not necessary when ZSketching. The process should feel natural and organic, which is why it's called ZSketching. The best approach is to add a few lines at a time, slowly and deliberately, and then hold the **Shift** key while brushing to smooth the forms of the model. Be mindful, but not obsessive, of how you paint the ZSpheres on the armature because their position and size can affect the look of the unified skin.

Preview the Unified Skin

Just as when you created the ZSphere armature, you can preview the mesh that the ZSketch will create by pressing the **A** hotkey. Remember that you don't want to use the sculpting brushes on the ZSketch preview. Once you're done with the ZSketching, you will convert the ZSketch into a skinned copy, which you can then sculpt into a more refined shape. There are a number of settings in the Unified Skin subpalette toward the bottom of the Tool palette that will determine how the unified skin looks and behaves (see Figure 4.72).

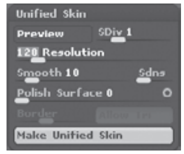


Figure 4.72
The settings in the Unified Skin subpalette of the Tool palette.

1. Continue with the ZSketch you created in the previous section or use the `ZSketch-Dragon_v01.ZPR` project from the `Chapter 4` folder on the DVD.
2. Press the **A** hotkey to preview the unified skin that will be created from the ZSketch (see upper left image in Figure 4.73).

Typically, ZSketch ZSpheres are converted into a unified mesh, as opposed to the adaptive mesh. As mentioned earlier in the chapter, the unified mesh is made up entirely of quadrilaterals that are all the same size. You can increase the number of polygons in the mesh and reduce their size by increasing the resolution of the preview.

3. Press the **A** hotkey again to switch back to the ZSketch. In the Unified Skin subpalette, set Resolution to 400 and create another preview. The result more closely resembles the ZSketch. The upper-right image in Figure 4.73 shows the preview when the resolution is set to 400.

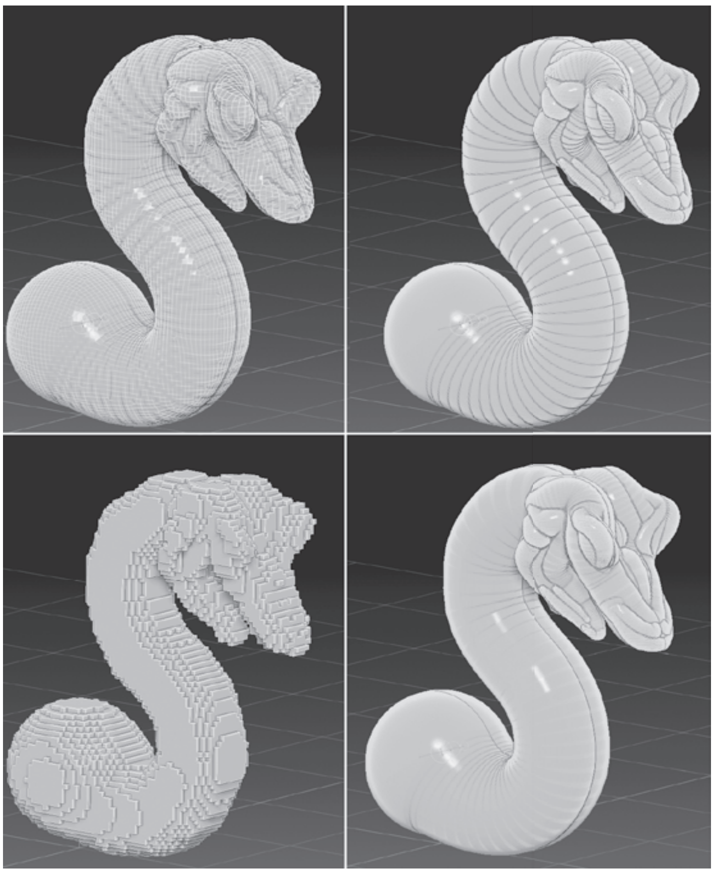


Figure 4.73
The ZSketch dragon is previewed using various settings in the Unified Skin subpalette of the Tool palette.

The ideal resolution value for your particular ZSketch will vary depending on the ZSketch; usually it takes some experimentation to find the value that's right for you. You try to get the lowest density mesh possible that still retains the level of detail that you want for the sculpt. Remember that eventually you'll be working over the converted mesh with the sculpting brushes, so you may not need to have a very high resolution to get the basic shape of the ZSketch.

The other settings in the Unified Skin subpalette affect how the mesh is generated:

- SDiv subdivides the resulting mesh just as when you add subdivisions to a regular mesh object. The Preview button displays the mesh at the subdivision level specified by the SDiv slider.
- Smooth evens out the surface of the mesh. For an interesting look, try setting the resolution to 128 and the Smooth slider to 0. The mesh will look as though it is made of tiny cubes (see lower-left image in Figure 4.73).
- The Sdns slider will add ZSpheres in between every ZSphere that was sketched out. It will create a smoothing, in a way. For example, if you set it to 100, ZBrush will add 100 ZSpheres between the ZSpheres that were sketched out. The lower-right image in Figure 4.73 shows the unified mesh with a Resolution value of 400, Smooth value of 10, and Sdns value of 100.
- The Polish Surface slider is another way to smooth the surface. There are two Polish modes you can use to polish the surface. To choose a mode, click the tiny circle to the right of the Polish slider. The open circle ensures that the polished mesh will maintain the original volume of the ZSketch. The closed circle allows the skin to be stretched; the original volume is ignored (see Figure 4.74). Experiment with different combinations of values for the Smooth and Polish sliders and see how they affect the mesh preview.

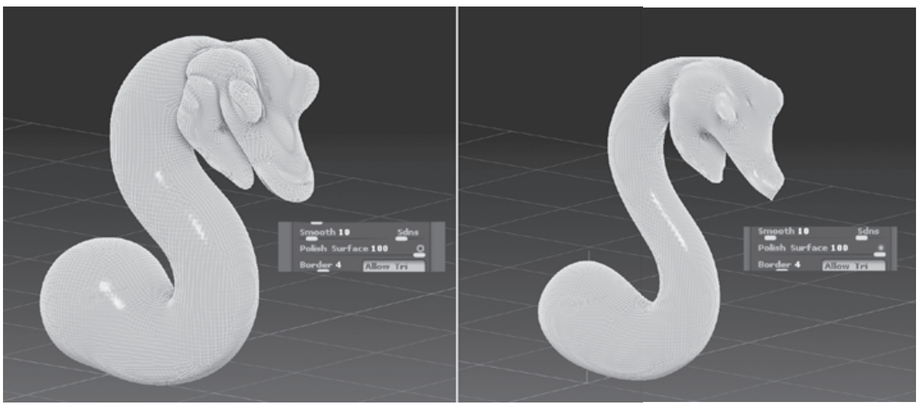


Figure 4.74

The Polish slider has two modes. The open circle mode maintains the volume of the ZSketch (left image). The closed circle mode stretches the surface (right image).

- The Border slider is active only when Polish is above 0. Each line of ZSpheres you sketch on a surface generates a new polygroup. The Border slider inserts loops of polygons along the borders of existing polygroups. The number of loops is determined by the value of the Border slider. The result is similar to when you apply the Group Loops button in the Geometry palette to a regular mesh object. The Smooth slider has to be more than zero in order for ZBrush to generate the loops. Figure 4.75 shows how loops are inserted in the mesh when the resolution has been set to 128.
- The Allow Tri button lets ZBrush generate triangular polygons when needed. This can result in a smoother looking mesh.

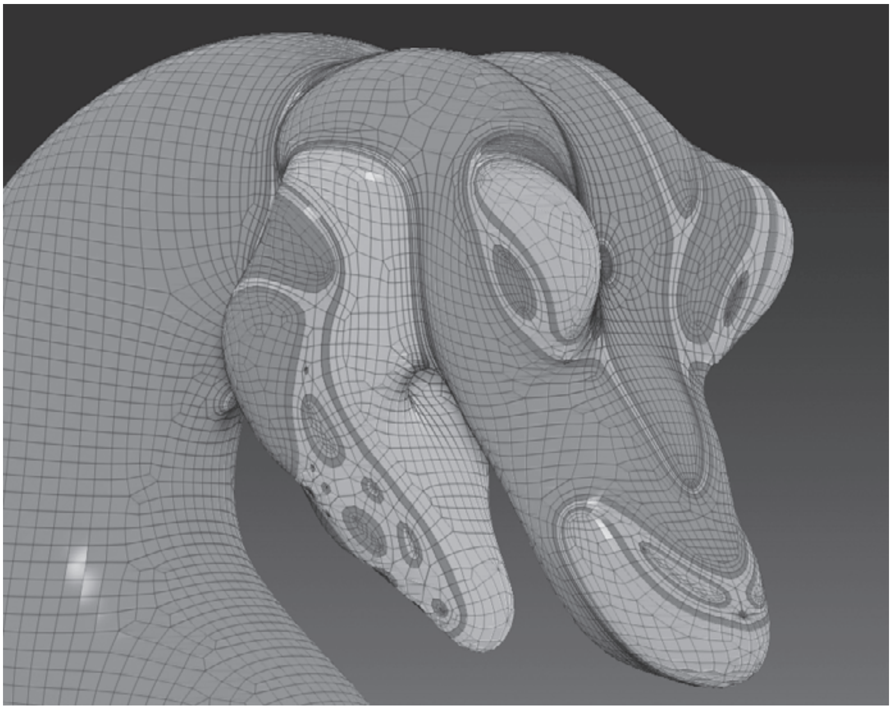


Figure 4.75
Polygon edge loops are generated around each of the polygroups in the unified mesh based on the setting of the Border slider.

Add Details

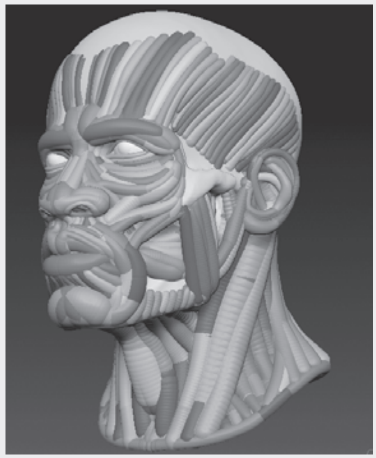
To create the face, use a small Draw Size value and scale up the view to zoom in on the head:

1. Switch out of Preview mode by pressing the **A** hotkey. Zoom into the head region. Use the Sketch 2 brush to add lips around the mouth and large nostrils (top left in Figure 4.76).
2. Switch to Move mode (hotkey = W) to carefully reposition the lips and nostrils and eyebrows.

TIPS ON ZSKETCHING

Here are some tips to keep in mind while you create a ZSketch:

- To reposition the ZSpheres you paint on the surface, you can use the Push Pull brush or switch to Move mode (hotkey = W) and drag the ZSpheres to place them wherever you like, even away from the ZSphere armature.
- To erase ZSpheres, switch to Draw mode (hotkey = Q) and use any of the ZSketch brushes while holding the **Alt** key.
- The **Armature** brush lets you easily paint the ZSpheres in any direction on the canvas as long as you start the stroke on the armature or on part of the exiting sketch.
- **Bulge** and **Flush** will inflate the ZSketched ZSpheres without moving them from the original plane on which they were sketched.
- **Float** pushes the sketch out along the original stroke direction, and holding the **Alt** key while using Float pushes the ZSketch in toward the model.
- **Flush** pushes and scales the ZSpheres along the viewing axis toward the back of the canvas. Hold the **Alt** key to push the ZSpheres in toward the model along the viewing axis.
- **Flush Dynamic** positions the ZSketch along the same plane based on the stroke path.
- **Flush Resize** uses the viewing angle to flatten the ZSketch line as well as scale the ZSketched ZSpheres.
- **Fuse** blends the ZSpheres together.
- In the Tool directory of Light Box, there are several examples of ZSketches created by other artists, such as the ZSketch_Bug, ZSketch_Critter, and ZSketch_Facial Anatomy tools. It's a good idea to examine these sketches to pick up some useful techniques.



3. Switch back to Draw mode (hotkey = Q) and hold the **Shift** key. Paint over the ZSpheres to smooth the changes you have made (top right in Figure 4.76).
4. Choose the Bulge brush from the brush fly-out library and use it to resize parts of the face as needed. Hold the **Alt** key while brushing over the ZSpheres to shrink them (bottom left in Figure 4.76).
5. Choose the Armature brush and use small strokes to add short lines of ZSpheres. The armature brush adds strips of ZSpheres parallel to the viewing angle so you may want to rotate the view of the dragon to add the ZSpheres in specific spots.
6. Use these techniques to add and shape details such as teeth, flames, swirls of hair, and whiskers (bottom right in Figure 4.76).

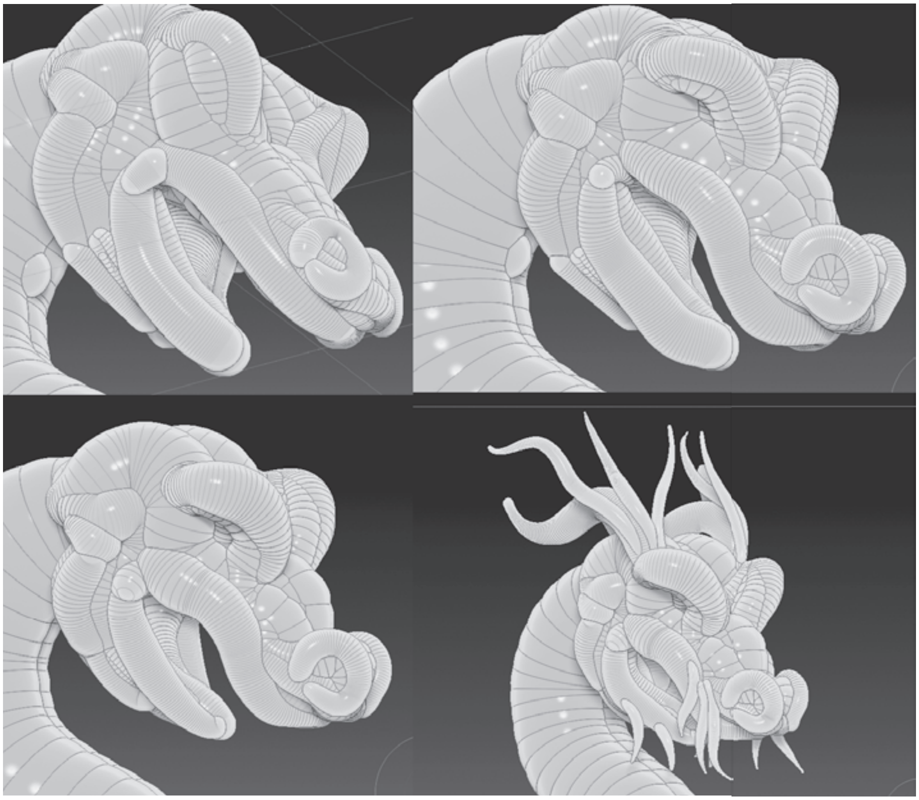


Figure 4.76
The face is formed using a variety of ZSketch brushes.

7. Use these techniques to add detail to the rest of the neck (see Figure 4.77).
8. Save the project as `ZSphereDragon_v02.ZPR`.

Figure 4.77
Details are added to the rest of the neck.

Bind and Pose the ZSketch

You can repose the ZSketch while you are working on it using a ZSphere armature. In this exercise you'll build a simple ZSphere skeleton for the ZSketch dragon and then use the skeleton to adjust the pose of the dragon.

1. In the ZSketch subpalette, deactivate the Edit Sketch button. The sketch will disappear; don't worry, it has not been deleted.
2. Press the ShowSketch button. The sketch reappears as a transparent mass over the original ZSphere (see Figure 4.78).

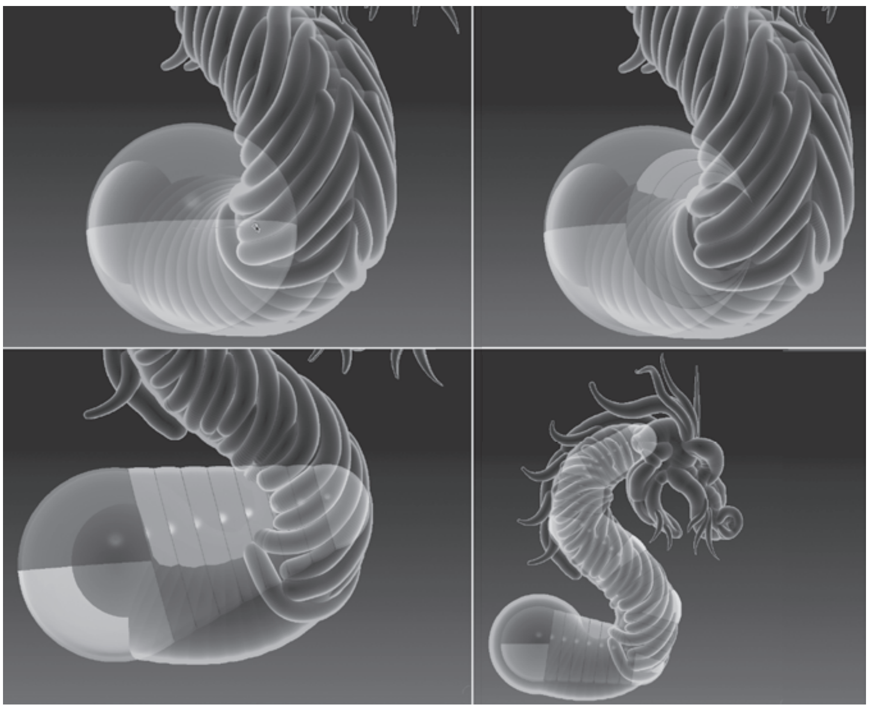
Figure 4.78
The ZSketch appears as a transparent mass over the original ZSphere.

3. Make sure the Draw button is activated on the top shelf. Hold the cursor over the ZSphere at the start of the neck. Symmetry should still be activated. Position the cursor so that the two red dots on the ZSphere come together to form a single green dot (upper-left image in Figure 4.79) and drag on the surface to add a ZSphere (upper-right image in Figure 4.79).
4. Switch to Move mode (hotkey = W) and pull this ZSphere outward (lower-left image in Figure 4.79).
5. Add several more ZSpheres to this armature to match the curvature of the neck (lower-right image in Figure 4.79).
6. Add more ZSpheres to the chain that fit inside the head and the jaw. Figure 4.80 shows the armature next to the ZSketch. I added extra branches for the horns.

Once you have created a basic ZSphere armature, you can bind the ZSketch to the armature and then move the ZSpheres around to adjust the pose of the ZSketch.

7. In the ZSketch subpalette of the Tool palette, press the Bind button.
8. Activate the Move button on the top shelf. Try moving the ZSpheres around and see how it affects the ZSketch (see Figure 4.81).

Figure 4.79
ZSpheres are added to the initial ZSphere to form a simple armature for the neck.



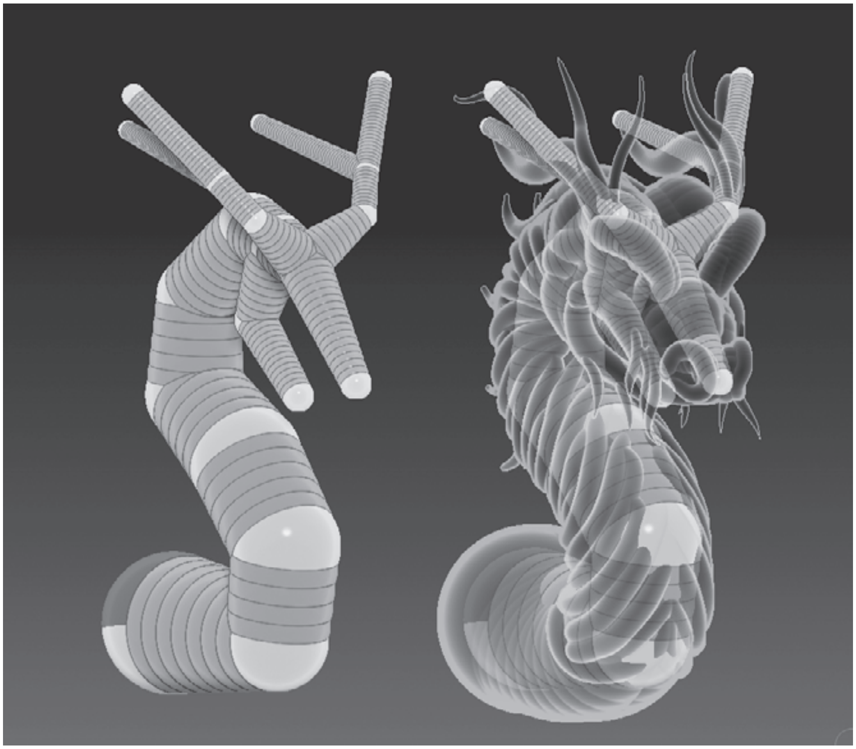


Figure 4.80
ZSpheres are added for the jaw and horns.

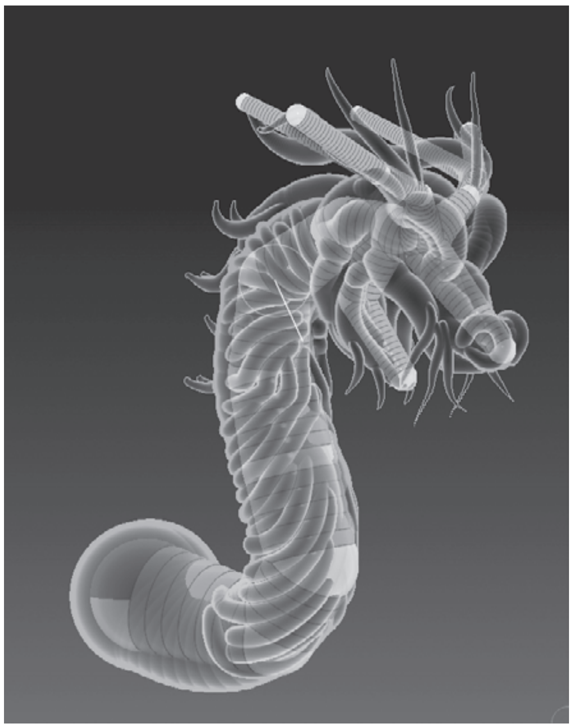


Figure 4.81
The ZSketch is posed by moving the underlying ZSpheres.

In all likelihood you'll need to spend some time cleaning up the model after posing. If you work slowly and methodically, you should be able to minimize the amount of touch-ups. The ZSketch is bound to the armature based on the distance between the ZSpheres and the ZSketch. You can turn off the Bind button, adjust the SoftBind slider, and even edit the position and scale of the ZSpheres in the armature and then press the Reset Binding button. Turn on Bind and continue posing.

9. When you have posed the dragon, turn off Bind Pose and then turn on the Edit Sketch button and use the ZSketch brushes to clean up any problems. Remember that you can delete stray ZSpheres by pressing the **Alt** key while the Draw button is activated (see Figure 4.82).

Figure 4.82
After posing, edit the ZSketch to fix any problems.

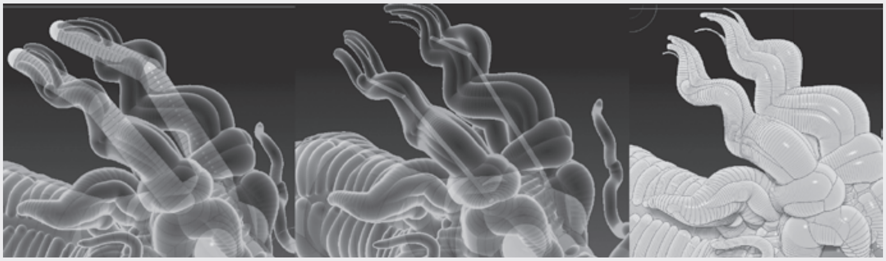
TIPS ON POSING

When using the techniques described in this section to pose and change the original armature, try to work slowly and deliberately. You can switch between posing the armature and editing the ZSketch as often as you like while you work. It's a very flexible workflow.

In some cases, you may find that the original armature is making it hard to add the details you'd like or parts of it are included in the mesh preview in an undesirable way. When this happens, try these steps to get the armature out of the way:

1. Turn off the Edit ZSketch button.
2. Turn on the Show ZSketch button so you can see the ZSketch as a transparent ghost over the armature.
3. Don't turn on the Bind button. Leave it off so that the changes you make don't affect the ZSketch.

4. Switch to Scale mode and reduce the size of the ZSpheres that are causing the problem.
5. Turn on Edit ZSketch and continue ZSketching.



Create A Unified Mesh

The whole point of ZSketching is to allow for an intuitive way to sketch out a design in three dimensions. ZSketching is perfect for when you want to experiment with ideas and concepts. Once you have the initial ZSketch created, you can convert it into a unified mesh, which allows for easy sculpting. From there you can continue to develop your idea.

Just as with standard ZSpheres, creating a unified mesh means making a copy of the ZSketch that is made up of polygons instead of ZSpheres. Before creating this copy, you'll want to preview the unified mesh in order to fix any problems that may occur during the conversion process:

1. In the Unified Skin subpalette, set Resolution to 304.
2. Experiment with the Polish Surface, Smooth, and Sdns settings. Try setting Smooth to 10, Polish Surface to 5, and Sdns to 50.
3. Press the **A** hotkey to see the preview. Examine the surface from as many views as possible to see if there are any holes that need to be filled.
4. Press **A** to switch out of Preview mode. Make any last changes you need to make to fill holes by adding to the ZSketch or moving parts around (Figure 4.83). Adjust the unified skin settings as you see fit.
5. Press the Make Unified Skin button in the Unified Skin subpalette of the Tool palette to create the unified mesh. The new mesh will appear in the tool inventory with the Skin_ prefix before the name.
6. Save the project as `ZSketchDragon_v03.ZPR`. This will save both the ZSketch version and the unified mesh in a single project file.

Figure 4.83

Inspect the preview for holes and the quality of the mesh.

Sculpt the ZSketch

Once you have created the Unified mesh, you can subdivide it just like any other 3D mesh and use your favorite sculpting brushes to shape it into a finished product. The unified mesh method of skinning creates a mesh in which all of the polygons are the same size and cover the mesh uniformly. This makes it easy to sculpt. However, if you want to use the geometry in an animation, you may need to retopologize the mesh so that it can easily be deformed in your animation software. To learn about retopology in ZBrush, read Bonus Content 1 "GoZ," which is available as a PDF on the DVD that comes with this book. The sculpted dragon is shown in Figure 4.84

Save the final dragon as `ZSketchDragon_v04.ZPR`.

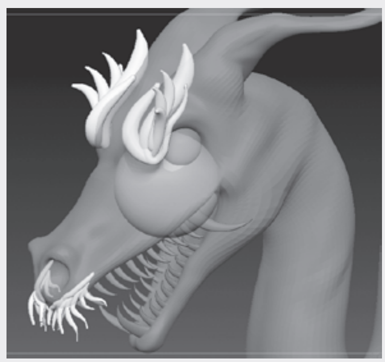
Figure 4.84

The unified mesh is subdivided and edited using the sculpting brushes.

ZSKETCHING TECHNIQUES

There are additional techniques you can use that can make ZSketching even more powerful. For example, you can sketch ZSpheres on top of an existing mesh object. This is a great way to add details. To do this, follow these steps:

1. Append a ZSphere as a SubTool to an existing mesh.
2. Select the ZSphere SubTool in the SubTool subpalette of the Tool palette. Turn on the Edit ZSketch button in the ZSketch subpalette of the Tool palette.
3. You can turn on the Transp button on the right shelf if you'd like, but make sure that the Ghost button is off. Otherwise, you will not be able to draw on the mesh.
4. Use the ZSketch brushes in the sculpting brush library to paint ZSpheres on top of the mesh.
5. You can use the A hotkey to preview the unified mesh while you work.
6. When you are ready to convert the ZSketch to a mesh, press the Make Unified Skin button in the Unified Skin subpalette of the Tool palette.
7. The unified skin appears in the tool inventory. You'll need to append the skin to your original mesh if you want to incorporate it into your sculpt.



The image to the right shows how whiskers and flames can be drawn onto the surface of the Chinese dragon mesh using the ZSketch brushes.

ShadowBox and Clip Brushes

The digital sculpting tools you've encountered so far in this book lend themselves very well to the creation of organic surfaces. Subjects such as creatures, characters, clothing, and natural environments are easily achieved using sculpting brushes, ZSpheres, and ZSketching. ZBrush has long held the reputation of being the best way to create these kinds of organic objects.

ZBrush 4 introduces several new tools that are designed to expand the power of digital sculpting to hard surface objects as well. Things like vehicles, buildings, robots, and armor can now be created just as easily as organic surfaces.

This chapter introduces some new tools that you can use to sculpt hard surface objects including the new ShadowBox tool and clip brushes.

This chapter includes the following topics:

- **Create meshes with ShadowBox**
- **Use radial symmetry in ShadowBox**
- **Use custom alphas in ShadowBox**
- **Refine surfaces using clip brushes**

ShadowBox

ShadowBox offers a completely new way to create meshes. The technology is included as a new feature in ZBrush, and you'll find that, once you get the hang of the basic concept, it's easy to use and a lot of fun. In a nutshell, here's how it works: A mesh is generated at the center of the ShadowBox tool based on the intersection of profiles that you draw on the three sides of the box (see Figure 5.1). You create the silhouettes on the sides of the box using the masking brushes, and as you edit the silhouettes the mesh at the center of the box instantly updates. Once you have the basic shape you want, you can turn ShadowBox off and you're left with a mesh that you can then refine using the sculpting brushes and other techniques. It's a very fast way to get an idea into three dimensions. Just as with the other ZBrush tools, the approach is artistic and intuitive, and there's only a few technical details that you need to worry about.

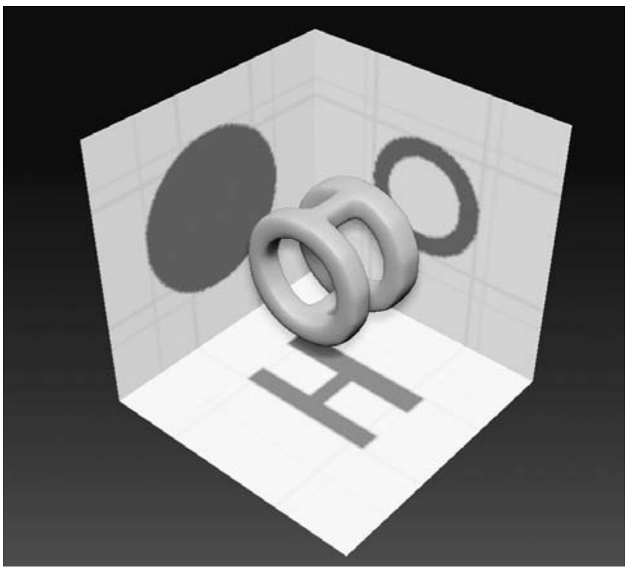
Create a ShadowBox

Let's start by taking a look at some of the basics of working with Shadow Box. In this exercise, you'll create a ShadowBox tool, set the resolution, and generate a basic mesh using the masking tools.

A ShadowBox is a tool just like any other tool. The settings for the tool are found in the SubTool subpalette of the Tool palette. Let's take a look:

1. Start a new ZBrush session.
2. Open Light Box to the Tool section and double-click the PolySphere. Drag across the canvas to create the PolySphere. After it is drawn on the canvas, make sure Edit mode is enabled on the top shelf (hotkey = T).

Figure 5.1
ShadowBox creates a mesh using silhouettes drawn on each side of a three-sided box.



You can use any tool you want as a basis for the ShadowBox; the key is to have a tool on the canvas in Edit mode.

3. In the material fly-out library, choose the SkinShade4 material. This will make it easier to see what's going on.
4. Open the Tool palette and expand the SubTool subpalette. On the right shelf, make sure Perspective is turned off.
5. Toward the bottom of the SubTool subpalette, click the ShadowBox button (see Figure 5.2).

Immediately, the PolySphere is replaced with a box. At the center of the box is a rounded cube. On each side of the ShadowBox you'll see a gray circle (see Figure 5.3).

What has happened is that the PolySphere has been replaced with the ShadowBox and a mask has been created on each side of the ShadowBox based on the profile of the PolySphere. These masks in turn have generated a new mesh at the center, which, at the moment looks like a rounded cube.

Figure 5.2

Click the ShadowBox button in the SubTool subpalette of the Tool palette.

6. Hold the **Ctrl** key and drag on a blank part of the canvas. This is an easy way to clear the masks from ShadowBox. The rounded cube disappears because you have cleared all the masks from the sides of the ShadowBox.
7. Rotate the view of the ShadowBox so that you can see the three sides, hold the **Ctrl** key, and drag on one of the sides to paint a mask.

When you let go to complete the stroke, you'll see a flat blob appear at the center of the ShadowBox. The profile of the blob matches the shape of the mask painted on the side of the ShadowBox.

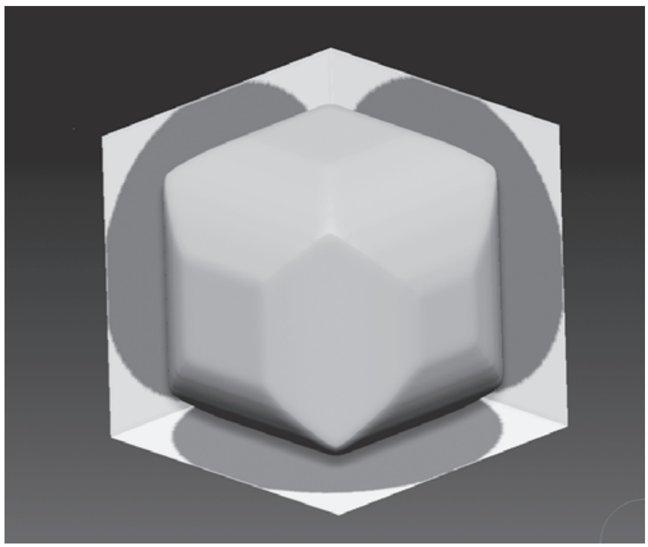
8. Turn on the Transp button on the right shelf. Make sure the Ghost button on the right shelf is activated and rotate the view. Now you can see the mask on the side of the ShadowBox through the blob at the center (left image in Figure 5.4).
9. Paint another mask on the other side of ShadowBox (middle image in Figure 5.4).

When you let go, the blob at the center updates. If you rotate the view, you'll see that from the sides, the profile of the blob matches each of the masks drawn on the sides of the ShadowBox. As you view the blob from a perspective view, you'll see that the shape of the blob is determined by the combination of the two masks.

10. Paint a third mask on the bottom of ShadowBox. You can see that the blob is now generated based on the combination of the three masks (right image in Figure 5.4).
11. In the SubTool subpalette, click the ShadowBox button again. The box disappears and you are left with the blob that was generated from the masks. At this point you have a mesh that you can subdivide and sculpt just like any other lump of digital clay (see Figure 5.5).

Figure 5.3

The ShadowBox tool replaces the PolySphere. A mesh appears at the center of the box.



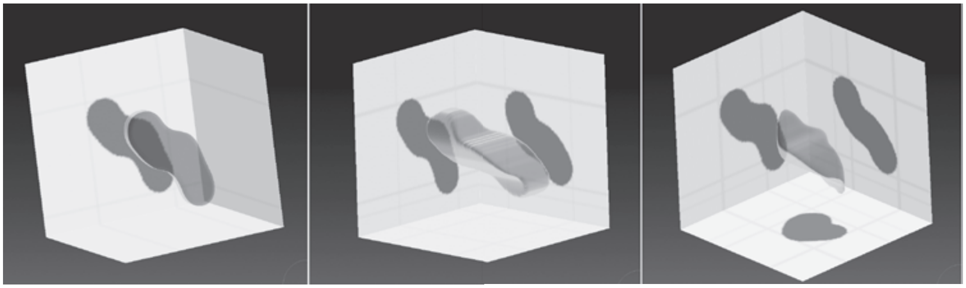


Figure 5.4
Paint a mask on each side of ShadowBox to create a mesh at the center.

This is the basic workflow for creating a mesh using ShadowBox. However, you can get much greater control by taking advantage of the various stroke types that can be applied to the mask brush. In the next sections, you'll learn how you can adjust the resolution of the mesh and how to use reference images within the ShadowBox tool.

ShadowBox Resolution

ShadowBox uses the unified skin method for generating the mesh created by the mask profiles. This means that the mesh is made up of quadrilateral polygons, just like when you convert a ZSketch into a polymesh object. So how do you set the number of polygons for the ShadowBox mesh? This is done using the Res slider in the SubTool subpalette of the Tool palette. The smoothness of the mesh can be adjusted using the Polish slider. However, these sliders must be set before you create the ShadowBox tool. Here are some tips on how to adjust the resolution of ShadowBox:

1. Continue with the tool created in the previous section. Click the ShadowBox button in the SubTool subpalette of the Tool palette.

Figure 5.5
The resulting mesh created from painting masks in ShadowBox.

The ShadowBox appears again and the masks are regenerated on each side of the ShadowBox based on the profiles of the selected SubTool.

2. On the right shelf, click the PolyF button to activate the wireframe display. Turn off the Transp button as well.

The wireframe appears on each of the sides of the ShadowBox (see Figure 5.6). This gives you an indication of the density of the mesh created by ShadowBox. Also notice that the ShadowBox tool has been organized into color-coded polygroups so that each side is in its own polygroup.

Take a look at the controls above the ShadowBox button in the SubTool subpalette of the Tool palette. The Res slider determines the resolution of the mesh, or in other words, the number of polygons that make up the surface of the mesh. The Polish slider determines how smooth the mesh is.

If you adjust either of these sliders while ShadowBox is active, nothing will happen. In order for these slider to work, you'll need to re-create the box.

3. Set the Res slider to 24 and click the ShadowBox button once to turn it off and then again to turn it on.

Notice that the squares that make up the wireframe display on the sides of ShadowBox are larger and that the mesh at the center of the ShadowBox is at a lower resolution (see left image in Figure 5.7). At a setting of 24, each side of ShadowBox is made up of a grid that is 24 × 24 polygons.

4. Set the Res slider to 400. Turn the ShadowBox button off and then on again.

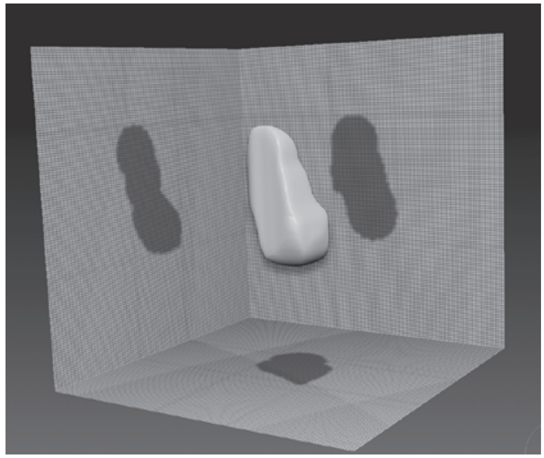


Figure 5.6

The wireframe display appears as a grid on each of the sides of the ShadowBox tool.

This time the grid on each side of the ShadowBox is very dense and the mesh at the center is at a much higher resolution. Notice that the edges of the masks on each side of the ShadowBox are smoother as well. The quality of the mask is directly related to the resolution of ShadowBox (see right image in Figure 5.7).

In practice, you want to consider the resolution of ShadowBox while you use the masks to generate the mesh. It's tempting to crank the Res slider up as high as you can in order to create a detailed mesh, but that's not always the best strategy. The purpose of ShadowBox is to allow you to quickly determine the shape of a surface, which you can then subdivide and sculpt with the sculpting brushes. If you create an overly dense mesh by cranking up the resolution of ShadowBox, you'll limit your ability to subdivide the mesh once you are ready to sculpt. A better approach would be to determine the lowest possible resolution necessary to create the detail you want in your ShadowBox mesh and use that value to create your mesh. You can easily refine the surface and add more detail after the mesh has been generated using subdivisions and the sculpting brushes.

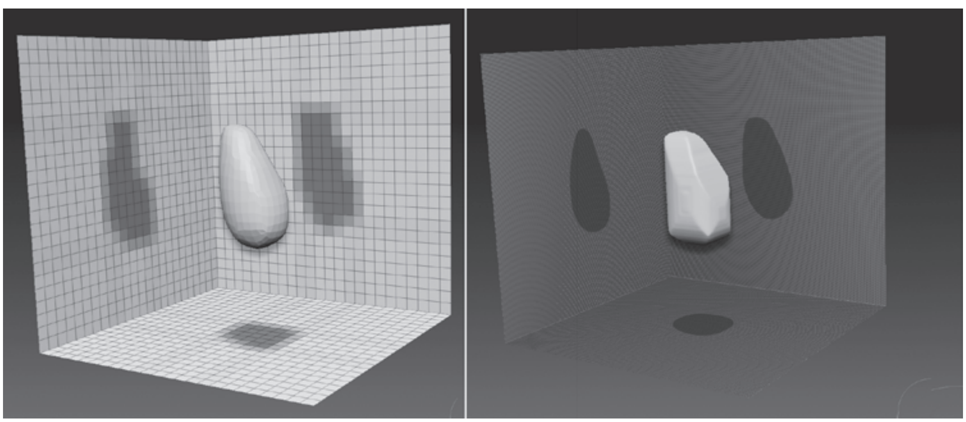
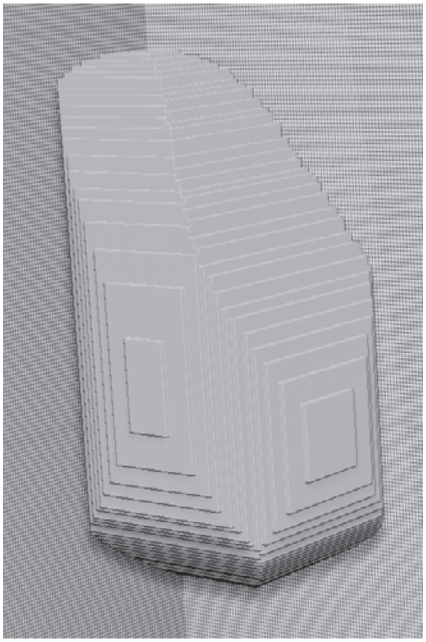


Figure 5.7

At a lower Res setting, the grid on the sides of ShadowBox is larger and the resolution of the mesh is lower (left image) Higher resolution settings for ShadowBox produce smoother masks and a denser mesh (right image).

Figure 5.8

Setting Polish to 0 creates a blocky looking mesh.



5. Set the Res slider to 256 and set the Polish slider to 0. Turn the ShadowBox button off and then on again. This time notice that the surface of the mesh is very "blocky" (see Figure 5.8).

   The Polish slider determines the smoothness of the mesh surface. Without smoothing, the surface will appear very blocky and rough. In some cases, you can use this aspect of ShadowBox as a creative advantage. Using a low or 0 Polish setting with a rectangular mask is a great way to create hard-edged surfaces. Later in this chapter you'll see how to use rectangular masks in ShadowBox.

6. Experiment with different Polish settings and see how it affects the appearance of the mesh.

   You can save the ShadowBox tool for future use and the settings you have established will be included whenever you load the tool into ZBrush.

7. Set the Res slider to 256 and the Polish slider to 10. Click the ShadowBox button twice to turn it off and then on again. This will establish the settings for the tool.
8. Hold the **Ctrl** key and drag on the canvas to clear any masks that may be drawn on the sides of ShadowBox. Clearing the masks will also clear any meshes that may be at the center of ShadowBox.

POLISH VOLUME CONTROL

The Polish slider has two modes that can be set by clicking the circle on the right side of it. The open circle means that as the surface is polished, the volume of the mesh will be preserved. The closed circle means that the volume of the surface will not be preserved when it is polished. Experiment with these two modes when working with ShadowBox. You can create some interesting effects using one mode or the other. The difference is more noticeable on surfaces that have variations in thickness.

SHADOWBOX TOOLS

There are four ShadowBox tools found in the Tools section of Light Box that are set up and ready for you to use. Each ShadowBox is already set to a different resolution (64, 128, 256, and 512).

Use Reference Images in ShadowBox

Now that you have the basics of ShadowBox down, let's look at how you can use ShadowBox to create a sculptable mesh. The goal is to create the body for a hot rod (see Figure 5.9). It's tempting to jump right in and start roughing out the shape for the body inside of ShadowBox, but it might be helpful to first create a guide within ShadowBox that can be used as a reference for the shape of the masks.

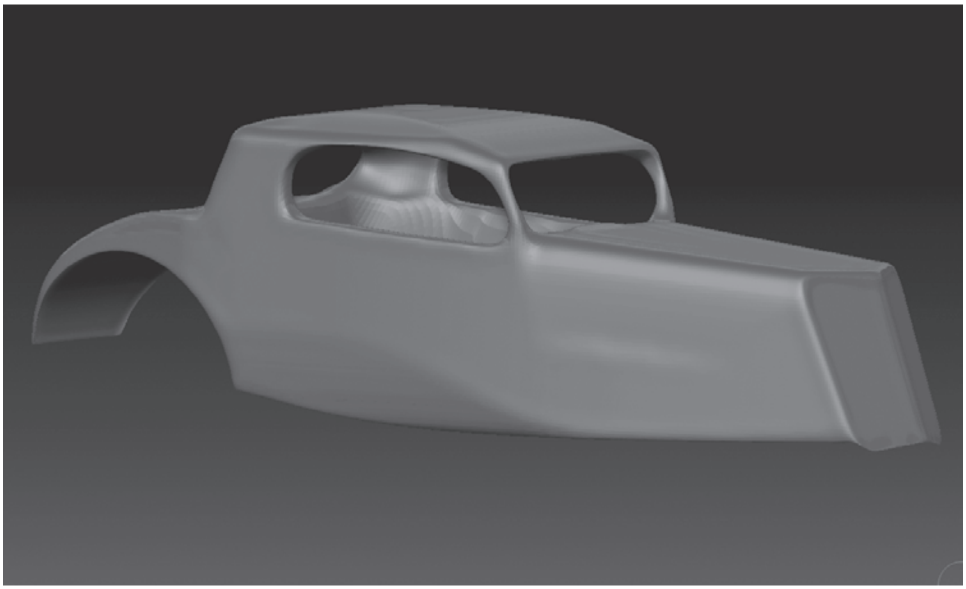


Figure 5.9
Image of the hot rod body

Follow these steps to add reference images to ShadowBox:

1. Open Light Box to the Tools section. Scroll to the right and find the ShadowBox256.ZTL tool (see Figure 5.10). Double-click it to load it into ZBrush. Make sure the tool is loaded on the canvas, and the Edit button on the top shelf should be active.

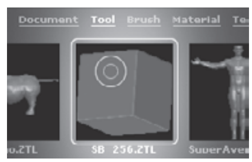
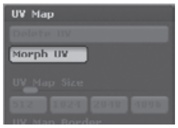


Figure 5.10
Load the ShadowBox256.ZTL tool from the Tool section of Light Box.

To create a reference image, you'll take a snapshot of an unfolded view of the ShadowBox tool. This snapshot can be exported from ZBrush and brought into a paint program such as Photoshop, where you can bring in photos, drawings, or paint your reference.

Figure 5.11
The Morph UV button is used to unfold the ShadowBox tool.



2. On the right shelf, make sure the Persp button is deactivated so that the canvas is not in Perspective mode.
3. In the Tool palette, scroll down to the UV Map subpalette. Click the UV Map heading to expand this subpalette. Click the Morph UV button (see Figure 5.11).

You'll see the ShadowBox tool unfold on the canvas. The arrangement of the unfolded polygons is based on how the UV texture coordinates of ShadowBox have been arranged.

UV TEXTURE COORDINATES

UV texture coordinates (or UVs for short) are a set of coordinates used to tell 3D software how to map a 2D image onto the faces of a 3D object.

4. Right-click drag on the canvas to rotate the view of the flattened ShadowBox tool. Hold the **Shift** key while dragging so that the tool snaps into an orthogonal view. You want to see the tool flat against the canvas so that you can clearly see the unfolded planes of the box.

The ShadowBox256.ZTL tool has a texture applied already. This texture is a grid pattern with labels that will help you understand how ShadowBox is arranged while you create your reference images. The grid pattern is aligned so that you can easily find the center of each side of the box. You can see how the grid texture is applied by opening the Texture Map subpalette of the Tool palette (see Figure 5.12).

Figure 5.12
A grid texture is applied to the ShadowBox256.ZTL tool.

5. In the UV Map subpalette of the Tool palette, click the MorphUV button, and ShadowBox reforms back into the cubical shape. You can see how the labels on the texture indicate which side is which; this will be helpful when arranging or painting your reference images in your paint program (see Figure 5.13).

The image file that is applied to the ShadowBox256.ZTL tool is found in the `ZBrush 4.0\ZTools` folder. The name of the texture file is `SBRef.PSD`. This image file can be opened in your favorite digital painting program and used to place reference images. Just make sure you save the altered image file under a different name so that you don't overwrite the existing `SBRef.PSD` file.

6. You can exit ZBrush and open the `SBRef.PSD` image in your favorite painting program.

Figure 5.14 shows the reference image I created in Corel Painter. I created very simple silhouettes of the front, side, and top view of the hot rod body.

7. When you're happy with the reference image, save it as a BMP file to your local drive. Go back into ZBrush and make sure the ShadowBox256.ZTL tool is loaded on the canvas and the Edit button on the top shelf is on.

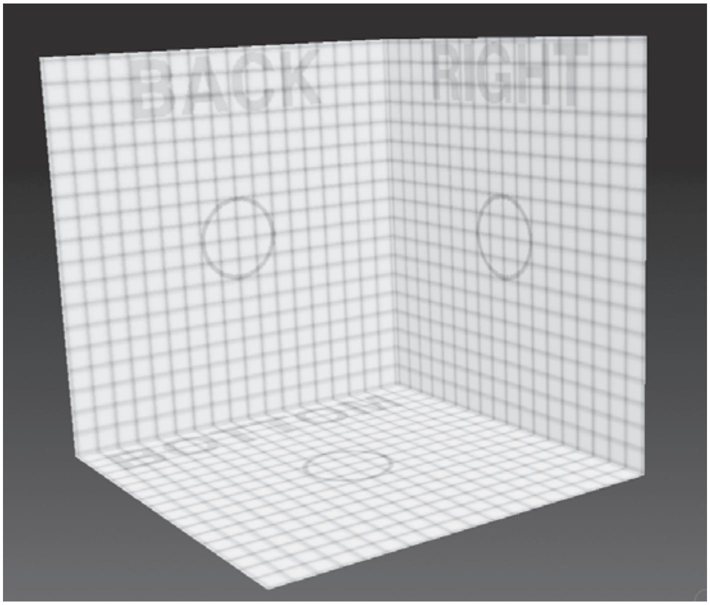


Figure 5.13

The grid texture is applied, allowing you to see how each face of ShadowBox is aligned.

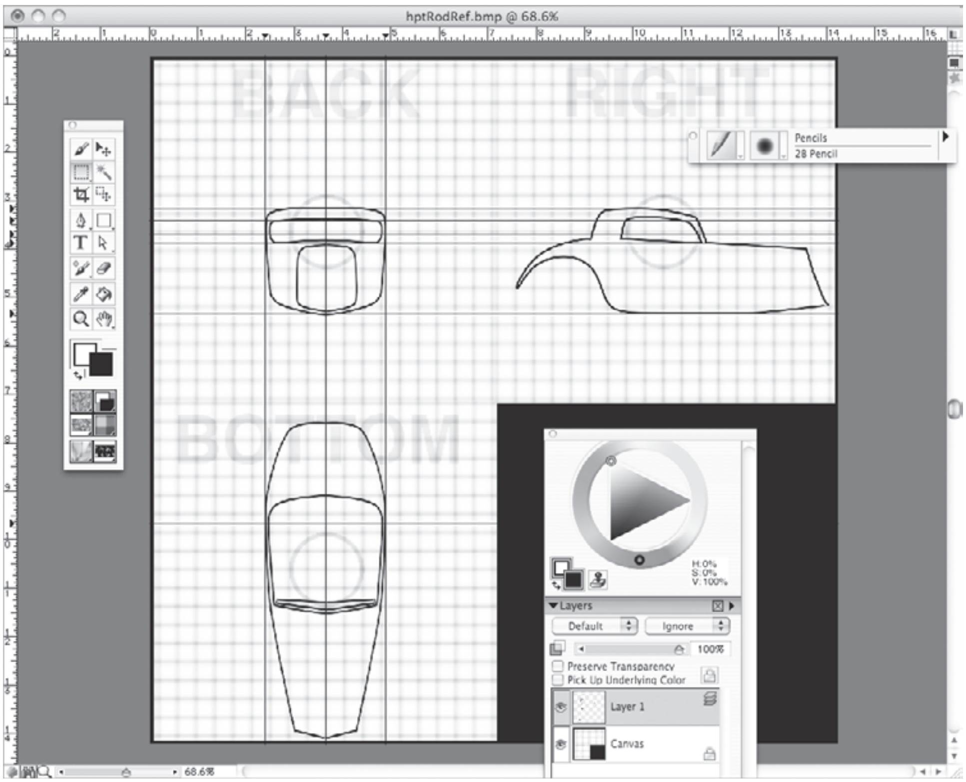


Figure 5.14

The reference image for the body of the hot rod is painted in Corel Painter.

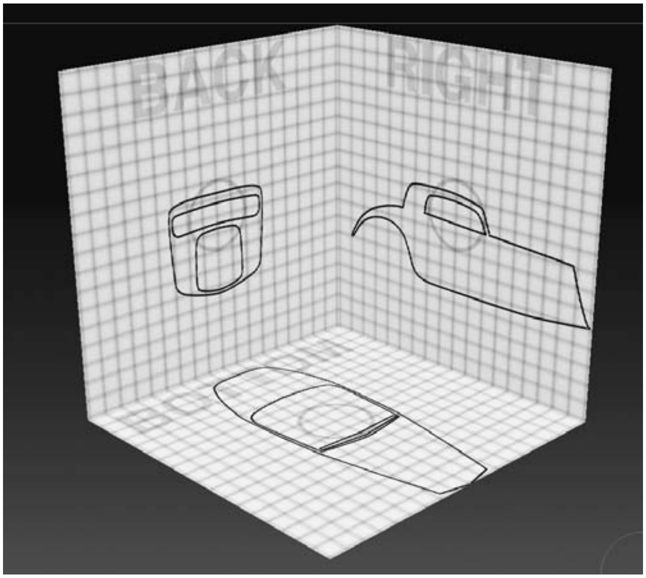


Figure 5.15
The reference image of the hot rod is applied to the ShadowBox tool.

8. Open the Texture palette and click the Import button. Find the saved reference image on your local drive and load it into ZBrush.
9. To apply the reference image to ShadowBox, go into the Texture Map subpalette of the Tool palette, expand the texture fly-out library, and select the texture. The Texture On button should activate automatically; if it does not, click on it and you'll see the texture appear on the ShadowBox tool (see Figure 5.15).
10. In the Tool palette, save the tool as `hotRodSB.ZTL`. The texture will be saved with the tool. Save the file in the `Pixologic/ZTools` folder so that it appears in Light Box.

Now you have a guide for creating the hot rod. You can use the reference I created if you'd like. Copy the `hotRodRef.BMP` from the `Chapter 5` folder on the DVD. The next step is to start roughing out the forms of the body by painting masks in ShadowBox.

Create the Car Body in ShadowBox

Now you're ready to start working on the car body. When approaching a shape such as this one, think about how you might carve the body of the car out of a piece of wood. You'll start by creating an overall block for the car and then whittle down each side using the Mask brushes:

1. Load the hotRodSB.ZTL tool into ZBrush and make sure that it is on the canvas and that the Edit button on the top shelf is activated.
2. Make sure the Persp button on the right shelf is off. It will be easier to create masks on ShadowBox if Perspective mode is off.
3. Rotate the view of the ShadowBox tool so that you can see the plane labeled Back, and then press the Frame button on the right shelf (hotkey = F) to center the view. Turn on the Transp button on the right shelf so you'll be able to see the reference images through the mesh generated in ShadowBox. Make sure Ghost is on as well. The Ghost transparency style is easier to use in ShadowBox than the standard transparency style.
4. Scale up the view of ShadowBox so that you can clearly see the reference image. Press **X** to activate symmetry. Hold the brush over the ShadowBox tool. You should see two red dots indicating that symmetry is activated along the x-axis (see Figure 5.16).

5. The two dots should meet at the center line in the middle of the back plane. If they do not, you'll need press the L Sym button on the right shelf to activate Local Symmetry.

6. Open the sculpting brush fly-out library on the left shelf. Press the **m** key and then the **a** key to select the Mast Rect masking brush. A warning will appear reminding you that this brush is active only while you hold the Ctrl key (Figure 5.17). Click OK.

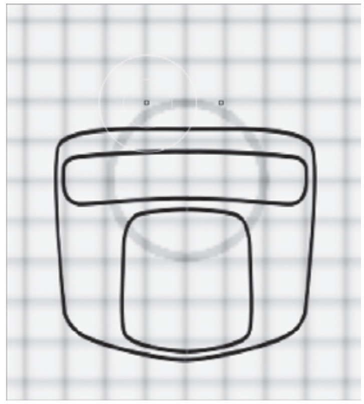


Figure 5.16

Activate Local Symmetry so that the brush tips are aligned symmetrically on either side of the center line of the reference.

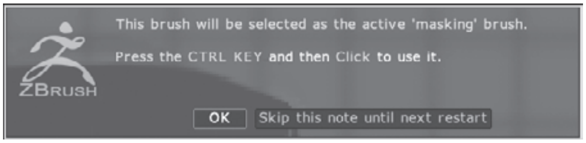


Figure 5.17

The Mask Rect brush is automatically mapped to the Ctrl key.

7. Hold the **Ctrl** key and open the stroke type fly-out library on the left shelf. Click on the Center button as shown in Figure 5.18. Now whenever you draw a rectangular mask using this brush, the mask will be created from the center of the brush stroke.

Figure 5.18

Turn on Center in the options within the Stroke Type library.

8. Hold the brush over the ShadowBox tool. You want to place the brush stroke roughly at the center of the front view of the reference image.

9. Hold the **Ctrl** key and drag out from the center to create a rectangular mask that covers the front view (see Figure 5.19). Don't worry too much about being absolutely precise; you'll be reshaping the rectangle in the next section.

10. Let go of the brush and you'll see a gray transparent box appear. This is the ShadowBox mesh. The next step is to whittle the shape down a little to refine it.

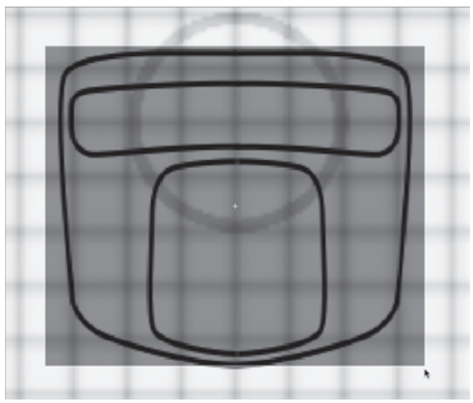


Figure 5.19

Hold the Ctrl key and drag from the center of the reference to create a rectangular mask that covers the reference image.

Use the Mask Curve Brush

To shape the front view, you can use the Mask Curve brush. The Mask Curve brush uses the Curve stroke type. This means that you use the brush to draw out a curve to define the mask. This can make your masking very precise.

To whittle down the rectangular mesh you created in the previous section, you'll actually be using the Mask brush to erase parts of the mask drawn on the back of ShadowBox. This means that you'll hold the Alt key before releasing the masking brush.

Before you try it out, here's a little background on how the Mask Curve brush works. You'll draw the curve by holding the Ctrl key and dragging on the canvas. You'll see a dashed line appear as you drag. The curve starts at the point where you initially touch the canvas, and it will be a straight line as you draw it. One side of the curve is shaded with a gray gradient. This indicates which side of the curve will be masked. If you start the curve and then drag to the right, the shaded area appears on the top; if you start the curve and drag to the left, it appears on the bottom.

To make the line curved rather than straight, you add a point and then continue dragging. The point pins down a section of the curve and then you can bend the line from there. To add a point to the curve, press the **Alt** key; to add a sharp corner, press the **Alt** key twice.

Once you release the mask by lifting the pen from the tablet (or releasing the mouse button if you're using a mouse), the area on the shaded side of the line becomes masked and thus a mesh is created. The mask will extend all the way to the edge of ShadowBox and so will the mesh. The following steps show how you use this technique to shape the front profile of the hot rod:

1. Open the sculpting brush fly-out library and press **m** and then **s** to switch the masking brush to the Mask Curve brush. This brush will now be mapped to the Ctrl key. Press the Skip Warning Until Next Restart button so you don't see the warning every time you switch masking brushes.
2. Let's take a little off the top. Hold the brush to the left of the reference image, near the top but outside of the area that has already been masked. Press the **Ctrl** key and drag out toward the right, as shown in the left image in Figure 5.20. Drag all the way past the center and outside of the original rectangular mask. The idea is that you'll be lopping off the corner of the rectangular mask.
3. Before you let go of the brush, press and hold the **Alt** key (it's okay to let go of the **Ctrl** key at this point). The dashed curve will turn white, indicating that you're in Erase mode.
4. Release the brush by lifting your pen from the tablet. The corners of the mask will disappear. Since symmetry has been enabled, the corner on the other side will also disappear (see right image in Figure 5.20).

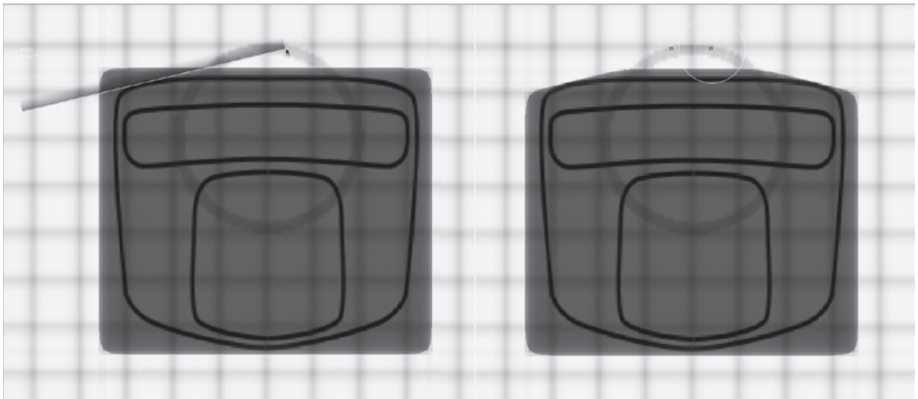


Figure 5.20
Drag the Mask Curve brush out at an angle from left to right (left image). Release the stroke to cut off part of the top of the mask (right image).

5. If instead you see two long masks shooting out at an angle, then you forgot to hold the Alt key or you let go before pressing the Alt key. This is an easy mistake to make. Just press **Ctrl+Z** to undo and try again.
6. To chop off any extra mask on the top, start the mask from the left side and drag toward the right. Hold the **Alt** key and then release to erase the little peak from the top of the mask (Figure 5.21).

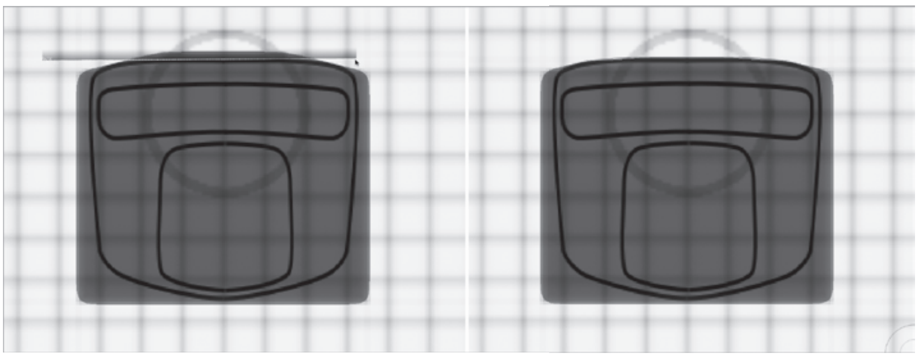


Figure 5.21
Use the Mask Curve brush to remove the very top of the mask.

Once you get the hang of refining the shape of the mask using straight lines, you can try using a curved line. To make a bend in the curve, press and release the **Alt** key while dragging out the curve. To make a sharper corner, press and release the **Alt** key twice.

7. Use Figure 5.22 as a guide for shaping the sides of the mask. Don't worry about detail at the moment; you just want to get a rough shape established. Sometimes it's easier to use series of mask curves rather than try to make a single mask curve that follows the reference perfectly.
8. When you're satisfied with how the front looks, rotate the view so you can see the result.

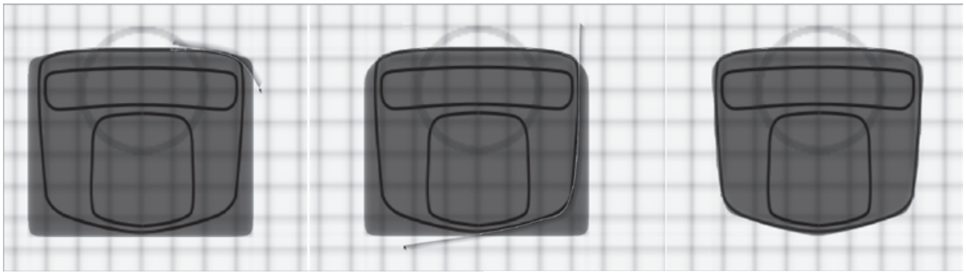


Figure 5.22
The Mask Curve brush is used to shape the mask so that it fits the shape shown in the reference image on ShadowBox.

From the perspective view, the mesh should look like a thick flat plane with angled corners, kind of like a piece of toast (see Figure 5.23). This is easier to see if you turn of the Transp button on the right shelf.

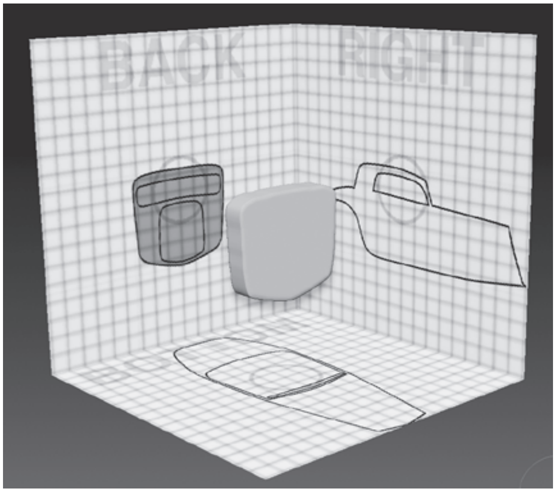


Figure 5.23
From a perspective angle the resulting mesh looks like a slice of toast.

9. Rotate the view so that you can see the side view clearly (remember to hold the **Shift** key after you start rotating the view in order to snap to a side view), and then scale up the view so that you can clearly see the profile of the car. Turn the Transp button on the right shelf back on if it has been turned off.
10. Use the Mask Rect masking brush to create a rectangle that covers the general shape of the profile. In this case, it may be easier to turn off the Center option in the Stroke palette and drag the mask out from the upper-left corner of the profile (see Figure 5.24).

It doesn't matter how tall the mask is, only how long it is. The resulting mesh will use the mask you've already created on the back side to constrain the height and width of the mask you create on the right side.

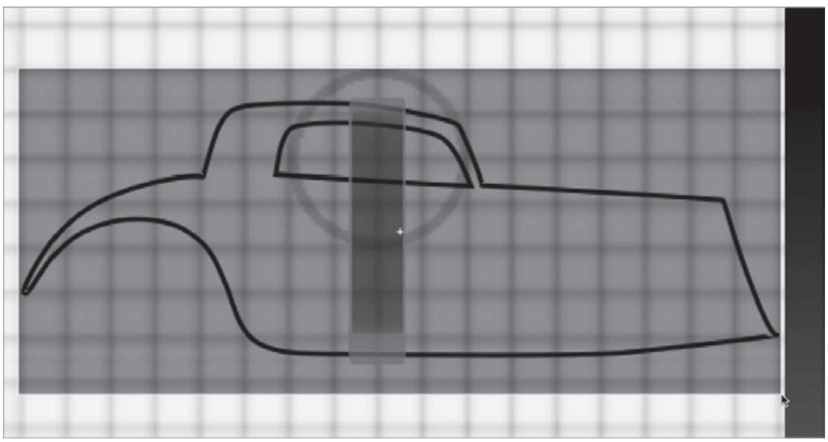
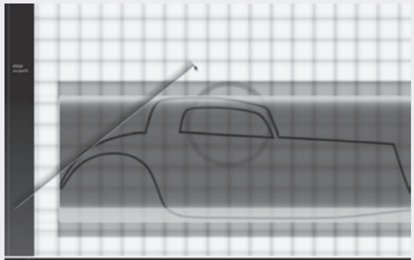
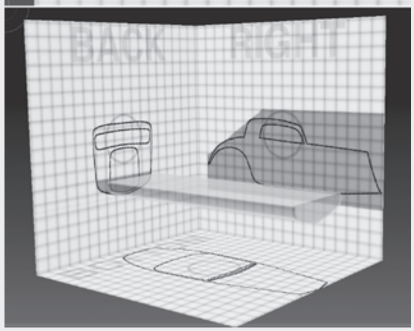


Figure 5.24
Draw a rectangular mask around the overall shape of the car body profile.

11. Once you have created the rectangular mask, switch back to the Mask Curve brush. You'll use this brush again to whittle down the rectangular mask until it matches the profile of the car body.
12. Rotate the view a little so you can see what's going on. **Ctrl+Shift-click** the plane that displays the right profile of the car body to isolate its visibility.
13. Rotate the view again so that you can see the profile.

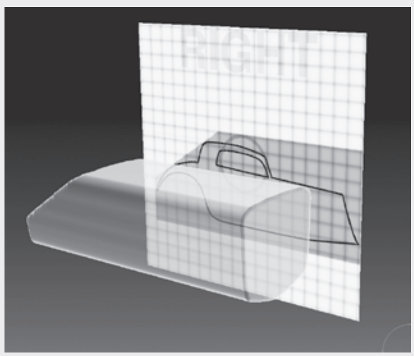
SHADOWBOX POLYGROUPING





Before you start slicing up the mask, I'd like to point out a tip that will save you some headaches while working in ShadowBox. Each side of ShadowBox is grouped separately. This means that you can hide all of the planes of ShadowBox except the one you are currently working on. This is helpful because a mask drawn on one side of the box can easily spill over to one of the other sides, which will cause strange behavior in the mesh created at the center. This is especially true when using the Mask Curve stroke type.

When you use the Mask Curve brush, the mask is generated on the shaded side of the curve and the mask continues on to infinity out into space. So let's say you use the Mask Curve to erase part of the mask near the back of the car. When you release the mask and then look at the mesh in perspective view, the top part has been chopped off, ruining all the work you did on the front. This is because the mask shoots out from the curve and erases not only part of the mask on the right side, but also part of the mask on the back side.



The solution to this problem is simple. Since each plane is a polygroup, just **Ctrl+Shift-click** the plane you need to work on and the other planes will be hidden. If part of the ShadowBox is hidden, the masking brush won't affect it, so you won't lose parts of your model.

Remember that you can Ctrl+Shift-click a polygroup to isolate its visibility, Ctrl+Shift-click on it again to invert visibility, and Ctrl+Shift-click on a blank part of the canvas to unhide everything.

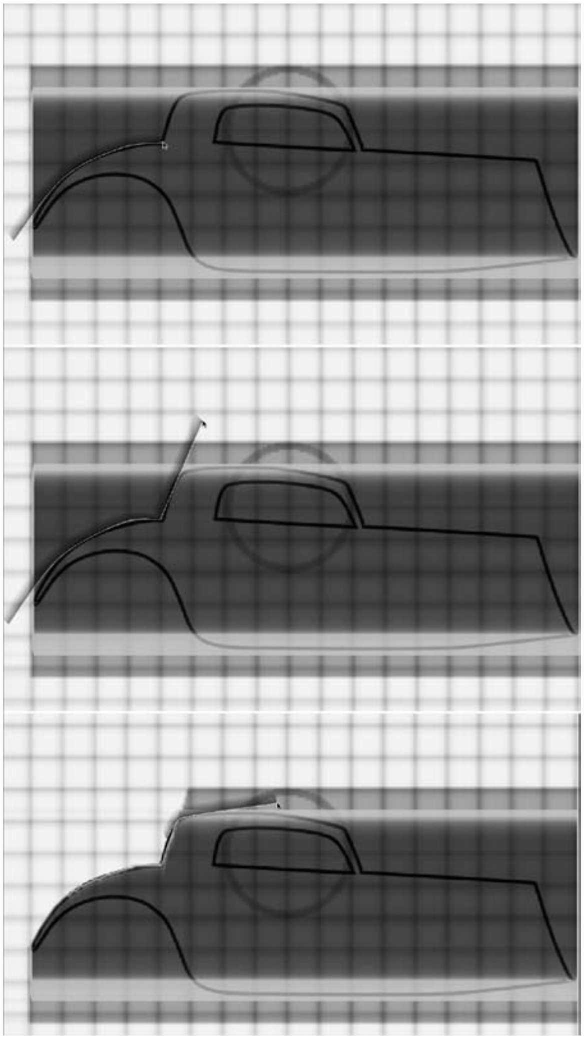


Figure 5.25
Draw the curve to match the shape of the trunk and the back of the car's top.

You'll continue to use the Mask Curve brush to work on the car, but now you'll add points to the stroke's curve so that you can match the curves of the profile. We'll start at the back of the car, work our way around the top toward the front, and then back toward the wheel well. This will take several strokes; it's not something you can do using a single curve. To add a point to a curve, press and release the **Alt** key while dragging the curve out. Keep your curves as simple as possible.

14. Click near the back of the car and drag up toward the right along the curved edge of the rear of the car. Press and release the **Alt** key to add a point. Try to match the arc of the rear of the car. You should need to only add two points to match this curve in the reference image (top image in Figure 5.25).
15. When you reach the point where the rear trunk meets the back of the car's top (where the rear window is), tap the **Alt** key twice. This adds two points on top of each other, allowing for a sharp corner. Drag the curve up past the top of the car (middle image in Figure 5.25).
16. Press and hold the **Alt** key and release the mask brush. The resulting mask should match the back of the car. It may take a couple of tries at first until you get used to creating masking curves.
17. Create another curve to form the rounded back of the top (bottom image in Figure 5.25).

Now you can create a curve that forms the roof, windshield, and hood (see Figure 5.26).

18. Finally, use a series of curves to refine the bottom. This time start each curve from the right and drag toward the left. The shaded side of the curve will face downward so that when you hold the Alt key and release the masking brush, the bottom parts of the mask will be erased. At this point, don't worry about creating the wheel well (see Figure 5.27).
19. This is a good place to save the project. Use the Save As button in the File menu to save the project as `HotRod_v01.ZPR`.

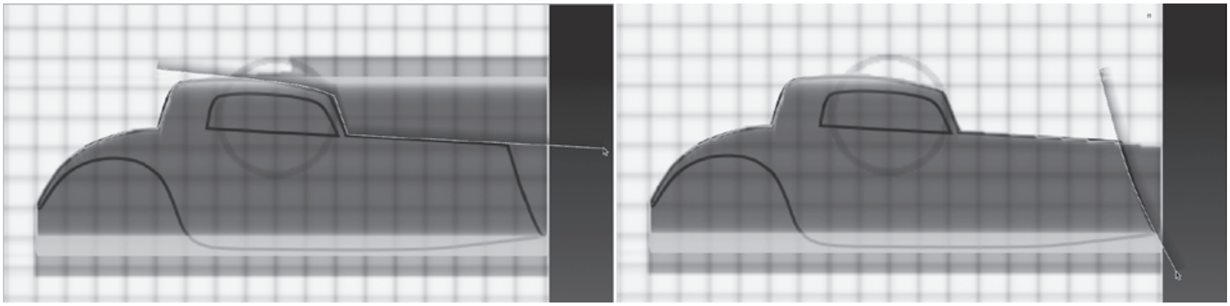


Figure 5.26
The profile of the top of the car is formed by using the Mask Curve brush to cut out parts of the mask.

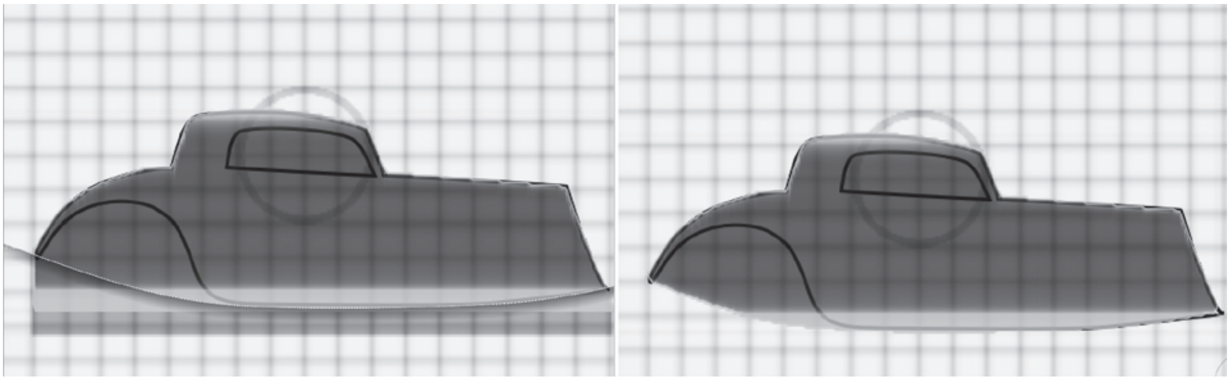


Figure 5.27
Use the Mask Curve brush to refine the bottom edge of the car.

Use the Mask Circle Brush

The Mask Circle brush simply creates the mask in the shape of an oval. This can be used to cut out the wheel-well in the profile of the car. As with the Mask Rect brush, you can activate the Center option so that the mask is created from the center of the stroke:

1. Continue with the project from the previous section or open the `HotRod_v01.ZPR` project from the `Chapter 5` folder on the DVD.
2. Open the sculpting brush fly-out library and press **m** and then **c** to switch to the Mask Circle brush. Remember that this brush is active only while you hold the Ctrl key.
3. Hold the **Ctrl** key, open the stroke type fly-out library on the left shelf, and turn on the Center button.
4. Turn on the Square button as well. This means that the circle fits within a square area, so instead of being an oval it will be a perfect circle (see Figure 5.28).

Figure 5.28
Turn on the Square and Center buttons in the stroke type fly-out library for the Mask Circle brush.

5. Hold the **Ctrl** key and drag outward from the center of the circular area of the wheel well.
6. It's usually impossible to get the mask perfectly placed the first time you drag it out, but this is an easy problem to solve. Before you release the mask, hold the **spacebar**. You can then move the mask around until you find the best position. This technique also works with the other type of mask brushes, such as Mask Rect and Mask Curve.
7. Once you have the mask positioned, hold the **Alt** key and release. This will cut a hole into the mask in the shape of a circle (see Figure 5.29).
8. Once you have used the Mask Circle brush to cut out the wheel well, switch back to the Mask Curve brush and use the curve to try to make the mask match the reference image a little better (see Figure 5.30).
9. Save the project as `HotRod_v02.ZPR`.

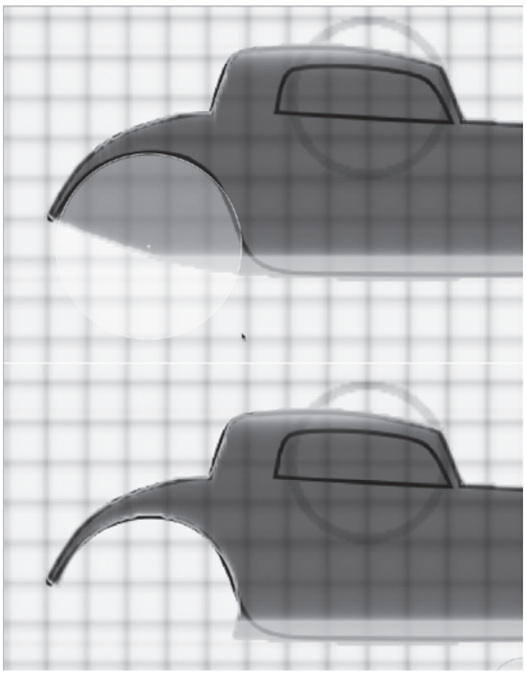


Figure 5.29
The Mask Circle brush is used to cut a circular hole for the wheel well.

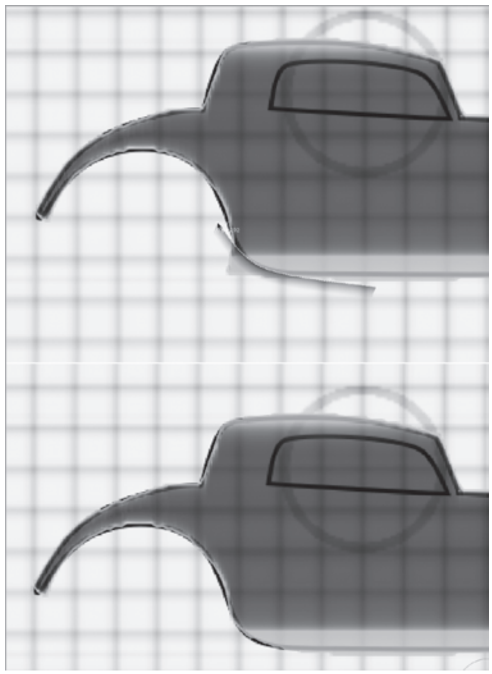


Figure 5.30
The extra parts of the mask are trimmed away using the Mask Curve brush so that the mask matches the profile.

Create the Top View of the Hot Rod

If you rotate the view of the ShadowBox, the mesh at the center looks a little jagged or "chunky." That's okay. As you create the final mask for the top view, you'll see that the mesh becomes a bit smoother again. Here are the steps:

1. Continue with the project from the previous section or open the `HotRod_v02.ZPR` project from the `Chapter 5` folder on the DVD.
2. Rotate the view of the ShadowBox so that you can see the mesh. Hold **Ctrl+Shift** and click on a blank part of the canvas to unhide the rest of the box.
3. Hold **Ctrl+Shift** and click on the bottom plane of the ShadowBox tool to hide everything but the bottom.
4. Rotate the view so you can see the ShadowBox from the top. Press **X** to activate symmetry.
5. Use the Mask Rect brush to draw a rectangle around the top of the reference image. It's easy to forget to do this, and then when you start to refine the edges, it seems as though nothing is happening. Don't forget to first create a rectangular mask that covers the top view of the car and then use the Mask Curve brush to shape the rectangular mask.
6. Use the Mask Curve brush to make the edges of the mask match the reference image. Use Figure 5.31 as a guide.
7. Save the file as `HotRod_v03.ZPR`.

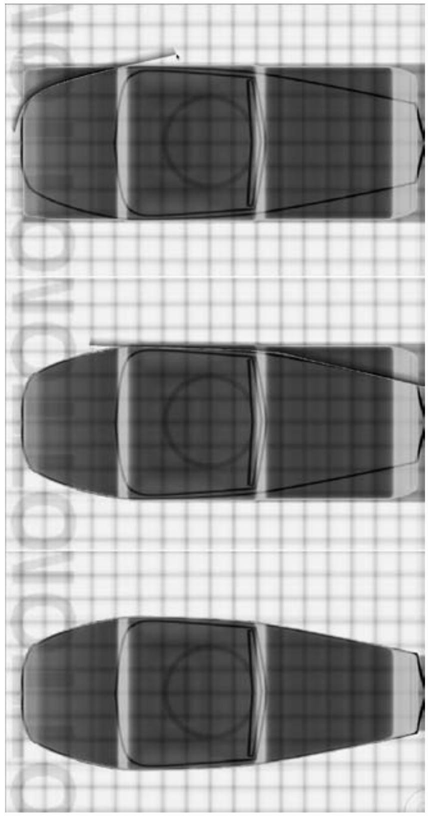


Figure 5.31

The Mask Curve brush is used to trim the mask from the top view.

Use the Mask Lasso Brush to Create Windows

To finish off the basic body of the hot rod, you can cut holes in the top for the windows. Using the Mask Curve brush won't work because you can't form a closed loop with the curve. Since the mask is created on one side of the curve, ZBrush won't understand how to create the mask when you try to make a loop. Instead you can use the Mask Lasso brush:

1. Continue with the project from the previous section or open the `HotRod_v03.ZPR` project from the `Chapter 5` folder on the DVD.
2. Open the sculpting brush fly-out library and press **m** and then **k** to choose the Mask Lasso brush. Remember that the brush is active only when you hold the Ctrl key.
3. Rotate the view of the hot rod so that you can see the right side.
4. Hold the **Ctrl** key and use the lasso to draw a shape roughly matching the window. Hold the **Alt** key before releasing the brush so that the mask is in Erase mode, otherwise nothing will happen when you let go of the brush (see Figure 5.32).

MASK LASSO OR MASK PEN?

The great thing about having so many masking options is that you can choose whichever mask brush fits your own modeling style. If you find that the Mask Lasso brush is hard to use, try switching to Mask Pen. Using Mask Pen, you can hold the Alt key and simply erase the window area on the ShadowBox plane. It's really up to you which method you prefer.

5. Rotate the view of ShadowBox so that you can see the back plane. Use the same technique to create the front windshield. Make sure symmetry is active so that you only have to draw the mask on one side of the windshield (see Figure 5.33).
6. Use the Save As button in the File menu to save the project as `HotRod_v04.ZPR`.

Congratulations. You've created your first ShadowBox model. The next step is to use the clip brushes to refine the edges, but before you get to that you can use a few more tricks in ShadowBox to create hubcaps for the wheels.

Figure 5.32
Use the Mask Lasso brush to create a window in the side view.

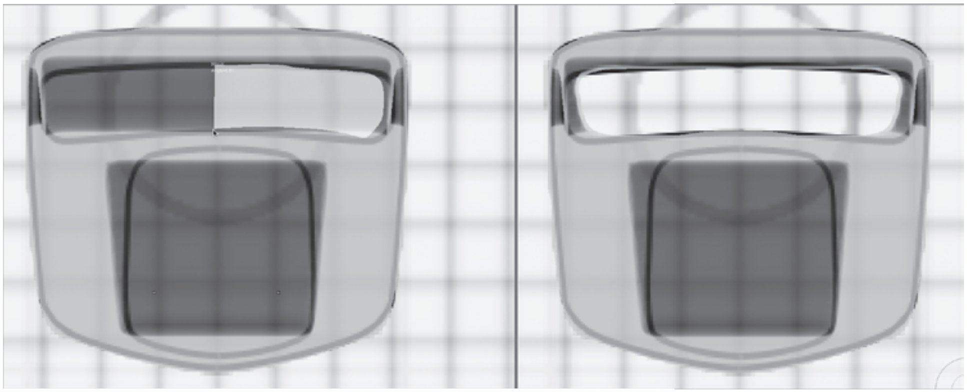


Figure 5.33

Use the Mask Lasso brush to create a window while facing the back plane of ShadowBox.

Use Radial Symmetry in ShadowBox

ShadowBox is a great way to explore shapes. Once you start to combine techniques, you can create some really interesting things. In this exercise, you'll look at some approaches for creating stylish hubcaps for the hot rod:

1. Start a fresh ZBrush session. Open Light Box to the tool section and double-click on the ShadowBox256.ZTL tool.
2. Draw the tool on the canvas by dragging out from the center and switch to Edit mode (hotkey = T).
3. In the material fly-out library on the left shelf, select the skinShade4 material so you can easily see the grid texture on the tool.
4. Turn off the Persp button on the right shelf, and turn on Transp and Ghost.
5. Press the Frame button on the right shelf to center the view of ShadowBox (hotkey = F).
6. Turn on the LSym button on the right shelf so that symmetry will be in line with the center of the back view of ShadowBox.
7. Expand the sculpting brush fly-out library and press **m** and then **c** to switch to the Mask Circle brush.
8. In the stroke type fly-out library, make sure the Square and Center buttons are on so that you can easily draw a perfect circle (The Square button just makes sure that the mask is perfectly round, that is, it fits into a square).
9. In the Transform palette, turn on Activate Symmetry if it's not on already. Turn on the >Z< button so that symmetry is activated on the z-axis. Turn on the (R) button so that radial symmetry is active and set RadialCount to 5 (see Figure 5.34).

Figure 5.34

Turn on Radial Symmetry on the z-axis and set RadialCount to 5.

Using Radial Symmetry, you can easily find the exact center of the back view of ShadowBox.

10. Hover the brush over ShadowBox. You'll see five red dots; these are the brush tips. Bring them toward the center until you see a single point. Hold the **Ctrl** key and drag outward to create a circular mask (left image in Figure 5.35).
11. Let go of the brush to create the mask. The mesh at the center of ShadowBox will be a circular disc (right image in Figure 5.35).

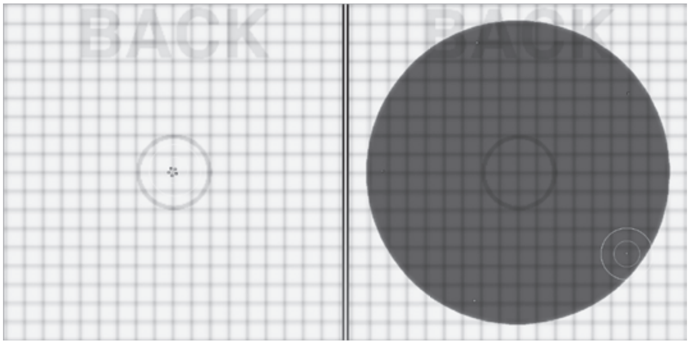


Figure 5.35
Use the five brush points to find the center of the back side of ShadowBox. Create a circular mask from the center.

Now for the fun part. You can start to experiment with designs using Radial Symmetry. This can get a bit addictive.

12. Move the brush tip away from the center of ShadowBox so that you see five red dots. Hold the **Ctrl** key and drag to create a circular mask. Make a small circle above the center. Hold the **Alt** key and release the brush to cut a circular hole into the mask (left and center images in Figure 5.36).
13. Five holes appear around the mask. Create a second series of larger circles slightly offset from the first. The result is a nice "bat wing" design for the hubcap (right image in Figure 5.36).

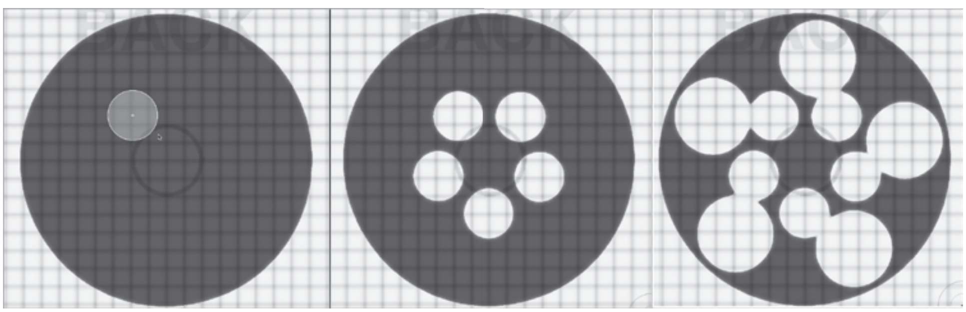


Figure 5.36
Circular masks are used to cut holes in the original mask. Using Radial Symmetry, you can easily create a pattern.

Experiment with different variations. You can try turning off the Square option in the stroke type fly-out library and use ovals. Try using the Mask Rect brush. Add more or less detail if you want. Figure 5.37 shows a few variations using different masking techniques. Try making freeform shapes using the Mask Lasso brush. Remember that you can hold the spacebar to reposition the mask before you release the masking brush.

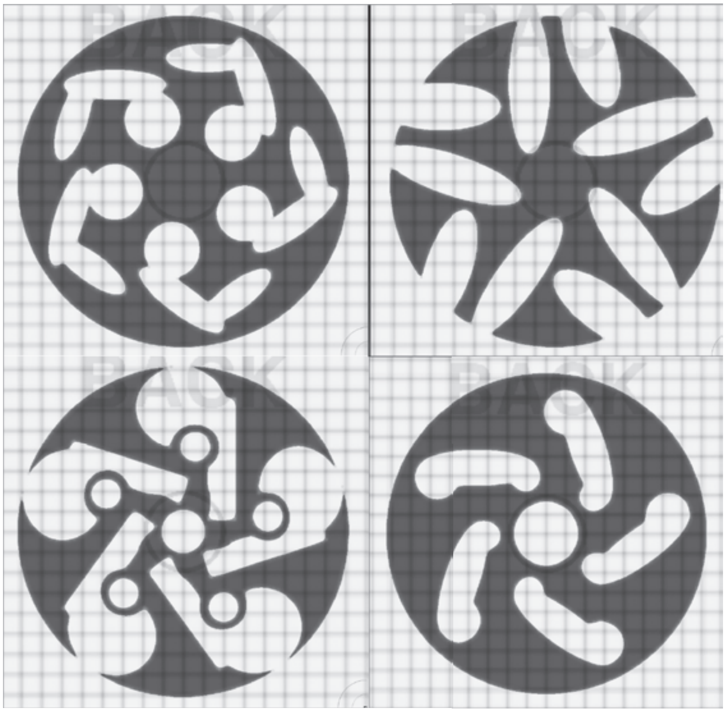


Figure 5.37
Use a variety of mask brushes and Radial Symmetry to come up with alternate hubcap designs.

Use Alpha Textures within ShadowBox

You can apply alpha textures to the masking brush to create precise designs. These can be the alpha textures that come with ZBrush or even your own custom textures that you can create in paint programs such as Photoshop, Painter, and Illustrator. Follow these steps:

1. Continue with the hubcap design you created in the previous section. Make sure Radial Symmetry is still active along the z-axis.
2. Open the sculpting brush fly-out library and press **m** and then **r** to switch to the Mask Rect brush. This is the best mask brush to use when you want to apply alpha textures to ShadowBox.

3. Open the alpha texture fly-out library on the right shelf and choose alpha 09. This is a simple circle alpha (see Figure 5.38).

Figure 5.38
Select the Mask Rect brush and choose Alpha 09.

4. Hold the **Ctrl** key and drag out across the back of ShadowBox, and then release the brush to create the mask (see Figure 5.39).

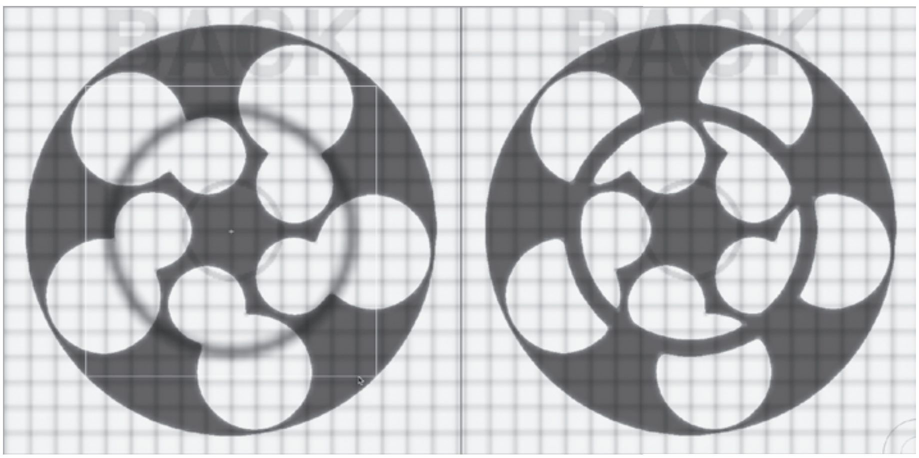


Figure 5.39
Using an alpha texture with the Mask Rect brush allows you to add complexity to your hubcap design.

Try variations to see what kind of designs you can create with this texture. You can also use the Import button in the Alpha palette to import your own alpha textures. The textures you import must be gray scale textures saved in TIFF, Photoshop, or BMP format. Figure 5.40 shows some of the designs I created using an alpha I created in Corel Painter. The alpha is called wingAlpha.BMP. You can open it from the `Chapter 5` folder on the DVD and try it yourself.

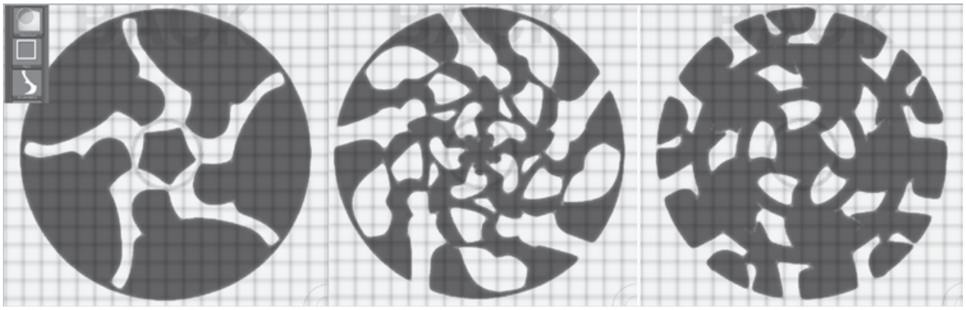


Figure 5.40
You can import custom alpha textures to create even more complex designs.

Match Maker Brush

The purpose of the Match Maker brush is to make one surface conform to another. For example, you can round the shape of the hubcap so that it's no longer a flat piece by using Match Maker to push the surface against a polysphere. In this section you'll do just that. The technique is very easy to use and a lot of fun:

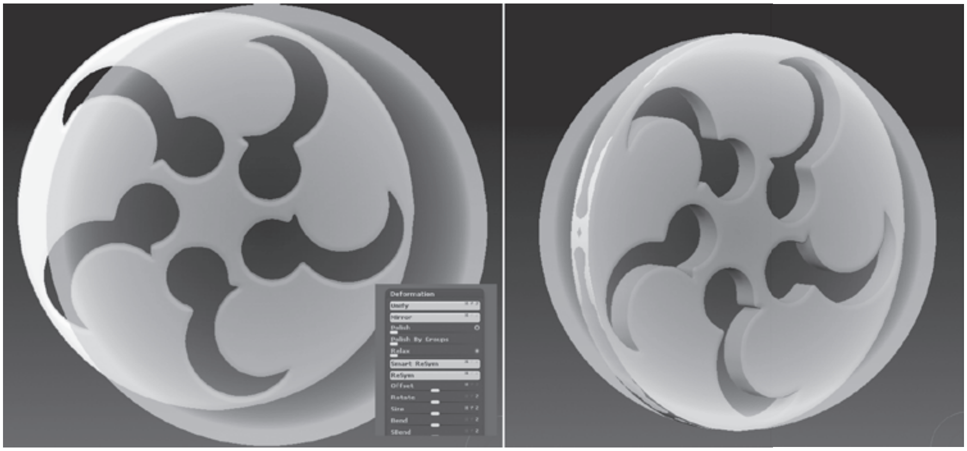
1. Open the `HubCap_v01.ZTL` tool from the Tool section of Light Box. Draw it on the canvas and switch to Edit mode (hotkey = T).
2. The hubcap is currently still a ShadowBox object. Open the SubTool subpalette of the Tool palette and turn the ShadowBox button off. Now the hubcap is a mesh which you can sculpt with any of the sculpting brushes (see Figure 5.41).

You'll need a round surface to act as a template for the Match Maker brush. A slightly flattened PolySphere should work just fine.

3. Open Light Box to the Tool section and double-click the PolySphere to load it into ZBrush. The canvas will automatically switch to the PolySphere in Edit mode. Don't worry if the hubcap disappears; it is still available in the Tool palette.
4. Open the SubTool subpalette of the Tool palette and click the Append button. Choose the hubcap to append it to the PolySphere.
5. On the right shelf, click the Transp button and rotate the view. You should see the hubcap appear as a transparent object inside the PolySphere.
6. Chances are the hubcap and the PolySphere are not aligned very well (Figure 5.42). There is a quick way to fix this. Select the hubcap in the SubTool subpalette of the Tool palette. Expand the Deformation subpalette of the Tool palette and click the Unify button at the top.

Figure 5.41
The hubcap is now a sculptable mesh.

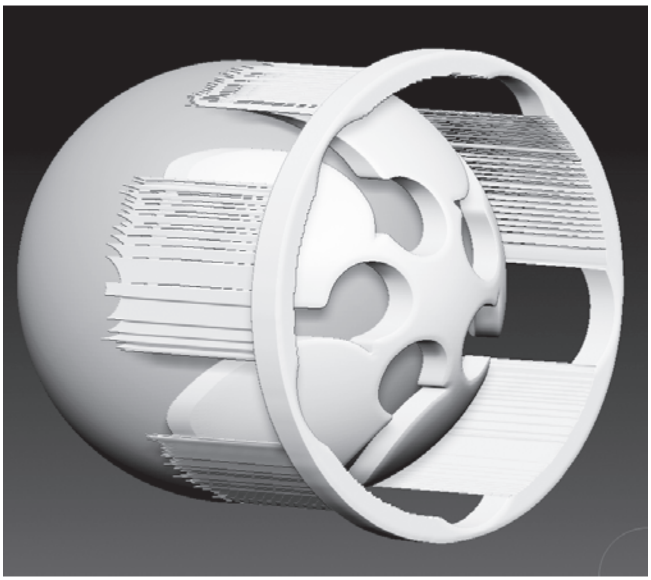
Figure 5.42
The hubcap is out of alignment with the PolySphere tool.



The Match Maker brush pushes the selected SubTool up against the other visible SubTools to make the surfaces conform. For it to work properly, there should be no empty space behind the selected SubTool, so the PolySphere needs to be scaled up a little so that the edges of the hubcap don't get distorted (see Figure 5.43).

7. In the SubTool subpalette of the Tool palette, select the PolySphere SubTool. Expand the Deformations palette. Click the Size deformer slider so that the numeric value appears highlighted in red. Type the number **10** and press **Enter**. You'll see the PolySphere grow slightly so that now the hubcap easily fits inside.

Figure 5.43
If there is empty space behind the SubTool, the Match Maker brush will not function properly.



8. Rotate the view of the PolySphere and hubcap so that you can see them from the side. In the Deformations subpalette, click the x and the y letters to the right of the Size slider to turn off these axes. Drag the Size slider all the way to the left; this will flatten the PolySphere a little (left image in Figure 5.44).
9. In the Deformations subpalette of the Tool palette, turn off the x and y buttons for the Offset deformer. Drag the Offset slider to the right until the PolySphere appears to the left of the hubcap (middle image in Figure 5.44).

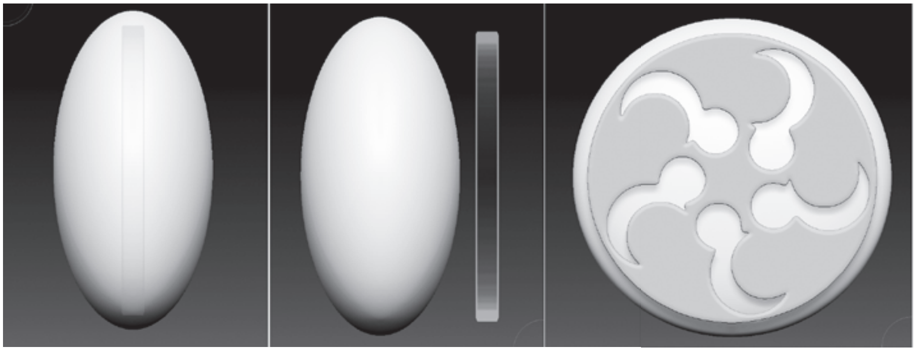


Figure 5.44

The PolySphere is flattened and moved to the left of the hubcap in the side view. From the front view the hubcap is ready to be pressed against the PolySphere with the Match Maker brush.

10. Switch to the HubCap SubTool and rotate the view so that you can see the hubcap straight on from the front (see right image in Figure 5.44). Turn off the Transp button on the right shelf.
11. Open the sculpting brush fly-out library. Press **m** and then **m** again to switch to the Match Maker brush (see Figure 5.45).
12. On the top shelf, make sure the Zsub button is on. Set Z Intensity to 40.
13. Turn off symmetry (hotkey = X). Position the brush at the center of the hubcap and then drag outward. You'll see the hubcap change, although it won't be clear what's happening until you're done.
14. Once you've dragged all the way out past the edge of the hubcap, let go of the brush and rotate the view. You'll see that the hubcap now appears rounded, matching the surface of the PolySphere. The design on the hubcap has been preserved (see Figure 5.46).

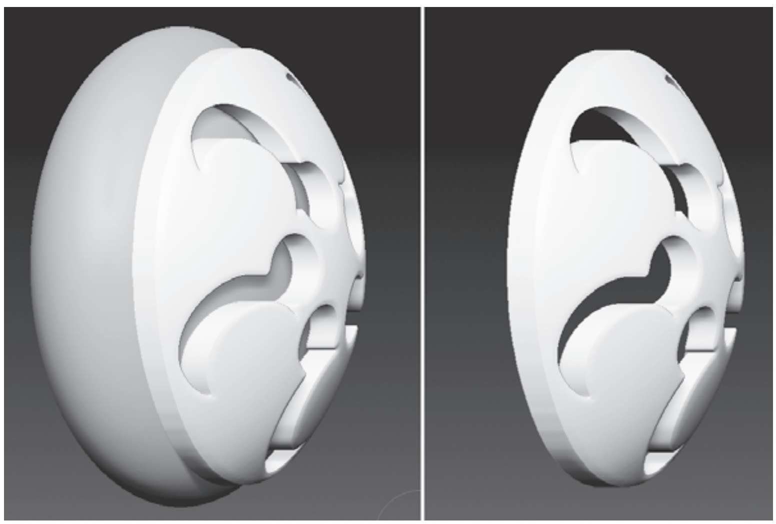
Figure 5.45

The Match Maker brush is selected in the sculpting brush library.

The Match Maker brush is extremely useful and versatile. In the Tool section of Light Box, you'll find several example tools named MatchMaker1.ZTL, MatchMaker2.ZTL, and so on. These have been set up for you to experiment with.

Figure 5.46

The hubcap appears rounded after using the Match Maker brush.



15. In the SubTool subpalette of the tool palette, select the PolySphere SubTool. Press the Delete button at the bottom of the SubTool subpalette to remove the PolySphere. Use the Save As button in the Tool palette to save the tool as `HubCap_v02.ZTL`.

Clip Brushes

Like ShadowBox, the clip brushes are new to ZBrush 4 and offer an entirely new approach to modeling. They are particularly well suited for hard surface modeling and, among their many possible applications, they do a good job of refining the edges of meshes created in ShadowBox.

Clip brushes use the same stroke types as the mask and selection brushes—namely the rectangular, circle, lasso, and curve stroke types. They are used to slice away parts of the surface, but it is important to understand that they don't actually delete geometry; rather they squash the selected polygons so that they conform to the selected shape. Imagine taking a lump of clay and squashing it down on a flat surface; that's the basic idea behind how clip brushes work.

In the following exercises, you'll get a taste for the kinds of things you can do with these brushes but the creative possibilities stretch far beyond this simple introduction. Let's start by trying the brushes out on a PolySphere.

Clip Brush Basics

There are a few rules you have to be aware of when using the clip brushes. An understanding of these rules will help you make sense of how the brushes work. Clip brushes are automatically mapped to the Ctrl+Shift hotkey, just like the selection brushes. When you choose ClipCircle, ClipCircleCenter, ClipCurve, or ClipRect, you'll get a warning that lets you know that these brushes are activated by holding Ctrl+Shift together. Be aware that both the clip brushes and the selection brushes share the Ctrl+Shift hotkeys.

This example demonstrates the basics of using the Clip Brushes.

1. Start a fresh session of ZBrush, open up Light Box to the Tool section, and double-click the PolySphere.ZTL tool. Make sure the tool is on the canvas and that Edit mode is enabled on the top shelf.
2. From the material fly-out library, choose the skinShade4 material.
3. On the right shelf, activate the PolyF button so that you can see the wireframe display on the polygons.
4. Open the sculpting brush fly-out library and press **c** and then **r** to choose the ClipRect brush. A warning appears reminding you that this brush is activated by holding Ctrl+Shift together (see Figure 5.47). Press Skip This Note Until Next Restart so that the next time you choose a clip brush, you don't see the warning.
5. Make sure symmetry is disabled.

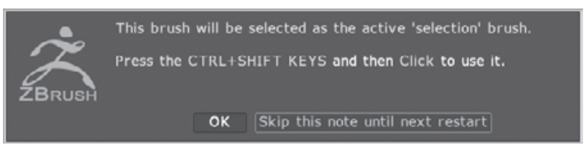


Figure 5.47
The ClipRect brush is assigned to the Ctrl+Shift hotkey combination.

6. Hold **Ctrl+Shift** and drag the rectangular shape over the top two-thirds of the PolySphere (left image in Figure 5.48). When you release the brush, it appears as though the bottom has been chopped off (middle image in Figure 5.48).
7. Rotate the view and zoom in so that you can see the bottom. You can see that the polygons have not been deleted, they've just been flattened (right image in Figure 5.48).

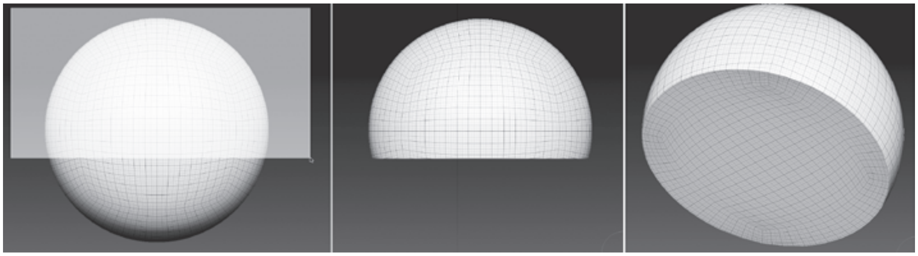


Figure 5.48
The ClipRect brush squashes all the polygons outside of the rectangular selection so that they fit within the selection area.

All the polygons outside the selected area are pushed up so that they fit within the rectangular selection.

8. Press **Ctrl+Z** to undo the last action. The PolySphere should return to its rounded state.
9. Now hold **Ctrl+Shift** and select just the upper third of the PolySphere (see Figure 5.49).

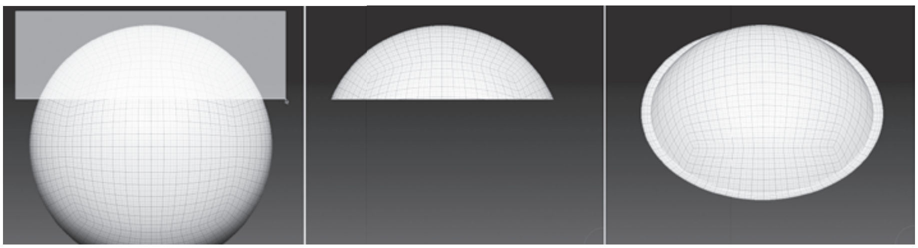


Figure 5.49
The top third is selected using the ClipRect brush, but this leaves a very thin lip around the edges of the selected area.

The bottom two-thirds disappear, but notice that when you rotate the view, you can see what appears to be a flattened lip around the edge of the remaining section (left image in Figure 5.49). This is because the lower two-thirds are pushed straight up to meet the outer edge of the selection rectangle but they are not pushed inward toward the center. This creates a flattened rim. When using the clip brushes, keep this in mind.

Holding the Alt key inverts the selection so that polygons within the selected area are pushed out of the selected area. Be careful when using this technique with the ClipRect brush because it usually creates very strange results (see Figure 5.50).

You can use the Square option in the stroke type fly-out library to make the selected area a perfect square and the Center option so that the selection starts at the center of the stroke rather than at the corner.

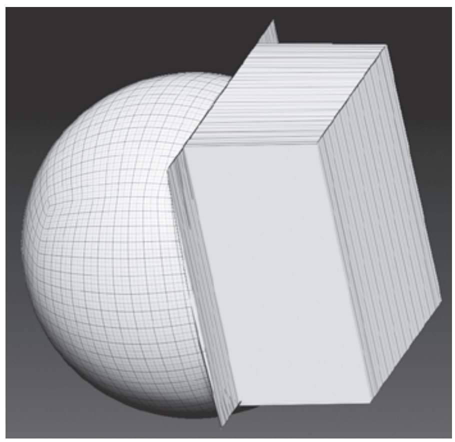


Figure 5.50
Holding the Alt key before releasing the ClipRect brush inverts the clipping action but can cause some odd results.

To turn these on, hold **Ctrl+Shift** and open the stroke type fly-out library on the right shelf. Click the Square and Circle buttons.

You can reposition the selection area before you release the brush. Just hold the **spacebar** and drag on the canvas. This allows you to precisely position the clipping area.

Use the Clip Circle Brush

The Clip Circle brush works just like the ClipRect brush except that the selection area is circular:

1. Press **Ctrl+Z** to undo any changes you've made to the PolySphere.
2. Open the sculpting brush fly-out library and choose the ClipCircle brush.
3. Hold **Ctrl+Shift** and drag an oval over the top two-thirds of the PolySphere. Release the brush.

Just as with the ClipRect brush, the area outside the selection is clipped away. When you rotate the view, you can see how the polygons outside the circular selection are pushed up to match the edges of the circle (see Figure 5.51).

4. Press **Ctrl+Z** to undo the last action.
5. Press **Ctrl+D** twice to add two more subdivisions to the PolySphere.
6. Hold **Ctrl+Shift** and drag a small circular selection on top of the PolySphere. Hold the **Alt** key and release.

The result is strange but also kind of interesting. The polygons are pushed out of the selected area as much as possible, resulting in a flattened circular plane within the PolySphere. This can be used for interesting details (see Figure 5.52). Notice that the wire frame on the PolySphere shows how this technique distorts the topology of the surface.

The ClipCircleCenter brush is just like the ClipCircle brush except that the Center and Square options in the stock type fly-out library are already enabled.

7. Spend a few minutes experimenting with the ClipCircle and ClipRect brushes. They take a little practice to get used to. As you'll soon discover, they are great tools for creating crisp edges and details for hard surface models.

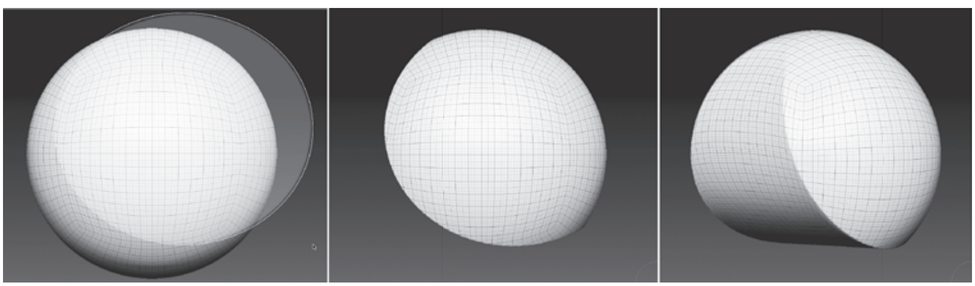


Figure 5.51

The ClipCircle brush clips away everything outside of the circular selection area.

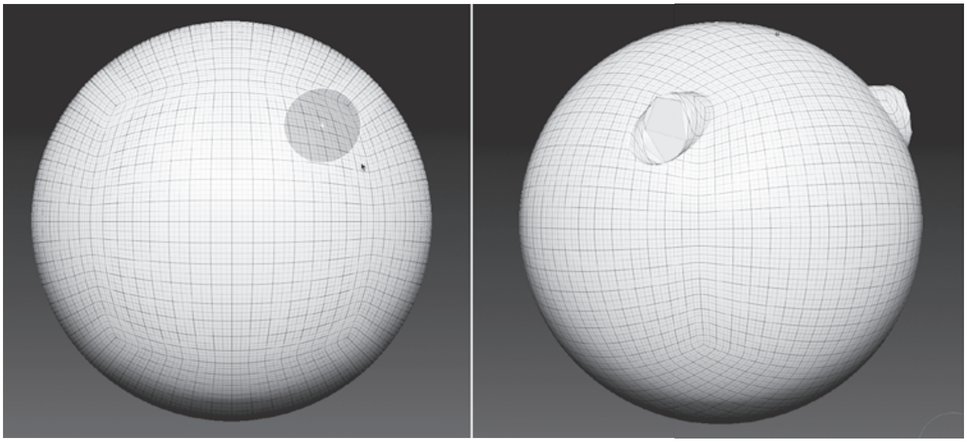
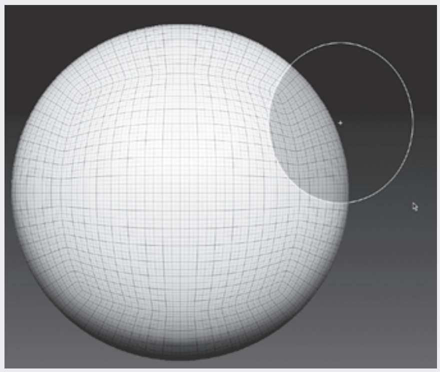


Figure 5.52
Hold the Alt key before releasing the ClipCircle brush on a small section of the PolySphere to create interesting details.

CLIP BRUSH CENTER

At the center of the clip brush boundary, you'll see a little plus sign indicating the center of the selection area. When using the circular clip brush and the Alt key together to cut away part of a surface, you'll get better results if the plus sign remains outside of the mesh.



Create a Tire Using Clip Brushes

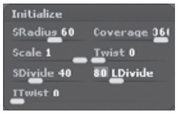
Now let's get some practice using these techniques to create a tire for the hot rod. You'll use the ClipRect and ClipCircle brushes to shape a torus into a tire:

1. Start a fresh session of ZBrush.
2. In the Tool palette, open the tool fly-out inventory and select the Ring3D tool. Draw the tool on the canvas and switch to Edit mode.

The Ring3D tool is a parametric 3D tool, meaning that it can't be edited using the sculpting brushes—including the clip brushes. You can convert it into a Polymesh object, but first you can establish a few settings just to thicken it up a little.

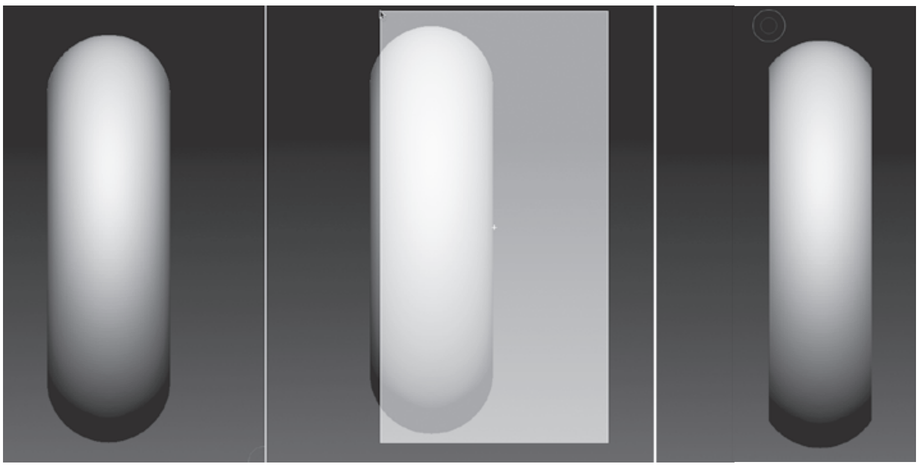
3. At the bottom of the Tool palette, expand the Initialize subpalette.

Figure 5.53
Set SRadius and the divisions in the Initialize palette.



4. Set SRadius to 60. Set SDivide to 40 and LDivide to 80 (see Figure 5.53).
5. At the top of the Tool palette, click the Make PolyMesh 3D button. At this point the object has been converted into a sculptable mesh.
6. In the material fly-out library, choose the Basic material.
7. Press **Ctrl+D** twice to add two levels of subdivision to the mesh.
8. Rotate the view of the tire so that you can see it from the side, as show in the left image in Figure 5.54.
9. In the Transform palette, turn on the Activate Symmetry button. Turn the >Z< button on and the >X< button off so that symmetry is created along the z-axis.
10. Hold **Ctrl+Shift** and drag out a selection box starting from the right and moving to the left. The box should cover most of the torus, as shown in the middle image of Figure 5.54. Release the brush. The tire will be flattened on both sides because symmetry has been activated as shown in the right image of Figure 5.54.

Figure 5.54
The ClipRect brush is used to flatten the sides of the tire.



Next you'll use the ClipCircleCenter brush to flatten the area of the tire tread. However, it can be a little tricky to find the center of the tire since there's a big hole at the center. Using Radial Symmetry can help with this problem.

11. In the Transform palette, turn on Radial Symmetry and set Radial Count to 16.
12. Rotate the view of the tire so that you can see it from the front.
13. From the sculpting brush library, choose the ClipCircleCenter brush.
14. Hold **Ctrl+Shift** and drag out from the center of the tire. Drag just so the edge of the selection circle is about halfway between the flattened edge of the tire and the outer edge, as shown in the left image of Figure 5.55.

15. Before you release the brush, hold the **spacebar** and move the selection circle. Try to center the selection with the tire as well as you can. Radial Symmetry will ensure that the clipping remains fairly circular.
16. Let go of the clipping brush to flatten the outer edge of the tire (right image in Figure 5.55).

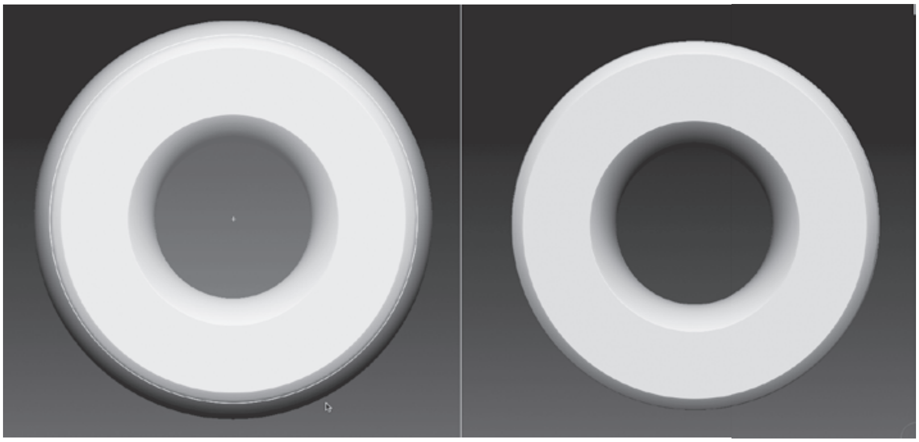


Figure 5.55
The edges of the tire are flattened using the ClipCircle brush.

17. Repeat steps 14 and 15, but this time align the selection brush with the inner edge of the flattened side of the tire. Once it's aligned, drag back toward the center.
18. Hold the **Alt** key and release the brush. This will flatten out the inside edge of the tire. This is a little tricky and may take you a couple tries to get perfect (see Figure 5.56).
19. If you want to make the tire a little wider, expand the Deformations palette, turn off the x and y buttons to the right of the Size slider, and move the slider to the right.
20. Use the Save As button in the Tool palette to save the tool as `tire_v01.ZTL`.

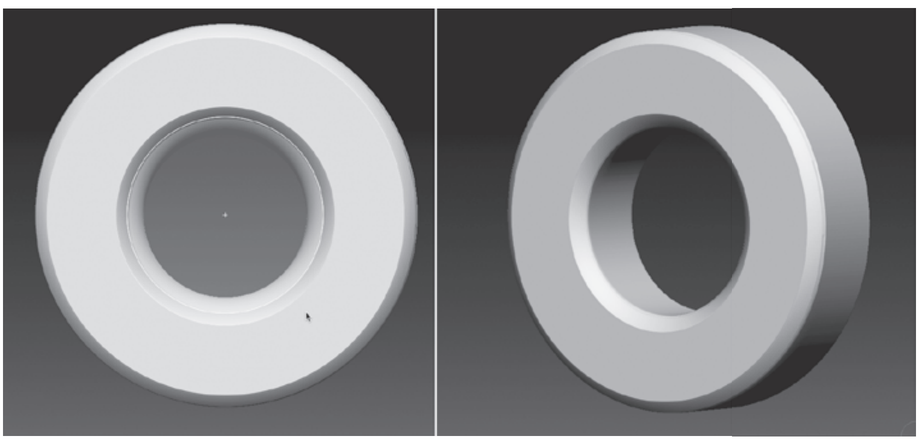


Figure 5.56
The inside edge of the tire is flattened using the ClipCircle brush.

Brush Radius and PolyGroup Clip Brush Options

The Brush Radius option constrains the size of the clipping based on the current radius of the brush. The PolyGroup option automatically divides the object into polygroups based on the clipped areas. In this section you'll use this option to add a little detail to the hubcap.

1. Continue with the tire model you created in the last section or open the `tire_v01.ZTL` tool from the `Chapter 5` folder on the DVD.
2. From the `Chapter 5` folder on the DVD, open `HubCap_v02.ZTL` using the Load Tool button in the Tool palette.
3. In the SubTool subpalette of the Tool palette, click the Append button. Choose the `tire_v01.ZTL` tool from the fly-out tool inventory to append it to the hubcap.
4. Turn on the Transp button on the right shelf. Expand the Deformation subpalette of the Tool palette.
5. Make sure the x, y, and z buttons are all active to the right of the Size slider. Move the slider to the left to scale down the hubcap so that it fits within the center of the tire (see Figure 5.57).

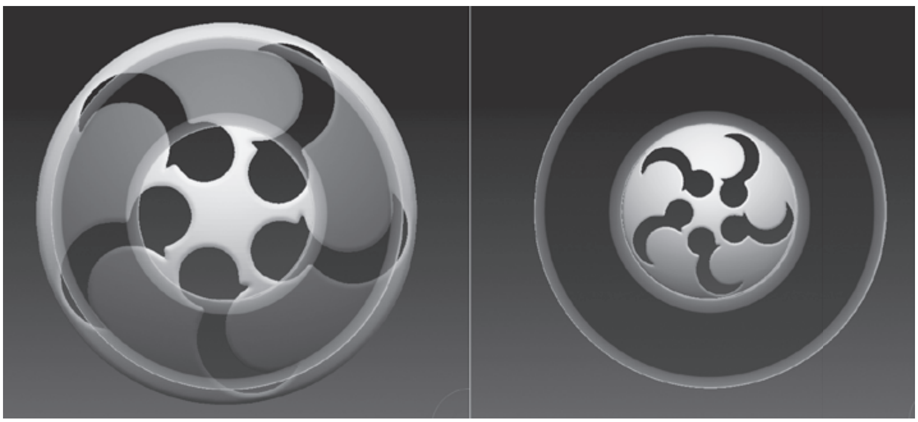


Figure 5.57
The hubcap is scaled down to fit within the tire.

6. Rotate the view of the tire to the side. In the Deformations subpalette of the Tool palette, turn off the x button next to Offset and turn on the z button. Move the slider to the left to move the hubcap out a bit (see Figure 5.58).
7. Turn off the Transp button.
8. Hold **Ctrl+Shift**. In the sculpting brush fly-out library on the right shelf, select the ClipCircle brush. Turn on Radial Symmetry on the z-axis for the hubcap if it's not already on.

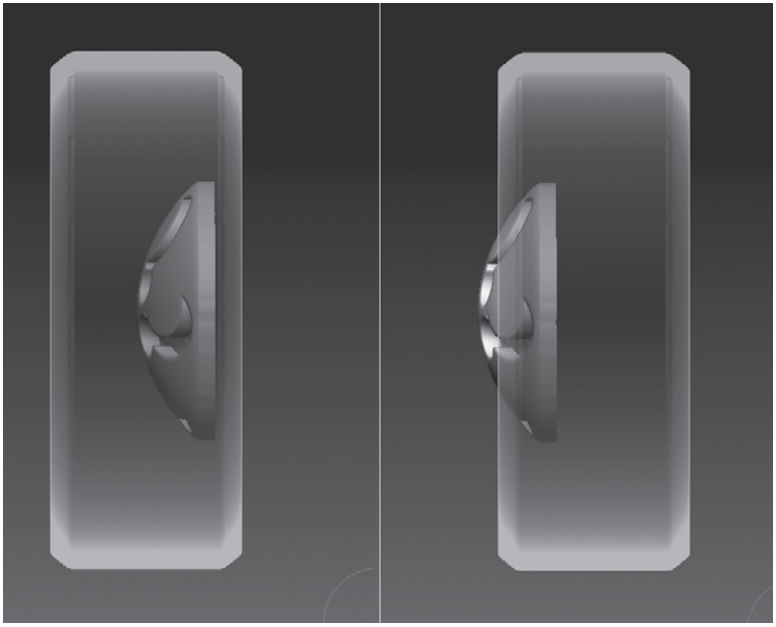


Figure 5.58

The hubcap is moved out from inside the tire.

9. Set the Draw Size slider on the top shelf to 10.
10. Rotate the view of the tire so that you can see the hubcap face-on. Position the brush at the center of the hubcap.
11. Hold **Ctrl+Shift** and press the **spacebar**. You'll see a small menu appear on the canvas with two options: BRadius and PolyGroup. Turn on both of these options (see Figure 5.59).
12. Hold **Ctrl+Shift** and drag outward from the center as shown in left image in Figure 5.60.
13. Hold the **Alt** key and release the brush. This creates a groove in the hubcap (see Figure 5.60).

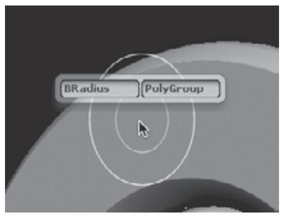


Figure 5.59

Hold the spacebar while the clip brush is activated to access the clip brush options. Turn on both BRadius and PolyGroup.

Figure 5.60

Create a circular selection with the clip brush. A groove is created in the hubcap because the BRadius option is on.

Because the BRadius option is on, the size of the clip is restricted by the Draw Size setting on the top shelf. This is a great technique for creating hard surface details such as grooves.

14. Turn on the PolyF button on the right shelf. You'll see that the face of the hubcap is now divided into polygroups based on the clipped area.
15. Save the tool as `wheel_v01.ZTL`. Save it to the `ZBrush 4/ZTools` folder so that it appears in the Tool section of Light Box.

Use the ClipCurve Brush

The ClipCurve brush uses a curve stroke type and is similar to the Mask Curve brush except that instead of masking an area, it clips it so that all the polygons on the shaded side of the curve are squashed to match the shape of the curve. The ClipCurve brush is great for designing complex surfaces and also works well for refining the meshes you make with ShadowBox.

Let's take a look at how the ClipCurve brush works by trying it out on a PolySphere:

1. Start a fresh session of ZBrush, open up Light Box to the Tool section, and double-click the PolySphere.ZTL tool. Make sure that the tool is on the canvas and that Edit mode is enabled on the top shelf.
2. From the material fly-out library, choose the skinShade4 material.
3. On the right shelf, activate the PolyF button so that you can see the wireframe display on the polygons.
4. Open the sculpting brush fly-out library and press **c** and then **c** to choose the ClipCurve brush. If this is a new session of ZBrush, you'll see the familiar warning advising you that the brush is mapped to **Ctrl+Shift**.
5. Hold the **Ctrl** and **Shift** keys and start a curve above and to the right of the PolySphere. Drag out a straight line that goes down past the right corner of the center of the PolySphere. The shaded side of the curve should be on the right of the curve line.
6. Release the brush. You'll see that the side of the PolySphere is now flattened (see Figure 5.61). The clipping action goes all the way through the surface in a direction that is perpendicular to the canvas.

Curve Snapping

You only need to hold Ctrl+Shift to activate the brush and start the curve. Once the curve is started, you can let go of Ctrl+Shift. If you continue to hold the Shift key, the curve will snap to specific angle increments. This can be a helpful aid in creating precise curves, but it can be confusing when you're just getting the hang of using the brush. If you notice that the curve is snapping from one angle to the next, let go of the Ctrl+Shift keys.

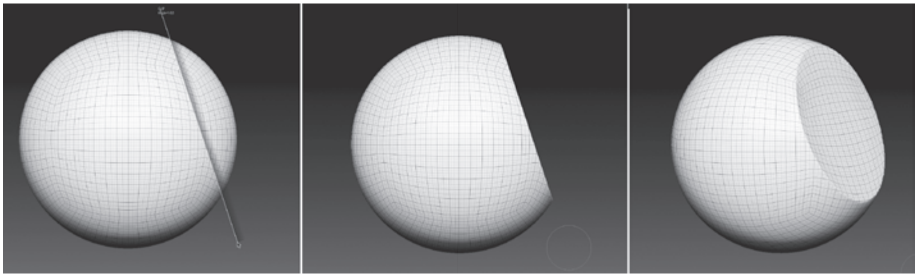


Figure 5.61
The surface is clipped on the right shaded side of the curve.

7. Press **Ctrl+Z** to undo and return the PolySphere to its unclipped state.
8. Now start a curve below and to the left of the center of the PolySphere; this time drag upward.
9. As you drag the curve up through the PolySphere, press the **Alt** key to add a point, and then change directions as you drag to make a curve. Add a few more points and then let go. The PolySphere is clipped so that it matches the curve (see Figure 5.62).

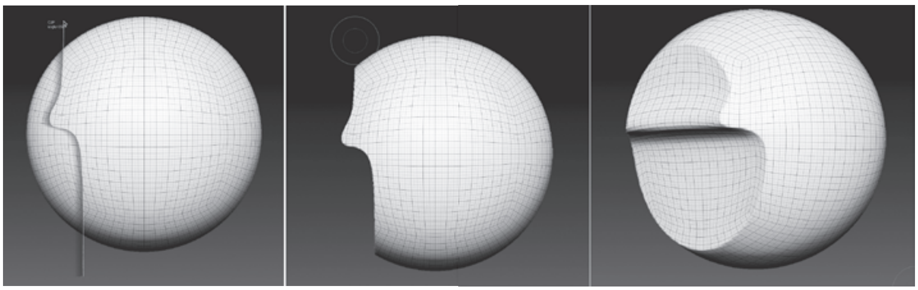


Figure 5.62
The clipped surface matches the contour of the curve.

There is a limit to the types of curves you can create. A curve that loops around will mangle the surface or create unpredictable results. Remember that all the polygons of the surface are squashed against the form of the curve in a straight line, so if the curve loops around, ZBrush will have a hard time clipping the surface (see Figure 5.63).

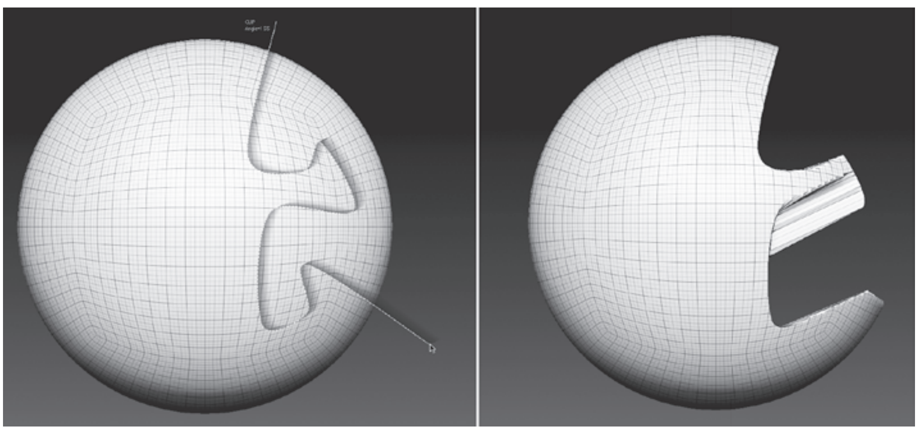


Figure 5.63
Complex curves cause unpredictable results when using the clip brush.

It's also important to pay attention to which side of the curve is shaded. If you drag the curve downward, the shaded side will be on the right; if you drag upward, the shaded side will be on the left. If you drag from right to left, the shaded side will be on top, and from right to left, the shaded side will be on the bottom. The shaded side is the clipping side. Holding the Alt key inverts the function of the brush so that the unshaded side becomes the clipping side. While you are first getting used to the way the brush works, try to avoid using the Alt key. Once you get the hang of it, you can start experimenting with using the Alt function.

If you need to reposition the curve, hold the spacebar and drag before releasing the brush. This is very helpful because it can be hard to draw the curve exactly where you want it on the first try. Typically you'll create a curve, then hold the spacebar and reposition the curve, and then let go. After a little practice this becomes somewhat second nature.

10. Press **Ctrl+Z** to undo and return the PolySphere to its unclipped state. Press **X** to activate symmetry along the x-axis.
11. Rotate the view of the PolySphere so that you can see two red dots when you hold the brush over the surface.
12. Use the ClipCurve brush to create a curving line down the right side of the surface. Release the brush. The surface is clipped symmetrically on both sides (see Figure 5.64).

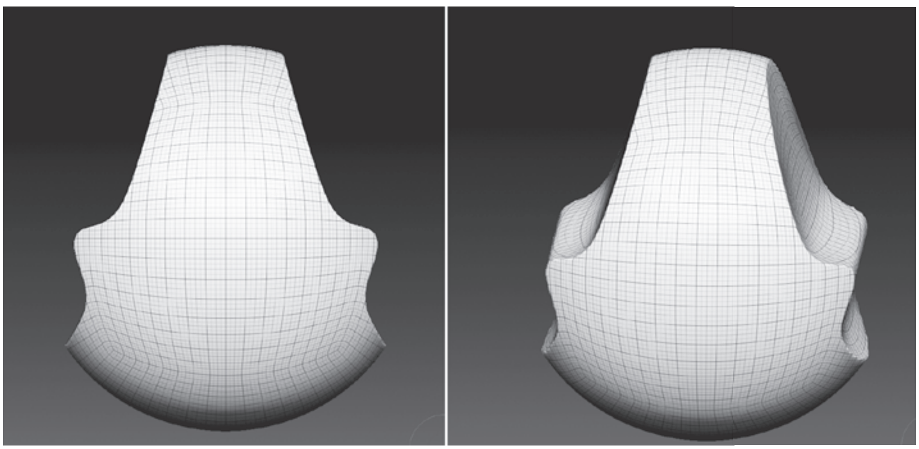


Figure 5.64
The surface is clipped symmetrically along the x-axis.

Using symmetry with the clip brush, you can create some really interesting shapes, but be aware that if you draw a curve that crosses over the center while symmetry is enabled, you'll get some strange results because the clipping action of one curve will overlap the area clipped by the symmetry (see Figure 5.65). Try using Radial Symmetry with the curve to create an interesting shape (see Figure 5.66).

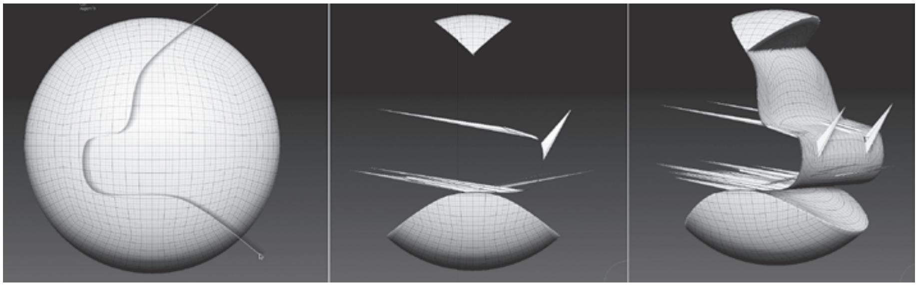


Figure 5.65
Curves that overlap the center point of the surface while symmetry is enabled can cause unpredictable results.

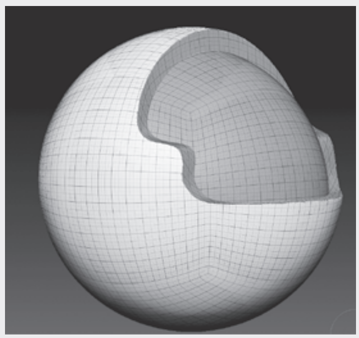
Figure 5.66
Use Radial Symmetry to create interesting shapes.

There is no ClipLasso brush in the Brush palette, but you can use the Lasso stroke type with the clip brushes. To select this stroke type, select one of the clip brushes and then, while holding **Ctrl+Shift**, open the stroke type fly-out library, and choose Lasso.

BRUSH RADIUS AND POLYGROUPS

Use BRadius to create curved grooves on the surface, just as with the ClipRect and ClipCircle brushes. You can activate these options by holding the spacebar when the brush is active. The option will appear in a pop-up on the canvas.

Use the PolyGroup option if you want the clipped part of the surface to be organized into a polygroup.



Refine the Car Body Using Clip Brushes

In this section, you'll get some hands-on experience using the ClipCurve brush to neaten up the edges of the hot rod car body created in ShadowBox. The general idea is to use the brush to refine the edges and prepare the model for detailing with the sculpting brushes. Here are the steps:

1. Use the Open button in the File menu to open the `HotRod_v04.ZPR` project you created earlier in this chapter, or open the file from the `Chapter 5` folder on the DVD.

Figure 5.67
Draw the clip curve to match the contour of the surface, and then hold the spacebar to position the curve over the surface. Release to create the clip.

2. At this point the body is still a ShadowBox tool. Expand the SubTool subpalette of the Tool palette and turn off the ShadowBox button to convert the mesh into a surface that can be sculpted.
3. Make sure the Persp button on the right shelf is off. The brushes work best when the tool is not in perspective mode.
4. Rotate the view so that you can see the model from the side view. Open the sculpting brush fly-out library and press **c** and then **c** again to select the ClipCurve brush.

Figure 5.68
With the ClipCurve brush, the edges of the car are cleaned up.

5. Scale up the view so that you are zoomed in to the car's roof. You'll use the curve to refine the back of the car's top.
6. Hold **Ctrl+Shift** and start a curve by clicking to the left of the car, as shown in the left image of Figure 5.67.
7. Let go of **Ctrl+ Shift** but drag the curve up to the right. Press the **Alt** key to add a bend in the curve. You want to create a curve that matches the shape of the top of the car. At the moment it's okay to draw the curve away from the car (left image in Figure 5.67).
8. When you have a curve that you like, hold the **spacebar** and drag the entire car down so that it overlaps the edge of the surface slightly (middle image in Figure 5.67). Release the brush to create the clip (right image in Figure 5.67).

If you mess up, just press **Ctrl+Z** and try again. It usually takes a couple of tries. Even experienced users have to try a few times to get exactly the curve they want. The beauty of computer graphics is that you can undo the action, as opposed to sculpting in the real world where it is possible to permanently ruin your work!

9. Repeat these steps to refine the outside edges of the car's profile, as shown in Figure 5.68. Remember that to make a sharp angle, tap the Alt key twice.
10. For the wheel well, you can try using the ClipCurve brush or switch to the ClipCircleCenter brush. Position the circular selection but hold the **Alt** key before releasing to create the circular clip (see Figure 5.69).

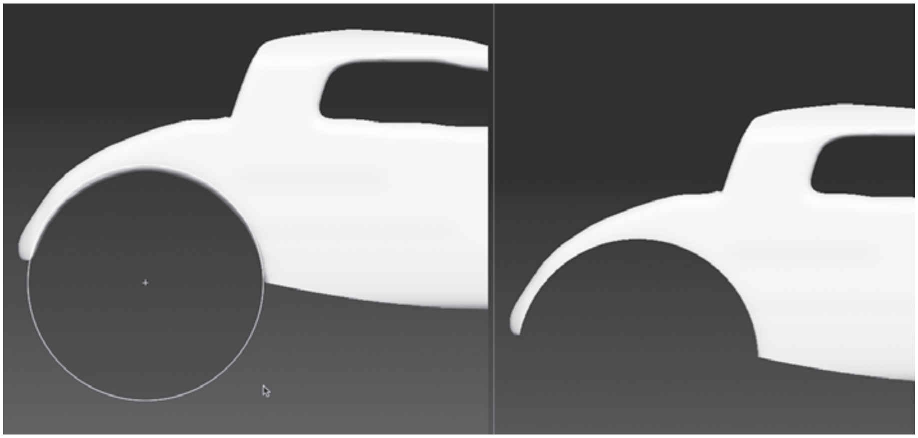


Figure 5.69
The ClipCurve brush is used to refine the wheel well.

11. You can use the same approach to refine the edges of the car from the top. Press the **X** hotkey to activate symmetry and make sure the LSym button on the right shelf is on (see Figure 5.70).
12. Use the Save As button in the File menu to save the project as `HotRod_v06.ZPR`.

Figure 5.70
With the ClipCurve brush, the edges of the car are cleaned up.

Clip at an Angle

For some parts of the car, you'll need to rotate your model to an odd angle in order to make a nice, clean, straight cut. For example, in the reference drawings used in ShadowBox, the front of the car is pointed out like a wedge. In the side view, the front slopes down at an angle (see Figure 5.71).

If you use the ClipCurve brush to cut the wedge from a straight-on, top view, you'll lose the sloping angle seen from the side. So in this case, to replicate that shape in 3D, you can simply rotate the view of the car to match the sloping angle of the front. It takes a little practice, but after a few tries you'll get the hang of it. Follow these steps:

1. Open your saved version of the HotRod_v06.ZPR project or use the example version from the `Chapter 5` folder on the DVD.
2. Rotate the view of the car while holding the **Shift** key and snap the view so that you're looking at the car from the top (top image in Figure 5.72).
3. Carefully right-click drag on the canvas from right to left so that the front of the car rotates away from the camera. You want the slope of the front of the car to be perpendicular to the viewing angle (bottom image in Figure 5.72).

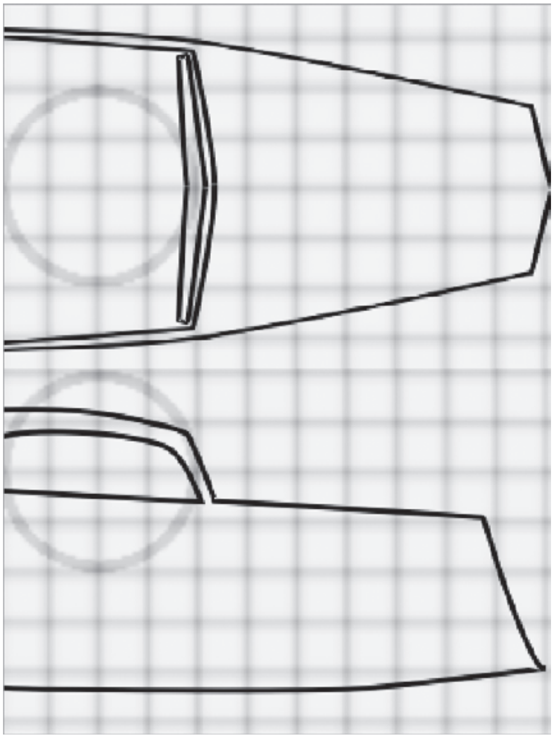


Figure 5.71

From the top view (top image), the front of the car is angled to form a wedge. From the side view (bottom image), the front is sloping at an angle.

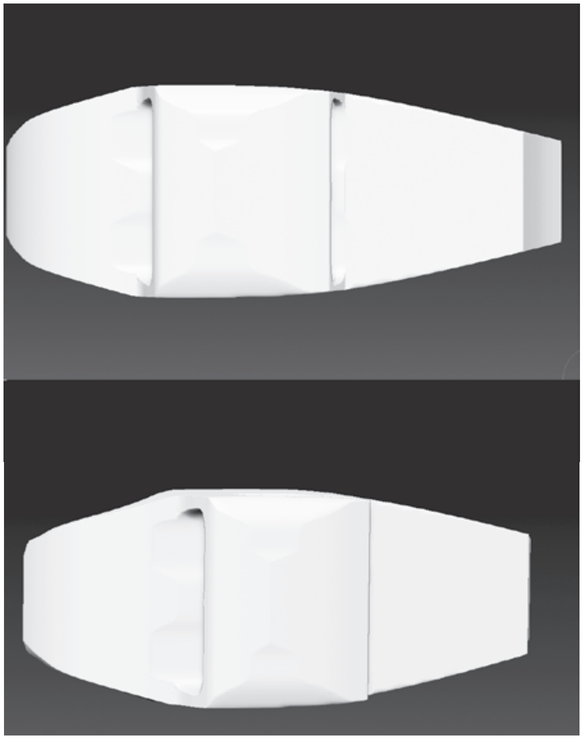


Figure 5.72

Rotate the view of the car so that you can see it from the top. Carefully rotate the view so that you're looking down along the slope of the car's front.

4. Open the sculpting brush fly-out library and press **c** and then **c** again to choose the ClipCurve brush.
5. Make sure symmetry is active across the x-axis and turn on the LSym button on the right shelf to turn on local symmetry.
6. Hold **Ctrl+Shift** and start dragging a curve down at an angle from left to right as shown in Figure 5.73.
7. Release the brush and then rotate the view and inspect the shape. If you didn't quite get it, press **Ctrl+Z** to undo and try again.

Once you get the hang of this, you can try creating a rounded curve for the edge of the trunk. This is a bit trickier because it requires making a curve line that clips the edge of the hood and goes from the front of the car up to the front plane of the windshield. Before you make the clip, you'll need to mask out the part of the car behind the windshield so it is not clipped as well.

8. Rotate the car so that you can see it straight on from the side.
9. In the brush fly-out library, press **m** and then **r** to set the mask brush to Mask Rect.
10. Hold the **Ctrl** key and drag a rectangular mask that covers the car from the windshield to the rear (see Figure 5.74).
11. Rotate the view so that you're looking at the car along the edge of the hood.
12. Hold **Ctrl+Shift** and draw a short curving line as shown in Figure 5.75. In this example, I clicked the **Alt** key twice while drawing the curve to create the two points necessary to make a smooth curve.
13. Release the brush to make the clip.
14. Rotate the view and inspect the clip. Press Undo and try again if it wasn't quite right. This area will be cleaned up even further with the sculpting brushes, so it's okay if the clip leaves some small bumps on the trunk (lower-left image in Figure 5.75).

You'll also notice some stretched polygons near the corner of the windshield. A little stretching is okay. You can fix this using remeshing and sculpting brushes. Remeshing is explained in Chapter 6.

15. Use these techniques to add a rounded edge to the roof and the trunk. Remember to use masks to control which parts of the car are clipped.
16. Use the Save As button in the File menu to save the project as `HotRod_v07.ZPR`.

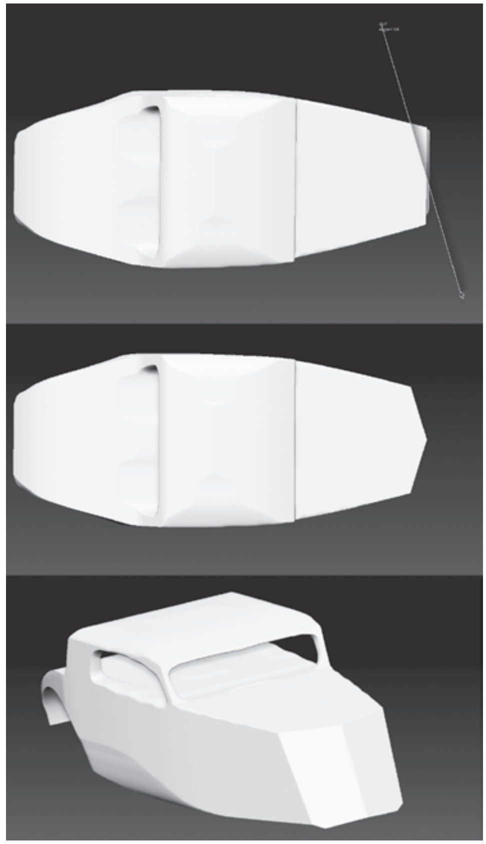


Figure 5.73

The ClipCurve brush is used to clip the front of the car at an angle.

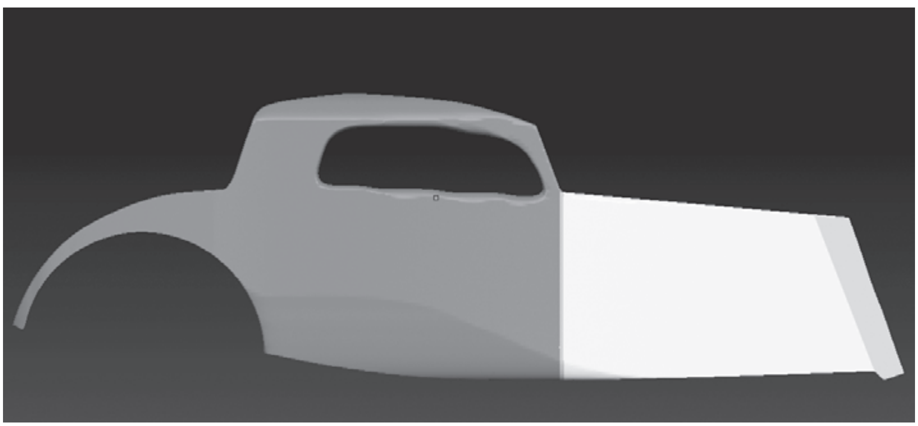
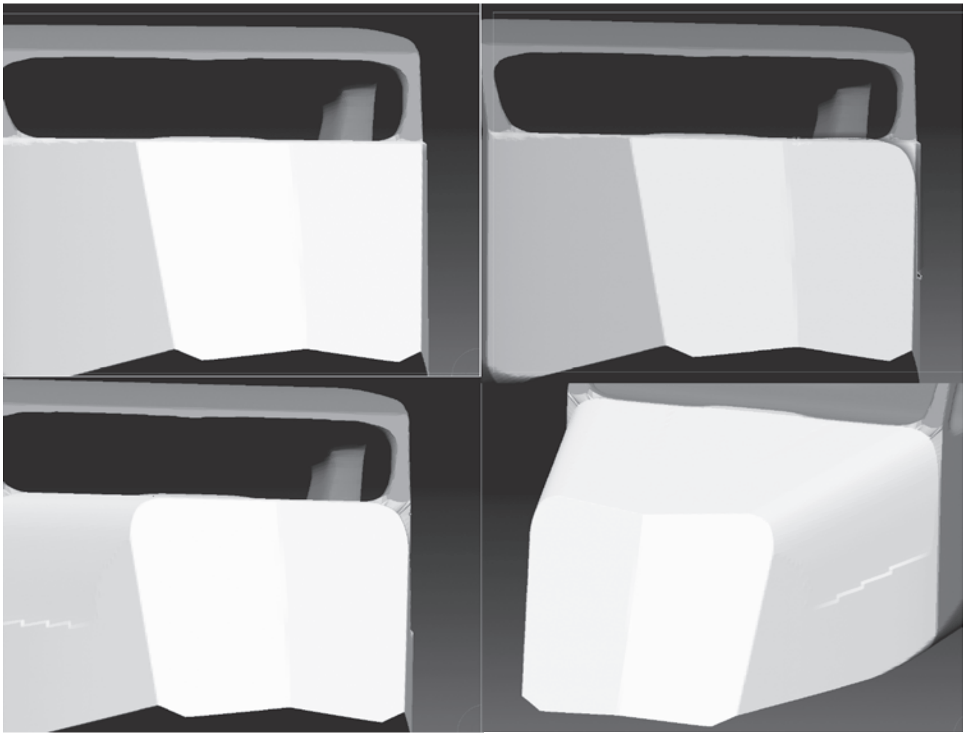


Figure 5.74

From the side view the car is masked from the windshield to the trunk.

Figure 5.75
The view of the car is rotated so that the car is viewed down the edge of the hood. A clip curve is used to create the rounded edge.



Refine the Windows Using Clip Brushes

The lasts part of the car body that need some cleaning up are the window openings. This is a little tricky since you can't create a closed loop with the clip curve. Again, using masks will help a lot (see Figure 5.76):

1. Open your saved version of the `HotRod_v07.ZPR` project or use the example version from the `Chapter 5` folder on the DVD.
2. Rotate the view of the car while holding the **Shift** key and snap the view so that you're looking at the car from the side.
3. Use the Mask Rect brush to mask everything below the top of the car.
4. Scale up the view so that you can see the window area up close.
5. Starting from the lower-right edge of the window, carefully draw out a curving line to match the shape of the upper part of the window opening.
6. Release the brush to make the clip.
7. Press **Ctrl+I** to invert the mask (or **Ctrl+click** on a blank part of the document). Draw the curve starting from the lower left and move toward the right to clip the bottom part of the window.

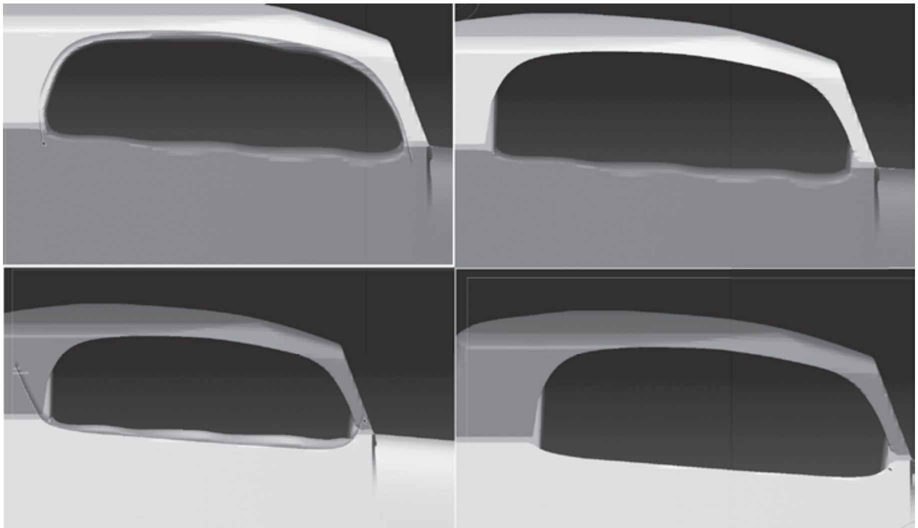


Figure 5.76
The window edges are refined using masking and the clip brushes.

8. Use the same technique to clean up the edges of the opening for the front windshield. This time mask the bottom of the car as well as the back part of the car top so that the work you do on the front of the windshield does not affect the opening for the back window.
9. Symmetry should be enabled so you only have to draw a curve for one side of the windshield. Start from the lower right and draw a curve moving up and to the left around the top edge of the windshield. To eliminate kinks in the curve, press the **Alt** key to add points, even along the straight parts of the curve at the top (see Figure 5.77).

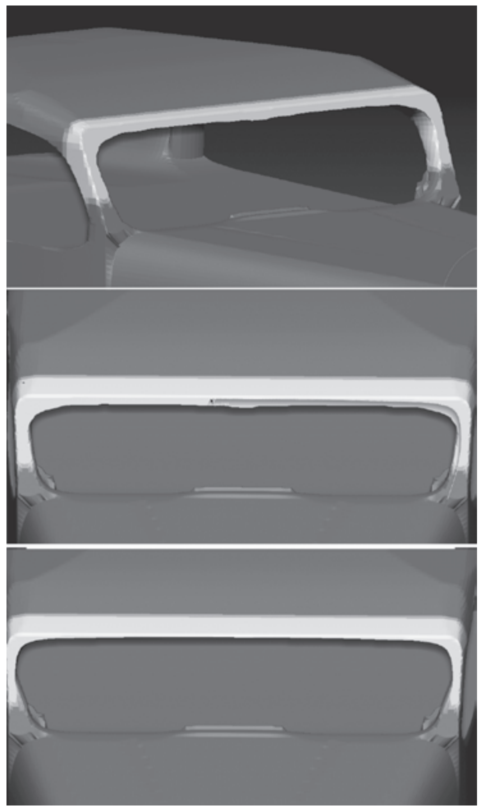


Figure 5.77
The ClipCurve brush is used to refine the opening for the windshield.

Relax the Mesh

At this point the edges should appear more refined, but no doubt the geometry is starting to look mangled. To fix this you can use the Relax deformer:

1. Hold the **Ctrl** key, drag on a blank part of the canvas, and release to clear any masks applied to the car.
2. In the Tool palette, expand the Deformation subpalette.
3. Select the Relax slider so that the numeric input value is selected; you'll see a zero highlighted in red.

4. Type a value of 1 and press the **Enter/Return** key. You'll see the surface relax and appear smoother. Many of the mangled parts of the geometry will disappear (see Figure 5.78).

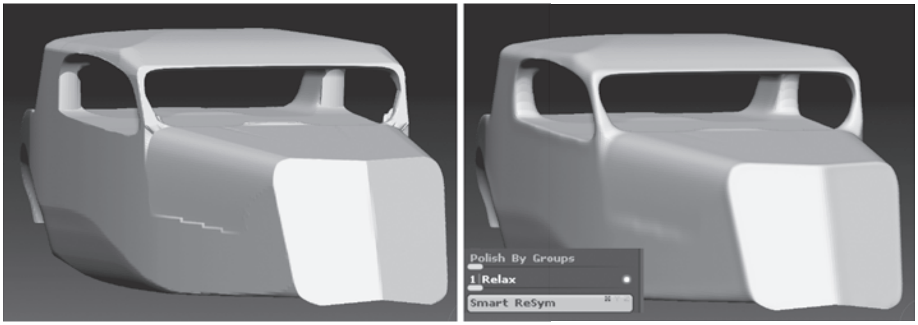


Figure 5.78
Use the Relax deformer to smooth the overall surface and remove artifacts left by the clip brushes.

5. Use the Save As button in the File menu to save the car as `HotRod_v08.ZPR`.

Create a Space for the Interior of the Car

The car model will look a little more convincing with space on the inside for drivers and passengers. To accomplish this, you can use masking and the clip brushes:

1. Open your saved version of the `HotRod_v08.ZPR` project or load the example version from the `Chapter 5` folder on the DVD.
2. Press **Ctrl+A** to mask the entire car model (or **Ctrl+Click** on the canvas).
3. Rotate the view of the car so that you can see it from the side.
4. Open the sculpting brush fly-out library. Press **s** and then **l** to choose the SelectLasso brush. This selection brush is mapped to the Ctrl+Shift hotkey combination.
5. Hold **Ctrl+Shift** and drag a selection around the roof of the car. You want to hide this part so that you can easily work on the inside of the car (see Figure 5.79). Hold the **Alt** key, let go of **Ctrl** and **Shift**, and release the brush to make the selection. The top of the car will disappear.
6. Rotate the view of the car so that you can see it from the top. Open the sculpting brush fly-out library and press **m** and then **m** to choose the Mask Pen brush.
7. Hold **Ctrl+Alt** together to erase the mask in the inside of the car (see Figure 5.80).
8. Hold **Ctrl+Shift** and click on a blank part of the canvas to unhide the top of the car.
9. Rotate the view so you can see the car from the side. Open the sculpting brush fly-out library and press **c** and then **c** again to select the ClipCurve brush.
10. Hold **Ctrl+Shift** and draw a curve from left to right as shown in Figure 5.81.

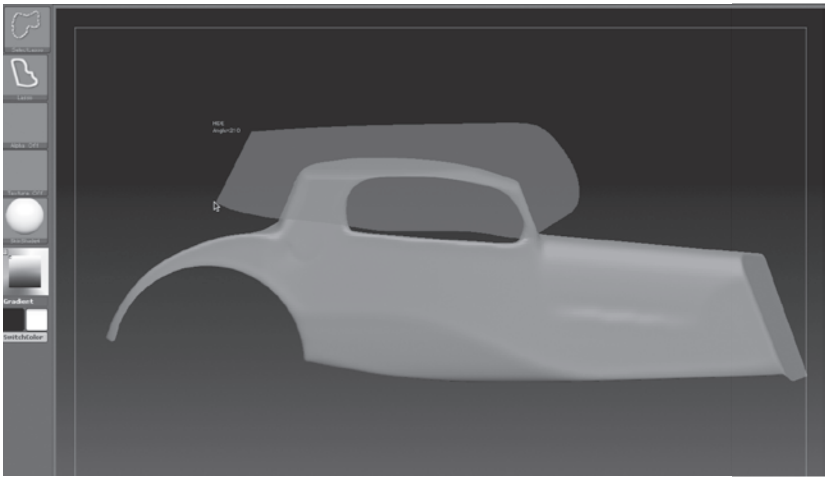


Figure 5.79

Use the SelectLasso brush to select the top of the car.

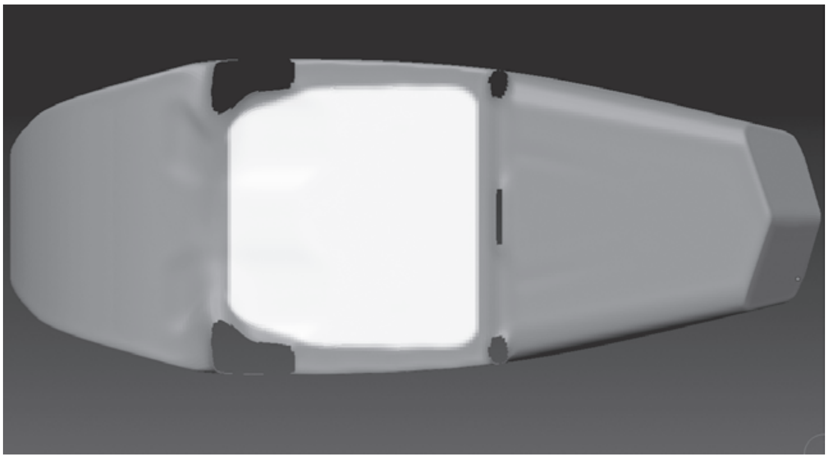


Figure 5.80

Erase the mask for the center of the car.

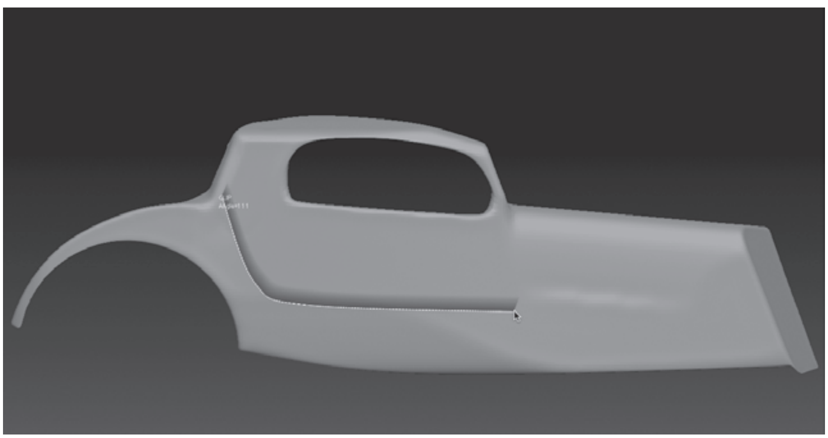
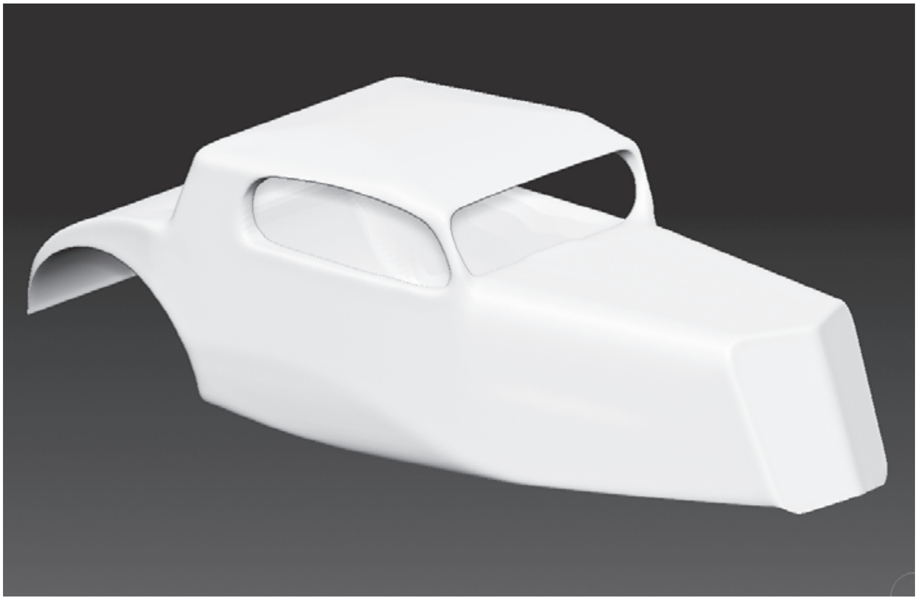


Figure 5.81

The ClipCurve brush is drawn in the side view of the car.

11. Release the brush. The unmasked portion on the inside of the car will be pulled down to meet the shape created by the curve.
12. Clear the mask applied to the car. In the Deformation subpalette of the Tool palette, move the Relax slider to the right to relax the polygons of the mesh (see Figure 5.82).

Figure 5.82
The car now has space inside for drivers and passengers. The polygons of the surface are relaxed using the Relax deformer.



13. Save the project as `HotRod_v09.ZPR`.

You now have the basic shape of the hot rod body, which is ready for sculpting and detailing.

CHAPTER 6

Remesh and Projection

As you have probably seen by now, a mesh in ZBrush undergoes a lot of transformations during the sculpting process. While experimenting with shapes and various techniques, you'll find that the mesh can become stretched and squashed, and at a certain point the polygons of the mesh become distorted, making it difficult to proceed.

Remeshing offers a solution to this problem. When you remesh a model, ZBrush generates a polygon skin that resembles the overall shape of the original. This new skin uses the unified skinning algorithm that is composed of evenly distributed quadrilaterals. Once you create a remesh, you have a surface that is easy to sculpt and you can continue working on your project. You can use projection to transfer the details of the original model to the newly created skin.

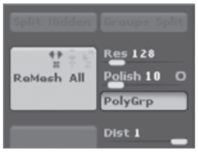
This chapter will teach you some tricks and techniques for integrating remeshing and projection into your sculpting workflow. This chapter includes the following topics:

- **Remesh a surface**
- **Combine SubTools using remeshing**
- **Use the ZSphere mannequins**
- **Transfer details using projection**

Remesh a Surface

The remeshing controls are found in the SubTool subpalette of the Tool palette (see Figure 6.1). The controls are fairly simple and should look familiar if you have read through the tutorials on Shadow Box in Chapter 5. In fact, Shadow Box uses some of the same sliders.

Figure 6.1
The Remeshing controls in the SubTool subpalette



When you remesh a surface, you'll first want to use the Res slider to set the resolution—the density of the polygons in the remeshed surface—and then set the Polish slider, which smooths the resulting mesh.

When you click the ReMesh All button, ZBrush will generate a skin that covers the shapes of all visible SubTools. The new mesh will automatically be appended as a SubTool.

It's extremely important to be aware of which SubTools are currently visible in the SubTool subpalette. If you just want to remesh a single SubTool, make sure you turn off the visibility of all the other SubTools by clicking the eyeball icon on the far right of the name of the SubTool (see Figure 6.2).

Figure 6.2
The eyeball icon controls visibility of the SubTools. All visible SubTools will be included in the remesh operation.

SOLO MODE AND REMESH

The Solo button on the right shelf hides all SubTools from view except for the selected SubTool. However, this is does not affect the remeshing calculation. To create a successful remesh, use the eyeball icon in the SubTool subpalette.

Remesh a Simple Object

Let's take a look at how the remesh controls work by remeshing a simple object:

1. Start a new ZBrush session.
2. In the Tool palette, open the tool fly-out inventory by clicking the large icon labeled SimpleBrush in the upper left.
3. Choose the Ring3D tool (see Figure 6.3). Draw the tool on the canvas, and switch to Edit mode (hotkey = T).

Figure 6.3
Choose the Ring3D tool from the fly-out tool library.

4. Expand the SubTool subpalette of the Tool palette. Toward the bottom you'll see a button labeled ReMesh All. To the right of this button are the Res and Polish sliders.
5. Without changing anything, click the ReMesh All button.

You'll see the progress bar appear at the top of ZBrush as it calculates the remesh. In this case it should be fairly fast. After a few seconds, a new SubTool is added to the SubTool palette. The new SubTool looks like a blobby version of the original Ring3D tool.

The new mesh is generated using the Unified Skin algorithm. This is the same type of skin generated when you convert a ZSketch into a skin or when you use Shadow Box to generate a mesh. The surface is composed of thousands of quadrilaterals evenly distributed and about the same size. This type of mesh is very easy to sculpt using the sculpting brushes.

6. In the SubTool subpalette, make sure you have the top SubTool selected (it should be labeled Ring3D_1). Expand the Deformation subpalette of the Tool palette and drag the Offset slider to the right. This will move the original ring tool along the x-axis so that you can see both tools (see Figure 6.4).
7. Turn on the PolyF button on the right shelf so that you can see the wireframe display of the polygon edges on the surface of the objects.
8. In the SubTool subpalette, switch between the two SubTools and compare the wireframe displays. You'll see how the remeshed version (labeled Skin_Ring3D_1) has small square polygons instead of the rectangular polygons of the original tool (see Figure 6.5).

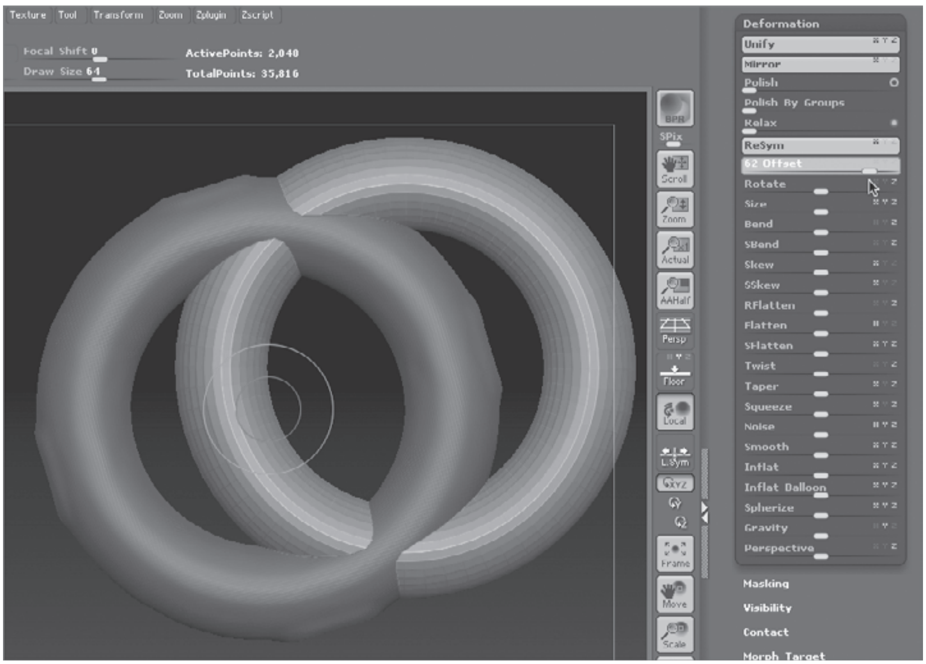


Figure 6.4
Use the Offset slider in the Deformation subpalette to move the ring.

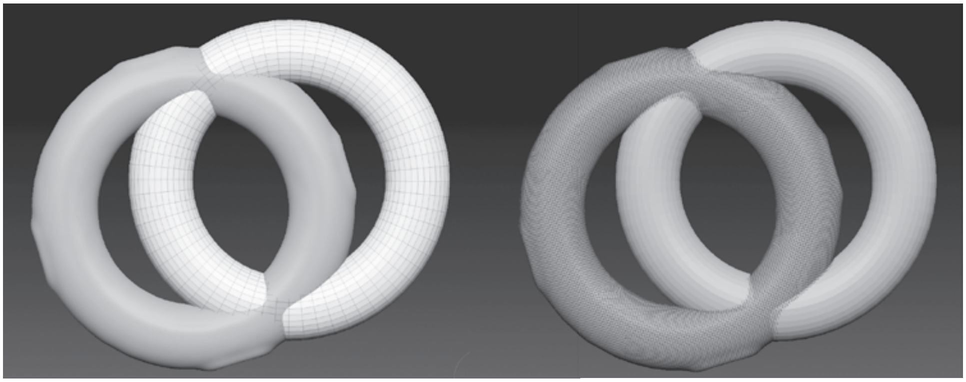


Figure 6.5

Compare the wireframe of the original ring (left images) and the remeshed version (right image).

9. In the SubTool subpalette, select the Skin_Ring3D_1 SubTool. Click the Delete button to delete the SubTool. A warning will pop up letting you know that this is an undoable operation. Click OK.
10. Click the ReMesh All button again. A new remesh is created but it looks very different (see Figure 6.6). What happened?

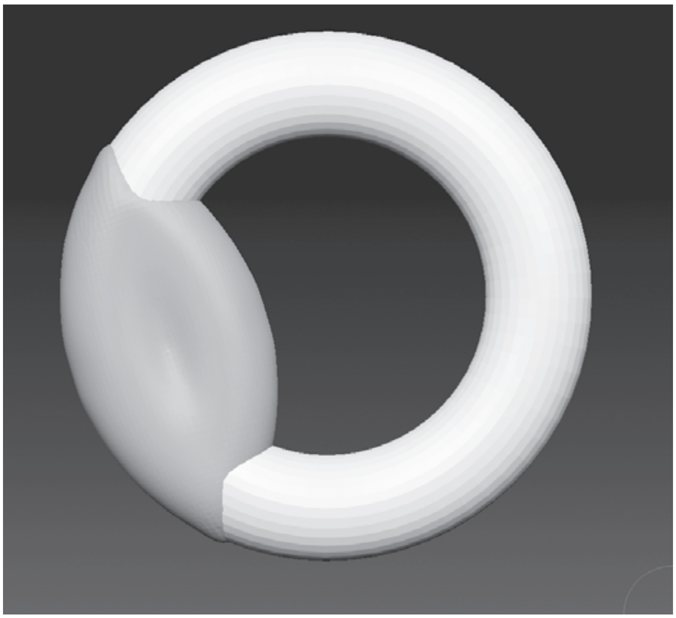


Figure 6.6

Remeshing the ring again produces some strange results.

Notice that on the ReMesh All button there is an X, a Y, and a Z (see Figure 6.7). These are buttons that control the symmetry of the remesh. By default, the X button is active, indicating that symmetry along the x-axis will be preserved in the remesh. However, back in step 6 you used the Offset deformer to move the tool away from the center. The remesh operation created a new symmetrical mesh using the pivot point to generate symmetry. Sometimes this works just fine as long as the surface you want to remesh is centered and symmetrical to begin with. If you get a result that seems strange or you get a warning indicating that a new mesh can't be generated, try turning off the X, Y, and Z buttons on the Remesh button.

Of course, you can also experiment with these buttons on to generate interesting shapes.

Figure 6.7

The ReMesh All button has X, Y, and Z buttons that determine the axis of symmetry.

Remesh Multiple SubTools

Using remeshing can be a great way to generate interesting shapes from multiple SubTools. Think of it as another way to create a lump of digital clay based on the combined shapes of existing SubTools, which can then be further refined using the sculpting brushes. Using remeshing, you can combine a head and a body into a single mesh, cut holes through surfaces, or just explore new ideas.

There are three icons in the SubTool subpalette of the Tool palette that determine how the remeshing operation will be calculated for each SubTool (see Figure 6.8). Remeshing creates a skin from all visible SubTools, and it calculates the operation in a specific order starting from the top SubTool and moving down through each visible SubTool in the stack.

Figure 6.8

The three icons in the SubTool subpalette that control the remeshing operation of the SubTool

The three circular icons in the SubTool slot of the stack determine how the shape of that particular SubTool will affect the mesh. Each icon represents a Boolean operation.

Try this example to see how Booleans can be used with SubTools:

1. Start a fresh ZBrush session.
2. Open Light Box and switch to the Tools section. Double-click the UnionSkin1.ZTL tool (see Figure 6.9). This tool is set up to demonstrate how remeshing works with Boolean operations.
3. Draw the tool on the canvas and switch to Edit mode (hotkey = T).
4. Expand the SubTool subpalette of the Tool palette. In the SubTool palette, set the skinning operation button for both SubTools to union. Do this by clicking the double circle icon closest to the preview image of the SubTool (see Figure 6.10).
5. Click the ReMesh All button. After a few seconds, the remesh object will appear at the bottom of the SubTool stack.
6. Select the new Skin_UnionSkin1 SubTool at the bottom of the SubTool stack. Click the Solo button on the right shelf to see the newly created SubTool by itself (see Figure 6.11).

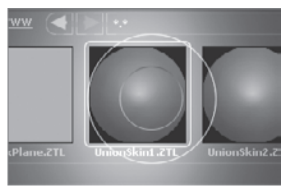


Figure 6.9

The UnionSkin1 tool has been set up to demonstrate how the Boolean operations work with remeshing.

Figure 6.10

Set the skinning operation to union for both SubTools.

BOOLEAN OPERATIONS

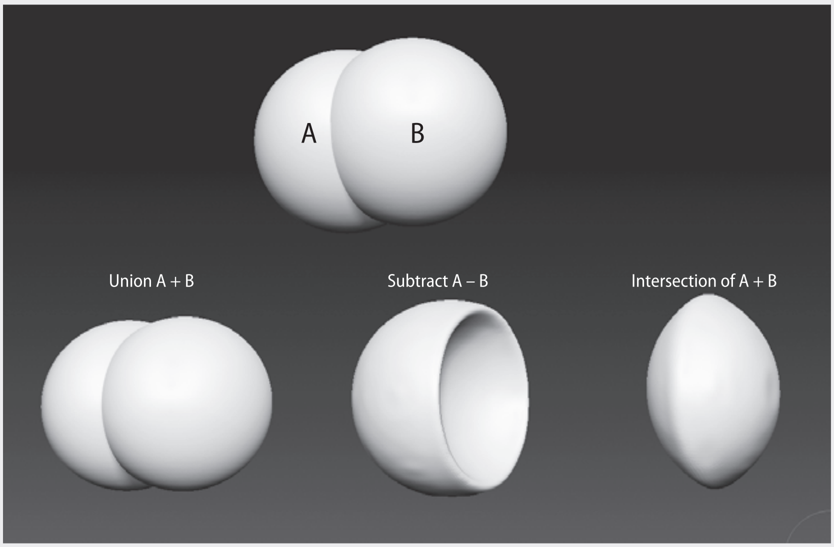
Boolean operations originated as part of George Boole's algebraic systems of logic in the eighteenth century. They have played a significant part in the development of computer logic and are encountered frequently in computer graphics. In this discussion, we'll look at Boolean operations in the context of working with 3D surfaces.

In simplified terms, consider two overlapping 3D objects labeled A and B. There are three Boolean operations that can be applied: union, subtraction, and intersection.

The union operation creates an object by combining the overlapping A and B objects and produces a shape based on the outside surface of the two objects.

Subtraction creates an object by subtracting one object from the other. So if you subtract B from A, the resulting object looks like something has taken a bite out of A. This missing bit matches the shape of the B object.

The intersection operation creates a surface that resembles the overlapping space of A and B.



The new mesh is a combination of the cube and the sphere. The newly created mesh is like a skin that has been stretched over both tools.

7. Turn off the Solo button on the right shelf.
8. In the SubTool subpalette, turn off the visibility of the Skin_UnionSkin1 SubTool. Select the SubTool at the top.
9. Set the skinning operation to subtract for the cube SubTool. To do this, click the second circular icon. This one looks like a half moon (see Figure 6.12).

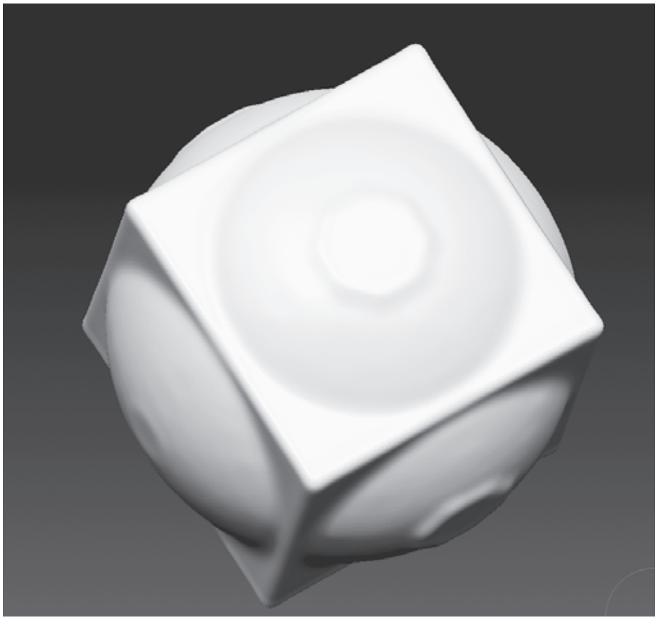


Figure 6.11
The new skin is a union of the cube and the sphere SubTools.

10. Press the ReMesh All button again.
11. Select the newly created sub tool at the bottom of the SubTool subpalette. On the right shelf, click the Solo button so that you can see the mesh by itself.

The new SubTool is a result of the cube subtracted from the sphere, so you'll see six rounded discs where parts of the circle were outside of the cube (see Figure 6.13).

Figure 6.12
Set the skinning operation to subtract for the cube SubTool.

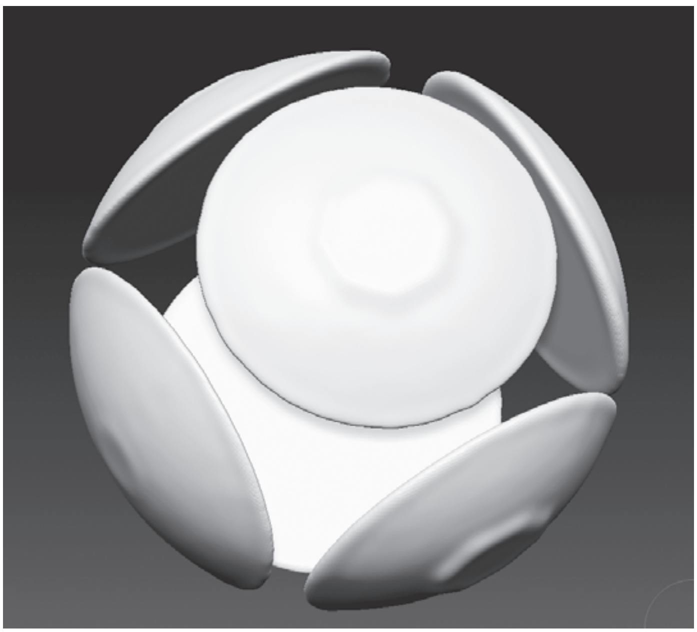


Figure 6.13
The new skin is generated by subtracting the cube from the sphere.

12. Repeat steps 9 and 10 but this time set the remeshing operation to intersection (Figure 6.14). Remember to hide the SubTools that should not be included in the remesh.

Figure 6.14
The skinning operation for the cube is set to intersection.

REMESH WARNING MESSAGES

If you get a warning telling you that current skinning modifiers will produce a mesh with not vertices, double-check and make sure you have the highest of the visible SubTools selected. Also, sometimes the symmetry setting on the ReMesh All button will produce this warning.

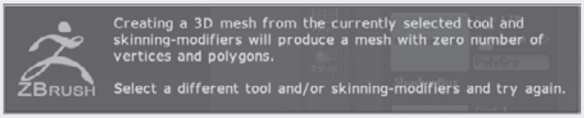
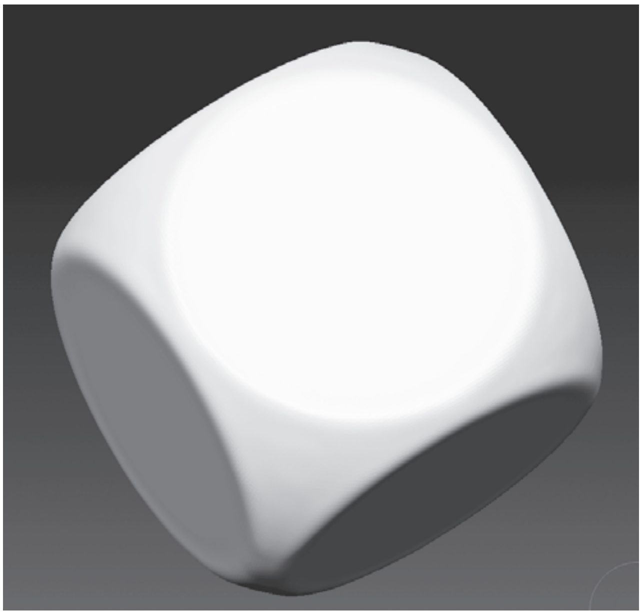


Figure 6.15 shows the result of the intersection. The cube has chopped off the outside edges of the sphere.

Figure 6.15
When the skinning modifier is set to intersection, the edges of the sphere are cut off by the cube.



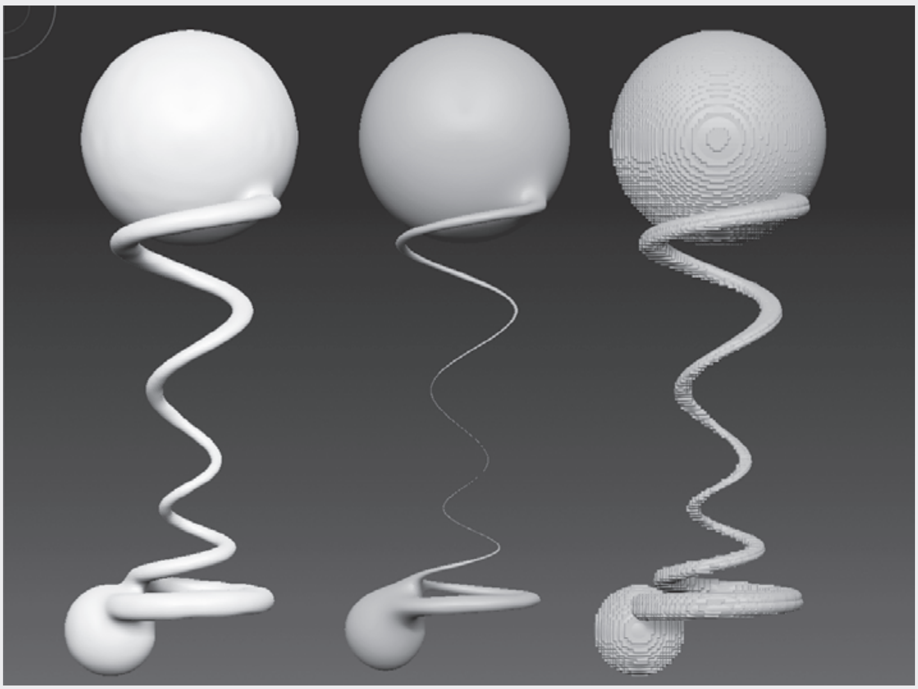
This simple example shows how this technique works with simple objects, but you can use remeshing on more complex objects as well, as you'll see later in this chapter. Experiment with different combinations of shapes and skinning modifiers. Use the UnionSkin1.ZTL, UnionSkin2.ZTL, and UnionSkin3.ZTL tools for practice. These are all found in the Tool directory of Light Box.

As mentioned, you can use the Res slider to increase the resolution of the mesh—set the slider before pressing the ReMesh All button. However, you'll notice that the mesh always seems to be like a loose skin around the surface of the original SubTools. How do you transfer the hard edges and details from the original SubTools to the newly created mesh? This is done with projection.

REMESH POLISH

The Polish setting smooths the surface of the generated mesh, ensuring a surface that's easy to sculpt. Using a higher Polish setting produces a smooth surface. You can toggle between Polish modes by clicking the circle icon on the right of the Polish slider. The open circle means that the polish operation will preserve the volume of the thinner parts of the new mesh. The closed circle means that the volume will not be preserved, resulting in thinner parts of the mesh. Try setting Polish to 0. This produces a very blocky-looking mesh, which can be used for creative effects.

The following image shows a remesh generated with a high Polish setting and preserve volume on for the surface on the left, a high Polish and preserve volume off for the center surface, and a Polish setting of 0 for the surface on the right.



Projection

ZBrush uses projection, which transfers detail from a source SubTool (or SubTools) to a target SubTool. The topology of the source and the target can be completely different, but the surfaces themselves should be similar in shape in order to achieve the best results. You can use projection for a variety of sculpting effects; the creative possibilities are endless. One of the more common uses of projection is to transfer hard edges and details from a number of SubTools to a remeshed surface. In the following section, we will take a look at some examples of how this technique can be useful.

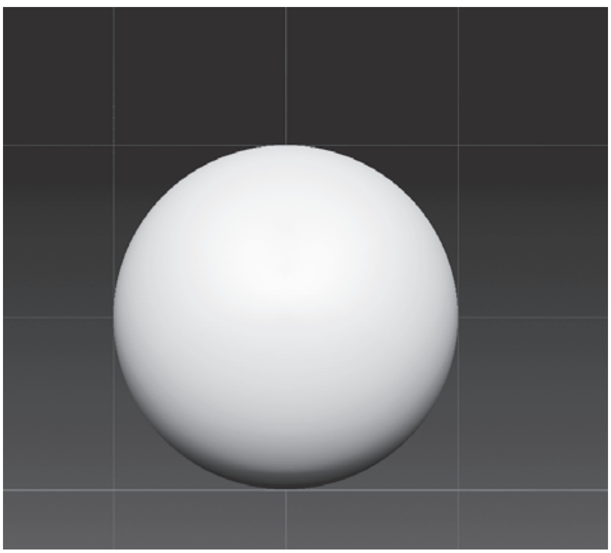
Build the Headlight and Case

In this example, you'll see how projection can be used to transfer hard edge details from multiple SubTools to a remeshed surface. This seems like a good opportunity to add on to the hot rod model started in Chapter 5. In this exercise, you'll create a simple headlight. First let's create the headlight case.

1. Start a fresh session of ZBrush.
2. Open Light Box to the Tools section and double-click the PolySphere.ZTL tool. Draw the tool on the canvas and switch to Edit mode (hotkey = T).
3. On the right shelf, turn on the Floor button so that you can see the grid. On the Floor button itself, make sure X and Y are active so you can see the grid for the x- and y-axis (see Figure 6.16).
4. In the material fly-out library on the left shelf, choose the SkinShade4 material.
5. Rotate the view so that you can see the PolySphere from the side. Hold the **Shift** key after you start rotating the view so that the view snaps to the side. You should see the x-axis grid from the side as shown in Figure 6.17.

Figure 6.16
Turn the Floor button on in the right shelf.

Figure 6.17
Rotate the view so that you can see the PolySphere from the side.



6. Open the sculpting brush fly-out library and press **c** and then **r** to choose the Clip-Rect brush. This brush will be mapped to the Ctrl+Shift key combination.
7. Hold **Ctrl+Shift** and drag out a rectangle starting from the lower right. The rectangular selection should cover the right half of the PolySphere. Release the brush to flatten one side of the PolySphere (see Figure 6.18).

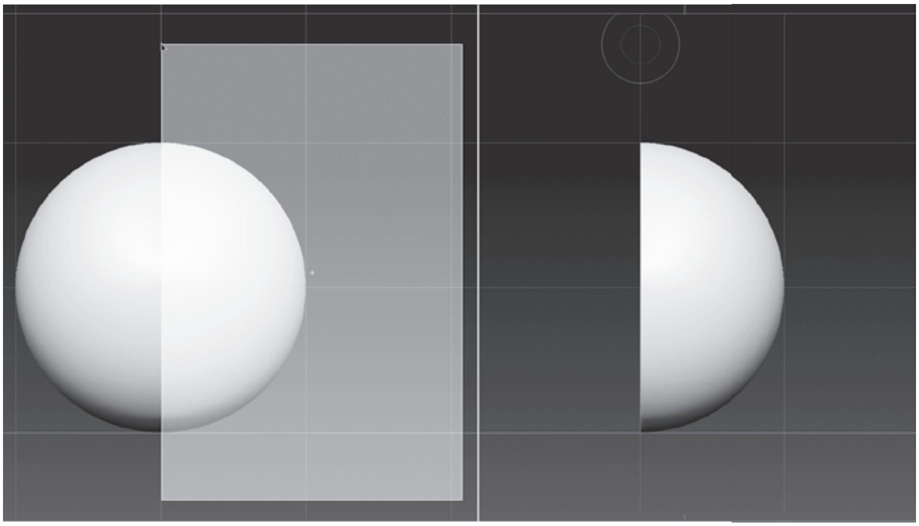


Figure 6.18
Use the ClipRect brush to flatten one side of the PolySphere.

8. Press **w** to switch to the Move mode of the transpose tool.
9. Start dragging over the PolySphere from left to right to draw out the transpose tool. Hold the **Shift** key after you start dragging to snap the handle to the horizontal axis (top image in Figure 6.19).
10. After you have drawn this out, position the handle by dragging on the axis line so that it is in the center of the PolySphere. Position the left end so that it matches the flattened end of the PolySphere (middle image in Figure 6.19).
11. Drag on the inner circle on the right handle of the Transpose tool; hold the **Shift** key after you start dragging to keep the movement in line with the action line of the Transpose handle. Pull the back of the PolySphere back to form an egg shape (bottom image in Figure 6.19).
12. Hold **Ctrl+spacebar**. A little menu will appear on the canvas. Turn on the BRadius button that appears in the little menu (see Figure 6.20).
13. Press the Draw button on the top shelf (hotkey= Q) to switch to Draw mode. Set the draw size to 56.
14. Hold **Ctrl+Shift** and drag another selection over the left side of the PolySphere. Select about an eighth of the PolySphere, as shown in the right image in Figure 6.21.

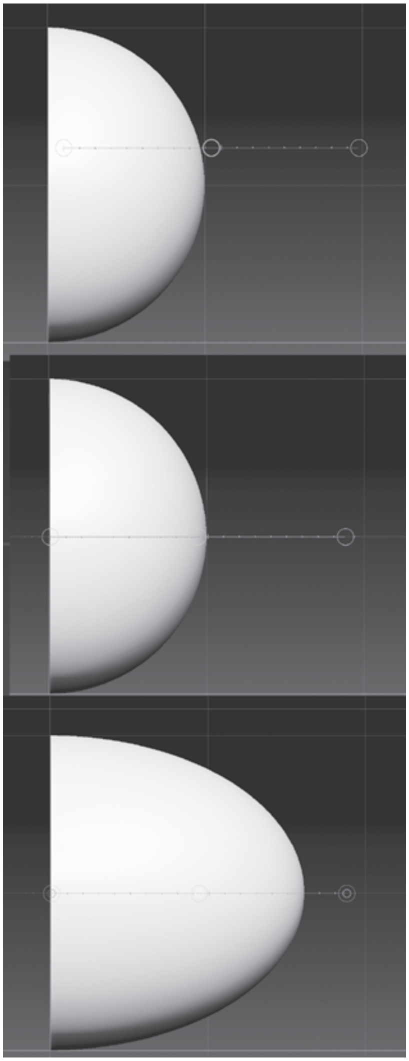


Figure 6.19

Position the Transpose handle so that the left side is even with the center of the flattened side of the PolySphere. Drag on the right handle to stretch the PolySphere into an egg shape.

Figure 6.20

Turn on the BRadius option for the ClipRect brush.

15. Release the brush.

This clips the left side of the PolySphere, but since the BRadius option is on, the clip is limited by the size of the brush, thus creating a hard-edge parting line in the surface. This makes the PolySphere headlight case appear as though it is made of two pieces.

16. Use the Save As button at the top of the Tool menu to save the tool as headlight_v01.ZTL.

At this point you can add a second PolySphere to the front of the headlight case. This will be the glass cover for the front of the headlight.

1. Open Light Box to the Tools section and double-click the PolySphere.ZTL tool. This loads the PolySphere on the canvas; the active tool will switch to the new PolySphere.
2. Open the tool fly-out library at the top of the Tool palette and select the headlight_v01.ZTL tool to switch back to the headlight.
3. Open the SubTool subpalette of the Tool palette. Click the Append button and choose the PolySphere to append it to the headlight tool.
4. Hold the **Alt** key and click the PolySphere to the canvas to select it.
5. Open the Deformation subpalette of the Tool palette. Drag the Size slider to the left until the value is around -20 to shrink the size of the PolySphere a little (see the left image in Figure 6.22).
6. In the Deformation subpalette of the Tool palette, on the Size slider, turn off the x and y buttons; only the z-axis button should be active. Drag the Size slider all the way to the left to flatten the PolySphere (see the right image in Figure 6.22).
7. Use the Rename button at the bottom of the SubTool subpalette to rename the PolySphere lamp.
8. Set your draw size to 20. Hold **Ctrl+Alt** and drag another selection over the right half of the PolySphere, making sure the rectangle covers a little more than half of the PolySphere (see the left image in Figure 6.23).

9. Release the brush. This adds a groove to the PolySphere. The surface should resemble the right image in Figure 6.23.
10. Save the tool as headlight_v01.ZTL.

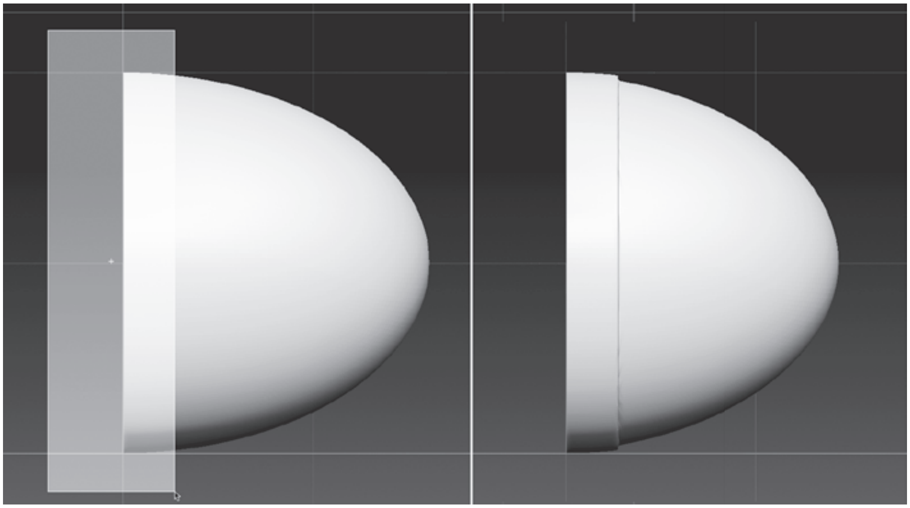


Figure 6.21
Use the ClipRect brush to select part of the right side of the PolySphere.

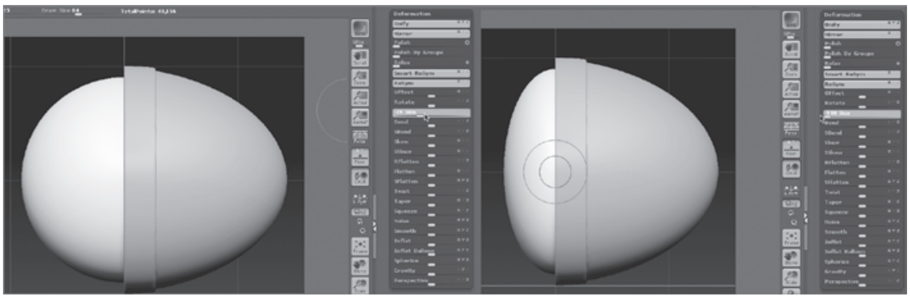


Figure 6.22
Use the Size deformation slider to resize the PolySphere.

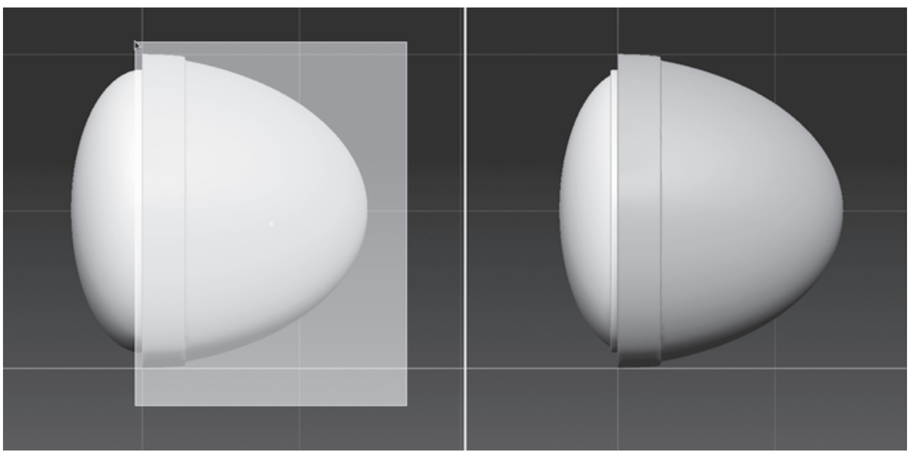


Figure 6.23
Use the ClipRect brush to create a groove in the lamp SubTool.

Remesh the Headlight and Project Details

At this point you can remesh the two PolySpheres to create a single surface that covers the headlight.

Figure 6.24

Select the headlight_v01 SubTool at the top of the stack and press the ReMesh All button.

1. Continue with the tool you created in the previous section or load the headlight_v01.ZTL tool from the `Chapter 6` folder on the DVD.
2. **Alt+click** on the back of the headlight to select the headlight_v01 SubTool. Expand the SubTool subpalette of the Tool palette and click the ReMesh All button to create a skin from both SubTools (see Figure 6.24).

The mesh appears as a new SubTool at the bottom of the stack. But you'll notice that it looks like loose skin. It lacks the hard edges of the original SubTool headlight (see Figure 6.25). To get the details into the new mesh you'll use projection.

3. In the SubTool subpalette of the Tool palette, select the Skin_PolySphere1 SubTool at the bottom of the stack. Press **Ctrl+D** two times to subdivide the model several times. This adds two subdivision levels to the surface.
4. Make sure the other two SubTools are visible in the SubTool subpalette. Projection uses all visible SubTools as the source for the projection.
5. Press the Project All button (see Figure 6.26).

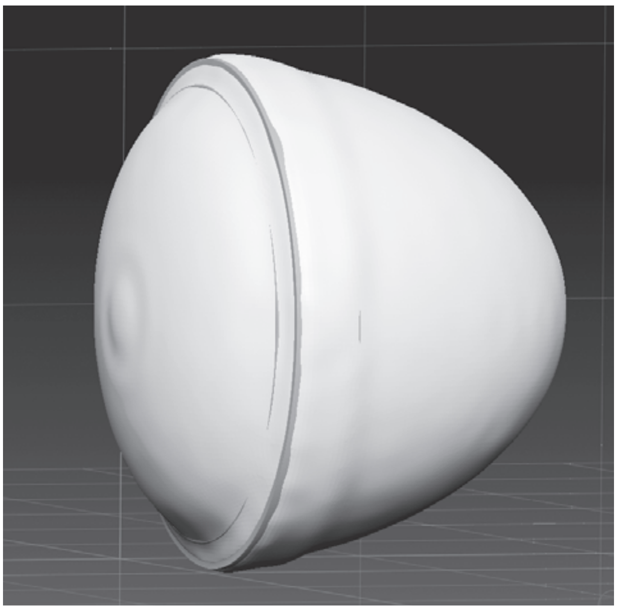


Figure 6.25

The remeshed skin looks like loose skin around the SubTool surfaces.

Figure 6.26

The Project All button is at the bottom of the SubTool subpalette of the Tool palette.

After a few seconds, you'll see the skin SubTool shrink until it meets the surfaces of the other two SubTools (see Figure 6.27). Projection makes the target SubTool act like shrink-wrap around the surfaces of the visible SubTools. This surface is fairly simple, so the results are very clean and don't require any cleanup. More complex surfaces take a little more work, but the technique as a whole is a huge time-saver and a great way to build new surfaces from existing SubTools.

6. Select the headlight_v01 SubTool at the top of the SubTool subpalette and press the Delete button toward the bottom of the subpalette to delete this SubTool. Delete the lamp SubTool as well. You should be left with just the remeshed subtool named Skin_headlight_v01 (see Figure 6.28).
7. Use the Save As button in the Tool palette to save the tool as headlight_v02.ZTL.

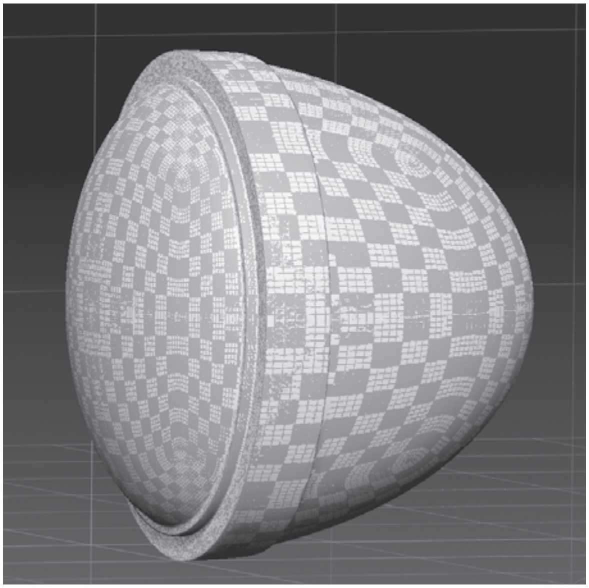


Figure 6.27

Projection causes the selected SubTool to shrink-wrap itself around the other visible SubTools.

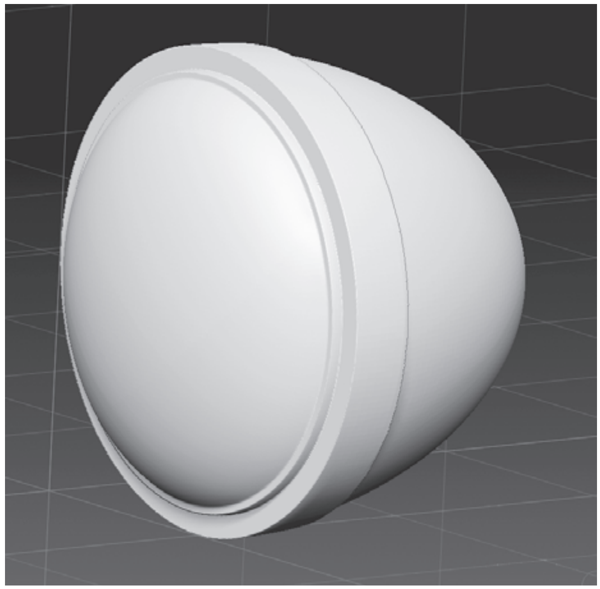


Figure 6.28

The result of this technique is a single mesh that retains the hard edges of the original SubTools.

TO REMESH OR NOT TO REMESH?

The techniques described in this section are useful when you want to generate a single mesh that is easy to sculpt from a number of SubTools. But when should you use it? That's entirely up to you as an artist. The headlight in this example could remain as two pieces, or you could use the Merge Visible button to simply merge the two tools. Personally, I find this technique useful when the geometry of my model becomes stretched and difficult to sculpt after it has been shaped. Sometimes, halfway through the sculpting process I will remesh the geometry, project the details from my original sculpt, and then subdivide the remeshed geometry and continue sculpting. The remeshed version lacks the stretching of the original surface, making it much easier to sculpt.

Mannequins

The ZSphere mannequins projects that come with ZBrush 4 are there for you to use as a starting place for exploring character poses. Using the mannequins, you can develop poses and multi-character compositions very quickly and easily without the need to create new ZSphere armatures or sculpt new sculpt models. The mannequins are all set up and ready to pose. What's more, using remeshing and projection techniques you can use the mannequins as a starting point for creating your own unique sculpts.

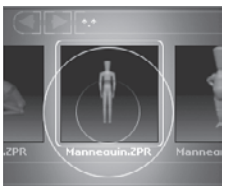
In the following sections, we'll take a look at how to create poses with the mannequins, how to create multi-character scenes, and also how to model the body of a dragon by remeshing a mannequin.

Pose a Mannequin

A mannequin is simply a premade ZSphere armature. Some of the ZSpheres in the armature have been replaced with simple mesh objects, and the result is something that looks like a mannequin. There are several example mannequin projects that ship with ZBrush 4. Let's open one and take a look at how it works.

Figure 6.29

Load the `Mannequin.ZPR` **project from the** `Project` **folder in Light Box.**



1. Start a fresh ZBrush session. Open Light Box to the `Projects` folder.
2. Find the `Mannequin.ZPR` project and double-click it to load it on the canvas (see Figure 6.29). On a Mac, the mannequin projects are found in the Project section of Light Box. On Windows, you'll see a folder labeled `Mannequins` within the `Project` section of Light Box. If you are using Windows, double-click the `Mannequins` folder within the `Project` section of Light Box to view the mannequins projects.

The mannequin looks like a gray figure on the canvas. There are several ways you can pose the limbs of the mannequin.

3. Press the **X** hotkey to activate symmetry on the x-axis.
4. Press the Move button on the top shelf (hotkey = W).
5. Select the long tube that represents the forearms of the character and drag upward. This action rotates the lower arm (see Figure 6.30).
6. Select the upper arm and try moving it upward as well (right image in Figure 6.30).

You get the same effect by holding the Ctrl key and dragging on the ZSpheres themselves. If you drag on the ZSphere without holding the Ctrl key, the position of the ZSphere is changed relative to its position in the armature. You can use this technique to reposition the joints of the mannequin (see Figure 6.31).

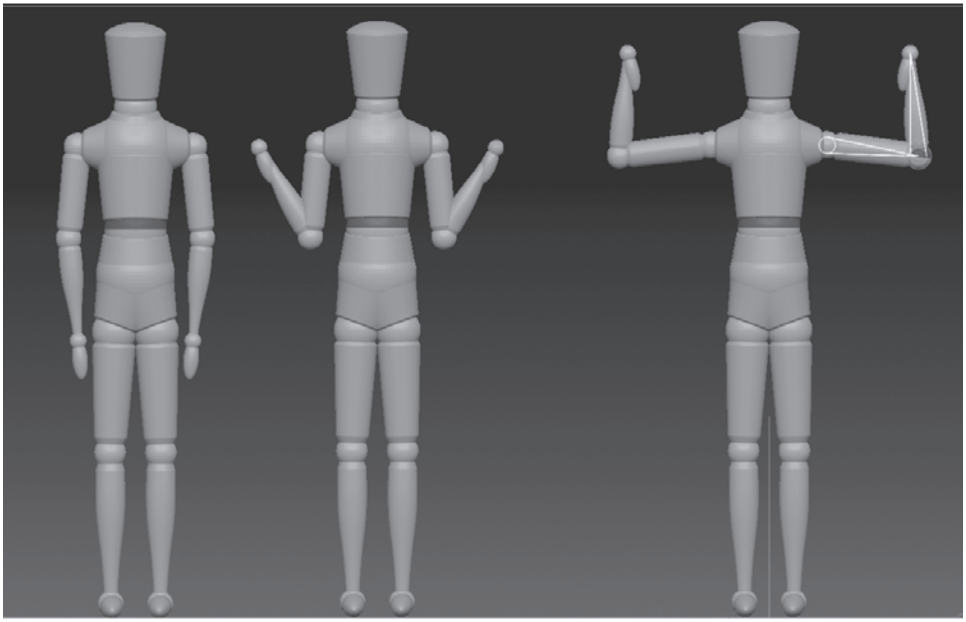


Figure 6.30

Drag on the forearms to move the arms upward.

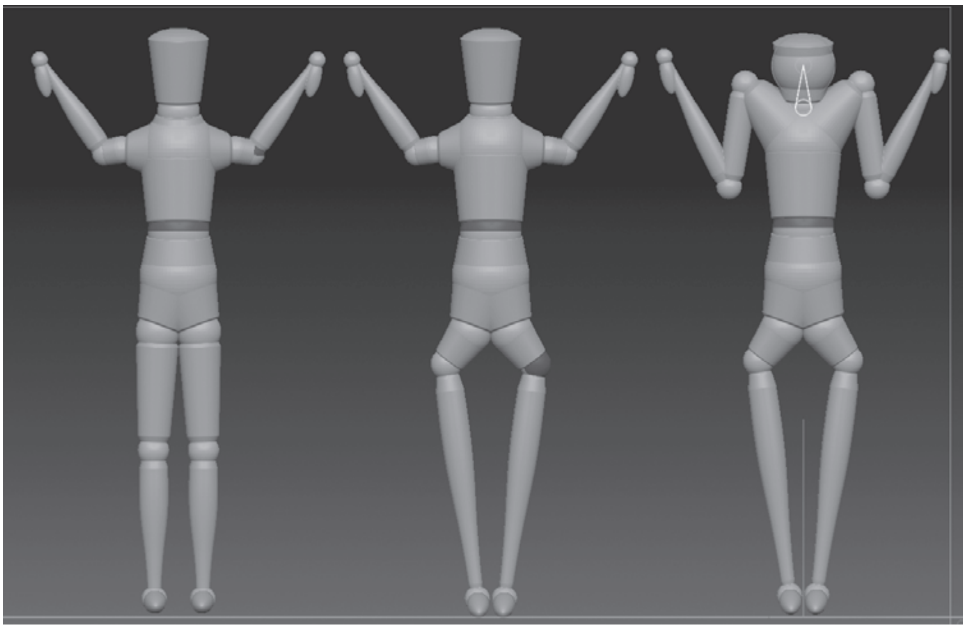


Figure 6.31

Drag on the ZSphere to change the position of a joint.

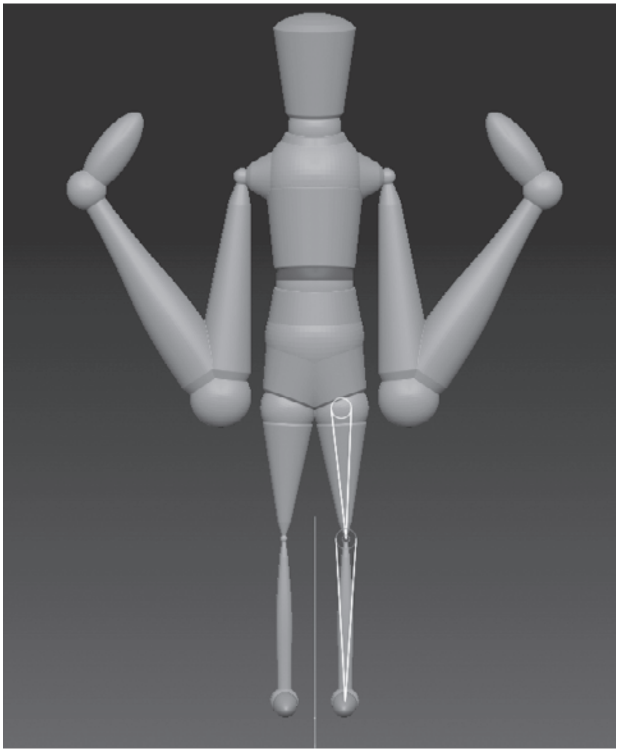


Figure 6.32
Scale mode allows you to change the size of parts of the mannequins.

You can use the Scale mode (hot key = E) to resize parts of the armature. To scale a joint, click and drag on a ZSphere. If you click and drag on the connecting cylinder, you will increase the size of it and all the child ZSpheres and cylinders. **Alt+drag** on the connecting cylinder to make them appear fatter or skinnier (Figure 6.32).

Rotate mode allows you to rotate the ZSpheres by dragging on them. In most cases, it is easier and more intuitive to pose the limbs using Move mode than using Rotate mode.

To move the entire mannequin, switch to Move mode, hold the **Ctrl** key, and drag on the root ZSphere.

Create a Multi-Character Scene

In this example, you'll learn how you can easily create a scene using multiple characters.

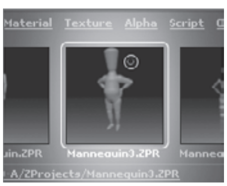


Figure 6.33
Select the `Mannequin3.ZPR` project from Light Box.

1. Open Light Box and switch to the Project section. Double-click the `Mannequin3.ZPR` project to load it on the canvas. This project has a single mannequin in a simple pose (Figure 6.33).
2. In the Tool palette, expand the SubTool subpalette. You'll see that the mannequin is a single SubTool at the top of the palette.
3. Toward the bottom of the SubTool subpalette, click the Duplicate button to make a copy of the mannequin. The copy is appended as a new SubTool (see Figure 6.34).

4. Use the Rename button to name one mannequin Man1 and the other Man2.

The easiest way to rotate an entire mannequin is to use the Rotate slider in the Deformations palette while the mannequin is at the origin.

5. In the SubTool subpalette, select the Man2 SubTool.
6. In the Deformation subpalette, click the Z button on the Rotate slider to turn the z-axis rotation off. Click the Y button to turn on rotations on the y-axis (see Figure 6.35).
7. Drag the Rotate slider all the way to the right to rotate the Man2 SubTool.
8. Expand the Deformation subpalette, click the X button on the Offset slider to turn off the x-axis. Click the Z button on the Offset slider to turn on the z-axis.
9. Move the Offset slider all the way to the left twice to move Man2 in front of Man1 (see Figure 6.36).

Figure 6.34

Use the Duplicate button to copy the mannequin.

Figure 6.35

Turn the Z button off on the Rotate slider, and turn Y on.

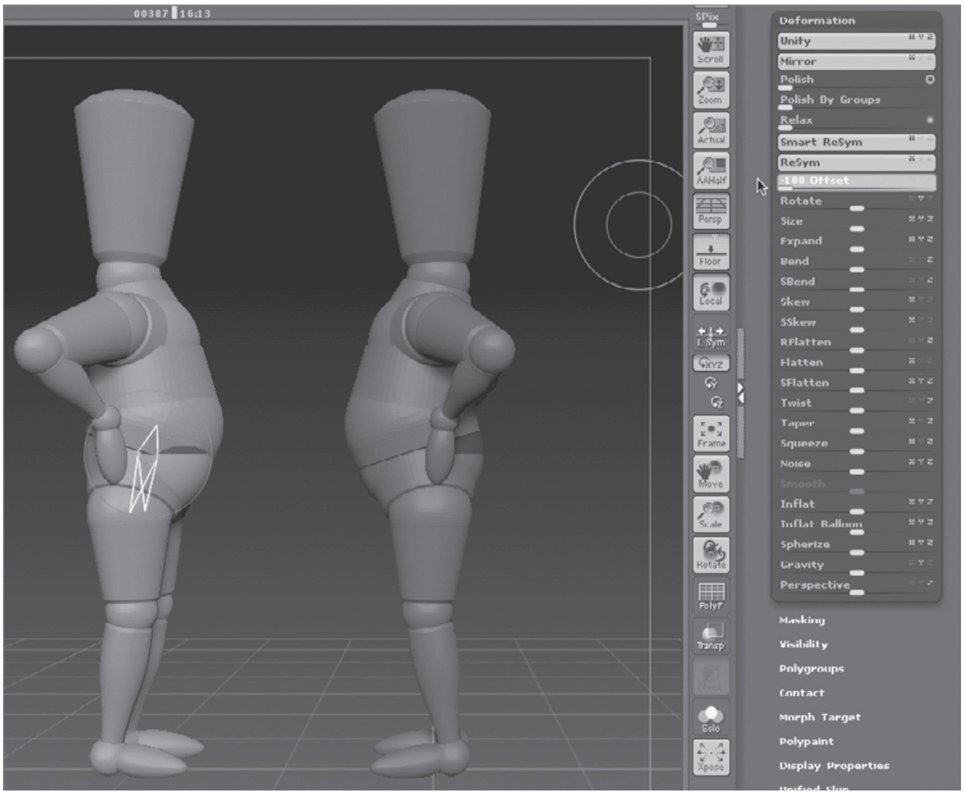


Figure 6.36

Drag the Offset slider to move one mannequin in front of another

Once the two mannequins are no longer overlapping, you can move them around by holding the **Ctrl** key and dragging on the root ZSphere.

10. Switch to Move mode and experiment with poses for the two characters using the techniques described in the section "Pose a Mannequin" earlier in this chapter. For best results, reduce your draw size so that you can easily move one part of the mannequin at a time (see Figure 6.37).

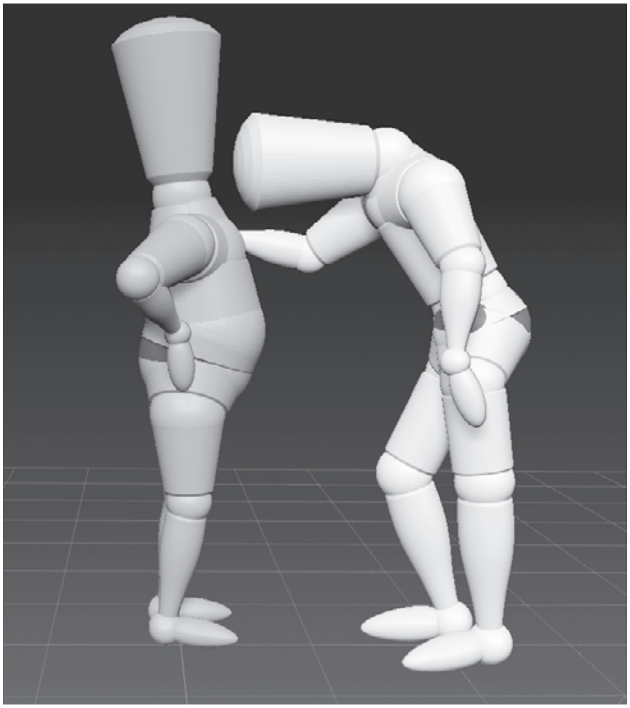


Figure 6.37
The second Mannequin is posed using Move and Scale modes.

QUICKLY SWITCH MANNEQUINS

You can quickly switch from one character to the other by holding the **Alt** key and clicking the mannequin.

Edit a Mannequin

In this section, you'll learn how you can edit the mannequin to create different types of creatures and characters. These techniques will be applied to creating a dragon model.

1. Start a new ZBrush session. Open Light Box to the Project section and double-click the `Dog1.ZPR` project. This is a ZSphere mannequin that resembles a dog.
2. Symmetry on the x-axis should already be activated in this file, but if it is not, press the **X** button to turn it on. This will allow you to pose both sides of the mannequin at once.

3. Turn off the Persp button on the right shelf. Rotate the view so that you are looking at the dog from the side.
4. To start changing the dog into a dragon, you can extend the length of the tail. Switch to Move mode (hotkey = W), hold the **Alt** key, and drag the short cylinder right (see Figure 6.38).
5. Hold the **Alt** key and drag upward on the cylinder below the head to extend the neck. Pull it back a little as well (see Figure 6.38).
6. Switch to Draw mode (hotkey = Q) and click on the lower part of the neck to add a ZSphere.
7. Switch to Scale mode (hotkey = E) and scale the ZSpheres of the neck down a little by dragging on them.
8. Switch to Move mode and reposition the ZSpheres of the tail and neck to create a more serpentine anatomy. Use Scale to enlarge the ZSpheres of the tail. The bottom image in Figure 6.38 shows the result.
9. Drag the ZSpheres of the leg to form the hind legs of the dragon. The feet should be large enough to support the weight of the beast.
10. Switch to Scale mode (hotkey = E) and scale the ZSpheres of the leg to create more of a muscular look.
11. Scale up the ZSpheres of the upper body to create more of a chest.
12. Switch to Move mode and reposition the ZSpheres of the front legs. Scale up the ZSpheres to create more muscle mass (see Figure 6.39).
13. Rotate the view so that you can see the dragon from a perspective view. Use Move mode to move the legs away from the body (upper image in Figure 6.40).
14. Zoom in to the head and switch to Draw mode (hotkey = Q). Add a ZSphere to the snout by clicking on it. Switch back to Move and drag the ZSphere out to form a long snout.
15. Try adding a ZSphere to create the lower jaw. Drag the ears back to form horns (lower image in Figure 6.40).
16. Use the Save As button in the File menu to save the project as `dragonBody_v01.ZPR`.

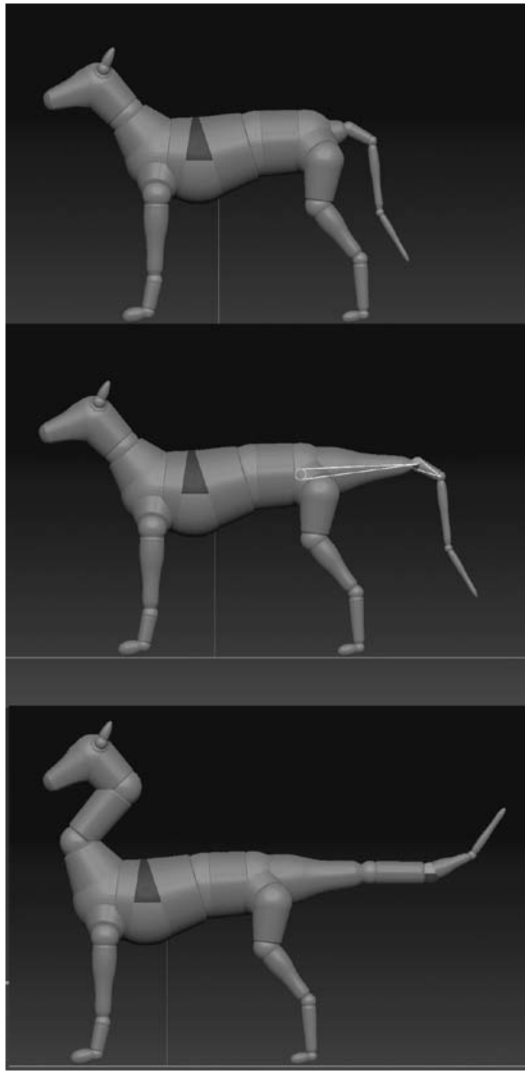


Figure 6.38

Drag the hind legs to the right to add length. Add two ZSpheres in the center and move them to create an arch.

Figure 6.39

Scale up the ZSpheres of the upper body and move the joints of the front legs.

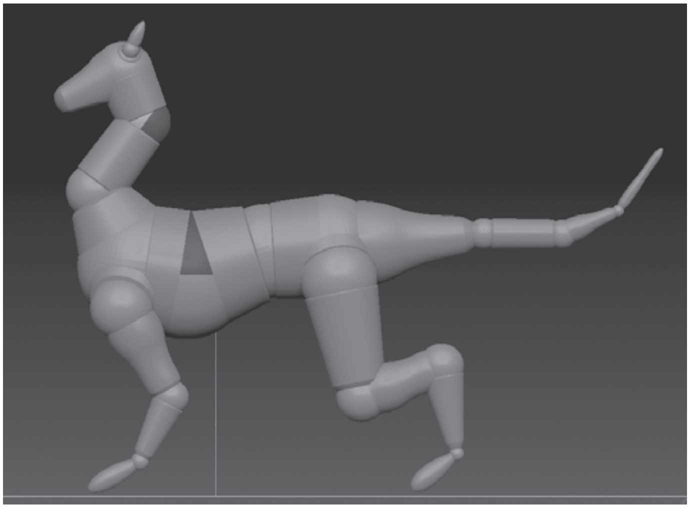
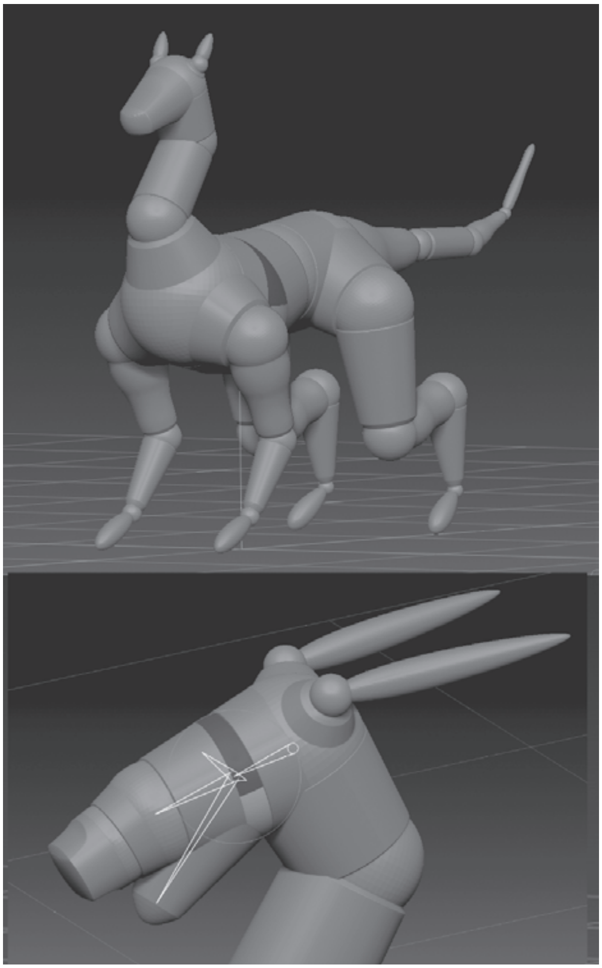


Figure 6.40

Move the legs away from the body (upper image). Add ZSpheres to create the snout and jaw, and drag the ears back to create horns.



Add Wings to the Dragon Body

To add wings to the body, you can draw new ZSpheres on the dragon's back and pull them outward.

1. Continue with the model created in the previous section or load and open the `dragonBody_v01.ZPR` project from the `Chapter 6` folder on the DVD.
2. Activate the Draw button on the Top shelf (hotkey = Q).
3. Rotate the dragon so that you can see the back from above. Drag on the ZSphere behind the front legs to create the start of the wings.
4. Release the brush and then drag on top of the newly added ZSphere to add a second ZSphere. Hold the **Shift** key while dragging so that the new ZSphere size matches its parent (see left image in Figure 6.41)
5. Switch to Move mode and drag the new ZSphere up and away from the body as shown in the right image in Figure 6.41. (Remember to reduce the Draw Size on the top shelf; this will help increase accuracy as you select and move ZSpheres).

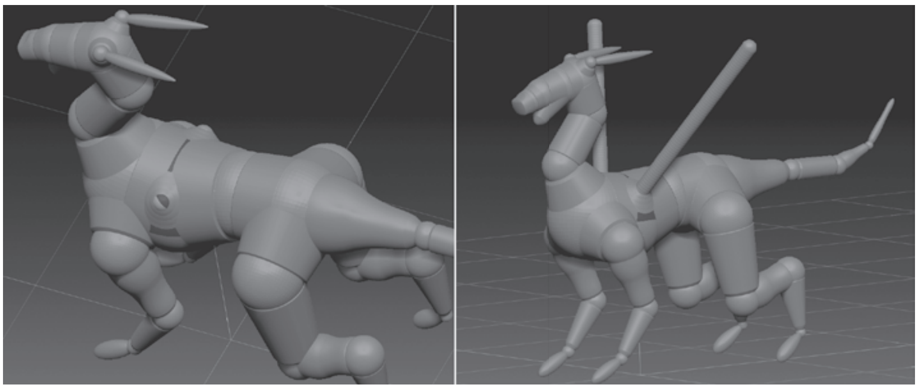


Figure 6.41
Draw ZSpheres on the back of the body and pull them out to create wings.

At this point you can add a cylinder to replace the connecting ZSphere between the root of the wing and the ZSphere at the end. This way the wings match the rest of the armature. This technique will allow you to replace connecting ZSpheres with any polymesh surface. In this case, we'll stick with the cylinders that are part of the original dog project.

6. The Move button should still be activated on the top shelf. Click on the connecting ZSpheres between the root of the wing and the tip.
7. In the Tool palette, scroll down to the bottom and expand the Adaptive Skin subpalette. Make sure the Use Classic Skinning button is activated. Click the Insert Connector Mesh button and choose the PM3D_Cylinder3D tool from the tool fly-out inventory. The PM3D_Sphereinder tool will also work just fine. Figure 6.42 shows how this process works; the material has been changed to the Framer 02 material so that it's easier to see what's going on.

The connecting ZSpheres are now replaced by the polymesh cylinder, but the behavior of the ZSpheres is the same. When using the Insert Connector Mesh button, keep in mind that the connecting ZSpheres behind the selected ZSphere will be replaced with the mesh.

8. Switch to Draw mode (hotkey = Q) and drag on the ZSphere at the end of the wing to add another ZSphere. Move this ZSphere away from the wings and scale it down to extend the wings. Notice that another cylinder mesh is added between the new wing ZSpheres (see Figure 6.43).

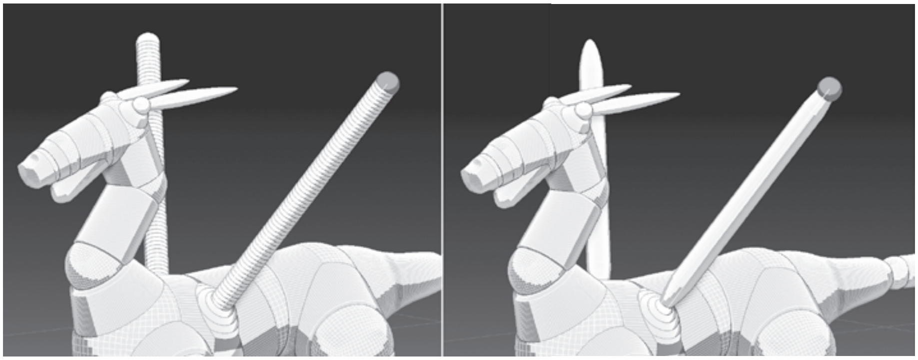


Figure 6.42
Use the Insert Connector Mesh button to replace connector ZSpheres with the PM3D_Cylinder3D mesh.

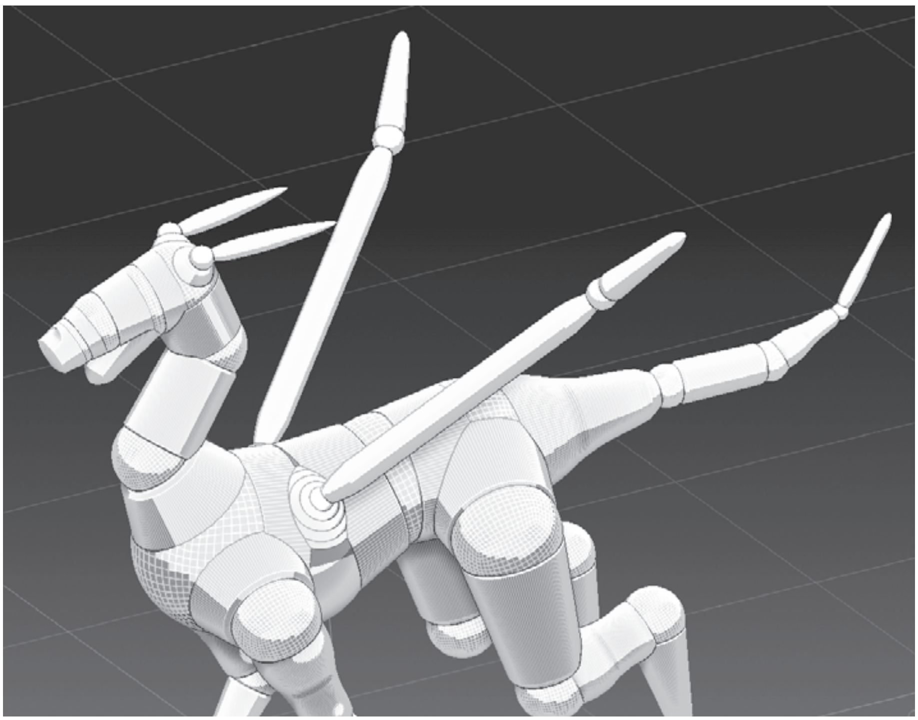


Figure 6.43
Another ZSphere is added to extend the wings.

9. Switch to Draw mode and add ZSphere spines to the wings by clicking on the cylinders. If you need to delete a ZSphere, just hold the **Alt** key and click the ZSphere you want to remove.
10. Use the Insert Connector Mesh button to replace any connecting ZSpheres in the wings with the PM3D_Cylinder3D tool.
11. When you are happy with the shape of the dragon, save the project as `dragonBody_v02.ZPR`. You can reuse this dragon armature in future projects (see Figure 6.44).

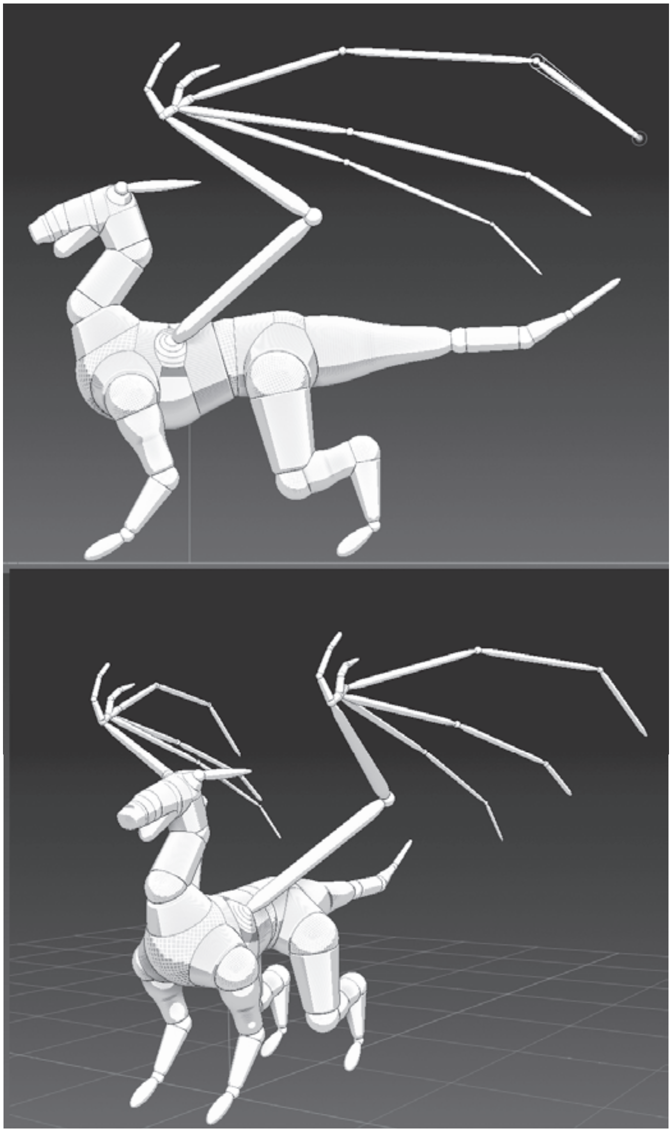


Figure 6.44
Add additional ZSphere spines to the bones of the wings.

Remesh the Dragon Body

Now that the body and the head are proportionally correct, you can remesh the dragon body. If you recall from earlier in the chapter, remeshing will create a skin that covers all visible SubTools.

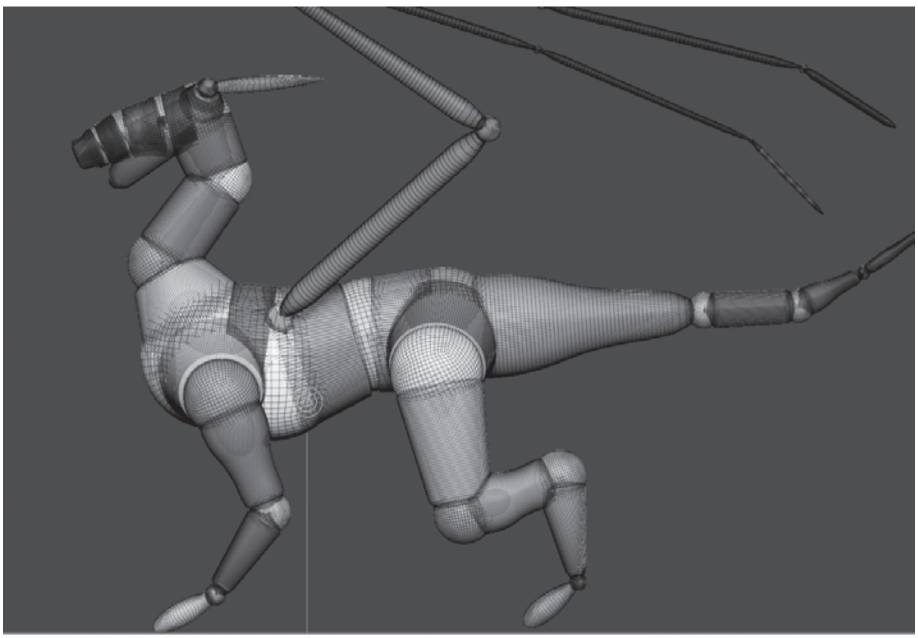
Remeshing usually takes some preparation and a few tries to produce the best results. This exercise will show you how to go about creating a skin from the dragon body ZSphere armature.

1. Continue with the project from the previous section or load the `dragonBody_v02.ZPR` project from the `Chapter 6` folder on the DVD.

So if the armature for the dragonBody is made up of ZSpheres, why not just create an adaptive skin? You can do this, but since the mannequin has replaced the connecting ZSpheres with cylindrical meshes, the result would be an adaptive skin made up of a bunch of different parts (see Figure 6.45). What we want is a skin that covers the whole armature. However, you can't simply remesh the ZSphere mannequin. You need to switch to the Adaptive Skin Preview before remeshing the mannequin. This is an easy step to forget. If your remesh looks like Figure 6.46, it's probably because you forgot to switch to Preview mode.

2. Press the **A** hotkey to switch to the Adaptive Skin Preview.
3. In the SubTool subpalette, set the Res slider next to the ReMesh All button to 304 (see Figure 6.47).
4. Click the ReMesh All button.

Figure 6.45
An Adaptive Skin created from a mannequin produces a mesh made up of separate parts.



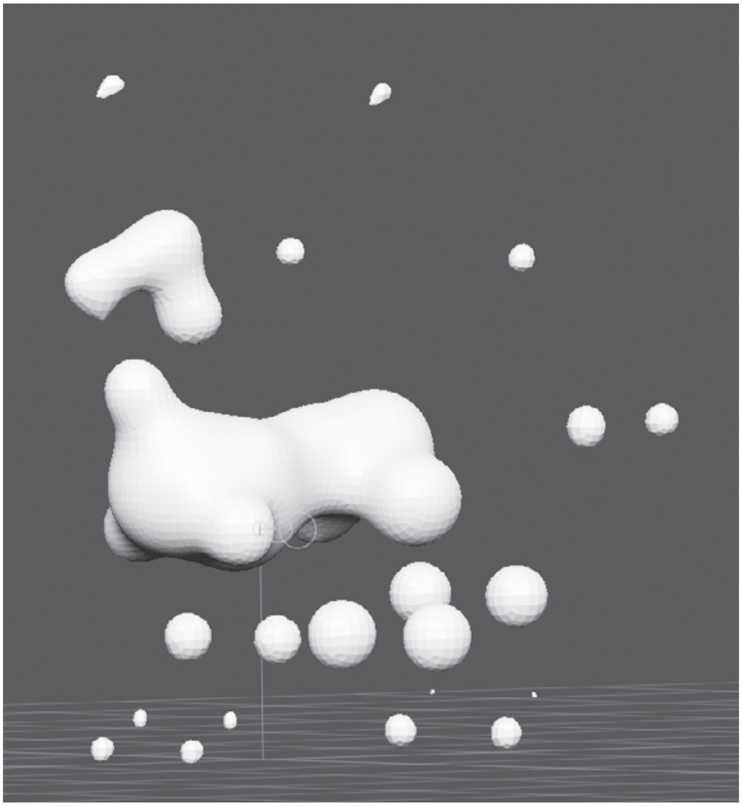


Figure 6.46
Remeshing the ZSphere armature produces a bunch of disconnected blobs.

Figure 6.47
Increase the Res slider to establish the resolution of the remeshed skin.

It will take a few seconds to calculate the remeshed skin. The new skin appears as at the bottom of the stack in the SubTool subpalette. It looks pretty good but you'll want to inspect it to see if there are problems.

5. In the SubTool subpalette, select the Skin_dragonBody SubTool. On the right shelf, press the Solo button so that you can see the skin clearly (see Figure 6.48).

When you remesh a mannequin, you may find that some parts are very thin or disconnected. If this is the case, you can try increasing the resolution or select the mannequin, switch out of Preview mode, and scale up the ZSpheres in the areas that are thin. You can also move parts of the armature to create a cleaner remesh, especially if the new mesh is creating a connection between parts that should not be connected, such as fingers and toes. Then switch back to Preview mode and try again until you get the results you want.

6. Once you have a mesh you like, use the Save As button in the File palette to save the project as `dragonBody_v03.ZPR`.

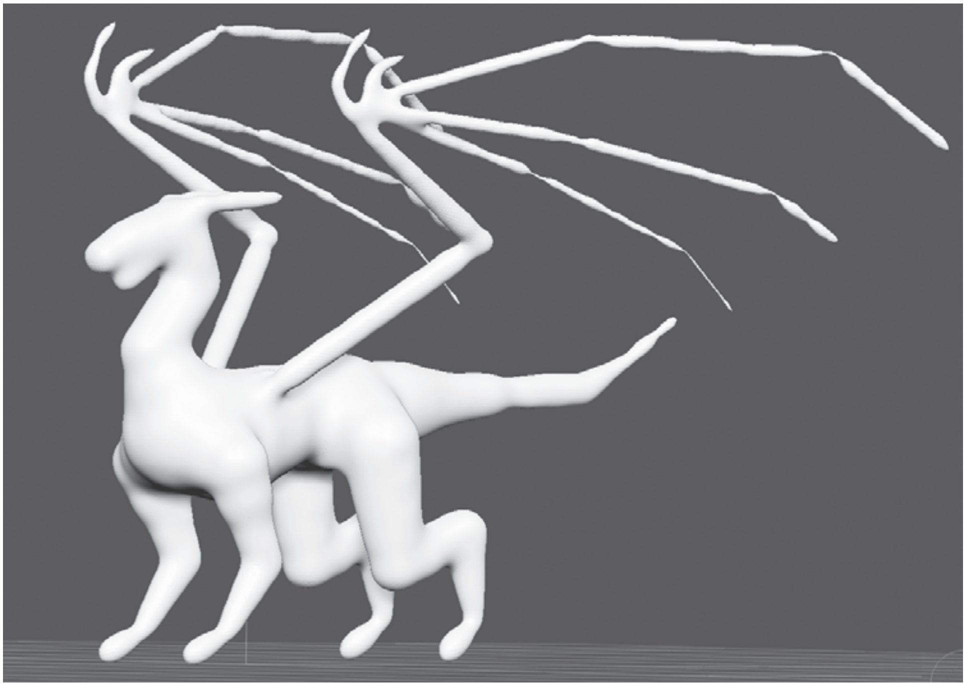


Figure 6.48
The skin created by remeshing the dragon's body.

SORTING OUT THE TOOL INVENTORY

Over the course of a typical ZBrush session, you may find that the tool inventory starts to fill up with tools that all have similar names. Remember that you appended the dragonBody to the dragon's head; however, there's still a copy of the dragonBody tool in the inventory. It has been renamed dragonBody_1. If you're not sure which is which, hold the cursor over each tool icon in the tool inventory. In the preview for the dragonBody_1 tool, you'll see that the label says ZSpheres=62. This means that this is just the original ZSphere armature by itself. If you want to remove this tool from the inventory, select it, open the SubTool subpalette, and press the Delete button. This deletes the mannequin SubTool, removing it from the tool inventory. Don't worry; it has not been deleted from your hard drive. Now you can switch to the other dragonBody tool, which consists of the ZSphere armature and the head.

Project the Mannequin Details

The skin created from the Remesh operation is obviously very low detail. It's also very loose and does not quite resemble the dragon mannequin you worked so hard to create. That's okay. You have the general shape of your dragon, so now you can simply project detail from the mannequin SubTool to the mesh.

Before projecting the details, you may want to clean up the mesh a little, especially the parts that are very thin.

1. Continue with the project from the previous section or load the `dragonBody_v03.ZPR` tool from the `Chapter 6` folder on the DVD.
2. Select the Skin_dragonBody SubTool. Press the **X** hotkey to activate symmetry.
3. Open the sculpting brush library on the left shelf, and press **i** and then **n** to select the Inflate brush. Use the brush to inflate the thin areas of the wing bones (see Figure 6.49).
4. In the Geometry subpalette, press the Divide button twice (hotkey = Ctrl+D). This will add two levels of subdivision to the skin. Ideally, you want to have enough polygons so that the details project from the mannequin but not so much that it takes forever to calculate the projection.

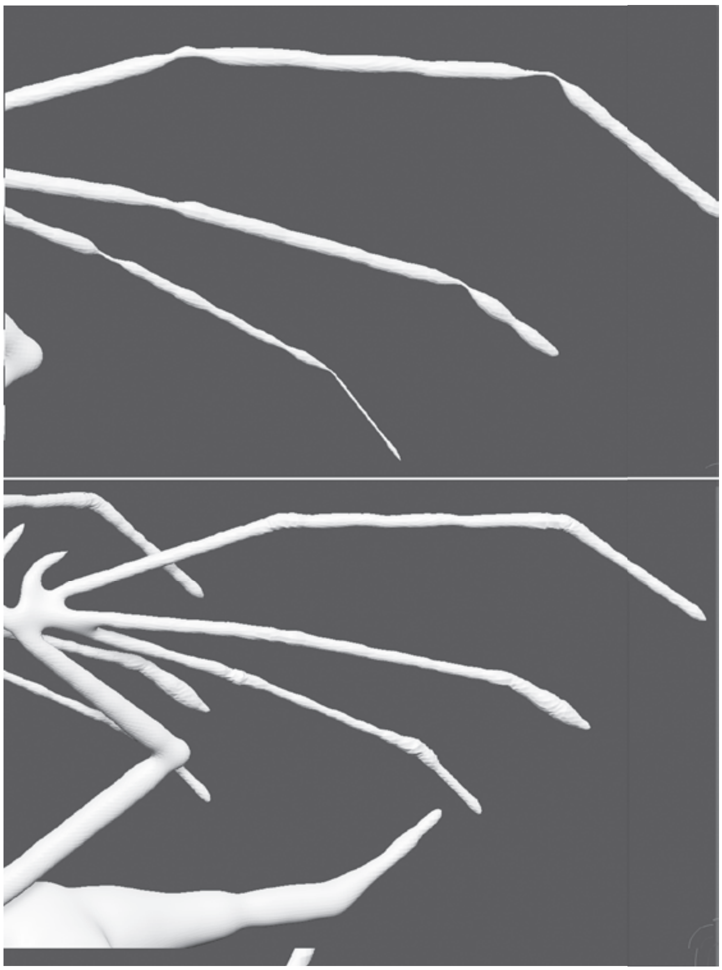


Figure 6.49
Use the Inflate brush to inflate the thin areas of the wing bones.

Figure 6.50

The ProjectionShell slider appears below the Project All button in the SubTool subpalette of the Tool palette.

Toward the bottom of the SubTool subpalette you'll see the Project All button. Below the Project All button is a button labeled ProjectionShell (see Figure 6.50). This slider determines how the projection will be calculated. The projection operation takes the polygons of the target mesh—in this case the Skin_dragonBody SubTool—and shrink-wraps them to the surface of the source mesh—in this case the original dragon mannequin.

During the process of calculating the projection, ZBrush looks at the distance between the target and the source and uses this to determine how to move the polygons of the target.

The ProjectionShell slider allows you to interactively determine the projection distance. When you move the slider to the right, you'll see the target mesh swell up. What you're actually looking at is a preview of the projection distance. When you let go of the target, the mesh snaps back to its original size, but you'll notice that a value for the Projection Shell has been established.

The three buttons below the slider also determine how the projection will be calculated.

Farthest means that the range of the projection will be determined by the farthest point on the source mesh.

The Outer button is turned on automatically when the ProjectionShell slider is moved to the left and a negative value is set. This means that only parts of the source mesh outside of the target mesh will be used in the calculation.

The Inner button is turned on automatically when the Projection Slider is moved to the right and a positive value is set. Any polygons outside of the Projection Shell preview will not be included in the calculation.

5. On the right shelf turn on Transp to activate transparency. Make sure Solo is off.
6. Slowly drag the ProjectionShell slider to the left. The Skin_dragonBody mesh appears to shrink. Eventually, most of it appears inside the transparent view of the dragonBody SubTool. The slider stops at -0.5 (see top image in Figure 6.51).
7. Slowly drag the slider to the right and you'll see the Skin_dragonBody mesh swell up until almost all of the dragonBody SubTool is hidden (see bottom image in Figure 6.51).
8. Press the ProjectAll button.

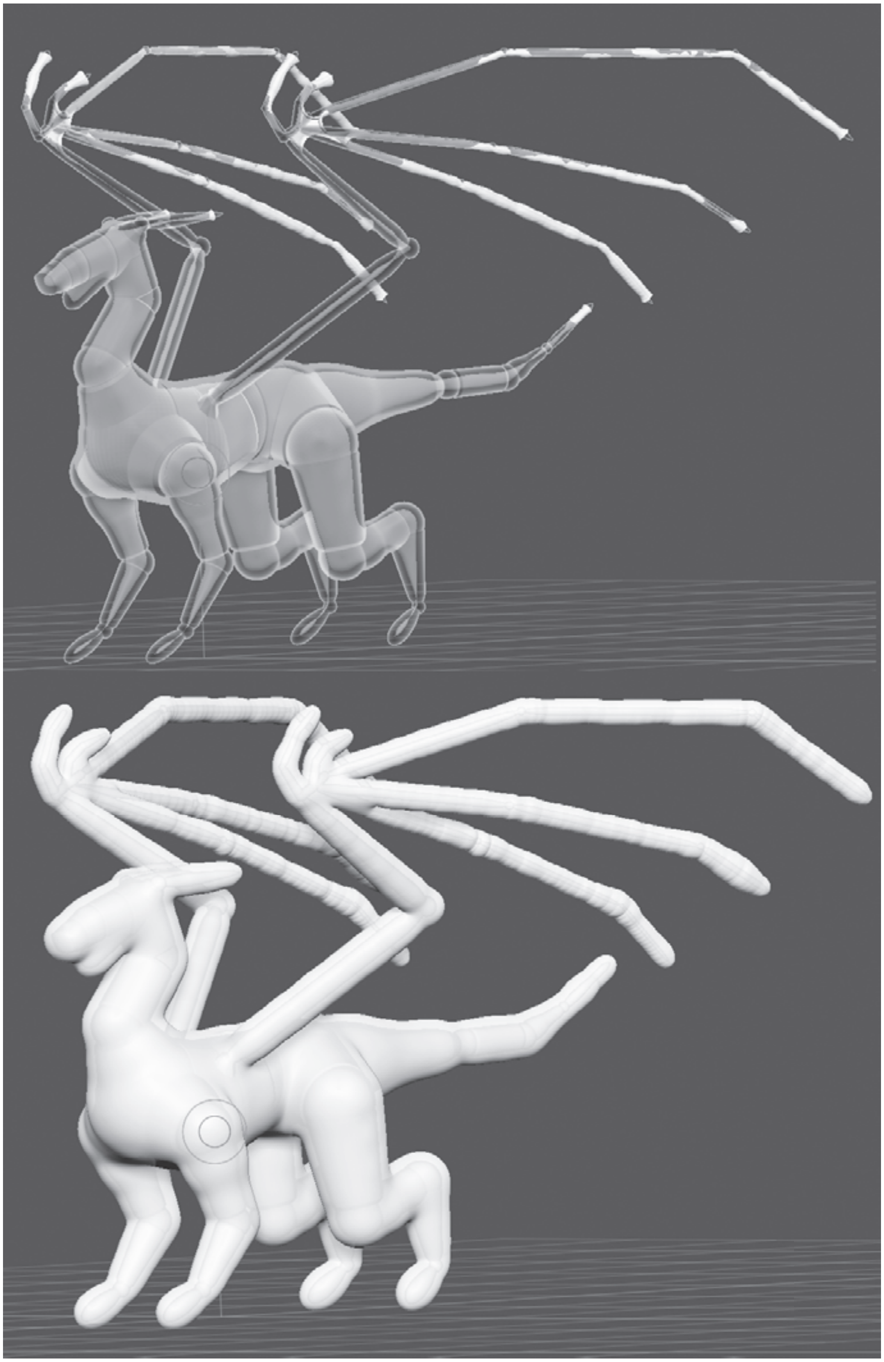


Figure 6.51

Negative ProjectionShell values shrink the projection preview so that it fits within the source (top image). Positive ProjectionShell values expand the size of the preview so that the source mesh fits inside (bottom image).

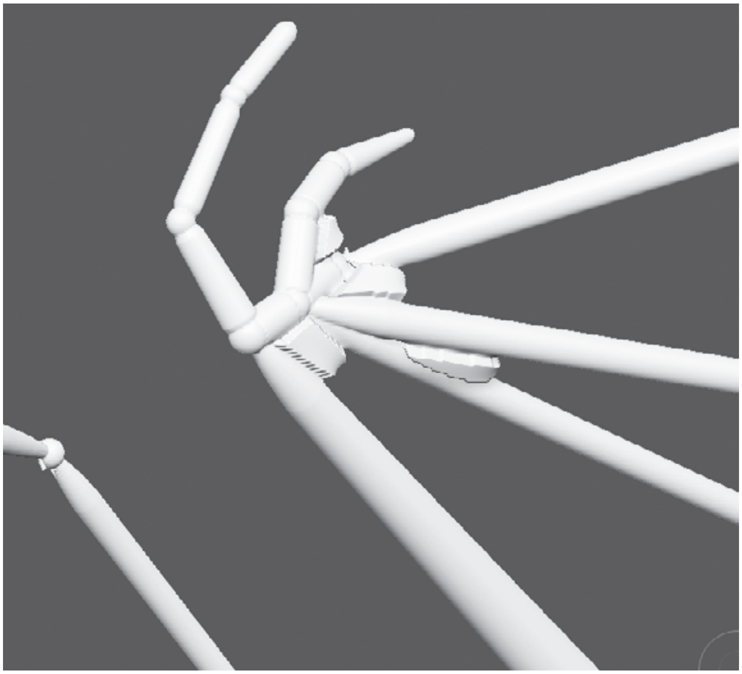


Figure 6.52

Parts of the target mesh still stick out past the source mesh.

After a few seconds, the Projection is calculated. You'll see that the Skin_dragonBody mesh has shrunk to match the surface of the mannequin. Well, most of it anyway. You'll see some spots that still stick out (see Figure 6.52). That's okay. Projection is rarely perfect, and there's usually a little cleanup involved in fixing the projection.

Figure 6.53

Relax the surface to smooth out some of the problem areas of the mesh.

9. Expand the Deformation palette and drag the Relax slider all the way to the right and let go (see Figure 6.53). After a few seconds you'll see the polygons of the mesh become slightly smoother. The relax operation is evening out the positions of the vertices while trying to maintain detail in the surface
10. On the right shelf, press the Solo button so that you can see the dragon mesh by itself. Make sure symmetry is activated on the x-axis (hotkey = X). Hold the **Shift** key and brush over the problem spots on the mesh.

You can try repeating the Project All process a few more times and experimenting with how the settings work if you like, but at this point you have a nice starting place to sculpt the dragon's body (see Figure 6.54).

11. Save the project as `dragonBody_v04.ZPR`.

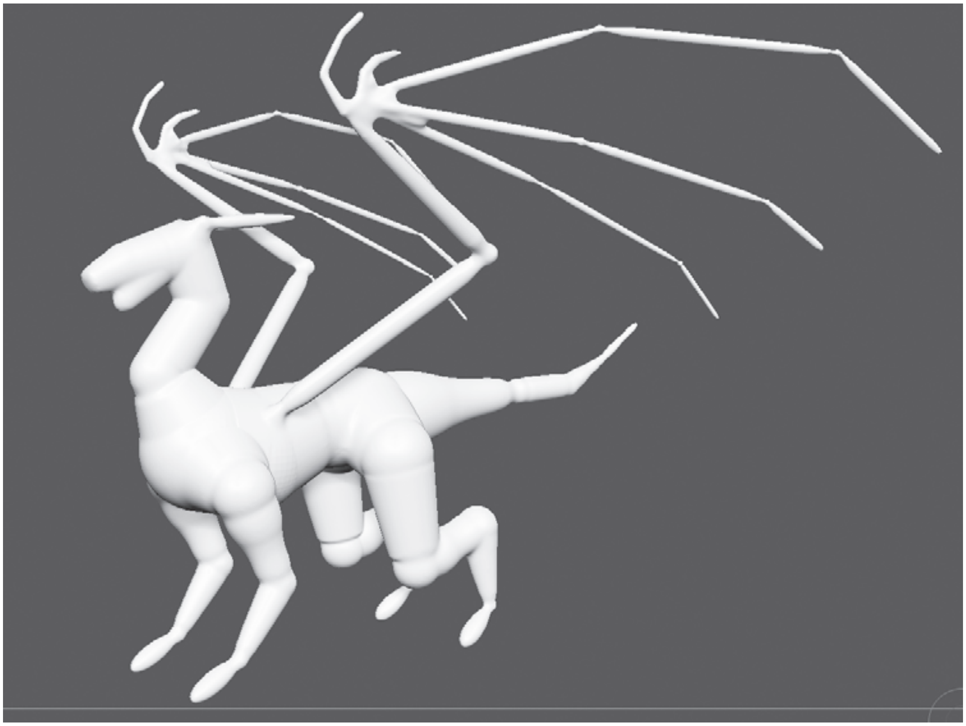


Figure 6.54
Use the Smooth brush to clean up problem areas.

ZPROJECT BRUSH

In the example shown in this section, projection is used to transfer details from a very simple mesh, so cleaning up problem areas is easily done using the Smooth brush. However, you may find yourself in a situation in which you want to project intricate detail from one mesh to another. You can use the ZProject brush to clean up areas where Project All did not produce a perfect result.

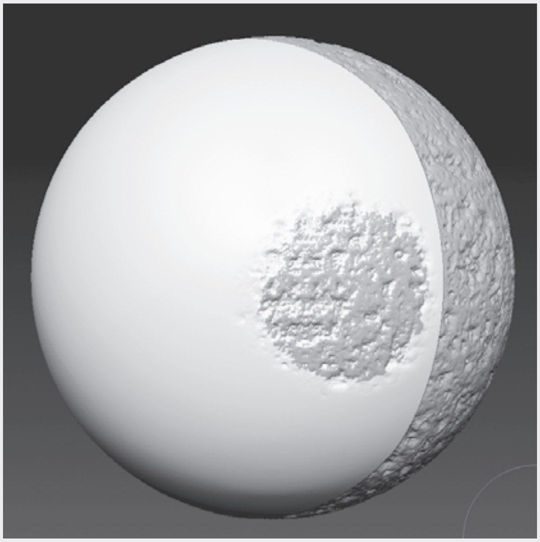
The ZProject brush is a sculpting brush that uses the same projection algorithm as Project All, but the fact that it is a brush allows you to project in very specific areas. You can use this to fix parts of your mesh or explore creative ideas. There are a few rules you need to follow when using ZProject to ensure the best results.

Follow these steps when using Project All:

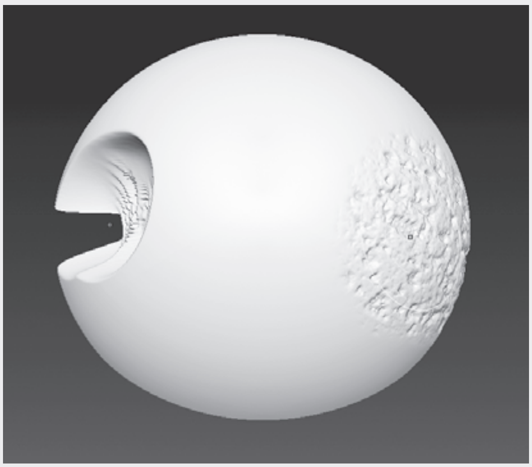
1. Just as with Project All, the ZProject brush uses a target mesh and one or more source meshes. Make sure the target mesh is selected and all source meshes are visible.

continues

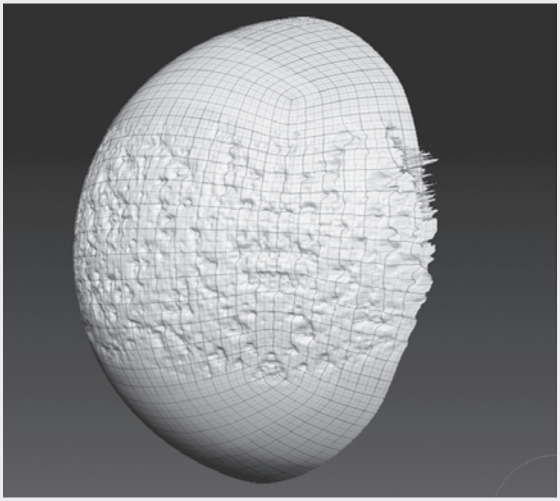
continued



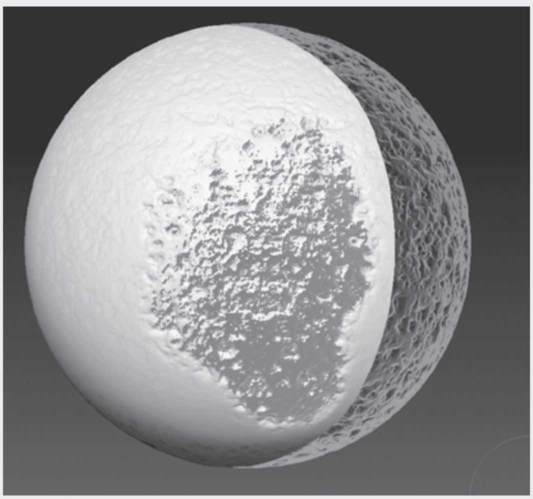
2. Make sure symmetry is off. ZProject does not work well with symmetry, and you can accidentally mess up one side of your model if symmetry is enabled for the tool.



3. Rotate the model so that the surface is perpendicular to your view and rotate frequently as you work. The brush will smear and squish parts of the surface that are brushed at an angle.



4. ZAdd should be active on the top shelf when using the ZProject brush. The brush brings the surface of the target SubTool out to meet the surface of the source SubTool. Hold the **Alt** key to push the surface of the target SubTool in to meet the surface of the source mesh.
5. Alternate between using ZProject and the Smooth tool on parts of the surface. Work over small parts holding and releasing the **Alt** key to move the surface of the target mesh until you get the results you want.
6. It may help to have Transparency on while you work.
7. If the Rgb button is activated on the top shelf and PolyPainting is on for both surfaces, the ZProject brush will transfer color information from one surface to the other. PolyPainting is discussed in Chapter 8.



Sculpt the Dragon Body Mesh into Shape

The result of all this work is that you now have a mesh in the shape of the basic dragon body and you're ready to start sculpting. After you go through this process a few times, you'll find that it takes only a few minutes and it's a very quick way to generate a mesh ready for sculpting. Consider this approach another trick you can pull out the bag when creating surfaces in ZBrush.

To turn this basic mesh into a dragon, I added several more subdivisions and used the sculpting brushes to create the muscles, bony forms, and details. Watch the `dragonBody.mov` movie on the DVD to see how I created my version of the dragon.

There are a number of ways to create the flesh for the wings. For this project, I used a combination of Maya and ZBrush, which is described in one of the bonus chapters on the DVD, Bonus Content 1, "GoZ."

Figure 6.55 shows the final dragon.

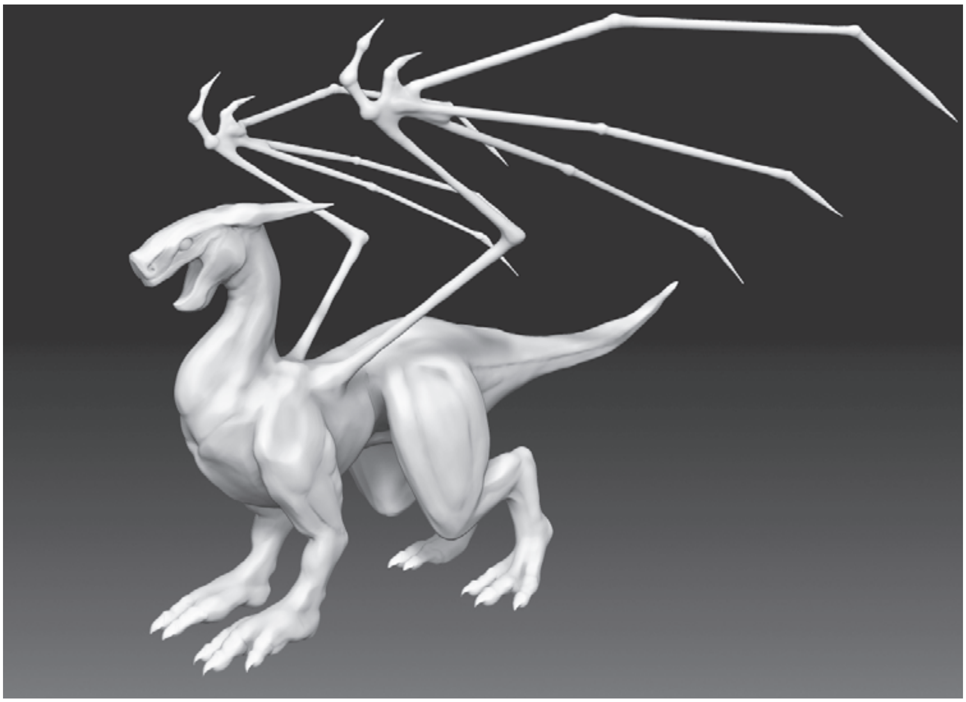


Figure 6.55
The remeshed dragon after sculpting

CHAPTER 7

Advanced Brush Techniques

The secret to creating fantastic models in ZBrush lies in the power to customize the sculpting brushes. Up to this point, the exercises in this book have primarily focused on different ways to generate general forms and the sculpting techniques have been fairly basic. In this chapter, you'll switch into high gear as you learn how to detail your models using the sculpting brushes.

The ZBrush 4 interface has been upgraded so that artists now have access to many of the brush controls that were hidden in previous versions. Once you gain an understanding of how the various controls can be used to customize the brush presets, you'll see that you can design a brush so that it can do just about anything you want. In this chapter, you'll learn how to design your own brushes to achieve specific results. Each section shows an example of how the custom brushes can be used on one of your models.

This chapter includes the following topics:

- **Brush base types**
- **LazyMouse**
- **Back Track**
- **Planar brushes**
- **Depth masking**
- **Stencils**
- **The Picker palette**

Brush Customization

You really don't have to create custom brushes in ZBrush. The existing brush presets found in the brush fly-out library are powerful enough to allow you to sculpt an astonishing amount of detail into your models, from wrinkles in skin to smooth hard surface models and even dragon scales. So why should you take the time to learn how to customize the sculpting brushes? By learning how the brush controls work, you'll be able to get more out of the existing brush presets. Sometimes just the slightest change to the settings in the Brush palette can make all the difference. Plus, creating your own brushes is a lot of fun. This is probably why there are so many presets available in the brush library—the developers at Pixologic can't seem to stop creating and adding new brushes.

Creating a custom brush involves adjusting a number of settings throughout the ZBrush interface. The Alpha, Brush, Picker, and Stroke palettes all contain controls that affect how the brushes manipulate the surface of your model. In fact, it would be possible to write a whole book devoted to how these controls work. Rather than overwhelm you with detailed descriptions of each and every button and slider, this section will give you an introduction to how these settings can be combined. As you go forward in your career as a digital sculptor, you'll be able to build upon the knowledge gained in this chapter.

We'll start with the fundamentals of how the brushes actually work. The brush presets that you see in the brush fly-out library are all variations created from a number of base brush types. Each brush base uses its own specific algorithm to determine how the surface of the model will be altered. You can find out the base type used by the various presets by holding your cursor over the brush in the fly-out library. The brush base is listed at the bottom of the info pop-up (Figure 7.1).

Figure 7.1

The brush base type is displayed at the bottom of the brush info pop-up.

As you apply the brush tip to the surface, ZBrush samples the polygons within the area defined by the Draw Size setting. Sampling is like a short conversation that takes place between the brush tip and the surface. This sampling action helps ZBrush to determine the properties of the surface, such as the direction of the normals, the number of polygons within the area defined by the brush, which polygons are masked, and so on. The polygons of the surface are then altered by the brush depending on the algorithm used by the brush base and, if you're using a digital tablet, the amount of pressure applied to the tablet.

The following list contains a brief, simplified description of how each brush base affects the surface as you sculpt:

Standard This brush type moves the polygons of the surface outward based on an average of the normal direction. Holding the Alt key causes the surface to be pushed inward (Figure 7.2).

Move This brush type allows you to push and pull the polygons of the surface around depending on how you move the brush (see Figure 7.3). Holding the Alt key moves the surface along the normal face.

Blur This is the base type used by all the smooth bushes. The position of the points of the surface are averaged, which causes the details to be smoothed away (Figure 7.4). Holding the Alt key reverses this action, causing details to become more prominent.

Polish This brush base flattens details on the surface, which can reduce the amount of detail in the surface, kind of like the blur base type. It does this by averaging the normals so that they lie along the same plane, but at the same time the brush continually evaluates and updates the normal direction. Brushes that use this base type work well when sculpting hard edges and flat areas. They are also useful for eliminating lumps in the surface (see Figure 7.5). Holding the Alt key reverses the direction of the polishing action, so for example, the mPolish brush (medium polish) pushes the surface inward, and holding the Alt key pulls the surface outward.

Clay This brush base affects recessed areas in the model before affecting the protruding parts of the surface (Figure 7.6). This results in a very organic type of deformation that is reminiscent of pressing clay into an actual model. The Clay brush base is used by a lot of the brush presets. Holding the Alt key reverses the direction of the deformation. Be careful when using this brush base on thin parts of the model; the opposite side of the model can become distorted.

Hide/Show This brush base type is used by the selection brushes when hiding or showing the polygons of the surface (see Figure 7.7). The selection brushes are explained in detail in Chapter 3, "Basic Digital Sculpting."

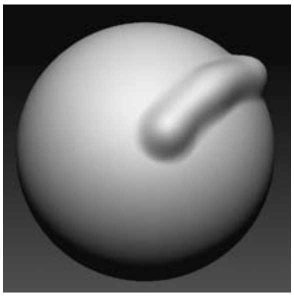


Figure 7.2

The Standard brush base displaces the surface based on an average of the surface normals sampled by the brush.

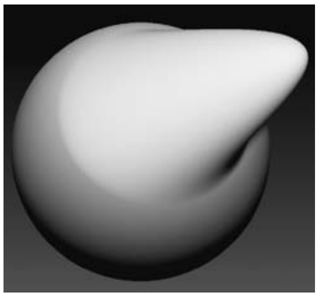


Figure 7.3

The Move brush base lets you pull and push the polygons of the surface.

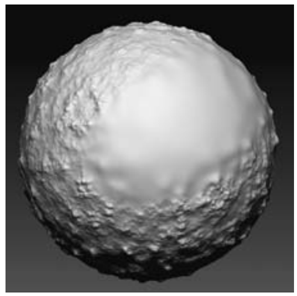


Figure 7.4

The Blur brush base is used by the smooth brushes. They let you smooth the surface to remove detail.

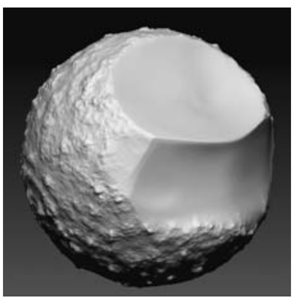


Figure 7.5

The Polish brush base smooths the surface and allows you to sculpt hard edges.

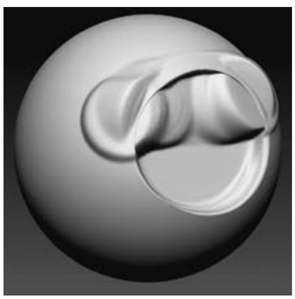


Figure 7.6

The Clay brush base fills in recessed areas of the surface faster than raised parts of the surface.

Figure 7.7

The Hide/Show brush base lets you select the polygons of a surface and hide them.

Mask This brush base is used by the various masking brushes to apply masks to the surface (see Figure 7.8). Masks are covered in detail in Chapter 3.

Project This brush base moves the surface of the model to match the surface of visible subtools close to the surface (see Figure 7.9). The ZProject and MatchMaker brushes both use this base. Projection is discussed in more detail in Chapter 6.

Elastic This brush base is similar to the Standard brush (see Figure 7.10). However, the position of each point is relaxed immediately after the brush deforms the surface. Holding the Alt key reverses the direction of the deformation.

Single Layer This brush base moves the surface outward while retaining preexisting details (see Figure 7.11). Holding the Alt key reverses the direction of the deformation.

Snakehook This brush base allows you to pull the surface outward in thin wiggly strands (see Figure 7.12). Be careful when using this brush because it can cause polygons to become stretched and therefore difficult to work with.

Displace This brush base is similar to the Standard brush in that the surface is pushed out based on the normal direction of the sampled area; however, the specific sampling algorithm is slightly different, causing the deformation to move directly outward from the surface (see Figure 7.13) or inward when holding the Alt key. Try comparing the results of using this brush with the results of using the Standard brush.

Pinch This brush base pulls the points of the surface together (see Figure 7.14). It's great for refining details such as wrinkles. Normally, the brush pinches the points up away from the surface. Holding the Alt key causes the pinched areas to be pushed down into the surface.

Trim This brush base pushes the points of the surface to create a flat plane (see Figure 7.15). It is used by the clip brushes, which were explored in Chapter 5. It is ideal for sculpting hard surface details and mechanical objects.

Figure 7.8

The Mask brush base is used to mask the polygons of the surface.

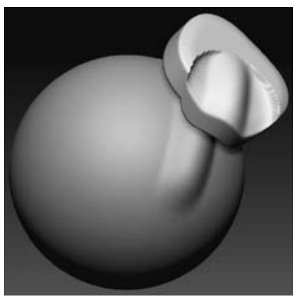


Figure 7.9

The Project brush base moves the polygons of the active SubTool so that they match the polygons of visible, inactive subtools.

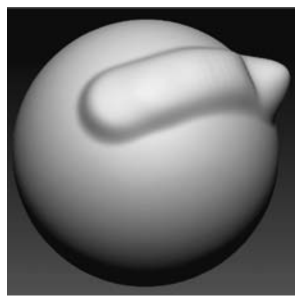


Figure 7.10

The Elastic brush is similar to the Standard brush except that the points of the surface are relaxed as the stroke is drawn.

Pump This brush base pushes each point outward based on its individual normal direction so the result is kind of a bulging action (see Figure 7.16). Holding the Alt key reverses the direction of the deformation.

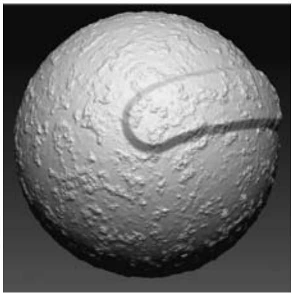


Figure 7.11

The Single Layer brush displaces the polygons of a surface by an equal amount while retaining existing details.

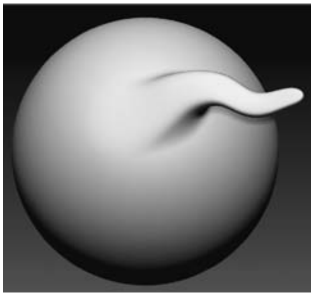


Figure 7.12

The Snakehook brush base lets you pull snakey strands out of the surface.

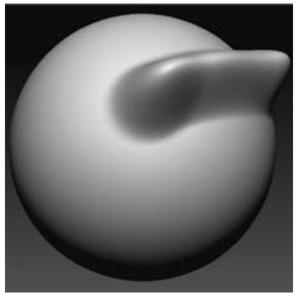


Figure 7.13

The Displace brush base moves the surface directly outward based on the direction of the sampled surface normals.

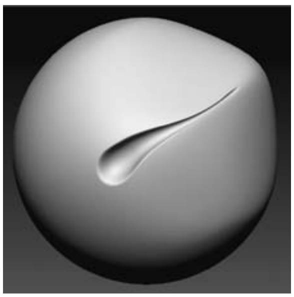


Figure 7.14

The Pinch brush base pulls the points of the surface together.

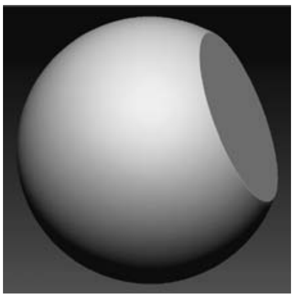


Figure 7.15

The Trim brush base is used by the clip brushes to flatten the polygons of the surface to a plane.

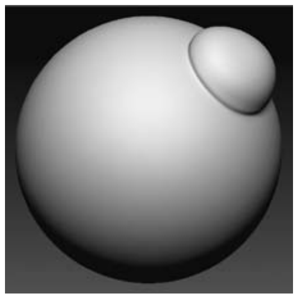


Figure 7.16

The Pump brush base moves the points of the surface outward based on the individual normal direction of the sampled polygons.

Make a note of the brush base listed in the icon for each of the brushes as you experiment with the presets. Understanding how each base type works will help you decide which brush to use for specific situations.

Design a Brush

In the exercises in the following sections, you'll create a custom detailing brush and then see how the brush can be used to refine the edges of the eyelids for the dragon head model created in Chapters 3 and 4. Creating the brush is very easy, and you'll see how adjusting a few settings can change the character of a sculpting brush. This brush will also be useful for creating organic details such as wrinkles.

You'll use the Standard brush as a starting point and begin the design of the brush by applying the LazyMouse feature to the Standard brush.

LazyMouse

LazyMouse stabilizes your brush stroke, allowing you to sculpt straight lines into the surface. This gives you more control over details you create. It seems odd that the feature is called LazyMouse. Technically it should be LazyBrush since most people do not sculpt with the mouse, but that's just my opinion.

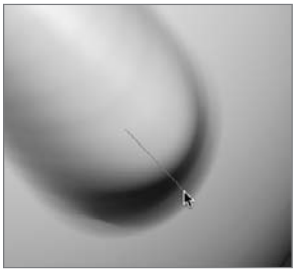


Figure 7.17
A red line connects the tip of the brush to the stroke on the surface. The length of the line indicates the amount of delay created by the LazyMouse feature.

The LazyMouse feature works by creating a delay between the end of the brush and the actual change made to the surface of the geometry. This delay minimizes the effect of small movements made while sculpting, making it easier to create straight lines as you sculpt. The feature uses a red line to indicate the amount of delay applied to the brush (see Figure 7.17). To adjust the amount of delay as well as other LazyMouse properties, use the controls in the Stroke palette.

You'll start by testing the brush on a simple PolySphere. Throughout this chapter, you'll be using this PolySphere as a surface for testing brushes. To save a little time and button clicking in future exercises, you can save this as a project. Each time you want to work on developing a brush, you can simply load this project into ZBrush. By storing a morph target, you can easily clear the PolySphere of all marks made by the sculpting brushes.

1. Start a new session of ZBrush.
2. Open Light Box to the Tool section and double-click the PolySphere tool. Drag on the canvas to create the PolySphere and then switch to Edit mode (hotkey = T).
3. Press **Ctrl+D** three times to add three levels of subdivision to the PolySphere.
4. From the materials fly-out library on the right shelf, choose the SkinShade4 material.
5. In the MorphTarget subpalette of the Tool palette, press the Store Morph Target button. A MorphTarget saves the current state of the tool so you can switch back at any time after making changes.
6. Use the Save button in the File menu to save the project as `brushTest.ZPR`. Save the file in the `ZBrush 4\ZProjects` folder so that it appears in Light Box.
7. Open the brush fly-out library and select the Standard brush. This will be the starting point for your custom detail brush.
8. Set Draw Size to **20** and ZIntensity to **50**.
9. Draw a stroke on the surface of the PolySphere. Move the brush back and forth in small motions as you drag on the surface. This gives you an idea of how the brush works when LazyMouse is not activated.

CLEAR THE POLYSPHERE WITH A MORPH TARGET

Don't forget that if the PolySphere becomes crowded with too many test strokes, you can simply press the Switch button in the MorphTarget subpalette of the Tool palette. To clear the PolySphere of all changes, follow these steps:

1. Press the Switch button. This switches to the clear version of the PolySphere.
2. Press the Delete Morph Target button. This makes the clear version of the PolySphere permanent.
3. Press the StoreMT (Store Morph Target) button to store a new state.

In Chapter 10, "Morph Targets, Layers, and the ZBrush Timeline," you'll learn how you can achieve similar results using 3D layers that are even more powerful than morph targets.

10. Open the Stroke palette and move it to the right tray.

    By default, the Standard brush has the LazyMouse feature activated already, but LazyRadius is set to 1, so the effect of LazyMouse is not very noticeable. To see how LazyMouse works, increase the LazyRadius value.

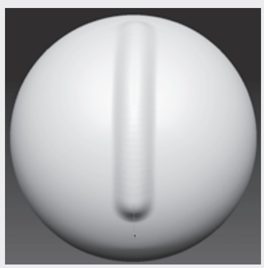
11. Set LazyRadius to **80**. Drag across the surface of the PolySphere and move the brush back and forth again. Compare this stroke with the one you made in step 9 (see Figure 7.18).

    The stroke is more stable, so there is less variation in the mark created on the PolySphere. By increasing the LazyRadius setting, you increase the amount of delay, and this is indicated by the length of the red line that connects the tip of the brush with the beginning of the mark made on the surface. To make it easier to create straight lines, set LazyRadius to **100**.

Figure 7.18
Increasing the LazyRadius value stabilizes the stroke as you draw on the PolySphere.

CREATE A VERTICAL LINE

You can make the brush stroke move straight up or down by holding the Shift key after you start dragging the brush across the surface. Then pull the brush up or down and the stroke will snap to a vertical line. This also works when creating horizontal lines or lines moving at a 45 degree angle. It takes a couple tries to get the hang of this.



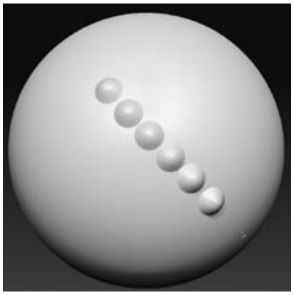


Figure 7.19
Increasing the LazyStep setting increases the space between each step in the stroke.

There are several other settings associated with LazyMouse:

LazyStep Increasing the value of this slider increases the space between the marks made by the brush. At the maximum value of 2, you'll see individual dots placed on the surface (see Figure 7.19). This can be really useful when creating the effect of bolts or stitches on the surface. Try setting this to the maximum value of 2 while using the Spray stroke type for an interesting effect.

Relative When this button is on, the Draw Size setting influences the space between steps as well. Use this as a way to modify the LazyStep setting.

LazySmooth This adjusts the overall strength of the LazyMouse settings. Use this as a way to modify or fine-tune the LazyRadius setting.

12. Experiment for a while with different settings for the sliders in the LazyMouse subpalette of the Stroke palette. Once you get the hang of it, use the following settings:

    LazyMouse: **On**

    Realtive: **Off**

    LazyStep: **0.1**

    LazySmooth: **10**

    LazyRadius: **20**

Save Your Custom Brush Preset

You're not finished creating your custom brush yet, but it's a good idea to save the brush now so that you can use it and modify it in future ZBrush sessions.

1. Make sure the Standard brush is the currently selected brush in the sculpting brush fly-out library. Make sure all the settings you created in the previous section are still applied.
2. In the Brush palette, click the Save As button. This will open your computer's file browser window.
3. Use the file browser to navigate to the `Program Files\Pixologic\ZBrush 4\ZBrushes` folder (in Mac OS, navigate to the `Applications/ZBrushOSX 4.0/ZBrushes` folder).

   In this folder you'll see a lot of files with the `.ZBP` filename extension. This is the file format ZBrush uses for brush presets. The files in the folder are all the presets that you see when you open the Brush section of Light Box.

4. Save the brush file in this directory using the name `detailBrush.ZBP` (see Figure 7.20)
5. Once the file is saved, open the Brush section of Light Box. The brushes are listed alphabetically. Scroll the icons to the left until you see the `detailBrush.ZBP` file.
6. To load the brush, just double-click the icon. Currently the icon looks the same as the Standard brush icon. Later in the chapter you'll learn how to create your own custom brush icon.

SAVE PRESETS TO THE BRUSH LIBRARY

It's nice to have your brushes organized into a folder within Light Box. However, if you would like the brush to appear in the sculpting brush fly-out library whenever you start a new ZBrush session, save the preset as `detailBrush.ZBP` (or whatever name you like) in the `ZBrush 4\ZStartup\BrushPresets` folder. This is the default folder that opens when you press the Save As button in the Brush palette.

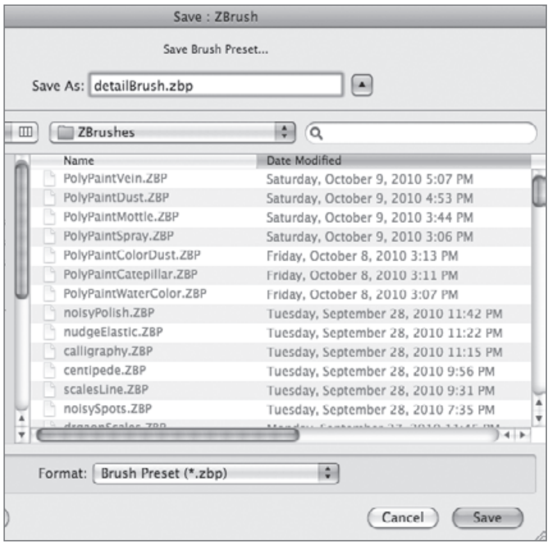


Figure 7.20
Save the brush as detailBrush.ZBP within the ZBrushes folder.

Use the Brush Modifier Slider

The Brush Modifier slider is one of the many controls found in the Brush palette. When you change the settings in the Brush palette, the changes affect all the currently selected brushes in the brush fly-out library. (The settings found in the Smooth Brush Modifiers subpalette of the Brush palette, however, affect only the Smooth brush.)

The Brush Modifier slider adds a pinch effect when applied to brushes that use the Standard base type. Positive values increase the pinch effect; negative values create more

Figure 7.21

The Brush Modifier slider is set to 70 in the Modifiers subpalette of the Brush palette.

of a bulging effect. By adding this pinching effect to the custom brush created in the previous section, you'll have a brush that works very well for creating wrinkles and precise details on a surface.

1. Load the `brushTest.ZPR` project that you created earlier or load the project from the `Chapter 7` folder on the DVD. This will load the PolySphere on the canvas in Edit mode with six levels of subdivision all ready for you to use.
2. Select the detailBrush you created in the previous section.
3. Set Draw Size to **20**. Drag across the surface of the PolySphere so that you can see how the brush behaves with its current settings.
4. In the Modifiers subpalette of the Tool palette, set Brush Modifier to **70** (shown toward the bottom of Figure 7.21).
5. Drag across the surface of the PolySphere. Notice that a pinch effect has been added to the marks made by the detailBrush (see Figure 7.22). This will help add to the precision of marks made by the brush.
6. Use the Save button in the Brush palette to save the brush as `detailBrush.ZBP`. Overwrite the previous version of the brush that you saved in the `ZBrushes` folder.

Tablet Pressure Settings

The Tablet Pressure settings found in the Brush palette allow you to fine-tune how the amount of pressure applied to the digital tablet affects various settings in the Brush palette. You can use this feature to further customize your brush and create some very interesting brush properties. An edit curve is used to manipulate each Tablet Pressure setting.

Figure 7.22

Increasing the Brush Modifier slider adds a slight pinch to the Standard brush.

In this section, you'll adjust the edit curves so that the pinching effect of the detailBrush is stronger when more pressure is applied to the tablet. In addition, the ZIntensity will be stronger when pressure is increased and the draw size will be larger when less pressure is applied.

1. Open Light Box to the Projects section and double-click the `brushTest.ZPR` project.
2. Select the detailBrush you created in the previous section.
3. Set Draw Size to **20**. Drag across the surface of the PolySphere so that you can see how the brush behaves with its current settings.
4. Place the Brush palette in the right tray so that you can easily access the controls.
5. Expand the Tablet Pressure subpalette so that you can see the controls (see Figure 7.23). Click the BrushMod box toward the bottom to expand the edit curve (see left image in Figure 7.24).

   This curve modifies the intensity of the Brush Modifier setting that you adjusted in the previous section. Currently, the edit curve box is filled with a light orange color because the curve itself is set to 100 percent all the way across the top of the edit curve graph.
6. Hold the mouse pointer over the Edit Curve box; you'll see two orange dots appear in the upper left and upper right. Drag the orange dot in the upper left all the way down to the bottom of the graph (see right image in Figure 7.24).

   The graph now looks like a diagonal line moving from the lower left to the upper right. This particular edit curve is tied to brush pressure in such a way that the horizontal axis of the graph corresponds to brush pressure and the vertical axis corresponds to the strength of the effect.

   By creating a diagonal line from the lower-left corner to the upper right, you are adjusting the intensity established by the Brush Modifier slider so that when the pressure is at 0, the intensity of the Brush Modifier is also zero. The Brush Modifier slider adds a pinch effect when applied to brushes that use the Standard base type, as mentioned earlier. As you press harder on the digital tablet, the intensity of the Brush Modifier increases so that the pinching effect becomes more pronounced. At full pressure, the maximum value of 70 (which is the current setting of the Brush Modifier slider) is achieved.

Figure 7.23
The Tablet Pressure subpalette of the Brush palette.

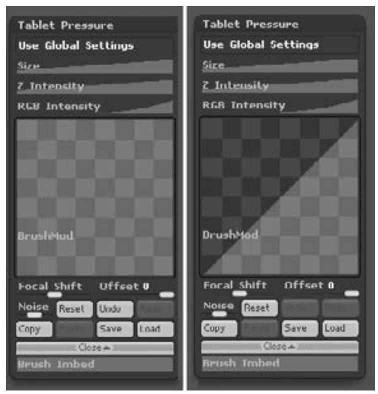


Figure 7.24
Expand the Edit Curve labeled BrushMod to fine tune the intensity of the Brush Modifier setting. Drag the dot on the left down to the bottom of the graph to create a diagonal line that slopes upward from left to right.

Figure 7.25
Two points are added to the graph in the BrushMod edit curve window. The points are moved to shape the curve.

7. Try dragging the brush across the surface of the PolySphere. Vary the pressure as you drag across the surface.
8. The effect is fairly subtle. To make it a bit more obvious, click the center of the line in the BrushMod edit curve window and drag down and toward the right. Add a fourth dot near the upper-right corner of the graph. See if you can make the curve match the one shown in Figure 7.25.
9. Try drawing on the surface again and vary the pressure. Now it should be more obvious that by increasing the pressure on the digital tablet, you get more of a pinching effect (see Figure 7.26).
10. Expand the Size edit curve in the Tablet Pressure subpalette of the Tool palette. Edit the curve so it looks like the left image in Figure 7.27.
11. Expand the ZIntensity edit curve in the Tablet Pressure subpalette of the Tool palette and edit the curve so it looks like the right image in Figure 7.27.
12. On the top shelf, set Draw Size to **60** and ZIntensity to **80**
13. Drag on the surface of the PolySphere again and vary the pressure as you draw. Now the marks made by the brush become more narrow, pinched, and more intense as you press on the surface (see Figure 7.28).
14. Use the Save button in the Brush palette to save the brush as `detailBrush.ZBP`. Overwrite the previous version of the brush that you saved in the `ZBrushes` folder.

Congratulations. You've created your first custom brush and it was really pretty easy. This is just the beginning though. There are endless combinations of settings that can be applied to brushes, and you'll find that you can design a brush to do almost anything once you get some more experience working with the settings.

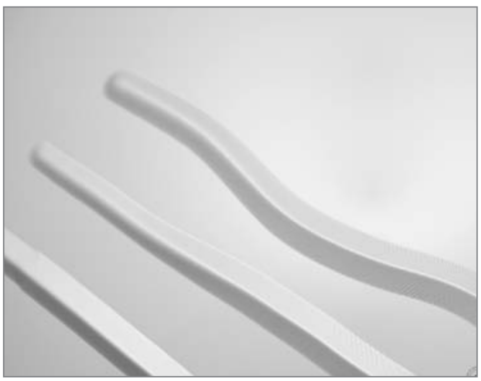


Figure 7.26
Varying the pressure on the tablet causes the strength of the pinching effect to change as the stroke is drawn on the surface.

Figure 7.27
The left image shows the altered edit curve for Size, and the right image shows the altered edit curve for ZIntensity.

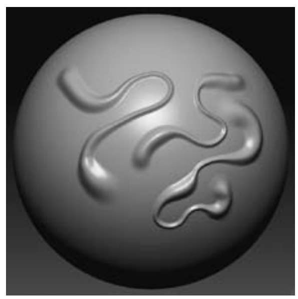
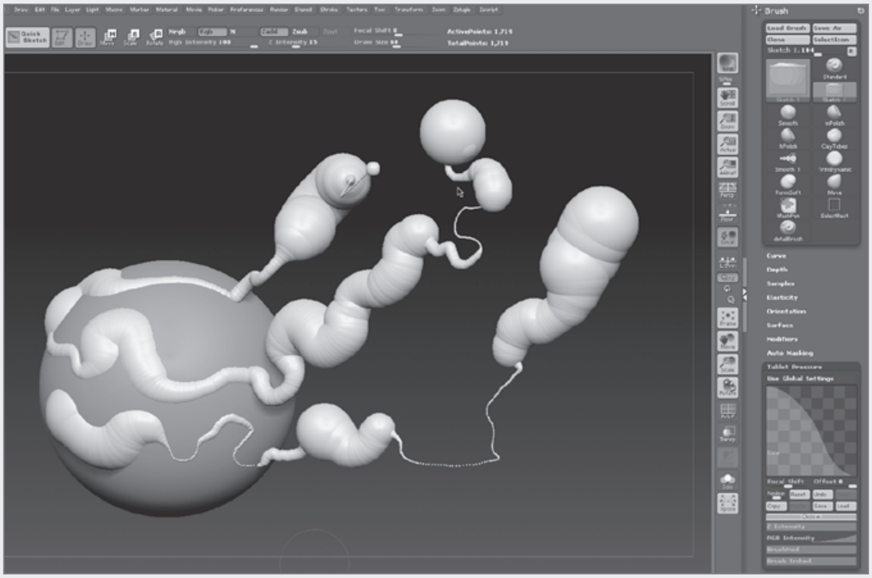


Figure 7.28
Marks made by the brushes vary in width, ZIntensity, and the amount of pinching based on pressure changes made while drawing the stroke.

APPLY PRESSURE SETTING TO ZSKETCH BRUSHES

Try editing the Size edit curve for one of the ZSketch brushes and see how it affects the shapes you create when using the ZSketch feature. You'll have to turn off the Use Global Settings button in the Tablet Pressure subpalette of the Brush palette in order to access the edit curves for the ZSketch brushes. For more on ZSketching, consult Chapter 4.



Create a Custom Brush Icon

It's very easy to create your own custom icon in ZBrush. The icon display can give you a good idea of what a brush does while you're searching through the library of available brushes. This exercise shows you how to create a custom icon for the detailBrush created in the previous section.

1. Open the Document palette. Turn off the Pro button next to the Width and Height sliders. This disables the Preserve Proportion option.
2. Set both the Width and Height sliders to 512 (see Figure 7.29).
3. Press the Resize button. This will resize the canvas and drop any tools that may be in Edit mode to the canvas in the process.
4. Press **Ctrl+n** to clear the canvas.
5. Set the Range slider to 0 to eliminate the gradient in the canvas background.
6. Click the square labeled "Back" and drag down to the black color swatch underneath the color picker. This will set the background color to black.

Figure 7.29

Set the Width and Height sliders in the Document palette to 512.

7. Open the Tool section of Light Box and select a fresh PolySphere. Draw it on the canvas and switch to Edit mode (hotkey = T).
8. Click the Frame button on the right shelf to frame the view of the PolySphere (hotkey = F). Use the Scale button on the right shelf to scale the view of the PolySphere down a little.
9. From the materials fly-out library, choose the BasicMaterial2 material.
10. Press **Ctrl+D** twice to subdivide the PolySphere two times.
11. Makes sure the detailBrush is loaded into ZBrush and is the currently selected from the brush fly-out library.
12. Draw a simple design on the PolySphere, something that gives a good indication of the type of mark made by the brush (see Figure 7.30).

Figure 7.30
Draw a design on the PolySphere using the detailBrush.

13. Press the AAhalf button on the right shelf to shrink the canvas by 50 percent.
14. In the Document palette, press the Export button to export the image to the document. The file browser window will appear.
15. Use the file browser to navigate to the `Pixologic` folder. Create a new folder here called `myIcons`.
16. Export the icon as `detailBrushIcon.psd`.

Figure 7.31
Use the selection button to select the image as the brush icon.

17. In the Brush palette, click the SelectIcon button. Use the file browser to find and select the `detailBrushIcon.psd` file. You'll see that the icon now appears in the Brush palette (see Figure 7.31).
18. Use the Save button in the Brush palette to save the brush as `detailBrush.ZBP`. Overwrite the previous version of the brush that you saved in the `ZBrushes` folder.

You'll see the icon appear whenever the brush is loaded into ZBrush as well as in the Brush section of Light Box (in the `myBrushes` folder). You can use any image you like as an icon, but the image can't be in color and should be square for best results.

Use the detailBrush

The detailBrush can be used for creating wrinkles and folds of skin on your dragon. Test it out on one of the dragon heads you created in Chapters 3 and 4. I find that this brush works well when refining details such as the edges of the eyelids and lips. I alternate between the detailBrush, the Smooth brush, and the mPolish brush to create wrinkles around the eyes like the ones on the dragon head shown in Figure 7.32.

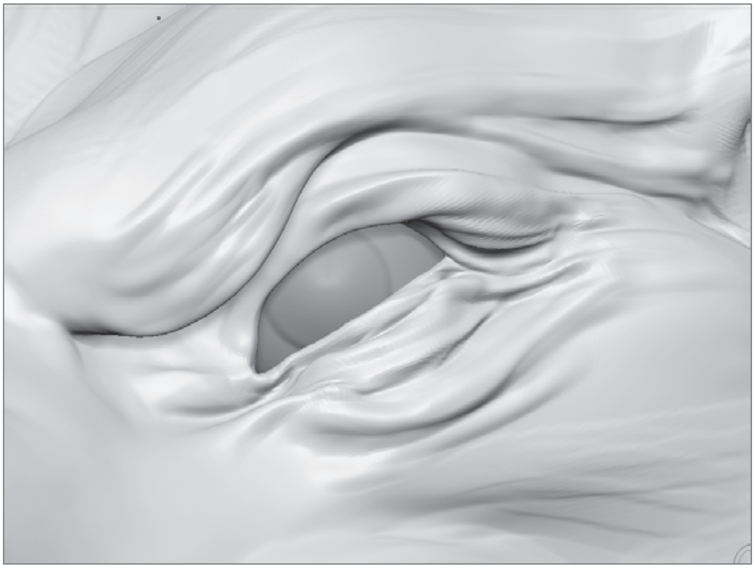


Figure 7.32
The detailBrush is used with the smooth and mPolish brushes to create the wrinkles and details of the dragon's eyelids.

Alpha Textures

In Chapter 2 you were briefly introduced to alpha textures and how they can be used. You have probably noticed that some of the sculpting brushes, such as clayBuildUp and Rake, already have special alpha textures applied. In the following sections you'll dive into alphas and get a taste for the many ways in which alpha textures can be used and manipulated.

An alpha texture (frequently referred to in ZBrush as just an alpha) is a grayscale texture, meaning that it has no color values other than black, white, and gray. Try not to confuse alphas with "alpha channels" which are used in compositing programs such as Photoshop.

In ZBrush, alphas are most often used to alter the way a sculpting brush affects the surface of a model. The alpha acts as a mask for the tip of the sculpting brush. White areas in the texture allow the brush to affect the surface, dark areas mask the effect of the brush, and gray values in between moderate the strength of the brush (see Figure 7.33).

An alpha can be an image created in another program such as Photoshop, or it can be created directly in ZBrush. Let's start by seeing some ways in which an alpha can be created.

Create an Alpha in Photoshop

The easiest way to create an alpha is to simply import an image into the Alpha palette. To see how, you'll do a little simple editing to a photograph in Photoshop. The image is a photograph I took of some snake scales, which is certainly something that could be adapted for use on a dragon model.

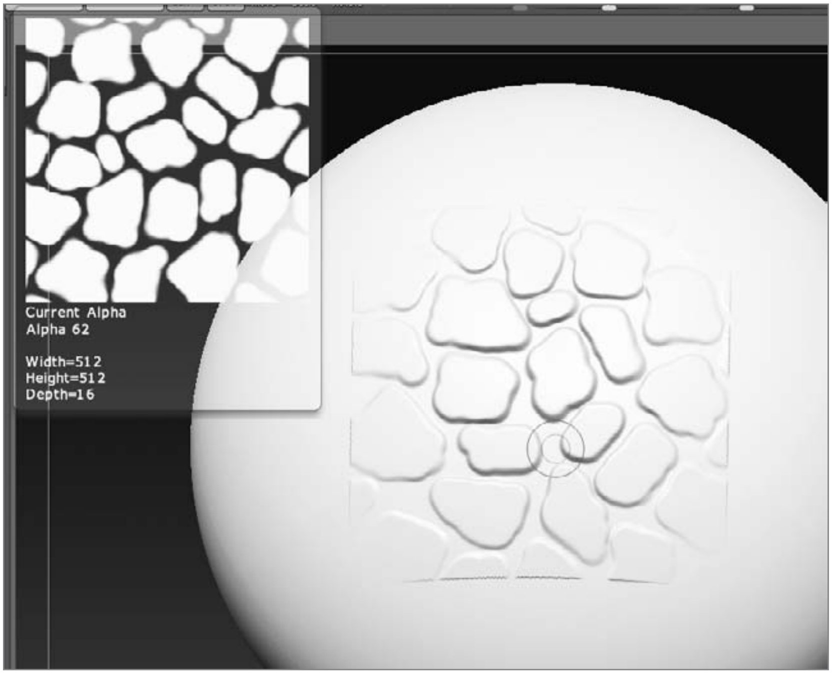


Figure 7.33
Alpha textures are used to modify sculpting brushes. Dark colors in the alpha mask the effect of the brush on the surface.

If you don't have Photoshop, you can use a similar image editing program or skip ahead to the next section.

1. Open Photoshop or a similar editing program.
2. Open the `snakeScales.PSD` file from the `Chapter 7` folder on the DVD.
3. The image currently has color information. One way to remove this is to set the mode to Grayscale. Choose image → Mode → GrayScale (see Figure 7.34).
4. Photoshop may display a warning that the image needs to be flattened. Press OK to accept this.
5. The image could use a little more contrast. Choose Image → Adjustments → Levels to open the histogram. Move the white marker below the histogram (the histogram is depicted as a graph labeled Output Levels) to the left and the black marker to the right. Move the central gray marker a little to the left. Match Figure 7.35.

   You can use whatever means you prefer to adjust the contrast. If you like using curves or the Brightness/Contrast controls instead of levels, go ahead and do that.
6. Press OK to accept the change.
7. Choose File → Save As and save the image as `scalesAlpha.psd`. Save the image in the `ZAlphas` folder (in the `ZBrush 4.0` folder) so that the alpha appears in the Alpha section of Light Box.

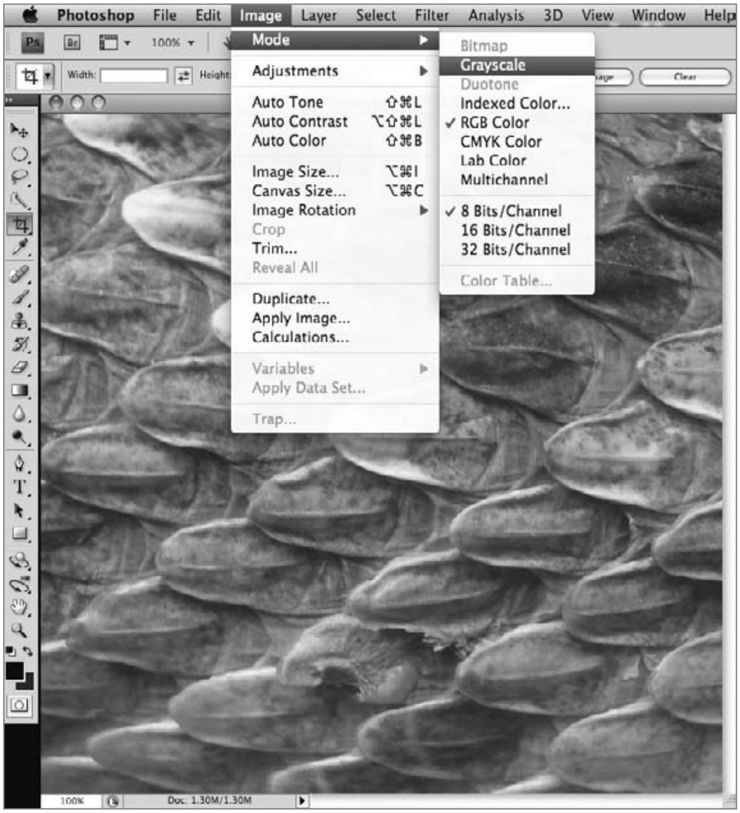


Figure 7.34

The snakeScales image is converted to grayscale, which removes color information.

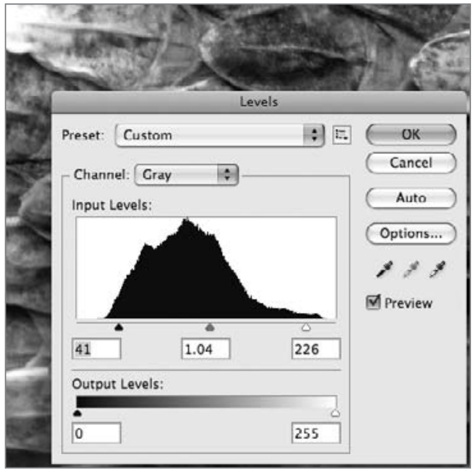


Figure 7.35

The levels are adjusted to add more contrast to the snakeScales image.

Alternatively, you can save the file in the `ZBrush 4.0\ZStartup\Alphas` folder if you want the alpha to load into the fly-out alpha library on the left shelf whenever you start ZBrush. However, you'll need to restart ZBrush if it's currently open, to see the file.

8. Open Light Box to the Alpha section and scroll to the right to find the `scalesAlpha.psd` file (see Figure 7.36).
9. To load the alpha from Light Box into the alpha library, hold the Shift key and double-click the icon in Light Box.
10. Load the `brushTest.ZPR` project into ZBrush.
11. Choose the Standard brush and set Stroke Type to DragRect.
12. In the alpha fly-out library, select the snakeScale alpha.
13. Drag across the surface of the PolySphere. You'll see the impression of the snakeScale image appear on the surface of the PolySphere (see Figure 7.37).

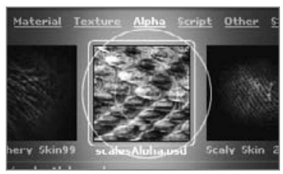
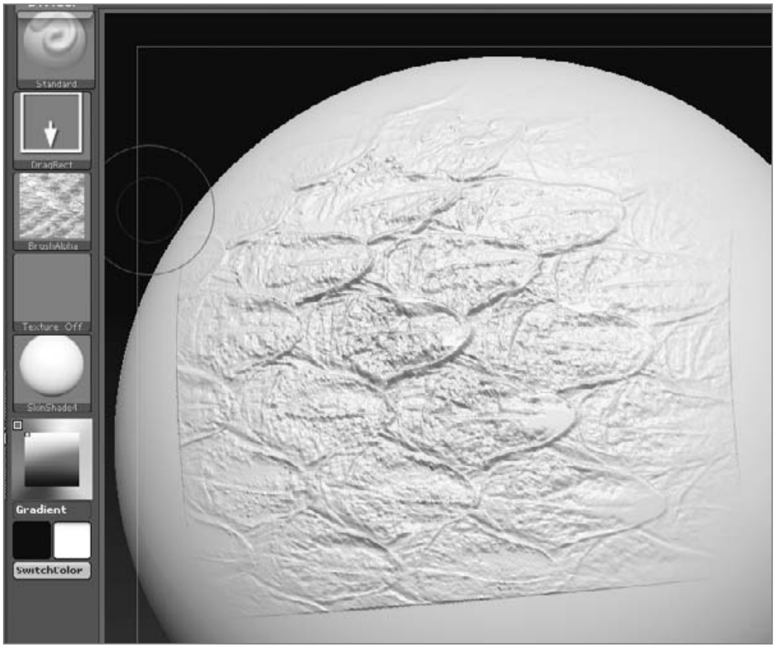


Figure 7.36

The `scalesAlpha.psd` file is found in the Alpha section of Light Box.

Figure 7.37

The snakeScale Alpha is applied to the Standard brush, which is then used on the PolySphere to create the look of snake scales.



This exercise demonstrates how a photograph can be used as an alpha, but I'd like to point out a few limitations related to this particular technique.

The image used in the example has light and dark spots that, in the photograph, appear as colors on the scales and the shadows cast by the scales. This looks natural in an image, but when the image is applied as an alpha, ZBrush interprets these light and dark values as lumps on the surface created by the brush, so it can look less like snake scales and more like just a bumpy surface. In my experience, using a photograph as an alpha to create a specific effect can be a little tricky for these reasons.

Simple alphas with clear shapes and less detail tend to work better than highly detailed images. In addition, if the image is low resolution or if the image suffers from heavy compression, artifacts can appear on the surface as lumps even if the surface itself is very dense. If you're set on using an image as an alpha texture, you'll want to spend some time editing the image to reduce noise and unnecessary detail. Also notice that the brush stroke has a hard edge created by the edges of the photograph. You'll learn how to eliminate this problem in the section titled "Edit an Alpha" later in this chapter.

If you want to load an image from another directory on your hard drive, you can use the Load button at the bottom of the alpha fly-out library, which will open your computer's file browser. If you load a color image, ZBrush will automatically convert it to a grayscale image, removing all of the color information for you. You can also convert a texture in the texture fly-out library on the left shelf into an alpha. Simply select the texture and then press the Make Alpha button at the bottom of the texture fly-out library. Working with textures is covered in more detail in Chapter 8.

Create an Alpha in ZBrush

You can generate an alpha texture directly in ZBrush by capturing the image that has been drawn on the canvas. ZBrush will not only convert the image to a grayscale texture, it will also use the inherent depth information to shade the alpha in varying degrees of brightness, depending on what is closest to the front of the camera and what is furthest away.

In this exercise you'll create a seamless tiling alpha texture that can be used as a dragon scale brush.

1. Start a new ZBrush session. Open the Document palette and turn off the Pro button.
2. Set the Width slider to 400 and the Height slider to 600. Press the Resize button. The canvas now appears as a narrow rectangle.

   You're going to use a PolySphere to shape a basic dragon scale, which will be used to create a dragon scale pattern.
3. Open Light Box to the Tool section. Double-click the PolySphere.ZTL tool. Draw the PolySphere on the canvas and switch to Edit mode (hotkey = T).
4. Open the Deformation subpalette of the Tool palette. To the right of the Size slider, turn off the Y and Z buttons so that the Size deformer applies only to the x-axis.
5. Move the slider gradually to the left. You'll see the PolySphere become flat; essentially you want to create a rounded disc (see Figure 7.38).
6. Rotate the view of the PolySphere so that you can see it from the flat side (not the edge).
7. Press the **X** hotkey to activate symmetry. In the Transform palette under Activate Symmetry, turn off the >X< button and turn on the >Z< button so that symmetry is now calculated across the z-axis.

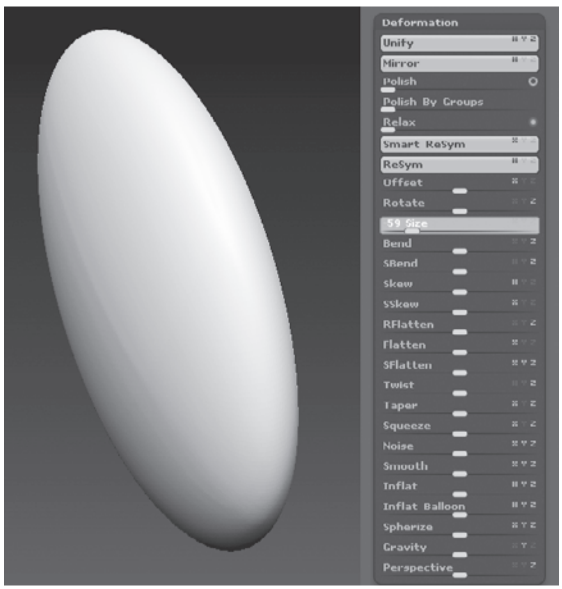


Figure 7.38
Use the Size deformer to flatten the PolySphere.

8. Open the sculpting brush fly-out library and select the Move Elastic brush. Use the brush to shape the PolySphere into a rounded triangle as shown in Figure 7.39.
9. Rotate the view of the PolySphere so that you can see it from the edge. Use the Move Elastic brush to shape the PolySphere so that it is bent. The pointed end should be bent toward the left of the canvas as shown in Figure 7.40. This will make it easier to overlap the dragon scales.
10. Rotate the view of the PolySphere so that you can see it from the flat side again. Center and scale the view of the PolySphere as shown in Figure 7.41.

Figure 7.39

Shape the PolySphere into a rounded triangle using the Move Elastic brush.

Figure 7.40

From the side view, use the Move Elastic brush to bend the tip of the PolySphere toward the left side of the canvas.

Figure 7.41

Center the view of the PolySphere.

Here's where things get interesting. To make a seamlessly tiling alpha of dragon scales, you'll use a special feature of ZBrush that allows you to wrap the view of an object across the edges of the canvas. To do this, you have to switch out of Edit mode.

1. Turn the Edit button on the top shelf off to switch out of Edit mode (hotkey = T).
2. Make sure the Draw button is still on. On your keyboard, press and hold the tilde key. This is the squiggly line that is usually just below the Esc key on most keyboards (~).
3. Drag downward on a blank part of the canvas while holding the tilde key. The PolySphere moves down, but notice that the image wraps around to the top of the canvas so that the bottom of the PolySphere is seen at the top of the canvas.
4. Stop dragging at the point where about half of the PolySphere is seen at the top and the bottom of the canvas (see left image in Figure 7.42).

5. Let go of the tilde key and drag on the center of the canvas where it is blank to create a new copy of the deformed PolySphere.
6. Press the **T** hotkey to activate Edit mode. Rotate the view of the PolySphere and adjust the scale so that the PolySphere is at the center, overlapping the other Poly-Sphere, as shown in the right image in Figure 7.42.

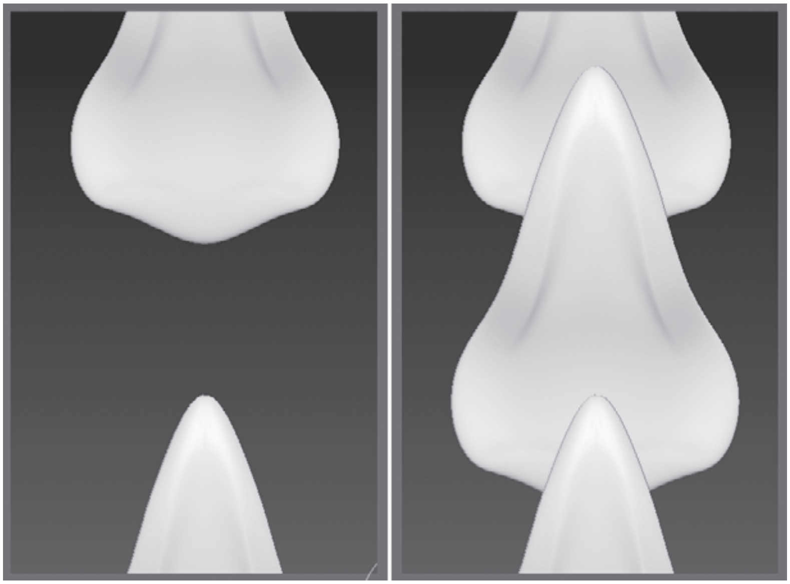


Figure 7.42

Drag downward on the canvas while holding the tilde key to wrap the image of the PolySphere (left). Create a new instance of the Poly-Sphere and position the view so that it overlaps the original image (right).

7. Open the alpha fly-out library on the left shelf and click the GrabDoc button (see Figure 7.43). This takes a snapshot of the canvas. The new alpha appears as the cur-rently selected alpha.
8. Hold the cursor over the newly created alpha to see a preview (see Figure 7.44).

Figure 7.43

The GrabDoc button is at the bottom of the alpha fly-out library.

You can see how the alpha is shaded so that the parts of the image that are closer to the front of the canvas are lighter in value than those that are farther away. This is because when you grab the document, the alpha grabs the depth information from the canvas as well as the overall shape of what is drawn on the canvas.

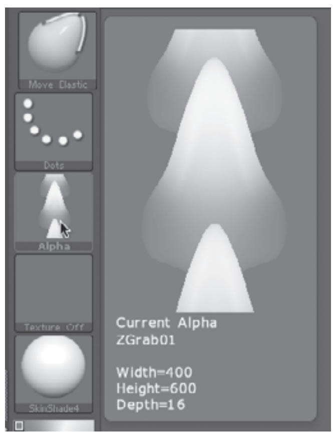


Figure 7.44

The GrabDoc button creates an alpha based on the image on the canvas.

9. In the Alpha palette, click the Export button and save the alpha as `dragonScale.psd`. Save the alpha to the `PZBrush v4.0\ZAlphas` folder. The alpha will appear in Light Box under the Alphas heading (see Figure 7.45).

Alpha Roll

Now you can use the `dragonScale.psd` file as an alpha texture to create a new dragon scale brush that tiles perfectly. To ensure that the tiling is even, you'll use the Roll feature in the Stroke palette. You can see how creating custom brushes often requires using controls that are in a number of different ZBrush palettes. Just as in the previous example, you can test the brush on a PolySphere.

Figure 7.45
The new dragonScale.psdalpha appears in the Alpha section of Light Box.

1. Load the `brushTest.ZPR`project you created earlier in the chapter. This project is available in the `Chapter 7` folder on the DVD.
2. Select the Clay brush in the sculpting brush fly-out library on the right shelf.
3. In the Stroke palette, turn on LazyMouse and set LazyRadius to **10**.
4. Open the alpha fly-out library on the left shelf and select the `dragonScale.psd` that you created in the previous section.
5. Drag across the PolySphere.

   Initially the marks made by the brush don't look very much like scales; this is because the alpha pattern is not spaced correctly, so it looks like a bunch of triangles (see the left image in Figure 7.47).

Figure 7.46
The Roll feature is activated in the Stroke palette.

6. In the Stroke palette, click the Roll button (see Figure 7.46). Drag across the PolySphere again (see the right image in Figure 7.47).

   Now you have something that looks more like the scales of a dragon. As you change direction in the stroke, the pattern bends around the curves as well. The Roll Distance slider adjusts the spacing between each stamp created by the alpha. With most tiling textures, the default value of 1 works very well, but you can experiment with different values for Roll Distance to see what kind of effect it has on the marks made by the brush.

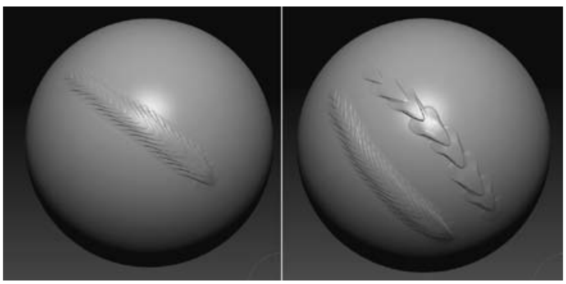


Figure 7.47
The dragonScale alpha is applied to the Clay brush, which is used to edit the PolySphere (left image). When Roll is activated, the dragonScale.psd alpha tiles seamlessly as it is used to edit the PolySphere (right image).

7. Use the Save As button in the Brush palette and save the brush as `dragonScales.ZBP`. Save the brush in the `ZBrushes` folder so that it appears in Light Box. If you'd like to create a custom icon, follow the instructions in the section titled "Create a Custom Brush Icon" earlier in this chapter.

Your custom alpha will be saved with the brush preset so you won't need to load it separately into the Alpha palette when you use this brush in future sessions of ZBrush. It will automatically appear in the alpha library when you load the brush from Light Box.

SCALE BRUSH PRESETS

Take a moment to look through the brush presets in the sculpting brush fly-out library as well as the presets available in the Brush section of Light Box. You'll notice that there are a fair number of brush presets devoted to creating scale effects.

Open Light Box to the Brush section and type "**scales***" into the search field. The results show that there are a large number of scale presets, including scalesFish, scalesSnake, and scalesLizard. Each of these presets use their own alpha textures in a slightly different way along with additional setting adjustments in the Brush, Stroke, and Picker palettes. As you learn more about brush customization, you can experiment with these brushes and deconstruct their settings to see how the developers at Pixologic created the presets. Any one of these presets can be adjusted a little bit or used as-is to create convincing scale details for your dragon models.

Edit an Alpha

In this section, you'll take a look at how the settings in the Alpha palette can be used to change the behavior of an existing alpha. You'll use one of the basic alphas that is already loaded into the alpha fly-out library but these settings can be applied to alphas that you create as well.

1. Load the `brushTest.ZPR` project created earlier in the chapter. This file is also available in the `Chapter` 7 folder on the DVD.
2. In the brush fly-out library, select the Standard brush.
3. Set the stroke type to DragRect.
4. Open the alpha fly-out library and choose Alpha 62. Figure 7.48 shows the Standard brush with the DragRect stroke type and Alpha 62 applied.
5. Place the Alpha palette in the tray so that you can easily access the control.
6. Drag on the surface of the PolySphere. You'll see the pattern appear on the surface of the PolySphere.

   The hard edge of the square alpha is clearly visible in the mark made on the PolySphere (see the left image in Figure 7.49). To eliminate this, you can use the Radial Fade feature.
7. In the Alpha palette, set the Rf slider to **10** and draw on a blank part of the surface of the PolySphere again. Now the hard edge is eliminated (see the right image in Figure 7.49).

Figure 7.48

Select the Standard brush, set the stroke type to DragRect, and choose Alpha 62 from the alpha library.

8. You can add some noise to the alpha to increase detail. The noise is applied to the lighter parts of the alpha. Set the Noise slider to **50** and Noise Scale to **24**. Drag across a blank part of the surface of the PolySphere to see how noise affects the stroke (see the left image in Figure 7.50).
9. You can adjust the repetition of the tiling across the vertical and horizontal axis independently using the H Tiles and V Tiles sliders. Set H Tiles to **3**. Test the brush again (see the right image in Figure 7.50).
10. Expand the Alpha Adjust edit curve below the Intensity slider. Try adding some points to the curve and notice how the alpha behaves. The curve controls the intensity of the black and white values. If you reverse the curve so that it slopes from the upper left down to the lower right, the alpha is inverted.
11. Try editing the curve so that it looks like Figure 7.51 and drag on a blank part of the PolySphere.
12. The changes you make in the Alpha palette are applied to whichever alpha the current sculpting brush uses. Switch to alpha 56 and see the effect you get when the settings are applied to this alpha.
13. Switch back to alpha 62. Press the Make Modified Alpha button. This creates a new alpha texture in the alpha fly-out library based on the current settings in the Alpha palette. This is another way you can generate new alpha textures within ZBrush.

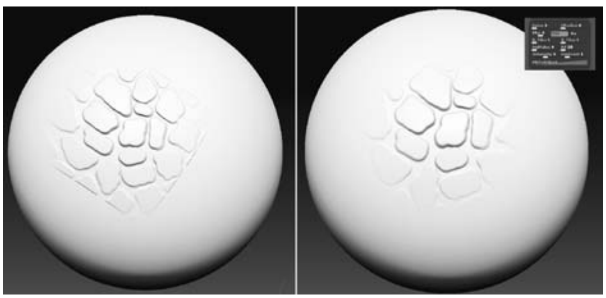


Figure 7.49

The hard edge of the alpha border is visible in the pattern created on the PolySphere (left image). The Radial Fade slider in the Alpha palette eliminates the hard edge (right image).

Figure 7.50

Noise is added to the alpha (left image). The horizontal tiling is set to 3 (right image).

Now that you have created a new alpha, you can save the brush, but before you do you'll need to set the alpha options back to their original state. Otherwise these settings are applied to the newly created alpha texture, which doubles the effects applied to the alpha.

1. Set the following options:

   H Tiles = **1**

   Noise = **0**

   Rf = **0**

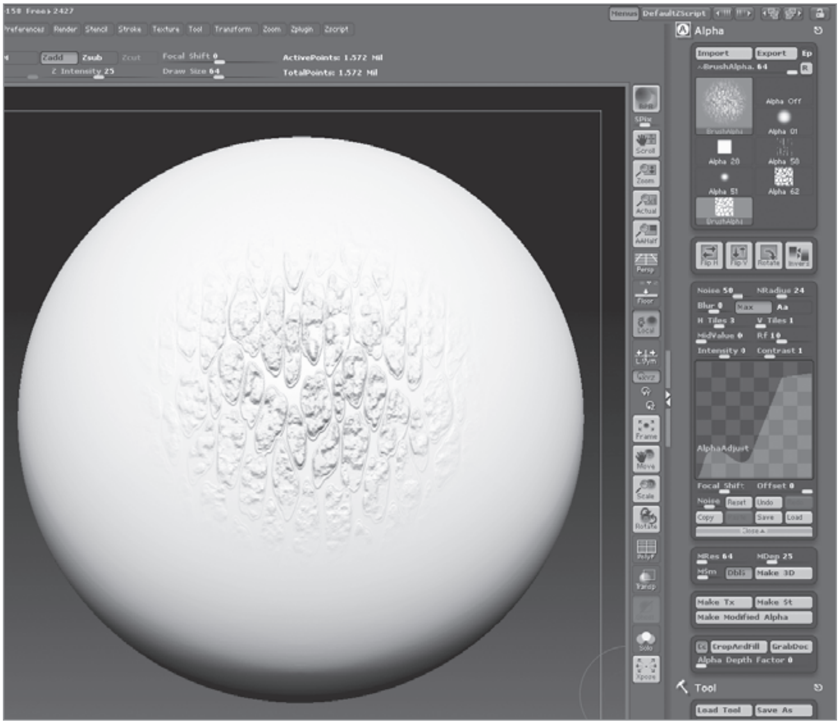


Figure 7.51
Adjust the edit curve for the alpha.

2. Under the Alpha Adjust curve, press the Reset button to restore the curve to its natural state.
3. In the Brush palette, press the Save button and save the brush as `noisySpots.ZBP` in the `myBrushes` folder.

You can experiment with the other options in the alpha palette. Here's a brief description of what each setting does:

Blur softens the alpha as well as any noise or other effects applied to it.

Max maximizes the range of the alpha so that the lightest values become 100% white and the darkest values become 100% black.

Aa adds anti-aliasing to the alpha, which can be helpful when using imported images that are not high quality.

MidValue adjusts how the alpha affects the depth of the alpha displacement. When this is at 0, lighter values in the alpha push the surface outward, and as you increase the setting, the amount of displacement caused by the lighter values is lowered. At a value of 100, the brush no longer pushes the surface outward. Instead, the impression made by the alpha is pushed in to the surface.

Intensity increases the overall intensity of the alpha. The Alpha Adjust curve also affects the intensity of the alpha but allows you greater control over the adjustment than the Intensity slider.

Contrast increases the overall contrast of the alpha.

Tilt

The Tilt settings cause marks made by a brush to slant slightly. This option is a great way to create overlapping scales and works best when an alpha is applied to the brush. In this section, you'll design a brush similar to the Scales A brush found in the Brush section of LightBox.

1. Load the `brushTest.ZPR` project into ZBrush. This file is available in the `Chapter 7` folder on the DVD.
2. From the sculpting brush library, choose the Elastic brush.
3. Open the alpha fly-out library and select alpha 50, which is a simple, blurry, white dot.
4. In the Stroke palette, turn on LazyMouse and set LazyStep to **0.4** and LazyRadius to **5**.
5. Set ZIntensity to **80**.
6. Drag across the PolySphere; the stroke looks like a bumpy line (see Figure 7.52, left image).
7. Open the Brush palette and expand the Modifiers subpalette. Set Tilt Brush to **70**.
8. Drag across the surface. You can see that now the bumps in the stroke are tilted, creating a scale effect (see the right image in Figure 7.52).
9. Use the Save button in the Brush palette to save the brush as `scalesLine.ZBP` in the `myBrushes` folder.

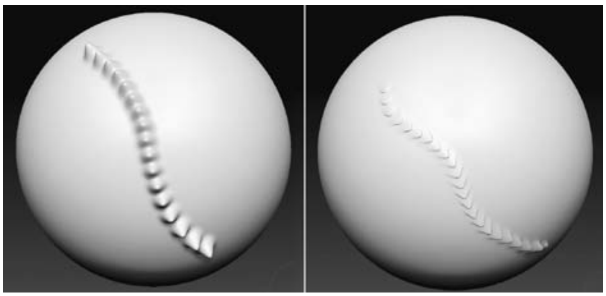


Figure 7.52
The Tilt Brush setting in the Brush palette tilts the marks made by the alpha in the direction of the stroke (right image).

Spin Alphas

The Spin Alpha feature causes the alpha to rotate with each step as you create a stroke across the surface. It's used by the deco brushes and is perfect when you want a brush that generates elaborate designs.

1. Open the `brushTest.ZPR` project. This file is available in the `Chapter 7` folder on the DVD.
2. Select the Layer brush from the brush fly-out library.
3. In the Stroke palette, turn on LazyMouse. Set LazyStep to **0.1** and LazyRadius to **20**.
4. In the Alpha palette, press the Load button and load the `centipede.PSD` alpha texture from the `chapter7\alphas` folder on the DVD. This is a simple alpha I created by grabbing an image from the ZBrush canvas (see Figure 7.53).

5. Open the Brush palette and expand the Tablet Pressure subpalette. Click the Size edit curve and edit the curve so it resembles Figure 7.54.
6. Press the **X** hotkey to activate symmetry. Set ZIntensity to **35** and drag across the surface of the PolySphere (see the top image in Figure 7.55).

   It looks pretty interesting, but now you'll add spin to the alpha and see how easy it is to create elaborate designs.
7. Expand the Brush palette. In the Orientation subpalette, set Spin Rate to 1 and drag across a blank part of the surface of the PolySphere (see middle image in Figure 7.55).

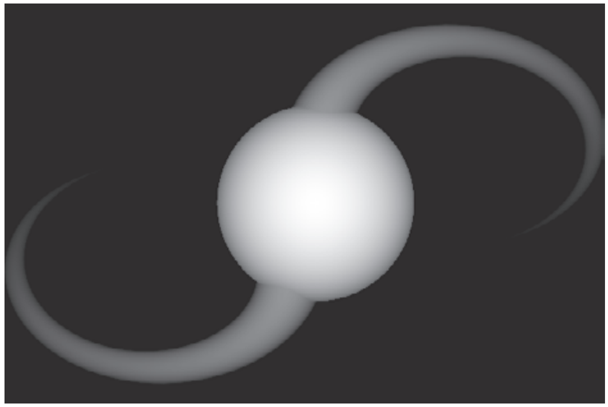


Figure 7.53
The centipede.PSD alpha was created by grabbing the depth information of simple objects drawn on the canvas.

   The Spin Rate setting determines how much the alpha spins around during each step of the stroke. Already it should be apparent how this setting changes the nature of the brush. The other Spin settings won't do anything unless Spin Rate is set to a nonzero value. Positive values cause the alpha to spin clockwise, and negative values cause the alpha to spin counterclockwise.
8. Set the SpinCenter slider to **1.2**. Drag across a blank part of the PolySphere (see bottom image in Figure 7.55).

   Spin center adds an offset to the center of the alpha. This creates a looping action to the stroke. The higher you set the slider, the greater the offset, so the loops become larger. Negative values cause the loops to go in the opposite direction.

   The Spin Angle slider sets the starting angle for the spinning action.
9. Experiment with different settings applied to the three sliders in the Orientation subpalette. Also, try combining this effect with different settings for H Tiles and V Tiles in the Alpha palette.
10. Save the brush as `centipede.ZBP` in the `myBrushes` folder.

Figure 7.54
Adjust the shape of the Size edit curve in the Tablet Pressure subpalette of the Brush palette.

THE LAYER BRUSH

The Layer brush works well for creating decorative designs on a surface because it pushes the surface out in a single layer. When you store a morph target for the model, the Layer brush always pushes the surface out the same amount even when strokes overlap each other.

Figure 7.56 shows some ways in which the alpha texture brush techniques described in this section can be used to create details and designs on the surface of some of the dragon models used in this book.

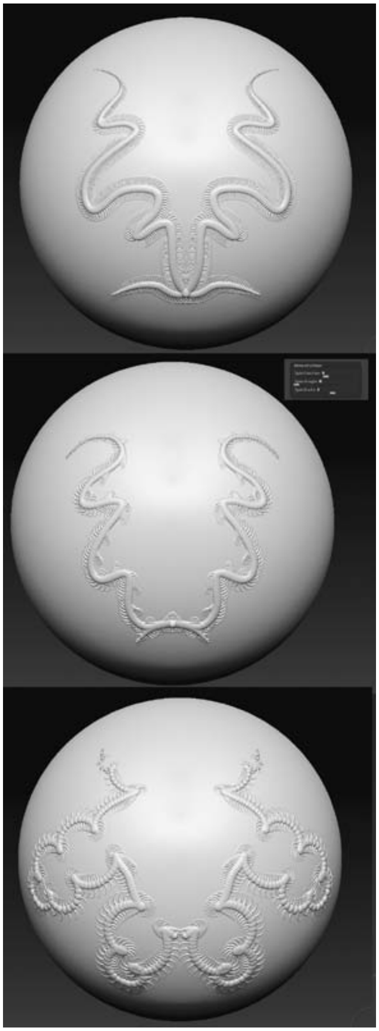


Figure 7.55

The SpinCenter setting adds an offset to the center of the alpha spin, which makes creating elaborate designs very easy.

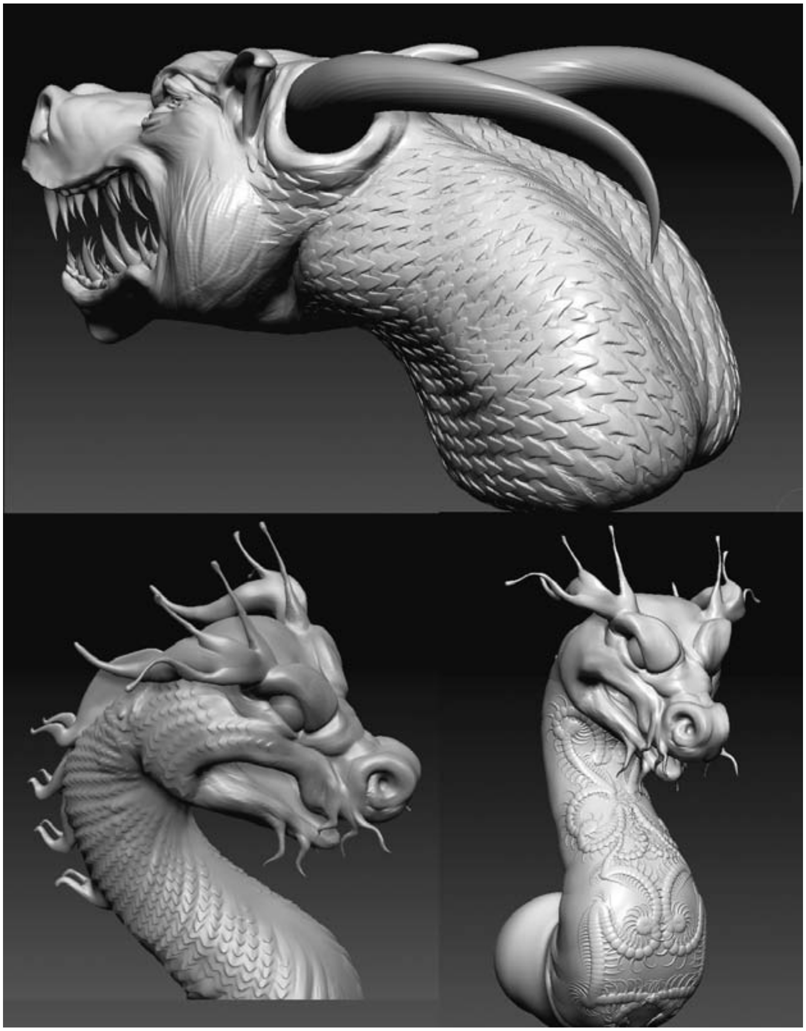


Figure 7.56

Details and designs are added to the surfaces of some of the dragon models using the techniques described in this section.

Brush Effects

There are a number of settings in the Brush palette that can add special effects to your custom brushes. In some cases, using these features in combination with alpha textures can add really interesting behaviors to your brush, allowing you to create details on your surfaces that would be difficult to achieve otherwise. In the following sections, you'll continue to add to your library of customized sculpting brushes by implementing some of these features.

Trails

You can think of the Trails feature as adding a kind of echo effect to your brush stroke. The Trails slider is found in the Brush Modifiers subpalette of the Tool palette. There is a Trails slider that, when set to a value above 1, adds another iteration of the stroke that "trails" behind the initial stroke. As long as you continue to apply the stroke to the surface, the trails continue to repeat until you release the stroke. There are a number of additional settings below the Trails slider that fine-tune how the trail effect is applied to the stroke.

In this exercise, you'll design a brush that uses the Trails feature. This brush can be used to create a kind of calligraphy stroke.

1. Open the `brushTest.ZPR` project from the `Chapter 7` folder on the DVD.
2. From the sculpting brush fly-out library, choose the Clay brush.
3. Set the Z Intensity to **60** and Draw Size to **15**, and turn on the Zsub button so that the brush cuts into the surface.
4. From the alpha fly-out library, select alpha 60.
5. In the Stroke palette, turn on LazyMouse and set LazyRadius to **5**. Turn on the Roll button.
6. Create a few test strokes on the surface of the PolySphere (see Figure 7.57).
7. Place the Brush palette in the tray so that you can access the controls.
8. In the Modifiers subpalette of the Tool palette, set the Trails feature to **85**.
9. In the Tablet Pressure section, turn off the Use Global Settings button. Expand the Size edit curve and adjust the curve so that it resembles Figure 7.58.
10. Create a few more test strokes on a blank part of the PolySphere surface (left image in Figure 7.59). As you make the stroke, observe the area behind the stroke. You can see that as the stroke continues, the earlier parts become deeper in the surface. This is because of the echo effect created by the Trails feature.
11. Set G Position and G Orientation to **1**. These settings adjust the global position of the trailing strokes as well as the orientation. The effect on the stroke is fairly dramatic.
12. Create a few more strokes. At this point, the Trails feature should appear more obvious (right image in Figure 7.59).
13. Save the brush as `Calligraphy.ZBP` to the `ZBrushes` folder.

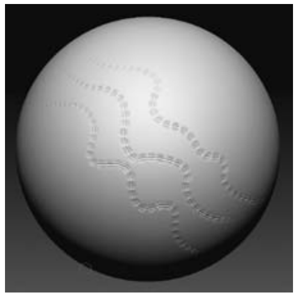


Figure 7.57

Test strokes are created on a blank part of the PolySphere.

Figure 7.58

The Trails slider in the Modifiers subpalette of the Brush palette is set to 85 and the edit curve for size in the Tablet Pressure subpalette is modified.

Elasticity

In Chapter 3 you used the Move Elastic brush to create the basic shape of the dragon head. The Move Elastic brush is a variation of the basic Move brush with additional Elasticity settings activated. The purpose of the Elasticity settings are to reduce stretching in the surface when it is pulled by the Move brush. As you use the Move Elastic brush, you can see the surface update while you work. In addition, pulling out and then pushing back in with the brush creates a tapering in the altered part of the surface.

The Elasticity settings can give other brushes some interesting behaviors as well. It works best when using the Move brushes, but let's see what happens when it is applied to the Nudge brush.

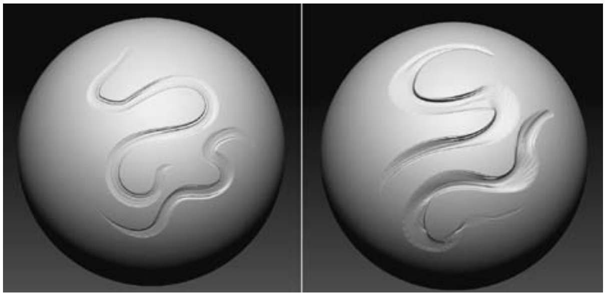


Figure 7.59

The Trails feature echoes the brush stroke as you draw on the surface (left image). Set G Position and G Orientation to 1 for a dramatic effect.

Because of the fact that ZBrush needs to reevaluate the surface as you work, its best to use the Elasticity fsettings on low-polygon surfaces.

1. Open the `brushTest.ZPR` project from the `Chapter 7` folder on the DVD.
2. In the Tool palette, expand the Geometry subpalette and set SDiv to **3**.
3. Open the sculpting brush fly-out library and choose the Nudge brush.
4. Set ZIntensity to **60** and Draw Size to 45. Set Focal Shift to **-100**.
5. Place the Brush palette in the tray and expand the Elasticity subpalette. This is where you will find the various Elasticity settings.

   Elasticity Strength determines how much effort ZBrush will use to recalculate the topology of the surface with each brush stroke. In the case of the Nudge brush, you'll get more noticeable results using a lower value. If you crank the value all the way up, ZBrush will try to preserve the shape of the surface so much that it will appear as if the brush does nothing at all.

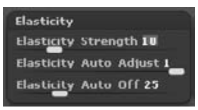


Figure 7.60

The Elasticity settings in the Brush palette

6. Set Elasticity Strength to **10** (see Figure 7.60).

   The Elasticity Auto Adjust setting controls the amount of tapering that occurs when you change directions while brushing on the surface. When applied to the Nudge brush, it creates more of a ripple effect as you move the brush back and forth.

7. Set Elasticity Auto Adjust to **1**.

   Elasticity Auto Off sets a polygon limit for the elasticity effect. If the surface has more polygons than the slider value, then the elasticity effect is automatically disabled. This prevents ZBrush from slowing down too much or crashing when trying to reevaluate the surface. The value set by the slider is multiplied by 1,000, so the default setting of 25 means 25,000. A PolySphere at SDiv 3 is 24,578 polygons, just under the default limit. You can raise this limit and use the Elasticity settings on a dense mesh, but do so with caution.

8. Try shaping the PolySphere with the Nudge brush. This brush should work well when developing facial expressions for characters because of the way that it pushes the surface around (see Figure 7.61).
9. Save the brush as `nudgeElastic.ZBP` in the `ZBrushes` folder.

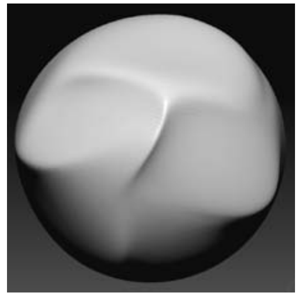


Figure 7.61
The surface of the PolySphere is pushed around using the Nudge brush with an Elasticity Strength setting of 10.

Noise

The Noise option adds a fractal-based noise effect to the marks created by a brush. The noise created by this feature has a different quality to it than the noise you add to alpha textures as demonstrated earlier in this chapter.

Using the Noise effect on a brush is a great way to sculpt rocky surfaces or create the look of damage for armor or mechanical objects. There are several noise brushes available in the sculpting brush fly-out library. In this exercise, you'll create your own custom noise brush based on the Polish brush so that you get a better understanding of how the feature works.

1. Open the `brushTest.ZPR` project from the `Chapter 7` folder on the DVD.
2. From the sculpting brush fly-out library, choose the Polish brush.
3. Set DrawSize to **80** and ZIntensity to **10**.
4. Place the Brush palette in the tray so that you can access the controls.
5. Expand the Surface subpalette of the Brush palette.
6. Turn on the Noise button. Set Strength to **1** and set Scale to **50**.
7. Draw on the surface of the PolySphere. You may not see much of an effect at first. Draw repeated strokes in a circular fashion as if you were rubbing the surface.

   The Scale slider controls the size of the noise distortion. A low value creates tiny bumps, which is good for fine detail. A large value creates very large details, which works well for rocky surfaces.

   The Strength slider controls how much noise is added to strokes created by the brush. This is also affected by the ZIntensity of the stroke. By using a Strength value of 1 on a brush with a lower ZIntensity, you'll get more of the noise effect with less of a change to the shape of the surface. Set the Strength slider to a negative value to invert the noise. This will cause strokes to create craters instead of bumps.

   The Noise edit curve allows you to change the pattern of the noise itself. You can create a wide variety of different noise textures by experimenting with different shapes for the curve.
8. Expand the edit curve below the noise sliders. Experiment with different shapes for the curve and test the brush while you make changes. Try matching the curves in Figure 7.62.
9. Save the brush as `noisyPolish.ZBP` in the `myBrushes` folder.

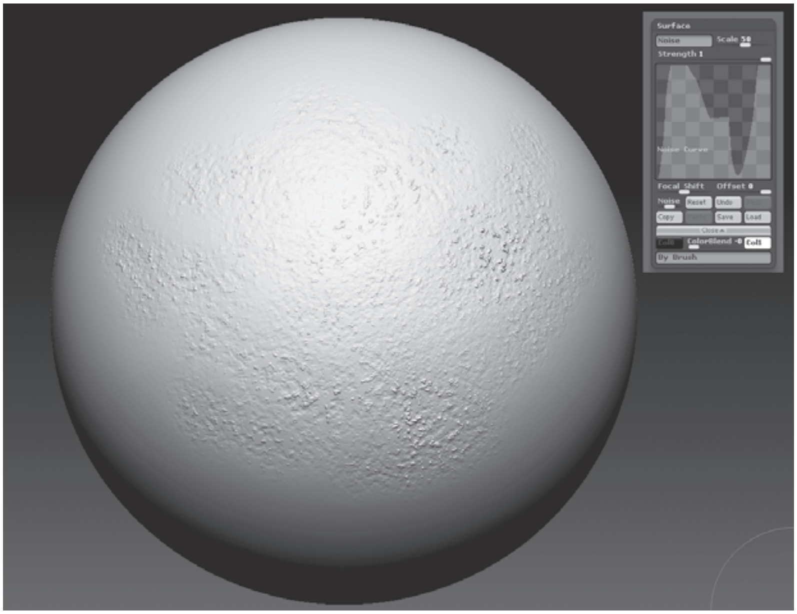


Figure 7.62

Change the shape of the Noise edit curve to create different looks for the noise patterns created in the stroke.

The Noise feature can be applied creatively to different brush types for interesting effects. Try adding noise to the Move brush, then hold the Alt key while dragging on the surface.

Hard Surface Detail Brushes

The developers at Pixologic first introduced the Planar and Trim brushes in ZBrush version 3.5 as a way to make sculpting hard surface details easier. If you've tried using these brushes, you may have found that their behavior is a bit mysterious. In the following sections, hard surface modeling with these brushes will be demystified and you'll learn how you can create your own variations of these brushes as well as use them to model mechanical surfaces.

Planar Brushes

The Planar brushes are used to sculpt flat surfaces onto an object. When applied to a surface, they press all of the points within the area defined by the brush tip into a flat plane. This is very similar to the way in which the Clip brushes described in Chapter 5 work.

Each Planar brush has been created through different combinations of settings applied to brushes that use the clay or polish base. Many of these settings will be described in detail throughout this chapter. Before we get into how these settings are applied, let's just see how the brushes can be used on a surface. We'll start by creating a good test surface.

1. Start a new session of ZBrush.
2. Open Light Box to the Tool section and double-click the PolySphere. Draw the PolySphere on the canvas and switch to Edit mode.

3. Open the Geometry subpalette of the Tool palette. Set SDiv to **1** and click the Reconstruct Subdivision button (see Figure 7.63) repeatedly until the PolySphere has been reduced to a simple cube.
4. Click the Del Higher button below the SDiv slider. This removes all the higher levels of subdivision.
5. Turn off the Smt button in the Geometry subpalette to disable the automatic smoothing that occurs when you subdivide the mesh.
6. Press the Divide button three times so that you have four levels of subdivision. The cube will look like it has not been changed, but in fact it has been subdivided.
7. Turn on the Smt button and click Divide four more times. The end result is a cube with rounded edges (see Figure 7.64).
8. Select the basicMaterial from the materials fly-out palette on the left shelf.
9. In the Morph Target subpalette of the Tool palette, click the Store Morph Target button. This will make it easier to clear the tool of strokes as you test the brushes.
10. Use the Save As button in the File menu to save the project as `planarBrushTest.ZPR`.

Figure 7.63

The Reconstruct Subdiv button in the Geometry palette adds lower levels of subdivision to the PolyCube.

This project will be used to test the various Planar and Trim brushes as well as customized variations. A copy of this project is found in the `Chapter 7` folder on the DVD.

Now it's time to take some of the Planar brushes for a test spin to see how they work.

1. From the brush fly-out library, choose the Planar brush. Use the brush to sculpt on one of the flat ends of the cube.

   Nothing happens when you use the Planar brush. What is going on? The Planar brush is used to extend the sampled area into a flat plane. If you use the brush on a flat surface, you won't see any change.

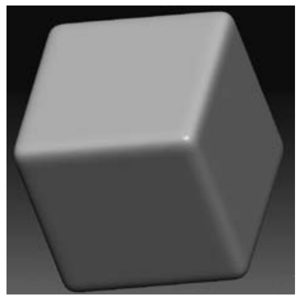


Figure 7.64

After the cube is subdivided, the edges become rounded.

2. Increase the draw size to **200**. Hold the brush over one of the rounded edges. Notice the angle of the brush icon as you hold it over the rounded corner. This gives you a visual indication of the angle of the plane that will be created when you use the brush on the corner (top image in Figure 7.65).
3. Drag along the corner with the Planar brush. Now a flat, beveled edge; appears based on the angle of the brush icon (bottom image in 7.65).

   So you can see how the Planar brush can be used to create a beveled edge, it can also be useful when extending a plane that has been cut into a surface. To see how this is useful we'll take a look at a similar brush: the PlanarCut brush

4. From the sculpting brush library, select the PlanarCut brush.
5. Use the PlanarCut brush on one of the flat surfaces. Brush over the entire face of the cube.

   This time the brush cuts into the surface, which flattens the plane completely, eliminating the round edges (see Figure 7.66). Every time you use the PlanarCut brush, it

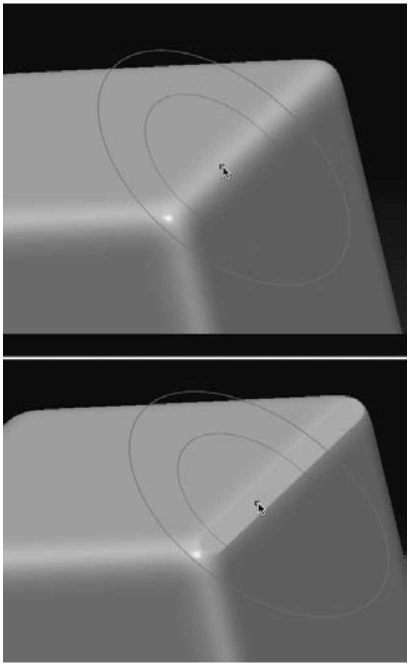


Figure 7.65

The Reconstruct Subdiv button in the Geometry palette adds lower levels of subdivision to the PolyCube.

cuts away more of the surface. What happens when you just want to level part of a flat surface without cutting into the surface? That's where the Planar brush comes in handy.

6. Set Draw Size to **85**. Use the PlanarCut brush on one of the flat planes of the cube but release the brush before you flatten the entire side, as shown in the left image in Figure 7.67.
7. Switch to the Planar brush. Start brushing in the area that was cut away by the PlanarCut brush and extend the stroke to the edges of the surface, as shown in the right image in Figure 7.67.

   You won't notice any change until the brush contacts the area that was not removed by the PlanarCut brush. The Planar brush is extending the plane. This can be useful when you want to level off a side of an object. The depth of the plane created by the Planar brush is determined by the depth at the sampled area of the surface; in other words, the area on the surface where you first touch the brush tip.

   The PlanarFlatten brush is similar to the Planar brush in that it will continue a plane based on the depth of the sampled area. However, unlike the Planar brush, the PlanarFlatten brush will also fill in recessed areas, creating a perfectly flat plane.
8. Spend a few moments experimenting on the rounded cube with the Planar, PlanarCut, and PlanarFlatten brushes. Note the difference in the way each brush behaves.

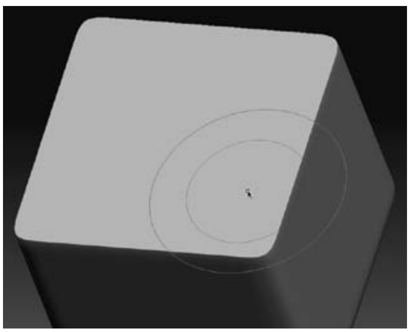


Figure 7.66

The PlanarCut brush cuts into the surface, leaving a flat plane.

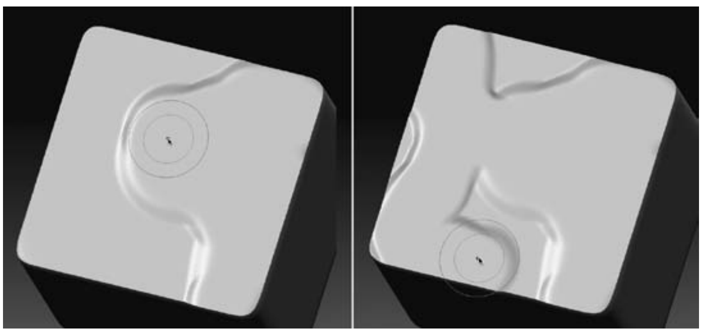


Figure 7.67

The Planar brush is used to extend the plane of a surface based on the depth of the area sampled by the brush.

BackTrack

BackTrack is a special set of modifiers that become available when LazyMouse is activated for a brush. The BackTrack settings are most often used with the Planar and Trim brushes as a way to help create hard surface details. These settings are also available for other types of brushes and can be used for creating interesting effects.

In the following sections, you'll learn how BackTrack works. The BackTrack feature is designed to help add precision to the sculpting brushes especially when creating beveled edges for surfaces.

The BackTrack options are found in the Stroke palette and become available when the LazyMouse button is enabled (see Figure 7.68). Once LazyMouse is activated, you can turn on the BackTrack button, which applies this feature to the current sculpting brush.

BackTrack has four modes: Plane, Line, Spline, and Path. The following exercises demonstrate how each of these different BackTrack modes work.

Figure 7.68

The BackTrack settings are at the bottom of the Stroke palette and become available when LazyMouse is enabled.

Plane

This exercise demonstrates how the Plane mode of BackTrack works.

1. Open the `PlanarBrushTest.zpr` project, which has the cube with rounded edges ready for testing. This project is available in the `Chapter 7` folder on the DVD.
2. In the sculpting brush library, choose the Planar brush. Set Draw Size to **200**.
3. Place the Stroke palette in the tray so you can see the options. By default the Planar brush has BackTrack enabled and the Plane option activated.
4. Hold the brush tip over one of the rounded edges of the cube. Move the brush until it looks like you have something close to a 45-degree angle set for the discs of the brush icon (see the left image in Figure 7.69).
5. Press down on the cube. The rounded edge will become flattened (see the right image in 7.69).

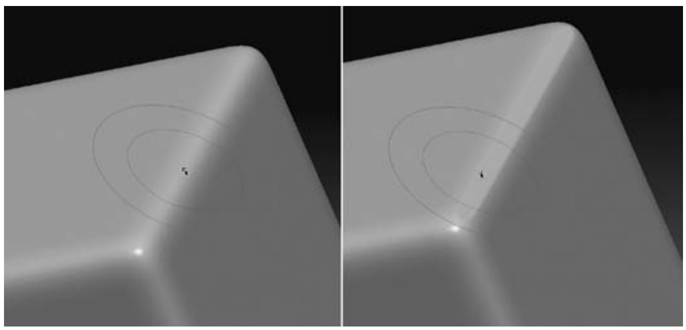


Figure 7.69

Set the angle of the cut by holding the mouse over the rounded edge. Press into the surface to create a beveled edge.

The larger the brush size, the more points are sampled, resulting in a larger cut in the surface. The Planar brush uses the Plane mode of BackTracking to create the virtual cut plane.

Line

Line mode lets you set the angle of the cut plane interactively. You create a start point and an end point by clicking on the surface and then move the stroke back up toward the starting point: hence the name *BackTrack*.

1. In the Stroke palette, click the Line button in the BackTrack settings.
2. Press **Ctrl+Z** to undo the last brush stroke.

3. Click on one the sides of the cube close to the rounded edge. Continue to press down on the surface and drag down to the other side of the edge.

   A red line appears as you drag (see the left image in Figure 7.70). At each end of the line is a perpendicular green line indicating the start and stopping points. By dragging this line out, you are setting the angle of the cutting plane interactively. Notice that the line goes through the surface, giving you a visual indication of the depth of the cut (see the center image in Figure 7.70).

4. Drag the brush back toward the start of the line. At this point the surface will be cut at the angle set by the red line (see the right image in Figure 7.70).

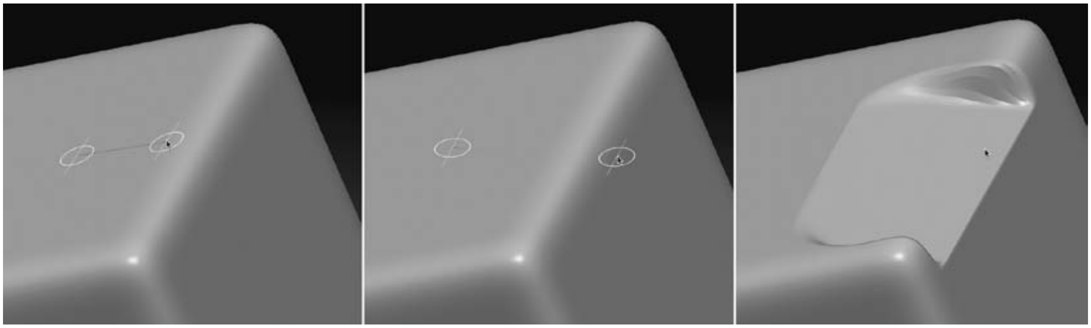


Figure 7.70
Drag the line indicator out along the surface of the cube (left image). Drag it over the edge and down along the side to set the angle (center image). Move the brush back toward the starting point to make the cut (right image).

Spline

Spline mode is designed to make it easier to create a rounded bevel. It is similar to Line mode in that you draw a line between two points and then backtrack toward the start of the point. But rather than cut along a flat plane defined by the two points, Spline creates a rounded bevel by interpolating a curve between the two points.

Using the Spline option is made easier by enabling SnapToTrack, which restricts the stroke to the initial line of the stroke. The PlanarSpline brush uses both Spline mode and SnapToTrack.

To see how this works, follow these steps:

1. Clear any changes you've made to the rounded cube or reload the `PlanarBrushTest.ZPR` project.

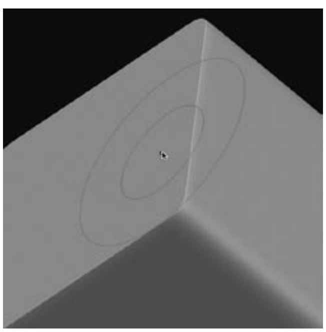


Figure 7.71
Use the Planar Cut brush to flatten one end of the cube.

2. Select to the PlanarCut brush.
3. Use the brush on one of the planes of the cube to flatten the edges of the surface, creating sharp corners as shown in Figure 7.71.
4. Select the PlanarSpline brush from the sculpting brush fly-out library.

5. This brush has an alpha applied. To make it easier to see how the brush works, select Alpha Off from the alpha fly-out library. This removes the alpha from the brush.
6. Set the draw size to **200**. Scale down the view of the rounded cube so that the brush size is very large relative to the object. Rotate the view so that you are looking straight down at one of the sharp edges (left image in Figure 7.72).
7. Starting from the left side of the edge, draw out the backtracking line by dragging on the surface to the right.
8. After you start drawing the line, hold the Shift key. This will keep the line perfectly horizontal (center image in Figure 7.72).
9. Once you have drawn out the line, move the brush left to right a few times to make the cut.
10. Rotate the view of the cube to examine the cut that is made by the brush (right image in Figure 7.72).

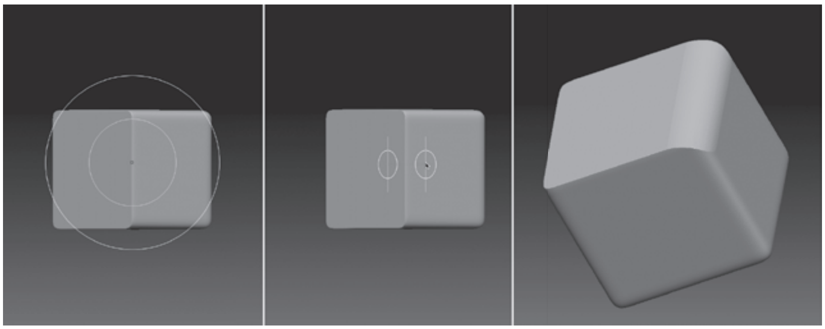


Figure 7.72
The PlanarSpline brush can be used to create a rounded bevel.

It's a bit tricky to create a perfectly rounded bevel on a surface using Spline mode. In some cases, you may want to create a rounded edge using the Clip brushes discussed in Chapter 5 and then use the PlanarSpline brush to clean up the edges.

The way in which the curve is cut into the surface can be adjusted by increasing the value of Track Curvature. Higher values create a shallower curve.

Path

Path mode restricts the stroke of the brush to the initial path that you draw on the surface. This can add precision to the details you create in a surface. Just as with Line and Spline mode, you first draw out the initial path and then move back and forth to create the cut. Unlike Line and Spline, the initial path you create does not have to be a straight line; it can be a curve.

1. Clear the changes you've made to the cube or reload the `PlanarBrushTest.ZPR` project.
2. From the sculpting brush library, select the PlanarCut brush.

Figure 7.73
Turn on the Path button on the Stroke palette.

3. In the Stroke palette, turn on the Path button (Figure 7.73).
4. Draw a curving line on the surface of the cube and then move the brush back and forth.

   When Path is on, you first define the shape of the curve by drawing on the surface. You'll see a green line appear that follows the path of your brush stroke (left image in Figure 7.74). Then as you move back and forth, a cut is made that follows the shape of the curve (right image in Figure 7.74).
5. Activate the SnapToTrack feature and create another cut. This option keeps the brush snapped to the initial path. Even if you move the brush away from the surface, the tip of the brush still follows the path perfectly.

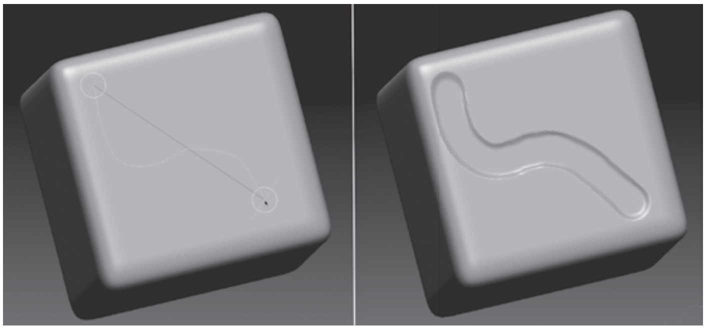


Figure 7.74
The Path mode creates a cut that follows the path of the initial stroke.

The SnapToTrack option can be used with Line and Spline mode as well. This is a great way to create a perfectly straight line.

Brush Depth

When you stroke along the surface of a mesh with the sculpting brush, the concentric circles give you an indication of the size, the falloff, and the angle of the stroke. However, the circles that represent the tip of the brush tell only part of the story. ZBrush actually understands that the tip of the brush is a spherical volume. The concentric circles you see as you sculpt on the surface are a cross section of that volume. And any part of the surface within the volume will be affected by the brush. Figure 7.75 illustrates this concept.

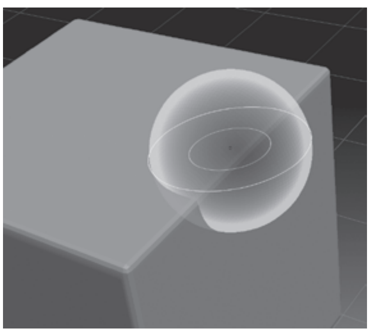


Figure 7.75
The concentric circles that represent the tip of the sculpting brush are a cross section of an invisible spherical volume.

By altering the position of this spherical volume relative to the surface of the mesh, you can change the depth of the marks made by the brush. To do this, you adjust the Imbed setting in the Depth subpalette of the Brush palette.

The Depth subpalette has a picture that represents a cross section of the brush tip viewed from the side. The circle represents the spherical volume of the brush tip while the horizontal line represents the surface of a sculptable mesh. The black dot represents the center of the brush tip (see Figure 7.76).

You can change the position of the brush tip's center by dragging it up or down within the diagram. You can achieve the same thing by moving the Imbed slider back and forth.

Let's take a look at how changing the imbed setting affects the way the brush reacts with the surface.

1. Load the `planarBrushTest.ZPR` project into ZBrush. This file is available in the `Chapter 7` folder on the DVD.
2. From the sculpting brush library, select the Planar brush. Set Draw Size to **100**.
3. Place the Brush palette in the tray and expand the Depth subpalette.
4. Drag on one of the flat sides of the cube with the brush. Nothing happens.

   Take a look in the Depth subpalette. The black dot at the center of the circle is in line with the horizontal line representing the mesh surface. At the moment, the brush has no depth, so the surface is unaffected.
5. Drag the black dot in the diagram down a little, or set the Imbed slider to **20** and drag the brush across the surface (see Figure 7.77).

   Now the brush cuts into the surface. By adjusting the Imbed slider you've made the Planar brush behave exactly like the PlanarCut brush. The only difference between these two brush presets is the value of the Imbed setting.

Figure 7.76
The Depth subpalette contains an interactive diagram that represents the depth of the brush tip.

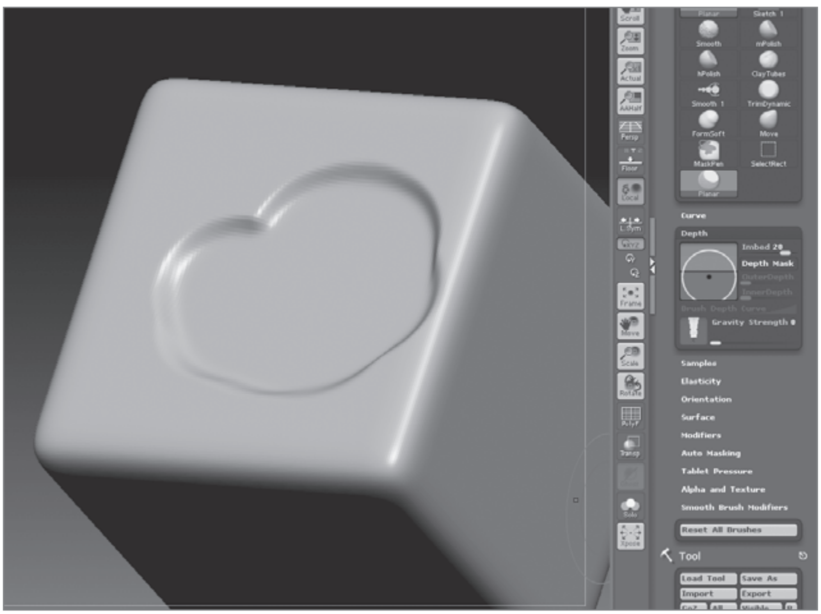


Figure 7.77
Setting the Imbed slider to 20 causes the Planar brush to cut into the surface of the cube.

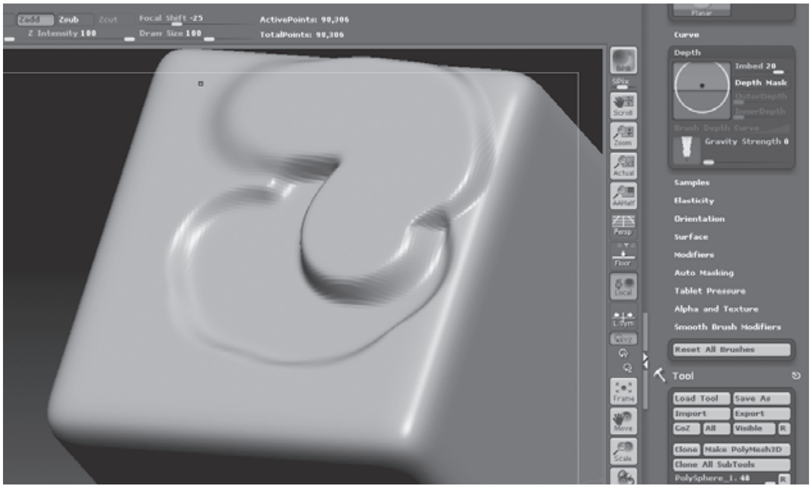
6. Try moving the black dot in the Depth subpalette above the line or set the Imbed slider to **-20**. Drag on the surface of the cube.

   This time nothing happens. Why is this? Take a look at the top shelf. The Planar brush has Zsub on by default.

7. Turn on the Zadd button and set Imbed to **20**. Now as you drag on the surface, the brush pulls the surface up to a flat plane (see Figure 7.78).

Figure 7.78

When the draw mode is set to Zadd and Imbed is set to 20, the Planar brush lifts the surface up.



   The Zadd and the Zsub buttons work together with the Imbed feature. This can trip you up a little if you're not paying attention. Make a note of whether the brush is in Zadd or Zsub mode when you are adjusting the Imbed option. Notice that as you switch between the Zadd and Zsub buttons, the black dot at the center of the diagram flips positions across the central line. Remember that you can also hold the Alt key to switch between Zadd and Zsub.

8. Set Imbed to **-40** and draw on one of the rounded corners of the cube. The corner is not affected but the area behind the corner is pulled up to a flat plane (see Figure 7.79).

   This behavior illustrates that, because the center of the tip is imbedded below the surface, the deformation of the surface occurs below the point of contact.

9. Play with the Imbed feature using the Planar brush for a while, and experiment with different combinations of Imbed settings and Zadd or Zsub. After awhile, it should start to make more sense.

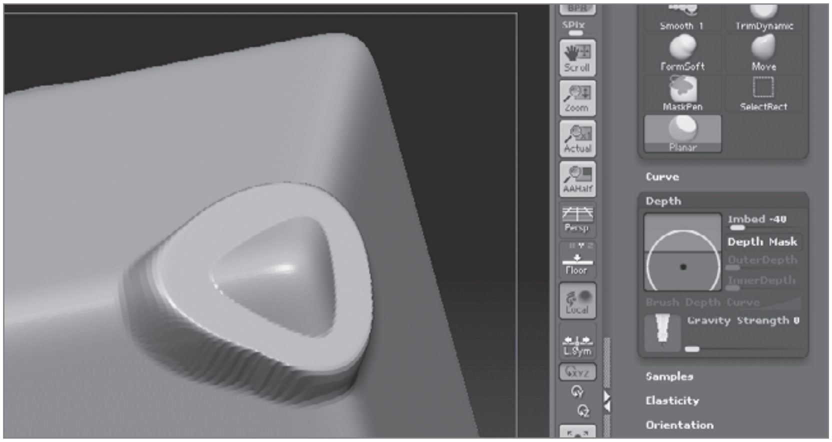


Figure 7.79

When Imbed is set to -40, the brush affects the area below the surface. This is most easily demonstrated by brushing on the corner of the cube.

DEPTH AND ZINTENSITY

Up to now you have probably been thinking that the depth of the stroke is controlled by the ZIntensity slider. Actually, ZIntensity controls how quickly you achieve the depth set by the Imbed setting in the Depth palette. Think of ZIntensity as accelerator pedal on a car. Increasing the value is like applying more pressure to the accelerator pedal. The Imbed setting represents your destination. The more pressure you apply to the accelerator pedal of a car, the faster you go and the sooner you reach your destination. So the higher the ZIntensity, the sooner the brush meets its maximum depth.

Depth Masking

Depth masking lets you change the spherical shape of the brush tip itself, which creates some very interesting brush effects. When you activate the Depth Mask button in the Depth subpalette of the Brush palette, a black dot appears at the top and the bottom of the brush diagram. By dragging these dots toward the center of the circle, you're actually masking out part of the volume of the brush tip. This exercise demonstrates how this works.

1. Clear the cube surface or reload the `PlanarBrushTest.ZPR` project.

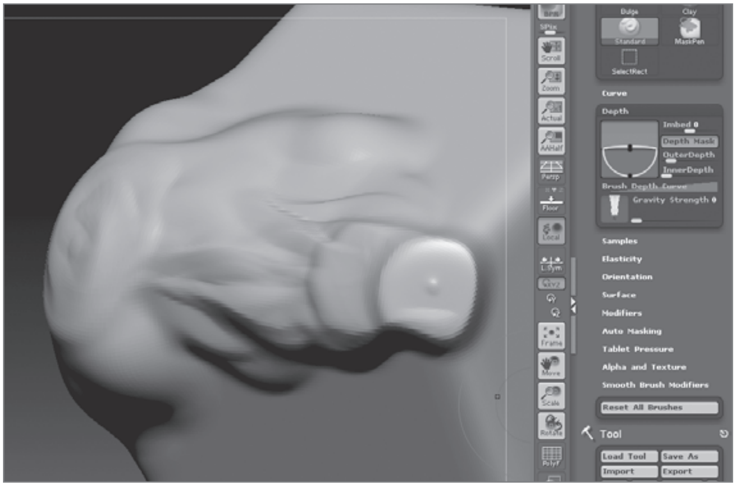
   In this case it's a little easier to understand how depth masking works when applied to the Standard brush.

2. Choose the Standard brush from the sculpting brush fly-out library.
3. Make sure the Brush palette has been docked in a tray so that you can easily access the controls.
4. Set Draw Size to **100** and draw some strokes on the surface of the cube.

5. In the Depth subpalette of the Draw palette, click on Depth Mask. Drag the black dot at the top of the circle down; you can also adjust the Outer Depth slider to achieve the same result. Drag the dot down so that it is almost level with the top of the circle.
6. Create some new strokes on the surface.

   The strokes have a much flatter quality because the outer depth of the brush tip is masked (see Figure 7.80).

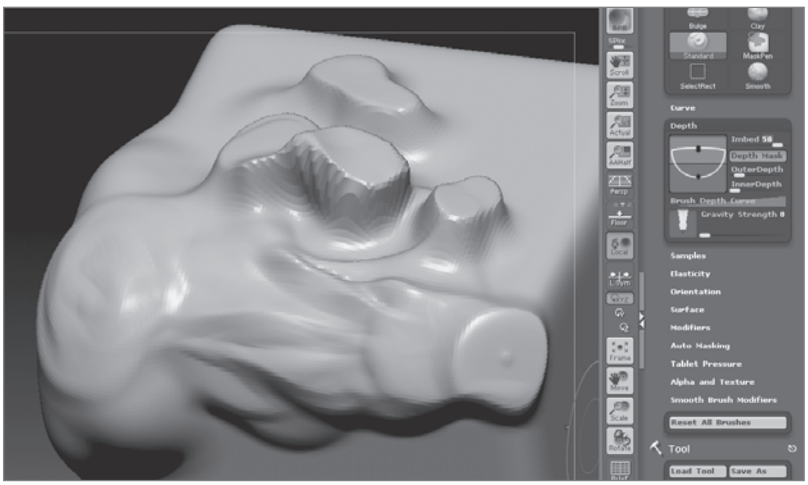
Figure 7.80
Mask the outer depth of the Standard brush to create a flatter stroke.



7. Set Imbed to **50** and draw on the surface.

   Raising the Imbed value creates an interesting effect: The center of the brush is above the surface, so you'll see a change only when the brush comes in contact with raised bumps on the surface. On top of this, the outer depth has been masked so that the resulting stroke is kind of a plateau (Figure 7.80).

Figure 7.81
Edit the Outer Depth and the Imbed values to create a brush that adds a raised plateau to the surface.



8. Expand the Brush Depth edit curve below the Depth diagram and experiment with different shapes for the curve.

   This edit curve adjusts the strength of the depth masking. It's interesting to see how different shapes for the curve create different effects in the brush stroke (see Figure 7.82).

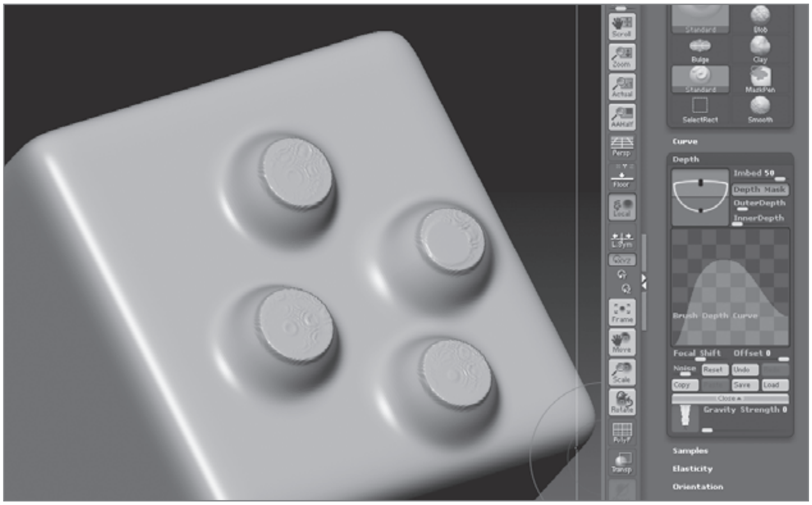


Figure 7.82

Change the shape of the Brush Depth curve to affect the strength of the depth mask. This adds interesting effects to the strokes made by the brush.

The Picker Palette

Even though the brush tip is a spherical volume, the actual deformation in the surface created by the brush is not. In many cases, the angle of the brush tip can make a big difference in how the brush deforms the surface. The Picker palette contains the control for how ZBrush determines the angle of the brush.

This exercise shows you how to work with the orientation controls in the Picker palette.

1. Clear any changes you've made to the cube or reload the `PlanarBrushTest.ZPR` project.
2. From the sculpting brush fly-out library, select the PlanarCut brush.
3. Place the Picker palette in the tray so you can access the controls easily.

   The controls that affect the angle of the sculpting brush are the Once Ori and Cont Ori buttons and the area to the left of these buttons (see Figure 7.83).

   Once Ori stands for Once Orientation, meaning that the orientation of the brush is set based on the normal direction of the surface at the point where the brush first makes contact with the surface. The angle of the brush is kept at this angle for the rest of the stroke.

   Cont Ori stands for Continuous Orientation, meaning that the angle of the brush is continuously updated during the brush stroke based on the sampled normal direction of the surface.

Figure 7.83

The Orientation settings in the Picker palette.

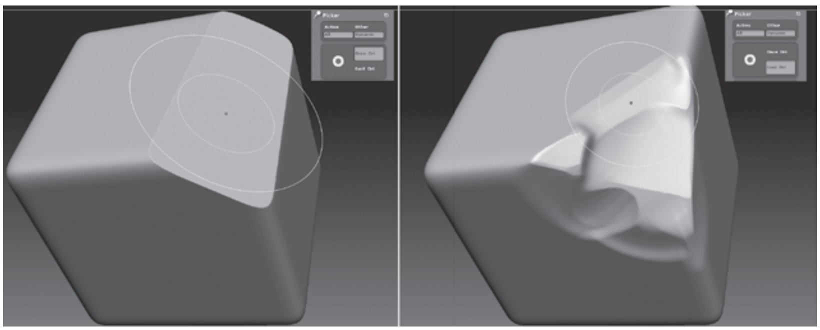
The area to the left of these buttons contains the image of a three-dimensional arrow that becomes active when you click it. By default, the arrow is pointed directly at you so it looks like a colored circle. Once you click in this area, you can drag within the defined box to rotate the view of the arrow. The direction of the arrow indicates the angle of the brush stroke for every stroke made with the brush.

Let's see a demonstration of how this works.

4. Drag on the surface of the cube with the PlanarCut brush. You can see how the angle of the planar cut of the stroke is set based on the first point of contact with the surface (left image in Figure 7.84). This is what allows you to easily make a flat surface using the brush.
5. In the Picker palette, click the Cont Ori button.
6. Drag on the surface again. Now as you continue to draw on the surface, the angle of the planar cut made by the brush changes constantly to match the angle of the surface (right image in Figure 7.84).

Figure 7.84

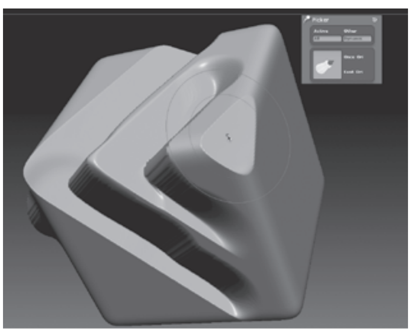
Once Ori sets the angle of the stroke based on the first point of contact on the surface. Cont Ori continuously updates the angle of the stroke while dragging on the surface.



7. Click below the arrow icon in the Picker palette to the left of the Once Ori and Cont Ori buttons to activate the selected orientation. Drag in this area to rotate the arrow. The direction of the arrow indicates the angle of the brush.
8. Draw on the surface and make a note of the angle of the planar cut of the stroke. Compare the angle to the orientation of the 3D arrow in the Picker palette (see Figure 7.85).

Figure 7.85

Use the three dimensional arrow icon to establish a specific orientation for the brush.



To set the arrow icon so that it faces the screen, click on the Once Ori Button and then click back in the area surrounding the arrow. When the arrow is pointed directly at the screen all strokes made by the brush are parallel with the screen.

Combine Settings

At this point you should start to see how much power you have over the behavior of the sculpting brushes. By combining various combinations of settings, you can create a brush that will do almost anything. Even if you're happy with the existing brush presets available in the sculpting brush library as well as in the Brush section of Light Box, understanding how the brush settings work will help you understand how best to edit each the brush.

Experiment with different combinations of settings in the Alpha, Brush, Stroke, and Picker palettes. Apply these settings to different brush base types and see what happens. Here's a few ideas you may want to try:

- Adjust the Size edit curve in the Tablet Pressure subpalette of the Tool palette for one of the ZSketch brushes. ZSketching is covered in Chapter 4.
- Apply an alpha texture to the PlanarCut brush. Increase the SpinCenter and SpinRate sliders in the Orientation subpalette of the Brush palette. Then set the BackTrack mode in the Stroke palette to Line.
- Turn on the Noise button in the Surface subpalette of the Brush palette to the Nudge brush.
- Apply the Path mode in the BackTrack settings of the Stroke palette to the Blob brush, and use the Color Spray stroke type for this brush.

These are just a few ideas to get you started.

There are many more advanced settings that you can continue to explore while you grow as a ZBrush artist. In the Brush palette, you'll find the Samples subpalette, which contains a number of settings that determine how the tip of the brush gathers information from the surface and applies it to the behavior of the brush. To find out more about what each of these settings does, place the mouse cursor over the setting while holding the Ctrl key.

Examples of each of the custom brushes created in this chapter can be found in the `Chapter 7` folder on the DVD.

Stencils

A stencil is an image file that is used to interactively mask areas of a surface. A stencil is created from an alpha texture and has its own special controller that is used to position the stencil relative to the surface. In the following sections, you'll learn how to create and use a stencil.

Create a Stencil

Stencils are very easy to create as long as you remember where to find the Make Stencil button. This button is in the Alpha palette, but it is abbreviated as Make St—not a very intuitive label. When you use this button, the current alpha is converted into a stencil. This exercise demonstrates the process.

1. Load the `brushTest.ZPR` project that you created at the start of this chapter.

2. In the alpha fly-out library, select alpha 53, which is the French curve (see Figure 7.86).
3. In the Alpha palette, click the Make St button (see Figure 7.87). The French curve appears on the canvas within a red box.
4. In the Alpha palette, select Alpha Off to remove the alpha from the brush you set to alpha 53. Your brush stokes will look kind of mangled.

Figure 7.86
Select the French curve alpha from the alpha fly-out library.

Manipulate the Stencil

Once you have created a stencil, you'll want to position it over the surface so it can be used as a sculpting aid. To do this you'll use the coin controller. This controller is only available when a stencil is active on the canvas.

1. Press and hold the spacebar. You'll see a little circular controller appear (Figure 7.88).

Figure 7.87
Press the Make St button in the Alpha palette.

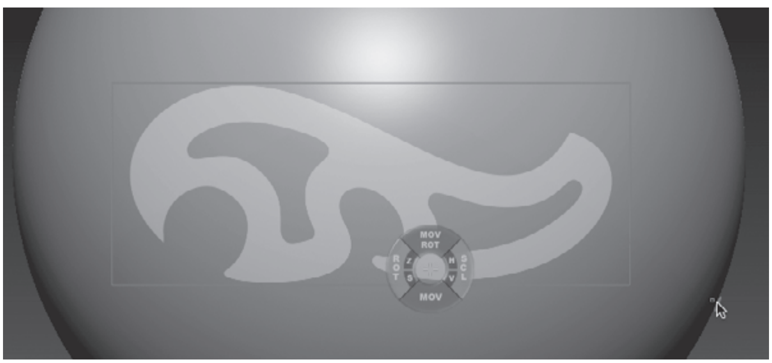


Figure 7.88
Hold the spacebar to activate the coin controller for the stencil.

2. Click and drag on the bottom part of the controller where you see the label MOV. This lets you move the stencil. Move the stencil so that it is over the PolySphere.
3. Release the spacebar after you have positioned the stencil.
4. Draw on the PolySphere along the edge of the stencil. You can see how the stencil masks part of the surface so that it is not affected by the brush. The white area indicates the area that will be masked (see Figure 7.89).

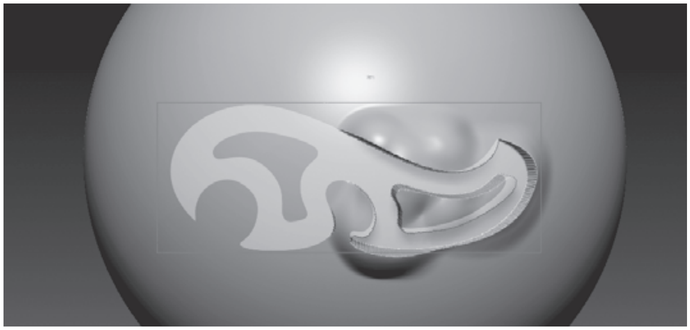


Figure 7.89
The stencil masks the canvas so that the surface behind the light color of the stencil is not affected by the sculpting brush.

5. Hold the spacebar and click and drag on the letters SCL. This scales the stencil.

   You can drag on the small H or V next to the SCL button to scale the stencil horizontally or vertically.
6. Hold the spacebar and drag on the ROT button on the left side of the controller. This allows you to rotate the stencil (see Figure 7.90).

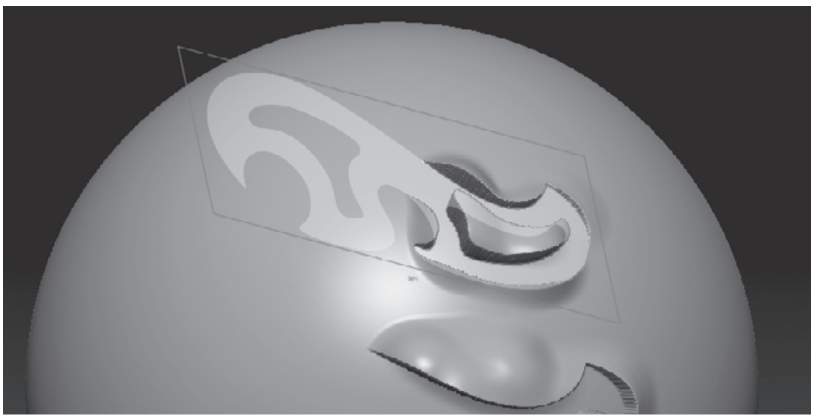


Figure 7.90
The stencil can be moved and rotated by dragging on the MOV and ROT buttons on the coin controller.

You can drag on the small Z next to the ROT button to rotate the alpha around its z-axis or drag on the small S to rotate the alpha around the screen axis. Hold the Shift key when dragging on the ROT button of the coin controller; this will cause the stencil to snap to 45-degree angles as you rotate it.

Figure 7.91
The Stencil palette contains controls for manipulating the behavior of the stencil.

If you drag on the MOV ROT button at the top of the controller, the stencil will move and rotate at the same time. The stencil will automatically rotate to match the normal direction of the surface behind it.

The Stencil Palette

The Stencil palette contains all the controls for manipulating the behavior of a stencil once you have created it (see Figure 7.91).

1. Right-click drag on the canvas to rotate and scale up the view of the PolySphere.

   Note that you can change the position of the stencil or the view of the surface or both. This makes it easy to precisely position a stencil wherever you need it.

2. Place the Stencil palette in the tray.
3. Press the Invr button. This inverts the stencil so that the entire screen is masked except the shape of the stencil.
4. Set Alpha Repeat to **3**. This creates a grid of stencils three stencils long by three stencils wide (see Figure 7.92).

Figure 7.92
The stencil is inverted and tiled three times horizontally and vertically.

The other buttons in the palette have the following functions:

Stencil On turns the stencil on or off. When you create a stencil, this button is activated automatically.

Interactive becomes active when you hold the spacebar to use the coin controller.

Stretch resizes the stencil so that it matches the dimensions of the canvas.

Actual restores the stencil to its original size and places it at the center of the canvas.

Horiz stretches the stencil to meet the horizontal dimensions of the canvas.

Vert stretches the stencil to meet the vertical dimensions of the canvas.

Wrap Mode wraps the stencil around the surface (see Figure 7.93).

Figure 7.93

The Wrap Mode option wraps the stencil around the surface.

Clip Rect restricts the boundaries of the stencil to the stencil rectangle. Strokes made outside the boundary of the stencil will not affect the surface.

Res increases the resolution of the wrap mode, reducing artifacts that may be caused by wrapping the stencil on a complex surface.

Smooth removes artifacts from the edges when Wrap Mode is on by smoothing the edges of the stencil.

The Show button activates the visibility of the stencil. The stencil will still function when the Show button is off, but you won't be able to see it.

The R, G, B, and Elv buttons control the display of the stencil. The R, G, and B buttons control the visibility of the red, green, and blue channels, and the Elv button shows an outline that illustrates the elevation of the stencil on the surface. These buttons do not change how the stencil works, just its display properties.

TIPS FOR USING STENCILS

When using a stencil, make sure the Persp button on the right shelf is off; otherwise, the deformations created with the stencil may become distorted.

To use a stencil on both sides of the surface at the same time, turn on >X< symmetry and rotate the surface to a side view. As you use the stencil to create a pattern on one side, the deformation will be projected to the other side.

You can use stencils in combination with masking techniques to create very precise details.

Remember that after you make an alpha into a stencil using the Make St button in the Alpha palette, be sure to deactivate the alpha for the active sculpting brush.

After a little practice, working with stencils becomes very easy. Stencils have been a part of ZBrush for the past view versions. ZBrush 4 introduces SpotLight, which has projection capabilities similar to stencils. However, SpotLight is much more powerful. You'll learn about Spotlight in Chapter 8, "Polypainting and SpotLight."

CHAPTER 8

Polypainting and SpotLight

Polypainting refers to the process of applying color values directly to the polygons of a mesh using the sculpting brushes. It's very much like painting a real 3D object: You can blend and mix colors on the surface of your model to create the look of realistic skin, details on hard surfaces, even decals and logos. You can take advantage of many of the advanced brush features to design your own special polypainting brush presets that suit your own style of working.

ZBrush 4 introduces SpotLight, an advanced image editing program built into the ZBrush interface that allows you to edit images and then project the colors of those images onto the surface of the model. SpotLight's unique interface makes this process very easy and fast, which saves you the need to leave ZBrush and edit your image files in another program.

This chapter introduces polypainting techniques and gives you a tour of SpotLight with practical examples that will tell you how to do the following:

- **Paint colors on a surface**
- **Use cavity and occlusion masking**
- **Edit images in SpotLight**
- **Save SpotLight files**
- **Project colors from SpotLight images onto a surface**

Polypainting

The technical aspects of polypainting sound complex at first, but in reality it's quite simple. Using polypainting, you apply RGB values (red, green, and blue) to each vertex of a model. The color values are blended across the face of the polygons that share those vertices, creating what appears to be very smooth and detailed coloring. Figure 8.1 illustrates this point.

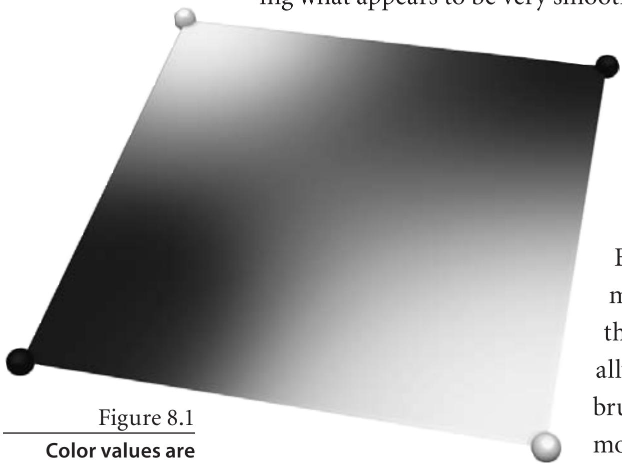


Figure 8.1
Color values are applied to each vertex and then blended across the polygon face.

Polypainting is performed using the same sculpting brushes you've been using throughout this book. Your polypainting will look better on a surface that has a lot of polygons, so usually you want to polypaint your 3D tools when they are set to their highest subdivision.

To polypaint a 3D tool, it must be on the canvas, in Edit mode, and the Colorize button in the Tool palette must be activated. The sculpting brushes you use to paint the surface need to have Rgb mode activated. You can actually have Rgb mode and Zadd on together, which means the brush can be used to paint and sculpt at the same time, but most artists prefer to polypaint their models after they have been sculpted.

The exercises in the following section demonstrate a typical workflow for polypainting a 3D tool.

Polypainting Basics

Let's take a look at some of the general concepts behind polypainting. In this exercise you'll see how to polypaint on a basic PolySphere and how the resolution of the mesh affects the quality of the brushstrokes painted on the surface.

1. Open a new ZBrush session.
2. Open Light Box to the Tool section and double-click the PolySphere.ZTL tool.
3. Draw it on the canvas and switch to Edit mode.
4. Press **Ctrl+D** three times to subdivide the model three times. The PolySphere already has three levels of subdivision, so this gives the PolySphere a total of six subdivision levels. At SDiv 6, the surface has 1.572 million polygons.
5. Open the materials fly-out library and select the SkinShade4 material (see Figure 8.2). This material is completely white, so the appearance of color values applied to the surface will accurately reflect their color values.

   Some materials, such as the MatCap Red Wax material, have a color component to them. If you paint color on surfaces that use a colored material, the colors you paint on the surface will combine with the color of the material and look "off." Materials are discussed in Chapter 9, "Rendering, Lighting, and Materials."

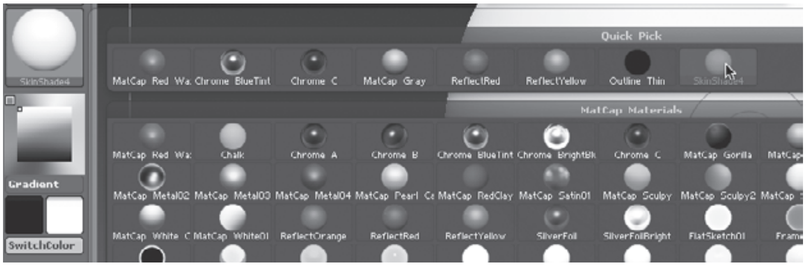


Figure 8.2

Select the SkinShade4 material.

6. Use the Save As button in the File palette to save the project as `PolyPaintTest.ZPR`. Save the project in the `ZBrush 4.0\ZProjects` folder in which the project appears in Light Box. In Windows, this folder is found in `Program Files\Pixologic`. On a Mac, the folder is found in the `Applications` folder.

   Now let's take a look at how to activate polypainting. This is a simple but important step and understanding it will explain some mysteries about ZBrush.

7. On the left shelf, drag the mouse pointer within the color picker and select the blue color (see Figure 8.3). The PolySphere turns blue when you do this. As you continue to select colors in the color picker the color on the surface changes.

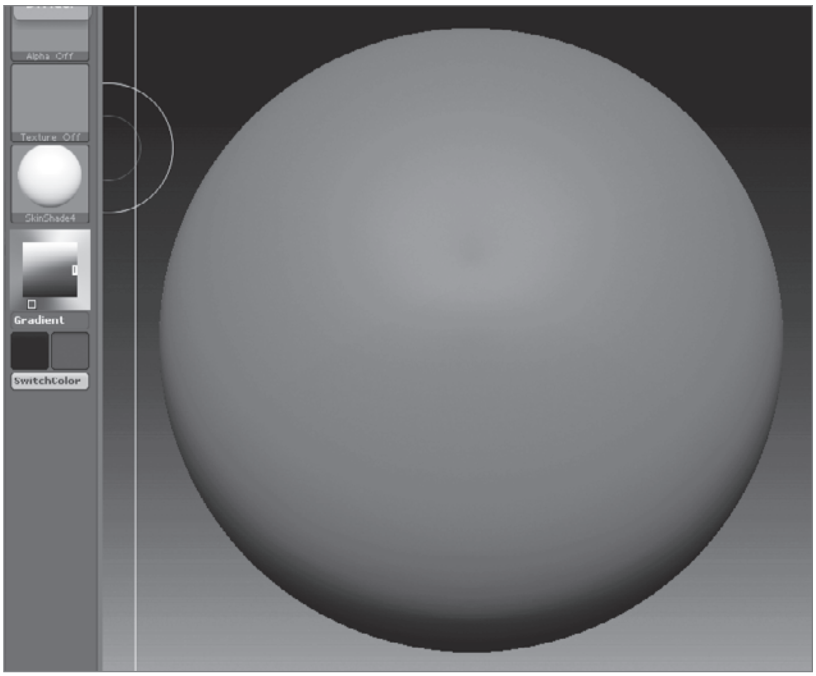


Figure 8.3

Use the color picker to select a blue color. This causes the entire PolySphere to turn blue.

8. Open the Tool palette and scroll down until you see the Polypaint subpalette. Expand this subpalette and press the Colorize button (see Figure 8.4). When you do this, the PolySphere turns white.

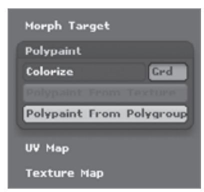


Figure 8.4

Turn on Colorize in the PolyPaint subpalette of the Tool palette.

Figure 8.5

On the top shelf, turn on Rgb and set Rgb Intensity to 100. Turn off Zadd.

9. Make sure the Standard brush is the currently selected brushstroke. On the top shelf, turn off the Zadd button and turn on the Rgb button. Make sure Rgb Intensity is set to 100 (see Figure 8.5).
10. Drag on the surface of the model. The brush leaves a blue stroke (see Figure 8.6).
11. In the color picker, select a red color and drag on the PolySphere again. Now the brush leaves a red stroke.

    So what just happened here? When the Colorize button is off, the color of the surface changes each time you pick a new color using the color picker. Once you turn on the Colorize button, you have activated polypainting for the surface. Now the surface turns white and you can use the Sculpting brushes to apply the current color picker value to the surface of the model. If you turn Colorize off, the strokes you painted disappear and the model goes back to a solid color. Turn Colorize back on and the colored lines reappear.

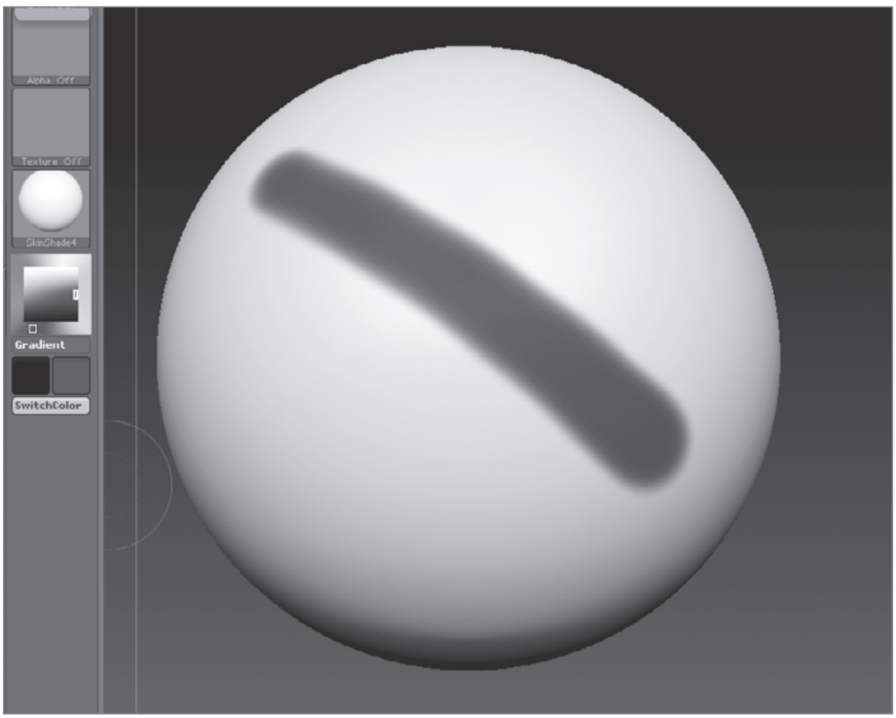
    The color values of the strokes you paint on the surface are stored within each vertex, so they won't be erased if you turn off the Colorize button; you just won't be able to see the strokes until you turn Colorize back on. When you save your model to disk as a Ztool (ZTL) or as a Zproject (ZPR), the polypaint information is saved as well.

    Masked areas of the surface will be protected from colors painted on the surface.

12. Continue on to the next section using the same PolySphere.

Figure 8.6

Drag on the surface to create a blue colored stroke.



ACTIVATING POLYPAINT

The Colorize button in the Polypaint subpalette of the Tool palette enables polypainting on the surface. Constantly going back to this button to turn on polypainting can get tiring. There are two other ways to enable polypainting:

1. Turn on the paintbrush icon for the SubTool you want to polypaint in the SubTool subpalette of the Tool palette.
2. Brush on the surface of the model with any sculpting brush that has the Rgb button activated. This will enable polypainting even if the Rgb Intensity slider is set to 0. You may have to rotate the view of the surface to get the display to update properly after brushing on the surface.

Secondary Color

So what happens if you do want to erase the colored strokes on the surface? Below the color picker you'll see two color swatches. These swatches are a way to store a backup secondary color so you can erase strokes or just have a second color stored in memory for use when you need it (see Figure 8.7).

Figure 8.7

The color swatches below the color picker store a main and secondary color.

To erase the strokes you've painted on the surface, you can set the secondary color to white and then paint over the strokes. Here's how this works:

1. Below the Color palette, click the swatch on the left. This activates the secondary color selection.
2. Choose a white color by moving the picker to the upper-left corner of the center square within the color picker.

   The swatch on the left becomes white.
3. Press the SwitchColor button below the swatches (hotkey = V). The colors in the two swatches are swapped, so now the main color is white and the secondary color is whatever the main color was.
4. Paint over the red and blue strokes you painted in the previous section.

   The white color of the brush is painted on top of the colored strokes, essentially erasing them from the surface (see Figure 8.8).

   Now let's try something a little more interesting.
5. Press the Gradient button below the color picker.
6. Select a red color for the secondary color.
7. Paint some strokes on the surface.

   When the Gradient button is on, the main and secondary colors are blended together. When you paint on the surface, the main color is at the center of the brushstroke and the secondary color is at the edges. This produces something like a watercolor effect (see Figure 8.9).

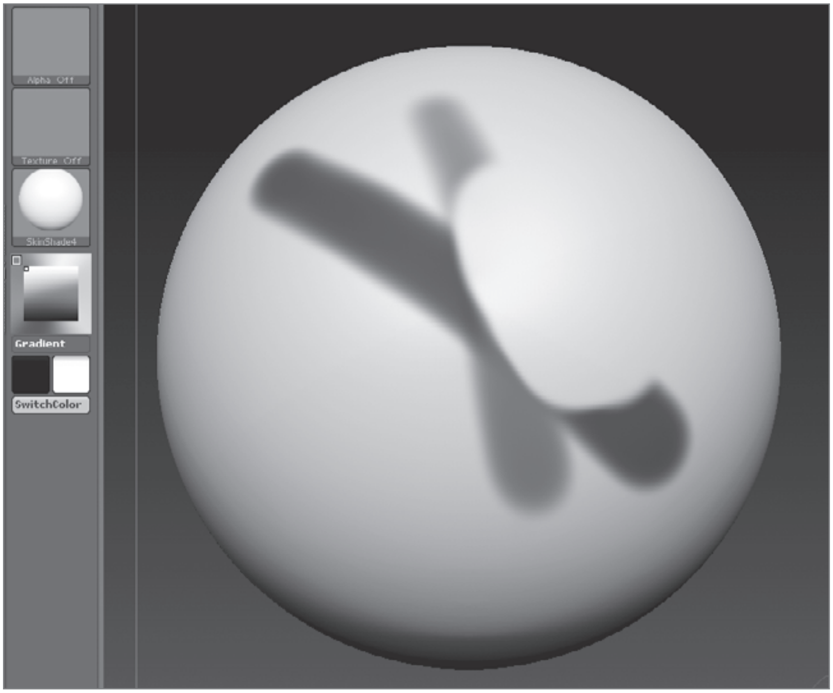


Figure 8.8
Paint white on top of other paint strokes to erase them.

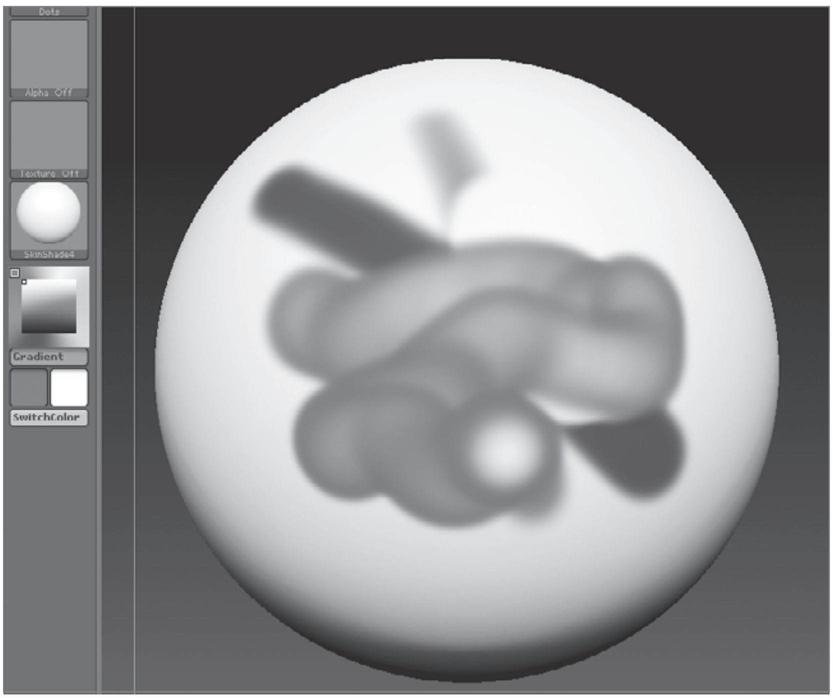


Figure 8.9
Activate Gradient to blend the main and secondary color with each brushstroke.

8. Select a yellow color from the color picker and paint some more strokes to get an idea of how this works.
9. Press the SwitchColor button again to swap the main and secondary colors. Paint some more strokes.
10. From the alpha fly-out library, select alpha 34. Paint some brushstrokes.

    When an alpha is applied to the brushstroke, the gradient feature can be used to create some interesting color effects (see Figure 8.10).
11. Continue on to the next section using the same PolySphere.

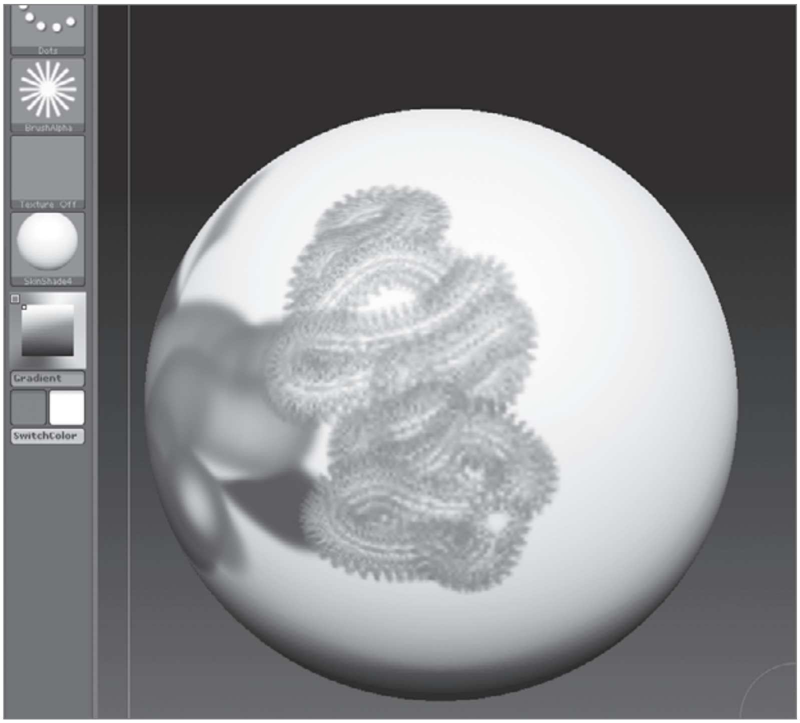


Figure 8.10
Apply an alpha texture to the brush and turn on Gradient to get some interesting effects in the brushstroke.

Color Blending

You can blend colors together by adjusting the Rgb Intensity slider on the top shelf.

1. In the color picker, select a dark blue color for the main color.
2. Turn off the Gradient button below the color picker. Choose Alpha Off from the alpha fly-out library on the left shelf to turn the alpha off.
3. Set the Rgb Intensity slider to 15. Paint some strokes on the surface.

    The blue color of the stroke is faded. At 15, it is 15 percent of the intensity selected in the color picker (see Figure 8.11). This is similar to reducing the opacity of a paintbrush when using a paint program such as Photoshop.

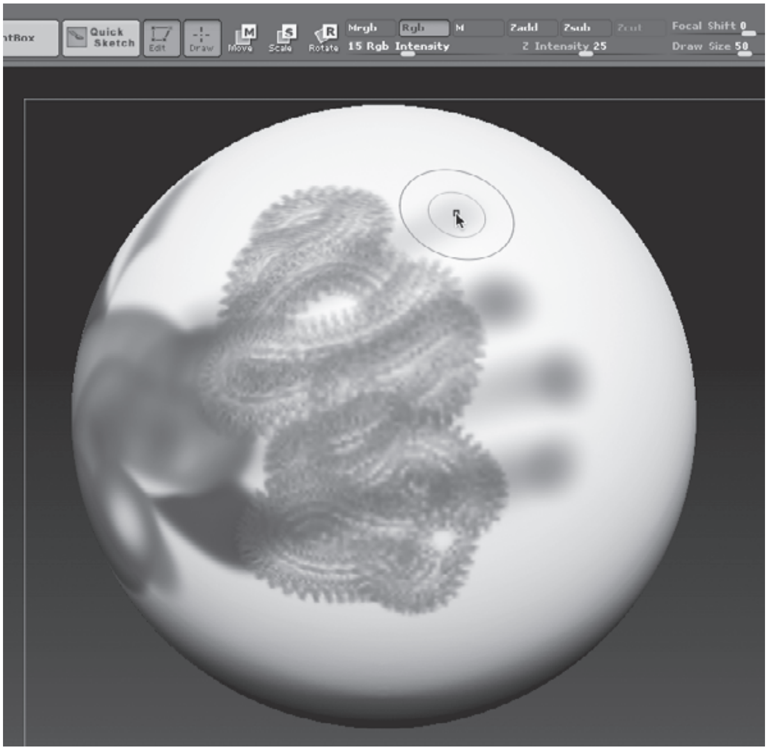


Figure 8.11

Lower the Rgb Intensity slider on the top shelf to reduce the intensity of the color painted on the surface.

4. Paint repeated strokes over the same area to build up the color.

   As you paint repeatedly over the same strokes, the color of each new stroke is blended with the stroke below it.

5. Choose a red color and paint on top of the blue strokes.

   When you paint red over blue, the colors are mixed together, resulting in a purple color.

   If you're using a digital tablet, you'll notice that the color intensity is pressure sensitive, so the harder you press, the more the intense the color becomes. You can build up color slowly by repeatedly brushing lightly over area of the surface. You can also change the way in which pressure affects color intensity by editing the RGB Intensity edit curve in the Tablet Pressure subpalette of the Brush palette (see Figure 8.12). Expand the RGB Intensity edit curve in the Tablet Pressure subpalette to access the curve. Editing tablet pressure settings is covered in detail in Chapter 7, "Advanced Brush Techniques." These settings may be different depending on which brush preset you choose from the sculpting brush fly-out library.

6. Continue to the next section using the same PolySphere.

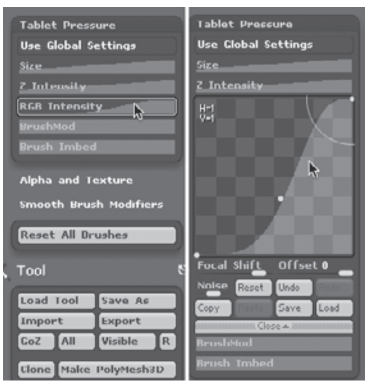
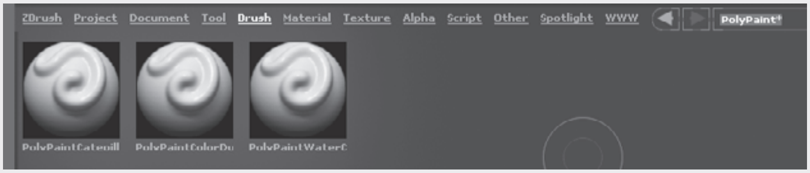


Figure 8.12

Click the RGB Intensity button in the Tablet Pressure subpalette of the Brush palette to adjust how the pen pressure affects the intensity of the color.

CUSTOM POLYPAINTING BRUSHES

Many of the brush settings discussed in Chapter 7 can be adjusted to affect how a sculpting brush applies color to a surface. Tablet Pressure settings, Orientation, LazyMouse, BackTrack, and other features can be customized to create a wide range of polypainting effects. You can quickly create your own library of special polypainting brushes by customizing the brush settings and then saving the presets. Save them to the ZBrushes folder within the ZBrush `4.0` folder so that they appear in Light Box. It's a good idea to give the brushes all the same prefix so that you can easily find them using the search feature in Light Box.



Blur Strokes

The Smooth brush can be used to blur the edges of a colored stroke painted on the model surface.

1. From the alpha fly-out library on the left shelf, select alpha 28. This is a simple white square.
2. Choose a red color and paint some strokes on the surface of the PolySphere.
3. Hold the **Shift** key and turn off the Zadd button on the top shelf. Make sure Rgb is on and Rgb Intensity is set to 100. By making these adjustments while holding the **Shift** key, you're setting the properties of the Smooth brush.
4. Hold the **Shift** key and paint over the strokes on the surface of the PolySphere. This blurs the edges of the strokes (see Figure 8.13).

Figure 8.13
Use the Smooth brush to blur the strokes painted on the surface.

You can adjust the intensity of the Smooth brush's blurring effect by lowering the Rgb Intensity slider while holding the **Shift** key.

Fill an Object with Color

At this point your PolySphere probably looks like a mess. How do you clear the entire surface? You can do this by filling the entire object with a single color.

1. Set the color picker to white if it's not already.
2. Set Rgb Intensity to 100.
3. Open the Color palette and click the FillObject button (see Figure 8.14). The entire PolySphere turns white.

Figure 8.14
The Fill Object button fills the entire surface with the current color.

This button is like a paint bucket that covers the whole object with the color currently selected in the color picker. You can use the Fill Object button as a way to tint the surface as well.

4. Select a bright red color in the color picker.
5. Paint some strokes on the surface of the PolySphere.
6. Set Rgb Intensity to 10.
7. Select a dark blue color in the color picker.
8. Open the Color palette and click the FillObject button.

The PolySphere is tinted slightly blue. This is because the Rgb Intensity setting determines the intensity of the color applied to the surface when you use the FillObject button. Each time you press the button, the object is filled at an intensity of 10, so you can press it repeatedly to gradually increase the amount of blue applied to the surface (see Figure 8.15).

Figure 8.15

When Rgb Intensity is set to a low value, each time you press the FillObject button, the surface is tinted with the current color.

Masked areas of the surface will be protected from the colors applied to the surface when the Fill Object button is used. The FillLayer button will clear the canvas and fill it with the current color.

Use Brush Texture

You can apply a 2D texture to the surface of a model using the sculpting brushes. The texture will override the color set in the color picker so that with each brush stroke, the colors in the texture are applied to the surface. Here is a quick demonstration:

1. Clear the PolySphere using the Fill Object button or load the `PolyPaintTest.ZPR` project you created earlier in this chapter. A version of this project is found in the `Chapter 8` folder on the DVD.
2. Make sure the Standard brush is the current sculpting brush preset. On the top shelf, Zadd should be off and Rgb Intensity should be set to 100.
3. From the texture fly-out library on the left shelf, choose Texture 12. This is the orange and yellow star (see Figure 8.16).

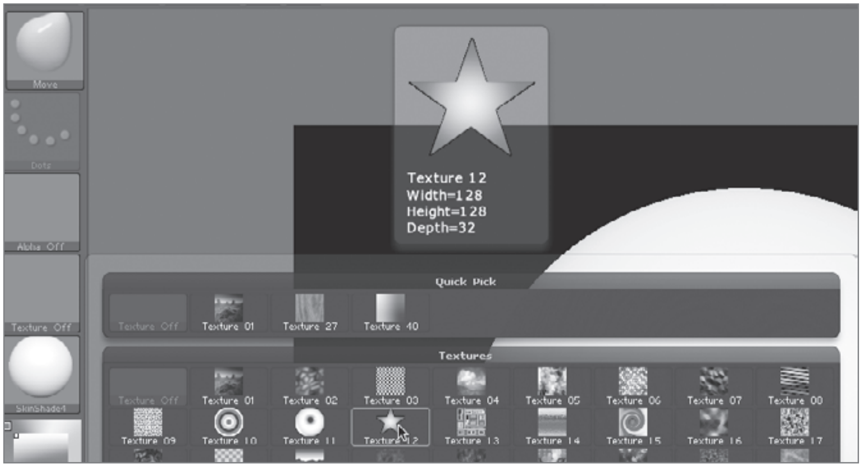


Figure 8.16
Choose the star texture from the Texture fly-out library.

4. Open the stroke type fly-out library on the left shelf and select the DragRect stroke type.
5. Drag on the surface of the PolySphere. The star appears on the surface.
6. Release the brush and drag again. Each time you drag on the surface, a new star appears on top of the previous stroke (see Figure 8.17).
7. Experiment painting on the surface using other stroke types such as Spray, FreeHand, and DragDot.
8. Lower the Rgb Intensity slider on the top shelf to decrease the opacity of the texture.

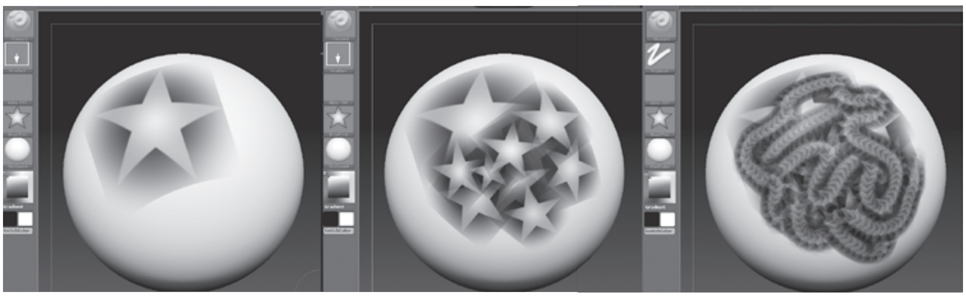


Figure 8.17
The star texture appears on the surface of the PolySphere when it is applied to the Standard brush. Use the FreeHand stroke type to create patterns with the texture.

FILL WITH TEXTURE

If you use the FillObject button in the Color palette while there is a texture selected in the texture fly-out library, the texture will be applied to the unmasked portions of the 3D tool.

Polypainting and Subdivisions

As you learned earlier in this chapter, the quality of the strokes painted on the surface is directly related to the number of vertices in the mesh. The more vertices you have, the smoother the edges will appear in the strokes painted on the surface. This is why it is often best to polypaint your models at the highest possible subdivision level.

This exercise demonstrates this principle.

1. Load the `PolyPaintTest.ZPR` project you created earlier in this chapter. A version of this project is found in the `Chapter 8` folder on the DVD.
2. Open the Geometry subpalette of the Tool palette and set the SDiv slider to 1. You can also press **Shift+D** repeatedly until the model is at its lowest subdivision level.
3. Select a red color from the color picker and paint a stroke on the surface.

   The edges of the stroke are very blocky because at SDiv level 1, there aren't very many vertices in the surface.
4. Open the Geometry subpalette of the Tool palette and set the SDiv slider to 6. You can also press **D** repeatedly until the model is at its lowest subdivision level.

Notice that even though the surface is increasing in subdivisions, the edges of the brush stroke look very blocky (see Figure 8.18). This is why you'll get the best results if you paint a surface at the highest subdivision level.

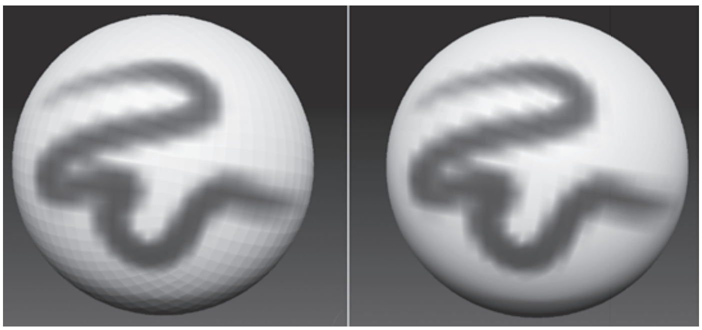


Figure 8.18
Paint strokes applied to a surface at a low subdivision level will appear blocky even when the surface is set to a high subdivision level.

Polypainting Techniques

Now that you have a basic understanding of how polypainting works, let's take a look at some techniques for painting a model. There are as many approaches to polypainting as there are ZBrush artists, so there's no one way to do it. Generally speaking, I like to use techniques that are similar to those used by effects artists who paint actual models. I use brushes that emulate the behavior of air brushes. I like to apply several coats of color at a low Rgb intensity. The following sections demonstrate some of the techniques I prefer to use. As you become more comfortable painting your models, no doubt you will develop your own approach.

The images in this chapter are black and white, so obviously it will be difficult to see exactly how the colors look on the model. For this reason, I have recorded a color movie based on this demonstration. The movies file is named `polyPaintDragon.mov` and is found in the `Movies` folder on the book's DVD.

TIPS ON POLYPAINTING

Here are just a few helpful tips you can use when polypainting an object:

- If you use the Spray stroke type to paint colors on the surface, the value (or brightness) of each dot in the stroke will be varied randomly. You can increase the amount of randomness by setting the Color slider in the Stroke palette to 1. To turn this feature off, set this slider to 0. You can also find this slider in the stroke type fly-out library.

- The Color Spray stroke type varies the hue of each dot in the stroke randomly. Again, to change the behavior of this feature, adjust the Color slider in the Stroke palette.
- To select a color from the surface, hold the mouse pointer over the color you want to pick and press the **C** hotkey. You can also do this by dragging from the color picker to the color you want to select. The selected color value will not include the colors of preview shadows or the color of the material.
- If you want to select the color as it appears exactly on the canvas (that is, the color of the surface, shadows, and material), hold the **Alt** key and drag from the color picker to the color you want to select.
- You can convert the colors painted on the surface into a mask using the Mask By Intensity, Mask By Hue, or Mask By Saturation button in the Masking subpalette of the Tool palette. Each button creates a mask from the colors in a slightly different way (that is, based on the intensity, hue, or saturation of the colors painted on the surface).
- You can convert the colors painted on the surface into polygroups by pressing the From PolyGroup button in the Polygroups subpalette of the Tool palette.
- The FillObject button will fill only the visible or unmasked parts of the surface on the model. Hide or mask parts of the object you don’t want colored.
- Colorize can be activated per subtool. The SubTool Master ZPlugin (discussed in Chapter 4) has a button for filling all the visible SubTools at once with a color.
- Colorize is automatically activated for a surface when you paint on it with a brush that has Rgb activated on the top shelf. This is true even if Rgb Intensity is set to 0.
- You can use layers to create and blend different polypaint layers together on the same surface. This technique is discussed in Chapter 10, “Morph Targets, Layers, and the ZBrush Timeline.”

Create a Base Coat

You can start painting a model at any point during the sculpting process; however, many artists prefer to paint the surface after they have done most of their sculpting and detailing. In this example, you'll start with a dragon head I created. Of course, you're also welcome to use this approach on your own model (see Figure 8.19).

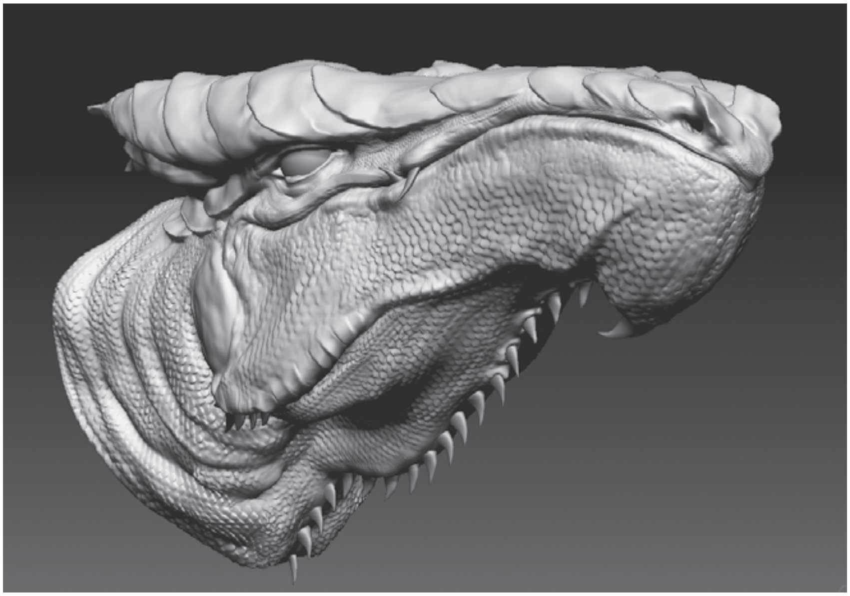


Figure 8.19
The dragon head model that will be used in this section can be found in the `Chapter 8` folder on the DVD.

As mentioned earlier in the chapter, you'll get the best results if you paint the model at the highest possible subdivision level. The model I'm using has five subdivision levels. At SDiv 5, the model uses 3.2 million polygons. Normally I would subdivide the model one more time for a total of six levels of subdivision. The model would be around 12 million polygons at SDiv 6; however, I want to make sure the example model can be easily used by readers using laptops or less-powerful machines.

1. Use the Open button in the File palette to load the `PolyPaintDragon_v01.ZPR` project from the `Chapter 8` folder on the DVD.
2. Open the Geometry subpalette of the Tool palette and make sure the model is set to the highest subdivision level; this should be SDiv 5.
3. Make sure the SkinShade4 material is selected in the materials fly-out library.

   I've decided that this dragon will be mostly reddish in color. So I'll start by experimenting with a color for the base coat.
4. Drag the cursor in the outer square of the color picker to the upper-left corner to select a red hue. Drag the cursor to the center square toward the middle to select a color that is not too dark or saturated (see Figure 8.20).

Figure 8.20
Use the color picker to choose a reddish color.

5. The color on the model should update as you move within the color selector. If the color is not updating, open the Polypaint subpalette of the Tool palette and make sure the Colorize button is off.

6. Once you have selected a suitable color for the base coat, make sure Rgb Intensity is set to 100, open the Color palette, and press the FillObject button.

   The dragon won't look any different when you fill it with the color, but the color has now been applied to the entire surface. Note that Colorize is automatically activated when you fill the object, so the model is all ready for polypainting. This is also indicated by the paintbrush icon, which is activated for the dragon's head in the subtool subpalette of the Tool palette. The Colorize button in the Polypaint subpalette and the paintbrush icon in the subtool subpalette share the same function: They both activate polypainting for the model (see Figure 8.21).

Figure 8.21

When you fill an object with color the Colorize button is automatically turned on, as is the paintbrush icon in the subtool subpalette of the Tool palette.

7. Choose a white color in the color picker. Note that the teeth, eyes, and other subtools on the head all turn white while the head remains red (see Figure 8.22). This is because Colorize has not been activated for these subtools, just the head. If you turn off the Colorize button, the head will turn white again. Turn it back on and the head returns to red.

8. Use the Save As button in the File menu to save the project as `PolyPaintDragon_v02.ZPR`.

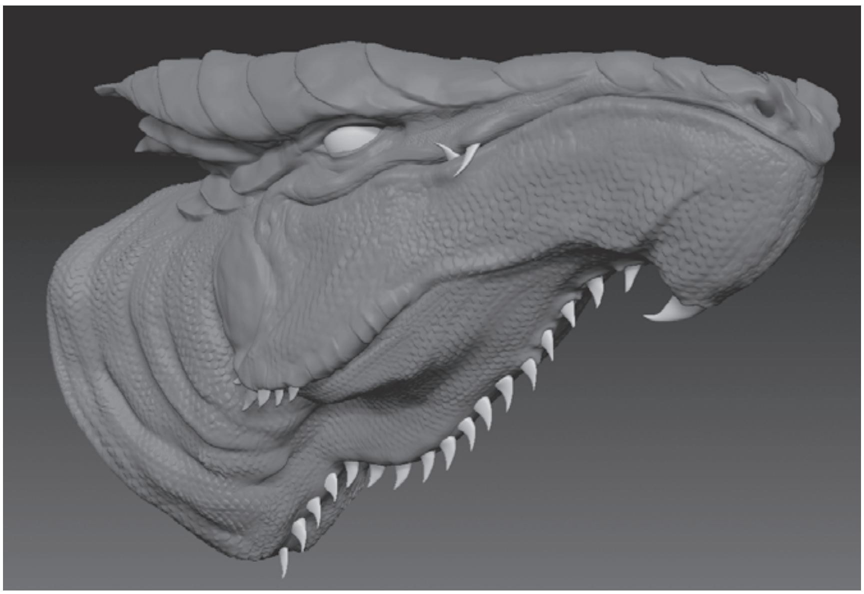


Figure 8.22

The head is colored red while the teeth, eyes, and other subtools are white.

Create Color Zones

Now that you have a solid color chosen for the base coat, you can start painting color zones on the head. Color zones are areas of color painted on different areas of the head. By dividing the head into areas of color, you can suggest something about the anatomy beneath the skin or scales of your character or creature. Areas of the head that have more blood vessels may have more red and purple hues. Areas close to bone may have more yellow or white. This is true of humans as well as many other types of animals. Of course, when you're painting a fantasy creature, you have much more liberty in terms of the colors that you use or the placement of color zones. When you divide up the head into regions of colors, your model will look less like it has been simply covered with a coat of paint.

Color zones are often painted using very vibrant colors. It's okay to go a little over the top. Keep in mind that these color zones will be covered up with successive coats of color later on in the painting process, so even though they look exaggerated when you first paint them, they will be much more subtle in the final version.

Figure 8.23

Click on each color swatch so that a shadow appears at the top of both swatches. Turn on the Gradient button.

1. Let's start by painting deep red and purple around the area of the eyes. In the color picker, select a deep dark purple.
2. Press the SwitchColor button below the color picker so that the purple becomes the secondary color.
3. Use the color picker to choose a deep dark red. This will become the main color.
4. Click on both color swatches so that you can see a slight shadow at the top of the swatch. This indicates that both the main and secondary colors are active. Press the Gradient button to activate the gradient feature (see Figure 8.23).
5. Choose the Standard brush in the sculpting brush fly-out library. Make sure the Zadd button is off on the top shelf. The Rgb button should be on. Set Rgb Intensity to 10.
6. Set the stroke type to Spray. In the Stroke Type Library, set the Color slider to 0.1. This reduces the randomization of the color values used by the Spray stroke type.
7. In the alpha fly-out library, choose alpha 58. This has a series of scribble vertical lines (see Figure 8.24).
8. Use the Save button in the Brush palette to save the brush as `PolyPaintSpray.ZBP`. Save the brush to the `ZBrush 4.0\ZBrushes` folder so that you can easily find it in the Brush section of Light Box later on (see Figure 8.25).
9. Make sure that symmetry is active across the x-axis in the Transform palette.
10. Set the draw size to 25. Zoom in on the area of the eye and start painting strokes in this area. You don't have to be particularly neat about it; in fact, the more varied your stroke, the better it will look in the end.
11. On the right shelf, press the Solo button to hide the eyes and other subtools. Paint inside the eye socket (see Figure 8.26).

12. As you paint, make sure to vary the colors applied to the surface. You can do this by switching the main and secondary colors (hotkey = V). You can also sample the colors you've painted on the surface by holding the **C** key while holding the mouse pointer over the surface. This is a great way to blend colors across the surface.

13. Add additional color zones. Paint bluish colors along the lips; paint deep reds around the nostrils; pale pinks, yellows, and reds on the larger scales, horns and bony parts. Paint dark reds in the larger folds of flesh.

    Neatness does not count. Go ahead and be very loose with your strokes. The end result should look almost like a clown. Experiment with using different alphas and other settings while you work. Figure 8.27 shows the model using the Flat color material after the color zones have been painted. To see the image in color, watch the `PolyPaintDragon.mov` movie in the `Movies` folder of the DVD.

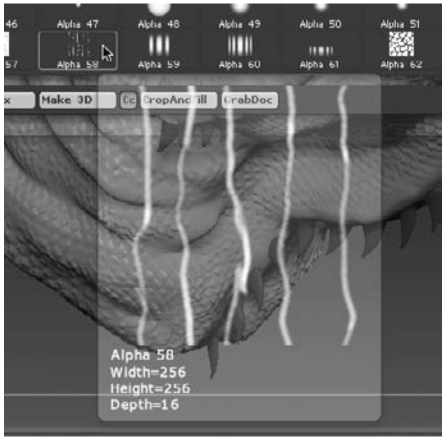


Figure 8.24

Choose alpha 58 in the alpha fly-out library.

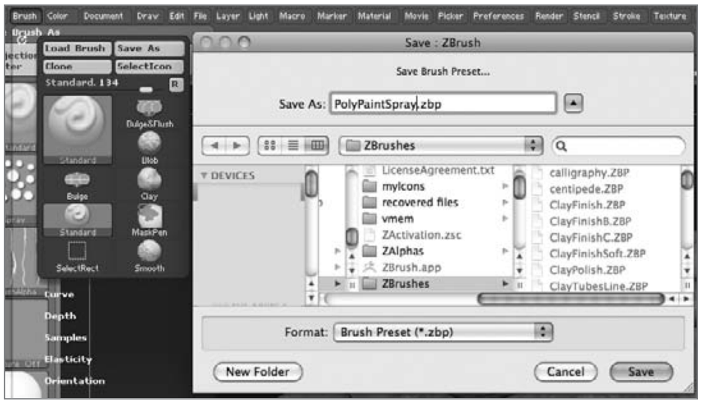


Figure 8.25

Save the brush preset so that you can use it for future ZBrush sessions.

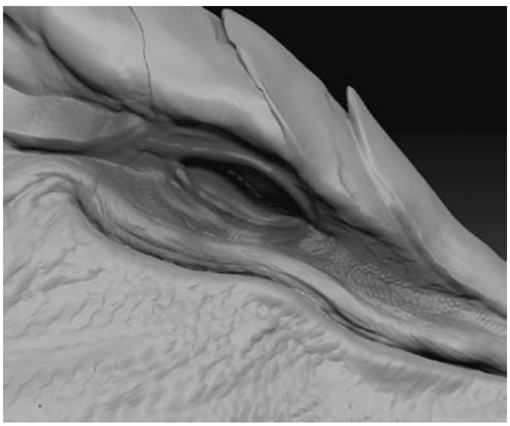


Figure 8.26

Paint purple and red in the eye sockets and around the area of the eyes.

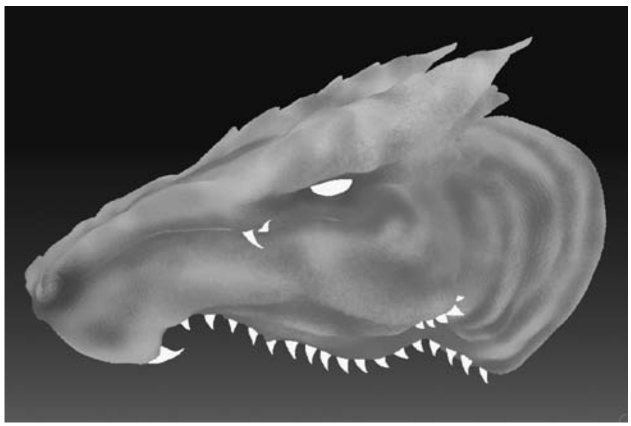


Figure 8.27

Color zones have been painted on the surface of the model.

14. While working, you should occasionally select the Flat color material from the material fly-out library so that you can see exactly how the colors are applied to the surface without the influence of lights or shadows.
15. Use the Save As button in the File menu to save the project as `PolypaintDragon_v03.ZPR`.

Paint a Mottling Pass

Once you have the colors of the head segregated into zones, you'll need to break up the color using what's known as a *mottling* pass. This technique is taken directly from artists who have been painting masks and maquettes in the movie industry for years. It was introduced to me by Scott Spencer, and even though it may seem like an odd approach at first, it always seems to look great in the final process. Check out Scott's book *ZBrush Creature Creation* (Sybex, 2011).

To create a mottling pass, you'll paint white squiggly lines all over the surface. These lines breaks up the color zones, making the face look less clownlike. In the end, it will also look as though the skin and scales are made up of layers of organic material.

1. Continue with the dragon model from the previous section or load the `Polypaint Dragon_v03.ZPR` project from the `Chapter 8` folder on the DVD.
2. Select the Standard brush from the sculpting brush library. Set the stroke type to DragRect.
3. From the alpha fly-out library, select alpha 22 (see Figure 8.28). This is a series of squiggly lines.

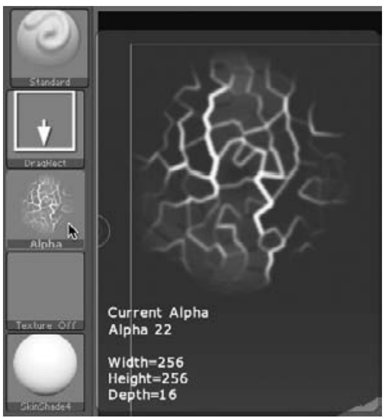


Figure 8.28
Choose alpha 22 from the alpha fly-out library.

4. In the color picker, set the main color to white.
5. Set Rgb Intensity to 20. Make sure the Rgb button on the top shelf is on and the Zadd button is off. Turn off the Gradient button below the color picker.
6. Use the Save button in the Brush palette to save the brush as `Poly-PaintMottle.ZBP`. Save the brush to the `ZBrush 4.0\ZBrushes` folder so that you can easily find it in the Brush section of Light Box later on.
7. Drag on the surface to add the stroke. The pattern will appear larger if you continue to drag before releasing. Rotate the pattern by dragging left or right before releasing (see top image in Figure 8.29).
8. Drag repeatedly over the surface to create a pattern with overlapping strokes (see bottom image in Figure 8.29).
9. Continue to cover the entire surface of the head. Create smaller strokes near the lips and eyes, larger strokes over the scales.

   You don't need to completely obscure the colors of the underlying layers, just use the mottling pass to break up the color zones. Once the surface is covered, you'll paint a light reddish color over the surface to tie the colors together. You may want to turn off symmetry when creating the pattern along the center of the model. Figure 8.30 shows the result using the Flat color material.

10. Select the Standard brush from the sculpting brush library. Set the stroke type to Color Spray.
11. Turn off the Zadd button and turn on Rgb. Set Rgb Intensity to 5.
12. Choose a light red color from the color picker.
13. From the alpha library, choose alpha 23 (see Figure 8.31).

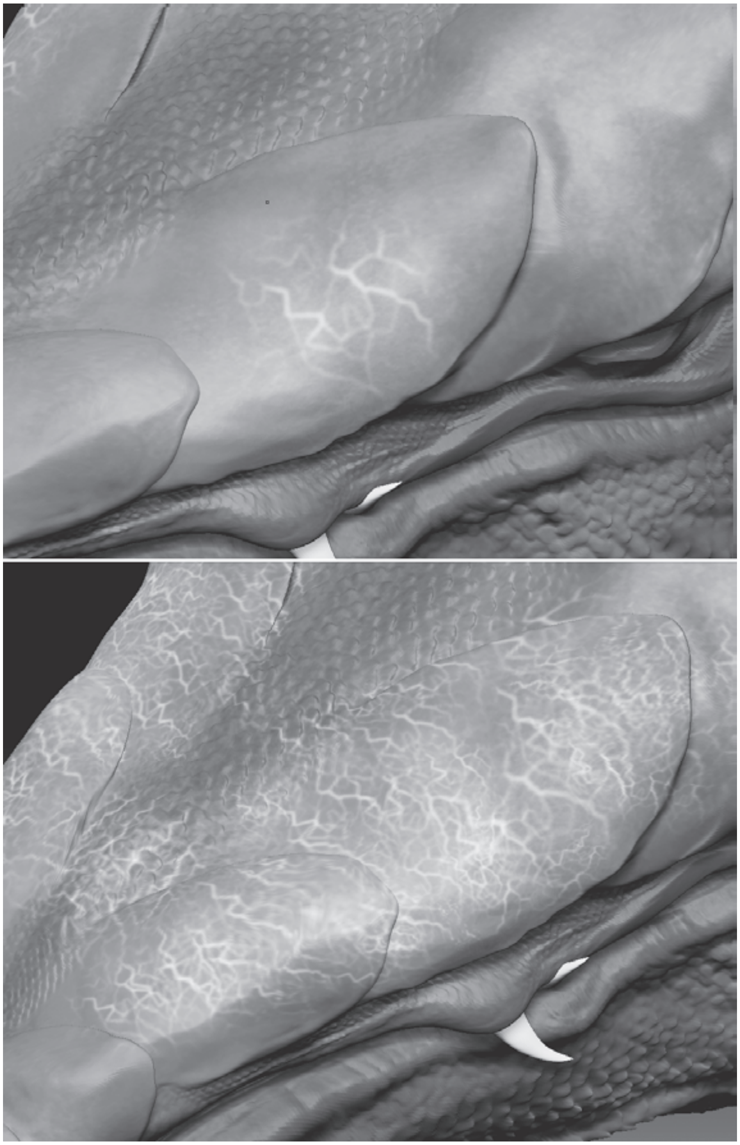


Figure 8.29

Create overlapping patterns using the PolyPaintMottle brush to break up the colors of the model.

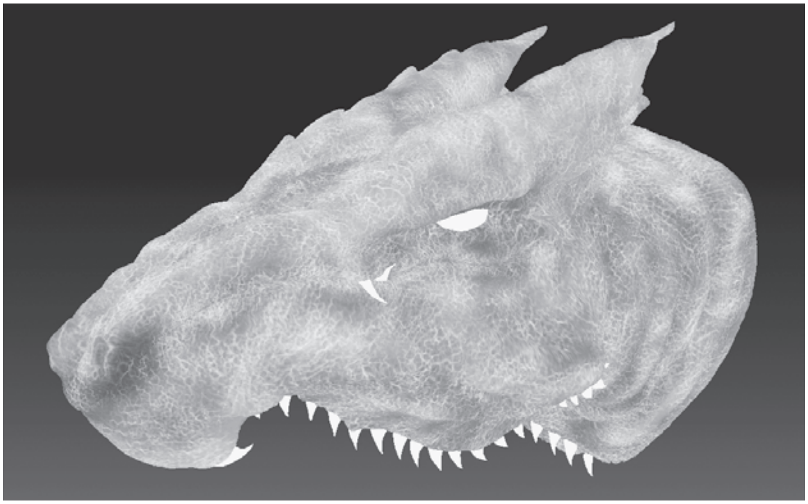


Figure 8.30

The strokes created with the PolyPaintMottle brush break up the colors on the surface.

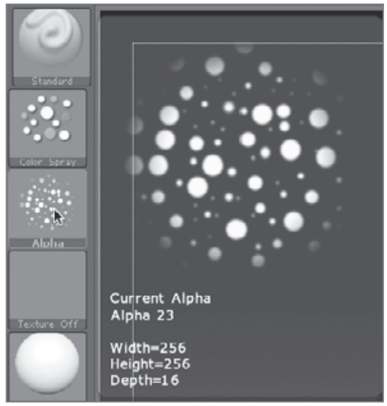


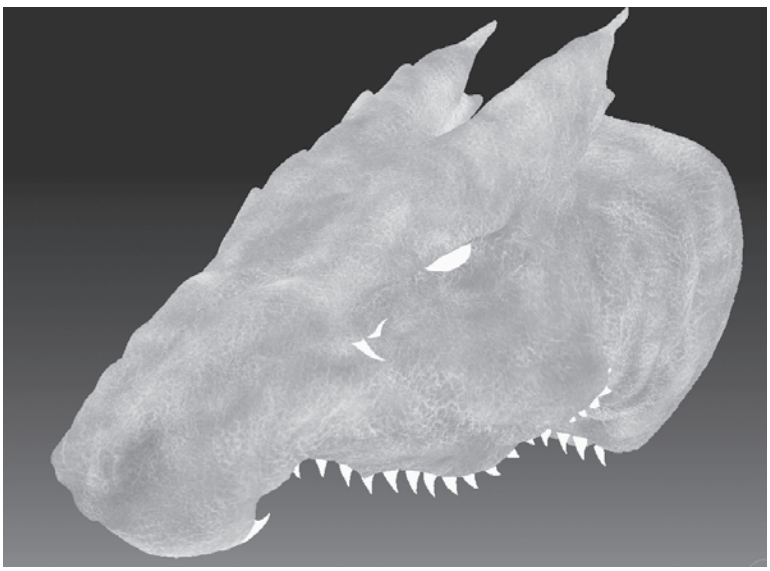
Figure 8.31

Choose alpha 23 from the alpha fly-out library.

14. Use the Save button in the Brush palette to save the brush as `PolyPaintDust.ZBP`. Save the brush to the `ZBrush 4.0\ZBrushes` folder so that you can easily find it in the Brush section of Light Box later on.
15. Set Draw Size to 30. Use the brush to paint lightly over the surface (see Figure 8.32). Again, you don't want to completely obscure the colors of the previous passes. The light red color is meant to make the color zones and the mottling pass seem more cohesive.
16. Continue with this file in the next section.

Figure 8.32

Paint over the surface with a light red color.



Paint Subsurface Details

Blood vessels and scar tissue are good examples of subsurface details. They appear just below the skin, which gives the impression that the surface is made up of overlapping layers of organic material. This particular dragon is covered in a lot of different-size scales, so it's unlikely that you would see as many subsurface details as you would on other models, such as an old man. Even so, many faint blood vessels can be added to the base of the larger scales. Blood vessels close to the surface of a creature expose the blood to air, which helps to keep him cool. In addition, you can imagine that the dragon may have scars from ancient battles. The tissue near the old scars may appear dark just below the skin.

In this section, you'll add these details to the dragon.

1. To paint veins on the surface, you can use the detailBrush you created in Chapter 7. If you have not created this brush, you can use the Load button in the Brush palette to load the preset from the `Chapter 7` folder on the DVD.
2. On the top shelf, set ZIntensity to 5 and Rgb Intensity to 20. Set Draw Size to 10.
3. Select a dark blue purple color palette. Turn off the Activate Symmetry button in the Transform palette.
4. Open the Stroke palette and turn LazyMouse off.
5. Use the Save button in the Brush palette to save the brush as `PolyPaintVein.ZBP`. Save the brush to the `ZBrush 4.0\ZBrushes` folder so that you can easily find it in the Brush section of Light Box later on.

   This brush is designed to use tablet pressure. As you paint on the surface, vary the pressure. Increase the pressure to make the stroke appear thin or dark and raise the surface.
6. Use the brush to create squiggly lines near the base of the larger scales and in the areas near the eyes and other parts of the head where you might imagine blood vessels would be visible.
7. Choose the PolyPaintSpray brush to paint dark reds, blues, and purples. Create dark splotches on the surface. Figure 8.33 shows the model with the flat color material applied.
8. Use the Save As button in the File menu to save the project as `PolyPaintDragon_v04.ZPR`. Continue with this project in the next section.

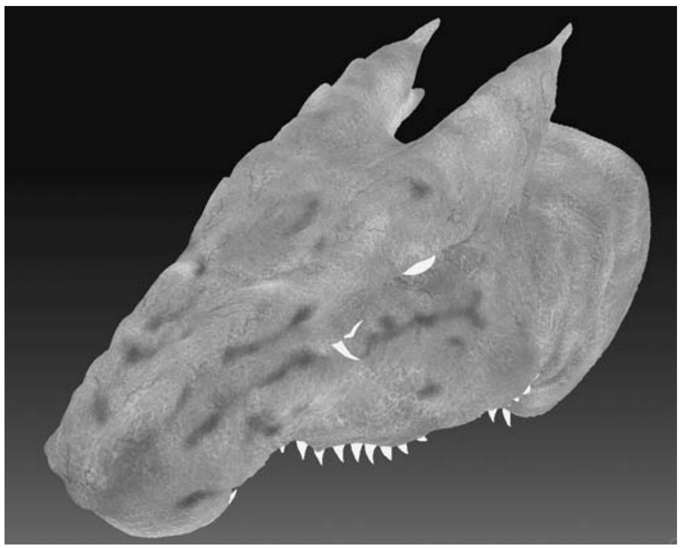


Figure 8.33
Veins and dark splotches are painted on the surface.

Use Cavity Masking

Figure 8.34
Set Intensity to 50 in the Masking subpalette of the Tool palette.

You can increase the detail on the surface and make the scales more apparent using cavity masking. When you create a cavity mask, the recessed areas of the surface are protected from changes. You can invert the mask and fill the recessed areas with a darker color. This will make the spaces between the scales and other areas appear darker.

1. Open the Masking subpalette of the Tool palette.
2. Below the Mask By Cavity button, set the Intensity slider to 50 (see Figure 8.34). This slider determines the intensity of the cavity mask. You need to set this value before creating the mask.
3. Press the Mask By Cavity button. After a few seconds you'll see a mask appear on the surface. The mask appears in the recessed areas of the surface (top image in Figure 8.35).
4. Press **Ctrl+I** to invert the mask. You can also **Ctrl+click** on a blank part of the canvas to invert the mask (bottom image in Figure 8.35).

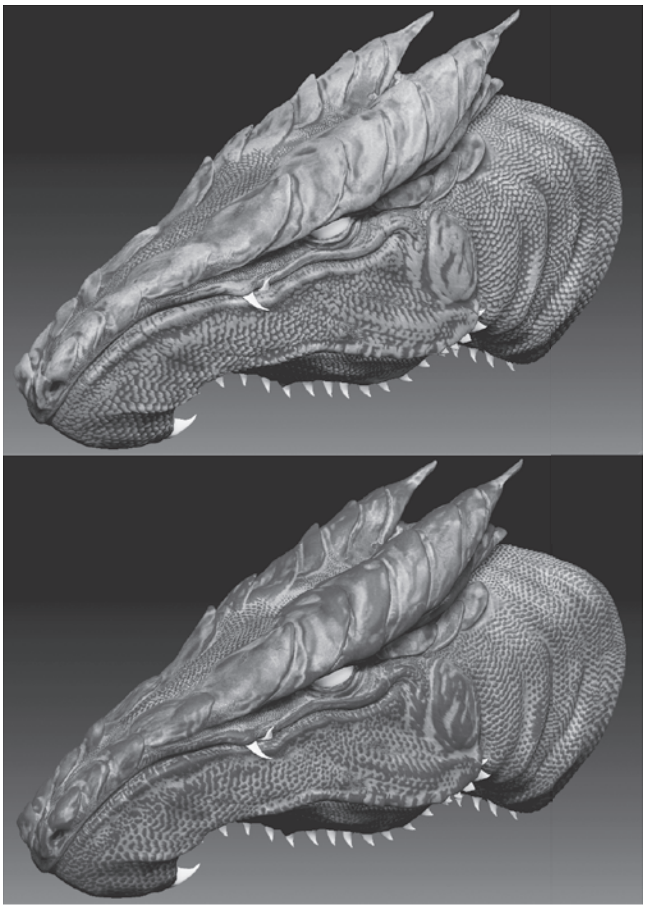


Figure 8.35
Cavity masking creates a mask in the dark recesses of the surface (top image). The mask is inverted (bottom image).

5. Use the color picker to choose a dark red color. On the top shelf, set Rgb Intensity to 5.
6. In the Masking subpalette of the Tool palette, turn off the ViewMask button. This will make it easier to see how the color is applied.
7. In the Color palette, press the Fill Object button. The dark red color will be applied to the recesses of the surface. No doubt it may be hard to see much of a difference since the Rgb Intensity setting is very low. Press the button repeatedly and you'll start to see the dark red color between the scales. Figure 8.36 shows how the color looks when the Flat material is applied to the model.

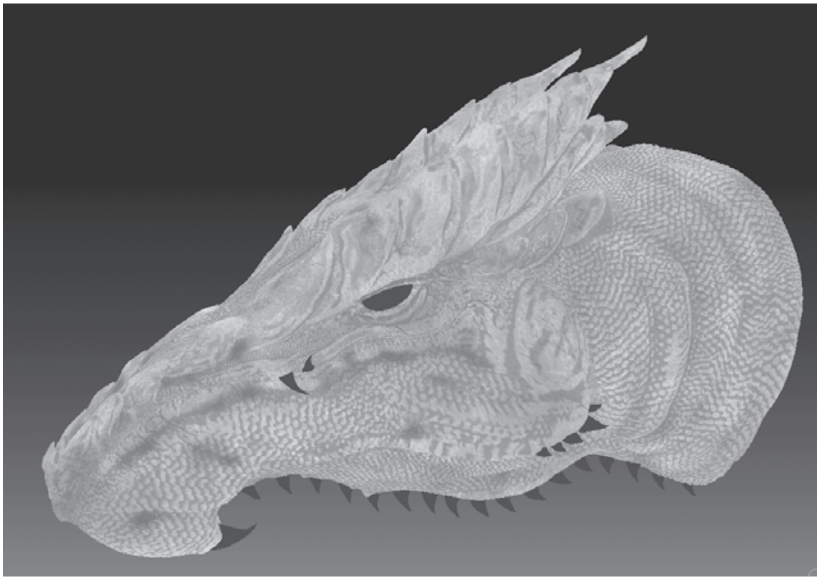


Figure 8.36
The unmasked parts of the dragon are filled with a dark red color

8. Once you're satisfied with the color, **Ctrl+drag** on a blank part of the canvas to remove the mask.
9. Use the Save button in the File palette to save the project as `PolyPaintDragon_v05.ZPR`.

Use Ambient Occlusion Masking

Ambient Occlusion is a type of shadowing that occurs when light rays are unable to reach the cracks and crevices of a surface. This kind of shadowing is most apparent on overcast days or in a room that is illuminated with diffused light. ZBrush can create a special type of mask in the recessed areas of a surface that simulates this type of shadowing. The mask is much softer and broader than masks created using cavity masking.

In this exercise, you'll create an ambient occlusion mask, invert the mask, and then paint dark colors into the unmasked areas. This will create darker areas in the folds of flesh and in the cracks between the larger scales.

TIPS ON USING CAVITY MASKS

Cavity masking is a very powerful feature that can be applied to a wide variety of sculpting and polypainting techniques. Here are some tips on using the cavity mask controls in the Masking subpalette of the Tool palette:

- The Blur slider to the right of the Mask By Cavity button applies blurring to the cavity mask when it is generated. This can help reduce jagged edges in the mask.
- You can blur the cavity mask after you create it by **Ctrl+clicking** on the mask.
- Hold the **Shift** key to access the controls for the Smooth brush. While holding the **Shift** key, turn off the Zadd button. Set Rgb Intensity to 10. Hold the **Shift** key and paint on the surface to blur out any jagged areas left by the cavity mask.
- To fine-tune the way the cavity mask is applied, expand the Cavity Profile edit curve in the Masking subpalette of the Tool palette.
- Cavity masking can be applied to the brush rather than the surface. Use the CavityMask options in the Auto Masking subpalette of the Brush palette. When you apply cavity masking to a brush, the mask is updated with each stroke.

Ambient occlusion masks tend to be fairly faint and hard to see. You can turn off polypainting and use the flat material to make the mask easier to see.

1. Continue with the project from the previous section or load the `PolyPaintDragon_v05.ZPR` file from the `Chapter 8` folder on the DVD.
2. Use the color picker to set the main color to white.
3. From the materials fly-out library, select the Flat Color material.
4. In the Polypaint subpalette of the Tool palette, turn off Colorize. The dragon will appear solid white. Don't worry; you haven't lost any of the colors painted on the surface.
5. Expand the Masking subpalette of the Tool palette. Under the Mask Ambient Occlusion button, set Occlusion Intensity to 1.3.
6. Set AO Scan distance to 0.35. This sets the maximum distance ZBrush will use when creating the mask. Higher values mean that more of the surface will be masked but it will also take longer to calculate (see Figure 8.37).

Figure 8.37
Adjust the settings for Ambient Occlusion masking before creating the mask.

7. Leave the AO Aperture at the default setting of 90. Lowering this value will diminish the size of the ambient occlusion mask.
8. Calculating an ambient occlusion mask on a complex surface that has a lot of polygons can take a long time. It's usually a good idea to save your work before creating the mask. Use the Save As button in the File palette to save the project as `PolyPaintDragon_v06.ZPR`.

9. Press the Mask Ambient Occlusion button. This takes a few minutes. The countdown will appear at the top of the ZBrush interface along with a progress bar (Figure 8.38). This is a good time to take a break!

   Once the mask has been calculated, the dragon should look something like Figure 8.39.

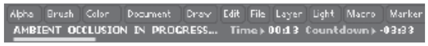


Figure 8.38
The progress bar at the top of the interface indicates the time it will take to calculate the ambient occlusion mask.

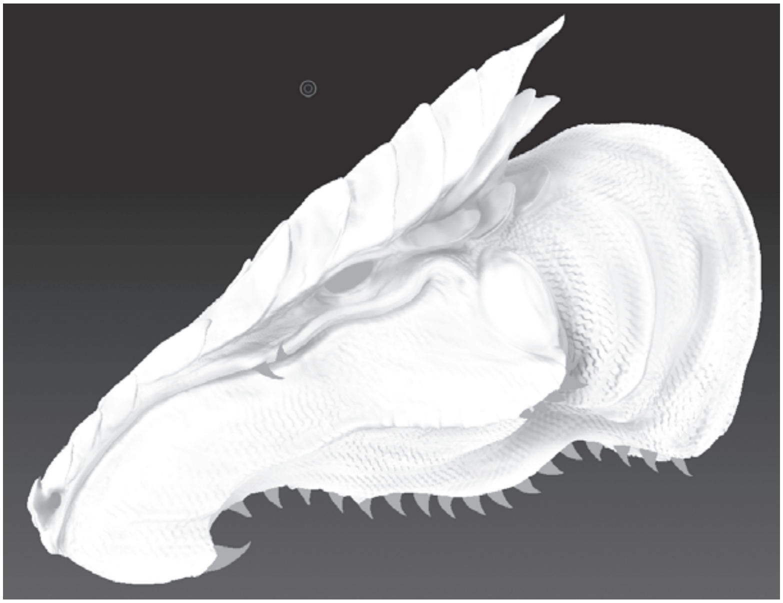


Figure 8.39
The ambient occlusion mask has been applied to the dragon head.

10. Press **Ctrl+I** or **Ctrl+click** on a blank part of the canvas to invert the mask.
11. In the Masking palette, turn off the View Mask button.
12. In the Polypaint subpalette of the Tool palette, turn on the Colorize button. The colors will appear on the surface.
13. Set Rgb Intensity to 14. Use the color picker to choose a dark purple color. In the Color palette, click on the FillObject button to fill in the unmasked areas. Press the button repeatedly until you're satisfied with the strength of the dark color applied to the surface (see Figure 8.40).
14. Hold the **Ctrl** key and drag on a blank part of the canvas to clear the mask.
15. Save the file as `PolyPaintDragon_v06.ZPR`.

Paint Surface Details

The colors for the dragon are meant to serve as a foundation. For the final pass, you'll paint the surface details. By building a foundation of color through successive passes, you'll ensure that the final model looks interesting, has variation, and seems believable.

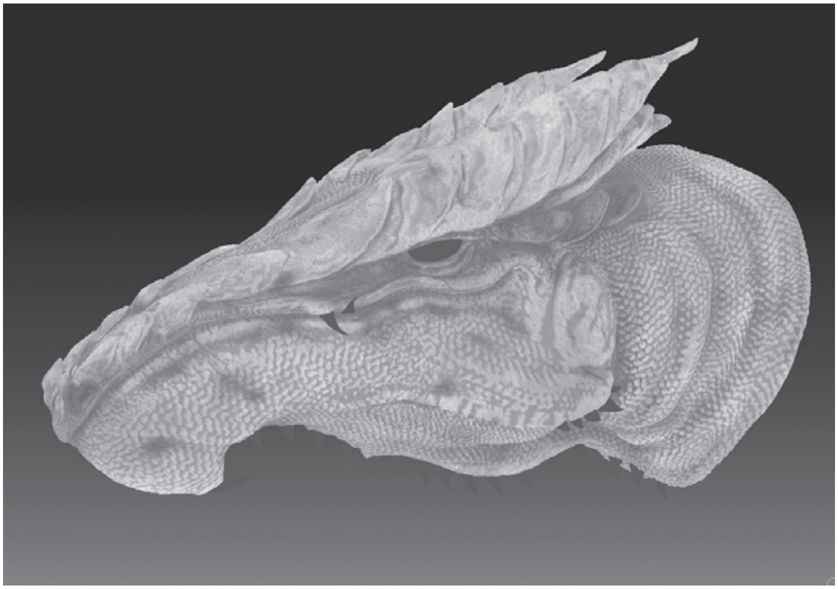


Figure 8.40
Fill the unmasked areas with a purple color.

The details on the surface can be as elaborate as you like. I recommend doing an image search for snake and lizard scales. Take a look at what kinds of patterns appear on the scales of venomous snakes. How do they differ from nonvenomous snakes? Look at dinosaurs and birds for inspiration as well. Also check out the work of other fantasy artists, such as John Howe. *The Dracopedia* by William O'Connor (Impact Books, 2009) is a book I find particularly entertaining and inspiring.

I've included several photographs from my own reference library. These are images I took of various snakes and lizards at the Desert Museum in Arizona. Color versions of these images are found in the `Chapter 8` folder of the DVD. Note the color variations on each individual scale as well as the repeating patterns in the overall surface of the animals.

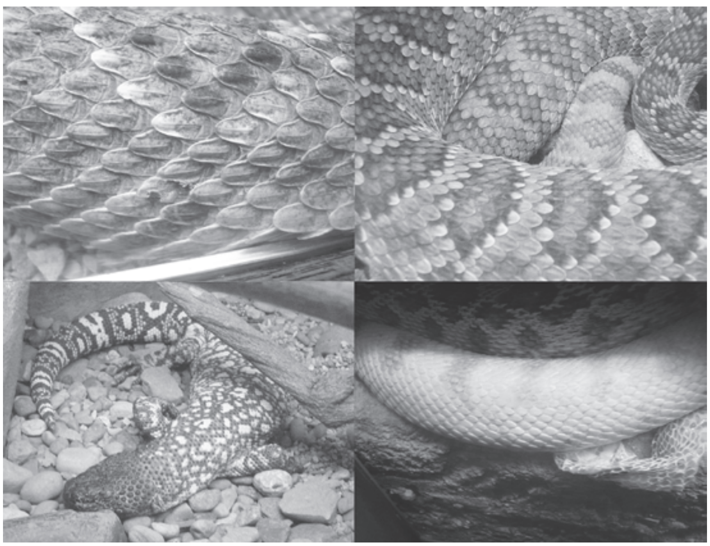


Figure 8.41
Images of snake and lizard scales can be used as reference.

Generally speaking, the techniques for creating surface detail are not that different from the techniques used to paint the underlying layers. In my version of the dragon, I painted the large scales on the top of the head using the Standard brush with an Rgb Intensity of 25. I painted dark red strokes to create simple designs on the scales based on the color of the scales in the upper-left image in Figure 8.41. I applied alpha 08 from the alpha fly-out library to the brush and varied the colors as I painted the strokes. Figure 8.42 shows the result. The Flat Color material is applied to the surface to make the strokes more apparent.

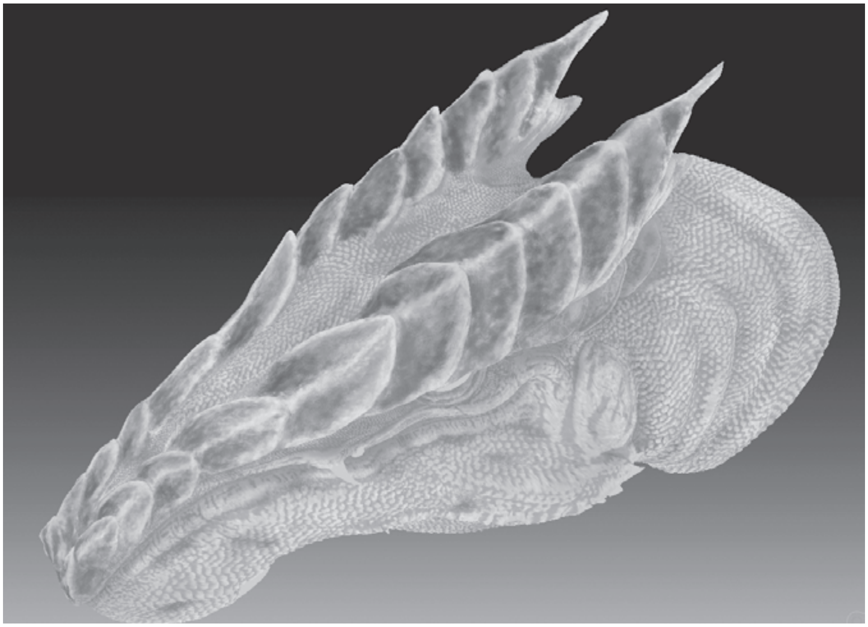


Figure 8.42
Dark red and brown brushstrokes are added to the large scales on the head.

For the smaller scales of the neck, I used the upper-right image in Figure 8.41 as inspiration. I lightly painted individual scales, alternating light and dark colors to create a pattern (see Figure 8.43).

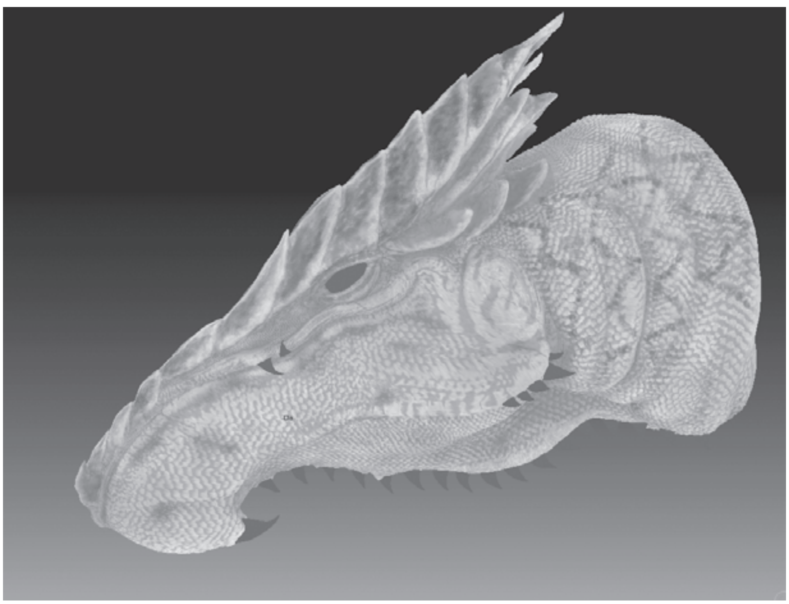


Figure 8.43
A pattern is created on the smaller scales of the neck by alternating light and dark colors on each scale.

For the lips, I painted dark colors using repeating thin lines. I painted light, reddish colors on the inside edge of the eyelids as well. You can continue to work over the surface adding color details where needed. It's never finished until you feel that it's finished. The important thing to keep in mind is that if you take the time to build up layers of colors for the undercoat, the details you paint on the surface will look much more organic and interesting.

When you feel that you have done enough, save the file as `PolyPaintDragon_v07.zpr`. A version of this project can be found on the `Chapter 8` folder of the DVD. Figure 8.44 shows the final version. A color version of this image can be found in the color insert section of this book.

USE COLOR TO CREATE A STORY

The colors you paint on the surface can create a sense of story for your dragon. Does your dragon have elaborate markings? Battle scars? Do the colors indicate danger? Attract mates? Do dragons have tattoos? Do the markings indicate rank? Age? Class? Number of slain knights or burned villages? You can have a lot of fun thinking up the history behind the colors of your dragon.

Figure 8.44
The final version of the dragon.

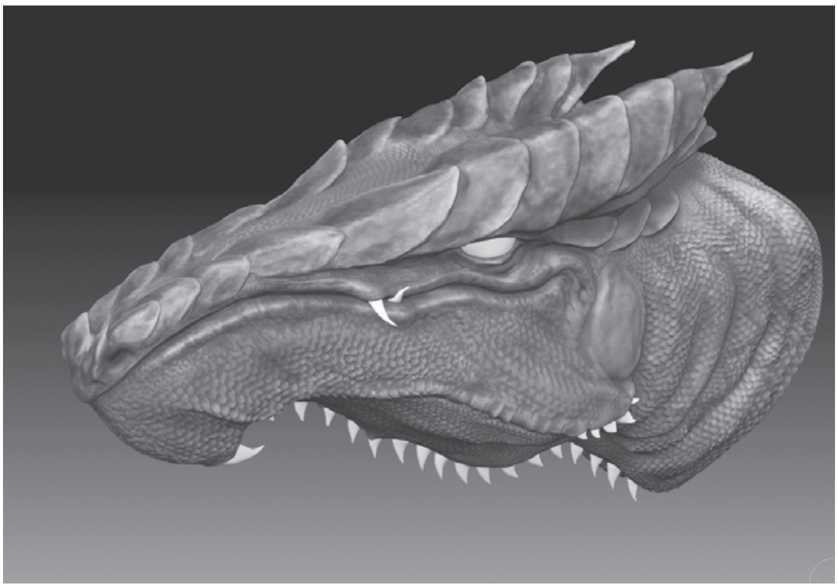


Image Editing with SpotLight

SpotLight is one of the most exciting new additions to the ZBrush toolset. The creative potential of this innovative image editing and projection technology seems limitless. SpotLight is designed to give artists the ability to manipulate images within the ZBrush interface. This eliminates the need to leave the ZBrush environment to edit images in a second software package such as Photoshop. Using SpotLight, you can color correct, transform, smudge, smear, and layer digital images and then project the result directly on your model.

In the following sections, you'll learn the basics of using SpotLight, starting with a tour of the interface. Later on in the chapter, you'll use SpotLight to texture the hot rod model started in Chapter 5.

Open and Close SpotLight

SpotLight is used for editing textures, so to launch SpotLight, you'll need to select a texture either from the texture library on the left shelf or from the Texture section of Light Box. A texture is simply an image file that's loaded into ZBrush. ZBrush accepts the most common image formats, such as Photoshop (PSD), Pict (PCT), bitmap (BMP), Tif (TIF or TIFF), Jpeg (JPG or JPEG), and Gif (GIF).

The following sections show you two ways to launch SpotLight.

Launch SpotLight from the Texture Library

This exercise demonstrates how to add an image to SpotLight from the texture library.

1. Start a fresh session of ZBrush.
2. On the left shelf, open the texture fly-out library.
3. Click on a texture such as Texture 01 (see Figure 8.45).

   The fly-out library closes when you select a texture. You'll see the selected texture appear as an icon on the left shelf.

Figure 8.45

Choose Texture 01 from the texture fly-out library.

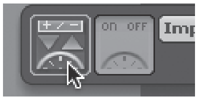


Figure 8.46
Click the Add To SpotLight button in the texture fly-out library.

4. Click on the texture on the left shelf to open the fly-out library again. Click the Add To SpotLight (plus/minus) button in the lower-left portion of the fly-out library (see Figure 8.46).

   The texture now appears on the canvas in full size. You'll also see a ring of small icons. This ring is the control interface for SpotLight. Note that the texture on the canvas appears slightly transparent (see Figure 8.47)

   To remove the texture from SpotLight, just select it in the texture library and press the plus/minus button again.

5. To close SpotLight, press **Shift+Z**.

Figure 8.47
The texture appears on the canvas when it has been added to SpotLight. The SpotLight interface appears as a ring of icons on top of the image.

As long as images have been added to SpotLight you can turn it on and off again using the **Shift+Z** hotkey combination. The images you have added to SpotLight will remain as part of SpotLight unless you remove them or close and restart ZBrush. The **Shift+Z** hotkey combination turns off SpotLight so that you can work on models or other artwork in ZBrush. ZBrush still remembers which images have been loaded and their current status. Press **Shift+Z** again to turn on SpotLight at any time.

When you press **Z** without a modifier, the SpotLight interface (the ring of icons) is hidden. Press it again to display the interface. There are essentially two modes to SpotLight: Edit mode and Projection mode. You know you are in Edit mode when you see the interface dial (the ring of icons). In this mode, you can edit the SpotLight images. In Projection mode, the dial interface is hidden and the images you see on the canvas can be projected onto your models. In the following sections, you'll learn how to work in these two modes.

Launch SpotLight from Light Box

Light Box is described in detail in Chapter 2. Recall that the icons in SpotLight are a preview of files saved to your local drive within the subfolders of the `ZBrush 4.0` directory. Adding a texture from Light Box to SpotLight is very easy.

1. Click the Light Box button on the top shelf to open Light Box.
2. Click on the Texture heading in Light Box.
3. Click one of the textures to select it. A white border will appear around the texture indicating that is selected (see Figure 8.48).
4. Double-click the texture to launch SpotLight. In some cases you may need to double-click the image twice.

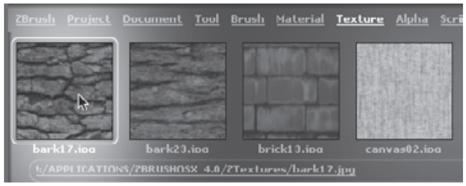


Figure 8.48
Select a texture from the Texture section of Light Box.

SpotLight will open and the image appears at full size. Note that any images you may have added to SpotLight will be scaled down and positioned at the bottom of the interface. (See Figure 8.49. The smaller image may be hidden by the Light Box interface. Close Light Box so that you can see the smaller image).

Figure 8.49
When a new texture is added to SpotLight, the other image appears scaled down at the bottom of the interface.

The last image you add to SpotLight always appears enlarged at the top of the interface, and previously added images appear at the bottom, scaled down. You'll learn how to resize and reposition images later in this section. At this point, you're simply building up a layout of active images. Imagine that you're pulling images out of a box and placing them on a table. That's basically what's going on when you add images to SpotLight. You can add new images at any time while working in SpotLight.

Note that you can load multiple copies of the same image into SpotLight if you want to.

LOAD IMAGES FROM THE INTERNET INTO SPOTLIGHT

If you're using ZBrush on Windows, you can also load images from the Internet directly into a SpotLight session without having to leave ZBrush. This feature is not available for Macintosh users.

1. Click the Light Box button on the top shelf to start Light Box.
2. Click the www heading to open the Internet search options.
3. Click the Yahoo icon.
4. In the search field, type in a search keyword such as "dragonfly."

   If your computer is connected to the Internet, after a few seconds SpotLight will fill up with images of dragonflies. The images you're seeing are a result of doing an image search using the Yahoo search engine from within ZBrush!

   At the top of each image you'll see a small bar. The length of this bar gives you an indication of the file size. A longer bar indicates a larger file and a longer download time.
5. Double-click an image.

   When you double-click an image, it is downloaded to your computer. The bar at the top of the image is filled with a white color indicating the progress of the download. Once the bar is completely white, the image has been successfully downloaded.
6. Once the image has downloaded, double-click it again and the image will be added to SpotLight.

Save and Load a SpotLight Session

Typically you'll use several images within a single SpotLight session. For example, let's say you're working on dragon scales. You may end up with a number of images that have been added to SpotLight from various locations such as your hard drive, the Internet, and so on. You can save the SpotLight session as a file that can be loaded the next time you start ZBrush. This saves you the trouble of having to add the images all over again the next time you start ZBrush.

You can create separate SpotLight files for use in different ZBrush sessions. So you might have a SpotLight file dedicated to images of snake scales, another one dedicated to vehicle decals, and another one dedicated to eyeballs, and so on. A SpotLight file uses a special format that contains the image files and their status.

This exercise demonstrates how to save and load a SpotLight session.

1. Make sure you have three to five images loaded into SpotLight and that the images are visible on the canvas.
2. Open the Texture palette and press the Save SpotLight button (see Figure 8.50). This will open up your computer's file browser.
3. Save the file as `SpotLightest.zsl`. You'll use this file for practice in the next few exercises.
4. To load a SpotLight file, use the Load SpotLight button in the Texture palette. You can have only one SpotLight file open at a time.

If you have been working in SpotLight, save your work before loading a different SpotLight file.

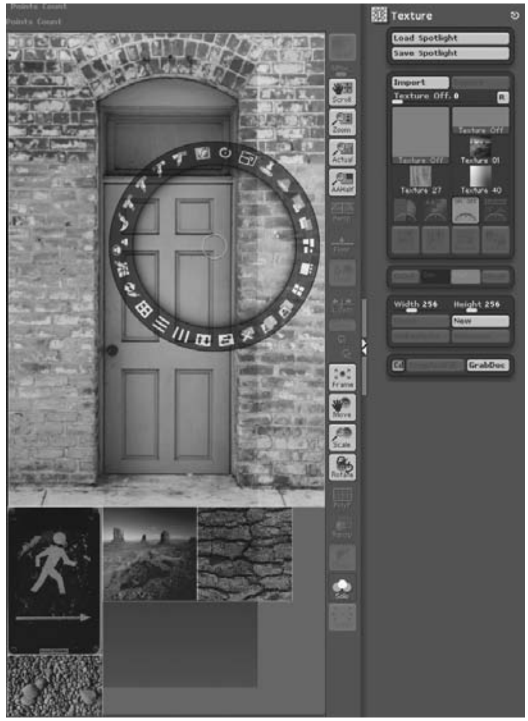


Figure 8.50

Use the Save SpotLight button in the Texture palette to save the SpotLight file.

Transform Images

Now that you understand how to start SpotLight, let's take a look at how you can do some actual work. The ring of icons that appears when you launch SpotLight functions as a menu and a manipulator at the same time. This exercise demonstrates how to move images around using the manipulator.

1. Continue with the SpotLight file from the previous section or use the Load SpotLight button in the Texture palette to load the `SpotLightTest.ZSL` file from the `Chapter 8` folder on the DVD.
2. Click and drag on the largest image on the canvas.

   The SpotLight menu pops over to the center of your brush cursor and the largest image moves as you drag on the canvas. This is how you move an individual image. Note that a red border appears around the image, indicating that it is selected.
3. Click and drag on one of the smaller images.

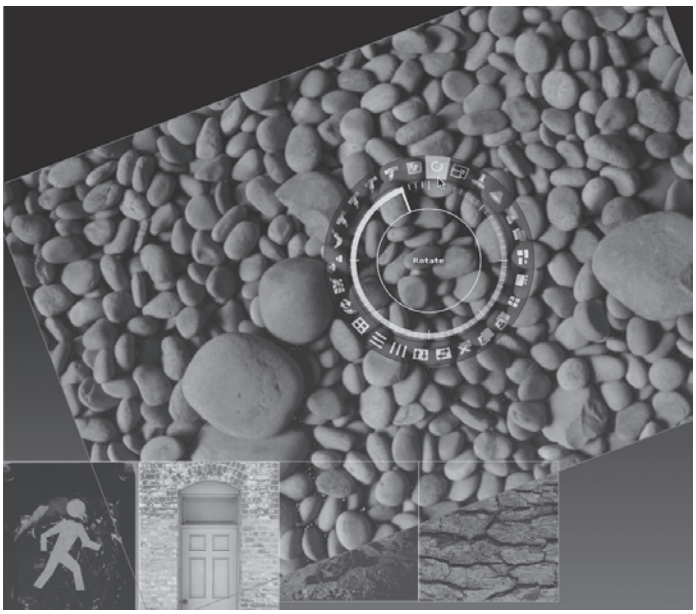
   Each time you want to move an image around, just click and drag on it (see Figure 8.51).
4. Click and drag on a blank part of the canvas. Now all the images move together. This is a handy way to move everything aside if you need to make space on the canvas.
5. Double-click one of the smaller images.

This rearranges all of the images so that the small image now becomes enlarged and the other images are scaled down and aligned at the bottom of the screen.

Figure 8.51
Drag on an image to move it.

6. Click and drag in the center of SpotLight (within the small circle). This allows you to move the SpotLight interface without affecting the image.
7. Click the largest image again to place the interface on top of it. Click and drag the circular arrow icon at the top of SpotLight (see Figure 8.52).

Figure 8.52
Drag the circular arrow in the SpotLight interface to rotate the selected image.



This rotates the image. Drag this icon right or left to rotate the image clockwise or counterclockwise respectively. The SpotLight interface acts like a dial. Each of the menu icons around the ring of the interface is a switch. Select an icon such as the circular arrow at the top of the ring. Drag the menu left or right icon to rotate the dial and activate the selected function.

The pivot point for the center of the rotation is indicated by the circle at the center of the SpotLight interface. To change the pivot point, just click somewhere else in the image.

If you want the pivot point of rotation to be outside of the image, select the image by clicking it (the red border will indicate that the image is selected). Then drag the center of the SpotLight interface, reposition the interface outside of the mage, and then drag the rotation icon.

If you want to rotate all of the images in SpotLight at once, click outside the image to deselect it (the red border will disappear), drag the center of the dial to reposition the SpotLight interface, then drag the rotation icon at the top of the interface.

8. Click one of the smaller images to select it. Click and drag the box icon to the right of the rotate icon. This scales the image. Drag to the right to scale the image up; drag to the left to scale it down (see Figure 8.53).

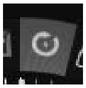
Figure 8.53

Drag on the rectangular icon to scale the selected image.

The scale function is similar to the rotate function in that the scale pivot is based on the circle at the center of the interface. Just as with the rotate function, you can scale the selected image or deselect the image and scale all the images at the same time.

SpotLight Functions

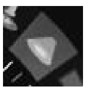
Each icon on the SpotLight interface indicates a different function. The icons are grouped together based on their purpose. Some SpotLight functions are used to transform the images, like rotate and scale demonstrated in the previous section. Some of the functions are used to edit the image. Some of the functions affect how the image is projected onto a surface. This section gives a brief description of each function, going clockwise around the interface starting at the top. Many of these functions will be explored in more detail in the exercises of this chapter.



Rotate As demonstrated in the previous section, drag this icon left or right to rotate the selected image or all of the images together. The center of Light Box is the pivot point for rotation.

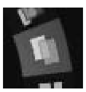
Scale As demonstrated in the previous section, drag on this icon left or right to scale the selected image or all of the images together. The center of Light Box is the pivot point for the scaling.

Pin This icon keeps the image at the center of the brush tip when you project the image onto a surface. Projection is discussed in the next section. Click this icon to toggle pinning on or off. When you see a white bar above the icon, this means that SpotLight is pinned. If pinning is off, the image will be projected onto the surface based on its current position on the canvas. When pinning is on, the area of the image at the center of the SpotLight image is pinned to the sculpting brush.

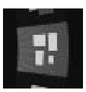


SpotLight Radius Drag left or right on this icon to set the SpotLight radius. This feature is used when projecting the image onto a surface. It allows you to see a small, transparent circular preview of the image while you project it on the surface.

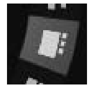
Opacity This is used to dim the interface while you are projecting the SpotLight images onto a surface. It does not affect the opacity of the projected image, however. Drag left or right to control the opacity of the SpotLight images. Drag left to reduce opacity; drag right to increase opacity. A low opacity makes it easier to see the surface while projecting images onto your model. A medium level of opacity is helpful when you are using SpotLight as a sculpture reference.



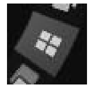
Fade This does control the opacity of the image as it is projected onto the surface. You can vary the opacity of overlapping images to blend them together in SpotLight and then project the result onto a surface.



Tile Proportional Click this icon to arrange the images in SpotLight on the left side of the canvas. The images are scaled down to fit on the screen, but their relative sizes are maintained. The image that is the largest size will be the largest on the screen, and then the next largest size image will be the second biggest on screen, and so on down to the smallest image.



Tile Selected Click this icon to arrange the images on the left side of the canvas. The selected image is shown at full size, and unselected images are scaled down and placed below the selected image.

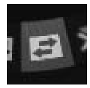


Tile Unified Click this button to arrange the images on the left side of the canvas. The images are all scaled to the same size.

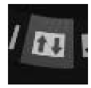
Front Click this image to move the selected image to the front. The unselected images are placed behind. This becomes more apparent when the selected image is overlapping another image.

Back Click this icon to move the selected image to the back. The unselected images are placed in front. This becomes more apparent when the selected image is overlapping another image.

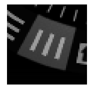
Delete This function removes the selected image from SpotLight.



Flip H This function flips the image horizontally.



Flip V This function flips the image vertically.



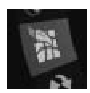
Tile H This tiles the images horizontally. To use this function, select an image by clicking it and drag the icon clockwise. As you drag, the image is repeated horizontally. If no images are selected, then this function is applied to all the images in Light Box. If you hold down the **Shift** key when moving this button, it will tile the texture horizontally and vertically and respect aspect ratio.

Tile V This works just like Tile H but the images are tiled vertically instead of horizontally.

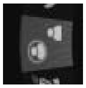
Grid This applies a grid or a checkerboard pattern to the image. Drag the icon counterclockwise to add a grid. As you drag to the right, the squares of the grid are enlarged. Drag clockwise to add a checkerboard pattern. As you drag to the left, the squares of the checkerboard are enlarged. When you release the icon, the grid is applied to the image. If you drag the icon again, a new grid is applied to the image in addition to any existing grid. This function works only when an image is selected.

Restore This function restores the image to its original state. To use this, select the image and drag the restore icon clockwise. As you drag, the changes made to the image will fade away. If you keep dragging, eventually the image will be completely restored.

Some of the SpotLight functions, such as restore, can be applied to the whole image or just parts of the image. If you click the icon and drag it counterclockwise, the restore function is applied to the whole image. If you click the icon and then drag on the image, the restoration occurs only where you paint on the image. The Draw Size, Focal Shift, and ZIntensity sliders will determine the size, falloff, and intensity of the restoration effect.



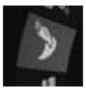
Nudge This function is used to smear the image. To use this feature, click the nudge icon to activate it and then paint on the image. As you paint, the image will be smeared. The Draw Size and ZIntensity sliders on the top shelf control the size and the strength of the smearing. If you click the nudge icon and drag left or right, the strength of the nudged areas is reduced. If you drag the icon far enough, the nudged strokes will disappear altogether.



Clone This function copies part of an image to other parts of the same image or other images that have been loaded into SpotLight. To use this function follow these steps:

1. Place the center of the SpotLight interface over the area that you want to clone. This is the clone source.
2. Click the clone icon to activate it.
3. Drag on another part of the image or another image loaded within SpotLight. The area at the center of the SpotLight interface will be copied to wherever you paint. If there is an image selected, when you click another image, the image will be selected instead of being cloned.
4. Use the Draw Size and ZIntensity sliders to determine the size and opacity of the cloned image.
5. To reposition the clone source, drag on the edge of the circle at the center of the SpotLight interface.

The cloned stroke will not be applied to blank parts of the canvas. It appears only on images loaded into SpotLight. The clone feature is very useful but can be tricky. Watch the `SpotLightClone.mov` movie in the `Movies` folder on the DVD to see a demo that better explains this feature.



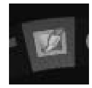
Smudge This is similar to nudge. If you select this icon and drag left or right, the selected image is blurred. Click this icon and drag on the image to create smudged strokes. The Draw Size and ZIntensity sliders on the top shelf control the size of the smudge and the intensity.

Contrast Click this icon and drag clockwise to increase the contrast of the image; drag counterclockwise to reduce contrast. As the dark colors in the image reach 100 percent black, they will appear transparent. Click this icon and drag on the image to paint areas of high contrast. The Draw Size and ZIntensity sliders control the size of the stroke and the intensity of the contrast. Hold the **Alt** key to paint areas of low or negative contrast.

Saturation The feature works very much like contrast. Drag the icon clockwise to increase the saturation of the color; drag counterclockwise to remove saturation. Click the icon and drag in the image to paint saturation into the image. Hold the **Alt** key and paint to remove areas of saturation. The Draw Size and ZIntensity sliders control the size of the stroke and the intensity of the saturation.

Hue Click the Hue icon and drag clockwise or counterclockwise to adjust the hue of the image.

Intensity This feature works very much like contrast and saturation. Drag the icon clockwise to increase the intensity of the color, and drag counterclockwise to remove intensity. If you keep dragging counterclockwise, eventually all the colors in the image become 100 percent black and the image becomes transparent. Click the icon and drag in the image to paint color intensity into the image. Hold the **Alt** key and paint to remove areas of intensity. The Draw Size and ZIntensity sliders control the size of the stroke and the color intensity.



Paint Click and drag clockwise on this icon to fill the image using the main color in the color picker. Drag counterclockwise to fill the image with the secondary color in the color picker. Click and drag in the image to paint colored strokes on the image. The colors are determined by the main color in the color picker. Hold the **Alt** key and drag in the image to paint with the secondary color. The Draw Size and ZIntensity sliders control the size of the stroke and the opacity of the color. Hold the **Ctrl** key to smart-fill selected color. Remember, black is seen as transparent. This will allow you to mask out parts of the textures. Watch the `SpotLightPaint.mov` video in the `Movies` folder of the DVD to see how this can be useful.

This concludes a brief tour of the SpotLight functions. To make sense of all this, you'll need to practice. In the next few sections you'll get some practical experience using SpotLight to perform a number of tasks.

SpotLight Projection

SpotLight's power lies in its ability to project the images you edit in SpotLight directly onto the surface of a digital sculpture. This means it's very easy to incorporate photographic elements as well as digital painting and custom textures into the colors you paint on your models.

In the following sections, we'll take a look at the basics of how to project images onto a surface using SpotLight.

Project an Image

Imagine shining a spotlight onto a surface, but rather than seeing just a bright light on the surface, you saw an image instead. That's kind of the idea behind SpotLight. The sculpting brush is kind of like the spotlight and you use it to project images onto the surface. The process is very simple but very powerful. This exercise demonstrates a typical workflow for using SpotLight to project colors onto a surface.

1. Open a new session of ZBrush.
2. Use the Open button in the File menu to open the `PolyPaintTest.ZPR` project created earlier in this chapter.
3. Use the Load SpotLight button in the Texture palette to load the `SpotLightTest.ZSL` file created in the previous section.
4. When the SpotLight file loads, you'll see the images on the canvas in front of the PolySphere. The SpotLight interface may be hidden. Press the **Z** hotkey to show the SpotLight interface.

When the SpotLight interface is visible, then you know that you are in image editing mode. This means you won't affect the PolySphere behind the images when you drag on the canvas.

5. Select the largest image and drag it away from the others toward the center of the canvas.
6. Select each smaller image and move them out of the way so you have some space to work.
7. Click the largest image. Use the scale icon on the SpotLight interface to increase the scale of the largest image. To do this, click the scale icon and drag the SpotLight dial clockwise until the image covers the PolySphere behind it.
8. Drag on the largest image to position it in front of the PolySphere (see Figure 8.54).

Figure 8.54
Arrange the SpotLight images so that the largest image is in front of the PolySphere. Scale the image up so that it covers the PolySphere.

9. Click the opacity icon on the SpotLight dial. Drag counterclockwise until the image is almost completely invisible and you can clearly see the PolySphere (left image in Figure 8.55).
10. Click the SpotLight Radius button, and drag the dial clockwise to increase the size of the SpotLight radius. You'll see part of the image appear as you drag within a faded circle. The circle increases in size when you drag clockwise (center image in Figure 8.55).

    The SpotLight radius function does not affect the brush size. The radius feature creates a preview of the SpotLight image so you can see which parts of the image will be projected as you work. Increasing the radius lets you see more of the projected colors, but it does not affect how the colors will be projected onto the surface.
11. Press the **Z** hotkey. This hides the SpotLight interface and puts SpotLight into Projection mode.

12. Hold the tip of the brush over the PolySphere. You can see a preview of the projection at the center of the brush tip. This is the SpotLight style projection.
13. On the top shelf, turn off Add and make sure Rgb is on. Set Rgb Intensity to 80.
14. Click and drag on the surface. The image is projected onto the PolySphere (right image in Figure 8.55).
15. Rotate the PolySphere and paint some more. You can cover the whole surface by rotating and positioning the PolySphere within the projected area (see Figure 8.56).

Continue with this project in the next section.

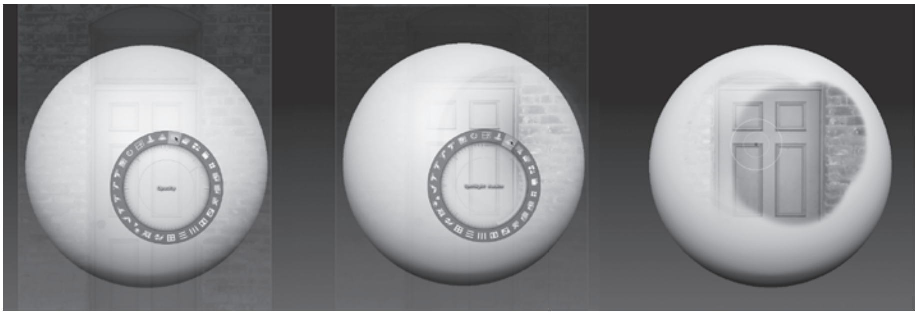


Figure 8.55

Reduce the opacity of SpotLight (left image), increase the SpotLight radius (center image), press the Z hotkey to enter projection mode, and drag on the surface (right image).

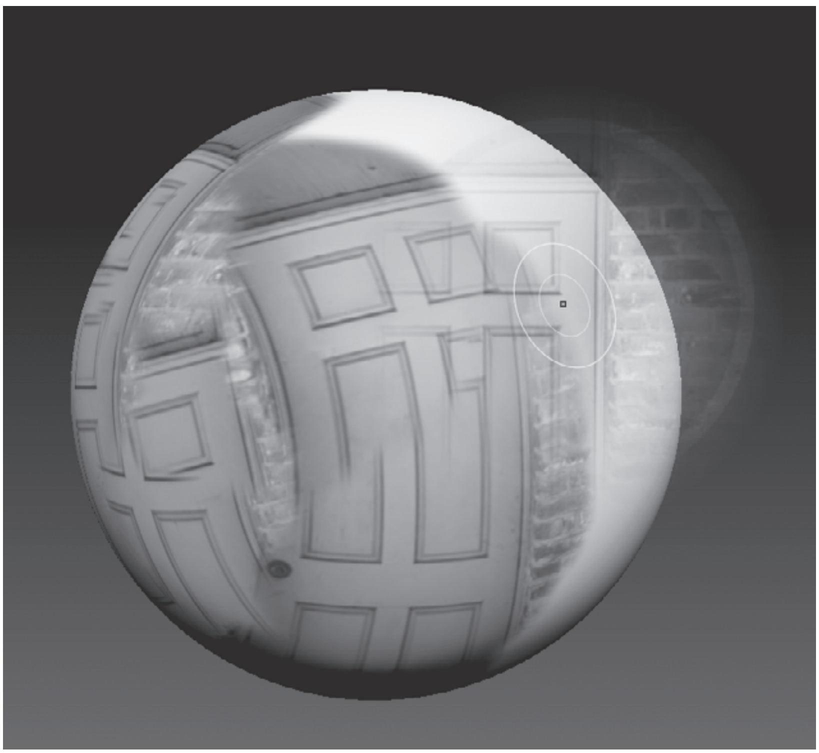


Figure 8.56

Rotate the view of the PolySphere and continue to paint on it to cover the surface with the projected image.

Pin the Projection to the Brush

When SpotLight is in Projection mode, the images remain fixed exactly as they have been arranged. SpotLight projects straight through the image onto the surface. If you want to use the location of the brush to place the image, you can use the pin function.

Figure 8.57

Press the pin icon on the SpotLight dial to turn on the pin function.

1. Press the **Z** hotkey to reenter SpotLight image editing mode.
2. Click the thumbtack icon in the upper right of the SpotLight dial. A white bar appears above the icon, indicating that the pin function has been enabled (see Figure 8.57).
3. Press the **Z** hotkey again to hide the SpotLight dial and return to Projection mode.
4. Drag on the surface of the model. Lift the brush and drag on another part of the surface.

   Each time you release the brush and paint on another part of the surface, the projected image is placed at the point where the brush makes contact with the surface. The center of the projection source is based on the center of the SpotLight dial relative to the position of the image in SpotLight (see Figure 8.58).

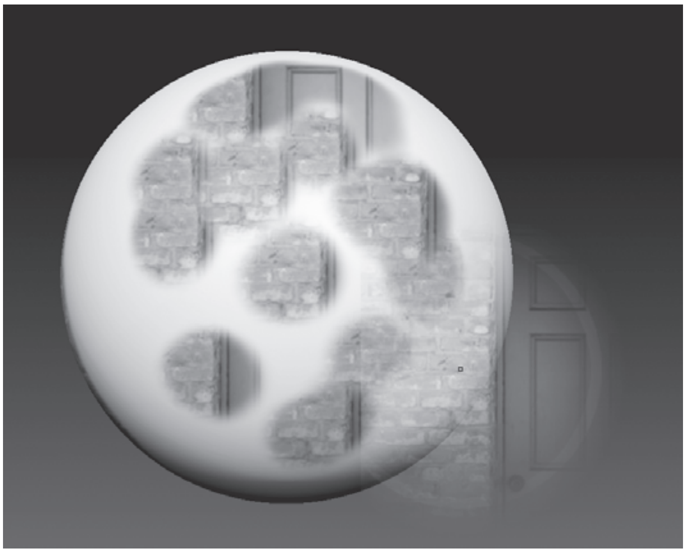


Figure 8.58

The projected image is pinned to the brush, so each time you touch the surface, the image is projected based on brush placement.

Continue with this project in the next section.

Blend Images Together Using Fade

Using the Fade function, you can control the opacity of the image as it is projected onto the surface. You can use this feature to blend two or more images in SpotLight and then project the result.

1. Press the **Z** hotkey to reenter SpotLight image editing mode.
2. Drag the opacity icon clockwise until you can see the images clearly.

3. Click and drag on one of the smaller images, and drag it over so that it overlaps the larger image. The smaller image may not be visible when it overlaps the larger image; this is because it is behind the larger image.
4. Select the large image by clicking it, and press the back icon on the SpotLight dial. The smaller image should appear now that the largest image has been sent all the way to the back (see Figure 8.59).
5. Click the smaller image to select it. The red border of the image indicates that is selected.
6. Drag the scale icon clockwise to enlarge the smaller image. The two images should be overlapping and the PolySphere should be behind both.
7. On the dial, drag the fade icon counterclockwise to decrease the opacity of the selected image (Figure 8.60). Set the fade of the selected image to about 50 percent of its original opacity.
8. Drag the center of the SpotLight dial so that it is above an area where the two images are overlapping.
9. Press the **Z** hotkey to leave the image editing mode and enter Projection mode.
10. Drag on the surface of the PolySphere. The resulting projection is the combination of the two overlapping images blended together (see Figure 8.61).

Figure 8.59

Click the back button to send the selected image behind the other images.

Figure 8.60

Reduce the opacity of the overlapping image by dragging the fade icon counterclockwise

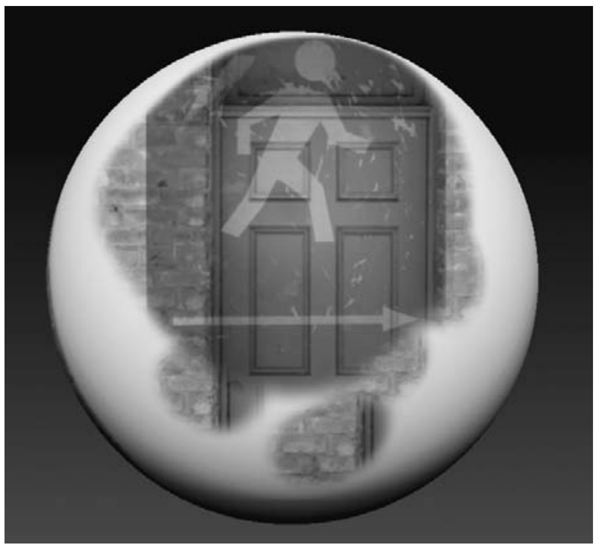


Figure 8.61

The blended images are projected onto the PolySphere.

Sculpt with SpotLight

SpotLight not only projects the colors of the images onto the surface, it can also be used to sculpt the surface based on the values of the projected images. To enable this ability, you simply need to turn on Zadd on the top shelf while in Projection mode. Any of the sculpting brushes can be used to create a wide variety of texturing effects. The projected image acts as a stencil for the sculpting brush. The darker values of the image mask the effect of the brush.

This exercise shows how to enable this feature.

1. Start a fresh session of ZBrush.
2. Open Light Box to the Projects section.
3. Double-click the `DefaultCube.ZPR` project. This will load it into ZBrush.
4. Turn off the Persp button on the right shelf. Rotate the view of the cube so that you can see it from the side.
5. Open the SubTool subpalette of the Tool palette. Click the paintbrush icon for the PolyCube_1 subtool to activate Colorize mode.
6. Press **Ctrl+D** three times to subdivide the model. The model should be 1.572 million polygons at the highest subdivision level.
7. Open Light Box to the Texture section. Scroll to the left by dragging on the images until you find the blue grate texture. It is labeled `IMG_4760.jpg` (see Figure 8.62).

Figure 8.62

Select the blue grate image from the Textures section of Light Box.

8. Double-click this image to load it into SpotLight (you may need to double-click it twice).
9. Drag the scale icon on the SpotLight dial counterclockwise to reduce the size of the image.
10. Drag the opacity icon on the SpotLight dial counterclockwise to reduce the opacity of SpotLight so that you can easily see the cube.
11. Drag the SpotLight radius icon on the SpotLight dial clockwise to increase the radius of SpotLight (see Figure 8.63).
12. Press the **Z** hotkey to leave the image editing mode.
13. Open the sculpting brush fly-out library and select the Layer brush.
14. On the top shelf, turn on the Zadd and Rgb buttons. Set ZIntensity to 50 and Rgb Intensity to 10.
15. Set Draw Size to 100.
16. Drag on the surface of the cube. You'll see the colors of the grate image appear on the surface, and you'll also see the details of the image sculpted into the geometry of the cube (see Figure 8.64).

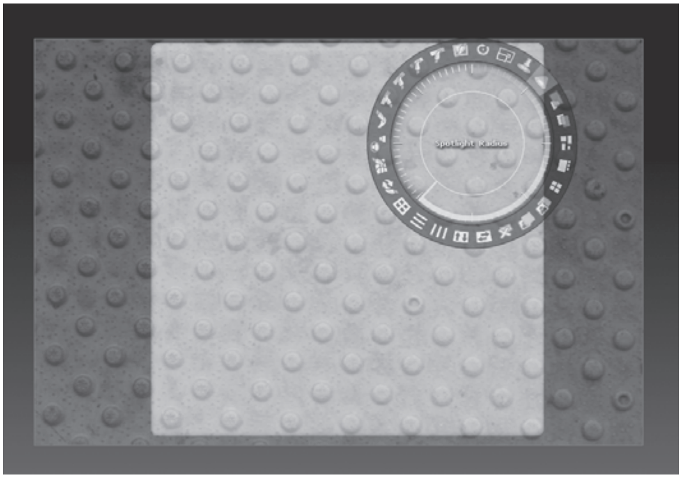


Figure 8.63
Increase the SpotLight radius.

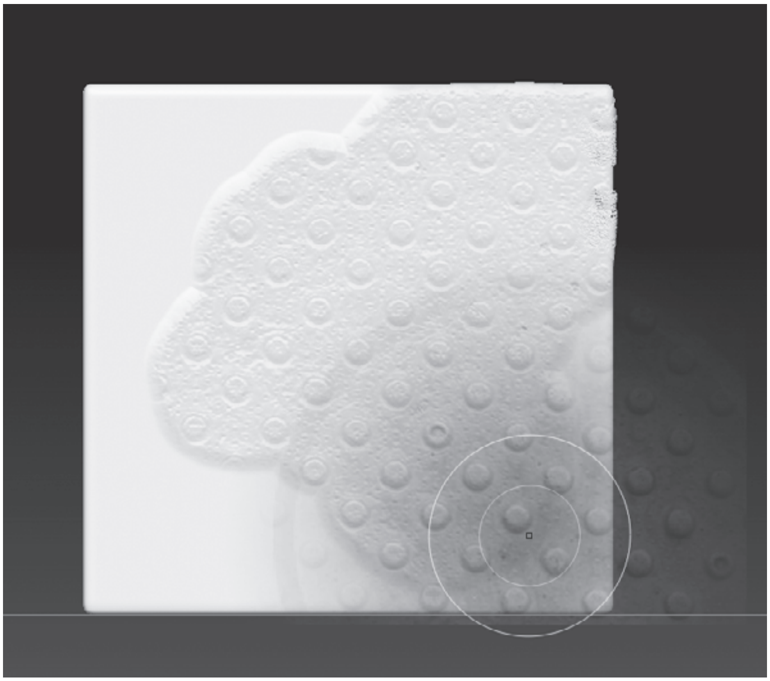


Figure 8.64
The sculpting brush sculpts the details of the image into the surface of the cube.

Try this technique with other sculpting brushes. Try Planar Cut, Clay Buildup, or Blob. Note that you can use all of your sculpting tricks in combination with SpotLight. This means you can use alphas on the sculpting brushes, masks, BackTrack, stencils, and so on. It's amazing how many interesting effects you can achieve using SpotLight as a sculpting tool.

IMAGE RESOLUTION AND SPOTLIGHT

You'll get better results in your SpotLight projection techniques if you use high-resolution images. Any image artifacts in the projected textures will affect the quality of the surface. So even if your model has been subdivided to millions and millions of polygons, if you project through a low-resolution or highly compressed image, the result will look blocky and pixilated.

Symmetrical Projection

Use symmetry when projecting SpotLight onto a surface in order to paint both sides of an object at the same time. For example, this technique can be used to paint two sides of a face using the same image.

This exercise demonstrates how this works.

1. Start a new session of ZBrush.
2. Open Light Box to the Project section and double-click the `DemoDog.zpr` project to load it into the current session.
3. Set the main color to white using the color picker.
4. Open the texture fly-out library on the left shelf. Click the Import button. Use your computer's file browser to load the `houndDog.jpg` image from the `Chapter 8` folder on the DVD.
5. Open the texture fly-out library and click the Add To SpotLight icon in the lower left (see Figure 8.65).

Figure 8.65
Add the houndDog image to SpotLight.

6. Use the SpotLight dial to scale the image down a little and move it towards the center of the screen.
7. Press the **Z** hotkey to exit image editing mode.
8. Scale the view of the dog model so that it matches the size of the head in the image. Rotate the view of the dog to match the angle of the head as well. It will be impossible to get a perfect match, but that is okay; just try to get it close.
9. Press the **Z** hotkey to switch back to the SpotLight image editing mode.
10. Scale and rotate the image using the SpotLight dial to see if you can make the image line up with the model a little better.
11. Click the nudge icon so that a bar appears above the icon. Drag on the image to push the pixels of the image. Use nudge to make the image match the model of the dog. Use the Draw Size and ZIntensity sliders on the top shelf to adjust the radius of the brush and the strength of the nudge effect (see Figure 8.66).

Figure 8.66
Rotate and scale the view of the dog model to match the SpotLight image (left image). Rotate the SpotLight image to match the view of the model (center image). Use nudge to push parts of the image to match the model.

12. Drag counterclockwise on the opacity icon to reduce the opacity of the image. Remember, this does not affect the opacity of the projection, just the opacity of the image. This makes it easier to see what's going on when you start to project the image onto the model.
13. Press the **Z** hotkey to switch out of the SpotLight editing mode.
14. Press **Ctrl+D** three times to subdivide the model.
15. Make sure Zadd is off and Rgb is on. Set Rgb Intensity to 80.
16. Paint on the face of the dog to project the image.
17. Press **Shift+Z** to hide SpotLight. Rotate the view of the dog. The image has been projected onto both sides (see Figure 8.67).

Figure 8.67
The image of the dog is projected onto the dog model. With symmetry enabled, the image is projected onto both sides of the model.

Using symmetrical projection and the SpotLight nudge feature, it's not hard to texture an entire face very quickly. If you have a series of images from different views, then you can easily blend the projections together to create a convincing texture. The amazing thing is that you don't have to struggle with making sure everything lines up perfectly. You can easily edit each image in SpotLight to match the view of your model.

Sculpting Reference in SpotLight

SpotLight can be used as a convenient way to load reference images into ZBrush. This can eliminate the need to have to switch to an image editing program or a web browser while sculpting, allowing you to stay comfortably within the ZBrush environment.

My original vision for the hot rod body created in Chapter 5 was to create a sculpture of a cartoon car in the monster art style of Ed Roth. I created a quick sketch of what I thought the end result should be. In this exercise, you'll see how the sketch can be used as a reference for sculpting the body.

1. Start a new session of ZBrush.
2. Use the Open button in the File palette to open the `HotRodModel.ZPR` project from the `Chapter 8` folder on the DVD.

   This model was created by combining the hot rod body, wheel, and headlight models created in Chapters 5 and 6 (see Figure 8.68).

Figure 8.68

The hot rod model is made up of tools created in Chapters 5 and 6.

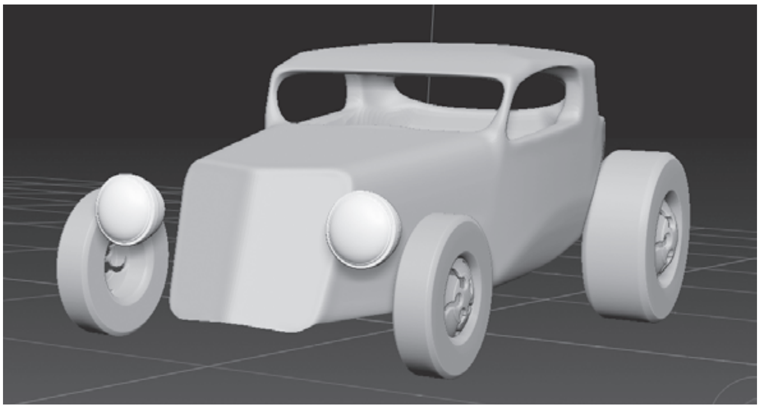


Figure 8.69

Import the image and click the Add To SpotLight icon in the Texture palette.

3. Open the Texture palette and click the Import button. Load the `hotRodRef.psd` file from the `Chapter 8` folder on the DVD.
4. Open the Texture palette and click the Add To SpotLight button. The image appears on the canvas in SpotLight (see Figure 8.69).
5. Drag counterclockwise on the scale icon to scale the image down. Move it off to the side so that you can see the model.
6. If you have a large number of images on the canvas in SpotLight, take a few minutes to arrange them so that you can see the model on the canvas.
7. Drag counterclockwise on the SpotLight radius icon all the way to make sure it is set to 0.
8. Press the **Z** hotkey to switch out of SpotLight Edit mode.
9. Open the Brush palette and expand the Samples subpalette. Turn off the SpotLight Projection button (see Figure 8.70).

This last step is the most important. If you don’t turn off SpotLight projection, the sculpting brushes will not work unless they are used to project colors and details on the surface. If the images disappear when you press the **Z** hotkey, it means you need to set the SpotLight radius to 0. Doing this keeps the images visible when SpotLight Edit mode is off (see Figure 8.71).

Figure 8.70

Turn off the SpotLight Projection button in the Samples subpalette of the Brush palette.

Now you are free to model the surface. Press **Z** whenever you want to toggle back into SpotLight and rearrange the images. Press **Shift**+**Z** when you want to hide SpotLight completely.

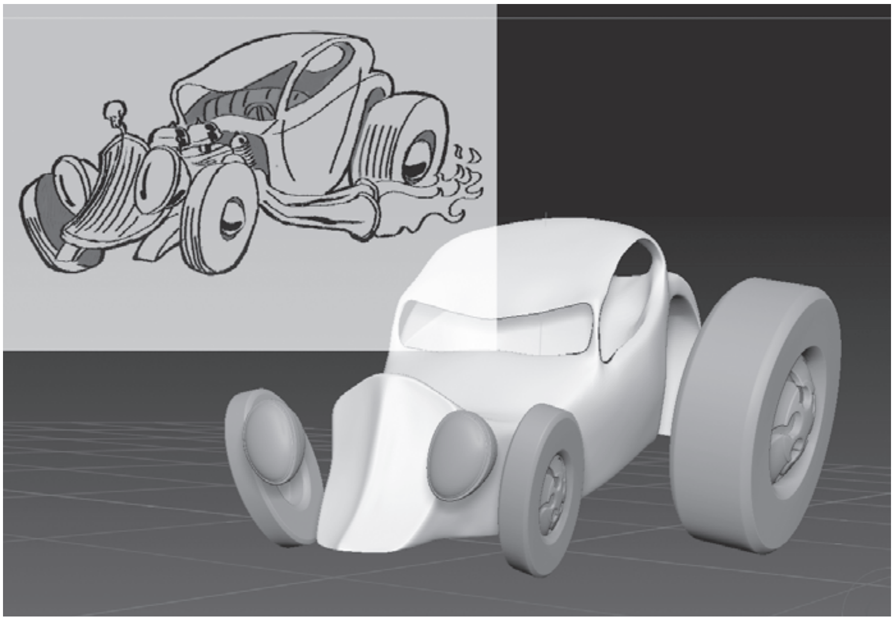


Figure 8.71

Model the car with the reference images in the background.

Check out the `engineRefImages.ZSL` SpotLight file in the `Chapter 8` folder of the DVD. I created this SpotLight from photographs I took of a hot rod parked on my street.

CHAPTER 9

Rendering, Lighting, and Materials

Once you have created a model in ZBrush, no doubt you will want to show it off to the world. Whether you are sharing your work online, presenting a model for approval from a director, or building up your portfolio, you'll want to make sure your models look as good as they possibly can. To help you accomplish this, ZBrush offers several rendering modes that range from simple to complex. Realistic shadows, transparency, subsurface scattering, ambient occlusion, and other options are all effects that you can take advantage of when rendering your creations.

This chapter covers the basics of working with lights, materials, and the different rendering styles available in ZBrush. Through a series of exercises, you'll learn how to use all the options available to create amazing images from your models.

This chapter includes the following topics:

- **Render modes**
- **Lights**
- **Standard materials**
- **Material Capture tool**
- **Advanced render effects**
- **Rendering fibers**

Rendering Basics

Rendering in ZBrush involves how the pixols and 3D polymesh objects look on the canvas based on the colors and materials applied, the lights in the document, and the rendering style selected in the Render palette. By default, all models are constantly rendered in Preview mode while you work in a typical ZBrush session. So throughout this entire book, you've been using Preview render mode without realizing it. Preview mode features preview shadows, reflection, basic lighting, and simplified materials (Figure 9.1).

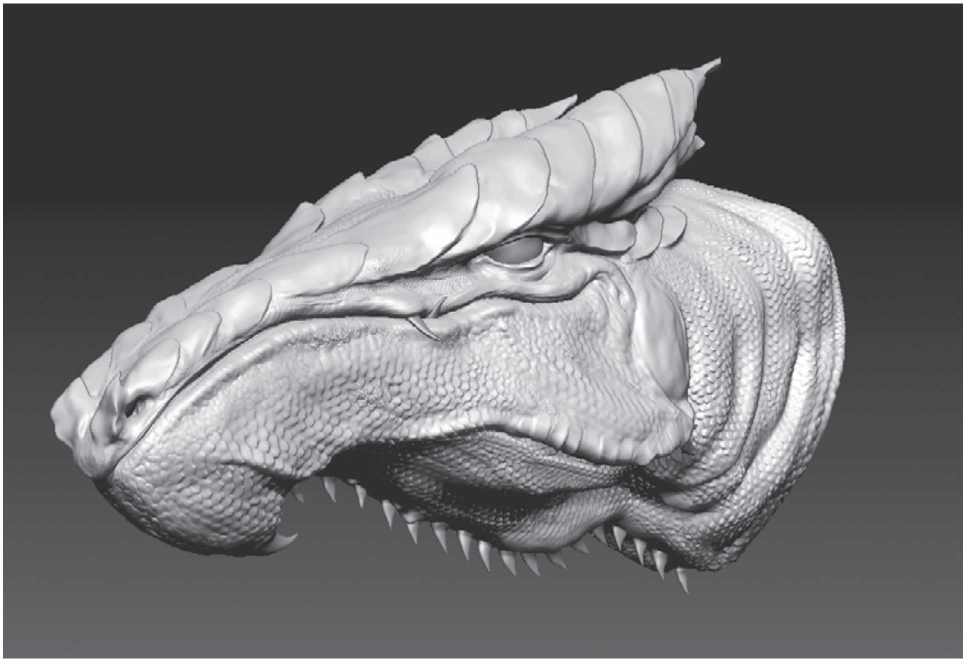


Figure 9.1
A model displayed in Preview rendering mode, which is the default rendering mode

The three other standard render modes are activated using the Flat, Fast, and Best buttons, which are on the Render palette (see Figure 9.2). You can see examples of the render modes in Figure 9.3. Flat render mode renders only the color of the pixols and 3D polymesh objects. It is quick and it allows you to view the colors applied to a polymesh, through polypainting or through textures, without the distraction of lights, materials, and shadows. Fast is similar to preview rendering; however, no shadows are visible. Best mode renders accurate shadows, reflections, global illumination, and other effects. It takes more time than the other modes and is used most often for finalizing a completed composition in ZBrush. Rendering a 3D polymesh is useful for when you want to present your digital sculpture as part of a portfolio.

Figure 9.2
Use the Flat, Fast, and Best buttons in the Render palette to switch between render modes.

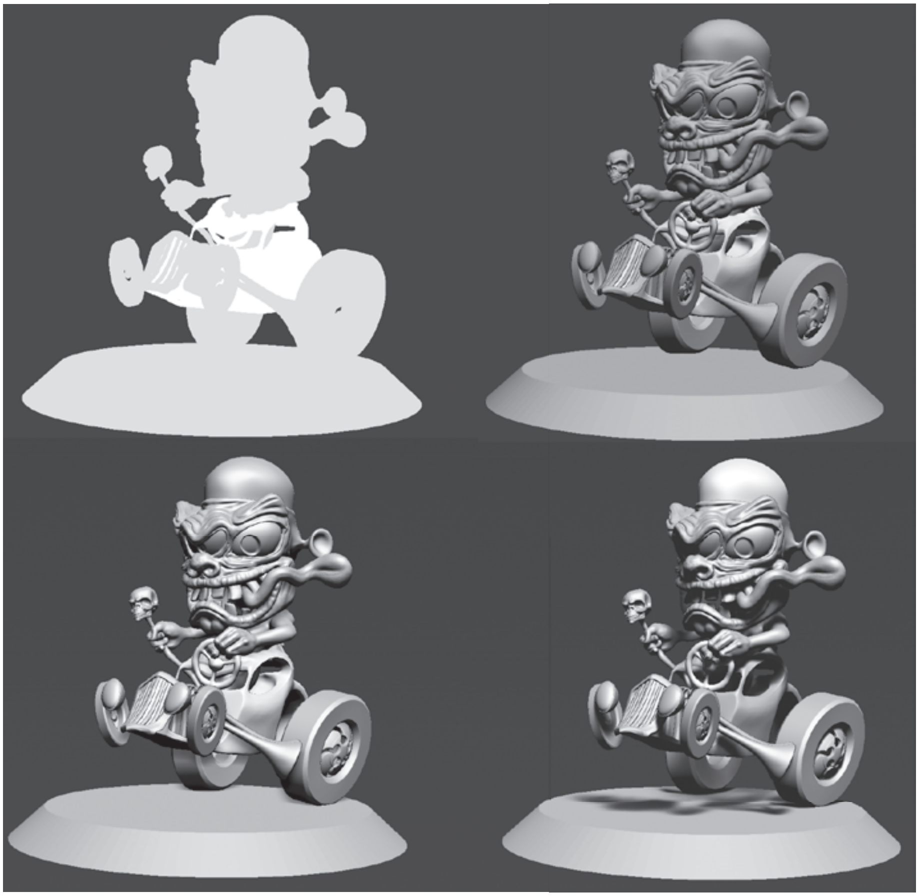


Figure 9.3
Clockwise from the upper left, a model is displayed using Flat, Fast, Preview, and Best render modes.

ZBrush 4 introduces a fifth render mode known as Best Preview Render (BPR). The purpose of this render mode is to offer you better-quality rendering than the standard Preview mode but without the computational overhead of Best mode. Best Preview Render also offers several advanced effects, including subsurface scattering, transparency, and ambient occlusion (see Figure 9.4).

The following sections provide a brief overview of how to use the Render palette. Rendering is very closely tied to lights and materials. After you have a basic understanding of how to use the Render palette, you will learn more advanced rendering issues in the sections on lights and materials.

SAVE OFTEN WHILE RENDERING

When rendering documents, save often. It is easy to accidentally create a setting that can crash ZBrush, causing you to lose your hard work.

Figure 9.4
A model rendered using Best Preview Render (BPR)

Choose a Render Mode

So which render mode should you use? There are many reasons for choosing one mode over another, but here are some general guidelines you can use. As you become more comfortable rendering in ZBrush, you may develop your own workflow for rendering and how you use the different modes.

Flat Use this mode when you want to see just the colors applied to a model. It is just like applying the Flat Color material to your model. You may want to switch to this mode when you just want to see the silhouette of your model or when you want to see the colors on the surface without the influence of shadows or material attributes.

Fast Use this render mode to optimize the performance of ZBrush while working on very high-resolution models.

Preview This is the default render mode. This is the most common mode to use while rendering because it displays the colors on the surface, simple shadowing, and BasicMaterial properties. Each of these features is a helpful visual aid while modeling, They help you see the contours of the surface and how the model will look when it has been polypainted.

Best Preview Render (BPR) This render mode offers the easiest way to get a great-looking image of your model. It offers the most advanced options of any of the render modes. Using BPR, you'll get excellent anti-aliasing along the edges of the model. You can easily render transparency for individual SubTools as well as realistic ambient occlusion and subsurface scattering. Many of the techniques demonstrated in this chapter rely on Best Preview Render, and you'll see how you can take advantage of its advanced features when rendering your own models.

Best Use this when you want to have more control over specific material properties, document layers, and shadowing effects. It generally takes longer to render in Best mode and a little more work to get good-looking results than using BPR.

This exercise demonstrates how to render using these different modes:

1. Start a new session of ZBrush. Use the Open button in the File palette to open the `dragonHeadRender.ZPR` project from the `Chapter 9` folder on the DVD.
2. Place the Render palette in a tray so that you can easily access the controls.
3. Rotate the view of the dragon head until you have a view that you like.
4. Press the Flat button in the Render palette.

Flat render takes almost no time at all. You can clearly see the color painted on the model but not the shadowing or any light effects.

5. Press the Fast button.

Fast render takes no time at all. You'll see very basic shadowing on the surface but no material effects.

6. Open the Light palette and drag on the large sphere to change the position of the light (see Figure 9.5). You'll see the lighting change on the model, indicating the direction for the light.
7. Try choosing another material from the materials fly-out library. The model won't look any different regardless of the material you select.
8. Select SkinShade4 from the materials fly-out library. Click Preview in the Render palette.

The model looks just like when you loaded it. When you change materials, the model updates. If you change the position of the light, the model updates as well as long as you have one of the standard materials applied. If you switch to one of the MatCap materials, the lighting of the surface will not update when you change the light direction in the Light palette. This is because of how MatCap materials are made. You'll learn more about lighting and the standard and MatCap materials later in the chapter.

9. Click the Best button in the Render palette.

Figure 9.5

Drag on the sphere in the upper left of the Light palette to change the light direction.

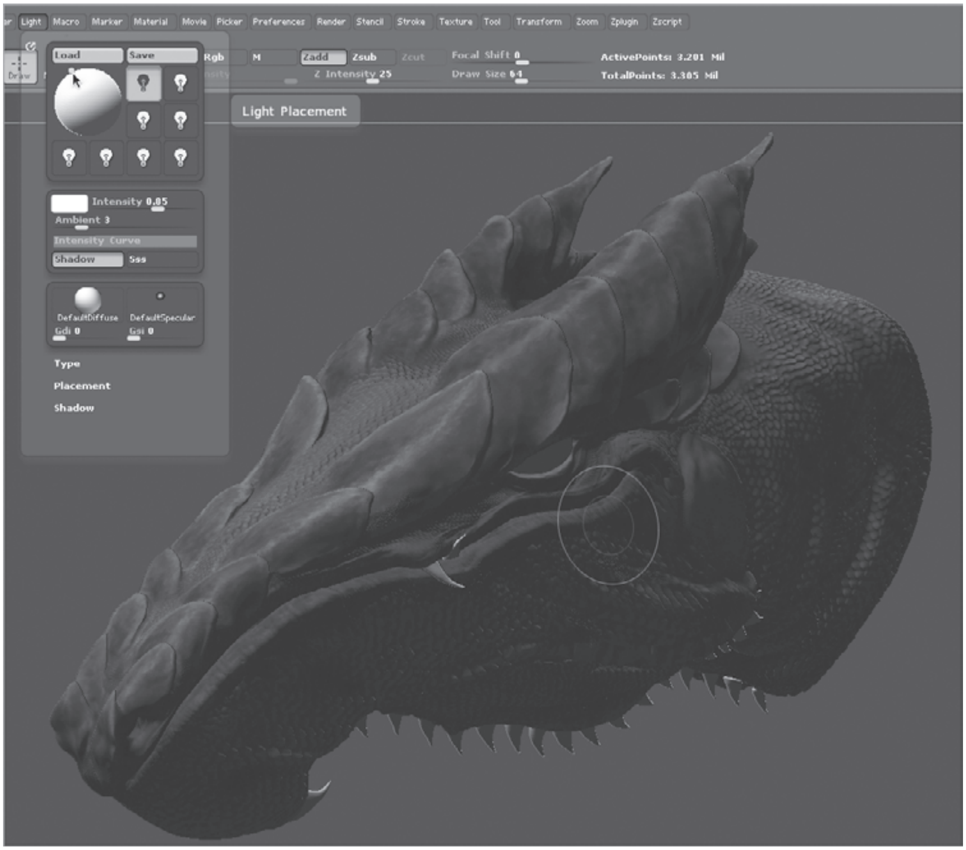
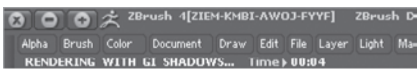


Figure 9.6

The progress bar at the top of the interface indicates how long it takes to create a Best render.



When you use the Best button, the screen takes longer to refresh. The progress bar at the top of the interface indicates how long the render is taking (see Figure 9.6). Note that the shadows look much softer. It may not seem like a massive improvement over the Preview render, but at the moment you are using just the default options, simple lighting, and the SkinShade4 material. As you start to adjust the options and as you create more complex lighting and materials, you'll see that the render time increases.

10. Rotate the view of the head. The canvas switches back to Preview mode automatically.
11. Press the Render button in the Render palette to create a new render at Best quality.
12. Press the BPR button on the top of the right shelf (see Figure 9.7).

Figure 9.7

Press the BPR button at the top of the right shelf.

You'll see the progress bar appear again as the screen refreshes. When the render is complete, you'll see that dragon head appear in Best Preview Render quality. The shadows will look a little different, and note that the edges of the model are at a higher quality. It may not seem like a dramatic difference, but as you learn more about the options available for Best Preview Render, you'll see that you can achieve very different effects using this mode instead of Best render mode. Just keep in mind that to create a render with Best Preview Render, you need to either press the BPR button on the right shelf or press the **Shift+R** hotkey combination. There is also a BPR button at the top of the Render palette.

That's all there is to creating a render. The following sections go into more detail about how to adjust the features for each render mode.

> **RENDERING SEQUENCES**
>
> Render modes in ZBrush are designed for rendering still images so you can show off your models or so you can create an illustration. You can render movies using Best and BPR quality render modes by using the settings in the Movie palette. This palette is discussed in Chapter 10.

Render a Region

Best rendering mode can often take a long time to calculate, and you may find yourself waiting around for the screen to refresh while you're developing the materials and lighting for your model. ZBrush gives you the option of rendering a small portion of the screen, which can make it faster to work on specific parts of the objects on the canvas. Note that the render region option is available only when you are using Best render mode. This exercise demonstrates how to use this feature:

1. Continue with the file from the previous section or load the `dragonHeadRender.ZPR` from the `Chapter 9` folder on the DVD.
2. Open the materials fly-out library on the left shelf and choose the ColorizeGlow material (see Figure 9.8).

Figure 9.8

Choose the ColorizeGlow material from the materials library.

This material has some features that are visible only when Best render mode is used, so it works well as a way to demonstrate how to render a region.

3. In the Render palette, click the Best button. As the image renders, the model turns bright yellow. This is the effect created by this particular material (see left image in Figure 9.9).
4. Rotate the view of the model. The mode switches back to Preview render mode.
5. Click the Cursor button in the Render palette. Drag the mouse pointer from the Cursor button to a spot on the dragon's head (see right image in Figure 9.9).

A small square section will render. You'll see that the dragon's head within the square is bright yellow while the rest of the model remains in Preview render mode. The area within the square has been rendered using Best mode. To choose another area, drag from the Cursor button in the Render palette to another part of the model. To refresh the area within the square, press the Cursor button.

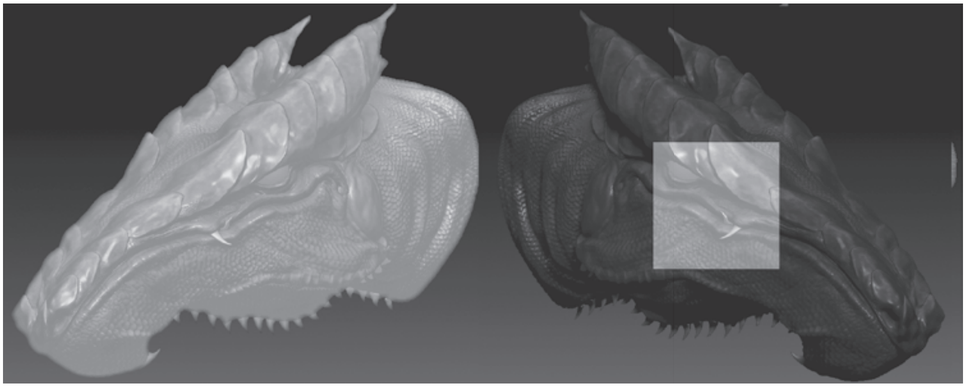


Figure 9.9

The dragon head renders in a bright yellow color when the Colorized Glow material is used at Best render quality (left image). Use the Cursor button to render a small section of the model at Best render quality (right image).

Render Options

In the Render palette, below the render mode buttons you'll see a number of buttons that activate various options (see Figure 9.10). The confusing thing about these buttons is that each option may or may not be available for each render mode. In the following list, I describe each option and which render mode it is used for. Remember that you can hold the mouse cursor over each button while holding the **Ctrl** button to see a pop-up box with more information about the option.

Figure 9.10

Render options are found below the render mode buttons

Shadows (BPR and Best) This enables the calculation of cast shadows. Shadows rendered in BPR will look different than shadows rendered in Best quality mode. The quality of BPR shadows is set using the Bpr Shadow options in the Render palette. The quality of shadows rendered in Best quality are set using the Shadow options in the Light palette.

AOcclusion (BPR only) This enables ambient occlusion shadowing. Ambient occlusion shadowing is a soft type of shadow that appears within the cracks and crevices of a model. It is similar to the type of shadowing seen in very diffuse lighting such as on a cloudy day. Using ambient occlusion is discussed in the section titled "Render Using BPR" later in this chapter.

Sss (BPR only) This enables subsurface scattering. This is a way of simulating deep translucency, which is helpful when rendering waxy materials or human skin. Using this feature requires a combination of settings found in the Render, Light, and Material palettes. Using Sss is discussed in detail later in this chapter in the section titled "Render Subsurface Scattering Effects."

Transparent (BPR only) This enables SubTools to appear transparent when rendering with BPR. Using the Bpr Transparency options in the Render palette, you can adjust the amount of refraction and the quality of the transparency. Note that there are also techniques for rendering transparency using Best render mode, but this requires a different set of options found in the Material palette. Using this option is explained later in this chapter in the section titled "Render Using BPR."

Fibers (BPR and Best) This enables rendering of fibers to create the look of fur when using the Fiber material. This is explained later in the chapter in the section titled “Render Fibers.”

HD Geometry (BPR Only) This enables the rendering of high-definition geometry when using BPR. HD geometry is an advanced feature and beyond the scope of this book.

Fog (Preview, BPR, and Best) This enables the display of fog, which can add a sense of depth to your images. The Fog settings are found toward the bottom of the Render palette. Using these options is discussed later in the chapter in the section titled “Render Using Best Mode.”

View Blur (all render modes) This is an interesting option that can be used while sculpting. Artists will often squint their eyes when looking at a subject or at their composition as a way to help them focus on the overall forms without the distraction of details. The View Blur option is meant to simulate this on the ZBrush canvas. Once you activate this feature by turning on the View Blur button, you can then adjust the amount of blurring using the VBlur Radius slider at the top of the Render palette.

Depth Cue (Best and BPR) This enables a subtle blurring effect meant to simulate camera depth-of-field effects. Parts of an object that are more distant appear blurrier than parts of the object that are closer to the front of the canvas. To tune the effect, use the options in the Depth Cue section of the Render palette.

Figure 9.11

Double-click the `Mnan Scene1.ZPR` **project in Light Box.**

The following steps demonstrate how to apply Depth Cue:

1. Start a fresh session of ZBrush.
2. Open Light Box to the Projects section. Double-click the `Mannequins` folder to see the Mannequins projects in Light Box (Figure 9.11). On the Mac, the mannequins are found within the Projects section of Light Box with all of the other project files.
3. Double-click the `Mnan Scene1.ZPR`. This is the scene that has several mannequins arranged in a restaurant scene.
4. Rotate the view of the scene so that the waiter with the pizza is in the background.
5. Open the Render palette. Click the Depth Cue option to enable this option.
6. Expand the Depth Cue section in the lower half of the Render palette (see Figure 9.12).

Figure 9.12

Expand the Depth Cue options in the Render palette.

There are two sliders that determine the depth settings for the blurring effect. The Depth1 slider determines where the image will be clear, and the Depth2 slider determines where the image will be blurred. You can enter the settings numerically by adjusting the sliders, but there’s actually a much more intuitive way to do this.

7. Click the Depth1 slider in the Render palette and drag the mouse cursor onto the canvas. Drag it to a part of the scene that is in the foreground, on top of one of the mannequins. This sets the depth for the area that will be in focus.
8. Click the Depth2 slider in the Render palette and drag the mouse cursor onto one of the characters in the background. This sets the depth for the area that will be out of focus.
9. Set Intensity to **100** and Softness to **8**.
10. Click the Best button in the Render palette to render the image at Best quality.

The Depth Cue effect is fairly subtle even at the highest settings (see Figure 9.13). You can fine-tune the effect using the Depth Cue edit curve at the bottom of the Depth Cue subpalette of the Render palette. If you want to create an image with a strong sense of depth of field, you may want to export a depth pass along with the image and use a program such as Photoshop to create depth of field. You'll learn how to export a depth pass later on in the chapter.

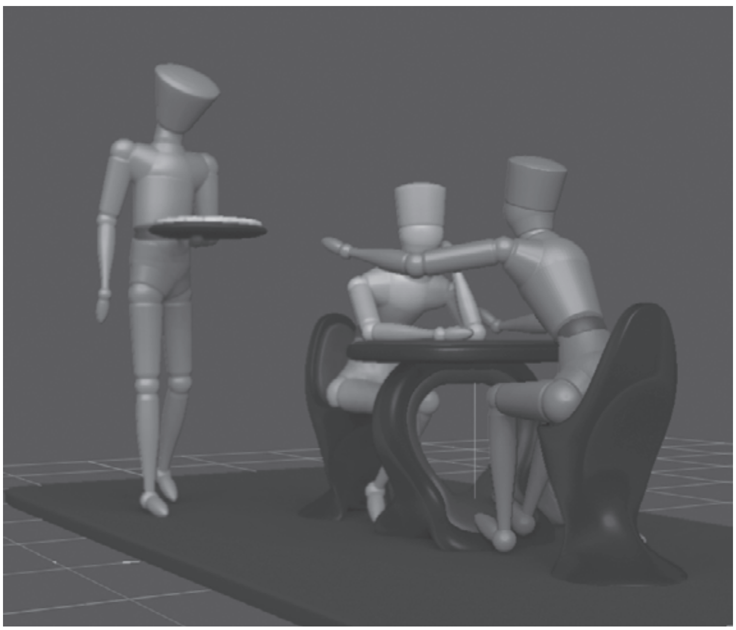
Soft Z (Best) This option helps improve the anti-aliasing of edges when rendering with Best render mode is used.

Soft Rgb (Best) This option helps improve the anti-aliasing of surfaces when Best render mode is used.

Flatten (Best) This is on by default. This option flattens all the document layers into a single pass when Best render mode is used. Document layers are different from 3D layers (discussed in Chapter 10).

Figure 9.13

Depth Cue adds a subtle blur to objects in the background.



Render Using BPR

As mentioned earlier, Best Preview Render (BPR) is a new render mode that has been added to ZBrush 4. BPR tends to render faster than Best quality mode and has a few features, such as SubTool transparency, ambient occlusion, render passes, and subsurface scattering, that are not available in other modes. Because it is easy to use and has so many great features, you may find that it will become your favorite render mode. It's the ideal choice when you want to export an image for easy compositing in a digital paint program such as Adobe Photoshop. In the following sections, you'll learn how to use BPR and some of its features.

SUBSURFACE SCATTERING

Subsurface scattering involves using specific light and material settings, so you'll learn about it at the end of the chapter in the section titled "Render Subsurface Scattering Effects" after you have acquired a good understanding of lights and materials.

Create a BPR Render

You can create a BPR render at any time by pressing the BPR button on the top of the right shelf (see Figure 9.14) or by pressing the **Shift+R** hotkey combination. When you start a BPR render, the progress bar at the top of the interface appears, indicating how long it will take to render the image. Note that unlike with Best render mode, you won't see any change on the canvas until the render is complete. Once it is finished, the render will appear on the canvas and you'll see a significant improvement in quality versus Preview mode.

You can stop the render at any time by pressing the **Esc** key on your keyboard. When the render is complete, any tools on the canvas that are in Edit mode remain in Edit mode—they have not been dropped to the canvas. If you move, scale, or rotate the view of the model, the canvas automatically switches back to Preview render mode. You'll have to create a new BPR render after you change the view on the canvas.

Figure 9.14

The BPR button at the top of the right shelf

Subpixel Anti-aliasing Quality

As discussed in Chapter 1, anti-aliasing refers to a trick used by graphics software packages to improve the quality of the edges of a digital image. All images created on a computer are made up of tiny colored squares known as pixels. Without anti-aliasing, these tiny squares are clearly visible along the edges of an object on a computer screen, which gives the image a jagged appearance. The process of anti-aliasing blends the colors of the edges together, creating a softer appearance for the edges.

Figure 9.15
The SPix slider at the top of the right shelf

When rendering with BPR you can control the amount of anti-aliasing using the SPix slider on the top of the right shelf (see Figure 9.15). To increase the quality of the anti-aliasing in the rendered image, increase the value of the SPix slider. Note that higher values will increase the time it takes to create the render.

SubTool Transparency

If you want parts of an object to appear transparent in a render, the easiest and best way to do this is to use the BPR SubTool transparency option. Using the Bpr Transparency options in the Render palette, you can add refraction effects, which can make your surfaces appear like glass or water.

In this exercise, you'll see how you can create the look of a glass dome on the monster car model.

1. Start a new session of ZBrush. Use the Open button in the File menu to open the `MonsterCar.ZPR` project from the `Chapter 9` folder on the DVD.

This model is a cartoon hot rod created in the style of Ed Roth. The three-eyed monster driving the car has a dome on the top of his head covering his brain. In Preview mode, you can't see his brain because the dome is opaque.

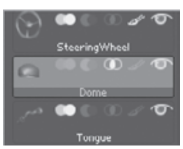
Figure 9.16
Turn on the Transparent button in the Render palette.

2. Place the Render palette in a tray so that you can easily access the render options while working on the model.
3. Turn on the Transparent button (see Figure 9.16). This enables SubTool transparency when rendering using BPR. Keep in mind that this option only affects BPR renders. It has no effect when rendering in any of the other render modes.

Now that Transparency is enabled, you have to indicate which SubTool or tools you want to be displayed as transparent in the BPR render. To do this, you'll activate a flag in the SubTool subpalette of the Tool palette.

4. In the Tool palette, expand the SubTool subpalette. Find the SubTool that has been labeled Dome.
5. Click the intersection icon, shown in Figure 9.17. This lets ZBrush know that you want this object to appear transparent in the render.

Figure 9.17
Turn on the intersection icon for the Dome SubTool.



You can make any number of SubTools transparent. SubTool transparency is completely independent of any material settings. So even if every SubTool uses the same material, only the SubTools that have the intersection icon activated will appear transparent.

6. Press **Shift+R** to render the model using BPR. After a few moments, the model will appear at a higher quality. You can clearly see the brain through the glass dome (see Figure 9.18).

Figure 9.18
The brain is visible behind the transparent dome.

Adjust SubTool Transparency

The quality of the SubTool transparency seen in the BPR render is determined using the Bpr Transparency settings in the Render palette. The level of transparency is determined by either the direction of the face normals or the color applied to the SubTool or a combination of both.

This exercise demonstrates how to take advantage of these settings using a very simple model.

1. Start a fresh session of ZBrush.
2. Use the Open button in the File menu to load the `SToolTrasparency.ZPR` project from the `Chapter 9` folder on the DVD.

   This project has a PolySphere surrounded by a twisted torus (see Figure 9.19).

3. Place the Render palette in a tray so you can easily access the controls.
4. In the Render palette, click the Transparent button to activate transparency for SubTools. Turn off the Shadows button.
5. Expand the Bpr Transparency subpalette of the Tool palette.

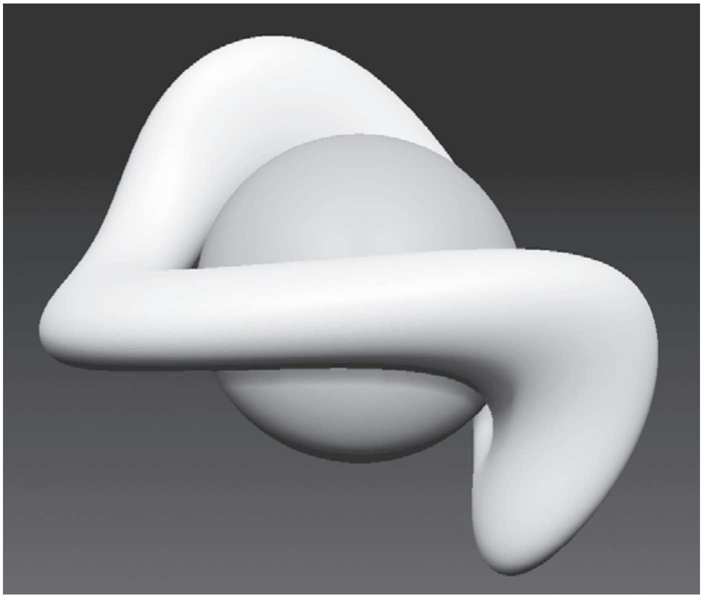


Figure 9.19
The SToolTransparency project contains a PolySphere surrounded by a twisted torus.

Surface Normal Transparency

For the moment, you're only interested in seeing how the normal direction of the objects affects the transparency of the SubTools. To see how this works, you want to turn off color transparency and refraction in the Bpr Transparency subpalette of the Render palette (see Figure 9.20).

Figure 9.20
Adjust the settings in the Bpr Transparency subpalette of the Render palette.

1. Set the ByColor and CFactor sliders to **0**.
2. Set Refract to **0**.
3. Set the Strength slider to **1**.

Strength determines how much the transparency of the SubTool is affected by the NFactor slider. NFactor determines how the direction of the surface normals affects the transparency.

FACING RATIO

Facing ratio is a term commonly used in 3D graphics to describe the angle of the surface relative to the view of the object. This is also referred to as angle of incidence. The parts of an object that are perpendicular to the viewing angle have a high facing ratio. So the front of the sphere, for example, has a high facing ratio. The parts of the surface that turn away from the viewing angle have a low facing ratio. So the sides of the sphere as they turn away from the view have a low facing ratio.

The NFactor slider sets the amount of transparency based on the facing ratio of the surface. This will be much easier to understand using the following demonstration.

1. In the SubTool subpalette of the Tool palette, select the Torus SubTool. Turn on the intersection icon as shown in Figure 9.21.
2. In the Bpr Transparency subpalette of the Render palette, set NFactor to **0.5**.
3. Press **Shift+R** to create a render with Best Preview Render.

Figure 9.21
Turn on the intersection icon for the Torus SubTool

The resulting render shows that the parts of the torus that are perpendicular to the view are transparent (see left image in Figure 9.22). The parts of the surface that turn away from the view are opaque.

4. Set NFactor to **0.1** and create another BPR render.

You can see now that when NFactor is low, only the very edges of the torus are opaque. Most of the surface is now transparent (see right image in Figure 9.22).

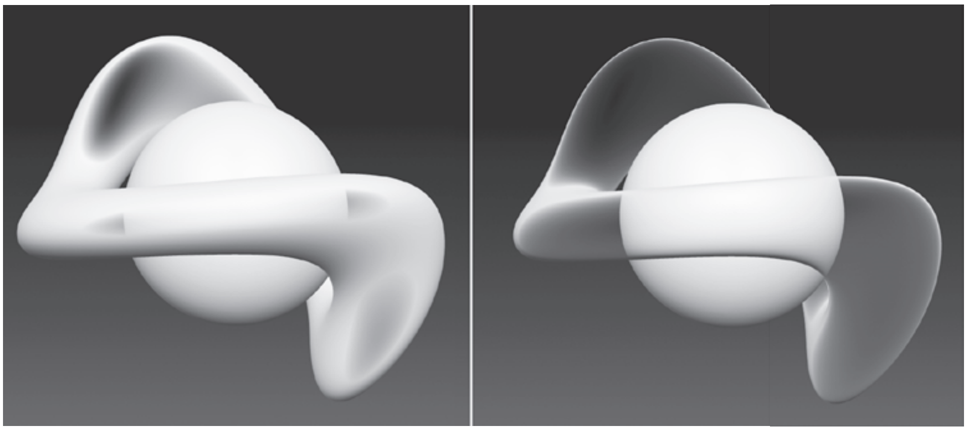


Figure 9.22
The parts of the torus that are perpendicular to the view are transparent (left image). Most of the torus is transparent except for the very edges (right image).

5. Experiment with different settings for NFactor and create a BPR each time to see the result.
6. Continue using this file in the next section.

At an NFactor setting of 0, the surface is invisible. At an NFactor setting of 1, the surface is opaque. If Shadows are turned on in the Render options, it will affect the transparency so that the edges of the sphere are always visible.

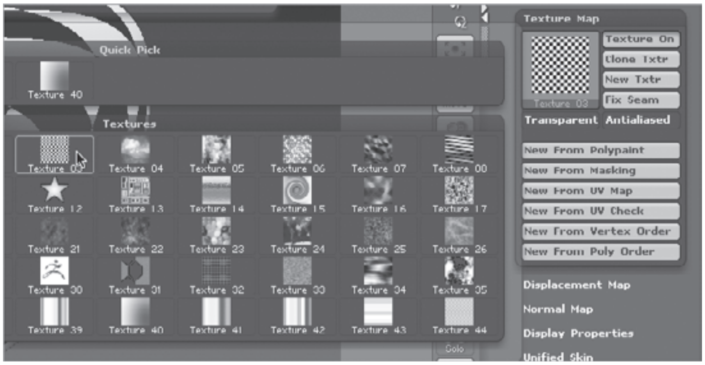
You can adjust the Strength setting in conjunction with the NFactor setting to create a variety of transparency styles.

Color Transparency

Now let's take a look at how color can be used to determine transparency. The color of a SubTool determines how transparent the surface appears when it is rendered using BPR. Darker values make the surface appear transparent; lighter values make the surface appear less transparent. It is important to understand that in this case the transparency effect takes into account the color of the SubTool as it appears on the canvas. This means that colors painted on the surface, the shadows, the reflectivity of the material, and any textures applied to the surface are all part of how transparency is calculated. This short exercise will help clarify this point.

1. In the SubTool subpalette of the Tool palette, make sure the Torus SubTool is selected.
2. In the Texture Map subpalette of the Tool palette, click the large square in the upper left to open the texture library. Select Texture 03, which is the checkerboard texture (see Figure 9.23)

Figure 9.23
Choose the checkerboard texture from the Texture Map subpalette of the Tool palette.



3. In the Bpr Transparency subpalette of the Render palette, set Strength to **0**.

The Strength slider determines transparency based on normal direction. While you are experimenting with color-based transparency, you don't want this option influencing the result. Setting Strength to 0 disables normal-based transparency.

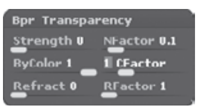
The ByColor slider determines to overall level of transparency of the SubTool based on the color of the object.

4. Set ByColor to **1**.

The CFactor setting determines how the color influences the transparency of the SubTool. Think of it as a way to set a threshold value. When CFactor is at a low value, colors darker than white will make the surface appear transparent. When CFactor is at a high value, the darkest colors will appear transparent. Let's take a look at how this works.

5. Set CFactor to **1** and press **Shift+R** (see Figure 9.24). The black areas of the checkerboard texture are completely transparent. The white areas are semitransparent (see Figure 9.25).

Figure 9.24
Set CFactor to 1 in the Bpr Transparency subpalette of the Render palette.



If you want the white areas of the checkerboard to appear opaque, increase the CFactor value.

Just as with normal-based transparency, you can adjust the ByColor slider to determine the overall transparency of the surface. Try different combinations of settings for ByColor and CFactor.

Now consider that changing the material also influences the color transparency, and furthermore, you can combine normal-based transparency and color-based transparency. By using different materials, textures, and a variety of settings for Strength, NFactor, ByColor, and CFactor, you have an almost infinite variety of ways to create a transparent look for SubTools. Even though the same settings in the Render palette apply to all SubTools, keep in mind that each SubTool can have a different color or texture, so through the strategic use of color, you can make some SubTools appear more or less transparent than others.

Figure 9.26 shows how using color-based transparency and different materials and textures affects the way the transparency appears.

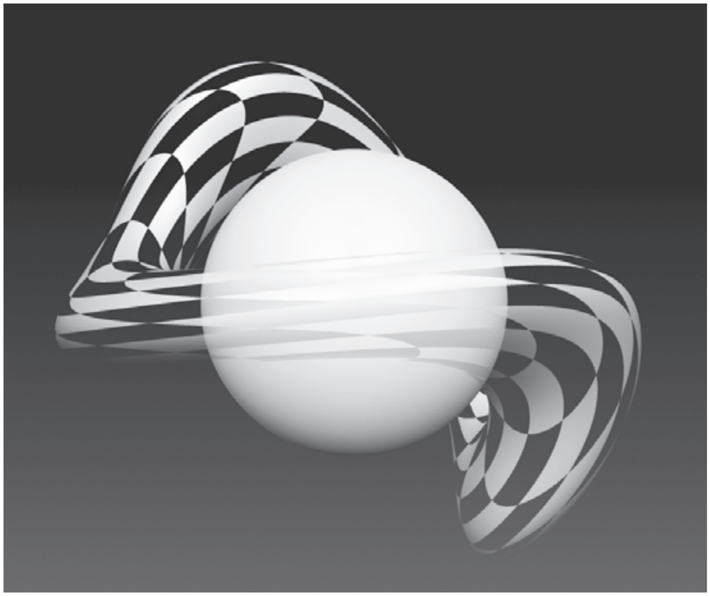


Figure 9.25

The black areas of the texture are transparent; the white areas are semitransparent.

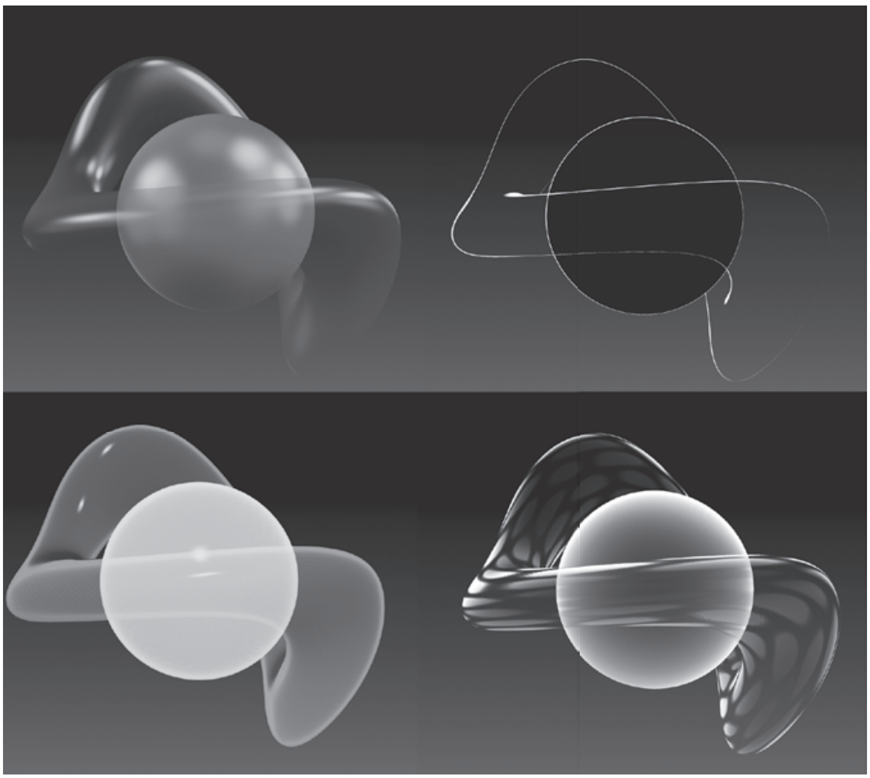


Figure 9.26

The torus is rendered using different materials and textures using a ByColor setting of 1 and a CFactor setting of 1.

SubTool Refraction

Refraction occurs when photons of light passing through a transparent material change direction. This is because the speed of the photons is actually reduced compared to the speed of light traveling through a vacuum. You can create the appearance of thick, transparent materials such as glass or plastic by adjusting the Refract and Refraction Factor sliders in the Render palette.

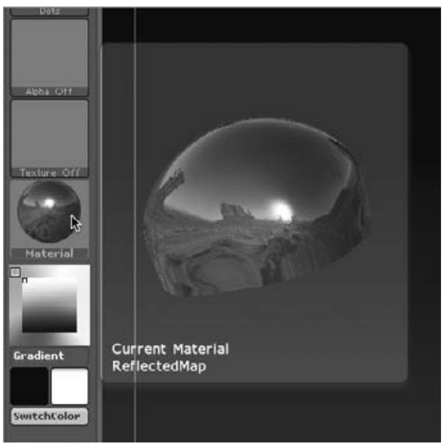
The Refract slider controls the amount of overall refraction; RFactor controls the quality of the refraction. The Refract slider goes from 0 to 1, where 1 is the most amount of refraction. The RFactor slider goes from 0 to 250, where higher values create the look of thick materials.

In this exercise, you'll create the look of a thick glass dome for the MonsterCar tool. The reflective quality of the dome will be created using a material, while transparency and refraction will be simulated using the Bpr Transparency settings.

1. Use the Open button in the File menu to load the `MonsterCar.ZPR` project from the `Chapter 9` folder on the DVD.
2. In the Tool palette, expand the SubTool subpalette. Select the Dome SubTool.
3. Turn on the intersection icon for the Dome SubTool.
4. In the materials fly-out library on the left shelf, select the ReflectedMap material. This material will be applied to the entire MonsterCar model, making it look like it is shiny chrome reflecting a desert scene (see Figure 9.27).
5. On the top shelf, turn on the M button. This activates material painting.
6. Open the Color palette and press the Fill Object button. This fills the current SubTool with the material. You won't see any difference just yet.
7. In the material library, select the SkinShade4 material. The model switches back to the white material except for the dome, which still uses the ReflectedMap material (see Figure 9.28).

Figure 9.27

Choose the ReflectedMap material from the material library.



The Dome SubTool has been filled with the reflected map material. By using the Fill Object button in the Color palette while the M button is activated, you can fill a SubTool with a material just as you can fill a SubTool with a color. If you turn on the Mrgb button and press Fill Object, then the SubTool is filled with both the main color and the material.

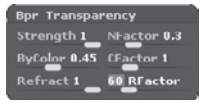
8. Place the Render palette in a tray so that you can easily access the settings.
9. Turn on the Transparent button.

Figure 9.28

The ReflectedMap material is applied to the dome while the rest of the model uses Skin-Shade4.

Figure 9.29

The Bpr Transparency settings in the Render palette



10. Position the view of the model on the canvas so that you can see the dome on the top of the monster's head.
11. In the Bpr Transparency subpalette, use the following settings (see Figure 9.29):

    Strength: **1**

    NFactor: **0.3**

    ByColor: **0.45**

    CFactor: **1**

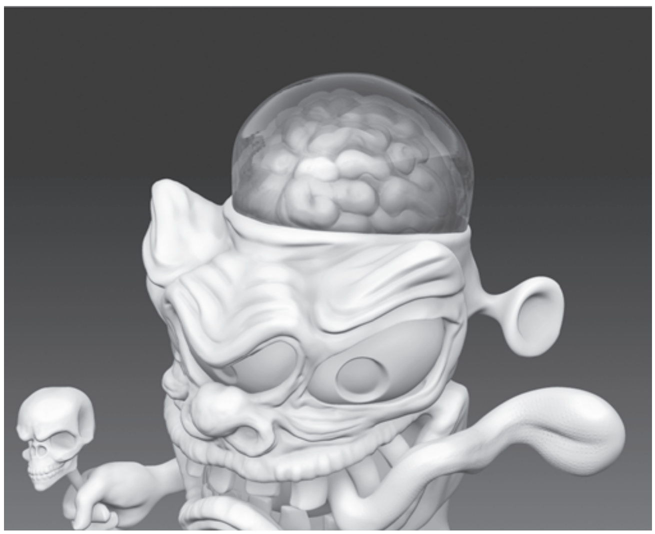
    Refract: **1**

    RFactor: **60**
12. Press **Shift+R** to create a BPR render (see Figure 9.30).

To make the glass appear thicker, try a higher setting for RFactor. You can also make the glass appear more realistic by adjusting the transparency settings. The reflectivity of the dome is controlled by the material. You'll learn more about working with materials later in the chapter.

Figure 9.30

Increase the RFactor slider to make the glass appear thick.



Bpr Shadow

Figure 9.31
Shadow quality for BPR renders is set in the Bpr Shadow subpalette of the Render palette.

When you're rendering with BPR, the position of the light in the Light palette determines the direction of the shadow, but the quality of the shadows themselves are determined by the settings in the Bpr Shadow subpalette of the Render palette (Figure 9.31).

To change the way the shadows look when rendering with BPR, adjust the settings in the Bpr Shadow subpalette and then render using BPR (hotkey = Shift+R). The following is a description of each setting:

Strength This determines the opacity of the shadows. The slider ranges from 0 to 1. At a setting of 1, the shadows are very dark.

S Color Click the S Color color swatch to open the color picker. This allows you to change the color of the shadows themselves, which can be useful for creating special effects.

Rays This determines the number of rays used to calculate the shadow. Increasing this value improves the render quality but can add to render time.

Angle This determines the angle between each shadow ray. The slider goes up to 360. Higher values create softer shadows (see Figure 9.32). An angle of 360 will create a look similar to ambient occlusion shadowing.

Res This determines the resolution of the shadow in pixels. Higher values produce sharper, higher-quality shadows, which can increase render time. You can save some render time by lowering this value when you plan to render blurred shadows.

Blur This adds a blurring to the edges of the shadows, which softens the overall look.

VDepth This is an offset to the position of the shadow casting lights based on the view. Negative values increase the intensity of the light and the shadows, and positive values create an overall shadow.

Figure 9.32
The left image uses an Angle setting of 0; the right image uses an Angle setting of 20.

LDepth Similar to VDepth in that this slider creates an offset to the position of the shadow casting light, however this offset is applied to the lights themselves. Negative values increase the intensity of the light and the shadows, positive values create a more overall shadow.

Spd This adds subpixel anti-aliasing calculations to the shadow. Turn this off to speed up the shadow calculation. Turn this on to improve the quality of the shadows.

Ambient Occlusion

Ambient occlusion is a popular way to simulate the look of diffuse lighting in computer graphics by using soft shadows in the cracks and crevices of 3D objects. ZBrush 4 has added this feature as part of the Best Preview Rendering mode. The settings on the Bpr AO subpalette of the Render palette allow you to balance the quality of the ambient occlusion shadows with the time it takes to render them.

To create ambient occlusion shadows, ZBrush creates an array of virtual lights in a sphere around the model. Each light casts a shadow, and the shadows are blended together. You don't actually see the lights in the scene, just their shadows. Models rendered with ambient occlusion tend to look solid and realistic.

The following is a description of what each setting in the Bpr AO subpalette of the Render palette does:

Strength Controls the opacity of the effect. The slider range goes between 0.01 and 1. Lower values reduce the visibility of the ambient occlusion shadows on the surface of the model.

Color Click on the color to open up the color picker. Choosing a color other than black will tint the ambient occlusion shadows. This can be used to create a stylistic look.

Rays This controls the number of rays used by each light to create the ambient occlusion shadow. More rays mean higher quality but longer render times.

Angle This controls the angle between each light used to create ambient occlusion shadows. Lower values mean that the lights are closer together, causing the shadows to look like blurry cast shadows. The default value of 360 means that the ambient occlusion shadow lights are arranged in a sphere around the model, creating the look of diffuse lighting.

Res Controls the resolution of the shadows cast by the lights in pixels. Higher values produce a stronger, higher-quality shadow but also increase render times. The default value of 500 is usually sufficient for most cases.

Blur This blurs the edges of each overlapping shadow cast by the ambient occlusion lights, which helps to create the look of soft, diffuse shadows. If you want to save render time by using lower settings for Rays or Res, then increase the Blur value to compensate.

LDepth and VDepth These sliders offset the position of the ambient occlusion lights. The result is longer or shorter shadow length. Use positive values for either slider to create larger areas of shadowing. Use negative values to create tighter areas of shadow. The purpose of these sliders is to allow you to adjust the look of the ambient occlusion shadows themselves.

Spd This button activates subpixel calculations, which improves the look of the shadows. Turn this off to save time while you make adjustments to the ambient occlusion and then turn it on when creating a final render to improve quality.

Figure 9.33
In the Render palette turn off Shadows and turn on AOcclusion.

Gamma This is more to control the gray value between the black and white. If you turn this down, you will have more gray values. If you turn it up, then there will be more white and only the blackest areas will remain in the areas shaded by the ambient occlusion effect. The default setting is 5. The slider goes from 0.1 to 25.

The following short exercise demonstrates a useful workflow for adding ambient occlusion to BPR renders.

1. Use the Open button in the File menu to load the `MonsterCar.ZPR` project from the `Chapter 9` folder on the DVD.
2. In the materials fly-out library on the left shelf, choose the Flat Color material. This will allow you to see just the white color of the surface without the influence of material color or surface shadowing.
3. Place the Render palette in a tray so that you can access the controls.

Figure 9.34
The model is rendered using ambient occlusion and the Flat Color material.

4. In the Render palette, turn off the Shadows button. Turn on AOcclusion (Figure 9.33). This way you'll only see the ambient occlusion shadows.
5. Expand the Bpr AO subpalette of the Render palette.
6. Turn off the Spd button. This will speed up the calculation while you tune the settings.
7. Press **Shift+R** to create a BPR render (see Figure 9.34).

You'll see the model with just the ambient occlusion shadowing. Try experimenting with the settings to see how you can change the look of the ambient occlusion shadowing. You can use ambient occlusion shadowing with any material. The Flat Color material just makes the effect more noticeable.

Render Using Best Mode

There are a number of settings in the Render palette that are used when rendering in Best quality mode. The anti-aliasing settings improve the quality of the image but can increase render times. Using Fog can add a sense of depth to the images you create on the canvas. The following sections describe how to use these options.

Anti-Aliasing

The Antialiasing subpalette of the Render palette pertains specifically to renders created using Best render mode. If you are using Best Preview Render (BPR), use the SPix slider on the right shelf to adjust image quality.

The following list includes a description of each control and how it affects renders created using Best render mode:

Blur This smooths the edges as well as the transition between different colors on the canvas by blurring the pixels.

Edge This slider sets a threshold value to determine how sharp an edge on the canvas needs to be before it is affected by blurring. Higher values mean that more of the image will be blurred to create the appearance of smooth edges. If this is set to a low value, only the sharper edges will be blurred.

Size (sample size) When you start a Best quality render, ZBrush examines the pixels on the canvas while the render is being calculated. Each pixel is compared to the surrounding pixels to determine how anti-aliasing should be applied. This process of comparing each pixel is known as sampling. By increasing the sample size, you are increasing the number of pixels within the sampling calculations. Larger values increase the render time but create a higher quality image.

Super Sample When you create a Best render, you can use the Super Sample slider to increase the number of times each pixel on the canvas is sampled. Higher values increase image quality but also increase the time it takes to render the image.

Fog

Fog creates a sense of depth by adding a color gradient along the z-axis of the canvas. This means that the parts of the image or model that are farther away from the front of the canvas generally receive more color tinting than the parts of the image or the model that are closer to the front of the canvas. You can adjust and even invert this effect to create stylistic images. This exercise demonstrates how you can use Fog. The Fog settings can be used in images created in Preview, Best, and Best Preview Render modes.

1. Use the Open button in the File menu to load the `MonsterCar.ZPR` project from the `Chapter 9` folder on the DVD.

Figure 9.35

The Fog settings in the Render palette.

2. In the Render palette, turn on the Fog button to activate Fog. You'll see the background turn white.
3. Expand the Fog subpalette of the Render palette (see Figure 9.35).

The Intensity slider controls the overall intensity of the fog effect.

4. Set Intensity to **70**.

The Depth1 slider determines the point along the z-axis at which the fog starts, and the Depth2 slider determines the point along the z-axis where the fog ends. You can use the sliders to determine these points numerically, or you can drag on the canvas to set these points interactively, as described in the next steps.

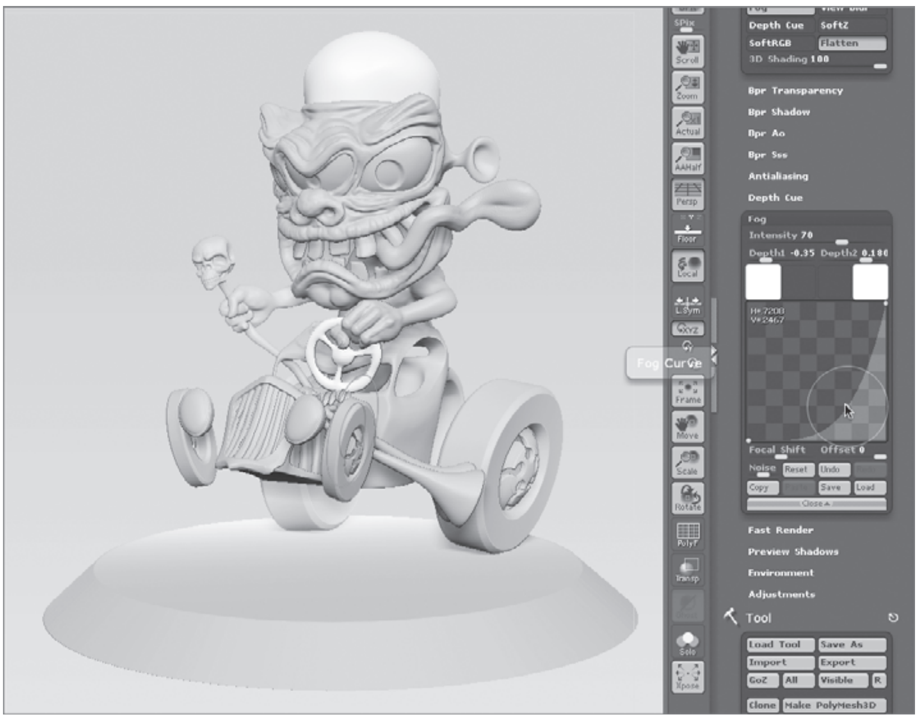
5. Click the Depth1 slider and drag the mouse cursor to part of the model that is close to the front of the canvas, such as one of the front tires of the car.
6. Click the Depth2 slider and drag the mouse cursor to part of the model that is far away from the front of the canvas, such as one of the back tires.

This establishes the depth of the fog effect. You can rotate the view of the model; the start and end point of the fog remains consistent regardless of how the model is rotated.

7. Click on the Fog Curve edit curve. Use this to fine-tune the fog gradient.
8. Add a point to the edit curve by clicking on it. Drag the point down to the right to create a curve with a sharp peak on the right, as shown in Figure 9.36.

Figure 9.36

Edit the look of the fog by adding a point to the Fog Curve edit curve.



Try adjusting the edit curve to create different looks for the fog effect.

You can change the color of the front of the fog by clicking the large white box on the left in the Fog subpalette. This opens a color picker that can be used to choose a color. Click on the large white box on the right to change the color for the back of the fog. For example, if you wanted to create an undersea image, make the front of the fog light blue and the back of the fog dark blue.

9. Click on the space next to the color swatch on the right. This opens the texture library.
10. Select texture 35 from the texture library. This is an image of turbulent noise. You won't see an immediate change just yet.
11. Click the Best button to create a Best quality render. The fog texture only appears in Best quality render mode (see Figure 9.37).

You can add a different texture to the front and the back of the fog. The left image is applied to the front, and the right image is applied to the back. Keep in mind that you can import your own images to create a custom look for the fog. Just use the Import button in the Texture palette to import an image; then apply it to the fog just like any other texture.

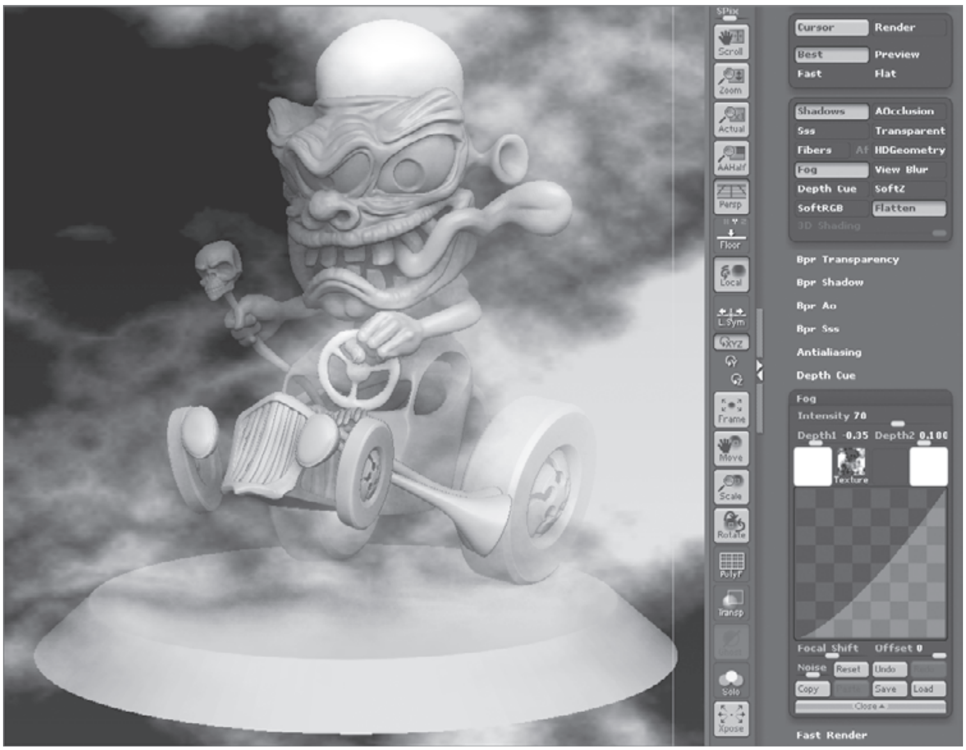


Figure 9.37

Add a texture to the fog to create the look of smoky fog.

Export a Render

Exporting the canvas as an image is very easy to do. You can use the Export button in the Document palette to export the canvas in Photoshop, bitmap, or TIF formats (see Figure 9.38). The image will look exactly as it does on the canvas, so if you want to export a high-quality image, render using BPR or Best render mode first, then click the Export button and save the image to your disk.

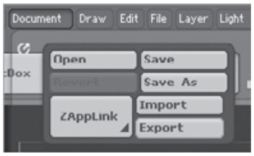


Figure 9.38
Export the canvas using the Export button in the Document palette.

ZBrush 4 adds additional render options that allow you to export passes, which can then be imported into and composited in another program such as Adobe Photoshop.

The following sections describe some options you can take advantage of when you want to export an image from ZBrush.

Document Size and Background

If you want to export an image at a specific size, use the Width and Height sliders in the Document palette. If the Pro button is activated, the values of the sliders will be linked proportionally, so you only have to adjust one of the values and the other will update automatically. Turn Pro off if you want to set a specific size for both Height and Width (see Figure 9.39).

The document will not change in size until you press the Resize button. Keep in mind that any tools on the canvas will be converted to pixols and dropped to the canvas when you press the Resize button. You may want to clear the canvas (Ctrl+N) after resizing and redraw the tool on the canvas after it has been resized.

Figure 9.39
Set the document size using the controls in the Document palette.

A large canvas size will affect the performance of working in ZBrush. If you want to export a large image from ZBrush, consider working on your tools in the default document size and then resize the document, draw the tool or tools on the canvas, arrange them where you'd like, and finally, export the image.

The Half and Double buttons are there for convenience so that you can cut the canvas size in half or double it easily. Just as with Resize, using these buttons will convert the active tools into pixols and drop them to the canvas. Many ZBrush artists will create an image that's twice the size they need and then export the final image at half size to improve anti-aliasing quality. However, with the improvements to anti-aliasing in BPR mode, this workflow is not as necessary anymore.

To change the look of the background, click the Back button in the Document palette and drag the mouse pointer to any part of the canvas to sample a specific color. Drag the mouse pointer down to the color picker on the left shelf to sample a color. Use the Range, Center, and Rate sliders to change to look of the background gradient. Set Range to **0** to get rid of the gradient altogether.

If you'd like to use your own image as a background, use the following steps:

1. Click the Import button in the Texture palette and choose an image from your local drive (see Figure 9.40). You can also use the Import button in the texture fly-out library on the left shelf to do the same thing.
2. Make sure the canvas is clear of any tools.
3. Choose the Flat Color material from the materials library.
4. In the Texture palette, click the CropAndFill button. This will resize the canvas to match the size of the image and place the image in the background (see Figure 9.41).

It is important to remember to choose the Flat Color material before filling the background with an image; otherwise, the color of the material will affect the color of the image.

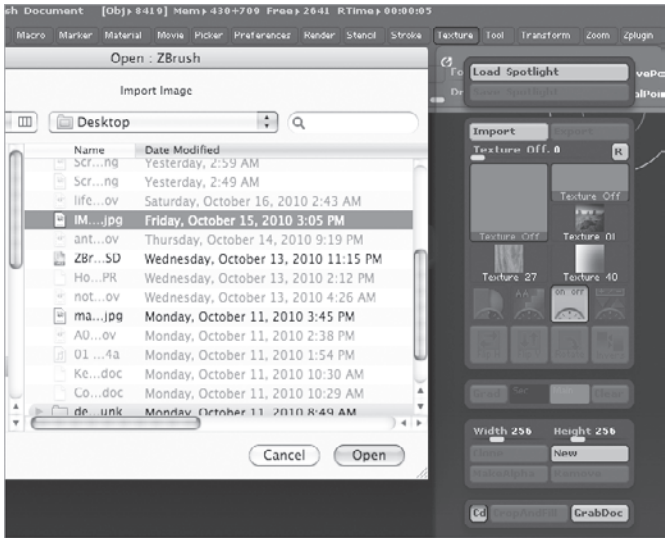


Figure 9.40
Use the Import button in the Texture palette to import an image from your local disk.

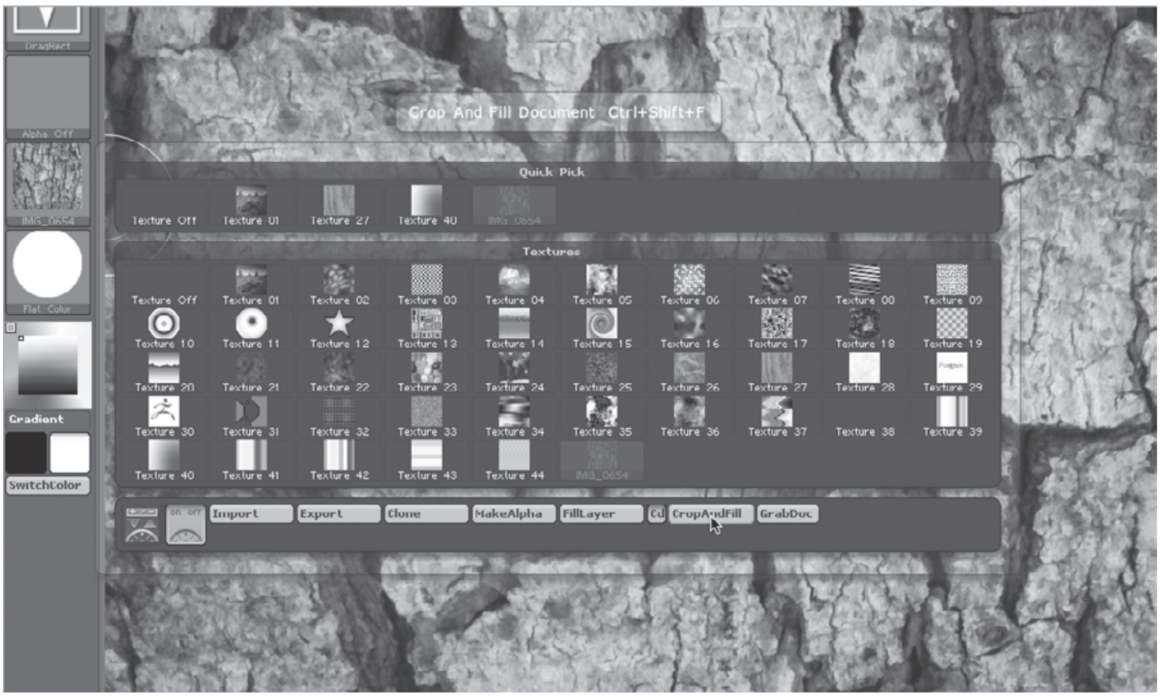


Figure 9.41
CropAndFill replaces the document with the currently selected texture.

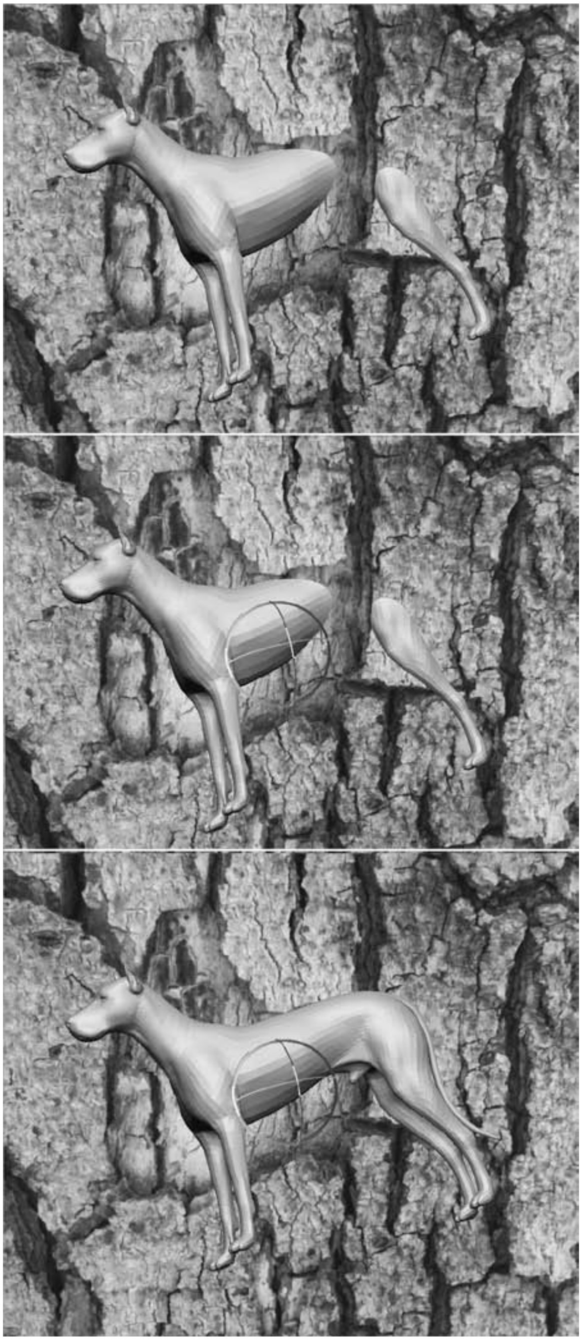


Figure 9.42

If the tool appears embedded in the background (top image), turn off Edit mode, turn on Move (center image), and drag down on the canvas to bring the tool forward (bottom image).

Once you have added a background image, you can continue to edit tools on the canvas. You may experience a situation in which the tool appears to be embedded in the image. This is not a bug. What is happening is the tool is being drawn on the back of the canvas and it is actually partially behind the back wall of the ZBrush environment. To fix this, you'll need to bring the tool forward along the z-axis, which means momentarily leaving Edit mode. Follow these steps:

1. Turn the Edit button on the top shelf off. Don't drag on the canvas after turning Edit mode off or you will create another instance of the tool.
2. Turn the Move button on. You'll see the Transform Gyro appear indicating that you are in Move mode (see center image in Figure 9.42).
3. Drag down on the canvas repeatedly to bring the tool forward (see bottom image in Figure 9.42). Don't drag on the manipulator; just drag down off to one side of the tool.
4. Once the tool is no longer intersecting the back plane, turn Edit mode back on (hotkey = T) and continue to work.

Adjustments

The Adjustments subpalette of the Render palette contains a number of sliders and edit curves that can be used to adjust the colors of the image as it is displayed on the canvas. The changes you make using Adjustments can be applied to all of the render modes before or after rendering the canvas.

To use this feature, expand the Adjustments subpalette of the Render palette and turn on the Adjustments button (see Figure 9.43). Use the Brightness and Contrast sliders to change the overall brightness and adjustments of the canvas. Expand the RGB Levels edit curve to adjust the color levels of the canvas. The left side of the curve adjusts the levels of the darker colors; the right side adjusts the levels of the lighter colors.

There are three additional edit curves in the Adjustments subpalette, which are used to adjust the red, green, and blue levels, respectively. You can shift the hues of the colors on the canvas by editing each curve.

To restore the changes you make in the Adjustments subpalette back to the default settings, just press the Clr button in the upper right of the subpalette.

Figure 9.43
A number of sliders and curve editors in the Adjustments subpalette of the Render palette can be used to adjust the brightness, contrast, and color channels of the document.

Render Passes

Many ZBrush artists prefer to use ZBrush in combination with digital paint programs such as Photoshop. Using Photoshop's compositing features, such as layers, blending modes, channels, and color adjustments, many artists start their artwork in ZBrush and finish them in Photoshop. The result is often an amazing illustration.

To make this type of workflow even easier, ZBrush adds the ability to automate the creation of render passes when using Best Preview Render. Render passes create a set of additional images extracted from the information generated during the BPR rendering process. Along with the render you see on the canvas, ZBrush creates separate images for depth, shadow, ambient occlusion, and alpha channel mask. Once the images have been generated, you can export them from ZBrush, import them into Photoshop, and use them to accentuate your initial ZBrush render.

Render passes are very easy to generate; follow these steps to use this feature:

1. Use the Open button in the File menu to load the `DragonHeadRender.ZPR` project from the `Chapter 9` folder on the DVD.
2. In the Render palette, turn on the Create Maps button (Figure 9.44).
3. In the Render palette, turn on the Shadows and AOcclusion buttons. If these buttons are not on, a shadow and an ambient occlusion pass will not be generated.
4. Press the BPR button on the right shelf (hotkey = Shift+R). After a few moments, the render will be generated.
5. Open the Render palette. At the top you'll see icons for the image, shadow, depth, ambient occlusion, and mask passes. Hold your mouse cursor over each icon to see an enlarged preview (see Figure 9.45).
6. Click each image to open your computer's file browser. Use the browser to save each image to your local disk.

Figure 9.44
Turn on Create Maps in the Render palette. Turn on the Shadows and AOcclusion buttons in the render options.

When you save a render pass to your disk, the image will match the current resolution of the canvas. The anti-aliasing quality of each image is determined by the setting of the SPix slider. Here is a description of each pass:

Figure 9.45
Once the BPR render is complete, the render passes are shown in the Render palette. Hold the mouse cursor over the pass icon to see a preview.

Image This pass contains the color information of the canvas minus cast shadows and ambient occlusion (upper-left image in Figure 9.46).

Depth This pass is a grayscale rendering of the image where lighter values are applied to parts of the image that are close to the front of the canvas and darker values are applied to parts that are farther away. Use this pass in your compositing software as a means for creating depth of field and fog effects (upper-center image in Figure 9.46).

Within Photoshop, you can paste this image into an extra channel and then use the Lens Blur effect to add depth-of-field blurring.

Shadow This pass is a grayscale image that contains shadows. Within Photoshop, this image can be pasted into a layer above the image pass and the blend mode of the layer can be set to Multiply. The advantage of using a separate pass for shadows is that the color, contrast, and opacity of the shadows can be easily adjusted without the need to create another render (upper-right image in Figure 9.46).

Ambient Occlusion This pass is a grayscale image that contains ambient occlusion shadowing effects. Just as with the shadow pass, you can paste this into a separate layer in Photoshop, place that separate layer above the other layers, and set the blend mode to Multiply (lower-left image in Figure 9.46).

Mask This pass consists of a black-and-white image representing the silhouette of the objects on the canvas. Within Photoshop, this image can be copied and pasted into the alpha channel in the Channels palette and used as a mask for selection or separation from background elements (lower-right image in Figure 9.46).

Figure 9.47 shows how a render of the dragon head has been composited in Photoshop using the render passes. A copy of this file can be found in the `Chapter 9` folder on the DVD. Feel free to open this image in Photoshop and examine how the passes have been used to create the image.

Keep in mind that each time you create a BPR image, the images in the render pass slots of the Render palette will be replaced by the images created for the most recent render.

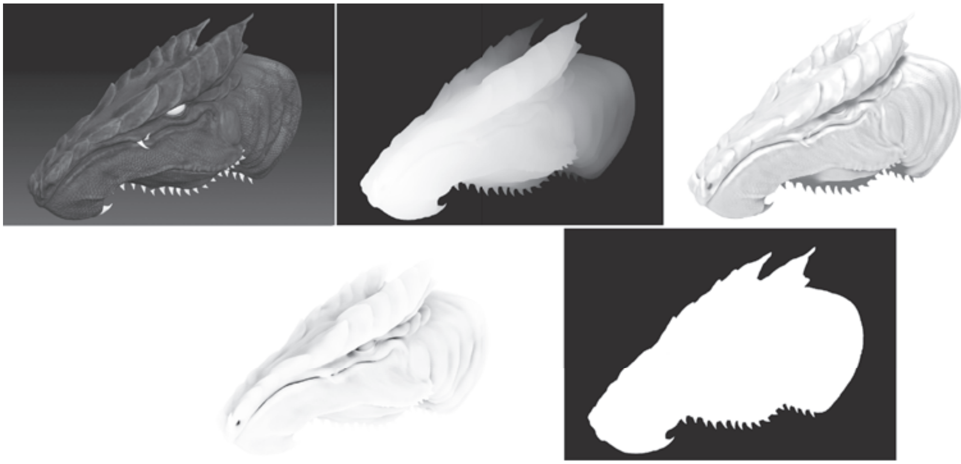


Figure 9.46
The image, depth, shadow, ambient occlusion, and mask passes generated by the BPR render

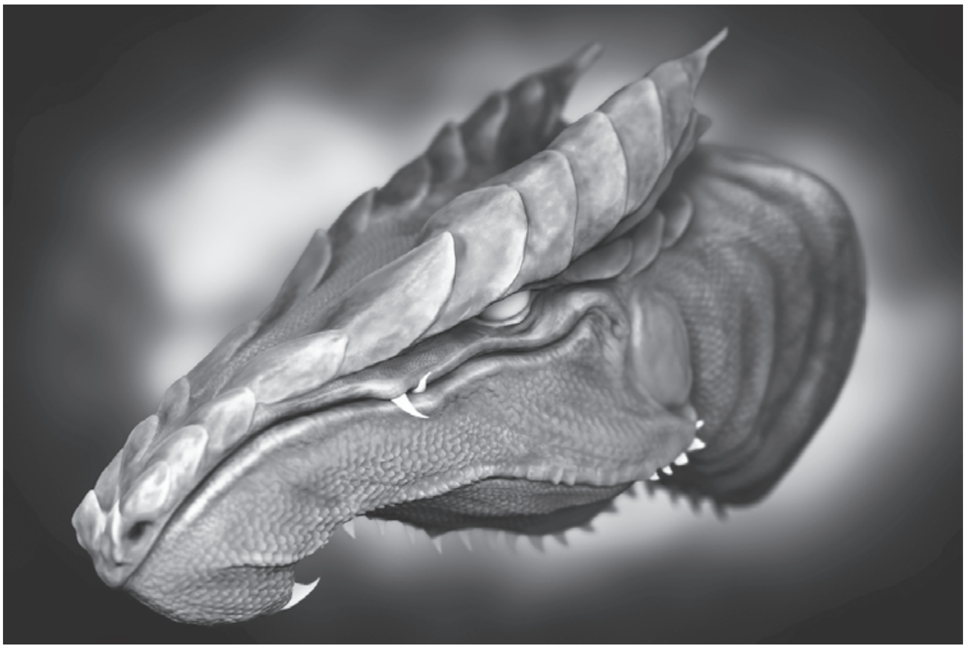


Figure 9.47
The passes are used to create a composition in Photoshop.

Using ZBrush Lights

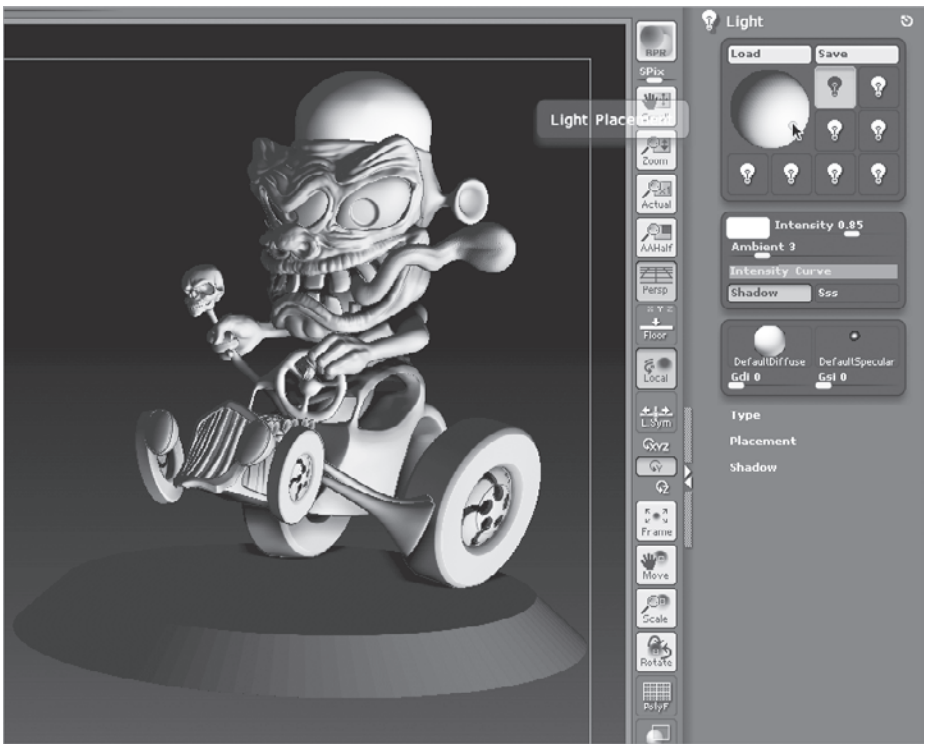
Lights in ZBrush are very simple to use and provide a way for you to change the lighting in a composition at any point during its creation. Lights are also an important aid to the sculpting process. Clay sculptors in the real world will continually move and adjust their lights so that they can literally see their work in a new light. This helps when they are defining forms and also while sculpting details. It's a good idea to change the position of the light as often as possible while sculpting a 3D model. You'll notice problems that you might not see otherwise.

Adjust Light Position

The following exercise shows you how to adjust the position of the light on the canvas while working with a 3D polymesh tool.

1. Start a fresh ZBrush session.
2. Use the Open button in the File menu to open the `MonsterCar.ZPR` project.
3. Choose the Basic material from the materials inventory.
4. Put the Light palette into a tray so that you can access the settings easily.
5. Set the render quality in the Render palette to Preview.
6. In the Light palette, drag across the sphere icon. This repositions the light. You'll see the lighting on the surface change accordingly. If it doesn't change, make sure you have BasicMaterial selected in the Materials palette (see Figure 9.48).

Figure 9.48
Dragging across the preview sphere in the Light palette will change the position of the light on the canvas.



LIGHTING AND BASICMATERIALS

Only the Standard materials in the lower section of the material inventory will react to the settings in the Light palette. The MatCap (Material Captured) materials at the top of the material inventory are created with the lighting information built into the material. All materials made with the MatCap tool contain their own lighting information. Repositioning the light has no effect on tools using MatCap materials. Materials are discussed later on in this chapter.

SEND THE LIGHT TO THE FRONT OR BEHIND

If the preview sphere in the Light palette goes dark, it means that the light has gone behind an object on the canvas. There is a trick you can use to toggle the position of the light to place it in front or behind the 3D objects on the canvas. Open the Light palette and click in the upper-right corner of the light position window. Clicking in this corner toggles the light position so that it acts as a front light or a back light.

Select and Add Lights

There are eight lights available to light the ZBrush canvas. By default, all but one of them are turned off. To select a light, click a lightbulb icon in the Light palette so that the icon border turns gray. To turn on a light, click the icon twice so that the icon turns orange.

1. In the Light palette, click the lightbulb icon that is colored orange. This will turn the light off. Click it again to turn it back on.

The border around the icon indicates that the light is selected. Changing settings such as Intensity and Light Type in the palette will affect the selected light only, even if the light is off.

2. Click the next lightbulb icon in the Light palette once to select it and again to turn it on (Figure 9.49). A second light is turned on for the canvas. You can turn on up to eight lights at a time.
3. With the second light selected, set the Intensity slider to **0.25**.
4. Click on the color swatch next to the Intensity slider to open the color picker. Use the color picker to choose a blue color.

Figure 9.49

To turn a second light on, click a lightbulb icon in the Light palette.

You can see that the lighting preview icon in the Light palette has been tinted with a blue color. This is indicating the color change in the second light. However, the light color in the document has not changed—it's just dimmer. To see changes in light color, render with Best quality mode. BPR will not render light color. You can render in BPR first and then Best render so you can take advantage of both render systems.

5. Press the Best button in the Render palette to render with Best quality. You'll see that blue lighting is tinting the color of the model on the canvas.

Light Settings

There are a number of settings available in the Light palette. Keep in mind that many of these settings adjust the properties of the selected light, which is the light that has a gray border around the icon in the Light palette. It is possible to adjust the settings for a light that is selected but turned off. When this happens, you won't see any change on the canvas until you turn the light on by clicking its icon until it turns orange. This is an easy mistake to make!

The following is a description of how these settings affect the light on the canvas:

Intensity edit curve The Intensity edit curve is found below the ambient and intensity sliders in the Light palette. This curve adjusts the intensity of the selected light. The left side of the curve refers to the intensity falloff. Reversing the curve can create some interesting negative exposure effects (Figure 9.50).

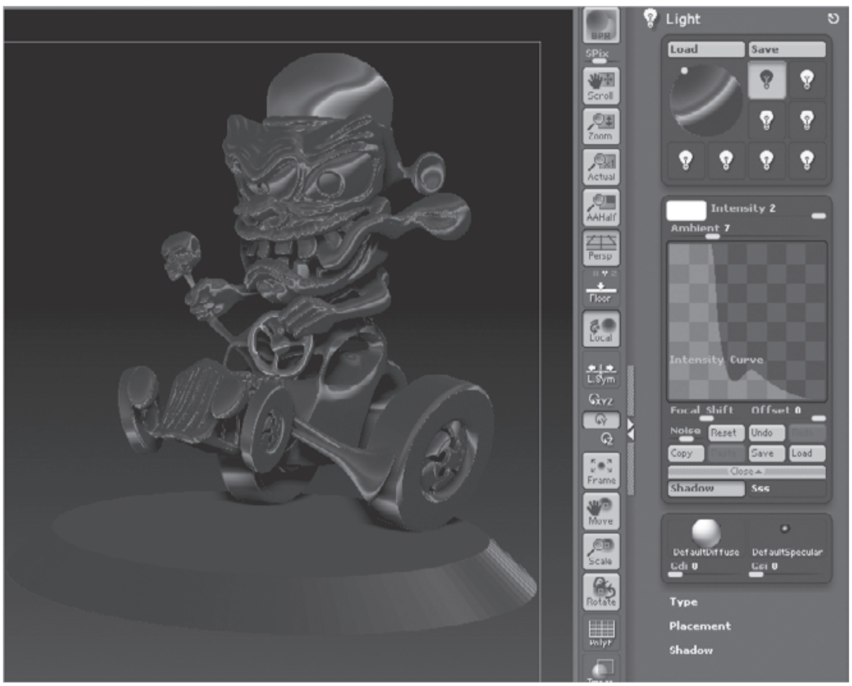


Figure 9.50
Reversing the edit curve for the Intensity slider can create some interesting effects.

GDI The GDI slider controls the global diffuse intensity. The Light palette limits you to eight lights in a scene; however you can use the Global Diffuse Intensity slider to create an overall diffuse light for all strokes and tools on the canvas.

GSI The GSI slider controls the global specular intensity. It adjusts the specular highlights on objects that have a shiny, standard material applied to them.

DefaultDiffuse The sphere icon labeled DefaultDiffuse lets you apply a texture to the default diffuse color. When you click this icon, it opens the Texture inventory, allowing you to choose a texture for the global color. The effect created by applying a texture to DefaultDiffuse is only visible when Best render mode is used.

DefaultSpecular The DefaultSpecular icon works just like DefaultDiffuse. It allows you to select and apply a texture to the specular highlights on the surfaces of objects that use shiny standard materials. The effect is only visible when rendering with Best render mode.

Figure 9.51 shows what happens when the star texture is applied to the DefaultSpecular option. The model is rendered in Best quality mode using the Chrome2 material.

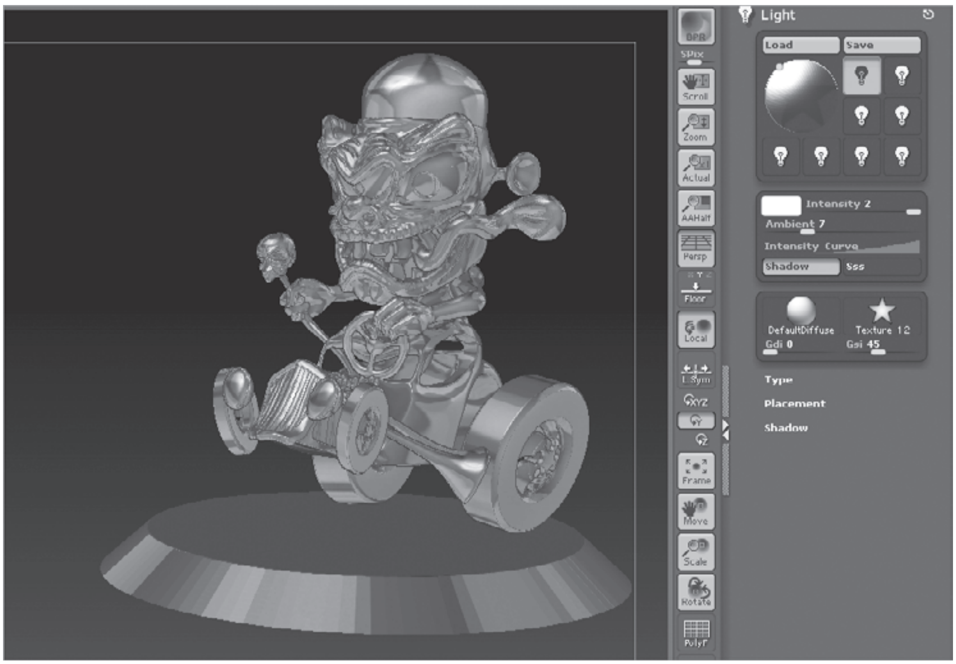


Figure 9.51

Adding a texture to the DefaultSpecular option can create additional lighting effects.

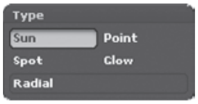
Light Types

ZBrush uses four types of lights to illuminate the strokes and 3D tools on the canvas. By default, there is a single sun light that is turned on when you start a ZBrush session. Sun lights have no point source—all of their rays are cast in parallel to simulate light coming from a distant source. You place sun lights using the sphere icon in the light window.

The other three types of lights are point, spot, and glow. To change the type of light you are using, click one of the buttons in the Type subpalette (see Figure 9.52). This will change the type of the currently selected light. Remember that the lighting you see on the canvas may not be coming from the currently selected light. Make sure the currently selected light is turned on when you change the settings if you want to see the lighting update accordingly.

Figure 9.52

Change the light type for the selected light by clicking the buttons in the Type subpalette of the Light palette.



The Radial button changes the behavior of the currently selected light so that the areas of the strokes or 3D tools that face away receive the light. This creates a good fill lighting effect. Radial lights can't cast shadows. Any of the light types can be modified using the Radial button (see Figure 9.53).

Figure 9.53

The Radial option turns the selected light into a fill light.

Sun Light

The following exercise will illustrate some of the differences between the types of lights.

1. Start a fresh ZBrush session.
2. Use the Open button in the File menu to open the `DragonHeadRender.ZPR` project.
3. Choose the Basic material from the materials inventory.
4. Place the Light palette in a tray so the settings are easily accessible. Make sure only one light is on by clicking the orange highlighted lightbulb icon in the Light palette (if it turns off, click the icon again to turn it on).
5. Drag across the sphere icon in the Light palette to change the position of the light. Set the position so that the dragon head is lit from the upper right.

6. Set Intensity to **2**.
7. Set the Ambient slider below the Intensity slider to **0**. This removes ambient light from the lighting on the canvas.
8. Click the second lightbulb icon until it turns orange to turn it on.
9. Make sure the second lightbulb icon is selected; there should be a gray border around the icon.
10. In the Type subpalette, turn on Radial. This makes the second light into a fill light.
11. Click the color icon next to the Intensity slider to open the color picker. Choose a red color.
12. Drag on the sphere icon in the light palette to change the position of the second light. You'll see a red band of light on the sphere. Position the light so that the red band illuminates the bottom of the preview sphere. Figure 9.54 shows the settings for the light.
13. In the Render palette, click the Best button to create a Best quality render. Figure 9.55 shows the result.

This is a typical setup using the sun light type. In the next section, you'll see how to use the point light type. Keep the same project open for the next section.

Figure 9.54

The second light is set to a sun light type with the Radial option activated.

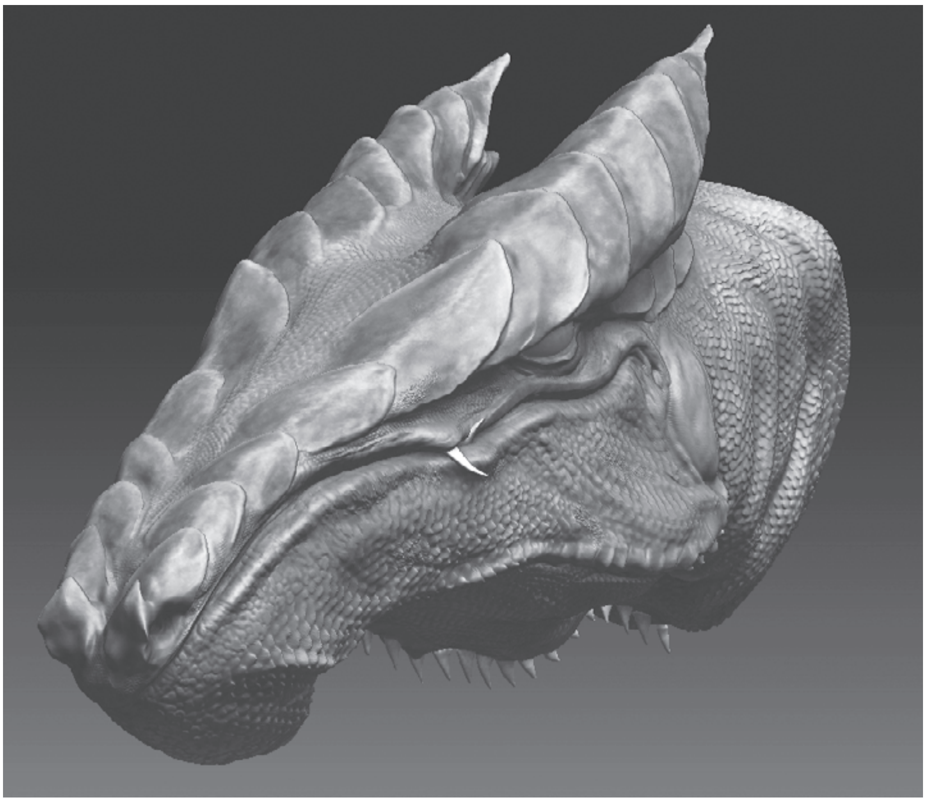


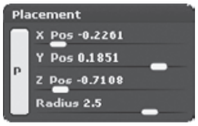
Figure 9.55

The dragon head is rendered using two sun lights.

Point Light

The point light type works slightly differently than the sun type light. To place the light, you'll use the settings in the Placement subpalette of the Light palette instead of the preview sphere. Keep in mind that the point light type works only when rendering in Best and BPR quality modes.

Figure 9.56
Adjust the Radius slider in the Placement subpalette of the Light palette.

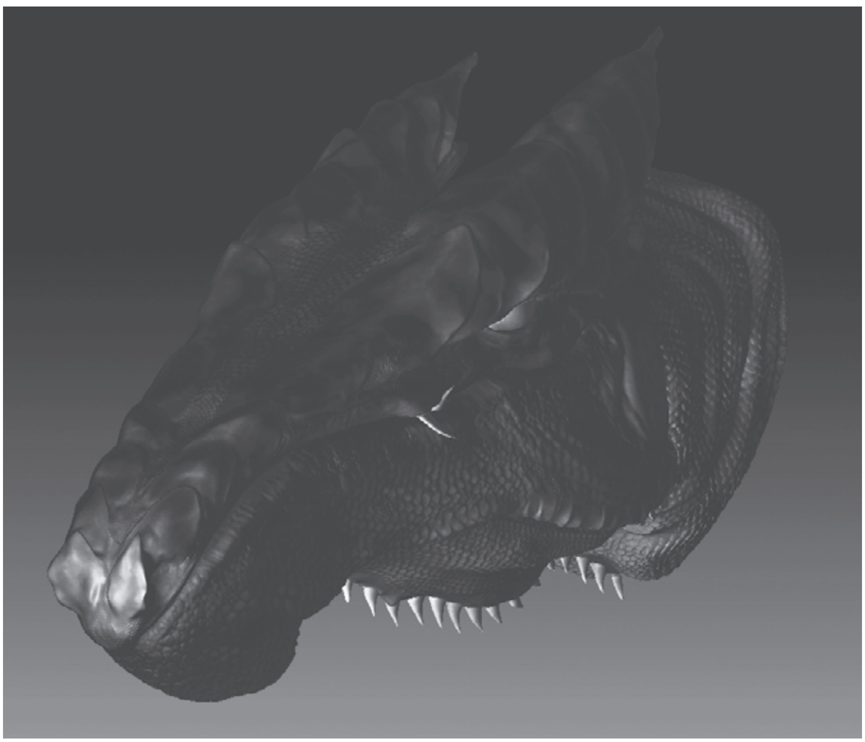


1. Turn the second light off. Make sure the first light is on.
2. In the Render palette, select Preview render mode.
3. Select the first lightbulb icon in the Light palette, and make sure its Intensity value is set to **2**.
4. In the Type subpalette, click the Point button to set the light to the point type.
5. Expand the Placement subpalette. To change the position of a point light, drag from the P button in the Placement subpalette to a spot on the front of the dragon head, on the tip of the nose.
6. In the Placement subpalette, set the radius to **2.5** (see Figure 9.56).

The point light emits light in all directions from a single point in space, like a candle. The radius determines how far the light from the point light travels in the scene.

7. Click the Best button in the Render palette to create a render using the point light. Figure 9.57 shows the result.

Figure 9.57
The point light type lights the tip of the dragon's nose.



You can combine point lights with other light types as a way to accentuate parts of the model or create mood lighting in a ZBrush illustration. In the next section, you'll see how to use the spot light type. Keep the same project open for the next section.

Spot Light

The spot light type is positioned using both the preview sphere and the Placement subpalette. The preview sphere in the Light palette is used to position the light. The controls in the Placement subpalette are used to aim the light. Keep in mind that the spot light type works only when rendering in Best and BPR quality modes.

1. In the Render palette, click the Preview button to switch to Preview mode.
2. In the Type subpalette of the Light palette, click the Spot button.
3. Drag from the P button in the Placement subpalette to the forehead of the dragon head tool to set the position where the spot light hits and illuminates the tool.
4. Drag across the sphere icon in the Light palette to set the source of the spot light—the position where the light comes from. Drag it to the upper left of the preview sphere.
5. Change the Radius slider to change the cone size of the spot light. Set Radius to **4**.
6. In the Render palette, click the Best button to render in Best quality mode. Figure 9.58 shows the result.

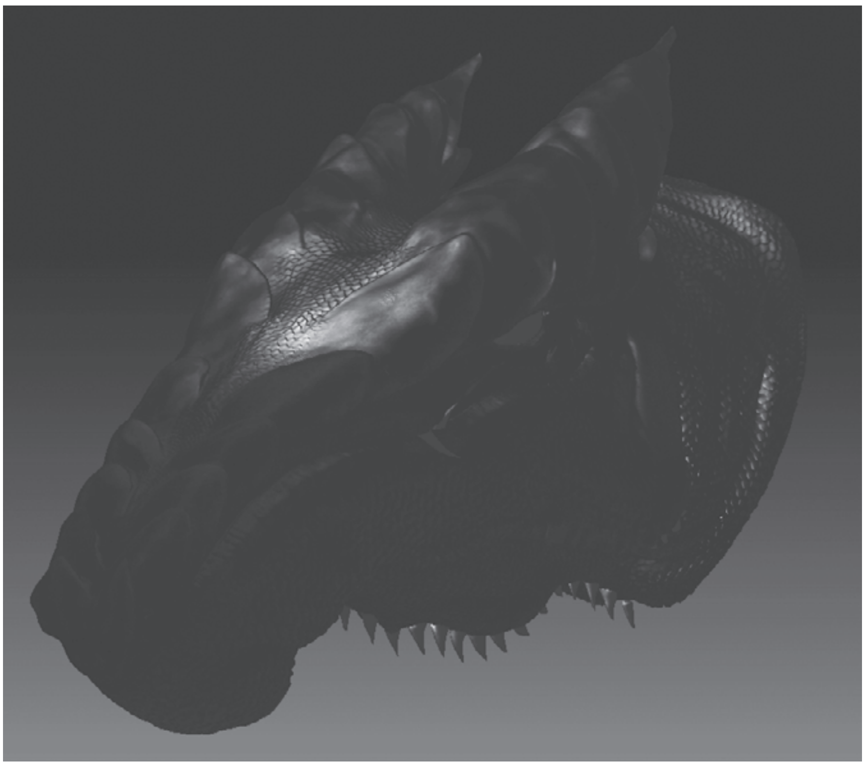


Figure 9.58
The dragon is rendered using the spot light type.

The spot light is similar to the point light. The main difference is how the lights are positioned. In the next section, you'll see how to use the glow light type. Keep the same project open for the next section.

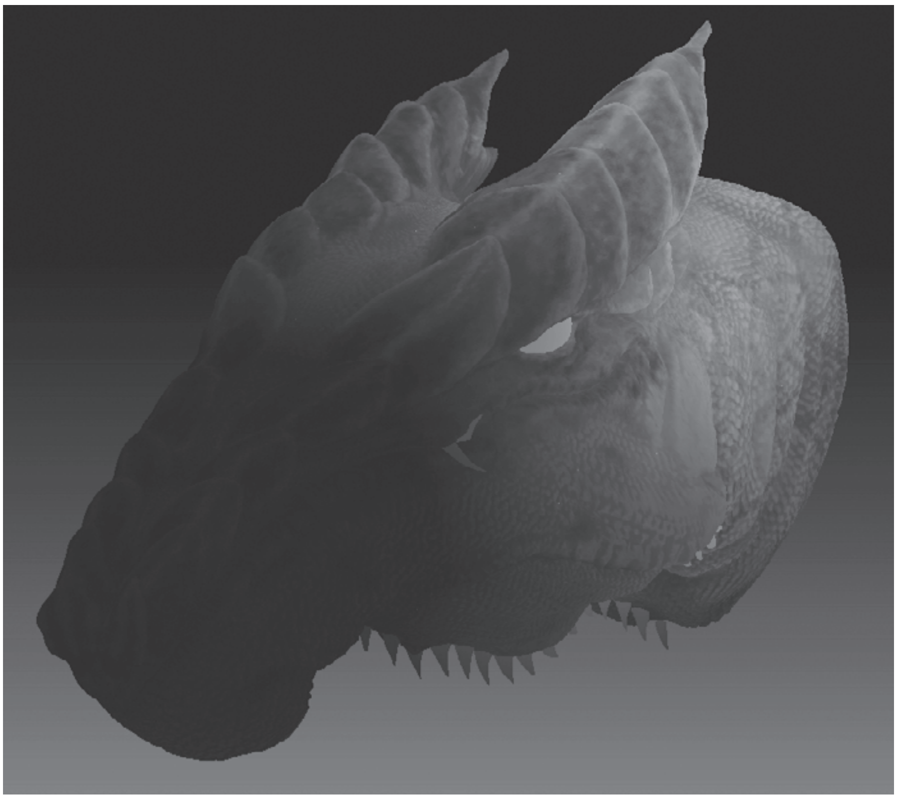
Glow Light

The glow light type adds ambient light that can tint parts of the model, adding an interesting look to the rendered image.

1. In the Render palette, click the Preview button to switch to Preview mode.
2. In the Type subpalette of the Light Palette, click the Glow button.
3. Click on the color swatch next to the Intensity slider to open the color picker. Use the color picker to choose an orange color.
4. In the Placement subpalette, click the P button and drag back to the dragon's neck to a place behind one of the horns.
5. Set the Radius slider in the Placement subpalette to 0.5.
6. Click the Best button to create a render in Best quality mode. Figure 9.59 shows the result.

Figure 9.59

The dragon is rendered using the glow light type.



Spend some time experimenting with different light types. Combine sun, spot, point, and glow lights in different combinations and test the results using Best quality render mode. Compare the results with BPR renders using the same lights.

Using Shadows in Best Render Mode

Sun, spot, and point lights can all cause strokes and 3D tools on the ZBrush canvas to cast shadows. Since a ZBrush document is not the same as a 3D scene in a 3D animation program such as Maya, the way ZBrush tools cast shadows may seem a little different. However, with some work, you can create convincing shadows on a ZBrush canvas that will add to the depth of your compositions.

1. Use the Open button in the File menu to load the `MonsterCar.ZPR` project from the `Chapter 9` folder on the DVD.
2. From the material fly-out library, select the BasicMaterial.
3. In the Render palette, click the Best button. ZBrush will take a couple moments to render the image. Notice the soft shadows cast on the base by the model (see Figure 9.60).

Figure 9.60
Soft shadows appear on the base when the canvas is rendered using Best quality mode.

If you change the position of the light in the Light palette, the shadows will update to match the position of the light. At the moment, this may be difficult to notice because the shadows are very soft. You can create sharper-looking shadows by changing the value of the Aperture slider.

4. Set Aperture in the Shadow subpalette to **10** and render the canvas again. The shadows are more defined (left image in Figure 9.61).
5. Set the Length slider to **400**. This increases the length of the shadow, which can create a more realistic-looking shadow (right image in Figure 9.61).

Figure 9.61

Adjust the aperture of the shadow to reduce blurring and increase the definition (left image). Adjust Length to create longer, more realistic shadows (right image).

Increasing the Rays slider improves the accuracy of the shadows, but the image will take longer to calculate.

ZMode produces more accurate shadows by considering the Z Depth of shadow-casting pixols when calculating the shadow. Sometimes a shadow created with ZMode on will have holes in it if shadow-casting strokes on the canvas intersect shadow-receiving strokes.

BEST RENDER SHADOWS VERSUS BPR SHADOWS

Shadows rendered in Best quality mode will look different than shadows rendered using BPR. They will appear softer in Best mode when using the default shadows settings for the lights, but they can be adjusted to look more or less sharp. Shadows rendered using BPR are easier to use than shadows rendered with Best mode, but you have more options when using Best mode.

The choice to use one render mode over another is usually determined by how you want the final image to appear. To cast shadows, a selected light must have the Shadow option in the Light palette activated regardless of whether you are using Best or BPR render modes.

The Uni slider adjusts the unified shadow setting. This slider is available when ZMode is on and can help to reduce artifacts and decrease render time.

Creating convincing shadows often requires a fair amount of experimentation with these settings. The Shadow edit curve and the Blur slider can also help tune the look of the shadows. The edit curve controls the fade of the shadows. The x-axis of the graph represents the distance from the shadow-casting object, and the y-axis of the graph represents the amount of fade.

6. In the Shadow subpalette of the Light palette, set Rays to **500**, Aperture to **5**, and Uni to **100**. Edit the Shadow curve so that the orange portion nearly fills the graph as in Figure 9.62.

> **MULTIPLE LIGHTS AND SHADOWS**
>
> Remember that the shadow settings are for the selected light. Another light can have a completely different arrangement of shadows at the same time when rendering with Best quality.

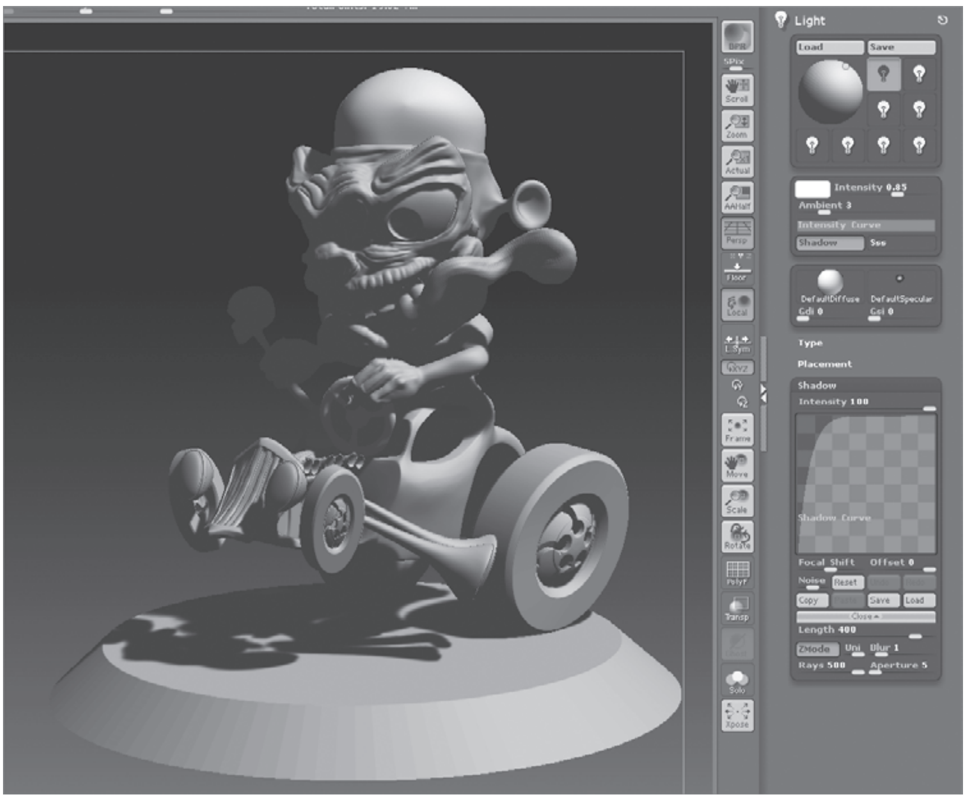


Figure 9.62
Realistic shadows can be created by experimenting with combinations of the shadow settings in the Light palette.

Understanding Materials

Materials in ZBrush determine the quality of the surface of a model and pixols drawn on the canvas. For example, if you want to create a purple shiny ball in ZBrush, the purple color is determined by the color or texture applied to the ball and the material determines the shiny quality. Of course in some cases, such as when you use a material such as the ReflectRed material, the red color of the material will be mixed with the colors applied to the surface. This may seem confusing at first, but as you gain an understanding of how materials work, it should start to make more sense.

For the most part, materials are meant to be used in ZBrush and cannot be exported directly from ZBrush for use in other 3D programs. All of the settings you create for materials exist only within the ZBrush document. You can save your materials and special material files (`.ZMT`); however, this file format can only be used within ZBrush.

EXPORTING MATERIALS

There are some tricks that you can use for exporting materials if you really want to. For information on how to do this, watch Joseph Drust's "Baking MatCaps to Texture Maps" tutorial at `www.pixologic.com/zclassroom/homeroom`. Keep in mind that this is not a standard ZBrush workflow and requires a good understanding of materials, textures, and other ZBrush features.

There are two major categories of material: Standard materials and MatCap materials. The materials library separates these types of materials. MatCap materials are in the upper section; Standard materials are at the bottom (see Figure 9.63). Standard materials are largely determined by the settings in the Modifiers section of the ZBrush palette.

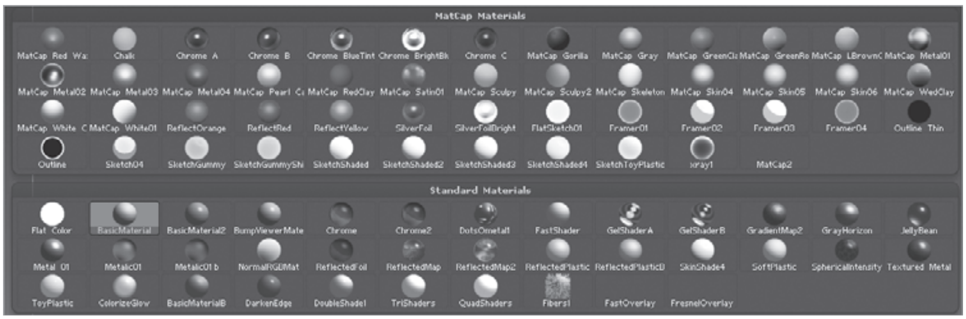


Figure 9.63
The materials library is separated into two major sections. MatCap materials are in the upper section, and Standard materials are grouped at the bottom.

MatCap (Material Captured) materials are created by sampling parts of an image. You can import a photo into ZBrush and use it as the basis for a MatCap material. Typical MatCap materials do not react to changes in lighting in a ZBrush document. They have their own set of modifiers. The section on MatCap materials in this chapter shows you how you can create your own MatCap materials.

Materials can add realism or special effects to the images you render in ZBrush. They can also be used as a sculpting aid. Different materials can reveal different aspects of your 3D tools. Changing materials every once in a while during the sculpting process can help you to see aspects of your sculpture you might not otherwise notice. And you can create your own material presets for use in future projects. For example, you'll notice a material named xray1 in Figure 9.63. This is a custom material I created myself; it will not appear in your version of ZBrush. Later in this chapter you'll learn how to create your own material presets.

A shader is a collection of settings that determine how the material looks on the canvas. Each material uses at least one shader. You can combine more than one shader into a single material and adjust how the different shaders work together. In fact, you can even create a complex material by combining the shaders that make up MatCap and Standard materials so that you get the best qualities of both types of shaders. A single material can combine up to four shaders.

ZBrush 4 now gives artists more options for combining shaders. Now you can create complex subsurface scattering effects as well as experimental and stylistic materials.

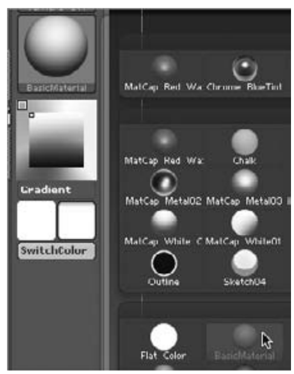
In the following sections, you'll learn how to use the different types of shaders.

Standard Materials and Shaders

This section introduces you to the Standard materials. They are found in the lower half of the material inventory. A Standard material uses one or more standard shaders. Changes you make to materials are saved with ZBrush documents. They are not saved with ZBrush tools.

1. Start a new ZBrush session.
2. Use the Open button in the File menu to load the `DragonHeadRender.ZPR` project from the `Chapter 9` folder on the DVD.
3. From the materials inventory, select the BasicMaterial (Figure 9.64).
4. Place the Material palette into a tray.

Figure 9.64
Choose the BasicMaterial from the material library.



The top of the Material inventory shows the current material in the large icon. The smaller icons represent more recently used materials. Hold the mouse pointer over any of the material icons and you'll see a preview of what the current tool will look like with the material applied (Figure 9.65).

5. Click the Show Used button below the icons. This will reduce the upper palette to show only the materials currently in use.
6. Expand the Modifiers subpalette for the BasicMaterial. Modifiers alter the settings of a material. Notice at the top there are four slots labeled S1, S2, S3, and S4. Only the S1 slot in the BasicMaterial is available. The others are grayed out.

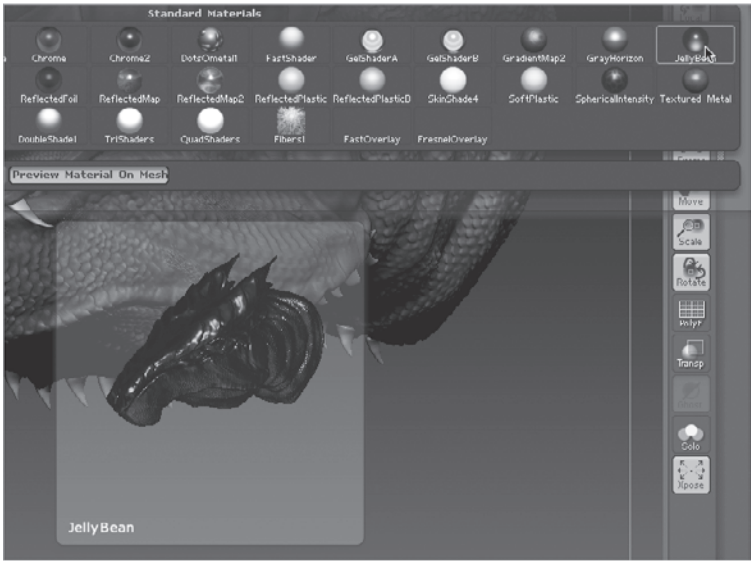


Figure 9.65

Hold the mouse pointer over a material to see a preview of the mesh with that material applied.

A material is made up of one or more shaders. The settings for each shader are displayed when one of the shader buttons is activated. The shader buttons are labeled S1, S2, S3, and S4 at the top of the Modifiers subpalette.

The shaders are sets of modifier settings. The long list of settings and sliders you see in the Modifiers subpalette of the BasicMaterial are essentially its shader (Figure 9.66). The BasicMaterial has only one shader available; other materials may have up to four.

7. Select the TriShaders material at the bottom of the materials inventory and expand its Modifiers subpalette. The shader is immediately applied to the entire dragon head.
8. The TriShaders material has three of the four shader slots available. Click the S2 button and set the Diffuse slider to **1** (see Figure 9.67). You'll see the dragon become slightly darker.
9. Click the S1 button and the Diffuse slider changes. However, the material on the model does not.

What's going on here is that you are switching between two of the three shaders that make up the TriShaders material. The TriShaders material uses three sets of the basic shader settings loaded into slots S1, S2, and S3. These settings are initially identical. When the dragon is rendered at Preview or Best quality, the settings from the three slots are combined.

Figure 9.67

Select the S2 shader and set the Diffuse slider to 1.

Figure 9.66

A shader is a group of settings within a material.

Copy and Paste a Shader

You cannot add or remove shader slots from a material, but you can change the settings in each slot. You create multi-shader materials by copying and pasting between shaders from one material to another.

1. Click the ReflectedMap2 material and it will be applied to the dragon head.
2. Click the S1 button to view the first shader settings. Notice that the modifiers are different between S1 and S2 of this material.
3. Click the CopySH button. This will copy the shader settings to memory (Figure 9.68).
4. Expand the materials inventory. You'll see that the TriShaders material has been moved to the top section, labeled User Materials. Click the TriShaders material again. The dragon head switches back to the TriShaders material.
5. Click the S1 button in the TriShaders' Modifiers subpalette.
6. Click the PasteSH button to replace the TriShaders' S1 settings with the shader settings from the ReflectedMap material which have been copied to the clipboard. This replaces all of the settings as well as the sliders available in the TriShaders material's S1 slot.

So to create a new material, you can copy shaders from one material and paste them into the shader slot of another material, such as the TriShaders material.

Figure 9.68

Click the CopySH button in the S1 settings of the ReflectedMap2 material.

Copy and Paste a Material

You can also paste all the shaders of a material at once by copying one material and pasting it over another material.

1. Click the CopyMat button in the Material palette. This appears below the inventory (see Figure 9.69).
2. In the Material palette, select the JellyBean material. This material normally has only one shader slot.
3. Click the PasteMat button.

All of the shaders and settings for the Jelly Bean shader will now be replaced with the shaders and settings from the TriShaders material. Notice that the Jelly Bean material now has three shader slots, just like the TriShaders material.

Figure 9.69

The CopyMat button appears below the inventory in the Material palette.

Save a Material

As you start developing your own materials, you'll want to save them for use on other ZBrush models. You can quickly develop your own library of custom materials. Custom materials are also saved as part of the ZBrush project (ZPR) and ZBrush document (ZBR) formats but not as part of the ZTool format (ZTL).

To save a material, use the Save button in the Material palette. The material is saved in the ZMT format. If you save the file to the `ZMaterials` folder in the `Pixologic\ZBrush 4` folder, the material will appear in the Materials section of Light Box.

Design a Custom Standard Shader

In this section you'll take a look at some of the specific settings that affect the way a material looks on the model. You'll start with some of the fundamental settings found in many of the Standard materials.

The Ambient, Diffuse, and Specular settings found within a standard ZBrush shader determine how a surface reacts to the lights that illuminate the ZBrush canvas.

The Ambient slider controls how the surface reflects the indirect lighting of an environment. Indirect lighting comes from the secondary rays of light that bounce around within an environment. The Ambient slider determines how strongly the ambient light in the document will be reflected by the material. It does not change the ambient lighting in the light panel, just how the material reacts to ambient light. Ambient light does not have a source.

The Diffuse slider controls how the material diffuses the light that comes directly from a light source. Higher diffuse values make the lighting appear more intense and the colors brighter.

The Specular slider controls how strongly the surface reflects the light source. A specular highlight on the surface is a reflection of the light source. In the real world, specular highlights are directly related to the reflectivity of a material. In computer graphics programs such as ZBrush, specular and reflectivity channels are often separated into different controls.

Rough materials such as concrete have a high diffuse value and low specular value. Smooth surfaces such as metal have a high specular value but a low diffuse value. Some materials such as glossy paint are made up of layers, which means both specular and diffuse values can be high.

Edit the Diffuse Channel

The best way to get a sense of how to work with shader settings is to use a very simple standard material such as the BasicMaterial. In this section, you'll start creating a custom material for the dragon head using the BasicMaterial shader as a starting point.

1. Start a new ZBrush session.
2. Use the Open button in the File menu to load the `DragonHeadRender.ZPR` project from the `Chapter 9` folder on the DVD.
3. From the material inventory, select the BasicMaterial.
4. Place the Material palette into a tray.

5. Expand the Modifiers subpalette of the Materials palette.
6. Set Ambient to **0** so that the material is only illuminated from direct lighting. This helps to add contrast to the surface.
7. Set Diffuse to **100**.

Many settings in the materials modifiers use both a slider and a curve. The slider sets the overall value of the channel; the curve allows you to fine-tune how the setting is applied. The value of the slider determines the 100 percent value used by the curve.

8. Expand the Diffuse curve and add a point to it. Create a slope like the one shown in Figure 9.70.

The Diffuse curve controls the strength of the diffuse light reflected in the surface based on the facing ratio of the surface. The left side of the graph represents the diffuse strength on parts of the surface that turn away from the view. The right side determines the strength of the diffuse light on the parts of the surface perpendicular to the view. When you create a steep slope, the diffuse light is reflected by more of the surface and the shadows appear darker and tighter, which adds contrast to the material. This helps bring out the shape of the scales.

Continue with this project in the next section.

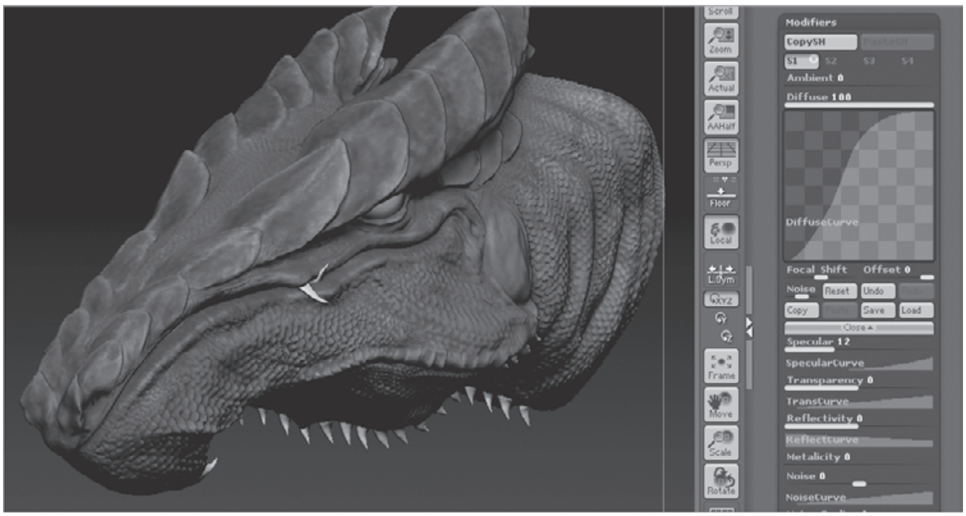


Figure 9.70

Edit the Diffuse curve to increase contrast in the surface of the model.

Edit the Specular Reflections

The Specular controls determine how the reflection of a light source on a material's surface appears.

1. Set the Specular slider to **40**.
2. Expand the SpecularCurve below the Specular slider.

Figure 9.71

Edit the Specular curve to change the appearance of the specular highlight on the surface of the dragon. Increase the Noise option for the curve to break up the highlight.

3. Add points to the SpecularCurve and experiment with the shape of the curve. See how it affects the look of the highlights on the dragon's head. Shape the curve so that it matches the left image in Figure 9.71.
4. Below the SpecularCurve, set the Noise slider to **0.2**. This adds noise to the curve, which breaks up the look of the highlight by adding random noise (see the right image in Figure 9.71).
5. Set Metalicity to **40**. This makes the surface appear more metallic by blending the surface color into the color for the highlights.
6. Scroll down in the Modifiers subpalette and find the Anisotropic-Specular slider. Set this slider to **0.25**.

   Anisotropy spreads out the edges of the specular highlight to simulate the way light is reflected from a surface that is made up of tiny microfacets.

7. In the Material palette, click the Save button. Save the material as `DragonSkin.ZMT`. Save the material to the `Pixologic\ZBrush4\ZMaterials` folder. The material will appear in the Materials section of Light Box.

Continue with this scene in the next section.

Edit the Reflectivity Channel

You can make the surface appear to reflect a texture using the Reflectivity channel. You can use one of the textures in the texture library or import your own custom texture. This exercise demonstrates how to add reflection to the surface.

1. In the Texture palette, click the Import button. Import the `Flames.bmp` file from the `Chapter 9` folder on the DVD. This is simply a render of a fluid dynamic simulation created in Maya.
2. In the Material palette, click the empty texture slot at the bottom of the Modifiers subpalette. Select the Flames texture from the texture library (Figure 9.72).
3. Set Reflectivity to **80**.

The Reflectivity slider can be set to positive or negative values. When positive values are chosen, the strength of the reflection of the Flames texture is based on the how much of the surface faces the view. When negative values are chosen, the strength of the reflection is based on the lightness of the surface colors.

Figure 9.72

The `Flames.bmp` file texture is added to the Reflectivity texture slot of the DragonSkin material.

4. Expand the Reflectivity edit curve below the Reflectivity slider. Edit the curve so that it looks like Figure 9.73.

The curve determines how the surface reflects the Flames texture. The slope as it appears in Figure 9.73 makes the reflectivity in the parts of the surface that turn away from the view stronger than the parts that face the view.

You'll also notice that the material has an Env Reflection slider. This determines how the environment is reflected on the object. The environment that is reflected in the surface is determined by the settings in the Environment subpalette of the Render palette. The environment reflection is only visible after the canvas has been rendered in the Best quality render mode.

Figure 9.73
Adjust the slope of the Reflectivity curve so that the left side is higher than the right.

5. Set Env Reflection to **10**.
6. In the Render palette, expand the Environment subpalette and press the Scene button. This means that the objects on the canvas will be reflected in the surface. Note that this reflection is added after the image completes rendering at Best quality mode.
7. In the Render palette, click the Best button to render the canvas at Best quality mode. Figure 9.74 shows the result.
8. In the Material palette, click the Save button. Save the material as `DragonSkin.ZMT`. Save the material to the `Pixologic\ZBrush4\ZMaterials` folder. The material will appear in the Materials section of Light Box.

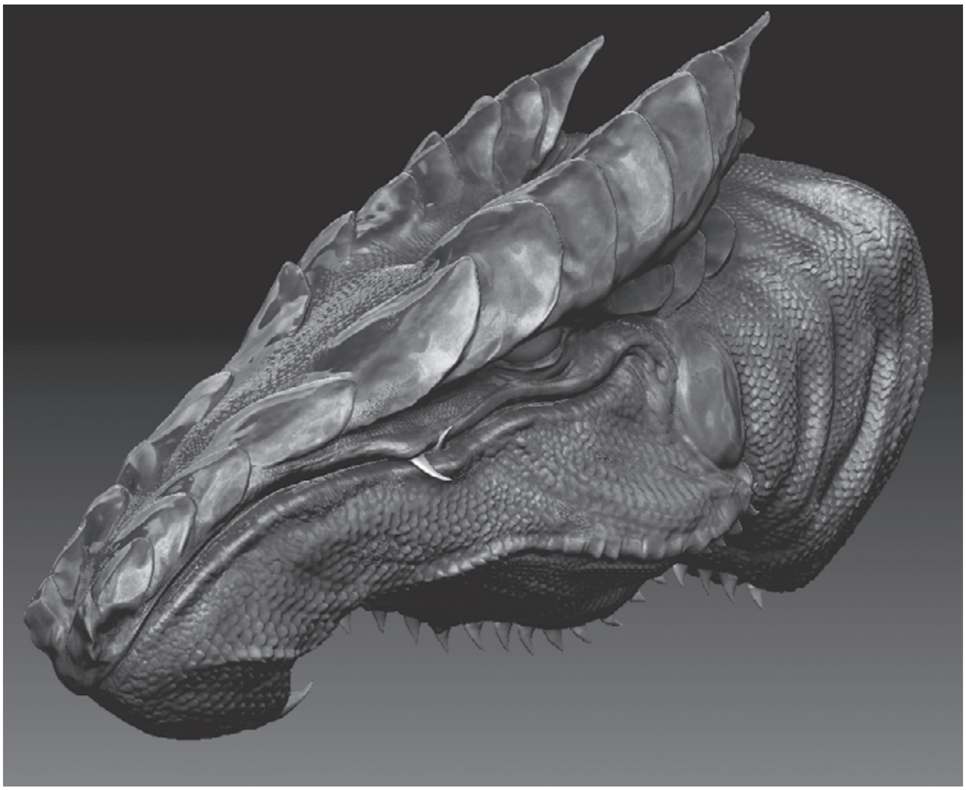


Figure 9.74
The dragon head is rendered at Best quality mode.

Additional Material Settings

There are a number of other settings available in the standard shader, which is used by the DragonSkin material created in the previous section. To find out how a setting affects the material, hold the **Ctrl** button while positioning the mouse pointer over the slider.

The following are some settings that can add interesting effects to the shader. Experiment with these settings using the DragonSkin material.

Noise Noise adds a turbulent noise to the color of the material. Increase Noise Radius to change the scale of the noise. The Noise curve determines the shape of the noise by adding areas of light and dark colors.

When the Noise slider is set to positive values, the noise has a sharp edge, and when it's set to negative values, the noise appears more cloudy.

Color Bump Color Bump adds a bumpy quality to the surface based on the colors of the surface. The colors painted on the surface and the material, textures, and noise applied to the material all affect how the bumps appear. Positive values for the Noise slider mean that the lighter colors push outward; negative values mean that the lighter values push inward.

Gel Shading The Gel Shading slider adds a translucent quality to the surface. The slider can be set to 0, 1, or 2. A value of 0 turns Gel Shading off. A setting of 1 or 2 creates a different quality of translucency.

High Dynamic Range High Dynamic Range intensifies the colors of the material. The value of the slider is multiplied against the settings of the material to increase the intensity.

Cavity The Cavity settings add a distressed look to the surface by adding color to the recessed areas of the material. You must render with Best quality mode to see the effect of Cavity. You'll also need to increase CavityRadius and CavityColorize to see the effect. CavityDiffuse and CavitySpecular set the way in which the recessed areas reflect light.

Colorize Diffuse, Colorize Specular, and Colorize Ambient Colorize Diffuse, Colorize Specular, and Colorize Ambient increase the influence of the colors set in the Dif, Spec, and Ambi color swatches at the bottom of the Modifiers subpalette. Click on the color swatches to set the color for each channel; then increase the Colorize Diffuse, Colorize Specular, and Colorize Ambient sliders to see how it affects the material.

PhongBlinn Specular PhongBlinn Specular changes the quality of the specular highlights based on the algorithms used by conventional Blinn and Phong shaders used in other CG programs. Set this to **0** to create Phong-type highlights, which are suitable for plastic and glass materials. Set this to **1** to create a Blinn-type highlight, which is more suitable for skin. Values in between 0 and 1 blend between the highlight styles.

Follow these steps to see how the edited material looks on the dragon head model.

1. Use the Load button in the Material palette to load the `DragonSkin_v2.ZMT` material from the `Chapter 9` folder on the DVD.
2. Apply it to the dragon head model and examine the settings (see Figure 9.75).
3. Render using Best quality to see the effect of the material.

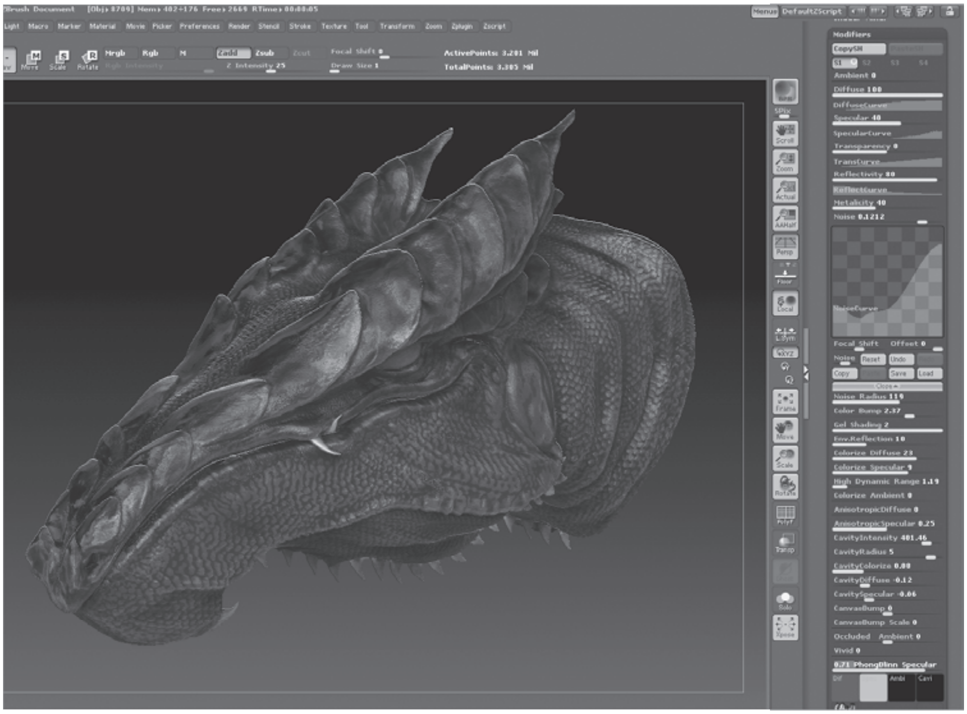


Figure 9.75
Apply the `DragonSkin_v2.ZMT` **material to the dragon head.**

MATERIAL TRANSPARENCY CHANNEL

The Transparency channel of the Standard shaders is a little tricky to use. The transparency effect of the material is only visible when rendering with Best quality mode and it requires the use of document layers. This means that the tool must be dropped to the canvas for material transparency to work. I recommend that you consider using SubTool transparency and render with BPR when you want to create transparent surfaces instead of using the material transparency controls. This workflow is described earlier in the chapter in the section titled “SubTool Transparency.”

PAINT MATERIALS

Materials can be painted onto a 3D tool just as colors can. Materials are applied to the polygons of a surface. Unlike with polypainting, materials are not blended, so unless the surface is at a very high resolution, the border between materials can appear somewhat jagged. However, if you use some strategy when painting a material on part of a surface, it is possible to hide the jagged borders between materials.

When you want to paint a material on a surface, you must make sure that the M or the Mrgb button is activated on the top shelf. The M button activates material mode; the Mrgb button activates material and color mode. In addition, polypainting must be turned on for the surface.

As demonstrated earlier in the chapter in the section "SubTool Transparency," you can fill a SubTool with a material using the Fill Object button in the Color palette.

MatCap Materials

MatCap (Material Capture) materials were originally designed to help artists integrate ZBrush strokes and tools seamlessly into photographs. Using the MatCap tool, the material quality of an object can be sampled directly from a photograph and applied to a 3D tool. ZBrush ships with a number of MatCap presets located at the top of the Material palette. This exercise will take you through the process of creating your own MatCap material.

Use the MatCap Tool

The MatCap tool is used to sample colors from an image. You can then use the tool to determine how the sample colors appear on the surface based on the normal direction of the surface. In this example, you'll use an image of uncooked chicken to create a fleshy material.

1. Start a fresh session of ZBrush.
2. In the Document palette, press the Open button. Open the `matCapStart.ZBR` document from the `Chapter 9` folder on the DVD.

This document has a photo of uncooked chicken, which has been placed on the canvas.

3. In the Tool palette, press the Load Tool button. Load the `Monster.ZTL` tool from the `Chapter 9` folder on the DVD. Draw the tool on the canvas and switch to Edit mode.
4. From the Material palette, choose the MatCap White01 material. This will be applied to the monster tool. You can use it as a guide as you work on creating the MatCap material.

5. Place the monster tool off to the side so that you can see the image in the background (see Figure 9.76).

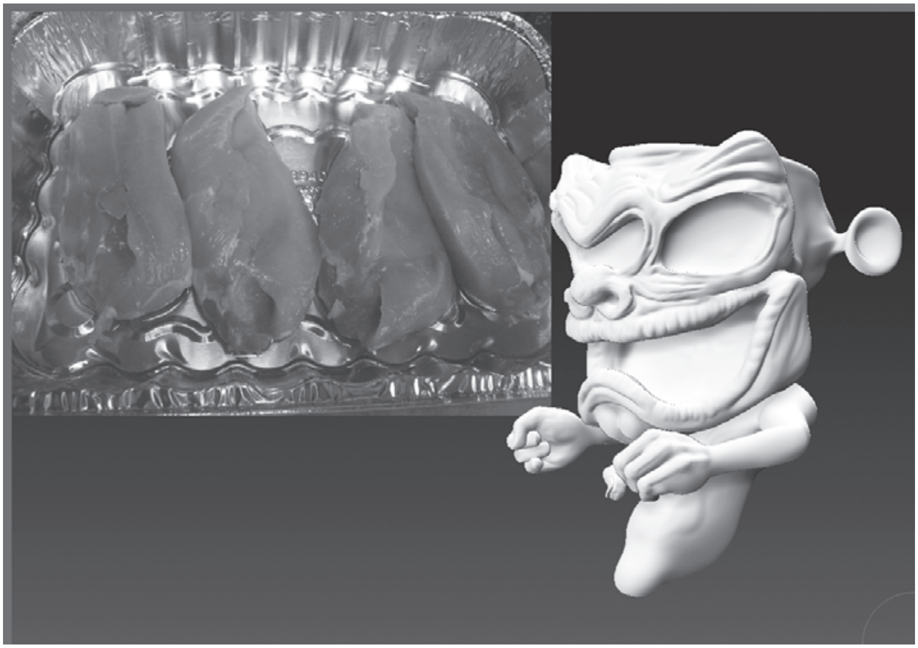


Figure 9.76
Place the monster tool off to the side so that you can see the image of the chicken in the background.

6. From the Tool palette, select the MatCap tool (Figure 9.77). You will get a warning asking if you want to switch tools. Click Switch to accept the warning.

When you switch to the MatCap tool, the monster will be converted to pixols and dropped to the canvas. That's okay. As you use the MatCap tool to edit the MatCapWhite01 material, you'll see the monster update. This will give you a good idea of how the material looks as you create it.

Figure 9.77
Choose the MatCap tool from the tool inventory

7. Click on one of the pieces of chicken in the photograph. An arrow with a circle will appear (see Figure 9.78). As you drag the brush, the angle of the arrow will change. The tool will sample the color from the point where you hold the brush.

The MatCap tool samples the color where you first click on the image. The arrow indicates how the colors will be mapped to the material surface. The direction of the arrow indicates the normal direction that corresponds to the sampled color. At first this won't appear to make much sense, but as you continue to sample colors using the MatCap tool, it should become more obvious how the tool works.

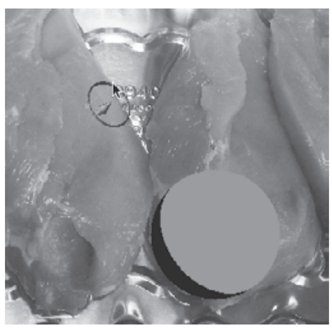


Figure 9.78
Click on the chicken in the image to sample a color.

8. Release the tool. The sample color is applied to the material. You can see the result on the monster model.
9. Click on another part of the chicken image to sample another color. Hold the brush and drag to change the normal direction. For best results, you'll want to aim the arrow in the direction the light is coming from if you want the light of the material to match the light in the image.

Each time you create a sample, a preview sphere appears to the right of the sample point. The preview sphere indicates how the sample color will be mapped to the material based on the direction of the arrow. When you release the brush, the second color is mapped to the material.

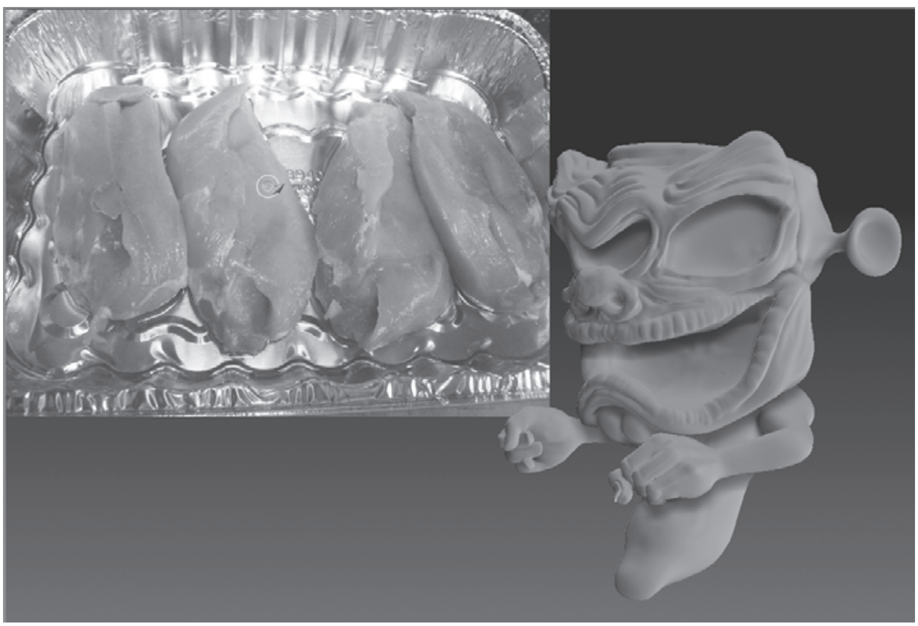
10. Use this same technique to sample six or seven more colors from the image (see Figure 9.79).
11. Move the brush over the chicken image without pressing on the mouse key or pressing on the tablet, and you'll see dots appear at the positions where you sampled the image.

If you position the brush over these spots, the arrow will reappear, allowing you to change the normal angle of the sample. You can remove the sample markers by holding the **Alt** key while clicking on the markers.

12. Sample one of the lighter colors of the image, where the chicken appears wet. Hold the **Ctrl** key and drag left or right. This reduces the area of the sample color on the material, creating a specular highlight (see Figure 9.80).

Figure 9.79

More colors are sampled from the image and added to the material.



13. Use the Save button in the Material palette to save the material as `chicken-Flesh.ZMT`. Save the material to the `ZMaterials` folder in the `Pixologic\ZBrush 4` folder on your local hard drive. The material will appear in the Materials section of Light Box.
14. Continue with this document in the next section.

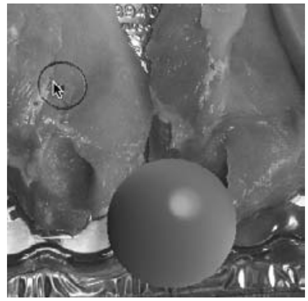


Figure 9.80

Create a highlight on the material by holding the Ctrl key and dragging to the right.

Modifying Mat Cap Materials

You can add a second set of sample points to the material. This second set of samples can be mapped to the cavities of the surface, which creates a sense of depth to the material.

1. Continue with the document from the previous section. Make sure the MatCap tool is still the current tool.
2. Place the Material palette in the tray so that you can access the controls.
3. Expand the Modifiers subpalette of the Material palette.
4. In the Modifiers section, hold the mouse pointer over the picture of the sphere toward the bottom of the palette. An enlarged view appears, showing you how the points that you have sampled so far are mapped to the material (see Figure 9.81).

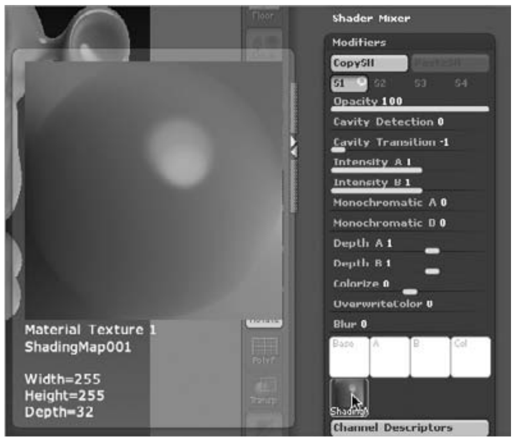


Figure 9.81

A preview of the samples appears in the Modifiers subpalette of the Material palette.

5. Click the B button in the MatCap Modifiers subpalette of the Tool palette (see Figure 9.82).
6. Use the MatCap tool to sample some darker colors from the image of the chicken.

When the B button is active, the colors that you sample are mapped to a second preview sphere. Note that now the material preview at the bottom of the Modifiers subpalette shows two spheres.

The sphere on the left is a shading map for the raised areas on the pixols or 3D tools that have the material applied. The sphere on the right is the shading map for the recessed areas or cavities. While the B button is activated, any samples you take from the image using the MatCap tool will be applied to the sphere on the right of the preview and thus all the recessed areas in the material. You can create an entirely different map for the recessed areas. The MatCap Red Wax material is an example of a material that uses two shading maps.

Figure 9.82

Click the B button in the MatCap Modifiers subpalette.

7. Take a few more samples from the image using the MatCap tool so that the B map looks different from the A map (see Figure 9.83)

Figure 9.83

A second shading map, seen as an additional sphere in the preview, determines the coloring for the recessed areas of a surface with the material applied.

8. In the Modifiers subpalette, set the Cavity Detection slider to **0.5**. This controls the sensitivity of the material to the raised and lowered parts of the pixols or the 3D tool.

9. Set the Cavity Transition slider to **-0.5**. This setting smooths the transition between the recessed and raised areas.

If you set this slider to **0.5** you will reverse the A and B channels so that shading map A (the preview sphere on the left) is applied to recessed areas and shading map B (the preview sphere on the right) is applied to raised areas.

10. Take a few moments to experiment with the other A and B sliders. These basically fine-tune the look of the A and B shading map channels. Increase the intensity of the B slider to **1.2** to give a translucent look to the material.

11. Use the Save button in the Material palette to save the material as `chickenFlesh.ZMT`. Save the material to the `ZMaterials` folder in the `Pixologic\ZBrush 4` folder on your local hard drive. The material will appear in the Materials section of Light Box. A copy of this material can be found in the `Chapter 9` folder on the DVD.

Figure 9.84 shows the final material applied to the monster tool.

The four white swatches can be used to tint the material. Click on each to open the color picker and choose a color.

Figure 9.84

The final material as it appears on the monster tool.

The base swatch takes away the specified color from the material color to the material, so if you set the base to green, the material will appear purple. The A and B swatches tint the A and B channels with the selected color. The Col swatch tints the material; the strength of the tinting color is determined by the Colorize slider.

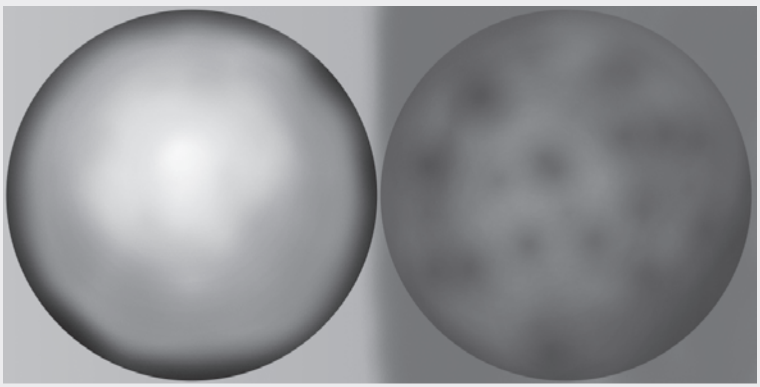
MatCap materials can be a lot of fun to make. You can try to match the colors in the initial photograph or just use it as a starting place for creating specialized materials.

CUSTOM MATCAP TEXTURES

When you're using the MatCap tool, you're essentially creating a spherical color map that appears as a texture. Another great way to create interesting materials is to simply replace the MatCap texture with your own texture. This way you don't even need to use the MatCap tool. For example, I created a cartoon look for the driver of the monster car by painting a simple image in Corel Painter. Here's how:

1. Create a square image in a paint program.
2. Create a circle that stretches to the edge of the texture.
3. Paint colors into the circle. Imagine the circle as a sphere; the placement of the colors on the sphere determine where those colors appear on a surface based on the normal directions of the surface. By painting dark edges around the circle, you can create the look of toon lines.
4. Save the image in PSD format.
5. In ZBrush, use the Import button in the Texture palette and import the PSD file.
6. In the Modifiers section for the MatCap material, click on the material sample image at the bottom of the palette to open up the Texture palette. Select the imported image.
7. Save the material. The texture will be saved as part of the material.

The following images show how I painted two circles to use as the A and B channel of the monster skin material and how the material looks on the surface of the model when rendered using BPR. Look in the `Chapter 9` folder of the DVD and you'll find samples of materials I created using this technique.



There are dozens of free MatCap materials created by artists and available to download at `www.pixologic.com/zbrush/downloadcenter/library`.

Use the Shader Mixer

When you create a material that uses more than one shader, you can use the settings in the Shader Mixer subpalette of the Material palette to determine exactly how the materials are blended. This means you can build complex materials by blending shaders.

Mix Shaders

In this example, you'll use the settings in the Shader Mixer to control how two shaders are mixed together. In this case, you'll layer a Standard material on top of a MatCap material to create a unique look.

1. Start a fresh session of ZBrush.
2. Use the Open button in the File menu to open the `MonsterCar.ZPR` project from the `Chapter 9` folder on the DVD.
3. Place the Material palette in a tray so that you can access the controls easily.
4. From the material library, select the JellyBean material.
5. In the Modifiers section of the Material palette, click the CopySH button to copy the shader into memory.
6. From the material library, choose the DoubleShade1 material.
7. In the Modifiers section of the Material palette, make sure S1 is selected; the S1 button should appear in orange. Click the PasteSH button to paste the JellyBean shader into the S1 slot.
8. From the material library, select the MatCap Sculpy2 material.
9. In the Modifiers section of the Material palette, click the CopySH button to copy the shader into memory.
10. From the material library, choose the DoubleShade1 material.
11. In the Modifiers section of the Material palette, make sure S2 is selected; the S2 button should appear in orange. Click the PasteSH button to paste the MatCap Sculpy2 shader into the S2 slot.

The DoubleShade1 material now uses the JellyBean shader in the S1 slot and the MatCap Sculpy2 shader in the S2 slot. This means that the JellyBean shader is layered on top of the MatCap Sculpy2 material.

12. Continue with the current project in the next section.

Shader Blending Modes

The BlendMode button determines what type of algorithm is used to combine the shaders together. The settings in the Shader Mixer are applied to the selected shader in the Modifiers section.

Figure 9.85
The Shader Mixer subpalette in the Material palette.

1. Click the S1 shader in the Modifiers for DoubleShade1.
2. Expand the Shader Mixer subpalette of the Material palette (see Figure 9.85).
3. Click BlendMode. A long list will appear. Try selecting various modes and see how the material is affected. Try Screen, Average, and Overlay and notice the difference each time you change blend modes (see Figure 9.86).

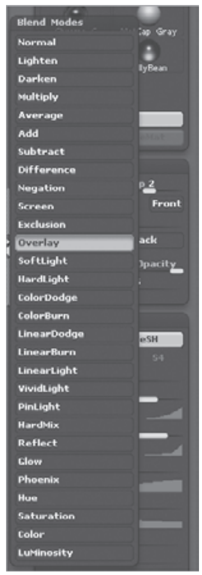


Figure 9.86
Choose from the list of blend modes to determine how one shader is layered on top of another.

When Screen is chosen, the lightest values from S1 are blended with the shader in the S2 slot. This is a good technique for adding specular highlights on top of a MatCap material.

4. Select Screen from the list of blend modes.
5. With S1 selected in the Modifiers subpalette of the Material palette, scroll down the list of settings and set Reflectivity to **30**.
6. Scroll to the bottom of the codifiers and click the Txtr00 button to open the texture library. Select Texture01 from the library. This is the desert scene.
7. Scroll back up to the Shade Mixer subpalette. Set Fresnel to **30**.

The Fresnel slider determines how the S1 settings are blended with the S2 settings based on the normals of the surface. Positive values mean that the S1 shader is stronger on the parts of the surface that turn away from the canvas. Negative values mean that the S1 shader is stronger on the parts of the surface that face the view.

8. In the Tool palette, expand the SubTool subpalette. Select the Dome SubTool and turn on the intersection icon (see Figure 9.87). This will cause the dome to render as transparent in a BPR render.

Figure 9.87
Turn on the intersection icon for the Dome SubTool.

9. In the Render palette, turn on the Transparent button.
10. Press **Shift+R** to create a BPR render. Figure 9.88 shows the result.

Figure 9.88
The monster car model is rendered using the blended shaders and the BPR render mode.

Try copying and pasting shaders into the TriShader material and see if you can use the Shader Mixer settings to blend three shaders together.

Render Subsurface Scattering Effects

Subsurface scattering is a term to describe the phenomena that occurs when photons of light penetrate the outer layers of a surface, bounce around, and then leave the surface and return into the environment. This effect gives wax, jade, and even human skin its translucent quality.

ZBrush 4 has upgraded many of the rendering and materials settings to enable the ability to create this effect for your models when you render using BPR.

The material setup is rather complex, but fortunately ZBrush has included a number of demonstration files that will help you get started applying this effect to your own models.

To make the subsurface effect visible in a BPR render, several options throughout the ZBrush interface must be enabled:

- In the Render palette, the Sss button should be turned on.
- In the Light palette, at least one light needs to have the Sss option enabled. The light does not need to be on but the option does. You can select the lightbulb icon in the lower right of the Light palette and enable the Sss option. Make sure the icon itself is not orange; this means that it is not turned on.

- The material that is applied to the tool needs to have three shaders. The S2 slot should be occupied by the subsurface scattering shader.
- The Sss slider in the Shader mixer should be increased for the S2 shader.
- You must render the tool using the BPR render mode.

Render a Subsurface Scattering Material

The easiest way to apply a subsurface scattering shader to one of your own models is to load your tool into an existing project that is already configured to render this effect. Follow these steps to render one of the dragon models with subsurface scattering.

1. Start a fresh session of ZBrush.
2. Open Light Box to the Projects directory.
3. Double-click on the `SSSRhino.ZPR` project to load it into ZBrush (see Figure 9.89).
4. Turn on the Perspective button and rotate the view of the rhino.
5. Set the main color in the color picker to white.
6. Press **Shift+R** to render the rhino. The subsurface effect is fairly obvious in the thinner parts of the model, such as the horn where the color is redder and lighter, than it is in the thicker parts of the model (see Figure 9.90).

Figure 9.89
Load the `SSSRhino.ZPR` project from the Projects section of Light Box.

Figure 9.90
The Subsurface Scattering is visible in the horns, ears, tail, and feet of the Rhino.

7. In the Tool palette, click the Load button and load the `WaxDragon.ZTL` tool from the `Chapter 9` folder on the DVD.
8. Adjust the view so that you can see the dragon model.
9. Press **Shift+R** to render the dragon. Again, the subsurface scattering quality is visible in the thinner parts of the model.

If you take a look at the modifiers for the material applied to the dragon, the material has three shaders. S1 and S3 are both standard shaders like the one used by the BasicMaterial. S2 is a special Fresnel Overlay shader that determines the color of the subsurface scattering effect.

10. Click on the Inner Blend color swatch at the bottom of the Modifiers subpalette for S2. Use the color picker to set the color to bright green.
11. Set Outer Blend to bright blue.
12. Press **Shift+R** to render the dragon. Now the thinner parts of the model take on a blue and green tint (see Figure 9.91).

You can also experiment with the settings in the Shader Mixer to create different effects for the shader. Try applying different blend mode settings to the S2 shader.

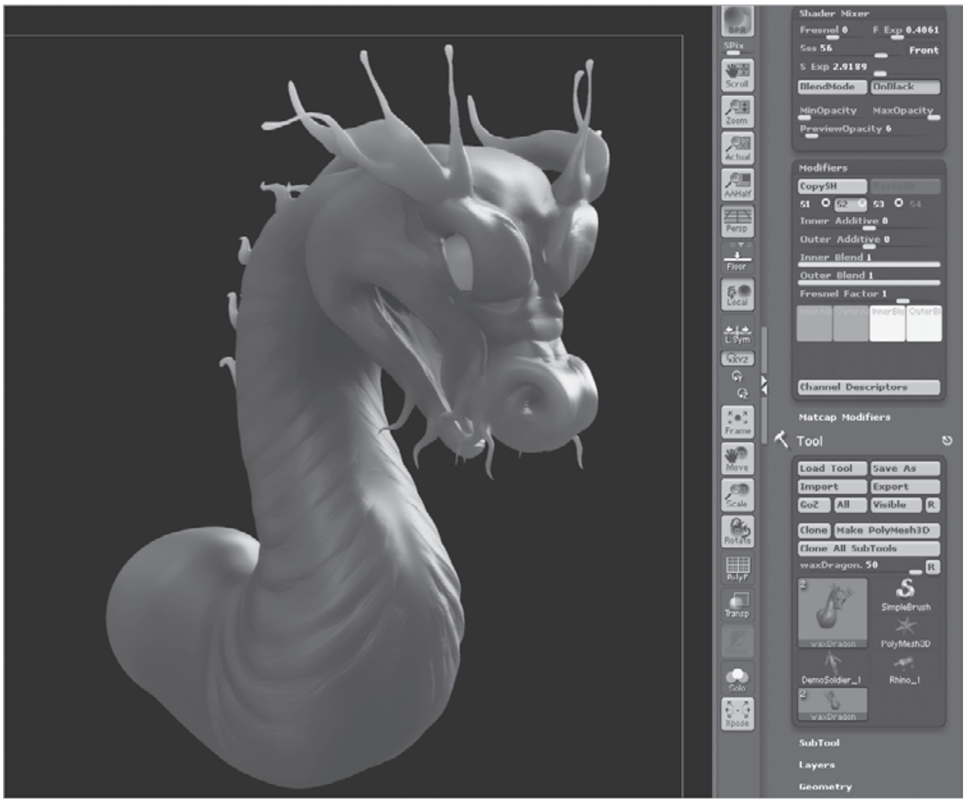


Figure 9.91
The dragon is rendered using the subsurface scattering material in BPR render mode.

The Fiber Material

Rendering hair and fur effects in ZBrush is very easy thanks to the special Fiber material. This material works with both Best and BPR render modes, but you generally get the best results when using BPR.

Render Fibers

To render fibers, you simply need to apply the Fiber material to a surface. Turn on the Fibers option in the Render palette, and then render using BPR. The fibers appear on the surface when the render is complete. There are a number of settings in the Fiber shader that determine the look of the hair and fur.

In this example, you'll apply the Fiber material to the DemoDog model.

1. Start a fresh session of ZBrush.
2. In the Tool section of Light Box, double-click the `DemoDog.ZTL` tool. Draw it on the canvas and switch to Edit mode.
3. Press **Ctrl+D** twice to subdivide the model.
4. In the material library, select the Fibers1 material in the lower right of the Standard Material section of the Material library (see Figure 9.92).
5. In the Render palette, turn on the Fibers option.
6. Press **Shift+R** to create a BPR render. When it is complete, you'll see that the dog is covered in fur (see Figure 9.93).
7. Place the Material palette in a tray and expand the Modifiers section.

Figure 9.92

Select the Fibers1 material.

Figure 9.93

The dog is rendered with Fibers1 material applied in BPR render mode.

The Fibers1 material has two shaders. The S2 slot uses a standard shader. The S1 slot uses the special Fiber shader. You'll find sliders that determine the length, density, gravity, waviness and so on for the fibers.

8. Apply these values to the following settings to create a shaggy dog look:

    Length: **45**

    Density: **45**

    Strand Density: **2**

    Length Variations: **12**

    Density Variations: **12**

    Direction Variations: **5**

    Gravity: 0.24

9. Press **Shift+R** to render the model with fibers (see Figure 9.94).
10. Use the Save button in the Material palette to save the material as `ShaggyHair.ZMT`.

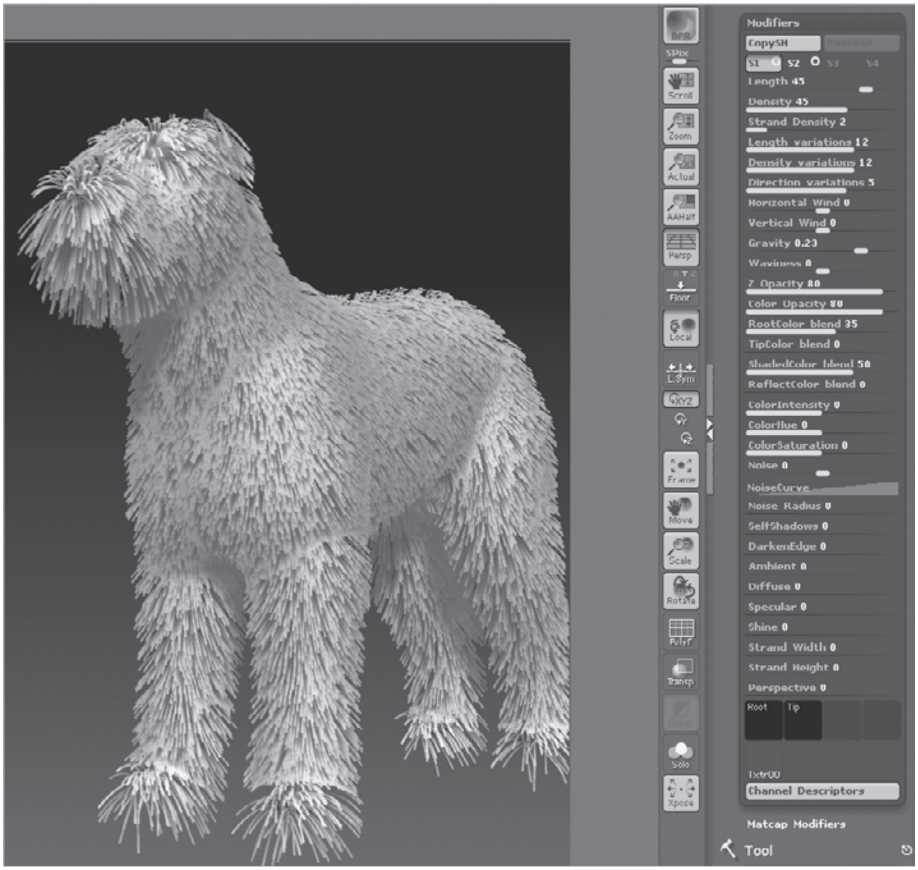


Figure 9.94
The settings are adjusted in the Fiber shader to create the look of a shaggy dog.

Create a Beard

You can paint the Fiber material onto the surface to create hair on specific parts of a model. In this exercise, you'll create a beard and eyebrows for the driver of the monster car using the `ShaggyHair.ZMT` material.

1. Use the Open button in the File menu to open the `MonsterCar.ZPR` project from the `Chapter 9` folder on the DVD.
2. Hold the **Option** key and click on the head of the driver to select this SubTool.
3. Press the Solo button on the right shelf to hide all of the SubTools except the head.
4. Scale up the view of the head.
5. Set the draw size to **30**. Hold the **Ctrl** key and paint a mask on the face of the model. Paint a mask for the beard area and the eyebrows (see Figure 9.95).

6. **Ctrl+click** on the canvas to invert the mask.
7. Use the Load button in the Material palette to load the `ShaggyHair.ZMT` material. This can be found in the `Chapter 9` folder of the DVD. Make sure this material is selected in the Material palette.
8. On the top shelf, turn on the M button.
9. In the Color palette, press the Fill Object button.

The Fill Object button fills the unmasked areas of the head with the `ShaggyHair.ZMT` material. If the head turns black, clear the mask by **Ctrl** dragging on a blank part of the canvas. Set the main color to white, press the Rgb button on the top shelf, and press the Fill Object button in the Color palette again.

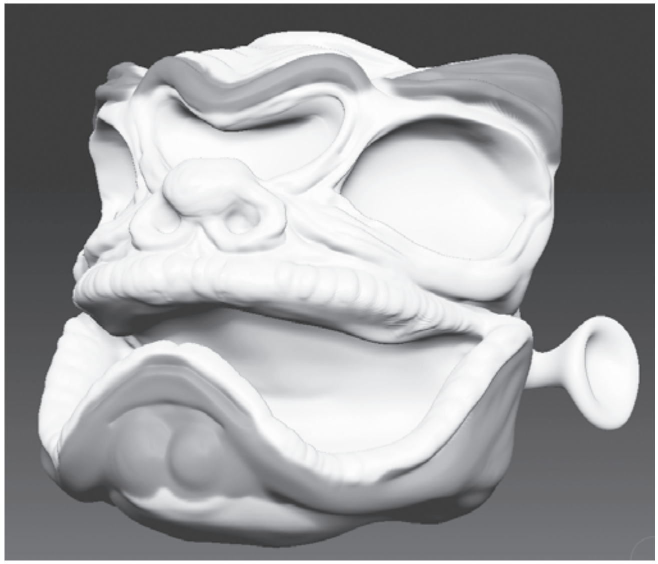


Figure 9.95
Paint a mask for the beard and eyebrows of the head.

10. In the Material palette, select the SkinShade01 material.
11. In the Render palette, make sure the Fibers button is on. Turn off the Solo button on the right shelf.
12. Press **Shift+R** to render the model. The driver should have a shaggy beard and eyebrows. Figure 9.96 shows the result.

Figure 9.96
The character uses the `ShaggyHair.ZMT` **to create a beard and eyebrows.**

CHAPTER 10

Morph Targets, Layers, and the ZBrush Timeline

Digital sculpting is often a nonlinear process. As you develop your own creations, you'll find that making the perfect digital sculpt is often not a straight line from concept to finished product. In reality, you will most likely try many techniques and test many ideas, and you'll want to see many variations before your final goal is achieved.

ZBrush 4 introduces some new tools and has revamped some of the existing features in an effort to help you through the development process. Morph targets and 3D layers allow you to store the model at different states during the sculpting process. You can use morph targets and layers to blend between variations of the model. The Timeline offers a simple way to animate between the stored states.

This chapter shows you how you can take advantage of these features and offers some examples of how they can be integrated into your sculpting workflow.

This chapter includes the following topics:

- **Morph targets**
- **The Morph brush**
- **3D layers**
- **Polypaint layers**
- **Use the Timeline**
- **Contact points**
- **Record and play movies**

Morph Targets

Morph targets are a familiar feature in many 3D animation programs. In Maya, they are known as blend shapes. Many animators use morph targets to store the position of each vertex of a model in 3D space. By interpolating between the stored states, artists can create and animate facial expressions.

ZBrush allows you to store a single morph target for your 3D tool. If the tool is made up of multiple SubTools, you have the option of storing a morph target for each SubTool if you want.

Morph targets in ZBrush are easy to create and use. Their simplicity makes them ideal for testing facial expressions and other types of simple animation. They are also a good way to save the initial state of the model, which means you have a way to restore the model even after you run out of undos.

Store a Morph Target

When you store a morph target, the position of each vertex in a model is stored in memory. This becomes part of the model. Until you delete a morph target, ZBrush keeps the state in memory. The morph target information is saved with the tool, so if you save the file, close ZBrush, and then open it up again at a later time, the morph target information will still be intact. This means that morph targets can be used like a safety net. You can always return to the original state of the model at any point during the development of the model.

The controls for storing and using a morph target are found in the Morph Target subpalette of the Tool palette. Morph targets are stored for the current active SubTool. If you have a model that is made up of multiple SubTools, each SubTool can have its own morph target. Keep in mind that each tool can have only one morph target at a time. If you want to create a more complex arrangement that uses multiple variations of a model, then you need to use 3D layers, which are discussed later in the chapter.

This exercise demonstrates how to save a morph target.

1. Start ZBrush.
2. Use the Open button in the File menu to load the `brainGuy.ZPR` project from the `Chapter 10` folder on the DVD.

The model is the head of a simple humanoid character created in ZBrush. The head should be on the canvas and Edit mode should be activated.

3. In the Tool palette, expand the Morph Target subpalette.
4. Make sure the Head SubTool is the current active SubTool. You can **Alt+click** on the head to select it (see Figure 10.1). On the canvas, the active SubTool appears in a lighter color than the inactive SubTools.

5. Click the StoreMT button (left image in Figure 10.2). This stores the current state of the model as a morph target.

When you click the StoreMT button, you'll see that the other buttons in the Morph Target subpalette become available and the StoreMT button is grayed out (right image in Figure 10.2). This is how you know that the model has a morph target saved in memory.

When you store a morph target, you can still work on other subdivision levels. If you switch to another subdivision level after storing a target, all the buttons except the DelMT button become unavailable until you return to the subdivision level where the morph target was stored.

6. Continue with this same file for the next section.

Figure 10.1
The head SubTool appears lighter than the other SubTools, indicating that it is the active SubTool.

Switch Targets

Once a morph target has been saved, any changes you make after you store it will not be included in the stored information. You can switch between the changes you make and the stored morph target using the Switch button in the Morph Target subpalette of the Tool palette.

Here is how this works: In the previous section you stored a morph target for the Head SubTool at the current subdivision level. The fact that the StoreMT button in the Morph Target subpalette is grayed out is an indication that the model has a SubTool stored already.

Figure 10.2
Click the StoreMT button in the Morph Target subpalette of the Tool palette to store a morph target.

1. Open the sculpting brush library and select the Move brush.
2. Increase the draw size to **70**. Make some changes to the face. Use the brush to pull the eyebrows down.
3. In the Morph Target subpalette of the Tool palette, click the Switch button. The head returns to its original state.
4. Click the Switch button again. The brows go down again.
5. Drag the Morph slider to the right. The brows go up (center image in Figure 10.3). Drag the Morph slider to the left and the brows go down even further than their original state (right image in Figure 10.3).

Figure 10.3
The Morph slider lets you control the intensity of the morph.

When using morph targets, try to keep in mind which state you are working on. The morph target saves two states: the stored state created when you pressed the StoreMT button and the altered state created by any changes made after you press the StoreMT button. If you switch back to the stored state and make changes, those changes will become part of the stored morph target.

The CreateDiff button creates a new mesh based on the difference between the stored state and the altered state. This mesh is stored in the Tool inventory with the prefix *MorphDiff* attached to the name.

The Project Morph button relaxes the mesh based on the stored morph target. This can help alleviate pinching and stretching problems while maintaining the detail of the surface.

6. Continue with this same file for the next section.

Delete a Morph Target

You can delete a morph target at any time to make the changes permanent or to free up room for another morph target.

To delete a morph target, just press the DelMT button in the Morph Target subpalette of the Tool palette. This makes the current state of the model permanent, so if you have made changes to the model after storing a morph target, those changes are now permanent. If you switch back to the stored state and then delete the morph target, any changes you have made will be deleted.

1. Press the Switch button so that the model returns to its original state, before any changes to the brows were made.

2. Press the DelMT button.

The other buttons in the Morph Target subpalette of the Tool palette become grayed out, indicating that the model no longer has a stored morph target.

3. Continue with this same file for the next section.

Use the Morph Brush

The Morph brush is a special sculpting brush that can be used to restore specific parts of a model to the state that has been saved as a morph target. There are many creative possibilities for using the Morph brush. In addition, the brush can be used as the ultimate "Undo" brush. If you don't like the changes you've made on a part of the model, you can use the Morph brush to carefully paint out the changes you have made.

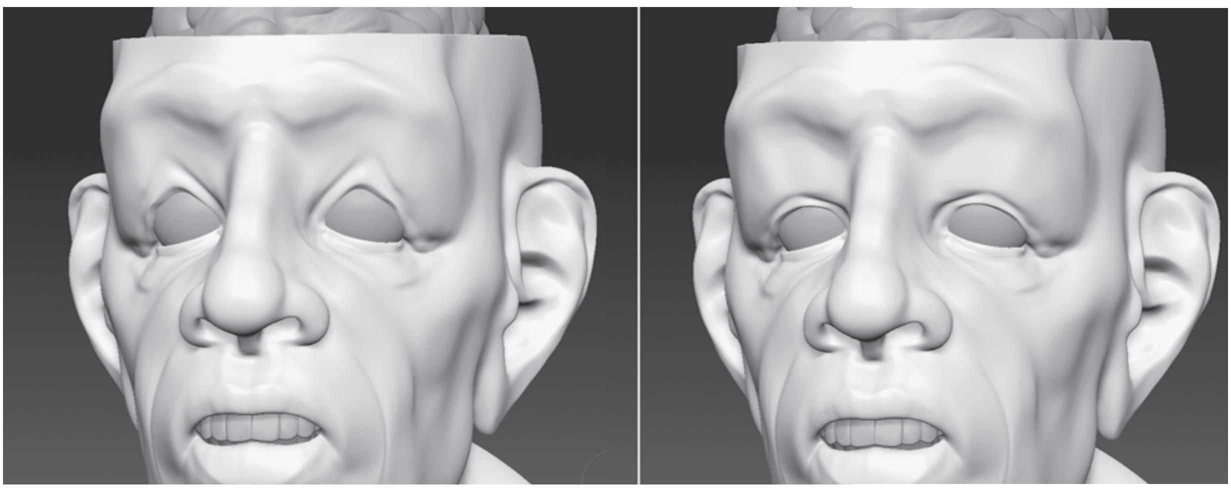
This exercise demonstrates how to use the Morph brush.

1. Make sure the head is the currently selected SubTool.
2. In the Morph Target subpalette of the Tool palette, click the StoreMT button.
3. Use the Move tool to push the eyebrows upward. It's okay to be a little sloppy; the upper eyelids will probably be moved upward as well.
4. Open the sculpting brush library and select the Morph brush.
5. Lower the draw size to **20**. Set ZIntensity to **10**.
6. Scale up the view of the model. Drag the brush over the stretched part of the eyelids (see Figure 10.4).

The upper eyelids move downward to their original state. Using the brush, you can fix problems areas that appear when you are sculpting facial expressions. It's a good idea to store a morph target when you begin editing your model so that you always have an easy way to fix problems such as stretched areas.

Figure 10.4

The Morph brush is used to fix the stretched areas of the upper eyelids after the brows have been moved upward.



Use 3D Layers

ZBrush introduced 3D layers in version 3.1 as a way to store and blend multiple variations of a model. ZBrush 4 has revamped and improved the way layers work, making them much more powerful. Along with the position of the models' vertices, 3D layers can also store masking, polypaint ZSphere rigging, and material information.

Like morph targets, layers store the position of the vertices in 3D space. But you can have as many layers as you like for each SubTool and the layers can contain different types of information. You can create a different layer for different types of details. For example, you can store the wrinkles of a character's face on one layer, the pores on the skin on another layer, scars and bumps on a third, a facial expression on a fourth, and even the color of the skin on a fifth. The possibilities truly are endless.

In the following sections, you'll learn the basics of working with 3D layers.

Figure 10.5

Use the Layers subpalette of the Tool palette to create and manipulate 3D layers.

The Layers Subpalette

The Layers subpalette of the Tool palette is where you'll find all the controls for working with layers (see Figure 10.5).

> **3D LAYERS VERSUS DOCUMENT LAYERS**
>
> Try not to confuse 3D layers with document layers. Document layers are very different and relate directly to illustrating in ZBrush and not to digital sculpting at all. Document layers are created using the Layer palette. For this chapter we will not be working with document layers so avoid going into the Layer palette. Instead, stick to the controls found in the Layers subpalette of the Tool palette.

A layer can only be created when the model is set to the highest subdivision level, otherwise you'll see a warning. In this exercise, you'll learn how to create a 3D layer.

1. Start a new session of ZBrush.
2. Use the Open button in the File palette to load the `BrainGuy.ZPR` project from the `Chapter 10` folder on the DVD.
3. Make sure the head is the currently selected SubTool.
4. In the Layers subpalette, click the large box button to create a new layer (see Figure 10.6).

Figure 10.6

Click the large box button in the Layers subpalette of the Tool palette to create a new layer.

The top slot in the Layers subpalette is now highlighted. It is labeled Untitled Layer 1, and notice that the record button, labeled REC, is enabled.

5. Press the Name button in the Layers subpalette and enter the name **Pores**. This will create a custom name for the layer, which is now labeled Pores1.

It's always a good idea to name your layers because the Layers subpalette can quickly fill up with a lot of layers. If you don't name them, it will be difficult to tell what information is stored on a layer.

6. Use the Save button in the File palette to save the project as `BrainGuyv01.ZPR`.
7. Continue with this file in the next section.

Layer Record Mode

When you create a new layer, it is automatically set to Record mode. This is indicated by the REC label on the right side of the layer slot in the Layers subpalette of the Tool palette. Any changes you make to the model while the layer is in Record mode are stored in that layer. You can record in only a single layer at a time. If you create a new layer while an existing layer is in Record mode, the original layer will stop recording and the newly added layer will be in Record mode. Any changes you make to model will be recorded in the new layer.

To turn off Record mode, press the REC button on the right side of the layer slot. The REC label will turn off and you'll see the eyeball icon instead. The eyeball icon controls the visibility of the layer.

You can turn off Record mode for all the layers and work on the model, but it's a good idea to use layers consistently. This will help you keep track of what changes are stored in which layers.

Layer Strength

You can record changes to a layer and then adjust the strength of the layer at any point afterward.

1. Continue using the `BrainGuy_v01.ZPR` project or use the File menu to open this project from the `Chapter 10` folder on the DVD.
2. Currently there is one layer, named Pores1. It should be in Record mode, indicated by the letters REC in the Layers subpalette of the Tool palette.

To create pores, you'll start by adding surface noise to the model. This creates a noise pattern all over the selected SubTool.

3. Expand the Surface subpalette of the Tool palette and turn on the Noise button.
4. Set Noise Scale to **2**. Set Strength to **0.1083**.
5. Expand the Noise curve and edit the shape of the curve so it resembles Figure 10.7.

The noise that is created using the controls in the Surface subpalette is not actually part of the model. In fact it is superimposed on top of the model. To make it part of the model, use the Apply To Mesh button.

6. Press the Apply To Mesh button in the Surface subpalette of the Tool palette.

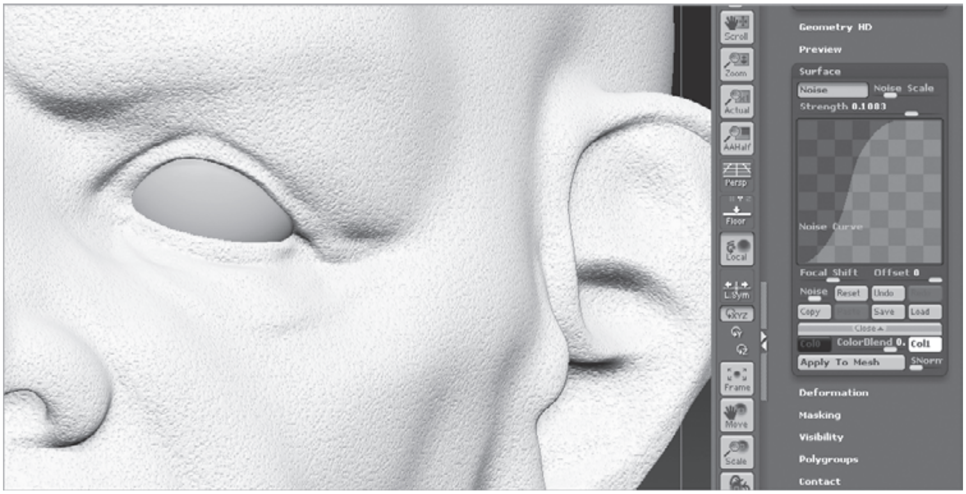


Figure 10.7
Edit the Noise curve to change the look of the noise on the surface.

The noise pattern is now part of the mesh. Since the REC button in the Pores1 layer was activated, the noise that was applied to the surface is contained in this layer.

7. In the Layers subpalette of the Tool palette, click the REC button to turn off Record mode.
8. Click the eyeball icon. This disables the visibility of the pores. The noise pattern disappears.
9. Click the eyeball icon again to turn the Noise layer back on.
10. You can adjust the Pores slider in the Layers subpalette to change the strength of the layer. Set the Pores slider below the layer stack to **0.4**. The noise pattern is not as prominent when the slider is decreased.

Note that the slider in the layer stack next to the Pores1 layer can also be used to adjust the strength of the layer.

11. Set the Pores slider to **1.5**. The strength of the noise is much stronger.

You can set the slider strength above a value of 1 to make the changes recorded in the layer even stronger than when you originally applied them. You can also invert the look of the layer by setting the slider to a negative value (see Figure 10.8).

12. Use the Save button in the File menu to save the project as `brainGuy_v02.ZPR`.

Bake Layers

The changes you create using layers can be made a permanent part of the model by baking the layers. In this example, you'll refine the look of the pores and then add wrinkles on another layer. Then these changes will be baked into the model, making them permanent.

1. Continue with the file from the previous section or open the `brainGuy_v02.ZPR` project.

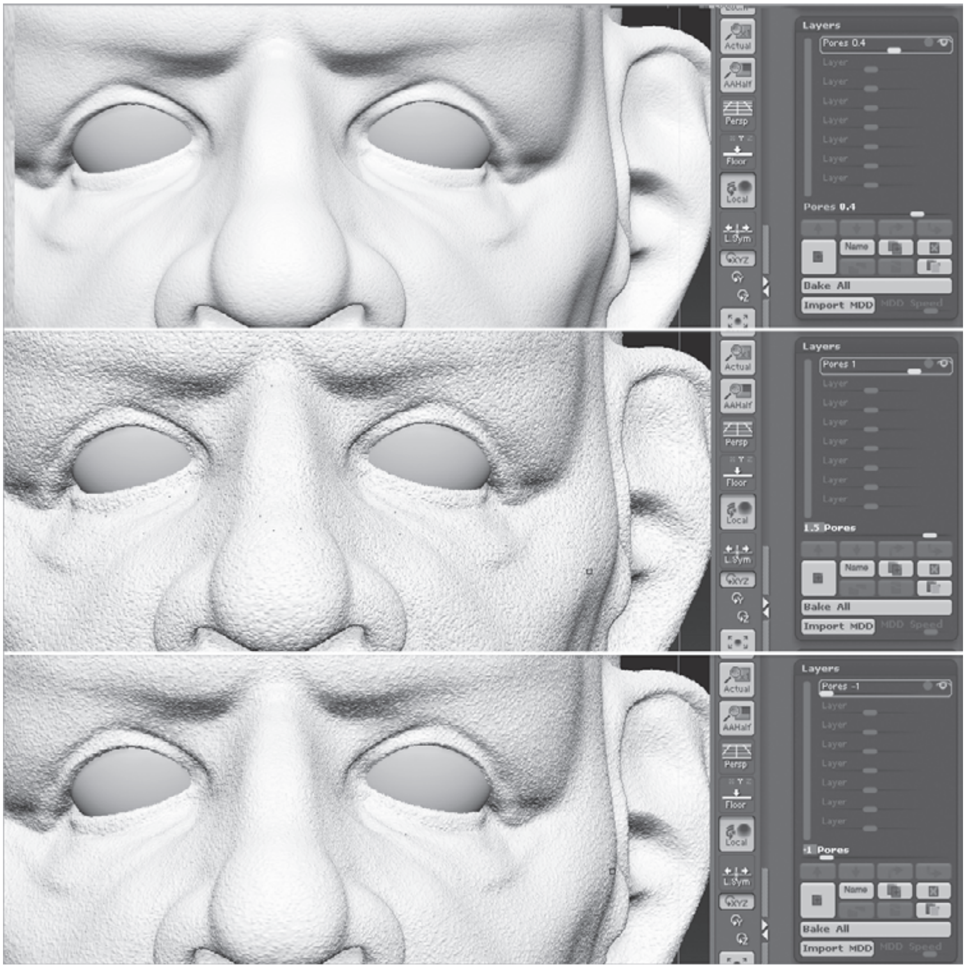


Figure 10.8
Adjust the value of the Pores slider to make the changes recorded in the layer more or less prominent.

The pores need a little smoothing to make them look more realistic. The SmoothPeaks brush works really well for creating realistic pores. This brush is not in the standard sculpting brush library; it can be found in the Brush section of Light Box.

2. Open Light Box to the Brush section. In the search field, type **smooth*** and press Enter. Only the brushes that start with *smooth* will be displayed (see Figure 10.9).
3. Double-click the SmoothPeaks brush. You'll see a warning reminding you that this brush will be mapped to the Shift key.

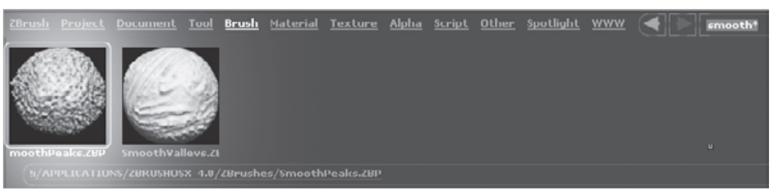


Figure 10.9
Use the search field in Light Box to search for the SmoothPeaks.ZBP brush.

4. Select the Pores1 layer and set the Pores slider to **1**.
5. In the Layers subpalette of the Tool palette, click the new layer button, the large square button with the Plus on it in the Layers subpalette of the Tool palette, to create a new layer.
6. Name the new layer **SmoothPores**.

When you create the new layer, the Pores1 layer switches out of Record mode. Now the SmoothPores layer should be in Record mode.

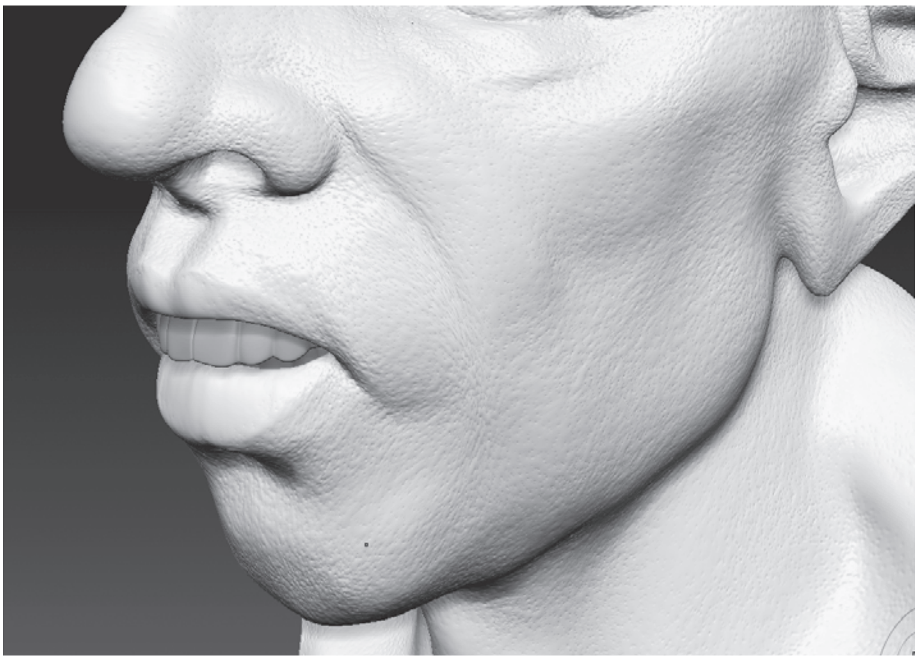
7. Scale up the view of the mode. Set Draw Size to **60**.
8. Hold the **Shift** key and set the ZIntensity slider on the top shelf to **40**. Use the brush to smooth the noise on the character's face.

The Smooth Peaks brush smooths only the parts of the surface that stick out. When it's used on a noisy surface, the effect can look a lot like skin pores (see Figure 10.10).

9. Brush over the entire surface of the head. You may want to vary the strength of the SmoothPeaks brush as you go to make some areas appear smoother than others. This adds variation to the overall look.
10. When you have finished smoothing the head, create a new layer in the Layers subpalette of the Tool palette. Click the Name button and name the new layer **Wrinkles**.

To create wrinkles, you can use the Dam Standard brush. This is another extra brush that is found in Light Box. It works well for creating fine lines, scratches, and wrinkles.

Figure 10.10
Smooth the noise to create realistic skin pores.



11. Open Light Box and switch to the Brush section. In the search field, type **dam***. You'll see the Dam Standard brush listed. Double-click the brush icon in Light Box to choose the brush.
12. Set Draw Size to **10** and ZIntensity to **15**. Make sure the ZSub button is active on the top shelf.
13. Use the brush to create wrinkles and fine lines below the eyes and in the folds of the skin (see Figure 10.11).

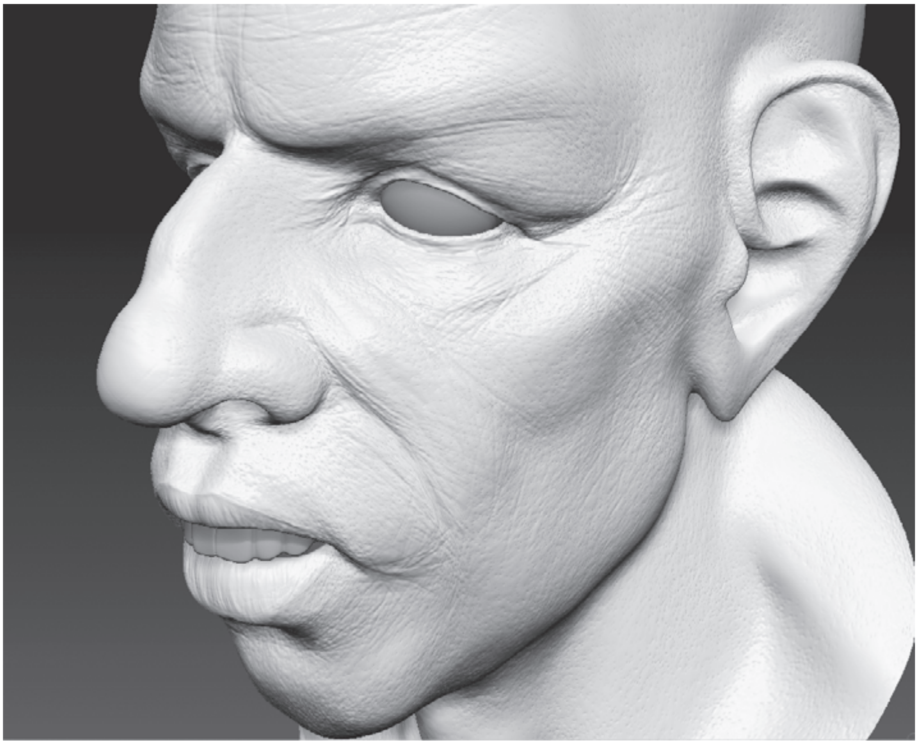


Figure 10.11

The Dam Standard brush is used to create wrinkles on the skin.

14. Once you have created enough wrinkles, go to the Layers subpalette of the Tool palette and click the REC button in the Wrinkles layer slot to turn off layer recording mode.
15. Spend a few minutes experimenting with different values for the sliders on the Pores, SmoothPores, and Wrinkles layers (see Figure 10.12).
16. Before you bake layers, it's always a good idea to save your work! Use the Save button in the File palette and save the file as `brainGuy_v03.ZPR`.
17. In the Layers subpalette, click the Bake All button.
18. Use the Save button in the File menu to save the project as `brainGuy_v04.ZPR`.

Figure 10.12

Try different values for each of the layers in the Layers subpalette.

The Bake All button removes the layers from the Layers subpalette and makes the changes in each layer a permanent part of the sculpture. The values you have entered for each layer's slider determine the strength of the layer when it is baked.

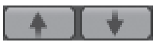
If you want to remove the layer and all the recorded changes, click the delete layer button, the small button with an x on it in the Layers subpalette of the Tool palette, to delete the layer.

You may or may not want to bake your layers while working in ZBrush. It depends on what you're trying to do. Layers can be helpful as a way to test ideas while sculpting and also as a way to create variations of a model that you can present for director or client approval.

The other buttons in the Layers subpalette have the following functions:

The up and down arrows (Shift+Page Up and Shift+Page Down) let you move up or down through the stack of layers (see Figure 10.13).

Figure 10.13
The up and down arrows let you move up and down in the layers stack.



The bent up and down arrows (Ctrl+Page Up and Ctrl+Page Down) change the position of the selected layer in the stack, moving it up or down (see Figure 10.14).

Figure 10.14
The bent up and down arrows change the position of the selected layer, moving it up or down in the stack.

Name lets you rename the selected layer. Note that when you name a layer, a number is appended to the end of the layer, so Colors become Colors 1 automatically. The number 1 indicates the intensity of the layer, which is set to 1 (or 100%) when you create the layer.

Duplicate Layer creates a copy of the selected layer and adds it to the layer stack.

Merge Down creates a new layer by merging the selected layer and the layer below it. For example, you could merge the Pores layer and the SmoothPores layer into a single layer.

Invert reverses the depth of the strokes on the surface. For example, if you invert the Wrinkles layer, it would be like setting the Layer slider to -1. The wrinkles would push outward from the surface instead of inward.

Import MDD can be used to import animation data as a layer. This is an advanced feature that is beyond the scope of this book.

Polypaint Layers

ZBrush 4 has improved upon the existing 3D layers by adding the ability to store polypainting information in the layers as well. You can create a layer specifically for the color information painted on the model as a way to keep it separate from the sculpting details. You can use multiple layers that contain different versions of the colors and even use layers to blend between variations of the colors. If you are using ZBrush to paint texture maps for use in another 3D application such as Maya, you can use layers to create multiple texture maps. One layer may contain the color of the model, another the reflectivity, another might be for ambient occlusion shadowing, another for cavity maps, and so on.

In the following sections, you'll paint texture maps for a human head model using different layers. Then you'll export each layer as a texture map.

Create Polypaint Layers

To create a polypaint layer, all you need to do is create a layer for the active SubTool and then start painting on it. ZBrush knows automatically that the layer is meant to contain the color information applied to your model. You can sculpt and paint on the same layer if you like, but it's a good idea to create separate layers for painting and sculpting. If you're not familiar with polypainting, read Chapter 8 to learn more.

This exercise demonstrates how to create polypainting layers.

1. Start a new session of ZBrush.
2. Use the Open button in the File palette to open the `brainGuy_v04.ZPR` project, or continue using the version of the model that you started earlier in the chapter.
3. In the SubTool subpalette of the Tool palette, select the Head SubTool.

When you start painting in a layer, make sure the tool is at the highest subdivision level. In the case of this model, the Head SubTool should be at SDiv level 5.

4. Open the Layers subpalette of the Tool palette. Create a new layer and name it **Color**.
5. The REC button for the Color layer should be activated. Select the Standard brush and turn off Zadd on the top shelf. Turn on Rgb and use the brush to paint colors on the model.

You can use techniques similar to those discussed in Chapter 8 to paint the model (see Figure 10.15).

6. Once you are happy with the colors painted on the skin, use the Save button in the File menu to save the project as `brainGuy_v05.ZPR`. It's always a good idea to save incrementally while painting layers.

Figure 10.15
Colors are painted onto the skin while the Color layer is in Record mode.

7. In the Layers subpalette of the Tool palette, click the REC button in the Color layer to turn Record mode off. Click the eyeball icon to turn the layer visibility off. The head should turn white when you do this, indicating that the Color layer has been hidden.
8. Create a new layer and name it **Specularity**. The new layer should have the REC button on, indicating that it is in Record mode. The Color layer should be hidden.

Always double-check that the layer is in Record mode before you start painting!

A specular map is a grayscale texture that is connected to the specular or reflective channel of a shader network in another 3D program, such as Maya. The light parts of the map indicate a higher degree of reflectivity and shininess. Darker colors reflect less light and therefore look duller. When you create a specular map, you want light gray and white colors on the shiny parts of the face such as the nose, the cheekbones, the lips, and parts of the ear. Paint darker colors where you want the skin to be less shiny, like on the cheeks and the back of the head.

9. Paint an overall layer of gray on the head, and then use the Standard brush to add light areas for the shiny parts of the face and dark colors on the duller parts. Use the spray stroke and alpha textures to make sure the colors are spotted and uneven. Too much evenness in the texture will make the head look like plastic in the final render (see Figure 10.16).

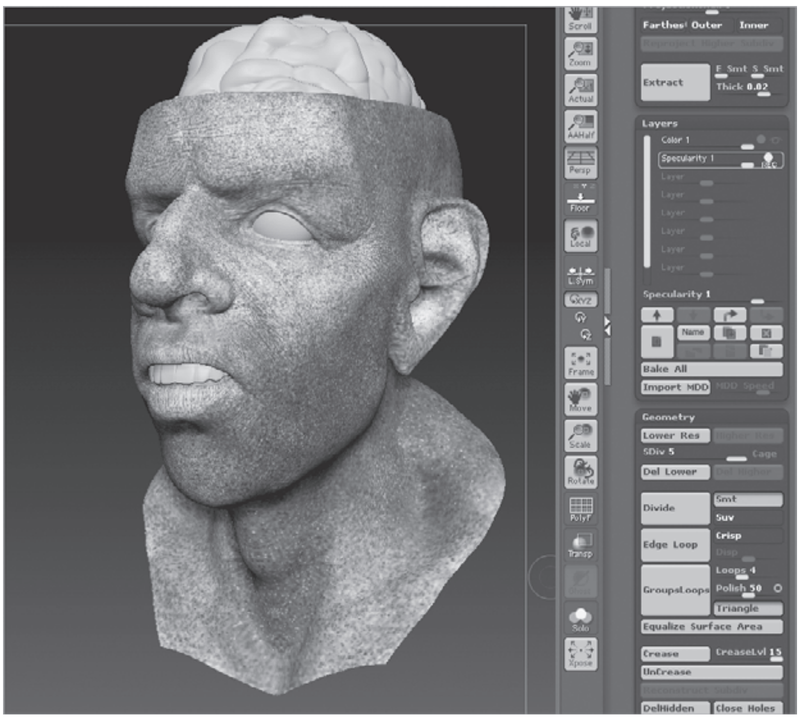


Figure 10.16
Dark and light areas are painted into a new layer named Specularity. The specular texture controls the reflectivity of the surface.

10. In the Layers subpalette of the Tool palette, click the REC button in the Specularity layer to turn Record mode off. Click the eyeball icon to turn the layer visibility off. The head should turn white when you do this, indicating that the Specularity layer has been hidden.
11. Create a new layer and name it **Occlusion**. The new layer should have the REC button on, indicating that it is in Record mode. The Color and Specularity layers should be hidden (see Figure 10.17).

While the Occlusion layer is recording, you'll paint in some ambient occlusion shadowing. The texture map created from this layer can be added to a shader network in another 3D package to enhance the look of the surface while saving the time that it takes to calculate ambient occlusion shadowing.

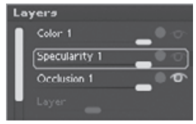


Figure 10.17

Create a new layer named Occlusion. Turn off the visibility of Color and Specularity.

Figure 10.18

Adjust intensity and scan distance in the Masking subpalette before you create the mask.

12. In the Tool palette, open the Masking subpalette. Set Occlusion Intensity to **2** and AO Scan Distance to **0.2** (see Figure 10.18).

The Intensity control will make the masking more apparent, and increasing the scan distance increases the amount of shadowing on the surface. Calculating ambient occlusion can take a long time. To save time, you can set the model to a lower subdivision level before creating the mask.

Figure 10.19

The Flat Color material makes the ambient occlusion mask easier to see.

13. In the Geometry subpalette of the Tool palette, set SDiv to **3**.
14. In the Masking subpalette, click the Mask Ambient Occlusion button.

It will take a few moments to calculate the ambient occlusion shadowing. The result may seem fairly faint.

15. In the materials library, select the Flat Color material. This makes it easier to see the ambient occlusion masking (see Figure 10.19).
16. In the Geometry subpalette, set the SDiv slider back to **5**.
17. In the Layers subpalette, double-check and make sure REC is enabled for the Occlusion1 layer. Sometimes this will turn off automatically when you change subdivision levels.

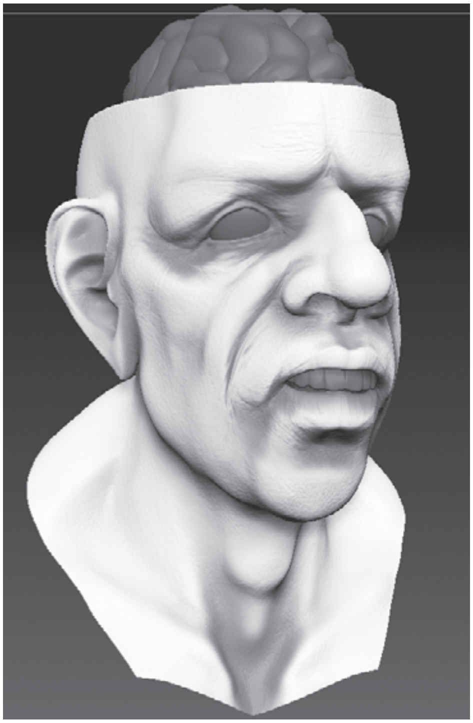


Figure 10.20
The Masked area is painted gray creating the look of shadows.

18. **Ctrl+click** on a blank part of the canvas to invert the mask (or use the Ctrl+I hotkey).
19. Turn off the View Mask button and switch back to the SkinShade4 material.
20. Use the Standard brush to paint dark gray in all over the face. The color should appear only in the unmasked parts of the surface (see Figure 10.20).
21. Use the Save button in the File palette to save the project as `brainGuy_v05.ZPR`.

Create Texture Maps

You can continue painting as many different layers of the model as you'd like. Some texture artists will paint separate texture maps for nearly every channel in a shader network. Using the layer strength sliders, you can even blend the layers together by adjusting the slider setting on visible layers. Eventually you're going to want to export these texture maps so they can be used in other 3D programs. This is a simple process, but there are a few things you need to keep in mind.

UV Texture Coordinates

When you polypaint a model, your model does not need to have any UV texture coordinates since the color values are applied directly to the vertices of the object. However, if you want to convert the colors of the model into a texture that can be exported for use in other programs, you do need to create UVs. There are several ways to do this in ZBrush. For the example in this chapter, I have already created UV coordinates using the UV Master plug-in. Using UV Master is described in Bonus Content 2, "ZScripts and ZPlugins," on the DVD. You can also import UV coordinates created in another program. The techniques for using ZBrush with other programs are described in Bonus Content 1, "GoZ," on the DVD.

At this point, the example model already has UV coordinates, so you do not need to create any for this exercise.

The exercise in this section demonstrates how to convert and export each layer as a texture map.

1. Continue with the project from the last section or open the `brainGuy_v05.ZPR` project from the `Chapter 10` folder on the DVD.
2. In the Layers subpalette, turn off the REC button for the Occlusion layer.

3. Turn off the visibility of the Occlusion and Specularity layers. Turn on the visibility of the Colors layer (see Figure 10.21).

Before you create a texture from the colors recorded on a layer, you must make sure of two things: Only the layer (or in some cases, layers) are visible, and any layer that you don't want to include in the texture is off. And make sure that none of the layers are in Record mode. The REC button should be off for all layers. If you see strange colors in your texture maps when you generate them, it's probably because the REC button is still on for one of the layers.

4. Expand the UV Map subpalette of the Tool palette and set the size of the texture using the UV Map Size slider (see Figure 10.22). In this case, you can leave it at the default setting of 2048.
5. Expand the Texture Map subpalette of the Tool palette. Click the New From Polypaint button (see Figure 10.23).

A texture is created from the colors painted on the model. You won't notice any difference in the model, but you'll see a preview of the texture map in the Texture Map subpalette of the Tool palette.

WHAT TO LOOK OUT FOR WHEN CREATING TEXTURES

When you apply a texture to a model, the texture covers the polypainted colors on the surface. Think of a texture as wrapping paper that is covering the entire surface of the model. When you create a texture from polypainting, the texture will look exactly like the colors painted on the model. Sometimes it's easy to forget when a texture is applied to the model. If you paint on the surface of the model but you don't see any new colors painted on the surface, it may be because a texture is applied to the model. When this happens, just open the Texture Map subpalette of the Tool palette and turn the Texture On button off.

To export the texture, you'll need to clone it so that it appears as part of the texture library.

6. In the Texture Map subpalette of the Tool palette, click the Clone Txtr button. You'll see the texture appear in the texture library on the left shelf (see Figure 10.24).
7. Open the texture library on the left shelf. Click the Export button. Save the texture to your local disk as **`head_color.tif`**.
8. In the Layers subpalette of the Tool palette, turn off the Colors layer and turn on the Specular layer.
9. Repeat steps 5, 6, and 7 to create the specular map. Save the file as **`head_specular.tif`**.
10. Repeat the process to create an ambient occlusion texture. Save the texture as **`head_AO.tif`**.

Figure 10.21

Turn off the visibility of the Occlusion and Specularity layers. Turn on the visibility of the Colors layer.

Figure 10.22

Set the UV Map Size slider to 2048 in the UV Map subpalette of the Tool palette.

Figure 10.23

Click the New From Polypaint button in the Texture Map subpalette of the Tool palette.

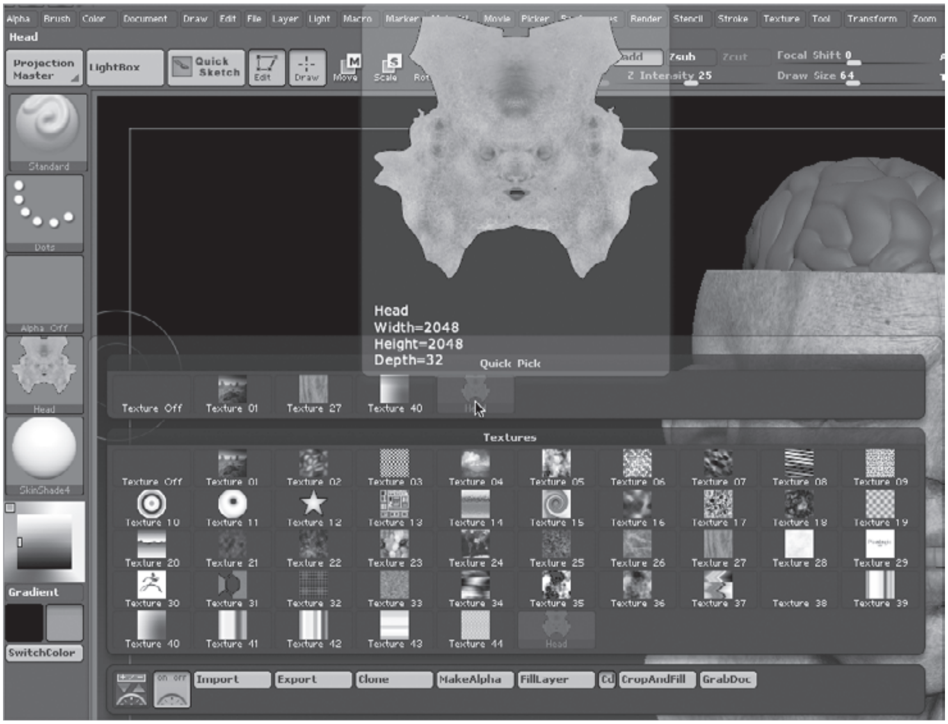


Figure 10.24
When you clone a texture, a copy appears in the texture library.

Once you have the textures saved to disk, you can import them into your favorite 3D program and add them to a shader network. Bonus Content 1, "GoZ," on this book's DVD, goes into more detail about using ZBrush with other programs and includes information on how to create displacement and normal maps.

FLIPPED TEXTURES

Some 3D programs such as Autodesk Maya use a UV configuration that is inverted vertically relative to ZBrush. When you import a texture generated by ZBrush into Maya to apply it to the same model, you have to remember to flip the image vertically. Once way to do this is to select the texture in the texture library and then press the FlipV button in the Texture palette before you export the file.

The ZBrush Timeline

One of the most exciting additions to the ZBrush toolset is the Timeline. ZBrush 4 now supports a limited amount of animation within the ZBrush interface. The animation capabilities of ZBrush 4 are not intended to compete with sophisticated animation programs such as Maya. Rather, the ZBrush Timeline is a tool you can use as a way to record view positions of the model while sculpting, to present variations of a model in the form of a movie, and to test animation targets such as facial expressions for use in animation programs like Maya.

In the following sections, you'll see how the Timeline can be used to make a simple camera animation to show off variations of a model. You'll also learn how to create movies of your ZBrush sessions and turntables using the controls in the Movie palette.

The Movie Palette

ZBrush has the capability of recording everything you do on the canvas as a movie. This movie can be saved and exported to popular computer video formats such as QuickTime. The controls in the Movie palette are used to determine how the movie will be recorded and exported.

The Movie palette also has the controls for displaying and recording on the Timeline. Some buttons are only available once a movie has been recorded and is stored in the movie buffer. The Pause button is only available while a movie is being recorded.

Let's take a look at the buttons at the top of the palette (see Figure 10.25).

Figure 10.25

The buttons in the Movie palette control loading, playing, and recording ZBrush movies.

The **Load Movie** button is used to load movies that have been recorded and saved using ZBrush's special ZMV movie format. When you load a ZBrush movie, you can play it back and even add more using the record feature.

Play Movie plays back any recorded movie has been loaded into the movie buffer.

Save As saves the movie that is loaded into the movie buffer to disk using the ZBrush ZMV movie format.

Export lets you save the movie that is loaded into the movie buffer as a QuickTime movie.

Record tells ZBrush to record everything that is going on in ZBrush, starting from the moment you press the button and until you press the Pause button. The recorded movie is stored in a buffer while you are working in ZBrush. If you want to keep the movie, you must remember to save it or export it before closing ZBrush or the movie will be lost.

Turntable creates a movie of the 3D mesh that is currently on the canvas. The movie shows the active tool rotating around its axis. This is known as a turntable animation and is used to show off a digital sculpture from all angles. The turntable movie is appended to any movie that is currently loaded into the movie buffer.

Snapshot stores a still frame of the canvas and appends it to the movie currently loaded into the movie buffer.

TimeLapse creates a movie by taking a snapshot of the canvas each time the mouse is released or when you lift the stylus from the digital tablet. The resulting movie shows how the model has progressed over time using a time-lapse effect.

Figure 10.26
The Modifiers section in the Movie palette customize the way the movies are recorded.

Pause stops the recording of the canvas.

Doc records only what is visible on the canvas.

Window records the entire ZBrush interface, including palettes.

Large, **Medium**, and **Small** set the size for the movie.

Delete clears the movie buffer of any recorded video that has been loaded into ZBrush.

The Modifiers section contains a number of settings that determine exactly how the movie is recorded (see Figure 10.26). For a complete description of each control, just hold the mouse cursor over the label while holding the **Ctrl** key.

The Timeline

The controls for animating the camera views or the layers are found in the Timeline subpalette of the Movie palette. To display the Timeline, press the Show button (see Figure 10.27).

Figure 10.27
Press the Show button in the Timeline subpalette of the Movie palette to show the Timeline.

The Timeline is displayed as a strip at the top of the canvas (see Figure 10.28). The tick marks on the Timeline represent the time in seconds. The label on the left of the Timeline displays the name of the selected layer in the Layers subpalette of the Tool palette. Or, if no layer is selected, the label Camera appears, indicating that the camera view is selected for the Timeline.

In this exercise, you'll see how you can create keyframes on the Timeline for the current camera view.

1. Use the Open button in the File palette to load the `brainGuy_v05.ZPR` project from the `Chapter 10` folder on the DVD.
2. Place the Movie palette in a tray so that you can easily access its controls.
3. Press the Show button in the Timeline subpalette of the Movie palette. The Timeline appears above the canvas.
4. Rotate, scale, and move the view of the model so that you are zoomed in on the face. Enable the Persp button on the right shelf to turn on perspective.

To the right of the Timeline you'll see the word *Camera*. This is letting you know that any keyframes you place on the Timeline will be applied to the current camera view.

5. Click the Timeline on the very left end. A large dot appears on the Timeline. This is a keyframe. The current view of the model is stored in the keyframe (see left image in Figure 10.29).

Figure 10.28
The Timeline appears above the canvas in the ZBrush interface.

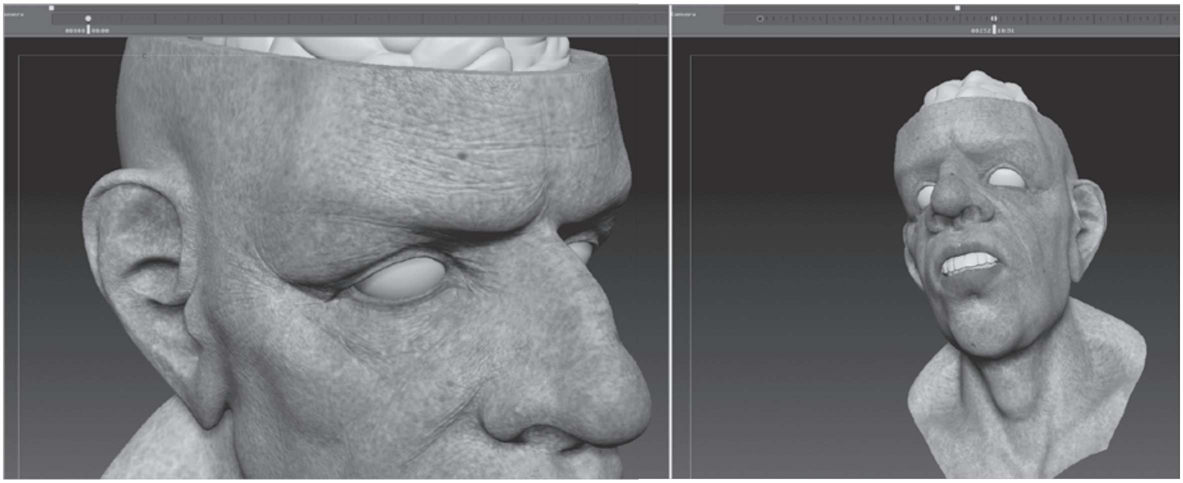


Figure 10.29
Click at different points on the Timeline to add keyframes for the camera view of the model.

6. Rotate the view and zoom away from the model. Click the Timeline about halfway across the Timeline (right image in Figure 10.29).
7. Drag the marker below the Timeline back and forth to scrub along the Timeline. You'll see the view of the model change over time.
8. Use the Save button in the File palette to save the project as `brainGuy_v06.ZPR`.

To add more keyframes, just change the view again and click on the Timeline. To change a keyframe's position, just drag it left or right. To remove a keyframe, drag it upwards off the Timeline. To change the length of the Timeline, change the Duration slider in the Timeline subpalette of the Tool palette. The value shown is the time in seconds. The default is 30 seconds.

You can continue to manipulate the view of the model while you work. It won't affect the animation unless you add another keyframe on the Timeline. Camera animation can be a helpful sculpting aid. If you find yourself continually zooming in on one area or if you need to see the model from one particular view (perhaps if you need to match the model to a background), then you can create keyframes for the view. To return to a view, simply scrub along the Timeline to the point of the keyframe.

Animate Layers

The strength value of a 3D layer can be key-framed so that you can actually create animations based on the changes you sculpt into a character. This is a great way to display variations on a sculpture or test facial blend shape targets in ZBrush.

In this exercise, you'll learn how to animate a facial expression change in ZBrush using layers.

1. Use the Open button in the File palette to open the `brainGuy_v06.ZPR` project from the `Chapter 10` folder on the DVD.

2. In the Movie palette set Duration to **5**.
3. The Timeline should be visible above the canvas. If you don't see it, press the Show button in the Timeline subpalette of the Tool palette.
4. By default, the camera is selected as the active tool on the Timeline. You can delete the keyframes on the camera by **Shift+selecting** the points on the Timeline and dragging upward. A warning message will ask you if you want to delete all points on the Timeline (see Figure 10.30). Click Yes.

Figure 10.30
Shift+select multiple points on the Timeline and drag upward to delete them. A warning message will appear.

5. In the Layers subpalette of the Tool palette, create a new layer and name it **Smile**.
6. The REC button on the Layers subpalette should be activated for the Smile layer (see Figure 10.31). To ensure that there are no masks on the model, hold the **Ctrl** key and drag a small selection on the canvas. When you release, all masks will be cleared.
7. In the sculpting brush library, select the Move brush.
8. Use the Move brush to shape the mouth into a smile. Pull the corners of the mouth back toward the ears, and shape the lower lip so that is tucked under the front teeth.
9. Use the Move brush to pull the eyebrows up. The lower eyelids should move up as well (see Figure 10.32).
10. In the Layers subpalette, click on the REC button for the Smile layer to turn it off (it may take a few seconds to switch off after you press it).
11. Set the slider for the Smile layer to **0**. The face returns to its original state.
12. Take a look at the Timeline. When a Layer is selected in the Layers subpalette, its name appears to the left of the Timeline (see Figure 10.33). If no layer is selected, then *Camera* is displayed. Make sure the layer you want to animate is selected

Figure 10.31
The REC button for the Smile layer should be activated.

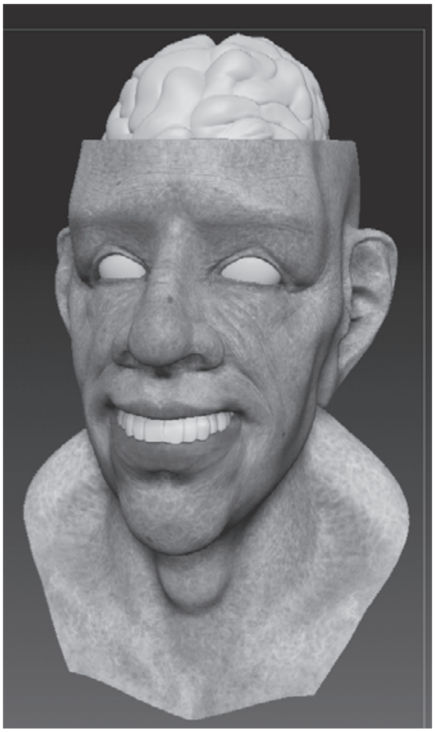


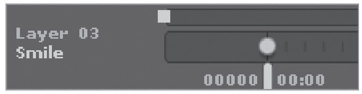
Figure 10.32
Use the Move brush to shape the mouth into a smile. Move the eyebrows and lower eyelids up as well.

before adding keyframes to the Timeline. Click on a point at the left end of the Timeline to create a keyframe.

13. In the Layers subpalette, set the Smile 1 slider to **1**. Click on a point midway through the Timeline to set a second keyframe.
14. Set the Smile 1 layer to **-0.24**. This moves the points of the face in the opposite direction, causing the face to frown a little. Click on a point at the right end of the Timeline to set a third keyframe (see Figure 10.34).
15. Drag on the marker below the Timeline to test the change in the expressions. If you need to make a change to the smile, just set the Smile slider to **1**, turn on the REC button, and make the changes. This will be recorded into the layer.

Figure 10.33

The name of the selected layer appears to the left of the Timeline.



You can make even more sophisticated animation by adding additional layers. When you set a keyframe on a layer, you are recording the value of the layer's strength slider. Animation is created by interpolating between different layer values. You can add additional layers and key-frame their strength values as well, creating overlapping movements. You could make an individual layer for each muscle in the face if you really wanted to!

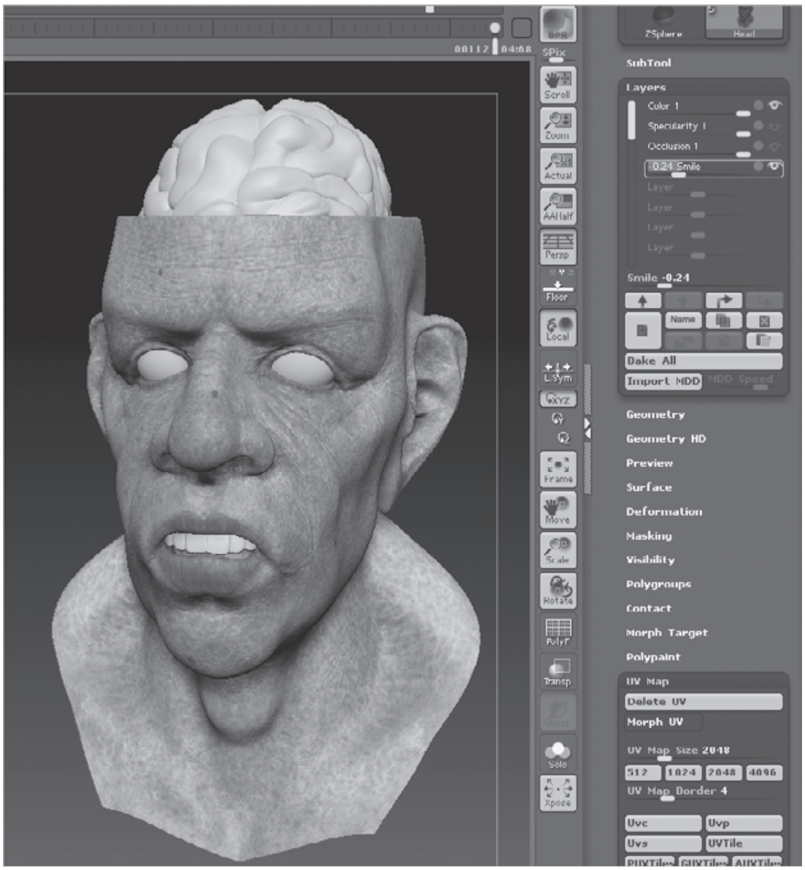


Figure 10.34

The Smile 1 layer is set to -0.24 and a keyframe is added at the right end of the Timeline.

When more than one layer has been keyframed on the Timeline, you'll see black dots appear on the Timeline indicating the keyframes for unselected layers. Use this as a visual guide for timing the animation of multiple layers.

16. Use the Save button in the File palette to save the project as `brainGuy_v07.ZPR`.

Note that you can also animate the strength of polypaint layers so you can fade between different version of colors painted on the model.

Record and Export Movies

You can record a movie of the animation playing directly on the ZBrush canvas and using any render mode you like. To record a movie, you need to add at least two keyframes to the camera Timeline.

1. Open the `brainGuy_v07.ZPR` project from the `Chapter 10` folder on the DVD.
2. The Timeline should be visible above the canvas. If you don't see it, press the Show button in the Timeline subpalette of the Tool palette.
3. Make sure the word *Camera* appears to the left of the Timeline. This indicates that keyframes placed on the Timeline will be stored for the camera position.
4. Center the view of the character and rotate so that the character is facing the left side of the canvas.
5. Click on the left side of the Timeline to create a keyframe.
6. Rotate the view of the model so that the character is facing the right side of the screen.
7. Click on the right end of the Timeline to create another keyframe.
8. **Shift+click** on the marker below the Timeline. This will cause ZBrush to play black the animation on the canvas starting from the point where you click on the Timeline. The animation will continue to loop until you press the **Esc** key.
9. **Ctrl+Shift-click** on the marker below the Timeline. ZBrush will play the animation again, but this time it is recording the animation and storing it in the movie buffer.
10. To stop the recording, press the **Esc** key.
11. To play the movie, press the Play button in the Movie palette. The animation is appended to any movies already loaded or recorded to the buffer.
12. To remove or change the fade-in text at the start of the movie, use the controls in the Title Image subpalette of the Movie palette (see Figure 10.35).
13. To save the movie to disk, press the Save As button. This will save the movie in ZBrush's special ZMV format.
14. To export the movie using the QuickTime format, press the Export button and choose the options in the Export dialog.

Figure 10.35

Change the duration of the fade in and fade out as well as text displayed for the movie title in the Title Image subpalette of the Movie palette.

If you want to render the movie using BPR, click the BPR button to create a render, then **Ctrl+Shift-click** on the marker below the Timeline. Keep in mind that it could take ZBrush a long time to create an animation using this render mode.

The Timeline feature is quite powerful and offers a way to add real excitement to your sculpting portfolio reel.

To see a version of the movie created from this exercise, watch the `animatedFace.mov` movie in the `Chapter10` folder on the DVD.

Contact Points

Contact points allow you to easily animate SubTools as a single object on the Timeline. This works best for simple animation and saves you the trouble of trying to create layers for each SubTool and animate them to match the motion of the main tool.

In this example, you'll see how to create contact points so that the teeth of a dragon follow the movement of its mouth.

1. Use the Open button in the File menu to open the `babyDragon.ZPR` project from the `Chapter 10` folder on the DVD.

This model is made up of four SubTools: Head, Eyes, UpperTeeth, and Lower Teeth (see Figure 10.36).

Figure 10.36

The babyDragon model is made up of four SubTools.

2. Drag the marker below the Timeline from left to right. The dragon's mouth closes (see Figure 10.37). This action has been animated using a layer named mouthClose (see Figure 10.38).

Notice that the bottom teeth are left behind in the animation. To fix this, you'll create contact points between the head and the teeth.

3. Make sure the Head SubTool is the currently selected SubTool. In the Tool palette, expand the Contact subpalette.

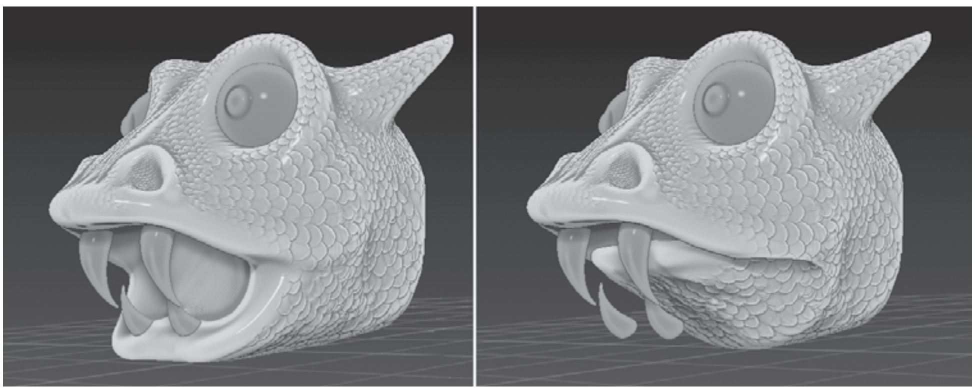


Figure 10.37

The mouth opens and closes when you move the marker below the Timeline.

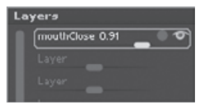


Figure 10.38

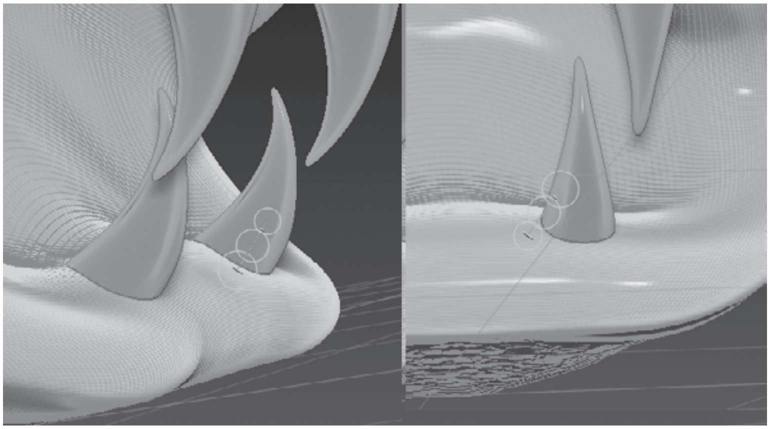
The mouthClose layer has been animated on the Timeline.

Figure 10.39
The Contact subpalette of the Tool palette

The Contact subpalette has three main buttons, labeled C1, C2, and C3 (see Figure 10.39). For contacts to work, you must establish three points between the animated surface and the SubTool. To do this, you use the Transpose tool.

4. Press the Move button on the top shelf (hotkey = W). You can use Move, Scale, or Rotate—it doesn't matter. What does matter is that the Transpose handle is available.
5. Use the Transpose tool to draw a line from a point on the lower jaw to the base of one of the lower teeth. Rotate the view and make sure the line goes to the tooth in all views (see Figure 10.40). Adjust the Transpose handle until it is clearly touching the surface of the jaw and the surface of the tooth.

Figure 10.40
The Transpose tool should connect the jaw to the tooth in all angles.



6. In the Contact subpalette of the Tool palette, press the C1 button. This stores the first contact point for the SubTool, which lets ZBrush know how to move the lowerTeeth SubTool in relation to the Head SubTool. You need to make two more points to establish the contact.
7. Create another line from the jaw to the base of the other tooth and press the C2 button.
8. Create a third line from the jaw to the base of either tooth and press the C3 button.
9. Scrub the Timeline back and forth. Now the lower teeth move with the jaw (see Figure 10.41).

If the upper teeth move as well, then it's possible that the end of the Transpose handle was too close to the upperTeeth SubTool. You can move the Timeline back to the start, adjust the Transpose handle, and restore the contact point by pressing the C1, C2, or C3 button in the Contact subpalette of the Tool palette. Also notice that the animation of the lower teeth occurs when you move the playhead on the Timeline. If you adjust the strength of the mouthClose SubTool, the teeth do not move. Once you move the Timeline playhead, the teeth snap back into position.

10. To see a finished version of the project, use the Open button in the File palette to open the `babyDragon_v02.ZPR` file from the `Chapter 10` folder on the DVD.

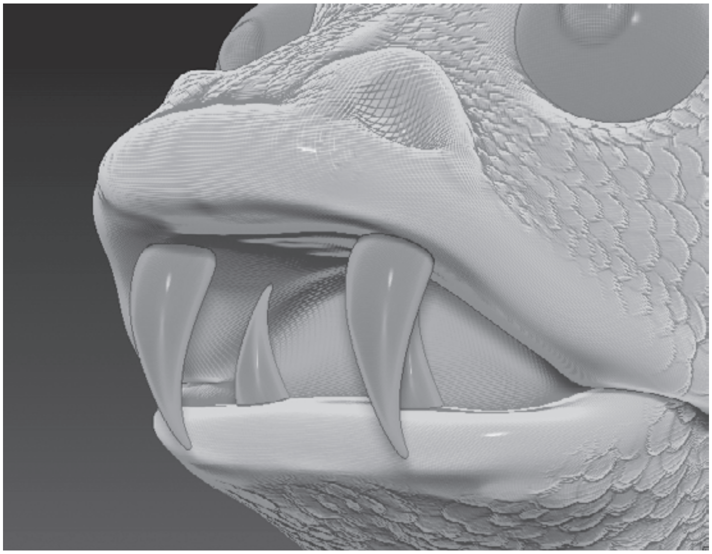


Figure 10.41
Now the teeth move with the jaw.

BONUS CONTENT 1

GoZ

ZBrush has become an integral part of the animation pipeline. In recent years, ZBrush has been adopted by modeling and texturing departments in many studios. Pixologic has developed GoZ as a bridge between ZBrush and the more popular animation packages. In this chapter, you'll learn how to use GoZ to send a model between ZBrush and Maya and back again.

You'll also learn how to retopologize a model within ZBrush and how to create texture maps and export them for use in other programs. You'll learn how to generate normal and displacement maps so the details you sculpt in ZBrush will be rendered properly in Maya.

This chapter includes the following topics:

- **Using retopology**
- **Modeling with GoZ**
- **Generating texture maps**
- **Working with normal and displacement maps**

Using Retopology

In the context of 3D computer graphics, *topology* refers to the arrangement of polygons on the surface of a model. Different types of topology serve different purposes. For example, the way the polygons on a face are arranged may make animating the model easier, whereas other topologies make sculpting surfaces easier.

It is not unusual these days to reorganize the topology of a model after it has been sculpted. This is a great way to take a model that has been sculpted as a conceptual design and make it ready for animation. Reorganizing a model's topology is known as *retopology*, and ZBrush has a built-in set of tools that makes this process easy.

The question of when to retopologize a model is up to you as an artist. In my own work, I often retopologize a model when I decide I need more polygons devoted to certain areas such as the face, or when I want to merge separate parts of a model into a single surface. Most often I start thinking about retopology if I decide that I need to send the model to animation software such as Autodesk Maya, 3ds Max, Maxon's Cinema 4D, or Luxology's Modo. In this section, you'll go through the process of retopologizing the dragon body created in Chapter 6, "Remesh and Projection," so that later in this chapter you can easily send the model to one of these 3D animation software packages.

Prepare the Model

The technical aspects of retopology are not difficult; the trickier part is deciding how the polygons of the new topology should be arranged on the surface. Planning ahead can help reduce problems later. One technique for planning the new topology is to simply paint a grid on the surface of your existing model:

Figure B1.1

Turn on the paintbrush icon for the Body SubTool to activate polypainting.

1. Open ZBrush and use the Open button in the File menu to load the `dragonRetopo_v01.ZPR` project from the `Bonus Content 1` folder on the DVD. This is the same dragon that was created in Chapter 6. The model is fairly simple. There are four SubTools: the body, the front toes, the back toes, and the eyes.
2. In the SubTool subpalette of the Tool palette, make sure the Body SubTool is selected. Turn on the little paintbrush icon to activate polypainting (see Figure B1.1).
3. On the right shelf, press the Solo button to hide the other SubTools.
4. In the Geometry subpalette, set the SDiv slider to 4. This is the highest subdivision level.
5. The body has been organized into polygroups. You'll start by working on just the head. Press and hold **Ctrl+Shift** and click on the head. The rest of the body becomes hidden from view.
6. From the sculpting brush library, select the Standard brush. On the top shelf, turn on Rgb and turn off Zadd. Make sure Rgb Intensity is set to 100.

7. Press the **V** hotkey. This switches the colors for the Main and Secondary colors in the color picker. The Main color should now be black, and the Secondary color should be white.
8. Set the Draw size to 3 and Focal Shift to -100.
9. In the Stroke palette, turn on LazyMouse and set the LazyRadius to 10.

RETOPOLOGY PAINT BRUSH

It might be a good idea to save the brush used in this exercise for future use, whenever you need to paint retopology lines on a model. Use the Save button in the Brush palette to save the brush as `marker.ZBP`. Save the brush in the `Pixologic/ZBrush 4.0/ZBrushes` folder so that it appears in Light Box in the Brush section.

Now you're ready to paint lines on the model. I usually start with areas that I know will require specific topology for animation such as the eyes. Figure B1.2 shows how I painted lines on the model.

10. Use the brush to paint lines on the surface of the dragon. If you decide you need to erase a line, just press the **V** hotkey to switch the Main and Back colors, and paint white over the lines you want to remove. Press the **V** hotkey again to switch the colors and then continue painting lines.

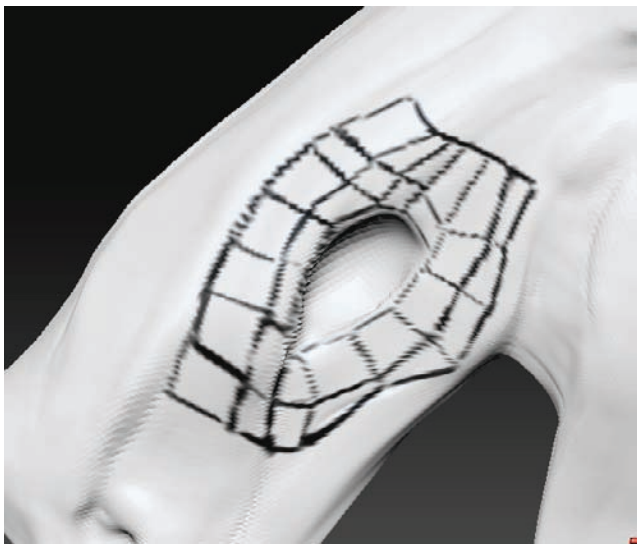


Figure B1.2

Lines are painted on the head, indicating how the polygons will eventually be arranged.

The retopology guide should consist of four-sided polygons (in other words, rectangles) as much as possible. Most polygon modelers agree that three-sided polygons (triangles) should be avoided if possible or placed in an area that will not deform when animated or in an area that is hidden from view. Avoid using *n*-sided polygons (polygons with more than four vertices) and try not to create an arrangement in which more than four polygons share a single vertex, at least not in a place that is visible. At the same time, try to make the "flow" of the polygons match the contours of the surface. It is tricky, which is why it's a good idea to paint the guide first and work out all the problems ahead of time, before starting to actually retopologize the model. You don't have to take the time to paint a topology guide, but it is usually helpful.

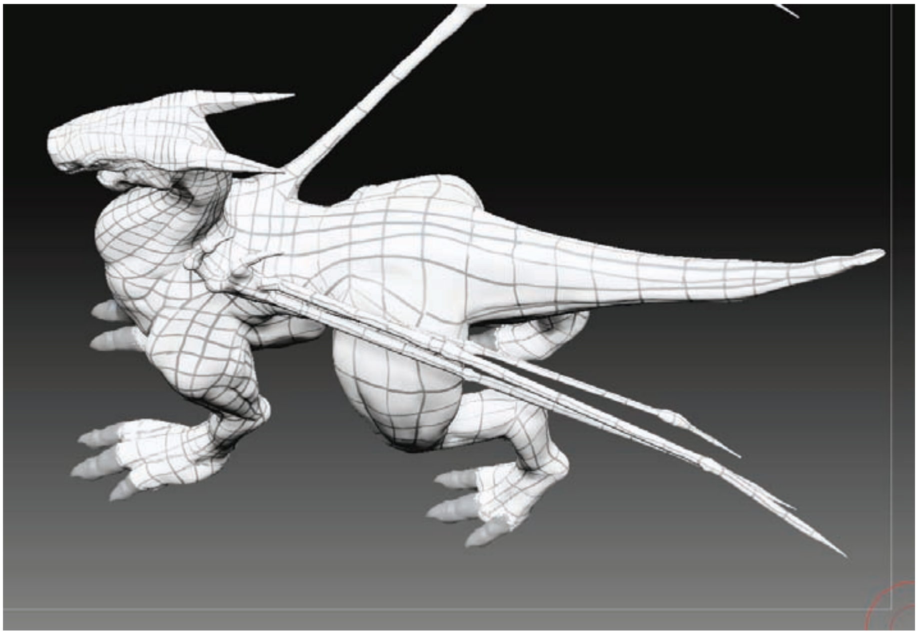
USE LAYERS WHEN CREATING THE RETOPOLOGY GUIDE

What happens when you want to paint a retopology guide on a model that has already been painted? The solution is simple. Create a new layer in the Layers subpalette of the Tool palette. Make sure the layer is in Record mode. Fill the model with a white color and paint the guide. You can hide the guide when you are finished by simply making the layer invisible.

It takes a while to do the entire body. Figure B1.3 shows the result.

11. After you have completed the body, use the Save As button in the File menu to save the project as `dragonRetopo.ZPR`. A version of this file is found in the `Bonus Content 1` folder on the DVD.

Figure B1.3
The retopology guide has been painted over the entire surface of the model.



Retopologize the Model

To retopologize the model, you'll create a network of connected lines by using ZSpheres. The lines will match the retopology guide painted on the surface of the model. As you create the network, you'll want to preview the result as you work. Follow these steps:

1. Continue with the project from the previous section or open the `dragonRetopo.ZPR` project from the `Bonus Content 1` folder on the DVD.
2. Open the Tool palette and click the Append button below the SubTool subpalette. From the tool inventory, select the ZSphere. This adds a ZSphere to the model.

3. Make sure the ZSphere is selected in the SubTool subpalette of the Tool palette. Switch to Scale on the top shelf (hotkey = E) and scale the size of the ZSphere down. Switch to Move (hotkey = W) and move the ZSphere somewhere out of the way, such as within the chest of the model. Activate the Transp button on the right shelf so you can see the ZSphere within the model (see Figure B1.4).

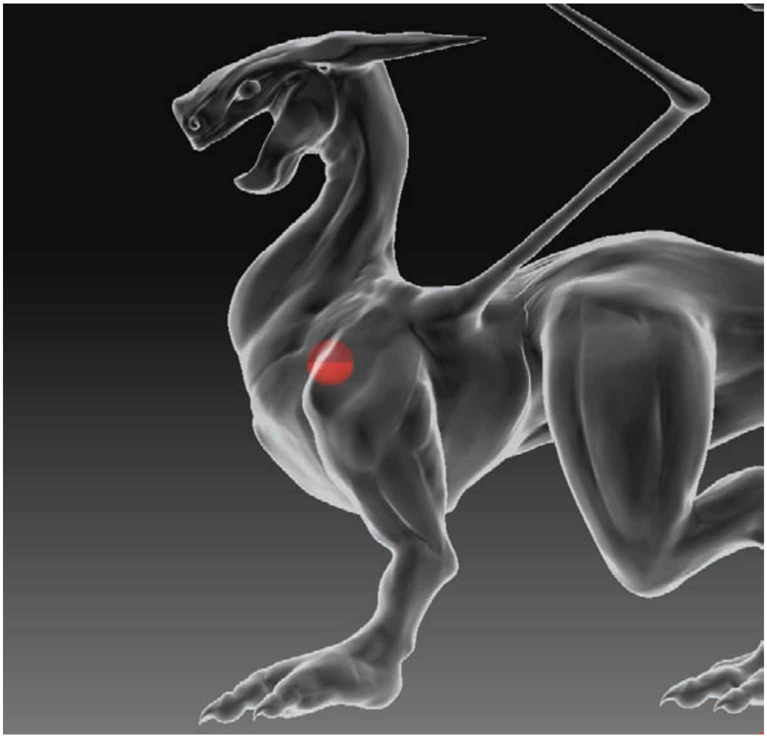


Figure B1.4
Activate transparency so you can see the ZSphere within the model.

4. Scroll to the bottom of the Tool palette and expand the Topology subpalette. This subpalette appears only when a ZSphere is the active SubTool. If you can't find Topology, make sure that you have the ZSphere selected.
5. Press the Edit Topology button (see Figure B1.5).
6. You'll start with the head. Scroll up to the SubTool subpalette and select the Body SubTool so it becomes the currently active SubTool. The body has been arranged into polygroups to make working on the model easier. **Ctrl+Shift-click** on the head to hide the rest of the body.
7. Press **F** to focus the view on the head.
8. Switch back to the ZSphere SubTool in the SubTool subpalette of the Tool palette.
9. Press **X** to activate symmetry.
10. Turn on the Trans button on the right shelf, and make sure Ghost is off so you can see the guidelines painted on the model.

Figure B1.5
Press the Edit Topology button in the Topology subpalette of the Tool palette.

11. Turn on the Draw button on the top shelf (hotkey = Q). Also make sure that the Zadd button is on.
12. Click on the model at the intersection of two of the guidelines, and you'll see a red circle. You've just added a ZSphere to the surface. Click three more times to create a square, again, matching the guidelines on the surface (see Figure B1.6). Close the square by clicking on the first ZSphere.

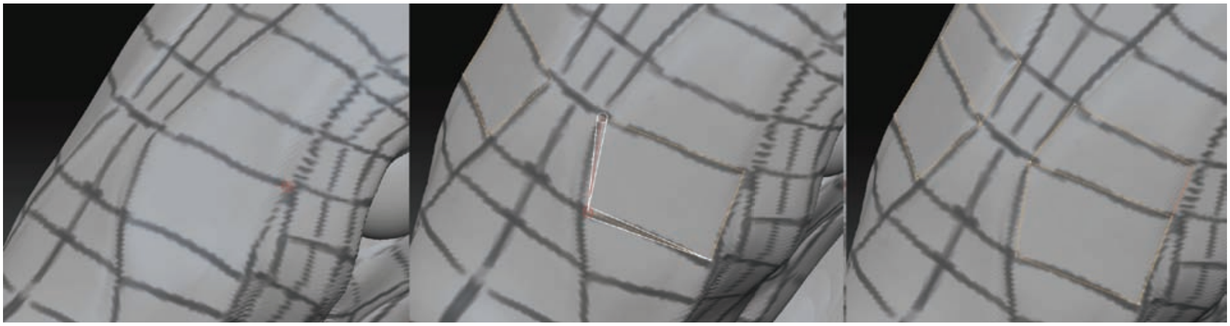
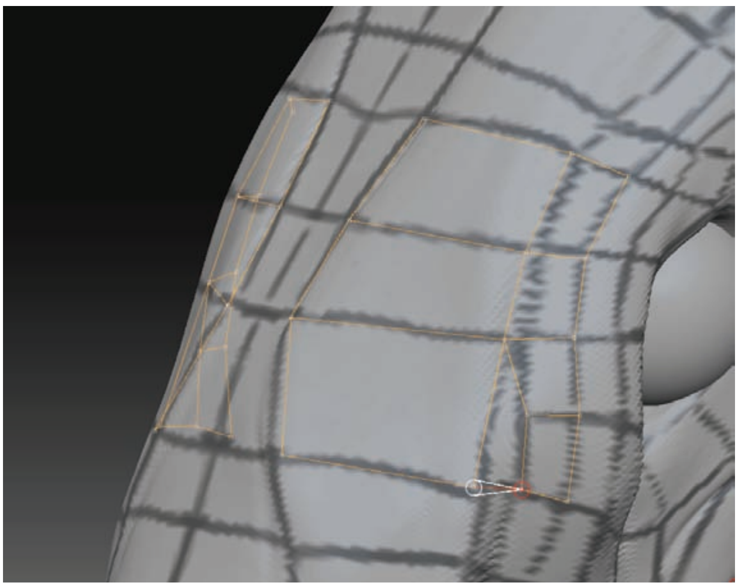


Figure B1.6
Start building the network by clicking on the surface of the model. Follow the guidelines painted on the surface.

Because symmetry is activated, you'll see a second set of lines appear on the other side of the head. As you add ZSpheres to the model, they will snap to the surface. Essentially you will build a network. Each new ZSphere is connected to the selected ZSphere. Each square that you create on the surface represents a polygon. The selected ZSphere is indicated by the red circle. You can deselect the ZSpheres by clicking on a blank part of the model or by rotating the view slightly. Select a ZSphere by clicking on it. Figure B1.7 shows how the network is started for the dragon's head.

Figure B1.7
Continue to build the network on the surface of the dragon's head.



TIPS ON CREATING THE ZSPHERE NETWORK

Retopology with ZSpheres takes a little bit of practice to get used to the process. But by the time you've retopologized an entire model, you should be pretty comfortable with the technique. Here are some tips that will help you when creating the network:

- You can move a ZSphere by switching to Move mode (hotkey = W) and dragging in on the ZSphere. When you move a ZSphere, it will no longer snap to the surface.
- Hold the **Alt** key and click on a ZSphere (while in Draw mode) to delete it.
- If you make a connection that you don't want, press **Ctrl+Z** to undo, and click on a blank part of the canvas (or rotate the view slightly) to deselect the ZSpheres. Click on the model again to add a new ZSphere and then click on a ZSphere in the network to make a connection.
- Preview the mesh frequently as you work. This is the only way to catch problems ahead of time!
- You can split the connections between ZSpheres by clicking on the lines that connect the ZSpheres. Notice that the cursor snaps to even divisions within the line so that you can easily split the line in half or into quarters.
- You can show or hide SubTools while working as well as parts of the original model. The ZSpheres will snap to only visible parts of the model.
- You can hide parts of the network by holding **Ctrl+Shift** and dragging over the ZSpheres. This can be helpful if the visibility of the network makes it hard to see what's going on.
- Save often and save multiple iterations of the file so you have something to go back to if you mess up!

Preview the New Topology

As you add to the network, you can preview the retopology by pressing the **A** hotkey. Follow these steps to preview:

1. Continue to build up the surface of the head by adding new ZSpheres to the network.
2. Press the **A** hotkey, and the network is replaced by a small patch of polygons (see left image in Figure B1.8).
3. Turn on the PolyF button on the right shelf to see the wireframe on the preview. You can also click the Solo button to hide the other SubTools.
4. Expand the Adaptive Skin subpalette of the Tool palette. If you want to see how the surface looks when subdivided, increase the Density slider (see right image in Figure B1.8).

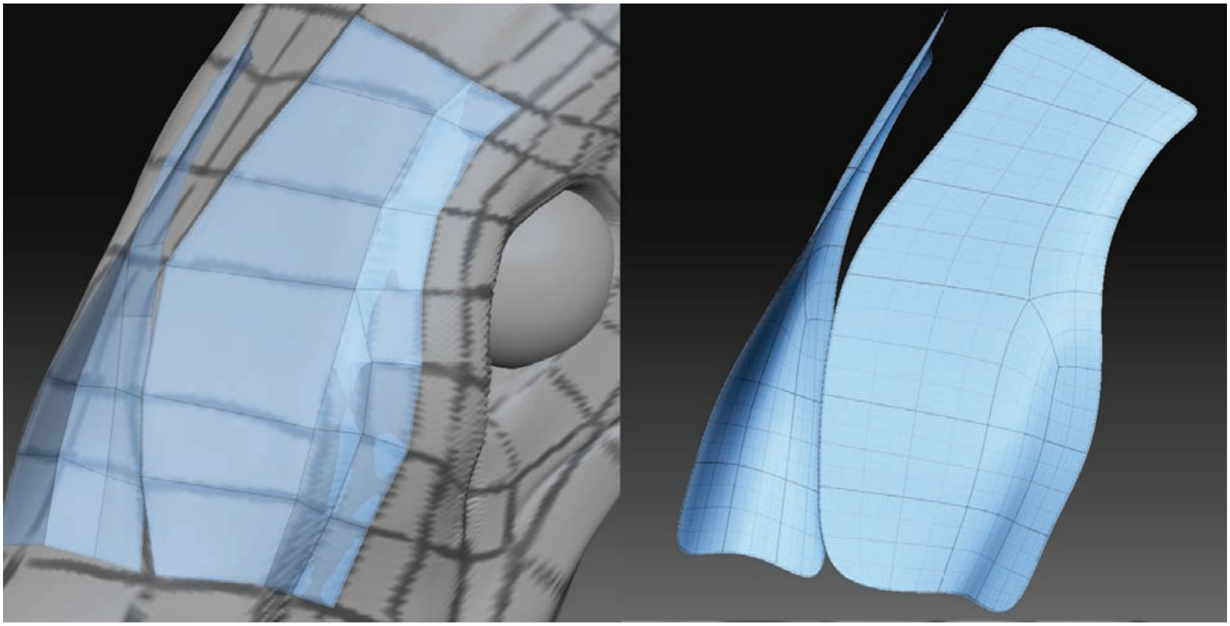
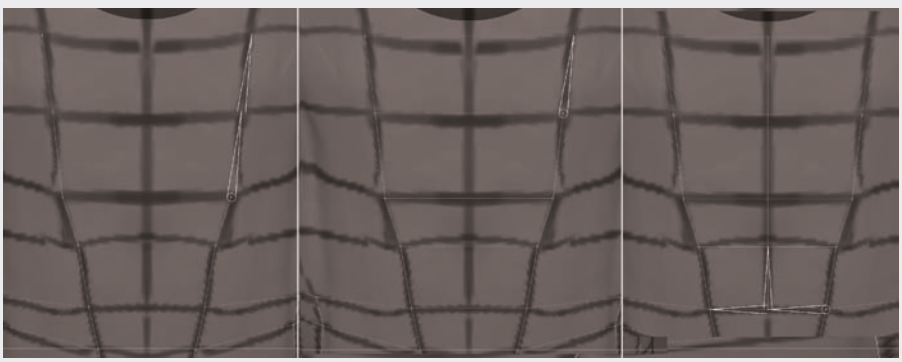


Figure B1.8
Press the A hotkey to preview.

5. Press the **A** hotkey again and then continue working on building the network.
6. Remember to save often! Use the Save As button in the File menu to save the project as `dragonRetopo_v03.ZPR`.

CREATING A CENTERLINE

While symmetry is enabled, you can easily retopologize both sides of the surface at the same time. However, creating a line of ZSpheres down the middle of the object can be a bit tricky. It's usually a good idea to create a pair of lines on either side of the center line, and then disable symmetry and join the lines together, as shown in the following images.



Retopologize Multiple Subtools

You can retopologize over multiple SubTools at the same time, which will allow you to create a single surface that covers multiple parts. This is similar to remeshing. However, retopologizing takes a bit more work. The advantage of retopology over remeshing is that you have absolute control over how the surface is created. Figure B1.9 shows how I created a topology that incorporates the toes into the surface for the dragon body.

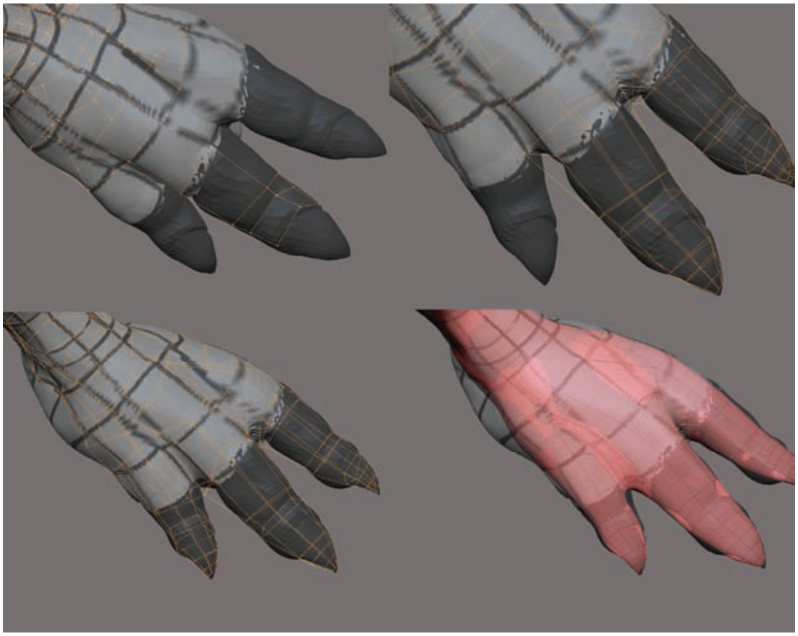


Figure B1.9

The toes are incorporated into the ZSphere network.

Create the Adaptive Mesh

After you have completed the ZSphere network, make sure to preview the mesh by pressing the **A** hotkey. Inspect the model closely for problems. If everything looks okay, you're ready to create the mesh:

1. In the Adaptive Skin subpalette of the Tool palette, set the Density slider to 1.
2. Press the Make Adaptive Skin button (see Figure B1.10).

   When you press the Adaptive Skin button nothing happens to the tool on the canvas, but just like when you create an adaptive skin from a ZSphere armature ZBrush creates a copy of the retopologized mesh and places it in the inventory of the Tool palette. The retopologized mesh appears in the Tool palette with the prefix *Skin_* attached to the name, usually something like *Skin_ZSphere*.
3. Use the File menu to save the project as `dragonRetopo_v03.ZPR`. When you save the project, ZBrush will save the original model, the ZSphere network, and the adaptive skin.

Figure B1.10

Press the Make Adaptive Skin button in the Adaptive Skin subpalette of the Tool palette.

THE SENSIBLE APPROACH TO RETOPOLOGY

ZBrush's retopology tools are pretty good, but in some cases the process can be a little tedious and difficult. For example, the long bones that form the wings of the dragon can be tough to retopologize using ZSphere. In cases such as this, the best approach is to combine ZBrush's tools with the power of the advanced polygon modeling tools found in programs such as Luxology's Modo or Autodesk Maya.

It's far easier and faster to extrude polygons in these programs than it is to construct these parts of the model point by point in ZBrush. Frequently I will use ZBrush's retopology tools to rough out the basic shape of a model and generate an adaptive skin, and then I'll export the adaptive skin as an OBJ file and fix problems and finish the basic model in Modo. Next I'll reimport the OBJ file into ZBrush, subdivide the model, and use projection to transfer the details from the original mesh to the imported version. This way, I can take advantage of the strengths of both ZBrush and Modo (or Maya). The process is even faster when you use GoZ to transfer models back and forth between programs. Using GoZ is explained later in this chapter.

The following image shows how I used Luxology's Modo to create the geometry for the wing bones.

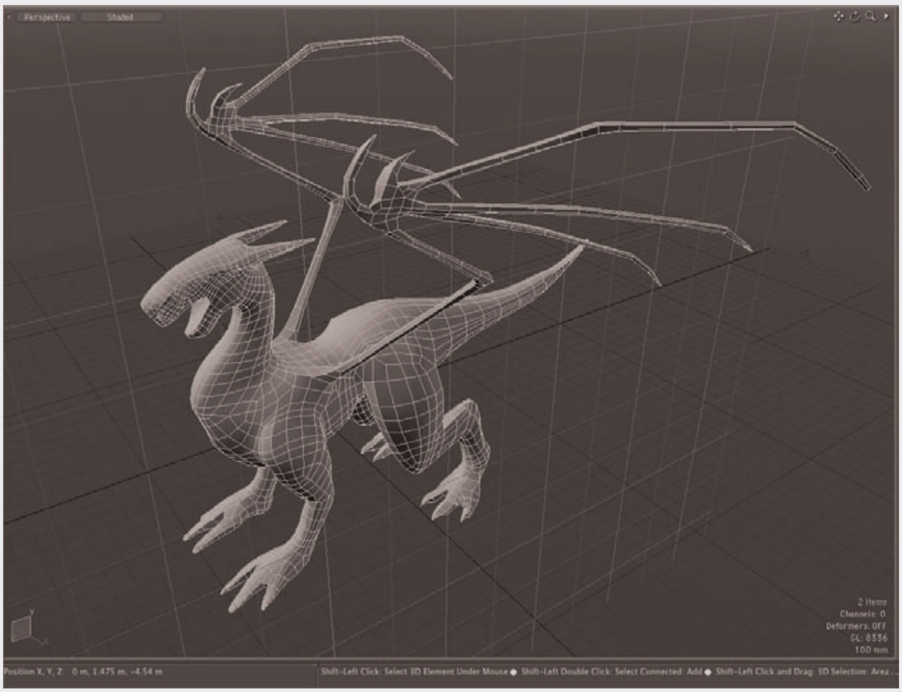


Figure B1.11 shows the completed retopologized model.

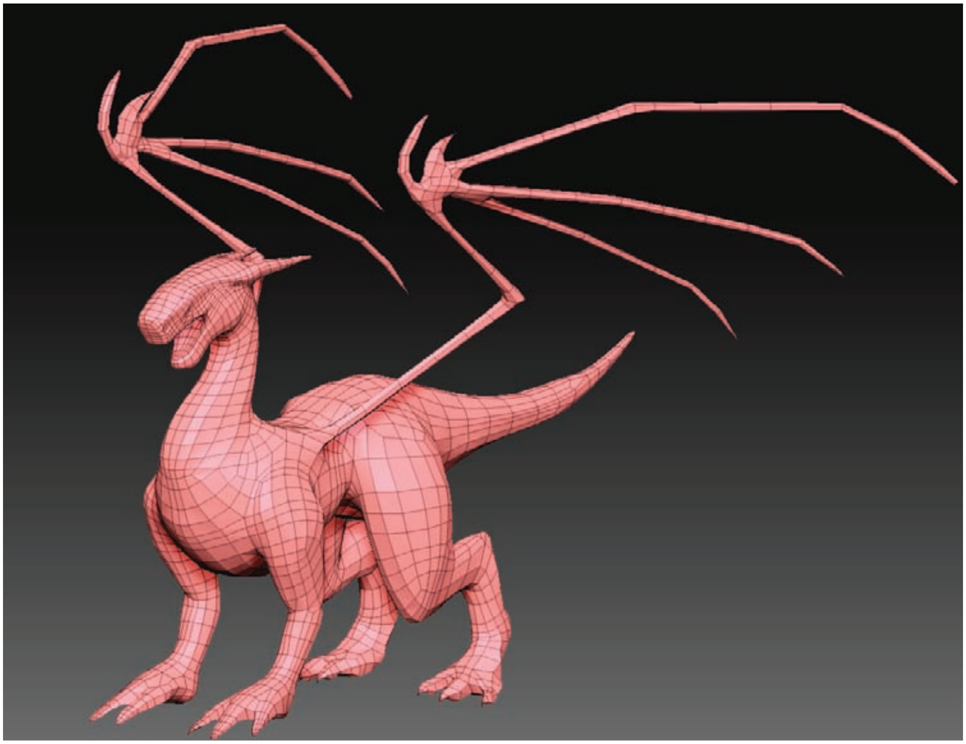


Figure B1.11
The retopologized mesh in ZBrush

Use Projection

After the surface has been completed, you can easily transfer the details from the original surface to the retopologized version by using projection. The following demonstrates how this can be done for the dragon model:

1. Continue with the file from the previous section or open the `dragonRetopo_v03.ZPR` project from the `Bonus Content 1` folder on the DVD.
2. In the SubTool subpalette of the Tool palette, click the Append button and append Skin_ZSphere as a SubTool.
3. Rename the Skin_ZSphere SubTool DragonRetopo.
4. Select the ZSphere SubTool (this is the ZSphere network created in the previous sections) and press the Delete button in the SubTool subpalette to remove it.
5. Select DragonRetopo and press **Ctrl+D** four times to create a total of five levels of subdivision.

Figure B1.12
Turn off the visibility of the Eyes SubToolSubTool; turn on the visibility of the other tools.

6. Make sure the Solo button on the right shelf is off. Turn on the visibility for the dragon, FrontToes, BackToes, and DragonRetopo SubTool. Turn off the visibility for the Eyes SubTool (see Figure B1.12).
7. In the SubTool subpalette of the Tool palette, select the DragonRetopo tool. Use the Move, Inflate, and Smooth brushes to adjust the mesh so it fits over the other SubTools, as shown in Figure B1.13. The Inflate and Inflate Balloon sliders in the Deformation subpalette of the Tool palette can help with this process.
8. Set the SDiv slider to 5 and press the Project All button in the SubTool subpalette of the Tool palette. It might take a few tries to get a clean projection, and you might need to adjust the settings. Your goal should be to get the shape of the retopologized mesh as close as possible to the original. More information about using Project All can be found in Chapter 6.
9. After you have a satisfactory projection, use the Smooth and Move brushes to repair any problem areas in the mouth and on the bones of the wings.
10. In the SubTool subpalette, delete all of the SubTools except DragonRetopo and EyesSubTool. Use the Save As button in the File menu to Save the project as `dragonRetopo_v04.ZPR`.

Figure B1.13
Use the Move, Inflate, and Smooth brushes to make the retopologized mesh fit over the original SubTool.

Retopology can take a while to do, but the payoff is usually worth it. I prefer to retopologize my models before sculpting fine detail into the surface. This makes projection easier to deal with. Because I know I will be making changes to the model anyway, I'm not concerned if the projection is not 100 percent perfect. I usually retopologize a model whenever I know that the model will be sent to another program such as Maya or Modo for rendering and animation. Or sometimes I retopologize a model if I want to reorganize the mesh to support more-detailed sculpting in specific areas such as the face.

After retopologizing the model, I'll spend some time sculpting details and making changes. I'll usually subdivide the model another time as well. Figure B1.14 shows the detailed dragon mesh.

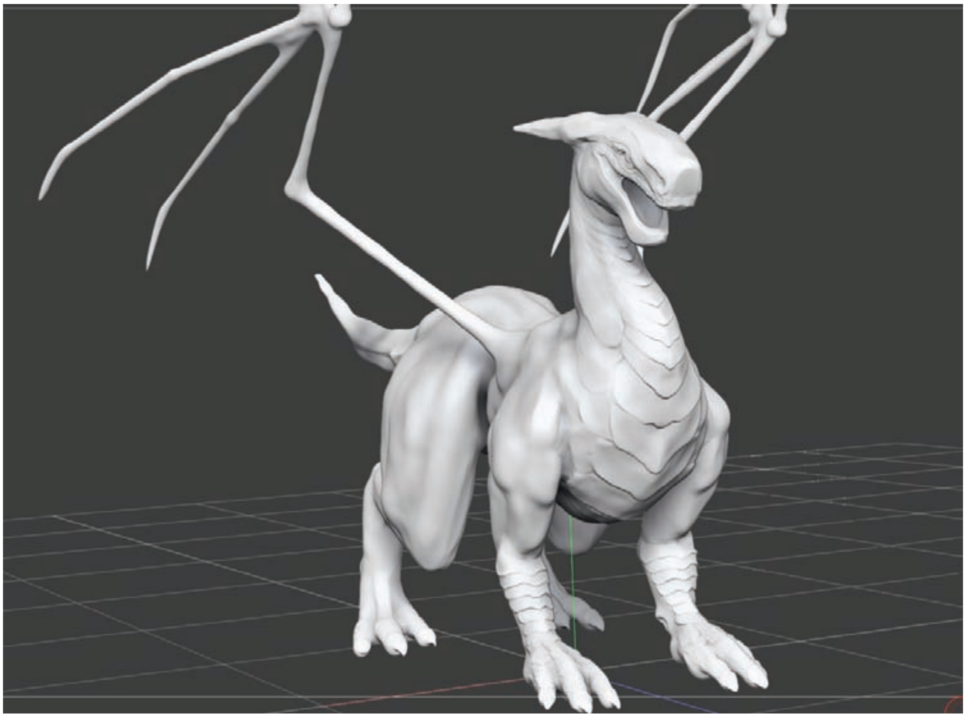


Figure B1.14

Details are sculpted into the retopologized surface.

Modeling with GoZ

GoZ is designed to enable you to move your models between ZBrush and your favorite 3D modeling and animation software packages with as few clicks as possible. GoZ is a ZBrush plug-in bundled with the scripts necessary to open the models in your 3D application of choice. GoZ makes it possible to use ZBrush and other 3D software at the same time so that changes you make to the model on one end can easily be updated on the other. This means you can take advantage of the strengths of and tools available in both applications. This also means that you can immediately see how the changes you make to the model in ZBrush will look in your 3D software. GoZ currently supports Maya (versions 2008 and up), Cinema 4D, 3ds Max (on Windows), and Modo. This section describes how the process works in Maya, because that is the most widely used 3D animation package available. Most of the process is easily applicable to other supported software packages.

The examples in this section demonstrate how to use GoZ to add wings and make other changes to the dragon body.

WWW.GOZBRUSH.COM

Pixologic has created a website specifically for information and updates to GoZ. As new applications are added to the GoZ toolset, updates will be posted on `www.gozbrush.com`. The site also has video tutorials and other information.

Send a Model from ZBrush to Maya

You'll start by sending the retopologized dragon body model from ZBrush to Maya in order to gain a basic understanding of how the GoZ feature works. This quick example will also allow ZBrush to install the necessary scripts needed to make GoZ function in later examples as well as in your own projects:

1. Start a new ZBrush session.
2. In the File palette, click the Open button and open the `GoZDragon.ZPR` project from the `Bonus Content 1` folder on the DVD. This project currently has just the dragon body as a single SubTool and a SubTool for the eyes.
3. In the Tool palette, expand the Geometry subpalette and set the SDiv slider to level 5 so you can see the detailed version of the model.
4. Make sure you have the Head SubTool selected in the SubTool subpalette of the Tool palette. At the top of the Tool palette, press the GoZ button to activate GoZ (see Figure B1.15).

You'll see a message that indicates ZBrush is searching the computer for GoZ-enabled applications as well as some instructions for installation of the plug-in (see Figure B1.16). The instructions appear only the first time you run GoZ.

Figure B1.15

Press the GoZ button at the top of the Tool palette.

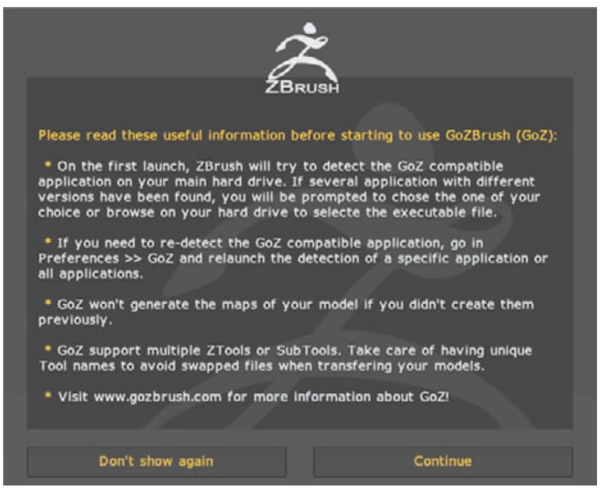


Figure B1.16

Instructions appear the first time you run GoZ.

GoZ will search for Cinema 4D, Maya, and Modo (and 3ds Max if you are using Windows). The first dialog box will ask whether you have Cinema 4D installed. If you do, click the link to update the path to Cinema 4D. If you do not have Cinema 4D, click the Not Installed button. On my machine, I have two versions of Maya and Luxology's Modo. Figure B1.17 shows the dialog boxes for Maya (top image) and Modo (bottom image). I'm running these application on a Mac, so the paths to each application lead to the APP file. On Windows, these applications are found in the `Program Files` directory and end with the `.EXE` extension.

I clicked the link for Maya 2011 and the link to Modo. ZBrush automatically installs all the scripts you need for these applications.

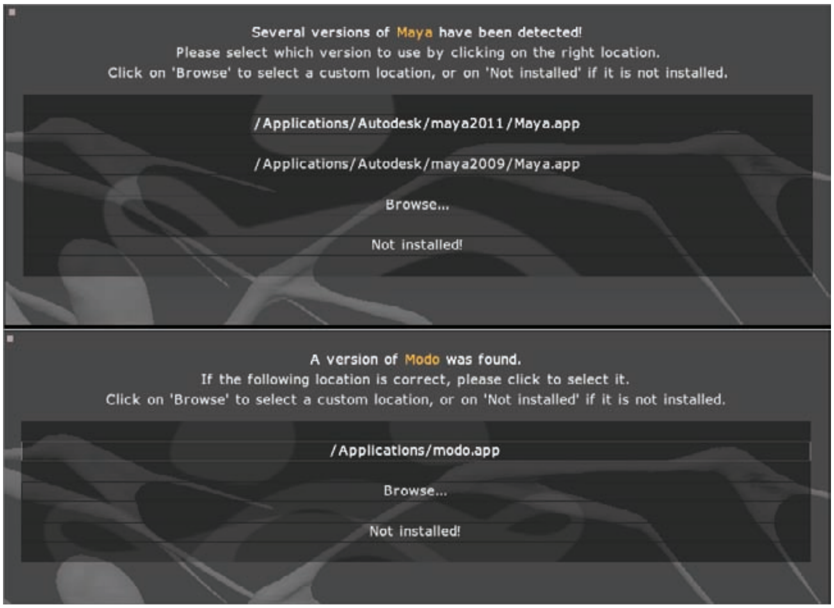


Figure B1.17

Dialog boxes appear, enabling you to choose the applications you want to connect to ZBrush through GoZ.

If you need to specify the path to the application, click the Browse button and use your computer's dialog box to find the path to the application. If you ever need to change or update these paths, open the Preferences palette and click the appropriate buttons in the GoZ subpalette (see Figure B1.18).

Figure B1.18

The GoZ subpalette of the Preferences palette lets you reset the links to the applications.

After Maya has been chosen as the target application, you'll see the DragonRetopo tool automatically switch to the lowest SDiv level. ZBrush will also launch Maya if it is not open already.

After a few seconds, you'll see the tool load in Maya as a polygon mesh (see Figure B1.19). The mesh uses the same name as the SubTool assigned in ZBrush. The mesh is also displayed as a smoothed mesh. By selecting the model and pressing the **1** key, you'll see that the model switches to the lower-polygon display.

Figure B1.19

The DragonRetopo tool appears in Maya as a polygon mesh.

You'll also notice that the detail present in the ZBrush version of the model does not appear in Maya. Later in this chapter, you'll learn how you can capture that detail by using a normal map and a displacement map and how you can use GoZ to easily send these texture maps to Maya with a minimal amount of work on your part.

If you want to send the Eye SubTools to Maya, you can switch back to ZBrush, select the Eye SubTools, and use GoZ to send them to Maya. Continue with these files in the next section, and keep ZBrush and Maya open while you work.

GoZ Files

When you press the GoZ button in ZBrush or in Maya, a temporary file is saved to your disk. These files are used to pass versions of the model between ZBrush and your target application as you work. When working on a Mac, the files are saved in the `Users/Shared/Pixologic` folder. In Windows, the files are saved in the `Users\Public\Pixologic` folder.

Send a Mesh from Maya to ZBrush

In this section, you'll explore the power of GoZ a little more as you create wings for the dragon. This book is not going to explain the complexities of polygon modeling in Maya (or whichever application you are using); I'm assuming you are familiar with how to model in your own application. Use whichever techniques you prefer, as long as the result is a polygon mesh. ZBrush does not support NURBS or other types of spline patches. For best results, try to keep things simple until you become more familiar with the workflow.

Figure B1.20 shows some very simple dragon wings that were modeled by using basic polygon modeling techniques. The wings have a little thickness added to them and have been combined into a single surface.

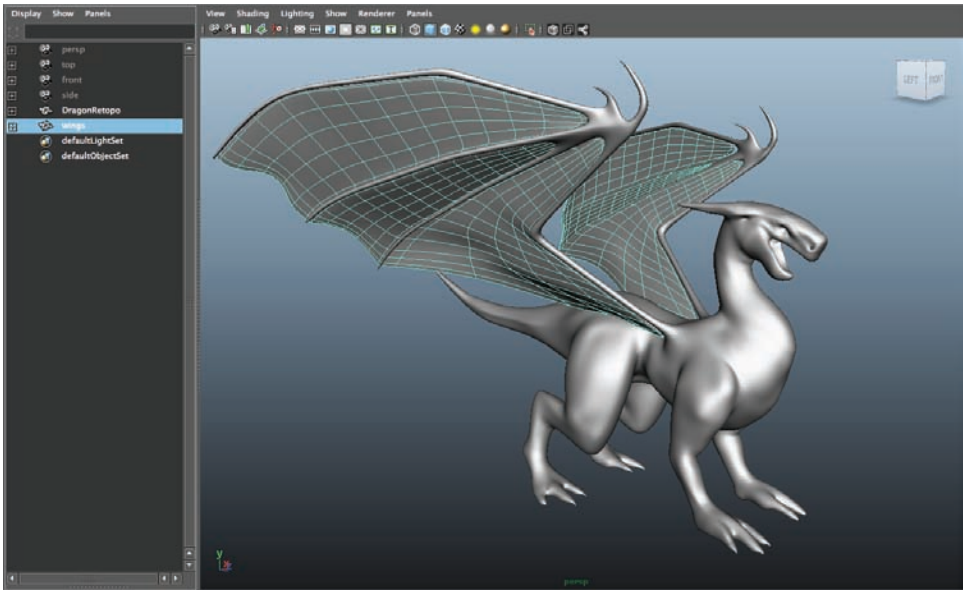


Figure B1.20
Simple wings have been modeled for the dragon.

Follow these steps to create and send the wings:

1. You can create your own wings or open the `DragonWingModel.ma` Maya scene from the `Bonus Content 1` folder found on the DVD.

   Now you can try sending these wings to ZBrush for further sculpting and refinement.

2. On the shelf in Maya, click on the GoZBrush shelf. This shelf is installed in Maya the first time you run GoZ.
3. Select the wings object and press the GoZ button on the GoZBrush shelf (see Figure B1.21).
4. Switch to ZBrush and you'll see the wings on the canvas, but the dragon is gone.
5. The dragon model is still there in the inventory of the Tool palette. Switch to the dragon and use the Append button in the SubTool subpalette to append the wings as a SubTool (see Figure B1.22).
6. Open the Preferences palette. In the GoZ subpalette, turn on the Import As SubTool button so that in the future, the imported objects are automatically appended as a SubTool (see Figure B1.23).

Figure B1.21
Press the GoZ button on the shelf in Maya.

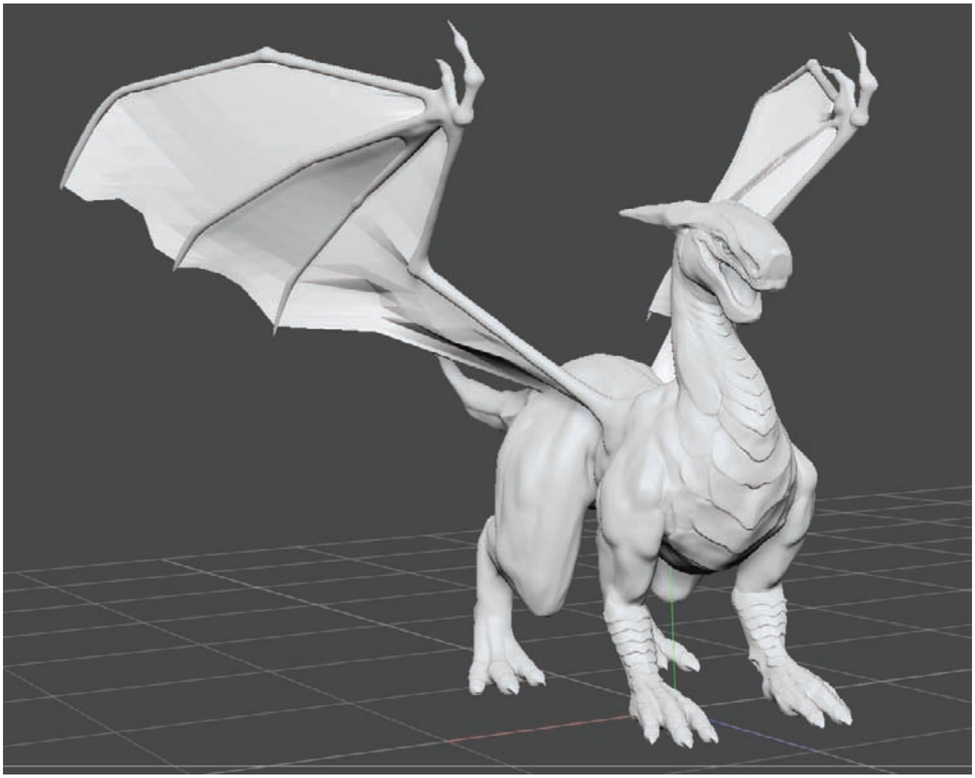
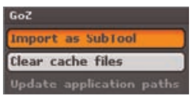


Figure B1.22
Append the wings as a SubTool to the dragon tool.

Figure B1.23
Press the Import As SubTool button in the GoZ subpalette of the Preferences palette.



7. Select the wings and press **Ctrl+D** five times to add a total of six levels of subdivision to the wings.
8. Press the **X** hotkey to turn on symmetry and spend a few moments sculpting the wings into shape.
9. Use the Save As button in the File menu to save the file as `GoZDragon_v02.ZPR`.
10. Continue with these files in the next section.

ADDITIONAL GOZ FEATURES

Next to the GoZ button at the top of the Tool palette are three additional buttons that can help make working with GoZ even easier:

The **All** button exports all SubTools to the GoZ-enabled application.

The **Visible** button exports all visible SubTools to the GoZ-enabled application.

The **R** button lets you switch your GoZ application. For example, I use both Maya and Modo on my computer. If I decide I want to send a model to Modo instead of Maya, I can press the **R** button and choose Modo. From that point on, Modo will be my default GoZ application, until I press the **R** button again and choose Maya.

Change the Topology in Maya

You can change the topology of the model in Maya without losing the detail sculpted at higher subdivisions in ZBrush. In this section, you'll add some edge loops to the head of the dragon and then bring it back into ZBrush.

To replace an existing object in the Maya scene, the name of the object in Maya and the name of the SubTool in ZBrush should match exactly, including capitalization. Otherwise, GoZ will simply add new versions of the object to the Maya scene, which may not be what you want.

Here is the process for changing the topology:

1. Continue with the project from the previous section.
2. In Maya, make sure the Wings object is named Wings with a capital *W* and the dragon body is named DragonRetopo.
3. In ZBrush, make sure the Wings SubTool is named Wings with a capital *W* and the dragon body is named DragonRetopo. Use the Rename button in the SubTool subpalette to rename the SubTool if you need to.
4. In ZBrush, click the GoZ button on the top of the Tool palette to send the wings back to Maya.
5. Switch to Maya. You should see the new wings in the scene. If the old wings are still there, you can simply select and delete them.
6. Switch to the Polygon menu set. Use the Insert Edge Loop tool in the Edit Mesh menu to add edge loops to the head of the dragon. Don't go crazy with this; just add a few, as shown in Figure B1.24.

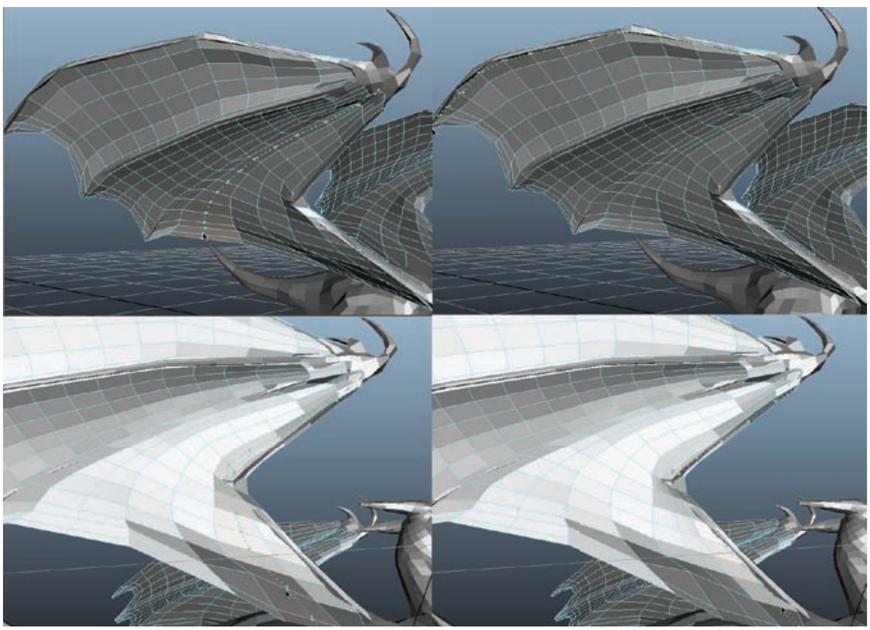
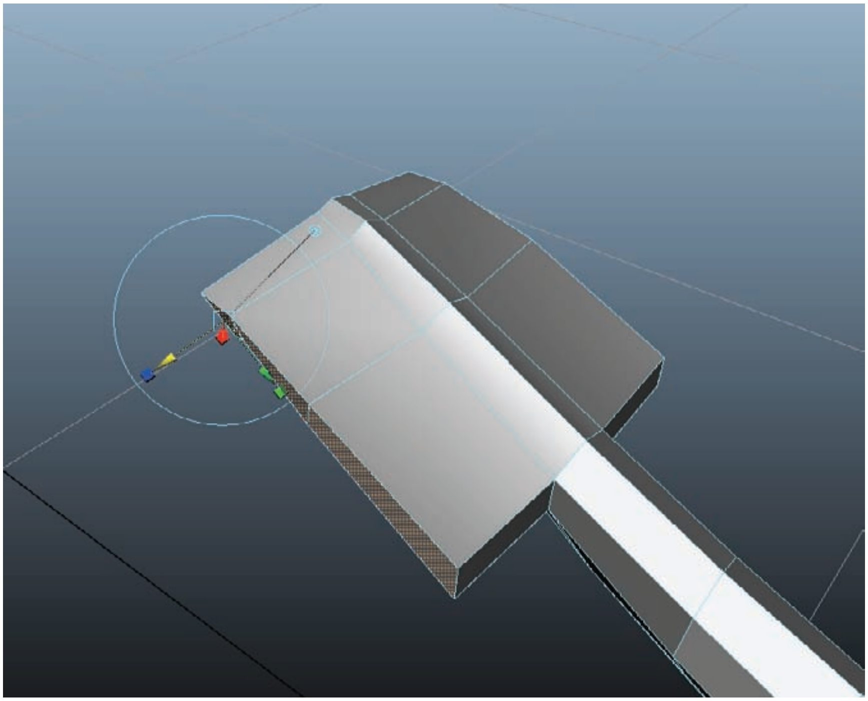


Figure B1.24

Add edge loops to the head of the dragon in Maya.

7. Try selecting some polygons at the end of the tail and extrude them as shown in Figure B1.25.

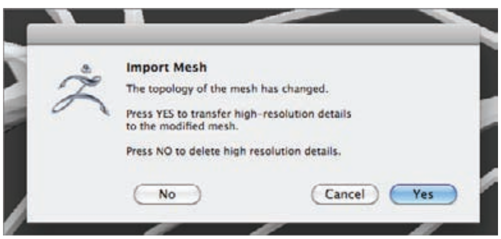
Figure B1.25
Extrude polygons at the end of the tail in Maya.



8. Make sure DragonRetopo is the currently active SubTool in ZBrush. In Maya, select the DragonRetopo object and press the GoZ button on the top shelf.
9. You'll see a warning in ZBrush that the topology of the wings has changed. Press Yes to import the altered wings (see Figure B1.26).

ZBrush imports the modified geometry and replaces the original DragonRetopo SubTool. ZBrush subdivides the imported mesh and, using projection, the detail from the original SubTool is transferred to the new surface. A mask is applied to protect the unaltered parts of the surface, as shown in Figure B1.27. Most important, the subdivisions of the DragonRetopo and all the sculpted detail remains intact.

Figure B1.26
A warning appears, asking whether you want to import the altered geometry.



10. Clear the masks from the surface and continue working. Save the Maya scene and the ZBrush project.

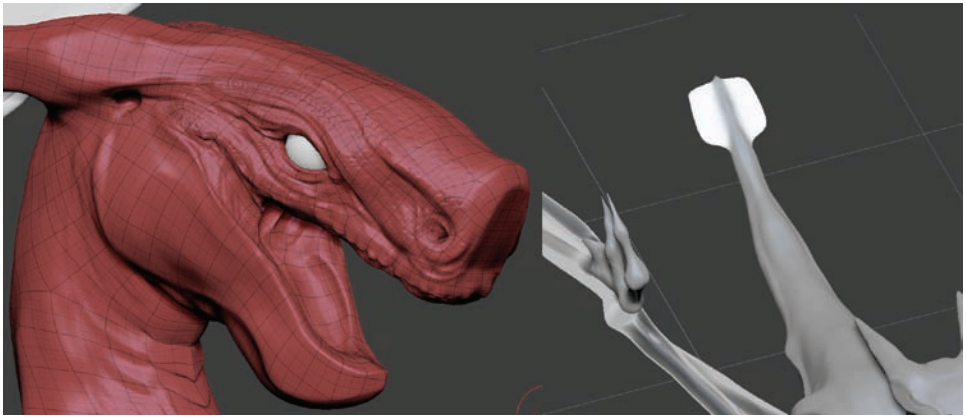


Figure B1.27

The altered geometry is imported into ZBrush. A mask is applied to preserve the unaltered portions of the surface.

Creating Texture Maps in ZBrush

Texture maps are two-dimensional images that are applied to three-dimensional surfaces. These maps are used to give a surface color, details, and other qualities when the surface is rendered. Most often, texture maps are used in 3D software such as Maya because most 3D software lacks the polypainting capabilities of ZBrush. By using texture maps, you can transfer the colors you paint on a model in ZBrush to a lower-polygon version of the same model, which can then be animated and rendered in programs such as Maya.

In addition to color maps, you can use normal maps and displacement maps to render the detail you sculpt in ZBrush in programs such as Maya. Maya can't support a mesh made up of millions of polygons. Therefore, it's often necessary to use these special maps so the model rendered in Maya looks like the model you sculpted in ZBrush.

Using GoZ, ZBrush can instantly send texture, normal, and displacement maps to Maya (or Modo, Cinema 4D, or 3ds Max) and even set up a basic shading network for you with all the proper settings.

In this section, you'll learn how to create these maps and how to send them to Maya by using GoZ.

Use UV Texture Coordinates

3D applications use x-, y-, and z-coordinates to determine where an object and each of its vertices is in 3D space. Likewise, U and V coordinates are used to determine how a two-dimensional image is wrapped around a three-dimensional object. Imagine drawing a dot on a cardboard box. Then unfold and flatten the box. The dot on the flattened box is like a UV coordinate (see Figure B1.28). The arrangement of the panels of the flattened box is similar to what's known as a UV layout. In computer graphics, there are many ways to create UV layouts for a model, and there are many different arrangements a UV layout can have.

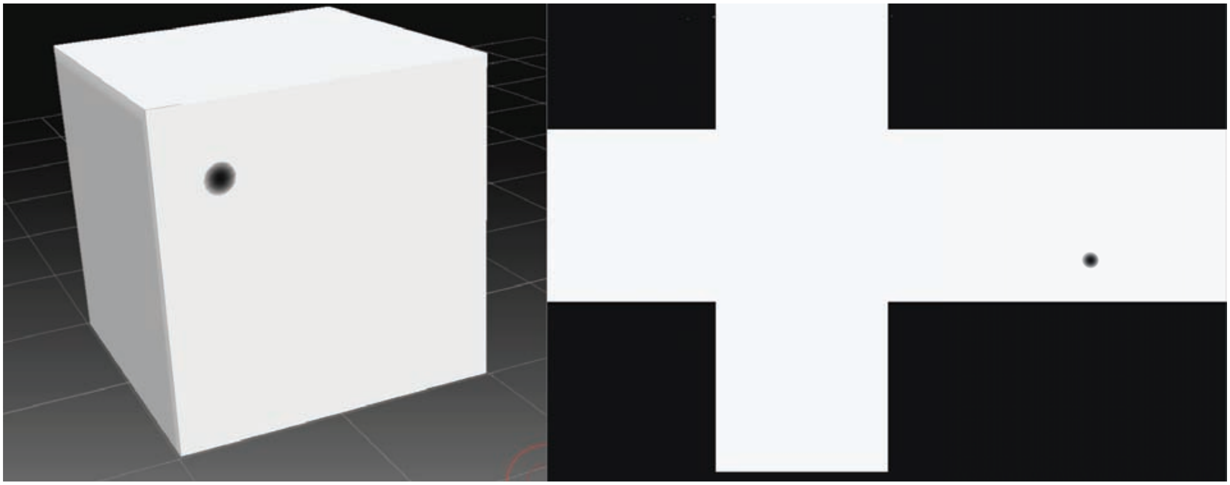


Figure B1.28
UV texture coordinates determine how two-dimensional texture is wrapped around a three-dimensional object.

ZBrush has some basic controls for creating UV layouts. These are found in the UV Map subpalette of the Tool palette (see Figure B1.29). In this subpalette, you'll find buttons for determining the size of the layout, which in turn determines the size of the texture map you create. You'll also find several buttons for creating simple UV layouts based on primitive shapes. These are the Uvc, Uvp, Uvs, and UvTile buttons. Unless your model is a very simple shape, you may not use these options very often.

The PUVTiles, GUVTiles, and AUVTiles buttons each create a different type of automatic mapping. The resulting UV layouts created by these buttons are efficient in terms of how they use the space allotted for textures. However the textures they make are a arranged as a basic grid that does not resemble the object in any way. Imagine cutting up wrapping paper into tiny individual squares. The pattern on the wrapping paper would still exist, but trying to reassemble the pattern from the squares would be difficult. This type of automatic layout can be useful when you need to generate a layout quickly or when the shape of the 3D object you are texturing is extremely complex.

Bonus Content 2, "ZScripts and ZPlugins," which is found only on the DVD of this book, describes a free plug-in called UV Master that can be used to generate UV layouts in ZBrush. It's an easy plug-in to use when you need a layout that looks like a flattened version of the object.

If you're already familiar with creating UV layouts in your own 3D application, you can simply use GoZ to export your model into your 3D application, generate UV coordinates by using your preferred method, and then use GoZ to bring the model back into ZBrush. This is probably the best method for creating UV coordinates for your 3D models.

Figure B1.29
The UV Map subpalette of the Tool palette

The bottom line is, you can't create textures of any kind in ZBrush unless your model has UV texture coordinates.

Create a Color Texture Map

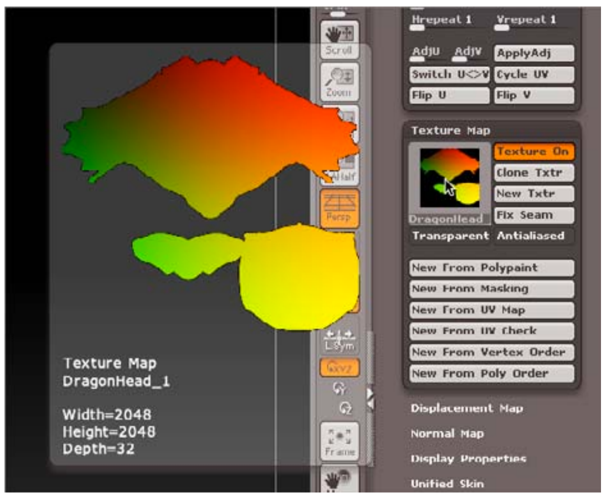
A *color texture map* is a texture map generated from the colors painted onto a model. These texture maps are generally connected to the color or the diffuse channel of a shader network in Maya. This exercise demonstrates how to generate a color texture map:

1. Start a new ZBrush session. Use the Open button in the File menu to open the `dragonHead.ZPR` project from the `Bonus Content 1` folder on the DVD. This is the same dragon head that was used as an example in Chapter 8, "Polypainting and SpotLight." It has been painted, and UV coordinates have been generated for the Head SubTool.
2. Make sure the DragonHead_1 SubTool is the currently active SubTool. In the UV Map subpalette, press the 2048 button. This sets the size of the map that will be generated to 2048×2048.
3. To take a look at how the UV coordinates appear on the model, expand the Texture Map subpalette of the Tool palette and press New From UV Map (see Figure B1.30). This button creates a color map and applies it to the model.
4. Hold the mouse cursor over the large preview icon in the Texture Map subpalette. You'll see a pop-up window appear that shows a larger version of how the UV coordinates will look, as shown in Figure B1.30.

   The colors painted on the dragon's head have been replaced by the color texture, which is a simple gradient. Don't worry, though—the polypainted colors are not gone; they are just hidden by the gradient texture map (see Figure B1.31). Imagine the texture map is wrapping paper that is covering all the colors painted on the model.
5. In the Texture Map subpalette, turn off the Texture On button. The texture map is hidden on the model, and the painted colors return.
6. In the Texture Map subpalette, click the New From Polypaint button. The model looks the same, but notice that there is a new texture map in the Texture Map preview window (see Figure B1.32).

Figure B1.30

Press the New From UV Map button in the Texture Map subpalette of the Tool palette.



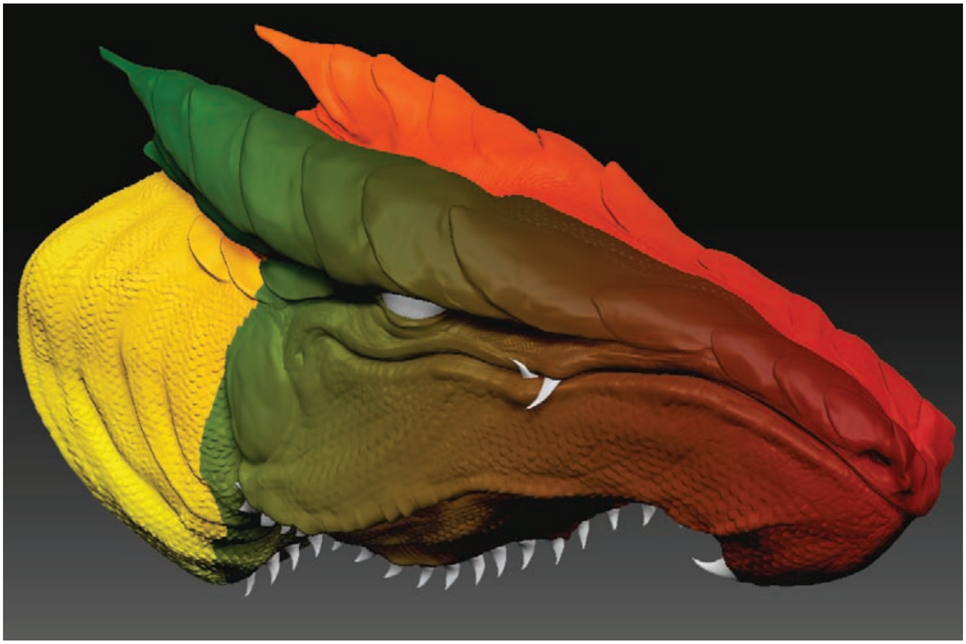


Figure B1.31

A gradient texture map covers the colors painted on the model.

When you click this button, a texture map is created and applied to the model. But because this new texture map has been created from the colors painted on the model, the texture looks exactly like the polypainted colors. So even though it looks as though the model has not changed, it has. As long as the Texture On button is active in the Texture Map subpalette, the texture is hiding the polypainted colors. It's important to understand this because it's easy to forget that this button is activated. If you tried to paint new colors on the model by using a sculpting brush, it would appear as though the brush was not working at all. In fact, the brush would be painting the model; you just wouldn't be able to see the strokes painted on the surface until you disabled the Texture On button.

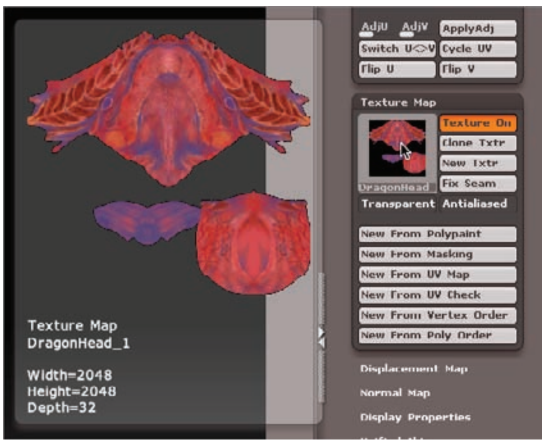


Figure B1.32

A texture map is created from the colors painted on the model.

That's pretty much all there is to creating a color texture map. If you save the project, the texture map will be saved with the tool as long as it appears in the preview icon of the Texture Map subpalette.

Keep this file open. In the next section, you'll create normal and displacement maps.

Create Normal and Displacement Maps

Normal and displacement maps are two types of texture maps that add detail to the surface of an object when rendered in a program such as Maya. They can be used separately or together, depending on what your final render requires.

Normal maps are color textures that use RGB (red, green, and blue) color values to determine how to bend the normals of the surface when the rendering software creates an image. By bending the normal, you can make it appear as though a surface is more detailed than actually exists in the mesh. Normal maps do not actually alter the geometry of the surface. Normal maps are popular with game developers because they render fast enough to be used in real-time game engines.

Different software and game engines have different requirements for normal maps. The options in the Normal Map subpalette of the Tool palette allow you to generate a range of different types of maps. Always consult the documentation for the software you use to render the image in order to determine how to set the options in ZBrush.

Displacement maps are grayscale textures that are used to deform the surface of the mesh at render time in 3D packages such as Maya. Unlike normal maps, displacement maps actually change the shape of the surface when it is rendered. This is a popular way to create the illusion of a very detailed surface when it is rendered. The detail is more convincing than normal maps alone because the surface is actually changed when it is rendered. Displacement maps do add a significant amount of time to the render, so they are not used by game engines. They are more often used when creating renders for still images or animations for feature films and broadcast.

In this demonstration, you'll create a normal and a displacement map for use in Maya:

1. Continue with the file from the previous section.
2. Make sure the head SubTool is selected.
3. In the Geometry subpalette of the Tool palette, set the SDiv slider to 1.

   ZBrush creates both normal and displacement maps by comparing the difference between the detail on the current subdivision level and the detail on the highest subdivision level. Usually you'll want to set the SDiv slider to the lowest subdivision level. When I create these maps, I decide which level of subdivision is low enough to be used in Maya while at the same time has enough polygons to deform convincingly when a displacement map is applied. Then I use the Delete Lower button to delete any subdivision levels beneath this setting. The SDiv slider is then set to 1 before creating the maps.

4. In the Normal Map subpalette, set the following options to create a Normal map for use in Maya:
   - Tangent: On
   - Adaptive: On
   - Smooth UV: On
   - SwitchRG: Off
   - FlipR: Off
   - FlipG: Off
   - FlipB: Off
5. Press the Create NormalMap button. ZBrush will take a few moments to create the map. When it is finished, you'll see a bluish map appear in the preview icon of the Normal Map subpalette (see Figure B1.33). If you hold the mouse pointer over the preview icon, you'll see a pop-up with an enlarged view of the map. The colors of the map are psychedelic. These colors tell the computer how to render detail in the surface.
6. In the Displacement Map subpalette of the Tool palette, set the following options to create a displacement map for Maya:
   - Adaptive: On
   - Smooth UV: On
7. Press the Create DispMap button. ZBrush will take a few moments to create the map (see Figure B1.34).
8. After you create the maps, save the project as `dragonHead.ZPR`. Continue with this project in the next section.

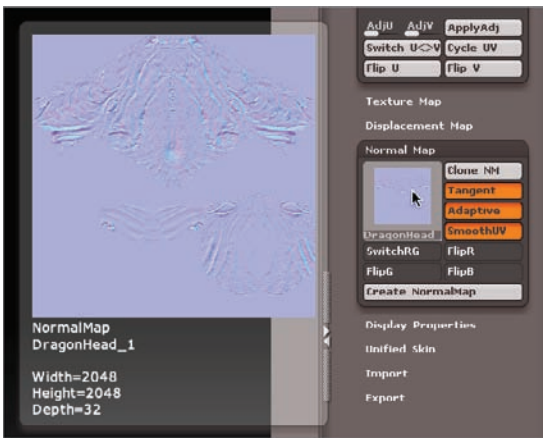


Figure B1.33

The normal map appears in the Normal Map subpalette of the Tool palette.

Figure B1.34

The displacement map appears in the Displacement Map subpalette of the Tool palette.

MULTI MAP EXPORTER

Pixologic offers a free plug-in for ZBrush called Multi Map Exporter. This plug-in lets you save all the settings for your various texture maps in one place and generate the maps for the model and all visible SubTools at once. The plug-in then exports the maps and the meshes wherever you like on your local disk. This plug-in is described in detail in Bonus Content 2, which is found on the DVD of this book.

When you create a displacement map for export with GoZ, ZBrush will create a 16-bit map, even if the 32 Bit button is on. If you need to create a three-channel, 32-bit map, use the Create And Save feature or use Multi Map Exporter.

Many artists use GoZ to create a 16-bit map for testing and then create a 32-bit map later by using Multi Map Exporter if they decide a 16-bit map is not sufficient.

Use GoZ to Send the Maps to Maya

Now that you have created the necessary texture maps, you can send all of them to Maya along with the model. GoZ will even set up a simple shader network that uses the texture maps for you. You can use this network as a starting place for your own more-sophisticated shaders. Here are the steps:

1. Continue with the project from the previous section.
2. Make sure the DragonHead_1 SubTool is selected in the SubTool subpalette.
3. Make sure that in the Texture Map subpalette, the Texture On button is activated and the color map appears in the preview icon. Likewise, the displacement map should appear in the preview of the Displacement Map subpalette, and the normal map should appear in the preview of the Normal Map subpalette.
4. Press the GoZ button at the top of the Tool palette. Maya (or whichever program you use with GoZ) opens after a few moments, and you'll see the dragon's head appear in the scene.
5. Zoom in on the model and frame the view for rendering.
6. Open the Hypershade window and select the DragonHead_1_blinn shader. Graph its input and output connections in the Hypershade window.

   You'll see that a normal map has been connected to the bump channel, the texture map has been connected to the color channel, and the displacement map has been connected to the SG node connected to the shader (see Figure B1.35).
7. In the perspective window, turn on the Hardware Texturing button and set the Render menu to High Quality Rendering. You can see the color texture and the details created by the normal map in the surface of the model (see Figure B1.36).

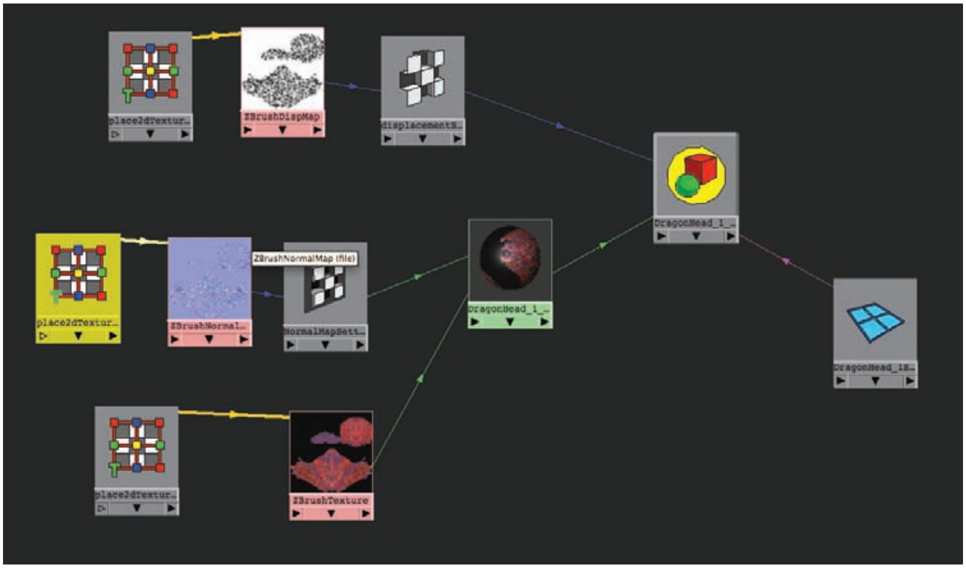


Figure B1.35
The shader network is already set up in Maya.

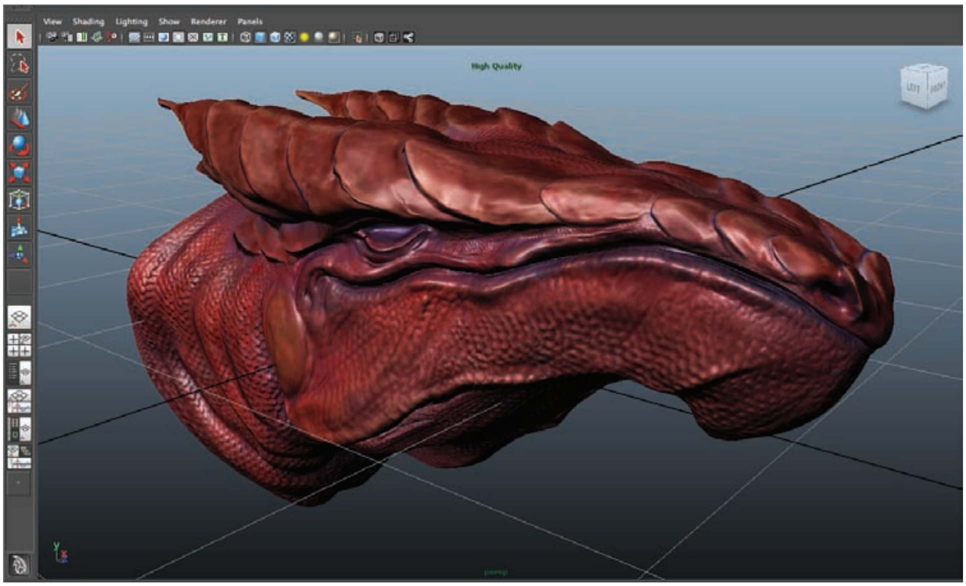


Figure B1.36
The normal map causes the surface to look detailed in Maya.

8. Select the DragonHead_1_blinn shader and open its Attribute Editor. Set the Reflectivity of the shader to 0. This prevents the model from appearing like reflective metal in the final render.
9. Open the Render Settings window and make sure the Render Using menu is set to Mental Ray.
10. Create a render of the model (see Figure B1.37).

Figure B1.37

A render of the dragon head created in Maya.

Using GoZ takes a lot of the guesswork out of determining the displacement map settings in Maya. It also makes testing texture maps a faster and easier process. You can go back to ZBrush, make changes to the texture, displacement, and normal maps, and use GoZ to send the model and the updated maps back to Maya.

The texture map files created by GoZ are stored in the `Users/Shared/Pixologic` folder on a Macintosh or the `Users\Public\Pixologic` folder in Windows.

These files are overwritten whenever you use GoZ on the same model. After you have created the texture maps that you want to use in the final scene, copy these files to the `sourceimages` folder in your current project and update the connections to the files in your shader network.

ZScripts and ZPlugins

ZScripts and ZPlugins are tools designed to extend the capabilities of ZBrush and make certain tasks much easier. ZScript is a simple scripting language that is essentially a list of commands. Many ZPlugins have been created using ZScript.

Pixologic offers a number of free ZPlugins, which can be downloaded from `www.pixologic.com`. The plug-ins are easy to install and use. Some of these plug-ins you've already encountered in previous chapters of this book.

This chapter demonstrates how to record, save, and use a simple ZScript. You'll also learn how to install and use the ZPlugins available from Pixologic. This chapter includes the following topics:

- **Using Quick Sketch ZScript**
- **Recording a ZScript**
- **Using Projection Master**
- **Installing a ZPlugin**
- **Using ZPlugins**

Using ZScript

ZScript is a simple scripting language designed to automate basic tasks in ZBrush. A good example of a ZScript is Quick Sketch, which is activated when you press the Quick Sketch button on the top shelf.

You don't actually need to write out a ZScript; ZBrush will create a ZScript for you by simply recording the actions you take within the ZBrush interface.

In this section, you'll learn how to use Quick Sketch and also how to record and use your own ZScript.

Use Quick Sketch

A good example of a ZScript is the Quick Sketch button on the top shelf. The purpose of this ZScript is to transform the ZBrush canvas into an environment in which you can sketch out ideas by using the Pen Shadow brush (see Figure B2.1). If you press the button, you'll see that the screen turns a light gray color. When you drag on the canvas, you'll see stylized lines appear. Symmetry is activated so the lines you draw on one side of the canvas are mirrored to the other side.

When you press the Quick Sketch button, ZBrush performs several tasks in order to make sketching possible. These tasks include the following:

- Creating a polygon plane that is parallel to the canvas
- Switching to Edit mode to ensure that the polygon plane can be edited

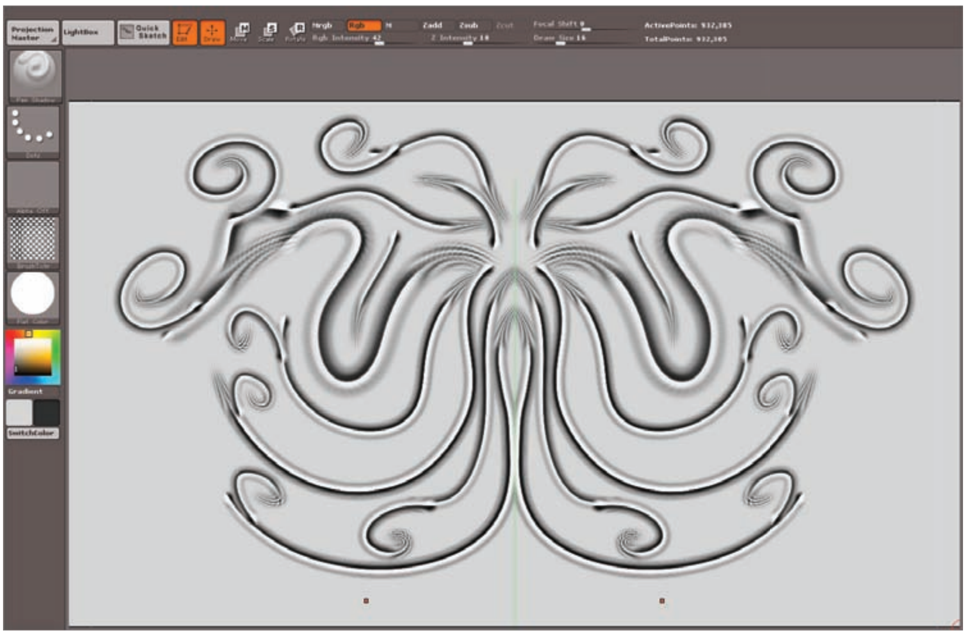


Figure B2.1

The Quick Sketch button rearranges the interface to make it easy to create symmetrical sketches on the canvas.

- Activating symmetry across the x-axis
- Setting the current material to Flat Color
- Setting the current sculpting brush to Pen Shadow

These are all tasks you could easily perform yourself, but by recording the tasks as a ZScript, ZBrush makes setting up a Quick Sketch fast and easy.

GET OUT OF QUICK SKETCH

If you accidentally press the Quick Sketch button on the top shelf while working on a sculpture, you may panic a little because it looks as though you've lost all your work. In fact, nothing has been lost. If you need to get back to your sculpture, just perform the following steps:

1. Open the tool fly-out inventory in the Tool palette and select the 3D tool you were working on.
2. Open the fly-out material library on the left shelf and find the material you were using.
3. Set the color back to white.
4. Open the sculpting brush fly-out library and select whichever brush you want.

The Pen sculpting brushes (Pen A, Pen B, Pen Dots, and so on) were designed with Quick Sketch in mind, but you can use them on your sculptures if you like. The Pen Sketch brush is useful for creating wrinkles on skin.

After these tasks are performed, the ZScript stops and you're ready to start creating your own Quick Sketch on the canvas. The sketch itself is really just a sculpt created on a polygon plane. You can scale and rotate the view of the plane, just as you can with any other tool. If you want to save your sketch as an image, use the Export button in the Document palette.

QUICK SKETCH ALPHAS

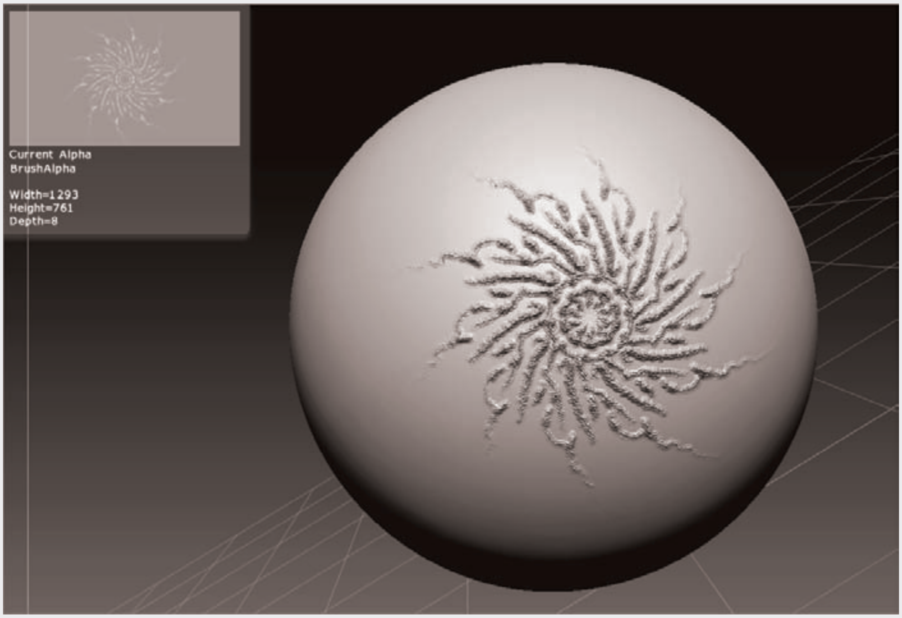
The Quick Sketch feature is a great way to create alphas. Follow these steps:

1. Run the Quick Sketch script by pressing the Quick Sketch button.
2. Create a design by using the Pen brushes.
3. Open the texture fly-out library and press the Grab Doc button.
4. Open the texture fly-out library and press the Make Alpha button.
5. Use the Export button in the Alpha palette to save the alpha to your local disk drive.
6. Test the alpha by applying it to a sculpting brush.

continues

continued

The following image shows an alpha created from a ZSketch that uses radial symmetry along the z-axis. The alpha is applied to the Standard brush by using the DragRect stroke type. The brush is then used on a PolySphere.



Record a ZScript

Figure B2.2

The ZScript palette contains controls for loading and recording ZScripts.

ZScripts are easy to create. You don't need to learn the ZScript language; you can simply record the actions you perform on the screen, and ZBrush will create the ZScript for you.

The important thing to understand about recording a ZScript is that the ZScript is very literal. It records exactly what you do while in ZBrush. If you record a ZScript while working on a customized 3D tool, the ZScript will expect to use that same tool whenever you run the ZScript. If ZBrush can't find the tool, the ZScript will automatically abort. For this reason, it's best to make your ZScripts as generic as possible.

In this example, you'll record a ZScript that loads a PolySphere onto the canvas in Edit mode and then subdivides the PolySphere:

1. Start ZBrush. Open the ZScript palette and place it in a tray. The ZScript palette contains the controls for loading and recording ZScripts (see Figure B2.2).
2. Press the Record button to start recording a ZScript. From this point on, everything you do in ZBrush is recorded.

   When you press the Record button, a warning pops up asking whether you want to initialize ZBrush. When you initialize ZBrush, all custom tools are removed and the interface returns to its default state. It's a good idea to initialize ZBrush when you record a ZScript to ensure that the actions you perform are as generic as possible so that the ZScript can function properly.

3. Press the Yes button on the warning to initialize ZBrush.
4. In the Tool palette, press the Load Tool button. Use your computer's browser to find the `PolySphere.ZTL` tool. This is in the `Pixologic/ZBrush 4/ZTools` folder.
5. Drag on the canvas to draw the tool. Press the **T** hotkey to activate Edit mode.
6. Press **Ctrl+D** twice to add two levels of subdivision to the tool.
7. Press the **X** hotkey to activate symmetry.
8. Press the Floor button on the right shelf to turn on the grid.
9. Rotate the view of the PolySphere so you are looking at the front.
10. Press the **F** hotkey to center the view of the PolySphere.
11. From the material fly-out library, select the BasicMaterial.
12. In the ZScript palette, press the End Rec button to stop the recording. Your computer's file browser will open. Save the ZScript as `makePSphere.txt`. Save the file to the `ZBrush 4/ZScripts` folder.

When you save the ZScript, three files are saved to your `ZScripts` folder: a text file named `makePSphere.txt`, which is a plain text file with all of the ZBrush commands recorded in order; a file named `makePSphere.zsc`, which is the actual ZScript file; and a file named `makePSphere.PSD`, which is a screen grab of the canvas that can be used as a ZScript icon (see Figure B2.3). The icon is used in the Script section of Light Box.

The long string of letters and numbers that you see in the ZScript text file is a record of coordinates that track the movements you made on the canvas while recording the ZScript.

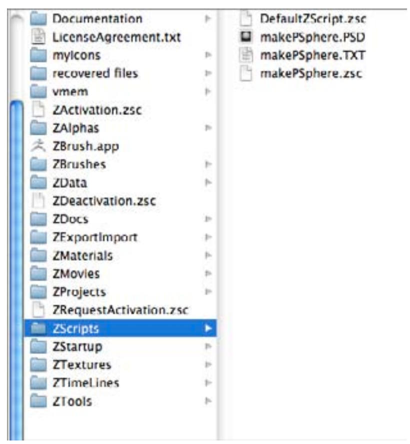


Figure B2.3

The ZScript is saved with a text file and an image file in the `ZScripts` folder. The text file is a list of the recorded commands.

Load and Run Your ZScript

There are a couple of ways to load the ZScript: You can use the Load button in the ZScript palette or double-click the icon in the Scripts section of Light Box. Follow these steps to load a ZScript:

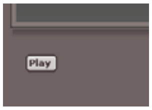
1. In the ZScript palette, click the Load button.
2. Use your computer's file browser to locate the `makePSphere.zsc` file in the `ZBrush 4/ZScripts` folder. The ZScript is loaded, but nothing is happening. To run the ZScript, you need to press the Play button in the bottom tray.
3. Click the Hide ZScript button in the ZScript palette. This expands the tray at the bottom of the interface. The button is a toggle, so

when you press the button, the bottom tray is either shown or hidden depending on its current state. You'll see a little button labeled Play.

4. Press the Play button in the bottom tray (see Figure B2.4).
5. A warning appears, asking whether you want to initialize ZBrush (see Figure B2.5). Press the Initialize And Continue button.

Figure B2.4

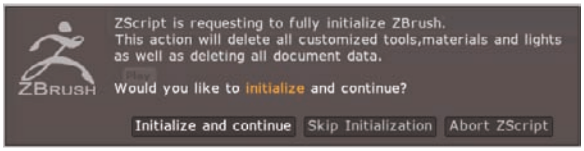
Press the button labeled Play in the bottom tray below the canvas.



In some cases, you can skip initialization depending on what the script does. In this case, if you skip initialization, the results will be kind of strange.

Figure B2.5

A warning appears asking whether you want to initialize ZBrush.



When you press the Initialize And Continue button, the script will execute and you'll see ZBrush execute the recorded commands. At the end of the script, you'll have a PolySphere on the canvas ready for sculpting.

CHANGE THE BUTTON LABEL

By default, whenever you record a ZScript and load it into ZBrush, the button in the bottom tray is labeled Play. If you'd like to add a more descriptive title, you can edit the text file and add a label. The label should be a single word with no spaces.

Open the text file in a plain text editor and replace the word Play in the second line with the new label. You'll need to reload the `makePSphere.TXT` file in ZBrush to see the label. After you load the text file, the ZSC file will automatically update. You can also change the descriptive text in quotes so when you hold the mouse over the button, a pop-up will appear, letting you know what the ZScript does.

If you want to see the text of the ZScript in the ZScript window in the bottom tray, press the Txt button in the ZScript palette. The Cmd button displays a list and description of ZScript commands. This can be helpful if you want to write or edit your own ZScripts.

Using Projection Master

Projection Master is a plug-in that comes preloaded in ZBrush. It is activated by pressing the Projection Master button on the top shelf. The purpose of the plug-in is to let you paint and detail your models by using the 2.5D brushes. Prior to ZBrush 3, Projection Master was used to edit digital sculpts. Since ZBrush version 3 introduced the sculpting brushes, the usefulness of this plug-in has diminished; however, many users still prefer to work in Projection Master. In this section, you'll get a brief overview of how the plug-in works.

Paint a Surface in Projection Master

When you start Projection Master, the current 3D tool is dropped temporarily to the canvas. You can then choose any of the 2.5D brushes in the tool fly-out library to paint or deform the surface. When you are finished working on one view, you can close Projection Master. ZBrush will switch back to Edit mode and transfer the strokes created with the 2.5D brushes to the surface of the model. You can then rotate the view of the model, start up Projection Master, and add more strokes. You continue this process until the model has been painted. It's best to work with the model at the highest possible subdivision level so the strokes you create in Projection Master retain their resolution when transferred to the surface. This exercise demonstrates the process:

1. Start a new session of ZBrush.
2. Open Light Box to the Tool section and double-click the `DemoHead.ZTL` tool. Draw it onto the canvas and switch to Edit mode.
3. Press **Ctrl+D** three times to add three levels of subdivision to the model. This will bring the poly count of the head to 3.646 million.
4. From the material fly-out library, choose the SkinShade 4 material.
5. Scale the view of the head so the face takes up most of the screen.
6. Click the Projection Master button on the top shelf. A dialog box appears, as shown in Figure B2.6.

   The options in this dialog box determine the mode that Projection Master will operate under. In this demonstration, you just want to paint the surface. The default options should work just fine.
7. Make sure Colors is selected and Shaded and Material are deselected. This means only color information will be used.

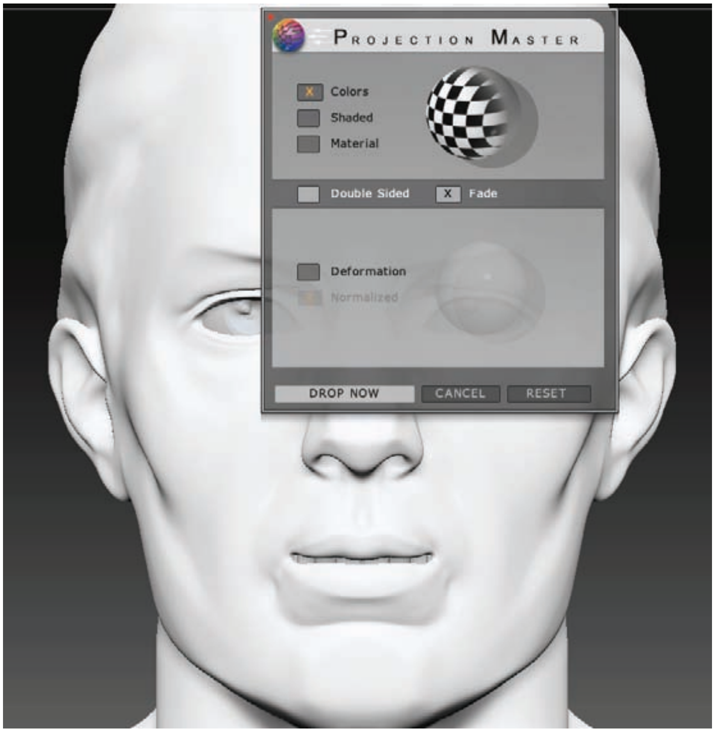


Figure B2.6
The Projection Master dialog box appears when you click the Projection Master button.

8. Make sure Fade is on and Double Sided is off.

   The Fade option ensures that strokes painted on parts of the surface that turn away from the front view will fade out to minimize artifacts.

   Double Sided means that strokes painted on one side are transferred to the other. Because you're working on the front view, this option should be turned off, but it is helpful when working on a side view because symmetry is not available within Projection Master.

9. Deformation should be deselected. This option lets you sculpt within Projection Master. You'll see how this works in the next section.

10. Press the Drop Now button. You'll see a pop-up window asking you to activate polypainting so the strokes are transferred to the model when you pick it up again. Use the Activate Texturing option if you want the polypainted colors to be transferred to a 2D texture image (see Figure B2.7).

11. Press Activate Polypainting.

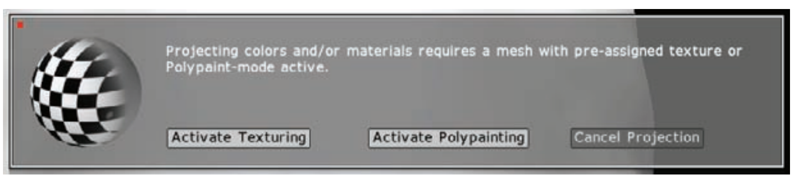


Figure B2.7
Press the Activate Polypainting button.

After Projection Master has been started, you can no longer move, rotate, or scale the object because it has been dropped to the canvas. Don't worry, though—when you are ready, you'll be able to pick the model up again.

Notice that the sculpting brush icon on the left shelf is grayed out, meaning that these brushes are not available. Take a look at the Tool palette and you'll see that the current tool is now the Single Layer brush (see Figure B2.8).

12. On the top shelf, turn off Zadd and turn on the Rgb button. Set Rgb Intensity to 12.
13. Set the main color to a light yellow and the Stroke Type to color spray. Paint on the forehead of the model (see Figure B2.9).
14. Open the tool fly-out inventory in the Tool palette and take a look at the 2.5D brushes. Select the Deco brush and use it to paint colors on the model's face.
15. Experiment with the 2.5D brushes to find out what a brush does. Hold the cursor over the brush icon in the fly-out inventory and hold the **Ctrl** key (see Figure B2.10).
16. After you have made a mess of the face, press the Projection Master button on the top shelf again. Click the Pick Up Now button.

After a few seconds, the brush strokes you created in Projection Master are transferred to the surface of the model. The strokes are somewhat faded as ZBrush does the best job it can converting the 2.5D brush strokes into polypaint information. It works pretty well. It's hard to believe this is how ZBrush artists painted all their models before polypainting was introduced in ZBrush version 3!

Figure B2.8

The Single Layer brush is selected in the Tool palette.

Figure B2.9

Paint the forehead by using the Single Layer brush.

Figure B2.10

Hold the cursor over the brush icon in the fly-out inventory. Press the Ctrl key to see a description of the brush.

Pressing undo (**Ctrl+Z**) after you exit Projection Master undoes all the changes you made when using Projection Master.

Sculpt a Surface in Projection Master

Projection Master can be used to sculpt a surface as well. It is not as easy as using the sculpting brushes, but using Projection Master as a sculpture tool can produce some interesting effects. Once again it's a good idea to use Projection Master on the highest possible subdivision level:

1. Continue with the model from the "Paint a Model" section in Projection Master or repeat steps 1–6 of that exercise to prepare a new version of the `DemoHead.ZTL` tool for use in Projection Master.
2. Click the Projection Master button on the top shelf to start the Projection Master plug-in.
3. In the options, turn off Colors and turn on Deformation. Turn on Normalized so changes made to the surface are projected out from the surface. This will make the change appear more natural.

4. Press the Drop Now button.
5. In the Tool inventory, select the DecoBrush. Turn off Rgb and turn on ZSub. Set ZIntensity to **100**. Set Draw Size to **8**.
6. Draw some strokes on the surface. The DecoBrush does a pretty good job at creating wrinkles.
7. Open the tool fly-out library and select the Ring3D tool. Draw a ring at the center of the forehead (see Figure B2.11).

Figure B2.11

Use the DecoBrush to draw on the surface of the DemoHead. Place the Ring3D tool at the center of the forehead.

8. Press the Projection Master button on the top shelf to open the Projection Master options. Click the Pick Up Now option.

   After a few seconds, the demoHead appears in Edit mode again, and the changes made to the surface are transferred as deformations. The Ring3D tool is fused to the forehead (see Figure B2.12).

   Projection Master takes a little practice because some changes you make while Projection Master is active do not always transfer very well when you exit Projection Master and pick up the tool.

9. Try rotating the view to a side. Scale up the view of the model and activate Projection Master again. This time turn on the Double Sided option.

Figure B2.12
The changes made in Projection Master are transferred to the tool after Projection Master is closed. The view of the model in this image has been rotated so you can see how the details have been transferred to the surface.

10. Experiment with the 2.5D brushes and see how they affect the surface.
11. When you are finished, pick up the model and make a note of how the brush strokes were transferred to the surface.

The Materials option lets you paint materials on the surface by using the 2.5D brushes. The Shaded option will convert shadows and lighting information into polypainted colors when you pick up the model.

Using ZPlugins

ZPlugins extend the capabilities of ZBrush, making many tasks much easier. ZPlugins are available for free as a download from `www.pixologic.com`. Periodically Pixologic will add new ZPlugins to their website.

In this section, you'll learn how to install the plug-ins and how to use the ZPlugins that are currently available for ZBrush 4.

Install a ZPlugin

Installing a ZPlugin is easy. In this example, you'll see how to install UV Master as an example. The other ZPlugins use the same method. Follow these steps:

1. Make sure your computer has access to the Internet. Open a web browser and go to `www.pixologic.com/zbrush/downloadcenter/zplugins`. On this page, you'll find all the ZPlugins that are currently available for ZBrush 4 (see Figure B2.13). All of these plug-ins have versions for Windows/PC and Mac OS.
2. Scroll down the web page and find the UV Master ZPlugin toward the top of the list. This plug-in is designed to make UV mapping in ZBrush fast and easy. This is definitely one ZPlugin that every ZBrush user should have.
3. Below the text describing UV Master there is a button to download either the PC or the Mac OS X version of the ZPlugin (see Figure B2.14). Click the link that is appropriate for your operating system.

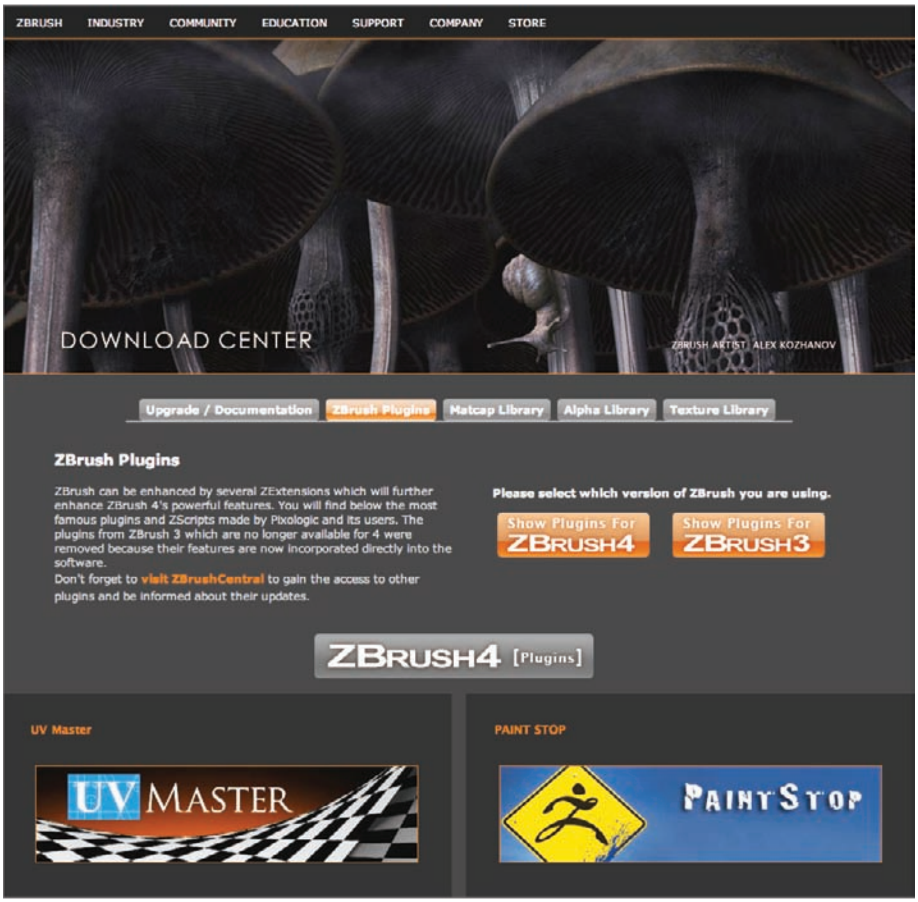


Figure B2.13

Download ZPlugins from the Download Center on the Pixologic website.

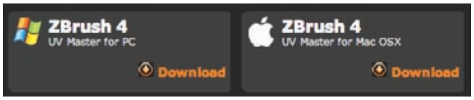


Figure B2.14
Click the link to download the version appropriate for your operating system.

You'll also see a link titled More About UV Master, which takes you to a page with a detailed description and a link to the PDF manual for using UV Master.

4. The ZPlugin will download as a zip archive. After it has finished downloading, double-click on the archive to extract the zipped files.
5. The zipped file consists of a folder called `UVMaster_PC_4.0` or `UV_Master_Mac.4.0`. For most ZPlugins, the folder contains a ZScript file with the `.zsc` extension and usually a folder for storing data while the ZPlugin is in use. For UV Master, the script file is named `UVMaster_4.0.ZSC`, and the folder is named `UVMasterData_4.0`. You want to move the file and the folder to the `ZPlugins` folder within the `ZBrush 4.0` directory.
6. Select the `UVMaster_4.0.ZSC` file and the `UVMasterData_4.0` folder. Move both of these to the `ZPlugs` folder (see Figure B2.15). On Windows, this folder is found in `Program Files\Pixologic\ZBrush 4.0\ZStartup\ZPlugs`. On a Mac, the folder is found in `Applications/ZBrush 4.0/ZStartup/ZPlugs`.

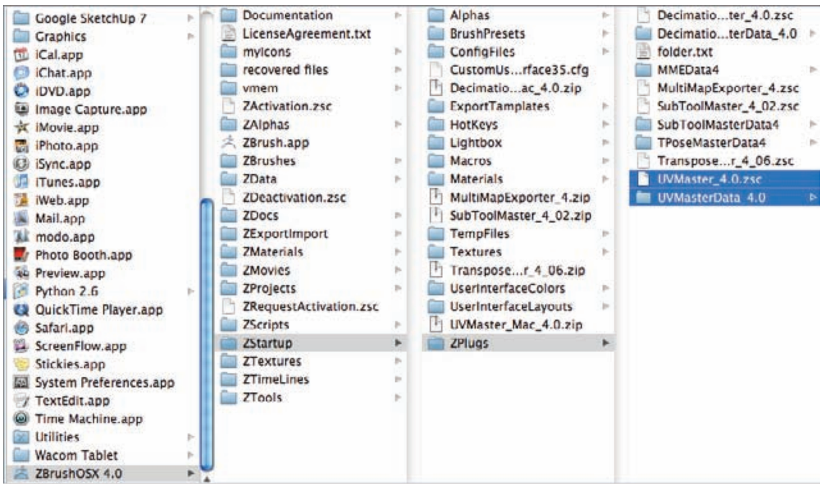


Figure B2.15
Move the files to the `ZPlugs` directory in the `ZBrush 4.0` folder.

7. Restart ZBrush. Open the ZPlugin palette. You should see the UV Master listed as a subpalette within the ZPlugin palette.

If you don't see the ZPlugin installed, make sure that you have moved the ZScript file and the folder to the `ZPlugs` directory. It's tempting to put the unzipped `UVMaster` folder in the `ZPlugs` folder, but if you do this, ZBrush will not be able to locate the necessary files and the ZPlugin will not load.

Some ZPlugins, such as ZAppLink, will not appear in the ZPlugin palette when they are installed. ZAppLink appears in the Document palette. If you can't find the ZPlugin, download the appropriate documentation and double-check to see where it is supposed to appear in the interface. The descriptions of the ZPlugins within this chapter will let you know how to find and use them as well. For future ZPlugins released after this book is published, always check the documentation.

If a ZPlugin is not installed correctly, ZBrush could fail to launch. Try holding the **Shift** key while ZBrush is loading; this skips all ZPlugins and at the very least ZBrush should open.

UV Master

UV Master is a must-have ZPlugin. Mapping UV texture coordinates is necessary when converting polypainted colors to file textures for use in other programs or when creating normal and displacement maps. Working with UV coordinates is explained in Chapter 8, "Polypainting and SpotLight," and in Bonus Content 1, "GoZ." Generally speaking, UV mapping is about as much fun as doing your taxes. Anything that makes it easier and faster is a welcome tool, and that's exactly what UV Master is meant to do.

UV Master is meant to give you a quick and easy way to generate a UV layout that still resembles the shape of the original surface. It is not meant to be quite as powerful as software such as UVLayout by Headus, which is devoted to making advanced UV texturing coordinates. Rather, UV Master should be used when you want to create a UV layout as quickly as possible with a minimum amount of labor. You can use the UV coordinates generated by UV layout as a starting point for further editing in other software. That being said, the UV coordinates created by UV Master are usually very good and certainly usable for most common texturing situations.

The following exercise is a brief overview of the basic controls for using UV Master. The ZPlugin itself is fairly powerful. For more detailed information, consult the UV Master documentation, which can be downloaded from the Pixologic website at `www.pixologic.com/zbrush/downloadcenter/zplugins`. Follow these steps:

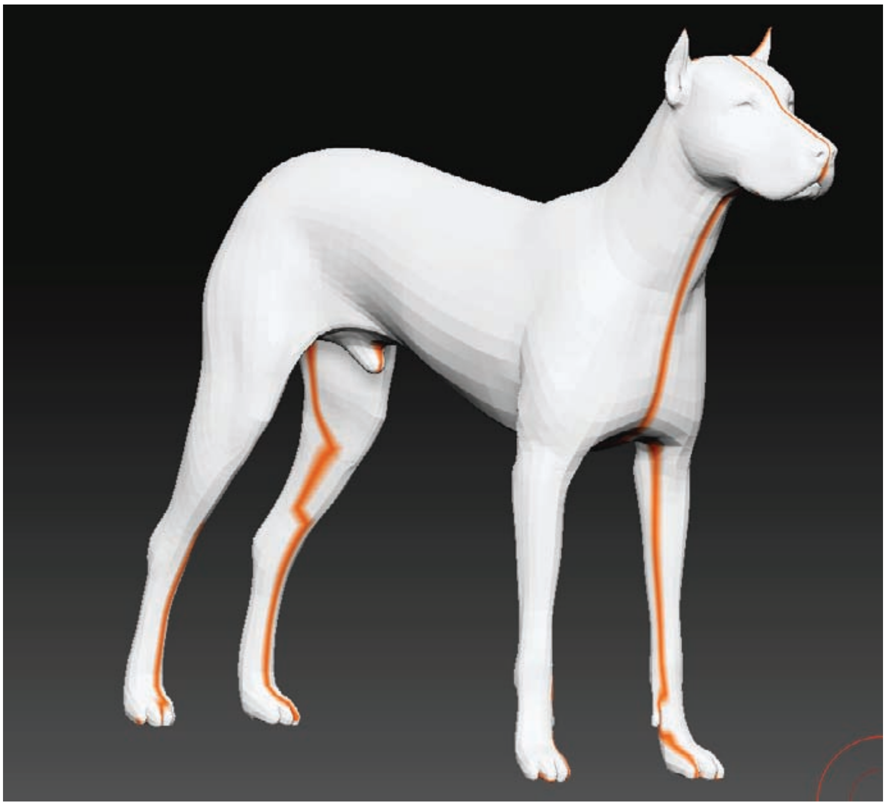
1. Open a new session of ZBrush. From the Tools section of Light Box, double-click on the `Dog.ZTL` tool.
2. Draw the dog on the canvas and switch to Edit mode.
3. Place the ZPlugin palette in a tray so you can easily access the controls.

   Let's pretend for a moment that this is a tool that you have spent a fair amount of time detailing and polypainting. The UV Master plug-in creates UV coordinates by flattening the tool. To speed up the process and prevent any damage to your hard work, it is usually a good idea to perform all of the UV mapping work on a clone of your tool rather than on the original. For this reason, the UV Master ZPlugin has a Work On Clone option.

4. Expand the UV Master subpalette and click the Work On Clone button. This button makes a clone of the original object and sets the clone at the lowest subdivision level. All UV mapping has to be done at the lowest subdivision level. The clone will have the SkinShade4 material automatically applied, and polypainting will be disabled so the clone will look like a blank, white version of the original.
5. Press the Unwrap button. The Unwrap button creates UVs for the surface. You'll see a gray progress bar appear at the top, indicating that ZBrush is calculating the UVs. When ZBrush is done, you won't see any difference in the model.
6. Click the Check Seams button at the bottom of the UV Master interface. Orange lines appear on the surface, indicating the position of the UV seams (see Figure B2.16).

Figure B2.16

Orange lines appear on the surface of the model, indicating the position of UV seams.



7. Press the Flatten button above the Check Seams button. The model is flattened on the canvas. This shows you exactly how the UV texture coordinates are mapped (see Figure B2.17). Note that, unlike other 3D programs, when you're looking at the flattened view, you're not in a separate UV texture viewer; you're still looking at the model on the canvas in Edit mode. If you want to, you can use the Nudge, Move, or Smooth brushes to tweak the position of the UVs by sculpting on the flattened view.

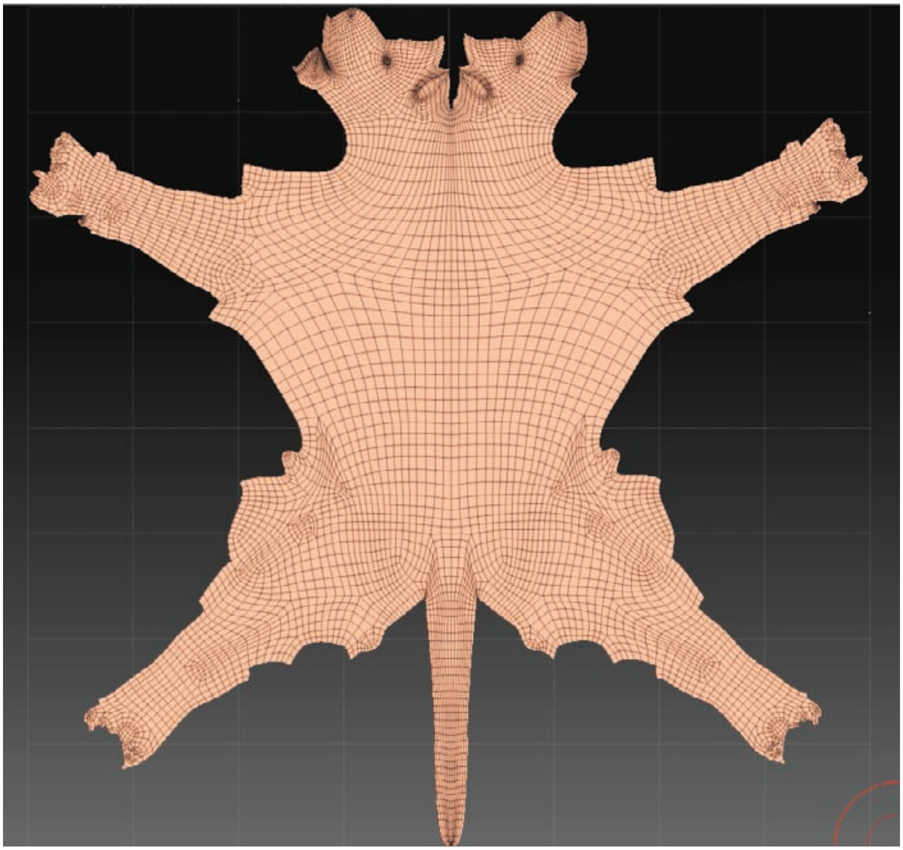


Figure B2.17

The flattened view shows how the UVs are arranged for the model.

8. If you're happy with the way the UVs look, press the Unflatten button. The model returns to the original dog shape.
9. In the UV Master interface, click the Copy UVs button. This copies the UV coordinates that were created when you pressed the Unwrap button.
10. In the Tool palette, select the original dog tool from the fly-out inventory. ZBrush switches to this tool.
11. In the Geometry subpalette of the Tool palette, set the SDiv slider to 1.
12. In the UV Master interface, click the Paste UVs button. This transfers the UVs from the clone to the original.
13. Expand the Texture Map subpalette of the Tool palette. Click the New From UV Map button. ZBrush creates a new texture map based on the UV coordinates. The shape of the texture map should look just like the flattened version of the clone (see Figure B2.18).
14. If this is your own tool, save it to your local hard drive. You don't need to save the cloned version.

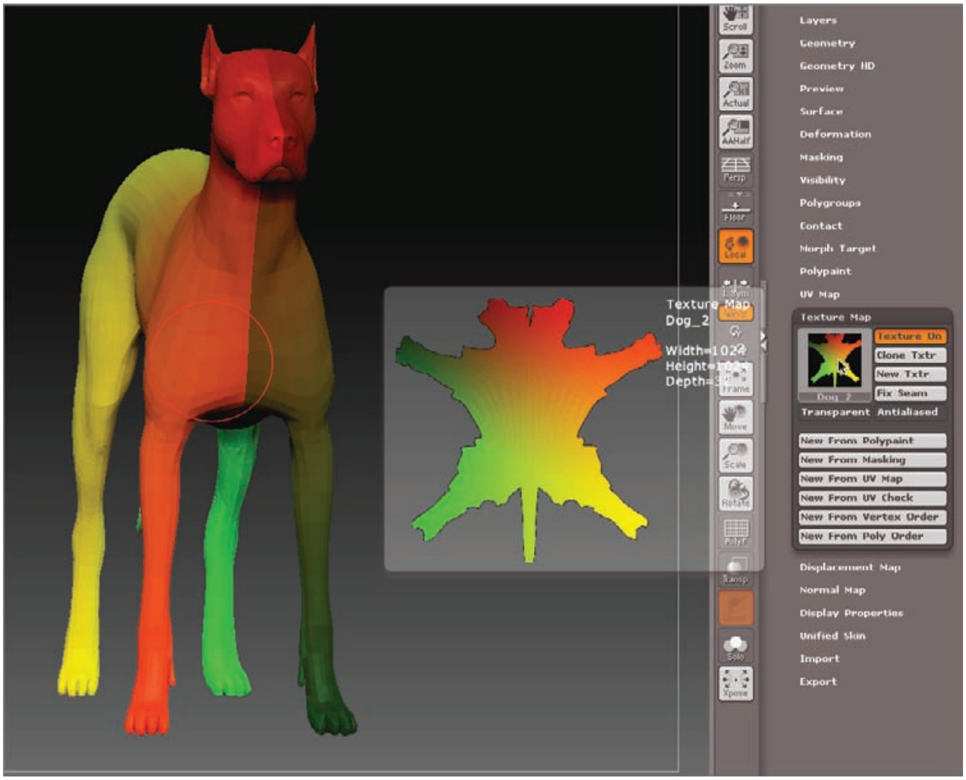


Figure B2.18
The pasted UV coordinates look just like the flattened version of the cloned dog.

There are some other options within the UV Master ZPlugin interface:

Symmetry tries to make the UV mapping symmetrical. This is useful when working on symmetrical objects such as characters or animals.

PolyGroups uses the polygroup information of the 3D tool to create separate UV islands. You can strategically create polygroups for the cloned version of the tool in order to create an ideal UV layout. This won't affect any polygroups created for the original 3D tool.

Use Existing Seams preserves the original UV seams when making adjustments to the UV mapping by using Control Painting (described in the next section).

Control Painting UVs

UV Master unwraps the model to create UVs as efficiently as possible while still maintaining the overall shape of the surface. However, UV Master has no way of knowing which part of your model is a head and which is a hand. Unlike other UV editing programs such as UVLayout by Headus, you don't have direct control over where UV Master places the UV seams, but you can give UV Master a clue as to which parts of the model are better suited for seams and which parts should be protected. To do this, you can use the Control Painting options:

1. Continue with the dog model used in the previous section.
2. Click the Work On Clone button to make a clone of the dog model. (Make sure the Texture On button is disabled in the Texture Map subpalette of the Tool palette.)
3. Press the Check Seams button in the UV Master subpalette of the ZPlugin palette so you can see how the seams are positioned on the model with the existing UV coordinates. If the button is already on, turn it off and then on again.

   Currently there is a seam that runs right down the center of the head (see Figure B2.19). You can move the seam to another part of the surface by telling UV Master not to place a seam on the top of the head. To do this, you'll activate Control Painting.
4. Turn off the Use Existing UV Seams button. This way, UV Master will generate entirely new UV coordinates.
5. Turn on the Enable Control Painting button.

   Below Enable Control Painting are three buttons: Protect, Attract, and Erase. To tell UV Master which parts of the model should not have seams, you'll paint colors on the surface of the model.
6. Turn on the Protect button. (The orange lines disappear from the model see Figure B2.20).
7. Press the **X** hotkey to activate symmetry along the x-axis.
8. The Standard brush should be automatically chosen in the sculpting brush library. Zadd should be deactivated on the top shelf, and Rgb should be on. The current color should be set to bright red.
9. Paint the bright red color on the top of the dog's head. You don't need to be terribly precise. Just cover the area on the top of the head where you want UV Master to not place any seams. Cover the ears as well (see Figure B2.21).
10. Press the Unwrap button in the UV master interface. ZBrush calculates the UV coordinates again.
11. Press the Check Seams button. You should not see any orange lines on the areas that you painted red (see Figure B2.22).

Figure B2.19

The orange line indicates that there is a UV seam running down the center of the dog's head.

Figure B2.20

Turn on the Protect button in the UV Master interface.

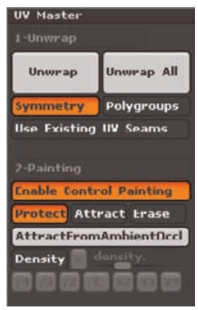


Figure B2.21

Paint the top of the dog's head red.

Figure B2.22

No orange lines appear on the top of the dog's head, indicating that there are no UV seams there.

12. Press the Flatten button to see how the UV layout appears now (see Figure B2.23).

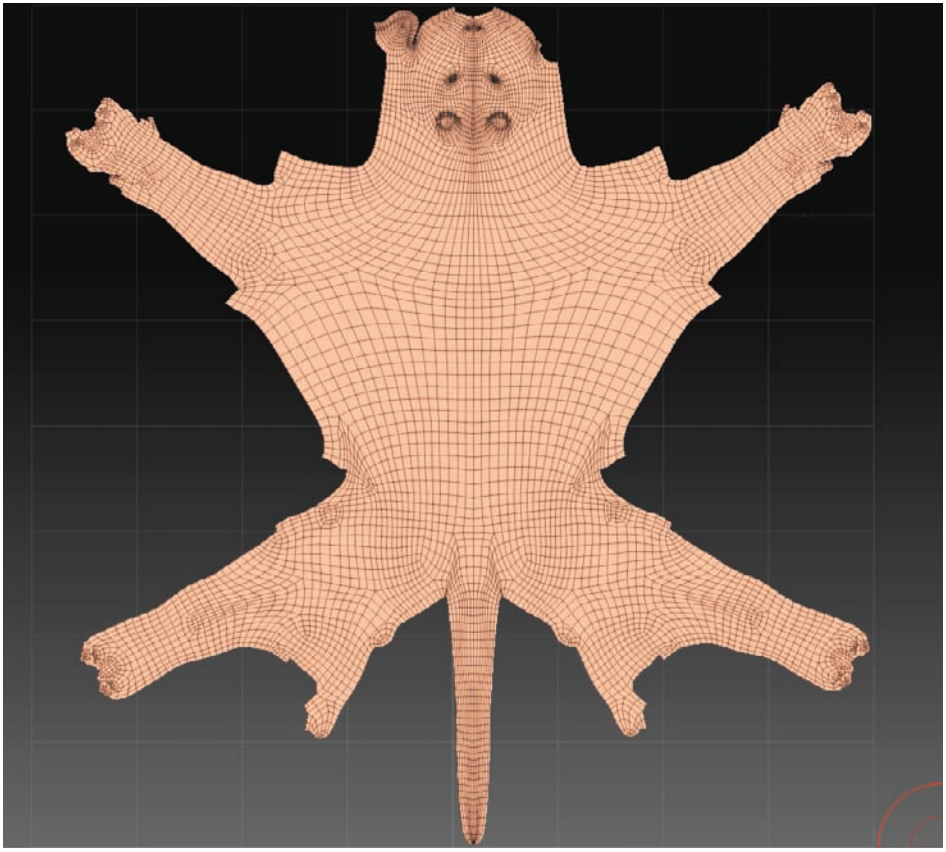


Figure B2.23
The flattened dog after the UV coordinates have been recalculated.

13. Press the Unflatten button and then the Protect button. The red color appears on the dog model. You can continue to paint on the surface to tell UV Master which parts of the model should not have seams. Keep in mind that seams will have to appear somewhere on the model, so don't paint the entire dog red!

The other options in the Enable Control Painting section perform the following functions:

Attract can be used to tell UV Master which parts of the model should have seams. As with the Protect feature, you do this by painting a color on the surface. In this case, the color is blue.

Erase lets you erase the red or blue colors from the model to eliminate any areas you did not intend to paint.

Attract From Ambient Occlusion adds a blue color to recessed areas of the model. This tells UV Master to place the UV seams in areas that are less likely to be visible.

Figure B2.24

The Density feature lets you paint areas on the surface where you want more or less texture space.

Density enables you to paint areas of the model where you'd like more or less texture space. If you want more texture space devoted to an area of the model, press the x2, x3, or x4 buttons (see Figure B2.24). Then paint the areas where you want more texture space. The color will be light green. If you want less texture space, press the /2, /3, or /4 buttons and paint on the surface where you want less texture space; the color will be light blue. It's a good idea to have the Use Existing Seams button pressed while painting Density so that UV Master doesn't have to recalculate the placement of the seams.

Clear Maps removes all Control Painting from the model.

LoadCtrlMap and **SaveCtrlMap** let you save the maps you have painted on the model as texture files.

PaintStop

PaintStop emulates a digital painting program such as Adobe Photoshop or Corel Painter within ZBrush. When you launch PaintStop, the ZBrush interface is transformed into a painting environment. However, any tools that you have on the canvas are still visible. You can use the painting tools within PaintStop to trace your model. This makes digital illustration within ZBrush even easier.

When you are finished, you can export the images directly from the PaintStop interface or, as with Projection Master, project your painting onto the surface of any tools on the canvas.

Figure B2.25

A dragon model with the FlatSketch01 material applied

This exercise demonstrates how to use PaintStop. For complete instructions on all the buttons in the PaintStop interface, download the documentation from `www.pixologic.com/zbrush/downloadcenter/zplugins`.

1. Download and install the PaintStop ZPlugin by using the same instructions from the "Install a ZPlugin" section earlier in this chapter.
2. Start a new session of ZBrush.
3. Open one of your dragon models.
4. From the material fly-out library, select the FlatSketch01 material (see Figure B2.25).
5. Turn on the Persp button on the right shelf and take a few minutes to find a good view of your model.
6. The button to start the PaintStop ZPlugin is not found in the ZPlugin palette; instead you'll find it at the bottom

of the Document palette. Open the Document palette and expand the PaintStop subpalette at the bottom. Click the PaintStop button to launch the ZPlugin (see Figure B2.26).

Figure B2.26
The PaintStop ZPlugin button is found in the Document palette.

7. A warning opens, asking whether you want to enable Polygon Colorize if Colorize has not already been activated for the model. Click the Enable Polygon Colorize button (top image in Figure B2.27).
8. A second warning opens, asking whether you want to Turn Perspective Off or Leave Perspective On. Click the Leave Perspective On button (bottom image in Figure B2.27).

   After PaintStop opens, the ZBrush interface changes completely. On the left side you'll find buttons for various types of paintbrushes. On the bottom are tabs for painting layers, and along the top are a number of settings for controlling the brush size and canvas opacity, and for saving files. On the right side are buttons for controlling the view of the document and the Exit button, which lets you leave PaintStop and return to ZBrush.
9. Set the Transparency slider on the top shelf to 50. The screen becomes a light gray color (see Figure B2.28).

   The canvas acts as tracing paper. The dragon model is a guide. You'll use the paintbrushes to paint an image on the canvas on top of the model.
10. Click the Canvas button on the top shelf (see Figure B2.29). A menu opens with options for choosing a paper grain. Click the Coarse Linen Canvas button.
11. Now you are set up to start painting. Experiment with the different brushes as you paint on the canvas over the model. If you want to see the image without the background, set the Transparency slider to 0 (see Figure B2.30).

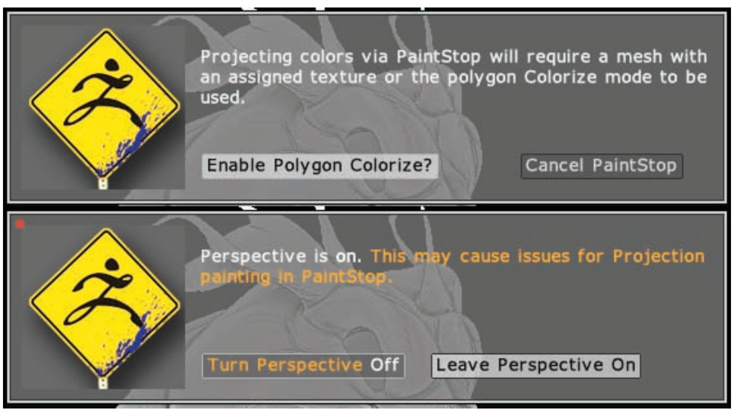


Figure B2.27
Warning messages may appear when you launch PaintStop.

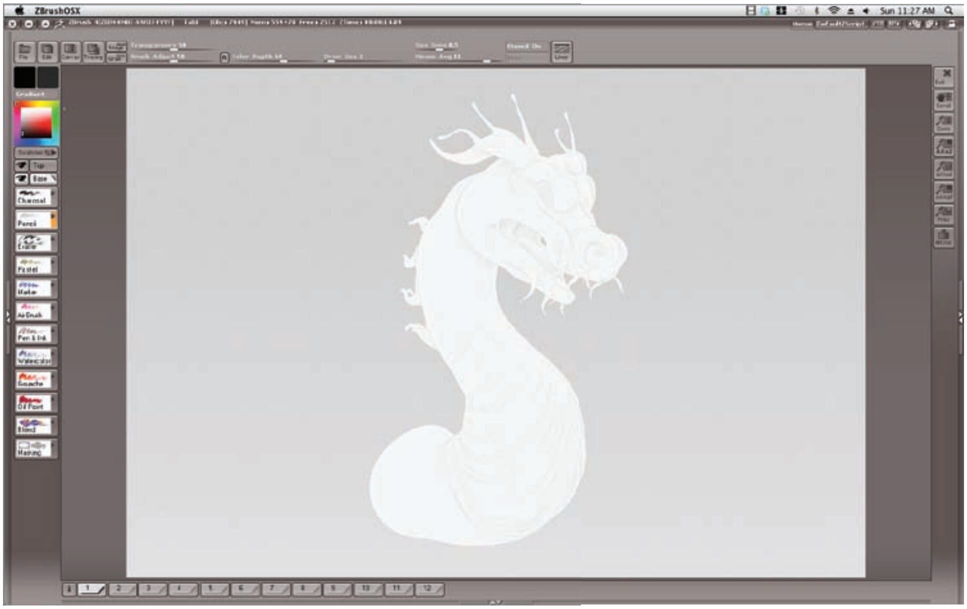


Figure B2.28
The PaintStop plug-in replaces the ZBrush interface with a new interface designed to emulate a painting program. Use the Transparency slider to adjust the opacity of the canvas so you can trace your dragon model.

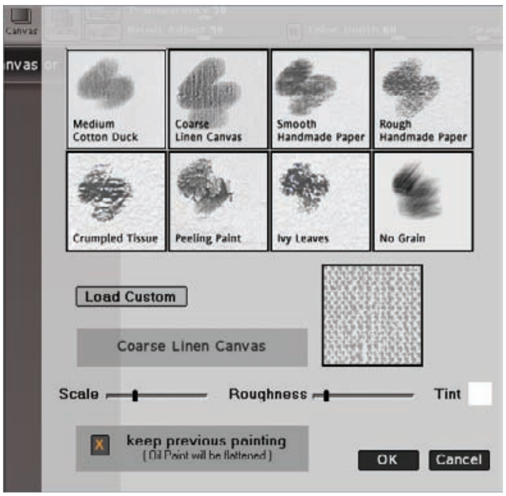


Figure B2.29
Click the Coarse Linen Canvas button to choose a grain pattern for the canvas.

Figure B2.30
Use the brushes to trace the image of the model. Set Transparency to 0 to see the image without the model.

12. Use the File menu to export the image to your local disk.
13. Press the Exit button in the upper right to leave PaintStop. A dialog box appears, asking whether you want to project the painting onto the model (see Figure B2.31). If you don't want to project the image, press the Cancel button, and PaintStop will close, returning you to ZBrush.

The Projection feature works just like Projection Master described earlier in this chapter: Anything you paint on the canvas will be projected onto the model, so PaintStop acts as another way to texture your surfaces.

The tabs at the bottom of PaintStop store the images you create. Each time you launch PaintStop during a ZBrush session, these tabs will store the work you have done so you can continue to work on a number of paintings within a session.

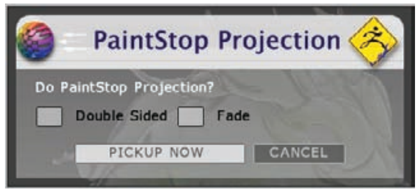


Figure B2.31

When you Exit PaintStop, a dialog asks whether you want to project the painting onto the model.

3D Print Exporter

3D Print Exporter is a simple plug-in that exports your model in various formats that can be read by 3D printing software. You install the ZPlugin by using the same method described earlier in the "Install a ZPlugin" section.

You have the option of exporting the selected SubTool or all SubTools (see Figure B2.32). You can set the size of the print and then choose the format. Some formats will also accept the color information painted on the surface.

If you plan to export your models for 3D printing, make sure you understand which options your 3D printing software requires. Figure B2.32 shows the interface for the 3D exporter plug-in.

Figure B2.32

The interface for 3D Print Exporter

Decimation Master

Decimation Master is used to convert a highly detailed, high-resolution mesh (meaning a mesh with millions of polygons) into a lower-resolution version while maintaining as much of the original detail as possible. 3D printing software often can't accept models above a certain polygon count or files above a certain size. Decimating a model is a way to prepare the surface so it can be exported from ZBrush (by using the 3D Print Exporter ZPlugin) and printed out as a three-dimensional surface.

Many CG artists who use 3D animation software such as Autodesk's Maya and 3ds Max or Luxology's Modo will use Decimation Master as an alternative to displacement maps and normal maps for rendering the highly detailed surfaces produced in ZBrush. In some cases, a decimated version of the model will look better than a version that uses displacement maps in a render using other 3D software. However, the decimated version of the model will have a topology that is not suitable for animation, so many artists decimate only models that are static, such as statues or scenery.

The documentation for Decimation Master is available at `www.pixologic.com/zbrush/downloadcenter/zplugins`. This exercise demonstrates the basics of using the ZPlugin.

First you'll prepare a surface for decimation:

1. Download and install Decimation Master from `www.pixologic.com/zbrush/downloadcenter/zplugins`. You install the ZPlugin by using the same method described earlier in the "Install a ZPlugin" section.

2. Restart ZBrush. From Light Box, select the `Rhino.ZTL`.
3. Draw the tool on the canvas and switch to Edit mode (hotkey = **T**).
4. Press **Ctrl+D** four times to add four levels of subdivision to the surface. At the highest level, the surface will have 3.660 million polygons.
5. Choose the BasicMaterial 2 shader from the materials fly-out library.
6. Open the Surface subpalette of the Tool palette. Turn on the Noise button. Use the following settings for Noise:
   - Noise Scale = 15
   - Strength = 0.15

   You're adding noise to the rhino so you can see how Decimation Master handles detailed surfaces.
7. Adjust the Noise edit curve so it looks like Figure B2.33.

Figure B2.33
Adjust the Noise edit curve to set the look of the noise on the surface of the rhino.

8. Press the Apply To Mesh button to bake the noise into the surface.
9. Use the Save As button in the File palette to save the project as `rhinoDecimate.ZPR`.

Now you're ready to decimate the rhino model:

1. Place the ZPlugin palette in a tray so you can access the controls. Expand the Decimation Master subpalette (see Figure B2.34).

   Before you can decimate the model, you need to preprocess it. Decimation Master creates a version of the rhino model and stores it within a cache so that as you adjust the controls for the amount of decimation, the model is updated.

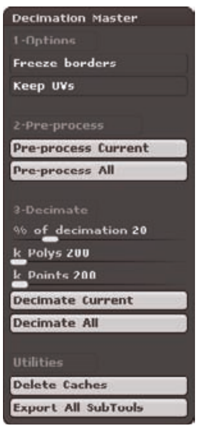


Figure B2.34
The interface for the Decimation Master plug-in

2. Press the Preprocess Current button. If the model has subtools, you can press the Preprocess All button and a cache file will be created for each SubTool.

   Preprocessing can take a long time. You might want to take a break while ZBrush is calculating. When the preprocessing is complete, you're ready to determine the level of decimation for your model.

   In the Decimate section of the Decimate Master ZPlugin, there are three sliders labeled % of Decimation, k Polys, and k Points. These sliders all work together. The % of Decimation slider shows how much decimation will occur to the model as a percentage. The k Polys slider lets you set the number of polygons (in thousands—so a setting of 300 will produce a model that is 300,00 polygons). The k Points slider lets you set the number of points in thousands. Moving one of these sliders causes the other sliders to update automatically so you can decide whether to set the decimation in terms of a percentage, or as total polygons, or as total points.

   Create a copy of the original model on the canvas so you can compare the decimated version to the original.

3. Move the view of the model to the upper left of the canvas. Press **Shift+S**. This drops a snapshot of the model on the canvas.
4. Move the view of the model down toward the lower right. Notice that a copy of the model is left behind (see Figure B2.35). This will give you a visual reference while you decimate.

Figure B2.35

Drop a copy of the rhino to the canvas for use as a visual reference. Move the rhino down toward the lower left.

5. Set the k Polys slider to **50** and press Decimate Current. The model is decimated so that the number of polygons is at 50 k and the number of points is at 25 k. It's pretty clear that much of the detail is lost so this is not an acceptable level of decimation (see left image in Figure B2.36).
6. Set k Polys to **100** and press the Decimate Current button again. The model looks a little better, but the triangulation of the surface is still pretty clear (see central image in Figure B2.36). But this gives you an idea of how Decimation Master works. You'll want to find the ideal level of decimation that preserves as much detail as possible while still keeping the polygon count as low as possible. Increase the k Polys or k Points sliders incrementally and use the Decimate current button to test the results of each value.
7. Try a value of **250** for k Polys (see right image in Figure B2.36). This seems to be a good value for this model. Other models will require a different value.

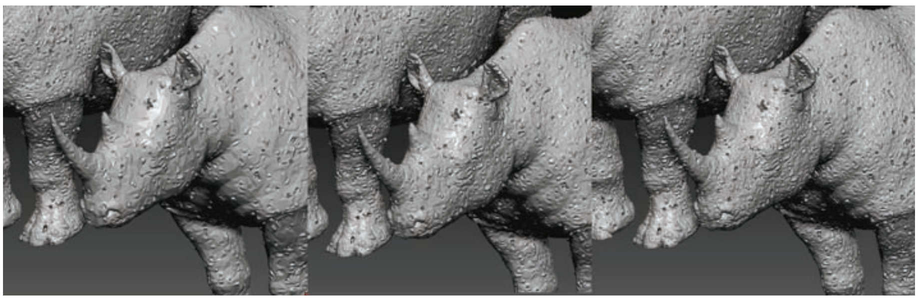


Figure B2.36

Different values are tested for the decimation of the rhino. The left image shows decimation at 50 k Polys, the central image shows decimation at 100 k Polys, and the right image shows decimation at 250 k Polys.

8. After you have found a setting that works, press the Export All SubTools button. This opens a file browser. You can save the file in the OBJ format, which is a generic 3D format accepted by most 3D applications.
9. Finally, press the Delete Caches button. This removes the cache from your hard drive. Cache files can be quite large, so it's a good idea to remember to do this whenever using Decimation Master.

If you want to see exactly how the surface has been decimated, press the PolyF button on the right shelf (Figure B2.37). The detail on the rhino is consistent over the entire surface because of the applied noise, so the polygons are mostly the same size. This also explains why it's hard to get good decimation below 250,000 polygons. For models in which the level of detail is different on various parts of the surface, you're more likely to get smaller polygons only where needed to preserve the detail, and you'll have a more efficient decimation allowing for lower k Polys settings. You can mask areas of the model before you decimate to more precisely control which parts of the model have more or less polygons and thus keep high-resolution detail exactly where you want it.

Figure B2.38 shows how the decimated rhino looks when rendered in Maya using mental ray. No displacement, bumps, or normal maps have been applied to the surface.

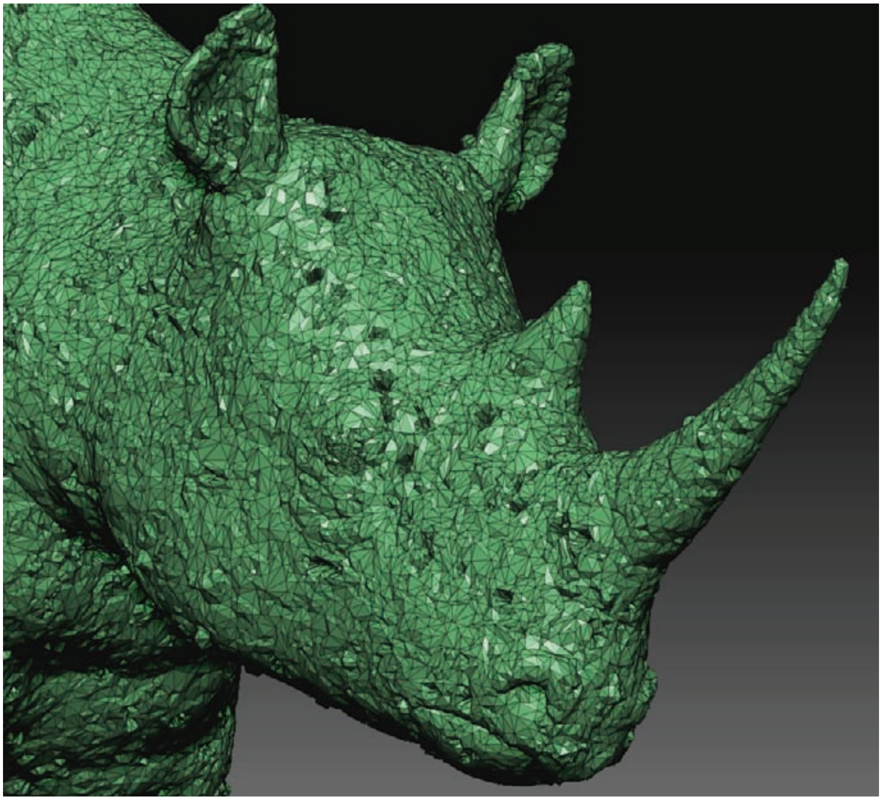


Figure B2.37

Turn on PolyF to see how the surface has been decimated.

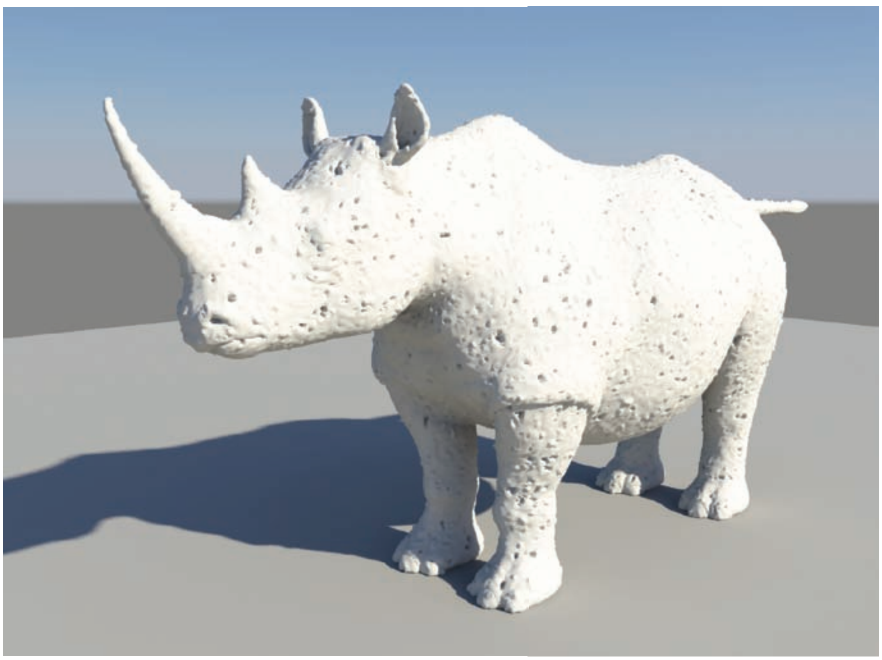


Figure B2.38

The decimated rhino is rendered in Autodesk Maya.

ZAppLink 3

ZAppLink combines the power of polypainting surfaces in ZBrush with the paint tools of your favorite digital painting software such as Adobe Photoshop or Corel Painter. The ZPlugin works similar to Projection Master in that, when activated, the current 3D tool is dropped to the canvas. However, instead of opening a ZBrush plug-in such as Projection Master, ZAppLink opens your digital paint program, letting you use your favorite brushes and painting techniques to paint on a still image of the model.

When you've finished painting in the other application, you can go back into ZBrush and pick the model up off the canvas. All the paint strokes created in your digital paint program are projected onto the surface. You can then rotate the view of the model, use ZAppLink to go back into your paint program, and then continue painting.

This exercise demonstrates the process:

Figure B2.39

The ZAppLink button is in the Document palette.

1. Download and install ZAppLink from `www.pixologic.com/zbrush/downloadcenter/zplugins`. You install the ZPlugin by using the same method described earlier in the "Install a ZPlugin" section.
2. From the Tool section of Light Box, open the `DemoHead.ZTL` tool.
3. From the materials fly-out library, select the SkinShade4 material.
4. Make sure the Persp button is off on the right shelf.
5. Rotate the head so you can see it from the side.
6. In the Tool palette, turn on the Colorize button in the Polypaint subpalette.
7. The controls for starting the ZAppLink plug-in are found in the Document palette. Open the Document palette and click the ZAppLink button in the upper left (see Figure B2.39).

   The first thing you need to do is set the target application. This should be a digital paint program such as Adobe Photoshop or Corel Painter. For this example, I use Adobe Photoshop, but the same techniques can be used with Corel Painter. The most important thing is that the paint program needs to support Photoshop style image layers.

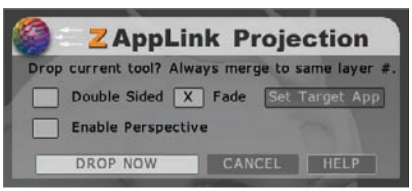


Figure B2.40

Click the Set Target App button to set the target paint program.

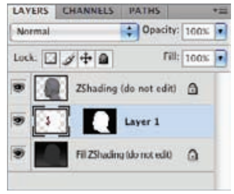
8. In the ZAppLink projection dialog, click Set Target App (see Figure B2.40). This opens your computer's file dialog box. Look through your system files and find your preferred target application. In Windows, this should be in Program Files, and in Mac OS this will be in Applications.
9. After the application is chosen, click the Drop Now button in the ZAppLink projection window.

ZBrush automatically launches your target app. In this example, it launches Adobe Photoshop. The canvas opens up in the paint program, looking just like it does in ZBrush.

ZAppLink uses the paint program's layers to keep information consistent between the ZBrush and the paint program. It is important that all the painting work that you do occurs on the layer labeled Layer 1 (see Figure B2.41). Don't paint on the ZShading or the Canvas layers. You can add layers while you work, but make sure that the ZShading and Canvas layers remain unchanged, and their position in the layer stack should not change relative to the other layers. ZShading should be on top, and Canvas should be on the bottom.

Figure B2.41

The layer arrangement in Adobe Photoshop. Do all of your painting on Layer 1.



10. Make sure Layer 1 is selected in the paint program's layer editor. Choose your favorite paintbrush and a nice bright color, and paint some strokes on the head (see Figure B2.42).
11. After you paint a few strokes, use the File menu to save the image. You don't need to change the location or the name of the file. By saving the image, you're updating the temporary file that ZAppLink uses to transfer data between programs.

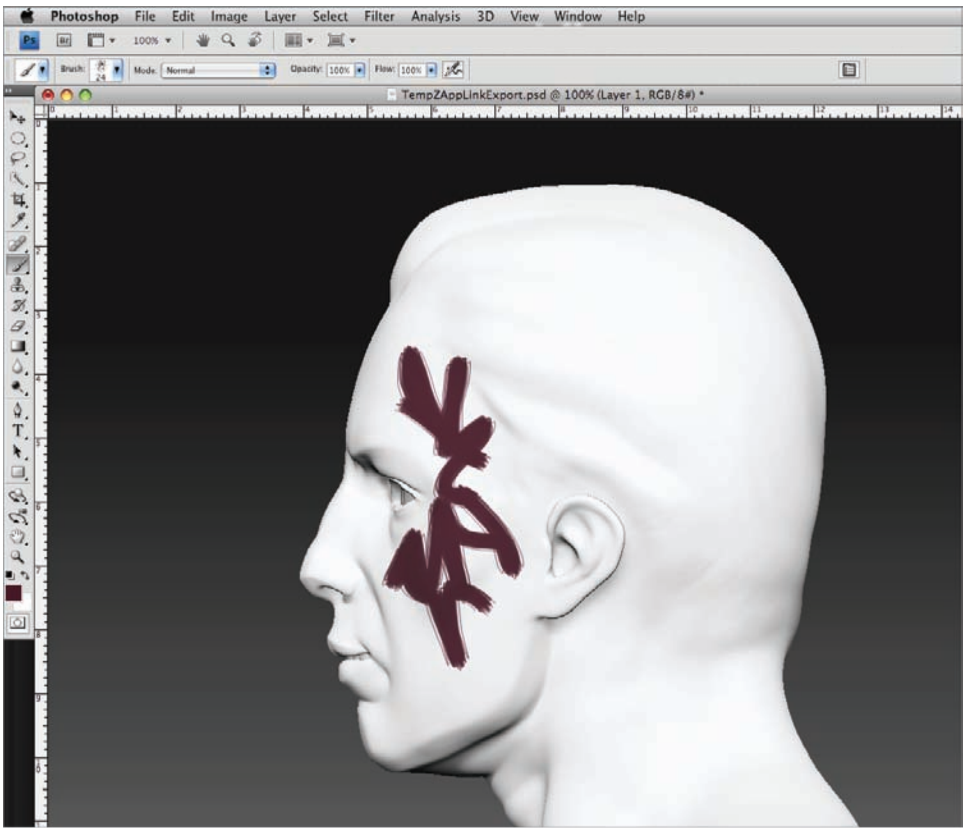


Figure B2.42

Colored strokes are painted on the head in Photoshop.

12. Minimize your paint program and switch back to ZBrush. You'll see a dialog box that asks whether you want to reenter ZBrush. Press the Re-Enter ZBrush button (see Figure B2.43).

13. The ZAppLink pop-up box appears again. Click the Double Sided and Fade options and then click Pick Up Now.

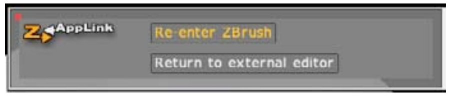


Figure B2.43
Press the Re-Enter ZBrush button.

After a few seconds, the colors you painted in Photoshop are projected onto the surface (see Figure B2.44). Because Double Sided has been selected, the colored strokes are projected through the surface, creating a symmetrical pattern.

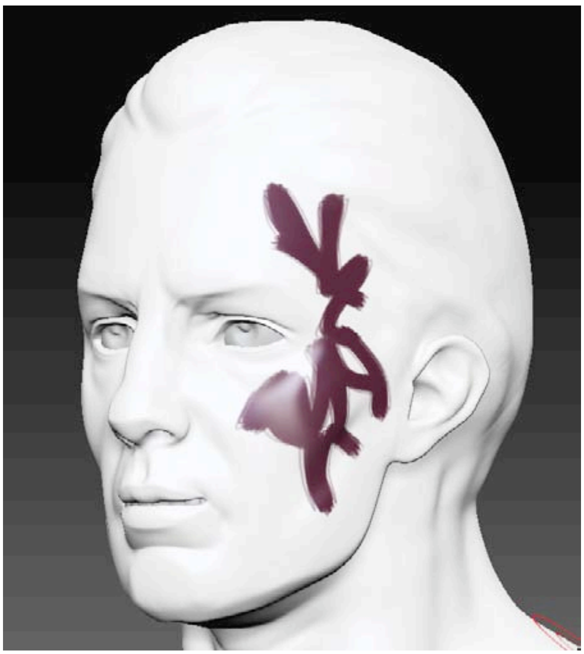
ZAppLink is a powerful ZPlugin that enables you to take advantage of any techniques or custom brushes you've created in your favorite digital paint program.

Multi Map Exporter

Multi Map Exporter offers a convenient way to create and export normal, displacement, texture, cavity, and occlusion maps and your mesh as an OBJ file all at the same time, using the controls within a single interface.

Creating texture maps and difference maps such as normal and displacement maps is discussed in Chapter 8, and in Bonus Content 1 which is available as a PDF file on the DVD. You should review these techniques if you're not already familiar with them. The settings used in the Multi Map Exporter ZPlugin are very similar. The main benefit of using this ZPlugin is convenience.

Figure B2.44
The strokes painted in Photoshop are projected onto the surface in ZBrush.



This exercise demonstrates the basics of using the Multi Map Exporter. You can download the documentation from `www.pixologic.com/zbrush/downloadcenter/zplugins`.

1. Download and install Multi Map Exporter from `www.pixologic.com/zbrush/downloadcenter/zplugins`. You install the ZPlugin by using the same method described earlier in the "Install a ZPlugin" section.

2. From the Tool section of Light Box, open the Rhino tool.

   Before you can create texture maps for this, you'll need to generate some UV texture coordinates.

3. Open the ZPlugin palette and expand the UV Master ZPlugin interface. Press the Unwrap button to

generate UV texture coordinates for the Rhino. For the purpose of this demonstration, the default UV texture layout should work fine.

4. Press **Ctrl+D** four times to subdivide the model.

   To generate some color and surface details quickly, you can use the Noise option in the Surface subpalette of the Tool palette.

5. Expand the Surface Subpalette of the Tool palette. Click the Noise button and use the following settings:

   Noise Scale: **10**

   Strength: **0.05**

   Press the Col1 button and choose a red color form the color picker.

6. Press the Apply To Mesh button to bake the noise and the color information into the surface.

   Now you have a model suitable for testing Multi Map Exporter. It may not be pretty, but it should work just fine.

7. Place the ZPlugin palette in a tray so you can easily access the controls.

8. Expand the Multi Map Exporter interface (see Figure B2.45).

   The top of the Multi Map Exporter ZPlugin has options for choosing which types of maps you would like to export.

9. Click the Displacement, Normal, Texture From PolyPaint, Ambient Occlusion, Cavity, and Export Mesh buttons. This means that all types of maps as well as the mesh itself will be generated and exported.

10. Before you generate the maps, it's a good idea to review the options of each map. Click the Export Options buttons. This expands the Multi Map Exporter ZPlugin interface to reveal options for each type of map.

    At the bottom of the interface are subpalettes containing settings for each type of map. The settings for Displacement, Normal, and Mesh Export are very similar to the settings found in the Tool palette. These are discussed in more detail in Bonus Content 1, which is a PDF file on this book's DVD. Settings for Ambient Occlusion map and Cavity map are very simple.

11. Expand each subpalette and use the following settings. These particular settings are chosen because they work well when rendering in Maya. The same settings may be different depending on which 3D application you intend to use to render the model.

Figure B2.45
The interface for the Multi Map Exporter ZPlugin

Figure B2.46

The options found in the Multi Map Exporter ZPlugin

If a setting is not specifically mentioned in the following list, you can use the default setting (see Figure B2.46).

Displacement Map

Subdivision Level **1** (meaning that the map will be generated by comparing the difference between the details at SDiv1 and the highest SDiv level)

Adaptive: **On**

Smooth UV: **On**

3 Channels: **On**

32 Bit: **On**

Normal Map

Subdivision Level: **1**

Tangent: **On**

Adaptive: **On**

Smooth UV: **On**

Ambient Occlusion

Occlusion Intensity: **1.5**

Scan Dist: **0.5**

Cavity Map

Use the default settings

Mesh Export

SubDiv Level **1**

Quad: **On**

Tri: **Off**

Flp: **Off**

Mrg: **On**

Grp: **Off**

After you have determined the options, you're ready to create the maps. The great thing about Multi Map Exporter is that it will remember these settings the next time you start ZBrush—so if you use the same settings each time, you have to set them only once. You can use the Load/Save Presets buttons to save these settings as a Preset that can be used in future ZBrush settings or shared with other users.

12. Scroll to the top of the Multi Map Exporter ZPlugin. Under Map Size, you can set the size for all maps. Click the 1024 button to set the size to 1024×1024. This is a good setting for testing, but you may require a larger map size depending on your project's needs.

13. Press the Create All Maps button. Your computer's file browser will open. This lets you set the directory where all the maps will be stored along with the mesh. The name of the files and the mesh is derived automatically from the name of the SubTool.
14. After you have established a location, click the Save button. ZBrush will go through the process of generating the maps. In some cases, this can take a while.
15. After the files have been generated, you'll find them in the directory where you saved them in step 13. The filename indicates the type of map (see Figure B2.47):

    DM: Displacement Map

    NM: Normal Map

    AO: Ambient Occlusion

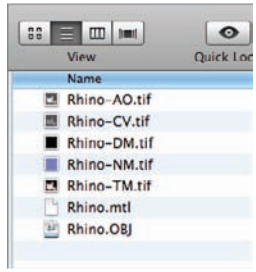
    CV: Cavity

    TM: Texture Map

You can change these extensions by clicking the File Names button in the Multi Map Exporter ZPlugin interface.

Figure B2.47

The texture maps are saved to disc.



Transpose Master

Transpose Master is used to make it easier to pose tools that have a lot of SubTools. Rather than having to move, rotate, and scale each SubTool individually to match the pose of the main tool, Transpose Master generates a temporary version of the tool with all SubTools merged into a single object. You pose this version of the tool, and the Transpose Master transfers the pose back to the original tool and does all the work for you.

The following steps demonstrate how to use Transpose Master:

1. Download and install Transpose Master from `www.pixologic.com/zbrush/downloadcenter/zplugins`. You install the ZPlugin by using the same method described earlier in the "Install a ZPlugin" section.
2. From the Tool section of Light Box, open the `DemoSoldier.ZTL` file. This tool has various SubTools used to make up the soldier's clothes and equipment (see Figure B2.48). Moving each of these SubTools to match a new pose would be extremely time-consuming. This is where Transpose Master comes in.
3. Place the ZPlugin palette in a tray. Expand the Transpose Master subpalette.
4. Click the TPoseMesh button in the Tranpose Master subpalette (see Figure B2.49). This creates the temporary version of the tool that you can pose. All of the SubTools have been merged together so you can easily use the Transpose control to pose the soldier.

Figure B2.48

The DemoSoldier is made up of many separate SubTools.

Figure B2.49
The Transpose Master interface

5. Mask all of the soldier except the left arm. Use the Transpose control to rotate the left arm. Using the Transpose control is covered in Chapter 3, “Basic Digital Sculpting.” Spend a few moments posing various parts of the soldier (see Figure B2.50).

   Most masking techniques will work on the merged version of the model with the exception of topological masks. ZBrush has a hard time masking overlapping SubTools when using topological masking.

6. After you have a pose you like, press the TPose → SubT button in the Transpose Master interface. You’ll then see ZBrush go through the process of transferring the pose to all the SubTools (see Figure B2.51).

You can use Transpose Master as often as you like while posing your character. Make sure that there are no masks applied to the original mesh when you transfer the pose from the posed version of the model. You’ll most likely need to clean the model up a little by using the sculpting brushes after the pose has been transferred from one to the other.

Figure B2.50
Create a pose for the merged version of the model.

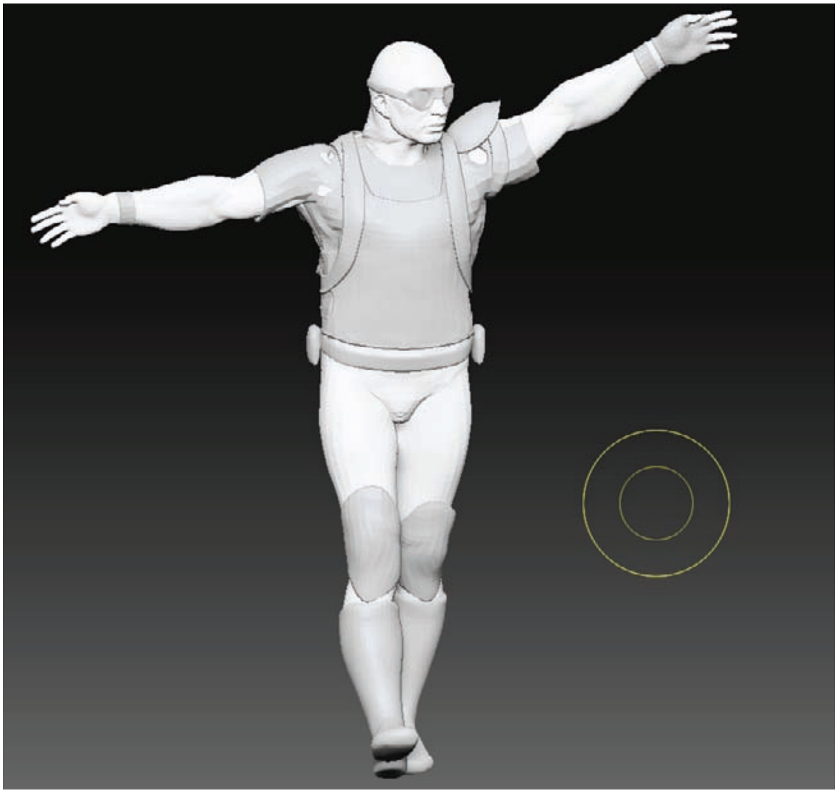


Figure B2.51
Transpose Master automates the process of posing all of the DemoSoldier's SubTools.

Adjust Draw Size

This plug-in is designed to help you save some time when adjusting brush attributes such as Draw Size, Rgb Intensity, and ZIntensity. Rather than having to use the sliders on the top shelf, you can use the Adjust Draw Size plug-in so that when you hold down a specified hotkey, you can simply drag back and forth on the canvas to adjust the attribute without having to use the sliders on the top shelf.

SubTool Master

The SubTool Master plug-in is described in detail in Chapter 4, "SubTools, ZSpheres, and ZSketching."

APPENDIX

About the Companion DVD

What you'll find on the DVD:

- **System requirements**
- **Using the DVD**
- **Troubleshooting**

This appendix summarizes the content you'll find on the DVD.

What You'll Find on the DVD

The following sections are arranged by category and provide a summary of the content you'll find on the DVD. If you need help with installing the items provided on the DVD, refer to the installation instructions in the section "Using the DVD" later in this appendix.

Chapter Files

In the `Chapters` folder you will find all the files for completing the tutorials and understanding concepts in this book. It includes sample files as well as video files.

The video files are stored in the `Movies` folder. The movies show how I sculpted some of the example files used in the book and include demonstrations of specific ZBrush features and techniques.

You will also find two bonus chapters—"GoZ" and "ZScripts and ZPlugins"—as well as the sample files for these chapters on the DVD.

System Requirements

> This DVD does not include the ZBrush software. You will need to have ZBrush 4 installed on your computer to complete the exercises in the book.

To complete the core exercises of this book, you need ZBrush version 4 or higher. Image editing software such as Adobe Photoshop and Corel Painter will be helpful (but not absolutely required) for some sections. "GoZ," which is a bonus chapter found on the DVD, requires Maya. However, you can also use Luxology's Modo, Maxon's Cinema 4D, or Autodesk's 3ds Max. Hardware requirements are a PC or Mac running ZBrush with a gigabyte or more of RAM. The more RAM you have, the better results you can get with ZBrush.

Make sure your computer meets the minimum system requirements, shown in the following list. If your computer doesn't match up to most of these requirements, you may have problems using the files on the companion DVD.

- A PC running Microsoft Windows XP, Windows Vista, or Windows 7 or an Intel-based Macintosh running OS X 10.5 or higher. The files on the DVD should be compatible with either operating system. The book was created using ZBrush 4 on an Apple Macintosh.
  - Your computer's processor should be a fast Pentium 4 or newer (or equivalent such as AMD) with optional multithreading or hyperthreading capabilities. ZBrush requires at least a Pentium 3 processor.
  - 2048 MB of RAM (4096 MB for working with multi-million polymeshes).
  - Monitor with a resolution of 1280×1024 or higher (32 bits).

- A Mac running Mac OS X 10.5 or newer.
  - 1024MB of RAM (2048MB recommended for working with multi-million polys).
  - Monitor with a resolution of 1024×768 set to millions of colors (recommended resolution is 1280×1024 or higher).
- An Internet connection.
- A DVD-ROM drive.
- Apple QuickTime 7.0 or later (download from `www.quicktime.com`).

For the most up-to-date information, check `www.pixologic.com/zbrush/system`.

While it is possible to use a mouse with ZBrush, a Wacom or other digital tablet will enable you to paint and sculpt naturally. It is essential to use some form of Wacom tablet with ZBrush, be it a Cintiq or a standard Intuos.

Using the DVD

For best results, you'll want to copy the files from your DVD to your computer. To copy the items from the DVD to your hard drive, follow these steps:

1. Insert the DVD into your computer's DVD-ROM drive. The license agreement appears.

> Windows users: The interface won't launch if Autorun is disabled. In that case, choose Start → Run (for Windows Vista, choose Start → All Programs → Accessories → Run). In the dialog box that appears, type **`D:\Start.exe`**. (Replace `D` with the proper letter if your DVD drive uses a different letter. If you don't know the letter, see how your DVD drive is listed under My Computer.) Click OK.

2. Read through the license agreement, and then click the Accept button if you want to use the DVD.

The DVD interface appears. The interface allows you to access the content with just one or two clicks. Alternately, you can access the files at the root directory of your hard drive.

> Mac users: The DVD icon will appear on your desktop; double-click the icon to open the DVD, and then navigate to the files you want.

Troubleshooting

Wiley has attempted to provide programs that work on most computers with the minimum system requirements. Alas, your computer may differ, and some programs may not work properly for some reason.

The two likeliest problems are that you don't have enough memory (RAM) for the programs you want to use or you have other programs running that are affecting the installation or running of a program. If you get an error message such as "Not enough memory" or "Setup cannot continue," try one or more of the following suggestions and then try using the software again:

Turn off any antivirus software running on your computer. Installation programs sometimes mimic virus activity and may make your computer incorrectly believe that it's being infected by a virus.

Close all running programs. The more programs you have running, the less memory is available to other programs. Installation programs typically update files and programs; so if you keep other programs running, installation may not work properly.

Add more RAM to your computer. This is, admittedly, a drastic and somewhat expensive step. However, adding more memory can really help the speed of your computer and allow more programs to run at the same time.

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If you have trouble with the book's companion DVD, please call the Wiley Product Technical Support phone number at (800) 762-2974. Outside the United States, call +1 (317) 572-3994. You can also contact Wiley Product Technical Support at `http://sybex.custhelp.com`. John Wiley & Sons will provide technical support only for installation and other general quality control items. For technical support on the applications themselves, consult the program's vendor or author.

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Please check the book's website at `www.sybex.com/go/introducingzbrush4`, where we'll post additional content and updates that supplement this book should the need arise.

Index

Note to the Reader: Throughout this index **boldfaced** page numbers indicate primary discussions of a topic. *Italicized* page numbers indicate illustrations.

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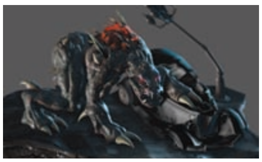
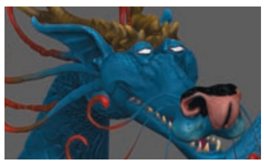
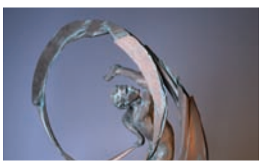
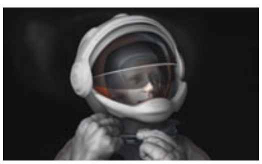
ZBrush Artist's Gallery

On the following pages you will find a gallery of images created by ZBrush users. Most of these images were created by students who are new to ZBrush. In addition, there are color renderings of some of the example projects used in this book's exercises.



Bird-Dinosaur, created in ZBrush 3.5 and rendered in Maya by Margaret Dost (`http://midost.cgsociety.org`).

ABOVE: *Rex* by Hunt Dougherty, modeled in ZBrush 4 and Maya. Hunt created the image by using the BPR passes rendered from ZBrush and composited in Adobe Photoshop. **BELOW:** *Rayageoth*, created and rendered in ZBrush 4 by Curt Binder (`www.curtbinder.com`).

ABOVE: *Bearded Dragon* by Nathan Morgan. **BELOW:** Dragon head designs by Anthony Ragusa (`www.anthonyragusa.com`) on the left, George Georgy (`http://ggeorgy.daportfolio.com`) on the right.

ABOVE: Dragon designs by Nathan Healy (`www.natehealyart.blogspot.com`) and Nikki Mull (`www.nikkimull.com`). **BELOW:** On the left, dragon design created and rendered in ZBrush 4 by Miguel Gorjao Clara (`miguelgorjaoclara@gmail.com`). Miguel has directed several independent short films which can be seen at `www.vimeo.com/user1845446/videos`. On the right, dragon design by Jermaine Dennis (`www.jermainedennis.com`).

TOP: The dragon project featured in Chapter 7 rendered in color. **BOTTOM:** *Circle of Life* by Ryan Kingslien (`www.zbrushworkshops.com`).

LEFT: *Toujours un peu dans les Etoiles* by Ara Kermanikian (`www.kermaco.com`). Ara is a CG artist and author of the book *Introducing Mudbox* (Sybex, 2010). **RIGHT:** *Biomech* by ZBrush master Scott Spencer. Scott has written several books on ZBrush, including *ZBrush Character Creation: Advanced Digital Sculpting* (Sybex, 2011) and *ZBrush Digital Sculpting: Human Anatomy* (Sybex, 2010). Scott is currently an artist at the Weta Workshop in New Zealand.

A render of the monster car project used in several exercises is this book. The render was created using the BPR render option.

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