Advanced 3D Photorealism Techniques

CREATE complex photorealistic organic objects

SURFACE complex organic objects using morph targets

DESIGN and create industrial and natural environments

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Welcome back to reality! I’m pleased to bring you the next installment of 3D photorealism. The first book, *3D Photorealism Toolkit* (Wiley, 1998), covered the “when” and “where” of 3D photorealism. This book covers the “how.” If you haven’t already read the *3D Photorealism Toolkit*, I suggest you pick up a copy. That book provides a solid foundation of photorealism principles. While these principles will be covered again in this book, they will be slanted toward outdoor settings, which are very different from the indoor variety. If you are seeking the complete photorealism package, it is a good idea to read both books.

So, what’s this book about? *Advanced 3D Photorealism Techniques* is about getting your hands dirty with some actual production work. In the pages to come, you’ll work through a number of insightful modeling and surfacing tutorials. Another distinction between this book and the *3D Photorealism Toolkit* is that you’ll be spending a great deal more time outdoors. The first book detailed how to create a variety of man-made objects and environments. Now you’re going to strip down and get natural. Well, not totally natural, but you will be taking a look at how to recreate the chaos Mother Nature has provided in the wondrous wilderness that surrounds us.

Nothing is more challenging and rewarding than creating outdoor settings. Nature is both chaotic and organized at the same time. The key to success in 3D photorealism is to be able to identify where and when the chaos should be used and, of course, how it can be accomplished. The process of creating photorealistic outdoor environments isn’t terribly difficult, but it does require creative thinking. In a world that’s nonlinear, you need to be flexible in your approach. That means using creative techniques to model and surface your objects. In this book I cover a variety of simple and easy-to-implement methods that will give you the tools you need to blow minds with your natural environments.

Naturally (no pun intended), you’ll also examine some of the man-made chaos that is around us every day when we walk down the street. This is important, because it provides the complete outdoor experience. There is a point where Mother Nature and man come together in our world, and you
need to examine the differences between these two environments so you can blend them properly. It's almost impossible to go anywhere and find a place where man's presence isn't evident. Even if it's nothing more than a rusty pull-tab from a soda can, you still need to explore how Mother Nature and mankind co-exist.

**Book and Technology Overview**

New technology that expands the capabilities of 3D products is steadily being developed. Even the most basic 3D programs possess many of the essential tools needed for creating photorealistic 3D images. While the capabilities of 3D programs will continue to grow, the principles of 3D photorealism will always remain constant. This book covers countless universal techniques for creating photorealistic 3D images. These techniques are not unique to any specific program; they can be used with any 3D program on the market—well, most of them, anyway. There will be some differences in the extent of the features between the low-cost amateur programs and the more expensive professional programs, but the techniques used for 3D photorealism remain the same.

If you use any of the following programs you should read this book:

- SoftImage
- Alias
- Lightwave
- 3D Studio MAX
- 3D Studio
- Strata Studio Pro
- ElectricImage
- Ray Dream
- truespace
- Extreme 3D
- Animation Master
- Houdini
- Imagine
- Pixels3D
- Cinema 4D
- POVRAY
How This Book Is Organized

This book is divided into six parts that take you logically through the process of developing photorealistic images. Each part is a complete concept, allowing you to reach closure at the end. You don’t have to read one part to understand another. If you are only interested in the principles of photorealistic modeling you can read part Two: Modeling Techniques and skip the other parts of the book, although I do recommend you read the entire book if you are interested in the complete process of developing photorealistic 3D images.

Part One: The Principles of Photorealism

This part revisits the ten principles of 3D photorealism discussed in the 3D Photorealism Toolkit. Of course, this time I’ll be gearing the exploration toward natural environments, rather than the man-made examples in the 3D Photorealism Toolkit.

Chapter 1: An introduction to Photorealism. Here is where you lay the foundation for a photorealistic 3D image. Chapter 1 identifies the ten principles of 3D photorealism and how they relate to outdoor settings. You will examine several photorealistic 3D images and learn to identify the elements that make them appear realistic. It’s all about taking the time to experience the chaos of reality. By the end of this chapter you will be looking at real-world objects in an entirely different way than you ever have before.

Part Two: Modeling Techniques

Modeling is the backbone of 3D photorealism. While having a solid image map is certainly helpful, it can’t hide the flaws of a poorly created model. The key to photorealism is to build a solid foundation with detailed models. In this part, you’ll explore some ingenious techniques for rapidly developing completely photorealistic models.

Chapter 2: Image Map Modeling. Creating detailed photorealistic models can be a real challenge. That’s where image map modeling steps in to make things easier. Image map modeling is a reverse-engineering process in which you model the object from the image map, rather than modeling the objects first and then creating an image map to match. Let’s face it, photographs can provide an abundance of details that would take you quite a while to recreate in a painting program. Why go through all that effort when you can use the photograph as your actual image map? This chapter has several tutorials involving the little-used yet very powerful image map modeling technique.
Chapter 3: Adding Depth with Seamless, Tileable Models. One of the most challenging aspects of natural scenes is ground cover. It’s visible in nearly every natural setting yet absent in all but a few 3D images. While a variety of image maps that represent ground cover are available, they lack depth and therefore appear very unrealistic. You can’t have a character running through ground cover when it’s flat beneath their feet. This is where tileable image maps come into play.

Tileable image maps are a creative method for replicating the 3D ground covers of real natural environments. They also come in handy for creating repeated details in industrial environments. In this chapter, you’ll explore techniques for creating both industrial and natural tileable models that will make your scenes come to life with extraordinary depth.

Chapter 4: Creating Tileable Ground Covers. Probably one of the most fascinating elements created in 3D images is the natural structure. Natural structures are man-made buildings or elements that are built using natural materials such as rocks, adobe, bricks, and boards. It’s amazing how inspiring a rickety, old shed in the middle of a wheat field can be. There is something about the natural structure that fascinates us.

This chapter covers several techniques for creating a number of natural structures, which can greatly enhance your natural settings.

Chapter 5: Displacement Map Effects. Natural environments are nothing but chaos. The last thing you want to see is repeating details in an outdoor setting. Mother Nature has a way of making every element unique. Like the old saying goes, no two snowflakes are alike. Therefore, to accurately re-create outdoor settings you need to incorporate chaos. That’s where the displacement map comes in. Nothing is better for adding chaos than a displacement map. This chapter takes a look at how displacement maps can be used to add irregularities that tend to repeat, such as ground covers, to your natural models.

Part Three: Surfacing Complex Objects

Surfacing organic objects can be a real nightmare. New techniques, such as implicit UV mapping, allow you to create a single image map to wrap around a model. However, these techniques come with problems, particularly that of creating a seamless map when your mesh template is all over the place. There are some simple and universal techniques for surfacing organic objects that will save you time and headaches, and this part explores several of those techniques.

Chapter 6: Creating Detailed Image Maps. The earmarks of a photorealistic surface are chaos. Just take a look at human skin, and you’ll quickly see that it’s more than a single tone. In fact, it changes tone radically across even the
smallest region. This is the chaos of reality. The same chaos applies to natural and industrial surfaces. If you are to mimic the chaos of real surfaces, you need to start incorporating these details into your surfacing regime.

This chapter covers several very simple techniques for adding this surface chaos to your image maps.

**Chapter 7: Morph Target surfacing.** Morph target surfacing is a real lifesaver when it comes to creating realistic environments. Have you ever tried to surface a tree, where the branches have the surface grain flowing along their length as real trees do? Well, then I’m sure you’ve realized just how frustrating this can be. Fortunately, there is a simple and effective solution: morph target surfacing.

You can use morph targets to position the original object so it can be surfaced effectively, and then use the morph target to position it naturally. In this chapter you’ll work through a number of tutorials on morph target surfacing, which will introduce you to one of the easiest methods for surfacing even the most complex objects without creating endless headaches.

**Part Four: Creating Industrial Environments**

One of the most popular 3D settings is the industrial environment, or man-made worlds. It’s only logical that we would m-create the world around us. Of course, there are a number of things to consider when creating industrial environments. This part explores the concepts and practices of creating 3D industrial worlds.

**Chapter 8: Designing City Streets.** What’s the human fascination with dark alleys and grungy streets? Well, they’re just plain cool. They have so much personality and chaos. City streets are a smorgasbord of visual inspiration. Let’s face it, a heaping pile of junk is captivating. It gives our eyes so much to focus upon. Who doesn’t enjoy a junkyard? I, for one, can’t get enough of them. To me, rust is simply a beautiful array of colors and textures.

This chapter explores all the finer points of creating city streets, including the placement of details and the types of chaos to apply.

**Part Five: Creating Natural Environments**

You rarely see natural settings in 3D images, probably because they appear very daunting and challenging to create. While it’s true they require more effort than an industrial environment, they really aren’t more complicated. They just have a different way of representing the details. Natural settings still have to comply with the ten principles of 3D photorealism—they just do it in their own unique way. This part studies how natural environments are
This book is for 3D artists who want to take their images to the next level. If you are truly dedicated to making photorealistic 3D images, you should read this book. Most of the 3D books I've read seem to throw the word photorealism around like the multimedia industry once did with the word interactive. It's one thing to call an image photorealistic, it's another thing to take the time to
really make the image realistic. I have a simple definition for photorealism: If it looks like a photograph, it’s photorealistic—no more, no less. A 3D pond isn’t photorealistic unless it has the cloudiness of small particle debris under the surface of the water. A leaf isn’t photorealistic unless the edges show some signs of having been eaten by insects, of the dryness of aging. And, of course, nothing is photorealistic if it’s perfect. If you want to create 3D images with unprecedented levels of photorealistic detail, then this book is for you.

If you fall into any of the following categories you should read this book:

Seeking a career in 3D. If you are seeking a career in 3D graphics, this book is a must. While there are literally thousands of 3D artists seeking work, only a handful are capable of generating photorealistic 3D images. A proficiency in creating photorealistic images puts you at the top of the stack of resumes in the major studios. You should read the book cover-to-cover because it will give you a distinct advantage in the job market.

Multimedia/games. If you are in the multimedia or game industry you are well acquainted with 3D graphics. 3D effects have permeated every aspect of your industry. Where it was once acceptable to use 2D or low-quality 3D graphics, photorealistic effects are now mandatory. Competition is fierce, forcing you to keep improving the quality of your 3D graphics. In this book you’ll discover hundreds of techniques for wowing your customers and clients with photorealistic 3D effects.

Film/broadcast. No industry is more particular about the quality of 3D work than yours. Every form of visual media is being saturated with 3D graphics—whether it’s needed or not. From virtual sets to animated stunt characters, 3D effects have become a part of nearly every film and broadcast production. Traditional special effects are being replaced with digital effects. This book provides you with the knowledge to create photorealistic sets and props for your next project or production.

Print media. Computer graphics have taken your industry by storm. More 3D graphics are popping up in print media every day. Your industry is probably the most challenging when it comes to photorealistic 3D. Unlike the film industry, where most things move by you too fast to really get a good look, your work lies there motionless, so even the smallest flaw can stand out like a beacon. This book shows you countless techniques for creating eye-popping photorealistic images that will keep your viewers glued to the page.

3D modelers. You are the foundation of every 3D image. It all starts with modeling. If you want to know the secrets of making photorealistic models, you should dive right into Part Two. You’ll discover dozens of proven techniques for adding photorealistic detail to your models.
3D texture artists. There is no more important element of photorealistic 3D than the textures. You are saddled with the responsibility of creating the eye candy. It’s up to you to create realistic textures that make the model photorealistic. You’ve mastered the painting technique, but now you want to learn the elements that make a texture realistic. You should skip ahead to Part Three, where you’ll learn how to add subtle nuances to your textures to make them undeniably realistic.

3D staging and lighting technicians. You’re sitting there with a pile of 3D models that have beautiful textures, and now it’s up to you to package them in a photorealistic environment. Part Four will show you how to mimic the chaos of reality in your scenes. You’ll learn techniques for making your scene look natural, not staged. You’ll also learn techniques for lighting every situation you’ll encounter.

Hobbyists. You’ve been experimenting with 3D and you really want to do something spectacular. Let’s face it, you want to show the world what you’re capable of doing. You want to leave them dumbfounded when they look at your 3D images. Well, you’re only 300 pages away from doing just that! Remember this: Photorealistic 3D is more attention to detail than artistic talent. Let everyone else be artistic—you’ll be photorealistic.

Whether you are an amateur or a professional, you will benefit from reading this book. In short, if you are a 3D artist who’s interested in creating photorealistic images, read this book!

Tools You Will Need

You will, of course, need a 3D program to take advantage of the information this book has to offer. Any 3D program is fine, the principles and techniques discussed here are not limited to any one program. I do recommend that you purchase SoftImage, Alias, Lightwave, or 3D Studio MAX if you are interested in exploring all the resources described in this book. The lower-priced programs typically lack a few of the surfacing and lighting features that make photorealistic 3D images possible. You can still create great-looking photorealistic images with the lower-priced programs, but the quality just won’t be as high as the professional programs.

To grasp the concepts in this book, you also will require a working knowledge of the modeling, surfacing, staging, and lighting aspects of your 3D program. The main focus of this book is to illustrate the principles and techniques of 3D photorealism. It doesn’t cover product-specific examples. If you are just beginning to explore 3D, you should become more acquainted with your before beginning to read this book.
You will also need a painting program, such as Photoshop. This is an important tool when creating the different types of image maps. Some Photoshop techniques will be described in Part Three, but the same techniques can be applied with Fractal Design Painter and Corel’s Photopaint.

The last item you need is patience. You have to be dedicated to creating photorealistic 3D images. It doesn’t happen overnight. It takes practice and experimentation, but in time it will become second nature. You won’t even have to think about doing it.

**What’s on the Companion CD-ROM**

The companion CD-ROM contains a variety of support materials for creating photorealistic 3D images. The support materials for the examples discussed in this book are provided in common formats such as 3DS files and JPG images that can be used by any program on any platform. The bonus models are available in several common formats and the bonus image maps are in a high-quality JPG format.

**Getting Started**

Creating realistic outdoor environments can be both exciting and challenging. Fortunately, you have many techniques and principles at your fingertips that will help to eliminate the challenge of creating realistic environments. Well, it won’t remove the design challenge of re-creating reality, but it will eliminate the tiresome headaches of production work. In fact, after reading this book, you’ll find 3D photorealism to be one of the easiest endeavors you’ve undertaken. Okay, I know that sounds a bit oversimplified, but you will definitely find many techniques in this book that will cut your development times in half, if not a third, and you can’t beat that.

What are you waiting for? Dive in!