The Complete Reference

Maya™ 6

▲ Use Maya for 3D modeling, animating, texturing, and creating motion dynamics

▲ Master Maya's Hypershade and rendering capabilities to create stunning images

▲ Build easy-to-use character rigs that provide extensive control over animations

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McGraw-Hill Osborne

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Maya™ 6: The Complete Reference

Foreword

by Alex Lindsay

Maya is not only one of the most powerful 3D software packages available, it's one of the most complicated. The possibilities are as limitless as the paths to get to them. This maze of tools can be very difficult to traverse for those looking to begin "high-end 3D" work. I think your guides, Tom and Shin, will make this journey much easier.

I met Tom when he was my student. I was still with Industrial Light & Magic, and Tom was just beginning his 3D work. Along with a handful of other students, we began to work on projects that required us to approach the work not from a student or teacher perspective, but as a production artist. While this may seem like a subtle difference, production is a completely different world. The saying, "The map is not the territory" perfectly describes the 3D market. So many things seem to make sense in theory and work in isolated cases, but they quickly fall apart under the weight of the "Real World."

When thinking about graphics, production, or life in general, this is one of the most important things to remember. We often think of learning as a set of skills, a collection of "tricks up our sleeve." Many classes and books provide many of these tidbits. But this rarely leads us to a profound understanding of our art that truly provides a foundation for inspiring work. Small problems become days of frustration or failure. We follow what we are "supposed" to do for weeks when the most effective, and often unconventional, solution is days away.

The key is to understand the underlying principles of the process. With these principles in mind, one has the agility to handle the issue at hand with a solid footing and clear vision. Through true understanding of the art in which we are immersed, we can have a bird's eye view of the process to help us make intelligent and grounded decisions.

So how do we get there?

- *Observe*. Would you like to know the fastest way to add realism to your work? Take a digital camera and shoot 10 photos a day of everyday items. Shoot door knobs, street signs, old cars. Watch not only how the light interacts with the object but how the camera interacts with the scene. I still do this constantly.

- *Fail*. Push yourself outside your boundaries. If you aren't failing, you aren't pushing.

- *Study*. When something doesn't work, find out why it doesn't work. Don't just figure out how to get around the problem—find out why the problem exists.

- *Experiment*. Playing with ideas is very important. You need to keep what you do fun. Experimentation gives you the space to play and is especially useful if you just failed at something.

- *Work with others*. Working by yourself is a nearly guaranteed way to fall behind. You can't learn everything and your eye is not perfect. You need a second opinion and a different perspective constantly to progress.

- *Work on real projects*. It is important, probably more important than anything else, to find real clients with real problems—even if it's work for free at first. People rarely do their best work for themselves. A client's needs help you mold your work and push you to perform. We often think we want to be a great artist like the masters in the art museums, rarely thinking about how much of their work was for contract—not art for art's sake. If you don't have any clients, find them. Give your work to non-profits or trade your work for services, but whatever you do, *do not* hide away to "work on your demo tape." I've seen many a computer artist get lost on this path.

With that, I will leave you with Tom and Shin. Their combined experience in production will provide a real grounding for the content presented here. I have worked with Tom for years, and Shin's background speaks for itself. This book is a place to start—and a good one. The rest of the path will be up to you.

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Acknowledgments

Introduction

If you have gone to the movies lately or played a video game on an Xbox system, you are familiar with the types of animation that Maya can produce. Maya is currently the industry-standard application for producing animation and effects for film, television, video games, and the Internet. This book was written to demonstrate how the program works and how it is used to produce content for these industries.

Not so many years ago, access to Maya by someone outside of the animation industry was limited. The software cost tens of thousands of dollars and the hardware required to run it was just as expensive. Attending a school was just about the only option for anyone interested in learning about this exciting new technology.

As computer hardware became faster and cheaper, software companies began to realize that they could sell these high-end applications to smaller studios, independent artists, and students if they made the price more appealing to those markets. Today you can purchase Maya Complete for under $2000, or you can download a free version, called the Personal Learning Edition, from the Alias Web site. The final obstacle, once you have the software installed, is learning how to use it. That's where this book comes into play.

Learning an application as large and powerful as Maya can be overwhelming, to say the least. While Maya 6's online documentation provides an excellent resource for learning about each and every little piece inside the program, it was not really designed to show you how all of the pieces fit together so that you can go about designing and completing a project. Knowing how to use a hammer does not necessarily mean that you can build a house. This book teaches you many of the tools in Maya *in the context of using them in a real-world production environment.*

This book was designed to cover the basics of the program and to demonstrate how Maya can be used to create projects. What you will gain from reading this book is a knowledge of specific workflows that are common to most 3D productions. Whether it be modeling a head for animation or rendering a vehicle for integration into a live-action plate, this book will direct you through processes that have been tried and tested in production environments. Successfully building a project that is free of errors and can be easily edited at any time during a production is beyond the scope of what any manual can teach you, but it is something that reading and working through the tutorials in this book can help you achieve.

Who Should Read This Book

This book is intended for CG artists, engineers, filmmakers, or hobbyists who are serious about using Maya to create high-quality images and animations. Some of the information here is very basic, while much of it is more advanced. Beginners will be happy to know that we've detailed where to find each and every tool or window as you follow along the tutorials. Advanced users will find plenty of information within these pages that you won't find in other books. We believe we have created a book that will be useful to anyone with a genuine interest in Maya.

While the book covers the fundamental aspects of Maya, such as the user interface and navigation, some knowledge or experience with 3D animation techniques will be necessary before you attempt to complete the tutorials. If you are migrating to Maya from another 3D package, it is suggested that you complete the introduction and Project One tutorials in the *Learning Maya 6 Foundations* book that ships with the software.

How the Book Is Organized

We have organized this book into six parts that begin with an overview of Maya and then follow the order of a typical production workflow. However, this does not mean that you have to read this book in order. Users with previous experience in Maya will have no problems jumping right to the character-rigging chapters in Part III or building explosions in Part IV.

For people with less experience, it is recommended that you try and follow the book in the order in which it has been laid out. We took extra care to explain how to execute basic tasks in the beginning of the book. These tasks, such as setting tool options and executing commands, are used throughout the entirety of the book but are not explained in such detail in later chapters.

Part I is designed especially for people new to the 3D production process or to Maya. It outlines the different processes used in a production and explains how they fit together. The overview of Maya's user interface is followed by a tutorial that directs you through a simple project, showing how to navigate through the interface and introducing some basic 3D concepts.

Part II covers modeling with all three of the geometry types available in Maya: NURBS, polygons, and subdivision surfaces. The NURBS and polygonal modeling chapters concentrate on hard-surface

modeling techniques, and the subdivision surface chapter shows how to build a humanoid head. Beginners should beware that some of these exercises, particularly the spaceship tutorial, may be difficult to complete if you are not totally comfortable using Maya. If you find you are having difficulties with one of these projects, there is no harm in skipping it and continuing on with the rest of the book. You can always return to missed sections and complete them at a later time.

Part III is dedicated to animation, with a strong emphasis on character animation. After covering the basics of keyframe animation and some basic deformation tools, the setup for a character is explained in detail in three chapters so that it can be easily animated in Chapter 12.

Part IV begins with an in-depth study of how to use Maya's Hypershade interface to build materials and control the lighting in a Maya scene. Advanced texture-mapping techniques are demonstrated, along with an approach to building a realistic skin shader. Workflows for using Maya's Paint Effects toolset are also covered in this section. Finally, we practice different rendering techniques in both Maya's software renderer and the Mental Ray for Maya renderer.

Part V explores Maya's Dynamics toolset. This includes particles, fields, expressions, and rigid and soft body dynamics for creating realistic effects and animation by running simulations based on natural phenomena. Maya's hardware renderer is also covered here.

Part VI focuses on completing a single project of a spaceship landing. Camera mapping, multipass rendering, command-line rendering, and compositing techniques are all explained in detail.

The appendix offers some brief information about Maya's scripting language, MEL (Maya Embedded Language). This concludes with a tutorial that supplements one of the exercises in Chapter 10, where we make a button that switches an inverse kinematics control to a forward kinematics control.

Conventions Used in This Book

A few conventions are used in this book. One has to do with choosing a command from a menu and opening its Options window. When we direct you to choose a command from the menu, we use the | symbol to signify a submenu. For example, if we say "create a polygonal sphere by choosing Create | Polygon Primitives | Sphere," that means you need to click the Create menu in the menu bar, mouse over Polygon Primitives from the resulting list, and then choose Sphere from the submenu.

Most of the tools and commands in Maya have options that can be edited and set before executing the tool or command. These options are usually accessed by clicking the little box next to a tool or command in the menu items. This book uses the ❑ symbol to denote the Options window command. For example, to open the Options window for the Sphere command, we say "choose Create | Polygon Primitives | Sphere ❑."

Another convention used throughout this book are icons appearing in the margin of some pages. Maya offers several ways to execute tools and commands. We will always direct you to execute these tools and commands via the main menus, but you may also choose to click a button on a Shelf or toolbar. For this reason, we provide the button icon in the margin when introducing a tool or command for the first time. The margin icons that look like CDs are explained next.

Finally, keyboard combinations are included for both the Windows and Mac platforms. Windows combinations appear first, and Mac combinations follow in parentheses.

About the CD

This book includes a CD that contains Maya scene files and other resources that are used throughout the book. Many tutorials will instruct you to open a certain CD file to use at the start of a project. This is emphasized with a CD icon in the text margin.

> *NOTE **Most of the files included with the book CD were designed to open in Maya 5 or later. However, some of the files use features that are specific to Maya 6 and therefore will not open in Maya 5 or earlier versions.***

Contents at a Glance

Contents

II   3D Modeling

III Animation

**9 Character Setup: Joints, Connections,
and Kinematics** **241**