Mark Gerhard
Jeffrey M. Harper
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MASTERING

Autodesk® 3ds Max® Design 2010

Create Compelling Visualizations for all of Your Architectural Projects

Master Key Techniques and Improve Your Productivity

SYBEX
SERIOUS SKILLS.

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Mastering
Autodesk® 3ds Max® Design 2010

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Summary: "The only comprehensive tutorial/reference exclusively devoted to Autodesk's robust architectural visualization software 3ds Max Design is a powerful real-time 3D design, modeling, and animation tool for architectural visualizations. This book covers all the software's crucial features, including how to simulate and analyze sun, sky, and artificial light-crucial factors for sustainable design-and how to define and assign realistic materials and work with AutoCAD and Revit files. You'll quickly learn how to get the most from this powerful software's 3D modeling, animation, and rendering capabilities. McFarland is an Autodesk Authorized Author with professional experience in creating complex visualizations for a large property development company. His real-world focus means workflows and instructions are professional and proven, and projects will include those that pros work on every day. Uses actual examples from the author's experience, including retail spaces, small offices, residential developments, and more Concise explanations, focused examples, step-by-step instructions, and hands-on tutorials teach the basics and fine points of the software Covers all the essential features, such as how to simulate and analyze sun, sky, and artificial light Demonstrates efficient use of the interface; how to work with Revit and AutoCAD files; using data, scene management, and solid modeling tools; rendering real-world surfaces; and setting up animated walkthroughs Mastering 3ds Max Design 2010 provides a practical education in using this powerful architectural visualization tool"--Provided by publisher.
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Dear Reader,

Thank you for choosing *Mastering Autodesk 3ds Max Design 2010.* This book is part of a family of premium-quality Sybex books, all of which are written by outstanding authors who combine practical experience with a gift for teaching.

Sybex was founded in 1976. More than 30 years later, we're still committed to producing consistently exceptional books. With each of our titles, we're working hard to set a new standard for the industry. From the paper we print on, to the authors we work with, our goal is to bring you the best books available.

I hope you see all that reflected in these pages. I'd be very interested to hear your comments and get your feedback on how we're doing. Feel free to let me know what you think about this or any other Sybex book by sending me an email at `nedde@wiley.com`. If you think you've found a technical error in this book, please visit `http://sybex.custhelp.com`. Customer feedback is critical to our efforts at Sybex.

Best regards,

Neil Edde
Vice President and Publisher
Sybex, an Imprint of Wiley

This book is dedicated to my wife Rhonda, who puts up with me; to my four children, Kai, Sakina, David, and Sam, who bring me so much joy; and to my grandson Mateo, may he enjoy the future. And to my mother and father who gave me the encouragement to do whatever I wanted, no matter how wacky it seemed at the time.
—M.G.

This book is dedicated to my family and friends, for always encouraging me in my endeavors, providing their emotional support, and for their understanding when I had to miss events or disappear from the face of the Earth to finish projects such as completing this book on schedule.

I would also like to dedicate this to Mr. Gil Moscatello, for introducing me to AutoCAD back in 1989 in his Architectural Drafting classes, for tolerating my enthusiastic investigation and critiquing of the software, and for his guidance and encouragement which has and will continue to help me throughout my career.
—J.H.

To my wife Lucy and our two sons, Zach and Jacob
—J.M.

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—*Mark Gerhard*

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I have to thank my family and friends again for all their love, support, encouragement, faith, and patience.

—*Jeff Harper*

About the Authors

Mark Gerhard is a 3ds Max Guru. He has devoted the past two decades to this software in all its forms. Mark was one of the first artists hired by Autodesk in 1990 to test the first version of 3D Studio on MS-DOS. In his 14-plus years at Autodesk he worked as an instructor, product manager, demo artist, application engineer, and technical writer. He wrote many of the tutorials that shipped with 3ds Max from versions 3 to present. He has been an ATC instructor, teaching 3ds Max to countless individuals at high schools, community colleges, and universities around the world. He has been the technical editor on numerous books on 3ds Max for New Riders, Wiley/Sybex, Friends of ED, Apress, 3DATS, and Focal Press. He has been co-author of several books as well.

Currently Mark teaches 3ds Max to architects and engineers across the United States and Canada. He is also a Forum Assistant on The Area, Autodesk's forum for all things 3D.

Mark holds a bachelor's degree in Practice of Art from University of California, Berkeley, with a focus on painting and sculpture. He is the author of the children's book "The Elf of the Shelf Sees Himself" (Push Press, 1983). He is also a trained musician, proficient in the tradition of North Indian Classical Music, having studied tabla with Ustad Shankar Ghosh and Pandit Jnan Prakash Ghosh of Calcutta. He has also studied vocal music with Ustad Ali Akbar Khansahib. He is also a student of Indian folk music, having studied and performed with the Bauls of Bengal (Babukishan Das Goswami Baul).

Jeff Harper started using Autodesk products (initially AutoCAD 9) in his architectural drafting classes when he was high school. Jeff was very excited to see AutoCAD add 3D modeling to its toolset and starting thinking cinematographically, creating renderings of his CAD files with AutoShade. Soon he began using 3D Studio R3 (for DOS) to help visualize his projects while he studied Architecture at the University of Colorado at Boulder. He upgraded to 3D Studio Max 1.0 for Windows when it was released, and he has used every version since, he also used LightScape 3.2 and a few versions of Autodesk VIZ.

He has used 3ds Max to create architectural and civil engineering visualizations from a combination of aerial and terrestrial LiDAR, USGS NED data, high-resolution digital orthophotography, stereo-compiled mapping data, and CAD files from different packages and disciplines. Jeff has also used 3ds Max to create models, stills, and animations used in Computer-Based Training programs for aircraft maintenance. Jeff has even used 3ds Max to create an STL file used to create a rapid-prototyped form from which he hand-pressed ceramic tiles used in the backsplash for a kitchen remodeling project.

As a CADD Manager and Data Manager for a large multistate, multidiscipline engineering firm, Jeff wrote a number of workflow/training documents to assist users with certain CAD and GIS functions and assisted users with AutoCAD, Revit Structure, Civil 3D, MicroStation, InRoads, Adobe Photoshop, and ArcGIS.

Jon McFarland lives in Cleveland, Ohio. He manages a design department at a property development company, where he uses AutoCAD and 3ds Max to create visualizations of proposed facility construction and expansions. He has authored five books and teaches AutoCAD and 3ds Max courses at the university level.

Contents at a Glance

Contents

Introduction

A significant portion of your work as a designer will involve sketching and drawing throughout the design process. These visual explorations will not only help convey your ideas to others, but they will also help you see problems with a design and help you refine your ideas. 3D computer modeling and animation take design visualization beyond hand-drawn sketches and foam-core models, by allowing you to create a complete replica of your design and study it from any point of view in any lighting condition.

With 3ds Max Design 2010, you can apply color, texture, lighting, and other effects to see how variations of these elements affect your design. You can get a realistic look at your design to help you make better decisions as you progress through the design process.

Mastering 3ds Max Design 2010 is intended to help architects, designers, and visualization artists present their designs through 3D models, rendered stills, and animations. This book focuses on the use of 3ds Max Design 2010 as a modeling and presentation tool. Because *Mastering 3ds Max Design 2010* is focused on design issues, you will not find information about character animation or advanced special effects. You also not find descriptions of every single tool or function available in 3ds Max Design 2010.

In this book you will find step-by-step tutorials covering the primary functions of the software that you will use in the process of visualizing designs. These tutorials are based on years of experience using 3ds Max on real projects with real requirements and deadlines. By completing the tutorials, you will learn how to construct complex geometric forms and how to apply realistic textures and lighting to study a design. You will also learn how to create effects to help emphasize parts of your design for presentations.

How to Use This Book

The goal of this book is to give you the appropriate skills to produce professional-level presentations of your ideas, from conceptual designs to finished renderings and animated walkthroughs. Once you have mastered those fundamental skills, you will be equipped to confidently explore 3ds Max Design 2010 and its robust set of tools and options on your own.

To get the most value from this book, you should read the chapters sequentially from front to back, doing all the exercises as you go. Each chapter builds on the skills you learned in previous chapters, so you can think of this book as your personal, self-paced course on 3ds Max Design 2010. As you are doing the exercises, don't be afraid to try things not in the tutorials. 3ds Max Design is too robust and complicated a piece of software to completely teach in one volume.

The first three chapters of this book will help you become familiar with how 3ds Max Design 2010 works and how it is organized. If you are already familiar with 3ds Max, 3ds Max Design, or Autodesk VIZ, you may want to skim these chapters to become accustomed to the new user interface and to be introduced to the some of the new features of 3ds Max Design 2010. Chapters 4, 5, and 6 will show you how to build fairly complex geometry using a variety of tools. These chapters introduce you to the more common methods of constructing and modifying objects in 3ds Max Design 2010. Chapters 7 through 10 show you how to use lights, materials, and cameras. Chapter 11 covers the mental ray rendering system. Chapters 12 and 13 introduce and then expand on animation topics. Chapter 14 covers using the built-in particle effect and dynamics systems in 3ds Max for enhancing your visualizations. Chapter 15 covers bringing data from other Autodesk programs into 3ds Max.

At the back of the book there are a set of appendices that offer general reference information on some of the more common tools used in 3ds Max Design 2010. Once you have completed the first few chapters of the book, you can use the appendices as an aid in your own exploration of 3ds Max. You can then refer to the appendices as you continue to work through the rest of the book.

Before you start going through the tutorials in this book, you need to go to the Sybex website (`www.sybex.com/go/Mastering3dsmaxDesign2010`) and download the compressed files with the content. You must extract the chapter archive files to a folder on your computer that you will use to complete the tutorials in the book. You will need those files to complete the exercises in the book.

Connecting 3ds Max to the Chapter Files

It is important that you configure 3ds Max Design 2010 to recognize the location of the tutorial files from the Sybex website (`www.sybex.com/go/mastering3dsmaxdesign2010`). Make sure that you perform the instructions given in the section titled "Adding a Map Path to Help 3ds Max Find Bitmaps" in Chapter 8. If you like, you can set up 3ds Max as described in that section right after you have extracted the files.

What You'll Find

To give you a better idea of what you'll find in this book, here is a summary of the chapters and their contents.

Chapter 1: Getting to Know 3ds Max Design 2010 In Chapter 1, you will get an introduction to 3ds Max Design 2010 and the new User Interface, and you'll get a first look at 3ds Max objects and how they are created. Toward the end of Chapter 1 you will be introduced to the different ways you can view your designs in 3ds Max Design 2010.

Chapter 2: Introducing 3ds Max Objects Chapter 2 delves deeper into the workings of 3ds Max objects. You'll learn about the different types of objects available in 3ds Max Design 2010 and how you can use them to create the shapes you want. You will learn how to manipulate 3ds Max's core set of shapes, called primitives, and turn them into more complex shapes. You will also learn about the different methods you can use to duplicate shapes, and how these methods can help you quickly complete your design.

Chapter 3: Creating Shapes with Splines In Chapter 3 you will look at how you can create complex forms from simple lines. Here you will learn how to manipulate a basic type of object called a spline shape and turn it into a wineglass. You will look at creating walls and 3D text objects as well.

Chapter 4: Editing Meshes and Creating Complex Objects Chapter 4 introduces you to object and editing methods that are common to architectural projects. You will start modeling a well-known building, using a hand-drawn sketch as a template. You will also focus on drawing objects that have unusual shapes.

Chapter 5: Creating AEC Objects Chapter 5 will introduce you to the parametric AEC (Architectural, Engineering, Construction) objects included with 3ds Max Design 2010, such as walls, windows, doors, stairs and railings, and foliage objects.

Chapter 6: Organizing and Editing Objects In Chapter 6 you will continue working on the main scene from Chapter 5 by exploring ways to organize the components of the design. You will learn how to use object names and layers to help identify parts in the design. You will also continue your exploration of modeling complex forms by creating additional objects and modifying existing objects to add detail and depth to the scene.

Chapter 7: Light and Shadow Chapter 7 uses another well-known building to introduce you to the concepts of lighting and rendering your digital models. You will also learn about the different types of lighting and shadows and how to use them together. In addition, you will learn how you can create more realistic renderings by the careful placement of additional lights in strategic locations.

Chapter 8: Enhancing Models with Materials In Chapter 8, you will continue to build on what you learned in Chapter 7 by exploring materials. You will experiment with the many properties of materials and maps in 3ds Max Design, such as diffuse color, bump map textures, and reflections. You will learn how to align a texture to a surface, and you will be introduced to methods for adding entourage, such as trees and people, to scenes.

Chapter 9: Using the 3ds Max Camera Chapter 9 discusses placing cameras in your model and creating environments to surround your models. You will learn how to control the background to affect the mood of your renderings. You will also experiment with rendering only selected portions of your scene to save time.

Chapter 10: Working with External Files Chapter 10 shows you different ways to use 3ds Max files. You will learn how to combine different files efficiently to allow you to work collaboratively with other members of a design team. You will discover ways to share data between project files. You will also see how you can share your models on the Internet.

Chapter 11: Using mental ray In Chapter 11 you will use the mental ray rendering system. The mental ray system offers you the capability to create incredibly realistic renderings. You will learn how to set up and use global illumination, create and use mr Proxy objects, the Multi-Sub-map material, create contour renderings with the Material Override feature, and perform Lighting Analysis on your projects.

Chapter 12: Understanding Animation Chapter 12 offers you an introduction to animation in an architectural context. You will learn to create and control the animation of a camera to create a flyby of one of the buildings you worked on in earlier chapters. You will also learn how to edit an animated object's motion, create previews of your animation, and control lights over time.

Chapter 13: Creating Animations Chapter 13 continues your look at animation by exploring the options for outputting your animations to files, creating shadow studies, adding other animated elements to add to the realism of your visualizations, and creating effective walkthroughs of your designs.

Chapter 14: Atmospheres, Effects, reactor, and Particles In Chapter 14 you will learn how to use the built-in particle systems, effects, and dynamics system to add atmosphere to your visualizations.

Chapter 15: Using Other Autodesk Applications with 3ds Max Design 2010 Chapter 15 shows you how to take advantage of files created in other Autodesk products, capitalizing on their unique strengths to reduce the time and effort you need to expend to create high-quality finished models in 3ds Max Design 2010.

In addition to the main chapters in this book, there are two appendices.

Appendix A: The Bottom Line Appendix A has the solutions for the Master It exercises found at the end of each chapter.

Appendix B: Modifiers and Materials Appendix B is a reference for the Modifiers and Materials found in 3ds Max Design 2010.

System Requirements

This book assumes that you already have Autodesk 3ds Max Design 2010 and a PC that can properly run the software. Additionally, you should perform a complete installation of 3ds Max Design 2010, including the optional tutorials and plug-ins. Many of the extra and demonstration plug-ins are not covered in this book; however, you should experiment with them on your own. The following list shows you the minimum system requirements necessary to run 3ds Max Design 2010; you should exceed these values whenever possible for better system performance and stability.

- Intel Pentium®4 or AMD-based equivalent processor
- 1GB of RAM (4GB recommended)
- 1GB of swap space (more recommended)
- 3GB of free disk space after 3ds Max Design 2010 software installation
- Microsoft Internet Explorer 6 or higher
- Graphics card supporting 1024 × 768, 32-bit color display, 128MB
- DirectX 9.0c (included on the 3ds Max Design 2010 DVD)
- DVD-ROM drive
- A three-button mouse with the appropriate driver software
- Microsoft Windows XP Professional (Service Pack 2 and higher) 32-bit or 64-bit, or Microsoft Windows Vista

Autodesk does not support running 3ds Max Design 2010 on Windows Me, NT 4.0, 98, or prior versions.

You can find the complete system requirements for 3ds Max Design 2010 on the Autodesk website, `www.autodesk.com/3dsmaxdesign`.

The 3GB of free disk space includes space for the sample files and general workspace for your projects. For later chapters, you may want to have AutoCAD 2007 or later installed and Adobe Photoshop CS or later. You can obtain a trial version of Photoshop from the Adobe website. You can also download a 30-day trial version of AutoCAD 2010 from the Autodesk website. These additional software applications are not crucial to have, but you may find them to be useful companions to 3ds Max Design 2010.

What's on the Book's Website

You will want to make sure that you have downloaded and extracted the sample files from the Sybex website (`www.sybex.com/go/mastering3dsmaxdesign2010/`) that are mentioned throughout the book. The website includes the `*.max` and support files necessary to complete the exercises in this book in archive files.

Chapter 1

Getting to Know 3ds Max Design 2010

Welcome to *Mastering Autodesk 3ds Max Design 2010*. Autodesk 3ds Max Design 2010 replaces Autodesk VIZ 2008 and benefits from the development of its sister product, 3ds Max, to give architects and other design professionals an indispensable design and visualization tool. Autodesk 3ds Max Design 2010 gives designers cutting-edge rendering technology, easy-to-use architectural materials, improved communication with other related software, enhancements to modeling and animation tools, and better viewport interactivity than ever before.

This chapter introduces some of 3ds Max Design 2010's special features and then gets you started working with the 3ds Max interface. In this chapter, you will learn to:

- Navigate and configure the viewports
- Dock and float toolbars
- Copy objects and use the Transform tools
- Create a named selection set

Introducing the New 3ds Max Design 2010 Features

3ds Max Design replaces Autodesk VIZ 2008 as Autodesk's 3D modeling and visualization tool for the architectural industry. It is comparable to 3ds Max and is essentially the same product without the Software Developers Kit (SDK), which is used to develop plug-ins that give the programs additional functionality. In addition to having all the features that 3ds Max has, 3ds Max Design offers a new Exposure lighting analysis tool, which is used to help meet the Leadership in Energy and Environmental Design (LEED) 8.1 certification standards. The program is referred to as either 3ds Max or 3ds Max Design throughout the text.

Each new version of 3ds Max incorporates fresh and exciting tools to enhance your capabilities and workflow while also increasing the performance of the program on your computer system. Utilizing these new features is key to improving your skills and decreasing the time it takes to complete your projects. To help you find information, the 3ds Max Design 2010 Learning Movies dialog box (see Figure 1.1) includes links to essential skills movies, which teach many of the basic skills for using 3ds Max, as well as links to movies that explain the new features and additional 3ds Max–related tutorials.

FIGURE 1.1
The new Learning Movies dialog box

New Features and Essential Skills Movies/What's New and Learning Path The new features and additional skills movies are located on the Autodesk website, and an active Internet connection is required to view them. When you no longer want the dialog box to appear as 3ds Max opens, simply uncheck the Show This Dialog at Startup option in the lower-left corner. The dialog box can then be opened by choosing Help ➢ Learning Movies from the menu bar.

Graphite Modeling Tools The new Graphite Modeling tools provide over 100 new modeling features for organic sculpting, texture painting in the viewports, and advanced polygon modeling. They are available on the new Graphite Modeling Ribbon. These tools bring a new level of interactivity to modeling in 3ds Max.

Containers Containers are a new toolset within 3ds Max designed to improve project collaboration and workflows by aggregating multiple objects into containers. Similar objects in a scene can be added to a container so you can interact with them as one unit. Containers can be loaded and unloaded from the viewports as necessary to improve the performance of 3ds Max Design 2010.

Material Explorer The new Material Explorer is a hierarchical display that allows you to review and manage all materials in a scene. Unlike the Material Editor, the Material Explorer does not suffer from a limitation of how many materials it can display at one time.

Exposure lighting validation When architectural or engineering visualizations are being created, accurate simulation of lighting conditions can be vitally important to a project's success. The Exposure feature, only available in 3ds Max Design, allows you to create more sustainable design projects by analyzing the interaction of artificial lighting, sun, and skylight directly in your models. This information can be studied right in the viewports. Although the Exposure name is trademarked by Autodesk, you won't actually find "Exposure" anywhere in the Help file or 3ds Max Interface.

xView Mesh Analyzer The xView Mesh Analyzer feature allows you to check your models in the viewport for common mesh errors such as overlapping UV coordinates, isolated