Kelly L. Murdock's Autodesk®

3ds Max® 2020

COMPLETE REFERENCE GUIDE

SDC PUBLICATIONS

Better Textbooks. Lower Prices.
www.SDCpublications.com

ACCESS CODE
UNIQUE CODE INSIDE

Visit the following websites to learn more about this book:

Table of Contents

PART I **1**
GETTING STARTED WITH AUTODESK 3DS MAX 2020 ..... **1**

CHAPTER 1 ..... **3**
EXPLORING THE INTERFACE **3**

Learning the Interface Elements 4
Using the Menus 6
Using the Toolbars 8
Using the Viewports 14
Using the Command Panel 14
Using the Lower Interface Bar Controls 18
Interacting with the Interface 19
Using Workspaces 22
Getting Help 24
Summary 27

CHAPTER 2 ..... **29**
CONTROLLING AND CONFIGURING THE VIEWPORTS **29**

Understanding 3D Space 30
Using the Navigation Gizmos 32
Controlling Viewports with a Scroll Wheel Mouse 37
Using the Viewport Navigation Controls 37
Changing the Viewport Display 43
Enhancing the Viewport 46
Displaying Materials, Lighting, and Shadows in the Viewport 50
Working with Viewport Backgrounds 54
Setting Viewport Visual Style and Appearance 57
Altering the Viewport Layout 62
Using Safe Frames 63
Setting Display Performance 65
Defining Regions 66
Viewing Statistics 68
Configuring the ViewCube and SteeringWheels 69
Summary 69

CHAPTER 3 ..... **71**
WORKING WITH FILES, IMPORTING AND EXPORTING **71**

Working with 3ds Max Scene Files 71
Importing and Exporting 78
Using the File Utilities 91
Accessing File Information and Sharing Views 93
Working with Asset Tracking 96
Summary 100

CHAPTER 4 ..... **103**
SETTING PREFERENCES **103**

Setting General Preferences 103
Setting File Preferences 107
Configuring Paths 110
Setting Interaction Mode 116
Setting Gamma and Look-Up Table (LUT) Preferences 117
Setting Rendering and Radiosity Preferences 119
Setting Animation Preferences 123

Setting Inverse Kinematics Preferences 125
Setting Gizmo Preferences 127
Setting Global Container Preferences 128
Setting Help Preferences 129
Summary 130

PART II 133
MANIPULATING OBJECTS 133

CHAPTER 5 135
CREATING AND EDITING PRIMITIVE OBJECTS 135

Selecting System Units 135
Creating Primitive Objects 137
Using Modeling Helpers 147
Summary 150

CHAPTER 6 153
SELECTING OBJECTS AND SETTING OBJECT PROPERTIES 153

Selecting Objects 153
Setting Object Properties 165
Hiding and Freezing Objects 169
Using the Scene Explorer 173
Summary 178

CHAPTER 7 181
TRANSFORMING OBJECTS, PIVOTING, ALIGNING, AND SNAPPING 181

Translating, Rotating, and Scaling Objects 181
Working with the Transformation Tools 184
Using Pivot Points 193
Using the Align Commands 197
Using Grids 200
Using Snap Options 203
Summary 208

CHAPTER 8 209
CLONING OBJECTS AND CREATING OBJECT ARRAYS 209

Cloning Objects 209
Understanding Cloning Options 212
Mirroring Objects 215
Cloning over Time 217
Spacing Cloned Objects 219
Using the Clone and Align Tool 222
Creating Arrays of Objects 224
Summary 230

CHAPTER 9 231
GROUPING, LINKING, AND PARENTING OBJECTS 231

Working with Groups 231
Understanding Parent, Child, and Root Relationships 233
Building Links between Objects 234
Displaying Links and Hierarchies 236
Working with Linked Objects 237
Summary 239

CHAPTER 10 241
ORGANIZING SCENES WITH LAYERS, CONTAINERS, XREFS AND THE SCHEMATIC VIEW 241

Using Layers 241

Working with Containers ... 245
Referencing External Objects ... 249
Using the File Link Manager ... 259
Using the Schematic View Window ... 262
Working with Hierarchies ... 270
Setting Schematic View Preferences ... 274
Using List Views ... 278
Summary ... 279

PART III ... 281
MODELING 3D ASSETS ... 281

CHAPTER 11 ... 283
ACCESSING SUBOBJECTS AND MODIFIERS AND USING THE MODIFIER STACK ... 283

Exploring the Model Types ... 284
Understanding Normals ... 286
Working with Subobjects ... 288
Introducing Modifiers ... 293
Exploring the Modifier Stack ... 295
Summary ... 305

CHAPTER 12 ... 307
DRAWING AND EDITING 2D SPLINES AND SHAPES ... 307

Drawing in 2D ... 307
Editing Splines ... 320
Summary ... 342

CHAPTER 13 ... 343
MODELING WITH POLYGONS ... 343

Understanding Poly Objects ... 343
Creating Editable Poly Objects ... 344
Editing Poly Objects ... 345
Summary ... 376

CHAPTER 14 ... 377
USING THE GRAPHITE MODELING TOOLS AND PAINTING WITH OBJECTS ... 377

Working with the Graphite Modeling Tools ... 377
Using the Freeform Tools ... 393
Using the Selection Tools ... 399
Using the Object Paint Tools ... 402
Summary ... 410

CHAPTER 15 ... 411
WORKING WITH COMPOUND OBJECTS ... 411

Understanding Compound Object Types ... 411
Morphing Objects ... 412
Creating a Terrain Object ... 415
Working with BlobMesh Objects ... 417
Working with ProBoolean and ProCutter Objects ... 419
Summary ... 426

CHAPTER 16 ... 427
DEFORMING SURFACES AND USING THE MESH MODIFIERS ... 427

Using Selection Modifiers ... 427
Using Primitive Maintenance Modifiers ... 429
Using Spline Modifiers ... 430
Using Edit Geometry Modifiers ... 439

Using Parametric Deformer Modifiers 449
Using Free Form Deformer Modifiers 464
Miscellaneous Modifiers 466
Subdivision Surface Modifiers 468
The Basics of Deformation Painting 470
Using the Deformation Brushes 472
Setting Painter Options 474
Summary 476

PART IV 477
APPLYING MATERIALS AND TEXTURES 477

CHAPTER 17 479
CREATING AND APPLYING STANDARD MATERIALS WITH THE SLATE MATERIAL EDITOR 479

Understanding Material Properties 479
Working with the Slate Material Editor 482
Using the Standard Material 490
Using Shading Types 490
Accessing Other Parameters 497
Using the Material/Map Browser 501
Using the Material Explorer 504
Summary 507

CHAPTER 18 509
ADDING MATERIAL DETAILS WITH MAPS 509

Understanding Maps 509
Working with Maps 510
Creating Textures with External Tools 523
Summary 526

CHAPTER 19 529
USING SPECIALIZED MATERIAL TYPES 529

Using the Ink 'n Paint Material 529
Using Architectural, Autodesk and Physical Materials 532
Using the DirectX Material 535
Accessing the ShaderFX Editor 538
Selecting and Applying Substance Textures 541
Randomizing Substance Textures 545
Summary 547

CHAPTER 20 549
CREATING COMPOUND MATERIALS AND USING MATERIAL MODIFIERS 549

Using Compound Materials 549
Applying Multiple Materials 557
Using the Matte/Shadow Material 559
Material Modifiers 561
Summary 565

CHAPTER 21 567
UNWRAPPING UVS AND MAPPING TEXTURES 567

Mapping Modifiers 567
Using the Unwrap UVW Modifier 571
Using the Edit UVWs Interface 573
Summary 591

CHAPTER 22 ..... **593**
PAINTING IN THE VIEWPORT CANVAS AND RENDERING SURFACE MAPS **593**

Using the Viewport Canvas 593
Using Vertex Colors 603
Rendering Surface Maps 607
Using Surface Maps 609
Summary 611

CHAPTER 23 ..... **613**
CREATING BAKED TEXTURES AND NORMAL MAPS **613**

Using Channels 613
Rendering to a Texture 615
Creating Normal Maps 619
Summary 624

PART V **625**
WORKING WITH CAMERAS AND LIGHTS **625**

CHAPTER 24 ..... **627**
CONFIGURING AND AIMING CAMERAS **627**

Learning to Work with Cameras 627
Setting Camera Parameters 635
Using the Camera Sequencer 642
Loading a Background Image and Camera 643
Perspective Matching the Background Image 644
Summary 648

CHAPTER 25 ..... **649**
USING LIGHTS AND BASIC LIGHTING TECHNIQUES **649**

Understanding the Basics of Lighting 649
Getting to Know the Light Types 653
Creating and Positioning Light Objects 656
Viewing a Scene from a Light 659
Altering Light Parameters 661
Positioning the Sun and Setting the Lighting Environment 668
Summary 673

CHAPTER 26 ..... **675**
WORKING WITH ADVANCED LIGHTING, LIGHT TRACING, AND RADIOSITY **675**

Selecting Advanced Lighting 675
Understanding Radiosity 681
Working with Advanced Lighting Materials 687
Summary 688

PART VI **689**
RENDERING A SCENE **689**

CHAPTER 27 ..... **691**
RENDERING A SCENE AND ENABLING QUICKSILVER **691**

Working with Render Parameters 691
Using the Rendered Frame Window 702
Summary 706

CHAPTER 28 ..... **707**
MANAGING RENDER STATES **707**

Using State Sets 707

Summary 713

CHAPTER 29 715
BATCH AND NETWORK RENDERING 715

Batch Rendering Scenes 715
Using the A360 Cloud Rendering System 716
Understanding Network Rendering 717
Setting Up a Network Rendering System 718
Starting the Network Rendering System 725
Configuring the Network Manager and Servers 730
Logging Errors 732
Using the Monitor 733
Summary 736

CHAPTER 30 737
RENDERING WITH ART AND ARNOLD 737

Enabling ART and Arnold 737
Working with Autodesk RayTracer (ART) 738
Working with Arnold 741
Summary 756

CHAPTER 31 757
COMPOSITING WITH RENDER ELEMENTS AND THE VIDEO POST INTERFACE 757

Using External Compositing Packages 758
Using Render Elements 762
Completing Post-Production with the Video Post Interface 764
Working with Sequences 766
Adding and Editing Events 767
Working with Ranges 775
Summary 778

PART VII 779
ANIMATING OBJECTS AND SCENES 779

CHAPTER 32 781
UNDERSTANDING ANIMATION AND KEYFRAMES 781

Using the Time Controls 781
Working with Keys 784
Using the Track Bar 787
Viewing and Editing Key Values 789
Using the Motion Panel 790
Using Ghosting 793
Animating Objects 794
Working with Previews 798
Using the RAM Player 800
Summary 803

CHAPTER 33 805
USING ANIMATION LAYERS AND ANIMATION MODIFIERS 805

Using the Animation Layers Toolbar 805
Working with Animation Layers 807
Saving and Loading Animation Files 809
Using the Animation Modifiers 813
Using More Animation Modifiers 818
Summary 825

CHAPTER 34 827
WIRING PARAMETERS 827

Wiring Parameters 827
Collecting Parameters 831
Adding Custom Parameters 833
Summary 835

CHAPTER 35 837
ANIMATING WITH CONSTRAINTS AND SIMPLE CONTROLLERS 837

Restricting Movement with Constraints 837
Understanding Controller Types 848
Assigning Controllers 848
Examining Some Simple Controllers 852
Summary 856

CHAPTER 36 857
EDITING ANIMATION CURVES IN THE TRACK VIEW 857

Learning the Track View Interface 857
Working with Keys 866
Editing Time 872
Editing Curves 873
Filtering Tracks and Creating Track Sets 882
Working with Controllers 884
Using the ProSound Plug-in 885
Summary 888

CHAPTER 37 889
EXPLORING THE COMPLEX CONTROLLERS 889

Examining Complex Controllers 889
Working with Expressions in Spinners 909
Understanding the Expression Controller Interface 910
Using Expression Controllers 916
Summary 919

PART VIII 921
WORKING WITH CHARACTERS 921

CHAPTER 38 923
UNDERSTANDING RIGGING, KINEMATICS, AND WORKING WITH BONES 923

Understanding Rigging 923
Building a Bones System 925
Using the Bone Tools 929
Forward Kinematics versus Inverse Kinematics 932
Creating an Inverse Kinematics System 932
Summary 939

CHAPTER 39 941
SKINNING CHARACTERS 941

Understanding Your Character 941
Animated Skin Modifiers 942
Using Character Animation Techniques 956
Summary 957

CHAPTER 40 959
ANIMATING CHARACTERS WITH CAT 959

Character Creation Workflow 959

Creating a CAT Rig....960
Animating a CAT Rig....969
Summary....977

CHAPTER 41....979
CREATING CROWDS AND USING POPULATE....979

Creating Crowds....979
Creating a Crowd of Bipeds....984
Using Populate....986
Summary....990

PART IX....991
ADDING SPECIAL EFFECTS....991

CHAPTER 42....993
CREATING PARTICLES AND PARTICLE FLOW....993

Understanding the Various Particle Systems....993
Creating a Particle System....994
Using the Spray and Snow Particle Systems....995
Using the Super Spray Particle System....997
Using the Blizzard Particle System....1009
Using the PArray Particle System....1009
Using the PCloud Particle System....1012
Using Particle System Maps....1012
Controlling Particles with Particle Flow....1014
Working with Actions....1016
Using Particle Flow Helpers....1018
Debugging Test Actions....1020
Summary....1024

CHAPTER 43....1025
USING SPACE WARPS....1025

Creating and Binding Space Warps....1025
Understanding Space Warp Types....1026
Combining Particle Systems with Space Warps....1042
Summary....1045

CHAPTER 44....1047
USING ATMOSPHERIC AND RENDER EFFECTS....1047

Adding an Environment Background....1047
Using Exposure Controls....1049
Creating Atmospheric Effects....1053
Using the Fire Effect....1054
Using the Fog Effect....1059
Adding Render Effects....1062
Using Render Effects....1064
Summary....1068

CHAPTER 45....1069
ADDING VOLUME LIGHT AND LENS EFFECTS....1069

Using Volume Lights....1069
Creating Lens Effects....1073
Working with Lens Effects Filters....1085
Summary....1091

PART X 1093
USING DYNAMIC ANIMATION SYSTEMS 1093

CHAPTER 46 1095
SIMULATING PHYSICS-BASED MOTION WITH MASSFX 1095

Understanding Dynamics 1095
Using MassFX 1096
Setting Object Properties 1100
Using Constraints and Baking Keys 1105
Working with mCloth and Ragdolls 1109
Summary 1111

CHAPTER 47 1113
WORKING WITH HAIR AND CLOTH 1113

Understanding Hair 1113
Working with Hair 1114
Styling Hair 1119
Rendering Hair 1124
Using Hair Dynamics 1125
Understanding Cloth 1127
Creating Cloth 1127
Simulating Cloth Dynamics 1133
Summary 1136

CHAPTER 48 1137
CREATING FLUID SIMULATIONS 1137

Understanding Fluids 1137
Getting Started with Fluids 1138
Setting Fluid Simulation Parameters 1141
Adding Foam 1143
Controlling Fluids with Motion Fields 1144
Using a Guide System 1146
Rendering Fluids 1148
Summary 1149

PART XI 1151
EXTENDING 3DS MAX 1151

CHAPTER 49 1153
CUSTOMIZING THE INTERFACE 1153

Using the Customize User Interface Window 1153
Customizing the Ribbon 1165
Customizing Modify and Utilities Panel Buttons 1167
Working with Custom Interfaces 1168
Summary 1172

CHAPTER 50 1173
CREATING PROCEDURAL CONTENT WITH MAX CREATION GRAPHS 1173

Installing a Max Creation Graph 1173
Creating a Max Creation Graph 1174
Summary 1180

CHAPTER 51 1181
EXPLORING 3DS MAX INTERACTIVE 1181

Installing 3ds Max Interactive 1181
Learning the 3ds Max Interactive Interface 1181
Creating a Live Link 1182

Building a Level 1183
Working with Assets 1186
Adding Interactions 1189
Deploying the Level 1192
Summary 1193

CHAPTER 52 1195
AUTOMATING WITH MAXSCRIPT 1195

What Is MAXScript? 1195
MAXScript Tools 1196
Setting MAXScript Preferences 1208
Types of Scripts 1209
Writing Your Own MAXScripts 1210
Learning the Visual MAXScript Editor Interface 1224
Laying Out a Rollout 1227
Summary 1232

CHAPTER 53 1233
EXPANDING 3DS MAX WITH THIRD-PARTY PLUG-INS 1233

Working with Plug-Ins 1233
Locating Plug-Ins 1238
Summary 1239

APPENDIX A 1241
WHAT'S NEW WITH AUTODESK 3DS MAX 2020 1241

Major Improvements 1241
Minor Improvements 1242

APPENDIX B 1243
INSTALLING AND CONFIGURING AUTODESK 3DS MAX 2020 1243

Choosing an Operating System 1243
Hardware Requirements 1243
Installing 3ds Max 2020 1244
Registering and Activating the Software 1245
Setting the Display Driver 1246
Updating 3ds Max 1247
Moving 3ds Max to Another Computer 1247

APPENDIX C 1249
KEYBOARD SHORTCUTS 1249

Using Keyboard Shortcuts 1249
Using the Hotkey Maps 1250
Using the Search Command Field 1251
Main Interface Shortcuts 1251
Dialog Box Shortcuts 1257
Miscellaneous Shortcuts 1262

INDEX 1263