Contents

Preface xxiii Acknowledgments xxix About the Author xxxi

Part I The Basics of Blender

1 What You Need to Know About Blender 3

What Is Blender? 3

Commercial Software Versus Open-Source Software 4

Commercial Software 4 Open-Source Software 5

The History of Blender 5

The Blender Foundation and Blender Institute 7

The Blender Community 9

Summary 10

Exercises 10

2 Blender Basics: The User Interface

Downloading and Installing Blender

Using Blender with Recommended Hardware

Navigating the Blender User Interface

Understanding the 3D View Editor 14

Navigating 3D View 18

Managing Areas 20

Working with Editor Types 21

Selecting Objects 24

Making an Active Selection 25

Using the 3D Cursor 25

Setting Blender's User Preferences 27

Summary 29

Exercises 29

31 3 Your First Scene in Blender Creating Objects 31 Moving, Rotating, and Scaling Using Manipulators (Basic Mode) Using Keyboard Shortcuts (Advanced Mode) Arranging Objects in Your Scene Naming Objects and Using Datablocks Renaming Objects Managing Datablocks Naming Your Scene's Objects 38 Using Interaction Modes Applying Flat or Smooth Surfaces Working with Modifiers 40 41 Adding Modifiers Adding a Subdivision Surface Modifier to Your Object 42 Using Blender Render and Cycles Managing Materials 44 45 Using Blender Render Materials Using Cycles Materials 45 46 Adding Materials to Your Scene Turning on the Lights 46 46 Light Options in Blender Render Lights Options in Cycles Adding Lights to Your Scene Moving the Camera in Your Scene Rendering 48 Rendering in Blender Render Rendering in Cycles 49 Saving and Loading Your .blend File Launching and Saving the Render 51 Summary Exercises 51

Part II Beginning a Project 53

4 Project Overview The Three Stages of a Project 55 Preproduction 55 Production 56 Postproduction 56 Defining the Stages A Film Without Visual Effects 57 A Visual-Effects Film 57 An Animated Film 58 A Photograph 58 Making a Character-Creation Plan Character Preproduction 59 **Character Production** 59 Project Postproduction 59 60 Summary

5

60

Exercises

Character Design 61
Character Description 61
Personality 62
Context 62
Style 63
Appearance 63
Designing the Character 64
Silhouettes 64
Base Design 65
Head 67
Details 68
Refined Design 69
Adding Color 70
Finalizing the Design 71
Making Character Reference Images 7:
Using Other Design Methods 74
Summary 75
32

75

Exercises

XV

Part III Modeling in Blender 77

6 Blender Modeling Tools 79
Working with Vertices, Edges, and E

Working with Vertices, Edges, and Faces
Selecting Vertices, Edges, and Faces
80

Accessing Modeling Tools 80

Making Selections 81

Shortest Path 81

Proportional Editing 82

Linked Selection 83

Loops and Rings 83

Border Selection 84

Grow and Shrink Selection 84

Limit Selection to Visible 84

Select Similar 84

Select Linked Flat Faces 85

Select Boundary Loop and Loop Inner-Region 85

Checker Deselect 85

Other Selection Methods 85

Using Mesh Modeling Tools 86

Bevel 86

Boolean Operations: Intersect (Boolean) and

Intersect (Knife) 87

Bisect 88

Bridge Edge Loops 89

Connect 89

Delete and Dissolve 90

Duplicate 91

Edge Offset 91

Extrude 92

Fill and Grid Fill 93

Inset 94

Join 95

Knife 95

Knife Project 96

Loop Cut and Slide 97

Make Edge/Face 98

Merge 98

Poke 99

Remove Doubles 100

Rip and Rip Fill 100

Screw **101**

Separate 102

Shrink/Flatten 102

Slide **102**

Smooth Vertex 103

Solidify 103

Spin 103

Split **104**

Subdivide 105

Working with LoopTools 105

Working with F2 107

Using Other Interesting Blender Options 108

AutoMerge 108

Hide and Reveal 108

Snapping 108

Summary 109

Exercises 109

7 Character Modeling 111

What Is Mesh Topology? 111

Choosing Modeling Methods 113

Box Modeling 113

Poly to Poly 113

Sculpt and Retopologize 113

Modifiers 114

The Best Method 114

Setting Up the Reference Planes 114

Modeling the Eyes 117

Creating an Eyeball 117

Using Lattices to Deform the Eyeballs 119

Mirroring and Adjusting the Eyes 120

Modeling the Face 121

Studying the Face's Topology 121

Blocking the Face's Basic Shape 12:

Defining the Face's Shapes 124

Defining the	Eyes, M	outh, and	d Nose	126
Adding Ears	128			
Building the I	nside of	the Mo	uth 1	L30
Modeling the To	rso and	Arms	131	
Modeling the Arms 13:		shapes fo	or the To	rso and
Defining the	Arms an	d Torso	134	•
Detailing the	Backpa	ck and J	acket	136
Finishing the Jacket 1 3	Belt an	d Adding	a Neck	to the
Modeling the Le	gs 1	L39		
Modeling the Bo	ots	141		
Modeling the Ha	nds	143		
Building the l	Basic Ha	and Shap	oe 1	43
Adding the Fi	ngers a	nd Wrist	149	5
Modeling the Ca	ip 1	47		
Creating the	Base of	the Cap	147	7
Adding Detai	ls to the	Cap	149	
Modeling the Ha	air 1	50		
Shaping Lock	s of Ha	ir 15	1.	
Adding Natur			Hair	152
Modeling the Fi	nal Deta	ils 1	54	
Eyebrows	154			
Communicat	or 1	55		
Badges 1	L56			
Teeth and To	_	156		
Other Clothir	g Detai	ls 1.5	57	
Summary 1	58			
Exercises 1	58			

Part IV Unwrapping, Painting, and Shading 159

8 Unwrapping and UVs in Blender 161 Seeing How Unwrapping and UVs Work 161 Unwrapping in Blender 162 Using the UV/Image Editor 163

Navigating the UV/Image Editor 166 Accessing the Unwrapping Menus 166 Working with UV Mapping Tools 166 Defining Seams 168 Considering Before Unwrapping 169 Working with UVs in Blender 170 Marking the Seams 170 Creating and Displaying a UV Test Grid 171 Unwrapping Jim's Face 173 Using Live Unwrap 174 Adjusting UVs 174 Separating and Connecting UVs Reviewing the Finished Face's UVs 175 Unwrapping the Rest of the Character 176 Packing UVs 177 Summary 179 Exercises 180 9 Painting Textures 181 Defining the Main Workflow 181 Painting in Blender 181 Texture Paint Mode 182 Before You Start Painting 183 Conditions for Painting Paint Slots 185 Limitations of Blender's Texture Paint Mode 186 Creating the Base Texture 186 Placing Texture Elements 186

Conditions for Painting 184
Paint Slots 185
Limitations of Blender's Texture Paint Mode 1
Creating the Base Texture 186
Placing Texture Elements 186
Saving Your Image 187
Packing Your Images 187
Texturing in 2D Image Editing Software 188
Exporting the UVs as an Image 188
Loading the UVs and Base Elements 189
Adding Base Colors 189
Adding Details 191
Applying the Final Touches 192

XIX

	Summary 193			
	Exercises 194			
10	Materials and Shaders	195		
	Understanding Materials	195		
	Materials Application	195		
	How Materials Work	196		
	Masks and Layers	196		
	Channels 196			
	Blender Render Mater	ials 198	3	
	Cycles Materials 1	L98		
	Procedural Textures	198		
	Shading Your Character v	with Blender	Render 199)
	Setting Up Blender Re	ender Materi	als 199	
	Applying Textures in B	lender Rend	ler 202	
	Shading Jim in Blende	er Render	205	
	Making Render Tests	211		
	Shading Your Character	with Cycles	212	
	Using Cycles Material	s 212		
	Using Basic Shaders	214		
	Mixing and Adding Sh	aders 2:	15	
	Loading Textures	215		
	Shading Jim in Cycles	216		
	Running Render Tests	219		
	Summary 220			
	Exercises 220			

Seeing the Painted Character in Blender

193

Part V Bringing Your Character to Life 221

11	Character Rigging 223	
	Understanding the Rigging Process	223
	What's a Rig? 223	
	Rigging Process 224	
	Working with Armatures 224	
	Manipulating Bones 225	

Working in Object, Edit, and Pose Modes 227 Adding Constraints 227 Rigging Your Character 229 Creating the Base Bone Structure 229 Rigging the Eyes 231 Rigging the Leg 232 Rigging the Torso and Head 235 Rigging the Arm 235 Rigging the Hand 237 Mirroring the Rig 238 Organizing the Rig 240 Skinning 242 **Understanding Vertex Weights** 242 Setting Up the Model for Skinning 243 Adding an Armature Modifier Defining Weights 245 Creating the Facial Rig 250 Modeling Shapes 250 Creating the Face Rig Using Drivers to Control the Face Shapes 253 Creating Custom Shapes 255 Making Final Retouches 257 Reusing Your Character in Different Scenes 258 Library Linking 258 Working with Groups 259 Protecting Layers 259 Using Proxies to Animate a Linked Character 260 Using Dupli Visibility 260 Summary 260 Exercises 261 12 Animating Your Character 263

Inserting Keyframes 263
Using the Manual Method 263
Using the Automatic Method 264
Using Keying Sets 264
Animating Properties in the Menus 264

XXI

	Working with Animation Editors 264
	Timeline 265
	Dope Sheet 266
	Graph Editor 266
	Non-Linear Animation (NLA) 268
	Common Controls and Tips 268
	Animating a Walk Cycle 269
	Creating an Action 270
	Creating the Poses for the Walk Cycle 270
	Repeating the Animation 272
	Walking Along a Path 273
	Summary 274
	Exercises 275
Part	VI Getting the Final Result 277
·	AT GOVERNMENT OF THE PARTY OF T
13	Camera Tracking in Blender 279
	Understanding Camera Tracking 279
	Shooting Video for Easy Tracking 280
	Using the Movie Clip Editor 281
	Tracking the Camera 282
	Loading Your Footage 282
	Studying the Anatomy of a Marker 283
	Tracking Features in the Footage 284
	Configuring Camera Settings 286
	Solving Camera Motion 287
	Applying Tracked Motion to the Camera 287
	Adjusting Camera Motion 288
	Testing Camera Tracking 289
	Summary 290
	Exercises 290
14	Lighting, Compositing, and Rendering 291
7-4	Lighting Your Scene 291
	Analyzing the Real Footage 291
	Creating and Testing Lights 292

Using the Node Editor 293 Compositing 293 **Understanding Nodes** 294 Studying the Anatomy of a Node 295 Using the Node Editor 296 Previewing the Result 298 Compositing Your Scene in Blender Render 299 Setting Up the Scene 299 Setting Up Render Layers 299 Compositing Nodes Compositing Your Scene in Cycles 304 Setting Up the Scene Setting Up Render Layers 305 Node Compositing 306 Rendering 307 Render Settings 307 Output 308 Final Render 308 Summary 309 Exercises 310

313

Part VII Keep Learning 311

15 Other Blender Features

Pie Menus

Particles 313 Hair Simulation 313 Cloth Simulation 314 Rigid and Soft Bodies 314 Fluids Simulation 314 Fire and Smoke 314 Grease Pencil 315

Game Engine 315
Freestyle Rendering 315
Masking, Object Tracking, and Video
Stabilization 316

315

Sculpting 316
Retopology 316
Maps Baking 317
Included Add-Ons 317
More Add-Ons 317
Animation Nodes 318
Python Scripting 318
Summary 318

Index 319