

toc

Contents

10 Precision and Drawing Aids	1
Precision and Drawing Aids.....	1
Tools for Precision	1
Helpers	2
Using Units	3
Using Grids.....	4
Using the Home Grid	4
Using Grid Objects.....	5
Viewing Grid Objects.....	6
AutoGrid	7
Aligning Objects.....	8
Aligning Normals.....	10
Setting Standard Snaps.....	10
Setting Snap Options.....	12
Measuring Distances	13
Measure Distance Tool	15
Standard Helper Objects.....	15
Standard Helper Objects	15
Dummy Helper.....	15
Expose Transform Helper	16
Grid Helper.....	19
Point Helper.....	22
Tape Helper	23
Protractor Helper	25
Compass Helper	26
Manipulator Helper Objects	26
Manipulator Helper Objects	26
Select And Manipulate	26
Cone Angle Manipulator.....	27
Plane Angle Manipulator	29
Slider Manipulator	30
Grid Commands.....	33
Grids Submenu.....	33
Show Home Grid.....	33
Activate Home Grid	34
Activate Grid Object.....	34
Align Grid to View	34
Snap Commands.....	34
Snap Commands	34
2D Snap, 2.5D Snap, 3D Snap	35
Angle Snap Toggle	36
Percent Snap Toggle	37
Spinner Snap Toggle	37
Grid and Snap Settings	38
Grid and Snap Settings.....	38
Grid and Snap Settings Dialog	38
Snap Settings	38
Snap Override.....	42
Snap Options.....	43
Home Grid Settings.....	46
User Grids Settings.....	48
Drawing Aid Utilities	48
Drawing Aid Utilities	48
Measure Utility.....	48
Rescale World Units Utility.....	49
Rescale World Units Dialog.....	50
11 Space Warps and Particle Systems	51
Space Warps and Particle Systems	51
Space Warps.....	51
Space Warp Objects	51
Bind to Space Warp	54
Forces	55
Push Space Warp	55
Motor Space Warp.....	57
Vortex Space Warp	59
Drag Space Warp	62
PBomb Space Warp.....	64

Path Follow Space Warp	67	Transforms	143
Gravity Space Warp	69	Position Icon Operator	143
Wind Space Warp	71	Position Object Operator	144
Displace Space Warp	72	Rotation Operator	149
Deflectors	74	Spin Operator	150
POmniFlect Space Warp	74	Scale Operator	152
PDynaFlect Space Warp	77	Speed	155
SOmniFlect Space Warp	80	Speed Operator	155
SDynaFlect Space Warp	81	Speed By Icon Operator	158
UOmniFlect Space Warp	81	Speed By Surface Operator	163
UDynaFlect Space Warp	82	Keep Apart Operator	168
SDeflector Space Warp	83	Shape	172
UDeflector Space Warp	85	Shape Operator	172
Deflector Space Warp	86	Shape Facing Operator	172
Geometric/Deformable	87	Shape Instance Operator	174
FFD(Box) Space Warp	87	Shape Mark Operator	179
FFD(Cyl) Space Warp	91	Material and Mapping	182
Wave Space Warp	96	Overview of Materials in Particle View	182
Ripple Space Warp	98	Material Static Operator	183
Conform Space Warp	99	Material Frequency Operator	185
Bomb Space Warp	101	Material Dynamic Operator	187
Modifier-Based	103	Mapping Operator	191
Modifier-Based Space Warps	103	Other	193
Particle Systems	104	Cache Operator	193
Introduction to Particle Systems	104	Display Operator	198
Particle Flow	105	Force Operator	200
Particle Flow	105	Notes Operator	202
Using Particle Flow	105	Render Operator	202
How Particle Flow Works	105	Script Operator	204
The Life of a Particle	106	Flows	204
Introductory Tutorial	108	Flows	204
Particle Flow FAQ	114	Empty Flow	205
Particle Flow User Interface	121	Standard Flow	205
Particle View	121	Tests	206
Particle View	121	Tests	206
Particle View Menu Bar	122	Age Test	207
Particle View Event Display	127	Collision Test	208
Event Display Right-Click Menu	129	Collision Spawn Test	211
Particle Flow Source	131	Find Target Test	214
Particle Flow Keyboard Shortcuts	136	Go To Rotation Test	220
Actions	137	Scale Test	223
Actions	137	Script Test	225
Action Time Frames	137	Send Out Test	226
Operators	138	Spawn Test	226
Operators	138	Speed Test	229
Birth and Death	139	Split Amount Test	230
Birth Operator	139	Split Selected Test	231
Birth Script Operator	141	Split Source Test	232
Delete Operator	142	Non-Event-Driven Particle Systems	233

Non-Event-Driven Particle Systems	233	Float Controllers.....	292
Using Particle Systems	234	Controlling Transforms.....	293
Creating a Non-Event-Driven Particle System	234	Controlling Position.....	293
Creating a Particle Emitter	235	Controlling Rotation	294
Using Materials with Particle Array	235	Controlling Colors	294
Achieving Particle Motion Blur	236	Morph Controllers	295
Using Mapped Materials with Particle Systems.....	236	Motion Panel Commands.....	296
Using Multi/Sub-Object Materials with Particle Systems	238	Trajectories	296
Using Spawned Particles	238	PRS Parameters Rollout	298
Using Interparticle Collision.....	239	Key Info (Basic) Rollout/Dialog.....	299
Spray Particle System	240	Tangent Types.....	300
Snow Particle System.....	242	Key Info (Advanced) Rollout/Dialog.....	301
Super Spray Particle System	245	Animation Controllers.....	302
Blizzard Particle System	247	Animation Controllers	302
PCloud Particle System	249	Audio Controller	303
PArray Particle System	252	Barycentric Morph Controller	304
PArray Particle System	252	Bezier Controllers.....	305
Basic Parameters Rollout (PArray)	254	Block Controller.....	307
Particle Generation Rollout.....	256	Boolean Controller.....	310
Particle Type Rollout.....	258	Color RGB Controller (Point3 XYZ Controller)	311
Rotation and Collision Rollout	264	Euler XYZ Rotation Controller	312
Object Motion Inheritance Rollout.....	265	Expression Controller.....	315
Bubble Motion Rollout.....	266	Expression Controller	315
Particle Spawn Rollout	267	Expression Controller Techniques	318
Load/Save Presets Rollout	270	Limit Controller	319
12 Animation.....	271	Linear Controller.....	325
Creating Animation	271	List Controller	326
Animation Concepts and Methods.....	271	Local Euler XYZ Rotation Controller	328
Animation Concepts and Methods.....	271	Look At Controller	329
Animation Concepts	272	Master Point Controller.....	330
Using Auto Key Mode	274	Motion Capture Controller.....	331
Using Set Key Mode	275	Noise Controller	337
Spinner Right-Click Menu	278	On/Off Controller	339
Viewing and Copying Transform Keys.....	279	Position XYZ Controller	340
Controlling Time.....	281	PRS Controller.....	341
Setting Time Segments.....	282	Reaction Controllers.....	342
Moving Through Time.....	282	Reaction Controllers	342
Choosing a Frame Rate and Playback Speed	283	Reaction Manager Dialog.....	345
Working with Controllers.....	284	Using Manipulators with Reaction Controllers	353
Working with Controllers	284	Scale XYZ Controller.....	355
Understanding Controllers	285	Script Controller.....	356
Changing Controller Properties.....	286	Smooth Rotation Controller	359
Assigning Controllers.....	287	Spring Controller.....	359
Specifying Default Controllers.....	289	TCB Controllers	361
General-Purpose Controllers.....	290	Transform Script Controller.....	364
Special-Purpose Controllers	291	Waveform Controller	366
Explicit Axis Keys.....	292	Controller Subdialogs	368
		Audio Controller Dialog	368
		Attach Controls Dialog (Block Controller)	370

Barycentric Morph Controller Key Info Dialog	371
Block Parameters Dialog (Block Controller)	372
Master Block Parameters Dialog (Block Controller)	372
Master Track Key Info Dialog (Master Point Controller)	373
Slave Parameters Dialog (Block Controller)	374
Track View Pick Dialog (Block Controller)	374
Animation Constraints	375
Animation Constraints	375
Attachment Constraint	376
Surface Constraint	379
Path Constraint	380
Position Constraint	384
Link Constraint	386
LookAt Constraint	388
Orientation Constraint	391
Parameter Wiring	393
Wire Parameters	393
Parameter Wiring Dialog	395
Hierarchies and Kinematics	398
Hierarchies and Kinematics	398
Hierarchies	398
Hierarchies	398
Linking Strategy	400
Linking and Unlinking Objects	403
Linking and Unlinking Objects	403
Select and Link	404
Unlink Selection	405
Adjusting Pivots	405
Viewing and Selecting Hierarchies	407
Animating with Forward Kinematics	408
Animating with Forward Kinematics	408
Using Dummy Objects	411
Animating Links	411
Adjusting Object Transforms	413
Locking Object Transforms	414
Animating Attachment	415
Changing Link Inheritance	415
Link Inheritance (Selected) Utility	416
Animating with Inverse Kinematics (IK)	417
Inverse Kinematics (IK)	417
IK Terminology	418
IK Methods	420
Inverse Kinematics Methods	420
IK Solvers	421
IK Solvers	421
History-Independent (HI) IK	427
Animating with the HI IK Solver	427
White Paper: Swivel Angle of the HI IK Solver	430
HI IK Solver Rollouts (Motion Panel)	435
IK Solver Rollout (HI Solver)	435
IK Solver Properties Rollout (HI Solver)	437
IK Display Options Rollout (HI Solver)	439
Sliding and Rotational Joints (HI Solver)	440
History-Dependent (HD) IK	442
Animating with the HD IK Solver	442
Binding Objects (HD Solver)	443
Controlling IK Precision (HD Solver)	444
HD Solver Motion Panel Rollouts	445
Working with Joints	448
Setting Joint Resistance and Spring Back (HD Solver)	448
Setting Joint Precedence (HD Solver)	449
Using Default Joint Precedence (HD Solver)	450
Choosing Child-to-Parent Precedence (HD Solver)	450
Choosing Parent-to-Child Precedence (HD Solver)	451
Setting Precedence Manually (HD Solver)	452
Terminating Chains (HD Solver)	453
IK Limb Solver	454
Animating with the IK Limb Solver	454
Spline IK	455
Animating with the Spline IK Solver	455
Spline IK Solver Dialog	459
Spline IK Solver Rollouts	461
Interactive and Applied IK	462
Animating with Interactive IK	462
Animating with Applied IK	464
Joint Controls	465
Setting Joint Parameters	465
Activating Joint Axes	467
Limiting Joint Action	468
Hierarchy Panel Commands	469
Hierarchy Panel Commands	469
Pivot	470
Pivot	470
Adjust Pivot Rollout	470
Adjust Transform Rollout	472
IK	473
IK	473
HD IK Solver Rollouts	473
Object Parameters Rollout (HD Solver)	473
Position/Orientation/Bind to Follow Object (HD Solver)	474
Precedence (HD Solver)	476

Copying, Pasting, and Mirroring Joint Parameters (HD Solver)	477
Sliding and Rotational Joints Rollouts (HD Solver)	478
Interactive and Applied IK Rollouts	480
Inverse Kinematics Rollout	480
Auto Termination Rollout (Interactive IK)	481
Link Info	481
Link Info	481
Locks Rollout	482
Inherit Rollout	482
Track View	483
Track View	483
Working with Track View	485
Track View Workspace	486
Curve Editor	489
Dope Sheet	489
Time Ruler	492
Track View Hierarchy	492
Track View Controller Window	492
Hierarchy Right-Click Menu	495
Properties (Track View Hierarchy)	498
Modify Subtree	498
Sound Options Dialog	499
Track View Menus	500
Track View Menu Bar	500
Modes Menu	501
Settings Menu	501
Settings Menu	501
Interactive Update	501
Sync Cursor Time	502
Manual Navigation	502
Auto Expand	502
Auto Select	503
Auto Scroll	503
Modify Child Keys	504
Display Menu	504
Display Menu	504
Show All Tangents	505
Keyable Icons	505
Hide/Show Non-Selected Curves	506
Controller Menu	506
Controller Menu	506
Collapse Controller	507
Tracks Menu	509
Keys Menu	509
Keys Menu	509
Use Soft Select	509
Soft Selection Settings	510
Curves Menu	510
Time Menu	510
Utilities Menu	511
Track View Quad Menu	512
Track View Toolbars	513
Curve Editor Toolbars	513
Dope Sheet Toolbars	516
Controller Toolbar	518
Ranges: Dope Sheet Toolbar	519
Extras: Dope Sheet Toolbar	519
Filters	519
Filters Dialog (Track View)	520
Copy Controller	522
Paste Controller	523
Assign Controller	523
Delete Controller	526
Ignore Animation Range	526
Respect Animation Range	527
Make Controller Unique	528
Parameter Curve Out-of-Range Types	528
Add Note Track	530
Remove Note Track	531
Edit Keys	531
Edit Keys	531
Snap Frames	532
Lock Selection	533
Align to Cursor	533
Add Visibility Track	533
Move Keys (Dope Sheet)	535
Slide Keys	535
Scale Keys - Time	536
Add Keys (Dope Sheet)	537
Properties (Track View Key Window)	537
Track View Utilities	538
Track View Utilities	538
Randomize Keys Utility	539
Create Out of Range Keys Utility	540
Select Keys By Time Utility	541
Current Value Editor	541
Edit Time	542
Edit Time	542
Select Time	543
Delete Time	543
Cut Time	544
Copy Time	544
Paste Time	545
Reverse Time	546
Insert Time	546
Scale Time	546

Exclude Left End Point	547	Motion Mixer	580
Exclude Right End Point	548	Understanding the Motion Mixer	580
Reduce Keys	548	Using the Motion Mixer	581
Edit Ranges	550	Working with the Motion Mixer	581
Edit Ranges	550	Adding Tracks to the Mixer.....	583
Position Ranges	550	Importing Clips to the Mixer.....	585
Recouple Ranges	551	Working with Clips in the Mixer.....	588
Editing Tracks: Copying, Pasting, and		Filtering Mixer Tracks	589
Handling Instances and References	551	Adjusting Clip Timing.....	591
Copying and Pasting Items	551	Working with Transitions.....	592
Copying and Pasting Objects.....	553	Adjusting Track Weight.....	596
Making Instance and Reference Controllers and		Adding Time Warps	597
Objects Unique	554	Adjusting Biped Balance in the Mixer	599
Curve Editor	554	Exporting Animation to the Biped	601
Curve Editor Overview	554	Using the Reservoir	603
Move Keys (Curve Editor)	556	Motion Mixer User Interface.....	605
Scale Keys	556	Motion Mixer Window	605
Scale Values	557	Motion Mixer Menus	606
Add Keys (Curve Editor)	557	Motion Mixer Dialogs.....	611
Draw Curves	558	Mixer Clip Source Options Dialog.....	611
Show Tangents	559	Copy Biped Animation to Clip Dialog.....	612
Lock Tangents	560	Reservoir File Groups Dialog.....	612
Apply Ease Curve / Apply Multiplier Curve	560	Mixer Transition Editor Dialog (Biped Object)	613
Remove Ease/Multiplier Curve	561	Mixer Transition Editor Dialog (Non-Biped	
On/Off (Curves).....	561	Object)	615
Ease Curve Out-of-Range Types.....	562	Pick Nodes Dialog (Motion Mixer)	618
Multiplier Curve Out-of-Range Types	563	Transition Optimization Dialog.....	618
Freeze Non-Selected Curves	564	Motion Mixer Toolbar.....	619
Status Bar / View Controls	564	Trackgroup Filter Dialog (Biped Object).....	622
Status Bar / View Controls	564	Trackgroup Filter Dialog (Non-Biped Object)	622
Zoom Selected Object	565	Motion Mixer Editor	623
Select By Name (Track View).....	565	Reservoir.....	626
Track Set List	567	Mixer Preferences Dialog	628
Track Sets Editor Dialog.....	568	Mixer Rollout	629
Key Time Display	570	Animation Utilities	630
Value Display	571	Animation Utilities.....	630
Show Selected Key Statistics	571	Follow/Bank Utility.....	630
Pan (Track View)	571	Motion Capture Utility	632
Zoom Horizontal Extents	572	MACUtilities Utility.....	642
Zoom Value Extents	572	Camera Tracker Utility	644
Zoom Track View Key Window	573	Camera Tracker Utility.....	644
Zoom Region (Track View)	574	Requirements for Camera Tracking.....	646
Managing Track View Windows	574	Camera Tracker: Movie Rollout.....	647
New Track View.....	574	Camera Tracker: Movie Window.....	648
Delete Track View.....	574	Camera Tracker: Motion Trackers Rollout	650
Delete Track View Dialog.....	575	Camera Tracker: Movie Stepper Rollout	653
Saved Track Views	575	Camera Tracker: Error Thresholds Rollout.....	655
Track View Customization	575	Camera Tracker: Batch Track Rollout.....	655
Track View Toolbar Right-Click Menu	579	Camera Tracker: Position Data Rollout.....	657

Camera Tracker: Match Move Rollout.....	658
Camera Tracker: Move Smoothing Rollout.....	659
Camera Tracker: Object Pinning Rollout	661
Camera Tracker: Troubleshooting.....	662
Dynamics.....	663
Dynamics Utility.....	663
Edit Object Dialog.....	673
Edit Object List Dialog.....	677
Skin Utilities	678
13 Character Assemblies.....	681
Character Assembly	681
Character Assembly Commands	683
Create Character.....	683
Destroy Character	685
Lock / Unlock Character	685
Insert Character.....	686
Save Character	686
Skin Pose Commands	686
14 Character Studio.....	689
Introduction to character studio.....	689
What is character studio?.....	689
What You Should Know to Use character studio....	690
Understanding Biped	691
Understanding Physique	692
Understanding Track Editing.....	694
Understanding the Workbench.....	695
Understanding Motion Flow.....	695
Understanding Crowds	696
Understanding character studio Workflow	697
Biped	701
Creating a Biped Skeleton	701
Working with Biped	701
Creating a Biped	703
Understanding Biped Anatomy	704
Changing Initial Biped Anatomy	705
Naming the Biped.....	705
Posing the Biped.....	706
Scaling Links	709
Rubber-Banding Arms and Legs	710
Biped Display Options	711
Deleting a Biped	712
Linking Character Body Parts to the Biped.....	712
Saving and Loading FIG Files	713
Creating Footstep Animation.....	714
Working with Footstep Animation.....	714
Creating Footsteps	718
Planning for Footsteps	718
Choosing a Gait.....	719
Creating Footsteps Automatically.....	720
Creating Footsteps Manually	720
Activating Footsteps.....	723
Deactivating Footsteps.....	723
Understanding Footstep and Body Keys	725
Editing Footstep Motion	726
Editing Footstep Placement	726
Editing Footstep Timing	727
Editing Active Footsteps	729
Splicing Footsteps.....	730
Animating Legs and Feet.....	731
Animating the Upper Body.....	732
Adjusting Body Keys in Track View	733
Shifting the Biped's Balance	734
Adjusting Vertical Motion.....	736
Saving Footstep Animation.....	740
Footsteps and Freeform Animation	740
Footstep and Freeform Animation	740
Freeform Animation Between Footsteps	741
Converting Between Footstep and Freeform Animations	742
Creating Freeform Animation	743
Working with Freeform Animation	743
Creating Freeform Animation	746
Selecting Biped Tracks	746
Animating by Moving Links	748
Animating by Rotating Links.....	749
Rotating Multiple Links	753
Using Controllers	754
Using Props	756
Freeform and IK	758
Using IK Keyframe Parameters.....	758
Understanding Walk Cycle Constraints.....	760
Setting Keys for Feet and Hands	762
Animating Pivots.....	763
Animating a Quadruped.....	765
Animating IK Attachments.....	766
Editing Freeform Animation.....	767
Editing Biped Keys	767
Copying and Pasting Postures and Poses	768
Mirroring Motion	771
Using Layers	771
Editing Trajectory Keys.....	772
Loading, Saving, and Displaying Biped Motion	774
Working with Biped Motion Files.....	774
Loading and Saving BIP Animation	774
Importing and Exporting Animation Data	775

Motion Mapping: Retargeting Biped Motion.....	776	Navigating the Workbench.....	858
Merging and Cloning a Character	777	Selecting Workbench Tracks	860
Combining BIP Motions	779	Analyzing Curves	860
Loading and Saving STP Files	779	Fixing Curves.....	861
Using Motion-Capture Data	780	Working with Euler Curves on Biped Animation...	861
Correcting Posture	780	Workbench User Interface	864
Copying and Pasting Tracks.....	781	Animation Workbench	864
Repositioning the Biped.....	782	Select Panel.....	867
Previewing Biped Motion	784	Analyze Panel	869
In Place Mode	785	Fix Panel	871
Trajectory Display	786	Filters Panel	874
Display Preferences	786	Using Motion Flow.....	878
Biped User Interface.....	787	Working with Motion Flow.....	878
Biped User Interface	787	Placing Motions on the Motion Flow Graph	878
Motion Panel (Biped).....	788	Creating Transitions.....	880
Center of Mass.....	788	Creating a Motion Flow Script.....	882
Motion Panel Rollouts (Biped).....	789	Saving, Loading, and Appending Motion Flow	
Assign Controller Rollout (character studio)	789	Graphs.....	883
Biped Apps Rollout	790	Customizing Transitions	885
Biped Rollout	791	Creating Random Motion.....	887
Biped Rollout.....	791	Unifying Motion	889
Save As Dialog (Biped).....	796	Sharing Motion Flow.....	890
Open Dialog (Biped).....	797	Setting Up Paths for Motion Flow Files.....	893
Display Preferences Dialog.....	799	Motion Flow User Interface	894
Track Selection Rollout	800	Motion Flow Mode.....	894
Quaternion/Euler Rollout	803	Motion Flow Rollout	896
Twist Poses Rollout.....	805	Motion Flow Graph Dialog.....	897
Bend Links Rollout.....	807	Motion Flow Scripts Group.....	900
Key Info Rollout	809	Transition Editor	902
Keyframing Tools Rollout	816	Create Random Motion Dialog.....	906
Set Multiple Keys Dialog	817	Shared Motion Flow Dialog	907
Copy/Paste Rollout.....	818	Transition Optimization Dialog.....	909
Layers Rollout	827	Clip Properties Dialog.....	910
Dynamics & Adaptation Rollout	833	Using Motion Capture	910
Structure Rollout (Figure Mode)	835	Working with Motion-Capture Data	910
Figure Mode	835	Importing Motion-Capture Data.....	912
Structure Rollout.....	837	Filtering Motion-Capture and Marker Data.....	912
Footstep Mode Rollouts.....	840	Sliding Footsteps	915
Footstep Mode.....	840	Prop Bone	916
Footstep Creation Rollout	841	Motion Capture User Interface.....	916
Footstep Operations Rollout.....	842	Motion Capture Rollout.....	916
Create Multiple Footsteps Dialog: Walk	844	Motion Capture Conversion Parameters Dialog	922
Create Multiple Footsteps Dialog: Run.....	847	Motion Capture Batch File Conversion Dialog	926
Create Multiple Footsteps Dialog: Jump.....	849	Marker Display Dialog	927
Convert to Freeform or Footsteps Dialogs	852	Physique.....	927
Footstep Mode Dialog.....	853	Using Physique	927
Track View (Biped)	855	Working with Physique	927
Using the Workbench.....	857	Creating a Skin	928
Working with the Workbench.....	857	Using Physique with a Biped.....	930

Using Physique with 3ds Max Bones	931	Bulge Angle Display Properties Dialog.....	978
Using Physique with 3ds Max Objects.....	933	Tendon Display Options Dialog.....	979
Applying and Initializing Physique.....	934	Type-In Weights Dialog	979
Previewing Motion.....	935	Physique Modifier Sub-Object Levels.....	980
Envelopes and Vertex Assignments.....	936	Physique Sub-Objects	980
Envelopes.....	936	Envelope Sub-Object.....	981
Adjusting Default Envelope Shape.....	938	Link Sub-Object.....	986
Fine-Tuning Envelopes.....	940	Link Sub-Object	986
Customizing Vertex Assignments	941	Link Settings Rollout.....	987
Envelope Display Options.....	941	Joint Intersections Rollout.....	991
Working with Deformable Envelopes	942	Bulge Sub-Object.....	992
Working with Rigid Envelopes.....	942	Tendons Sub-Object.....	998
Working with Both Deformable and Rigid Envelopes	943	Vertex Sub-Object (Physique).....	1001
Adjusting Link Parameters.....	943	Crowd Animation.....	1006
Partial Blending and Weight Assignments.....	944	Using Crowd Animation	1006
Bulges.....	945	Working with Crowd Animation	1006
Bulges.....	945	Creating a Crowd System	1007
Creating Bulges.....	946	Creating Crowd Helpers.....	1008
Setting Bulge Angles.....	947	Adjusting Delegate Parameters	1011
Fine-Tuning Bulges	947	Assigning Behaviors.....	1011
Tendons.....	948	Directing Delegates	1014
Tendons	948	Obstacle Avoidance	1016
Creating Tendons	948	Changing Delegate Orientation and Speed.....	1019
Saving and Loading Physique Data.....	949	Solving the Simulation	1019
Reinitializing Physique Settings	949	Linking Objects to Delegates	1020
Working with an Initial Pose.....	950	Cognitive Controllers	1021
Improving Interactive Performance.....	950	Using Motion Synthesis	1023
Scaling a Character.....	951	Using Motion Synthesis.....	1023
Facial Animation.....	952	Biped Crowds	1023
Physique and Modifiers	955	Non-Biped Crowds.....	1030
Combining Physique with Other Modifiers	955	Crowd Animation User Interface.....	1034
Physique and Free Form Deformations (FFDs)	956	Crowd Animation User Interface.....	1034
Physique User Interface	957	Delegate Helper Object	1034
Physique User Interface.....	957	Geometry Parameters Rollout	1035
Physique Rollout.....	958	Motion Parameters Rollout.....	1035
Physique Level of Detail Rollout	960	Crowd Helper Object.....	1038
Floating Bones Rollout	962	Crowd Helper Object	1038
Physique Dialogs	963	Setup Rollout	1039
Physique Initialization Dialog.....	963	Setup Rollout	1039
Reinitialize Physique	964	Scatter Objects Dialog.....	1040
Bulge Editor	965	Random Placement Difficulty Dialog.....	1047
Physique Load Specification Dialog.....	974	Object/Delegate Associations Dialog.....	1047
Physique Initialization Rollouts	974	Edit Multiple Delegates Dialog.....	1048
Vertex-Link Assignment Rollout	974	Associate Bipedes With Delegates Dialog.....	1051
Cross Sections Rollout	976	Behavior Assignments and Teams Dialog.....	1052
Sub-Object Options Dialogs	976	Select Behavior Type Dialog	1056
Blending Envelope Display Options Dialog	976	Select Delegates Dialog.....	1057
Exclude Envelopes Dialog	977	Cognitive Controllers	1057
		Cognitive Controller Editor	1057

State Dialog.....	1059	character studio File Formats.....	1117
State Transition Dialog.....	1060	Procedures.....	1118
Behavior Rollout.....	1062	15 Lights and Cameras.....	1125
Behavior Rollout.....	1062	Lights and Cameras.....	1125
Behaviors.....	1063	Lights.....	1126
Avoid Behavior.....	1063	Lights.....	1126
Orientation Behavior.....	1066	Name and Color Rollout (Lights).....	1127
Path Follow Behavior.....	1068	Using Lights.....	1128
Repel Behavior.....	1070	Using Lights.....	1128
Scripted Behavior.....	1072	Working with Lights.....	1128
Seek Behavior.....	1072	Properties of Light.....	1130
Space Warp Behavior.....	1073	Lighting in 3ds Max.....	1133
Speed Vary Behavior.....	1074	Guidelines for Lighting.....	1134
Surface Arrive Behavior.....	1075	Positioning Light Objects.....	1136
Surface Follow Behavior.....	1078	Animating Lights.....	1136
Wall Repel Behavior.....	1079	Light Include/Exclude Tool.....	1137
Wall Seek Behavior.....	1081	Light Lister.....	1139
Wander Behavior.....	1083	Standard Lights.....	1142
Solve Rollout.....	1084	Standard Lights.....	1142
Priority Rollout.....	1087	Target Spotlight.....	1143
Set Start Frames Dialog.....	1089	Free Spotlight.....	1144
Smoothing Rollout.....	1090	Target Direct Light.....	1145
Collisions Rollout.....	1092	Free Direct Light.....	1147
Geometry Rollout.....	1092	Omni Light.....	1148
Global Clip Controllers Rollout.....	1093	Skylight.....	1149
Vector Field Space Warp.....	1093	mr Area Omni Light.....	1152
Create Method Rollout.....	1094	mr Area Spotlight.....	1153
Lattice Parameters Rollout.....	1094	Photometric Lights.....	1155
Obstacle Parameters Rollout.....	1094	Photometric Lights.....	1155
Motion Synthesis.....	1097	Photometric Lights: Preset Lights.....	1156
Motion Synthesis.....	1097	Target Point Light (Photometric).....	1157
Synthesis Dialog.....	1098	Free Point Light (Photometric).....	1158
Synthesis Dialog.....	1098	Target Linear Light (Photometric).....	1159
Motion Clips Panel.....	1098	Free Linear Light (Photometric).....	1160
State Panel.....	1100	Target Area Light (Photometric).....	1161
Synthesis Panel.....	1102	Free Area Light (Photometric).....	1162
MotionClip Parameters Dialog.....	1104	IES Sun Light (Photometric).....	1163
Track View Pick Dialog.....	1104	IES Sky Light (Photometric).....	1165
ClipState Dialog.....	1105	Isotropic Light Distribution (Photometric Lights).....	1167
ClipState Dialog.....	1105	Diffuse Distribution (Photometric Lights).....	1168
Speed Panel.....	1106	Spotlight Distribution (Photometric Lights).....	1168
Acceleration Panel.....	1108	Web Distribution (Photometric Lights).....	1169
Pitch Panel.....	1109	Photometric Webs.....	1171
Pitch Velocity Panel.....	1111	IES Standard File Format.....	1172
Heading Velocity Panel.....	1113	Example of Photometric Data File.....	1173
Script Panel.....	1114	Common Lamp Values for Photometric Lights.....	1174
Shortcuts, File Formats, and Index of Procedures.....	1115	Common Lighting Rollouts.....	1175
Character Studio Keyboard Shortcuts.....	1115		

General Lighting Parameters	1175
Exclude/Include Dialog	1179
Shadow Parameters	1181
Spotlight Parameters	1183
Advanced Effects Rollout	1185
mental ray Indirect Illumination Rollout (for Lights)	1187
mental ray Light Shader Rollout	1189
Additional Rollouts for Standard Lights	1190
Intensity/Color/Attenuation Parameters	1190
Directional Parameters	1193
Atmospheres and Effects for Lights	1194
Add Atmosphere or Effect Dialog	1195
Hair Light Attr(ributes) Rollout	1196
Additional Rollouts for Photometric Lights	1197
Intensity/Color/Distribution Rollout	1197
Linear Light Parameters Rollout	1198
Area Light Parameters Rollout	1198
Area Light Sampling Rollout	1199
Web Parameters Rollout	1199
Rollouts for Specific Shadow Types	1200
Advanced Ray-Traced Parameters Rollout	1200
Area Shadows Rollout	1202
mental ray Shadow Map Rollout	1205
Optimizations Rollout	1206
Ray-Traced Shadow Parameters Rollout	1207
Shadow Map Parameters Rollout	1208
Cameras	1210
Cameras	1210
Free Camera	1215
Target Camera	1216
Using Cameras	1217
Characteristics of Cameras	1217
Common Camera Parameters	1218
Using Transforms to Aim a Camera	1223
Using Clipping Planes to Exclude Geometry	1224
Using the Horizon to Match Perspective	1225
Animating Cameras	1225
Multi-Pass Rendering Effects	1227
Multi-Pass Rendering Effects	1227
Depth of Field Parameter (mental ray Renderer) ..	1227
Multi-Pass Depth of Field Parameters for Cameras	1228
Multi-Pass Motion Blur Parameters for Cameras ..	1230
Camera Match Utility	1232
Camera Match Utility	1232
Camera Match Helper Objects	1235
Camera Match Helper	1235
CamPoint Helper	1236
Two-Point Perspective	1237
Camera Correction Modifier	1237
16 Material Editor, Materials, and Maps ...	1239
Material Editor, Materials, and Mapping	1239
Designing Materials	1239
Designing Materials	1239
Sample Slots and Material Name	1240
Material Type	1241
Shading Type	1242
Material Components	1243
Lights and Shading	1243
Choosing Colors for Realism	1244
Using Maps to Enhance a Material	1247
Applying a Material to an Object	1249
Mapping Coordinates	1249
Saving a Material	1250
Material XML Export Utility	1251
UVW Remove Utility	1252
Material Editor	1253
Material Editor	1253
Material/Map Browser	1256
Copying and Pasting: Right-Click Menu for Materials, Maps, Bitmaps, and Colors	1262
Sample Slots	1264
Sample Slots	1264
Sample Slot Right-Click Menu	1266
Dragging and Dropping Maps and Materials	1267
Drag and Drop Sub-Object Material Assignment	1268
Creating a Custom Sample Object	1269
Material Editor Tools	1271
Material Editor Tools	1271
Material Editor Menu Bar	1272
Reflectance and Transmittance Display	1274
Sample Type	1275
Propagate Materials to Instances	1276
Backlight	1276
Sample Slot Background	1277
Sample UV Tiling	1277
Video Color Check	1278
Make Preview, Play Preview, Save Preview	1278
Material Editor Options	1279
Material Editor Options Dialog	1280
Select By Material	1283
Get Material	1283
Put Material to Scene	1285
Assign Material to Selection	1285
Reset Map/Mtl to Default Settings	1286

Make Material Copy	1286	Oren-Nayar-Blinn Shader	1323
Make Unique (Material Editor)	1286	Phong Shader	1323
Put to Library	1287	Strauss Shader	1324
Material Effects Channel	1287	Translucent Shader	1326
Material Effects Channel Flyout	1288	Basic Parameters for Standard Materials	1327
Show Map in Viewport	1289	Color Controls	1327
Show End Result	1290	Self-Illumination Setting	1328
Go to Parent	1290	Opacity	1330
Go Forward to Sibling	1291	Diffuse Level	1330
Material/Map Navigator	1291	Roughness	1331
Pick Material From Object (Eyedropper)	1292	Translucency Setting	1332
Name Field (Materials and Maps)	1292	Specular Highlight Controls	1333
Type Button (Materials and Maps)	1293	Anisotropic Highlights	1333
Animating Materials.....	1293	Blinn, Oren-Nayar-Blinn, and Phong	
Animating Materials.....	1293	Highlights	1334
Creating and Playing Animated Material		Metal Highlights.....	1335
Previews.....	1294	Multi-Layer Highlights.....	1336
Synchronizing an Animated Bitmap with the		Translucent Highlights	1337
Scene	1294	Mapping Standard Material Components.....	1339
Material Editor Subdialogs	1295	Ambient Color Mapping	1339
Copy (Instance) Map Dialog.....	1295	Diffuse Color Mapping	1339
Copy or Swap Colors Dialog	1295	Diffuse Level Mapping	1340
Create Material Preview Dialog	1296	Diffuse Roughness Mapping.....	1341
Duplicate Name Dialog (Material Library)	1296	Specular Color Mapping	1341
Merge Dialog (Material Library)	1297	Specular Level Mapping	1342
Merge Material Library Dialog	1298	Glossiness Mapping.....	1342
Put to Library Dialog	1298	Self-Illumination Mapping.....	1343
Render Map Dialog	1299	Opacity Mapping.....	1344
Replace Map Dialog	1300	Filter Color Mapping.....	1344
Replace Material Dialog	1300	Anisotropy Mapping	1345
Update Scene Materials Dialog	1300	Orientation Mapping	1346
Materials	1301	Metalness Mapping	1347
Types of Materials	1301	Bump Mapping.....	1347
SuperSampling Rollout	1302	Reflection Mapping.....	1349
mental ray Connection Rollout.....	1305	Refraction Mapping	1350
DirectX Manager Rollout	1308	Displacement Mapping	1352
Standard Material.....	1309	Raytrace Material	1353
Standard Material	1309	Raytrace Material	1353
Shader Basic Parameters Rollout	1310	Raytrace Basic Parameters Rollout	1355
Basic Parameters Rollout (Standard Material)	1311	Raytrace Extended Parameters Rollout	1360
Extended Parameters Rollout (Standard		Raytracer Controls Rollout	1362
Material)	1312	Raytrace Maps Rollout	1364
Maps Rollout (Standard Material)	1315	Raytrace Dynamics Properties Rollout.....	1368
Dynamics Properties Rollout.....	1320	Raytracer Global Parameters Rollout	1369
Basic Material Shaders	1321	Raytracing Acceleration Parameters Dialog.....	1372
Anisotropic Shader.....	1321	Raytrace Exclude/Include Dialog.....	1372
Blinn Shader	1321	Raytrace Antialiaser Dialog: Fast Adaptive	
Metal Shader.....	1322	Antialiaser.....	1374
Multi-Layer Shader.....	1323		

Raytrace Antialiaser Dialog: Multiresolution	
Adaptive Antialiaser	1375
Architectural Material	1376
Architectural Material	1376
Templates Rollout	1377
Physical Qualities Rollout	1377
Special Effects Rollout	1380
Advanced Lighting Override Rollout	1381
Cutout Mapping	1383
mental ray Materials	1384
Materials for Use with the mental ray Renderer	1384
mental ray Material	1385
mental ray Material	1385
Material Shaders Rollout (mental ray Material)	1385
Advanced Shaders Rollout (mental ray	
Material)	1388
DGS Material (mental ray)	1389
Glass Material (mental ray)	1391
Subsurface Scattering (SSS) Materials	1392
Matte/Shadow Material	1393
Matte/Shadow Material	1393
Compound Materials.....	1396
Kinds of Compound Materials.....	1396
Blend Material	1397
Composite Material.....	1399
Double-Sided Material	1400
Morpher Material	1401
Multi/Sub-Object Material.....	1403
Shellac Material	1407
Top/Bottom Material.....	1408
Shell Material for Baked Textures	1409
Shell Material.....	1409
Advanced Lighting Override Material	1410
Advanced Lighting Override Material	1410
Lightscape Material.....	1413
Lightscape Material	1413
Ink 'n Paint Material	1414
Ink 'n Paint Material.....	1414
DirectX 9 Shader Material.....	1422
DirectX 9 Shader Material.....	1422
DirectX Viewport Shaders	1423
LightMap Shader Rollout	1423
Metal Bump Shader Rollout	1424
XRef Material	1425
XRef Material.....	1425
Maps	1426
Types of Maps.....	1426
Real-World Mapping.....	1429
Output Rollout	1430
Missing Map Coordinates Dialog	1433
2D.....	1434
2D Maps	1434
Coordinates Rollout (2D)	1434
Noise Rollout (2D)	1439
Bitmap 2D Map	1441
Select Bitmap Image File Dialog	1445
Checker Map	1447
Combustion Map	1448
Gradient Map	1460
Gradient Ramp Map.....	1462
Flag Properties Dialog	1465
Swirl Map.....	1466
Tiles Map	1468
3D.....	1472
3D Maps	1472
Coordinates Rollout (3D)	1472
Cellular Map	1473
Dent Map.....	1477
Falloff Map	1480
Marble Map	1483
Noise Map.....	1484
Particle Age Map	1485
Particle MBlur Map	1486
Perlin Marble Map.....	1487
Planet Map.....	1488
Smoke Map.....	1489
Speckle Map	1490
Splat Map.....	1491
Stucco Map.....	1492
Waves Map.....	1493
Wood Map.....	1494
Compositor	1497
Compositor Maps.....	1497
Composite Map	1498
Mask Map	1499
Mix Map	1499
RGB Multiply Map	1501
Color Modifier.....	1502
Color Modifier Maps.....	1502
Output Map	1502
RGB Tint Map	1503
Vertex Color Map	1503
Reflection and Refraction	1505
Reflection and Refraction Maps	1505
Flat Mirror Map.....	1505
Raytrace Map	1508
Reflect/Refract Map	1509
Thin Wall Refraction Map.....	1513

Raytrace Map Rollouts	1514
Raytracer Parameters Rollout	1514
Raytrace: Attenuation Rollout	1516
Raytrace: Basic Material Extensions Rollout	1517
Raytrace: Refractive Material Extensions Rollout	1518
mental ray Shaders.....	1520
mental ray Shaders	1520
Custom Shaders for 3ds Max	1521
mental images Shader Libraries	1522
Shaders in the LumeTools Collection	1523
Connect Parameter to Shader Dialog (mental ray).....	1523
3ds Max Custom Shaders	1524
3D Displacement Shader (mental ray).....	1524
Bump Shader (mental ray)	1526
DGS Material Shader (mental ray)	1527
Dielectric Material Shader (mental ray)	1529
Environment Shader (mental ray)	1531
Height Map Displacement Shader (mental ray)	1532
Material to Shader (mental ray)	1533
Shader List (mental ray).....	1533
UV Generator	1534
UV Generator Shader (mental ray).....	1534
UV Generator Parameters Rollout.....	1535
Shaders Rollout (UV Generator)	1537
UV Coordinate Shader (mental ray).....	1538
XYZ Generator	1539
XYZ Generator Shader (mental ray).....	1539
XYZ Generator Parameters Rollout	1539
Shaders Rollout (XYZ Generator)	1540
XYZ Coordinate Shader (mental ray).....	1541
Normal Bump Map	1541
Normal Bump Map	1541
Camera Per-Pixel Projection	1542
Camera Map Per Pixel	1542
Material, Mapping, and Vertex Color Utilities ..	1544
Assign Vertex Colors Utility.....	1544
Channel Info Utility	1549
Clean MultiMaterial Utility.....	1552
Instance Duplicate Maps Utility	1555
Index	1559