

Learning Objectives

After completing this chapter, you will be able to:

- Use modifiers
- Understand the types of modifiers
- Create complex objects using modifiers

INTRODUCTION

In this chapter, you will learn about modifiers. As the name indicates, modifiers are used to modify an object. They enable you to create models that would otherwise be quite difficult to create.

MODIFIERS AND MODIFIER STACK

In 3ds Max, the modifiers are used to modify an object. You can apply more than one modifier to an object. The modifiers can also be used to modify the object at sub-object levels.

To apply a modifier to an object, select the object in the viewport and then choose the **Modify** tab in the **Command Panel**; the **Modifier List** drop-down list will be displayed, as shown in Figure 12-1. To view the options in the drop-down list, click on the arrow on the right of **Modifier List**, as shown in Figure 12-2. There are different types of modifiers in this list. Select the modifier that you want to apply to the object; the selected modifier will be displayed in the modifier stack along with various rollouts in the Modify panel to modify the object, refer to Figure 12-3.



Figure 12-1 The Modifier List drop-down list

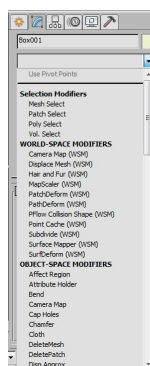


Figure 12-2 Partial view of the Modifier List drop-down list



Note

The modifiers are displayed in the **Modifier List** drop-down list based on the selection of the object in the viewport.

In the modifier stack, there is a bulb-like button, refer to Figure 12-3. It is used to show or hide the effects of the modifier in the viewport. By default, this button is active. Click on this button to make it inactive; the button will become dark and the effect of the modifier will not be displayed in the viewport. The buttons at the bottom of the modifier stack are used to manage the modifier stack. These buttons are discussed next.

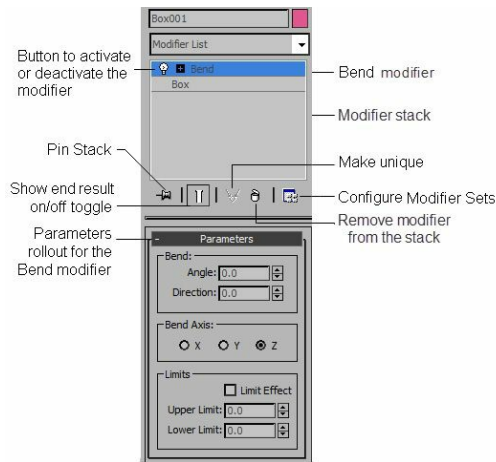


Figure 12-3 The modifier stack

The **Pin Stack** button is used to lock the modifier stack for the selected object in the viewport. If you choose the **Pin Stack** button for the selected object in the viewport, and then select another object in the viewport, the **Modify** tab will display the modifier stack and the rollouts for the pinned object only.

The **Show end result on/off toggle** button is used to toggle the effect of all the modifiers in the modifier stack on the selected object in the viewport. If this button is deactivated, then the selected object in the viewport will display only the effect of the selected modifier in the modifier stack.

The **Make unique** button is used to convert an instanced object into a unique copy. On making the instanced objects unique, they become independent and you can modify them independently without affecting the other objects in the viewport. By default, this button is inactive. When you create the instance of an object, this button will be activated. Select the instanced object in the viewport and choose the **Make unique** button in the modifier stack to make it unique.

The **Remove modifier from the stack** button is used to remove the selected modifier from the modifier stack.

The **Configure Modifier Sets** button is used to control the display of the modifiers in the modifier stack.



Note

- 1. If you change the order of the modifiers applied to an object in the modifier stack, the object will display different effects.*
- 2. The object should have more number of segments to get the best effect of the applied modifier.*

In the modifier stack, move the cursor over the modifier and right-click on it; a shortcut menu will be displayed, as shown in Figure 12-4. You can rename, delete, cut, copy, or paste the selected modifiers by choosing the corresponding option from the shortcut menu displayed. Choose the **Collapse All** option from the menu to collapse the entire stack; the **Warning: Collapse All** message box will be displayed. Choose the **Yes** button; all the parameters and modifiers will be replaced by **Editable Poly** in the modifier stack. Choose the **Collapse To** option from the shortcut menu to collapse the selected modifier along with the modifiers and objects below it.

TYPES OF MODIFIERS

There are three categories of modifiers in the **Modifier List** drop-down list: **Selection Modifiers**, **WORLD-SPACE MODIFIERS**, and **OBJECT-SPACE MODIFIERS**. The **Bend** and **Taper** modifiers from the **OBJECT-SPACE MODIFIERS** category have already been discussed in Chapter 3. The most commonly used modifiers in these three categories are discussed next.

Mesh Select Modifier

The **Mesh Select** modifier is used to access the sub-object levels without converting the object into editable mesh. To work with this modifier, select the object in the viewport and choose the **Modify** tab in the **Command Panel**. In the modifier stack, click on the arrow on the right side of the **Modifier List** drop-down list and select the **Mesh Select** modifier from the **Selection Modifiers** category. Alternatively, choose **Modifiers > Selection Modifiers > Mesh Select** from the menu bar; the **Mesh Select** modifier will be displayed in the modifier stack with various rollouts in the Modify panel, refer to Figure 12-5. Click on the plus sign (+) on the left of the **Mesh Select** modifier in the modifier stack; the sub-object levels will be displayed. Now, select any of the sub-object levels and then select the corresponding sub-objects of the object in the viewport. Next, apply another modifier; it will affect only the selected sub-objects in the viewport. The most commonly used rollout is discussed next.

Mesh Select Parameters Rollout

In the **Mesh Select Parameters** rollout, there are five buttons **Vertex**, **Edge**, **Face**, **Polygon**, and **Element**. These buttons are used to select the sub-objects of the object and are same as described in Chapter 8. Choose any button to activate the sub-object and is same as selecting the sub-object level in the modifier stack. When you choose any of the buttons, the transform tools such as **Select and Rotate**, **Select and Move**, and so on will be disabled in the **Main Toolbar**.

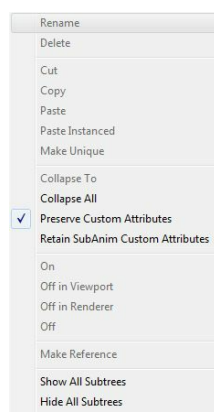
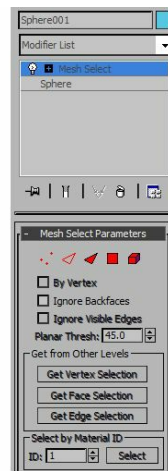


Figure 12-4 The shortcut menu displayed on right-clicking on the modifier in the modifier stack



*Figure 12-5 Partial view of the rollouts displayed on selecting the **Mesh Select** modifier*

The options in the **Get from Other Levels** area are used to apply the selection of the sub-objects from one sub-object level to another. The **Get Vertex Selection** button is available for the **Face**, **Edge**, **Polygon**, and **Element** sub-object levels. Choose this button to select the faces of the object based on the last selection of the vertices. The **Get Face Selection** button is available only for the **Vertex** and **Edge** sub-object levels. Choose this button to select the vertices of the object based on the last selection of the faces, polygons, and elements. The **Get Edge Selection** button is available for the **Vertex**, **Face**, **Polygon**, and **Element** sub-object levels. Choose this button to select the faces based on the last selection of the edges.

Displace Modifier

The **Displace** modifier is used to deform the shape of an object. You can distort the object either by using the gizmo of the modifier or by using the bitmap image. To apply the **Displace** modifier, select the object in the viewport and choose the **Modify** tab in the **Command Panel**. Now, click on the **Modifier List** drop-down list and select the **Displace** modifier from the **OBJECT-SPACE MODIFIERS** category. Alternatively, choose **Modifiers > Parametric Deformers > Displace** from the menu bar; the **Displace** modifier will be displayed in the modifier stack and the **Parameters** rollout will be displayed in the Modify panel. You need to use the options in this rollout to distort the surface of the object. These options are discussed next.

Parameters Rollout

The most commonly used areas in this rollout are discussed next.

Displacement Area

The options in this area are used to specify the amount of

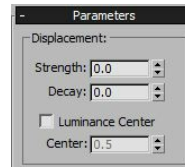


Figure 12-6 The Displacement area in the Parameters rollout

displacement of an object from the position of its gizmo, refer to Figure 12-6. By default, the value in the **Strength** and **Decay** spinners is 0 which indicates that there will be no displacement. Set the value more than 0 in the **Strength** spinner to displace the object away from the gizmo. Set the value less than 0 in the **Strength** spinner to displace the object toward the gizmo. Set the value in the **Decay** spinner to decrease the strength of the displacement based on the distance of the object from the gizmo.

Image Area

The options in this area are used to choose a bitmap or map as the source for the displacement. The button labeled as **None** at the top of the **Bitmap** group is used to assign a bitmap image to the object for displacement. To do so, create a plane with heavy segments and then apply the **Displace** modifier. Next, choose the **None** button from the **Bitmap** group; the **Select Displacement Image** dialog box will be displayed. Select the image of your choice and choose the **Open** button; the name of the image will be displayed on the button. Next, set the values in the **Strength** and **Decay** spinners in the **Displacement** area to view the displacement, refer to Figures 12-7 and 12-8. Choose the **Remove Bitmap** button to remove the assigned bitmap image.

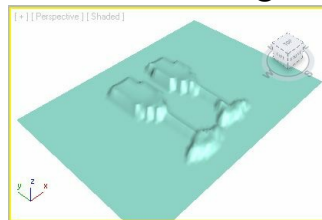


Figure 12-7 The plane after using the bitmap image in the Displace modifier



Figure 12-8 The bitmap image that has been used for displacement in Figure 12-7

The button, labeled as **None** at the top of the **Map** group, is used to assign a map to the object for displacement. To do so, choose the button; the **Material/Map Browser** dialog box will be displayed. Select the map of your choice from the **Maps > Standard** rollout and choose the **OK**

button; the name of the map will be displayed on the button. Next, set the values in the **Strength** and **Decay** spinners in the **Displacement** area to view the displacement, refer to Figures 12-9 and 12-10. Choose the **Remove Map** button to remove the assigned map. Set the value in the **Blur** spinner to soften the edges of the map or bitmap.



*Figure 12-9 The plane after using the map image in the **Displace** modifier*



Figure 12-10 The map image that has been used for displacement in Figure 12-9



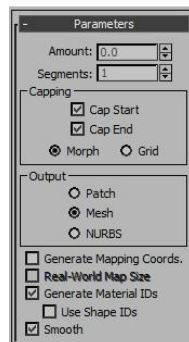
Note

You can apply the map and bitmap images simultaneously.

Set the parameters in the **Map**, **Channel**, and **Alignment** areas to define the placement or alignment of the map on the object.

Extrude Modifier

The **Extrude** modifier is used to convert a 2D spline into a 3D object.

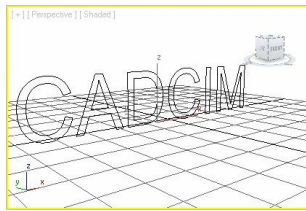


*Figure 12-11 The **Parameters** rollout*

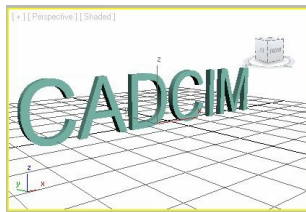
It provides thickness and depth to a spline. To apply the **Extrude** modifier, select the spline in the viewport and choose the **Modify** tab in the **Command Panel**. Now, select the **Extrude** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > Mesh Editing > Extrude** from the menu bar; the modifier will be displayed in the modifier stack and the **Parameters** rollout will be displayed below the modifier stack in the Modify panel, as shown in Figure 12-11. Next, you need to use the options in the **Parameters** rollout to view the effects of the **Extrude** modifier. These options are discussed next.

Parameters Rollout

The **Amount** spinner in this rollout is used to specify the amount of extrusion of the spline, refer to Figures 12-12 and 12-13. Set the value in the **Segments** spinner to specify the number of segments in the extruded object. The areas in this rollout are discussed next.



*Figure 12-12 The text spline before applying the **Extrude** modifier*



*Figure 12-13 The text spline after applying the **Extrude** modifier*

Capping Area

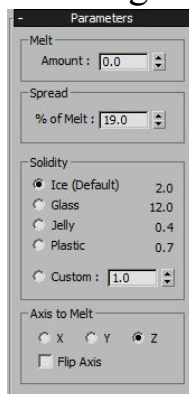
By default, the **Cap Start** and **Cap End** check boxes are selected in the **Capping** area. They are used to place a plane surface at the start and end of the extruded object. Clear the **Cap Start** check box to remove the surface at the start of the extruded object. Similarly, clear the **Cap End** check box to remove the surface at the end of the extruded object.

Output Area

The options in this area are used to specify the type of the object to be created by the **Extrude** modifier. By default, the **Mesh** radio button is selected that produces a mesh object. Select the **Patch** or the **NURBS** radio button to produce the patch or the nurbs object.

Melt Modifier

The **Melt** modifier is used to apply a realistic melting effect to all types



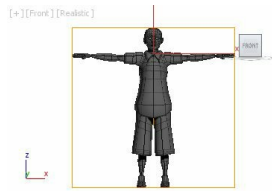
*Figure 12-14 The **Parameters** rollout*

of objects. To apply the **Melt** modifier, select the editable object in the viewport and choose the

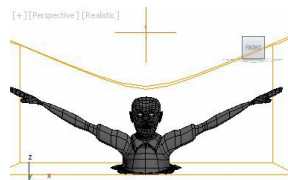
Modify tab in the **Command Panel**. Now, select the **Melt** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > Animation > Melt** from the menu bar; the modifier will be displayed in the modifier stack and the **Parameters** rollout will be displayed below the modifier stack in the Modify panel, as shown in Figure 12-14. You can use the options in the **Parameters** rollout to view the effects of the **Melt** modifier. These options are discussed next.

Parameters Rollout

Set the value in the **Amount** spinner of the **Melt** area to specify the amount of melting of the editable poly, refer to Figure 12-15 and 12-16. Set the value in the **% of Melt** spinner in the **Spread** area to specify the percentage of melting.



*Figure 12-15 The object before applying the **Melt** modifier*



*Figure 12-16 The object after applying the **Melt** modifier*

Solidity Area

This area is used to define the relative height of the center of the melted object. This area has five radio buttons: **Ice**, **Glass**, **Jelly**, **Plastic** and **Custom**. These radio buttons determine the relative height of the center of ice, glass, jelly, and plastic. Select the **Custom** radio button to define the custom solidity of the object and its melting process that varies between 0.2 to 30.0.

Axis to Melt Area

This area is used to define the axis on which the object will melt. By default, the melting axis is set to Z. You can change it to X and Y, as required.

Flip Axis Radio Button

The **Flip Axis** radio button is used to reverse the direction of the selected axis of melting which normally occurs from the positive direction to the negative direction.

ProOptimizer Modifier

This modifier is used to reduce the number of vertices in an object while preserving the object's appearance. It helps in reducing a scene's memory requirements, simplifies the modeling, and improves the speed of viewport display and render. To apply the **ProOptimizer** modifier, select the

editable poly object in the viewport and choose the **Modify** tab in the **Command Panel**. Now, select the **ProOptimizer** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > Mesh Editing > ProOptimizer** from the menu bar; the modifier will be displayed in the modifier stack and the **Optimization Level** rollout will be displayed below the modifier stack in the Modify Panel, as shown in Figure 12-17. Next, you need to use the options in the **Optimization Level** rollout to view the effects of the **ProOptimizer** modifier. This rollout is discussed next.

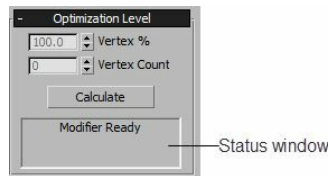


Figure 12-17 The Optimization Level rollout

Optimization Level Rollout

The **Calculate** button in the **Optimization Level** rollout is used to calculate the total number of vertices and faces. Set the value in the **Vertex %** spinner of the **Optimization Level** area to specify the percentage of the vertices that should be reduced, refer to Figures 12-18 and 12-19.

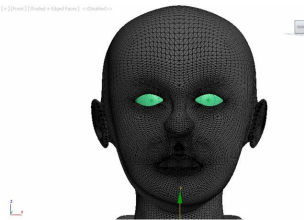


Figure 12-18 The object before applying the ProOptimizer modifier

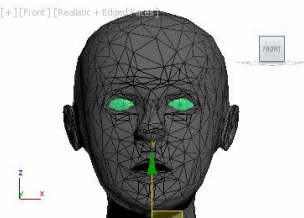


Figure 12-19 The object after applying the ProOptimizer modifier

Set the value in the **Vertex Count** spinner of the **Optimization Level** rollout to specify the amount of vertices in the object. The **Status** window in this rollout is used to display the status of the **ProOptimizer** modifier. Before the **Calculate** button is chosen, the **Status** window will display the text, **Modifier Ready**. However, after choosing the **Calculate** button, it will display the statistics that describes the before and after effects on the vertex and face count of an object.

Face Extrude Modifier

This modifier is used to extrude the selected faces along their normals. A normal is an invisible line coming straight out of a face in a particular direction. To apply the **Face Extrude** modifier, first convert the object into editable poly object. Next, select the **Face** sub-object level and then select the faces of the object in the viewport. Now, select the **Face Extrude** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list.

Alternatively, choose **Modifiers > Mesh Editing > Face Extrude** from the menu bar; the **Face Extrude** modifier will be displayed in the modifier stack and also the **Parameters** rollout will be displayed below the modifier stack in the Modify Panel, as shown in Figure 12-20. Now, you need to use the options in the **Parameters** rollout to view the effect of the **Face Extrude** modifier on the selected faces, refer to Figure 12-20. These options are discussed next.

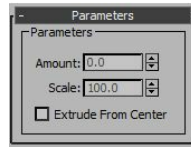


Figure 12-20 The Parameters rollout

Parameters Rollout

The **Amount** spinner of the **Parameters** area in this rollout is used to specify the amount of extrusion of the selected faces, refer to Figures 12-21 and 12-22. Set the value in the **Scale** spinner to specify the percentage of the original face size used for the extruded face.

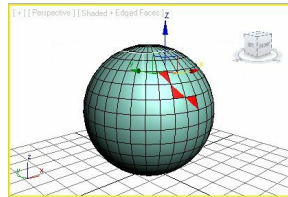


Figure 12-21 The faces selected to be extruded in a sphere

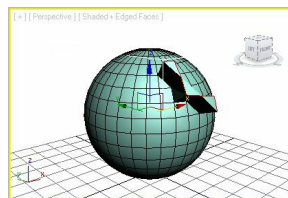
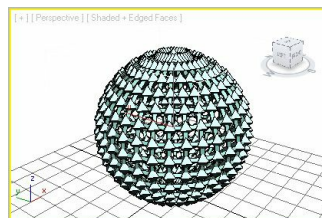


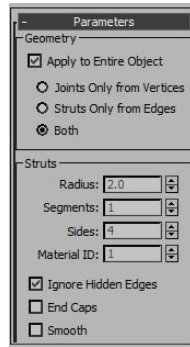
Figure 12-22 The selected faces extruded

Lattice Modifier

The **Lattice** modifier is used to convert the segments or edges of an object or shape into wireframes or cylindrical struts. To apply the **Lattice** modifier, select the object or shape in the viewport and choose the **Modify** tab in the **Command Panel**. Now, select the **Lattice** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > Parametric Deformers > Lattice** from the menu bar; the modifier will be displayed in the modifier stack and its effect will be displayed on the object, as shown in Figure 12-23. The **Parameters** rollout will also be displayed below the modifier stack, as shown in Figure 12-24. Now, you need to use the options in the **Parameters** rollout to modify the effects of the **Lattice** modifier. These options are discussed next.



*Figure 12-23 The sphere after applying the **Lattice** modifier*



*Figure 12-24 Partial view of the **Parameters** rollout*

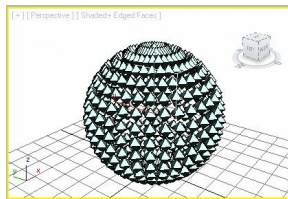
Parameters Rollout

The options in this rollout are used to specify whether the wireframes will be displayed on the joints, struts, or both of them. The areas in this rollout are discussed next.

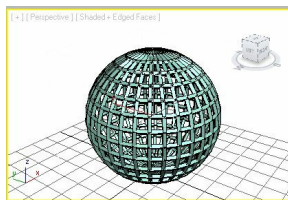
Geometry Area

In this area, the **Apply to Entire Object** check box is selected by default. As a result, wireframe is applied to all the segments or edges of the object. If you clear this check box, then the wireframes will be applied only to the selected segments or edges of the object.

By default, the **Both** radio button is selected to apply the wireframes both on the struts and joints, refer to Figure 12-24. Select the **Joints Only from Vertices** radio button to display the wireframes only on the joints generated from the vertices of the object, as shown in Figure 12-25. Select the **Struts Only from Edges** radio button to display the wireframes only on the struts generated from the edges of the object, as shown in Figure 12-26.



*Figure 12-25 The sphere after selecting the **Joints Only from Vertices** radio button*



*Figure 12-26 The sphere after selecting the **Struts Only from Edges** radio button*

Struts Area

The options in this area are activated only if the **Struts Only from Edges** or **Both** radio button is selected in the **Geometry** area. Set the value in the **Radius** spinner to define the radius of the struts. Set the value in the **Segments** spinner to specify the number of segments along the struts. Set the

value in the **Sides** spinner to specify the number of sides around the circumference of the struts. Set the value in the **Material ID** spinner to specify the material id for the struts to apply the material.

Joins Area

The options in this area are activated only if the **Joins Only from Vertices** or **Both** radio button is selected in the **Geometry** area. There are three radio buttons in the **Geodesic Base Type** group that specify the type of polyhedron to be used for the joints. By default, the **Octa** radio button is selected and is used to create the octahedron joints. Select the **Tetra** or the **Icosa** radio button to create the tetrahedron or icosahedron joints, respectively. The other options are the same as discussed in the **Struts** area.

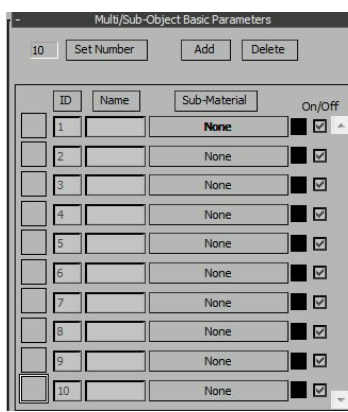
Material Modifier

The **Material** modifier is used to assign material ID to an object or sub-objects. The material ID of an object is the value given to specify the sub-material that is applied to it from the **Multi/Sub-Object** material. You can apply different materials to the selected sub-objects by assigning different material IDs to them. To do so, create an object in the Top viewport. Choose the **Material Editor** tool from the **Main Toolbar** and apply the **Multi/Sub-Object** material to the object, as described earlier in Chapter 7; the **Multi/Sub-Object Basic Parameters** rollout will be displayed in the **Material Editor** dialog box, as shown in Figure 12-27. In this rollout, assign two different colors to the first two sub-materials using the color swatches on the right side. By default, the first two sub-materials have the material IDs, 1 and 2. Now, assign the **Multi/Sub-Object** material to the object in the viewport. Next, make sure that the object is selected and apply the **Mesh Select** modifier to it. Select the **Polygon** sub-object level and select the polygons of the object in the viewport. Now, make sure that the **Polygon** sub-object level is active and select the **Material** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. You can also choose **Modifiers > Surface > Material** from the menu bar; the **Material** modifier will be displayed in the modifier stack and the **Parameters** rollout will be displayed. Now, in the **Material ID** spinner of the **Parameters** rollout, set the value **1**; the selected polygons will display the color that you have assigned to the sub-material with the material ID 1. Select another set of polygons and set the value **2** in the **Material ID** spinner; the selected polygons will display the color that you have assigned to the sub-material with the material ID 2.

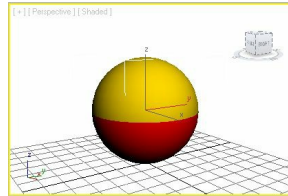
The options in the **Parameters** rollout are discussed next.

Parameters Rollout

The **Material ID** spinner in this rollout is used to change the material ID of the selected sub-object in the viewport. Set the value in the **Material ID** spinner that you have assigned in the **Multi/Sub-Object Basic Parameters** rollout; the selected sub-objects will display the color of the same material ID. For example, if you have assigned yellow color to the material ID 1 and red color to the material ID 2 in the **Multi/Sub-Object Basic Parameters** then on entering the value **1** in the **Material ID** spinner, the selected sub-objects will appear yellow. If you enter the value **2** in the **Material ID** spinner, the selected sub-objects will appear red, refer to Figure 12-28.



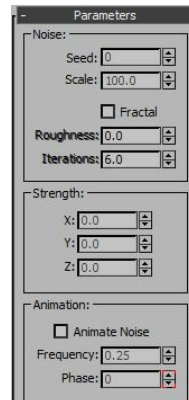
*Figure 12-27 Partial view of the **Multi/Sub-Object Basic Parameters** rollout in the **Material Editor** dialog box*



*Figure 12-28 The object displayed in two different colors after applying the **Material** modifier*

Noise Modifier

The **Noise** modifier is used to generate disturbances on the surface of an object to create irregular surfaces. It can also be used to animate the water or wavy surfaces.



*Figure 12-29 The **Parameters** rollout*

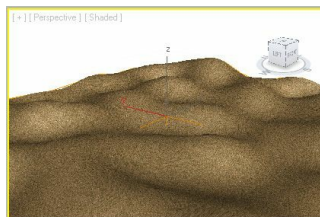
To apply the **Noise** modifier, select the object in the viewport and choose the **Modify** tab in the **Command Panel**. Now, select the **Noise** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. You can also choose **Modifiers > Parametric Deformers > Noise** from the menu bar; the **Noise** modifier will be displayed in the modifier stack and the **Parameters** rollout will also be displayed in the Modify panel. Next, you need to use the options in the **Parameters** rollout, refer to Figure 12-29, to apply the effects of the **Noise** modifier on the selected object. These options are discussed next.

Parameters Rollout

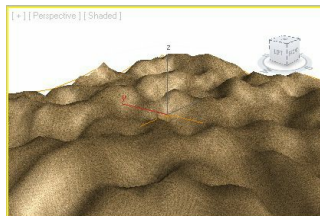
The options in this rollout are used to generate noise effects in an object, as shown in Figure 12-30. The areas in this rollout are discussed next.

Noise Area

The options in this area are used to define the appearance of the surface of the object on applying the **Noise** modifier. Set the value in the **Seed** spinner to specify the starting point for generating the noise randomly in the object. Set the value in the **Scale** spinner to specify the size of noise effects. By default, the value in the **Scale** spinner is 100. A higher value in this spinner produces smoother noise effects and a lower value produces scraggy noise effects. By default, the **Fractal** check box is cleared. Select the **Fractal** check box to produce the fractal-based noise effects, refer to Figure 12-31. When you select the **Fractal** check box, the **Roughness** and **Iterations** spinners get activated that are used to set the fractal effects in the noise. Set the lower value in the **Roughness** spinner to produce smooth fractal effects in noise. Set the higher value in the **Roughness** spinner to produce rough fractal effects in noise. The value in the **Roughness** spinner varies from 0 to 1.0. Set the value in the **Iterations** spinner to apply the fractal effects multiple times. By default, the value in the **Iterations** spinner is 1.0. It varies from 1.0 to 10.0.



*Figure 12-30 The plane with the **Noise** modifier applied*



*Figure 12-31 The plane with the **Fractal** checkbox selected*



Note

- 1. The number of segments in an object should be more to generate a better effect of the **Noise** modifier.*
- 2. You can also create the terrain objects using this modifier.*

Strength Area

The options in this area are used to specify the strength of the noise effects. By default, the value in the **X**, **Y**, and **Z** spinners is 0 that produces no noise effects in the object. Set the value in these spinners to generate the strength of the noise effects.

Animation Area

The options in this area are used to animate the noise effects of the object. To view the animation effects, you need to select the **Animate Noise** check box. Set the value in the **Frequency** spinner to specify the speed of the animation of noise waves. The lower value produces a slow animation and the higher value produces a fast animation. Set the value in the **Phase** spinner to set the start point and the end point of the wave animation along with the frames in the time slider.

Twist Modifier

The **Twist** modifier is used to produce the swirling effect on an object. To apply the **Twist** modifier, select an object in the viewport. Select the **Twist** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose the **Modifiers > Parametric Deformers > Twist** from the menu

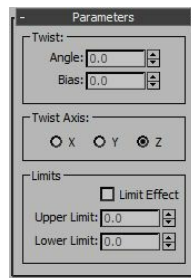


Figure 12-32 The Parameters rollout

bar; the **Twist** modifier will be displayed in the modifier stack and the **Parameters** rollout will also be displayed in the Modify panel. Next, you need to use the options in the **Parameters** rollout, refer to Figure 12-32, to apply the effects of the **Twist** modifier to the object. The **Parameters** rollout is discussed next.

Parameters Rollout

This rollout is used to set the parameters to generate the swirling effects on an object, as shown in Figure 12-33. The areas in this rollout are discussed next.

Twist Area

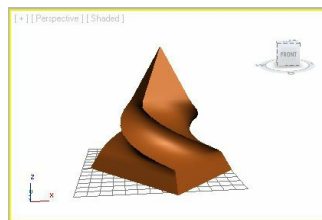
Set the value in the **Angle** spinner to specify the amount of twist in degrees along the selected axis in the **Twist Axis** area. Set the value in the **Bias** spinner to shift the twist at one of the ends of the object. By default, the value in this spinner is 0, which specifies that the twist is uniform along the length of the object. It varies from 100 to -100.

Twist Axis Area

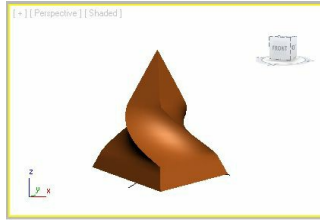
By default, the **Z** radio button is selected. As a result, the object will twist along the Z-axis. Select the **X** or the **Y** radio button to twist the object along the X-axis or the Y-axis, respectively.

Limits Area

The options in this area are used to define the portion of an object to which the twist effects will be applied, refer to Figure 12-34. Select the **Limit Effect** check box to apply the limits to the twist effects of the object. Set the value in the **Upper Limit** spinner to specify the upper limit for the twist effect. Set the value in the **Lower Limit** spinner to specify the lower limit for the twist effect.



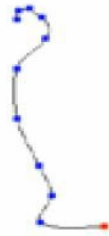
*Figure 12-33 The **Twist** modifier applied to the pyramid object*



*Figure 12-34 The **Twist** modifier applied to a portion of the pyramid object using the options in the **Limits** area*

Lathe Modifier

The **Lathe** modifier is a shape modifier that is used to create a 3D object by rotating a shape about an axis. The direction of the axis of revolution depends on the pivot point of the shape. To apply the **Lathe** modifier on an object, create a shape with the spline in the Front viewport and choose the **Modify** tab in the **Command Panel**. Now, select the **Lathe** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > Patch/Spline Editing > Lathe** from the menu bar; the 2D shape will be converted into a 3D object, as shown in Figures 12-35 and 12-36. And, the modifier will be displayed in the modifier stack. The **Parameters** rollout will also be displayed below the modifier stack, refer to Figure 12-37. This rollout is discussed next.



*Figure 12-35 The **Line** spline created to apply the **Lathe** modifier*



*Figure 12-36 The **Line** spline after applying the **Lathe** modifier*



Parameters Rollout

Set the value in the **Degrees** spinner to specify the amount of rotation of the object in degrees around the axis specified in the **Direction** area. The **Weld Core** check box is used to weld the vertices which are on the axis of revolution. The **Flip Normals** check box is used to flip the normals of the lathed object. Set the value in the **Segments** spinner to specify the desired number of segments around the axis of revolution. The areas in this rollout are discussed next.

Capping Area

The options in this area are the same as described in the **Extrude** modifier.

Direction Area

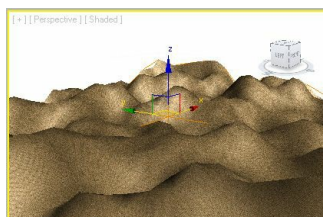
Choose the **X**, **Y**, or **Z** button to specify the axis around which the objects will rotate while applying the **Lathe** modifier.

Align Area

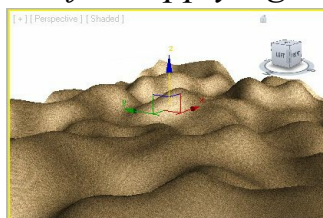
Choose the **Min**, **Center**, or **Max** button to align the spline with the axis of revolution.

MeshSmooth Modifier

The **MeshSmooth** modifier is used to produce smoothness in 3D mesh objects. To apply the **MeshSmooth** modifier, select an object in the viewport. Select the **MeshSmooth** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list; the edges of the object become smoother, as shown in Figures 12-38 and 12-39. Alternatively, you can choose **Modifiers > Subdivision Surfaces > MeshSmooth** from the menu bar; the **MeshSmooth** modifier will be displayed in the modifier stack and various rollouts will also be displayed below the modifier stack. The most commonly used rollout is discussed next.



*Figure 12-38 The surface before applying the **MeshSmooth** modifier*



*Figure 12-39 The surface after applying the **MeshSmooth** modifier*

Subdivision Amount Rollout

Set the value in the **Iterations** spinner to specify the number of times you want to apply the **MeshSmooth** modifier, refer to Figure 12-40. Set the value in the **Smoothness** spinner to smoothen the edges of the object. The **Iterations** and **Smoothness** spinners in the **Render Values** area determine the effects of the **MeshSmooth** modifier at rendering. To activate these spinners, you need to select the check boxes on their left.

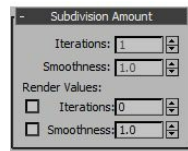


Figure 12-40 The Subdivision Amount rollout

Tessellate Modifier

The **Tessellate** modifier is used to subdivide the faces of an object. It provides smoothness at curved surfaces for rendering. To apply the **Tessellate** modifier on an object, create an object in the viewport and convert it into an editable mesh object. Select the sub-objects of the object in the viewport and select the **Tessellate** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > Mesh Editing > Tessellate** from the menu bar; the selected sub-objects will be subdivided into faces, as shown in Figures 12-41 and 12-42. When you apply the **Tessellate** modifier on an object, the entire object is tessellated. The **Parameters** rollout of the **Tessellate** modifier is shown in Figure 12-43. This rollout is discussed next.

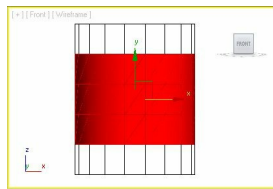


Figure 12-41 The sub-objects selected in a object to apply the Tessellate modifier

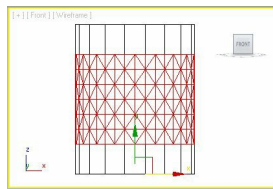


Figure 12-42 The selected sub-objects converted into triangular faces after applying the Tessellate modifier

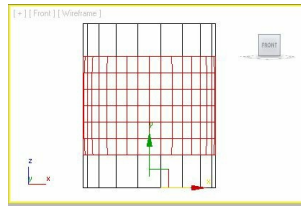
Parameters Rollout

In the **Operate On** group, there are two buttons: **Faces** and **Polygons**. These buttons are used to define whether the modifier will be applied to the faces or the polygons of the object. The **Faces** button is chosen by default and it displays the selected sub-objects as triangular faces, refer to Figure 12-42. Choose the **Polygons** button to display the sub-objects as polygonal faces, as shown in Figure 12-44.

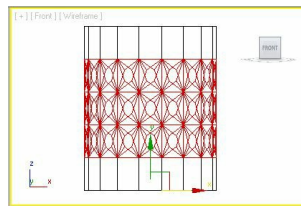


Figure 12-43 The Parameters rollout

By default, the **Edge** radio button is selected and is used to subdivide the selection from the middle of each edge. Select the **Face-Center** radio button to subdivide the faces of the selection from the center to the vertex corners, as shown in Figure 12-45. The **Tension** spinner will be activated only if the **Edge** radio button is selected. The 0 value in the **Tension** spinner specifies that the new faces are flat. The positive value in this spinner specifies that the new faces are convex. The negative value in this spinner specifies that the new faces are concave. By default, the **1** radio button is selected in the **Iterations** area. Select the **2**, **3**, or **4** radio button to specify the number of times the modifier will be applied to the selection.



*Figure 12-44 The selected sub-objects converted into polygonal faces after choosing the **Polygons** button*



*Figure 12-45 The selected sub-objects converted into triangular faces after choosing the **Face-Center** radio button*

Push Modifier

The **Push** modifier is used to push an object inward or outward along the normals of its faces. A normal is an invisible line coming straight out of a face in a particular direction. To apply the **Push** modifier on an object, select the object or the sub-objects

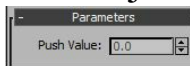


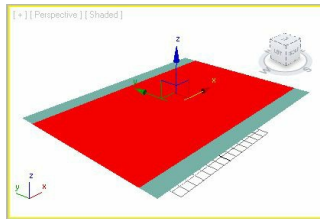
Figure 12-46 The Parameters rollout

in the viewport and select the **Push** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > Parametric Deformers > Push**

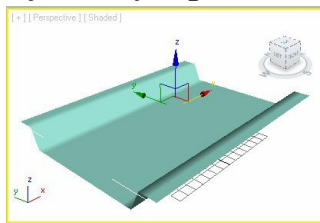
from the menu bar; the **Push** modifier will be displayed in the modifier stack and the **Parameters** rollout will also be displayed in the Modify panel, refer to Figure 12-46. To modify the effects of the **Push** modifier, you need to use the **Parameters** rollout, which is discussed next.

Parameters Rollout

Set the value in the **Push Value** spinner to view the effects of the **Push** modifier, refer to Figures 12-47 and 12-48.



*Figure 12-47 The selected sub-objects of a plane before applying the **Push** modifier*



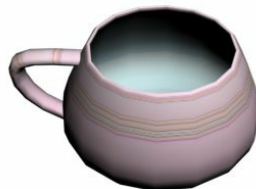
*Figure 12-48 The plane after applying the **Push** modifier*

Normal Modifier

The **Normal** modifier is used to flip the normals of an object without converting it into the editable mesh. To apply the **Normal** modifier to an object, select the object in the viewport and then select the **Normal** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, you can choose **Modifiers > Mesh Editing > Normal Modifier** from the menu bar; the normals of the object will be reversed, refer to Figures 12-49 and 12-50. Also, the **Parameters** rollout will be displayed in the Modify panel, as shown in Figure 12-51. The **Parameters** rollout is discussed next.



Figure 12-49 The object with two different materials on the inner and outer sides



*Figure 12-50 The inner and outer materials interchanged after applying the **Normal** modifier*

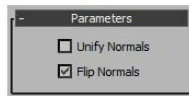


Figure 12-51 The Parameters rollout

Parameters Rollout

By default, the **Flip Normals** check box is selected. It is used to reverse the direction of the normals of all faces of the selected object. Select the **Unify Normals** check box to make all the normals of the object point in the same direction.

Edit Mesh Modifier

The **Edit Mesh** modifier is used to convert the object into editable mesh. The procedure to do so has already been discussed in Chapter 8. The **Edit Mesh** modifier and the editable mesh object provide the same sub-object levels to modify the object at an advanced level. The main difference is that you can retain the object creation parameters and then use them to edit the object even after applying the **Edit Mesh** modifier. Note that you cannot animate the sub-objects of an object after applying the **Edit Mesh** modifier.

To apply the **Edit Mesh** modifier to an object, select the object in the viewport and choose the **Modify** tab in the **Command Panel**. Now, select the **Edit Mesh** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > Mesh Editing > Edit Mesh** from the menu bar; the modifier will be displayed in the modifier stack and the rollouts will also be displayed below the modifier stack in the Modify panel. Next, modify the object at sub-object levels as discussed in the previous chapters.

Similarly, the **Edit Patch** and **Edit Poly** modifiers are used to convert the object into an editable patch and editable poly respectively. The only difference is that the **Edit Patch** and **Edit Poly** modifiers retain the object creation parameters.

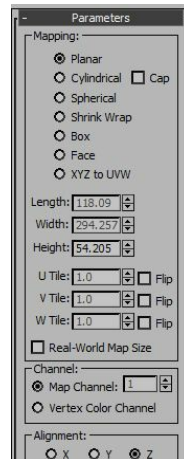
UVW Map Modifier

The **UVW Map** modifier is used to adjust the mapping coordinates on an object. Sometimes when you apply maps to objects, they are not displayed properly on its surface. To apply the map properly, you need to adjust the mapping coordinates on the object. The UVW coordinate system is the same as the XYZ coordinate system. The U, V, and W axes of a map correspond to the X, Y, and Z axes, respectively.

To apply the **UVW Map** modifier, select the object in the viewport and then select the **UVW Map** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > UV Coordinates > UVW Map** from the menu bar; the **UVW Mapping** will be displayed in the modifier stack and the **Parameters** rollout will also be displayed below the modifier stack. The **Parameters** rollout is discussed next.

Parameters Rollout

The options in this rollout are used to set the mapping coordinates on an object, refer to Figure 12-52. These options are discussed next.



*Figure 12-52 Partial view of the **Parameters** rollout*

Mapping Area

The options in this area are used to adjust the type of mapping coordinates and the tiling used on an object. There are seven types of mapping coordinates such as Planar, Cylindrical, Spherical, and so on. The radio buttons available for these mapping coordinates are discussed next.

By default, the **Planar** radio button is selected. As a result, the map is projected from a single flat plane to an object, as shown in Figure 12-53.



*Figure 12-53 A box with the **Planar** mapping coordinate*

Select the **Cylindrical** radio button to project the map onto a cylinder, as shown in Figure 12-54. On selecting the **Cylindrical** radio button, the **Cap** check box will be activated. Select the **Cap** check box to apply mapping coordinates to the cap of the object, as shown in Figure 12-55.



*Figure 12-54 A cylinder with the **Cylindrical** mapping coordinates*



Figure 12-55 The Cylindrical mapping coordinates applied to a cylinder and its cap

Select the **Spherical** radio button to project the map onto a sphere, refer to Figure 12-56. On selecting the **Shrink Wrap** radio button, the map will be projected onto a sphere. But in this case, the corners of the map will be truncated and they will join at a single pole, refer to Figure 12-57. Select the **Box** radio button to project six planar maps from the six sides of a box, refer to Figure 12-58. Select the **Face** radio button to project a copy of the map to every face of the object, refer to Figure 12-59.



Figure 12-56 The Spherical mapping coordinates applied to a sphere

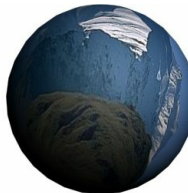


Figure 12-57 The Shrink Wrap mapping coordinates applied to a sphere



Figure 12-58 The Box mapping coordinates applied to a box

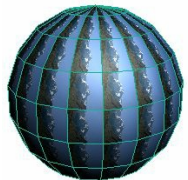


Figure 12-59 The Face mapping coordinates applied to a sphere

Select the **XYZ to UVW** radio button to translate the XYZ coordinates of the procedural map into the UVW mapping coordinates. If you modify the object by changing its shape, the coordinates will adjust to match the new shape, as shown in Figure 12-60.

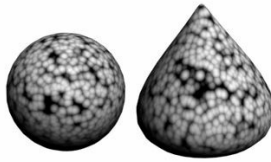


Figure 12-60 *Coordinates of the object adjusted to match the new shape*

 **Note**

*The 3D maps such as **Cellular**, **Falloff**, **Noise** are known as procedural maps. These maps have already been discussed in Chapter 7.*

Set the value in the **Length**, **Width**, and **Height** spinners to define the length, width, and height of the modifier gizmo. Set the value in the **U Tile**, **V Tile**, and **W Tile** spinners to define the tiling for the map in the X, Y, and Z axes. The value 1 in these spinners indicates that the map has been applied only once. Select the **Flip** check box to reverse the direction of the map.

The **Real-World Map Size** check box is used to control the scaling of the textured mapped materials applied to the object. You can set these values using the **Use Real-World Scale** check box in the **Coordinates** rollout of the applied material in the **Material Editor** dialog box.

Channel Area

By default, the **Map Channel** radio button is selected. The value 1 in the **Map Channel** spinner is used to define that the object has 1 UVW mapping coordinate. Set the value in this spinner to assign more than one UVW mapping coordinates. An object can have up to 99 UVW mapping coordinates.

Alignment Area

The options in this area are used to define the alignment of the gizmo of the modifier with the object.

FFD (Free-Form Deformation) Modifiers

In Autodesk 3ds Max, the FFD modifiers are used to deform objects by creating a box around them. This box is made up of lattice and control points. You can deform an object using these control points and lattice. There are five different types of FFD modifiers: **FFD 2x2x2**, **FFD 3x3x3**, **FFD 4x4x4**, **FFD(box)**, and **FFD(cyl)**, refer to Figures 12-61 through 12-65.

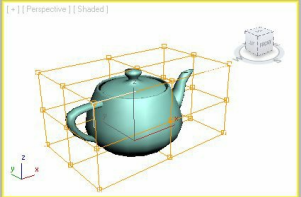


Figure 12-62 *The **FFD 3x3x3** modifier applied to an object*

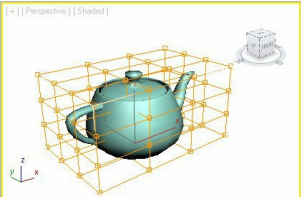


Figure 12-63 The FFD 4x4x4 modifier applied to an object

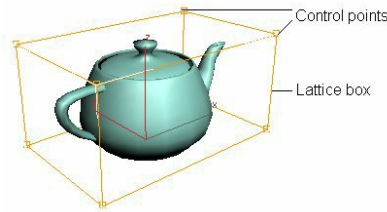


Figure 12-61 The FFD 2x2x2 modifier applied to an object

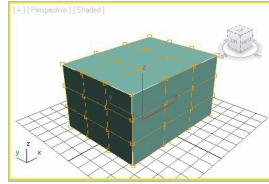


Figure 12-64 A box object with the FFD(box) modifier applied

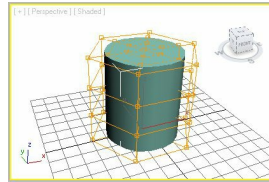


Figure 12-65 A cylindrical object with the FFD(cyl) modifier applied

The different types of FFD modifiers are based on the number of control points. The **FFD 2x2x2** modifier provides a lattice box with two control points on each of its edge. Similarly, **FFD 3x3x3** and **FFD 4x4x4** modifiers provide the lattice boxes with three and four control points on each of their edge, respectively.

The **FFD(box)** and **FFD(cyl)** modifiers are used with the box-shaped and cylinder-shaped objects. In these modifiers, you can adjust the number of control points in the lattice box in the **Parameters** rollout.

To apply the FFD modifiers, select an object in the viewport and then select one of the **FFD** modifiers from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list. Alternatively, choose **Modifiers > Free Form Deformers** from the menu bar to select the FFD modifiers; the lattice box with the control points will be displayed around the selected object in the viewport. The selected FFD modifier will be displayed in the modifier stack. Also, the **FFD Parameters** rollout will be displayed below the modifier stack in the modify panel. To deform the object using the FFD modifiers, you need to use the sub-objects levels of the modifier in the modifier stack. The sub-object levels and **FFD Parameters** rollout are discussed next.

Sub-Object Levels

To view the sub-object levels of the selected modifier, you need to expand the modifier in the modifier stack by clicking on the plus sign on its left, as shown in Figure 12-66. There are three sub-object levels, **Control Points**, **Lattice**, and **Set**

Volume. These are discussed next.

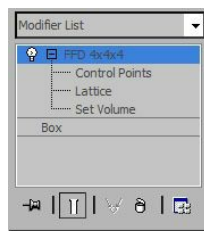


Figure 12-66 The sub-object levels in the modifier stack

Control Points

The control points are the vertices of the lattice box that surround the object after applying the FFD modifier. Select the **Control Points** sub-objects level; the level will be activated and now you will be able to select the control points of the lattice in the viewport. Next, select the control points and manipulate them using the transforming tools such as **Select and Move**, **Select and Scale**, and so on. When you transform the control points, the shape of the lattice box will be modified. Also, the shape of the object will be modified accordingly, refer to Figures 12-67 and 12-68.

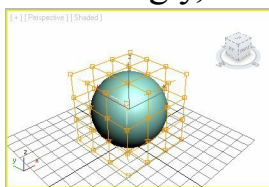


Figure 12-67 The FFD modifier applied to the objects

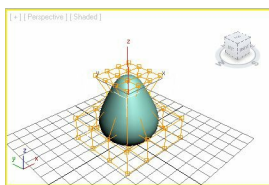


Figure 12-68 The shape of the object modified after transforming the control points

Lattice

Select the **Lattice** sub-object level; the lattice box will be highlighted in the viewport. Next, you can reshape the object by moving, rotating, or scaling the lattice box.

Set Volume

If you select this sub-object level, then the control points of the lattice box will turn green in color. You can select these green control points and move them to fit according to the shape of the object without affecting the object.

FFD Parameters Rollout

This rollout is displayed in the Modify panel, as shown in Figure 12-69. The most commonly used areas in this rollout are discussed next.

Display Area

By default, the **Lattice** check box is selected. It is used to display the lines

connecting the control points of the lattice box. On clearing the check box, only the control points of the lattice will be displayed in the viewport. Select the **Source Volume** check box to display the original shape of the lattice box. If you clear the check box, then the modified shape of the lattice box will be displayed in the viewport.

Deform Area

By default, the **Only In Volume** radio button is selected. It is used to deform the part of the object that is inside the lattice box. On selecting the **All Vertices** radio button, the entire object whether it is inside or outside the lattice box can be deformed.

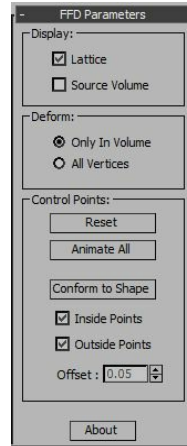


Figure 12-69 Partial view of the FFD Parameters rollout

Control Points Area

This area is used to modify the control points of the lattice box. Choose the **Reset** button to bring all control points to their original position. If you animate the control points, then a controller will be assigned to each control point. Choose the **Animate All** button to place the controllers in the track view for each control point. In the track view, you can view, edit, copy, or adjust the number of animation keys at the same time. You will learn more about adjusting the animation keys in the later chapters.

Choose the **Conform to Shape** button to bring the FFD control points to the intersection of the object with a straight line from the object's center to the original location of control points. The **Inside Points** and **Outside Points** check boxes are selected by default. If you clear the **Inside Points** check box, then the control points that are inside the lattice box will not be affected. If you clear the **Outside Points** check box; the control points that are outside the lattice box will not be affected. Set the value in the **Offset** spinner to specify the distance of the control points from the surface of the object.

Dimensions Area

This area is available only for the **FFD(box)** and **FFD(cyl)** modifiers and is used to define the number of control points in the lattice box. Choose the **Set Number of Points** button; the **Set FFD Dimensions** dialog box will be displayed, refer to Figure 12-70. Set the value in the **Length**, **Width**, and **Height** spinners to specify the number of control points on each axis of the

lattice box. Note that for the **FFD(cyl)** modifiers, the spinners displayed would be the **Side**, **Radial** and **Height**.

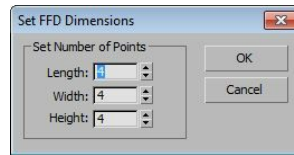


Figure 12-70 The Set FFD Dimensions dialog box

TUTORIALS

Before starting the tutorials, you need to download the *c12_3dsmax_2015_tut.zip* file from *www.cadcim.com*. The path of the file is as follows: *Textbooks > Animation and Visual Effects > 3ds Max > Autodesk 3ds Max 2015: A Comprehensive Guide*

Extract the contents of the zip file and save them in the *Documents* folder.

Tutorial 1

In this tutorial, you will create the 3D model of a tennis racket, as shown in Figure 12-71, using the **Lattice** modifier and shape splines. **(Expected time: 30 min)**



Figure 12-71 A tennis racket model

The following steps are required to complete this tutorial:

- a. Create the project folder.
- b. Create the head of the racket.
- c. Create the shaft of the racket.
- d. Create the handle of the racket.
- e. Save and render the scene.

Creating the Project Folder

Create a new project folder with the name *c12_tut1* at *\Documents\3dsmax2015* and then save the file with the name *c12tut1*, as discussed in Tutorial 1 of Chapter 2.

Creating the Head of the Racket

In this section, you will create the head of the racket by using the **Ellipse** tool.

1. Choose **Create > Shapes** in the **Command Panel**; the **Splines** option is displayed in the drop-down list. Choose the **Ellipse** tool from the **Object Type** rollout.

2. Activate the Top viewport and create an ellipse, as described in Chapter 5. Choose the **Modify** tab in the **Command Panel**. Expand the **Rendering** rollout and select the **Enable In Renderer** and **Enable In Viewport** check boxes.

Select the **Rectangular** radio button and enter the values given next:

Length: **1.0** Width: **3.0**

Make sure that the **Auto Smooth** check box is selected.

3. In the **Parameters** rollout, set the parameters as follows:

Length: **145.894** Width: **93.72**

4. Modify the name of the ellipse to *head* and change its color to black.

Next, you need to create the stringed area inside *head*.

5. Choose **Create > Geometry** in the **Command Panel**. Next, choose the **Plane** tool from **Standard Primitives** and create a plane in the Top viewport. In the **Parameters** rollout, set the following parameters:

Length: **148.314** Width: **131.401**

Length Segs: **12** Width Segs: **12**

6. Modify the name of the plane to *stringed area* and change its color to black. Now, align *stringed area* at the center of *head*, refer to Figure 12-72.

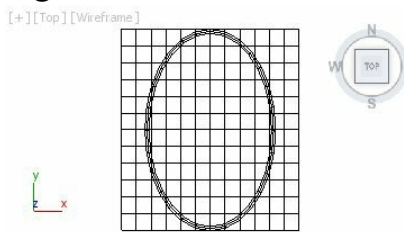


Figure 12-72 The plane created in the Top viewport

Next, you need to modify *stringed area*.

7. Choose the **Maximize Viewport Toggle** tool to maximize the Top viewport.

8. Select *stringed area* in the viewport and choose the **Modify** tab in the **Command Panel**. Next, select the **Edit Mesh** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list; the **Edit Mesh** modifier is displayed in the modifier stack and different rollouts are also displayed below the modifier stack.

 Note

*By applying the **Edit Mesh** modifier, the name of the **Plane** tool will be displayed in the modifier stack. To modify creation parameters of the plane, you can select it from the modifier stack and set*

new values in the rollouts displayed in the **Modify** panel.

- In the **Selection** rollout, choose the **Vertex** button; all the vertices of *stringed area* are displayed in the viewport, as shown in Figure 12-73.

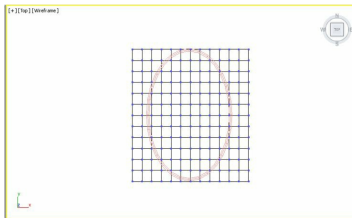


Figure 12-73 The vertices of the stringed area displayed in the Top viewport

Next, you need to select and move the vertices of *stringed area* one by one and then arrange them into the shape of the head.

- To move vertices to the exact location, choose the **Zoom Region** tool and drag a selection box around the vertices of the upper left portion of *stringed area* to zoom in on them, refer to Figures 12-74 and 12-75.

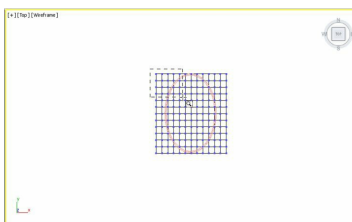


Figure 12-74 A selection box dragged around the vertices using the **Zoom Region** tool

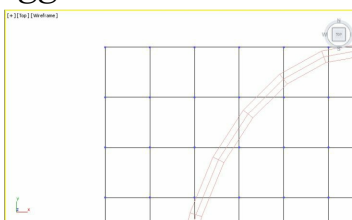


Figure 12-75 The selected area zoomed in

- Choose the **Select and Move** tool to select the vertices one by one and arrange them to form the shape of *head*, as shown in Figure 12-76.

- Choose the **Zoom Extents** tool; *head* and *stringed area* are displayed in the active viewport, refer to Figure 12-77.



Figure 12-76 The vertices arranged into the shape of the head

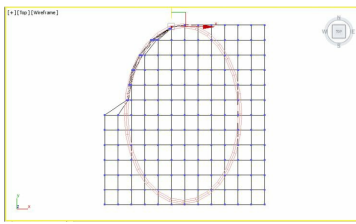


Figure 12-77 The objects after invoking the **Zoom Extents** tool

13. Follow the procedure discussed in steps 10 and 11 for the outer vertices and arrange them, as shown in Figure 12-78. Choose the **Vertex** button again in the **Selection** rollout to exit the sub-objectlevel.

Next, you need to apply the **Lattice** modifier to *stringed area* of head.

14. Make sure that *stringed area* is selected in the viewport. Select the **Lattice** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list; the **Lattice** modifier is displayed in the modifier stack and rollouts are also displayed below the modifier stack.

15. In the **Parameters** rollout, set the following parameters:

Select the **Struts Only from Edges** radio button.

Struts area

Radius: **0.2**

Stringed area is displayed, as shown in Figure 12-79.

16. Group *stringed area* and head as *racket head*.

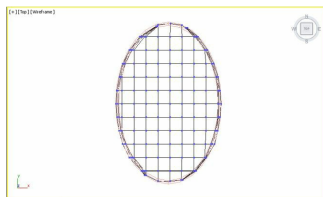


Figure 12-78 All outer vertices aligned to the shape of the head

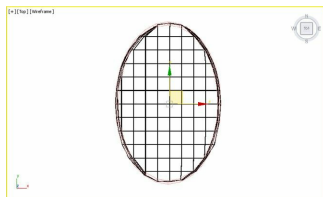


Figure 12-79 The stringed area after applying the **Lattice** modifier

Creating the Shaft of the Racket

In this section, you will create the shaft of the racket using the **Line** tool.

1. Choose the **Zoom** tool and zoom in the Top viewport to get sufficient room for creating the shaft of the racket, as shown in Figure 12-80.
2. Choose **Create > Shapes** in the **Command Panel**; the **Splines** option is displayed in the drop-down list. Choose the **Line** tool from the **Object Type** rollout.
3. In the **Creation Method** rollout, select the **Smooth** radio button in the **Initial Type** area and then select the **Smooth** radio button in the **Drag Type** area.
4. In the Top viewport, click and drag the cursor to create a line around *racket head*, as shown in Figure 12-81.

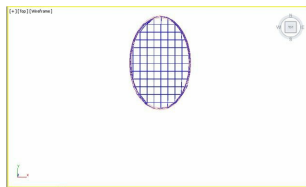


Figure 12-80 *The racket head in the Top viewport*

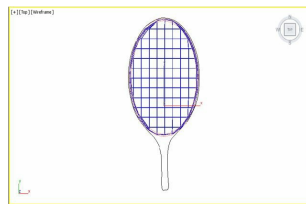


Figure 12-81 *A line created around the racket head*

5. In the **Rendering** rollout, make sure the **Enable In Renderer** and **Enable In Viewport** check boxes are selected. Also, select the **Radial** radio button and then enter the value **3** in the **Thickness** spinner.
6. Modify the name of the line to *shaft01* and then modify its color by setting the following parameters:
Red: **8** Green: **8** Blue: **136**
7. Choose the **Maximize Viewport Toggle** tool and activate the Front viewport. Now, align *shaft01* at the bottom of *racket head*, refer to Figure 12-82.
8. In the Front viewport, select *shaft01* and create its copy in the vertical direction. It is automatically named as *shaft002*.
9. Align *shaft002* at the top of *racket head*, as shown in Figure 12-83.

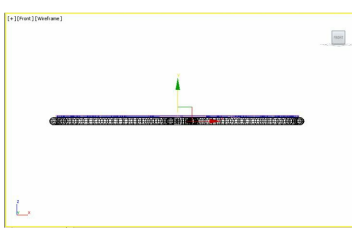


Figure 12-82 Alignment of the shaft01 at the bottom of the racket head

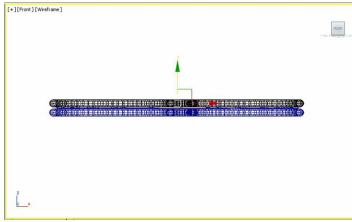


Figure 12-83 Alignment of the shaft002 at the top of the racket head

Creating the Handle of the Racket

In this section, you will create the handle of the racket by using the **ChamferCyl** tool from **Extended Primitives**.

1. Choose the **ChamferCyl** tool from **Extended Primitives** in the **Command Panel** and create a chamfer cylinder in the Front viewport.

2. In the **Parameters** rollout, set the following parameters:

Radius: **7.0** Height: **74.477** Fillet: **2.816**

3. Modify the name of the cylinder to *handle* and change its color to black.

4. Align *handle* with *shaft01* and *shaft002* in viewports, as shown in Figure 12-84.

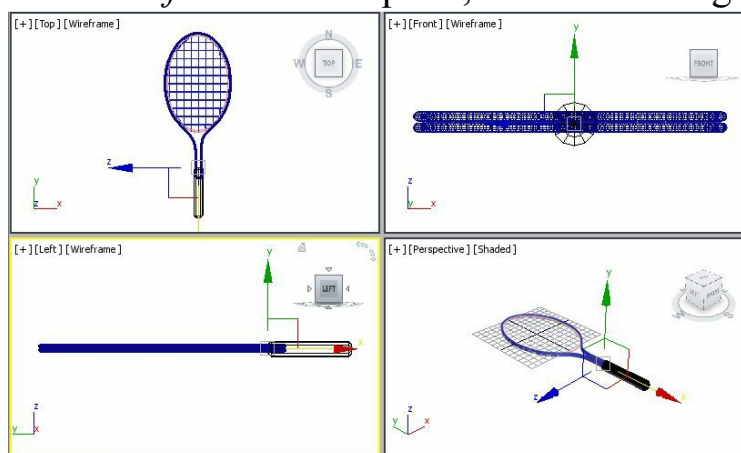


Figure 12-84 Alignment of handle in viewports

Saving and Rendering the Scene

In this section, you will save the scene and then render it. You can also view the final rendered image of this model by downloading the file *c12_3dsmax_2015_rndr.zip* from www.cadcim.com. The path of the file is as follows: *Textbooks > Animation and Visual Effects > 3ds Max > Autodesk 3ds Max 2015: A Comprehensive Guide*

1. Change the background color of the scene to white as described in the previous chapters.
2. Choose **Save** from the **Application** menu. Next, activate the Perspective viewport.
3. Choose the **Render Production** tool from the **Main Toolbar**; the **Rendered Frame** window is displayed with the final output of the tennis racket, as shown in Figure 12-85. Next, close this window.

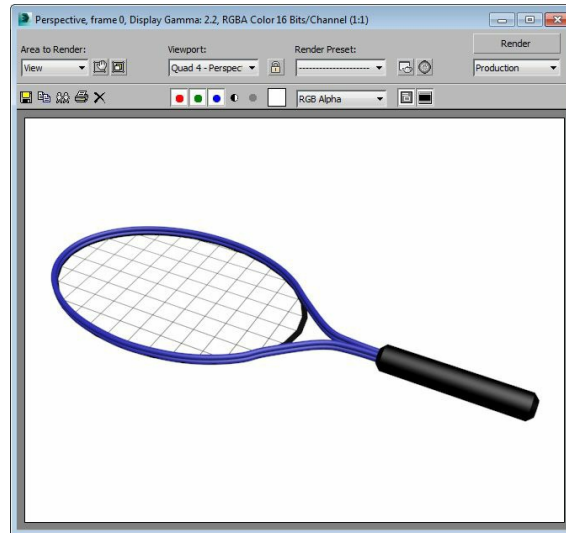


Figure 12-85 The final output

Tutorial 2

In this tutorial, you will create a water surface, as shown in Figure 12-86, using the **Noise** modifier. **(Expected time: 30 min)**

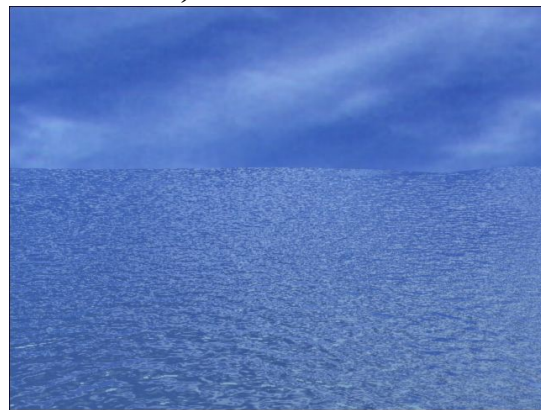


Figure 12-86 The water surface

The following steps are required to complete this tutorial:

- a. Create the project folder.
- b. Create water surface.
- c. Create environment.
- d. Save and render the scene.

Creating the Project Folder

1. Create a new project folder with the name *c12_tut2* at `\Documents\3dsmax2015` and then save the file with the name *c12tut2*, as discussed in Tutorial 1 of Chapter 2.
2. Open the Windows Explorer and then browse to the *c12_3dsmax_2015_tut* folder. Next, copy the *sky.jpg* file from this folder to `\Documents\3dsmax2015\c12_tut2\sceneassets\images` and the *water_surface.mat* in the `\Documents\3dsmax2015\c12_tut2\materiallibraries` folder.

Creating Water Surface

In this section, you will create a plane by using the **Plane** tool and then you need to apply the **Noise** modifier to give it the wavy effect.

1. Choose **Create > Geometry** in the **Command Panel**; the **Standard Primitives** option is displayed in the drop-down list. Choose the **Plane** tool from the **Object Type** rollout.
2. Activate the Top viewport and create a plane. In the **Parameters** rollout, set the following values:
Length: **669.234** Width: **788.627**
Length Segs: **10** Width Segs: **10**
3. Choose the **Zoom Extents All** tool to display the objects to their extent in the viewports.
4. Modify the name of the plane to *water surface*.
5. Activate the Perspective viewport and set its view using the **Orbit** and **Zoom** tools, as shown in Figure 12-87.

Next, you need to apply the **Noise** modifier to *water surface*.

6. Make sure that *water surface* is selected in the viewport. Choose the **Modify** tab in the **Command Panel**; the **Modifier List** drop-down list is displayed. Select the **Noise** modifier from the **OBJECT-SPACE MODIFIERS** category in the **Modifier List** drop-down list; the **Noise** modifier is displayed in the modifier stack and the **Parameters** rollout is displayed in the Modify panel.
7. In the **Parameters** rollout, set the following parameters:

Noise area

Select the **Fractal** check box.

Roughness: **0.5** Iterations: **6.0**

Strength area

X: **120.0** Y: **150.0** Z: **5.0**

After setting the values, *water surface* is displayed, as shown in Figure 12-88. Next, you need to

assign the material to *water surface* to make it look realistic.

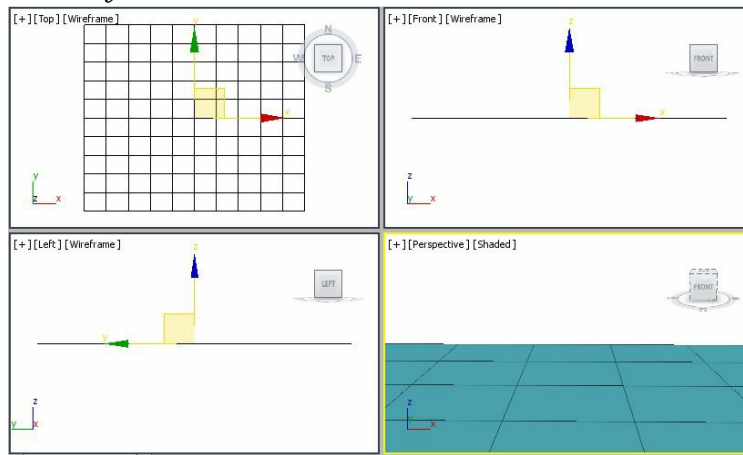
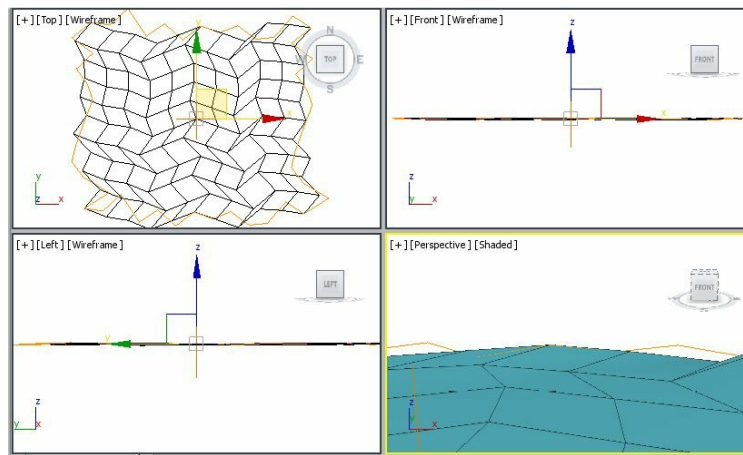



Figure 12-87 The water surface in viewports



*Figure 12-88 The water surface displayed after entering the values in the **Parameters** rollout of the **Noise** modifier*

8. Choose **Rendering > Material Editor > Compact Material Editor** from the menu  bar; the **Material Editor** dialog box is displayed. By default, the **01-Default** sample slot is selected in the **Material Editor** dialog box.

9. Choose the **Get Material** button; the **Material/Map Browser** dialog box is displayed.

10. In the **Material/Map Browser** dialog box, choose the **Material/Map Browser Option** button; a flyout is displayed. Choose the **Open Material Library** option from the flyout, as shown in Figure 12-89; the **Import Material Library** dialog box is displayed.

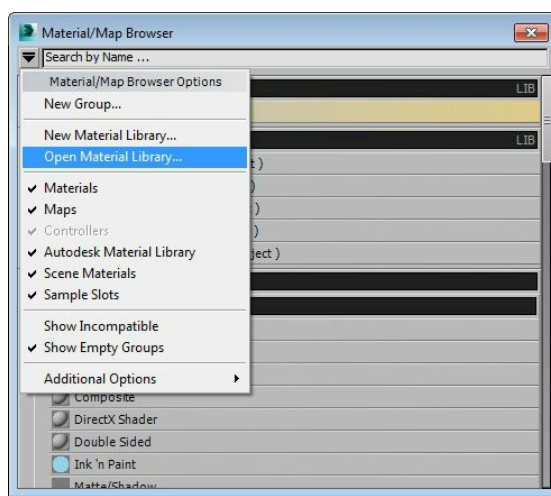



Figure 12-89 Choosing the *Open Material Library* option from the flyout

11. As the Project folder is already set, the path `\Documents\3dsmax2015\c12_tut2\materiallibraries` is displayed in the **Look in** drop-down list of this dialog box. Select the **water_surface.mat** file from it and choose the **Open** button; the *water_surface.mat* material library is added to the **Material/Map Browser** dialog box.
12. Expand *water_surface.mat*, if it is not already expanded. Next, double-click on the **water surface** material; the **water surface** material is displayed in the sample slot. Also, the name of the sample slot is replaced with the **water surface** in the **Material Name** drop-down list.
13. Close the **Material/Map Browser** dialog box.
14. In the **Material Editor** dialog box, choose the **Diffuse** color swatch from the **Raytrace Basic Parameters** rollout; the **Color Selector: Diffuse Color** dialog box is displayed. Set the values in the dialog box as follows:

Red: **164** Green: **214** Blue: **249**
15. Choose the **OK** button to close the **Color Selector: Diffuse Color** dialog box.
16. In the **Material Editor** dialog box, make sure that *water surface* material is selected. Also, select *water surface* in the viewport. Next, choose the **Assign Material to Selection** button; the *water surface* material is assigned to *water surface*.
17. Choose the **Show Shaded Material in Viewport** button to view the material in the viewport. Close the **Material Editor** dialog box.

 **Note**
*You need to render the scene in the Perspective viewport to view the realistic effect of the **Noise** modifier and the material.*

Creating Environment

In this section, you will apply the map in the environment to make the scene realistic.

1. Choose **Rendering > Environment** from the menu bar; the **Environment and Effects** dialog box is displayed.
2. By default, the **Environment** tab is chosen. You need to set the parameters in the **Common Parameters** rollout in this tab. In the **Background** area, choose the **Environment Map** button labeled as **None**; the **Material/Map Browser** dialog box is displayed.
3. In the **Material/Map Browser** dialog box, type **bitmap** in the **Search by Name** area; the **Bitmap** map is displayed in the drop-down list. Select the **Bitmap** map and choose the **OK** button; the **Select Bitmap Image File** dialog box is displayed. Select a sky image of your choice from the desired location. Next, choose the **Open** button; the name of the map is displayed on the **Environment Map** button.
4. Now, choose the **Material Editor** tool from the **Main Toolbar**, the **Material Editor** dialog box is displayed.
5. Press and hold the left mouse button on the **Map # 2(Sky.jpg)** name from the **Environment Map** button and drag the cursor to the **02-Default** sample slot; the **Instance (Copy)map** dialog box is displayed.
6. Select the **Instance** radio button in this dialog box; the sky image will be added to the **02-Default** sample slot. In the **Coordinates** rollout, enter the value **2** in the **U** and **V Tiling** spinners. In the **Cropping/Placement** area, select the **Place** radio button. Next, enter **0.333** value in the **U** spinner and **0.479** in the **V** spinner. Similarly, make sure **0.667** is set in the **W** spinner and **0.521** in the **H** spinner.

Note

To view the environment map in the scene, you need to render the Perspective viewport.

Saving and Rendering the Scene

1. Choose **Save** from the **Application** menu.
2. Choose the **Render Production** tool from the **MainToolbar**; the **Rendered Frame** window is displayed. The final output of the scene at one frame is shown in Figure 12-90.

3. Close this window.

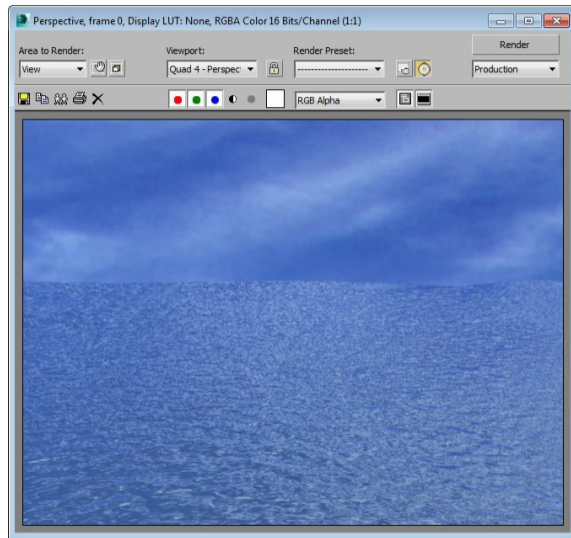


Figure 12-90 The final output of the scene after rendering