Learning Objectives

*After completing this chapter, you will be able to:*
- ***Create compound objects***
- ***Modify compound objects***

INTRODUCTION

In this chapter, you will create complex models by combining two or more existing objects into a single object. The different techniques explained in this chapter will help you to combine different 2D and 3D shapes that would otherwise be difficult or impossible to do.

COMPOUND OBJECTS

In 3ds Max, the compound objects are created by combining two or more objects. There are twelve tools to create various compound objects. To create these compound objects, you need to choose the respective tools. To create a compound object, choose **Create > Geometry** in the **Command Panel**; a drop-down list will be displayed below the **Geometry** button. Select the **Compound Objects** option from the drop-down list; the **Object Type** rollout will be displayed with all the tools to create compound objects, refer to Figure 11-1. The most commonly used tools to create compound objects are discussed next.
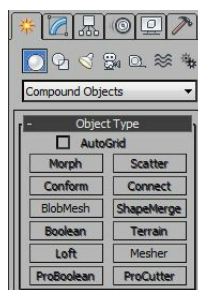
Figure 11-1 *The tools for creating compound objects displayed in the rollout*

Boolean

Menu bar: Create > Compound > Boolean
Toolbar: Create > Geometry > Compound Objects >
Object Type rollout > Boolean

The **Boolean** tool is used to trim or combine objects in an operation. To carry out boolean operation, you need two objects. The objects to be operated upon are known as operands.

To create a boolean object, first create two overlapping objects in the viewport, refer to Figure 11-2. Select one of the objects in the viewport. Choose **Create > Geometry** in the **Command Panel**; a drop-down list will be displayed. Select the **Compound Objects** option from the drop-down list

and choose the **Boolean** tool from the **Object Type** rollout; the **Name and Color**, **Pick Boolean**, and **Display/Update** rollouts will be displayed, as shown in Figure 11-3. Theselected object will become operand A and the name of the object will be displayed in the list box of the **Operands** area in the **Parameters** rollout. Next, choose the **Pick Operand B** button in the **Pick Boolean** rollout and move the cursor over the second object or operand B in the viewport; the shape of the cursor will change into a selection cursor. Now, select the second object to perform theboolean operation, refer to Figure 11-4. Right-click in the viewport to exit the **Boolean** tool. The most commonly used rollouts and areas related to this tool are discussed next.
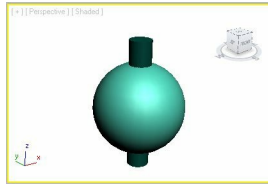

Figure 11-2 Two overlapping objects created in the viewport

Pick Boolean Rollout

The **Pick Operand B** button in this rollout is used to select the second object or operand B in the viewport to complete the boolean operation. There are four radio buttons to specify the type of operand B. By default, the **Move** radio button is selected, which specifies that only the operand B will be used to create a boolean object. The **Reference** radio button is used to create a clone of operand B simultaneously that behaves like a reference object. Select the **Copy** radio button to create a copy of the operand B that can be used later in the scene. Select the **Instance** radio button to create the instance of the operand B. Now, if changes are made in operand B, then those changes will reflect in the boolean object as well.
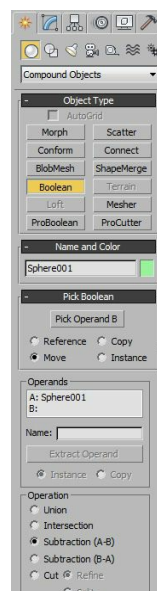
Figure 11-3 Partial view of the rollouts displayed on choosing the **Boolean** tool

Figure 11-4 *The object after performing the boolean operation*
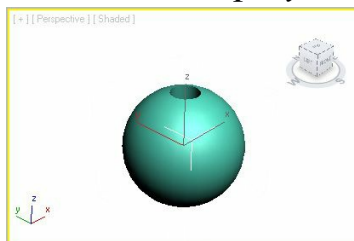
Operands Area

The list box at the top in this area displays the name of the current operands in the viewport. To change the name of an operand, select the operand from the operand name list box; the name of the selected operand will be displayed in the **Name** text box located below the list box. You can modify its name in the **Name** text box.

The **Extract Operand** button will be available only after performing the boolean operation. It is used to extract a copy or an instance of the operands of the boolean object. To understand the working of this button, select the boolean object in the viewport and choose the **Modify** tab in the **Command Panel**. Now, in the **Parameters** rollout, select the operand that you want to extract from the list box given in the **Operands** area; the **Extract Operand** button will be activated. Next, select the **Copy** radio button to extract a copy of the selected operand or select the **Instance** radio button to extract an instance of the selected operand. Choose the **Extract Operand** button; the instance or the copy of the selected operand will be displayed in the viewport.
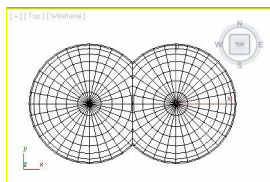
Operation Area

The radio buttons in this area are used to specify the type of boolean operations to be performed on the operands. You need to select one of the radio buttons in this area before choosing the **Pick Operand B** button in the **Pick Boolean** rollout to perform various types of boolean operations.
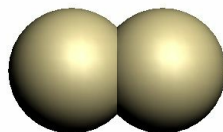
Select the **Union** radio button to attach two operands for creating one object. If the operands overlap, then the overlapping portion of the objects will be removed, refer to Figures 11-5, 11-6, and 11-7.
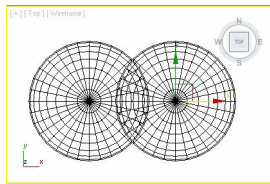
Figure 11-5 *Two spheres in the Top viewport before performing the **Union** boolean operation*


*Figure 11-6* *Two spheres in the Top viewport after performing the **Union** boolean operation*

Figure 11-7 *Two spheres in the perspective viewport after performing the **Union** boolean*

Select the **Intersection** radio button to create a boolean object from the overlapping portion of the two operands. In this operation, the overlapping area will not be removed. Instead, the portions that are not overlapping will be removed, refer to Figures 11-8 and 11-9. Note that the operands must overlap to perform this operation.
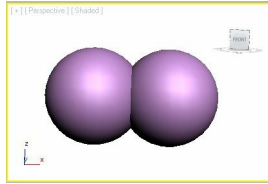

*Figure 11-8 Two spheres for the **Intersection** boolean operation*
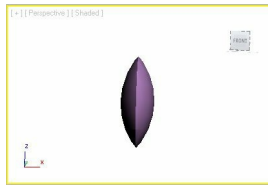

*Figure 11-9 Two spheres after performing the **Intersection** boolean operation*

By default, the **Subtraction (A-B)** radio button is selected. It is used to remove the overlapping portion of the operand B from operand A. Also, the boolean object will have the operand A with the intersection portion subtracted from it. Note that the operands must overlap to perform this operation.

Select the **Subtraction (B-A)** radio button to remove the overlapping portion of operand A from operand B. Also, the boolean object will have the operand B with the intersection portion subtracted from it, refer to Figures 11-10 and 11-11. The operands must overlap to perform this operation.
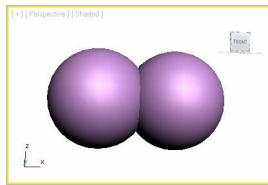
*Figure 11-10 The operand A and B selected for performing the **Subtraction (B-A)** boolean operation*
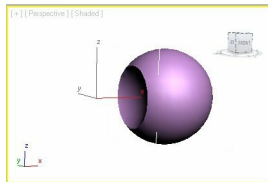
*Figure 11-11 The boolean object after performing the **Subtraction (B-A)** boolean operation*

Select the **Cut** radio button; the four radio buttons, **Refine**, **Split**, **Remove Inside**, and **Remove Outside** will be activated. By default, the **Refine** radio button is selected, which is used to add new vertices, edges, and faces to the operand A at the location where the operand B intersects the operand A. Select the **Split** radio button to add a double set of new vertices, edges, and faces where the operand B intersects with the operand A. Select the **Remove Inside** radio button to remove all faces of operand A that are inside the operand B. Select the **Remove Outside** radio button to remove all

faces of operand A that are outside the operand B.

Note

*To view the effect of the **Cut** radio button, you need to convert the operands into editable objects.*

Terrain

Menu bar: Create > Compound > Terrain
Toolbar: Create > Geometry > Compound Objects > Object Type rollout > Terrain

The terrain compound objects are created from splines. In this case, the splines represent the contour lines. The contour lines are the lines drawn on a map, which connect the points of equal height. Usually, the terrain objects are used to add buildings and roads on them to create virtual cities.

To create a terrain object, first create the contour lines in the Top viewport using the **Line** tool, as shown in Figure 11-12. Align these lines in the Front viewport, as shown in Figure 11-13. You can also import an AutoCAD drawing file to use as contour data. Next, select all the contour lines and choose the **Terrain** tool from the **Object Type** rollout of the **Compound Objects**; a 3D terrain object will be created, as shown in Figure 11-14. The **Name and Color**, **Pick Operand**, **Parameters**, **Simplification**, and **Color by Elevation** rollouts will also be displayed to modify the terrain object. The most commonly used rollouts related to this tool are discussed next.
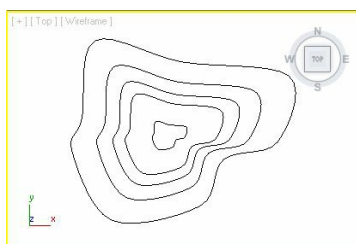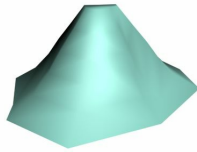

Figure 11-12 The contour lines created for the terrain object in the Top viewport
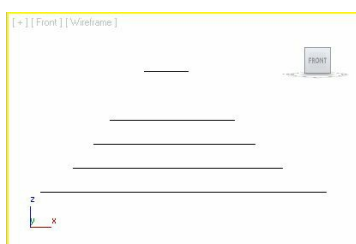

Figure 11-13 The contour lines aligned for the terrain object in the Front viewport

Pick Operand Rollout

The **Pick Operand** button in this rollout is used to add splines to the terrain object, refer to Figure 11-15. To add splines to the terrain object, first create new splines and select the terrain object. Next, choose the **Pick Operand** button and move the cursor over the new spline in the viewport; the shape of the cursor will change to the selection cursor. Next, select the additional splines one by one to add them to the terrain object. In this rollout, the four radio buttons, **Reference**, **Copy**, **Move**, and **Instance** are used to specify the type of new contours to be added to the terrain object. The functions of these radio buttons are same as those discussed in the **Pick Boolean** rollout of the **Boolean** compound.

Figure 11-14 *The terrain object created from the contour lines*
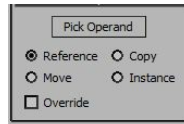
**Figure 11-15** *The* **Pick Operand** *rollout*

Parameters Rollout

The areas in this rollout are discussed next.

Operands Area

The list box on the top of the **Operands** area displays the list of the current operands in the viewport, refer to Figure 11-16. The **Delete Operand** button is used to delete the selected operand or contour lines from the terrain object. To delete a selected operand, select the name of the operand that you want to delete from the list box and choose the **Delete Operand** button.

Form Area

The radio buttons in this area are used to specify the type of terrain object to be created. By default, the **Graded Surface** radio button is selected. As a result, an empty surface is created for the open bottom of the terrain object. Select the **Graded Solid** radio button to create cover at the open bottom of the terrain. Select the **Layered Solid** radio button to create the layered terrain objects such as cardboard architectural model, as shown in Figure 11-17. Select the **Stitch Border** check box to prevent the creation of new triangles at the edges of the terrain object when the splines are open. Select the **Retriangulate** check box to create more precise terrain objects by following the contour lines more closely.
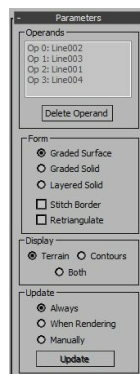
Figure 11-16 *Different areas in the* **Parameters** *rollout*
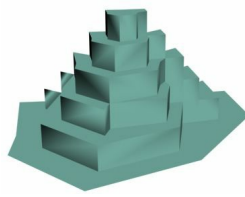
*Figure 11-17 The terrain object with the **Layered Solid** radio button selected*

Note

*You can select the different radio buttons and check boxes in the **Form** area to view their effect on the terrain object in the viewport.*

Display Area

The options in the **Display** area are used to specify the terrain object that will be displayed in the viewports. By default, the **Terrain** radio button is selected. As a result, the terrain object is displayed over the contour lines. The **Contours** radio button is used to display only the contour lines of the terrain object in the viewport. The **Both** radio button is used to display the terrain as well as the contour lines in the viewport.

The options in the **Update** area are the same as those discussed in the previous chapters.

Simplification Rollout

The options in this rollout are used to simplify the mesh of the terrain object, refer to Figure 11-18. The areas in this rollout are discussed next.

Horizontal Area

The options in this area are used to set the number of vertice sused in the terrain object. By default, the **No Simplification** radio button is selected and is used to include all vertices on the contour splines. Select the **Use 1/2 of Points** radio button to use half of the vertices of every contour line in the terrain object. Select the **Use 1/4 of Points** radio button to use one/fourth of the vertices of every contour line in the terrain object. Select the **Interpolate Points * 2** radio button to double the vertices of every contour line in the terrain object. Select the **Interpolate Points * 4** radio button to multiply the vertices of every contour line four times in the terrain object.
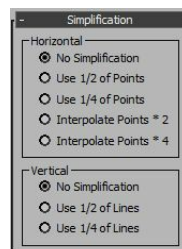
*Figure 11-18 Different areas in the **Simplification** rollout*

Vertical Area

The options in this area are used to set the number of contour lines used in the terrain object. By default, the **No Simplification** radio button is selected and is used to include all the selected

contour lines in the terrain object. Select the **Use 1/2 of Lines** radio button to use half of the lines in the terrain object. Select the **Use 1/4 of Lines** radio button to use one-fourth of the contour lines in the terrain object.

Color by Elevation Rollout

The options in this rollout are used to set the color of the terrain object on the basis of the elevation of the terrain object.
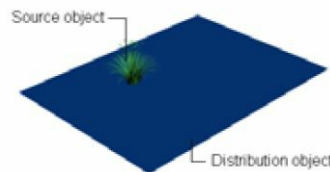
Scatter

Menu bar: Create > Compound > Scatter
Toolbar: Create > Geometry > Compound Objects > Object Type rollout > Scatter

The **Scatter** tool is used to randomly distribute the source object as an array or over the surface of the distribution object. To create a scatter object, first create an object to be used as the source object and create another object to be used as the distribution object. Next, select the source object and choose the **Scatter** tool from the **Object Type** rollout of the **Compound Objects**; the **Pick Distribution Object**, **Scatter Objects**, **Transforms**, **Display**, and **Load/Save Presets** rollouts will be displayed. Now, choose the **Pick Distribution Object** button in the **Pick Distribution Object** rollout and move the cursor over the distribution object; the shape of the cursor will change into a selection cursor. Select the distribution object in the viewport. Next, expand the **Scatter Objects** rollout. In the **Source Object Parameters** area, set the required value in the **Duplicates** spinner to create a number of duplicates of the source object, refer to Figures 11-19 and 11-20. The most commonly used rollouts of this tool are discussed next.

Pick Distribution Object Rollout

The **Pick Distribution Object** button in this rollout is used to select the distribution object in the viewport as discussed above. When you select the distribution object, the name of the selected object will be displayed next to the **Object** option at the top of the **Pick Distribution Object** rollout, refer to Figure 11-21. The four radio buttons, **Reference**, **Copy**, **Move**, and **Instance** in this rollout are used to specify the type of distribution object to be added to the scatter object.
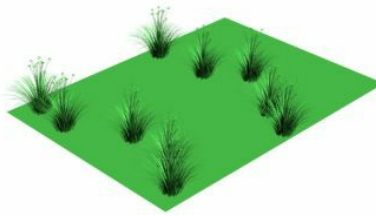

Figure 11-19 *The distribution and source objects*
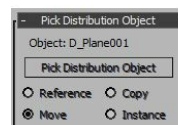
Figure 11-21 *The **Pick Distribution Object** rollout*

Figure 11-20 *The duplicates of the source object distributed over the distribution object*

Scatter Objects Rollout
The areas in this rollout are discussed next.

Distribution Area
The two radio buttons in this area are used to specify the method of distribution of the source object. By default, the **Use Distribution Object** radio button is selected, which is used to scatter the source object according to the geometry of the distribution object. If you select the **Use Transforms Only** radio button to distribute the source object, then the distribution object is not needed. Instead, you need to use the **Transforms** rollout to position the duplicates of the source object.

To position the duplicates of the source object, select the source object and choose the **Scatter** tool from the **Object Type** rollout in the **Compound Objects**. Make sure that the **Use Transforms Only** radio button is selected in the **Scatter Objects** rollout. Set the number of copies that you want to scatter in the **Duplicates** spinner. Next, expand the **Transforms** rollout and set the transform parameters using various options in it.
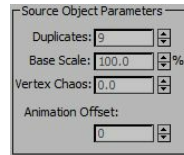
Objects Area
The list box in this area displays a list of source objects and the distribution objects, refer to Figure 11-22. Select the objects in the list; their names will be displayed in the modifier stack. On selecting the name of an object in the modifier stack, the corresponding **Parameters** rollout will be displayed in the Modify panel. You can modify the object using this rollout. The **Source Name** and **Distribution Name** text boxes display the names of the source object and the distribution object, respectively. You can also modify their names by entering new names in the text box. The **Extract Operand** button is used to create an instance or a copy of the selected object in the viewport depending on the selection of the radio button below it.

Source Object Parameters Area
The **Duplicates** spinner in this area is used to specify the number of source objects to be copied. Set the value in the **Base Scale** spinner to reduce the size of the source object, refer to Figure 11-23. The value in the **Vertex Chaos** spinner is used to create a disturbance in the source object. The value in the **Animation Offset** spinner is used to create a wavy animation.
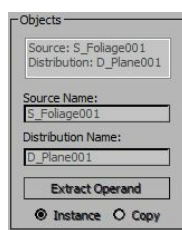
*Figure 11-22 The **Objects** area*

*Figure 11-23 The **Source Object Parameters** area*

Distribution Object Parameter Area
The options in this area are used to arrange the copied source object over the distribution object.

Display Area
The radio buttons in the **Display** area are used to display the output before and after scattering. In this area, the **Result** radio button is selected by default. As a result, the final output is displayed after scattering. You can select the **Operands** radio button to display the objects before scattering.

Transforms Rollout
Set the values in various spinners of this rollout to specify the random transform offsets for each copied source object.

Connect
Menu bar: Create > Compound > Connect
Toolbar: Create > Geometry > Compound Objects > Object Type rollout > Connect

The **Connect** tool is used to connect two or more objects at the holes on their surfaces. To connect the objects, create two objects and then convert them into editable objects. Next, select the **Polygon** or **Face** sub-object level in the modifier stack. Now, select the sub-objects of the editable objects in the viewport and then press the DELETE key
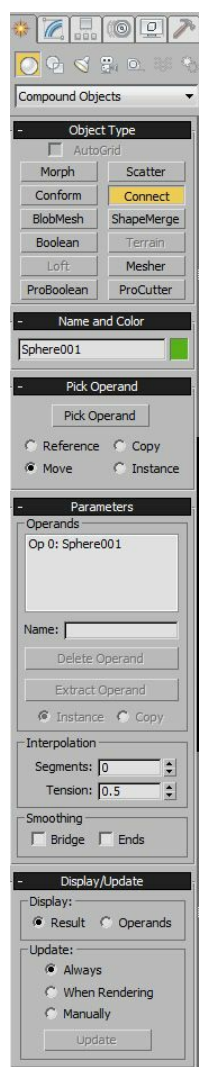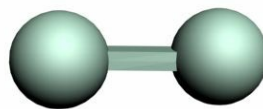
Figure 11-26 The rollouts displayed after choosing the Connect tool

to delete the selected face or polygon sub-objects, refer to Figure 11-24. Note that you need to position the objects in such a way that the holes should face each other, as shown in Figure 11-24. Next, select one of the objects and choose the **Connect** tool from the **Object Type** rollout in the **Compound Objects**. Choose the **Pick Operand** button in the **Pick Operand** rollout and move the cursor over the second object in the viewport; the shape of the cursor will change into a selection cursor. Select another object; new faces will be created to connect the holes of the objects, as shown in Figure 11-25. Next, right-click to exit the command.
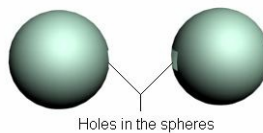
Figure 11-24 Two spheres with holes on their surfaces

Figure 11-25 The spheres after performing the Connect operation

When you choose the **Connect** tool, the **Name and Color**, **Pick Operand**, **Parameters**, and **Display/Update** rollouts will be displayed, refer to Figure 11-26. The most commonly used rollouts

are discussed next.

Pick Operand Rollout
As mentioned earlier, the **Pick Operand** rollout is used to select another object in the viewport. The **Pick Operand** button in this rollout has been discussed in the previous section.

Parameters Rollout
The areas in this rollout are discussed next.

Operands Area
The options in this area are the same as those discussed in the boolean compound objects.

Interpolation Area
The **Segments** spinner in this area is used to increase the number of segments in new faces connecting the holes of the two objects. The **Tension** spinner is used to create a curve between the connecting faces. To create a curve, the value in the **Segments** spinner should be high.

Smoothing Area
The **Bridge** check box in this area is used to apply smoothness to the connecting faces of the object. The **Ends** check box is used to apply smoothness to the faces that are at the border of the old and new surfaces of the object.

Display/Update Area
The options in the **Display/Update** area are the same as those discussed in the **Boolean** tool.
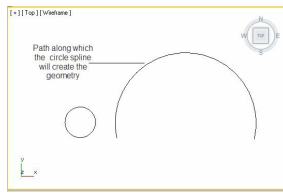
Loft
Menu bar: Create > Compound > Loft
Toolbar: Create > Geometry > Compound Objects > Object Type rollout > Loft

The **Loft** tool is used to create 3D geometry or loft objects from 2D shapes. For creating a loft object, you need to create a path and shape spline in the viewport.

To create a loft object, choose **Create > Shapes > Splines** in the **Command Panel**. Next, create a spline that you need to loft and create another spline to be used as a path, refer to Figure 11-27. Select the spline in the viewport that you want to loft along the path. Choose the **Loft** tool from the **Object Type** rollout in the **Compound Objects**; the **Name and Color**, **Creation Method**, **Surface Parameters**, **Path Parameters**, and **Skin Parameters** rollouts will bedisplayed, as shown in Figure 11-28. Now, choose the **Get Path** button in the **Creation Method** rollout and move the cursor over the path spline in the viewport; the shape of the cursor will change into a selection cursor. Select the path spline; the loft object will be created along the shape of the path spline, refer to Figure 11-29.

Figure 11-27 Two splines to create a loft object

You can also create a loft object using the **Get Shape** button in the **Creation Method** rollout. To do so, first you need to select the path spline, and then choose the **Loft** tool from the **Object Type** rollout in the **Compound Objects**. Choose the **Get Shape** button in the **Creation Method** rollout; a selection cursor will be displayed in the viewport, which will prompt you to select the shape spline. Select the shape spline; the loft object will be created along the path. The most commonly used rollouts to modify the loft objects are discussed next.

Creation Method Rollout

The options in the **Creation Method** rollout are used to select the path spline or the shape spline in the viewports to create a loft object. If you first select the shape spline in the viewport, then you need to choose the **Get Path** button in the **Creation Method** rollout to select the path spline in the viewport, along which the shape will be extruded to create a loft object. If you first select the path spline in the viewport, then you need to choose the **Get Shape** button in the **Creation Method** rollout to select the shape spline in the viewport to create a loft object along the path. Select the **Copy**, **Instance**, or **Move** radio button to specify the type of path or shape added to the loft object.
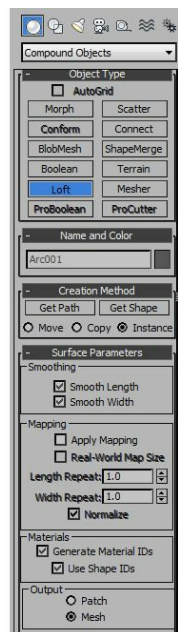
*Figure 11-28 Partial view of the rollouts displayed after invoking the **Loft** tool*

Figure 11-29 The loft object created

Surface Parameters Rollout

The options in the **Surface Parameters** rollout are used to specify the smoothness and the mapping coordinates of the lofting surface. The areas in this rollout are discussed next.

Smoothing Area

In this area, the **Smooth Length** and **Smooth Width** check boxes are selected by default. The **Smooth Length** check box is used to create the smoothness along the length of the path. The **Smooth Width** check box is used to create smoothness around the circumference of the path.

Mapping Area

The **Apply Mapping** check box in this area is used to apply the mapping coordinates to the loft object. On selecting this check box, the other options in this rollout will be activated. Set the value in the **Length Repeat** spinner to specify the number of times the map will be repeated along the length of the path. Set the value in the **Width Repeat** spinner to specify the number of times the map will be repeated around the circumference of the path.

Materials Area

In this area, the **Generate Material IDs** and **Use Shape IDs** check boxes are selected by default. The **Generate Material IDs** check box is used to create the material IDs for the loft object. The **Use Shape IDs** check box is used to create the material IDs from the spline material IDs. The material ID is the identification number that determines the sub-material in the **Multi/Sub-Object** material.

Output Area

The options in the **Output** area are used to define the type of the loft object to be displayed. By default, the **Mesh** radio button is selected and it is used to produce a mesh object. The **Patch** radio button is used to produce a patch object.

Path Parameters Rollout

If you use more than one shape to create a complex loft object, then the options in this rollout will be used to specify the position of multiple shapes along the path of the loft object. Set the value in the **Path** spinner to define the distance between the multiple shapes along the path. Select the **On** check box; the **Snap** spinner will be activated. Set the value in the **Snap** spinner to define the snap increments while setting the value in the **Path** spinner. For example, if you set the value 10.0 in the **Snap** spinner, then on setting the value in the **Path** spinner, it will be increased in the multiples of 10.0.

By default, the **Percentage** radio button is selected. Therefore, the values in the **Path** and **Snap** spinners are defined as the percentage of the total path length. Select the **Distance** radio button to define the values in the **Path** and **Snap** spinners as the distance from the first vertex of the path. To place the shapes on the path steps and vertices, select the **Path Steps** radio button.

Skin Parameters Rollout

The options in this rollout are used to simplify the mesh or patch object.
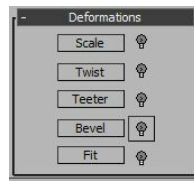
Figure 11-30 The **Deformations** *rollout*

Deformations Rollout

This rollout will be available only when you choose the **Modify** tab in the **Command Panel**. The options in this rollout are used to modify the loft objects to get different shapes, refer to Figure 11-30. You can scale, twist, teeter, bevel, and fit the loft objects using the tools in this rollout. To modify a loft object, first select it in the viewport and then choose the **Modify** tab in the **Command Panel**. Now, expand the **Deformations** rollout and choose one of the tools in this rollout to modify the selected loft object; the respective **Deformation** dialog box will be displayed. The **Scale Deformation(X)** dialog box is shown in Figure 11-31.
.
By default, a horizontal red line is displayed in this dialog box that represents the path steps along the X-axis of the loft object. The left point on the line represents the first vertex of the path. The right point on the line represents the last vertex of the path. To modify the loft object along its X-axis, choose the **Move Control Point** button on the top of the dialog box, refer to Figure 11-31. Now, move the cursor over the first or the last vertex; the shape of the cursor will change. Press and hold the left mouse button on the vertex and move the cursor vertically to scale the shape of the loft object. You can also insert more vertices in between these two vertices. To do so, choose the **Insert Corner Point** button on the top of the dialog box and click on the path where you want to insert the vertices.
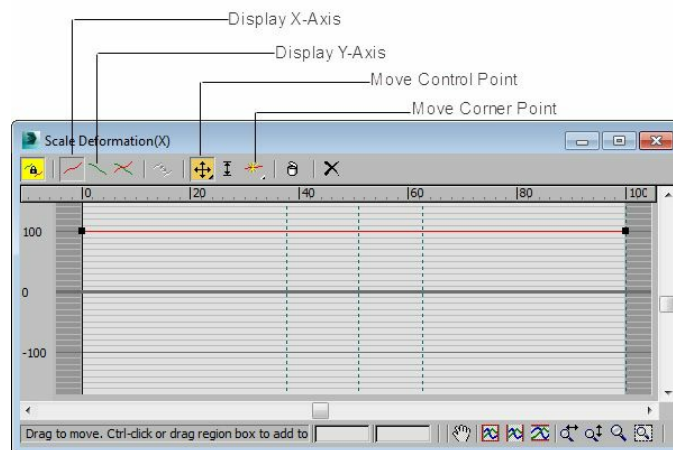

Figure 11-31 The **Scale Deformation(X)** *dialog box*

To modify the loft object along the Y-axis, choose the **Display Y-Axis** button on the top of the dialog box; the path for the Y-axis will be displayed in green color. Figures 11-32 through 11-36 show the loft objects modified using the **Scale**, **Twist**, **Fit**, **Bevel**, and **Teeter** tools.

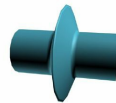*Figure 11-32 The loft object modified using the **Scale** tool*
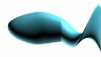
*Figure 11-33 The loft object modified using the **Twist** tool*

*Figure 11-34 The loft object modified using the **Fit** tool*

*Figure 11-36 The loft object modified using the **Teeter** tool*

*Figure 11-35 The loft object modified using the **Bevel** tool*

ShapeMerge

Menu bar: Create > Compound > ShapeMerge
Toolbar: Create > Geometry > Compound Objects >
Object Type rollout > ShapeMerge

In a shape merge object, the shape is either embedded in the mesh object or subtracted from it. To create a shape merge object, first you need to create a mesh object and a shape, and then align them, as shown in Figure 11-37. Next, select the mesh object and choose the **ShapeMerge** tool from the **Object Type** rollout of the **Compound Objects**. Next, choose the **Pick Shape** button in the **Pick Operand** rollout; a selection cursor will be displayed that will prompt you to select the shape spline. Select the shape spline and right-click to exit the shape merge command.

To view the shape merge object with the embedded shape in it, select the shape merge object. Choose the **Modify** tab in the **Command Panel** and select the **Face Extrude** modifier from the **Modifier List** drop-down list. In the **Parameters** rollout of the **Face Extrude** modifier, set the value in the **Amount** spinner; the shape will be embedded in the mesh object, as shown in Figure 11-38.

To view the subtracted shape in the shape merge object, select the **ShapeMerge** object level in the modifier stack; various rollouts will be displayed. In the **Parameters** rollout, select the **Cookie**

Cutter radio button in the **Operation** area; the shape will be subtracted from the mesh object, as shown in Figure 11-39.

Note
*The **Face Extrude** modifier is used to extrude the faces of the selected mesh object.*

When you choose the **ShapeMerge** tool, the **Name and Color**, **Pick Operand**, **Parameters**, and **Display/Update** rollouts will be displayed, as shown in Figure 11-40. These rollouts are discussed next.

Pick Operand Rollout

The **Pick Shape** button in the **Pick Operand** rollout is used to select the shape in the viewport and to merge it in the mesh object. The other options are the same as discussed earlier.
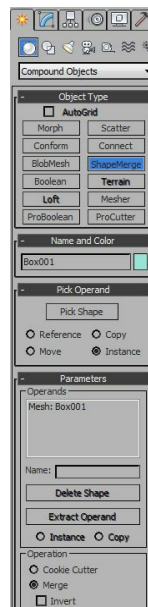

Figure 11-38 The shape embedded in the mesh object
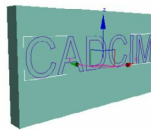
Figure 11-37 Alignment of the shape with the mesh object

Figure 11-39 The shape subtracted from the mesh object

*Figure 11-40 Partial view of the rollouts displayed after invoking the **ShapeMerge** tool*

Parameters Rollout
The areas in this rollout are discussed next.

Operands Area
The options in this area are the same as discussed earlier.

Operation Area
By default, the **Merge** radio button is selected, which is used to create an embedded shape merge object. Select the **Cookie Cutter** radio button to create the subtracted shape merge object. Select the **Invert** check box to invert the effects of the **Merge** or the **Cookie Cutter** radio button.

Display/Update Rollout
The options in this rollout are the same as discussed earlier.

Conform
Menu bar: Create > Compound > Conform
Toolbar: Create > Geometry > Compound Objects > Object Type rollout > Conform

The **Conform** tool is used to adjust the position of an object over another object such that the object completely fits on another object according to its shape, refer to Figure 11-41. The object that is to be positioned over another object is known as the Wrapper object, whereas the object on which the Wrapper object will be positioned is known as the Wrap-To object.

To create a conform object, you need two objects. One of these objects will be used as the Wrapper object and another as the Wrap-To object. Position both the objects, refer to Figure 11-41. Select the Wrapper object and then choose the **Conform** tool from the **Object Type** rollout in the **Compound Objects**. Choose the **Pick Wrap-To Object** button in the **Pick Wrap-To Object** rollout; a selection cursor will be displayed which will prompt you to select the Wrap-To object. Select the Wrap-To object; the Wrapper object will be positioned over the Wrap-To object in such a way that it fits according to the shape of the Wrap-To object, as shown in Figure 11-42. Next, you need to set the other parameters in the various rollouts displayed on invoking the **Conform** tool. These rollouts are discussed next.

Figure 11-41 *The road (Wrapper object) over a hilly area (Wrap-To object) before using the **Conform** tool*

Figure 11-42 *The road (Wrapper object) over a hilly area (Wrap-To object) after using the **Conform** tool*

Pick Wrap-To Object Rollout

The **Pick Wrap-To** button in this rollout is used to select the Wrap-To object in the viewport. The other options are the same as discussed earlier in this chapter.

Parameters Rollout

The areas in this rollout are discussed next.

Objects Area

The options in this area are the same as discussed earlier in this chapter.

Vertex Projection Direction Area

The **Vertex Projection Direction** area consists of different radio buttons that are used to specify the projection of the vertices in the conform object.

Wrapper Parameters Area

Set the value in the **Default Projection Distance** spinner to adjust the distance of a vertex in the Wrapper object from its default position so that it intersects the Wrap-To object. Set the value in the **Standoff Distance** spinner to adjust the distance between a vertex of the Wrapper object and the surface of the Wrap-To object.

The **Update** and **Display** areas are the same as discussed earlier.

ProBoolean

Menu bar: Create > Compound > ProBoolean
Toolbar: Create > Geometry > Compound Objects >
Object Type rollout > ProBoolean

The **ProBoolean** tool is used to perform some advanced functions in a boolean operation. In this process, you can select multiple objects to boolean at a time, change the boolean operations, and reorder the operands. The objects that are used to create the proboolean object are called as operands. You need to perform the boolean operations on these operands using the **ProBoolean** tool.

To create a proboolean object, create two or more objects in the viewport and arrange them such that they should intersect each other, refer to Figure 11-43. Now, select the object on which you want to perform the boolean operation. Next, choose the **ProBoolean** tool from the **Object Type** rollout in

the **Compound Objects**; the **Name and Color**, **Pick Boolean**, **Parameters**, and **Advanced Options** rollouts will be displayed. Next, choose the operation that you want to perform in the **Operations** area of the **Parameters** rollout. Now, choose the **Start Picking** button in the **Pick Boolean** rollout and move the cursor over another object; the boolean cursor will be displayed. Now, click on the object to perform the boolean operation. Note that the **Start Picking** button remains active and you can select one or more objects to perform the boolean operation. Select other objects in the viewport one by one to perform the boolean operation. Then, choose the **Start Picking** button again to deactivate it, refer to Figures 11-44, 11-45, and 11-46.
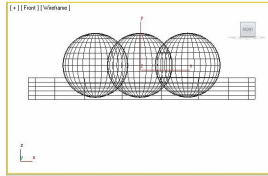
Figure 11-43 The objects to perform the proboolean operation in the Front viewport
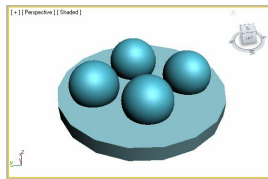
Figure 11-44 The objects to perform the proboolean operation in the Perspective viewport
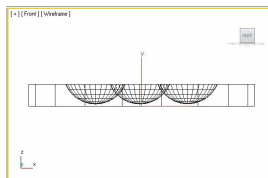
Figure 11-45 The objects after performing the proboolean operation in the Front viewport
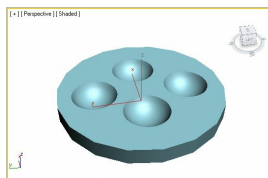
Figure 11-46 The objects after performing the proboolean operation in the Perspective viewport

Note

*When you select the objects to perform a boolean operation in the viewport, they will be displayed as operands in the text field of the **Sub-objects Operations** area in the **Parameters** rollout.*

The most commonly used rollouts are discussed next.

Pick Boolean Rollout

The **Start Picking** button in this rollout is used to select the operands in the viewport to perform the proboolean operation. The other options in this rollout are the same as discussed earlier in this chapter.

Parameters Rollout

The **Parameters** rollout is used to define the type of the proboolean operation. The areas in this rollout are discussed next.
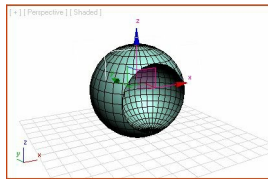
Operation Area

The options in the **Operation** area are used to specify the type of proboolean operations to be performed on the operands. You need to select one of the radio buttons in this area before choosing the **Start Picking** button in the **Pick Boolean** rollout to perform different boolean operations.

The **Union**, **Intersection**, and **Subtraction** radio buttons are the same as discussed earlier in this chapter. The **Merge** radio button is used to join the objects into a single object. You can also select one of the check boxes in this area to create more effects. Select the **Imprint** check box to print the outline of the intersecting edges of the object, refer to Figures 11-47, 11-48, and 11-49. Select the **Cookie** check box to delete the faces of the original object, as shown in Figure 11-50.
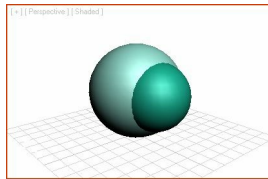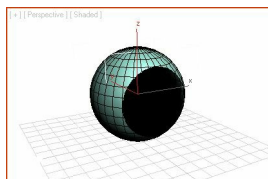

Figure 11-47 The two spheres intersecting each other to perform the boolean operation

Figure 11-48 The proboolean object after performing the boolean operation
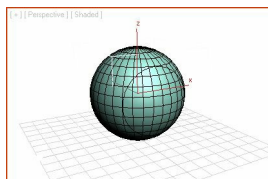
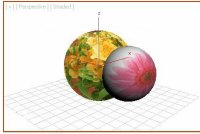*Figure 11-49 The proboolean object after selecting the **Imprint** check box*

*Figure 11-50 The proboolean object after selecting the **Cookie** check box*

The options in the **Display** area are the same as discussed earlier.

Apply Material Area

Select the **Apply Operand Material** radio button in this area to apply the material of the operand to the new faces created by the proboolean operation. Select the **Retain Original Material** radio
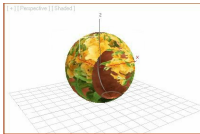
button to apply the material of the original object to the new faces created by using the proboolean operation, refer to Figures 11-51, 11-52, and 11-53.

Figure 11-51 The two spheres with materials applied on them
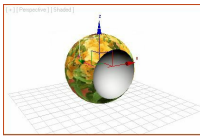
*Figure 11-52 The proboolean object after selecting the **Apply Operand Material** radio button*

*Figure 11-53 The proboolean object after selecting the **Retain Original Material** radio button*

Sub-object Operations Area

The options in this area are used on the operands created in the viewport. These operands are also highlighted in the list given at the bottom of the **Sub-object Operations** area. The **Extract Selected** button is used to extract a copy or an instance of the selected operand of the boolean object from the list. To do so, select the boolean object in the viewport, choose the **Modify** tab in the **Command Panel**, and then select the operand that you want to extract from the list in the **Parameters** rollout. Next, select the **Copy** radio button to create a copy of the selected operand. Select the **Remove** radio button to remove the selected operand from the list or select the **Inst** radio button to create an instance of the selected operand. Next, choose the **Extract Selected** button to extract the selected operand.

The **Reorder Ops** button is used to change the order of the boolean operations in the viewport. To do so, select an operand in the list and then set the order in which you want the boolean operation to be performed by entering the corresponding number in the spinner on the right side of the **Reorder Ops** button. Next, choose the **Reorder Ops** button; the order of the boolean operations will be changed in the list as well as in the viewport.

The **Change Operation** button is used to change the type of operation for the selected operand. To do so, select the operand in the list and select the required operation by selecting the corresponding radio button in the **Operation** area. Next, choose the **Change Operation** button; the operand will show the changed boolean operation.

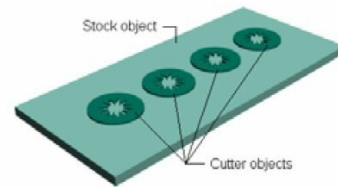# ProCutter

Menu bar: Create > Compound > ProCutter
Toolbar: Create > Geometry > Compound Objects > Object Type rollout > ProCutter

The **ProCutter** tool is used to break an object into separate objects with the help of the mesh objects.

The mesh objects that are used to break the object are known as cutters and the object that is divided by cutters is known as the stock object.

To create a procutter object, first create an object to be broken into separate objects. Create one or more mesh objects to be used as cutters. Align both the objects, as shown in Figures 11-54 and 11-55.
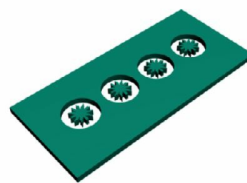

Figure 11-54 The cutter and stock objects aligned for the procutter operation
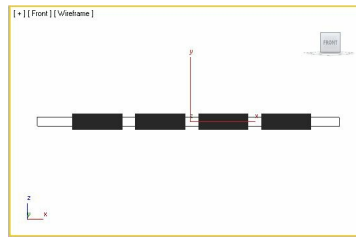
Figure 11-55 The cutter and stock objects before performing the procutter operation in the Front viewport

Select one of the cutter objects, choose the **ProCutter** tool from the **Object Type** rollout in the **Compound Objects**; the **Name and Color**, **Cutter Picking Parameters**, **Cutter Parameters**, and **Advanced Options** rollouts will be displayed. In the **Cutter Picking Parameters** rollout, choose the **Pick Cutter Objects** button and select the additional cutters in the viewport. Next, choose the **Pick Stock Objects** button and select the object that you want to cut in the viewport; the object will be cut, as shown in Figure 11-56. Right-click to exit the command. The most commonly used rollouts are discussed next.

Figure 11-56 The cutter and stock objects after performing the procutter operation

Cutter Picking Parameters Rollout

The **Pick Cutter Objects** button in this rollout is used to select the objects or cutters in the viewport that are used to divide the object. The **Pick Stock Objects** button is used to select the object that will be separated by the cutters. The other options in this rollout are the same as discussed earlier.

Cutter Parameters Rollout

The **Cutter Parameters** rollout is used to define the type of procutter operations. The areas in this rollout are discussed next.

Cutting Options Area

The check boxes in this area are used to define the final output of the procutter operation. The **Stock Outside Cutter** check box is used to get the parts of the stock object that are outside the cutters, refer to Figure 11-56. Select the **Stock Inside Cutter** check box to get the parts of the stock object that are inside the cutters, refer to Figure 11-57. Select the **Cutter Outside Stock** check box to get the parts of the cutters that are outside the stock object, as shown in Figure 11-58.

*Figure 11-57 The cutter and stock objects after selecting the **Stock Inside Cutter** check box*

*Figure 11-58 The cutter and stock objects after selecting the **Cutter Outside Stock** check box*

The options in the **Display** and **Apply Material** areas are the same as discussed earlier.

Sub-object Operations Area
The options in this area are the same as discussed in the **ProBoolean** compound object.

TUTORIALS

Before starting the tutorials, you need to download the *c11_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 zipped file and save them in the *Documents* folder.

Tutorial 1

In this tutorial, you will create a toothpaste tube using the **Loft** and **Boolean** tools, as shown in Figure 11-59. **(Expected time: 30 min)**

Figure 11-59 The model of a toothpaste tube

The following steps are required to complete this tutorial:

a. Create the project folder.
b. Create the body of toothpaste tube.
c. Create the cap of toothpaste tube.
d. Assign materials and maps to the tube.

e. Save and render the scene.

Creating the Project Folder

1. Create a new project folder with the name *c11_tut1* at *\Documents\3dsmax2015* and then save the file with the name *c11tut1*, as discussed in Tutorial 1 of Chapter 2.

2. Open the Windows Explorer and then browse to the *c11_3dsmax_2015_tut* folder and copy the *toothpaste_tube.jpg* file from this folder to *\Documents\3dsmax2015\c11_tut1\sceneassets\images*.

Creating the Body of Toothpaste Tube

In this section, you will create the body of toothpaste tube by using the **Loft** tool.

1. Activate the Front viewport. Choose **Create > Shapes** from the **Command Panel**; the **Splines** option is displayed in the drop-down list in the **Command Panel**. Next, choose the **Circle** tool from the **Object Type** rollout.

2. Create a circle in the viewport to use it as a shape spline. It is automatically named as *Circle001*.

3. In the **Parameters** rollout, set the value **4.0** in the **Radius** spinner.

4. Create another circle in the Front viewport, refer to Figure 11-60, to use as a shape spline and set the value **16.0** in the **Radius** spinner. It is automatically named as *Circle002*.

5. Choose the **Line** tool from **Create > Shapes > Splines > Object Type** rollout in the **Command Panel**.

6. Create a line in the Front viewport to use as a path spline. You can assume your own dimensions for the length of the line, refer to Figure 11-60. The line is automatically named as *Line001*.
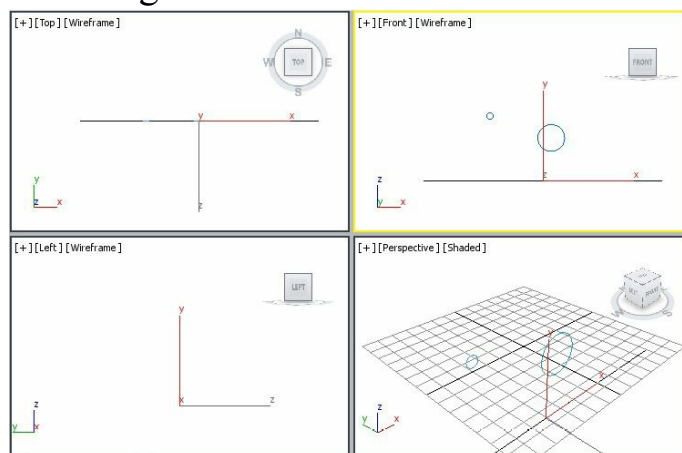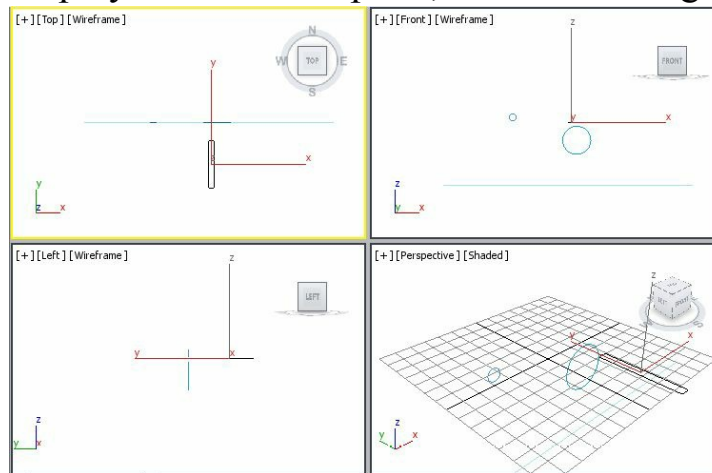

Figure 11-60 The Circle001, Circle002, and Line001 splines in viewports

7. Activate the Top viewport, and choose the **Rectangle** tool from **Create > Shapes > Splines > Object Type** rollout in the **Command Panel**. Create a rectangle to use as a shape spline. The rectangle is automatically named as *Rectangle001*.

8. In the **Parameters** rollout of *Rectangle001*, set the following parameters:

Length: **55.033** Width: **5.76** Corner Radius: **1.0**

The *Rectangle001* spline is displayed in the viewports, as shown in Figure 11-61.

Figure 11-61 The Rectangle001 in viewports

Next, you will create a loft object using the shape splines, path spline, and the **Loft** tool. You will use *Circle001*, *Circle002*, and *Rectangle001* as the shape splines and *Line001* as the path spline.

9. Activate the Front viewport, select *Line001* spline in the viewport.

10. Choose **Create > Geometry** from the **Command Panel**. Select **Compound Objects** from the drop-down list and then choose the **Loft** tool from the **Object Type** rollout; various rollouts are displayed in the **Command Panel**.

11. In the **Creation Method** rollout, choose the **Get Shape** button and move the cursor over *Circle001* in the Front viewport; the shape of the cursor changes. Now, select *Circle001*; a shape is created, as shown in Figure 11-62. The new shape is automatically named as *Loft001*.

12. Make sure that *Loft001* is selected in the viewport. In the **Path Parameters** rollout, set the value **8.0** in the **Path** spinner to define the distance between *Circle001* and *Circle002* along *Line001*.

Note

*The value in the **Path** spinner is set according to the length of the line spline.*
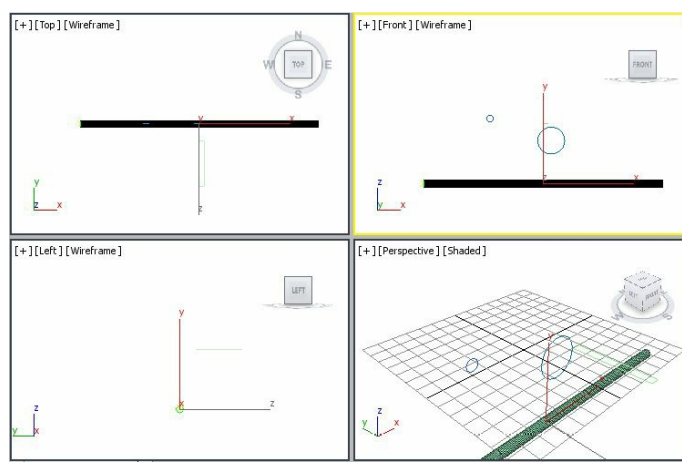
*Figure 11-62 A shape created along the path spline (Line001)*

13. In the **Creation Method** rollout, choose the **Get Shape** button and move the cursor over *Circle002* in the Front viewport; the shape of the cursor changes. Select *Circle002*; the shape of the tube is created, as shown in Figure 11-63. Again, choose the **Get Shape** button to exit the command.
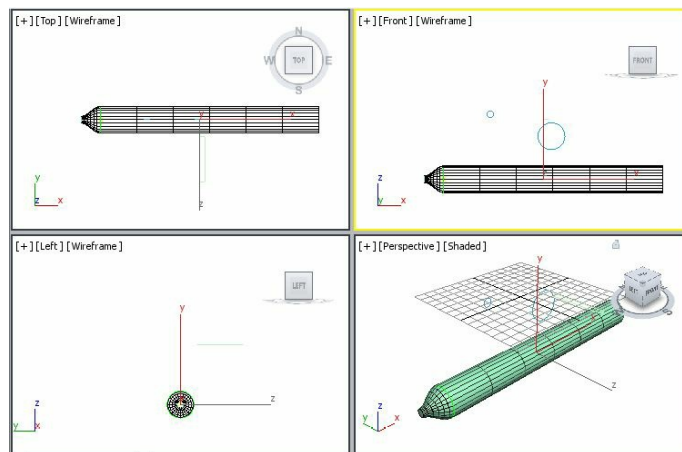
Figure 11-63 The shape of the tube created along the path spline

Next, you need to create the shape of the lower portion of the tube. To do so, activate the Top viewport.

14. Make sure that *Loft001* is selected in the viewport. In the **Path Parameters** rollout, set the value **98.0** in the **Path** spinner.

15. In the **Creation Method** rollout, choose the **Get Shape** button and move the cursor over *Rectangle001* in the Top viewport; the shape of the cursor changes. Select *Rectangle001*; the shape of tube is created, as shown in Figure 11-64. Next, right-click in the viewport to exit the loft command.
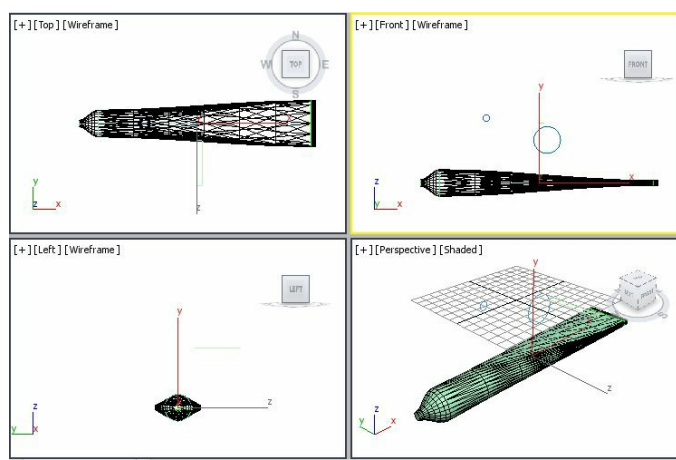
Figure 11-64 The shape of tube created in viewports

16. Make sure that *Loft001* is selected. In the **Name and Color** rollout, rename *Loft001* to *toothpaste tube*.
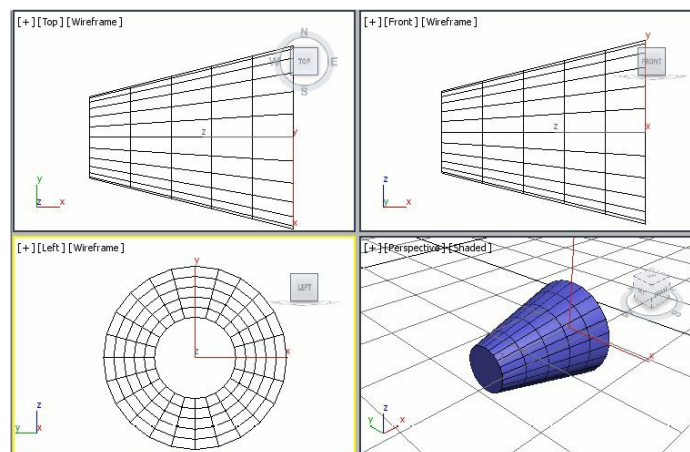
Creating the Cap of the Toothpaste Tube

In this section, you will create the cap of the toothpaste tube by using the **Cone** tool.

1. Activate the Left viewport, choose **Create > Geometry** in the **Command Panel** and select the **Standard Primitives** option from the drop-down list. Now, choose the **Cone** tool from the **Object Type** rollout and create a cone.

2. Choose the **Modify** tab from the **Command Panel**. Next, in the **Parameters** rollout, set the following parameters:

Radius 1: **9.0** Radius 2: **4.0** Height: **20**

Use the default values for other options.
3. Modify the name of cone as *cap01*.

4. Make sure that *cap01* is selected. Next, right-click on it; a quad menu is displayed. Choose the **Hide Unselected** option to temporarily hide the other objects in the viewport.
5. Choose the **Zoom Extents All Selected** tool; *cap01* is zoomed in viewports, as shown in Figure 11-65.

Figure 11-65 The cap01 geometry zoomed in viewports

Next, you need to create a hole in *cap01* to create the space for inserting the top portion of *toothpaste tube*. To do so, you need to use the **Boolean** tool in **Compound Objects**.

6. Activate the Top viewport and select *cap01*.

7. Choose the **Use Selection Center** tool from the **Use Center** flyout in the **Main** ⬛**Toolbar**; the coordinate gizmo moves to the center of *cap01*. Also, choose the **Select and Uniform Scale** tool.

🌀Note

*The tools available in the **Use Center** flyout determine the geometric center for the scale and rotate operations.*

8. Activate the Perspective viewport and make sure the cap is selected. Press and hold the SHIFT key and the left mouse button and move the cursor down until the value in the X, Y, and Z coordinates in the coordinate display becomes **90** and then release the left mouse button and the SHIFT key; the **Clone Options** dialog box is displayed. Make sure that the **Copy** radio button is selected and **1** is set in the **Number of Copies** spinner and then choose the **OK** button; *cap002* is displayed, as shown in Figure 11-66. You need to switch to wireframe mode in the Perspective viewport to view *cap002*, refer to Figure 11-66.

9. Activate the Front viewport and then choose the **Select and Move** tool and align *cap002* with *cap01*, as shown in Figure 11-67.
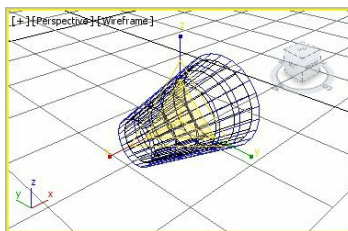
Figure 11-66 The cap002 geometry displayed
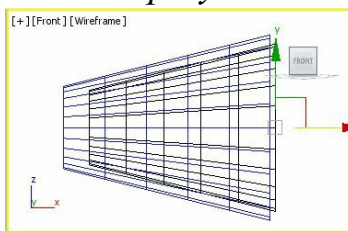
Figure 11-67 The cap002 geometry after the alignment

10. Select *cap01* in the Top viewport. Choose **Create > Geometry** in the **Command Panel**. Select the **Compound Objects** option from the drop-down list in the **Command Panel** and choose the **Boolean** tool from the **Object Type** rollout.

11. Make sure that the **Subtraction(A-B)** radio button is selected in the **Operation** area of the **Parameters** rollout.

12. In the **Pick Boolean** rollout, select the **Move** radio button if it is not already selected. Choose the **Pick Operand B** button and move the cursor over *cap002*; the shape of the cursor changes. Select *cap002*; the overlapping portion of *cap002* is removed from the *cap01*. Next, switch to Shaded mode in the Perspective viewport. Figure 11-68 shows *cap01* in viewports. Next, right-click to exit the boolean command.

Note

*To view the effect of the boolean operation in the Perspective viewport, you need to use the **Orbit** tool.*

Next, you need to modify the cap using its sub-objects to make it look realistic.

13. Convert *cap01* into editable mesh object.

14. In the modifier stack, click on the plus (+) sign on the left side of **Editable Mesh**; all sub-object levels are displayed.

15. Select the **Polygon** sub-object level to activate it.
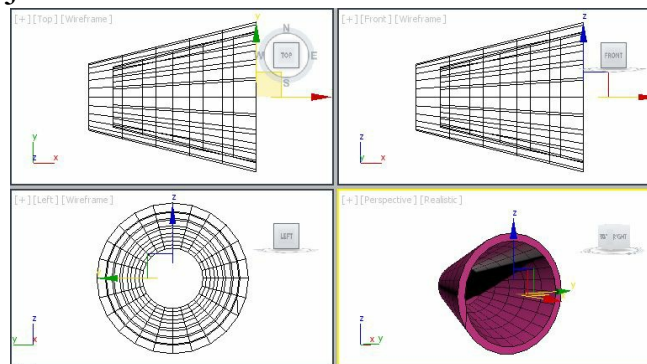
Figure 11-68 *The cap01 after performing the Subtraction(A-B) boolean operation in viewports*

16. In the **Selection** rollout, select the **Ignore Backfacing** check box.

17. In the Left viewport, select the alternative row of polygons of *cap01* by holding the CTRL key, as shown in Figure 11-69.
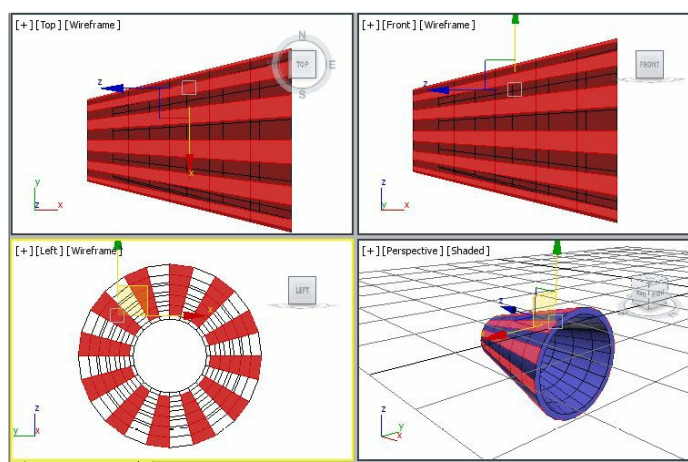
Figure 11-69 *The selected polygons of cap01*

18. Create a selection set of the selected polygons. You can use the selection set of the selected objects or sub-objects later, if needed. To create a selection set, enter **selected polygons** in the **Named Selection Sets** drop-down list in the **Main Toolbar** and press ENTER, refer to Figure 11-70.

19. In the **Edit Geometry** rollout, set the value **0.1** in the **Extrude** spinner, and then press the ENTER key; the selected polygons are extruded.

20. The extruded polygons are displayed, as shown in Figure 11-71. In the modifier stack, select the **Polygon** sub-object level again to deactivate it.
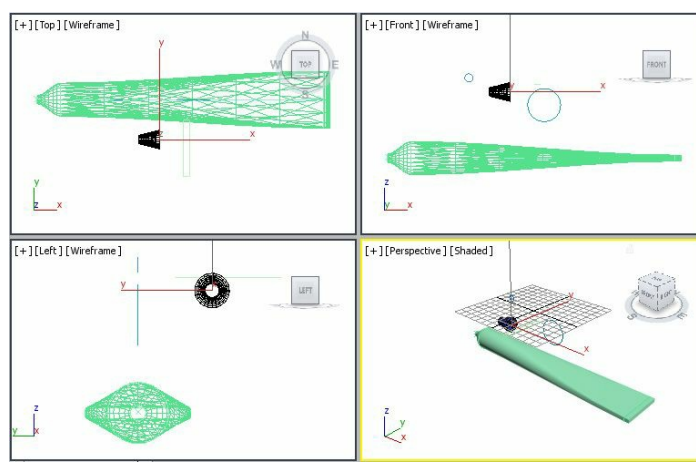

***Figure 11-70*** *The **Named Selection Sets** drop-down list*
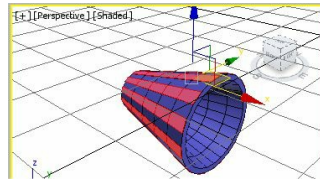
Figure 11-71 *The extruded polygons in the Perspective viewport*

21. Right-click in a viewport; a quad menu is displayed. Choose the **Unhide All** option; all objects and shapes are displayed in the viewport.

22. Choose the **Zoom Extents All** tool; all objects are displayed, as shown in Figure 11-72.

Figure 11-72 The objects in viewports

23. Make sure *cap01* is selected and then choose the **Use Pivot Point Center** tool from [icon] the **Main Toolbar**. Now, align *cap01* with *toothpaste tube* using the **Select and Move** tool in viewports, as shown in Figure 11-73.
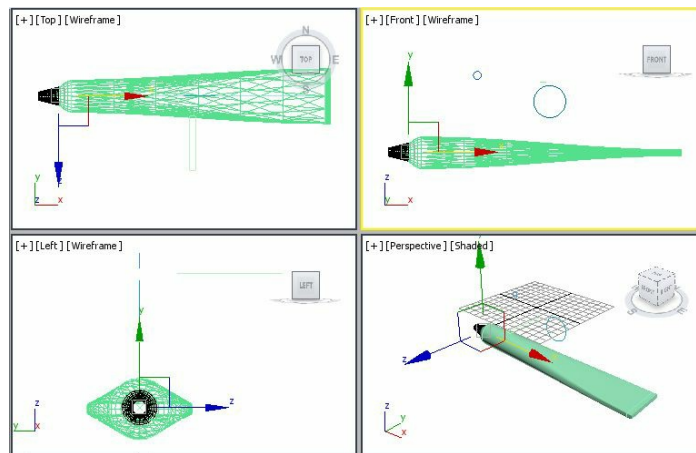
Figure 11-73 The cap01 geometry in viewports after aligning with toothpaste tube

24. Select *Circle001*, *Circle002*, *Line001*, and *Rectangle001* shapes from the Scene Explorer using the CTRL key. Next, press the DELETE key to delete all shapes from the scene.

Assigning Materials and Maps to the Tube

In this section, you will assign the materials and maps to *toothpaste tube*.

1. Select *toothpaste tube* in any viewport. Next, choose **Rendering > Material Editor > Compact Material Editor** from the menu bar; the **Material Editor** dialog box is displayed. Make sure the first sample slot is selected in the **Material Editor** dialog box. By default, the **Standard** material is selected in it and you need to use the same for *toothpaste tube*.

2. Make sure that the **Blinn** shader is selected in the **Shader Basic Parameters** rollout. In the **Blinn Basic Parameters** rollout, choose the **Diffuse** map button on the right side of the **Diffuse** color swatch; the **Material/Map Browser** dialog box is displayed. Expand the **Maps > Standard** rollout and select the **Bitmap** map. Next, choose the **OK** button; the **Select Bitmap Image File** dialog box isdisplayed. As the project folder is already set, the *images* folder is displayed in the **Look**

in drop-down list of this dialog box.

3. Select the file *toothpaste_tube.jpg* and choose the **Open** button; the image is displayed in the selected sample slot. Also, the rollouts to modify the bitmap are displayed in the **Material Editor** dialog box. Now, choose the **Go to Parent** tool to go back to the parent level.

4. In the **Specular Highlights** area, set the following parameters:

Specular Level: **56** Glossiness: **40**

5. Make sure that *toothpaste tube* is selected in the viewport. Next, choose the **Assign Material to Selection** tool in the **Material Editor** dialog box. Also, choose the **Show Shaded Material in Viewport**tool to display the map in the viewport.

6. You will notice that the map in *toothpaste tube* is not aligned properly, refer to Figure 11-74. To align the map properly, you need to apply the **UVW Map** modifier.

7. Choose the **Modify** tab in the **Command Panel**. Select the **UVW Map** modifier from the **Modifier List** drop-down list; the **UVW Mapping** is displayed in the modifier stack. Also, the **Parameters** rollout is displayed in the Modify panel.

8. In the **Parameters** rollout, select the **Box** radio button.

9. In the **Alignment** area of the **Parameters** rollout, select the **Y** radio button and set the value **0.5** in the **Height** spinner. You can set values in the **Length** and **Width** spinners as per the length and width of the tube to align the map properly, refer to Figure 11-75.

Next, you will create the material for *cap01*.

10. Select *cap01* in the viewport and select another sample slot in the **Material Editor** dialog box.
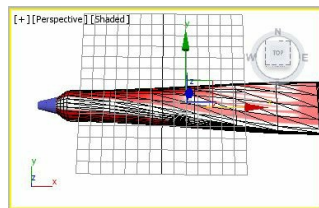
Figure 11-74 The map on the toothpaste tube
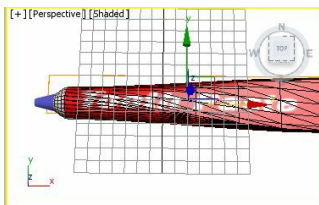
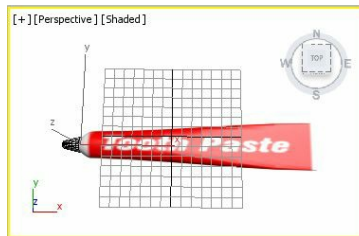*Figure 11-75 The map on the toothpaste tube after applying the UVW Map modifier*

11. By default, the **Standard** material is selected in the **Material Editor** dialog box and you will use the same for *cap01*. Make sure that the **Blinn** shader is selected in the **Shader Basic Parameters**rollout. In the **Blinn Basic Parameters** rollout, choose the **Diffuse** color swatch; the **Color Selector: Diffuse Color** dialog box is displayed. Select the white color and choose the **OK** button to close the dialog box.

12. In the **Specular Highlights** area, set the following parameters:

Specular Level: **44** Glossiness: **16**

13. Make sure that *cap01* is selected in the viewport. Next, choose the **Assign Material to Selection** tool in the **Material Editor** dialog box. Also, choose the **Show Shaded Material in Viewport** tool to display the map in the viewport.

14. The toothpaste tube is displayed, as shown in Figure 11-76. Close the **Material Editor** dialog box.


Figure 11-76 The toothpaste tube after assigning the map

Next, you need to apply the twist deformation.

15. Select *toothpaste tube* in the viewport and choose the **Modify** tab in the **Command Panel**.

16. In the modifier stack, select **Loft** and expand the **Deformations** rollout in the Modify panel. Now, in the **Deformations** rollout, choose the **Twist** button; the **Twist Deformation** dialog box is displayed, as shown in Figure 11-77.
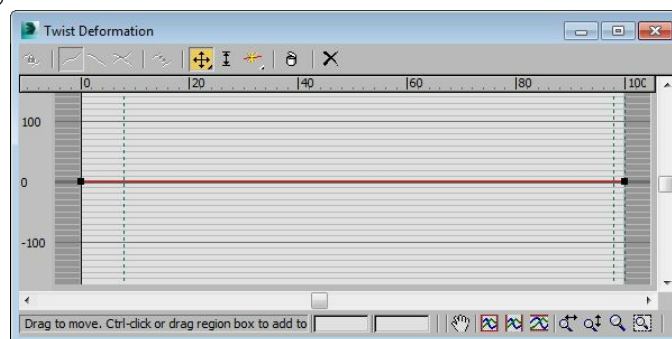
*Figure 11-77 The **Twist Deformation** dialog box*

17. In the **Twist Deformation** dialog box, choose the **Move Control Point** tool. Next, move the first vertex point (placed on the left side) vertically downward to **-65.0**. Alternatively, you can set the exact value in the edit box given at the bottom of this dialog box, refer to Figure 11-78; the

toothpaste tube geometry is twisted, as shown in Figure 11-79. Close the **Twist Deformation** dialog box.
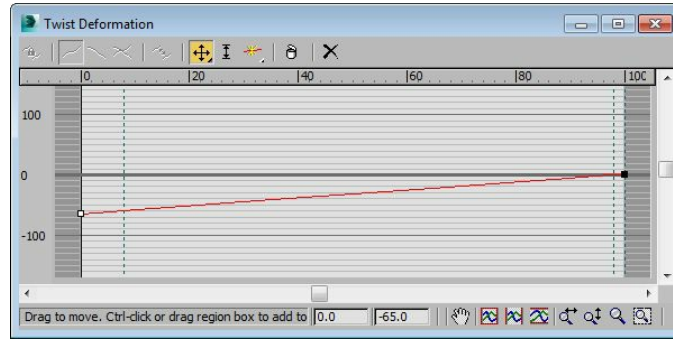
Figure 11-78 *The first vertex point moved in the **Twist Deformation** dialog box*

Figure 11-79 *Twisted toothpaste tube*

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 *c11_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. Choose **Save** from the **Application** menu.

2. Activate the Perspective viewport. Render the scene using the **Render Production** tool in the **Main Toolbar**; the final output is displayed, refer to Figures 11-80 and 11-81.

Figure 11-80 *The final output after rendering (view 1)*

Figure 11-81 *The final output after rendering (view 2)*

Tutorial 2

In this tutorial, you will create a scene, as shown in Figure 11-82, using different compound objects. **(Expected time: 60 min)**

Figure 11-82 Scene for Tutorial 2

The following steps are required to complete this tutorial:

a. Create the project folder.
b. Create the ground.
c. Create hills.
d. Create plants.
e. Create road over ground.
f. Create background for the final output.
g. Save and render the scene.

Creating the Project Folder

1. Create a new project folder with the name *c11_tut2* at *\Documents\3dsmax2015* and then save the file with the name *c11tut2*, as discussed in Tutorial 1 of Chapter 2.

2. Open the Windows Explorer and then browse to the *c11_3dsmax_2015_tut* folder and copy the *Grass.jpg, SANDSHORE.jpg,* and *Road.jpg* files from this folder to *\Documents\3dsmax2015\c11_tut2\sceneassets\images*.

Creating the Ground

In this section, you will create a ground by using the **Plane** tool.

1. Activate the Top viewport. Choose **Create > Geometry** in the **Command Panel**; the **Standard Primitives** option is displayed by default in the drop-down list. Choose the **Plane** tool and create a plane.

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

Length: **383.432** Width: **395.936**
Length Segs: **20** Width Segs: **20**

Next, you need to edit the plane using its sub-objects to make it look like a hilly surface.

3. Make sure that the plane is selected in the Top viewport and then convert it into editable poly object. Choose the **Zoom Extents All** tool.

4. In the modifier stack, expand **Editable Poly** by clicking on the plus sign on its left side. Select the **Vertex** sub-object level; all vertices of the plane are displayed in viewports, as shown in Figure 11-83.
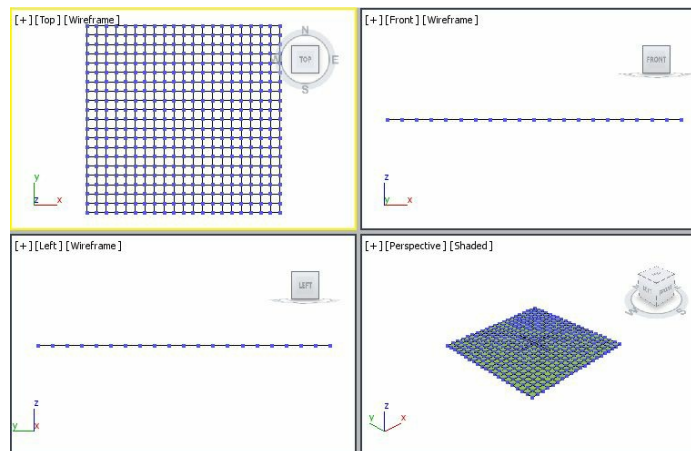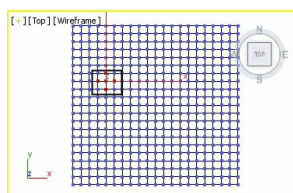

Figure 11-83 All vertices displayed in viewports

5. In the Top viewport, select a vertex, as shown in Figure 11-84. Now, in the **Selection** rollout, choose the **Grow** button twice to select the vertices, as shown in Figure 11-85.
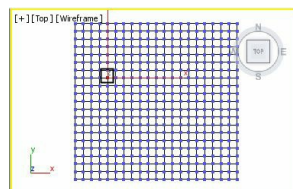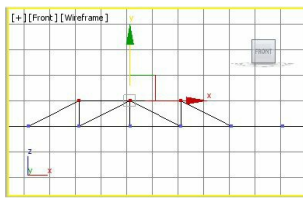

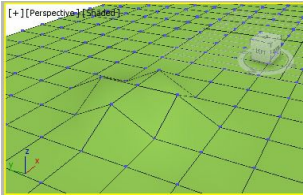*Figure 11-84 A vertex selected in the Top viewport*

*Figure 11-85 The vertices selected after choosing the **Grow** button*

6. Activate the Front viewport. Move the cursor over the vertical axis and drag the selected vertices up by one grid point, refer to Figures 11-86 and 11-87.

*Figure 11-86 The selected vertices dragged up in the Front viewport*

Figure 11-87 The selected vertices dragged up in the Perspective viewport

7. Zoom in the Perspective viewport and create the hilly surface by selecting vertices at different places on the plane using the same method as discussed in steps 5 and 6, as shown in Figure 11-88.

8. Deselect the **Vertex** sub-object level in the modifier stack. Then, apply the **MeshSmooth** modifier from the **Modifier List** drop-down list, as discussed earlier, to make the surface smooth, as shown inFigure 11-89.
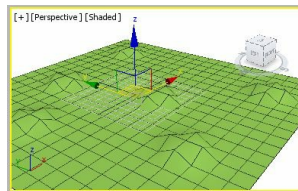
Figure 11-88 The hilly surface created using the vertices of the plane
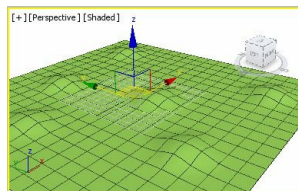
Next, you need to assign a map to the plane to give it a realistic look.

9. Make sure that the plane is selected in the viewport. Next, choose **Rendering> Material Editor > Compact Material Editor** from the menu bar; the **Material Editor** dialog box is displayed.

10. Select the **01-Default** sample slot in the **Material Editor** dialog box. Choose the **Diffuse** map button on the right side of the **Diffuse** color swatch; the **Material/Map Browser** dialog box is displayed. Select the **Bitmap** map from the **Maps > Standard** rollout and choose the **OK** button; the **Select Bitmap Image File** dialog box is displayed. As the project folder is already set, the *images* folder is displayed in the **Look in** drop-down list of this dialog box. Select the

file *Grass.jpg* from this dialog box and then choose the **Open** button; the selected image is displayed in the selected sample slot.

11. In the **Coordinates** rollout of the **Material Editor** dialog box, set the values as given next.

U-Tiling: **5** V-Tiling: **5**

12. Make sure that the plane is selected in the viewport. Next, choose the **Assign Material to Selection** tool from the **Material Editor** dialog box. Now, choose the **Show Shaded Material in Viewport** tool to display the map in the viewports. The map is assigned to the plane and displayed in the Perspective viewport, as shown in Figure 11-90. Now, close the **Material Editor** dialog box.
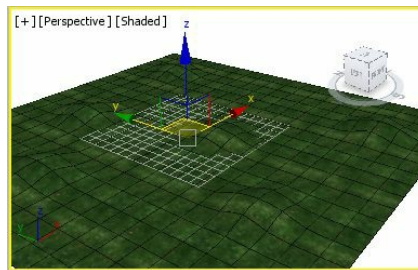
*Figure 11-90 The plane after assigning the map to it in the Perspective viewport*

13. Set the view of the plane in the Perspective viewport using the viewport navigation tools such as **Zoom**, **Orbit**, as shown in Figure 11-91.

14. Name the plane as *ground* in the **Name and Color** rollout.

Creating Hills

In this section, you will create hills by using the **Terrain** tool in **Compound Objects**.

1. Activate the Top viewport, Next, choose **Create > Shapes** in the **Command Panel**. Also, choose the **Line** tool from the **Object Type** rollout.
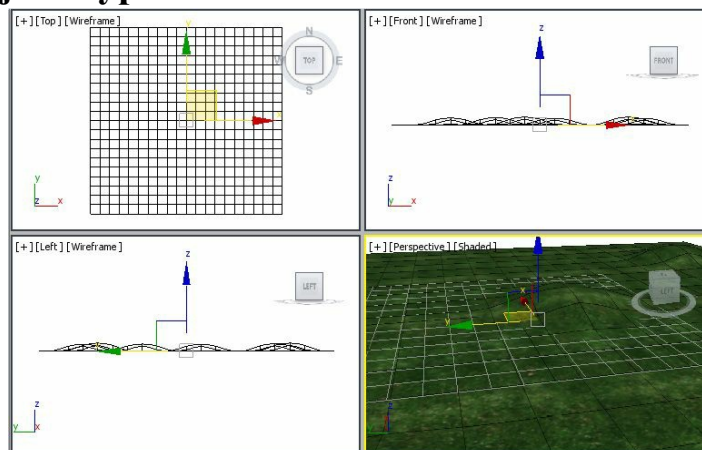

*Figure 11-91 The plane after using the viewport navigation tools*

2. In the **Creation Method** rollout, select the **Corner** radio button in the **Initial Type** area and select

the **Smooth** radio button in the **Drag Type** area.

3. Create a close line spline, as shown in Figure 11-92.

4. Hide *ground* temporarily, as discussed earlier, to get more room to create hills.

5. Activate the Front viewport and create four copies of the line spline, refer to Figure 11-93.
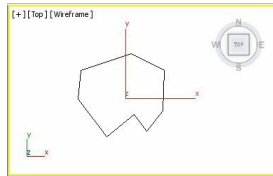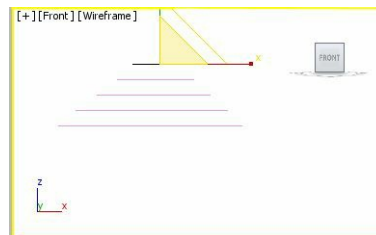

*Figure 11-92 A close line spline created in the Top viewport*
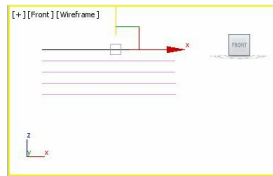
Figure 11-93 Four copies of the line spline created in the Front viewport

6. Choose the **Select and Uniform Scale** tool and scale the lines in the Front viewport, as shown in Figure 11-94.

*Figure 11-94 The scaled lines after using the **Select and Uniform Scale** tool*

7. Choose the **Select Object** tool and select all lines by dragging a selection box around them.

8. Choose **Create > Geometry** in the **Command Panel** and select **Compound Objects** from the drop-down list displayed below the **Geometry** button. Choose the **Terrain** tool from the **Object Type** rollout; the terrain object is created, as shown in Figure 11-95. Right-click to exit the command.

Figure 11-95 *The terrain object created in viewports*
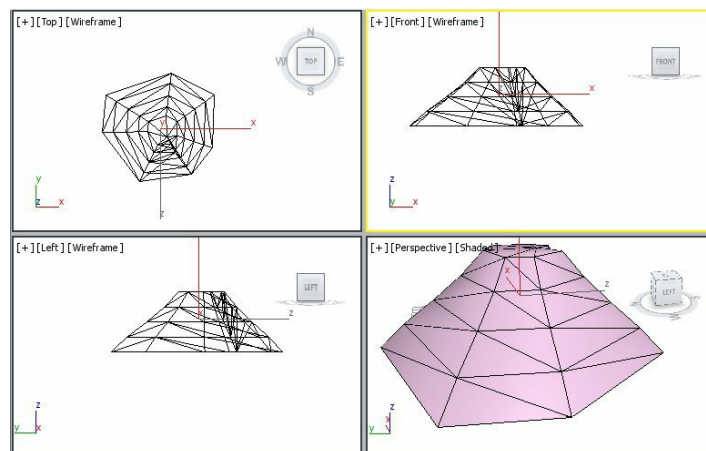
9. Click on the terrain object again and then modify the name of the terrain object as *hill01*.

Next, you need to assign a map to *hill01*.

10. Make sure that *hill01* is selected in the viewport. Press the M key to choose the **Material Editor** dialog box.
11. Select the **02-Default** sample slot in the **Material Editor** dialog box. Select the **Diffuse** map button on the right of the **Diffuse** color swatch; the **Material/Map Browser** dialog box is displayed. Select the **Bitmap** map from the **Maps > Standard** rollout and choose the **OK** button; the **Select Bitmap Image File** dialog box is displayed. As the project folder is already set, the *images* folder is displayed in the **Look in** drop-down list of this dialog box. Select the file *SANDSHORE.jpg* and choose the **Open** button; the image is displayed in the selected sample slot.

12. In the **Coordinates** rollout, select the **Planar from Object XYZ** option from the **Mapping** drop-down list and set the values as given next.

X-Tiling: **3** Y-Tiling: **3**

13. Make sure that *hill01* is selected in the viewport. Next, choose the **Assign Material to Selection** tool in the **Material Editor** dialog box. Then, choose the **Show Shaded Material in Viewport** tool to display the map in the viewport. The map is assigned to *hill01*, as shown in Figure 11-96. Now, close the **Material Editor** dialog box.
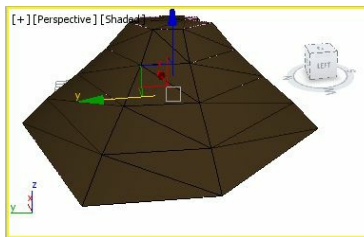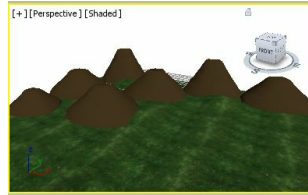

Figure 11-96 *The map assigned to hill01*

14. Unhide *ground*. Next, scale and align *hill01* with *ground*, and delete all the lines, refer to Figure 11-97.

15. Create multiple copies of *hill01* as required. Now, scale, rotate, and align them, as shown in Figure 11-98.
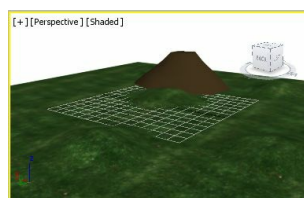
Figure 11-97 The hill01 after scaling
and aligning with the ground

Figure 11-98 The hills displayed after scaling and alignment

16. Apply the **MeshSmooth** modifier to hills as discussed earlier.

Creating Plants

In this section, you will create plants by using the **Foliage** tool.

1. Activate the Top viewport. Choose **Create > Geometry** from the **Command Panel** and select **AEC Extended** from the drop-down list. Now, choose the **Foliage** tool from the **Object Type** rollout; various rollouts are displayed in the Modify panel.

2. In the **Favorite Plants** rollout, double-click on the **Banyan tree** option; the tree is displayed in the viewports.

3. Name the plant as *tree01* in the **Name and Color** rollout.

4. Make sure that *tree01* is still selected. Choose the **Modify** tab in the **Command Panel**; the **Parameters** rollout is displayed.

5. In the **Parameters** rollout, set the value **25.0** in the **Height** spinner. Use default values for other options.

6. Choose the **Select and Move** tool and align *tree01* in viewports, as shown in Figure 11-99.
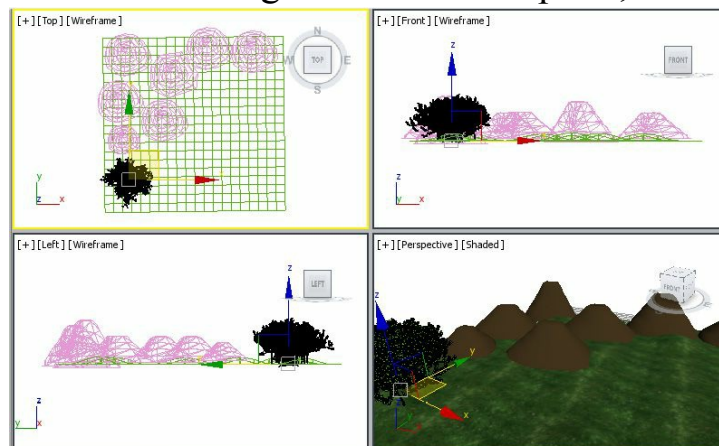
*Figure 11-99* Alignment of the tree01 in viewports

7. Activate the Top viewport. In the **Favorite Plants** rollout, double-click on the **Society**

Garlic option; the tree is displayed in the viewports. In the **Parameters** rollout, make sure the value **18.0** is set in the **Height** spinner. Use default values for other options.

8. Modify the name of the plant as *tree02* in the **Name and Color** rollout.

9. Create multiple copies of the *tree02* and align them, as shown in Figure 11-100.
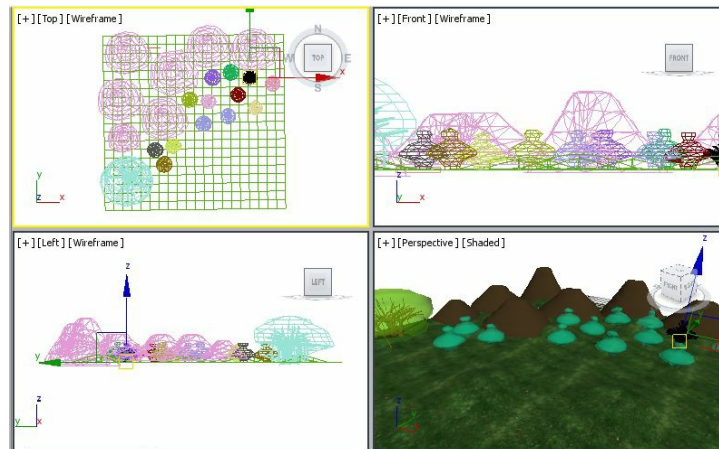
Figure 11-100 *Alignment of trees in viewports*

Creating Road over Ground

First, you need to use the **Loft** tool for creating the road and then use the **Conform** tool to adjust road according to *ground*. To create the loft object, you need to create a path spline and a shape spline in the viewport.

1. Activate the Top viewport and 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 and create a line, as shown in Figure 11-101, which will be used as a path spline.

2. Activate the Front viewport and create a rectangular spline using the **Rectangle** tool. It will be used as a shape spline. Set its parameters as follows:

Length: **4.0** Width: **30.702**

3. Make sure that the rectangle is selected in the viewport. Choose **Create > Geometry** in the **Command Panel**. Now, select the **Compound Objects** option from the drop-down list. Choose the **Loft** tool from the **Object Type** rollout. Choose the **Get Path** button in the **Creation Method** rollout and move the cursor over the line that you have just created for the path spline in the Top viewport; the shape of the cursor changes. Select the line; a shape is created.
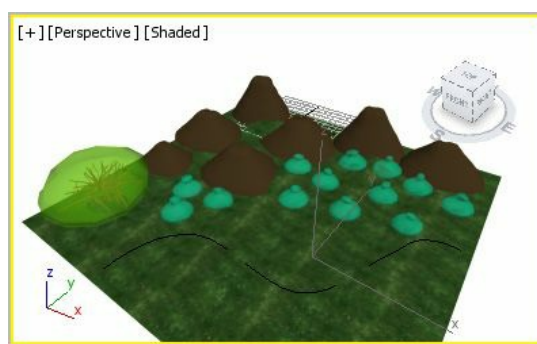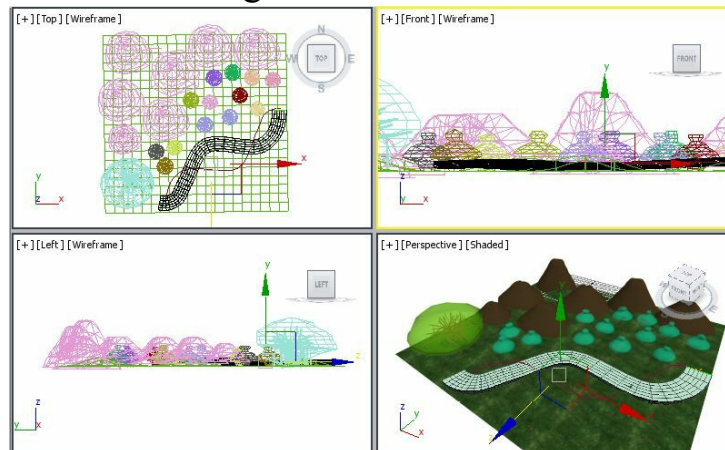
Figure 11-101 The line created in the Top viewport

4. The new shape is automatically named as *Loft001*. Rename it as *road*.

5. Align *road* in viewports, as shown in Figure 11-102.

Figure 11-102 The road geometry aligned with ground

Now, assign a map to *road*.

6. Make sure that *road* is selected in the viewport. Next, press the M key; the **Material Editor** dialog box is displayed.

7. Select the **03-Default** sample slot in the **Material Editor** dialog box. Choose the **Diffuse** map button on the right of the **Diffuse** color swatch; the **Material/Map Browser** dialog box is displayed. Select the **Bitmap** map from the **Maps > Standard** rollout and choose the **OK** button; the **Select Bitmap Image File** dialog box is displayed. As the project folder is already set, the *images* folder is displayed in the **Look in** drop-down list of this dialog box. Select the file *Road.jpg* and choose the **Open** button; the image is displayed in the selected sample slot.

8. In the **Coordinates** rollout, set the values as given next:

U-Tiling: **5** V-Tiling: **5**

9. Make sure that *road* is selected in the viewport. Next, choose the **Assign Material to Selection** tool from the **Material Editor** dialog box. Then, choose the **Show Shaded Material in Viewport** tool to display the map in the viewport, as shown in Figure 11-103. Close the **Material Editor** dialog box.

Figure 11-103 *The road after assigning map to it*

In Figure 11-103, you will notice that road is not properly aligned with ground because of its bumpy
surface. To align road properly with ground, you need to use the **Conform** tool.
The *road* geometry will behave as a Wrapper object and *ground* will behave as a Wrap-To object.

10. Select *road* and choose the **Conform** tool from **Compound Objects**. Choose the **Pick Wrap-
To Object** button and move the cursor over *ground*; the selection cursor is displayed.
Select *ground*; *road* is positioned over *ground* to fit according to the shape of *ground*.

11. In the **Wrapper Parameters** area of the **Parameters** rollout, set the value in the **Standoff
Distance** spinner to adjust the distance between the vertex of the Wrapper object and the surface of
the Wrap-To object. Also, apply the **MeshSmooth** modifier to the conform object.

12. In the **Update** area of the **Parameters** rollout, select the **Hide Wrap-To Object** check box; the
scene is displayed, as shown in Figure 11-104.
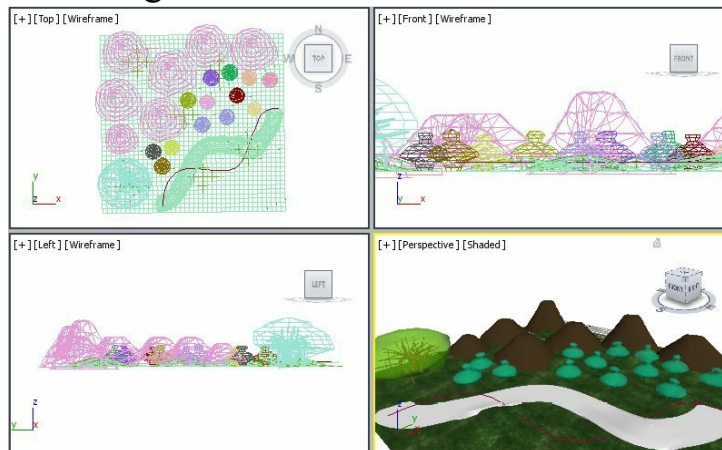
Figure 11-104 *The scene after using the **Conform** tool*

Creating Background for the Final Output
In this section, you will assign a map to the background to make the scene more realistic.

1. Choose **Rendering > Environment** from the menu bar; the **Environment and Effects** dialog box is
displayed.

2. In the **Common Parameters** rollout, choose the **Environment Map** button that is labeled as **None**;
the **Material/Map Browser** dialog box is displayed. Select the **Noise** map from the **Maps >
Standard** rollout and choose the **OK** button; the **Map X Noise** name is displayed in
the **Environment Map** button.

3. Now, choose the **Material Editor** tool from the **Main Toolbar**, the **Material Editor** dialog box is displayed.

4. Press and hold the left mouse button on the **Map X Noise** label from the **Environment Map** button and drag the cursor to the **04-Default** sample slot; the **Instance (Copy)map** dialog box is displayed.

5. Select the **Instance** radio button from this dialog box; the **Map X Noise** will be added to the default 04-sample slot. In the **Noise Parameters** rollout, select the **Turbulence** radio button from the **Noise Type** area. Set the value **8.8** in the **Levels** spinner and **200** in the **Size** spinner. Next, select the blue color in the **Color #1** swatch and make sure white color is selected in the **Color #2** swatch.

Saving and Rendering the Scene

In this section, you will save the scene and then
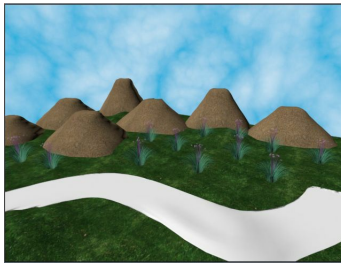
Figure 11-105 *The final output of the scene*

render it. You can also view the final rendered image of this model by downloading the file *c11_3dsmax_2015_rndr.zip* from *www.cadcim.com*. The path of the file is as follows: *Textbooks > Animation and VisualEffects > 3ds Max > Autodesk 3ds Max 2015: A Comprehensive Guide*

1. Activate the Perspective viewport. Next, choose **Save** from the **Application** menu.

2. Choose the **Render Production** tool in the **Main Toolbar**; the **Rendered Frame** window is displayed with the final output of the scene at one frame, refer to Figure 11-105. Next, close this window.

Self-Evaluation Test

Answer the following questions and then compare them to those given at the end of this chapter:

1. Which of the following options is not a type of boolean operation?

(a) **Union** (b) **Cut**