

TRANSFORMING OBJECTS AND COMPONENTS

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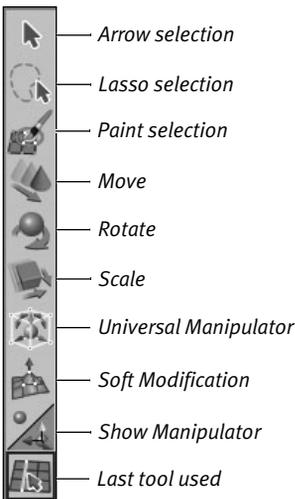


Figure 4.1 Maya's manipulation tools.

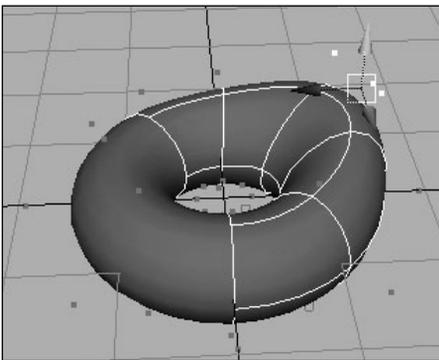


Figure 4.2 The Move tool's Translation manipulator is used to move objects and components around the scene.

Maya gives you many ways to move, rotate, and scale objects around a scene, and many shortcuts for completing these common tasks. These actions, known as *transformations*, can be performed in a couple of different ways: You can type new coordinates or values in the Channel Box or use one of the many manipulation tools (Figure 4.1) to drag an object freely around the scene or constrain it to an axis.

Using the same tools you would employ to manipulate objects in the scene, you can also manipulate *parts* of an object, known as *components*. Each object type has its own components that can be translated (Figure 4.2), rotated, and/or scaled to change their look and position, in turn changing the appearance of the object.

Most tools include advanced features (shown in the Tool Options) that you can explore as your knowledge base grows. The duplication options provide a good example of this. Once you get used to using them, you can employ a number of advanced options like duplicating an object multiple times throughout your scene, or using them to construct and mirror objects.

Moving, Rotating, and Scaling Objects

Maya provides multiple tools for moving, rotating, and scaling objects and components. The Universal Manipulator tool can perform all of these operations at once, which can be helpful when an object requires all three transformations. We'll discuss the Universal Manipulator tool in more detail later in this chapter.

Each of these tools, including the Universal Manipulator tool, has axes that you can grab and move to transform an object. These axes, called *manipulators* (Figure 4.3), let you translate (move), rotate, or scale the object. Manipulators make it easy to constrain objects along a particular axis: You click and drag the colored line for the axis along which you want to constrain the object. The colors remain consistent for each tool. RGB colors coincide with the x - y - z axes (Figure 4.4): The manipulator's x axis is red, the y axis is green, and the z axis is blue. If you forget an axis's color, check the View axis in the lower left-hand corner of each pane or the View Compass at upper right (Figure 4.5). The axis selected on the manipulator is always yellow.

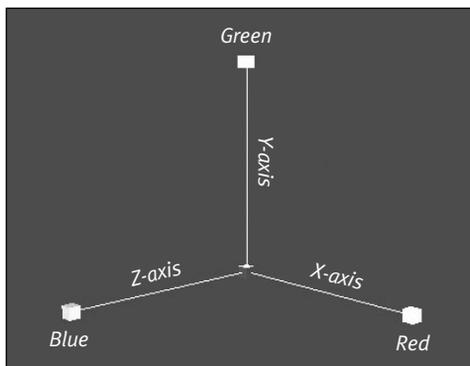


Figure 4.4 RGB colors match the x - y - z axes.

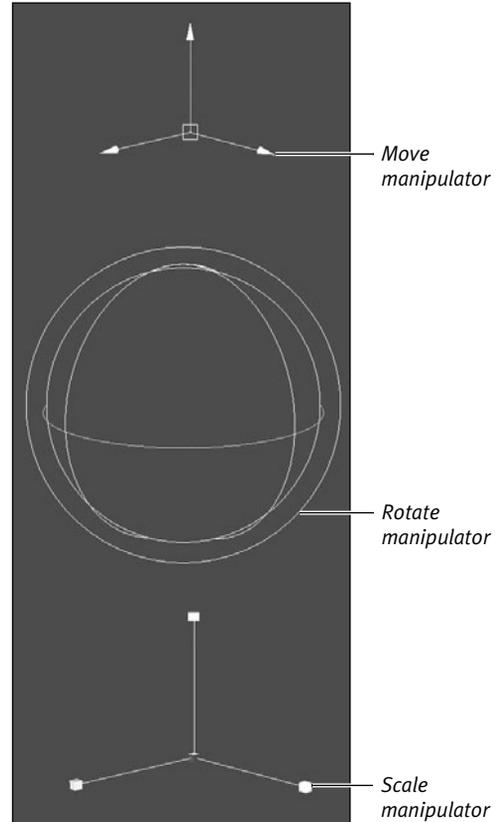


Figure 4.3 The Move, Rotate, and Scale manipulators.

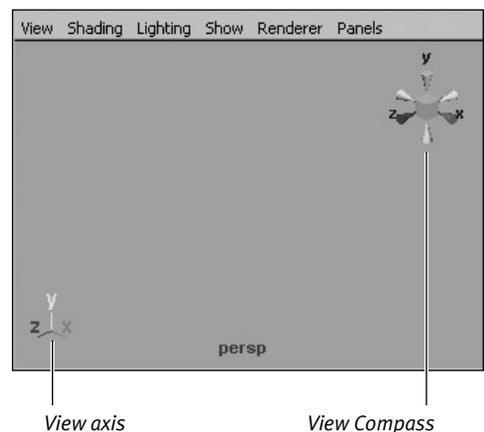


Figure 4.5 Check the View axis in the lower-left corner of each pane to remind yourself which color is associated with each axis.

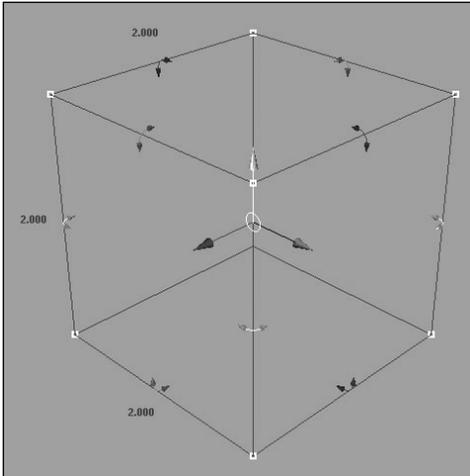


Figure 4.6 The Universal Manipulator combines the common functions of the Move, Scale, and Rotate tools.

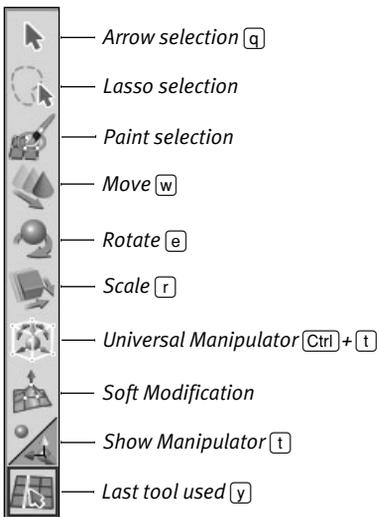


Figure 4.7 The manipulation tools and their shortcut keys.

✓ Tip

■ Be aware that these keys won't work if the Caps Lock key is on. Maya is case sensitive: Capitals represent different hotkeys with different functions mapped to them. For example, the Move, Rotate, and Scale tools' associated keyboard

In addition to constraining an object along an axis, you can freely manipulate the object by clicking and dragging the square in the middle of the Move, Scale, and Universal Manipulator tools (**Figure 4.6**), or by clicking and dragging anywhere inside the Rotate manipulator.

To get precise results, you can also use the Channel Box for numerical entry. The Channel Box allows direct access to any of the attributes (translation axis, rotation axis, and scale values) that the translation tools affect.

Each of the tools in the toolbar—with the exception of the Lasso tool, the Soft Modification tool, and the Universal Manipulator—has an associated shortcut that coincides with qwerty keys on the keyboard. You can press a tool's key (or, in the case of the Universal Manipulator, the key combination) to turn on its manipulator.

The shortcut keys and the manipulators they turn on are as follows (**Figure 4.7**):

- q** Arrow selection tool
- w** Move tool
- e** Rotate tool
- r** Scale tool
- Ctrl + t** Universal Manipulator
- t** Show Manipulator
- y** Last tool used

shortcuts are **q**, **e**, and **r**, respectively. However, when those same keyboard letters are capitalized, they set an animation keyframe on the translation, rotation, or scale channels instead (keyframes are discussed in Chapter 12).

To translate an object or component using the Move tool:

1. Select an object or component by clicking it.
2. Press **[w]**, or click the Move tool icon  in the toolbar.
The Move manipulator becomes visible on the object or component (**Figure 4.8**).
3. Click and drag the manipulator's arrow in the direction you want the object to move (**Figure 4.9**).
This action translates the object along the selected axis.

or

Hold down **[Shift]**, and then, with the middle mouse button, click and drag in the direction you want the object to move (**Figure 4.10**).

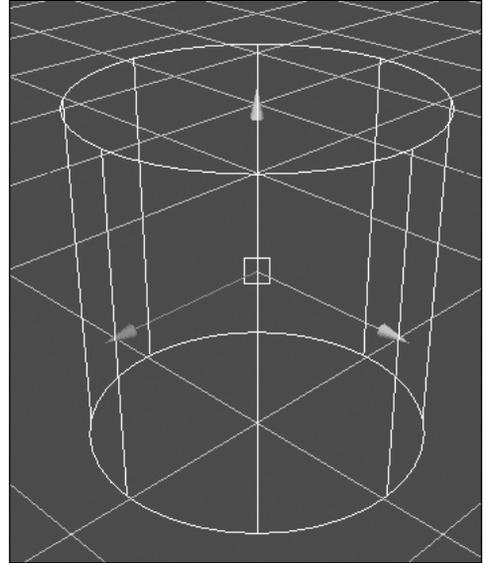


Figure 4.8 The Move manipulator is used to move the object around the scene.

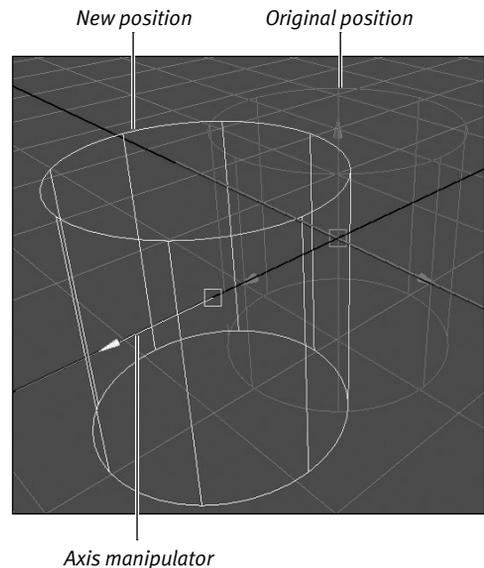


Figure 4.9 Click and drag the axis to which you want the object constrained so that you can maintain precise control over the surface's position. This is particularly useful in the Perspective view.

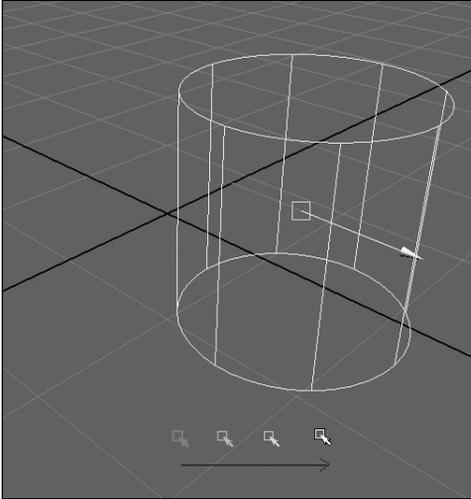


Figure 4.10 By holding down **[Shift]** and dragging with the middle mouse button, you can move an object without using the manipulator handles.

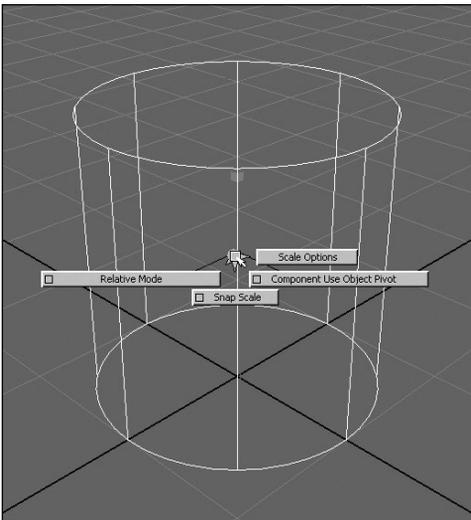


Figure 4.11 The Scale tool's marking menu includes shortcuts for scaling proportionally and changing the pivot options for components.

This action selects the appropriate manipulator axis and translates the object in that direction. This is particularly useful if you've created an object at the origin but moved the camera away from the grid. You can pull the object into your camera view if you know the direction of the origin.

or

To translate the object freely, click and drag the center of the manipulator, and the motion won't be constrained on any axis.

✓ Tips

- You'll usually want to avoid using free translations for large adjustments in the Perspective view. The nature of the view can lead to translations in unwanted directions.
- You can also hold down **[x]** to activate grid snap. In addition, if you drag with the middle mouse button anywhere on the grid, the object snaps to that location.
- You can use the **[+]** and **[-]** keys to enlarge or shrink the manipulators.
- From anywhere in a view pane, you can hold down the keyboard shortcut for the Move (**[w]**), Rotate (**[e]**), or Scale (**[r]**) tool and click to bring up that tool's marking menu (**Figure 4.11**). Maya's Transform marking menus include shortcuts to many of the tools' options.

To scale an object or component using the Scale tool:

1. Select an object or component by clicking it.
2. Press **[r]**, or click the Scale tool icon  in the toolbar.
The Scale manipulator becomes visible on the object or component (**Figure 4.12**).
3. Click the small square of the axis on which you want to scale the object or component, and drag in the direction you want the object to scale (**Figure 4.13**).

or

While pressing **[Shift]**, click and drag with the middle mouse button anywhere in the pane in the direction in which you want the object to scale (**Figure 4.14**).

This action selects the appropriate manipulator axis and scales the object in that direction.

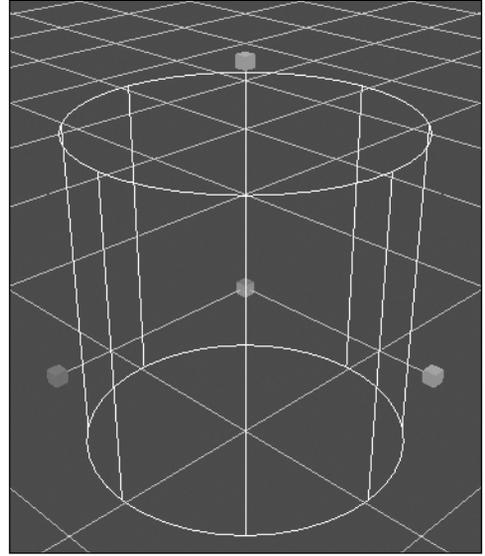


Figure 4.12 You use the Scale tool's manipulator to scale an object proportionally or along a single axis.

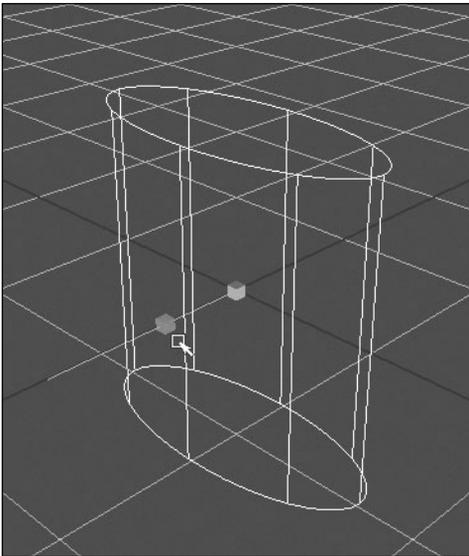


Figure 4.13 Click and drag a Scale tool's axis to scale an object along a particular axis.

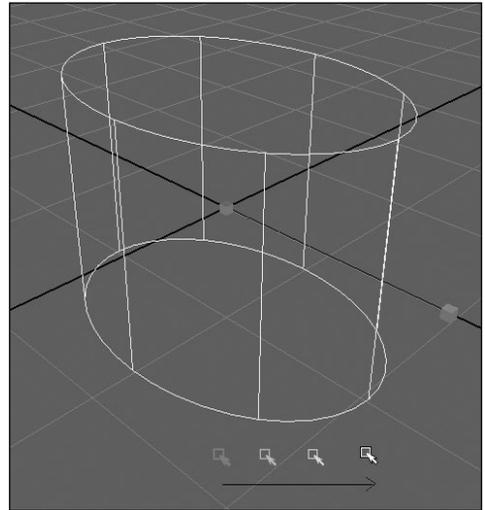


Figure 4.14 This cylinder is being scaled along the x axis by shift-clicking and dragging with the middle mouse button.

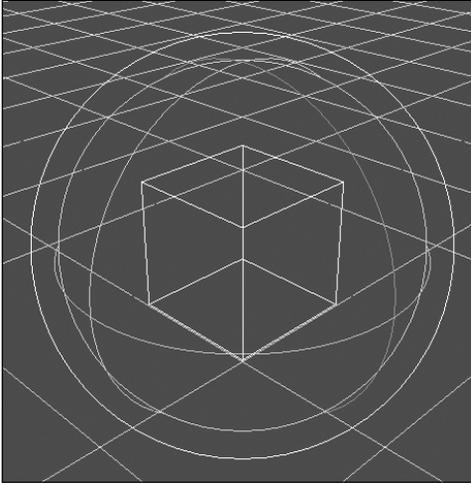


Figure 4.15 The Rotate manipulator is used to rotate the surface on one or more axes.

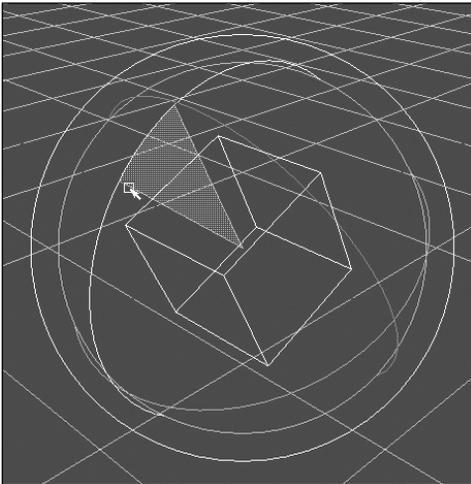


Figure 4.16 Click and drag the axis circle to which you want the object constrained. A gray pie slice shows you how many degrees you have rotated the object.

To rotate an object or component using the Rotate tool:

1. Select an object or component by clicking it.
2. Press **[R]**, or click the Rotate tool icon  in the toolbar.
The Rotate manipulator becomes visible on the object or component (**Figure 4.15**).
3. Click the circle of the axis around which you want to rotate the object or component, and drag in the direction you want the object to rotate (**Figure 4.16**).

✓ Tips

- You can click anywhere within the Rotate manipulator sphere, and click and drag to rotate the object without being constrained to any axis.
- Once the axis you want to use is yellow on the manipulator, you can click and drag anywhere in the pane with the middle mouse button to rotate the object around that axis without touching the axis or the object.
- The light blue outer ring rotates the object or component around an axis that always faces the camera view (**Figure 4.17**).

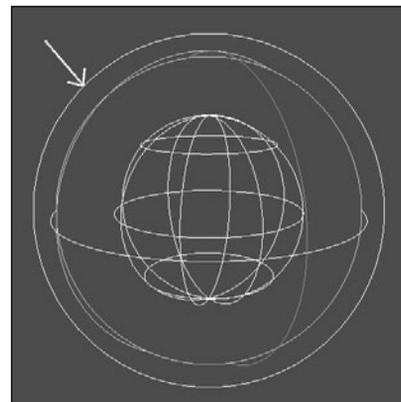


Figure 4.17 The light-blue outer ring rotates the object or component in the view plane.

To translate, rotate, or scale an object or component using the Channel Box:

1. Click an object or component to select it.
2. In the Channel Box, click once in the field next to the attribute you want to change (**Figure 4.18**).
3. Type a new value in the selected field. The object reflects the value change (**Figure 4.19**).

or

Click to select the attribute's name, and then move the mouse over a view pane. Hold down the middle mouse button, and drag left or right to interactively change the value of the selected attribute (**Figure 4.20**).

Using the Universal Manipulator

The Universal Manipulator provides easy access to three transformations in one tool (**Figure 4.21**). You can use it to enter exact values without using the Channel Box, and it enables you to quickly perform these operations around different temporary center points.

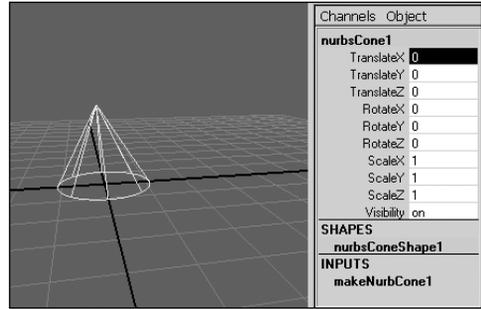


Figure 4.18 Click the field name of the attribute you want to change (in this case, Translate X).

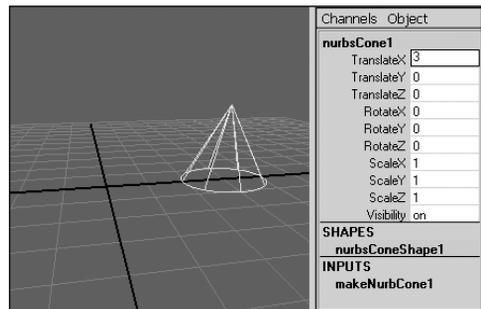


Figure 4.19 Changing the Translate X value to 3 moves the cone three units in the positive x direction.

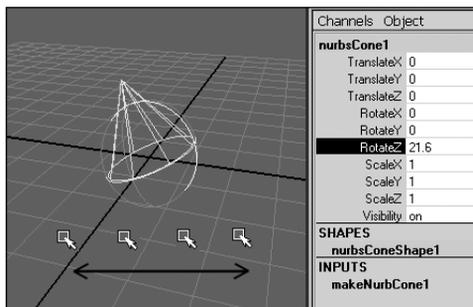


Figure 4.20 You can use the middle mouse button to interactively change values anywhere in a pane.

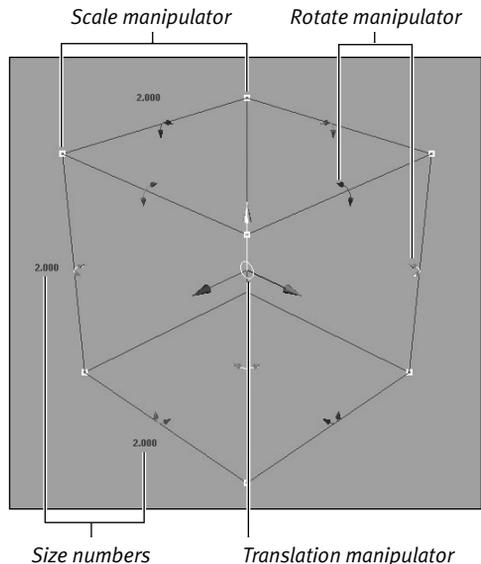


Figure 4.21 The Universal Manipulator combines many functions for quick manipulation. It's a great time saver for performing common transformations.

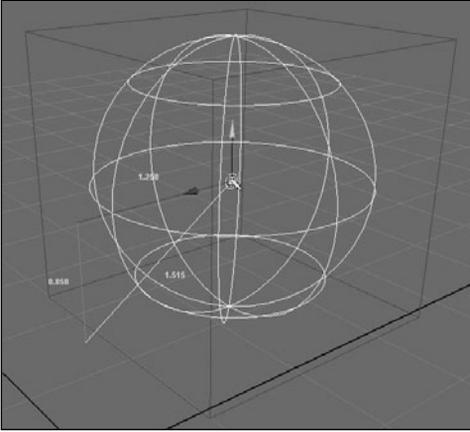


Figure 4.22 Using the translation axis displays a color-coded triangle showing exactly how far you have moved your object along each axis.

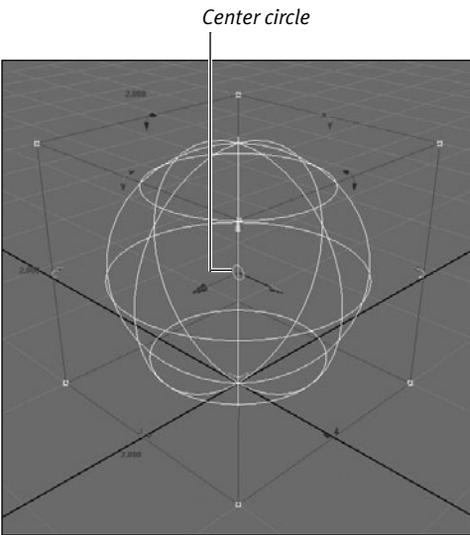


Figure 4.23 The Universal Manipulator shows a bounding box around your object.

The Universal Manipulator also provides real-time information about how far you have translated or rotated an object (**Figure 4.22**).

The Universal Manipulator does have its limits. For instance, it can't rotate freely in all directions, and you can't use it to manipulate components—only objects.

To translate an object using the Universal Manipulator:

1. Select an object or component by clicking it.
2. Press **[Ctrl]+[t]**, or click the Universal Manipulator tool icon .

The Universal Manipulator becomes visible on the object or component (**Figure 4.23**).

3. Click the axis you want to translate, and drag the mouse to translate in that direction.

or

Click the center circle, and drag the mouse to translate the object freely.

or

Click once on the tip of the translation axis, and enter a numerical value in the box that appears (**Figure 4.24**).

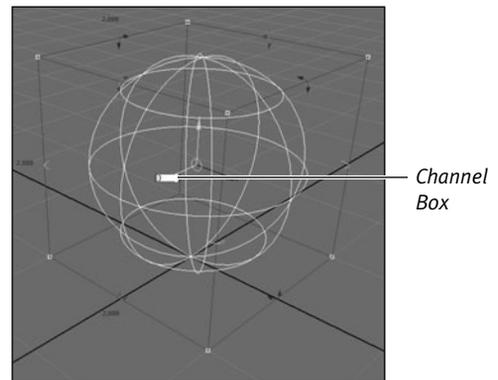


Figure 4.24 Entering a precise value saves a trip to the Channel Box.

To rotate an object using the Universal Manipulator:

1. Select an object or component by clicking it.
2. Press **Ctrl**+**t**, or click the Universal Manipulator tool icon .
3. Click the arrow corresponding to the axis you want to rotate, and drag the mouse to rotate on that axis (**Figure 4.25**).

or

Click once on a rotation arrow, and enter a numerical value in the box that appears.

To scale an object using the Universal Manipulator:

1. Select an object or component by clicking it.
2. Press **Ctrl**+**t**, or click the Universal Manipulator tool icon .
3. Click a vertex of the bounding box, and drag to scale the object evenly on all axes (**Figure 4.26**).

Note that the Universal Manipulator uses the opposite corner from the one you've selected as the center point for the scale. This means it scales toward the opposite corner instead of the center of the object.

or

Click one of the size numbers, and enter a numerical value.

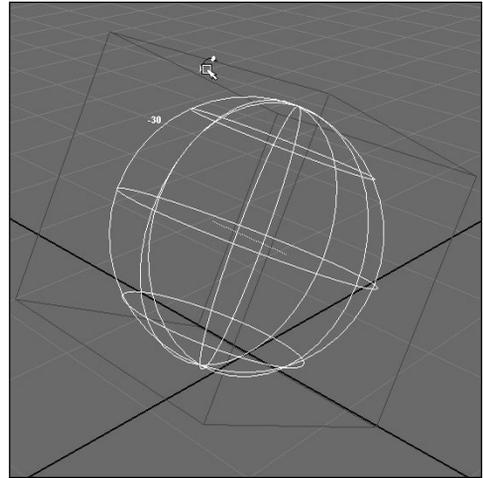


Figure 4.25 When you're rotating an object on an axis using the Universal Manipulator, the length (in degrees) of the rotation is displayed near the rotation handle.

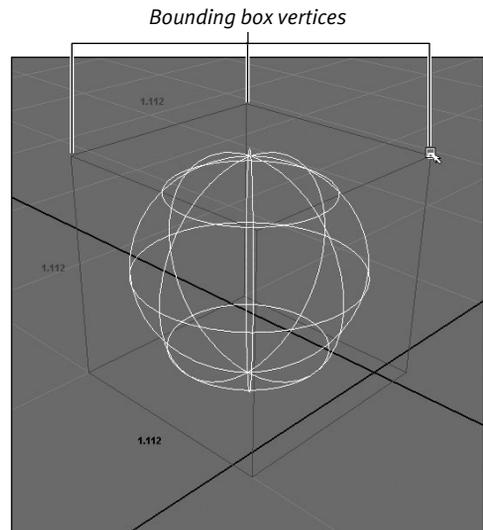


Figure 4.26 Scaling with the bounding box scales to the opposite corner of the one you've selected.

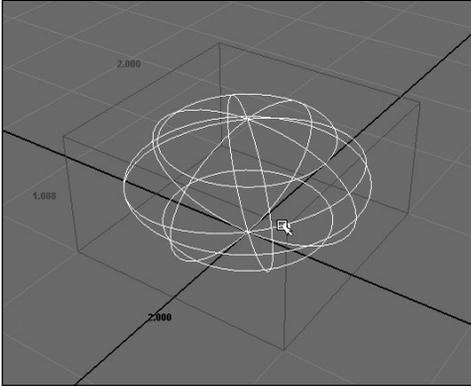


Figure 4.27 Using **(Ctrl)** lets you scale on an axis instead of to a corner.

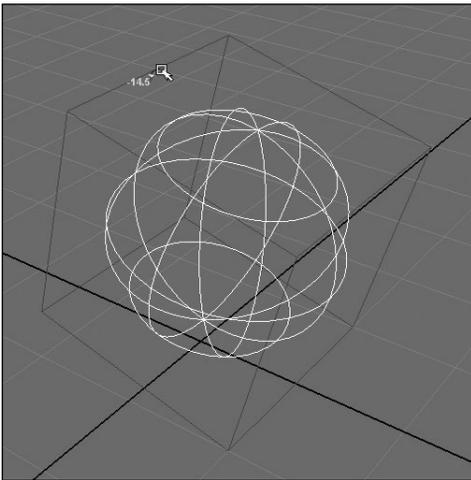


Figure 4.28 Rotating an object around a corner saves you from having to reposition the pivot point every time.

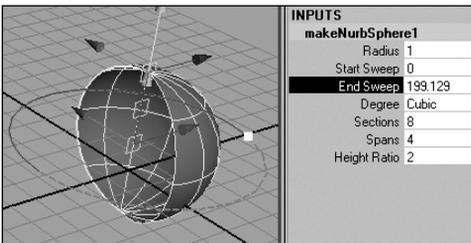


Figure 4.29 The additional manipulator on the Show Manipulator tool controls additional input attributes, saving you from going to the Channel Box. In this example, End Sweep was changed to less than 360 degrees by moving the circular manipulator.

✓ Tips

- To restrict scaling to one axis, hold **(Ctrl)** and move the mouse in the direction of that axis (**Figure 4.27**), or click a size number and enter a value.
- Pressing **(Shift)** when performing scale operations performs them from the center of the object rather than from a corner or side.
- Pressing **(Ctrl)** when rotating the object using the Universal Manipulator rotates the object around the bounding box edges. The Universal Manipulator uses the edge opposite the rotation arrow you chose (**Figure 4.28**).

Using the Show Manipulator tool

The Show Manipulator tool  lets you access the Inputs node of an object (known as its *construction history*) to alter a surface or curve. In other words, the Show Manipulator tool gives you access to certain attributes used in the creation or manipulation of an object that are usually available only in the Channel Box or Attribute Editor (**Figure 4.29**).

The Show Manipulator tool is commonly used to adjust spotlights and cameras. When you use it on a spotlight, the light has three manipulators instead of one—one to move the light; one for the light to point at, which makes adjusting lighting easier; and one represented by a circle with a tick mark, which adjusts the attributes to be manipulated.

To aim a spotlight using the Show Manipulator tool:

1. Select Create > Lights > Spotlight.
2. Click the Show Manipulator icon  in the toolbar.
The spotlight now has one manipulator at its base and another in front of the light (Figure 4.30).
3. Select and move the manipulator at the base of the spotlight (Figure 4.31).
The spotlight moves with the manipulator but continues to point at the second manipulator (Figure 4.32).
4. Select and move the manipulator in front of the spotlight.
The spotlight remains in place but continues to point at the manipulator (Figure 4.32).

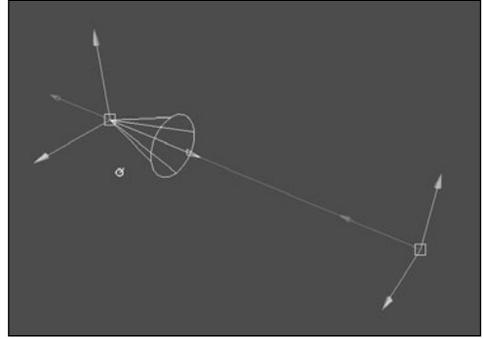


Figure 4.30 Two manipulators appear, giving you more precise control over what objects the spotlight is pin-pointing and the direction in which the light is aimed.

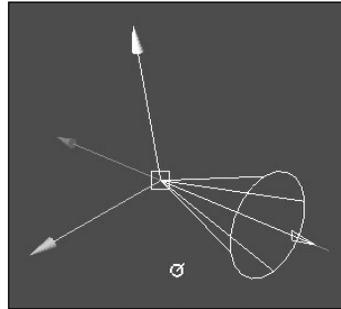


Figure 4.31 Select the manipulator attached to the spotlight to translate the light.

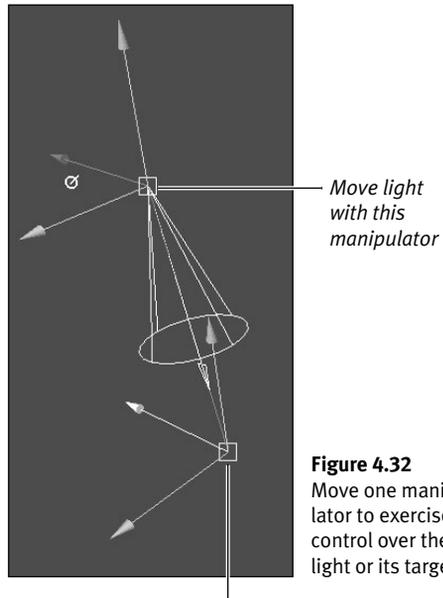


Figure 4.32 Move one manipulator to exercise control over the light or its target.

Change light direction with this manipulator

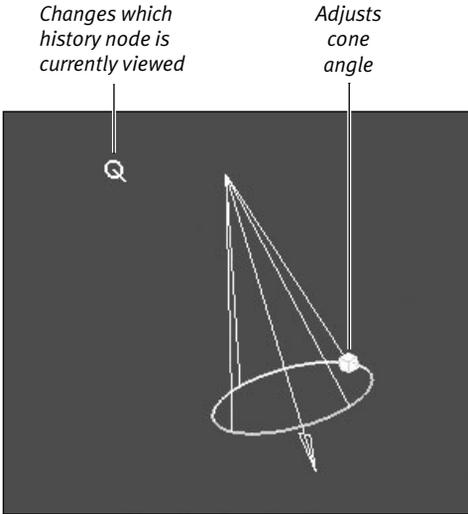


Figure 4.33 Most objects display a blue ring from which you can access that object's input nodes or attributes interactively.

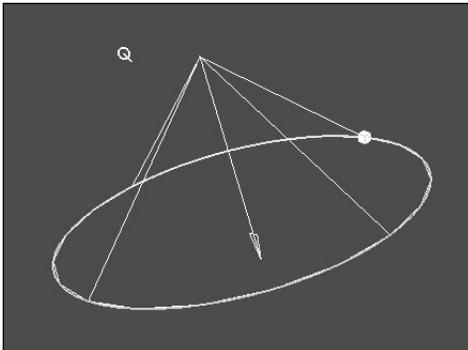


Figure 4.34 The cone angle controls the width of the light beam.

5. Click twice on the ring that hovers near the spotlight.
The manipulators change into a ring around the cone of light. Each time you click the ring, you cycle through some of the cone's input nodes (**Figure 4.33**).
6. Click and drag the cube atop the circle that surrounds the cone.
The cone angle changes interactively as you drag the mouse (**Figure 4.34**).

About Pivot Points

Each object in Maya has a pivot point. When you rotate an object, it rotates around its pivot point, and when you scale an object, it scales to and from the pivot point. By default, the object's pivot point is at the center of the object, but Maya lets you move the pivot point according to your needs. For example, if you model a clock, you can position the pivot point of each hand at the center of the clock rather than the middle of the hand. This lets you easily rotate the hands around the face of the clock (**Figure 4.35**).

To change an object's pivot point position:

1. Select the object whose pivot point you would like to move.
2. Select the Move tool from the Tool Box, or press **[w]**.
3. Press **[Insert]/[Home]** to go into pivot point mode.

The pivot point manipulator is now visible (**Figure 4.36**).

4. Click and drag one of the pivot point manipulator handles to move the pivot point to a new position (**Figure 4.37**). The new position will be the new rotation point for the object.

5. Press **[Insert]/[Home]** to disable pivot point mode.

To position the pivot point in the center of an object:

1. Select the object whose pivot point you would like to center.
2. Choose **Modify > Center Pivot**.

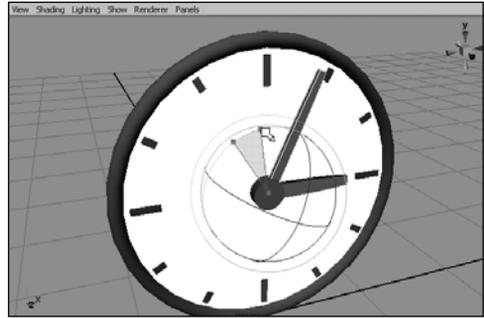


Figure 4.35 This simple clock has had the pivot points of its hands repositioned to the center of the clock face.

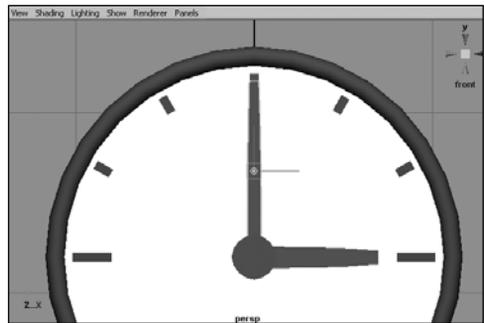


Figure 4.36 By default, an object's pivot point is located at the center of the object.

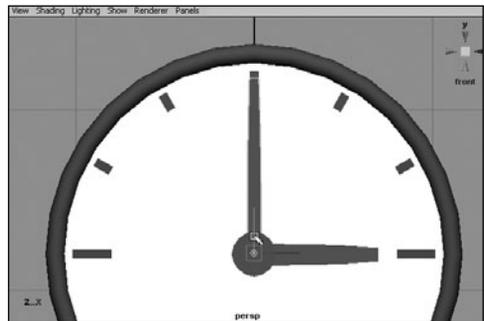


Figure 4.37 You can reposition an object's pivot point by using the pivot point manipulator.

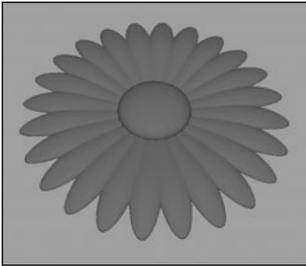


Figure 4.38
This flower was made with two objects and one duplication, which placed the petals around the center.

INPUTS	
makeNurbSphere1	
Radius	0.504
Start Sweep	0
End Sweep	360
Degree	Cubic
Sections	8
Spans	4
Height Ratio	2

Figure 4.39
The sphere's Inputs node holds its editable history attributes.

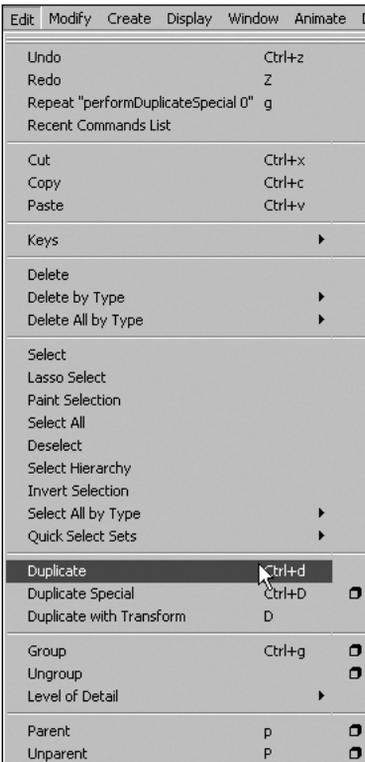


Figure 4.40 All the duplicate tools can be found together in the Edit menu.

Duplication Options

Maya provides duplication shortcuts for modeling objects with repetitive geometry—for example, a staircase or flower petals. To model a flower in a minimum number of steps, you can make one petal and then reproduce it many times around the center (**Figure 4.38**).

There are three duplication options. The Duplicate tool creates a new copy of your object at the same location. The Duplicate Special tool can be used for more complex duplications, including ones that apply changes to the rotation, translation, and scale of an object. You can also use the Duplicate Special tool to mirror and create instances of objects. Duplicate Special is the only way to duplicate an object's input graph or input connection, which will preserve its construction history (**Figure 4.39**). (See Chapter 1 for more information about construction history.)

Duplicate with Transform duplicates an object with offsets determined by relative positioning. It's a more visual alternative to Duplicate Special, but without some of the advanced options.

To duplicate an object:

1. Select an object.
2. Choose Edit > Duplicate (**Figure 4.40**).
or
Press **Ctrl** + **d**. Note the lowercase *d*.
3. Move your new object away from the original so you can distinguish the two.

To duplicate an object with simple translation:

1. Create a primitive sphere.
2. Choose Edit > Duplicate with Transform (**Figure 4.41**).
3. Move the duplicated sphere a few units in the z direction (**Figure 4.42**).
4. Choose Edit > Duplicate with Transform. A new sphere is created. It's the same distance from the second sphere that the second sphere is from the original (**Figure 4.43**).
5. Press **(Shift)+[d]**. Another duplicate is made, an equal distance from the last (**Figure 4.44**).

✓ Tip

- You can also use Duplicate with Transform to apply changes to rotation, scale, or all three transforms at once.



Figure 4.41 Choose Edit > Duplicate with Transform.

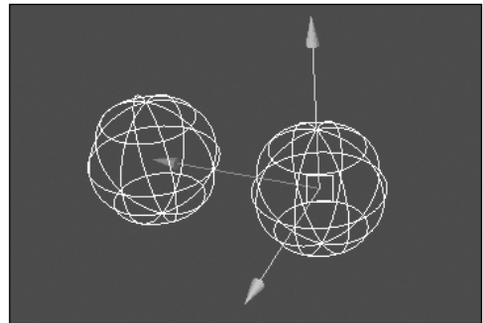


Figure 4.42 Move the sphere the distance you would like your future duplications to copy.

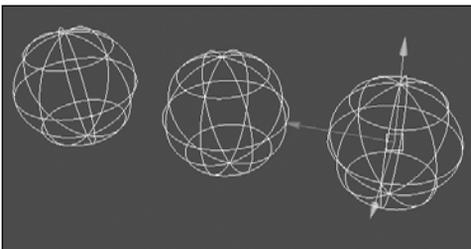


Figure 4.43 Duplicate the object again.

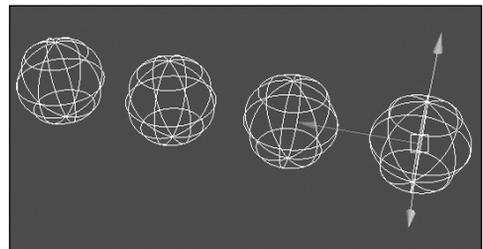


Figure 4.44 Each new copy moves down the axis the same amount as the original copy.

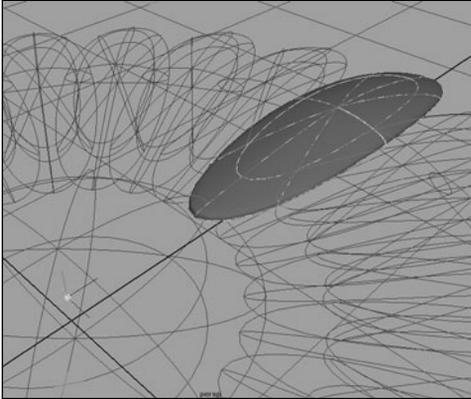


Figure 4.45 The pivot point's placement determines the placement of a duplicated surface.

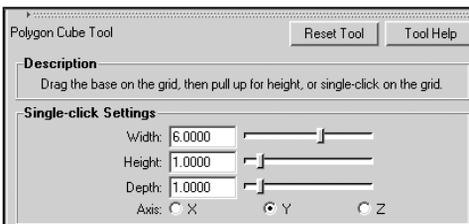


Figure 4.46 Change the Polygon Cube Tool Settings to create a cube of a specific size.

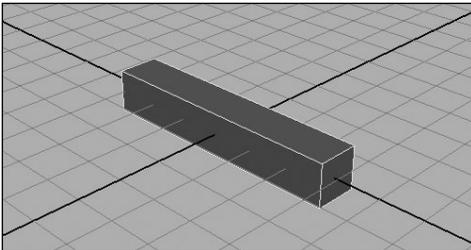


Figure 4.47 The cube is created when you click once in the view.

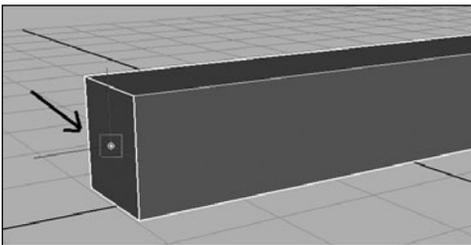


Figure 4.48 The pivot point determines the point in space around which the staircase rotates.

Constructing with duplication

Now that you have a general idea of how to duplicate an object, let's examine the third option: Duplicate Special. Duplicate Special duplicates an object with transformations, like Duplicate with Transform; but you can specify the number of duplications and the precise nature of the transforms, which makes this option useful for constructing more elaborate forms.

The key to successfully creating an object with Duplicate Special lies in placing the pivot point in the correct position. This provides the proper axis for the objects to rotate around (**Figure 4.45**).

To create a simple staircase:

1. Select the box next to Create > Poly Primitive > Cube.
The Polygon Cube Tool Settings appear.
2. Change the Single-click Settings to use a Width of 6.0, and a Height and Depth of 1.0 (**Figure 4.46**).
3. Click once in the center of the grid.
A cube with the specified dimensions appears (**Figure 4.47**).
4. Press **[w]**, or click the Move tool icon  in the toolbar.
5. Move the cube up so its base rests on the grid.
6. Press **[Insert]/[Home]** on the keyboard to go into pivot point mode.
7. Move the pivot point to the far-left edge of the cube, using the *x*-axis manipulator (**Figure 4.48**).
8. Press **[Insert]/[Home]** again to turn off pivot point mode.

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9. From the Edit menu, select the box next to Duplicate Special to open the Duplicate Special options window.
 10. Set the duplicate options as follows (Figure 4.49):
 - Translate: 0, 1, 0**—This setting moves each new duplicate up the *y* axis one unit. The cube is one unit high, so each copy sits on top of the previous one.
 - Rotate: 0, 15, 0**—This setting rotates each duplicate 15 degrees more than the previous one around the *y* axis.
 - Scale: .95, .95, .95**—This setting scales each duplicate proportionately to 95 percent the size of the last. The staircase gets smaller as it goes higher.
 11. Enter 20 in the Number of Copies field. This setting will create 20 new steps.
 12. Click Duplicate.
- The specified number of copies are made and placed above each other after being rotated and scaled (Figure 4.50).

✓ Tips

- It's a good idea to check your options before duplicating. The previous settings are retained unless you reset them. To return the options to their default settings, with the Duplicate Special Options window open, select Edit > Reset Settings.
- Move the pivot point farther down the *x* axis before duplicating to make room for a pole in the center of the staircase (Figure 4.51).

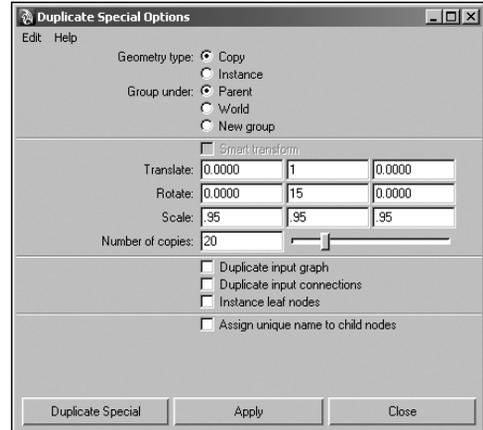


Figure 4.49 Set the duplicate options as shown to properly duplicate the cube.

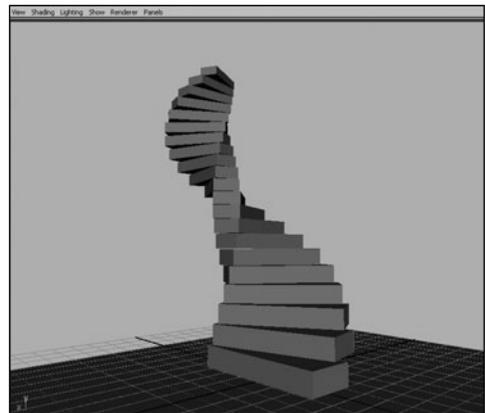


Figure 4.50 You can use the Duplicate Special tool to quickly construct geometric or repetitive shapes like this staircase.

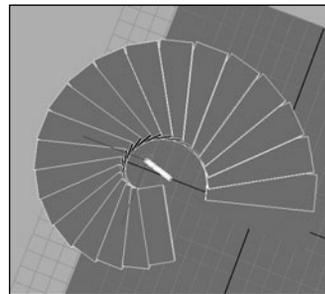


Figure 4.51 The pivot points of the steps are shown here, revealing that they form a straight line up the center of the staircase.

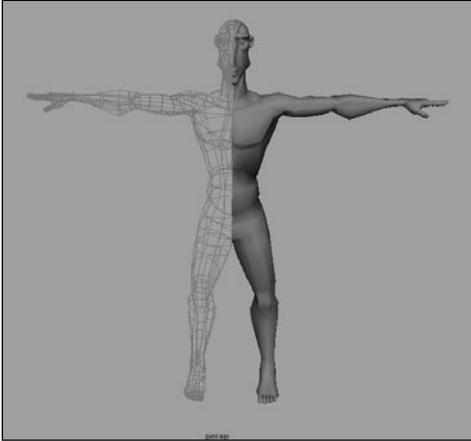


Figure 4.52 By mirroring a character or anything symmetrical, you can save a lot of work.

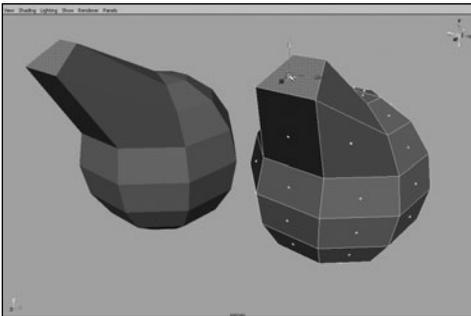


Figure 4.53 Instances of objects mimic the edits of the first object interactively. Here one poly sphere reflects the change to the other.



Figure 4.54 You can create half a face and then mirror it to complete the rest of the face.

Mirroring and Instancing Objects

In addition to translating objects, you can use the Duplicate Special options to create a mirror image of an object (that is, a reversed copy of the original). Body parts or characters make good candidates for mirroring because many characters are nearly symmetrical. This allows you to model one half of a character and mirror it, saving yourself almost half the work (**Figure 4.52**).

Additionally, you can create *instances* of objects—duplicates that retain a connection to the shape of the original (**Figure 4.53**). The beauty of this technique is that you can then edit any of the objects and have each of the rest follow those edits interactively. For example, if you're creating a building with multiple identical pillars, you can create one pillar and then create a number of *instances* of it to get the additional pillars. If you later decide to change the look of the pillars, all you have to do is edit one, and the rest are updated automatically.

Mirroring

Mirroring an object produces a precise reverse copy of the object. This technique is great for symmetrical objects, such as creating one side of a face and then mirroring the face across an axis to complete it (**Figure 4.54**). The pivot point is used as the mirror axis, which means that the farther the pivot point is from the object, the farther the mirrored copy will be from the original.

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You can also use mirroring to place objects an equal distance away from an axis line, creating a mirrored copy that's perfectly placed (**Figure 4.55**).

In the following task, you'll mirror a sphere across an axis, as if to create two eyes.

To mirror an object:

1. Create a NURBS primitive sphere, or select another object to mirror.
2. Type -2 in the Translate X field in the Channel Box (**Figure 4.56**).
This setting moves the object two units down the negative x axis.
3. Press **[W]** or click the Move tool icon  in the toolbar.
4. Press **[Insert]/[Home]** on the keyboard to go into pivot point mode.
5. Holding down **[X]**, move the pivot point to the origin (**Figure 4.57**).
[X] snaps to the grid, which ensures that the pivot point is precisely at the origin.
6. Press **[Insert]/[Home]** to get out of pivot-point edit mode.
7. From the Edit menu, select the box beside Duplicate Special.
The Duplicate Special Options window opens.

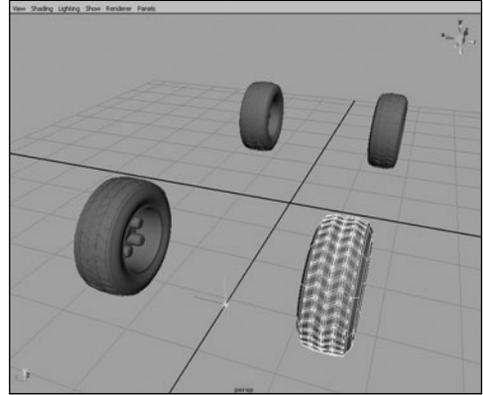


Figure 4.55 Any symmetrical object is ideal for mirroring. Here, a pair of tires is flipped to the other side of the x axis.

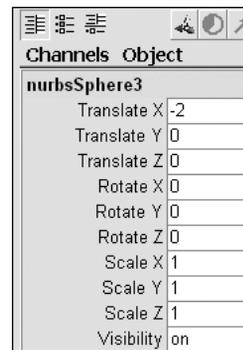


Figure 4.56 Type -2 in the Translate X field of the Channel Box to move the object two units in the negative x direction.

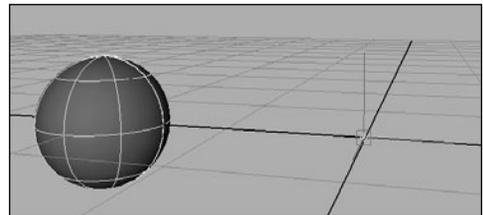


Figure 4.57 Move the pivot point to the origin to send the copy an equal distance away from the origin.

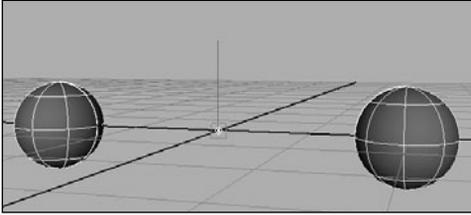


Figure 4.58 A mirrored copy is duplicated an equal distance from the pivot point.



Figure 4.59 Combining mirroring and instancing allows adjustments to one side of this face to be reflected on the other.

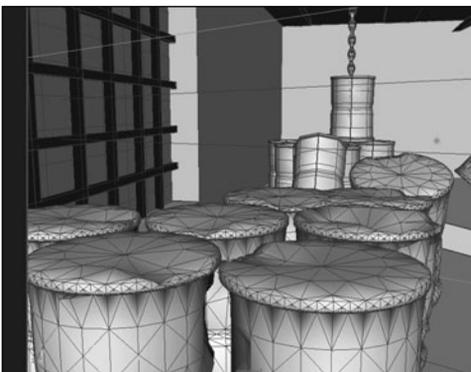


Figure 4.60 Oil drums are instanced to cut down on the number of edits that need to be made. The objects are rotated to hide their similar attributes.

8. Select Edit > Reset Settings in the Duplicate Special Options window to reset the settings, and then set the Scale X field to -1.
9. Click Duplicate Special.
A mirrored copy is duplicated an equal distance from the pivot point (**Figure 4.58**).

✓ **Tip**

- Often, mirroring is used in conjunction with instancing so your modifications are automatically reflected across the object (**Figure 4.59**).

Instancing

Instancing is a great way to save time, both in modeling and in rendering. An instanced object follows the edits of the original, making instancing ideal for any object that will have identical copies anywhere else in the scene (**Figure 4.60**). Instanced objects are loaded into memory only once, saving render time. Very large scenes can be populated by instanced objects and stay workable. You can still scale, rotate, and move the objects independently once they've been instanced.

To make an instance of an object:

1. Select an object by clicking it.
2. From the Edit menu, select the box next to Duplicate Special.
The Duplicate Special Options window opens.

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3. Set the Translate X field to 2 and the rest of the Translate and Rotate fields to 0 (Figure 4.61).

You add a translate here so the copy doesn't sit directly on top of the original.

4. For Geometry Type, select Instance (Figure 4.62).

5. Click Duplicate Special.

The duplicate is now an instance, or virtual copy, of the original.

6. With one of the objects selected, press **(F8)** to go into component-selection mode.

7. Marquee-select across the top third of the object to select one of its components (Figure 4.63).

8. Press **(w)**, and translate the components in any direction.

Note that the other object follows the translation of the selected surface (Figure 4.64).

✓ **Tip**

- Once you've created an instance of an object, you can't modify its components independently. However, you can translate, rotate, or scale the whole object without affecting the other instances.

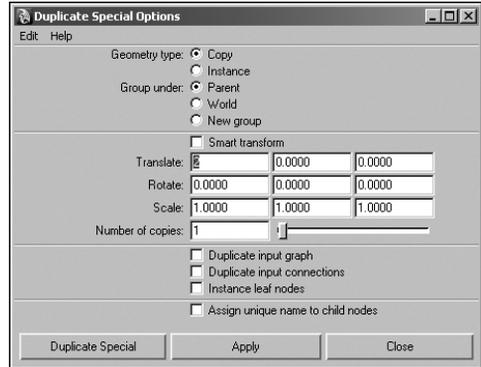


Figure 4.61 Set the Translate X field to 2.



Figure 4.62 Selecting Copy duplicates the object; however, selecting Instance results in an additional connection to the original object.

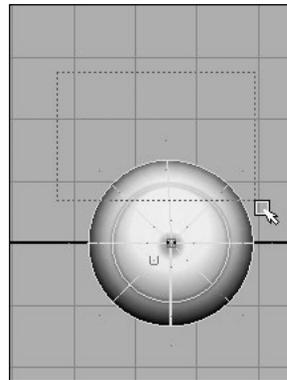


Figure 4.63 Marquee-select across the top third of the object to select control vertices to manipulate.

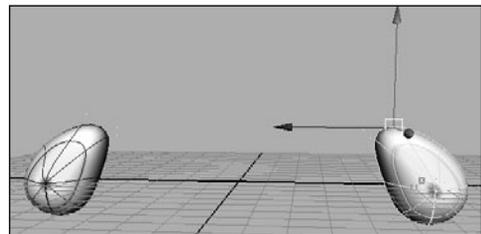


Figure 4.64 The other object follows the translation of the selected surface but in the opposite direction, like an object in a mirror.

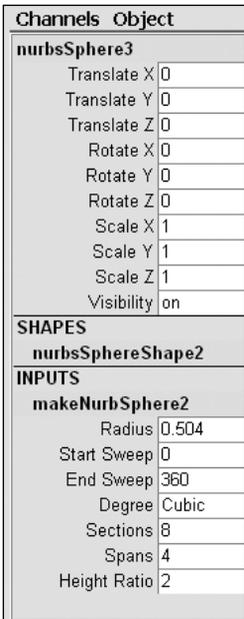


Figure 4.65 A primitive sphere's Inputs node holds the editable history of the sphere.

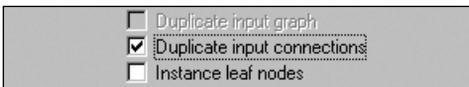


Figure 4.66 Select the “Duplicate input connections” check box in the Duplicate Special Options window to copy the input connections to the new object.

Duplicating input connections

Often, you'll want the construction history to remain attached to an object when you create a copy of it. This produces an effect like instancing but allows you to alter the objects independently as well. You can do this by selecting the “Duplicate input connections” check box in the Duplicate Special Options window. The objects then share the same Inputs node, and both the original and the duplicates are changed by it.

To duplicate an object with its input connections:

1. Select an object that has input connections attached to it—a primitive sphere, for example (**Figure 4.65**).
2. From the Edit menu, select the box next to Duplicate Special.
The Duplicate Special Options window opens.
3. Select the “Duplicate input connections” check box (**Figure 4.66**).
This option connects the duplicated object to the Inputs node of the original. Now, if you alter the Inputs node of one object, the duplicates are also affected.
4. Type the number of duplicates you want to produce in the “Number of copies” field.

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5. Click Duplicate Special.

A copy of the object is made, and its connections are attached to it (**Figure 4.67**). The new object sits directly on top of the original.

6. Select the Move tool, and move the duplicated object away from the original.

7. In the Channel Box, select the End Sweep attribute name, and drag the middle mouse button in the View pane to confirm the connections.

The End Sweep is changed on both objects interactively (**Figure 4.68**).

8. Right-click a sphere, select CVs from the marking menu, and move a few around. When you duplicate with input connections, you can make changes to the new copies without affecting the rest (**Figure 4.69**).

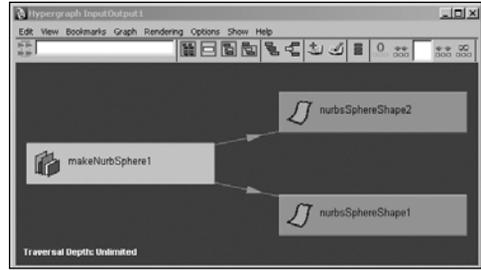


Figure 4.67 The same makeNurbSphere node is connected to both spheres.

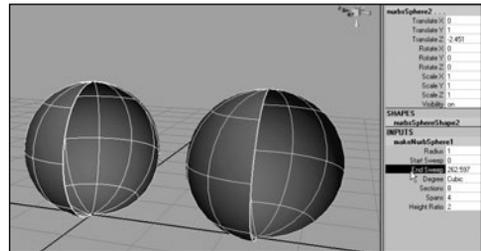


Figure 4.68 Because both spheres share the input node makeNurbSphere1, adjusting the sweep of that node adjusts both spheres.

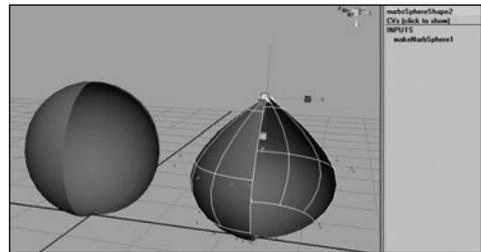


Figure 4.69 When you retain the Inputs node on duplicated objects, you can continue to make individual changes to the surfaces.



Soft Modification tool

Figure 4.70 Choose the Soft Modification tool from the toolbar.

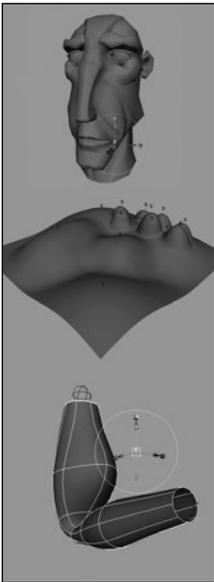


Figure 4.71 Faces, smooth terrain, and muscles are just a few examples of what Soft Modification can do.

Soft-Modifying Objects

The Soft Modification tool  gives you the ability to *sculpt*, or smoothly modify, dense surfaces (**Figure 4.70**).

You can use this tool for animation as well as modeling, because its parameters can be keyframed as long as the construction history has been enabled (see Chapter 1 for more about construction history). The Soft Modification tool's uses range from adjusting a dense facial mesh, to creating smooth terrain, to animating bulging muscles on a superhero's arm (**Figure 4.71**).

The Soft Modification tool works by tapering the effect of adjusting points on surfaces. In Maya 8, this tapering is displayed as a color-coded gradient while the softMod is selected. SoftMods allow smooth adjustments of a surface across several points. This technique is especially useful when you're working with dense surfaces: Without the Soft Modification tool, it would be far too time-consuming to individually move the large number of components required to make smooth changes.

As with the other translation tools, you can activate the Soft Modification tool and then select the area of the object you want to soft-modify. Or, if you select an object first and then choose the Soft Modification tool, the effect is automatically applied to the center of the object. The effect can be moved at any time, unless you delete the construction history.

To soft-modify an object:

1. Create a primitive polygonal plane (Create > Poly Primitives > Plane), give it Subdivisions Height and Width of **100**, and scale it to about 20 times its original size (**Figure 4.72**).
2. Make sure your plane isn't selected, and then click the Soft Modification tool  in the toolbar.
3. Click the part of the object where you want to create the soft modification (softMod).
A softMod node is added to the surface, and its manipulator becomes active (**Figure 4.73**).
4. Select the y translate axis of the manipulator, and drag it up (**Figure 4.74**).

A softMod node is added to the surface, and its manipulator becomes active (**Figure 4.73**).

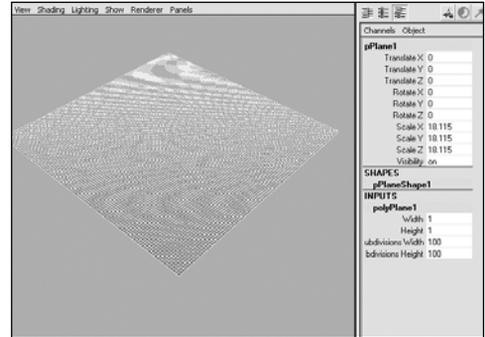


Figure 4.72 In the Channel Box, increase the Subdivisions Width and Height to create a dense polygon plane.

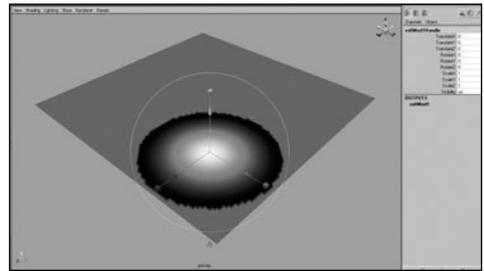


Figure 4.73 Add a softMod to a surface. The orange and black gradient displays the variable effect of the softMod.

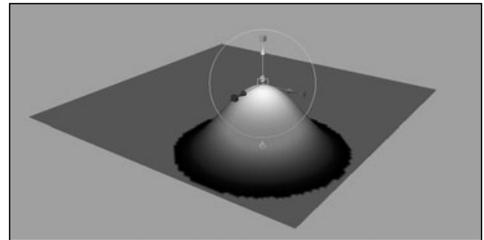


Figure 4.74 Drag the y axis of the softMod manipulator.

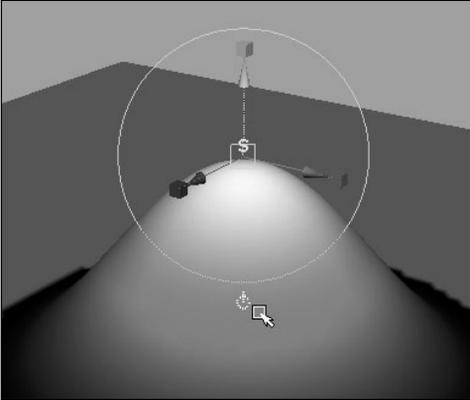
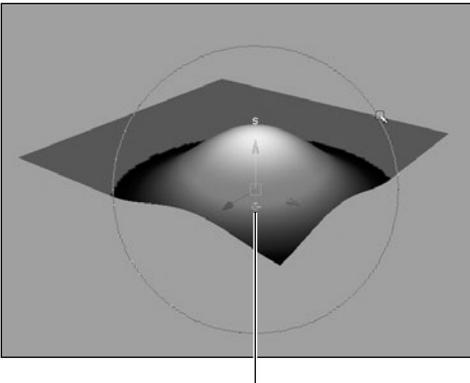


Figure 4.75 The Cycling Index is a circle with a line through it under the softMod manipulator. Click the Cycling Index to toggle on the Falloff manipulator.

5. Click the Cycling Index to display the Falloff manipulator (**Figure 4.75**).
6. Click and drag the red circle surrounding the Falloff manipulator to increase or decrease the drop-off area (**Figure 4.76**).
7. Click the translation icon on the Falloff manipulator, and drag it from side to side (**Figure 4.77**).

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Cycling Index

Figure 4.76 Click and drag the red circle around the Falloff manipulator to adjust the drop-off area.

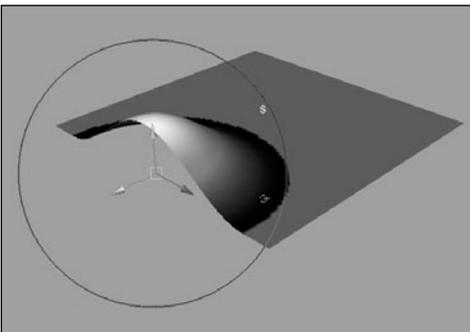


Figure 4.77 Using the Move tool, click and drag the Falloff manipulator.

8. Press **Ctrl**+**a** to open the Attribute Editor for the softMod, and select the arrow next to the Falloff Curve (**Figure 4.78**).

The graph opens in a new window, so that you can adjust it more easily (**Figure 4.79**).

9. Click the ramp to create a new edit point (**Figure 4.80**).
10. Click and drag the edit point into the desired position.

or

Click the box with an x in it to delete the edit point.

11. Add two edit points, and position them as shown in **Figure 4.81**.

You can see the results of editing the Falloff Curve on the surface of the softMod you created.

✓ Tips

- Before clicking the Soft Modification tool in the toolbar, be sure you don't have any objects selected. If you do, a softMod node will be added to them.
- If you deselect the Falloff manipulator, you can click the S icon floating above the surface and then press **T** (Show Manipulator) to reactivate it.
- Soft modification can work on selected components as well as the entire object.

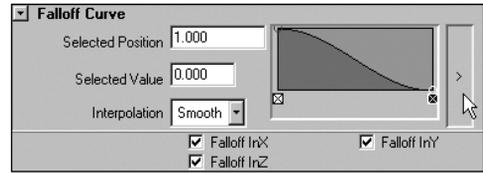


Figure 4.78 The new ability to bring up a larger graph window makes editing the Falloff Curve much easier.

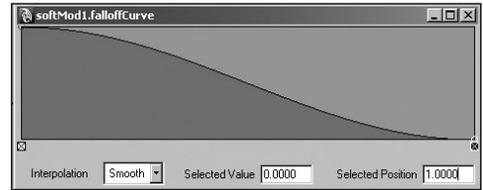


Figure 4.79 Click the graph in the Falloff Curve window...

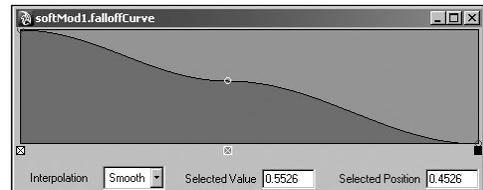


Figure 4.80 ...to create edit points.

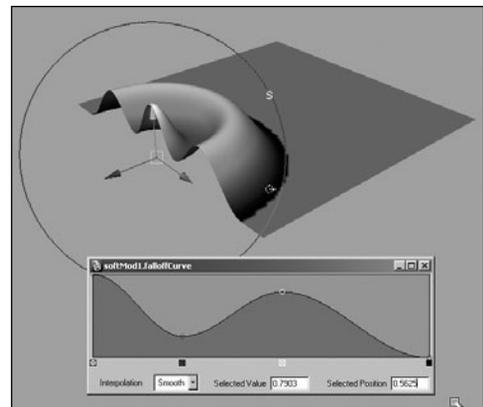


Figure 4.81 The softMod now has a smooth, wavelike shape.