

# Chapter 2

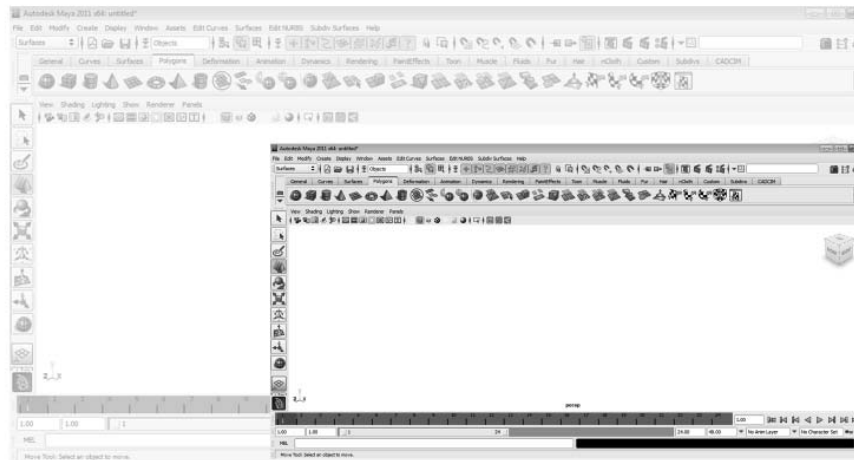
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## Interface of Maya

### Learning Objectives

**After completing this chapter, you will be able to:**

- Use Maya Interface.
- Use Help line, Command line, marking menus, Hotkeys.
- Work with main Maya windows.



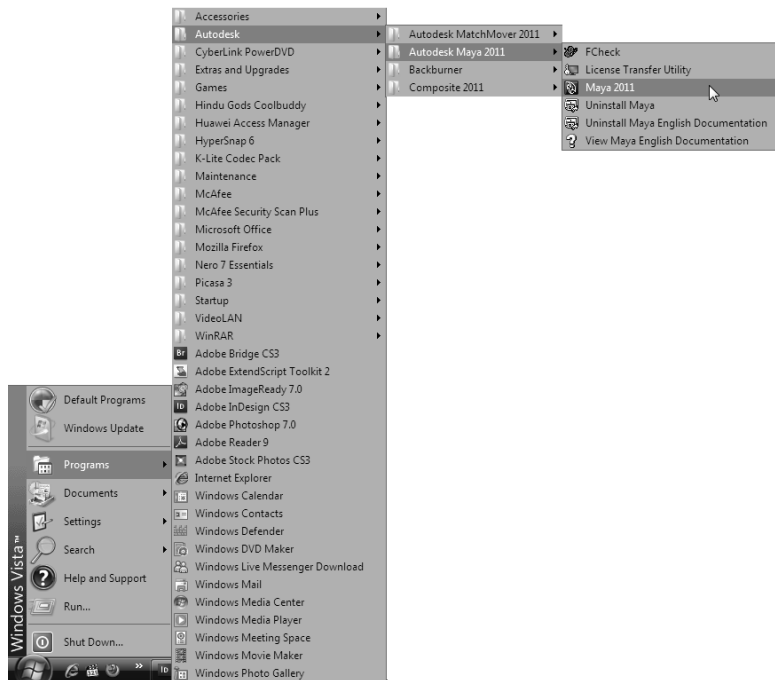
## INTRODUCTION

In this chapter, you will learn about the interface of Autodesk Maya and the basic tools and windows used while working with it. In this textbook, you will use Maya software to create character animation. Therefore, it is important to get familiar with the tools and techniques used in Maya. Although Maya is a vast software and its detailed description is beyond the scope of this textbook; therefore, only some of its major tools have been discussed in this chapter.

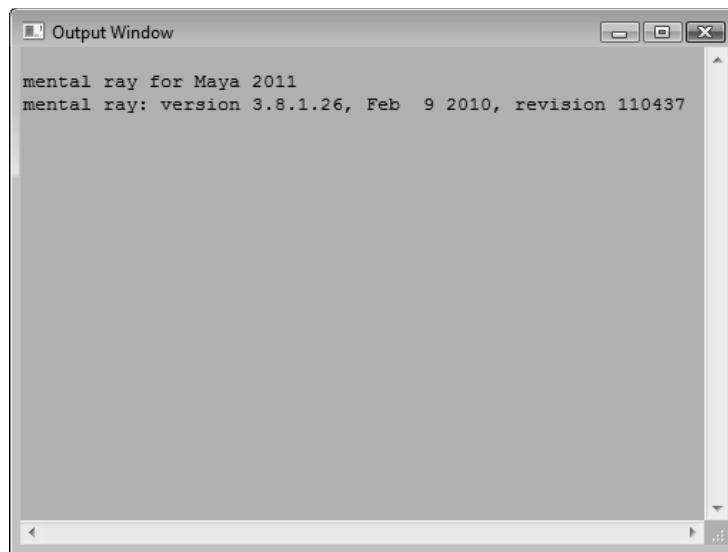
## STARTING Autodesk MAYA 2011

To start Autodesk Maya 2011, choose **Start > All Programs > Autodesk > Autodesk Maya 2011 > Maya 2011** from the taskbar menu, as shown in Figure 2-1; the default Maya screen will be displayed with its different components.

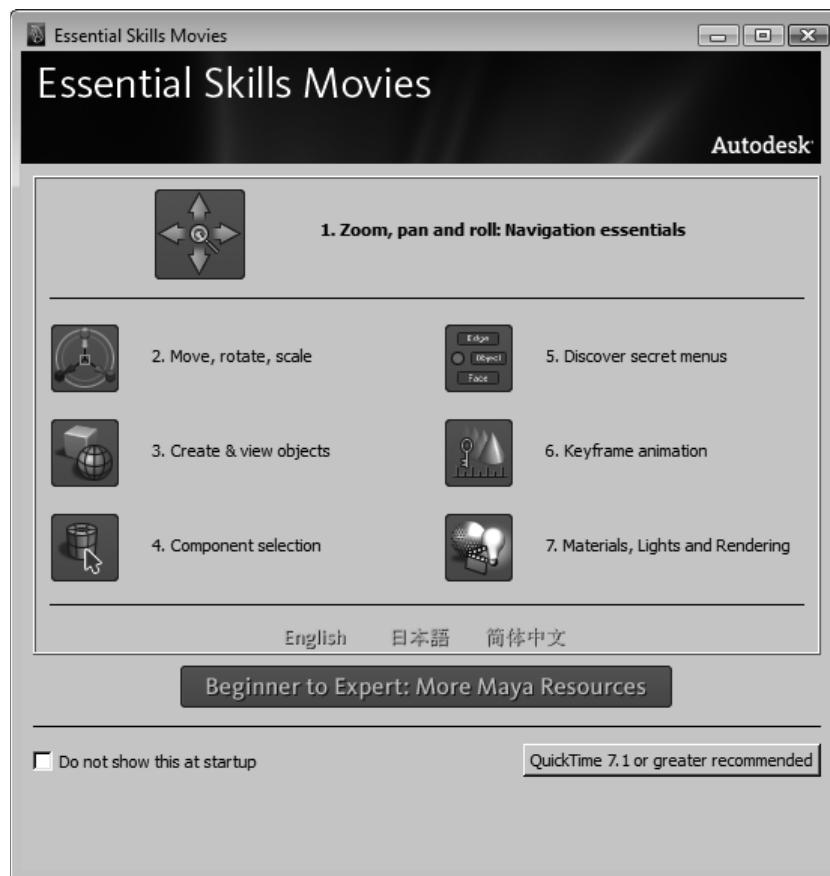
Alternatively, you can start Autodesk Maya 2011 by double-clicking on its shortcut icon displayed on the desktop of your computer. This icon will automatically be created when you install Autodesk Maya 2011 on your computer. When you double-click on the icon, three windows will be displayed on your computer screen; the **Autodesk Maya 2011** window, the **Output Window**, as shown in Figure 2-2, and the **Essential Skills Movies** window, as shown in Figure 2-3. You will work with various tools in **Autodesk Maya 2011** window to create different types of animations. The **Output Window** helps you to check the render time and other calculations made while rendering. The **Essentials Skills Movies** window provides access to some video tutorials that will help you learn about the basic interface of the software.



*Figure 2-1 Starting Autodesk Maya 2011 using the taskbar menu*



*Figure 2-2 The Output Window*



*Figure 2-3 The Essential Skills Movies window*

## Autodesk Maya INTERFACE

Autodesk Maya interface consists of viewports, menu bar, status line, shelf, toolbox, and so on. When you start Autodesk Maya 2011 for the first time, the **persp** panel will be displayed by default, which is the default screen of Maya 2011. Panel is the work area where you can create 3D scenes. Panels are also known as viewports or simply views. In this textbook, panels will be referred to as viewports. Every viewport has a grid placed in the center. A grid is the intersection of lines which are perpendicular to each other in the X-Y plane. The center of the grid is intersected by two dark lines. The point of intersection of these two dark lines is known as the origin. The origin is an arbitrary point, which is used to determine the location of the objects. At the origin, the X, Y, and Z coordinates are at 0, 0, and 0 position, respectively. Note that in Maya, the X, Y, and Z axes are displayed in red, green, and blue colors, respectively. Some of the major components of Maya are discussed next.

### Viewports

Autodesk Maya 2011 screen is divided into four viewports: **top**, **front**, **side**, and **persp**. These viewports are classified into two categories, orthographic and perspective. The orthographic category comprises the **top**, **front**, and **side** viewports and the perspective category comprises the **persp** viewport. The orthographic viewport displays the 2-dimensional (2D) view of the objects created in it, whereas the perspective viewport displays the 3-dimensional (3D) view of the objects created. Every viewport can be recognized easily by its name, which is displayed at the bottom of each viewport. To view the four viewports simultaneously, choose the **four view** button from the toolbox. Figure 2-4 shows all four viewports along with different components of Autodesk Maya 2011.



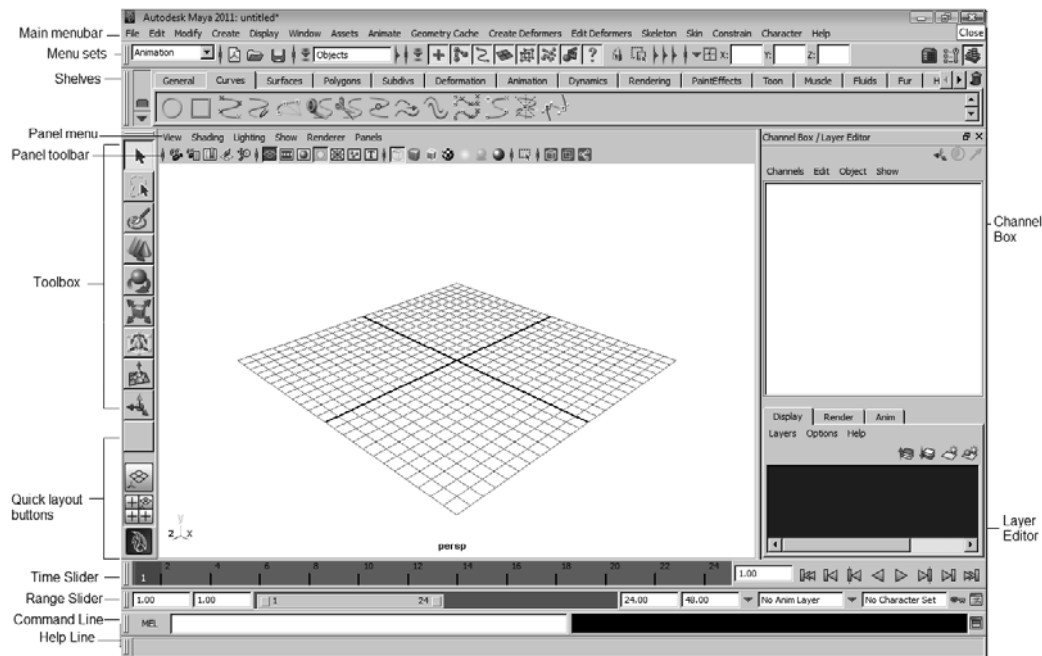
**Tip.** To toggle between the single and four viewport views, move the cursor over any one of the viewports and press the SPACEBAR key.

Every viewport has a menubar with it that allows you to access the tools and functions related to that specific viewport. The axis direction indicator located at the lower left corner of the viewport shows the X, Y, and Z directions. Similarly, every viewport in Maya has a default camera in it, through which the viewport scene can be viewed. The name of the camera is displayed at the bottom of each viewport. In other words, the name of the viewport is actually the name of the camera of that particular viewport.

The title bar on the top of the screen displays the name of the software and the location where the current file is saved. A Maya file is saved with the *.mb* extension. The three buttons at the extreme right of title bar are used to minimize, maximize, and close the **Autodesk Maya 2011** window, respectively. Various components of this window are discussed next.

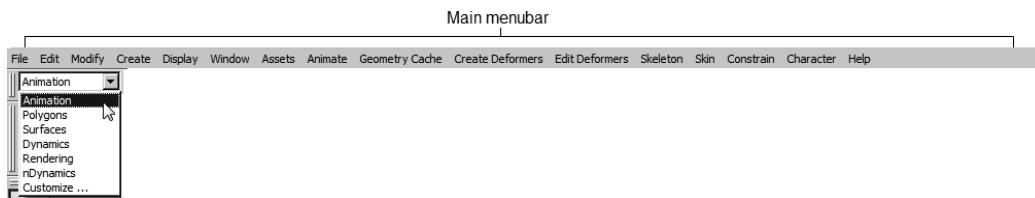
### Main Menubar

In Maya, the menubar is grouped into different menu sets. Each menu set corresponds to a particular module in Maya interface (refer to Figure 2-5). Various types of modules available in Maya are Animation, Polygons, Surfaces, Dynamics, Rendering, nDynamics, and Customize.



**Figure 2-4** Autodesk Maya 2011 displaying four viewports and its different components

On selecting a particular module, the menus in the menubar change accordingly. On choosing the menu set, the first six menus and the last menu **Help** will remain same and the remaining menus will change as per the changes in the modules. Figure 2-5 shows the main menubar and different modules of menu set.



**Figure 2-5** The main menubar and menu sets



**Tip.** You can also select different modules using the hotkeys that are assigned to them. The default hotkeys are F2 (Animation), F3 (Polygons), F4 (Surfaces), F5 (Dynamics), and F6 (Rendering).

On choosing any menu from the menubar, a pull-down menu will be displayed, as shown in Figure 2-6. On the right of some options in these pull-down menus, there are two types of demarcations, arrows and option boxes, refer to Figure 2-6. When you click on an option box, a dialog box will be displayed. You can use this dialog box to set the options for that particular tool or menu item. On clicking the arrow, the corresponding submenu will be displayed.

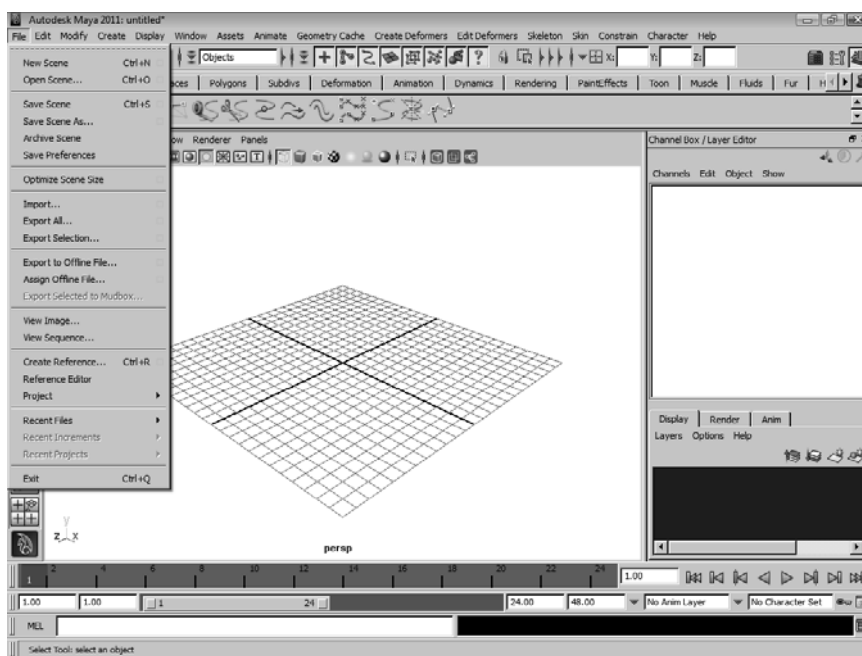


Figure 2-6 The **File** pull-down menu

## Status Line

The status line is located below the main menubar, as shown in Figure 2-7. It begins with the menu set drop-down list, which is used to select the modules. The menu set on the right of the main menubar changes as per the module selected. The status line consists of different graphical icons. The graphical icons are further grouped and these groups are separated by black vertical lines with a box or an arrow symbol in the middle. These vertical lines, refer to Figure 2-7, are known as collapsers. You can click on a collapser with a box symbol to hide a particular group on the status line. On doing so, the corresponding group will be hidden and the box will change to an arrow symbol. Similarly, if you click on a collapser that has an arrow symbol in the middle, the particular group will display all the tools grouped in that collapsers group icon. Various groups separated by collapsers are discussed next.



Figure 2-7 The status line

## Menu Set Menu

The menu set menu of the status line is used to select different modules such as Animation, Polygons, Surfaces, Dynamics, and so on from the drop-down list, as shown in Figure 2-8.

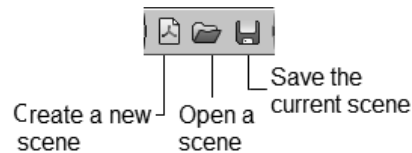


*Figure 2-8 The menu set*

For example, if you select the **Rendering** module from the drop-down list; all commands related to it will be displayed in the menu of the main menubar.

### Scene File Group

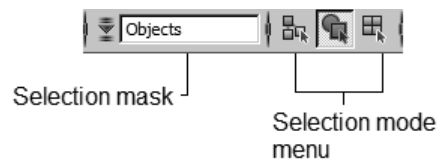
This group is used to perform different file related operations such as creating a new scene, opening an existing file, and saving the current scene, refer to Figure 2-9.



*Figure 2-9 The scene file icons*

### Selection Mask and Selection Mode Menu

The Selection mask and Selection mode menu is used to select objects or components of objects from the viewport, refer to Figure 2-10. The group of icons next to this selection mode group comprises three distinct nodes: Object, Hierarchy, and Components.



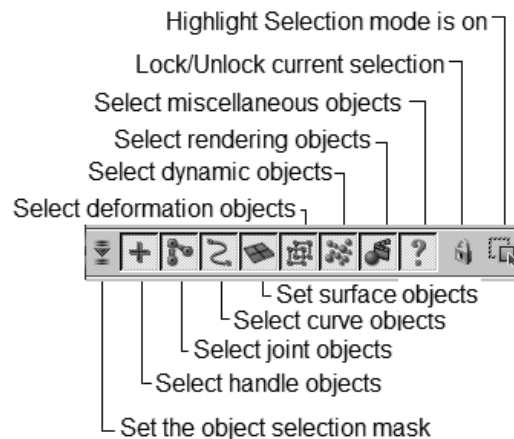
*Figure 2-10 The selection mode group*

### Selection Mode Buttons Group

The selection mode buttons group contains selection filters that help you select objects or their components in the viewport, refer to Figure 2-11. The selection mask helps you decide which filters/icons should be displayed in the viewport. You can select the required object from a group by using the filters/icons.

### Snap Buttons Group

The snap buttons group comprises different snap tools, as shown in Figure 2-12. The snap tools are used to snap the selected objects to specific points in the scene.



*Figure 2-11 The selection mode buttons group*

### Input and Output Connections Group

This part of the status line helps you control various objects, refer to Figure 2-13. The objects with input connections are affected or controlled by other objects, whereas the objects with output connections affect or control other objects.

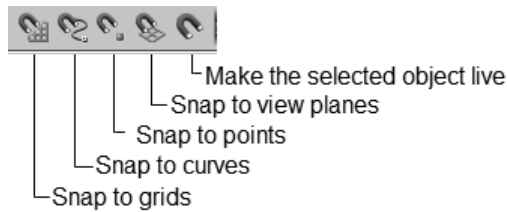


Figure 2-12 The snap buttons group

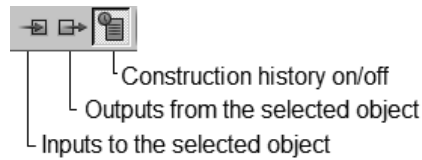


Figure 2-13 The input and output connections group

### Render Controls Group

This group of the status line helps you access all render controls in Maya, refer to Figure 2-14.

### Input Box Group

This group in the status line helps you quickly select, rename, and transform the objects that are created in the viewport, refer to Figure 2-15. Some of the options in the **Name Selection** field are in hidden modes. To view them, move the cursor over the arrow on the left of the input field and then press and hold the left mouse button on it; a list will be displayed. Now, select the required option from the pull-down menu; the corresponding mode will be displayed. By default, the **Absolute transform** mode is displayed in the status line.



Figure 2-14 The render controls group

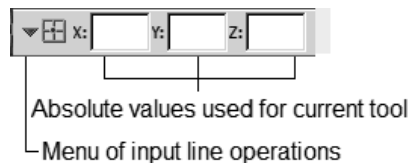


Figure 2-15 The input box group

### SideBar Buttons Group

This is the last part of the status line. The SideBar buttons control the properties of the objects created in the viewport and the tools required for working with the objects, refer to Figure 2-16.

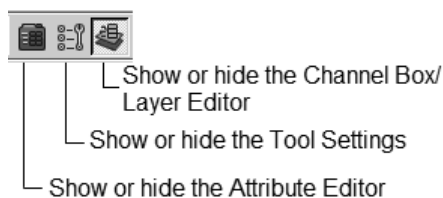
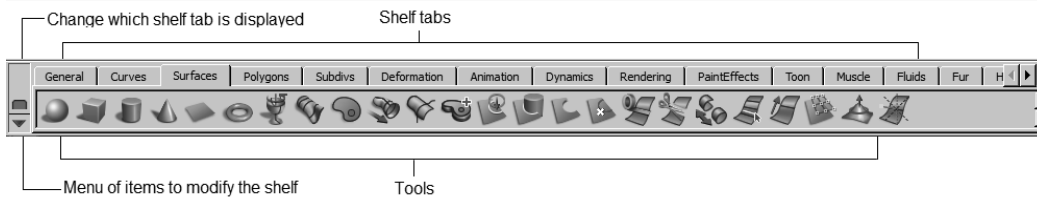


Figure 2-16 The sidebar buttons group



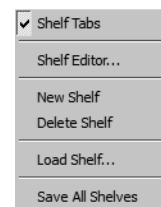
## Shelf

The **Shelf** is located below the status line. Figure 2-17 shows the shelf in Maya. It helps you access various tools in Maya easily and quickly. The shelf contains various tabs such as **General**, **Curves**, **Surfaces**, and so on. The tools in the shelf change according to the tab chosen. For example, if you choose the **Animation** tab, the tools related only to the animation will be displayed in the shelf. The tabs help you create and edit various objects such as curves, surfaces, and so on. Also, it helps you to create and perform various functions such as animation, rendering, deformations, and so on, on objects in the viewport.



**Figure 2-17** The Shelf

The **Change which shelf tab is displayed** button, refer to Figure 2-17, is used to switch between different shelf tabs. You can create a new shelf with the required options and also modify the current shelf. To do so, press and hold the right mouse button over the **Menu of items to modify the shelf** button, refer to Figure 2-17; a flyout will be displayed, as shown in Figure 2-18. The tools in this flyout can be used to create a new shelf, delete shelf, load shelf, and save the shelf.



**Figure 2-18** The Menu of items to modify the shelf flyout

## Toolbox

The toolbox is located on the left of the viewport. It comprises the most commonly used tools in Maya such as **Select**, **Translate**, **Rotate**, **Scale**, and so on, as shown in Figure 2-19. In addition to these tools, the toolbox has several other tools that will help you change the interface. Various tools in the toolbox are discussed next.

### Select Tool



The **Select Tool** is used to select the objects created in the viewport. To select an object, invoke the **Select Tool** from the toolbox and click on an object in the viewport; the object will be selected.

### Lasso Tool



The **Lasso Tool** is used to select an object using a free form marquee tool. It is very much similar to the **Select Tool**. To select an object, invoke the **Lasso Tool**; the cursor will change



**Figure 2-19** The toolbox

to a rope knot. Now, press and hold the left mouse button and drag the cursor in the viewport to create a selection area around the object. Then, release the left mouse button; the object inside the dragged area will be selected. You can also adjust the properties of the **Lasso Tool** by choosing the **Show or hide the Tool Settings** button from the status line or by double-clicking on the **Lasso Tool** itself.

### Paint Selection Tool



The **Paint Selection Tool** is also known as the selection tool. This tool is used to select various components of an object. To do so, invoke the **Select Tool** from the toolbox and select an object in the viewport. Next, press and hold the right mouse button over the selected object; a marking menu will be displayed. Choose **Vertex** from the marking menu to make the vertex component of the object active. Now, invoke the **Paint Selection Tool** from the toolbox; the cursor will change to the paint brush. Next, press and hold the right mouse button and drag the cursor over the object to select the vertex.

You can also increase the size of the **Paint Selection Tool** cursor. To do so, press and hold the **b** key on the keyboard. Next, press and hold the middle mouse button in the viewport and drag the cursor to adjust the size of the tool cursor.

### Translate Tool



The **Translate Tool** is used to move an object from one place to another in the workspace. To do so, invoke the **Translate Tool** from the toolbox; the icon will change to an arrow with a box at its tip. Select the object in the workspace that you want to move. You can move the selected object in the X, Y, or Z direction using the handles/manipulators over the object. You can also adjust the properties of the **Translate Tool** by choosing the **Show or hide the Tool Settings** button from the status line or by double-clicking on the **Move Tool**.

### Rotate Tool



The **Rotate Tool** is used to rotate the selected object in the viewport. To do so, invoke the **Rotate Tool** from the toolbox; the icon will change to an arrow with a box at its tip. Select the object that you want to rotate. You can rotate the selected object in the viewport using the circular rings formed on the object. The properties of the **Rotate Tool** can be adjusted by choosing the **Show or hide the Tool Settings** button from the status line or by double-clicking on the tool.

### Scale Tool



The **Scale Tool** is used to scale the selected object in the viewport. To do so, invoke the **Scale Tool** from the toolbox and select the object in the viewport that you want to scale. You can scale the selected object in the viewport by moving the handles/manipulators on the object. Each handle scales the object in different axis. You can also scale the object uniformly by moving the yellow cube in the center of the handle/manipulator. You can adjust the properties of the **Scale Tool** by choosing the **Show or hide the Tool Settings** button from the status line or by double-clicking on the tool.

**Note**

While rotating, moving, or scaling an object, different colored handles are displayed that indicate different areas. You can use this color scheme while working with three transform tools as well. The red, green, and blue colors represent the X, Y, and Z axes, respectively.

**Universal Manipulator**

The **Universal Manipulator** tool can perform the functions of the **Move Tool**, **Scale Tool**, and **Rotate Tool** simultaneously. To do so, select an object from the viewport and invoke the **Universal Manipulator** tool; the selected object will be surrounded by a number of manipulators or handles to scale or rotate the object. Select the scale or rotate manipulator; an edit box will be displayed on the selected manipulator. Enter the required value in the edit box to transform the object and press ENTER; the selected object will transform accordingly. Alternatively, select and move the cursor to transform the object.

**Soft Modification Tool**

The **Soft Modification Tool** helps you deform a geometry in such a way that the deformation is widest at the center and it gradually decreases towards the end.

**Show Manipulator Tool**

The **Show Manipulator Tool** helps you display the object-specific manipulator.

**Current Tool Display**

The **Current Tool Display** tool displays the last used or the currently selected tool.

**Channel Box/Layer Editor**

The channel box is used for editing the attributes of an object. Figure 2-20 displays the **Channel Box/Layer Editor**. The channel box consists of all attributes for editing, and the layer editor lets you create layers for objects in the scene. To display the **Channel Box/Layer Editor**, choose **Display > UI Elements > Channel Box/Layer Editor** from the main menubar. Alternatively, press CTRL + a + a keys to display the **Channel Box/Layer Editor**. Select an object for editing its attributes; the attributes of the selected object will be displayed in the **Channel Box/Layer Editor**. You can also use the **Channel Box/Layer Editor** as a floating window by double-clicking on its name.

The channel box is divided into three parts that are discussed next.

**Transform Node**

The transform node contains the transformation attributes of the selected object. Select an object from the viewport; the transform node will become active, refer to Figure 2-20. Enter the transform values in different transform parameter edit boxes to transform the object in the viewport. Alternatively, click on an attribute in the transform node; the background of the attribute will change to black color. Now, move the cursor to the viewport, press and hold

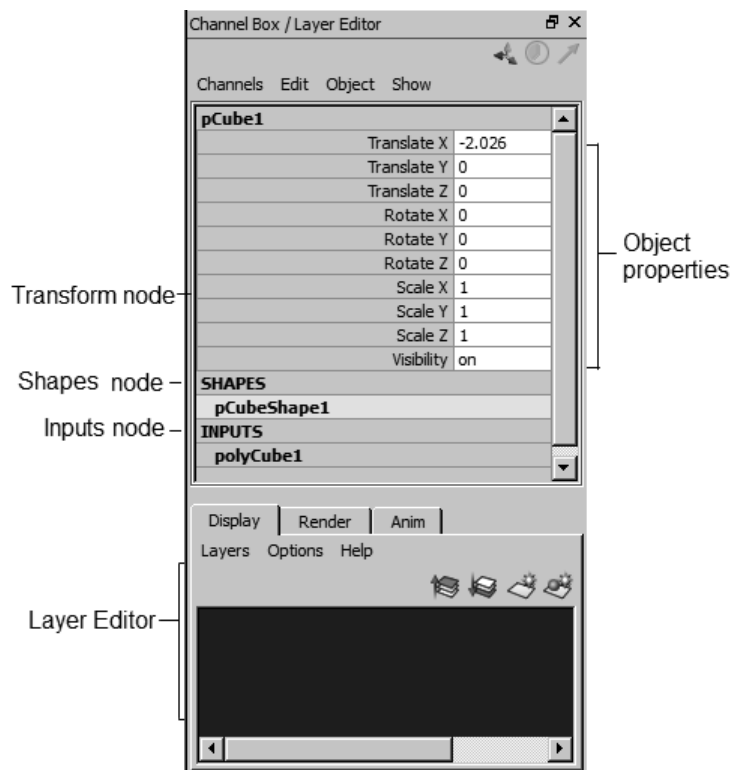


Figure 2-20 The Channel Box/Layer Editor

the middle mouse button and drag it to make changes in the selected attribute. You can also adjust the values of more than one attribute at a time. To do so, press and hold the SHIFT key, select the attributes that you want to adjust, and then move the cursor in the viewport. Now, press and hold the middle mouse button and drag the cursor to make changes in the selected attributes. Choose the **Visibility** attribute to set the visibility of the object. You can enter **0** in the **Visibility** edit box to turn off the visibility of the selected object or enter **1** in the **Visibility** edit box to turn the visibility on.

### SHAPES Node

The **SHAPES** node gives a brief information about an object. It displays the name of an object, refer to Figure 2-20. Every object is named in a particular manner. For example, when you create a NURBS sphere in the viewport, it is named as **nurbsSphereShape1**. Here, nurbs indicates that the object has been created using the NURBS primitives, Sphere indicates that a sphere has been created and Shape1 indicates that this is the first sphere shape created in the workspace.

### INPUTS Node

The **INPUTS** node is used to modify the geometric structure of an object. Select an object from the viewport; the geometric attributes of the selected object will be displayed in the

**INPUTS** node of the channel box, refer to Figure 2-20. Adjust the geometric values as per your requirement.



### Note

To edit the components of the Channel Box, choose **Window > General Editors > Channel Control** from the main menubar.

The layer editor is located below the channel box. To create a new layer in the layer editor, choose **Layers > Create Empty Layer** from the layer editor menu, as shown in Figure 2-21; a new layer will be created, as shown in Figure 2-21. To add an object to the layer, select the object in the viewport and then press and hold the right mouse button over the empty layer; a flyout will be displayed. Choose **Add Selected Object** from the flyout; the selected object will be added to the layer. The layer editor is mainly used when there are multiple objects in the scene.

In Maya 2011, the layer editor is divided into three phases: **Display**, **Render**, and **Anim**. These phases are discussed next.

### Display

The **Display** radio button in the layer editor is used to display and assign objects to organize a scene. By selecting the **Display** radio button, you can quickly turn on and off the selections.

### Render

The **Render** radio button in the layer editor helps in separating the renders in different layers or passes. Rendering in different passes will help later, when the scene is combined in any compositing program. Also, it gives controls over the objects in the scene.

### Anim

The **Anim** radio button in the layer editor is used to add and blend two animations together. In other words, the animation layers help you organize a keyframe animation without overlapping the original animation.

### Panel Menu

The Panel Menu is available in every viewport, refer to Figure 2-4. The commands or options in the Panel Menu control all actions performed in the workspace. The Panel Menu comprises six menus, which are discussed next.

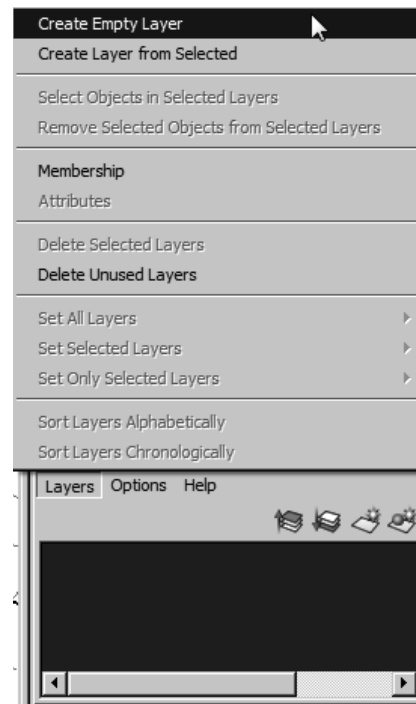


Figure 2-21 Creating a new layer

**View**

The **View** menu is used to view the object in the viewport from different angles using different camera views.

**Shading**

The **Shading** menu helps you use various shading modes in Maya such as wireframe, smooth shade all, flat shade all, and X-ray. You can also use the **Wireframe on Shaded** option in this menu for working comfortably in the shaded mode.

**Lighting**

The **Lighting** menu helps you use different presets of lights in Maya. You can select default lighting or any other lighting that you need to apply to the scene.

**Show**

The **Show** menu is used to hide or unhide a particular group of objects in the viewport.

**Renderer**

The **Renderer** menu is used to render the view in the selected panel. You can also set the color texture resolution and the bump texture resolution to high quality rendering using the options in this menu.

**Panels**

The **Panels** menu is mainly used to shift between the active viewport and a different view.

**Panel Toolbar**

The **Panel** toolbar is located just below the panel menu in all viewports. Figure 2-22 displays the **Panel** toolbar. The **Panel** toolbar comprises the most commonly used tools present in the panel menu. These tools are discussed next.

**Select camera**

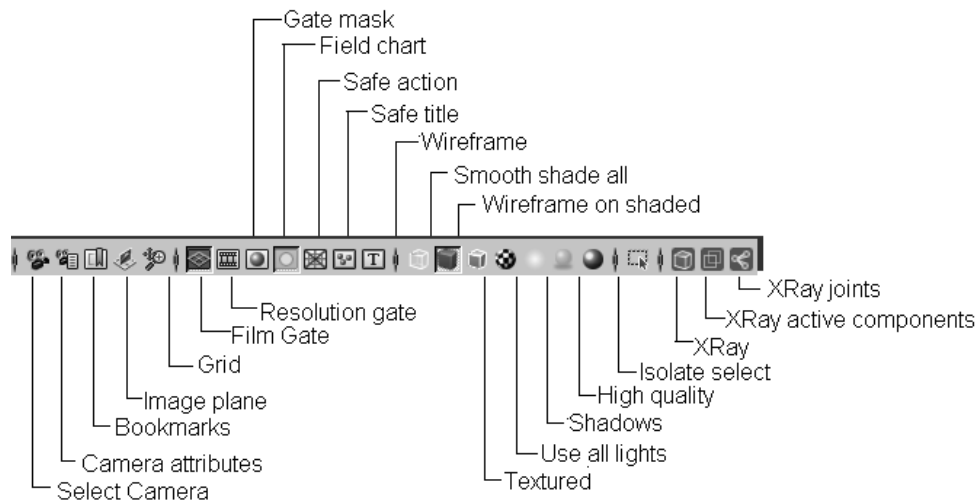
The **Select camera** tool is used to select the current camera in the selected viewport. You can also select the current camera in the scene by choosing **View > Camera** from the Panel Menu.

**Camera attributes**

The **Camera attributes** tool is used to display the attributes of the camera in the active viewport. The attributes are displayed on the right of the viewport in the **Attribute Editor**. You can also view the attributes by choosing **View > Camera Attribute Editor...** from the Panel menu.

**Bookmarks**

The **Bookmarks** tool is used to set the current view as a bookmark. Set a view in the viewport and then invoke the **Bookmarks** tool; the set view is bookmarked for further reference. Press and hold the right mouse button over the tool; a flyout will be displayed, with list of bookmarks created. You can also edit the bookmarks that you have created by choosing the



*Figure 2-22 The **Panel** toolbar*

**Edit Bookmarks...** option from this flyout. On doing so, the **Bookmark Editor** dialog box of the active viewport will be displayed. You can change the name and other attributes of the selected bookmark using the options in this dialog box.

### Image Plane

The **Image Plane** tool is used to add an image to the active viewport. On invoking the **Image Plane** tool, the **Open** dialog box will be displayed. Choose the image plane that you want to insert in the active viewport from this dialog box. You can also set the image to the active viewport by choosing **View > Image Plane > Import Image** from the Panel menu.

### Grid

The **Grid** tool is used to display grids in the viewport. You can also invoke this tool by choosing **Show > Grid** from the Panel Menu. Moreover, you can set the attributes for the grids in the viewport by using this tool. To do so, press and hold the right mouse button over the **Grid** tool in the **Panel** toolbar; a flyout will be displayed. Choose **Grid Options** from the flyout; the **Grid Options** dialog box will be displayed. Set the grid attributes in the dialog box as per your requirement.

### Film gate

The **Film gate** tool is used to toggle the display of film gate border on or off in the active viewport. You can also choose **View > Camera Settings > Film Gate** from the Panel Menu to display the film gate border in the active viewport.

### Resolution gate

The **Resolution gate** tool is used to toggle the display of resolution gate border on or off in the active viewport. The resolution gate sets the area in the viewport that will be rendered, thus resulting in a rendered view. You can also choose **View > Camera Settings > Resolution Gate** from the Panel Menu to set the resolution gate in the active viewport.

### Gate mask

The **Gate mask** tool is used to turn the display of gate mask border on. It changes the color and opacity of the area that lies outside the film gate or the resolution gate. The gate mask will only work when you have applied the film gate or the resolution gate to the active viewport. You can also choose **View > Camera Settings > Gate Mask** from the Panel Menu to set the gate mask in the active viewport.

### Field chart

The **Field chart** tool is used to turn the display of field chart border on. On invoking the **Field Chart** tool, a grid is displayed that represents twelve standard cell animation field sizes. The **Field Chart** tool should be used only when the render resolution is set to NTSC dimensions. You can also invoke this tool by choosing **View > Camera Settings > Field Chart** from the Panel Menu.

### Safe action

The **Safe action** tool is used to turn the display of safe action border on. This tool is used to set the region in the active viewport for TV production. You can also invoke this tool by choosing **View > Camera Settings > Safe Action** from the Panel menu.

### Safe title

The **Safe title** tool is used to turn the display of safe title border on. This tool is also used to set the region in the active viewport for TV production. This tool should be used only when the render resolution is set to NTSC or PAL dimensions. You can also invoke this tool by choosing **View > Camera Settings > Safe Title** from the Panel menu.

### Wireframe

The **Wireframe** tool is used to toggle the wireframe display on or off. You can also choose **Shading > Wireframe** from the Panel menu to switch to the wireframe mode. Alternatively, press 4 from the keyboard to turn on the wireframe mode.

### Smooth shade all

The **Smooth shade all** tool is used to set the display to smooth shade. You can also choose **Shading > Smooth Shade All** from the Panel menu to switch to the smooth shade mode. Alternatively, press 5 from the keyboard for the smooth shade mode.

### Wireframe on shaded

The **Wireframe on shaded** tool is used to switch all objects in the viewport to the wireframe shaded mode. You can also choose **Shading > Wireframe on Shaded** from the Panel Menu.



## Textured

The **Textured** tool is used to turn on/off the hardware texturing display of the objects in the viewport. You can also choose **Shading > Hardware Texturing** from the Panel menu to toggle on/off the textures on the objects in the viewport. Alternatively, press 6 from the keyboard to switch to the textured mode.

## Use all lights

The **Use all lights** tool is used to illuminate the objects using all lights in the viewport. You can also invoke this tool by choosing **Lighting > Use All Lights** from the Panel menu.

## Shadows

The **Shadows** tool is used to display the hardware shadow maps. This tool will function only when the **Use all lights** tool is active. You can also invoke this tool by choosing **Lighting > Shadows** from the Panel menu.

## High quality

The **High quality** tool is used to toggle on/off the high quality interactive shading in the active viewport. On invoking this tool, the objects in the viewport will show all the after render effects in the active viewport itself.

## Isolate select

The **Isolate select** tool is used to display only the selected object in the viewport. To do so, select an object in the viewport and invoke the **Isolate select** tool from the **Panel** toolbar. You can also invoke this tool by choosing **Show > Isolate Select** from the Panel menu.

## X-Ray

The **X-Ray** tool is used to make the objects in the viewport semi-transparent. You can also choose **Shading > X-Ray** from the Panel menu to switch to the X-Ray mode.

## XRay active components

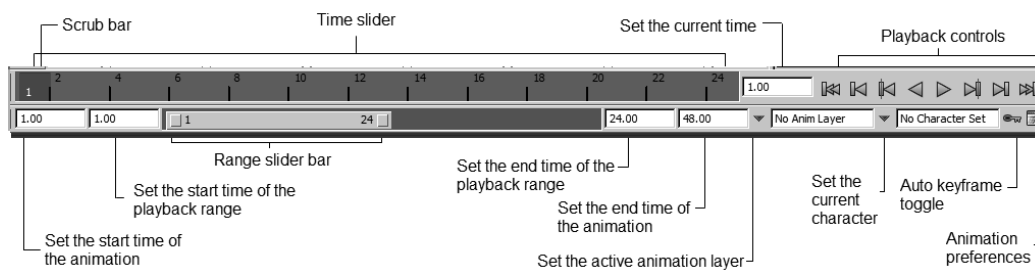
The **XRay active components** tool is used to display the active components over the top of other shaded objects. You can also invoke this tool by choosing **Shading > X-Ray Active Components** from the Panel menu.

## X-Ray joints

The **X-Ray joints** tool is used to display the skeleton joints over the top of other objects in the shaded mode. You can also invoke this tool by choosing **Shading > X-Ray Joints** from the Panel menu.

## Time Slider/Range Slider

The time slider and the range slider are located at the bottom of the viewport, refer to Figure 2-23. These two sliders help in controlling the timing of animation. The time slider comprises the frames that you use for animation. There is a text box in the time slider called **Set the current time** that indicates the current frame of the animation. This text box is also used to enter the keyframe that you want to access.



**Figure 2-23** The time slider and the range slider

The keys in the time slider are called key ticks and they are displayed as red lines. In the time slider, you will find one black box known as scrub bar, and it is used to move back and forth in the active range of frames available for animation. The playback controls at the extreme right of the time slider help you control the animation for the selected object in the viewport.

The range slider, located below the time slider, is used to adjust the range of animation playbacks. The range slider indicates the start and end time that allows you to focus on a specific part of the animation. The edit boxes placed on the left and right of range slider direct you to the start and end frames of the selected range. The length of the range slider can be altered using these edit boxes.

At the right of the **Set the end time of the playback range** input box, you will find the **Set the active animation layer** button. This button gives you access to all the options needed to create and manipulate the animation layers. This option helps you blend multiple animations in a scene.

Next is the **Character Set Selection menu** button located on the right of range slider and it is used to achieve automatic control over the character. There are two buttons at the extreme right of the range slider, the **Auto keyframe toggle** button and the **Animation Preferences** button, which are discussed next.

### Auto keyframe toggle Button



The **Auto keyframe toggle** button is a toggle button and is used to set the keyframe automatically. This button sets the keyframe automatically whenever an animated value is changed. Its color turns red when it is on.

### Animation preferences Button



The **Animation preferences** button is used to modify the animation controls. On choosing this button, the **Preferences** dialog box will be displayed. In the

**Preferences** dialog box, select the **Time Slider** option from the **Categories** list menu on the left; various options will be displayed on the right of the dialog box. You can set the animation controls in the **Time Slider** and **Playback** area of the **Preferences** window, as shown in Figure 2-24. Choose the **Save** button to save the changes.

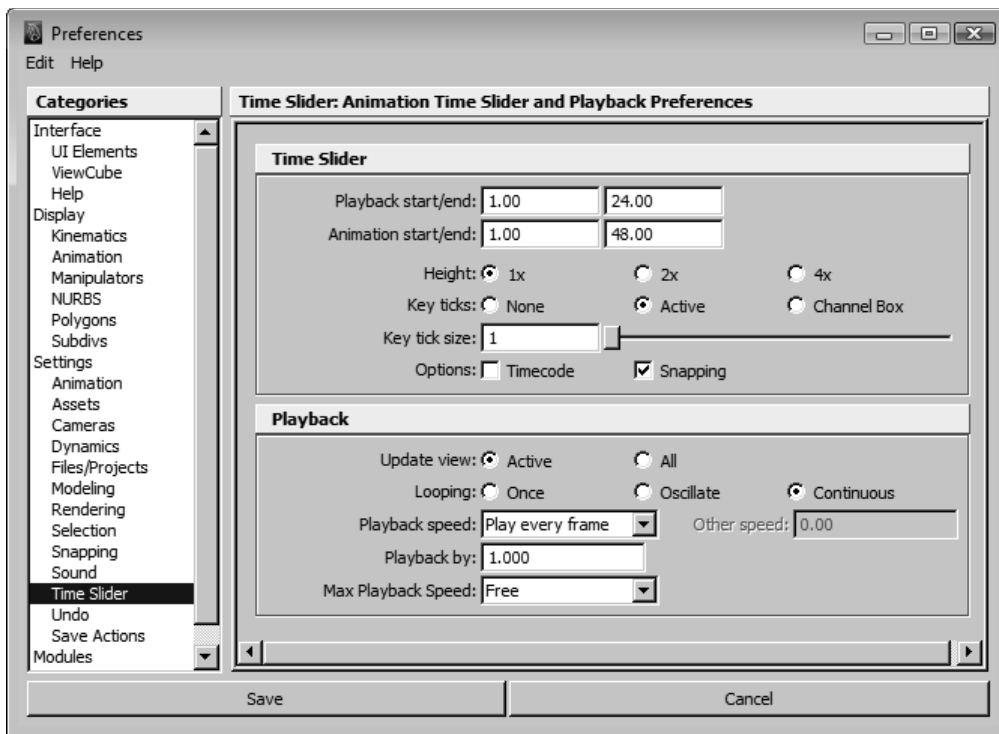


Figure 2-24 The Preferences window

## COMMAND LINE

The **Command Line** is located below the range slider. It is used to work in Maya interface by using the MEL script or the Python script. MEL and Python scripts are the scripting languages used in Maya. Choose the **MEL** button to switch between the two scripts. The **MEL** button is located above the **Help Line**.



### Note

***MEL** stands for MAYA Embedded Language. The **MEL** command is a group of text strings that are used to perform various functions in Maya. It is used to execute commands to build scenes as well as various user interface elements.*

The **Command Line** also displays messages from the program in the grey box on the right. At the extreme left of the **Command Line**, there is an icon for **Script Editor**. The **Script Editor** is used to enter complex and complicated **MEL** scripts into the scene.

## HELP LINE

The **Help Line** is located at the bottom of the **Command Line**. It provides a brief description about the selected tool, or the active area in Maya interface.

## HOTBOX

The hotbox helps you easily access the menu items in the viewport, as shown in Figure 2-25. The hotbox is very useful while working in the expert mode or the full screen mode. It helps you access the menu items and tools using cursor in the workspace. To access a command, press and hold the SPACEBAR; the hotbox will be displayed. Now, you can choose the option from the hotbox that you need to work with. The hotbox is separated into five distinct zones, East, West, North, South, and Center, refer to Figure 2-25. When you activate the hotbox, a set of shortcut menus called markings menus are displayed. These menus are discussed in the next section.

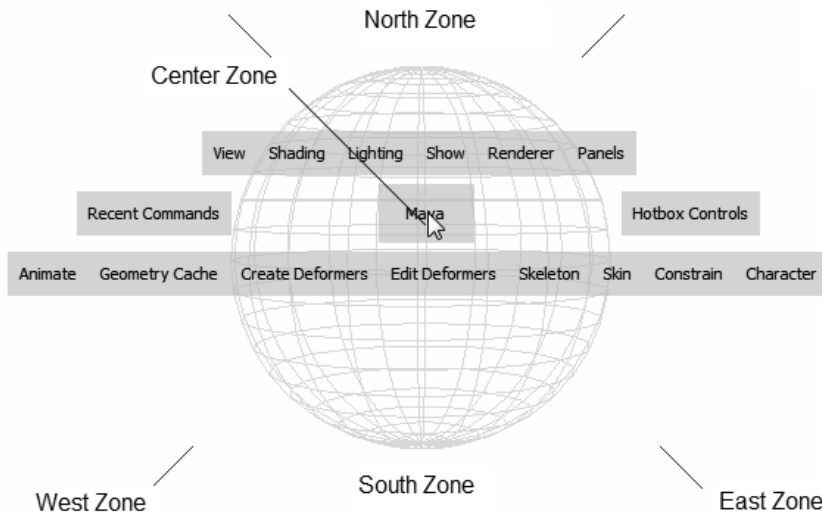


Figure 2-25 The Hotbox



### Note

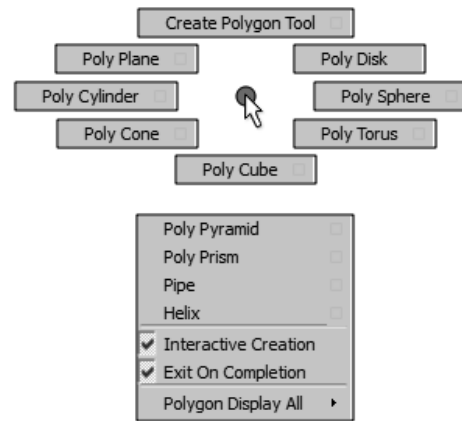
*You can use the hotbox to increase the workspace. But you must do it only after you have established a workflow for yourself. In the beginning, you should use the main menubar located at the top of the screen instead of the hotbox, as it reduces the possibility of confusion in finding a command at a later stage.*

## MARKING MENUS

The marking menus are a type of shortcut menus that consist of almost all tools related to an object. You can quickly access the commonly used commands using the marking menus.

After invoking the marking menu, drag your cursor to the option that you want to choose; the movement of the cursor will be depicted by a thick black line trailing behind the cursor, with its one end still attached to the center of the marking menu.

There are three different forms of marking menus in Maya. The first type of marking menu is used to create default objects in the viewport. To create a default object, press and hold the SHIFT key and right-click anywhere in the viewport; a marking menu will be displayed, prompting you to select the object that you want to create, as shown in Figure 2-26.



**Figure 2-26** The marking menu displaying the default objects to be created

Another type of marking menu is used to switch among various components of an object such as vertices, faces, edges, and so on. To display this marking menu, create an object and then right-click on it; a marking menu will be displayed prompting you to select components of the selected object, as shown in Figure 2-27. This marking menu also allows you to add texture to an object. To add texture to an object, right-click over the selected object; a shortcut menu will be displayed. Choose the **Assign New Material** option; a cascading menu will be displayed. Now, choose the required material; the material will be applied to the selected object.

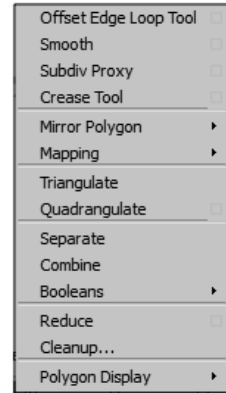
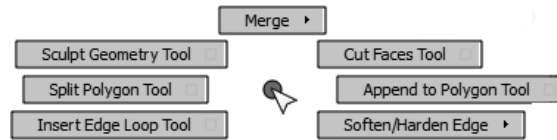
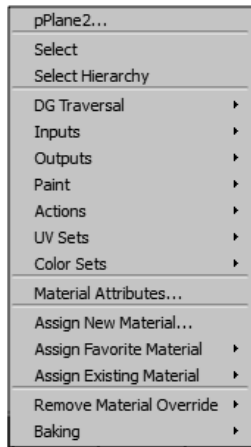
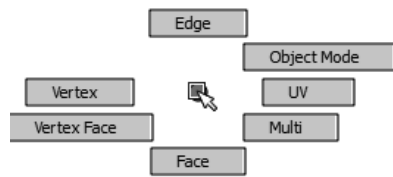
The third type of marking menu is used to modify the selected object. To do so, select an object, press and hold the SHIFT key, and then right-click on the selected object; a marking menu will be displayed prompting you to invoke the required tool to make changes in the selected object, as shown in Figure 2-28.

## HOTKEYS

The Hotkeys are also known as the shortcut keys. By default, every tool has its own shortcut key in Maya. Unlike other software, Maya lets you create your own shortcut keys or even change the default shortcuts. To do so, choose **Window > Settings / Preferences > Hotkey Editor** from the main menubar; the **Hotkey Editor** window will be displayed, as shown in Figure 2-29. Select the required options from the **Categories** and **Commands** list menus to assign shortcut keys to them. Choose the **List All** button in this window to access all mapped and unmapped keys; the **List Hotkeys** window will be displayed, as shown in Figure 2-30.

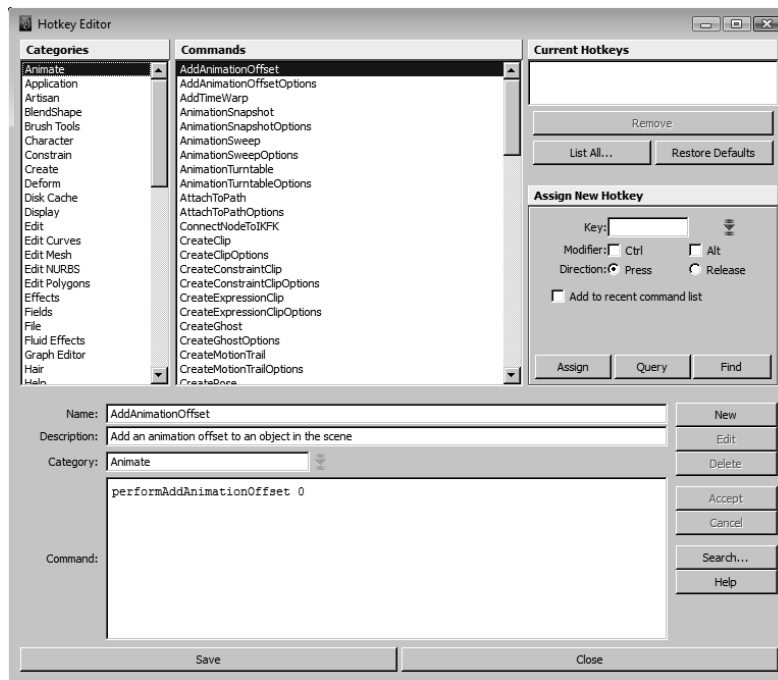
In the lower part of the **Hotkey Editor** window, you can enter a brief description of all commands or shortcuts that you have created. You can also use the **Hotkey Editor** dialog box to know about the commands that are used while writing the MEL script.

Before proceeding further, it is recommended to learn about the keyboard shortcuts and functions of some tools, refer to Table 2-1.

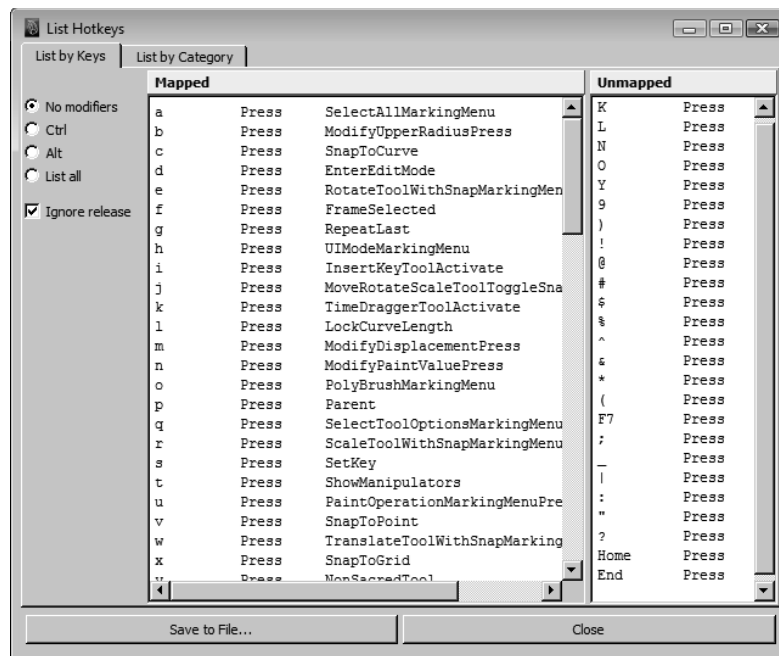


**Figure 2-27** The marking menu displaying components of the selected object

**Figure 2-28** The marking menu displaying various tools for modifying the object



**Figure 2-29** The Hotkey Editor window



*Figure 2-30 The List Hotkeys window*

Keyboard shortcuts	Tools/Uses/Functions
<b>W</b>	Move Tool
<b>E</b>	Rotate Tool
<b>R</b>	Scale Tool
<b>Q</b>	Select Tool
<b>S</b>	Sets keys for animation.
<b>Alt + MMB + Drag</b>	Helps in panning the view.
<b>Alt + RMB + Drag</b>	Helps in dolly in and out of the viewport. Dolly is similar to zooming in and out.
<b>Alt + LMB + Drag</b>	Helps tumble around in the viewport to see the object from various angles.

*Table 2-1 Keyboard shortcuts*

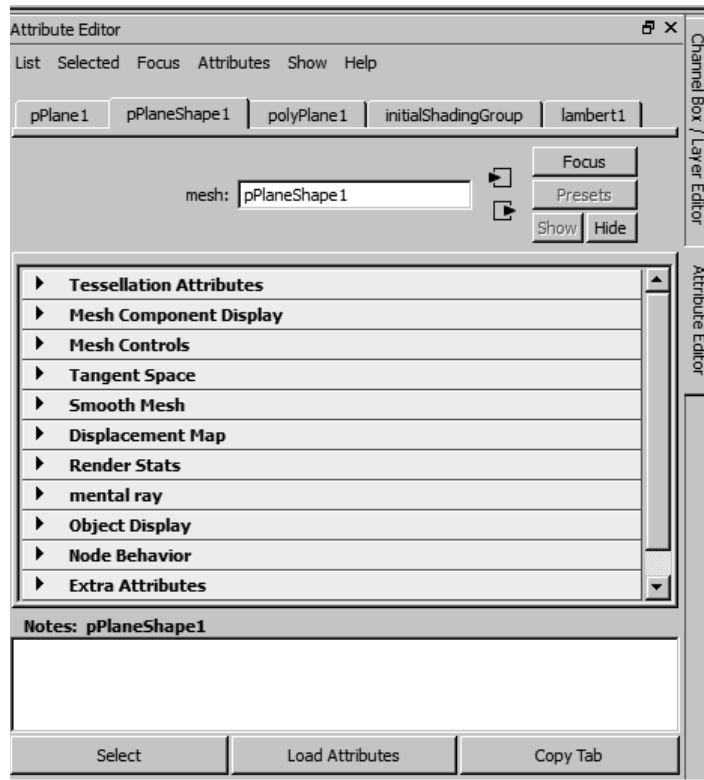
## MAIN MAYA WINDOWS

In Maya, there are several types of windows that help you create, manipulate, and view 3D objects, particles, and animation. Some of the important and commonly used windows are discussed next.

## Attribute Editor

**Main menubar:** Display > UI Elements > Attribute Editor  
**Keyboard:** CTRL+a

The **Attribute Editor** is one of the most important windows in Maya. It provides information about various attributes of a selected object, tool, or the material applied to that particular object. The **Attribute Editor** is used to make changes in the attributes of the selected object. Choose **Display > UI Elements > Attribute Editor** from the main menubar; the **Attribute Editor** window will be displayed on the right of the viewport, displaying attributes of the selected object, as shown in Figure 2-31.



*Figure 2-31 The Attribute Editor window*

Alternatively, you can open the **Attribute Editor** window by selecting the object in the viewport and pressing the CTRL + a keys; the **Attribute Editor** window will be displayed. The **Attribute Editor** comprises a number of attribute tabs which help you modify the object. At the bottom of the **Attribute Editor**, there is an area for writing down the notes regarding the selected object. You can adjust the size of this notes area by dragging the horizontal bar below it.



## Outliner

**Main menubar:** Window > Outliner  
**Tool Box:** Persp/Outliner > Outliner

The **Outliner** window displays all objects of a scene in a hierarchical manner, as shown in Figure 2-32. The **Outliner** window is also known as the scene management editor as it is used to manage all objects in the viewport. You can select any object from the scene by simply clicking on its name in the **Outliner** window.

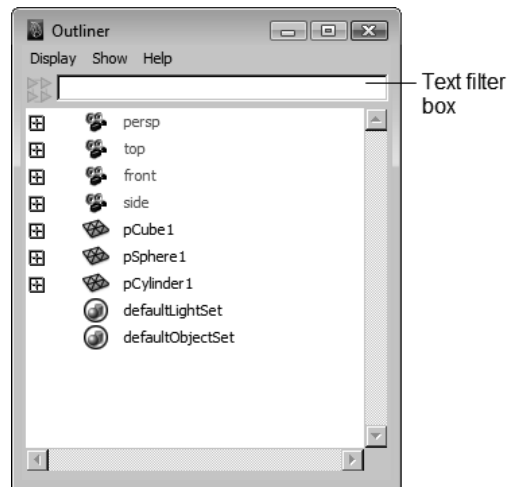


Figure 2-32 The **Outliner** window

The first four nodes in the **Outliner** window are always the names of default cameras, following that are the viewport contents, and then the different default object sets. At the top of the **Outliner**, there is an input box known as the **Text Filter Box**. You can use this box to select objects with a particular name. For example, enter **\*front\*** in the box and then press ENTER; all objects with the name 'front' will be selected in the viewport.

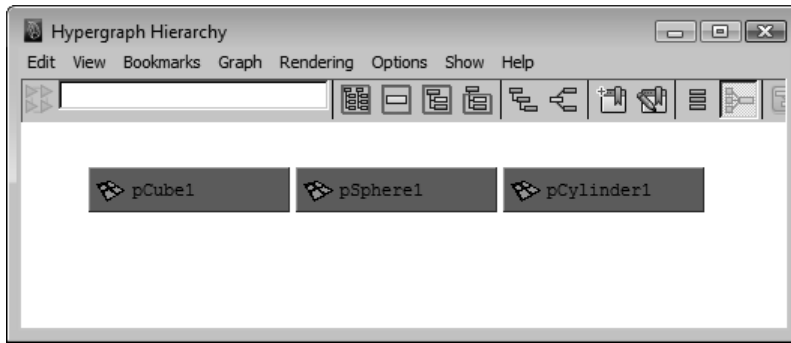
Each object in the **Outliner** has an icon of its own. When you double-click on any of these icons, the **Attribute Editor** window will be displayed, where you can change the properties of that particular object type icon.

In the **Outliner** window, the objects are placed in the order of their creation in the viewport. For example, if you create a cube in the viewport, followed by a sphere, and then a cylinder, all these objects will be placed in the order of their creation in the **Outliner** window, which means the object that was created first (cube) will be placed first and the object that was created last (cylinder) will be placed last, refer to Figure 2-32. To organize the order of the objects manually, hold the middle mouse button and drag and drop one object below another object. To rename an object, double-click on the name of the object and then enter the new name.

## Hypergraph

**Main menubar:** Window > Hypergraph: Hierarchy

The **Hypergraph** window is used to display the scene hierarchy in a graphical form, as shown in Figure 2-33. In the **Hypergraph** window, the boxes represent the nodes and the lines represent the relationship between the nodes. This window helps you to view and edit the hierarchical relationships. To open this window, choose **Window > Hypergraph: Hierarchy** from the main menubar; the **Hypergraph Hierarchy** window will be displayed. Figure 2-33 displays the **Hypergraph Hierarchy** window with the sphere, cube, and cylinder created in the viewport.



*Figure 2-33 The Hypergraph Hierarchy window*

This window allows you to view the relationship between the objects in a scene more closely. Navigating in the **Hypergraph Hierarchy** window is similar to navigating in the viewports of Maya. You can also view the group of objects in this window. Figure 2-34 displays a group of cube and sphere. The group1 is the parent node for this hierarchy of objects. Using the hypergraph, you can view and edit connections between nodes. To view the input and output connections of a particular node, select the node and choose **Graph > Input and Output Connections** from the main menubar; all input and output connections of the selected nodes will be displayed.

## Connection Editor

**Main menubar:** Window > General Editors > Connection Editor

The **Connection Editor** is used to refine the shading networks and also to connect attributes between any two objects. For example, you can control the X-axis rotation of the sphere by the X-axis translation of the cylinder using the **Connection Editor** window, refer to Figure 2-35. By using the **Connection Editor** window, you can set any relationship between any number of objects. To open this window, choose **Window > General Editors > Connection Editor** from the main menubar; the **Connection Editor** window will be displayed.

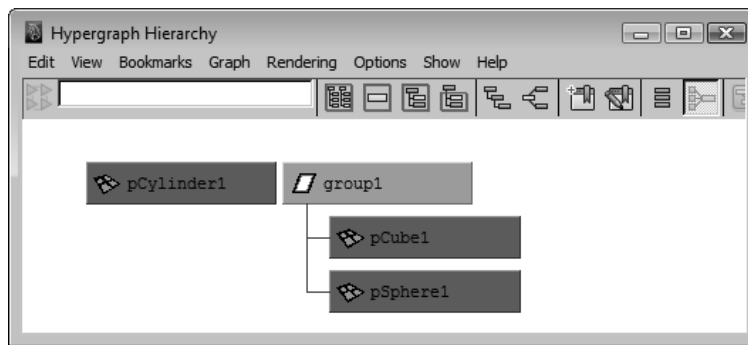


Figure 2-34 The *Hypergraph Hierarchy* window

The **Connection Editor** window is divided into two vertical columns, each representing attributes of the two selected objects. Select an object from the viewport and choose the **Reload Left** button from the window; all attributes of the selected object will be displayed in the **Connection Editor** window. Similarly, on selecting the second object and choosing the **Reload Right** button, all the attributes of the second object will be loaded. Also, the color of the connected attribute changes to yellow, which represents that this attribute is connected to some other object attribute. The connected attributes of the selected objects will be displayed in italics in the **Connection Editor** window, refer to Figure 2-35.

After connecting the objects in the **Connection Editor**, you cannot change the value of the attribute which is controlled by the other object attribute in the channel box. For example, in the above case, (see Figure 2-35) where sphere and cylinder are connected in the **Connection Editor** window, the value of the **RotateX** attribute of the sphere cannot be changed in the channel box. To change the value, you first need to translate the cylinder in the X-axis.

In this way, using the **Connection editor**, you can create any kind of relationship between any attribute of an object to create simple, complex, or interconnected animations. For example, using this window, you can connect four wheels of the car such that they rotate automatically when the car moves forward.

## Hypershade

**Main menubar:** Window > Rendering Editors > Hypershade

The **Hypershade** window is used to create, edit, and connect the rendering nodes such as textures, materials, and lights. To invoke this window, choose **Window > Rendering Editors > Hypershade** from the main menubar; the **Hypershade** window will be displayed, as shown in Figure 2-36. The **Hypershade** window consists of three sections: Create bar, the Hypershade tabs, and the Work area. These sections are discussed next.

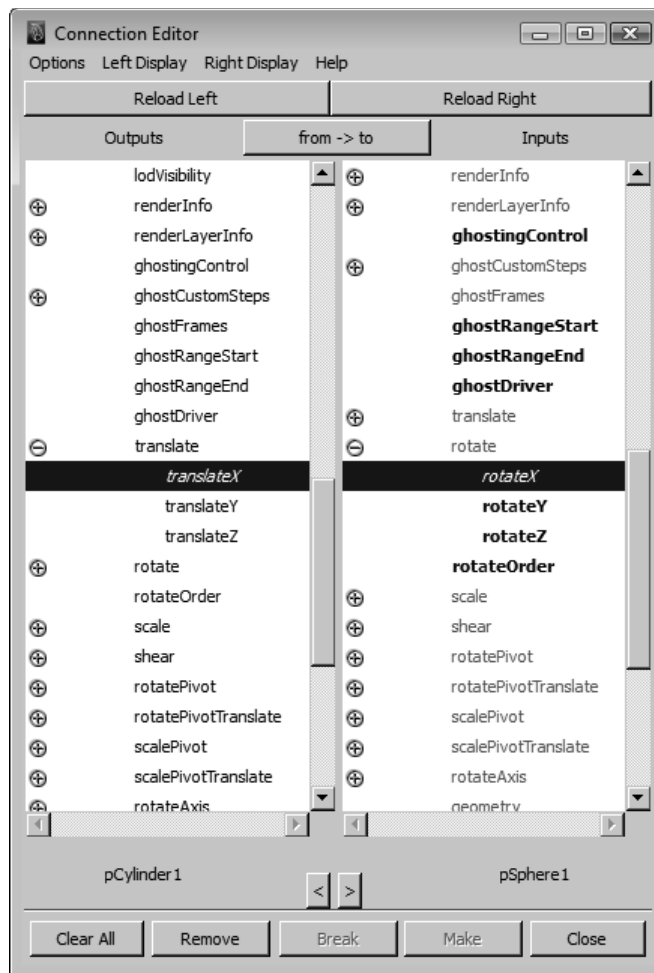
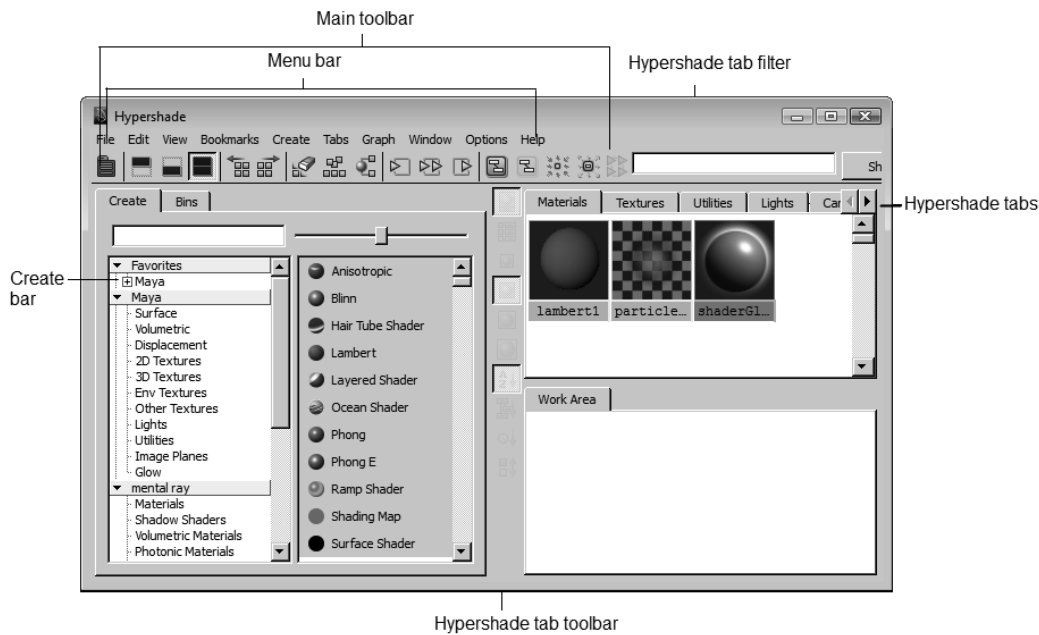


Figure 2-35 The Connection Editor window

You can create any render node and its supportive textures by choosing the desired shader or texture from the Create panel. The Create panel is divided into two tabs: **Create** and **Bins**. By default, the **Create** tab is selected. The **Create** tab helps you access different rendering nodes. The **Bins** tab is used to store sets of shaders in different bins.

The Hypershade tabs consist of all nodes that can be used in the current scene, refer to Figure 2-36. On invoking this tab, the **Hypershade** window is displayed. This window consists of nine tabs, each of which corresponds to various objects present in the viewport. For example, the **Materials** tab contains all materials that are used in the scene, the **Lights** tab contains lights that are used in the scene, and so on.



**Figure 2-36** The *Hypershade* window

The work area is used to connect nodes to create shading networks that can be assigned to the objects in the viewport. The work area displays a clear flowchart of the shading network which helps in editing the complex shaders. A shading network is an arrangement of different nodes that affect the final look of the surface on which the material is applied.



#### Note

You can navigate in the *Hypershade* window by using the same mouse and key combinations that you use to navigate in the viewport.

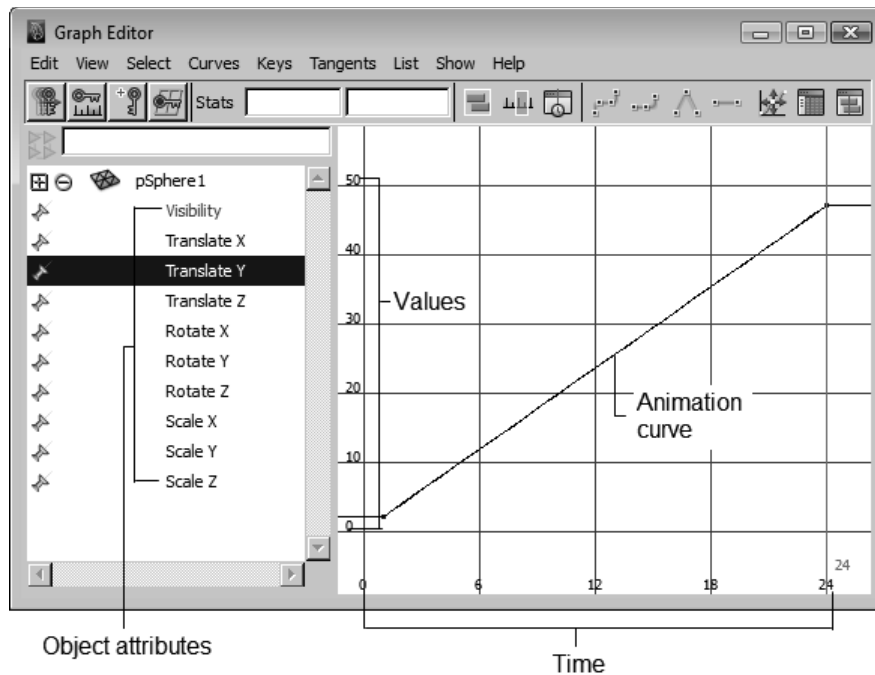
## Graph Editor

### Main menubar:

Window > Animation Editors > Graph Editor

The **Graph Editor** is used to edit keyframes in an animation. To invoke the **Graph Editor** window, choose **Window > Animation Editors > Graph Editor** from the main menubar; the **Graph Editor** window will be displayed, as shown in Figure 2-37. This window provides you a graphical representation of the objects animated in the viewport. The graph helps you change or set values of keys as per you requirement in this window.

The **Graph Editor** window is divided into two sections, refer to Figure 2-37. The left section displays the selected objects and their hierarchy with a listing of their animated attributes. The right section displays animation curves. On selecting an object or an object's attribute on the left side of the **Graph Editor** window, only selected attributes or curves will be displayed in the right section.



**Figure 2-37** The **Graph Editor** window

The animation curves in the right section of the Graph Editor are arranged on two axes, which represents value vs. time. The vertical axis represents value, and the horizontal axis represents time. In the **Graph Editor** window, the keyframes are represented by points on curves. These points are known as keys. You can move these keys freely to fine tune the animation. To move a key on the curve, select it, press and hold the middle mouse button, and then drag the key in the timeline to adjust the animation as per your requirement.



#### Note

You can navigate in the **Graph Editor** window by using the same mouse and key combinations that you use to navigate in the viewport.

## EDITING TOOLS

In Maya, different editing tools are used for editing features of an object, which gives you the flexibility to create models or animate them as per the required parameters. Some of the commonly used editing tools are discussed next.

### Duplicate Special Tool

**Main menubar:** Edit > Duplicate Special > Option box  
**Keyboard:** Ctrl + D

The **Duplicate Special** tool is used to create a copy of an object. To make a duplicate copy, select the object in the viewport and choose **Edit > Duplicate Special** from the main menubar; a copy of the selected object will be created. You can also set the properties of the **Duplicate Special** tool. To do so, choose **Edit > Duplicate Special > Option box** from the main menubar; the **Duplicate Special Options** dialog box will be displayed, as shown in Figure 2-38. Some of the important attributes in the **Duplicate Special Options** dialog box are discussed next.

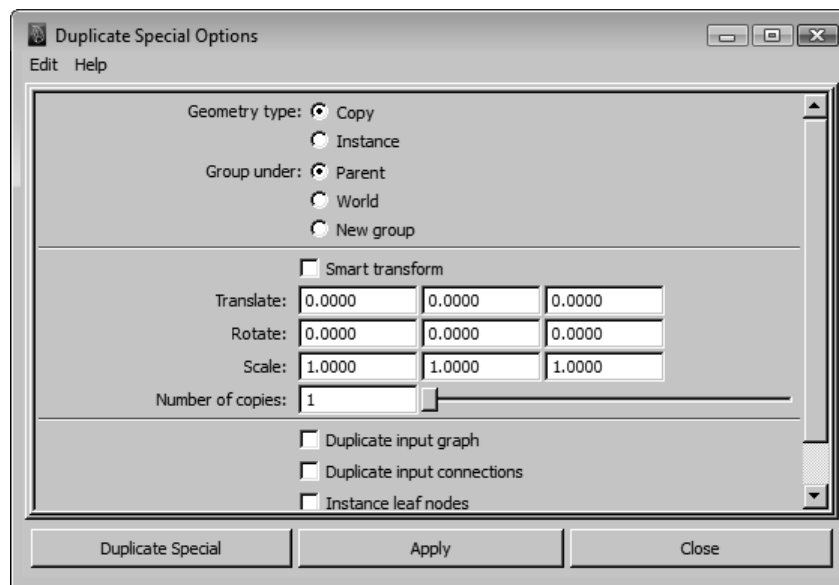


Figure 2-38 The **Duplicate Special Options** dialog box

### Geometry type

The **Geometry type** attribute lets you specify the geometry of an object that needs to be duplicated. Select the **Copy** radio button to create a copy of the selected geometry. Select the **Instance** radio button to create an instance of the selected geometry. Creating an instance of the selected object does not create a copy of the object, it just redisplay the geometry being instanced such that if you make changes in one object, they will be reflected in the instanced object also.

### Group under

The **Group under** attribute lets you specify the category under which the selected objects can be grouped. On selecting the **Parent** radio button, the selected objects are grouped under the lowest common parent in the hierarchy. On selecting the **World** radio button, the selected objects are grouped under the world, the top level of the hierarchy. On selecting the **New group** radio button, the duplicated objects will create a new group.

### Number of copies

The **Number of copies** edit box lets you create 1 to n number of duplicates of the selected object. To use this option, enter the number of copies in the edit box or move the slider next to it. The default value in this edit box is 1.

### Group Tool

<b>Main menubar:</b>	Edit > Group
<b>Keyboard:</b>	Ctrl + g

The **Group** tool is used to group the selected objects. On grouping some selected objects, a new node will be created which allows you to select and transform all selected objects at a time. To create a group, first select the objects that you want to group from the viewport, and then choose **Edit > Group** from the main menubar. You can also set the properties of the **Group** tool. To do so, choose **Edit > Group > Option box** from the main menubar; the **Group Options** dialog box will be displayed, as shown in Figure 2-39. Some of the important attributes in the **Group Options** dialog box are discussed next.



*Figure 2-39 The Group Options dialog box*

### Group under

This option is same as discussed earlier in the **Duplicate Special Options** dialog box.

### Group pivot

The **Group pivot** attribute is used to select the position where you want the pivot point to be placed for the group created. Select the **Center** radio button to place the new group pivot at the center of the bounding box of the grouped objects. Select the **Origin** radio button to put the new group pivot point at the origin of the new group coordinate system.



**Note**

To ungroup the grouped objects, choose **Edit > Ungroup** from the main menubar; the grouped objects will get ungrouped.

## Parent Tool

<b>Main menubar:</b>	Edit > Parent
<b>Keyboard:</b>	p

The **Parent** tool is used to create parent-child relationship between the selected objects. To create the parent-child relationship, create two objects in the viewport such that one object is larger than the other. Next, select the smaller object, press and hold the SHIFT key, and then select the larger object. Now, choose **Edit > Parent** from the main menubar; the larger object will act as the parent of the smaller object. You will notice that the child object remains selected in the viewport even after the parent command is completed and the parent object is deselected. The parent object passes its transformations down the hierarchy chain to its children, and each child object inherits all properties of its parent. Note that a parent object can have more than one child object, but not vice-versa.

You can also set the properties of the **Parent** tool. To do so, choose **Edit > Parent > Option box** from the main menubar; the **Parent Options** dialog box will be displayed, as shown in Figure 2-40. Some of the important attributes of the **Parent Options** dialog box are discussed next.

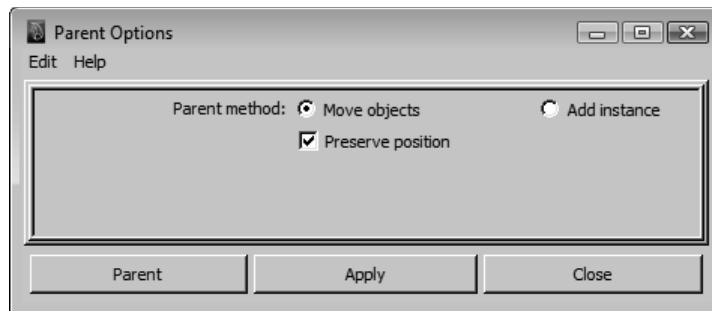


Figure 2-40 The **Parent Options** dialog box

### Parent method

The **Parent method** attribute is used to apply the parent-child relationship to the selected objects in two different ways. Select **Move objects** radio button to move the child objects to their parent object (last selected object). Select **Add instance** radio button to create an instance of the child object. Also, two groups will be created that have parent-child relationship, one group between the parent and the child object and another between the two instanced objects.

### Preserve position

The **Preserve position** check box is used to preserve the position of the parent object. If this check box is not selected, then the position of the objects will change, when they will be parented.

## MAYA OVERVIEW

Maya deals with various aspects of modeling, animation, rendering, and so on. The different aspects are discussed next.

### Modeling

In Maya, there are three different types of modeling methods: NURBS, polygons, and subdivision surfaces. To be able to create models using these methods, you need to have a complete overview of these methods. Before modeling an object, you first need to visualize it in 3D terms. Your visualization and approach towards the object will guide you to judge the type of modeling that you want to use for creating the object.

### NURBS

NURBS (non-uniform rational b-spline) is a mathematical representation of 3D geometry that can describe any shape accurately. NURBS modeling is basically used for creating curved shapes and lines. You can create cars, animals, characters, and many more high-end 3D objects using the NURBS modeling.

#### NURBS curves

NURBS curves are used to create NURBS surfaces. A NURBS curve has different components such as **Control vertex**, **Edit point**, and so on. Figure 2-41 shows a NURBS curve with its important components. Different tools that are used to create NURBS curves in Maya are **CV Curve Tool**, **EP Curve Tool**, **Pencil Curve Tool**, and **Arc Tool**.

#### NURBS surfaces

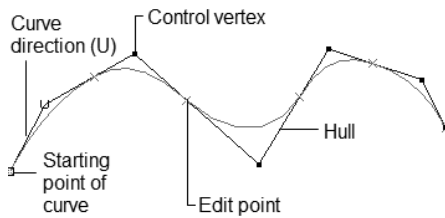
NURBS surfaces are smooth geometries. They are designed in patches in which each patch corresponds to a rectangular array of data points in u-v space. In Maya, there are different tools that are used to create NURBS surfaces. For example, Sphere, Cube, Cylinder, and so on. A NURBS surface has different components such as **Surface Point**, **Isoparm**, **Surface Patch**, and so on. Figure 2-42 shows a NURBS surface with its important components.

### Polygons

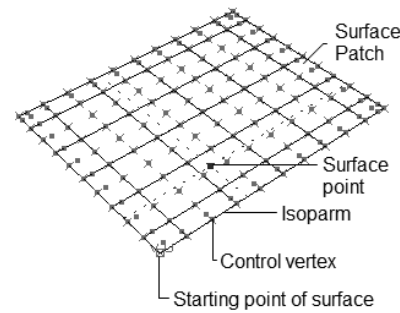
Polygon modeling is the most commonly used modeling technique in Maya. A polygon is made up of a flat surface with n number of sides. Each side of a polygon is called as face. Each face can be further classified into edges and vertices. By modifying the face, edge, or the vertex of an object, you can create any new object as per your need. A polygon surface has different components such as **Vertex**, **Edge**, **Face**, and so on. You can build different models by modifying the components of the polygon. Figure 2-43 shows a polygon surface with its important components.

### Subdivision Surfaces

Subdivision surfaces modeling exhibits characteristics of both NURBS and polygonal modeling. The subdivision surfaces are used to divide an object into regions for greater detail. This method

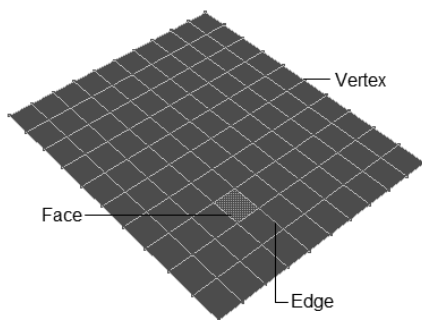


**Figure 2-41** A NURBS curve

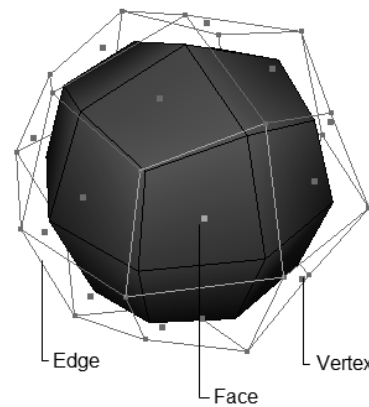


**Figure 2-42** A NURBS surface

is mainly used to model smooth objects with comparatively less control vertices. A subdivision surface has different components such as **Vertex**, **Edge**, **Face**, and so on. Figure 2-44 shows a subdivision surface with its important components.



**Figure 2-43** A polygon surface



**Figure 2-44** A subdivision surface

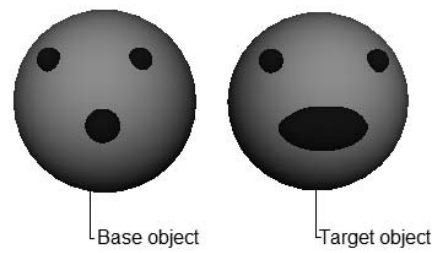
## Deformations

Various deformations can be applied to an object by using different deformers. The deformers are tools that are used to change the geometry of an object. By using deformers, you can create different shapes or can also add some animation effects such as squash and stretch to an object. You can deform any object in Maya by defining the control points of deformers. Some of the important deformers in Maya are discussed next.

### Blend Shape Deformer

The **Blend Shape** deformer is used to change the shape of an object into another object by means of morphing. Morphing is an animation technique which is used to combine two or more objects by matching their vertices in a sequential form to produce the final animation.

The original object that is used in this morphing process is known as the base object, and the object into which the base object gets morphed is known as the target object. To deform a shape, you first need to create a copy of the base object, and then modify the shape of the copied object by selecting its vertices. Figure 2-45 shows the base object and the target object after modifying its vertices. The blend shape deformer is mainly used for creating facial expressions of a character (discussed in detail in Chapter 8).



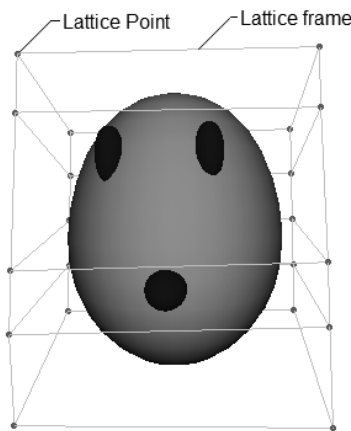
**Figure 2-45** The base and target objects

### Lattice Deformer

The **Lattice** deformer is used to modify an object using lattices. Lattices are external frames that can be applied to deform an object. You can deform a surface by moving the **Lattice Points** available on the lattice frames. Figure 2-46 displays a face which has been deformed using the **Lattice** deformer.

### Cluster Deformer

The **Cluster** deformer is used to modify a particular area of the mesh. The clusters are groups of control vertices or lattice points that are built into a single set. On applying the cluster deformer to a set of vertices, a cluster handle is created, refer to Figure 2-47. You can modify the selected vertices by moving the cluster handle. Also, you can weigh the control vertices to indicate how much each point will be affected by any translation, rotation, or scale of the cluster handle. Figure 2-47 shows the object modified after applying the **Cluster** deformer.



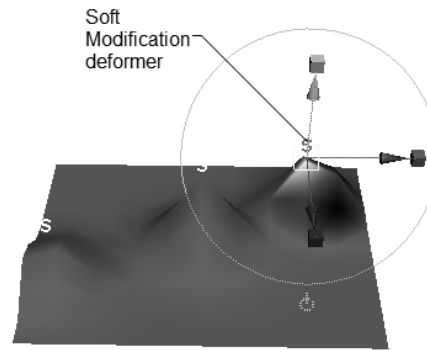
**Figure 2-46** Face of a character deformed by using the **Lattice** deformer



**Figure 2-47** The object after applying the **Cluster** deformer

## Soft Modification Deformer

The **Soft Modification** deformer helps you in deforming high density surface meshes without adjusting the vertices manually. The color feedback lets you visualize the area of influence around the deformer and across the surface mesh. Darker the color, lesser will be the influence of deformation, and vice-versa. By default, the amount of deformation is greatest at the center and it gradually decreases towards the end. Figure 2-48 shows an object modified after applying the **Soft Modification** deformer.



*Figure 2-48 The object after applying the **Soft Modification** deformer*

## Nonlinear Deformers

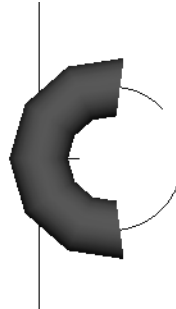
In Maya, there are different types of nonlinear deformers which help you to modify an object by giving it different shapes. These deformers are discussed next.

### Bend

The **Bend** deformer is used to bend an object along a circular arc. Figures 2-49 and 2-50 show an object before and after applying the **Bend** deformer.



*Figure 2-49 The object before applying the **Bend** deformer*



*Figure 2-50 The object after applying the **Bend** deformer*

### Flare

The **Flare** deformer is used to taper an object along the X, Y, and Z axes. Figures 2-51 and 2-52 show an object before and after applying the **Flare** deformer.

### Sine

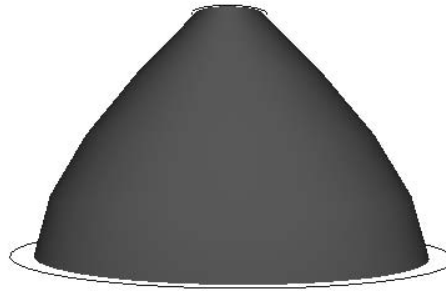
The **Sine** deformer is used to deform an object in the shape of a sine wave. Figures 2-53 and 2-54 show an object before and after applying the **Sine** deformer.

### Squash

The **Squash** deformer is used to squash and stretch an object along a specific axis. Figures 2-55 and 2-56 show an object before and after applying the **Squash** deformer.



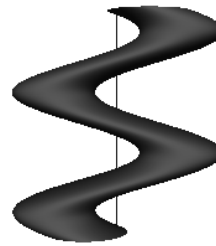
**Figure 2-51** The object before applying the **Flare** deformer



**Figure 2-52** The object after applying the **Flare** deformer



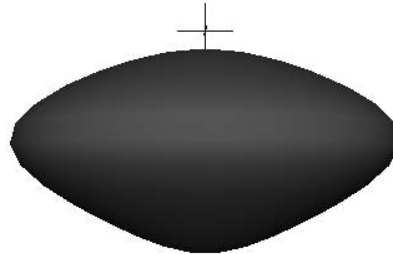
**Figure 2-53** The object before applying the **Sine** deformer



**Figure 2-54** The object after applying the **Sine** deformer



**Figure 2-55** The object before applying the **Squash** deformer



**Figure 2-56** The object after applying the **Squash** deformer

### **Twist**

The **Twist** deformer is used to twist an object along a specific axis. Figures 2-57 and 2-58 show an object before and after applying the **Twist** deformer.

### **Wave**

The **Wave** deformer is used to propagate waves on an object in the X and Z directions. Figures 2-59 and 2-60 show an object before and after applying the **Wave** deformer.



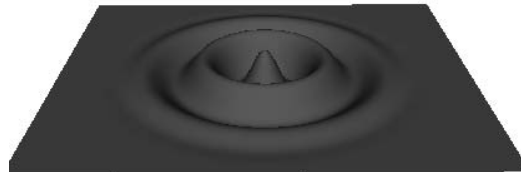
**Figure 2-57** The object before applying the **Twist** deformer



**Figure 2-58** The object after applying the **Twist** deformer



**Figure 2-59** The object before applying the **Wave** deformer



**Figure 2-60** The object after applying the **Wave** deformer

### Sculpt Deformer

The **Sculpt** deformer is used to create a rounded deformation on an object. To apply the deformer, select an object or vertices of an object where the deformation is required. Figure 2-61 shows a modified object after applying the **Sculpt** deformer.

### Jiggle Deformer

The **Jiggle** deformer is used to shake an object or its parts while they are moving. For example, you can use this deformer to shake the stomach of a wrestler while he is moving.

### Wire Tool Deformer

The **Wire Tool** deformer is used to change the shape of an object by setting one or more of its NURBS curves. This tool is mainly used for setting lips or eyebrow deformations.

### Wrinkle Tool Deformer

The **Wrinkle Tool** deformer is used to create wrinkle effect on an object. This tool is mainly used on NURBS surfaces.



Sculpt deformer

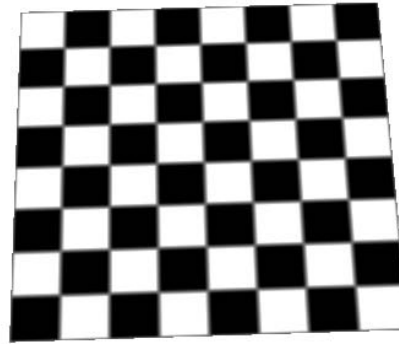
**Figure 2-61** The object after applying the **Sculpt** deformer

## Texturing

Texturing gives an object a realistic look. For example, while creating a brick wall, you first need to apply texture to it to give its basic color and look. Next, you need to apply the bump attribute of the same texture to the wall. On doing so, the darker area of the texture will give bumpiness to the surface on rendering. In this way, you can make a model more attractive by using shading, texturing color, surface bumps, transparency, reflection, shine, or other such attributes. Figures 2-62 and 2-63 show a plane before and after applying texture to it.



**Figure 2-62** The plane before applying texture



**Figure 2-63** The plane after applying the checker map texture

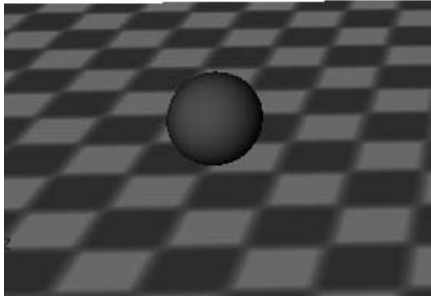
## Lighting

Lights are used to illuminate the scene so that the scene looks more realistic. While applying lights to a scene, you should take care of various parameters such as intensity of the light, the direction and angle of the light, color of the light, movement of light during animation, and so on. Using the tools in Maya, you can add multiple effects such as lights with no shadows, negative lights, ambient lights, and also the ability to look through a light as a camera. There are six types of lights in Maya. You will mostly use a combinations of these lights to achieve desired effects. Figures 2-64 and 2-65 shows a scene before and after applying light.

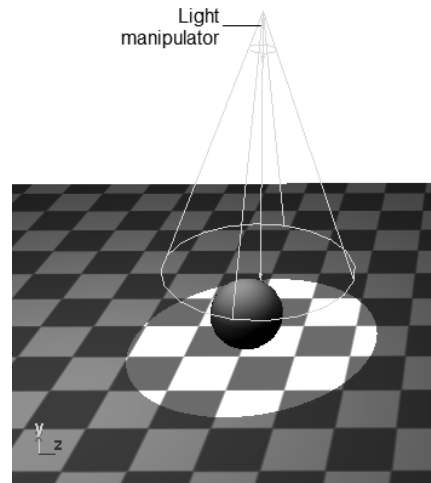
## Animation

Animation brings life to an object. It is the process of creating and editing the properties of an object. To animate an object, you need to define different positions, rotations, and scaling of the object at different key points in the time slider. These defined points are known as keyframes. The keys between the frames consist of the information about the actions performed in an animation. When you play an animation, a series of frames are displayed quickly one after another and the object seems to be moving. In Maya, there are various types of animation. Some of them are discussed next.





**Figure 2-64** The scene before applying light



**Figure 2-65** The scene after applying light

### Keyframe Animation

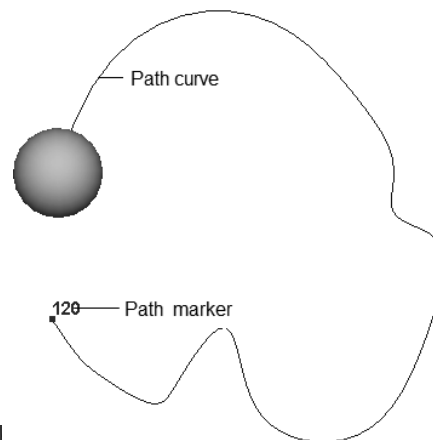
The keyframe animation is the most commonly used animation type. It helps you determine how you want the parts of your object to look at a particular frame and then save the important attributes as keys on the timeslider. Using the keyframe animation, you can manually control the timing of keyframe animation. After the keys are set, Maya fills the motion in-between the keys automatically. Figure 2-66 shows the keys created in the timeslider using the keyframe.

### Path Animation

The path animation is used to animate an object along a path. You can use the path curve to edit and tweak the resulting animation. Using path animation, a car can move on a road or a spaceship can follow a specific path through space. Figure 2-67 shows a sphere on a path curve.



**Figure 2-66** The keys created in the timeslider using the keyframe animation



**Figure 2-67** A sphere on a path

## Nonlinear Animation

The nonlinear animation is an advanced method of animation. In this method, you can blend a group of animation sequences to set up the motion of the objects, independent of time. You can create layers and blend any type of keyed animation, including the motion capture and path animation. For example, to create a walk cycle, you can make a clip of the walk animation and then adjust the motion of the legs without affecting the way the rest of the characters move. In Maya, nonlinear animation is done through the **Trax Editor**. To invoke the trax editor, choose **Window > Animation Editors > Trax Editor** from the main menubar; the **Trax Editor** window will be displayed, as shown in Figure 2-68.

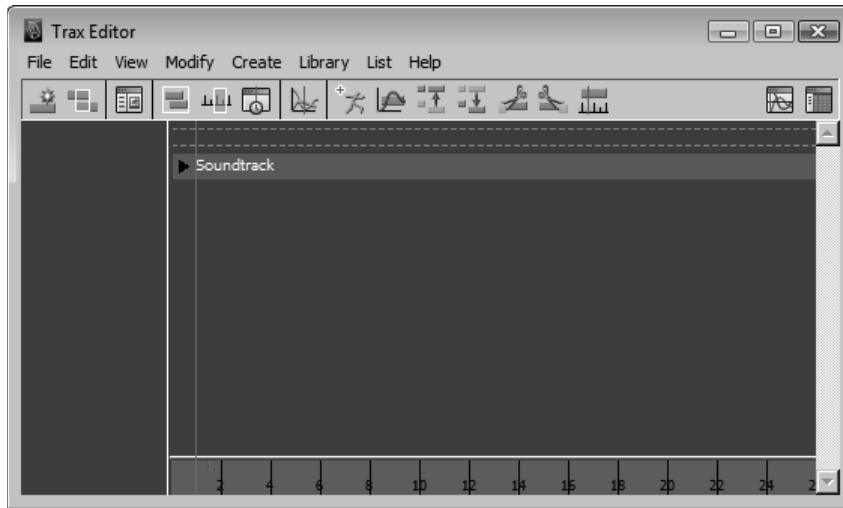


Figure 2-68 The *Trax Editor* window

## Motion Capture Animation

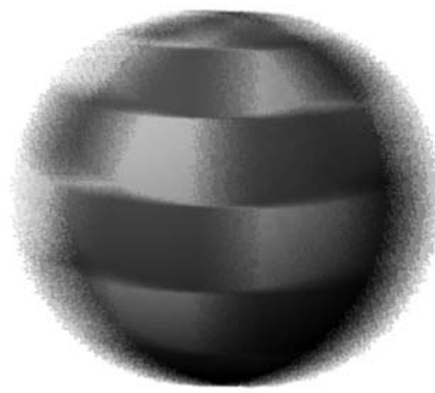
The motion capture animation is used to animate a character by applying the real-time motion captured using the motion capturing devices. The motion capture devices let you achieve the real-time monitoring and recording of data. For example, this type of animation can be used to create realistic animation of a human walk in a scene. When a real-life camera takes a shot of a moving object, the final image is often blurred. The motion blur can be added to an animated object in a scene. Figures 2-69 and 2-70 show an object without and with motion blur.

## Technical Animation

The technical animation is used to animate an object by linking the attributes of one object with another object. For example, in a locomotive engine, you need to link different parts of the engine together. The tools that are used to create technical animation in Maya are discussed next.



*Figure 2-69 An object without motion blur*



*Figure 2-70 An object with motion blur*

### **Set Driven Key**

The set driven key is used to link different objects together such that the attributes of one object can control the attributes of another object. A set driven key creates relationship between objects so that controls are created for driving certain features of a character.

### **Expressions**

The expressions are scripts that let you connect different attributes on different nodes.

### **Connection Editor**

In the **Connection Editor** window, the attributes of one object can be directly linked to the attributes of another object using the node connections. The connection editor is mainly used for fine-tuning a shading network.

### **Constraints**

Constraints help you constrain an object with another object by specifying some limits.

## **Dynamics**

Dynamics helps in creating realistic animation based on principles of physics. This type of animation is hard to achieve with traditional keyframe animation. Dynamics is a special effects animation that not only deals with physical phenomena such as smoke and fire, but also helps in giving natural movements such as effect of colliding bodies.

In Maya, dynamic objects are categorized into fields, rigid and soft bodies, fluids, particles, cloth, hair & fur, and paint effects. These objects are discussed next.

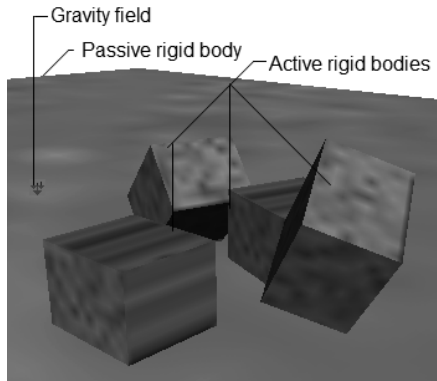
### **Fields**

Fields are the physical properties that simulate the motion of natural forces. In Maya, there are a number of physical fields such as air, gravity, newton, drag, and so on that can be used to animate the motion of particles, or soft and rigid bodies.

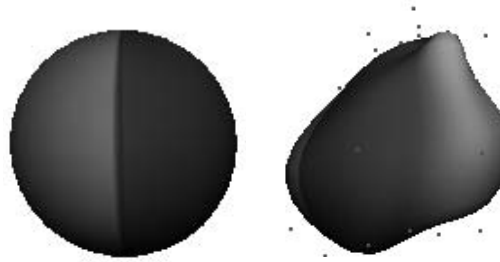
## Rigid and Soft Dynamics Bodies

There are two types of dynamic bodies: rigid and soft. The rigid bodies are solid objects such as a football, a pair of dices that move and rotate according to the dynamics applied, and so on. There are two types of rigid bodies: passive and active. Passive rigid bodies are not affected by fields and cannot be moved by collisions, though they can take part in collisions. You can also keyframe passive bodies to make them move and rotate. On the other hand, the active rigid bodies are affected by fields and are moved by collisions. However, they cannot be keyframed. Figure 2-71 shows the active and passive rigid bodies.

The geometric objects that are recreated as flexible objects are known as soft bodies. For example, a bouncing rubber ball, a flag, and so on. Figure 2-72 shows a sphere and a soft body created by reshaping the sphere.



**Figure 2-71** The active and passive rigid bodies



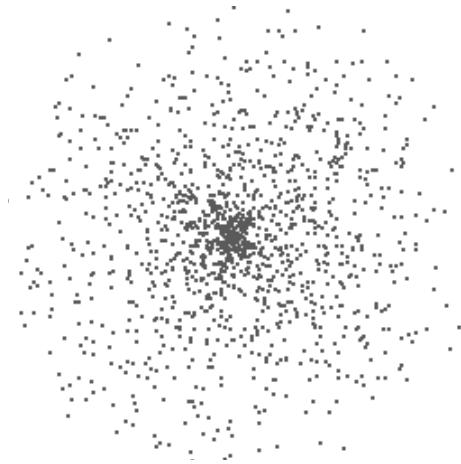
**Figure 2-72** A sphere reshaped to soft body

## Particles

Particles are tiny points that can be used to create effects such as smoke, fire, explosions, and so on. These points are also affected by dynamic fields. You can also set the position, velocity, or acceleration attributes of particles. Particles are most often used together in large numbers so that when they are rendered, an effect is created. To control a particle system, you first need to create an emitter and then define fields and attributes that can control movement of particles. Figure 2-73 shows a particles system.

## Paint

The paint effects help you to create realistic objects such as trees, plants, rain, and so on. The paint effects let you paint a scene by using mouse or pressure sensitive tablet. Different brushes are used to create different paint strokes for giving different effects such as rain effect, thunderstorm effect, and so on. You can also animate these paint effects to create natural motion. Figure 2-74 shows a scene created using the paint effect.



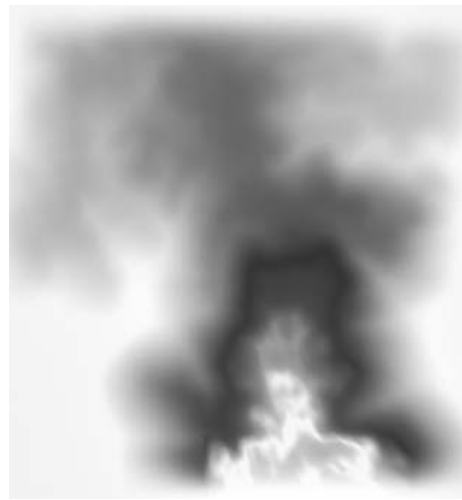
**Figure 2-73** *The particle system*



**Figure 2-74** *The scene created using paint effects*

### Fluids

Fluid effects help you to add various stunning effects to your scene such as of running water, explosions, cigarette smoke, moving clouds and many more. Maya's fluid effects simulation engine is based on Navier Stokes mathematical equations. The fluid simulation in Maya is carried out in boxes, called as fluid containers. Maya can calculate the speed of fluid within these boxes but not outside them. Figure 2-75 shows the fire effect created using fluids.



**Figure 2-75** *The fire effect created using fluids*

### Hair and Fur

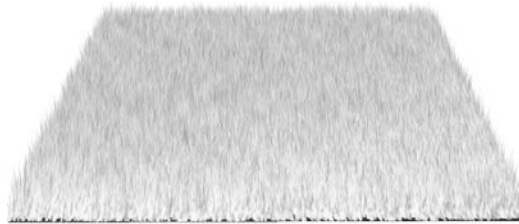
In Maya, you can create realistic hair and fur effects. Hair and fur consist of curves that behave dynamically in the form of strings. You can also set various hair and fur attributes such as color, width, length, baldness, opacity, curl, and direction as per your requirement. Figures 2-76 and 2-77 show the effect created by using hair and fur respectively.

### nCloth

Maya ncloth is a dynamic simulation that helps you to create realistic cloth effect. A common use of cloth effects is to simulate dynamic clothing on a character. Figure 2-78 shows an example of a cloth applied on a character.



*Figure 2-76 The character with hair effect*



*Figure 2-77 The plane with fur effect*



*Figure 2-78 A character with ncloth*

## Rendering

Rendering is the process of generating an image from a 3D model by means of computer programs. The rendering process helps in visualizing the lighting effects, materials applied, background, and other settings that you set for a scene.

In Maya, different types of renderers are used to view the final output of the scene such as software renderer, hardware renderer, vector renderer, and mental ray renderer. All these types of renderers are discussed next.

## Software Renderer

The software renderer is the default renderer in Maya. It is an advanced, multi-threaded renderer that produces high quality images. This type of rendering supports most of the entities in Maya such as all geometries, particles, fluid effects, and paint effects.

The software renderer has an advance feature called IPR. IPR stands for Interactive Photorealistic Rendering. The IPR helps you make interactive adjustments in the final rendered scene in the viewport. The IPR creates a special image file that not only stores the pixel information of an image, but also the data of the surface normals, materials, and objects associated with each of these pixels. This information is updated regularly when you make changes in the lighting and texturing properties of the scene.

## Hardware Renderer

For using hardware renderer in Maya, you should have a graphic card with good memory. A graphic card helps you calculate the color, light, and other aspects of the object in the scene.

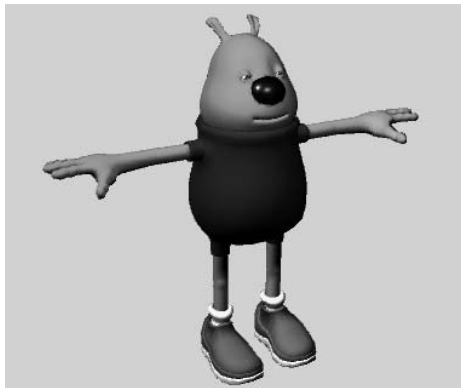
If you are rendering a scene for the first time by using the hardware renderer, it may take more time to render the scene. It is so because in this rendering technique, the scene is first converted into data structure, which is later on well calculated by the graphic division of the CPU. If you want to use this technique to render a scene, it is recommended to use the lambert and phong materials on the objects in the scene as they make the tweening of objects easier. The hardware renderer uses the same tessellation settings that are used in the software renderer.

## Vector Renderer

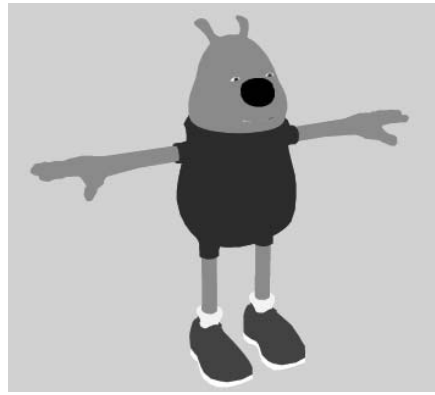
In Maya, the vector renderer is used to create unrealistic images such as cartoons, tonal art, wireframe, and so on. Such rendered images can be saved in various formats such as *.swf*, *.ai*, *.tiff*, and *EPS*.

To understand the effects created by using the vector renderer, compare Figure 2-79 with Figure 2-80. In these figures, you will notice that Figure 2-79 displays a more real life character than the one shown in Figure 2-80. This is because the character in Figure 2-80 displays the tonal art effect, and such effects are mainly used for creating logos and diagrams.

The vector renderer is based on the concept of the RAViX Technology. RAViX stands for Rapid Visibility Extension. This technology converts a 3D model into a 2D vector-based imagery by detecting the lines and vertices that make up a 3D model and then converting them into shaded polygons to recreate the 3D image in a 2D vector format (specifically Adobe Flash SWF and EPS formats). RAViX provides per polygon shading capabilities that are much superior as compared to other rendering technologies. Also, the file size created using this technology is smaller as compared to other technologies. The vector renderer does not support lights in Maya, except the point light. If there is no light in the scene, the vector renderer creates a default light at the camera position at the render time.



*Figure 2-79 A software rendered image*



*Figure 2-80 A vector rendered image*

The Maya vector renderer cannot render some features such as bump maps, displacement maps, Maya fluid effects, image planes, Maya fur, multiple UVs, Maya paint effects, particles, post-render effects, and textures. To render an object with any of the above features using the Maya vector renderer, first you need to convert the object into a polygon and then render the object as per your requirement.

## mental ray Rendering

The mental ray is a production-proved renderer used in the industry. It generates images of outstanding quality, unsurpassed realism as well as gives scalable performance.

The mental ray has certain important attributes such as caustics, global illumination, final gathering, and HDRI that provide a realistic look to a scene.

## CUSTOMIZING MAYA INTERFACE

You can customize the Maya interface by changing the default settings as per your requirements by using the options discussed next.

### User Preferences

To customize Maya, choose **Window > Settings/Preferences > Preferences** from the main menubar; the **Preferences** window will be displayed, as shown in Figure 2-81. The **Preferences** window is divided into different categories that help in setting preferences for many functional elements of Maya. These categories are discussed next.

### Interface

The **Interface** category is used to change the main user interface.

### Display

The **Display** category is used to specify how objects will be displayed in the viewport.



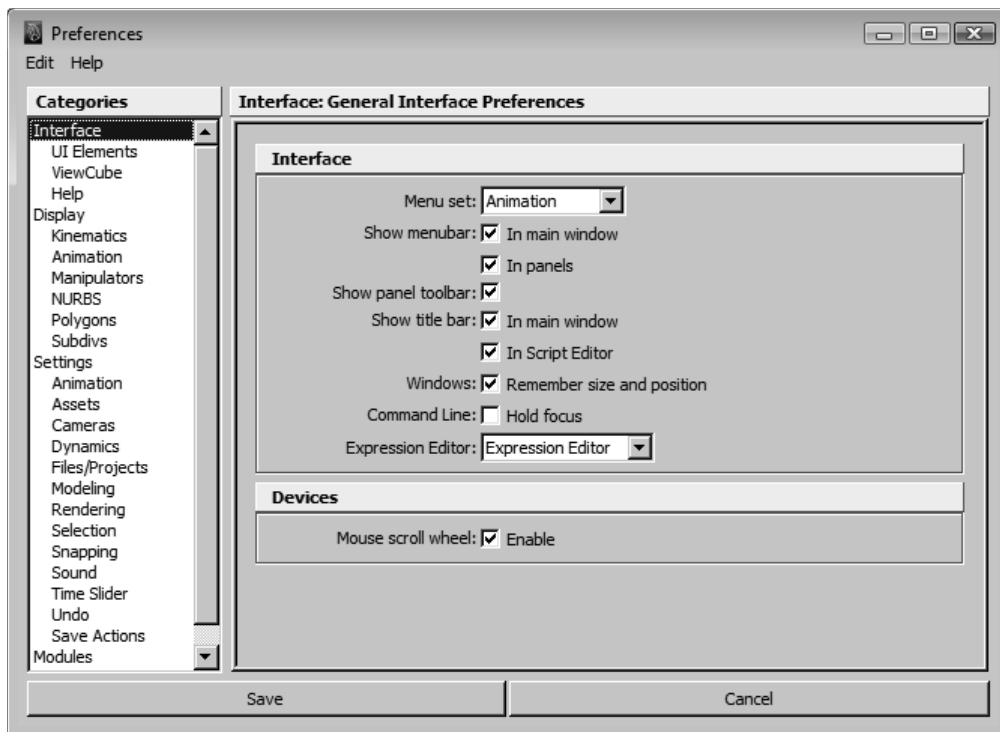


Figure 2-81 The Preferences window

## Settings

The **Settings** category lets you set the default values of various tools and their general operation.

## Modules

The **Modules** category specifies the modules that will be loaded by default whenever you start Maya.

## Applications

The **Applications** category lets you set the applications that are commonly used in Maya.

## Adjusting the Colors

You can change the color of the user interface and objects display in Maya. To do so, choose **Window > Settings/Preferences > Color Settings** from the main menubar; the **Colors** window will be displayed, as shown in figure 2-82. By using this window, you can adjust the color of Maya interface as per your requirement. For example, to change the background color of the viewport, choose the **General** tab in the **Colors** window. Expand the **3D Views** area and move the slider of the **Background** option to change the background color. Next, choose the **Save** button to save the changes.

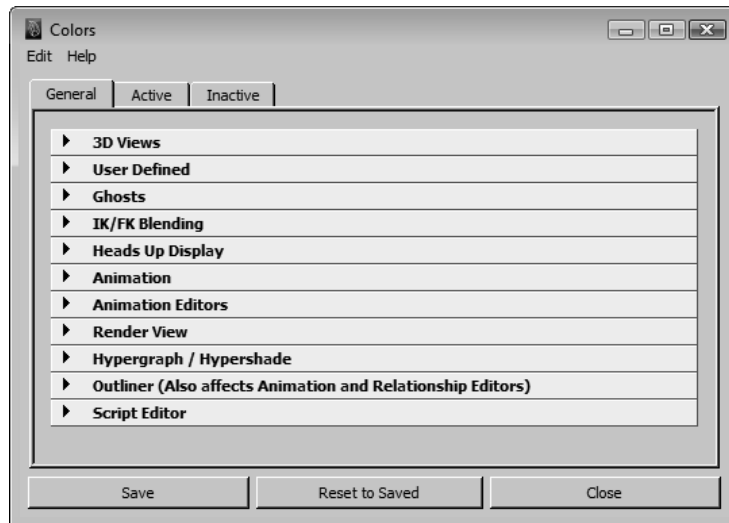


Figure 2-82 The Colors window

## Plug-in Manager

The **Plug-in Manager** helps you load and unload plug-ins for Maya. For example, mental ray for Maya is a plug-in that must be loaded to have mental ray rendering in the scenes. To invoke the Plug-in Manager, choose **Window > Settings/Preferences/ Plug-in Manager** from the main menubar; the **Plug-in Manager** window will be displayed, as shown in figure 2-83.

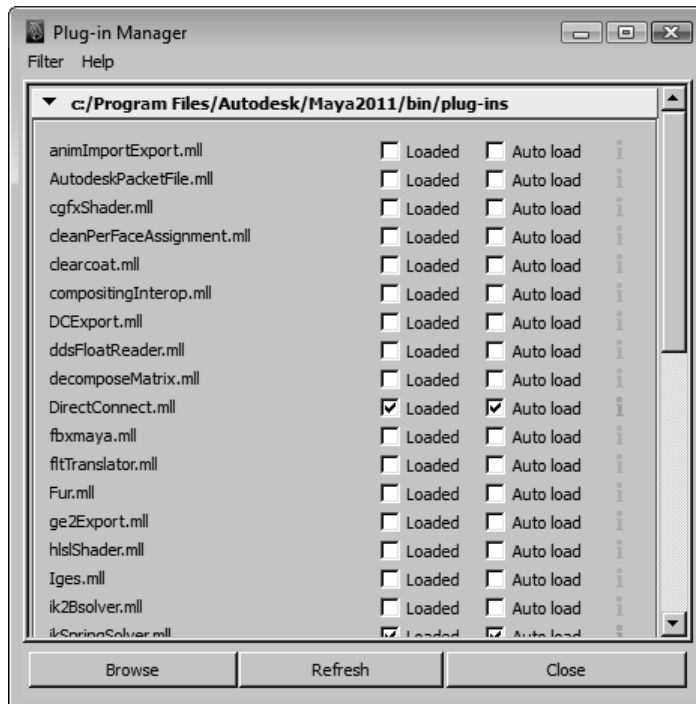


Figure 2-83 The Plug-in Manager window

You can also reset Maya to its default settings using the **Preferences** window. In the **Preferences** window, choose **Edit > Restore Default Settings** from the **Preferences** menubar and then choose the **Save** button to save the default Maya settings. It is always recommended that you choose the default settings, each time you start a new scene in Maya.

### Self-Evaluation Test

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

1. The \_\_\_\_\_ tool is used to select an object using a free form marquee tool.
2. The channel box is used for editing the \_\_\_\_\_ of an object.
3. The \_\_\_\_\_ tool is used to add an image to the active viewport.
4. The **Outliner** window is also known as the \_\_\_\_\_
5. The \_\_\_\_\_ is used to display all objects in the scene in a graphical layout similar to a flowchart.
6. The Autodesk Maya 2011 screen is divided into five viewports. (T/F)
7. Creating an instance is similar to copying an object. (T/F)
8. The keys in the time slider are displayed as yellow lines. (T/F)
9. The path animation is used to animate an object along a path. (T/F)
10. Which of the following tools is used to rotate an object in the viewport?
  - (a) **Move Tool**
  - (b) **Rotate Tool**
  - (c) **Scale Tool**
  - (d) **Select Tool**

### Review Questions

Answer the following questions

1. The \_\_\_\_\_ tool is used to move an object from one place to another in the workspace.
2. The darker color in the **Soft Modification Tool** indicates that the deformation is greatest at this point. (T/F)
3. **Hotkeys** are also known as \_\_\_\_\_ keys.

4. The **Auto Keyframe toggle** button is used to set the keyframes automatically. (T/F)
5. The \_\_\_\_\_ is the process of generating an image from a 3D model by means of computer programs.
6. Which of the following windows is used to load and unload the plug-ins?
- (a) **Preferences** window (b) **Colors** window  
(c) **Rendering** window (d) **Plug-in Manager** window
7. Which of the following renderings is used to create unrealistic images?
- (a) Hardware rendering (b) Software rendering  
(c) Vector rendering (d) mental ray rendering
8. The \_\_\_\_\_ helps in creating realistic animation based on principles of physics.
9. The \_\_\_\_\_ editor is used to connect attributes between any two objects.
10. The **Squash** deformer is used to squash and stretch an object along a specific axis. (T/F)

#### Answers to Self-Evaluation Test

1. **Lasso**, 2. attributes, 3. **Image Plane**, 4. Scene management, 5. Hypergraph, 6. F, 7. F, 8. F, 9. T, 10. b