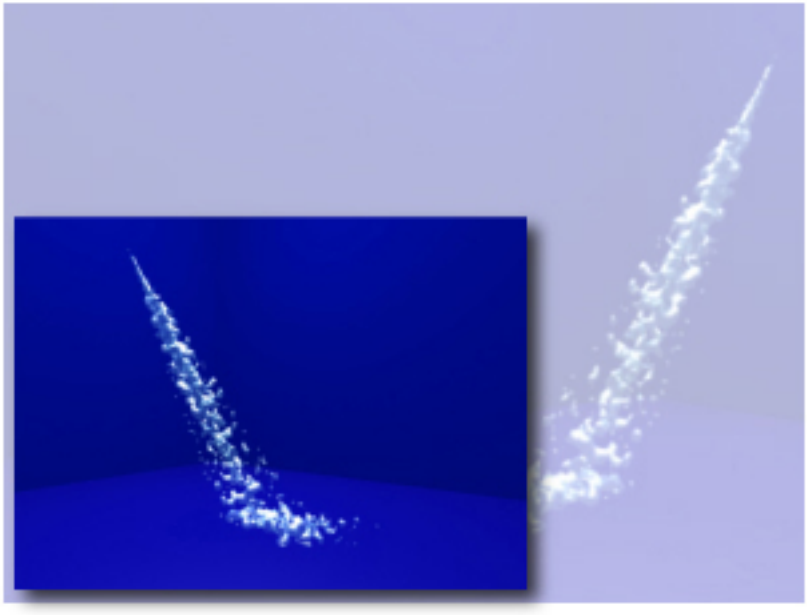
17

Particle Systems and Space Warps-I

Learning Objectives

After completing this chapter, you will be able to:

- *Create particle systems*
- *Create space warps*
- *Understand Mesher compound object*
- *Understand blobmesh compound object*



INTRODUCTION

In 3ds Max, the particle systems are used to create an object that generates other objects known as particles. These particles are used to simulate snow, dust, rain, and so on. You can also animate the particles in a particle system.

PARTICLE SYSTEM

To create a particle system, choose **Create > Geometry** in the **Command Panel**; a drop-down list will be displayed below the **Geometry** button. Select **Particle Systems** from the drop-down list; the **Object Type** rollout containing all the tools to create a particle system will be displayed, as shown in Figure 17-1. In this chapter, you will learn to create and modify different types of particle systems using these tools.

Spray Particle System

Menu bar:	Create > Particles > Spray
Command Panel:	Create > Geometry > Particle Systems > Object Type rollout > Spray

The Spray particle system is used to generate particles that are similar to water drops or spray, as shown in Figure 17-2. To create the spray particle system, choose the **Spray** tool from **Create > Geometry > Particle Systems > Object Type** rollout in the **Command Panel**; the **Name and Color** and **Parameters** rollouts will be displayed. In the Top viewport, press and hold the left mouse button, and then drag the cursor from one point to another; a rectangular shape will be created that is known as emitter. The emitter will not be visible during rendering. Choose the **Play Animation** button from the animation playback controls; the emitter will start emitting particles, refer to Figure 17-3. The straight line passing through the center of the emitter specifies the direction of the particles. If you create the emitter in the Front or the Left viewport, then the direction of the particles will be different. After creating the emitter, you need to set the size, shape, number, and other properties of the particles in the **Parameters** rollout, which are discussed next.

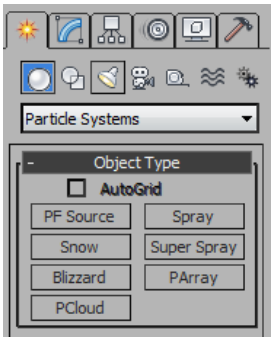


Figure 17-1 *Various tools displayed to create particle systems*

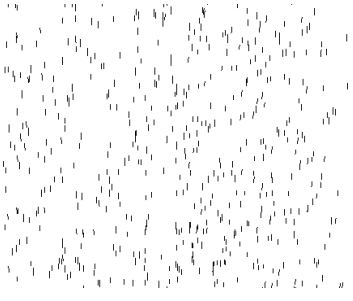


Figure 17-2 *The Spray particle system*

Parameters Rollout

This rollout is used to modify the size, shape, number, and other properties of the spray particles. To display this rollout, select the emitter in the viewport and choose the **Modify** tab in the **Command Panel**; the **Parameters** rollout will be displayed. The different areas of this rollout that are used to modify the properties of the particles are discussed next.

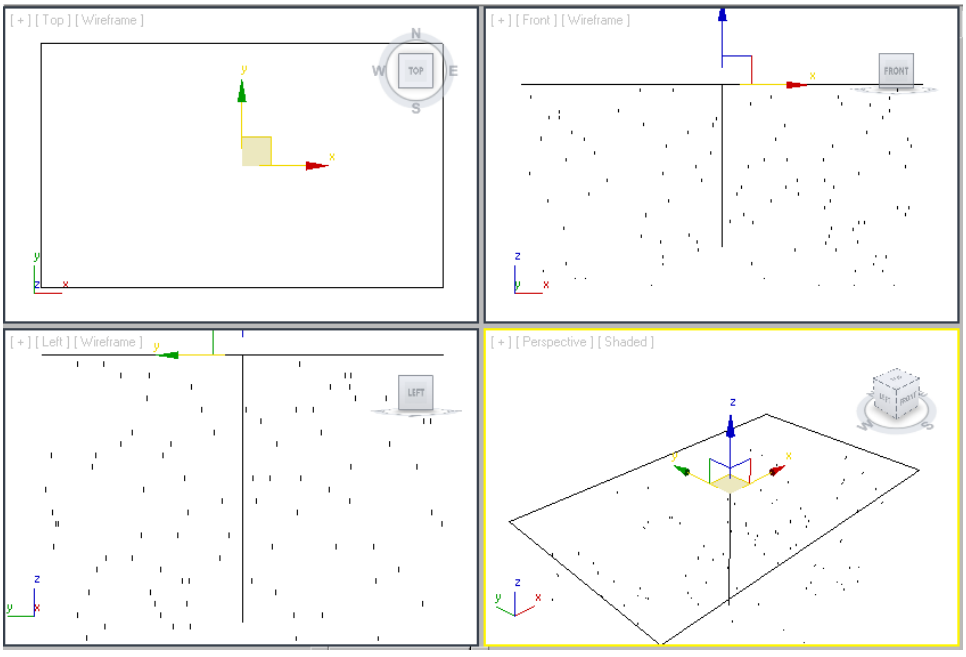


Figure 17-3 *The emitter displayed in all viewports for the Spray particle system*

Particles Area

The options in this area are used to define how the particles will be generated, refer to Figure 17-4. Set the value in the **Viewport Count** spinner to define the number of particles per frame displayed in the viewport. Set the value in the **Render Count** spinner to define the number of particles displayed per frame on rendering. Set the value in the **Drop Size** spinner to modify the size of the particles. Set the value in the **Speed** spinner to define the initial velocity of the particles when they leave the emitter. The velocity is known as the distance traveled per unit time.

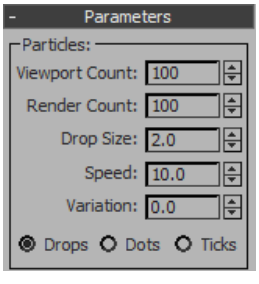


Figure 17-4 *The **Particles** area in the **Parameters** rollout*

The particles remain at the same speed unless they are affected by a space warp. You will learn more about space warps later in this chapter. Set the value in the **Variation** spinner to define the variation in the speed and direction of the particles. As you increase the value in the **Variation** spinner, the particles will get wider and stronger.

By default, the **Drops** radio button is selected in this area. As a result, the particles are displayed in the shape of drops in the viewports. Select the **Dots** or **Ticks** radio button to

display the particles in the shape of dots or ticks. These radio buttons do not affect the shape of the particles at rendering.

Render Area

This area is used to define the shape of the particles on rendering, refer to Figure 17-5. By default, the **Tetrahedron** radio button is selected in this area. As a result, the particles are displayed as tetrahedrons. Select the **Facing** radio button to display the particles as square faces.

Timing Area

The options in this area are used to define the lifetime of the particles, refer to Figure 17-6. The value in the **Start** spinner specifies the frame number at which the emitter will start generating the particles. The value in the **Life** spinner shows the life span of the particles in terms of the number of frames. The value in the **Birth Rate** spinner shows the number of new particles generated at each frame. By default, this spinner is not activated. To activate this spinner, you need to clear the **Constant** check box.

Emitter Area

This area is used to define the dimensions of the emitter, refer to Figure 17-7. Set the value in the **Width** and **Length** spinners to define the width and length, respectively of the emitter. Select the **Hide** check box to hide the emitter in the viewports.

Figure 17-5 *The* ***Render*** *area*

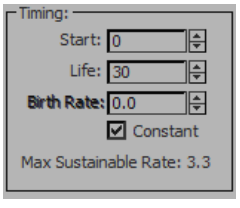


Figure 17-6 *The* ***Timing*** *area*

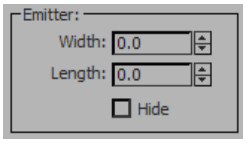


Figure 17-7 *The* ***Emitter*** *area*

Snow Particle System

Menu bar:	Create > Particles > Snow
Command Panel:	Create > Geometry > Particle Systems > Object Type rollout > Snow

The Snow particle system is used to generate the particles that are similar to snow flakes, as shown in Figure 17-8. To create the snow particle system, choose the **Snow** tool from **Create > Geometry > Particle Systems > Object Type** rollout in the **Command Panel**; the **Name and Color** and **Parameters** rollouts will be displayed. In the Top viewport, press and hold the left mouse button, and then drag the cursor from one point to another; the emitter will be created. Choose the **Play Animation** button; the particles will start emitting from the emitter, as shown in Figure 17-9. After creating the emitter, you need to set the size, shape, number, and other properties of the particles in the **Parameters** rollout, the method to set these properties is discussed next.

Figure 17-8 *The snow particles on rendering*

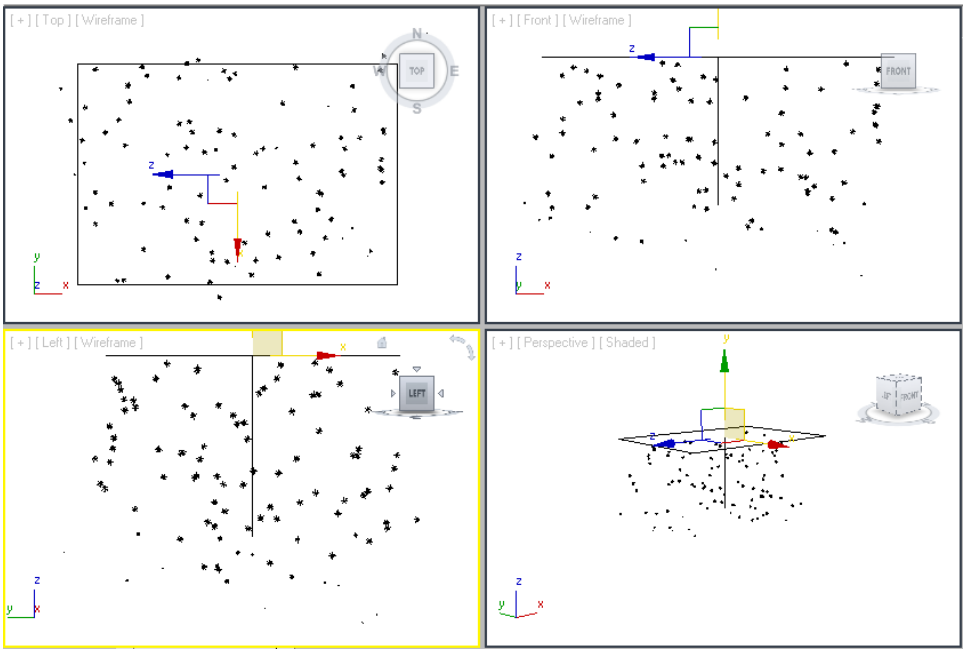


Figure 17-9 *The particles displayed in all viewports for the Snow particle system*

Parameters Rollout

This rollout is used to modify the size, shape, number, and other properties of the snow particles. To display this rollout, select the emitter in the viewport and choose the **Modify** tab in the **Command Panel**; the **Parameters** rollout will be displayed. In the **Parameters** rollout, most of the options are the same as discussed in the spray particle system. The remaining options are discussed next.

Particles Area

The **Flake Size** spinner in this area is used to specify the size of the particles. Set a value in the **Tumble** spinner to specify the amount of random rotation of the snow particles. Set the value in the **Tumble Rate** spinner to specify the speed of rotation of the snow particles. As you increase the value in the **Tumble Rate** spinner, the speed of rotation also increase.

Render Area

By default, the **Six Point** radio button is selected in this area. As a result, the particles are displayed as six point shape on rendering, refer to Figure 17-8. Select the **Triangle** or **Facing** radio button to display the triangular or facing particles at rendering, as shown in Figures 17-10 and 17-11.

Figure 17-10 *The triangular snow particles*

Figure 17-11 *The facing snow particles*

Super Spray Particle System

Menu bar:	Create > Particles > Super Spray
Command Panel:	Create > Geometry > Particle Systems > Object Type rollout > Super Spray

The Super Spray particle system is the advanced version of the Spray particle system. To create the Super Spray particle system, you need to choose the **Super Spray** tool from **Create > Geometry > Particle Systems > Object Type** rollout in the **Command Panel**; the **Name and Color**, **Basic Parameters**, **Particle Generation**, **Particle Type**, **Rotation and Collision**, **Object Motion Inheritance**, **Bubble Motion**, **Particle Spawn**, and **Load/Save Presets** rollouts will be displayed. In the Top viewport, press and hold the left mouse button, and then drag the cursor from one point to another; the emitter will be created. Choose the **Play Animation** button; the particles will start getting emitted from the emitter, as shown in Figure 17-12.

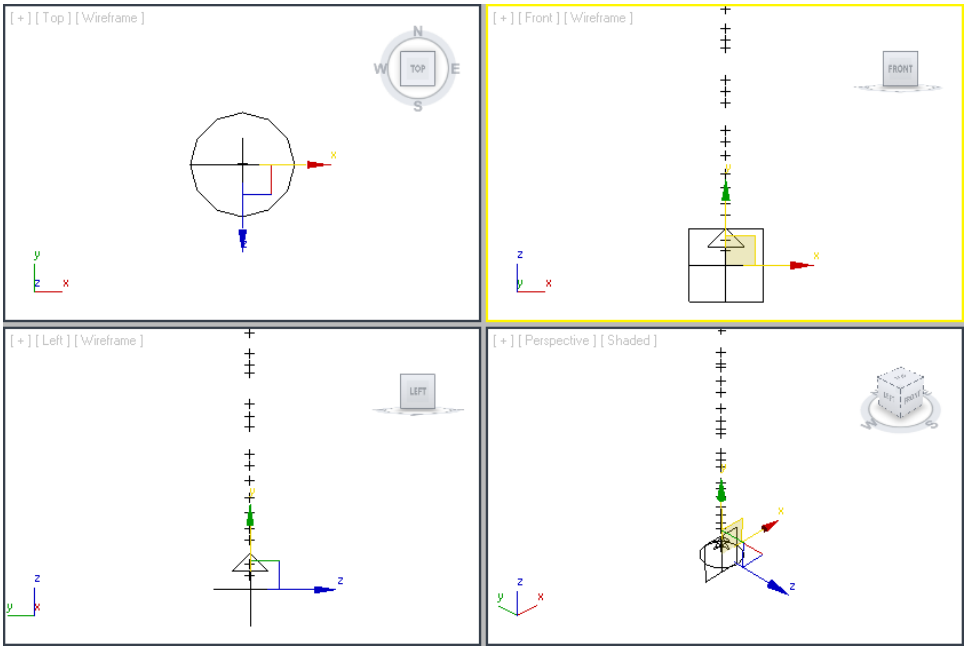


Figure 17-12 *The particles generated for the Super Spray particle system*

After creating the emitter, you need to set the size, shape, number, and other properties of the particles in various rollouts. The most commonly used rollouts are discussed next.

Basic Parameters Rollout

The options in this rollout are used to define the direction, spread, and other properties of the particles, refer to Figure 17-13. The areas in this rollout are discussed next.

Particle Formation Area

Set the value in the **Off Axis** spinner to offset the angle of the particles in the Z-axis. Set the value in the **Spread** spinner to spread the particles away from the emitter. Set the value in the **Off Plane** spinner to offset the direction of particles in the horizontal plane. The value in the **Spread** spinner is used to spread the particles around the off plane axis.

Note

*If you set the value **0** in the **Off Axis** spinner, then the value in the **Off Plane** spinner will not affect the particles.*

Display Icon Area

Set the value in the **Icon Size** spinner to define the size of the emitter icon in the viewport. Select the **Emitter Hidden** check box to hide the emitter icon in the viewport.

Viewport Display Area

The radio buttons in this area are used to define the shape of the particles in the viewport. Set the value in the **Percentage of Particles** spinner to define the percentage of the number of particles to be displayed in the viewport.

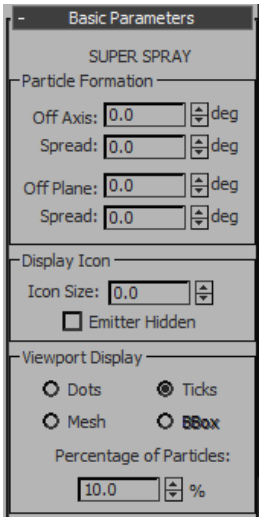


***Figure 17-13** The **Basic Parameters** rollout*

Particle Generation Rollout

The options in this rollout are used to define motion, quantity, size, and other properties of the particles, refer to Figure 17-14. The areas in this rollout are discussed next.

Particle Quantity Area

The radio buttons in this area are used to define how the particles will be generated over the time. By default, the **Use Rate** radio button is selected. It is used to define the number of particles generated at each frame. The spinner below this radio button defines the number of particles created per frame. Select the **Use Total** radio button to define the total number of particles generated over the life span of the system. Set the value in the spinner below this radio button to define the total number of particles created over the life span of the system.

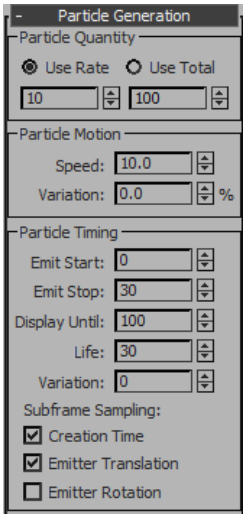


***Figure 17-14** Partial view of the **Particle Generation** rollout*

Particle Motion Area

The options in this area are used to define the speed of the particles. Set the value in the **Speed** spinner to specify the initial velocity of the particles when they leave the emitter. Set the value in the **Variation** spinner to specify the variation in the speed and the direction of the particles.

Particle Timing Area

In the **Emit Start** and **Emit Stop** spinners, set the frame number at which the particles will begin and stop the emission. Set the value in the **Display Until** spinner to define the frame number at which all particles will disappear from the scene. The value in the **Life** spinner specifies the life span of the particles in terms of the number of frames. The value in the **Variation** spinner is used to define the number of frames by which the life of the particles can vary randomly.

Particle Size Area

The options in this area are used to define the size of the particles. Set the value in the **Size** spinner to specify the size of the particles. The value in the **Variation** spinner is used to define the variation in the size of the particles. The value in the **Grow For** spinner is used to define the number of frames in which the particles will grow from their original size to the size specified in the **Size** spinner. The value in the **Fade For** spinner is used to define the number of frames in which the particles will shrink to 1/10th of their size before their death.

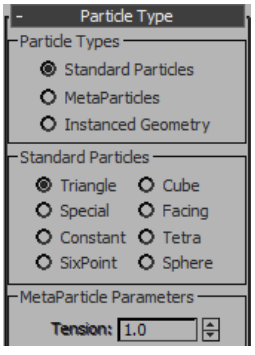


Figure 17-15 *Partial view of the* ***Particle Type*** *rollout*

Particle Type Rollout

The options in this rollout are used to define the type of particles used in the scene, refer to Figure 17-15. The areas in this rollout are discussed next.

Particle Types Area

The radio buttons in this rollout are used to define the type of geometry of the particles on rendering. When you select a radio button in the **Particle Types** area, its corresponding area will get activated in the rollout where you can modify the parameters as per your requirement. By default, the **Standard Particles** radio button is selected, and therefore, the **Standard Particles** area is activated. There are eight types of radio buttons such as **Cube**, **Tetra**, **Facing**, and so on in this area to define the geometry of the particles. Select the corresponding radio button to change the geometry of the particles at rendering.

Note

You cannot view the change in the geometry of the particles in the viewport. It will be displayed only after rendering.

Select the **MetaParticles** radio button in the **Particle Types** area; the **MetaParticle Parameters** area will be activated. The options in this area are used to create the particles in the form of metaballs. The metaball particles can join together to form a blob or a

stream of particles. The blob is an indistinct form of particles, refer to Figure 17-16. You can modify the parameters of the meta particles in the **MetaParticle Parameters** area.

Select the **Instanced Geometry** radio button in the **Particle Types** area; the **Instancing Parameters** area will be activated. This area is used to select an object in the viewport to be used as particles in a particle system. These particles will be an instance of the object. To create an instance of the object, choose the **Pick Object** button in the **Instancing Parameters** area and select the object in the viewport; the particles will take the geometry of the selected object and will be displayed on rendering, refer to Figure 17-17.

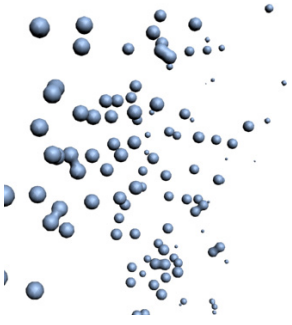


Figure 17-16 *The meta particles*

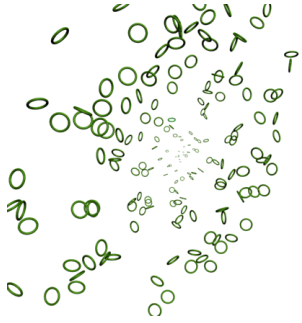


Figure 17-17 *The torus object selected to create the instance particles*

Mat'l Mapping and Source Area

The options in this area are used to define the material and the mapping for the particles.

Rotation and Collision Rollout

The options in this rollout are used to rotate the particles and add motion blur to them, refer to Figure 17-18. The motion blur is used to provide the blur effect to the fast moving animated objects to make them look realistic. The areas in this rollout are discussed next.

Spin Speed Controls Area

The value in the **Spin Time** spinner specifies the total number of frames that the particles will take to complete one rotation. Set the value in the **Variation** spinner to set the percentage of variation of the spin time. The value in the **Phase** spinner is used to define the initial rotation of the particles at birth. Set the value in the **Variation** spinner below the **Phase** spinner to specify the percentage of variation of phase.

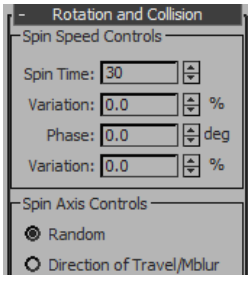


Figure 17-18 *Partial view of the* ***Rotation and Collision*** *rollout*

Spin Axis Controls Area

The options in this area are used to set the axis of rotation for the particles. By default, the **Random** radio button is selected that is used to define the axis of rotation for each particle randomly. On selecting the **Direction of Travel/Mblur** radio button, the particles will rotate about a vector formed in the direction of the movement of the particles. In the **Stretch** spinner, set the value in

percentage to stretch each particle. The **Direction of Travel/Mblur** radio button is also used to apply the motion blur to the object. Select the **User Defined** radio button to use a vector for the rotation that is defined in the **X Axis**, **Y Axis**, and **Z Axis** spinners.

Interparticle Collisions Area

This area is used to control collisions between the particles.

Object Motion Inheritance Rollout

The spinners in this rollout are used to specify the extent by which the motion of particles will be affected by the motion of the emitter. These options are discussed next.

Influence Spinner

The **Influence** spinner is used to specify the percentage of particles that inherit the motion of the object-based emitter at the moment of particle formation.

Multiplier Spinner

The **Multiplier** spinner is used to specify the extent upto which the emitter motion affects the particle motion. This can be a positive or negative number.

Variation Spinner

The **Variation** spinner is used to specify the percentage of variation of the **Multiplier** spinner.

Bubble Motion Rollout

The options in this rollout are used to provide a waveform motion path for the particles, refer to Figure 17-19. This rollout is also used to produce a wobbling effect in the particles. Set the value in the **Amplitude** spinner to specify the height of each wave. The value in the **Period** spinner is used to define the number of frames it takes to complete one cycle of the wave. The value in the **Phase** spinner specifies the initial position of a particle along the wave. Set the values in different **Variation** spinners to produce variations in the corresponding parameters.

Particle Spawn Rollout

The options in this rollout are used to specify the reaction of the particles when they die or collide with a particle deflector, refer to Figure 17-20. A deflector is a space warp about which you will learn later in this chapter. The most commonly used areas of this rollout are discussed next.

Particle Spawning Effects Area

By default, the **None** radio button is selected and therefore particles will not spawn. The properties of the deflector objects set the nature of particles on collision. On selecting the **Die After Collision** radio button, the particles disappear after colliding with the deflector object. Also, the **Persist** and **Variation** spinners get activated. Set the value in the **Persist** spinner to specify the number of frames, in which the particles remain alive after the collision.

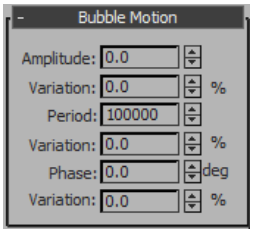


*Figure 17-19 The **Bubble Motion** rollout*

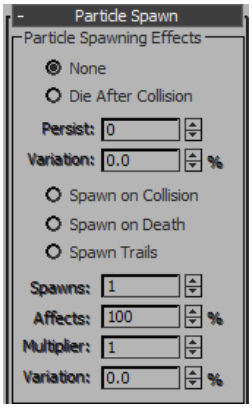


*Figure 17-20 The **Particle Spawn** rollout*

If you select the **Spawn on Collision** radio button, the particles will be generated after the collision. Whereas on selecting the **Spawn on Death** radio button, the particles will spawn at the end of their life span. On selecting the **Spawn Trails** radio button, the particles will spawn from each existing particle at each frame of the particles' life. Set the values in the **Spawns**, **Affects**, **Multiplier**, and **Variation** spinners to modify the spawn of the particles.

Direction Chaos Area

Set the value in the **Chaos** spinner in this area to vary the direction of the spawned particles.

Speed Chaos Area

Set the values in different options of this area to vary the speed of the spawned particles.

Scale Chaos Area

Set the values in different options of this area to scale the spawned particles.

Lifespan Value Queue Area

The options in this area are used to specify a list of alternative lifespan values for each spawned particles.

Object Mutation Queue Area

The options in this area are used to switch between instanced-object particles with each spawning. These options are available only if the **Instanced Geometry** radio button is selected in the **Particle Type** rollout.

Load/Save Presets Rollout

The options in this rollout are used to load the predefined settings of the particle system, refer to Figure 17-21. You can save these settings to use in other particle systems. On the top of this rollout, enter a name for the settings in the **Preset Name** text box and choose the **Save** button; the name of the settings will be displayed in the list box given in the **Saved Presets**

area. If you need to use the same settings for another particle system, then select the new particle system in the viewport and select the name of the settings from the list box in the **Saved Presets** area. Now, choose the **Load** button; the same settings will be applied to the new particle system.

To delete the settings, select the name of the settings in the **Saved Presets** area, and then choose the **Delete** button. You can also use the default settings available in the list box such as **Bubbles**, **Fireworks**, and so on in the **Saved Presets** area.

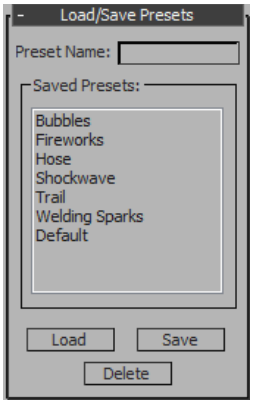


Figure 17-21 *The* ***Load/Save Presets*** *rollout*

Blizzard Particle System

Menu bar:	Create > Particles > Blizzard
Command Panel:	Create > Geometry > Particle Systems > Object Type rollout > Blizzard

The Blizzard particle system is the advanced version of the Snow particle system. To create the Blizzard particle system, choose the **Blizzard** tool from **Create > Geometry > Particle Systems > Object Type** rollout in the **Command Panel**; the **Name and Color**, **Basic Parameters**, **Particle Generation**, **Particle Type**, **Rotation and Collision**, **Object Motion Inheritance**, **Particle Spawn**, and **Load/Save Presets** rollouts will be displayed. In the Top viewport, press and hold the left mouse button, and then drag the cursor from one point to another; the emitter will be created. Choose the **Play Animation** button; the particles will start getting emitted from the emitter, as shown in Figure 17-22. After creating the emitter, you need to set the properties of the particles in various rollouts. The options in the rollouts are same as discussed in the Super Spray particle system. However, the main difference is that in the **Basic Parameters** rollout of the Blizzard particle system, you need to set the width and length of the emitter icon in their respective spinners in the **Display Icon** area.

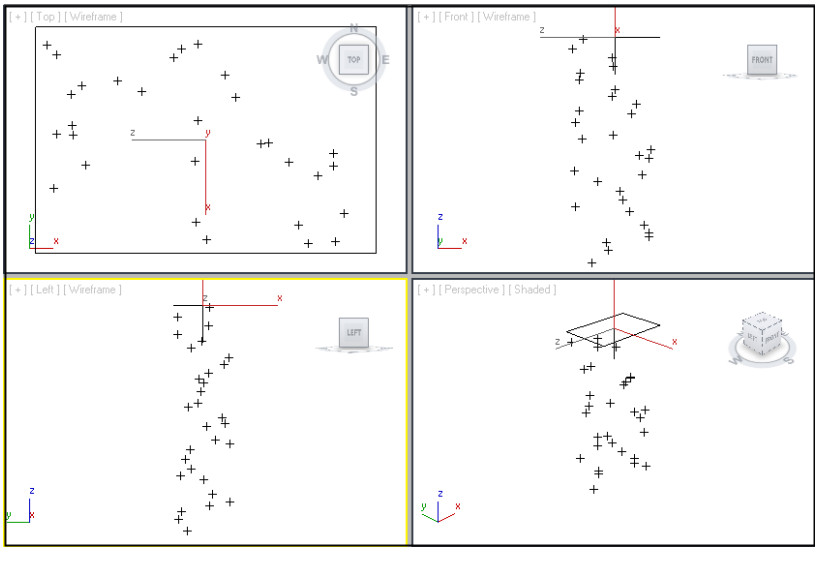


Figure 17-22 *The particles generated for the Blizzard particle system*

PArray Particle System

Menu bar:	Create > Particles > PArray
Command Panel:	Create > Geometry > Particle Systems > Object Type rollout > PArray

The PArray particle system is used to generate particles from the selected geometry. Moreover, it is used to create an explosion of the objects. In the PArray particle system, the geometry that you use to emit the particles becomes the emitter and is referred to as the distribution object. To create the PArray particle system, first you need to create a geometry in the viewport and then choose the **PArray** tool from **Create > Geometry > Particle Systems > Object Type** rollout in the **Command Panel**; the **Name and Color**, **Basic Parameters**, **Particle Generation**, **Particle Type**, **Rotation and Collision**, **Object Motion Inheritance**, **Particle Spawn**, **Bubble Motion**, and **Load/Save Presets** rollouts will be displayed. In the Top viewport, press and hold the left mouse button, and then drag the cursor to create the PArray particle system. Next, in the **Basic Parameters** rollout, choose the **Pick Object** button, move the cursor over the geometry that you want to use as the distribution object or the emitter, and then select the geometry; the selected geometry will act as the distribution object. Now, choose the **Play Animation** button; the particles will start getting emitted from the selected geometry, as shown in Figure 17-23. Now, you need to set the properties of the particles in various rollouts. Most of the options in the rollouts displayed are same as those discussed in the Super Spray particle system. The remaining ones are discussed next.

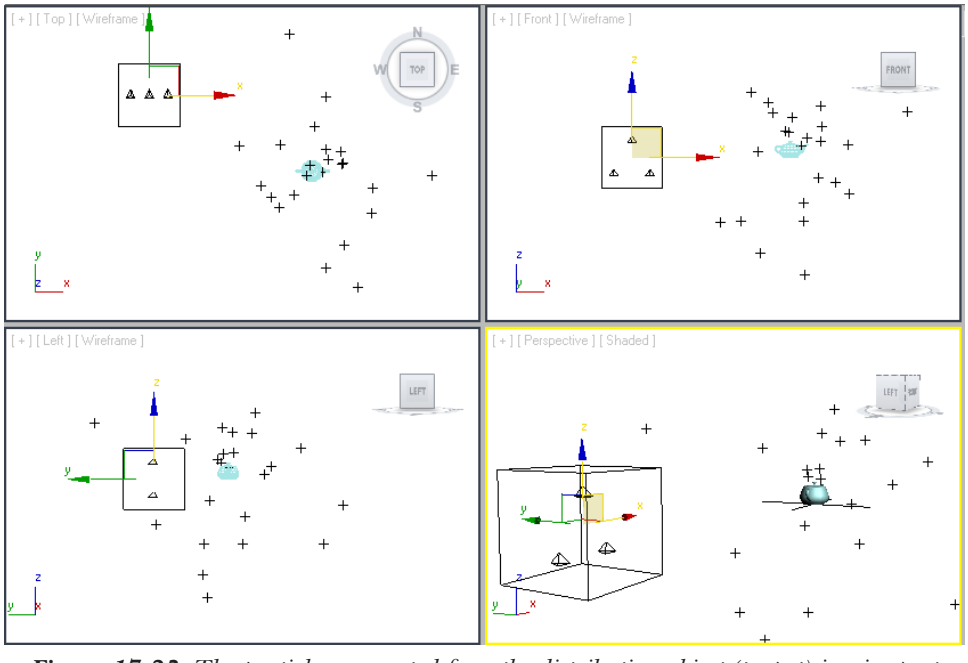


Figure 17-23 *The particles generated from the distribution object (teapot) in viewports*

Basic Parameters Rollout

The options in this rollout are used to define the distribution object and set the properties of the PArray particle system, refer to Figure 17-24. The **Pick Object** button in the **Object-Based**

Emitter area is used to select a geometry in the viewport to use it as the distribution object. The **Particle Formation** area is discussed next.

Particle Formation Area

The options in this area are used to define how the particles will be distributed over the surface of the distribution object. By default, the **Over Entire Surface** radio button is selected that is used to emit the particles over the entire surface of the distribution object. Select the **Along Visible Edges** radio button to emit the particles randomly from the visible edges of the distribution object. Select the **At All Vertices** radio button to emit the particles from the vertices of the distribution object. On selecting the **At Distinct Points** radio button, the **Total** spinner will get activated. Set the value in this spinner to specify the number of points over the surface of the distribution object, from which the particles will be emitted. Select the **At Face Centers** radio button to emit the particles from the center of each triangular face. Select the **Use Selected SubObjects** check box to emit the particles from the selected sub-object of the distribution object.

Particle Generation Rollout

The options in this rollout are the same as those discussed in the Super Spray particle system. In the **Particle Motion** area, set the value in the **Divergence** spinner to vary the direction of the particles in degrees.

Particle Type Rollout

The options in this rollout are used to specify the particle type and the type of mapping performed on the particles. On selecting the **Object Fragments** radio button in the **Particle Types** area of this rollout, the **Object Fragment Controls** area will get activated. The options in this area are used to generate particles from the fragments of the distribution object, as shown in Figure 17-25. Also, you can use this option to create an explosion in an object. Set the value in the **Thickness** spinner in the **Object Fragment Controls** area to specify the thickness of the fragments. By default, the **All Faces** radio button is selected, therefore, all faces of the selected object turn into fragments. Select the **Number of Chunks** radio button to break the object into irregular fragments. Set the value in the **Minimum** spinner to specify the minimum number of fragments that will be generated. Select the **Smoothing Angle** radio button to break the object based on the angle between the face normals.

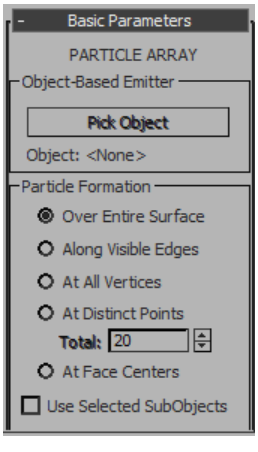


Figure 17-24 *Partial view of the* ***Basic Parameters*** *rollout*

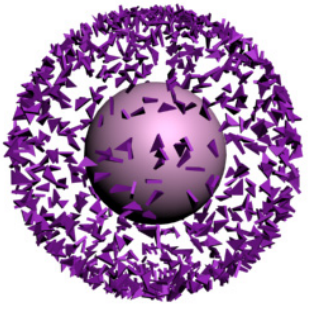


Figure 17-25 *The PArray particle system with the* ***Object Fragments*** *particle type*

PCloud Particle System

Menu bar:	Create > Particles > PCloud
Command Panel:	Create > Geometry > Particle Systems > Object Type > PCloud

The PCloud particle system is used to create the particles that will be enclosed in a specific volume. To create the PCloud particle system, choose the **PCloud** tool from **Create > Geometry > Particle Systems > Object Type** rollout in the **Command Panel**; the **Name and Color**, **Basic Parameters**, **Particle Generation**, **Particle Type**, **Rotation and Collision**, **Object Motion Inheritance**, **Particle Spawn**, **Bubble Motion**, and **Load/Save Presets** rollouts will be displayed. In the Top viewport, press and hold the left mouse button, drag the cursor from one point to another, and then release the left mouse button. Move the cursor up or down to specify the height of the emitter and then click on the screen; an emitter will be created, as shown in Figure 17-26. Next, you need to set the properties of the particles in various rollouts. Most of the options in the rollouts are the same as discussed in the Super Spray particle system. The others options are discussed next.

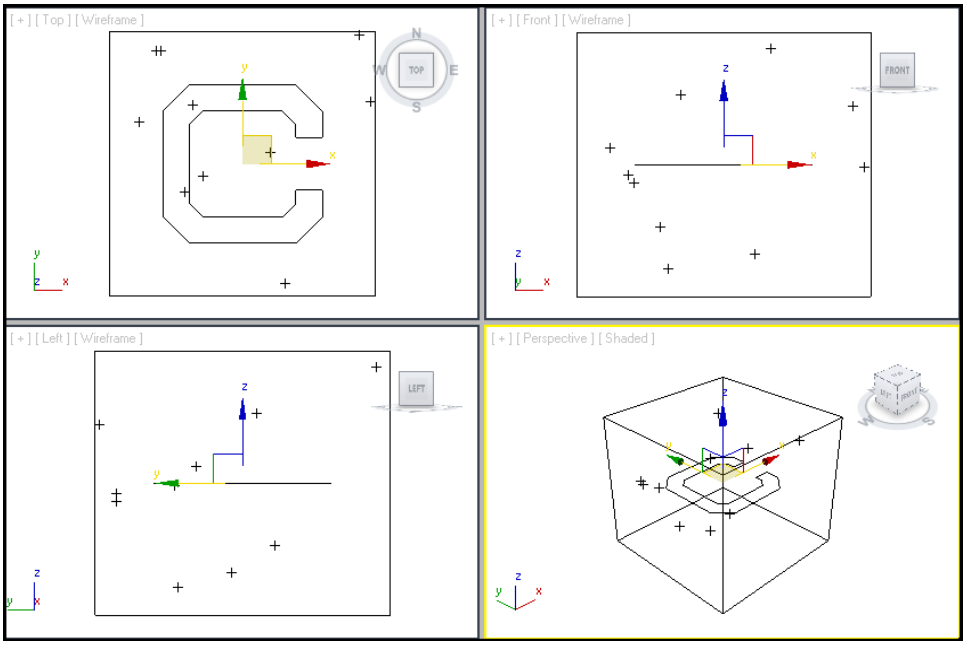


Figure 17-26 *The emitter created for the PCloud particle system*

Basic Parameters Rollout

The radio buttons in the **Particle Formation** area of this rollout are used to define the shape of the emitter icon, refer to Figure 17-27. By default, the **Box Emitter** radio button is selected and it is used to display a box shape emitter. Select the **Sphere** or **Cylinder Emitter** radio button to display a spherical or a cylindrical shape emitter. If you use the geometry in the viewport as the distribution object, then the **Object-based Emitter** radio button will automatically get selected.

Particle Generation Rollout

In the **Particle Motion** area of this rollout, there are some additional options to define the path of the particles, refer to Figure 17-28. By default, the **Random Direction** radio button is selected. It is used to emit the particles from the emitter in random directions. Select the **Direction Vector** radio button; the **X**, **Y**, and **Z** spinners will get activated. Set the value in these spinners to specify the direction of the particles along a vector. Select the **Reference Object** radio button to emit the particles along a vector defined by the local Z-axis of the selected object. Choose the **Pick Object** button to select an object. Set the value in the **Variation** spinner to vary the direction of the particles in percentage.

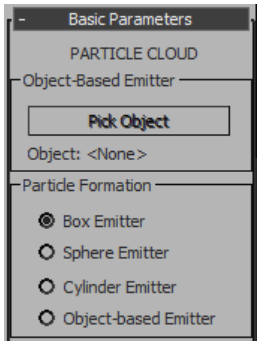


Figure 17-27 *The* ***Particle Formation*** *area in the* ***Basic Parameters*** *rollout*

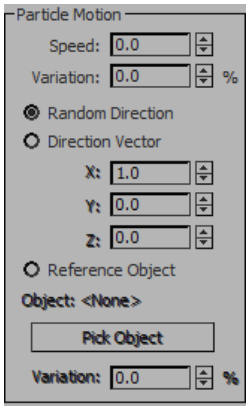


Figure 17-28 *The* ***Particle Motion*** *area in the* ***Particle Generation*** *rollout*

In the next section, you will learn to create the blobmesh and mesher compound objects with the help of various particle systems.

BLOBMESH

Menu bar:	Create > Compound > BlobMesh
Command Panel:	Create > Geometry > Compound Objects > Object Type rollout > BlobMesh

The **BlobMesh** tool is used to create metaballs based on the object selected in the viewport. These metaballs create the blobmesh objects that can flow, such as thick liquids and soft objects. A metaball is a type of sphere that connects itself to another object within a particular distance using a connecting surface. Therefore, a blobmesh compound object will generate the metaballs and then connect the spheres together to create the effect of thick liquid and so on. If the particles are in a certain range, they will connect together to give the effect of liquid. On moving the particles apart, they will unite again to take a spherical shape.

You can create a blobmesh compound object from any geometry or particle system. To create the blobmesh object using the particle system, first create a particle system as discussed earlier in this chapter, and set its parameters in the rollouts available in the Modify panel. Next, choose **Create > Geometry** in the **Command Panel**; a drop-down list will be displayed below the **Geometry** button. Select the **Compound Objects** option from the list; the **Object Type** rollout

will be displayed. Choose the **BlobMesh** tool and click anywhere on the screen; a metaball will be created. Next, choose the **Modify** tab in the **Command Panel**; the **Parameters** and **Particle Flow Parameters** rollouts will be displayed where you can specify the parameters to modify the metaball, refer to Figure 17-29. In the **Blob Objects** area of the **Parameters** rollout, choose the **Add** button; the **Add Blobs** dialog box will be displayed. Select the particle system from the list displayed in this dialog box and choose the **Add Blobs** button; the metaball will be displayed at each particle of the particle system. You can apply material to the blobmesh object to get the realistic effect, as shown in Figure 17-30. Also, you need to set the values in the **Parameters** rollout to get the desired effect.

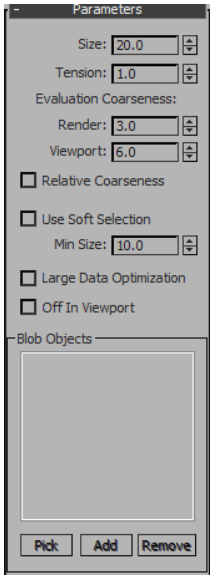


Figure 17-29 *The* ***Parameters*** *rollout*

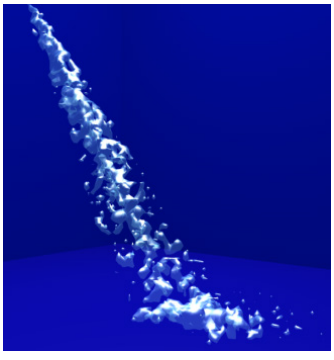


Figure 17-30 *The BlobMesh object created from the blob mesh compound object*

MESHER

Menu bar:	Create > Compound > Mesher
Command Panel:	Create > Geometry > Compound Objects > Object Type rollout > Mesher

The **Mesher** tool is used to create instances of the animated objects. This tool has been mainly designed to be used with the particle systems. Moreover, you can use it with any object. You can also apply the modifiers to a particle system using the mesher compound object.

To create a mesher object, first create a particle system and then set its parameters as per your need. Next, choose **Create > Geometry** in the **Command Panel**; a drop-down list will be displayed below the **Geometry** button. Select the **Compound Objects** from the list; the **Object Type** rollout will be displayed. Choose the **Mesher** tool in this rollout and drag the cursor from one place to another in the Top viewport; a pyramid shape will be created, as shown in Figure 17-31. Next, choose the **Modify** tab in the **Command Panel**; the **Parameters** rollout will be displayed, as shown in Figure 17-32. In the **Parameters** rollout, choose the **Pick Object**

button labeled as **None**, and then select the particle system in the viewport; an instance of the particle system will be displayed once you play the animation, as shown in Figure 17-33. Also, the pyramid shape will disappear. When you play the animation, the instance particle system will behave exactly like the original one. You can also assign a modifier to the instanced particle system, as shown in Figure 17-34.

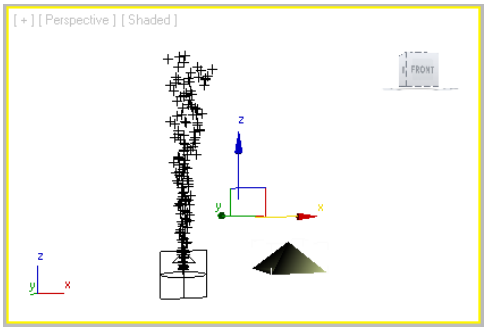


Figure 17-31 *The mesher object in the Perspective viewport*

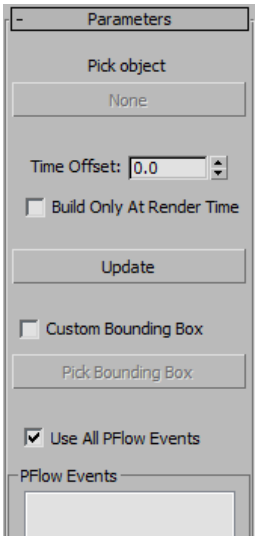


Figure 17-32 *The **Parameters** rollout*

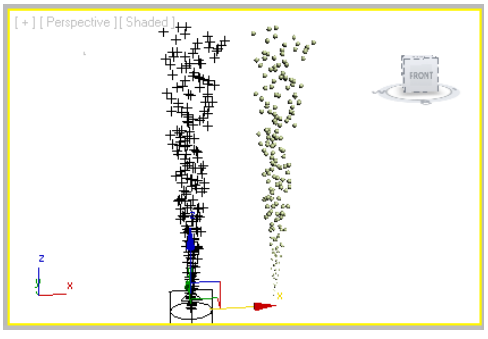


Figure 17-33 *The instance of the particle system displayed*

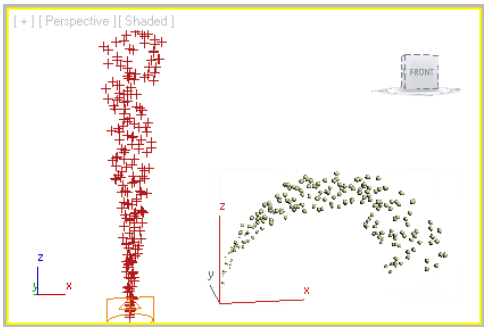


Figure 17-34 *The **Bend** modifier assigned to the instanced particle system*

Note

The size of the mesher object does not affect the particle system.

INTRODUCTION TO SPACE WARPS

In 3ds Max, the space warps objects cannot be rendered and are used to affect the motion and appearance of the other objects. They can generate special effects such as blowing wind, flowing waves, and so on in the animation. There are five categories of space warps, **Forces**, **Deflectors**, **Geometric/Deformable**, **Modifier-Based**, and **Particles & Dynamics**.

To create a space warp, choose **Create > Space Warps** in the **Command Panel**; the **Forces** category will be displayed by default in the drop-down list below the **Space Warp** button. Select another category from the drop-down list, if required; the **Object Type** rollout showing all the tools related to the selected category will be displayed, refer to Figure 17-35. Next, choose the required space warp tool and drag the cursor in the viewport to create the space warp.

To view the effect of the space warp on the object, you need to bind the object with the space warp. To do so, select the object that you want to be affected by the space warp in the viewport. Next, choose the **Bind to Space Warp** tool from the **Main Toolbar** and move the cursor over the selected object in the viewport; the cursor will be displayed, as shown in Figure 17-36. Now, click on the object and drag the cursor to the space warp object; a dotted line will be displayed from the selected object to the space warp object, as shown in Figure 17-37. Release the mouse button; the object will be bound to the space warp object. Also, the name of the space warp object will be displayed in the **Command Panel** to indicate that the object is linked to the space warp object, as shown in Figure 17-38.

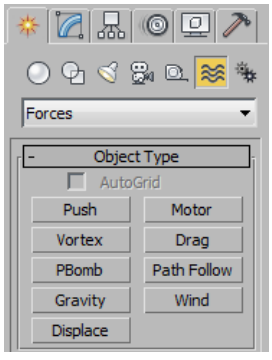


Figure 17-35 *The* ***Forces*** *category selected in the drop-down list*

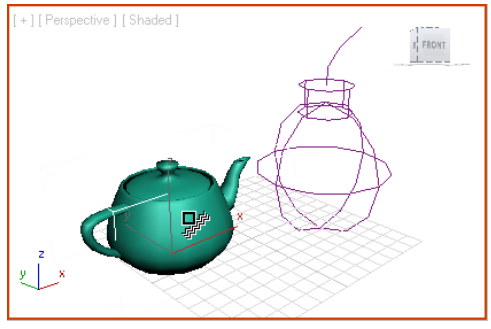


Figure 17-36 *The cursor displayed on invoking the* ***Bind to Space Warp*** *tool*

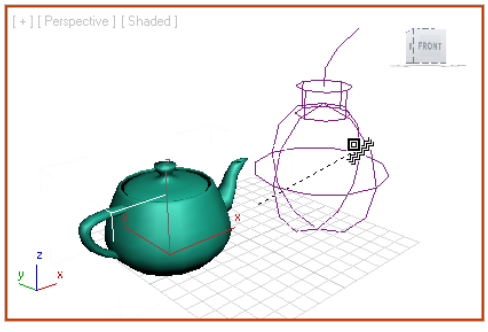


Figure 17-37 *A dotted line displayed from the selected object to the space warp object*

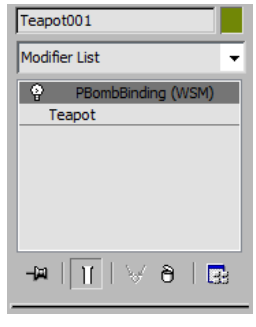


Figure 17-38 *The space warp object displayed in the* ***Command Panel***

Next, select the space warp object in the viewport and choose the **Modify** tab in the **Command Panel**; various rollouts will be displayed to modify the parameters of the space warp object.

Modify the parameters to create special effects in the object. You can also transform the space warp object using the **Select and Move**, **Select and Rotate**, and other transforming tools. In the **Modify** tab of each space warp, there is a rollout named as **Supports Objects of Type**. This rollout displays a list of types of objects that you can bind with the selected space warp.

Note
You can bind multiple objects to a single space warp. In this case, all the objects will be equally affected by the space warp. Also, you can apply multiple space warps to a single object.

CATEGORIES OF SPACE WARPS

There are five categories of space warps. Choose **Create > Space Warps** from the **Command Panel**; a drop-down list will be displayed. You can select the required category from the drop-down list. These categories are discussed next.

Forces

Menu bar:	Create > SpaceWarps > Forces > Push
Command Panel:	Create > Space Warps > Forces > Object Type rollout > Push

The tools in the **Forces** category are used to create the space warps that generate the effect of natural forces on the objects such as push, wind, gravity, and so on. Some of the space warps in this category are discussed next.

Push Space Warp

The Push space warp is used to generate a force in the particle system in a single uniform direction, as shown in Figure 17-39. It can be used to create effects such as of blowing wind, cigarette smoke, and so on.

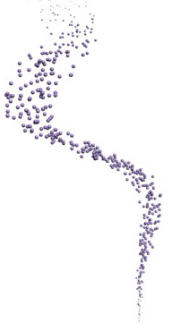


Figure 17-39 *The effect of Push space warp on the particle system*

To create a Push space warp in the viewport, choose the **Push** tool; the **Name and Color**, **Supports Objects of Type**, and **Parameters** rollouts will be displayed. Next, activate the suitable viewport, press and hold the left mouse button, and drag the cursor to create the Push space warp; the Push space warp icon will be displayed in all viewports. Figure 17-40 displays the Push space warp icon in the Perspective viewport. Next, you need to bind the Push space warp with the particle system using the **Bind to Space Warp** tool. Also, you need to set the parameters in the **Parameters** rollout of Push space warp to generate the effect. The **Parameters** rollout and its options are discussed next.

Note
The size of a space warp icon does not affect the particle system.

Parameters Rollout

The options in this rollout are used to set the effect of the Push space warp on the particle system, refer to Figure 17-41. The different areas in this rollout are discussed next.

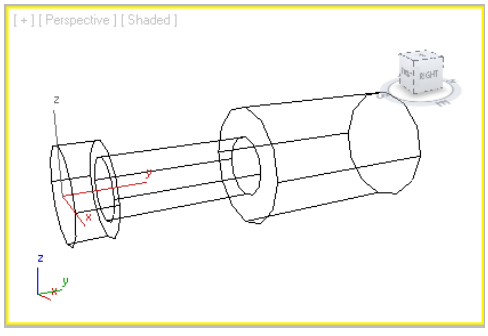


Figure 17-40 *The Push space warp icon*

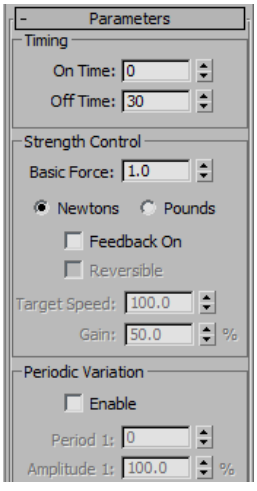


Figure 17-41 *Partial view of the* ***Parameters*** *rollout for Push space warp*

Timing Area: The options in this area are used to define the number of frames in which the effect of Push space warp will start and end. Set the values in the **On Time** and **Off Time** spinners to set the frame number at which the Push space warp will start and end the effect, respectively.

Strength Control Area: Set the value in the **Basic Force** spinner to specify the strength of the force generated by the Push space warp. Select the **Newtons** or the **Pounds** radio button to define the units of the force. Select the **Feedback On** check box; the **Reversible** check box, the **Target Speed** spinner, and the **Gain** spinner will get activated. The **Feedback On** check box is used to vary the force that depends on the speed of the bounded particles relative to the speed in the **Target Speed** spinner. If the **Feedback On** check box is cleared, the force remains constant. On selecting the **Reversible** check box, the force is reversed if the speed of the particles exceeds the speed in the **Target Speed** spinner.

Periodic Variation Area: The options in this area are used to generate variations in the strength of the force applied by Push space warp. Select the **Enable** check box to activate the options in this area. Set the values in the **Period 1** and **Period 2** spinners to set the number of frames it takes to complete one cycle of variation in strength of the Push space warp. Set the values in the **Amplitude 1** and **Amplitude 2** spinners to define the strength of variation in percentage. Set the values in the **Phase 1** and **Phase 2** spinners to offset the variation pattern.

Particle Effect Range Area: Select the **Enable** check box in this area; a spherical shape will be displayed in the viewport, as shown in Figure 17-42. Set the value in the **Range** spinner to limit the range of the effect of the Push space warp.

Display Icon Area: Set the value in the **Icon Size** spinner to specify the size of the Push space warp icon.

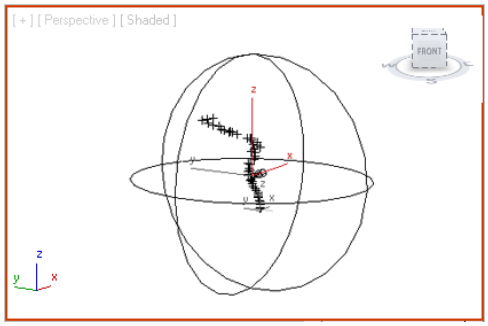


Figure 17-42 *The spherical shape of the Push space warp*

Gravity Space Warp

Menu bar:	Create > SpaceWarps > Forces > Gravity
Command Panel:	Create > Space Warps > Forces > Object Type rollout > Gravity

The Gravity space warp is used to generate a gravitational force in a particle system toward a particular direction. The particles affected by the Gravity space warp will be accelerated in the direction of gravity arrow, as shown in Figure 17-43.

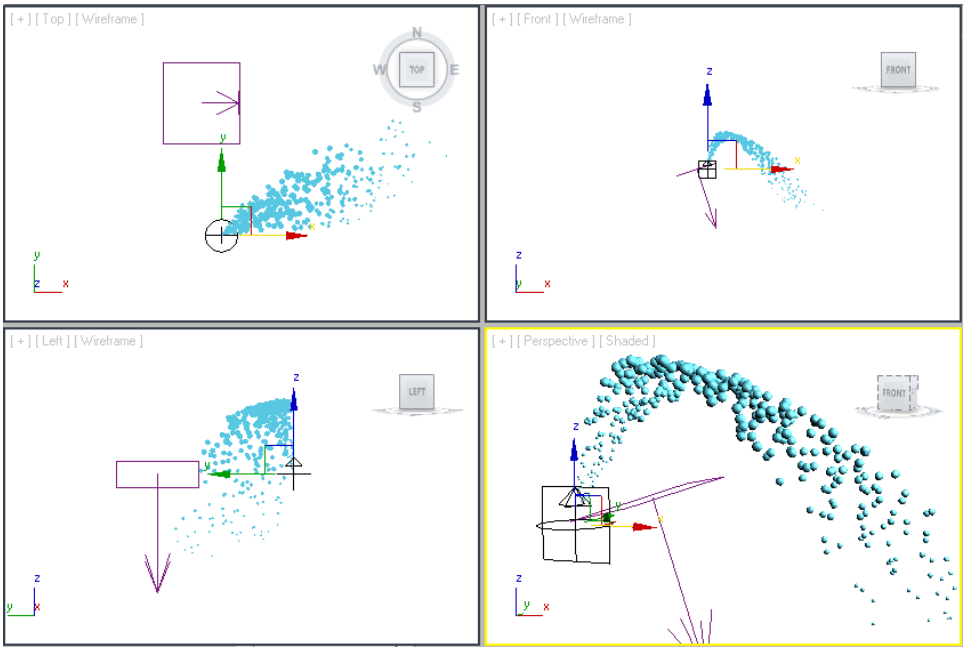


Figure 17-43 *The particle system with the Gravity space warp*

To create a Gravity space warp, choose the **Gravity** tool; the **Name and Color**, **Supports Objects of Type**, and **Parameters** rollouts will be displayed. Next, activate the suitable viewport, press and hold the left mouse button, and drag the cursor to create the Gravity space warp; the Gravity space warp icon will be displayed in all the viewports, refer to Figure 17-43.

Next, bind the Gravity space warp with the particle system and set the parameters in the **Parameters** rollout to generate the desired effect. This rollout is discussed next.

Parameters Rollout

The options in this rollout are used to set the effect of the Gravity space warp on the particle system, refer to Figure 17-44. The **Force** area in this rollout is discussed next.

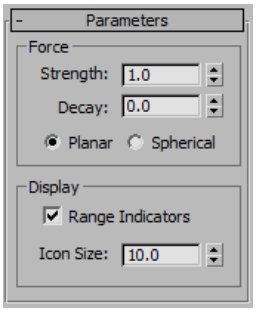


Figure 17-44 *The* ***Parameters*** *rollout for the Gravity space warp*

Force Area

Set the value in the **Strength** spinner to set the effect of the gravity force on the particle system. As you increase the value in the **Strength** spinner, the effect of the gravity force will also be increased. If you set the negative value in the **Strength** spinner, then the particles will be affected by the negative gravitational force and therefore, they will be repelled from the gravity icon. The value in the **Decay** spinner affects the strength of the gravity force. If you increase the value in the **Decay** spinner, then the effect of the gravity force will be decreased. By default, the **Planar** radio button is selected in this area. As a result, the gravitational force will be applied on the particles in a direction that is perpendicular to the plane of the Gravity space warp, refer to Figure 17-43. Select the **Spherical** radio button to apply the gravitational force on the particles toward the center of the sphere, as shown in Figure 17-45.

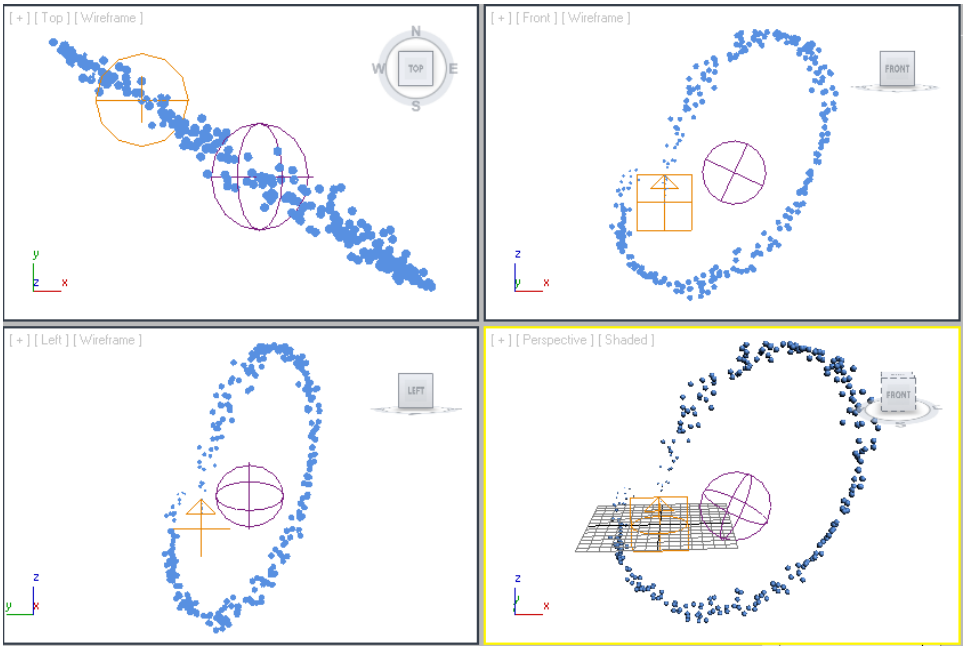


Figure 17-45 *The particle system with the spherical Gravity space warp*

Path Follow Space Warp

Menu bar:	Create > SpaceWarps > Forces > Path Follow
Command Panel:	Create > Space Warps > Forces > Object Type rollout > Path Follow

The Path Follow space warp is used to select a spline in the viewport that will be used as a path for the particles, refer to Figure 17-46.

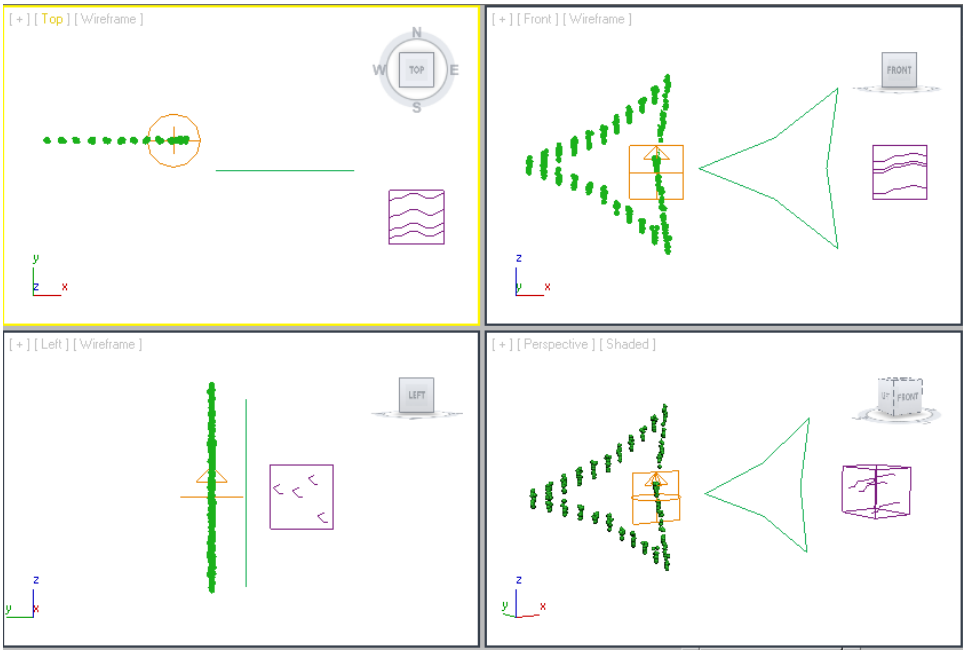


Figure 17-46 *The particle system with the Path Follow space warp*

To create a Path Follow space warp, first create a particle system and a spline. Next, choose the **Path Follow** tool; the **Name and Color**, **Supports Objects of Type**, and **Basic Parameters** rollouts will be displayed. Next, activate the suitable viewport, press and hold the left mouse button, and drag the cursor to create the Path Follow space warp; the Path Follow space warp icon will be displayed in all viewports, refer to Figure 17-46. Now, bind the Path Follow space warp with the particle system. In the **Basic Parameters** rollout of the Path Follow space warp, choose the **Pick Shape Object** button and select the spline in the viewport. Next, you need to set the other parameters of the Path Follow space warp in the **Basic Parameters** rollout. This rollout and its options are discussed next.

Basic Parameters Rollout

The options in this rollout are used to set the parameters of the Path Follow space warp to affect the particles in a desired way, refer to Figure 17-47. The areas in this rollout are discussed next.

Current Path Area: The options in this area are used to select the spline path and limit the range of effect of the space warp. Choose the **Pick Shape Object** button to select the spline in the viewport.

Motion Timing Area: Specify the frame numbers at which the Path Follow space warp will start and stop affecting the particles in the **Start Frame** and **Last Frame** spinners, respectively. Set the value in the **Travel Time** spinner to specify the number of frames in which the particles will cross the entire path.

Particle Motion Area: The options in this area are used to control the motion of the particles along the path. The **Along Parallel Splines** radio button is selected by default. As a result, the path followed by the particles will be exactly the same as that of the selected spline. On selecting the **Along Offset Splines** radio button, the motion of the particles will be affected by the distance between the particle system and the spline path. The **Constant Speed** check box is used to generate the constant speed for the particles. Set the value in the **Stream Taper** spinner to specify the amount of the stream of the particles that will be tapered along the path, as shown in Figure 17-48. Set the value in the **Variation** spinner to specify the amount of deviation of the particles from the taper value. Set the value in the **Stream Swirl** spinner to specify the number of turns that the particles will take around the path, as shown in Figure 17-49. Set the value in the **Variation** spinner to specify the deviation of the particles from the swirl value.

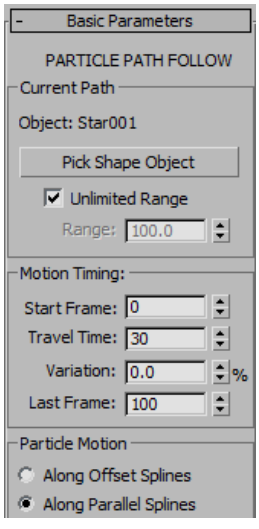


Figure 17-47 *Partial view of the* ***Basic Parameters*** *rollout*

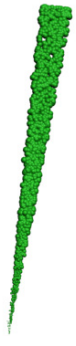


Figure 17-48 *The particles with the stream taper effect*

Figure 17-49 *The particles with the stream swirl effect*

Wind Space Warp

Menu bar:	Create > SpaceWarps > Forces > Wind
Command Panel:	Create > Space Warps > Forces > Object Type rollout > Wind

The Wind space warp is used to generate the blowing wind effect in a particle system, refer to Figure 17-50. The Wind space warp is very similar to the Gravity space warp. The only

difference is that the Wind space warp has an additional turbulence effect, which gives a realistic view to the particle system.

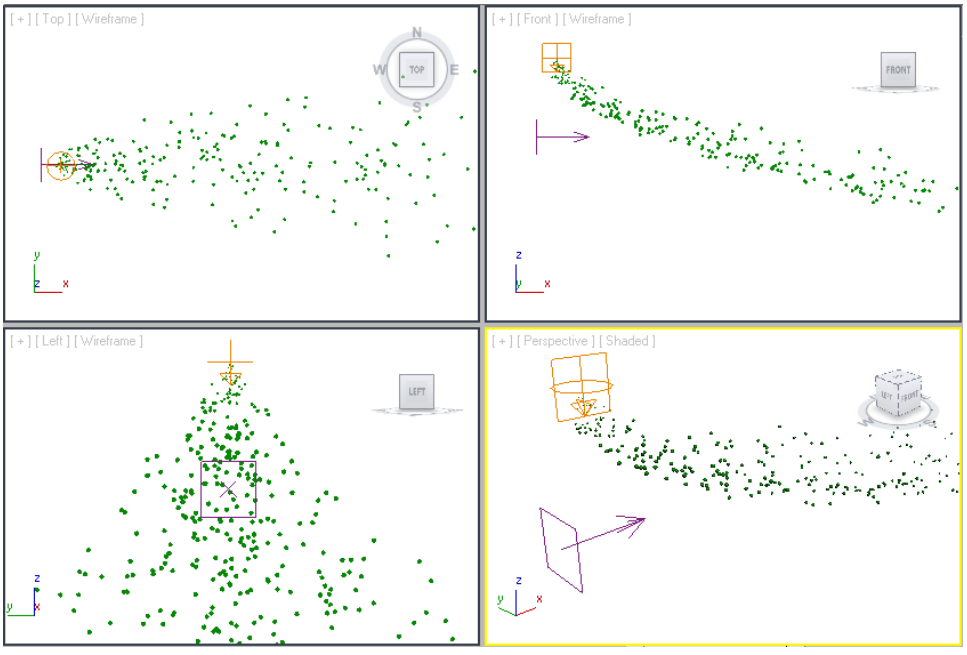


Figure 17-50 *The effect of the Wind space warp on the particle system*

To create a Wind space warp, choose the **Wind** tool; the **Name and Color**, **Supports Objects of Type**, and **Parameters** rollouts will be displayed. Next, activate the suitable viewport, press and hold the left mouse button, and drag the cursor to create the Wind space warp; the Wind space warp icon will be displayed in all viewports, refer to Figure 17-50. Next, bind the Wind space warp with the particle system and set the parameters in the **Parameters** rollout to generate a realistic effect. This rollout is discussed next.

Parameters Rollout

The options in the **Force** and **Display** areas are the same as those discussed in the Gravity space warp. The **Wind** area, as shown in Figure 17-51, is discussed next.

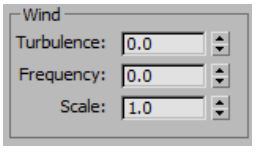


Figure 17-51 *The **Wind** area in the **Parameters** rollout*

Wind Area: Set the value in the **Turbulence** spinner to create random variations in the flow of particles when the Wind space warp blows them. The value in the **Frequency** spinner is used to define how the turbulence will vary over the time. Set the value in the **Scale** spinner to scale the turbulence effect.

PBomb Space Warp

Menu bar:	Create > SpaceWarps > Forces > PBomb
Command Panel:	Create > Space Warps > Forces > Object Type rollout > PBomb

The PBomb space warp is used to explode a particle system, refer to Figure 17-52. The PBomb space warp is mostly used with the PArray particle system.

Figure 17-52 *The effect of the PBomb space warp on a sphere at a single frame at rendering*

To use the PBomb space warp, first create an object that you want to explode. To do so, choose the **PArray** tool from **Create > Geometry > Particle Systems > Object Type** rollout and then create a PArray particle system in the viewport. Next, choose the **Pick Object** button in the **Basic Parameters** rollout of the PArray particle system and select the object that you have created. In the **Particle Type** rollout of this particle system, select the **Object Fragments** radio button and set the other parameters. Next, choose the **PBomb** tool from **Create > Space Warps > Forces > Object Type** rollout in the **Command Panel**; the **Name and Color**, **Supports Objects of Type**, and **Basic Parameters** rollouts will be displayed. Press and hold the left mouse button and drag the cursor in the viewport to create the PBomb space warp; the PBomb space warp icon will be displayed in all viewports, as shown in Figure 17-53.

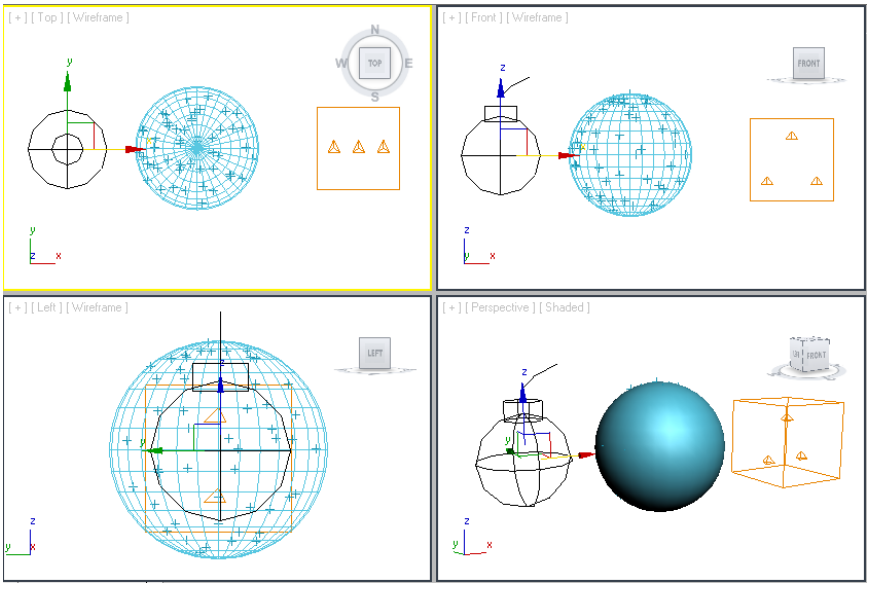


Figure 17-53 *The PBomb space warp icon in the viewport*

Next, bind the PBomb space warp with the PArray icon and set the parameters in the **Basic Parameters** rollout to generate a realistic effect. The **Basic Parameters** rollout is discussed next.

Basic Parameters Rollout

The options in this rollout are used to modify the parameters of the PBomb space warp, refer to Figure 17-54. The areas in this rollout are discussed next.

Blast Symmetry Area: By default, the **Spherical** radio button is selected. As a result, the force is applied outward from the PBomb icon in all directions, refer to Figure 17-52. Select the **Cylindrical** radio button; the PBomb icon will change to a cylindrical shape, refer to Figure 17-55. The **Cylindrical** radio button is used to apply the force outward in a cylindrical form from the PBomb icon, as shown in Figure 17-56. Select the **Planar** radio button; the PBomb icon will change to a plane with arrows in it, as shown in Figure 17-57. The **Planar** radio button is used to apply the force outward from the PBomb icon, perpendicular to the plane.

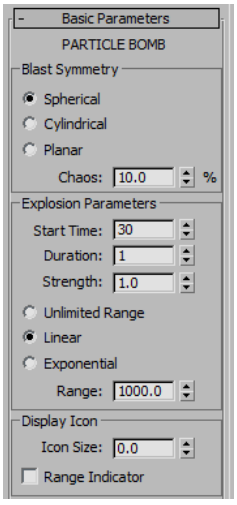


Figure 17-54 *The **Basic Parameters** rollout for the PBomb space warp*

Figure 17-55 *The PBomb icon after selecting the **Cylindrical** radio button*

Figure 17-56 *The effect of the PBomb space warp on a sphere after selecting the **Cylindrical** radio button at rendering*

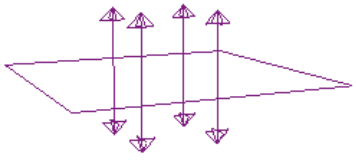


Figure 17-57 *The PBomb icon after selecting the **Planar** radio button*

Explosion Parameters Area: Set the value in the **Start Time** spinner to specify the frame number at which the explosion will start. Set the value in the **Duration** spinner to specify the number of frames over which the forces will be assigned. Set the value in the **Strength** spinner to specify the strength of the force.

Self-Evaluation Test

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

1. Which of the following tools is used create the particle system that generates particles similar to the water drops or spray?

   (a) **Spray** (b) **Blizzard**
   (c) **Snow** (d) **PCloud**

2. Which of the following is a category of the space warps?

   (a) **Forces** (b) **Geometric/Deformable**
   (c) **Deflectors** (d) All of these

3. Which of the following rollouts in the Super Spray particle system is used to load the settings that you can use further in other particle systems?

   (a) **Particle Spawn** (b) **Bubble Motion**
   (c) **Load/Save Presets** (d) **Particle Type**

4. Which of the following tools is used to create the space warps that generate the effect of natural forces on objects?

   (a) **Push** (b) **Gravity**
   (c) **Path Follow** (d) All of these

5. You can view the emitter of any particle system on rendering. (T/F)

6. The options in the **Particle Motion** area of the Super Spray particle system are used to define the speed of the particles. (T/F)

7. The space warp objects are used to affect the motion and appearance of other objects. (T/F)

8. A _____ is a type of spherical shape that connects itself to another object within a distance using a connecting surface.

9. The _____ tool is used to bind the object with the space warp object.

10. The _____ particle system is used to create a fountain.

Review Questions

Answer the following questions:

1. Which of the following space warps is used to generate gravitational force in a particle system in a particular direction?

   (a) Push (b) Path Follow
   (c) Gravity (d) Wind

2. Which of the following space warps is used to explode a particle system?

   (a) Gravity (b) Wind
   (c) Push (d) PBomb

3. Which of the following space warps is used to select a spline in the viewport to use as a path for the particles?

   (a) Wind (b) Displace
   (c) Path Follow (d) PBomb

4. Which of the following options in the **Basic Parameters** rollout of the PBomb space warp is used to specify the number of frame at which the explosion will start?

   (a) **Start Time** (b) **Range**
   (c) **Duration** (d) **Strength**

5. The Wind space warp is used to explode a particle system. (T/F)

6. The Mesher compound object is used to create instances of the animated objects. (T/F)

7. The PCloud particle system is used to create the particles that will be enclosed within a specific volume. (T/F)

8. The _____ particle system is the advanced version of the Snow particle system.

9. The _____ particle system is used to generate the particles from the selected geometry.

10. The _____space warp is used to generate the effect of blowing wind on a particle system.

Answers to Self-Evaluation Test

1. a, **2.** d, **3.** c, **4.** d, **5.** F, **6.** T, **7.** T, **8.** metaball, **9. Bind to Space Warp**, **10.** Super Spray