


Mirror Modifier

The Mirror modifier provides a parametric method of mirroring an object or a sub-object selection. You can apply the Mirror modifier to any type of geometry, and you can animate the mirror effect by animating the modifier's gizmo.

-  Modify panel > Make a selection. > Modifier List > Object-Space Modifiers > Mirror
- Default menu: Make a selection. > Modifiers menu > Parametric Deformers > Mirror
- Alt menu: Make a selection. > Modifiers menu > Geometry (Parametric) > Mirror



Mirroring a bench

Tip: When modeling the left or right side of a character for mirroring to the opposite side, use the [Symmetry modifier](#) to create the other side. Its Weld Seam feature helps create a more natural-looking model.

Procedures

To apply the Mirror modifier:

1. Apply the Mirror modifier to a selection.
2. Set the axis or axis pair on which to mirror the object.
3. To create a mirrored pair, specify an Offset amount and turn on Copy.

Interface

Modifier Stack



Mirror Center

Represents the axis of the mirror effect. You can move, rotate or scale the gizmo to affect the mirroring. You can animate the gizmo transforms, which you can't do with the toolbar [Mirror](#) tool.

For more information on the stack display, see [Modifier Stack](#).

Parameters rollout

Mirror Axis group

X, Y, Z, XY, YZ, ZX

Specify the axis or axes about which the mirroring takes place. You can usually see the effect in the viewport as you select the option.

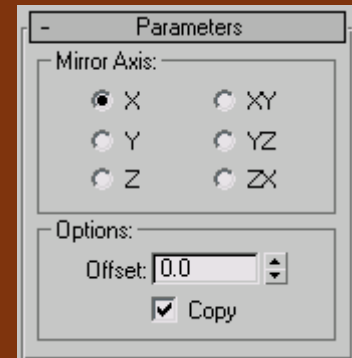
Options group

Offset

Specifies the offset, in units, from the mirror axis. This is an animatable parameter.


Copy

Copies the geometry rather than simply mirroring it.



Lathe Modifier

Lathe creates a 3D object by rotating a shape or NURBS curve about an axis.

- Select a shape. >  Modify panel > Modifier List > Lathe
- Default menu: Select a shape. > Modifiers menu > Patch/Spline Editing > Lathe
- Alt menu: Select a shape. > Modifiers menu > Spline > Lathe



Object resulting from 360-degree lathe

Procedures

To use the Lathe modifier:

Interface

Modifier Stack



Axis

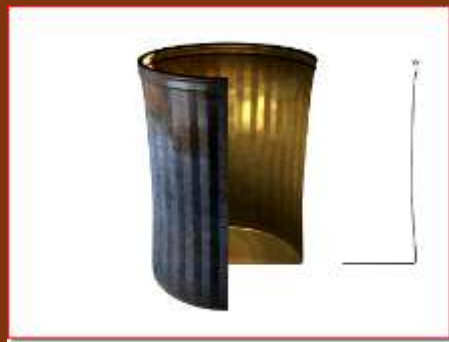
At this sub-object level, you can transform and animate the axis of revolution.

For more information on the stack display, see [Modifier Stack](#).

Parameters rollou

Degrees

Determines the number of degrees that the object is spun around the axis of revolution (0 to 360, default=360). You can set keyframes for Degrees to animate the circular growth of a lathed object. The Lathe axis auto-sizes itself to the height of the shape being lathed.



Object resulting from 270-degree lathe

Weld Core

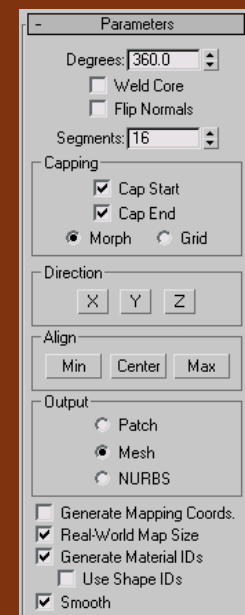
Simplifies the mesh by welding together vertices that lie on the axis of revolution. Keep it turned off if you intend to create morph targets.

Flip Normals

Depending on the direction of the vertices on your shape, and the direction of rotation, the lathed object might be inside out. Toggle the Flip Normals checkbox to fix this.

Segments

Determines how many interpolated segments are created in the surface between the start and endpoint. This parameter is also animatable. Default=16



Note: You can create up to 10,000 segments using the segments spinner. Try not to create geometry that is more complex than you need. Often you can get satisfactory results by using smoothing groups or smoothing modifiers, rather than increasing segmentation.

Capping group

Controls whether or not caps are created for the interior of the lathed object if Degrees is set to less than 360.

Cap Start

Caps the start of the lathed object with Degrees set to less than 360 and a closed shape.

Cap End

Caps the end of the lathed object with Degrees set to less than 360 and a closed shape.

- **Morph** Arranges cap faces in a predictable, repeatable pattern necessary for creating morph targets. Morph capping can generate long, thin faces that don't render or deform as well as grid capping. Use morph capping primarily if you are lathing multiple morph targets.
- **Grid** Arranges cap faces in a square grid trimmed at the shape boundaries. This method produces a surface of evenly sized faces that can easily be deformed by other modifiers.

Direction group

Sets up the direction of the axis of revolution, relative to the pivot point of the object.

X/Y/Z

Set the direction of the axis of revolution relative to the pivot point of the object.

Align group

Min/Center/Max

Align the axis of revolution to the minimum, center, or maximum extents of the shape.

Output group

- **Patch** Produces an object that you can collapse to a patch object (see [Editing the Stack](#)).
- **Mesh** Produces an object that you can collapse to a mesh object (see [Editing the Stack](#)).
- **NURBS** Produces an object that can be collapsed to a NURBS surface (see [Editing the Stack](#)).

Generate Mapping Coordinates

Applies mapping coordinates to the lathed object. When Degrees is less than 360, and Generate Mapping Coordinates is turned on, additional mapping coordinates are applied to the end caps, placing a 1 x 1 tile on each cap.

Real-World Map Size



MARWAH AL-HELLI
ARCHITECT

2025-2026

LECTURE 7 AL-HELLI MARWAH

Controls the scaling method used for texture mapped materials that are applied to the object. The scaling values are controlled by the Use Real-World Scale settings found in the applied material's [Coordinates rollout](#). Default=on.

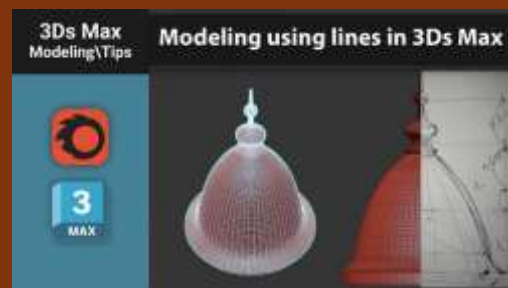
Generate Material IDs

Assigns different material IDs to the sides and the caps of the lathed object. Specifically, the sides receive ID 3, and the caps (when Degrees is less than 360 and the lathed shape is closed) receive IDs 1 and 2. Default=on.

Use Shape IDs Uses the material ID values assigned to segments in the [spline](#) you lathed, or curve sub-objects in the [NURBS](#) curve you lathed. Use Shape IDs is available only when Generate Material IDs is turned on.

Smooth

Applies smoothing to the lathed shape.

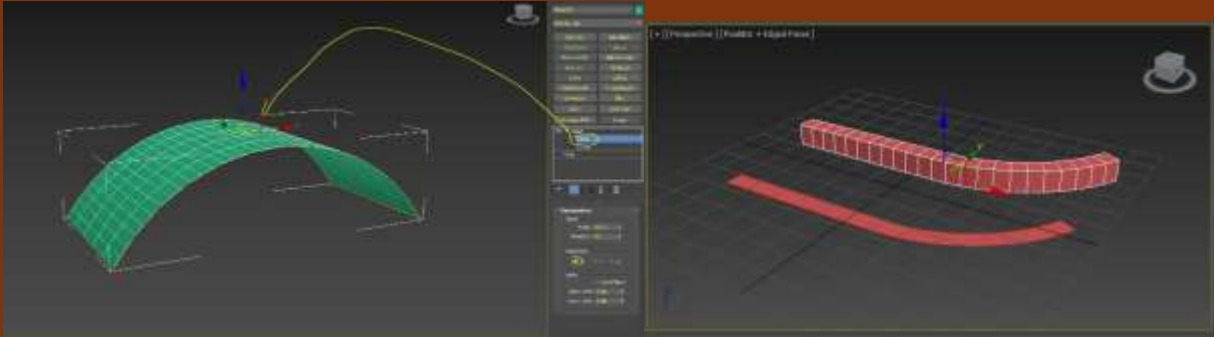




Bend Modifier

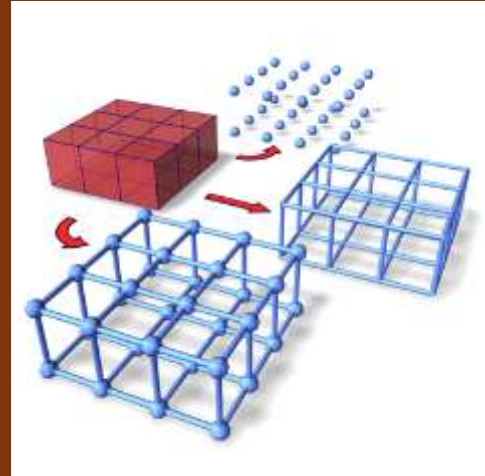
The Bend modifier lets you bend the current selection up to 360 degrees about a single axis.


Bend lets you control the angle and direction of the bend on any of three axes. You can also limit the bend to part of the geometry.



Lattice Modifier

The Lattice modifier converts the segments or edges of a shape or object into cylindrical struts with optional joint polyhedra at the vertices. Use this either to create renderable structural geometry based on the mesh topology, or as an alternate method to achieve a rendered wireframe effect.



- Select an object or a shape. >  Modify panel > Modifier List > Object-Space Modifiers > Lattice
- Default menu: Select an object or a shape. > Modifiers menu > Parametric Deformers > Lattice
- Alt menu: Select an object or a shape. > Modifiers menu > Geometry (Parametric) > Lattice

Top: Joints only

Middle: Struts only

Bottom: Both (joints and struts)

Note: This modifier can act on the whole object or on sub-object selections in the stack.

Tip: You can combine the [Scatter compound object](#) with the Lattice modifier to place any object you want as a joint, rather than the provided polyhedra. To do this, create your mesh distribution object and your source object (for example, a box). Use Scatter to scatter the box at the vertices of the distribution object. (Be sure to use the Copy option rather than Instance.) In the Scatter Display parameters, hide the distribution object. Select the original object that was used as a distribution object, apply Lattice to it, and turn off the joints. You'll have two coincident objects: one providing the lattice struts, and the other positioning the boxes.

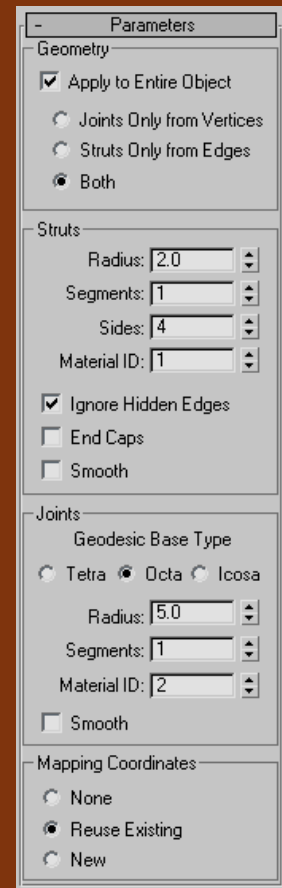
Interface

Geometry group

Specifies whether to use the whole object or selected sub-objects, and which of the two components (struts and joints) is displayed.

Apply To Entire Object

Applies Lattice to all edges or segments in the object. When turned off, applies Lattice only to selected sub-objects passed up the stack. Default=on.



Note: When Apply To Entire Object is turned off, unselected sub-objects render normally. For example, if you convert a box to an editable mesh, select one polygon, and then apply Lattice with Apply To Entire Object turned off, the face does not render, while the edges and vertices that form that face are converted to struts and joints, and the remaining faces render normally. However, if you select the four edges surrounding the polygon and turn off Ignore Hidden Edges, the struts and joints are added to the object while all faces render as normal. If you turn on Struts group > Ignore Hidden Edges, one of the polygon's faces renders, while the other doesn't.

- **Joints Only From Vertices** Displays only the joints (polyhedra) generated by the vertices of the original mesh.
- **Struts Only From Edges** Displays only the struts (cylinders) generated by the segments of the original mesh.
- **Both** Displays both struts and joints.

Struts group

Provides controls that affect the geometry of the struts.

Radius

Specifies the radius of the struts.

Segments

Specifies the number of segments along the struts. Increase this value when you need to deform or distort the struts with subsequent modifiers.

Sides

Specifies the number of sides around the perimeter of the struts.

Material ID

Specifies the material ID to be used for the struts. The struts and the joints can have different material IDs, making it easy to assign them different materials. The struts default to ID #1.

Ignore Hidden Edges

Generates struts only for visible edges. When turned off, generates struts for all edges, including the invisible edges. Default=on.

End Caps

Applies end caps to the struts.

Smooth

Applies smoothing to the struts.

Joints group

Provides controls that affect the geometry of the joints.

Geodesic Base Type

Specifies the type of polyhedron used for the joints.

- **Tetra** Uses a tetrahedron.
- **Octa** Uses an octahedron.
- **Icosa** Uses an icosahedron.

Radius

Specifies the radius of the joints.

Segments

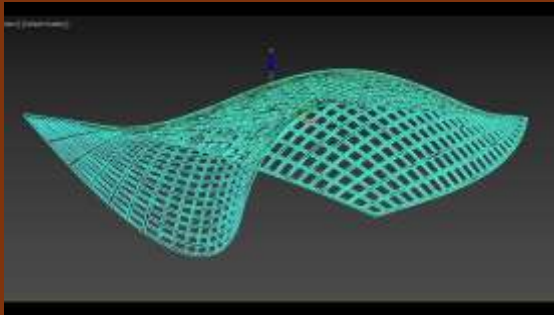
Specifies the number of segments in the joints. The more segments, the more spherical the joints' shape.

Material ID

Specifies the material ID to be used for the joints. Defaults to ID #2.

Smooth

Applies smoothing to the joints.



mapping modifier. When using this option, each joint inherits the mapping of the vertex it surrounds.

- **New** Uses mapping designed for the Lattice modifier. Applies cylindrical mapping to each strut, and spherical mapping to each joint.

Mapping Coordinates group


Determines the type of mapping assigned to the object.

- **None** Assigns no mapping.
- **Reuse Existing** Uses the mapping currently assigned to the object. This might be the mapping assigned by Generate Mapping Coords., in the creation parameters, or by a previously assigned



Noise modifier

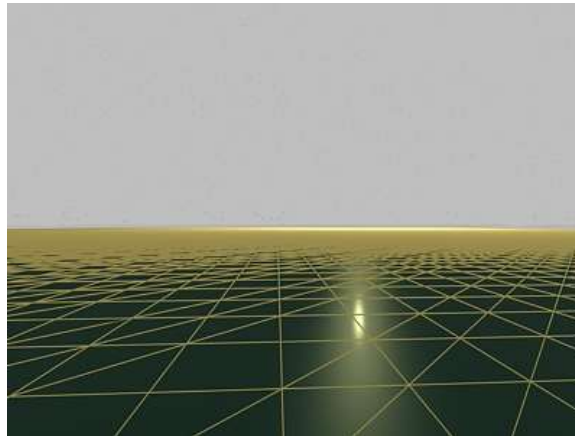
The Noise modifier modulates the position of an object's vertices along any combination of three axes. This important animation tool simulates random variations in an object's shape.

-  Modify panel > Make a selection. > Modifier List > Object-Space Modifiers > Noise
- Default menu: Make a selection. > Modifiers menu > Parametric Deformers > Noise
- Alt menu: Make a selection. > Modifiers menu > Geometry (Parametric) > Noise

Using a fractal setting, you can achieve random, rippling patterns, like a flag in the wind. With fractal settings, you can also create mountainous terrain from flat geometry.

You can apply the Noise modifier to any kind of object. The Noise gizmo changes shape to help you visualize the effects of changing parameter settings. The results of the Noise modifier are most noticeable on objects that have greater numbers of faces.

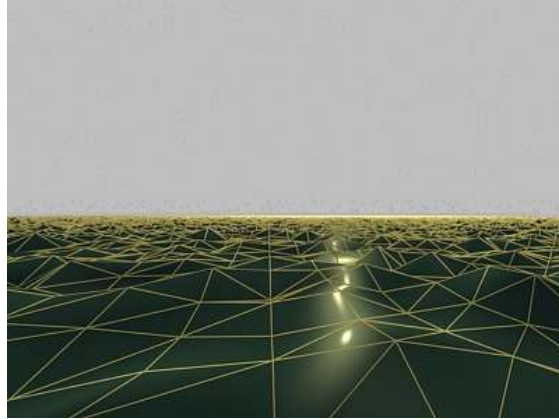
Most of the Noise parameters have an animation controller. The only keys set by default are for Phase.



Plane with no noise applied



Adding texture to the plane creates a calm sea.







Plane with fractal noise applied



Textured plane with noise creates a stormy sea.

Procedures

To apply noise to an object:

1.  Select an object and  apply the Noise modifier. To animate, move to a nonzero frame and turn on  (Auto Key).
2. In the Parameters rollout  Strength group, increase Strength values along one or more of the three axes.

You begin to see noise effects as the strength goes up.

3. In the Noise group, adjust Scale. Lower values increase the dynamics of the Strength settings, making the effect more obvious. See Noise group, below, for other options.


If you've animated this procedure, you can change parameters as the animation runs to see the effects.

For another source of noise effects, go to the sub-object level of the Noise modifier and transform the gizmo and center of the modifier.

To create terrain effects:

When set for Fractal, the Noise modifier produces a random fractal noise that creates a variety of topological and terrain effects. You can animate these effects or use them to model static landscapes and other complex forms.

The following steps assume you begin with a broad object like a multi-segment box lying on the XY plane.

1.  Apply the Noise modifier to the object.
2. In the Parameters rollout ► Noise group, turn on Fractal.

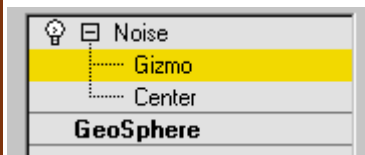
Roughness and Iterations settings are now available.

3. Increase Strength on the Z axis and adjust other parameters.

Once you have a base terrain, you can select sub-objects with Edit Mesh and apply Noise to grow mountains in a smaller region. You can also apply a second Noise modifier to amplify the first one.

Interface

Modifier Stack



Gizmo/Center

You can move, rotate, or scale the gizmo and center sub-objects to affect the noise. You can also animate the sub-object transforms.

For more information on the stack display, see [Modifier Stack](#).

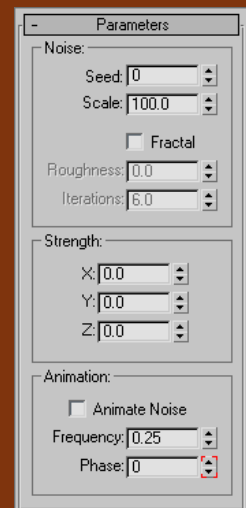
Parameters rollout

Noise group

Controls the appearance of the noise, and thus its effect on the physical deformations of the object. By default, the controls are inactive until you change the settings.

Seed

Generates a random start point from the number you set. Especially useful in creating terrain, because each setting can produce a different configuration.



Scale

Sets the size of the noise effect (not strength). Larger values produce smoother noise, lower values more jagged noise. Default=100.

Fractal

Produces a fractal effect based on current settings. Default=off.

If you turn on Fractal, the following options are available:

Roughness

Determines the extent of fractal variation. Lower values are less rough than higher values. Range=0 to 1.0. Default=0.

Iterations

Controls the number of iterations (or octaves) used by the fractal function. Fewer iterations use less fractal energy and generate a smoother effect. An iteration of 1.0 is the same as turning Fractal off. Range=1.0 to 10.0. Default=6.0.

Strength group

Controls the magnitude of the noise effect. No noise effect occurs until some strength is applied.

X, Y, Z

Set the strength of the noise effect along each of three axes. Enter a value for at least one of these axes to produce a noise effect. Default=0.0,0.0,0.0.

Animation group

Controls the shape of the noise effect by overlaying a sine wave for the noise pattern to follow. This keeps the noise within bounds, dampening random extremes. When Animate Noise is turned on, these parameters influence the overall noise effect. However, you can animate Noise and Strength parameters independently; these do not require Animate Noise to be on during animation or playback.

Animate Noise

Regulates the combined effect of Noise and Strength parameters. The following parameters adjust the underlying wave.

Frequency


Sets the periodicity of the sine wave. Regulates the speed of the noise effect. Higher frequencies make the noise quiver faster. Lower frequencies produce a smoother and more gentle noise.

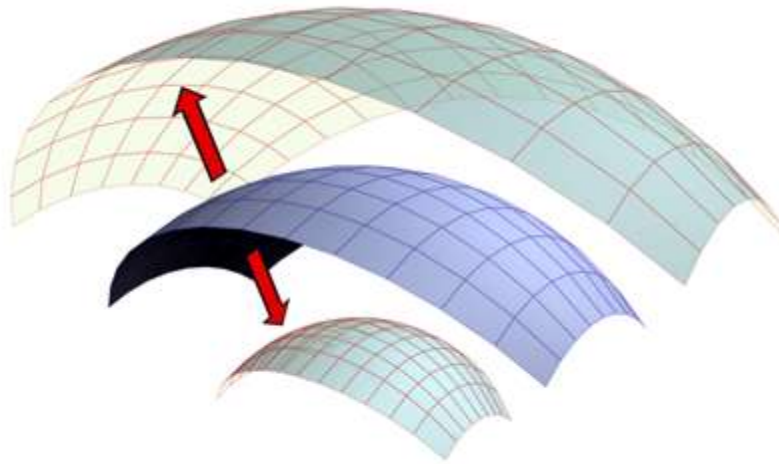
Phase

Shifts the start and end points of the underlying wave. By default, animation keys are set at either end of the active frame range. You can see the effect of Phase more clearly by editing these positions in Track View. Select Animate Noise to enable animation playback.

Push Modifier

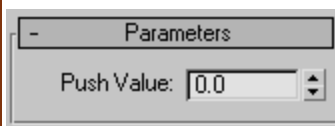
The Push modifier lets you "push" object vertices outward or inward along the average vertex normals. This produces an "inflation" effect that you can't otherwise obtain.

-  Modify panel > Make a selection. > Modifier List > Object-Space Modifiers > Push
- Default menu: Make a selection. > Modifiers menu > Parametric Deformers > Push
- Alt menu: Make a selection. > Modifiers menu > Geometry (Parametric) > Push



Positive and negative amounts of push applied to an object.

Interface




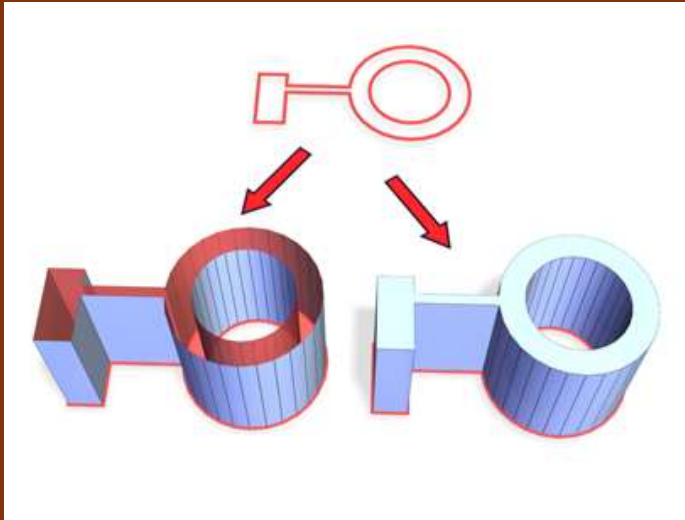
Push Value

Sets the distance in world units by which vertices are moved with respect to the object center. Use a positive value to move vertices outward, or a negative value to move vertices inward.

Extrude Modifier

The Extrude modifier adds depth to a shape object and makes it a parametric object.

- Select a shape. >  Modify panel > Modifier List > Object-Space Modifiers > Extrude
- Default menu: Select a shape. > Modifiers menu > Mesh Editing > Extrude
- Alt menu: Select a shape. > Modifiers menu > Spline > Extrude (Spline)

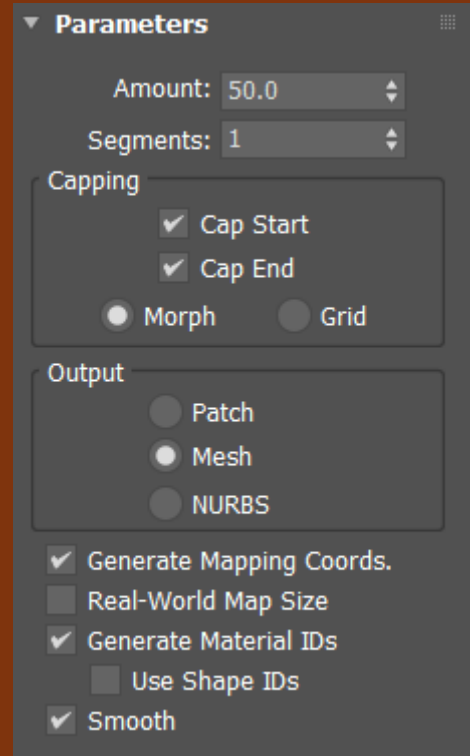


Above: Spline before extrusion

Below left: Extruded spline with Cap End off

Below right: Extruded spline with Cap End on

Interface



Amount

Sets the depth of the extrusion.

Segments

Specifies the number of segments that will be created in the extruded object.

Capping group

Cap Start

Generates a flat surface over the start of the extruded object.

Cap End

Generates a flat surface over the end of the extruded object.

LECTURE 7
AL-HELLI MARWAH

- **Morph** Arranges cap faces in a predictable, repeatable pattern, which is necessary for creating [Morph targets](#). Morph capping can generate long, thin faces that don't render or deform as well as grid capping. Use morph capping primarily if you're extruding multiple morph targets.
- **Grid** Arranges cap faces in a square grid trimmed at the shape boundaries. This method produces a surface of evenly sized faces that can be deformed easily by other modifiers. When you choose the Grid capping option, the grid lines are hidden edges rather than visible edges. This primarily affects any objects assigned a material with the Wire option turned on, or any objects that use the [Lattice modifier](#).

Output group

- **Patch** Produces an object that you can collapse to a patch object; see [Editing the Stack](#).
- **Mesh** Produces an object that you can collapse to a mesh object; see [Editing the Stack](#).
- **NURBS** Produces an object that you can collapse to a NURBS surface; see [Editing the Stack](#).

Generate Mapping Coords

Applies mapping coordinates to the extruded object. Default=off.

When on, Generate Mapping Coordinates applies separate mapping coordinates to the end caps, placing a single 1 x 1 tile on each cap.

Real-World Map Size

Controls the scaling method used for texture mapped materials that are applied to the object. The scaling values are controlled by the Use Real-World Scale settings found in the applied material's [Coordinates rollout](#). Default=on.

Generate Material IDs

Assigns different material IDs to the sides and the caps of the extruded object. Specifically, the sides receive ID 3, and the caps receive IDs 1 and 2.

This checkbox is turned on as a default when you create an extruded object, but if you load an extruded object from a *MAX* file, the checkbox is turned off, maintaining the same material ID assignment for that object as it had in R1.x.

Use Shape IDs

Uses the material ID values assigned to segments in the [spline](#) you extruded, or curve sub-objects in the [NURBS](#) curve you extruded.

Smooth

Applies smoothing to the extruded shape.



2025-2026

LECTURE 7
AL-HELLI MARWAH