When you press “Shift-A” for “Add”, you will notice other object types beside meshes, cameras and lights that can be created. Two types of objects that can be created are **Surfaces** (NURBS) and **Meta Objects**. A lot can be said about surfaces, but for this tutorial, I want you just to become aware that they are there and describe some basics about them. Meta objects have been expanded to a variety of shapes and can be used to give you a “liquid metal” effect where the objects “pull” together as they become close to each other.

**Using NURBS to Create Lofted Shapes (surfaces)**

If you look at the **Surface** menu, you will see a variety of shapes that can be created. These shapes can be use as they are or converted to meshes so you can work with traditional vertices. To convert a surface into a mesh, select the object and press the “Alt” and “C” keys and choose the appropriate option. You can do a lot with NURBS and there are several tutorials online describing them, but for now, we will just work with a **NURBS Circle** to create an interesting looking tunnel.

**Creating a Lofted Tunnel**

This process will take several profiles of a NURBS Circle and connect them together. First thing you need to do is create a **NURBS Circle**. To do this, press “Shift-A”, select “Surface” and “NURBS Circle”. In **Edit Mode**, select the points and shape the circle a bit. After shaping, exit edit mode.

Change your view so you are looking at the edge of the circle (try front view if circle was made in a top view). You may also want to switch to a wireframe view. Use the “Shift-D” keys to duplicate the circle several times. Then rotate your view so you can select each circle and edit the shapes in **edit mode** (Tab key).

After shaping the circles, exit edit mode and select them all by RMB clicking on them while holding the “Shift” key. To join them together, press “Ctrl- J”. For the final step, press “Tab” for edit mode, “A” to select all vertices, then “F” for face. Your result should be a lofted object. You can control the detail of the shape in the “**Object Data**” panel. If you need it to be a mesh, press “Alt-C”. This is a great technique for making boat hulls and other related items.
Chapter 12- NURBS & Meta Shape Basics

Liquid and Droplet Effects Using Meta Shapes

Up until a few releases ago, Blender only had the capability to make one Meta shape - a ball. Interest grew, programmers added other shapes and cleaned up the code. You can now make several different meta shapes in Blender. They all work with the same principle. As the shapes get close to one another, they begin to “pull” and flow together. As meta shapes combine, their mass grows which is ideal for certain animations. Meta shapes can be animated like other objects and can be textured. Ray-tracing settings like reflection and transparency can also create some stunning effects. Meta shapes are created like other objects, except that the first shape acts like a parent to the other shapes. As that shape is moved, the others display a rotation. Materials are also linked for all meta shapes.

Meta shapes can seem a bit confusing at first because of their interactions. For example, individual meta objects are selected by RMB clicking on the Selector Ring around the object. When clicking on the actual meta shape “mesh” itself, all shaped are selected. Remember that meta shapes are linked and controlled by the first meta added. By selecting the object, materials are linked to all shapes. Remember to select the ring to transform just that object. Meta shapes can be scaled, rotated, moved, and combined for different effects. You can also control the quality and effect of the meta shapes in the properties window. Experiment with these to get a desired effect.

RoboDude Asks:
Why are all my Meta shapes joined together?
If you get into Edit mode while making your meta shapes, they will all join together. Remember to be in Object mode while making Meta shapes.
Create a new Blender Scene, erase the initial cube and name it “Lava Lamp”. For this activity, we will be extruding circles, lofting NURB circles and using meta balls to create an interesting lava lamp.

Begin by making a *Mesh Circle* in the top view and select the *Fill* option in the Tool Shelf to fill the circle. In the Front View, enter *Edit Mode* and *Extrude* (E key) the circle to form the base of the lava lamp to a shape something like seen to the right. You will want to Smooth (Tool Shelf) and Auto-Smooth (Object Data buttons) the base. Set the Auto-Smoothing angle to your desire.

We could make the glass bottle by extruding a circle exactly as we did the base, but for practice, let's loft the shape by using NURBS Surface Circles. Go to the *Add-Surface* menu and add a *NURBS Circle*.

After adding the NURBS Circle, switch to a front view and duplicate it a few times. Size them to match the shape you want for the lamp. While holding the "Shift" key, select all the circles and join them together with "Ctrl-J" or the "Join" command in the tool shelf.

It's now time to give the circles a surface. Enter *Edit Mode* and select all vertices with the "A" key. Press the "F" key to face the circles. It may not look exactly as you wish so you may need to deselect all vertices ("A" key) and box select ("B" key) a single ring of vertices in the front view to move or scale them.

When finished, the shape should look something like the image to the left.

The final step is to convert the NURBS Surface to a mesh. This is done by pressing "Alt-C" and selecting "Mesh from Curve/Meta/Surf/Text". Set Smooth and Auto Smooth.
Chapter 1 - The Blender Interface

The next step is to create a top for the lamp. Do this the same way we made the base, using a Circle mesh. After shaping the mesh and applying Smooth and Auto Smooth, it may look something like the image to the right. To correct this, we need to change the Normal settings of the faces. Enter Edit Mode and select all vertices. In the Tool Shelf, find the options for Normals. Try pressing both “Recalculate” and “Flip Directions”. This should correct the problem.

It’s now time to get a nice render of your lamp. Apply a nice material to all 3 objects, using Ray-transparency on the glass bottle. Experiment with your Fresnel and IOR (refraction) settings. You may also want to take the Depth setting up a bit.

With the lamp finished, it’s time to add the lava. Start by adding a Meta Ball shape. Remember that this first shape controls the material and action of the other meta shapes. Add as many meta shapes as you wish. Scale as needed. Use all 3 principle views to get your locations correct and all shapes are in the bottle. Add a material and render an image.
Your lava lamp should look something like the image to the left. Even though you applied a material (*I used green*), the meta shapes will probably appear black. This is due to the lighting effects and the ray-tracing on the bottle.

To fix this, go back to your Material settings on the meta shapes and find the *Emit* slider under *Shading*. This will now give you a green color, but the shapes will look flat.

Our next step is to add a Point Lamp at the bottom of the bottle. In the lamp settings, turn off all shadow effects for this lamp. At your next render, you should see some effects on your lava.

Looking better, but we can make use of the Indirect Lighting features discussed back in chapter 7. Because we used the material *Emitter* feature on the lava, by making some changes in the World buttons, it will glow.

Go to the World button and select "Approximate" in the Gather panel. Check the box in the Indirect Lighting panel to use the feature. Render an image and check your results. Fine tune your adjustments if needed.

If time allows, animate your lamp and make a movie.

**Call the instructor when finished**
The Spill

Using your design skills and imagination, create a realistic scene of a fluid spill using meta shapes. A possible scene could be something like this. Add as much detail and realism to the scene as time allows.

When finished, save a .png image file of your scene.

Chapter 12 Reflection and Wrap-up:

Program Interfaces and User Reactions

NURBS is an acronym for non-uniform rational B-spline. They are useful for making point-controlled curves in 3D and we experienced how to generate objects in Blender using them.

1. From internet research, find an application of NURBS in Blender besides how we used them. What did you discover? Explain.

2. Meta Shapes can be used to represent many things in 3D models and animations. We used them to represent a spilled liquid and the lava lamp wax. Think outside of the box. Discuss two other ways that you think meta shapes can be used in a 3D scene. What could we use them to represent?