Additional Content Volume 1: More Blender Tools and Modifiers

In this **Online Tutorial** you will learn how to use additional Modeling Tools and Modifiers in Blender, that hasn't been covered in *CHAPTER 1, Introduction to BLENDER'S 3D Modeling and Sculpture tools*.

We will be covering the following main topic:

- Learn more **Modeling Tools & Modifiers**

- Learn more **Sculpting Brushes**

- Learn more **Sculpture Tools & Modifiers**

At the end of this Online Tutorial, you will understand how use these extra Tools and Modifiers for your own personal Projects.

Technical requirements

The following is the technical skills and software you would need to complete this chapter.

- A Computer that can run basic 3D animation software.

- Have a basic understanding of how to navigate and manipulate meshes in Bender. This has been covered in *Chapter 1, Introduction to BLENDER'S 3D Modeling and Sculpture Tools*.

- You need to have installed **Blender** (Open-Source Software) from: https://blender.org/ (At the time of writing). The Blender version in this chapter is 2.93.5. Even if your version of Blender is newer, the examples should still work without any problems.

More Modeling Tools

Knife Tool

This tool allows you to cut Edges into the Faces of your mesh. To use, select this tool with this icon that is on the Toolbar, or use the shortcut: *K*.

First, *click* a point on a Face where you want to start your cut, then *click* your next points until you are finished with your cut. To cut to the middle of an Edge you can use the *Ctrl* key while cutting and the cutting point will snap to the middle of an Edge.

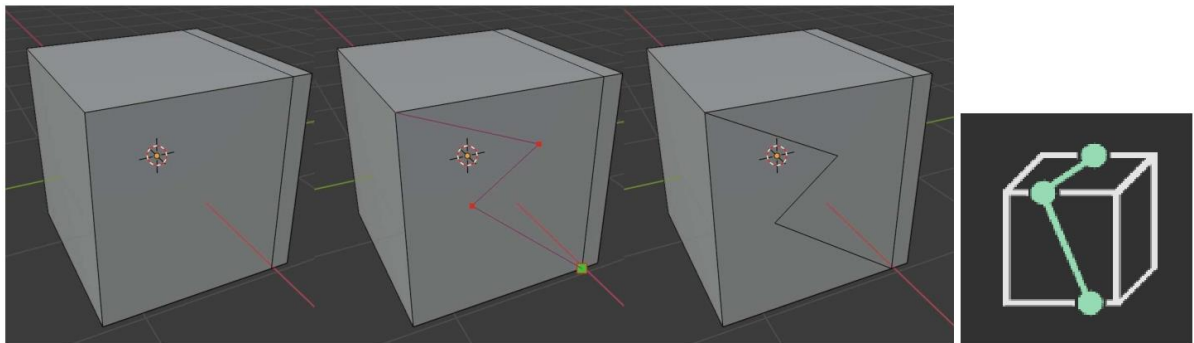To accept the cut, press *Enter*. *Click* outside the mesh to exit the Cut Tool mode.

Figure 1: (A) Using the Knife Tool. (B) The Knife Tool Icon.

The Knife Tool can also **cut right through the entire mesh in a straight line,** as if cutting it with a digital sword. To use this feature, start the cut outside the mesh and then point toward which direction you want to cut while holding the *Z* key and then pressing *Enter* to accept the cut. (To cut through the mesh, the back side included). As seen in *Figure 2*.
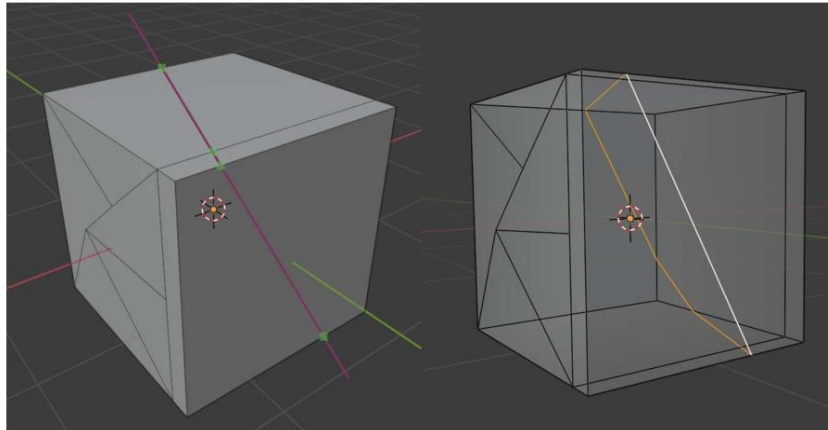
Figure 2: Using the Knife Tool to cut right through your Mesh.

Connect Vertex Pairs

When you want to connect two or more Vertices together to form a new Edge connection between them you can ==*Right-Click*== your mouse near the Mesh. This brings up a context sensitive menu that will show you the option to select **==Connect Vertex Pairs==**. Now the selected Vertices are connected.
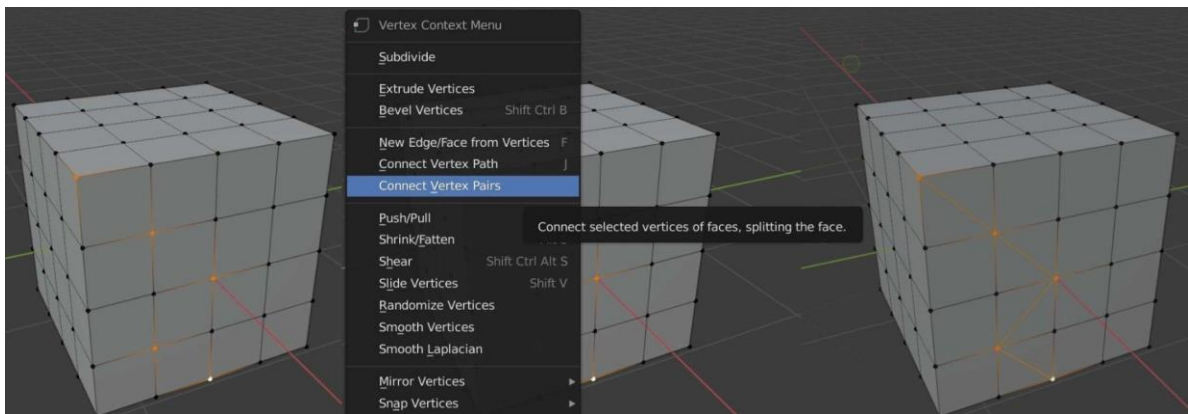

Figure 3: Connecting Vertex Pairs.

Merge Faces

To collapse **Faces**, **Edges** or **Vertices** down to a single point, use the **Merge** option from the *Right-Click* menu, as seen in *Figure 4*.
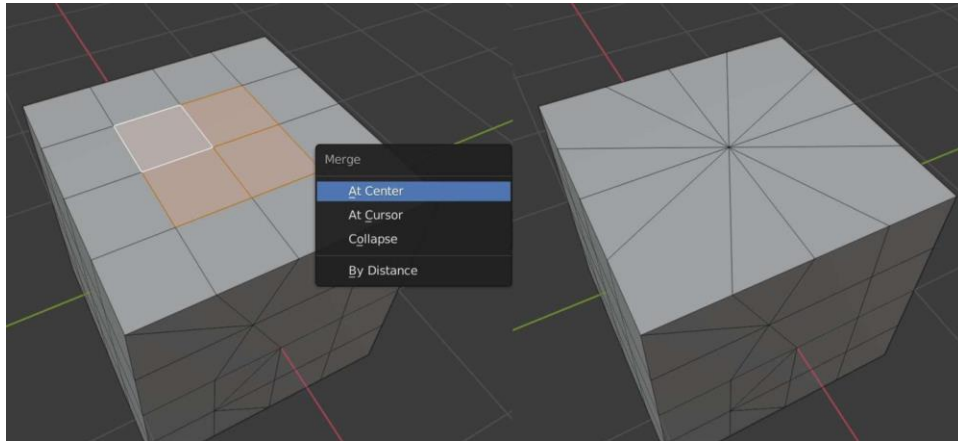

Figure 4: Merging Faces on a Mesh.

Edge Slide

When you want to slide an **Edge**, **group of Edges** or **Edge-Loop**. Select this tool with this icon shown here in the Toolbar, or press the Shortcut: *GG* on your Keyboard. This will "slide" the component along the edges that connect them to neighboring components.
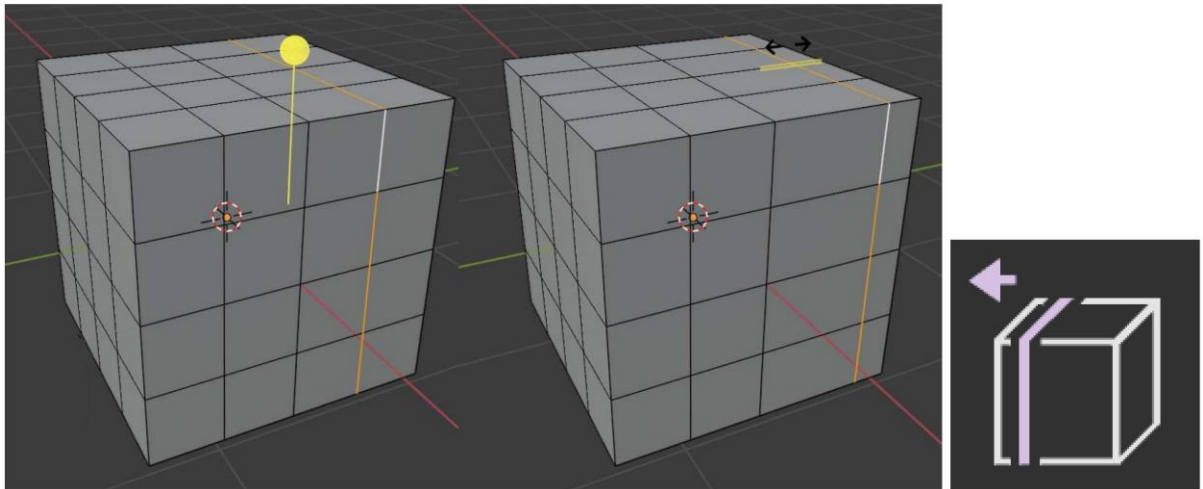
Figure 5: (A) Selecting an Edge Loop, and then using the Edge Slide Tool (B) The Edge Slide Icon.

Poly Build

This tool extrudes open Edges on a mesh to build new Faces. Select this tool with this icon above on the Toolbar.

The Left-Click option will highlight an edge in blue and extrude it when dragging it out. When Left-Clicking and dragging on Vertices it will move them.

To delete faces you can hold Shift and the highlighted Faces will turn red when hovering over with the mouse. Shift + Left-Click to delete these Faces.

To build new Faces by placing Vertices in 3D space you can hold Ctrl + Left-Click. By default it will build Triangular Faces, but if you build two Triangular Faces next to each other, they turn into a Quad (Four Sided Face) Automatically.
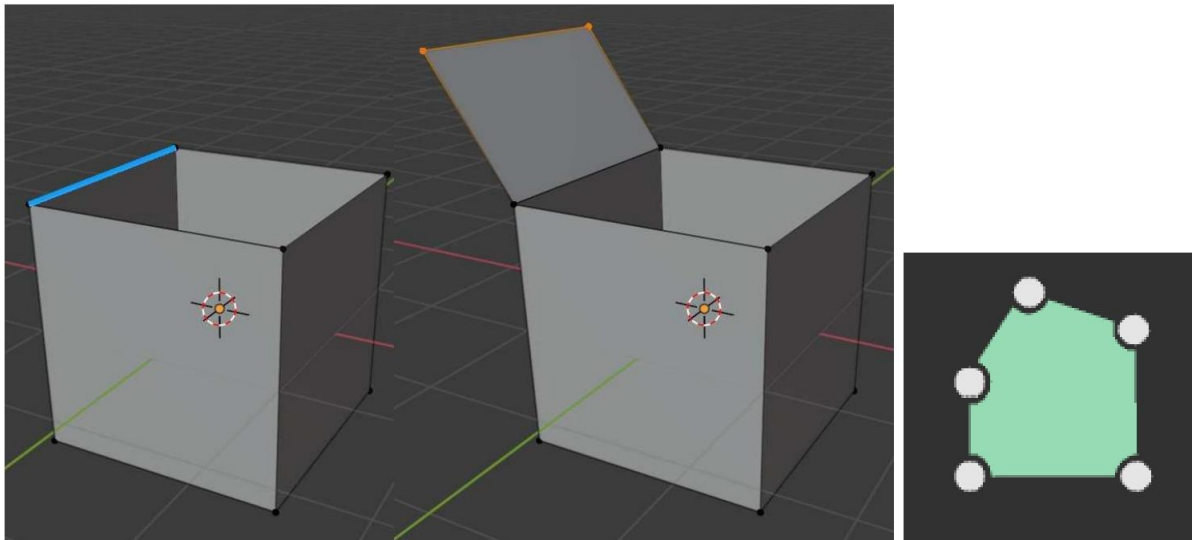
Figure 6: (A) Using the Poly Build Tool. (B) Poly Build Tool Icon.

Separate Faces

Useful to separate Faces from the rest of a mesh, by using the shortcut: P. This creates a new Mesh in the Outliner. To move these separated faces (now a new mesh), go out of Edit mode, back to Object mode, select the mesh in Outliner and manipulate it.
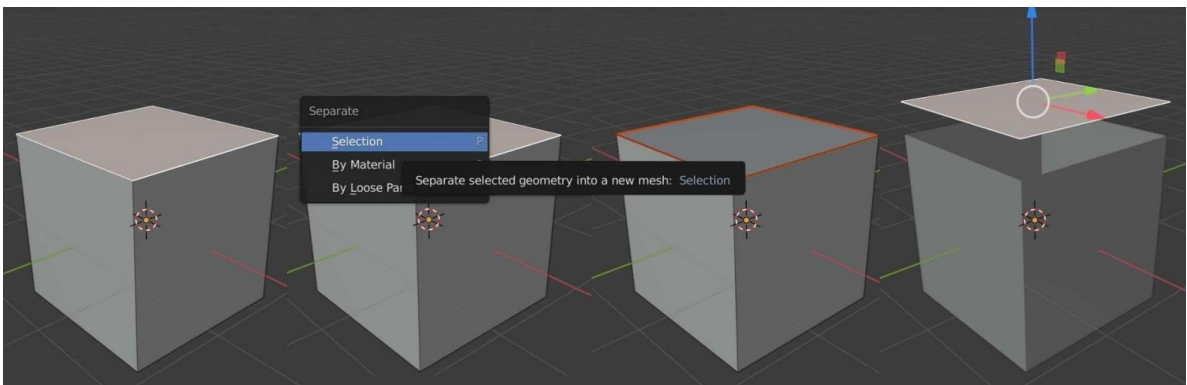

Figure 7: Using the Separate Faces Tool.

Bridge Edge Loops

To connect, or bridge, two or more selected Edges together with a newly generated Face. Select the edges in the same mesh that is close to each other but not connected directly by an edge. To use this tool, ==*Right-Click*== and select **Bridge Edge Loop**.
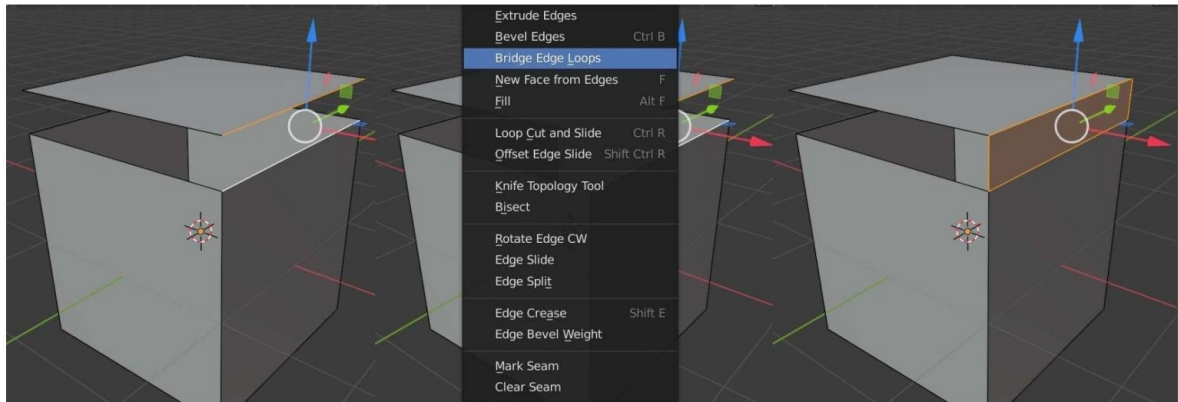

Figure 8: Using the Bridge Edge Loops Tool.

Dissolve Faces, Edges or Vertices

When you want to remove mesh components from the Mesh, but not create a hole in the process. Select the components, ==*right-click*== and select **Dissolve** from the menu. (as shown in ==*Figure 9*==).
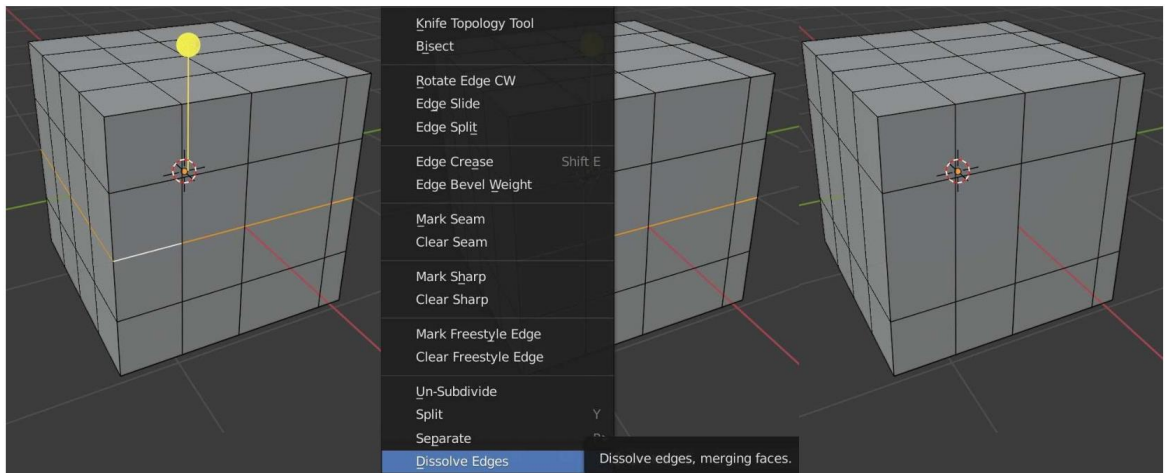
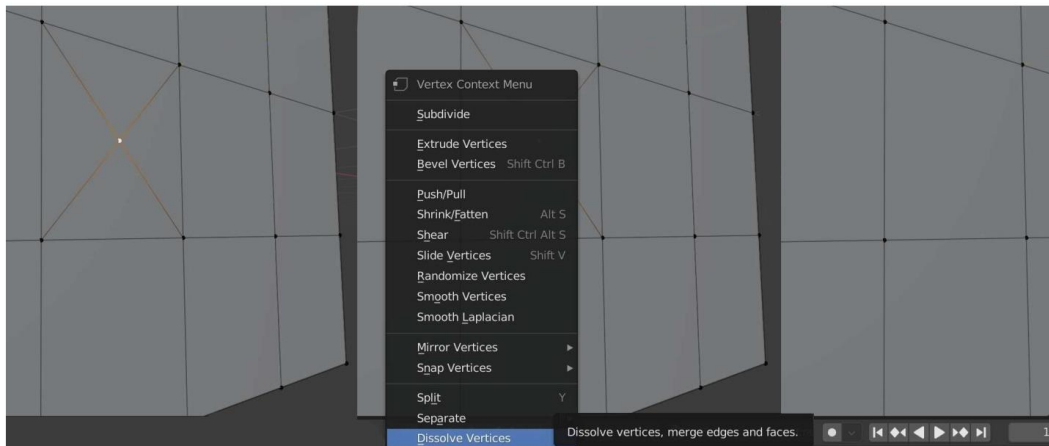**Figure 9: Using the Dissolve function to dissolve an Edge Loop.**

Figure 10: Using the Dissolve function to dissolve a Vertex.

More Modifiers

The Array Modifier

This Modifier is used to make a copy, or multiple of copies of a source Object. These copies are called an "array". The array of copies are offset from each other and Blender provides functions to control this offset in a variety of ways.

Another function of the Array Modifier is the ability to merge Vertices if the copies' vertices are within a certain range.

You could also use the Array Modifier multiple times, with different settings for each version of the modifier.

When you first apply the Arry Modifier to your source Object, it will automatically make 1 copy and apply an offset of 1. As seen in *Figure 11*, I applied the Modifier to the default 3D Cube Mesh and this is the result. The copy has been placed at exactly the same distance as the Width of the source Object.
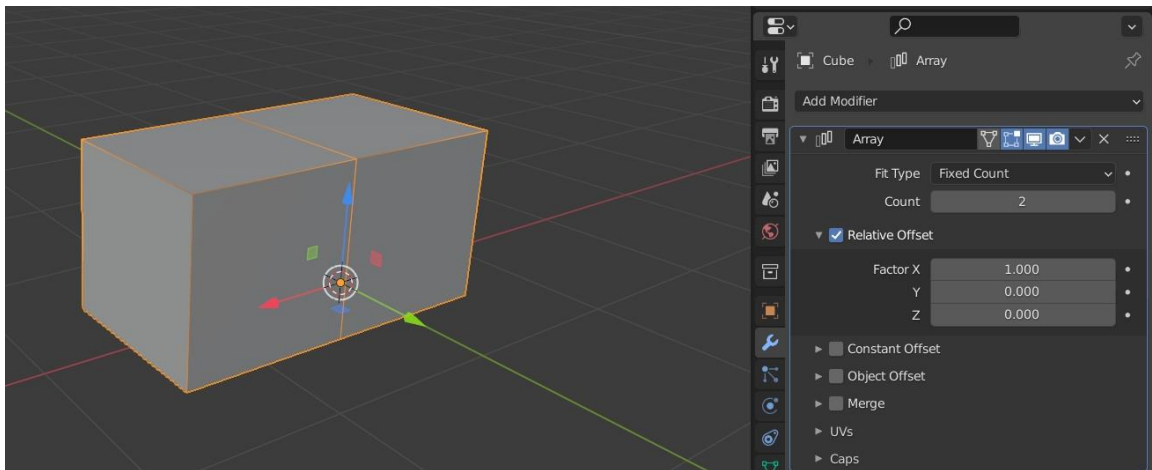

Figure 11: This is the Array Modifier's default settings.

Currently we are using **Fixed Count mode**, which means we can manually set the number of copies that we want. In the Image above, the Fixed Count is set to: 2, but you can change the count to any number of copies that you require.

Relative Offset & Constant Offset:

There are two kinds of Offsets you can choose from: **Relative Offset** and **Constant Offset**. Let's discuss these now.

You will notice there is a *tick-box* for **Relative Offset** will change the spacing between the copies of the Object. This kind of Offset is based on the width of your Object.
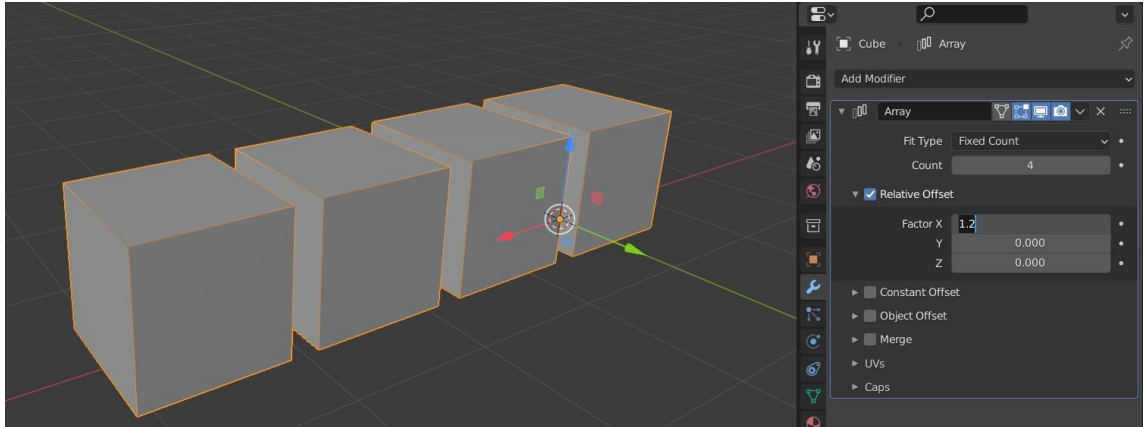

Figure 12: Changing the Count and the Relative Offset amount in the Array Modifier's settings.

In this Image I have changed the Fixed Count to 4, and the Relative Offset to: 1.2. This placed a copy relative to the width of the source Object, in this case 1.2 times the width.

You can also use the Relative Offset in any of the Axis (X, Y , Z), so that your copies are oriented at a particular angle in the Scene.

The other Offset option is the **Constant Offset**, which lets you specify the offset distance between your source object and the copies. This offset also has a tick-box that toggle it on/off.

Fit Types:

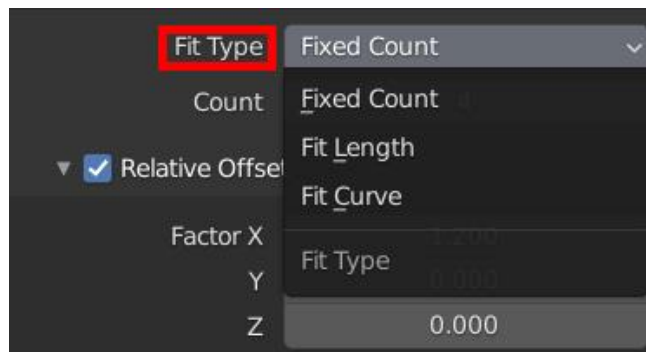There is also various Fit Types, as can be seen in *Figure 13*. Fit Type controls the length of the Array.

Figure 13: The Fit Types drop down menu, showing the three options available.

Let's take a look at the three types of Fit Type:

- **Fixed Count**: This is the default type. This generates the number of copies specified in the count number entered.

- **Fixed Length**: Creates the amount copies needed to fit inside a specified length that is entered.

- **Fit Curve**: Creates the amount copies needed to fit inside the length of the Curve object. The Curve Object needs to be picked with the eyedropper Icon. Note: This tool does not cause the copies to follow the shape of the curve, but only to match the length of the Curve object.

Object Offset:

The **Object Offset** is another way to control the orientation of your Offsets for the Arrays. This Offset works great when you want curved or Helix shapes.

The way this works is as follows:

1. Make sure your Source object has no Transform values. Reset your Transforms by Pressing: *Ctrl + A* and choose **All Transforms**.
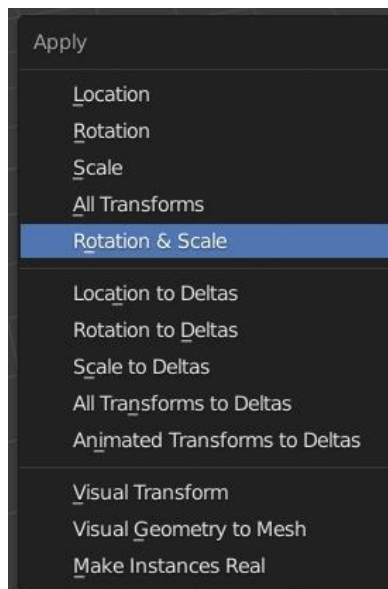
Figure 14: Applying Transforms.

2. Create an Object. I used the Suzanne Monkey Head Model as an example of an Object, but you can create any Object.
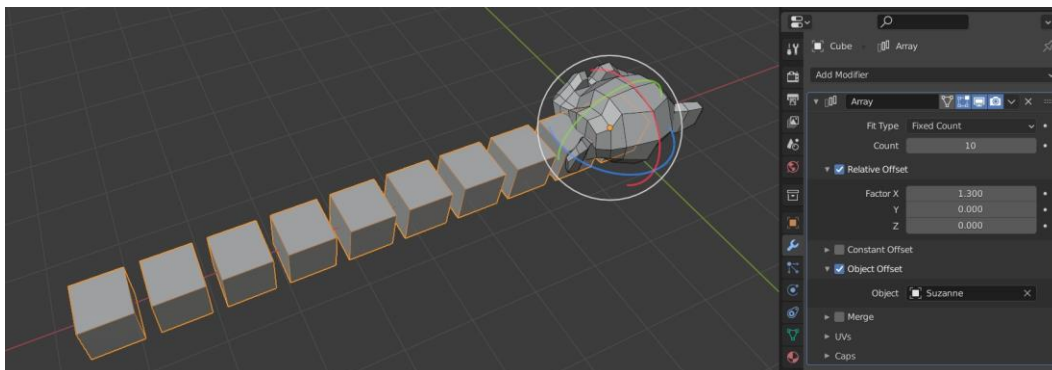
3. Make an Array as shown in *Figure 15*.

Figure 15: Adding an Object (The Suzanne Monkey head in this case) in the Scene.

4. Use the eyedropper tool from the Object Offset Menu, and pick your Object. The eyedropper icon can be seen in the highlighted area in *Figure 16*.
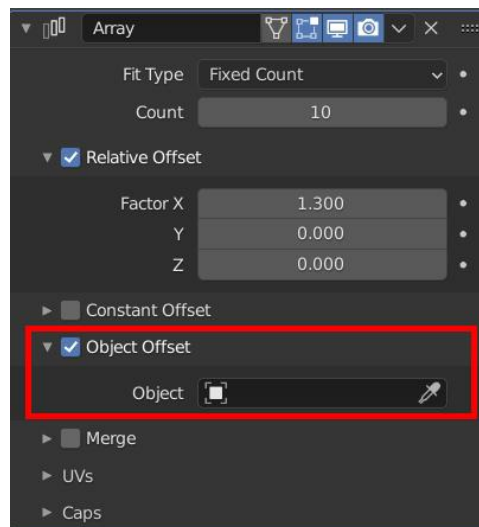
Figure 16: Enabling Object Offset.

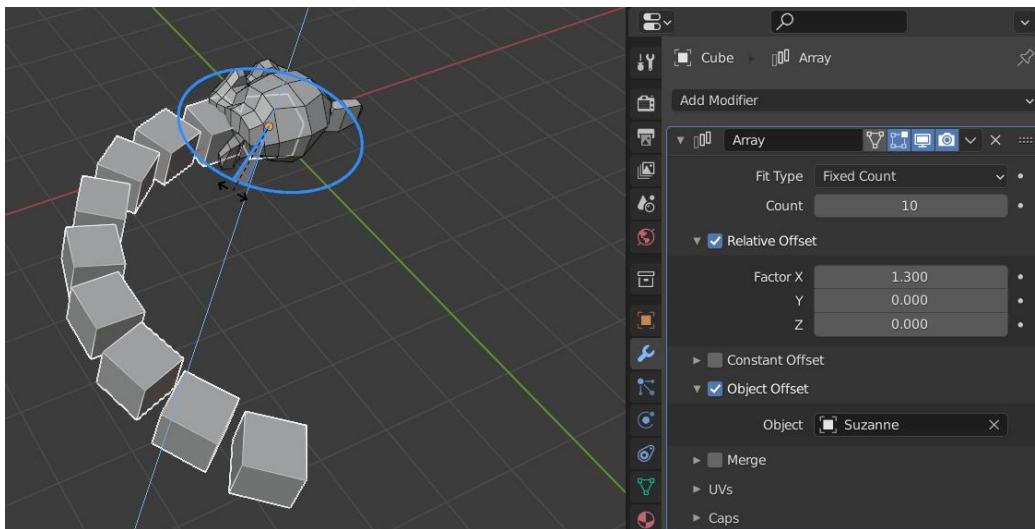5. Rotate your Object. In this case I rotate the Suzanne Model.

Figure 17: Picking the Object (Suzanne Monkey Head) and rotating the Head.

6. You can also use Scaling on the Object to create some interesting effects as shown in Figure 18.
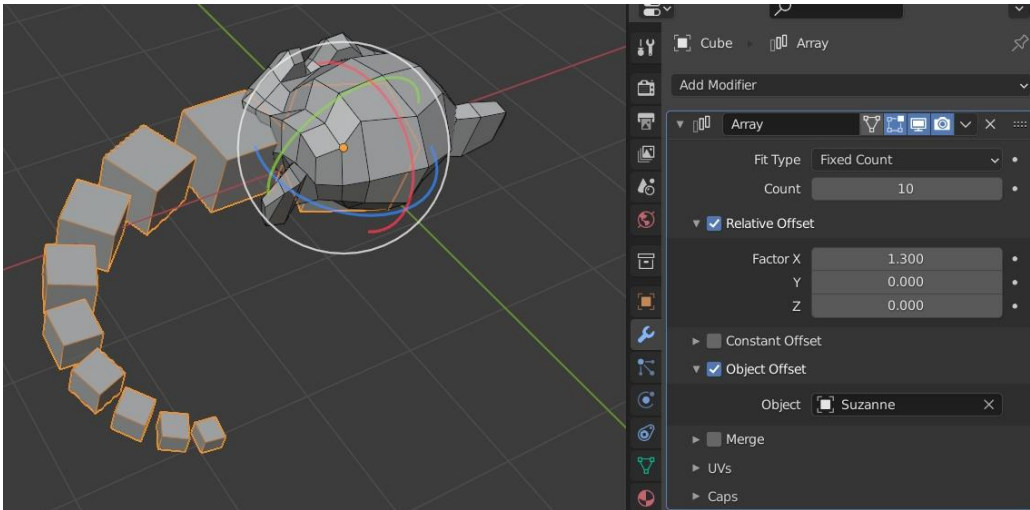
Figure 18: Scaling the Monkey Head Object, causes this effect on your Array.

As you can see from this example, by rotating the Empty Object, you are able to create Circular, Curved or Helix like shapes with your Array copies by using the Object offset option.

Check out some more examples of how the Array Modifier works from the Official Blender Documentation. Here is the link:

https://docs.blender.org/manual/en/latest/modeling/modifiers/generate/array.html?highlight=array%20modifier

More Sculpture Tools & Functions

Dyntopo

Sculpting in Computer Graphics requires plenty of geometry to deform. This is easy to understand if you take a cube mesh as an example (with only 6 faces) and try to add detail to that mesh by sculpting the surface. Sculpting will just push, pull and slide the Vertices of the mesh around.

The purpose of Dyntopo is to sculpt the mesh by dynamically adding new geometry where we need it, on-the-fly.

Dyntopo is a dynamic Tessellation method, it affects the surface of your mesh by adding or removing existing faces and replacing them with new triangular faces as you brush over your mesh surface. The size of these newly generated triangle faces are by default dependent on your closeness to the surface.

To enable Dyntopo, look on the Header Bar and find this ==tick-box==, shown in ==*Figure 19*==, or you can use the Shortcut: ==*Ctrl+D*== to toggle it on/off.
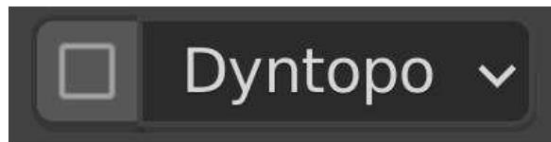

Figure 19: The Dyntopo tick-box in the Header Bar.

When this is enabled you will get a warning message that Dyntopo will not preserve vertex colors, uv's and other custom data. For the purposes of our tutorials we will close this warning message.
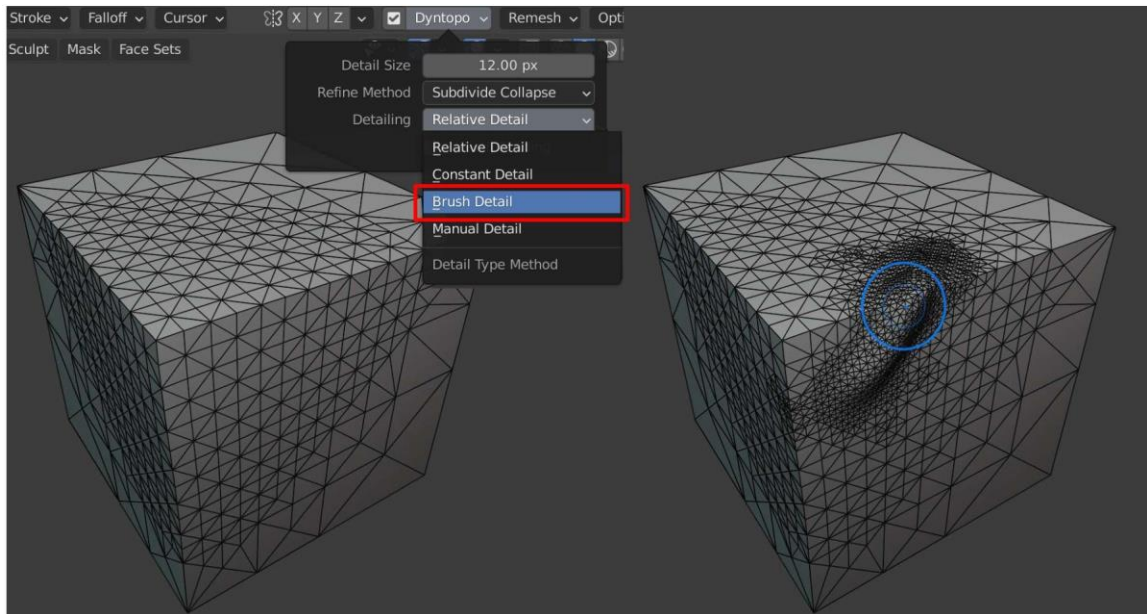
Figure 20: Using the Dyntopo Function.

This cube on the left (in the image above) has been brushed with Dyntopo enabled. This added fine triangular Faces over the area of the bush stroke.

Then we changed the Detailing setting to "Brush Detail" in the Dyntopo Drop-Down menu. This tells Blender that you will use your brush radius as the size guide for the new triangular faces. This mesh on the right shows the effect of using a small brush radius on the mesh. As you can see it added finer details in areas of your brush stroke on the mesh. Setting the brush to a bigger radius will create bigger triangular faces.

MultiRes Modifier

A Modifier for adding levels of geometric detail in your mesh for sculpting purposes.

The benefit of this modifier as opposed to the Subdivision Surface Modifier is that it allows you to sculpt on the surface of the subdivided mesh, while the Subdivision

Surface Modifier does not. You can also choose which level to sculpt on (choose a higher or lower level of subdivision).

This method of subdivision is non-destructive, since you can turn the modifier on or off at any time. The way this works is to apply this modifier to your mesh and then using the **Subdivide button to add a "level" of subdivision**. A subdivision turns each face into four faces. These new faces have the effect of smoothing out the shape of the mesh. Each time you press on subdivide, Blender will add another "level" of subdivided faces.
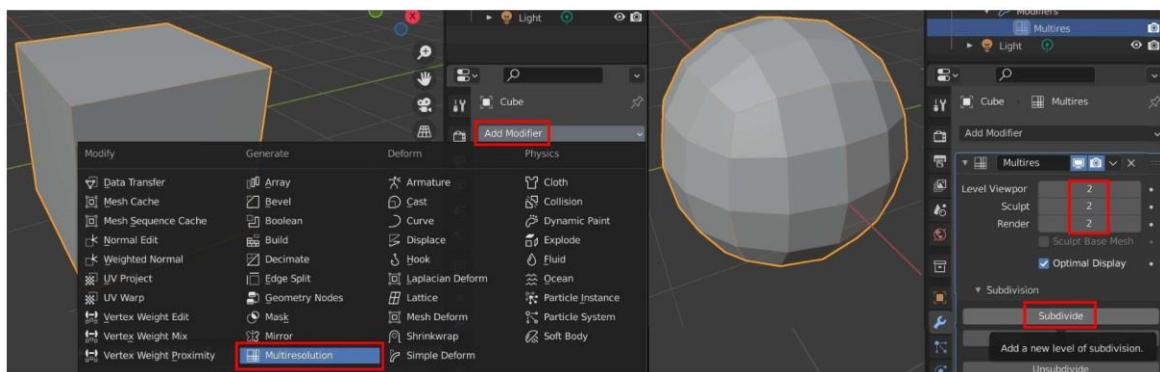

Figure 21: Using the MultiRes Modifier.

You can also go down in subdivision levels by adjusting the levels in the Properties Panel, as shown in *Figure 22*.
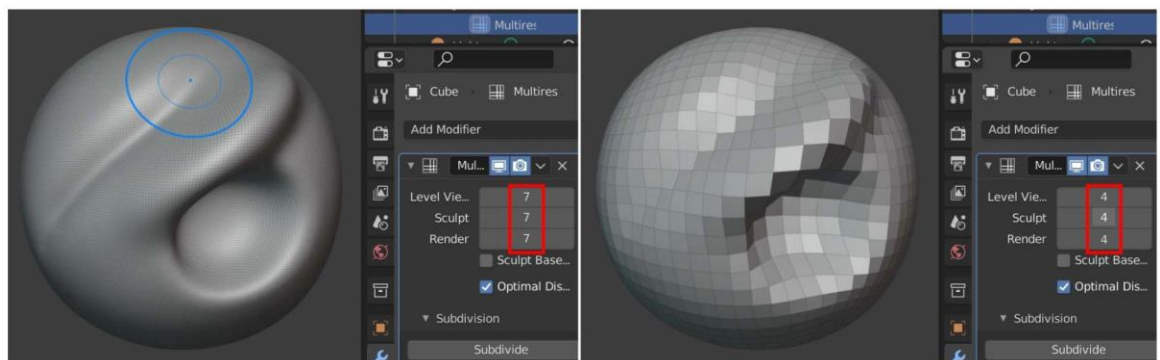

Figure 22: Using the MultiRes Modifier to go down Subdivision Levels.

To **quickly go up and down a subdivision level while sculpting**, pressing the shortcut: *Ctrl* + a number key (0 to 5), will go to that level of subdivision.

Symmetry Mode

This mode in the Sculpting workspace Tab will allow you to sculpt in symmetry in any of the chosen Axis. Find this following menu in the Top Bar.

Figure 23: The Symmetry mode in the Top Bar Menu.

You can also make an existing mesh symmetrical in mesh form by choosing an Axis and pressing on the **Symmetrize button**.

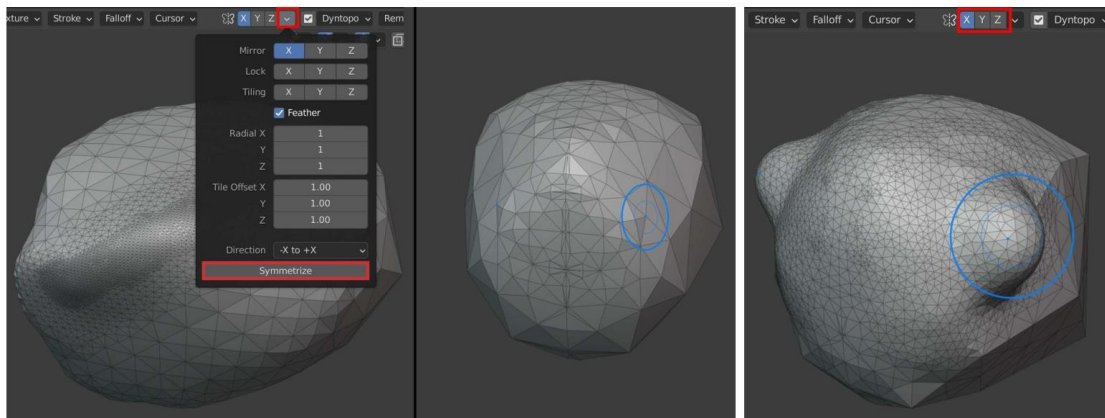In *Figure 24*, I have used the Symmetrize function to turn this organic Mesh into a Symmetric Mesh.

Figure 24: Using the Symmetrize function on a Mesh.

More Sculpting Brushes

Scrape Brush

This brush is used to "scrape off" any bumps on the surface. The effect is similar to a mechanical "flattening" of the surface. When using the negative (-) mode the surrounding mesh around the brush moves up towards the brush cursor as can be seen in the third mesh in the image below.

To use this tool, either press: *Spacebar* + *6* on the Keyboard or select the tool with the icon shown here, that is in the Toolbar
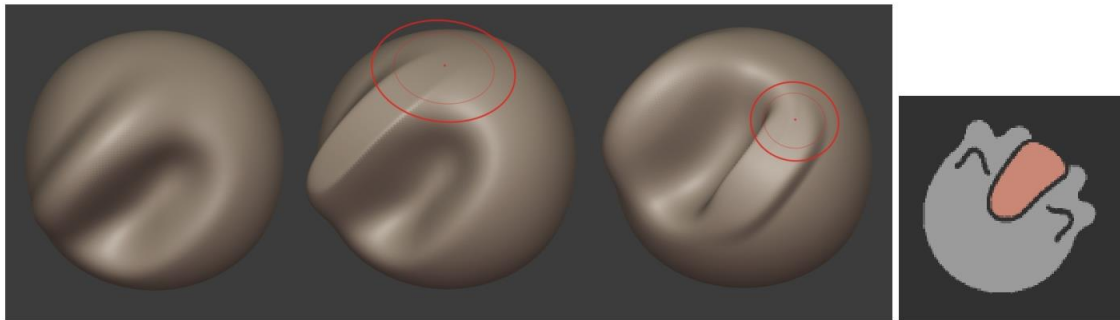

Figure 25: (A) Using the Scrape Brush. (B) The Scrape Brush icon.

Fill Brush

This brush is used to "fill-in" details like cracks and bumps on the surface while keeping the peaks of the bumps mostly intact. When using the negative (-) mode the effect is similar to a mechanical "flattening" of the surface.

To use this tool, either press: *Spacebar* + *5* on the Keyboard or select the tool with the icon shown here, that is in the Toolbar

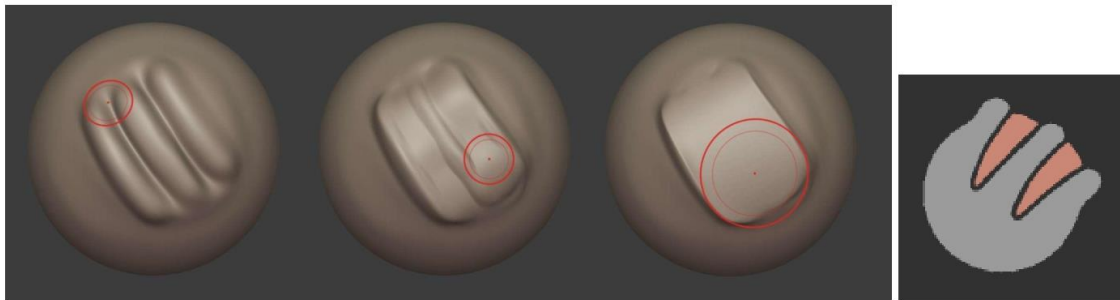**Figure 26: (A) Using the Fill Brush. (B) The Fill Brush icon.**

Pinch Brush

This brush is used to "pinch" details like cracks and bumps on the surface together. When using the negative (-) mode the effect is like "squeezing together and inflating" at the same time. To use this tool, either press: *P* on the Keyboard or select the tool with the icon shown here, that is in the Toolbar.
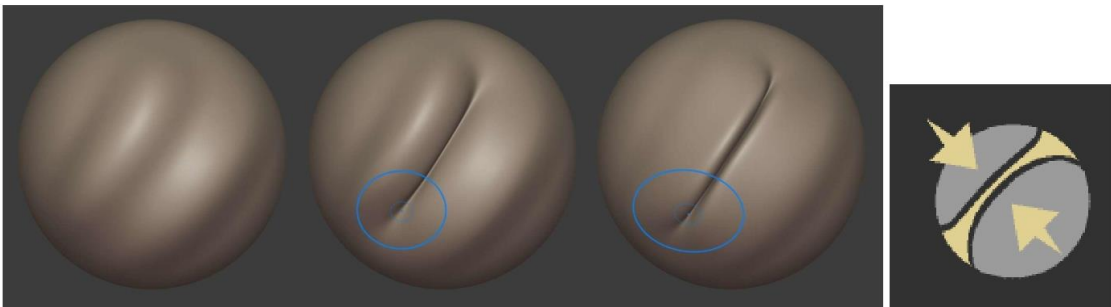

Figure 27: (A) Using the Pinch Brush. (B) The Pinch Brush icon.

Grab Brush

This brush is used to "grab and move" parts of the surface. Good for modifying the overall shape of the mesh. When using the negative (-) mode the movement is constrained to the "surface normal direction" (pointing out in a straight line, perpendicular from the surface).

To use this tool, either press: <mark>G</mark> on the Keyboard or select the tool with the icon shown here, that is in the Toolbar.
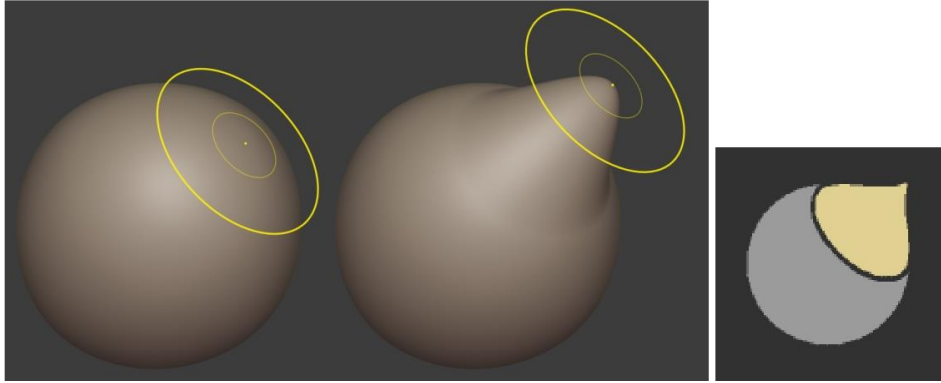

Figure 28: (A) Using the Grab Brush. (B) The Grab Brush icon.

Snake Hook Brush

This brush "grabs and moves" parts of the surface but as it drags the geometry it adds new geometry on-the-fly. The effect is akin to "snake or tentacle like extrusions" as seen in the image above.

When using the negative (-) mode the brush carves into the surface when combined with a swirling motion as seen in the second mesh in the image.

To use this tool, either press: <mark>K</mark> on the Keyboard or select the tool with the icon shown here, that is in the Toolbar.
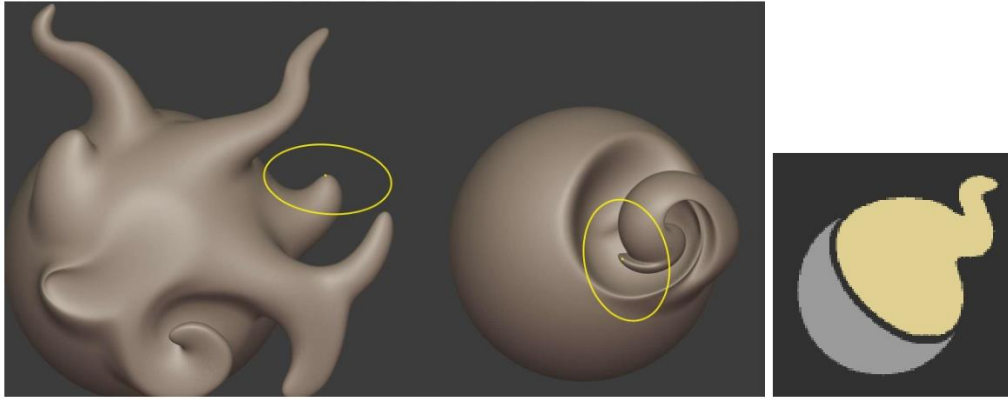
Figure 29: (A) Using the Snake Hook Brush. (B) The Snake Hook Brush icon.

Thumb Brush

This brush is used to push along the surface of the mesh in the direction of the brush stroke. The effect is like using your thumb to push clay, as seen in the image above. Good for sculpting Clothing wrinkles.

When using the negative (-) mode the effect is similar to the positive mode (+) but a bit more dampened.

To use this tool, either press: *Spacebar* + *9* on the Keyboard or select the tool with the icon shown here, that is in the Toolbar.
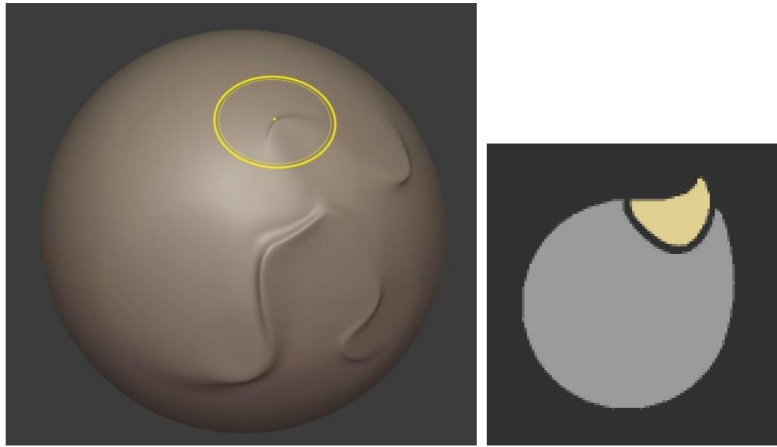
Figure 30: (A) Using the Thumb Brush. (B) The Thumb Brush icon.

Summary

In this Online Chapter, you have learned about more Tools, Brushes and Modifiers that are available to you in Blender.