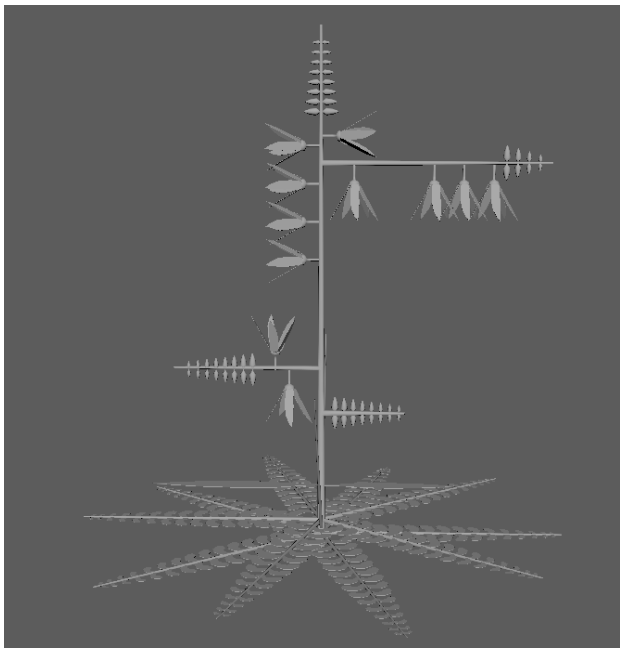
Symfaunic Flower Process:

Modeling with MASH:



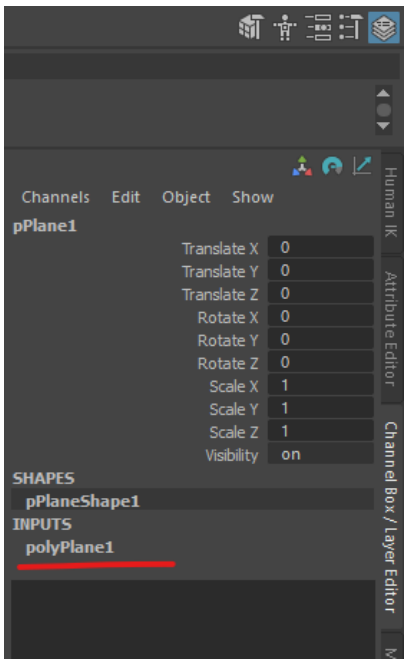
Three components to a Flower:

- **Creating the Stem**
- **Creating the Leaf**
- **Creating the Flower**
    - **Putting it all together and MASH Tips**

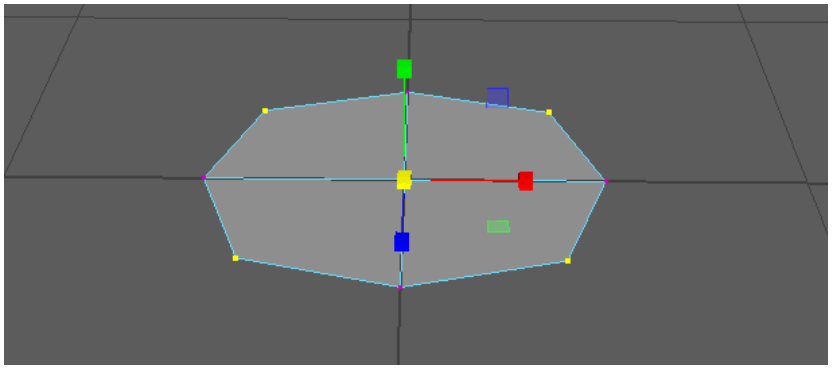
Note: This workflow places several objects at the world's origin. **Isolate Selected** is useful to "*hide*" all objects except for currently selected objects. Shortcut (ctrl + 1) to toggle on and off.

Creating the Stem

1. Create a new plane, through Channel Box> Inputs> polyPlane1 change SubdivisionWidth and SubdivisionHeight to 2.

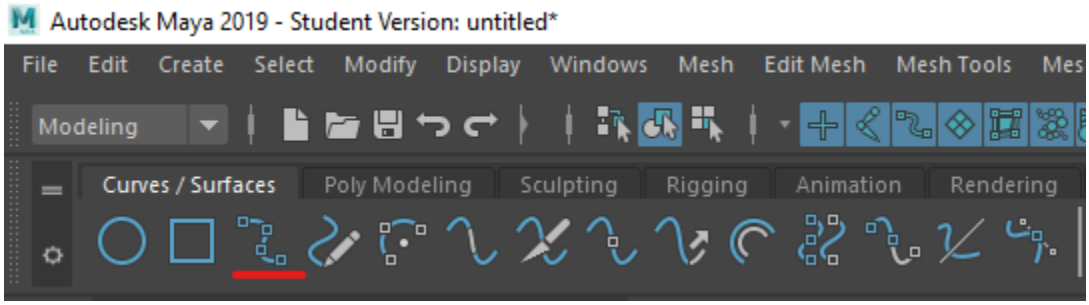


2. Scale corners of stem base inward for more organic form, geometry should lay flat at origin of world. The plane should also be at the origin of the world.

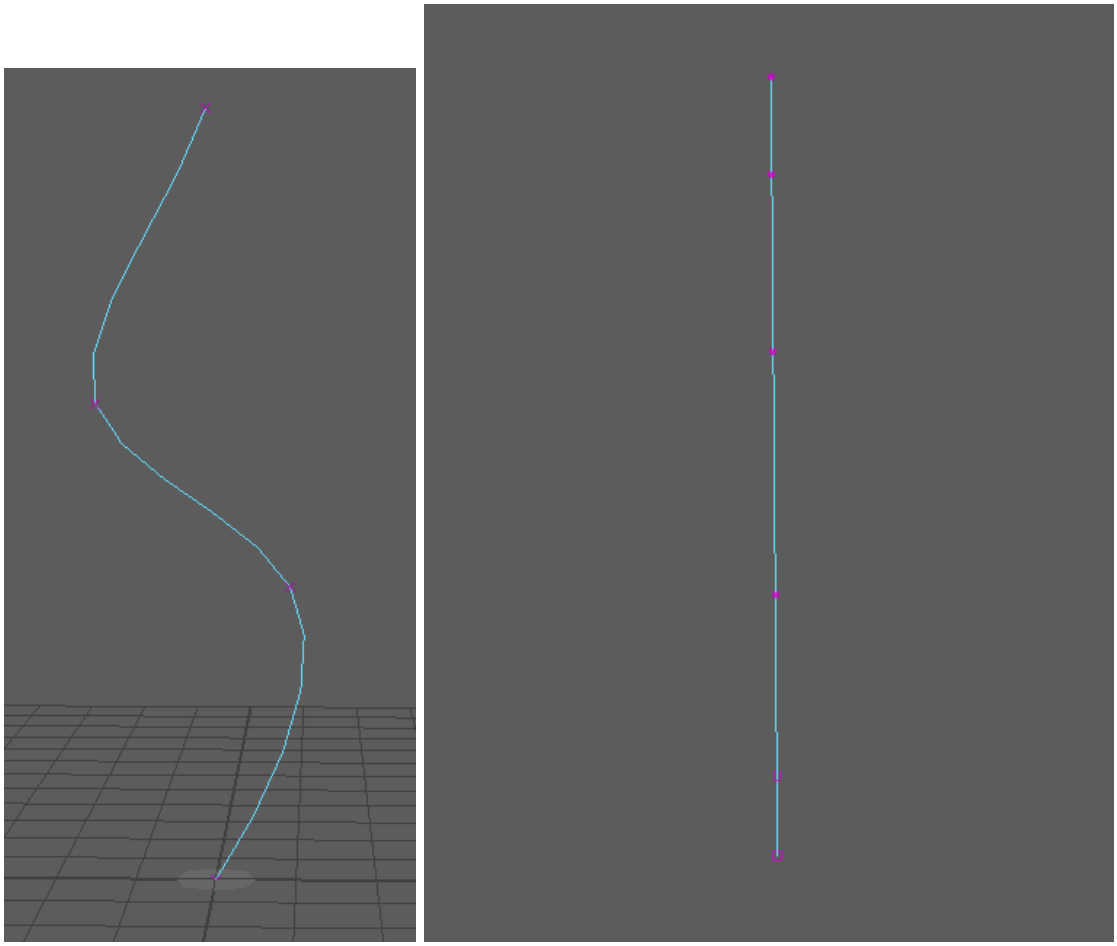


3. Rename polyPlane1 to "**Stem_Base"**

4. In *Object mode* create a new EP Curve with 3 to 7 points depending on complexity of model. Symfaunic flower stems were straight for t pose, but creating a curve is also good for more advanced shapes.



Adjust orientation of curve as needed, through *Edit Point mode* Translate base of stem curve to snap to center of origin by holding ‘X’ key and middle mouse dragging from center of gizmo.

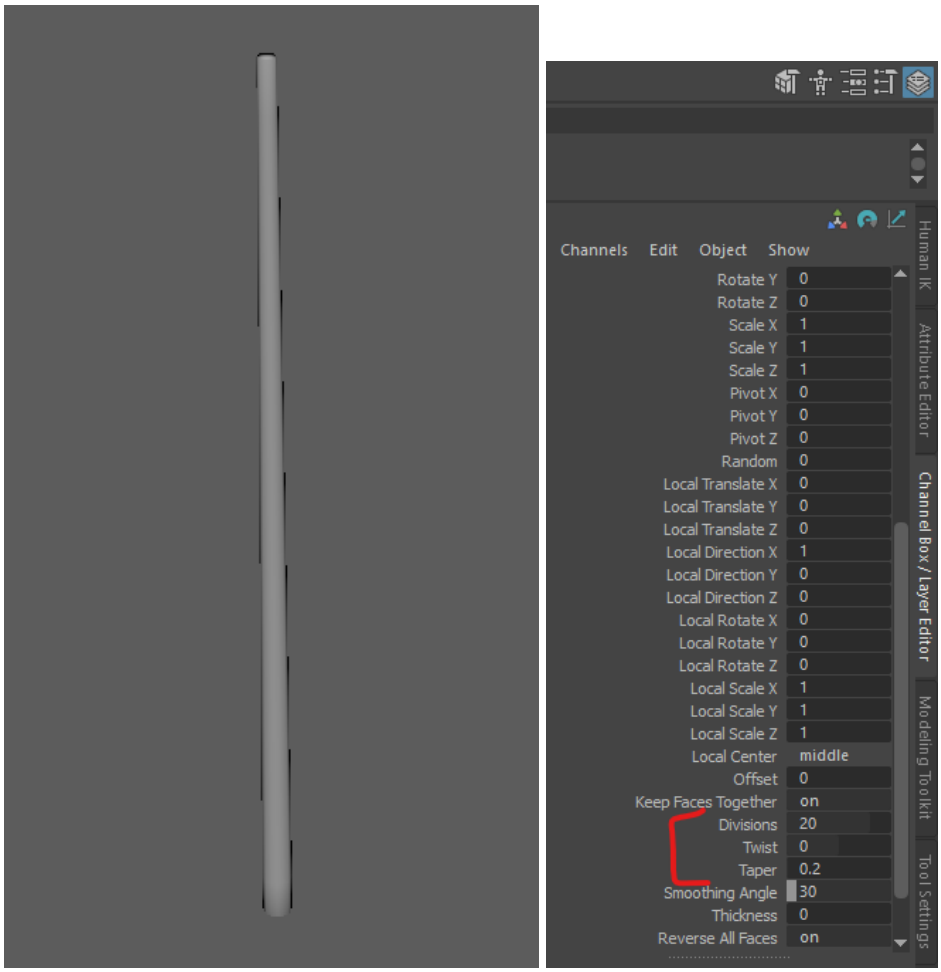


5. Rename curve1 to **“Stem_Curve”** and group both **“Stem_Base”** and **“Stem_Curve”** together, rename group to **“Stem_Group”**

   Note: For branching stems: duplicate **“Stem_Group”** for each stem before extruding as object history does not transfer over copied objects. Step 7 will need to be repeated for each branched stem. Alternatively if each branch stem looks identical copy after extruding, understand that this decision loses a great deal of control in shaping branched stems.

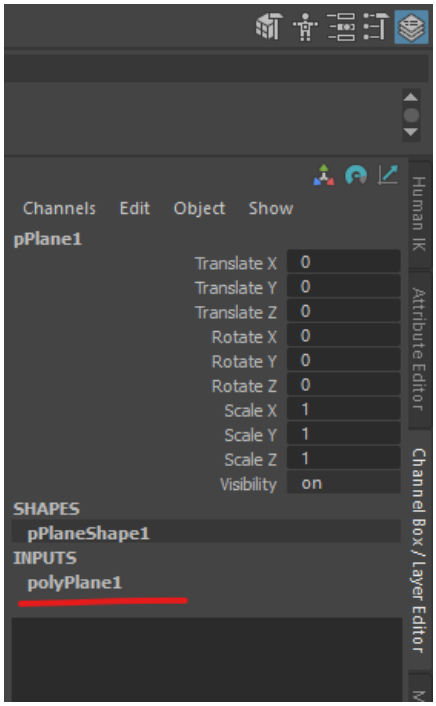
6. In *Face Mode* select all faces of **“Stem_Base”** and shift select **“Stem_Curve”** from viewport, then extrude (ctrl + E). From Channel Box> Inputs> PolyExtrudeFace1 adjust divisions, twist, and taper as needed.

Note: Don't forget to delete bottom faces of extruded **"Stem_Base"** at origin of world.

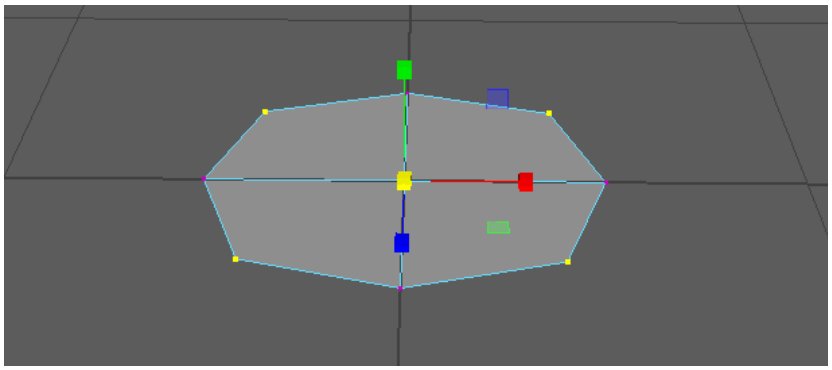


Creating the Leaf

1. Create a new plane, through Channel Box> Inputs> polyPlane1 change SubdivisionWidth and SubdivisionHeight to 2.

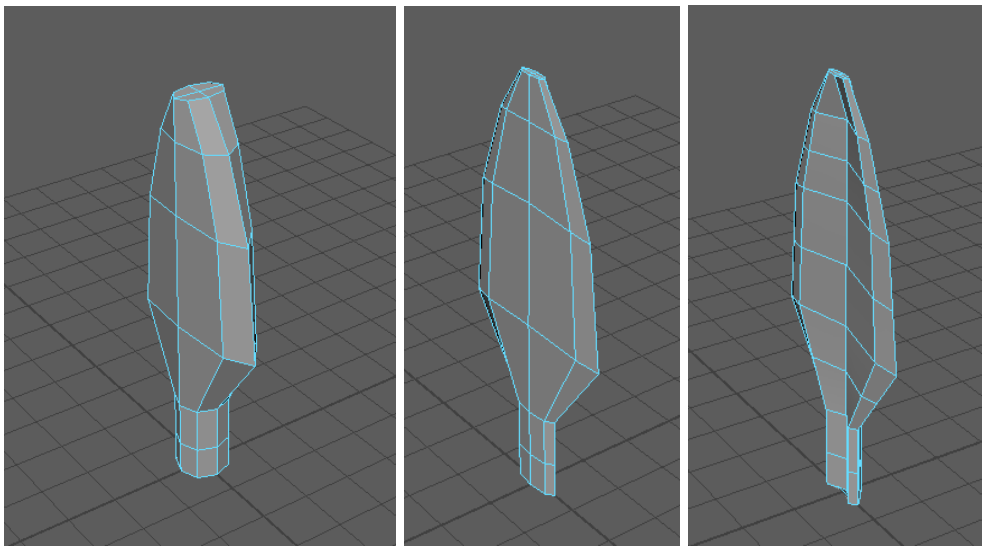


2. Scale corners of stem base inward for more organic form, geometry should lay flat at origin of world.



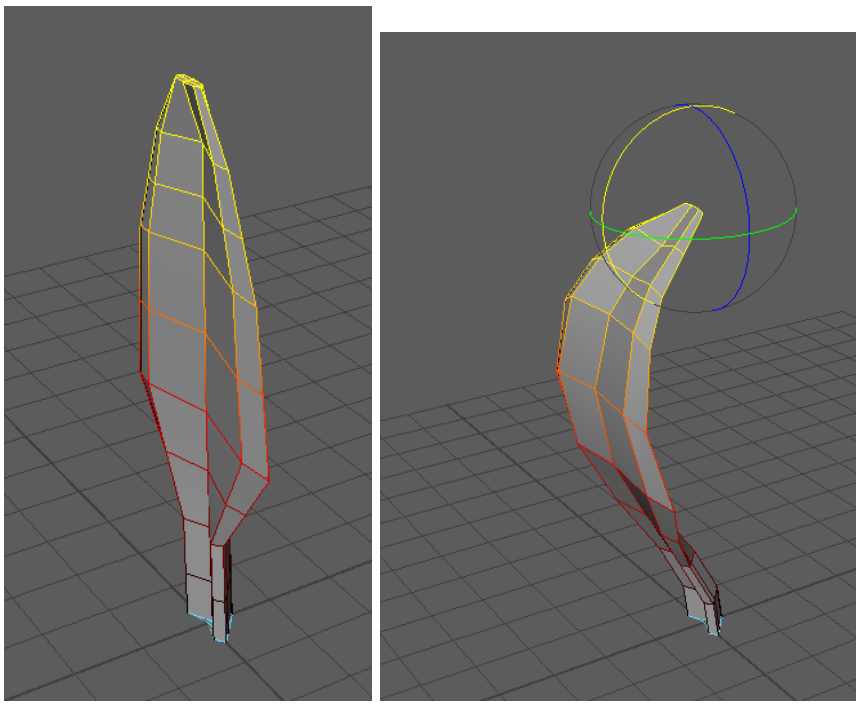
3. Rename polyPlane1 to **“Leaf_Base”**
4. In *Face Mode* extrude out **“Leaf_Base”** through a box modeling approach.

   Note: Having a one-sided geometric leaf is preferred for our workflow.



5. In *Face Mode* select top most edges or faces of "**Leaf_Base**" and with soft select enabled rotate faces as needed.

   Note: Keep edges or faces as well as pivot point at origin of world.

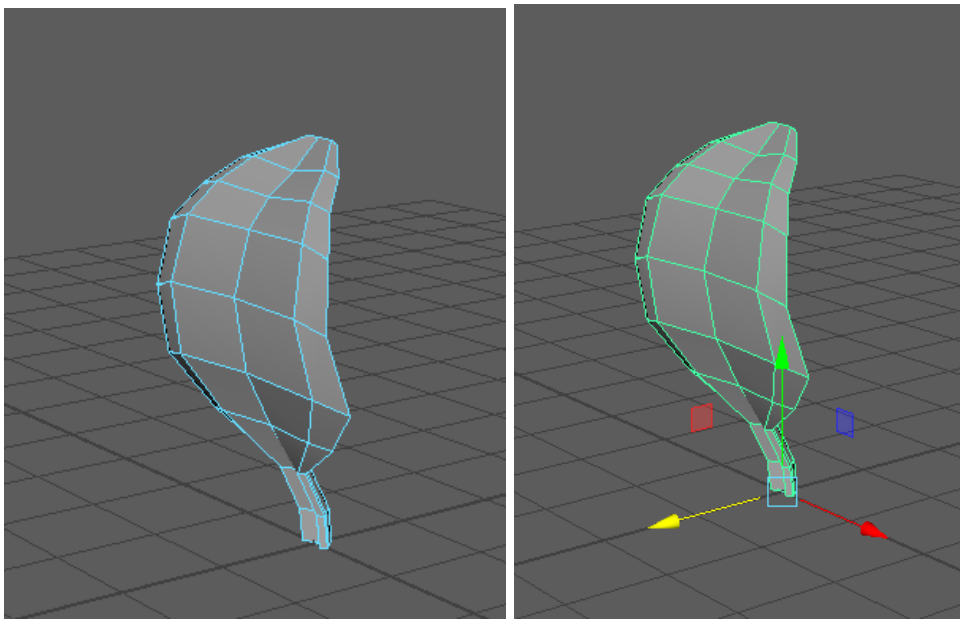


6. In *Object Mode* scale leaf as needed to fit size of stem.

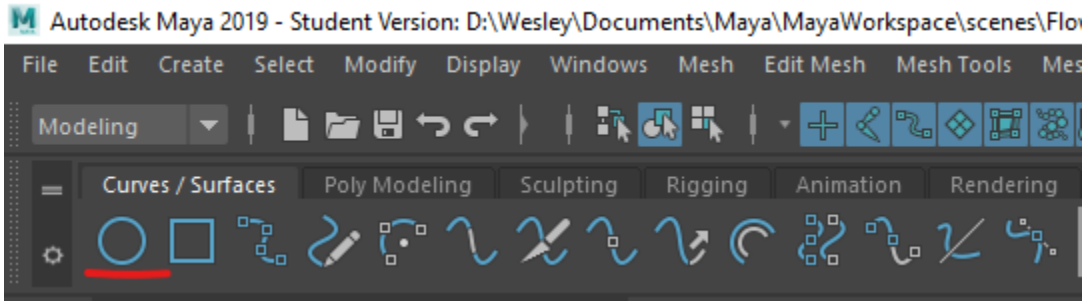
Creating the Flower

1. Create **"Petal_Base"** object through box modeling workflow shown in *Creating the Leaf*.

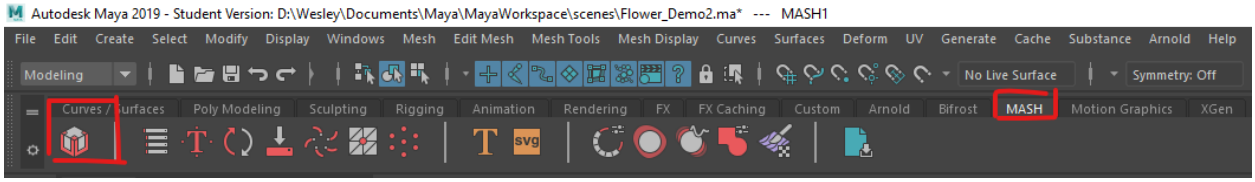
   Note: Petal base should have pivot point at origin of world.

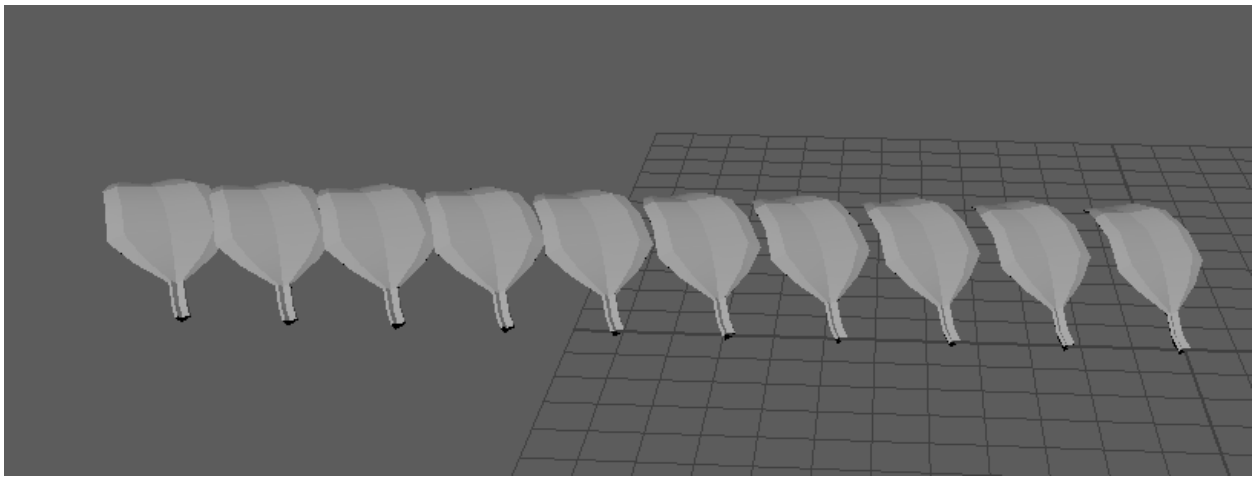


2. Create a new Nurbs Circle and rename to **"Flower_Curve"**

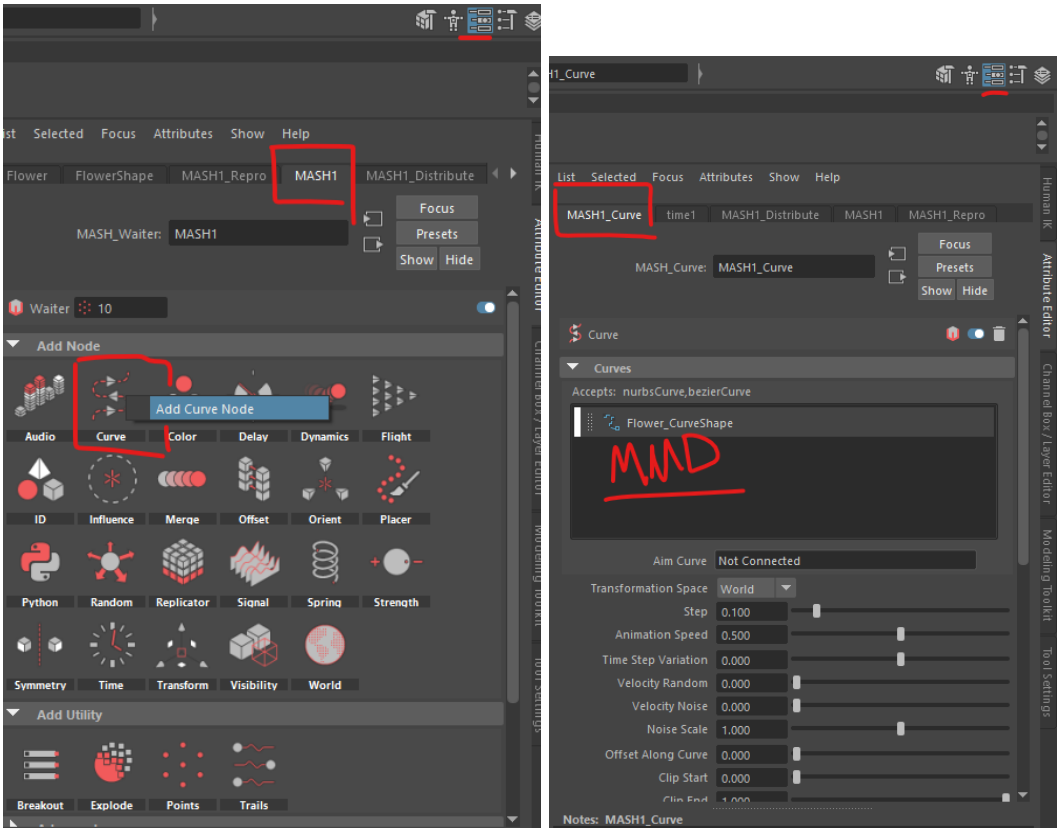


3. With **"Petal_Base"** selected create a new Mash object and rename to **"Flower."** An array of **"Petal_Base's"** should be visible in viewport.

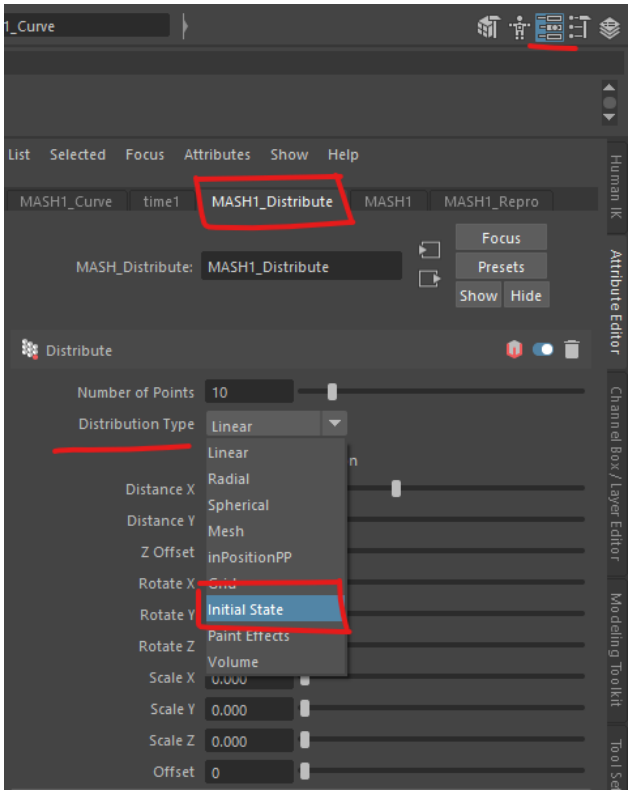




4. With **“Flower”** selected in *Outliner*, navigate to *Attribute Editor.* In AttributeEditor> MASH1 add a *Curve Node* to **“Flower’s”** Attributes. *Curve Node* can be found in AttributeEditor> MASH1_Curve. From outliner navigate to **“Flower_Curve”** and middle mouse drag the object from outliner to giant empty Input Curve Box in AttributeEditor> MASH1_Curve.

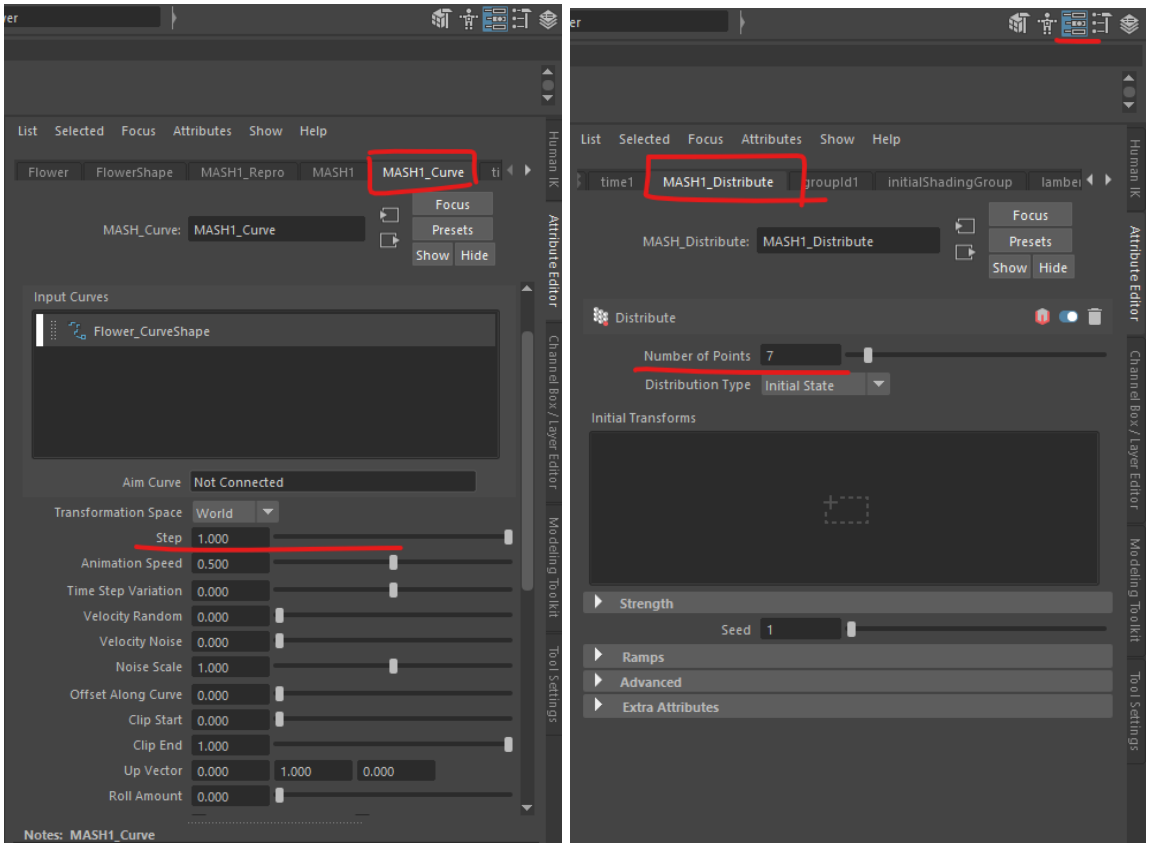


5. Array of **“Flower’s”** will not immediately snap to **“Flower_Curve”**. To enable navigate to **“Flower’s”** AttributeEditor> MASH1_Distribute> Distribution_Type and change from *Linear to Initial State*.

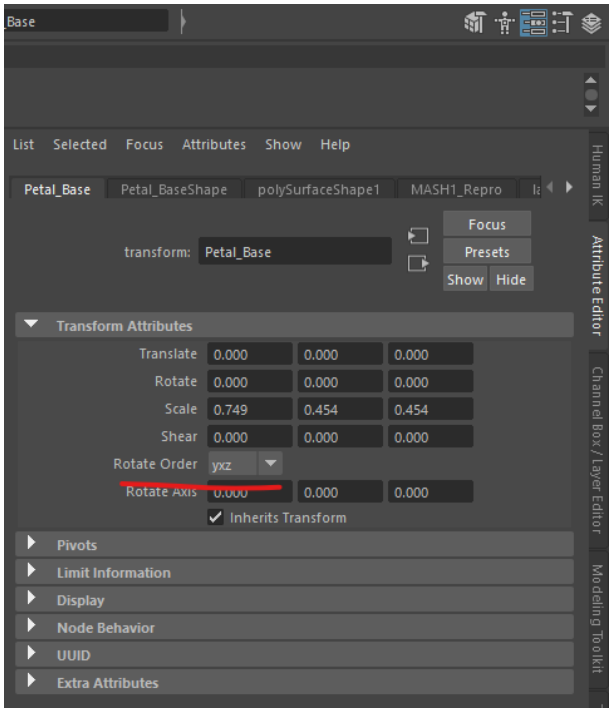


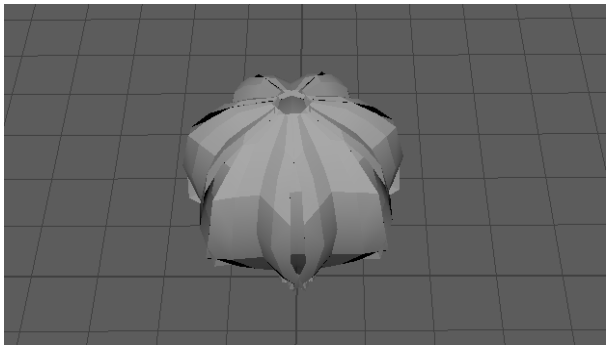
6. To adjust distance between each petal in **“Flower”** Select **“Flower”** and Navigate to AttributeEditor> MASH1_Curve> Step and change *Step* to a value of ‘1.’

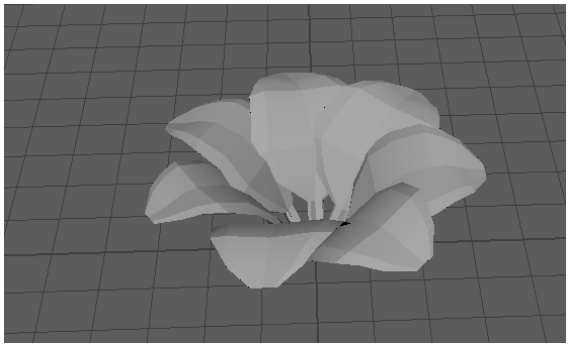
To adjust the number of petals in **“Flower”** Select **“Flower”** and Navigate to AttributeEditor> MASH1_Distribute> NumberofPoints.



7. Array of **“Flower’s”** will now snap to **“Flower_Curve”**, however **“Pedal_Base”** must be reorientated to get a desired result. Recommended to navigate to AttributeEditor> Petal_Base> TransformAttributes> RotateOrder and change rotation order of **“Pedal_Base”** to yxz before rotating from *Object Mode,* DO NOT rotate from *Component Mode*.


Base
List Selected Focus Attributes Show Help
Petal_Base
Petal_BaseShape
polySurfaceShape1
MASH1_Repro
transform: Petal_Base
Focus
Presets
Show Hide
Transform Attributes
Translate 0.000 0.000 0.000
Rotate 0.000 0.000 0.000
Scale 0.749 0.454 0.454
Shear 0.000 0.000 0.000
Rotate Order yxz
Rotate Axis 0.000 0.000 0.000
Inherits Transform
Pivots
Limit Information
Display
Node Behavior
UUID
Extra Attributes
Human IK
Attribute Editor
Channel Box / Layer Editor
Modeling Toolkit





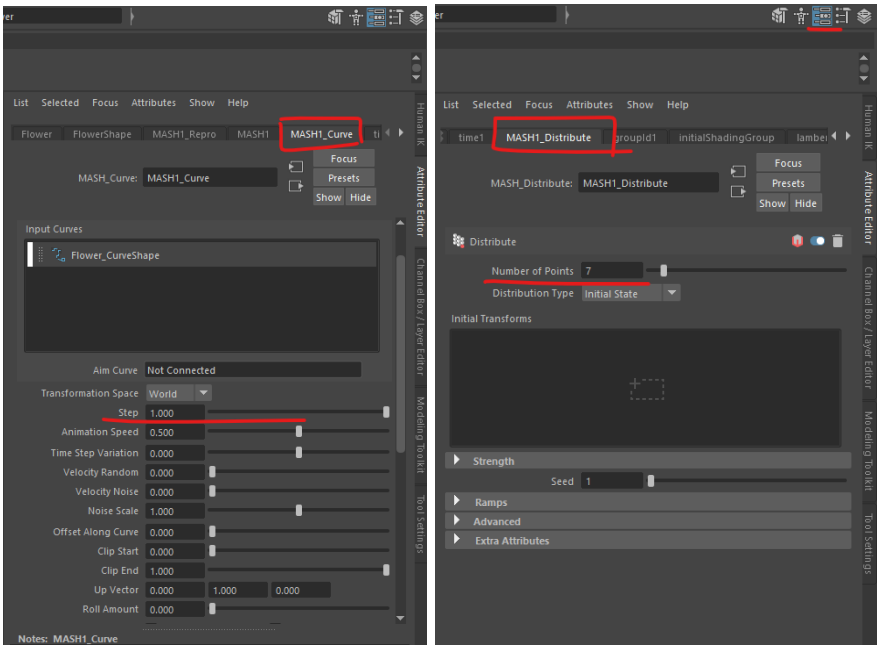
Putting it all together and MASH Tips

- **Positioning the Flower:** Position **“Flower_Curve”** object to desired position on **“Stem_Curve”**.

  Parenting the Flower to the Stem: Select **“Stem_Curve”** and in *Control Vertex Mode* select the closest CV to **“Flower_Curve”** and navigate to Deform> Cluster then add the *Cluster Deformer.* While in *Object Mode* parent the “**cluster1Handle”** to **“Flower_Curve.”**

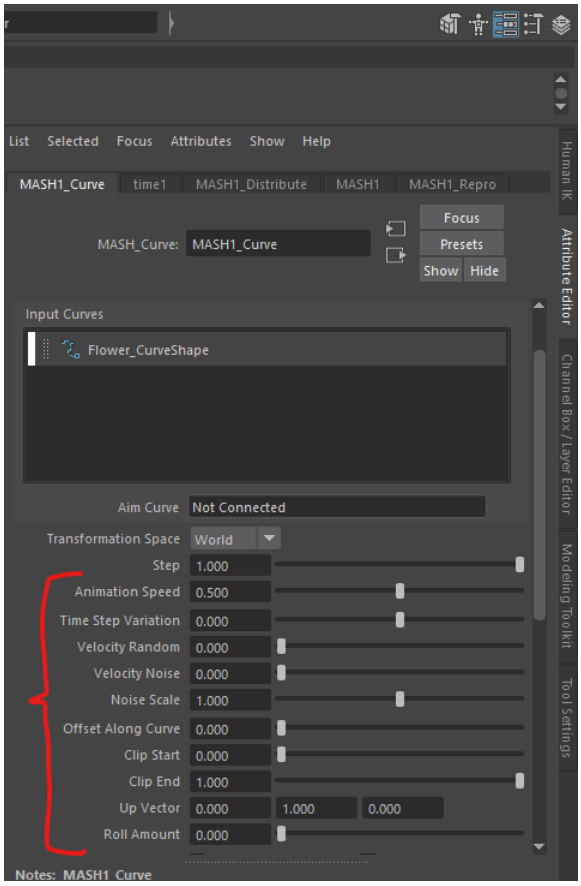
- **Positioning the Leaf:** Follows the same process as **Creating the Flower** from steps 3 to 7.

- **Some Useful Settings in MASH:**
  - **Step**: changes distance between geometry along curve.
  - **Number of Points**: Changes the amount of objects in the array.

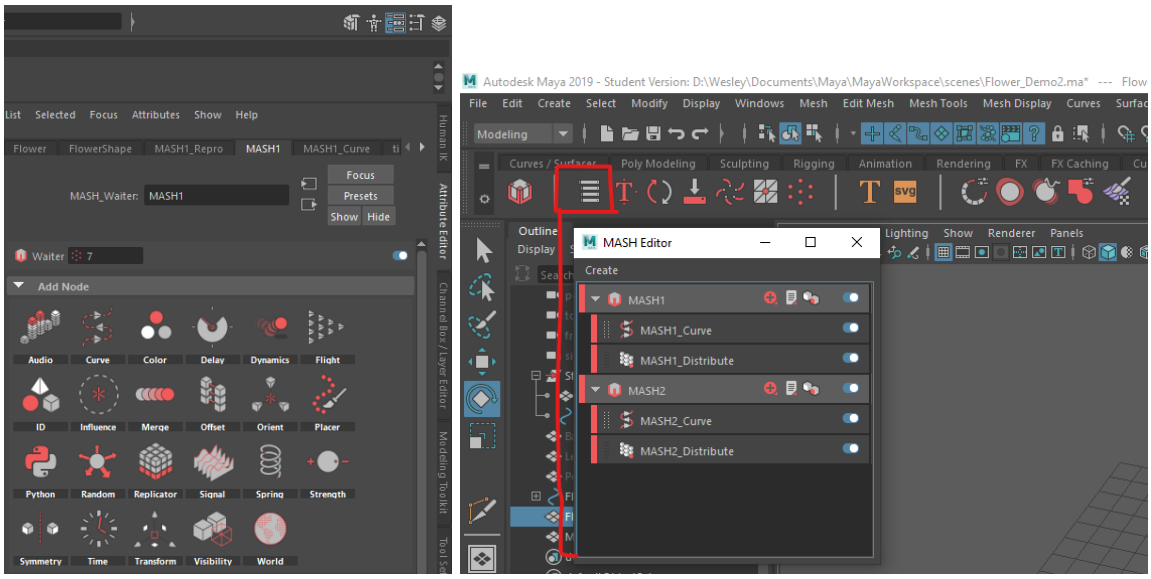


- **Other Useful Settings to Test Out:**
  - **Clip Start / Clip End**: to change beginning and end position of array on curve.

- **Animation Speed:** When not set to a value of ‘0’ will animate when timeline moves.

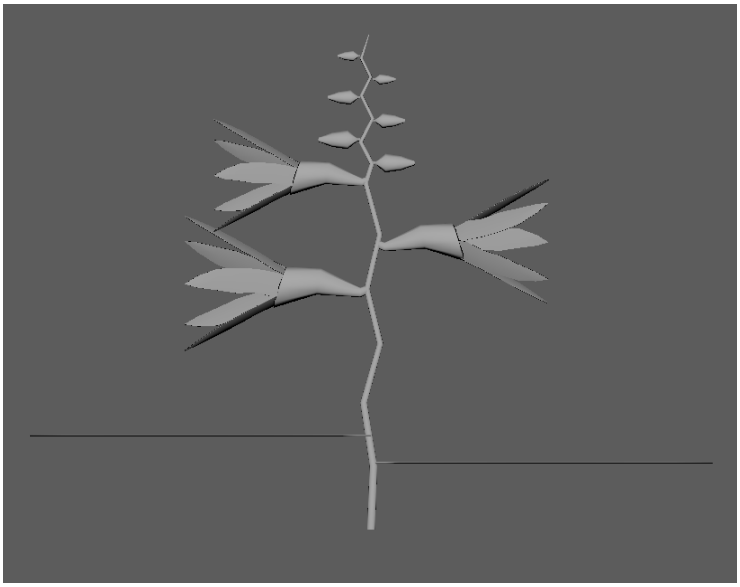


- **MASH Order of Operations:** Multiple Nodes can be added to an object under its Attribute Editor through AttributeEditor> MASH1> AddNode. Each Node added to the object can create interesting variation in geometry, but sometimes they can conflict as well. Opening MASH Editor reveals that each Node has an order of operation (executed from the bottom of the stack to the top) and the order can be changed by dragging one effect in the MASH Editor below or above the other.


List Selected Focus Attributes Show Help
Flower FlowerShape MASH1_Repro MASH1 MASH1_Curve
MASH_Waiter: MASH1
Focus
Presets
Show Hide
Waiter 7
Add Node
Audio Curve Color Delay Dynamics Flight
ID Influence Merge Offset Orient Placer
Python Random Replicator Signal Spring Strength
Symmetry Time Transform Visibility World
Attribute Editor
Channel Box / Layer Editor
Modeling Toolkit
Autodesk Maya 2019 - Student Version: D:\Wesley\Documents\Maya\MayaWorkspace\scenes\Flower_Demo2.ma*
File Edit Create Select Modify Display Windows Mesh Edit Mesh Mesh Tools Mesh Display Curves
Modeling
Curves / Surfaces Poly Modeling Sculpting Rigging Animation Rendering FX FX Caching
Outliner
Display
Lighting Show Renderer Panels
MASH Editor
Create
MASH1
MASH1_Curve
MASH1_Distribute
MASH2
MASH2_Curve
MASH2_Distribute

Flower Rigging Process:

Goal: Rather than rigging each flower completely separately the Flower Rigs use a system of references to simplify the rigging process so each flower petal does not have to be individually rigged. This process saves time for the while still allowing for a great amount of control for the animators. *Rigging the four base rigs: (Leaf_petal_base_RIG, Bud_base_RIG, Flower_base_RIG, and Stem_base_RIG) updating one of the base rigs should also update all of their referenced counterparts (updating the Leaf_petal_base_RIG will update all Leaves and Petals in all the rigs which the base rigs are referenced in).*

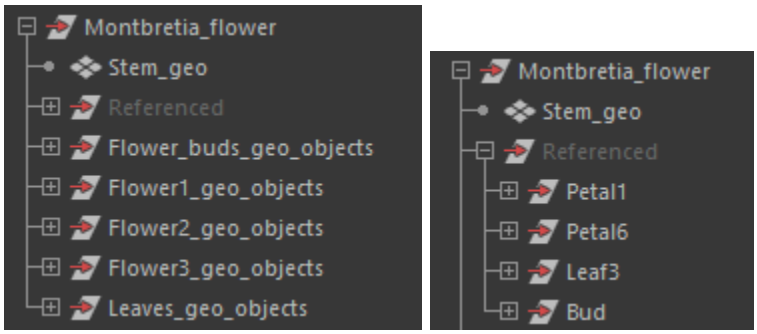


Location:

- **Flower rigs location:**
    - \03_Production_Maya\assets\02_Rigs\02_environmentObjects
- **Subasset rigs location:**
    - \03_Production_Maya\assets\02_Rigs\02_environmentObjects

- **Prop rigs location:**
    - \03_Production_Maya\assets\02_Rigs\03_props

File Structure:



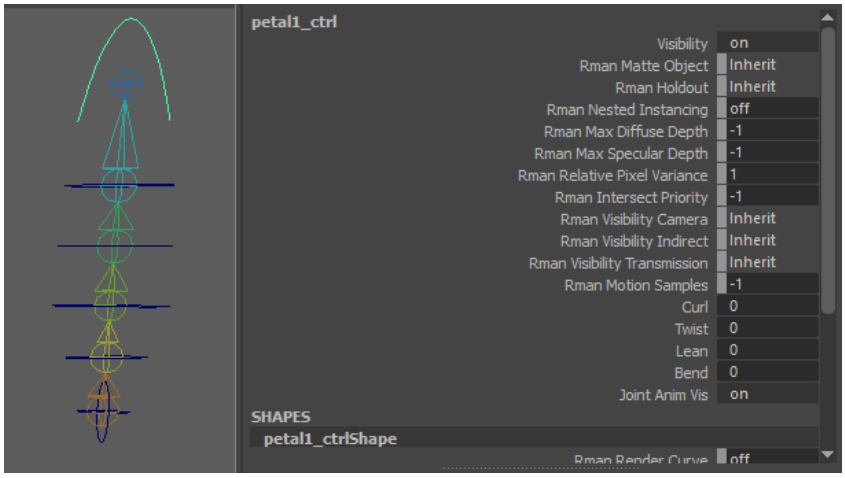
- Each flower model contains a **Stem, Petal, Leaf,** and sometimes a **Bud** at the top of the file structure under **Referenced**. Petals and Leaves are referenced while stems and buds are unique to the model and are not referenced.
- To update a flowers geometry make changes to the sub-asset's GEO file under *\03_Production_Maya\assets\01_Models\02_environments*

  Reloading the reference files will then update all flower sub-assets within the scene.

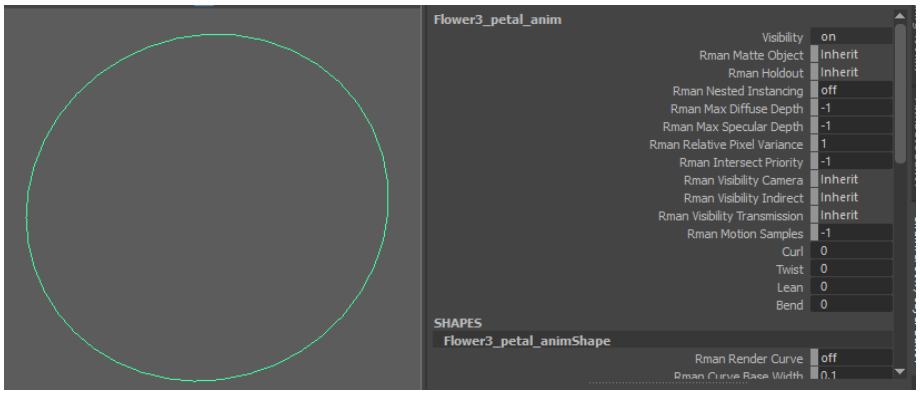
RIG Structure:

- **There were many flowers to be rigged, rigging a single base *(Leaf_petal_base_RIG, Bud_base_RIG, Flower_base_RIG, and Stem_base_RIG)* and referencing that base into the flower rigs saves the rigger from having to rig each flower petal individually and allows for easier updating.**

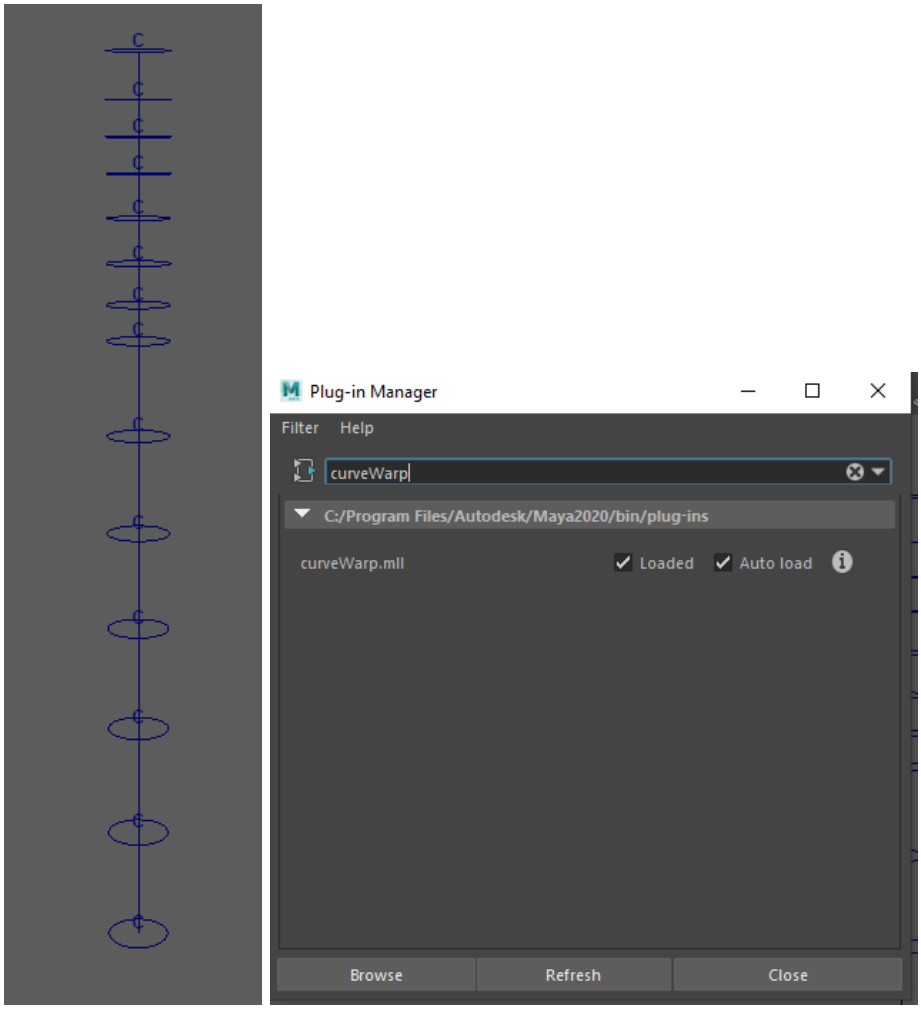
- **Leaf_Petal_RIG / Bud_RIG :** A six joint rig with each joint parented to a nurbs circle that acts similar to the functionality of a finger. At its tail there is another nurbs curve with added attributes (Curl, Twist, Lean, Bend) a **Plus Minus Average** node from the ***Hypershade Window*** was used to Drive each individual rigged joint. The **Plus Minus Average** node was connected in the ***Hypershade Window.***

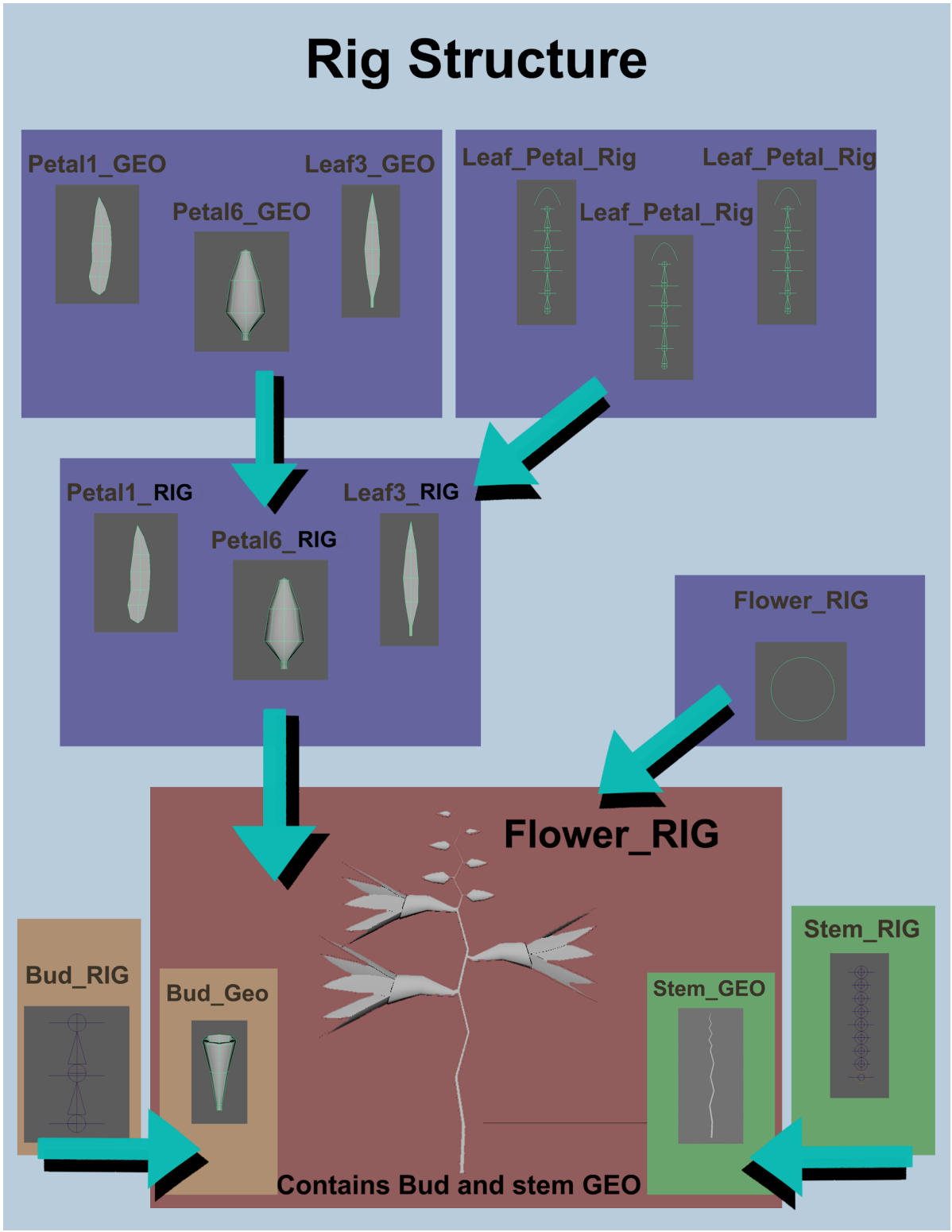


- **Base_RIG:** A basic nurbs circle with added attributes (Curl, Twist, Lean, Bend) which is used as a Controller to Drive several flower buds at the same time. The Base_RIG can also be used as an ALL_ANIM. Each flower has a Base_RIG which can then be connected to the ALL_ANIM which will drive all the Flowers at once.



- **Stem_RIG:** A Nurbs Curve with a **cluster** (Deform> Cluster) connecting each individual Control Vertex to a Nurbs Circle used as a handle to grab a Control Vertex to change the shape of the stems Nurbs Curve by moving the Nurbs Circle. **Curve Warp** was imported from **Windows> Settings/Preferences> Plug-in Manager** and used as a deformer to deform the stem geometry. Select the stem_GEO then the Stem_Curve and then apply the defromer ((While in Modeling Menu) Deform> CurveWarp)

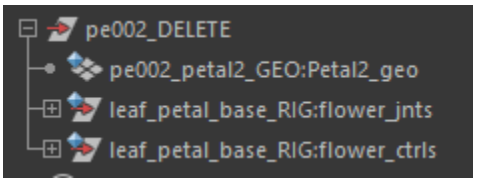


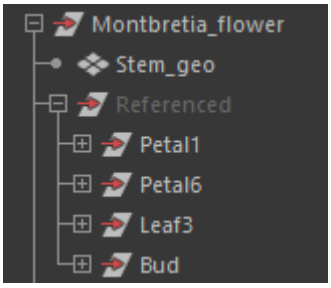


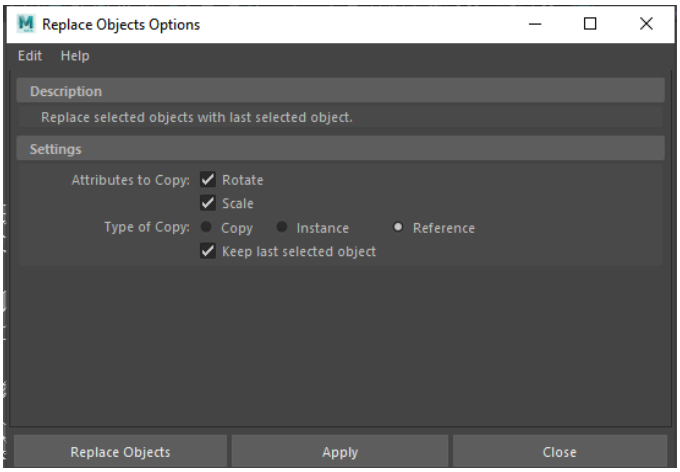
Arrows indicate that the file types are used as references. **Bud_GEO** and **Stem_GEO** are unique to each Flower_RIG and are not referenced.

Once *(Leaf_petal_base_RIG, Bud_base_RIG, Flower_base_RIG, and Stem_base_RIG) has been created, import original maya files that contain flower geometry into a blank maya file and rename the maya file as a RIG file (also move the file to the rig section of your maya workspace). Move on to referencing the base rigs into your Flower_Rigs containing Flower Geometry.*

Referencing:

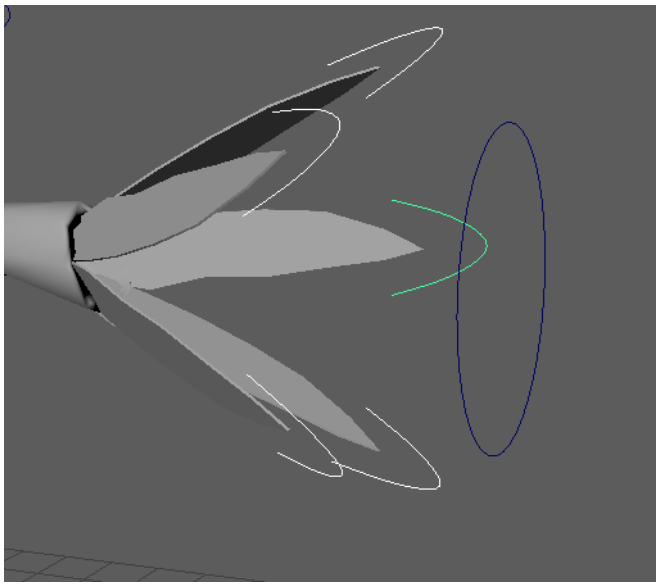
- **Open** a sub-asset rig and **group** all the objects together. **Rename** the group pe00#_PACKAGE or le00#_PACKAGE and **safe file as** pe00#_RIG_GROUP. **DO NOT** save over the existing rig file. **Repeated** this for all sub-assets
    - 

- **Create Reference**: Check file structure for "*Referenced"* and ***reference*** all corresponding GROUP assets. Montbretia_flower will reference pe001_petal1_GROUP, pe006_petal6_GROUP, le003_leaf3_RIG, bud_base_RIG, as well as stem_base_RIG and flower_base_RIG.
    - 

- **Replace Objects**: For each Petal_GROUP and Leaf_GROUP file referenced ***search*** in outliner for corresponding objects, select all then select corresponding reference last, then **Modify> ReplaceObjects:**
    - 

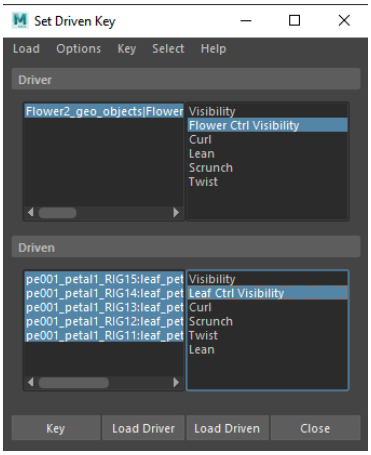
    - Mesh turns Green when referenced? After saving, the issue is resolved.
    - **Note For Bud_base_RIG:** scale to **Bud_GEO**, then duplicate all Bud_GEO in file right before Replacing to preserve original geometry. Afterwards don't forget to **Modify> Convert> InstanceToObject** before binding rig**.**
- **In Outliner: Search** for keyword 'PACKAGE', **expand** all groups by shift left clicking the '+' next to any groups, **select** all groups with keyword 'PACKAGE' (**DO NOT** select any of the groups children) **unparent** from all (shift + P), finally **import** all groups with selected keyword (**DO NOT** reference any of the groups children) **Remove** keyword 'PACKAGE' from outliner search.
    - **Note:** Since the references are embedded within other references you can import a reference at the top of the hierarchy while leaving the other embedded references intact. A colon in a referenced objects naming designates another reference.

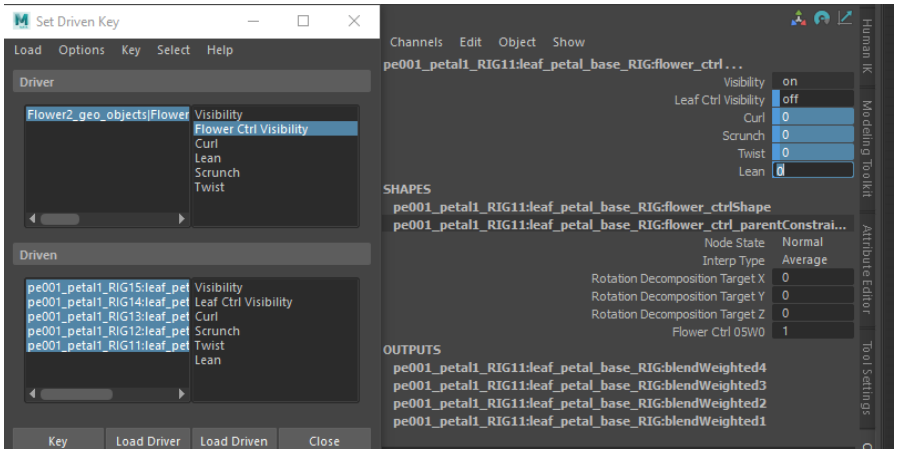
- **In Outliner: Search** for **geo, rig, and jnt** separately and create three new **groups** for each corresponding **geo, rig, and jnt.** Group all objects to corresponding groups.
- For the **Flower_Base_RIG** create some geometry just beyond the flower petals, then Replace Objects with the rig (make sure that the created geometry has it's y axis normal to the flower and is about centered from the flower.) Create a referenced **Flower_Base_RIG** at the base of the entire plant as well, this will be the **Master Control**.



Set Drivers: (While in animation menu) Key> SetDrivenKey> Set (box)

- The most time consuming part of the entire process. For each individual **Leaf_Petal_Base_RIG** set driven key to their respective **Flower_Base_RIG.** Each flower must have its own dedicated **Flower_Base_RIG** to make it fast for the animators. And then again for the **Master Control** at the base of the flower.

- **Tips for keying driven**: you can key all driven to a single driver attribute at the same time. (First key all at default 0, then Maximum at 10, then minimum at -10)
  - 

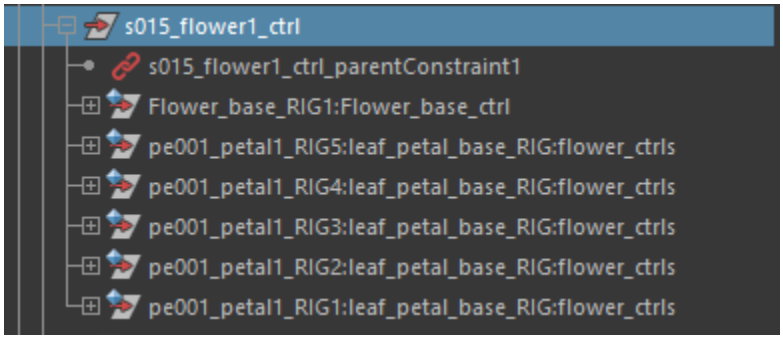
- **Tips for keying driven:** Using the set driven key option box to select the **Driver** navigate to attribute editor and left click drag over all the desired value boxes and input a value into multiple attributes at the same time. Then do so for **Driven**.
- 

Rivets: (while in rigging / animation menu) Constrain> Rivet

- Go into edit vertex mode with the stem and select a vertex for which each nearby flower bud in relation to that stem (Bud_GEOs, Flower_GEOs, and corresponding rigs should all be grouped together for the rivet points) Create the

series of rivets and then create a parent constraint connecting the flower group to each individual rivet (do not parent constraint individual components to the rivet, make sure it is indeed the group and not a mesh)

- Since all geometry is bound to a joint based rig, parent constraints can't be added to geo for rivets. Since all joints (except for one) are bound to ctrls, parent constraints can't be added to joints for rivets. Therefore, all controls must be added to the ctrl group parent. Add a parent constraint to any single joints that are not connected to a controller (you will see them when trying to move the rivet if the ctrls have already been parent constrained to the rivet)



- Bind skin to anything if you haven't already and check the entirety of the flower rig for any inconsistencies and double transformations. Pose the rig and move, scale, and rotate the all anim to see if any double transformations do exist.