



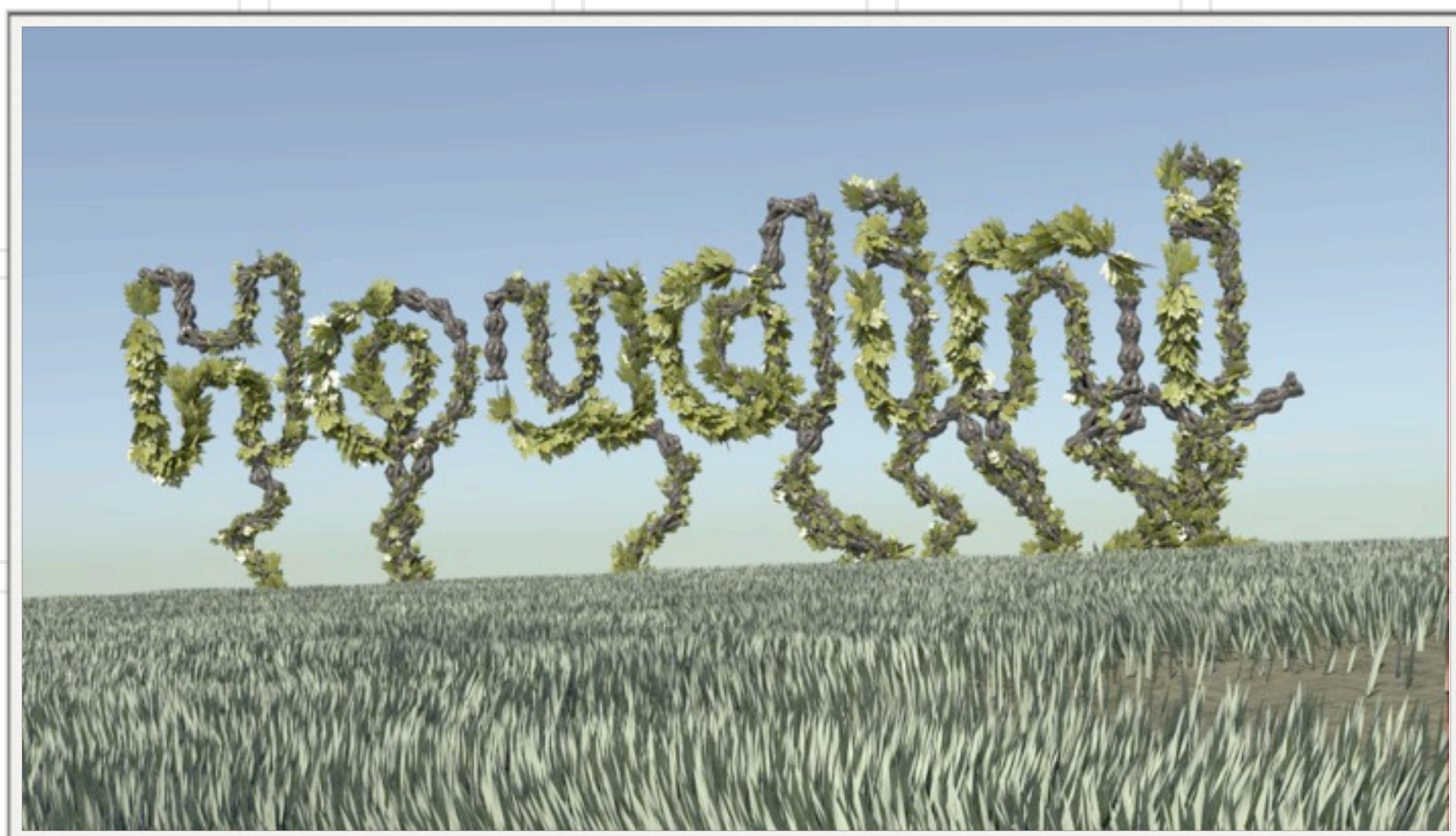
Next Steps: Houdini Procedural Modeling

M06: Vines - Building Vines with Attributes from L-Systems
NO ACTUAL L-SYSTEMS

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SIDE EFFECTS
SOFTWARE

Goal of this Module



- ▶ Create Vines with Leaves
- ▶ Learn about the Polywire SOP
- ▶ Learn about the Attributes in L-Systems that the Polywire Uses
- ▶ Learn to use the Trace SOP to make leaves
- ▶ See how we can re-purpose what we learned with pipes to create Vines

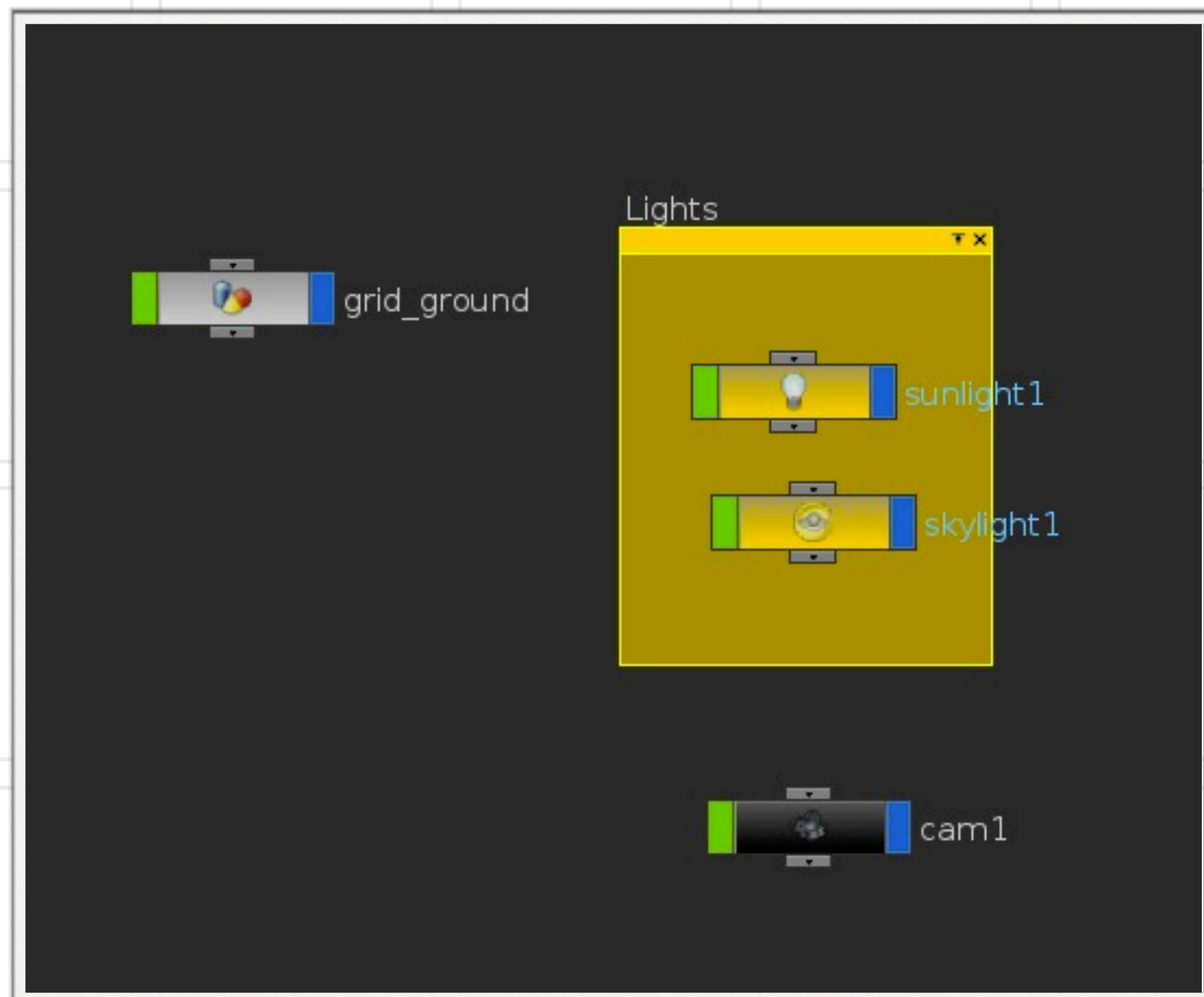


Basic Scene Setup

Just Camera, Grid, Skylight

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Basic Setup



- ▶ Lay down a grid 50x50 to act as a ground plane
- ▶ Drop down a Skylight and turn on - Render Light Geometry
- ▶ Drop down a Camera Pointing to the Center of the Ground
- ▶ Drop down a Mantra Node (PBR)



Generating Input Curves

Making the Paths for the Vines

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Creating Vine Paths

Just like our other projects we want to de-couple the input curves from our “Vine Generator”

- ▶ This way the artist can create his own curves or import curves from another package

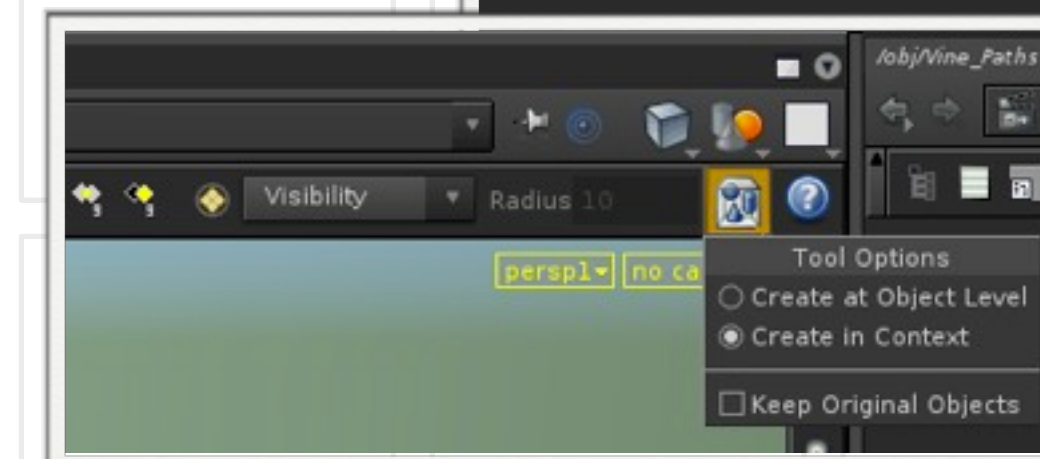
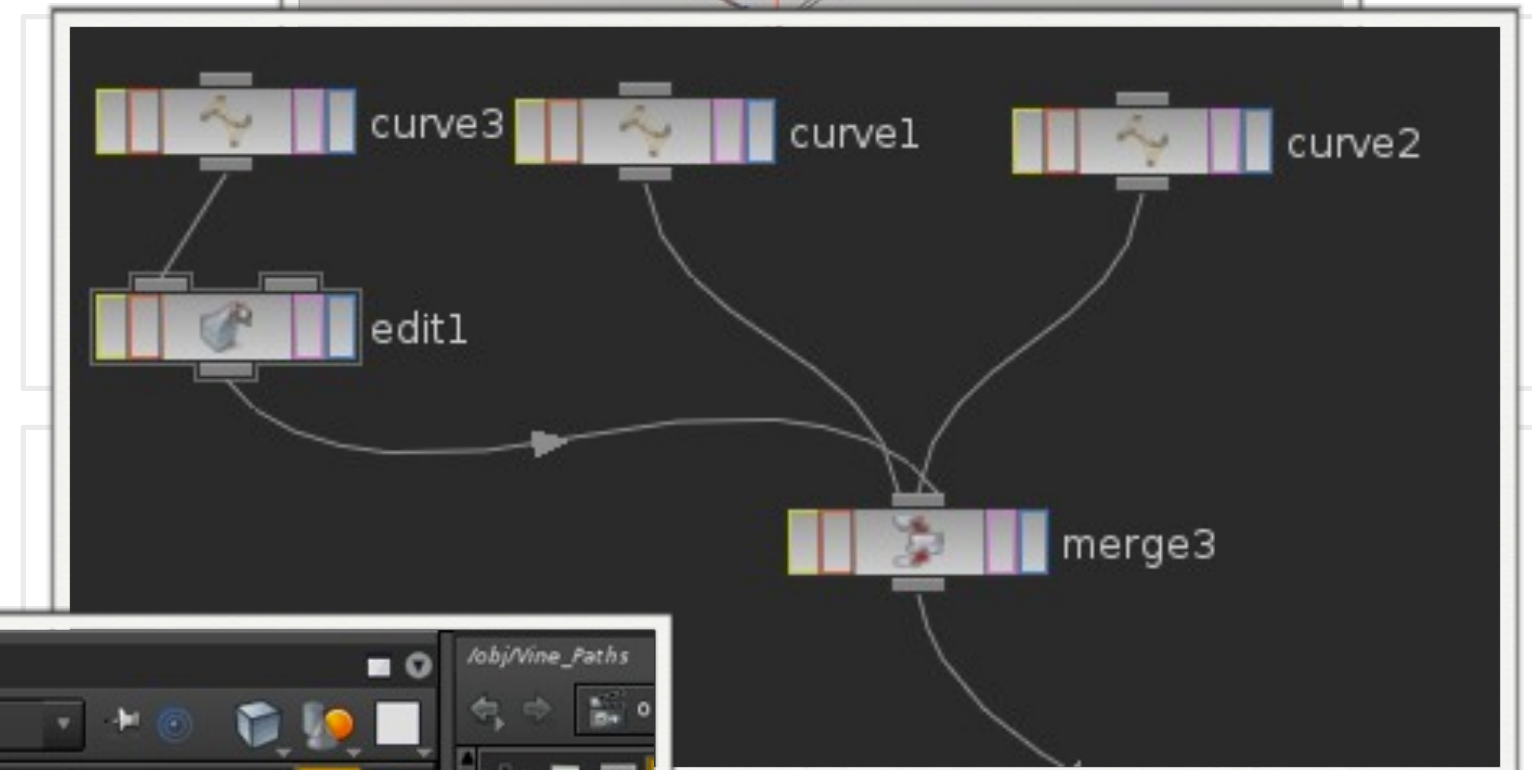
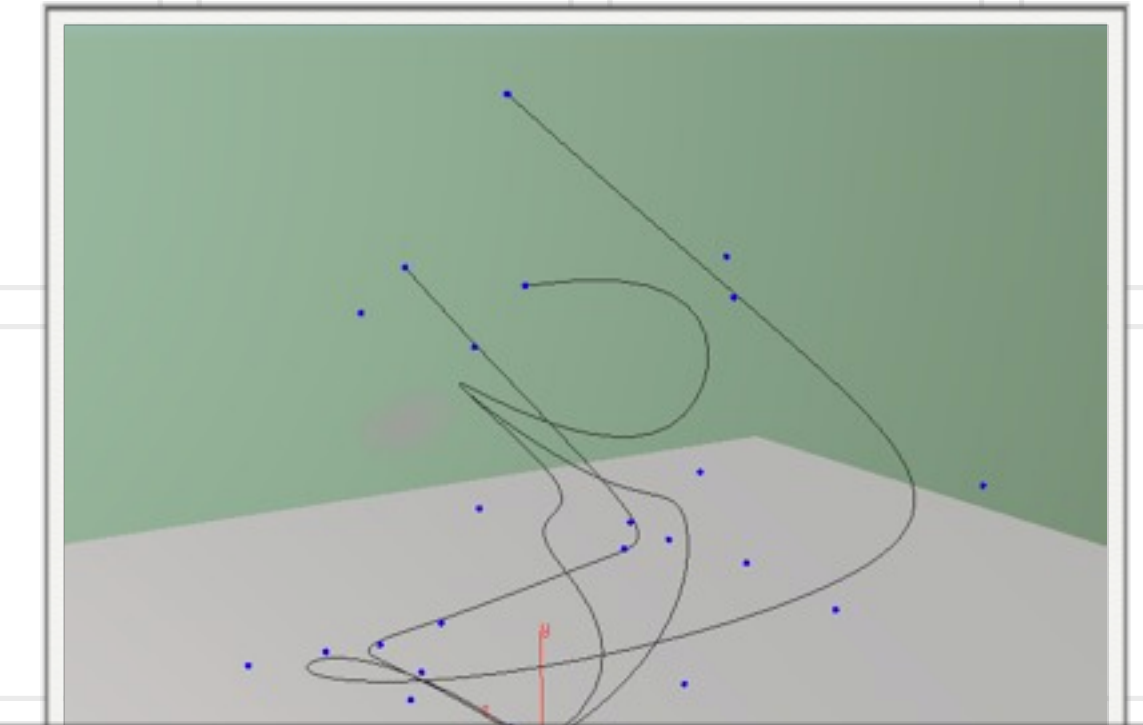
At the Object level drop down a Geometry Object and dive inside

Let us create a couple different types of curves

- ▶ Continued on next slide...

Simple Curve

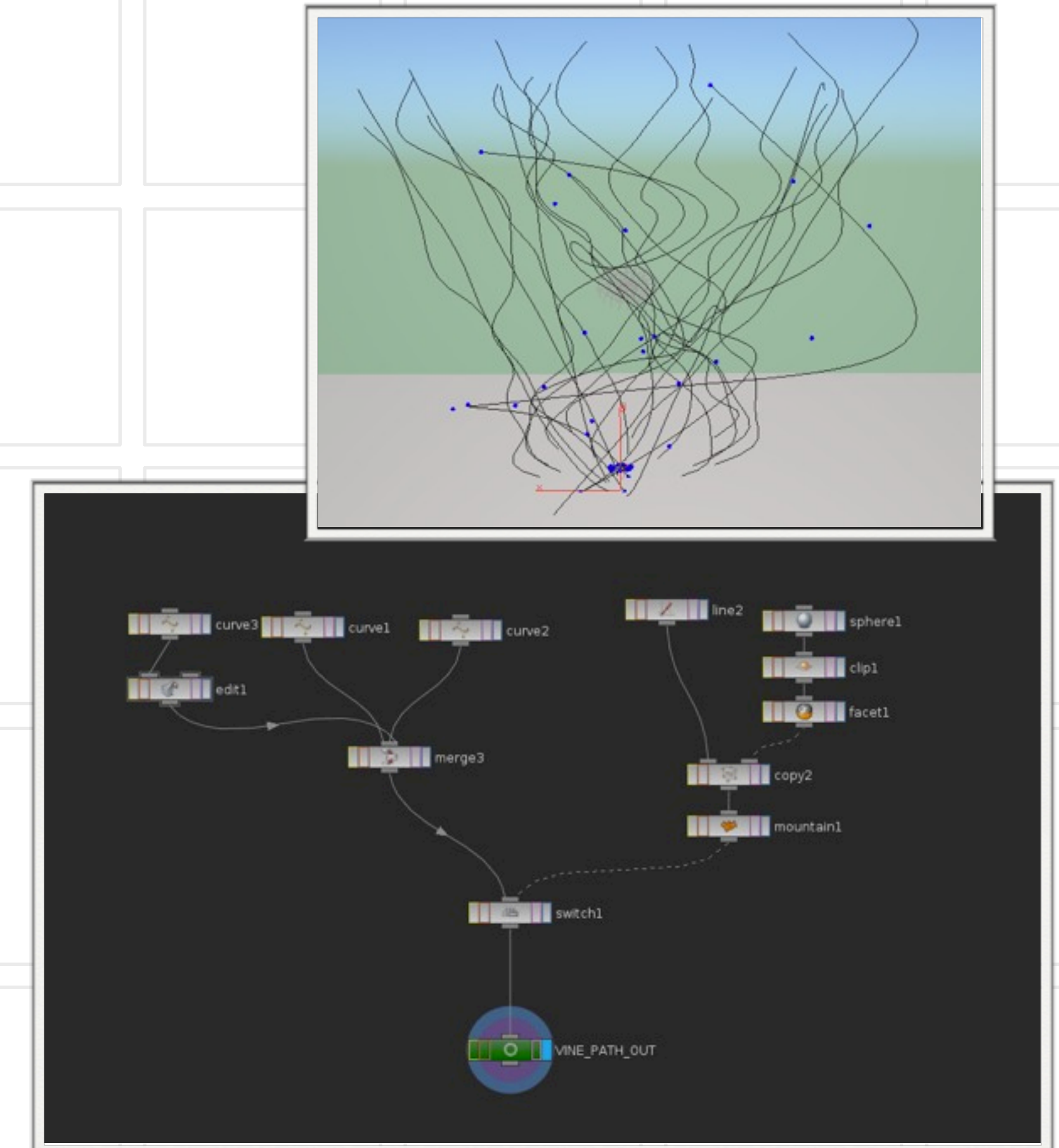
- ▶ Draw a couple of simple curves going up the y-axis
 - ▶ To draw a 3D curve
 - ▶ Turn on - Create in Context
 - ▶ Start with the Construction Grid on to anchor the first point to the Ground.
 - ▶ Turn off Construction Grid
 - ▶ Rotate Scene View and drop down points of curve
 - ▶ Keep on rotating and dropping points
 - ▶ When done switch Curve Type to NURBS
 - ▶ Create a few Curves a Merge them



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Curve from Mountain SOP

- ▶ In the same object drop down a sphere - make it polygonal - frequency 3
- ▶ Append a Clip SOP - Distance 0.9
- ▶ Drop down a Line SOP
 - ▶ Distance - 18
 - ▶ Points 50
- ▶ Copy the Line with the Facet
- ▶ Append a Mountain SOP to distort the Vine Path
- ▶ Append a Switch and Input both types of Curves



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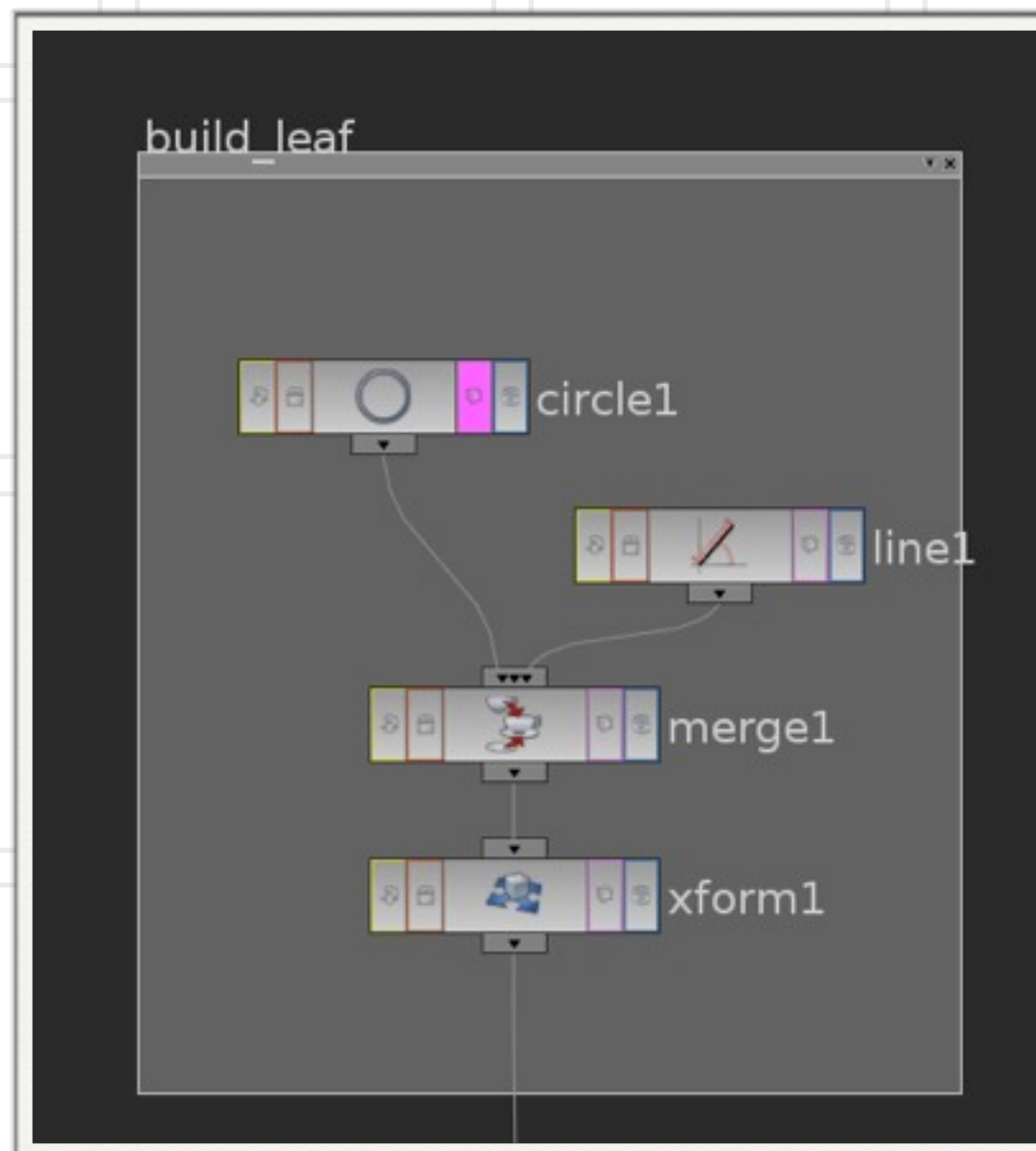
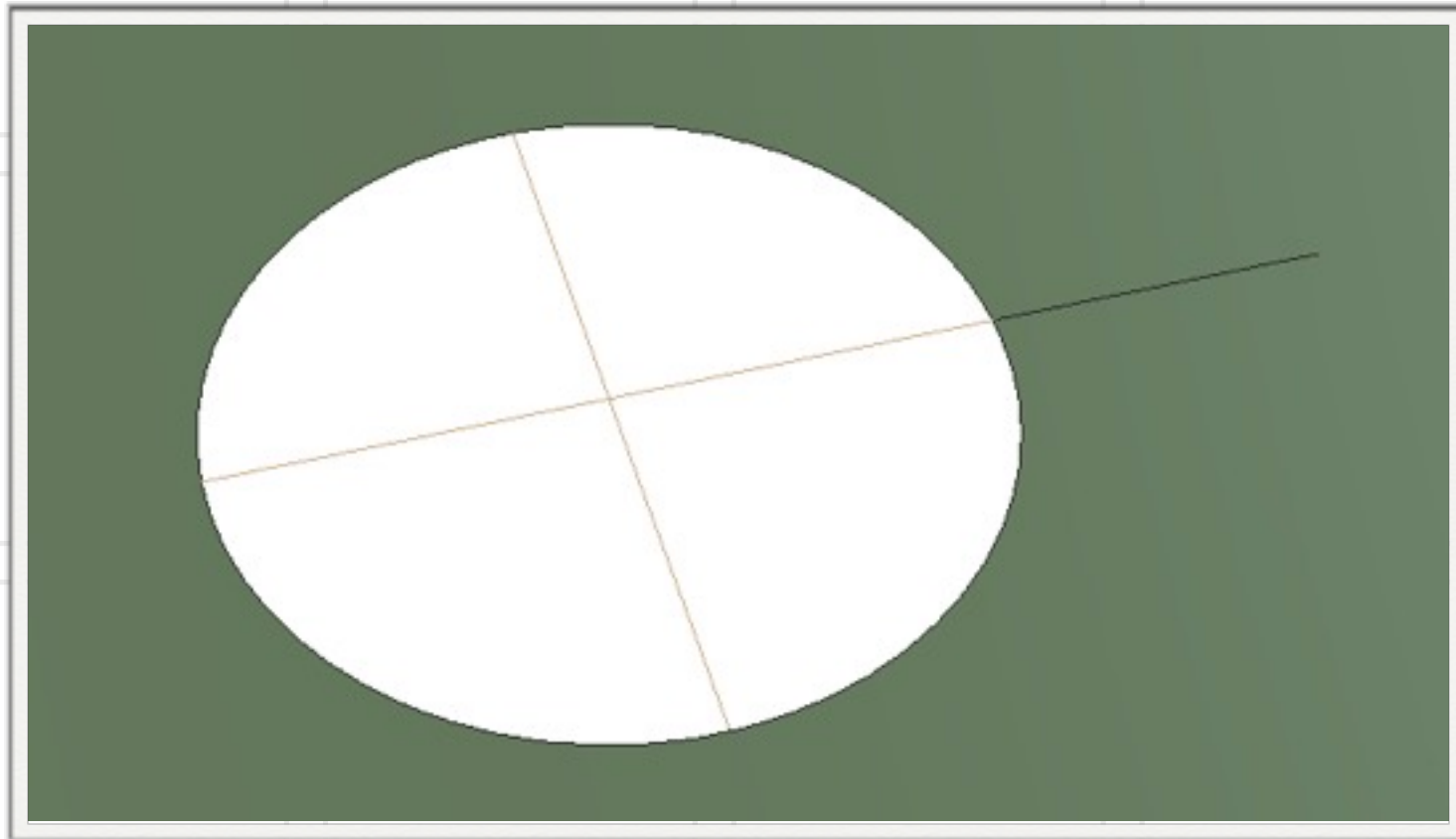


Making a Leaf

Remember do not use Alpha - Build the Geometry

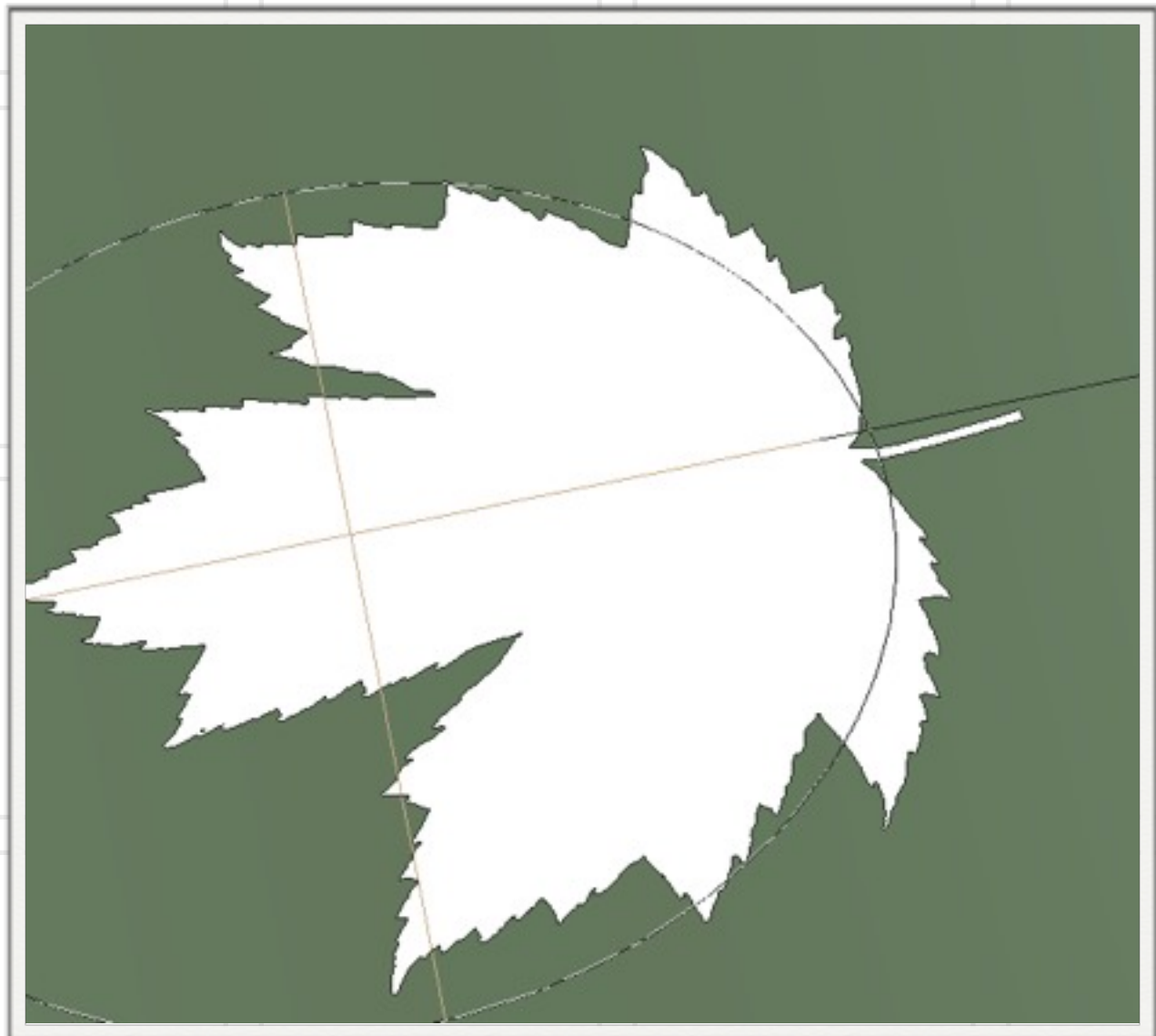
**SIDE EFFECTS
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Building a Simple Circle Leaf



- ▶ At the Object Level Dope down a Geometry Object
- ▶ Rename it Leaf and Dive Inside
- ▶ Drop down a Circle
 - ▶ Type - Primitive, Orientation - XY Plane
 - ▶ Radius 0.5, 0.5, Center 0.95
- ▶ Drop down a Line
 - ▶ Direction 0,1,0, Distance 0.5, Points - 2
- ▶ Merge Line and Curve
- ▶ Append a Transform - Rotate X 90 degrees

Build a Leaf from a Trace SOP



- ▶ In the same Object drop down a Trace SOP
 - ▶ Image Input - Let us use something from the default pic foldermap
 - ▶ Image Input - \$HFS/houdini/pic/mapleleafAlpha.rat
- ▶ Append a Transform
 - ▶ Rotate 90
 - ▶ Translate 0,0,.8
- ▶ Append a Switch
 - ▶ Add the Simple Circle Leaf
- ▶ Append a Null Leaf_OUT

What is the Trace SOP

Traces curves from an image file.

This node reads an image file and automatically traces it, generating a set of faces around areas exceeding a certain brightness threshold. You can control this threshold and the resolution of the resulting faces.

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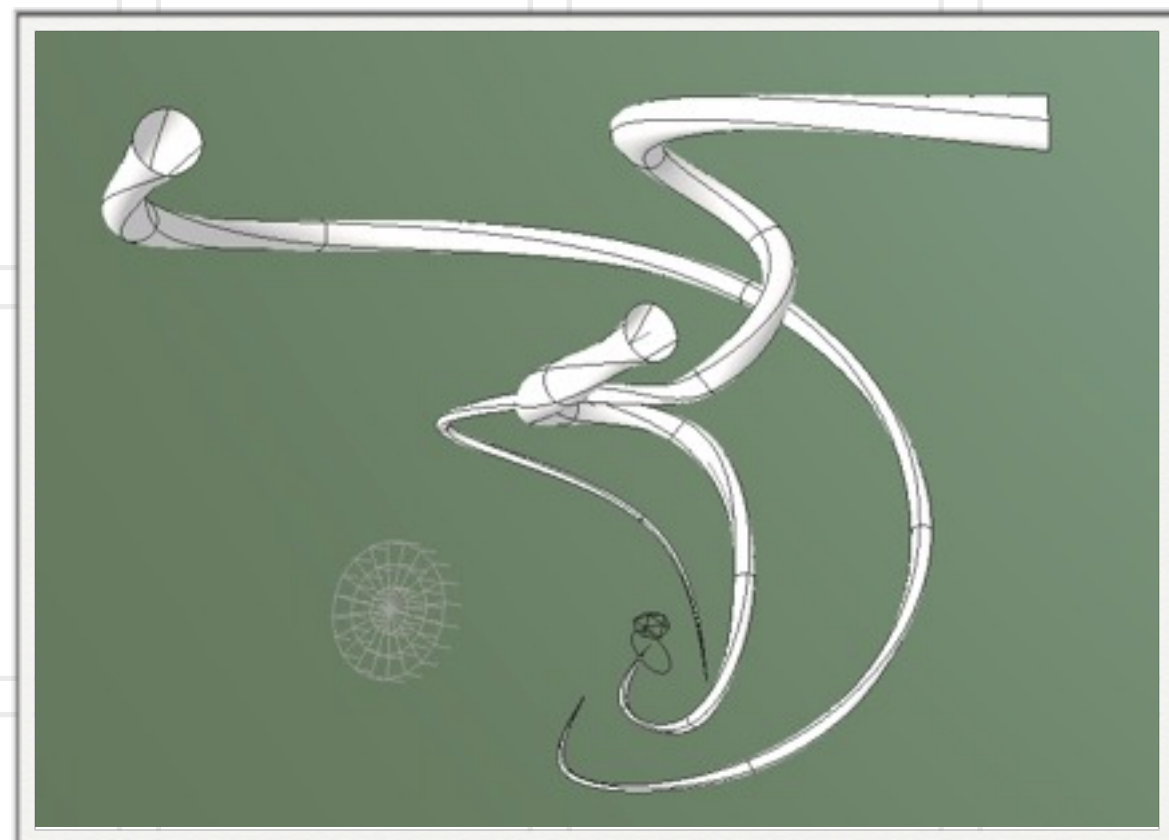


Making the Vine Trunks

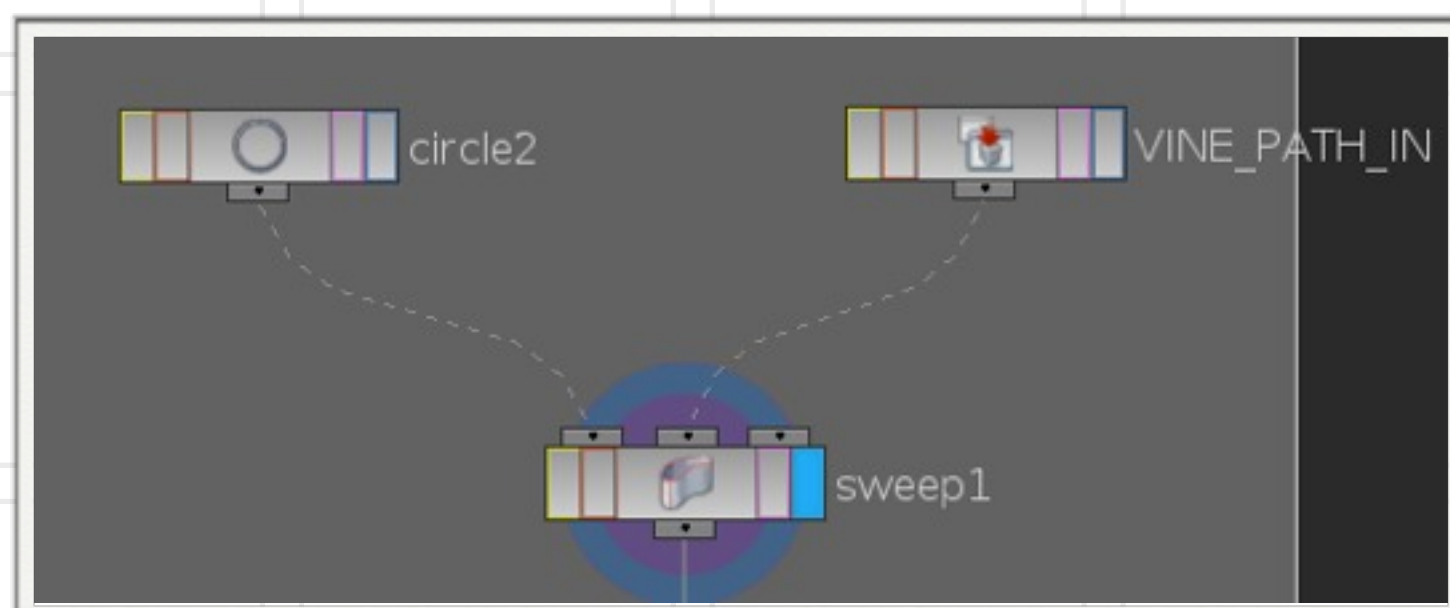
Creating Vine Trunks that Twist Around Each Other

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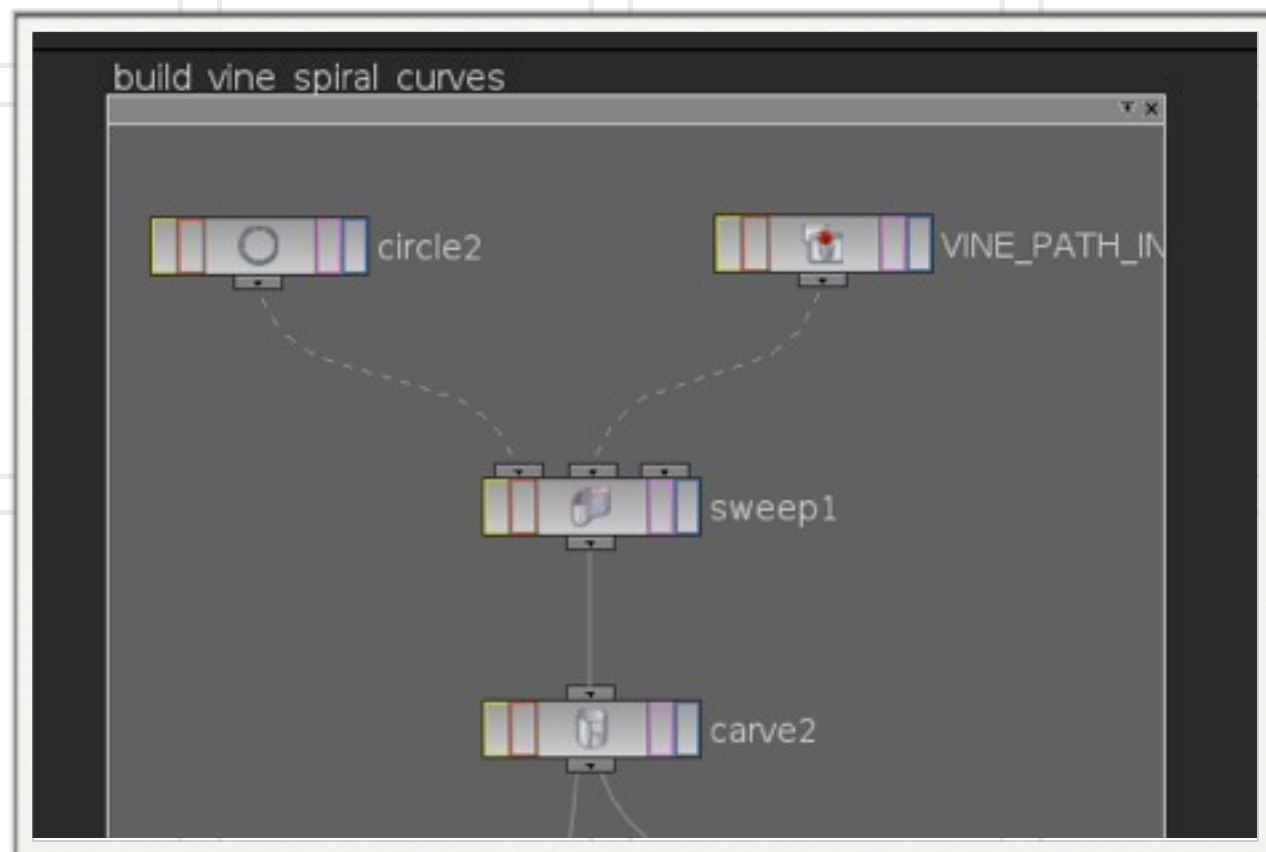
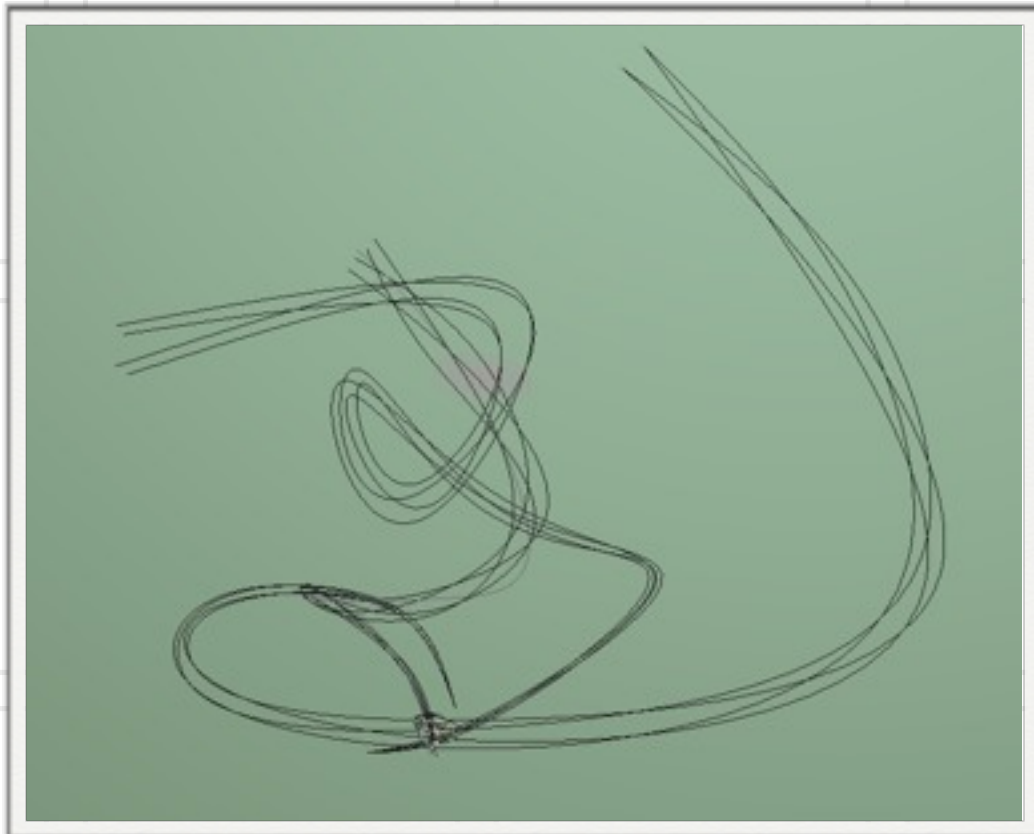
Creating the Twisting Trunk



- ▶ At the Object Level Drop down another Geometry
 - ▶ Rename it Vine Generator
 - ▶ Dive Inside
- ▶ Drop down a Object Merge
 - ▶ Point to - ../../vine_paths/VINE_PATH_OUT
- ▶ Drop down a NURBS Circle
 - ▶ Radius - 0.6, 0.6
 - ▶ Order 4, Divisions 4
- ▶ Append a Sweep and use the circle to sweep the Vine paths

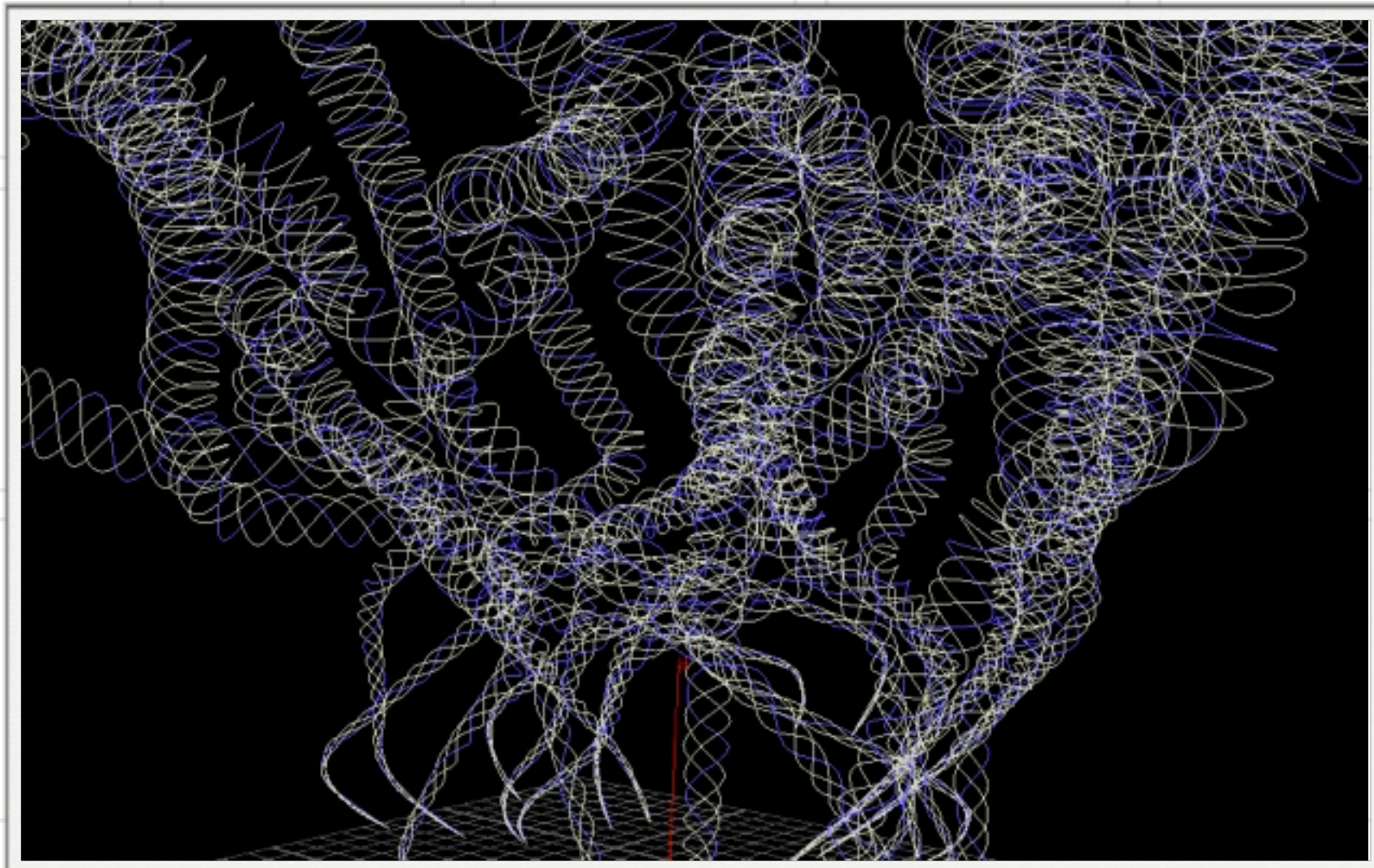
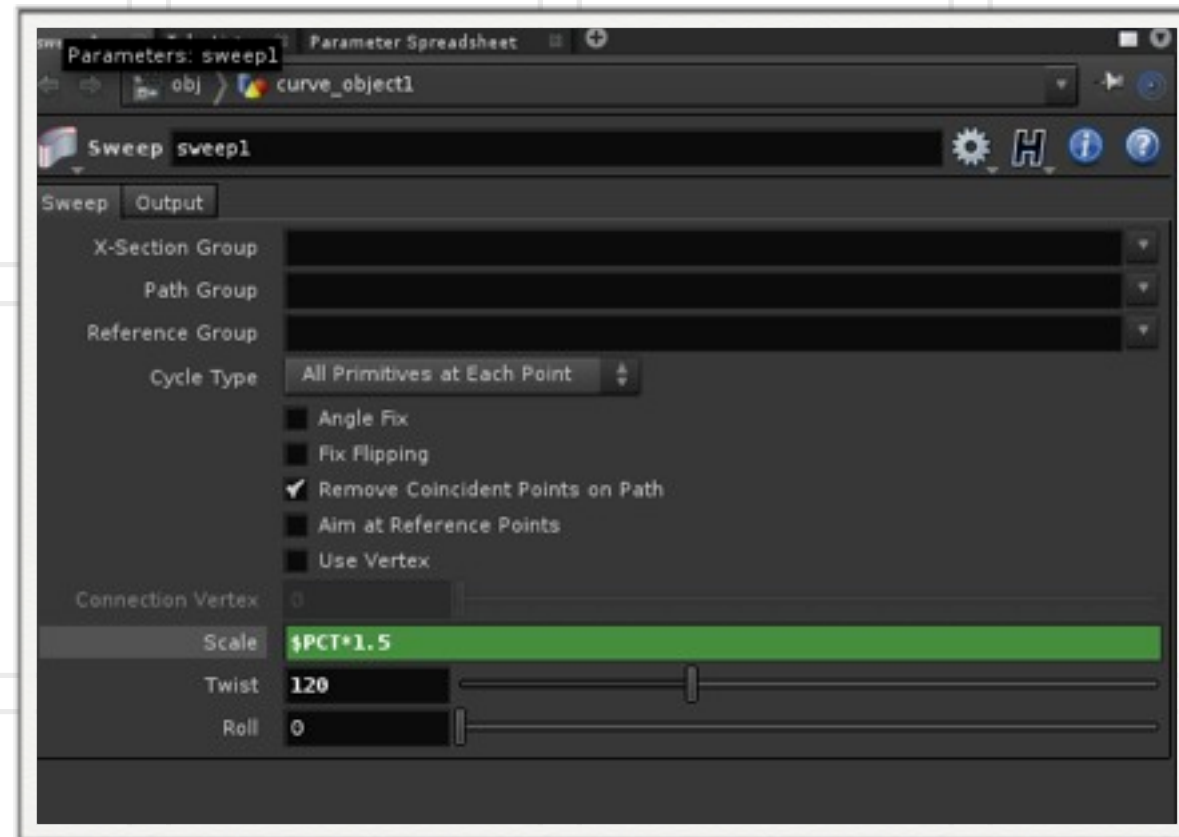


Creating the Twisting Trunk (cont.)



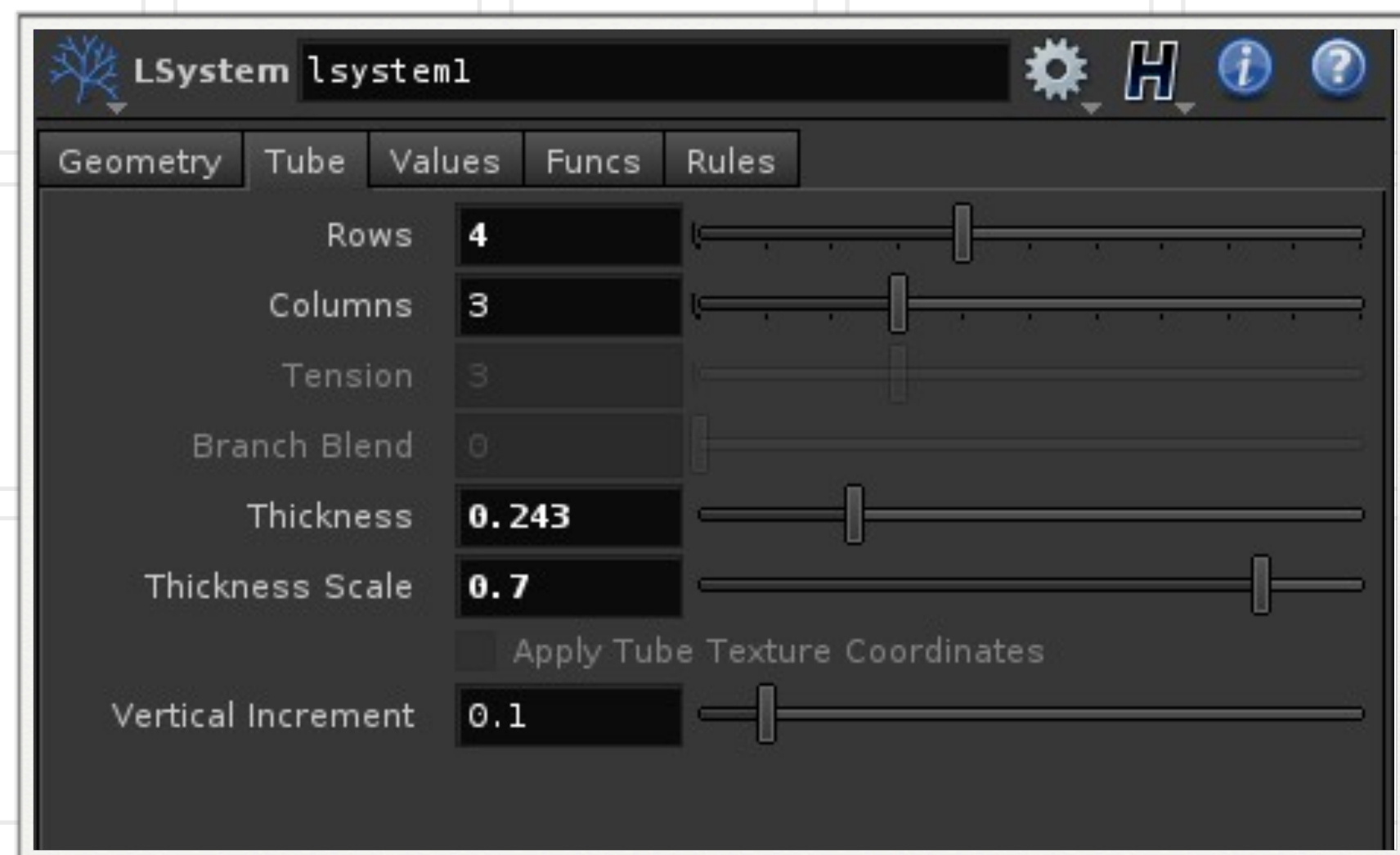
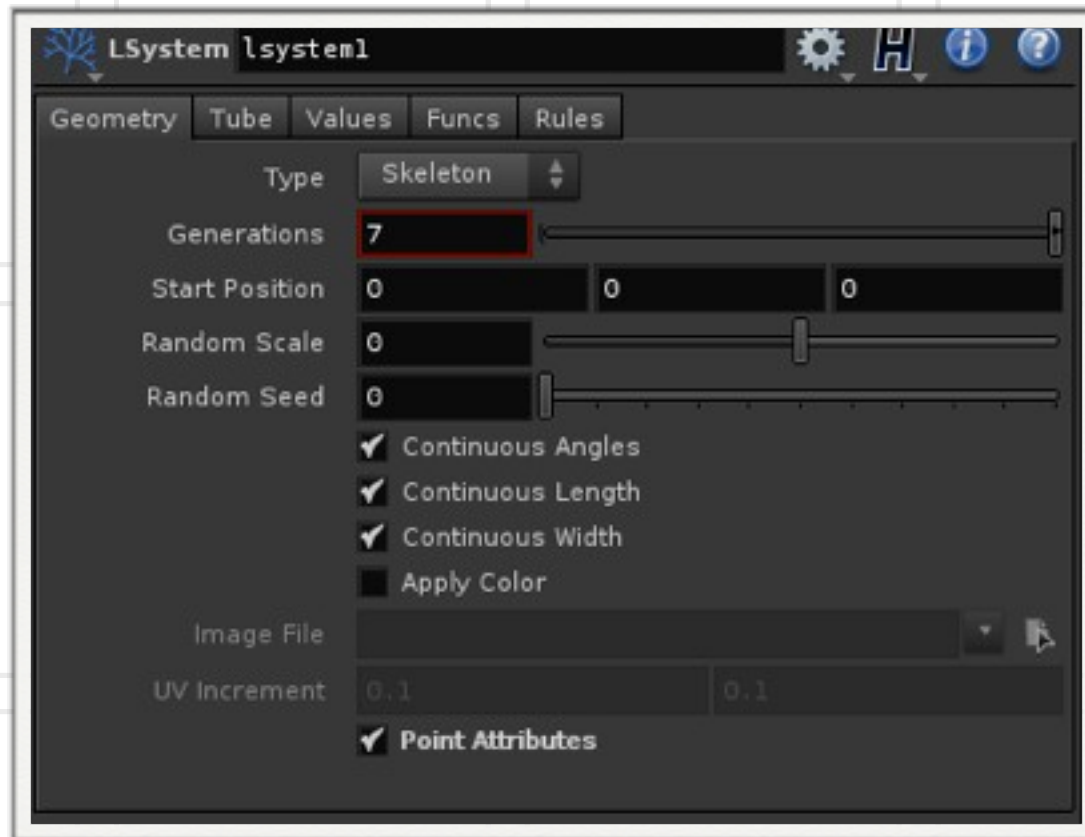
- ▶ Now like the pipes in Module 01 we need to break apart the tubes into separate curves to twist
 - ▶ Append a Carve to the Sweep
 - ▶ First U - 0
 - ▶ Second U - 1
 - ▶ Breakpoints Tab
 - ▶ Extract 3D Isometric Curves

Creating the Twisting Trunk (cont.)



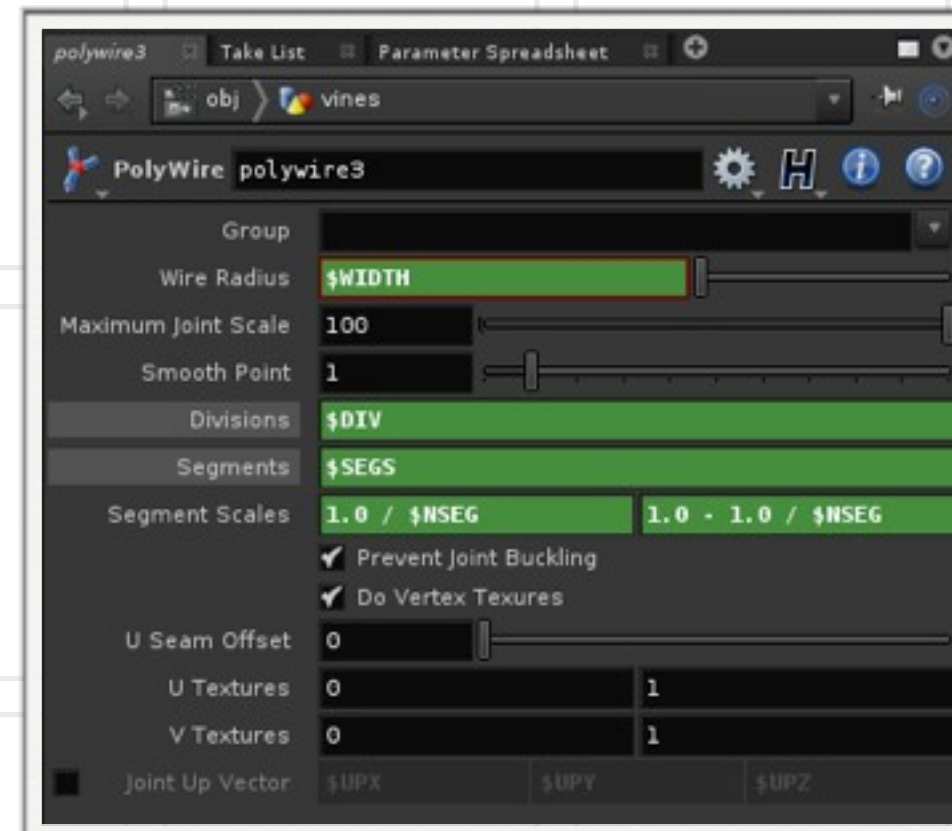
- ▶ Now let us make the twist
 - ▶ Select the Sweep SOP created a few steps ago
 - ▶ Scale - \$PCT (you can multiply this to get bigger spreads)
 - ▶ Twist 120

Creating the Twisting Trunk (cont.)

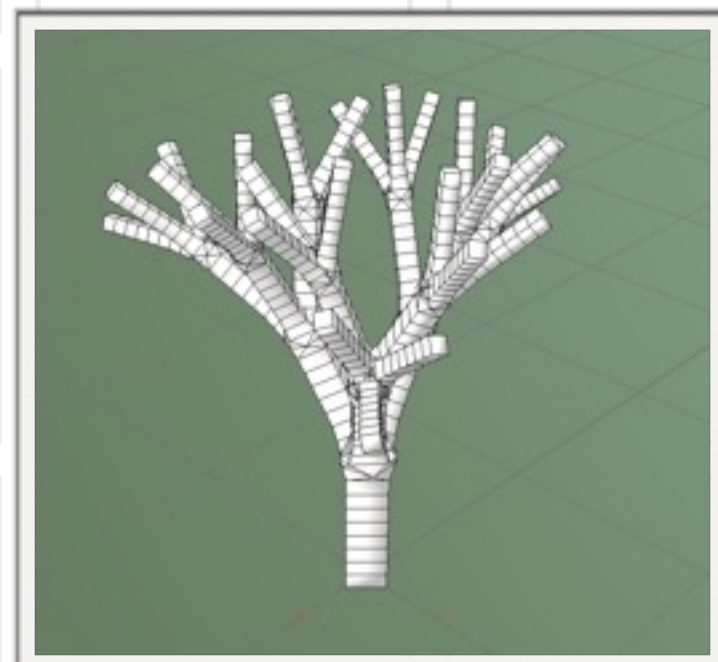
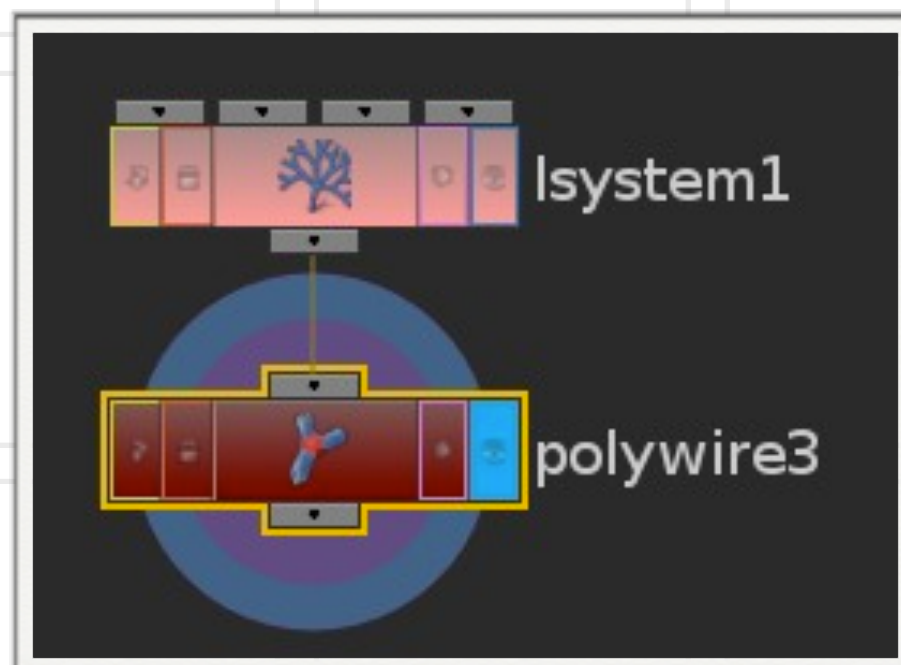


- ▶ We are about to use the Polywire to create the Trunks but first let us understand the attributes by dropping down a L-System
 - ▶ Drop down a L-System
 - ▶ Select the Tube tab
 - ▶ Notice everything is de-highlighted
 - ▶ Go to the Geometry Tab and Select Point Attributes
 - ▶ Go back to the Tube Attribute and notice parameters are enabled
 - ▶ Hover over the parameters to see names

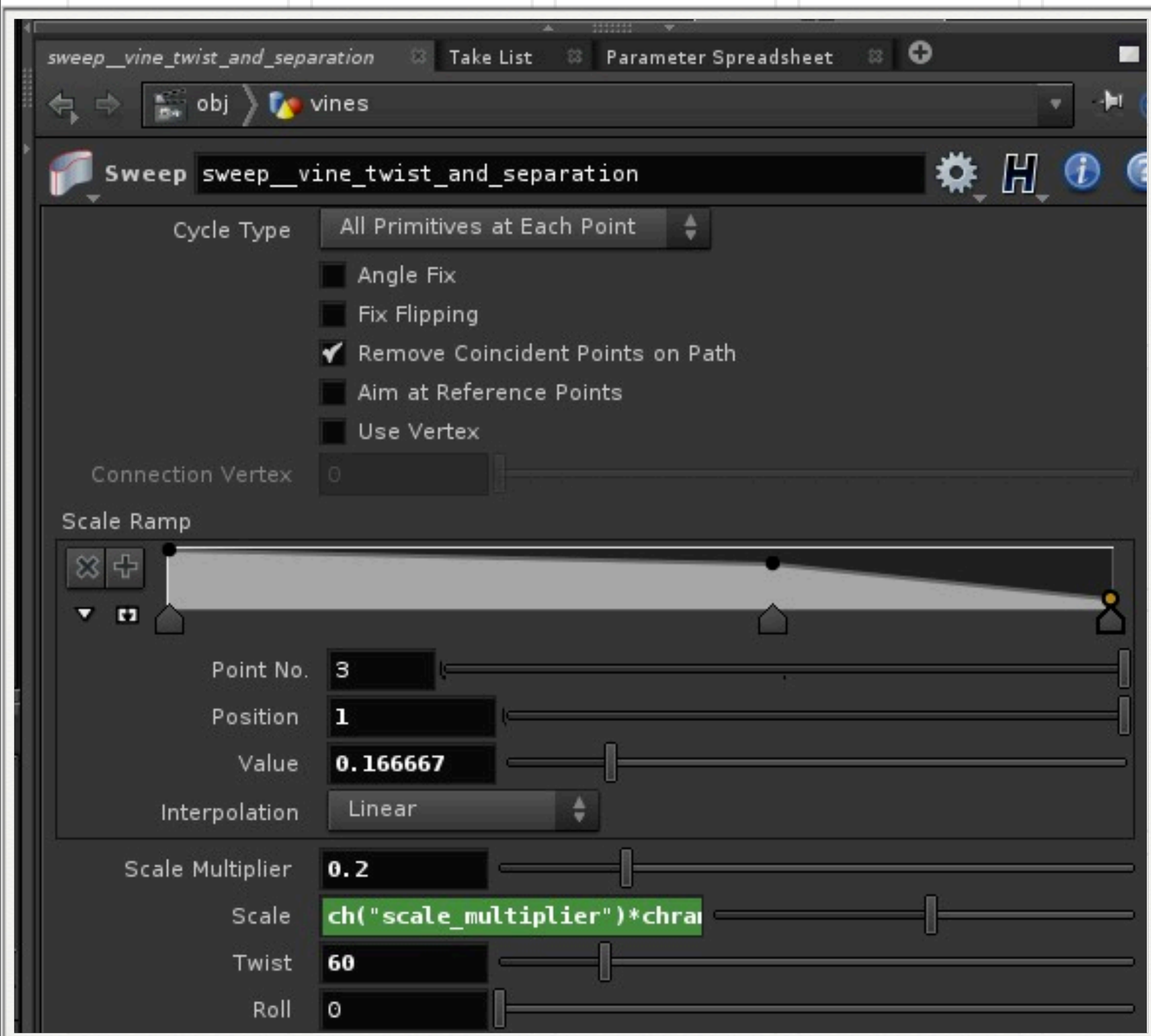
Creating the Twisting Trunk (cont.)



- ▶ Names of Importance
 - ▶ rows, cols, thickinit, thickscale, vertinc
- ▶ Append a Polywire
 - ▶ In the Presets for the Polywire
 - ▶ Choose - L-System Settings
- ▶ Rows map to \$DIV
- ▶ Columns map to \$SEGS



Creating the Twisting Trunk (cont.)



- ▶ OK back to our Vines
- ▶ First lets add some artist controls to the Sweep
 - ▶ Open - Edit Parameters
 - ▶ Add a Ramp,
 - ▶ name - scale_ramp
 - ▶ label - Scale Ramp
 - ▶ Add a Float
 - ▶ name - scale_multiplier
 - ▶ label - Scale Multiplier
 - ▶ Hit Accept
 - ▶ In the Scale Parameter -
`ch("scale_multiplier")*chramp("scale_ramp",$PCT, 0)`

chramp()

float chramp (string ramp_path, float position, float component_index)

Returns the value of a ramp parameter at a specific position.

<position> must be a value from 0 to 1.

<component_index> is the component of the evaluated value to return. For color ramps, it must be either 0, 1, or 2. For single-valued ramps, <component_index> must be 0.0

EXAMPLES

chramp("/obj/geo1/popnet1/color1/rampcolor", 0.33, 1)

Returns second component of the evaluated ramp value at a position of 0.33

Adding Attributes for the Polywire

After the Carve SOP append an Attribute Create

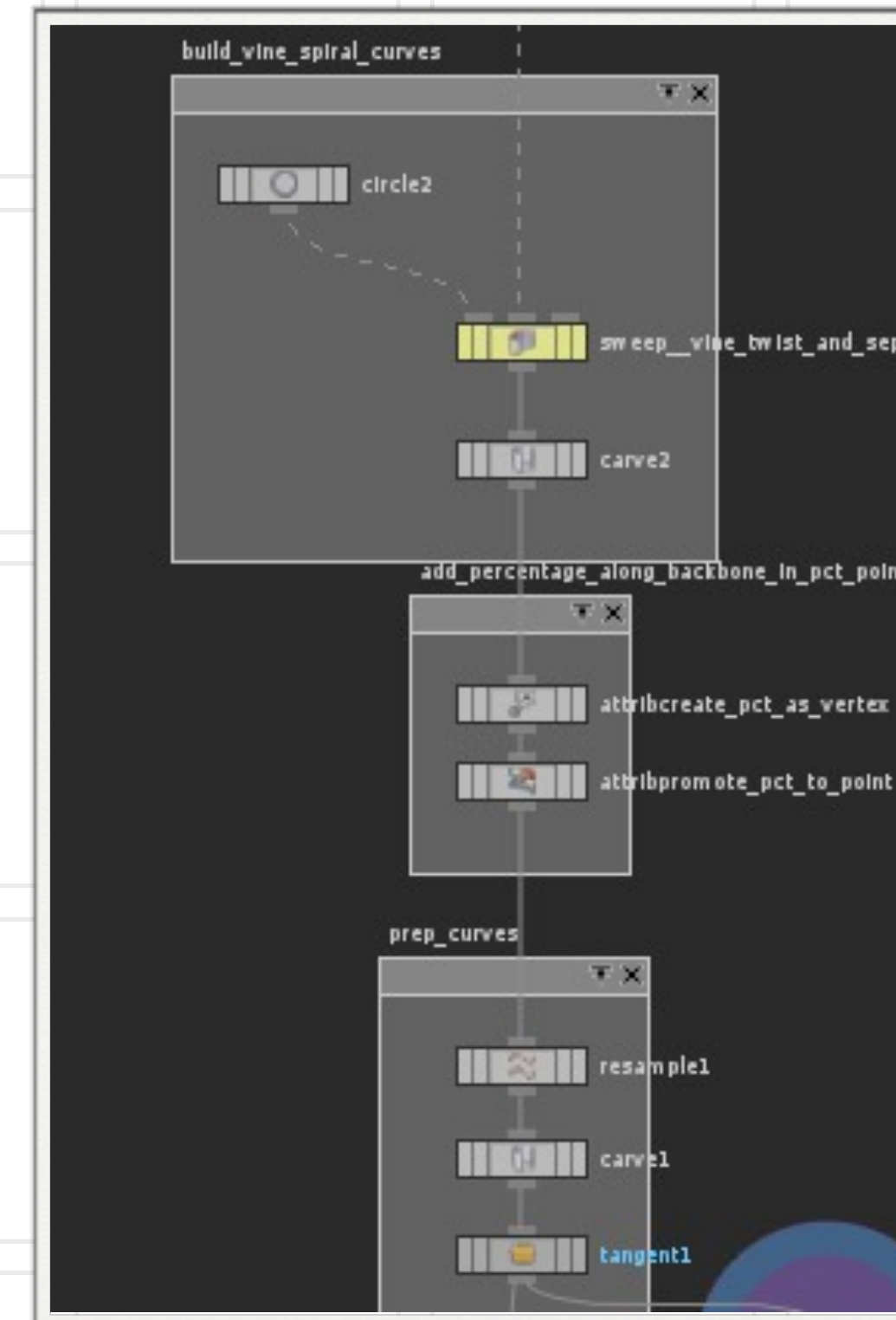
- ▶ Name - pct
- ▶ Class - Vertex
- ▶ Value - $\$VTX/(\$NVTX-1)$

Append a Attribute Promote

- ▶ Original name - pct
- ▶ Original Class - Vertex
- ▶ New Class Point

Carve Out the Area Where Leaves Will Be

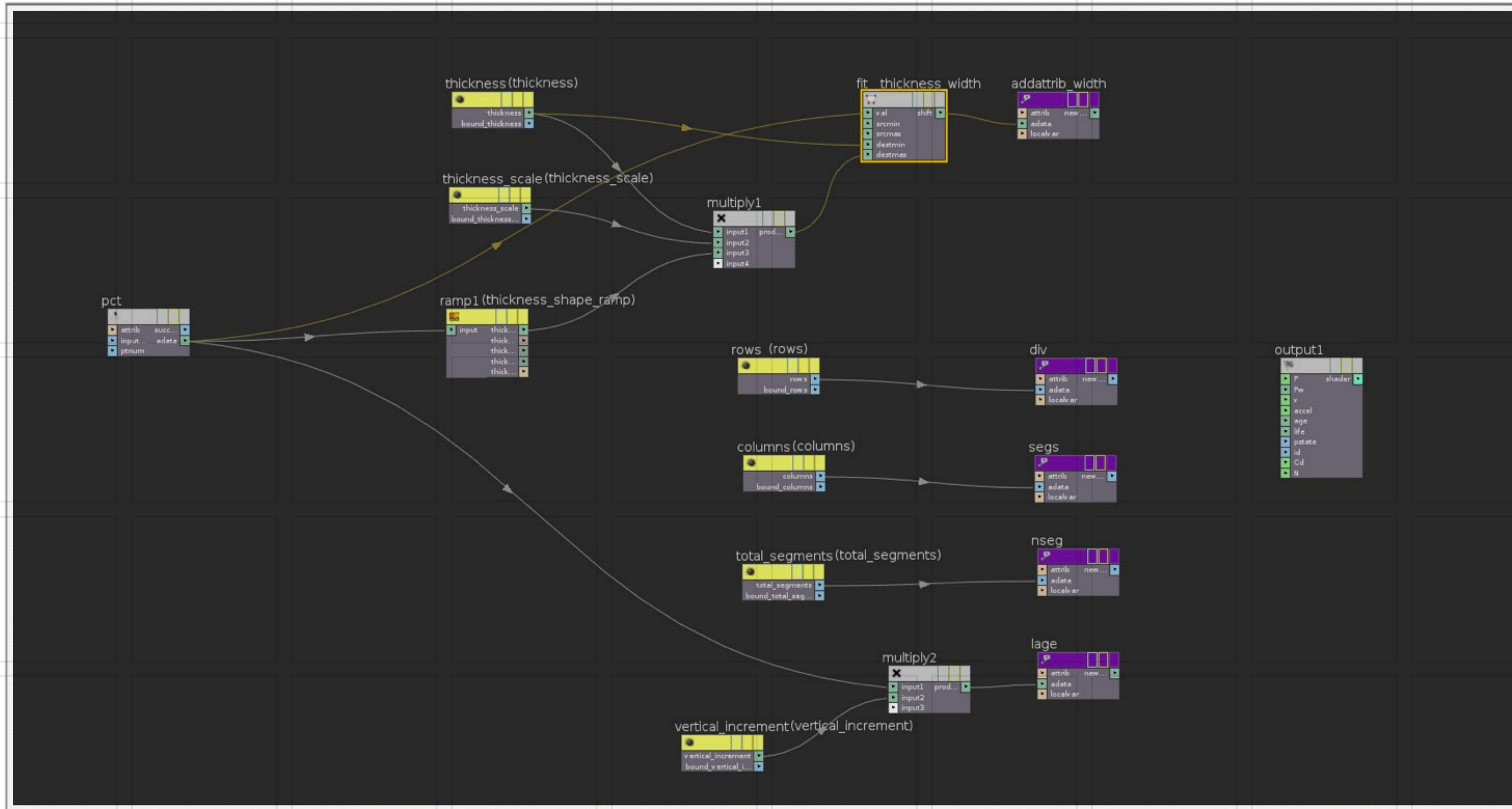
- ▶ Append another Carve
- ▶ We do not want leaves growing too close to the Ground
 - ▶ First U - 0.25
- ▶ Append a Tangent OTL
 - ▶ Where do I get the OTL?
 - ▶ Houdini Exchange
 - ▶ http://www.sidefx.com/index.php?option=com_wrapper&Itemid=148



What Does the Tangent Do?

This tool lets you build tangent and radial vectors for all input curves. This op is great for adding tangent velocities to be used in particle systems with attribute transfer SOP or POP. The radial attribute is useful to add normals that radiate out from a curve to birth particles from. Especially nice on circles.

VOPSOP to Create Polywire Attributes



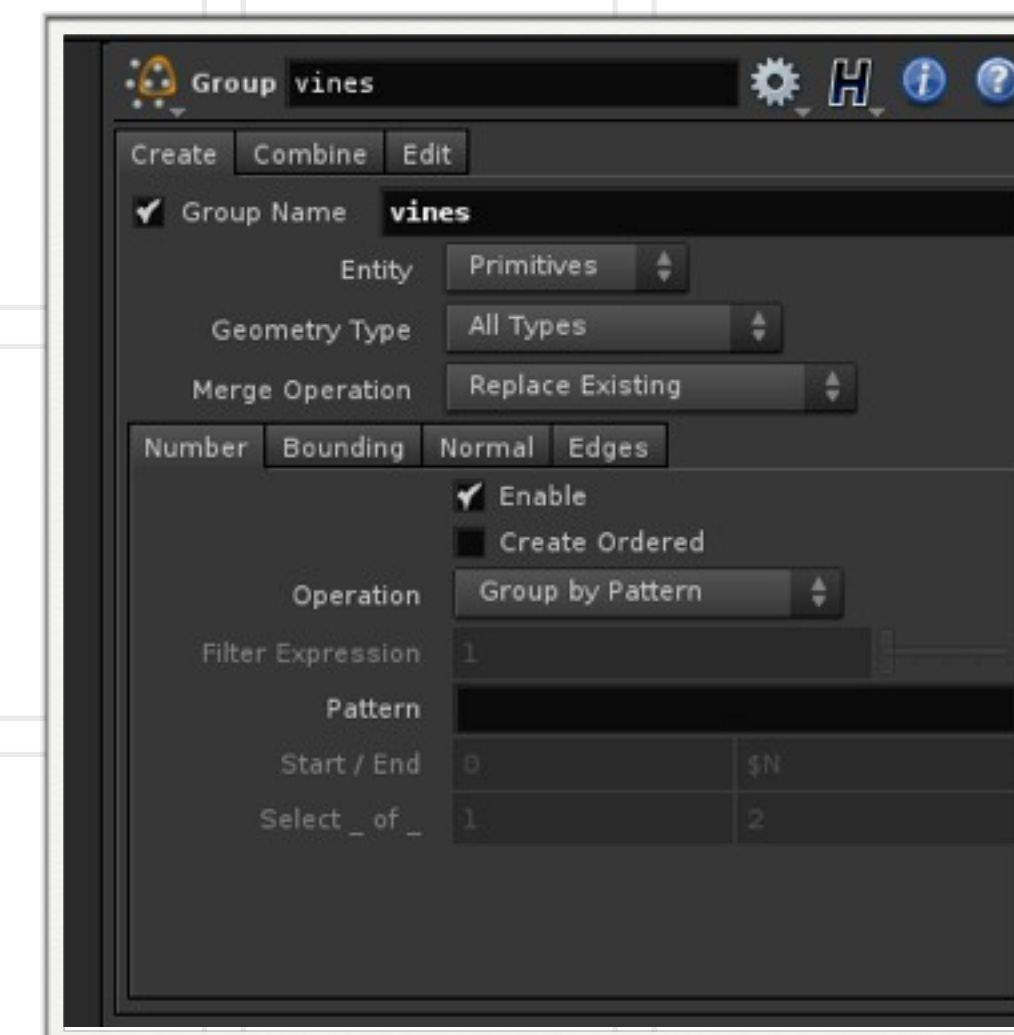
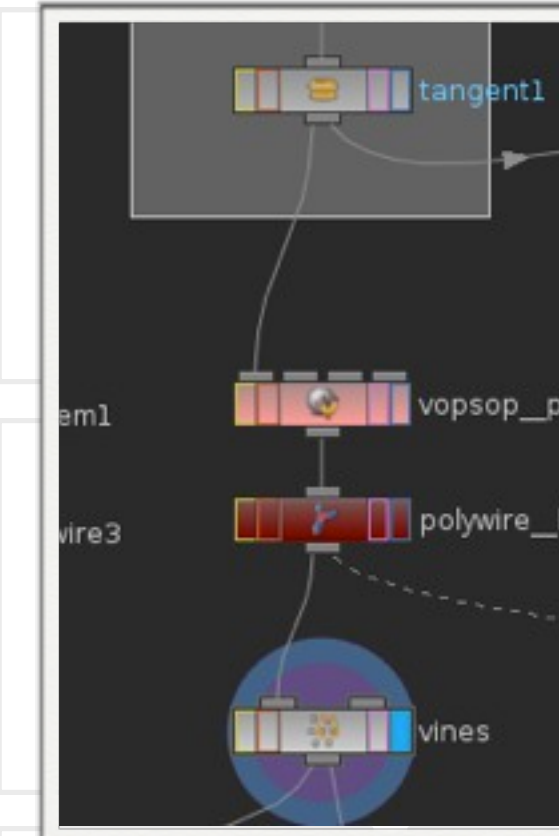
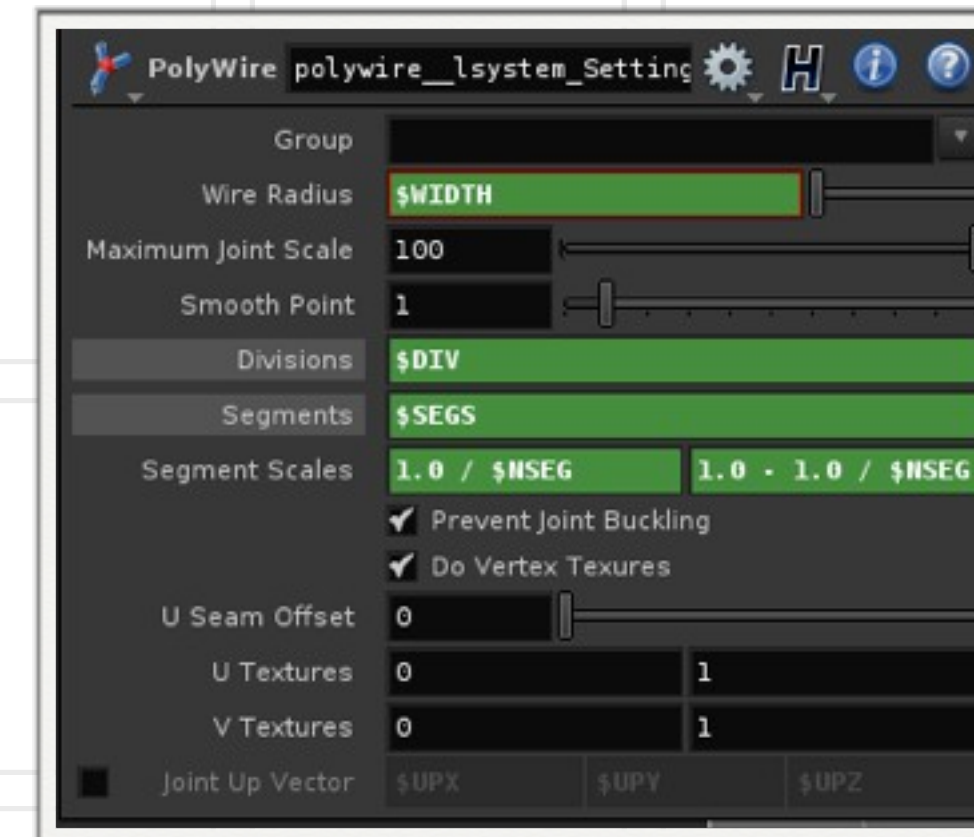
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Append a Polywire and Group Vines

Remember
to use LSystem
Preset in
Polywire



Resulting
Twisted Vines



SIDE EFFECTS
SOFTWARE



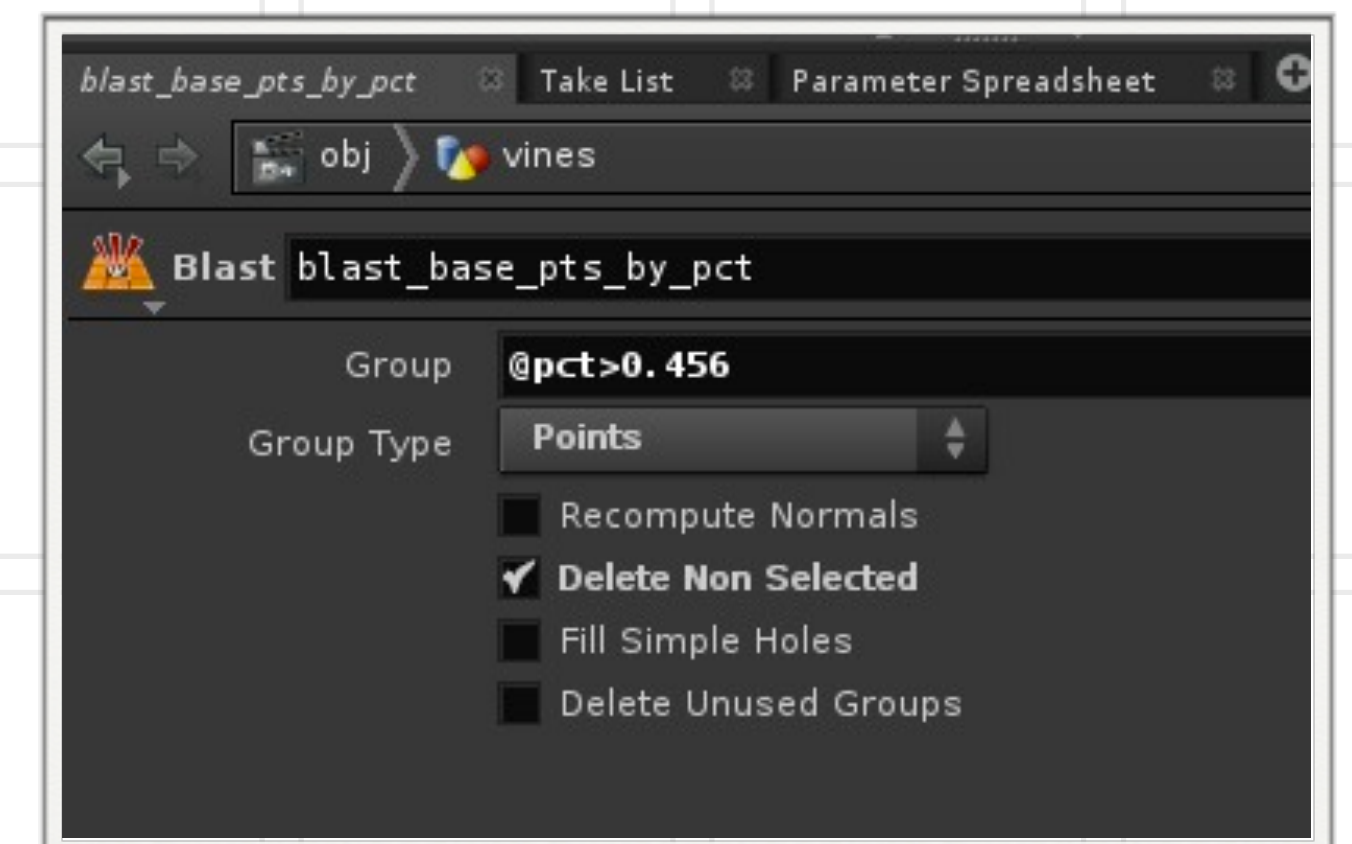
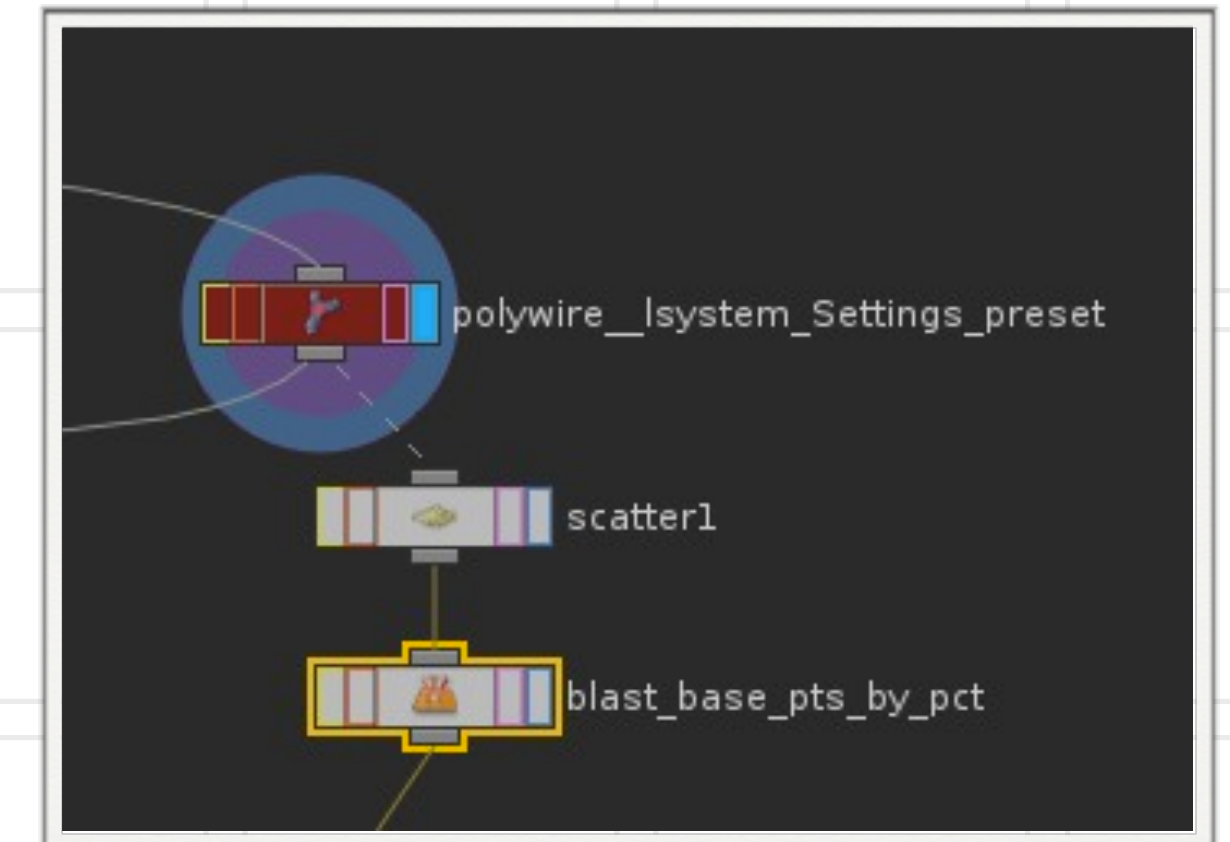
Creating the Anchor Points for the Leaves

That old familiar Scatter SOP

**SIDE EFFECTS
SOFTWARE**

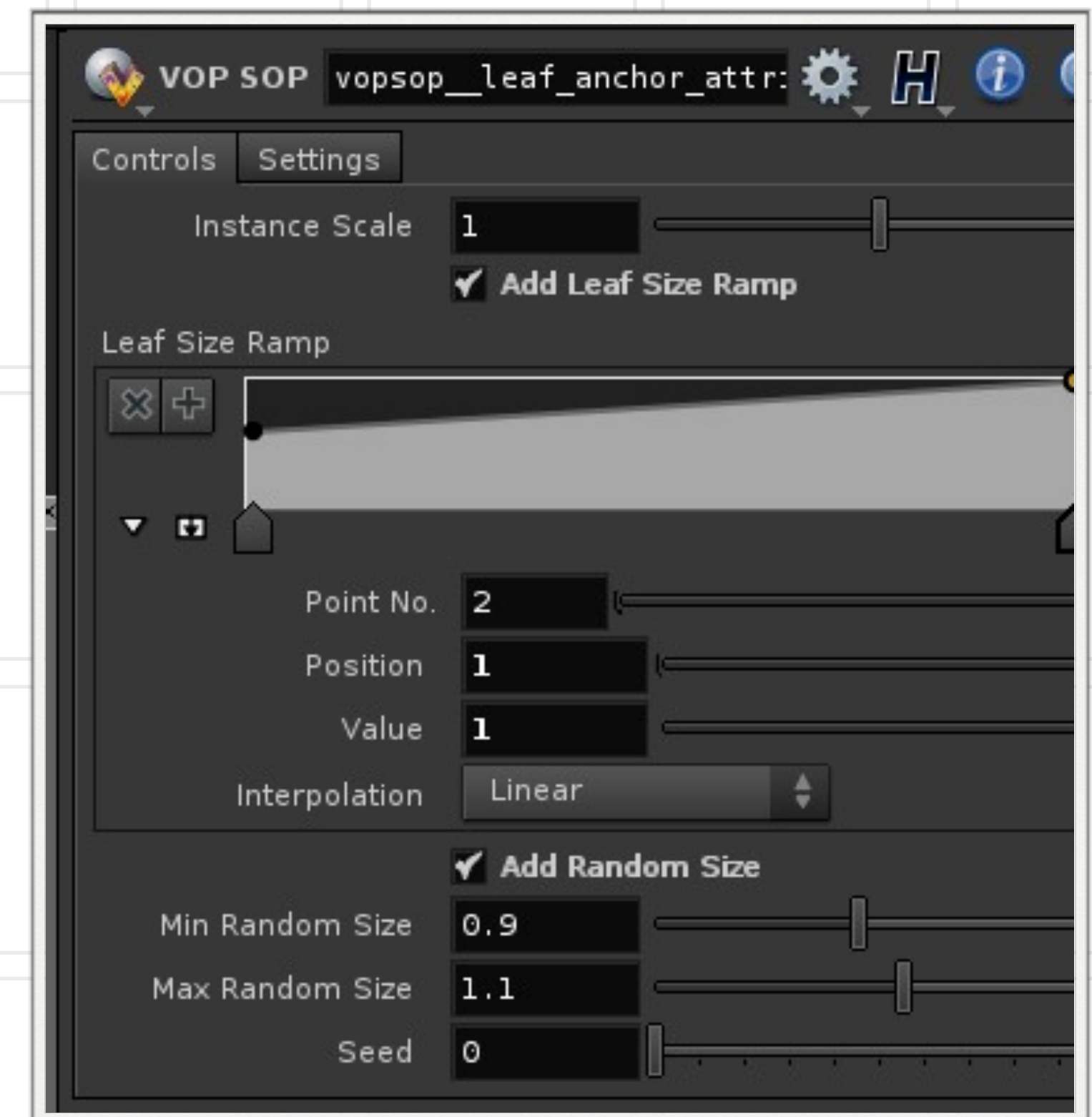
Scattering Points for Leaves

- ▶ After the Polywire append a Scatter SOP
- ▶ Try 15,000 points for now
- ▶ Append a Blast SOP (we do not want leaves below a certain point)
 - ▶ Group - @pct>0.456
 - ▶ Select - Delete Non Selected



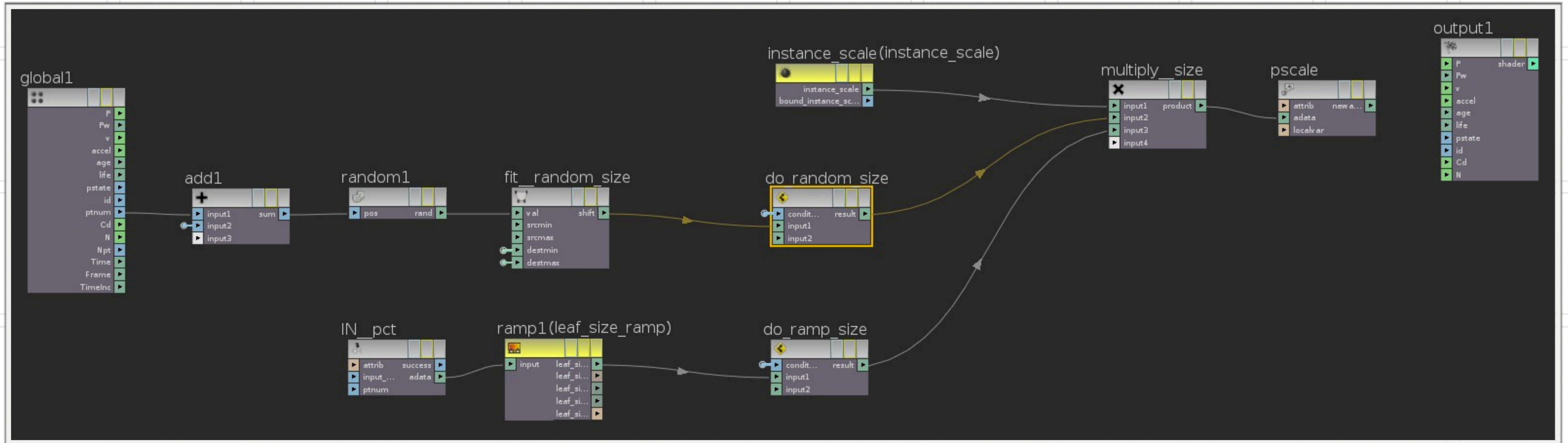
Creating Leaf Anchor Attributes

- ▶ We want to add attributes to the anchor points to tell the leaves what size they are
- ▶ We want the artist to control
 - ▶ The general ramp up of leaf size along the vines backbone (pct)
 - ▶ A Minimum Random Size
 - ▶ A Maximum Random Size
 - ▶ A Seed Value for the Random Function
- ▶ Append a VOPSOP

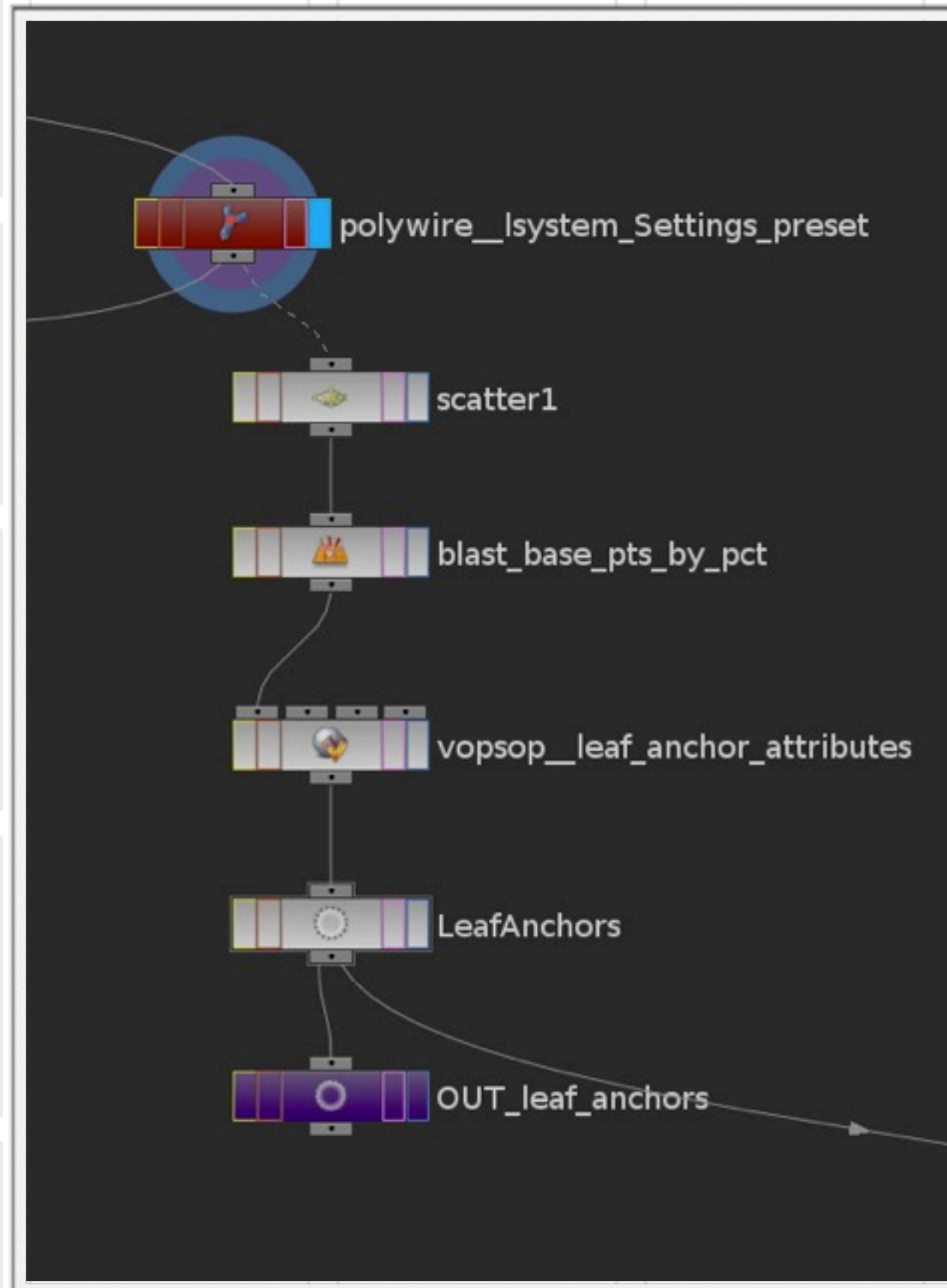


**SIDE EFFECTS
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Creating Leaf Anchor Attributes

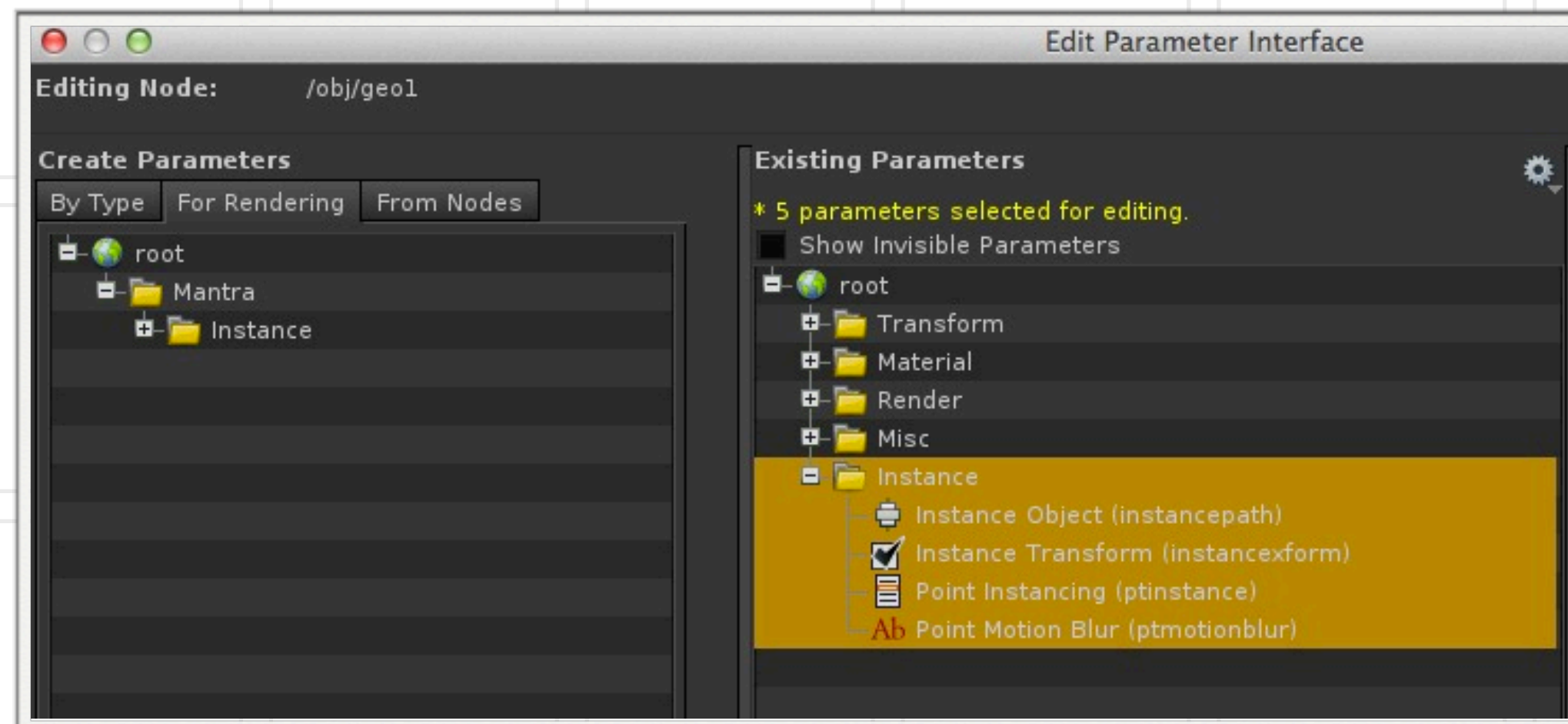


Creating Leaf Anchor Attributes (cont.)



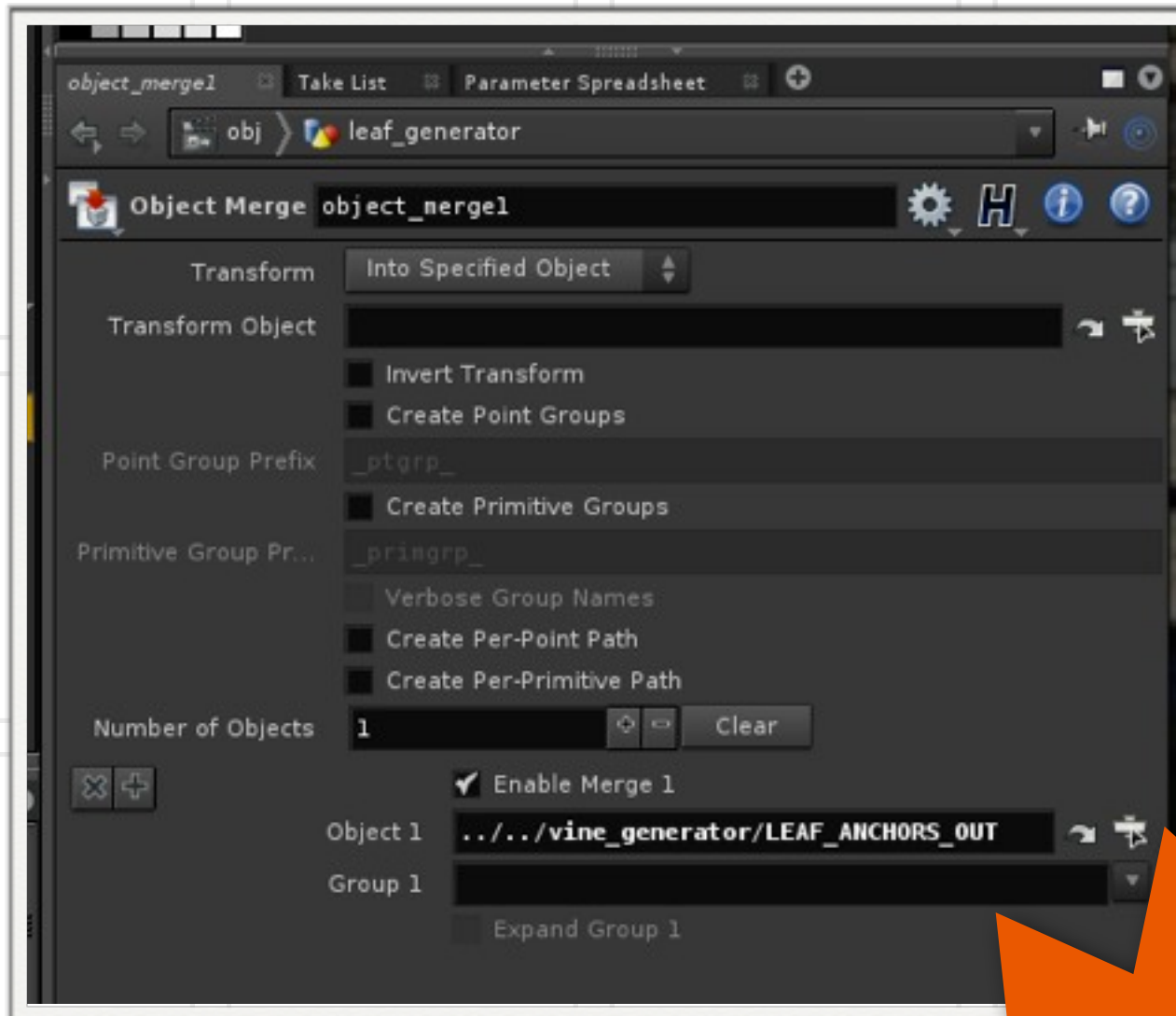
- ▶ Append a Null SOP to the VOPSOP
 - ▶ Name - Leaf Anchors
- ▶ Append another Null SOP
 - ▶ Name - LEAF_ANCHORS_OUT

Using Instances to Create Leaves

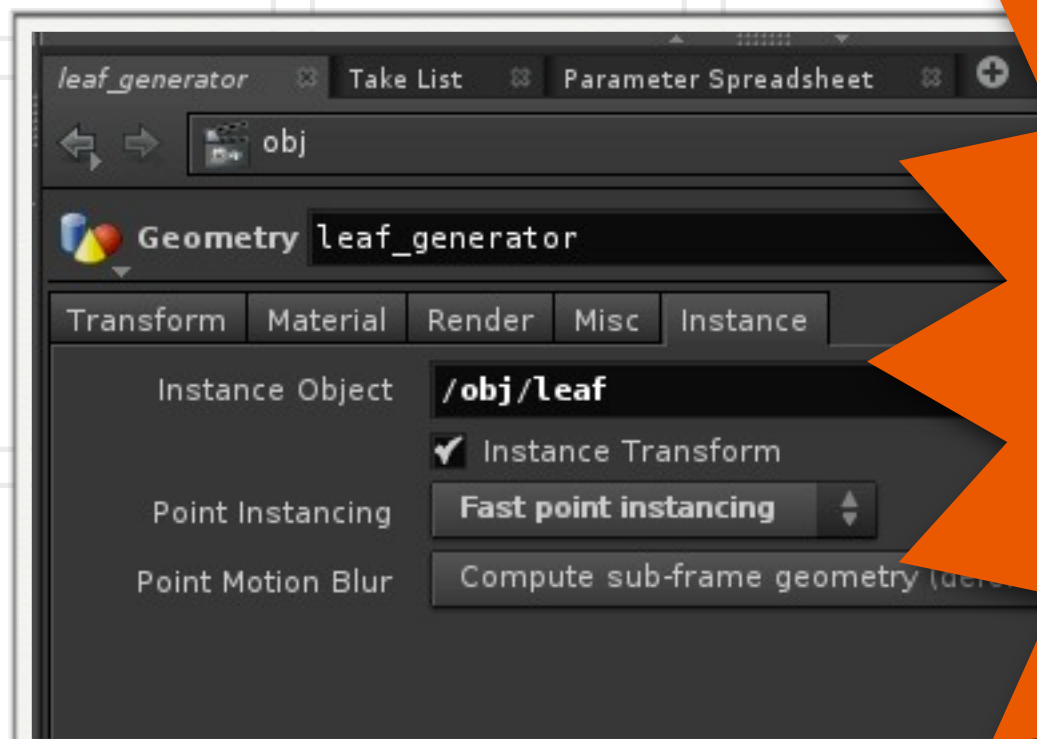


- ▶ At the Object Level Create a Geometry Object
 - ▶ Name - leave_generator
- ▶ Select - Edit Parameter Interface
- ▶ Select the “For Rendering” Tab
- ▶ In the Filter field type “Instance”
- ▶ Under mantra Move the entire Instance Folder over
- ▶ Click Accept

Using Instances to Create Leaves (cont.)

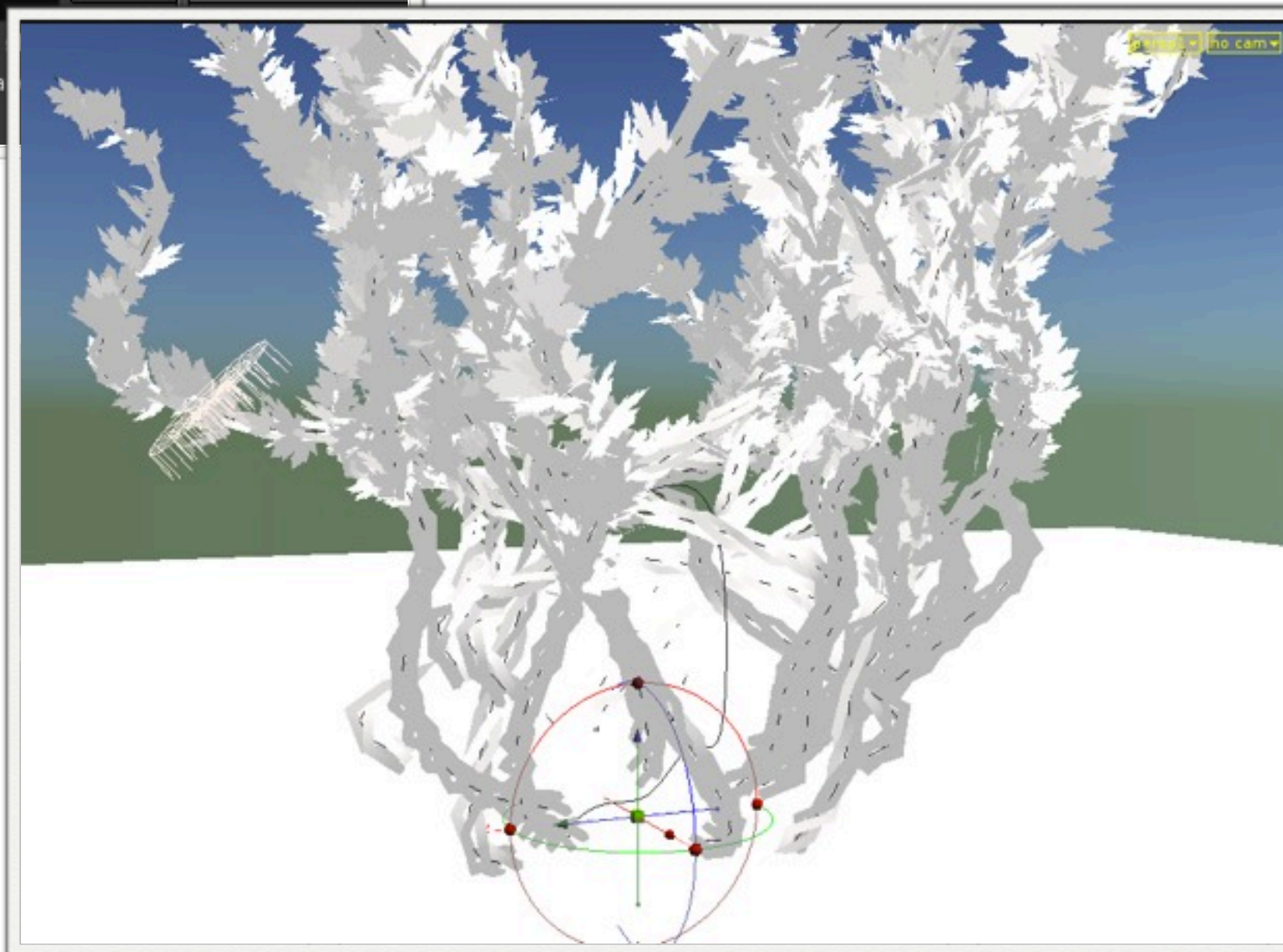
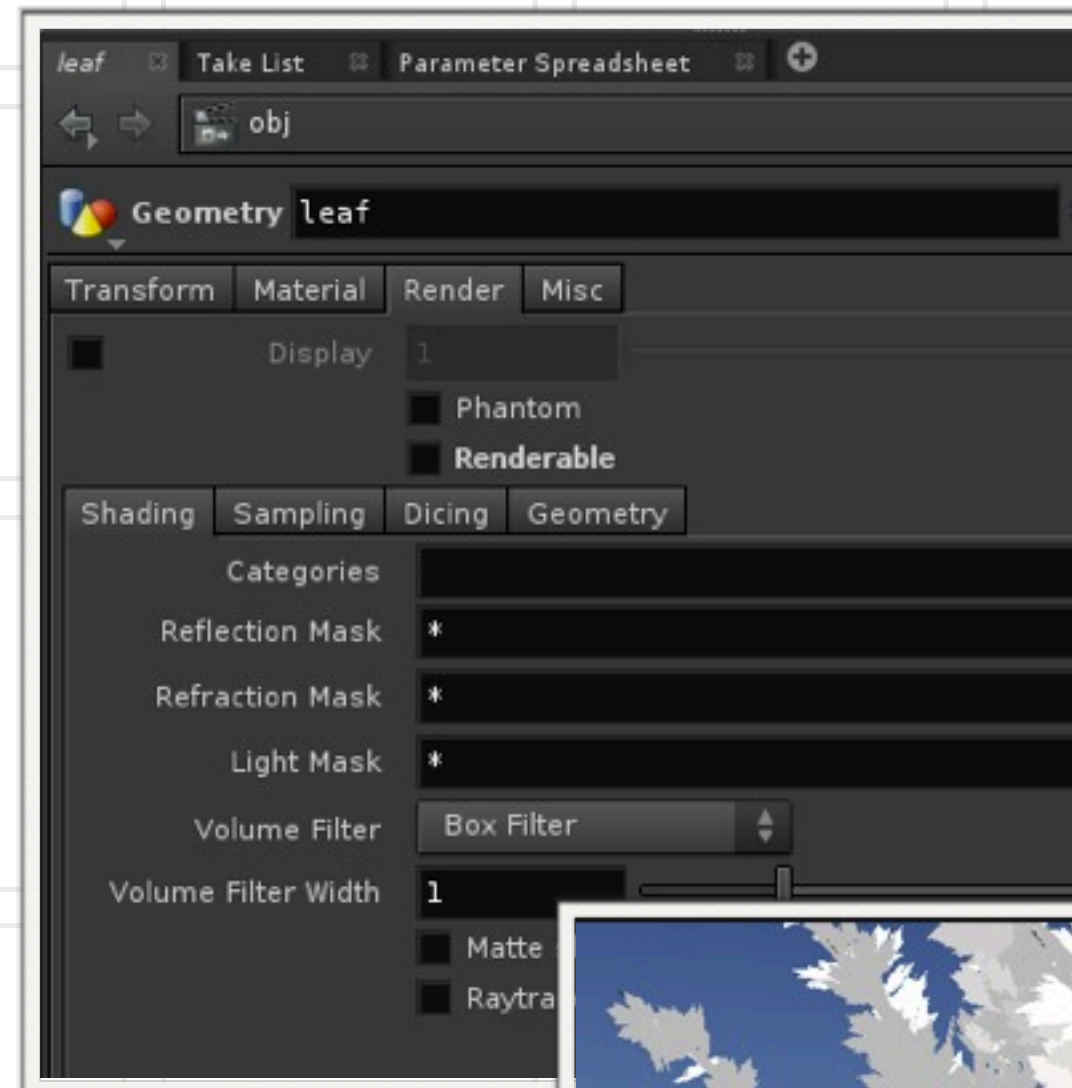


- ▶ Dive Inside the leaf_generator
- ▶ Delete the File SOP
- ▶ Drop down an Object Merge
 - ▶ Object - ../../vine_generator/LEAF_ANCHORS_OUT
- ▶ Back at the leaf_generator object
 - ▶ Instance Object - /obj/leaf
 - ▶ Point Instancing - Fast Point Instancing



Remember
for Fast point
instancing you
need an absolute
Path

Setting up the Leaf Object for Instancing



- ▶ Turn on the Visibility Flag
- ▶ In the Render Tab turn off Renderable



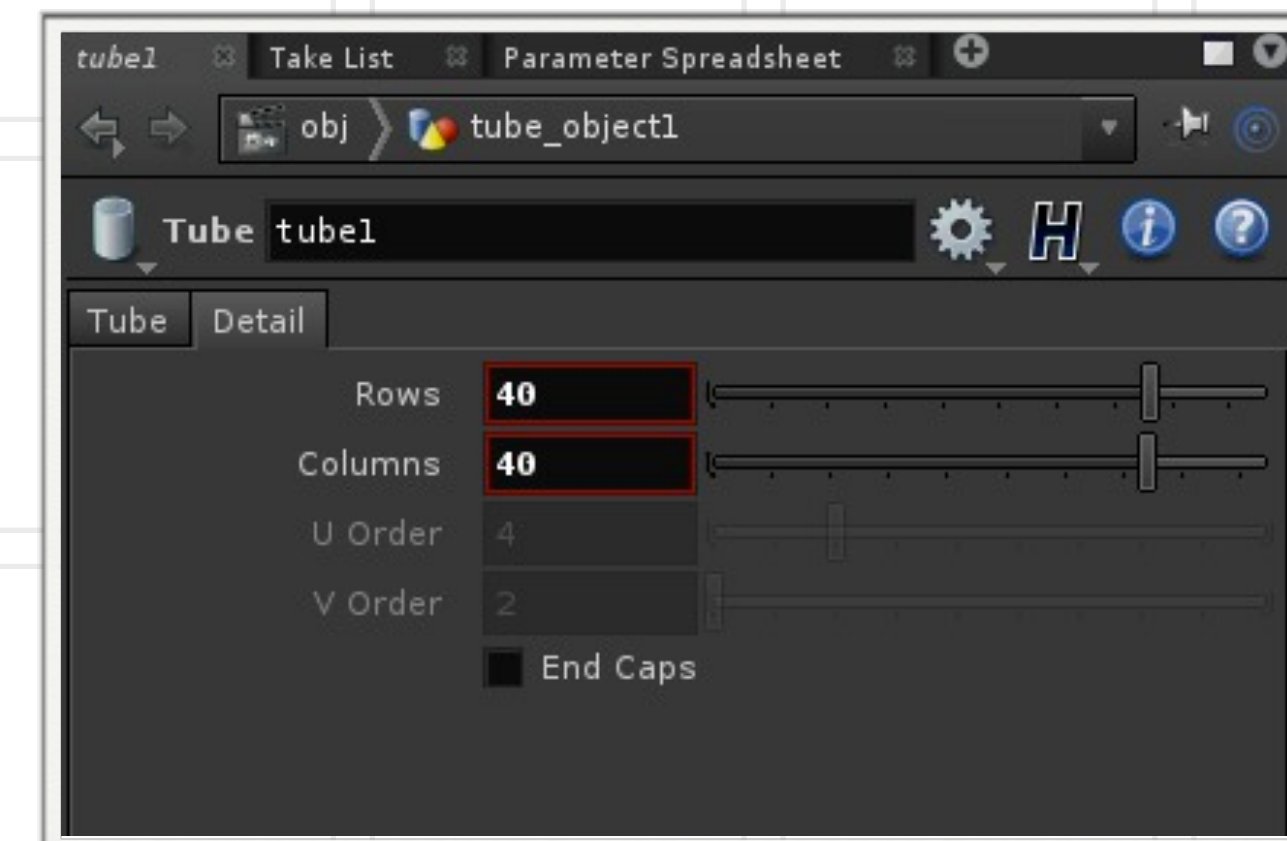
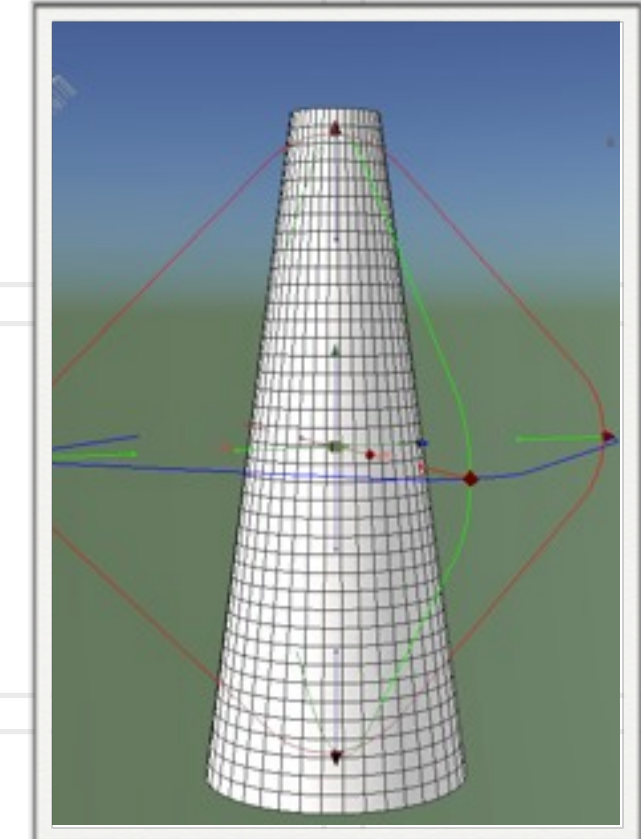
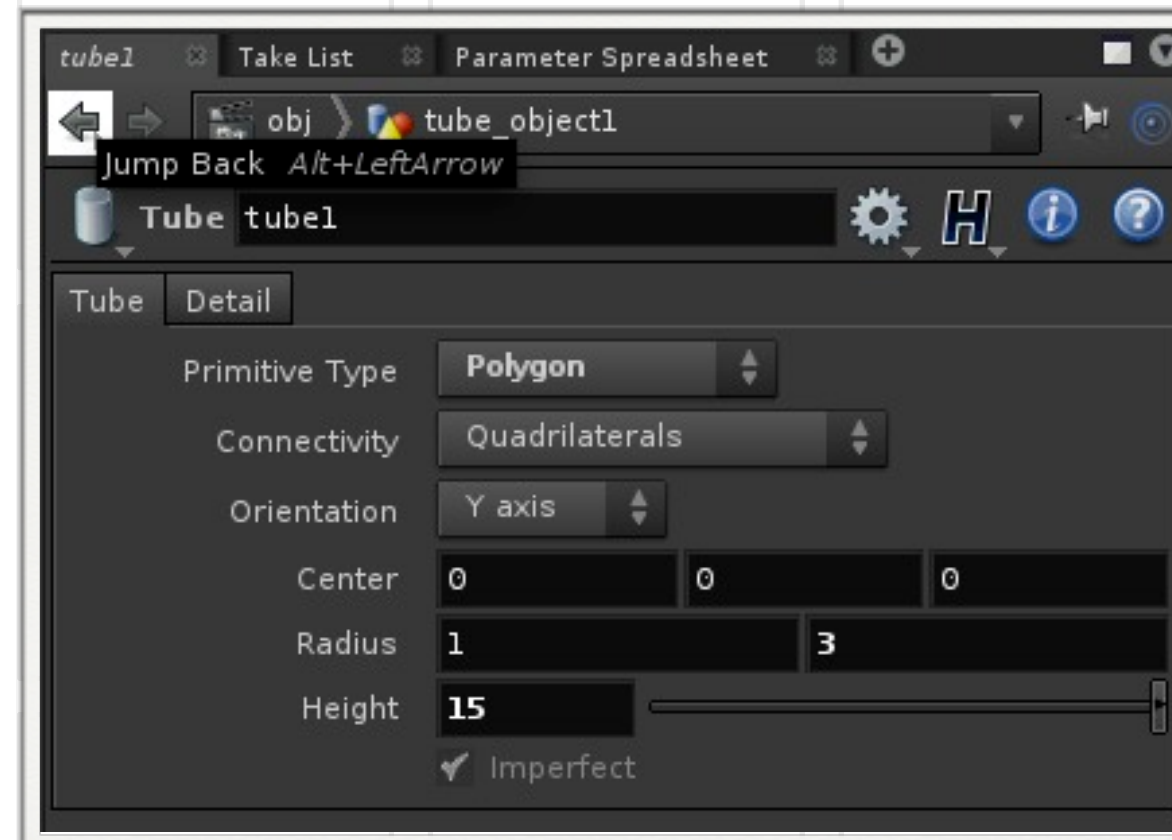
Drawing a Curve on an Object

Wrapping Vines around an Object

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Setup

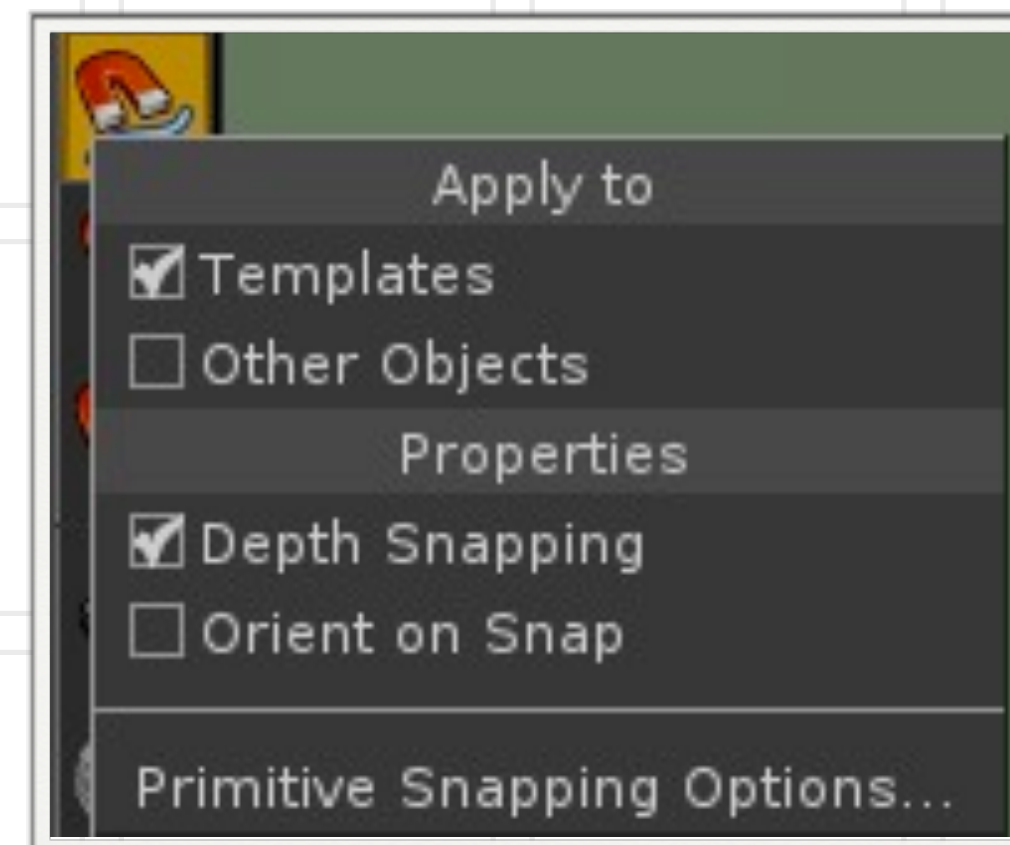
- ▶ Drop down a Tube at the Object Level
- ▶ Tube Tab
 - ▶ Primitive type - Polygon
 - ▶ Height - 15
 - ▶ Radius - 1,3
- ▶ Detail Tab
 - ▶ Rows - 40
 - ▶ Columns - 40



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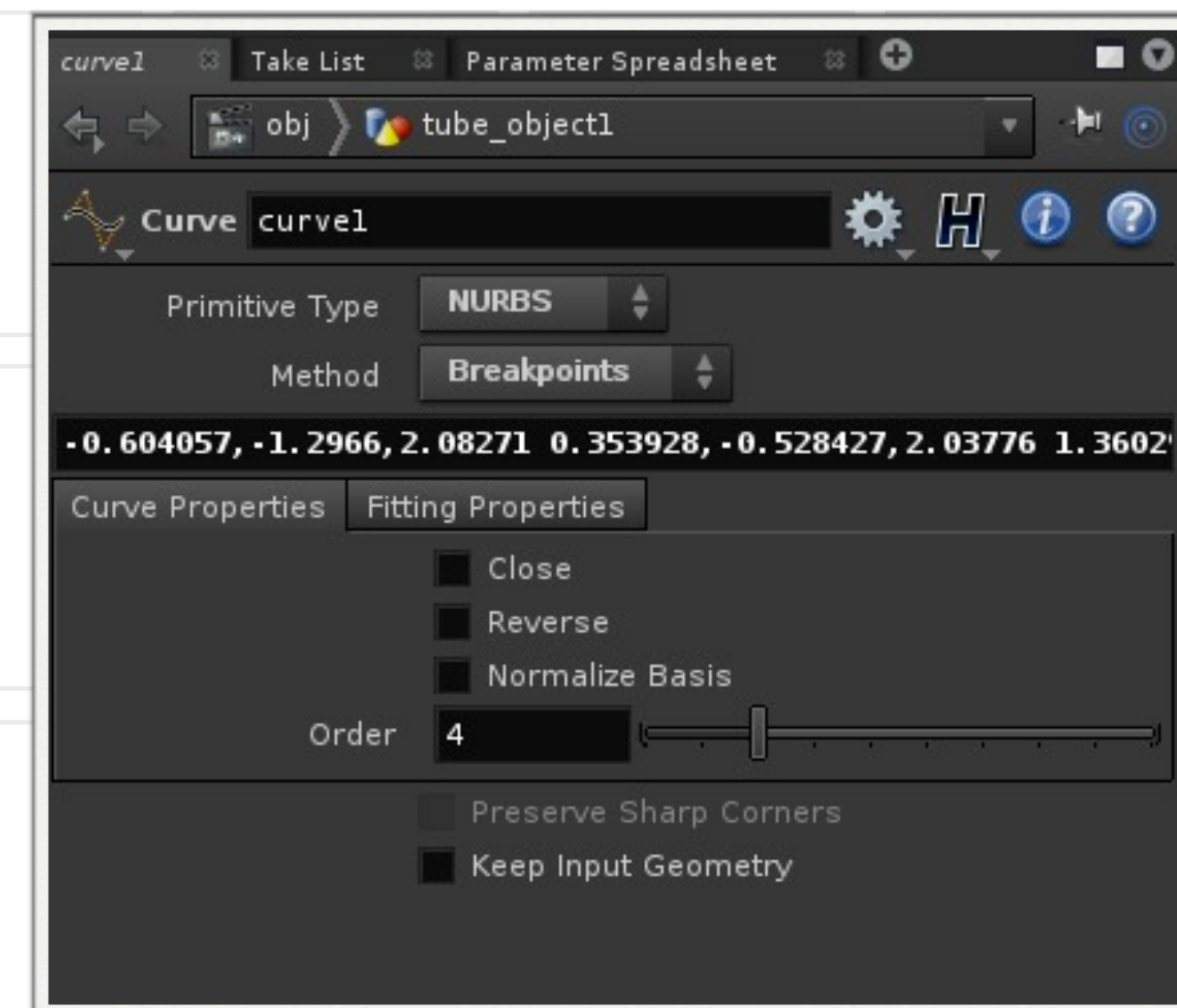
Drawing the Curve

- ▶ Inside the Tube Object
 - ▶ Drop down a Curve SOP
 - ▶ Select the Visibility Flag
 - ▶ On the Tube SOP Control Click on the Template Flag
 - ▶ Control Clicking makes the Template Selectable
- ▶ Back up at the Object Level
 - ▶ Select Primitive Snapping
 - ▶ Right Click on Primitive Snapping
 - ▶ Turn Off other Objects



Drawing the Curve (cont).

- ▶ Turn off the Construction Plane
- ▶ Draw curve on Tube
- ▶ In the Curve SOP
 - ▶ Primitive Type - NURBS
 - ▶ Method - Breakpoints





End Module 06

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