



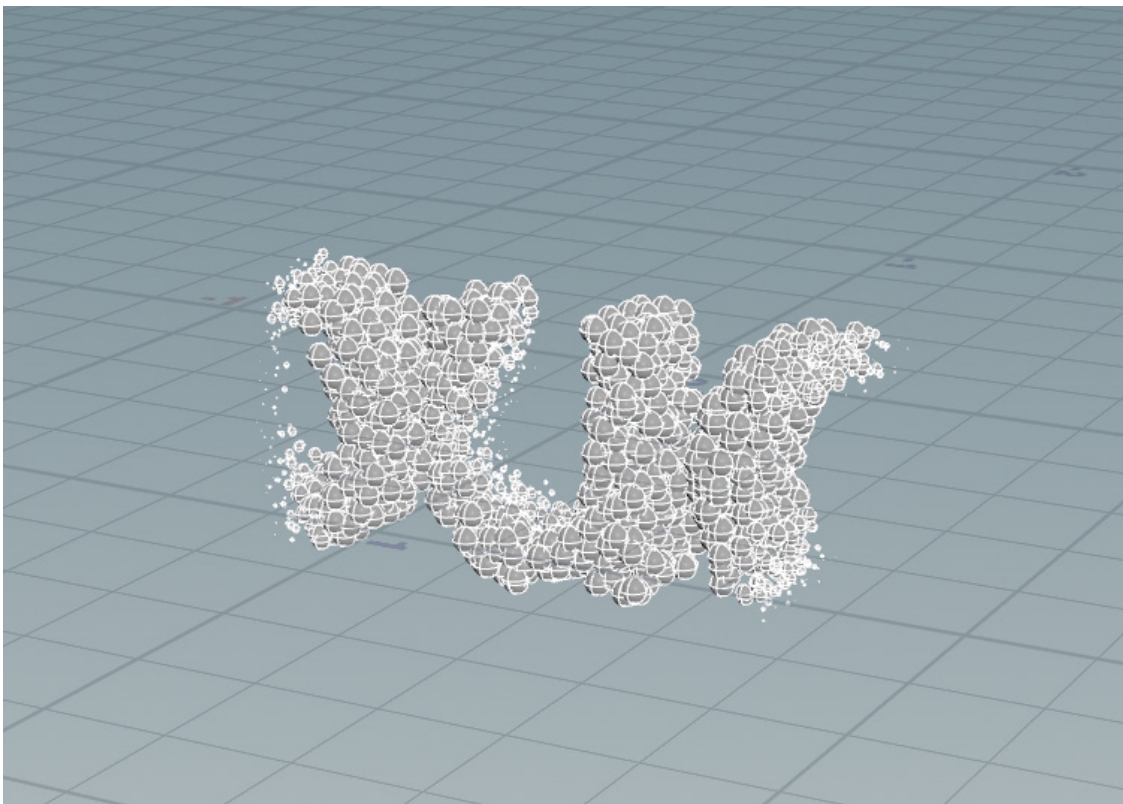
Curriculum-in-a-Box | Lesson 3 | Guided Work

# ADVANCED TEXT SCATTER

Students are now asked to follow-along with the teacher as they build something in Houdini. For this lesson, students will learn how to work with attributes, and how to use those attributes to manipulate copies of geometry. This specific example will take some text, scatter spheres into it, and animate the spheres' scales by transferring an attribute from a second piece of geometry. In order to achieve this, you will learn how to transfer an attribute with the Attribute Transfer SOP. Copying geometry to points and transferring attributes are fundamental concepts for working with geometry in Houdini, and students will have a much deeper understanding of this after completing the following exercise.

## WHAT STUDENTS WILL LEARN

- How to scatter points into the volumetric area of geometry
- How to transfer an attribute from one geometry to another
- How to use the Attribute Adjust nodes
- How to use the Copy to Points SOP to copy geometry
- How to use the Attribute Noise SOP to deform a sphere with animation



## PART ONE

# Text Creation and Point Scattering

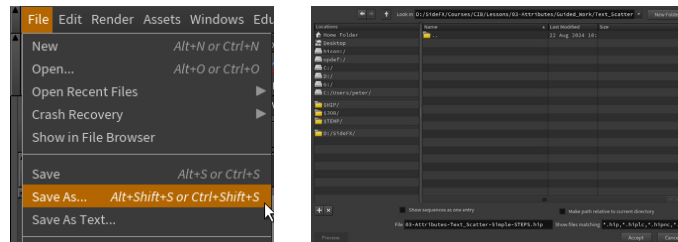
In this first section of the assignment, you will show your students how to set up their project, add text to the scene, and scatter points within it. These points will be the location onto which you copy your geometry later in the lesson.

### 1. Set up your Project Directory

- Download the *CIB\_Lesson03.zip* file and unzip it, then place it in the *documents>HoudiniProjects* directory.
- Open Houdini and from the **File** menu, choose **Set Project**.
- Navigate to the *CIB\_Lesson03* directory and press **Accept**.

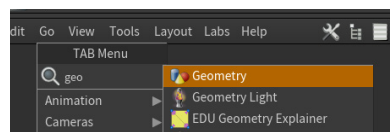
### 2. Save your Scene File

- From the File menu, choose **Save As**.
- Make sure you are in the *CIB\_Lesson03* directory, give the **File** a name and press **Accept**.

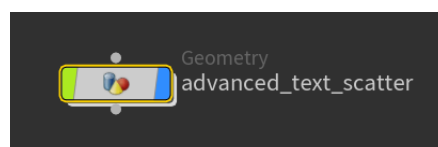


### 3. Set up the Geometry Network

- Press Tab in the Network View, start typing *geo*, then select **Geometry**.



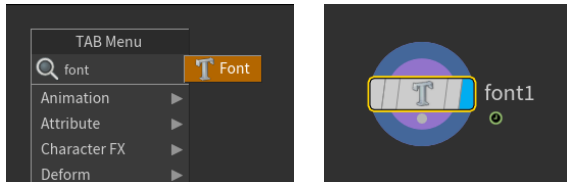
- Click in the Network View to place the node.
- Double-click the *geo1* name and change it to something like *advanced\_text\_scatter*.
  - This will be a container for the geometry that you create.



- Double-click the *advanced\_text\_scatter* node to dive inside.

#### 4. Add text to the scene

- Press **Tab** in the Network View, type *font*, and press **Enter**.
- **Left-click** to place the node.

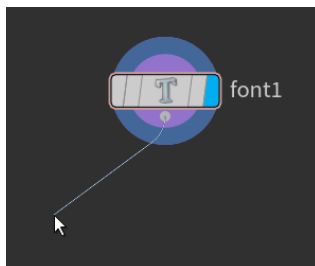


- In the Parameter Pane, change the **Text** to *Houdini*.
  - You should now see *Houdini* as 2D geometry in the Scene View.

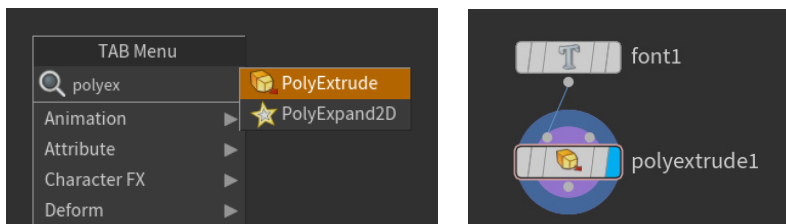


#### 5. Extrude the text

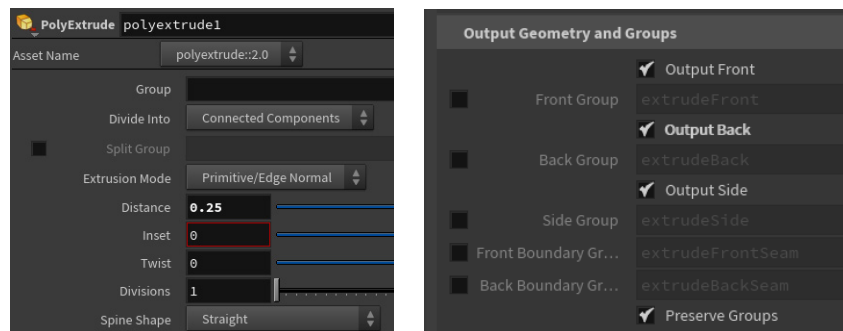
- **Left-Click** on the *Font* node's output dot.
  - You will now have a wire that follows your cursor and is connected to the output dot.



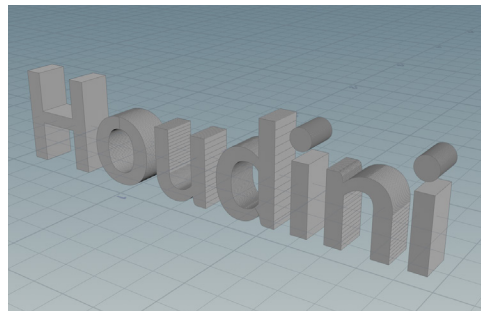
- Press **Tab** in the Network View, type *polyex*, and press **Enter**.



- A new *PolyExtrude* node will be placed in your Network View, and will be connected to the *Font* node.
  - You can move the new node in order to keep your network organized. You should see the node snap into alignment with the positions of the other nodes that are already in the network.
- Click the right-most section of the *PolyExtrude* node to move the blue Display Flag.
  - This allows us to visualize what the *PolyExtrude* node is doing. The Display Flag is a cornerstone of using Houdini because it lets you visualize the result of all nodes that were placed before the one with the Display Flag.
  - If your *PolyExtrude* node isn't highlighted in yellow, click on the center of it in the Network View.
- In the Parameter Pane, change the **Distance** to **0.25**.
- Scroll down to the **Output Geometry and Groups** section, and check the box next to **Output Back**.

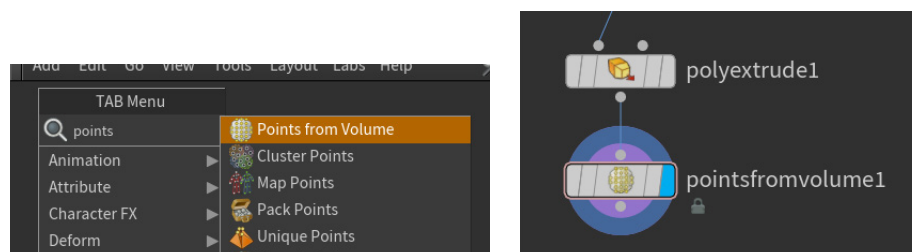


- You should now see your text as closed, 3D geometry.

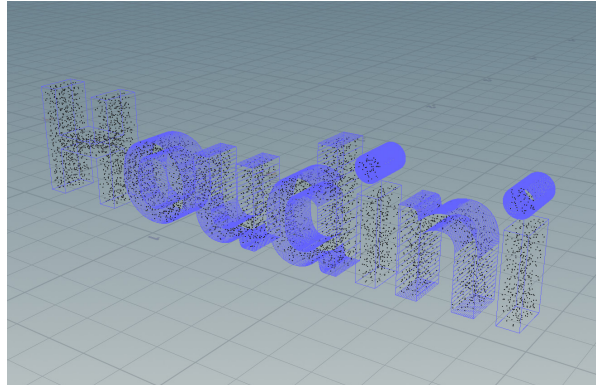
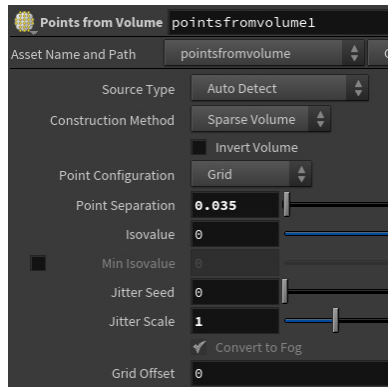


## 6. Fill the text's volume with points

- Click the output dot of the *polyextrude1* node.
- Press **Tab** in the Network View, type *points*, and press **Enter**.



- In the Parameter Pane, change the **Point Separation** to **0.035**, and the **Jitter Scale** to **1**.



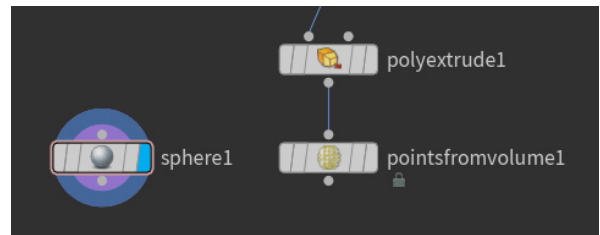
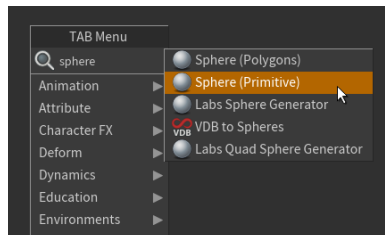
## PART TWO

# Copy Spheres to the Points

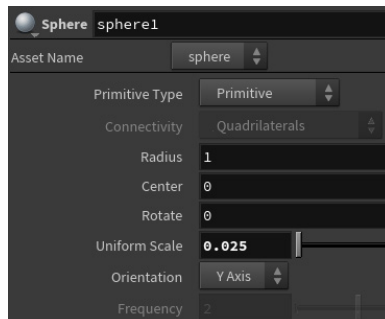
The next step in this exercise will show your students how to paint an attribute onto geometry in Houdini. The concept of writing attributes to geometry is one of the fundamental ideas of Houdini's procedural workflows. Painting these attributes will allow you to drive this proceduralism with artistic decisions.

### 1. Add a sphere to the scene

- Press **Tab** in the Network View, type *sphere*, and select **Sphere (Primitive)**.
- Left-click** to place the node.

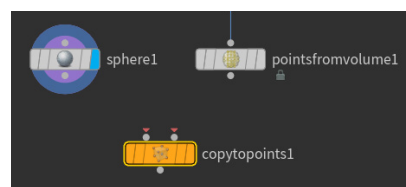
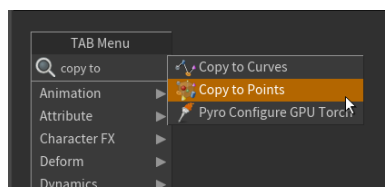


- In the Parameter Pane, change the **Uniform Scale** to **0.025**.

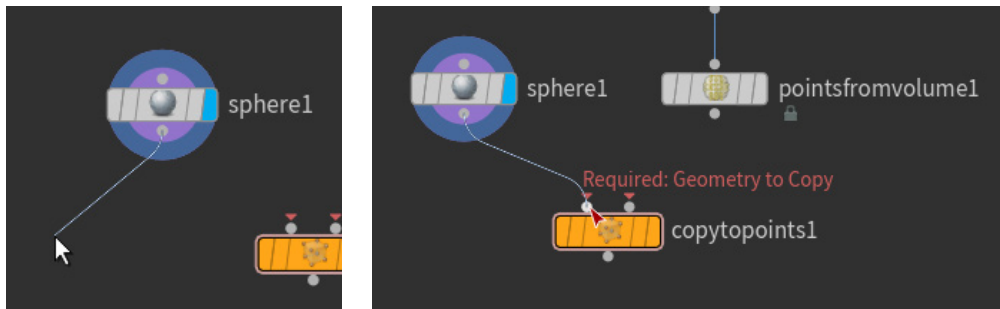


### 2. Copy the sphere to the points

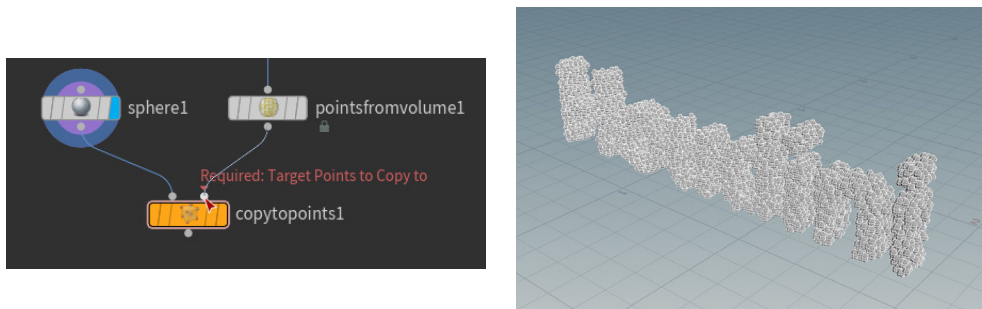
- Press **Tab** in the Network View, type *copy to*, and select **Copy to Points**.
- Left-click** to place the node.
  - Take care to select **Copy to Points**, and not **Copy to Curves**. The latter node comes first in the list, so it might be easy to select incorrectly.



- **Left-click** on the output dot from the *sphere1* node, and **Left-click** to attach the wire to the first input of the *copytopoints1* node.
  - You can see that inputs are named in the screenshot. This is especially helpful for multi-input nodes like *Copy to Points*. Here, we can see that input 1 is named **Geometry to Copy**.



- Repeat the last step between the *pointsfromvolume1* node and the *copytopoints1* node's second input.
  - If we change the blue Display Flag to the *copytopoints1* node, we'll see that our primitive spheres are now copied to the points.



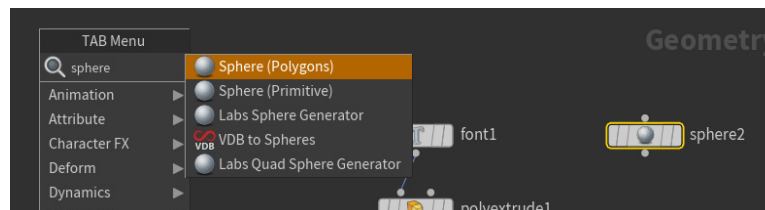
## PART THREE

# Transferring *pscale* from a Noisy Sphere

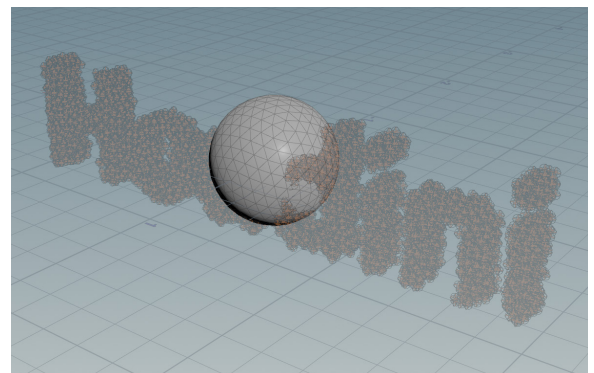
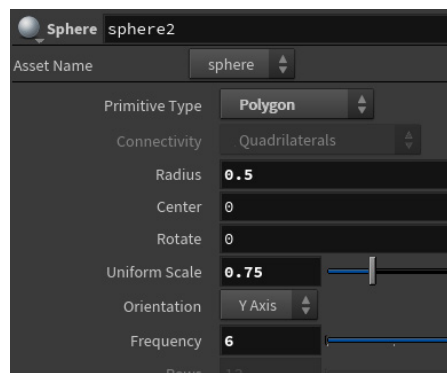
In this next part of this exercise, you will guide your students through adding and animating a *pscale* attribute. You will do this by first creating an animated deforming sphere with a *pscale* attribute on it. Then, you'll use an *Attribute Transfer SOP* to transfer the *pscale* attribute to the text points based on distance. This transferred *pscale* attribute will make the spheres scale up over time, based on their location near or far from the surface of the deforming sphere.

### 1. Add a sphere to the scene

- Press **Tab** in the Network View, type *sphere*, and select **Sphere (Polygons)**.
- Left-click to place the node.



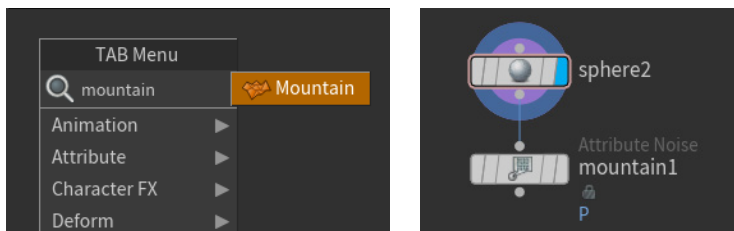
- In the Parameter Pane, change the **Primitive Type** drop-down to **Polygon**.
- Change the **Uniform Scale** to **0.75**, and the **Frequency** to **6**.
- Move the blue Display Flag to *sphere2*, and move the pink Template Flag to *copytopoints1*.



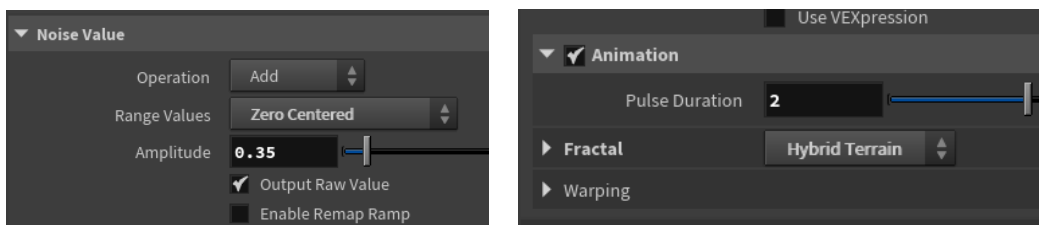


## 2. Add noise to the sphere's surface

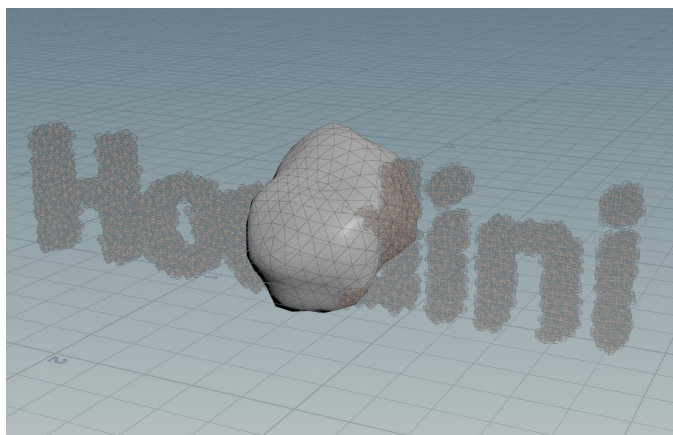
- Click the output dot of the *sphere2* node.
- Press **Tab** in the Network View, type *mount*, and press **Enter**.



- In the Parameter Pane's **Noise Value** section, change the **Amplitude** to 0.35.
- Scroll down to the **Animation** section, click the arrow, check the box, and change the **Pulse Duration** to 2.

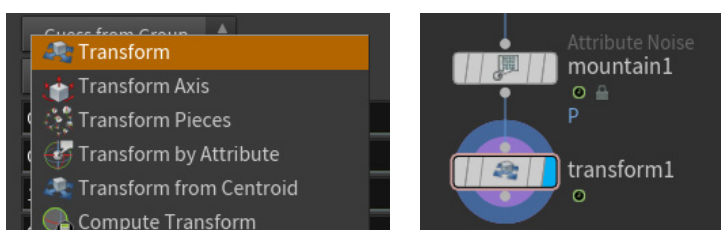


- This is now what your scene should look like:



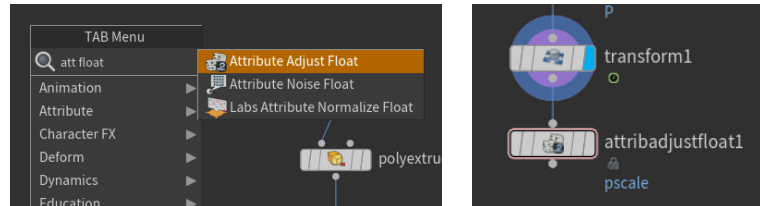
## 3. Add a Transform node to be able to control the noisy sphere

- Click the output dot of the *mountain1* node.
- Press **Tab** in the Network View, type *transform*, and press **Enter**.

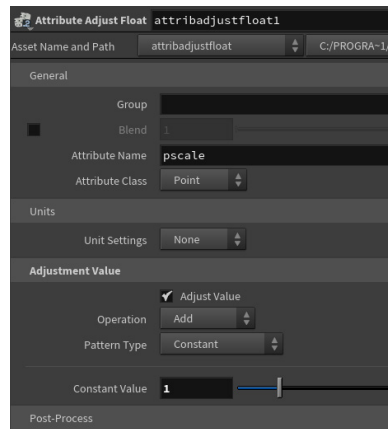


#### 4. Add a *pscale* attribute to the sphere

- Click the output dot of the *transform1* node.
- Press **Tab** in the Network View, type *att float*, and press **Enter**.



- In the Parameter Pane, change the **Constant Value** to **1**.
  - By default, Attribute Adjust Float creates a *pscale* attribute. This will control the scale of our copied points.



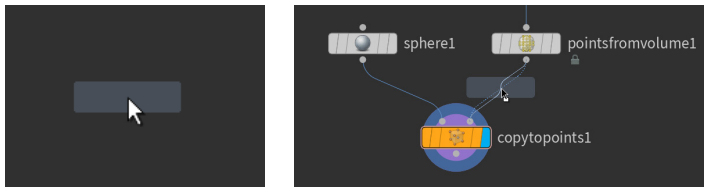
## PART FOUR

# Transfer *pscale* to Source Points

The final step in this exercise will show your students how to transfer the *pscale* attribute you created from the noise sphere to the source points. It is also very helpful to set the source points' *pscale* to 0 before transferring the attribute. This concept is very useful in many different workflows, and controlling the flow of attributes is a fundamental concept of working in Houdini.

### 1. Set point's *pscale* to 0 before copying

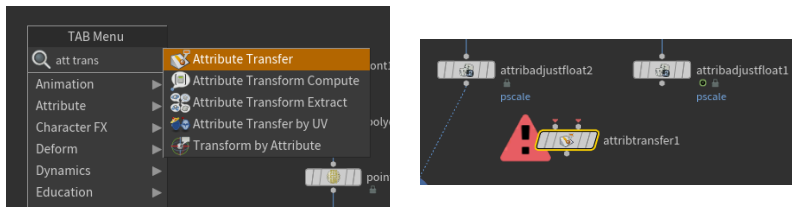
- Press **Tab** in the Network View, type *att float*, and press **Enter**.
  - You should now have a ghost node attached to the cursor.
- Left-click to drop the node between *pointsfromvolume1* and *copytopoints1*.



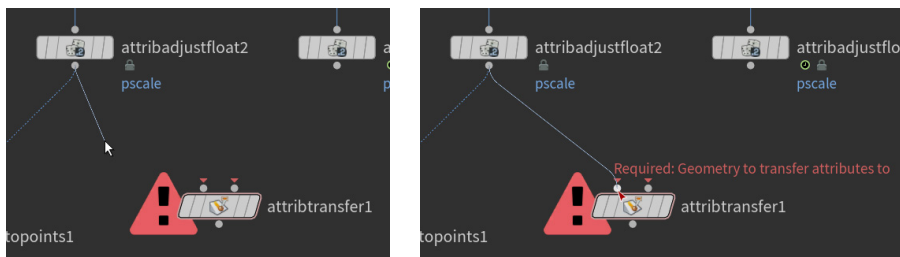
- By default, this node will set the *pscale* to zero, which is helpful for later steps.

### 2. Transfer attributes from the sphere to the points

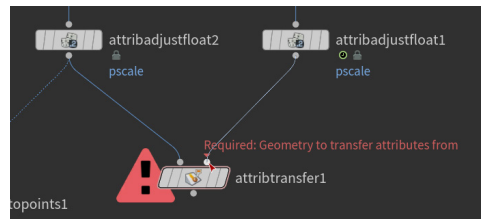
- Press **Tab** in the Network View, type *att trans*, and press **Enter**.
- Left-click to place the node.



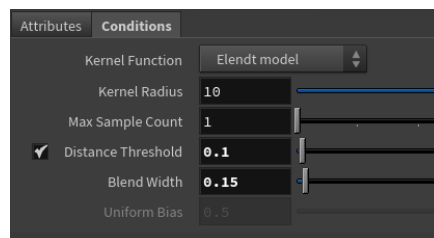
- Left-click on the output dot from the *attribadjustfloat2* node, and Left-click to attach the wire to the first input of the *attribtransfer1* node.



- You can see that inputs are named in the screenshot. This is especially helpful for multi-input nodes like *Attribute Transfer*. Here we can see that input 1 is named **Geometry to transfer attributes to**.
- Repeat the last step between the *attribadjustfloat1* node and the *attribtransfer1* node's second input.

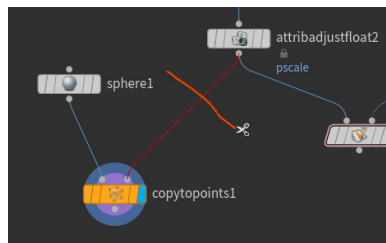


- In the Parameter Pane, select the **Conditions** tab. Within that tab, set the **Distance Threshold** to **0.1** and **Blend Width** to **0.15**.

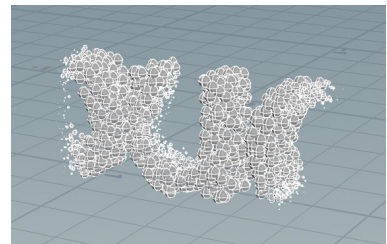
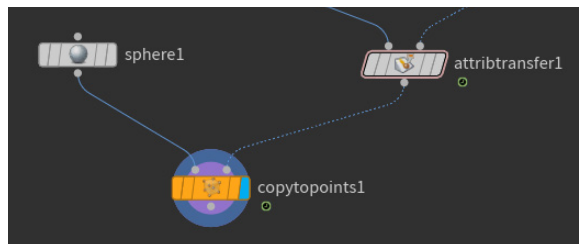


### 3. Attach the *Attribute Transfer* to the *Copy to Points*

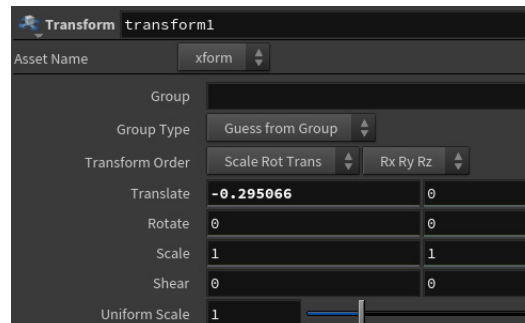
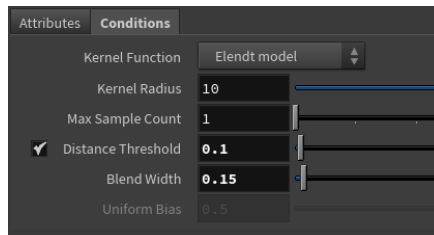
- In the Network View, **Left-click** and **drag** across the displayed wire while holding the **Y** key.



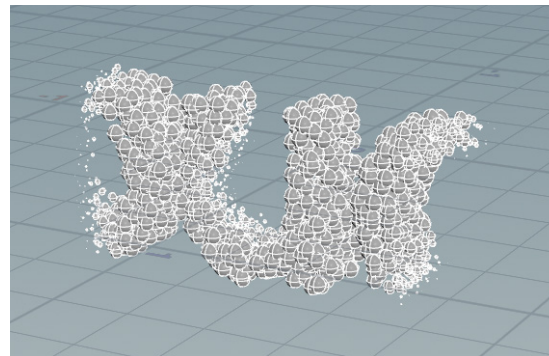
- **Click** the output dot of the *attribtransfer1* node and attach that to the second input of the *copytopoints1*.
  - Make sure to move the blue Display Flag to the *copytopoints1* node.
  - You should now see the sections of the letters that lie within the sphere.



- To control how far the attribute is being transferred, select the *attribtransfer1* node.
- In the Parameter Pane, change the **Distance Threshold** and **Blend Width** in order to see the impact these controls have.
- You can also use the *transform1* node to move the sphere around to other parts of the word.



- You can press **Play** on the Timeline to see the sphere animate and how that changes the attribute transfer.



## CONGRATULATIONS

You have now completed your text scattering exercise. This has taken you through a project that began with text geometry, then you scattered points into the 3D volume of the text, copied primitive spheres onto the points, created deforming geometry with a pscale, and then transferred that attribute to the source points.