Houdini 16 Hair and Fur

Introduction

Hair/fur in Houdini is done by through the concept of guide hairs. Guide hairs give detail on a particular cluster of hairs (e.g. length, shape, etc..), then when you actually do a render the real hairs show up modelled around those guide hairs.
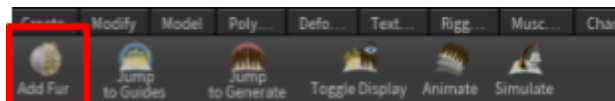
All hair functionality is provided via 3 shelfs: Hair Utils, Guide Process, and Guide Brushes. You can find these in the shelves in the first shelf-set of the Build desktop…

Creating Hair

To create hair, use Add Fur in the Hair Utils shelf.


Once you do this…
1. The scene view will prompt you to select an object and press Enter
   (only happens if nothing already selected when you clicked Add Fur).
2. The scene view will prompt you to select an object for "animated skin" and press Enter
   (you can just press enter without selecting anything -- don't know what this is)

You'll notice 2 things…
- Fur will show up on your entire object
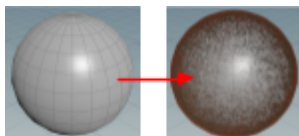
- There are 2 new nodes in /obj: a Guide Groom node and a Hair Generation node
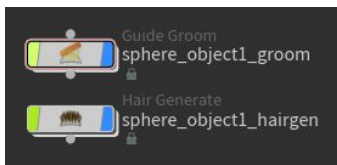
The Guide Groom node is used for the hair guides and the Hair Generation node is what renders the actual hair. You do all your styling on the Guide Groom node, and the Hair Generation node will use those guides when it generates the hairs.

> **NOTE**: If you want to have only a specific group on your object have hair, select the Guide Groom node and choose the group you want to specifically target.
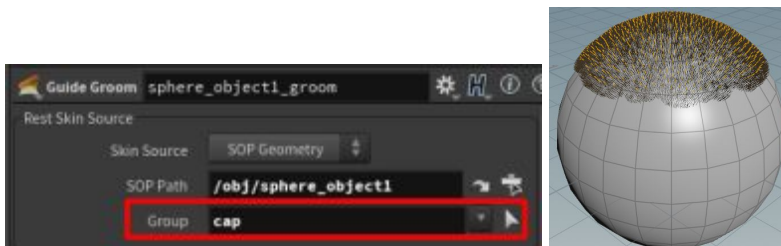
Remember that you don't need to specifically target a group. You can use the little arrow next to the dropdown to select random polygons directly in the sceneview.

Hair Spread and Density

Hairs are distributed based on the guide hairs. You can set how many guide hairs you have via the Density property of the Guide Groom node (under the Basic tab)...
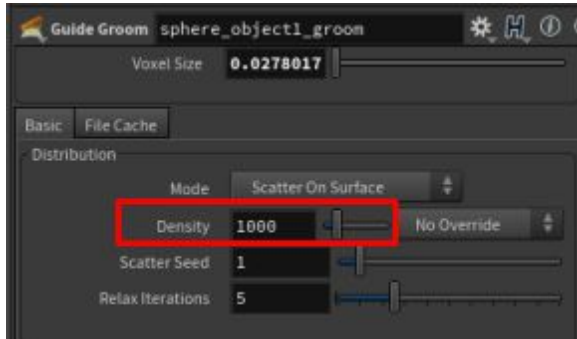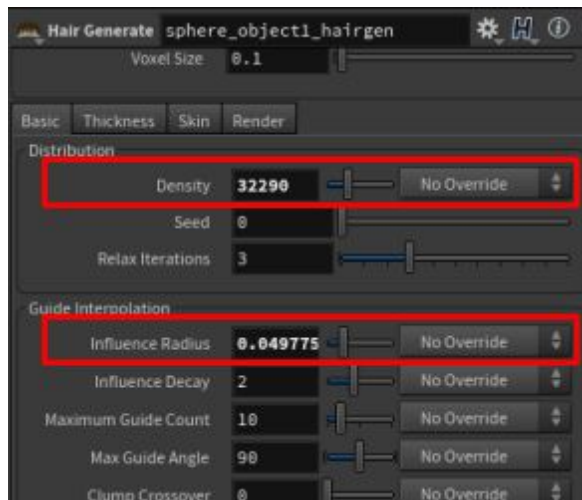

Here's an example of a density of 1000 vs 100…
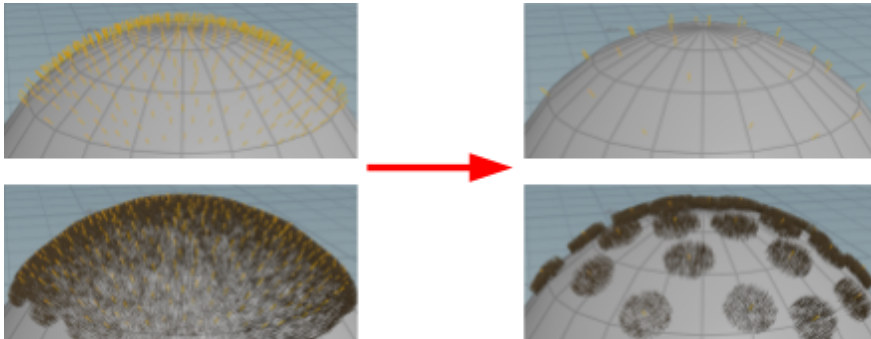
Notice how it becomes super obvious how the hairs cluster around guide hairs once the hair density drops. We can have a low guide hair density if we want, we just need to go into the Hair
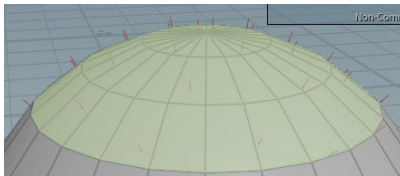
Generator node and jack up the Influence Radius and Density under the Basic tab…

For example, here's a guide hair density of 100, but with a large influence radius (0.15) and a high density (132290)...
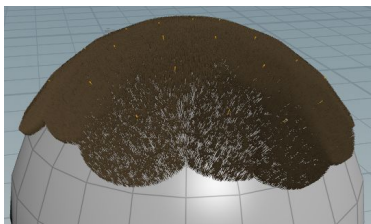
NOTE: The hairs are being generated on top of the sphere only because the groom node's targeting the top polygons only…


If you look closely at the images of hair above, you'll see that the guide hairs (yellow lines) are on these polys but the actual rendered hair is bleeding out to the rest of the polys below it.

The only way to stop this is to explicitly DELETE all the polygons that hair shouldn't be on. One trick is to simply create a copy of an object and only keep the polys that should have hair. Generate hair on that new object and hide the object from your scene. The hair will stay and it'll be confined to those polys
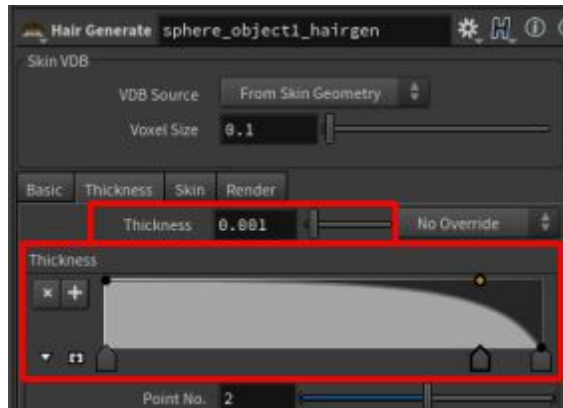
Hair Length

You can control the length of your hair by going to the Length property of the Guide Groom node (under the Basic tab)...
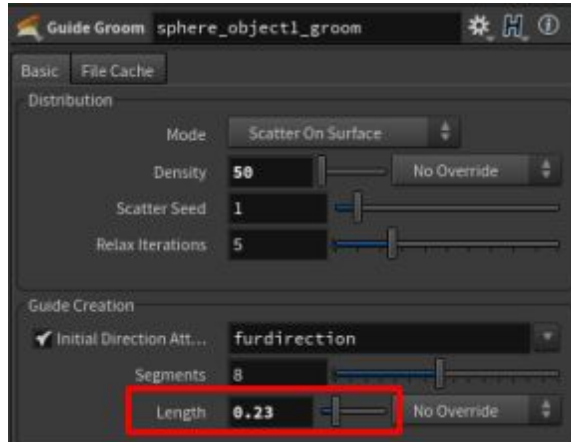
> **NOTE**: This is the initial length of your hair. You'll likely either cut or extend it further down in your workflow as you stylize it. How to do that is discussed in later sections.

Hair Thickness

You can control how thick your hairs are (both overall and in certain areas) by going to the Thickness tab of the Hair Generator node…

It should be fairly straight forward what's happening here. The thickness is the overall thickness, and the ramp controls how that thickness grows/shrinks over the length of the hair.

Procedural Styling

You can stylize your guide hairs procedurally by using the items in the Guide Processing shelf…

Most of what the items do should be self-explanatory. Remember that Houdini has a node based procedural workflow. As you use these items, they'll get added as nodes inside the Guide Groom node.

For example, here's what a Frizz + lengthen would look like inside the Guide Groom node…
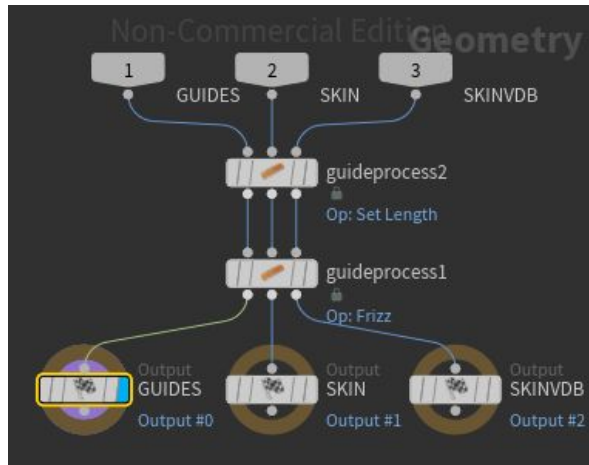
You can do all the stuff you would normally do with nodes here: reorder, manually add more in, bypass, etc..

> **NOTE**: Most all the options in this Guide Processing shelf translate to a <u>Guide Process</u> node being added in (most… not all). Guide Process nodes have a Operation dropdown where you can select what you want them to do (the options in the shelf). You can even add more than one operation together here if you really wanted to…
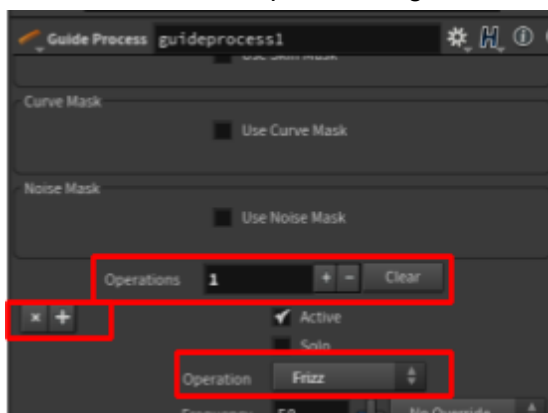
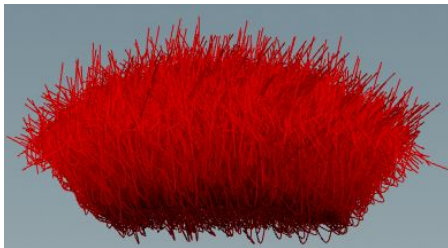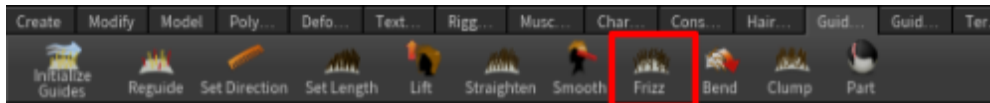> **NOTE**: If you're doing renders inside the renderview, as you add/change these nodes

the refresh/auto-update won't pick up the new hair geometry. You need to explicitly hit the Render button if your hair geo changes…
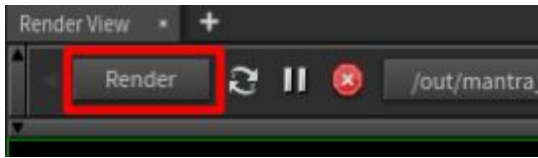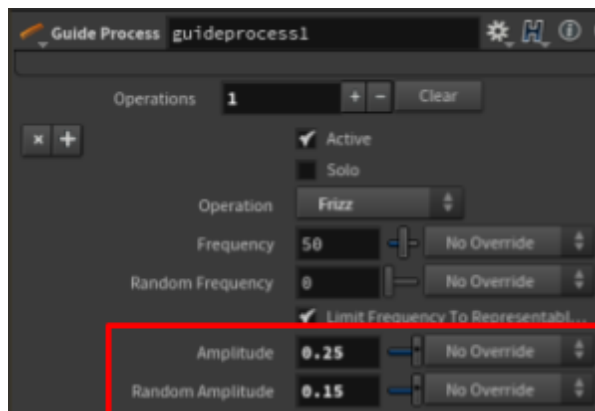

Not sure if something similar required if rendering to MPlay.

Frizz

You can add frizz to your guide hairs via Frizz…

The main property here is amplitude. The higher the amplitude is, the more noise (aka frizz) is added to the guide hair…
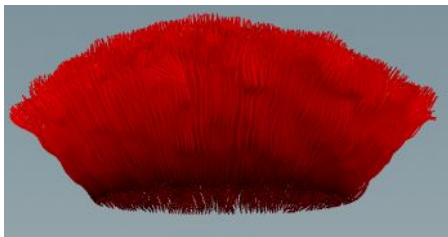

Remember that this operation is happening on the guide hair. If you have too few guide hairs, the entire thing will look off. It'll look like clusters/hunks of hair are bending randomly, as if

someone stylized the hair to make it look like a "bedhead" look…

Smooth

You can smooth your guide hairs via smooth…

> **NOTE**: The example above has frizz applied before smooth. Note that it's almost back to being uniformly straight.

The main property here is number of neighbours. The higher this value is, the more neighbouring guide hairs are brought into the averaging calculations to create a smoothed hair (I think)…
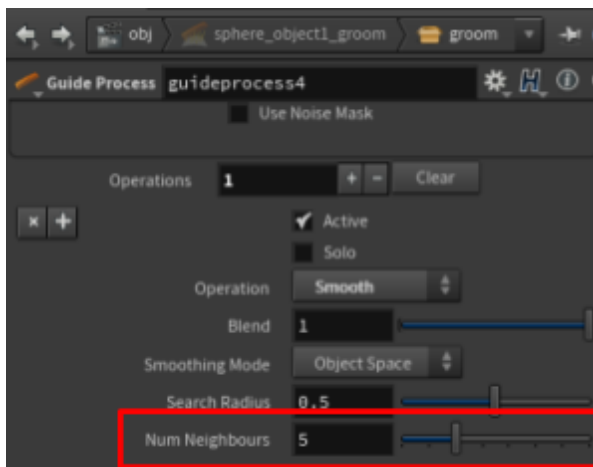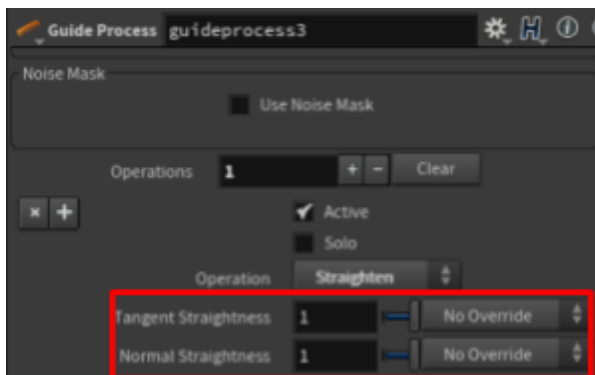
Straighten

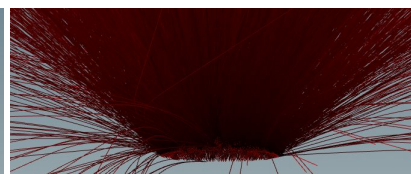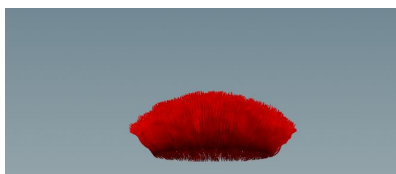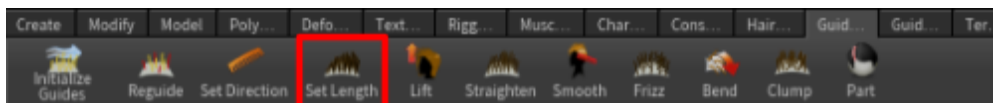You can straighten your guide hairs via Straighten…
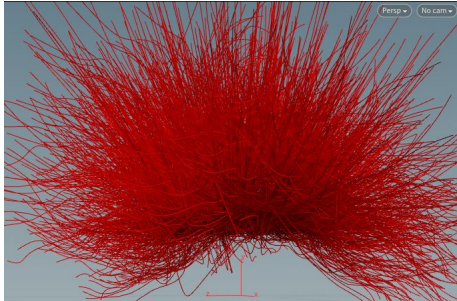
> **NOTE**: The example above has frizz applied before straighten.

I honestly have no idea how this is suppose to work. There are 2 properties here: Normal Straighten and Tangential Straighten. No idea what they're suppose to do...


Set Length

You can grow/shrink your guide hairs via Set Length…

NOTE: The example above has frizz+smooth applied. Note that when we shorten the length, the hair pretty much truncates (as expected). But, when we grow the hair, it pretty much grows straight out in the direction it was before the growth.

The important property here is Length, which I think is the overall length of the hair. You can change the Mode dropdown if you want to do things like offset the hair length instead of setting it directly...
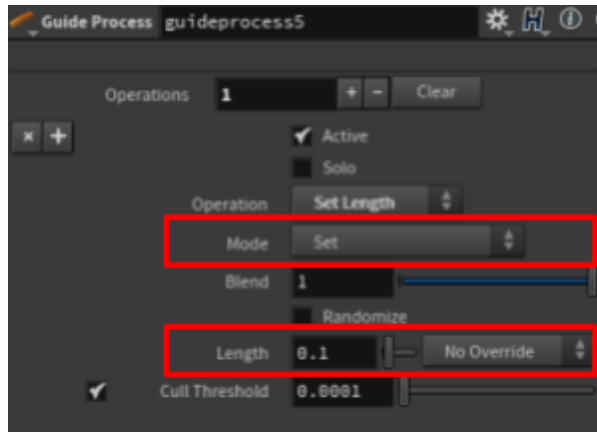
Bend

You can bend your guide hairs via Bend…
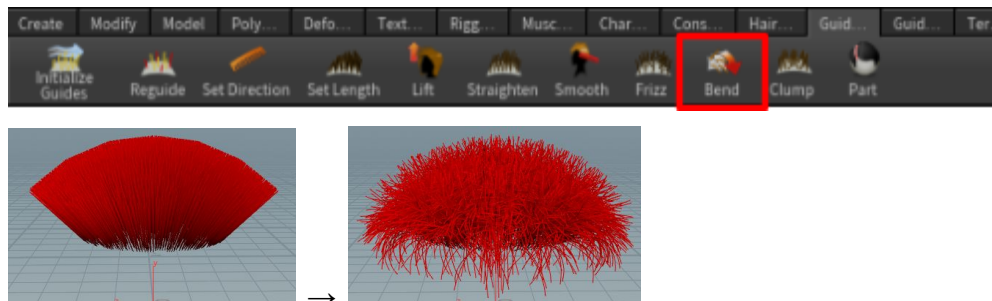
This bends the hair such that its new endpoint is x degrees different from the previous endpoint. The important property here is Angle and Random Angle, which controls how much of an angle

you want to bend by + how much randomness you want in that angle for each guide hair.

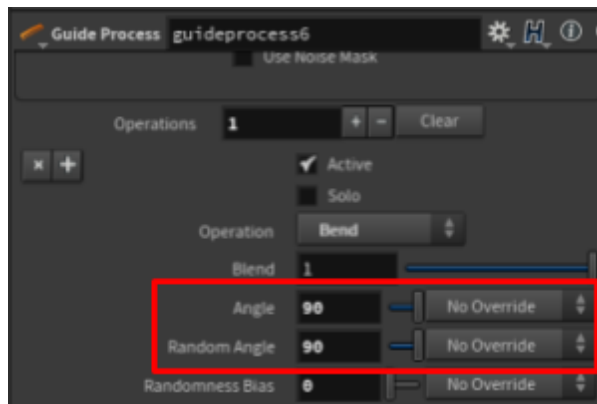> **NOTE**: It doesn't look like you can control the ultimate direction in which the bend is applied.

Clump

You can clump your guide hairs together via Clump…
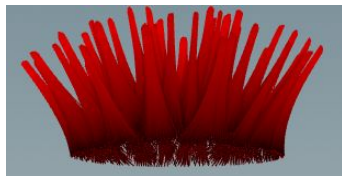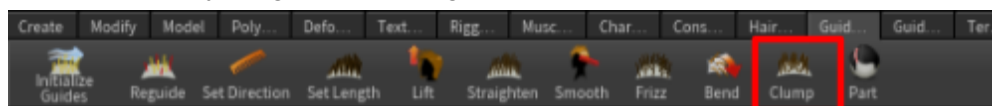
Clump does not get added as a Guide Processing node, but as its own node type (Hair Clump).

The important property here is Clump Size, which technically will define how many clumps you'll have (based on the number of guide hairs you have). But, there are also a ton of other options here. For example, you can curl your clumps if you want to, or you can use a ramp to set the

thickness of your clumps in different areas...

Manual Styling

You can stylize your guide hairs manually (via the scene view) by using the items in the Guide Brushes shelf…

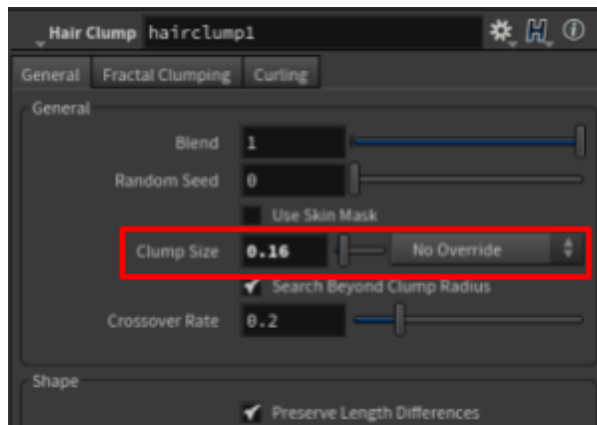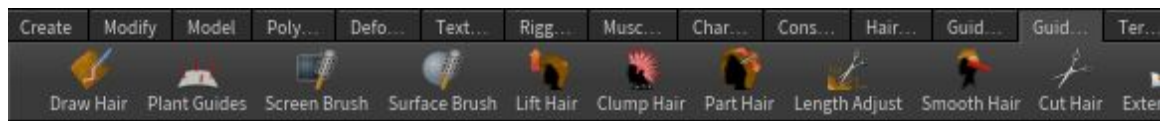Once you select any of these (don't know about the first 2), your handle in the scene view should turn into a circular brush tool + you should get an internal Guide Groom node added to your top-level Guide Groom node.
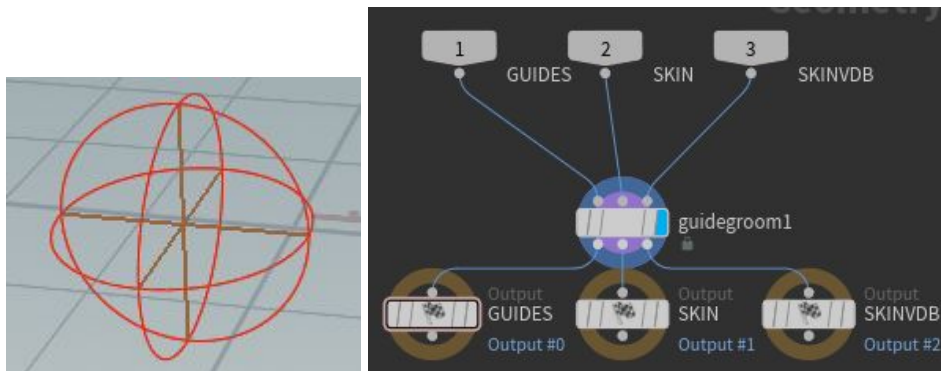
Your scene view's toolbar should now also have a dropdown that'll let you specifically select which tool you want to use…

> **NOTE**: These options are exactly what's in the Guide Brushes shelf. You can manually switch here as you're making changes to your hair.

From here you can use the brush tool to pretty much change anything however you see fit: cut pieces of hair, extened pieces of hair, clump, brush, etc..

> **NOTE**: It may be better to do this in 4-panel orthographic view. Depending on how many guide hairs you have, it may be difficult to target an individual hair. You might have to zoom in a lot to isolate which kind of defeats the concept of brushing.
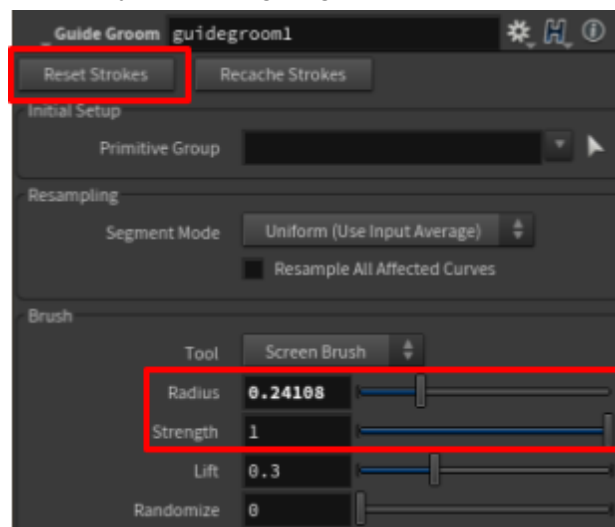
You can change the brush size, brush strength, and undo all your strokes in the properties of the Guide Groom node added for these changes. You may get more/less options depending on the Tool you're using (e.g. brush, extend, cut, clump, …)...


> **NOTE**: Remember that you can undo individual steps with Ctrl+Z. Also you can use the mouse wheel in the scene view to increase/decrease brush size.

> **NOTE**: The lift parameter is also important. It controls an artificial buoyancy for the hair as you're manipulating it… such that if you were to brush it down, it wouldn't go exactly

flat The hair would have some bounce back to it (unless maybe if you wanted to act as if it were being weighed down with something like hair gel).

NOTE: If you're doing renders inside the renderview, as you add/change these nodes the refresh/auto-update won't pick up the new hair geometry. You need to explicitly hit the Render button if your hair geo changes…
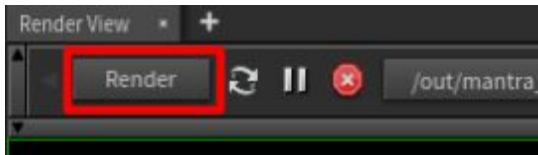

Not sure if something similar required if rendering to MPlay.

Dynamics/Physics

This section was not covered in the lessons, but it looks like you can enable physics for hair by using Simulate under the Hair Utils shelf…
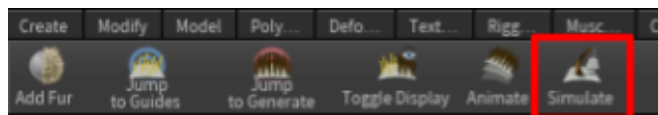
Doing this does not do the same thing as creating a collision object (e.g. ground plane) or a rigid body. YOU WILL NOT GET STUFF ADDED TO AN AutoDopNetwork NODE. Instead what will happen is that you'll get a new Guide Simulate node…
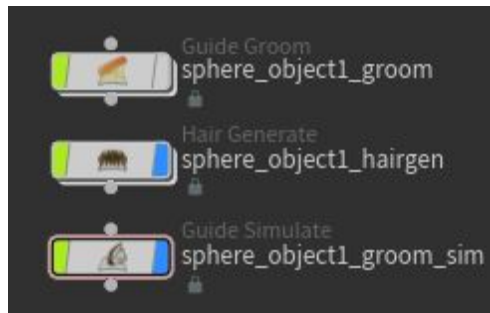
In this Guide Simulate node's parameters, you'll get a button to create a DOP network for this piece of hair. If you choose the button, a new DOP network will be created and referenced. You can go into that DOP network and cut/paste the contents it to your own DOP network + update

the Guide DOP Object path.
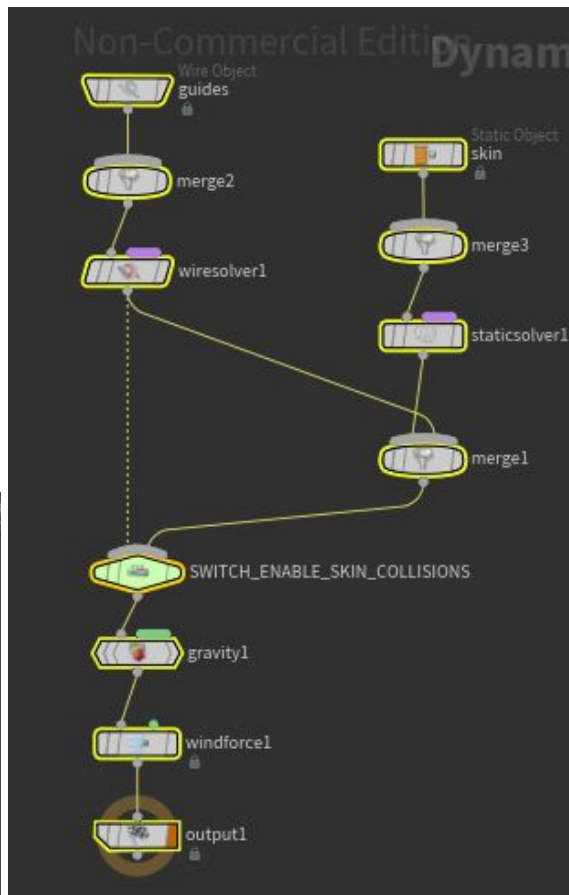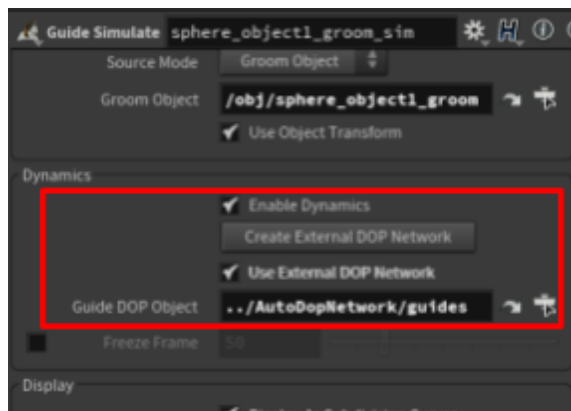
NOTE: There's also a Simulation and Collision tab in the Guide Simulation node that defines how your guide hairs will react/collide with other stuff. There's too much to go into detail here and none of it was talked about in the lesson.

Once you do that, the hair should be able to interface with other dynamics in your system (particles, collisions, etc.. etc..).

Rendering

If you're doing renders inside the renderview, as you add/change these nodes the refresh/auto-update won't pick up the new hair geometry. You need to explicitly hit the Render button if your hair geo changes…
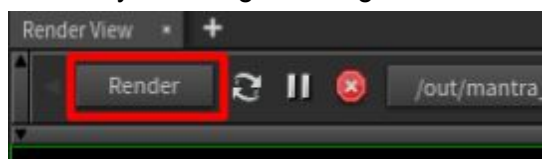
Not sure if something similar required if rendering to MPlay.

Hair Shader

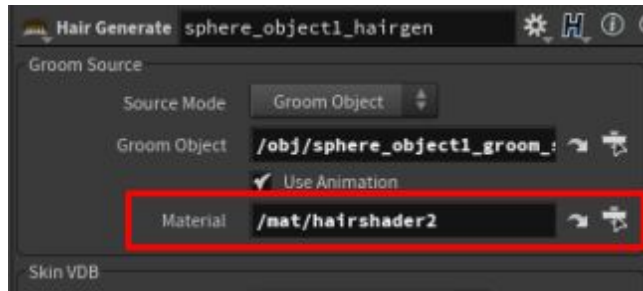**NOTE**: If your hair geometry changes, you need to hit the Render button. But, if all you're doing is messing around with the hair shader, you don't need to do this. See the main Rendering section above if you're confused.

The Hair Geometry node contains a path reference to which material will be used to render whatever hair it's generating…

NOTE: You can use the second to last button (curved arrow) to go directly to the shader.

The shader here is of type Hair Shader, and you can pretty much modify the properties here to get your hair to look however you want it to look. There are multiple tabs here…
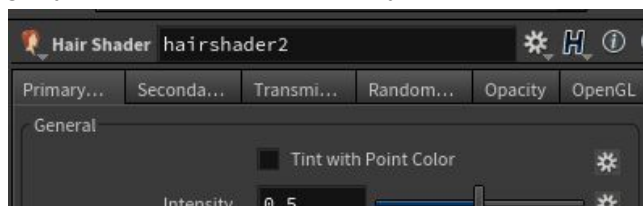
- Primary Reflection

  This defines the primary color of the hair. You can set a tip color vs a root color and control how they transition with the provided ramp.

- Secondary Reflection

  This is like the specular. You'll notice that by default the hair shader gives off this horrible sheen as if the individual hairs hasve been coated in wax. This is where that sheen is coming from. You can turn off the entire thing via the Enable checkbox at the top of just lower the intensity.

- Transmission Color

  This is for "light passing through the hair". Unsure if this is the same thing as a transmittance color in Arnold, which is… "Like color, but tints the object more as the ray

goes through the object. Thin parts of the object get less tint while thicker parts get more tint."

So maybe the hair thickness attribute has an effect on the output for this??? I tried playing with the values but I couldn't get it to show any difference.

- Randomness

Allows you to Randomize the HSV values of the diffuse (Primary Reflection) in addition to randomizing the specular. So the hair can technically be more varied in terms of brightness/darkness or color.

Motion Blur

By default, your Hair Geometry will not support motion blurring. If you want motion blurring to be enabled, go to your Hair Generate node. In the properties, there will be a Render tab. Under that tab there's tab called Sampling.

Turn on the Geometry Velocity Blur checkbox.
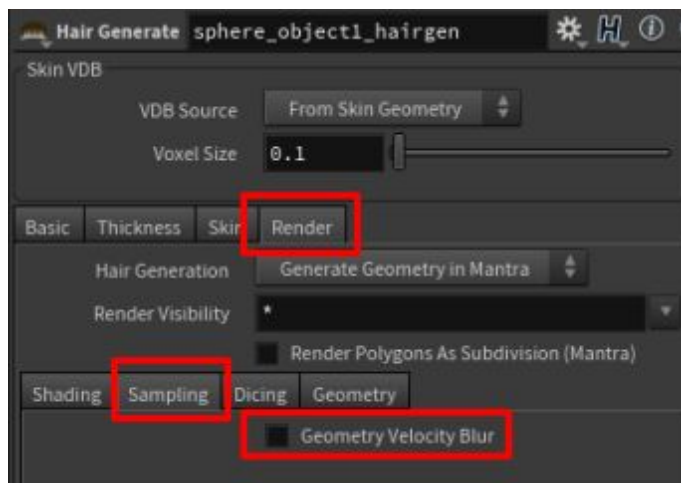
Render Quality

Once you start rendering, you'll notice areas with sparse amount of hairs (e.g. the tips of the hair where it tapers off) have a lot of noise. You need to bump the rendering pixel samples to get rid of the noise.

See the Render Quality section of the Mantra Rendering document to see how to do this.