Dynamic Joint Chains

(for hair!)
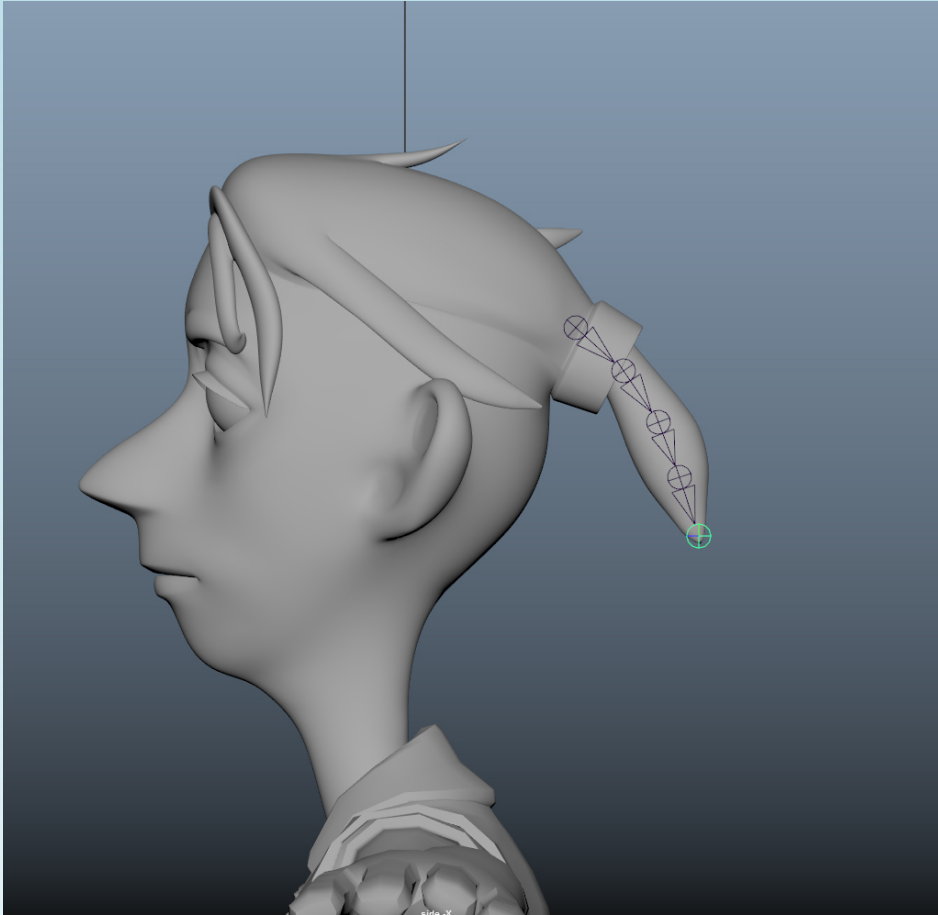
BY ALEXIS PLANER

Overview (feat. Viktor's face)

- Dynamic joint chains were used in Cuddlefish to have slight movements in Viktor's hair pieces.

- These joint chains were mainly controlled by dynamics, with an extra level of FK control if needed (if there was any inner penetration/clipping, the animator could adjust or hand-animate a piece)

First things first…

- First, create a joint chain however you want the curve to lay naturally.

- In this case, we will use Viktor's ponytail.

- In the Rigging menu set, go to Skeleton>Create Joints

- In the side view, click where you want joints and then hit enter to complete the joint chain.

Wow so many joint chains! What will I do with all of them?

- Duplicate this joint chain twice, so you have three identical chains.

- Add a prefix hierarchy name to each chain by selecting the top joint and going to Modify>Prefix Hierarchy Names...

- On one joint chain, add the prefix "DYN_" This will be your dynamic joint chain.

- On another joint chain, add the prefix "FK_" This will be your FK joint chain.

- On the last joint chain, add the prefix "SKIN_" This will be your skinned joint chain.
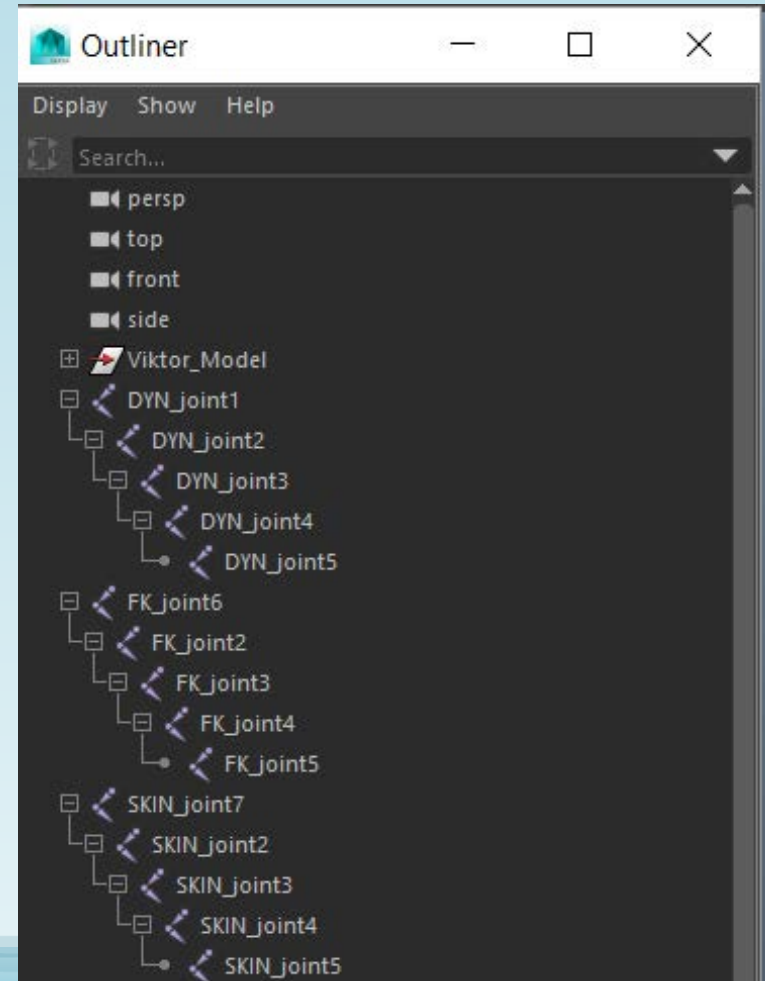
IK Spline Handles, oh my!
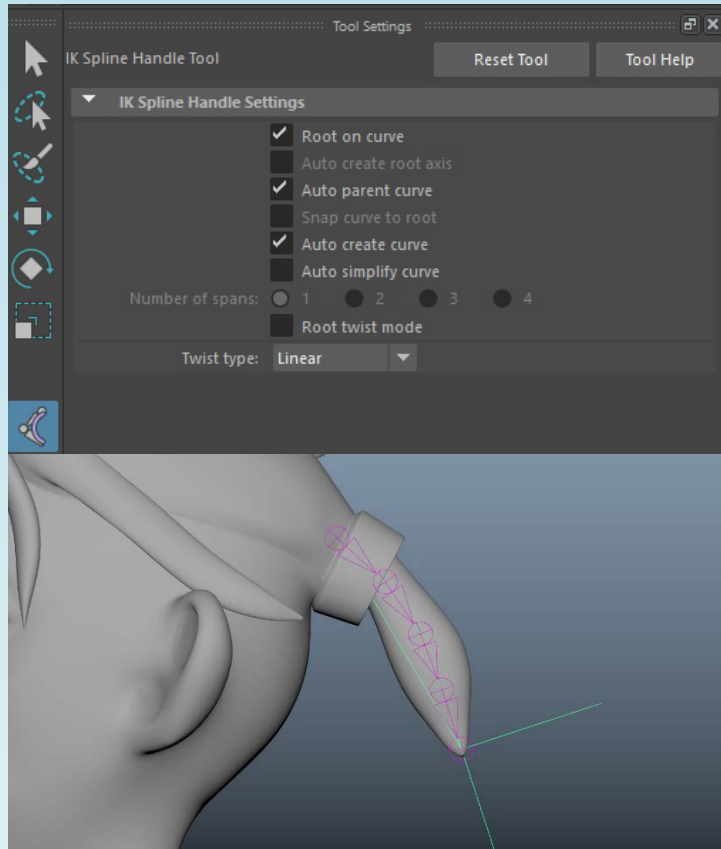
- To have Maya create the curve for us, go to Skeleton>Create IK Spline Handle (option box)

- Reset the tool and uncheck "Auto simplify curve"

- Select the first joint in the dynamic chain and then the last joint in the dynamic chain.

- This will create a curve that follows your joint chain.

- We only need the curve from this, so go into your outliner (Windows>Outliner) and delete the ikHandle.

It's time to be dynamic

- With the curve selected, go into the FX menu set, then nHair>Make Selected Curves Dynamic (option box).

- Make sure everything is at default (if you are unsure, click Edit>Reset Settings), and click Make Curves Dynamic.
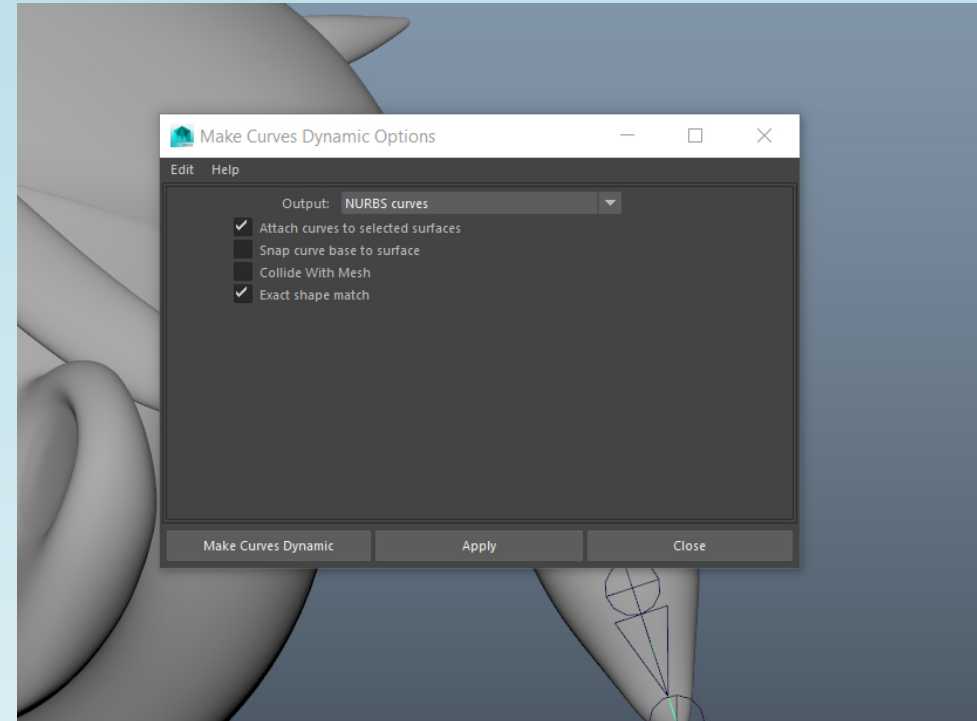
Organization is important always
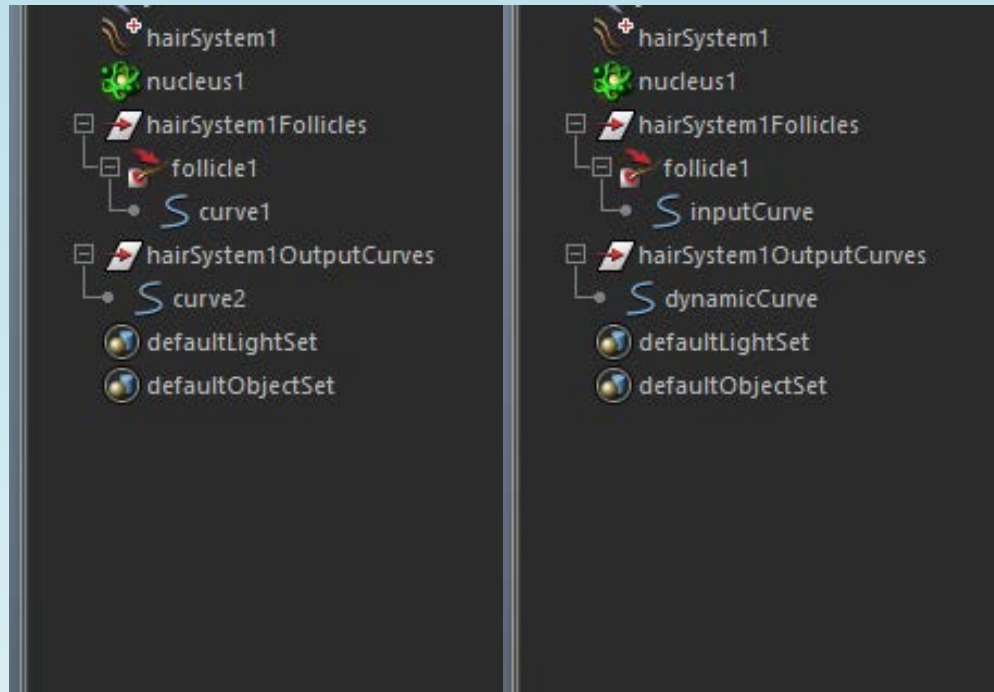
- You will see in your Outliner that there is now a hairSystem, a nucleus, a hairSystemFollicles group, and a hairSystemOutputCurves group.

- In the hairSystemfollicles group, you will find your original curve. Rename that to inputCurve and hide it (hit "H" with it selected).

- In the hairSystemOutputCurves group, you will find another curve. This is your dynamic output curve. Rename this to dynamicCurve.

More IK Spline Handles, oh my!

- Now we are going to create our IK spline, so go back to the Rigging menu set, Skeleton>Create IK Spline Handle (option box).

- This time, we don't need to create a curve, so deselect all of the boxes in the tool settings.

- Select the first joint of the dynamic chain, then the last joint in the chain, and then finally select the dynamicCurve in the Outliner while holding Ctrl (or hold shift if carefully selecting it from the viewport).
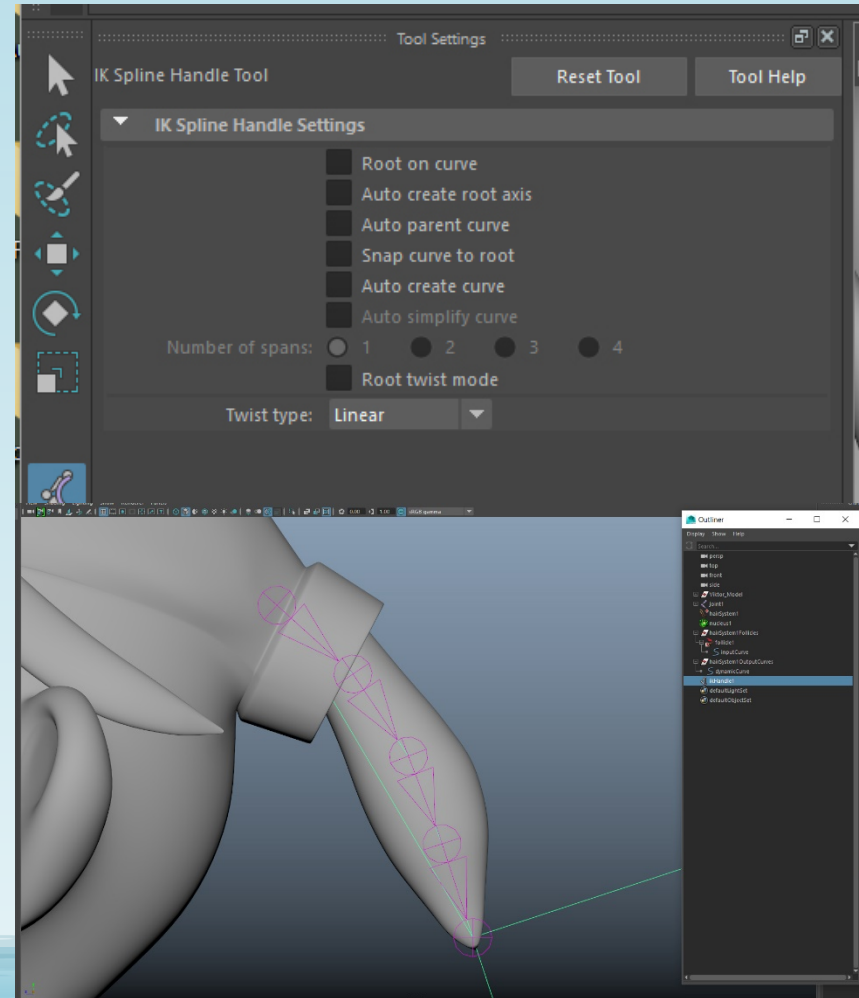
Oh look it's doing something
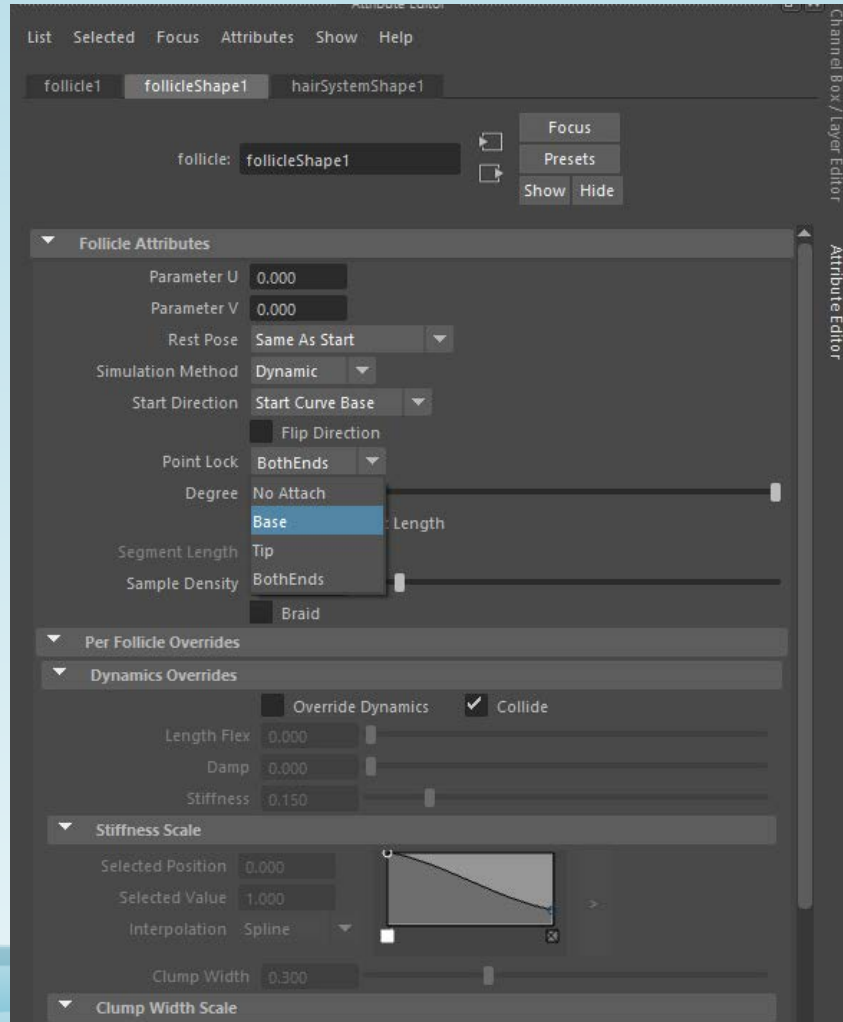
- If you play back your chain, you will see that your joints are now being controlled by dynamics; however, the bottom joint is not moving.

- To change this, select the follicle from the Outliner and go to the Attribute Editor.

- Under the Follicle Attributes, change the Point Lock from "BothEnds" to "Base."

- Your joint chain will now be free to swing back and forth.

Orient constraints, orient constraints everywhere

- Now we will go back to the joint chains we created earlier. We want the skin joint chain to be controlled by both the dynamic joint chain and the FK joint chain. In order to do this we need to add an orient constraint to each joint.

- Select the first joint of each chain in the order of dynamic first, FK second, and skinning last. Then, in the Rigging menu set, select Constrain>Orient (option box)

- Make sure the settings are on default and click "Add"
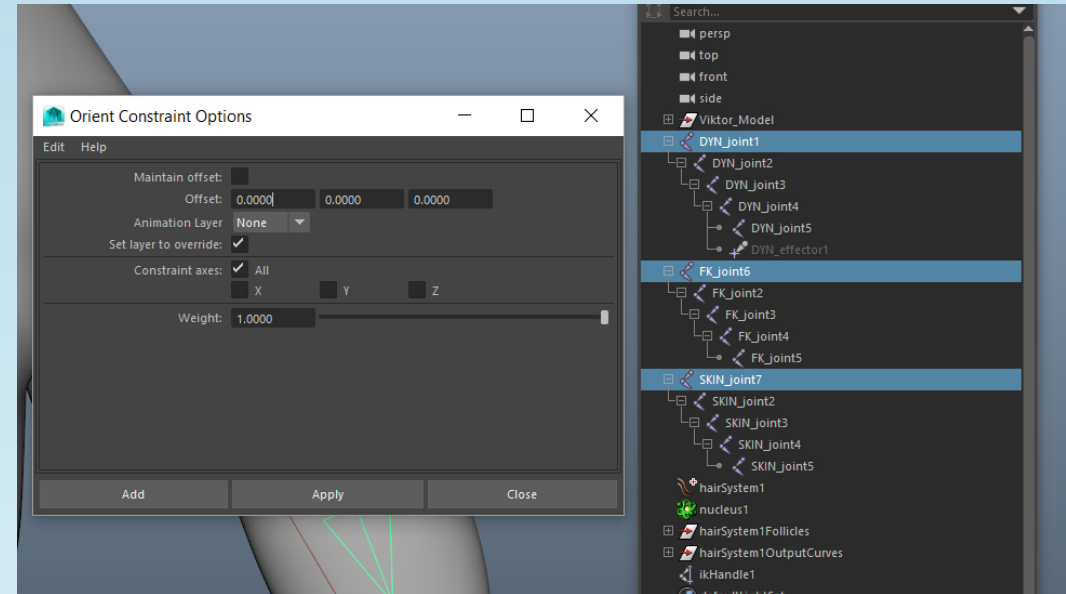
Just keep constraining...
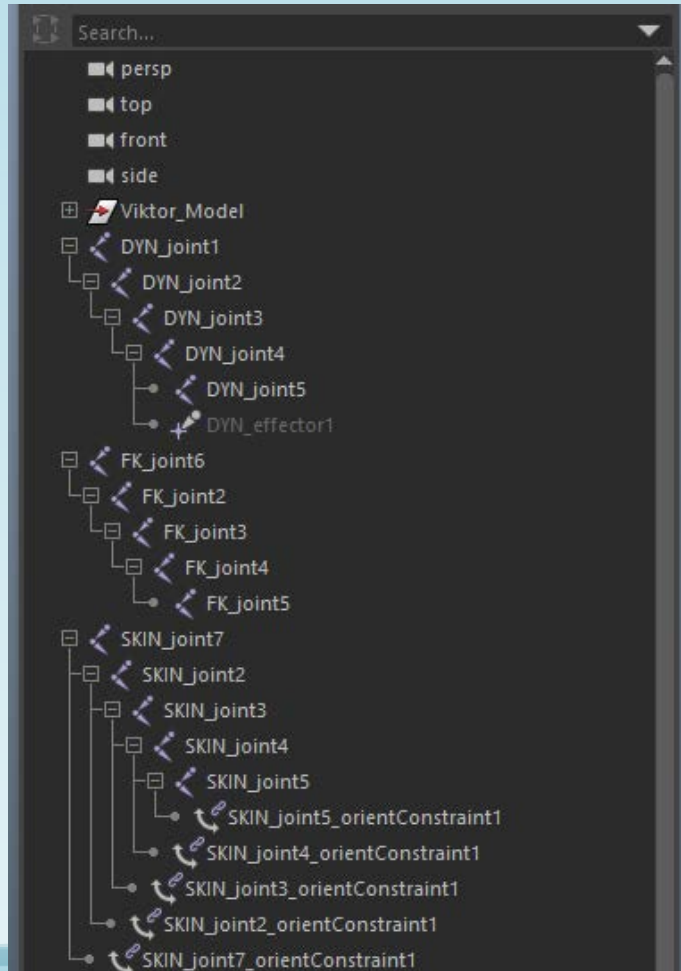
- Repeat this orient constraining process for each identical joint in each chain, with the same selection order, until you have an orient constraint on each skin joint.

- This will cause the skin joint chain to be affected by both the dynamic joint chain and the FK joint chain.

From left to right: dynamic joint chain, skin joint chain, FK joint chain
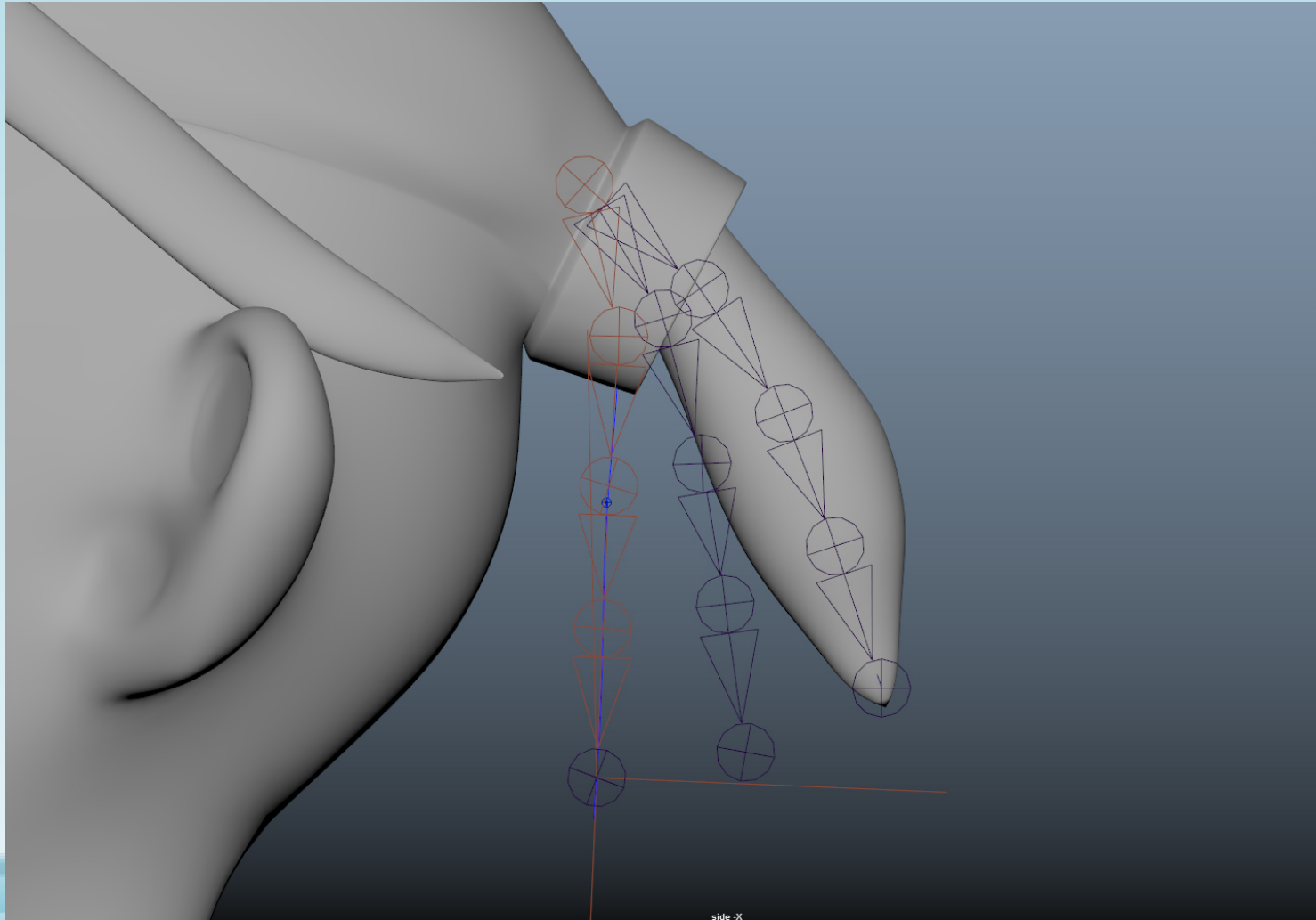
Time to add some control

- Now that we have the joints working properly, let's make controllers for the FK joints so we have that added level of control.

- Go to Create>NURBS Primitives>Circle to create a circular controller.

- Move the center of the NURBS circle to the center of the joint you want to control.

- Repeat this as many times as necessary, depending on the length of your joint chain and which joints you want FK control.
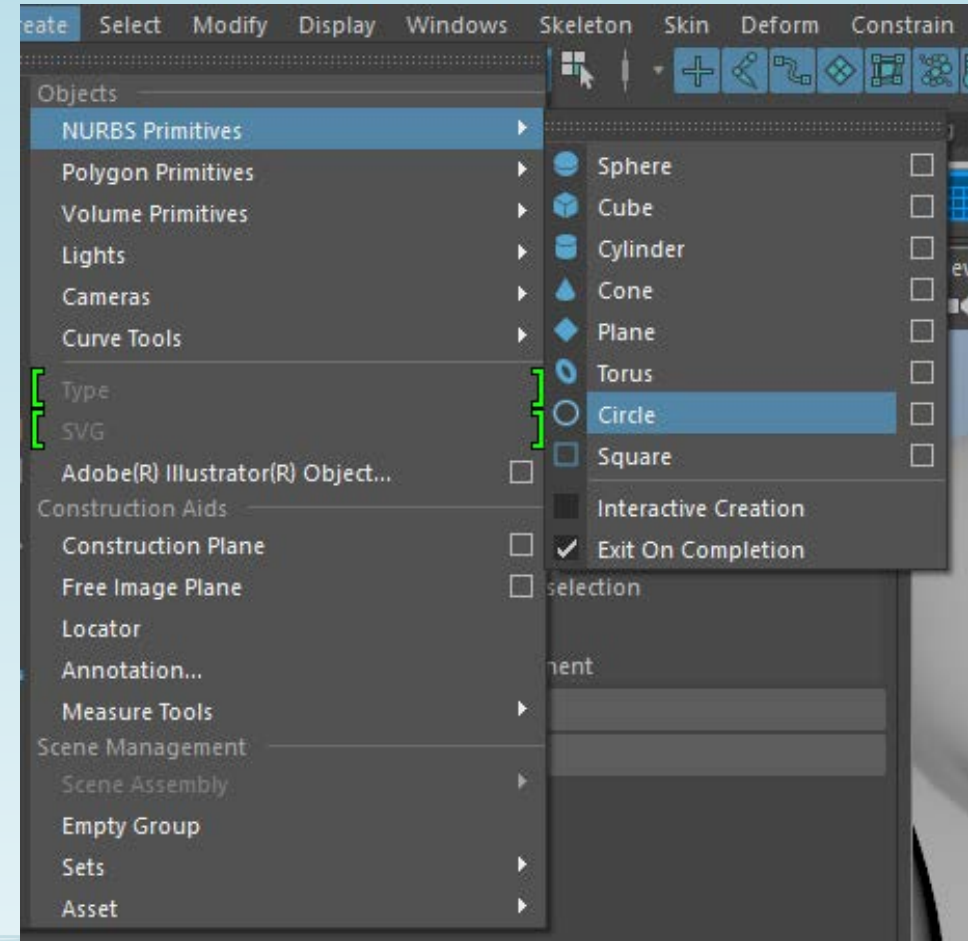
FREEZE
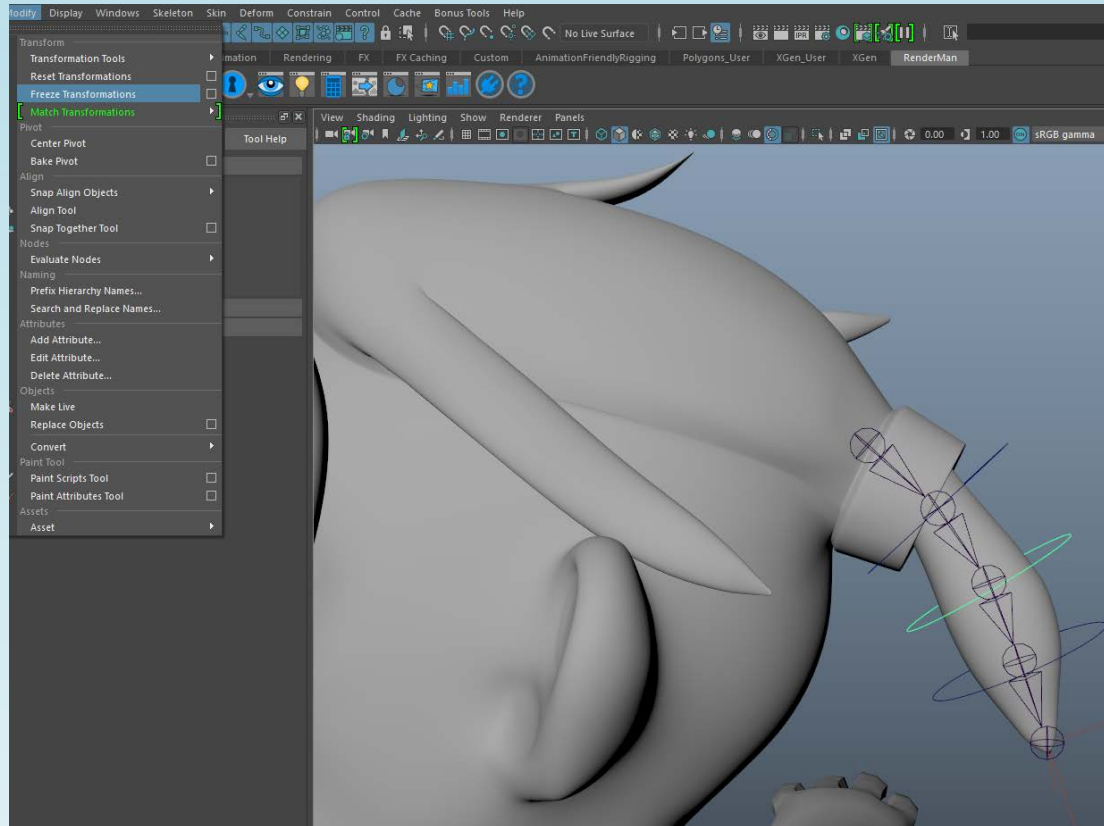
- Before we make the controllers actually control anything, we need to freeze the transformations.

- Once you have your NURBS circles placed properly, with a circle selected, go to Modify>Freeze Transformations.

- Repeat this for each controller.

Are you my mom?

- Now it's time to parent the NURBS circle to the corresponding joint!

- First select the NURBS circle, then select the joint you want to control.

- In the Rigging menu set, go to Constrain>Parent.

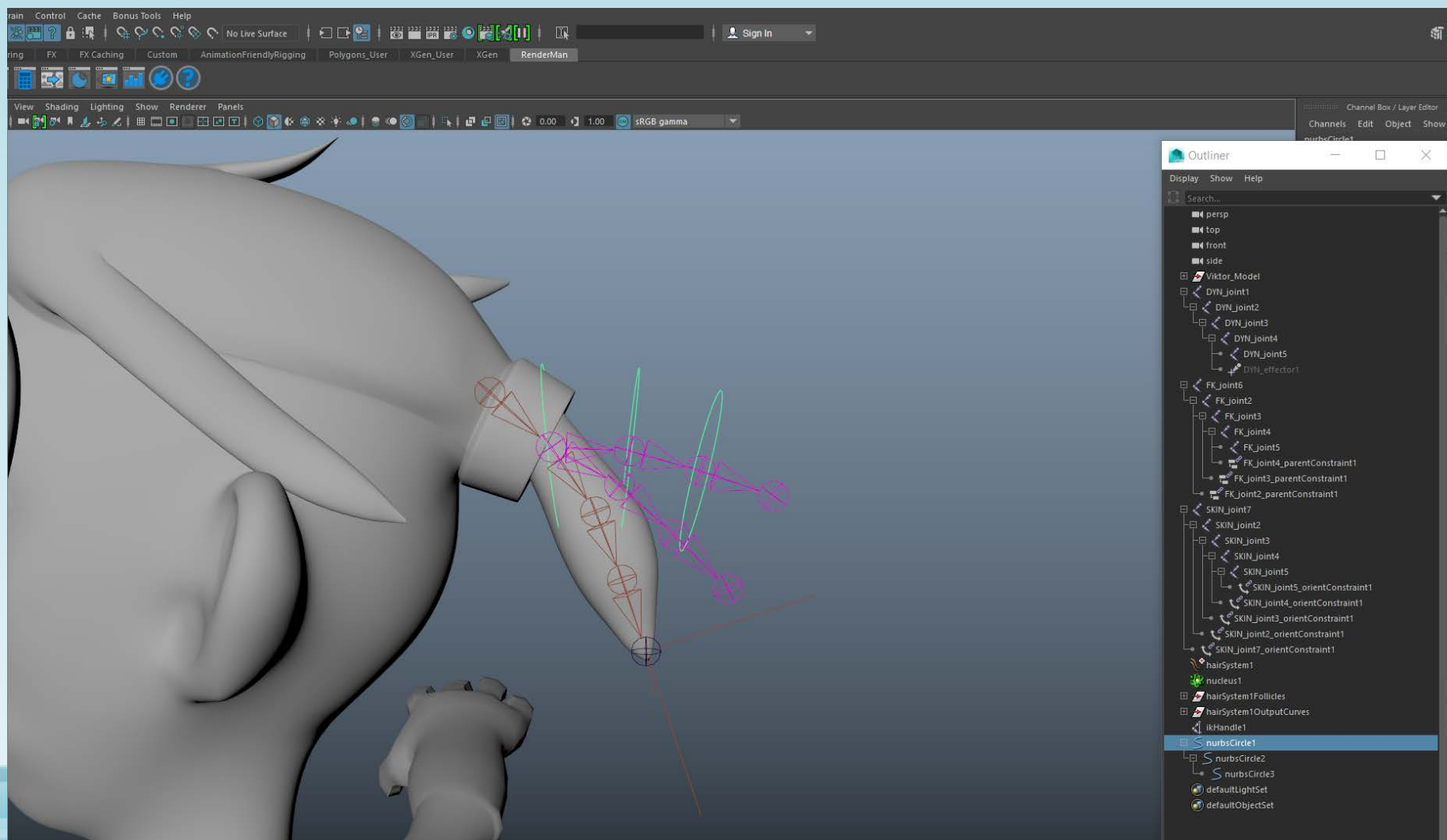- Repeat this for each controller/joint you want to control.
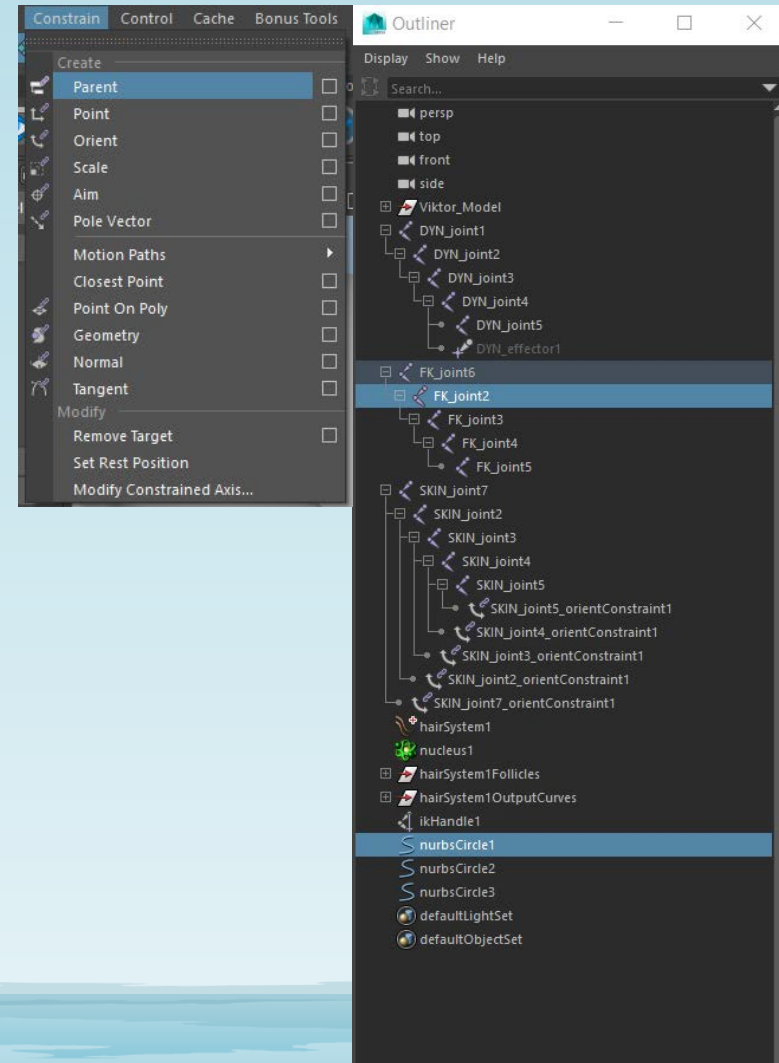
One last parent…
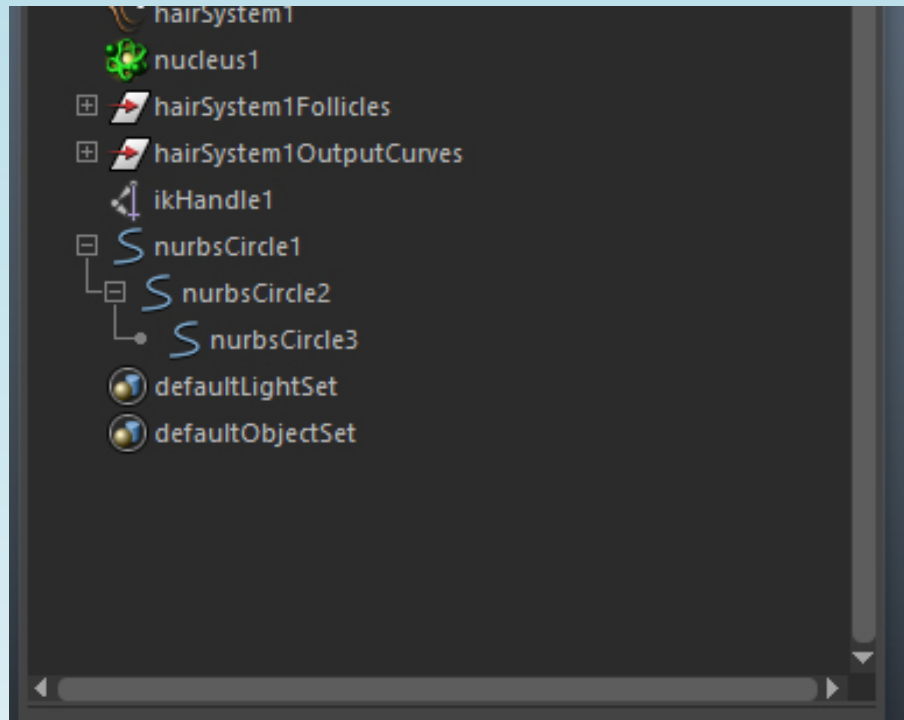
- Once you have constrained everything, you will notice that the controllers are not following each other in the hierarchy.

- You need to parent the controllers so each NURBS circle follows the circle above it. Middle mouse drag circle 2 to circle 1, and then middle mouse drag circle 3 to circle 2. This parents each controller to the one above it.

And that's it! As you can see, the skin joint chain now follows the FK controllers, as well as is affected by the dynamics of the dynamic joint chain.

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