

# Chapter 31:

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In this chapter, we will apply many of the previously learned concepts to create a lightning ray. Upon completion you should be able to draw lightning curves.

Download the two Chapter 31 files from <https://github.com/rbarbosa51/GeometryNodesByTutorials/tree/main/Chapter31>. Open the Chapter31Start.blend file so you can follow along.

Upon examining the Chapter31 object you will notice that is a straight up and down curve. Go to the Geometry Nodes workspace. Connect a **Resample Curve(3)** in between the **Group Input(1)** and **Group Output(2)** nodes. We need to create more points on this object, therefore set the **Resample Curve(3)’s Count** to 200. This will give us the required points to simulate a lightning ray. Connect a **Curve to Mesh(4)** node in between the **Resample Curve(3)** and **Group Output(2)** nodes. Now, connect a **Curve Circle(5)** node to the *Profile Curve* socket of the **Curve to Mesh(4)** node. On the **Curve Circle(5)** node, change the *Resolution* to 16 and the *Radius* to 0.02. Your node tree should look like Figure 31-1 and viewport results should look like Figure 31-2.

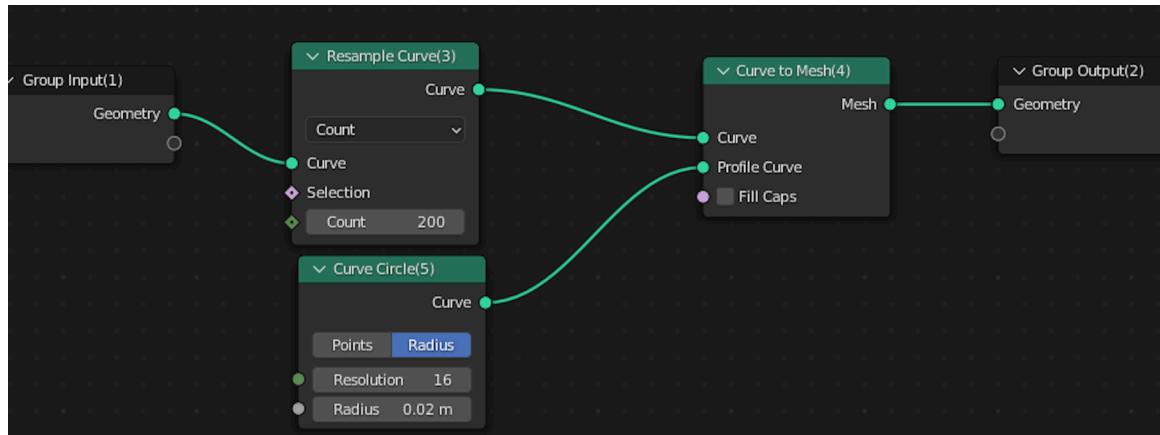


Figure 31-1

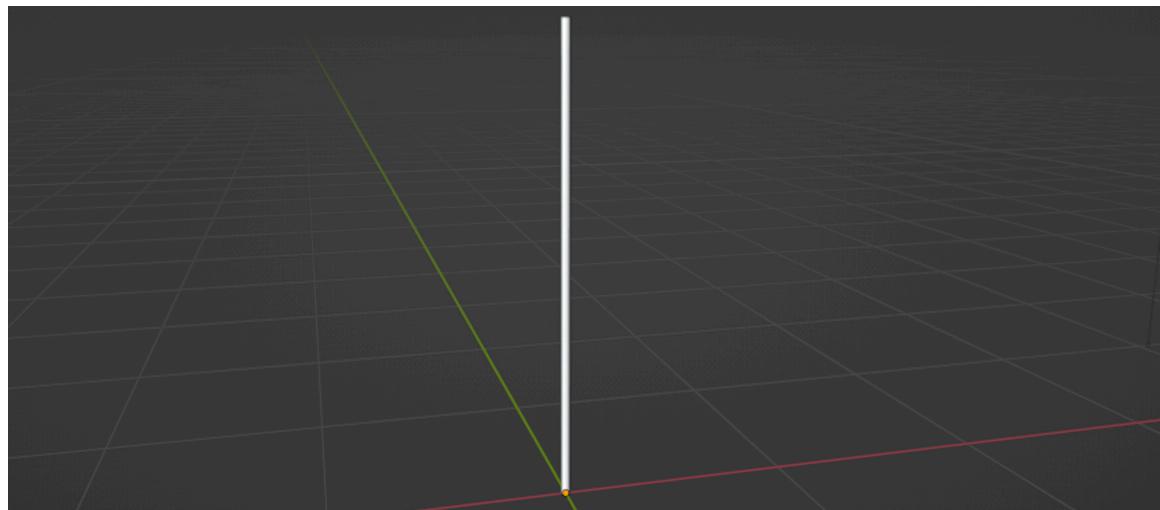


Figure 31-2

You can now minimize **Curve Circle(5)** to save visual space. Connect the **Set Position(6)** node in between the **Resample Curve(3)** and the **Curve to Mesh(4)** nodes. Grab a **Noise Texture(7)** node and set it to 4D. Connect the outbound *Color* socket of the **Noise Texture(7)** to the first *Vector* socket of the **Vector Math(8)** node. Set the **Vector Math(8)** node's function to *Subtract*. Then set the second *Vector* value to 0.5, 0.5, 0.5. As previously discussed the **Noise Texture** adds an average of 0.5 on all axis hence the need to subtract. Connect the **Vector Math(8)** to the *Offset* socket of the **Set**

**Position(6)** node. Your node tree should resemble Figure 31-3 and viewport should look similar to Figure 31-4.

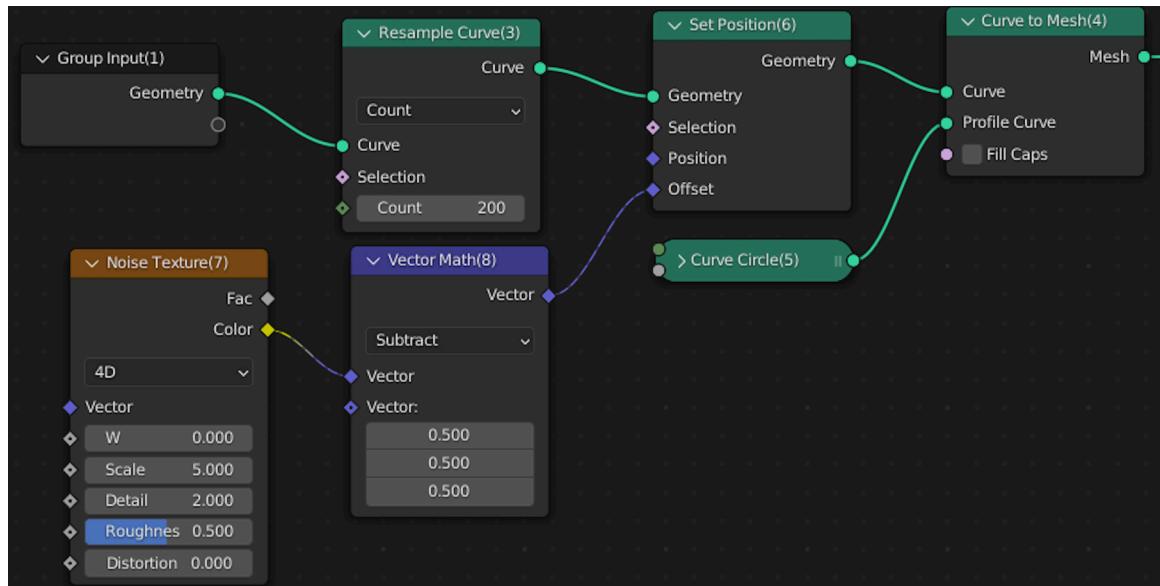


Figure 31-3

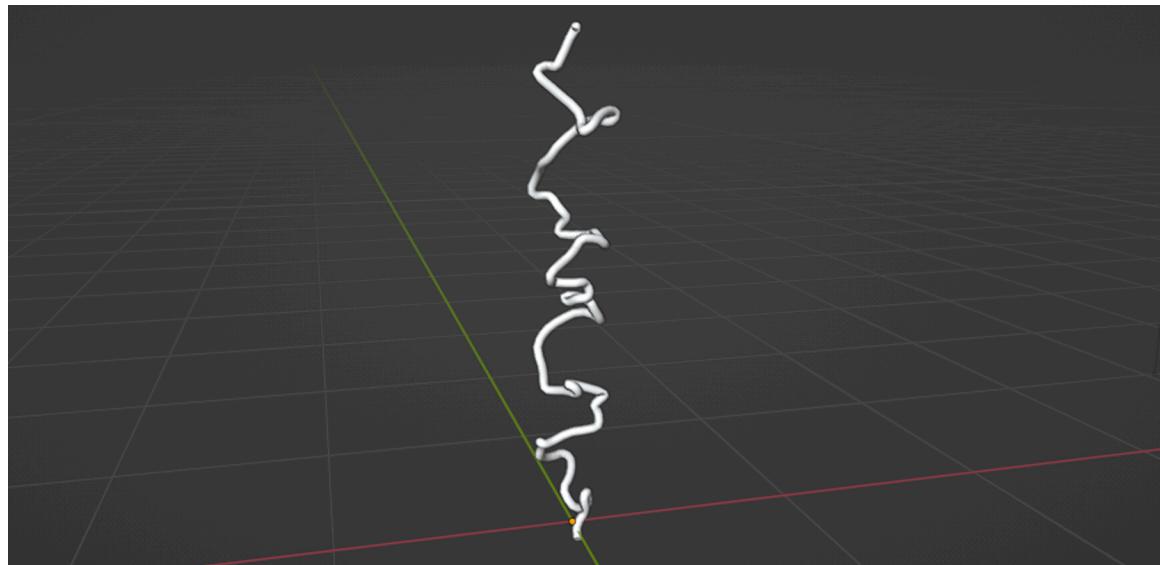


Figure 31-4

As we can see in the viewport, the vertex displacement effect is too strong. In order to tone it down a little we are going to scale down the effect. Connect a **Vector Math(9)** node in between the **Vector Math(8)** and the **Set Position(6)** nodes. Set the **Vector Math(9)**'s function to **Scale**, and its **Scale** value to **0.6**.

You might have noticed that all of the points are moving. We need to have the first and last vertices to remain stationary. We can accomplish this by inverting the boolean value an **Endpoint Selection** node. Connect a **Boolean Math(11)** node to the **Selection** socket of the **Set Position(6)** node. Set the **Boolean Math(11)**'s Operation to **Not**. Grab and connect the **Endpoint Selection(10)** node to the **Boolean** socket of the **Boolean Math(11)** node. Leave the **Endpoint Selection(10)**'s **Start Size** and **End Size** to **1**. Your node tree should resemble Figure 31-5.

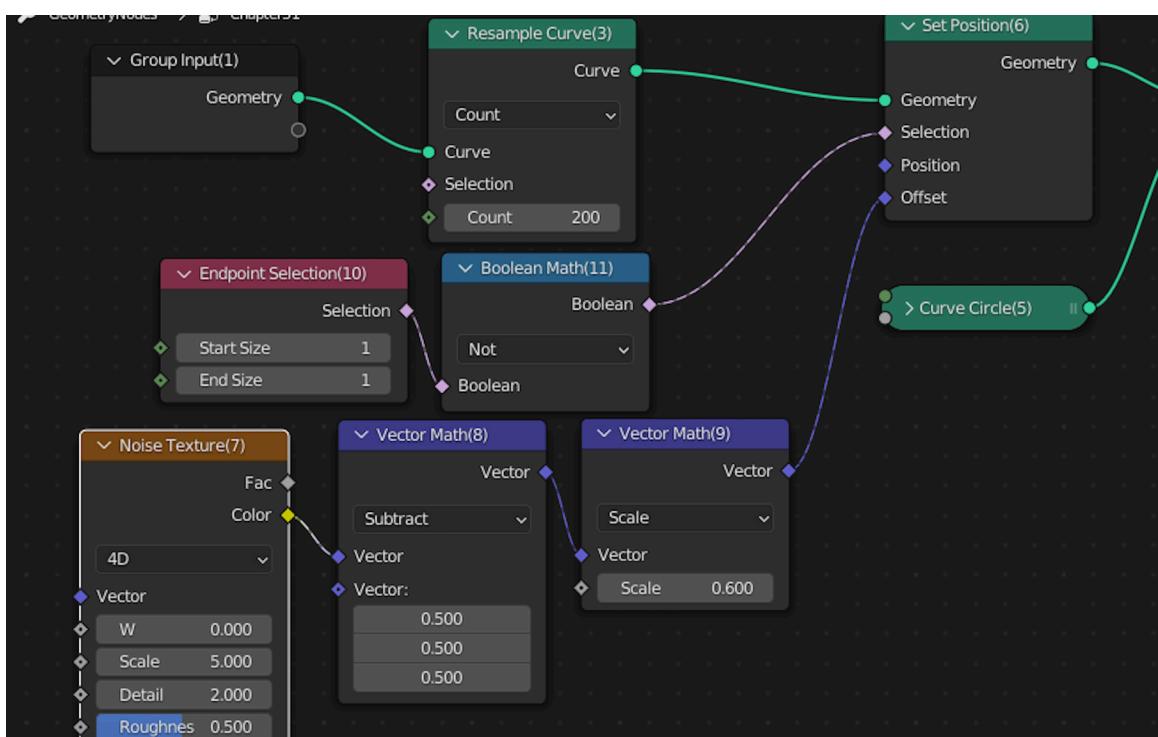


Figure 31-5

Grab a **Group Input(12)**, a **Scene Time(13)**, and a **Math(14)** nodes and place them to the left of the **Noise Texture(7)** node. Connect the **Noise Texture(7)**'s Scale inbound socket to an empty socket on the **Group Input(12)** node. Change the **Math(14)** function to *Multiply*. Connect the first **Value** socket of the **Math(14)** node to an empty socket of the **Group Input(12)** node. On the **Group Input(12)** node, change this new sockets name from **Value** to **Speed**. Connect the **Scene Time(13)**'s **Seconds** socket to the second **Value** of the **Math(14)** node. Finally, connect the **Math(14)**'s **Value** outbound socket to the **Noise Texture(7)**'s **W** socket. See Figure 31-6.

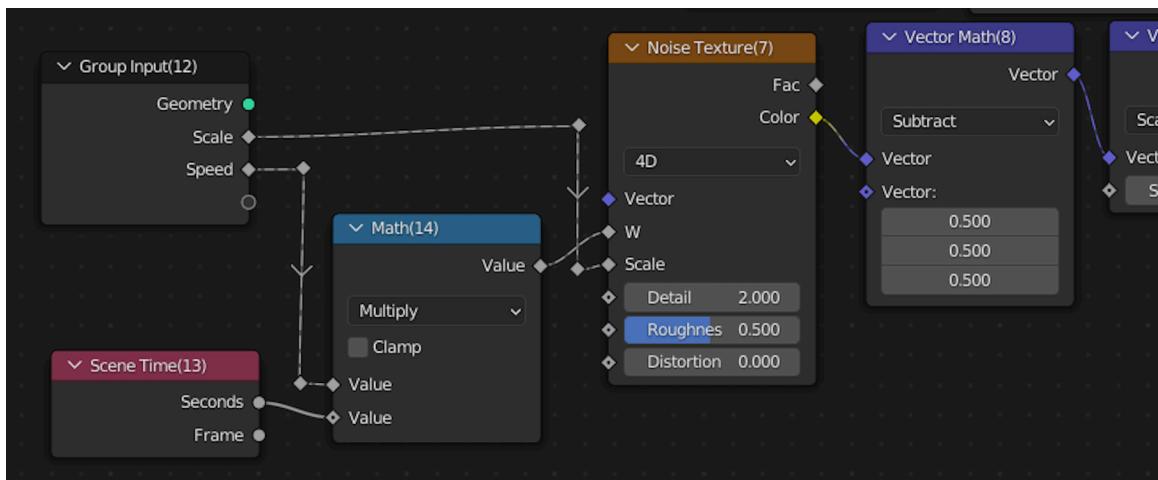


Figure 31-6

Go to the Layout Workspace. Start the animation. You should see that the randomness resembles lighting. On the Modifier tab change the **Scale** value to 0.0. You should now see an almost vertical line. Change the **Scale** to 10.0. You should now see that there are spaces that are too bent. Change the **Scale** back to 5.0. Start the Animation, and change the **Speed** from 0.1 to 1.0. You will see that at low values it barely moves and at 1.0 it moves too fast. Set the **Speed** at 0.2. Go back to the Geometry Nodes Workspace.

We want to make the curve thicker on the top and thinner in the bottom. Connect a **Set Curve Radius(15)** in between the **Set Position(6)** and the **Curve to Mesh(4)** nodes. Connect the **Spline Parameter(16)**'s *Length* socket to the inbound *Value* socket of the **Float Curve(17)** node. Connect the **Float Curve(17)** to the *Radius* socket of the **Set Curve Radius(15)** node. On the **Float Curve(17)** node, click on the center to add a point handle. Set the values of this handle to X: 0.55 and y: 0.45. See Figure 31-7. You should now see that the curve gets very thin at the bottom (Figure 31-8).

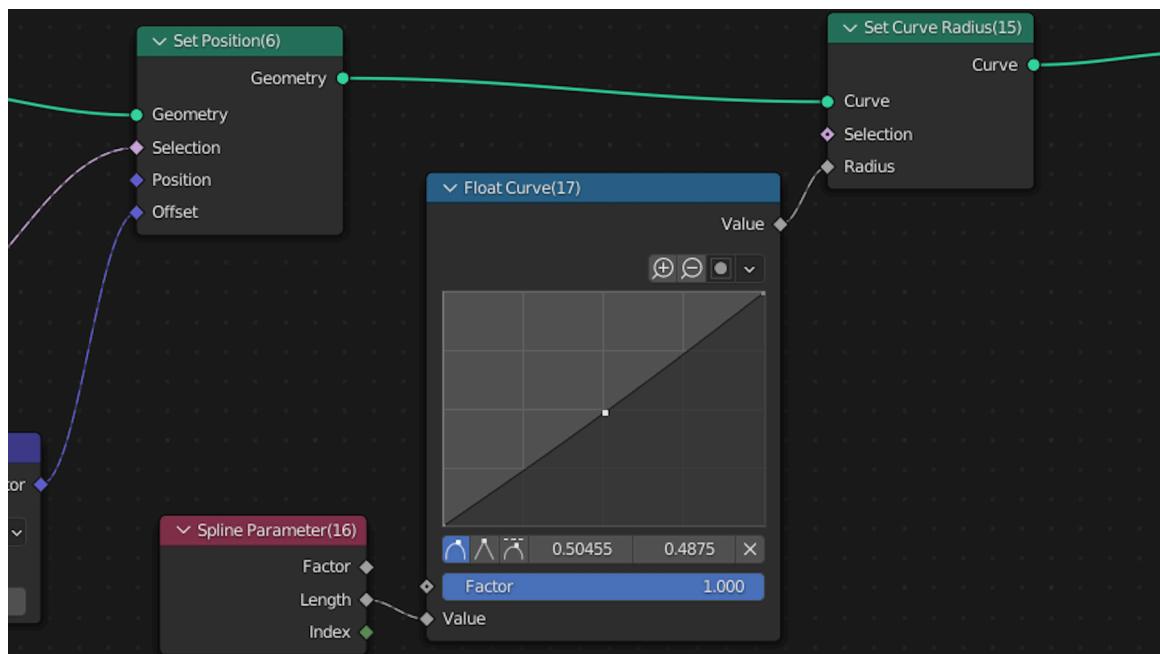


Figure 31-7

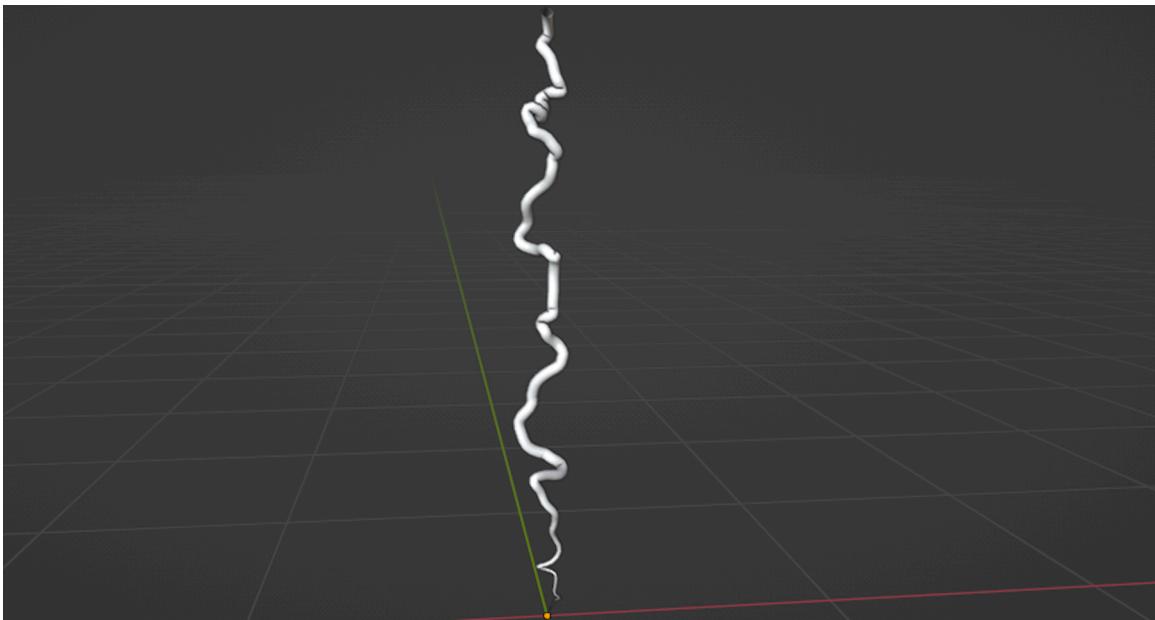


Figure 31-8

Connect a **Store Named Attribute(18)** node in between the **Curve to Mesh(4)** and **Group Output(2)** nodes. On the **Store Named Attribute(18)**, change the name to *EmissionStrength*. Connect the *Value* socket of the **Store Named Attribute(18)** node to an empty socket on the **Group Input(19)**, and then change the name of this socket to *EmissionStrength*. Connect a **Set Material(20)** node in between the **Store Named Attribute(18)** and the **Group Output(2)** nodes. Set the **Set Material(20)**'s *Material* to the pre-made *Emission* material. See Figure 31-9.

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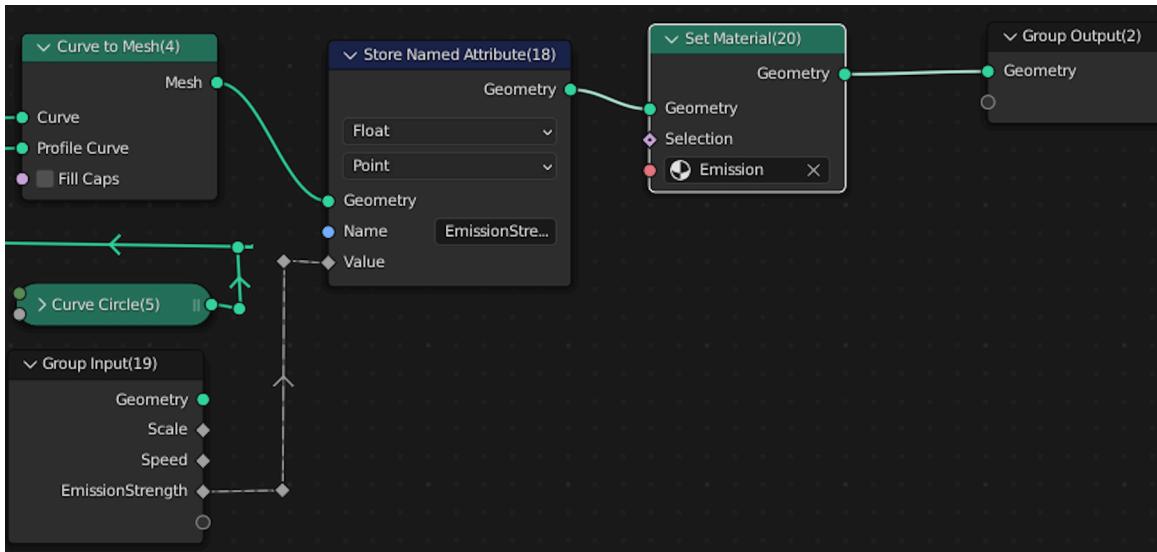


Figure 31-9

On the modifier tab, change the EmissionStrength to 100.0. Go to the Shading Workspace. In the **Attribute(21)** node, on the Name field write *EmissionStrength*. The Shading Workspace should look like Figure 31-10. Change the Viewport Shading to Material Preview. The render results should look like Figure 31-11.

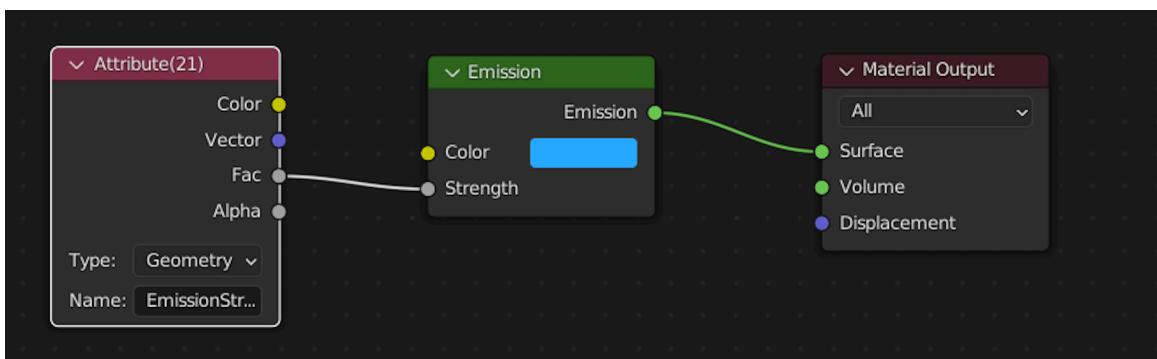


Figure 31-10

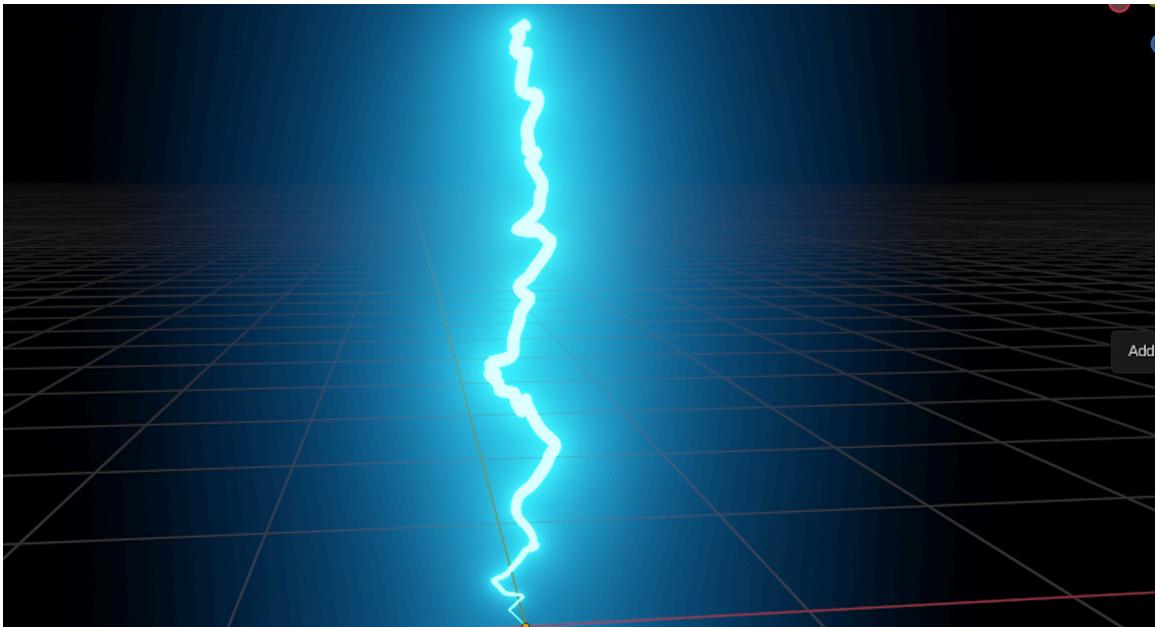


Figure 31-11

From the Layout Workspace, go to Edit Mode. Select all vertices and delete them. With the draw tool selected draw three curves, and watch them become lightning (Figure 31-12). Select all vertices once more and delete them. Now draw line by line some text. For this example, I chose to write: Hello World (Figure 31-13).



Figure 31-12

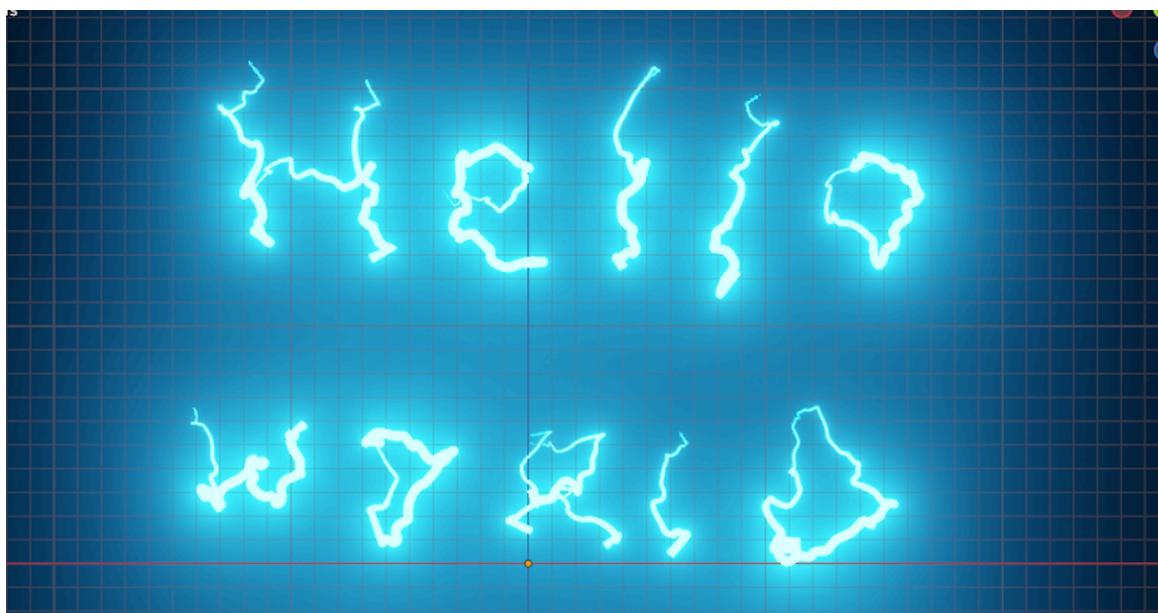


Figure 31-13

Experiment by animating the text by key-framing the EmissionStrength value. Go to keyframe 1 and set the EmissionStrength to 1.0. Go to the last keyframe and set the EmissionStrength to 100.0. You could as well keyframe the Scale and Speed should you choose.

Compare your results and node tree with those of the downloaded Chapter31Final.blend file.