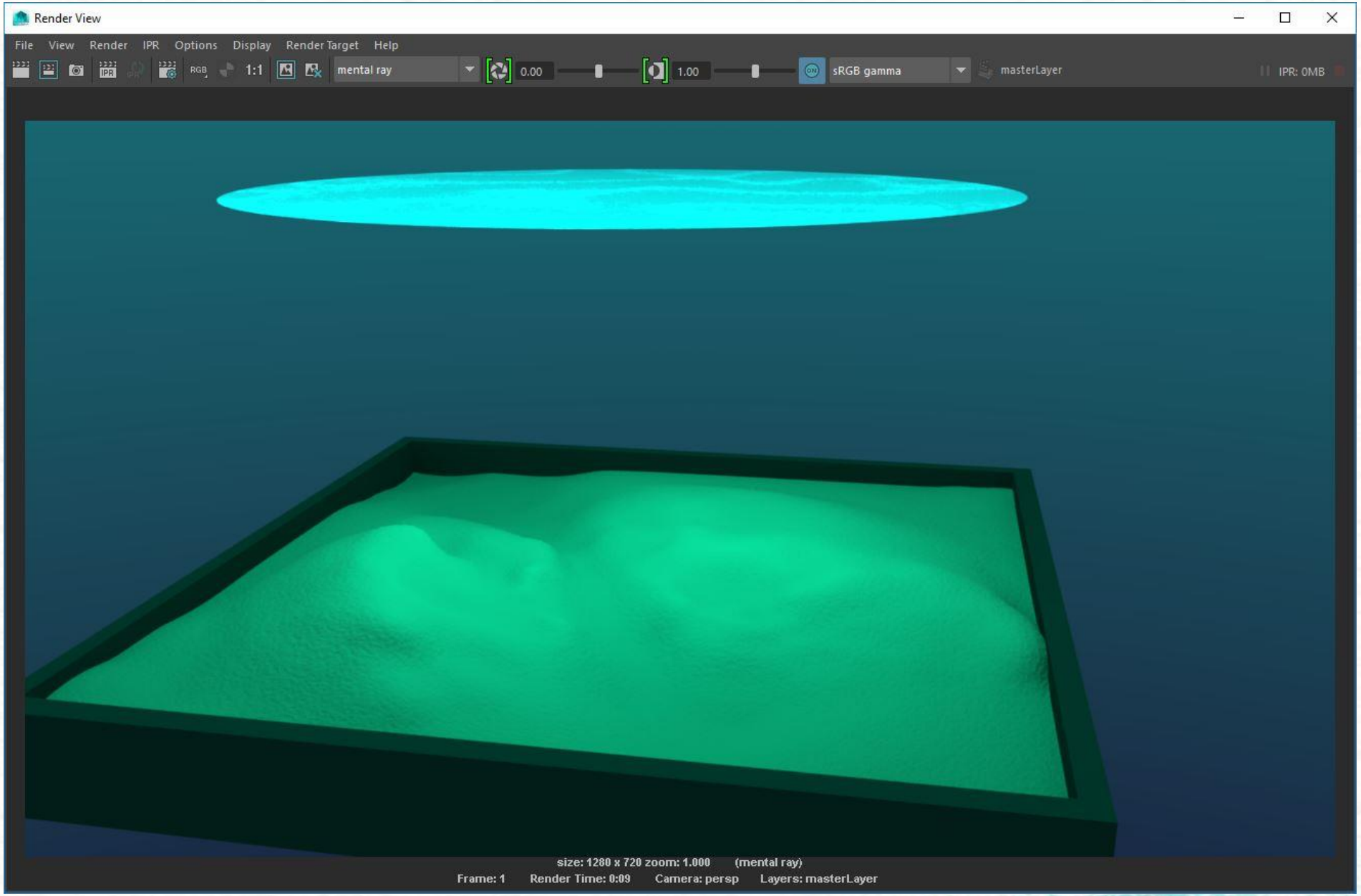
Caustic Lighting Effects

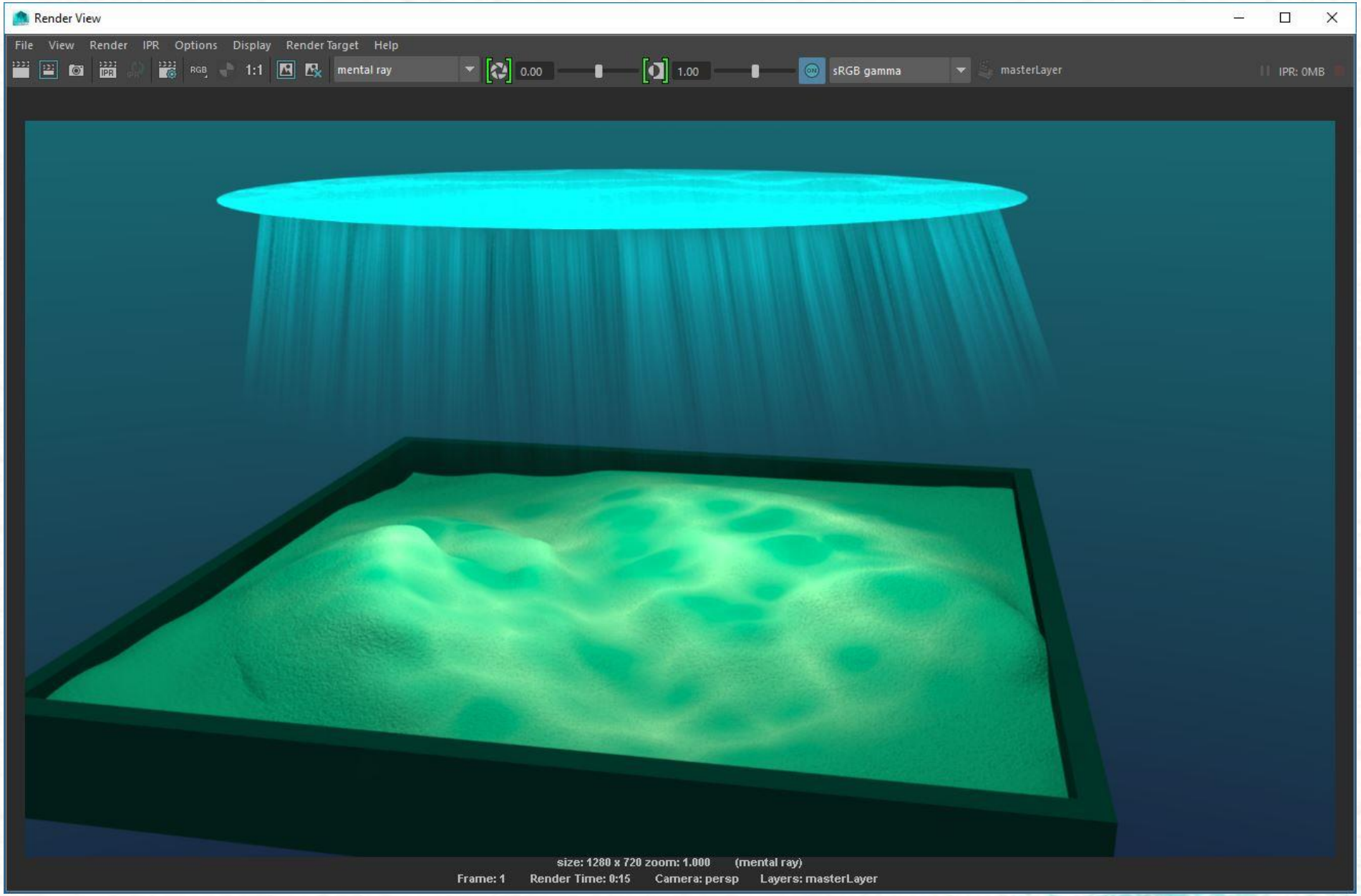
By Connor Waugh

In this presentation, I'm going to show you how to create two different caustic lighting effects to make your underwater scene go from drab-



-to

FAB!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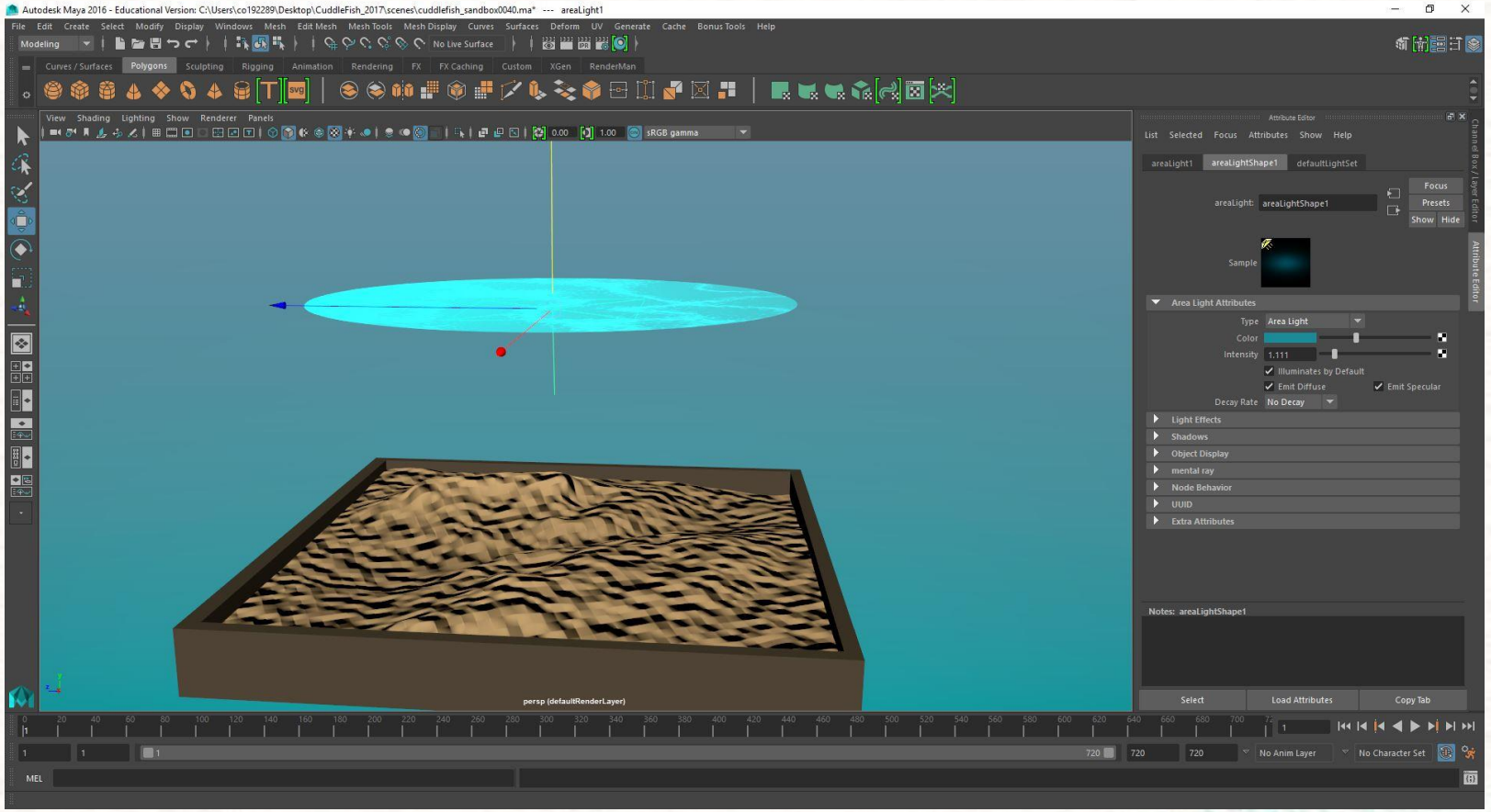
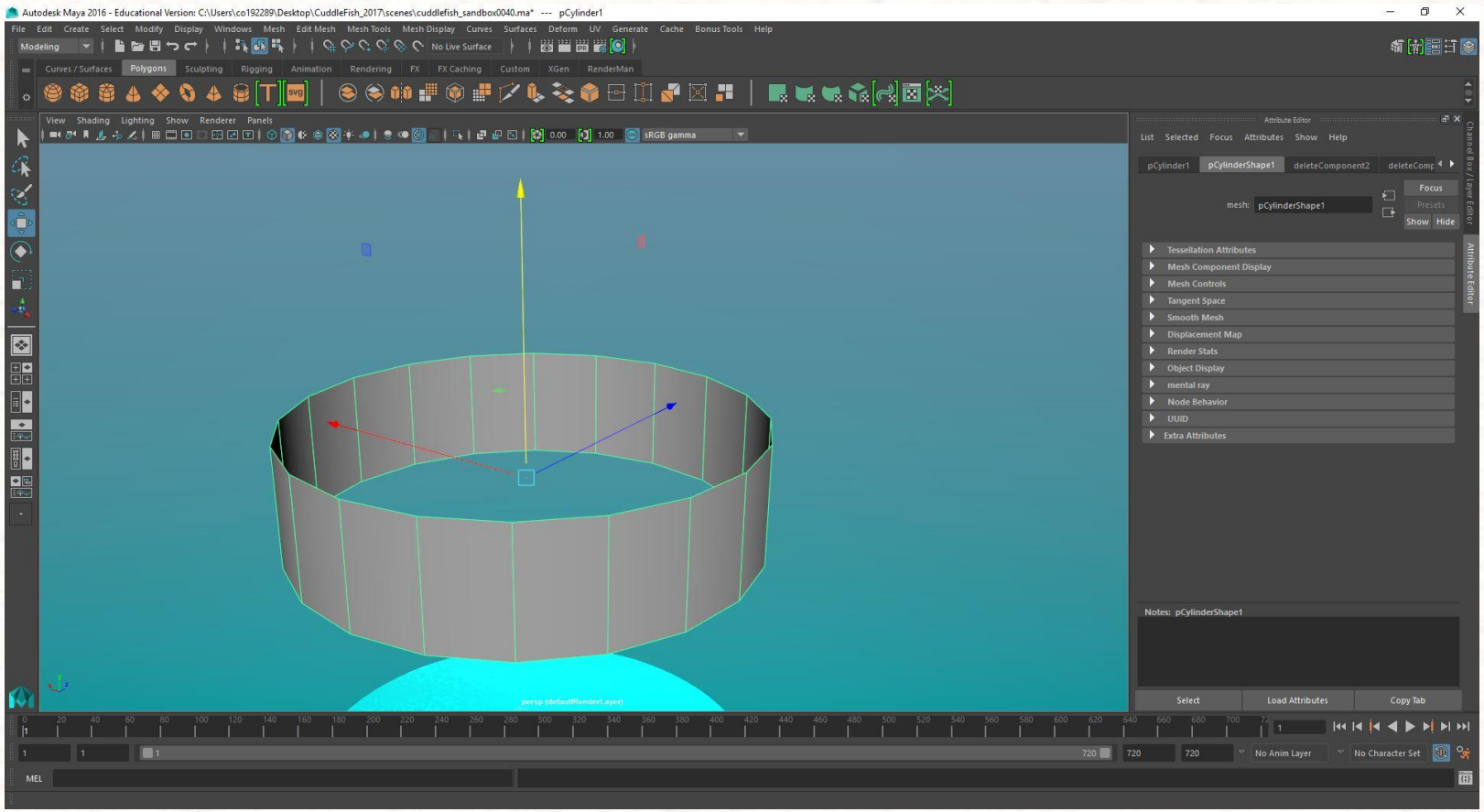
Caustic Rays

- Start by setting your project.

- I began my scene with a sky dome, water surface plane, sandbox, and a teal colored area light- as seen here.

  The major two components here are your water plane and your ground plane. both can be whatever you want but these give you a point of reference for sizing and an area for the caustics to show up on.

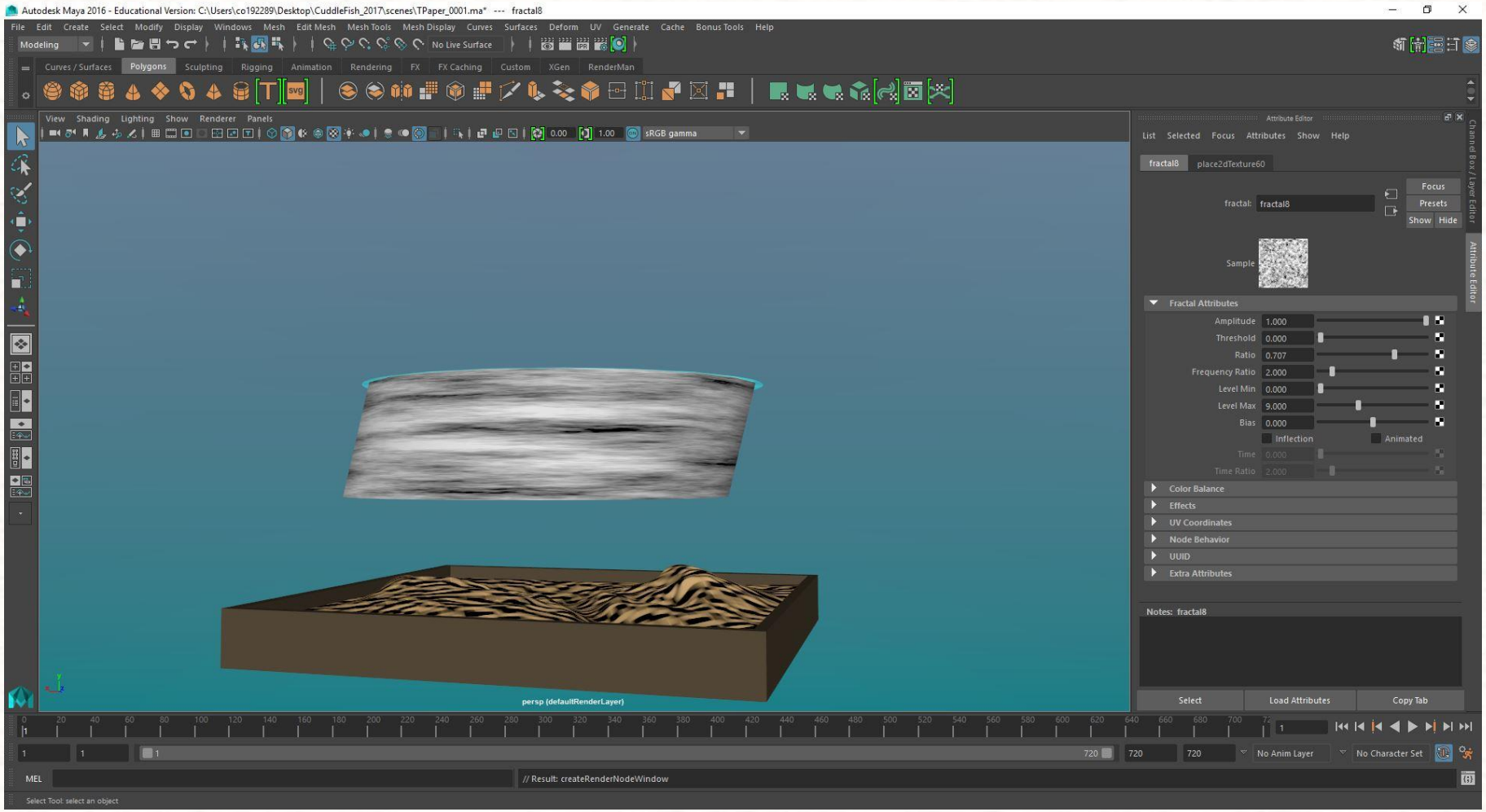




- Create a cylinder, make it just smaller than the water surface plane and about half way between the water surface and sandbox plane. Delete the top and bottom faces to make an open tube.

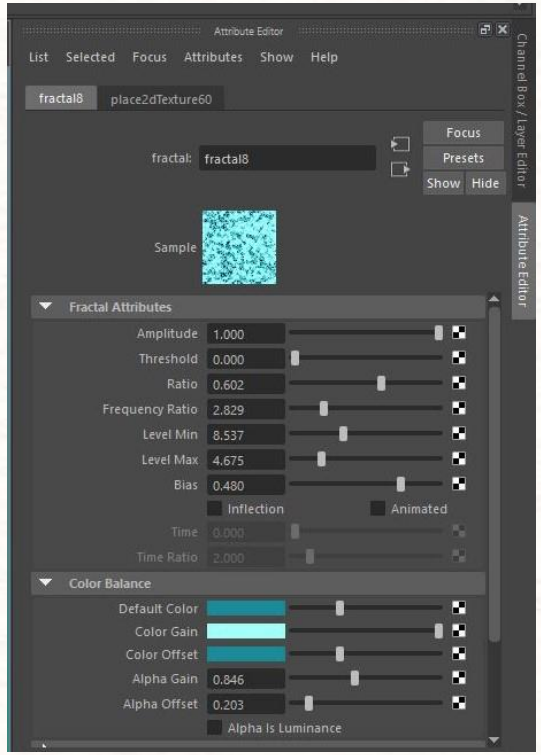
- Next, place your cylinder just under the water plane and select the vertices on the bottom of the cylinder. Angle them the direction you want your light source to be coming in from.
  As you go on you will probably be adjusting these vertices more and more to fit your liking and your scene so don't worry about getting them perfect the first time!

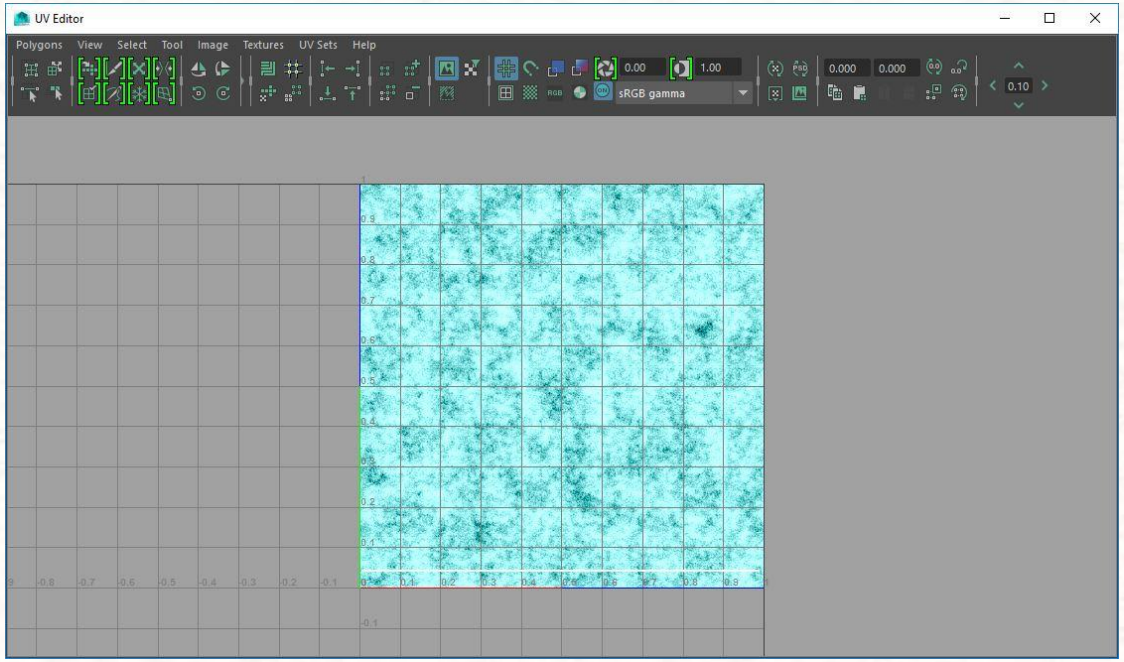
- Assign a new Lambert to your cylinder. I've named mine causticLam.
- Click on the symbol to the right of the Color attribute in causticLam and assign a fractal texture. If done correctly, you should end up with black and white streaks going horizontally across your object.

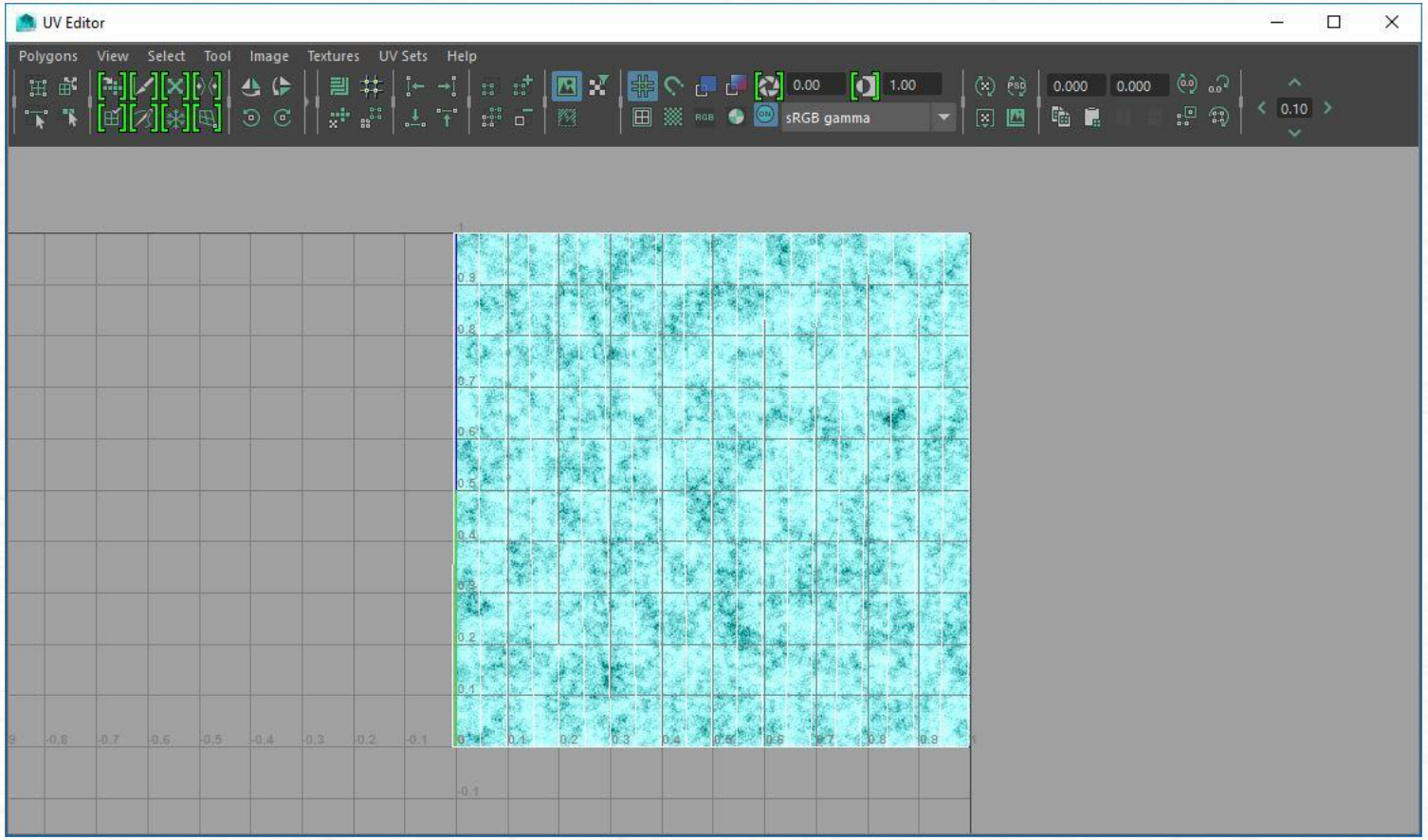


- These are the settings in the fractal's attribute editor I used to get my effect. I wanted my effect to reflect the teal I was previously using for the water's color and I needed an even ratio of dark and light teal in order to get a stylized ray.

- Go into the cylinder's UV editor and stretch the UVs until long and thin and resize to fit the UV editor (it should look like a thin, white line like what I have circled in red). This will give you long, vertical lines over your object with your different gradients of teal.



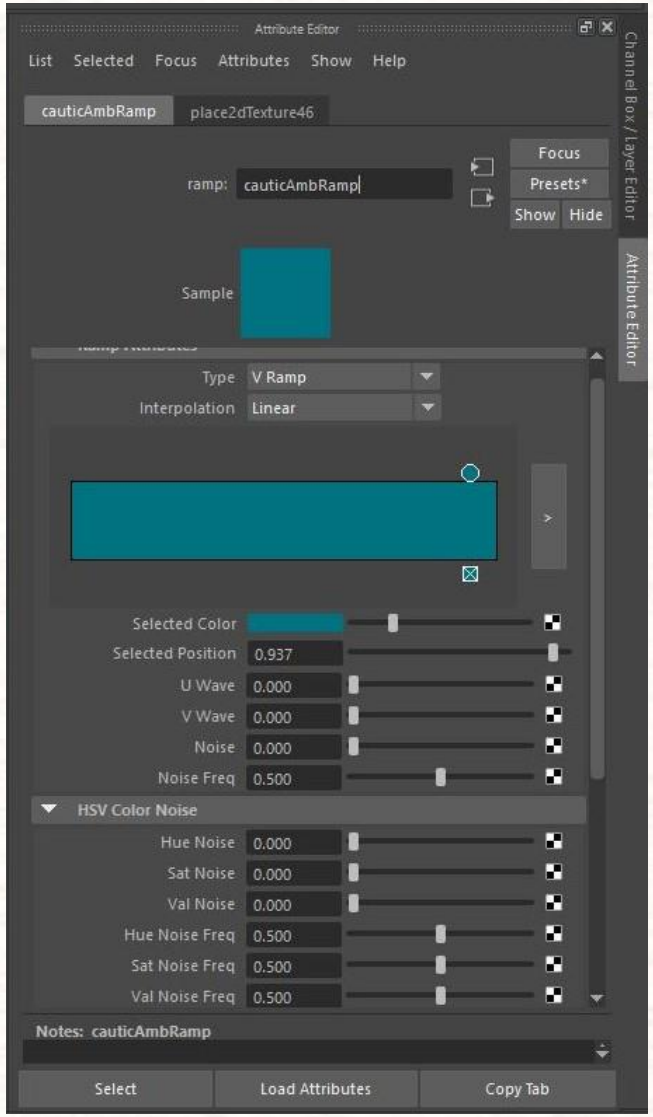


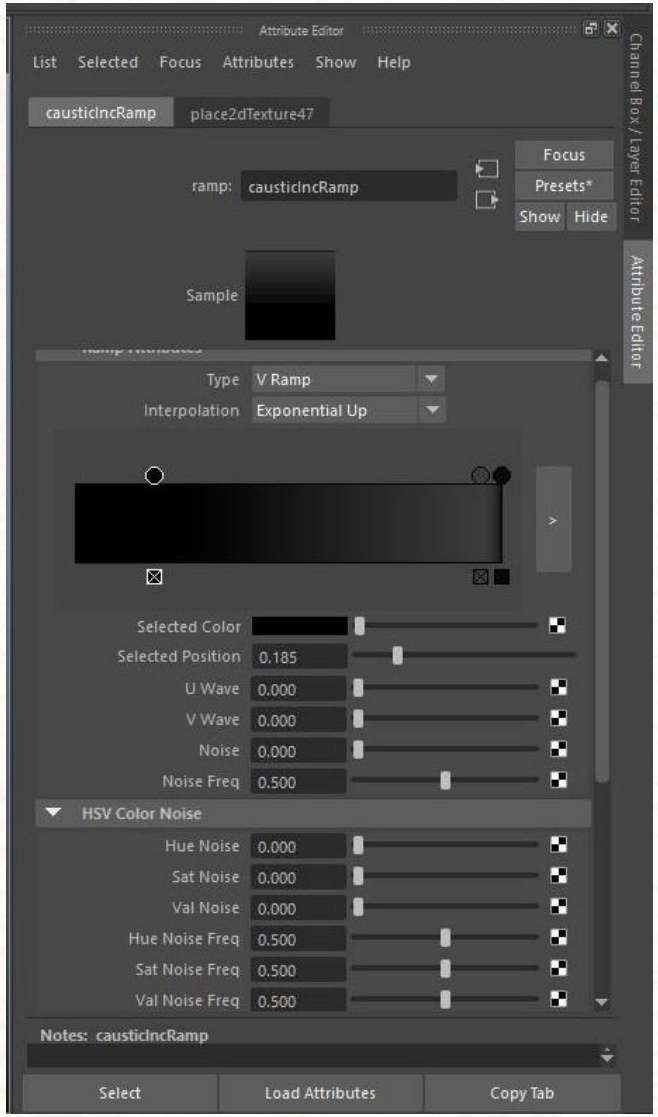


- Create a second UV on the cylinder and link it to the object. Fit your new UV to the UV box. You'll notice that the white lines representing the second UV fill the entire box in the image to the left. This is to give you more control when using a ramp shader on the object.

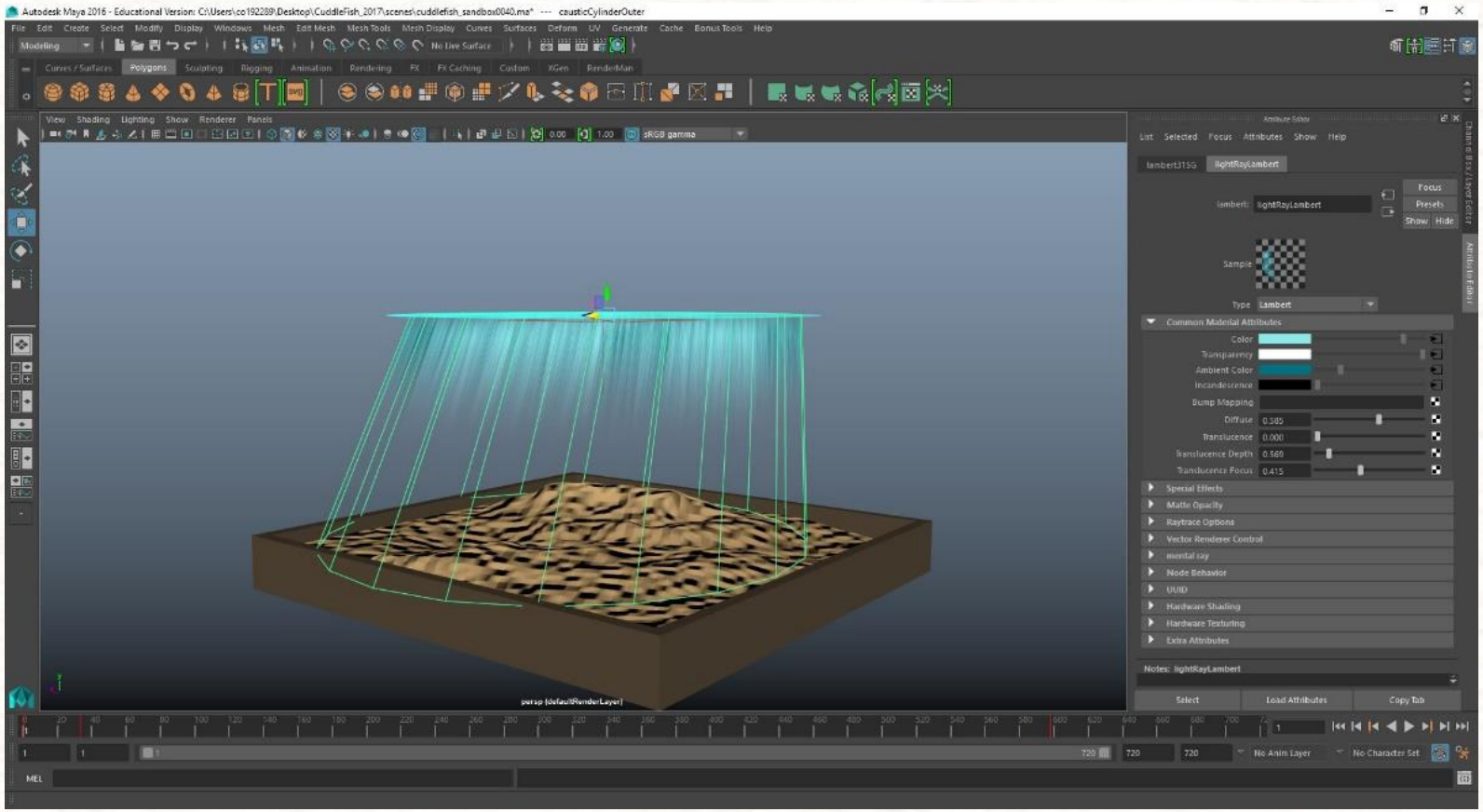
- Click the icon to the right of the transparency attribute in the attribute editor and assign a ramp shader. I've named mine ramp.
  This ramp shader will be used to give your rays a soft tapering at the bass much like natural lighting would disperse.

- I added a ramp to the Ambient color that I called causticAmbRamp and a ramp to the incandescence I labeled causticIncRamp.
  These were used to better match the rays to my previously placed Area light and sky dome.



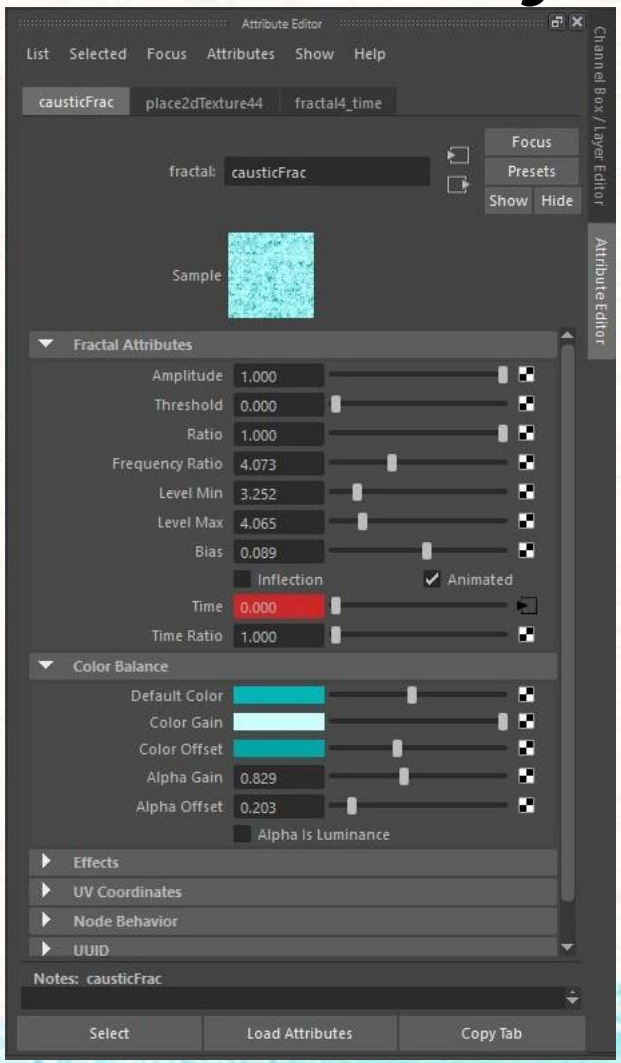


I adjusted my bottom vertices to better fit my scene by expanding them and moving them over slightly. This is a good time to eyeball the shape, size, and angle of your rays to make sure they better suit your scene and lighting placement. Once satisfied with these attributes you're ready to animate the rays!



Animating Caustic Rays

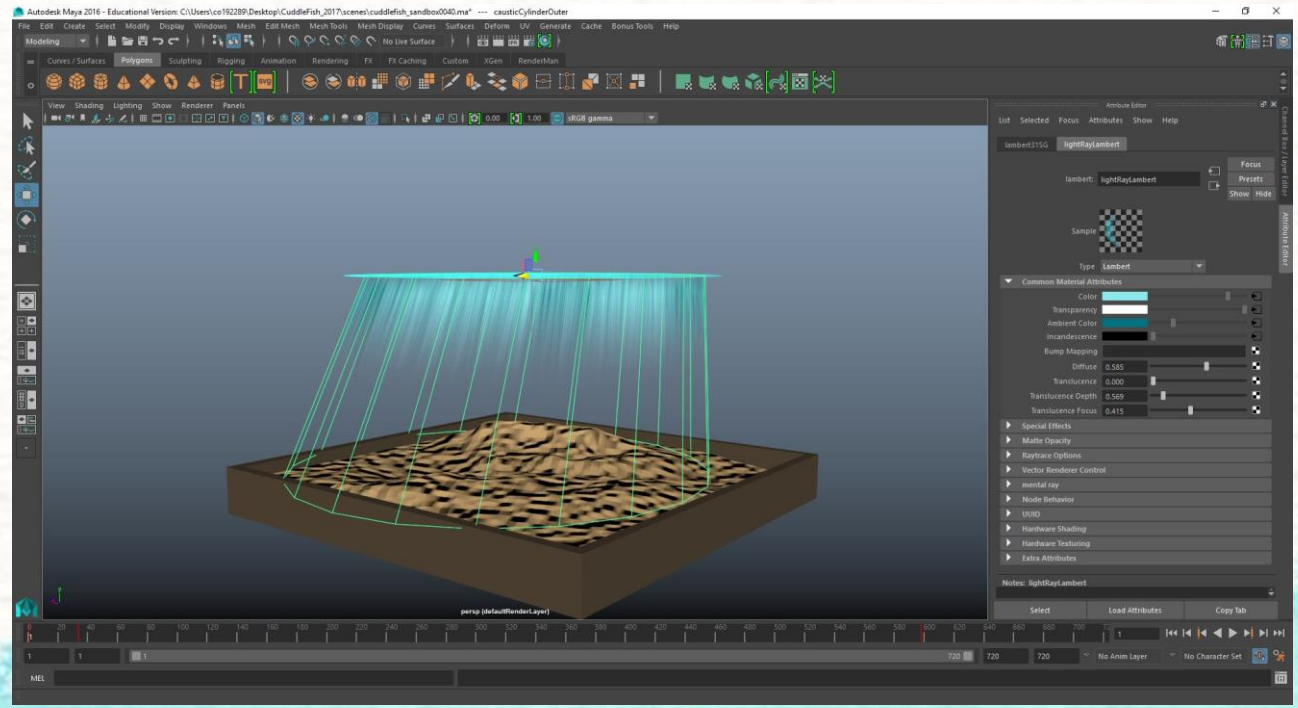
To animate caustic rays, go into the fractal shader connected to the color attribute in cauticLam and check animated, located in the Fractal Attributes drop down menu. Make sure you've selected the first frame on your timeline and right click Time and select Set Key at 0.000. Set a new key every 50 frames and raise the time by 0.25. Because this effect is a texture, you will be able to watch the animation in the maya view panel and adjust the speed to your liking accordingly.

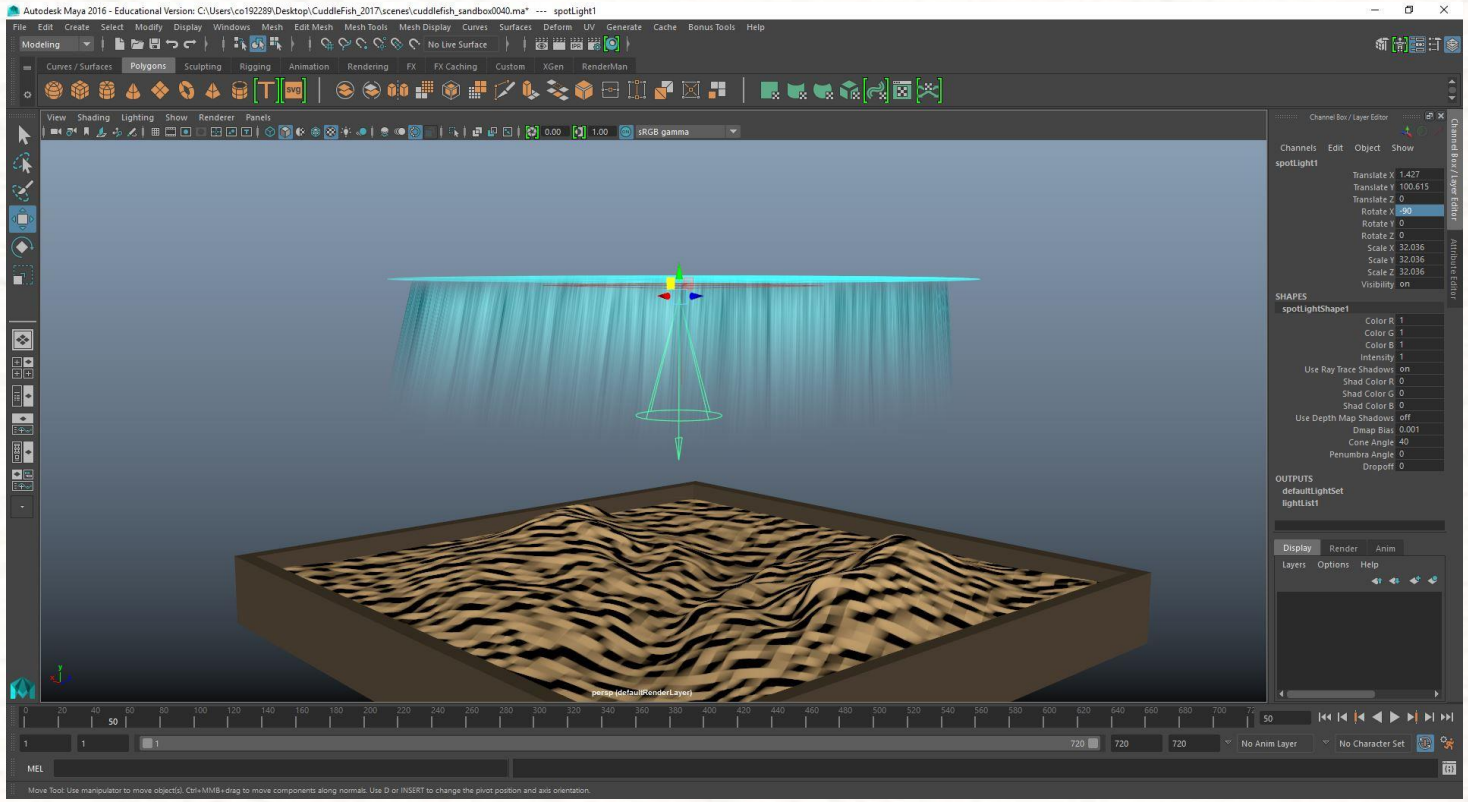


Surface Caustic Lighting

So here's where that ground plane, or in my case, sandbox, is really going to come into play. With the previous effect we used a cylindrical object to project a texture map. The ground caustics effect uses an actual light source and must have an object to be projected upon.

If you followed along with the previous instructions, your scene should look something like this



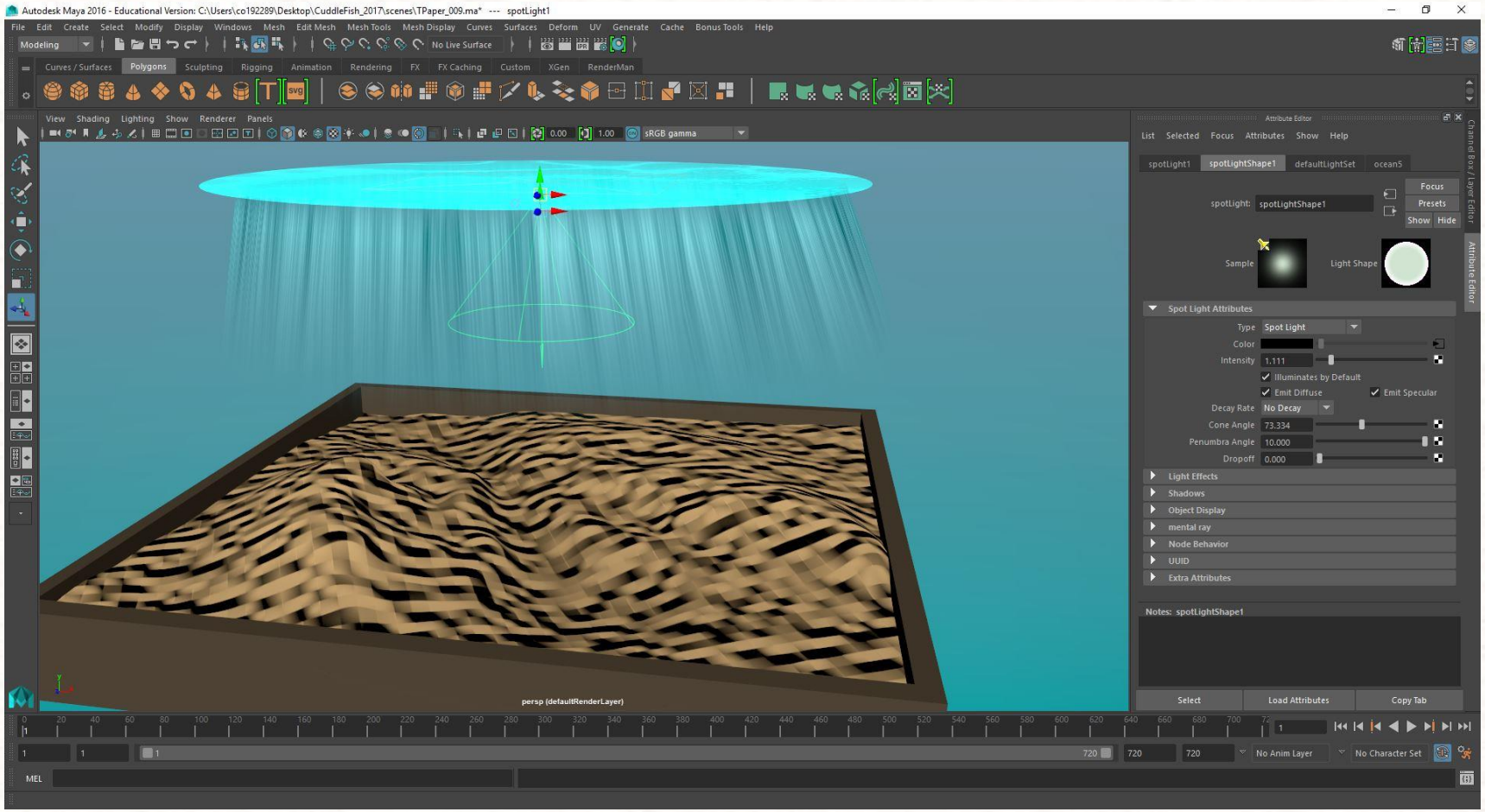


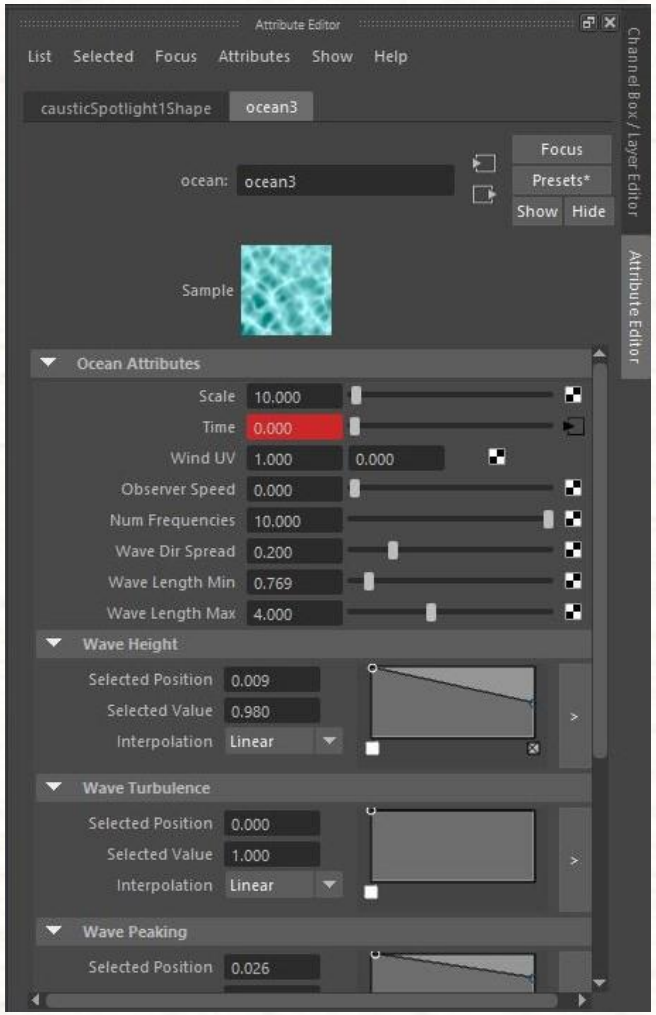
- Start your surface caustic lighting by creating your light source. Do this by going into maya and selecting **Create > Lights > Spotlight**

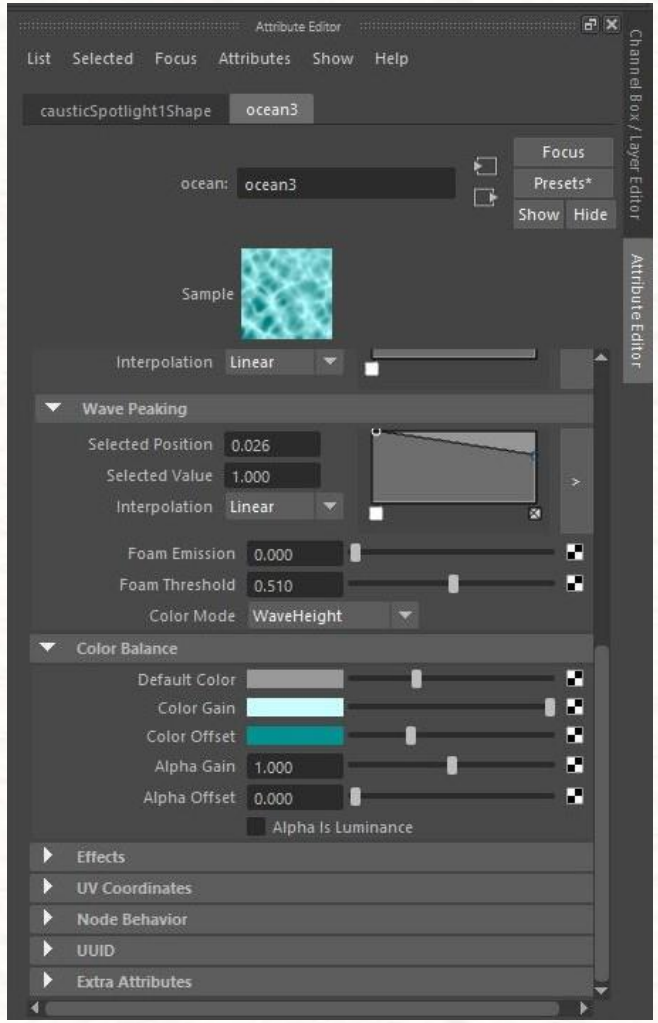
- Resize your light and position it directly under your water surface plane. You want to make sure that it is not clipping the water surface plane at all. If it does clip, your light will not show up on your ground plane. You can fix this by translating the light directly under the plane or turning off the connection between your light and the water surface plane in your light linking editor.

- Rotate your spotlight on the X-axis by either -90 or 270 so that it is directly pointing at your ground plane.

- Resize the base of the spotlight cone by choosing the Cone Angle attribute in the attribute editor and expanding it or pressing the T key and clicking the symbol that appears to select and resize the cone angle.



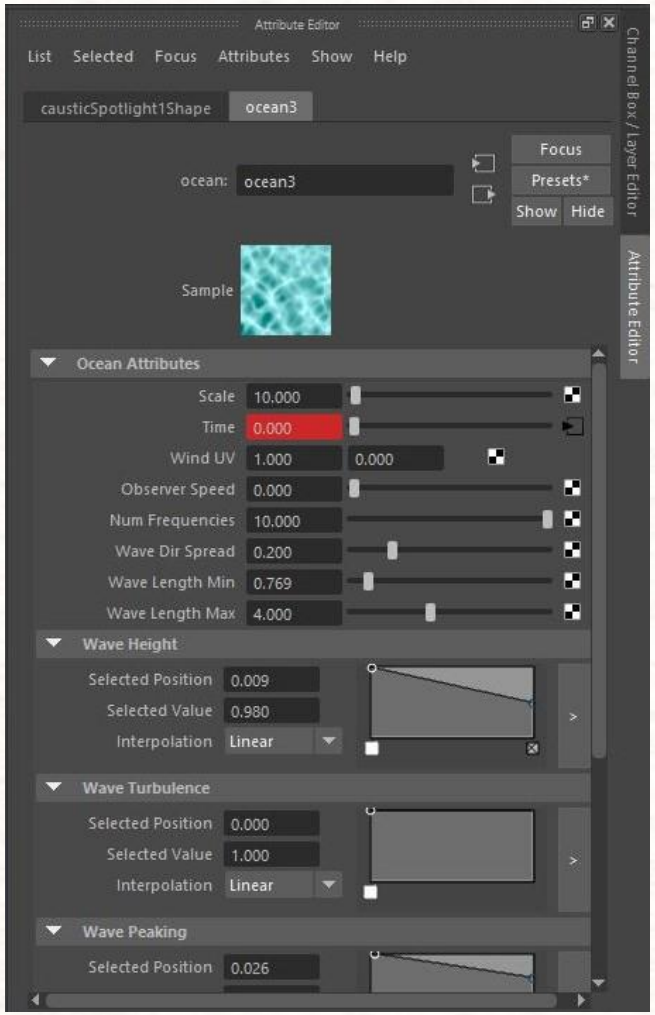


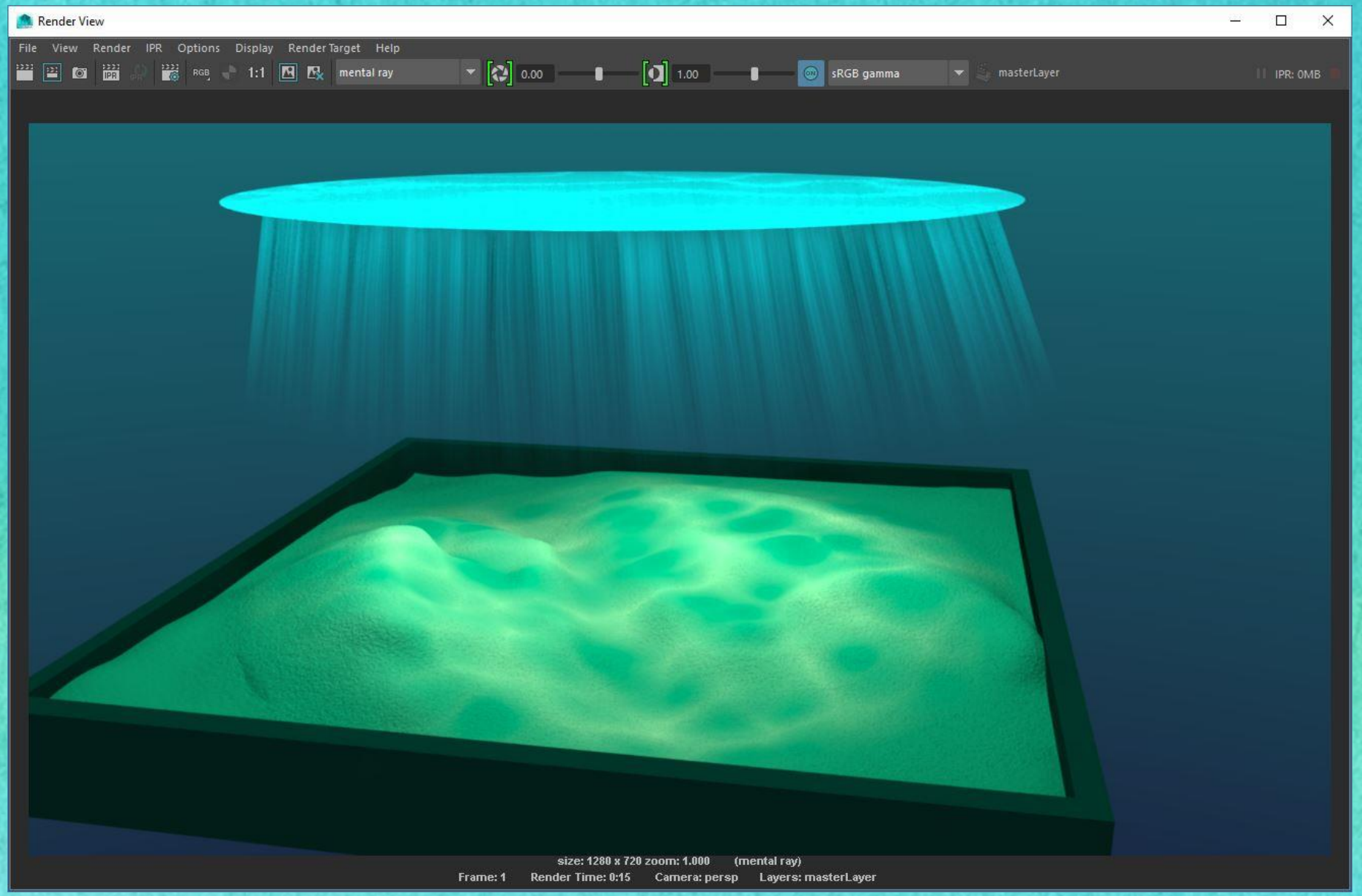


- Click the icon to the right of the color attribute and assign it an Ocean shader.
- The wave height and wave peaking scales in the attribute editor will change the frequency, sizing, and variation of your dark and light spots when rendered.
- Try to keep the coloring consistent with previous lighting you have used for your ray caustics, area light, and sky dome.

Animating Surface Caustics

Animating surface caustics is the exact same process as animation ray caustics with minor differences. In order to do so, select the ocean shader connected to the spotlight's color attribute in the attribute editor. Underneath the ocean attributes tab is a slider labeled "Time". Make sure you're on the first frame on your timeline and that Time is set to 0.000. Right click Time in the ocean attribute and select Set Key. Set a key every 50 frames and raise the Time by .20 at each key. Because this is a light effect you will have to do a few render passes to see the outcome of your animation. Edit your timing like you would for ray caustics accordingly.





And you're done! Use these easy to do caustic effects to take your underwater scenes to the next level!