

CS148 Project - Glacial Ice Caves



Motivation



One of my favorite scenes in nature is glacial ice caves (I've visited them in Alaska). The roof of the ice caves are usually solidified glacial ice with no impurities which makes them beautifully blue, reflective and sometimes transparent. The floor of ice caves is usually made up of stones and frozen over black ice. I have tried to replicate these the floor and roof of the ice caves as much as possible.

I added a mystical reindeer in my scene which is shy and hiding behind a boulder. I drew inspiration for the reindeer from the final project from fall 20 class.

Assets

Cave Floor + Pebbles

I used a simple XY plane and shaped it with small curves (like hills) by moving vertices and turning on proportional editing to create the curves.

I shaped a small pebble from the procedural boulders I have create (more details below). I then used geometry nodes to distribute points randomly on the floor and added an instance of the pebble to the distributed points. I also scaled the pebble randomly to give it an appearance of randomness in size.

Cave Roof + Icicles

I created the roof of the cave from a UV sphere. I sculpted the hemisphere using proportional editing to have 2 openings so that natural sunlight can enter. I added a displacement map along normals to give it natural peaks and troughs.

I created a single icicle by scaling an icosphere along z axis and proportionally pulling the tips of the iceberg apart. I then distributed random points along the roof and added icicle as an instance to those random points.

Snow-covered Boulders

To model boulder, I shaped a UV sphere into an ellipsoid and added a cloud displacement modifier. To model snow, I used point distribute (geometry) node to select points on the surface of the boulder, converted them to volume geometry to make the points continuous and then converted the volume back to mesh. Translating/rotating the rocks changed their shape due to the volumetrics effect!

Reindeer

I downloaded the reindeer from an online website. I used online tutorials to add a glowing and a transparent material. I used a mixture of translucent BSDF and an emission shader. I also turned on glare in the compositor to give the glowing reindeer effect.

Lighting

I used 2 angular suns outside the cave. They reflected some light into the cave which bounced around to give sufficient illumination for rock objects. However, it did not bring out the full effect of the blue color of ice roof. Therefore, I added a total of 6 point lights at various locations close to the roof to highlight the roof's blue reflective color. The reindeer is also a source of light as I added an emission sharer to it.

Materials and Textures

SNOW

I created snow material and texture procedurally. I mixed 2 voronoi textures together and scaled them differently to create a combined repeating pattern. I also set the base color to a slight tinge of blue. I added some bump nodes along with noise textures to the Principle BSDF material to make it appear less smooth. I set this snow as the snow of top of the rock.

I also created another simpler snow material for the floor which has a simple noise texture on a Principle BSDF material. I increased subsurface scattering and radius, decreased roughness and increased clearcoat.

ICE

I created the ice material as a Principle BSDF with a bluish base color. For ice, I set the highest subsurface scattering value

(=1.0) and very low roughness. I set the ice material to icicle and roof.

Rock

I set a simple Principle BSDF material to the rock with a noise texture. A complex rock texture wasn't needed as they are all covered by snow. I set the base color of the rock as a slight shade of blue.

Fog

I added fog at the back of the cave to utilize blender's cycles features well. While this image looks excellent in itself, I decided to choose a different image because personally for me, the roof becomes a bit dull in this image.



Blender Cycle Requirements

- Main Geometry from scratch - I built all the geometry from scratch except the reindeer
- Texturing+Materials - I used procedural textures and materials for snow, ice and rock. I didn't use any textures from the internet.
- Blender Cycles feature - I used volumetric fog in blender cycles as shown in the above image

Resources/References

Deer: <https://free3d.com/3d-model/reindeer-v3--83304.html>

Deer Glow: https://www.youtube.com/watch?v=4njRqkN_4Kc

Procedural snow: <https://www.youtube.com/watch?v=UzJnsqIRbDw&t=263s>

Fog: https://www.youtube.com/watch?v=MoggY_6v5qQ&t=33s

Geometry nodes Ice cave: <https://www.youtube.com/watch?v=WdgM4jOfzTE&t=3s>

Icicles: <https://www.youtube.com/watch?v=ifhxTbtcd1g>