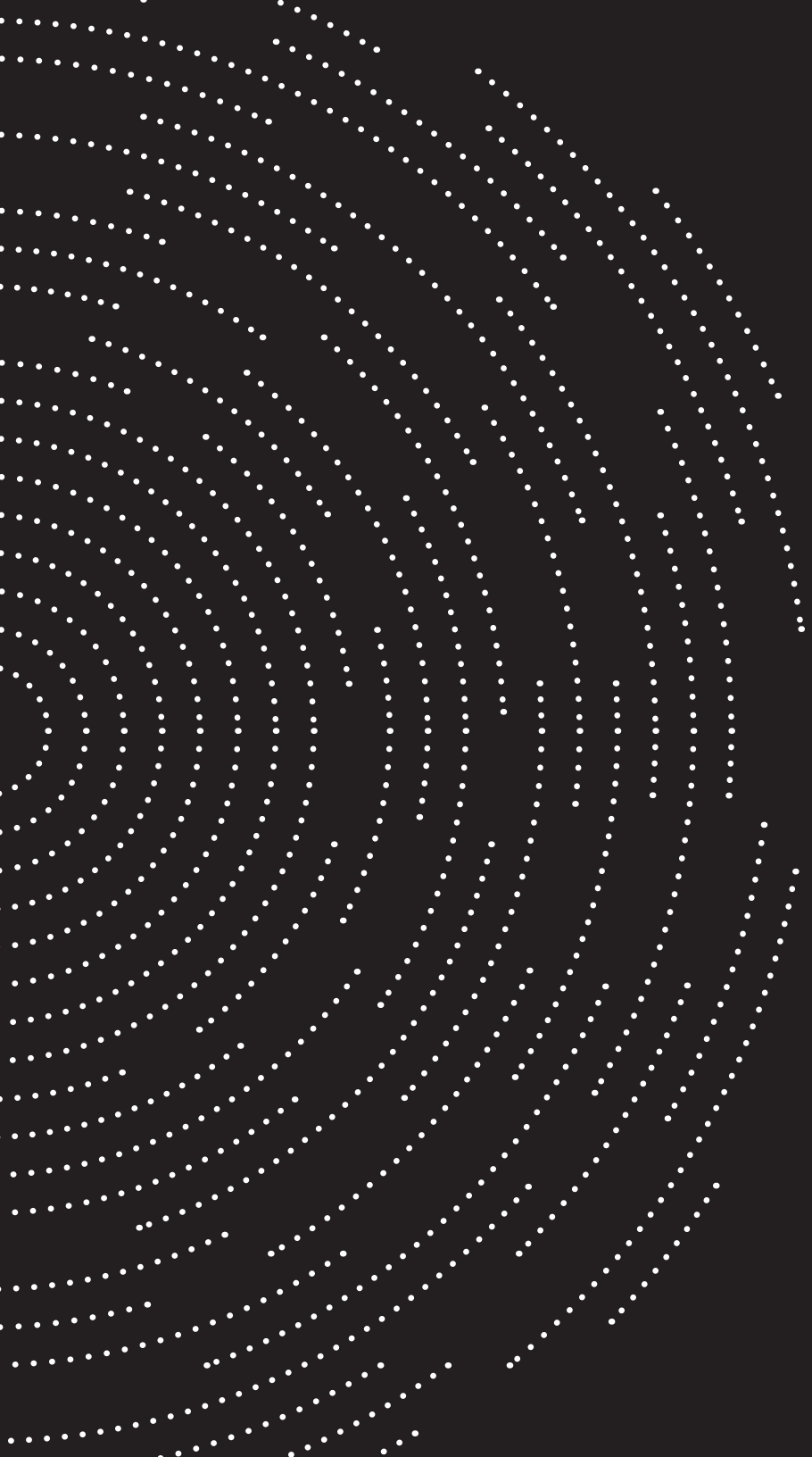
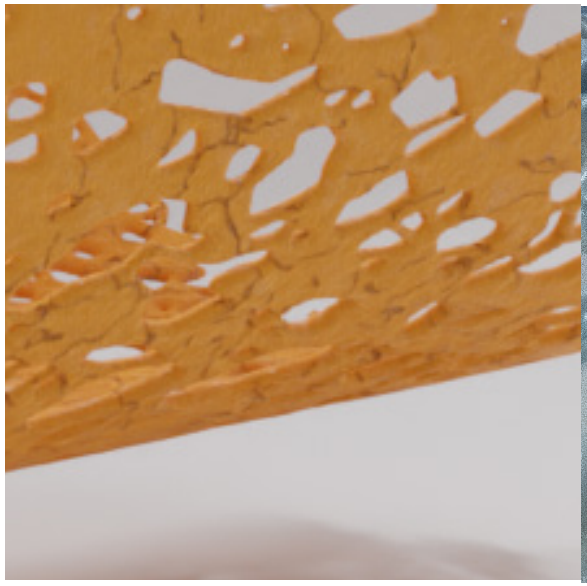


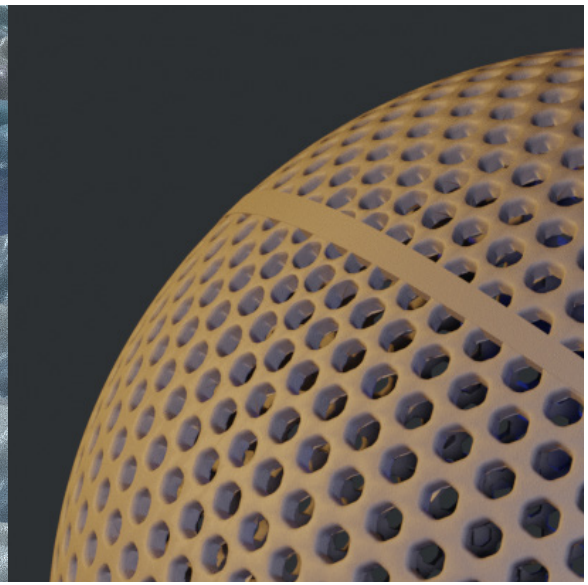
Portfolio

Math + Design

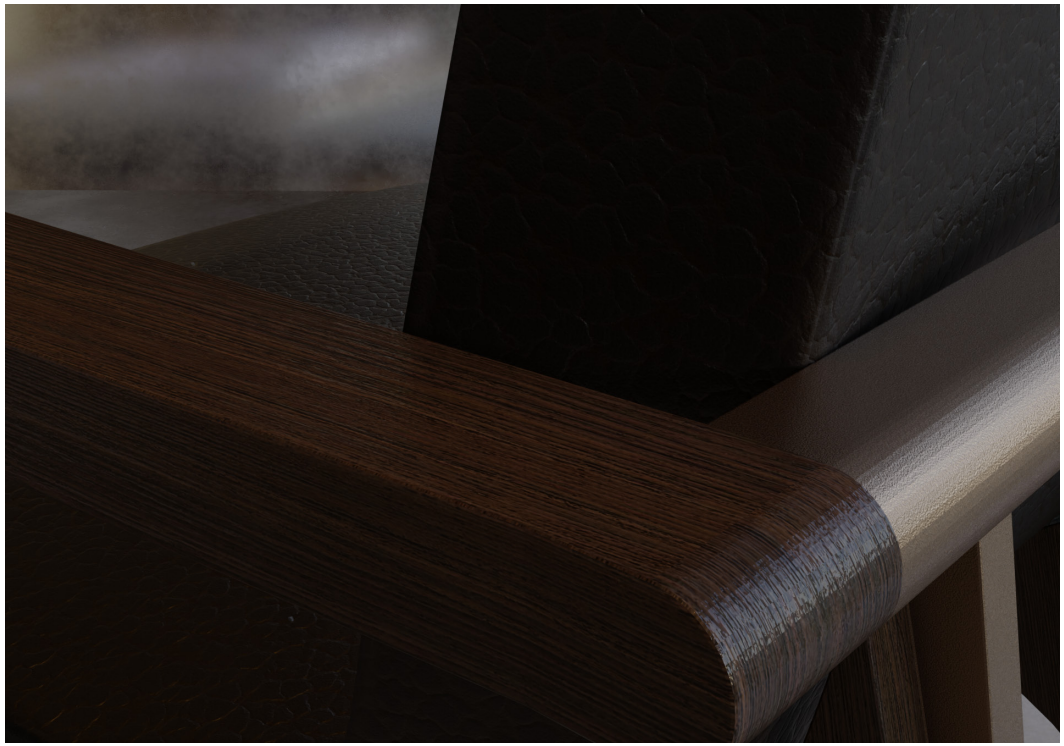
=KYLE ZACHRICH

2024





Contents



02
Tattoo Camouflage

An industrial design project uing procedural modeling to create a custom wearable tattoo cover

03
3D Game Assets

A showcase of 3D models and materials made for week-long ‘game jams’

04
Educational Materials

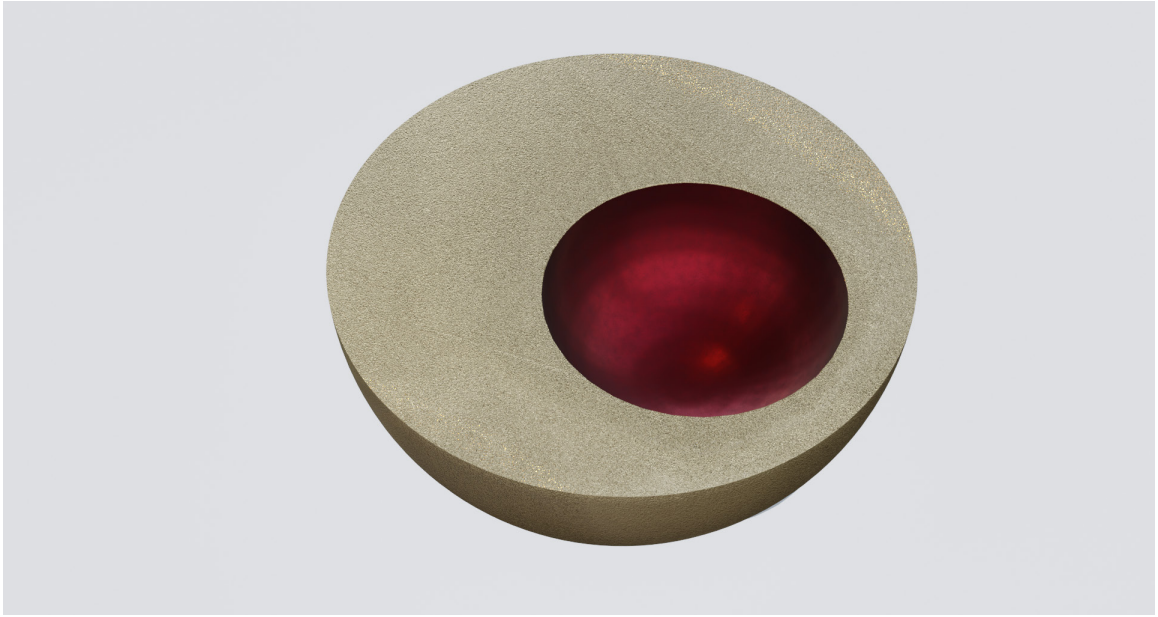
A selection of materials created for a math class designed for architecture and design students

05
Personal Art Projects

Various paintings, product designs, creative coding projects, and patterns

Archviz

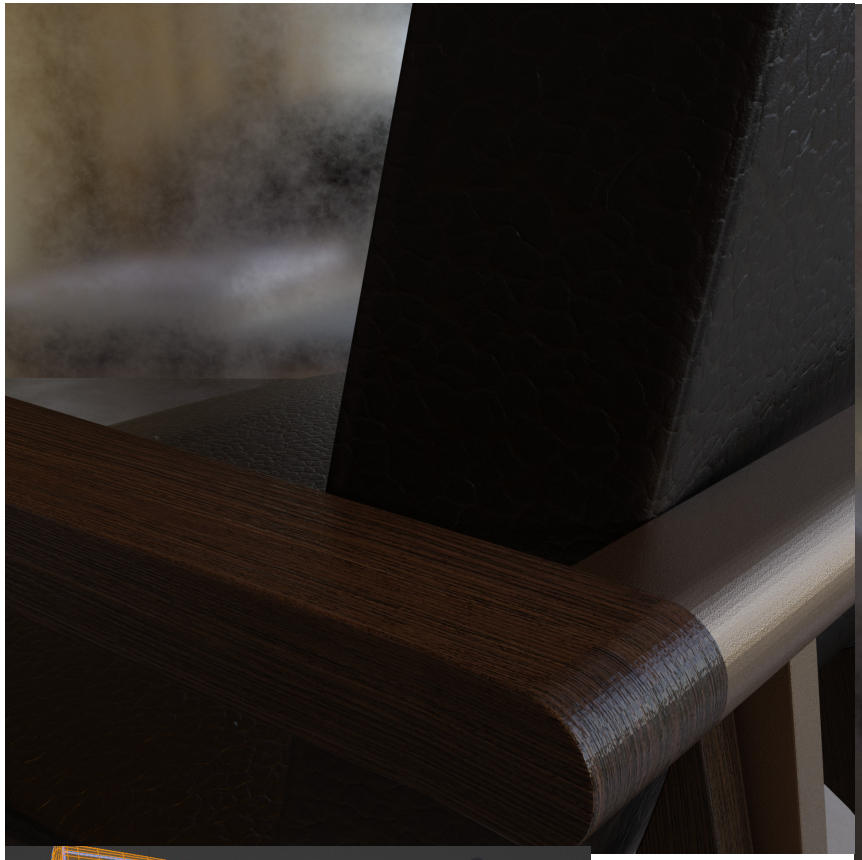
In addition to the 3D models, I wanted to capture the unique finishes. Based on the pictures made available on Mayerdesigns.com, I created seamless textures and bump maps in Photoshop. These models are ready to be incorporated into existing photos, or made into animations showcasing modular furniture.

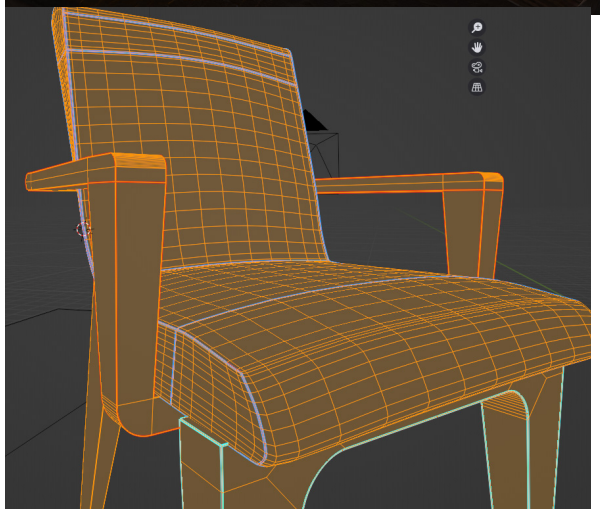


Shown in Ruby Red / Brass Quartz

TANGENT BOWL

From the vessel collection. My render (left) and reference image (right)





SILO ARM CHAIR

Lighting and modeling done in Blender
Textures generated in Photoshop

SILO ROUND DINING TABLE

Materials generated in Blender and Photoshop.

The pyrite shell texture in the reference picture has a unique texture. In order to transform the reference photos into a texture, I used Photoshop's generative fill to create a seamless pattern that would not have noticeable seams. The wood texture was similarly generated, and care was taken to align the grain of the wood with the natural flow of the table's edges.

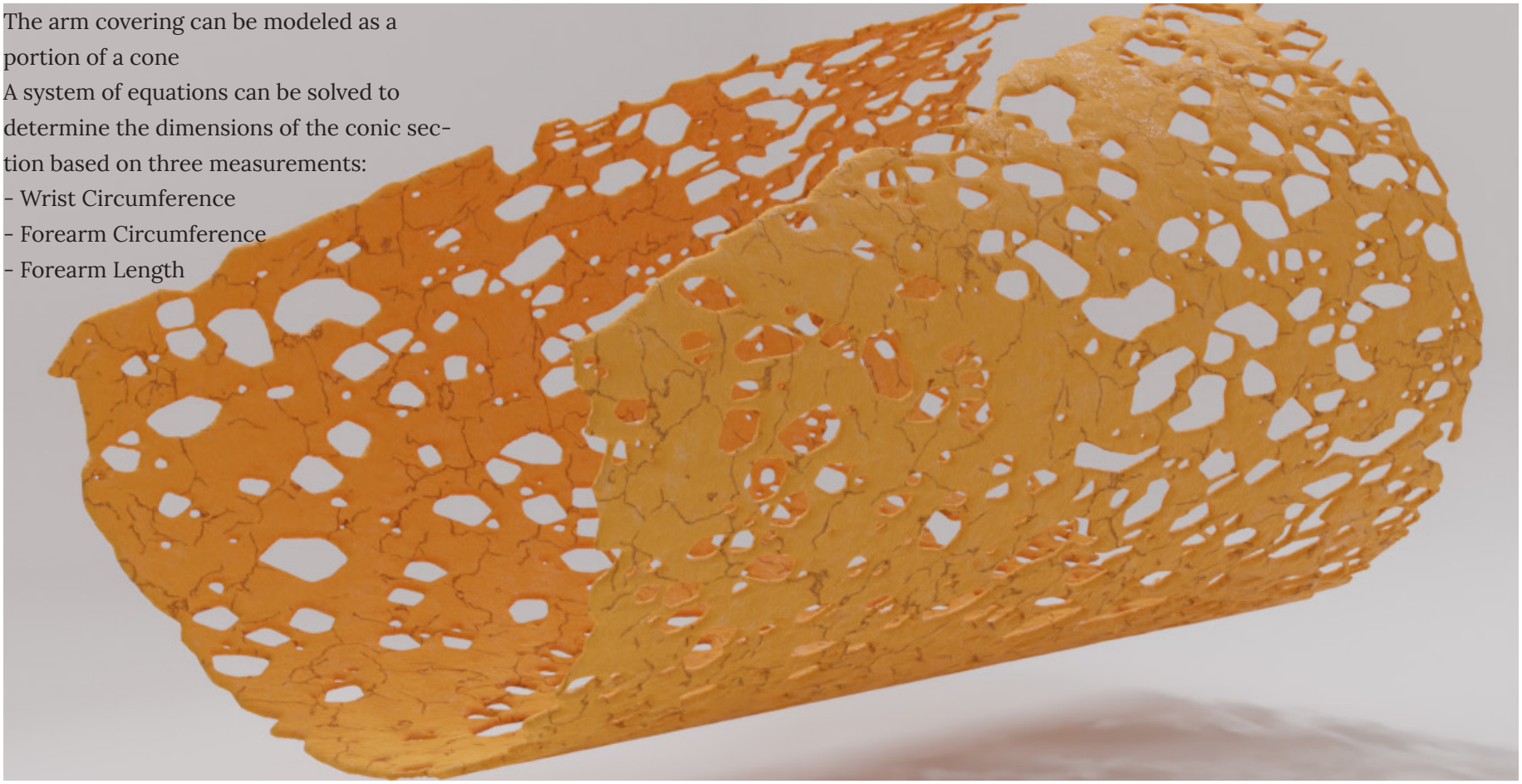
INTERIOR SCENE

Tattoo Camouflage

This forearm covering is meant to hide the appearance of a tattoo while ostensibly hiding nothing at all. The goal is to create an intricate pattern that makes it difficult to distinguish between lines that are obscuring the tattoo, and lines that are randomly placed.

It could serve as an alternative to using mesh cover sleeves or makeup to cover up forearm tattoos.

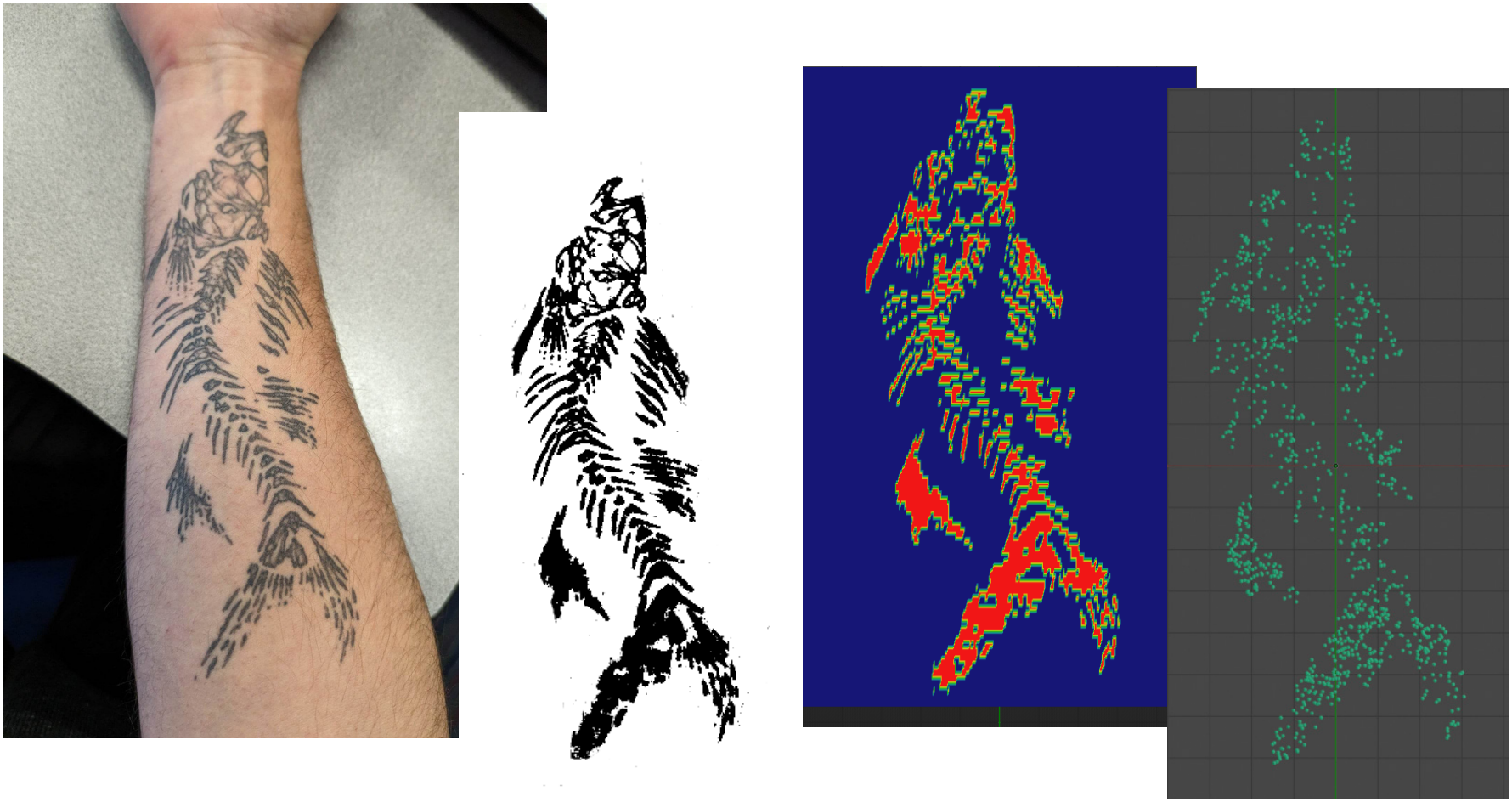
The arm covering can be modeled as a portion of a cone
A system of equations can be solved to determine the dimensions of the conic section based on three measurements:
- Wrist Circumference
- Forearm Circumference
- Forearm Length

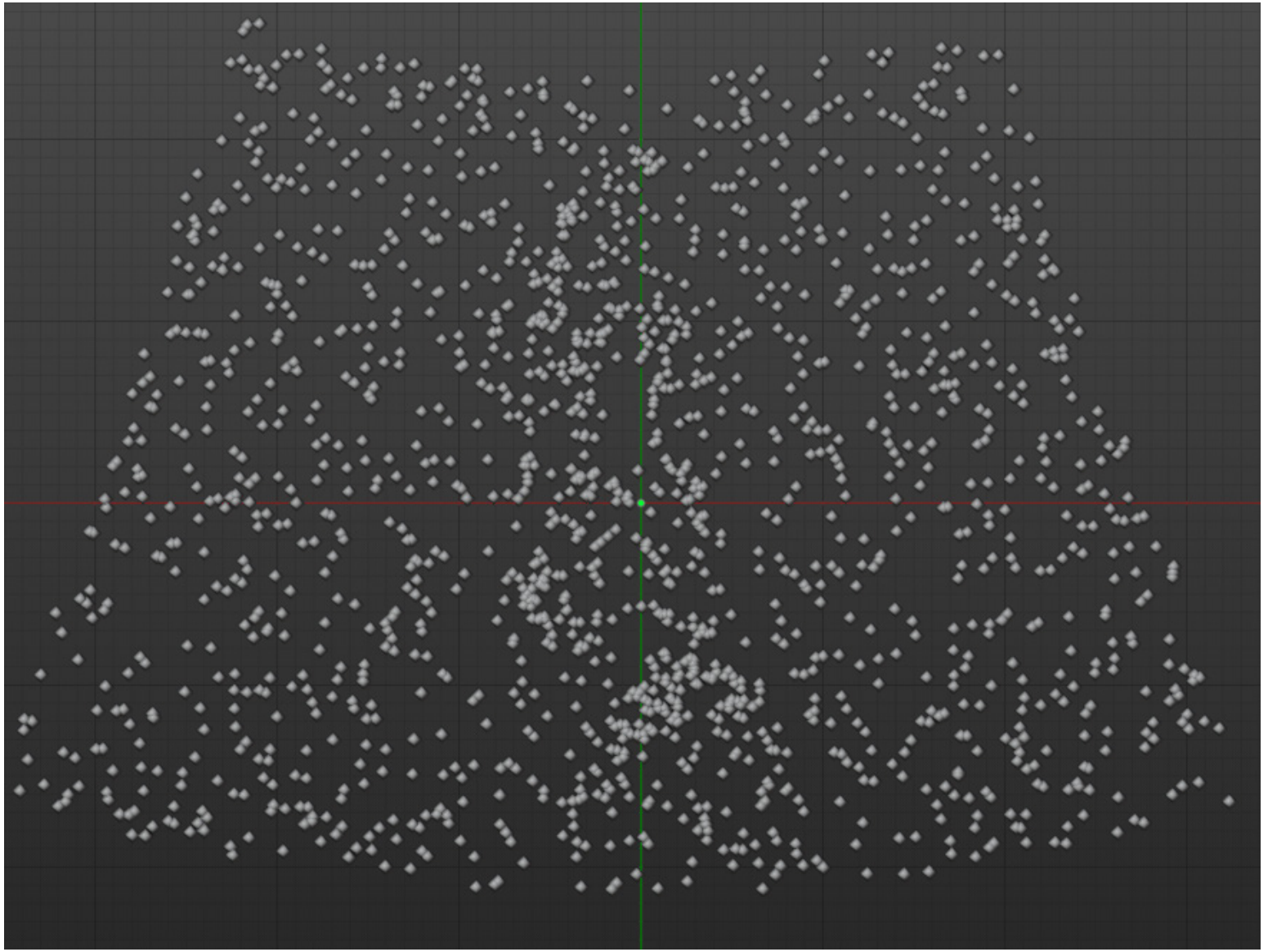


A picture of a tattoo is used to make a black and white mask

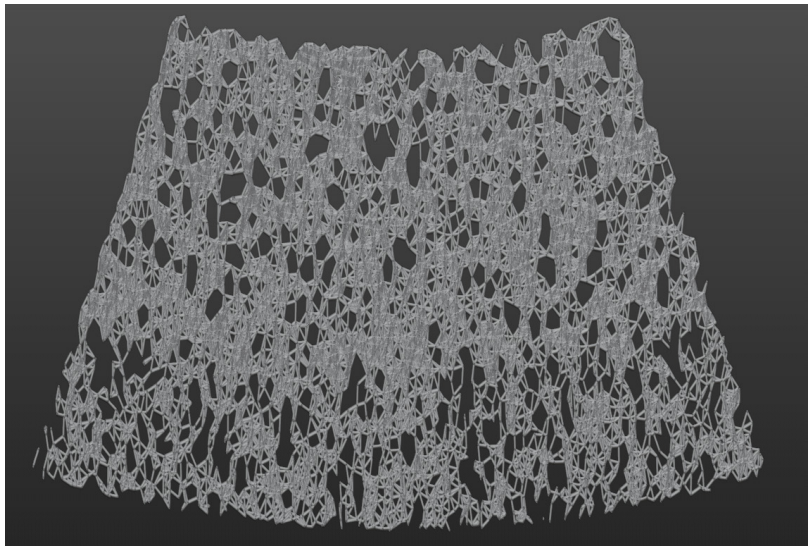
The mask is then used to make a weight paint on a plane

Points are distributed on the faces according to weight





Points from both processes are combined
in the point cloud above

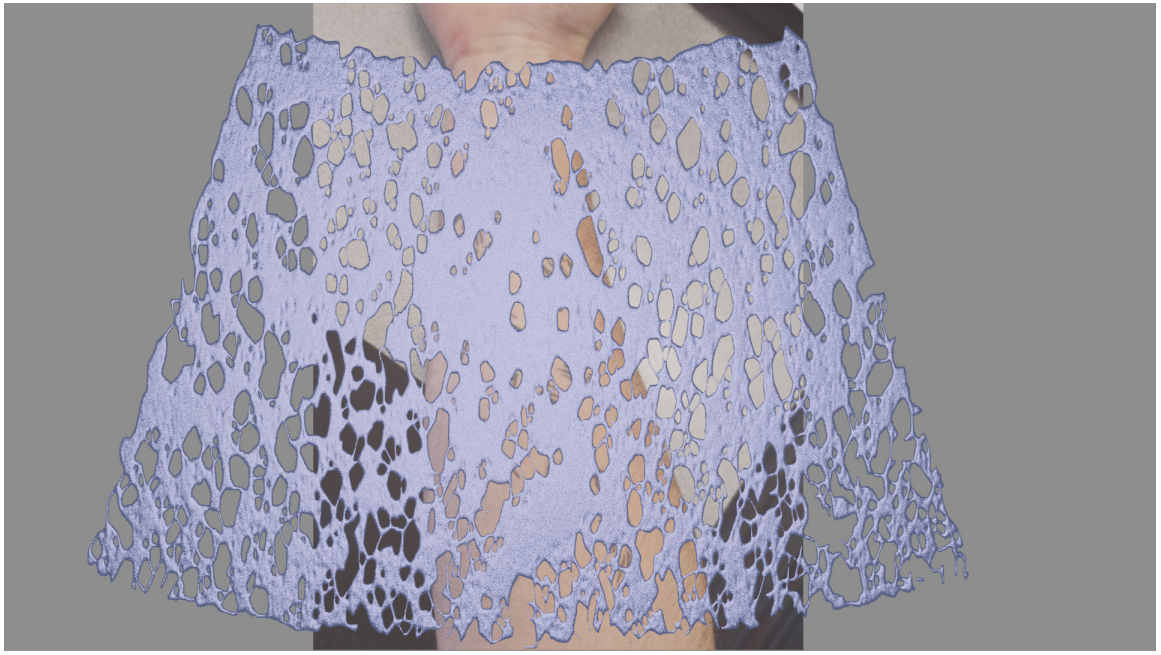


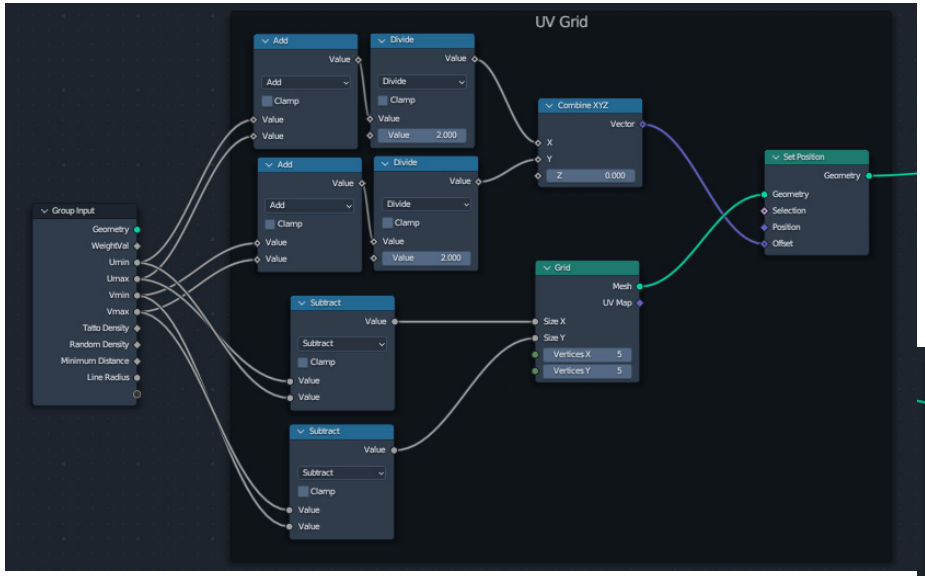
For each pair of points in the point cloud,
their distance is compared.

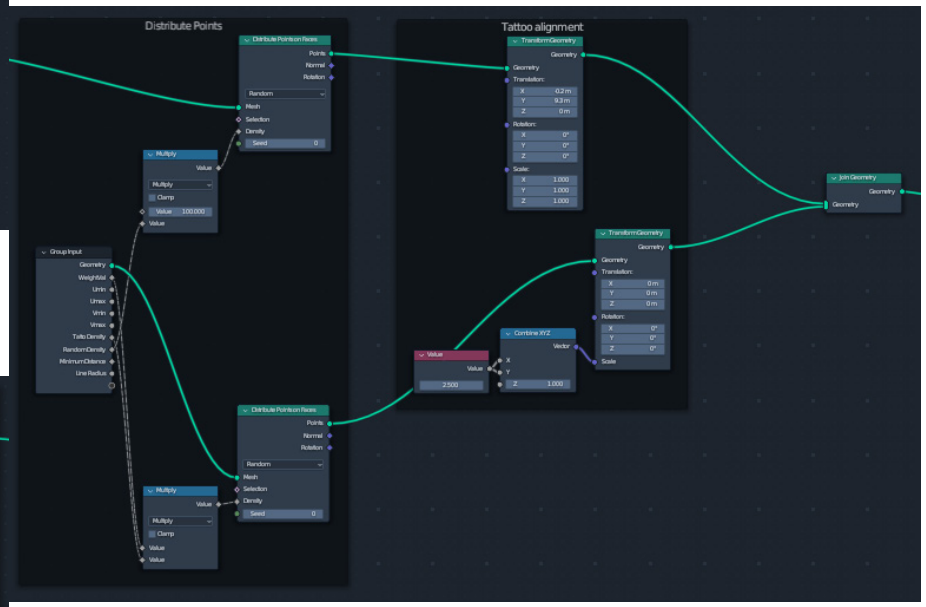
If the distance is below a certain threshold,
an edge is formed.

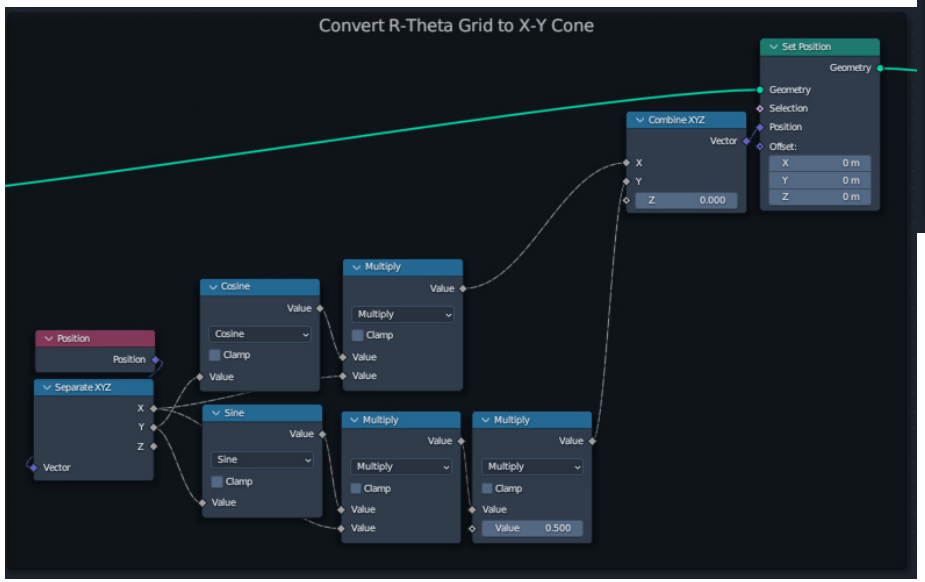
Cylinders are placed along the formed edges
The mesh is voxelized to allow for 3D printing
of the object.

The tattoo is no longer visible, but the shape and position of the tattoo is also obscured.

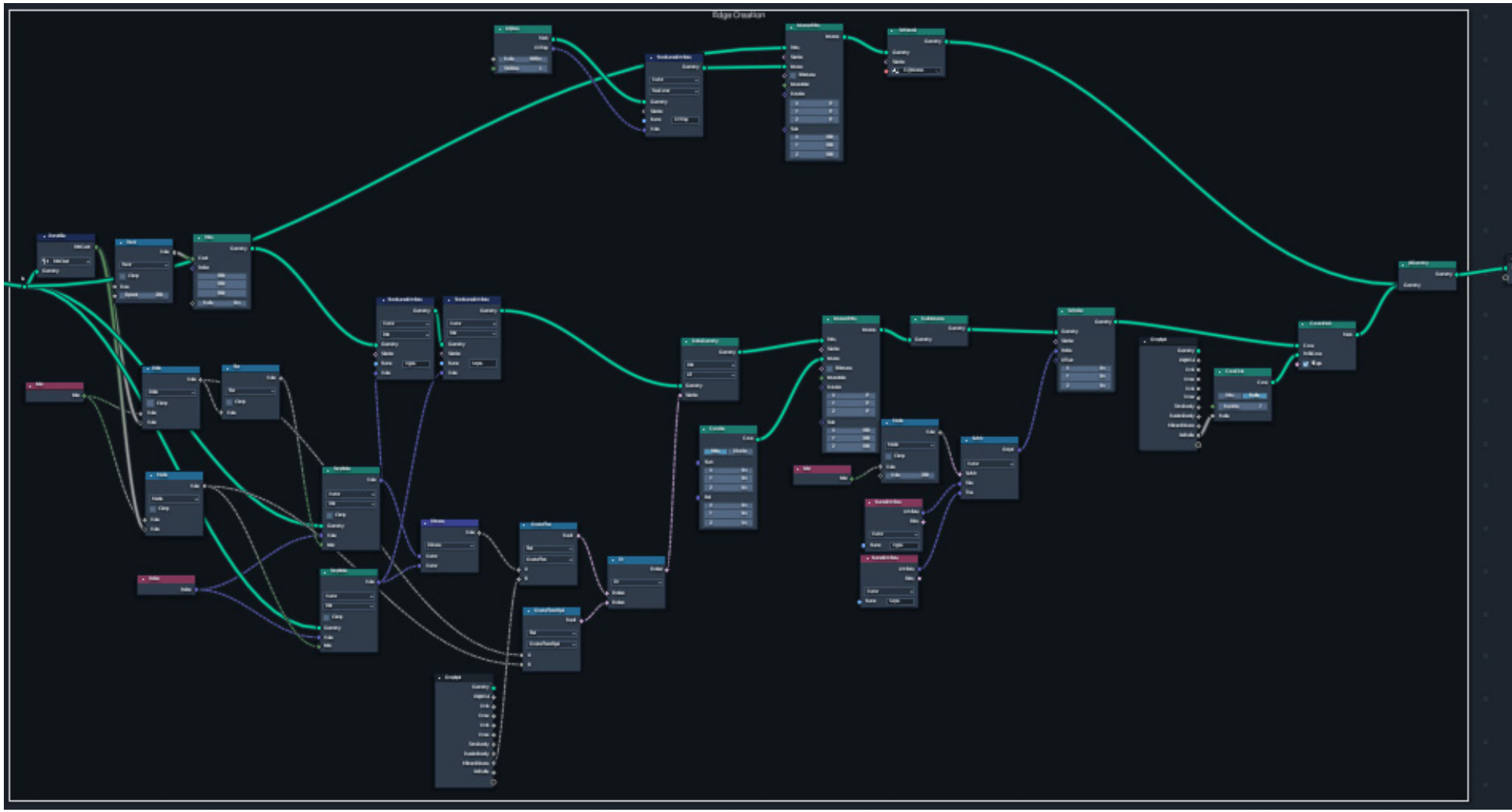



UV Grid
Add
Value
Clamp
Divide
Combine XYZ
Vector
Set Position
Geometry
Selection
Position
Offset
Group Input
WeightVal
Umin
Umax
Vmin
Vmax
Tatto Density
Random Density
Minimum Distance
Line Radius
Subtract
Grid
Mesh
UV Map
Size X
Size Y
Vertices X
Vertices Y


Distribute Points
Tattoo alignment
Distribute Points on Faces
Transform Geometry
Join Geometry
Multiply
Group Input
Combine XYZ
Value


Convert R-Theta Grid to X-Y Cone
Set Position
Combine XYZ
Position
Separate XYZ
Cosine
Sine
Multiply
Vector
Value
Clamp
0.500

GEOMETRY NODES



3D Game Assets

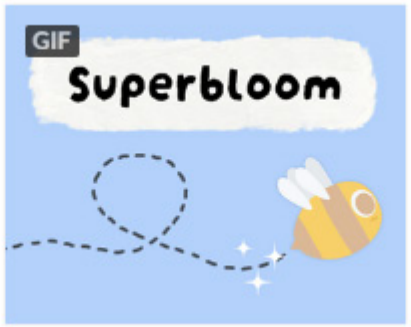
Game Titles:
- The Killing Tree

- Superbloom

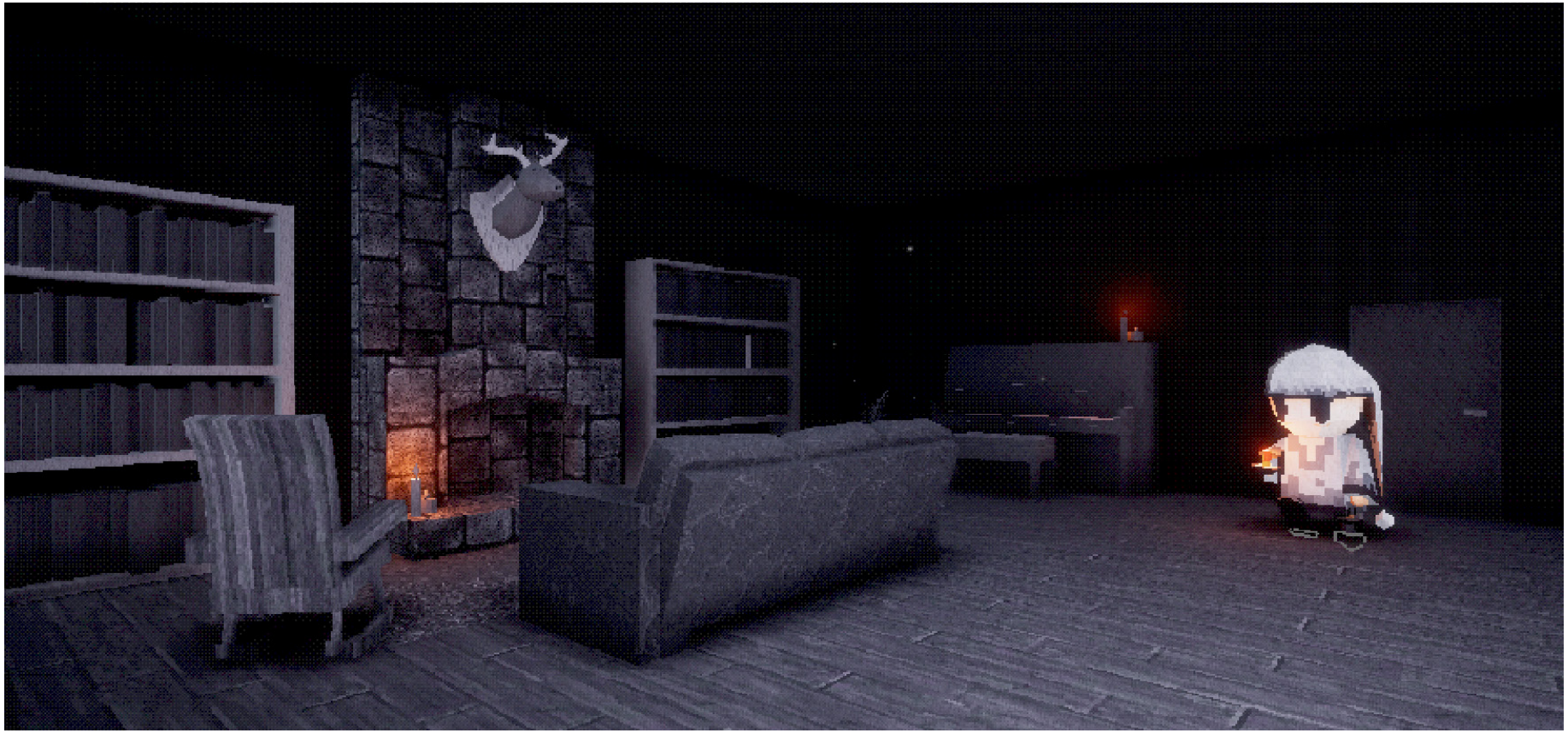
- bonsaidle

-Rat Stew

Along with a team of around a dozen people, I work to create video games from scratch during game jams, where a theme is revealed, and teams have anywhere from 48 hours to two weeks to make a complete game around that theme. For the titles listed on the left, I made 3D models, animations, and shaders, as well as playtested.

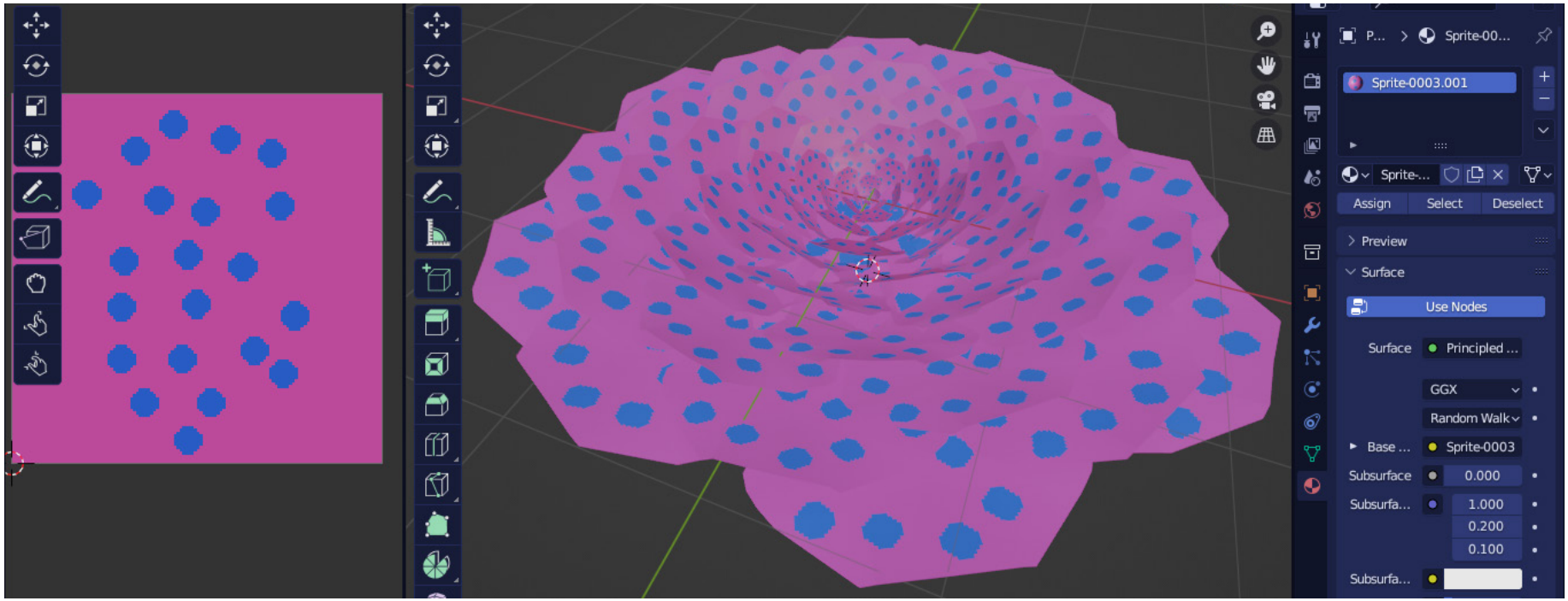


Props modeled:
Deer Mount, Couch, Bookshelf, Fireplace,
Knife Block, Knives, Bathtub, Sink, Faucet,
Dishware, Shampoo Bottle, Mirror

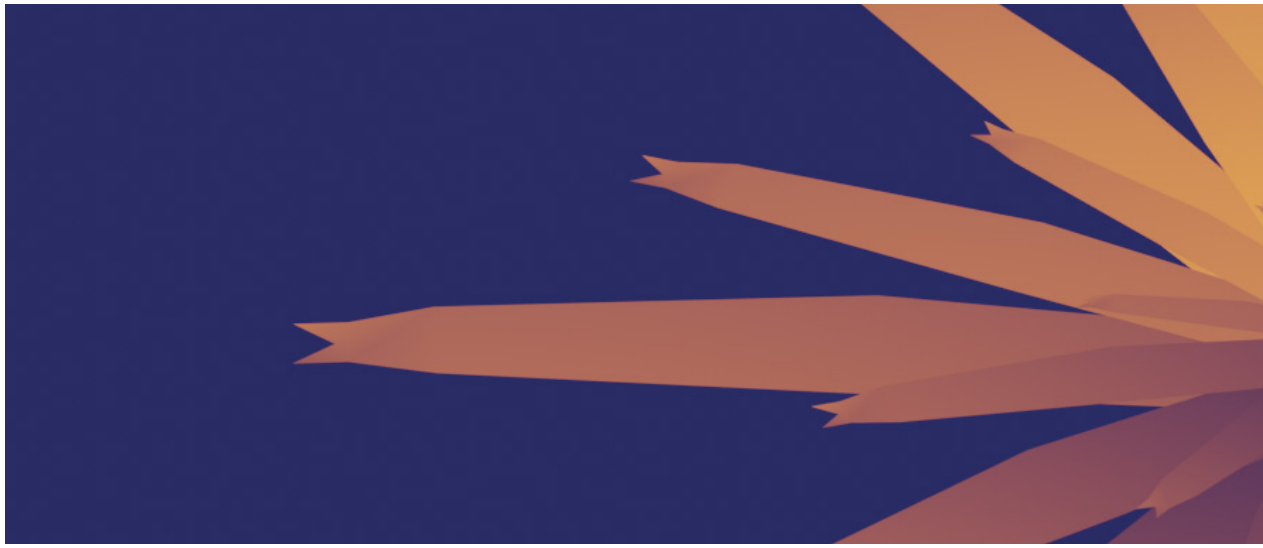


The Killing Tree

A thriller survival game with a low-poly
art style

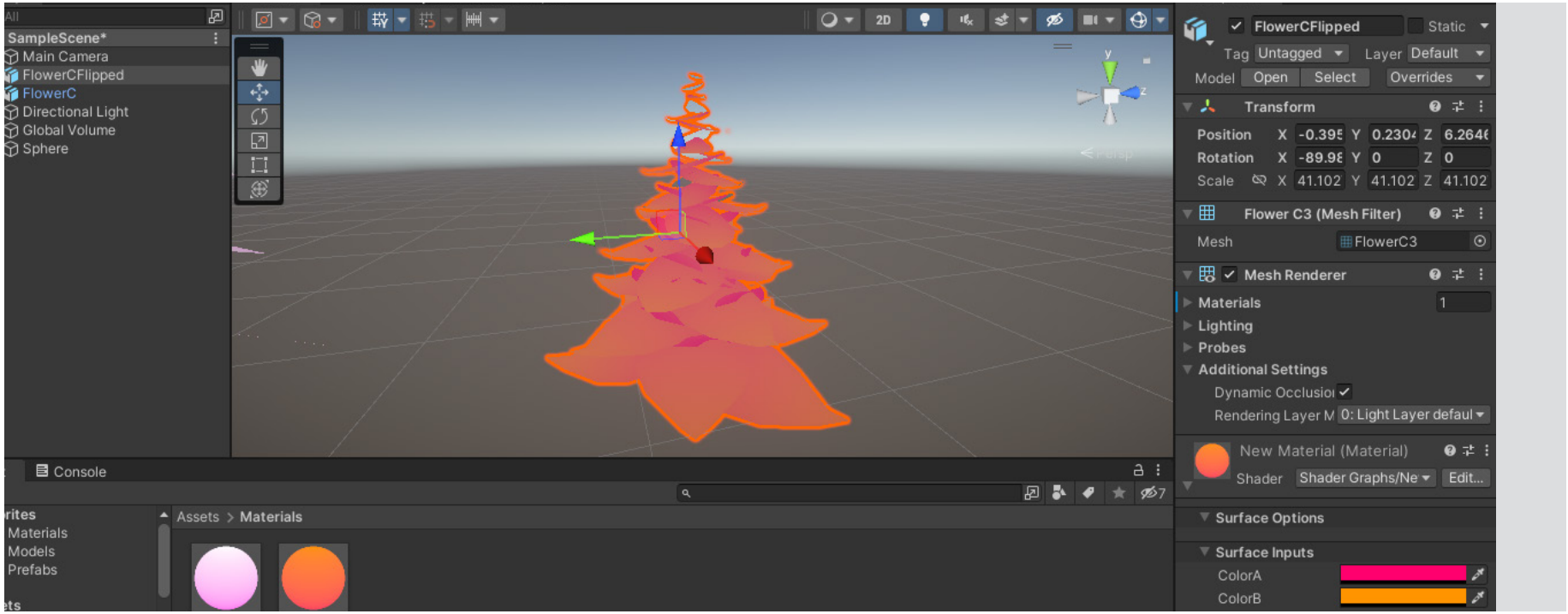


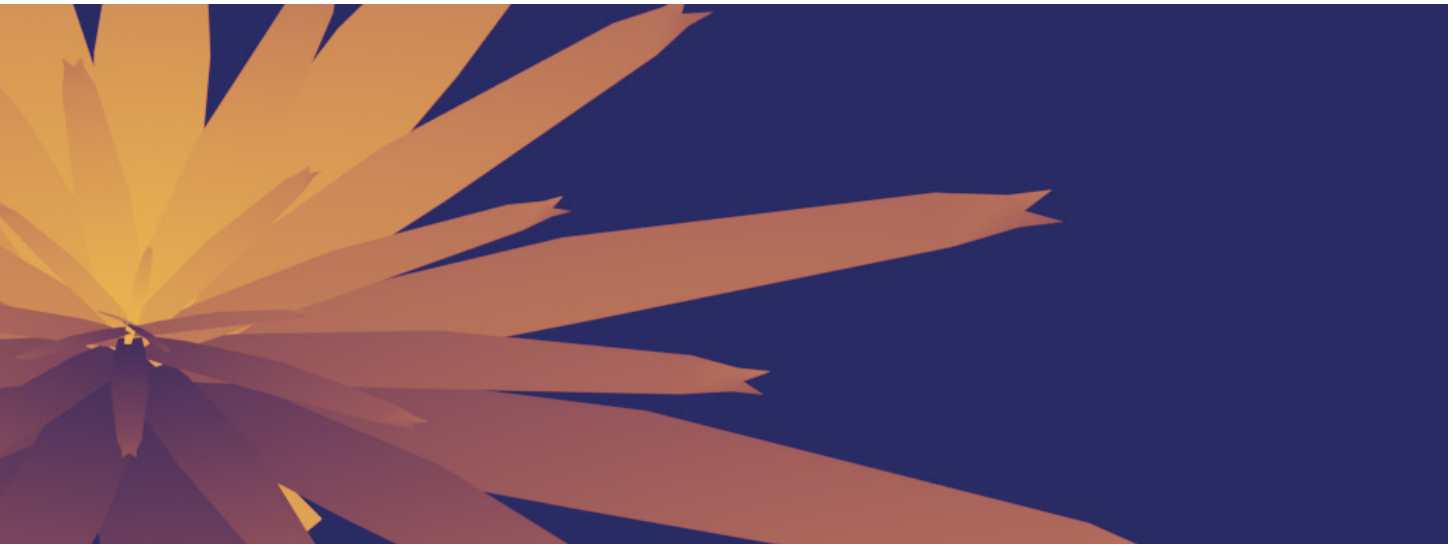
Flowers were modeled procedurally, according to the golden angle. Parameters such as number of petals, color gradient of petals, and petal type were made available as sliders for the team.

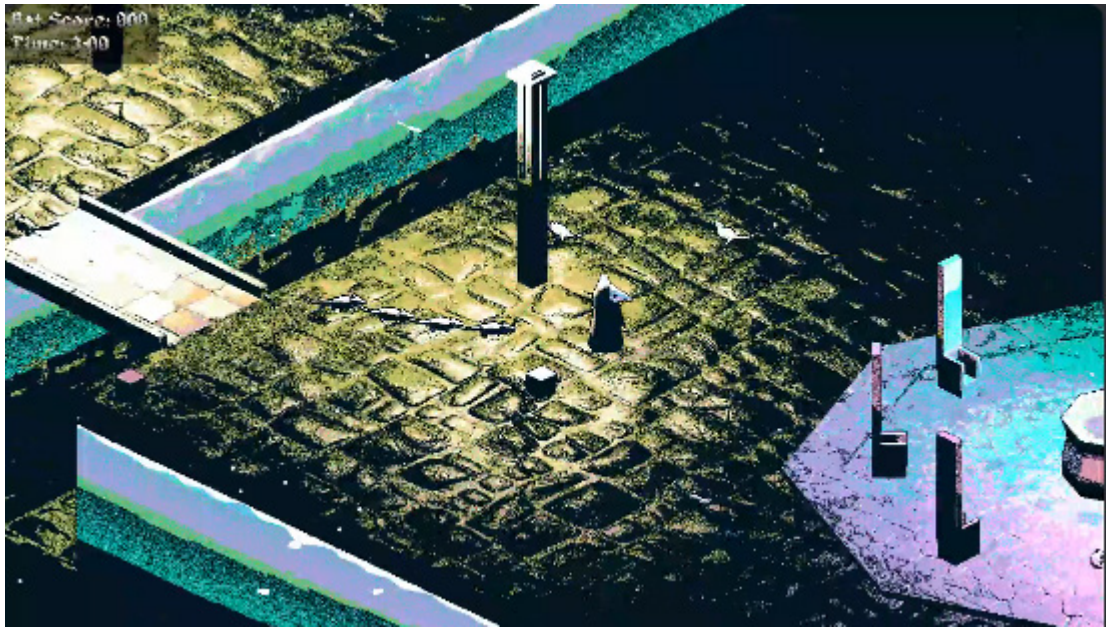


Superbloom

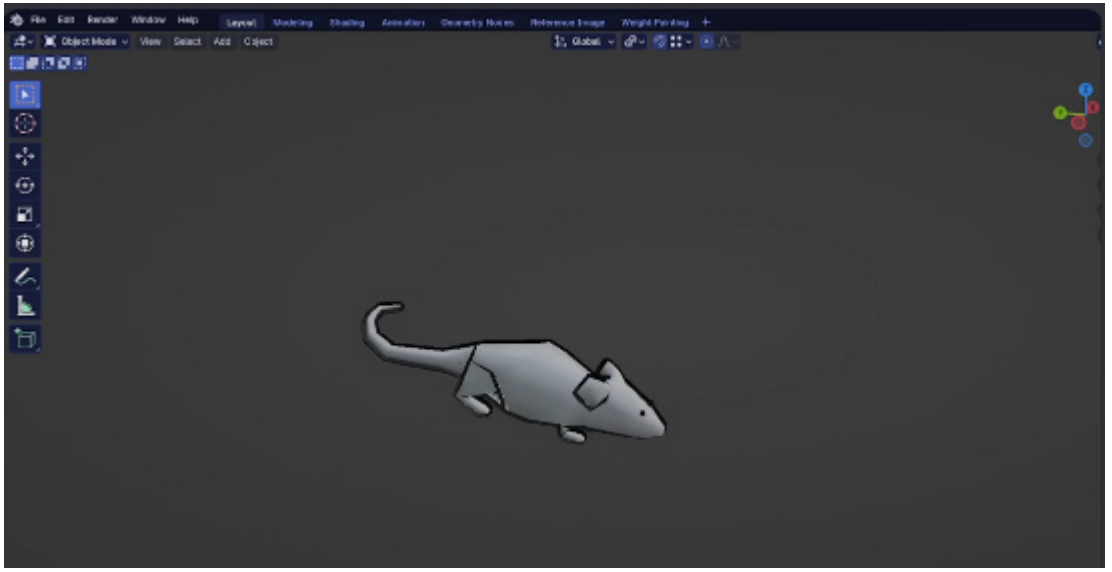
A bee pollination simulation game based on breeding flowers.


SampleScene*
Main Camera
FlowerCFlipped
FlowerC
Directional Light
Global Volume
Sphere
2D
Persp
Console
Assets > Materials
Materials
Models
Prefabs
FlowerCFlipped
Static
Tag Untagged
Layer Default
Model Open Select Overrides
Transform
Position X -0.395 Y 0.2304 Z 6.264
Rotation X -89.98 Y 0 Z 0
Scale X 41.102 Y 41.102 Z 41.102
Flower C3 (Mesh Filter)
Mesh FlowerC3
Mesh Renderer
Materials 1
Lighting
Probes
Additional Settings
Dynamic Occlusion
Rendering Layer M 0: Light Layer defaul
New Material (Material)
Shader Shader Graphs/Ne Edit...
Surface Options
Surface Inputs
ColorA
ColorB



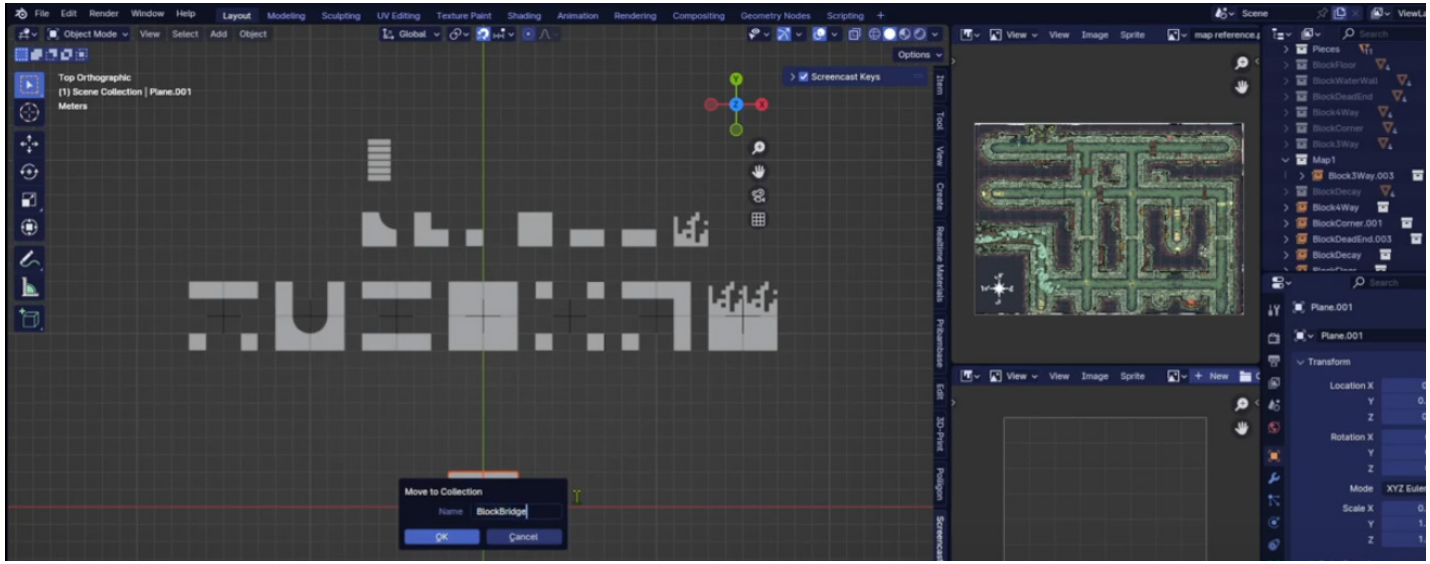


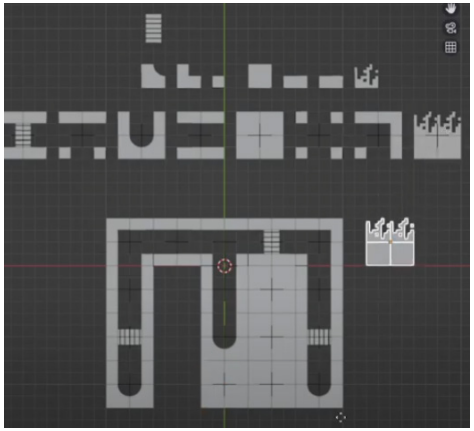
The character models and animations I made were designed to match the style and play nice with the final shader.

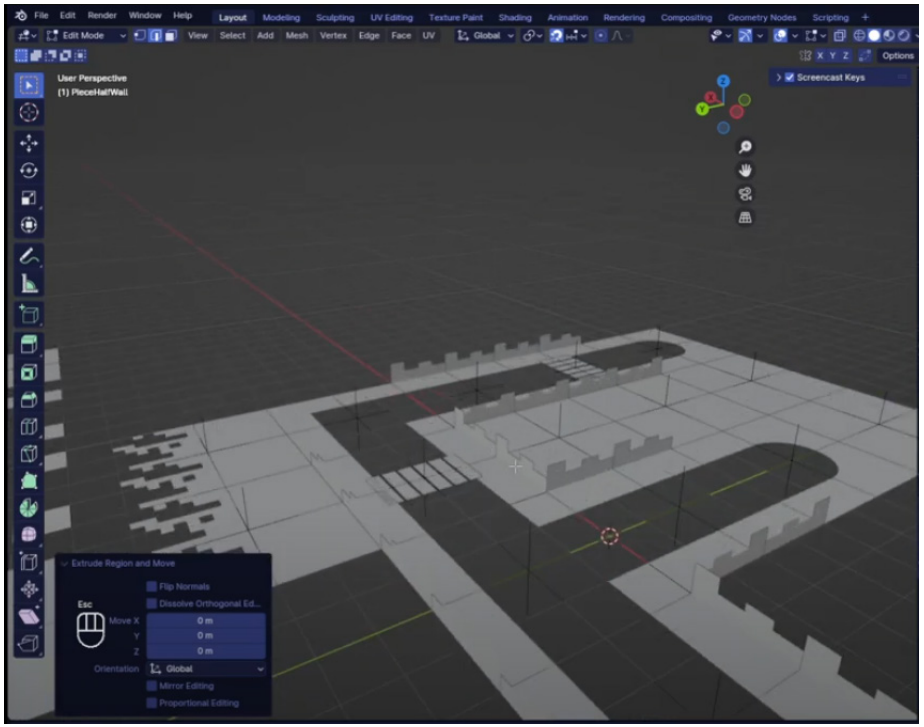


Rat Stew

A stylized multiplayer rat-tossing game taking place in an underground sewer



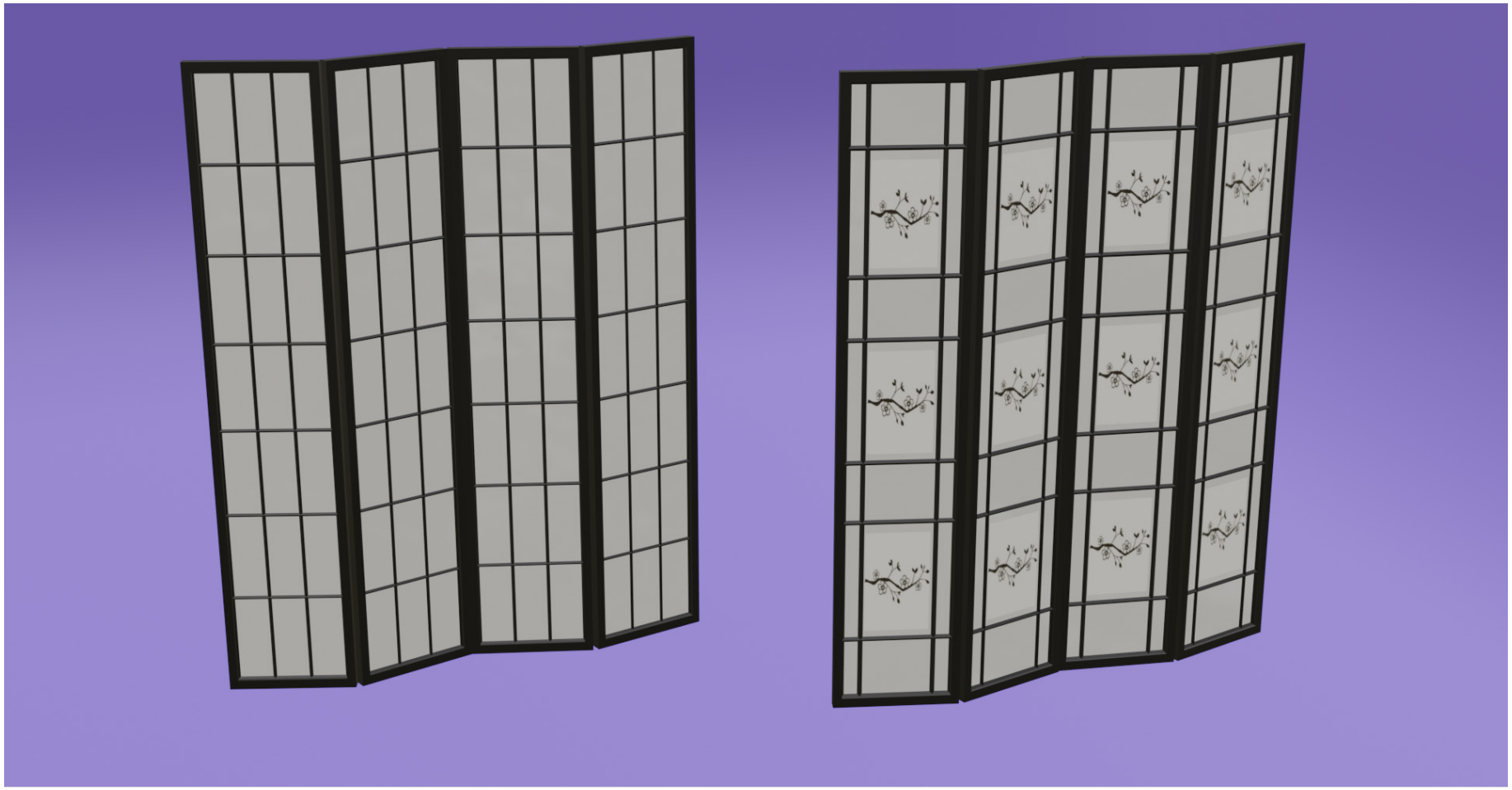




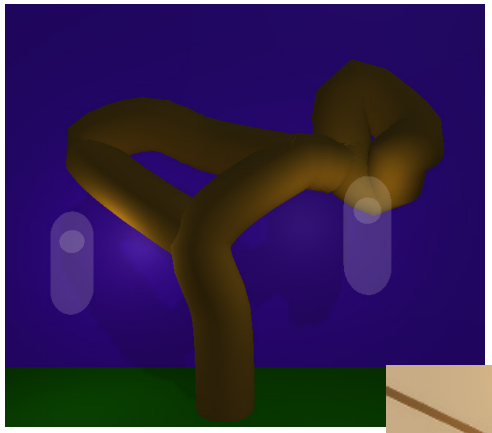
I also created a dungeon-designer system to help reduce the number of assets needed to design new levels by making modular assets that can be more easily assembled.

bonsaidle

An idle game where you grow and trim
a bonsai tree



All 3D models and materials shown were made by me



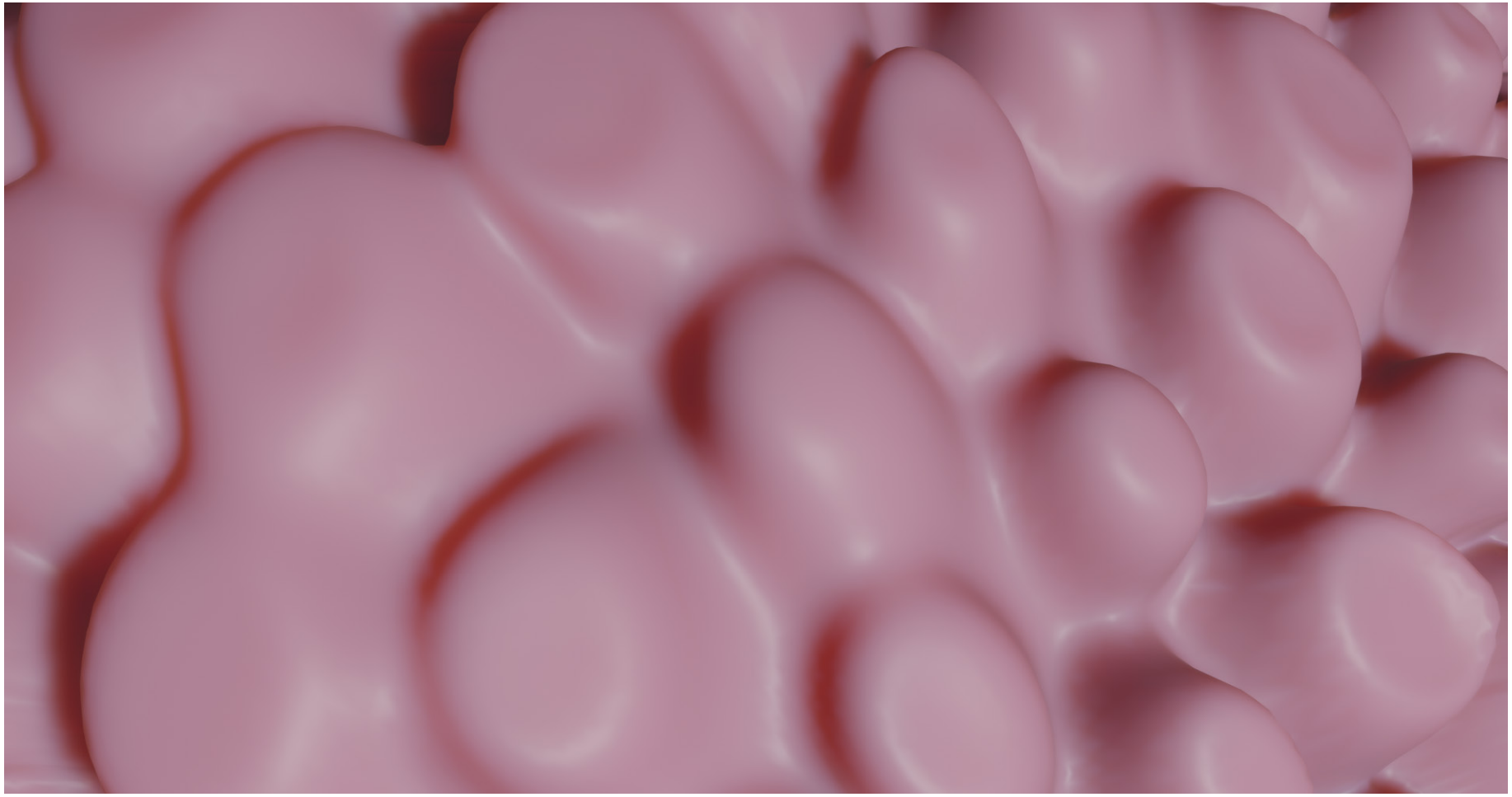
The tree itself is meant to grow in different directions, depending on where the tree is trimmed. In order to give the tree its twisted rope look, I made a shader in Unity's Shader Graph that rotated around around the base cylinder, with adjustments available for angle and width of the twist. Since the game object relied on keeping the cylinder mesh unchanged, all geometry is in reference to the original cylinder.

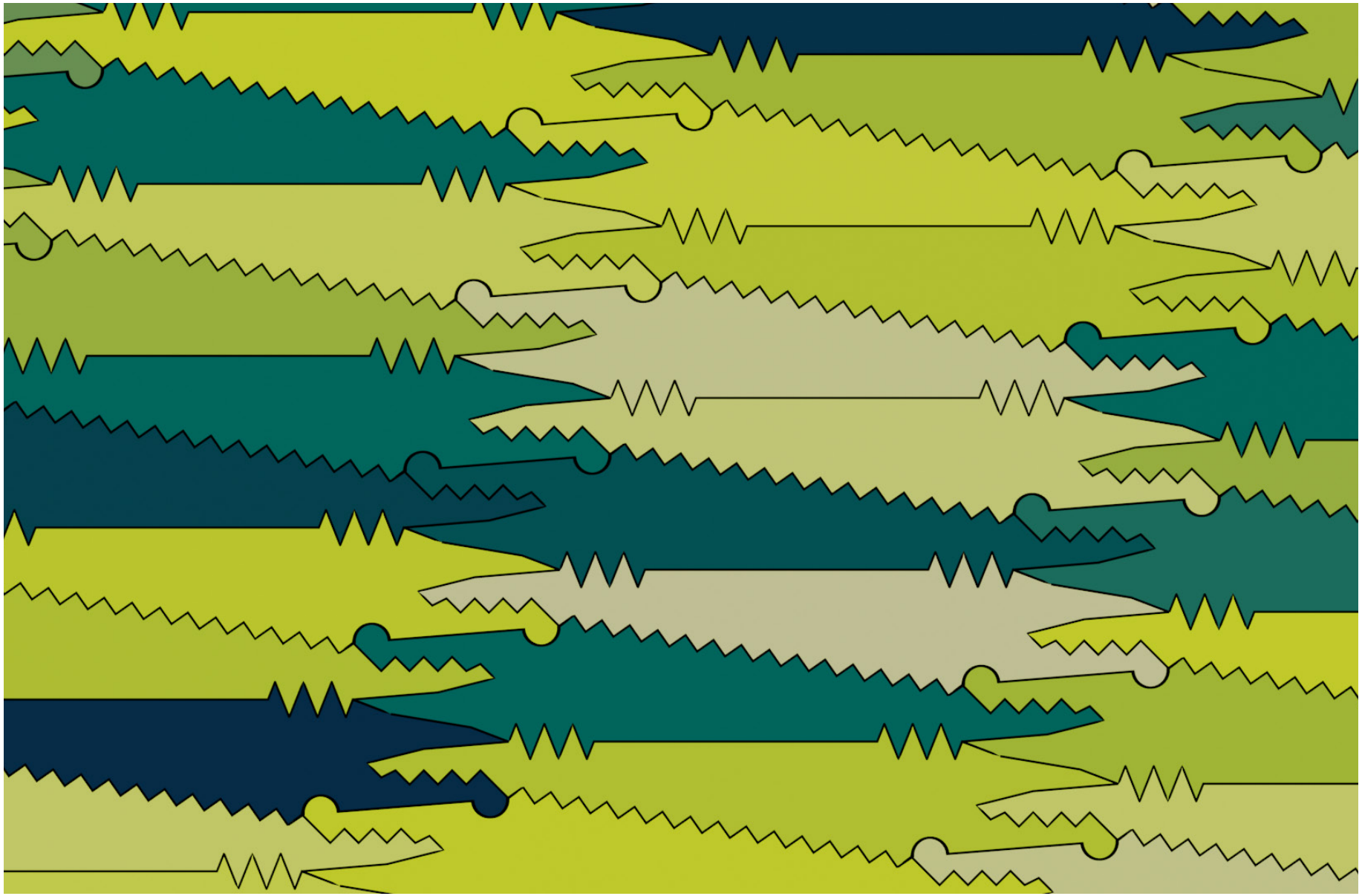
Educational Materials

Parametric Design

Students were tasked with manipulating a grid to create a new shape by twisting, and bending according to provided formulas.

In 2021, I was given the task of creating a class intended to teach relevant mathematics to freshman students in Architecture, Industrial Design, and Interior Design. The proposed curriculum for this course had not been updated in at least 15 years, so there was a lot of room for creative lessons. Many of the topics introduced are real applications of designs I have used in my personal design work. This spread includes examples I created for students to use as inspiration.





Conway's Criterion
Tiling Patterns

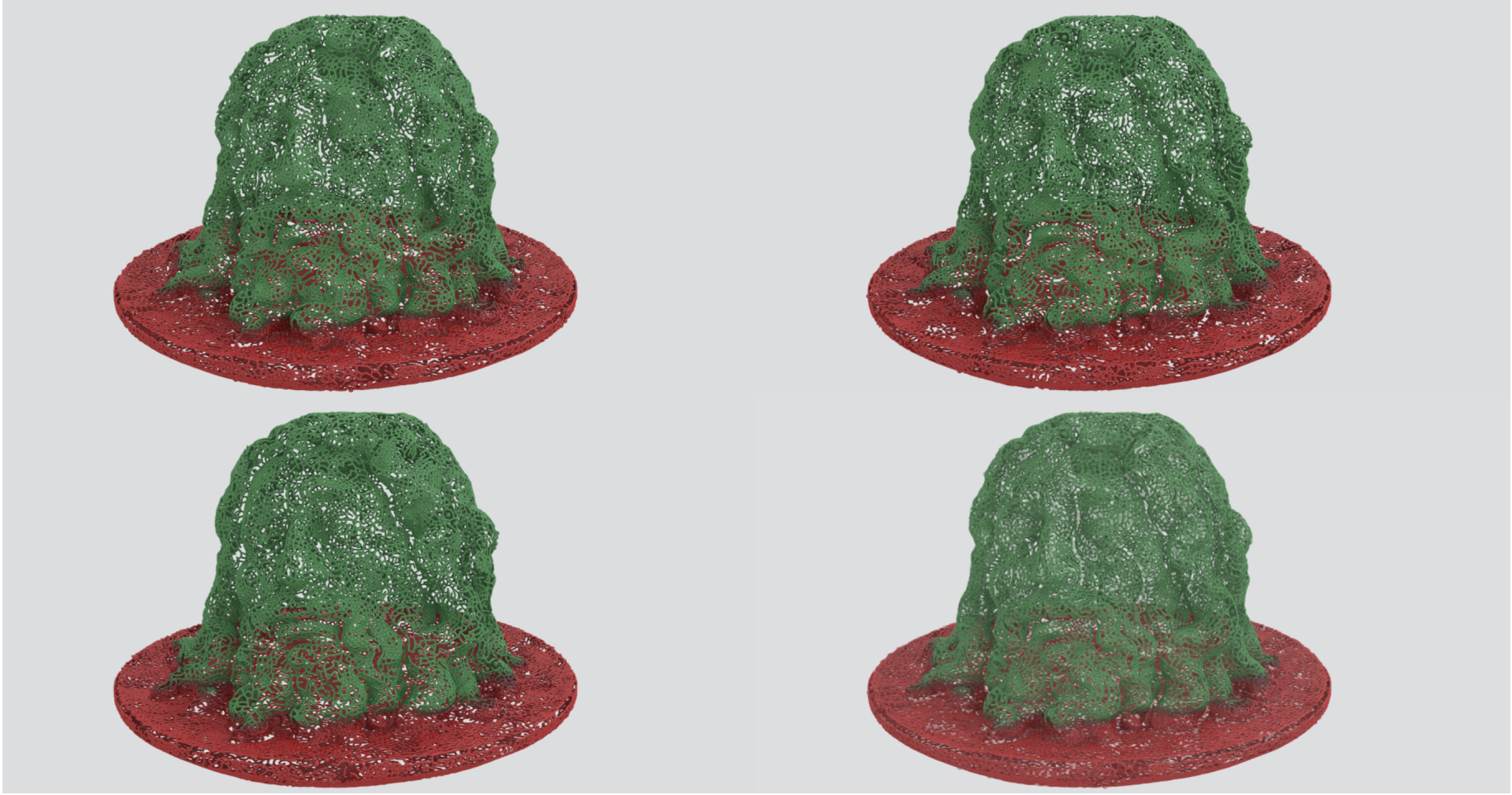
Students followed a set of geometric rules known as Conway's Criterion to create their own unique tiling patterns

Personal Art Projects

Face Blindness

Made in Houdini, and recreated with spray paint and Posca markers on canvas.

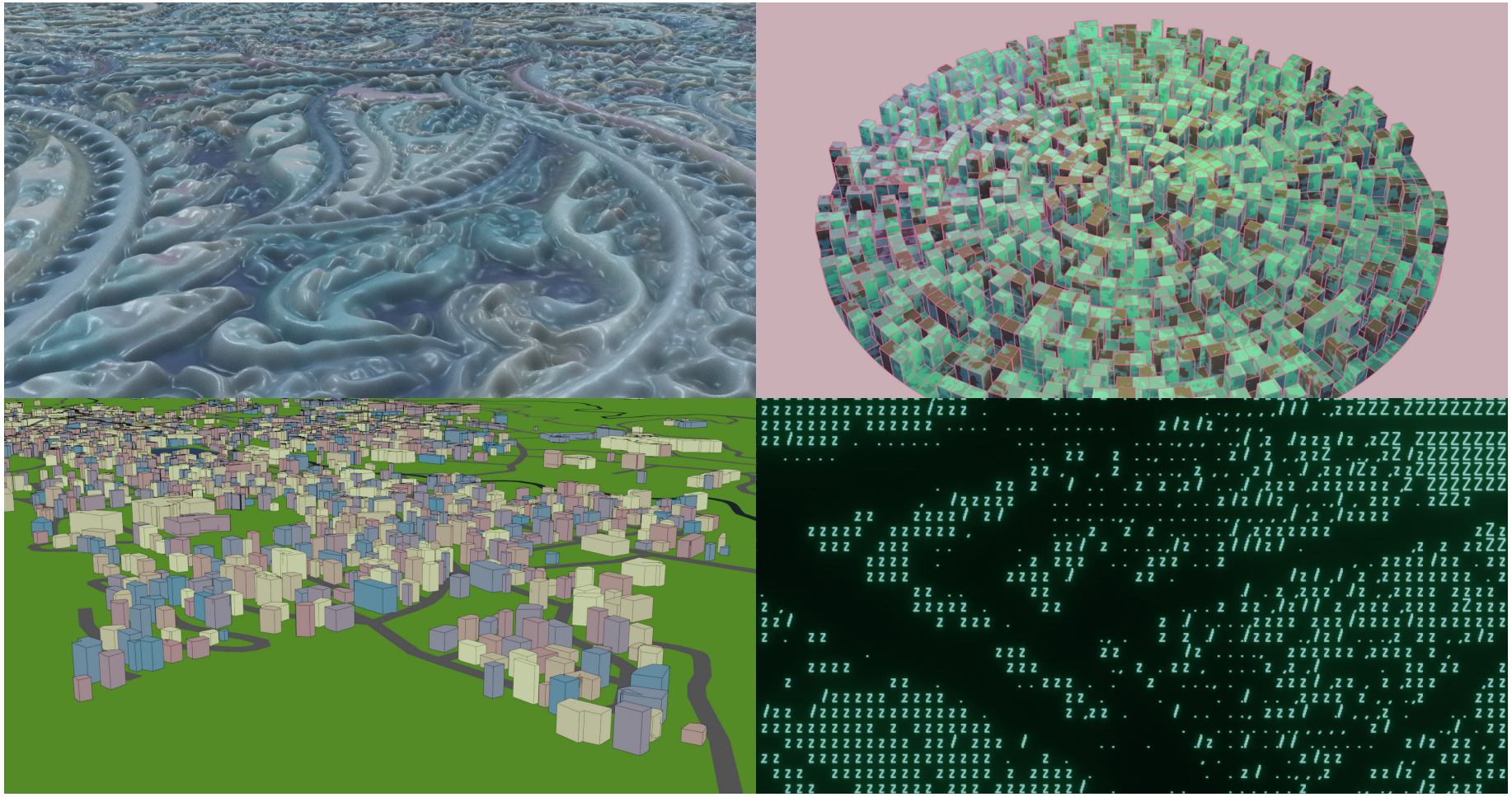
Using a process that simulates the growth of slimemolds, a 3D model of a statue of John the Baptist's head on a platter is covered in vines. The vines are randomly generated and made sparse enough such that individual frames of an animation appear to be nothing more than a tangled pile. Only once the frames are allowed to play in sequence is the picture revealed. A combination of three frames is shown on the bottom left.

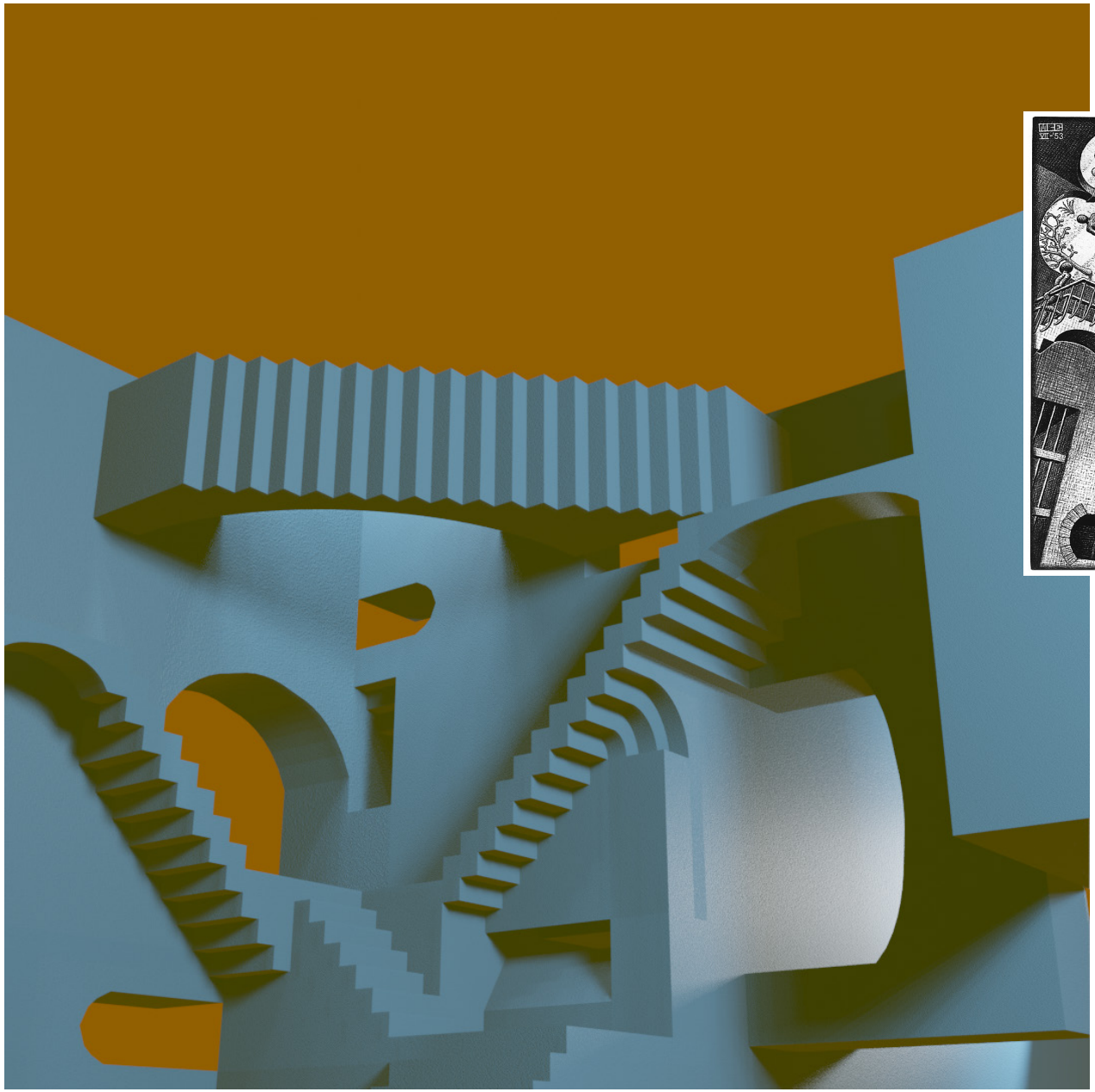


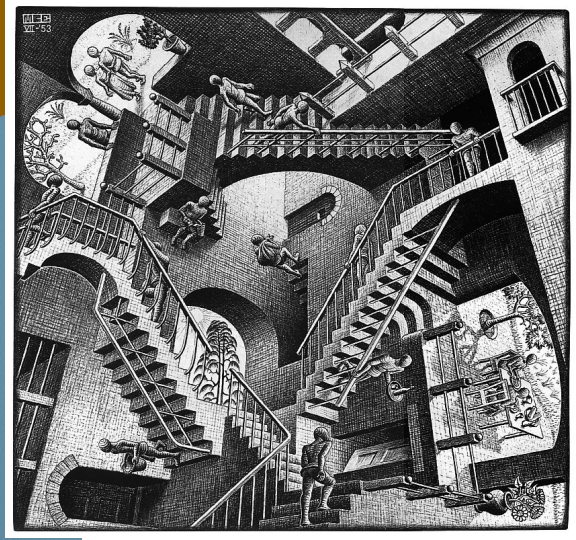
Face Blindness Painting

Pattern Explorations

A series of creative coding projects including the creation of a 3D paisley pattern, an arrangement of sectors, populating a scene using GIS data from Japan, and an image-to-ASCII conversion process





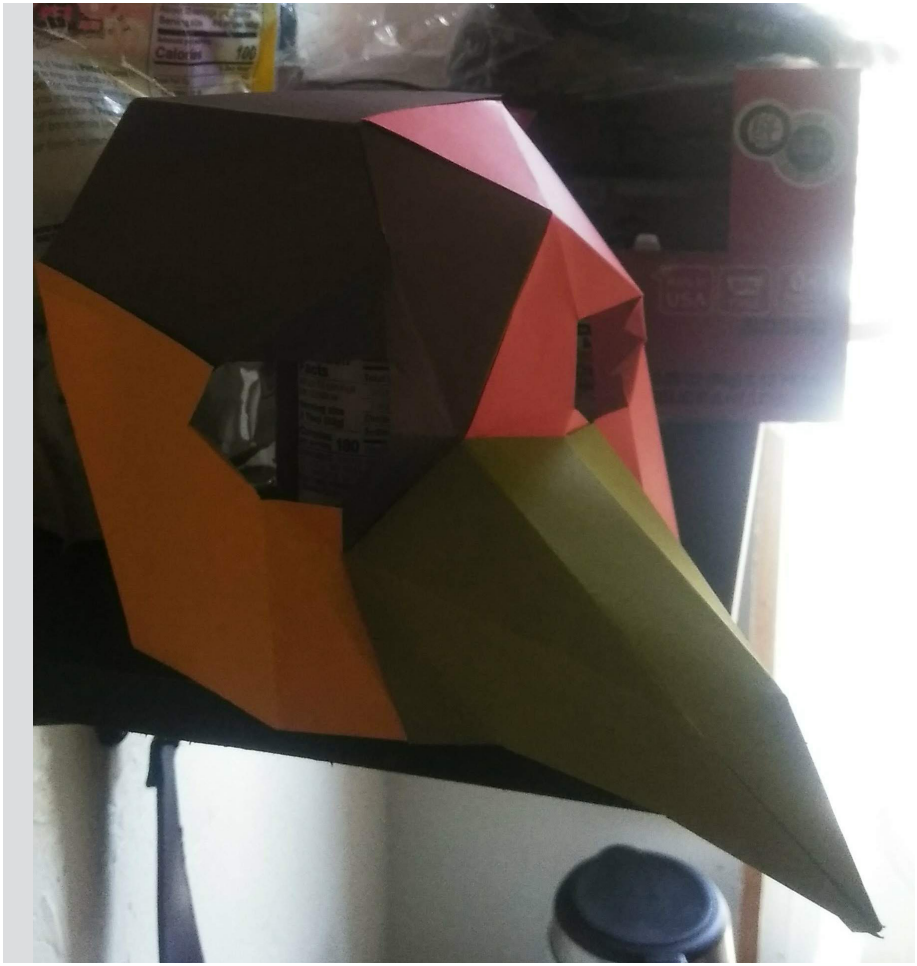


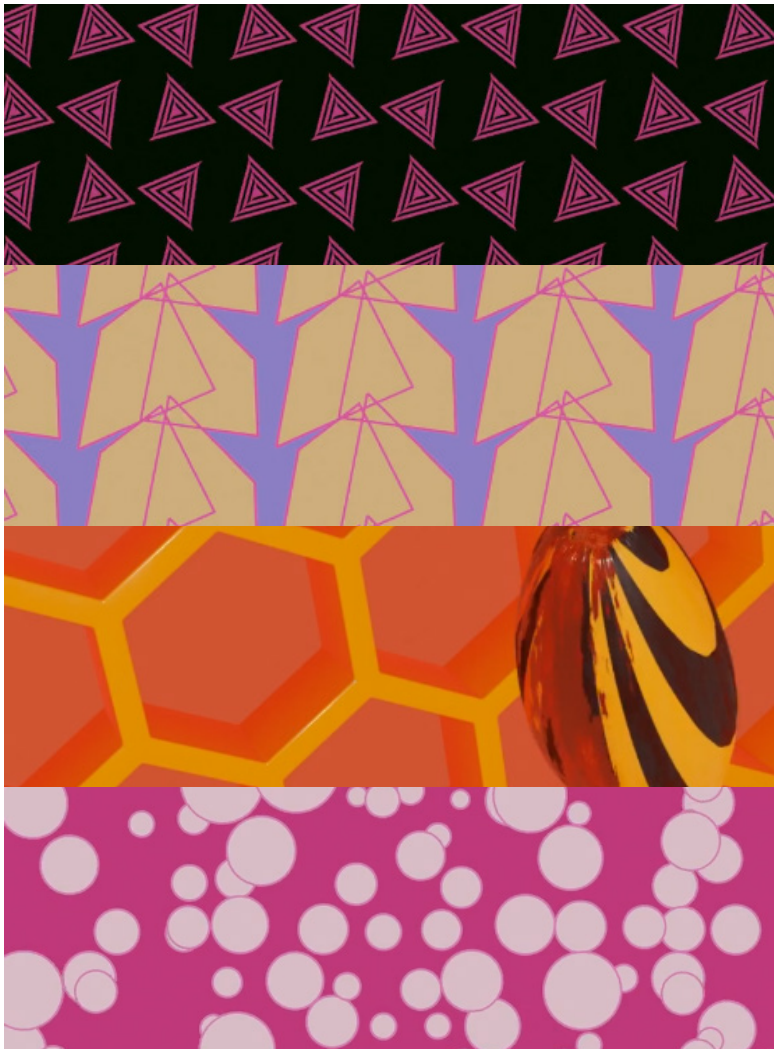
Recreation of MC Escher's 'Relativity'

My recreation (left) and the original (right)

Papercraft Bird Mask

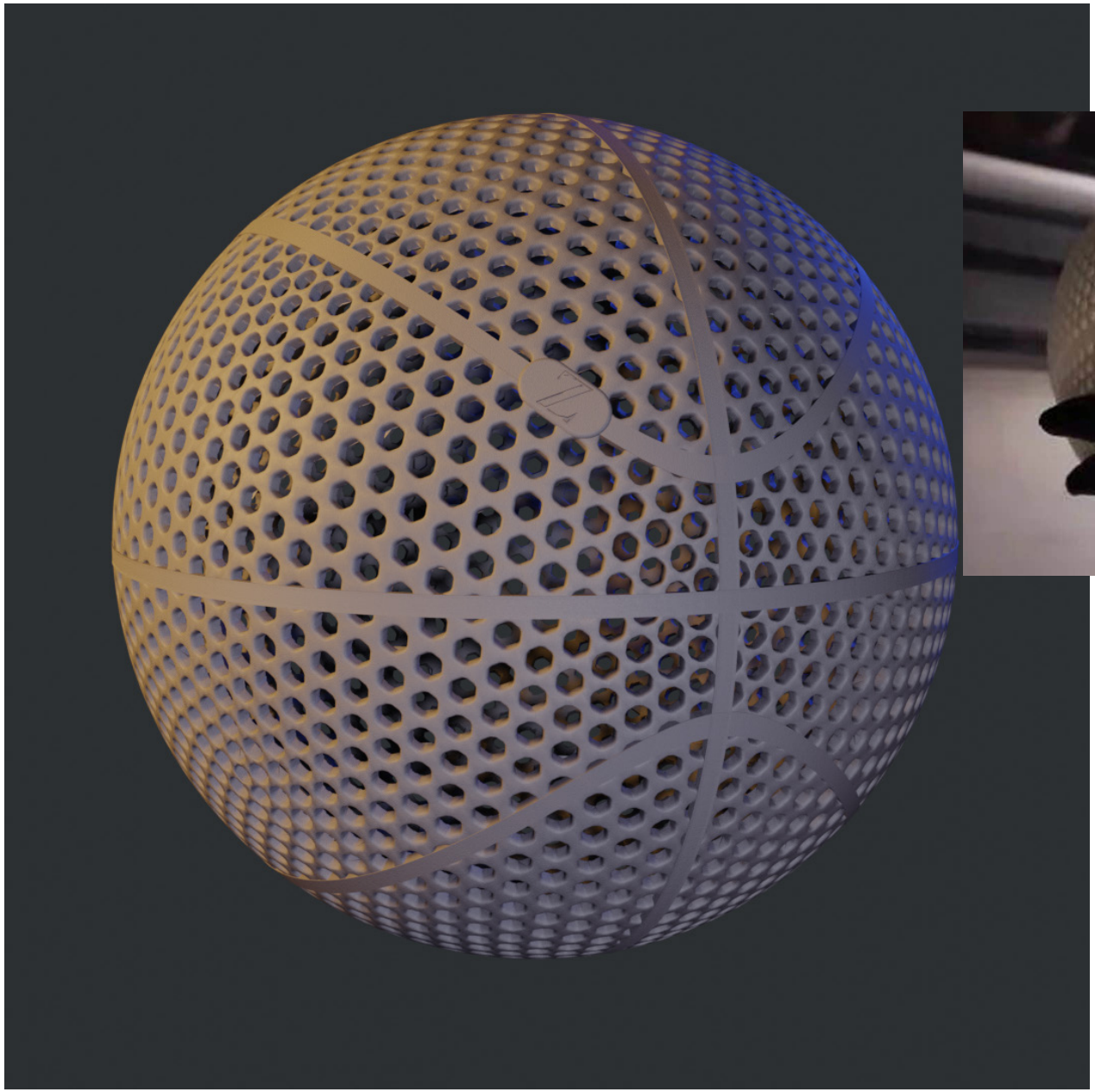
Designed printable plans to make a foldable papercraft bird mask.

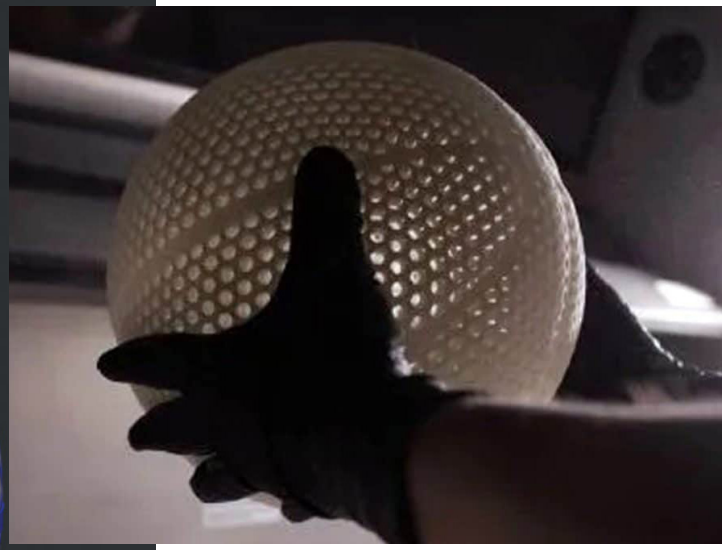




Nodevember Animations

Frames from a daily animation challenge to make node-based designs. The prompts for these challenges were ‘three’, ‘four’, ‘six’ and ‘round’.





Similar to Wilson's airless basketball, my design has the same weight and size as a standard basketball.

Airless Basketball

My recreation (left) and the original (right)

CONTACT

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