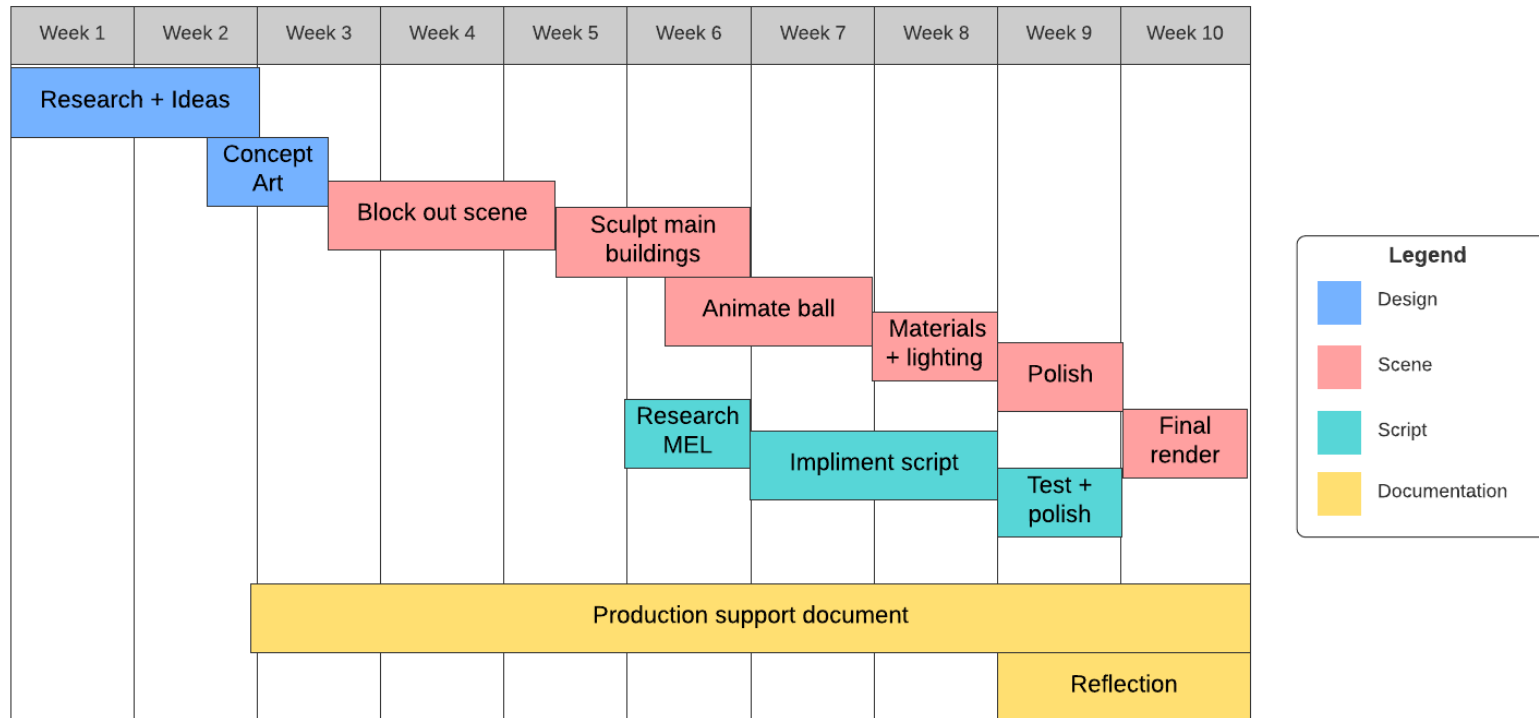


# CGI TOOLS: PLANNING AND DEVELOPMENT

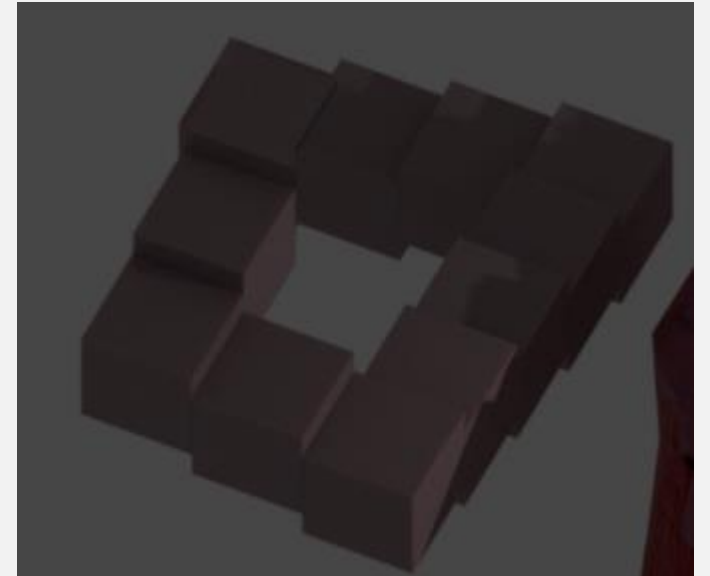
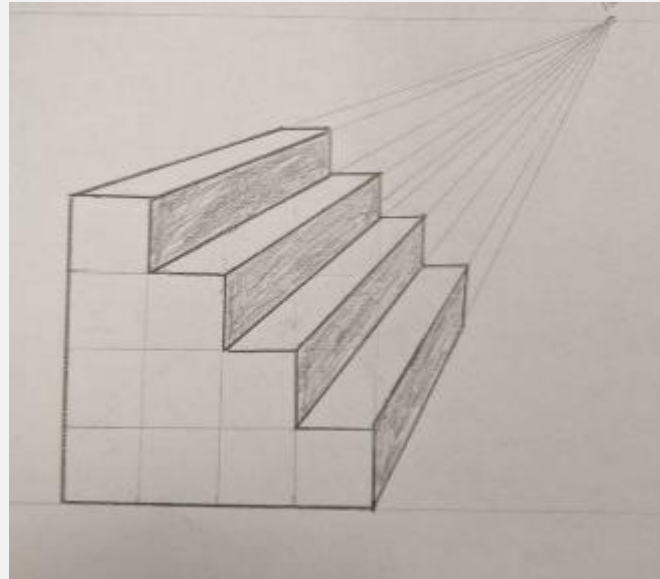
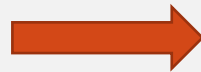
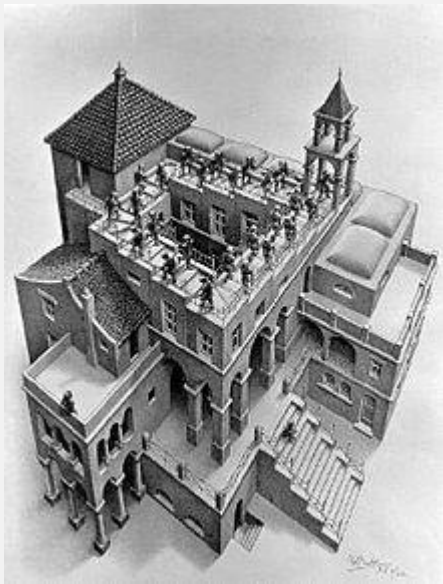
Alex Christo

# INITIAL PLAN



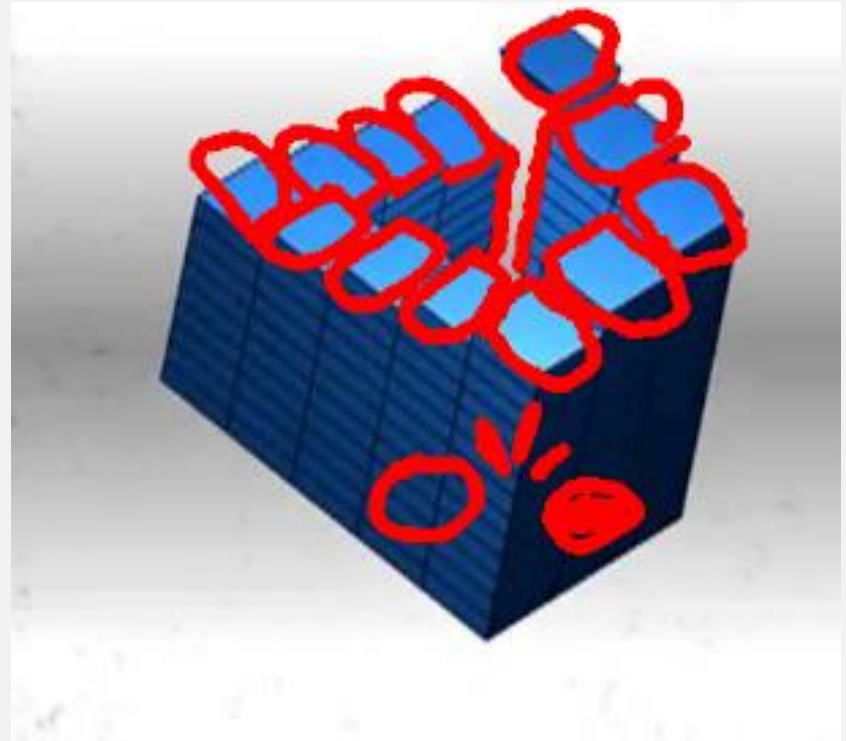
The Penrose staircase is a famous illusion in which a staircase seems to infinitely loop. Before coming up with scene ideas incorporating the infinite staircase, I made sure I understood the mechanics of it first. I drew a simple perspective drawing of some stairs and in doing so realised that perspective effects would ruin the illusion (as steps further away would become smaller, making the gap between steps that the illusion requires obvious).

With this in mind, I created a simple version of the staircase in Maya. An orthographic camera was used to remove any perspective scaling. Satisfied that I understood the illusion, I started coming up with ideas.



# IDEAS

Inspired by an untitled painting by Zdzisław Beksiński, I came up with the idea of having the stairs themselves be the teeth of some large opening mouth.



To flesh out the design, I researched movie monsters with prominent mouths and teeth. One of the ones that was most engaging was the titular mummy from 'The Mummy'. I Wasn't sure how I could incorporate a ball into the scene. But seeing this photo of the mummy it struck me that the most prominent aspects were the teeth and the eyes (one bulging and one receded). Building on this, I decided that my creature would have one missing eye, which would act as the ball bouncing around its mouth.

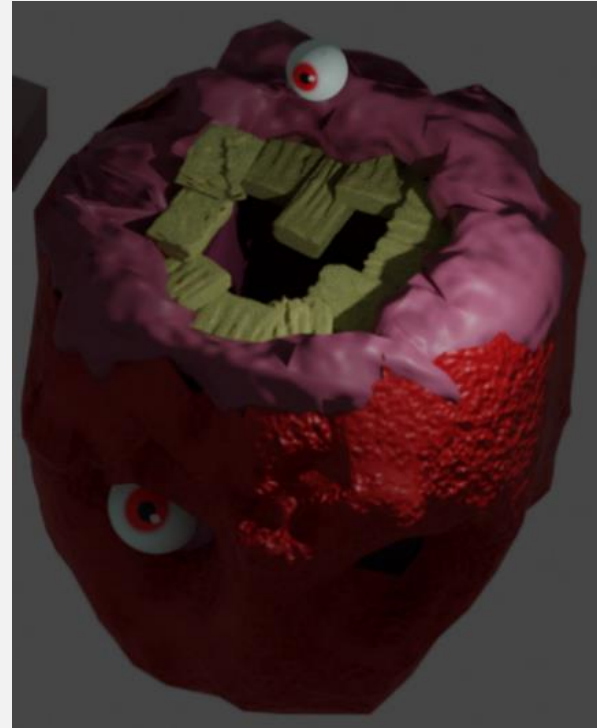
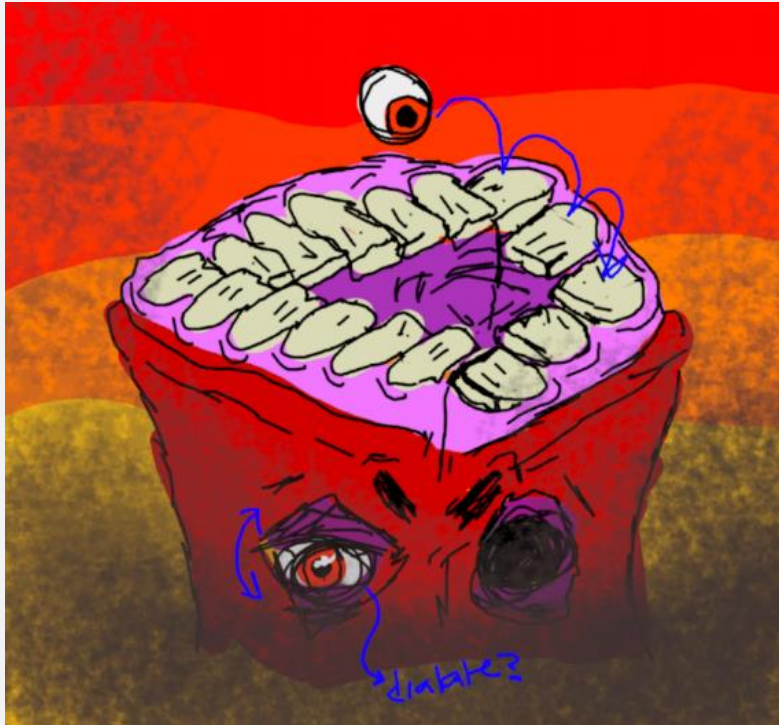






# CONCEPT ART

I created a quick concept design of the creature, and then implemented it in blender (as I was more experienced with this at the time) to ensure the design was achievable.





Happy with this as proof of concept, I created a more refined version with the background elements sketched in. The colour palette and architecture were primarily inspired by the painting 'an angel leading a soul into hell'. This painting encapsulated the tone I wanted to evoke perfectly. I took care to respect the rule of 3rds, ensuring that the mouth and ball were central. I also incorporated areas of chaos and clam, having the bottom of the scene be very busy, where the top is mostly sky expect for the mouth and ball. This should lead the viewers eye to the infinite staircase illusion immediately, despite the complicated setting.





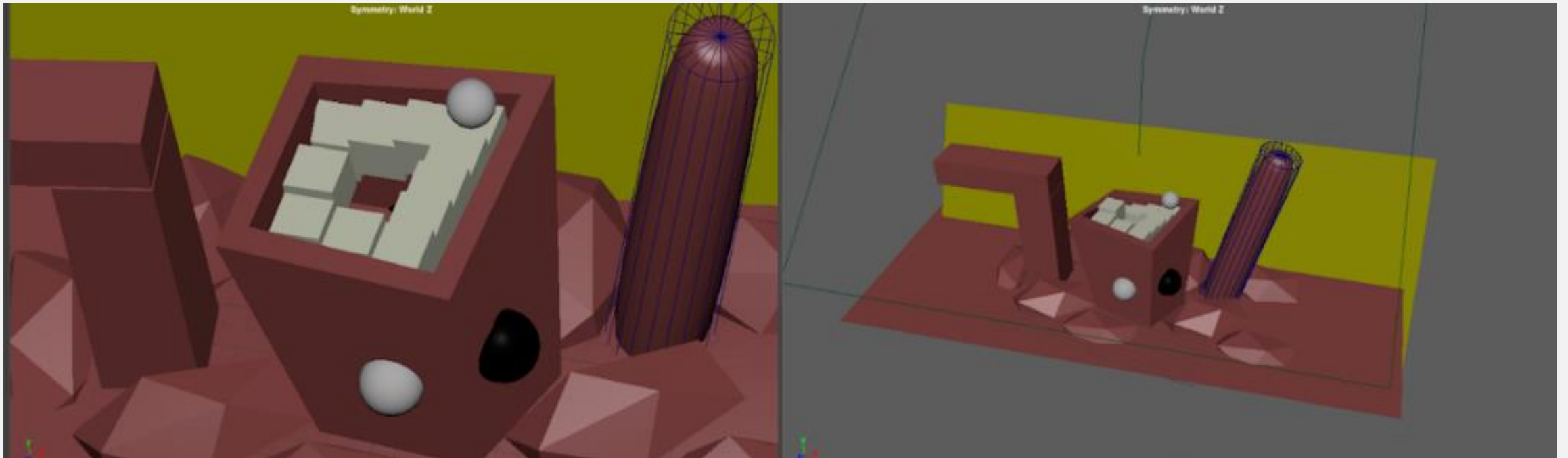
My final stage of research was visiting the natural history museum and photographing interesting rocks which looked like they could work well as a 'hell rock' material.



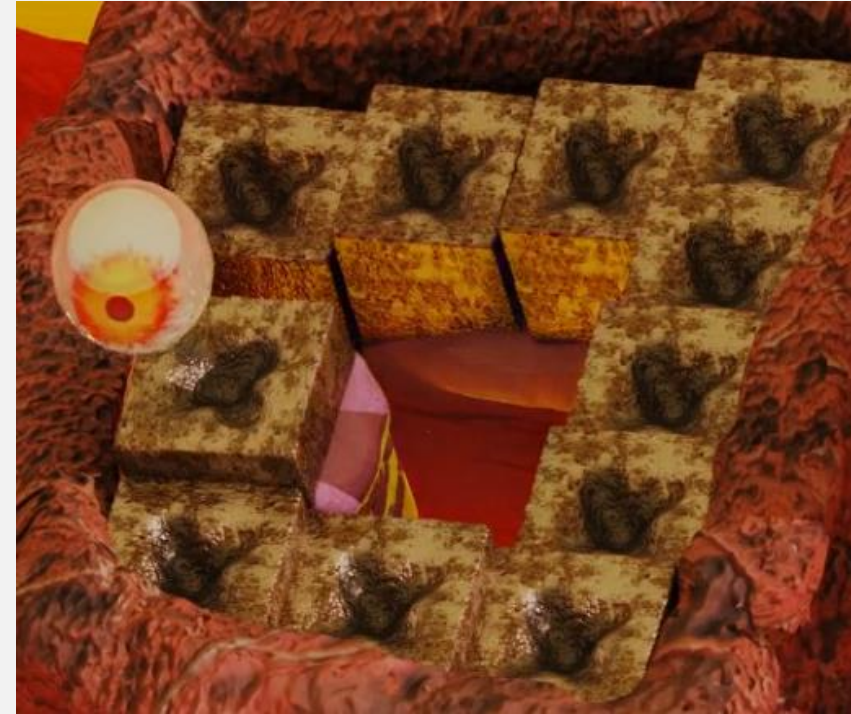
# IMPLIMENTATION

There were many different techniques used to construct the scene, for brevity the most interesting / challenging are presented here.

The scene was first blocked out using simple primitives to get the correct layout, and then further refined.

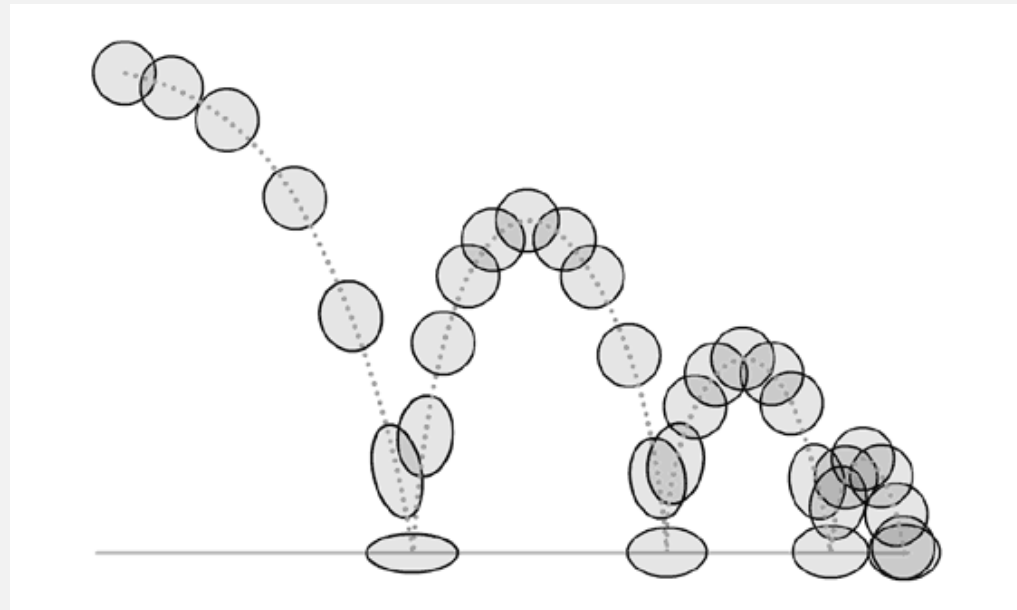


One of the biggest challenges was getting the teeth to both read as teeth and also maintain the illusion. An early design had the teeth looking much closer to real teeth, however after referring back to the Penrose stairs I felt as though the spirit of the infinite stairs had been lost and the illusion was not as strong. To this end I sacrificed some of the aesthetics of the teeth, making them more cubic. I remedied this somewhat by using substance painter to create rotten tooth like textures for them, with shiny black tar and matte rotten enamel.

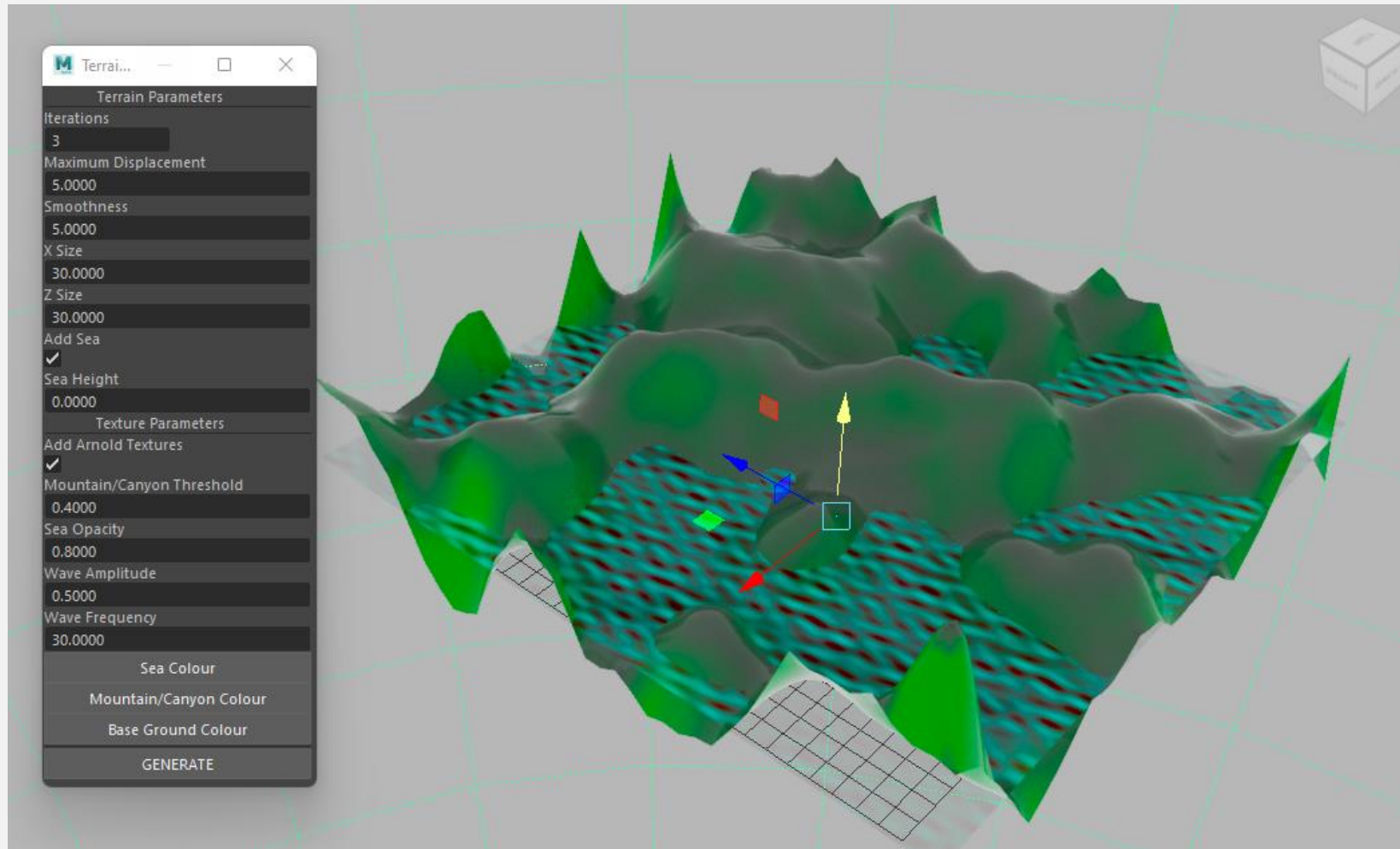




The next challenge was animating the eyeball bouncing around the stairs. I referred to the 12 principles of animation as well as footage of both a bouncy ball and space hopper for reference. Heavy use of “squash and stretch” as well as “slow in, slow out” were crucial to selling the eyeballs gelatinous nature. A problem here was that the final jump (between the two disconnected steps) is a longer distance than it appears. To prevent the bounce from looking noticeably different from the others, the timing of the highest point of the jump was shifted forward in time. Without this cheat the ball appeared to jump up very quickly and then fall down much slower. To ensure that the animation loops properly, the final frame of the animation has all of the parameters exactly copied from the first frame. This final frame is then ignored during rendering to prevent a duplicate frame. The eyeballs movement is not entirely realistic (changing direction at corners) but implies a life of its own (perhaps possessed by some dammed spirit), rather than simply bouncing freely.



I created a terrain generation tool using MEL scripting to generate the base of the scene. This tool uses the principles of the Diamond Square algorithm, a classic approach to terrain generation. A flat plane is continually subdivided, moving the vertices up or down by a random amount each time, with the level of randomness reduced on each pass. I also added the ability to add a 'sea' which I used as an animated ocean of blood. I tried to ensure that the tool had enough features to be useful outside of the context of my scene.



Finally, finishing touches were added to the scene including throbbing lighting, fog, smoke, and a simple matte painting background (a la star wars).

