Here Comes Science

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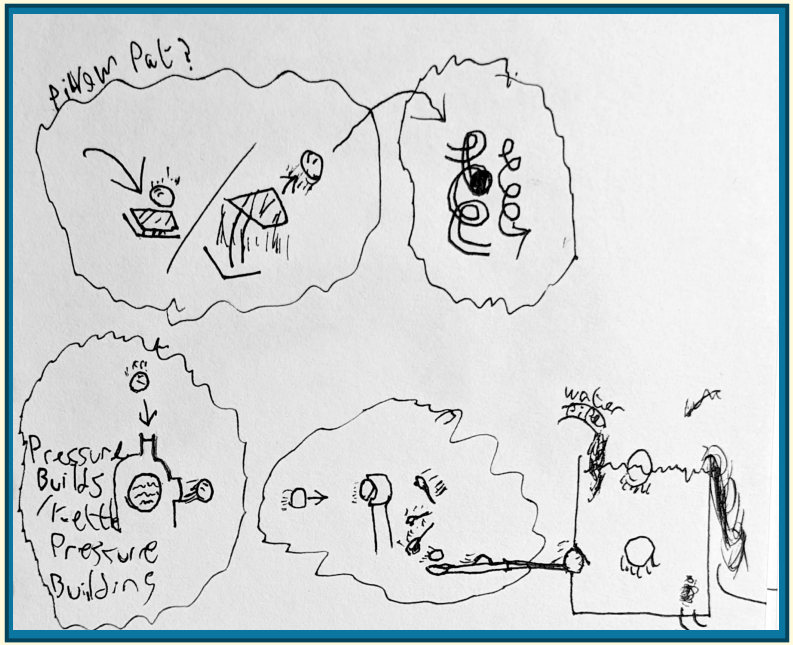
Concept

This project was originally envisioned as an all-encompassing VR experience, featuring video art inspired by visuals often used in old educational programs. However, I believed that this would severely restrict the viewership, as experiencing the project in its intended way would require an expensive VR headset.

Due to this issue, the concept evolved into animating a Rube Goldberg machine, which would consist of multiple contraptions directing a marble ball around. This idea had the same abstract potential, with a slightly different sound design outlook. The focus was instead going to be on the contraptions; these would use a variety of outlandish methods to move the ball from one place to the next. Some of these drafts are available in the image to the right.

However, I believed that it would be difficult to retain viewer interest in this idea for longer periods of time. The workload for the animator would also be too heavy, as it would be difficult to create so many contraptions in such a short span of time. The concept therefore returned to the aesthetic of old educational programs, but this time it would manifest in a traditional 2D video showcase format. This allowed me to use archival footage to broaden the range of content that I was able to compose for, whilst still retaining the general theme of the abstract visuals behind the initial VR concept.

The basis of the concept was to expose the relation between sound and visuals; exploiting how we would expect something to sound, whilst still retaining a distinctive aesthetic. The end result is a video compilation of multiple microscopic, scientific videos that are scored in a unconventional, synthesized way - similar to the clips used in older educational programs.



A couple of draft contraption sketches

Concept: Visual

I challenged myself by filming my own clips, which are orientated around the aesthetic of educational science television programs ranging from the 1950s-1980s. The vast majority of these programs feature pseudo-realistic portrayals of microbiology, amongst other scientific areas that are difficult to represent visually without some form of abstract animation or visual effects.

Due to the age of these programs, most of the visual effects were created using physical elements, such as oils and water. I attempted to create similar results in my clips by using items that were relatively easy to obtain, aiming to replicate the DIY methods used in these old programs. Alongside this, I plan to attain authentic archive footage to broaden the types of sound used for the project. For instance, my idea to include genuine microscopic footage of creatures would be extremely difficult without some form of animation.

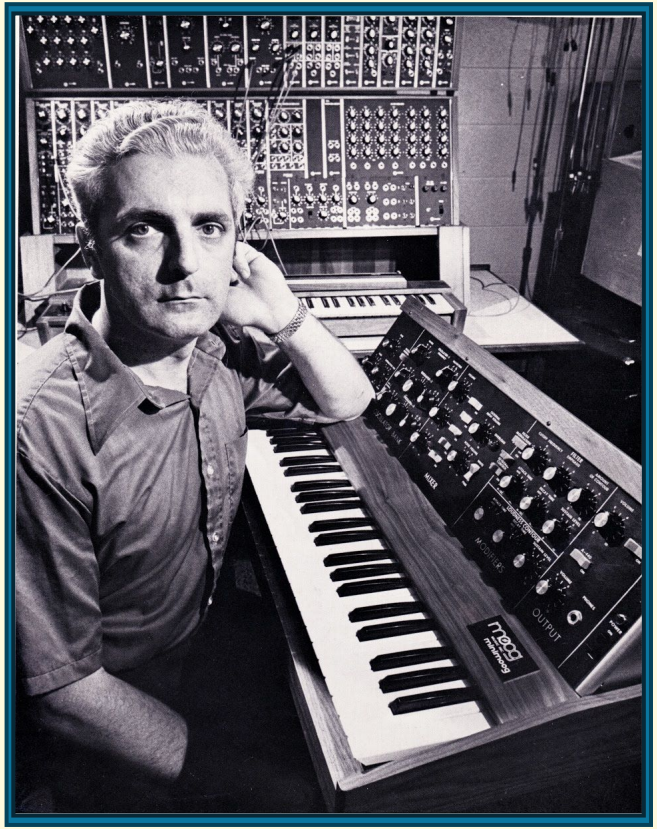
The plan to exhibit these works would be to drill a hole into a wooden box, and attach a projector lens onto the box, so that a screen can be mounted below the lens to display the video. This would also distort the image which further immerses the viewer, as the image would appear similar to a microscope's viewfinder.

Drag simulated through liquid in a model from archival footage

Concept: Audio

The scientific programs of that era likely would have been scored using large synthesizers, most commonly in modular form. However, due to the extremely high cost of the equipment, I opted to use a piece of software called VCV Rack.

This software contains a virtual modular synth, and it allowed me to import a wide range of community-created modules. This increased the number of possibilities available for sound generation and cross modulation between the different modules.



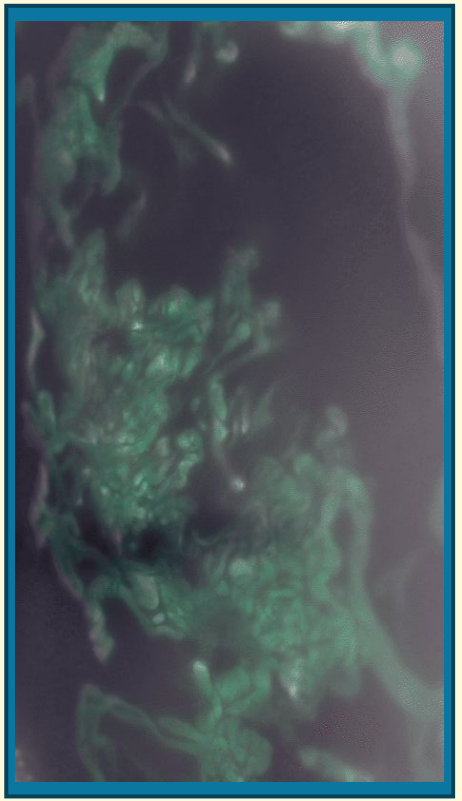
Moog Modular synth pictured behind founder Bob Moog

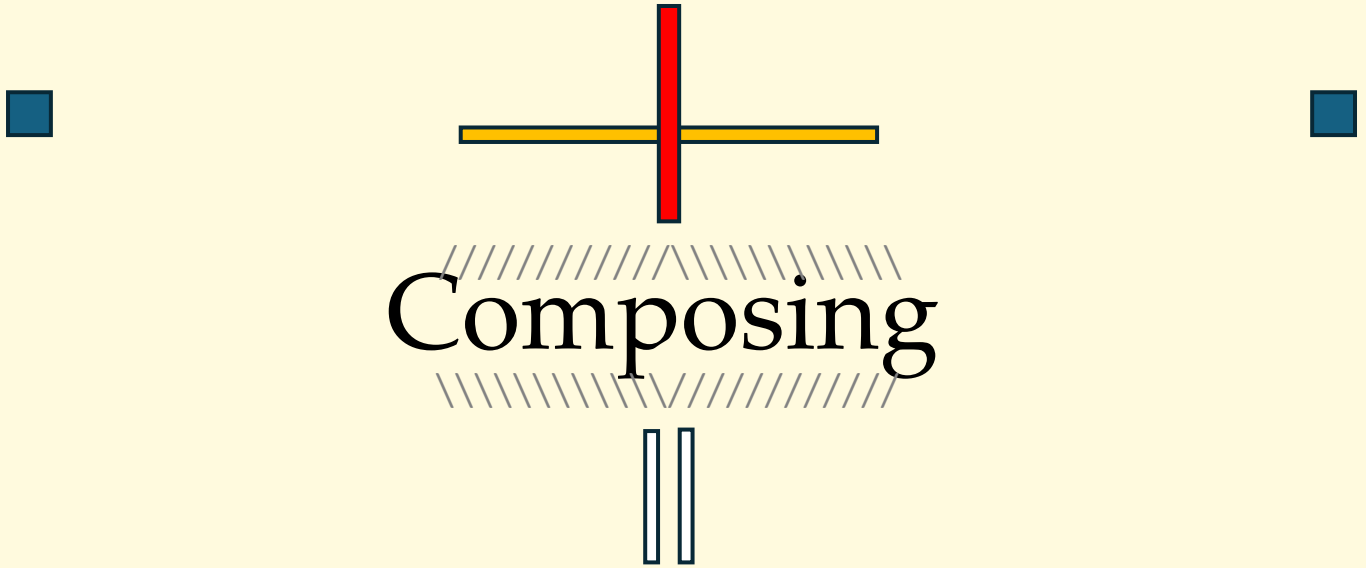
Filming Clips

My initial idea was to heat up various liquids in a saucepan to investigate how they reacted to heat application. Another idea was to film the growth of yeast, to portray a sense of rhythm similar to the inside of a lung.

To film these clips, I booked out a macro lens alongside a Nikon D800 DSLR, but I struggled to obtain a variety of clips beyond the movement of fluids. I contemplated resorting to stop motion, but my real aim was for the clips to take on a gritty and grainy appearance, reminiscent of the source material I was aiming to imitate. I was worried that stop motion would look like poorly-drawn worms, as well as taking a substantial amount of time to create.

I decided to integrate archive footage into the project alongside my own recordings, as this would grant me more time to design modular patches and create more abstract compositions.



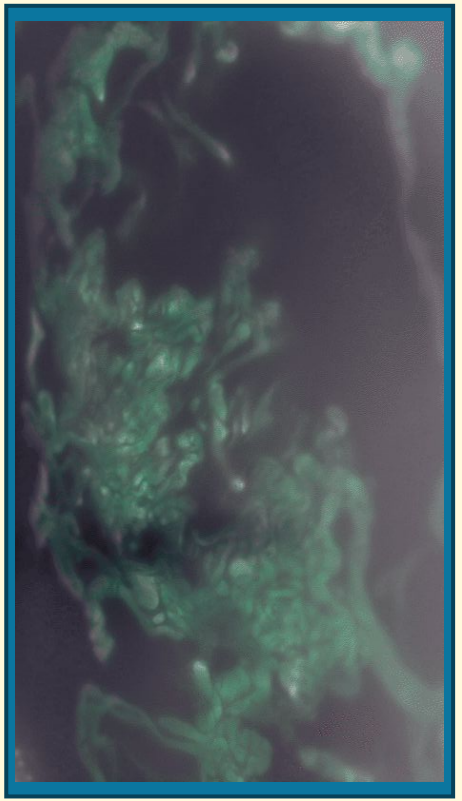

Composing

Scene 1: Soapy Milk

Video

I filmed milk in a heated saucepan, and then poured soap in to provide a sense of ongoing development to the clip. I applied a ‘negative’ effect that inverted the video’s colours, altering the opening scene to have a more alien and foreign appearance.

Whilst filming this, I knocked the tripod whilst trying to reduce the fogging up of the lens that occurs near the end of the video. Knocking the tripod provided the perfect opportunity to toggle the ‘negative’ effect off, and reveal the true appearance of what was actually being filmed. This gave a sense of tangibility to the clip, whilst still retaining its abstract appearance, which was akin to blood or some form of biological cell.



Scene 1: Soapy Milk

Composition

For this composition, I aimed to express the ongoing vortex of the soap in the milk by creating something which reflected the clip's constant movement, whilst keeping the overall composition sounding relatively minimalistic.

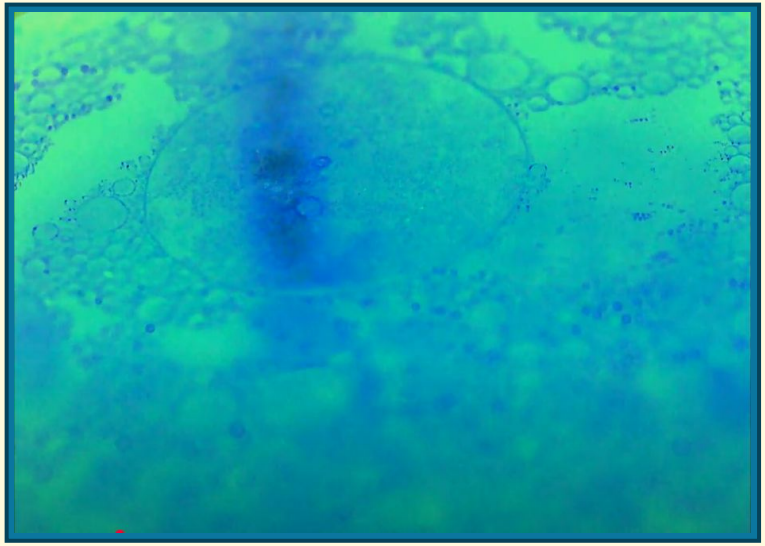
I used many sound sources with slightly varying properties - different LFO modules within these sources send data signals to modulate different values within other modules. This created the illusion of motion within the milk vortex. The technique also allowed the sound to evolve at different rates, representing the variety of actions by the vortices in the video.

Scene 2: Oily Water

Video

When filming this scene, I gently poured oil into a pan of water, and aimed to vary the size of the bubbles it would create. I produced a large bubble through slow pouring, and formed the surrounding smaller bubbles through quicker, more incremental pouring.

The movement of these bubbles spawned from pure chance, but this benefitted the clip by introducing a sense of scale and narrative which would have been difficult to replicate otherwise.



Scene 2: Oily Water

Composition

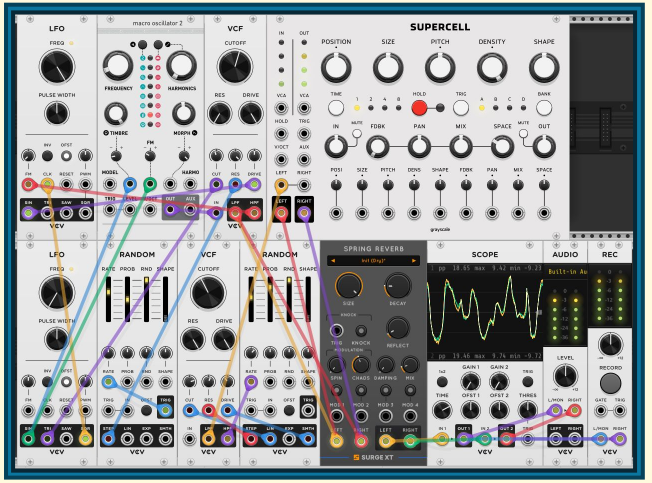
p.8

For this scene, there were two key elements that I wanted to express the most - the first was the large bubble that journeyed its way across the screen. I aimed to convey its sense of scale compared to the rest of the bubbles, and have this component of the composition evolve to represent its movement.

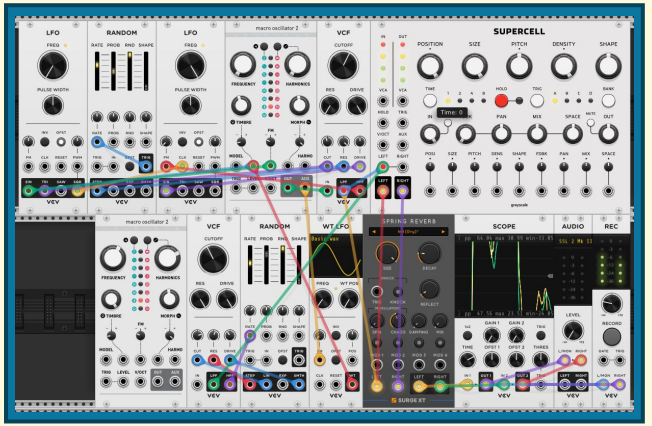
The second element comprised of the general background atmosphere, which complemented the movement of the large bubble. To reinforce the clinical aesthetic of the clip, I opted for the background to be comprised of synthesised sounds in the style of Radiophonic Workshop and science fiction films that date from the 1950s and 1960s.

I decided that letting a random note generator select the notes fit the style I was aiming for; it also produced microtonal notes which helped the 'experimental', scientific aesthetic thrive.

The large bubble drone was sourced from the melody patch to retain a sense of consistency; this is why both patches look very similar.



Ambient Melody modular arrangement



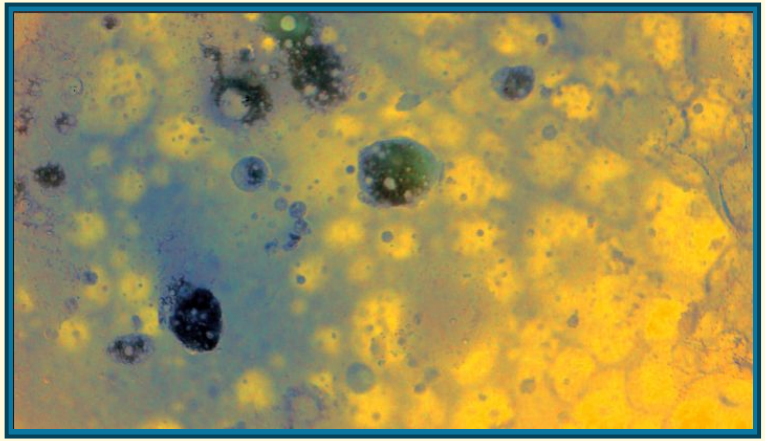
Large bubble modular arrangement

Scene 3: Yeast Mix

Video

To create this clip, I used a yeast mixture to create a viscous and cell-like liquid. Applying the colour-inverting ‘negative’ effect helped to convert the colours into something abstract, making it difficult to recognise the original substance.

I attempted to manipulate and move the liquidated yeast with a rhythmic pace similar to the inside of a lung. This would ground the clip in a sense of reality through the use of relatable movement for the viewer.



Scene 3: Yeast Mix

Composition

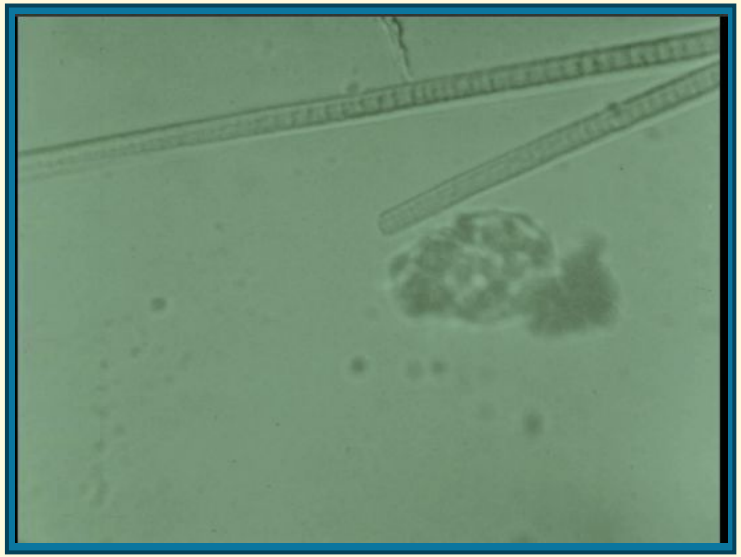
p.10

When I started creating this modular chain, my goal was to create a signal path where the first oscillator changes the frequency of the second one. Both of these oscillators would have different textures, to ensure that the central moving element could be distinguished without overcrowding the composition. This was done to represent the delay in the different sections of the 'lung' slowly catching up to each other, due to their wave-like movement formation.

Scene 4: Worm Noise

Video

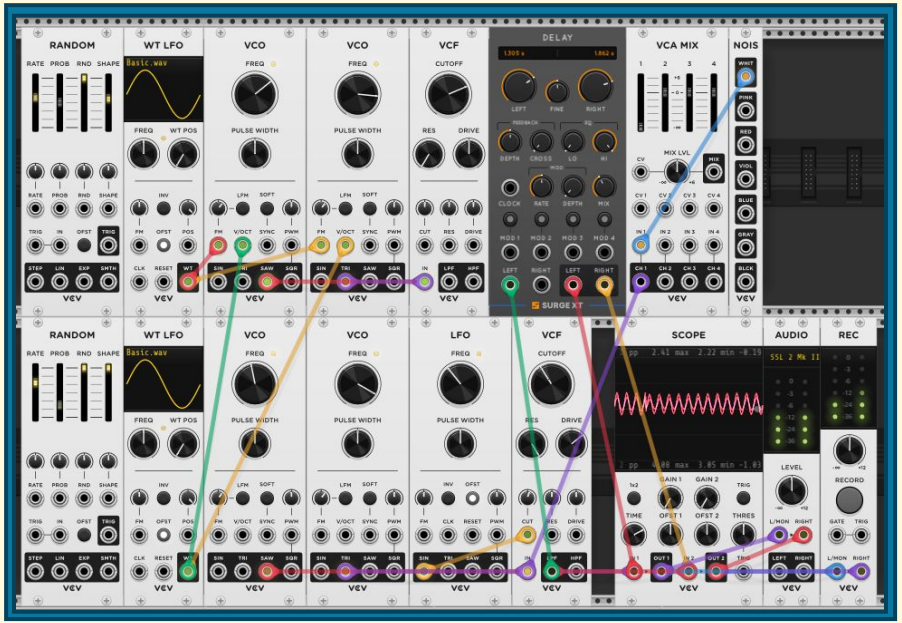
I selected this clip as I felt that its movement would allow me to create something focused on a more central character. This led the scene to feel like it had more tangible surroundings, such as the cloud of material that the worm briefly enters.



Scene 4: Worm Noise

Composition

After envisioning the sounds to create for this scene, I decided to adjust the resonance and filter simultaneously so that these elements could be controlled at the same time. The plan was to adjust the dial in accordance to the worm's relation to the other stationary worm, then layer the cloud's noise element in post.

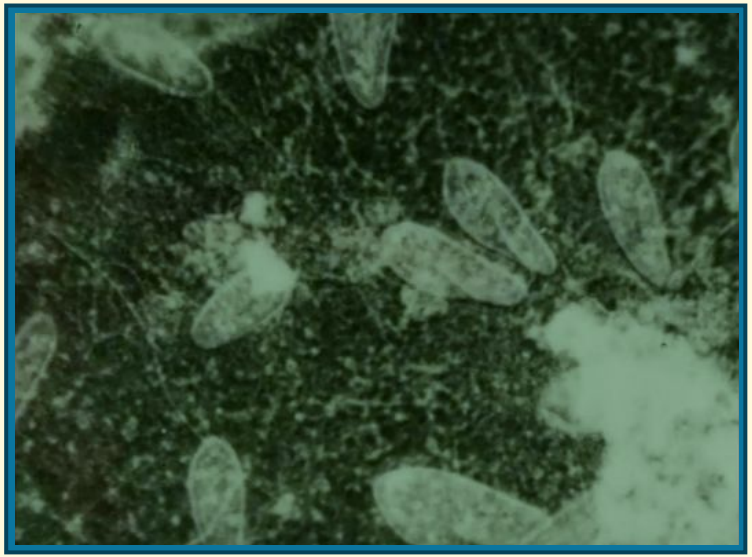


Scene 5: Little Worms

Video

I selected this archival clip, so that the viewer might get attached to the worms and anthropomorphise them.

As the worms rushed around, I was intrigued by the challenge of conveying their speed and urgent movements through sound, especially through analog synthesis. I aimed to create the illusion of a dense worm population, whilst still retaining a relatively minimal production aesthetic.

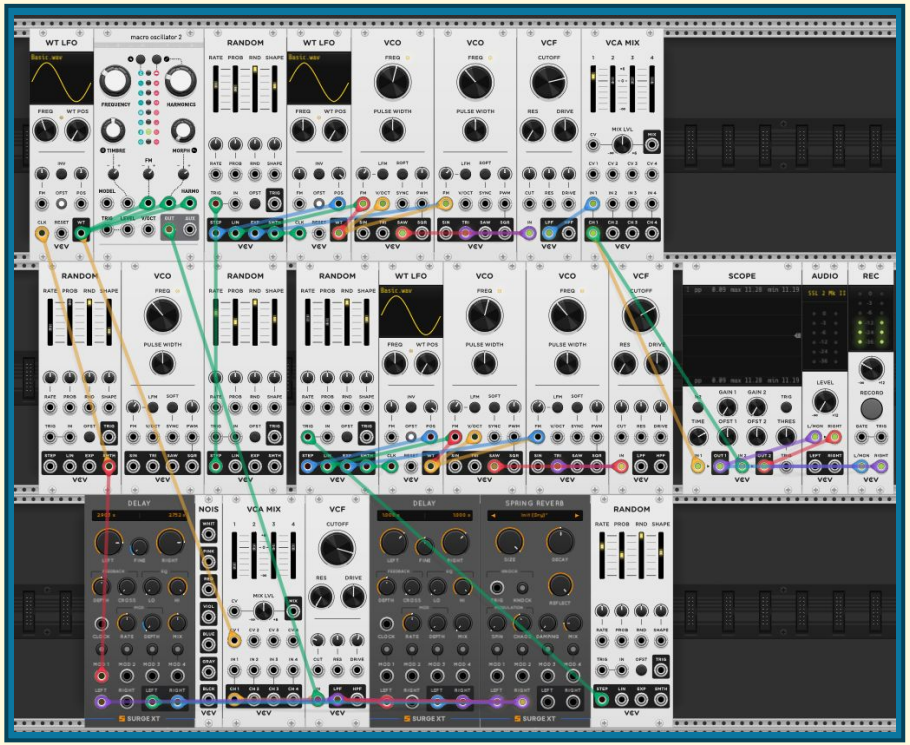


Scene 5: Little Worms

Composition

To create the sound of congested ‘little worm’ traffic, I utilised a lot of flickering cross modulation. This allowed me to rapidly change the shape of the modulator, creating a sound reminiscent of older Sci-Fi films such as Forbidden Planet (1956), where electronic devices make erratic synthesised sounds. This rapid flickering sound conveys the chaos and congestion of the worms rushing to their destinations.

I further utilised this modulation to affect the level, octave and delay effect properties. This created the sound of the worms whisking away on their way out of the frame.



Scene 6: Spiral Worm

Video

The expressive movement of the worm stood out to me when choosing this clip. It had its own sense of charm and character, whilst still retaining quite an alien appearance, and this allowed your imagination to conjure up a myriad of different textures and sounds.

Scene 6: Spiral Worm

Composition

When I began composing for this scene, I knew I wanted to create a sense of consistent vocalisation for the worms throughout the many different clips.

This idea manifested as me modulating the filter and other elements to introduce a sense of expression. I wanted the vocalisation to mimic that of animals, namely cats, human babies and other smaller animals by using a higher pitch. This helps to endear the characterful worms to the viewer because of the maternal connection we often associate with smaller creatures.

This more human approach contrasts with the previously clinical and scientific approach of the previous clips, further bringing the scene closer to the aesthetic of children's educational programs.

Scene 7: Orb Worm

Video

I felt compelled to include this clip as it expanded on the idea of the worms becoming little characters. This presented me with an opportunity to do their expressive actions justice with similarly emotive and engaging sound design.

This video in particular, where this worm is moving erratically and repeatedly hitting itself on the orb, presents a fun contrast to express through sound design.

Scene 7: Orb Worm

Composition

When composing, I ensured that I kept a consistent method of vocalisation through the filter adjustment, whilst slightly adjusting the timbre/tonality of the worm's expressive actions and voice.

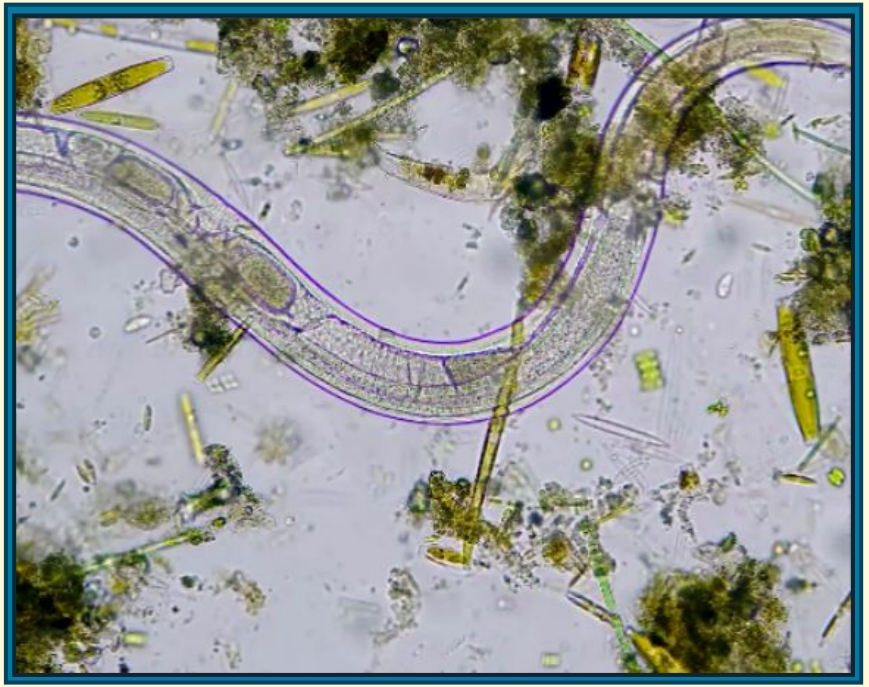
The worm in this clip appears to have a love for slapstick comedy, as it repeatedly hits its head on the orb. This allowed me to use rapid filter adjustments (utilising the module that would normally be used for the voice), to create a low thud that expressed the worm's reaction to the collision in a comedic tone.

It is worth noting that I reused the patch for the previous worm, as I really liked the tone that it created. The resonance from one filter being fed into another resonating filter, and out into a spring reverb, allowed the sound to take on multiple layers of distortion - this would have been difficult to achieve through traditional oscillators.

Scene 8: Large Worm

Video

With this scene, I wanted to convey a sense of scale and the worm's intentions, as it seemingly tries to hunt for food from the tight gap at the top.



Scene 8: Large Worm

Composition

p.21

I first focused on creating the resonance-based ambience, utilising noise as a modulator to rapidly cycle through the different oscillator types on the macro oscillator. This helps to give the much smaller objects some character, in an attempt to convey the true scale of the worm.

There is also a very deep drone present, representing subsonic vibrations for microscopic lifeforms.

Scene 9: Smoke Line

Video

My initial concept for this clip was similar to a horror soundscape, as it would use an array of noise and other sound effects to convey a gothic aesthetic.

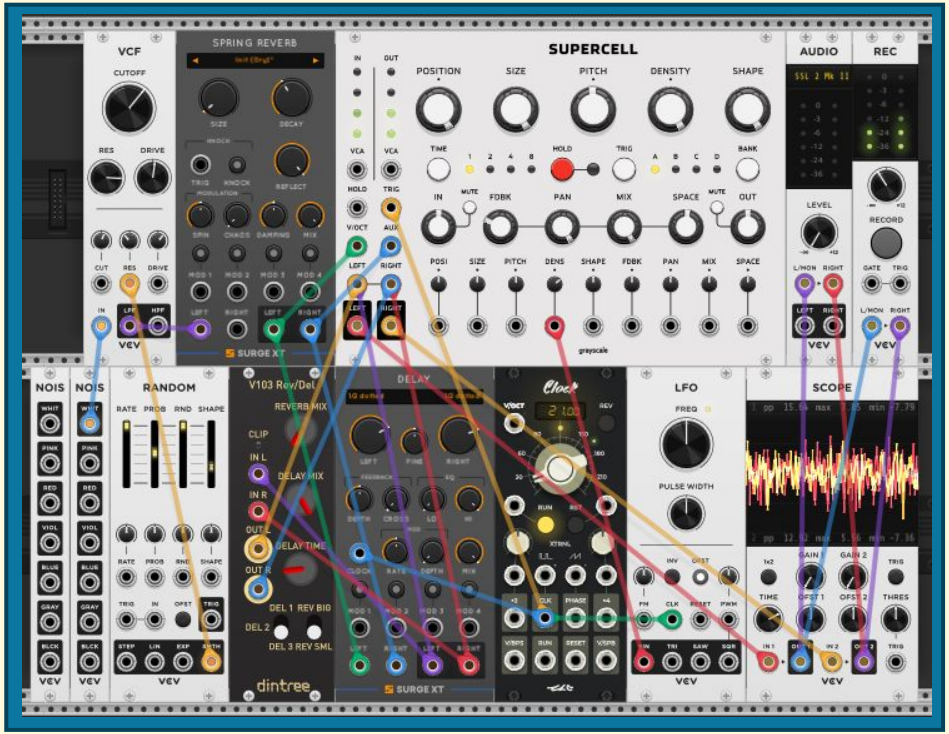
However, I instead decided to focus on conveying the motion and pressure of the spirals trailing behind the line realistically.

Scene 9: Smoke Line

Composition

I layered two drafts to create this composition. The first draft featured synthesised noises, and more breathy noise wind implementations, but it didn't fit the density of the smoke in the clip.

The second layer was predominantly focused on creating the correct amount of wind noise and conveying a sense of wind pressure.

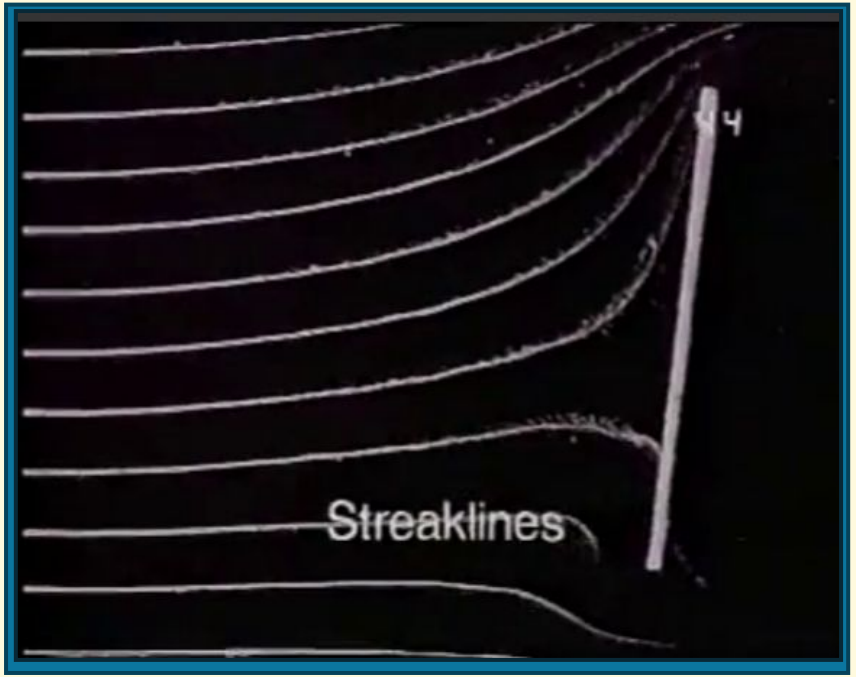


Scene 10: Streaklines

Video

p.24

During this clip, I decided upon the concept of synthesising something ‘brush’-like to express the way the streak lines are deflected by the primary line.



Scene 10: Streaklines

Composition

p.25

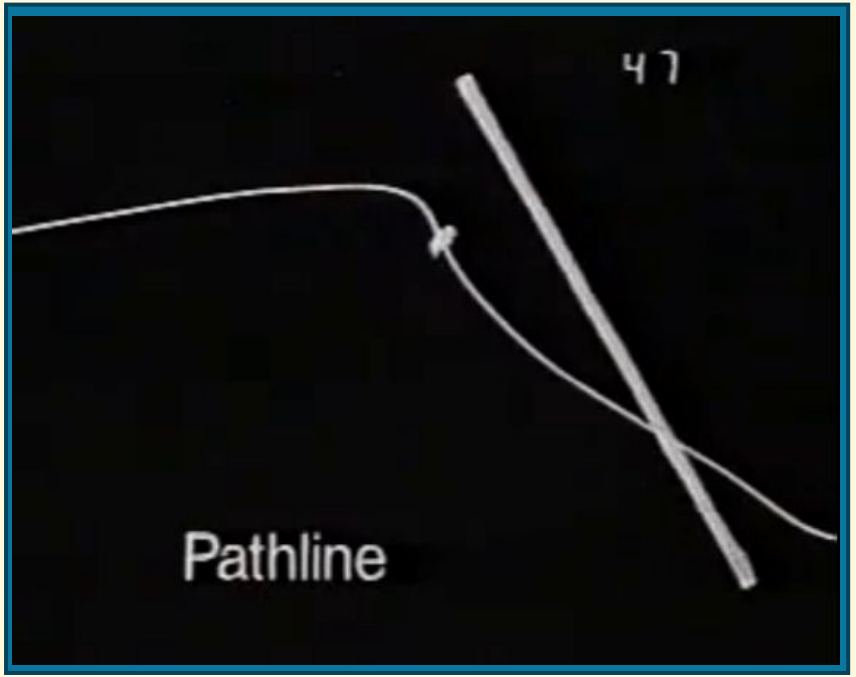
I decided that I was going to characterise the streak line strokes as brush strokes, as this would present the listener with a sense of their texture and how they would interact.

The lines manifested in my sound design as a metallic drone; this was created by a two operator FM sound source being sent through a delay and spring reverb. This produces an illusion of multiple brush stroke sounds occurring in quick succession.

Scene 11: Pathline

Video

As this clip is the longest in the project, I decided that it to incorporate a more musical approach to it, so that the clips have some added variety to them.



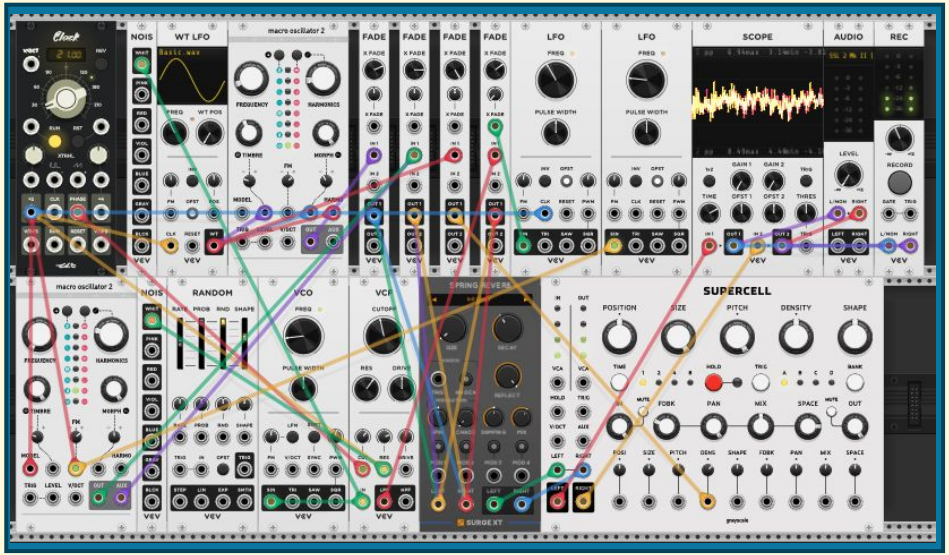
Scene 11: Pathline

Composition

I started composing the patch for this scene with a click track module, setting the click track rate to be when the white bar in the clip stops at one end and begins its journey back to the other side. By doing this, I was able to incorporate the visuals into the musical composition.

I then created various elements, such as the chord oscillator to represent the laser/siren beam. The speech synthesis engine created a progressive growling oscillation pattern alongside the whistle.

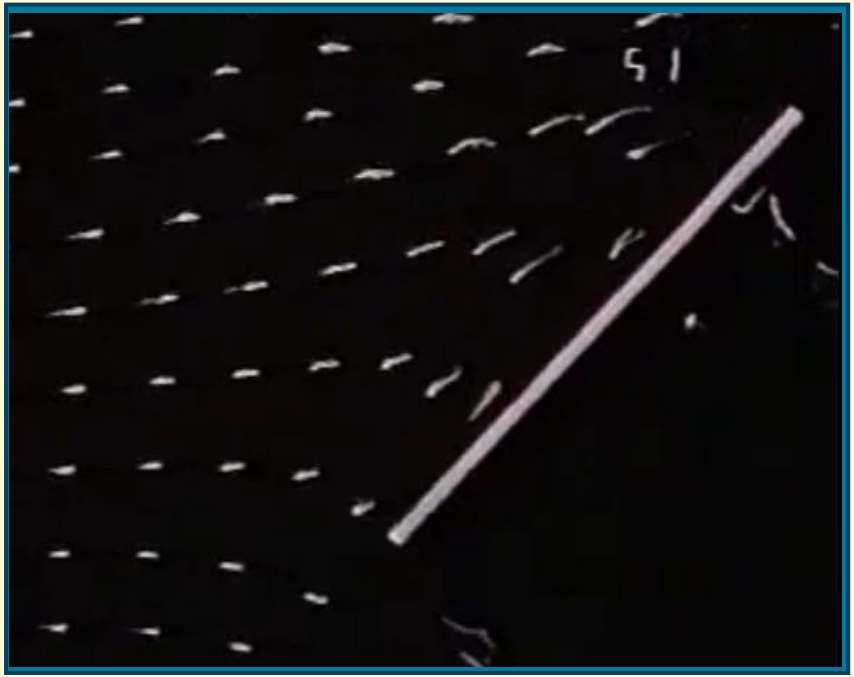
I modulated the density property on the Supercell module to create an element of percussion, whilst still staying within the realm of sound design.



Scene 12: Dotline

Video

This clip stood out to me as, I wondered how to compose to fit its very simplistic visual elements. I decided to view the moving line as a filter that would direct the flow of the particles.



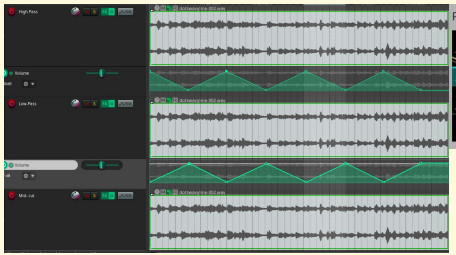
Scene 12: Dotline

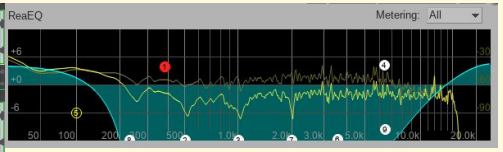
Composition

I had established the idea that the oscillating line was a filter - however, I had to determine the sound that was going to be filtered.

I began experimenting by using filter resonance as a source of the sound, after adding some modulated noise, oscillators and delay, all running through a spring reverb. The result is something akin to a combination of slowed down glass shattering and rain splashing.

After exporting the VCV Rack results, I started working on them in Reaper and making three identical tracks. The first track had a high pass filter applied, the second had a low pass filter applied. The third track has a inverted band pass filter applied, which represented the dots in the video that escaped the filter line over the top and very bottom. I then automated this, so that the high pass and low pass crossfade repeatedly, representing the oscillation of the line.



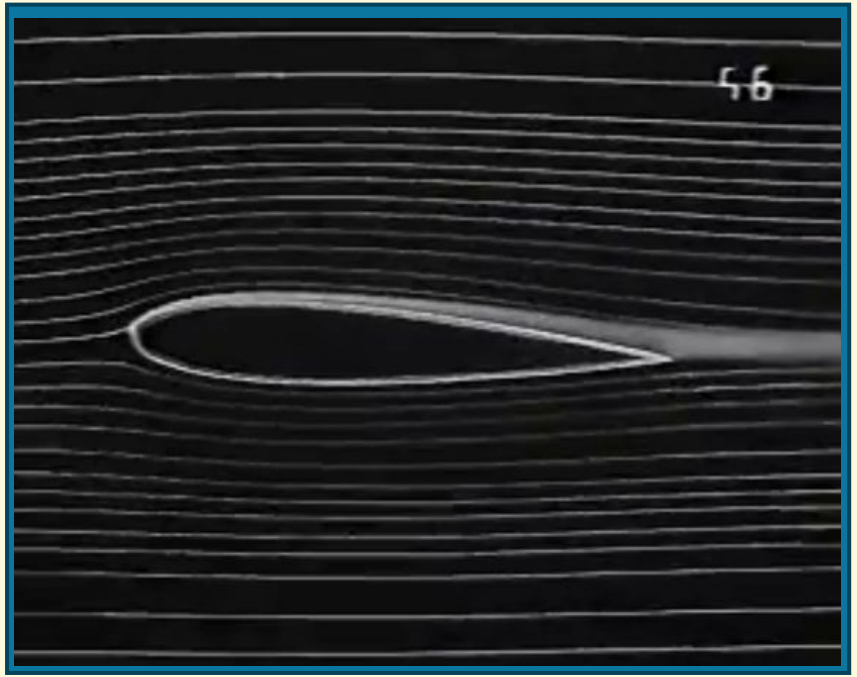


Scene 13: Laminar Flow

Video

p.30

When I first approached this film, I recognised its similarities to a wind tunnel. I was eager to create something similar but still very abstract, as I was curious if I could represent the lines surrounding it in a way other than just noise.

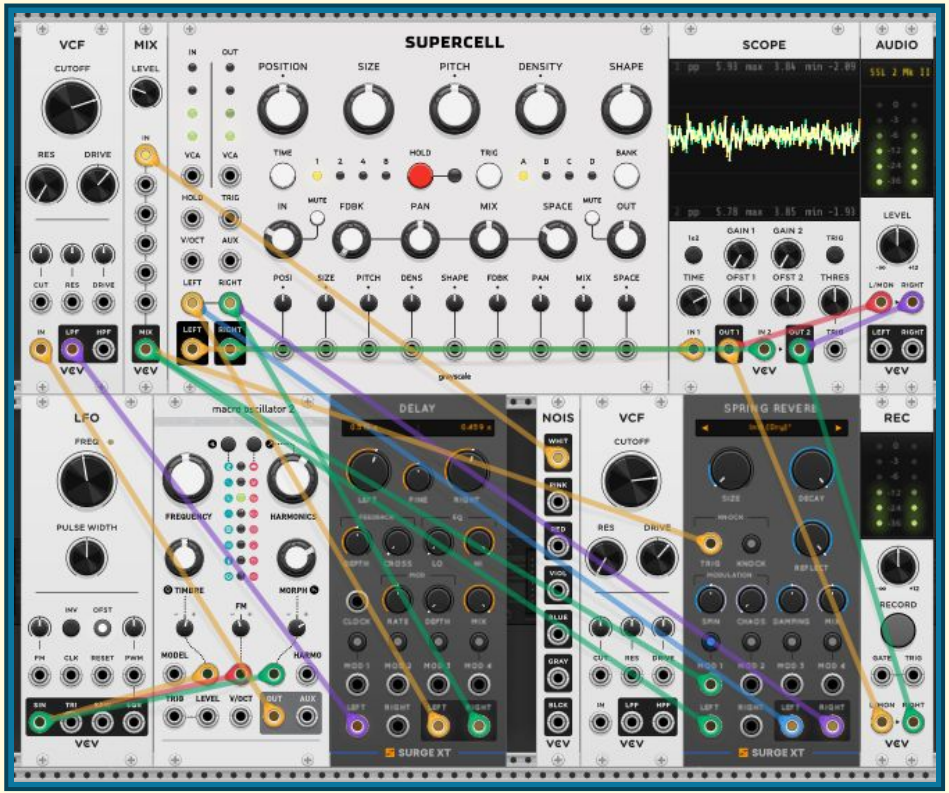


Scene 13: Laminar Flow

Composition

p.31

When it came to designing these sounds, I was aiming for something resembling a wind tunnel, however, it quickly developed into something more akin to a spacecraft re-entering the atmosphere. I was set on achieving a gritty sound to provide the clip with more progression as the object became increasingly canted, to express the difference in aerodynamics compared to the start of the clip.

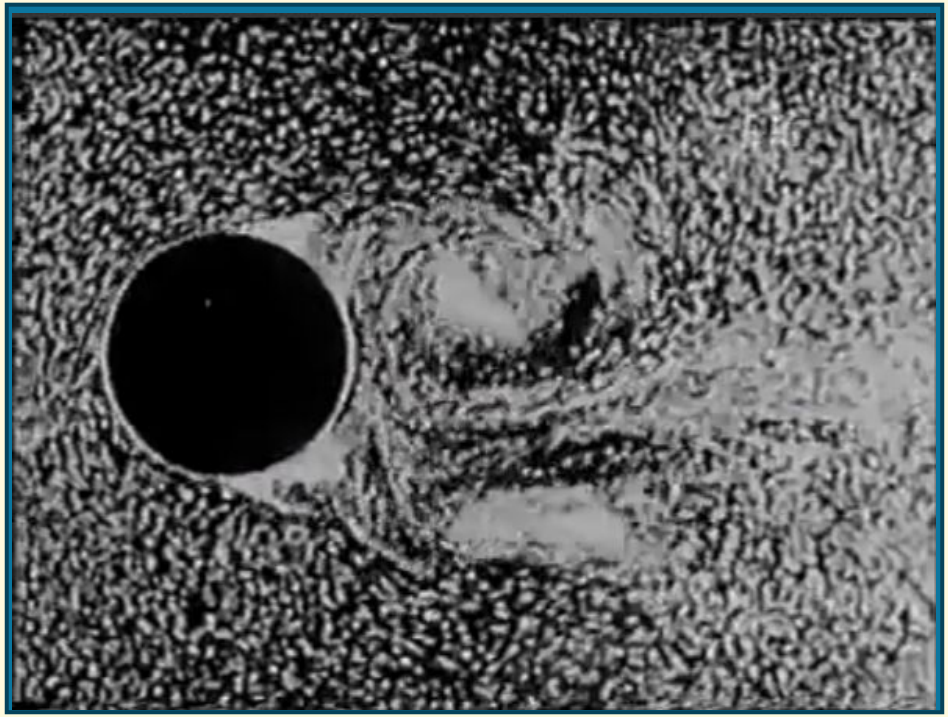


Scene 14: Particle Circle

Video

p.32

This scene was taken from a fluid dynamics educational video; I wanted to express the flow of the movement using a more abstract sound, so that more information and texture could be conveyed compared to recorded liquid-based sounds.



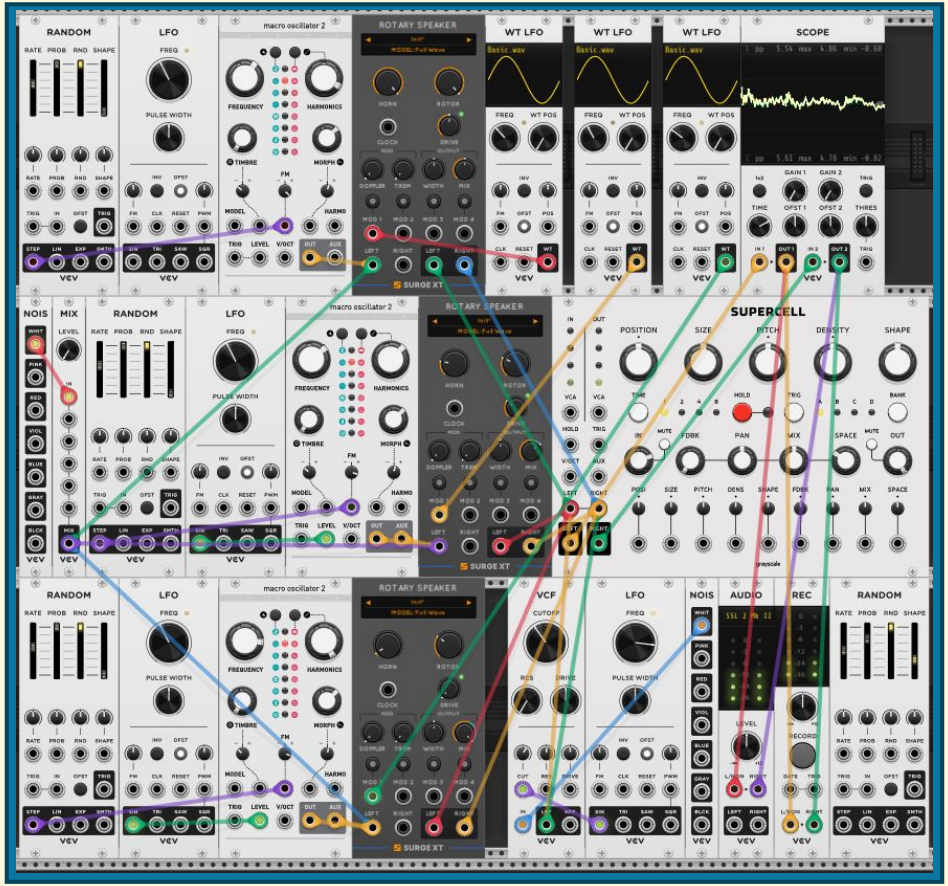
Scene 14: Particle Circle

Composition

p.33

When composing this, I aimed to create a sound that resembles the viscosity of water, as the video demonstrates fluid dynamics. To do this, I automated a variety of modules to rapidly change certain property values, creating the quickly evolving texture of water sloshing.

Alongside this, I included a bed of noise that oscillates to simulate the sound of waves. This draws the listener's focus to the water collisions, solidifying the concept that the particles in the video are a form of liquid.



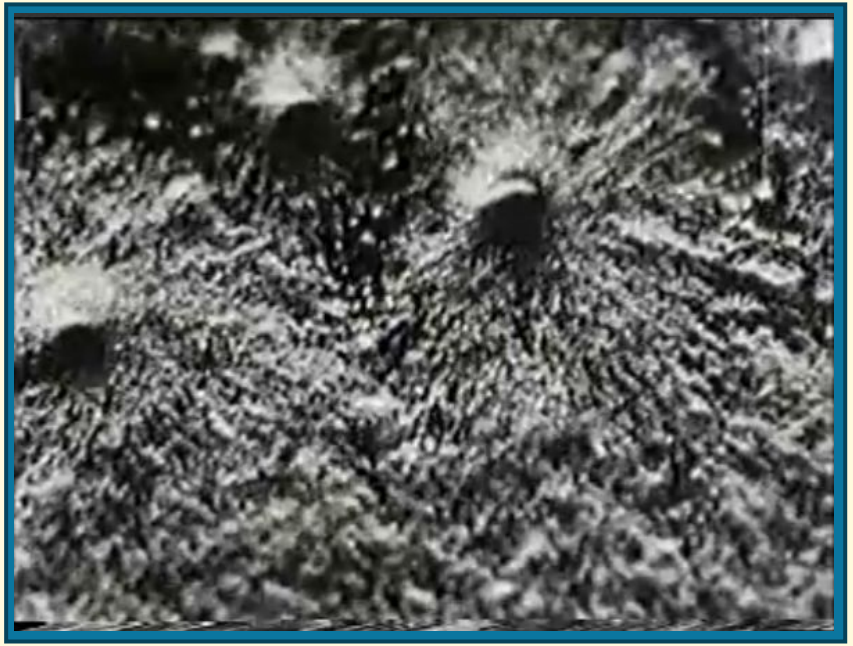
Scene 15: Shifting Sands

Video

p.34

This clip portrays magnets fixed in place, surrounded by metal particles. When the surface beneath them vibrates, it moves the particles closer to the magnets.

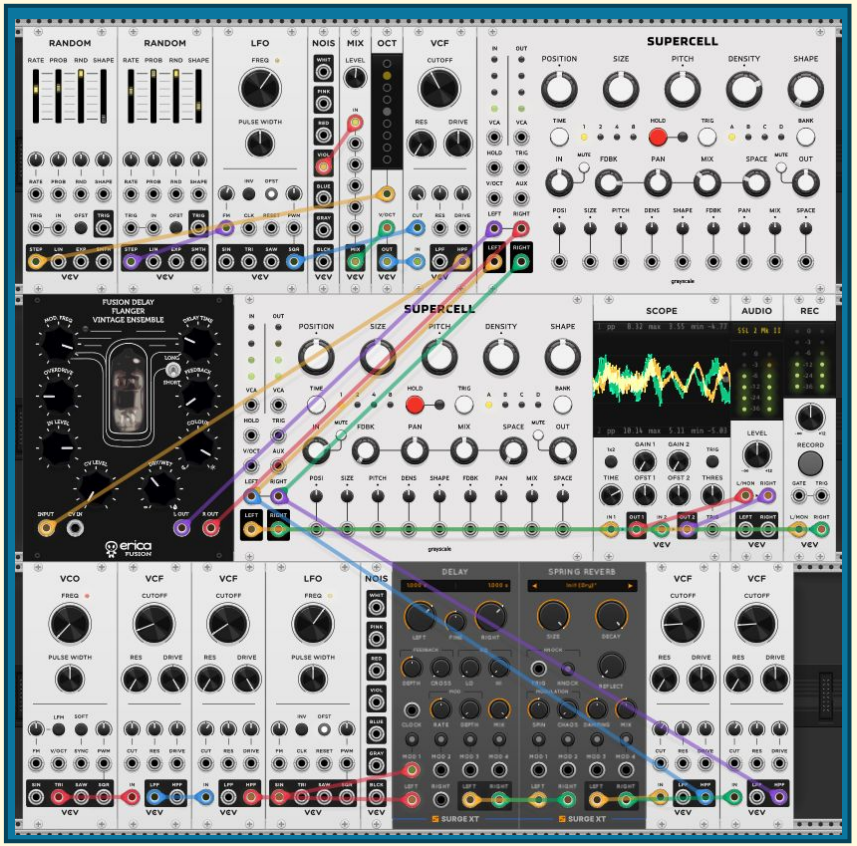
I thought the process of scoring this would be interesting, as the clip contains textures dissimilar to those I had already scored.



Scene 15: Shifting Sands

I began by developing the drone element; this was key to portraying the source of the vibration. It also became an audio-visual representation of the suspenseful, slow rising of the metal shards.

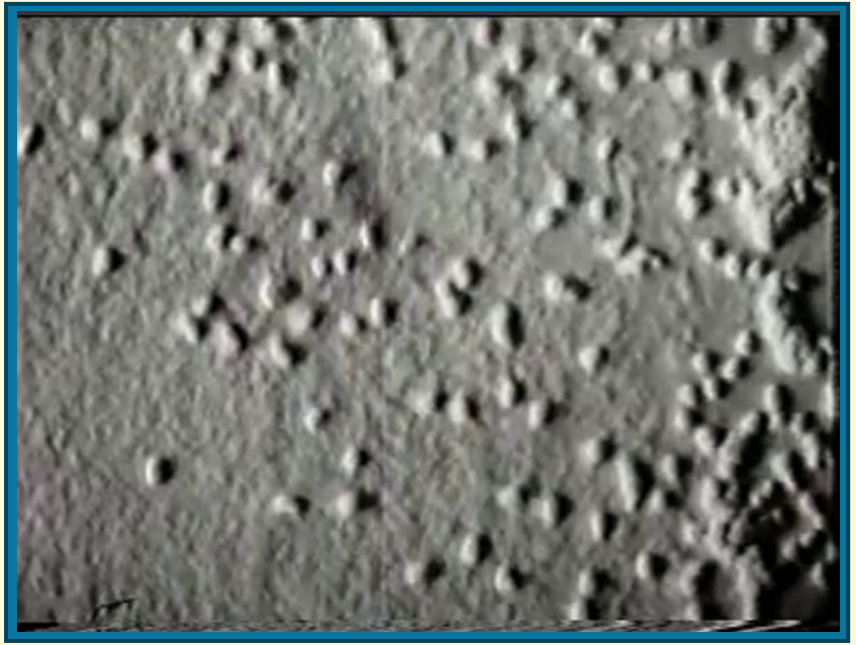
The second element that I created was the noise of the particles moving towards the magnets. This was achieved through automated octave and filter cutoff oscillation, an Erica delay module, and the density property on the Supercell module. This combination helped to represent the quantity of particles and their movements as they interacted with one another.



Scene 16: Dust Migration

Video

In this very short clip, I was interested in conveying the aesthetic of these little creatures traversing a foreign environment. Our perspective as viewers was solidified by imitating footage recorded from spacecraft.



Scene 16: Dust Migration

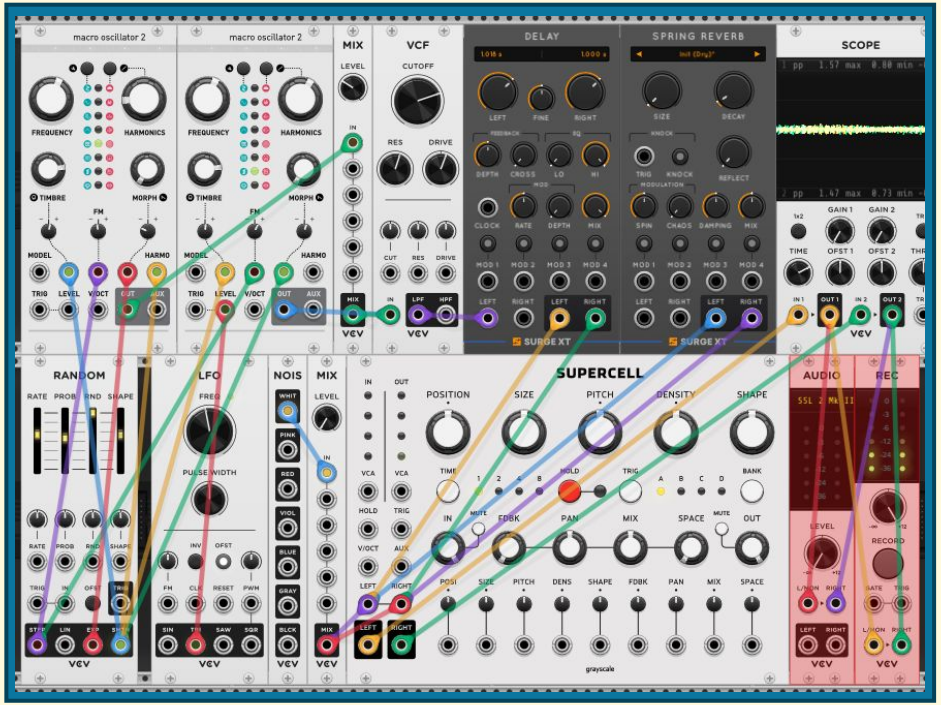
Composition

p.37

I began by determining what sound the creatures would make as they traversed the landscape - I opted to use high-pitched oscillators and tones to make them semi-endearing to the viewer.

Alongside this, I also began to work on an ambience layer for the composition. This would represent noise created by the hardware that was recording the video, as the aesthetic I was aiming for was something similar to an early space age satellite.

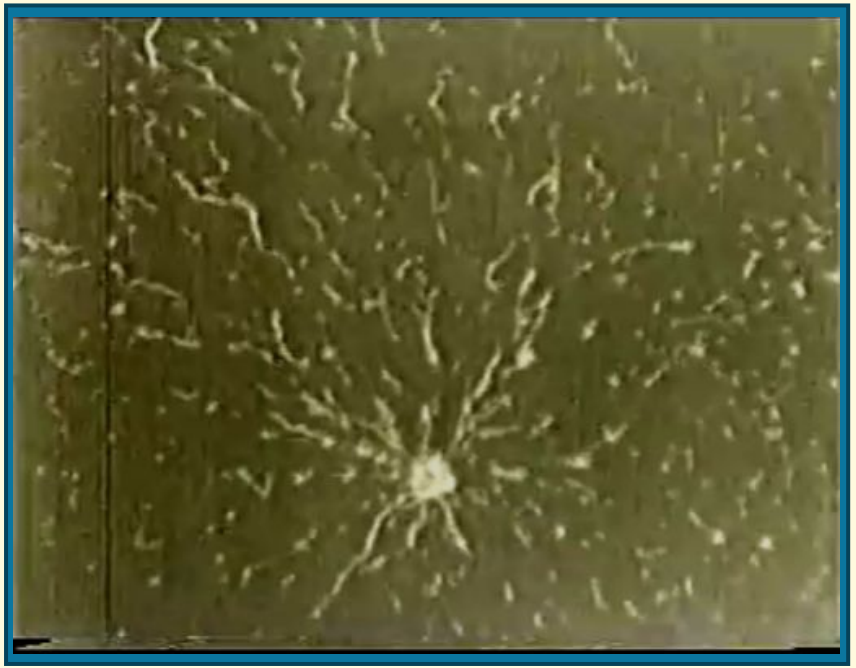
Another perspective you could take from the combination of the footage and ambient sound design, is that the dust clumps are some form of alien being observed stealthily.



Scene 17: Hive Society

Video

For this clip, I wanted to represent the collective energy of the various lines journeying to create one central mass.



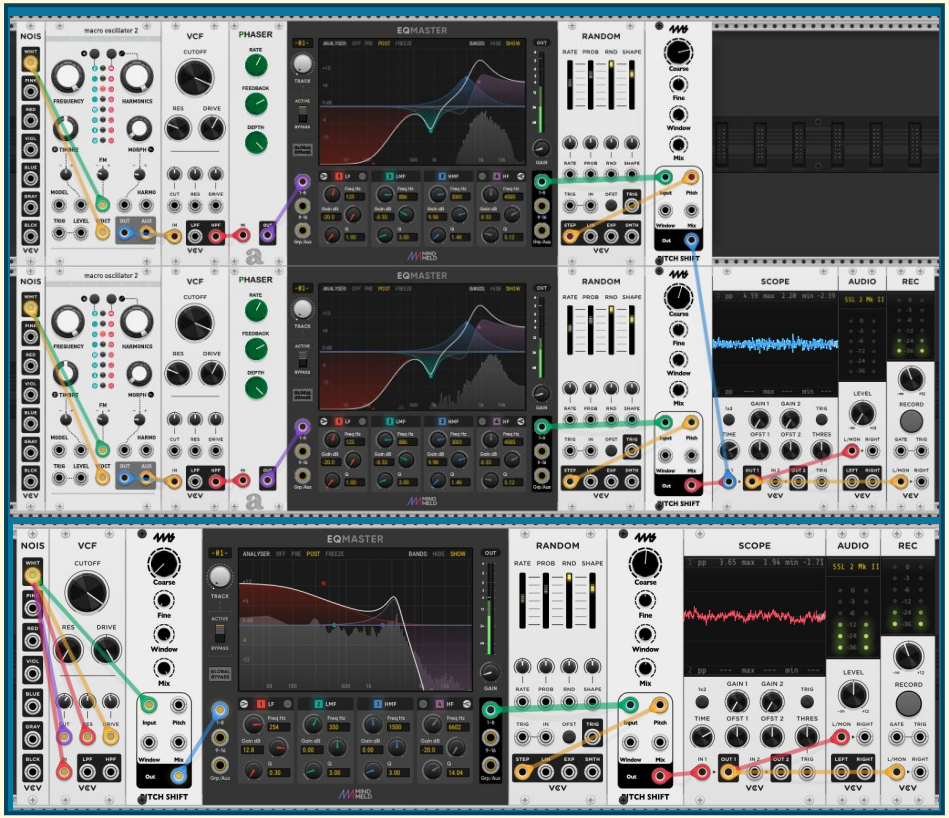
Scene 17: Hive Society

Composition

p.39

I tasked myself to develop a sound that sounds similar to electrical arcing, which represented the scattered lifeforms. I then reversed this sound effect, as this would provide the listener with an impression of movement towards the orb.

Once all the lifeforms have been compressed within the orb, the sound develops by becoming more distorted and quickening in rate; this helps to express the potential energy that is contained inside.



Scene 18: Brown Worms

Video

p.40

This scene presented an intriguing opportunity to create multiple sonic elements that begin to fit together over a short period of time.

Scene 18: Brown Worms

Composition

p.41

I first established three elements which were going to gradually move apart. This separation results in an audio-visual relationship between the imagery and the widening stereo field.

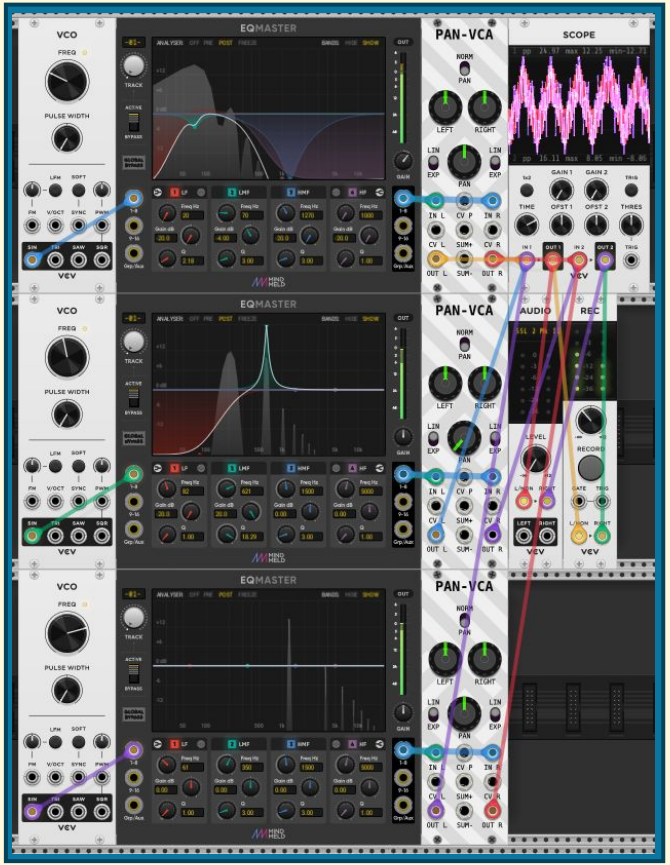
The concept was that the highest and lowest frequency would be filtered so that they would get panned to one side, and the other frequencies would be panned to the other side.

However, I made a creative decision to clip the lowest frequency, as it became harder to distinguish compared to the other two, resulting in the panning feeling lopsided. This clipping provided the lowest element with some slightly distorted overtones, helping to highlight its location in the soundstage.

LOW

MID

HIGH



Conclusion

Throughout this project, the archival clips have provided a wide range of footage that would have been near impossible to obtain myself. The use of this footage allowed me to explore new sound design avenues that would have been difficult to justify otherwise, due to the abstract nature of the visuals.

The sound design was the most challenging aspect, developing each VCV Rack patch was very time consuming, and often didn't result in the sound that I was aiming for. Although, due to this, I used a relatively limited selection of modules in a way that encouraged creativity. Knowing how the modules reacted together allowed me to have an extra level of control over the developed sounds. Whilst focusing on new modules would have yielded more unexpected results, whenever I tried this approach, I spent more time attempting to locate the correct module for my use case - as opposed to achieving a similar result with a limited palette of modules.

Key elements of the sound design, that I believe became the highlights of the project, were the sounds that expressed characteristics of the central focal points in the video. These helped to vocalise the movements and thoughts of the elements in the clips.

Ultimately, if I had spent more time recording the clips, and had invested in a macro lens and some materials for visual experiments, it would have created a more coherent viewing experience. Considering the time it took to create these patches, I'm confident with how the final piece presents itself and the characters in the footage. I look forward to creating more sound design, microcosm-style narratives such as these.

Unfortunately, I struggled to find the time to create the exhibition casing using the projector lens, but this would have become the true method of viewing the work. I am definitely going to pursue this in a couple of months time, hopefully securing an exhibition space to showcase this composition in the near future.