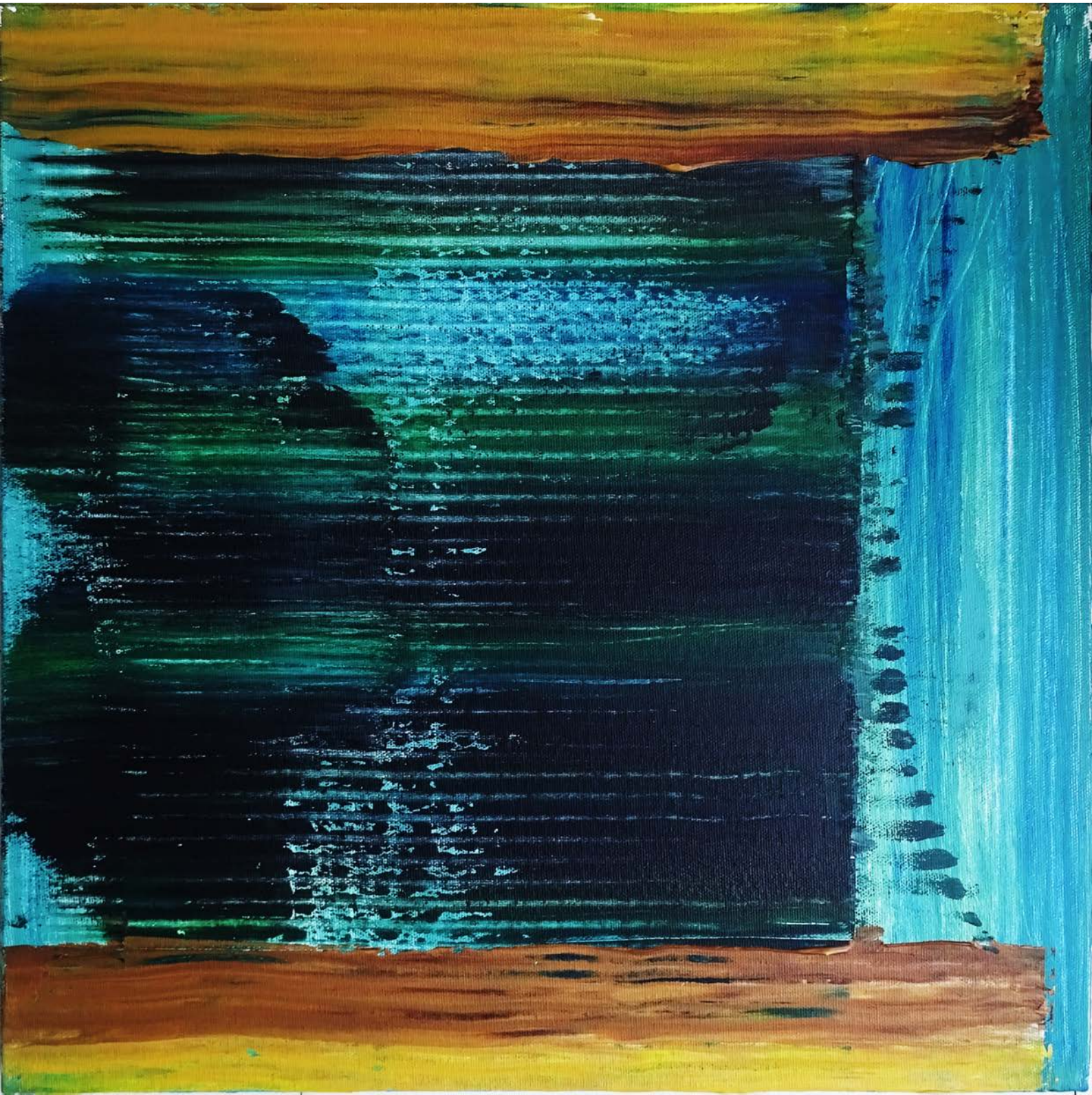
Reflective Research Journal

UBLMKB-30-3 Architectural Representation & Modelling

Madeline Johnston



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Word Count: 2179

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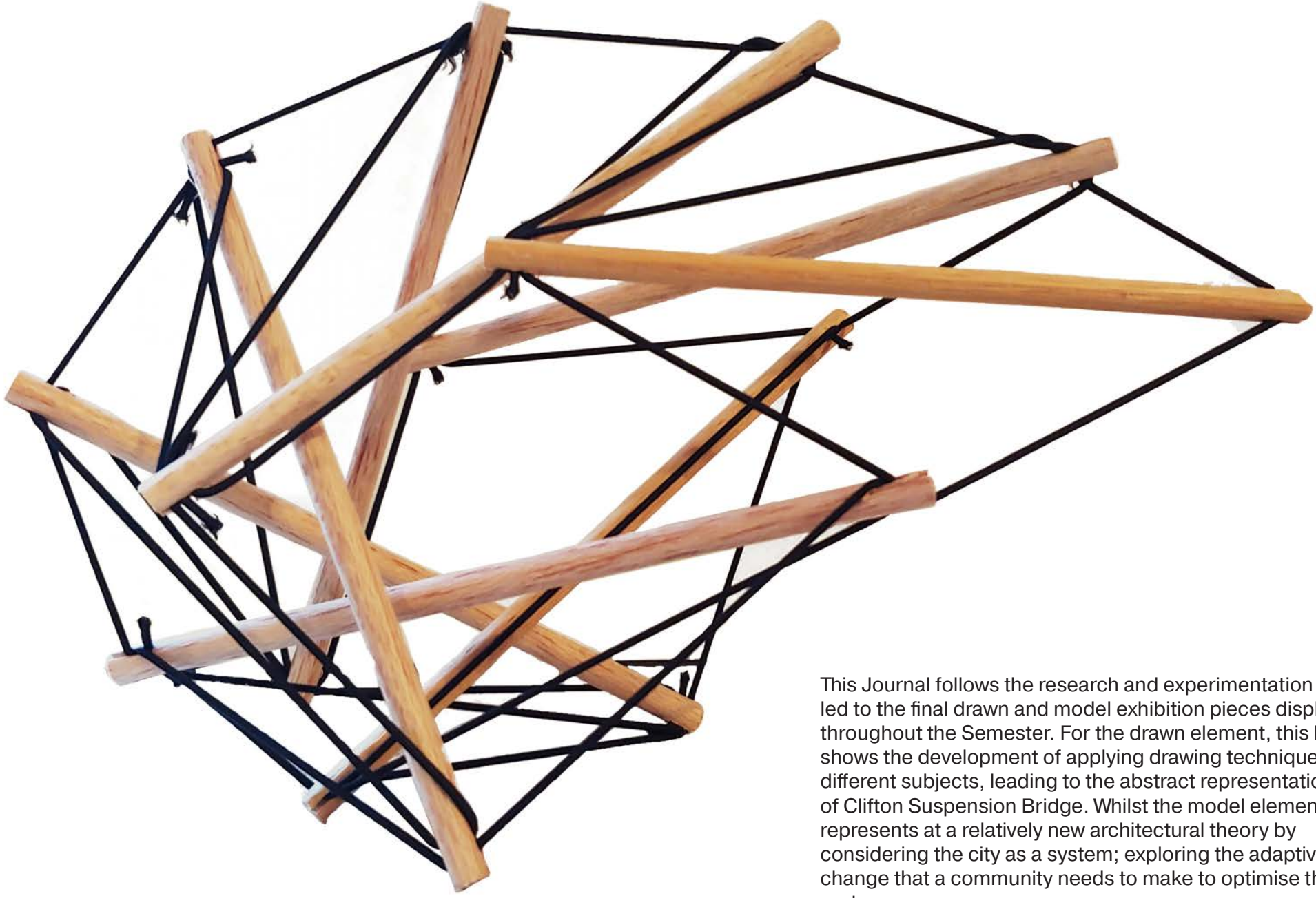


Modelling Resilience - Example of a test tensegrity model.

This Journal follows the research and experimentation that led to the final drawn and model exhibition pieces displayed throughout the Semester. For the drawn element, this booklet shows the development of applying drawing techniques to different subjects, leading to the abstract representation of Clifton Suspension Bridge. Whilst the model element represents at a relatively new architectural theory by considering the city as a system; exploring the adaptive change that a community needs to make to optimise the system.

Interpreting The Abstraction

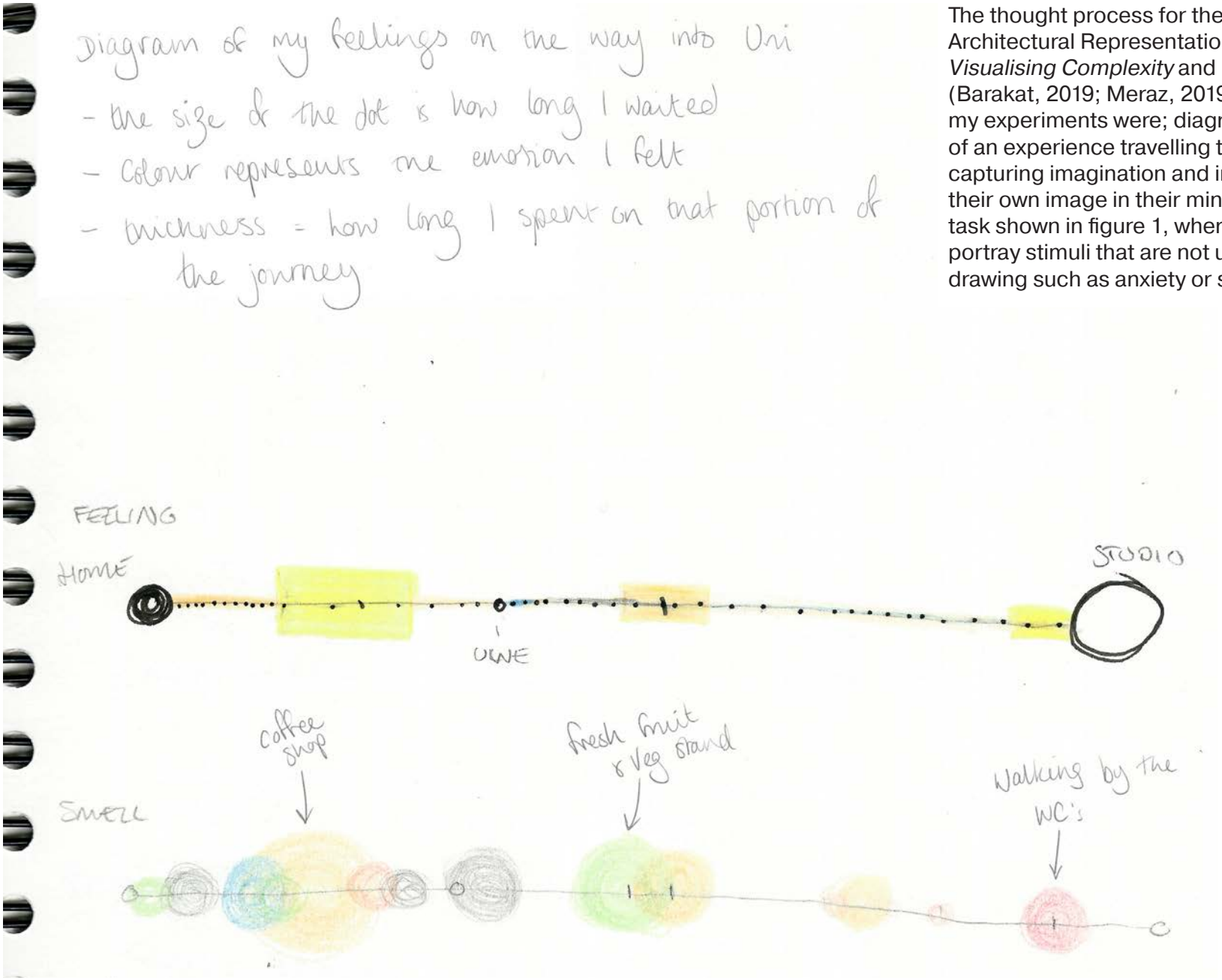


Figure 1: Sketching my journey into University through smells and feelings.

The thought process for the drawn element of Architectural Representation began during the *Visualising Complexity* and *Drawing as Design* lectures (Barakat, 2019; Meraz, 2019). Key ideas that inspired my experiments were; diagrams to show the abstraction of an experience travelling through a building, drawings capturing imagination and inviting viewers to produce their own image in their mind, as well as the workshop task shown in figure 1, where simple rules were set to portray stimuli that are not usually represented through drawing such as anxiety or smell.

Interpreting The Abstraction

Taking the idea of images capturing our imagination further, El-Bizri states (2007, p.35) “drawings are potentialities rather than actualities” discussing how drawings do not have to be descriptive of the subject to be able to create a realization in the viewer of what the drawing points at. Introduced into the narrative was the idea of perceptual confidence, with the example of an axonometric drawing in figure 2, seeing something in part allows for the imagination to reveal the structural wholeness, in this case a cube (El-Bizri, 2007). Here began the theme of my experimentations, taking a subject and only partially displaying it, be that, drawing only part of the whole or representing the emotions of the artist.

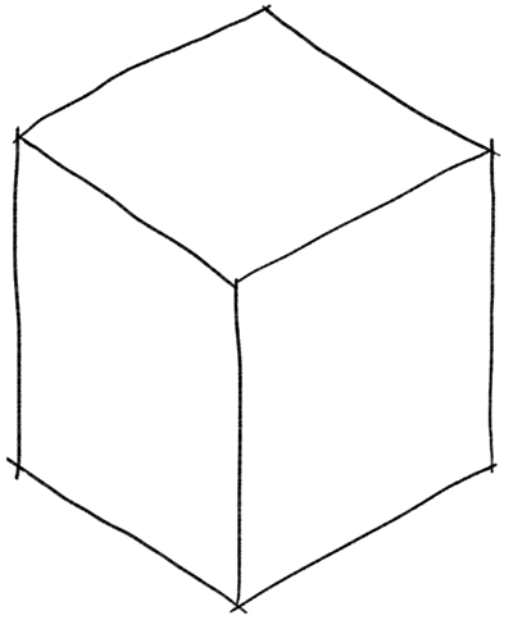


Figure 2: Perceptual confidence that this is a cube.

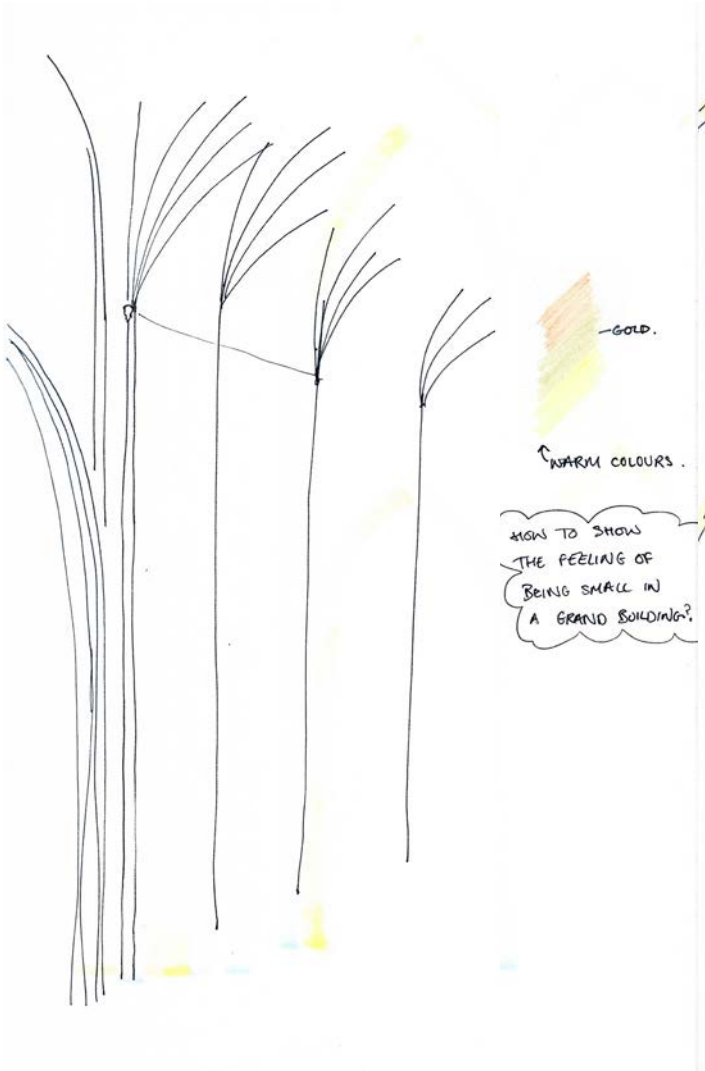


Figure 3: Minimal lines to sketch St Mary’s Church.

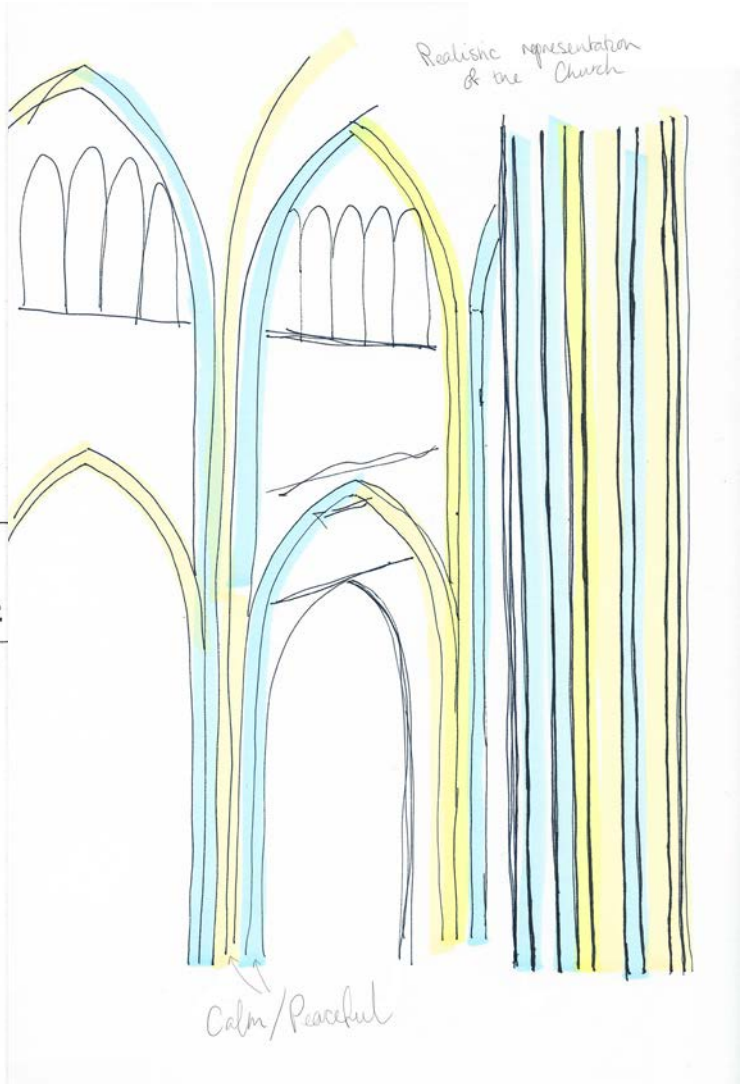


Figure 4: Accents of calming colours to portray how I felt.

Initial experimentation utilised techniques from the workshop in the second lecture, applying simple rules to draw a subject, providing an image with the subject drawn in part, ready for the viewer to interpret. The subject was St Mary’s Church, Redcliffe. Rules applied to my sketches included using colour to show emotion and simplifying geometries, these sketches are shown in figures 3-5.

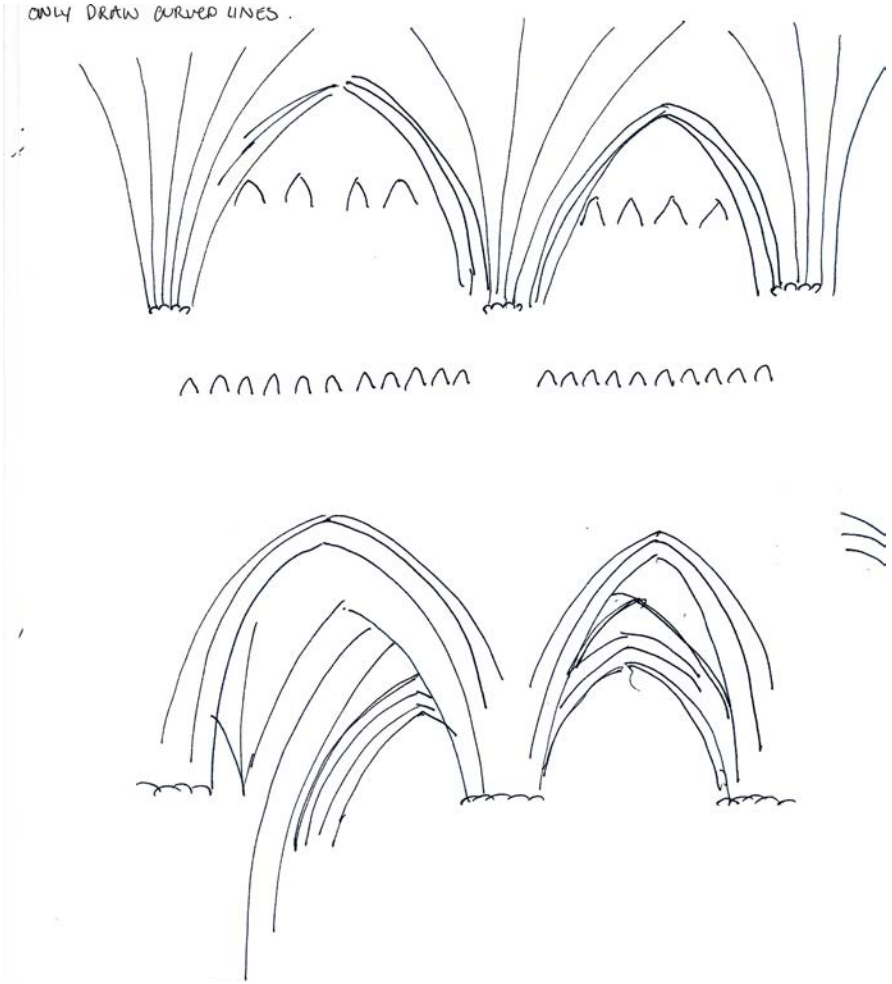


Figure 5: Highlighting only the curved lines of St Mary's Church.

The literal use of perceptual confidence was also explored whilst at St Mary's Church, with the axonometric sketch in figure 6. Similar to the example of the cube, only 2 faces are shown however the imagination allows interpretation to be of a solid three-dimensional column. Although the perceptual confidence works in this sketch, the column represented could be interpreted as different to the specific column I sketched. I therefore wanted to take the theories used here and apply them to a more iconic building, leading to explorations of Clifton Suspension Bridge.

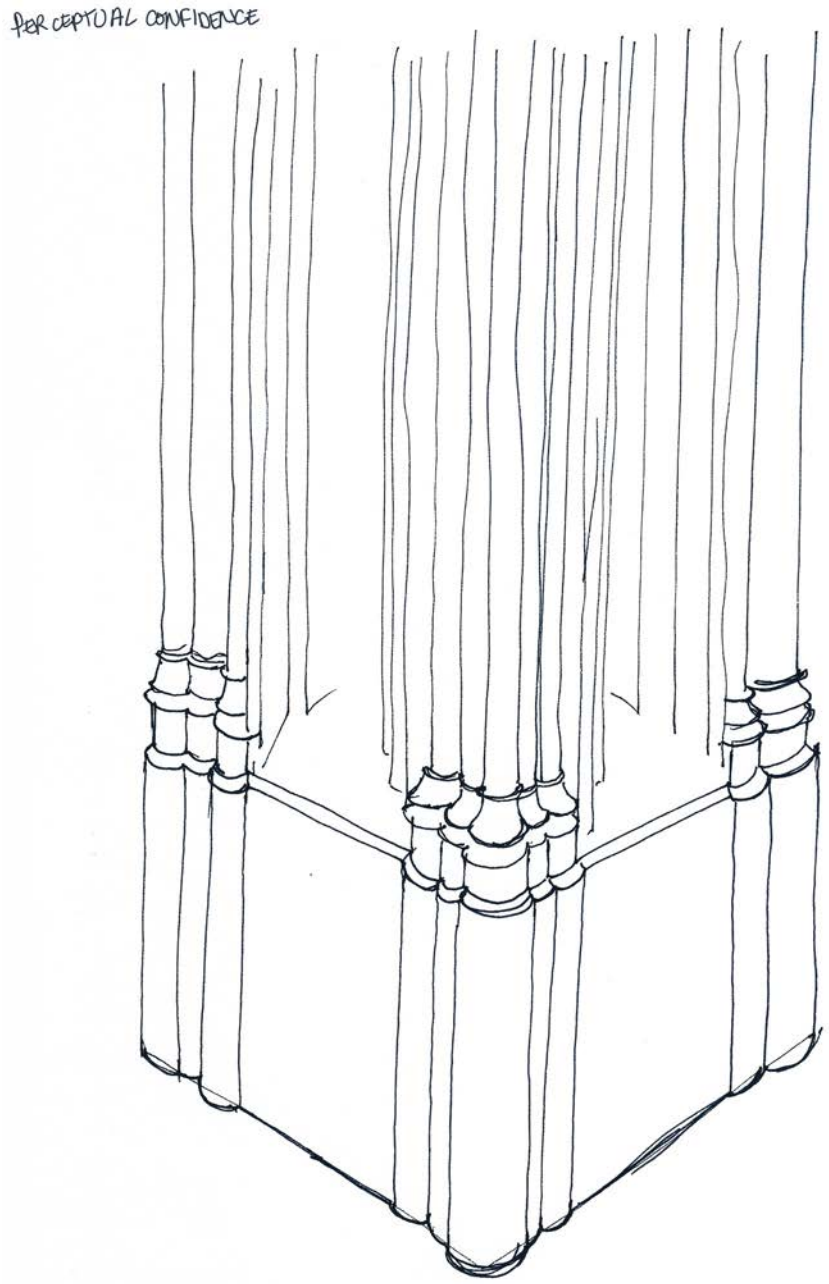


Figure 6: Sketch of column in St Mary's Church using perceptual confidence.

Interpreting The Abstraction

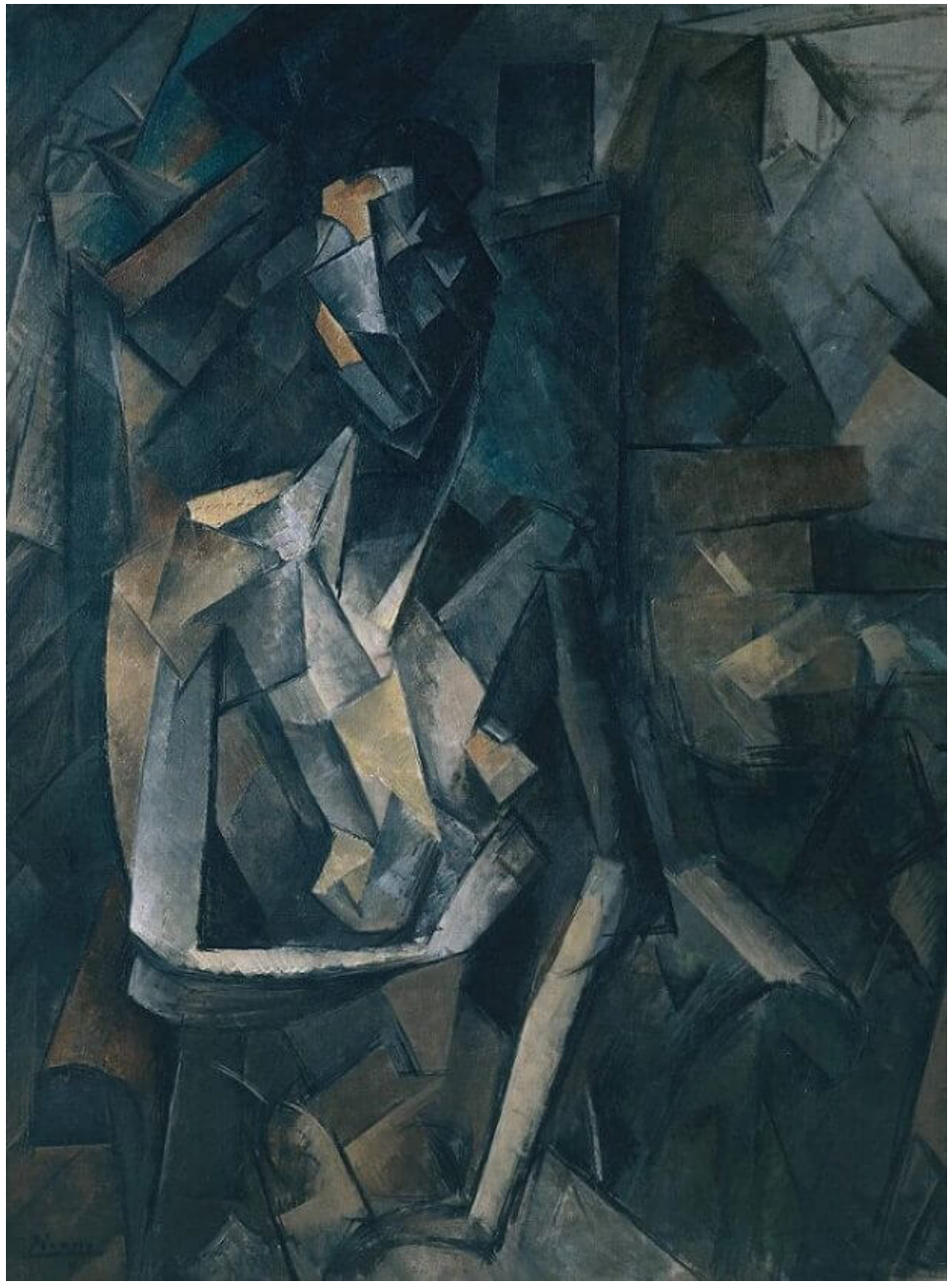


Figure 7: *Seated Nude* (Picasso, 1909-10).

I developed two driving enquiries for the drawing through discussions with peers about representation of abstract ideas in cubism and works by Gerhard Richter. How can the motion of brush movements portray the emotion I feel around the built form? With minimal literal representation of the actuality, what do other people interpret the drawing as?

My experiments were to combine the expression of my emotions in relation to the subject, whilst only revealing the subject in part. Through analyzing Picasso's *Seated Nude* (1909-10), figure 7, I discovered through few recognizable features and a certain colour palette, the viewer can use their imagination to form the whole figure in their mind with a sense of what the emotion of the painting is. In Richter's painting, *Milan: Cathedral (1964),* figure 8, the motion of the paint obscures the subject of the painting but the viewer can still interpret the painting as a cathedral. This painting technique instills a sense of horror relating to the gothic architecture of the cathedral, a powerful manipulation of emotion that I seeked to recreate through my painting.

Figure 8: *Milan: Cathedral* (Richter, 1964).

Interpreting The Abstraction

Initial sketches of a pier from Clifton Suspension Bridge (figure 9), tried to emphasise the scale of the pier through perspective. I explored adding colour in specific strokes to portray my emotions (figure 10), warm colours portraying a sense of security and happiness and the cooler colours fear and discomfort, however lighter shades of greens suggest tranquility rather than fear.

Figure 9: sketch of the pier from a perspective that tries to emphasise the scale of the pier.

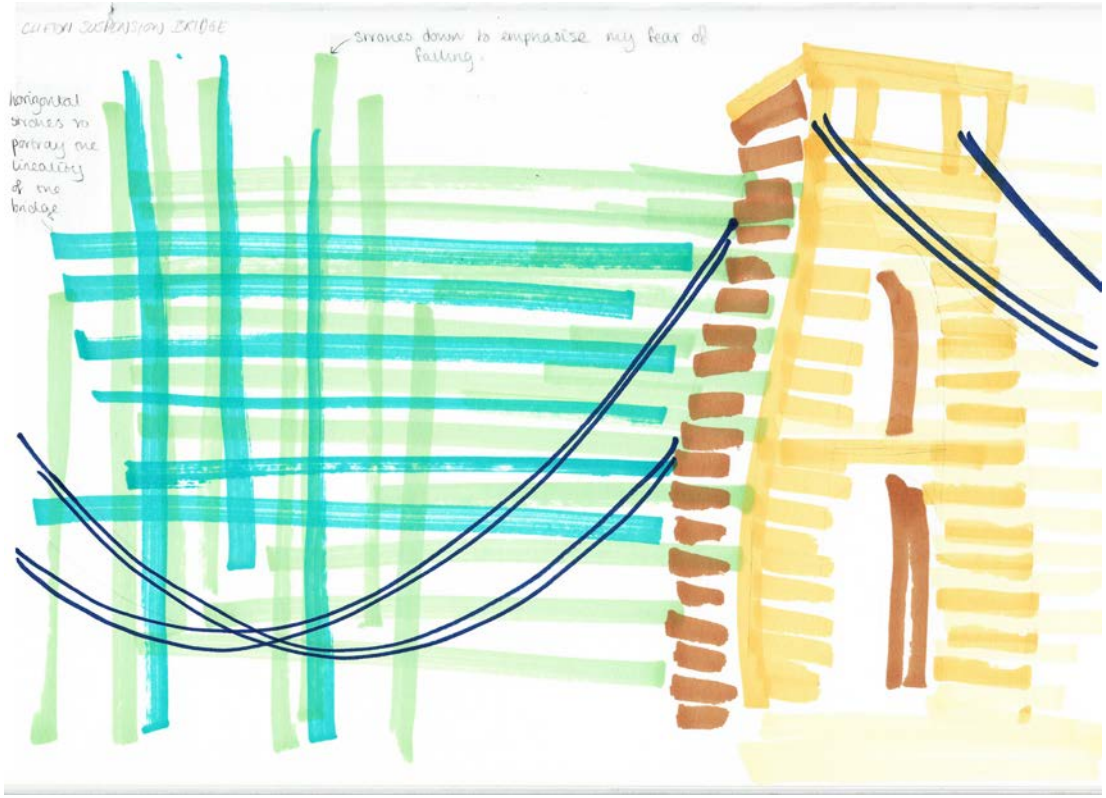


Figure 10: using marker pens to draw the pier and suspension cables.

I translated these sketches into acrylic paintings, enabling the brushstrokes to be more liberal and more variety in colours. Figures 11 and 12 on the following page explore bold brushstrokes to convey emotion but they also very literally portray the pier of Clifton Suspension Bridge not leaving any interpretation to the viewer.

I found using a brush limited my painting, being too particular with the way paint was applied to the page. A successful test in further abstracting the depiction of the pier was to experiment with scraping paint down the page, similar to the technique of Gerhard Richter, shown in figures 13-15.

Interpreting The Abstraction

Top Left; Figure 11: Using a paintbrush to apply colours and features to the drawing.

Top Right; Figure 12: Dry brush painting trying to be more liberal with the paint.

Bottom Left; Figure 13: First test scraping the paint instead of using a brush.

Bottom Right; Figure 14: Corrugated card as the scraper created different patterns in the scrapes.

Interpreting The Abstraction

Figure 15 shows the experimentation of creating a pure abstraction, this was unsuccessful because of no recognizable features present in the drawing, the painting was not interpreted as a bridge.

The following experiments, in figures 16-19 changed the projection of the subject from perspective to orthogonal, this adaption allowed for the bold scrapes of paint to portray the subject better whilst the colours still related to the emotions I was feeling. Adapting aspect ratio of the painting changed the emphasis of the emotions. I found the panoramic ratio in figure 18 to emphasis the literal span of the suspension bridge, whilst the square ratio allowed the paint motion to better portray the literal height of the bridge, and in turn, my fear of falling.

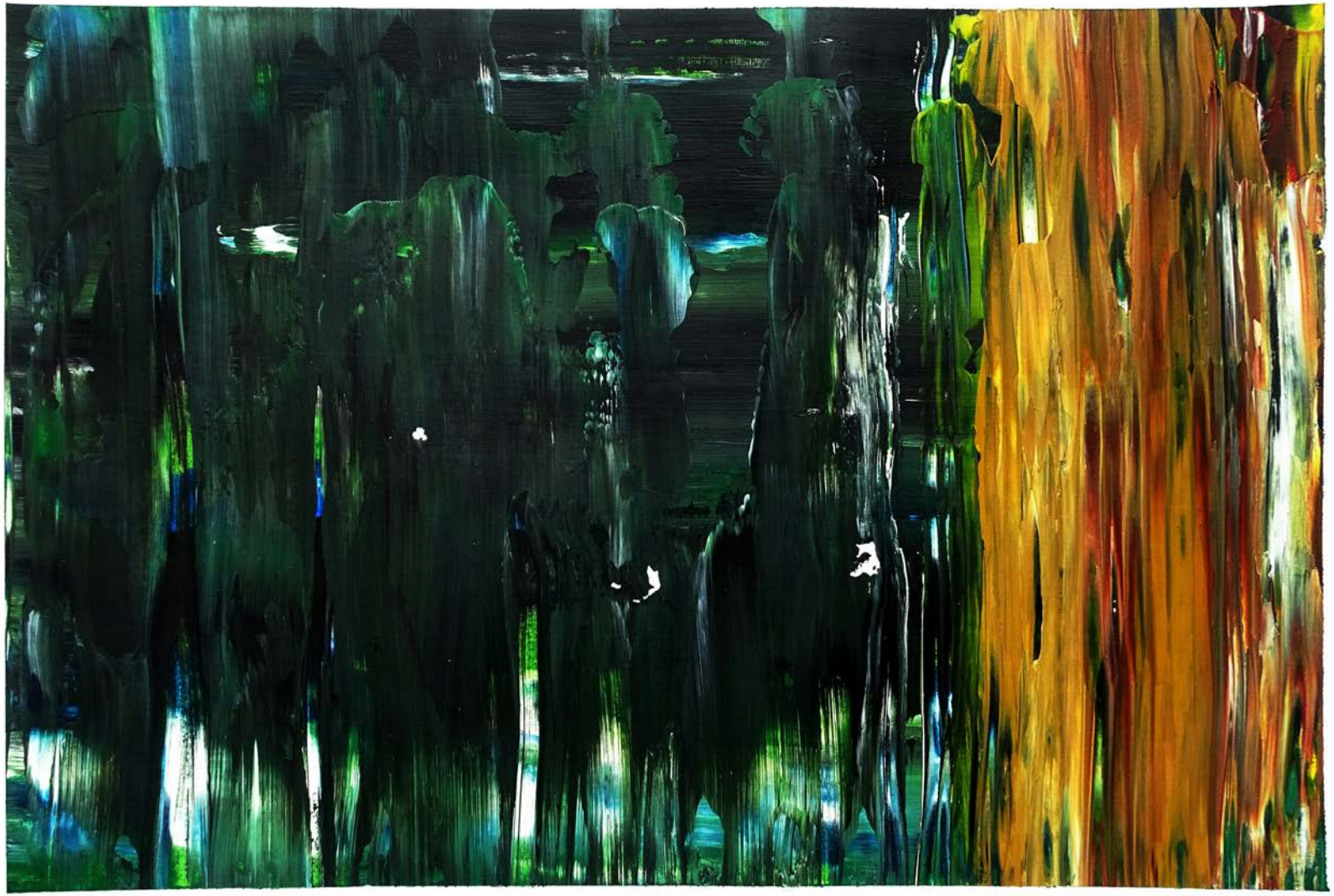


Figure 15: Abstract painting of a pier of Clifton Suspension Bridge.

Interpreting The Abstraction

Top Left; Figure 16: Orthographic projection allowed for a clearer understanding of the subject.

Bottom Left; Figure 17: Panoramic aspect ratio, with a scrape of paint to emphasise the suspension cables of the bridge.

Top Right; Figure 18: Square ratio, only darker colours scraped down from the deck - portraying fear of falling from the bridge.

Bottom Right; Figure 19: Altering the combination and order that colour is applied to the page.

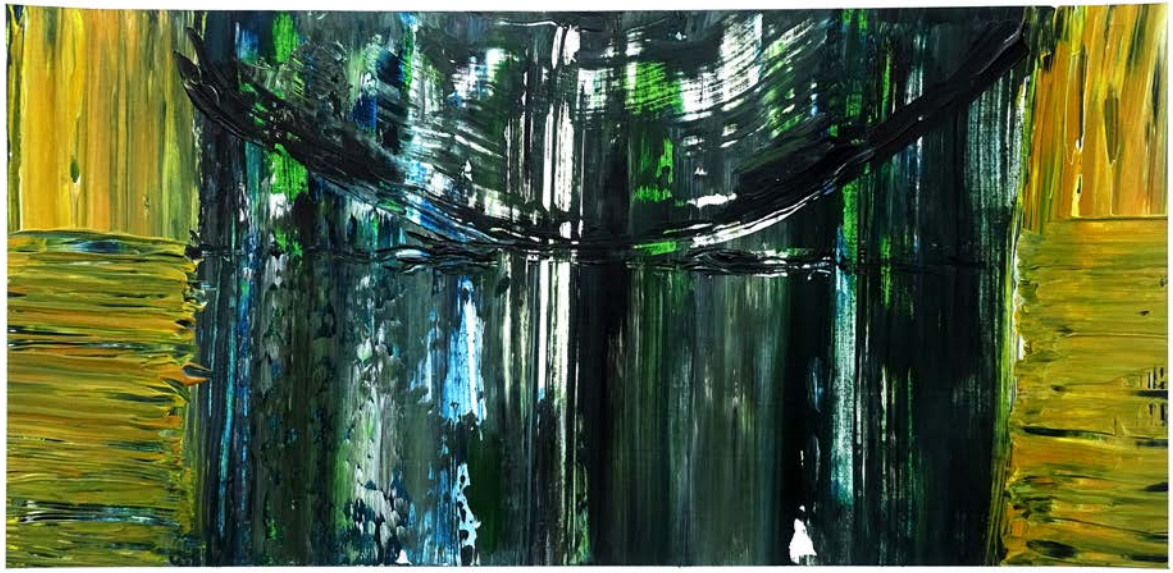


Figure 20: Test on canvas, scraping paint with a plastic paint guard. The result was very smooth and looked more like two skyscrapers rather than Clifton Suspension Bridge.

I also experimented on canvas (Figure 20), as the amount of paint on the paper was causing a wrinkling to occur. The final canvas shown in figure 21 best encapsulated my experiences of the landmark through the portrayal of emotions when crossing the bridge. Its indeterminate qualities force the viewer into interpreting the abstraction, asking the question, “what do you see?”

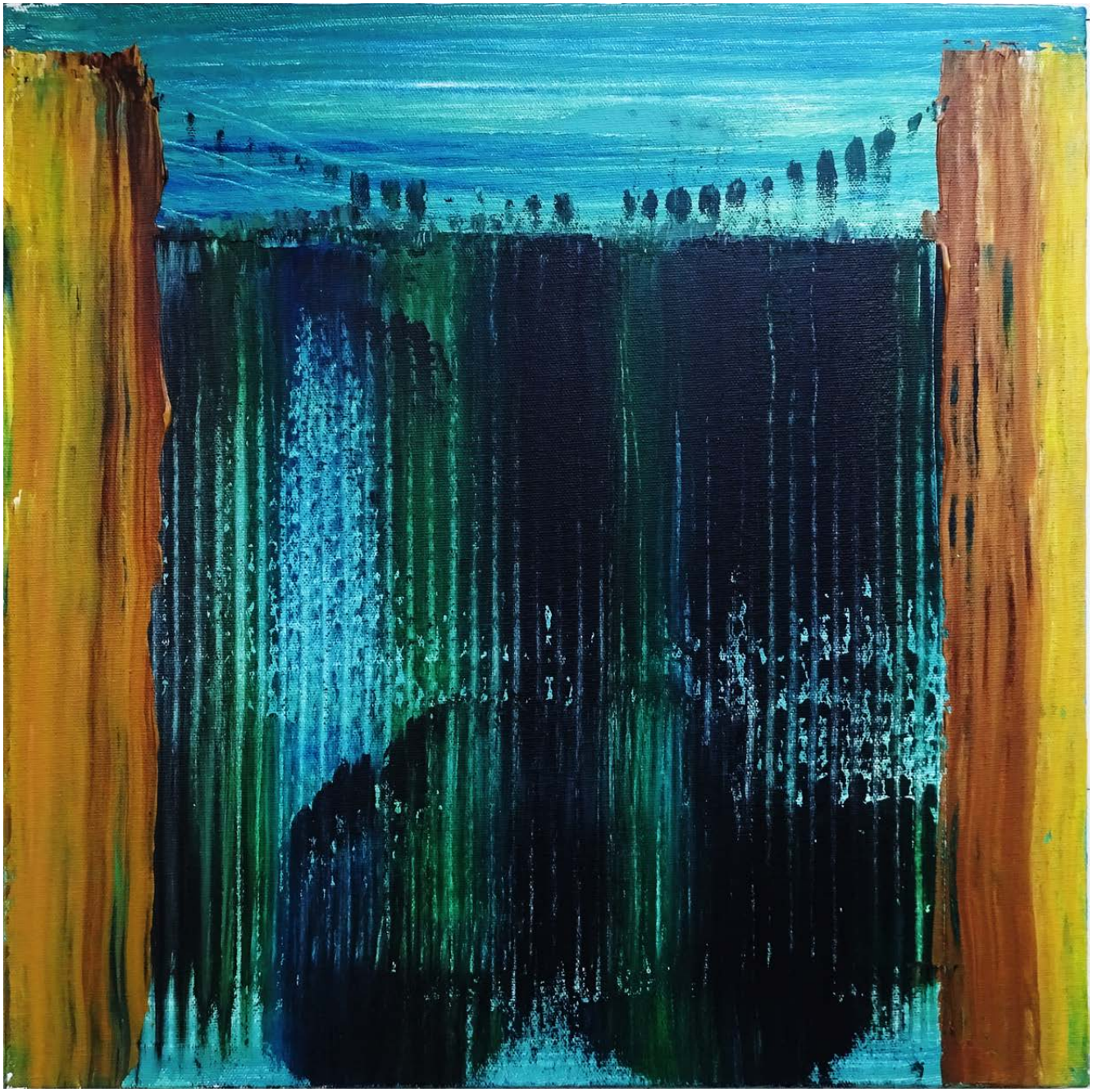


Figure 21: Final acrylic painting on canvas for the exhibition. Canvas size 40x40cm.

The rationalization of the model's representation, starts at the Fidel's lecture *Curating Representation* (Meraz, 2019), and the exploration of the model being a narrative. I wanted to explore the approach of abstracting a factual issue to create a narrative that makes the models audience come to a realization. At this starting point, I was also interested in tensegrity structures. Introduced to us through Merat's lecture *Form Finding* (Barakat, 2019), tensegrity structures are in tension and compression at the same time, the whole structure can be compromised by removing one element. My initial test model of the 6-strut tensegrity structure was popular in the workshop session, with my peers wanting to pick up and play with the structure, testing it's fragility.

The Future of Cities (2016), is a documentary film that hypothesises that when a city addresses the needs of the people and innovates to solve problems it becomes a well-functioning city. This documentary suggests that the city is a connected entity which needs to listen to the people to develop and be heatlthy (Boyson, 2016). The idea of the city being a connected entity with a sense of fragility seemed to be well represented by my initial experiment with a tensegrity model (figure 22), Further exploring this theory would create avenues for the model experimentation to progress down.

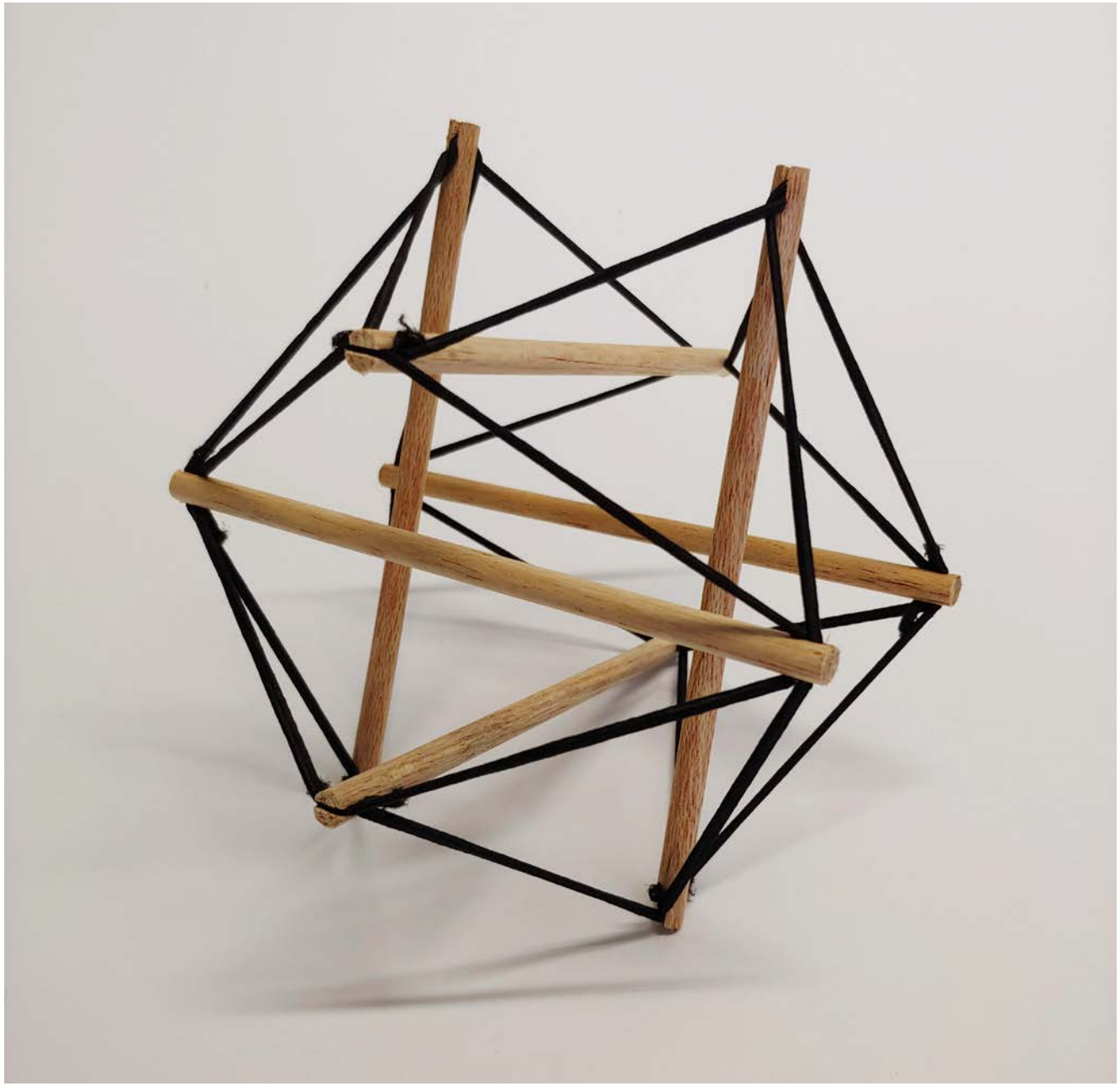


Figure 22: Initial 6-Strut tensegrity model, inspired by the invention of Frei Otto (Barakat, 2019).

In *Emergence of Architecture*, Weinstock (2010) explores the ideas of nature being a complex system of processes that has evolved over time. Portrayed in figure 23, genetic evolution is limited vertically thus each generation develops slowly, in contrast, cultural development in human society shares information horizontally as well as vertically between generations, making development a lot more rapid. Biological evolution adapted the living species to their environment whereas human culture has adapted the environment to our needs (Weinstock, 2010).

Furthermore, both biological and cultural systems develop through the flow of information and energy, this flow is subject to perturbations with amplifications of energy flow causing the system to change, reorganise or collapse (Weinstock, 2010).

As the system reorganises it learns and gains complexity, in turn creating a higher energy flow which is more susceptible to collapse or change. Wienstock (2010) defines a critical threshold as when the effect of something small is disproportionately large, relating this to global ecological and climatic systems that are at a critical threshold, such as arctic ice melting.

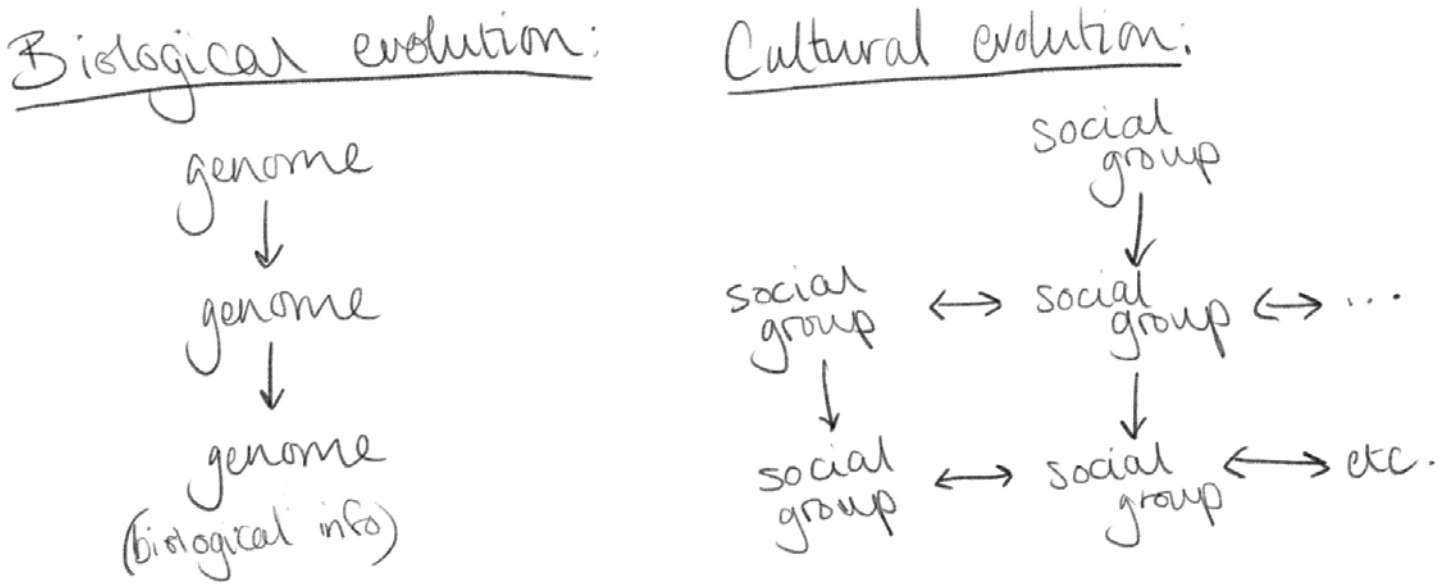


Figure 23: Diagram of the contrast beween biological and cultural evolution.

This research explores the evolution of a city as part of a global system and how such evolution has caused us to have a tremendous impact on the environment. This provided the confidence to pursue the narrative of change happening within a system because of the environment. In particular, how the critical threshold of the arctic sea ice melting will cause disruptive reorganization, maybe even collapse of the individual city system. The tests and ideas explored in figure 24-26 are inspired by the work of Olafur Eliasson in *Ice Watch*, 2014 (figure 27) where viewers of the icebergs have an ominous sense of what our actions are doing to the global ecological system. As these ideas have already been explored by other artists, I chose to contextualise the model, looking at problems affecting Bristol, and change that will have to happen to the system here to cope.

Figure 24: Ice Watch, Place du Panthéon, Paris (Eliasson, 2015).

Figure 25: Cupcake-size ice cube, with coloured ink to see the process of the ice melting.

Figure 26: Tray of ice melting at room temperature, card box to represent a structure on top of ice.

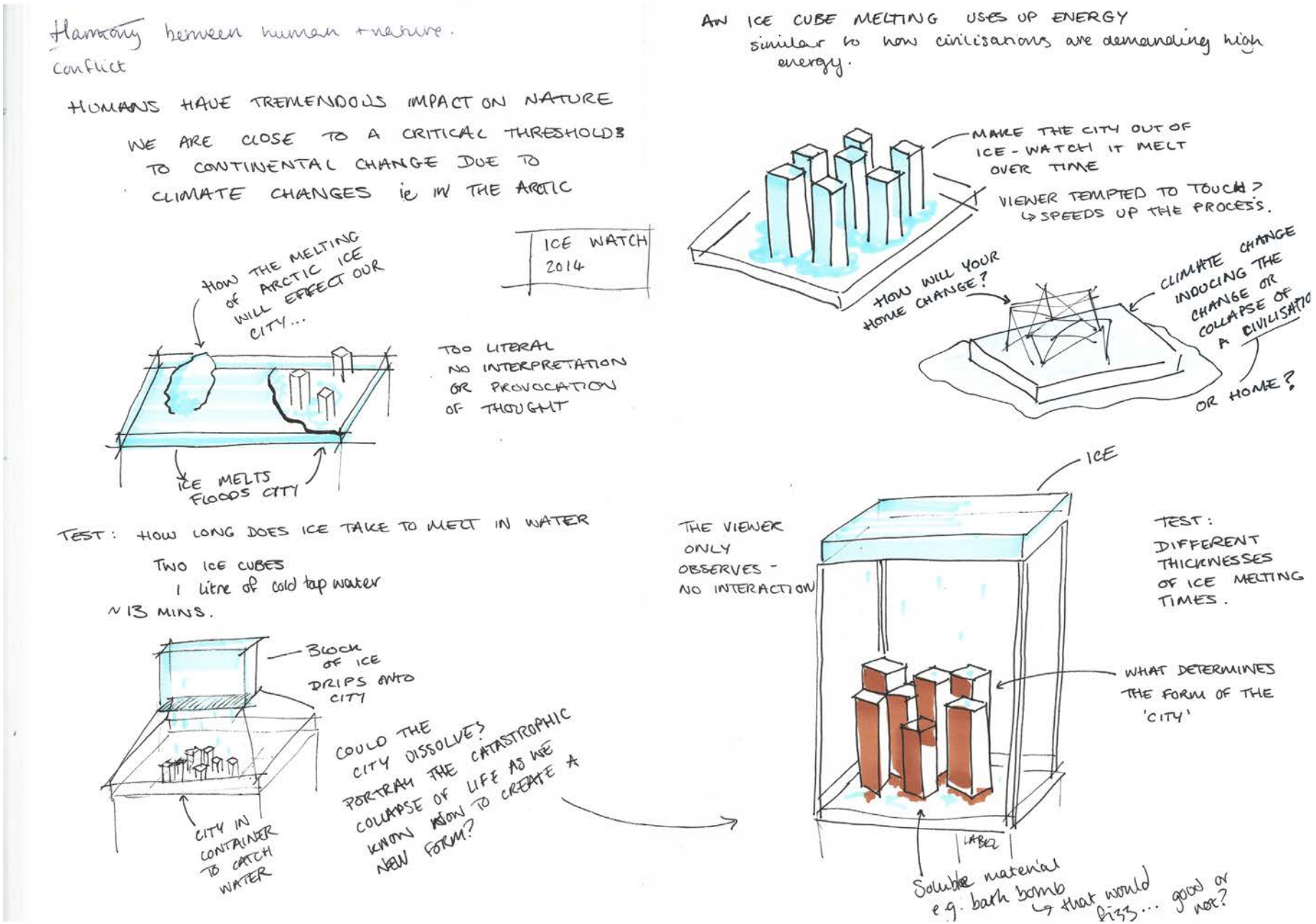


Figure 27: Sketch ideas for an interactive model made of ice.

To understand how change occurs in a system of a city, the resilience of such city has to be analysed. Walker *et al.* (2004) define resilience of a system as, the capability to absorb disturbance and reorganise to keep relatively the same form and function. As identified in this article, and as we know from the general sharing of scientific knowledge, the resilience of a system at a particular scale depends on influences of states and dynamics of scales above and below the system, this is shown in global change triggering local surprises or regime shifts (Walker *et al.*, 2004). This concretised local change in a system due to global environmental factors as the narrative for my model.

Walker *et al.* (2004) also argue that complex adaptive systems, which resilient cities would be, have a self-organization characteristic without intent. This means that the individual actions within a system may be intentional or not, but it is possible for actors to manage cross scale interactions to generate or avoid loss of resilience at the largest of catastrophic scales (Walker *et al.*, 2004). The idea of communities working together to build resilience and adaptability is fortified by the findings of Pizzo (2014). These theories clarified my idea for the realisation of the users, that they need to work together to adapt the system in order to overcome problems, in this case, environmental issues. Applying the collapsible properties of the tensegrity structure demonstrated in figure 28, to the idea of an adaptable system that responds to individual choices were the next steps in refining my experimental model.

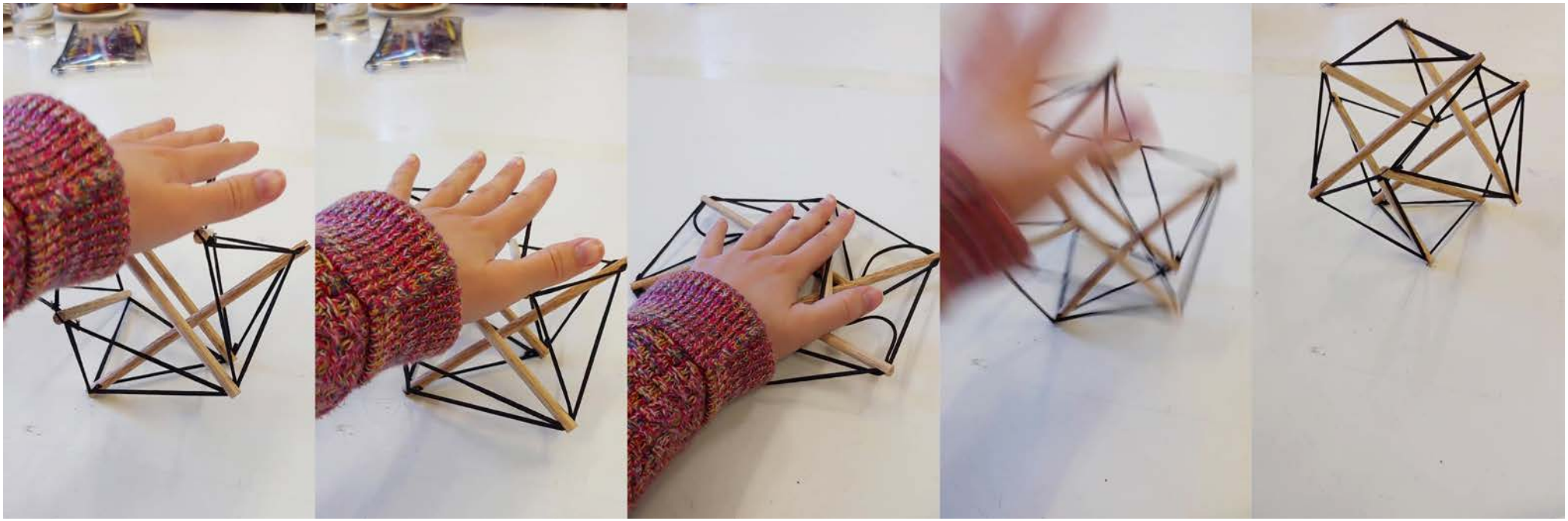


Figure 28: A 6-strut tensegrity model collapsing and bouncing back to it's original form.

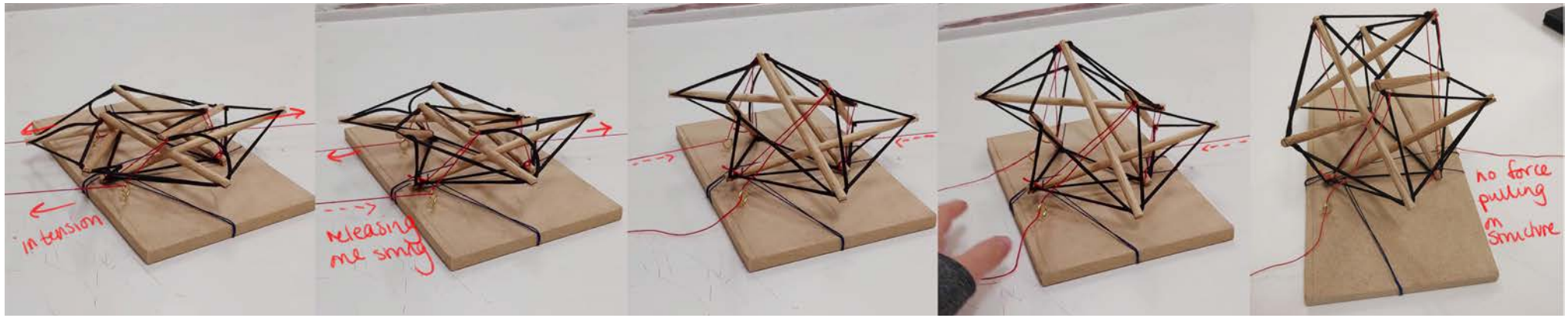


Figure 29: A 6-strut tensegrity model as part of an adaptive system with thread adjusting the form of the structure.

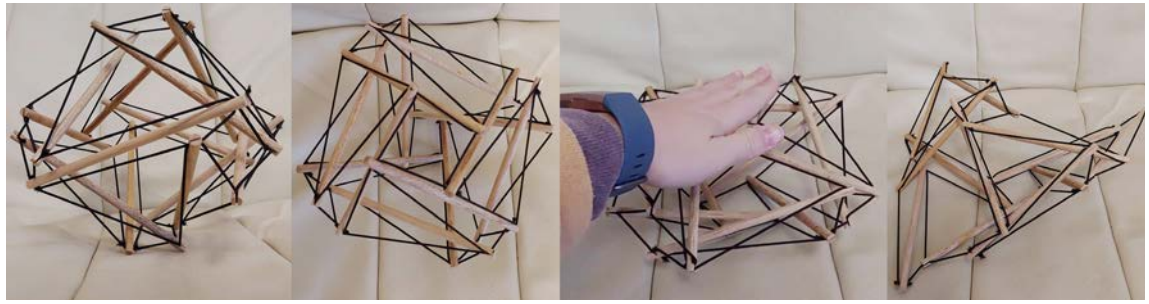


Figure 30: 16-strut tensegrity model, unable to hold it's form whilst under pressure.

Figure 31: Alternative 6-strut tensegrity, bounces back to original form but does not vary much in size when collapsed.

I tested different tensegrity models and their collapsibility whilst still managing to portray a complex system, this experimentation is shown in figures 29-32. Sharifi (2019) discusses the opportunities and constraints of a monocentric system compared with a polycentric system in a city – with the polycentric system offering better opportunities but being more complicated to implement within a city. An overview of this theory helped me to develop the standard six-strut tensegrity model into a more complex polycentric structure that is still able to collapse and rebuild itself. Experimentations into the form and development towards the desired polycentric tensegrity led to the final tensegrity form pictured in figure 33.

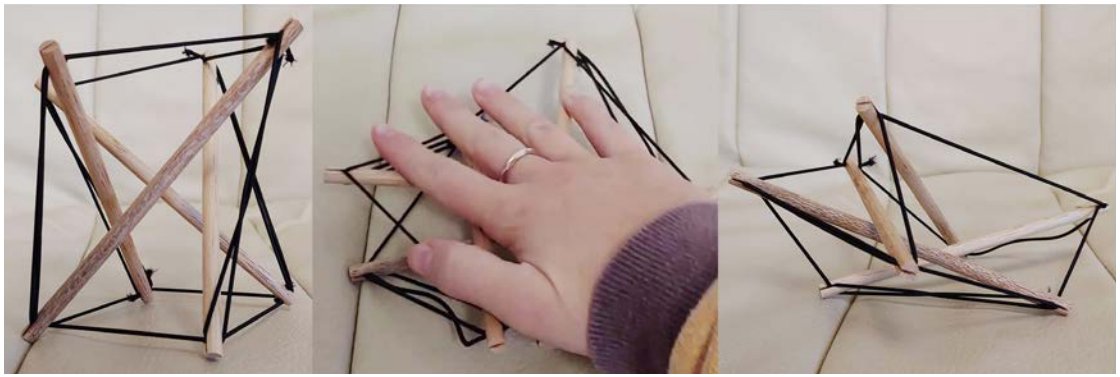
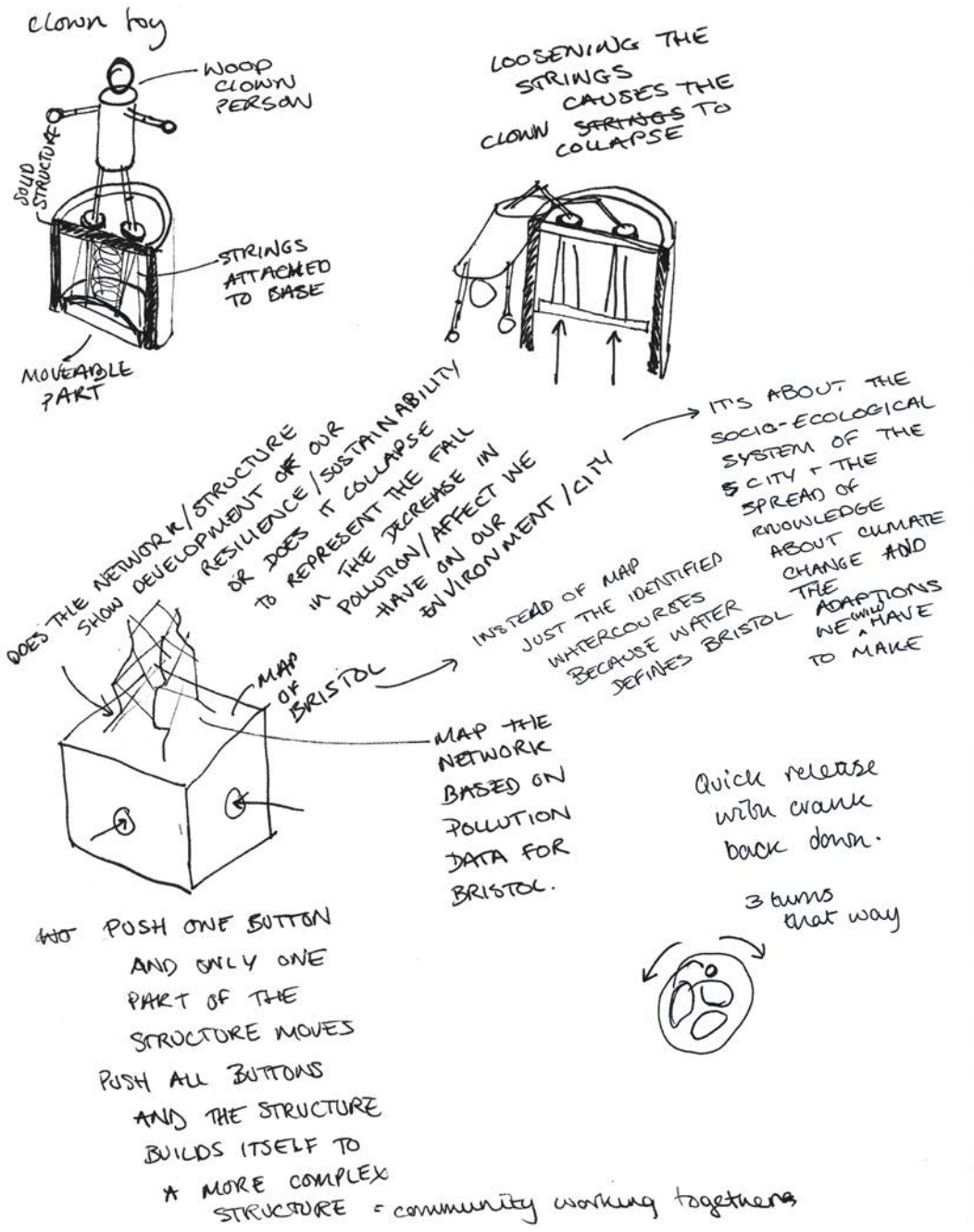


Figure 32: 4-strut tensegrity doesn't not collapse and re-take the original form.

Above; Figure 33: Final form of the collapsible polycentric tensegrity model.



Right; Figure 34: Extract of development notes for the model mechanism.

Left; Figure 35: Two people lifting the weights, testing the development of the structure.

Right; Figure 36: Situational statements that were attached to each of the knobs on the model.

PULL THE KNOB IF... You choose to grow your own vegetables or plant a pollinator garden.	**PULL THE KNOB IF...** You choose to refuse, reduce and recycle plastic usage.
PULL THE KNOB IF... You choose ecological methods of transport; cycling/public transport.	**PULL THE KNOB IF...** You choose to live closer to work to have shorter commutes.

The sketches shown in figure 34, explain the development of the mechanism behind the interactive element. This started as the idea of a thumb puppet but on a larger scale, and morphed into the representation of the weight of the problems associated with climate change in Bristol as physical weights that stop the complex system from developing. When an individual makes a choice to action change in their behavior to better the environment and therefore the system of the city, they lift the weight of the problem off the system and cause the structure to adapt.

To incorporate the idea of communities working together to optimise the development of the system, I chose to have 4 weights holding down the system, each relating to different environmental issues for Bristol. The model now needs atleast 2 people to lift the weights to create the optimum form of the tensegrity structure (figure 35). I created situational experiments to highlight user interaction further, each statement relates to the 4 environmental issues (figure 36).

My final model (figures 37-44) abstracts the theories discussed in this Journal, for users to interact with and come to the realization that individuals need to work together to create positive change and develop the community and city as a system, in order to positively impact the environment that the system is grounded within.

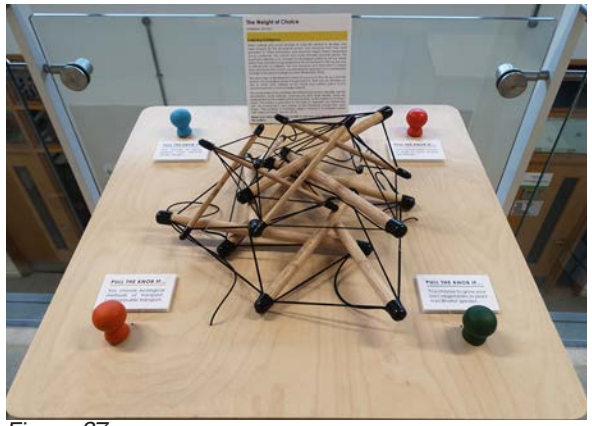
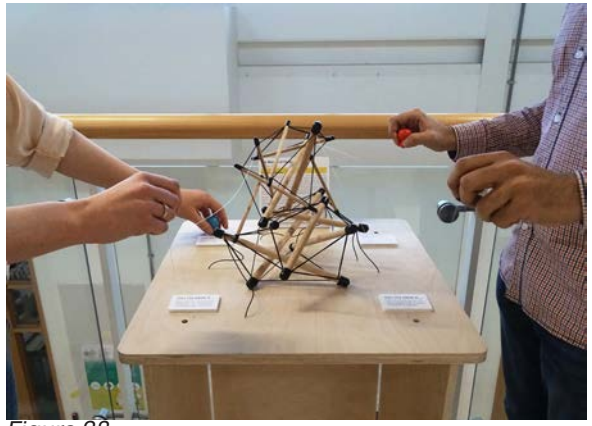


Figure 37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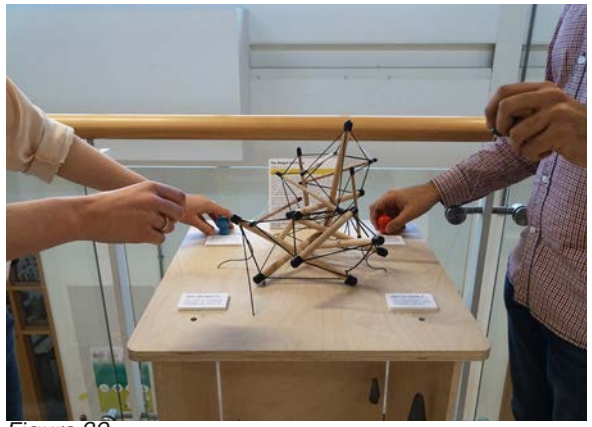


Figure 39

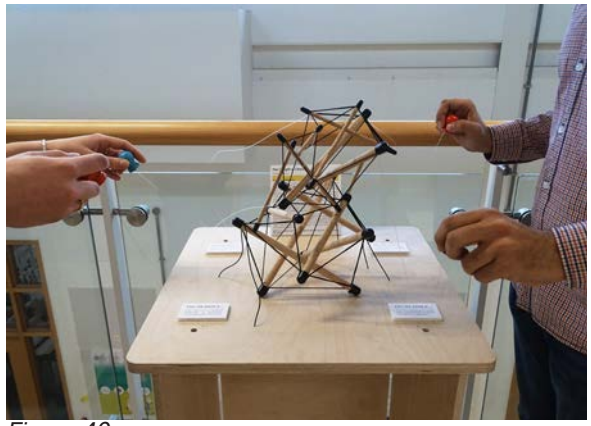
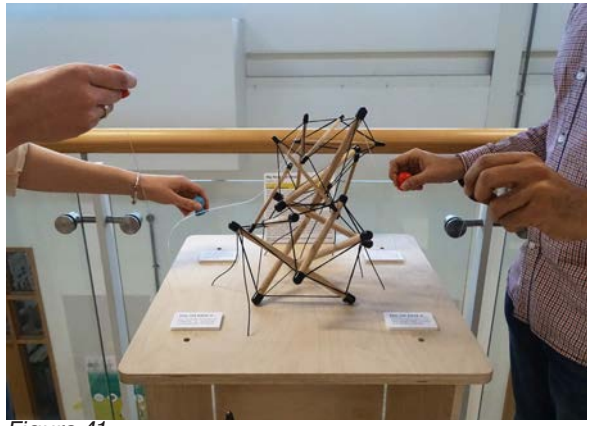


Figure 40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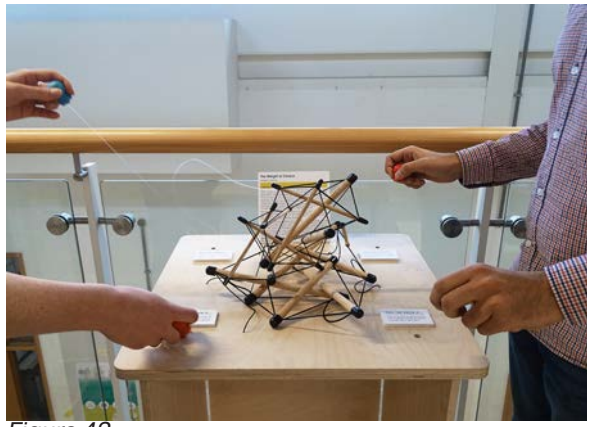


Figure 42

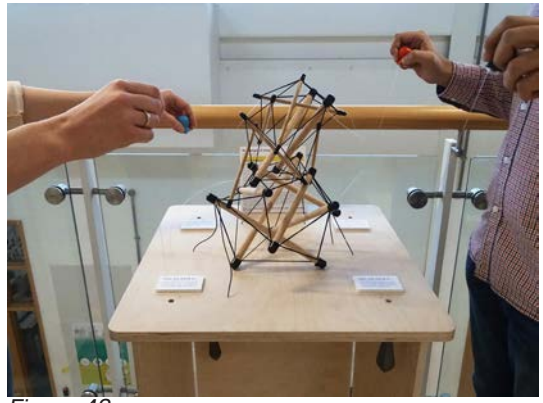
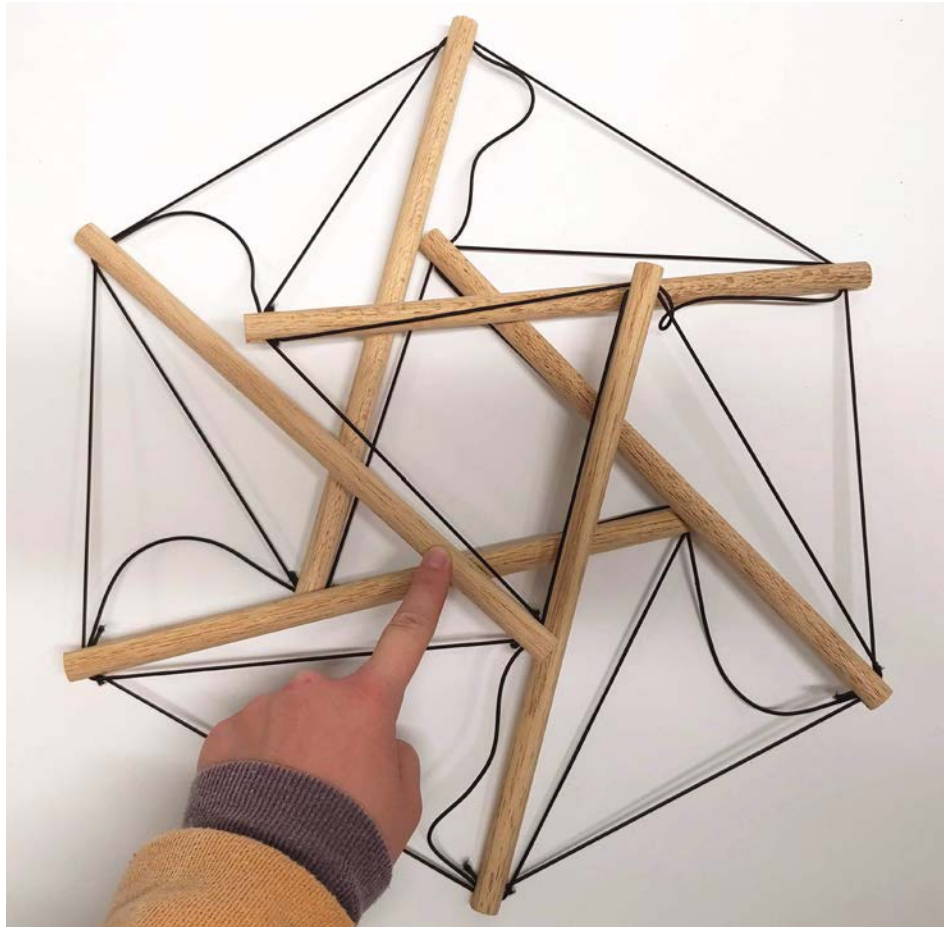


Figure 43

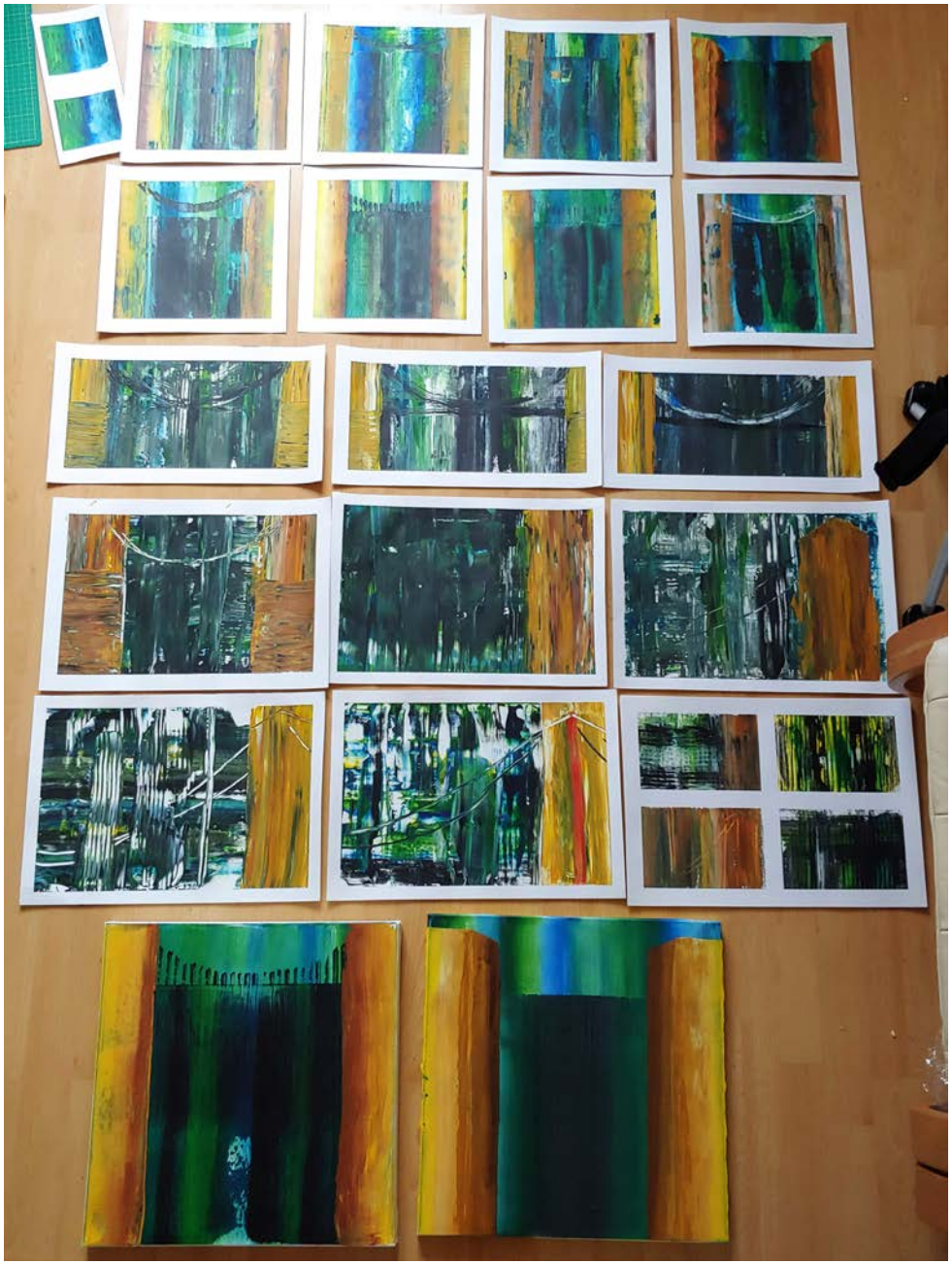

Figure 44

Conclusion

Through researching architectural theories, I abstracted ideas and experimented with representing the ideas through drawing and modelling. The drawing element managed to combine a number of representational techniques into one architectural drawing. Whilst the model took an understanding of a relatively new theory within architecture and immersed the audience in the ideas through an interactive exhibition piece. Documenting my experimentations and research throughout the semester in this Journal has allowed me to build a foundation for new ways of representing architectural theories in future projects.



Flattened 6-Strut tensegrity model, creating a geometric pattern.



Experimentation examples for the drawn element.

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