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Interference : Interwoven

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INTERFERENCE : INTERWOVEN

by

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Under the Direction of Jessica Jones, MFA

ABSTRACT

Weaving, a symbol of knowledge and technology, is so prevalent throughout time that it simultaneously predates recorded history and propels us into our future – a future that is in danger due to environmental threats. The work in *Interference* : *Interwoven* reflects upon human attempts to control nature and contrasts these efforts against nature's inherent unruliness and chaos. Through geometric and tumultuous woven structures, I examine the idea that humanity's constant drive toward greater knowledge and better technology relies upon the flawed belief that we have the right to meddle in nature's processes. The work in *Interference : Interwoven* examines the implications of our intrusive actions by exposing the tensions between humans and nature, order and chaos.

INDEX WORDS: Weaving, Technology, Control, Patterns, Temporality, Chaos

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DEDICATION

This paper is dedicated to Jason Rafferty – I am incredibly lucky to have your constant support, inspiration, and encouragement, especially since we were both on this path together. Your input on my thesis work and paper have been invaluable, and I could not have managed this past year, or the entirety of graduate school, without you. Thank you for being a compassionate partner and for having a laugh with me every day. I could not have put this show together without you. Thank you so very much.

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1 INTRODUCTION

Weaving in its various forms is present in every culture. It has shaped our society in numerous ways and is so prevalent throughout our past that it predates written record. Unlike other textile processes, "there is a precise, ancient and well-developed vocabulary for weaving [because it] is older than history" (Postrel 271). The English word *order* comes from the Latin: *ordior*, which happens to be the ancient word used for describing the specific process of *setting* – or organizing – the warp threads on a loom. *Ordior* is also the root word for the French *ordinateur*, which translates to *computer* (Postrel 5).

Interlaced (woven) objects represent humanity's past and future. Weaving was one of the first ways we made survival tools. In most civilizations, interlacing preceded even ceramics (Larsen 17). It connects us to our past; and although it is a prehistoric technique, it is still relevant to us today in the fabrics that build our lifestyles, such as domestic textiles and clothing. In new technologies, it is used to build flexible and strong devices, such as life-saving medical implants and fabric digital displays (e-textiles). With the right material, textiles can conduct electricity; and engineers working with military and aeronautics/space organizations are developing fabric sensors from this technology that can "respond to touch, sound and heat, and [to] 'smell' chemical vapours" (Colchester 38-54). Clearly, weaving is an important craft form that will always play a significant role in human culture. By "craft," I mean the term many historians have used to describe the artistic techniques that are more relevant to the applied arts – aesthetically designed objects that are practical in use.

Weaving is the interlacing of threads or other strand-like materials. Most woven textiles are made up of two groups of strands, the warp and weft. The warp is the stabilized group of fibers that are often parallel to each other and acts as a base on which to weave. The weft is the

material that is woven perpendicularly through the warp strands. The interlacing of these fibers creates a woven structure that becomes a textile surface. For example, we interlace threads to create cloth, or rattan reeds –a wild-harvested climbing palm grown in Southeast Asia – to make baskets (“Rattan” iii).

These textiles can be made completely by hand, using “off-loom” methods, such as basket weaving. Or they can be made using various types of looms as tools to help separate and organize the strands. On the loom, threads are laced through *heddles* that are divided into groups and placed on *shafts*. The shafts are attached to *treadles*, which the weaver controls through various mechanisms depending on the loom. In the case of the 8-shaft loom that I work with, I control these movements with foot pedals on the floor. As I depress a pedal, the harnesses connecting the treadle to the allotted shafts lifts the heddles and the threads assigned to them. Once the directed portion of warp threads are lifted, the artist passes the weft thread through the opening, resulting in the interlacing that forms the weaving. (Figure 1.1)

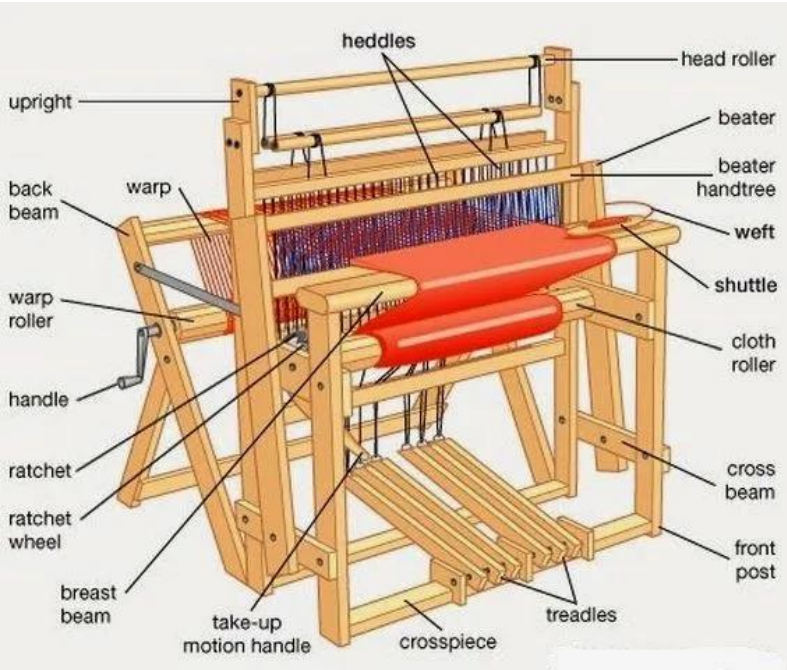

Figure 1.1: Diagram of the basic construction of a floor loom.

When weaving off-loom, the artist physically manipulates the material into place. Although various tools can be used to support the process, there is not one specific tool that is required to weave off-loom. Basketry is the main form of off-loom weaving. Typically, when creating forms in basket-weaving, a base is the first portion to be secured. The base acts like a foundational support for the rest of the structure. There are different methods, but to create a basic rattan basket, for example, one would secure two groups of the rattan strands in an 'X' formation. Each of these warp reeds would be separated and woven through with the active *weaver*, a smaller reed that makes up the weft, which weaves around the warp and shapes the basket.

Weaving is important to my practice because I am interested in its mathematical components and repetitive process. I like the challenge of creating patterns and executing them through weaving because the feeling is comparable to putting together a jigsaw puzzle. It takes concentration and attention to detail, and when the pieces fit together it is satisfying to reveal the image. The constant repetition of movements is relaxing as well – I find that the back and forth of the weft yarn and the choreography of the foot pedals is meditative.

I also practice self-care by finding time to be out in nature, whether that is by hiking a trail, walking at a local park, or traveling great distances to see impressive natural landscapes. I am always awed by nature's beauty and revel in the strange curiosities one can discover if looking hard enough. As I become increasingly alarmed about climate change, concern for the planet overshadows my feelings of wonder: I worry about the creatures and plants that are endangered because of rising temperatures and other environmental issues, including human-imposed changes. I believe that we exploit this world like no other species has before. We extract

nature's resources and consume them with abandon. What is to say that the choices we make now will not result in further harm for the planet in our future?

Changing our habits of consumption is a difficult task, of course, because we are used to the fast-paced, technology rich society that these resources afford us. But we need to be aware of the implications of our actions. In the exhibition *Interference* : *Interwoven,* my work questions the notion of human control over nature and contrasts it against nature's inherent ungovernability. I use weavings to explore the idea that technology has instilled in humanity (in a broad generalization) a faulty belief that we have a right to meddle in nature's processes. I negotiate the underlying tensions between order and chaos through the creation of geometric and tumultuous woven structures. My work examines the implications of our intrusive actions by manipulating natural found materials into woven configurations.

2 WEAVING AS KNOWLEDGE

In my woven structures, I attempt to connect with the primal human need to learn and to innovate. From experimenting off-loom with traditional basketry techniques, to creating loom woven designs that utilize digital tools to calculate difficult one-of-a-kind configurations between the humble warp and weft, I am working with weaving as a form of knowledge and technology. Weaving is a perfect example of humanity's ingenuity and our innate desires for constant improvement and moments of beauty in our everyday lives.

The society we currently inhabit is in many ways indebted to the development of woven textiles. From agriculture and economics to science and technology, our need for textiles spawned our desire for growth in each of these fields. In *The Fabric of Civilization: How Textiles Made the World*, Virginia Postrel examines the various ways that the textile industry has shaped global societies. During the Neolithic Revolution our ancestors started to create permanent settlements as they began to grow their own food and fibers. They controlled the production of goods to satisfy their own needs, and producing cloth was a high priority. Sheep, among the first animals to be domesticated, were slowly altered to generate better quality fleece through selective breeding over thousands of years, a huge leap in agricultural sciences (Postrel 10-12). The appeal of turning those fibers into beautifully colored cloth sparked an experimental pursuit for newer and longer-lasting dyes. It took a lot of testing that likely resulted in many errors until the correct substances were found; and this kind of experimentation heavily influenced the field of chemistry (Postrel 111). The demand for beautiful cloth sparked the international trade of textiles. Fabric is so specialized and easy to transport, so it has always been a significant player in global exchange. Economies flourished through the development of prized cloth like those made of silk, wool, and linen (Postrel 148-149).

Various types of looms were created to weave these desirable fibers as the evolution of textile production grew. From simplistic forms like the backstrap loom to the more complicated Jacquard, humans have developed increasingly complex machines for weaving. The Jacquard loom itself is a piece of groundbreaking technology. Its inventor, Joseph-Marie Jacquard, was able to complicate woven patterns and produce them more efficiently by using a punch-card system, which – much like a binary system – allowed the weaver to "program" the loom in a rudimentary way, lifting certain warp threads for the desired pattern. Jacquard's design actually "inspired Charles Babbage's Analytical Engine, the digital precursor to the computer" (Postrel 76).

However, long before the Jacquard loom was invented, weavers already understood and used mathematics to create complex patterns (Postrel 77). Weaving is bound to arithmetic – a foundational part of mathematics that creates logic within numerical systems, as it deals with the relationship between numbers and their properties (prime, odd, even, etc.). To create patterns, both basic and intricate, the weaver primarily thinks about the thread count of the warp, converting it into ratios and proportions and paying attention to odd and even groupings. It is here that the weaver is actively using arithmetic to create a plan for the design. Making sure that the loom is set up with the exact number of warp threads is paramount for evenly producing repeating patterns (Postrel 79-80).

The mental labor expended to create weaving patterns is one reason why cultures develop and reuse specific patterns. Repeating these patterns allows weavers to learn and become familiar with the specific cultural designs. Weavers ultimately use the cloth as a primary tool for studying their practice, but also learn traditionally from elders or masters of this craft. Weaving patterns are passed down to new weavers in interesting ways. The rhythm inherent in weaving gave rise

to sing-song chants and melodies that are easy to remember and communicate encoded instructions for thread counts (Postrel 83). And just like in music, notation was developed for the communication of weaving patterns, which commonly is called a weaving *draft*. (Figure 2.1) The draft allows weavers to record and pass on information without needing the actual cloth as reference – it is a helpful tool for preparing the weaver to create complicated patterns as it dictates the way the warp should be set up on the loom and how the weaver should proceed in producing the fabric. Even with a draft, weavers are tasked with actively keeping time and place in the pattern. Postrel describes this mental practice as it is associated with weaving patterns that are beyond the plain weave, which is the most basic of pattern structures:

> Patterns are more taxing. Whether simple twills or elaborate brocades, they use more complex threading arrangements, often involving many different shafts of heddles. As the weaving proceeds, the pattern forces the weaver to think about what comes next and to remember what came before. Let your mind drift and you could lose the thread. The more complicated the pattern, the more essential the weaver's ongoing attention – and the greater the challenge of remembering what to do. (83)

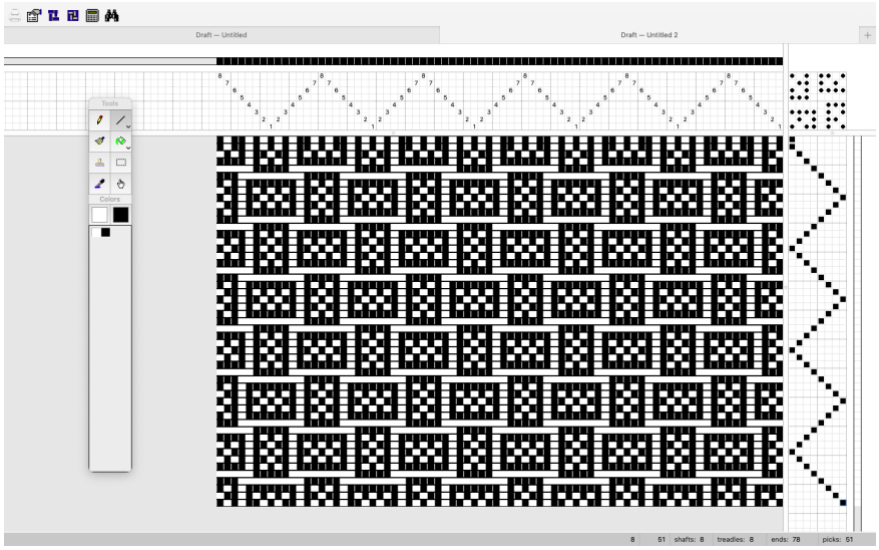

Figure 2.1: Sally C. Garner, Weaving draft using PixelLoom design program, 2022.

However, the most direct way of storing information for future generations is within the cloth itself. Experienced weavers can examine and understand the work that was done by the original weaver(s). The cloth then becomes a record that keeps the information of the weaving process as it happened in real time. The information is embedded within each crossing of the fibers and has figuratively absorbed the thoughts and decisions made by the original weaver (Plant 65-66). The cloth itself holds an intrinsic sign of intelligence.

With everything that weaving stands for – creation, pattern, mental acuity, mathematics, technological advances, and information keeping and sharing – it makes sense that Plato, in many of his discourses, used weaving as a metaphor for the "analysis of knowledge itself" (Lehmann 155). The act of weaving represents the many facets of what we categorize as "knowledge," transcendent of any particular period in civilization. Likewise, I use weaving as an artistic metaphor for knowledge to examine our state of being in this world and how we relate to each other.

Much like the weaver who learned a pattern through passed down songs or chants, humans often attain knowledge by learning from others rather than relying on firsthand experiences. Craft processes in general share this distinct parallel connection to learned knowledge, as craft "depends on a sense of continuity" that often "resembles oral tradition" (Adamson 186). In this way, craft is closely related to storytelling with its repetitive structure that recalls the feeling of knowing through remembering. The process of producing crafts through learned skills actively connects the present time to past memories and experiences (Adamson 187).

Weaving is still ingrained in craft traditions, despite the mechanical advances that ushered in the Industrial Revolution and gave rise to the global textile industry. The shift from

hand woven to machine-made never changed the fundamental form of weaving: warp and weft threads interlacing at right angles to form cloth (Albers 29-30). In this way, textiles will always speak to the type of knowledge that connects us to our past, the kind of knowledge that is passed down through generations. However, the work that I create focuses more on showcasing weaving as a first-hand type of knowledge that seeks innovation and improvement for the future through technology and experimentation.

Over the past few years, I have been learning how to weave basketry and weave on an 8-harness floor loom by studying with others in classroom settings, by reading books, and by watching tutorial videos online. This shared knowledge makes me feel connected to a broader community of weavers, especially those in the digital era. However, in certain instances I teach myself through the process of experimentation. This way of making fulfills two goals. First, I feel connected to pre-historic weavers, who had to experiment with these techniques out of necessity. Second, I am satisfying my own curious nature.

I like the feeling that results from figuring something out for myself. I am ultimately creating my own knowledge through experimenting with the material, seeing how it behaves and determining how I can create forms from various weaving techniques. My recent series of rattan basketry samplers is the outcome of this type of experimentation. During the summer of 2022, I participated in an artist's residency in Northern Georgia, taking with me various off-loom weaving supplies. I decided that I would spend my time there experimenting with the woven form. With a hand-drawn illustration of traditional oval basket base techniques for inspiration, I created several different woven rattan objects that resembled creatures: numerous spokes resembled legs and intricate wrappings produced spines. (Figure 2.2)

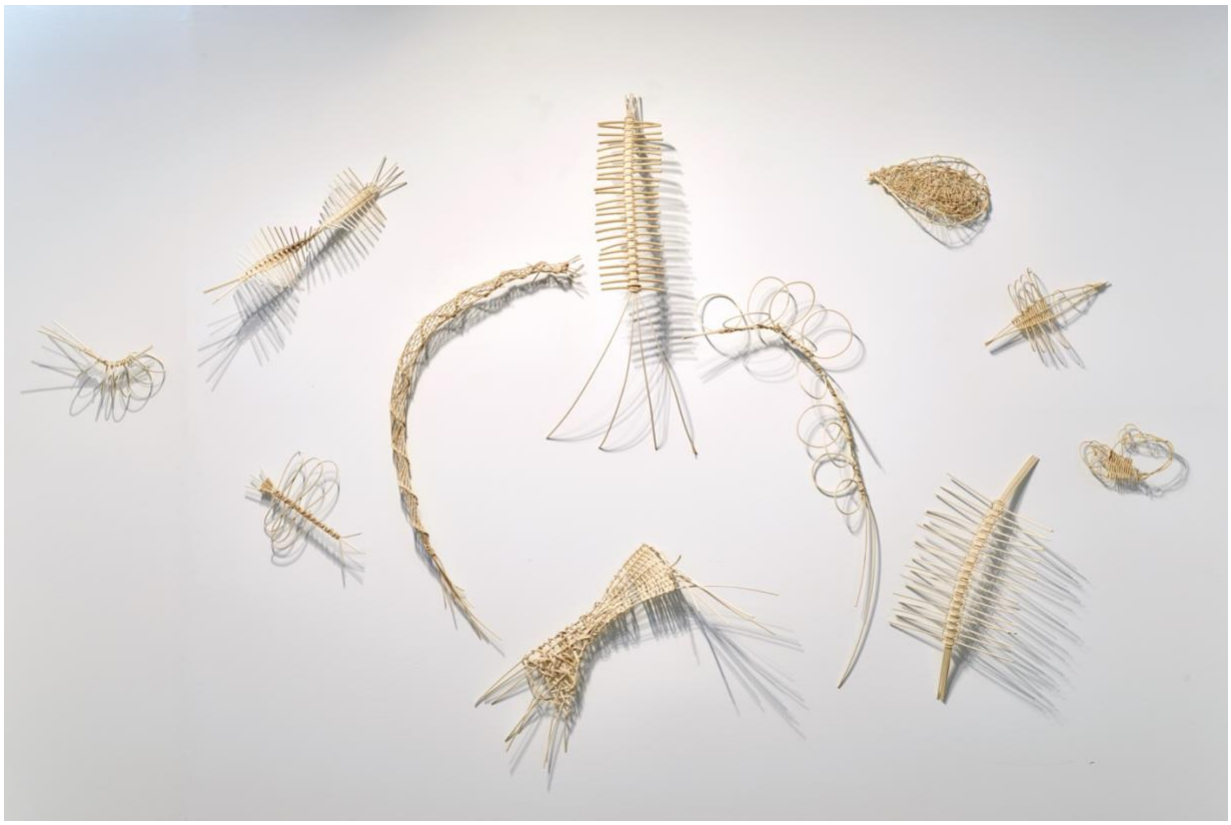

Figure 2.2: Sally C. Garner, various woven forms from an artist's residency, 2022, rattan.

The experimentation in this series of works led to a greater knowledge of materials and techniques, but also served as a conceptual metaphor for the scientific method, a process people use to attain knowledge in many other areas of human endeavor. The scientific method follows a familiar method of generating a theory and using experiments to come to conclusions on that theory. In a sense, I was approaching this work as a scientist. I developed questions (hypotheses) about my materials and techniques, I tested my questions through experimentation, and I analyzed my findings, which yielded new insights into how I could use these materials and techniques in future works. (It helps that I have a logical mentality that makes me decently good at recognizing and interpreting numerically based patterns!)

I am inspired by contemporary textile artists who explore the ideas of pattern and technology in their work. Jovencio de la Paz uses the computerized Thread Controller 2 (TC2) Jacquard loom to create weavings with incredibly detailed patterns. The crossover from ancient craft to modern technologies is a focal point of de la Paz's works. At this intersection, de la Paz chooses to "push [the] design software to the point of rupture or failure" to depict the clash between the analog and the digital. The patterns that de la Paz creates through the hacked programming results in fractured and distorted patterns; the artist deems them "frenzied" in their digital corruption. The computer-generated glitches can be seen in the artist's series of weavings titled *Didderen*. This title and the digital processes used by de la Paz in this series refer to a digital processing error in which data noise is purposefully added to degrade a file (Diver, par. 4). (Figure 2.3)

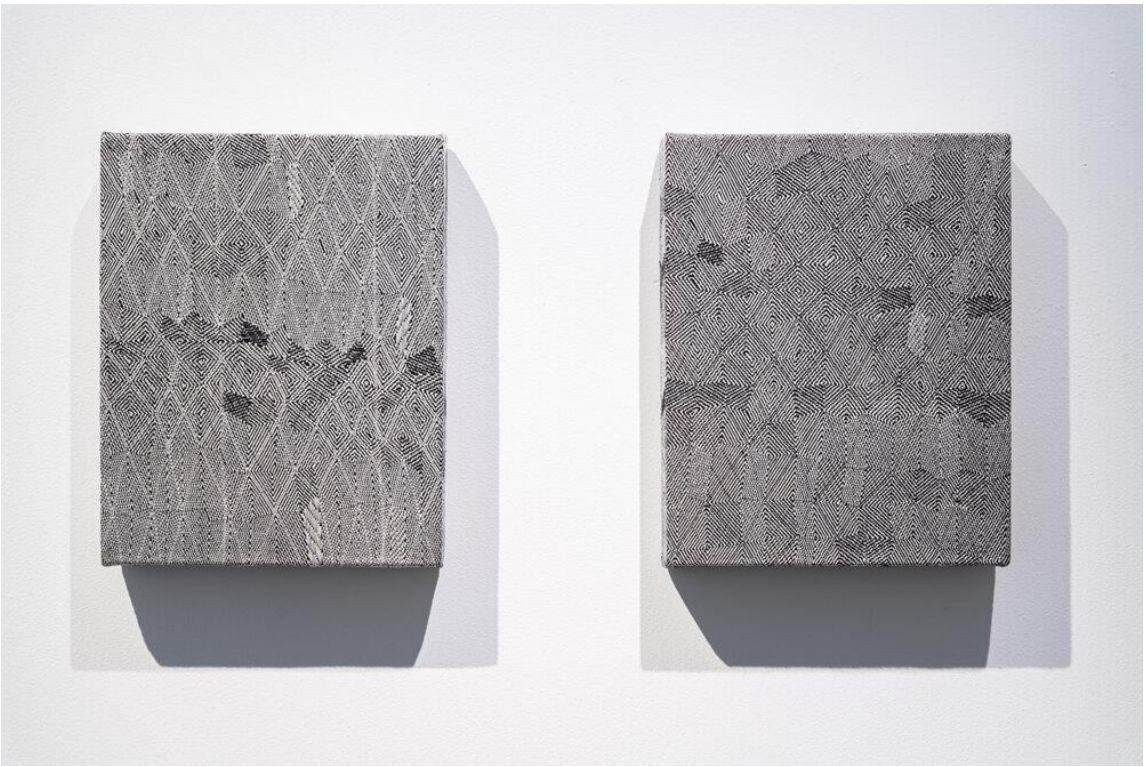

Figure 2.3 Jovencio de la Paz, Diddern 1.4 and 1.5 *(diptych), 2018, handwoven natural and synthetic fibers*

Like de la Paz, I seek to imitate technological knowledge in the loom weavings that I create, even without access to computerized looms such as the TC2. Using a computational weaving program called PixelLoom, I have designed patterns for some of my weavings to visualize various technologies. In *A Prototype for Recalling Visual Noise,* I reference several common weaving patterns that create curved parallel lines within one pattern. When combined, the curved lines and fractured diagonal "twill" patterns resemble the static from an analog television displaying distorted noise when its visual information is corrupted or inaccessible. The weaving consists of hand-dyed fibers interlaced with the shiny, black plastic tape from within a VHS cassette. (Figure 2.4) This combination of materials and static imagery references a certain type of technology that is exclusive to the era of analog television, but the effect can also represent the larger idea that technology, including digital forms, are vulnerable to failure.

The drive for better technology is fundamental to the idea of an evolving knowledge. Throughout my work, I utilize weaving as a conceptual technique to examine humanity's ingenuity. Weaving is a very controlled and meticulous process. It is a manipulation of material that produces a secondary product – a cloth or a basket – which is often created for practical use. By understanding this connection weaving has to consumption, I am able to use weaving in my work to represent the human desire for innovation, technology, and knowledge.

Figure 2.4: Sally C. Garner, A Prototype for Recalling Visual Noise, *2022, hand-dyed cotton thread, unplayable VHS tape, found metal loom reed, pine, monofilament, artist's ceramic studio bowl.*

3 PATTERNS IN NATURE

I primarily create my work in my studio, but this changed in the summer of 2022, when I began to work outside and weave with things I found in nature. Nature inspires me, and this inspiration informs the work directly: I capture the nature's shapes, textures, and material properties within my weavings and throughout their surroundings. (Figures 3.1 and 3.2) The patterns of these weavings, whether simple or complex, communicate my presence and connection to nature. I physically manipulate the materials I find, which leaves my imprint on the land – at least temporarily. I documented this series of works through photographs because of this ephemerality. Since the weavings imply knowledge, I also draw connections between the natural world and our understanding of its phenomena. We learn from nature and should continue to learn from it to create a more harmonious relationship with the Earth.

Figure 3.1: Sally C. Garner, Woven Seaweed, *2022, seaweed*

Figure 3.2: Sally C. Garner, Untitled, 2022, seaweed and stone.

Because humans are creatures capable of complex logical thinking, we are naturally drawn to patterns. Pattern detection is an important part of learning and decision-making. When we find patterns, our ventromedial prefrontal cortex is engaged. This part of the brain has been linked to our sense of reward, so, we subconsciously feel rewarded when we detect patterns (Ohio State University). When patterns arise in natural constructs, we see these moments of order as being complete and beautiful because we perceive the world to be primarily chaotic. I start to feel that sense of reward when I discover the patterns hidden within nature. The more I weave, the better I comprehend the patterning structures involved; it is this knowledge of woven

patterns that allows me to comprehend and appreciate the similarities between the structural components of both weaving and nature.

I find the overlap between math and nature to be incredibly inspiring. Mathematics is intertwined with nature in many ways, but here I will focus on certain types of patterns because of their significance to my work and to the dichotomy between order and chaos. Fractals are a type of geometric patterning that remain the same visually despite an increase or decrease in scale. We can see fractals in the growth of a tree. A tree trunk divides into smaller limbs as it grows. The same structure repeats itself as the limb divides into branches, and as the branches divide into twigs. A smaller piece of the whole appears remarkably like the whole. Fractals are a type of patterning that do not produce pure symmetry, but rather reveal an unexpected logic within a complete, complex structure (Ball 48-50).

Crystalline formations, on the other hand, have repetitive structures that are more exact. The atomic characteristics of the minerals and compounds control the crystal forms, which accounts for the wide variety of structures we see in nature. The repeating patterns in these structures can only be rotated and reflected a certain number of times without changing the overall appearance. In two dimensions, this type of pattern is called a *tiling* of shapes. Crystals act in a similar way but in three dimensions, allowing the tiles to become *arrays* of atomic material. To be a true crystal formation, the arrangement of these arrays must align perfectly, and theoretically it must be able to repeat indefinitely (Ball 190-193).

Like crystals, other structures in nature are made of repeating geometric shapes, but unlike crystals they are filled with empty space. These architectures are considered a type of *foam structure*. The geometry in a honeycomb or wasp nest are two examples, but exoskeletons of various organisms also adopt these forms. Foam structures naturally take on hexagonal shapes

because of the ease with which circles, or bubbles, can transform into a six-sided shape when forced together into tight spaces. (Figure 3.3) When the bubbles are pushed together, a 120-degree angle is formed; so, while there may be some irregularities, most of the time foam structures have a regular hexagonal shape (Ball 164-167).

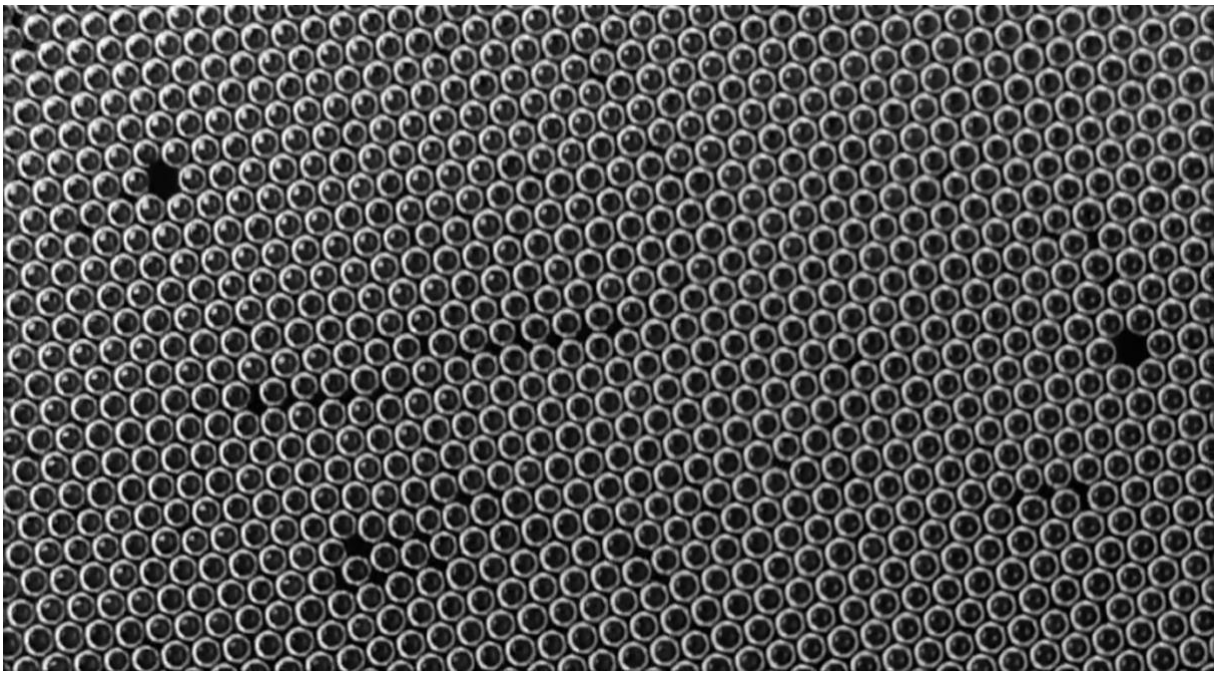

Figure 3.3: Bubbles packed together, showing the natural formation of hexagonal arrangement in foam structures.

When these types of ideas and patterns emerge, it can feel wonderous – even magical. It is not surprising that artists have been inspired by nature for as long as humans have been producing art. Biologist and artist Ernst Haeckel was inspired by the patterns he found throughout nature, such as in organism exoskeletons. His portfolio of drawings on the subject, *Art Forms in Nature* (Figure 3.4), has been an influential resource on natural structures for artists since the early twentieth century (Ball 168). The connection between artists and nature is ever evolving, and often presents itself as a way for the artist to better understand the world we live in.

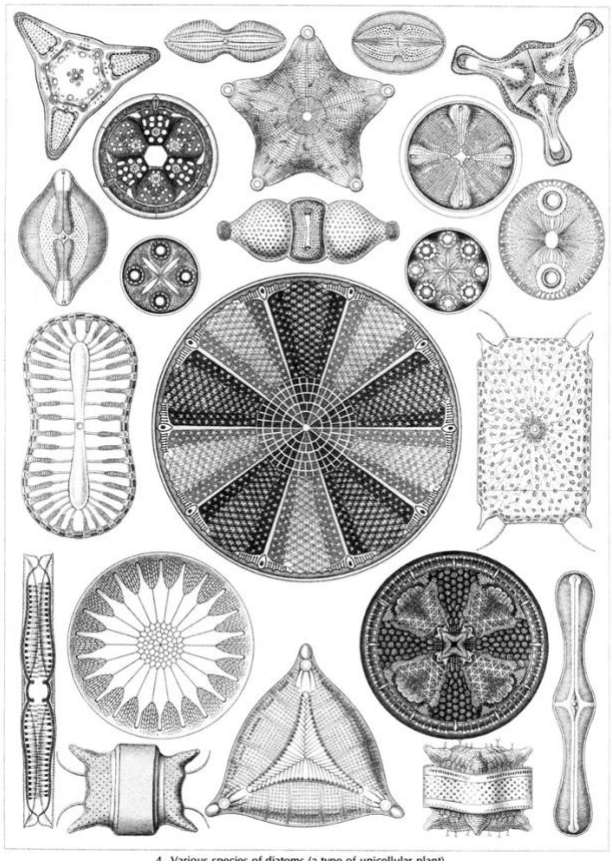

Figure 3.4: Ernst Haeckel, drawing from Art Forms in Nature, *captioned "Various species of diatoms (a type of unicellular plant)"*

Due to growing concerns for the environment in the late 1960s, artists began to make work within the environment itself, often only relying on the natural landscape to create large scale, site-specific works. This form of art became known as Land Art, and although there are some controversial points on the ethics of altering the natural environment, the intention for many of these artists was to pull our attention to its fragile state. While some Land Art pieces, like *Spiral Jetty,* by Robert Smithson were influential on the new art form for being so permanent ("A Masterpiece…"), others took this approach to art making in a more ephemeral manner. Many of the works by Andy Goldsworthy are made of items he finds in nature, but rather than altering the landscape, his focus is to create temporary works from strategic

arrangements of items like leaves, twigs, and rocks that are intended to create illusions within the landscape. The ephemerality of these works justify that the works live on in photographs, rather than in the original place (Erikson 206-207).

Eco Art, by contrast, is not always tied physically to the land itself but pulls inspiration from the environment and incorporates physical objects from nature within institutional spaces with which art is associated to recontextualize these objects. “Eco” is derived from “ecology,” and it is specifically the study of not just the land itself, but the relationship that humans have with their living environments. When combined with the Conceptual Art Movement, this focus begins to take on a political tone that I will discuss further in the following section of this paper. The main idea for now is that Eco Artists are inspiring dialogues on the various ways that we could improve our place, self, and society within an “interwoven world-view where nature counts” (Grande 7).

I am attracted to work by Neri Oxman and Nathalie Meibach because I enjoy the various interpretations of patterns these Eco Artists present to us. Oxman, a contemporary designer and scientist, builds off the semi-woven structures innately found in nature. Her designs show that integrating nature into her projects result in objects that are not only functional but also possess an elegant beauty. In a presentation in 2009, Oxman explained that instead of designing in a form-first configuration, she flips the normal process on its head and finds the material first, allowing it to set forth the needs of the form. Natural materials that have influenced her designs include the microstructures in butterfly wings, the strength of silk, and the scaffolding of a leaf’s vascular network. (Figures 3.5) Andrea Lipps, art historian, curator, and writer on contemporary design, has described Oxman’s designs as being physically embedded with nature itself. Oxman, along with her team at the Mediated Matter group at MIT’s Media Lab, examines the mathematic

laws that explain certain properties of materials, alters those algorithms, and then attunes new fabrication tools to reconstruct these natural materials. Her goal as a designer is to improve our lives while simultaneously enhancing the natural host environment (Lipps 146).

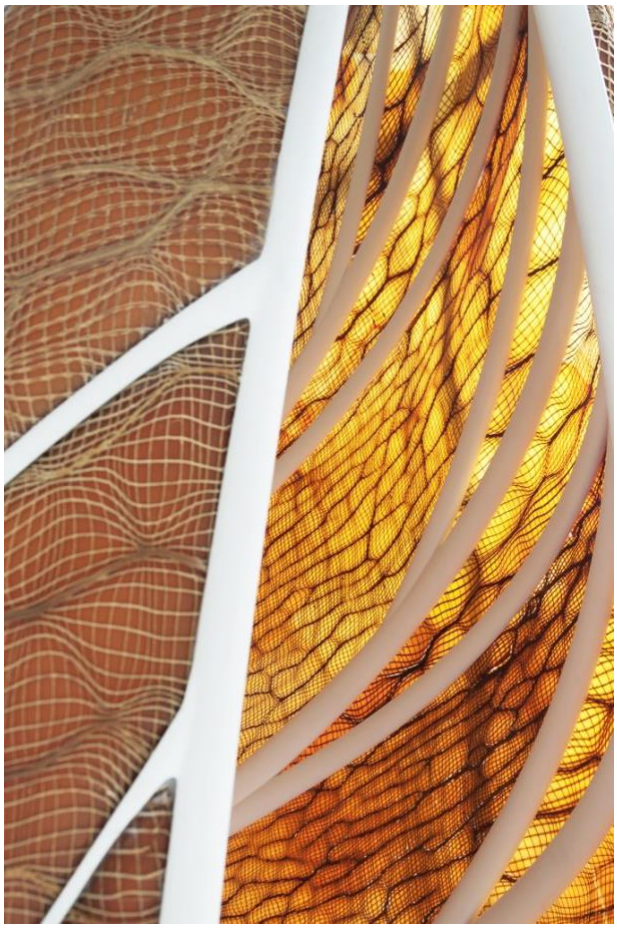

Figure 3.5: Neri Oxman, Aguahoja*, 2017-2019, a pavilion with skin 3D printed from biocomposite material originating from plant cells and invertibrate shells, such as shrimp.*

The basketry sculptures and paper triaxial weavings by Nathalie Meibach translate weather patterns into works of art. Meibach uses weaving's inherent association with number grouping to transcribe enormous ideas from nature – ideas we cannot usually visualize – into woven forms. She gathers scientific data on things like air pressure, temperature, and ocean tides, and assigns each of these datasets to an element in her weavings. The numbers primarily control the finished work. (Figures 3.6 and 3.7) By working directly from the datasets, her sculptures

and weavings “reveal behavioral relationships that may not come across in a two-dimensional graph” (Meibach). The triaxial weaving that is featured in some of Meibach’s work relates to the natural foam structure that relies on the strength of the hexagon. Most weaving is done with one set each of warp and weft, which intersect at right angles, but triaxial weaving (also called “mad weave” due to its added complexity and difficulty despite its regularity) is made of strands of material woven in three directions, each with a 60- or 120-degree angle of difference. It is a stronger structure than the regular biaxial-woven configuration (Scardino and Ko 89).

Figure 3.6: Nathalie Meibach, Antarctic Explorer – Darkness to Lightness*, 2007, Reed, wood, plastic, data, 54”x36”x24”. A portable data device for the Antarctic Explorer, this piece explores the transition from complete darkness in June to 24-hour sunlight in October.*

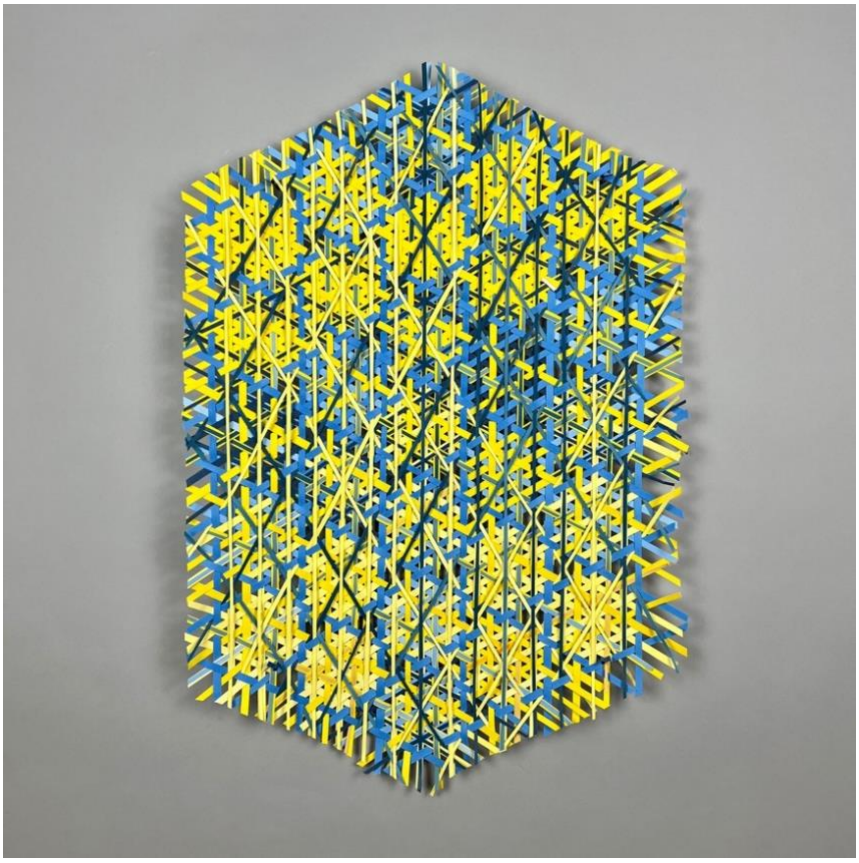

Figure 3.7: Nathalie Meibach, Weather of War: Kiev*, 2022, 26"x 20", Paper, data. A weaving that translates weather data from both Kiev and Moscow of the first 24 days of the War in the Ukraine.*

In the work that I create using the triaxial weaving technique, I am not only referencing the interesting hexagonal pattern found in nature, but also the robust order that is evident in natural materials and structures. The triaxial weave is a very geometric, complex repeating pattern. It signifies an order in nature that is dependent upon the organization of matter, like crystalline structures and foam structures. However, the reality of nature is that these ordered moments are often balanced by chaos.

The surface wake of the water surrounding a leaf flowing downstream, the movement of the wind as hot air meets cold, or a winding river that physically changes the land over time: each of these natural phenomena are examples of patterns created by flow and turbulence.

Turbulent flow is unpredictable: there are innumerable tiny nuances that affect its direction; therefore it is challenging to predict the specific shapes that flowing movement will create as time goes on. Turbulence, much like a fractal pattern that does not rely on pure symmetry, also appears to have an underlying structure. Thus, there is a "hidden order" among the chaos (Ball 108-114). In fact, the mathematician who first developed the concept of fractal structures, Lewis Fry Richardson, described the turbulence in flow as a cascade of energy that passes down from one eddy to the next, becoming smaller and smaller until it dissipates as thermal energy (Ball 112). The eddy is the turbulence itself; visually, it is the whirlpooling action that happens off to the side of the flowing current. (Figure 3.8)

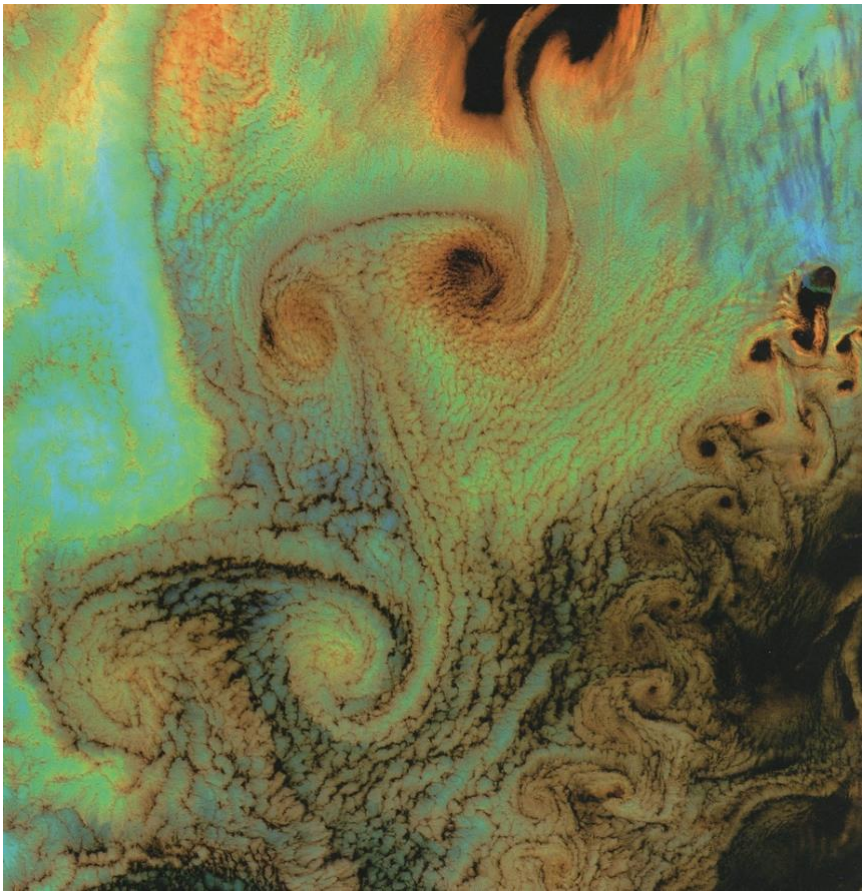

Figure 3.8: Turbulent flow in cloud movement.

I visualize this flow and turbulence, along with the foam structure, in a sculpture titled *Order in Chaos.* In this work, long pieces of rattan basket reed are woven into the triaxial structure and suspended in the gallery. The ends of each reed are not bound into the geometric structure; they cascade down from the weaving with a disorder that mimics the soft whirlpools created through turbulent flow. (Figure 3.9)

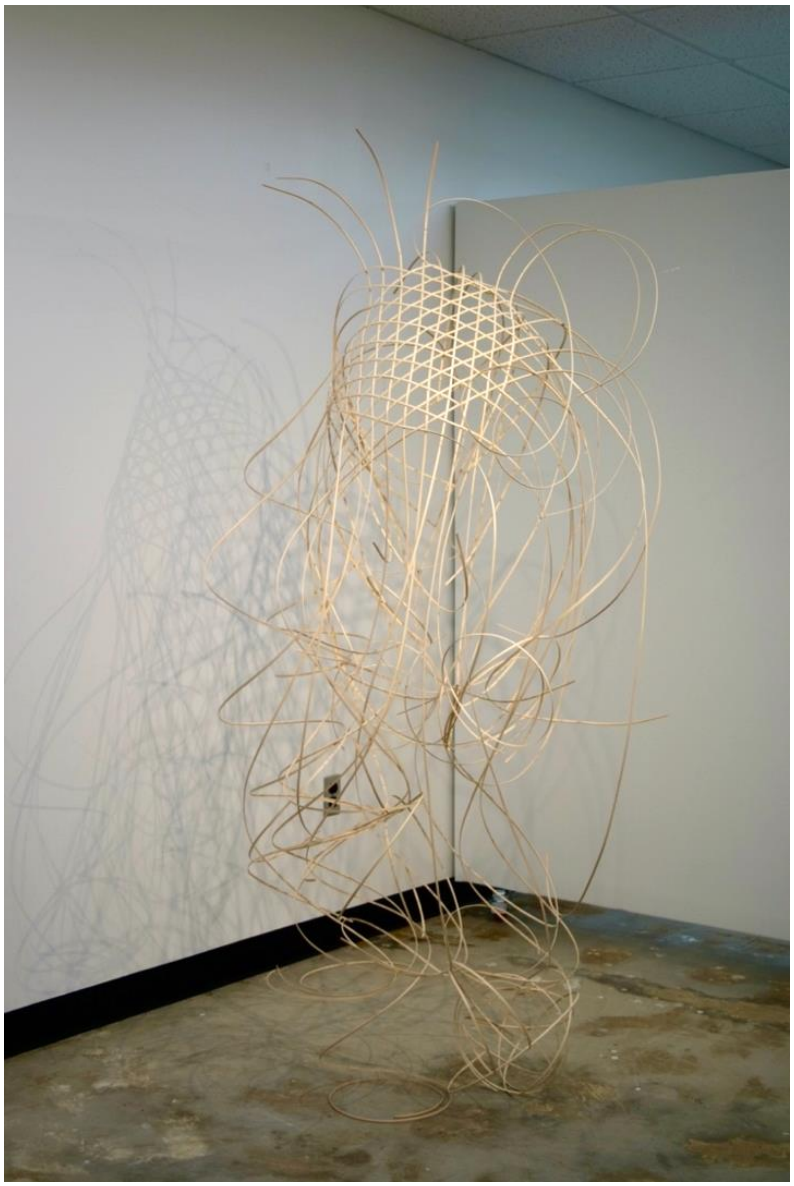

Figure 3.9: Sally C. Garner, Order in Chaos*, 2022, rattan and monofilament.*

Another sculpture, titled *Embedded*, similarly compares order and chaos through contrasting weave structures. The triaxial weave is precise and orderly, though the frayed edges hint at its ability to come apart. I dyed the rattan in the triaxial weave to a teal blue color. Red-orange strands of rattan are woven throughout the structure randomly. The random weaving does not follow any pattern and is woven chaotically through the underlying triaxial weave. The complementary colors imply the duality between order and chaos – the pattern and the random. (Figure 3.10) I display the weaving in a high location, mounting it on the wall at a point towards the bottom of the weaving. Because the weight at the top of the piece is not mounted to the wall, the weaving bends outward to loom over the viewer. Although the piece's scale is not large, this placement makes the sculpture seem domineering, as if the viewer has surrendered control of the situation.

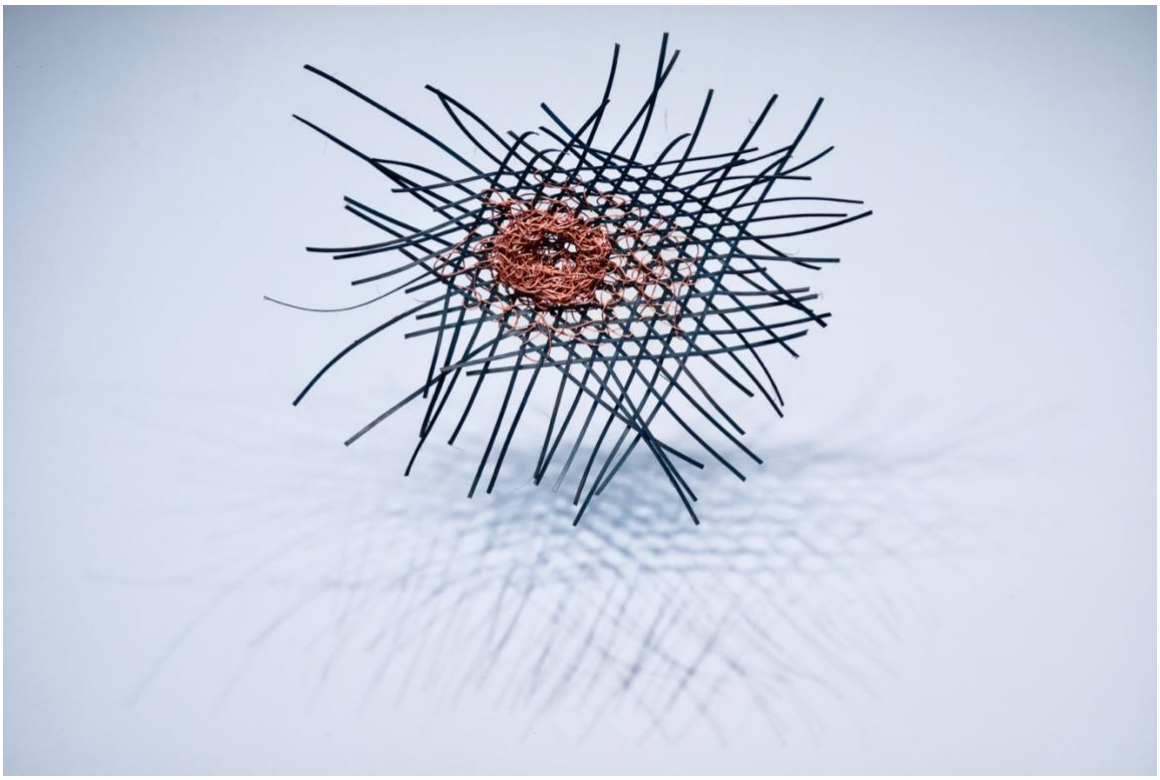

Figure 3.10: Sally C. Garner, Embedded*, 2022, hand-dyed rattan.*

My series of sculptural weavings entitled *Altered Timelines* was born out of a desire to create a flexible structure that could stand on its own. Originally relating to the twists and turns of human memory, the sculptures capture a helical crystalline shape. The helix structure is seen in certain crystalline structures, such as in the rare natural metalloid compound called Tellurium. The shape of the helix is very distinct, and most people are familiar with it as its double form: the two helixes twisting into DNA strands, the biomolecules that carry our genetic coding. The helix structure has a symmetry that revolves around a screw axis; the helical object "twists" around the central axis with a constant diameter, much like a spiral staircase (Hoffman 163-164).

Made of rigid wefts bound by just four twining warps, the *Altered Timelines* weavings are able to twist into a double helix. Twining is a type of woven pattern found in both loom weaving and basketry. It is created by repeatedly twisting the fibers around each other, as well as around either the warp or the weft. As the material twists around and around, the twining itself becomes a reflection of the helix, too. To create a sculpture that supports itself, the resulting fabric is twisted into a helix shape and then twisted around and upon itself. I interlock the rigid materials so that each twist supports another. In the more recent *Altered Timelines* pieces, I have been using bamboo toothpicks as the weft. The pointed ends stick out with every twist and turn, giving the helix shape an even more geometric, mathematical element. The weaving has a radial quality as the straight toothpicks twist away from each other. (Figure 3.11) The scale of these works is rather small; each toothpick is just 2.5 inches long. The lengths of the weavings vary but are sometimes as long as twelve feet. However, once twisted upon itself, each sculpture becomes mere inches in length and width.

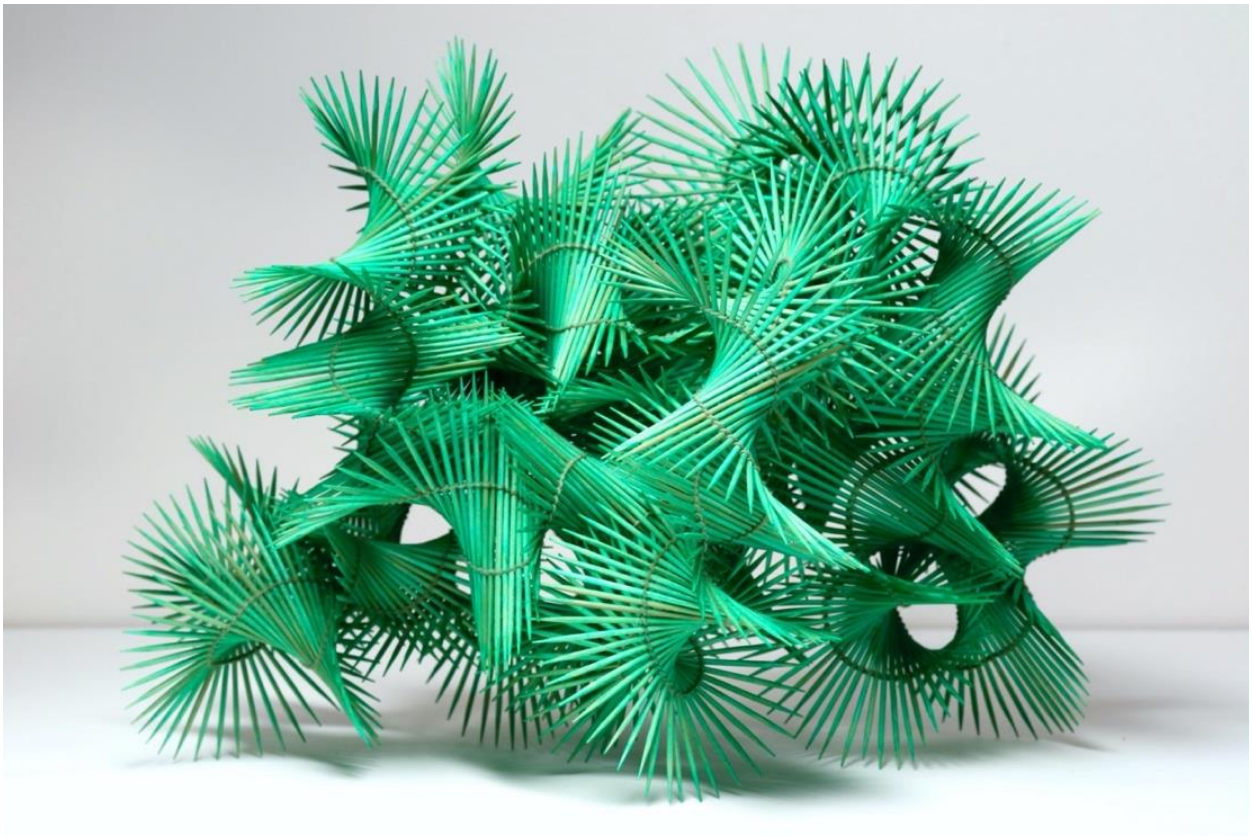

Figure 3.11: Sally C. Garner, Altered Timeline No.4, *2022, dyed bamboo and cotton.*

When I take these sculptures out into nature, I am mindfully placing the objects in wooded locations that subtly point to fractals or turbulent flow through the context of trees and rivers in the background. Often, I choose to photograph them from low angles to manipulate the perception of the sculpture's scale. When confronted with a larger scale image in the gallery, the viewer is unable to discern the original small scale of the object. It therefore takes on the feeling of being monumental and highlights the significance of being able to see the mathematical structures in nature. (Figure 3.12 and 3.13)

Figure 3.12: Sally C. Garner, Thought Experiment on Anthropogenic Alterations, *2022, archival print of dyed bamboo and cotton.*

Figure 3.13: Sally C. Garner, The Science Fiction of What Is and What Could Be, *2022, archival print of dyed bamboo and cotton.*

4 CONTROL AND CHAOS

Driven by the desire for innovation and advancement, we frequently try to control nature for our own benefit by bending it to our will. But how often do these actions prove to be shortsighted? How long until we know the effects of our interferences? The idea that small changes to the natural order can have larger consequences in the future is a well-known concept that Chaos Theory encompasses. Chaos Theory is a complex mathematical approach to examining seemingly random data. The theoretical application of chaos has informed applied sciences such as meteorology, astronomy, and population biology. I am interested in Chaos Theory as it relates to humans and our relationship with nature – the ecological point of view. It reasons that seemingly random or isolated data has an underlying order, which can be disrupted by changes. Because of the hidden structure, each small change to the environment can result in larger deviations to the order, even if we cannot perceive an obvious connection (Smith 1-2).

As capitalist societies grow and technology advances, we bypass natural processes to achieve greater wealth, advanced technology, and ultimately, more power. John K. Grand, a leading writer on Eco Art, has concern for the land and environment that we take for granted with our focus on technology. He says, "The bank of nature…continues to be emptied. …Technology drives progress… [as its] imperative is controlling" and that there will not be anything left for the world when "global interests remove all from nature" (11). We exploit the earth in many ways. The effects of our actions will be hard to predict because of chaos' domino effect. Just like fluid turbulence, chaos depends on innumerable factors, and thus even insignificant changes can lead to devastating consequences.

For example, we can look at the current debate on the development of genetically modified organisms (GMOs) for the use of human and animal food. Although using

biotechnology to modify the genetics of farmed plants has been practiced since the 1970s ("Science and History…"), there is still strong opposition to the large-scale manufacturing of plants with modified genomes as they could affect food safety and pose environmental risks. According to the World Health Organization, some of the main concerns with GMOs have arisen from their potential to provoke an adverse allergic reaction, to transfer modified genes to similar plants in the wild or elsewhere, called "outcrossing," or to transfer antibiotic resistant genes to humans through food absorption ("Food, Genetically Modified"). There is a reason why we do not have a resolution to the debate yet: the short-term results do not always predict long term effects. It is difficult to make accurate predictions on complicated matters, especially when nature is involved.

Science fiction writers are quick to warn of these unpredictable dangers. Their writing primarily functions as creative thought experiments, is often based on historical information, and considers the future implications of humanity's relationship to the planet and to non-human things. There is a realism to this fiction because the "*what-if*s" are almost always based on actualities present at the time of writing. Many of these authors question the cause and effect of our actions and often present their fears as dystopian narratives. Because of this, science fiction writers have a particular way of making "biophysical systems and problems visible" (Robinson 88) to their audiences. I am interested in how these writers see the future of our planet through their thought experiments. My own work also contains a narrative when the works are viewed together but is more abstractly presented than science fiction works. Conceptually, I am inspired by the ecological concerns raised by science fiction writers, and contextualize my works as visual thought experiments, too.

Michael Crichton wrote his famed *Jurassic Park* novel using Chaos Theory to question the implications of biotechnology. In this book, Crichton imagines humanity narrowly escaping the total destruction wrought by the actions of an entrepreneur, John Hammond, who constructs a remote tourist attraction that houses dinosaurs. These creatures have been recreated from their DNA, found within mosquitos preserved in amber. Once the scientists bring these previously extinct creatures back to life, Hammond invites paleontologist Alan Grant and mathematician Ian Malcolm, among others, to preview the park before it opens. Quickly, they discover that nature has a way of overpowering the bioengineered safeguards that are designed to prevent the dinosaur population from rising. Moreover, an unpredicted event occurs that causes the electric fences to lose power; the dinosaurs are then free to wreak havoc on the island and almost escape to the mainland.

Throughout *Jurassic Park,* Crichton explores the idea of Chaos Theory through the wisdom of Malcolm. As in the case here, after Jurassic Park is almost destroyed, Malcolm lectures Hammond – and us, the readers – on the implications of his greedy actions:

> "When the hunter goes out in the rain forest to seek food for his family, does he expect to control nature? No. He imagines that nature is beyond him. Beyond his understanding. Beyond his control…. He's at the mercy of it.
>
> "But you decide you won't be at the mercy of nature. You decide you'll control nature, and from that moment on you're in deep trouble, because you can't do it. Yet you have made systems that require you to do it. And you can't do it – and you never have – and you never will. Don't confuse things. You can make a boat, but you can't make the ocean. You can make an airplane, but you can't make the air. Your powers are much less than your dreams of reason would have you believe." (350-351)

Crichton, through Malcolm, explains that science gives us certain knowledge about nature and change, but the thought that we have any control over nature is an arrogant illusion. Nature is a non-linear system, chaotic and therefore predictably unpredictable.

An Eco Artist who goes by the name of Rigo 23 frames the idea of technological and scientific control as a contrast to a more desirable ecology in which humanity lives more sustainably with nature. Between the years 2005 and 2008, this artist created two installations, *Struggle for Life* and *Cry for Help*, with help from local communities of southeast Brazil. (Figure 4.1) The sculptures were constructed using objects made via the traditional methods and materials that coincide with the community's sustainable lifestyle. However, the subjects of the sculptures were objects of destruction, particularly from American military technological advancement. The cluster bomb and nuclear submarine built out of traditional natural fiber basketry "highlight the fact that although developed countries encourage economically disadvantaged populations to preserve the environment, they nevertheless continue to exploit the Earth to sustain their own, often destructive, lifestyle" (Brown 63).

Figure 4.1: Rigo 23, Struggle for Life *and* Cry for Help, *2005-2008.*

Viewers can see evidence of my hand manipulating nature through certain pieces of my artwork. The weaving reflects the marks I make on the land, and the materials I use control the narrative. In some pieces, such as *Wandering Ends*, I am weaving directly with natural elements, such as vines or roots (Figure 4.2), but in others I weave found man-made materials together with found natural materials. This process is evident in the piece *In the Seaweed Bed*, which is a living branch of seaweed intertwined with bright blue scraps of nylon rope used on boats, particularly industrial fishing boats. (Figure 4.3) I found these objects washed up on a shoreline in Ireland. By physically interlocking the found ocean debris with the seaweed's organic form, binding it to the human-made, non-biodegradable rope, the work references our negative impact on the Earth.

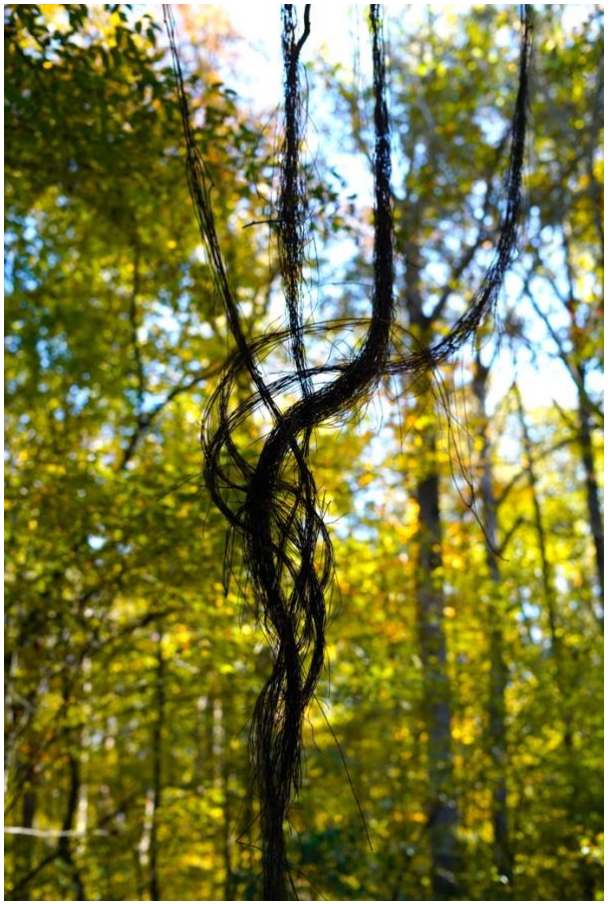

Figure 4.2: Sally C. Garner, Wandering Ends*, 2022, muscadine roots.*

Figure 4.3: Sally C. Garner, In the Seaweed Bed*, 2022, seaweed and found plastic nautical rope.*

For another piece, I wove grass, a material that has many species with a strong connection to traditional basket weaving, through the grid of a half-buried, plastic crate that was discarded hap-hazardously in the woods. I found the crate – plainly stamped with a recycling symbol – broken and partially submerged in a river's bank, as if it had been carried downstream during a heavy rainfall. The river winds a bend at that exact spot, evidence of a changing flow pattern due to turbulence; the viewer of the work is only aware of this detail through the title, *A Basket at the River's Bend*. (Figure 4.4) In this piece, I used local grass that was growing nearby to weave a plain-weave pattern into the crate. The simplistic pattern is representative of how a basic environmental courtesy was ignored when the owner of the crate littered, instead of recycling, their item. The juxtaposition of the live grass growing through the broken and forgotten box draws attention to humanity's neglectful impact on the landscape.

Figure 4.4: Sally C. Garner, A Basket at the River's Bend, *2022, found plastic crate and grass.*

Because the nature of weaving is a manipulation of material to interlace and become something else (i.e., a fabric, a basket), the artist's hand is always visible. Therefore, as the weaving patterns become more complex, the viewer is more aware of this manipulation. Just as nature found a way to prevail in *Jurassic Park,* it ultimately wins out in my sculptural weavings, too, as chaotic events take place outside of my control. I have a growing mastery of certain techniques in basket-making and often experiment with form because of this knowledge. However, my approach is like that of a scientist attempting to circumvent natural processes. I experiment without fully grasping the knowledge, and my forms start to take on a shape I had not envisioned. Nature has a way of taking back control as soon as there is a vulnerability in my technique. The rattan has an ingrained memory of shape, and once the form starts to shift from

my original idea, it is difficult to reassert my control over the artistic vision. In fact, creating *It's Supposed to be a Half Sphere (Unmanaged Control)* taught me that the further along I trudged, the more out of control the form became. Viewers see that the rattan is pulling far away from where it once was at the edges and that the overall organic form is not at all a half sphere. (Figure 4.5)

Figure 4.5: Sally C. Garner, It's Supposed to be a Half Sphere (Unmanaged Control)*, 2022, rattan.*

The other part of this narrative is that nature will always find a way to dominate. I use nature in the gallery, but not just as an object from the environment that I carried into the sterile, white-walled gallery. Although I am still manipulating it in a way that places nature in the room for the duration of the exhibition, the piece *In Conflict for Control* visualizes the process of nature taking over. I digitally designed a pattern draft for a mathematically complex weaving to allude to technology and the mathematical knowledge that weaving references. (Figure 4.6) Using this draft, I wove a large sample of the pattern with contrasting warp and weft colors so that the viewer can plainly see the pattern's complexity. Once on display, grass grows through the fabric draped across the piece. The grass is supported by containers filled with water underneath the fabric. Over the period of the exhibition, the grass obscures some of the complex patterns found in the textile. (Figures 4.7)

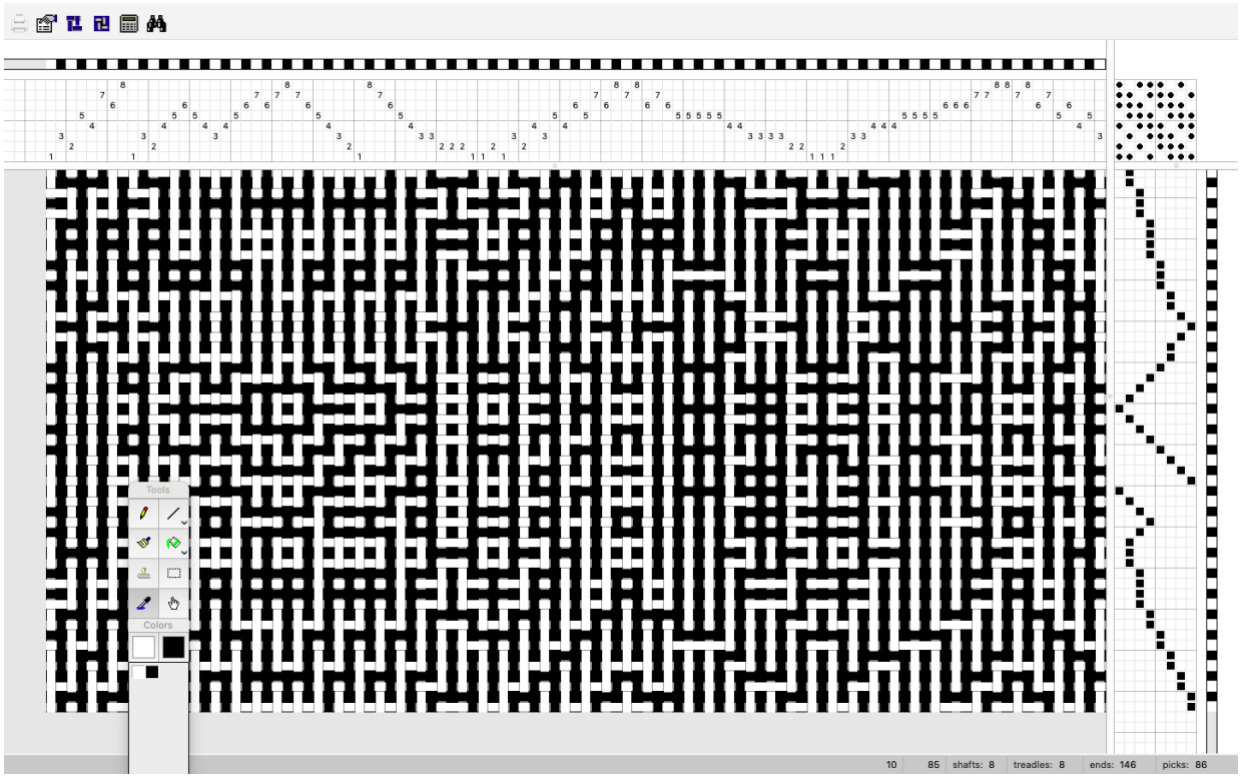

Figure 4.6: Sally C. Garner, Weaving draft using PixelLoom design program, Pattern Draft for In Conflict for Control, *2022.*

Figure 4.7: Sally C. Garner, In Conflict for Control, *2023, cotton yarn, triticale grass, acrylic containers, window screen, plastic piping, water, wood.*

I am typically searching for perfection in my artwork, so I find it difficult to work in a way that intentionally releases control, whether it is to the material, like in *It's Supposed to be a Half Sphere (Unmanaged Control)*, or to another organism completely, such as *In Conflict for Control*. My work conveys that control is not always obtainable, and that the struggle for control over a natural chaos exists in every instance in which humanity and nature interact. The ephemerality of the outdoor weavings I create is the result of chaos imposing itself back into the situation. Eventually nature will take over, and the weavings will slowly fall apart. My illusion of control over my environment falls away as I am ultimately humbled by nature's more powerful forces.

5 EXHIBITION

In this exhibition, I wanted to incorporate the various facets of my research to highlight the many methodologies I use within my practice. Experimentation with technology, pattern and nature is an integral element of this show. As I conceived this body of work, I embarked on new areas of research that have not previously surfaced in my work. These new areas include making site-specific work, which in turn led to the use of photography to document and exhibit these works in the gallery, and making work that includes live, natural elements such as grass.

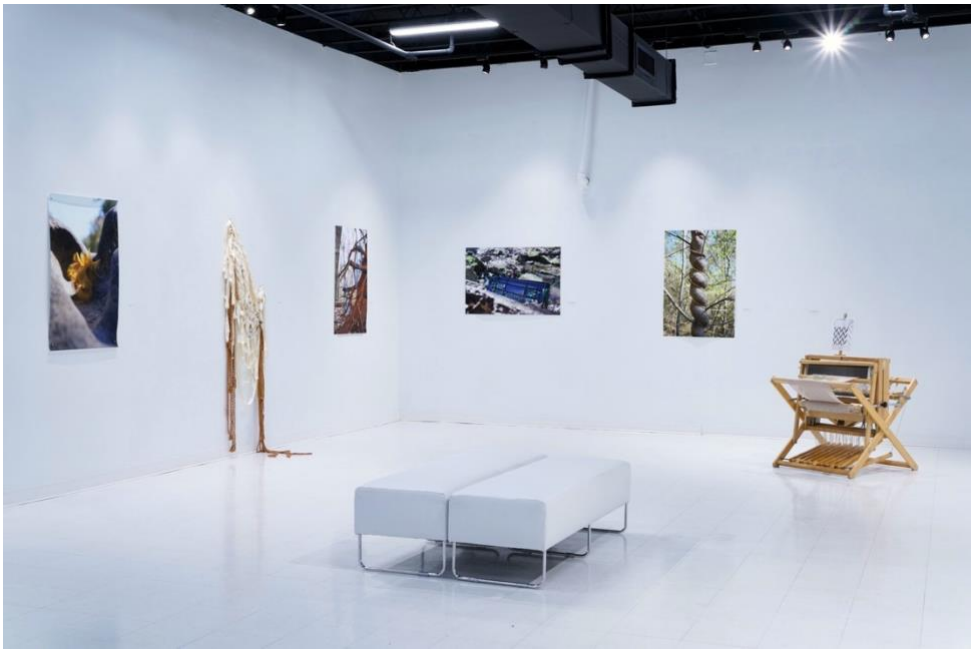

Figure 5.1: Sally C. Garner, photo from the exhibition, Interference : Interwoven, *2023.*

Working with natural and found materials out in nature felt like a logical way to explore my ideas about humanity's manipulation of nature. I made a total of four pieces while hiking the trails of Yellow River Park, in Stone Mountain, GA. I photographed these works for the show and installed enlarged archival prints in the gallery. I attached the photographs to the wall using magnets, as an informal method of display that implies an impermanence and echoes the

ephemerality of the site-specific works. These images draw the viewer in and emphasize my interventions within the natural environment. (Figure 5.1)

Across the gallery from these images is an installation of multiplicity showing various experimentations in basket weaving called *EGBs (Experimental Genetic Blueprints)*, nicknamed "the specimens." Each design is unique, though all are based on a select few traditional basketry techniques. The specimens resemble small creatures or insects, affixed to the wall with the same pins that entomologists use to mount insects. I only used rattan basket reed to make the first few, but as I created more specimens, I brought in vines and branches foraged in nature to contrast the natural but human-processed rattan. I installed the *EGBs* by spacing out the specimens evenly, distributing the different sizes, materials, and "species" types throughout the space. (Figure 5.2)

Figure 5.2: Sally C. Garner, EGBs (Experimental Genetic Blueprints), *2022-2023, basket reed and various foraged plant matters, specimen pins.*

For the duration of the exhibition, two works actively change with the growth of a living plant element. *In Conflict for Control* and *Should We Be Drafting a New System?* both include triticale, which is a hybrid plant of wheat and rye grasses. The plant's hybridity further explores the idea that we are tampering with nature to produce (in this case) crops that suit our desires for easy cultivation and cheaper production. For each of these works, I placed handmade textiles on top of window screen, with the grass seeds between the layers. The triticale grows through these textiles as the show progresses; it sprouts up through the weavings, growing taller and denser each day, eventually obscuring the textiles' patterns.

For the piece *In Conflict for Control*, I created a textile with patterning that resembles a QR Code, or computer wire mapping, such as the designs seen on computer chips, to directly reference human technology. I laid this fabric over the sprouted grass, and as the grass grows from beneath, it lifts the fabric and overtakes it. (Figures 5.3 and 5.4) The grass is predictable, yet unruly.

Figure 5.3: Sally C. Garner, In Conflict for Control, *2023, cotton yarn, triticale grass, acrylic containers, window screen, plastic piping, water, wood. First day of exhibition.*

Figure 5.4: Sally C. Garner, In Conflict for Control, *2023, cotton yarn, triticale grass, acrylic containers, window screen, plastic piping, water, wood. Last day of exhibition.*

Should We Be Drafting a New System? asks the viewer if we should be improving upon nature. (Figure 5.5) In this piece, I created an installation about the herringbone pattern, a woven structure named for its resemblance to the bones of a fish. I placed the textile in the loom as if it had just been created, right before the weaver would take it off the loom. A container with the sprouting seeds occupies the area where the weaver typically works. I spread the seeds onto the growing surface according to the pattern referenced on the weaving draft, which is drawn and displayed for the viewer's benefit and shows the herringbone pattern transcribed onto a sheet of paper ripped out of a scientific laboratory notebook. As the grass grows through the fabric, it produces a herringbone pattern that becomes unmanageable and illegible the higher it grows.

Figure 5.5: Sally C. Garner, Should We Be Drafting a New System?*, 2023, weaving loom, cotton thread, triticale microgreens, acrylic bin, window screen, plastic tubing, plexiglass, water, ink on paper.*

The exhibition represents the various approaches to art-making I use to explore the concepts of man and nature, chaos and control in my work. Along with the photographs and installation work, I exhibited select sculptural pieces to supplement the curation: *It's Supposed to*

Be a Half-Sphere (Unmanaged Control), Altered…, and *PBRs (Precariously Balanced Rocks)*, which is a draped weaving of elastic fabric bands that support five stones. (Figure 5.6) These sculptural pieces are the manifestation of a sustained inquiry into weaving and interlacing, which in turn reflects my questions about the management of materials, both natural and processed, and the ability and inability I have in controlling them.

Figure 5.6: Sally C. Garner, PBRs (Precariously Balanced Rocks), 2023, *elastic fabric bands, cotton thread, found stones, T-pins.*

Figure 5.7: Sally C. Garner, photo from exhibition Interference : Interwoven, *2023.*

Figure 5.8: Sally C. Garner, photo from exhibition Interference : Interwoven, *2023.*

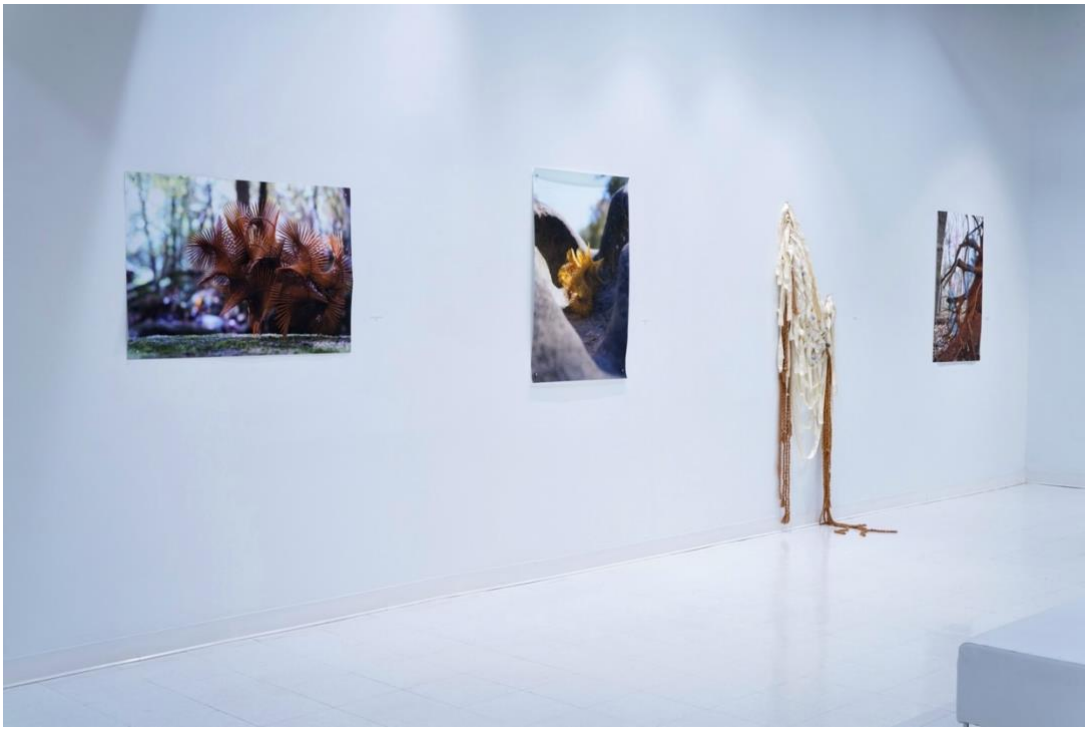

Figure 5.9: Sally C. Garner, photo from exhibition Interference : Interwoven, *2023.*

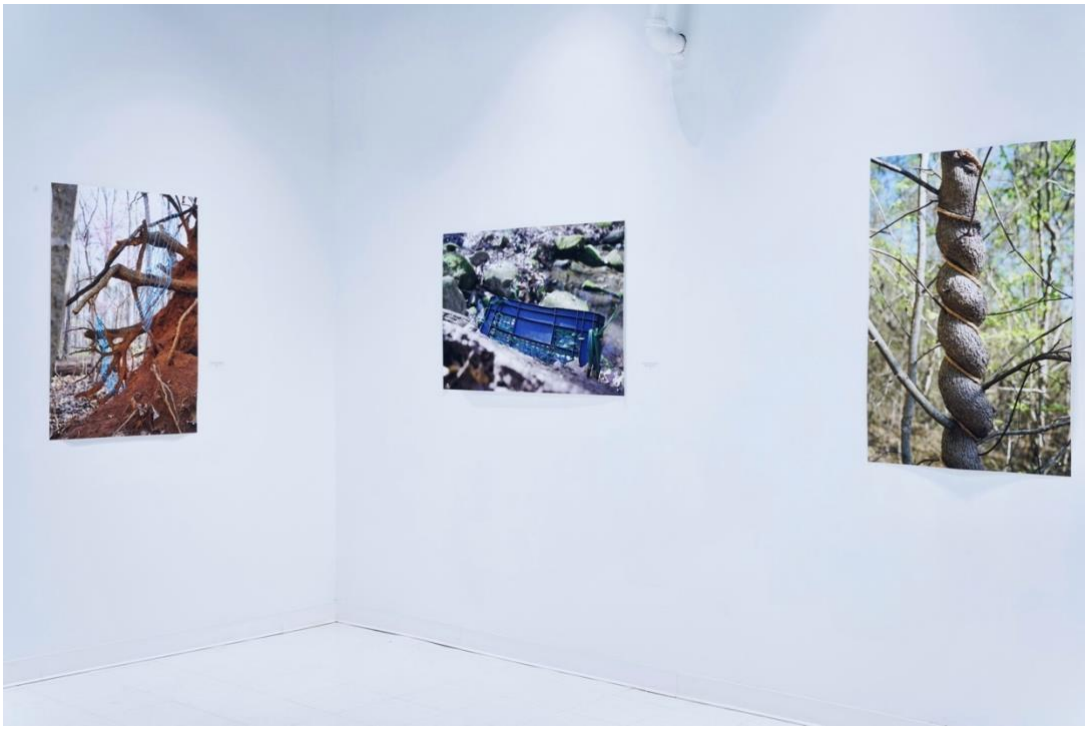

Figure 5.10: Sally C. Garner, photo from exhibition Interference : Interwoven, *2023.*

6 CONCLUSION

Interference : Interwoven questions the notion of human control over nature and contrasts this pursuit against nature's inherent ungovernability. Within these sculptural works and site-specific weavings, I symbolically use woven structures to explore the idea that technology has instilled in humanity a faulty belief that we have the right to meddle in nature's processes. In these works, I manipulate natural and found materials using an interdisciplinary approach to art making in order to explore the various implications of our intrusive actions.

Knowledge and technology are symbolically linked to woven structures. Cloth is a record of time and material – a documentation of our history through fiber, pattern, and use. It is so prevalent throughout time that it simultaneously predates recorded history and propels us into the future. Our ancestors interlaced fibers to create tools of survival and cloth, a necessity that has been ingrained in our way of life for millennia. As technology to weave cloth became more mechanized, the Jacquard loom introduced the world to binary coding, and inspired the invention of modern computers. While technology is imperative to our growing society, we need to consider where the boundaries are located. What could happen when we use technology to change aspects of nature to suit our desires?

This body of work examines the implications of our meddling actions by creating various science-fiction-esque "thought experiments" in visual form. In these geometric and tumultuous weavings, I am negotiating the underlying tensions between chaos and order by contrasting living and natural materials against the manmade and manipulated. Ultimately, *Interference : Interwoven* seeks a sustainable, less intrusive relationship with the only place we can call home.

Going forward, I will continue to research and produce artwork about sustainability and the environment. I still have more to learn about weaving and plan to continue exploring the

various structures that can be created through pattern and material on the floor loom. The most exciting part of producing this exhibition was working with living, growing plants, the triticale especially. Having a live component in my work was challenging because I had to plan well in advance of the show, examining the needs for the grass and creating small scale experiments before making the larger one. I am likely to incorporate living elements in future bodies of work because it so clearly addresses the questions I want to ask about humanity and nature and control—or lack thereof. I had to lose a small portion of my control over the work to be able to work with the grass, but the risk of using a new, constantly changing material was worth the effort because it brought an element of nature's chaos into the gallery.

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