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### Naturally Synthetic: Our Interwoven World

Increasing technological advances make it difficult to envision life on earth without humans. In reality, our existence is fairly new to our world. To put this into perspective, if one were to compress earth's history into one calendar year, humans would appear on December 31st at 11:48 PM.<sup>1</sup> Sharks are 350 million years old, the first plant dates back 114 million years and humans are reported to be only 200,000 years old.<sup>2</sup> As humans, we are the successful result of millions of years of evolution — a process that continuously refined the first, simple prokaryotes that dominated the landscape. Functions of our bodies derive from natural patterns found in plants and animals that came before us. For example, our bodies send messages to the brain in the form of energy just as plants spread energy through their veins. As humans we touch upon these natural, effective patterns, as well as amend and implement them in a myriad of ways to serve a variety of functions. Why do we imitate patterns found in nature through our technology and what can we say in art and design by exposing these connections? By highlighting the congruence between nature and technology, what can be gained and revealed? What is the best way to compare these patterns?

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<sup>1</sup> H Silvers, "Geologic History Compressed into 1 Calendar Year Timeline." Timetoast. Accessed December 12, 2015. <https://www.timetoast.com/timelines/63215>.

<sup>2</sup> Gretchen Hooker, "Biomimicry - Innovation Inspired by Nature." Lecture, CSS Forum, 1040 Dana Building, Ann Arbor, September 29, 2015.

For my project I am creating a series of three graphic weavings of natural and synthetic shapes. Each piece will be 36" x 48" in size, mounted to foam core and hung with a shadow reveal. I will be taking images of both natural and man made shapes, simplifying them into lines varying in width and digitally weaving them to create new shapes of interaction. Weaving existing shapes responsible for the construction our natural and artificial worlds highlights the ever-evolving relationship between our two contrasting realities and uncovers further interaction.

### Contextual Background

Today, our world advances from nature inspired evolution. Throughout history, the natural world has assumed systems allowing for harmonious existence. Charles and Ray Eames's, *Powers of 10* video illustrates a visual depiction of the repetition within our natural world. Eames explore our universe as "arena of both continuity and change" as they utilized micro and macro-

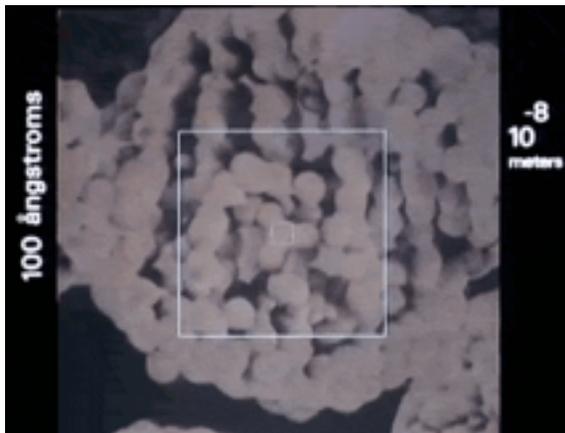


Fig. 1: View at  $10^{-8}$  meters



Fig. 2: View at  $10^{20}$  meters

scopic angles to depict the relative size of things.<sup>3</sup> The video begins with a close-up shot one meter away from a man in a park, located lakeside in Chicago. The frame zooms out until it reaches the edge of our known universe, then speeds up to a rate of 10-to-the-tenth meters per second as

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<sup>3</sup> "POWERS OF TEN AND THE RELATIVE SIZE OF THINGS IN THE UNIVERSE | Eames Office." Eames Office. 2013. <http://www.eamesoffice.com/the-work/powers-of-ten/>.

it zooms back into the man enjoying his picnic in Chicago, and further into his body to the level of a carbon atom. Throughout the plethora angles there were an incredible amount of visual similarities form.

The repetitive patterns observed through different angles of the natural world expand amongst human creation. Technology may seem far removed from the nature, however, innovation is directly inspired by natural practices. Beyond their clashing exteriors, nature and technology share an intertwined fundamental structure. For example, on a large scale, Information sharing systems of the Internet appear exactly like computer models of dark matter in the universe which appears exactly like neurons in our brain. These processes are all modeled after the pattern of branching, which is most commonly recognized in trees and plants. Comprising and perceiv-

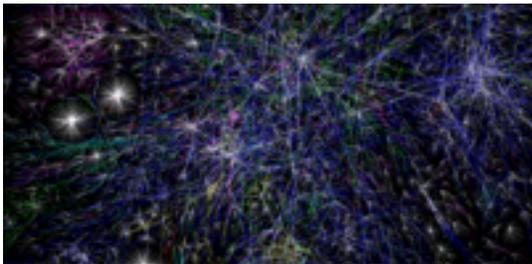


Fig. 3: Information Sharing Systems of Internet

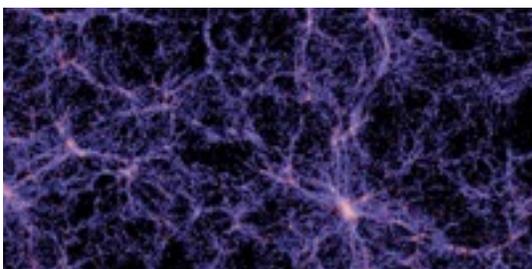


Fig. 4: Computer Model of Dark Matter

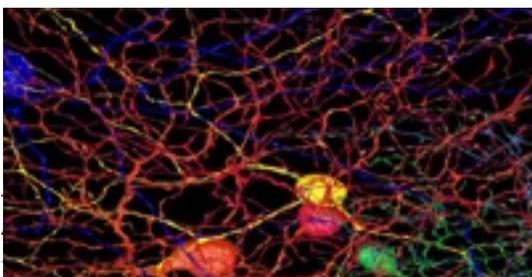


Fig. 5: Neurons in Human Brain

ing this large external pattern develops further understanding between nature and technology. Similarities in pattern and formation create manmade systems that have striking similarities to preexisting natural visual systems. Human's conscious adaptation of nature's best lessons into our infrastructure is known as the practice of Biomimicry. Biomimicry is simple yet complex; a radical way to design, manufacture and build, giving humans the power to run the world.<sup>4</sup>

Beyond bio-inspired design, the practice of

Inspired by Nature." Lecture, CSS Forum, 1040 Dana

biomimicry requires humans to learn and look to nature for inspiration, in order to craft innovative and creative solutions. Creators engage in ongoing conversations with nature, fostering deep connections and respect with our natural world. This practice has resulted in an increased efficiency in our world: the pattern of nature repeats itself, however, in alternating physical forms. One natural pattern that is widely used in human creation is the Fibonacci Spiral. Fibonacci, an Italian mathematician found a sequence of numbers that begins with adding the two numbers before that had come to be nature's numbering system.<sup>5</sup> This series comes to create a spiral that appears nearly everywhere in nature, from the leaf arrangements in plants, to the formation of hurricanes, design of seashells and even patterns in our skin. PAX water technologies, a company specializing in water purification sought inspiration from the patterns of whirlpools and tornadoes to "significantly improve the performance and energy usage of mixing water storage tanks."<sup>6</sup> Turning to nature, Jay Harman, founder of PAX Water realized, "nature never moves in a straight line, it tends to flow in a spiraling path."<sup>7</sup> Thus, they created the *Lily Impeller*, modeled after the spiral flow patterns existing in



Fig. 6: PAX Lily Impeller



Fig. 7: Calla Lily Flower

<sup>5</sup> Nikhat Parveen, "Fibonacci in Nature." Fibonacci in Nature. Accessed December 13, 2015. [http://jwilson.coe.uga.edu/emat6680/parveen/fib\\_nature.htm](http://jwilson.coe.uga.edu/emat6680/parveen/fib_nature.htm).

<sup>6</sup> Jay Harman, "Biomimicry | Pax Water Technologies." Biomimicry | Pax Water Technologies. Accessed December 13, 2015. <http://www.paxwater.com/biomimicry>.

<sup>7</sup> Jay Harman, "Biomimicry | Pax Water Technologies." Biomimicry | Pax Water Technologies. Accessed December 13, 2015. <http://www.paxwater.com/biomimicry>.

the Calla Lily, and it is the most powerful active mixer for circulating water in storage tanks in existence. An additional example of biomimicry in modern design is the creation of *ORNILUX Bird Protection Glass*. Spiders excrete UV reflectors in their webs so they are visible and prevent other animals from running into them. Arnold Glas, one of Germany's largest glass producers, made a name as the most innovative in the glass production space with their creation of *ORNILUX*. They worked closely with architects and planners to implement transparent UV protection within their glass, creating a product visible to birds in order to decrease the hundreds of millions of birds killed every year due to collisions with man-made structures.<sup>8</sup>

Drastic increases in technologies have greatly affected nature as technology has become largely implemented into our natural world. The expanding intertwined qualities of nature and technology has further evolved our classifications of nature. Similarities in behavior between manmade technological infrastructure and naturally occurring systems contribute to technology playing a key role in expanding human consciousness. The more data we have to measure results increases our quality of visualization, which then magnifies awareness in our surrounding environments. Isaiah Berlin, a social philosopher who dedicated his life to studying the evolution of mankind, stated, "to understand is to perceive patterns."<sup>9</sup> Berlin compares the use of patterns to the idea of understanding, as patterns convey a message that contributes to a larger make up and outcome. "To understand historical explanations is not merely to describe a succession of events, but to make [evolution within the universe] intelligible."<sup>10</sup> Studying the relationship of technolo-

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<sup>8</sup> "Birds & Glass." Birds & Glass. Accessed December 13, 2015. <http://www.ornilux.com/birds---glass.html>.

<sup>9</sup> Isaiah Berlin, *The Proper Study of Mankind: An Anthology of Essays*. New York: Farrar, Straus and Giroux, 1998. 129.

<sup>10</sup> Isaiah Berlin, *The Proper Study of Mankind: An Anthology of Essays*. New York: Farrar, Straus and Giroux, 1998. 129.

gy and our environment is a foreshadow of the future, a map of all the ways the present can reinvent itself due to evolution of current patterns and connections.

*Patternity*, the world's largest organization dedicated to solely pattern analysis, explores the similarities in patterns through our ever-changing perception of how we view the world around us. The individuals at *Patternity*, work with patterns to discover a new way of seeing as they believe "a shared awareness and understanding of pattern will positively shape the future."<sup>11</sup>In relation to our environment, they say, "we may live increasingly urbanized lives, seemingly far removed from the patterns of the wild, yet we still instinctively respond to and pursue patterns."<sup>12</sup> Examples of this in our world today range from the texture and color of snakeskin or the white speckles on a poisonous toad, and how these patterns stand as cautionary markings. We mimic this method with our markings on roadways, used to direct traffic and raised spots on the pavement that signal danger. These patterns prove successful in nature for they have withstood existence for an extensive amount of time and implementing them into our road systems conducts daily order within our world.

*Patternity* created an interactive outdoor installation, *KALEIDOHOME*, that "playfully engages the public with the fundamental shapes that make up life on earth, our "collective home".<sup>13</sup> They explore our varied perception of home



Fig. 8: *Patternity*, *KALEIDOHOME*, Interactive Installation, Trafalgar Square, London, England.

<sup>11</sup> Murray, Anna, and Grace Winteringham. *Patternity: A New Way of Seeing : The Inspirational Power of Pattern*. 33.

<sup>12</sup> Murray, Anna, and Grace Winteringham. *Patternity: A New Way of Seeing : The Inspirational Power of Pattern*. 33.

<sup>13</sup> "Patternity." *Patternity*. Accessed December 13, 2015. <http://patternity.org/studio/>.

through “transforming the fundamental shapes and patterns from all four corners of the world into an evolving sculpture placed at the heart of the project.”<sup>14</sup> The structure stands with a monochrome-patterned facade. In the center of the piece is a revolving prism that, when one looks into it, utilizes mirrors and reflective optical illusions to demonstrate our uniquely personal and varied perspective of what ‘home’ truly means. These reflected and dynamic images highlight our distinct perceptions that differ due to our personal relationship to ‘home’ and the outer four corners of the world. This installation is direct in addressing how perception often changes based on context and perception paradigms. When moving the prism, we enjoy the same pattern of reflection in a unique form, depending on where it is currently facing. Through this project, *Patternity* successfully uncovers the notion of perception and how it demonstrates the similarities between the patterns and shapes of our personal homes in relation to the earth, our collective home.



Fig. 9: Patternity,

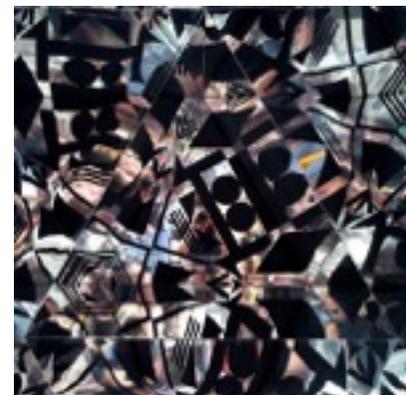


Fig. 10: Patternity, KALEIDOHOME, Interactive Installation, Trafalgar Square, London, England.

Ben Fry, an American expert in data visualization, explored nature from a microscopic angle. He took on the large task of finding similarities in makeup between humans and other mammals. In doing so there are countless areas so delve into, thus Fry decided to look at our DNA. In his piece *Aligning Humans and Mammals*, he aligns our DNA and shows similarities using different letter characters and colors. The rows in his piece to the left are ordered roughly

<sup>14</sup> "Patternity." Patternity. Accessed December 13, 2015. <http://patternity.org/studio/>.

in evolutionary distance from humans. The white characters represent human DNA and the red and blue characters show the different DNA within mammals. Here, Fry uses the tool of pattern making by highlighting the similarities in makeup of humans and mammals.<sup>15</sup> Fry's work



Fig. 11: Ben Fry, *Aligning Humans and Mammals*, 2008, Digital Reproduction.

touches upon one of *Patternity's* ideals: "our lives are interwoven patterns of interaction."<sup>16</sup> In Fry's work, each sequence of code interacts with one another, illustrating the various connections between the subjects depicted. A microscopic view on the makeup of humans and mammals uncovers fur-

ther scientific patterns and connections that transcend beyond the human eye. Rather than comparing the two at large, we are forced to juxtapose each individual element in the sequence of human and mammal genetic makeup. By physically intersecting genetic makeups, Fry makes it impossible to view these sequences as mutually exclusive. His work strengthens our perception of connection between the two different subjects, humans and mammals.

### **Methodology**

Transitioning from my research to reality, I began to explore the visual world around me.. Photographing innumerable images around me, I recognized my subconscious attraction to visual

<sup>15</sup> Fry, Ben. "Aligning Humans and Mammals." *Aligning Humans and Mammals* (illustration). Accessed December 13, 2015. <http://benfry.com/infoseed/>.

<sup>16</sup> Murray, Anna, and Grace Winteringham. *Patternity: A New Way of Seeing : The Inspirational Power of Pattern*. 33.

repetition. Within nature, it was clusters of leaves, each similar in shape, color and size. Within the manipulated, man made world, I captured countless images of geometrical shapes adding up to create a larger pattern and structure. I found this everywhere from patterns on articles of clothing to the architecture of buildings surrounding me. My attention to repetition reflected my research in that natural patterns are borrowed in man made creations. With a collection of images related by the single element of repetition I challenged myself to find further connections between the two. I was inspired by Ben Fry who took two different subjects, humans and animals, and depicted them in the same medium, as lines of DNA in order to uncover further relations among one another. I traced over an image of leaves, and an image of a pattern on a desk chair in order to explore any connections between these natural and artificial subjects. Once in the same



Fig. 12: Image of leaves, image of chair pattern, tracing of leaves, tracing of chair pattern

medium I was incredibly surprised to see the strong similarity in form between the two. Simplifying both images, they exist as a makeup of similar shapes. The pattern on the desk chair was merely a reflection of shapes found in our natural world composed in an alternate form. This exploration encouraged me to explore ideas of repetition and reflection among our natural and man made worlds.

I spent a lot of time exploring the symmetry in make-up and advancement between our natural and artificial worlds. Using images of both natural elements and scenes and man made structures and creations, I created symmetrical designs and patterns. I focused on abstracting designs in a kaleidoscope design because similar to the idea of evolution, and the evolution of nature and human creation since the beginning of time, the pattern expanded out from one central point. Conceptually, working with this idea spoke perfectly to the ideas and knowledge of my research however my visual exploration lacked intrigue. I found myself incredibly caught up with the consistencies in evolution of both nature and technology, and created visual work to illustrate so. Observing my own creations, they lacked excitement and mystery, the opportunity for viewers to create their own, unique conclusions. With an intense fixation on consistency, repetition and symmetry, I was preventing natural surprises within my creations.

I continued my exploring through making, allowing myself to pick up on relationships through my creations. I began with images of both natural and man-made shapes I observed in the world around me, fusing them together in a myriad of ways. I compared the shapes with one another, using methods of overlaying and cropping to exaggerate a sense of connectivity between the two. Once I began cutting the images into strips and weaving them within one another, a spark went off in my head. This method resonated with me as it conveyed the point I was trying to share, our world is composed to definitive patterns of interaction. No longer manipulating my the visuals to appear perfectly symmetrical, I uncovered much more to see about the harmonious ever-evolving relationship between our natural world and our man-made, technological creations that inhabit it.

### **Creative Work**

For the creation of my final project I have greatly evolved the methods with which I am working with my materials. Through my process I have honed in on creating a final piece of work that conveys the idea that our “our lives are all interwoven patterns of interaction.”<sup>17</sup> Rather than manipulating natural and man made shapes to form and repetitive, symmetrical design, I am using these shapes to compliment one another, to create a larger, inclusive way of seeing the two together. My images of both natural and calculated shapes serve as a source of material to interact, and create new shapes. This idea speaks to how the pure and synthetic elements within our world work and react in unison with one another.

Playing with the idea of “interweaving”, I am cut images of natural and man-made shapes up into lines, and wove them through one another. Creating a composition formed from entirely new shapes creates a coexistence between the two opposing elements. Conceptually, the interaction of the two illustrates how natural shapes and patterns have inspired our man made creations, yet, at the same time, our artificial creations have effects on the natural world. An interweaved connectivity creates interaction, all elements are related and play a part in forming a larger relationship. Cutting down the images into simple lines creates a scale of complexity, symbolizing our natural world and its expansion and evolution. Additional details emerge as viewers step closer to the piece. This represents the ever evolving relationship between our natural and synthetic worlds and it also illustrates the complexity in detail of the interconnectivity between the two. The final piece expands among three different prints, each scaling about 3 feet by 4 feet in size. This triptych contributes to conveying the idea of interaction as each panel holds a relationship with one another.

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<sup>17</sup> "Patternity." Patternity. Accessed December 13, 2015. <http://patternity.org/studio/>.

As I set out to create my project, my overarching goal was to explore the relationship between both naturally occurring and man made structures. At first, I was largely focused on evolutionary patterns and the similarity between natural and man made infrastructure. As I overlaid images and searched for existing repetition, I created folders and saved my work in a processing program. When I reopened the files, I noted that there were consistent glitches in the imagery. After some investigation, I realized that the file sizes were so large, that the processor corrupted my work. Each time I saved an image or a file, I continued to discover evolution in my work, whether that be a newly introduced pattern or unexpected repetition. This experience led me to gain deeper understanding into the inherent connectivity between man and nature. Consciously and unconsciously created patterns cannot be controlled — patterns and connections can only be controlled by a creator to a certain extent, but they tend to take on a life of their own. Just as genetic structures evolve and mutate — due both to their environment and a factor of entropy — during the process of evolution, my work evolved based on my personal perception and artistic limitation. Thus, the process of my creation led me to an unexpected and novel discovery that ultimately laid the groundwork for my thesis.

Through my triptych I created a space; a new environment in which to experience the ever-changing patterns simultaneously occurring in our world around us. Within these 2-Dimensional works, I played with scale and perspective, to simulate a space unbounded by dimension. I invite artists to view each panel alone, step up close and observe the delicate detail that gets lost within the larger composition. Much of these delicate lines occurred due to the glitches in my work and bring a multitude of dimension to larger patterns that I was unable to create myself. The delicate patterns only visible when looking closely at a piece represent the structural makeup that is invisible to the naked eye that make up elements we see in our everyday lives. As view-

ers step back and observe the pieces as an entire triptych, then observe the patterns expanding, playing a role in a larger structural makeup. From a distance, the forms and hues that stick out to an observer are much different than viewing up close, however, there remains similar shapes in the pattern, even from opposing scale. This further emphasizes the connectivity within our natural and synthetic world, and its persistence regardless of scale.

### **Conclusion**

My extreme interest in visual and symmetrical patterns and designs suddenly became very ironic to me. Thinking into my personal life, I am discouraged by the idea of doing the same thing every single day. I make a point to include something new and exciting within my schedule everyday, regardless of the magnitude. Relating back to my initial exploration of evolution in relation to our natural and man made worlds, the process of evolution is dependent upon inconsistencies in order to change and expand into something new and different. By preventing inconsistencies within my visual work, I was constraining my own exploration, inhibiting myself from uncovering a larger connection between both our natural and artificial worlds.

I didn't realize how significant watching other people experience my work would be until opening night at Slusser Gallery. I was hoping to create an experience where viewers had to analyze my work understand the concepts conveyed through my triptych. It was incredibly interesting to hear people's reactions to the work before and after they read my statement. Dealing with such large subjects within my work, it was fascinating to hear the differentiation viewers saw within my visual work. The viewers experience conveyed the my ideals of an interwoven interaction as individuals beliefs evolved and expanded by others as well as my statements within my description.

The experimental film, *Koyaanisqatsi*, directed by Godfrey Reggio, musical composition by Philip Glass and cinematography by Ron Fricke juxtaposes our natural and man made worlds. Reggio succeeds in allowing his creative work to uncover larger experiences for him as well as the viewers. The Hopi term, *Koyaanisqatsi*, means “unbalanced life”. Reggio depicts life out of balance by transitioning between slow motion and time-lapsed footage of cities and natural landscapes across the nation. The juxtaposing tone set in the film depicts the contrasting relationships between humans, nature and technology. The visual collage techniques utilized indicate, “it’s not that we *use* technology, we *live* technology.” He explains, “technology has become as ubiquitous as the air we breathe.”<sup>18</sup> I found *Koyaanisqatsi* to be an incredibly inspiring video for it allowed me to create further conclusions about the relationship he is exploring. Reggio describes his subjects to illustrate a life out of balance, however, I focus and expand upon the balance created by both the natural and artificial existence.

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<sup>18</sup> Carson, Greg (director) (2002). *Essence of Life* (DVD). MGM Home Entertainment.

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