

PERCEPTUAL INTERFERENCE

by

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ABSTRACT

When I explore my surroundings, I often wonder about what we can never truly know. My studio practice serves as an outlet for my questions, and I expect it to generate more questions than answers. I have questions about origins, the unknown future, and the interactions between matter and energy.

In conjunction with this written thesis I created works that will be displayed as my MFA thesis show in the Helen E. Copeland Gallery. These works are responses to my research into various energy forces, which stems from my collaborations with Montana State University's Physics Department. My primary interest this year has been electromagnetism which is the study of the interactions between electricity, magnetism and light. But I am also interested in how electromagnetism connects to other forces such as gravity and sound, and how these various systems follow patterns that are very similar to fractal patterns found in nature. There is a lack of knowledge when it comes to what connects various forces to others, which stimulates my interest in the interactions between them. My current questions have led me to the conclusion that invisible forces connect and influence all things.

INTRODUCTION

I am intrigued by questions that are unanswerable. When I investigate my surroundings, I often wonder about what we can never truly know. My studio practice serves as an outlet for my questions, and I expect it to generate more questions than answers. I have questions about origins, the unknown future, and the interactions between matter and energy. I want my artwork to spark a moment of contemplation of something beyond ourselves and beyond our perceptions. My current questions have led me to the conclusion that invisible forces connect and influence all things.

Scientific discoveries and research often inform my work. Artists and scientists have an intrinsic relationship; both supporting the others progress. I have the desire to investigate the ways the interlocking pieces of reality fit together, and like scientists, I perform an editive process stemming from my imagination. Science offers a systematical, reliable method to analyze the world while art encompasses an imaginative realm of aesthetic qualities which can be utilized to produce visual representations and phenomenological experiences of things we cannot see. It can open people's minds to new frames of thought like the way a new discovery or theory in science can alter our perspectives. By finding ourselves in a new place, coming from a new perspective, we can begin to imagine things we could not have imagined before. Art can use laws of the universe in a way that presents these truths as magic; generating various interpretations.

There are many forces that are invisible but known to exist through experimentation and observations of natural phenomena such as lightning. Once humans became aware of these forces, such as electricity, we began to investigate them and reproduce them. Our

technologies rely on these energies and allow us to see and interact with forces that would otherwise be beyond our control. There are still many unknowns surrounding these invisible forces, our interactions with them, and their effect on biological entities. Understanding the fundamental interactions of nature – electromagnetism, gravity, and the strong/weak nuclear forces - can alter our perception of reality. But scientists have been proven wrong countless times throughout history. How much do we really know about the nature of reality?

“Impressionists like Monet tried to capture light. Futurists like Boccioni portrayed motion and speed. Expressionists like Van Gogh conveyed emotions. These qualities – light, speed, emotion – are variations of energy”¹. It is energies like this, in addition to the fundamental forces of the universe that inform my work. Contemporary works, such as the light installations of Robert Irwin and Olafur Eliasson’s sun installations continue to prove that energy is one of the most ephemeral qualities to depict.

In physics, energy is defined as the capacity to do work or to cause change, but it is notoriously difficult to define. Some feel energy as a connection with another human being while some perceive it as the brightness or the heat of the sun. According to the Law of Conservation of Energy, energy can never be created or destroyed, but can be changed into different forms. Yet some label energy as a destructive force while others see it as the genesis of life. We all have an innate sense of the impact of energy; It produces power, movement, and interaction.

¹ Vaselli, Giorgio, and Zerebeski, Laura. *About the Movement*. www.energyartmovement.org. 2008. Accessed December 2018.

Quantum mechanics provides evidence to show that solid matter does not exist in the universe. Atoms are made up of the subatomic particles of protons, neutrons, and electrons. The protons and neutrons are packed together into the center of the atom, while the electrons whizz around the outside.

“The atoms that form objects and substances that we call solid are actually made up of 99.99999% space...And, as everything is made of atoms, which are energy, this shows us that everything is made up of energy. The energy that makes you is the same energy that composes trees, rocks, the chair you are sitting on and the phone, computer or tablet you are using to read this article. It’s all made of the same stuff – energy.”²

My influences range from widely accepted scientific theory to poetic and spiritual takes on energy. I am skeptical of many theories and I believe that to be able to adapt to an uncertain future people need to open their minds up to the possibility that what is known may not be true, or all that is known. Greed has controlled what is valued, what is utilized, and what is known. The direction we are moving on a global scale is not sustainable. The pursuit of profit often seems to hinder the possibility of other technologies that could have helped elevate humanity beyond profit driven motives. We need to harness our connections between natural energy systems to advance our technologies in way that are sustainable and maintains a responsible relationship with our environment. The biggest issue we face is global climate change. Tapping into our imagination, and thinking beyond the mainstream, could help us adapt to changing ecosystems and depleted resources. Nikola Tesla, an inventor and engineer best known

² Kristie Pursey

for dozens of breakthroughs in the production, transmission and application of electricity claims that “If you want to find the secrets of the universe, think in terms of energy, frequency and vibration.”³

³ Reflections Magazine article on Tesla and a “life force energy”

PERCEPTUAL LIMITATIONS

Louis Kahn's theory of Silence and Light is an explanation of the relationship existing between the spirit of things, and the manifestation of that spirit into the objective world. To Kahn, light is the real, tangible world. On the other side of the tangible world is the unmeasurable, dark silence of the unknown. The threshold where the unmeasurable meets the measurable is the point of inspiration that Kahn denotes as the Sanctuary of Art. Science brings together the real tangible world with that of the unknown. This threshold is what sparks imagination and creativity. Caleb Charland also claims:

“[There's] an energy [that] vibrates in that space between our perceptions of the world and the potential the mind senses for our interventions within the world. This energy is the source of all true art and science, it breeds those beloved “Ah Ha!” moments and it allows us to sense the extraordinary in the common.”⁴

I am drawn to explore the extraordinary found within the common, and those unmeasurable unknowns. Investigations into energy systems have brought my attention to the limited perceptual abilities of humans, and the concealed forces that are shaping reality. Their interactions mostly occur outside of the realm of what we can sense, and it is this hidden dimension of nature that I often ponder. The mystical complexity of nature and how it presents itself in a seemingly minimal design reflects Kahn's notion of the measurable meeting the unmeasurable. We have studied and measured what we can observe and imagine, but the unmeasurable possibly reaches beyond what we can imagine, remaining in the dark silent unknown.

⁴ Caleb Charland – Artist Statement

The book *The Secret Life of Plants* opened my mind to the possible complex interactions that occur beyond our perceptions. Although the studies examined in this book are mostly seen as a 'paranormal ideas' and is now categorized as a pseudoscience, recent studies and discoveries on plant communication have proved many aspects of these studies to be correct. The most controversial concept from the book is the idea of primary perception; This idea of non-time-consuming communication, and a oneness among all living things. Experiments have shown that human thoughts can affect plants. Plants exposed to positive thoughts thrive, while a plant subjected to negativity struggles. Do the interconnections between energies systems establish a connection between all living things that is beyond awareness?

ART AND SOLAR ENERGY

While collaborating with Montana State Universities Physics Department, I created various works that were a response to research being done on the sun. When my work addresses the sun, I am reminded that it brings life to Earth, and without it we wouldn't exist. Photons from the sun also allow for all visual experiences, and all color. Color is an important aspect in my work and used to create an alluring visual experience. I am fascinated by the sun's interactions with our magnetic field, as well as with the magnetic field lines that are made visible by solar flares. Although the sun gives us vision, we cannot look at the sun with the naked eye. A depiction of the sun inherently incorporates surreal and transcendent qualities, things I enjoy exploring in my work.

The Carrington Event is the name given to the solar flare that came towards earth in 1859. This solar flare was large enough to catch telegraph lines on fire. According to NASA, electrical disturbances as strong as those that took down telegraph machines would be far more disruptive today. "The big fear is what might happen to the electrical grid, since power surges caused by solar particles could blow out giant transformers. Such transformers can take a long time to replace, especially if hundreds are destroyed at once", said Baker, who is a co-author of a National Research Council report on solar-storm risks.⁵ Even smaller storms have been known to affect power and communications.

My research into solar physics has brought me back around to again investigate our electrical power grid. I see our current technology as fragile, immature, and self-

⁵ Richard A. Lovett – National Geographic

damaging, and it is a bit unnerving to realize how much society relies on them. “An Artwork can present itself as an opposition to the present, and this opens the present up to the future; but art does not guarantee that the future will be better than the present”⁶

When I learn about alternative, sustainable power sources, I can’t help but wonder why we still use what we use and how things will change in the future. Is there a balance point between using what we make and using what’s already provided? Ironically nature is the inspiration for the invention and advancement of our technologies, but our ‘advancements’ have been blamed for disconnecting us from nature. What would happen if the entire power grid went out? Our loss of interactions with the world in which we evolved has made most people lose the ability to survive without our technologies. “This new phase of human history is characterized by a traumatic loss of coordinates, “the end of the world”⁷.

Based on my experiences and research, I believe that I could live to see the planet and the trajectory of our species go through huge changes. Having knowledge of how to live off the grid is essential when you rely on such a fragile system. Maybe I am paranoid, but I think knowledge of alternative energy systems is very important to have. Our planet has never experienced the state that it is in now. “The Sixth Extinction” argues that

“As temperatures rise, the ice at the poles will melt. Any living thing that depends on the ice will be faced with extreme challenges that could ultimately drive them to extinction. Kolbert estimates flora and fauna loss by the end of the 21st century to be between 20 to 50 percent of all living species on earth.”⁸

⁶ Paolo A. Bolanos “Critical Role of Art”

⁷ Timothy Morton “Hyperobjects”

⁸ Elizabeth Kolbert “Sixth Extinction”

Even though the Earth goes through natural atmospheric cycles, the CO₂ levels have never reached the levels they exist at now. Because it is naturally slow moving, the effects of global climate change may not be apparent to a single human generation. It has now been 122 years since the first scientist warned of the effects of fossil fuels on the environment and atmosphere,⁹ yet we continue using them. In the modern world it is common place for records to be broken when it comes to weather and land changes. Record rainfall, record snowfall, record fire season, record hurricanes, record droughts, record floods; we have been keeping track, and things are obviously changing drastically.

⁹ In 1896, the world renowned Swedish scientist and Nobel Prize Winner Svante Arrhenius (1859-1927), described how CO₂ influences the climate. He suggested that increasing emissions of CO₂ from burning fossil fuels could lead to a global warming—the so-called greenhouse effect. In the subsequent decades, research into greenhouse gasses continued. But it was not until 1938 that Guy Callendar first showed how the Earth's temperature was already increasing.

ELECTROMAGNETISM

My research into solar flares and their interactions with the earth's magnetic field and power grids led me to begin exploring electromagnetism. Electromagnetism is the inquiry into the interactions of electricity, magnetism, and light. Electricity and magnetism are known to be two aspects of the same force. Maxwell's equations are a set of four equations which you can basically use to describe electrical and magnetic phenomenon. You can induce electrical fields from magnetic ones and vice versa. They are aspects of the same fundamental interaction. However, a consequence of electromagnetism is whenever you change a magnetic field in respect to an electrical one or vice versa, the field releases energy in the form of an oscillating electrical/magnetic field. This is what light is, a wave which oscillates both an electrical and magnetic field, which propagates through space. Waves of light also interacts with matter in specific chunks or packets called photons. The visible spectrum of light is the only energy force we can see. When electricity leaves a circuit, and a spark is produced, the spark you see is not electricity. Just like the phenomena of lightning, a spark is a flame that occurs when electricity travels through the air and burns up oxygen particles.

Scientists believe that there is a unifying theory that connects electromagnetism with that of gravity and the nuclear forces, but one has yet to be discovered. Because there is this lack of knowledge when it comes to what connects various forces to others, I am interested in the interactions between them, how they affect each other, and the similar patterns that these various energies follow.

Electromagnetic waves are the only waves that can travel through matter and empty space. It is more difficult for light waves to pass through matter than other frequency waves. It takes a very bright light to pass through a wall, but it is possible. And light easily passes through paper or glass. Higher frequency waves, such as gamma rays are small enough particles to travel between and within atoms and molecules. And with radios waves that are lower frequency and large particles can 'ignore' a wall, because they don't interact with the vibrations of visible matter.

MATTER AND ENERGY

All energies can be described as a wave. Sound is different in that it is a pressure wave, and physically pushes particles in the air. By simply placing a metal plate topped with sand or salt on a speaker, you can adjust the frequency to create different patterns in the sand. The higher the frequency the more complex the pattern. This is called Cymatics. These structures, reminiscent of the mandala and other forms recurring in nature, are a manifestation of the invisible vibrational energy that generated it.

I notice many connections between the patterns produced by energies and the patterns found in visible matter in nature. I wonder about how a force like magnetism relates to fractal patterns. There have not been many studies done on this, but there are many similarities in the path's energies follow, and the forms matter takes on. When I asked a physicist about their relationship, after a long explanation of how magnetized atoms act, he concluded that atoms enter the "fractal dimension" during a period of phase change. Although I don't fully understand what he means by fractal dimension, I find it very fascinating and want to know more. And if all matter is energy, and all matter forms in patterns that follow the rules of fractal math, then I see fractals as the patterns of various forms of energy, and as visual representations of the 'energetic essence' of an entity.

CONCLUSION

There is a frequency or vibration of energy that fills the Universe. This energy is not only beneficial, but also essential to all living cells whether human, plant or animal. Humans utilize this energy with their mind. Every thought is transmitted by this energy.¹⁰ Like the interconnections of energy systems, much is unknown about how the brain manifests energy into things such as intelligence, information processing, and consciousness.

I believe a lot of what artists create comes from the subconscious, and I find my work is much more interesting if I just make and analyze it later. I subconsciously put all the pieces together that say what I want to say, or what I am thinking about. And even if all the pieces don't get put together in the correct way, I don't mind because then the viewer can come up with even more interesting interpretations.

The research presented in this paper informs the works that are included within my show in the Helen E. Copeland Gallery at Montana State University. My title *Perceptual Interference* comes from the physics term 'Interference' which describes the ability of two waves passing through each other to mingle, reinforcing each other where crests coincide and canceling each other out where crests and troughs coincide. Like the way ripples in water interfere with each other. Do our senses produce their own unique waves that interact with other energy waves? *Perceptual Interference* is also defined as: "the ability to infer sensory stimuli from predictions that result from internal neural representations built through prior experience." In other words, it is the phenomena of our brains filling in the

¹⁰ Reflections Magazine article on Tesla and a "life force energy"

gap, based on previous experiences, which is largely automatic and unconscious. I believe letting your curiosity activate your imagination and having a sense of wonder is important.

“The most beautiful thing we can experience is the mysterious. It is the source of all true art and science. He to whom the emotion is a stranger, who can no longer pause to wonder, and stand wrapped in awe, is as good as dead – his eyes are closed.” -Albert Einstein.

There will always be the mysterious because of the limited cognitive abilities of our brain. Technology may magnify our perceptual ability, but the journey from the unknown to understanding is a cumulative and fascinating enterprise.

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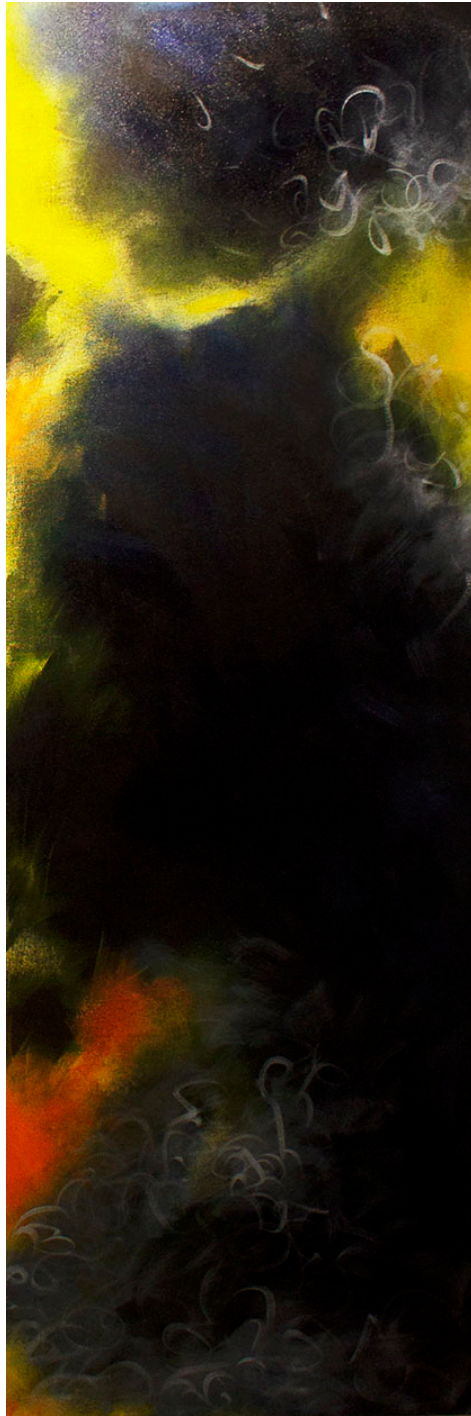
IMAGES



Sentience



Unbidden #1



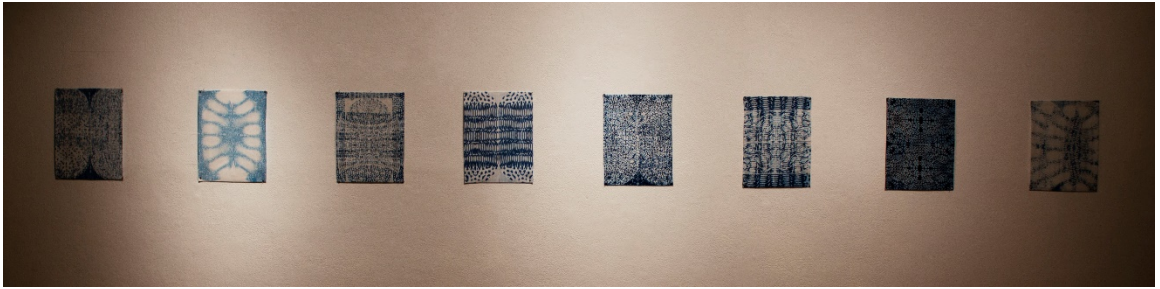
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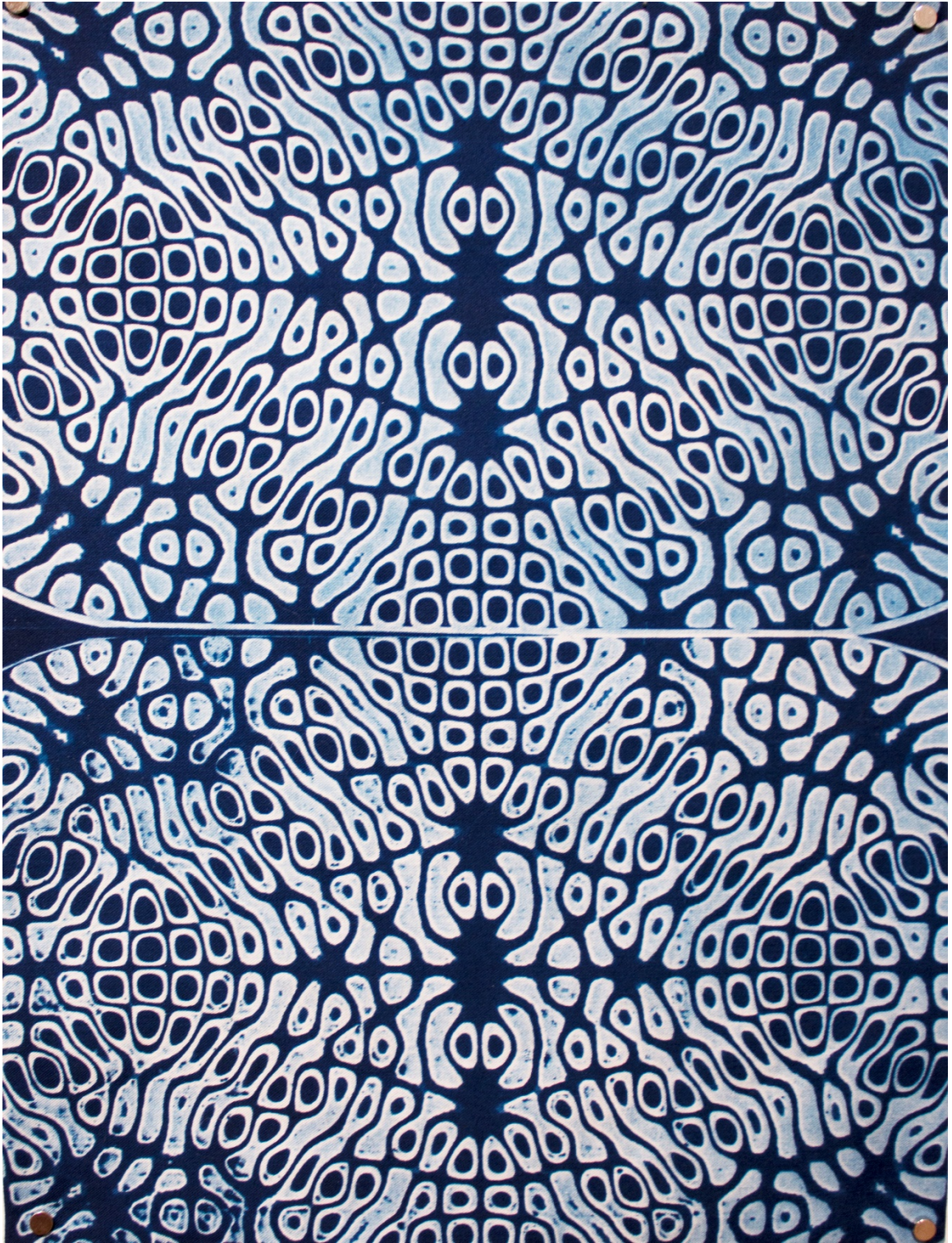
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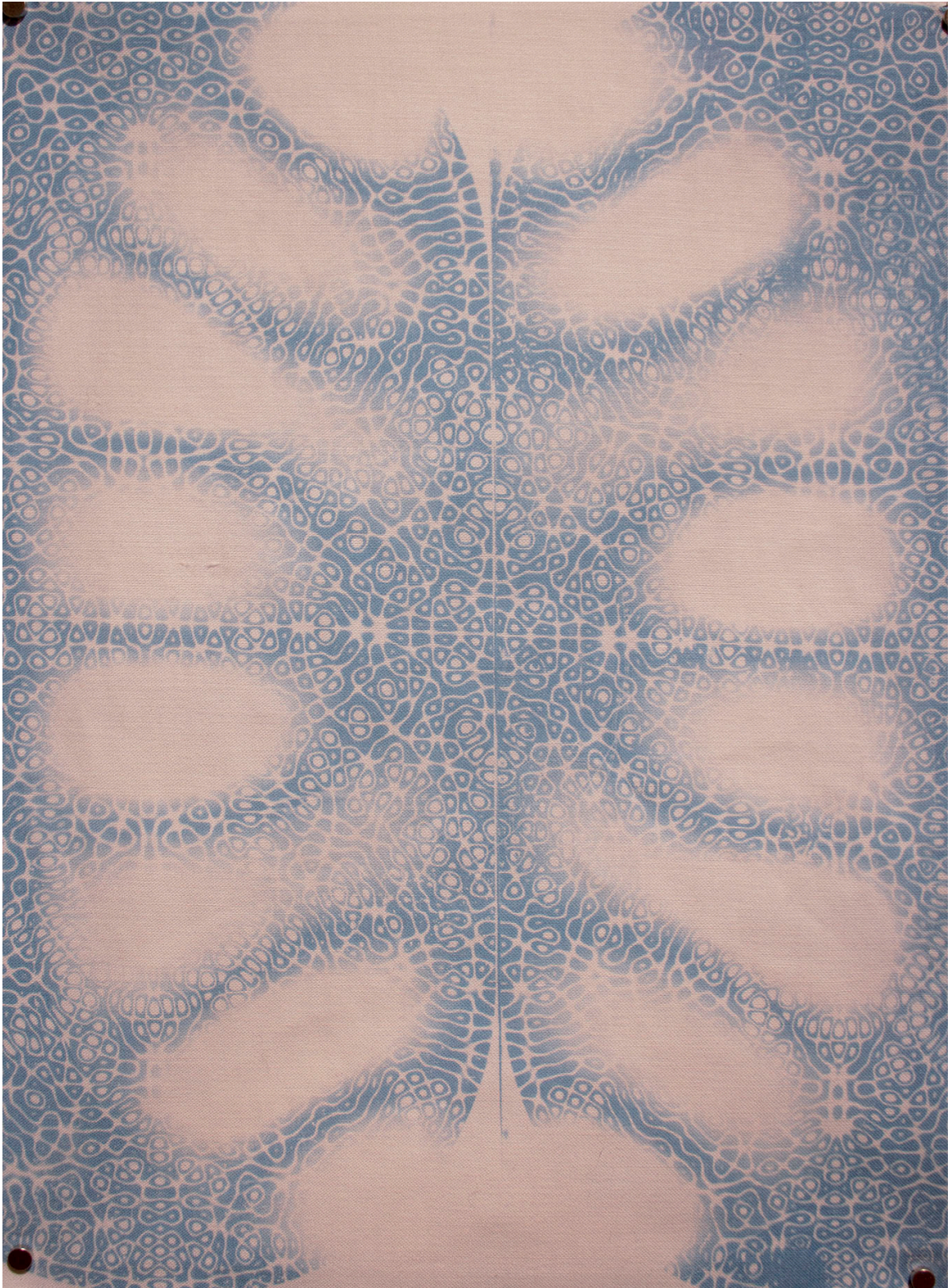
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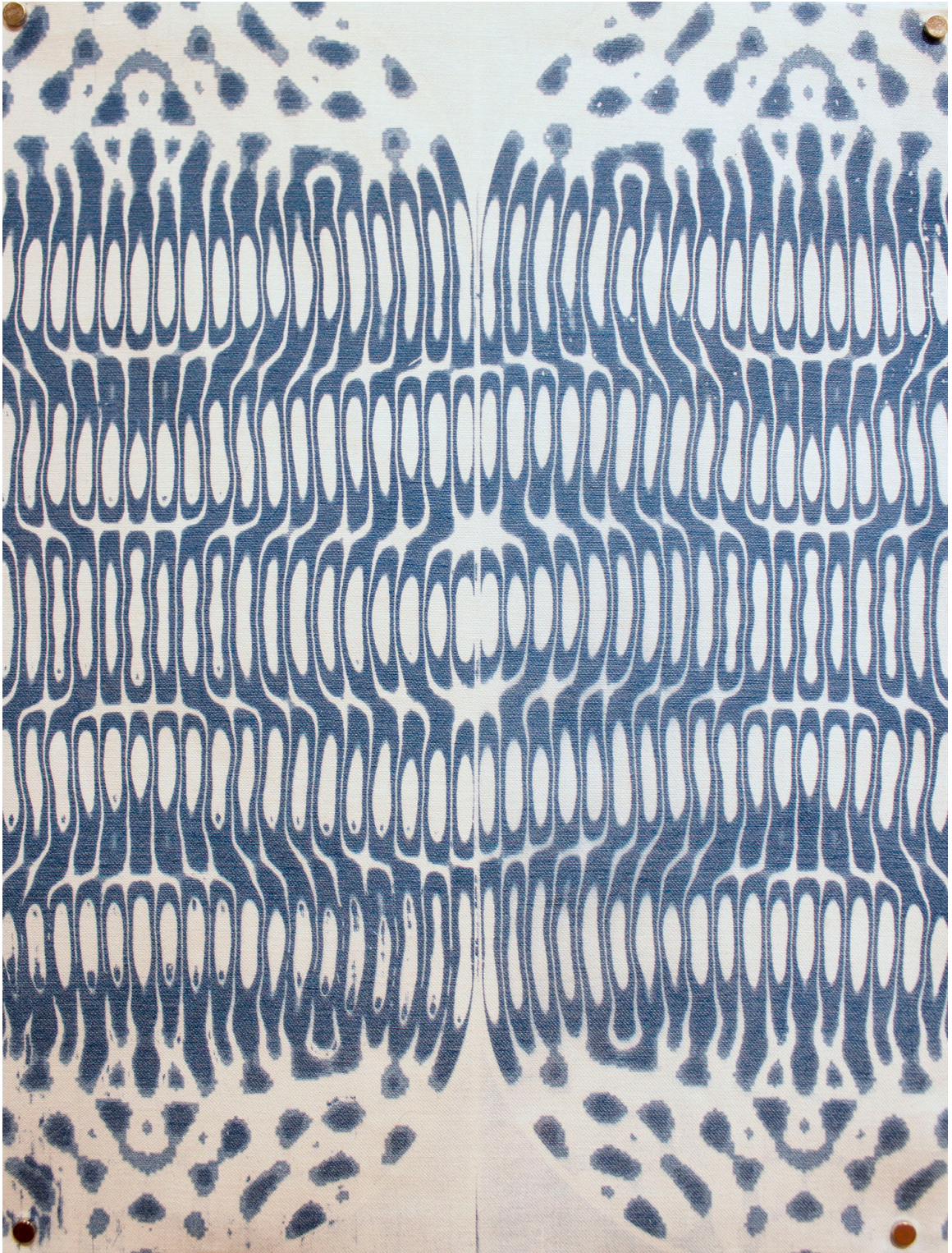
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Cymatics #2



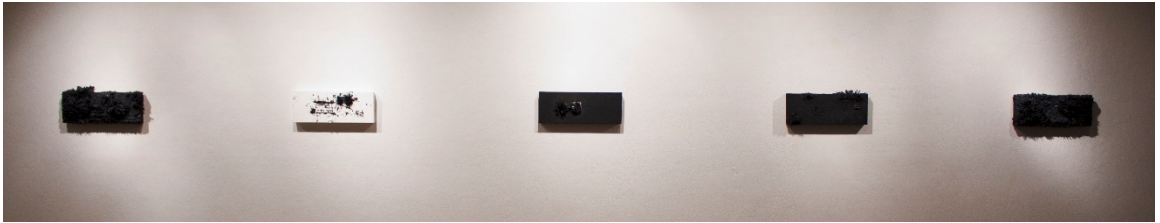
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Cymatics #4



Cymatics #5



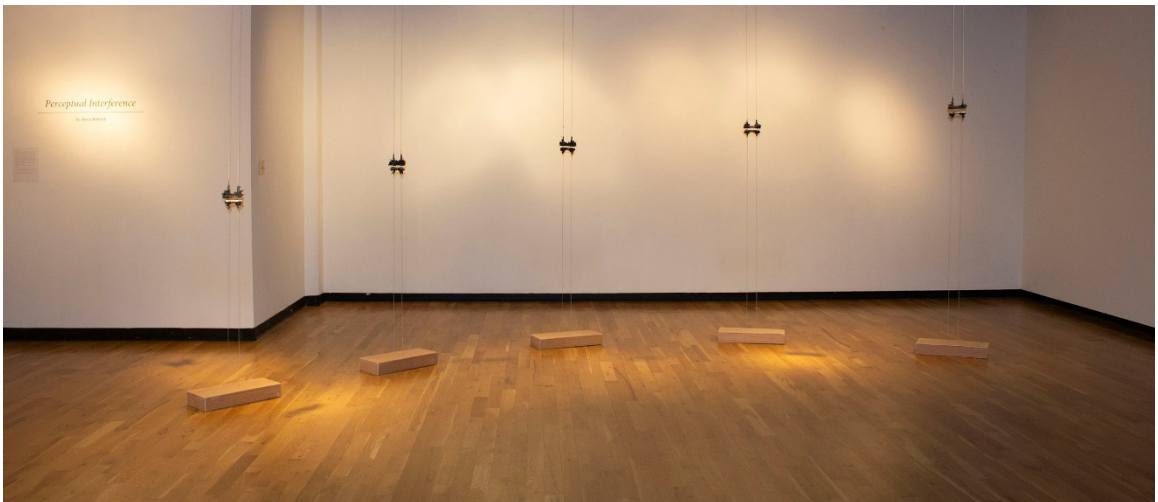
Perceptual Interference



Perceptual Interference - Detail #1



Perceptual Interference - Detail #2



Interference



Interference – Detail #1



Interference – Detail #2