

Apropos Obsolescence

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Abstract

Apropos Obsolescence is the title of this PhD in visual art dissertation and exhibition. It is an exploration of how a human mind interfaces with and mediates both proximal space and the larger environment of planet Earth. How is the outside brought inside? What is mediation and how does it operate upon our consciousness? Within the exhibition explored in this text are several works that investigate mediation. The main work, *Hexagraphy*, is a rudimentary backlit screen; a sculpture that refers to a field of neurons using light. Neurons in the brain's hippocampus region are active during movement as a component of our agency in connecting to the navigational aspect of consciousness. These neurons operating in grids are calculating our direction and placement in space as we move around. To engage with this information, I improvised a decentered geometry for some of the work in the exhibition. In other works, I included signs of the enormous physical forces that are in play on the planet, the non-local phased objects we are immersed within that are not easily represented due to their enormity, but that "technoscience" exposes.

Two questions became evident to me through looking at both science and new materialist philosophy. The first is that following the *digital turn*, an extension of our senses aided by computation, it is clear that humanity exists contingently on planet Earth. Humanity was not the beginning and is not the end of evolution. Thus, upending any notion that any "thing" was created *for us*. Secondly, is technology as an end in itself helpful for humanity? Through its decentering of humanity and imposing an acknowledgement of contingency upon us, the entire realm of objects is paradoxically elevated. This decentering could be the only thing that saves our species from extinction. It may be the objects that save us. "Hyperobjects" like hurricanes and El Nino, or climate change in general are caused by a combination of cyclical forces. These large objects decenter humanity, and in my artwork, I want to emphasize the fact that I am a fragile human and not a machine.

Dedicated to my mother, Sue Wolstenholme

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Figure 1. Dissertation exhibition, *Apropos Obsolescence*. September 8 – October 27, 2018 Art Mur, Montreal, QC.

INTRODUCTION

This PhD dissertation paper is written in conjunction with my studio-based research/creation and my thesis exhibition of sculpture, drawing, and digital/electronic media work. It traces a fundamental turn in my artistic practice, my materials, method and content toward global concerns that are of a personal urgency for all living humans and those to come. The questions I am raising that are responsible for a shift in my strategy for making sculpture and other work in the exhibition *Apropos Obsolescence* are four-fold:

- In what ways do humans interface with their environment?

- What tools does sculpture, an object-based medium that exists in actual space, provide to respond to the 'Digital Turn' and the predominance of a mediated interface and information-based content?
- How can one who is implicated in causing climate devastation respond to the Global environmental crisis of the 21st Century?
- How is the 'Digital Turn' responsible for the discovery by humanity of its own interstitial nature? How can art relate to contingency as it appears in the knowledge of an unstable universe and hyper-chaos?

The four questions above have given structure to my project and evolved with my journey through the material I have been exposed to in a physical, digital, and cerebral sense. I set a challenge for myself to continue to be relevant in the work I make and to build a vocabulary around that. My methodology blends popular culture with the disciplines of art, neuroscience, computation, digital media, electronic engineering, philosophy, critical theory, and environmental science. It is through the layering of the questions raised in each of these areas and by looking at research coming from these increasingly interrelated disciplines, that I have found a clear vision of how I see my role as an artist and a thinking agent in the world who is concerned with the current moment and the connection between personal and global survival.

One unifying element of the research and sources for the work under consideration here is the planet Earth because I am interested in how we interface with it; with its space and its environment. I am approaching the brain as subject matter through our ability to navigate around in the space provided to us by our planet. Each brain is a unique interface with the Earth, operating in conjunction with an individual set of senses that send it coded messages. One of the ways I have found to respond to the digital turn and the environmental crisis in the work under

consideration here attempts to reconcile the individual with the general. We all share the Earth and rely on it for life but each of us approaches it independently and in my video and drawings I locate myself here as an agent.

In my artwork I wanted to create a relationship between the Earth's geography and that of the neurons in the brain. This has been amplified by my readings in recent philosophy and critical theory that has to do with reconciling humans and objects with our physical environment here on planet Earth. In trying to trace the development of the materialist, and object-oriented thought that is beginning to describe our position in relation to the Earth and its environment, I stumbled onto the concept of "hyperobjects". These are unimaginably huge entities that exist over vast amounts of space and can stretch across thousands of years.

My discovery of this idea inspired the urge to dig deeper into the physical realm by looking at objects that exist on their own terms and in a relationship to the environment. This physical engagement is reflected in the conceptual devices I have employed for generating form. My sculpture-making process proceeds repetitively by marking the individual instance in time using a connective method of fabrication. An index is presented in the work I have done as a temporal interface in space that contains information as a trace of my activity.

In *Hexagraphy*, a sculpture and animated LED work and one of the central pieces in my dissertation exhibition, I have made a device that is an interface for computer code. As a structure for that interface I attempted to produce physical versions of time so that the material unfolding of the work contains a capacity to signify time. In this project I discovered a way to proceed

through time by making sculpture in such a way as to create a spontaneous workflow and I felt this process gave me an analog for a basic form of organic becoming. It is a way to allow the work to unfold organically in a contingent chain of activity that marks time and space. In this process through repetition of difference I mean to infer an endlessness. Contingency is the principle by which the whole thing is organized which is another way of looking at cause and effect. I am working in a way that presents the example of growth, found in organic life, in order to present a non-teleological model of emergence. I am adopting processes where the work grows from the bottom up. It comes into being by replicating differences as a way to represent some aspects of the billions of organic cells that accumulate and congeal into form that operates on a cycle bookmarked by birth and death.

I have used this material process as a method to generate form that physically creates the scaffolding of my work. This is my way of demonstrating how a material-based practice such as sculpture can speak in the terms needed to suggest contingency to begin to signify the fragility of life on Earth. I am looking for ways in my work to show the planet Earth was not somehow “given” *for us*. It is my feeling that in order to be able to stop extinction humans need to accept the harsh reality of our interstitial being that exists contingently as a result of conditions on Earth that we have evolved with over time.

The work included in my exhibition *Apropos Obsolescence* stems from a strong desire to direct our attention to the planet's environment. I sought to do this by creating an exhibition that merges a vision of the brain with ideas about the human relationship to the Earth. I used three material strategies to make the work for the show: sculpture, drawing and video.

- *Hexagraphy*, the main sculpture, with its form that signifies terrain like a landscape, functions as a backlit screen. It is a digital array of light emitting diodes that are housed in hexagonally shaped cells to symbolize neurons activated by microprocessors loaded with code.
- The *Wind Algorithm* drawings are done using a set of parameters taken from weather data visualization software in order to record a series of lines found on weather maps onto a sheet of paper.

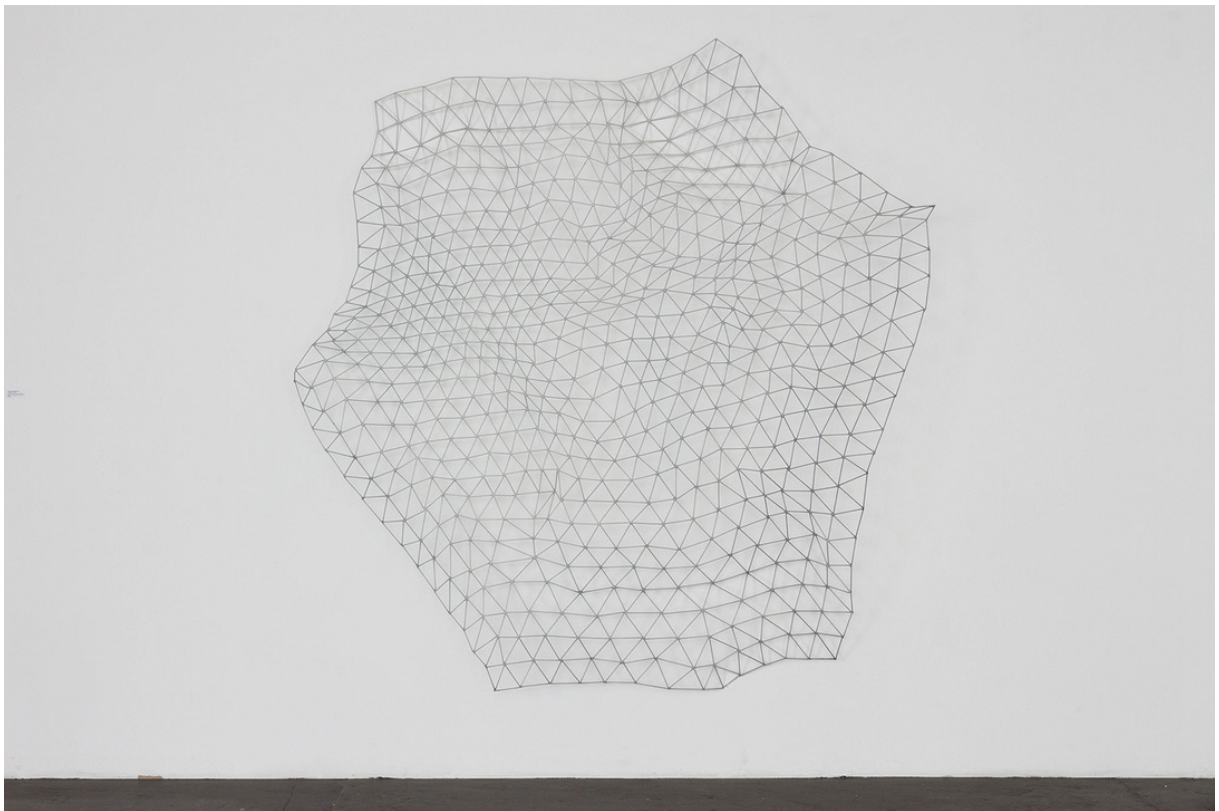


Figure 2. *Triangular Matrix*, 2015. Powder-coated steel, 228.6 x 190.5 cm.

The limited number of lines I record from the weather mapping software indicate wind direction and speed and I use them as a guide in completing the drawings by following their lead with each consecutive line. I explore the various filters found on the website's

menu that contain colour-based gauges that record elements of the environment like relative Humidity (RH) or carbon dioxide levels (CO2).

- *A Year of the Air I Breathe*, is a video I made by taking a series of screen shots of the same weather data visualization website showing carbon dioxide levels where I live on a daily basis ongoing since 05/17/17. This video is concerned with making the carbon dioxide gas visible as it exists in my environment and in fact shows it steadily increasing and moving around in space.



Figure 3. *Wind Algorithm 4*, 2017. Ink on paper, 77 x 111.5 cm.



Figure 4. *A Year in the Air I Breathe*, 2018. Video, 3:43 minutes.

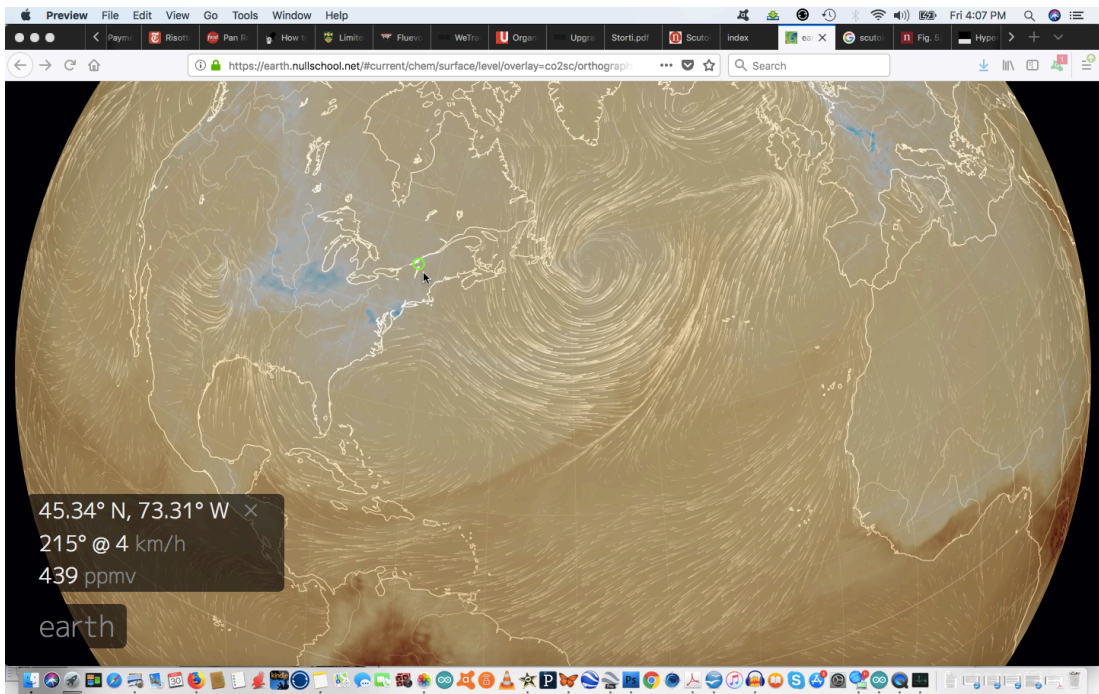


Figure 5. *A Month of the Air I Breathe*, 2018. Detail. Inkjet print, 33 x 48 cm.

The word *apropos* used here as part of the title of this exhibition means both “regarding” and “relevant to” obsolescence. In this work I am considering obsolescence in relation to the technological situation we are in at this time in the world. In fact, the electronic parts I use are already obsolete in the marketplace by the time I obtain them because digital image resolution continues to become clearer and new screen technologies are quickly developed with the older parts then becoming less proprietary and more widely available. By making a technologically obsolete object like this I wanted to see what meaning emerges through that aspect of the object's mode of existence. I sought to demonstrate form through material practices rather than using a more illustrative model of something with predefined meaning. The material practice I was interested in for creating the structure of the sculpture *Hexagraphy* uses an open system with less constraint and demonstrates the difference between closed and open systems where open systems lead to greater formal heterogeneity (growth) and closed systems greater homogeneity and stasis.

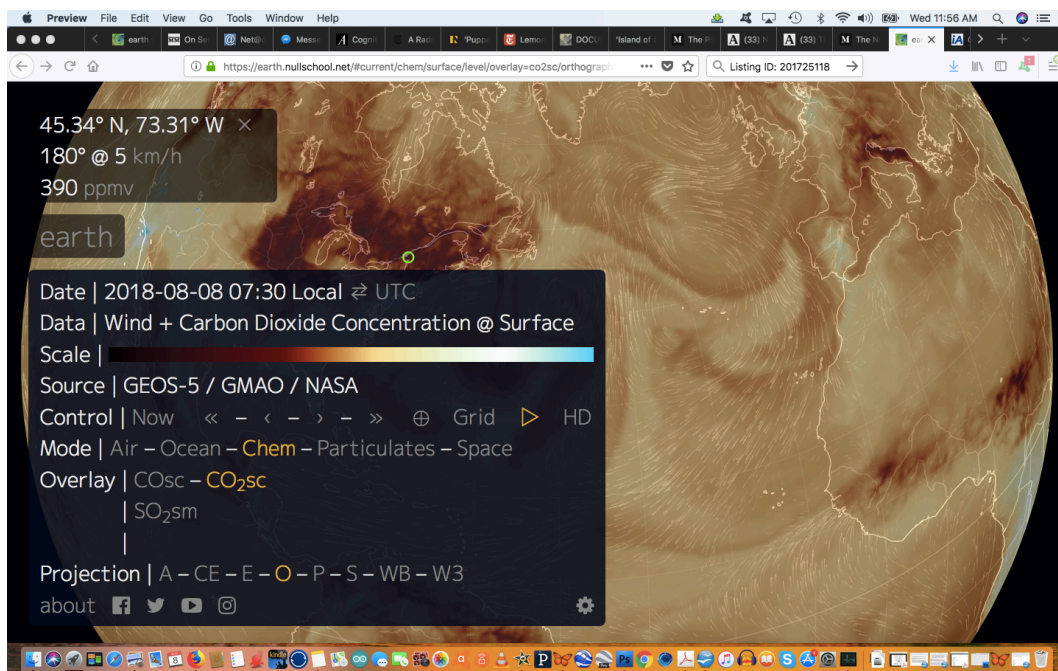


Figure 6. *A Month of the Air I Breathe*, 2018. Detail. Inkjet print, 33 x 48 cm.

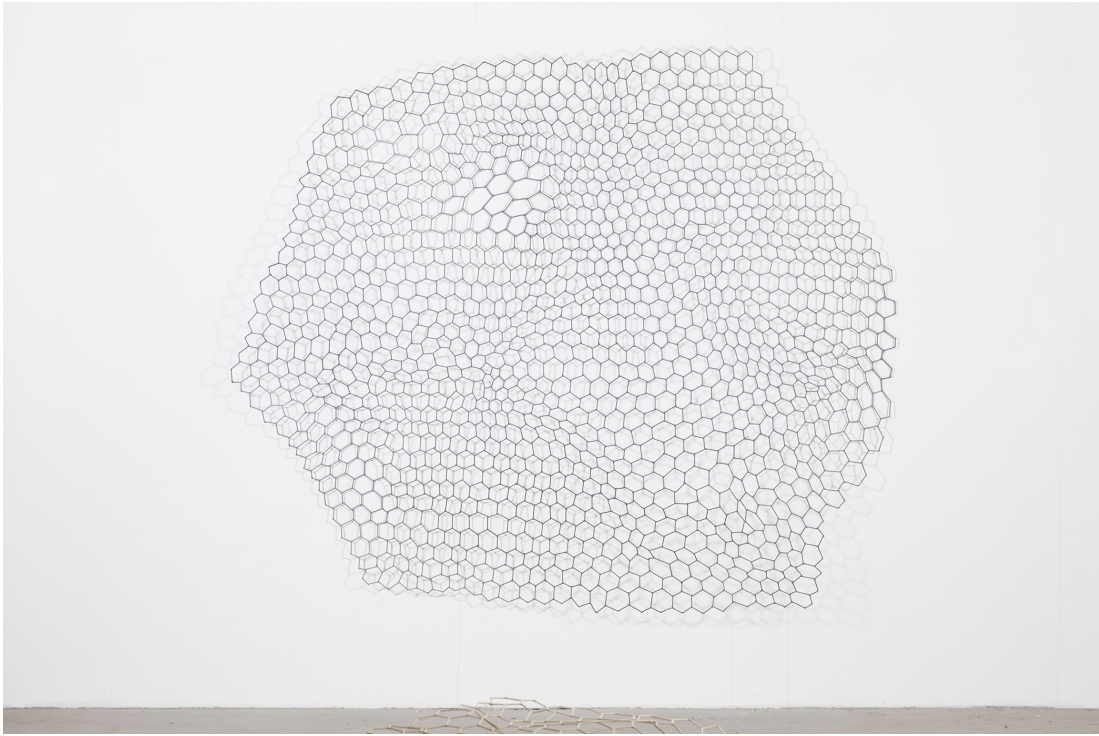


Figure 7. *Deviant Grid*, 2015. Powder-coated steel, 180.5 x 221 cm.

It was an analog version of an array of neurons that I wanted to make and to do it I used LEDs. I made a provisional backlit screen with pixels that each measure approximately 7 x 7 centimeters. The assemblage of these pixels turned them into a physical object that counters the move toward a high-resolution image with invisible pixels. By suspending the screen horizontally in the position of a landscape its terrain-like characteristic is emphasized in order to recall the planet Earth. Finally, in this exhibition, I have coded *Hexagraphy* to mimic waves of water in order to bring narrative into the work. I wanted to use a myth that included an element of nature that could be processed through the backlit screen and I chose the myth of Narcissus as apropos to our situation in relation to the object I have created and its ability to be mesmerizing.

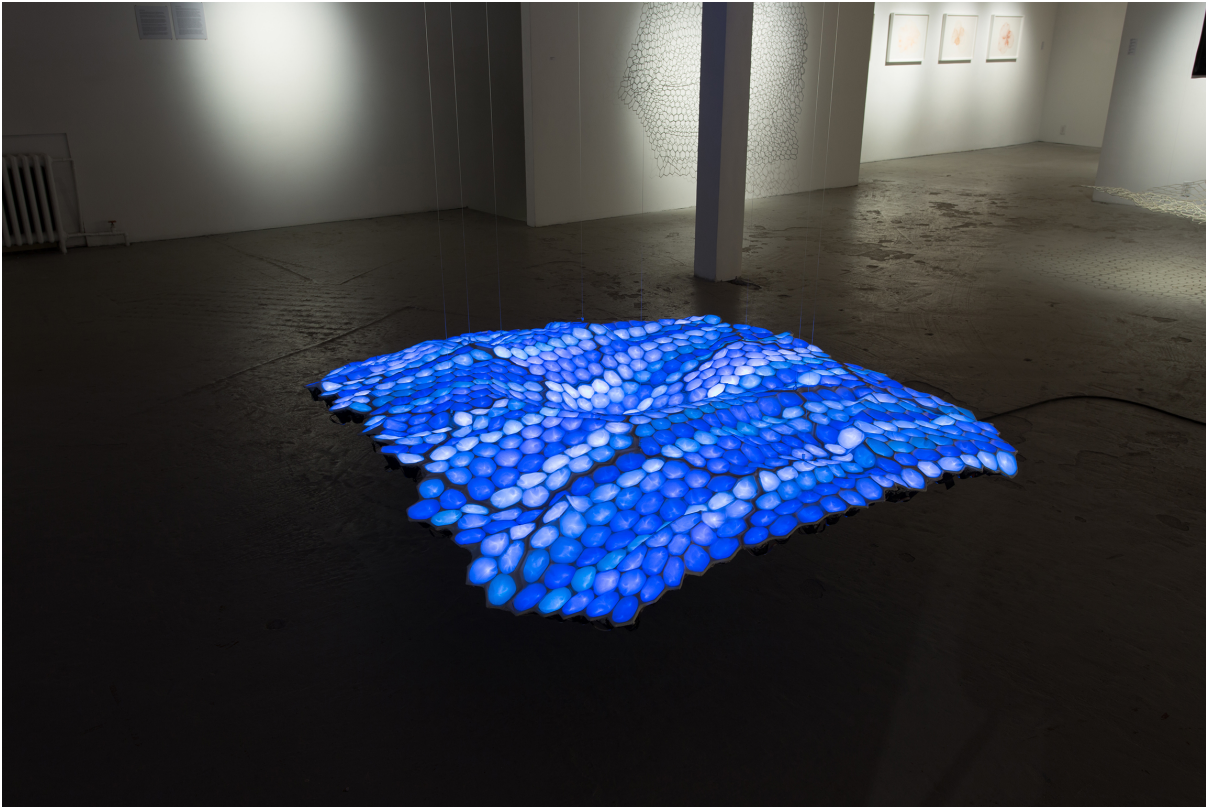


Figure 8. *Hexagraphy*, screen, 2018. Mixed media, 190 x 152 x 28 cm.

In this text I use the example of *Star Trek* as a lens for looking at the development of electronic technology requiring a consumer revolution for its proliferation. I have called upon *Star Trek* as a television show that parallels the “digital renaissance” from the sixties through the eighties and now well into the twenty-first century. This storied franchise is still churning out narrative to help us understand the re-positioning data digitization enacts. Our expectations for technology were set by popular culture through *Star Trek* and shows like it. Is it a surprise that the smartphones we all carry around now recall the imaginary devices shown on *Deep Space Nine*?

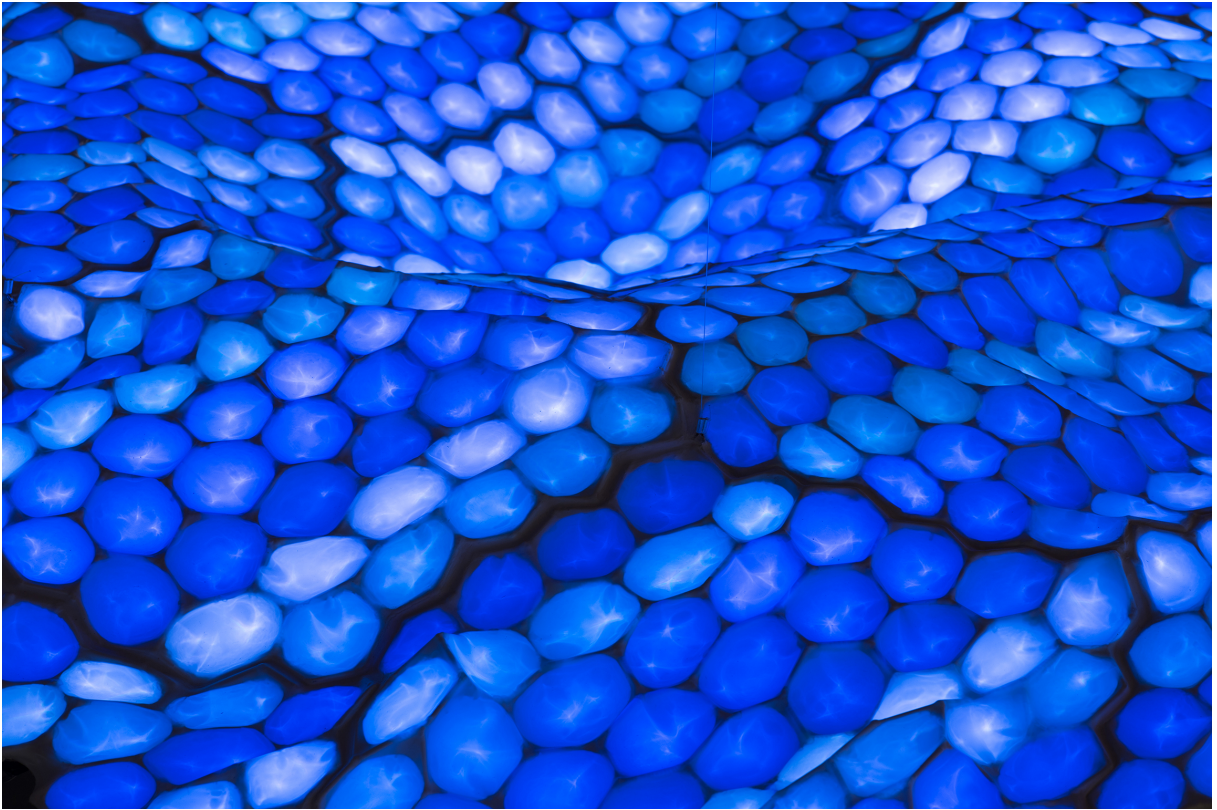


Figure 9. *Hexagraphy*, screen 2018. Detail. Mixed media, 190 x 152 x 28.

It seems to me that a material practice holds more relevance now because through it I am able to use an emergent process so that a material's characteristics (hardness, straightness, thinness, the ability to be cut and reconnected) are combined with a process (welding/drawing) and are responsible for how the work comes into being. The synergy between this process and my brain holds value to me because the brain can actually generate a real randomness. That is, an irregular repetition not a repeated similarity. I am intrigued by the relationship of the brain to the format of a computer interface and the screen's relationship to data as a way of reflecting upon the brain's interface with the world.

With that interface we are brought back to the planet Earth or some other part of the

universe, which is where our data comes from. The changes in society wrought by the digitization of information are ubiquitous. I attempt herein to describe how computation is giving us more objective views of our home planet, by controlling apparatuses that extend far beyond the reach of our senses. The massive amounts of scientific data we are gathering is generating new philosophy that examines objects and I am using that as a guide in developing ways of thinking and building a language about the artwork I am making. I am positioning my text to see my artwork through all of the processes involved in its creation. I am trying to establish a place for myself in the digital future by using my computer as a tool as opposed to it using me as a tool. The digital renaissance has left humans in a precarious position as it positions us as responsible for the destruction of the environment.



Figure 10. *Hexagraphy, grid*, 2018. Powder-coated steel, 190 x 152 x 28 cm.

I HEXAGRAPHICS

As a way of thinking about the emergent forms necessary for the project at hand I started out by constructing grids using decentered hexagons and triangles through welding together segments of steel rod. These structures I then used to create the vacuum-formed polystyrene skin that diffuses the light for an undulating array of hexagonal cells that each contain a light emitting diode (LED). In this manner I intend to visualize the cells in the brain that fire as we navigate our bodies in space. I have been studying the cellular structure of living organisms and the geometric elements that create their form. Recently described scutoids are the cellular components of organic form pictured in the illustration below.¹

From: [Scutoids are a geometrical solution to three-dimensional packing of epithelia](#)

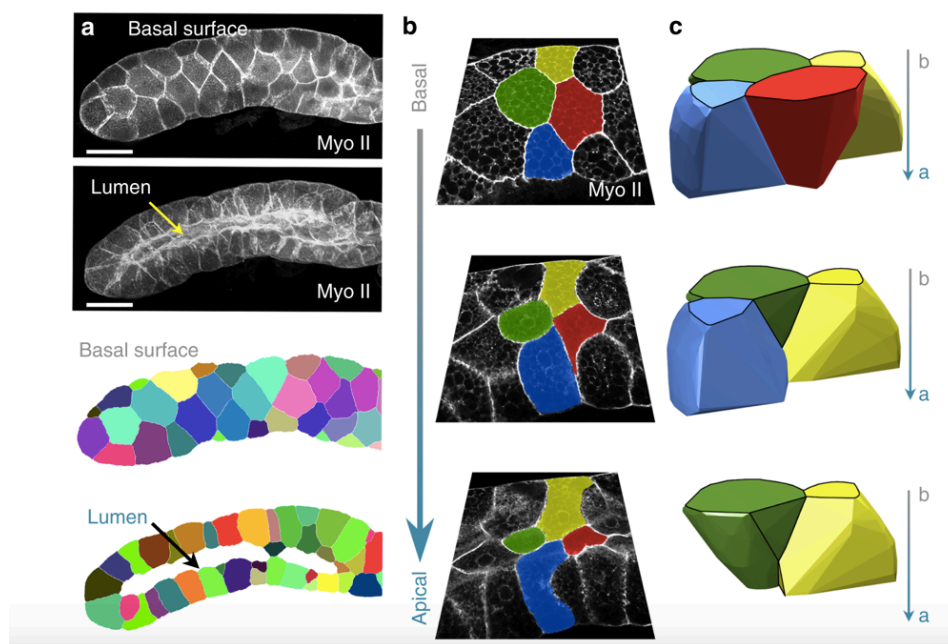


Figure 11. Scutoid shaped epithelial cells²

¹ Gomez-Galvez, Pedro; Vicente-Munuera, Pablo; Tagua, Antonio; et al. "Scutoids are a Geometrical Solution to Three-dimensional Packing of Epithelia." *Nature Communications* 9, Article number: 2960 (2018).

² Loc. Cit.

These are cells that include intercalations as a means of describing a curved shape. Natural cells do not occur in flat planes and I wanted to describe cells in the brain. At the same time, I was looking at the brain as our interface with the Earth and comparing it to a computer screen that is an interface with data. Part of the methodology of my sculptural device *Hexagraphy* is to use RGB LEDs as an analog for chemically triggered neurons. This was the result of searching for ways to visualize neurons that would also signify the neurochemistry moving around in the brain as a correlate of the electrical activity that causes the 0s and 1s to physically move around as information. Energy pushed around by switches that communicate with each other through binary code animates the lights in my sculpture turning them on and off and tuning them to any of 256 colour frequencies.

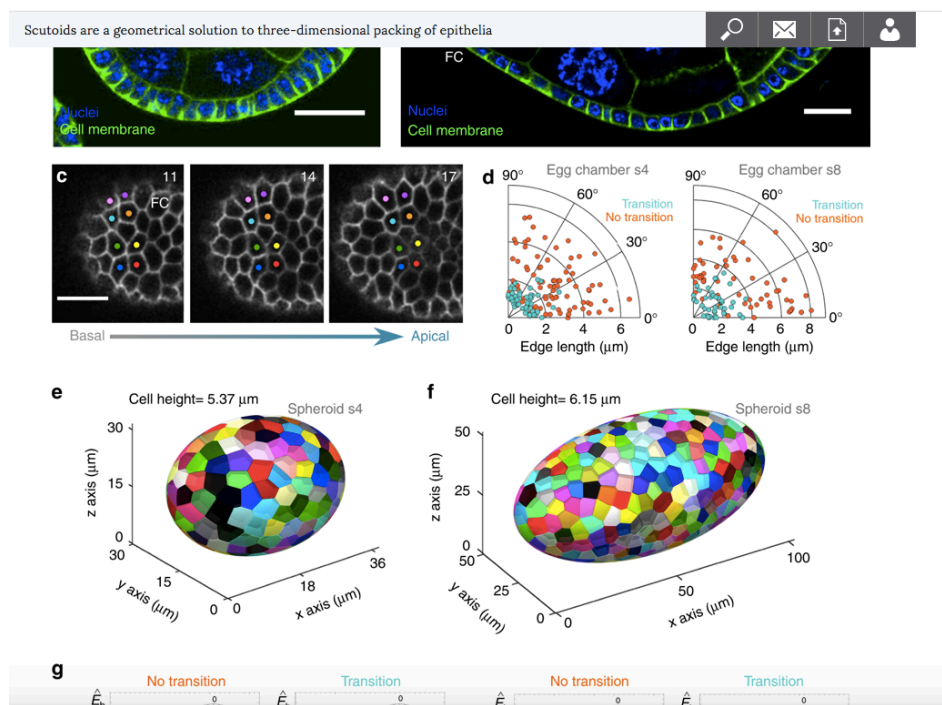


Figure 12. Scutoid shaped epithelial cells³.

³ Loc. Cit.



Figure 13. *Hexagraphy* in progress bottom.

Mapping is a practice found within the study of the Earth, the activity in the brain, and in computer circuits used for controlling grids of data. Maps are like diagrams and often involve precise measurements. In the maps I have been making however, precision gets lost through a process such as drawing triangles or topological lines used for completing the task by my hand. By translating the source data into material equivalences, I am building a language for my work to communicate using mapping which is a language developed to describe objects.

In my exhibition *Apropos Obsolescence*, I intend the central artwork, *Hexagraphy*, as a map of a small section of 814 neurons. In order to realize this goal, I used an array of lights to

mimic electro-chemical neural activity. The form the sculpture inhabits is a map of a series of

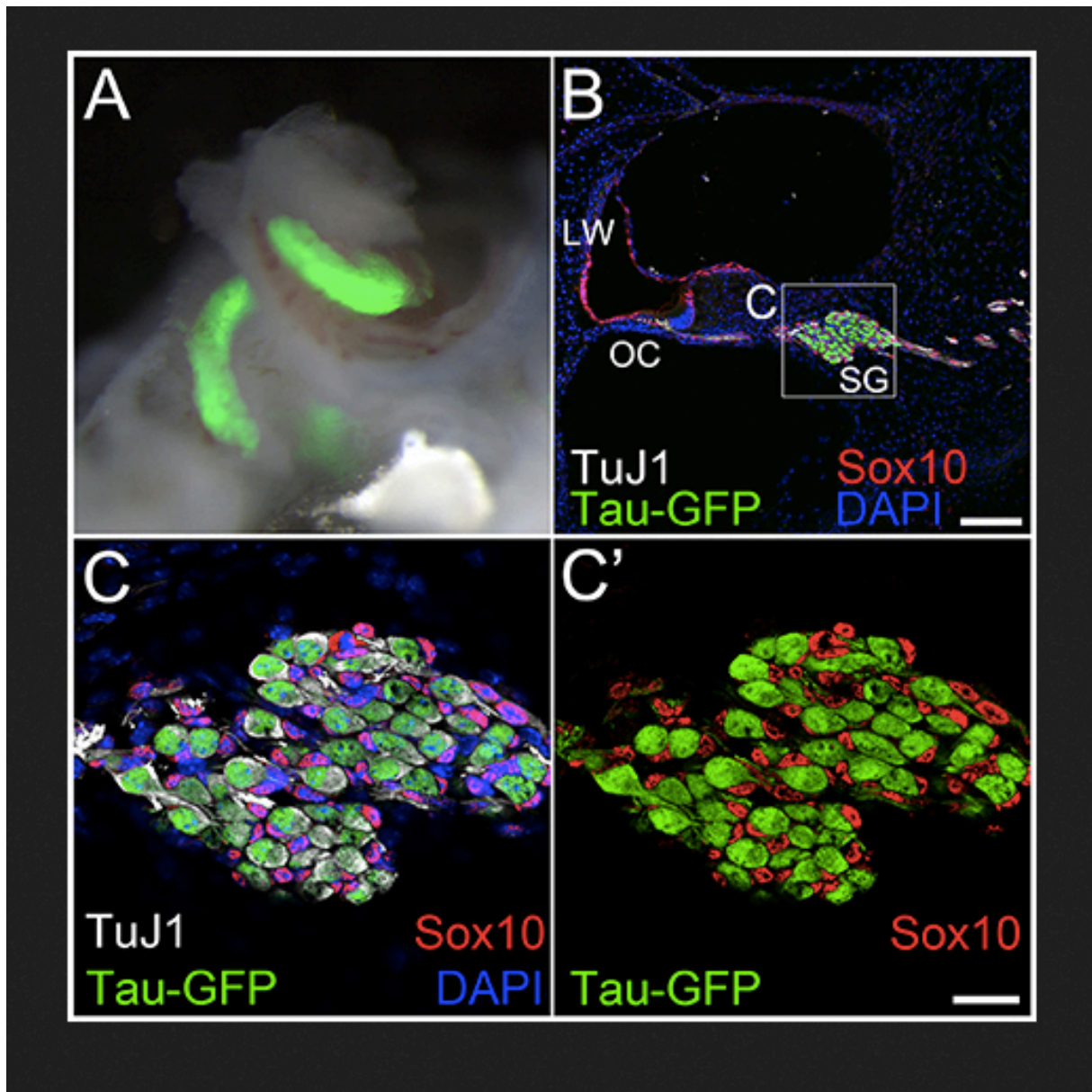


Figure 14. Spiral ganglion SG neurons pictured above in magnification also provide some clarity about how neurons are arranged in the Ear suggested a format for the array of LEDs I was making.

actions in time. Frequency based colour in the LEDs makes a symbolic map of neurochemicals

and the screen essentially maps the code that is running through it. The data transmitting through the device is changeable unlike the physical form of the work which is set. I am using electrical activity tuned to colour frequencies to light pixels and mimic the brain's activity when chemicals move around through neurons. I want to suggest the brain's relationship to both space and technology in proposing a radically altered field of neurons as a backlit screen. To create a relationship to the Earth the work is horizontal and thereby turned into a landscape.

This “neurochemical screen” was inspired by the research of scientists who were looking at how the brain behaves as we move through space. They discovered groups of neurons firing in hexagonal grids, creating rudimentary maps of the space we are in. Operating in the hippocampus these spatially activated grids of neurons made me think about sculpture in the terms I've tried to show by making *Hexagraphy's* backlit screen. It got its name because it presents a geography of decentered hexagons. The sculpture is horizontal and floats in space above the floor creating a horizon line of its own. It operates as a device informed by my reading of current philosophical thought accounting for objects that have agency that I will explore in this text.

The very notion of representation and how it is accomplished and what is being represented have always been key questions in my art-making process. In *Hexagraphy* representation is divided into three acts:

1. As a series of actions in time, it records that time and represents the contingent process of its formal creation; it is a mathematically ontological form.
2. It is an array of lights that has been merged with a symbolic field of neurons because of a shared hexagonally based cellular geometry. The hexagonal matrix mimics both shapes of

carbon atoms and cellular grids in the brain. Multiplied into a grid format the

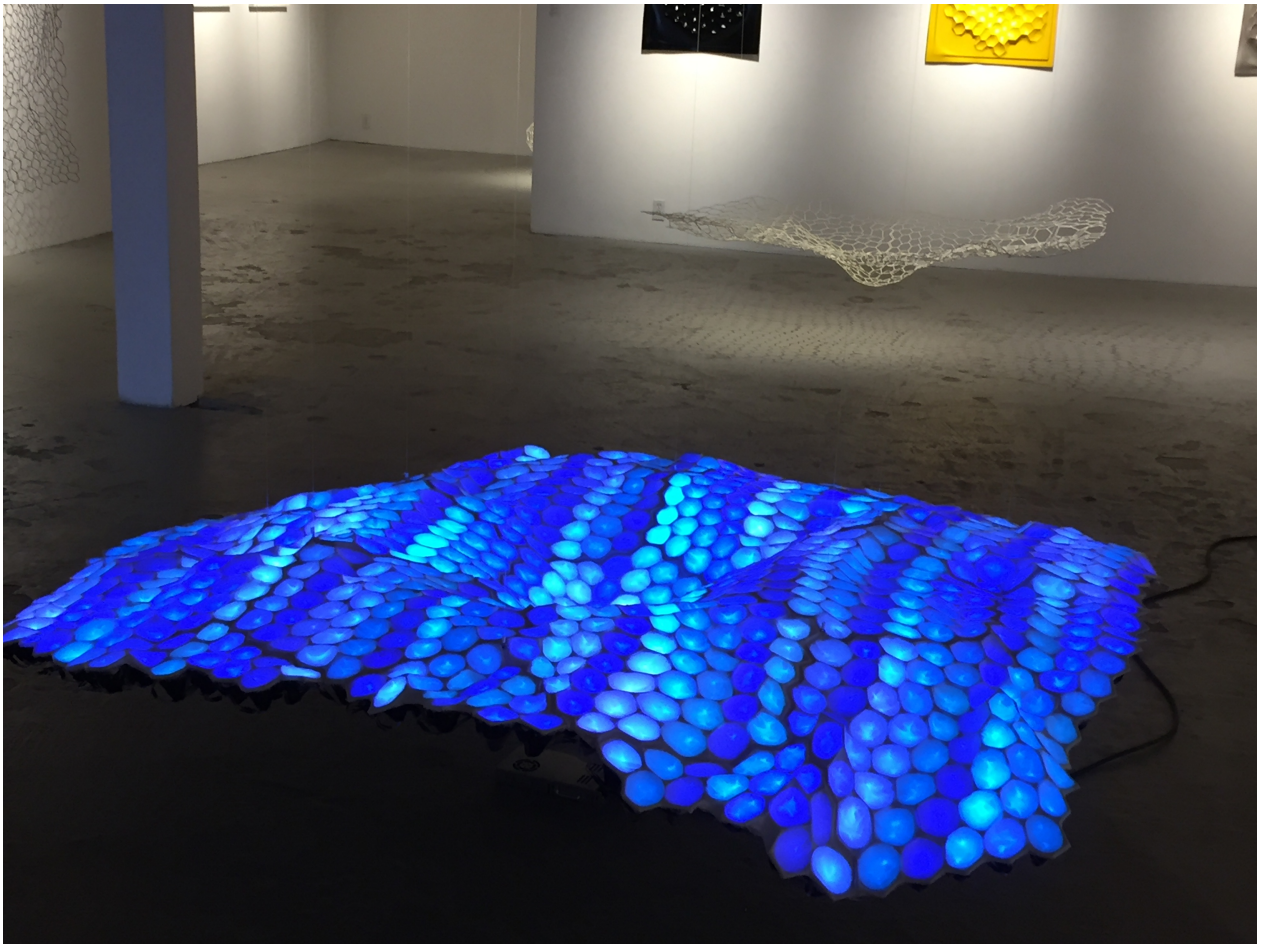


Figure 15. *Hexagraphy*, diptych, 2018. Mixed media, 2 @ 190 x 152 x 28 cm.

hexagon becomes a component of media that is analogous with a neural field.

3. Because light is the original “pure” media⁴ the idea of media itself is suggested by the oversized pixels in this exaggerated screen.

⁴ “The electric light is pure information. It is a medium without a message, as it were, unless it is used to spell out some verbal ad or name. This fact, characteristic of all media, means that the “content” of any medium is always another medium...whether the light is being used for brain surgery or baseball is a matter of indifference. It could be argued that these activities are in some way the content of the electric light. ...because it is the medium that shapes and controls the scale and form of human association and action.” Marshall McLuhan, *Understanding Media*. Boston: MIT Press. P. 8.

I set fabrication challenges for myself in this work that are a means of expressing the notion of contingency. Matter, in the form of a technological device, is exaggerated by this artwork and function is problematized by scale. Short randomly sized lengths of steel rod are welded into grids that are matrices and therefore have become structural elements. Thin thermoplastic sheet is vacuum-formed over the steel and the resulting indices create the form of the rudimentary LED screen I have made. The assembled plastic panels embody the screen's structure as well as diffusing the light of the LEDs. Each cell in the grid is a separate pixel and backed with a cone that is lined with reflective plastic film. I am embedding extra-human agency into this screen object by using a microprocessor and electricity to control the lights. Driven by code the object is a *device*. Coded objects using energy of some kind have the prospect of agency. In *Hexagraphy* the potential is for broadcasting a vague message. The code used in the exhibition *Apropos Obsolescence* makes the animation of the pixels reminiscent of lapping waves of water.

With *Hexagraphy* the process I engaged is one that relies on connecting with a material through a consistent and repetitive technique. The similar but not identical lengths of randomly cut steel rod being used allow contingency to become a factor in the result. I have no way of determining in advance what form will emerge. This method lends a topographic geography to the pixels. This work, like many other works I have done, is also organized into components. In this case I needed an assemblage that could be broken apart in order to facilitate the fabrication process because the vacuum forming machine was limited to two feet square.

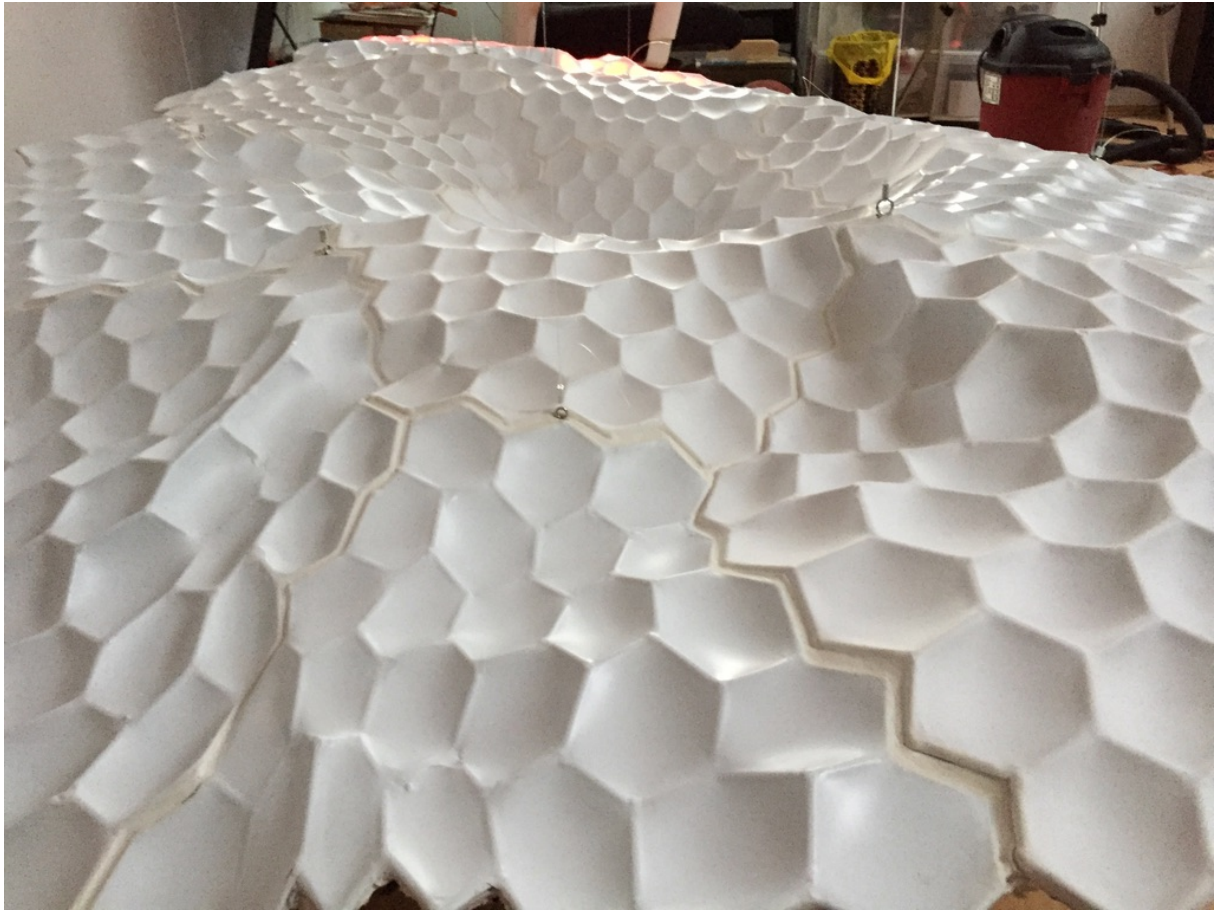


Figure 16. *Hexagraphy*, screen, 2018. In process.

Assemblages

In order to make sense of the material world I often notice assemblages and sets of things. My attention to this is the result of the influence of Montessori teaching that I received from my mother, who was using that method in her preschool when I was very young. Maria Montessori was a student of Rudolf Steiner⁵ who was an Austrian scientist and spiritualist interested in biodynamics and founder of both Anthroposophy and the Waldorf Schools. Montessori wrote

⁵ Steiner, Rudolph. *The Philosophy of Freedom: A Modern Philosophy of Life Developed by Scientific Methods*. Trans. Hoernle and Hoernle, ed. Harry Collison, G.P. Putnam and Sons, London, 1916.

The Montessori Method,⁶ a book where she set out some principles for a form of preschool education also named after her. The method she developed uses well-made tools for teaching math based in geometry, colour and set theory. I remember many of these apparatuses well. The central principle is to inspire spontaneous creativity in the child by having a “prepared environment” where materials are set out in an orderly fashion that exemplify various characteristics of form and colour so that the children themselves can discover how they might be used. There were many tools for teaching mathematical principles, such as a solid cube made from colour-coded glass beads held together on stiff wire to illustrate multiplication. Sets of lozenge-like items were available for colour matching with many shades and tints to arrange in gradients. A lot of the work I have done might indicate that my interest in art and sculpture was born at that time, when I was three years old. *Hexagraphy* seems to me to be a direct result of those early experiences channeled through my current practice where I have returned to the basic elements of geometry and colour.

⁶ Montessori, Maria. *The Advanced Montessori Method, Vol. I: Spontaneous Activity in Education; Vol. II: The Montessori Elementary Material*. English edition (1917). My mother, Sue Wolstenholme, eventually opened her own preschool in Moncton NB and subsequently during the 1970s she was consequential in creating affordable public and certified childcare options in Nova Scotia.

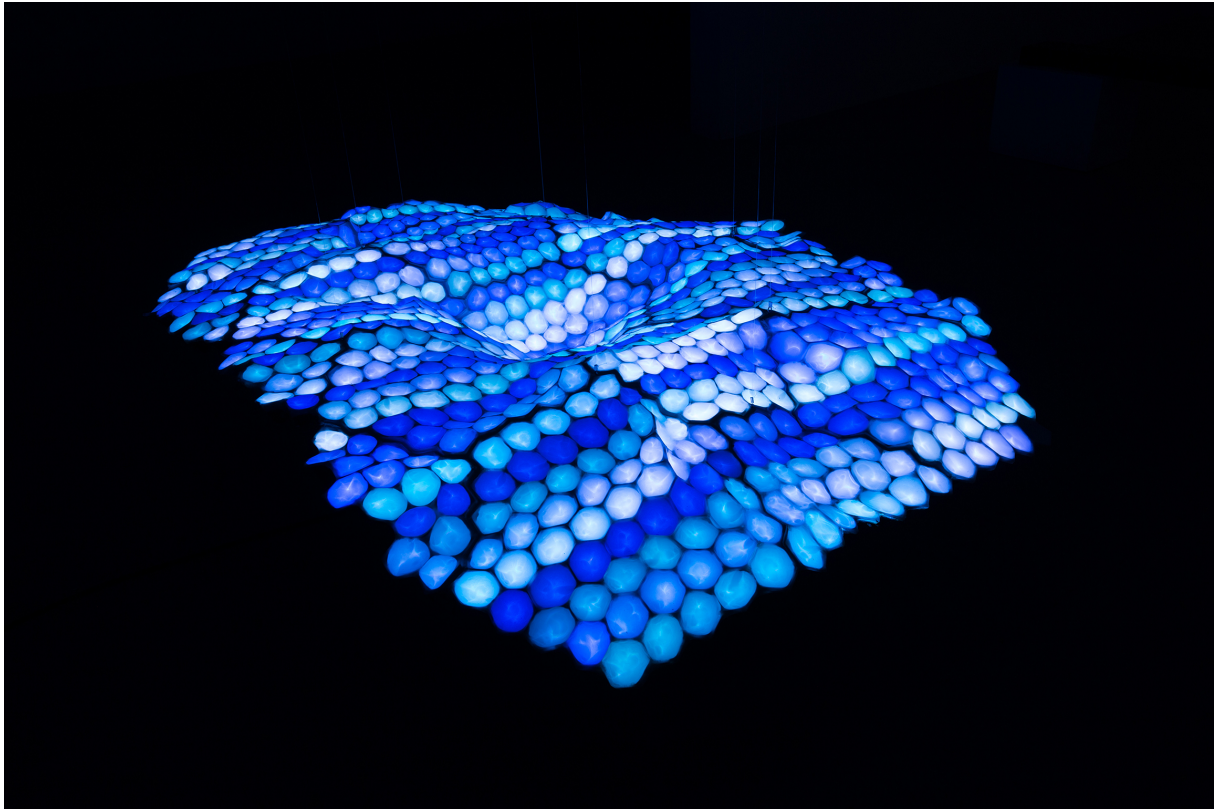


Figure 17. *Hexagraphy*, screen, 2018. Mixed media. 190 x 152 x 28 cm.

Assemblage Theory is a book written by polymath artist, filmmaker, architect, and philosopher Manuel DeLanda, who is also interested in biodynamics. He approaches space and the stuff in it from a materialist perspective not unrelated to systems theory. Assemblage theory too is concerned with how groups of things interact. While the former is based in speculative mathematics, the latter is theoretical and grows from a Deleuzian concept of assemblage defined in the quote below:

We will call an assemblage every constellation of singularities and traits deduced from the flow – selected, organized, stratified – in such a way as to converge ... artificially or

naturally. An assemblage is, in this sense, a veritable invention.⁷

Another of Manuel DeLanda's guides is Fernand Braudel, a materialist historian whose writings include a trio of books examining medieval life in painstaking detail all around the world.⁸ For DeLanda, Braudel is important in building a base for critical thinking about modular theory because of the way he organizes the information he relates to us into sets of various kinds possessing specific attributes. For instance, he considers currency, as it existed during a specific timespan from the standpoint of several different societies. He gives the same treatment to the way houses were built in different parts of the world, or what types of foods were eaten and what clothes were worn by whom. In his historical reportage, Braudel divides civilization into sets and DeLanda reminds us that these are components coming together to form assemblages such as towns and cities. A lot of human behaviour on the planet is concerned with the organization of space as required for our daily existence which is endemic to our survival. We need spaces to live, work, worship, heal, learn, and spaces to be sick and die in.

From physical space to mental space and media space - the space of the interface, examining our conceptions of space might help us to notice they are marked by the tendency to see things reductively. In this way seeing space as “a container homologous with whatever it contains.”⁹ But scientists have again and again suggested that space is not empty and is in fact

⁷ Deleuze, Gilles; Guattari, Felix. *A Thousand Plateaus*. Minneapolis, University of Minnesota Press, 1987: 406. (as quoted in Manuel DeLanda's *Assemblage Theory*. Edinburgh, (2016: 79.)

⁸ Braudel, Fernand. *The Perspective of The World* (New York: Harper and Row, 1986); *The Structures of Everyday Life* (Berkeley: University of California Press, 1992); *The Wheels of Commerce* (New York: Harper and Row, 1982).

⁹ Lefebvre, Henri. *The Production of Space*, Blackwell Publishing: English Translation Donald Nicholson-Smith (1991). P.136.

composed of a field of subatomic particles that pervade everything. I am thinking about fields that are invisible to the naked eye, but that provide a matrix in the brain where electrically charged ions operate in our cells.

In *Hexagraphy* I am using a non-deterministic geometry to instantiate space. The unstructured grids I am making reflect a paradigm for understanding space and proffer a counterpoint to deterministic symmetrical computer models. I am interested in a surface that is arbitrarily asymmetrical, a random rendition of space to suggest a neural field. I decided to generate this field using a process to manufacture it that instantiated contingency because I hoped to create forms that might also better reference the Earth's arbitrarily bumpy geography.

A 2011 article published by scientists in the journal *Nature* claiming we are witnessing *the sixth mass extinction* on the planet emphasized our very contingent situation here on Earth as biological beings. Concern was expressed because the speed at which we are losing species is faster than any other time period that the fossil record supports. Another recent (2017) article in the *New York Times* claims that 60% of Earth's primate species are on the verge of extinction because of increased mining, hunting and loss of habitat through questionable¹⁰ agricultural practices.¹¹

¹⁰ The World Health Organization recently released a study the results of which indicated that if humans continue to use the current farming and agricultural stewardship methods in place now there is only sixty years of growing seasons left until the soil is entirely depleted. This is in large part to do with toxicity levels caused by chemical farming practices including aggressive GMO seed; Round Up and Round Up ready seed Monsanto's gift to the world; Carbon footprints of transportation methods for food; the list goes on.

¹¹ "Has the Earth's sixth mass extinction already arrived?" Anthony D. Barnosky; Nicolas Matzke; Susumu Tomiya; Guinevere O. U. Wogan; Brian Swartz; Tiago B. Quental; Charles Marshall; Jenny L. McGuire; Emily L.

In January (2016) the journal *Science* published an article in which researchers confirm suspicions around how human activity on the planet is consequently impacting Earth's geology. No longer simply speculation, the authors of the groundbreaking study weigh in on the debate over just when the Anthropocene¹² actually began. The suggestions range from the onset of agriculture in the Neolithic era creating increased methane and carbon dioxide; the global exchange of species created by colonization of the Americas; the coal powered industrial revolution; up to the post nuclear radionuclide spiked era peaking in 1964.¹³ Black carbon, plastic molecules and other synthetic materials that humans have been manufacturing and disseminating around the globe have been depositing in the layers of the planet's geological record. The Anthropocene is following on the heels of the Holocene and is named for the appearance of the mark of humans on the geology of planet Earth.

It is becoming more and more obvious that in addition to impacting the geology of our planet the activities we are engaging in are having an extreme effect on the atmosphere of the Earth. In this way we are changing the elements that generate the environmental elements that we

Lindsey; Kaitlin C. Macguire; Ben Mersey; Elizabeth A. Ferrer. *Nature*: Vol. 471, 3 March 2011.

<https://www.nytimes.com/2017/01/18/science/almost-two-thirds-of-primate-species-near-extinction-scientists-find.html?contentCollection=weekendreads&action=click&pgtype=Homepage&clickSource=story-heading&module=c-column-middle-span-region®ion=c-column-middle-span-region&WT.nav=c-column-middle-span-region>

¹² Waters, Colin N.; Zalasiewicz Jan; Summerhayes, Colin; et al. "The Anthropocene is Functionally and Stratigraphically distinct from the Holocene", *Science*, Vol 351 Issue 6269 (8 January 2016) : p. 2622-1

¹³ Loc. Cit. P 2622-5

Since the explosion of the first atomic bomb the atmosphere of the planet has been seeded with excess carbon 14 a naturally occurring isotope and plutonium 239 a rare isotope in nature both accruing as a layer of the Earth's crust. Many experts consider that the "most widespread and globally synchronous anthropogenic signal is the fallout from nuclear weapons testing."

experience as weather. In conjunction with the discovery of climate factors like El Nino we have become aware of objects operating around us that can make our lives miserable. Extreme weather events can destroy human habitat and the fact that they are caused by man-made global warming is impossible to deny today. These immense objects that we are immersed within have been referred to as hyperobjects.¹⁴



Figure 18. *A Month of the Air I Breathe*, 2018. Inkjet on paper, each print is 33 x 48 cm.

Hyperobjects exist over vast amounts of space and time and include the huge entities we humans are surrounded by on planet Earth that are generated by physical forces. These enormous objects are assemblies, made up of components acting together, a confluence of agency phased

¹⁴ Morton, Timothy. *Hyperobjects: Philosophy and Ecology after the End of the World*. University of Minnesota Press, 2013.

over long stretches of time. As a way of signifying hyperobjectivity, I collected a daily record of the CO2 measurement where I live for over a year and turned this data into an animated visualization. I used carbon dioxide in this work because it is a component of climate change, a hyperobject operating in and around the Earth in which we are immersed.

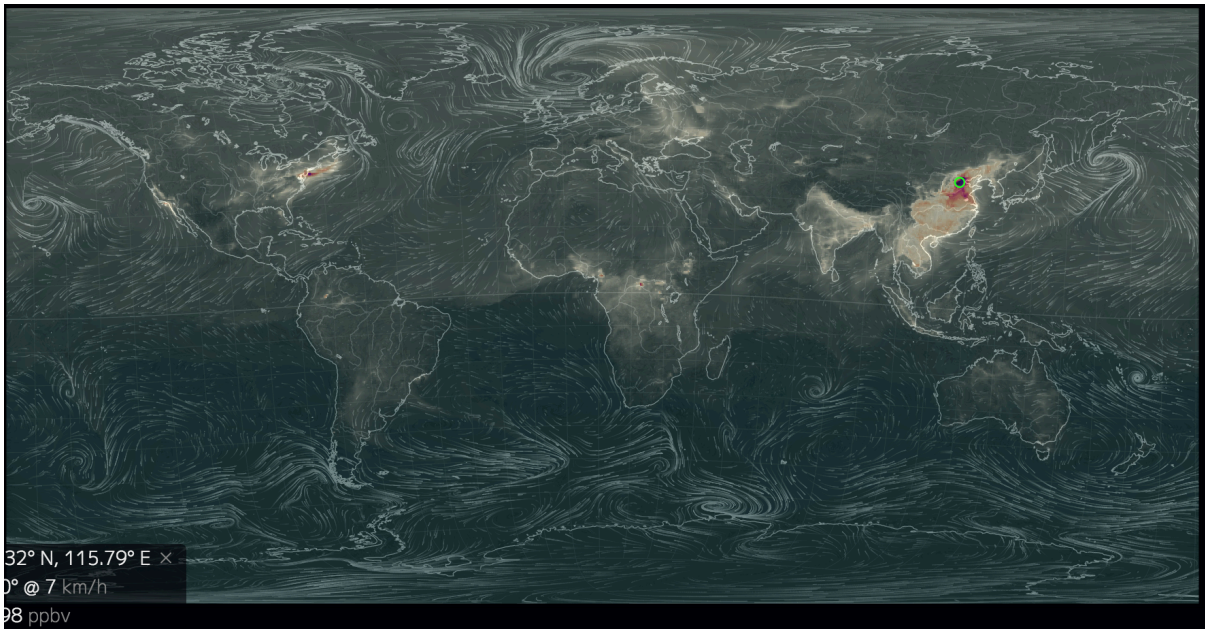


Figure 19. Carbon monoxide readings mapped and displayed by software at earth.nullschool.net

Objects are examples of continuous form as it exists in whatever medium is involved, including atmospheric forces. Larger objects can always be broken down into smaller and smaller parts giving some people cause to consider whether anything actually exists at all. From a Buddhist perspective, in absolute reality there is only primordial emptiness.

Here on the relative plane, three tiny objects are creating fundamental and disruptive shifts in civilization by helping us to understand the physical world on planet Earth and they are:

the atom, the byte and the gene. The atom gave us the disruption of the atomic bomb and the byte; the byte gave us the gene and has created the *digital renaissance* and completely upended manufacturing and other sectors of the world's economy; the gene has changed everything we thought we knew about humanity. These tiny objects are units of matter that are connected and have become irreplaceable gauges that have changed the ways we measure things. They are all contributing to new sets of relationships governing how we live in and assess the world. These gauges frame reality through their inherent characteristics. The atom itself has been split into smaller parts, quarks that are themselves now under assault. In a well-funded effort to smash these particles apart, physicists are hoping to find the so-called "god-particle" or Higgs Boson¹⁵, the existence of which would shed light on dark matter and formlessness.

Indices

As a way of looking at atoms that can help us learn more about the meteorological history of Earth scientists have been removing thin columns of ice that is thousands of years old. Examination of the cores of ice harvested by drilling down hundreds of feet deep into glaciers in Antarctica, Greenland, and other ice sheets is helping researchers to discover weather patterns and other information about the past. By looking at sediment and organisms trapped in the layers of ice scientists can make conjectures about how the climate was operating during specific decades in time. It is a way of finding out how much volcanic activity occurred and what levels of CO₂ and other chemicals existed in the atmosphere in that region over a span of time. These frozen artefacts are created with precision by machines designed for the purpose. The layers of

¹⁵ At CERN physicists use an enormous particle accelerator to shoot particles around at great speeds in an effort to smash them apart to find their smaller components.

stratified ice can be read much like the rings on a tree and go back thousands of years. Each thin layer of ice is an index of the atmosphere deposited over the period of the Earth's revolution around the sun.



Figure 20. Drilled ice core detail showing striations that demarcate yearly ice deposits.

Indeed, contemporary researchers have discovered thick layers of sulphate ions trapped deep within ice in Greenland, a sure fingerprint of the sulfur dioxide volcanoes would have released into the environment. In fact, these findings are backing up early references documented in Europe in 536 CE that describe a lack of sun and the failure of crops. In the *Annals of Ireland*, a failure of bread was recorded that year. In his 536 report on wars occurring then with the Vandals, the Byzantine historian Procopius tells of a time when “the sun gave forth its light without brightness...”.¹⁶ The weather anomalies that were reported around 535/6 are now

¹⁶ “Extreme Weather Events of 535 and 536” Wikipedia: accessed 09/11/18.

speculated to have been caused by a catastrophic volcanic eruption. The theory holds that Krakatoa, a huge still active volcano in Indonesia between Java and Sumatra known to erupt violently, blew up. The projected proto-Krakatoa eruption considers that a 50 km mountain exploded. This is a volcanic event thought by some to have set the stage and triggered the Justinian plague that invaded Europe and Asia shortly thereafter.¹⁷ The 535/6 CE weather event that resulted redirected world history and was ultimately responsible for bestowing upon the era that followed the moniker of *the Dark Ages* lasting almost one thousand years.

These catastrophic events indicate that there are entities existing in ways that occupy time and space on a much vaster scale and in ways that have previously been unknown. Biological life on the planet sometimes suffers great consequences from these events. We are reminded of how insignificant humans are by our exposure to enormous objects like volcanoes. Additionally, we participate in existence with huge objects that are orbiting within the vastness of space. They give us the slow but steady plodding of an infinite seeming time that we find traces of recorded in the geology of the planet; indices of the past.

An index is a component of linguistic sign theory as elaborated by Charles Sanders Peirce, which holds that it is a signifying modality existing among three types of sign along with symbols and icons. An indexical sign points to something such as the way the pronoun I refers to a specific person, or the way a fingerprint or footprint might indicate that a person was definitely

¹⁷ Wohletz, K. H. "Were the dark ages triggered by volcano-related climate changes in the 6th century". *EOS Transactions of the American Geophysical Union*. (2000).
<https://www.lanl.gov/orgs/ees/geodynamics/Wohletz/Krakatau.htm>

present at the scene of a crime. It is essentially the result of a physical process. An example is a photograph because of the way it is chemically etched into a material as an exact recording of reflected light. Photographs were hard to convincingly falsify and were considered reliable evidence of actual occurrences; even if they might have been staged. The physical nature of an index is exact, and it seems closer to what it testifies to than a word does as a sign for something.

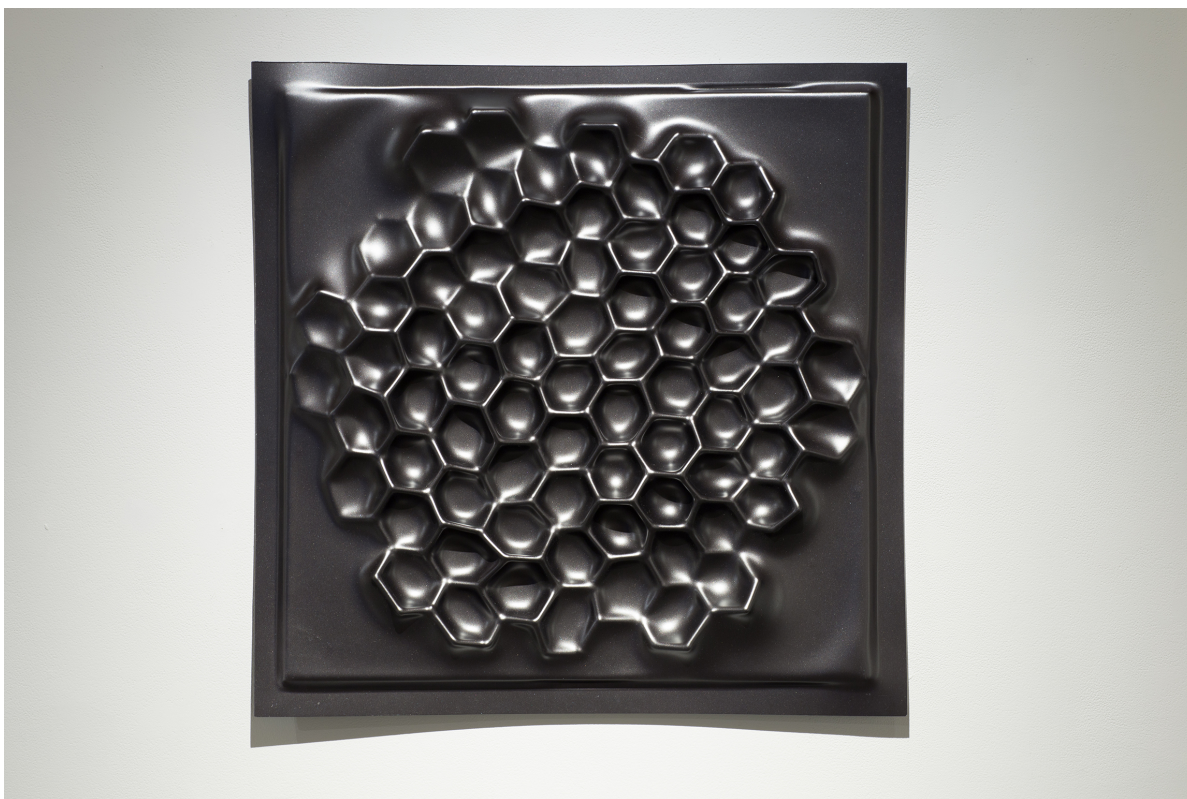


Figure 21. *Matrix Index 3, Charcoal*, 2017. Polystyrene and automotive paint, 66 x 66 cm.

In the 1980s as a young artist, I felt the factual nature of an archivable object gave it a justification for existing, it seemed as though one could think about what it meant as a kind of truth. I was intrigued by the concept of an index as an imprint of something real. Perhaps a map of these indices was a reliable vehicle for ascertaining what was true. They seemed like something very valuable in a world of rapidly changing codes. I thought that when applied to art

an index leant an easy association with cause and effect; this put it into a relationship with *truth* and was also proof to me of the importance of process in art. Through their affects we come to know many causes, but because they are traces it is always in a kind of hindsight that they are found. Because indices seem to be a straightforward rendition of cause and effect bringing at least some relationship to truth, they thread through my practice and so it is not unexpected that this project should have evolved to become a depiction of an index.



Figure 22. *Hexagraphy*, grid, 2018. Powder-coated steel, 190 x 152 x 28 cm.

Hexagraphy went through several phases during its incarnation as an object. The first phase involved welding the steel armature together. Then it had to be cut apart into smaller sections to facilitate the vacuum-forming process on a bed that was 24 inches square. The next phase entailed vacuum-forming polystyrene sheet that was being formed over the separated sections of the steel matrix of approximately 20 by 20 inches each. When the process was complete the steel grids were welded together again. Once these plastic pieces were formed, they

had to be carefully pieced together, connected with seams made by bridging the gaps between them and securing them using a narrow fabric band glued on either side.



Figure 23. *Hexagraphy*, screen, 2018. In process.

In a subsequent phase, circles cut from heavy black paper were bisected and the two halves fashioned into cones upon whose interior surface sticky-backed shiny silver film had been

attached. The cones were each fitted and glued to the back of the individual cells to house the LED and reflect its light. I reinforced the layer of cones using pipe cleaners to fill in the ruts between the cones adding a layer of caulking and fusing everything more permanently to the back of the plastic sheet. The “mini-pixel” RGB LED lights were set into the small holes at the tops of the paper cones and sewn into place. The whole structure was made more rigid by the judicious use of wooden doweling on the underside of the construction to stiffen it up.



Figure 24. *Hexagraphy*, screen, 2018. In process.

Once the physical object was complete, I connected a microprocessor to control the lights by using code to animate patterns of flickering lights, bringing the work to life with its own

neural activity so to speak. The pixels function as an index of colour frequency and in this artwork all 814 of them can be controlled separately with code because it is a mathematically controlled device. Many effects are possible, but the code employed in the initial exhibition creates a range of colour within the parameter of blue to resemble the lapping of waves of water. The possibilities are not closed however, and in another incarnation perhaps on a larger scale, it will be possible to build on what I have begun here. Plugging this work into any microprocessor will run the lights with code, potentially making these lights any of 256 colours for any length of time.

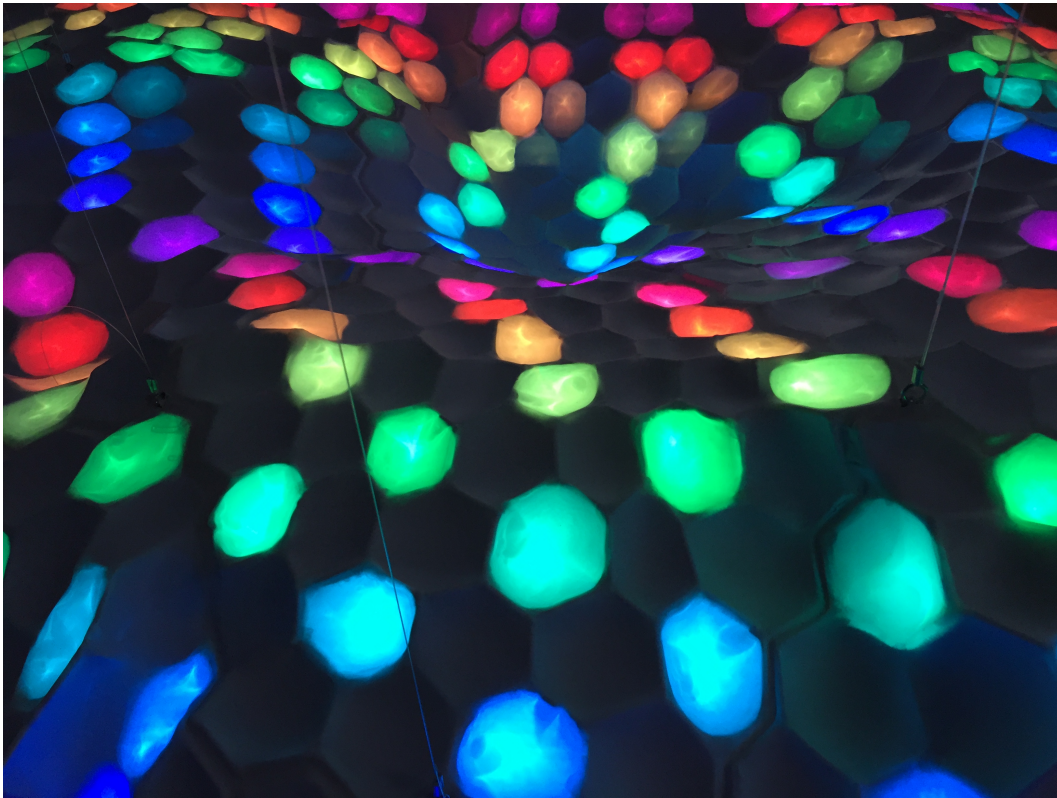


Figure 25. *Hexagraphy*, screen, 2018. Detail.

I created a form to suggest a topography for a field of neurons by opting for a non-generalized abstraction. It is a work that has a relationship to time, and I am interested in time

because as contingent beings it is what we are and every moment is different. The grid I made is an index of my time. Time-based media rely on a series of moments that are sequentially captured and/or arranged but all media has a relationship to time. The process used for piecing the welded steel grids together is one that accrues step by step each one marked in the repetitive matrix. The hexagons that serve as a format here are neither identical nor symmetrical and channel my agency through time and thereby take a measure of at least part of my life. The work accrues and emerges as a topographical field of decentered hexagons that bend and flow in space.

Hexagraphy is rebelling against standardization and manifesting a type of abstraction by breaking away from the pictorial but doesn't abandon it entirely. Suspended horizontally like a landscape it echoes the horizon line. All of the work in the exhibition hovers around the line between pictorial and abstract, seeking out the gap between these two principles of artistic practice. It is suggested the gap between representation and what is represented is where we maneuver subjectively.¹⁸

I am trying to operate within the space of that gap and index human instantiation in the work in both a physical and an ephemeral sense. The grids count time as it floats by and the form that begins to emerge has been determined by a repetitive process. Repetition is soothing both to produce and to contemplate. Through my body's activity, recorded by the welding process and using simply organized and connected lines, a series of moments in time is marked by this specific material. The result is an analog of this activity of my movements in performing the

¹⁸ Emmanuel Kant; Jacques Lacan; Slavoj Zizek maintains this gap is where we exist as real live beings; that spawn creativity.

process.

As my environment pushes against me, I push back against it and the spaces I exist within shape and deform my existence. It is a physical struggle too as our increasingly compromised environment on planet Earth affects our health. This is in part because the air we breathe is being infused with formidable levels of dust, CO₂, and humidity which are all big triggers for asthma, a disease from which I and approximately 10 percent of the female population in Canada suffers.¹⁹

In my exhibition the video I made uses satellite data recorded by sensors for tracking CO₂ measurements. I did this by capturing screenshots of my computer on a daily basis for over a year, showing pollution levels as visualized by software on the internet. *A Year of the Air I Breathe* is actually slightly more than a year of these screenshots, formatted in consecutive order and turned into an animation. This animation reveals the gaseous emissions wafting out over the Atlantic coming largely from New York, New Jersey, and Pennsylvania. The stream of screenshots that record daily levels of CO₂ clearly shows a continual rise from 2017 to 2018. In this work by using the mouse to point to my location I include a sign for my agency. *A Month of the Air I Breathe (August 2018)* was created as a kind of didactic for the video. I tacked a month of screenshots on the wall reproduced as 13 x 19-inch inkjet prints and placed in a grid near the video but not within sight of it. The dark orange to aqua blue colour gauge that indicates the amounts of CO₂ present is shown in one of the prints. The video's soundtrack plays a multi-layered recording of church bells that are ringing the news that humans might almost be obsolete.

¹⁹ <https://www150.statcan.gc.ca/n1/pub/82-625-x/2015001/article/14179-eng.htm>

Ultimately it may be the failure of foresight in not predicting the consequences of our actions that takes us to the brink of extinction. Hindsight is 20/20 as the saying goes.

My experiences in the world have often given me information that has been “transubstantiated” through the inert matter with which I make my artwork. As a human I am a “mediumistic being.”²⁰ Mediumism might seem a quaint way to put it now but for me it is this connection to materials that drives a work's completion. It is the transmutation of what is gained by a life being lived that has given me the fuel to make the work.

This project was a bit out of my skill set and posed enough of a challenge to make it seem worth doing; but proposing it for a PhD was what forced me to make the necessary leap and do the incredibly tedious and precarious work to complete the project. I tried a number of avenues before landing on the one that merged my drawing practice with my sculptural work. What is presented here is the culmination of this effort. Because the project is rooted in technology it also began to accrue meaning on that basis, in addition to its formal disposition.

The confluence of the brain with a backlit screen in this project is a consequence of a long history of brains being compared to computers by engineers, scientists, psychiatrists, and science fiction writers. Our brains are driven neurochemically and through this activity we are bioelectric, and it is this electricity that enables our behaviour of any type. Therefore, using lights and electricity seemed unavoidable. The backlit screen I made is a visual representation of a neural

²⁰ Duchamp Marcel, *The Creative Act*, 1967.

process presented as an array that can be used to mimic cell activation occurring on fields of neurons in our brains.²¹

The code running the “screen” in *Hexagraphy* communicates information through light and creates colours fed by electricity that is causing minerals to glow as it flows through their contacts. Rare minerals like gallium are used that allow the phosphorescent coating, referred to as doping on semiconductor chips to project the brilliant colours of the rainbow that are governed by the amount of electricity moving through them. The chemicals used in doping LEDs to produce the coloured light such as gallium or lanthanum and yttrium might be seen in relation to chemicals in the brain like dopamine or serotonin because neurochemistry moves around within the brain's landscape like electricity. These minerals, like the neurochemicals in our brains, conduct energy and create a variety of effects. Whereas a neurochemical like dopamine charges neurons in one way, tryptamine²² does something different. For LED light the electricity is tuned to differing frequencies creating the variety of colours due to rates of vibration that are caused by the amount of electricity flowing through the mineral doping.

²¹ New evidence suggests that even having your smartphone in your vicinity can affect your cognitive abilities as reported in *The Harvard Business Review* 2018/03: https://hbr.org/2018/03/having-your-smartphone-nearby-takes-a-toll-on-your-thinking?mc_cid=4139722249&mc_cid=dec964448e

²² Tryptamine is one of many neurotransmitters and these are the chemicals that activate our synapse receptors causing various affects. There are at least 77 different neurotransmitters with more being discovered as we learn more about the brain. These include peptides, and gaseous signaling molecules, which are part of what makes up the chemistry in the brain. Scientists divide neurotransmitters into: amino acids, gasotransmitters, monoamines, trace amines, peptides, purines, and others. These are chemicals that are produced by the cells in the brain to signal other cells. Each chemical has a specific action in the brain, and some are also found within various other systems in the body; for instance, 90% of serotonin is found in the gut.

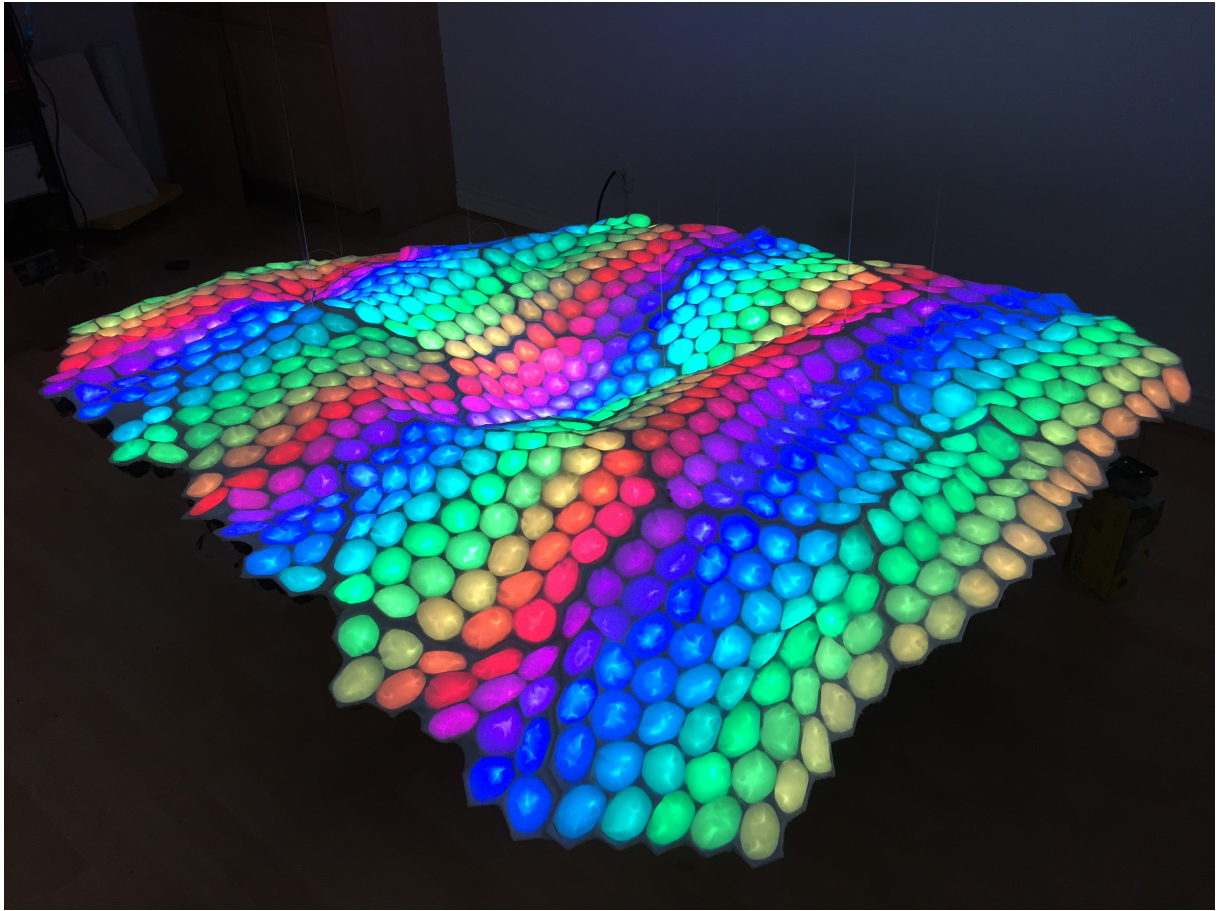


Figure 26. *Hexagraphy*, screen, 2018. Mixed media, 190 x 152 x 28 cm.

The topological characteristics found in this work might describe the placement of activated cells in neural fields, a tracing and mapping of the way they fire together in the brain. Neurochemicals are carriers of emotion. Often even when we are consciously trying to suppress an emotional response to something or someone, it will be exposed. This activity of the brain makes it difficult to hide our emotions and leads to signals that can be of many types that we don't see, such as causing the dilation of our pupils when we are attracted to someone. These signals are indices of our emotions exposing something of our interior selves of which we may not even be conscious.

In the work for this exhibition I am using human agency as a means of manifesting data and/or visualizing it using a stochastic process and thereby behaving like computer software. In order to emphasize a relationship with adaptation, I am deliberately improvising a way to visualize data that relies on the geometry of differences or “failure” to achieve what otherwise would be a more homogeneous result. If all of the elements I was using were the same I might have achieved a strict Euclidean geometry. But here I am inventing my own method to create the formal habit of the work by deliberately distorting that geometry. These hexagons have become decentered, and the work takes form via a randomized proliferation of variance in its simple element: lengths of steel rod. I am engaging a process that exploits my subjective opinion during its making because the position of each rod is made by an improvised choice within the parameters I have set up.

This method seems to me to be an organic approach to creating form and it results in a type of abstraction. All artwork is a kind of maneuvering within parameters and my goal is to find those that might help elucidate the contingent and precarious situation organic life inhabits and communicate that through the structure. Because objects like rocks have their form defined by the environment that activity can be traced within them. Rock cools into magnetized strata that reveal how the continents have changed abetted by volcanism or subduction. By looking at the rings of trees we can see how their location in relation to the sun and other plants as well as soil, air quality and time, defines their form. Trees also manifest through coded genetic plans but the variation amongst them is what produces change making them better adapted to their environment. Each individual within a species is an instance of form operating within a set of

parameters and reveals a heterogeneous type of repetition and cells similarly instantiate differences. Looking at form this way guided me to choose an unstructured mode of generating geometry to reveal a potential format that neurons might assume in a mammalian brain. I envision this as a richly faceted plane, as a non-uniform and decentered enactment of a type of cellular mimesis. I also feel the process of repetition brings the inference that these grids are fragments of larger spatial objects.

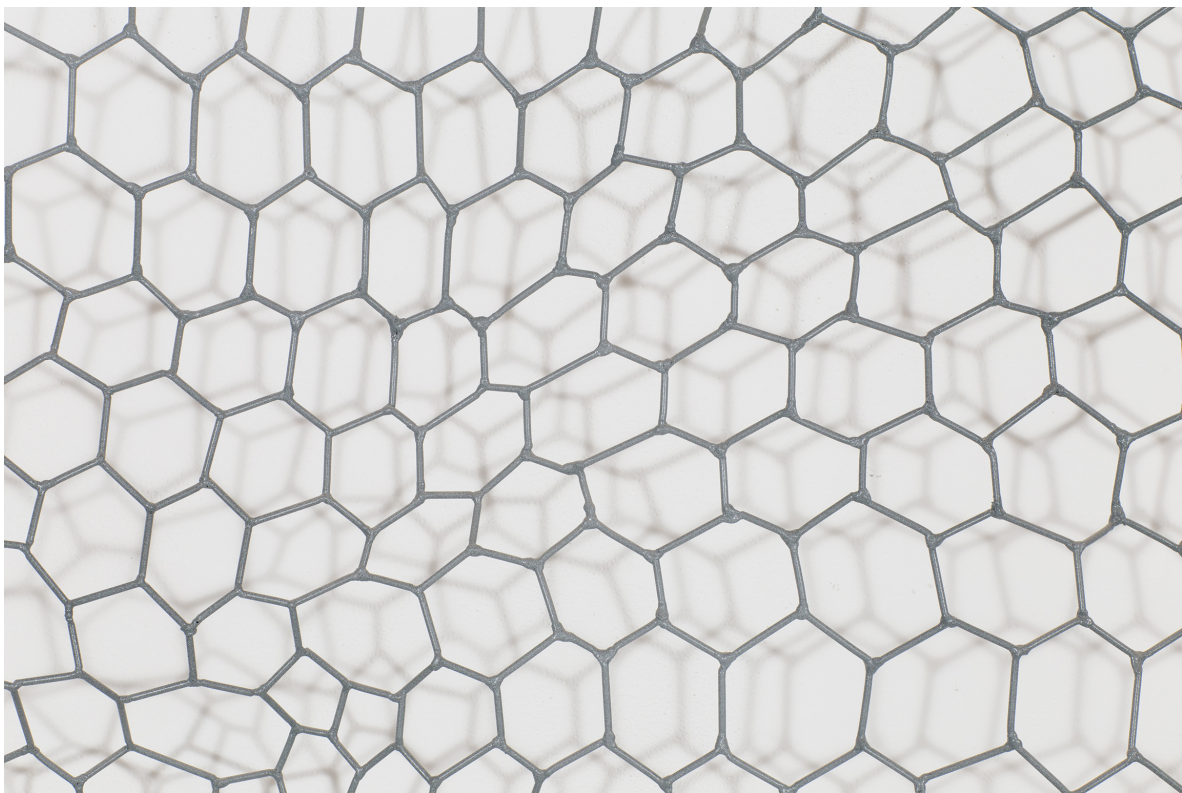


Figure 27. *Deviant Grid*, 2015. Detail.

The acknowledgment of large entities that are difficult to fathom and exist in their own reality on their own terms has been slow in coming for humans. Our knowledge of the forces of

the universe is rooted in abstraction: mathematics. In talking about the nature of energy, Richard Feynman gives a definition of abstraction in a 1963 lecture when he says the following:

It is important to realize that in physics today, we have no knowledge of what energy *is*. We do not have a picture that energy comes in little blobs of definite amount. It is not that way. However, there are formulas for calculating some numerical quantity... It is an abstract thing in that it does not tell us the mechanism or the reasons for the various formulas.²³

Energy just is the way it is but clearly humans can harness it, but so far not without unintended consequences. Feynman's definition provides an alibi for my current abstract exploration in drawing and sculpture. Form is created through praxis in this work and is determinedly so because the process involved makes the form self-generating and non-teleological; it evolves something out of nothing by the replication of a simple line with a single human being as the reason why.

In this project materials replicate the simple shape of a decentered hexagon and combine these into a disorganized grid to suggest contingency, because each shape is dependent on the preceding one. Every new line is connected to the existing grid in a way that is repetitive, and its placement is determined by the lines that were added beforehand. The off-kilter shapes govern the grid in a way which is not flat but exhibits a topographical characteristic that gradually accumulates during the process of its making. Eccentricities are compounded upon eccentricities. These sculptures are the residual trace of an agency. The activity of making the hexagons by cutting up the metal rod only to weld it back together again is an exercise in futility that causes

²³ Smil, Vaclav. *Energy: A Beginner's Guide*. Oneworld Publications, 2006. P. 8.

the disorganized geometric topography of the sculpture's form to accumulate.

This project was the result of a search for a process and a way to create form that might reflect some ideas recently generated by neuroscience about the ways the brain works. Electrical activity bounces around in a living body facilitating the operation of numerous sensory inputs. Our vital energy, generated by nutrients found in food, air, and water is responsible for directing the coordination of motor skills and allows us to maintain our individual narratives. Our brain in conjunction with our organs instigates and regulates how we feel. It adjusts our body temperature and regulates other processes. Imagining, dreaming, and planning future activity are all facilitated by that combination.

The simple correlation of neurons with pixels found in my sculpture is a way to elaborate the recently discovered hexagonal grids of cells called *space* and *place* neurons that exist within the hippocampus. These cells are purported to fire in ways that embody maps of our immediate environment enabling us to move around. It is a subconscious part of our agency that is busy creating these maps. We gain awareness this way of what is ahead so we might adapt to the obstacles in our paths, all the while talking or thinking about something entirely different. Spatial awareness happens in advance of consciousness. It is a neural activity that is busy preventing us from walking into things. Space and place cells are located in the brain's limbic system where the fear and reward centers are also housed. Spatial awareness contributes to the sense we have of being in the moment by filtering the environment for our conscious awareness. These are also the filters that enable us to be calm and not respond to everything in our surroundings.

The backlit screen I made uses landscape as a means of merging the geographical engagement of our bodies with the idea of cellular activity in the brain and in so doing mixes aspects of the outside with the inside. The repetitive activity of connecting bits of material together into a physical object merges time and agency. The thin steel line is irregularly segmented and then reassembled to create a geometric grid with three converging lines creating hexagonal shapes. The emergent form is decentered, where differences arise through the random size of elements. The process creates an incongruence that lends itself to the instantiation of topography. It is a small piece of terrain that implies a larger space because of repetition.

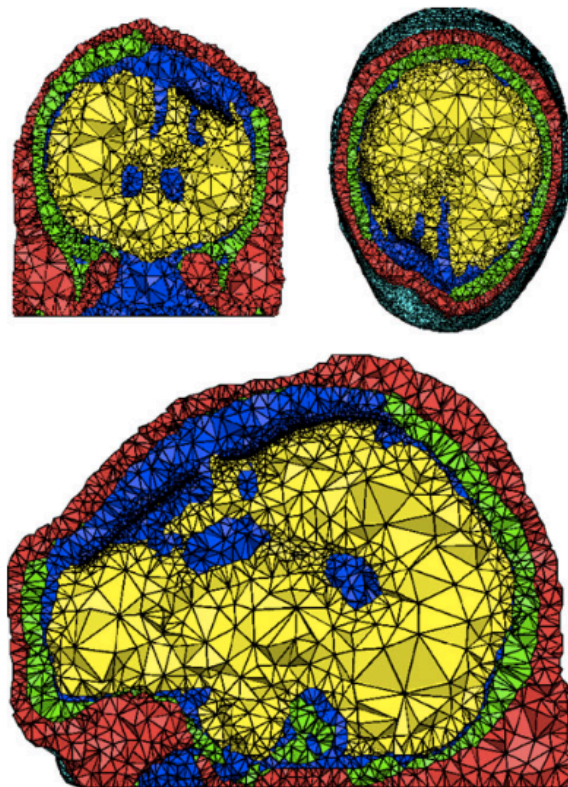


Figure 28. Model of patient's head with implanted ECoG grids²⁴.

²⁴ Lanfer, Benjamin; Roer, Chritian; Scherg, Michael; et. Al. "Influence of a Silastic ECoG Grid on EEG/ECoG Based Source Analysis", *Brain Topography: A Journal of Cerebral Function and Dynamics*. Vol. 26, Number 2.

II TECHNOLOGY

The Taoist principle of Wu Wei is roughly translated as “actionless action” and it refers to a situation where we become aligned with a source of energy that readily flows through us, removing all obstacles. When I weld or draw line segments in the way I have been describing to create abstract forms, action takes on a natural progression and the time I spend floats away but leaves behind its record in the work. I feel the passage of time more and more acutely and the sequential nature of building these grids seems to preserve huge chunks of time for me on paper and in steel.

The work in *Apropos Obsolescence* aspires to suggest computer generated imagery and much of the activity involved follows a set of rules akin to an algorithm to produce an artwork. But I am convinced it is the slight deviation of human fallibility that naturally and randomly occurs while an individual is drawing or welding that makes the lines seem worth looking at, because they reveal a vulnerability and have clearly been drawn by a human hand that is affected by life. In my drawings I record a smattering of lines on the paper that indicate airflow. Once I have drawn enough lines, these become algorithms determining those that come next. The original lines shape the resulting work, but they are all placed on the paper by my hand. These drawings are based on visualizing wind patterns as linear abstraction in aid of bringing something enormous down to human scale.

The information in the drawings in the exhibition originates as meteorological data. Five of the *Wind Algorithm* series are part of *Apropos Obsolescence*, but I have made many others. They use data collected by satellites to visualize different types of information. The data is found on an interactive website where measurements are visualized, colour-coded and layered on a map showing information about any place in the world. Formatted somewhat like Google Earth, at earth.nullschool.net they are using different and more abstract visualization parameters. On this website, one might watch a swath of chemical laden air move around the atmosphere following the wind that spreads the air pollution around almost in real time. Using the website's software, I can frame maps of specific parts of the world. I have done this for places including Antarctica, North Atlantic Ocean, Pacific Rim. The wind is visualized using lines following its direction and colour indicates speed, relative moisture levels, or amounts of carbon dioxide. There are many possible data overlays, each different filter of information has differently colour-coded scales to gauge the various types of data.

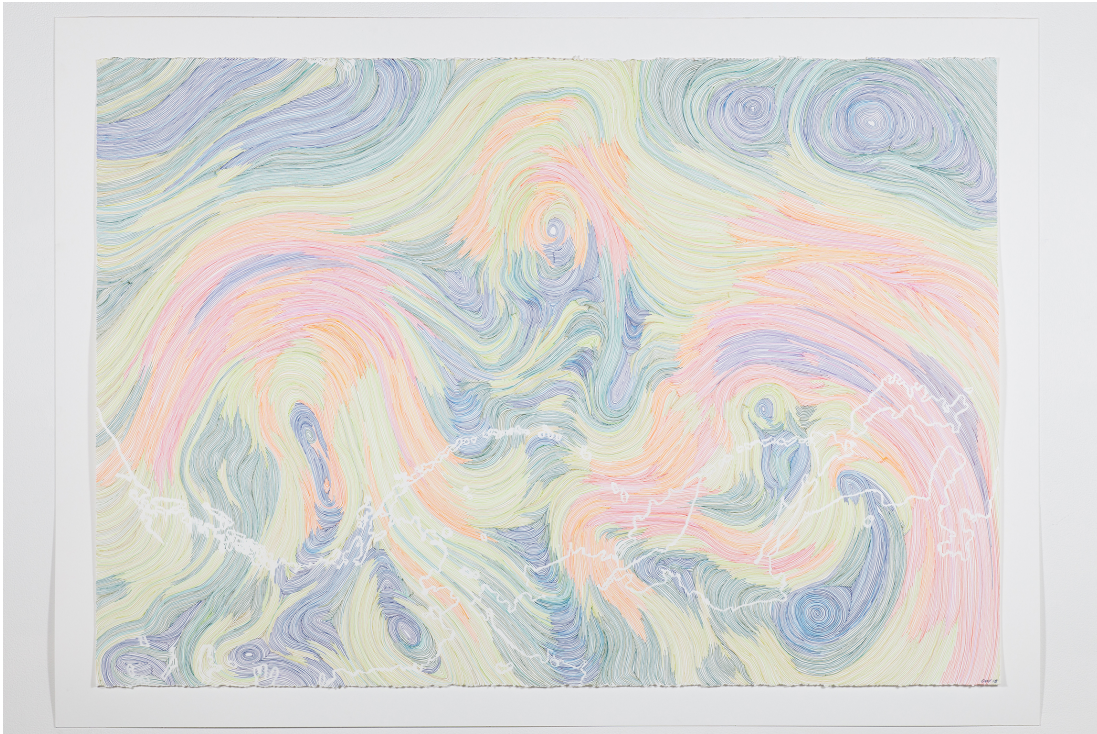


Figure 29. *Wind Algorithm 3*, 2017. Ink on paper, 77 x 115.5 cm.

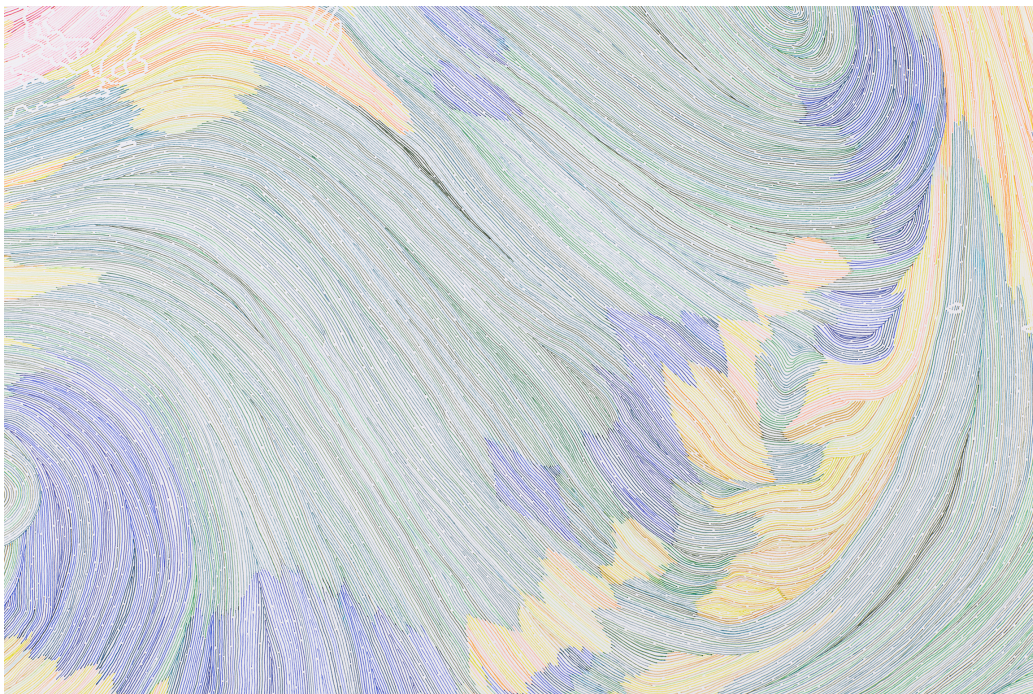


Figure 30. *Wind Algorithm 4*, 2017. Ink on paper, 77 x 111.5 cm. Detail.



Figure 31. *Wind Algorithm 4*, 2017. Ink on paper, 77 x 111.5 cm.

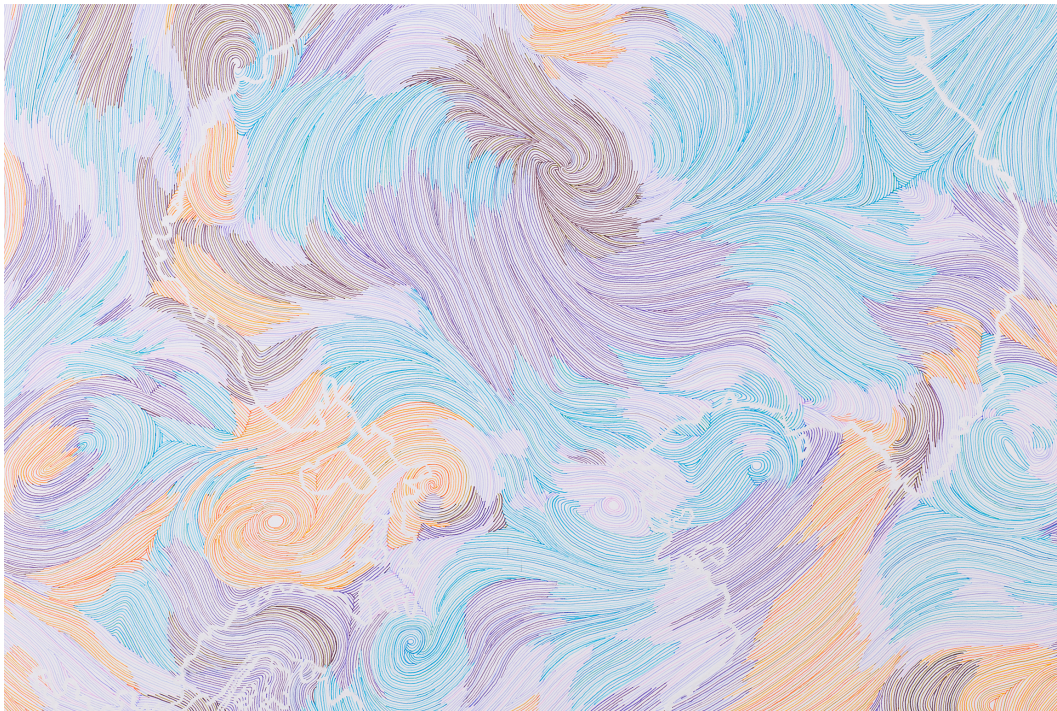


Figure 32. *Wind Algorithm 1*, 2018. Ink on paper, 77 x 111.5 cm. Detail.

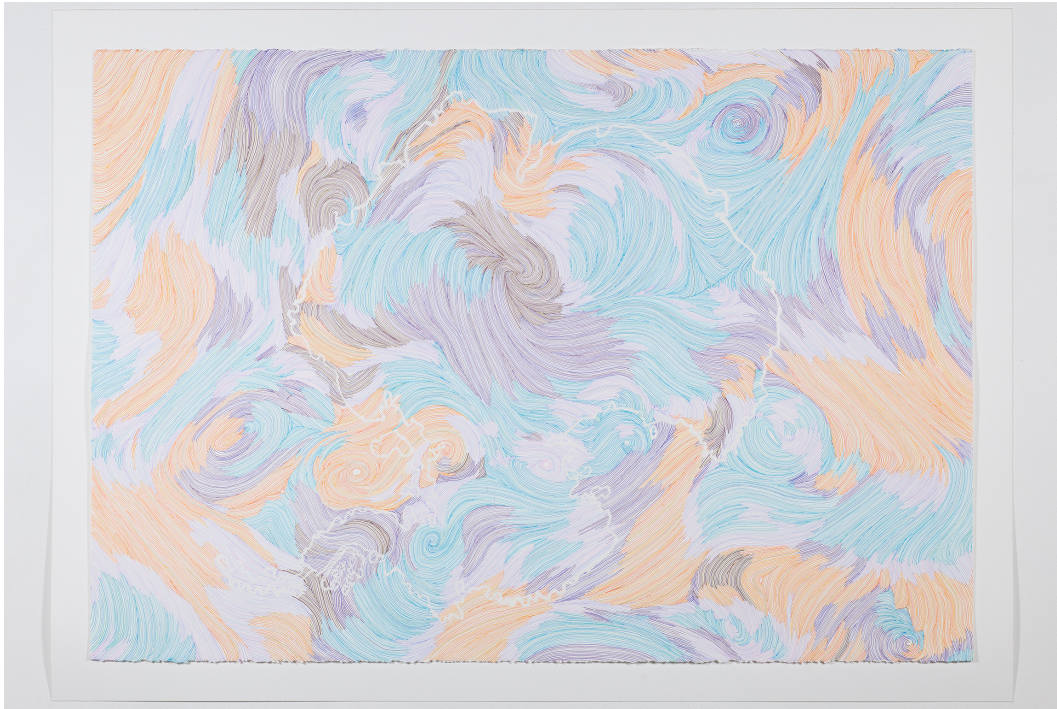


Figure 33. *Wind Algorithm 1*, 2018. Ink on paper, 77 x 111.5 cm. Detail.

Digitized data is piling up in the world and we are experiencing a *digital renaissance* in technology. We have been under this spell for many years undergoing constant updates that necessitate the purchase of new hardware on average every three years. This economic model is producing heaps of techno-trash much of it is made out of plastic. Although there are attempts to recycle these discarded products it isn't enough to keep up with a world whose economy is based on growth which the digital economy is happy to oblige. These objects are designed to be addictive because we are compelled to behave in ways they dictate, and this is the methodology behind it. Technology plays on our emotions and mesmerizes us at an increasing rate. Reeled in by any of thousands of Apps enabling one to run a gamut of tasks means we are becoming ever more reliant on technology.

Some in the tech sector however are starting to believe there is a need to encourage more disconnecting from technology. In “The Binge Breaker,” a recent article for *The Atlantic Magazine*²⁵, Bianca Bosker writes about Tristan Harris, one-time product philosopher at Google who now actively advocates on behalf of unplugging from technology. Ms. Bosker is convinced Mr. Harris is the closest thing Silicon Valley has to a conscience. In the article she conveys his desire to develop a:

“Hippocratic oath” for software that, he explains, would check the practice of “exposing people’s psychological vulnerabilities” and restore “agency” to users. “There needs to be new ratings, new criteria, new design standards, new certification standards,” he says. “There is a way to design based not on addiction.”

This is urgent in light of rapid integration of developing technologies and capabilities to create and maintain profiles of users. Harris was a student of experimental psychologist B.J. Fogg in the Persuasive Technology Lab at Stanford. He describes Fogg's methodology as one that instills the concept of “behaviour design” in his students. This is a form of design that when applied to products, helps to compel us toward behaving in ways dictated by those products. I think it is relevant that technology and psychology have been conflated, because we are seeing an increasing loss of agency for users who are encouraged to become more and more reliant on technology. Manipulation of how we spend our time is the goal of many new start-ups so they can capture a market share of our attention and are ever more ruthless about it.

²⁵ Bosker, Bianca. “The Binge Breaker”. *Atlantic Magazine*, November 2016 Issue.

*The Filter Bubble: How the New Personalized Web is Changing What We Read and How We Think*²⁶, is a 2011 book by Eli Pariser, a fellow at the Roosevelt Institute and co-founder of the progressive activist organizations MoveOn.org and Avaaz.org. He describes how new algorithms introduced in 2009 by Google and Facebook to personalize web searches and news feeds are creating what he calls *filter bubbles* around their users. This means what people are shown is more in line with what they have already “liked”. These algorithmic trackers follow our online behavior noticing previous activity and suggesting similar or the same information; monopolizing what we see if we are not proactive in searching and using the internet.

STAR TREK

Media, from the printed word to streaming YouTube videos, influences us as individuals and helps chart the course of culture. A popular television show like *Star Trek* is a media stalwart and has been a player in the field of popular culture for fifty years. *Star Trek* is a vehicle that has nurtured our desire for space travel and paved the way for consumers of electronic technology and gadgetry. Some of the very obsolete “solid state” looking computer technology seen on classic *Star Trek* may seem laughable today, but by the time *Deep Space Nine* came along the franchise was displaying touchscreen technology that resembles what we have in our smartphones twenty-five years later.

Having launched a new franchise in every decade since the sixties save one, *Star Trek* will

²⁶ Pariser, Eli. *The Filter Bubble: How the New Personalized Web is Changing What We Read and How We Think*. Penguin, 2011.

not fix all of the problems we face but might have a few answers about the way technology could change humanity and is a good place to look at how culture is portraying and contributing to the situation. In *Hexagraphy* I am using large digital pixels to parody the “solid state” technology still around in the 1960s and 70s while at the same time acknowledging the existence of mesmerizing iPhones and android smartphones.

Objects like the highly portable touch screen devices seen on *Deep Space Nine* have set the stage for our obsession with a parade of ever improving technology and the race to the stars is heating up. An entrepreneurial effort being led by Elon Musk and Space X aims to send people to space for a price very soon. As a publicity stunt Musk mimicked a *Star Trek* episode recently by sending a car into space with a camera filming the view out of the windshield.²⁷ This car is now thought by scientists to be a potential “biohazard” for Mars.²⁸

If we spent our resources fixing the problems with Earth's environment, we might not feel the need to escape from our planet quite so badly, and despite the infraction mentioned above, Musk is a major purveyor of green technology. All of this is to say that *Star Trek* is a culturally influential television show that has primed our notions about what technology can do for us. It contains a chronicle of how society has been portraying technology since the 1960s found within various franchises over a span of 50 years: classic *Star Trek*, *Star Trek the Next Generation*, *Deep Space Nine*, *Voyager*, *Enterprise*, and now *Discovery*. A sequel to *The Next Generation* is also in

²⁷ “The 37's” First episode of the second season of *Star Trek Voyager*. A '37 pickup truck is shown floating in space.

²⁸ <https://www.purdue.edu/newsroom/releases/2018/Q1/tesla-in-space-could-carry-bacteria-from-earth.html>

development with Patrick Stewart reprising his role as Captain Jean-Luc Picard.

As a genre, science fiction arose in the early twentieth century, but it was spurred on by nineteenth century classics such as those written by Jules Verne: *Twenty Thousand Leagues Under the Sea* (1870) and H. G. Wells: *The Island of Doctor Moreau* (1896) or *The War of The Worlds* (1898). However, there are precedent setting works going back at least to the beginning of the Common Era with Lucien's *A True Story* (2nd Century). Modern "Sci-Fi" seeks to grapple with the information being proffered by science in relation to myth and incorporates factual ideas generated by scientists about the environment and the universe beyond. The upshot of television shows like *Star Trek* is that they alert us to the forces of the universe and by overstepping the boundaries of reality this is brought into view. These are forces that are enormous and terrifying and this creates the need for mythologies to help us process that fear.

Some of the characters in the show are transformed into mythological archetypes and exhibit extraordinary skill or prowess, as in *Deep Space Nine (DS9)* where Captain Sisko is "The Sisko" a reluctant descendent of "the prophets." These are a group of godlike figures that dwell inside a stable wormhole, a topological defect in space that connects the Alpha and Delta Quadrants of the Milky Way Galaxy. The Prophets rule the wormhole and they are held to be gods by believers on the nearby planet of Bajor. The Prophets communicate with Captain Sisko whenever he needs their advice using a mysterious crystal device that puts him in an alternate world. When technology is combined with myth humans seem to believe it will make them like gods.

TV shows about space are a natural fit for technologically augmented human beings. Cyborgs are introduced on *Star Trek* in the 1980s by the appearance of the Borg who are technologically augmented members of various species including humans. They partake of a hive mind and thrive by assimilating other species and converting them into computerized drones. The Borg, part human, part spacecraft, and part invading colony controlled by a queen mosey around with limbs that are robotic weaponized multi-tools. The Borg are considered one of *TV Guide's* nastiest villains of all time and first appear in the second season of *The Next Generation* (the second live action *Star Trek* franchise).

Humans that are upgraded by technology are explored in television shows from the 1970s like *The Bionic Woman*. But there is also a facet of our being cyborg when we consider all of the technological instruments designed to measure and record that enhance our intelligence, from a simple abacus to the current circumstances where tomography and other imaging methods look inside of our bodies.

The stories and plots on *Star Trek* often involve planets and objects with agency exhibited by physical characteristics such as energy fields of various types, sentient clouds, or rocks with exceptional properties. When I stream through the many versions of the series, I realize I was stimulated by the show more than by my staid predigital junior high school education. Now when I read about the properties of self-sustaining systems within other systems that are impacting the planet, I am reminded of the kinds of enormous assembled objects encountered on *Star Trek* sometimes threatening to humans and often discovered floating around the galaxy using their own propulsion and never mentioned in school.



Figure 34. *Star Trek*: Captain Kirk, Spock and Dr. McCoy surround the M5 computer and its creator.

In hindsight it seems quite prescient that in 1967, in the second season of the original *Star Trek* series, there was an episode that dealt with technology and its disruptive powers in the lives of humans. The M5 computer is introduced to the Enterprise, on *Star Trek*: episode 24, “The Ultimate Computer.” This “machine” was designed to take over the Enterprise in lieu of a captain, turning it into an autonomously guided starship. But the M5 proves to be unfriendly and consequently threatens the crew and in turn is threatened by them, setting off a series of tragic events. At one point during the episode the computerized voice refers to Captain Kirk and Dr. McCoy as nonessential personnel. Then Spock, the rational Vulcan, attempts to assuage Dr. McCoy's fears: “Doctor, this unit is not a human body. The computer can process information but only the information that is put into it.” Captain Kirk pipes in, “Granted, it can work a thousand and many times faster than the human brain, but it cannot make a value judgment, it hasn't intuition, it cannot think.” As the computer begins to “defend” itself against the crew they suspect its designer has delusions of grandeur and eventually Captain Kirk and Dr. McCoy come to

question his integrity.

The artificial intelligence in this fictional world is accomplished by using human “engrams” that are somehow impressed upon the computer circuits through osmosis. Once the renegade computer is in control of the ship, it lethally attacks other ships during war games. Spock explains that it was a human mind behind the Machiavellian undertaking, amplified by “computer relays”. Eventually Kirk and Spock save the day by convincing the M5 it has killed starship crewmen, and as they have correctly surmised that is a conflict with other “engrams” forbidding it to kill. In the end Spock noted that the machine was “committing suicide” in order to atone for the murder of 19 starship crewmen. Not a particularly logical determination, but artificial intelligence is the personification of life by life, and it is not surprising that even a Vulcan would project sentience onto the technology.

The set of the original *Star Trek* has a rich visual quality and is a remarkable showcase of vacuum-forming technology. Vacuum-formed items are central features of television set design because using that technology designers can quickly make a sheet of thin plastic assume any shape that will fit into the machine being used. The plastic becomes an index of the object it is formed over, and this index becomes a counterfeit object on the set. The vacuum formed polystyrene skin of *Hexagraphy* resembles objects found on Sci-Fi TV show sets. It would have been a convincing prop on classic *Star Trek*. Because this show had such an impact and I watched reruns of it for years in the 1970s, its old-school and somewhat lumbering approach to gadgetry appeals to me enormously. It at least partly set the stage for my experience of both art and technology.

Deep Space Nine first aired in 1993 and reflected the values and politics of the Clinton era. It ran concurrently with *Star Trek Voyager*. During this time power was accorded to women and we were being brought together through art and culture. Humanity had woken up after the harshly conservative and drug inflected 1980s (“I Wanna Be Sedated” The Ramones). Women artists were exposing their sexuality in powerful ways. Performance artist Annie Sprinkle confronted audiences with the bodily material of sex and fantasy.²⁹ Artist Karen Finley, by smearing chocolate on her body in her controversial performance art, triggered an indictment of her work by some of her country's conservative politicians.³⁰ Meanwhile, on *Star Trek Voyager* the female Captain Janeway is a competent but fallible leader and Seven of Nine struts her exquisite mind and body around a ship that is lost in a far corner of the galaxy. In another version of the show, produced in the mid 2000s and meant as a prequel to the original *Star Trek*, the crew of the *Enterprise* under Captain Archer is a rag tag group of space travelers and not a well-honed war machine like that featured on *Deep Space Nine* set a few hundred years later.

The recent series reprise *Star Trek Discovery* gives us a spore drive propelling the ship that (now the story goes) moves even faster than warp speed through mycelium networks inhabiting outer space. This technique of driving the vessel literally fuses with the mind of the ship's navigator. Throughout the various franchises of the series there are a constant stream of timeless questions arising, triggered by the interaction of a variety of sentient beings with technology and thankfully they have remained current and are not clinging to the original plot

²⁹ https://en.wikipedia.org/wiki/Annie_Sprinkle

³⁰ https://en.wikipedia.org/wiki/Karen_Finley

line.

From its inception *Star Trek* exhibited a diplomatic concern for others, a reflection of the civil rights era in America during which the show was first conceived. One of the lessons of postmodernity is formulated in Gene Roddenberry's Prime Directive, which was established at the show's inception in 1966. This is a requirement forbidding all crew of any Federation starship from contaminating other cultures with their knowledge and technology. This served as an acknowledgement to some extent that those cultures encountered on the journey had value; not exactly the way things were seen on the American Western frontier fifty years earlier. Nonetheless the show was bound to bear some resemblance to the western movie genre popular at the time of its inception and has drawn the obvious comparisons between them, prompted by the show's proffering of space as a "frontier." For his part Roddenberry cites the satirist Jonathan Swift as a model and maintained that he saw in space a way to distance the action enough from the planet Earth to be able to consider ideas too threatening to people at the time.

Gulliver's Travels by Jonathan Swift is a parable of altered reality that brings size into focus. The many volumes of this surrealistic work have been claimed as among the first examples of the science fiction genre. One relationship of the *Gulliver's Travels* stories to *Star Trek* is found in the very notion of a voyage of discovery. Another, in the way the show's plots often offer a moral challenge through the crew's encounters with alien beings and are driven by the adventures they have as a result. The writers of *Star Trek* are poking fun at humanity in a similarly cynical manner as that of Jonathan Swift, while also considering some perennial challenges such as disruptive technology. Humanoids are definitely not the most advanced

species in the *Star Trek* version of the Milky Way galaxy. In fact, Gene Roddenberry, one of the show's originators, eventually spoke about how his motivation was similar to Swift's:

Jonathan Swift wanted to write about his times, but he would have had his head chopped off if he talked about stupid kings and queens, crooked prime ministers and all of that. He decided to create a place where he could talk about such things – and get away with it. So, he created Gulliver's Travels. I started thinking, 'well, maybe if I could have all my stories happen on far off planets, then I could talk about all those things I wanted to talk about'. That seemed to be a good idea and Star Trek came fairly easily after that.³¹

Hexagraphy seeks to capture some of the magic of television by interacting with technology in such a way as to recall broadcast TV and its mesmerizing characteristics. My generation, X, was called the TV generation because we tended to sit transfixed for hours in a state of rapt attention in front of our sets anytime we could, watching shows like *Star Trek*. But television had a shadow side as well and purportedly affected our production of brainwaves, leading to an increase in alpha brainwaves said to make us more open to suggestion and susceptible to advertising. This was often used as a way to disparage TV. Most recently the addictive characteristics of dramatized serials have come into focus because of binge watching, that is, watching the entire number of episodes in a row without stopping sometimes for days on end.

According to neuroscience this behaviour is most disruptive to our brain's *orienting response* by triggering an instinctive reaction to stimulus. It is an involuntary response to potential threats where the brain becomes focused on determining the level of real danger present.

³¹ Gene Roddenberry quoted here: <http://www.startrek.com/article/remembering-roddenberry-26-years-later>.

As might be surmised, high drama in videos can trigger this response in viewers. Studies by American researchers have shown that the format of TV with flash editing, panning and zooming of the camera's viewpoint with constant shifting and changes in location do in fact trigger a lot of involuntary reactions in viewers. Some of what happens can leave the viewer passive with lowered alertness and thereby more open to suggestion.³²

Perhaps humans are attracted to light because we possess electricity within our body's own pulses and currents. Electric light is used in *Hexagraphy* to mimic the way the brain is activated in neurochemically charged arrays. My research began with learning about the way the brain maps space on cellular grids. From there I decided to translate a group of materials into a sculpture as a formal analog for the neurological process in the brain concerned with mapping space. My idea was to try to demonstrate a material and abstracted version of the brain, specifically the region of the hippocampus responsible for navigation and movement, an aspect of neurological activity that mediates reality.

The pixelated field of neurons in my sculpture is an exaggerated “macroscopic” latticework made up of lights that represent neural cells and allude to the interior workings of a brain. Experiments using mice have shown that our brains create maps or spatial analogs of the location of our body in real time. In retrospect this information seems kind of obvious because it is logical that we would have to map out space using our neurons somehow otherwise it would be difficult to get very far.

³² Kubey, Robert; Csikszentmihalyi, Mihaly. “Television Addiction is No Mere Metaphor”. *Scientific American* February 2002. <http://www.sciam.com/2002/0202issue/0202kubey.html>

In my art practice, like Jonathan Swift, I use scale as a way to transmit information, and here I have constructed a landscape of gigantic neural cells using enormous pixels to suggest the media “landscape” as a type of applied geography. Applied geography is a collection of data-sets that are being generated by physical activity in specific locations. These include information about tectonic plate activity, pollution of all kinds, population density, traffic congestion, weather patterns, and air quality. All of these and more are now part of an augmented understanding of geography.

Hexagraphy calls upon the geography of myth as well and draws us in to gaze upon its lights that are reflecting azure blue to suggest water in the exhibition. I wanted to recall the myth of Narcissus as we gaze into the blue light. The story of Narcissus tells of a Greek hunter who was the son of a river god. He was proud and with disdain rejected the advances and affection of Echo a wood nymph who had the misfortune to have fallen in love with him leading to her own demise. The goddess Nemesis³³ saw this, and being roused by it, caused Narcissus to become enchanted by his own reflection when she drew him to a nearby pool where he gazed upon himself. Nemesis is a Greek word meaning ‘to give what is due’ and the goddess personifies an idea from which there is no escape. Narcissus and Nemesis, hubris and retribution, cause and effect, a cautionary tale for our time with the unfortunate planet Earth cast as Echo.

In addition to representing water, this group of 814 overgrown pixels is reminiscent of land and assumes a pixelated topography with a screen resolution of 35 PPF (pixels per foot). In

³³ Nemesis was charged by the gods to enact retribution upon those whom were found to have exhibited hubris.

Hexagraphy the large geometrically shaped backlit cells allude to the pixelated nature of digital representation. But it is supportive of abstract and not cogent images because this assemblage supports only a very low clarity of resolution. This invented format for the *dissemination* of the variable computer code I am using is immediately obsolete, a counterpoint to the prevailing trend for higher and higher resolution. The pixels here get in their own way and are generating a foggy and unresolved image challenging the authority of technology made from shifty bits.

The shift from continuous to discrete data storage has meant the whole economic basis of the world changed as well, essentially pulling the economic carpet out from underneath many generations. The potential that more computing power brings has led to technological disruption in all sectors. This *Digital Renaissance* is a structural shift that will reverberate for centuries. I remember a time before cable TV even existed, when telephones were all rotary dial and portable communication devices really were an impossible dream found as far as I can remember, only on *Star Trek* and *Get Smart*. These memories of life before electronic technology invaded the world and occupied our lives so completely have a lot to do with the way this project looks. I am a student of the ontological effects of this shift in media. (I still cringe when I remember my fraught first encounter with a CD player at a party in a loft in New York City where I had recently arrived in 1987). As a way of emphasizing this evolutionary relationship we have with our technology I am using stochastic and non-teleological methods for generating form. In this work made up of oversized pixels I want to demonstrate an aspect of technology that holds us in a state of enchantment.

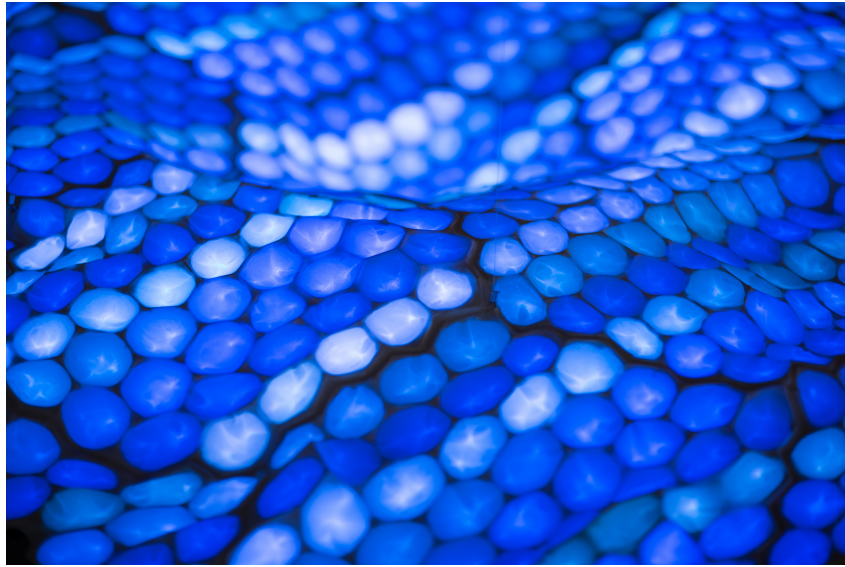


Figure 35. *Hexagraphy*, screen, 2018. Detail.

III ONTOLOGIES

Within the work in my exhibition are numerous processes and parameters that are indebted to the work of others and my experience of their art. I saw in the of these artists qualities such as: dedication to an activity of some kind that creates a residual object, maneuvering of a material or process into a position that gives it exposure as such, looking at ways to encode meaning, creation of tools to use as part of the procedure of making a work, bravery to follow my vision enough to follow it through.

Eric Cameron

As a student I had the fortuitous opportunity to work with Professor Eric Cameron during his time at the Nova Scotia College of Art and Design. He is knowledgeable in ancient Greek philosophy and would often relay anecdotes in our weekly meetings to describe some aspect of my sculpture-based studio work. This was inspiring because the work I was doing was

completely abstract and I studied the Ancient Greek language for a year as a result. But the example of his artistic practice and the objects that have resulted from his activity are what hold my attention still. Eric Cameron's *Thick Paintings* require layer after layer of gesso to be applied in a ritual he has devised for the purpose. He has ritualized his practice in very specific ways. He uses a tiny brush to coat the objects he chooses and is meticulous in counting the layers. An object is created through the application of repetitive layers of paint over things of his choosing like an egg, film canister, or a packet of sweetener. He often uses titles relating to his family or friends (*Morgane's White Sugar (1456)*).

The objects Cameron makes this way are committed to remaining hidden from the viewer, only maintaining some very intriguing and basic aspect of the original shape. In the end we must trust him when he tells us what is inside of these sculptures. The continuous relationship he maintains to the object is commendable. The discipline required in producing these artworks is somewhat akin to an oyster manufacturing a pearl. Tiny brushes accrete meticulous layers of paint, strokes of gesso used to cover the chosen objects until they eventually become pearl-like sculptures. These works are painstakingly painted into existence. Their form is coded by the thing that is underneath giving the layers a structure. These incredibly sensually created objects resonate in my mind in a way that has helped me go forward in my own practice.

Eric Cameron began as a painter but has spent a lot of time investing his work with some basic aspects of the nature of objects. His *Thick Paintings* seem to proffer a suggestion that objects are ultimately inaccessible and always receding from view. A Kantian bent informs this work where objects are only perceived through an "inner sense". We can only know them

through our relation to them, but they are not seen in themselves only as they relate to us. In Cameron's work we have the trace left by the object in the form of the sculpture, but the object itself is completely removed from view. It suggests a lot to me about the layers of obfuscation that accrue through the ways our minds frame the information they receive.

My current approach to fabricating form intersects with Cameron's practice. Where his method is made up of individual brushstrokes and their accumulative power over a shaped object that organizes the form, mine spreads the form out by making use of the consecutive addition of units of a randomly segmented line. Piece by piece the line is reformatted into a decentered geometry with each successive step determined by the previous. Instead of an object disappearing under coat after coat of paint, my process maneuvers stochastically within a code to generate the form by improvisation. The code uses basic parameters that guide me and geometrically organize the endless lengths of cut up steel rod into grids that assume a hexagonal matrix. The labour involved in making these grids transpires in a morphogenetic flow with each step quickly following the previous one in an auto-catalytic loop created by feedback from the lines already in place. This type of "feedback" is becoming a crucial part of my art practice.



Figure 36. Eric Cameron, *Morgane's White Sugar* (1456). Acrylic white gesso and acrylic, begun 2004.

Gerald Ferguson

In the work of Gerald Ferguson many strategies are represented, demonstrating how his work transformed occasionally within the span of his career. A lot of his work is influential to me and something of his approach to materials as well because he rather approached the materials of painting the way one makes sculpture and often used objects to aid in the application of paint. He used stencils he made one of a bunch of grapes and then applied paint to the canvas using a roller until it was covered and the grapes no longer overtly discernable. But when you study the paint, signs of their traces appear.

For a few years in the mid 1990s we shared the same location for our studios, and I would walk by and see him hard at work on most days. I think his diligent example infused me with an understanding of what I needed to do in order to continue at all on the difficult path of maintaining an art practice over a long period of time. The paintings that he was taken up with in the final years of his life have resonated with me. He referred to them as his *frottage paintings*. In order to make these works he had to rig up something to put under the canvas over which to carry out the paint “rubbing” which he did using a paint roller. Coiled up rope, clothesline, and garden hose were called upon to put underneath the canvas among other things in order to make the circular marks and then he would take the dark paint and begin rolling. Each canvas was worked differently, and it is the difference within repetition in this work that gives it strength. The resulting canvases are composed of circles upon circles, indexes of the coils encircling each other. His processes influenced me and for a period of time I saw him often hard at work. The simplicity of the activity he engaged in impressed me as a way to produce an artwork. It is the processes he invented throughout his career and the tools he made himself to get the job done that stuck with me all of these years. This is because of their unfussy material quality, their workmanlike procedure, and I think this was important to him too.



Figure 37. Gerald Ferguson, *800' Hose*, 2002. Enamel on canvas, 168 x 168 cm.

Garry Neill Kennedy

I completed my undergraduate degree at the Nova Scotia College of Art and Design (NSCAD). It was then a school specializing in teaching art that was headed by an artist: Garry Neill Kennedy. NSCAD had quite a considerable reputation when I became a student there in 1982. This had been established during the 1970s upon the arrival of many conceptual artists including Vito Acconci, Donald Judd, Richards Jardin, from New York and John Baldessari from California who visited and taught there. Over the course of that decade the trio of artists Garry Neill Kennedy, Gerald Ferguson, and David Askevold established the school as a place where the most esoteric art was practiced. This activity became, at least for a while, imprinted on the pedagogy of the school.

There, during my undergraduate education from 1982-6, I encountered the ideas that would lead me to choose the almost impossible life of an artist. I am someone who is obsessed with physical materials and I discovered that in the sculpture studio it was possible to use anything at all. This appealed to my young rebel sensibility. GNK's work utilized everything from potted plants to newspaper cartoons and generally held some hidden information that one would have to be "in on". There was always a code embedded in the work and it is with his work that I first began to think of art as code that is brought together in a material and physical sense. My quest to find ways to infuse materials with conceptual properties started because I was a student at that school which was organized like no other.



Figure 38. Garry Neill Kennedy, *Finchwell, Finchwell, Finchwell, Finchwell and Osborn*, 1983/2016.

David Askevold

Using time-based media became part of my art practice after taking a few courses in video art at NSCAD with David Askevold in 1984-6. This experience has finally come to fruition in the artwork included in this exhibit. Throughout my involvement with David as a friend and mentor he was supportive of my art practice and this also aided me in continuing down my path as an artist. While I was at NSCAD David brought in Mike Kelley, aka Banana Man, to our class and then Sonic Youth appeared one Friday afternoon in the cafeteria and their improvisational punk rock held us enthralled as they used their instruments in unconventional ways to explore the materiality of sound.

It was in David's class that I became interested in using the camera as a physical object. Many of my teachers had done the same when they made their videos. I shot my video footage for this course in a playground. Shooting while sliding down a slide, swinging on swings, up and down on teeter totters, and round and round on merry-go-rounds. I was doing this in deference to the way Michael Snow, whose work we saw, used the camera in his films. In his movie *Wavelength* (1967: 45 min) the camera is positioned formally, and a single tracking shot is edited together as it gradually moves toward the opposing wall where a photograph of a close-up of waves of water is positioned and during the final minute this photograph comes to occupy the entire screen. It started as a speck on the distant wall in the beginning of the film. With bits of reality jumping in and out of the frame, evidently, this tracking shot was recorded over a series of days. The material of film and the apparatus it is created with are really the subject in this formalist approach to filmmaking in which "content" takes a backseat. In *La Region Centrale*, (3h) Snow uses predetermined tracking and the camera performs a 360-degree pan from the top

of a mountain in Northern Quebec, while at the same time it also begins to revolve around itself, so the horizon line of the shot does a 360-degree rotation several times as the circular panning shot continues going around. The vertiginous rotating horizon created by his apparatus causes a disorienting physical reaction in viewers of the film.



Figure 39. Michael Snow, *Wavelength*, film still, 1967

A contemporary of Snow, David Askevold also had a materialist approach to film and video. With Askevold content was also a material to be amassed through the pursuit of information. The apparatuses he constructed became part of the exhibits of the time-based media projects he created. The camera is often augmented in Askevold's work, for instance in the exhibition *Once Upon a Time in the East* this is done by shooting aurally from a helicopter. In this way he collected footage that would be exhibited alongside the aurally shot images he *found* of small craft harbours along the Nova Scotia coastline in the Department of Fisheries and

Oceans Canada (DFO) library. For another of the exhibition's components, *The Road Journal 1994-95* he took road trips to the locations of the harbours in the photographs and documented them by placing a camera on a brick sitting on the pavement shooting in each direction from that position on the road next to the harbour.



David Askevold, *The Nova Scotia Project: Once Upon a Time in the East*, 1993, 293 electrostatic prints, 2 videotapes transferred to digital video, reference map
153 1/2 × 307 1/2".

Figure 40. David Askevold *Once Upon a Time in the East*, 1993

Inclusion of the apparatus responsible for creating the work by leaving its traces in the resulting information is also a component of my method. In my video, *A Year of the Air I Breathe*, I am using the computer screen as an apparatus in a way that I think recalls the minimalism of both David Askevold and Michael Snow. I took screen shots every day for more

than a year that show levels of carbon dioxide (CO₂) in the environment to document their rise. I lined them up sequentially to create approximately 4 minutes of information indicating the variance in CO₂ levels where I live in the North Atlantic region. The computer and internet both leave their trace in my time-based digital files.

David Askevold's artwork and performance *The Two Hanks* reenacted by him in 2003 in New York used a Theremin fed by electricity as a material in the work to enhance the poetry of chance. The polar opposites of Hank Williams and Hank Snow are both represented here as two clumps of dry ice; one was an alcoholic who died tragically and the other a teetotaler. In reference to these facts the artist pours water on one suspended clump of the stuff while on the other he uses beer to activate the foggy potential of the solid form of carbon dioxide. The beer left its scent in the room adding to the work's physical presence. Consistent with how he often dealt with content in his work the artist here pours liquid on dry ice in an attempt to conjure the ghosts of the two musicians for whom the piece is named. He does this by generating fog, an ephemeral substance that might rise to the occasion and allows for the inclusion of chance. He also uses electricity as a substance by including a Theremin in the work generating variations on their music. The way he approaches the substances in this work uses contingency to negotiate with ephemeral substances.



Figure 41. Robin Peck, *Shallow Podium*, 2011. Standard size acrylic sheets, MDF, cut acrylic sheet.

Robin Peck

Shallow Podium is a work by my earliest sculpture professor Robin Peck, and his artworks continue to challenge me. This sculpture is made up of three small podiums lined up against the wall to one side, and three pristine sheets of Plexiglas placed on the floor edge against edge with each sheet being of slight difference in thickness, and the thickest sheet is in the middle. These are standard sheets purchased locally to the exhibition. The work requires a pristine floor that is also completely flat. With *Shallow Podium* one confronts what appears to be a void of matter, a space below the floor. It resembles a still pool of water with a surface like glass and this elicits the uncanny feeling that space exists on the other side of the smooth surface. There is a vertiginous quality in this work like that found in Michael Heizer's *North, East, South, West*, 1967-2002 which is comprised of large geometric volumes removed from the floor at DIA

in Beacon NY and pictured here.



Figure 42. Michael Heizer, *North, East, South, West*, 1967-2002.

Robin Peck's sculpture placed directly on the floor also keeps a low profile. Richard Serra's *Cutting Device: Base Plate Measure* comes to mind too because it is a work that also uses standard pieces of material and exists as the consequence of an action that constitutes its making. The three piles of construction materials that are presented are clearly a result of having simply been cut by chopping their ends off³⁴ to make each middle piece fit the width of a base plate made of steel placed on the floor.



Figure 43. Richard Serra, *Cutting Device: Base Plate Measure*, 1969.

³⁴ A 12" x 12" beam of cedar, various sized rolls of lead sheet; thick lead sheets; a partial sheet of some type of fire brick; steel pipe.



Figure 44. Robin Peck, *A Shallow Flight of Stairs*, 2007

Peck's intention, I glean from the title, is to remind us that the differences between the bronze silver and gold of medal winning performance in sports might be as slight as those in thicknesses of sheets of Plexiglas at 1/4, 3/8 and 1/2 inch. In *Shallow Podium* the thickest sheet, representing gold, is in the middle sandwiched between silver and bronze. A podium is an awards platform, but what are we competing for here in this forum of art?

In another of the series of Plexiglas sheet works, entitled *A Shallow Flight of Stairs* and included in a show about conceptual art at the Vancouver Art Gallery in 2012³⁵, Peck lines up many sheets of clear Plexiglas in a row each consecutive sheet thicker than the previous so it does

³⁵ *Traffic: Conceptual Art in Canada 1965-1980*. Vancouver Art Gallery: September 29, 2012-January 20, 2013.

indeed form something resembling a shallow flight of stairs. When approached from the side the high polished sheets placed right next to each other in a row are reminiscent of Carl Andre's firebrick floor works like *Equivalent VIII*. But with Peck, we are looking through windows to spaces beyond the floor almost beyond matter itself into the world of fantasy. We were gazing through the surface into an imaginary pool of space. I am pulled back by the surface of the floor and the passing through is felt as absence. Peck gives us a window through the floor the opposite of Andre and Serra who occupy it with opaque materials like clay brick, cement, stone, lead or steel - doors, not windows.

While Peck's pools are flat, precise and pristine, my sculpture is anything but flat, being messy and dependent on deviations to be interesting. But different references notwithstanding, the comparison of a smartphone screen might be made with either of our sculptures. *Hexagraphy* floats above the floor instead of resting upon it. In some sense the form in my work acknowledges and responds to the rigid formalism I find in works like *Shallow Podium* where it is essential.

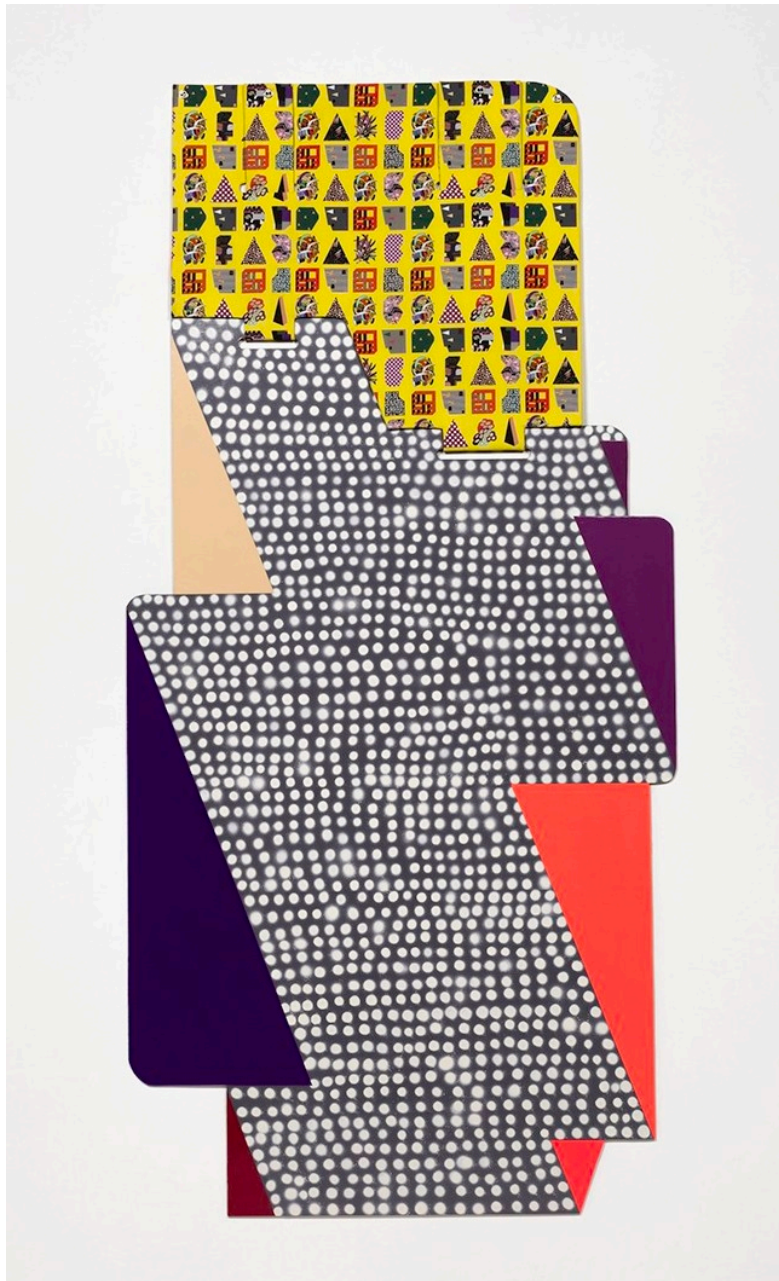


Figure 45. Ruth Root, *Untitled*, 2017 Plexiglas, enamel paint, spray paint 107 x 52 in.

Ruth Root

Ruth Root is an American abstract painter whose practice I have followed for the past 25

years, and who I greatly admire. Her large shaped paintings are amalgams, conglomerates made up of several similar but different components, many of them patterned. Often the surfaces are painted, but sometimes actual fabric is stretched over a shaped backing. Her striking works have earned her much admiration among artists and critics alike.³⁶ I've known Ruth's work since meeting her through a mutual friend in 1990. Her paintings have shown an unrelenting attachment to a minimal yet lively approach to abstraction. Her body of work as a whole is laudable and her paintings always challenge me to keep making art.

The work she is doing now uses flat panels that appear to be assemblages of plain or patterned shapes, the edge of the panel is cut out in such a way as to follow the blocks of pattern and colour in the work. She uses hard surfaces and recent works on aluminum panels are impressive. The clearly demarcated sections of these works are differently coloured and sometimes patterned fabric is stretched over and laminated to the flat surface covering one of the shaped areas. Sometimes the smooth visual appearance of each shape is interrupted with triangular wedges, and in others little squares can be found floating around among larger fields of colour. The works all exhibit a clear logic but don't proffer any excuses for their existence. I know there are strategies behind them, and this is the hook for me, but I can let go of my desire to know exactly what those are and simply marvel in the result of that journey she has made in each one.

³⁶ Smith, Roberta. "Art in Review; Ruth Root." *The New York Times* 9 May 2003: Web. 4 Aug. 2018.



Figure 46. Jim Campbell, *Scattered Light*, 2010.

Jim Campbell

Using electronic technology, it is possible to make spectacular works of art, but in artist Jim Campbell's work *Scattered Light* (2010), many aspects collide to create a work of singular experience. Occupying and colonizing the space in front of us in a randomized array, the tiny white light bulbs dangle and flicker in the air. The lights are more or less evenly set apart within the substantial block of space they inhabit. From certain directions one notices the ghost-like images conjured by the artist appearing and disappearing. The work uses a loop of digitized film that is streaming through the lights showing figures passing by and the image is directed to a particular point of view, so it comes in and out of focus as you walk around it. From above the lights are connected to a highly organized 3-D grid pattern and this is what allows thousands of

little bulbs dangling from their thin wires in mid-air to conjure the moving image. The poetry of obsolescence is palpable in this work while at the same time it is a marvelous feat of digital technology.

Jim Campbell's outdoor public artwork seen in New York in 2009/10 was memorable and inspired me to learn about electronics. His massive array of dangling lights installed in a park on 23rd Street was mesmerizing. The fact that the little white light bulbs he was using could all be controlled to broadcast images appearing almost like ghosts in space was inspiring. It was upon seeing this artwork that I wanted to make work that broadcast information using light and coded message systems.

Robert Smithson

Robert Smithson, whose work is deeply invested in things, specialized in using contingency as a means. Unburdened by aesthetics, in *Spiral Jetty* he found straightforward solutions to simple problems: the rocks, the salt, and the mud. In the displacement works, the mirrors, and the downhill flows, materials and means are combined. In *Asphalt Rundown* Smithson has a truckload of hot asphalt dumped over the edge of a barren hill and the sculpture is formed as the substance flows into position and cools, sheathing the ground beneath it. In the end finding itself perched on the steep side of a gravel pit.

In *Spiral Jetty*, a jetty in the form of a spiral built into Great Salt Lake, Smithson gives us a good example of hyperobjectivity, a tall order for an artwork. It is suggested here because this

work uses the interaction of materials over time and will exist in perpetuity unless it is somehow destroyed. Because of the scale and the enormous weight of the materials he used, in addition to the biological systems that have evolved around it, the likelihood of this work being dismantled anytime soon is quite low. The continuing life of this giant earthwork in the Great Salt Lake is not static it is constantly changing as a result of the saline crystallization process and changing water levels. This process is a major component of the work, and it is meant to last a very long time and continue changing with that environment. This work is a dynamic object embedded in its environment.



Figure 47. Satellite image of *Spiral Jetty* taken from 423 miles above the Earth.



Figure 48. Robert Smithson, *Spiral Jetty*, 1970. Great Salt Lake, Utah.

My work does not employ such grand means, but the processes I have employed in my project do take their cues from Smithson's contingent aesthetic. I cut up a line comprised of steel rod into random segments and then I weld those back together into something else by using a hexagonal geometrical matrix as a rough guide. The process is constituted through my devising an opportunity for improvising sequentially in time within those boundaries I have set up as the parameters for my artwork and then letting it flow like Smithson's asphalt.



Figure 49. Robert Smithson, *Asphalt Rundown*, 1969

IV INFORMATION

Information is physical as Claude Shannon famously conjectured mathematically in his 1948 paper, *A Mathematical Theory of Communication*³⁷. Electrical information can be used in a physical way that can be coded to operate switches as it moves through wires that interrupt its movement and force it to opt for one of two directions depending on the charge of a third wire in the switch. This breakthrough by Bell Labs led to the development of the transistor and that eventually led to the computer revolution. It is a discovery that had an enormous impact that is continuing today.

I intend *Hexagraphy* and its mode of transmitting animated data to emphasize the physical characteristic of energy. As transistors became smaller and smaller and more widely available, they were added together creating more and more complex structures where calculations could be performed. The increasingly intricate machines being built used combinations of these simple switches to channel electricity in specific ways generating a need for organizational systems. Since the onset of the digital age, electronic technology is determining the way the world works and is cued to have an enormous impact on human evolution. It was electrification that charged the enormous bursts of human ingenuity that has been driving the continuous technological revolution the world has been experiencing. As a result, information theory began to have a strong influence in the 1950s.

³⁷ Shannon, Claude. "A Mathematical Theory of Communication". *Bell System Technical Journal*, 1948.

Systems Theory

The ideas that led to systems theory originated in biology in 1928 and resulted from research done by Ludwig von Bertalanffy, a biologist who was looking for emergent properties in biological systems.³⁸ Examining how organic materials grow over time, Bertalanffy proposed a different ontological mechanism for open systems than the second law of thermodynamics allowed for closed systems.³⁹ Steady state systems are those where the variables remain unchanged over time. Life, he proposed, was based on open systems with changing parameters and growth occurs over time at certain rates that could be determined by mathematics and he developed equations for systematic organic growth.

Fig. 3.1.0.1 The von Bertalanffy growth equation

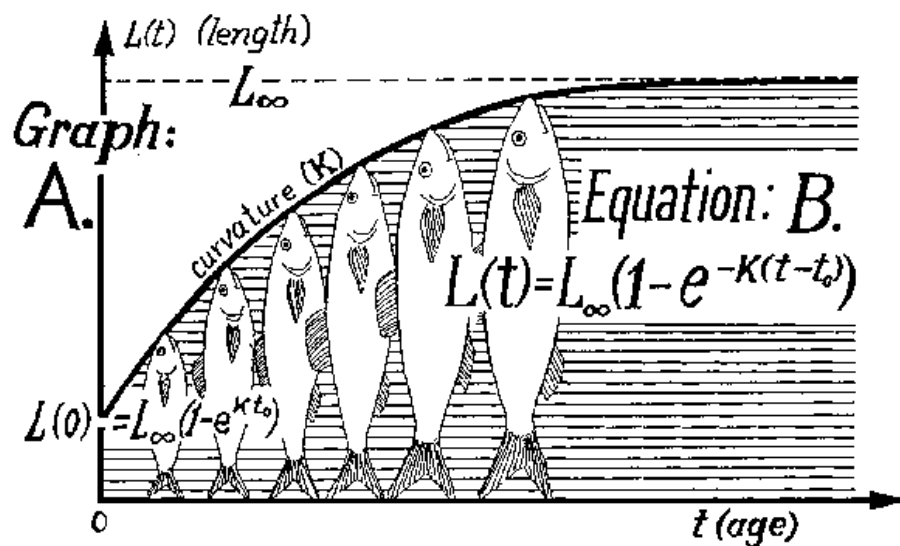


Figure 50. Ludwig Von Bertalanffy, graph of biological growth equation, 1928

³⁸ Von Bertalanffy, Ludwig. *Kritische Theorie der Formbildung, Borntraeger*. 1928 In English: *Modern Theories of Development: An Introduction to Theoretical Biology*, Oxford University Press, New York: Harper, 1933.

³⁹ The second law of thermodynamics: Entropy: the measure of the loss of energy in an irreversible or closed system. Of particular concern in pressurized engines that use heat and steam. The term has entered the culture as a metaphor for lost energy or collapse.

A discursive shift that influenced all realms of culture occurred in the 1960s when *systems theory*, a corollary of the general information theory then circulating, became a multi-disciplinary field. Systems theory is applicable in biology and computer science as well as physics, climatology, linguistics and history among other disciplines. It is the study of the organization of parts that are interacting in dynamic processes. It acknowledged the influence of reality (time, space, and matter) on these complex systems and the relations between large and sometimes newly delineated entities.

As a result of the shift precipitated by the combination of the lowly transistor with general systems theory, the interface mediating for humans today, is a backlit screen. Ten thousand years ago it would have been huge monumental sculpture found in purpose-built environments like Gobekli-Tepi, a large Neolithic temple recently found in Turkey. The mysterious temples on the island of Malta seem to mediate the moon and the stars, as does Stonehenge. After the dawn of Christianity Gothic cathedrals were the interface for humanity with God. It was the gradual development in human communication leading to the invention of the printing press (c 1440) that eventually caused a major leap forward for human intelligence. By the same token it disrupted economies, religion, aristocratic power, monarchies, and incited riots among mobs of people bent on destruction. The Reformation and Inquisition notwithstanding, we are blessed that knowledge and opinions written in books soon gained authority and leveraged power. Literacy was a gift of the book for many who were fortunate and increased the ability of humans to make sense of their reality.

Books written by many different people opened up human perspectives. Whereas architecture imposed a set of forms and a more universal reality upon us, books allowed an increase in experimentation and enabled other realities, helping individuals to bloom. In the nineteenth century the book's power would give way first to chemically produced photographs. Soon after that these were shown in sequence as moving pictures commandeering the attention of the crowds through combining still photographs in series with light and sound. Early photography was an isomorphic imprint of chemically produced light reflected off of the objects being photographed. These seemed to reproduce reality because different tones were created on the reactive paper when it was exposed to the recording of actual light in the negative.

Photography was seen as an index of reality. Movies were ephemeral flickering reflections of light projected into space, and the population experienced a pleasant and entrancing enchantment and a new realm for the imagination began to soar. The same thing is happening now because of the shifty bits that manufacture the digital media interface. This development has unfettered us from truth because the bits that go into digital images can be altered by software designed for the purpose, giving dreams and fantasy room to soar far beyond reliable old indexical ties to the real. Fixed images in all formats decontextualize experience and set up a gaze in the consciousness of the viewer who looks at something presented in a certain way. Gazes are cast by *subjects* looking out on visual events in a moment of observation. An image imposes a specific point of view that merges with and frames the way we see.

Neuro-Cartography

As a result of more complex digitized computational circuitry, maps are being made of

the brain and its various circuitry that are starting to delineate the systems operating there. In my work with LEDs I am merging the neuro-cartographical information I have been looking at with an example of media. Observing the brain while looking at images is increasingly possible with rapidly improving technology designed for this purpose. Mapping activity in the brain is sometimes accomplished using MRI and fMRI technology. It is possible to record activity in the brain because it operates with electro-chemical signals that pulse through its cells along axons connecting its various parts to each other and the rest of the body. Using these imaging techniques, it has been possible to discover that the *default mode network* is a structural channeling of neural activity said to be responsible for self-referential awareness. Together with other attention networks in the brain, it is part of one's connectome and said to be akin to a network of superchannels. It is the particular way each of our brains is wired which is something like a fingerprint and contributes to how it is we think we have a “self” who is the navigator of our ship, so to speak.

To begin to look at how the brain exists I decided to make a sculpture that would be an array of lights allowing for independent activation of each cell. My initial attempt was a 3-dimensional cell shape pictured here that was constructed entirely of almost one thousand 10 mm through hole RGB LEDs. The three-dimensional LED grid I constructed is still waiting to be turned on because the obsolete technology I used was quickly usurped by mini pixels that contain a tiny chip making them smarter and much easier to use. These were what I needed to make an LED screen of individually controllable pixels so I could merge my discoveries about the brain with an interface that might somehow reflect that information. Once I abandoned the idea of making large independent 3-D grid cells, for now, I was able to begin to think more about form

and particularly abstract form. I then decided to link my sculpture to the planet Earth by making the screen into a horizontal landscape of pixels that would be a rudimentary map of neurons.



Figure 51. *Shifty Bit*, 2013 – unfinished. First attempt to make the work for this project.

In fact, fields of neurons in our brains approximate themselves into maps on many levels⁴⁰ but recently light has been shed on the system that helps us negotiate our surroundings, so we are able to move around in space without knocking into everything. Nobel prize winning researchers (Physiology or Medicine, 2014) are mapping the brain's navigational abilities. The scientists involved⁴¹ explored the way grid cells and place cells in the hippocampus region operate in maps that help us navigate within proximal space. They demonstrated how these cells are active in aiding humans and other mammals to experience the placement of their bodies in space with relation to other things in it. They found hexagonally organized grids of cells in the hippocampus firing as maps as a component of our perception of space.⁴²

In other neuroscience research cognitive neuroscientists have divided the space we experience everyday into two classes: vista spaces (VS) and environmental spaces (ES). Vista spaces can be taken in from one vantage point (0'), and environmental spaces such as those existing within architecture or cities include several vantage points. They require one to physically traverse that space in order to generate the neural spatial maps needed for us to move around with any sense of direction.

⁴⁰ Gallese, Vittorio. "The Problem of Images: A View from the Brain-Body". In *Phenomenology and Mind* (pp. 70-79), Firenze University Press, 2018. Mirror neurons and their relationship to "embodied simulation" is discussed by this author adding to the ways the brain maps our experience into memory through perception and action where mirror neurons hold some memory of previous experience and are triggered when the experience is repeated, or we watch as someone else partakes.

⁴¹ May-Britt Moser, Edvard I. Moser; John O'Keefe

⁴² Hafting, T.; Fyhn, M.; Molden, S.; Moser, M. -B.; Moser, E. I. (2005). "Microstructure of a spatial map in the entorhinal cortex". *Nature* **436** (7052): 801–806.

Fyhn, M.; Hafting, T.; Witter, M. P.; Moser, E. I.; Moser, M. B. (2008). "Grid cells in mice". *Hippocampus* **18** (12): 1230–1238.

Killian, N. J.; Jutras, M. J.; Buffalo, E. A. (2012). "A map of visual space in the primate entorhinal cortex". *Nature*.

A new study⁴³ reveals aspects of how memory treats these two classes of space differently. The study of proximal space was performed using virtual reality headsets and head tracking equipment in a 12 x 12 m tracking space. The virtual spaces that were used in the study were set up to correspond to space in two ways: one was meant to be perceived from a single vantage point, and the other requires a series of experiences to build from. Among the many other differences between ES learning and VS learning is that the retrieval of configurational memory in ES learning is bound to the actual space traversed. It is influenced by the order of the experiences that are acquired through movement, whereas the VS learning occurs in a stationary mode and is focused more on the layout's intrinsic structure, giving more of an overall perception of the space one is in.

As we visually assess our surroundings, mapping neurons in the hippocampus are activated. *Hexagraphy* is my exaggeration of this mediating membrane; an attempt to mirror the cellular mapping of space that neuroscience has determined is occurring in the brains of mammals. Electrodes pinned to neurons in the brains of mice led to the discovery of space and place cell mapping neurons. The idea for my sculpture *Hexagraphy* arose in my mind as a result of learning about how neurons operated in relation to spatial acuity. I thought about making some kind of a map that was constructed of elements that would signify neurons. The observation of proximal space apparently requires the material constituents of the brain to be made up of neural

⁴³ Tobias Meilinger; Marianne Strickrodt; Heinrich H. Bulthoff. "Qualitative differences in memory for vista and environmental spaces are caused by opaque borders, not movement or successive presentation". *Cognition* 155 (2016) 77-95.

cells laid out in grids that fire in configurations corresponding to the observed space. The brain's mapping of space in an array of neurons grants us a sense of direction. This is certainly a component of our sense of having a self who is at the helm of our body.

Scientists are using massive amounts of computational power to mimic a single human brain in order to better understand how consciousness itself is generated.⁴⁴ The brain uses chemical signals to communicate through its synapses. These neural channels are compatible with electrical stimuli. Cochlear implants are wired directly into the brains of hearing-impaired patients and provide signals that are decoded there to generate the sensation of hearing. They generate electrical pulses from sound vibrations and when these are fed through contacts attached to the relevant brain areas, they successfully perform the function of the ear. This is possible because when you send an intermittent current through them using specific sound frequencies, the brain will begin to make sense of that information picking up sounds from frequencies that are read by neurons. It has become apparent by this evidence that the brain will rewire itself to interface with at least some electronic prosthetics.

In cyborg technology biology is combined with digitized equipment with the ultimate objective of creating a biomechatronically⁴⁵ augmented human who has hardware and software working synergistically with their brain. Cyborg technology is at least possible in a limited sense

⁴⁴ The Human Brain Project is a projected ten-year endeavor beginning in 2013 funded by the EU headquartered in Geneva. Using a combination of neuroscience and computation on “exascale computers” with a goal of building a collaborative infrastructure for research using various disciplines to advance the understanding of the brain. https://en.wikipedia.org/wiki/Human_Brain_Project

⁴⁵ An integration of organic biological organisms with mechanical and electronic elements resulting in devices that compensate for loss of physiological function <https://en.wikipedia.org/wiki/Bioelectronics> (accessed 092318).

because the brain is operated with electro-chemical impulses that can be mapped and plugged into the relevant technologies. Medical devices with electronic controls that patch into the electrical grid of the brains of people with Parkinson's and other crippling diseases are already used to ease suffering. Trans-magnetic stimulation creates electric impulses enhancing the circuitry in brains of people with autism. Brain activity in areas responsible for social behaviour in these patients is typically very low. When those areas are artificially stimulated using electric pulses the activity increases, and this can have lasting effects for the individual involved. The brain's electro-chemical structures are seemingly wired with binary switches that will interface with artificially created low voltage electric pulses to encourage it to control more complex prosthetic devices.

Computer code can conjure an incredibly intricate world with something relatively intangible and simple: a binary function, the crossing of a threshold. In the brain this happens in lithium switches that are fed by chemicals flowing through dendritic channels. Neural pathways are connected by millions of synapses whose switches are given to existing in one of two states, making them receptive to binary code. Neurons fire based on a weighted voting model that requires some number of dendrites to be stimulated for the cell to activate. When activated these synapse connections make up chemical voting blocks that either dispose the neuron to firing or not. When something unknown appears, activity increases in the brain. Once that quantity is assessed and known less activity occurs as is the case in our expected encounters with the world.

In my practice as an artist I am interested in the mammalian brain and the information being accrued by neuroscientists as it implicates our spatial awareness and thereby how we see

the planet Earth. In my art practice I consider the way a body moves in space and that person's awareness of their surroundings. My sculpture *Hexagraphy* is unmistakably there in the space in front of us, unavoidable and seductive with its glowing coloured light. Suspension from the ceiling allows the space to cradle the work. The typical reaction to a work such as this is by walking around it to view it from different angles. Looking at the differing aspects this work provides and framing those views as it is circumambulated emphasizes its relationship to landscape. The prospects we see when we look out at the world guide our lives, and this is determined by the frame of reference we have developed in our own minds.

The hyper-connectivity of the young brain allows learning to occur and makes it easier to do when we are young. Through experience, our activities delineate the unique pathways housed in our brains, but only some of these multitudes of connections that are around when we are born survive whereby others are allowed to atrophy. In this way, throughout our lives the superhighway channels of our white and grey matter are catalyzed into what some neuroscientists now refer to as our 'connectome.' The field of *connectomics* grew out of recent developments in neuroscience provided by computation. It is the study of the scaffolding in the brain upon which information travels. Activity in the brain uses primary and secondary structures with multiple channels and scientists are constructing models of these trying to determine the communication pathways between the two architectures. Electrical signals housed in our grey matter and white matter course through the brain using assemblages of neurons as superhighways through which the information flows. This scaffolding is where the signals occur that are powering our habits, thoughts and imagination.

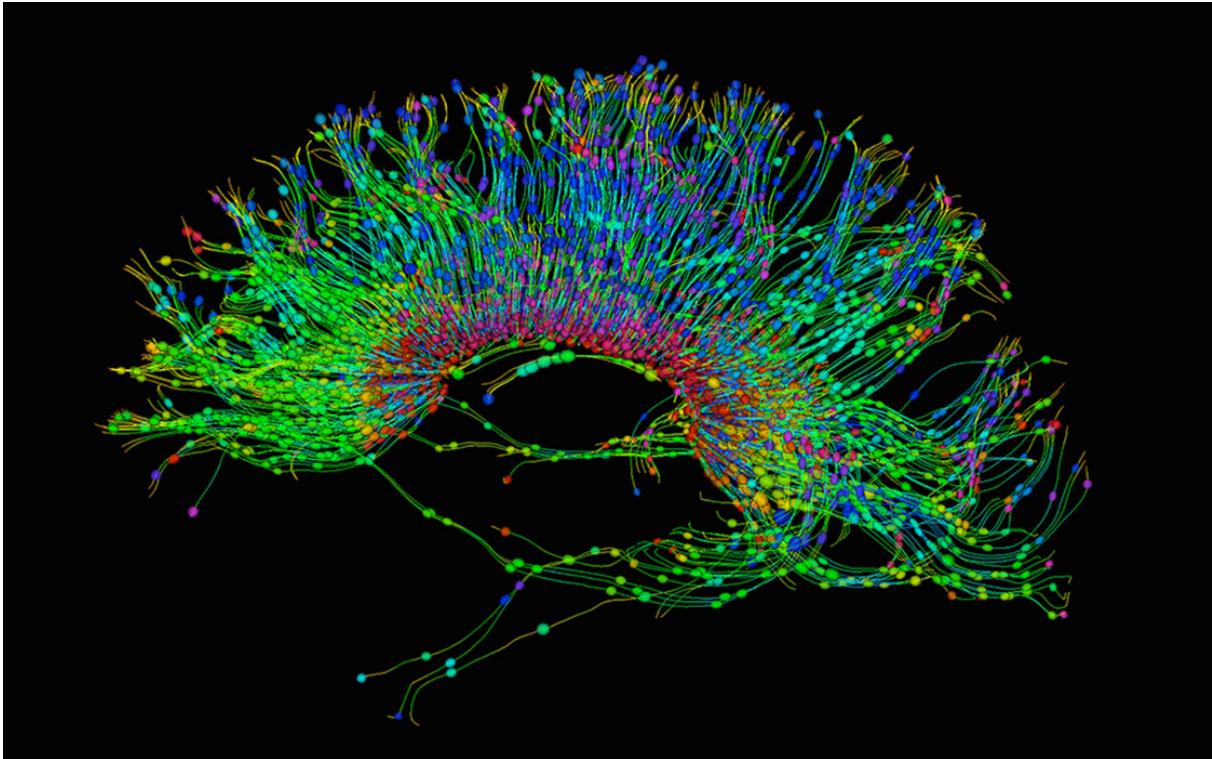


Figure 52. Connectome visualization. Created by diffusion tensor MRI

Conditions in the brain are by no means stable; injuries and other events can trigger changes that lead to new connections being made when the brain adapts itself to differing circumstances. This process occurs throughout one's life and the patterns of each person's neural channels appear to be individualized like fingerprints.⁴⁶ Because the structures formed by pathways are idiosyncratic to each of us, they may be another clue as to why we have personalities or selves. These neural frameworks, such as the default mode network purportedly in charge of daydreaming among many other things, appear to be regulating the agency propelling our lives.

⁴⁶ Seung, Sebastian. *The Connectome*. Houghton, Mifflin Company, (2012).

The phased condition of the existence of organic life in time provides a sense of continuity in our lives and we develop an ego despite our being separated from the past and future in every moment and the fact that much of what our minds are engaged with is based on confabulation. On average, a person maintains their own inner monologue by speaking to oneself 300 to 1000 times a minute with much of this emotionally flat activity occurring in the frontal lobes. Other areas such as the amygdala, found in the limbic system of the brain, are known through *fMRI* imaging to be triggered when emotions accompany our thoughts. The limbic brain uses memory to constantly travel around time in order to link fragments of significance to the present from the past presumably through the emotions attached to those moments.

The Bayesian brain hypothesis is a framework that uses statistics and predictable probabilities in order to explain mental calculations. It is a current theory but is based on the thought of a 19th century German named Hermann von Helmholtz, who began applying the statistical theorem of Thomas Bayes an 18th century English Presbyterian minister who wanted to prove the existence of *miracles*. Bayes came up with his calculus as a reaction to David Hume's questioning of people's belief in the existence of miracles in his 1748 treatise, *An Enquiry Concerning Human Understanding*. Hume was particularly concerned with witnesses of the resurrection of Jesus whose testimony, he claimed, contained a high degree of inaccuracy. Vexed by this questioning of religious authority, Reverend Bayes decided to quantify the probability of unreliable witnesses to prove the skeptic Hume wrong. In doing so he and his collaborator Richard Price initiated the field of statistics where, in this case, they proved that even the multiplication of fallible evidence could establish something as fact; a time honoured human practice.

For neuroscientists like Peter Dayan, however, probabilities were how the brain incorporated knowledge and they relied heavily on uncertainty to establish any ground. These were statistical equations used to estimate uncertainty that might account for the way neurons are voting in the brain as to whether they should be facilitating our hearing, seeing, smelling, tasting, or touching something. The weighted voting of neurons is giving neuroscience a basis for modeling consciousness using Bayesian inference that would randomly sample for probability based on prior likelihood. When applied to artificial neural networks this inferential process is being used to uncover hidden data sets by regenerating them from the ground up and is referred to as a *Helmholtz machine*. A machine-learning neural-network uses the adjustment of weights to adapt its internal matrix in conjunction with the information it receives. It will adapt the basic computing unit of a perceptron that uses three inputs including a preset bias and two measurements to compute a result that is either positive or negative.

Neuroscientists have determined that some of our neurons assume tasks that are repeated for us throughout our lives, unless something happens such as a head trauma interrupting and rearranging that brain's connectivity. It seems neurons are dedicated to the objects we encounter allowing us to recognize things based on cellular activity. Memories are made from connectivity that is occurring during experiences we have using dedicated neurons that operate by gauging signal strength to parse what is going on inside and outside of our skin. As we grow and mature, in response to change we lay down mats of connectivity that continually recalibrate the existing structure, giving us familiarity with the world around us and helping in our ability to live in a changing world. The continuous recalibration in the brain accounting for chance and contingency

is phenomenal. Consciousness is an interface that accumulates information triggering change as it absorbs new data.

*Could a neuroscientist understand a microprocessor?*⁴⁷ This is a recent article by two neuroscientists who are frustrated with the lack of progress in understanding the processes in the brain that lead to consciousness. In their paper they describe the study they conducted as an attempt to use the methods applied by neuroscientists in studying the brain to look at an obsolete computer processor to see if this method would produce an understanding of how it worked. They found they could measure, and chart activities occurring in the microprocessor and map the locations of the transistors, but that this got them no closer to an overall understanding of its operation.

This study makes clear the difficult task ahead in conceptualizing the working of the human brain. Even so, it elucidates strong correlations between the brain and microprocessors. Both operate on multiple timescales and consist of hierarchically organized and specialized modules. They both retain memory over time and route information through their channels in flexible ways.⁴⁸ But the differences are far greater because neural systems “operate at temporal scales vastly slower” than classical processors but achieve “far greater parallelism.” “Typical neurons also have several magnitudes more of inputs than a transistor.”⁴⁹ In addition “the human brain has hundreds of different types of neurons and a similar diversity of proteins at each

⁴⁷ Jonas, Eric.; Kording, Konrad. “Could a neuroscientist understand a microprocessor?” (May 26, 2016) <http://dx.doi.org/10.1101/055624>

⁴⁸ Loc. Cit.: 2.

⁴⁹ Loc. Cit.: 9.

individual synapse”⁵⁰ whereas transistors are more limited.

In *Hexagraphy* I want to explore the relationship between the tiny transistor switches that backlit media uses (often referred to as the media landscape) and neural networks by indicating the positive or negative firing of a neuron using RGB LEDs. The artwork adapts light pixels into a landscape format to create an analog of neural mapping. Presumably the colours mapped out on the low-resolution screen I have made are even mimicked in the brain by mapping neurons following the changing colours when viewing the work.

Numbers

In Buddhism the mind is the focus of attention and there are many teachings proposing that everything within *samsara*, or relative reality, is ultimately empty and meaningless. *Shunyata* is the process of emptying one's mind in meditation. Named for a state of mind aspired to by students of Buddhism, this emptiness is said to be primordial. Mathematical zero (Sanskrit: *shunya*) was a gift of the Buddhist philosophy of emptiness. As a result of this, zero was probably first written in India. A key element in the binary system that allows us to conjure these chimerical manifestations made out of pixels, zero, the idea of nothing, is that against which we are able to make a measurement of any kind.

Euclidean geometry is a system to describe form and it is an apparatus for me to measure against in order to create an uneven and stretched out or shrunken topology. I have created a

⁵⁰ Loc. Cit.: 2.

different geometry, it is irregular and uses a series of probabilistic and indeterminate paths through time wherein any one of a number of probabilities might occur because the elements I use are all random in length. An operating guide for producing one of my grid sculptures is a stochastic chain. I start with the hexagon as a structural key and by using large quantities of randomly segmented thin steel rod one step at a time each sculptural iteration is rendered in this way to yield a result with a different topology. Some have veered away from simple relief becoming three-dimensional objects (*Spatial Anomaly*). The fact that many of these unstructured grids are reminiscent of a topographical description of space is pertinent to my present intention, which is to make a work that speaks to the way our brains relate to the terrain around us.

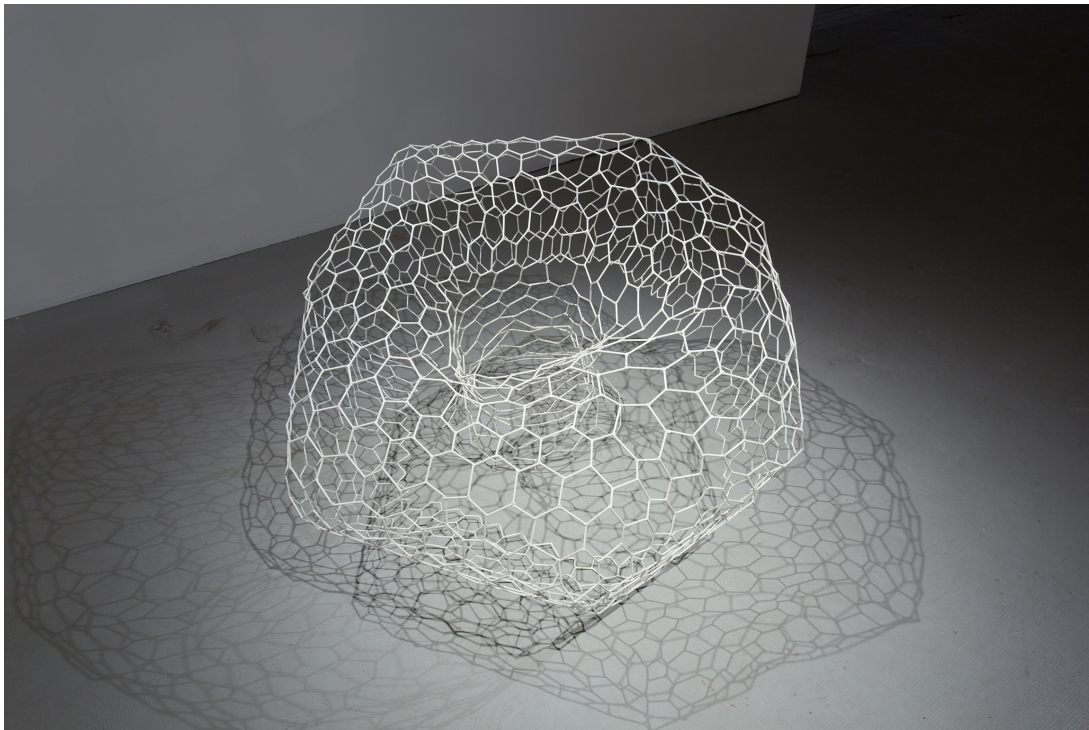


Figure 53. *Spatial Anomaly*, 2018. Powder-coated steel.

Each length of steel rod I use becomes a fragment of a hexagonally coded object. One component of the data I am creating is the length of each rod. Length has a storied past in

mathematical theory in the form of the number 2; the second position which has moved away from the single point becoming a line. 2 it turns out is an important number, it is the first prime number and the base of the binary number system that uses only two digits: zeroes and ones. It is both an *evenly even* number and an *evenly odd* number.⁵¹ The Pythagoreans associated it with women because they considered it to be symbolic of the material world due to its having been removed from the monad. 1 for the Pythagoreans was indivisible and they believed 2 contained a copy of 1 and 1. The first two whole numbers 1 and 2 added together equal 3 the magical number of the triangle. When there are 2, they can be opposed to each other in some way, which is a notion that is at the root of the line and gives rise to philosophical duality which contains the idea that something and not something occur simultaneously and separately which defines potential in a sense because of the tension between them. This describes many things neuronal as well as electrical charges that rely on the poles of positive and negative. 2 is audacious in its separation from the monad, which for the Pythagoreans was the beginning of a circle of numbers ending in the greatest number: 10.

In the artwork explored in this text 2 represents a line, the variable lengths of the rods I am using to create the hexagonal shapes of the grids that all have 2 points: their beginning and their end. 2 is important for its symbolic association with the material world as a measure of variation from 1.

⁵¹ Evenly even numbers are all duple in their ratio to the number one. They can be halved back to one. So they include 1,2,4,8,16,32,128,256,512,1024 and may seem familiar because of the binary math used in computing. Evenly odd numbers which might only be halved once because halving them produces odd numbers in the Pythagorean system which doesn't divide one; 2,6,10,18,22... every fourth number is divided with this result.

3 and 6 are also important numbers in this artwork. 3 is the number of the triad and it is the second prime number perched exactly next to the first one 2. 3 is a Pythagorean incomposite number meaning it cannot be evenly divided by whole numbers other than 1 and itself. In ancient lore 3 represented the primary colours and the major planets and it creates a triangle that brings forth the seven spirits in Masonic symbology. 6 is the hexad and represents the creation of the world for the Pythagoreans. It is a measure of duration and equilibrium allegedly containing the elements of immortality. With the number 28, 6 is one of only two perfect numbers between 1 and 100. A perfect number is one which is equal to the sum of its positive divisors excluding the number itself and when that number is included it is equal to half of that sum. So $1+2+3=6$ and $1+2+3+6=12 / 2 =6$. There are only four perfect numbers between 1 and 10,000. 6 is a perfect number and it works very well in my geometric grid construction in giving me the number of sides in the element that I repeat a number shared with the carbon molecule. Using 3 points of connection in a repetitive visual pattern one creates 6-sided elements and using this method it is possible to define curves that arc in more than one direction resulting in the contorted hexagons that create the terrain-like properties of the grids I am making.

Stochastic processes and Markov Chains

Over the course of a decade I have moved toward a methodological practice where I am operating in a much more improvisational and provisional manner, which is a key element in the creation of my recent work. By using a stochastic process which is a sequential evolution in time using a set of randomized variables I can improvise the form in both sculpture and drawing. Using randomized elements and constructing form in a repetitive and sequential manner is the method I am employing. The lengths of rod are welded together in a continuous stream of time.

In this activity there is indeterminacy because the form could develop in many ways. Time is represented topologically because of the way the sculptural grids created this way emerge within space.

The means in this project of creating form emphasize difference within repetition. It is a randomized rendition of deterministic operations. I mean to suggest there is a significant difference between computation and consciousness by matching the determinism of a processor with the randomness exhibited by neurons. The *stochastic* process that I have employed for creating form by adding one line at a time creating an assemblage of lines is also indicative of utilizing a continuous-time Markov chain. Known in statistics and probability theory, a continuous-time Markov chain is considered a stochastic process; it occurs and incurs changes in continuous time resulting from the existence of a series of variables. The process I am engaging here in both the welded grids and the wind algorithm and other drawings generates evidence of this type of continuum of activity in the means involved in constructing the forms. It is a way of thinking about art by mixing objectivity with subjectivity.

Objective Subjectivity

Written by Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* is a book that promises to attempt a reconciliation between science and epistemology. She is a scientist with a PhD in theoretical particle physics as well as a Professor of Feminist Studies, Philosophy, and History of Consciousness.⁵² Her brand of

⁵² Karen Barad is Professor of Feminist Studies, Philosophy, and History of Consciousness at the University of

materialism, “agential realism,” merges objectivity with subjectivity and blends disciplines, which is a characteristic of post Deleuzian materialist philosophy. Crossing disciplines lends her writing an uncommon richness and tenability. Barad suggests that performative and agential processes of mattering create phenomenological results. The human imprint on a purportedly objective scientific process provided by technology. Barad’s ideas suggest that a complete remapping of our notion of reality is underway and this is especially true for post or trans-humanists aspiring to reposition *Homo sapiens*:

...humans (like other parts of nature) are of the world, not in the world, and surely not outside of it looking in. Humans are intra-actively (re)constituted as part of the world's becoming. Which is not to say that humans are the mere effect, but neither are they/we the sole cause, of the world's becoming.⁵³

Humanity has arrived at the realization that the planet Earth wasn't created *for* us, but that we are part of a continuum of life here that is nurtured and sustained by being here. The biodiversity on planet Earth is extraordinary but everything survives in a web of contingency that seems to have limits. I am engaging continuous processes that result in emergent form in order to try to experience something of the continuum I exist within.

Extensions of our senses such as electron microscopes or particle accelerators are apparatuses performing agential cuts into the real by framing the information they yield in specific ways, inseparable from the ways that the information has been gained. Barad maintains this equipment gives us insight into the real. She looks at our new cybernetic reality as a place

California, Santa Cruz.

⁵³ Barad, Karen. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Duke University Press, (2007): 206.

where access to the real is granted through an augmented agency using devices like particle accelerators that frame the information in discernible ways.

The combination of science and technology that amounts to an almost infinite extension of our senses is lending humanity an aegis that both amazes and terrifies us. For instance, carbon dating techniques allow us to have a window into the past and are one of the developments in technology giving us better knowledge of objects. Scientists have gathered information through the ever-expanding array of instruments available and this is forcing critical thinkers to bring objects back into view. Scientists who are in the forefront of establishing their given-ness now view objects on their own terms.

Karen Barad locates an idea about the region that separates each of us from any other person or thing in the concept of an *interface*. She is talking about an interstitial area where we meet each other and objects and where they meet us. For Barad, Judith Butler's notion that gender is performed⁵⁴ expands the agential field to include materials because gender is grown into and expressed in ways that are inseparable from regulatory norms. Bodies materialize over time within regulatory fields that gradually exert their influence upon us. Barad expands these ideas far beyond the realm of humans and the social to also include everything else.

In fact, with Barad's "agential realism there aren't separate kinds of materiality.... because there is a causal linkage.... which is to be understood in terms of (the) causality or intra-

⁵⁴ Butler, Judith. Gender Trouble

actions”⁵⁵. Her ideas are informed by quantum mechanics and conjure notions of materiality enfolding and encompassing us. According to Barad, “the world isn't naturally broken up into social and scientific realms that get made separately. ... The social and the scientific are co-constituted.”⁵⁶ Agential realism sees an apparatus as creative because its physical circumstances slice through “the materiality of phenomena”⁵⁷ in what she refers to as an agential cut. The interface between materiality and an apparatus is phenomenological because matter is dynamic, prolific, and inexhaustible.

In the video *A Year of the Air I Breathe*, I use the computer as an apparatus in synergy with the internet and satellite technology to locate myself on Earth in a way that shows me submersed in my environment vis a vis carbon dioxide gas that triggers the asthma that I and others suffer from that forces me to pay close attention to air quality. The irony that humanity is fouling its own nest is a stark reality becoming impossible to avoid.

The production of reality is not a novel concept to us by now and Barad reassures us: matter is not a fixed substance it is “a congealing of agency ... a stabilizing and destabilizing process of iterative intra-activity.”⁵⁸ It is in Barad's reverential reading of Niels Bohr that she finds inspiration and she explains it like this: “apparatuses are macroscopic material arrangements through which particular concepts are given definition, to the exclusion of others, and through which particular phenomena with particular determinate physical properties are

⁵⁵ Loc. Cit.: 211.

⁵⁶ Barad, Karen. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Duke University Press, (2007): 168.

⁵⁷ Loc. Cit.: 210.

⁵⁸ Loc. Cit.: 151.

produced.”⁵⁹

Barad informs us that not everything is materially instantiated in the same way, “matter matters, and so the nature of the specific embodiment matters.”⁶⁰ She tells me that materials bring potency even before they are put to any use. Materials are all specifically embodied in ways that relate to other forms of embodiment: wood for instance burns well when it encounters oxygen; water saturates well when it encounters a porous material.

V PHILOSOPHY and OBJECTS

In fact, the concept of “mattering” suggested by Karen Barad is an underlying cause of philosophy. This is because at the end of the day, we humans are made of matter with the same types of molecules, like carbon, that exist in our environment. We humans are not only concerned with mattering in the conceptual sense of *this matters* but also in how matter comes to be at all shifting the focus to a scientific investigation of objects. Objects have a large role in how we exist and the way our lives play out. The so-called digital revolution has given us the aid of computation and with that as a tool we are finding out more about the planet Earth and the universe beyond. The big challenge is to bring the individual and the universal together in a meaningful way. Geological objects are showing us how the physical situation of the world we have created does not always bode well for interstitial beings.

⁵⁹ Loc. Cit.: 142.

⁶⁰ Loc. Cit.: 210.

The relationship of human beings to things is what I am concerned with in this section, and I discovered in some recent philosophical thinking there is a shift in how we think about objects. The philosophers who I will examine here owe a debt to the phenomenologists that were active at the same time that Niels Bohr was experimenting with bits of matter leading to the inception of quantum physics. I will give a brief explanation of the relevant ideas I found in this early twentieth century philosophical school and then look at some of the ways current philosophy is considering objects.

Phenomenology

Phenomenology in philosophy is a study of essences and it sets out to use something called 'facticity' as a starting point. *Facticity* is a quality that causes something to be something. It exists outside of consciousness and so it presupposes a world already there before any particular knowledge of that world began.

One of Phenomenology's leading proponents, Edmund Husserl, held that consciousness itself was contingent on the world; it is of the world and not the opposite. For Husserl operative intentionality constitutes the mode of our lives and propels us through life. This, he proposes, is a non-predicative⁶¹ and utterly contingent self. *Facticity* generates contingency and floods the world with meaning, "Because we are in the world, we are condemned to meaning."⁶²

⁶¹ Plato in his theory of forms posits self-predication as: every instance of a certain thing (for example largeness) is in fact that thing (large).

⁶² Merleau-Ponty, Maurice. *Phenomenology of Perception*. London: Routledge, 2004 reprint (1958 translated by Paul Kegan from 1945 French edition): xxii.

Husserl, who established the school of Phenomenology, sought to deconstruct historicism through his inquiry into the origins of idealities. He wanted to uncover the root of the agreed upon objectivity he saw as creating idealities. Historicity is the chain of tradition these idealities engender. Objective idealities were tied to a universality found in language or geometry, places that may harbor some objectivity. By looking at logic as a formal structure and mathematics as ontological of form he felt he had evidence for a theory of all possible theories. He called his method phenomenological reduction. His system had three layers. The first was concerned with grammar or the meaning a form inhabits, the second was a stratum containing consequence and non-contradiction a realm of semantics, and the third was metalogical occupied by a theory of all formal possibilities for theories.

In fact Jacques Derrida's first manuscript of any length examined the limits of phenomenology by looking at, retranslating and publishing a 1936 essay by Husserl as "Origin of Geometry: An Introduction."⁶³ In it, Husserl discusses subjectivity in the context of empathy and language in contrast to what he calls the "systematic, endlessly growing stratified structure of idealities" of geometry.⁶⁴ Indeed, in the text he is taken up with its origin. Geometry was seen by him as "a mathematics of pure spatiotemporality", a categorical abstraction. Derrida in his introduction explains:

Geometry, in effect, is the science of what is absolutely objective – i.e., spatiality – in the objects that the Earth, *our* common place, can indefinitely furnish as our common ground with other men. But if an objective science of earthly things is possible, an objective

⁶³ Derrida, Jacques. *Edmund Husserl's Origin of Geometry*, University of Nebraska Press (1989).

⁶⁴ Loc. Cit.: P. 163.

science of the Earth itself, the ground and the foundation of these objects, is as radically impossible as that of a transcendental subjectivity. The transcendental Earth is not an object and can never become one. And the possibility of a geometry strictly complements the impossibility of what could be called a “geo-logy,” the objective science of the Earth itself.⁶⁵

The Earth is both the ground zero and horizon of the human individual. But the circle that magically encapsulates each of us in our own ego is decentered as we become aware that perhaps this ground or “zero point” does not in fact exist *for us*, and that at any time we might be obliterated by a wayward asteroid. Because humanity has by now created images of the Earth while not on it, we can develop an understanding of the planet’s status as a finite object in some sense and of it being *in space*.

Writing in 1945, Maurice Merleau-Ponty, also a proponent of Phenomenology, claimed that its chief gain for humanity was *rationality*, which he defined as a kind of middle road between extreme subjectivism and extreme objectivism. Indeed, for phenomenologists, essences propel the entire mesh of perception and phenomena, without them there is no necessity and contingency does not arise. In the phenomenological reading of the situation, essences establish *facticity* from which consequences emerge and this is how meaning is generated.

Philosophy and the Digital Turn

In many of the texts I have read for this thesis the authors grapple with the question of the

⁶⁵ Loc. Cit. P. 83.

reality and primacy of objects in relation to humans. Perhaps it is computer code that will perform the final rites of the transcendental subject, or at least remove its privilege in the field of critical thought. Undoubtedly, because of its residence in human minds, thought has been privileged in philosophy in relation to things. Many of the enormous objects which exist in ways that are not obvious to us through our senses have however been defined by math. This mathematics involves so many calculations that it has to be performed by computers in order that it is done in a reasonable amount of time, and this is only made possible as more computing power has come online. I am interested in finding the place of humans in a world of objects and compounded objects; enormous and unimaginably large *hyperobjects* that are assemblages and generate fields of contingency with which we humans are saturated and largely unaware. The problem has been not knowing enough to look for them until we did.

Over a period of centuries, philosophers have gradually been coming to terms with the existence of objects. These have been assessed as being anything from 'bundles of qualities' (Hume) to being only able to generate an identity by having a history. Philosophers of difference see objects as differing even from themselves, making them indeterminate and therefore it cannot be said whether they play a role in philosophy or not. It is against this grain that speculative realism strives, and it is from that ground it arose. Speculative realism is the name for a group of loosely associated thinkers who are shifting the polarities in philosophy through a process of coming to more realistic terms with objects. This is because new tools that have been developed as a result of advancements in technology are deepening the understanding of the dynamics of our environment.

Philosophy doesn't deny outright that objects exist, but typically fails to see the importance in questioning them on their own terms. Do objects have agency or any impact outside of our immediate sphere? There are many forces operating on planet Earth that are invisible to the naked eye electricity and magnetism being but two. We have only been toying with our electrical computational contraptions for less than a hundred years and it seems odd we are now in the position of creating artificial intelligence.

Because of opportunities in science created by its synergistic relationship with advances in technology, the twentieth century gave us the ground upon which to re-evaluate objects. Now, in the twenty-first century, *speculative realism* and *object-oriented ontologies* are among an increasing number of materialist philosophical systems focused on objects. The philosophers concerned are contending that objects do not exist *for us* and they find the situation is even reversed with things having more permanence but apparently even objects are no match for time. My artwork *Hexagraphy* is a device that is not particularly advanced and is clearly not striving to be, but it is an object that nonetheless does appear to wield an agency of its own, albeit one that is algorithmic.

Speculative Realism

Quentin Meillassoux

In his preface to philosopher Quentin Meillassoux's *After Finitude: An Essay on the Necessity of Contingency*, Alain Badiou explains, “Meillassoux's proof – for it is indeed a proof – demonstrates that there is only one thing that is absolutely necessary: that the laws of nature are

contingent.”⁶⁶

Technologically assisted apparatuses have greatly exceeded our five senses, allowing us to measure and record phenomena that previously we did not know about and therefore were beyond the realm of our thought. You cannot think about what you do not know about, is a claim Socrates attributes to Meno. But it is a credo that sounds like a warning today. Technology ruptures our understanding of reality all the time with one apparatus or another, in order to bring ever more compelling information that recalibrates the position of the world we exist within.

What happens to the culture at large when science makes game changing discoveries? In some sense it takes extending beyond conventional understanding and requires speculative thinking to explain. The assurances of the subject-object duality have been ruptured by digitized data providing an extension of vision with microscopes and telescopes and even extending down into the ground hundreds of meters to bring up drilled ice cores going back thousands of years in time. The information found by analyzing each layer of information trapped in the ice as it is melted away aids a speculative scientist and undermines a metaphysics driven by what Quentin Meillassoux calls *correlationism*, by which he is referring to the subject-object loop⁶⁷ where neither term can be considered separately.

Meillassoux rejects *correlationism*, wherein he finds the unbreakable Cartesian subject-object circle and claims the object is always presented in philosophy *for us* and never *in itself*. He

⁶⁶ Meillassoux, Quentin. *After Finitude: An Essay on the Necessity of Contingency*, Continuum (2008) Bloomsbury Academic reprint (2014): vi. Alain Badiou is quoted here from the preface to the essay.

⁶⁷ A term coined by Quentin Meillassoux in his book *After Finitude: An Essay on the Necessity of Contingency*. London; New York: Continuum, (2008). Meillassoux uses this term to refer to the subject-object circle of Kantian transcendentalism and Hegelian Idealism.

reminds us that under *correlationism* the very possibility for any independent consideration of either subject or object has been “disqualified.” For him the task of philosophy is found in breaking this circle by upending reason using speculation and *facticity*.

A logo-centric ethos is fascinated with the difference between the sensible and the intelligible and this is driving a general human obsession with difference. The interface between the sensible and the intelligible is consciousness. The separation between the material and immaterial characteristics of the human brain is a basic dualistic paradigm of difference. We strive to solve the secret of how the brain's fleshy material can give rise to immaterial thought, wonder, and the imaginative creativity that has caused the extent of human culture. In the same way it really is astonishing that zeroes and ones can conjure the highly resolved images rendered by coded software on pixelated screens. Digitized representations are manufactured not by a chemical reaction to light forever embedded in a material substance, but by electrical sensors that measure light and continue to get smaller and smaller every few years. The binary language is neither sensory nor logocentric and it stands outside of their quarrel perhaps as the third side of a triangle?

Meillassoux's text uses a reasoned method to disrupt the tendency in philosophical thought that strives not to consider objects as entities in their own right. It maintains the need for a polydualism to counter the subject-object duality that he sees as controlling philosophy. In his method he endows objects with the property of being *given* in themselves, outside of human thought because they can be mathematically proven to exist. Simply because human cognition fails to know *things* from an objective position, it doesn't mean they don't exist that way. In his

version of what is real only objects make the cut, and he makes his case by turning the *correllationist* logic around.

In developing his notion of *ancestrality*, Meillassoux relies on techniques like carbon dating to provide evidence of the breach in the subject-object circle. Evidence that things exist on their own terms outside of human cognition. Our new computationally supported tools show us objects in ways that call into question the primacy of the subject in thinking the object. These tools make cuts into the real but also condition what we see in a way that frames it. Objects, it is maintained via these scientific methods, turn out to be much older than human thought, because objects like rocks have existed almost since time began if we count that as the Big Bang, whereas humans have only been around for a tiny fraction of that. Meillassoux is forced to face the vastness of time and he acknowledges the geological existence of the planet before humans even arose from their molecular soup. It is a fact that carbon atoms don't disappear they simply change form, where once they were vital molecules needed by long dead and fossilized organic life then they were hydrocarbons and eventually carbon dioxide and the cycle is repeated.

Perhaps humanity will have to concede its ultimate pointlessness because in reality it only occupies interstitial space in relation to the compounded objects that surround us. Any methods we use to process the objects in our midst have consequences that will only really affect organic life. Objects are actors in *hyperchaos* in contrast to our fleeting appearance as vulnerable water-based vessels. Philosophy, for Meillassoux, has much to account for in privileging the epistemologically constructed subject that saw everything *for us*, because a lot occurred in the realm of objects on this planet and many cataclysmic events took place here for many eons before

human cognition had even arisen.

Acknowledgement of *ancestrality* and the *givenness* of objects makes it easier to perceive the agency *things* possess. In studying the planet geologists find many processes occurring that we have nothing to do with but that have a lot to do with us. In my practice I have an ongoing interest in objects that carry agency, whether chemical or conceptual. In earlier work the drugs that formed my subject matter, for instance, are objects that disappear once ingested but then exert an agency beyond our control; like Alice we fall down the rabbit-hole. A drug's agency is to place the body within its constraints for specific purposes of some kind and these effects ought to be experienced similarly by everyone universally. The *universal subject*, that deep thinker whose perception acknowledged his existence was like a drug too, in that it was a prescribed set of constraints emanating from what Jacques Derrida would have termed the “metaphysico-theological roots” that are the footing of Western culture.

For Derrida, who described a logocentric bias of philosophy that is maintained by the ultimately untenable (for him) separation between signans (sign) and signatum (signified), thought itself is onto-theological because of that separation. The very idea of the sign refers to a marked difference between the sensible and intelligible leading to various metaphysical elaborations. Thought itself arises from this gap between a sign and what it signifies, and the many new gaps generated between thoughts. In Derrida's view linguistic science is inherently onto-theological because it references a “signified able to 'take place' in its intelligibility, before

its 'fall', before any expulsion into the exteriority of the sensible here below.”⁶⁸

Meillassoux however, is on a quest for the unconditional and does not find any necessity in “the processes of nature.” He finds chaos to be the primary absolute and describes it as “a Time capable of destroying even becoming itself by bringing forth, perhaps forever, fixity, stasis, and death.”⁶⁹ In his expression of time as *hyperchaos* he proposes “an extreme form of chaos...for which nothing is or would seem to be impossible, not even the unthinkable.”⁷⁰ *Hyperchaotic* time is the absolute principle governing our world and therefore, for him, it is all that truly *is*. Meillassoux claims he is not a metaphysician but a speculator on the absolute, which he finds only in contingency. Hyperchaotic time is the time of the Universe the time of stars and whole galaxies merging as in how the Milky Way and the Andromeda galaxy are moving together and set to collide in a few million years which will cause the destruction of the delicate balance in our solar system that supports life. Organic life exists between the beats of the clock of *hyperchaotic Time* and the beings of this planet carry within our hearts a tiny fragile clock of our own that barely registers as a blip within hyperchaos.

Those blips are that of *ontological becoming* and although Gilles Deleuze helped lay the epistemological ground for the development of speculative realism, Meillassoux believes that Deleuze’s vitalist approach is irrational and contradictory. Because Meillassoux is positioning non-contradiction as ontological and Deleuze is focused on the creative differentiation of thought

⁶⁸ Derrida, Jacques. *Of Grammatology*, (transl. G.C. Spivak). Baltimore: Johns Hopkins University Press, (1976): 13

⁶⁹ Meillassoux, Quentin. *After Finitude: An Essay on the Necessity of Contingency*. Continuum (2008): 64.

⁷⁰ Loc. Cit.

and would abolish every non-contradictory logical principle with his belief in the changing and evolving of thought that continually recreates the very rules of its own game. Thought for Deleuze is ontological and this makes it capable of conceiving what Meillassoux is suggesting which is a kind of rule-changing on the stage of meaning, whereby the concepts of *facticity* and *ancestrality* are necessarily acknowledged. But Meillassoux is putting us on another spectrum of probability where hyperchaotic agency coalesces through a combination of universal physical forces. It seems as though it is their differing conception of meaning itself that is somehow unreconcilable.

Whereas Meillassoux is minimizing *ontological becoming* in considering time as *hyperchaos* because his time is astrophysical and the bio-becoming of Deleuze is a perpetrating of agency or *ontological becoming* that sees time differently and exists on another spectrum of possibility. The probable and the possible seem like different places. There is almost no way of reconciling these two views except through becoming; they can be described as being of differing wavelengths that exist alongside of each other and become entangled. One of these fellows sees the real from the position of the universe and the other from the perspective of the flora and fauna on our planet. Meillassoux is accessing the inorganic using a program of rational physical science that sees meaning that exists with or without humans around to notice. With Deleuze meaning resides in how humans and other beings respond to the challenge for ontological becoming in changing the rules of thinking itself, of representation. In other words, as the unfolding of our genes responds to and understands the challenges of our environment it is how we evolve. In the environment we can find evidence but Meillassoux is letting us know about a different type of existence, where our planet lives, which is something everybody on it shares. As physicists

become cognizant of what is occurring within our environment and beyond in outer space and even outside of our own galaxy the slow methodical plodding of the universe is portrayed for us by media, and we can all learn about it quickly now if we feel the imperative. The survival of the species seems to count on it and the explosion of knowledge into the public realm of the internet has given anyone who can connect to it the opportunity to explore.

In his defining work, *Difference and Repetition*, Deleuze sets out a program where identity dissolves into repetition and multiplicity and where, “pure presence such as it appears in the simulacrum has the 'disparate' as its unit of measure – in other words, always a difference of difference as its immediate element.”⁷¹ Deleuze’s de-centering tendencies of difference and repetition help undermine any claim to solidity or quest for an absolute and show us that he was engaged in elaborating ontological becoming by questioning the privilege of identity over difference. Deleuze called his position “transcendental empiricism” and held that philosophy was the way to determine and generate those conditions of the new that would lead to fostering creativity. “The fracture of the I was no more than the pure and empty form of time, separated from its content.”⁷²

The dissolution of a transcendental subject that so famously vexed Jacques Derrida⁷³ is

⁷¹ Deleuze, Gilles. *Difference and Repetition*. New York: Columbia. Copyright: Athlone Press (1994): 69.

⁷² Loc. Cit.: 110.

⁷³ "Deconstruction contributes to a philosophical account of a non-classical subject whose 'phenomenology' is contingent upon and 'open' to historical or technical environments which are also its quasi-transcendental conditions. However, as we shall see below, the classical subject exerts a hold on Derrida's thinking where he qualifies this contingency in the most radical manner: as a relation to an 'other' so transcendent that it resists conceptualization through rational methods of belief-fixation."

"The Subject" by David Roden in *Understanding Derrida: An Invitation to Philosophy*, Jack Reynolds and John Roffe (eds), Continuum Press, pp. 93-102 (P. 95)

also the fracturing of the privileged human position. Within the fracture of this epistemological *hyperobject* it is now revealed by Meillassoux that each instantiation of subjectivity performs its own version of the content of time, albeit a performance that lasts but a nano-instant of *hyperchaotic* time, thereby undermining the reliability of any transcendental biological reality.

The resonance this idea has with Buddhist teachings on existence comes through in the words of one Zen Buddhist Scholar, Master Eihei Dogen who wrote in the eleventh century, “Time is not separate from you, and as you are present, time does not go away.”⁷⁴ The pure and empty form of time in Deleuze is reminiscent of the Dzogchen Buddhist concept of *dharmakaya*, or absolute reality, where time is emptied of ego or *self-nature* through transcending form into the realm of formlessness. It is paradoxically also the base from which all form arises.

Meillassoux is presupposing an evaluation of objects in themselves that have laws and governance of their own. In his view it is only objects that are really *given* in themselves. Under this rubric he maintains “the subject is not really even an entity, but rather a set of conditions rendering objective scientific knowledge of entities possible.”⁷⁵ He gives us the subject as a gaze, a gauge; a device that measures and frames aspects of the environment. In addition to its inherent fragmentation the subject does not exist apart from its individuation. Subjects are “instantiated rather than exemplified in thinking bodies.”⁷⁶ Meillassoux wants us to “grasp in facticity not the inaccessibility of the absolute but the unveiling of the *in-itself* and the eternal property of what is,

⁷⁴ Dogen, Eihei. Shobogenzo: Uji (Being Time). As quoted here: <http://buddhism.about.com/od/Existence/a/About-Time.htm>

⁷⁵ Meillassoux, Quentin. *After Finitude: An Essay on the Necessity of Contingency*. London; New York: Continuum, (2008): 23.

⁷⁶ Loc. Cit.: 25.

as opposed to the mark of the perennial deficiency in the thought of what is.”⁷⁷

Graham Harmon

In Graham Harmon's *The Quadruple Object* he examines Martin Heidegger's ideas about objects⁷⁸ and through this develops his own nuanced materialistic approach. Harmon is the key figure in *ooo* or *object oriented ontology*, which is another branch of speculative realism. By “objects” Harmon writes, “I mean unified entities with specific qualities that are autonomous from us and from each other”.⁷⁹

Harmon discovers within the text of the 1919 presentation by Martin Heidegger of his tool-analysis what he calls an early *four-fold model*⁸⁰ that is, a way to look at the tension between the cognitive and sensual on one hand and the physical realm where objects retreat from us on the other. In his own model Harmon borrows from Heidegger who opposed the veiled and unveiled aspects of an object with each other on one axis, paired with beings as a whole as opposed to an individual being on another. Whereas Harmon gives us a fourfold of real objects and real qualities paired with sensual objects and sensual qualities. It is the sensual realm where we exist

⁷⁷ Loc. Cit.: 52.

⁷⁸ Heidegger, Martin. “The Question Concerning Technology”. In German in *Vorträge und Aufsätze*. Germany, Garland Publishing, 1954. (English trans. 1977).

⁷⁹ Bryant, Levi. Harmon, Graham. Smicek, Nick. *The Speculative Turn: Continental Materialism and Realism*. Re.press Melbourne (2011): P. 22.

⁸⁰ Aristotle's fourfold of “soul vs world and matter vs form” is one example of such a model within philosophy. In addition to the book I have mentioned above Harmon has referred to the early model of Heidegger's in a 2016 essay “The Future of Continental Realism: Heidegger's Fourfold,” *Chiasma: A Site for Thought*: Vol. 3: Iss. 1, Article 6: (P. 95). In the 1919 tool analysis Heidegger presents to his students, Heidegger “speaks of two types of theory” For every layer of perception might be said to be “something in general” so while a hammer is something perceived by *Dasein* (*being in the world*) it is also something in general, distinct from how it appears to humans in a realm of its own leading to there being two realms for objects and two realms for *Dasein*: (veiled and unveiled vs beings as a whole and an individual being).

as beings with individual experiences and Harmon reminds us that some part of the real objects we encounter are always withdrawn from our cognition, but these objects are still there and are in fact *given* in themselves in a way that we “beings” are not. The problem as Harmon sees it is that humans need everything to be given *for them* not just *given* in general.

Harmon determines that the notion of deduction is stripped of plausibility as the mode by which human beings access their environment because so much is beyond human scope. Thereby he decides deduction is philosophically inadmissible as any kind of first principle. Philosophers are notorious in their quest for first principles. Leibniz believed it was God but Meillassoux proposes *hyperchaotic Time*. Harmon does not (as he puts it) consider philosophy to be a branch of geometry and wants to steer clear of overly abstract principles in order to avoid being useless. Harmon's asymmetrical quadruple object grew from precedents set by other philosophers. In particular Edmund Husserl's noting of the tension existing between objects and their qualities caused by seeing them in many differing ways, a precursor of Heidegger's fourfold model. In a deeper sense Husserl believed the real qualities of objects are withdrawn and “limited to oblique approaches by the intellect.”⁸¹

We don't ever witness objects in their entirety because they are always withdrawn behind veils like that of time. In this sense it is *time* within which Eric Cameron's objects are veiled behind layers of accumulated paint becoming objects that have been entirely hidden from view. These objects only exhibit vague hints of what lies underneath; one of these is a light. It is odd

⁸¹ Harmon, Graham. *The Quadruple Object*. Zero Books, (2011): 98.

that Eric's lamp unplugged and completely removed from view should shed any light, but it did show me the way forward in my own practice. In Harmon's estimation, “we face a landscape of unified sensual objects that emanate or radiate different qualities at different times.”⁸²



Figure 54. Eric Cameron, *Soft White*. 1994, lightbulb, acrylic paint.

Hyperobjects

Timothy Morton

Designated by Timothy Morton in his 2013 book *Hyperobjects: Philosophy and Ecology After the End of the World*, hyperobjects are enormous and phased objects. These types of objects

⁸² Loc. Cit.: 80.

can be observed over space and through time, some exist as weather systems that are now thought to be involved in the larger context of rising global temperatures. It was climatologists, who were plotting the trajectories of weather systems in order to gauge their interaction, that first noticed large interactive conglomerate entities like El Nino. Computation, which excels at modeling the behaviour of vast systems and plotting potential interactions, was effectively applied to weather systems and other compounded entities leading to the discovery of *hyperobjects*.

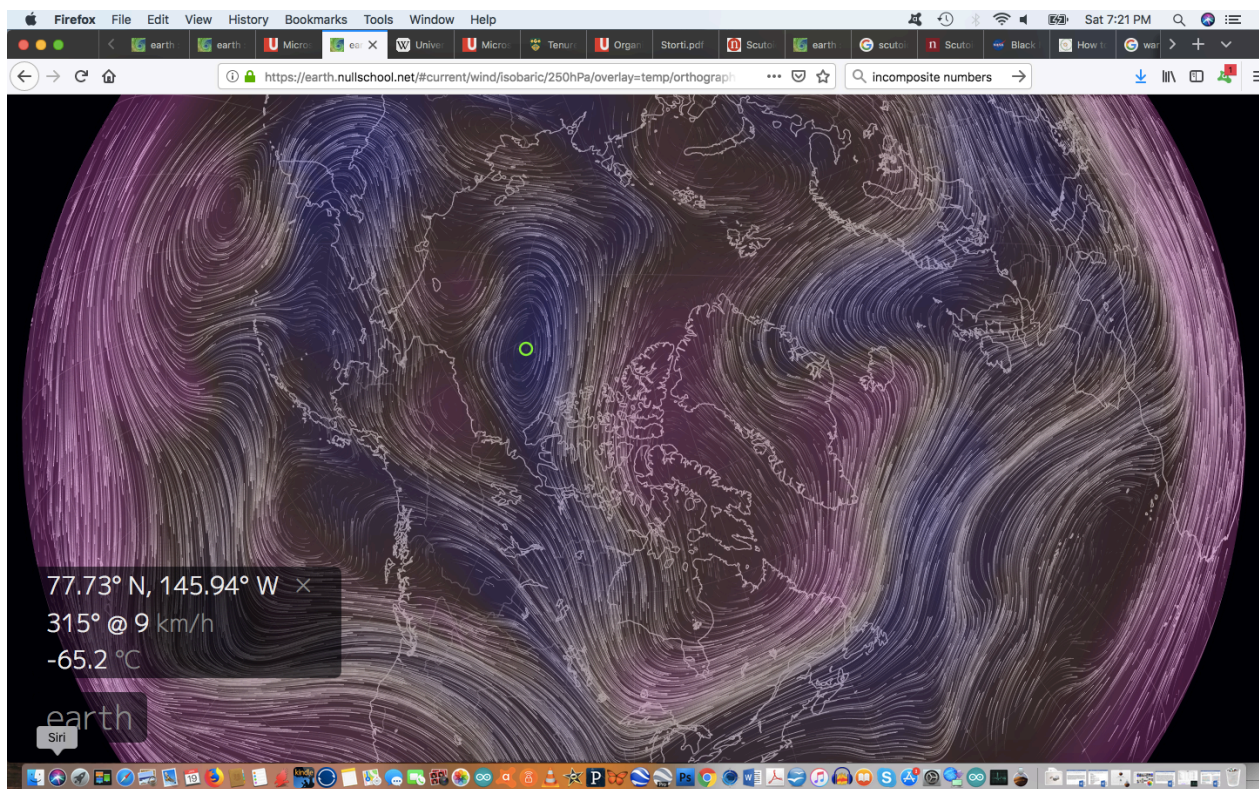


Figure 55. The polar vortex measured at a distance of 11 km from surface (250hPa) January 19, 2019

A hyperobject is a vast and complex entity like the polar vortex pictured above that funnels frigid air from high above to the surface of the Earth but typically keeps it at the poles. Sometimes due to other factors it drives that frigid air South because warm air flows North due to a weakened jet stream. It is an entanglement of objects with a viscous, non-local configuration

and completely out of our control. Viscous because it sticks to and saturates the objects immersed within it, and non-local because it is an object arising in a highly dimensional phased space. Hyperobjects are invisible to ocular vision because we are immersed within their time and space and can find only traces of their existence to observe. For Morton, a deep and structural shift has occurred in human awareness as a symptom of, “a profound upgrade of our ontological tools.”⁸³ Because of the viscosity of the phased relationship they have with time, hyperobjects are constantly withdrawn from us leaving only their traces; indices of their existence that are fixed in hyperchaotic time like a series of fossilized footprints in space.

Tracking hyperobjects often requires recognizing fluctuations within precise measurements. We can't see them because our awareness of them arises speculatively based on indices and these quantities can be modelled using mathematical theory. They are objects that overwhelm the space they occupy in a vast nonlocal network. Inter-objectivity is a habit of hyperobjects where a common space is shared by numerous entities such as wind, temperature, humidity, electromagnetism, and gravity which merge in space creating a vast rhizomatic mass sometimes manifesting together in a thunder storm. Hyperobjectivity seems to exploit space, it is a galvanizing of proximity where forces coalesce and generate synergistic causality. Electromagnetism, nuclear energy, and to some extent gravity, are forces that have become greatly elaborated upon because of technologically assisted science. The twentieth century's digital turn has generated a lot of new scientific data that continues to accrue within the reservoir of available knowledge and is continuously recalibrating our position in regard to the planet.

⁸³ Morton, Timothy. *Hyperobjects: Philosophy and Ecology After the End of the World*. University of Minnesota Press, (2013): 101.

On Earth scientifically verified phenomena like gravity and magnetism combine with volcanism and the planet's vast oceans; each one of these individual forces is an example of hyperobjectivity but they all coalesce in the enormous and relentless ruptures of plate tectonics. The isostatic buoyancy of the tectonic plates floating in the lava under the planet's crust is generating the properties of conduction and convection. These factors indicate how the Earth's surface has gradually been formed by continual eruptions of molten lava, most ending up on ocean floors cooling into new strata that sometimes creates islands on top of the sea. Through its industrious processes the Earth is one giant index of itself and the perfection of its relation to contingency is relentless.

The orbit and rotation of the planet provide the stage for Earth's magnetic field. It is emanating from the dynamo in the planet's core creating enormous forces that make our very ground drift and collide. Despite the events of plate tectonics moving the terrain of the Earth around, the magnetic alignment of mineral molecules in rocks is an indication of two once connected regions. It is difficult for our subjective awareness to track this type of thing because we measure everything by the length of a lifetime. But during the past century this has dramatically changed because more information can be collected and collated therefore new data arises a lot more quickly.

In fact, we have accumulated so much information it needs to be stored in as minute a package as DNA. The continued shrinking of digital circuits means computers will eventually fit on the head of a pin; for the bits of matter in the universe are even smaller when broken into

constituent parts and the tiniest of those can be used to transmit information. Even now at a company called Twist DNA they are recording information using DNA.⁸⁴

Inventor Tim Berners-Lee considers the internet⁸⁵ to be a “large-scale emergent phenomenon that is anti-human.” He has hit here upon the characteristic of hyperobjects that we need to be most aware of. That is, the tendency for this type of object to have no regard for humans or our survival. The discovery of emergent phenomena is one of the most significant of our time because their apparent unsympathetic disregard for organic life is a threat to it. Through neural net assemblages code is being written now that does amazing things and the coders have no idea how it operates but a synergistic propensity emerges. It remains to be seen how machine learning will evolve but this code still begins with human initiative. I have found the internet to be most useful for research of many types and it has been a tool in my art practice since 1995 so I am very aware of how it has evolved.

In 2015 a friend⁸⁶ sent me a link for a website: <https://earth.nullschool.net/> and therein was an amazing map of the Earth created by a NASA scientist named Cameron Beccario. It uses the NASA controlled GEOS satellites and others⁸⁷ positioned around the globe that collect weather data to visualize various aspects of the atmosphere such as water vapour fields or thermal

⁸⁴ The artist Robin Peck's brother Bill Peck is working for a company called Twist DNA that is using DNA to record data.

⁸⁵ “I Was Devastated: Tim Berner's Lee, the Man Who Created the World Wide Web, Has Some Regrets.” *Vanityfair.com/news/2018/07*.
https://www.vanityfair.com/news/2018/07/the-man-who-created-the-world-wide-web-has-some-regrets?mc_cid=42e48fab29&mc_eid=dec964448e

⁸⁶ James Parrish

⁸⁷ GEOS-5; GMAO; NASA; OVATION; SWPC; NCEP; NOAA

and other structures. This software shows wind, ocean currents and other environmental factors such as CO₂ levels in an animated format with a three-hour lag in refreshing the information. Using this tool one can track environmental data at any location around the globe. The information already being collected using satellites, by NASA and other international agencies, is visualized on this website and used to help forecast and visualize virtual weather systems and air quality levels around the world.

On the site one can look at particulates and dust using an incremental measurement scale with a range of particulate mass (PM) of 2 micrometers through 10. Other filters display carbon monoxide, carbon dioxide, and sulfur dioxide. Air temperatures and wind speeds at various distances from the surface of the Earth are also visualized, and many more filters are available using the interactive map that occasionally adds new features. There are eight different map projections to render the planet on the site. The software provides data from many levels of the atmosphere, from sea level through to the jet stream and stratosphere.

Discovery of this tool led me to invent a process to make a drawing using guides adapted from the site to visually explore the concept of hyperobjects. Using it I can track wind and temperature which are very difficult to depict. With this site I stumbled upon a way to at least provide evidence of these phenomena in my artwork through an ongoing series of large ink drawings that use projections of the site's maps overlaid with filters available there as gauges of enormous environmental forces.

In order to set up parameters for the drawings I frame one of the maps on my computer

screen to project on the wall onto a sheet of paper. I then render a set of widely dispersed lines on the 44" x 30" surface directly from the projection. A few hundred widely dispersed colour-coded lines are drawn setting up a kind of algorithm for completing each drawing. I match the colours with those on the screen that gauge measurements from the atmosphere like relative humidity or air temperature. Once the guide lines are in place the projection is removed. This part of the process usually takes less than an hour. During the subsequent stages often lasting for a few months I engage in a process of echoing these lines in parallel approximately one millimeter apart and sequentially braiding the curving lines together as they coalesce. The curved coloured lines are an index of the planet's form as it interacts with the forces of wind that drive these elements of the atmosphere moving them around and mixing them together.

For me this way of aesthetically engaging an enormous entity within the environment is a means of beginning to connect with and understand the atmosphere that surrounds me. Wind is a ferocious hyperobject that we humans and other sentient beings are immersed within. It occupies interstitial space between things in a manner that is comparable to light. Where light incubates and exposes the world, wind shapes it carving space out of stone. Bringing the enormity of these forces into view on human scale is an impossible task but nonetheless one I find challenging. My goal in this work is to convey the potential of energy and suggest the contingent reality we humans exist within.

Bio-Organic Objects

Every human life is an instantiation of DNA that manifests through time in matter. From the tiniest starting point an actual physical being grows into matter out of code built with cells

that replicate in space and time. In his book *The Selfish Gene* Richard Dawkins lays out the way genes control life. They control form in bio-organisms, and he explains, the structure of a beehive uses hexagons because they are the most efficient shape to maximize space for the round bodies of the bees. According to Dawkins, humans are carriers of genes and despite determining many things about our lives the most important priority of our genes is for their own survival not necessarily ours.

Dawkins explains that some beings possessing lives magnitudes shorter than us such as insects like ants, bees, and termites, are social creatures that exist in time as larger entities transcending the lifespan of the individual members. This is evidence of a different order of hyperobject: a social organism where all members act in concert. A beehive is an organic component of the larger environment because of the way it exists in time and space as an entity that performs an integral role in the larger biome:

A society of ants, bees, or termites achieves a kind of individuality at a higher level. Food is shared to such an extent that one may speak of a communal stomach. Information is shared so efficiently by chemical signals and by the famous “dance” of the bees that the community behaves almost as if it were a unit with a nervous system and sense organs of its own.⁸⁸

Deoxyribonucleic acid (DNA), is an organic hyperobject because it is self-replicating and located in the nucleus and mitochondria of every living cell on the planet. It is a code that acts like a blueprint for the organism containing biological guidelines and providing fairly stable storage of genetic data. Ribonucleic acid (RNA), also found in the nucleus and additionally in the

⁸⁸ Dawkins, Richard. *The Selfish Gene*. Oxford University Press. (2006 reprint; First published 1976): 171.

cytoplasm and ribosome of a cell, occurs in various forms and is synthesized from DNA. It helps perform the DNA information that determines which traits will occur by transferring code to the ribosome that is needed by the cell for the production of proteins. Our DNA is a perfectly self-reflexive paradigm of code through its role as the enabler of complexity in bio-organic entities such as we are; in that we have even discovered the existence of these minute entities within ourselves. By actuating genetic codes that are housed in DNA, RNA is the substance that causes the various life forms on our planet to materially unfurl.

Inherent in the idea of code are the functions of replication and transmission. Within the genetic code, genes transmit the plan for the materials of life, but our genes don't always end up expressing themselves: they only turn on when the right circumstances arise. Genes are particular bits of DNA that replicate in individual humans and thereby become distributed throughout the world. To their own ends, genes are shared among us striving to thrive and replicate as widely amongst the population as possible. Dawkins refers to this as a *distributed agency* in *The Selfish Gene*.⁸⁹

Replication is not all that is needed to drive evolution. Evolution only happens when our genes do it badly: mistakes in replication are what lead to mutations. Mutations are what actually cause evolution. What triggers mistakes are challenges to survival that are often environmental. According to Dawkins it turns out that, “erratic copying in biological replicators can in a real sense give rise to improvement, and it was essential for the progressive evolution of life that

⁸⁹ Dawkins Richard. *The Selfish Gene*. Oxford University Press, (1989 reprint of 1976 original): 88.

some errors were made.”⁹⁰ In errors new genes are formed and sometimes they contribute enough to stick around for generations. Genes have evolved to enable us to metabolize complex proteins found in food like dairy. The relative stability of the genes in our DNA has given us the opportunity to use them to trace our genetic history. According to the description given by Dawkins genes fit the category of hyperobject easily because of their phased development over time. We are carriers of genes: they live through us in our bodies and then in the bodies of our offspring and for generations down through our lineages. Because of this we are immersed in them in the most intimate way.

VI TECHNO-GENETIC ANTHROPOGENESIS

In his book *The Selfish Gene*, Dawkins goes on to explain that a culture-*meme* is “an entity that is capable of being transmitted from one brain to another.”⁹¹ Language evolves through memes or units of cultural transmission and every generation produces new ones to help them make sense of and get on with their lives. “Language seems to 'evolve' by non-genetic means, and at a rate which is orders of magnitude faster than genetic evolution.”⁹² According to Dawkins a meme can be a method or a mode, a style or saying: any cultural unit that is transmitted through replication is a meme. The cultural environment is the meme pool and like genes in the gene pool those memes that stand the test of time stick around and help to define our reality.

⁹⁰ Loc. Cit.: 16.

⁹¹ Loc. Cit.: 196.

⁹² Loc. Cit.: 189.

The theory that genes and culture share a co-evolutionary relationship was first proposed in a 1981 book entitled *Genes, Mind, and Culture: The Coevolutionary Process*. In it, E.O. Wilson and Charles Lumsden argue that because neural networks are nodal, they share a correspondence with basic biological units of culture that form the language of memory and the cultural inheritance of humanity. The essence of their term “cultorgen” they later conceded was better reflected by the term “meme” that Richard Dawkins coined in *The Selfish Gene*. Dawkins argues that genetic evolution is propelled by a self-replicating unit of transmission, a gene, but also maintains that cultural units too are replicators. Human behaviour essentially consists of copying and thereby we are replicators of culture. Memes morph and change and, Dawkins surmised, culture itself evolves in tandem with biology.

Epigenetics is a field looking at what happens when there are changes in the phenotype of an individual that are passed on outside of a typical genetic inheritance scenario. Epigenetic factors are responsible for changes in the way genes behave and are expressed. These kinds of changes affect chromosomes but not genes. The term “epigenetic landscape” refers to the space of interaction between genes and their context and surroundings. Certain traits can be picked up and are heritable but do not change our DNA. Cell changes like those that come with cancer that affect our cells but not our DNA are said to be epigenetic. This is how the environment can trigger cell changes. A lot of cancers are initially caused by environmental or dietary factors and when our genes react to pressure in ways like this it can sometimes be heritable. Technology can become a genetic challenge if it is a constant such as might be endured through doing a particular job for many years. Backlit screens of predominantly blue light are known to negatively affect

our eyes and potentially cause changes there; the devices themselves all transmit wirelessly now emitting radiation and this is creating health problems in some and this could cause cell changes.

A study measuring brain size of uber-gamers has shown their brains to actually be larger than non-gamers, possessing more grey and white matter:

“Video gaming causes increases in the brain regions responsible for spatial orientation, memory formation and strategic planning as well as fine motor skills. This has been shown in a new study conducted at the Max Planck Institute for Human Development and Charite University Medicine St. Hedwig-Krankenhaus. The positive effects of video gaming may also prove relevant in therapeutic interventions targeting psychiatric disorders.”⁹³

Whether these changes to human cells become heritable is another question but changes are happening in cells within humans because of using media. It stands to reason then that these may affect gene expression. It is within gene expression where mistakes can cause heritable changes. These changes are epigenetic in the chromosome and genetic when occurring in the DNA. Humans are the format of our DNA expression and the physical way our genes determine our form is called a phenotype. If media affect our phenotype in any heritable ways this would be considered epigenetic. Our technology is affecting behavior which in turn may make changes to our cells.

Vitalist Materialism

Rosi Braidotti

Because the body is the site where the biological and the social intersect it is impossible to

⁹³ <http://www.mpg.de/7588840/video-games-brain>

separate my social sense of self from my materiality. Subjectivity is considered as a dimension within which one negotiates “the socio-political field of the microphysics of power...”⁹⁴ My inner life is derived from my corporeal reality and the social material realities that influence me. Therefore, because I am enmeshed in ways that I am governed by and I cannot escape from, my subjectivity as an ontological entity is somehow contingent upon that materiality. In the materialist view, this is how the self develops, because we are caught up in our lives and under the influence of many factors all interacting and creating new contingencies that are steadily emerging. *Zoe* is Rosi Braidotti's term for “the dynamic, self-organizing structure of life itself” that “stands for generative vitality.”⁹⁵ It is zoe-centred egalitarianism that Braidotti holds as the core of the post anthropocentric turn and it cuts across lines of species, categories, and territories.

Writers like Rosi Braidotti, Donna Harroway, Karen Barad, Elizabeth Grosz, or Judith Butler who all espouse varying degrees of vitalism via their materialist theorizing, are indebted to Gilles Deleuze who was inspired by Friedrich Nietzsche and Edmund Husserl. Within the writings of all of the above-mentioned female authors one finds ideas that expand the field for objects. Common cause among them includes questioning the binary opposition of terms like nature/culture, mind/body, male/female, and instead positing the notion of a spectrum upon which these binaries rest. For more than a few decades now the female authors listed above have sought to recast the status of women by focusing on and elevating the entire realm of objects. In particular the biosphere of the planet Earth is seen as vital and dynamic. According to these

⁹⁴ Braidotti, Rosi. “The Politics of Ontological Difference”, in *Between Feminism and Psychoanalysis*, ed. Teresa Brennan. New York: Routledge, (1998): 97.

⁹⁵ Braidotti, Rosi. *The Posthuman*. Polity Press, (2013): 60.

authors we exist as a result of our evolving in the world with each other and the entire realm of objects present here.

Nomadic Materialism

In her contemporary nomadic theory, Rosi Braidotti provides a tool to survive the current globalizing tendencies occurring in the world. Cultural insularity can and does lead to problems, for certain groups such as women, children, and the elderly. The very idea of culture has been elaborated enormously in the twentieth century to become more inclusive and we can now share it all instantaneously if we are connected to the internet. This has provided many challenges for humanity. Cultural influences are steadily migrating around the world in the twenty-first century. Instantiation of individual subjectivity is driven by culture, seen by Braidotti and others as a living breathing entity becoming increasingly hybridized as people move around the Earth. Through the instantiation of culture, our human selves come alive. Braidotti's materialism is full of vitality and hers was an early voice for a more globalized creativity.

A 1994 book written by Braidotti, *Nomadic Subjects: Embodiment and Sexual Difference in Contemporary Feminist Theory*, was a call for cultural producers to cross boundaries as a way to counter stasis in both political and intellectual realms. As one of a number of materialist philosophers calling for the abandonment of hegemonic thinking, Braidotti's approach to the situation has been informed by diverse feminist theorists that include Donna Haraway, Julia Kristeva, Genevieve Lloyd, and Bell Hooks. As a thinker, Braidotti claims she is without a mother tongue and that her output exists only as a series of translations, "of adaptations to

changing conditions.”⁹⁶ She *yearns*⁹⁷ for escape from phallogentric visions of subjectivity, and searches for ways around dualistic thinking. Once we drop the subject-object trap, cultural boundaries become less of a constraint because we no longer see our individual selves as quite so separate from the “other” whatever shape it may have. We become enmeshed with everything in a much larger field. Feminist materialist expressions can take on many faces from fleshy representations to cyborg circuitry. The ways all women represent themselves are figurations of the feminine for Braidotti, and all are important to this thinker. I believe her thinking is increasingly relevant because our proximal relationship to the world is changing as we move around the globe. The metaphor of the nomad is a very reasonable suggestion for a life lived creatively.

The unrelenting habitual tendencies of one's own mind provide overwhelming evidence that suggests the chemicals traversing through our brains often opt for the same channels most of the time. But human brains have shown that when given new challenges neural pathways can become nomadic and form new connections, such as those needed to enable relearning something or extending a capacity within an individual. Novelty also causes adaptation of neural connectivity and helps form new chains of communication between neurons, and this may be why we seek it out. These communicating neurons combine into bundles of electrical activity moving around the brain in response to the challenges of environmental stimuli. Subjective

⁹⁶ Braidotti, Rosi. *Nomadic Subjects: Embodiment and Sexual Difference in Contemporary Feminist Theory*. New York, Columbia University Press, (1994):1.

⁹⁷ “The black feminist writer and poet bell hooks, in her work on postmodern blackness, describes this kind of consciousness in terms of “yearning”. She argues that “yearning” is a common affective and political sensibility, which cuts across the boundaries of race, class, gender, and sexual practice and that “could be fertile ground for the construction of empathy – ties that would promote recognition of common commitments and serve as a base for solidarity and coalition.”” Loc. Cit.: 2.

nomadism is just such a challenge to hegemonic thinking. Braidotti calls for an “ethics based on the primacy of the relation, of interdependence, which values non-human or a-personal Life.”⁹⁸

Posthumanism

In her book *The Posthuman*, Rosi Braidotti's version of posthumanism is a vitalist materialist view where “transformative becoming”⁹⁹ is staged. Complex non-linearity is the mode of posthuman time and continuous re-invention of a self is the process of a nomadic subject. Braidotti contrasts being “joyfully discontinuous” with “being mournfully consistent.”¹⁰⁰ For Braidotti “life” or *zoe* as she calls it, encompasses death and the defeat of the universal subject. There is an echo of Deleuze in her opinion that life lived as “virtual suicide is life lived as constant creation.”¹⁰¹

Posthumanism is the view that if ever there were any valid human-centric rationale for existence they have expired. If speculative realists are reassessing our positioning of objects with relation to ourselves, posthumanism is calling into question the entire philosophical basis of the past few thousand years. It may be that we biological creatures exist merely as vessels for a code evolving during a fraction of the long geological expanse of *hyperchaotic* time.

The nature of a human mind and how it observes and elaborates is an enduring enigma. Theories aimed at determining how consciousness manifests in each of us are rife with

⁹⁸ Braidotti, Rosi. *The Posthuman*. Cambridge, Polity Press, (2013): 95.

⁹⁹ Loc. Cit. : 166.

¹⁰⁰ Loc. Cit. : 167.

¹⁰¹ Loc. Cit. : 135.

speculation. The speculative philosophers discussed here have undermined the notion that self-consciousness sets humans apart from “other beasts.” Immortalized in the Cartesian statement, *I think therefore I am*, anthropocentric privilege confers being only to those that think and limits thinking to humans. In order to determine whether thought is in fact uniquely human we need to understand what it is.

The question for philosophers is often, do we only have access to the world through our minds or does the world inhabit us? Scottish philosopher David Hume, 1711-1776, wrote about the bundles of qualities he believed make up every object; these he claimed are brought together into a unit as a result of habits of seeing that humans share. He was a skeptic who claimed our conception of the external world was heavily mediated for us by perceptions and our tendency to conflate things. This he believed was what was giving us the semblance of a “self” to make sense of the world for us.¹⁰²

Human beings interact with their tools and technologies in ways that alter both our species and the technology we create. According to N. Katherine Hayles in her book *How We Think: Digital Media and Contemporary Technogenesis*, there is a feedback loop for humans with technology that enables a continued fine tuning and evolution on both sides, “...technogenesis implies continuous reciprocal causality between human bodies and technics.”¹⁰³ If we were suddenly transported back to 1980 our daily activities would look nothing like they do now, even

¹⁰² Hume, David. *A Treatise of Human Nature: Being an Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects* (1739-40) Oxford (1978). P. 252.

¹⁰³ Hayles, N. Katherine. *How We Think: Digital Media and Contemporary Technogenesis*. University of Chicago Press (2012). P. 123.

1990 would be significantly different. Most people would be lost without their smartphones. Within twenty years we will not recognize our current technologically enhanced selves. Opting for convenience has increased to such an extent that without a certain level of technology many of us would not know how to get by.

We humans have been inventive enough to determine how to smelt iron or extract petroleum, and on a physical level we have a deep understanding of the existence of objects because our very wellbeing depends upon this. But objects that are byproducts of our activity on the planet that we had not accounted for are manifesting. These are objects like the artificial radiation belts that result from the very low frequency (VLF) range transmissions of communications technology disturbing the electrons of the magnetosphere with their radiation. The discovery of such things points to the autonomous existence of objects and suggests that our proximity to them may make us vulnerable. As a result of this we are coming to realize that exposure to all of their properties might not always be pleasant *for us*.

Media is not benign. Due to it causing new behavior that may be repetitive thus becoming habitual it has a physiological toll and might well affect gene expression the way drugs or other addictions do.¹⁰⁴ The artwork in my exhibition is enlisting obsolescence in an attempt to create a counterpoint to, and perhaps disrupt, a technological obsession rooted in humans that even appears to be causing epigenetic engagement. The physiological effects of some objects in our environment such as dichlorodiphenyltrichloroethane (DDT) are known to cause cancerous cells

¹⁰⁴ Robinson, A.J., Nestler, E.J.. “Transcriptional and epigenetic mechanisms of addiction”. *National Review of Neuroscience*. 12 (November, 2011: 623-637).

to form and that is an epigenetic impact. In defining the term epigenetic scientists decided in 2008 to include changes in gene expression that are heritable affecting the chromosome but not altering the genome. When cells begin to change it can affect nearby cells without altering their DNA. This is part of the mechanism of cancer. Scientists believe it is the environment that has an impact on us through chemicals, food, drugs, and other factors and some mechanisms have been uncovered that cause cell changes that are considered to be epigenetic.¹⁰⁵

Obsolescence

For humans, technological obsolescence is laden with meaning produced by affective attachments to our things and their ontological history. This means we add significance to modalities like analog and digital and to styles like Art Deco or Modern. In the work for this exhibition obsolescence has become a site for aesthetic resistance to hyper-media because we are aware of the parameters of the work which do not absorb the data seamlessly.

In the spring of 2002 the editors of *October Magazine* dedicated an issue to obsolescence. At the time digital media was edging out the mechanically produced variety and this was even threatening to overturn the isomorphic characteristic of photography. An invocation of Walter Benjamin's "Angel of History" was used in the magazine to herald a call for a "counter-intuitive" approach to the "totalizing aspirations" of technology. Obsolescence was enlisted as a potential site of resistance to the "spectacle."¹⁰⁶ It didn't matter though because technology marched along,

¹⁰⁵ Dupont, C, Armant D.R., Brenner, C.A. "Epigenetics: definition, mechanisms and clinical perspective". *Seminars in Reproductive Medicine*. 27. (September 2009: 5)

¹⁰⁶ "Introduction": *October*, Vol. 100, (Spring, 2002): 3-5.

and acetate film nearly disappeared.

In 2002, like the editors of *October Magazine*, I was thinking about obsolescence because I was using what had been gender-based technologies that are considered obsolete like sewing and other needle arts, marginalized because they were associated with women. At the time I felt I was using these *craft*-based formats as sites of resistance. At the same time, using software I was making photo-collaged cartoons for intricately patterned oil paintings that I painted on boards by hand. Engaging technology through obsolescence is part of the approach I have developed to it in my art-making practice.

Under the spell of our technologically advanced products we have been lulled into charmed states and time escapes from us as we sit or even walk around transfixed by backlit screens. Filtered by myth, technology can become an obstacle masquerading as an allurement with a shadow side that actually takes away our freedom because we are enchanted. Magic carpet rides, golden eggs and donkey poop, genies in bottles, the morality in fairy tales is built around not exceeding limits. Technology seen through myths spun by entertainment-based media opens windows to what appear to be other worlds where automated vehicles ferry humanoids and other species around in outer space, and through this window the future looks bright and rosy. But this is escapist and wishful thinking because with population and poverty both on the rise and the Earth on the brink of climate catastrophe human survival is not a given.

Technology exerts an enormous amount of control over us. The obsolete technological objects I am building can hold us in their sway by the seductive nature of the blue light they

embody. But this distracting and addictive light obfuscates the way technologies that we interface with are conditioning our vision toward certain ways of looking and even contributing methods of categorization. My project is a sculpture that is also a device, I made it as a way to explore and disrupt our current media technology's power to frame reality. *Hexagraphy* is capable of generating an array that will broadcast messages that aren't entirely clear using colour and light.

Indeed one can be deceived in many ways; one can be deceived in believing what is untrue, but on the other hand, one is also deceived in not believing what is true;¹⁰⁷

Disruptive Technology

Technology is considered in its capacity to be disruptive in a book called *The Innovator's Dilemma; When New Technologies Cause Great Firms to Fail*. Written in 1997 by Clayton M. Christensen, the book describes what happens when companies are too slow to absorb and perfect new technologies. Disruptive technology takes time to catch on, initially developing niche markets to become profitable. Large and successful firms do not often survive if the technology they are selling has been completely disrupted. Christensen emphasizes the importance in recognizing disruption ahead of its appearance in order for businesses to survive. However, implementation of new technology can take time and requires a lot of experimentation and is costly to perfect. In the book he divides technology into sustaining and disruptive. Sustaining technologies are those that improve the performance of existing products, whereas disruptive technology upsets the status quo completely and can cause huge firms to fail.

¹⁰⁷ Kierkegaard, Soren. *Works of Love*. Harper Perennial, (1962): 23.

Disruption, according to Christensen, always happens against the backdrop of existing technology, but it is not the result of a mere improvement, it is a structural shift. This occurred when the transistor upset the vacuum tube industry. It happened again when transistors became tiny enough so that digital imaging was finally of high enough resolution to nearly destroy mammoth chemically based photographic firms like Kodak. Disruption occurs during a span of time that includes the entire transition to the new product often taking place over decades. Huge economic and cultural impact occurs, as was the case when digital technology finally swept through the cultural realms and transformed liberal arts education into something called the digital humanities. Disruptive technology destroys existing economic players and can kill cities that were once major hubs if they are reliant on one industry. Disruption has an irreversible impact and changes people's habits.

In the nineteenth century, at the beginning of its reign over representation, mechanically based photography was praised for showing not the slightest trace of the process of its manufacture. It was so unlike the way brushstrokes exposed the material means of making a painting. One hundred years later we faced the demise of chemically produced photographs etched in a material substance in favour of the rise of digital images created with binary bits of data. It has been noted how the two types of image have different ontologies, but it was the impeccable resolution of chemically reactive images that digital images had to contend most with.

At the beginning of the twenty-first century it was clear electronic photography was going

make the proliferation of chemical laden darkrooms mostly a thing of the past. Digital photographic technology became available to every single person within twenty years and has made the production of images ubiquitous in our lives. Image manufacturing on the part of the public at large has unleashed a monstrous appetite for narcissism in the population of the entire world as vying for “selfies” with anything of note has become common.¹⁰⁸

As WJT Mitchell points out in *The Reconfigured Eye*, the inherent variability of coded data makes each production of a digital image a version, rather than a copy of it. This is a classification acknowledging the increased possibilities for reproduction wherein these images can easily be altered or now even digitally transcribed into three dimensions using software made for the purpose. There has been an increased dissemination and proliferation of images in relation to the rise of digital technologies.

Because a disruptive technology often takes a long time to incubate it might seemingly pose no threat to existing technology in the beginning of its life. Disruption is layered, and during the last fifty years the disrupted strata of the economy have started piling up, creating growing disillusion with change and inspiring some sober second thought. But the future of green technology is inherently tied to the digital realm while on the other hand the production of vast amounts of electronic equipment leaves a huge ecological footprint.

¹⁰⁸ Many cute animals subjected to these selfie mobs die as a result.
<https://www.theguardian.com/commentisfree/2016/apr/13/animal-cruelty-death-camera-phone-selfie-giant-python>

Anthropocene

The development of technology and its reifying influences on human civilization have amounted to an imprint on the planet Earth and its solar system that is anthropic, that is: critically influenced by the human being whose footprint is technological. In the editorial introduction of an issue of the journal *Angelaki* focused on the Anthropocene, Debjani Ganguly and Fiona Jenkins explain their desire to contemplate our newly arrived era on Earth marked by human intervention in geological space-time. According to these two editors “modernity's self-conception as progressive, humane and historically necessary proves instead to have been an unmonitored and dangerous experiment with life's very conditions of possibility.”¹⁰⁹ We should not assume that technology is completely controlled by human beings, because the compositing of the various modalities and tendencies within its sphere brings together forces that are often at odds in the beginning, before adaptation occurs, as when Capitalism met the internet. It is important to remember that the digital innovation juggernaut took place in aid of militaristic goals that require the instantaneous level of communicative ability proffered by the World Wide Web. As a result of the ability to reach directly into people's lives via social media a new level of international information war targeting voters has begun. This is illustrated by the 2016 American federal election because the interference of another state (Russia) that is being uncovered was facilitated by the proliferation of smartphones and social media sites.

In fact, the way I have witnessed many people use their cellular smartphones as they move through space was one impetus for this project. When seen from above the phones are held

¹⁰⁹ Ganguly, Debjani; Jenkins, Fiona. “Limits of The Human”. *Angelaki: Journal of the theoretical humanities*, vol. 16 no. 4. (December 2011): 1.

out slightly ahead of their users who appear to be following the little blue lights around. I had occasion to look down from a fifth story window onto Eighth Avenue in New York City repeatedly on Sundays noting how many phones were in use; at night it was a bit like seeing fireflies down there. These technological marvels did not appear in a vacuum. As I have already suggested, Western society had its technological expectations stimulated by television shows like *Star Trek*, a cultural phenomenon we all seem to have a relationship with of some kind. This science fictional depiction of deep space travel is an apt symbol of the combination of culture and science.

Bridging gaps between science and epistemology is a worthy task in our present situation within Western cultures, where misapprehension of reality is common. It seems humans avoid the truth because it is inconvenient and can cause enormous suffering. To quote a favourite song of mine in 1990 by the popular rapper MC 900 Foot Jesus, "Truth is Out of Style."¹¹⁰ The onus is now on the individual to discern fact from fiction in order to survive, but the game is increasingly weighted against us. Fantasy and reality are interwoven in CGI (Computer Generated Images) and the digitally depicted counterfeit narratives are presented to us on an internet of increasingly broken dreams. Our time is one of great uncertainty because shifts in technology mean economic disruption is increasing and therefore so is poverty as people get left out. The digital turn has led to a torrent of disruption. In my experience the extreme shifts in mediation have made being alive a continuous technological learning curve. I am interested in pursuing work that will both engage and disrupt our blithe reliance on a prosthetic brain like the internet that we all have access to

¹¹⁰ MC 900 Foot Jesus, "Truth is Out of Style", *Hell with the Lid Off*, 1990.

enabled by electricity. However, I see the positive effects as well such as the democratization of knowledge found on sites like Wikipedia.

Computers keep getting smaller and faster because for several decades late Western capitalist society is witnessing a constant rate of decrease in the ratio of space to bits in microchips that has been called Moore's Law. The "law" was named for Gordon Moore, who happens to be the co-founder of Intel and Fairchild Semiconductor, in honour of a paper he wrote in 1965 that describes a situation where every two years the number of transistors contained within a computer chip will double. The resulting increase in processing power and storage capacity has been enabling computerized technology to continue expanding exponentially. The situation is driving an economic model of growth that is ultimately unsustainable as computers quickly eliminate many middle-class jobs and they are not getting any less expensive so who will be able to buy them? The constant evolution in computer chip technology is driving our preoccupation with growth. Growth that is responsible for the accumulation of piles of society's techno-trash that are an unmistakable index of this unsustainable situation.

In the economies generated by mediating technologies, information is currency. Information technologies are conducive to being monopolized by elites for gain. Whether comprised of monks in a monastery, owners of printing presses, or Google new information technologies all spawn elites of their own. Because the access to digital technologies is now unparalleled by any media of the past, with them comes an increase in agency for individuals and a broadening of elites. Anyone can express their deepest desires and most conscientious opinions

for all to see, and potentially be rewarded for it by gaining an audience for their efforts and this is the new normal.

Reality Distorted

Since 2009 all of the information we generate by interacting with the web is tracked to create algorithms for personalizing our searches so that no two people will get the same results when they search for something. This information is tailored by our habits and has created what Eli Pariser a senior fellow at the Roosevelt Institute has called an internet filter bubble.¹¹¹ This happens when we only get to see more of what we have already demonstrated we are interested in through our online behavior and this algorithmic curation is distorting our view of reality.

Ironically, Steve Jobs a leader of the digital realm is said to have generated a *reality distortion field* by his very presence amongst the core people at Apple, such that he could have convinced them of anything. “Reality distortion field” was actually their term for his charismatic influence. Jobs was not the only guy distorting reality, the New York Times describes the situation with Donald Trump: “For him, facts aren’t the point; trust is. Like any autocrat, he wins his followers’ trust — let’s call it a blind trust — by lying so often and so brazenly that millions of people give up on trying to distinguish truth from falsehood.”¹¹² Steven Colbert’s “truthiness” describes the state we are in well, where people basically make up their own versions of reality in alignment with a variety of options based on their individual needs. I wonder what other rabbits

¹¹¹ Pariser, Eli. *The Filter Bubble: How the New Personalized Web is Changing What We Read and How We Think*. Penguin, 2011.

¹¹² <http://www.nytimes.com/2016/12/10/opinion/truth-and-lies-in-the-age-of-trump>.

the digital turn has up its sleeve? It might be said the “post truth” era actually started around the time of September 11, 2001.

During the Bush years, the administration saw itself as racing ahead of a faltering media. In 2002, one of President George W. Bush’s top advisers mocked a Times reporter as living in the “reality-based community.” “That’s not the way the world really works anymore,” he was quoted as saying. “We’re an empire now, and when we act, we create our own reality. And while you’re studying that reality — judiciously, as you will — we’ll act again, creating other new realities, which you can study, too, and that’s how things will sort out.”¹¹³

Life often uncannily follows art. The concept of a “reality distortion field” was concocted by Gene Roddenberry in the nineteen sixties and is from the original *Star Trek* where an alien race is able to distort reality with only their thoughts. Apparently, those computer geeks at Apple are such Trekkies they have leveraged this term to describe Steve Jobs. It is an apt way to describe the phenomenon of a persona that casts a glamouring spell on those nearby in order to make them into tools. In fact, Gene Roddenberry and another sci-fi visionary, Rod Serling might be the perfect foil to counteract the spell of men like Donald Trump. As Roddenberry demonstrates in the quote below:

I condemn false prophets. I condemn the effort to take away the power of rational decision, to drain people of their free will — and a hell of a lot of money in the bargain.¹¹⁴

For me *Star Trek* is relevant because I watched it religiously every night as a young teenager and was sympathetic to its message. *Hexagraphy*, my sculpture under analysis here, has

¹¹³ Loc. Cit.

¹¹⁴ Roddenberry as quoted in: *In His Name*. (2010) by E. Christopher Reyes, p. 39.

an appearance that would have been quite at home on a *Star Trek* set. It seeks to demonstrate some aspects of digital technology because I can program these LED lights with digital code to do whatever I want within the parameters of the microprocessors I am using. This screen loads the same way a predigital television does in a linear fashion one row after the next each starting on the same side. It is a screen of distorted hexagonally shaped pixels making an oddly coloured landscape; not cutting-edge technology but perhaps an appropriate form of obsolescence.

Epimetheus - hindsight

Hexagraphy's screen is coded to run animated variations of blues and greens to suggest lapping waves and create the effect of water. As a poetic interface between nature and art, *tekhne*, the device is an object that within a play of limits possesses great potential. *Phusis* is an ancient Greek philosophical concept that denotes the inner essence of a thing but also comes to mean *nature* itself. The object I made exists because of a fusion of *phusis* with *tekhne* or processes that aren't natural but produce effects that are tangible. By conjuring water with lights, I am suggesting an attachment to the natural world which relates to the ocean. An ocean of thoughts is a way of looking at all the activity that occurs in the mind, each one is a tiny drop that dissolves and gets absorbed into the whole. It is also a nod to Michael Snow's minimal and materialist film *Wavelength* that as a byproduct of exposing the means in filmmaking focuses the shot in on a picture of waves of water pinned to a wall.

I have also manufactured a shift in my relationship with representation in this work by turning a plane of neural activity into an awkward landscape of pixels. The pixels of light that are tasked with representing neurons in this artwork are oversized and hexagonally shaped because in

addition to delineating the carbon atom the hexagon is an efficient and adaptable shape as beehives attest to. Steel is made from carbon too, and all life on this planet is carbon based. The requirement I set for myself of representing individual neurons as a group resulted in my developing and adapting a non-teleological system of creating sculptural form in my practice. The distribution of neurons across a field in the brain is unlikely to inhabit a flat plane and warranted a more randomized structure.

The carbon molecule has six sides and is the fourth most prevalent chemical element in the Universe. It is set apart from other elements because it is able to form a vast number of other compounds with approximately ten million described so far, and this is said to be only a fraction of what has been deemed theoretically possible. The various forms of carbon are called allotropes: diamond is one, graphite is another. Scientists claim the amount of carbon on Earth and in the atmosphere is relatively stable because it is rarely converted to any other element, but when combined with the elements hydrogen and oxygen it forms most of the building blocks of life.¹¹⁵ Element six on the periodic table, C is its symbol. So much of what we use to survive is carbon based and it permeates our bodies. It purportedly never goes away, it just transitions through cycles of existence. Like all good things however, there is a downside with carbon when we produce too much of a bad kind for us and poison the air we breathe. This knowledge has resonated in the world and its inhabitants are beginning to mobilize but it may be too late; we may have only seen it in hindsight.

¹¹⁵ <https://en.wikipedia.org/wiki/Carbon>

Technics and Time, 1: The Fault of Epimetheus, written by Bernard Stiegler is a book that elaborates on the human relationship with tools. In the very title of his text Stiegler conjures Epimetheus, a Titan of Greek mythology who endowed humans with the capacity for hindsight. Because we only know them by their traces, humans know more after the fact with regard to both hyperobjects and technology than we did beforehand. But digitization gives us the ability to reverse this situation somewhat by providing room for speculation and following various probable trajectories, thus making it more possible to predict contingent outcomes.

In the book, Stiegler remarks that technology “only becomes concretized in passing through the laws of matter.”¹¹⁶ Bernard Stiegler sets out to elucidate “the question of the relation between living matter and organized inorganic matter”.¹¹⁷ He too means to reveal an agency in technical objects that arises from a potency they harbour that creates a paradox for humans because our technology gives us power, but might it have enough of its own to threaten our survival?

...but to the synergetic necessity that most often is unplanned, and is affirmed within the object in the course of its functioning, whereby the technical object invents itself independently of a “fabricating intention”¹¹⁸ ...the organized matter that the technical object itself is, the system of constraints that it forms and that, as a play of limits, of a combination of forces, frees ever-new possibilities – in this sense invents them. There is here an actual techno-logical *maieutic*.

Technology then, engenders itself with its development expanding exponentially. The

¹¹⁶ Stiegler, Bernard. *Technics and Time 1: The Fault of Epimetheus*. Trans Richard Beardsworth and George Collins, Stanford University Press, (1998): 75.

¹¹⁷ Loc. Cit.: 78.

¹¹⁸ Loc. Cit.: 75.

autonomy of the technical object is Stiegler's focus, and the ways in which its naturalization engender its own milieu. Computers are a perfect example of this, especially smart phones. Humans are operators of technics and from that sense become agents of technology who are dedicated to its perpetuation. Our computer technology has alerted us to many vulnerabilities and helps categorize them and we are beginning to understand the contingency that defines our existence such as when we finally acknowledge chemicals like DDT as untenable toxins. DDT is a technological object itself and is an example of means generating unintended consequences and of hindsight being too late.

Technological expansion has occurred in ways unimaginable before now, making it essential that we understand these developments in relation to our own phylum and its evolution. Bernard Stiegler frames the concept of “epiphylogenesis” as “the technological rooting of all relation to time” and the “the pursuit of the evolution of the living by means other than life”.¹¹⁹

Stiegler reminds us that since Darwin humanity can no longer claim to be the origin of life and so clearly is not the end of *becoming* “in life and beyond life”.¹²⁰ He poses a question which points to the paradoxical situation we occupy with regard to technology “if it is no longer obvious that progress is tantamount to benefit for the human race... can it still be affirmed that technoscience submits theories to useful finalities – usefulness still being understood as usefulness for humanity?”¹²¹ He determines that if technics has become “an end unto itself”¹²²

¹¹⁹ Loc. Cit.: 135.

¹²⁰ Loc. Cit.: 92.

¹²¹ Loc. Cit.: 95.

¹²² Loc. Cit.

oppositional categories such as means and ends are no longer “sufficiently radical” enough to describe the situation. These are categories that he believes have been inherited from metaphysics and in examining the notion of human origin, he brings us, via Socrates and Gilbert Simondon,¹²³ to the realization that “mortality is nothing but the domain of the contingent, of forgetfulness, of becoming: passion, suffering (patir), that which is not a principle unto itself.”¹²⁴

Conclusion

The questions I considered in my research and the artwork examined here came about through my response to the digital turn as an artist. I, like many people, sensed there had been an enormous leap in the late twentieth century that is carrying the people of the Earth with it. It was precipitated by new technology as is typically the way with our species. Swept along myself in the enormous wave of transformation brought by the discovery that information is physical, I seek ways to manifest this transformation in my art. My work is driven by the insight that technology permeates our bodies, and this is poignant in relation to my gendered experience in the world. I realized that because hyperobjects are orders of magnitude greater in size than anything previously pondered by our species, humanity has been moved so forcibly that most of our societal assumptions have been shattered and not all of us realize this is irreversible.

I decided to attempt to begin to describe the interstitial position organic life occupies in

¹²³ Gilbert Simondon was a student of phenomenologist Maurice Merleau-Ponty. His theory of individuation influenced Bernard Stiegler and Gilles Deleuze. Simondon claimed the “subject” was an effect rather than a cause and thus individuation is a process involving both a subject and a collective. He refuted Norbert Wiener's cybernetic theory because it used pre-existing criteria that Simondon felt needed to be overcome.

¹²⁴ Gilbert Simondon quoted in: Stiegler, Bernard. *Technics and Time 1: The Fault of Epimetheus*. Stanford University Press, (1998): 100.

the universe. Our fragility as sentient beings began to resonate strongly within my mind, and I have attempted to develop ways of answering the challenges it posed through the work I am doing. The work explored here arose as a result of exploring the ramifications of the digital revolution that occurred during my lifetime. The artwork in the exhibition and this text are my attempt to make sense of these questions:

- In what ways do humans interface with their environment?
- What tools does sculpture, an object-based medium, that exists in actual space, provide to respond to the 'Digital Turn' and the predominance of a mediated interface and information-based content?
- How can one who is implicated in causing climate devastation, respond to the Global environmental crisis of the 21st Century?
- How is the 'Digital Turn' responsible for the discovery by humanity of its own interstitial nature? How can art relate to contingency as it appears in the knowledge of an unstable universe and hyper-chaos?

Sensing the changes within culture wrought by digitization led me to embark on this path of looking for ways to physically manifest what I was thinking about. I thought about how to position the material to take up that challenge. This resulted in an intention to create various works that demonstrate contingency through the use of sculptural processes and media technology. The neural grids in the brain I have depicted in my artwork operate as an interface with physical space. It occurred to me that I might be able to describe that space as a landscape to generate its form. I settled upon a contingent geometry achieved through performing a repetitive process.

I think sculpture possesses characteristics that are appropriate for performing a critique of

the current milieu and I want to exploit those through looking at how the brain creates an interface of its own. The brain navigates by taking readings of proximal space in order to guide the body through the environment. It does this by construing neurons referred to as space and place cells into maps. The discovery of mapping neurons by scientists suggests the brain has evolved formatting schemes in response to physical sensory data that activate its circuitry in a geometric grid that maps the space we are in. This mapping activity that helps us get around has evolved in the limbic system and operates in conjunction with memory and emotion whose capacities are also centered there. The olfactory bulbs are located there too just behind our noses responding to the contents of the air we breathe. All of this sensory input combines to synergistically create our awareness of the environment. I am looking at the ways we respond to the environment because there has been such a shift in how we think about the objects in it. By determining the ways objects actually exist outside of our direct perception of them science has enlightened us as to our own place in the universe.

As a way of pointing to our interstitial existence I want to show real data generated by the environment. Through software that visualizes this data and is available online for anyone to see I found I can encourage people to become more cognizant of the components of the ecozone they inhabit. I have started to do so by using this website that contains a virtual connection to reality. The first work I did using the site was a series of ink drawings. The drawings that are reliant on a number of lines recorded from maps projected onto my piece of paper, are an example of how I am using the logic of algorithmic programming. But I carry out the task with my hand in order to foreground bio-organic life of which I am an example. The many lines I draw are initially only an indication of the direction of airflow. In subsequent works the coloured gauges found on the site

that measure other environmental factors are used for the lines I draw, and I attempt to match that colour key. These lines are also curved indices of wind flowing over the surface of the Earth that are recorded by apparatuses typically located on satellites that measure using light and other means to accomplish their tasks. Through using these digital tools proffered by scientists on the internet that generate virtual versions of reality, I am finding ways to show evidence of environmental factors interacting with planetary processes.

In my video *A Year of the Air I Breathe* I have again framed a map of part of planet Earth by using the same software but here it is a record of daily levels of CO₂ I am capturing in a daily screenshot. This repetitive interval manufactures an accumulation of images sequentially compiled over the course of more than a year. These images show a type of carbon dioxide index recorded by satellites that are measured using spectroscopic infrared light. Environmental readings are presented by using coloured gauges as a means of data visualization. By adapting this method of interface with the planet Earth into artwork it is my hope that it might enable a deeper understanding of the environmental challenge humanity is up against.

Overall, my investigation examined two kinds of reality and with my work I attempt to bring them both into view. The first is the anthropocentric sphere of human subjectivity that is elaborated upon in the writing of Deleuze, Barad, Braidotti, and Harmon and in my work by the attempt to represent neural cells with an LED array, or my own performance of algorithms. The second is the astrophysical condition of the universe where time is behaving differently than the way we perceive it to be on Earth. This is the Time that is taken up by Meillassoux, and to some extent Morton where humanity appears to be superfluous. By using satellite data and mapping

software in the ways I have I aim to demonstrate hyperobjectivity because it exists over vast space and phased time. The video explores this by sequentially compounding over time in order to suggest factors existing in a different relation to time and space than humanity has previously accounted for.

The “Digital Turn” has enhanced human exploration and learning using increasingly more detailed methodology that is enabling our species to look further or deeper than we previously have done. The technology for measuring and recording data is constantly changing and becoming more precise all the time. A lot of our new technology is developed in aid of going to space. Every time NASA launches a new rocket to carry a probe of some kind into deeper space there is new technology developed because of the many challenges involved in doing that.

In the process of looking at materialist philosophy’s acknowledgement of matter I am finding it is relevant to how an individual brain interfaces with space. Things exist separately from me in many ways, but this is difficult to track because of being submersed within bio-dynamic existence. Software enhanced versions of events such as the animation of the recent Mars landing for instance create a meta-reality through having been generated by CGI¹²⁵ graphics. There is a whole new kind of reality being created by this media that is becoming indistinguishable from the real. It will become increasingly difficult to ascertain what is real.

Inspired by learning about the brain’s geometry, the grids I make are an attempt to create

¹²⁵ Computer Generated Imagery

sculpture that is describing a landscape of neural cells writ large. I am bringing something minute to a scale that is visible albeit abstract. My intention is to create a structure for this using difference, and I chose a process capable of generating form that resembles the Earth's terrain. I am bringing together a set of parameters designed to invent a geometry that stems from a Deleuzian vision of the real where it is hard to find the universal apart from difference. In my estimation this is a way to make sculpture that responds to the tenuous position of our species with regard to time, because I am engaging in a contingent stochastic chain of activity to create its form. Repetition of difference is the Deleuzian universal necessary for matter and mattering to even become operational.

In completing this work, I looked at many different kinds of interface. Insights I am gaining through the activity described here emphasize the utterly contingent position of the existence of our species within the long span of geological time. The very structures in the brain that format reality seem to have evolved in relation to the environment. I am investigating human existence by way of pondering the modes that have evolved to interface with the environment we are immersed within. I opt for an egalitarian view that still values life and the creative process of mattering contained within the writings of Gilles Deleuze, Rosi Braidotti and Karen Barad. The shift in humanity's understanding of physical reality that occurred during the twentieth century is continuing and is irreversible. The impact of objects on bio-dynamic organisms is real, but only by becoming cognizant of this and discovering ways to change will we be able to reorient ourselves and ameliorate some of their effects.

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