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The Assembly of Liquid | against an excess of order

A thesis presented in partial fulfilment of
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Abstract

The Assembly of Liquid is a creative exploration of systems in a prolonged state of irresolution. Using sculpture, electronics and installation, I am creatively investigating notions of how technological processes can remain open ended through the connection of multiple dynamic components. Using commonplace industrial objects, I attempt to fabricate a synthetic but dispersed organism. Sensors, code and electricity form connections, making objects porous. This installation exists in a state of sustained self-modification, as much artwork as ongoing construction site. This experimental installation explores technological frameworks to evoke more liquid and multi-sensory phenomena.

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Thank you for your patience, guidance and encouragement.

Kelly McArthur

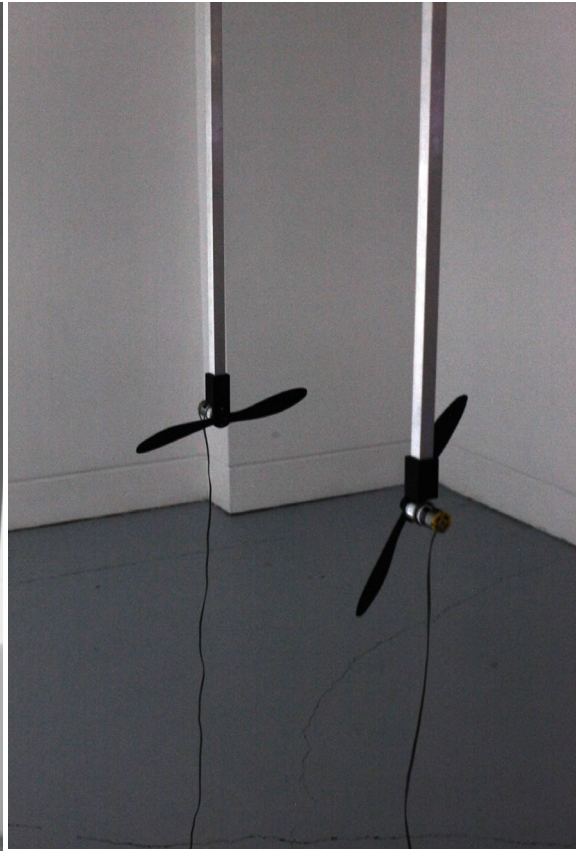
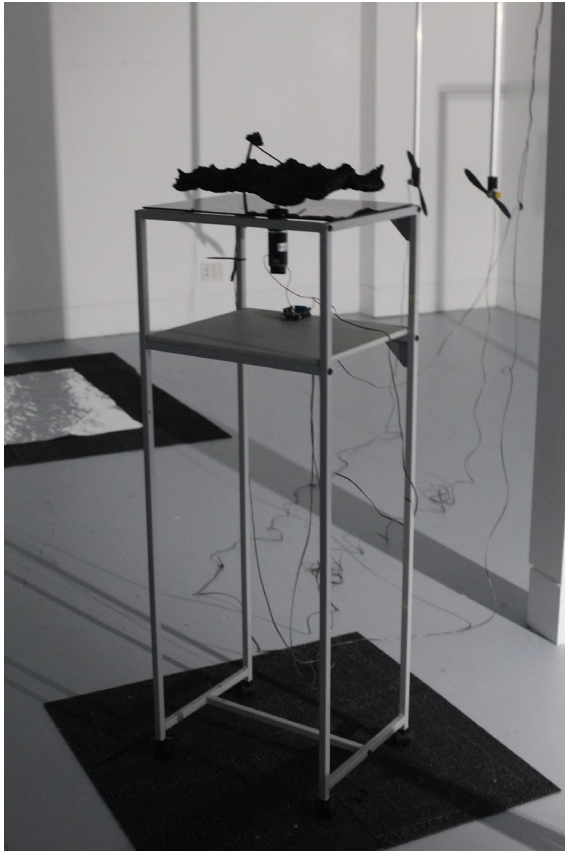
Thanks for your ongoing support and for listening to me ramble on.

Introduction

The Assembly of Liquid is a creative exploration of systems in a prolonged state of irresolution. Using sculpture, electronics and installation, I am creatively investigating notions of how technological processes can remain open ended through the connection of multiple dynamic components.

In developing a practice of technological instability, I have adopted the idea of an exhibition as a technological organism - an unpredictable assemblage that continues to change beyond my input and control. I locate the idea of an organism within the increasingly blurred divisions between technology and the natural world.

To explore this terrain, I have attempted to shift my practice to a more nuanced and modular exploration of connection between electronic and physical objects. I use commonplace industrial objects in the construction of these assemblages, materials from the contemporary means of production. Through the activation of these materials by electronic apparatus, I hope to explore ideas of technological disorder and irresolution. This exegesis serves as a companion to my work and elaborates upon these ideas.



The Assembly of Liquid, studio experimentation, 2018



The Assembly of Liquid, studio experimentation, 2018

Generative art, dead systems

Computational practice

Digital generative systems have formed the central pillar of my creative practice. I have used code and hardware systems to fold computational ability directly into creative production. Initially my love for digital technology grew out of an attraction to precision. The short history of my practice is one of accumulating computer and electromechanical knowledge.

I define this form of generative activity as the harnessing of digital systems to make artworks that are increasingly autonomous and complex.¹ The tools include computers, programming, and electronic hardware, which allow high-fidelity processes to be manipulated. The flow of information within a system is controlled by inputs and outputs. This form of creative production continues to emerge alongside technological progress as new tools of Capitalist production and consumer distraction are appropriated for creativity.

I initially began making art in this way by considering generative processes as the crafting of an instrument; an object which would modulate simple inputs to create multiple artworks: a system that could be played. In this manner, process and output are simultaneously a creative act. My outputs in this field of practice include print, video and sculptural works.

In 2015, I completed a 2-year project entitled *Fabrications* - a body of work that generated over 200,000 highly detailed large-scale photographs of a synthetic planet. The idea was partly inspired by researching and scrutinising NASA's extensive library of images of MARS which were being returned in high definition by the Mars Reconnaissance Orbiter². The *Fabrications* project centered around an idea of fabricating an entire planet with diverse surface detail, an infinite number of fake 'sites'. At the time I began the project, my creative identity was firmly rooted in the photographic. Working with code as a material, the massive potential for exploring photographic aesthetics and conceptual parameters with code became irresistible.

Inventing a process at the intersection of 2D drawing, code, and 3D heightmap generation, I formed this planet slowly by endlessly tweaking the system's code and parameters. When I finally became exhausted with the development of the planet - I set a virtual camera to

¹ For a range of context driven-definitions of generative art, see Jon McCormack et al. 2014. "Ten Questions Concerning Generative Computer Art." *Leonardo* 47 (2):135.

² See <https://mars.nasa.gov/mro/multimedia/images/>

roam its surface in a helical arc, creating and populating a digital archive from which I then extracted works as a photographer.

My ongoing attraction to generative processes has multiple facets which continue to be important to my practice.

First, the potential for infinite iterations. My background in photography was primarily a love affair not of the moment of capture, but of the joys of editing and processing. A practice built around iterative possibilities significantly elevates this potential.

Secondly, by constructing a system, the artist's primary role becomes the ongoing investigation of parameters. A system, with energy flows that remain fixed, can be manipulated incrementally to create an immense amount of variation. Imagery becomes increasingly autonomous and takes on the form of a flow. The act of intersecting an expansive plane is likened to dropping a needle onto a record, to experience only a fragment of information extracted from the whole. Much remains invisible, but a fragment is both unique and representative.

Third, a notion of a mimesis or emulation, with the observation of natural phenomena driving computational exploration. And in contributing to this arena, opening an arc of potential for exploring the continuous evolution in a connection between technological and natural phenomena.

Finally, a tendency towards the reduction of human agency. While I am the initial author of the system and the maker of the rules, I can also become another observer of a system's autonomous development.



Fabrications, 2016-2017

Library of 200,000 images, limited series of digital prints at various dimensions

Exhibited: MARS Gallery, Melbourne, 2017 & Yarra House,

Melbourne, 2017 & Gippsland Art Gallery, 2018



Fabrications, view of install, 2017

Break (a generative death)

Beginning a new program of investigation provoked me to critique my practice, with the core critique focused on the limits I had imposed upon generative systems. The dynamic processes I had created were in turn only creating stable outputs - photographs, video and sculptures. Creating stable works from a process that contains myriad open-ended loops enacts the extinguishing of potential, a generative death. Where mechanisms are explicit, repeating similar processes over time will elicit similar, even mechanical results. This is the equivalent of temporarily breathing life into an organism, only to then kill it, reducing the system to a fragment of its former potential.

In 2017, I completed the first iteration of a lightwork entitled *Labyrinth* which serves as an apt illustration of my *attempt* to create a dynamic object. *Labyrinth* is a Stroboscopic Zoetrope, a mechanism that simulates organic movement through a carefully timed strobe light. *Labyrinth* produced the high-definition illusion of an endlessly collapsing geometric vortex. This work is a network of code, signal, 3d form and mechanical motion, precisely orchestrated to produce the intended illusion. Some of the parameters include:

- A steel disc of 1m diameter rotates at precisely 2.8 rotations per second, kept stable through an DC motor and encoder feedback system.
- A light repeatedly turns on for 0.2 milliseconds, then turns off for 56 milliseconds.
- On the disc is a model, consisting of a network of rectangles, placed along a helix with a spacing of exactly 58.5 degrees.

And so on. Along this process of resolution, closely determined parameters shape the work into a relatively stable form. The process decisions are constrained by the relatively static identity of the art object anticipated as the outcome. This is the resolution of a fixed idea through computation, to bring a singular execution of complexity into focus. The American art historian Jack Burnham called this type of activity 'an entities list structure, or all the enumerated properties needed to physically rebuild an object'.³ This stands in contrast to a dominant characteristic of complex natural systems: the capacity for ongoing morphology and evolution, an open-endedness. Burnham introduced his theories of systems into the art discourse of the late 1960s, articulating a transition from an 'object oriented to a systems oriented culture'

³ Burnham, Jack. 2015. "Systems Aesthetics." In *Dissolve Into Comprehension: Writings and Interviews, 1964-2004*. MIT Press. 119

aimed at fostering 'stable, ongoing relationships between organic and non-organic systems.'⁴ Burnham's essay *Systems Aesthetics* outlines the complex interaction between components of diverse material and conceptual organisation. Components derive value from their context within the whole, and the whole takes on unique properties arising from their interaction. In this model, art is not a hermetic or independent material entity, but dynamic relations between objects and environment. Burnham continues:

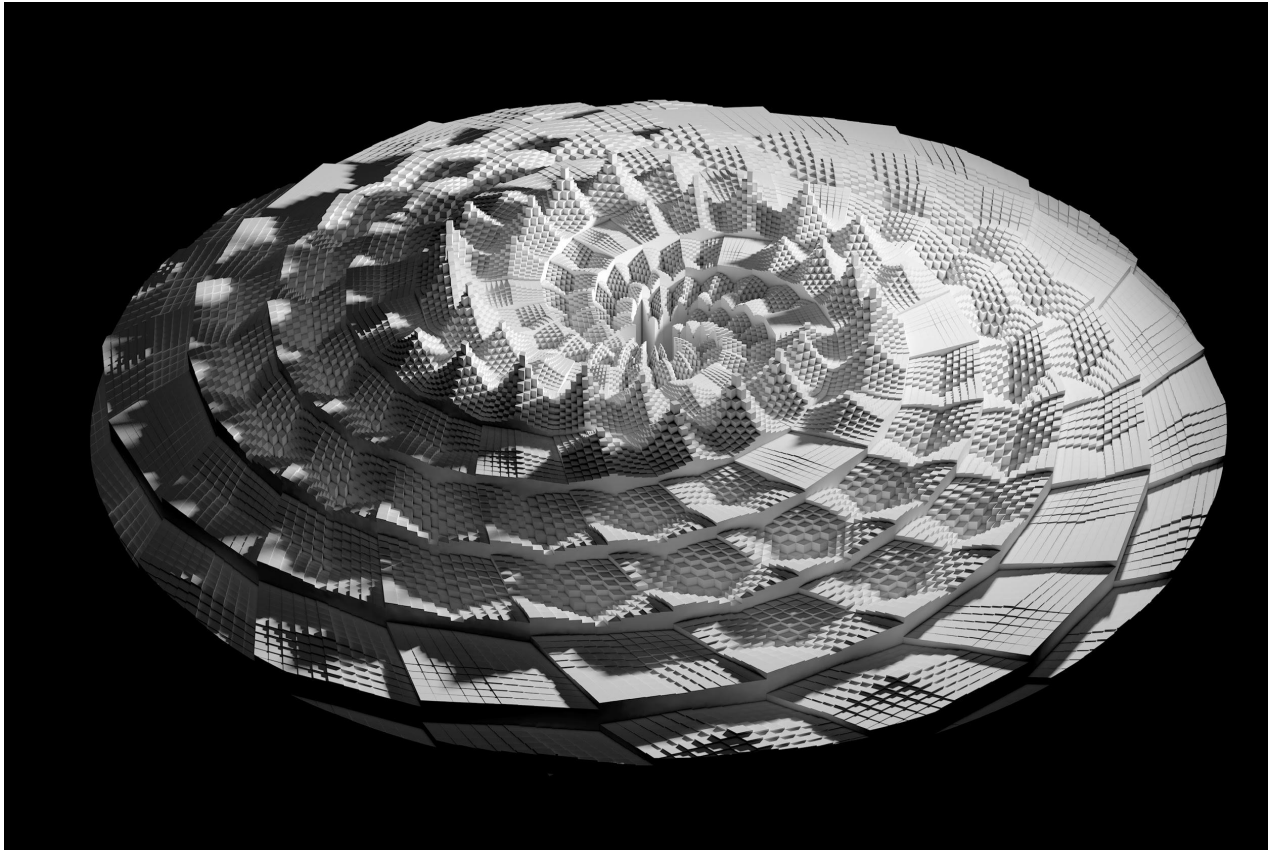
*In evaluating systems the artist is a perspectivist considering goals, boundaries, structure, input, output, and related activity inside and outside the system. Where the object almost always has a fixed shape and boundaries, the consistency of a system may be altered in time and space, its behavior determined both by external conditions and its mechanisms of control.*⁵

In this respect, diverse materials become components of the system - including 'people, ideas, messages, atmospheric conditions, power sources'.⁶ The artist's role is not to construct boundaries around matter to create an object, as I had done, but to create a spatio-temporal event of interacting dynamic components. Burnham envisioned the increased complexity of environments built by artists over time and as their experience with systems progressed.

⁴ Ibid.,116

⁵ Ibid.,118

⁶ Ibid.,118.



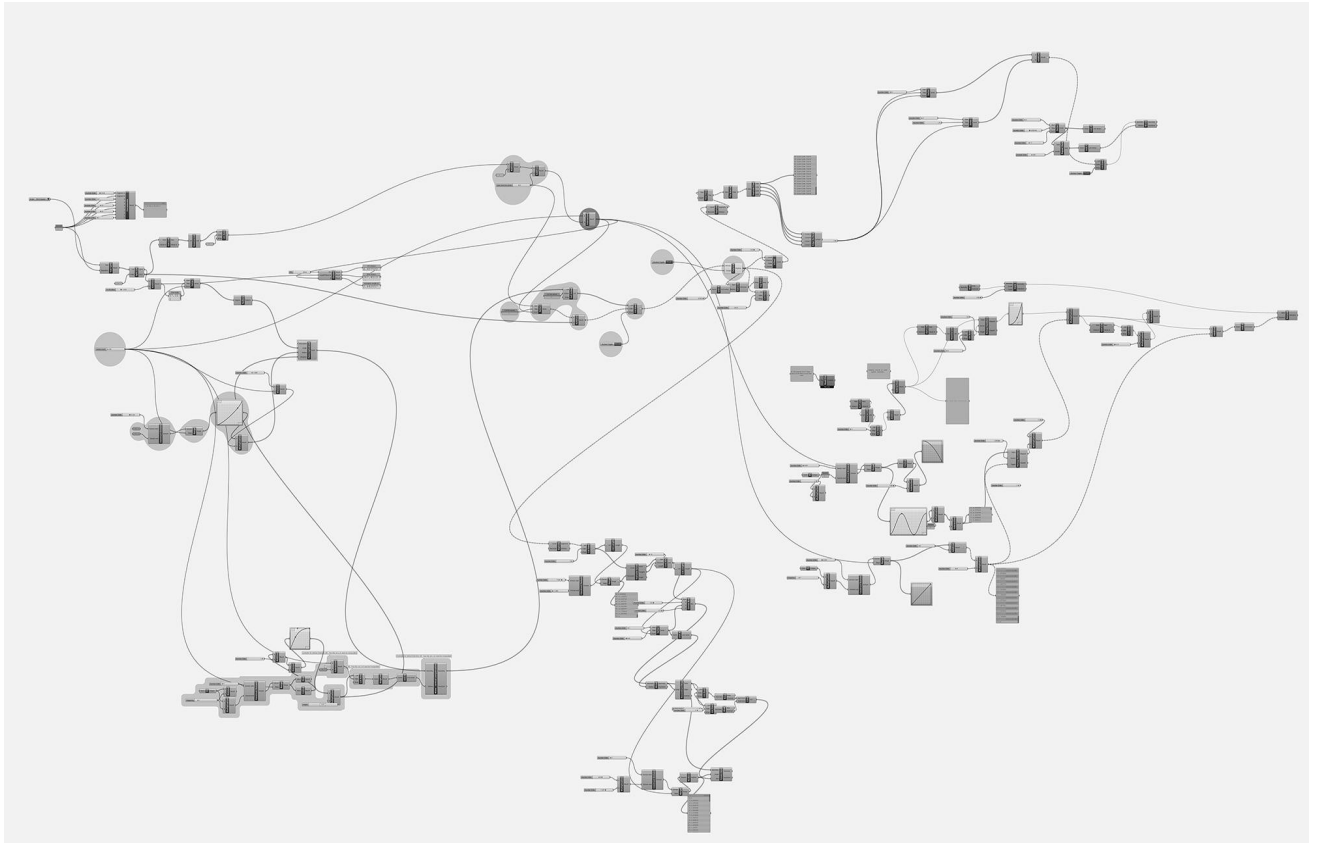
Labyrinth

Aluminium Plate, Steel, ABS, Microcontroller, LED lights, DC Motor, Bearings, Pulley, Belt, Speaker

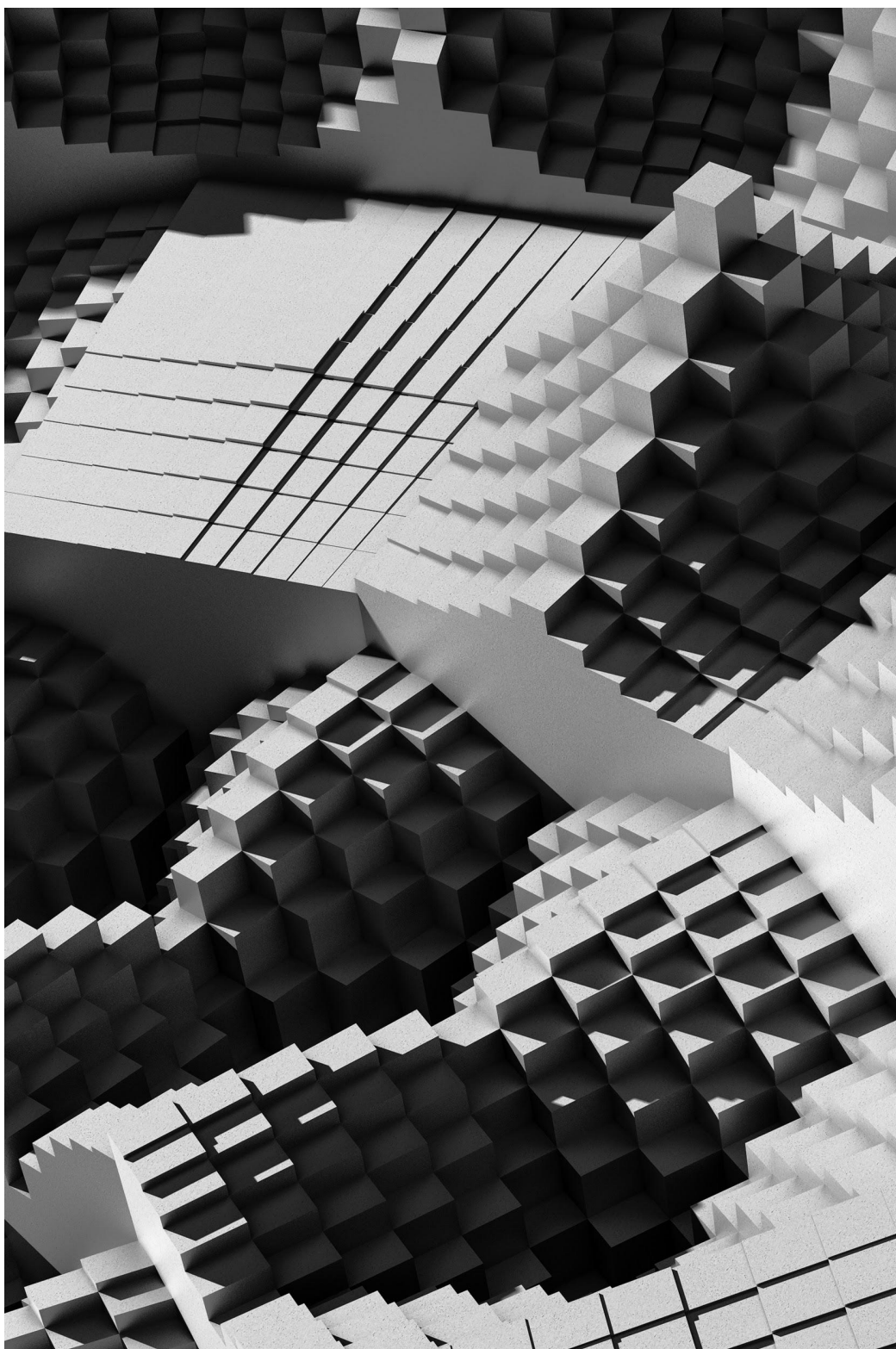
800mm (h) x 1500mm (w) x 1500mm (d)

Exhibited Lux Festival, Wellington, 2017 & MARS Gallery, Melbourne, 2018

<https://vimeo.com/231969446>



The final parametric definition of *Labyrinth*, which controls everything from the curvature of the physical form, to the dimensions of the mechanical components, to the speed of the strobe light. The entity's 'List Structure'.



Labyrinth, detail.

Synthetic organism

Algorithms in puddles

*We might just be insects pollinating machines that do not happen to have their own reproductive organs right now.*⁷

Manuel DeLanda

An exit strategy from a path of restraining generative potential, is to tune into the open-ended dynamics associated with an organism. Artists working with technology often turn to complex organisms, to the behaviour of insect swarms or slime mould, as a source of inspiration and benchmark of success.⁸ Through the research and emulation of organisms, artists can guide complexity in the creation of generative systems. For my purposes, I adopt an all-encompassing definition of an organism as 'anything resembling a living thing its complexity of structure or functions'.⁹

In 1959, the Cybernetic technician Stafford Beer portrayed one of the more bizarre utopian visions of biological computing. In one version of this idea, a factory is controlled by a pond through the regulation of its internal ecosystem. This ambitious vision was to be achieved by using an electronic feedback system to couple the factory with the pond. The pond could simply be plugged in, replacing the position of manager. Just as a manager of a factory should do, the pond responds to the factory and keeps things in balance. Despite some effort, this vision was ultimately destined to fail due to the difficulty in coupling human made technologies and the organic world, and what sociologist Andrew Pickering describes as an issue of getting the pond to care about human life.¹⁰ This utopian vision of a controlling, centralised organic intelligence never came to light. Instead, technological developments are *informed* by organic life. Finnish media theorist Jussi Parikka states the desire for this emulation stems from a

⁷ Davies, Erik. 1992. "De Landa Destratified." *Mondo 2000* (8).

⁸ One recent trend is the influence slime mould of technology and the arts (*Physarum polycephalum*). For a recent practitioner, see Sutela, Jenna. 2017. *Orgs: From Slime Mold to Silicon Valley and Beyond*: Garret Publications.

⁹ <https://www.collinsdictionary.com/dictionary/english/organism>

¹⁰ For an interesting summary of Stafford Beer and the Pond, see Pickering, Andrew. 2016. *Sketches of Another Future: Cybernetics in Britain, 1940-2000*. CSTMS Berkeley, accessed 5/10/2018. https://www.youtube.com/watch?v=z8Z1D_7Gcgk.

perception of nature as a 'perfection engine', which leads to the construction of machines and the optimization of algorithms based on natural phenomena¹¹.

In my own personal efforts to consider responsive technological systems as emulating living systems, I am employing a mix of integrated software, electronic and mechanical components. Working with these materials, I am embracing a world of artificial systems continually penetrating the terrain of natural phenomena, redefining an emergent 'second order nature'. The dichotomy of natural phenomena as pitted against human production has been consistently dissolving. In 1960, British artist and cybernetic theorist Roy Ascott suggested that the metaphors employed to describe nature had become inadequate and called for artists to update. The binary that stacked the refuge of nature against human production, the city against the countryside, was disintegrating. The convergence of advances in electronics, computerised intelligence and biotechnologies, had produced a nature that no longer resembled the image of the natural world that was maintained by artists and writers.¹² In complex systems of the contemporary world, such a multitude of connections between artificial and natural exist, that any clear line in the sand loses its definition,

*...the transformations in our models of the world and the accelerated increase in our technological powers of manipulation in recent years suggest that a cardinal question for artists in of the 21st. century will instead be, "what might nature become?"*¹³

This provoked me to define a synthetic organism as a key metaphor for exploration of an unstable system. Despite the more invisible nature of telecommunications, the value in Stafford Beers' pond as factory controller is not the metaphorical associations of nature that might inform code or programming, but in the transfer of energy between physical systems.

In 2017, I started to construct physical objects such as conveyors and bellows, drawing a sculptural language from the factory and the office. These objects formed the modular parts of a system but incorporated very simple mechanisms such as DC motors and actuators. The intention of working this way was not to construct a complex organism through layers of nested code, but rather to let behaviour emerge from more simplistic measures and visible physical interactions.

¹¹ Feigelfeld, Paul. "Media Archaeology out of Nature: An Interview with Jussi Parikka." *e-flux* 62 (February 2015 2014).

¹² Ascott, Roy. 1993. "Back to Nature II." In *Telematic embrace : visionary theories of art, technology, and consciousness*. Berkeley : University of California Press, 326.

¹³ Ibid.,(p.328)

Assembly and irresolution

The late New Zealand artist Paul Cullen's diverse studio experiments including *r/p/m* and *Recent Discoveries* are collections of found and modified objects, connected in provisional arrangements at various states of (ir)resolution. Alan Smith, in an essay accompanying Cullen's 2016 show *Provisional Arrangements* described the 'apparatus' as

*...a set of things linked through a shared task or purpose. Something or some set-up at work, a related group of things, procedures, and rules, enlisted to perform a particular operation. An apparatus works by co-opting a variety of parts from their general business in the world to converge on a particular project.*¹⁴

Richard Dale, writing about Cullen's extensive project 'Revolutions per Minute' (started in 1995) states that 'Each object participates in corporeal sensations caused by vibration and rhythm. Neither strict installation, nor four autonomous artworks' but 'part-sculpture, part-assemblage, part-controlled laboratory experiment'.¹⁵ In these minimal sculptural collections, the use of furniture and mechanisms, as well as water and air, can be viewed as components in an assemblage. In these assemblages, objects are temporary multiplicities existing as part of a whole but also retaining individual, physical, and symbolic heterogeneity.

¹⁴ Cullen, Paul, and Allan Smith. *Provisional Arrangements : Paul Cullen*. Christchurch, New Zealand: Ilam Campus Gallery, School of Fine Arts, University of Canterbury, 2016.

¹⁵ Cullen, Paul, and Richard Dale. *R/P/M*. Auckland: Split/Fountain Pub., 2011.



Figure. 1 Paul Cullen, 3.F.1, date unknown

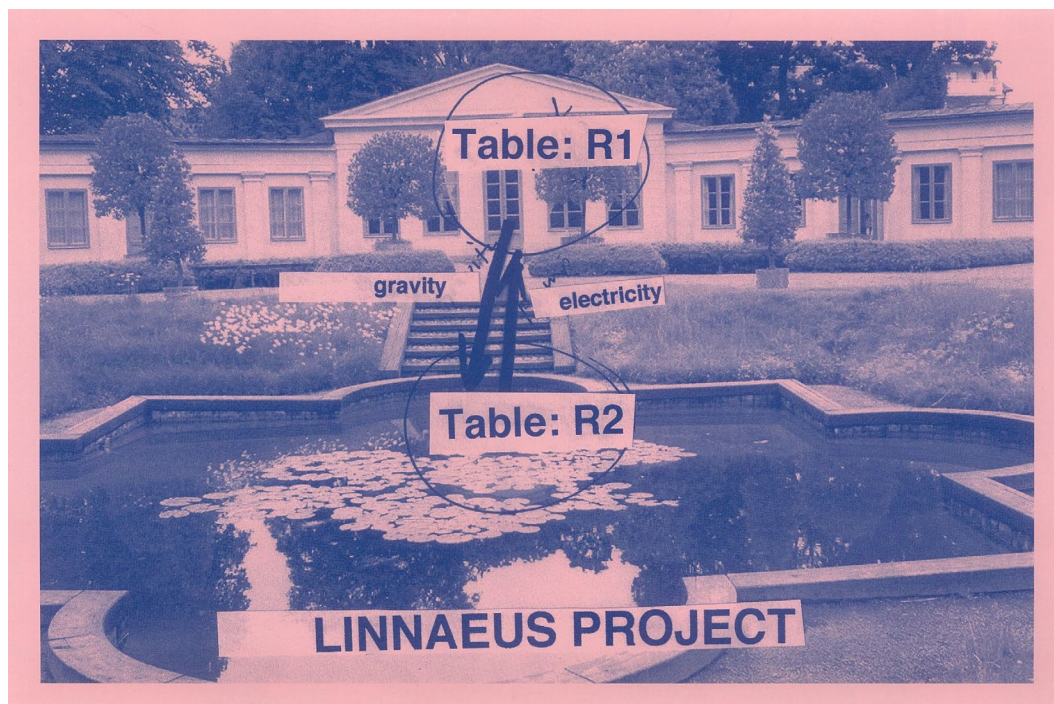


Figure. 2. Paul Cullen, sketch for *Linnaeus Project* installation at the Linnaeus Garden in Sweden, 2007.

Water is kept in continual circulation between a fountain in the courtyard and a cardboard box, through the use of gravity and a pump opposing gravity.

Manuel DeLanda models the properties of an assemblage in his book *Assemblage Theory* (2006). In this model, an assemblage is a whole consisting of various parts. The whole is irreducible - it has properties that are defined as emergent - characteristics that not found within its components. The components of an assemblage should be heterogeneous: they must be diverse in their nature. However, this alone is insufficient for emergent properties to take place. Like hydrogen and oxygen, there needs to be a form of mutual amplification. Any increase in amplification will correlate with clearer boundaries and more emergent properties. Conversely, a decrease in diversity or interaction causes the boundaries to dissolve and the components to reduce back to only their heterogeneous properties. The practical application of *Assemblage Theory* to creative practice lies both in the fluidity of the assemblage, and of the various agents involved in its stability. Delanda continues,

*You have to look for those magical moments when matter and energy show you what they can actually do if you let them.*¹⁶

DeLanda adopted this model from *One Thousand Plateaus* (1980) by the French philosophers Gilles Deleuze and Félix Guattari. Intersecting the idea of Assembly, Deleuze and Guattari introduce the 'Rhizome' as a concept of endlessly changing networks of connection with no clear beginning or end. The Rhizome is contrasted with the tree-like structure ideologically present in much of society, including the traditional hierarchies of corporations with a centralised source. The Rhizome resists organization, instead favouring the more free-flowing and wandering system of growth and the formation of multiplicities¹⁷ Deleuze and Guattari illustrate the notion of a multiplicity with meeting of a wasp and an orchid, in which the combination of these two simultaneously retain heterogeneity and form a union, a third.¹⁸

¹⁶ Ibid.

¹⁷ Deleuze, Gilles, and Félix Guattari. 1987. *A thousand plateaus : capitalism and schizophrenia*: Minneapolis : University of Minnesota Press, 8-9

¹⁸ Ibid.,10.

If the system is solid, too crystallized, its dynamics are completely uninteresting. If it's gaseous, it's also uninteresting...Liquids have a lot more potential, with all kinds of attractors and bifurcations. Now what they're coming to believe is that the liquid state in nature – not just actual liquids, but liquidity in the abstract sense of being not too rigid or too loose – these liquid systems “poised on the edge of chaos” are natural computers.

Manuel DeLanda ¹⁹

It would be easy to fall into the trap of always trying to achieve ‘emergence’, to try to align perfectly these magnetic elements that overlap items. Doing this, however, would undermine the value in DeLanda’s model, where irresolution also has value.

In *The Assembly of Liquid*, I have created modular structures and small components, without directly trying to assemble each thing into a perfect whole. Through the use of spatially dispersed objects, my renewed idea of an exhibition installation becomes about co-presence and the porous relationship of components. One component does not need to carry the weight of everything.

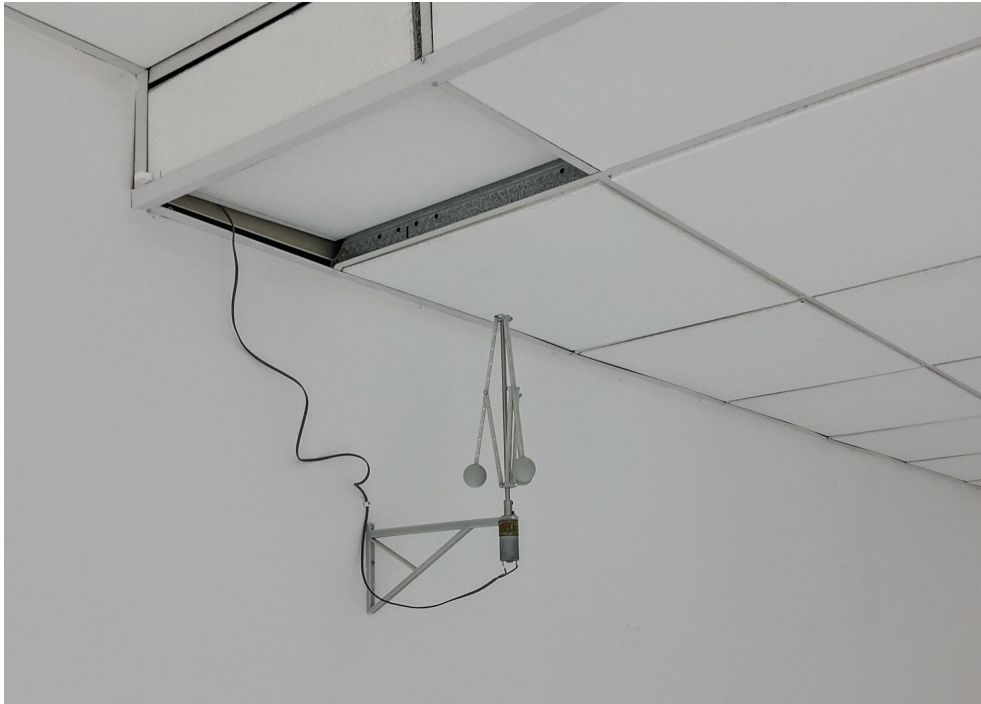
In my 2017 studio experimentation I introduced notions of assemblage into a sculptural practice. In the experiment *Melter* I attempted to work with objects as remnants of structural manipulation. Through ongoing assembly, the traces of my failed experimentation became increasingly visible detritus. In another experiment *Governor*, I fabricated an assemblage of objects intended to physical disrupt and modify space. A mixture of found generic hardware and fabricated components were kept in oscillation by low-speed motors mounted to walls and ceiling. Through the multiple uses of rotation and encoder speed feedback, the three groups of elements in this minimal system relied on each other for signal but were also modulated by their own idiosyncratic movements - a change in one element subtly echoed through the rest of the group.

¹⁹ Davies, Erik. 1992. "De Landa Destratified." *Mondo 2000* (8).



Melter, 2017

Wood, fabric, metal, plastic



Assembly Test, 2017

3D printed governors, air conditioning ducting, plastic wrap, DC motors, encoders, mounts.

Exhibition as organism

By focusing less on the *resolution* of an *object* as the outcome of a process, my practice has shifted toward the *irresolution* of a *spatial assembly* informed by technology. By introducing dynamic components into a space, the physical space is compelled into motion. Space is allowed to change, an organism where pieces shift and morph based on their interactions with each other. French artist Pierre Huyghe posited a powerful metaphor for his process, likening exhibition *Untilled* (2013) and *AfterALife Ahead* (2017) to a mass of decomposing forms.

*I find this compost, a place where you throw things that are dead. I use the same methodology in a certain way, something like old markers, or fragments of history that I have been affected by.*²⁰

Compost as a philosophical strategy for art, can be untangled for a multitude of strategies. Fragments, which Huyghe calls 'markers' - weighted and heterogeneous artefacts drawn from across time and from diverse contexts, are introduced into a larger, discrete but amorphous body. In this dynamic system, there is an entropic transmutation of mass. The markers thrown into the system melt, their original heterogeneity begins to dissolve - there is a morphology of individual forms as the fragments have the potential for further fragmentation and to take part in an emergent form. This ongoing transmutation is a poetic development that clearly builds on an earlier identification of Huyghe's practice with an ongoing construction site.

*Huyghe's permanent construction site was a manifestation of a desire for an open-ended temporal threshold...the focus was on distributed effects rather than hermeneutic systems, on dispersal and openness rather than hermetic concepts.*²¹

²⁰Nasher Sculpture Center. 2017. "Pierre Huyghe - 2017 Nasher Prize Laureate." Nasher Sculpture Center. <https://www.youtube.com/watch?v=xy3GFEaz-IY>

²¹Barikin, Amelia. *Parallel Presents: The Art of Pierre Huyghe*. Cambridge, Massachusetts : The MIT Press, 2012.

Figure. 3. Pierre Huyghe, *After Alife Ahead*, Skulptur Projekte in Münster,

In *After ALife Ahead*, presented as part of 2017 Skulptur Projekte in Münster, Germany, Huyghe transformed an abandoned ice skating rink to create a large organism in a perpetual state of evolution - a symbiotic set of relationships in continual shift and transformation. A site becomes an organism that disperses an endless flow of images. Various systems are continually unravelling in *After ALife Ahead*, perhaps one of the more literal forms of (dis-)connection used in Huyghe's works, and a new perspective on electronic connectivity. The pattern of a shell contained inside of a small aquarium modulates the drone of audio throughout the space. In the ceiling, black skylights open and close according to the temperature and humidity changes. The floor is excavated based on the found pattern of an IQ logic game. As a whole, the site is 'an evolving system driven by biological caprice, in this case human cancer cells'.²² As illustrated by the artist's sketch, some of these systems are highly tangible while others are more covert, subtle, or absent.

²² Herbert, Martin. 2017. "Münster Sculpture Project." *Art Monthly* 408:26-28.

Figure. 4. Pierre Huyghe, *After Alife Ahead*, Skulptur Projekte in Münster

Huyghe's practice has indicated some viable modes of artistic operation. In both the idea of an organism and ongoing construction site, there is the clear preservation of indeterminacy, of shaping an event and then removing the artist from the equation, to resist further manipulation. From my own perspective as an artist habitually manipulating and tweaking generative systems on a minute scale - this is not a straightforward departure. The practical execution of this involves opening systems up to more dynamic and conceptual modes of interference. I am not open to exploring the use of live organisms in my work - but I feel that the spatial notions and more nuanced forms of connection within an evolving system are powerful in relation to our current technological era.

Psychedelic fragments

An excess of order

In my assemblages, the endless spatial play of components disrupts physical space and promotes a sense of disorder. The corruption of order is often a recurring theme in my visual explorations. *Silent Treatment* is a simulation I created for an exhibition in at Blindsight gallery in 2018. My intention for this work was to simulate the interaction of physical materials, a test for a future physical work. In this digital simulation of infinite length, a geometric cave is constructed from reflective tiles. A fluid surface is placed within the form to create a pool of water. Through the oscillation of two parallel sources of wind, the pool is agitated in various degrees of interference. Reflections from the tiles and the water create an ongoing distortion of the underlying grid. The corruption of the grid is a symbolically simple execution of the idea of corruption and entropy, but one that immediately forms a relationship to psychedelics.

After a long ban on scientific study, research and interest in psychedelics resurfaced. The American writer and journalist Michael Pollan has rigorously documented the history of psychedelics through research and personal experience in 'How to Change your Mind - the New Science of Psychedelics'. Pollan traces how the initial research outputs strongly indicate that psilocybin and LSD may have the real potential to assist individuals trapped in their own narratives, projections about self and purpose. These chemical technologies restructure the ego, quieting the default mode network, enabling dramatic perceptual shifts through repositioning.²³

This type of destruction stands in comparison to the quantified self movement, or utilising the mechanisations inherited by capitalism to become a more stable, healthier and productive member of society - overcoming of a *lack of order*. The negative associations of order can relate psychologically to a set of inflexible behaviours and/or an inflexible society.

The symbolic power of something like psychedelics is the idea of deconstructing and morphology. In this chemical liquefaction, stable elements in the world lose their definition, perceptions distort, and orientation to stable values are lost. I see this same energy potential as present in the intersection of computational technology and art, in its dynamic and connective potential. I see such creative processes as having a unique opportunity to disrupt and to provide

²³ Pollan, M. *How to Change Your Mind: What the New Science of Psychedelics Teaches Us About Consciousness, Dying, Addiction, Depression, and Transcendence*. London: Penguin Publishing Group, 2018.

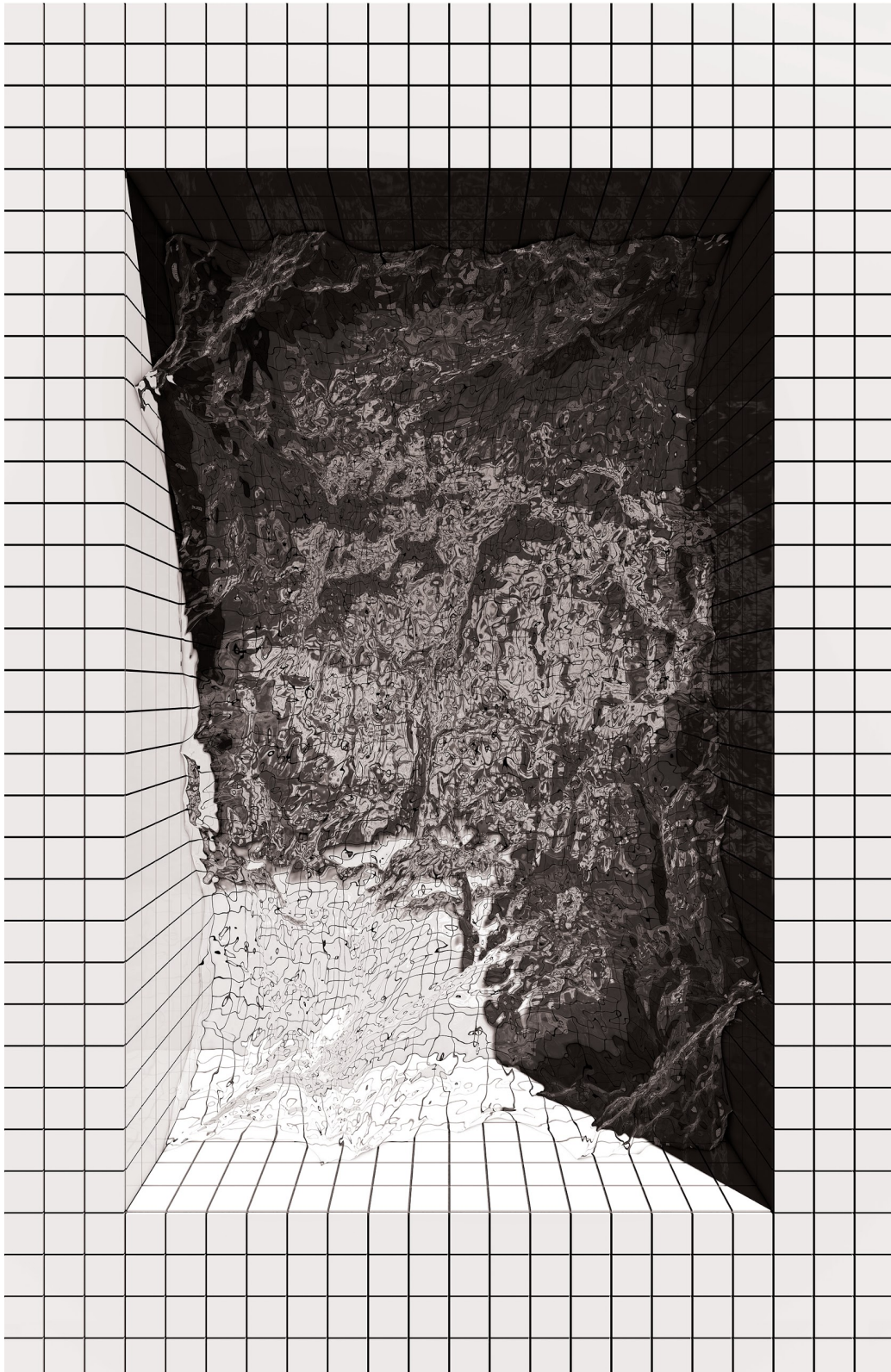
alternative vantage points, to directly reflect and render uncertainty into the production of psychologically manipulative images and sounds.

*As knowledge and perception are increasingly mediated by computer-based systems, the question "what is reality?" is being replaced by "how do we interact with a proliferation of separate realities"*²⁴

Despite this innate ability of technology, potential is inhibited through the various boundaries and limitations exerted by Capitalism and the reinforcing illusions of technological inevitability. Art has the unique opportunity to disrupt this.

Connection allows for the creation of technological organisms that remain unpredictable, computational stacks that continually diffuses forking realities. In this endlessly shifting dynamic, there is amplified opportunity for perspectival shifts within the constricted version of reality. This is a psychedelic longing but also a desire to rekindle a personal sense of technological wonder.

²⁴ Ascott, Roy. "Back to Nature li." In *Telematic Embrace : Visionary Theories of Art, Technology, and Consciousness*, edited by Edward A. Shanken: Berkeley : University of California Press, 1993, 329.



Silent treatment, digital simulation of infinite length, 2018

Sublime networks

One of the fundamental aesthetic opportunities to explore within my current practice is a relationship to the sublime. The sublime is a notion I have often connected with in the past by working with landscapes but is something that I increasingly associate with electronic and audiovisual technologies. In my current practice, the psychological impact of spatially dispersed, unstable objects enhances this association.

The Kantian mathematical sublime describes the perception of the boundless and immeasurable. Originally stemming from a psychophysical response to vast and overwhelming natural phenomena, the term significantly broadened to encompass the response to representational media, and has recently become increasingly entangled with technology.²⁵ In relationship to the idea of only perceiving a point in a network, we again return to the idea of a needle dropped onto a record - a singular, framed extraction from a vast field that suggests an expansive plane.

...art, through the plane of composition it throws over chaos, gives life to sensation that, disconnected from its origins or any destination or reception, maintains its connections with the infinite it expresses and from which it is drawn.

(Grosz, 2008, p.8)

Linking Japanese Audiovisual artist Ryoji Ikeda and Pierre Huyghe is the experience of a unique spatiotemporal point within a dispersed field of other unique unfolding points. Like many exhibitions of dispersed pieces, only by walking through each exhibition are you able to grasp the individual components. The distinction here is that all elements are constantly changing and porous. Whereas Huyghe creates a endlessly proliferating garden, Ryoji Ikeda provides a tight orchestration of digital energy. In my own experience of Ikeda's work *Supersymmetry* (2014) at the Museum of Old and New Art in Hobart, the work is sensorially affecting. *Supersymmetry* aggressively reveals itself, screens accumulate and release a raft of data structures in time with the invasive assault of high frequency audio sine waves.

²⁵ de Mul, Jos. 2012. "The (Bio)Technological Sublime." *Diogenes* 59 (1-2):32-40.

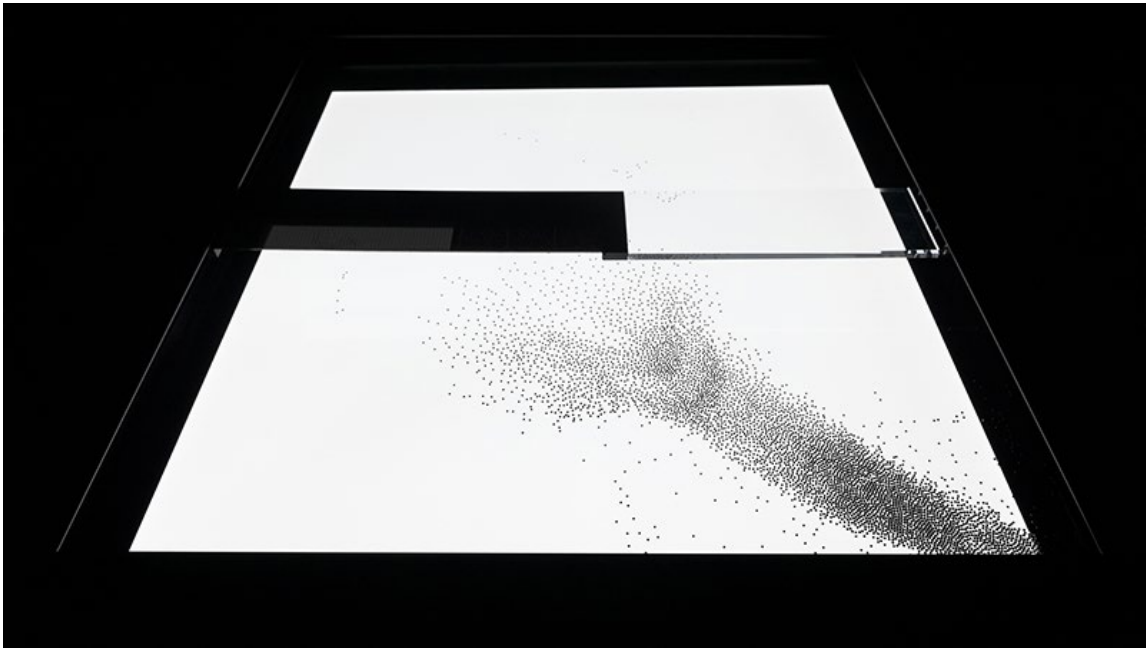


Figure. 5. Ryoji Ikeda, *Supersymmetry*, 2018

Supersymmetry is a sublime structure executing a fractal orchestration of data. At each spatial point within the installation, there were folds within folds of visual and auditory energy that forced my perspective to oscillate between micro and macro scales. The work's complex data roots remain completely inaccessible, it does not just try to convey information, it attempts to generate an encompassing sensory experience of the inexplicable quantity of data²⁶.

The consideration of the relationship between Ikeda and Huyghe's practice provides some linkages to the way I am considering porous and dynamic components. This not a question of connection, but of perception. Using light, sound and moving objects, components in my assemblages can leak into the spaces that surround it, rendering their presence at multiple points of the room. This is enhanced through the continuous change of elements - an audiovisual space always in motion.

²⁶ Supersymmetry reflected on Ikeda's residency at the Centre For Nuclear Research (CERN), and of the centre's research into the nature of particle mass (<http://www.ryojiikeda.com/project/supersymmetry>).

Behaviour and breakdown

Indeterminate interaction

One can encounter and differentiate multiple sources of chance and spontaneity in contemporary art. I am investigating a shift where the sources of indeterminacy in autonomous technological artworks are no longer located through an invisible or random source, but through the intermingling of tangible agents.

Most famously, John Cage built his practice of aleatory compositions using 'I Ching' hexagrams. Cage engaged this Chinese divination tool to increase playful, chance encounters.

Throughout my practice, I have used a more constrained form of spontaneity - digital randomisation. Digital randomisation is a core component of creative software packages. If triggered, this function will return a value between a desired range, which in turn can be plugged in to another part of a process. By introducing a random value to an otherwise constrained system, I can iterate through variations of artworks, dependent only on a single dynamic variable. I have used randomisation broadly in creative practice, to either build complexity or introduce noise into overly constrained environments. Even pursuing a less deterministic approach to written material for this MFA program, I wrote a simple program to generate random word associations from a database of research notes.

In mid-2018, I revisited my earlier work *Labyrinth* for an exhibition in Australia with the intention of directly degrading the rigidity of the illusion. Using a small script that interfered with the repeating strobe [on/off] light sequence, the sharp edges of the form disappeared periodically into a vortex of geometric noise continuously under assault.

Although the myriad uses of randomisation can greatly amplify complexity, in terms of a mimetic relationship with natural phenomena, the use of randomisation as a core component has limitations. In the physical world, chance encounters in the vast networks of objects are far more complex and entwined. The increase in sophistication of hardware and software tools for digital production provide new terrain for computational possibility that enable a deeper form of entanglement.

On the software front, an example is the American artist Ian Cheng. Cheng creates vast complex simulations within the widely used computer game software Unity. These simulations behave like boundless Petri dishes, in which figures and objects bump into other with dynamic consequences. Cheng describes the process of making 'Emissary in the Squat of gods':

... [I] basically make a video game that learns, stupidly, to play itself...I write little, individualised fragments in C# that describe a behaviour or tendency of an object. I also write a set of laws that modify the overall physics of the virtual environment...The simulation in the end is virtual space with a huge accumulation of mini-behaviours and laws that act and react to each other with no master design, just tendencies.²⁷



Figure. 6 - Ian Cheng - Emissary in the Squat of gods, simulation still

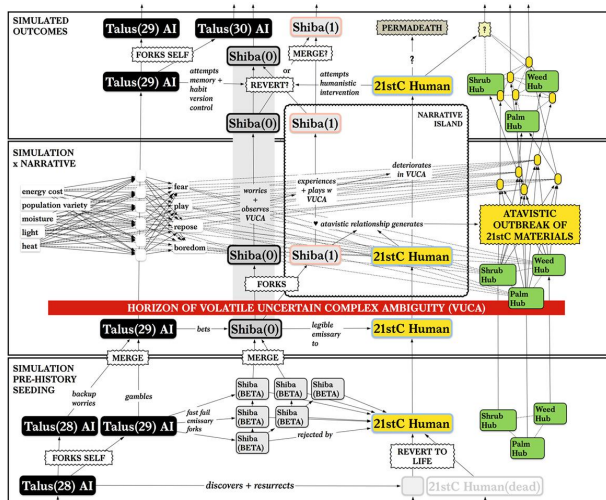


Figure. 7 - Ian Cheng - Emissary forking at perfect. Diagram showing the intricate network of potential mutations.

²⁷ Raphael Gyax. *Ian Cheng: Forking at Perfection*. Zurich, Switzerland: Migros Museum für Gegenwartskunst, 2016, p.14-15.

These simulations, in absence of a 'master plan', appear to achieve a much closer relationship with emergent behaviour. Characters are assigned private goals, and the entanglement of these goals in the game's environment drives the narrative forward. In this infinite game, the scale of all emergent events is impossible to behold from an audience's limited temporal perspective. More than just a dynamic composition, these simulations suggest a subtler framework of mutation that implies a much longer time-frame.

It is the availability of these open-ended dynamics that intrigues me in the assembly of porous components. A component at any scale, whether digital or physical, is an object able to affect and be affected, but is still an object ultimately concerned with its own goals. In the words of media archaeologist Jussi Parikka this is same idea being traced through the building of intelligent systems as informed by insect behaviour:

...you can instead focus on building enough small subsystems so that, by interacting with each other, they are able to create intelligent systemic behavior on their own.²⁸

This is the idea elucidated by Cheng's simulations, with one significant difference - the aim of the system is not machine intelligence; but rather the purposes of observing the subtle mutations of infinite play.

²⁸ Feigelfeld, Paul. 2014. "Media Archaeology Out of Nature: An Interview with Jussi Parikka." *e-flux* 62, 9.

Porous electronics

In my studio experimentation, I use electricity and code to modulate physical materials. Simple and reductive mechanical gestures can create significant variance internally and across a system. What differs here from the Kinetic art, is that the apparatus, whilst visible in the assemblage, is not the end goal or the singular artwork itself.

As with Ian Cheng's simulations, the elements of an assembly are simultaneously bodies for transmission and exhibit visible behaviour. Code and microprocessors are mechanisms of connection and transfer, weaving components together, forming intersections and multiplicities. Components can act as the temporary hosts for the transfer of a pattern, and the opportunity arises for the pattern to be affected by the host. This places the pattern as an important object in these assemblages.

The characteristics of a wave - its amplitude, frequency, phase, can all be calculated irrespective of its material substrate. The MIT Physicist Max Tegmark uses this analogy of a wave to emphasise the trajectory of computation and intelligence - a future in which 'matter doesn't matter.' Tegmark explains that 'Computation, intelligence and consciousness are patterns in the spacetime arrangement of particles that take on a life of their own, and it's not the particles but the patterns that really matter.'²⁹ It is not my intention to dive into the complexity of substrate independence, but merely to signal a correlation where pattern and signal have been and continue to increase as a primary material within our current technological era.

The current phase of a transition towards a world of complete interconnection is illustrated by the 'Internet of Things' (IOT). IOT is a network of physical devices that contain embedded sensors and software which enable the collection and dissemination of information over networks. One current suggestion anticipates that the next wave of IOT heralds the combination of physical objects with artificial intelligence.³⁰ In the greater transition towards a world of increased networked cloud computing, matter becomes porous, and objects become transitory.

German musician and artist Carsten Nicolai (also known under his audio-based pseudonym Alvo Noto) methodically probes the connections between sensory phenomena, translating immaterial to material, audio to visual. In a 2011 work *Pionier I*, Nicolai used a wind machine to create an ephemeral but highly restrained interaction with a parachute.³¹ Through

²⁹ Tegmark, Max. "Substrate-Independence." <https://www.edge.org/response-detail/27126>

³⁰ Sbardella, Alex. "Smarter Things: The Autonomous Iot." GDR Creative Intelligence, 2018.

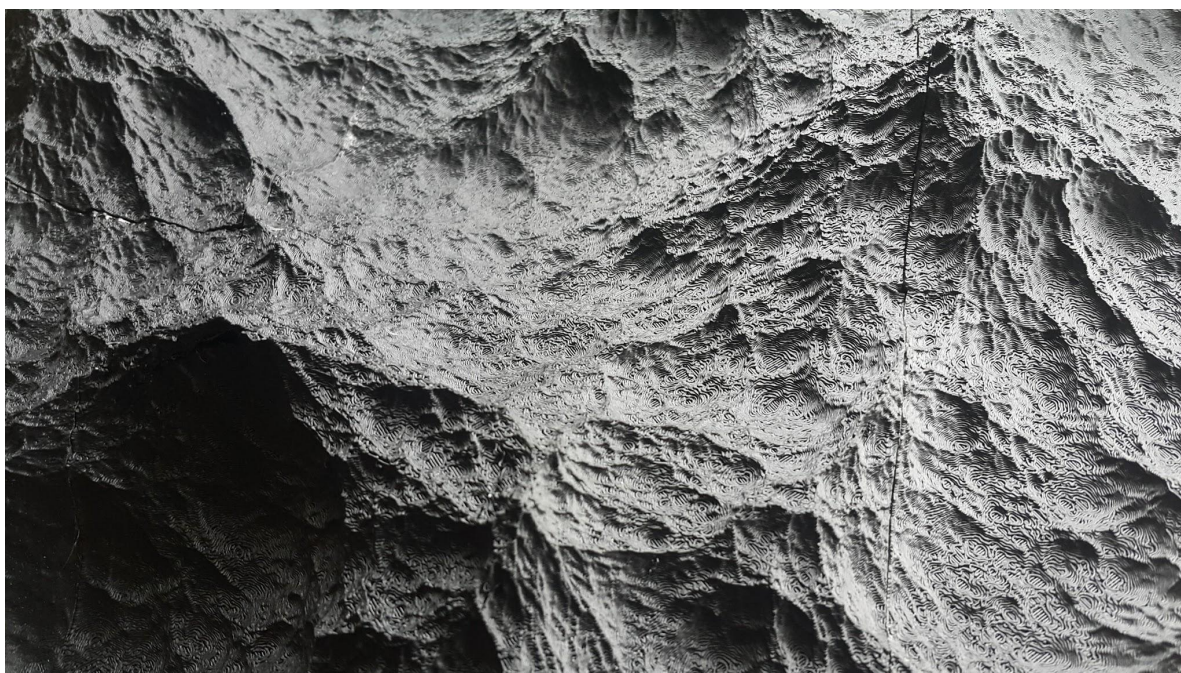
³¹ Nicolai, Carsten. Carsten Nicolai : *Parallel Lines Cross at Infinity*. Edited by Gerd and Nicolai Harry Lybke, Carsten Berlin: Gestalten, 2015.

the simple interaction of these two objects, an endless spatial play translated simple a signal (the speed of a wind machine) into a complex and powerful interaction between objects.



Figure. 8 - Carsten Nicolai, *pionier I*, 2011

In one component from this recent practice, I suspend three wires from the ceiling. One wire is a fan from a CPU, the second wire holds an LED light, facing downwards, the third is an electro-optical sensor, also facing downwards. These three elements are suspended over a sheet of crushed reflective mylar as found in hydroponic setups. In this simple assembly, the fan creates a vortex of air, so that all three elements are set into motion. The light rapidly traverses the crushed mylar, creating dynamic reflections, which are in turn read by the sensor as shuttered variations to light. There is a simple relationship between input and output modulated through a material assembly. Using sound and light the boundaries of an object are extended and interfere with each other. Direct overlaps and feedback mechanisms are available to me using sensors and microcontrollers.



Input test, 3D print as source of modulation, 2018

Degenerative death

*...the stable state of a living organism is to be dead*³²

Norbert Wiener

According to philosopher Boris Groys, entropy remains largely invisible until the damage has been done; 'Only after the system collapses does it become clear that it was the forces of entropy that undermined it'. The image of a collapse may be a signifier, but entropy is a state of ongoing permanent dissolution, not a fixed end. Groys continues,

*God is dead and the forces of nature are already under technological control. However, all systems, including modern and contemporary systems of control, are subject to forces of entropy. Modern technology is immune to divine intervention, but not to the fatigue of the materials of which it consists. Entropic processes permanently undermine every system, dissolving it into material chaos. The forces of entropy operate mostly underneath the surface of the world. Their workings remain unobserved and they sap energy from the system and render it unstable.*³³

In any closed system the processes of entropy are continuously present. The amount of entropy will increase as energy continues to dissipate and becomes unavailable. Dealing at the molecular level of disorder in a system, entropy underscores matter universally. In the case of electronic and kinetic apparatus, the observable characteristics of entropy are heightened and in observable motion - particularly in the more sinister implications of malfunction and glitch, mechanical degradation, and outright failure.

Grafted from Thermodynamics into information theory, the idea of entropy and neg-entropy is closely related the distinction between signal and noise.³⁴ Noise is the undesirable field that surrounds the production of a clean signal, the clean signal a fantasy of a utopian information age.

³² Wiener, N. 1961. *Cybernetics Or Control and Communication in the Animal and the Machine*: M.I.T. Press, 58.

³³ Groys, Boris. "Poetics of Entropy: The Post Suprematist Art of Mladen Stilinović." *e-flux* 54.

³⁴ Ana Teixeira Pinto traces the transfer of entropy into informational and behavioural sciences. See Pinto, Ana Teixeira. "Death Wall: Extinction, Entropy, Singularity." *e-flux* 67, 4.

In an interview for Rhizome³⁵, artist and writer Hito Steyerl noted that one of the biggest misinterpretations with digital information is that it can be duplicated without any loss, 'digital practice is constituted-like perhaps any technology, by malfunction' due the need for the technological need for constant transformation.³⁶

All that is not information, not redundancy, not form and not restraints—is noise, the only possible source of new patterns. ³⁷

Gregory Bateson

In my practice of building electronic apparatus, entropic processes are always tangible in the form of heat loss, mechanical degradation, and signal loss. I intentionally add to this entropic collected through the continuous transmission of signal among objects. Following the point of inception and along the slow mutation of a system, there will inevitably be ongoing systemic breakdown - and systems will lose their temporary emergent and active properties.

³⁵ Rhizome.org, a long-running digital art and culture organization

³⁶ Steyerl, Hito. 2013. "Artifacts: A Conversation Between Hito Steyerl and Daniel Rourke." *Rhizome*.

³⁷ Bateson, Gregory. "Cybernetic Explanation." *American Behavioral Scientist* 10, no. 8 (1967): 29.

Materiality and technics

Capital fragments

...if artists do not expose themselves to the workflow and economies that come with contemporary means of production, they become souvenir peddlers.

Hito Steyerl³⁸

In my assemblages, commercial materials are coupled with electro-mechanical components. The materials of an assembly are diverse, but always fabricated: they include commercial plastics, aluminium tubing, fans, furniture, consumer drone parts, opto-electrical sensors, 3D printed forms, LED strips, wire, actuators and small computers.

These physical fragments are mixture of the high-tech and the dull. The monochromatic, photocopier-grey commercial materials draw heavily from my personal experience of the surface of work and technology, of the nine to five circumstances of the past decade of my professional life, comprising 6 years in a stained, dusty Nauru House in Melbourne, 3 years in a windowless grey bunker in Tawa.

Life in these environments was dominated by repetitions of cubicles, spreadsheets, air conditioning vents, wireless phone headsets, worn carpet tiles, keyboards layered with skin cells, performance reviews, leadership training, change management, and organizational charts. This is a landscape full of sterile technological monuments trying to retain a sense of order, at odds with the warmth and intelligence of the bodies it contained.

The apparatus of the office and technology present in my assemblage's act as markers of a contemporary milieu dominated by the efficiency demands of commercial production. This is the continuation of a development from conceptual art of the 1960's. Art Historian Benjamin Buchloh stated that the aspirations of transcendence within art were subjected to 'the relentless order of the vernacular of administration'. In doing this, Conceptual art purged 'itself entirely of imaginary and bodily experience, of physical substance and the space of memory, to the same extent that it effaced all residues of representation and style, of individuality and skill.'³⁹ Jack

³⁸ Steyerl, Hito. "Artifacts: A Conversation between Hito Steyerl and Daniel Rourke." *Rhizome* (2013).

³⁹ Buchloh, Benjamin H. D. "Conceptual Art 1962-1969: From the Aesthetic of Administration to the Critique of Institutions." *October*, 55, no. Winter, 1990: 105-43.

Burnham stated that artists should show this drive *'to reduce the technical and psychical distance between [] artistic output and the productive means of society.'*⁴⁰

In using of materials that disavow any handcraft, and in electronically activating a space to be perform without human intervention, I am consciously engaging with the contemporary technologies available to me.

⁴⁰ Burnham, 1968, p.117

Capital reconfiguration

Within nature, the potential for extinction and oblivion remains in dialectical tension with the possibility of renewal and creation. The notion of history, on the other hand, implies an arrow of time, a unidirectional movement which can only lead to one of two outcomes: harmony or tragedy

Ana Teixeira Pinto⁴¹

Images do not reflect our reality. Instead, reality is shaped by the images we consume. These are images endlessly generated for our consumption through social, political, and commercial structures. And this is a world characterised by the overproduction of images.

My spiritual background was Jehovah's Witness, but my house was sporadically divided by ideas about the natural world. Some of my family marvelled in the evidence of perfection of creationism, while others marvelled at the evidence of slow mutations and natural selection. Either side focused on proof, engaging natural phenomena and complex organisms as the cornerstones of a defence or attack. My subsequent disillusionment with the doctrinal 'truth' led me to continually question how reality is constructed but drawing direct parallels with the façade of spirituality to a broader network of image construction within the world. Older and more knowing, I am interested in how technology and Capitalism work in tandem to present a unified narrative that supplants this spiritual terrain. This is an overt manipulation of a homogenised version of reality, which continually validates and reinforces itself. The dominating forces of technology and Capitalist production limit alternatives and produce the illusion that what is current is simply inevitable. James Bridle describes this as 'a belief in a direct line of technological and historical progress that we are powerless to resist ... this enlightenment idea where more knowledge - more information - leads to better decisions.'⁴² Bridle continues,

The illusion of knowledge and the anticipation of mastery combine to impel the timeline of progress, but they obfuscate the absence of understanding at its articulation point: the zero mark, the dark present, where we see and comprehend nothing beyond movement and efficiency, where our only possible act is to accelerate the existing order.⁴³

⁴¹ Pinto, Ana Teixeira. "Death Wall: Extinction, Entropy, Singularity." *e-flux* 67 (November 2015).

⁴² Bridle, J. 2018. *New Dark Age: Technology and the End of the Future*: Verso Books. 14.

⁴³ Ibid.,138.

Bruno Latour notes that technologies are always interpreted under this development:

...techniques are always engulfed in a vast narrative that makes them part of an advancing modernizing frontier to the point that every little gadget, trick, stratagem, or machination is transmogrified into some irreversible and undisputable destiny that only irrational and archaic nitwits will resist. ⁴⁴

This final trajectory of this narrative is often portrayed by the screens of capitalism in techno-utopian terms, where technology will be driving the world toward utopian homeostasis. Though I am attracted to a more dystopian vision of the long reach of capitalism in which ‘extinctions are drawn to it like magnets’, which may also see the materials of the world transformed into grey goo while the act of computation becomes increasingly more invisible to human perception.

The world ends, then, as a dead, undifferentiated, slimy surface - a massive lithosphere covered in lifeless sludge and nanomass wreckage.

Alternative forking realities are possible, differing notions of equilibrium can be found, but in the singular construction of reality, a trail of these effaced alternatives are left in its wake.

I do not intend for my work to directly critique systemic issues within Capitalism. This framing simply motivates critical awareness of the signifying power of technology, and of the potential for creativity in seeking indeterminacy. Organic life that spawns - grows, decays, leaks in and out of these fragments. An aim for art that mutates and produces disorders. It is this sort of psychedelic longing for any shift in our perception of the technological and cultural technoscape in which we currently find ourselves; a landscape itself under radical acceleration and mutation.

Through my spatial assembly of objects and reconfigurations of connective potential, I attempt to create a situation endlessly in flux, actively reconfiguring alternatives. To explore the material possibilities that different interactions can provide as afforded by technological and material questions. The experience of which involves objects that move, change position, have goals, create feedback. My practice focuses on the ongoing reconfiguration of these objects in the studio. Rather than trying to attain a predetermined goal, play becomes dominant again. This is the endless articulation of instability. Everything is ever unfolding, and everything is in motion, so nothing is fixed or ever completely true.

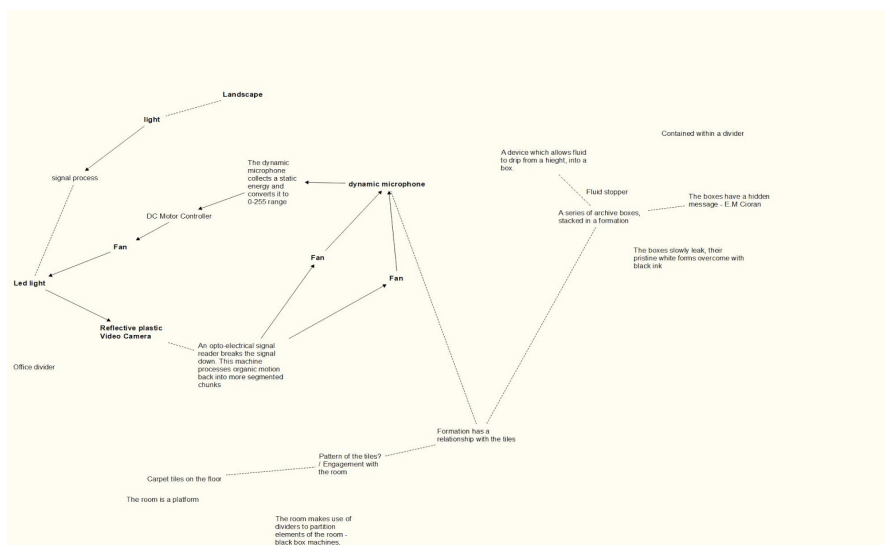
⁴⁴ Latour, Bruno. *Reset Modernity!* : Karlsruhe, Germany : ZKM, Center for Art and Media, 2016, 306.

Further notes on process

Notes on diagrams

In my working life, I rely on diagrams to articulate and explain ideas. In this new program of research, I have incorporated the network diagram directly into my practice as a pragmatic tool of conceptualising dynamic artworks. Diagrams are abstractions of systems, an untested ideal used as the starting block for exploration the reconfiguration of components. And as Pierre Huyghe and Ian Cheng has shown, Diagrams can be used for the modelling of dynamic behaviours or environmental states.

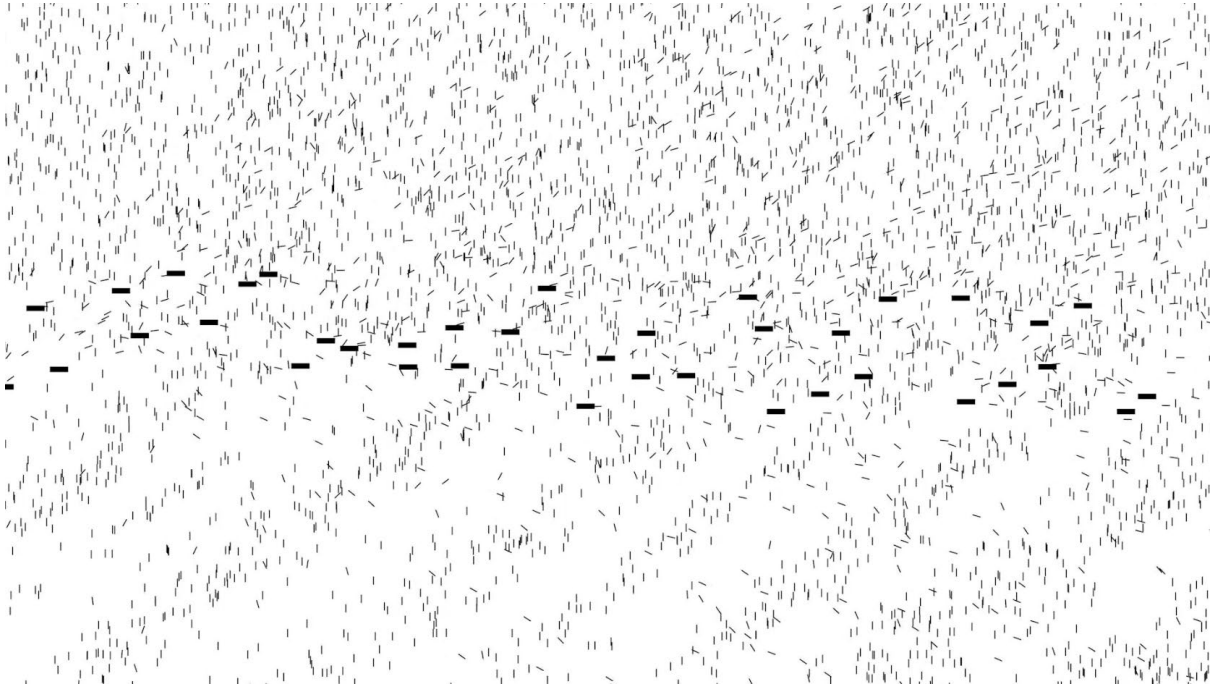
Through the use of diagrams, I try to understand and model how various components interact and relate to one another in a conceptual form, how energy and language (code) flow through a series of components. The diagrams I have created are non-hierarchical and have no clear beginning or end. Some elements are connected directly, others float. In this ongoing process of elaboration, elements are conceptually brought into play with each other. As an idea takes form, the nodes in the diagram may then be elaborated through sketching and modelling.



Fan modulator diagram, 2018.

Notes on modelling and simulation

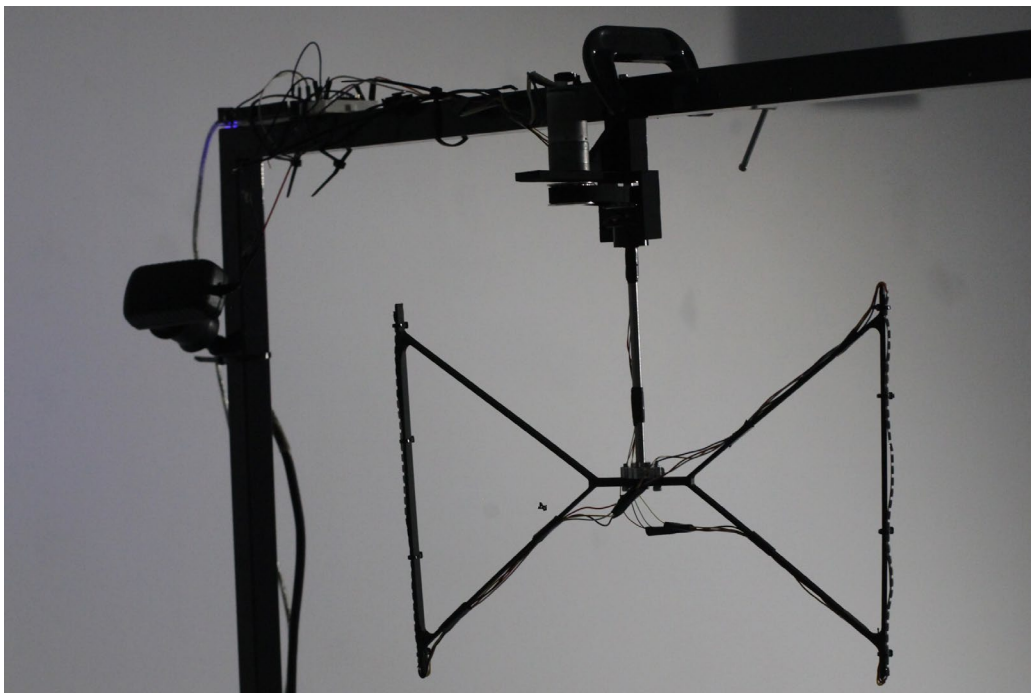
As I become interested in a component or assembly of objects, I use a mixture of sketching and 3d modelling to visualise the object. I also use 3d animation software to make small physical assemblies to test ideas.



Physical_Simulation_test, colliding swarms, 2018.

Notes on material

In the process of making sculptural assemblies, I have a range of overlapping material sources. By sourcing or borrowing commercial hardware including items of furniture, I can work on a process of a temporary assembly. I augment these industrial objects with smaller pieces that I have fabricated myself. For physical motion, I use small motors often found in industrial automation or architecture. Lastly, I use a range of electronic hardware including microcontrollers, wires and sensors. In the process of combination, I am less concerned with the perfect fit of materials, and the resolution of a commercial work, more intrigued with a haphazard ephemeral combination of materials.



Assembly test, 2018. Office furniture, LED lights, Arduino, DC motor, clamp

Notes on Software and Electronics

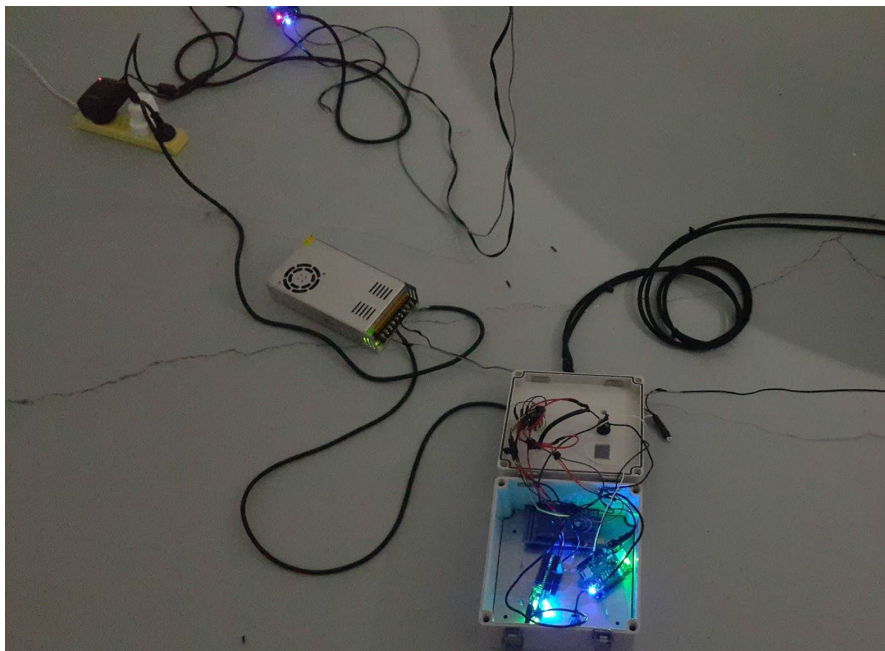
To amplify the physicality of connection, I have intentionally reduced the complexity of the code I write, so the physical materials are doing more. Loosely, the code in the assemblages is doing one of three things.

Electronic inputs - sensors and encoders read elements in either digital binary (on/off signals) or in 8-bit signals (a value between 0-255).

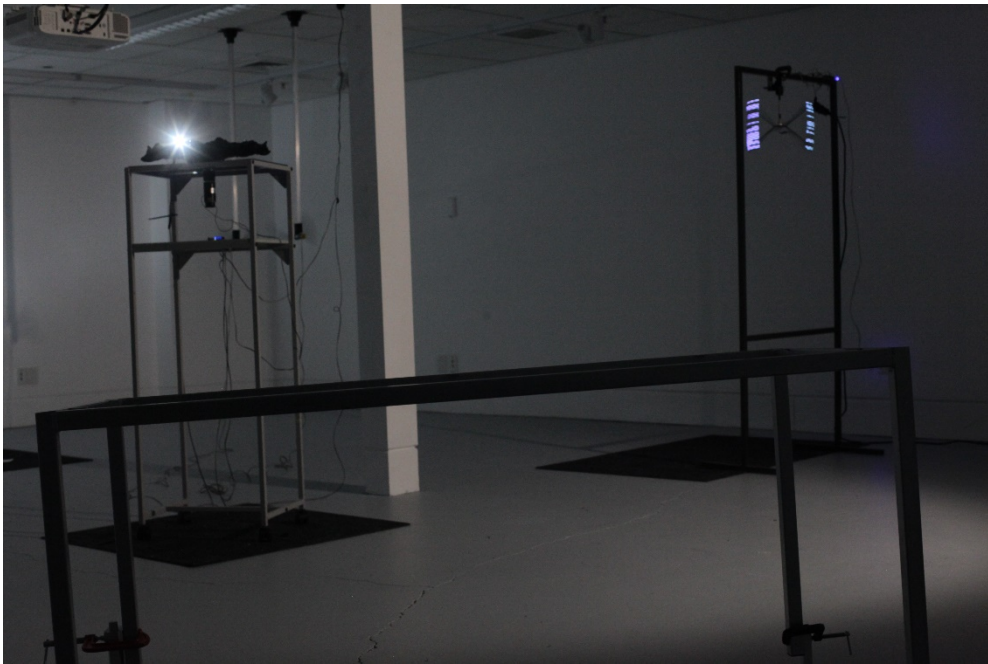
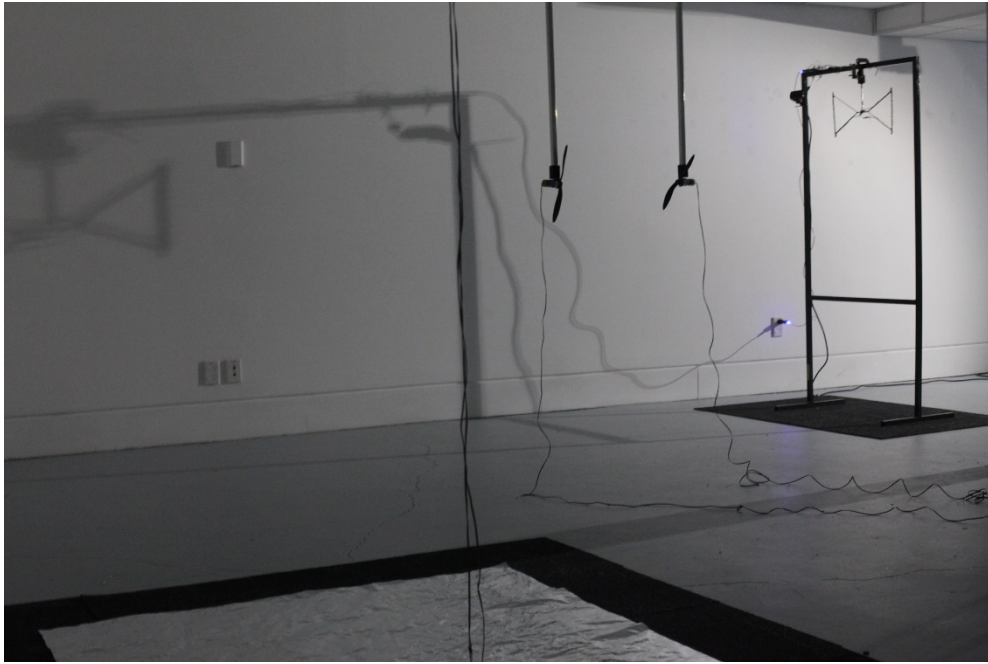
Value mapping - using a microcontroller and very basic code, the values are mapped or modified so that an input signal is translated or mapped to an appropriate value for output.

Electronic outputs - the mapped values are sent to electronic components.

Through this simplification, I use code and electronics as this middle-ground between materiality - these elements are primarily concerned with the transmission of information.



Assembly test, 2018. Assorted electrical components.



Assembly test, 2018, office furniture, DC motors,
linear actuators, drone parts, LED lights

Conclusion

The Assembly of Liquid is a mutating sculptural system assembled from commonplace industrial objects. These objects - fans, furniture, clamps, aluminium and plastic - are markers of the contemporary means of production and the sterile materiality of the office. These elements are woven together with a series of sensors, lights and motors. They become an assemblage of dynamic objects, a field of dispersed effects. I offer that through these interconnections, these assemblages are a primitive technological organism. For its lifespan, the exhibition undergoes a process of autonomous internal feedback, all the while diffusing dynamic imagery.

Operating under an exploratory context for this MFA program has had a positive disruption and impact on my practice. Using *Labyrinth*, my first artwork completed under this MFA program, as the launching pad for critique and repositioning, I have distanced myself from the resolution of hermetic objects as artworks. Through some early studio experimentation, I began working with sculptural assemblies in experimental works like *Melter* and *Governor*. Through additional experimentation in simulations, code and electronics, I have introduced the practice of activating found and commonplace materials, so that they become dynamic objects capable of receiving or transmitting energy. Building on DeLanda's model of an Assemblage, these physical components remain heterogeneous yet entangled in a greater network of connection.

In this new context, I position electronics and code primarily as the means of connecting objects. Electronic and mechanical components are the means of translation and feedback. Objects become porous and transitory through these systems. The behaviour of the system is not determined by a digital choreography by a centralised hidden controller, but through the interaction of the sub-components within a system. Through the interplay of commercial materials brought into dynamic play, I am probing the continuously dissolving boundary between technology and natural phenomena, in the gradual transition of a world into 'grey goo'.

List of illustrations

Figure 1: Paul Cullen, *3.F.1*, date unknown, in Cullen, Paul, and Richard Dale. *R/P/M*. Auckland: Split/Fountain Pub., 2011.

Figure 2: Paul Cullen, *Linnaeus Project*, 2007, in Cullen, Paul, and Richard Dale. *R/P/M*. Auckland: Split/Fountain Pub., 2011.

Figure 3: Pierre Huyghe, 2017, *After ALife Ahead*, Esther Schipper Gallery, Berlin, accessed October 1, 2018, <https://www.estherschipper.com/exhibitions/448/>

Figure 4: Pierre Huyghe, 2017, *Artists Sketch*, Esther Schipper Gallery, Berlin, accessed October 1, 2018, <https://www.estherschipper.com/exhibitions/448/>

Figure 5: Ryoji Ikeda, *Supersymmetry*, 2018, Ryoji Ikeda, accessed October 1, 2018, <http://www.ryojiikeda.com/project/supersymmetry/>

Figure 6: Ian Cheng - *Emissary in the Squat of gods*, Ian Cheng, accessed October 1, 2018, <http://iancheng.com/#simulations>

Figure 7: Ian Cheng - *Emissary forking at perfect*, Ian Cheng, accessed October 1, 2018, <http://iancheng.com/#simulations>

Figure 8 - Carsten Nicolai, *pionier I*, 2011, Carsten Nicolai, accessed October 1, 2018 http://www.carstennicolai.de/?c=works&w=pionier_I

Bibliography

- Ascott, Roy. "Back to Nature II." In *Telematic Embrace : Visionary Theories of Art, Technology, and Consciousness*. Berkeley : University of California Press, 1993.
- Barikin, Amelia. *Parallel Presents : The Art of Pierre Huyghe*. Cambridge, Massachusetts : The MIT Press, 2012.
- Bateson, Gregory. "Cybernetic Explanation." *American Behavioral Scientist* 10, no. 8 (1967): 29.
- Béghin, Cyril. "In the Machine." In *Philippe Parreno : H {N}Y P N{Y} Osis, Hypothesis*. Milan : Mousse Publishing, 2017.
- Bennett, Jane. *Vibrant Matter : A Political Ecology of Things*. Durham Duke University Press, 2010.
- Berardi, Franco. *After the Future*. Chicago: AK Press, 2011.
- Bridle, J. *New Dark Age: Technology and the End of the Future*. New York: Verso Books, 2018.
- Buchloh, Benjamin H. D. "Conceptual Art 1962-1969: From the Aesthetic of Administration to the Critique of Institutions." *October*, 55, no. Winter, 1990: 105-43.
- Burnham, J. "Systems Aesthetics." In *Dissolve into Comprehension: Writings and Interviews, 1964-2004*. Cambridge: MIT Press, 2015.
- Nasher Sculpture Center. *Pierre Huyghe - 2017 Nasher Prize Laureate*. Nasher Sculpture Center, accessed 1 October 2017, <https://www.youtube.com/watch?v=xy3GFEaz-IY>
- Cheng, Ian, Raphael Gyax, and Heike Munder. *Ian Cheng : Forking at Perfection*. Zurich, Switzerland : Migros Museum für Gegenwartskunst : JRP/Ringier, 2016.
- Crary, Jonathan. *24/7: Late Capitalism and the Ends of Sleep*. New York: Verso, 2013.
- Cullen, Paul, and Richard Dale. *R/P/M*. Auckland: Split/Fountain Pub., 2011.
- Cullen, Paul, and Allan Smith. *Provisional Arrangements : Paul Cullen*. Christchurch: Ilam Campus Gallery, School of Fine Arts, University of Canterbury, 2016.
- Davies, Erik. "De Landa De-stratified." *Mondo 2000*, no. 8 (Winter 1992).
- de Mul, Jos. "The (Bio)Technological Sublime." *Diogenes* 59, no. 1-2 (2012): 32-40.
- Deleuze, Gilles, and Félix Guattari. *A Thousand Plateaus : Capitalism and Schizophrenia*. Minneapolis : University of Minnesota Press, 1987.
- Feigelfeld, Paul. "Media Archaeology out of Nature: An Interview with Jussi Parikka." *e-flux* 62 (February 2015).
- Grosz, Elizabeth. *Chaos, Territory, Art : Deleuze and the Framing of the Earth*. New York : Columbia University Press, 2008.
- Groys, Boris. "Poetics of Entropy: The Post Suprematist Art of Mladen Stilinović." *e-flux* 54 (April 2014).

- Herbert, Martin. "Münster Sculpture Project." *Art Monthly* 408 (2017): 26-28
- Jon, McCormack, Bown Oliver, Dorin Alan, McCabe Jonathan, Monro Gordon, and Whitelaw Mitchell. "Ten Questions Concerning Generative Computer Art." *Leonardo* 47, no. 2 (2014): 135.
- Latour, Bruno. *Reset Modernity!* : Karlsruhe, Germany : ZKM, Center for Art and Media, 2016.
- Morton, T. *Dark Ecology: For a Logic of Future Coexistence*. New York: Columbia University Press, 2018.
- Nicolai, Carsten. *Carsten Nicolai : Parallel Lines Cross at Infinity*. Berlin: Gestalten, 2015.
- Pickering, Andrew. *Sketches of Another Future: Cybernetics in Britain, 1940-2000*. CSTMS Berkeley, accessed 1 October 2018, https://www.youtube.com/watch?v=z8Z1D_7Gcgk.
- Pinto, Ana Teixeira. "Death Wall: Extinction, Entropy, Singularity." *e-flux* 67 (November 2015).
- Pollan, M. *How to Change Your Mind: What the New Science of Psychedelics Teaches Us About Consciousness, Dying, Addiction, Depression, and Transcendence*. London: Penguin Publishing Group, 2018.
- Sbardella, Alex. *Smarter Things: The Autonomous lot*. GDR Creative Intelligence, 2018.
- Steyerl, Hito. "Artifacts: A Conversation between Hito Steyerl and Daniel Rourke." *Rhizome* (March 2013).
- Steyerl, Hito. "A Sea of Data: Apophenia and Pattern (Mis-)Recognition." *e-flux* 72 (April 2016).
- Sutela, Jenna. *Orgs: From Slime Mold to Silicon Valley and Beyond*. Helsinki: Garret Publications, 2017.
- Tegmark, Max. "Substrate-Independence" *Edge.org*, 2018, accessed 1 October 2018, <https://www.edge.org/response-detail/27126>.
- Wiener, Norbert. *Cybernetics or Control and Communication in the Animal and the Machine*. Cambridge: MIT Press, 1961.
- Wiener, Norbert. *The Human Use of Human Beings: Cybernetics and Society*. Boston: Da Capo Press, 1988.

Appendix- Materials List

Light Output

WS2812 and APA102 Addressable LED
5050 LED strips
3W Cree LED star modules

Motors and actuators

12V DC Motors
12V Stepper Motors
Shaft mounted speed encoders
DC Motor controllers

Sensors

Opto-electronic sensors
Vibration sensors
Accelerometers
Pickup Microphone

Microcontrollers

Arduino Uno
Arduino Mega

Force and motion

50" drone fans
12V DC CPU Fan

Material

Crushed Mylar
3d Printed landscape
Water

Infrastructure

Aluminium Tubing
Office tables
Pinboards
Chairs
Plastic Buckets
Wire
Clamps

Software

Arduino
MAX Msp
Rhino + Grasshopper
Cinema 4D

Appendix - Additional studio documentation



Melter, 2017, wood, aluminum, fabric, wire



Governor, 2017, DC motor, Stepper Motor, Ventilation Tube, Custom 3d print



Assembly Video Feedback test, 2018, Turntable, foam,
LED light, Digital SLR, Sensor Motor, Projector



Assembly Video Feedback test, 2018, Turntable, foam,
LED light, Digital SLR, Sensor Motor, Projector



Assembly test, turntable, turbines, model landscape, projector



Assembly test, DC motor, 3D printed turbine, wire



Labyrinth support structure, 2018, steel support, trailer axle, DC motor, pulley, LED light



Assembly Test, Screen, Simulation, a blood-red wave, CPU Fan, LED