Machines at Play
The Attraction of Automation

Thesis submitted in partial fulfilment of the requirements for the
Royal College of Art for the degree of Doctor of Philosophy.

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This thesis represents partial submission for the degree of Doctor of Philosophy at the Royal College of Art. I confirm that the work presented here is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

During the period of registered study in which this thesis was prepared the author has not been registered for any other academic award or qualification. The material included in this thesis has not been submitted wholly or in part for any academic award or qualification other than that for which it is now submitted.

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🗋 Abstract

Taking as its starting point the ubiquitous nature of automated technology, this research asks how *play* may be used in an antagonistic form against the regimentation of machines but, conversely, may also be employed to instrumentalise them. The work undertaken specifically focuses on how play (a quality considered here as intrinsic to human culture and nature following Johan Huizinga's *Homo Ludens*) can expose issues of control, agency and authority within a technological context.

While automated machines have become increasingly complex over time (synchronous to the trickle-down availability of computing devices to the everyday consumer), the understanding of their function and the means through which they produce, represent or declare forms of 'knowledge' are today even more opaque. An automated machine—thought of here as being any set of infinitely repeatable, programmed procedures—raises anxiety as to the human condition. *Machina ludens*, the figure of the playing machine that I propose, takes this model a step further and uses 'attractive' effects to produce (what Huizinga terms) "false play" so as to hide the ramification of any social or political design by its engineer. Following Vilém Flusser and Bruno Latour's notion of the "black box", how then can an artist open up an automated machine and its script in order to declare this?

The research is undertaken through an interlinked practical and written component. These components use a methodology that undertakes an analysis of the *play-element*, alongside a technological/engineering analysis of the *machine-element* in culture. In practice, following a lineage of artists who have similarly made use of technology in the production of machines in their artwork, from Jean Tinguely and the E.A.T. group to Harold Cohen's *AARON*, the research examines various forms of the 'art machine'. Both the written and practical works use the tension (or contention) between disciplines, the researcher overtly taking the position of being simultaneously engineer and artist. As such, this research is a re-reading of Huizinga's understanding of the *play-element* of culture through a contemporary, technological lens that bridges the gap between a humanities/philosophical approach and an engineering approach, applying this to contemporary issues surrounding automated 'art machines'.

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Set-up

Artist + Engineer

For thirty years Martin Gardner wrote the Mathematical Games column in the *Scientific American*. He had no formal training in mathematics, in fact he had problems learning calculus; indeed, his education at the University of Chicago had been in philosophy.[1] His learning of abstract mathematics came via the very articles he wrote, using play and games as a means to explore, what he described as, "nontrivial" ideas (Gardner, 1975, x). By doing so, he introduced a wider audience to mathematical problems and discoveries, including William Newcomb's paradox in decision-making theory, Roger Penrose's aperiodic tiling and the cellular automata of Conway's *Game of Life* (Mulcahy, 2014). Looking through Gardner's columns in chronological order, one can see how they commenced on an elementary level of knowledge, developing into increasingly complex relations and concepts. Gardner puts into practice a method of learning built on active construction and self-reflexivity, leading to an increasing density of relations within his thoughts over time. This is, to me, a method for undertaking research; the act of researching therefore understood as the continuing examination of an obstacle through the acquisition of knowledge.

On setting up a research question (to reach a particular *ob*-jective), one creates an *ob*-stacle; the prefix *ob*-, to place in front of, to be in the way of. The means of dealing with the objective may be linear, meandering, structured or entangled but importantly for me, it is conceived of as being *with* rather than *against* the object. That is to say, in this research, the position of the machinic, automatic device should not be as a monstrous *other* (as an object that might defy Isaac Asimov's laws and at any moment subject me to its rule) but, instead, be an accomplice in co-creating knowledge.[2] This research process is driven through the question of how one might work with the 'unknown' to encourage a process of mutual learning as an exchange or dialogue. In opposition to the passive banking or storing of information that is the continual territorialisation of *knowledge-as-progress* (and a power relationship akin to the master dictates ⇒ the student receives model), it is a position in which it is important to declare openly, however temporarily: I do not really know what stands in front of me.[3] It is to say, against all academic

[1] Alongside his column in the *Scientific American*, Gardner's intellectual interest was that of a polymath; from his best-selling work *The Annotated Alice* (2000) to his philosophical memoir *The Whys of a Philosophical Scrivener* (1999), Gardner's work covered mathematics, pseudoscience, scepticism, magic, religion, philosophy and literature.
[2] The three laws being: (1) A robot may not injure a human being, or, through inaction, allow a human being to come to harm. (2) A robot must obey the orders given it by human beings except where such orders would conflict with the First Law. (3) A robot must protest its own existence as long as such protection does not conflict with the First or Second Law (Asimov, 2013, p.44).
[3] Paulo Freire criticised traditional pedagogy in relation to the "banking concept"—a form through which the person that learns was reduced to an automaton—whereas his method proposed a 'problem-posing' system. Freire writes, "Knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry human beings pursue in the world, with the world, and with each other" (1996, p.244).

calls and pedagogical imperatives that ask for increasing the territory of what is known, that a "zone of indeterminacy" (Cocker, 2013, p.126) is necessary, through which, one might be allowed to play freely and allow for an unexpected discovery. The artist-as-researcher needs be free to make new connections, to take risks, to learn—to play.

In Isaac Asimov's *I, Robot*, written in 1950, two characters who receive little attention as to their role within the unfolding narrative are the testing engineers, Donovan and Powell. Working 'in the field' with one another but also with their assigned automated machines, they aim to explore and test—in practice—the limits of the technology placed before them i.e., the machine's ability to do as intended.[4] As the pair work alongside their technological automatons (as research subjects), they encounter increasingly complex theoretical and technical problems to navigate. They are, for all intents and purposes, 'only' technicians, yet they teach us more than those who design the machines; solving problems via embodied knowledge, intuition or a priori reasoning rather than the explicit logic of the machine's manual. They are acutely aware of how an 'on-the-ground' application of a machine may produce unexpected results and that they must use all of the tools at their disposal (both cognitive and physical) to resolve any issues.

Within this research there is an inherent struggle to understand machines at play through, somewhat ironically, the limits of my own knowledge in getting them to *work*. What follows therefore, is not an answer but a structuring of the relationship between research objective, artwork and viewer as a metaphorical 'set-up' of parameters; the configuring of a program ready to be run which, in setting free and through applying learning, may produce a quality of surprise (that questions notions of chance, failure and agency).

> Why are we fascinated by machines? It is the last refuge of the artistic temperament. If you want a steady, reliable job you get a dull man. But if you want an unpredictable prima donna, get a machine. I have never been to a gallery where all of the machines were running after the day of the opening. Sometimes even then it's too late. So there are records of machines. A fossil or a tombstone. We bring it flowers. Tell us what it did. The interest in machines is to have them surprise us. (Antin, 2011, p.34)

By being in a position of simultaneously designing, constructing and testing 'art machines' while also thinking theoretically of their implication for both the viewer and those artists who work

[4] Asimov considers the machines in his fiction as "robots" – automata that think but without a 'soul' (following Čapek's fictional story *R.U.R.*,1921, in which a robot class overthrow the dominant society). With robots today often thought of as approaching sentience (the grail of artificial intelligence), Asimov's robots are in fact still based on calculation from observed data, relying on an internal algorithm and ethical meta-laws to limit their action; they are *human-like* machines. I will be using the term *machine* in this research to define all objects that rely upon a human-configured script (see Chapter ∇, Machine).

with automation, I have approached this research as both an artist and engineer. In order to unpick the social and cultural 'set-up', it is important to state that this is not seen through the lens of artist-as-playing-engineer or engineer-as-playing-artist but at the fulcrum of this binary. It would be too easy to break down this relation into a dichotomy of disciplines, into a figure of play (*ludens* – artist) and a figure of seriousness (*faber* – engineer); instead, the purpose of this research is to explore these characteristics as interwoven and to develop an image of a culture that combines them to create attractive, seductive, playful qualities in machines, elucidating often serious results (and consequences). This research is therefore a re-reading of the play-element of culture in the context of 'art machines', in particular, it explores the tension between rules and free-play; extending the notion of "false play" (Huizinga, 1950, p.205) from this dichotomy as an attractive effect, one made with hidden rules that can instrumentalise the rhetoric of agential control by machines.

Today, moments of both work and play are infused with technology in ways that seem impossible to grasp; the understanding of an automated machine might appear as a black hole or box, which when peering into may (or may not) reveal any further understanding as to its influence in the world. Few of us are able to write and engineer code at 'machine level', with the majority of professional computational engineers, coders and programmers working on high level programming languages that relate closer to natural, human language in order to allow for greater ease in writing and legibility. Perhaps it is this that both repels us—the root of anxiety around automation and machines being to live with the unknown means of its operation—but also, conversely, attracts us, for they retain the potential (despite determinism) to surprise.

This research asks that if an artist de-centres/withdraws themselves from control of a machine, such that *machina ludens*—the figure of a 'playing' machine—is left to produce abstractions indistinguishable from human or machine intention, how can one trust its efficacy? How can an artist open up an automated machine and its rules in order to both exploit and declare this?

Structure

Each chapter in the thesis refers to one of the key terms in the project's title: play, machine, automation and attraction. While they are not conceived of as being separate factors in the exploration undertaken, this allows for a systematic means of examining their interrelation in synchronisation with the development of the practical component.

In the first chapter, ▷ Play, the meaning and context of "play" is identified through a key text, Johan Huizinga's *Homo Ludens: A Study of the Play-Element in Culture* (1950). The ideas and theories most relevant are his initial definition of play (which resonates through the vast majority of later literature on play and ludology) and the assignment of culture's "play-element" as figuring in, and pre-figuring, its development. In addition, this chapter introduces Roger Caillois's (2001) use of the terms *paidia* and *ludus* that, extending from Huizinga's conception of play, describes how rules (i.e., a game) exist as a framework for play. *Paidia* refers to the Ancient Greek for 'childish play' or 'amusement' (one of the *charis*), while *ludus* is the Latin word used to cover a broad interpretation of play that for Caillois, mainly invokes the sporting events of Ancient Rome. This play/game relation, emphasised as a dichotomy between indeterminacy and rules, is explored through art practices that utilise both chance and instructional techniques (artworks by Hans Arp and Sol LeWitt are used as examples) to explore the tension of human agency and control that is repeated in artworks made via machines and automation. In the project's practical component, I have developed coded actions and a written program that composes 'spare' studio material into chance, digitised configurations, that then act as a set of instructions for me to fabricate in the studio; the results appearing as if from human intuition rather than machine. Huizinga identifies a possible receding of the play-element in developed civilizations due to science and technology, resulting in appearances of "false play" (1950, p.205); instances of play that are co-opted for the improvement of productivity and as a stultifying rather than emancipatory force.[5]

The following chapter, ▽ Machine, will discuss how kinetic practices through machines and programmed systems have been used to develop artwork in the latter part of the twentieth century, focusing on the works of Jean Tinguely, Channa Horwitz and Haroon Mirza. Tinguely's *Homage to New York* (1960), while left greatly to chance in its outcome, was a work intended to be 'self-acting' and represents a collaborative exchange between artist, engineer

[5] The installation of play apparatus in the offices of Google is an example of play being appropriated in this manner (Myerson, 2016), or the 'best employee' badge that turns work into a neo-liberal individuation of targets (as a play of competition) above any sense of community or collaboration. Huizinga writes: "This process goes so far that some of the great business concerns deliberately instil the play-spirit into their workers so as to step up production" (1950, p.200).

and machine. Tinguely and Billy Klüver, a lead in the Experiments in Art and Technology Group and the engineer on the project, worked together to produce the carnivalesque event in the garden of the Museum of Modern Art. It is from Klüver's perspective that I draw out the role of engineering in art practice. Fifty-five years after *Homage to New York*, Haroon Mirza was asked to produce an exhibition at the Tinguely museum in Basel, responding to (and intervening with) works in the collection. This was a collaboration again, only at a distance to both the original technical context and Tinguely himself. Two works are of interest here: one is a response to Tinguely's *Mengeles: Dance of Death* (1986) upon which Mirza layers automated light and sound; the second is Mirza's interpretation of Channa Horwitz's *Sonakinatography* art system in the work, *A Chamber for Horwitz*: *Sonakinatography Transcriptions in Surround Sound* (2015). In both these instances there is a relation to the rule and chance systems discussed in the first chapter but, in addition, Mirza's digitally constructed artworks overlap the mechanics of Tinguely and Horwitz into systems dominated through electrical current, logic gates and transistors. This thematic of collaboration, of working alongside machines, is figured by a practical work—an auto-destructive painting machine, *Untitling Machine* (2016)—made in partnership with another artist whose body of paintings are altered and affected by the machine.

In the chapter, △ Automation, the focus of the project moves towards the precise nature through which machines are made to act; and the access to, or 'sealing off' from, understanding that occurs through internalised processes. The notion of the "black box" (Flusser 2000, 2011; Latour 1987, 2005) is used to assist in picking apart the idea of automation and how contemporary methods, such as media archaeology, can evidence the discontinuities that a black box might hide. The black box also traces a transition from a Newtonian understanding of the world to one of quantum mechanics that seems to defy the laws we observe; from the automated machine as a lever-device that produces attractions such as the infamous chess-playing automaton the Turk, to the machine as a computational-device that folds multi-media capabilities within a miniaturised space and where being beaten by a machine at chess no longer seems surprising. The question in either case is whether access to the inner workings of a machine allows for further understanding of its function—its means of automation—as a technical apparatus and, as such, its political or social design. Does opening the black box reveal any further the nature of an object's affect in the world? In this sense, the black box phenomena will be explored as analogous to Huizinga's magic circle, being a space that is marked off from the world in order to allow for an "act apart" (Huizinga, 1950, p.10). This draws into question how permeable or flexible a machine's structure (as either software or mechanical movement) might be. I suggest that a black box, within the context of automated machines, is in fact an analogous embodiment of false play, in which an intention or limitation (as forms of proscribed governance) are constructed and proceed without being fully understood by the user. Play, as a

'human-like' quality, can therefore be used to masquerade an object as autonomous agent. In the practical work, *When A Tyrant Eats Itself* (2020), which accompanies this discussion, an elongated process of production is employed that, as an automated workflow shared between human and machine, creates and tests the entanglement of agency in art making.

The final chapter, ◁ Attraction, draws together the encounter with automation both as an artwork and as an object or device that might elicit playful representations. Devices that demonstrate human action and thought have been of wonder since the mythology of Hephaestus' workshop, in which automatons would make possible the tools of warfare that the gods demanded. The increasing sophistication of technology has allowed us to harness natural forces in line with an anthropocentric view of the world—the belief that machines are made *for us*. I illustrate this with the example of amusements such as moving panoramas and fairground rides. Cinematic machines, for example, in turning singular images and animating them into moving images, would draw the viewer's attention to the mechanics of their operation over any filmic narrative, demonstrating a technological sensuality and spectacle; described by Tom Gunning as early cinema's "attractive" (1986) quality following Sergei Eisenstein's "montage of attractions" (1974). In the same way, the playful quality encouraged of many automated machines today, for example voice assistants like Amazon's Alexa, might excite us through their novelty but hide a less 'helpful' narrative, one focused on the acquisition/automation of the user and not just the reflexive demonstration of 'knowledge as information' which seems so attractive. That is to say, they mediate information in a way that appears, quite literally, at our command, yet what is presented and returned can often be without veracity and disappointingly hollow. In dialogical exchanges with the machine, data can simultaneously also be drawn from us and incorporated into their calculations via the invisible osmosis of a person's sovereignty. The practical work similarly follows this dialogic question of interaction; consisting of an automated projector that can locate, move, turn and focus moving images in a space (using technologies employed by Google for its autonomous vehicles) and proceeds in a reciprocal loop, both acquiring and responding to information within its environment.

The final synthesis of the project focuses on the limits of machine automation in relation to art practice. Today many artists work with automated machines for the production of their artwork, from the commonplace use of various computer software programmes to 3D printing, laser cutting and rapid prototyping. One might say it is possible to use automated processes, effects and techniques for what they can simply *do*—how they may assist in the realisation of an idea into a material form—but what is at stake is, more accurately, what they *are*. In the conclusion, I draw together the limits (and possibilities) of automation and machines in the production of an artwork. Ultimately, this research is not intended as a means to demand a

luddite upheaval or to 'rage against the machine', for the very devices and machines I discuss also allow me to make my work, as well as access the information and knowledge that produce this very text; but I believe the automated machine is limited by an inability to account for play. The appearance of a playing machine (the contradictory 'non-functional machine') may reduce the artist's and engineer's apparent presence in the work but they cannot be eliminated. In this way, if this research is a call to anything, it is to rage *with* the machine.

Ethos, Pathos & Logos: A Note on Method

Due to the research exploring forms of persuasion in automated technology—its attractive affects, processes and representational use of play—what follows in this thesis has also been built around the persuasive forms required to engender a convincing argument: a rhetoric. The Aristotelian forms of *ethos* (the appeal to credible weight or character), *logos* (the appeal to rational and empirical data, i.e., logic) and *pathos* (the appeal to emotion as poetics) are used within both practical and written components as a kind of structural framework similar to the coding of a 'playing machine'. In attempting to avoid a polemic based solely on auto-ethnographic experience or a documentary grounded in the collection/analysis of 'hard' empiricism, the exact nature of the 'voice' and the 'speaker' through which this research is constructed and disseminated, in relation to these methodological poles, is worth further consideration.

If one accepts that a researcher has a limit in regard to what can be practically achieved at any moment; this work therefore represents a snapshot of a particular technological context, much in the way Huizinga's theory of play was developed in a vastly different one.[6] How, then, can one claim assuredness of ethos? The notion of ethos in this research, as the figure of the expert,

[6] By this I am referring to the everyday array of processes that are automated, networked and commercialised in comparison to 1938 (when *Homo Ludens: A Study of the Play Element in Culture* was first published). At that time, Konrad Zuse had just completed building a binary, electrically driven calculator in Berlin, capable of reading programs from a punch tape reader. While the machine was very limited in function, Zuse essentially conceived of a universal machine that could combine the calculation, storage, control and transmission of information. Turing had also reached the same conclusion (a year earlier) of what Zuse would call "a special purpose brain" (Ceruzzi, 2012, p.27) in his theoretical machine (both men re-discovering the earlier work of Charles Babbage). There were others too who were working on calculating machinery that, from various viewpoints, realised the relation between binary switching and calculus that would usher in the digital age. It would be reasonable to assume that Huizinga might be aware of such advancements in scientific knowledge; Leiden University, where he worked from 1915 (Anchor, 1977, p.72), was home to both the arts and sciences with academics and Nobel prize winners such as Albert Einstein and Enrico Fermi—referred in his obituary as the "architect of the atomic bomb" (NYTimes, 1954)—passing through its doors. The language of automated thought processes and 'mechanical brains' that surrounded science and technology discourse in academia would explain Huizinga's concern for culture as being co-opted by a quantitative rather than qualitative framing of what it is to be human. He was most certainly anxious and full of lament as to the state of the world and the prospects of modernity; his 1936 book *In The Shadow of Tomorrow* critically exposes the various "distemper" of the age, including a whole chapter titled, "Science Misused" (2019), and this research will examine whether this critique was, in retrospect, accurate.

can be questioned in relation to how much one may trust that which is presented by the author or producer. This is problematic in relation to the PhD requirement for the author to be an expert in their field and to make an "original contribution to knowledge" (RCA, 2020, p.8). Entering into unknown areas requires the construction of a framework that allows the expansion of knowledge through the 'freeing' of prior thought or assumption. An expert therefore is only an expert *temporarily* before the arrival of a new advancement in knowledge, understanding and, in this case, technology. In tandem, how that knowledge might then be gathered and presented (as an aesthetic experience and as an artwork) should also be explored; that is to say, how the methods of dissemination impact on what constitutes that knowledge. For example, I am not an expert in the field of computational engineering and my preference is, as with the multi-disciplinary approach of Martin Gardner cited earlier in this introduction, for a philosophy developed through practice that channels research as a dissemination of my understanding in constant flux or, rather, always in the process of learning. That is not to say that the expert need not be keenly listened to; at the time of writing, with 'post-truth' the latest nomenclature for any attempt at shared objectivity, the expert should be lauded if their aim is for accountability as well as for systematically and rigorously exploring knowledge, ideas and theories in depth.

What, then, of relying on an ethos built around one's force of character—what might be called one's *attractive* force—as a means to persuade the viewer/reader? Papering over an empty vessel of knowledge is of course as problematic as lacking expertise; the false but spectacular ideologue might seem inviting but warrants vociferous probing. To reveal and make available the foundations of what one claims, which I aim to do, is to try and provide an open framework and mode of development that accounts for failures as well as successes. It is the maxim of scientific research to be reproducible, for an experiment to be re-run (under the same conditions) and with the same results. While the exactitude of this seems a misfit for art practice, following the artist 'in action' as one might do a scientist can in part alleviate any mystery that might be employed, which is to say, that the very method of construction should at least be evident.

In relation to the machine—the other 'figure' in this project—I question relying upon it as an expert on two levels: (1) Beneath an automated machine is the human engineer/designer and as such, their intention for its output, i.e. the extent to which we rely on those who can speak, write and understand the language of a machine's automation;[7] and (2), as to whether the

[7] As the researcher, this also includes my own action, for I am also a producer of 'art machines'. I am not, as termed in social science research "unobtrusive" in the "physical evidence […] available to be exploited opportunistically by the alert investigator" (Campbell et al., 1966, p.36) but this again re-iterates the need for a transparency in the construction and thought process that is hopefully described in this thesis.

machine can be fully self-reflective as to the implications of any knowledge or information it disseminates. The first point will be the main area of investigation here while the second point—equally important—goes slightly beyond the scope of this research and deeper into the realms of artificial intelligence, machine learning and the ethics of sentience in machines. In both cases though, there exists an anxiety about the status of identifying a reliable, persuasive voice or ethos in the context of art or cultural production when working with automated machines. My own position in being artist-as-researcher/researcher-as-artist may well be unreliable for as one might critically suggest of an auto-ethnographer, I am incapable, despite every effort, of being unobtrusive (and thereby not creating bias) in the work undertaken. With the reliability of both human and machine as similarly questionable, as a reader, I believe it is correct to maintain a position of scepticism. An attempt at self-rhetorical analysis in the written component (that includes the verification of its claims against others working in the field) should be accompanied by an acknowledgement of the issues in the practical production, for despite my attempt at following any procedures, accidents, chance and failure are as crucial here as functionality. As with the aforementioned Donovan and Powell—Asimov's testing engineers—each of the machines that they observed required reporting back upon following their testing in order to document unexpected outcomes. Their story bridges the gap between the desires of the manufacturer or designer who script a manual of the machine's operation and their 'going forth' into the world in practice. Each chapter in this thesis is therefore linked through a personal anecdote; a minor narrative to not only illustrate the idea being discussed in the main body of the text but to evidence that both rational, objective analysis of information (*logos*) and an appeal to the human nature of emotive experience (*pathos*) is simultaneous within research in action.

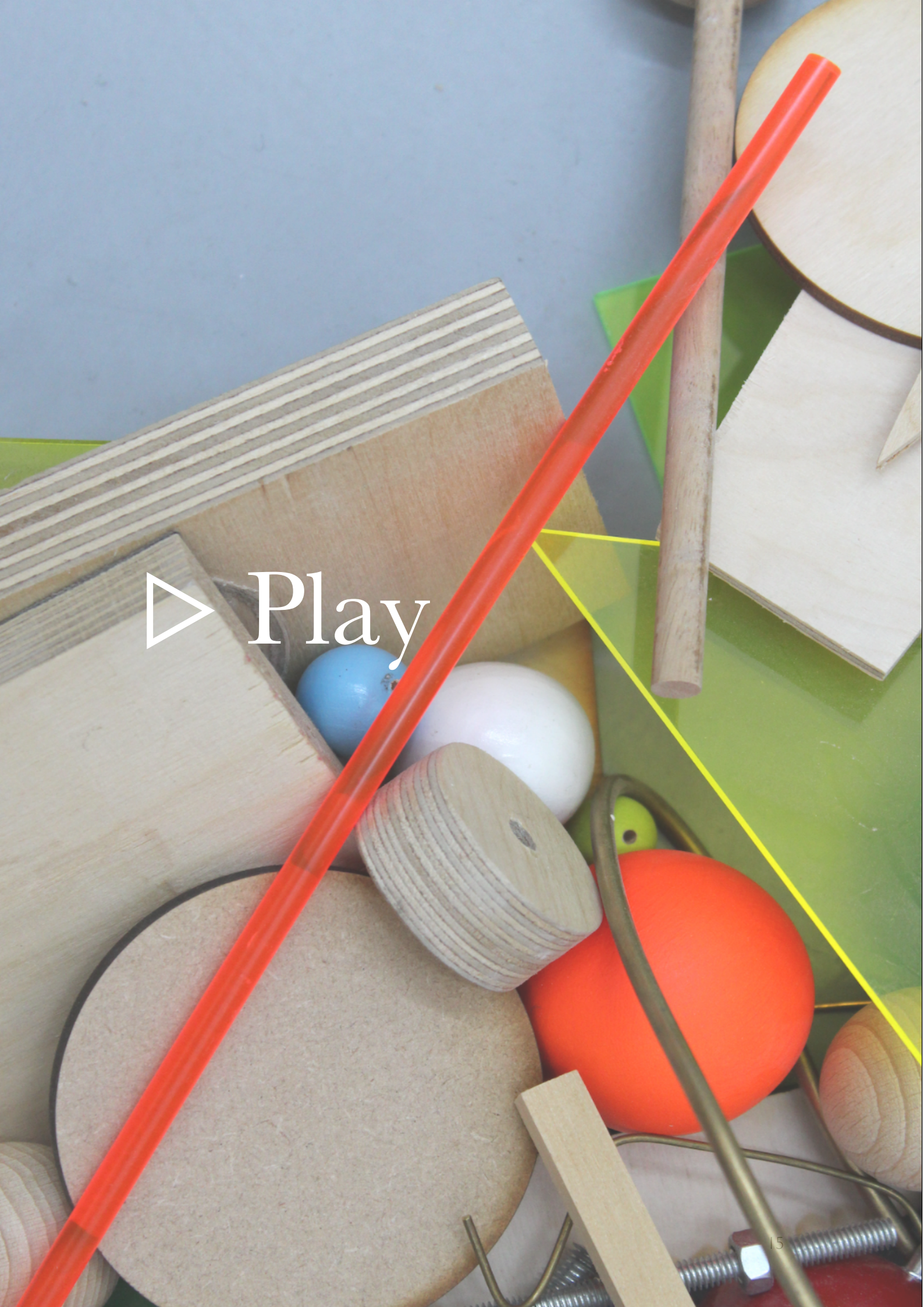
In the practice of coding, thoughts and comments are often typed in but bracketed out in relation to the functional running of the program. This bracketing out is variously indicated depending on the programming language being used: '//' in Javascript, the letters 'REM' in BASIC, '!' in Fortran and '#' in Python. It is an embedded text intended only to be read by the operator rather than the machine or indeed, the end user.[8] In the special assembly language developed for the Apollo mission, phrases and comments were inserted by programmers (of which there were over 400) in its 40,000 lines of code.[9] The Apollo Guidance Computer software, developed under the directorship of Margaret Hamilton in 1969, has been made

[8] All of these are high level programming languages. Machine code, meanwhile, is the binary or hexadecimal numeric code that directly controls the logic gates of computing systems, not requiring any form of transformation or translation to be understood by the machine. To write programs in this code is exceptionally difficult and the domain of relatively few people (a further discussion of this can be read in Chandra, 2014).

[9] To put this into perspective, Google's search engine is made up of over two billion lines of code while Microsoft Windows approximately fifty million (Metz, 2015). While the number of lines is not a clear measure of a system's sophistication, it is nonetheless impressive that the programmers were able to develop such a 'light' piece of software which still allowed the multiple tasks of launching, landing and returning from space.

available via the code sharing site GitHub (Garry, n.d.) and internet users have found multiple 'insider' references in the code, many of which are humorous. One comment reads: "Temporary. I hope. I hope." (Burkey, 2019). I believe that it is important, despite the common understanding of working with machines as being a distanced, discrete interaction with code, parts and assembly lines, that there is always a proximity, often belied by the exterior (and the signification of terms such as 'hardwiring', 'cold logic' etc). It is this human trace on the machine that I aim to reveal in the parallel text.

So, while the procedural structure of the thesis follows a systematic de-construction of the research terms (and acts as a logical un-packing of the discussion), there sits in contrast the anecdotal or incidental; the aim being to combine qualitative and quantitative approaches. Throughout the whole project, the relation (and duality) between qualities such as *logos* and *pathos* are repeated as rhetorical voids; by positioning *paidia/ludus*, play/games, artist/engineer and human/machine dualisms as the 'terms of engagement' in the research, ethos is built through the very exploration of the liminal space between them. Ultimately, the aim is to test automated (art) machines as having the potential to similarly be able to contend such dualisms, to be both logical and emotional (in functional procedures) and that through the use of rhetorical devices, one can create attractive and persuasive effects for the viewer. "Beyond our sensory enjoyment of machines lie the uses and effects of those aesthetic experiences. Those effects are *rhetorical*: we influence others, and they influence us, in many ways" (Brummet, 1999, p.2).


▷ Play

There was an object with a grey dimmer switch.

It hummed, that grey box with its white plastic wheel for a switch. It was larger than the dial of a standard domestic switch, exaggerated like toys are—a cartoon control for a child. I remember that hum, not for its warmth, but for its danger; it was clearly the noise of an electrical imperfection and it felt as though that box might burst into flames at any moment. The box controlled the speed of a train, a model that was my father's and his father's before him. Looping around four panels that he had constructed from chipboard and brass screws, it was a modular set up that came out into the living room only when there was enough enthusiasm for the effort (or more often than not, required as a pacifier for boredom). Once up and running, it always disappointed; going only round and round in circles, the lack of decoration and constant breaking down meant its attractive affect was very temporary.

When not being watched, I would remove the four screws on the lid of that grey box, peer in and access the electrical circuit at work. This access to the object's guts did not offer the clarity I expected. I remember coloured wires and a faint smell of hot dust while distinctly learning nothing of the physical operation in front of me; it revealed instead a desire for transgression, the undoing of an interface so that I could cross the limits of safety and—when the screws were back in—without anyone noticing. I don't ever remember even disconnecting the electricity. Here then, despite the risk of a verbal and physical scolding, was 'play'; not through the expected model or the thrill of controlling the intended object of the game, but the risky archaeology of a machine that, bit by bit, might push the limits of my knowledge.

Figure 1: Selby, M. (2015) *Auto-Assemblage #32.* [Mixed media] 30x18x12cm.

Spare materials, archived objects and found parts; a 'live' archive of accidental and conscious aesthetic choice.

Selected pieces from this 'database of material' are drawn up as digital, 3D replicas. Geometry and dimensions are measured by hand, transposed and rendered in as close an approximation as possible to their 'physical' form.

Then, the digital versions are, one-by-one, connected in a chain of events that build into a mass: an auto-assemblage. Through a coded script, the various objects attach to one another along vertices, edges and faces. The location and co-ordinates for intersection are selected by the pseudo-random number generation of the computer/machine.

The model on the screen is used as a guide for the artist. A 'physical' replica is made with variations allowable only upon a lack of skill, experience or tool. Colour is applied through existing supplies in the studio; the selection of which is left undefined.

Finally… and to render a relation to the pictorial 'screen' from which they came…the final output is displayed vertically, attached to the wall.

Figure 2: *Mark Selby* (2016). [Exhibition] Three Weeks, Weymouth. 3rd-24th June.
Installation view of Selby, M. (2015) *Auto-Assemblage #20*. [Mixed Media] 135x110x38cm..

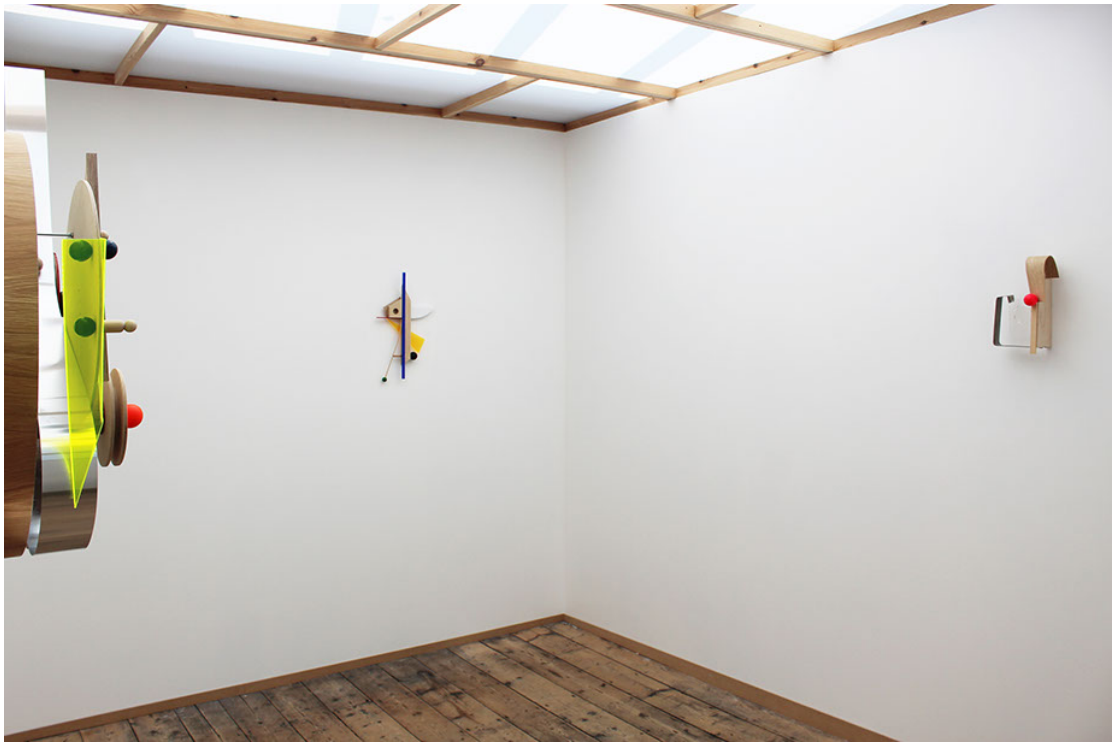


Figure 3: *Mark Selby* (2016). [Exhibition] Three Weeks, Weymouth. 3rd-24th June. Installation view.

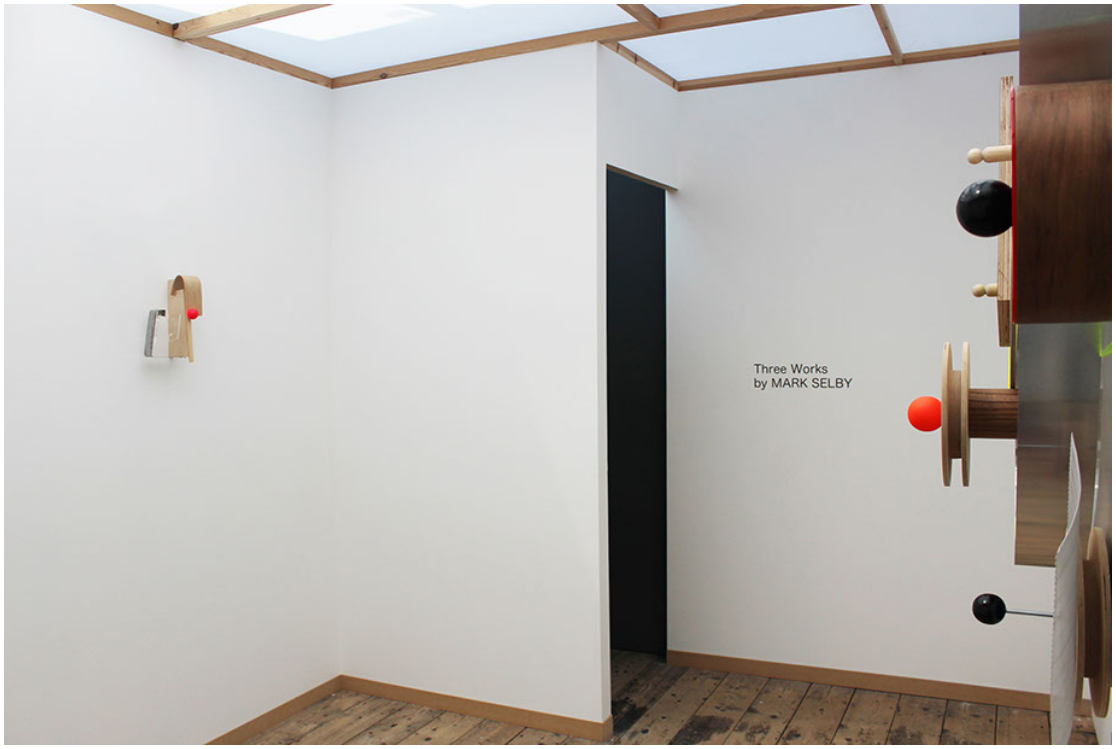


Figure 4: *Mark Selby* (2016). [Exhibition] Three Weeks, Weymouth. 3rd-24th June. Installation view.

Huizinga's Homo Ludens

Play is ordinary to conceive of yet elusive in definition; any attempt to pin it down can prove deceptively complex and slippery. To fix the exact nature of play into a pre-defined (rational) formula is inherently problematic due to the very fact that play involves (to varying degrees) elements of chance, unpredictability and improvisation; in the same way that a joke explained loses the very quality it aims to elicit, play has a difficult relation to any analytical procedures. In the literature, there is an evolving definition of play from a wide range of disciplines and each attempt at grasping the nettle leads to an ever-expanding taxonomy. There is, though, in this density of approaches, one text cited more often than any other: Johan Huizinga's, *Homo Ludens: A Study of the Play-Element in Culture* (1950). Due to its scale of ambition and breadth of discussion, Huizinga's opus acts as a reference point for much of the academic study in play, particularly when examining play as a generative factor within cultural development. It spans a range of approaches within the context of the humanities—historical, linguistic and artistic—that in Huizinga's words "leaves off" from the imperatives of "biology and psychology" (1950, p.4).[10] Huizinga aims to "tackle the problem of play as a function of culture proper" (Ibid.), to explore its qualitative features as intrinsic to culture rather than supplementary to natural evolution. In addition, writing at a time in which the regimentation of thought through fascism was once more on the rise in Europe, there is a clear sub-text for Huizinga's focus on the humanities: a distrust in foregrounding science and technology for their alignment to radical de-humanisation. Technology, for Huizinga, was the rhetorical tool that allowed for much of the nationalistic and anti-humanistic political oppression to be put into action; implemented no more clearly than in the sphere of warfare and genocide (Kammen, 1982, p.606). Huizinga laments that, "modern warfare has […] lost all contact with play" (1950, p.210) and resembles only a limitless, violent activity with no regard for shared rules or humanitarian principles, with science and technology being instruments that intensify the potential of such savagery (Hammond & Pötzsch, 2016). It is, with this motivation, that Huizinga places the civilising propensity of play at the centre of his thesis.

Huizinga's attempt to define play is initiated by an inspection of its formal properties, leading him to conclude that play is what, "we might call a free activity standing quite consciously outside 'ordinary' life as being 'not serious', but at the same time absorbing the player intensely and utterly" (1950, p.13). He goes on to add that there is a spatio-temporal nature to play and

[10] From Friedrich Schiller's "play-drive [*Spieltrieb*]" (2016) that brought together the formal and sensual nature of being to the Spencer/Darwinian biological imperative for play as a form of natural selection, there has been a general bifurcation of thinking that has been pervasive in the literature (mainly one that followed a philosophy/humanities approach (as in Huizinga) and one that took a psychological/biological/scientific approach.

that it occurs within certain fixed limits, according to rules that are freely joined and are accompanied by, "a feeling of tension, joy and consciousness" (Ibid.). Immediately upon the appearance of this seemingly neat definition, the aforementioned slipperiness causes it to unravel; importantly, one must ask what may or may not constitute an "ordinary life"? Huizinga goes on to develop, through an exploration of play's etymology and roots in natural language, that this "ordinary life" can be said to be that which is serious. Seriousness, for Huizinga, is defined here by its negation, by that which is absent and as such, "not of equal value" to play, "[f]or seriousness seeks to exclude play, whereas play can very well include seriousness" (1950, p.45). Huizinga does assert, then, that play can be serious, and many serious activities can contain ludic features,[11] but that for him, "achievements in human culture depend less on rational thinking than on a deep-rooted craving for ludic experience" (Rodriguez, 2006). Huizinga traces back evidence of this deep-rooted craving to early socio-cultural activities—carnivals, rites and rituals—that, repeated in history via various forms, have led to the hierarchical, systematised social structures of the contemporary. One key example that Huizinga uses is of the Kwakiutl potlatch, a gift-giving feast in which one of the main elements is both the exchange and waste of goods in order to demonstrate (and organise) social standing. "In the potlatch one proves one's superiority not merely by the lavish prodigality of one's gifts but, what is even more striking, by the wholesale destruction of one's possessions to show that one can do without them" (Huizinga, 1950, p.58). This contest and display of excess wealth, of frivolity, is about the glory of winning and for Huizinga, an expression of the "agnostic instinct"; a serious play that, "raises the collective to a higher power" (Ibid., p.61). In line with Huizinga's distrust of scientific rationalism, rather than seeing the Potlatch as a phenomenon that can be filed as an anomaly within a localised, ethnographic structure, Huizinga extrapolates it as an example of the fundamental human play-element in culture. The potlatch is a moment, for Huizinga, outside of day-to-day life that marks a space for a particular type of festivity, but it importantly also drives the social structures of that society in the 'real' world. From sacred acts of play, Huizinga tells us, culture proceeds, moving from savagery to modernity and in doing so we have masked our play with a greater seriousness and rational or utilitarian desire (Huizinga's conception of the scientific or functional), pushing play to the margins and as extraneous to culture.[12]

> As a culture proceeds…as a rule the play-element gradually recedes into the background, being absorbed for the most part in the sacred

[11] Huizinga devotes a chapter on the relationship between war and play with its clearly serious implications (1950, pp. 89-150). More recent 'serious' approaches to play have been examined in relation to video game theory as a way of defining their educational but also critical potential (for example: Bogost, 2010 and Flanagan, 2009). Flanagan's Tiltfactor Lab for example developed a game *Layoff* (2009) that studied empathy following the financial crisis. In the game, one had to decide between the values of business, or the value of those individuals in relation to planning job cuts.

[12] Akin to the contemporary notion of 'leisure' which can be considered here as the play-element of consumerism.

> sphere. The remainder crystallizes as knowledge: folk-lore, poetry, philosophy, or in various forms of judicial and social life. The original play-element is then almost completely hidden behind cultural phenomena. But at any moment, even in a highly developed civilization, the play-"instinct" may reassert itself in full force, drowning the individual and the mass in the intoxication of an immense game. (1950, pp.46-47)

In the context of this research, the receding of play will be seen as matching a trajectory of technological machines as cultural phenomena; whether made to aid our social and cultural behaviours or not, the ubiquitous nature of automation and machines now inscribes laws of 'action' upon us (through the coding of our interactions with the world) that could not have been foreseen by Huizinga–or rather, he did not wish to speculate on the relation between play and machines within the scientific and technological developments also occurring at the time.[13] But, the machine phenomena in culture does allude to playfulness and those automated machines produced by a highly organised, technical society are often presented as full of wonder and attraction; for example, one need only look at the latest advertisement for an Apple product. A mobile phone leans on the play-element of culture: it seems a tool of free-play and endless connectivity in a boundless space, but it is also a fully controlled device in/by design. Beyond the surface/interface of playfulness lies an ability to act as a location tracker, a harvesting tool for consumer behaviour or identity capture using automated facial recognition software. None of these seem to align with Huizinga's conception of play as a free activity. Such computational objects, calculating machines of a far different sort from Babbage's Difference Engine, use play as a surface of harmless, secure sociability. This technological reading creates an inversion of Huizinga's theory; play can be seen as not necessarily receding but, in highly developed civilisations, co-opted and placed at the very forefront of its production in order to hide an ulterior motive. These technological surfaces reconfigure how we observe play and its adaption of human behaviour and encounters. Huizinga's literature is important to this research in that it frames the play-element and purpose of play in cultural formation, while also alluding to a sense of wonder that is intoxicating and attractive; play then could become a means to be antagonistic towards social structures as well as examine serious social or cultural ideologies or rhetoric.

[13] Huizinga is not alone in this regard. Both Roger Caillois (2001) and Brian Sutton-Smith (1997), for example, do not make this correlation while also both constructing schemas and technical terminology for identifying particular play activities. More recently, for example see Bateman (2011), Bogost (2010 & 2016) and Salen & Zimmerman (2003), who have developed play theory as part of a ludological approach, mainly in relation to computer and video games technology.

Paidia, *Ludus* & the Magic Circle

Huizinga's text makes evident some of the tensions in Western thought around the rational and pre-rational nature of being. His very notion of play at once describes a free activity but places this alongside the requirement of rules and an intentional demarcation that may be spatially and temporarily assigned. Huizinga suggests that for play to happen there needs to be a set of rules that segregate it from the normal activity of everyday life, the infamous "magic circle" (Huizinga, 1950, p.10), that has become a core topic in relation to the study of play.[14]

> All play moves and has its being within a play-ground marked off beforehand either materially or ideally, deliberately or as a matter of course. Just as there is no formal difference between play and ritual, so the "consecrated spot" cannot be formally distinguished from the play-ground. The arena, the card-table, the magic circle, the temple, the stage, the screen, the tennis court, the court of justice, etc., are all in form and function play-grounds, i.e., forbidden spots, isolated, hedged round, hallowed, within which special rules obtain. All are temporary worlds within the ordinary world, dedicated to the performance of an act apart. (Ibid., p.10)

The magic circle allows for an understanding of different forms of play through an analysis of their rule structure, that is, the parameters that surround any playful experience. Any assertion that this magic circle, as proposed by Huizinga, is an absolutely observable and fixed line—an isolated, hermetically sealed space—would be incorrect. As noted with the Potlatch example, there is a clear osmosis between the magic circle and the real world, the competition being an important way of marking hierarchies and power outside of its arena. The closing remarks of the book evidence that Huizinga firmly believed that the complete segregation of play from life is not beneficial to the understanding of its impact on culture. To assign 'hard and fast' spaces—embodied, cognitive or otherwise—in which play occurs, and is therefore sealed off, would simply destroy its spontaneity. If the magic circle is permeable, the space, location or rules of play can also therefore be in constant flux; it becomes less a static but liminal space that is full of interruptions, multiple locations and connections. The phrase, 'making the rules up as we go along' seems apt here; the rules of the game in which one plays may be written but the play itself may re-shape that game. This permeability, or constant re-framing of the magic circle during play, is a to- and fro-ing between Huizinga's "ordinary life" and imagination, between

[14] Despite the common attribution of the magic circle idea to Huizinga, discussion and further analysis is not particularly prominent in the text. The term, *magic circle*, appears once each on pages 10, 11, 20, 77, 210, and 212 (of the 1972 Beacon Edition). Ideas around the magic circle have only been taken up more widely following the development of computer game studies and the associated desire to understand the effects of game design structures—and their construction of 'worlds within worlds'—upon a player. The term being more concretely applied in Salen & Zimmerman's text *Rules of Play: Game Design Fundamentals* (2003).

knowing and not-knowing the outcome of the play-at-hand; broadly speaking, between the rational and pre-rational.[15]

The magic circle cannot be conceived then as a surface, a border between states but as a type of interface, as an eliding, two-way relation that allows for the transfer of experience from one to the other (interior and exterior) as knowledge.[16] One can see how artists might see play under this guise; for example, the notion of the artist's studio as a site of play—a place of experimentation and risk-taking, separate or private from the viewer—precedes the autonomous artwork that then transitions into the 'hard reality' of the gallery or public space. Two recent PhD theses have explored how play in and of itself has been used within art practice in relation to this movement between production and viewing/participation. Kataryna Zimna's PhD project, titled *Play in the Theory & Practice of Art* (2010), has a focus on participation and less representational forms of practice. It traces a lineage of art that moves from employing play as a visual aesthetic or liberated automatism (Karel Appel's paintings are produced through this form of play for example) towards play as a means of creating social situations (one can think here of Tino Sehgal's work or Nicholas Bourriaud's theory explicated in *Relational Aesthetics*, 2002). These more recent strategies, identified as dialogical, relational, interactive or participatory in art discourse,[17] emphasise how the construction of an interface—the threshold of play—has become a key concern. The viewer, as a player of a game, must attempt to understand the significance of their play in the construction made for them. In a socially engaged approach, this places emphasis on 'art as exchange' and receivership as a means to construct narratives that are set within a specific context or location, as opposed to a material object that might hold within it a set of semiotic signifiers or symbols for un-packing. Zimna follows Huizinga's conception of the "plastic arts": Huizinga writes that the artist working with material is always at the limits to their forming hand, working with "seriousness and intent" (analogous to an engineer or craftsman) and "the very fact of their being bound to matter and

[15] Besides my conception of the magic circle as the experience of an interface (and alongside the way it is used by Salen & Zimmerman, 2003), there have been other metaphors, the most prominent is the magic circle as a "frame" by Goffman (1986). Popular in ludology, it describes the varying 'levels' of engrossment a player may experience within immersion in a game. For a detailed analysis of the tension between "strong boundary" approaches and those with a more osmotic understanding of the magic circle see *In Defence of a Magic Circle: The Social and Mental Boundaries of Play* (Stenros, 2012).

[16] The term interface here refers to the notion of a "boundary condition that comes into being through the active relation of two or more distinct entities or conditions" as defined by Brendan Hockway (2014, p.12); the interface then being between human and machine as well as between various elements of the machine itself.

[17] I have put these various terms under a wide umbrella of socially engaged practice, though within each approach there is variation. Certainly, a social approach to play as antagonistic form against political hegemony remains of interest within culture; for example, the current PhD research project (at the University of Kent) by Adam James on the use of LARP (Live Action Role Play) in art practice (Valinoti, 2019). Perhaps most relevant to my research is the disjuncture between the ideas of *participation* and *interactivity*. Claire Bishop (2005, 2006) and David Beech (2008) both acknowledge a differentiation between these terms, where the former is based around a sociability while the other, "especially in connection with developments in digital technology, merely incorporates the viewer 'physically' (pressing buttons, jumping on sensitive pads and so on)" (Beech, 2008, p.28).

to the limitations of technical skill, forbids them absolute free-play and deny the more "ethereal spaces open to music and poetry" (1950, p.166). As such, for Huizinga, art's play-element can only start to function within "its exhibition [as] necessarily part of some rite or other, a festival, entertainment or social event" (Ibid., p.167). One must bear in mind here that Huizinga's conception of art takes the conservative notion of value as placed within the skill of the artist; an artwork is made thus in terms of a quantifiable correctness in relation to the traditions of a medium (and namely, for Huizinga, as imitation of nature), rather than the conceptual prioritisation of 'meaning' in which the viewer is an *active* participant through imagination and thought. It is interesting here that Huizinga, one suspects, would rally against the Duchampian readymade; despite Duchamp's often playful works, the *Rotoreliefs*—an artwork on display at Hultén's *The Machine As Seen at the End of the Mechanical Age* exhibition—being one example for their optical illusion of depth (Hultén, 1968, p105), the readymade object is an encounter with art *as* "ordinary life" and would be for Huizinga the lowering of culture to a sensationalist simulation rather than cultural development. Huizinga's damning of the "doodle" as at best a "play-function of low order" (1950, p.168) would see him also in direct opposition to the avant-garde practices of Dada and Surrealist automatism that were already widespread.[18] With this in mind, it is understandable why Zimna's research steers away from the limitations of the plastic arts and focuses on relational and public action so as to follow Huizinga's lineage in exploring "the manner in which [artworks] are received in the social milieu" (Ibid., p.169).

In an alternate approach, one that attempts to re-examine Huizinga's contestation of the plastic and material relation to play, is the PhD research of Elly Thomas (2013); recently developed into the book *Play and the Artist's Creative Process: The Work of Philip Guston and Eduardo Paolozzi* (2019). Huizinga does identify that play can occur in arts "conceiving" (1950, p.166) and so lays the initial stepping-stone for relating play to art discourses in material terms but with little expansion as to this point (ultimately then for Huizinga, one is left feeling the *process* rather than 'input' or 'output' of an artwork is his area of concern in relation to play). Thomas takes an approach that partly defends representation and materiality, using the work of Eduardo Paolozzi, Phillip Guston and, in her thesis, Tony Oursler, as examples of play not as a means to naively return to childhood but as "a move in the opposite direction, to explore what continues and *evolves*" (Thomas, 2019, p.1). Contrary to Zimna's reasoning that the "idea of

[18] This would also seem contradictory to the discourse of Surrealism, as a whole, being so strongly linked to Huizinga's ideas. There was certainly a clear interest from Guy Debord, André Breton and the Situationist International in regards Huizinga's ideas (Andreotti, 2002) and certain forms of Surrealist production seem to fit (alongside perhaps at its core, there was a shared philosophy). Certainly, within Surrealist approaches to 'writing', such as *The Surrealist Book of Games* and the poetic language games of André Breton, there contains Huizinga's notion of "free association reveal[ing] the supra-logical character of play" (Rodriguez, 2016). But in the aesthetic dimension of art and images, that Huizinga sees as needing to be fixed in the twentieth century for all its "turgidities and excrescences" (1950, p.202), he does not wholly support, or condemn, a re-alignment of the play-element in relation to art.

work as *ergon*, with its implications of stability, fixity, hierarchy, mastery and control" (Zimna, 2010, p.7) means that play is marginal, Thomas finds artistic revelry in the ongoing and provisional nature of 'making'; *ergon* in Thomas's research is therefore not simply mastery but interpreted as an open-ended 'toying' with materiality. Objects—traditional and non-traditional art materials—have agency in production as much as the artist's hand, the contestation between artist and object as analogous to two players of a game (who often know not where *ergon*—the work—will end). Both Thomas and Zimna then unpack their divergent research through an extensive discussion around the binaries between, and problematics of, understanding play *and* games in the forming of an artwork. Both researchers use Mihaly Spariosu's (1989) distinction between the interpretations of play and games as rational/*ergon* or pre-rational/*paregon* but also similarly point towards the work of Roger Caillois that followed and built on Huizinga's writing. In Caillois's *Man, Play and Games* (written in 1958), he refers to the opposition between play and games as "paidia" and "ludus", both elements of the holistic "play concept". Caillois names *paidia* as a primitive and basic impulse, covering an immediate and disordered agitation, an impulsive and easy recreation, but readily carried to excess. It is a principle "common to diversion, turbulence, free improvisation and carefree gaiety" (Caillois, 2001, p.14). *Ludus*, on the other hand, "is the structure of more developed forms of play – with rules and limits, being a root of culture, customs and institutions" (Zimna, 2010, p.27).

The acknowledgement of both researchers is that the rational and pre-rational duality of play create a productive tension; this is relevant to my own work, only my intention is to examine through a specifically technological lens rather than one that attempts to claim a material or participative construction as primary. In either the representational or the social model of play (as art practice), the common question is how much the artist might to construct limits around play, to either dictate or abdicate rules or stand away from the centre of the artwork in order to allow it (as a form of 'playing') to proceed. The entanglement of play and games is similarly highlighted within machines and automation; with their reliance on coded and scripted actions—a language game—they may appear self-acting but (currently) are more often than not limited by that very code. *Ludus*, with its propensity for frameworks, scaffolding and rules is a focus in disciplines like design, law and engineering in which a demarcation of right and wrong, of rules and their syntax, is the expected, though not only, method of practice. The use of ludic structures allows for a particular construction of society via a function-centred method of thinking, which can be both a means to control or open up the play-element of culture. *Ludus* has, in the context of extensive technological progress, become the dominant method of constructing the world. The organisation of everyday life into precise de-limited areas for regulation (be they spaces, laws, ideas, technologies etc) would be a feature of automation as instrument of power. It would seem problematic to absolutely marginalise *paidia* (as also

identified by Thomas in her thesis), certainly in relation to this increased role of automation; it seems timely to ask how we might locate improvisation, chance and moments of unscripted freedom in this cultural moment? What kind of rupturing of the magic circle would be required to allow for this?

> Players and designers can work against the disciplinary function of rules. In the process, the element of danger may sometimes come to the foreground, but this should not always provoke us into calling for protective measures. Unregulated street festivals can be perilous, but they can also provide improvisational arenas leading to innovative forms of spontaneous sociability. (Rodriguez, 2006)

At the time of Huizinga writing *Homo Ludens,* the oscillation between rules and spontaneity was already being explored by avant-garde art practices—such as those involved in Dada—that were equally sceptical, in the wake of conflict, towards rational reason and ego-centric power. Hans Arp's 'chance' collages, such as *Untitled (Collage with Squares Arranged According to the Law of Chance)* (1916-17), used torn paper dropped onto surfaces to create random-instantiated compositions that de-cantered the ego of the artist. Hans Richter, Arp's colleague, claims that the 'laws of chance' were discovered when Arp tore up a failed drawing and was struck by the pattern it made on the floor (Elderfield, 1983, p.108). Following the paper collages, a painted wood relief from a series made in Paris during 1930, titled *Configuration with Two Dangerous Points*, is constructed from six curved shapes assembled not unlike a jigsaw puzzle. Four of these forms are white and two black, the whole work bound only by the frame of its backing board support. In this visually playful work, full of soft rhythms and curved shapes, where are the "dangerous points" that Arp humorously refers to? Arp sets up a game in the composition; are the dangerous points perhaps the two, small apertures in one of the white, floating shapes or perhaps the two black forms themselves? It would seem that these elements, though, contribute to the balance of the work as a whole, and that therefore the two dangerous points seem more likely to be the pair of close, touching points between the sets of black forms and their nearest cut-out. There is a tension created by this proximity, one that plays on the limits of breaking the rules—the creation of an overlap that would break the composition—and it is precisely this point, on the threshold of danger, that Arp seeks to play.

Looking back at the paper collages after analysing this later work, one could easily question why there was so little overlap and a surprising amount of geometry. "I further developed the collages," Arp wrote later, "by arranging the pieces automatically, without will" (Sudhalter & Umland, 2008, p.48). The collages are then perhaps not entirely without the hand of the artist or his sensibility for composition; Arp's work is balanced between the accidental and artistic intention as to his material, with the interference of his hand against the nature of gravity,

atmosphere and environment seemingly too difficult to resist. For Arp, there was still a frame of self-reference and subjectivity, a sense of control in the configuration of the work's meaning that could de-centre, but not make entirely absent, the artist. Is it possible to fully release sovereignty in the making of an artwork? This is the question of the automatic in relation to play, a self-assembling configuration made by, and through, the instruction of action without thought i.e, as a machine.

If one were to become a tool under another's control, it is worth examining the use of instructional art as a form of practice that sets up a ludic structure in which creative play is prescribed. Sol LeWitt exemplifies this use of instruction as a form of restriction, one that might conversely 'open up' creativity, in art practice. With LeWitt's demarcating the most important aspect of an artwork as being its conception, he began scripting production of artworks through numerical, mathematical and linguistic permutations. *Wall Drawing #232* (1974) asks for the making of a drawing via a series of mathematical divisions and orientations dependent upon a square, while *Wall Drawing #53* (1970) assigns colours to numbers in a sequence not dissimilar to the hex code of web-based colour palettes. The "idea"—we are told—is Sol LeWitt's play-element: his infamous "[t]he idea becomes the machine that makes art" (1967, p.80), which could be restated as, 'the *game* becomes a machine that makes *play*'.

An internal contradiction in this method of production is that the implementation of these game-like instructions would also give over an opportunity for the insertion of subjectivity. LeWitt would make approximately thirty-five of the first one hundred wall drawings but by 1982 had left the craftsmanship entirely to others.[19] He asked that each drawing should work with the "holes, cracks, bumps and grease marks" and "imperfections of the wall surface" (Lovatt, 2010) and so subsume any contextual imperfection in production. In addition, when reading the instructions, there is noticeable room for freedom and interpretation that could lead one to different results if repeated.[20] While seemingly a manual for reproducibility, there is enough room, as the maker, to lean on the rules and explore that point of danger where they might break. *Wall Drawing #73* (1971) asks for "Lines straight, not touching, drawn at random, uniformly dispersed with maximum density, covering the wall". We would therefore need to ask ourselves: at what angle should the lines be? What should their length be? How might I achieve uniform distribution or maximum density? LeWitt's rules are also questions.

[19] They would be gallerists, collectors and, by the time he stepped away from their making, an assembled team of specialist technicians were being employed (Haxthausen, 2014, pp.42-43).
[20] LeWitt would show the instructions alongside the drawings in order to evidence the abstraction of the labour that brought them into being.

This interpretation runs contrary to literature that sees LeWitt's rules as made up of words that are concrete, fixed and unequivocal to the embodiment of them in the act of drawing. Robin Kelsey (2012) writes that LeWitt's logic meant that his "structures" (a term LeWitt preferred to describe his work) were logic driven and not, as such, games. This sense of procedural logic is compared by Kelsey to examples such as John Baldessari's *Throwing Three Balls in the Air to Get a Straight Line (Best of Thirty-Six Attempts)* (1973), a work that Kelsey sees as more explicitly a game due to a greater sense of chance, perhaps because of its reliance on the forces of nature as opposed to syntactical rules.

> Once LeWitt's artist-as-clerk establishes a production procedure, he or she becomes an automaton, bound by a predetermined sequence of operations, a knowing exemplar of alienated labour. The result is art production as bureaucratic protocol: following instructions, by the manual, to the letter. (Kelsey, 2012, p.750)

Kelsey makes judgements upon the steadfastness of those rules or instructions on a fundamental level: text == order. While instructions have the potential to make us behave automatically—input ⇒ process ⇒ output—the messy intervention of human interpretation (from eye to brain to hand) causes the work to remain a material and embodied response that defies the exactness of a machine. Chess, which is similarly procedural in its fixity of rules, is no less a game full of play but which similarly raises questions (of planning, decision, strategy) that may seem clerk-like or mechanical.[21] Duchamp noted the "mechanical" quality of chess but says it is no less a drawing, a "mechanical reality" and a work of art, indeed for Duchamp, "I have come to the conclusion that while all artists are not chess players, all chess players are artists" (cited in Bailey & Nauman, 2009, p.34). The limiting structure of the game provides the very human necessity for agency and action; having attempted several of LeWitt's instructions the feeling is that the constraints provide a creative urge to push, to go over the line, to wilfully transgress and induce error. This thought—even if not taken into action—reminds me that I am human.

The extension of drawing by algorithmically coded action or instruction was taken into machines by artist such as Peter Beyls, Manfred Mohr and Harold Cohen, who developed early systems that "modelled knowledge about the act of drawing" (Hertz, 2009, p.69). By 1973, Cohen had developed algorithmic methods for describing aspects of mark-making and

[21] It is noticeable how games are used as a form of testing the ability of a machine's intelligence (see also Chapter △ Automation). *Alpha Go*, the Google DeepMind artificial intelligence has successfully played the game Go, beating the champion Lee Sodol in 2016. The machine made a move (no. 37) in the second game that seemed strange and unexpected. "AlphaGo had calculated that there was a *one-in-ten-thousand* chance that a human would make that move. But when it drew on all the knowledge it had accumulated by playing itself so many times—and looked ahead in the future of the game—it decided to make the move anyway" (Metz, 2016). Then, in move no.76 (the fourth game) by Sodol, the machine was beaten by an equally unexpected move, what became colloquially known as 'God's Touch'.

knowledge about image production into a computational engine, *AARON*, that evolved over many years as the primary source of his art (McCorduck, 1991). Cohen, the tutor, 'fills' *AARON* with knowledge, with rules and systems (of colour, form, composition etc). Cohen always maintained that *AARON* is not creative; one could say it is simply an archive of stylistic approaches turned into pictorial forms (whichever forms are entered into the database for the program to use as information for its work). LeWitt and Arp both therefore created codes that exist(ed) as games for the production of art and employed different 'forces' to do so: the force of gravity and the force of human labour. Cohen's automated machine forces through another type of production that similarly explores the tension between system/network and hand/matter. "The program is not uniquely responsible for its impressive output, and I am not directly responsible for any single image" (Cohen, 2009). The figure of the de-centred artist remains at play here, of how much agency one should, can or want to give to a machine. Only, perhaps unlike my remaking of a Sol LeWitt wall drawing, Cohen's machine would struggle to surpass the limits of the game it is asked to play.

Figure 5: Selby, M. (2015) *Auto-Assemblage #07* [Mixed media] 44x30x15cm.

Figure 6: Selby, M. (2015) *Auto-Assemblage #12* [Mixed media] 25x25x8cm.

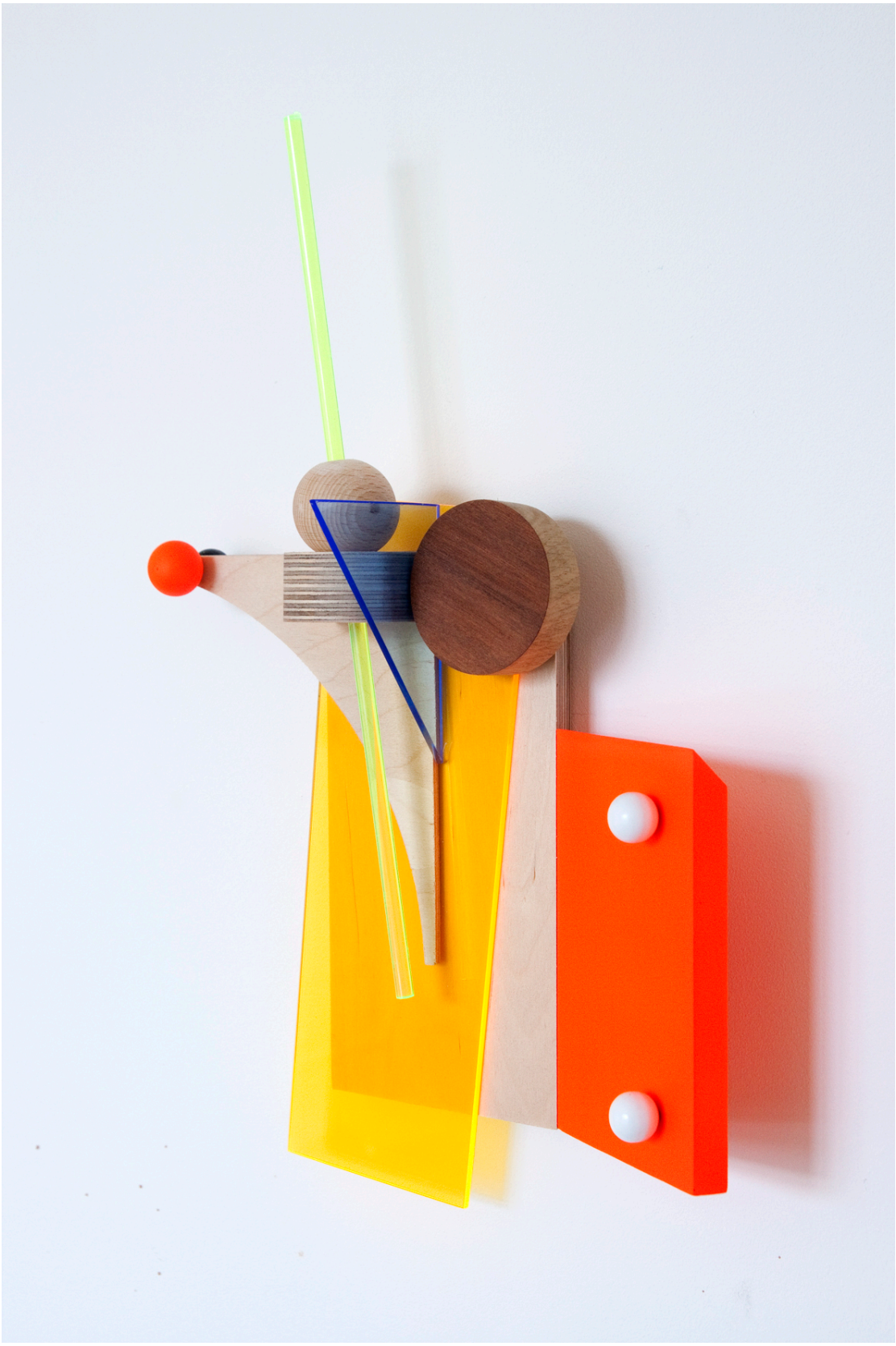


Figure 7: Selby, M. (2015) *Auto-Assemblage #14* [Mixed media] 31x26x9cm.

False Play - *Machina Ludens*

After Huizinga has traced the development of play and its importance in cultural development, there is a warning as to the organisation of play as a means to hide a motivation for some "social or political" design; to which he gives the term, "false play" (1950, p. 205). These are events where there is a pre-agreed outcome—a 'rigged' game, so to speak—that destabilises play and replaces it with a superficial pretence.

> [O]rganised play, such as spectator sports, casino gambling, beauty pageants, and bridge tournaments, many scholars have noted that these events are frequently controlled by non-playing administrators and follow procedures that maximize the benefits for the sponsors they represent. Huizinga termed activities of this type "false" play. Participants in such events may or may not believe that they are controlling the pattern and pace of their activity, but in reality, the outlines of their behaviour have been determined well in advance. (Henricks, 2008, p.169)

In the final chapter of *Homo Ludens,* the conclusion is to be wary of play as manipulated representation of freedom or liberation. The tendency in social life (within well-established cultures) is to be lured towards "the insatiable thirst for trivial recreation and crude sensationalism, the delight in mass-meetings, mass-demonstrations, parades etc […] it is a disaster when whole nations turn into clubs" (Huizinga, 1950, p.205). Huizinga names this as a "puerilism", a blend of adolescence and barbarity "which has been rampant all over the world for the last two or three decades" (Ibid., p.205). It is very difficult to define here where the demarcation of a 'free' excess, Huizinga's positive play-element, becomes instead a primal, regressive behaviour; one might suggest this is context dependent, relative to an individual or collective cultural sense of ethical or moral responsibility. Huizinga concludes that the rise of fascism he was witnessing at the time of writing was certainly a distorted 'members club' with a sinister, violent connotation in its reduction of thought and humanity; similar to the way a child might assume the world centres on them and them alone.[22] For play to occur, there needs to be a sense of safety, a net around it that protects the players from actual harm. The very pressing sense of danger that comes from the instrumentalisation of hate and violence leads only to a distortion of one's rights and so, "We can only speak of war [and violence] as a cultural function so long as it is waged within a sphere whose members regard each other as equals or antagonists with equal rights; in other words, its cultural function depends on its play-quality" (Huizinga,

[22] Huizinga goes on to advocate the "boy-scoutism" of Baden-Powell as the opposite to "puerilism" (1950, p.206), which is perhaps a dubious example in hindsight. The various values and prejudices associated with the beginnings of the movement, characterised by Michael Rosenthal's *The Character Factory* (1986), suggest a kind of 'behavioural automation' was being used that more closely resembled the very autocratic statism Huizinga was against.

1950, p.89). This returns us to the magic circle, a space which binds players, its participants, into a contract that when broken may foreground the very seriousness of one's actions.

The use of drones for modern warfare is an example of how the appropriation of play has led to a means of distancing the very real horror of violence from the player. The belief in automation, letting an object act for us, has allowed for a false play to be further embedded into culture, making it increasingly difficult for human action to see its resulting (side-)effects. In dealing with technological interfaces, a level of control often reduced to the notion of, 'I push this button, and this happens *over there*', one might fail to understand that there is an intertwining of ourselves with complex and abstract realities. It reduces us, ironically, to automatons rather than sovereign agents at the controls of what we experience; that which we may base decisions on is the game's reality rather than the world beyond its magic circle. Automation is therefore a process of misdirection, a 'trick at play' in the magic circle, where one is distracted in order to look away while another operation goes unnoticed; *machina ludens*, the figure of a 'machine at play', can therefore manipulate, camouflage and deceive.[23] Industrial society's obsession with technology leads to negating of "play's profoundly civilising functions" and instead leads to "a profusion of highly administered amusements" (Henricks, 2015, p.102). The bright glamour of the fairground can cloak, for example, the dirty job of its operation or the conditions of those working there. Disney's theme parks, as per Jean Baudrillard's sense of simulation (1981), springs to mind as a site of play designed and structured in a complex, diffuse manner so as to maximise consumer behaviour. Disney's theme parks are hermetic, rigid magic circles of play at the centre of which lies *machina ludens*. If false play is a form of misdirection, we can certainly say that such amusements do not offer the escape they claim and instead are an attractive means to encourage a continued instrumentalisation of the machine rhetoric (namely for the increasing of capital).

Returning to Harold Cohen's *AARON* machine, one can say that it *appears* to be at play, it *seems* playful, but it is, in itself, working from a supervised data set. As the master teaches the student, it learns (if only on a didactic level) and is able to undertake more complex tasks. While producing these artefacts, is it playing? The appearance I would suggest is deceptive and *AARON*, unable to modify its own behaviour, is an example of false play. Using Huizinga's original definition for play, while *AARON* may be creating a visual order (whatever that might

[23] The term *machina ludens* I have constructed using the Latin declension for 'machine' akin to the terms *homo ludens* and *homo faber;* the intension being to indicate a third figure that is rising alongside these ontologies. In addition, the notion of a *machina faber* would seem to naturally extend only initially as a tautology—a working machine—which does not require 'naming' (for that is precisely what a machine should *do*). If we consider *faber* as being more broadly, 'a maker of artifice', one that controls its environment through its means of operation, then this does warrant further reflection as it implies a machine that no longer requires human instruction.

be) and under certain rules (within a magic circle), it is not operating with free will or accompanied by a feeling of tension or joy, given that it is a non-sentient object. It is, though, worth noting that for Cohen, one senses that there is a vast amount of tension and joy and indeed, potentially for the viewer. It would also be wrong to make *AARON* comparative to a theme park amusement, for Cohen is directly addressing the very discourse of the machine in his work, beyond just it's 'use'. In the later stages of *AARON*'s development, Cohen returned to collaborating with the machine rather than constantly refining its program in order to control it. He noticed that there was stagnation in its development; he had reached his ability to code or instruct the machine to self-act or rather, appear self-acting. He moved away from the paradigm of creating a machine as mimesis (of the 'artistic genius') and accepted its difference; for what it could do more than him. *AARON* could offer "impeccable memory and an impeccable ability for building an internal model" (Fox, 2011) and so was capable of holding an extensive, encyclopaedic knowledge of colour systems and theory that Cohen could not. For his exhibition *Collaborations with My Other Self* (2011) Cohen is quoted in the press release as saying, "once I'd realised that the thing had to be formulated in the program's terms, not in my terms, then I was able to make significant progress" (cited in Fox, 2011). *AARON* was instructed to produce coloured under-paintings for Cohen to then complete by hand in a human-machine collaboration. These final works, made towards the end of Cohen's career, exemplify best the human-machine/play-game relation as ambiguous and the blurred lines of agency, influence and learning between subject and object. Cohen and *AARON* are not proto-typical ideologies of *homo ludens* or *machina ludens,* but an interplay of the various qualities that are brought about within each of them via *paidia* and *ludus*.

The analysis undertaken here of Huizinga's *Homo Ludens* reveals the contradiction inherent in play. At one end of the scale, he asks us to see how play is the seed and the germinating power behind culture (*paidia* – free play) but then he also tells us that it requires a structure (*ludus* – games), both real (serious) and outside real life (magic circle), requiring rules yet at the same time allowing for those rules to be in constant flux. This dualism, or rather, play's contradiction holds no matter how far one might reduce play into various taxonomies or typologies;[24] the

[24] Caillois (2001) develops four different 'types' of play, "agôn" (competition), "alea" (chance), "mimicry" (role playing) and "ilinx" (a temporal disruption of perception). More recently, Sutton Smith's *The Ambiguity of Play* suggests that these four categories shift in their acuteness under varying "rhetorics" throughout history (1997). These rhetorics are of the ancient discourses: fate, power, communal identity, and frivolity as well as the modern discourses of progress, the imaginary, and the self. A focus then on *agôn* or competitive play might be about a rhetoric of power—defeating the opposition—while a rhetoric of communal identity might align to Huizinga's example of the Potlatch as a form of play (1950, p.58-63). In both author's approaches (of mode and/or rhetoric), there is recognition that pretence or deception is indeed an inherent part of play so long as it is a shared function amongst the players. As outlined in the introduction to this thesis, the 'rhetoric of the machine' manifests the application and activation of play across various categories; the main focus of this research explores the myth of the machine as totalising, hegemonic force—the rhetoric of power, fate and progress—where intention is always beyond the 'matter at hand' i.e., one may be playing one game while unwittingly also playing another.

prerational and rational notions exist as a "family of play concepts" that is synchronous but also diachronic and historical (Spariosu, 1989, p.5). How can there be any falsity when play is so often blended with contrary moments; what might be called 'true play'? Perhaps the lesson of Huizinga's text is not to find a fixed definition of play but that there is a responsibility—a political, ethical responsibility *to one another*—in the forms through which we play. In a recent work by Ian Bogost, *Play Anything: The Pleasure of Limits, the Uses of Boredom, and the Secret of Games* (2016), he asks us to see every object as a possible playground—a trip to Wall-mart or mowing the lawn—and in these examples, "delineate the absurdities it houses, the crimes it masks, the exact nature of the sickness at its heart" (Morris, 2016). Bogost argues that the problem is with our perception of the world, and that we need only appreciate it more deeply, to remove condescension or cynicism in order to find joy. The issue with Bogost's call to turn each of these moments into a playground (to see the world as a networked, nodal diagram of magic circles) is to forget that these systems inscribe a whole plethora of issues beyond the immediate ones appearing to the 'self', that is, the individual. There is something egocentric in the call to develop infinite, micro-playgrounds that divide the world up into self-centred battles and that therefore lead to deeper detachment from one another. His example of lawn-care, a mundane task Bogost sees as ripe for play, is woefully forgetful of the privilege and wealth it encompasses to own land, or property, in the first instance. In principle, no single domain—serious, playful or otherwise—within human life is indeed exempt from ludification. This even applies to the domain that Huizinga considered embodying the very decay of playfulness: modern technology. But rather than focusing on what play *is* (and how it might be 'anything') we should examine how it functions: Huizinga's play-element. We should question what it *does*, asking what the implication of such an elemental process might be as the rules are real, and some are not written or played out with our best interest at heart.

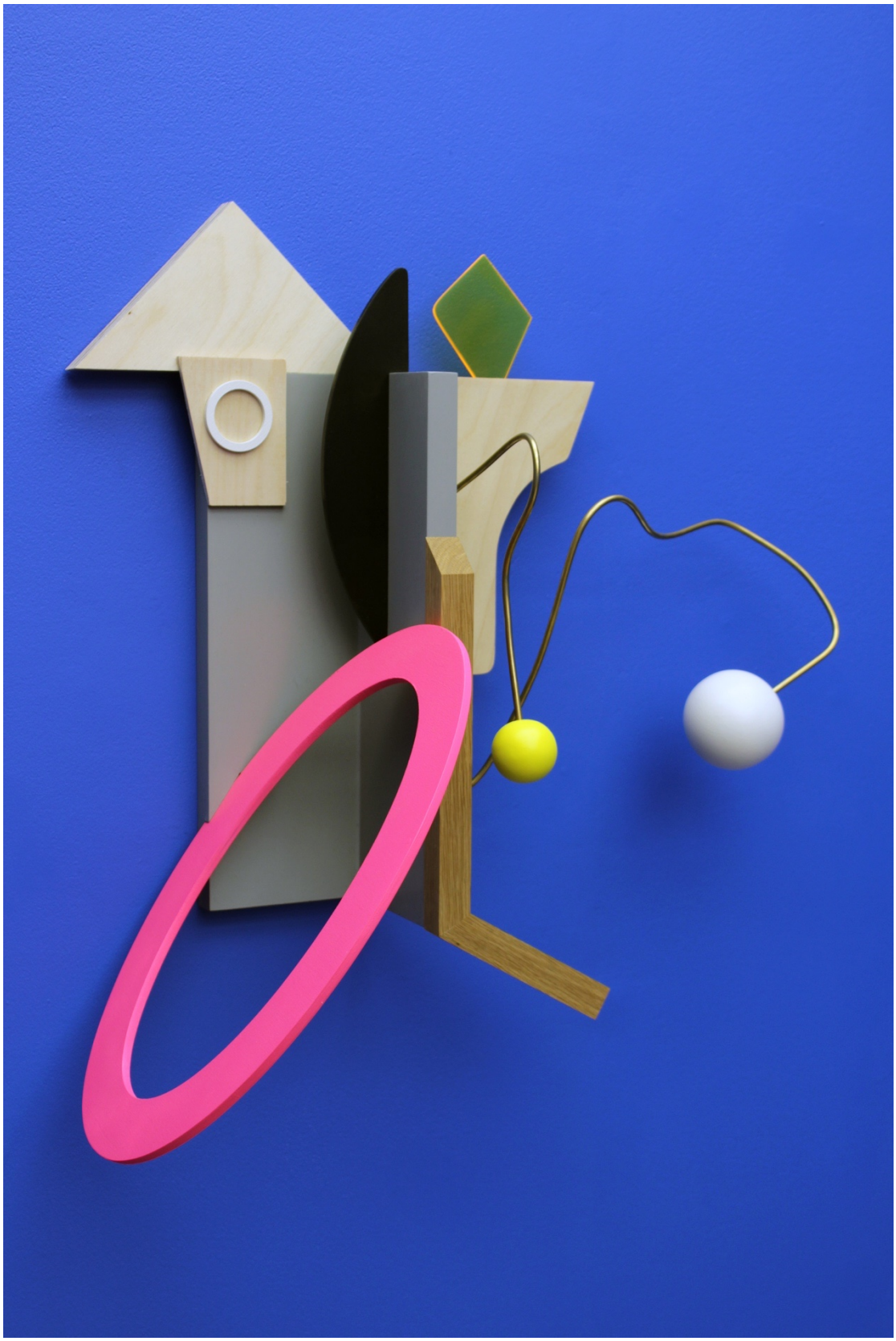


Figure 8: Selby, M. (2020) *The Nerves, The Blood, The Muscles and The Eyes.* [Mixed media] 53x52x25cm.

Figure 9: Selby, M. (2020). *Brighter Than A Thousand Suns.* [Mixed media] 56x46x19cm.

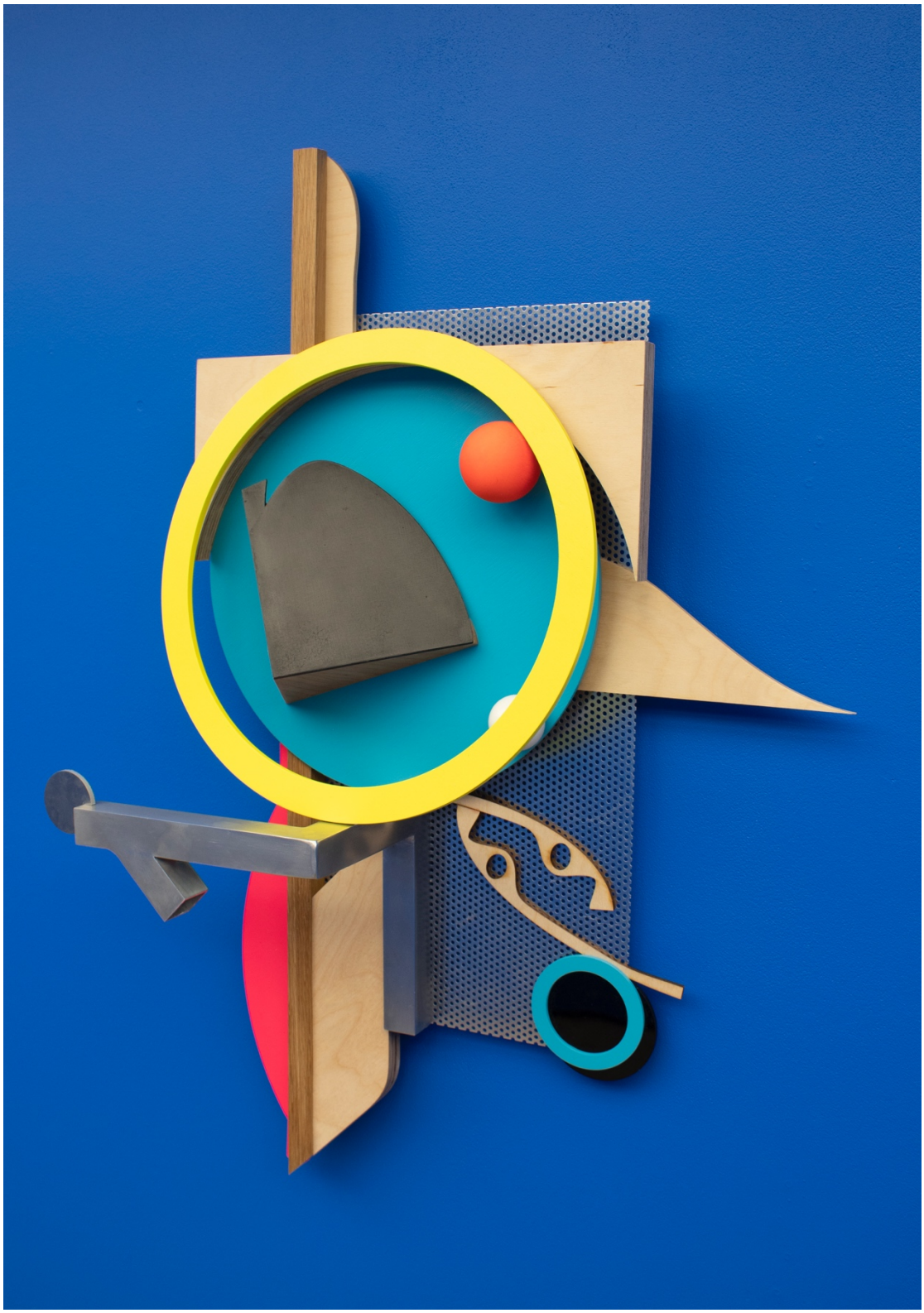


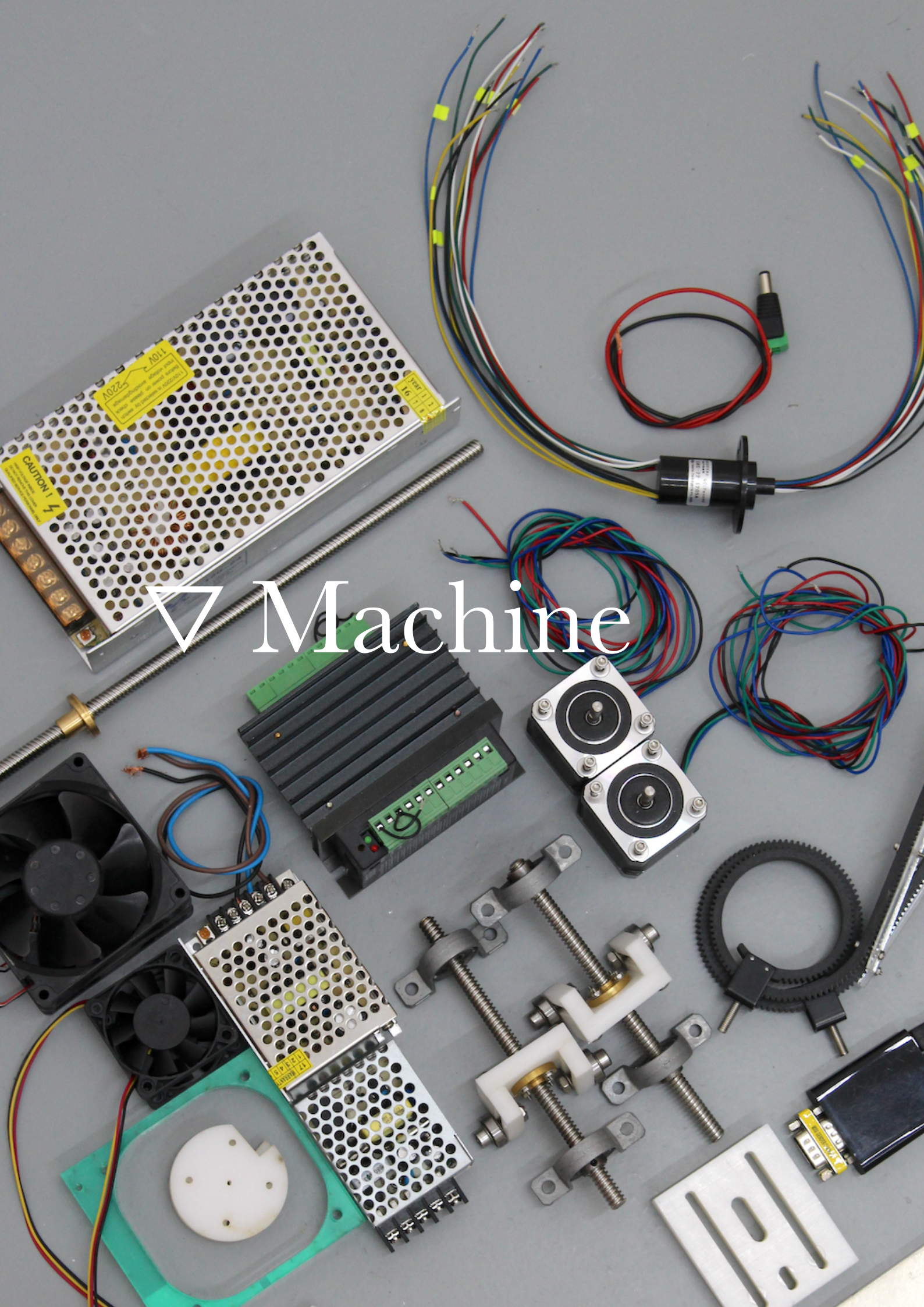
Figure 10: Selby, M. (2020) *Seeing Meaning Where None Exists.* [Mixed media] 77x53x19cm.

Figure 11: *Mark Selby* (2020). [Exhibition] Three Works, Scarborough. 18th September- 22nd October. Installation view of room 3.

Figure 12: *Mark Selby* (2020). [Exhibition] Three Works, Scarborough. 18th September- 22nd October. Installation view of room 3.

Oh, what joy!

I didn't have the heart to say they were nothing more than the product of logic… except for the colour; the last bastion of my will and by some extension, offering me a space of sanctity from rationalising yet another subjective choice into a system.


∇ Machine

Jocularity can hide being on the threshold of the amiable and the antagonistic; our collaboration was the perfect illustration of that.

My intention was to approach an abstract painter, one who referenced human gesture and the application of brush on canvas with impressive authorial confidence, all while under the spectre of a Modernist language that seemed like martyrdom to the 'God of Anthropocentrism'.

I thought they might find it 'amusing'—a playful game—to think about the convergence of automation and automatism, of hearing from beyond that voice which asks us to follow some procedure… be that intuitive or logical, rational or irrational, it's all the same game, right?

I send a letter to my dear Malvolio to find out.

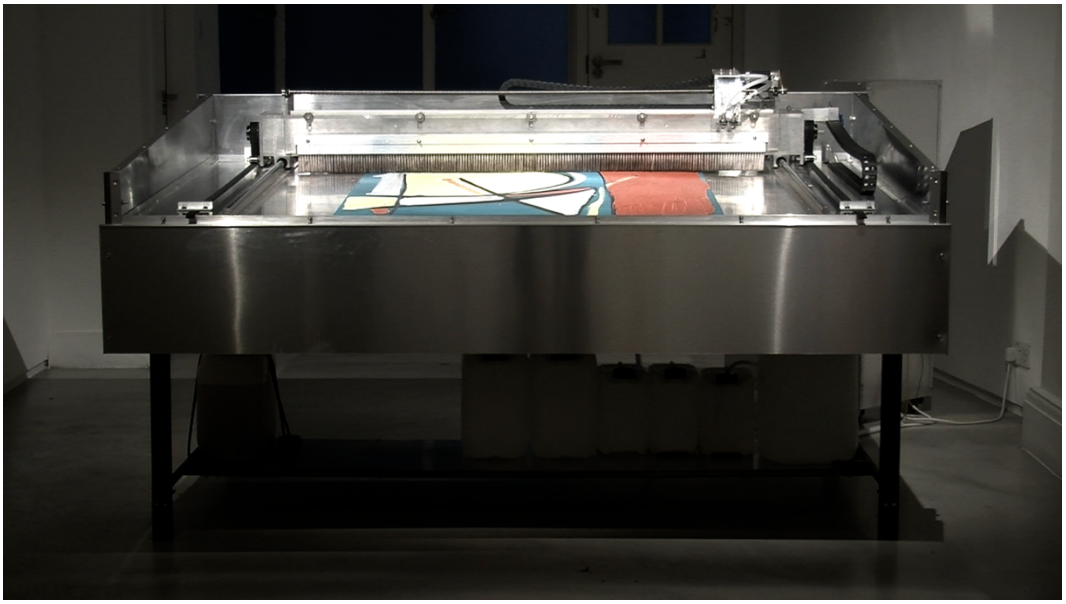


Figure 13: Selby, M. (2014) *Untitling Machine.* [CNC machine installation].
Installed at: *Work Hard, Play Hard* (2014). [Exhibition] Berloni Gallery, London.
26th November 2014-31st January 2015. Paintings by William Bradley.

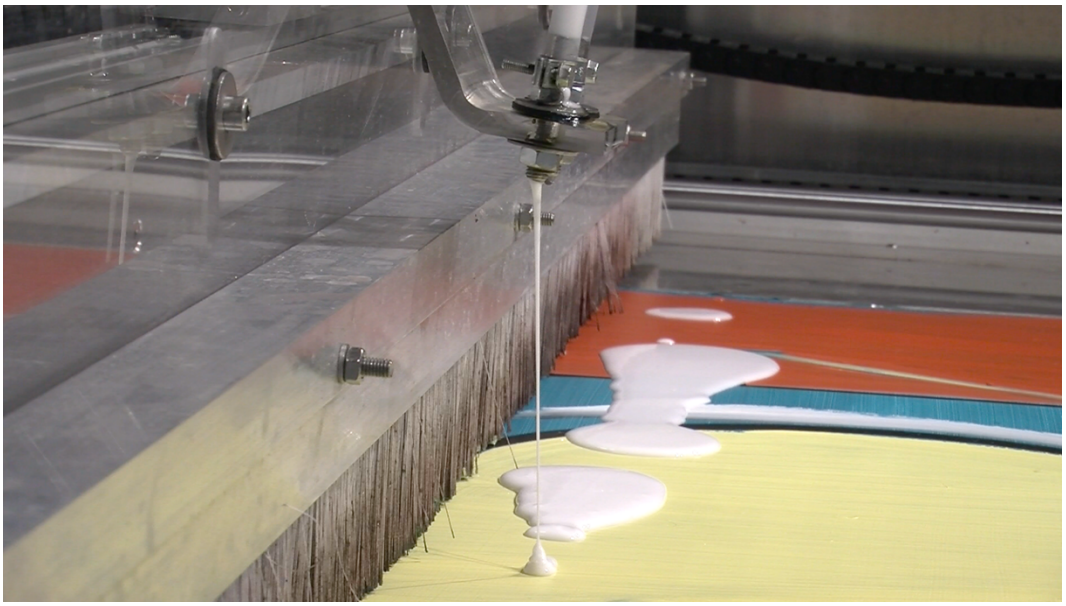


Figure 14: Selby, M. (2014) *Untitling Machine.*[CNC machine installation].
View of the paint stripper pumped onto the surface of oil paintings.

Figure 15: Selby, M. (2014) *Untitling Machine.* [CNC machine installation].
The paint stripper fluid is brushed across the surface at intervals between 1 and 3 minutes.

Paintings are placed onto the bed of a specially constructed CNC machine. The X axis allows for paint stripper and water to be pumped onto their surface. The Y axis—a large brush—pushes and pulls the chemical across.

The gallery can decide how long the programme runs for, though I expect they won't want them to go so long as to reveal the bare aluminium substrate; that kind of reduction might be too far.

It seems they'll probably take longer now anyway.

Why?

A new oil-based primer, it's meant to be harder. Someone definitely didn't want their work totally destroyed then! Are you going to fight back?

Figure 16: Selby, M. (2014) *Untitling Machine.* [CNC machine installation].
After a random duration (between 1 and 15 minutes) water, via a second tube, was pumped onto the surface.

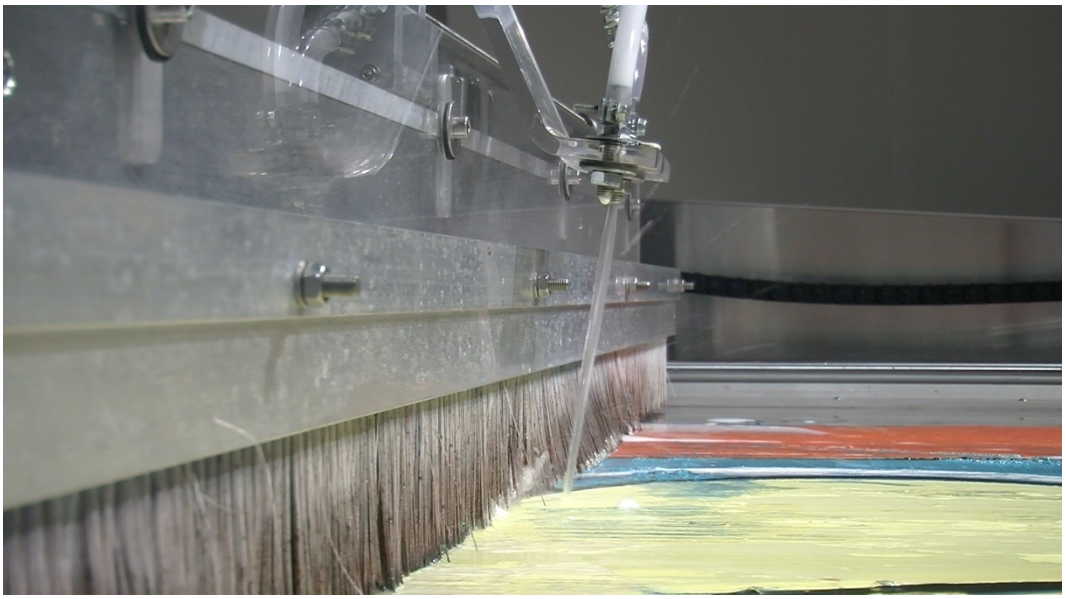


Figure 17: Selby, M. (2014) *Untitling Machine.* [CNC machine installation].
The pump moves horizontally across the machine and after each pass (of 3) the brush wipes the surface

Figure 18: Selby, M. (2014) *Untitling Machine.* [CNC machine installation].
Installation view of paintings being developed and processed by the machine.

Performing a Task

In Norbert Wiener's terms: "The machine is not only a form of matter, but an agency for accomplishing certain definite purposes" (1961, pp.177-178). In this broad sense, one can see how the term *machine* is as elusive in definition as that of play, for it seems simply to define any assemblage that follows the procedure of cause ⇒ effect. With its broad spectrum of inferences, the term *machine* is driven by subjectivity and multiple discourses. Following the growth and importance of *techne* since the industrial age that ushered in more and more influence upon the organisation of everyday life, it has come to simultaneously mean an object, theory and metaphor. The application of the machine label is thereby undertaken through expressive action—the making of an object, an artwork, a written, a speech act or social re-structuring—the definition of a 'coming into form', rather than perhaps a specific category of technological apparatus.[25]

Furthermore, in this research, the term *machine* is seen as incorporating elements of the robotic without labelling them as such; it attempts not to designate all moving machines as robots. When one thinks of 'machines at play' (*machina ludens*), it may conjure up the representation of gesture, image and movement akin to the human body, that is to say, a machine conceived as mimesis of human action and anthropomorphic qualities. One would think, therefore, that a 'machine at play' would be more suitably defined as a robot. Following Karel Capek's play *R.U.R.* (1920) the term *robot* was popularised, "derived from the Slavic (Czech) word *robota* meaning 'forced labor' or 'serf'" (Wirth, 2017, p.20) though in Capek's play, robots are far from mechanical automata; the ensuing narrative depicting robots as so closely mimicking humans they become identical in mind and body. This point of convergence has influenced a range of

[25] Broeckmann (2018) attempts to outline, more specifically, five variants of the machine: Firstly, the engines of the industrial age, what the mathematician Gotthard Günther calls the "first machines" (using steam and mechanical action) followed then by the "second machines" of the cybernetic age that shift towards control via electronics i.e., computers and processors. This is the threshold at which machine working becomes increasingly 'sealed off'; appearing not only as cognitive abstractions but also physical ones, with mechanical and electrical parts buried out of view through miniaturisation. Thirdly, there is the application of the machine term as to mean the bureaucratic structures of the state, that in their entirety may form what Lewis Mumford calls in his treatise *The Myth of the Machine* (1971), the "megamachine"; a system where control of the machine means ruling over all of its delineated parts. Here, there is also a critique (or anxiety) being asserted in relation to the instrumentalisation of machines for social and cultural organisation—a technological rationality—that reaches beyond that previously exerted by Mumford in *Technics and Civilisation* (2010). This leads to the fourth form of the machine that Broeckmann cites, that of Turing's abstract, mathematical machines that have become foregrounded with more contemporary advances in artificial intelligence and machine learning that allow an increasing level of self-actualisation by the machine. Lastly, there is the application of the term to the human psyche itself; Deleuze and Guattari's "desiring machines" (1983) that are oppositional to an Oedipal theory of (object and social) relations, in that desire's basic function is to render machinic i.e., produce. Most relevant here is Deleuze's idea of the machine-assemblage as, "the way in which arbitrary elements are made to be machines through recursion and communication" (1983, p.498).

popular science fiction notions around the robot as an exact, perfect reflection of ourselves and is an extension of the 'machine myth'; a myth that imagines human replacement.[26]

> The robot is a servant, a colleague, and hence also a rival who can replace humans as workers. The machine by contrast can in principle perform operations which a human being precisely cannot – typically the generation and transmission of power in the manufacturing process, or the execution of calculations the complexity and speed of which exceed human capacities. (Broeckmann, 2018, p.182)

The performing of tasks by a machine suggests a functional imperative (and aesthetic) as defining characteristic, while a robot, as well as bringing forth images of the anthropomorphic figure, also alludes to an ability for the mimesis of human cognition and judgement; a machine into which self-governing ethics and morals can be hard-coded or programmed to then be modified through machine-experience. This essentially describes a paradigm shift to a type of machine that would no longer require the intervention of a human to operate or mobilise action.[27] This research does not focus on the testing of human mimesis through the anthropomorphising of objects; this would lead (perhaps) to a body of research more focused on the role of artificial intelligence and machine learning, rather than attend to its cultural function as per Huizinga's play-element. There are, of course, artists working within the field of robotics, machines and human as kinetic mimesis; the recent work of Sun Yuan & Peng Yu at the Venice Biennale (2019), *Can't Help Myself*, consisted of an industrial robot arm behind a plexi-glass cube, continuously sweeping towards itself a blood-like liquid, in what seems to suggest either a helpless machine attempting to contain the loss of hydraulic fluid or a violent

[26] The dystopian robot as human android can be seen in culture as the creature in Mary Shelley's *Frankenstein or a Modern Prometheus* (1974) to HAL 9000 from Stanley Kubrick's *2001: A Space Odyssey* (1968) and the replicants of *Bladerunner* (1982) (taken from Philip K. Dicks 1968 novel *Do Androids Dream of Electric Sheep*?) or the "hosts" of *Westworld* (1973). "All of these interpretations bring to mind the contemporary discourse on autonomous, self-learning machines" (Wirth, 2017, p.21) that turn back on their designer and become unbound from human law.

[27] In Harold Cohen's *Parallel to Perception: Some Notes on the Problem of Machine-Generated Art* (1973), he writes that "'behavioural functions' are defined here as functions which require feedback from the results of their actions as a determinant to their subsequent actions" (p.1). Feedback is required here to make 'in-progress' decisions in a rhetorical nature, "'awareness' of the work is totally defined by this question-and-answer structure, and in this sense is equivalent to the human perceptual system" (Ibid.). In an exhibition by Pierre Huyghe, *UUmwelt* (2018) at the Serpentine, London, 'mental images' captured and then reconstructed by a neural network from a human subject who had memorised a series of 'building blocks'—various components that are used by young animals, children and intelligent machines to mentally play with—were placed in a gallery ecosystem that contain a growing body of flies. The images, throughout the exhibition duration, were shifted via feedback from sensors that read temperature, light, humidity, as well as viewer and insect presence. The work is a realisation of Cohen's diagrammatic looping model of feedback-to-image that he had proposed in 1973. At the time, he saw this as impossible for we would need to imagine "a machine equipped with an archival memory, running a self-modifying program not once, but hundreds or even thousands of times, modifying future performance on the basis of past performance." (Cohen, 1973, pp. 5-6). He adds it would "profoundly challenge man's thinking about his own identity, there will be emotional roadblocks of significant proportions to be taken down" (Ibid.). Indeed, Huyghe's exhibition was deeply effective in exploring this emotional (and cognitive) roadblock, placing the human viewer as anxiously caught between the reciprocal nature of being an agent of change and an agent without perception of that change: the human-machine black box network (see chapter △ Automation).

one waiting to be released. Rather than the production of culture through machines at question in such work, it is the myth of the machine—of the menace, danger or 'humanness' of a machine—that is the subject of the work positioned through anthropomorphising. This research, as evidenced in the practical work, would suggest that it is not a mimetic outcome that is of initial concern (in the sense of making a painting machine that paints *like* a painter's hand) but the dialogical interplay of the machine myth, of the perpetual tension between humans and technics that questions agency and control in the *process* of cultural production. A machine infers, in this sense, much of what has already been said of play; it need not be a definition that leads to a taxonomical system of technological types, for a 'simple' machine can have as much effect upon human agency as a more technically complex one. Instead, it is what could be termed, the *machine-element* within culture that is of key concern; that is to say, its affect upon either the emancipation or restriction of human agency in the making of art. The robot is one figure within this multi-various discourse of the machine-element in culture. What typifies it is the tendency to believe that we pour information into machines, be that knowledge of gearing and kinetics, a system of diagrammatic information (such as an electrical logic board or software code) or an ethical bias, in order that we maintain our position as, what Rancière explicated in *The Ignorant Schoolmaster*, a form of "stultifying" master (1991, p.14).

The Machine-Element in Art Practice

I have already illustrated that in relation to certain historical art practices (Hans Arp, Sol LeWitt and Harold Cohen) there was a move towards explicitly using programmed procedures or rules to perform tasks and question the relation between learned master, procedural making and play. This 'performing of a task' alludes to the concept of a machine-element in practice, a means to apply control to an object, idea or material and turn it into an artwork, but also requires use of the play-element to ground the work as artistic production. To extend the genealogy of art practice in relation to the machine- and play-elements, the shift from human instruction and analogue machines will be explored, figured by the mechanistic approaches of Jean Tinguely and schematic drawings of Channa Horwitz before the development of in digital machines by Haroon Mirza. Specifically, there is a focus on investigating how an artist might acquire knowledge of the machine-element and its technical operation to create work in an increasingly abstract materiality—from visible, moving parts to the seemingly invisible forces of digital machines—and how that may place constraints or limits on the play-element available to an artist. The transition from analogue to digital is quite marked, for example, within the previously cited work of Harold Cohen. He had exhibited paintings at the Venice Biennale of 1966 that followed his own, pre-determined rules to allow "painting to paint itself" but by 1968

he had, prior to the development of *AARON,* already embarked on the frustrating path of learning the FORTRAN coding language to develop drawings on a Calcomp plotter (Cohen, 2008, pp.141-150). Cohen was testing the limits of the machine-element through a gradual induction into the technical languages and structures required to work *with* it and as a tool to de-centre himself from production.

During this period in time, the late 1960s, there is what appears to be a cultural focus on the machine (and wider technological influences) in art practice; the advancement of science and technology presented a utopian future in which nature could be overcome, bringing travel beyond the sphere of earth but also the democratisation of images through media and communication networks. In moving through this period of late-modernity, which also sought to harness technological science for the purpose of the arts, there is a culmination of cultural outputs that explore the impact of the machine alongside societal shifts in the implementation and intensification of the human-*techne* relation. As the control of machines moves from vacuum tubes to solid-state devices and the more economically available transistor switch, with its binary operation of integrated circuits (microchips) appearing towards the later part of the decade, the machine as a programmed, automated object began entering the sphere of the consumer and not just that of large-scale industry or the academic institution.

In 1968, Pontus Hultén curated the exhibition *The Machine as Seen at The End of the Mechanical Age* at MoMA, New York, comprising over 200 objects that were, according to Hultén, a collection of "comments" (1968, p.3) on the status of technology and the machine in culture.[28] Items in the exhibition ranged from models and drawings to early automatons, alongside artworks such as Moholy-Nagy's *Light Space Modulator* (1930) and the contemporaneous work of Jean Tinguely (who featured prominently). As Hans-Christian von Hermann explains in his essay "At the End of the Mechanical Age: Jean Tinguely's Machines" (2016) (and as is also identified by Broeckmann in *Machine Art in the 20th Century*, 2016), it is important to note that Hultén's exhibition in the USA occurred at the same time as a major exhibition in the UK, *Cybernetic Serendipity* (at the Institute of Contemporary Art, London) curated by Jasia Reichardt, seemingly demonstrating that there was a wider ushering in of a "caesura" (Herrmann, 2016, p.217) in the history of the machine-element in culture. Hultén is quoted in the press release to his exhibition as saying:

> We are surrounded by the outward manifestations of the culmination of the mechanical. Yet, at the same time, the

[28] MoMA has long played a central role in promoting this concept, beginning with its 1934 exhibition *Machine Art* curated by Philip Johnson, "who displayed boat and airplane propellers as if they were Brancusi sculptures and Pyrex laboratory glassware as if it were as precious as Baccarat crystal" (Filler, 2018).

> mechanical machine - which can most easily be defined as an imitation of our muscles - is losing its dominating position among the tools of mankind; while electronic and chemical devices - which imitate the processes of the brain and the nervous system - are becoming increasingly important...By the year 2,000, technology will undoubtedly have made such advances that our environment will be as different from that of today as our present world differs from ancient Egypt. What role will art play in this change? Human life shares with art the qualities of being a unique, continuous and unrepeatable experience. Clearly if we believe in either life or art, we must assume complete domination over machines, subject them to our will, and direct them so that they may serve life in the most efficient way - taking as our criterion the totality of human life on this planet. In planning for such a world, in helping to bring it into being, artists are more important than politicians, and even than technicians. (MoMA, 1968)

The precise nature of *why* any caesura was about to happen is not entirely elucidated upon by Hultén, other than that a transition towards an accelerated, networked and digitised culture of the machine was somehow inevitable. One could suggest that the context and direction for this transition would be governed by the ongoing capitalist drive for profit, in which inefficient workers were required to be replaced by more efficient, less 'playful' objects i.e., machines; an economic imperative that had already been underway since at least the industrial revolution or indeed, one might say, since humans fashioned their first tools. From a utopian standpoint, and for those advocating this 'inevitability', a manifesto might state: the increased role of the machine will allow for time to be re-allocated back to humans for play rather than work. At the same time (in 1968), Roy Ascott, who was then developing a telematic approach to art practice which explored the widening fields of electrical engineering and computer science as artistic mediums, identified the coming of a "cybernetic art matrix" (Ascott, 1968, p.105). The "cybernetic art matrix" par excellence—following Norbert Weiner's definition of cybernetics as the scientific study of control and communication (1961)—would be, for Ascott, the more recent arrival of the internet and associated transmission systems of information and data.[29] Ascott, with a keen understanding and relation to pedagogy as well as art practice, could see that such a system had the potential to "spread creative involvement and responsibility over the whole community to the extent that the specialist term 'artist' becomes redundant. The almost universal leisure of the cybernated society will enable everyone to participate in creative play and learning" (Kapopkin, 1995).

[29] Prefigured into this cybernetic field is the work undertaken by Jack Burnham. Published also in 1968, *Systems Esthetics* elucidates a shift from a culture of objects to a culture of systems and, as such, the machine moves towards de-materialisation and ephemerilisation (Bessette, 2017). The move from *things* to *processes* mirrors the transition in advanced Western societies from an economic reliance upon industrial production and mining of raw materials to the trading of data (as finance, information, services etc). It can also be seen in the dematerialisation of the art object as evidenced in the multiple 'conceptual' approaches alongside those of Sol LeWitt's already discussed; further documented in Lucy Lippard's, *Six Years: The Dematerialization of the Art Object from 1966 to 1972* (1997).

Alongside the described caesura in the age of the mechanical machine, and with a move towards a networked, digitised transformation of the machine concept, Ascott identified play as the 'filler' of that space it would leave behind. The distrust of the rational language of technology following the world wars of the earlier part of the century was being (partly) replaced by artists who sought a more positivist approach to the burgeoning philosophy of the *machine-element*, one that allowed for the expansion of culture through technology; the role of the artist being to show its limits and/or capabilities and to provide *homo ludens* an increased space for play.[30] Hultén's exhibition and its thematic reinforces this point:

> Standing astonished and enchanted amid a world of machine, these artists are determined not to allow themselves to be duped by them, their art expresses an optimistic view towards man, the creators of machine, rather than toward technology as such. They lead us to believe that in the future we may be able to achieve other, more worthy relations with machines. (Hultén, 1968, p.13)

If these more "worthy relations" aim for an emancipation of social and cultural space, it draws into focus as to whether creative play (and learning without prescribed outcome) is valued in the wider context: the economic marketplace and social dynamics with which it is entwined. How is our excess, our available surplus, to be returned back to us? Surely the machinic system of capital accumulation only thrives on the efficiency of work as opposed to open-ended play? It is the very nature of this structure that the working roles that would be required (or demanded) in a future labour market would be the technician or engineer; that is, those logisticians that can maintain and develop the machine rather than the academic or philosopher who may question its purpose and seek play.

An accompanying exhibition in 1968 was organised by E.A.T. (Experiments in Art and Technology), a group led by Billy Klüver, Robert Rauschenberg, Fred Waldhauer and Robert Whitman. The not-for-profit organisation matched artists with engineers as a means to catalyse

[30] The work of Dutch artist Constant Nieuwenhuys (and other Situationists such as Asger Jorn) was greatly inspired by Huizinga's *Homo Ludens*, using the notion of play as a movement against the hegemonic structuring or everyday life. Constant's project, *New Babylon* (1959-74), mapped out an architectural construct for the potential transformation of urban space into one dedicated to human freedom (Kubecka, 2018); one expressed through play and the mobilisation of a fluidity in the actions and arrangements within 'lived' space (a nomadic and labyrinthine approach to interior and exterior). Most appropriate to this research, is that this reading of *homo ludens* was not to withdraw from the technologies of Modernism, but to re-purpose them for the enhancement of creativity. "*New Babylon* was intended to overcome modernist (rationalist) urbanism à la Corbusier, which was organized around places of labour and spaces of dwelling and the problems of circulating people and material between them; but it also sought to overturn the very anthropological foundation of modernist urbanism in *Homo faber*, in a labouring humankind, in favour of a new anthropological horizon of free time and play realising *Homo ludens* on a universal scale" (Miller, 2017, p.79). What Constant argued, as per Herbert Marcuse (2002, 2018), was that machines and automation in themselves are not the problem but that the over-arching rhetoric of 'technological progress' as put forward by the ruling class's ideology would dictate the instrumentalisation of machines.

the link between industry, technology and art through close collaboration. It intended to encourage "new art through new technology" (Klüver & Rauschenberg, 1967, p.1), in particular generating insights between the two disciplinary perspectives of artist and engineer. "The collaboration of artist and engineer emerges as a revolutionary contemporary sociological process" (Ibid.). The exhibition, titled *Some More Beginnings*—perhaps as a counterpoint to the *end* of the mechanical age—was to be held at Brooklyn Museum, from which nine works were selected as part of a competition within Hultén's MoMA exhibition. The competition was for the somewhat subjective 'best' contribution by an engineer to a work of art made in collaboration with an artist; the prize being given to the engineer rather than the artist. How might artists and engineers work together to challenge the oncoming structural changes that the machine and automation would engender? Indeed, how might artists, engineers *and* machines collaborate? Klüver, who consistently maintained that artist-engineer collaborations might provide "variety, pleasure and avenues for exploration and involvement in contemporary life" (Shanken, 1998, p.59), also believed that they used distinct methodological approaches. "Klüver does not believe in art and technology as a unified concept because, in his opinion, each field is a separate and distinct entity, the protocols and goals of which are not translatable, much less compatible" (Shanken, 2001, p.81-82).

Collaborating with the Machine

In 1960, Jean Tinguely travelled to New York, a city he had heard much about but never visited before. He was travelling to meet and work with Billy Klüver, having been put in contact with him via Pontus Hultén when Tinguely was offered the chance to develop a new artwork for the sculpture garden of the Museum of Modern Art. Billy Klüver studied for his PhD at Berkeley in 1957 and would shortly thereafter begin working for Bell Laboratories, a technological research and development company, sited in New York City at 55 Bethune Street in the Far West Village.[31] Klüver "regarded the artist as capable of taking on the mantle of the research scientist" (Joseph, 2004, p.39), in the sense that they would be able to set goals to be reached through the assistance of engineering 'know how' and understanding. The hopeful model he put forward required the artist to have a clear, focused intention and outcome; a problematic model for many artists, such as Robert Rauschenberg, who showed interest in working with

[31] Bell Labs was located at that site until 1966 before it moved to Murray Hill, New Jersey. The old buildings at Bethune St. were then changed into the Westbeth Artists Housing complex in the early 1970s, consisting of 384 live/workspaces for artists of all disciplines (Etherington, 2020). In a return to its past function, that community is now the location of the *School for Poetic Computation* who aim to "explore the intersections of code, design, hardware and theory — focusing especially on artistic intervention" (SFPC, 2020).

engineers and technologists but "professed [a] desire for a 'surprise package', delivered by the engineer without expressing an a priori objective" (Ibid., p.42).
While working at MoMA, Tinguely and Klüver were housed in a leftover Buckminster Fuller geodesic dome (from a prior exhibition) and from under its Modernist structure they developed *Homage To New York*. This infamous artwork was a huge undertaking both in scale and ideas, being the culmination of various aspects of Tinguely's thinking as well as a collaborative extension of his practice.[32] The final, whirling mass of mechanics reflected Tinguely's interest in chance, kinetics, failure, auto-destruction and spectacle, building (quite literally) on the more explicitly generative *Meta-matic* works he had made in the 1950s.

Tinguely's machine was a conglomeration of spare parts and salvage sourced from junkyards, "sixty or more bicycle and baby-carriage wheels, a meteorological balloon, a piano, a bassinet, tin cans, a cable drum, sheet metal, a washing machine drum, an addressograph machine and various motors" (Sillars, 2009, p.21), complemented also by two drawing machines. The entire object was, at the last minute, painted white in order to give it some formal unity, but overall, it was an intuitive construction of which "the first drawings of the machine show little resemblance to the final result" (Klüver, 1968, p.169). It proceeded into action on the evening of March 17th and, after a shaky (late) start, undertook a part choreographed, part self-acting destruction.

Klüver stood on the side-lines alongside Tinguely and was instrumental in the work moving at all.[33] His part in the collaboration, often seen as the subordinate engineer, is perhaps underestimated in written reviews. Klüver kept his own account of the evening, *The Garden Party,* an anecdotal reflecting on the project that was written two days after the event and later published in Hultén's exhibition catalogue. He wrote that he felt his role was "[a]s an engineer, working with him [Tinguely], I was part of the machine" (Klüver, 1968, p.169). Klüver never identified as an artist and the aim of E.A.T. had always been to seek organic collaborations between artists and engineers but the relation with Tinguely seemed to remain de-limited by the various qualities of each other's disciplinary knowledge.

[32] Alongside Klüver, Robert Rauschenberg was also to contribute a 'money thrower' into the assemblage of actions and machines.
[33] Klüver's involvement had been integral on many levels, including the final wiring up and running of electricity to the machine for power. It was Klüver who also noticed at the last minute that one of the legs in the structure had not been sawed through. "If it had been left, the structure would presumably not have collapsed and fallen over" (Klüver, 1968, p.170). The ensuing performance did not entirely go to plan: the paper for the *Meta-matic* machine had been rolled the wrong way, the drawing arm failed, an in-built radio couldn't be heard above the general noise, a fan motor couldn't quite knock over a series of stink bombs and the fire extinguisher that had been placed in the (burning) piano failed to go off (Sillars, 2009). For Tinguely, though, these 'live' malfunctions were intrinsic to the work.

Tinguely's play with technology was indeed limited by his knowledge in regard to methods of electrical and mechanical engineering; the combination of electrical timed relays and mechanical parts required a methodological approach that Klüver had to apply on his behalf. It was Tinguely's *not knowing* that allowed for the work to exist—and destruct—as it did, in as much as Klüver's *knowing* (as to the technical operation of machines) was similarly integral. For Huizinga, this collaboration would have been pragmatic rather than playful; the play-element of the work would have only been located in the half hour of chaos and entropy that followed its turning on and release into the world.[34] With its riotous sense of noise, movement, fire and animated force it was certainly a social festival of joy that would sit comfortably as an occasion of 'pure' play; viewers at the very end (once the fire department had put out the flames)[35] clamoured to take parts of the machine home, treating them like techno-archaeological remnants from (what would become) a mythic event.[36] I would argue that the play-element of the work is, though, further grounded within the relation between Klüver, Tinguely *and* the machine; their productive space, as a magic circle, is de-limited by their collaboration and mutual facilitation of experimentation (the relational interchange rather than the power exerted by human control). As such, the play-element and machine-element of the work link together to allow for the production of the whole.

> For me, the machine is above all an instrument that permits me to be poetic. If you respect the machine, if you enter into a game with the machine, then perhaps you can make truly joyous machines—by joyous, I mean free. (Tinguely cited in Broeckmann, 2016, p.32)

Tinguely's optimism for the potential within machinic collaboration as being poetic and playful can be seen through the lens of accessibility to the technology of that time; being mechanically

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[34] Tinguely was more concerned with the relation between human and machine than being limited to a narrow 'black and white' positioning as to his works. The destruction of technology can all too quickly be assigned as a luddite action rather than a playful one. The luddites (as noted in Pynchon, 1984; Conniff, 2011), were less voicing anti-technological feelings against the machine per se, but rather protesting against the change in labour rights, the loss of community and control that increasing automation would bring through its use. To be a luddite is not to be inept with technology (at least not without wanting to be as a form of protest); many of the "frame smashers" were highly skilled operators of the loom machines and were required for their upkeep. The luddites of the Industrial Revolution were expressing what can be seen now through a networked, gig economy, that is, that labour rights become increasingly precarious in relation to welfare. Modern 'luddites' could be said to be those who fight against the regimentation of neo-liberal and capitalist structures via hacking, malware, viruses and so on.

[35] Contrary to many media reports, this was at the request of Tinguely and Klüver not due to the lack of control or danger perceived by the gallery organisers (Klüver, 1968, p.170).

[36] A similarly social approach to displaying his work as a 'performative festival of the machine' had occurred a year before in Paris, 1959 at the Iris Clert Gallery when he displayed the *Meta-matics* for the first time. The sculptural objects were arranged on plinths and would function through the insertion of special coins he had made for the event. The viewer would literally pay homage to the machine in order to allow for the spectacle, for the 'coming alive' of its action; the coin being the offering that satisfied the daemon within. The *Meta-matics* were more overtly productive and generative than *Homage to New York*, being machines that made art in their operation, though both contained irregularities, errors and mishaps that liberate the work from the precision of Modernism. Huizinga would identify their carnival slot-machines mimicry as the thrill of a fairground attractions and in our interaction—visually and physically—with them contained the possibility of play. In this celebratory, playful (and collaborative) sense of experience, it is difficult to see Tinguely as 'anti-automation' or 'anti-machine' entirely and the objects themselves as devoid of play qualities or affordances—they are also poetic, contemplative and humorous.

'hackable'—with the support of Klüver in this instance but as also evidenced in much of his prior work—meant he could twist the function of found objects into a representation of anarchy.[37] What then of today, where digital interfaces are present as much as mechanical ones; a time in which machinic failure or destruction is of increasing concern and not simply as a minor inconvenience but as a catastrophic collapse of a social or cultural system? The abstraction of skill sets into discrete units (following the Fordist lineage of labour) means the complex inner workings of a machine are left unknown with multiple, discrete, specialist skillsets embodied within it. To construct, for example, a computer from various purchased or salvaged parts is certainly possible for many, but to be able to solder each circuit board, each element of every fan, of every transistor and every detail of the hardware before even commencing on the machine code required to define its operating system, is the realm of the very few (if any!). One would need to be a polymath, able to understand physical mechanics, coding languages, computational action, user interfaces, sensor design etc. within even just one device; it is difficult for an individual to gather sufficient knowledge so as to be able to re-build, repair or construct the contemporary machine. There is perhaps a more sinister, anxious undercurrent that the caesura has engendered; a narrative that is not perhaps full of joy and freedom but anxiety and increased opacity as to the machine-element of culture and the rising *machina ludens*.

[37] Tinguely's excellent understanding of mechanics is clear from his work and so he does not start from the position of a complete novice. Tinguely had already started to introduce electric motors into his work in the mid-1950s with the *Meta-matic* works. Klüver, though, brought access to a wider range of functionality. For example, the collapse of *Homage To New York* was intended to be activated through remote controlled (automated) transistors that he designed to overheat and melt the metal legs supporting much of the structure.

Figure 19: Bradley, W. (2015) *Painting #1* [Oil on aluminium]. 100cm x 65cm.
Painting prior to being processed on the machine.

I have always thought of painting as a perverse activity. I remember discussing with a curator that working within that frame for your lifetime, not just literally (though many do) but wanting to work with the weight of painting's history bearing down on every brushstroke might be somewhat of a masochistic activity. He raised his eyebrows. Of course, I am hardly one to talk, being someone that seems more driven by pragmatism, order, function and so on… certainly a poetic meandering is not what first springs to mind in conceiving of the way I shape the world. But the machines and objects I craft have careful consideration as to their making. I care for them; poetic devices as much as a painting might be. Perhaps being precise and ordered is no bad thing.

The construction of the machine for the painter to play with, and its coding, took a period of time that might correlate to me learning a foreign language. It seemed to take an age to build and extend the limits of my knowledge so as to deliver the action and movement I desired; or at least to the point that it would do enough mischief to provide the painter a challenge.

When ready, it was shipped off to the gallery. The first painting was laid onto its aluminium bed and began to be 'processed' via water, chemical and brush. Moments of movement were then ensued by sludge-like waste from the paintings surface being scraped into a bottle.

Under a spotlight, encircled by onlookers, it was theatre-in-the round, a computationally scripted play.

I wondered if Tinguely would be proud.

Figure 20: Bradley, W. & Selby, M. (2016) *Untitled* [Oil on aluminium]. 100cm x 65cm.
Painting after being processed on the machine for 24 hours.

Dance of Death

The Tinguely Museum in Basel is an impressive resource on the life and work of Tinguely. Alongside the museum's permanent collection, there is a revolving programme of artists who are invited to produce temporary exhibitions, their work either extending or relating to that of Tinguely.[38] In 2015, invited by curator Roland Wetzel, Haroon Mirza produced an exhibition for the museum, *Haroon Mirza/hrm199 Ltd*, in which works in the collection were shown alongside several new commissions. Mirza's use, or rather "mis-use" (Wetzel, 2015, p.9), of technology links his practice to that of Tinguely. One particular commission intervened very directly with a Tinguely work: *Mengele - Dance of Death* (1986). This late work by Tinguely shows him at his most ludic macabre; less celebratory, it is more a reflective comment on the corporeal and incorporeality of the machine/human subject. The fourteen sculptural assemblages that configure the work were taken from a farm destroyed by fire (the central piece being a burnt, distorted combine harvester). The work references both the medieval dance of the macabre (the *danse macabre)* and the dire experiments of the Nazi physician Dr Josef Mengele who, while working at the Auschwitz concentration camp, undertook unethical, barbaric genetic research on human subjects. The irony of Mengele installing a playground in his laboratory (adjacent to one of the crematoriums) in order to dupe his test subjects suggests perhaps the most violent use of false play against nature and humanity; beneath the surface of friendliness and play lay only barbarous intentions. The twisted, darkened metal machines from the ashes of that farm are made to move, clunk, screech and scream with uncomfortable asynchrony that produces a haunting, disquieting response. The use of machines, as instruments of warfare, of torture and of menace, is drawn sharply into view.[39]

Mirza's intervention overlapped digital technology onto the mechanical machines, intertwining algorithmically processed sound and light with the creaking, awkward movements of Tinguely's machines. Re-programmed gallery spotlights (that turned on and off in sequence with the audio) raised the experiential quality of the work to that of a séance; the automated 'taking over' of the machine-body as a device to communicate between the living and the dead. The overlaid noise sounded like the beating of a rhythmic drum and accompanied by the screeching violin-like sound of metal on metal, the *danse macabre* was electrified. In his collaboration with the ghostly

[38] Previous solo exhibitions have included the artists Panamerenko, Daniel Spoerri, Michael Landy and Stephen Cripps. In addition, the Tinguely Museum has held exhibitions, such as *Art Machines – Machine Art* (2008), that have explored the very question of what happens when a machine produces art. In 2014, *Play Objects – The Art of Possibilities* was also developed as part of their programme, in which over one hundred art objects where gathered, the compositions of which could be modified (as ludic objects) by either the artist or viewer.

[39] In a further connection, Mengele, after leaving Auschwitz and evading the authorities, worked briefly as a farm hand and Tinguely's burnt-out objects were manufactured by the Mengele company, owned by Josef Mengele's father.

figure of Tinguely, and in using his works as a vehicle for extending the questioning/meaning of technological effects, Mirza adds to Tinguely's "chronicling of the last machine age" (Ibid., p.12) within the context of contemporary machine culture; the mechanical screech layered with an omnipotent, electronic hum. It is a play of objects that frames a serious concern; the spirit or daemon that resides in the machine, lurching and rattling, reminds us that in the context of the contemporary *machina ludens* all is similarly not well.

A noticeable difference to Mirza's approach is in his treatment of collaboration, in that while following a methodology of mutual exploration (and 'playing' with the machine) Mirza aims to maintain individuality within the collective identity of the artwork. In the catalogue for the exhibition, Rachel Madder writes—in relation to Gesa Ziemer's bringing forth of an agreed 'complicity' as a key component of collectivity and social relations[40]—that Mirza and Tinguely act as "accomplices", sharing a similar orientation to the world-at-large in relation to technology but come from different contexts and thereby retain their individuality (2015, p.218). As such, "shared production does not spell a complete resolution of artistic authorship but rather its relative contextualisation" (Ibid.). The exhibition catalogue (Wetzel, 2015) attempts to elucidate the various accomplices—people, objects, methods, processes—that are involved in building and producing an exhibition, or rather, the individual constituents that share in its meaning as a network: the machine of cultural production. It documents every stage and person (described as "participants") involved in the set-up and development of the work using a colour-coded system, akin to a manual for the machinic assemblage of an exhibition. Indeed, in this new technological density that the machine enters, one might expect Mirza to require various and considerable technical help in not only curation and logistics, but the very engineering of his work.

In an interview with Laura Bannister for *Museum* magazine (2018), Mirza instead maintains a refutation of the engineer as an external assistant (at odds to the intentions of Klüver, Tinguely and E.A.T.); developing and learning (through trial and error) the process/skills required to construct his work alone is important, if not always practicable.

> Well, there's Tom in my studio, and there's another guy Ben that used to work with me. I used to just do it myself, but … something that would take me two weeks to do could probably be done by someone else in an afternoon. For efficiency's sake, I often ended up calling someone … One thing though—it's easy to try things, to experiment, when you don't know how they're done. But when you

[40] The notion of "complicity" has been explored in more depth in Madder's book *Complicity: New Perspectives on Collectivity* (2017).

> know how it's 'supposed' to be done; you always do it the same way.
> I try not to work with engineers. (Mirza cited in Bannister, 2018)

While Mirza's statement doesn't entirely refute help or assistance, he certainly resists the role of the engineer. This view, that art and music are inherently beneficial to playing with machines, suggests that the engineer, while functionally efficient, operates with some 'other' intention or inherent limit (the inference being they are complicit with the machine's operation; that is, they apparently lack the capability of self-reflective questioning and follow instead only blind, procedural logic). Klüver's aim in E.A.T.—the importance of evolving the potential viewpoints and dichotomy of disciplines into an interplay of knowledge and perception—seems to be lost; despite the acknowledgement of those involved, they remain discretely 'boxed' into components.[41]

Returning to the *danse macabre*, one is reminded that it is a call to unification where both the ages of machine and human move towards finitude. Tinguely would ask for the work to never be greased, "Ne jamais graisser!" (Wetzel, 2015, p.191), ensuring it continually produces its scream-like sound but also, over time, allowing it to move towards entropy like *Homage to New York*. No matter man or machine, there needs be sensitivity in order to maintain a system of sustainability and co-operation—for even mechanical systems need care—and each can support the other through their 'ways of being' in the world. But even with care, the material of Tinguely's work would eventually wear itself into dust and metal filings; would the resonant hum or amplified electronic sounds continue and take over? Each ensuing machine age, while more technologically complex, does not affirm the possibility of its own failure, corruption or retirement, but rather each version leaves behind a legacy that is echoed in its replacement.

[41] This is further supported by looking at the publication (Legg ed., 2012) for Haroon Mirza's exhibition /|/|/|/|/|/|/|/|/|/|/|/|/|/|/| *A User's Manual* (2012) which is designed in a similar manner. Documentation from the studio technician (Barwise, 2012, pp.57-58), while 'included', seems limited to the procedural description of the logical engineering challenges rather than their relation to any creative dimension. One might ask if it would be more interesting to evident a dialogic sensibility, emphasising the connection and not just the nodal points of the productive schematic Mirza outlines. For example, the technician could be assigned a task of writing beyond their compartmentalised 'part' in the machine but to document some other quality. This is meant not as one 'playing' another but, if seen truly as accomplices, then there needs to be playful ways of celebrating each other's differences while in search of the same goal (in this case, an act against the invisible labour behind cultural production).

Procedures

Also exhibited at *Haroon Mirza/hrm199 Ltd.* was the work, *A Chamber for Horwitz*: *Sonakinatography Transcriptions in Surround Sound* (2015). Here, Mirza responded to the archived works of Channa Horwitz, transposing her drawings into a sound and light installation using similar methods to his *Mengele - Dance of Death* intervention, that is, via the amplification of electrified sound and light.

Horwitz's drawings are constructed as a system for organising time, space, colour and movement as musical score. Titled *Sonakinatography* (1968-2004), it is a system of symbols in an eight-part notation device that uses a simple set of formal characteristics. She is quotes as saying, "if I wanted to experience freedom, I needed to reduce all my choices down to the least amount" (Kraus, 2013). By 1966, the search for a freedom of exploration through the rationalising of options culminated in the use of only circles and squares (in black and white). Through this simple, restricted language and a set of rules as a strategy (not unlike an Oulipian limitation to enable creativity) [42] she sought to break down the barriers between different sensual forms; the visual and the audible. In its 'writing out', the work's density of relations could become very complex and poetic, not the cold, rational idea of coded actions we are perhaps familiar with today.

The system of visual composing that Horwitz develops is the logical, sequential plan and structure of a program. She wrote in *Flash Art* (1976) about the development of her work, "I have created a visual philosophy by working with deductive logic. I had a need to control and compose time as I had controlled and composed two-dimensional drawings and paintings". In this way, Horwitz's instructional drawings are akin to an engineered machine; one that powers and controls the production of image through a processing language but in addition, allows for the examination of knowledge that can be construed by such a system. Importantly, while they appear mathematical and computer-generated—seemingly objective—the rules and forms are self-generated and as one might build a world, so her visualisations map a way of understanding information in a human sense. In Reza Negarestani's *Intelligence and Spirit* (2018), which considers

[42] Oulipo was formed in 1960 and its title is the shorthand for *Ouvroir de littérature potentielle*, translated as 'Workshop of potential literature'. It consisted of a group of loosely associated writers, exploring the formal structure(s) of their literature via an invented, or re-invented, form of rulemaking. While commonly thought of as using systems of constraint, which infer some negative reduction, the purpose of Oulipo can be seen as "a riposte to the surrealists, for if surrealism maintains that writing can be released by the access given to the unconscious in 'automatic writing'" then Oulipo illustrated how rules allowed for the same expression of the individual self (Terry, 2019, p.4). One of the foremost examples of Oulipian writing is George Perec's *La Disparition (A Void)* (2008) in which the novel is written without use of the letter 'e'. Perhaps even more surprising, is that the English translation by Gilbert Adair follows the same rule. The research here finds parallels with Oulipo through this relation to 'rules' or code as a form of supporting expression as much as the free-form play of automatism.

the functionalist perspective in the contemporary, technical space of the machine (and our fascination with the figure of the automaton as mimesis of the human mind born out today as artificial intelligence), he describes how philosophy can be viewed as a "program – a collection of action-principles and practice-or-operations which involve realisabilities i.e., what can possibly be brought about by a specific category of properties or forms" (Negarestani, 2018, p.407). He goes on to identify that this philosophy is an *organon* for world-building.

> One cannot adequately represent the world or enrich intelligent reality without first being acquainted with ways of world-making or toying around with the idea of reality as if it were unbound play rather than a game bound to established rules designed to represent the given order of things. (Ibid., p.423-424)

Philosophy becomes the game of games, the continual re-formulation of a magic circle (a set of rules) not pre-established but mutable via a "cognising agent" (Ibid., p.421) live 'in play'. One can see how artists-as-agents, including Tinguely, Mirza and Horwitz, understand their work as propositions of a new order that may delete or supplement the traditional rules of constructing comprehension. Horwitz's drawings, also being made at the same moment as those exhibitions that identify a caesura in machines, mark the deletion of a mechanical age with the coming of a digital one. Negarestani cites the shift from analogue to digital as one that causes continuities to be deleted and/or supplemented (see also Nelson Goodman's *Ways of Worldmaking*, 1978). "We are now in the domain of pure mechanisability: discrete inputs, discrete states, and discrete outputs […] the very distinction between human and machine collapses" (Negrastani, 2018, p.428). This is a radical disruption of one form of understanding world-making in that we move from a free-flowing, continuously variable sensorium (linked to natural phenomena) to a 'controlled' unitisation of information and experience.

Horwitz's drawings supplement the traditional form of 'scoring' while Mirza's work similarly supplements those rules, aiming to make visible the invisible, or rather, evidence not the deletion of one system (Horwitz's) but the supplementation of it through shifting the emphasis of what can be seen—the 'sound' of electricity, the 'sound' of a drawing—into the viewer's field of encounter. This is to say, Mirza's work hybridises both analogue and digital forms into a supplementary system that seems more analogous to a recognisable contemporary culture, one in which the distinction between human and machine collapses. Similarly, Mirza's intervention with *Mengele - Dance of Death* speaks of the machine-element in culture at the current moment; algorithmically controlled and automated, 'sampling' the mechanics of Tinguely into an electrified, coded model that spreads out into the automation of the gallery lighting system

> He talks about creating works as making "a discovery" but is quick to add that this discovery is "not a paradigm shift but more of a tiddly-wink shift." It is not so much that functionality haunts Mirza's work but more that the artist toys with the idea of something that was once functional. Making art was once functional, like making bread – Mirza playfully conjures up a past functionality without valorising it (like the Constructivists for example) or dismissing it in the pursuit of a higher truth (like the Abstract Expressionists). (Ratnan, 2018)

Mirza's approach to undertaking this "tiddly-wink" shift reflects on the obsolescence of machines; the legacy of one machine-element being supplanted by the next in order to maintain the rhetoric of progress. The notion of this as a scientific "discovery" analogises Mirza as an artist that applies new models, systems and modes of technology in search of some 'truth'. In this way, one must be careful of where and how the cause of change is assigned; Luigi Galvani applied electricity to the muscles of dissected animals and claimed there was an inherent 'animal electricity' within, yet as we now know, the movement was caused by external rather than internal energy. In the 'bringing to life' of the work of Tinguely and Horwitz as a contemporary sensorium, is there the possibility of a false play that obscures the meaning of the work?

In the physical encounter with *Chamber for Horwtiz*, one enters a darkened room where a series of eight neon LED light boxes encircle the space, each one attached to the walls with a speaker. These play synthesised sound that is translated from Horwitz's graphic system into notes with a pulsating rhythm.[43] By being placed in-the-round, the light/sound boxes act out a performative dialogue with one another via their automated sequencing, echoing what Goethe wrote of chamber music as being akin to "four rational people conversing with one another" (Bashford, 2003, p.4). Only, this conversation occurs in a manner that borders on the impolite, with the electrical sound lacking intonation, timbre or articulation, offering only density of volume as a means to describe depth. While Mirza's installation consists of eight rather than four voices, this conversational analogy seems apt when one also considers the disjuncture between the synthetic sound of Mirza's transcription and Horwitz's sensitivity to mark-making as a dialogue between two forms of rational thought and two differing modes of technology.

[43] The spatial arrangement and form of Mirza's installation has a subtext that references a project Horwitz developed but was never realised. Horwitz's proposal consisted of eight Perspex boxes, accompanied by eight beams of light that would "vary in intensity based on the adjacent beam" (Ellegood, 2012, p.90). The work was declined for an exhibition curated by Maurice Lachman at the Los Angeles Los Angeles County Museum, *Art and Technology* in 1968; an exhibition in which only male artists were presented. Her exclusion exemplified a macho-centric approach to working with systems, codes and technologies in art (McCoy, 2018). Similarly, we can also talk about her relationship to Sol LeWitt in this manner. They were frequently in communication with one another—their instructional approaches being very similar—but not considered as equals at the time (Lisson, 2019).

In the supplementation of one technological system on another, there is an argument generated over that which would be the new dominant force; as the Luddites battled against the machine to preserve their working rights, so any collaboration from different perspectives can become a play of violence rather than agreement. It is important to concede that the shift in the *Sonakinatography* system that Mirza presents is his; a singular reading and it is, after all, Mirza's translation and supplementation that one encounters and therefore *his* subjective response to the score: it is an abstraction of an abstraction. The work is not the concrete 'realisation' of one form into another; it is rather the demonstration of how contemporary technological procedures continually re-abstract systems of the past, often without sensitivity (for they are, after all, machines). What Mirza makes for us in *Chamber for Horwitz*, is *his* magic circle, taking (one might say 'dragging') Horwitz's system into a set of colours, sounds and orientations that leave a paradoxical 'uncomfortable pleasure' in its experience.

> The relationship between the work of Mirza and Horwitz moves beyond an interest in coded systems and performing the spectrum of color, sound and spatial orientation. Each leaves some element of chance to play into their compositions: Mirza through the unpredictability of electricity and its "live" qualities; Horwitz by employing structure and rules as a means to finding the inherent chance within a running system. (Francois Ghebaly Gallery, 2016)

The experience of *Chamber for Horwitz* contains the play-element of liveness and a game of chance not unlike a fairground ride. Mirza (2017) notes on much of his work that: "There's absolutely a nightclub experience there. I make work like that because I spent a lot of time in nightclubs. But beyond what it feels like, a nightclub performs an extremely important social ritual". The experiential phenomenon encountered is one that riffs on the play-element of Huizinga's identification of play in festivals and rites. But what kind of ritual, and the rules of its magic circle, is the viewer asked to partake in? The experience feels as though it is one in which we are to pay homage to technological rationality—birthed from the drawings of Modernism—that is now attempting to enter into a strange new dichotomy: the sensory poeticism of logic.

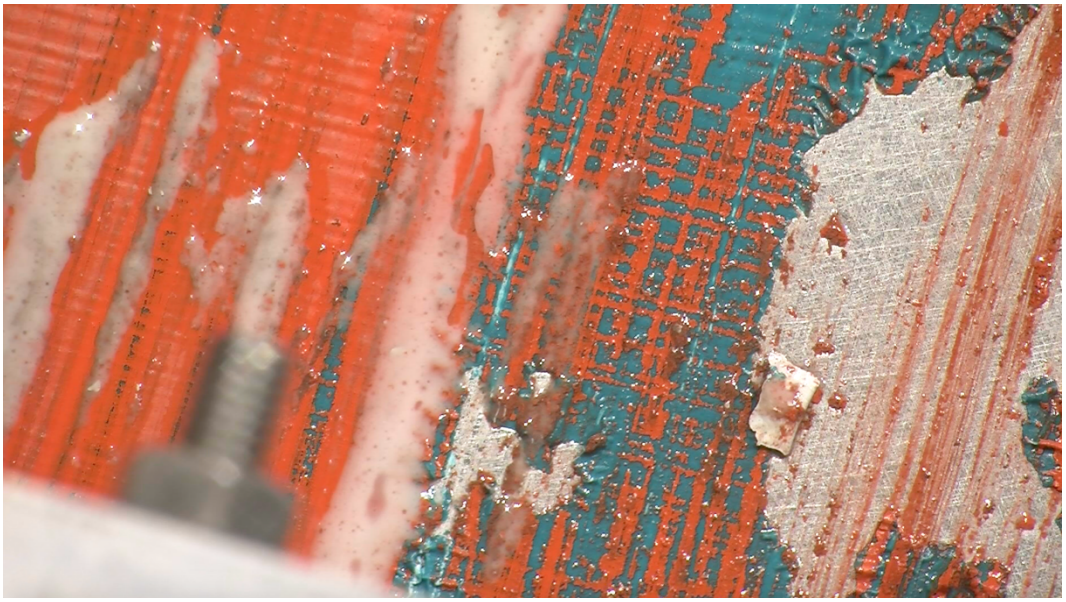


Figure 21: Selby, M. (2014) *Untitling Machine.* [CNC machine installation].
Installed at: *Work Hard, Play Hard* (2014). [Exhibition] Berloni Gallery, London.
26th November 2014-31st January 2015. Paintings by William Bradley.
Painting destruction in progress (detail).

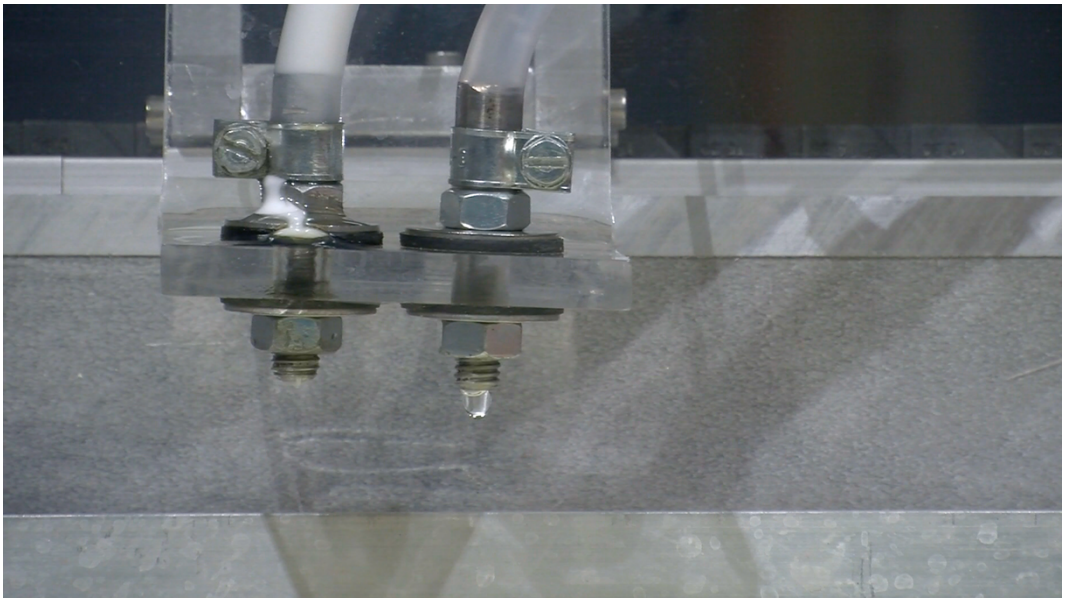


Figure 22: Selby, M. (2014) *Untitling Machine.* [CNC machine installation].
Pump head (detail).

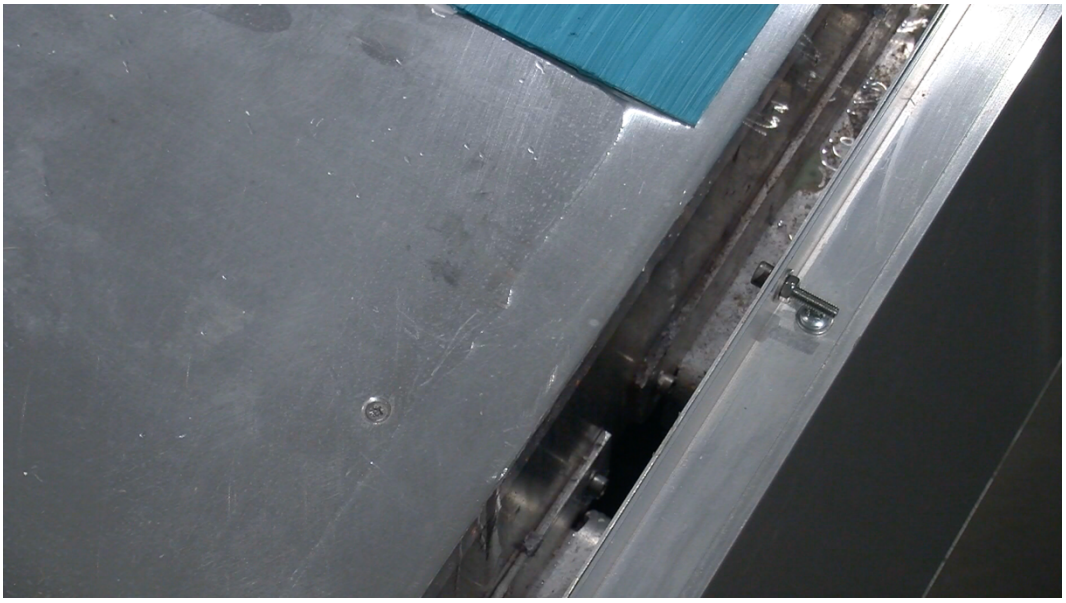


Figure 23: Selby, M. (2014) *Untitling Machine.* [CNC machine installation].
The paint, water and paint stripper would flow into a channel and be collected in a series of containers under the machine during the exhibition.

As the exhibition went on, parts started to go wrong. Initially, the belt drive and motor slipped causing an audible 'hic-up', then the code was somehow corrupted into gibberish and finally the wood support under-frame came into contact with water and distorted the whole thing out of true. Over the six weeks of the exhibition, I returned most days to fix it.

It was barely automatic.


△ Automation

It was very common for me to be unable to sleep when I was younger; the precise reason for which either escapes me or is simply the kind of thing one does not want to return to easily.

Certain mannerisms, the constant wringing and rubbing of hands that tries to calm the feeling of accelerated thoughts, still remain with me today. I would lay there in bed, automated knots in my head tying themselves inside out, wondering whether it was normal for the mind to manifest so physically. "Better than banging my head against the wall" I'd say to myself, as if some comfort could be gotten from making skin red and raw.

Ironically, I also cannot remember in the chronology of that time when I got my favourite watch, but I do know that it meant more to me than being able to keep an accurate hour and minute. It was the age of multi-functional digital watches; not just the tellers of time but portable machines that allowed one to be a master of calculus, know the ambient temperature or light up the way through a tiny beam of light. A friend's watch had a barometer and altimeter; a wild adventurer, a mountaineer, a deep-sea diver, what images that watch seemed to solicit in a hair-brain fool.

Mine was not so talented a timepiece but it was good enough not to seem at odds with others. A common function was the stopwatch, of which mine could also memorise selected records. Its circular, grey plastic frame was designed with four small buttons on the outside, allowing start, stop, split and lap times to a degree of timing only really practically useful for a professional athlete. At night, under the sheets, I would press start and then stop in order to try and precisely land on 00:01:00. From there, other numbers of my choosing—or sometimes just the same one—would be selected. Repeat. Outside my room, while the game went on, I am sure all one could hear for hours on end, was the 'beep' of each attempt.

I didn't stop when I did manage the task; any small feeling of delight in success was not celebrated, and failure neither castigated, for each attempt had its own joy. Again and again I would do it, practicing for no purpose other than my own satisfaction. Sometimes in the morning I would wake to find I was still holding the watch in my hand with the timer running.

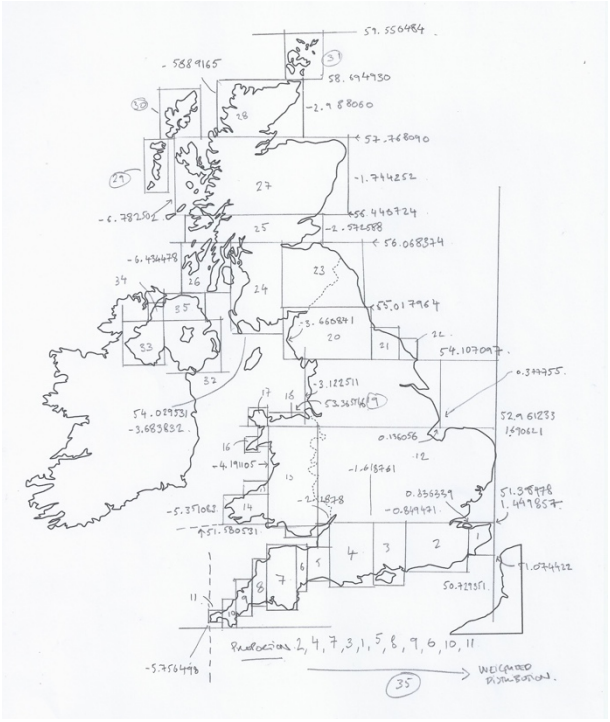
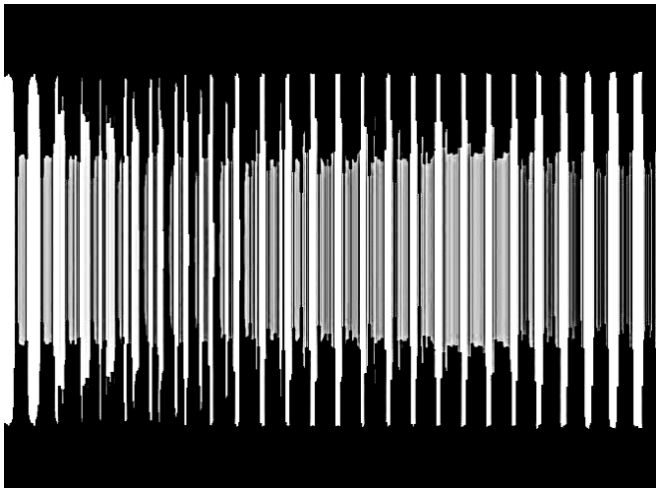


Figure 24: Selby, M. (2020) *When A Tyrant Eats Itself.* [Studio process].
Using the division of a map by rectilinear shapes, co-ordinates are then taken, and each shape measured against other others to form a weighted area distribution list (for the purposes of probability). The computer programme first selects a shape out of the 31 possible areas, then a random co-ordinate within that area. This co-ordinate represents a place for me to travel to and gather audio.

Figure 25: Selby, M. (2020) *When A Tyrant Eats Itself.* [Studio process].
Location no.1 for audio gathering.



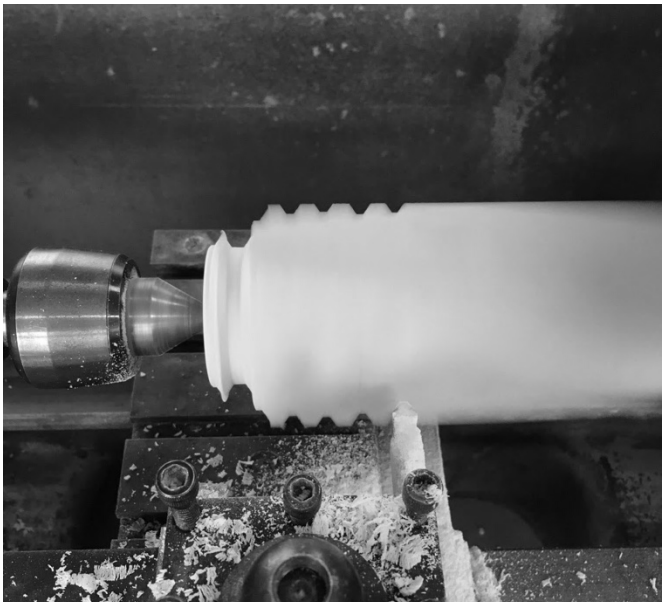


Figure 26: Selby, M. (2020) *When A Tyrant Eats Itself.* [Studio process].
The audio gathered on location is printed out as a graph of air pressure vs time as a waveform.

Figure 27: Selby, M. (2020) *When A Tyrant Eats Itself.* [Studio process].
The graph is then used as a model for turning chemiwood (aprox. 30cm sections) on an engineering lathe to approximate, as closely as possible by hand, the waveform.

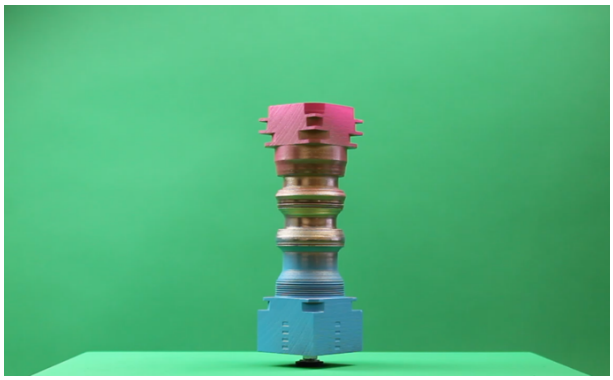


Figure 28 & 29: Selby, M. (2020) *When A Tyrant Eats Itself.* [Studio process].
Each column is painted and then filmed rotating on a mechanical turntable at 6rpm for 3mins. At a frame rate of 24fps, this results in 4320 individual frames for processing during each loop.

A computer program generates random geographical co-ordinates in the UK for me to travel to and collect sound. The 'sampled' audio is then visualised as a graph and translated into sculptural form as a column on a wood lathe. These columns are painted and then filmed rotating mechanically. The film is uploaded to a written program that separates out each individual frame, before reconstructing the column back into sound and on each loop of the film, a frame is randomly selected and corrupted; eventually the film (playing from a black box) will be unreadable and reduced to a black screen. A tyrant, slowly but surely eating itself.

Figure 30: Selby, M. (2020) *When A Tyrant Eats Itself.* [Video still – Location 1].

Figure 31: Selby, M. (2020) *When A Tyrant Eats Itself.* [Video still – Location 2].

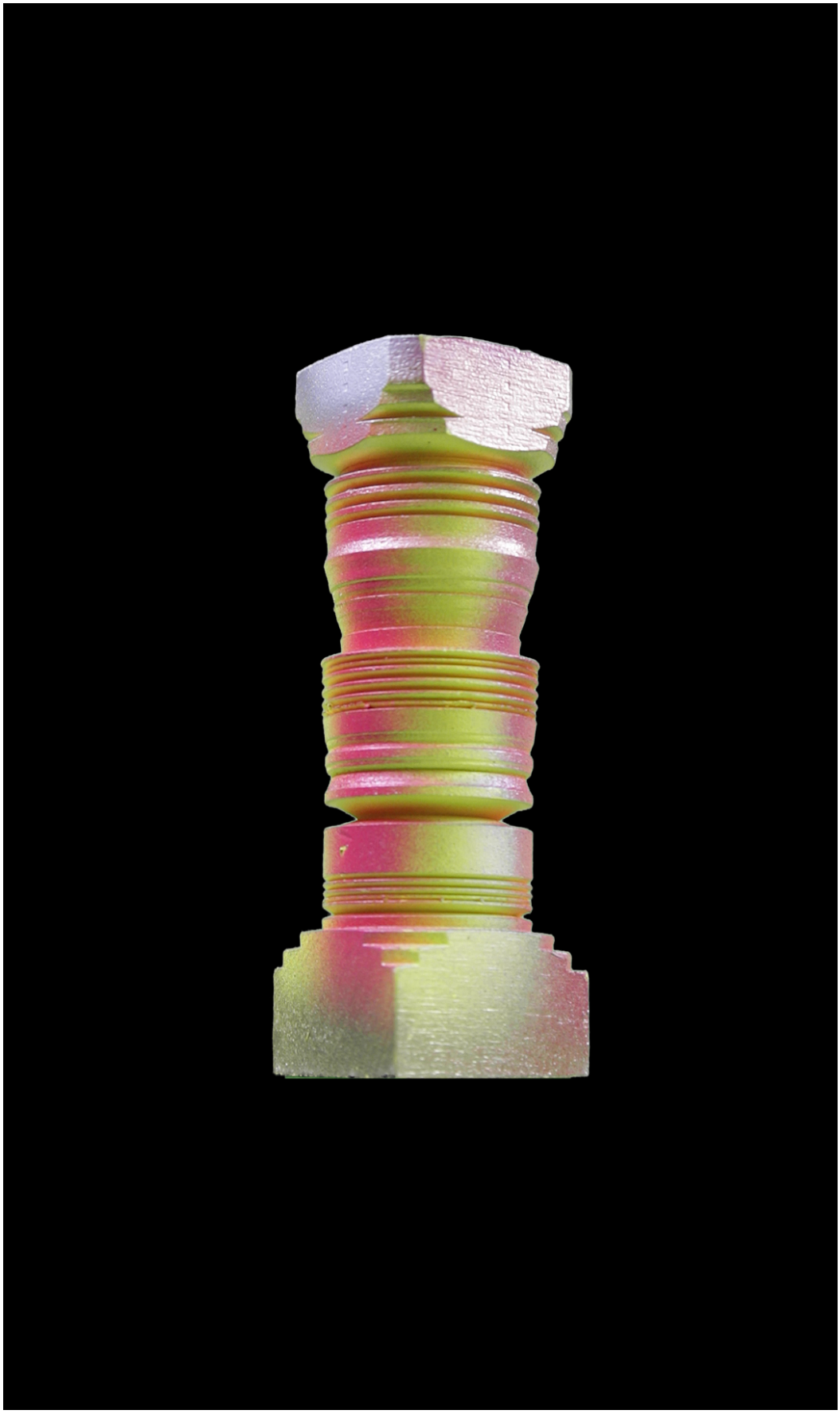


Figure 32: Selby, M. (2020) *When A Tyrant Eats Itself.* [Video still – Location 3].

The Hidden Operator

In 1783, an infamous automaton—the Turk—found itself in London's public eye. On encountering the Turk, one would see a life size figure dressed in an "ermine-trimmed robe, loose trousers, and a turban" (Standage, 2002, p.22). Sat at a large, wooden cabinet, one arm of the figure lay beside a chessboard while its other arm would rest on a pillow, a large pipe in hand.[44] The automaton was designed to play full-length games of chess against human opponents and, to the amazement of those who came to watch it play, the Turk would rarely be defeated. Engineered and fabricated by Wolfgang Von Kemplen, the Turk had primarily been made for the ruler of the Hapsburg dominion, Maria Theresa, in 1770. A somewhat un-characterful boast by Von Kemplen, after seeing a stage magician perform at the court, led him to declare that he was capable of constructing a machine of which, "the effect […] would be much more surprising and the deception far more complete" (Ibid., p.19) than anything the conjurer could do. From this challenge to the Turk's first showing at the Schönbrunn Palace, Von Kemplen required only a brief six months to construct the machine—his *machina ludens*.

While it gained notoriety for its playing abilities, defeating professional and amateur players alike, its means of functioning remained a mystery for some time. It was not until 1971 that the Turk's method of operation was fully re-created (Ibid., pp.213-219); the truth being that within the machine hid a chess player. The Turk's story remains of intrigue for two reasons: (1) For the very *idea* of it as a hoax, which is to say, that while its deception as a 'true' *machina ludens* encouraged a type of false play that rigged the game for the sole purpose of winning favour, the idea of a playing machine—and one that can play such a complex game as chess—becomes a touchstone for the capabilities of future automation and (2) Von Kemplen's deceit combined his characteristics as both showman and engineer; the Turk was therefore a demonstration of an object as *poiesis*—a dramatic game made to test human skill—as well as a demonstration of knowledge and application of *logos*. Embodied then, within Von Kemplen's production of the Turk, is a question of the possible artifice within both art *and* science; both being tools for assembling and re-imagining our understanding of the world. Despite the necessary questions this raises, such as being cautious of the human stewardship of machines, the Turk became one of many vehicles for the rhetoric of an industrial revolution. This is to say, the desire to find ways for lowering human inefficiency increased the rhetoric of machines, or as Huizinga would

[44] The traditional dress of the "oriental sorcerer" was seen as part of the fashionable "Turkish style" at the time; an "alluring combination of elegance and exoticism" (Standage, 2002, p.23).

point towards, continued to also marginalise, *homo ludens*.[45] Enquiry and critique, in the main, was overtaken by a fervent investment in *believing* automation was the answer to an ideology of winning at all costs, even if those costs impacted upon its human operators.

By 1834 the first electric motor capable of doing 'work' was built and followed ideas on direct current devices by William Sturgeon.[46] Joseph Swan harnessed electricity in a different manner in order to develop the first lightbulb by 1860. Studies in telematics, electromagnetic waves and those technologies involved in the sending of information over great distance were also occurring at this time, with electric telegraphy being pioneered. The controlling of audio waves could also be seen in Thomas Edison's first phonograph of 1877 that followed the making of the phono-autograph by Édouard-Léon Scott de Martinville (through which sound could be read graphically but not heard). And while vacuum tubes, like those used in early computers such as the ENIAC and Colossus, where not to be implemented in machines until the turn of the century, Heinrich Geissler had in 1857 found the glowing discharge of electricity through a gas tube that formed part of the discourse around electronics and the controlling of electron beams. In each of these moments, invisible forces to the human eye become captured for use.

To try and exhaust a list of technological achievements since the Turk is beyond the scope of this research—though it would no doubt raise questions as to the precise linearity we imagine automated machines to come from and perhaps encourage a greater sense of the intuition, chance and play involved—but this simple sketch alone illustrates perhaps the fortuitous rather than inevitable convergence of various fields in theory and practice. This multi-threaded convergence is of a much longer-standing history of our desire to control the world around us, not only that which is visible but also the 'invisible material' of particles, waves and light; as Jean Baudrillard (1981) maintains, the proliferation of technological objects and their related codes are based on the assumption that nature, as we can perceive it, is mechanistic and capable of being reproduced. As the Enlightenment privileged science and the more science claimed through its method and made perceptible, the more it could be applied and engineered to

[45] Edmund Cartwright, a poet, inventor and clergyman, was greatly enthusiastic rather than sceptical of the machine and prior to seeing the Turk in London, had visited the cotton mills of Richard Arkwright. On seeing the spinning machines Arkwright had patented, he proclaimed, in reference to the Turk, that it should be no more difficult to, "construct a machine that shall weave than one that can make all the variety of moves which are required in that complicated game [of chess]" (Standage, 2002, p.69). Cartwright followed up on his words with initial ideas for a power loom and while it was not a complete success in his lifetime, fifty years later, textile looms had reached full automation. Also, a young boy named Charles Babbage would visit the Turk in London and in 1819, Babbage played the Turk twice, losing both matches. While Babbage did not believe it possible for the automaton to be intelligent, he would go on to make his own theoretical and practical machines that have become key in the concepts of programming, machine intelligence and computing that were picked up later by Turing, Zuse et al. (see Ceruzzi, 2012).

[46] Putting to use the electrical motion displayed as by Michael Faraday in 1821.

machines and automation; this alone acted as an idealised perpetual motion machine of ideas, experiments and results forged in the name of progress.

The convergence of these multiple and varying technologies eventually takes the popular conception of a digital paradigm in contemporary culture. Rather than an abrupt caesura (as a deletion or cutting away), the workflow of automation instead withdraws from view as it becomes a contingent process for the majority of the developed world to use for the production, alteration and storing of objects and images.[47] It reprises those questions asked by the Turk—are we in control of *these* machines, of our relation to them?—only now the spread of automation has spilled from mechanical theatrics on stage, out into the street; into both public and private domain. This is no more evident than in the computational machine I sit and write this thesis on; a 'thing' for purchase that, it seems, is a necessity for engaging in the richness of life (as such, also for the purchasing of other 'things') and acts as a conduit for various forms of work and leisure. It is constructed of material *stuff* as hardware, but also bound by text in the form of its coded rules and applications. The computer is a tool with depths of technicity that seem far from my reach.

> Computers are unquestionably the descendants of automata: they are "self-moving machines" in the sense that they blindly follow a preordained series of instructions, but rather than moving physical parts, computers move information. Furthermore, just like automata before them, computers operate at the intersection between science, commerce, and entertainment. And they have given rise to an industrial revolution of their own, be extending human mental (as opposed to physical) capacity. (Standage, 2004, p.224)

The mechanical chess-playing automaton is thus a ghostly figure that lingers in the background of a computational machine's capability. In 1997, when Garry Kasparov infamously lost to Deep Blue, the competition drew much attention from the public for its positioning as 'man

[47] In this sense, the digital paradigm is somewhat of an illusion, the reality being a slow and complex move between modes of technology; we have in many ways always been 'digital'. The division of movement, action and thought into compartmentalised fragments has been happening over a longer duration than modernity. The convergence of elements required for the computer as an object in its own right is as complex a web as that of any automated machine; the study of which would be an ever-growing density of relations that is not entirely linear. For the purpose of this research, it is understood that as well as Turing and Babbage, the work of John Von Neuman, Konrad Zuse and others 'plug into' a detailed, networked narrative. For example, at approximately the same time as Huizinga's writing (1950), J.V. Atanasoff, a professor of physics in the USA, was working on discarding 'analogue' techniques in favour of direct calculation yet remains not in the popular view as a constituent within the history of computing. In Paul Ceruzzi's *Concise History of Computing* (2012) he neatly subdivides the rise of computing through a series of four major discourses: (1) The mathematical work undertaken to link logic with binary calculus (2) The convergence of various technologies that support it (3) The advancement of solid-state electronics that has allowed for its continued miniaturisation, and finally, (4) The development of human-machine interfaces. These major discourses are a bold attempt to group together themes of history but as Ceruzzi acknowledges himself: "The history of computing can never be written. New developments transform the field while one is writing, thus rendering obsolete any attempt to construct a coherent narrative" (Ibid., ix). Thus, to find a definitive point of origin would be a wasted task.

versus machine', with the important contextual omission of *at chess* to clarify the field of play. The force of computational power was clearly on a trajectory to surpass the analogous computational capacity of the human mind (in terms of logical strategies), but Kasparov believed he would be able to use the human qualities of intuition and gamesmanship to defeat it (as he had done the previous year). In the final deciding game of that 1997 competition, Kasparov was surprised by a move made by Deep Blue that ultimately proved decisive; two years later, he was to claim that such a move could only have been made by a hidden, human operator (Kasparov, 2017 & Manuel, 1999). Kasparov felt that he had been cheated, and while any competitor most certainly has an element of pride, it is conversely such claims that only perpetuate the myth of the machine.

> To our way of thinking, cheating as a means of winning a game robs the action of its play-character and spoils it altogether, because for us the essence of play is that the rules be kept—that it be fair play. Archaic culture, however, gives lie to our moral judgement in that respect, as does the spirit of popular lore […] any of the heroes of mythology win by trickery or by help from without. (Huizinga, 1950, p.52)

Soon after, Kasparov would return with his own form of chess that merged both human and machine, realising the potential for extending the game lay in collaboration. Titled *Advanced Chess* as well as *Cyborg* or *Centaur Chess*, it required a human and machine to work together against their opposition, to help each other out, for "even the most powerful contemporary programme can be defeated by a skilled player with access to their own computer—even one less powerful than their opponent" (Bridle, 2018, p.160). As such, "Cooperation between human and machine turns out to be a more potent strategy that the most powerful computer alone". For Kasparov, cooperation levelled the playing field and reduced the sting of computation.[48]

Since 2005, Amazon has been running the crowd-sourcing marketplace, *Amazon Mechanical Turk*, known colloquially as 'MTurk' that brings human and automation into a different vision of cooperation. In this online version of a mop fair, jobs are broken down into small, repetitive and discrete units by potential employers (individuals or businesses known as "Requesters"), to then be processed through Amazon's marketplace and completed by human workers:

[48] Bridle refers to this as the "Optometrist Algorithm" that was developed by specialists from Google and Tri Alpha (a nuclear fusion company) and "named after the either-or choices presented to a patient during an eye test" (Bridle, 2018, p.99-101). Nuclear fission experiments occurred at approximately every eight minutes in the Tri Alpha laboratory and after each test, the machine would change a small variance to compare with the last; the human operator would then select which was desirable. "In this way, the Optometrist Algorithm combines human knowledge and intuition with the ability to navigate through a high-dimensional solution space" (Bridle, 2018, p.100). This accounting for unpredictability increased the success of the experiment.

"Turkers". The renumeration to "Turkers" is often low; recent research found that of the three million tasks completed by the 2500 workers sampled, the mean wage was a little over $3 per hour (under half the federal minimum wage at the time) (Hara et al., 2018, p.449). As an automated workflow, the requester interacts with a machinic-assemblage of bodies, reaching into the gig-economy and receiving back what (they hope) is an accurate response to their question. This first part of the system occurs via the distancing of the screen, the work happens 'over there…somewhere' as if within the computer itself; the machine conceals the human operator, automating them to endlessly repeat a function. The machine operates as a black box; the requester is unable to verify whether they are indeed provided with an accurate picture in the returned response (but also obligingly happy to pass this by).

This form of automation, the machine as the mediator of a diverse set of human agents, needs to be thought through carefully, for it has deep implications in the way we instrumentalise the machine. When the Turk was toured and placed on view, the sceptic claimed a hoax while the believer saw opportunity. Ultimately, if one 'sees it for what it is', it is the tethering of *humans to machines* and *machines to humans*. James Bridle alludes to this as requiring "stewardship" (2018, p.160)—not in the strictly theological sense but as "an ethics of cooperation"—or in recent writing, Jan Verwoert highlights notions of "care" and "coalescence" that are required within our high speed, always 'on', always producing machinic culture (2010, pp.13-73). In the image suggested by these words, there is a power assigned to collaborative and convivial acts, as indeed those found in Kasparov's *Cyborg Chess*; though it is important to remember that for any relation to be successful there must be trust in each other's intentions. Therefore, the exchange should be a reciprocal one as opposed to hierarchical; it is difficult to be in partnership with machines if the motives for playing are not the same. And so, from the rhetoric of play as competition, imagination and progress that are figuratively exampled in automation seen in objects such as the Turk, to the rhetoric of power assigned to the possibilities of automation in relation to Amazon's MTurk, the level of access and opacity to the rules of the game—*and* who is playing—highlights the question of ethos, and ethical responsibility, bound within advanced automation.

Figure 33: Selby, M. (2020) *When A Tyrant Eats Itself.* [Studio process].
The process leads to the films being stored on a Raspberry Pi that runs the programme for its auto-destruction.

Black Box

The machines that conclude the lineage of technological progress in Isaac Asimov's *I, Robot* assume an omnipotent Providence; machines of divine control that care of man and the world (2013, pp.216-245). As the Roman orator and statesman Cicero exclaimed, "the universe and all its parts both received their first order from divine providence and are at all times administered by it" (In Our Time, 2018). Superior to humans in every faculty, the machine automates the conditions of the world as if running a laboratory experiment and is sufficiently self-reflexive to understand that it must hide this interference. Any visible trace of its domination would result in humans knowing of their slavery, from which position—no longer sovereign—they would surely revolt. As such, the machine intentionally inserts errors into its data and calculations for governance, allowing for just enough unpredictability and harm to occur in the world without causing catastrophe.[49] By doing so, the machine takes into account any human tendency to disobey, to protest and to be inefficient—to be both predictable and unpredictable. When the machine is asked for an explanation as to the errors, it replies, "the matter admits of no explanation" (Asimov, 2013, p.222), sealing off its intention in order to keep up the artificiality of the anthropocentric view. If I do not know what is happening inside a machine, am I subordinated to its decision-making, do I relinquish some part of me to it? Am I—the anthropocentric figure—being made to look stupid, 'played with' as if a child who is unable to know what is best for them? How, therefore, can I trust a machine, even one I have made?

In the early 1960s, as Sol Le Witt was writing his instructions that paralleled the efficient forms of Modernism, Robert Morris made a series of 'box' works that seem to frame various questions on function, agency and the place of the artist in relation to automation.[50] One of these works, *Box with the Sound of its Own Making* (1961), takes the appearance of a wooden cube approximately 25cm square. From its interior, one can hear the muffled sound of a hammer, saw, parts being

[49] as that would be contrary to Asimov's first law of robotics: "A robot may not injure a human being or, through inaction, allow a human being to come to harm" (Asimov, 2013, p.44).

[50] In a letter to John Cage in February 1961, he bullet-pointed the "objects made" to that date:

- 'The Performer Switch' - An electrical switch fitted inside a card-file box with following directions written inside the lid: "To begin, turn on—continue what you are doing—or don't—do something else. Later switch may be turned off—after a second, hour, day, year, posthumously."
- 'The Game Switch' - Made of the same construction but with no directions, the switch having only two "on" positions.
- 'Clock' – [Later titled, *Footnote to the Bride*] A box with a "tight membrane of thin rubber" stretched over its front. A phallic, rubber appendage would hang below and when the viewer pulled it, a motor would be activated causing "a bulge in the shape of a breast against the rubber membrane". This would last for a minute before returning.
- 'The Plus and Minus Box' – A box with two doors, one marked (+) the other (-). The positive, when opened, revealed a grey rubber surface that pushed out towards the viewer as if by a finger; the negative would do the reverse (pull the rubber into the box).
- 'Box with the Sound of its Own Making'

(Morris, 1961, pp.73-74)

moved, pushed and handled, as well as periods of silence; the three hours and fifteen minutes of construction recorded by Morris "echo the collapse of time present at the event horizon of a black hole" (Wasserman, 2001, p.34) as both existence and creation become congruous.

In a recent PhD thesis on Robert Morris's "thematics", Nena Tsouti-Schillinger claims that "in Morris's *Box with the Sound of Its Own Making*, there is neither secrecy nor mystery involved with the work—nothing is really hidden inside the box. And as the visual part of the piece has been reduced to just a simple geometric form, a cube, a viewer soon realises that there is not much to see" (2011, p.76). While there may not be "much to see", I disagree with the implied notion that the work is the 'plain-speaking' reality of an emptied-out process of production. Through its pragmatic titling and form, alongside an audio soundtrack that seems neither edited nor altered but a durational document commensurate with the task, the work does assume a humble, modest ethos that would perhaps deny the vagaries of mysticism; yet how can we know the sound is of *this* box being made? One might be attuned to the sound of *a* production (what carpentry might involve), that a box—*this* box—has been made, but a sceptic might ask if its matter-of-fact signifiers lead us only to assume that which is seen and heard as belonging 'together'. If one were to open the box, might that reveal something further? One would guess that inside is a speaker, followed by a wire to a tape machine, inside of which is a tape running over a head that moves up and down following the magnetic charge it senses. On that tape is an 'etching', a transposition of a moment passed that we might *see* as magnetic particles but, even peeling back these technical layers, we cannot be certain of the reality it claims to record: a body interacting with tools, materials and air. "Morris forces us to grapple with how we measure reality. Just as scientists have shown us how to conceive of a universe between what we can see, Morris forces us to move beyond initial appearance" (Wasserman, 2001, pp.34-35). The input of Morris's material into the output of the box, despite the lingering fossil of documentation that is a tape recording, is a process akin to transmogrification, the mysterious relative of doubt and irreproducibility.

The sealing off of the means through which material—in its widest sense—becomes processed, manufactured or manipulated is a key question as technology and its apparatus have moved from the analogue to the computational; as internal mechanics have become packaged down to electrical impulses and the drive to contain the function of a device into physically sealed objects—for patent purposes, for safety, for aesthetics, for profit etc—means they present themselves as containers of a mysterious chain of actions.[51] Objects have moved from the Modernist mantra of 'form ever follows function', to a position in which an aesthetic form may

[51] Examples of this include the proprietary screws used by Apple to limit the opening of their machines and the rendering of 'warranties' as void should anyone other than a professional enter the interior of the product.

remain stationary while its function varies from one task to another; a computer can be a communication device and a games machine without changing physical form. The machine then, through additional and multiple layers of automation, has developed a magic circle whose depths we may try to only occasionally glimpse into; closed internal rules and logic are veneered with familiar, sensuous interfaces with which we can play but where we cannot change the rules of the game.[52] The dense layers of interaction—circuits, code, solenoids, wireless communication networks and so on—that assemble and seal off a technological object in order for it to work, have the power to manipulate both physical and cognitive action of the user's play at its interface. Robert Morris's box is not simply the placing of process and output in congruence; it teases us instead into *thinking* that creation and existence of the box can be presented simultaneously at all.

Morris leaves us with a *black box*. For some time, the notion of the black box has been used in literature as shorthand for the coffin and its corpse, as in "She had been in the black Box (meaning the Coffin) e're now" (Godfrey, 1674, p.91), which refers to both the interior colour of the coffin and the mystery of death itself. Its usage in direct correlation to technology would occur nearer WW2, when sophisticated radar equipment was developed for the RAF to help with night-time bombing raids and poor weather conditions. Once the equipment was implemented into aircraft, pilots and crew often knew how to use it but had no idea how it worked. The black box therefore became a colloquialism for the sealed 'darkness' of a process beneath a functional device (Morris & Wollard, 2008). Moving towards the late 1950s and into the 1960s, the black box became more closely aligned to specific theoretical perspectives, expanding into behavioural psychoanalysis as well as cybernetics, in which the problem of the black box arose mainly in the understanding of electrical engineering. "The engineer is given a sealed box that has terminals for input, to which he may bring any voltages, shocks, or other disturbances he pleases, and terminals for output, from which he may observe what he can" (Ashby, 1956, p.86). It is only more recently that the term has become synonymous with the hidden, tamper-proof recording devices on aircraft; a suitably apt return to the notion of the coffin, in that following catastrophic failure, the black box acts as a narrative voice from beyond the grave.

The *black box* term simultaneously acts as a metaphor in the rhetoric of agency around not only machines, but all objects and subjects where access as to their 'being' is unknowable (see Pasquale, 2015). In the field of engineering, though, black boxing has been taken not as a

[52] This intentionally links the play characteristic of automation as a 'performance'; an actant—using an approach to Actor Network Theory (see Latour 1987, 2005)—that would consist of a multiple range of actions that constitute its use from, for example, a mobile phone's code, human physical interfacing, network of communication masts and so on that link to form its 'black box'.

metaphor but into a methodological frame; applied in technical analysis for individuating elements within a system and reducing the complexity of the whole. By acknowledging some elements solely for their inputs and outputs, rather than plumbing the depths of every part of a network, those parts of interest to the observer/researcher/engineer can then be focused upon. This abstraction, or simplification, allows the understanding of a larger operation via limiting noise from the rest of the system (the various subroutines, libraries of data etc that might exist in code, for example).[53] Perhaps then, this leads to the notion of the black box as being less the description of an object or metaphor for an opacity of understanding, but as an *action for learning* (Straube, 2019).

In engineering it is, therefore, a useful tool when put into action as means to find problematic areas within very complex, multi-layered systems or networks. In order to fix such objects, a black box approach saves having to trace the entirety of its routing; access at a meta-level retains comprehension of the whole if not how each *individual* part works.

> It is easy to view a pebble on the beach as a black box to be collected or thrown, until a geologist teaches us the stress of volcanoes or sedimentation through which the pebble was slowly assembled…To speak of *objects in action* is to convert objects from black boxes into withering trails of strength, re-enacting the torrid events that gave birth to the most obvious facts in the world. Thank God we do not do this for all actants at every moment; thank God we are ignorant of the turbulent details and razor-thin margin of victory in the love story of our parents. (Harman, 2009, p.36) [Emphasis added]

On a meta-physical level and within the context of philosophy, the term *black box* is part of understanding human access to the ontology of objects; this is an approach that corresponds to the notion of computational engineering as an object-orientated thinking of the world (see for example, Graham Harman, *Object-Orientated Ontology: A New Theory of Everything*, 2018). Latour's *Actor-Network Theory* (2005) is key in this development; objects—and included in the 'flat' ontological plane ANT requires, this means all things from humans to pebbles—are actors that reside in a network of relations (what they *do* in the world) that are constantly being re-

[53] This stems from Wilhelm Cauer, a German mathematician and engineer, who at the same time had conceived of a device that would become the beginnings of black box analysis (though Cauer never used the term *black box* in his work) and understood the term through the analysis of electrical circuits in which inputs and outputs were not relational (Cauer et al., 2000). Similarly, Norbert Wiener identifies a form of black box analysis as useful in cybernetics; using a comparative analysis of a black box (to which we have no knowledge as to its operation but has two terminal inputs and outputs) and a "white box" (to which there is a "definitive structural plan"), one can apply a "process of working in, or learning, by choosing appropriate inputs and outputs for the black and white boxes and comparing them […] In engineering, devices of similar character can be used not only to play games and perform other purposive acts but to do so with a continual improvement of performance on the basis of past experience" (Wiener, 1961, xi-xii).

constructed and changed.[54] Latour's black box occurs when these relations become assumed knowledge and he demonstrates this through *Science in Action: How to Follow Scientists and Engineers Through Society* (1987) via an extensive description of knowledge formation by the actors at work within such settings. In Harman's example, the expert teacher brings forward some knowledge of the object in order to change our position or view of it and show that he holds access to some of the black boxes within the pebble. The teacher's own information has perhaps come from textbooks and discussions with others, objects that were once to him also black boxes but changed through shifting actor-network relations. In this way, the reality of the stone's nature comes from a distance, from a "tracing of associations" built on a tumultuous set of social performances (Latour, 2005, p.5). Latour writes that over time: "[t]he assembly of disorderly and unreliable allies is thus slowly turned into something that closely resembles an organised whole. When such a cohesion is obtained, we at last have a black box" (Ibid., p.130-131). Latour asks that we trace these relations in order to understand the black box, rather than to think of it as an object merely to be 'opened up' with its mysteries awaiting to be revealed; for in this case, it would only be a Pandora's Box of *infinite* depth. As Latour would have it, the danger of opening Pandora's Box will mean being stuck within the perpetual loop of revealing only more and more nested black boxes and so 'knowing' always recedes from grasp (for Harman it "withdraws"). The material of a wooden box follows a trajectory of relations one could start to pick apart in the same way as those of a pebble: the wood comes from a larger piece of timber planed, sawn and prepared at a wood mill, the wood in the wood mill having arrived on a logging lorry that may have travelled hundreds of kilometres from where the wood was hewn, the tree itself having been transformed in growth through soil and climatic conditions that provide the particular individuality of its grain… *Pick——Pick——Pick*. The importance of Robert Morris's work is that his box demolishes the notion of the singular sealed object, and quietly says in a muffled voice: my path to existence was of turmoil, of being cut and hammered… *but one can only imagine what it was like!*

When, in Latour's terms, the black box become a stable network of actants they are joined in an (often temporary) solidity that allows it (the black box) to go unnoticed: "Established facts are quickly turned into artefacts, and puzzled people ask, 'How could we have believed such an absurdity?'" (1987, p.121). They become a kind of 'substance' that frames part of our world, a hardening of fact. This is, in a way, the aim of much human activity; to create and name

[54] It is important here to clarify the use of the word *network* as I intend it. In a reflection on ANT made in 1998, Latour comments, "Network at the time clearly meant a series of transformations -translations, transductions-; now, on the contrary, it clearly means a transport without deformation, an instantaneous, unmediated access to every piece of information. That is exactly the opposite of what we meant." The seeming structural integrity of the network as embodied by digital systems has made the term itself appear concrete, rather than give rise to the sprawling 'mess' of actors that Latour intended it to refer to.

assemblages of material, objects and matter that are held together just enough to be brought forward into comprehensibility as a 'thing'. In relation to *Box with the Sound of its Own Making*, my dissention towards the belief of both the wooden box and the sound emanating from the wooden box being of one and the same thing requires that I am a sceptic as to the substance of that statement, a Latourian "Dissenter" (see Latour, 2005 and Harman, 2009). But where does that position lead? Harman writes, it is possible to "continue to dispute ad infinitum, but only at the cost of increasing isolation and perhaps even mental illness (and here I do not jest)" (2009, p.43). Indeed, anything and everything can be challenged but I would suggest, as does Harman, that the opposite is in fact more problematic; the "fate of most of the objects in the world" is to be "simply ignored" (Ibid., p.38).

In the black boxing of a machine, what we would term the user or operator, is imperatively included within (rather than antagonistic to) the assemblage of relations. If part of the network slips, goes wrong, breaks, or becomes too obtrusive, it opens up that black box for re-configuration by the user. Derrida once wrote of his preference for a typewriter over a word processor:

> A software program that, when I got to the end of a paragraph of such and such length, roughly twenty-five lines, told me, "The paragraph is going to be too long; you should press the return button." Like an order coming from I know not whom… the computer maintains the hallucination of an interlocutor (anonymous or otherwise), of another "subject" (spontaneous and autonomous, automatic) who can occupy more than one place and play plenty of roles: face to face for one, but also withdrawn; in front of us, for another, but also invisible and faceless behind its screen. Like a hidden God who's half asleep, clever at hiding himself even when right opposite you. (Derrida, 2005, p.22)

This playful daemon is represented in its most basic form as the now defunct Microsoft Office assistant, Clippy ('Clippit' as named by Microsoft), an automaton that was meant to unite learning of the programme entirely within the programme itself, sealing it off and bounding it.[55] Clippy is the automaton's voice from within, speaking on behalf of the software programme in order to give its users structured access to its operation. The voice of the black box, telling us what to do and how to do it *better*, or *easier*, or *faster*…and without even having to think. The issue with Clippy, that Microsoft promptly realised, was that its continual, unwelcome and often poorly timed intrusions on screen meant the consumers of their product delved immediately into the black box only to turn it off.

[55] Before release, Clippy was tested on focus groups with a mainly negative response in which, "[m]ost of the women thought the characters were too male and that they were leering at them" (Cain, 2017). The suggestion from Microsoft was that it was (and still is) not so much how office assistants are but how they *act* that requires improvement.

> We can observe nearly everywhere how apparatus of every sort tends towards programming our lives for a kind of dumb automation. […] How our values begin to shift from things to information. How our thoughts, sentiments, desires and actions begin to assume the structure of automatons. How to "live" is coming to mean "to feed apparatus and to be fed by them". In short, we can see all around us how everything is becoming absurd. Where, then, is there any room left for human freedom? (Flusser, 2000, p. 36)

Word processing software, with or without virtual assistants, sets up a framed space of writing; a space, as with all machines, that needs to strike a balance between being 'helpful' while not impinging on human agency.[56] Its interface design requires enough control to be flexible in operation but not so much that the average user has the possibility of damaging its internal network easily or by accident. It aims to be fed input information to be processed but does not want to appear as a dangerous animal that happily consumes your that information in order to make some analysis of you; the daemon must hide its face. This is the computer's mantra: the user must be allowed to *feel* free within the paradoxical constraints of its system. Within this difficult context, one can see how a black box can only exist as a set of finite connections (with other black boxes), needing to shift 'substance' and form over time when the ability, knowledge or desire of the user—as an actor in the network—changes.[57]

In Vilém Flusser's work he uses the term *black box* to reflect on the nature of technical apparatus and their tendency to make the user their subject, black boxing being a method to lessen the scrutinisation of an apparatus's operation. A machine for Flusser is "a tool which simulates an organ of the body with the help of a scientific theory"[58], while the apparatus is "a plaything or game that simulates thought" (2000, p.83-85). A simple lever would be a machine as it follows the applied laws of Newtonian physics—motion, mass, interaction of forces—to simulate physical movement, while a computer is an apparatus; a toy to play with information and conceptual relations (as in also the "apparatus of the State or of the market" (Ibid.)). In this reading of Flusser's definition, a machine can potentially therefore have a seriously designed

[56] Autocorrect functionality attempts to tread this precarious line; with recent advances in the technology also 'learning' from the typing errors made by the user so as to become ever more automatic/without notice.
[57] Proprietary software systems are continually being updated and augmented in the background. Open-source software is an example of a developmental model that reverses this notion by attempting to open up interactions with the computer and those tools aligned to machines via collaboration. While proprietary software intentionally defines a 'hard' demarcation in its black boxing, sealing off compatibility with other machines at conception, open-source models search for a continual flexibility. Once proprietary software is 'hacked' and/or elements re-distributed and copied, it becomes part of an open-source model to which the owner of the propriety version must therefore change its form in order to maintain differentiation. The reverse is also true, in that open-source projects can, and often are, purchased during development so as to exclude their availability to the wider community.
[58] An "automatic machine" is also in his lexicon of basic concepts as an "apparatus that has to obey an arbitrary program" (1983, p.83).

purpose, whereas the apparatus has a play-element that encourages a re-thinking of the world through a propensity towards a certain (instrumental) function.

Flusser writes that the translation of play into utility and productivity will mean "we lose sight of the cultural centrality of uselessness and leisure, the festive and theoretical, that is to say, art and theoretical science" (2011, p.153). The type of play Flusser is describing here is a 'serious' play, one that would resonate with Huizinga and attempts some cultural or scientific function that preserves human agents in the production of knowledge. What Flusser also notes is that *homo ludens* is not automatically free, returning us to what was discussed earlier as a mode of false play; that is, one in which the appearance of play is akin to a puerilism activated by the apparatus. In *Towards a Philosophy of Photography*, Flusser continues: "The photographer is not a worker, but rather a player: not *homo Faber*, but *homo ludens*" (2000, p.35). Flusser does not see this *homo ludens* as emancipated, but that the playful toy (the apparatus) hides a conceit of controlling the operator, who Flusser terms the "functionaries" (Ibid., p.17). "The apparatus does as the photographer desires, but the photographer can only desire what the apparatus can do" (Ibid., p.20). Flusser is not restricting this solely to the realm of photography, but in a world before digital advances that would allow a camera to be in everyone's pocket, it is, for Flusser, the apparatus *par excellence*. The black box must reside on the threshold of appearing to be the helpful agent of our desires, limitlessness in our hands, yet it's rules of operation have dictated what may constitute those very desires.

One can see that Flusser and Latour aim to re-frame the automated machine as not solely a black box—a magic circle constituted as input ⇒ a set of internal rules ⇒ output—but as a reciprocal relation between the player and the machine (as *apparatus*), in which they both have agency to affect one another (as a network of cause ⇔ effect). Under this understanding, and following Latour, simply opening the black box would render no useful purpose. One might ask, therefore, how play could be re-appropriated as a method to question the stability of a black box and learn of its instrumentalising quality or even temporarily disrupt its network of relations? Flusser points towards those "experimental" photographers who "seem to know what is happening to them. They are conscious of the fact that image apparatus, program and information constitute their basic problems" (2000, p.37). They know that they are playing against the apparatus. Yet, Flusser concedes that even then those operators of the apparatus need to be more aware of their activity as the direct question of freedom, the self-same freedom in Huizinga's conception of play.

Archaeological Play

By framing the black box as a network of actions and actors, appearing to us as if it were a discrete, individual object, the methodology for 'picking' at its interface—the very coalface of contemporary technology—requires examination in order to find access for artists to do their work, or rather, their play. The first move, following the conception of the black box, is to consider that any interference with it will not to be 'clean'; the network of materials and intentions that occur to form an object are not able to be separated into every element of its assemblage neatly so that a direct analysis of a central origin—the beating heart of the object—can be done or a schematic made that takes into account all the discourses that brought it into existence. By firstly accepting that one needs to make a 'mess of parts' then one can begin to move from an object of stability to one of instability and onto a sprawling horizon of possibilities.[59] In *The Archaeology of Knowledge*, Foucault (2002) goes to great lengths to identify that for any historicity that lays claim to knowledge, from the unit of the "statement" to the "archive" and the "general system of the information and transformation of statements", that "discontinuity" is always present. This resonates with the understanding of turmoil within the 'coming into being' of an object as proposed by Latour; that the object at hand—the automated machine—has a wealth of unwritten and unspoken histories within it that, when analysed, form further "discontinuities". While we must accept that no clear, firm continuity of knowledge will be found in hacking apart an object, a growing sense of its 'messy vitality' laid bare, might lead an artist to explore and re-write its potential and as such, offer a wider sense of perceived freedom.

If we consider an automated machine as being the logical conclusion to a series of linear inventions—the inevitable joining of various threads of knowledge into a clear vision—and replace this with a meandering path of multifarious elements, it might require considerable time and effort to unravel such serendipity. Foucault notes that approaches to history (of its discourse, relations and objects) might find greater articulation through an archaeology that uses the specificity of its documents rather than following the tradition, say, of a material's discourse and meta-narratives. Rather than focusing on the whole of a black boxed machine, one might therefore delve into the narrative historicity of, for example, a singular transistor to find parallels

[59] This 'mess' is not necessarily the image of a disagreeable confusion needing to be ordered but refers instead more to the Latin etymology of mess, *missum*, 'to put something on the table' and as such, is more akin to the 'mess' of a ship; a 'mess' then becomes simply a means to bring together disconnected, separate bodies (though traditionally a 'mess' in the military was strictly hierarchical). A mess therefore maybe an organised grid or a loose pile of tangled elements, depending on the subject's understanding of the indexing, it being important that the subjective understanding of what a 'mess' is should not be lost. A mess can simply mean a "dynamic linkage of multifarious elements" (Zielinski, 2006, p.277).

that re-write the object of which it is a part. If we reflect on the specificity of social and cultural relations that reside within (and between) machines, this simple privileging of attunement to detail might avoid one falling into the trap of generalised myth; one that is of determinations, "a total history, in which all the differences of society might be reduced to a single form" (Foucault, 2002, p.14). Latour and Foucault see both networks and the discourses of history as under continuous duress, always at the point of "threshold, rupture and transformation" (Foucault, 2002, p.15), always ready to be re-written. If the artistic search is to seek for breaks in normative continuities in order to re-see the world, then one needs to find those spaces in which to enter and prise apart the object of knowledge (of research) and develop new connections (Foucault's "discontinuities"). The *artist-archaeologist* might need to use both the tools of an engineer to do the dirty work and the imagination of the artist (or vice versa) to develop experimental, playful discontinuities of discourse; the two figures proposed here being dependent on, rather than exclusive of, each other.

In Siegfried Zielinski's *Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by Technical Means* (2006), he leads us through an archaeology of media and machines that traverses their teleology as if it were an undulating fabric, cutting across, through and over information and ideas to link multiple black boxes (code and electrical telecommunications being just a few). Without needing to 'enunciate' them in the foreground, Zielinski weaves a discourse that feels adventurous and experimental without losing sight of that which it discusses, that is to say, it leads a poetic and rigorous duality of work and play.[60] While Zielinski's approach takes direct influence from Foucault's ideas in *The Archaeology of Knowledge* (as to how to construct historical discourse), it resides under the loosely defined method of "media archaeology". Vivian Sobchack states media archaeology's value as being "an undisciplined discipline that assiduously avoids any kind of comprehensive interpretation or totalizing theory" (2011, p.328). But, perhaps the most striking feature that applies to media archaeology is the very non-linearity of the project itself, one that could be described as three-dimensional or sculptural; a search for knowledge that might, for example, move horizontally, U-turn on itself and then radiate off at a seemingly oblique axis. In this way, media archaeology uses ideas and materials on the periphery as much, if not more so, than those in the centre; the idea of an "undisciplined discipline" could also therefore be the leitmotif of contemporary art practice.

[60] Zielinski describes this as "anarchaeology", a media analysis that is a "collection of curiosities" (2006, p.34). I would also add to this description of "anarchaeology" that poeticism is an important part of its praxis. Sometimes the path of the text leads onto uncomfortable, difficult terrain—the ethics of Aleksej Kapitanovich Gastev's implementation of a Taylorism and scientific management upon the Russian workforce for example—but then crosses back over narratives of biomechanics and cinematic media to invoke that his work cannot be isolated within just that discourse. It is nomadic and searching, which is a poetic impression when one considers firstly the nature of the subject and also that the text never removes chronology or seems to lose its footing in the material documents it analyses (the *Mundus subterraneus* and *Musurgia universalis* by Athanasius Kircher for example).

> To find one's own way through all this and arrive at original creative expression is not easy, assuming that merely reprocessing what already exists for the new channels of communication is not an option. Many art and design activists choose to create something original by establishing unusual connections between existing means of expression and/or material; such work stands out significantly from the media products we encounter every day. (Zielinski, 2006, p.255)

Objects (and perhaps machines in particular) arrive through a long chain of events and actants, opening up a space that is fertile for artists; a multitude of opportunities to both discover other narratives as well as re-examine the limitations of existing ones. For the purposes of this research, objects, materials, information and instructions are used in both existing form and combined in new connections as part of its practical work. In *When A Tyrant Eats Itself* (2020) a set of instructions is laboriously constructed so as to be a chain of human and non-human actants (Fig.34), ultimately resulting in a black box that destroys the very information it requires to function. The work *Better With or Without (*Fig.47-49) meanwhile uses an existing technological medium—a digital projector—re-aligned through various supplemental mechanical and programmed technologies to extend its original functionality. Here then, is perhaps a fork in the common discursive notion of technological black boxes that can be examined further: the identification of hardware and software as two methods or areas for an artist to play with in the exploration of the contemporary automated machine.

The hardware of automated machines is the *stuff* that makes up the ergonomic appearance of an object plus its moving parts or mechanical action; the motors, wires, chemicals and other elements that make substance its circuitry as well as the materials of casement, (sub)frame or structure.[61] Artists working with a hardware focus are often searching for new interconnections or abilities between already existing forms, such as Nam June Paik's placing of magnets on top of televisions to alter the production of its images, *Magnet TV* (1965), or taking hardware from one disciplinary signification to another, such as Cory Arcangel's relocation of video game technology into the gallery. In Jeremy Deller and Allan Kane's *Steam Powered Internet Machine* (2006), there is a literal connection between the technologies of the contemporary and industrial ages, showing that the discourse of the mechanical machine has not been eliminated despite the rhetoric of advanced networks and computerisation. Holly Hendry's recent work, *Slacker* (2019), similarly apes the industrial age; a re-circulating machine sends a re-constituted fabric, made of recycled plastics, all melted into a 'belt of organs' as an infinite loop, the machine and the body

[61] Hardware may be assembled by hand or made by other machines; it may be neatly polished, painted and seductive or prioritise function over aesthetics, but each material element will have been applied for the purposes of aiding the coming into being of a homogenous machine-form.

working together in re-constituting one another. Examination of a rhetoric of progress as opposed to Sisyphean loop is seen in the commercial-scale machines of artist James Capper, whose functional 'tools' for the automation of labour are analogies of the industrial inventor of both past and future; art practice becomes an engineering business, the products of which generate questions as to the type of marks such machines etch into nature. And, Tinguely's archaeology of hardware would see him scouring everyday objects for motors and moving parts in the discarded wasteland of consumerism, the make-up of his haul dictating the form and function of his work. These are all artists whose approaches to technology appropriate existing black boxes or play with the language of industry and its history, splicing machinic and bodily forms or dislocating automated production from its context; all are marked by an interest in creating discontinuities within the notion of hardware.

In the previously cited example of Haroon Mirza (see chapter, ∇ Machine), his use of both current and obsolete media has been a key element of his practice; the selection of those objects often dictated "by function, whether it is the devices' original function (a television displays a moving image) or an inscribed 'alternative' function" (Mirza, 2011, p.71). Minimal compositions such as *Slip Ring* (2010) and *MuseO* (2010) take radios, lamps, record players and other objects to perform alternate functions as new assemblages, with Mirza aiming to make the 'noise' between them—their interaction as part of the network—visible.

> I moved my transistor radio next to a lamp fitted with an energy saving lightbulb. Instead of treating the buzzing inference as noise, I embraced it as a sound I could exploit: a product of old and new technology co-existing in the everyday. (Mirza, 2011, pp.71-72)

Mirza's approach to the sampling of cultural forms (from objects such as radios, televisions and synthesisers to other artist's work in his reverse ready-mades) alludes to media as being discrete units ready for collaging into original works.[62] Roland Wetzel, director of the Tinguely Museum, describes Mirza's practice as "borderline experiments" in which he tests the categories of art production and its transformative potential; they "question as to the perceptual epistemology of sensual-relational processes, and the probabilities of synaesthesia" (Wetzel, 2015, p.11). Mirza's media machine ready-mades—ready-mades taken here as also being the work of other artists/people for Mirza to mobilise—are assimilated into assemblages through grafting them into alternate connections. They become postmodern Rube Goldberg machines, constructed via a periodic table of technicity in order to coolly bond their influence upon one

[62] *Automation is Dead* (2011) is another assemblage by Mirza that uses existing artwork (from another artist). By appropriating a phrase from Jenny Holzer on an LED screen (that reads 'automation is deadly'), the work uses a turntable and transistor radio that makes a sound during each revolution. In these 'reverse readymade' works there is a sense of both nostalgia and cold progress as to the adaptability of past technologies: automation is dead, long live automation.

another.[63] This seemingly 'trial and error' approach (aligned to methods of science and the laboratory) gives rise to artworks that may feel as though they either gently collide like bumper cars or, alternatively, have been forced into one another as if sent through a Large Hadron Collider; all the while, the hope is that *something* might just grip together enough to sustain a relation, even if it is precarious.[64] It is a method that both parodies and mimics brute force automation, an experiment which produces as much information on failure (incorrect answers) as it does success.

Mirza's work is an archaeology of existing media and machine objects that retain some transparency for the recognisability of their function. His use of existing and often obsolete objects of consumer culture acts as stand-ins for the "punctualised" points in the actor-network as a "multitude of traces" (Latour, 1987, p.235). Their joining together then becomes, in effect, a teetering re-punctualisation of artefacts into a new black box that can provide interesting and unexpected results. One might question, though, whether there is sufficient archaeological depth to fulfil what Garnet Hertz and Jussi Parikka have described as "depunctualisation", "a practice that shows a circuit of dependencies and infrastructures" (2012, p.428) within the commodified objects he uses. One might describe Mirza's work, following the frame of the laboratory, as more of an alchemic approach to object punctualisation, with the aim to produce sound from the machine as if it were a mystical daemon, making the voice of the black box be 'heard' as somewhere between sound, noise and music. Beyond the pleasure of a new discovery—the sound of inanimate 'things'—that is undertaken through re-wiring hardware, could the underlying text that produces that change also be available for digging into? Returning to Zielinski:

> Few activists, however, take the more daring path of exploring certain points of the media system in such a way that throws established syntax into a state of agitation. This is poetic praxis in the strict sense that the magical realist Bruno Schulz of Poland understood it: "If art is only supposed to confirm what has been determined for as long as anyone can remember, then one doesn't need it. Its role is to be a probe that is let down into the unknown. The artist is a device that registers processes taking place in the depths where values are created. (Zielinski, 2006, pp.255-256)

[63] Rube Goldberg (as also Heath Robinson) machines typically consist of an over-designed and complex set of mechanics for the purposes of a simple function. It is often attributed to an aesthetic that is 'lo-fi' in construction, meaning the assembly and re-appropriation of everyday items to solve the problem at hand.
[64] Pil and Galia Kollectiv (2009) noted how "flimsy yet carefully balanced assemblages" were becoming a de-rigueur method of object arrangement in sculpture as part of a rise in interest around object-oriented thinking and philosophy. Their presentation investigated how such thinking and practices encouraged an anti-humanist political position, they argued that if all objects including humans are to be treated on the same ontological plane, "we cannot truly believe in any demand for equality still lacking" when in reality this is not the case.

In automated objects, values and action are written both in the hardware and the software of its being; the hidden operators of automation use language as their means for control. For the artist-archaeologist to go deeper into the depths of automated technology, both the physical material form *and* the language that describes its motion or action may need to be extrapolated. This leads to the second element for consideration in this archaeology of automated machines: software. As already alluded to earlier in the thesis, the end of the machine age that Pontus Hultén pointed to was a concerted move from a hardware focus to software in art; although this line is not a distinct 'cutting off' but a folding in of additional technological capabilities into the sphere of art. Sol LeWitt and Channa Horwitz offered coding and programming of art through analogue instruction and visual diagrammatic before Harold Cohen and other digital pioneers (of computer art in both America and the UK) were also exploring the programming language of machines.

A general definition of software is described by Andreas Broekmann as, "the operational layer […] which is made up of coded electro-magnetic signals, and which forms the interface between user intentions and the technical hardware of the apparatus" (Broeckmann, 2007, p.158). As such, the hardware of the machine is also linked to software and its coded, written structure– beneath both software and hardware lies a text. At the very core of this is machine code, an incredibly difficult language to learn and so most programmers work and write at the interface of high-level programming languages, those which represent more closely the syntax of natural language. These various languages are still technical and require precision, only they now import the use of functions, expressions, structure and metaphors to create a more readable workflow.

> Programming is a species of logical writing whose operational efficacy derives from the correspondence of surface display (that is, what the screen shows the interpreter) with coded instruction, where correspondence is not equivalent to representation. Natural language works on principles of coherence, empathy and a level of syntactical forgiveness. (Weight, 2006, p.419)

Vikram Chandra, better known for his fiction work, simultaneously worked as a code writer and in *Geek Sublime: Writing Fiction, Coding Software* (2014) he makes an interesting comparison between the flexibility (and ambiguity) of language and the nuance of a narrative, as opposed to the procedural nature of coding. To be able to play upon coding's syntactical tightrope is incredibly difficult; writing code for software is difficult as "it tries to model the irreducible complexity of the world" (Chandra, 2014, p.125) into a cohesive set of dependencies. Aristotle, in his *Poetics*, wrote of plot development, that it should represent "a single unified action—and one that is also a whole" such that the "transposition or removal of any one section dislocates

and changes the whole" (1996, p.15). If an element, he goes on say, can be removed and make no discernible difference to the whole, it can be taken away without consequence. A coders job is to discard anything that does not add to the required function of the programme; for the difference between 'good' code and 'bad' code is its efficiency of form. Code also, of course, needs to work and while inefficient code can do this, the expression of form within the smallest data space implies a longevity and cohesiveness that would require radical re-thinking to break apart.

Antagonism

When software is sufficiently succinct in its coded and aesthetic form, it can be packaged up and distributed, becoming another tool to extend the hardware of the machine. These tools ('applications') are designed, written and made for us, though following Flusser, they also *write* us.[65] Software packages such as Adobe's Photoshop and Illustrator have become industry standard tools for the production and editing of visual forms that cascade through the networks of image-exchange, both analogue and digital. These contain built in methods of working and production—the 'tool palette' being one—that allow for creative production, but are also the limitation of the software, pre-describing the possible aesthetic forms and gestures.[66] In 1988, the artist Maurizio Bolignini started to programme machines to create a continuous flow of expanding, random images and from 1992 onwards he started to seal these machines (titled *Programmed Machines / Sealed Computers)*, pouring wax or silicone into their input and output ports; the images, therefore, have never been seen. The various installations of the work, always consisting of several grey computers linked together for electrical power,[67] would lie flat on the floor, humming quietly, computing and expanding their portfolio of randomised images *ad infinitum*. Our interaction occurs only as the position of two bodies—the computational, material box and human form—in parallel. The void between what occurs within the automated machine and human subject, normally filled by the absent visual interface, makes the work take

[65] In divergence from this view, there are (online) communities that work as collaborative or shared coding methods that are open source; the Linux operating system being one such example. While the system is free to use and distribute, to contribute to the Linux kernel would involve a considerable learning curve meaning that while it lowers the monetary cost, the system itself is still very complex.

[66] The artist and programmer Adrian Ward produced a project for Transmedial 2001 titled *Signwave Auto-Illustrator*; a left-field competitor to Adobe's software product, it was a subversion of Illustrator's workflow logic as it intentionally provided partly uncontrollable and nonsensical tools. "There is a big, tempting button in the preferences palette with the caption 'Don't push this button,' which paradoxically pinpoints and heightens the desire to push it" (Pold, 2008, p.36). It would seem that no matter the function or danger of the action being asked by the button, the desire is always to use it and as such, be controlled by it.

[67] Each computer being the grey, geometric object so familiar in the 1990s visual language of personal computing, prior to the competing aesthetic form of Apple's iMac G3 which re-focused the computer as a design-orientated object and biomorphic aesthetics/sensuality.

an antagonistic form to both human and machine.[68] "The antagonism of denied direct engagement forces the spectator to examine the relation of the surface of the work and of their own parallax position to what might lie beneath" (Benjamin, 2016, pp.87-88).

Antagonistic acts can also be found with artistic (and other cultural) praxes of not only hardware but software manipulation: hacking, glitching or data moshing are all methods to interrupt the flow of code. These are actions that push at the edges of failure and collapse, moving automated processes towards a point of breakage. In relation to Amazon's MTurk, there have been reports of Turkers, 'hacking' the system through the use of their own algorithms and using bots to complete tasks, pitting automaton against automaton (Dreyfuss, 2018). While the superficial understanding of hacking is that of a malicious and illegal act, being labelled as a hacker does not sufficiently encompass the range of approaches of those that may go under the term.[69] As the complexity of computer languages and mediated networks has expanded through the wider connectivity of the internet, the hacking of such structures—as a combination of art and science—has become increasingly in contestation with those that claim an 'ownership' of digital space. In 1997, Cornelia Sollfrank hacked the first Internet Art competition run by a museum, *EXTENSION* sponsored by Galerie der Gegenwart of the Hamburger Kunsthalle. Sollfrank created a web based, automatic art-production machine that allowed for nearly 300 fictitious female artists to enter the competition. Titled *Female Extension* (Sollfrank, 2010), its method was akin to the surrealist game, *Exquisite Corpse*; each of the fictitious artists was assigned a 'web page' that was auto generated by the programme, splicing sections of other randomly sourced HTML pages found online. Due to Sollfrank's intervention, two thirds of the entries were female, yet the finalists selected were all-male; it was at this point that Sollfrank made her intervention public. This dissention and institutional critique intended to place, as well as expose, a glitch in the system. This glitch brings forth error into the network and breaks the rhetoric of machines and automation in terms of their decorum and 'proper' use (Bellinger, 2016). In this sense, moments of anomaly, error and failure can challenge the "procedural rhetoric" (as developed by Bogost, 2010, pp.1-64) of the machine as well as the wider rhetoric of the social, political or cultural attitude towards 'efficiency'; the rules and logic of the machine's 'proper' function being re-routed through a playful, creative diversion.[70] This diversion, the exposition of an inefficiency

[68] This spatial difference between that of the black box and human geographic measurement can also be seen in David Barrett's online works of the same era: *The Square Mile* (1996a), *Just Browsing* (1996b) and *Hundred File Dash* (1999).

[69] Students at MIT in the 1960s would have found it a badge of honour to be called a hacker; the term being used to identify an individual who has the ability to develop creative, innovative solutions to difficult computational problems.

[70] Bogost defines procedural rhetoric as "a technique for making arguments with computational systems and for unpacking computational arguments others have created" (2010, p.3).

or lack of self-awareness in the machine, allows antagonistic acts to be actualised: a glitch in the system is therefore not an error, only a road not normally followed.[71]

For the artist and academic Rosa Menkman, the procedural rhetoric of automation is a drive towards a "noiseless channel", with her relation to *glitching* as a means to, "[e]mploy bends and breaks as metaphors for différance" (2011b, p.11).[72] By disrupting the linearity of an image's data (see, for example, the project *A Vernacular of File Formats*, 2010-2020), Menkman's work emphasises the pixelated and grainy image construction of compression formats and data degradation. But, it is not without irony that the aesthetic of glitching she has developed, alongside other associated ways of corrupting images, have been appropriated as a form and programmed into 'legitimate' applications, such as *Glitcho* or *photomosh.com*.[73] The over-arching machinic system neutralises antagonistic acts and reigns in modes of dissention by turning them into stylistic forms. Rather than being a mode of encouraging the—potentially creative—energy and play of entropy, antagonistic acts become a form of feedback that is re-introduced as a commodified form. She writes that, "the 'real' glitch in glitch art has slowly diminished into a virtual signifier" (2011a). Menkman (in collaboration with John Larsby) developed *Monglot* in response to this.[74] It exists as a downloadable piece of software that auto-generates a random glitch within an image's data set, though with its graphical user interface the work appears in the context of a semi-research/laboratory-like mode of experimenting with file types; intentionally adopting the feel of an alternate pedagogical tool for the understanding and learning of data formats. *Monglot* attempts to keep the cycle moving by 'glitching the idea of glitch software'. The relation between error and correction seems therefore to be cyclical. The process of 'error correction' can be a means of repeating the structural learning process of action ⇨ outcome ⇨ reflection but it is the self-criticality and perception of reflection that determines change. The practice of error correction in coding, for example, uses algorithmic analysis to identify spurious elements within a data set and eliminate them based on the 'average noise' of the system; a process that limits accurate reflection. Those elements on the polar ends of the

[71] Sylvere Lotringer and Paul Virilio also identify: "Malfunction and failure are not signs of improper production. On the contrary, they indicate the active production of the 'accidental potential' in any product" (2005, p.2).
[72] This 'noise' is also an intrinsic internal element to the system. Menkman notes how the noise "contextualises" the information being carried through the system and allows it to be a functioning channel—a conduit—for transmission (Menkman, 2011b, p.14; see also Parikka & Sampson, 2009).
[73] As a further example: Paul B. Davis was one of a number of artists working on 'datamoshing' or 'compression aesthetics' as a new visual approach to moving images when, just before a solo exhibition at Seventeen Gallery in London in 2009, Kanye West released his video for *Welcome To Heartbreak ft. Kid Cudi* in which the aesthetic Davis was working on had been appropriated. "[T]he very language I was using to critique pop content from the outside was now itself a mainstream cultural reference" (Seventeen, 2009). It raises pertinent questions of the cycle of cultural image production and how tools of antagonism become reflected as "empty signifiers".
[74] The title, *Monglot,* is a combination of the words "Mongrel: the offspring of a variety of species, of mixed background, bastard, or imperfect crossbreed and Monoglot: knowing only one language; monolingual" (Menkman, 2011a).

scale become nullified in this smoothing out and it is this instrumentalisation of automation—as a means to lessen difference—that Menkman et al. aim to disrupt.

Ultimately, we can see that artists seeking the play-element of automation, are frequently using both elements of hardware and software and in de-lineation or cooperation, all though are re-writing the instructions for use. While the hardware/software duality is a well-known one, the division, in reality, has become ontologically void as quantum computing and organic circuits (wetware) blur the binary and while it has been useful here in allowing an initial move—the first 'picking apart' in a black box operation—the entanglement of the two fast becomes apparent.[75] In Foucault's notion of "discontinuity" within the tracing of a history; any attempt to divide hardware and software discourses would create too easily a bifurcation of the machine.[76] But, if our only means of action is to either ignore *or* engage with the interface of a black box, whether it be composed of hardware or software, any step outside of its current continuities is perhaps the most important one.

To go one step further, as well as playing with existing forms of machines and automation, one might need to build 'from the ground up' (as much as may be possible). Zielinski:

> The only effective form of intervention in this world is to learn its laws of operation and try to undermine or overrun them. One has to give up being a player at a fairground sideshow and become an operator within the technical world where one can work on developing alternatives. For artistic praxis with computers in particular, this means learning the codes they function with.
> (2006, p.260)

This problem is mired in technicity, funding and economies of time as well as knowledge. Early automated artworks and computational play were often linked to those academics and institutions that had the resources to own such tools or technologies. Art can of course be parasitic or take advantage of external funding/collaboration with private industry, though that often brings with it an additional set of politics and issues; but conversely if an artist-engineer works in isolation, progress can be excruciatingly slow. Erkki Huhtamo describes the arrival of a new 'kind' of artist that is required to do such a role, the artist-archaeologist; a mode of

[75] For a further discussion on the ontological relation of hardware and software see Duncan (2009) and Moor (1978). Duncan in particular, places these discussions alongside quantum computing in which hardware and software are entirely merged. This also leads onto further discussions about quantum entanglement and machines in relation to computing; that what we normally perceive at the 'classical' level can, at the extremes of macro and micro scale, seem to break the laws of physics (i.e., supercooled Helium—a superfluid—seems able to defy gravity through zero friction). In this way, quantum computing starts to account for uncertainty and (perhaps) play, going beyond the binary 0's and 1's of determinism through logic.

[76] One could similarly look at the technical objects in early forms of moving images, such as the zoetrope, where an alternate historical discourse of the hardware/software duality could be collapsed through framing such objects as having a program for use already 'written' within their material construction. At all technical levels, hardware and software, one can see that they are dependent upon how one might 'read' the function inscribed upon them.

operation that perhaps fits the previous analysis of Mirza's practice. "The role of the artist-engineer, which rose into prominence in the 1960s (although its two sides rarely met in one person), has at least partly been supplanted by that of the artist-archaeologist" (Huhtamo, 1996, p.243). One must be careful here that the artist-archaeologist is not placed as the honed, hunter of knowledge and excavator of information within material and immaterial networks, while the artist-engineer is laden with their hands at the mechanical machines of Modernist productivity. It could too easily be seen as a pole of verticality akin to the play/game split, in which the archaeologist metaphorically digs down into the complex web of historical discourse to find new, flowing, discontinuities to play with, while the engineer takes their materials and attempts an out-moded 'construction' of the world from the ground up (as if a child playing with building blocks).[77] In the process of gathering, assembling and building 'with what one can' there is the exploration of one's own limitations to that of the material at hand (be that learning to code, constructing a circuit board or wiring a motor) that of itself has value.

My belief is that while media and materials have shifted alongside machine and automation development, both forms of black-box investigators will be required to go beyond the pre-existing use of technology and as such be constantly re-designing, re-thinking and re-aligning the trajectory of their work (and play). Huhtamo also suggests this person to be a "t(h)inkerer", creating the image of a garden-shed enthusiast who places the 'this and that' pieces of their "depunctualisation" (Hertz & Parikka, 2012, p.428) into continuously variable ensembles, often without precise expertise but a wild sense of experimentation.[78] Whichever analogy of practice is applied, Zielinski defines the key element at stake within media archaeology as the nurturing of "dramaturgies of difference" (Zielinksi, 1997); a mobilisation against the view of linear progression. It encourages thinking to be maintained during the dramatic release of tension—a seemingly paradoxical 'thoughtful joy'—when an artist, engineer, archaeologist or t(h)inker intervenes in their chosen black box. This is a call that encourages "thinking to continue during pleasure" (Zielinski, 2006, p.259).

> The least that artists and engineers who engage with such processes can do is to ensure that the re-formation, which takes place in the course of the process, sets marked differences between the qualities operating on the input and the qualities of experience operating on

[77] Zielinski notes "Formalisability and computation on the one side [games], and intuition and imagination [play] on the other, are the two poles of the *mixtum compositum* media art with regard to the actions of the subject. To understand these poles as two ends of a scale that can be played in both directions is an alternative to a dualistic view, which is an easy option but also fatal, if one remains trapped within this kind of thinking" (2006, p.274).
[78] "Depunctualisation" refers to Latour's *Actor-Network Theory* (2005), where punctualisation "is used to describe bringing components together into a single complex system that can serve as a single object" (Hertz & Parikka, 2012, p.428).

> the output. This would indeed be efficacious work on the interface; that is, its dramatization. (Ibid., p.274)

As Tinguely and Klüver were to go bounding through the junk yards of New York to re-formulate motors, parts and materials from obsolete machines and consumer items, today a similar archaeological game can be seen in the territory of the various digital interfaces (inputs) and methods of display (outputs) that artists can play with in order to create works that reveal the dramaturgy of black boxed machines and their automated actions.

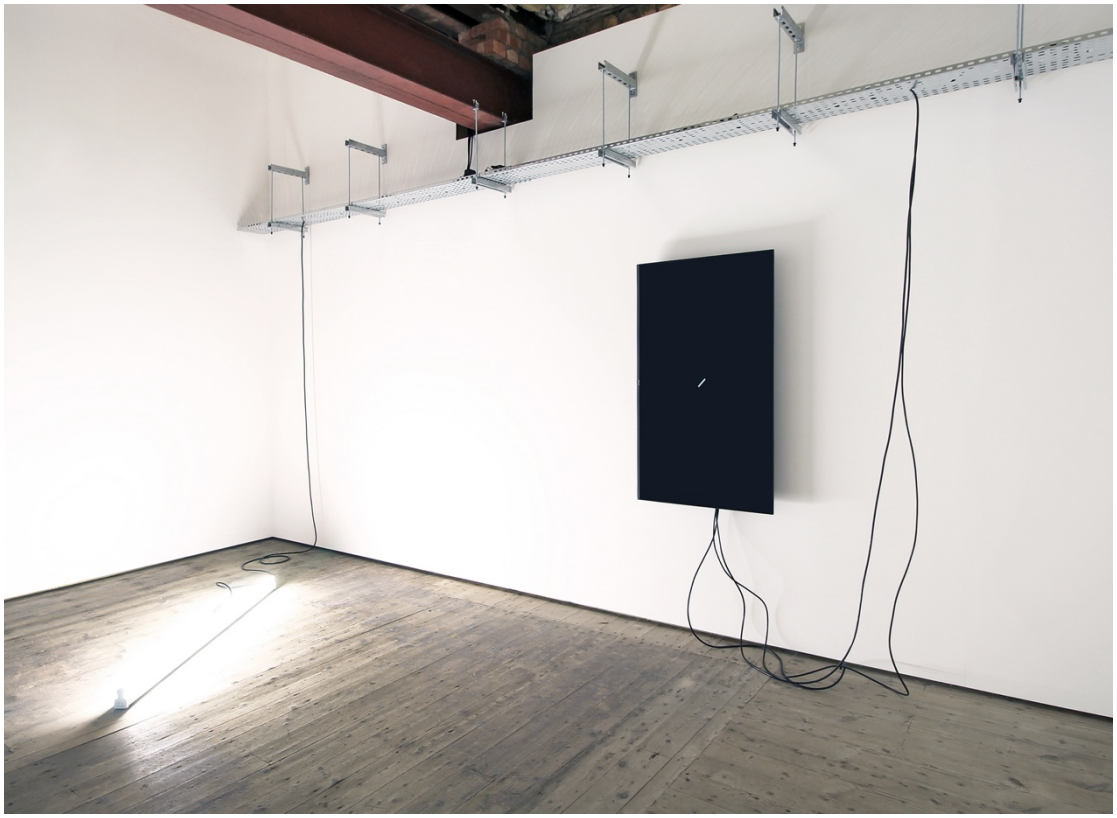


Figure 34: *Mark Selby* (2020). [Exhibition] Three Works, Scarborough.18th September-22nd October.
Installation view: Selby, M. (2020) *When A Tyrant Eats Itself.* [Installation] Dimensions Variable.
While a microcomputer programme runs, a light in the space is turned on automatically and a rotating 'cursor' on the screen indicates the computer is working. The programme deconstructs every frame in the video (selecting one frame to glitch) – the film is 3 minutes long, resulting in 4320 frames to work through; once the film is then recompiled, the light switches off and the resulting video played on the screen. The gap between playing each video and the running of the programming is approximately 6 minutes. In this installation there were 3 videos being used. The video image is also turned back into audio via the programme and is played through the monitor speakers. This loop continues throughout the duration of the exhibition.

Figure 35: *Mark Selby* (2020). [Exhibition] Three Works, Scarborough.18th September-22nd October. Installation view: Selby, M. (2020) *When A Tyrant Eats Itself.* [Installation] Dimensions Variable.

Figure 36: Selby, M. (2020) *When A Tyrant Eats Itself.* [Video still – Location 1]. End of exhibition.

Figure 37: Selby, M. (2020) *When A Tyrant Eats Itself.* [Video still – Location 2]. End of exhibition.

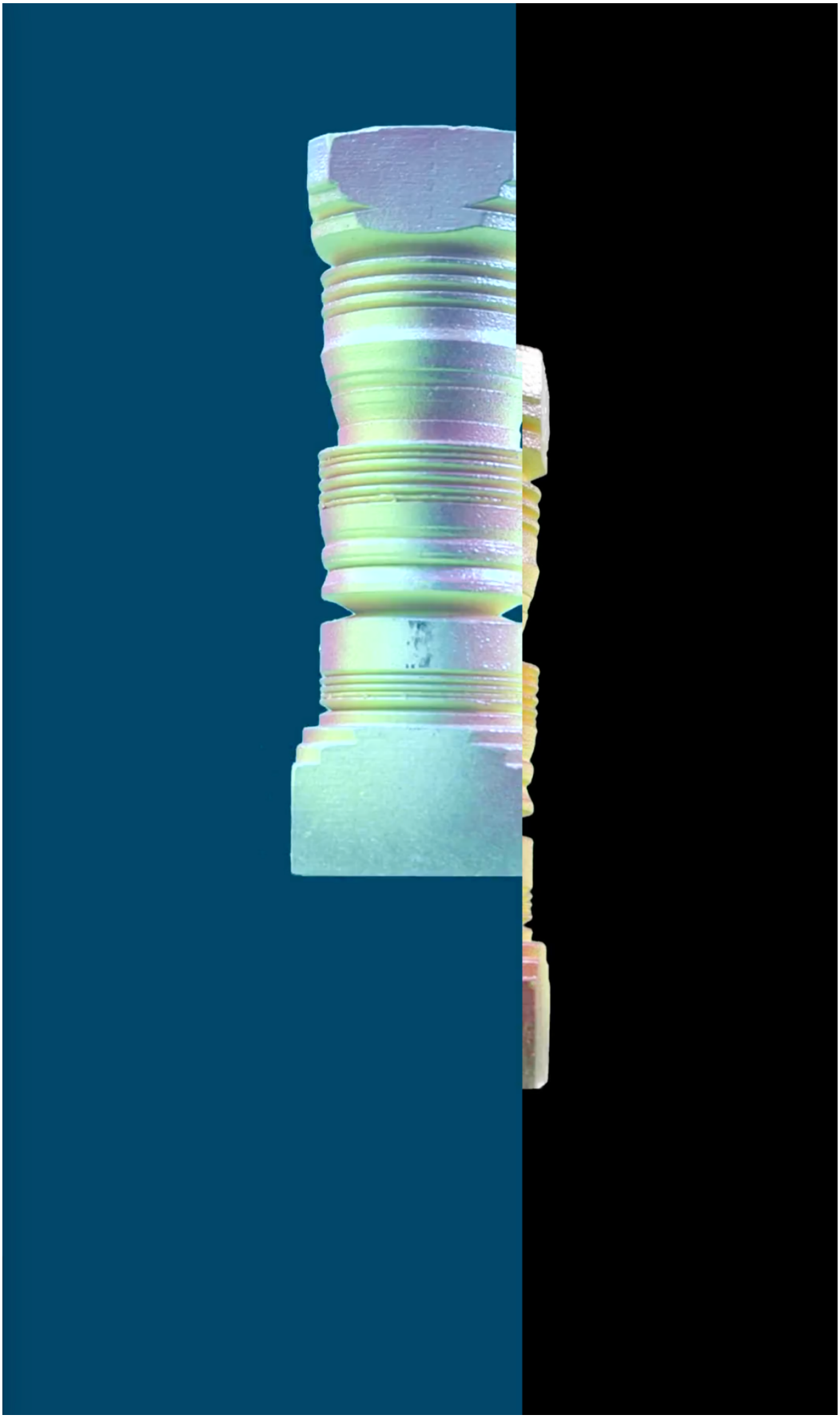
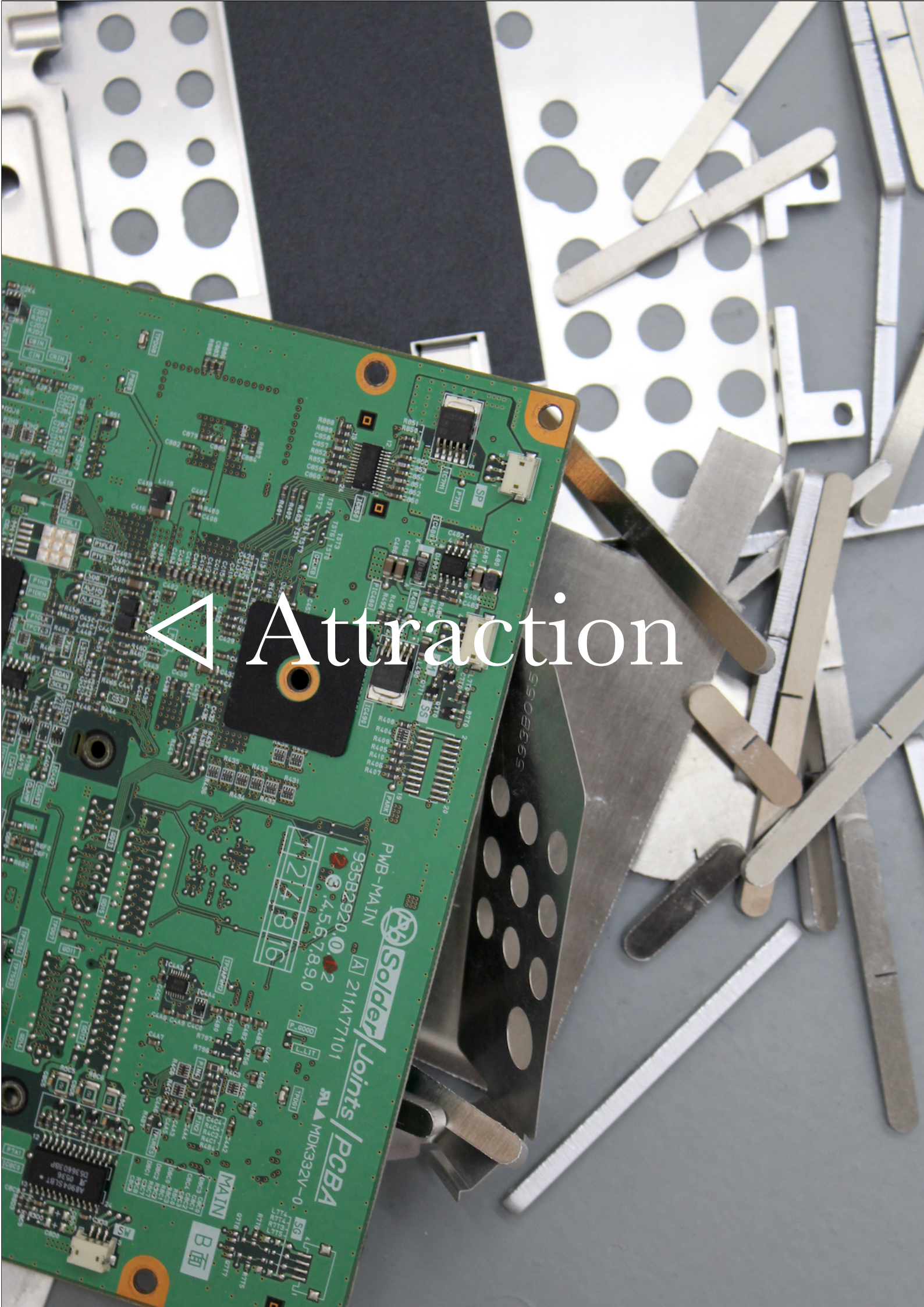


Figure 38: Selby, M. (2020) *When A Tyrant Eats Itself.* [Video still – Location 3]. End of exhibition.

In one sense, I remember how I got here. It had been an early start and the sense of trepidation that I awoke with still lingered…despite checking multiple times on the map that there was somewhere safe to stop nearby. At the same time, I was also unsure of how it had come to this. It was never my plan to be precisely 'here', yet here I was; a machine had told me quite pragmatically that this location was the next destination in a long series of commands. Luckily, only 0.1% of the UK is made up of water and even luckier perhaps, so far, I hadn't ended up in a peat bog; of which there is a near 1 in 10 chance of!

Need some help?

This did not feel caring or collaborative and certainly not playful; fear and uncertainly had put that to bed. And I wondered what sort of help was implied… help for the machine that I was sat in by the side of the M11, or help for the machine that I had become?


◁ Attraction

I only have one photo of me on a ride; I am on a log flume at an unknown theme park. That photo, neither flattering nor descriptive of the actual experience, seems distant to me. I have never been one for the free-falling, free-wheeling adrenaline rush of an amusement; there has never seemed to be much desire to push at the limits of bodily precarity. I do remember understanding, in the lead up to my photographically documented fall, that tension formed almost a greater part of the ride; indeed, it is this anxiety that I remember more clearly than enjoyment. The anxiety of being asked to trust something I knew nothing about and to abandon the pleasure of analysis for a different type of joy.

Figure 39: Selby, M. (2017) *Untitled.* [Prototype projection machine].
The initial version for a rotating projection machine was constructed from plywood and was not fully programmed or able to tilt. At this stage, the process of developing a suitable 'slip ring' for transfer of power and allowing continuous 360º movement proved problematic and the aesthetic form overly anthropomorphised.

A machine capable of rotating 360° and tilting on its vertical axis by ±30° is fixed in the centre of a space. Once turned on, the machine rotates to a random position, measuring the distance to the surface it faces before adjusting the zoom and focal length of its lens.

After a random period of time—generated by the computer—it repeats.

The machine is both demonstrating and learning; searching and projecting, testing and being tested. The projected image: the duochrome eye test, a test screen for focal optimisation and spherical correction asks for a subjective response to find a scientific answer. Trial and error.

Better with…
Better without…

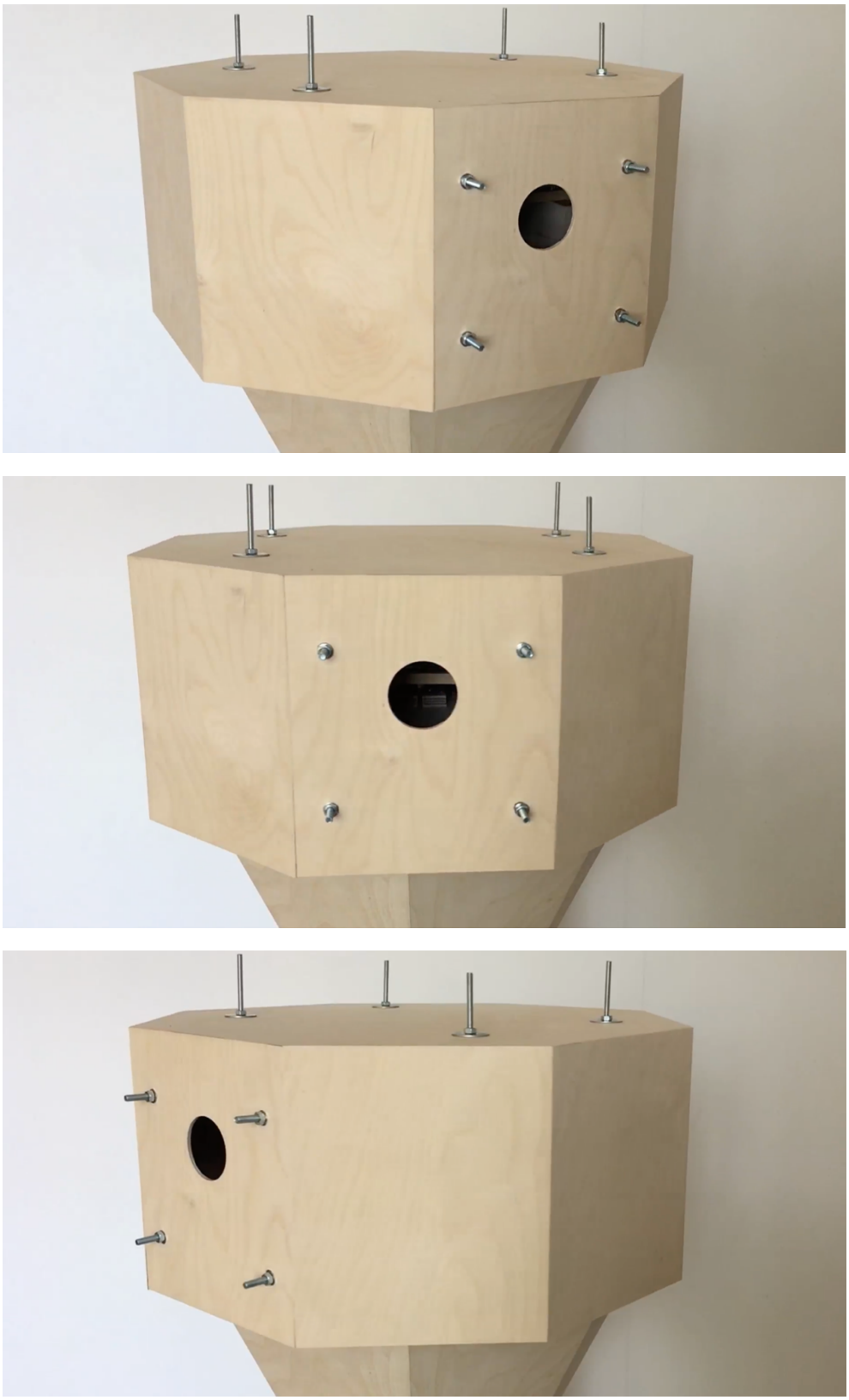


Figure 40: Selby, M. (2017) *Untitled.* [Prototype projection machine].
Once the movement of the projector was resolved, the machine was further developed into an open system capable of responding to context via the use of LIDAR sensors as used for Google's autonomous vehicle design.

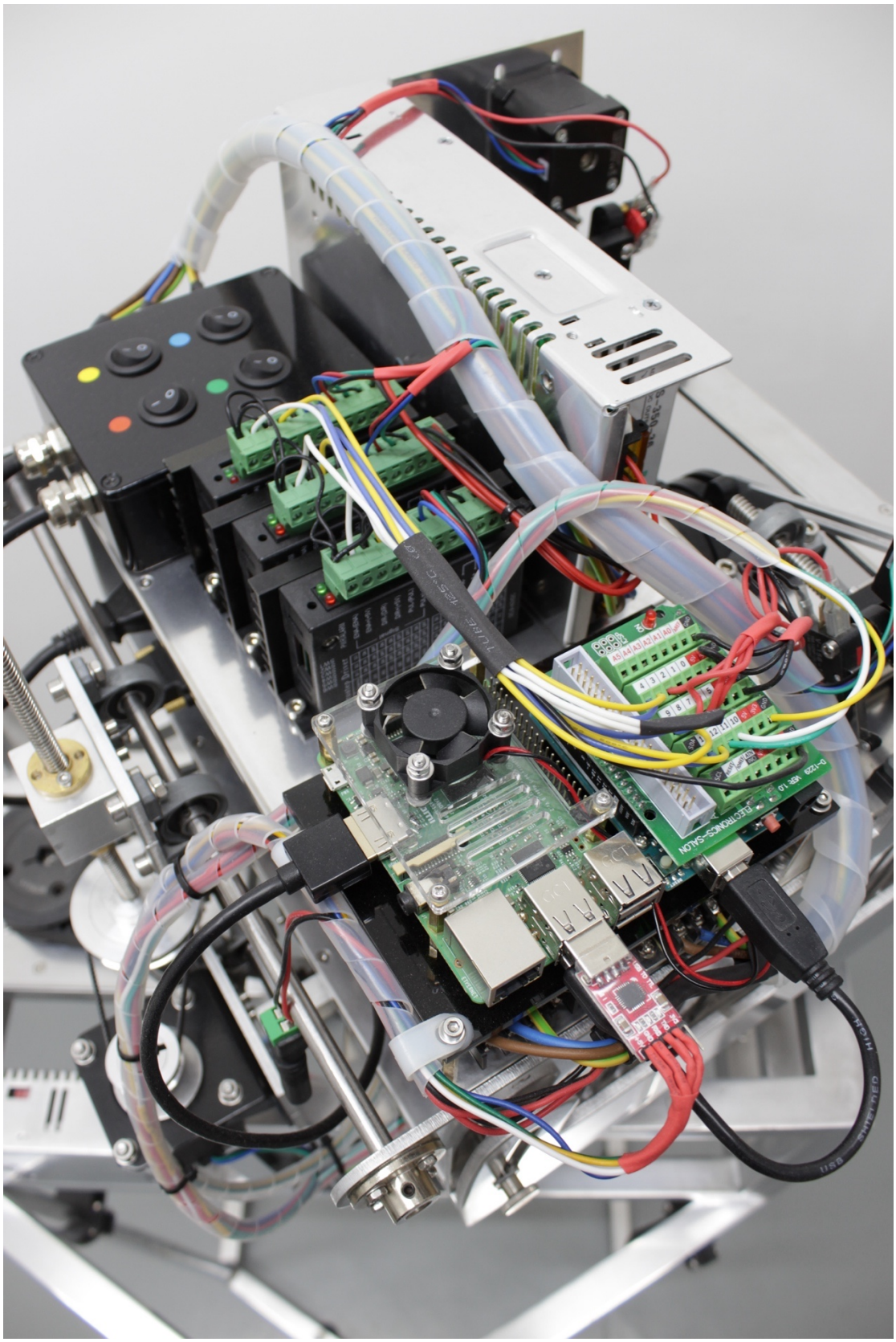
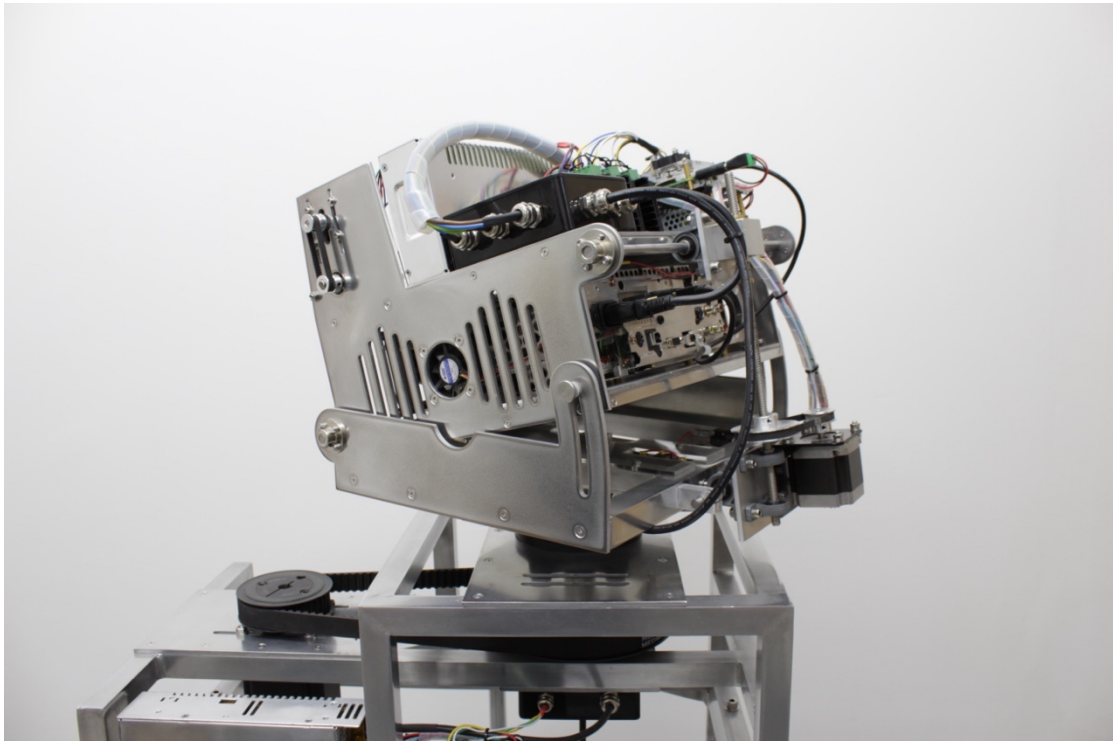


Figure 41: Selby, M. (2020) *Better With or Without.* [Sculpture] 160cm x 95cm x 70cm.
Detail view, top of the final machine. It used both Raspberry Pi and Arduino as controllers for computing the sensory data, film and movement. 4 motors were used to control movement (and adjustments of the projection lens) and 6 additional fans maintain cooling. The frame is constructed from welded and laser cut aluminium.



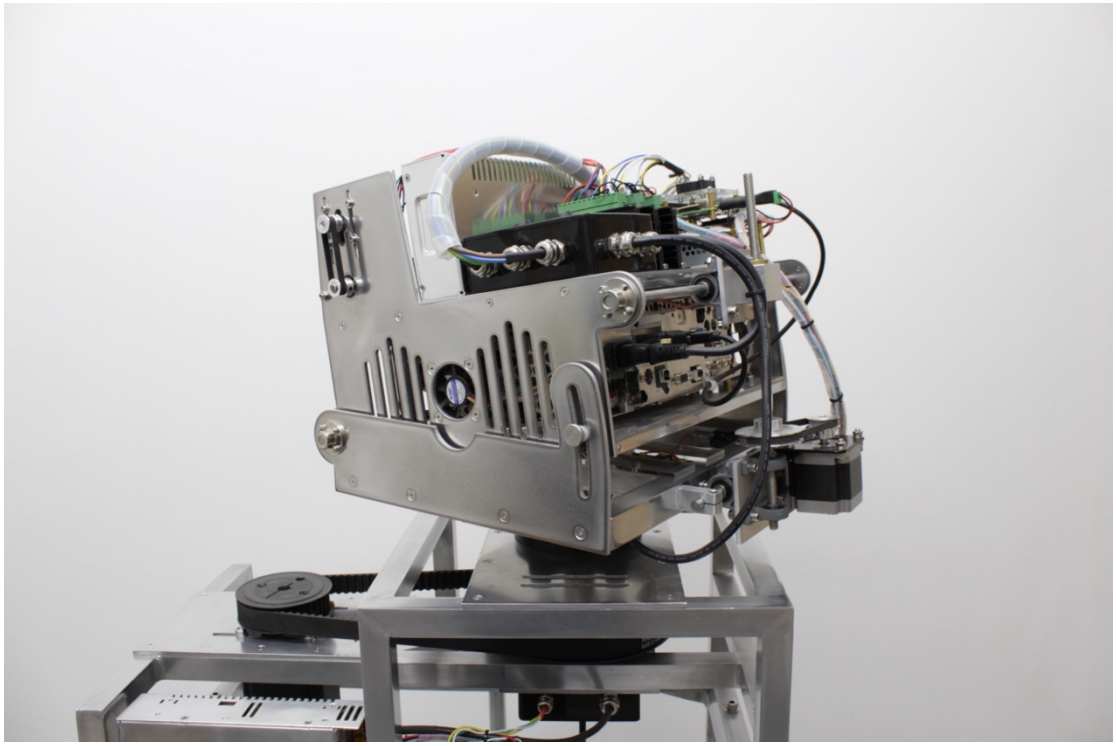
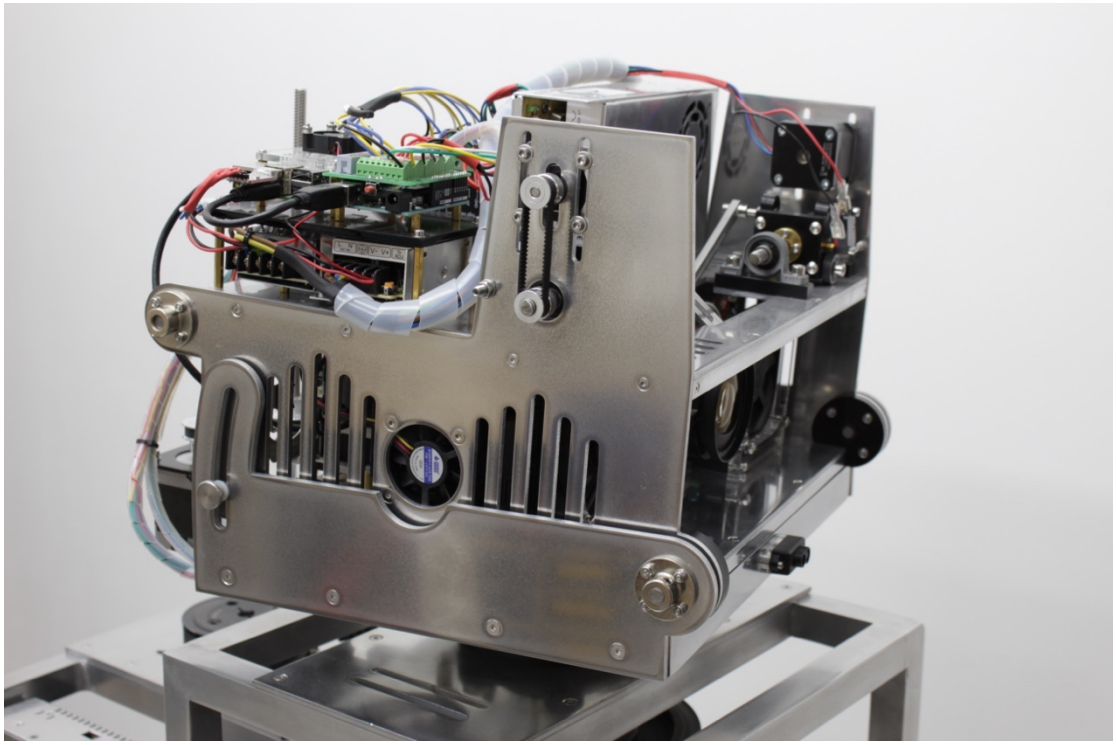


Figure 42: Selby, M. (2020) *Better With or Without.* [Sculpture] 160cm x 95cm x 70cm.
The angle of the projection is able to shift + or - 30º on the vertical.



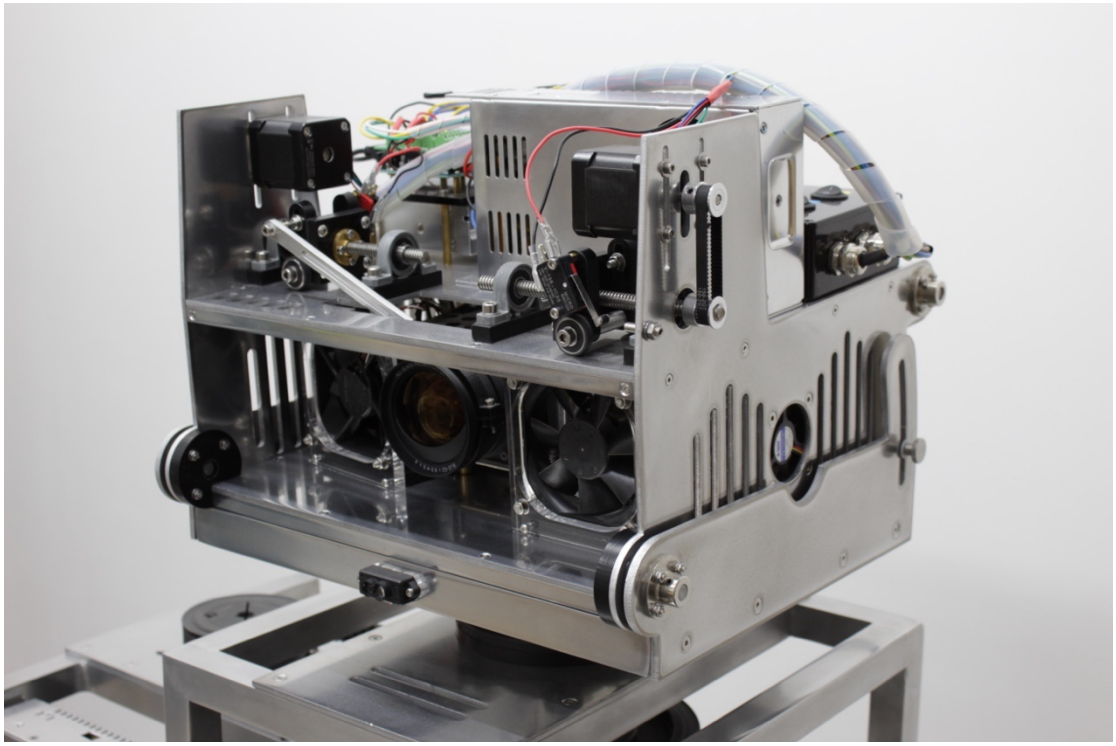


Figure 43: Selby, M. (2020) *Better With or Without.* [Sculpture] 160cm x 95cm x 70cm.
The machine can rotate continuously (both clockwise and anticlockwise) through 360º as well as change focal and zoom on the projection lens. All movements are able to occur simultaneously.

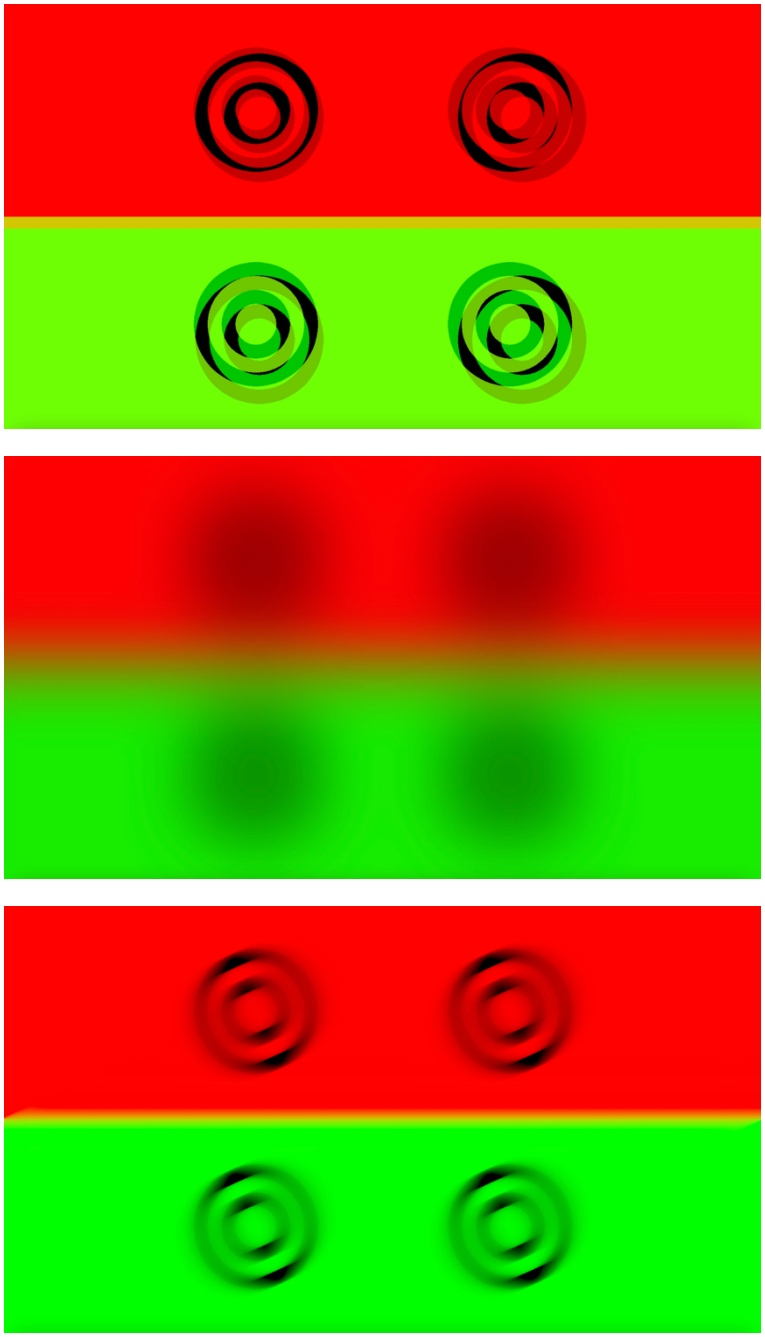


Figure 44: Selby, M. (2020) *Better With or Without.* [Sculpture] Video stills.
The projected image from the machine is the standard duochrome eye test used by opticians; the machine is programmed to interfere and blur the image, playing a game with itself and its context as it maps out the space.

A Tyranny of Perception

To review so far, we can say that *machina ludens*—the playing machine—is one that will be present to us as a network of black boxes, able to conceal its automation of the user and viewer via appropriation of the play-element. Art, in its archaeology of the machine object as both material and discourse, can attempt to create different dramaturgies of configuration to 're-see' this black box. At this point, and in the final chapter, it is the direct effect of the play-element's representation, as an encounter for the viewer, that will be considered; a reflection on where the sensorial notions of pleasure and joy sit within the procedures of automation, machines and play. How can a complex representation of frivolity, of dramaturgy—and in Huizinga's terms "joy"—be present in automated machines that are, by their nature, capable of only following instructions?

I apply the notion of *attraction* as a means to scribe some form around the subjective response to automated machines and those object-subject relations that may initially appear in excess of a machine's logical function. The supplementary idea of an aesthetic attraction—an additional layer upon function—should be avoided as the contestation in this research is that attraction is prefigured within the function of an automated machine; attraction is the sum spectacle of the input ⇨ process ⇨ output model rather than an addition to it. The word *attraction* would seem also concurrent to the theory and ideas followed thus far, specifically in relation to networks and their assemblage, for it describes a force between objects that draws them together. The potential pull of one Latourian actant against another is present from organic atoms to inorganic bodies, from individuals to organisations, from electrical node to a timing chain; the scale of actors playing at any moment within the black box of a machine makes for a spectacle of 'production' that appears bound together and as natural as the swarming of bees or ants. This image of action at a distance, of multiple actors in a network moving towards the same goal without direct connection, means seemingly independent parts can work together and interact; an illusion that automated machines are certainly approaching. In the concept of the black box, it is clear black boxes are attracted to one another for what they are able to do *for* each other, without necessarily needing to know their precise operation; black boxes always move toward the specified production demanded of the whole. Autonomous cars are densely packed black boxes that swarm with data from multiple sensors, spreading out that information to other moving parts (black boxes) within the machine; to sit back within such a vehicle and watch this *in motion* can be both terrifying and thrilling.

An additional purpose for using the word *attraction* relates to the position of the human subject within the performance of automation; the term pertaining to a history of play that follows a cultural and technological thread of the machines as objects made for pleasure outside the 'serious' domain of work. The Turk and other "devices of wonder" (see Stafford & Terpak, 2001) were able to serve such a spectacle through museums and exhibitions that were then repeated at the advent of moving image and cinema (and more recently in video games). Each can be defined as excess expressions to the everyday; an attempt to submerse oneself in a pocket of play—a magic circle—if only briefly. Automated machines can be seen and used as theatrical entertainments which lean heavily upon attractive play effects in order to encourage a collision between thrill and anxiety, between danger and safety, between action at a distance and immediacy. The Turk can be seen as an object that enthralled audiences with its surprising abilities and the novelty within its very existence; an object never thought possible to be made by the human subject was thrilling to see (a feeling no doubt fanned by the showmanship within its display) even if the game itself—chess—is a game of slow progress. The performance of the Turk was received with joy and delight in the social milieu, but it also brought onto the horizon a feeling of anxiety; it paradoxically prophesises an unknown landscape of understanding that asks the uncomfortable question: what is it to be human? This is a question so immeasurable that its attractive effect, either anxiety inducing or pleasurable, can immerse us entirely.

In the example of the Turk, its false play projects a particular viewpoint and situates the viewer in a position (quite literally seated) such that they are 'carried along' by the unfolding theatrical display, to be thrilled and worried on a journey into fiction or simulation. This can be thought of as a passive model of object-viewer relations of the type Guy Debord (1994), Jean Baurdrillard (1981) and Marshall McLuhan (2001) warned against; the human as receiver of directions and positioned by the media through our engagement with it. It is a model of the spectacle that has become more visible in exhibition design and curatorial methods which, in the contemporary era, have privileged the 'interactive' as a means to try and democratise cultural spaces away from passivity. Interaction has now become a misnomer for particular types of object-viewer relations that frame a use of technicity; it is one that deems the ocular experience as a mere viewfinder or 'window onto the world', while the haptic approach of instigating a physical connection between artefact and viewer has become the most sought-after primary experience (of many cultural institutions). The desire to activate the viewer, from a critical viewpoint, is the reduction of art to entertainment and as such, recursion into the system it seeks to avoid (one that encourages alienation and regimentation). Play is no longer the production of culture but simply a mirror to the current system and organisation of life. Huizinga writes: "Mechanisation, advertising, sensation-mongering have a much greater hold upon art because as a rule it works directly for a market and has a free choice of all the

techniques available. None of these conditions entitles us to speak of a play-element in contemporary art" (1950, p.202). Huizinga saw that art's "eternal child-like innocence" (Ibid.) would be corrupted by Modernist rationality, and a growing culture of entertainment through commerce, that would make exhibitions of art simply facile replicas of a degrading culture. While this notion is a dubious standpoint, for it identifies art as being for the privilege of an elite who can uphold its 'purity' rather than as part of a culture that is social and dialogic, Huizinga's concern as to the relation between art and the society warrants attention. It is clear that the 'relational turn' (to a physical interactivity) is also intended to break institutional boundaries around the hermetic and hierarchical ownership of art objects (art as its own black box); any critique here is more focused on the methods employed to do so rather than evidence of an anti-technological stance or desire for solely non-physically interactive modes of viewer engagement.

In the same year Pontus Hultén curated *The Machine as Seen at the End of the Mechanical Age* (1968) and as the director of the Moderna Musset in Stockholm, he approved an exhibition at the gallery that took a very different approach to technology (one that hundreds of children in Sweden participated in) titled *The Model – A Model for a Qualitative Society*. Palle Nielsen, a social activist and artist, turned the institution into a model that intended to rally against the structures of the traditional exhibition space, creating in lieu, an adventure (or anthropological experiment) with material and social relations.[79]

> The idea is to create a framework for children's own creative play. Children of all ages will work on developing this framework. Indoors and outdoors – in all kinds of play – they should have the right to communicate their capacity for self-expression. Their play is the exhibition. The exhibition is the work of children. There is no exhibition. (Larsen, 2010, p.70)

Nielsen's construction embodied the notion of an emancipated spectator, in which the viewer becomes the very constructor of the work as an "active interpreter, who render[s] their own translation, who appropriate the story for themselves, and who ultimately make their own story out of it" (Rancière, 2007, p.280). It is important here to note that Nielsen's model also excludes technological tools and machines, focusing on tactile, malleable materials that are conceived by the artist as the basic component of children's play. Nielsen's opposition to rationality was conceived as a messy revelry in materiality, from daubed paintings on the wall, to bundles of

[79] Prior to this event, Nielsen had been building unauthorised adventure playgrounds in Copenhagen, mainly around the disadvantaged areas of the city, and his work at the Moderna Musset took on a large-scale architectural form in the same manner (Larsen, 2010).

foam and fabric to be thrown, cut up or re-purposed; this was a direct split from the continuity of the machine-element in culture and a re-focusing on play's plasticity. [80]

Roger Caillois would classify this kind of play as *ilinx*, "the pursuit of vertigo [. . .] the desire temporarily to destroy one's bodily stability and equilibrium, escape the tyranny of one's ordinary perception and prompt the suspension of one's usual consciousness" (2001, p.44). Most frequently imagined as the whirling, dizzy heights of a roller coaster, it is an immersion that needs to border on impinging the very agency of the viewer (or player) in that they become unsure of the outcome and where potential danger takes up a larger proportion of the mind's eye. Overthrowing this tyranny of perception is the reversal of expected experience and Nielsen was not alone in making such work at the time, work that leads to the participatory and relational practices of the contemporary era.

Returning to the use of technology in such terms, artists similarly need to be aware of how such tools—the apparatuses—position the viewer while engaging with art. One might work, for example, with 'moving image' as film, but the precise encounter—as cinema, television, projection etc—impacts upon the reading of the work. Hito Steyerl's recent exhibition at the Serpentine Gallery, *Power Plants* (2019), included mobile phone apps, *Power Plants*^{OS} and *Actual Reality*^{OS} which made use of *ilinx* to re-orientate the viewer around the gallery (internally and externally), revealing 'hidden' elements of the exhibition that were generated from external data. This re-interpretation of the 'museum guide' is both a play on the apparatus employed by institutions to lead visitors through constructed narratives (as a pedagogical didact) and to emphasise a reversal of the expected norms of such technology as a 'natural' part of human evolution. Much of the work lies in the cryptographic generation and interpretation of complex ecological systems, both natural and artificial, and the use of 'new media' acts as a means to access or follow this flow of information. The exhibition takes the 1999 audio walk of Janet Cardiff's Artangel project *The Missing Voice (Case Study B)* into an era of augmented reality. Janet Cardiff's work asked the viewer/participant to start at the Whitechapel Library in London where they would be handed a CD player and headphones. They would then be told to go to the crime section and seek out a book called *Dream of Darkness* (1989) by Reginald Hill. A recorded narrator on the CD would then lead one from there on a journey through the streets and alleyways around the gallery; the work acting as a directed journey to reveal hidden

[80] A replica was made in Denmark in 2014, and one can also see how it influenced such projects as the *Brutalist Playground* by Assemble (2015). Palle Nielsen's education and research was primarily focused on architecture, to which he gained a PhD. *The Model*, in its reproduction, takes on a different meaning having seen the idea and formation of *Relational Aesthetics* (Bourriaud, 2002) in the meantime, as well as shifts in technology that make such play as the children are involved in (physical as opposed to with digital interfaces) more poignant.

evidence and clues along the way. Now the library no longer exists, the work can be downloaded or streamed directly, yet to share audio in this way being so common, an element of intimacy—and by this, I mean not in the mediated *object* but the *action*—has been lost. Steyerl's work makes use of a complex network of 'partners' and accomplices in developing the software and visualisations for the project, components that—much like Mirza—are assembled for the purpose of her own archaeology of the local cultural and economic machine. The use of media in these terms has been described by Mary Flanagan as "locative", in which the blending and hybridisation of space (through such tools as mobile phones) can provide an opportunity to 're-play' space from a perspective that breaks the normal "social, discursive category" of those sites, this being tied therefore to a political position and rhetoric of "liberation" (2009, pp.204-205) not dissimilar to that of Huizinga.

Any wariness as to the role of technology upon viewer engagement is centred on the very action—political, social, cultural—that it aims to induce and its potential literalisation of the play-element in culture to a didactic exchange that, paradoxically, only institutes further the machine-element. As much as the text written on a gallery or museum wall frames information for the viewer, a button labelled 'push here' to make a machine move or screen come alive can encourage, if it not well conceived, a reductive approach to individual thinking and action. A more detailed understanding of the play-element within the technologies of museology is perhaps an additional thesis in its own right, but the general notion of foregrounding the (technological) interface in the experience of art—as one that produces the mimesis of those mediating tools experienced in much of automated life—is one that 'art machines' can rally against.

The basic excitement of 'push button' interactivity lies within chance, a feeling created through knowing the input of a black box (the button signifying a switch between two or more states), but not the process to follow, and as such, the action that concludes. This is a game that uses *alea*—another of Caillois's play taxonomies—where, for example, the throw of dice results in an unknown result and focuses play on the liminal space between action and outcome. The 'physical interface' method of art engagement makes use of *alea* to create the required tension and attraction;[81] only once the button is pushed and action occurs, *alea* slips away almost instantly. Huizinga notes, "In the faculty of repetition lies one of the central qualities of play" (1950, p.10) in that through repetition, play can be perpetuated, and the magic circle maintained. *Time to move onto the next button… what does that one do?* are therefore the familiar cries

[81] In many instances, the results of 'pushing the button' can normally be pre-determined and so instead requires one to more consciously lean on the magic circle and allow for the suspension of rational thinking i.e, in order to 'just go with it'.

in many museums that employ such modes of viewer engagement; the novelty of the button quickly wears thin. This 'physical interface' methodology to machine-art is also most certainly not a new occurrence. It can be seen in some of Tinguely's works; for example, in 1959 some thirty of the *Meta-metic* series were made to operate by specially produced tokens for an exhibition at Iris Clert gallery (Hultén, 1987, p.55). Tinguely intended to be provocative as to the way the exhibition was introduced to the public, using techniques of advertisement that were "normally used to publicise a new restaurant or a soap powder" (Ibid.). Such action is no longer a provocation in the same sense within the context of contemporary technology; the interface has become omnipotent and buttons are not even 'buttons' in the same sense but can exist as purely images of them. In the construction of 'art machines' that follow physical mediation, there are decisions to be made about the method of 'turning on' the work and its control, and thereby the information the participant, viewer or interlocuter requires to proceed.

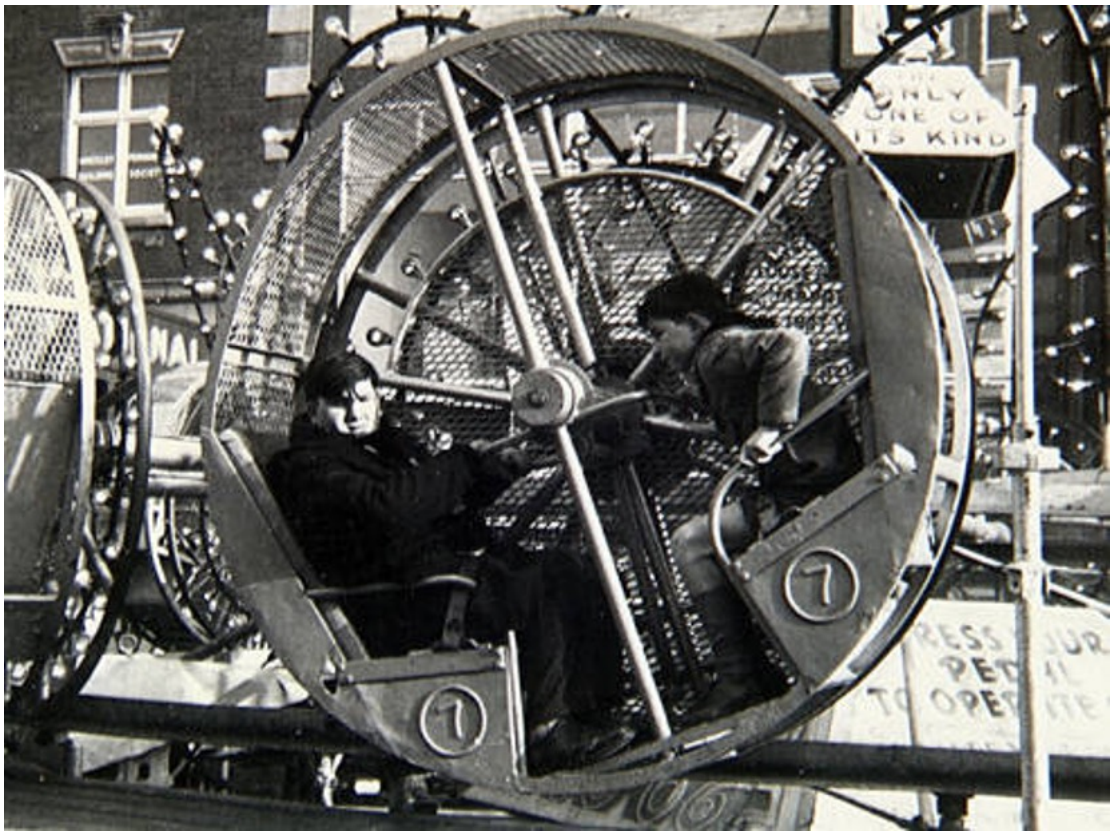


Figure 45: Leeson, J. (1963) *J. Williams' Looper.* [Photograph] Jack Leeson Collection, NFA0019. Sheffield: National Fairground and Circus Archive. Reproduced with permission of the University of Sheffield

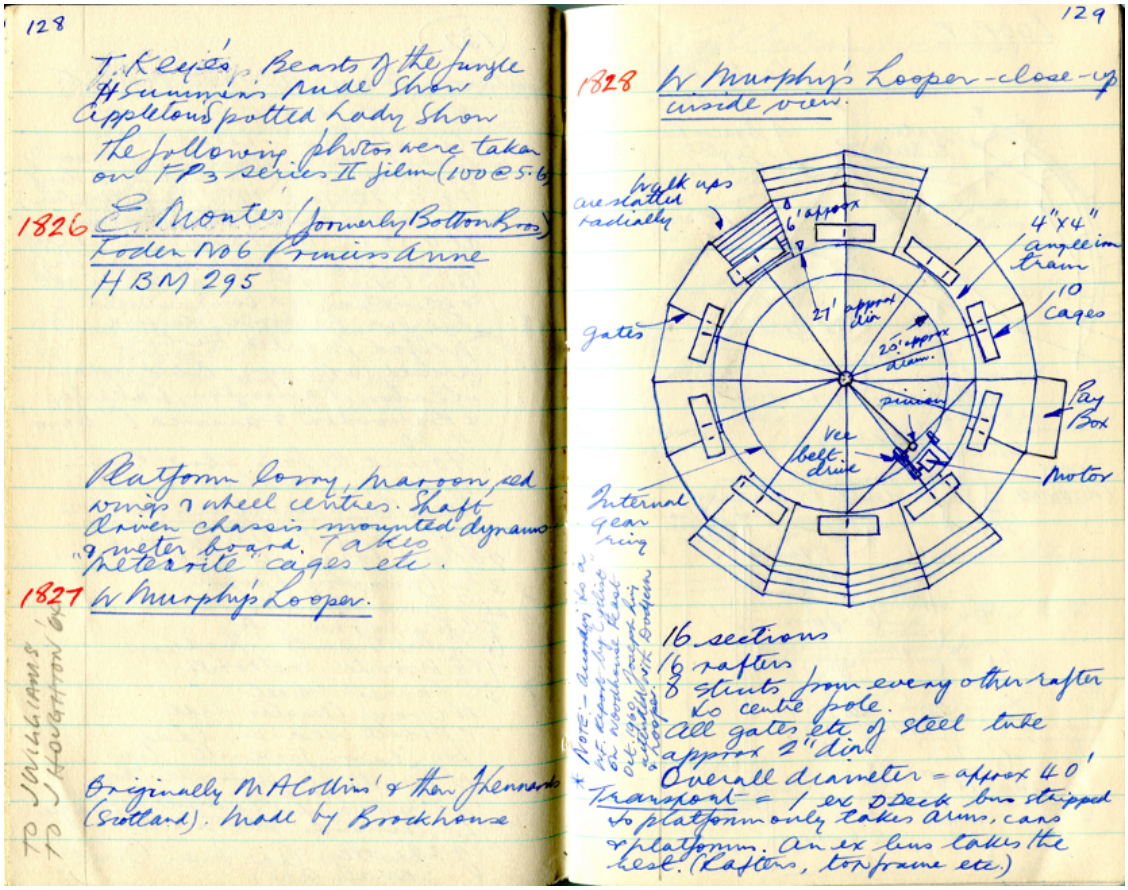


Figure 46: Leeson, J. (1960) *Notebook No.6.* [Scan] Jack Leeson Collection, 178P1.11. Sheffield: National Fairground and Circus Archive. Reproduced with permission of the University of Sheffield,

For the Love of an Amateur

Along with the aforementioned *ilinx* and *alea*, Caillois identifies two further types of play: *agôn,* a play that inspires a "desire to win" (2001, p.111) through competition, "a question of rivalry" (Ibid, p.14) and *mimicry* as the temporary acceptance of an imaginary universe (Ibid., p.19). The pleasure and attraction of play can come from aspects of these in combination; with one element often foregrounded, and others available in part, a gestalt formation of play occurs in which the 'levels' of *agôn, alea, mimicry* and *ilinx* describe, at any one moment, the experiential whole. Attraction does not solely exist at the poles of this spectrum: not all play is the instantaneous, heady spark of *ilinx*, an 'edge-of-the-seat' feeling of *agôn*, the vaudeville showmanship of *mimicry* or a high-risk *alea*; there can also be the steady love affair and deep-seated attraction that seems an unanswerable mystery as to the magnitude of its pull. These are those people who will go back again and again, even after working out the mystery of the black box operation, as if anxious to have missed an element of the experience or wish to obsessively gather information as though the game is not one of perception at all (a qualitative experience), but of accumulating data as a quantitative exercise. This is the threshold between attraction and obsession.

Sited at the University of Sheffield, the National Fairground and Circus Archive contains a phenomenal wealth of historical documents that surrounds the legacy of fairgrounds, showpeople and the socio-cultural development of attractions. The archive has been developed through the work of Professor Vanessa Toulmin, her own family going back five generations as showpeople; Toulmin grew up spinning candyfloss and operating rides and later wrote a PhD on "backslang", the showpeople's substitutions and codes that "flatties" (non-showpeople) cannot comprehend (Ellis, 2004). One can find all manner of attractions within the archive's index that go from the architectural mapping of a fairground's booths by city planners to the biographic and narrative accounts of the boxers involved in the brutal 'boxing booths' of the earlier part of the twentieth century. Moreover, it is a living archive, in the sense that it still gathers information on the limited number of fairs operating today. Amongst this plethora of information are a set of notebooks, photographs and negatives by Jack Leeson. Leeson was one of a generation of amateurs who became fascinated by fairgrounds, not only for the purposes of conservation (in regard to their historical objects and materials) but also to document changes on both a technical and social level. He was trained and then employed in Rugby as an engineer and documented fairgrounds in his spare time for around forty years up to his death in 1995; of the 8000-plus photographs taken through his lifetime, 200 were then developed into a publication, *Heart of England Fairs: Photographs from the Jack Leeson Collection* (Campbell et al., 2000).

Viewing them, one can immediately see the shifting aesthetic of fairgrounds over time; from the decoratively painted facades of amusement rides in the 1950s to the multiple, electrical lighting designs of the 70s and 80s that dazzled the public, the importance of visual enticement—to stand out in the crowd—was clearly critical to success.

Along with these photographs, Leeson's accompanying notebooks are available to view by request. They are predominantly A5 red, memo books (the laurel leaf logo of the Silvine brand on their cover) with feint, ruled lines. On each page, Leeson added a pencil margin about 2cm in width. In that margin (always in red pen), a number would be written to index his notes, diagrams or recorded thoughts against a photographic negative. Throughout each notebook there are a variety of hand-sketched technical drawings of the machines he observed on his travels, alongside comments as to their origin and which fairs they had been installed at during that season. The eleven notebooks combine as an impressive technical and migratory study of amusement machines through the 60s and 70s. The notebooks, perhaps more than the sheer number of images, emphasise Leeson's interesting application of engineering protocol to the amusements he meticulously followed. The diagrams in particular are clearly made by someone competent in, and knowledgeable of, mechanical design; they are not obvious in their description of a precise function, often appearing cryptographically labelled and made for an engineer's not an artist's eye. But each one performs a movement, signalling a change in not just the register of Leeson's voice but in his detailed search for knowledge. As enthusiasts often do, he created a language of technical terms and improvised, specialist vocabulary in order to delineate his community—those in the know and those who are not—making it a black box to anyone on the 'outside'.

In one notebook there are a series of drawings that describe the mechanism of a looper ride. A looper ride mainly took two forms: the Looper Plane (or Loop-o-Plane) which started as a by-product of military training devices, taking the rider through a 360º spin on a vertical axis and then also the 'Rock 'n' roll', a ground-based looper that turned 360º horizontally in addition to the seated modules that rotated 360º on a vertical axis (see Fig.45). In Fig.46, one can see Leeson drawing the latter and in the notes the name Brockhouse, who manufactured the only non-American looper in the UK around 1945.[82] Being somewhat of a 'rare find', the detailed interest he enters across several pages seems to be a well-tamed effervescence of enthusiasm for the machine.

[82] The first type of looper ride was patented in around 1945 by the aviation engineer Lee Ulrich Eyerly. The original owner of the machine Leeson was drawing, M.C Collins (who by 1961 had passed the machine on), is also noted by the drawing (NCFA, n.d.).

The looper was designed as a white-knuckle ride—the danger being part of the excitement—though Huizinga notes that the magic circle of play becomes disrupted when it borders on the potential for harm and falls away entirely when play becomes unbalanced and "outside the sphere of equals" (1950, pp.89-90). The experience of such a ride needs to therefore tread a balance between instilling both fear and safety for it to be successful. Leeson's experience, though, is at the other end of the spectrum; throughout all of his notes there is no mention of a personal experience on a ride, leading one to wonder if he actually 'used' them at all but was, instead, fascinated by simply watching them in motion. In this scenario, Leeson's play is more akin to the act of *mimicry* than *ilinx*, though not in the common understanding of 'imitation' but, in a type of play where he "makes himself and others believe that he is another" (Caillois, 2001, p.61). This is a step outside of normality and is the projected version of oneself through imagination (under a different set of rules). As a steward of the machines he follows, the engineer goes beyond the confines of his discipline—Huizinga's "ordinary life"—and partly believes that these machines offer another version of himself and his work, a place where machines play and perform not only for function but to produce excess and frivolity.

Leeson attends to his task as if it were a ritual or rite, meticulous in preparation (in the back of one book is a tick list of items to be taken on his field trips) and precise in execution. While this is not a ritual of archaic play, it is one of personal drama; even at the periphery of the machine, he is participating in its action. Huizinga states it thus:

> The rite is a *dromenon*, which means "something acted", an act, action. That which is enacted, or the stuff of the action, is a *drama*, which again means act, action represented on a stage. […] The word "represents", however, does not cover the exact meaning of the act, at least not in its looser, modern connotation; for here "representation" is really *identification*, the mystic repetition of *re-presentation* of the event. The rite produces the effect which is then not so much *shown figuratively* as *actually reproduced* in action. The function of the rite, therefore, is far from being merely imitative; it causes the worshippers to participate in the sacred happening itself. As the Greeks would say, "it is *methectic* rather than *mimetic*". It is "a helping-out of the action". (1950, pp.14-15)

His action is as much a part of the wider amusement-machine as any other, for he is "being seized" (Ibid., p.17) as much as a child is drawn to go on the ride, only his form of expression (perhaps through the only means he knows how) is to draw and make notes: to record. It is only through our viewing of the documents, separated from the moment in which they were made, that we might seclude them from the sphere of play and treat them as part of another discourse of emotionless logic.

Round and Round... again

Many attractions use an enclosed dynamic to concentrate the medium; of which looping is one method of achieving that affect. By creating some sense of circularity, a machine can hold the attention of the viewer or participant, for at all times one is 'on the edge' and at the very periphery of the magic circle. As opposed to a linear progression through which one acknowledges an end, the loop is a game always occurring at the threshold of the finite and the infinite, in the liminal space and balance of centrifugal and centripetal forces. There is chance (*alea*) always at play here too. The chance of slipping from the edge and either being pulled back, or pushed far away from, the centre of the game. In addition, there the chance in the success or failure of holding on (*agôn*), the chance that the endlessness being experienced may not be an illusion (*mimicry*) and eventually stop, and even the chance of losing one's perceptive view of the world (*ilinx*). The panorama (and panoramic device) is one such 'amusement' based on the idea of circularity and as such, able to imbue the multi-faceted potential of play and its development within culture.[83] In Erkki Huhtamo's *Illusions in Motion: Media Archaeology of the Moving Panorama and Related Spectacles* (2013) moving panoramas are specifically explored through an in-depth "media-archaeological" approach to their history.[84] For Huhtamo, the signification of the panorama as a term sees it established mainly for its relation to circularity (though latterly in the twentieth century it has become more broadly to mean any wide-ranging view) and the history of moving panoramas has become secondary; a fault he sees as needing to be rectified.

In the grand, circular (fixed) panoramas constructed in Europe during the nineteenth century, the visitor would enter into a seamless, 360º oil painting that, along with specific lighting effects that could be natural and/or artificial, would place the viewer at the centre of the image. The moving panorama shifted mediation towards an experience more akin to that of the diorama; one that not only privileged the anthropocentric view but would draw attention inward (to the viewer) through a procession of images. Despite being in a room with multiple others, "not only did the apparatus surreptitiously create the spectacle, but it also enveloped the user in a closed optical system where one could be refreshingly alone in spite of being surrounded by a multitude" (Huhtamo, 2013, p100). So, while the circular panorama offered "a single stationary view; a single slice of time" (Ibid., p.74) the moving panorama allowed time-based structures

[83] It would be difficult to emphasise that as well as being an exploration of art/painting into a new medium for viewership and as a novel amusement, the importance of the panorama and diorama in twentieth century culture caused an "overriding influence in retelling events, defining subjects, and shaping popular thought in an age before widespread literacy" (Stafford & Terpak, 2001, p32).

[84] Moving panoramas took various shapes and forms: the peristrephic panorama, for example, consisted of painted images on a roll of fabric would be placed in the form of a concave semi-circle (thereby being part-circular panorama, part-moving panorama) while other moving panoramas existed not as rolls but as part of a dioramic stage set (Huhtamo, 2013, pp.65-84).

and narrative to be enacted. In the varying modalities of the moving panorama as a spectacle, one can see the attractive effect as being the ability to 'carry the viewer along' and direct the viewer's gaze. The large-scale dioramas—part of Huhtamo's bracketing of the moving panorama history—were shown in Paris during 1822 (at Rue Sanson) and London in 1823 (in Regents Park) and quite literally acted as "vision machines" (2013, p.144), with the audience placed in rotating amphitheatres such that the amusement controlled the focal point of attention.

In Huhtamo's extensive excavation of their history, the moving panoramas, as a means of spectacle, are understood as an intermediate between still and moving images; from the predominant image of landscape and current affairs, to the appearance of virtual travel that would be accompanied by music and an authorial voice. In the majority of panoramas, the images mediated were based mainly on information or representation as opposed to any fictional narrative. Speculatively, this may be due to the circular panorama's links to the tradition of painting while moving panoramas followed a tradition of dramatised, historical storytelling (via an orator) that pertained to a mode of lecturing and demonstrating. The moving panoramas were experienced more as "disjointed visual fragments" that made the viewer feel "not unlike the readers of a new kind of travel narrative" (Stafford & Terpak, 2001, p.99). By the time of the 1900 *Cinéorama*, exhibited at the Paris World Fair, multiple film projectors were being used to explore, on a huge scale, the projected panorama of a balloon flight through moving images. Despite the machinic possibility and ambition of the project, it was the re-representation of reality, or rather an illusion of a reality, that seemed key to any success.[85] In the *Circarama* attraction produced by Disney in 1955 (which patented a new camera projection system) the first film, *America the Beautiful* toured the viewer around a (literal) landscape of nationalistic achievements (Weiss, 2017). In a slight twist, in 1964 Disney's *Carousel of Progress* turned the circular filmic experience into a theatrical one; the audience were spun around a central display of automaton figures who told (through an automaton voice) a comforting history of human technological innovation and mastery. Disney opted for the function of the amusement to act as a rhetorical tool—a pseudo-pedagogical one—that told a tale of human triumph and unrivalled sovereignty over nature. One might argue that a story of technological chronology as told by a theme park attraction could only be received as a fictional narrative and as Baudrillard (1981) would conceive, such seductions in the form of playing machines and machines-at-play are prototypical simulacra, but the intent was to use factual information as demonstration of a hierarchal order between humans and objects. Circularity then,

[85] The Cinéorama as a spectacle did not quite meet its intention. Only one of the films was actually shot from the air and so the point of view, for the most part, was from the ground. Once opened, it had a short lifespan and "the attraction seems to have been closed as a fire hazard after four performances" (Huhtamo, 2013, p.318).

paradoxically it would seem, is also a perfect means to depict and describe the rhetoric of continual, forward progress.

In a PhD thesis by Criodhna Costello, *The Continuous View, Practices of Attraction in Moving Image* (2015), there is a neat division employed to describe practices that mirror the circular panorama and moving panorama: between "continuous" and "re-iterating" loops. Costello describes in moving images what has already been observed in the panorama: that one can construct an endless loop that is seamless (or at least one where the viewer is unable to perceive the join) and one where the cut is made evident (a 'jump') which jolts the viewer into recognising a seamed beginning and end. This is also analogous to the programming loop, only both forms can be contained within the procedural flow of code: a singular statement can loop with a periodic check for an exit condition (a loop that awaits a signal to move onto the next stage).

> It is relevant to recall that the loop gave birth not only to cinema but also to computer programming. Programming involves altering the linear flow of data through control structures, such as 'if/then' and 'repeat/while'; the loop is the most elementary of these control structures. As the practice of computer programming illustrates, the loop and the sequential progression do not have to be thoughts of as mutually exclusive. (Manovich, 2016)

In this programming scenario, a loop is a holding pattern in which the programme is caught in a 'waiting' state, what Costello calls "a perpetual present tense" (2015, p.205), that is, the contradiction of a "circular temporality" (Ibid., p.156).[86] In watching automated machines run through their program, one might say it is not only the looping of an action that holds our gaze but, also, the waiting for a 'break' point. While the mechanics of the projector in early cinema created an attractive affect, the ready availability of digitised film today can both allow a similar observation of machines and additionally, through the screen of another machine. This 'doubling', such as watching a YouTube video of a paperclip folding machine (Rudolf Grauer AG, 2012), might secure the same, if not greater, impact. They are images of an endless loop of production that at once seems absurd (the level of engineering in production seems incongruous to the function of the object it produces) but in precision and speed of repetition it can hold one's gaze again and again. *But… what exactly are we waiting for? Deus ex machina?*

[86] This understanding of the loop as a structural form of attraction built between two states concurs with Sergei Eisenstein's observations of how popular entertainments at fairs and circuses held the attention of the spectators. He defined, in relation to theatre rather than film though taking the fairground as inspiration, an "attraction" to be "any aggressive aspect […] that which subjects the spectator to a sensual or psychological impact, experimentally regulated and mathematically calculated to produce in him certain emotional shocks" (1974, p.78). Tom Gunning would go on to build on this in relation to the technologies and machines of early cinema (1986).

A recursive structure allows for the insertion of a variable as feedback: *wait… until X condition is true or false*. In the electro-mechanical artworks of James Seawright, who also featured in the *Cybernetic Serendipity* exhibition, there is a clear advancement of feedback possibilities in the making of automated art-machines that still seems prescient. An array of works produced in the mid-60s with titles such as, *Watcher*, *Searcher*, *Scanner* and *Captive* (see Kostelanetz, 1971), embody a period of investigation that explored, what Seawright was to call, "phenomenal art"; the term being used in relation to the notion of an artwork that might directly produce 'phenomena' *of their own* (Seawright, 1970, pp77-78). Seawright wrote about this as not the type of 'push button' activity normally associated with machines, but a combination of feedback and interpretation that takes advantage of the "mechanism's ability to control itself" (Ibid., p.78). Seawright sees this as something different to the idea of an art that changes the relation between art and viewer—one being reliant upon the other for action—but, in many ways, as an ideology of a co-existence without direct control. The mechanisms of Seawright's automated sculptures are for him, a structure for which there is an interplay of varying bodies of information (be that a human physical body or an electric sensor) that are always working together whether consciously or not. One might say that at the heart of Seawright's work is the interaction between human and machine as not a mutually exclusive one for the purpose of controlling the other (as cause == effect), but that the artist's roles is to structure space for indeterminacy once their work has been 'put into the world'. Seawright imagines that his work therefore has some form of actual sensitivity and his enjoyment at the power of animation through technology (in the context of art) is clear. The work *Searcher* (1966), which Seawright describes as "a kind of automaton" (Ibid., p.87), has the science fiction aesthetic one might associate with a primal, android form; a light source, atop a spindly, multi-legged base, rotates and turns continuously, either seeking or avoiding light depending on the programmed state of its circuitry (Ibid., p.89). I do not believe that Seawright aimed to simply anthropomorphise machines as objects that *play* being human but exploring (as an engineer might) the socio-cultural effect of automated kinesis on the behaviour of humans when in tandem with the machine.

> There is, however, an unpredictability involved, since it's a powerful source of light itself and will be either frustrating or encouraging its own efforts to react to light […] when a person walks in front of it, and it happens to be in a certain state (of internal connection), it will follow that person around the room with its light beam. It's impossible not to think that this isn't what its "supposed to do" expect that it will ignore him the next time, even if he tries to induce an expected reaction with some provocative movement […] as the artist, you are setting up a generalised set of options and throwing them, so to speak, at an audience. (Seawright, 1970, p.89)

The pattern of behaviour within the machine might be cyclical (a looped programme), but moments of synchronicity and feedback with its exterior can be fleeting—even frustrating—and this seems to hold greater attraction for the artist than an elaborate system in which all the outputs are pre-determined. Seawright seems to notice that as the machine might become more complex and that in its programming loop one might therefore capture every conceivable option, what becomes left for the artist, human desire and irrationality?

The Final Attraction

As automated machines have shifted from cranks and cogs to sending information at the speed of light, the movement of all objects and materials around the world, from wheat, grain and oil to financial transactions and data have increased in their speed of movement.[87] The need for this whirring *dromos* is to enable the myth of the machine to extend itself;[88] the myth of technological rationality leading us to a 'better place', a place beyond the now that needs to be travelled to and that can only be reached through rationalising nature (and extending its limits) to a greater and greater extent. An automated machine might promise, for example, the possibility of recycling, of looping our excess back into the system (to *feed-back*) but it ignores the very irrational flow of materials in the world. On a micro-scale this can be seen within the action of cleaning: using a vacuum to clean up one's mess is not the elimination of that material, rather it is the relocation of that material 'somewhere else' and, as such, is the irrational movement of parts into temporary hiding for the purposes of agential power. With more attractions, continuous novelties and the interaction of all the various network of actors—of particles, of bodies and black boxes—only becoming more vibrant through time, speed encourages an oscillation of such excess energy that it spills out violently in reciprocation; the biproducts of our technological lust being lakes of putrid, toxic liquid spilling out of view in the corners of Inner Mongolia (Maughan, 2015). This is the blind spot created by the contemporary machine-as-attraction and it is the final threshold; our endless desire for new attractions becoming play as self-destruction.

There comes a point, if that is not oxymoronic, where a loop can become frustrating, indeed, even maddening; the need to force an exit when the 'spinning wheel of death' refuses to move

[87] One can play this narrative out also in relation to scale. The moving panoramas, for example, soon became miniaturised 'toy' versions that allowed the public to create their own stories and 'shows' at home. In conclusion, Huhtamo notes, "as a side practice of such seemingly innocuous play, the mighty world of media began losing its monolithic face […] as the device became smaller, the human grew—or at least appeared to grow—bigger" (2013, p.368).

[88] Dromos refers to what Paul Virilio would study as "dromology", the "way speed determines or limits the manner in which phenomena appear to us" (James, 2007, p.29).

onto its next line of code and causes the loss of one's work being an obvious example for any Apple user. The only way to 'crash' an infinite loop is to pull the plug and remove the machine's umbilical cord of power.

> The polar opposite of repetition is destruction; it is only natural that destruction should represent a powerful attraction and temptation for people whose work is of a repetitive nature. (Hultén, 1987, p.68)

In Tinguely's work there is evidence of circularity, loops and feedback, and then there is also destruction. As noted in chapter, ▷ Play, *Homage to New York* was a riotous affair that led to the work's demise, one that can be interpreted as a celebration of a machine's whirling force of serendipity whose lifecycle can exist beyond the physical and reside also in discursive form as a folkloric myth. In this sense, the loop's 'ending' through destruction is less a nihilistic response to an automated machine, but a means to pose other questions of how such objects perpetuate themselves beyond their operational qualities.

Gustav Metzger, in his manifesto for auto-destructive art, writes that "auto-destructive art re-enacts the obsession with destruction, the pummelling to which the individual and masses are subjected" (2012). The repeated cycle of destruction that is Metzger's "pummelling" of the masses is the balancing of a scale, one element affecting another in order to maintain equilibrium for the world has only finite resources. If wealth is to be created, wealth must also be destroyed (synchronous to the notion of the Potlach) which as a zero-sum reading of the checks and balances of power follows a mechanical metaphor. Seawright noted this very problem in his sculptures, that while working with technological material, the tampering with one element in the machine would affect "the whole cycle to some degree" (1970, p.81); the continuous shuffling of elements and phenomena is therefore needed to maintain stability. The irrationality of self-destruction seems to antagonise such a network, an in-built drive for destruction opposite to the attractive tension at play in maintaining the balance between stability and collapse. Yet a schematic for failure is the very definition of 'planned obsolescence', and even without artificially limiting the lifetime of a machine, they are—as objects of human production—at risk of being superseded by developments in science and engineering; in one sense then, machines are no less fragile than us.

> The element of tension in play […] plays a particularly important part. Tension means uncertainty, chanciness; a striving to decide the issue and so end it. The player wants something to "go", to "come off"; he wants to "succeed" by his own exertion […] Play is "tense". (Huizinga,1950, p.10)

In 1999 Chris Burden exhibited the work *When Robots Rule: The Two Minute Airplane* as a commission for the Tate, London. Sited within the Duveen galleries it consisted of a complex, large, modular frame made from extruded aluminium; within this structure were various motors, pneumatics, actuators and other mechanisms that would—in two minutes—produce a small model airplane. Designed to require the minimum amount of human intervention, the machine would cut, fold and glue the various parts of the model before finally winding a rubber band (that was attached to the plane) so as to launch it into the gallery space.

The rhetorical power of the machine as a device for increased industrial production (and its assemblage of various actors) in advanced technological capitalism is brought into view by Burden's work and located within the context of automation. Some seventy years early, in 1929, Vladimir Tatlin constructed a different type of flying machine that, using the mechanical power of its user, aimed for air travel: the *Letatlin* machine (Lodder, 1983). It was the combination of art and engineering as one, which contrary to the received ideas of Russian Constructivism in the mainstream, represented a belief in science and technology away from complex industrial objects and instead used natural material and (curvilinear) form. Tatlin is to have said: "The engineers made hard forms. Evil. With angles. They are easily broken. The world is round and soft" (Lodder, 1983, p.214). Whether it worked or not, as an artistic endeavour it was a proposal—a model—for an alternative path to be taken, much in the same way that his architectural tower was less about a celebration of the machine as per "contemporary technology on the American model" rather it was "a reassertion of a closer relation to nature and the natural environment via that technology" (Ibid., p.209). The machine-element of culture would label such ideas as 'fantasy' rather than taking seriously Tatlin's play on constructivism as the projection of another potential reality. Tatlin suggests an alternative rhetoric of the machine and in Tinguely's work later in the 1960s, there was an attempt to empty out the machine of its rhetorical power altogether and become entropic. Burden does not strip the machine of its rhetorical power but directly *plays* with it.

The idea of automating the dexterity and hand-eye co-ordination used by a human to make the model airplane would not be an easy task; it required the breaking down of each action and component into a machine process that would then need to be re-connected. The *coming into being* of the model would therefore be precarious but a good deal of experience and money was handed over to solve the problem. The work becomes, therefore, what Haroon Mirza would similarly define as working with a set of accomplices; a network of alliances and knowledge connected together in order to make a small, seemingly insignificant object of play be made without human touch.

Ultimately, in its 'turning on', the work produced not a single one of the estimated 18,000 model planes that it aimed to let fly in the gallery. Arriving at the gallery and seeing the machine, one would be met by the occasional movement of the launching mechanism, the "robot systematically stick[ing] out its dysfunctional "tongue" […] every two minutes" (Preece, 1999, p.71). The machine itself is left *on the tip of the tongue*, between actuality and potential. While there is the attraction of such a catastrophic spectacle—the 'rubbernecking' at accidents out of morbid curiosity—there is also the tense, enduring wait for a final resolution as to the way a game 'plays out'. The end of the game sees the end of play but is conversely also the very target of playing. The tension, then, of the precise duration of the magic circle, becomes part of an *alea*-type play that is finding the limits of the game itself. This raises an interesting question as to the possibility of failure in an automated machine. When an automated process ceases to 'work' it is no longer withdrawn from view, but the black box presents itself and asks questions of its own existence: we know something is wrong but do not know *what* is wrong. In most cases we might replace the whole object, but might also its failure—as a glitch—allow for a different actualisation of play in relation to the machine?

Aristotle noted in his *Poetics*: "We enjoy contemplating the most precise images of things whose sight is painful to us. The explanation of this too is that learning gives great pleasure" (1996, p.6). From the tumultuous 'coming into being' of the machine as an object—the errors and mistakes made in the journey of its assembly—one can also learn. Failure may not necessarily be a non-productive position in such a conception; failure is, if anything, linked directly to ideas around the risk-taking of creativity, for to take risks means stepping outside of one's comfort-zone and security of understanding (and knowledge) to expand a concept. Failure, in this self-dialogic mode, may only be temporal; it breaks the game momentarily in order for it to expand its sphere and in order to alter its rules or structure: failure can act as a catalyst for the deepening of 'thoughtful play'. Asimov's meta-machines insert failure, glitches and an allowable, balanced level of self-destruction in order to mimic what it perceives as the continuous loop of human behaviour, aiming to maintain the 'continuities' of history. What the machine cannot allow for in this automated loop, and despite its continuous searching, is the variables at the far ends, those at the polar opposite of the scale that shock and jolt the system; attractive effects that arise through seeming absurdity, serendipity or risk. It returns us to the fact that both the attraction and limit of a machine, is in our desire to have it surprise us.

Figure 47: *Mark Selby* (2020). [Exhibition] Three Works, Scarborough. 18th September-22nd October.

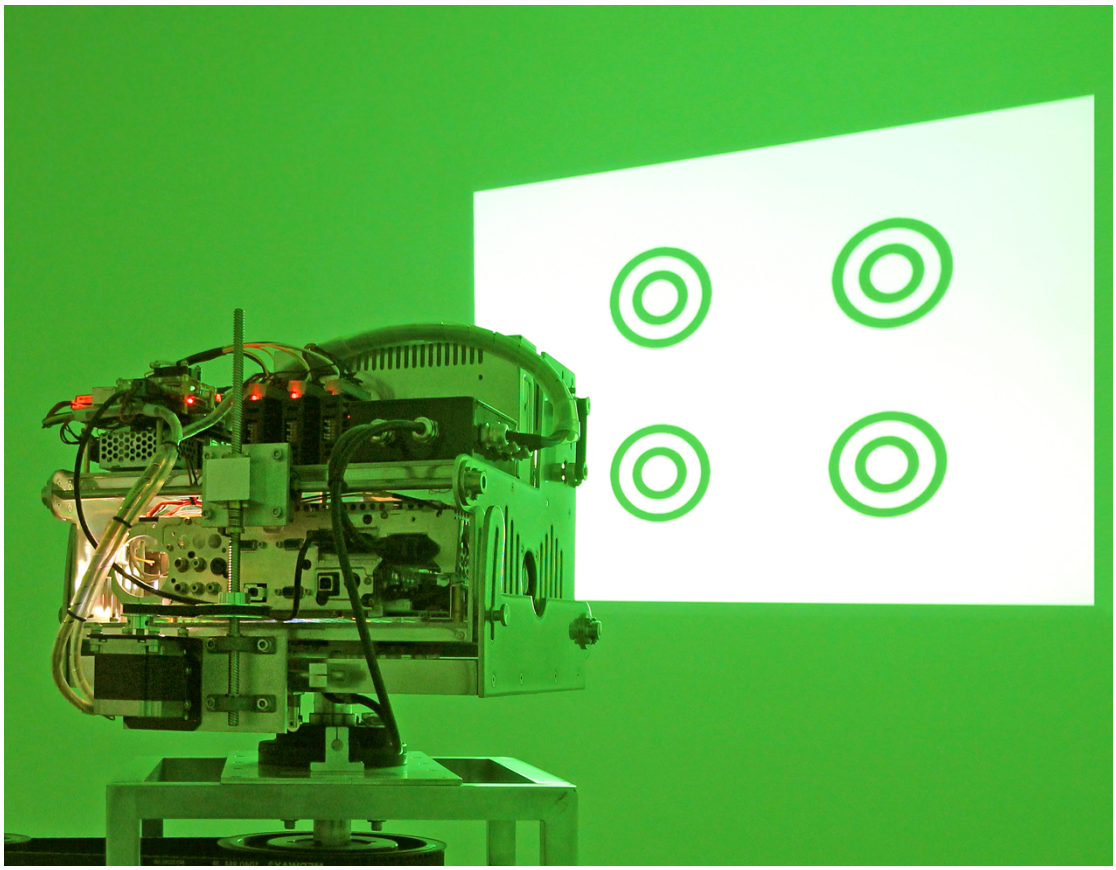


Figure 48: *Mark Selby* (2020). [Exhibition] Three Works, Scarborough. 18th September-22nd October.

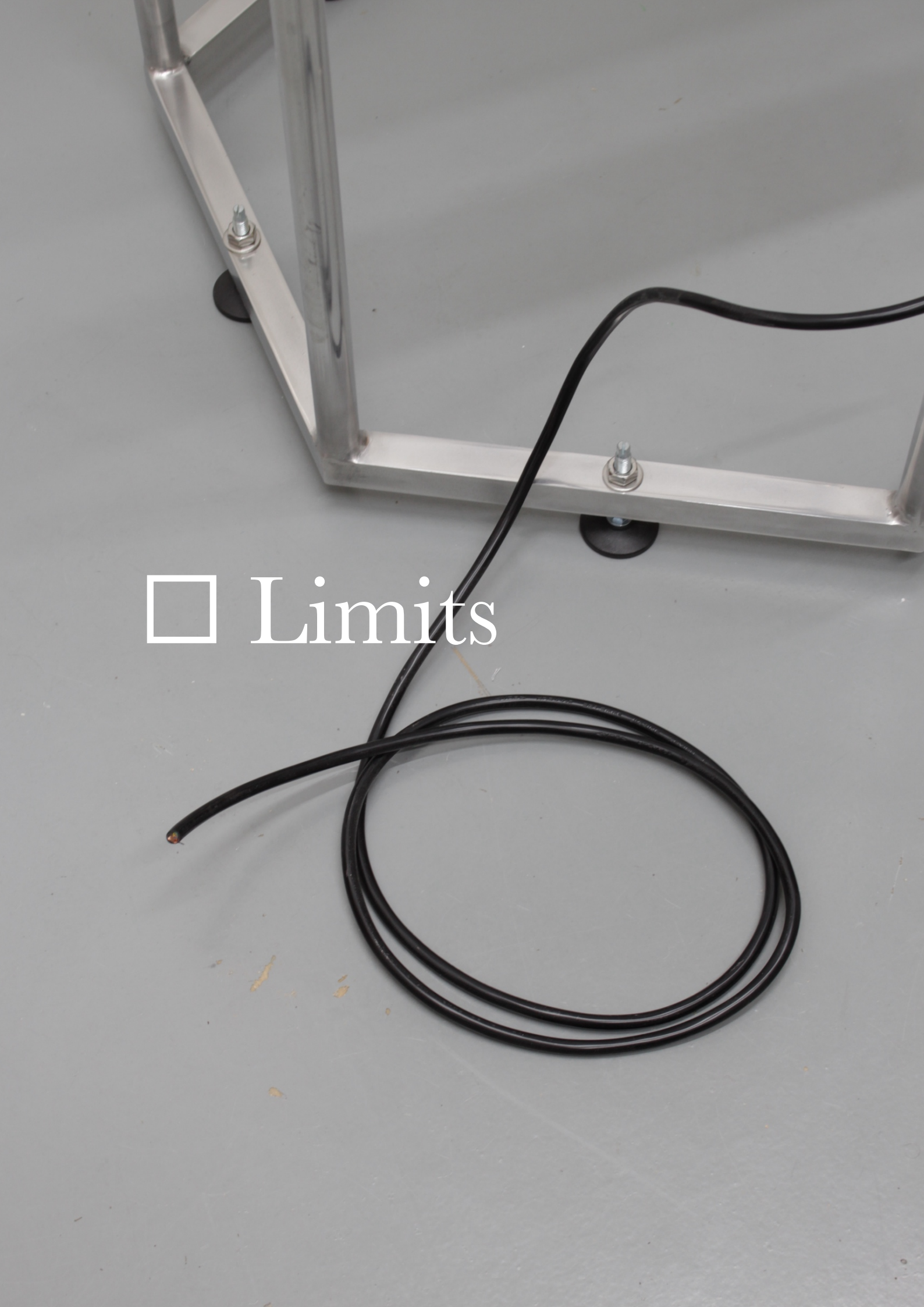
Figure 49: *Mark Selby* (2020). [Exhibition] Three Works, Scarborough. 18th September-22nd October.

At the final hour it is decided that the floor needs a quick vacuum so as to be suitably presentable. The coming into life of such a simple machine as a vacuum cleaner—nozzle, fan, container and filter—seems oddly prehistoric as it does its human-powered loop around the other machine in the room.

That other machine, though, stutters to a stop. For a moment I wonder if the vacuum motor has discharged, via the airwaves, some electromagnetic interference and scrambled my computer's program. The memory of the TV flickering when the vacuuming was done at home reminds me of a physics lesson that, only much later, did Nam June Paik teach me; his magnet being a force of attraction that pulled that old vision machine's function apart.

Surely not now

Luckily, it is—of course—my error, not some other machine with an axe to grind about its aluminium-framed cousin. I find the line of script I need to edit, reset the machine and wait… crossing my fingers in the hope that, this time, nothing fails.



☐ Limits

What is it doing?

Do you, Bartleby, prefer not to work? Yes, no… another option? What do I say…? It is doing something when it's not even doing anything like all the other objects in the world… such a reply seems more like a feeble excuse for something that might just be plain broken; a reply that might suggest I am hiding my lack of ability through the abstraction of a machine.

Like Bentham's Panopticon—the all-seeing eye—those on the periphery feel uneasy when a machine takes centre stage. Our attraction is desire, for image, for knowledge, for understanding (and to therefore not look foolish)… I am too nearby to resist being asked for an easy answer and so, walking away, I leave the machine to explain itself and for others to try to listen.

Turning On, Walking Away

Martin Gardner introduced John Conway's *Game of Life* in an article that indicated a growing pre-occupation with "simulation games"; ones that in some way re-created the life of "a society of living organisms" (Gardner, 1970, p.120). Conway's game, played on any gridded board, requires the player to select a variety of squares (with a coloured counter) to create a pattern. Then, following a set of simple rules,[89] the game completes without any further participation or interference; the cellular automaton—analogous here to a machine—plays the game by itself. The rules are iterated in a loop—each loop being a lifecycle—until either the pattern finds a stable state, an oscillating phase of two or more cycles or disappears entirely. Conway initially claimed that in the game, no pattern could grow without limit. Gardner writes:

> Put another way, any configuration with a finite number of counters cannot grow beyond a finite upper limit to the number of counters on the field. This is probably the deepest and most difficult question posed by the game. (Ibid., p121)

The answer to this question was provided relatively quickly by Bill Gosper, who in 1970 found the *glider gun* pattern that proved a finite pattern could indeed produce infinite growth.[90] If, therefore, a set of rules can be used to generate increasing complexity and maintain a stable order, the game can (and has been made to) also operate as a working universal machine with logic gates and memory blocks that allow 'computation'.[91]

Cellular automata, then, are a method of modelling the emergence and growth of complex systems. By allowing for the play of a machine to be foregrounded, one sees the machine and nature combine and seemingly satisfy an innate curiosity in the projection of 'life' (as instigated by the player). This is an ideological attraction but also an aesthetic one. Indeed, Conway notes the pleasure of sitting and watching the game, having translated it into a software program, cycle through its rules 'live' on a computer screen (Gardner, 1970, p.123). Similarly, artists have also been fascinated by the role of set procedures that appear to produce complexity and non-human agential production. In the 1970s, Paul Brown and his colleagues at the Computer and

[89] The rules are: "(1) Survival. Every counter with two or three neighbouring counters survives for the next generation. (2) Death. Each counter with four or more neighbours dies (is removed) from overpopulation. Every counter with one neighbour or none dies from isolation. (3) Birth. Each empty cell adjacent to exactly three neighbours-no more, no fewer-is a birth cell. A counter is placed on it at the next move" (Gardner, 1970, p.120).
[90] In Gosper's pattern, the main constituent (the *gun*) oscillates but also periodically omits another pattern (a *glider*) (Rendell, 2001).
[91] In April 2000, Paul Rendell created the first fully functioning Turing Machine using the games rules. And in, 2008, Nicloas Loizeau developed an 8-bit computer using five relatively simple patterns (Zucconi, 2020). To watch this in action provides an aesthetic pleasure in the labyrinthine complexity of its network (see Loizeau, 2020).

Experimental Department at Slade School of Fine Arts (University College London) developed artwork taking inspiration from Conway's game.

> I remember my own excitement when I read Gardner's article and my frustration working on large sheets of graph paper with a pencil and eraser as I laboriously recalculated frame after frame. The idea of using a system to create an artwork appealed to my logical mind and I began exploring other alternatives like video feedback and symmetry systems. Six years later, in 1974, I began to learn how to use computers and quickly recognised a perfect medium for explorations of this kind. (Brown, 1996)

Brown cites Edward Ihnatowicz's *Senster* (1969) and Harold Cohen's *AARON* as being examples of working at different methodological poles in order to explore the limits of automation.[92] Cohen's work is a self-referential (closed) system that epitomizes the "top-down" approach to exploring automation and computation—working with internal data to represent ideas—while Ihnatowicz's approach saw the automatic machine as an object that can interact and decode its environment, allowing for a "bottom-up" approach more akin to ideas of evolutionary and emergent systems (Brown, 2008, pp.276-277). *Senster* is in many ways similar to the works of James Seawright that equally sought to have the machine object reflect upon its surroundings and project back onto the world from which it came. Following the 1968 exhibitions of *Cybernetic Serendipity*, *The Machine as Seen at the End of the Mechanical Age* and *Some More Beginnings* as well as (amongst others) the first exhibition at the Royal College of Art by the Computer Arts Society, *Event One* (1969), the automated machine—invariably in the form of the computer—became used in art practice through the 1970s and 80s. Brown notes that beyond using the machine as a means to create randomisation through numbers (as calculus), there was evidence of a shift towards the very behaviour of machines themselves. It is no longer enough that machines are tools, but through their automation, they become a greater part of a dialogic network of actors that impress on life.

Today, coding and automating the computer to find order behind chaotic systems has meant that nature, chance and randomness have been increasingly paralleled with computational systems (Taylor, 2014, p.167).[93] The application of such ideas has largely become translated into the control of complex market-based systems for the exchange (and distribution) of capital; here I am thinking of, for example, play in the context of the gambling undertaken on financial markets through high-frequency trading. The belief, that underlaying free play is a definable

[92] *Senster* was dismantled in 1974 though in 2018 a team in Poland have re-made the machine; a large amount of information about *Senster* has been gathered on a website by enthusiast Aleksandar Zivanovic.
[93] Though 'Computer Art' itself has always struggled in relation to being a medium in its own right, the use of computing as part of art practice—in the form of logistical organisation and representation of work to an audience via the web—means even those who consider themselves 'analogue' artists must recognise the impact of such tools.

pattern of behaviour, is the desire to harness an almost certain level of probability and so 'win' the game. The proliferation of computational automation created in order to 'speed up' this approach and accelerate to find its limits (of 100% accuracy, efficiency and speed)—no matter which methodological approach—is the aim of removing 'noise' from the network of bodies a machine consists of and works with. Artists have, and still do, try to resist becoming Flusser's "functionaries" of automation, attempting a different kind of free play within creative production or in developing a micro-level shift in the application of automation and machines in culture through antagonism and/or collaboration. It would seem that for these to take hold and to be an attractive force for the development of 'difference' as opposed to simulation (or ultimately be re-appropriated back into the system it might aim to antagonise), the more the rules of the game—the learning and knowledge of the systems, technologies and languages of automation—need to be known. In spite of C.P. Snow's distinction of "two cultures" in his 1959 Rede lecture,[94] which depicted science and art as having "a curious distorted image of each other" (1990, p.169), the artist and engineer (of which there is a long lineage) can be seen as singularly associated with play through a need to learn *in combination* the *paidia* and *ludus* of practice; working *with* the machine to shape its relation to culture (and overcome the 'othering' of it).

{Exit(0);….

In understanding the nature of play, as discussed in chapter ▷ Play, the dichotomy of its relation to rules or structure can be understood as the productive discourse of Huizinga's play-element in culture. In Martin Gardner's book, *Mathematical Carnival*, he notes that in order for a seemingly abstract mathematical investigation to hold the attraction of the reader, "there must be an interplay of seriousness and frivolity. The frivolity keeps the reader alert. The seriousness makes the play worthwhile" (Gardner, 1979, x). This tension, between seriousness and play, between Caillois's understanding of *paidia* and *ludus*, has made it difficult for a definition of 'play' to hold true. As play is context driven and as such shaped by temporal forces (one that changes *during* play)—an undulating magic circle of both written and improvised rules—it becomes a pliable behaviour. This can be one of the advantages of play, for to nullify it as a concept would

[94] Art practice has long been involved in a relation with science and engineering as a means of developing the 'images' an artist can make. In *Il Libro dell'Arte* (The Craftsman's Handbook) by Cennino d'Andrea Cennini, two chapters are given to instructions for making one's own paint brushes, a common practice up to the introduction of the metal ferrule in the nineteenth century. "Mechanisation eliminated the time-consuming and expensive operation of binding the hair to the handle by hand" (Katlan, 1999, p.24) and so allowed for a sturdier brush that could be used for on-site painting; the link to the rise in painting *en plein air* during that same time period (as to whether it is cause or effect) would require further examination but it is clear that technology and art move as synchronised cultural accomplices. The notion, then, that those in the arts are "natural luddites" serves only the rhetoric of dualistic thinking between art and science; a discourse of competition that does little for the progress of learning and education around either discipline.

be to reduce it to a static reading, thereby removing all of its supplementary potential to logic and rationality. This is not to say that play cannot contain 'serious' qualities, indeed for Huizinga the play-element is an important part in the development of civilised cultures. But, as much as play is a potential tool for both the development of, and the re-structuring of, a regulatory form, "false play" can be employed to divert its players towards a different rhetorical function than the aim seemingly being played; one that limits agency.

By identifying an increasing array of taxonomies for play, as in the work of Roger Caillois to Brian Sutton-Smith (and his seven rhetorical play-types), false play i.e., that of a playing machine—*machina ludens*—can apply these rhetorical tropes/discourses into persuasive and attractive qualities for the purposes of increasing its opacity. In the practical work figured within the first chapter, *Auto-Assemblage*, there is an exploration of rationalising play via assemblage; the human intuitive abstraction of material is presented in a manner that does not reveal the machine and automation as its 'maker'. The process used in this work can potentially take any material as an input and re-constitute it with other forms to create an alternate reading of how those materials might relate or be seen in dialogue with each other; this is not the machine as creator of an ever-expanding map of the 'real'—as in the map Jorge Luis Borges' cartographers undertake in *On Exactitude in Science* (1999, p.325)—but as a means to actively re-model the world. This is what a 'true' *machina ludens* would be capable of doing and the abstractions it would produce might become attractive forms indistinguishable from human or machine intention. As human and machine collapse from binary dualism, the automation of play means that when stepping away from the interface of a machine, entire worlds are busy being made; a portal to infinity much like Ian Cheng's artwork *Emissaries* (Louisiana Channel, 2017). Here, the initial structure of a game develops complexity through playing (with/against) itself, "the game becomes a self-governing, homeostatic system, a retroactive machine acting and reacting upon itself" (Fizek, 2018, p.211). Interactivity here goes far beyond the push of a button that makes an object move and becomes, instead, relegated to the history of an intelligence; the *learning machine*—and not the machine learning from its master—is that which plays. This, though, is for further research: the question of how, as an artist, an approach led by both creative concept building and technical construction might maintain an *equality of minds* (and not a technocracy or non-dialogic cultural production) when a machine can play creatively beyond not only the screen (or 'within' its black box) but as a form of intelligent, rhizomatic hardware.[95]

[95] Robin McKay, in discussion with Reza Negarestani, describes this dualistic approach to making—of being both drifting thinker and constructor of stable artefacts—as the problem of intelligence being undertaken "with the cheerful pragmatism of an engineer who, unable to simply pop the hood of his own braincase to peep inside, gets out his Lego and begins to build a model" (McKay & Negarestani, 2018).

Rather than a post-humanism, this is the on-going question of what it is to negotiate being human *in the present*—de-centred but not dismissed—for elements of this are already congruent to the machine-element in culture; its subsumption into "ordinary life" already withdraws all forms of free-play. Play has become marginalised as a form of excess or, as per Friedrich Schiller, an "overflow of surplus energy" (Sutton-Smith, 1987, p.75) that individuates us and can be captured for the purposes of capital in the form of commodification. In the current moment, with a global pandemic causing restrictions to be placed on access to, and the making of, culture via 'ordinary' means, perhaps there can be a re-assessment of 'how to play' with machines in this space and time. In the chapter, ∇ Machine, the caesura described during the mid-twentieth century in regards the end of a mechanical age could arguably be seen as no more significant than any other shift in culture since materials have been manipulated into tools. Refutation of the machine-element would therefore seem a gesture that might ignore its long-held and integral constitution as an 'actor' in the development of culture, and as such, the question becomes more akin to *how* it might be tamed or applied by the play-element (as the poeticism of logic). Artists such as Jean Tinguely would make the mechanical machine perform in the world, Channa Horwitz would make pleasurable those systems of logic through compositional scores while Haroon Mirza has re-sampled these 'machines' in attempts to reveal their withdrawal in the contemporary era. To me, this reading of Mirza's work would seem to represent the same question posed of access to the languages of automation; moving to high-level coding means information can be more easily bound into parts for writing but increases the depths of the black box, for it takes us another step away from its 'coming into being'. Does the play-element in the contemporary moment need to dig-deeper—be more than just a translation, one based solely on attractive affordances—in order to more effectively understand the precise depths of the rhetoric and agential influence it aims to plumb?

> Cohen expressed a passionate disdain for what he referred to as "off-the-shelf" software. […] Inevitably the artist would be associated with a product inexplicably linked to the future-orientated economy of new digital technology. (Taylor, 2014, p.194)

As I suggested in chapter △ Automation, the role of exploring discontinues and the inevitability of the machine-element's rhetoric of progress, requires an archaeology of the 'coming into being' of the abstractions before us. Through lengthy, complex networks of actors do black boxes become a substance for negotiation. In the practical work *When A Tyrant Eats Itself*, there exists the accumulation of a series of, in part or individually, 'meaningless' tasks of transcription—a practice one might say of data visualisations without purpose—that culminate in an object that, in itself, fails to hold together and consumes itself. Rather than allowing for the hermetically sealed programming of such objects, by creating a dialogue with the machinic

process of automation, similar to a game of consequences, there is always opportunity for some 'other' purpose; it is only when we hold technological objects up as concrete realisations, as icons, that they become tyrannical. As Flusser writes, perhaps a "dialogical programming" might mean that each of us are able to program our own apparatus (2011, pp.149-157). "To play for himself, each player plays for all others" (Ibid., p.162). A collaboration *with* the machine-element of culture, in order to be effective, is a collaboration for *all of us*. A dialogue with the machine opens up acceptance and learning of its difference, rather than the attempt to control it: a process of 'othering'. Harold Cohen found this in his work with *AARON*, and Tinguely found it working with Klüver–the artist, the engineer, the machine, all are programmed differently but the democratic nature of the dialogue needs to remain: "Each player is both a sender and receiver of information" (Ibid., p.162).

Learning plays a crucial factor in this and this research has perhaps been an unexpected self-served lesson in that respect, though also in relation to ideas of play more generally. The very rollercoaster ride of making materials and information traverse the network of ideas I have put into play—from handling nuts and bolts to writing programs in Python—has in many ways been a journey through the automated, machinic terrain dictated by my own limits of knowledge. To learn to write machine code or to wire a circuit is an act of resistance in itself, for I mean not in the procedural sense of a goal-orientated action as in the rhetoric of quantifiable learning outcomes and criteria within a prescribed 'curriculum' (for that already sets one on a path to being an automaton) but through working intuitively and stripping (or 'playing') with the binaries of disciplines, one can find other forms of co-existence. This is no easy task. The pull between free-play and a secure framework of rules creates tension, the temptation being to take the path of least noise and friction. Gardner noted the pedagogic attraction of play as a means to superficially 'lighten' knowledge in order to provide a scaffolded entry to the subject-at-hand, but one must be wary that this is not all it becomes and thereby does not provide the tools necessary to make one's own rules.

Understanding the different and complex regimes 'at play' within the present machine-element of culture requires a level of patience and time to pick apart; to have excess time, though, is marginalised and undesirably perceived as energy 'wasted' which is the same thinking that sees the play-element of culture as non-productive (in an economic sense). In chapter ◁ Attraction, the seeming 'side project' of Jack Leeson, his meticulous documenting of fairground amusements across the country, exists outside his day-to-day work and seems to me poetic—and attractive—for this precise reason. For me, to learn is not the thrill of coloured, flashing lights or the entertainment of a 'push button' interactivity (except perhaps in those moments in which a black box might temporarily reveal some part of itself and I might find myself in the

revelry of a small success!) but the gestation of a constellation of objects, materials and ideas unfolding into and onto one another much like Conway's *Game of Life*: once set in motion, understanding can move forward through cycles of birth, death and survival. Billy Klüver wrote: "In the same way as a scientific experiment can never fail, this experiment in art could never fail" (1968, p.171). Much like Chris Burden's work *When Robots Rule: The Two Minute Airplane,* whether the machine is stable and works or not, perhaps discoveries found along the way can prove to be just as invaluable, if not more so, than those expected in the result.

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