Performing Algorithms: Automation and Accident

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Abstract

Performing Algorithms: Automation and Accident investigates how artists might stage encounters with the algorithms driving our post-industrial, big-data-based, automatic society. Several important theories of this contemporary condition are discussed, including control societies, post-industrial societies, the automatic society, the cybernetic hypothesis, and algorithmic governmentality. These concepts are interwoven with histories of labour and automation, recent developments in machine learning and neural networks, and my own past work.

Through a series of expanded lecture performances that describe our algorithmic condition while setting it into motion, this research seeks to discover ways in which to advance new critical positions within a totalizing technical apparatus whose very design preempts it. The included creative works have been performed, exhibited, and published between 2014 and 2018. They are made available online through an artificially intelligent chatbot, a frequent figure in the research, which here extends the concerns of that research through to how the work is framed and presented.

The thesis focuses on both generative art and the lecture performance, which converge in *performing algorithms* but are generally not discussed in connection with one another. They emerged in parallel as artistic methods, however, at a time when management and computation were taking root in the workplace in the 1960s. Furthermore, as the Internet became widespread from the 1990s, generative art and the lecture performance each found renewed prominence.

With human language and gesture increasingly modelling itself on the language of computation and work constantly reshaped by the innovations of capital, this project identifies “not working” both in terms of the technological breakdown and also as a condition of labour under automation. A discussion of the first fatal accident involving a self-driving vehicle illustrates this dual condition. Shifting from glitch art’s preoccupation with provoking errors to a consideration of *not working*, this research proposes artistic strategies that learn to occupy rather than display the accident.

Declaration

This is to certify that:

(i) this thesis comprises only my original work towards the Doctor of Philosophy, except where indicated in the Preface;
(ii) due acknowledgment has been made in the text to all other material used; and
(iii) this thesis is fewer than 50,000 words in length, exclusive of tables, maps, bibliographies, and appendices as approved by the Research Higher Degrees Committee.

Preface

This research was funded by the Australia Postgraduate Award.

The “Melting Points” section of the “Essaying Algorithms” chapter has been adapted from a catalog essay I wrote for the exhibition, *Technologism*, at the Monash University Museum of Art in 2015.

Acknowledgments

In higher education, one finds themselves at the nexus of the various meanings of the word *credit*. The degree is a credit, a token that one has fulfilled assorted requirements, ticked boxes, and cleared whatever hurdles of demonstrable or new contributions to knowledge. And over the past few decades, these credits have become increasingly expensive, requiring that students borrow against their future in order to acquire them. An inverted credit, lives indebted. These are profoundly individualizing processes, which are reflected in the proliferation of IDs, passwords, and course management software.

While this pedigree, this symbolic capital can only be given by the institution, it is possible for *me* to give credit to others, however, and I have dutifully done so throughout the footnotes and bibliography. This is one way that I might make apparent that I am located within discursive networks and histories and that my own intellectual and artistic development has been shaped by them. *And yet*. And yet, the many self-reflective comments and references still fall far short of really, actually telling that story and acknowledging the significant and varied modes of material support that have been as formative, but otherwise invisible.

Thank you, first and foremost, Fiona, Siobhan, and Jasper.

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productive of the theoretical framework with which I embarked on the project. Particular thanks to Caleb Waldorf, Chandler McWilliams, Vladada Gallegos, Jordan Biren, Nikita Pashenkov, Elise Co, Naoko Miyano, Sarah Kessler, Ken Ehrlich, Solomon Bothwell, Jason Smith, Marc and Robby Herbst, Christina Ulke, Fiona Geuß, Fotini Lazaridou-Hatzigoga, Lars Fischer, Taeyoon Choi, Scott Rigby, Melanie Bouteloup.

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Not long after starting the PhD, I was drawn into an international lawsuit that is still ongoing. It interrupted the research through stress, financial difficulties, and the plaintiff's effort to have me expelled from the University of Melbourne. I am still here, however, and I have to thank the University of Melbourne; my lawyer in Montreal, Cory Verbauwhede; and all of the people who donated to my legal defense fund over these last four years. If it weren't for you (and Cory's flexibility) then I surely would have not made it this far.

Twenty years ago, I dedicated my undergraduate thesis to my mother who had passed away not long before I started the project. My father died less than a year before I began this one and I warmly acknowledge his unquestioning support.

Finally, I respectfully acknowledge the Boonwurrung and Wurundjeri peoples of the Kulin Nations, their ancestors and elders, who are part of the longest continuing culture in the world. It was as an uninvited guest on their unceded territory that I wrote this document.

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Creative work can be accessed at: *http://phd.e-rat.org*

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Introduction

It was an accident that I ended up learning to program. After graduating from university with a degree in architecture, I tried but couldn't find an architecture job. Anxious, unable to live in New York without one, I jumped at the offer a friend made to me at a party to work in an office with him as a programmer, even though I didn't really know how. "You can learn as you go," he said. Just like that, I was sucked into a rapidly inflating dot-com bubble.

Those accidents - failing at architecture, going to that party, being in New York in the ascent of the bubble - tuned my attention into a developing technological and economic landscape that would eventually manifest itself in the platform capitalism that engulfs us today. In those ensuing two decades, I have been trying to both keep up with the changes and also figure out possibilities for intervention, whether in order to establish new infrastructures for collaboration and sharing knowledge or to draw attention to lurking dangers.

Performing Algorithms: Automation and Accident is a practice-led research project that asks how artists might stage encounters with the algorithms driving our post-industrial, big-data-based, automatic society. Through a series of expanded lecture-performances, I have attempted to, as Vilém Flusser writes, "grasp them in their cretinous concreteness," learning to play their game or else be played.[1] But what is the nature of these *encounters*? Although I have conducted this project in the spirit of critique, as almost a kind of institutional critique within the non-site of computational capitalism, I am also conscious that critique itself is under pressure from these very conditions. How might one advance "new critique and new positions"[2] within a totalizing technical apparatus whose very design preempts it?

The boundlessness of such a technical apparatus and the logic of preemption, which doesn't set up obstacles that prevent events from happening so much as create the conditions where events are never even possible, are particularly difficult to grasp. "Framelessness" is the name given by Mark Andrejevic to the cultural logic that reduplicates the world in data, no longer bound by the partial perspectives of narrative or subjectivity because it aspires to absorb and represent

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[1] Vilém Flusser, *Post-History*, ed. Siegfried Zielinski, trans. Rodrigo Maltez Movaes (Minneapolis, MN: Univocal Publishing, 2013), 26.

[2] Bernard Stiegler and Anaïs Nony, "Bernard Stiegler on Automatic Society, As Told to Anaïs Nony," *The Third Rail Quarterly*, no. 5 (2015): 17, *http://thirdrailquarterly.org/bernard-stiegler-on-automatic-society/*.

everything.[3] It also suggests the disorienting problem of finding it difficult to get one's bearings, to get a hold of things, particularly from within the space-time of an artwork.

Although it has turned out to be a marginal, even gimmicky mode of painting, certainly at odds with the flatness valued by Clement Greenberg, I wonder if the tradition of *trompe l'oeil* might suggest an artistic response to such framelessness. The 1874 "Escaping Criticism," (Figure 1) painted by Pere Borrell del Caso shows a boy, poised to spring out from the painting. His two hands grasp the sides of the frame, one foot rests on the bottom, and his head pokes out beneath the top. In order to conjure the illusion, the frame itself is painted such that it is occluded by and receives shadows from the painting's "content."

Figure 1: Pere Borrell del Caso, Huyendo de La Crítica (Escaping Criticism), 1874.

[3] Mark Andrejevic, "'Framelessness,' or the Cultural Logic of Big Data," in *Mobile and Ubiquitous Media*, ed. Michael S. Daubs and Vincent R. Manzerolle (Peter Lang US, 2018), doi:*10.3726/b13289*.

The “escape” referred to in the title appears to be literally shown as the boy in the painting “breaks out” of the frame and into the space of the viewer. But it is also possible to look at it in the opposite direction: that the space of the viewer is already present in the space of the painting due to the frame and light. This slippage between the space of viewing and the space of representation[4] both acknowledges, even mobilizes the boundlessness, while intensifying the moment of the frame: the boy is *in the act* of escaping. The format of the lecture-performance has worked in a similar manner within the course of this project, which I discuss in more detail in Chapter 9.

One theme that pervades the entire project is “*not working*,” alluding to both changing labour conditions (via automation) and to technological malfunction (or accident). Wendy Hui Kyong Chun warns us not to attribute to much power to systems of control by imagining that they are more effective and pervasive than they actually are. This attitude cuts between the familiar techno-utopian and techno-dystopian positions, which each compete for our allegiance to their belief in an all-powerful technosphere, by insisting instead “on the failure and the actual operations of the technology.”[5] In much the same way that psychoanalysis distrusts what the patient believes they are saying, the marketing and publicity of technology companies is often less revealing than the particular ways that things don’t work. I propose that the recursive complexity of computational systems suggests similarly recursive artistic strategies that learn to occupy, rather than just display these many, minor accidents.

The focus of my research at the outset of this project was the “expanded essay,” largely informed by Theodor Adorno’s influential text, “The Essay as Form.” Although this might appear to have very little relation to what the project has become, the journey between the two was actually quite natural.[6] My interest in the essay was framed by a question of how the 500 year-old form was adapting to the context of networked media, especially given how the essay mutates with new

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[4] In Gérard Genette’s 1972 structuralist study of narrative form, he identifies a similar collapse of diegetic boundaries when Julio Cortazar “tells the story of a man assassinated by one of the characters in the novel he is reading.” (234, footnote specifies Cortazar, “Continuidad de los Parques,” in Final del luego) Metalepsis is the name Genette provides for those moments of breaking the frame between “the world in which one tells [and] the world of which one tells,” (236, italics added) even referring to “characters escaped from a painting” in the work of Alain Robbe-Grillet. (235, “… a book, a press clipping, a photograph, a dream, a memory, a fantasy, etc.”)

[5] Wendy Hui-Kyong Chun, *Control and Freedom: Power and Paranoia in the Age of Fiber Optics* (Cambridge, Mass: MIT Press, 2006), 9.

[6] More than a century ago, Walter Pater wrote that “there will always be much of accident in this essentially informal, un-methodical, method.”, Walter Pater, *Plato and Platonism; a Series of Lectures* (London: Macmillan and co., limited, 1922), 185–86, *http://name.umdl.umich.edu/aje1092.0001.001*

technologies of distribution - for example, printing press and cinema. In much the same way that the essay-film, as described by Timothy Corrigan, Phillip Lopate, Laura Rascaroli, and Nora Alter, demonstrates that the essay can be considered as methodology that can operate beyond the printed page, it can also be found at work in many lecture-performances. Moreover, the methodology of the essay seems to hold some appeal for filmmakers and artists examining new technologies, in part because it allows for those technologies to be incorporated into the form. Chris Marker's *Level Five* (1996), Harun Farocki's *Parallel* (2012), Rabih Mroué's *The Pixelated Revolution* (2012), and Hito Steyerl's *How Not to be Seen. A Fucking Didactic Educational .MOV File* (2013) each exemplify this tendency for me.

And now, even if it is not the central focus, the presence of the essay can still be felt throughout my project, both in the artwork (a handful of published articles and scripts along with some lecture-performances) and also in the writing that follows, which is broken into 13 essay-length chapters. My intention throughout this writing has been to allow history, theory, news, personal reflection, and my own work to appear in close proximity to each other so that connections can be drawn between them, rather than isolating them under the pretense of academic structure. That isn't to say it is haphazard, but rather, "it proceeds, so to speak, methodically unmethodically."[7] Each chapter presents a perspective onto the same subject, but from a different orientation, such that what is in the foreground in one chapter recedes into the background, or is eclipsed by something else, in the others.

[7] Theodor W. Adorno, "The Essay as Form," in *Notes to Literature* (New York: Columbia University Press, 1991), 13.

Generative Art

Generative art is the art of control societies. My initial reason for making this provocation is quite simply the frequent concern with *control* in theorizations of generative art. Philip Galanter, who claims a definition of generative art that is "the most widely cited… to date"[8] says:

> Generative art refers to any art practice where the artist cedes control to a system that operates with a degree of functional autonomy that contributes to or results in a completed work of art. Systems may include natural language instructions, biological or chemical processes, computer programs, machines, self-organizing materials, mathematical operations, and other procedural inventions.[9]

This notion of handing over 'control' was not in the definition he originally proposed in 2003 — "*the artist uses a system… that is set into motion with some degree of autonomy*"[10] — but after adding it in 2008 it has remained in place as recently as 2016 when he writes that "[t]he key element in generative art is this use of an external system to which the artist cedes partial or total control."[11] In short, the artist moves from *using* a system that is "set into motion" with "some degree of autonomy" to *ceding control* to a system that "operates" with "a degree of functional autonomy." "Use" suggests the relationship that a craftsman might have to a tool, while "set into motion" conjures up a machine or a motor, but ceding control points somewhere else entirely: towards a post-industrial context.

To *cede* something means to give it up, to yield, surrender, or withdraw. It is a calculated decision and an act, not just a loss. When a generative artist cedes control in this way, they do so in order to be surprised by some novel, emergent

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[8] Philip Galanter, "Generative Art Theory," in *A Companion to Digital Art*, ed. Christiane Paul (Malden, MA: Wiley Blackwell, 2016), 151. The definition that he refers to is in his 2003 article, "What is generative art? Complexity theory as a context for art theory." That definition, which I quote next, was updated in a 2008 conference paper.

[9] Galanter, "Generative Art Theory," 154. Galanter is actually misquoting himself here. He quotes Philip Galanter, "What Is Complexism? Generative Art and the Cultures of Science and the Humanities," in *International Conference on Generative Art. Generative Design Lab, Milan Polytechnic, Milan*, 2008, 4. but in that text "functional autonomy" is actually "relative autonomy," which is not insignificant for his argument in 2016.

[10] Philip Galanter, "What Is Generative Art? Complexity Theory as a Context for Art Theory," in *In GA2003 6th Generative Art Conference*, 2003, 4.

[11] Galanter, "Generative Art Theory," 151. In the 2003 text, he follows up the definition with a sentence that is almost identical, suggesting that control has been a persistent concern, even more notably for its exclusion from the proper definition: "The key element in generative art is then the system to which the artist cedes partial or total subsequent control."

behavior or outcome. In this sense, Margaret Boden and Ernest Edmonds write that control is not merely "lost" in generative artworks, but "deliberately sacrificed"[12] and their definition explicitly locates the generative dimension of the artwork in "*some process that is not under the artist's direct control*."[13] Similarly Jon McCormack and Alan Dorin wrote in 2001: "Generative art seeks to exploit the out-of-control nature of nature, but to achieve this in a genuine sense, the artist is obliged to acknowledge that control must really be relinquished."[14] Control features prominently and frequently in each of these three accounts and across all of them the type of control that is being deliberately redistributed is the artist's control over their material and medium, suggesting a new form of mastery, as if the generative artist were a virtuosic choreographer of autonomous processes.

For Galanter, the process or system must have "functional autonomy," which means that it must function on its own without "moment-to-moment decision making or control by the artist" but not that the system has any particularly will or consciousness.[15] The stakes of this delegation of control are problems of authorship, intent, uniqueness, authenticity, creativity, and meaning.[16] Boden and Edmonds pose similar questions, such as, "what, exactly, do we mean by creativity?"; "How can we identify the 'artwork'"; and "Just where… is the true author?"[17] And McCormack and Dorin, along with Oliver Bown, Jonathan McCabe, Gordon Monro, and Mitchell Whitelaw crafted an entire "Ten Questions Concerning Generative Computer Art," which treads the same ground while also beginning a more critical self-interrogation, speculating that artists "are agents of production within a stratified global art market" and wondering "Has generative art run out of ideas?"[18]

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[12] Margaret A. Boden and Ernest A. Edmonds, "What Is Generative Art?" *Digital Creativity* 20, nos. 1-2 (June 2009): 30, doi:*10.1080/14626260902867915*.

[13] Boden and Edmonds, "What Is Generative Art?" 29.

[14] Jon McCormack and Alan Dorin, "Art, Emergence, and the Computational Sublime," in *Second Iteration: Emergence: Proceedings of the Second International Conference on Generative Systems in the Electronic Arts* (Melbourne, Australia: Monash University - Centre for Electronic Media Art, 2001), 79.

[15] Galanter, "Generative Art Theory," 152.

[16] Galanter, "Generative Art Theory," 166–73.

[17] Boden and Edmonds, "What Is Generative Art?" 39–40.

[18] Jon McCormack et al., "Ten Questions Concerning Generative Computer Art," *Leonardo* 47, no. 2 (April 2014): 139–40, doi:*10.1162/LEON_a_00533*. For what it's worth, Boden and Edmonds and Galanter make scant reference to the others, while McCormack and Dorin seem to be more comprehensive in their survey of the field.

In one early touchpoint for generative art, the “Manifesto of Surrealism” (1924), André Breton provides a definition for the noun Surrealism:

> Psychic automatism in its pure state, by which one proposes to express — verbally, by means of the written word, or in any other manner — the actual functioning of thought. Dictated by thought, in the absence of any control exercised by reason, exempt from any aesthetic or moral concern.[19]

Here, the hand and mind of the artist may well still be involved, but creative control is taken away from *reason* and influence by aesthetics or morals. Although Breton’s notion of art and the associated poems and images may have once shocked public sensibilities, the methods and artifacts have since been totally absorbed into modern art history. The recent theorists of computer-based generative art suggest that computation now occupies the role formerly played by psychic automatism, appropriating many of Surrealism’s aesthetic claims. Galanter writes that artists use generative systems because they “surprise the artist and provide a springboard for novelty and new ideas,”[20] echoing Breton’s ode to the freedom of the imagination and his methods for rehabilitating it.

Breton’s definition, proposing an automatism as a mechanism that enables a short-circuit of reason, projected onto digital networks and massive data processing, however, amounts to a celebratory version of the “collapse of reason” that Bernard Stiegler warns about in an automatic society, and which I will discuss later along with Antoinette Rouvroy’s algorithmic governmentality. But amidst the aesthetic claims, there is no sense of the concerns of Stiegler or Rouvroy in the dominant literature on generative art. If these concerns are addressed at all, they are framed as coy questions about the collapse of authorship and authorial responsibility.

My feeling is that because recent theories of generative art seem preoccupied with questions of creativity (the artist’s or the machine’s) they have not run out of ideas so much as worked themselves into a corner, the way a feedback loop in a computer program might leave that program stuck in one small part of its possibility-space until it’s been restarted. If there is a moment within the recent generative art discourse that stands out to me as a point of intervention, it would be Galanter’s pronouncement in 2003 that “Generative art is ideologically neutral,”[21] a claim he repeats 13 years later: “generative art per se is ideologically neutral,” in order to establish a broader transhistorical assertion: “generative art is prehistoric

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[19] André Breton, *Manifestoes of Surrealism*, 1. ed. as an Ann Arbor paperback, Ann Arbor Paperbacks 182 (Ann Arbor, Mich.: Univ. of Mich. Pr, 1972), 26.

[20] Galanter, “Generative Art Theory,” 168.

[21] Galanter, “What Is Generative Art? Complexity Theory as a Context for Art Theory,” 19.

and precedes modernism, postmodernism, and every other 'ism' on record."[22] Generative art's ideological "neutrality" recalls Chris Anderson's "end of theory" and the idea that an algorithmic system would overcome human bias — and neither acknowledges that ideology might be encoded into the algorithm, or that such an algorithmic sensibility is itself already ideological. Moreover, while each one of the theories of generative art specifically divorces itself from a necessary relationship to computers such that the art predates computers by thousands of years, all of them were developed within discourses focused on computation, from visualization to artificial intelligence and artificial life. In short, generative art would not exist were it not for the computer.

The essence of generative art, for McCormack, Dorin, *et al.*, is "a methodology" such that generative art is split into its computational and non-computational counterparts.[23] Margaret Boden and Ernest Edmonds locate the terminological origins of 'generative art' and 'computer art' in the mid 1960s, emphasizing that at the time both of these terms were usually used together, if not interchangeably, as in the title of George Nees's exhibition in Stuttgart in February 1965, *Generative Computergraphik*.[24] Boden and Edmonds's article, "What is Generative Art?," ultimately subdivides this unified computer-generative art and rearranges and superimposes the parts into a taxonomy that resembles a table of elements or DNA — Ele-art, C-art, D-art, CA-art, G-art, CG-art, Evo-art, R-art, I-art, CI-art and VR-art[25] — such that CG-art (computer generated art) is a subclass of a larger category of G-art (generative art). And Galanter warns that "conflating the term 'generative art' with the term 'computer art' would come at an unacceptable cost."[26]

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[22] Galanter, "Generative Art Theory," 171.

[23] McCormack et al., "Ten Questions Concerning Generative Computer Art," 135.

[24] Boden and Edmonds, "What Is Generative Art?" 23. Two months later, the work of A. Michael Noll and Béla Julesz was shown in an exhibition called *Computer-Generated Pictures* at the Howard Wise Gallery in New York City. In both exhibitions, the titles concatenate computation and generation, immediately describing how the artworks themselves were produced through the use of a computer to 'generate' an image.

[25] These names of these eleven classes are short for electronic, computer, digital, computer-aided, generative, computer generated, evolutionary, robot, interactive, computer-based interaction, and virtual reality — in short, the names used over the past few decades for art involving technology. Media art is probably the most significant exclusion from the taxonomy., Boden and Edmonds, "What Is Generative Art?" 27–38

[26] Galanter, "Generative Art Theory," 146.

Although I have no proof other than my own exposure to the world of 2000s media art,[27] the recurring urge to pry generative art away from computer art has been often based in a desire for recognition from the "precious bubble"[28] of the art world. Boden and Edmonds even conclude their essay with an extended argument for the computer generated works considered to be given "the coveted status of art."[29] Any such desire was the quiet obverse of a more outspoken criticism of the art world for being too commercial (or not commercial enough in its openness to new industries), too conservative, or too passive. For Galanter, divorcing generative art from the computer breaks a postmodern impasse that would allow artists to put aside all the influences of "man and culture" in pursuit of timeless aesthetic concerns like truth and beauty.[30]

I am not interested in generative art for its alleged timeless qualities but rather in how the generative allows for a consideration of automation, labour, and art's imbrication with capitalism vis a vis technology. In other words, I am particularly interested in grounding generative art within social, political, economic, and cultural practices, even welcoming a connection with computation in an expanded sense.

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[27] At UCLA's Design | Media Arts department from 2003 to 2008 (first as graduate student and then as adjunct faculty) and as a director from 2005 to 2013 of Telic Arts Exchange, a non-profit with a mission to provide a critical engagement with new media and culture.

[28] McCormack et al., "Ten Questions Concerning Generative Computer Art," 139.

[29] Boden and Edmonds, "What Is Generative Art?" 42.

[30] Galanter, "Generative Art Theory," 170.

Control Societies

I can't remember the first time that I read Gilles Deleuze's "Postscript on the Societies of Control"[31] or how many times I've returned to it over the years, but I've never forgotten the moment within the text that seemed to me at the time a terrifying void: "Individuals have become "*dividuals*", and masses, samples, data, markets, or "*banks*."[32] In that small passage from individual to dividual, from masses to banks, it felt as though personal and collective agency, obstinate refusal, the power of protest, or just about every way that I've ever imagined resistance might unfold disappeared in a puff of smoke. Why? As a *dividual*, I would be decomposed and subdivided into innumerable reduced or highly abstracted digital representations. In that moment I felt burnt alive and scattered like ashes. Worse still was the sense that collectivities weren't developing out of shared political project, mutual desire, or even the accident of being in the same place at the same time, but because cops and corporations were recomposing our bits and pieces into exploitable resources - *banks*.

The periodizing story of "Postscript", developed during the late 1980s, was that the *disciplinary societies* that Michel Foucault has associated with the eighteenth and nineteenth centuries were giving way to *control societies*. Institutions of confinement, such as hospitals, schools, and prisons, were "breaking down" and "a new system of domination"[33] was being introduced in their wake. This transition isn't instantaneous. Deleuze sees the initial judicial contours of control societies

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[31] There are two translations of the essay, which was originally published in *L'autre journal*, no. 1 (May 1990): in Winter 1992, the art journal *October* published one called "Postscript on the Societies of Control"; and in 1995 the essay was included in the edited collection, *Negotiations: 1972-1990*, under the title "Postscript on Control Societies". On a sentence by sentence level, the two essays are identical, but there are significant differences within each sentence, from structure to the particular words used. Where the *October* version uses "enclosure", "corporations", "stocks", "stockholders", "marketing", "numerical", "crisis", and "serpent" the version in *Negotiations* uses "confinement", "businesses", "activities", "administrators", "sales department", "digital", "breakdown", and "snake". I don't find one version superior to the other, preferring corporations to businesses but digital to numerical. The *October* writing is overall a bit more cumbersome but has surgically whittled down some lines down with memorable precision, like "There is no need to fear or hope, but only to look for new weapons" (pg. 4); or "Many young people strangely boast of being 'motivated'". (pg. 7) I will be drawing from both translations based on affinity, but when quoting from one I will also provide the alternative translation in the footnotes.

[32] Gilles Deleuze, "Postscript on the Societies of Control," *October* 59 (n.d.): 5. "Individuals become '*dividuals*' and masses become samples, data, markets, or '*banks*'".

[33] Gilles Deleuze, "Postscript on Control Societies," in *Negotiations, 1972-1990*, European Perspectives (New York: Columbia University Press, 1995), 182. The breakdown was called the "crisis of the institutions" in *October*.

described in Frans Kafka's *The Trial*, in which the legal system vacillates between discipline's "*apparent acquittal*" and control's "*endless postponement*"[34]; institutions were breaking down especially in the aftermath of the Second World War; until he writes in 1990 that "we're at the beginning of something new;"[35] and finally that we "should closely watch the themes that develop over the next forty or fifty years."[36] Even still, "[i]t may be that older means of control, borrowed from the old sovereign societies, will come back into play, adapted as necessary,"[37] describing a scene in which old sites, institutions, and practices are in various states of decay, rebirth, or reincarnation, rather than an entirely new regime. Avoiding a clear, discrete sequence of periods, the kind of description that might have been made in a disciplinary society, Deleuze's conception is formed by the metaphors of control, "shifting,"[38] "like a self-transmuting molding continually changing from one moment to the next."[39] If you "never finish anything"[40] in control societies, then nothing ever finishes either, it is constantly repurposed, reshaped, reproduced, but never in quite the same way.

The paradox, of course, is that this flexible, improvisational, unconfined, seemingly *free* society is characterized by its *control*. William Burroughs, whom Deleuze acknowledges[41] for "naming the monster"[42], commented that this sense of free will was *necessary*: "control also needs opposition or acquiescence; otherwise it

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[34] Deleuze, "Postscript on Control Societies," 179.

[35] Deleuze, "Postscript on Control Societies," 182. "We are at the beginning of something".

[36] Gilles Deleuze and David Lapoujade, "What Is the Creative Act?" in *Two Regimes of Madness: Texts and Interviews, 1975-1995*, Semiotext(E) Foreign Agents Series (New York : Cambridge, Mass: Semiotext(E) ; Distributed by MIT Press, 2007), 322.

[37] Deleuze, "Postscript on Control Societies," 182. "It may be that older methods, borrowed from the former societies of sovereignty, will return to the fore, but with the necessary modifications".

[38] Deleuze, "Postscript on Control Societies," 181. "rapid rates of turnover, but also continuous and without limit".

[39] Deleuze, "Postscript on Control Societies," 179. "like a self-deforming cast that will continuously change from one moment to the other".

[40] Deleuze, "Postscript on Control Societies," 179. "one is never finished with anything".

[41] Gilles Deleuze, "Having an Idea in Cinema," in *Deleuze & Guattari: New Mappings in Politics, Philosophy, and Culture*, ed. Eleanor Kaufman and Kevin Jon Heller, trans. Eleanor Kaufman (Minneapolis: University of Minnesota Press, 1998), 17. "the term put forth by William Burroughs… societies of control".

[42] Deleuze, "Postscript on Control Societies," 179. "proposes as a term for the new monster".

ceases to be control."[43] If "the workers have become machine-like tape recorders"[44] then they are merely being *used*, not controlled. For Burroughs, control requires incompleteness, or a gap between the controller and the controlled, which is not quite a direct performance of the wishes of the controller, but *almost*. The gap is bridged by words - suggestions, persuasions, orders - in fact, "no control machine so far devised can operate without words."[45]

Interestingly, when discussing the machines that correspond to each society, Deleuze associates the cybernetic machines and computers, which *do* operate without words. Still, he makes specific reference to the "digital language of control"[46] and "codes," which is suggestive of "*order-words*." Order-words are not imperative statements, but a function of language that connects the words to social acts or obligations. They describe J. L. Austin's performative utterances, but also promises, questions, and situations in which a declaration is effective because of the particular material circumstances in which it is made.[47] Deleuze also aligned order-words with information, inasmuch as the order-word is the means by which "you are told what you are supposed to believe," ultimately concluding that "information is exactly the system of control."[48]

Paranoia pervades Burroughs's text, "The Limits of Control", which announces its interest in "techniques of mind control"[49] in the very first sentence. He seems fixated on *controllers*, asking of America "Who actually controls this country?"[50] and then proceeding to venture an answer. The sense I have from "Postscript", on the other hand, is that control is not simply a relation between controllers and the controlled, but control is autonomous and ubiquitous, having a force of its own, without any necessary sovereign *intention*.

Can this difference in control (directed versus autonomous) be explained by the introduction of computers and algorithmic automation? Not entirely. Deleuze emphasizes that a machine is not determinative of the society it corresponds to,

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[43] William S. Burroughs, "The Limits of Control," ed. Sylvere Lotringer, *Semiotext(e): Schizo-Culture* III, no. 2 (1978): 38.

[44] Burroughs, "The Limits of Control," 38.

[45] Burroughs, "The Limits of Control," 38.

[46] Deleuze, "Postscript on Control Societies," 180. "numerical language of control".

[47] Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (Minneapolis: University of Minnesota Press, 1987), 79–82.

[48] Deleuze and Lapoujade, "What Is the Creative Act?" 321.

[49] Burroughs, "The Limits of Control," 38.

[50] Burroughs, "The Limits of Control," 41.

but rather “they express the social forms capable of producing them and making use of them”[51] and so in order to begin understanding what they do, one would have to “analyze the collective apparatuses of which the machines are just one component.”[52] The development of these new cybernetic machines - coming after the thermodynamic machines of disciplinary societies - is “deeply rooted in a mutation of capitalism,” in which production centers are globally dispersed to the Third World, displaced by a “metaproduction”[53] in the form of finance, logistics, marketing, and other services. If there is a difference in control, it is not fundamentally because of technology, but because of power; or as Deleuze said in a conversation with Foucault 18 years earlier, “it is clear who exploits, who profits, and who governs, but power nevertheless remains something more diffuse.”[54]

Even still, technology plays a fundamental role in the diffuse exercise of power, as we can see in a hypothetical, practical example, in the final section, of a control mechanism that could track the position of any “animal in a reserve” or “human in a corporation”[55]. Coming from the imagination of Felix Guattari, this tracking mechanism is an electronic access card (Figure 2), which is able to position an individual in space and time, thereby allowing or prohibiting access somewhere based on some set of rules, potentially changing in real time. The important thing is “not the barrier but the computer that tracks each person’s position,”[56] setting up an asymmetry between the world of things and the world of data, where one is governed by the other.[57]

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[51] Deleuze, “Postscript on Control Societies,” 180. “they express those social forms capable of generating them and using them”.

[52] Gilles Deleuze and Tony Negri, “Control and Becoming,” in *Negotiations, 1972-1990*, European Perspectives (New York: Columbia University Press, 1995), 175.

[53] Deleuze, “Postscript on Control Societies,” 181. “higher-order production”.

[54] Michel Foucault and Gilles Deleuze, “Intellectuals and Power,” in *Language, Counter-Memory, Practice: Selected Essays and Interviews*, 1. printing, Cornell paperbacks, [Nachdr.], Cornell Paperbacks (Ithaca, NY: Cornell Univ. Press, 1980), 214.

[55] Deleuze, “Postscript on the Societies of Control,” 7. “animal in a game reserve, a man in a business”.

[56] Deleuze, “Postscript on the Societies of Control,” 7. “it doesn’t depend on the barrier but on the computer that is making sure everyone is in a permissible place”.

[57] This project was affected by the context it describes. One example: in the course of my PhD research, my studio access was revoked during a period of construction and now my access card doesn’t have the permission to open any of the many locked doors in The Stables - a restoration of the Victorian Police mounted branch horse stables as the new studio spaces.

Figure 2:The access cards that I have acquired over the past few years at various Australian universities.

As a writer of software, I naturally see this image from Guattari as a spatial manifestation of a conditional statement — *if* this person has access *then* open this barrier — which raises questions of the boundary of the program as a whole and the operating system in which it is running. And to even begin to form a response, we'd have to "analyze the collective apparatuses of which the machines are just one component," from war to biometrics. In other words, a person 'on the ground' is just one component in a larger system of heterogenous, interconnected components; and while the effects of control are materially felt by, for example, the one who is blocked, the locus of control is dispersed and most often invisible.

Wendy Hui-Kyong Chun warns that Deleuze's persuasive text has become something of a self-fulfilling prophecy, imagining that control systems are more pervasive and effective than they are, a reading that gives them too much power in our imaginations, which is then realized in time. Chun would rather we focus on the technology, not to fetishize it, but "to insist on the failure and the actual operations of technology,"[58] which are largely absent from "Postscript." The gate locks up, the computer system crashes, the access card gets corrupted, or the reader is simply out of service. There are so many parts of the apparatus that can and do go wrong - I have often drawn attention to these moments in my work, such as Google's misunderstanding of my words in *s2t*, or YouTube's automated cease and desist letters to my automated monochrome videos, both of which are discussed in the final chapter. These errors don't take away from "Postscript" but suggest some methods for working against control.

"Postscript" leaves me uncertain in terms of how it understands the persistence of industrial exploitation (in the service of high tech economies). I've already noted the overlapping periodization of discipline and control, even the vacillation between the two. And with capitalist restructuring of production, Deleuze gestures towards a spatial redistribution of discipline according to the demands of control. For millions of imprisoned Americans or for Chinese iPhone assembly workers, sites of discipline certainly didn't just go away. In fact, Deleuze remarks that "one thing" that "hasn't changed" is that "capitalism still keeps three-quarters of humanity in extreme poverty, too poor to have debts and too numerous to be confined."[59] So what is the status of this impoverished majority in a control society? Deleuze leaves the question open, as something that control will have to 'deal with', and by writing "man is no longer man enclosed, but man in debt,"[60] he seems to suggest

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[58] Chun, *Control and Freedom*, 9.

[59] Deleuze, "Postscript on Control Societies," 181. "It's true that capitalism has retained as a constant the extreme poverty of three quarters of humanity, too poor for debt, too numerous for confinement".

[60] Deleuze, "Postscript on the Societies of Control," 6. "A man is no longer a man confined but a man in debt".

that control is a ‘first-world problem.’ At the very least, it operates differently in different places and at different times.

Automatic Societies

The measurement of the global annual temperature anomaly began rising above 0°C beginning in the early 1970s and has never returned. In that same period, productivity began to pull away from wages, leading to similarly rising inequality. The effects of a warming planet are as unevenly distributed as the accumulated wealth, with the destructive weather, potable water shortages, and toxic landscapes barely touching the lives of the hyper-mobile wealthy. It's clear that economic inequality is related to climate change in their effects; but are they also both symptoms of the same cause? One might simply say "yes, capitalism," but capitalism pre-exists the acceleration of both of these trends. McKenzie Wark even raises the question, "What if this is not capitalism any more, but something worse?"[61] as a consequence of the development of information since the Second World War. Is it something about *information* that is driving both a warming planet and an extreme concentration of wealth?

Here, I am approaching a discussion of the Anthropocene, which is a widely used but unofficial term for describing the present geological era in which the climate, geology, and ecosystems of the Earth are significantly altered by human activity. There is disagreement about the start date, the dominant cause and even the name, and I am not going to provide an overview here, but I will simply mention that both the environmental effects (for example, the rise in temperatures or the reduction of insect biomass) and social awareness (measured by the amount of research or the number of mentions in popular media) of the Anthropocene have accelerated in tandem with one another, particularly over the past 40 years.

"The Anthropocene era," Bernard Stiegler writes, "is that of industrial capitalism, an era in which *calculation prevails over every other criteria of decision-making*, and where algorithmic and mechanical becoming is concretized and materialized as logical automation and automatism," suggesting both a continuity with a process that began with the industrial revolution and a break, or acceleration, in the intervening algorithmic revolution. He continues by saying that this amplification of calculation ushers in "the advent of nihilism, as computational society becomes an automatic and remotely controlled society."[62] This nihilism, this devaluation of all

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[61] McKenzie Wark, "What If This Is Not Capitalism Any More, but Something Worse? NPS Plenary Lecture, APSA 2015, Philadelphia, PA," *New Political Science* 39, no. 1 (January 2017): 58–66, doi:*10.1080/07393148.2017.1278846*.

[62] Bernard Stiegler, "Automatic Society 1: The Future of Work - Introduction," trans. Daniel Ross, *La Deleuziana Online Journal of Philosophy* 1 (2015): 130, *http://www.ladeleuziana.org/wp-content/uploads/2015/05/Stiegler.pdf*.

values or "*the negation of knowledge itself*,"[63] refers to the destruction of individual and collective 'protentions' — our orientation towards or creative anticipation of the future — in much the same way that Antoinette Rouvroy has described algorithmic governmentality's short-circuiting of reflection, deliberation, and critique.

Steigler puts it in different terms: a "collapse of reason" occurs because the network, in spite of its massive distances, operates at a speed millions of times faster than the human body. Computers are perfectly capable of analyzing data (which pours in from all over the world, including through the actions of individuals) but, Stiegler argues, "it is not possible to calculate the future." This doesn't mean that computation is unable to make predictions about what will happen — it does, and it often does so very effectively — but rather that such calculations reduce the future to a matter of probabilities. When the future is treated in this way, it obliterates the 'improbable' dimension of futurity, and since this dimension is the one incalculable thing, it is precisely that which is attenuated at every step by computation.[64] Moreover, it "structural[ly] eliminat[es] conflicts, disagreements and controversies."[65]

While 'the completion of nihilism' and 'a collapse of reason' are deeply troubling consequences of automaticity, Stiegler isn't setting up an anti-technology platform in order to make simple oppositions such as autonomy and automation or human and technology. On the contrary, his growing philosophical project is based on the fundamental place of technics in human existence. The idea of recovering the human makes practically no sense within this framework, because what it means to be human is completely imbricated in technological development. Unlike other species, humans developed "a system of inheritance based not on the transmission of genes but of technical artefacts,"[66] an idea which recasts the technical world as a kind of environmental DNA, which plays as much of a role in shaping the potentialities of an individual or collective as their genetic codes.

Technics, for Stiegler, is the *exteriorization* of knowledge. One significant instance of this is the exteriorisation of memory into 'tertiary retentions,' an extension of Edmund Husserl's primary retentions (how one retains and understands in the present moment) and secondary retentions (in which memory is drawn upon). Tertiary retentions are no longer in one's head, but exteriorised, spatialised, and

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[63] Stiegler, "Automatic Society 1," 136.

[64] Stiegler and Nony, "Bernard Stiegler on Automatic Society," 17.

[65] Stiegler, "Automatic Society 1," 139. This quote introduces a quotation of Evgeny Morozov.

[66] Bernard Stiegler and Pieter Lemmens, "'This System Does Not Produce Pleasure Anymore' An Interview with Bernard Stiegler," *Krisis*, no. 1 (2011): 36, *http://krisis.eu/wp-content/uploads/2017/01/krisis-2011-1-00-complete-issue.pdf?*

detemporalised.[67] They are written on paper, etched in stone, or stored in hard disks.

Now, while this exteriorisation isn't problematic as such, it becomes *proletarianisation* when it results in a "loss of knowledge and know-how (*savoir-faire*) in individuals and collectives."[68] Paradoxically, "*knowledge can be constituted only through its exteriorization*,"[69] which reveals the *pharmacological* nature of technology, or its tendency to function as both poison and cure. At first, the exteriorisation is destructive, it results in a loss of knowledge, in a loss of individuation, in a dependency on the technology; but then, in "the second moment of epochality of technics,"[70] the new capacities introduced by automatization are incorporated into individual and collective life such that new modes of individuation are formed. In other words, "if you want to become an autonomous pianist you must form your body into such a thing like the piano."[71] Proletarianisation is not (necessarily) a terminal condition, but one phase in an ongoing process guided by the interrelated dynamics of autonomy and heteronymy.

Although the term seems to explicitly refer to the proletariat of the industrial era whose manual skills were lost as they were mechanized, Stiegler insists that proletarianisation is as old as technics itself.[72] Furthermore, proletarianisation underscores the fact that technics isn't simply a modification of the world via the production of new things, but a corresponding modification of the brain in response to the technical apparatus within which it operates. In its present manifestation, digital tertiary retention — Rouvroy's algorithmic reality — is the "*current operator of proletarianization*," short-circuiting our "faculties of theorization and deliberation." He locates us now "a step beyond" Deleuze's control society, where "*total automation*" has established a "hyper-industrial… *hyper-control*."[73] In short, the

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[67] Antoinette Rouvroy and Bernard Stiegler, "The Digital Regime of Truth: From the Algorithmic Governmentality to a New Rule of Law," trans. Anaïs Nony and Benoît Dillet, *La Deleuziana Online Journal of Philosophy* 3 (2016): 20, *http://www.ladeleuziana.org/wp-content/uploads/2016/12/Rouvroy-Stiegler_eng.pdf*.

[68] Stiegler and Lemmens, "'This System Does Not Produce Pleasure Anymore'," 33.

[69] Bernard Stiegler, *The Future of Work*, trans. Daniel Ross, epub, Automatic Society, Bernard Stiegler ; volume 1 (Cambridge, UK Malden, MA: Polity Press, 2016). Section 16, although in a footnote Stiegler points out that he makes this argument repeatedly through his work.

[70] Stiegler and Lemmens, "'This System Does Not Produce Pleasure Anymore'," 36.

[71] Stiegler and Nony, "Bernard Stiegler on Automatic Society," 16.

[72] Stiegler and Lemmens, "'This System Does Not Produce Pleasure Anymore'," 37.

[73] Stiegler, *The Future of Work*. Section 18, except for "total automation," which is from section 14.

consumerist drive of the ’data economy’ produces a proletarianisation of the user and sends the planet hurtling towards ”entropic catastrophe.”

One ambition of Stiegler’s project in *The Future of Work* is to “propose”[74] a different way of structuring the digital’s total automatization to exit the Anthropocene, in a process he calls the *Neganthropocene*. Countering the unchecked entropy of the profit-driven and data-driven automatic society will require the production of our capacities for negentropy and disautomatization. What this means is probably familiar: “new critique and new propositions, and also practical propositions” or even *dreaming*, which he defines as the time for creating new configurations of retentions.[75] What is less familiar is how to approach these ambitions against a totalizing technical apparatus whose very design preempts such approaches; but also how to make use of and incorporate these same automatizations in the service of this negentropic disautomatization. In the next chapter, I look at one operator of total automation: opaque, non-linear systems under the name of the Black Box.

[74] Stiegler, “Automatic Society 1,” 128.

[75] Stiegler and Nony, “Bernard Stiegler on Automatic Society,” 17.

Black Boxes

In late 2001, after the terrorist attack on the World Trade Center, I was laid off from a computer programming job because the company I worked for was located in a part of Manhattan that was blocked off during recovery and cleanup efforts. Around this time on the other side of the world, Monash University was hosting a conference called *Second Iteration: emergence*, which explored the relationship between generative processes, creativity, and artistic practices.[76] For the conference proceedings, Jon McCormack and Alan Dorin published their paper, "Art, emergence, and the computational sublime," providing one of the early internet-era theorizations of generative art.

In Morningside Heights — where I knew nothing about the conference — I visited Labyrinth Books and a street bookseller on Broadway nearly every day, spending my unemployment reading and building a library. One of the books I bought at the time was *The Philosophy of Artificial Life*, edited by Margaret Boden, which mapped the contours of a field initially named and unified by Christopher Langton's 1987 conference paper, "Artificial Life," reprinted as the first chapter of Boden's collection. Although the book didn't specifically discuss something called "generative art," its essays were part of the same emerging field as the Monash conference, which itself named "Artificial Life" (hereafter, A-Life) and many subcategories of A-Life, such as cellular automata and genetic algorithms, as topics of interest. Prior to any encounter with generative art, in other words, I had already become familiar with its underlying concepts - through an encounter with A-Life.

[76] See http://users.monash.edu/~iterate/SI/about.html (Accessed 24 March 2018)

Figure 3: Screengrab of Rodney Brooks from 'MIT's Cog (1)' on YouTube.com.

The 'generative' is absolutely essential to an understanding of A-Life, as distinct from classical Artificial Intelligence (AI). Whereas classical AI uses symbolic representations of the world, imposed by an external programmer, there are no such schema provided to the system in A-Life, which instead generates its own 'intelligence' autonomously.[77] Rodney Brooks (Figure 3) for instance, argued that the classical AI approach to building a robot would model the world explicitly in its 'brain,' ultimately failing in cases of sensor malfunction or unpredictability in the environment. A "new approach," inspired by the routinized behavior of both people and animals, would short-circuit the elaborate model entirely in favor of interconnected networks of elements, like a nervous system without a brain. Significantly, rather than have an isolated, Cartesian, computational brain, in this

[77] Margaret A. Boden, ed., *The Philosophy of Artificial Life*, Oxford Readings in Philosophy (Oxford ; New York: Oxford University Press, 1996), 3.

approach, the ”boundary between computation and the world was harder to draw as the systems relied heavily on the dynamics of their interactions with the world.”[78]

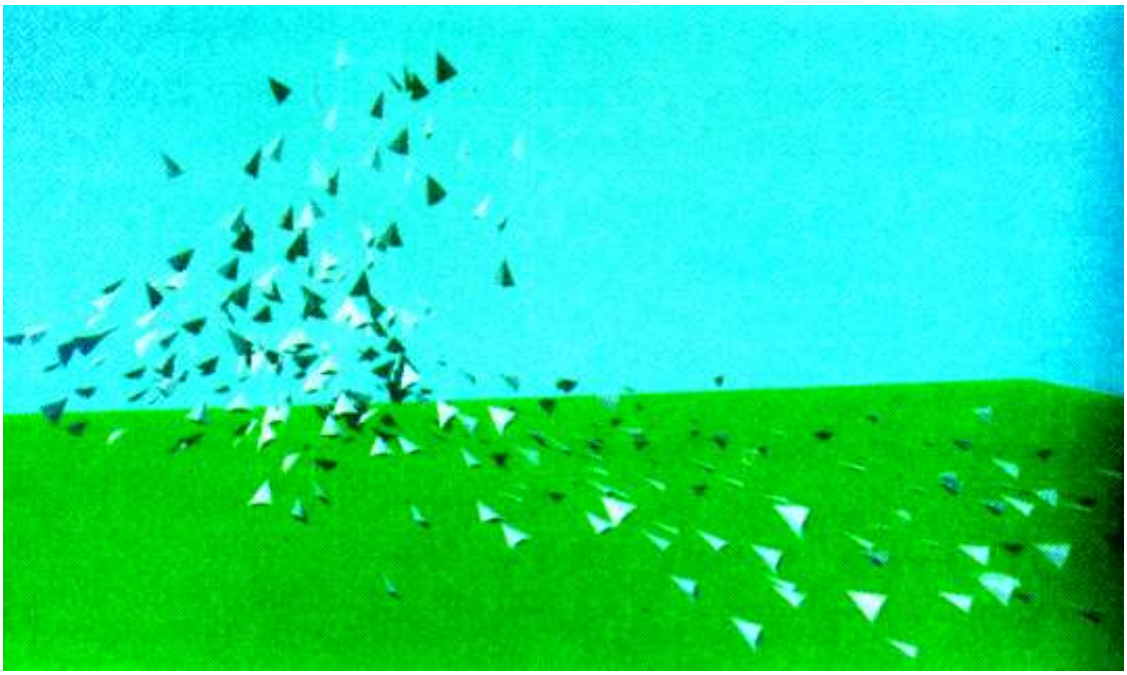

Figure 4: Flocking boids image created by Craig W. Reynolds at the Graphics Division of Symbolics, Inc. From Craig W. Reynolds, “Flocks, Herds, and Schools: A Distributed Behavioral Model,” in ACM SIGGRAPH ’87*, vol. 21(4) (Anaheim, California: Computer Graphics, 1987), 25–34,* http://www.cs.toronto.edu/~dt/siggraph97-course/cwr87/*.*

While the technical details of how A-Life works in robotics or genetic algorithms is outside of the scope of this research, I’ll summarize one example from Langton’s paper that can serve as an illustration. In 1987, Craig Reynolds created a computer graphics simulation of flocking behavior (Figure 4) that seemed *lifelike* in the way that the individual ‘Boids’ avoided obstacles and each other while moving around their virtual environment in a way that didn’t appear to be scripted in advance. Although one might reasonably assume that the computer code to produce such a complex animation would be similarly complicated, it turns out to have been produced not by scripting the entirety of the flocking behavior but instead by giving simple rules (try to go as fast as your neighbors, try not to collide with your neighbors, and try to follow the crowd) to each member of the flock. As these simple rules interact with each other and the environment, the emergent flocking

[78] Rodney Allen Brooks, *Cambrian Intelligence: The Early History of the New AI* (Cambridge, MA: MIT Press, 1999), 63–68. Quote from p.68.

behavior is generated.[79] This particular application has since been used in many action movies, typically where the hero is pursued by a swarm of some kind of animal, and Reynolds himself is now working as a software engineer for testing self-driving vehicles, a topic that I will return to later.

Langton attributes this paradox of simple complexity to the difference between linear and non-linear systems. Whereas a linear system can be understood by breaking the system down into its constituent parts and looking at them in isolation, it's impossible to comprehend a non-linear system through such an analytical method because looking at the parts in isolation fails to account for "the key feature of non-linear systems… the *interactions between parts*." Instead, non-linear systems are best understood through "*synthesis*," or simulating the system from smaller parts rather than breaking the system down.[80] This approach already anticipates the more recent cultural anxiety around contemporary AI — which, I must emphasize, is actually closer to A-Life than classical AI — that "no one really knows how the most advanced algorithms do what they do."[81] While a traditional procedural algorithm in which instructions are followed in a linear fashion, one after the other, may be complicated, it is ultimately understandable because one can reconstruct or predict the trajectory from input to output; but a non-linear system doesn't allow for this kind of understanding, some of its most essential parts only coming into existence in the performance of the system itself, giving rise to the notion of the system as a kind of *black box*.

In the same way that the logical structure of a machine can be abstracted from its material form, and how the algorithm can be conceived of independently of the particular computer or even language in which it might be implemented, A-Life considers life itself as a "logic," thus opening the doors to the synthesis of life in an "alternative medium" such as the computer.[82] Langton eventually formalizes this distinction as "*genotype/phenotype*," the distinction "between a specification of machinery — the genotype — and the behavior of that machinery — the phenotype."[83] This framework separating logic from behavior is present across the entirety of the recent generative art discourse, and not only in the evolutionary sub-type that explicitly uses genetic concepts, such as Karl Sims's *Galapagos*.

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[79] Christopher Langton, "Artificial Life," in *The Philosophy of Artificial Life*, Oxford Readings in Philosophy (Oxford ; New York: Oxford University Press, 1996), 66.

[80] Langton, "Artificial Life," 53.

[81] Will Knight, "The Dark Secret at the Heart of AI," *MIT Technology Review*, April 2017, *https://www.technologyreview.com/s/604087/the-dark-secret-at-the-heart-of-ai/*.

[82] Langton, "Artificial Life," 50.

[83] Langton, "Artificial Life," 55.

Galanter's definition of generative art distinguishes between "a system with functional autonomy" and "a completed work of art." McCormack *et al.* discuss the "two aspects" of a generative artwork, "the process underlying the artwork and the sensory artifacts it produces."[84] For Boden and Edmonds, it can be distilled to "rules" and "what they might generate."[85] All of these distinctions[86] echo that one between genotype and phenotype, between the genetic makeup and the observable features of an organism (or, in this case, an artwork). Not all generative artwork specifically acknowledges itself as organism, even if etymologically, "generative" is imbued with a quality of reproduction, but Langton explicitly expanded this framework to operate in"non-biological situations" by opening up the terms to "*generalized genotype*" and "*generalized phenotype*," or the "specification for a set of machines" and "the behavior that results when the machines are run."[87]

To "run" a machine, in the space of computers, means to execute a program. In the days of paper tape, a program was punched into the tape, which was subsequently *run* through the machine. This is, of course, something that occurs *over time*, much like running a race has a starting point and then should terminate when some finish point has been reached. Today, running a program is often less goal-oriented and it will run for hours or even years on end, shifting the sense of "run" towards something more like the flow of a river than some kind of race. The interrelated systems of Facebook are a long way away from a singular, automated calculation — we know that Facebook is *running* but we may not know when it stops (or even, exactly, when it started).

This emphasis on the time of execution is not incidental to the use of computers (which have programs that are run) but an essential feature of non-linear systems: one cannot know what the outcome of some rules will be simply by inspecting the rules. Those rules must be performed, the machine must be run. Computability theory offers an interesting problem for reflecting on the importance of the "run," which is called the halting problem. Given some program and some input, will the program ever finish or will it run forever? Alan Turing proved that there is no

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[84] McCormack et al., "Ten Questions Concerning Generative Computer Art," 137.

[85] Boden and Edmonds, "What Is Generative Art?" 26.

[86] Interestingly, a similar bifurcation (not between rules and outcome, but between rules-as-idea and the machinic implementation of the rules) was specifically noted by Allen Newell and Herbert Simon as they were struggling to demonstrate their Logic Theorist. What they named the "*realization problem*" was the difficulty in translating the specification for an abstract, nonlinear system into circuitry, acknowledging that this construction might potentially take on any number of forms., A. Newell and H. Simon, "The Logic Theory Machine–A Complex Information Processing System," *IEEE Transactions on Information Theory* 2, no. 3 (September 1956): 62, doi:*10.1109/TIT.1956.1056797*

[87] Langton, "Artificial Life," 56.

machine that can definitively answer this question. The best it could do is emulate the program, or run it itself to see what happens, but then it has the exact same problem as before[Described in Langton,[88] p. 46] Newell and Simon discuss studying complex systems by running and re-running them "under a range of initial and boundary conditions."[89] Not every computer program, however, has this degree of contingency. Those programs that embody the "singularly serial and centralized control structures associated with the machines of our invention" most often operate predictably, whereas those that are, like life, "exceedingly parallel and distributed" tend to behave in surprising ways.[90] Given both neural networks, which are intentionally deploying life-like methods and metaphors, and the context of networked systems and platforms, which are incidentally life-like in their interactions, the notion of the computer as a simple-machine has become increasingly archaic.

The further a system drifts from a sequence of instructions and towards a Black Box, the more autonomy we attribute to the system. Given a Black Box, we no longer try to understand its essence but rather its performance, if only because it is more likely our intuitive grasp of what the Box *does* will be more useful in describing the system and anticipating its future behavior than our apprehension of what the black box *is*. The Black Box's autonomy, a refracted image of our frustrated analytical understanding, is realized as surprise or a threat when the black box creates something 'new,' like when the Google Translate AI "invented" its own language.[91] Notions of authorship and responsibility, typically attributed to an individual or group subject, are destabilized, drawn towards the presence of this autonomous Black Box. Crucially, however, the Black Box cannot wholly absorb authorship or responsibility — even if they are dispersed, these culturally-constructed notions still seem to require a human somewhere in the mix.[92] The way

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[88] "Artificial Life."

[89] Newell and Simon, "The Logic Theory Machine–A Complex Information Processing System," 62.

[90] Langton, "Artificial Life," 55.

[91] A story about an autonomous AI is reliable way to attract attention, playing on humans' fascination and fear of accelerating technological change. This new language was not readable or in any way usable by humans and was more of an intermediate state of the neural network. This isn't to say what happened isn't interesting — it is — but rather that it was described in tantalizing terms that anthropomorphize the technology. Then again, given that we are in a field with neural networks and artificial intelligence, the rhetoric of inventing a language is not totally surprising. https://www.newscientist.com/article/2114748-google-translate-ai-invents-its-own-language-to-translate-with/ (Accessed 25 March 2018)

[92] Cliff Kuang, "Can A.I. Be Taught to Explain Itself?" *The New York Times*, November 2017, *https://www.nytimes.com/2017/11/21/magazine/can-ai-be-taught-to-explain-itself.html* mentions that the European Union "will begin enforcing a law requiring that any decision made by a machine be

we acquire knowledge of a Black Box is closer to the way we might understand a pet — by playing with it, watching it, seeing how it changes over time, all along accepting a certain fundamental unknowability — than how we would understand a mechanical watch — by taking it apart, studying the parts, and putting it back together.[93]

In his 1956 *An Introduction to Cybernetics*, W. Ross Ashby devoted a pivotal chapter to the Black Box, discussing situations in which the entirety of a system is not directly observable. This Problem of the Black Box refers to an experimental setup where an electrical engineer tries to deduce as much as they can from a sealed box, given only access to input and output terminals and commonplace electronics tools. Ashby radically expanded the scope of the concept, emphasizing that "the theory of Black Boxes is practically coextensive with that of everyday life," which effectively subsumed everything, even the most opaque, within the purview of cybernetics. This was not a revolutionary transformation in the material world, however, but simply a new hypothesis: "real objects are in fact all Black Boxes, and … we have in fact been operating with Black Boxes all our lives."[94]

It was already understood that an electronic circuit might be a Black Box; and it wasn't a stretch to consider that a machine might also be one; but already in the first page of the chapter, Ashby applies the concept to living things — albeit conspicuously *other* living things — such as "a rat in a maze" and "a patient with brain damage and aphasia;"[95] and eventually, "a brain."[96] So, while cybernetics has given the language for describing A-Life (or any form of non-linear computation that humans do not understand) as a Black Box, in that same moment it also reframed everything else as Black Boxes, humans included. Therefore, when Langton discusses the potential for using computer technology to create "life *in silico*,"[97] I

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readily explainable", which ultimately assumes a chain of responsibility can be traced through the code to the software engineers.

[93] Although Ashby, who I discuss next, would perhaps even insist that the watch is also a Black Box: "At first we are apt to think, for instance, that a bicycle is not a Black Box, for we can see every connecting link. We delude ourselves, however. The ultimate links between pedal and wheel are those interatomic forces that hold the particles of metal together; of these we see nothing, and the child who learns to ride can become competent merely with the knowledge that pressure on the pedals makes the wheels go round." William Ross Ashby, *An Introduction to Cybernetics* (New York: J. Wiley, 1956), 110

[94] Ashby, *An Introduction to Cybernetics*, 110.

[95] Ashby, *An Introduction to Cybernetics*, 86.

[96] Ashby, *An Introduction to Cybernetics*, 113.

[97] Langton, "Artificial Life," 50.

think not simply of simulations of lifelike behaviors on a computer screen, but also of our actual lives lived in data centers.

A person's "digital footprints" can be used by machine learning algorithms to predict more intimate traits (sexual orientation deduced from public profile photographs, for instance).[98] Even though these footprints are only an incomplete picture of the individual, who is effectively a Black Box, they are often enough to make probabilistic deductions. And while one might object to such a conclusion because there will be exceptions and false positives, because people are complicated, or because that the training data already has assumptions built into it, this looseness and imprecision is exactly the point. These Black Box systems that couple with Black Box humans operate through patterns and probabilities, not absolute accuracy in individual cases.

[98] Yilun Wang and Michal Kosinski, "Deep Neural Networks Are More Accurate Than Humans at Detecting Sexual Orientation from Facial Images." (PsyArXiv, 2017), doi:*10.17605/OSF.IO/HV28A*.

Facebook

Part of the power of Deleuze's "Postscript" is that even though it was written when Mark Zuckerberg was only six years old, its observations and speculations anticipate Facebook and a world reshaped by social media. As I write this sentence, Facebook has two billion monthly users[99] and revenue of $9 billion per quarter[100], but these are just numbers. Zuckerberg's statement that, "in a lot of ways Facebook is more like a government than a traditional company,"[101] tells us something about the scale of the company in the social and corporate imaginary. In truth, there is nothing in "Postscript" that predicts *this*; instead, it's that some of the details seem so familiar.

Deleuze writes that we have become snakes "in the way we live and in our relations with other people,"[102] meaning that because there is no real spatial and temporal separation between different spheres of life (home, work, school, etc.) we are shifting roles, constantly, on a moment by moment basis. For some time, these distinct spheres were replicated on the Internet, through bulletin boards, chat channels, and online forums. Although moving between these early digital spaces was much more rapid than, for example, taking the train from work to a concert, they were still separate in that one could construct a different identity within each space. More than simply attracting hundreds of millions of users onto its platform, Facebook colonized these spaces, ultimately reformatting them into generic "pages", "groups", "communities", or just regions of the "social graph." So when Deleuze says that "*surfing* has taken over from all the old *sports*"[103], it didn't anticipate 'web surfing' so much as the virtuosity required in order to slip between different spaces, communities, and subjectivities as a single Facebook user.

The enforced singularity of the user is most likely a product of Facebook's revenue model — where *banks* of data facilitates the sale of targeted advertisements — but it has been defended on ethical rather than financial terms. Zuckerberg's opinion

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[99] Mark Zuckerberg. Facebook status update. https://www.facebook.com/zuck/posts/10103831654565331 (accessed January 7, 2018)

[100] As of Second Quarter 2017.

[101] David Kirkpatrick, *The Facebook Effect: The Inside Story of the Company That Is Connecting the World*, 1st Simon & Schuster trade pbk. ed (New York: Simon & Schuster Paperbacks, 2011), 254.

[102] Deleuze, "Postscript on Control Societies," 180. "in our manner of living and in our relations with others".

[103] Deleuze, "Postscript on Control Societies," 180. "Everywhere *surfing* has already replaced the older *sports*".

that “having two identities for yourself is an example of a lack of integrity”[104] has emerged in tandem with a Facebook policy requiring users to use ‘real names.’ In “What names are allowed on Facebook?,”[105] the company makes two potentially contradictory demands: firstly, “the name on your profile should be the name that your friends call you in everyday life,” which already makes cultural assumptions that one’s name is consistent across their every day; and secondly, “this name should also appear on an ID or document from our ID list,” which of course might have no relation whatsoever to the first. The ultimate requirement, however, is simply that “pretending to be anything or anyone isn’t allowed.”

In website development, policies such as these are called ‘business logic’ when they are translated into code requirements. If the policy determines, for example, that a name should be a maximum of three words and the software is built in such a way that it is incapable of recording longer names, then cultural bias is enforced at the level of code. Indigenous people, drag queens, and political activists, among others,[106] have come up against different aspects of this policy with consequences for those users ranging from insulting to life-threatening. If one examines Facebook’s accepted forms of identification[107] Facebook’s ambition to accurately connect each account to external data sets (travel, medical, credit, educational, etc.) becomes more clear. Moreover, a Facebook account, the integrity of which is guaranteed by a “*password*,” becomes a new form of identification, a digital visa, used to authenticate for services across the Internet.

Restricting access in this way is reminiscent of Guattari’s imaginary barrier, or Deleuze’s assertion that the “digital language of control is made up of codes indicating whether access to some information should be allowed or denied,” but access control tends to be more subtle in algorithmic contexts. Rather than experience the rejection of attempting to access something for which they don’t have permission, a person will typically only experience *that which they do*. If the barrier isn’t experienced as a barrier, it’s because it isn’t seen as a door but a wall.

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[104] Kirkpatrick, *The Facebook Effect*, 199.

[105] “What Names Are Allowed on Facebook?” Facebook. https://www.facebook.com/help/112146705538576 (accessed January 7, 2018)

[106] “Facebook real-name policy controversy.” Wikipedia. https://en.wikipedia.org/wiki/Facebook_real-name_policy_controversy. Last edited January 5, 2018 (accessed January 7, 2018)

[107] “What types of ID does Facebook accept?” Facebook. https://www.facebook.com/help/159096464162185 (accessed January 7, 2018). “Birth certificate, Driver’s license, Passport, Marriage certificate, Official name change paperwork, Personal or vehicle insurance card, Non-driver’s government ID, Green card, residence permit or immigration papers, Tribal identification or status card, Voter ID card, Family certificate, Visa, National age card, Immigration registration card, Tax identification card”

There are no doors in a control society — or rather, there is only one heavily guarded door that enters into an open plan space.

Fieldnotes from the Cloud

I traveled to Luleå, Sweden in the summer of 2012, to visit a new data centre that Facebook was building. So much of the physical infrastructure of computational capitalism, including the gargantuan buildings within which the data is stored, is tucked out of sight — in a generic, windowless building, on the periphery of a city or, in this case, up near the Arctic Circle — that at that time it felt important to 'see' a part of it. And since this new part was still in the process of construction, maybe visiting Luleå would be like seeing the parts of an unedited film, seeing it before the last of the cladding went on, before the security cameras were hooked up, and the fans started humming. At the same time, I knew perfectly well there would be nothing to see, that Facebook wouldn't actually be there because it is everywhere.

Figure 5: Construction site of the Facebook data centre, Luleå, Sweden. Sean Dockray, Fieldnotes from the Cloud, 2012. Video still.

In my research for the trip, I came to understand that the data centre industry was extremely power hungry and drawn to the same locations as industrial factories from the previous century. Luleå, for example, was home to a steel mill and Google even repurposed an abandoned paper mill in Finland. Fibre-optic data communications traffic follows many of the same paths as the old undersea telegraphy cables. The industrial world was being re-inhabited by an information

world. It was said that Facebook was brought to Luleå by its cool temperatures, which was a nice environmentally-conscious story where the ambient air would cool the hot servers, but the determining factor was actually the cheap hydro-electric power generated by the Lule River.

Figure 6: Lule River, Sweden. Sean Dockray, Fieldnotes from the Cloud, 2012. Video still.

Figure 7: SSAB steel mill, Luleå, Sweden. Sean Dockray, Fieldnotes from the Cloud, 2012. Video still.

Mines to the north of Luleå are connected by rail to the city, where the SSAB mill produce steel from the iron ore. The automation that I discuss throughout has spread throughout the mining industry and factory system (produced by companies like Siemans and the ABB Group) with driverless trucks and trains, camera vision, and robotic mechanisms to allow for continuous production. The hydroelectric plants along the Lule are virtually empty. Although the Facebook data centre brought with it the promise of jobs – this was an investment by one of the most profitable companies in the world – most of those jobs would only exist during the construction phase and even those were hemorrhaging as different techniques of offsite assembly were employed as a cost-cutting measure. When the job was done, the mammoth facility only employed about 150 people, with Zuckerberg seemingly torn (Figure 8) between being a job-creator or being a (jobs-destroying) technical-innovator.

Figure 8: Mark Zuckerberg's Facebook post of the inside of the Luleå data centre boasts that the "simplified design" of the facility and servers also minimizes labour requirements.

The run of the powerful Lule is both a metaphor for the non-stop production of these virtually depeopled industries as well as the actual source of power that drives them along. Clocks don't figure into these rhythms, the water doesn't rest for the night and the servers are *never* turned off. And in these empty, whirring halls of data, billions of profiles are perpetually updated. Are the people attached to these profiles unwaged workers?[108] Is the data centre a 21st century mine?[109]

[108] http://wagesforfacebook.com

[109] A more provocative question in 2012 when our data was being collected without a clear idea of what would be done with it or how it might create wealth, but after the Economist declared data to be "the world's most valuable resource" on its cover in 2017, the answer became obvious - yes.

Critical

In the early 1960s, a group of Italian Marxists developed an analysis arguing that the social relations of the factory were being generalized to all of society. This analysis developed throughout the decade, into the 1970s, leading some to focus on labor that was being left outside of the wage-relation because it was outside of the factory, not seen as work, such as housework. By 1992, Antonio Negri, a participant in these debates during the 60s and 70s, summed up two aspects of this "new phase of political history… the subsumption of of the entire society in the process of capitalist accumulation and … the end of the centrality of of the factory working class as the site of emergence of revolutionary subjectivity."[110]

Jacques Camatte, writing in 1972, explicitly connects subsumption to cybernetics:

> But the introduction of machinery transforms everything. Capital becomes the master of all the activity that the proletarian performs in the factory. Capital incorporates the human brain, appropriates it to itself, with the development of cybernetics; with computing, it creates its own language, on which human language must model itself etc.. Now it is not only the proletarians - those who produce surplus-value - who are subsumed under capital, but all men, the greater part of whom is proletarianized. It is the real domination over society, a domination in which all men becomes the slaves of capital…
>
> Thus it is no longer merely labour, a defined and particular moment of human, activity, that is subsumed and incorporated into capital, but the whole lifeprocess of man.[111]

It is tempting to get lost down the rabbit holes of Marxist interpretations of subsumption, class composition, and valorization here, but for now I simply want to dwell for a moment on this widespread sense of subsumption, this sense that more and more of life feels controlled, commodified, or *like work*. Jonathan Crary's *Sleep* argues that capital has progressively impinged upon even that period of nightly rest, viewing it as both unproductive and a potential frontier for expansion. And for computer users, this is immediately clear when the boundary between work and apparent leisure is no more than a finger twitch to switch virtual windows. But more than that, as Camatte and Tiqqun, in "The Cybernetic Hypothesis," remind us, it is not just that life becomes work, but that capital's language becomes our language, its forms of life become our forms of life, and so on. At one time, I might have said that there is no outside to capitalism and therefore it is impossible to find any

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[110] Antonio Negri, "Interpretation of the Class Situation Today: Methodological Aspects," in *Open Marxism, Volume 2: Theory and Practice* (London: Pluto Press, 1992), 69.

[111] Jacques Camatte, *Capital and Community: The Results of the Immediate Process of Production and the Economic Work of Marx*, trans. David Brown (London: Unpopular books, 1988), 72–73, *https://www.marxists.org/archive/camatte/capcom/camatte-capcom.pdf*.

critical distance from it. This generic formulation perpetuates a search for new territories, however, and risks the search itself being an expression of capital's innovation. There are other critical models, however, that rely less of territorial expansion than on immanent performance.

The Cybernetic Hypothesis

Many of the conventions of scholarly writing are frustrated by the question of how exactly to deal with "The Cybernetic Hypothesis," even from the relatively straightforward perspective of referencing. Originally published in French in 2001, it was anonymously translated into English and posted as a PDF to the website tiqqun.jottit.com around 2010. Any lack of clarity around the origin of the translation is reinforced by the original essay, which was a part of the second issue of the philosophical journal *Tiqqun*. This journal, which also was the origin of the text, considered itself as neither a journal nor a group but an activated philosophical concept or "a space for experimentation."[112] While I will attribute quotes to Tiqqun, this turns Tiqqun into an authorial subject, which is contrary to the spirit of the experiment. Even in the above footnote, driven by an academic sense of duty, I make some effort to individualize, assign authorial credit, and make transparent a theoretical text that was intentionally opaque.

The 'cybernetic hypothesis' is the "fable" motivating and orienting "a diffuse constellation of agents,"[113] a story that wills itself into existence as a technology of government and a world of devices. While cybernetics as a discipline was established by the likes of Norbert Wiener after the Second World War, Tiqqun situates the beginnings of capital's gradual cybernetization in the late 1870s when an interrelated system of devices were put into service in order to minimize railway accidents. Electronic communication networks, clocks, maps, processes, advertisements, and decision-making guidelines all produced, stored, and circulated information alongside commodities. This metadata, this information about the production and distribution of commodities spread across the whole of industrial production, eventually becoming a commodity itself. It was after the War that these technologies of information and control began to become computerized, allowing the volume and speed of commodity flows to accelerate so that accumulation could continue.

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[112] From an interjection by Fulvia Carnevale in a public discussion about Tiqqun with Eric Hazan and Giorgio Agamben. A translation of the discussion was posted, second-hand as "Tiqqun Apocrypha Repost" (https://anarchistwithoutcontent.wordpress.com/2010/04/18/tiqqun-apocrypha-repost/, accessed January 15, 2018) in April, 2010. Carnevale, formerly part of Tiqqun, is now – with James Thornhill – Claire Fontaine.

[113] Tiqqun, "The Cybernetic Hypothesis," trans. Unknown, *Tiqqun* 2 (2010): 2, *https://www.mediafire.com/file/2i1vkj39l25i4c2/cybernet.pdf*.

In short, the cybernetic hypothesis refers to the widespread belief that cybernetics can and should be used as a framework for understanding biological and social behaviors as controllable systems. This belief is applied to every domain, in large part because cybernetics is a general purpose approach to the "*practical problems of mastering uncertainty*."[114] What it results in is not a separate layer of information and technology over the world, but an "*autonomous world of apparatuses so blended with the capitalist project that it becomes a political project*."[115] Or, to put it in the Foucaultian language on which the critique is largely based, cybernetics has emerged "*as a new technology of government.*"[116]

In the interview published as "Confessions of the Self," Foucault is asked to define *apparatus (dispositif)* to elaborate on how 'sexuality' could be considered as an apparatus. He replies that he uses the term to denote:

> a thoroughly heterogeneous ensemble, consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions – in short the said as much as the unsaid.[117]

Similarly within Tiqqun, cybernetics is not simply something that happens with machines and computers, but it takes hold in the world in material and discursive ways. Its irreducible heterogeneity and diffusion is what makes it so embedded in power relations and also so difficult to conceptualize. It's difficult to avoid a somewhat cybernetic character of Foucault's apparatus, which is constituted and perpetuated through *functional overdetermination* – where the different parts of the apparatus recalibrate themselves in response to events – and *strategic elaboration* – where the unintended effects of the apparatus generate new strategies.[118] These unanticipated expressions of the apparatus have "nothing to do with any kind of strategic ruse on the part of some meta- or trans-historic subject conceiving and willing it,"[119] echoed in the acknowledgment that "it would be in vain to look for some malicious purpose or the traces of a plot"[120] behind the development of cybernetics. And like Vilém Flusser, who insisted that one needed to *play* against

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[114] Tiqqun, "The Cybernetic Hypothesis," 11.

[115] Tiqqun, "The Cybernetic Hypothesis," 4.

[116] Tiqqun, "The Cybernetic Hypothesis," 3.

[117] Michel Foucault, "The Confession of the Flesh," in *Power/knowledge: selected interviews and other writings, 1972-1977*, ed. Alain Grosrichard, 1st American ed (New York: Pantheon Books, 1980), 194.

[118] Foucault, "The Confession of the Flesh," 195–96.

[119] Foucault, "The Confession of the Flesh," 195.

[120] Tiqqun, "The Cybernetic Hypothesis," 11.

programs (rather than using the usual critical methods), Tiqqun, more stridently, wrote that “it’s not worth it anymore to critique the cybernetic hypothesis either: it has to be fought and defeated.”[121]

Common across Deleuze, Flusser, and Tiqqun is the understanding that because the nature of capitalism has changed, so too are “the possibilities of its contestation.”[122] And where Deleuze suggested to “look for new weapons,”[123] Tiqqun, in the second half of “The Cybernetic Hypothesis,” outlines a “protocol for experimentation”[124] that includes slowness, interference, and zones of opacity, echoing Flusser’s notion of sabotage to delay progress. While each of their totalizing portrayals is overwhelming in its scope and foreignness (relative to available critical and conceptual tools), the modes of resistance that they propose aren’t exactly utopian either, based instead on guerilla tactics and provoking a breakdown of the informational system. While the Tiqqun essay concludes with a poetic and hopeful autonomy, it is intentionally open and unspecified, and certainly not a political program. Flusser, who showed occasional enthusiasm for the dialogical, utopian possibilities of networked communication – although “catastrophes may be relied upon to prevent it”[125] – also wrote that “we can no longer be revolutionaries, which means, to be opposed to the operative program through other programs.”[126]

So what does the cybernetic hypothesis look like? What subjectivities does it produce? To a large extent, we can read Deleuze’s “Postscript” as just such a description, which is not a surprise given the importance of Foucault for both projects. While Deleuze didn’t mention cybernetics specifically in his text, he does identify control societies with “cybernetic machines and computers”[127] in a contemporaneous interview with Antonio Negri, which introduces the essay in the *Negotiations* collection. Where Deleuze explains that in a society of continuous control and instantaneous communication the individual becomes dividual and mass becomes data bank, for Tiqqun the cybernetic hypothesis tends to ‘hollow out’ individual and collective subjects. “Each person was to become *a fleshless*

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[121] Tiqqun, “The Cybernetic Hypothesis,” 4.

[122] Tiqqun, “The Cybernetic Hypothesis,” 6.

[123] Deleuze, “Postscript on the Societies of Control,” 4.

[124] Tiqqun, “The Cybernetic Hypothesis,” 56.

[125] Vilém Flusser, “The Photograph as Post-Industrial Object: An Essay on the Ontological Standing of Photographs,” *Leonardo* 19, no. 4 (1986): 331.

[126] Flusser, *Post-History*, 127.

[127] Deleuze and Negri, “Control and Becoming,” 175.

envelope,"[128] akin to a Black Box, in order to allow for a frictionless circulation of information and data throughout the social body, where everyone's "bodies and their emotions are abstracted within the system of symbols."[129] Crucial to this fluidity of data is *formatting* and *transparency*. Formatting refers to the formal decisions and standards that are established in order to describe the shape something must take or other rules it must follow in order for it to effectively enter into circulation. Alexander R. Galloway's work on 'protocol' suggests that network protocols, for instance, are a specific instance of formatting — they are "highly formal" and "encapsulat[e] information… while remaining relatively indifferent to the content of information contained within."[130] Galloway is a notable reader and translator of Tiqqun, and that his book on protocol extends the work started by Deleuze's "Postscript," explaining "how control exists after decentralization."

Secrecy, opacity, and the unknown are non-communicative concepts that impede the fluidity of circulating information. Transparency, on the other hand, makes the latent information within a system available to the system. It is expropriative.[131] The idea is that if a system has *all* the available information at its disposal then it can prevent accidents by forecasting risk. More ominously, this logic is "intended to ward off all events,"[132] suggesting that in a cybernetic society, nothing ever happens. To this end, Tiqqun claims that "*[f]or cybernetics it is no longer a question of predicting the future, but of reproducing the present*."[133] Practically, transparency is implemented across apparatuses, both via devices and discursively. State surveillance and corporate data acquisition each operate through tracking technologies embedded in phones, computers, televisions, automobiles, cameras, and microphones. Simultaneously, "mental problems and social pathologies" have been reconsidered in terms of informatics and cybernetics, such that transparency and communication have emerged as valued individual and interpersonal qualities.[134] As institutions break down and control becomes diffuse, nomadic, and internalized by bodies, risk is similarly distributed and internalized (for example, when public health care is replaced by an insurance system that covers individuals

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[128] Tiqqun, "The Cybernetic Hypothesis," 18.

[129] Tiqqun, "The Cybernetic Hypothesis," 18.

[130] Alexander R. Galloway, *Protocol: How Control Exists After Decentralization*, Leonardo (Cambridge, Mass: MIT Press, 2004), 7.

[131] Tiqqun, "The Cybernetic Hypothesis," 39.

[132] Tiqqun, "The Cybernetic Hypothesis," 31.

[133] Tiqqun, "The Cybernetic Hypothesis," 21.

[134] Tiqqun, "The Cybernetic Hypothesis," 19.

based on each individual's calculation of expense versus the likelihood of an impending medical problem).

In this way, the cybernetic hypothesis is behind what is otherwise described as the economic ideology known as neoliberalism, late capitalism, Post-Fordism, or the New Economy, ultimately producing "new subjugations."[135] When we talk about affective labour, cognitive capitalism, or the information economy, we are talking about the many symptoms of the cybernetic hypothesis. Common to all of these accounts is the recognition that value is produced in the sphere of circulation, communication, and social life, and not merely in industrial factories. Power is decentralized through apparatuses and value production is spread across the social field, both of which mean that resistance too is possible almost anywhere (Tiqqun, for instance, points towards infrastructures of circulation such as communication and logistics channels). The obverse of all of this is the eclipse of a viable workers' movement, dutifully commented upon in every analysis. Flusser dismisses the revolutionary worker; Deleuze asks "whether the trade unions still have any role,"[136] or, with much stronger language in the *October* translation, he writes that "[o]ne of the most important questions will concern the ineptitude of the unions… will they be able to adapt themselves or will they give way to new forms of resistance against societies of control?"[137]

The diminishing emancipatory possibilities of revolutionary class struggle within the political dimension of Deleuze, Flusser, and Tiqqun — suggesting new methods and new sites of contestation — is coupled to a sense of criticality's ineffectiveness. To "defeat" the cybernetic hypothesis means "to fight cybernetics, instead of being a *critical cybernetician*."[138] In some ways this sounds simply like saying 'old methods are obsolete, we need new methods,' but what is interesting about these analyses is the way the new structures account for the previous structures, which is to say, the particular ways they render old methods obsolete and ineffective. For Flusser, the infinite encapsulation of programs within meta-programs establishes the foundational impossibility of getting outside and that every act is already part of some larger program. In quoting Lyotard, Tiqqun shows that recuperation *is* what cybernetics does: "Everywhere, in every way, the Critique

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[135] Tiqqun, "The Cybernetic Hypothesis," 21.

[136] Deleuze, "Postscript on Control Societies," 182.

[137] Deleuze, "Postscript on the Societies of Control," 7.

[138] Tiqqun, "The Cybernetic Hypothesis," 51.

of political economy and the critique of alienated society that was its corollary are used as elements in the *programming of the system*."[139]

Critique and Criticality

Irit Rogoff exemplifies, from a curatorial and art critical perspective, the wider lack of confidence in critique's efficacy and productivity in her "'Smuggling' – An Embodied Criticality," which begins by acknowledging that with the "vast range of structuralist, post and post post-structuralist tools and models of analysis we have at our disposal, we have been able to unveil, unravel, expose and lay bare the hidden meanings of cultural circulation and the overt and covert interests that these serve,"[140] but suggests that these strategies ought to be left aside in a more performative culture. For artworks, publications, exhibitions, and other discursive platforms in this performative mode, meaning is not waiting to be discovered but is taking shape and "*taking place*"[141] in the course of events. Rogoff sees the habitual unveiling, unraveling, and exposing as actions that lead to nothing beyond themselves, asking what comes after the critical analyses, cataloguing, marking and making visible, pointing fingers, celebrations, and empathetic acknowledgements?

To overcome these limitations, Rogoff proposes "criticality," in which the critic "occupies" the the problem rather than analyzing it from an exterior position. This doesn't produce resolution in the form of a "judgment" but rather a "heightened awareness."[142] In this sense it sounds like Flusser's 'becoming conscious' of living in an a program, especially considering that both methods withdraw from overt political engagement in favor of a more tactical play with existing structures. Rogoff writes of "not wanting to set up conflictual and binary engagements… not wanting to have a fight… not wanting to battle it out," but instead "seeking the opportune moment, the opportune breach" to do what one wants to do.[143]

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[139] Tiqqun, "The Cybernetic Hypothesis," 44. The original quote in the official translation of Lyotard's text (as opposed to the translation of Tiqqun) is: "Everywhere, the Critique of political economy (the subtitle of Marx's Capital) and its correlate, the critique of alienated society, are used in one way or other as aids in programming the system.", Jean-François Lyotard, *The Postmodern Condition: A Report on Knowledge*, Repr, Theory and History of Literature (Manchester: Manchester Univ. Press, 2005), 13.

[140] Irit Rogoff, "'Smuggling'," August 2006, 1, *http://eipcp.net/dlfiles/rogoff-smuggling*.

[141] Rogoff, "'Smuggling'," 2.

[142] Rogoff, "'Smuggling'," 2.

[143] Rogoff, "'Smuggling'," 5.

In “The cultural logic of criticality,” Marina Vishmidt argues that various traditions of critique (namely from Kant, Adorno, and Marx) *are* models that understand themselves to be implicated in the field they are analyzing and — responding to Rogoff’s essay directly — that ’criticality’ is dependent on and invested in a maintenance of the existing state of affairs.[144] Interestingly, Vishmidt frames her critique of criticality in terms of cybernetics: first, as a way of understanding how criticality functions and, also, to historicize it as a symptom of the diffusion of cybernetics into governance, economics, and culture. One symptom that Vishmidt diagnoses is ‘participation,’ which ostensibly dissolves authority into a mode of social control where individuals are empowered to make their own decisions within certain parameters while attenuating conflict by getting “the individual or group to identify with the goals” of that system that is setting the terms of inclusion.[145] Feedback from this process of participation engenders shifts in the system without political or legal conflict. Imagine an art fair that hosts a public discussion about the commercialization of art, gentrification, or — even more to the point — about the appropriation discursive events to neutralize critique of fairs. The goal of this system isn’t stasis — dynamism and change are more than welcome, they are totally necessary for the reproduction of the new, which here is also the production of value — the goal is homeostasis.[146]

The word that is typically used for this institutional drive for homeostasis is ‘sustainability.’ With its environmental connotations, it has became a term of value for arts funding agencies who understand their role as supporting an arts ’ecosystem.’[147] If this vocabulary has any reference to ’crisis’ then it is in terms of returning to a state of stability, perhaps looking to turn crisis into an ’opportunity,’ but it is never understood as anything desirable. Feedback, especially *negative feedback*, is absorbed and channeled into processes of self-regulation such that it “optimizes system function.”[148] While one might object that I am conflating economic sustainability — crucial for precarious artists and small to medium-sized arts institutions who are perpetually in crisis — and critical homeostasis, this is precisely the point! That objection reproduces the boundary between art and its

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[144] Marina Vishmidt, “The Cultural Logic of Criticality,” *Journal of Visual Art Practice* 7, no. 3 (December 2008): 258, doi:*10.1386/jvap.7.3.253_1*.

[145] Vishmidt, “The Cultural Logic of Criticality,” 262.

[146] Vishmidt, “The Cultural Logic of Criticality,” 263.

[147] See, for example, the introduction to an interview with Joel Sachs, President of the Andy Warhol Foundation, which dutifully praises the Foundation’s commitment to “sustaining” a ”vital ecosystem.” (https://philanthropynewsdigest.org/5-questions-for/joel-wachs-andy-warhol-foundation, Accessed 24 January 2018.)

[148] Vishmidt, “The Cultural Logic of Criticality,” 254.

economic context, whereas an immanent critique that destabilizes the homeostatic equilibrium would disrupt this very boundary.

Where Rogoff and Vishmidt seem to agree is in the performativity of critique and the transgression of boundaries. Rogoff proposes ‘smuggling’ as an under the radar movement across borders, be they institutional or disciplinary, that will ”never settle into containment and stasis”[149] but without “being in conflict” and “without producing a direct critical response” to an existing system. A quote from Lawrence Liang seems to point towards Rogoff’s long game, which is that the ideas, objects, and discourses smuggled into the institution by the embodied critic will eventually eat away at the structure and solidity of that institution. Vishmidt dismisses smuggling as a kind of cultural appropriation practiced by academics who don’t have to live with the hard material realities of real borders and suggests, in the language of cybernetics, three alternative strategies: a critique that talks about what cannot be talked about and risks expulsion from the system; exploiting the principle of artistic or academic freedom to divert institutional resources to external political or social struggles; and making collective demands of the system that are so harmful to its quiet maintenance that they can’t be reintegrated and rather point outwards to an entirely new system.[150] All three (expulsion, diversion, and maladaptation) heighten the tension of the boundary between inside and outside whereas criticality attempts to “unthink those binaries” for something more ‘unbounded.’[151]

[149] Rogoff, “‘Smuggling’,” 7.

[150] Vishmidt, “The Cultural Logic of Criticality,” 255–56.

[151] Rogoff, “‘Smuggling’,” 6.

Adversarial

Interestingly, the recuperative dynamics of critique are cybernetically appropriated within recent developments in the field of artificial intelligence. Many of the practical uses of neural networks involve pattern recognition and prediction, such as computer vision, machine listening, social media feeds, or game play. Generally, these neural networks take a signal (an image, a sound, an identity) as input and give some data (a word, a path, some pieces of media) as output. The signal must first be reduced to structured sets of numbers before it is fed into the network and the data that comes out is similarly numeric and consequently must be mapped into a format that is legible to the person or machine that is making use of the output.

In a hypothetical example, there might be an animal classifying machine whose job is to determine whether an animal is present in an image and if so, to classify the animal. If there is not an existing neural network for this, then one must be produced, through a time consuming and computing intensive process of 'training.' Even though the neural network does need to be trained, it will likely use an existing 'architecture' (itself in a family of architectures, such as convolutional neural networks, recurrent neural networks, or long short-term memory networks) as a starting point, imagined as an unprejudiced brain. The training process involves something like showing a toddler a picture and letting them guess what the word for it is, correcting them if they get it wrong. For a neural network, this correction is called 'backward propagation,' which involves slightly adjusting the thousands upon thousands of variables within the network to perform differently, ideally a little better, the next time. After several 'epochs,' or rounds of the entire set of training data, or the thousands or millions of images shown, the neural network is hopefully capable of making correct classifications; and if not, it's back to modifying the network's structure or the training process and trying again.

Even after the neural network has been adequately trained, it will come across new images with animals that it fails to properly classify. Perhaps it was trained exclusively on frontal animal images and it can't recognize that the galloping horse in a new image is, in fact, a horse. In 2013, the authors of "Intriguing properties of neural networks" found another source of errors, reporting that by "applying an imperceptible non-random perturbation to a test image, it is possible to arbitrarily change the network's prediction."[152] In other words, they could manipulate an image of a panda bear (that the machine would normally recognize) in a way that

[152] Christian Szegedy et al., "Intriguing Properties of Neural Networks," *ArXiv Preprint ArXiv:1312.6199*, 2013, 2.

the human eye could not detect, thus making the machine recognize it as a gibbon.[153] The paper calls these minimally-perturbed images "adversarial examples,"[154] suggesting that algorithms could be tricked into misbehaving by antagonistic actors.

Adversarial images explicitly bind together two different modes of viewership, machine and human, aligning with Harun Farocki's "operative images" and Trevor Paglen's "invisible images" insofar as they explicitly acknowledge the machine as an intended viewer. In *Eye/Machine* (2001), Farocki described images that weren't meant for entertainment, information, or to "represent an object" — in other words, are not produced by humans or meant for human consumption — "but rather are part of an operation."[155] One kind of operation was the U.S. missile strike of the 1991 Gulf War, which introduced to the world visions of a seeing, "intelligent weapon." These images were, however, ostensibly intended "only for the eyes of war technicians," whereas the computer "needs no pictures to verify or falsify what it reads in the images it processes. For the computer, the image in the computer is enough."[156] Paglen extends this idea to a kind of generalized invisibility, in which the "overwhelming majority of images are now made by machines for other machines, with humans rarely in the loop."[157]

Striking a similar tone in 1990, Jonathan Crary proposed that a break was occurring in visual culture in the relations between "*observer* and *representation*," or even the very meaning of those terms, as new imaging technologies[158] were "relocating vision to a plane severed from a human observer."[159] Paul Virilio, anticipating the new connection between this severed visual apparatus and the computer, names this automation of perception "*sightless vision*." Humans would

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[153] This is an actual example provided in a followup paper., Ian J Goodfellow, Jonathon Shlens, and Christian Szegedy, "Explaining And Harnessing Adversarial Examples," 2015, 3

[154] Szegedy et al., "Intriguing Properties of Neural Networks," 2.

[155] Harun Farocki, "Phantom Images," *Public*, no. 29 (2004): 17.

[156] Farocki, "Phantom Images," 21.

[157] Trevor Paglen, "Invisible Images (Your Pictures Are Looking at You)," *The New Inquiry*, December 2016, *https://thenewinquiry.com/invisible-images-your-pictures-are-looking-at-you/*.

[158] Crary lists "[c]omputer-aided design, synthetic holography, flight simulators, computer animation, robotic image recognition, ray tracing, texture mapping, motion control, virtual environment helmets, magnetic resonance imaging, and multispectral sensors"

[159] Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, Mass: MIT Press, 1990), 1.

be “definitively removed from the realm of direct or indirect observation of synthetic images created *by the machine for the machine*.”[160]

Adversarial images are simultaneously human and machine readable and it is the gap between the two readings that give them meaning. In this sense they are closely related to steganography, which embeds a secret message within another, non-secret message. Whereas steganography intends, however, for the secret to be only accessible to the intended recipient who knows the key to decoding it, adversarial images depend on the intended recipient *not* being aware of itself as recipient, *not* knowing that its programmed mode of working is actually being exploited to decode the secret, and *not* recognizing the secret as a secret. Steganography would be useful for a spy attempting to slip a message through enemy lines, while adversarial images fool the machine, for example in a military context in which Virilio says strategy has shifted from deterrence to deception, “in which winning is simply a matter of not losing sight of the opposition.”[161]

Generative Adversarial Networks

But couldn’t a neural network be trained specifically to watch out for such deception? In 2014, Ian Goodfellow extended the findings in “Intriguing properties of neural networks” to describe a new framework called ”generative adversarial networks” (GANs), where a generative model tries to deceive a discriminating model, also sometimes called a *critic*,[162] each improving the performance of the other.

> The generative model can be thought of as analogous to a team of counterfeiters, trying to produce fake currency and use it without detection, while the discriminative model is analogous to the police, trying to detect the counterfeit currency. Competition in this game drives both teams to improve their methods until the counterfeits are indistiguishable [sic] from the genuine articles.[163]

This is an accelerated preemption, a codified internalization of critique,[164] one in which various kinds of failure and error are anticipated and already incorporated in

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[160] Paul Virilio, *The Vision Machine* (Bloomington: BFI : Indiana U.P., 1995), 59–60.

[161] Virilio, *The Vision Machine*, 70.

[162] This is partly in reference to the actor-critic method in reinforcement learning, another two-part approach to optimization problems.

[163] Ian Goodfellow et al., “Generative Adversarial Nets,” in *Advances in Neural Information Processing Systems*, 2014, 1.

[164] Or, simultaneously critique’s internalization of power: Slavoj Žižek, writing on the totalitarian style of Laibach’s performances wrote that it “*’frustrates’ the system… precisely insofar as it is not its*

the process of production. But GANs go even further, using the dynamic interrelationship between generator and discriminator, between criminal and police, to discover and overcome entirely new, unanticipated forms of failure and error. In one practical example, images of real celebrities[165] are used to produce realistic ”photographs” of previously nonexistent celebrities.[166] Researchers at the University of Washington generated ”photorealistic” video of Barak Obama lip synced to unrelated audio,[167] flipping the adversarial image so that now the human eye is the one deceived by the constructed image.

The word *adversarial* and its usage in machine learning set up an antagonistic, competitive face-off between humans and machine. As a potential method for making work with these algorithmic systems, I prefer to think of it more as an interference pattern, as overlapping perspectives that are in the process of unifying, but which still allow for incongruities that can be discovered or provoked. Such an adversarial engagement would open a gap through mistakes, accidents and errors, only locatable through a knowledge of the system, that provide a space for critical deliberation and potential intervention. Moreover, the adversarial is an ongoing process, like a game, as opposed to the generative, a more transactional relationship in which the artist delegates some kind of control to the machine, the way a factory owner might.

In 1967, Italo Calvino gave a lecture in Turin called “Cybernetics and Ghosts,” which straddled the adversarial and the generative. Towards the middle he provocatively says that “it is with a clear conscience and without regrets that I state that my place could perfectly well be occupied by a mechanical device,”[168] as a means of describing the combinatorial game of literature. Following this with an

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ironic imitation,” which would be legible as critique, a cynical distance, “*but represents an over-identification with it*.”, Slavoj Žižek, *Universal Exception.* (Bloomsbury Publishing, 2014), 73

[165] Using the CelebA dataset, http://mmlab.ie.cuhk.edu.hk/projects/CelebA.html (last accessed 15 April 2018)

[166] Tero Karras et al., “Progressive Growing of GANs for Improved Quality, Stability, and Variation,” *ArXiv Preprint ArXiv:1710.10196*, 2017, It was claimed that the same algorithm was used for FakeApp, which puts new faces onto actors in porn videos, but this was apparently not true. Another programmer *did* implement the same idea as a GAN, however, which demonstrates the degree to which different kinds of neural networks can be used to do the same thing, albeit with tradeoffs in quality, time, and complexity. See https://www.deepfakes.club/forums/topic/gan-implementation/ (last accessed 15 April 2018).

[167] Supasorn Suwajanakorn, Steven M. Seitz, and Ira Kemelmacher-Shlizerman, “Synthesizing Obama: Learning Lip Sync from Audio,” *ACM Transactions on Graphics* 36, no. 4 (July 2017): 1–13, doi:*10.1145/3072959.3073640*, Again, note that this is not done using a GAN, although it seems well-suited.

[168] Italo Calvino, “Cybernetics and Ghosts,” in *The Uses of Literature* (San Diego, New York, London: Harcourt Brace & Company, 1986), 16–17.

adversarial argument — that literature always aspires to say something that hasn't already been said, that can't be said with language, giving voice to the unconscious — one gets the sense of how "a struggle to escape from the confines of language"[169] subsequently expands the field of language. Moreover, by playing the "combinatorial game," the author will more quickly find themselves free from the constraints of the conscious mind. Picking up on themes from an earlier essay,[170] the conclusion of the lecture connects this game to Hans Magnus Enzensberger's "labyrinth," as instantiated in literature, which proposes that by reconstructing the plan of the labyrinth, by figuring it out, one destroys it ("the only way to escape the prisoner's state is to know how the prison is built"[171]). Calvino takes this as a decision between working critically by trying to understand the world, as complex and insurmountable as it might seem; or simply confirming the state of things by refraining from any such understanding. In short, it is such a cognitive mapping enabled by a combinatorial, automated, or algorithmic engagement with the world (or the labyrinth or language) that advances this process.

In the concluding paragraph, Calvino quotes the concluding paragraph of the very last story in his own *t zero*, "The Count of Monte Cristo," which seems to anticipate the behavior of the GAN:

> If I succeed in mentally constructing a fortress from which it is impossible to escape, this imagined fortress either will be the same as the real one — and in this case it is certain we shall never escape from here, but at least we will achieve the serenity of knowing we are here because we could be nowhere else — or it will be a fortress from which escape is even more impossible than from here — which would be a sign that here an opportunity of escape exists: we have only to identify the point where the imagined fortress does not coincide with the real one and then find it.[172]

By imagining a more perfect fortress, a more absolute system, or a more totalizing cybernetic control apparatus, one introduces a gap between the 'imperfection' of the present state of things and absolute imprisonment to discover a possibility for escaping complete control. Identifying this opening, however, also potentially modifies the real fortress, making it smarter, closing the gap until it is indistinguishable from the ideal. In the context of algorithmic governance, this contraction would be articulated in terms of an "indistinction between reality and

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[169] Calvino, "Cybernetics and Ghosts," 18.

[170] "La sfida al labirinto (The Challenge of the Labyrinth)," *Il Menabò* 5 (1962)

[171] Italo Calvino, *The Complete Cosmicomics*, First U.S. Edition (Boston: Houghton Mifflin Harcourt, 2014), 283.

[172] Calvino, "Cybernetics and Ghosts," 27; Calvino, *The Complete Cosmicomics*, 293.

the world," resulting in a diminishing "radical uncertainty."[173] GANs rehearse this adversarial cycle, where the generator continually improves itself in order to produce more difficult challenges for the discriminator, which in turn becomes more discerning, until they effectively merge. The anxiety of a world in which all future action is anticipated through calculation has materialized around the photorealistic "fakes" of artificial celebrities and video puppets.

Two years after Calvino's lecture, a wave of strikes crashed through northern Italy's industrial cities, including Turin. The Fiat Mirafiori factory, subject to these rolling strikes through the 'hot autumn' of 1969 and 1970, was also the setting for Nanni Balestrini's *We Want Everything*, the story of a worker caught up in the dehumanizing turnover of the assembly line. It is not simply the story of one man, as Rachel Kushner explains in her introduction, but also of the 20,000 "nameless and unknown" who were hired in the same month as the protagonist. Like the worker depicted in Amazon's recent patent for a haptic feedback system, the Fiat worker gave over control of their body to factory control:

"On the Fiat line it's not a question of learning but of getting your muscles used to it, of getting used to the force of those movements and the rhythm. Having to place a whatchamacallit every twenty seconds meant you had movements quicker than a heartbeat. That is a finger, your eye, any part was forced to move in tenths of a second: forced actions in fractions of a second. The action of choosing the two washers, the action of choosing the two bolts, those movements were actions your muscles and your eyes had to make by themselves, without you deciding anything.[174]

In Mirafiori, the automatic worker had become an alienated machine (not the type of machine that *learns*) but Turin presents us with two modes of negentropic disautomatization. Outside of the factory gates, Calvino imagined replacing himself with a machine in order to realize new combinations in writing that would open the unconscious possibilities of language. *He* would not become a machine, but through delegation would "liberate himself from the slavery of the combinatory search."[175] Balestrini, on the other hand "dissolved himself, became the mere medium through which Alfonso Natella [the protagonist] speaks," refracting "the passing thoughts a worker," who was otherwise a mechanized wage-slave, "was having on the assembly-line."[176]

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[173] Antoinette Rouvroy, "The End(s) of Critique : Data-Behaviourism Vs. Due-Process," in *Privacy, Due Process and the Computational Turn*, ed. Mirielle Hildebrandt and Ekatarina de Vries (London: Routledge, 2013), 3.

[174] Nanni Balestrini and Rachel Kushner, *We Want Everything: The Novel of Italy's Hot Autumn*, trans. Matt Holden, Verso edition (London ; New York: Verso, 2016), "Fiat".

[175] Italo Calvino, "Prose and Anticombinatorics," in *The New Media Reader*, ed. Noah Wardrip-Fruin and Nick Montfort (Cambridge, Mass: MIT Press, 2003), 187.

[176] Balestrini and Kushner, *We Want Everything*. "Introduction" by Rachel Kushner.

Essaying Algorithms

In a series of avant-garde dance performances in 1964, arranged by dancer and choreographer Steve Paxton at Stage 73 in New York, Robert Morris, in his contribution *21.3* (Figure 9), transformed himself into a kind of puppet for Erwin Panofsky. Lip-synching to a recording of himself reading an excerpt from Panofsky's "Studies in Iconology," the artist's physical performance incorporated other gestures and habits of the scholarly lecture, including changes in posture, hand position, and breathing.[177] These gestures and movements were scored on standard office paper, in between the lines and words of the excerpt such that, when he put his "left hand on hip" or would "look at ceiling," they were not simply superfluous body language, but part of the dance of an academic.[178] In the text that is spoken, the author — the "I," who was Panofksy and is now Morris, or a parody of an academic — meets an acquaintance who "greets me on the street by removing his hat,"[179] which turns out to be an action invested with layers of expressive and conventional meaning. At this moment in the script, Morris's notes direct the "speaker" to "Step back… Both hands in pockets," implying that that gesture would itself be read by the author as a meaningful action.

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[177] A review described it this way: "Mr. Morris, another painter, stands at a lectern and for six minutes mouths the words of a pre-recorded excerpt about esthetics." Allen Hughes, "Dance: An Avant-Garde Series Begins," *The New York Times*, February 11, 1964.

[178] Mashinka Firunts, "Staging Professionalization: Lecture-Performances and Para-Institutional Pedagogies, from the Postwar to the Present," *Performance Research* 21, no. 6 (November 2016): 19–25, doi:*10.1080/13528165.2016.1240924* focuses on the lecture in relation to the academic institutionalization of art that was occurring in the early 1960s and which has only accelerated since, although now with dynamics specific to practice-based PhDs. *21.3* referred to the administrative number of an art history course that Morris taught at Hunter College.

[179] Erwin Panofsky, *Studies in Iconology: Humanistic Themes in the Art of the Renaissance*, Paperback ed, Icon Editions (Boulder, Colo: Westview Press, 1972), 3.

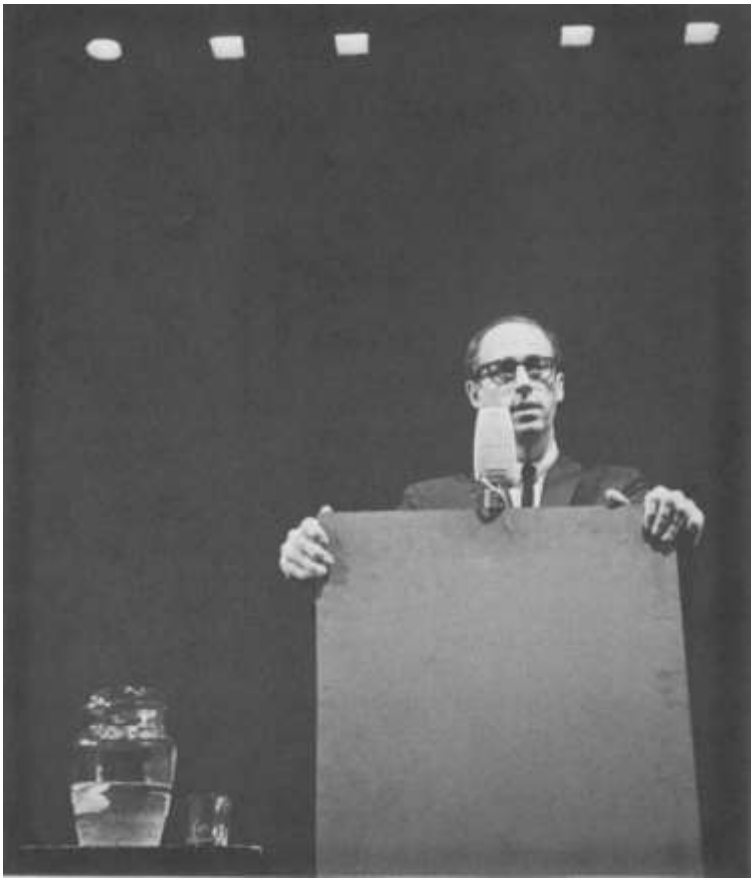

Figure 9: Robert Morris performing 21.3, 1964.

Eve Meltzer, in an analysis of *21.3* that emphasizes its connection to his statement 30 years later that the constant target of his work has been "'the rotting sack of Humanism'," [180] describes how the scored movements and the ventriloquism itself was "not so much *in*, but rather *out* of sync with the recording." [181] This slight phase shift between observed speech and action and their "sounds," this imperfect alignment of audio and visual tracks, not only undermined the humanist content of the text, but rational systems embodied in the form of delivery as well, "inserting friction into the flow of information." [182] Like so much of Morris's work, such as *Box with the Sound of its Own Making* (1961), the self-contained and self-referential

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[180] Eve Meltzer, *Systems We Have Loved: Conceptual Art, Affect, and the Antihumanist Turn* (Chicago ; London: University of Chicago Press, 2013), 77. Meltzer's reading is itself indebted to Richard J. Williams. The quote is originally from Robert Morris, *Continuous Project Altered Daily: The Writings of Robert Morris* (Cambridge, Mass. : New York, N.Y: MIT Press ; Solomon R. Guggenheim Museum, 1993), p. ix.

[181] Meltzer, *Systems We Have Loved*, 76.

[182] Firunts, "Staging Professionalization," 21.

quality of *21.3* is ultimately humorous and non-threatening, providing enjoyment in the ways it folds in on itself. Meltzer references a review of the piece in a footnote, for example, in which the reviewer writes “a description that becomes consumed by her own self-pleasure.”[183] Even if the various parts of the work are administrative, depersonalized, and automatic, the overall diagram or organization is absurd and counterintuitive. This humorous tension is a knot, as if the system has been set to work on itself and has gotten stuck in a loop, or as Meltzer’s reviewer writes, “Morris illustrates the product in the process of a lecture, which in turn becomes a product illustrating the process of the paper. It all turns around on itself.”[184]

Although Morris took aim at the “rotting sack,” it wasn’t as if he then appropriated the machine in the way Sol Lewitt had: where, for Lewitt, “The process is mechanical and should not be tampered with. It should run its course;”[185] Morris would write that “Change and not continuity has been the guide… Paradox and the fugitive were always more attractive than assured style and stable position.”[186] Even though Lewitt was discussing an individual artwork and Morris an artist’s wider practice,[187] Lewitt’s ”sentence” gestures to a wider sensibility and Morris’s skepticism found a way of manifesting itself within individual works. I am trying to put a little space between these two artists, who appear so close together in the history books, in order to compare their respective approaches to automation and suggest an alternative trajectory for generative art.

In his most sustained discussion of automation, within “Some Notes on the Phenomenology of Making,” Morris discusses a tendency in which the systematic means of an artwork’s production are revealed within the final work as information. Tracing this tendency as far back as Donatello’s methods of casting (rather than modeling) clothing and extending it through John Cage’s chance operations, Jackson Pollock’s use of gravity, and even contemporary theatre and dance, Morris sees the space of the studio or rehearsal brought into closer proximity with

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[183] Meltzer, *Systems We Have Loved*, 216. Fn. 29.

[184] Meltzer, *Systems We Have Loved*, 216. Fn. 29. Originally quoted from Jill Johnston, “Pain, Pleasure, Process,” Village Voice, February 27, 1964, 9, 15.

[185] Sol Lewitt, “Sentences on Conceptual Art (1969),” in *Theories and Documents of Contemporary Art: A Sourcebook of Artists’ Writings*, ed. Kristine Stiles and Peter Howard Selz, California Studies in the History of Art 35 (Berkeley: University of California Press, 1996), 827.

[186] Morris, *Continuous Project Altered Daily*, ix.

[187] In fact, Morris would also write a sentence that could very well have been written by Lewitt: “Making art is much more about going through with something.”, Morris, *Continuous Project Altered Daily*, 87

the space of exhibition or performance.[188] At one point in the text, Morris sounds indistinguishable from the generative artists that take Lewitt as their forebear and who talk of relinquishing or deliberately sacrificing control to an autonomous process. He writes that automation allows for the artist's "regress into a controlled lack of control."[189] Similarly, Morris's interest in freeing sculpture from representation and moving "away from illusionism, allusion, and metaphor"[190] in art resonates with certain "non-mimetic"[191] trends on generative art that depict the outcome of a computational process. But what I find useful in humorous, sonic works like *21.3* and *Box with the Sound of its Own Making* is the way in which illusion and performativity breaks from these trends, suggesting how to stage an encounter with those computational processes that attends to the way they are embedded in broader social, political, and economic processes.

Lewitt is a frequently cited inspiration for generative artists. Galanter's discursive boundary drawing exercise, "What is Generative Art?," claims, for example, that "most of [Lewitt's] work is generative." Citing Lewitt's 1967 text, "Paragraphs on Conceptual Art," Galanter is particularly drawn to the idea that the actual process of *making* a conceptual art work is "a perfunctory affair," which is aligned with generative art's delegation of execution to an automatic process. And the statement that "[t]he idea becomes a machine that makes the art,"[192] often realized through instructional works (Figure 10[193]) and wall drawings, was embraced by generative artists as a kind of pseudocode for their own practice.[194]

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[188] Morris, *Continuous Project Altered Daily*, 86–91. "Some Notes on the Phenomenology of Making".

[189] Morris, *Continuous Project Altered Daily*, 87.

[190] Morris, *Continuous Project Altered Daily*, 64. Notes on Sculpture, Part4.

[191] McCormack et al., "Ten Questions Concerning Generative Computer Art," 137.

[192] Galanter, "What Is Generative Art? Complexity Theory as a Context for Art Theory," 18; Sol LeWitt et al., *Sol Lewitt: The Museum of Modern Art, New York: [Exhibition]* (New York: The Museum, 1978), 166.

[193] In a 1971 set of ten lithographs, *Work from Instructions*, one similar drawing's instructions were provided: 'Within a twenty inch square area, using a black, hard crayon, draw ten thousand freehand lines, of any length, at random.'

[194] Pseudocode is writing that is legible to humans but which is in the structure of a computer program. It is often used as an initial draft of a future program or as a teaching aid.

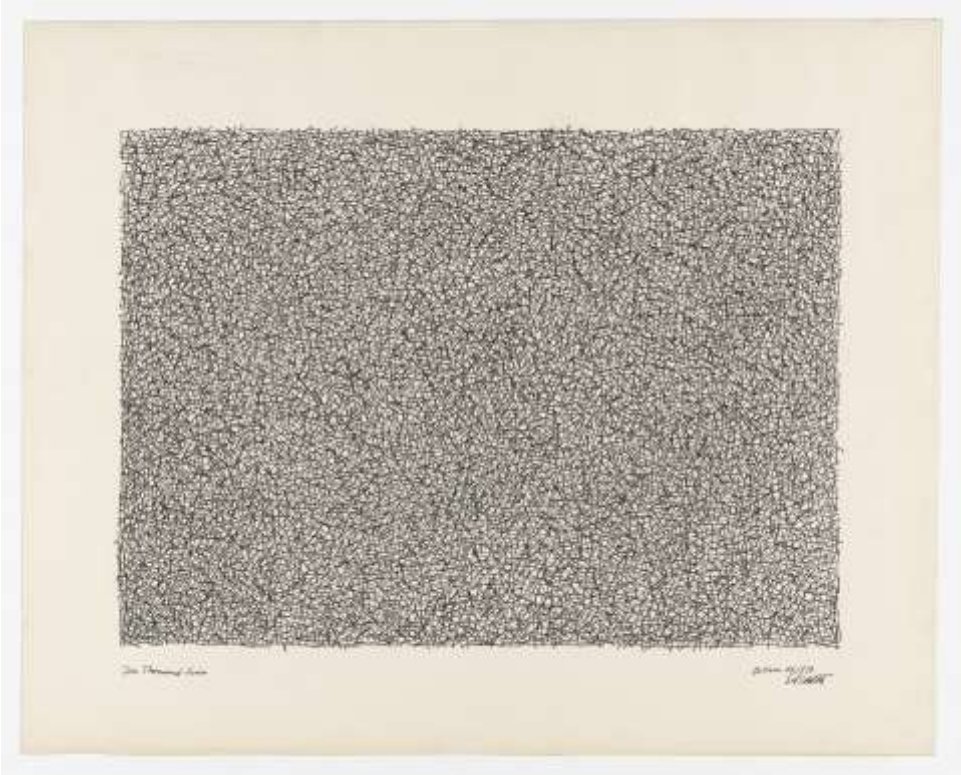

Figure 10: Sol LeWitt, Ten Thousand Lines, 1970.

Generative art, in Lewitt's terms, would be diametrically opposed to the essay form. Where for Lewitt, "[i]f the artist changes his mind midway through the execution of the piece he compromises the results and repeats past results,"[195] Michel de Montaigne made a point of doing precisely that, of not following the planned course of an argument — "I got out of my way; but 'tis rather by license than oversight."[196] For the essay, "a genre in which caprice, improvisation, and the arbitrary and impulsive ('irresponsible') linking of ideas seems to be the rule,"[197] if there *is* a plan it's a plan not to follow a plan. One point of agreement, however, might be that Montaigne was also uncompromising and would not want to merely repeat the past. And where Lewitt refuses the traditions of painting and sculpture and the limitations they place on the artist, so too did Montaigne resist the strict formats of

[195] Lewitt, "Sentences on Conceptual Art (1969)," 826.

[196] M.E. de Montaigne, *The Complete Works of Michael de Montaigne*, ed. W.C. Hazlitt (London: John Templeman, 1842), 461.

[197] Réda Bensmaïa, *The Barthes effect: the essay as reflective text* (Minneapolis: University of Minnesota Press, 1987), xxx.

the scholarship of his time.[198] Still, the Montaignian essay is more deeply subjective and introspective ("I am myself the substance of my book"[199]) than Lewitt would accept, arguing that "[t]he artist's will is secondary to the process he initiates from idea to completion. His wilfulness may only be ego."[200] The Montaigne of some essays might disagree, while in others the author allows themself "to be tossed in the wind, or seem to be,"[201] as if will were not in control of the writing but merely following it.

If generative art has largely reflected Lewitt's conceptual schema over the past two decades, then Gottfried Jäger's "generative photography" lurks in a blind spot. In 1968, between the writing of "Paragraphs…" and "Sentences on Conceptual Art," Jäger organized *Generative Fotografie* at Bielefeld Art Center, exhibiting the works of four artists, including himself. Breaking with representational tendencies in "subjective photography," generative photography sought to no longer reproduce objects, but produce new forms.[202] This was accomplished through systematic and methodical chemical and mechanical experiments that "[bring] to light pictures that are latent in the photographic process." The results observed in a series of these photographs would represent an inner language, which Jäger described as "a kind of syntactical system, a creative, visual grammar," drawing on Noam Chomsky's "generative grammar."[203]

In his 1956 paper, supported by the Pentagon like so much work at M.I.T., Chomsky theorized a language's grammar as the set of rules that would determine the set of possible grammatical sentences within that language.[204] Such a structured grammar seemed at the time to have practical application in allowing

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[198] Michel de Montaigne, *Essays*, trans. John M. Cohen (London: Penguin Books, 1993), 15. "Introduction," J. M. Cohen.

[199] Montaigne, *Essays*, 25. "To the Reader".

[200] Lewitt, "Sentences on Conceptual Art (1969)," 826.

[201] Tracy Chevalier, ed., *Encyclopedia of the Essay* (London ; Chicago: Fitzroy Dearborn Publishers, 1997), 1203. In this quote, Montaigne is referring to Plato as an example of the wandering quality of the essay. I am using this translation for its brevity, but it can also be found in Montaigne, *The Complete Works of Michael de Montaigne*, "letting themselves be carried away at the pleasure of winds; or at least seem as if they were." (461).

[202] Gottfried Jäger, "Generative Photography: A Systematic, Constructive Approach," *Leonardo* 19, no. 1 (1986): 19, doi:*10.2307/1578296*.

[203] Jäger, "Generative Photography," 20.

[204] N. Chomsky, "Three Models for the Description of Language," *IEEE Transactions on Information Theory* 2, no. 3 (September 1956): 113–24, doi:*10.1109/TIT.1956.1056813*.

"natural language as an operational language for command and control,"[205] such that humans could operate machines without resorting to *programming*. Although interfaces are more advanced today, we can still probably recognize the way we restructure our own speech in anticipation of the grammatical structures that Siri or Alexa expect, a form of what Bernard Stiegler calls *proletarianization*.

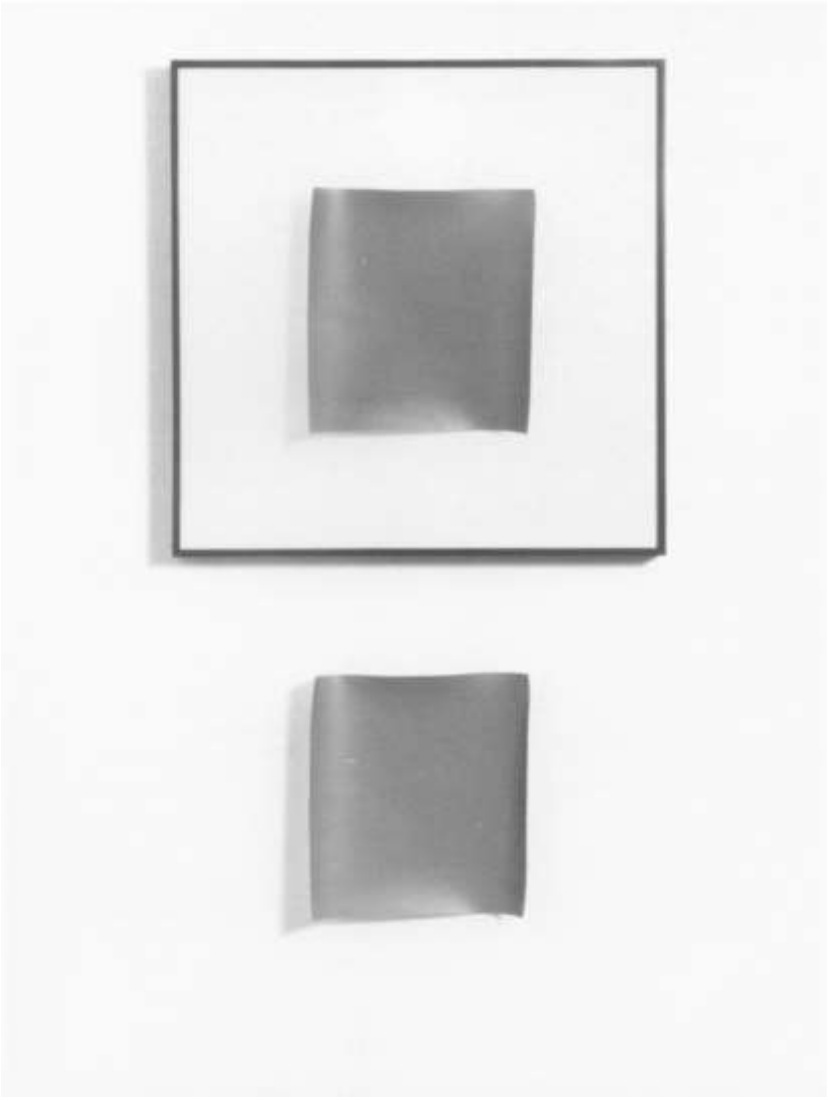

Figure 11: Gottfried Jäger, reproduced from Jäger's article in Leonardo.

[205] A. Zwicky, "Grammars of Number Theory: Some Examples," Working Paper (Bedford: The MITRE Corporation, 1963), "Forward". Not only were Chomsky's ideas on grammar used in research by the MITRE Corporation, but he also was a consultant in the early 1960s.

Generative grammar's machinic understanding of language was mobilized in Calvino's combinatorial writing as a means of giving voice to a preconscious or unconscious subject matter; and in Jäger's generative photography that disassembles the act of photography into elementary units that are combined into formally new photographic statements. Is this systematic approach to language, again, something that bears no relation to the essay? Not necessarily. Jäger critically "rejects stereotypical handling of an apparatus system that functions automatically only and accepts existing models without question,"[206] in a way that is, from the perspective of the medium if not the artist, "independent and self-critical", an "introverted approach," full of "introspection," and "a response, a last bulwark of freedom in the face of the inaccessible and closed political system around them." Interestingly, this freedom was not to be found by stepping out of that system or giving form to the artist's inner fantasies, but by "work[ing] *inside* the apparatus,"[207] at times playful and at others contentious. Even if generative photography is not "arbitrary" and "impulsive," there is something of the sensibility of the essay in them: Flusser (who wrote an approving letter in response to Jäger's article in *Leonardo* that I have been citing) contrasts the treatise, in which "I will *think about* my subject," to the essay, wherein "I will *live with* my subject."[208]

One particularly striking intersection of the essay and the generative is in the figure of Max Bense, the German philosopher and writer who defined a "generative aesthetics" in the early 1960s. Inspired by Chomsky's generative grammar and providing a theoretical foundation for generative photography, generative aesthetics "implies a combination of all operations, rules and theorems which can be used deliberately to produce aesthetic states (both distributions and configurations) when applied to a set of material elements."[209] This scientific, quantifiable conception of aesthetic structures and their value seems strange — as much today as then — because it doesn't adhere to traditional liberal ideas of creativity. More than a decade earlier, Bense similarly wired a circuit between science and art,[210] comparing the essay form to experimental physics with its approach of "interrogating, prodding, examining, thoroughly reflecting on [its

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[206] Jäger, "Generative Photography," 20.

[207] Jäger, "Generative Photography," 23.

[208] Vilém Flusser, "Essays," in *Writings*, ed. Andreas Ströhl, trans. Josiah Blackmore, Electronic Mediations, v. 6 (Minneapolis: University of Minnesota Press, 2002), 193. Emphasis added.

[209] Max Bense, "The Projects of Generative Aesthetics," in *Cybernetics, Art, and Ideas*, ed. Jasia Reichardt (London: Studio Vista, 1971), 57.

[210] Hans Haacke captured this sentiment in his 1967 statement, "In the mind of the public and some artists, the border between art and science has become fluid…", Hans Haacke, *Working Conditions: The Writings of Hans Haacke*, Writing Art (Cambridge, Massachusetts: The MIT Press, 2016), 12

object].”[211] While much changed in the interim — Bense’s exposure to information theory and semiotics, as well as his own experiments in the 1950s with concrete poetry — his understanding of both the essay form and generative aesthetics shared a sense of experiment within precise conditions, the “conditions for the composition”[212] or “produc[ing] the conditions under which the subject matter is brought into the context of literary configuration.”[213]

Melting Points

In his 1968 essay “Systems Esthetics,” Jack Burnham wrote, “the significant artist strives to reduce the technical and psychical distance between his artistic output and the productive means of society.”[214] Rather than paint and sculpt, artists would make use of new technologies such as television, video and computers. What Burnham was really getting at, however, was a paradigm shift from finite objects, bounded by material limits such as the picture frame, towards “*unobjects*,” systems and environments that transfer the locus of art onto “*the relations between people and between people and the components of their environment*.”[215] The picture frame was exploded by new demands placed on art.

But what is the distance between artistic output and the productive means of society? Can it be measured by the tools and the machines the artist uses? Thirty-four years earlier, just when Hitler had come to power, Walter Benjamin explicitly formulated the question “what is a work’s position *vis-à-vis* the production relations of its time?” to “what is its position *within* them?”[216] Working from the historical materialist conception that “social relations, as we know, are determined by production relations,” Benjamin placed the writer (or artist, for my purposes here) squarely within the productive means of society, where they might choose just how entangled to become.

Burnham says that “*the most important artist*” is absolutely entangled, succeeding “*by liquidating his position as artist vis-à-vis society*.”[217] For him, this isn’t about

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[211] Max Bense, “From ‘On the Essay and Its Prose’,” in *Essayists on the Essay: Montaigne to Our Time*, ed. Carl H. Klaus and Ned Stuckey-French (Iowa City: University of Iowa Press, 2012), 72.

[212] Bense, “The Projects of Generative Aesthetics,” 60.

[213] Bense, “From ‘On the Essay and Its Prose’,” 72.

[214] Jack Burnham, "Systems Esthetics," *Artforum* VII, no. 1, September 1968, 31.

[215] Burnham, “Systems Esthetics,” 31. All emphases in the original.

[216] Walter Benjamin, "The Author as Producer," in *Understanding Brecht*, (London and New York: Verso, 1998), 87.

[217] Burnham, “Systems Esthetics,” 31.

proletarian solidarity but is rather a consequence of repudiating craft while collapsing artistic and technological decision-making. Whereas Benjamin essentially demanded writers "*think*" about their "position in the production process,"[218] Burnham, influenced by Productivism but tempered by his historical perspective on Stalinism, was simply concerned with the "implementation of the art impulse in an advanced technological society."[219] "Systems Esthetics" reads like a prophecy of the aesthetic transformations that would soon come about from the 1973 oil crisis, the overseas migration of industry, the growth of finance and the proliferation of personal, networked media.

If "Systems Esthetics" introduces extrinsic language and concepts (from cybernetics, economics, and military science research) into art, one would have had no sense from the essay of the spread of civil unrest across America between 1965 and 1968. Nor would one have been able to anticipate the impact that urban and suburban music and counterculture were to have on the arts in the 1970s and '80s. According to the terms of Benjamin's analysis, the position within production relations that Burnham outlines is an immaterial one ("the maker of *esthetic decisions*" and not of "tools and images"),[220] perhaps with progressive ideas but ultimately disconnected from political agency, situated in "an impossible place."[221]

Asserting that "during the 1970s, rock culture became the religion of the avant-garde art world,"[222] Dan Graham, in *Rock My Religion*, simultaneously joined artistic practices to "a new mythology of origin fashioned from the images and sounds of working-class religious rituals,"[223] to the factory, to the Industrial Revolution of eighteenth-century England. This was not an official historical argument, wrote Kodwo Eshun in his monograph on *Rock My Religion* (and it would have been problematic if it were, for its participation in the exclusion of black culture from history) but a heretical, hyperbolic, anti-historical provocation, the appeal of which "lies in its autodidacticism, its amateurism and its do-it-yourself perseverance."[224]

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[218] Benjamin, "The Author as Producer," 101.

[219] Burnham, "Systems Esthetics," 35.

[220] Burnham, "Systems Esthetics," 35..

[221] Benjamin, "The Author as Producer," 93.

[222] Kodwo Eshun, *Dan Graham: Rock My Religion*, One Work, (London: Afterall Books, 2012), 95.

[223] Eshun, *Dan Graham*, 7.

[224] Eshun, *Dan Graham*, 6.

It is the form and technique as much as the content, however, that Eshun finds noteworthy. Known primarily as a video essay, *Rock My Religion* was realised through multiple iterations of a written script, composed in relation to a series of essays written by Graham largely between 1979 and 1984. Eshun, recognised for his own writing on music and his essay films as part of the Otolith Group, acknowledges the encouragement *Rock My Religion* provides to "the fraction of artists who write." He coins the term "scriptovisuality," which "demands doubled vision and twin hearing,"[225] noting that an encounter with the video involves not only viewing and listening but also *reading*. Specifically, the text-over enters into dialogue with voiceover and lyrics, and also the image; sometimes they are in concert, but often in they are conflict of one kind or another.

Although structures, systems and machines dominate the history of media art, there has also been a minor but significant tendency in which the timeworn technologies of writing and voice are central. At first glance this might seem a conservative, humanist reaction to an expanded technological field, but I think it is quite the opposite; it is driven by an engagement with the new media and, for Benjamin at least, a belief in the possibilities of technical innovation. A video essay such as *Rock My Religion* might share much with a textual essay, but Eshun notes that because it "inhabits the same medium as its subject, it can enact its speculations in ways that a textual essay cannot."[226] For one, its statements and questions are not related to their subject through reference, pointing at something outside. Rather, it has the "capacity of exemplification," collapsing to some degree the apparent gap between language and the material world, such that writer, text and object of inquiry are imbricated in one another.

Sergey Tretyakov, Benjamin's primary example in "The Author as Producer," offers the model of the "operative" writer, as distinguished from the merely "informative" one. Rather than remain outside of things, content to report from a distance, an operative writer actively intervenes within his or her field of activity. This was as much a matter of technology as it was a product of attitude or motivation. Benjamin described how the Russian newspaper, as opposed to the bourgeois press, dissolved the boundaries between author and public, between genres of writing, between topics and, finally, between specialist authority and practical experience. A twenty-first-century reader can't help but project these same words onto the internet, "the place where words are most debased" but which also "becomes the very place where a rescue operation can be mounted."[227]

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[225] Eshun, *Dan Graham*, 10.

[226] Eshun, *Dan Graham*, 8.

[227] Benjamin, "The Author as Producer," 90. Benjamin is quoting "an author of the left" who happens to be himself.

If Walter Benjamin was prone to nostalgia, it was not of a sentimental or reactionary variety. After all, “The Author as Producer” was written as a counterpoint to precisely these tendencies in fascism. Benjamin saw revolutionary potential within technology’s capacity to dismantle old hierarchies: “we are in the midst of a vast process in which literary forms are being melted down,[228] a process in which many of the contrasts in terms of which we have been accustomed to think may lose their relevance.”[229] (Later in the essay he points to music and photography as elements in the new blend, so this liquefication wasn’t limited to literary forms; and my purpose in discussing them here is to extend these phase transitions to algorithmic media.)

Which brings me back to Eshun’s critical text on *Rock My Religion,* which, he concludes, “suspended the hierarchies that rock cultures and art worlds continually tried to resurrect – it melted them into shared states of intensity, attitudes, gestures, performances, parties, scenes and cliques.”[230] Once we begin looking for this heterodox sensibility, we find it pervading Eshun’s practice, from his alchemical neologisms to his inventive music journalism to his speculative explorations of archives with Otolith Group collaborator Anjalika Sagar. For his part, Dan Graham had integrated his writing into magazines (*Homes for America*, which also migrated between forms – first as a slideshow and only later as an article – included a text on suburban housing), into advertisements and into lectures (although *Performer/Audience/Mirror* was purportedly unrehearsed). Reflecting on Jean-Luc Godard, Graham said, “I like Godard, because his early films were almost like magazine page essays;”[231] he was echoing Godard’s own slippery provocation from 1962, “I think of myself as an essayist, producing essays in novel form or novels in essay form: only instead of writing, I film them.”[232]

An essay of this kind is not a message tucked into a bottle; rather, it reflects in on itself as if it were printed on the inside of the bottle. This essay and its mode of presentation are inseparable. Look at Harun Farocki’s hands in *Images of the*

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[228] A metaphor of melted-down forms comes strikingly close to the language used to depict ‘the essay’ in the tradition of Montaigne’s *Essais*. O.B. Hardison says, characteristically, that “there is … no genre that takes so many shapes and that refuses so successfully to resolve itself, finally, into its own shape.” Perhaps more to Benjamin’s point, which is less about categorisation than it is about potentiality, is Réda Bensmaïa’s rejection of conceiving an essay as a mix of genres, proposing instead that it is “the moment of writing *before* the genre … the matrix of all generic possibilities.”

[229] Benjamin, “The Author as Producer," 89.

[230] Eshun, *Dan Graham*, 95.

[231] Ute Meta Bauer And Dan Graham, ‘From Magazines to Architecture’, *Mousse Magazine*.

[232] Jean-Luc Godard, *Godard on Godard: Critical Writings by Jean-Luc Godard*, (New York: Da Capo Press, 1986), 171.

World and the Inscription of War or the way he's filmed research materials as material. The poetic historical-theoretical voiceover so often found in his work keeps alive the forensic process initiated in the archival work and technical production of the images: "As a filmmaker you always see the work from different perspectives – through the viewfinder, on the editing table, in fragments …"[233] In Farocki's later projects, occurring more frequently in galleries and museums than cinemas, the screen is multiplied and scriptovisuality spatialised.

If the video installation is one means by which the written essay has been "translated"[234] into three dimensions, then the lecture-performance is another. For Hito Steyerl, texts, videos and lectures propel ideas and concepts between one another, with each format circulating differently through the world, at different velocities, to different audiences and demanding different kinds of attention. But these formats, of course, are not rigorously separated. Steyerl's *Is the Museum a Battlefield?* has, for example, migrated between a lecture-performance, exhibited documentation of the performance, and a separate video installation. Rabih Mroué has produced a series of monologues in which an actor (often Mroué himself) probes media archives. The form of mediation or representation becomes as much the object of inquiry as the explicitly stated subject is, whether that is a missing man, his brother or a revolution.

Throughout the creative work propelling *Performing Algorithms*, I have – almost by artistic habit – sought to compose and perform texts within a format that was intertwined in the subject matter of the research. And the inverse is also true: the formats themselves have histories that become subject matter.[235] *Always Learning*, for example, uses the voices, personalities, and histories of the Google, Apple, and Amazon smart speakers. *Learning from YouTube* is a didactic YouTube video that is made from other YouTube videos in order to talk about the use of these videos to teach machines. The *AI-Commune* lecture discusses technophilic fantasies of immortality as a preface to a workshop in which participants donate their own media corpus to a nascent commune that might resist a future where corporations reanimate our data profiles in various ways without our consent. There is a pedagogical imperative to many of these works, where text is vocalized, displayed for reading, or otherwise performed.

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[233] Harun Farocki, interview by Frances Guerin, *Artslant*, April 2009, online at *http://www.artslant.com/trn/articles/show/6740*. (Accessed 10 July 2015)

[234] N.M. Alter, "Translating the Essay into Film and Installation," *Journal of Visual Culture*, 6, no. 1, (April 2007), 44–57.

[235] I have to acknowledge, after *Is the Museum a Battlefield?*, that the institution of art remains relatively unquestioned in the work that's been made during this research project. It's not that I don't think about it, but that the work slots into institutional contexts so infrequently that commenting on them feels as though it would be more of an imagined entanglement than a real one.

Lecture Performance

Lurking beneath the concepts of chance and luck in Aristotle's *Physics*, where the teleological drive is thwarted and something unexpected happens, is the sense that if one were to trace a chain of immediate causes for the seemingly meaningless accident back far enough then the universe would still fit together purposively. Pierre-Simon Laplace's theory of probability formalizes this sensation in the idea that for an intelligence capable of accounting for every factor throughout the universe, knowing all the rules, and calculating accordingly, there would be nothing unpredictable - for such an intelligence, there would be no accidents.[236] In these terms, chance is not something that happens in the world, but is a deficiency of comprehension on the part of the observer. Raymond Queneau, in developing the conceptual apparatus of OuLiPo (*Ouvroir de littérature potentielle*), oriented this determinism into a critique of romantic creativity:

> Another entirely false idea in fashion nowadays is the equivalence which is established between inspiration, exploration of the subconscious, and liberation; between chance, automatism, and freedom. Now the inspiration that consists in blind obedience to every impulse is in reality a sort of slavery. The classical playwright who writes his tragedy observing a certain number of familiar rules is freer than the poet who writes that which comes into his head and who is the slave of other rules of which he is ignorant."[237]

Like the classical playwright in this quote, Oulipo realized freedom through formal constraints. Perhaps the most well-known example of such a constraint is the lipogram, a composition in which one or more letters is not used, like in Georges Perec's *La Disparition*, which does not include the letter *e*. That formal absence also found expression within the plot (as was often the case with Perec) which concerns the disappearance of a man named Anton Vowl. Other possible constraints have included the liponym (writing without certain common words), palindrome or the 'S + n,' in which every noun was substituted with the nth noun after it in the dictionary. Perec not only found freedom in the constraints, but embracing them provided an escape from his own fear of possibility, the paralysis of choice, referring to "the terror I would feel in writing 'poetry' freely."[238] But if this

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[236] Hanjo Berressem, ed., "'Incerto Tempore Incertisque Locis': The Logic of the Clinamen and the Birth of Physics," in *Mapping Michel Serres* (Ann Arbor: University of Michigan Press, 2005), 62.

[237] Warren F. Motte, ed., *Oulipo: a primer of potential literature* (Lincoln: University of Nebraska Press, 1986), 45. Raymond Queneau quoted in Jacques Roubau, "from Mathematics in the Method of R Queneau."

[238] Georges Perec quoted in Motte, *Oulipo*, p. 20

sounds rigid and deterministic, Perec subverted his own invented systems with the deliberate introduction of an anti-constraint, the *clinamen*.

At the etymological root of 'accident' is the Latin root *cadere*, which means 'to fall.' In the ancient atomism of Democritus, revived by Epicurus, it was thought that the universe was comprised of atoms in motion through the void. The parallel fall of atoms presented a dilemma for the atomist philosophers, namely how to account for free will (and other accidents). Why would atoms ever collide at all? Epicurus suggested a swerve of atoms in the mind, an idea that the Epicurean poet Lucretius formalized and extended in the clinamen, a swerve that takes place at an indeterminate place and time during the fall and sets the trajectory for unpredictable atomic collisions instigating a series of increasingly perceptible effects, including free will. This concept was culturally "repress[ed]"[Jacques Derrida,[239] p. 18] for two thousand years before being recovered in the twentieth-century, among new scientific and mathematical discoveries in complexity, by Henri Bergson, Jacques Derrida, Michel Serres, Gilles Deleuze, and Jacques Lacan[240] among others.[241] One of those others was the writer Alfred Jarry, whose invented 'science of imaginary solutions' recuperates the clinamen as part of the pataphysical method, and who passed on the concept through affiliation to OuLiPo, which began as a subcommission of the College of Pataphysics.

For Perec, to only follow a set of constraints was the literary equivalent of the Democritean atomic system, mechanistic, predictable, and lifeless. Discussing his clinamen of the removed 66th chapter of *La vie mode d'emploi*, a 99 chapter novel whose structure was based on a knight's tour of a 10x10 grid, Perec reasoned that:

this chapter must disappear in order to break the symmetry, to introduce an error into the system, because when a system of constraints is established, there must also be an anti-constraint within

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[239] "My Chances/ Mes Chances: A Rendezvous with Some Epicurean Stereophonies," in *Taking Chances: Derrida, Psychoanalysis, and Literature*, ed. Joseph H. Smith and William Kerrigan, Psychiatry and the Humanities, v. 7 (Baltimore: Johns Hopkins University Press, 1984), 1–32.

[240] Berressem, "The Logic of the Clinamen," 53–54.

[241] Including Karl Marx, whose doctoral thesis, "Difference between the Democritean and the Epicurean Philosophy of Nature," considers consciousness, resistance, and overcoming fate through the figure of the Epicurean 'atom in declination.' Notably, especially in the context of this research, Michel de Montaigne was rather dismissive of the concept of the clinamen, "Wherefore they were forced to add later a sideways, fortuitous movement, and also to furnish their atoms with curved and hooked tails, to make them capable of attaching themselves together and intertwining." The Epicureans were patching a hole in their system with a dubious twist. But if this was enough to explain why atoms came together at all, Montaigne continued, then "why have they never happened to meet to make a house, or a shoe? Why do we not believe likewise that an infinite number of Greek letters scattered about the place would be capable of forming the web of the *Iliad*?", Michel de Montaigne, *The Complete Essays of Montaigne* (Stanford, Calif.: Stanford University Press, 1965), 407. This last image could be part of a pre-history of generative art!

it. The system of constraints - and this is important - must be destroyed. It must not be rigid; there must be some play in it; it must, as they say, "creak" a bit; it must not be completely coherent; there must be a clinamen - it's from Epicurean atomic theory: "The world functions because from the outset there is a lack of balance."[242]

At the conclusion of Warren Motte Jr.'s "Introduction to Oulipo," the source of the translation of the above quote, "Oulipians" are given a definition that suggests motivation for Perec's choreography of constraints and anti-constraints: "*rats who must build the labyrinth from which they propose to escape*."[243] It reminds me of the "*fort/da*" in Freud, who observed that the little baby Ernst would throw his toy away out of view, causing some satisfaction in causing the disappearance. But there would also be disappointment or longing and when the toy came back (because mother picked it up, or Ernst himself pulled it back by a string) he would exclaim, "Da!," in delight. The contradiction of the constraint, that it both enabled freedom and was ultimately deterministic, was unraveled, *Da!*, by the clinamen.

Automatism meant something different for OuLiPo than it did for orthodox Surrealists. Queneau, who left the Surrealists or was excommunicated by Breton, understood the automatic expression of chance or the subconscious as unintentional, whereas the application of constraints in OuLiPo, while automatic, was deliberate. And the clinamen did re-introduce the aleatory, but it did so intentionally, controlling chance. The concept of the clinamen, part of OuLiPo from the start, could be seen as a kind of immanent swerve to the group.[244] It was already a part of their constitution, their orientation, even without actively deploying it as a method - which, according to some histories,[245] they didn't do until the 1970s. While executing a text within the 'S + 7' constraint, it's said that writers would occasionally *not* choose the 7th noun, but another that worked better. In other words, OuLiPo, whether they would admit it or not, would bend and break the rules if they really wanted to. Perec, who was extraordinarily diligent and virtuosic in his execution of constraints to the extent that, while writing *La vie mode d'emploi*, he kept an accounting for each chapter of the 42 different constraints he

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[242] Motte, *Oulipo*, 24.

[243] Motte, *Oulipo*, 25.

[244] The different members of the OuLiPo had different approaches to the relationship between the constraint and the piece of writing that might potentially be produced using that constraint, with some, like François Le Lionnais, saying that no example need be produced, whereas for Perec the writing was clearly essential. There was no unanimity around the question of the relative value of the example, how many needed to be produced to illustrate the constraint, and how rigorous the application of constraints or clinamen ought to be.

[245] Mark Wolff, "Reading Potential: The Oulipo and the Meaning of Algorithms," *Digital Humanities Quarterly* 1, no. 1: 10, accessed March 14, 2018, *http://www.digitalhumanities.org/dhq/vol/1/1/000005/000005.html*.

was using. After the 42nd chapter, he stopped counting and simply continued to write. In *La vie mode d'emploi*, the clinamen was the missing chapter; but also this missing accounting; and also, for instance, the 18 constraints that Perec did not use in Chapter 5, according to his own tally.[246]

How do I bring this discussion of automation and the clinamen up to the present? One way to begin is to look towards the role of the computer in the application of constraints in OuLiPo, especially since the formal methods of permutation, combination, list look-ups, reversal, substitution, and decision trees map so closely to computational capabilities. Digital Humanities scholar Mark Wolff describes how the group was engaged with this question from their start in 1960, even working with a computer programmer to generate a potential telephone book (Figure 12) of generative people. There are strong parallels with NVIDIA's StyleGAN architecture, seen in use on thispersondoesnotexist.com (Figure 13), which synthesizes portraits of people, who could very well be listed in that phone book.


Tab Philippe, 14, rue de La Machine normande
Dubit Anatole, 20, av. du Moine Romain
Pouguinf Jules, 45, rue de la Maison
Herebier Adolphe, 38, rue des Maisons Jolies
Lir Yves, 64, rue Saint-Pierre
Lorbont Edouard, 21, av. du Buisson Gai
Sech André, 18, rue des Montagnes riveraines
Dreber Gilbert, 5, rue Jules Marcel
Micier Michel, 54, rue Saint Augustin
Debate Robert, 25, rue des Montagnes
Locrobelier Adolphe, 18, av. des Gares étroites
Rexer Augustin, 1, rue de la Tour blonde
Quimier Anatole, 20, rue du Buisson galant

Example 1. Computer-generated names and addresses from Starynkevitch's telephone directory

Figure 12: Image of computer-generated names and addresses originally in Mark Wolff, "Reading Potential," 2018.

[246] David Bellos, *Georges Perec: A Life in Words*, 2010, *https://nls.ldls.org.uk/welcome.html?ark:/81055/vdc_100048902478.0x000001*.

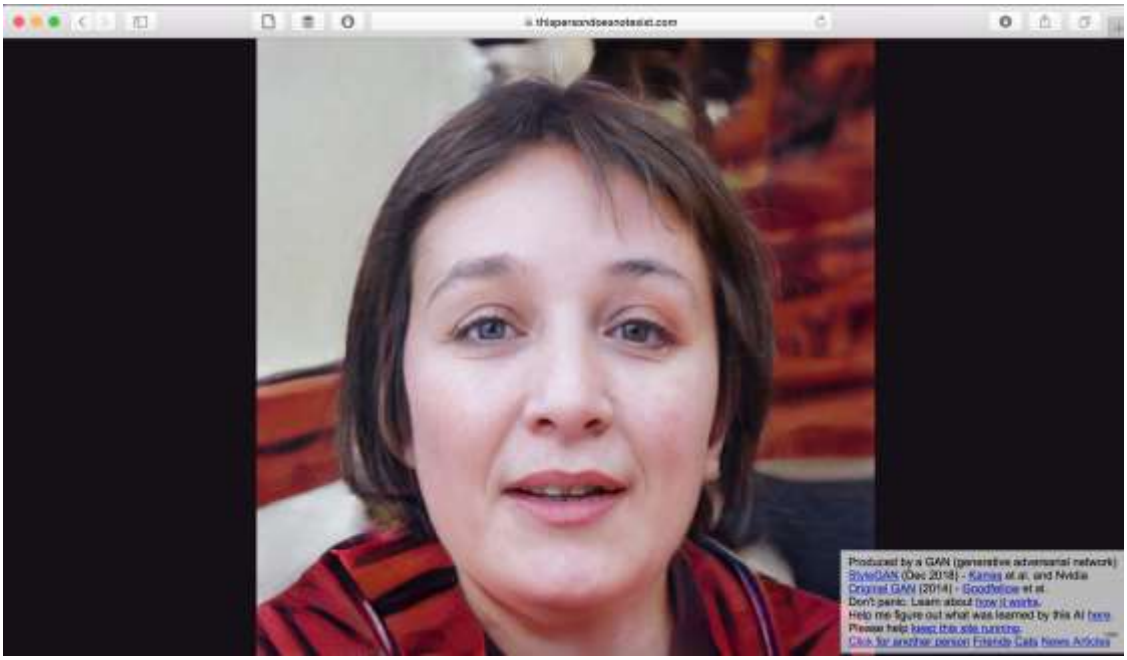

Figure 13: thispersondoesnotexist.com, accessed 30 June 2019.

Wolff notes that Le Lionnais, the scientist and writer, "found the phone book interesting because it was not particularly interesting: it was neither bizarre nor funny, and it looked like a real phone book,"[247] while others weren't as convinced. The line between what had potential for literature and what didn't, what was interesting and what wasn't and why, has echoes in the publication of the computer science research of NVIDIA; the reception of thispersondoesnotexist.com as uncanny, sinister, yet humorous in its banality; and the many more conventionally artistic appropriations of StyleGAN in the months after its release, which were comfortably ambiguous in their resistance to representation.[248] Jacques Bens, another founding member of OuLiPo, recalled that the experience of generating literature with the computer concerned some members because the complexity of the computer and the total delegation of control threatened to reintroduce chance, becoming a new non-intentional automatism.[249] Software-based generative art reaches the same impasse, which it proposed to overcome with the curatorial function of the artist, who chooses what examples to sign and exhibit from among

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[247] Wolff, "Reading Potential," 6.

[248] My own essay "Artificial Imagination: Deepfakes from Latent Space" goes further into this. Although it was written prior to the publication of the StyleGAN paper, it focuses on earlier GAN research by the same lab.

[249] I am relying on Wolff's summary (also on pg. 6) of this section of Jacques Bens's book, Jacques Bens, *OuLiPo: 1960-1963* (Paris: C. Bourgois, 1980), pg.

the nearly infinite possible outputs. This could be precisely what Calvino was suggesting when he argued that the computer allowed the writer-artist "to liberate himself from the slavery of a combinatory search, allowing him also the best chance of concentrating on this 'clinamen' which, alone, can make of the text a true work of art."[250] Contemporary generative art tends to place the artist's aesthetic tastes in the position of clinamen, although an ultimately uninteresting one because it reinforces existing norms (much the same way that AI perpetuates the latent bias of the data set) rather than proposing new ones.

Another approach would be that of the *clinamen-performer*,[251] the transduction between the text and the audience, which like Michel Serres's 'parasite'[252] is a kind of static in the system, a means of transmission that is also an obstructive noise. What makes the clinamen-performer different than, say, just a performer? The Live Artist who coined the term, Oliver Bray, suggests that it is simply a submission of the performer, who is by nature suggestible, energetic, and error-prone, in "responding to oulipian restriction."[253] Discussing the experience of performing a new translation of Georges Perec's radio play, *La Machine* (1968), Bray recounts how performers slipped between submission, ateleological competition, disruption, and play while reading their lines, which had been written according to rigid constrains that transformed a Goethe poem. The four voices of *La Machine*, a System Control and three Processors, responded to the growing role of computation, both in the wider society and narrowly in the focus of artists on instructions and process throughout the decade. Calvino had just suggested in "Cybernetics and Ghosts" that the computer might replace the writer entirely. After performing the piece, Bray wrote that "Perec's representation of a machine in the play is an ironic step in that direction, demonstrating the shortcomings of real people while celebrating their necessity in providing texture and/or pleasure to the mechanical."[254] The clinamen-performer is a performative anti-constraint. The 'real person' does introduce some friction, it does make the text "creak," but I would also argue that within certain circumstance, the performance of a globally computational system across the materiality of sensors, networks, across jurisdictions and cultures, is also performative and prone to "not working." The clinamen-performer can be - but does not need to be - human. In my *s2t*, for example, the expressivity

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[250] Calvino, "Prose and Anticombinatorics," 187.

[251] Oliver Bray, "Playing with Constraint: Performing the OuLiPo and the Clinamen-Performer," *Performance Research* 21, no. 4 (July 2016): 41–46, doi:*10.1080/13528165.2016.1192866*.

[252] Michel Serres, *The parasite*, trans. Lawrence R. Schehr (Baltimore: Johns Hopkins University Press, 1982).

[253] Bray, "Playing with Constraint," 41–42.

[254] Bray, "Playing with Constraint," 44.

and inconsistency of the human voice undermines the clean delivery of the original text, but so to does the complex apparatus of Google Docs, network, Google data center and algorithms, which the performer both uses but is also entangled within.

If the clinamen-performer responds to “oulipean restriction” then the ”performing speaker” is posed by Erving Goffman in 1976 against the written text of a lecture. The script is never transmitted directly from page into the minds of everyone in the audience, but is unfurled over time within a social context by a particular person. Goffman discusses how the lecture cleaves the experience in two, separating the “enduring” subject matter of the talk from the “felicities or unfelicities of the presentation,”[255] a characterization that carries reverberations of Aristotle’s essential qualities as opposed to accidental ones. This separation of content and form - or the ”cake“ and the “box”[256] - interacts in interesting ways, where the expression of the text is occasionally unwound by the presentation, or what Goffman describes as “the additional footings that can be managed at the same time, footings whose whole point is the contrast they provide to what the text itself might otherwise generate… a running counterpoint to the text.”[257] It can go too far, however, and the audience’s attention can shift from the *what* to the *how* of the lecture - to the meta-commentary, to the excessive gestures, fidgeting, and stuttering, to the “supportive animation” - ”jeopardiz[ing]… the partition between the inside and the outside of words,”[258] leading to an unpleasant experience of failure for the audience.

One audience’s pain is, however, another audience’s pleasure. The framing collapse that would overwhelm the text and distract the audience from its meaning, the focus of attention on the mechanics of presentation where the lecturer flips from a “speaker performing” to a “performing speaker,” are precisely the desired outcome of many lecture performances in contemporary art. Goffman, for his part, recognizes the possibility of the primarily performative mode of lecturing and is performatively dismissive of such an idea, saying, ”He who attempts such breaching, and succeeds, should have come to the occasion dressed in tights, carrying a lute.”[259] The introduction of his lecture on “The Lecture” is insistently dismissive and defensive, as if concerned that he, a serious academic, might be lumped in and cast aside with irreverent artists. Therefore, Goffman distances

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[255] Erving Goffman, *Forms of Talk*, University of Pennsylvania Publications in Conduct and Communication (Philadelphia: University of Pennsylvania Press, 1981), 166.

[256] Goffman, *Forms of Talk*, 173.

[257] Goffman, *Forms of Talk*, 174.

[258] Goffman, *Forms of Talk*, 173.

[259] Goffman, *Forms of Talk*, 163.

himself from that “puerile opportunism,” a category that includes ”the John Cage school of performance rip-offs.”[260]

One year earlier, in 1975, Dan Graham stood before an audience giving a monologue - a lecture, maybe - that might be the apotheosis of the performing speaker, *Performer/Audience/Mirror*. Standing before a mirrored-wall that reflected his back but also the front of the entire audience, Graham described in real time, with the urgency of a horse-racing commentator, his own performing body. “I’m standing on my right foot,” is the way Graham begins, giving voice to the barely visible objective reality of the performance. It seems as if every shift in his posture is narrated, but we also know that the pile up of words can’t possibly capture everything and there must inevitably be some loss, and that what is transmitted through the narration is only that which Graham notices, finds interesting, or remembers. At one point, with both hands to his face, rubbing, he begins to interpret the pose he is making (and can’t see) as religious in its symmetry. In this interpretive shift, the narration begins purposively putting images into the mind of the audience. As the rubbing moves to his outer thighs his increasingly subjective words seem to give him the idea to move forward, Graham’s narration now no longer reflecting but feeding back into action. As he notes the ”mild amusement” of certain people in the audience, the focus of Graham’s observations shifts to the observers, effectively collapsing everything in the room into the content of the monologue, such that the discomfort of individuals shifting their gaze and bodies is vocalized.

Performer/Audience/Mirror would be, in Goffman’s terms, a box with no cake, or a box that makes its own cake. In Goffman’s lecture, however, when characterizing the charlatans who would use to opportunity of the podium “to talk about something ready to hand,” such as “what it is like to address you,”[261] it doesn’t quite reflect Graham’s performance, which isn’t so much about what it is *like* so much as what it *is*. It is literally a meta-reflection but it isn’t holding the mirror - it is a mirror caught in its own reflection.

Whatever was animating Goffman’s antipathy towards and fascination with the aesthetic component of the lecture, Goffman’s own lecture was, of course, an articulate consideration of exactly these performative qualities. But, because of his scholarly focus, he maintained a commitment to knowledge’s connection to the text and not the “antics”[262] of the speaker. Nonetheless, “when communication occurs,

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[260] Goffman, *Forms of Talk*, 162.

[261] Goffman, *Forms of Talk*, 162.

[262] Goffman, *Forms of Talk*, 166.

noise will also,"[263] like an uninvited guest, and it will creep in at many levels, from outside the space of the lecture to within, but most prominently in the body of the speaker themselves, who:

> must breathe, fidget a little, scratch occasionally, and may feel cause to cough, brush back his hair, straighten her skirt, sniffle, take a drink of water, finger her pearls, clean his glasses, burp, shift from one foot to another, sway, manneristically button and unbutton a jacket, turn the pages and square them off, and so forth.[264]

This could almost be Dan Graham's score in *Performer/Audience/Mirror*. Similarly, the script for Robert Morris's *21.3* (1964) was not simply the text from Erwin Panofsky's *Studies in Iconology*, but margin notes specifying stage directions, like those again in the list above. And Andrea Fraser, who has appropriated the format of gallery talks and exhibition welcomes beginning in the 1980s (Figure 14), studies and redeploys the conventional behaviors (in addition to the rhetorical formalities) before collapsing their limits by, for example, stripping off her clothes. It could be said that the entire tendency in contemporary art and dance of the "lecture performance" from the early 2000s attends to the extra-linguistic parts of public speech.

Figure 14: Andrea Fraser, Museum Highlights: A Gallery Talk, 1989.

[263] Goffman, *Forms of Talk*, 182.

[264] Goffman, *Forms of Talk*, 183.

The pre-history of lecture performances would include Graham, Morris, and Fraser, but also Joseph Beuys's *How to Explain Pictures to a Dead Hare* (1965) and Robert Smithson's *Hotel Palenque* (1969). By the time lecture performances had become a format of interest to curators and writers, for example the "Performing Lectures Series" organized by Unfriendly Takeover in Frankfurt between 2004 and 2006, the *Lecture Performance* exhibition in Belgrade and Cologne[265], Patricia Milder's essay, "Teaching as Art: The Contemporary Lecture Performance," and Maaike Bleeker's "Lecture Performance as Contemporary Dance," there was nearly a decade of material to reflect on, including an "educational turn" in art manifesting in an explosion of schools and other pedagogical platforms, such as the Copenhagen Free University (2001-2007) to the School of Panamerican Unrest (initiated in 2003).[266] One of the earlier texts that discusses the lecture performance *is* a lecture performance by Pirkko Huseman in 2004, within Unfriendly Takeover's series, observing "a boom of lecture-performances in the dance world that calls for a theoretical examination"[267] that references dancer Xavier Le Roy's 1999 "Product of Circumstances" as the spark. As Bleeker notes, "Product of Circumstances," and other early 21st century German avant-garde dance, "confront their audiences with a prominent absence of dance understood as continuous movements of a body on stage."[268] One imagines Erving Goffman as dance critic, frustrated, "He who attempts such breaching, and succeeds, should have come to the occasion dressed in tweed, carrying a laptop."

Bleeker's text is surprisingly interesting for me. I say *surprisingly*, because I have never felt a particularly strong relationship between what I do and dance. My assumption has always been that there is a bodily virtuosity and control, a good and confident posture, that has always escaped me. So, it surprised me then to read about Andre Lepecki, describing dance and writing compacted into the word "choreography," producing "qualitatively unsuspected and charged relationalities between the subject who moves and the subject who writes" so that in the end "the

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[265] Curated by Kathrin Jentjens, Radmila Joksimović, Anja Nathan-Dorn, and Jelena Vesić. The exhibition also included a catalog that is not as well-known as other literature on the lecture performance that includes several interesting essays on the subject. Kathrin Jentjens, ed., *Lecture Performance* (Berlin: Revolver Publishing by VVV, 2009).

[266] I initiated one such project in 2007 called The Public School.

[267] Pirkko Husemann, "The Absent Presence of Artistic Working Processes. The Lecture as Format of Performance" (Unfriendly Takeover, 2004), 1, *http://www.unfriendly-takeover.de/downloads/f14_husemann_engl.pdf*. Unfriendly Takeover's series and documents collected within their archival website points to the beginnings of discourse, occurring within the German context, of this "boom."

[268] Maaike Bleeker, "Lecture Performance as Contemporary Dance," in *New German Dance Studies*, ed. Susan Manning and Lucia Ruprecht (Urbana: University of Illinois Press, 2012), 7.

modern body revealed itself fully as a linguistic entity."[269] This movement plays itself out in reverse in the development of computation, so that those programmers who write are often slouched and inert, while their algorithmic choreography directs the movement of shipping containers, bodies, transactions, and information. The program and its execution are separate, although we might use the occasion of the software's execution to reflect back on the code, using some of the very methods of the lecture performance. For Lepecki, the body's disciplined movement, its "kinetic subjectivity" in modernity is critically "exhausted" by the interruptions and stasis of recent dance.[270] Bleeker makes a point of not giving too much attention to choreography and writing in order to argue for a methodological conception of dance, or dance's sensibility, as a "mode of conduct"[271] such that from the exhaustion of dance emerges "a practice of exploration and experiment"[272] that might be "constitutive of subjectivities and their realities."[273]

"Product of Circumstances" essentially takes the form of an auto-biographical artist's talk, which discusses Le Roy's professional life prior to art as a molecular biologist and his experience in taking up dance, occasionally breaking the monologue to perform (from his earlier works, from the history of dance). Le Roy explains on his website that he was "very often presented as an atypical dancer or as a dancer molecular biologist. It became my currency."[274] Normally this information would be marginal, part of the publicity and marketing to generate hype and individuate the artist (which, arguably, supplants the modernist value of creative genius), but with the lecture performance the peripheral framing becomes material. Le Roy isn't cynical, but he recognizes what is happening and the format becomes a way of maintaining a certain degree of control over his own presentation. I am not mentioning this to make a point about artistic autonomy or self-determination, however, so much as to say that one thing that the lecture performance offers as a format is the possibility to construct a frame, with all of the responsibility that comes with the the act. Lucia Rainer describes the "ambiguity of

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[269] André Lepecki, *Exhausting Dance: Performance and the Politics of Movement* (New York ; London: Routledge, 2006), 7. The Jesuit priest, Thoinot Arbeau, who coined the word within a study and manual of social dance called *Orchésographie*, lived across the French countryside from Michel de Montaigne.

[270] Lepecki, *Exhausting Dance*, 8.

[271] Bleeker, "Lecture Performance as Contemporary Dance," 10.

[272] Bleeker, "Lecture Performance as Contemporary Dance," 11.

[273] Bleeker, "Lecture Performance as Contemporary Dance," 13.

[274] http://www.xavierleroy.com/page.php?sp=5ff3b0bfa8cfe85dab0293c2ce0dd7ca7be0a037&lg=en, Accessed April 21, 2019.

neither being" lecturer nor performer because the performances "adhere to two frames that never entirely blend."[275] One of these frames is stubbornly *real* because there are expectations of verbal communication and an engagement with knowledge, inasmuch as it is a lecture. One thing that Goffman insists upon in the end is that the "wider world of structures and positions is bled into" the occasion of the lecture,[276] underscoring that the lecture performance is finally embedded in a place and time in the real world. *But*, at the same time, it doesn't give up its hold on the aesthetic frame which authorizes formal experimentation, self-reflexivity, and *failures of communication*.

Like Le Roy, many artists are given the opportunity to discuss their practice before an audience. My own experience has been that I am invited to speak significantly more than I am invited to exhibit something, such that I personally began to think about how to approach those speaking opportunities as a *site*, treating them in the same way I would approach making an artwork. With an increasing number of artists not simply lecturing, but lecture performing, the lecture format becomes less "didactic" and more desirable for schools and institutions, who can grow their artistic and education program simultaneously. I don't mean to say that the lecture performance ever grew to be ubiquitous - more accurate would be a trend within a certain segment of contemporary art - but by occupying a small footprint (spatially, temporally financially) the format can fit the needs of both community-based and artist run spaces as well as pop ups and art fairs.

Notably, the timeline of the prehistory and recent boom of the lecture performance parallels that of generative art. Is this just a coincidence? It's difficult to understand computational writing and generative art in the 1960s outside of the context of the introduction of the computer into society. Similarly, Robert Morris's *21.3* is a direct response (its title taken from a Masters course number) to the growing professionalization of art, instituted in part through the new MFA degree that was sanctioned by the College Art Association in 1960.[277] More recently, the millennial rediscovery of both generative art and the lecture performance correspond to the popularization of the internet and democratization of coding, on the one hand and, on the other, renewed energy behind the drive to professionalize artistic research with the PhD superseding the MFA as terminal degree. Each of these artistic responses to post-industrial capitalist development manifests differently. While they are both performative in the simplistic sense of having a script and executing it, in generative art the artist is usually 'offstage' or behind the scenes. There is no

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[275] Lucia Rainer, *On the Threshold of Knowing: Lectures and Performances in Art and Academia*, Critical Dance Studies, volume 46 (Bielefeld: transcript, 2017), 75–76.

[276] Goffman, *Forms of Talk*, 192.

[277] Firunts, "Staging Professionalization," 22.

human body; in fact, the absence of the human body (as creator of the artwork) is the typical dramatic arc, until at the last moment the human has been there all along, orchestrating everything. Often in the lecture performance, the artist is the focus of attention, the machine who animates their own text.[278] However, the “social and situated conditions”[279] within which the lecture performance occurs allows for an “openness”[280] that de-centers the performer and allows for contingency, for personal affect in the experience of the work, and not merely its “generation.”

Expanding the Lecture Performance

The creative component of this project is archived and presented through an online interface that enacts many of the themes and concepts that have driven the research overall. Rather than display all the material in some tabular or list-like structure, the viewer is instead plunged into a mediated dialog with some other entity. “Hi,” it says, in the disarming and casual tone that saturates corporate customer relations. And like the customer service representatives of many companies, this one turns out to be an AI chatbot, whose underlying “intelligence” is rented out to me by IBM. Unlike those representatives, however, this chatbot identifies not so much as a helpful employee, but as me, the artist, heightening the familiar observation that “the contemporary artist embodies the figure of the precarious, entrepreneurial worker, the manager of his own human capital.”[281]

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[278] Goffman disaggregates the ”speaker“ into “animator,” “author,” and “principal.” Goffman, *Forms of Talk*, 167.

[279] Rike Frank, “When Form Starts Talking: On Lecture-Performances,” *Afterall: A Journal of Art, Context, and Enquiry*, no. 33 (June 2013): 15, doi:*10.1086/672015*.

[280] Frank, “When Form Starts Talking,” 9.

[281] Irmgard Emmelhainz, “Art and the Cultural Turn: Farewell to Committed, Autonomous Art?” *E-Flux*, no. #42 (February 2013), *https://www.e-flux.com/journal/42/60266/art-and-the-cultural-turn-farewell-to-committed-autonomous-art/*.

Figure 15: Sean Dockray, Learning from YouTube, 2018. Video still.

Although it doesn't take place in a lecture theater, this performance of the self and other performances like it provide an opportunity for staging encounters with the algorithms driving our post-industrial, big-data-based, automatic society. They are sites where spoken and written language is structured by computational languages, offering an opportunity for the former to speak to the latter. In much the same way that the lecture-performance is both a text, but also a performance of that text within a particular set of material conditions, an expanded conception of the lecture-performance might place itself within the conditions of which it speaks. So, for instance, my interrogation of the gradual automation of stenography in court systems, *Stenographer's Memorial* (2017), was staged in the Federal Courthouse in collaboration with both Google's speech recognition engine - extending my earlier *s2t* (2015) - and a stenographer, who transcribed not the spoken word but the ambient sounds within the room. *Learning from YouTube* (2018) is a didactic YouTube video (Figure 15) about the Google AudioSet for training machine listening algorithms, which aspires to insert itself into that very dataset. *Always Learning* (2018) is an installation that put three corporate clouds (Google, Apple, and Amazon) in conversation with each other through their flagship AIs (Google Home Assistant, Siri, and Alexa) and then staged a collective connection to these data centers through a kind of incantatory performance within the installation. And *AI-Commune* (2015) put several of my peers and influences together in conversation through "artificial intelligences" created from corpuses of texts that

they donated to me, while a public workshop gave an audience the opportunity to do the same after a lecture that examined the whether the commune form held any potential within an age of networked computation.

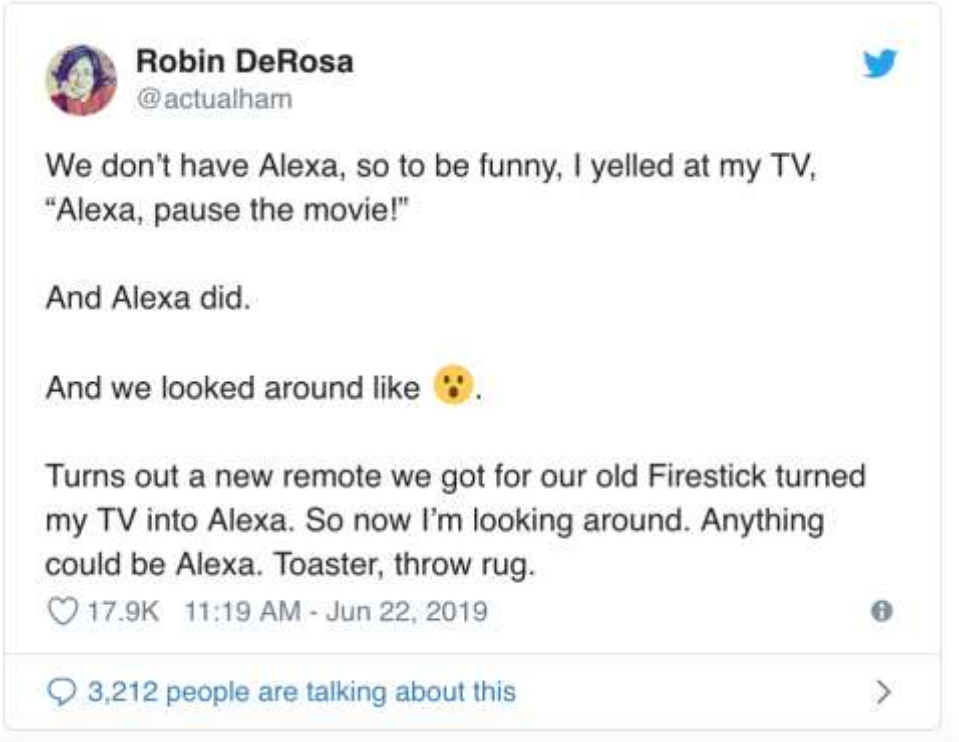

Figure 16: Robin DeRosa Twitter post, 22 June, 2019.

Furthermore, each of these projects was constructed primarily through voice (albeit not always spoken), giving focus to the ways in which language, speech, and sound are increasingly a context through which algorithmic power operates. During this research, Australians adopted smart speakers faster than any other technology, going from none in June 2017 to 30% of the adult population in December 2018.[282] Siri and Alexa have became ubiquitous with Cortana, Bixby, and a host of other AIs jostling for attention. These entities are increasingly brought into the home unwittingly (Figure 16), especially as more and more devices are 'empowered with the sense of hearing,' connecting between devices and back to algorithms running in the clouds. Every time I do something in the four corners of a screen, I am conscious of the peculiar device, the phone or laptop, that frames the screen and then to some degree the networks it is embedded within. The smart

[282] Bret Kinsella and Ava Mutchler, "Smart Speaker Consumer Adoption Report: March 2019 Australia" (Voicebot.ai, March 2019), 3.

speaker attempts to provide an ambient sense of ease, a seemingly unfettered and unframed experience that lowers my guard. Perhaps this is why the paraphernalia of home computing, the cables and PCs and modems, will be remembered less as a flood than a wave that recedes and leaves behind a 'traditional' 1960s home saturated with computation. All that is left behind is a voice.

Figure 17: Susan Bennett, the original voice of Siri, reading NaturallySpeaking by Tyler Coburn. Part of User Agent, curated by Rachel Valinksy c/o NYPAC, March 29, 2015, Judson Church.

Ultimately, these automated voices aren't as ethereal and immaterial as they would like us to believe. They are the product of real labour. Susan Bennett worked for an entire month reciting nonsensical phrases to build the voice of Siri. "The true origin of the voice is hidden from view,"[283] writes the artist Tyler Coburn in *NaturallySpeaking* (2013-2015), which addresses this among other consequences of this new oral regime. Like Coburn, I have moved between writing essays, developing scripts, and performing them as a means of engaging with voice recognition and speech synthesis. While *NaturallySpeaking* had Bennett "lead

[283] Tyler Coburn, "NaturallySpeaking," in *You Are Here: Art After the Internet*, ed. Omar Kholeif (Manchester : London: Cornerhouse ; SPACE, 2014), 156–67.

listeners in a pseudo-training session,"[284] my performance *Chorus* (2018) had participants collectively actually train a new synthetic voice by reading aloud excerpts from the one-sided contract between Uber and its drivers. The results (from both Mt. Gambier, South Australia and Hobart, Tasmania) were rough and unnatural, as the machine learning algorithm struggled to stitch together the grains of many individual voices, but the 'training' process allowed for discussion about the work embedded in these voices as well as the separation and individualizing of voices within the gig economy.

All of these projects provoke and perform with some generative process. They don't delegate or relinquish control to an external agent so much as get sucked up into it. In the adversarial schema I described earlier, they try to generate an interference pattern that opens a space for critical deliberation and potential intervention.

[284] Tyler Coburn, "NaturallySpeaking," 2013, *http://www.tylercoburn.com/naturally.html*.

Preemption

Control is a mode of power for Deleuze. It characterizes societies based in computer networks and information where subjects can move freely within designed parameters. When Vilém Flusser talks about control he means something that has been *lost*, namely freedom: “The crisis of authority has not led to the emancipation of society, but as it allows for an apparent freedom of choice, it has led to the cybernetic totalitarianism programmed by apparatus.”[285]

Rather than periodizing disciplinary society and a control society - evoking power and politics - Flusser thinks in terms of *industrial society* and *post-industrial society*.[286] ‘Industrial’ is, like so many words deployed by Flusser, both familiar and alien. His “Lexicon of Basic Concepts” at the end of *Towards a Philosophy of Photography* has only one neologism (*textolatry*) and the rest are common words (like *work*, *tool*, and *reality*) that are defined in unusual ways.[287] *Industrial society* is “a society in which the majority of people work at machines,” placing emphasis not on urban or economic forms, but on the relationship between workers and technology; and *post-industrial society* is “a society in which the majority of people are occupied in the tertiary sector.”[288] *Work*, *machine*, and *tertiary sector* are all defined in the Lexicon, with their definitions depending on further redefinitions, like *tool*, *object*, *inform*, and *information*. Discussing freedom in a post-industrial society becomes a matter of relearning everything.[289]

In a post-industrial society, people don’t work, they are occupied. Work is left to automatic machines that manipulate the material world into mass-produced objects. Being occupied means that people are *functionaries* and *programmers* involved in the processing of symbols, like a white collar worker who sends memos and fills in spreadsheets. So far, it doesn’t sound so different from accounts of immaterial and affective labor (such as in Michael Hardt and Antonio Negri’s

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[285] Flusser, *Post-History*, 86.

[286] Flusser, *Post-History*, 28.

[287] Flusser’s introductory note acknowledges that “these definitions are not intended to have a general validity but are offered as working hypotheses.” Vilém Flusser, *Towards a Philosophy of Photography* (London: Reaktion, 2000), pg. 7

[288] Flusser, *Towards a Philosophy of Photography*, pg. 84.

[289] While the Lexicon suggests a pedagogical dimension to the text, it is much more clear in *Post-History*, which was originally written as a series of lectures for students, and *Does Writing Have a Future?*, which asks “Do we have to go back to kindergarten?”, Vilém Flusser, *Does Writing Have a Future?*, trans. Nancy Ann Roth, Electronic Mediations: V. 33 (Minneapolis : University of Minnesota Press, c2011., 2011), 155

Empire) or, more recently, rehabilitated discussions about a 'universal basic income' and the possibility of 'a world without work.'[290] Flusser moves in an entirely different direction, however, asking what the ontological consequences of such a post-industrial society are. It's not that we are simply engaged in new forms of work, but that our entire way of thinking, seeing, and experiencing has become functionalized, "our thoughts, feelings, desires and actions are being robotized."[291]

Flusser's dark and totalizing vision (even if he often conjures a cautious optimism) is based on the proposition that the world and human life is *programmed* in post-industrial society. At first glance, to be programmed seems analogous to being controlled and since both terms evoke computers, one might make an equivalence between the two. This would be a mistake because there are fundamental differences. Firstly, control emerges through a breakdown of institutions, with Kafka's portrayal of the legal system as an early example. The camera is a "prototype" for the programmed apparatuses of the present and near future, placing it not only earlier in time but dispersed via media technologies. Whereas control is dispersed and, as a concept, doesn't give as much attention to where it came from and how it emerged as to the nature of its effects, programs are closely tied to apparatuses and have a coherence and agency all of their own. Finally, where one might assume that calculability is the dominant characteristic of programming – and the language of control certainly embraces this term – Flusser counterintuitively nominates *chance* as the fundamental concept.

Chance is not simply randomness, but the unrelenting realization of a program's latent possibilities. A program makes a large, but ultimately finite number of things possible. Unrealized, they are virtualities. Chance is the process in which virtualities become real. Programs, for Flusser, are "games in which every virtuality, even the least probable, will be realized of necessity if the game is played for a sufficiently long time."[292] It's not just that something – a camera or a microcontroller, for example – operates according to a program, but that programming becomes the framework through which we understand the world. The structure of DNA holds within it a universe of potential forms. The possible futures for a world with nuclear energy includes total destruction.

But don't these things happen for reasons? Isn't that precisely *not* chance? Flusser distinguishes chance from two prior paradigms, causality and fatalism. Whereas

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[290] In Flusser's phrasing, "humankind is becoming unemployed and thus free to pursue the useless dialogical elaboration of pure information." Flusser, "The Photograph as Post-Industrial Object," 331. Elsewhere, he terms this "programmed totalitarianism." Vilém Flusser, *The Shape of Things: A Philosophy of Design* (London: Reaktion, 1999), 93

[291] Flusser, *Towards a Philosophy of Photography*, 80.

[292] Flusser, *Post-History*, 22.

the fatalistic thinker searches for a purpose (usually religious or mystical) behind events, and the causal thinker explains an event by identifying the (typically scientific) causes for it, the programmatic thinker is in the absurd position of having no reason beyond the functioning of the program itself.[293] The program, which at one time might have been influenced by human intention, has become *automatic* such that "*situations that were not intended by anyone will realize themselves* by chance."[294] Given Flusser's expansive idea of what a program might be, this is truly terrifying, ultimately leading to atomic war, environmental collapse, and whatever other heretofore unimagined catastrophes lie waiting within the technological program. The only recourse available to humans is sabotage, to slow the program's incessant exploration of its own virtualities, recalling Walter Benjamin's inversion of Marx's revolutionary progress:

> Marx says that revolutions are the locomotive of world history. But perhaps it is quite otherwise. Perhaps revolutions are an attempt by the passen-gers on this train – namely, the human race – to activate the emergency brake.[295]

Blind progress, for Flusser, is the terrifying realization of a program's endgame. When he writes of catastrophe that "It is programmed to do so,"[296] it echoes Paul Virilio's *accident* as that failure embedded within any technological development, "the shipwreck which did not exist before the ship did."[297] There is, however, no comfort to be found in his writing in the idea of 'going back,' but only some hope in 'going through.' He insisted that "there is no place for human freedom within the area of automated, programmed and programming apparatuses, in order finally to show a way in which it is nevertheless possible to open up a space for freedom."[298] The delay, introduced by the saboteur, provided the possibility for such an opening. Within this gap – or perhaps this turns out to be the very thing that *produced* the gap – we could "*become conscious* of the absurd stupidity"[299] of the apparatus. Neither going forward nor going back ("we dread romantic anti-rationalism as much as enlightened rationalism"[300]) we must instead "grasp [the apparatus] in their

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[293] Flusser, *Post-History*, "Our Program." pp.19-26.

[294] Flusser, *Post-History*, 126, Emphasis in the original.

[295] Walter Benjamin, *Volume 4, 1938-1940*, ed. Michael W. Jennings, Selected Writings 4 (Harvard University Press, 2003), 402.

[296] Flusser, *Post-History*, 126.

[297] Virilio, *The Vision Machine*, 28.

[298] Flusser, *Towards a Philosophy of Photography*, 81–82.

[299] Flusser, *Post-History*, 66. Emphasis mine.

[300] Flusser, *Post-History*, 129.

cretinous concreteness," accept that its absurdity is our reality, and learn to play its game (or else be played).[301]

As it turns out, however, 'play or be played' – or 'program or be programmed' – isn't a choice so much as an aspiration. The games of apparatuses are constantly recoding players as pieces and turning outsides into insides. Take Flusser's distinction between *programmers* and *functionaries*: at a superficial level, programmers are the ones who write the programs and functionaries are the ones who use them. But if we look more deeply, the two collapse into each other. Computer programmers program by pushing buttons in order to manipulate symbols. Every choice made in every keystroke is, however, a choice made within another program, a *metaprogram*. "And this regression from meta- to meta-, from the programmers of programmers of programmers, proves to be infinite."[302] At every level, programmers are simultaneously functionaries.

Functionaries in a post-industrial society are the analogue to serfs in agricultural economies or workers in the factories. "The codified world"[303] is the functionary's world of life and work, a programmed totality that seems comparable to a 'control society.' Importantly, the functionary isn't simply a *user* of the program, but one who has a *function*, which suggests that they are, like a function within computer programming, part of the program. This conflation of human and apparatus is most explicit in *The Shape of Things: A Philosophy of Design*:

> It becomes more and more apparent that the relationship between human being and robot is reversible and that they can only function together: the human being in effect as a function of the robot, and by the same token the robot as a function of the human being. The robot only does what the human being wants, but *the human being can only want what the robot can do*. A new method of manufacturing - i.e. of functioning- is coming into being: The human being is a functionary of robots that function as a function of him. This new human being, the functionary, is linked to robots by thousands of partly invisible threads: Wherever he goes, stands or lies, he carries the robots around with him (or is carried around by them), and whatever he does or suffers can be interpreted as a function of the robot.[304]

Upon closer analysis, programmers turn out to be functionaries and functionaries are part of the programs, ultimately leading to the conclusion that "[t]he apparatus will form the real dominant class. It will be an inhuman society."[305] Flusser doesn't

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[301] Flusser, *Post-History*, 26.

[302] Flusser, *The Shape of Things*, 93.

[303] Flusser, *Post-History*, 29.

[304] Flusser, *The Shape of Things*, 48. Emphasis mine.

[305] Flusser, *Post-History*, 32.

bemoan the lack of the human so much as the impossibility of freedom – or, as he eventually called it, *responsibility*[306] – in this particular inhuman society. A humanistic approach to this situation might be critique or demystification and it is precisely these habits that Flusser insists against in order to find effective strategies that are attentive to the automaticity of the apparatus.

By unveiling the hidden human intention behind the apparatus we can rely on traditional critical categories to reveal how it is a product of the interests of those in power. This is a mistake, says Flusser, because "if we continue to seek for the purposes behind the programs that govern us, we will fall fatal victims to this absurd programming, which precisely predicts just such attempts at 'demythologizing' among its virtualities."[307] Such "Kulturkritik" has become a part of the program! The new critical method would be something like "systems analysis," which Flusser anticipates being more generative and surprising than the critical methods of historical thought, which can't uncover anything behind those "things that have already been fully criticized, fully calculated."[308] This is a novel form of recuperation, but it is one that structurally repeats across Flusser's thought, as new meta- levels continuously swallow up positions that *had* seemed to offer freedom to move and think. Avant-garde experimental photographers, for instance, who are consciously attempting to produce photographs that are not a part of the camera's program find that "the apparatuses themselves assimilate these attempts at liberation and enrich their programs with them."[309]

In a post-industrial, post-historic, programmatic society, the difficult thing is not ideological critique, but "the need to *learn* to think apolitically."[310] I am all to aware that this statement strikes my ears today as a terribly bad idea, particularly if it means that "it makes no sense to try and distinguish between conservatism and revolution, between right and left."[311] But this isn't necessarily a denial of the factions active in political and social life today; perhaps, it gestures to the larger

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[306] Vilém Flusser, Kenneth Kronenberg, and Anke K. Finger, *The Freedom of the Migrant: Objections to Nationalism* (Urbana: University of Illinois Press, 2003). "What used to be called sin in the Middle Ages came to be called freedom in the modern era, namely the possibility of opposing fate… When one enters into a responsible relationship with another person, on loses oneself in the matter at hand, and that is a creative situation… At those moments something happens that might perhaps be called freedom, namely, creative engagement. I would give to the word *responsibility* the role that was accorded to *freedom* in the nineteenth century." (pg. 93).

[307] Flusser, *Post-History*, 25.

[308] Flusser, *Does Writing Have a Future?*, 152.

[309] Flusser, *Towards a Philosophy of Photography*, 75.

[310] Flusser, *Post-History*, 24.

[311] Flusser, *Post-History*, 32.

program that allows for these different factions to articulate themselves today. Still, when Flusser foresees two distinct trajectories, “fascism and the apparatus society,”[312] the stark reality may be turning out to be even worse: a fascist apparatus society.

Algorithmic Governmentality

If cybernetic programming makes critical methods outmoded in the sense of becoming ineffective, for Antoinette Rouvroy there is an even more fundamental dimension to the crisis of critique — the subject no longer appears, there is no room for truth, and the space for critique shrinks to nothing. The name that Rouvroy and Thomas Berns have given to this regime of power is ‘algorithmic governmentality,’ which addresses how big data mobilizes the automatic data collection, processing, and reproduction of social reality. It targets the field of the possible. Although Rouvroy is a lawyer, she studies the effects of computing not directly on law as such, but instead uses Foucault’s concept of governmentality “to see this impact through the transformations of knowledge and of the modalities of power (and resistance) that such technological developments implement.”[313] So while algorithmic governmentality ostensibly frees us from authority, it does so by ensuring the smooth continuity of neoliberal capitalism via optimization, calculation and preemption.

Rouvroy grounds her ideas about computation in a redefinition of reality, generated by the massive accumulation of raw data and the growing time spent actively (browsing the Web, for instance) or passively (carrying a ‘connected’ phone) online.[314] Drawing on Luc Boltanski’s work in his 2009 book, *On Critique*, she proposes that reality is being replaced by a new computational form of reality. Boltanski observes that there is a difference between *reality*, as it is shaped by social institutions, versus the *world*, as people experience it in their lives. In other words, reality is not ‘the way things are,’ but a representation of the way things are, and the gap between these two things amounts to a space of “radical uncertainty.”[315] It is within this space that critique becomes possible, for example by

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[312] Flusser, *Post-History*, 129.

[313] Antoinette Rouvroy, “Governmentality in an Age of Autonomic Computing: Technology, Virtuality and Utopia,” in *Law, Human Agency and Autonomic Computing : The Philosophy of Law Meets the Philosophy of Technology / Edited by Mireille Hildebrandt and Antoinette Rouvroy.*, ed. M. Hildebrandt and Antoinette Rouvroy (London: Routledge, 2011), 6.

[314] Rouvroy, “The End(s) of Critique,” 3.

[315] Luc Boltanski, *On Critique: A Sociology of Emancipation*, English ed (Cambridge, UK ; Malden, MA: Polity, 2011), xi.

accounting for things in the world that aren't included in reality, in short challenging "*the reality of reality*."[316]

Today, what we take to be the 'world' has changed. Now it is constituted by the raw digital data automatically collected through sensors and devices distributed throughout what we formerly called the world. The rawness of the data in this amorphous mass suggests that while they may have been produced by humans inasmuch as data, sensors, devices, and networks are all human creations, the data are "taken as the digital version of the world."[317] And what, then, becomes of *reality*? It is extracted from the data via algorithms, which are also understood to have been created by humans but yet assumed to be rational, neutral and objective. The algorithms operate such that reality "doesn't seem produced anymore, but always already there, immanent to the databases, waiting to be discovered by statistical algorithmic processes."[318] Examples of algorithmic biases — which appear frequently in the news — usually are taken to suggest an unfortunate, continued presence of the human, ultimately reinforcing the belief in their capacity to transparently discover reality in the world. As a result, the gap between reality and the world collapses, as does the space for interpretation and critique.

An important precondition for this algorithmic reality is the proliferation of data centers over the past 20 years, which have created the material conditions for this shift from networked computers to "planetary computation."[319] The data that pours into these warehouses comes from governments, corporations — both mentioned by Tiqqun — and science, relatively unformatted and unprocessed compared to older kinds of databases that imposed limits on size and made strict demands on the shape of data.[320] In the second stage, knowledge is "produced" by the automated processing of the data into patterns and correlations. Norms and hypotheses seem to emerge directly out of the data as opposed to being preexisting structures that are used as a lens through which to examine and test

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[316] Boltanski, *On Critique*, xi.

[317] Rouvroy, "The End(s) of Critique," 3.

[318] Rouvroy, "The End(s) of Critique," 4.

[319] I am using this from Matteo Pasquinelli, "The Automaton of the Anthropocene: On Carbosilicon Machines and Cyberfossil Capital," *South Atlantic Quarterly* 116, no. 2 (April 2017): 311–26, doi:*10.1215/00382876-3829423*, who is building on an idea from Felix Guattari's *Schizoanalytic Cartographies* of 1989

[320] Antoinette Rouvroy and Thomas Berns, "Gouvernementalité algorithmique et perspectives d'émancipation: Le disparate comme condition d'individuation par la relation ?" trans. Elizabeth Libbrecht, *Réseaux* 177, no. 1 (2013): VI, doi:*10.3917/res.177.0163*.

the data.[321] The algorithms that perform this processing can be constantly modified as new raw data becomes available. This modification is sometimes 'by hand' but increasingly is itself automated. Finally, in the third stage, the knowledge is used in order to anticipate behaviors,[322] resulting in some effects that cybernetically feeds back into the raw data.

One other source for recalcitrance is the future, or more specifically the "unrealized part of the future, the actualisation of the virtual."[323] But this realm of *possibility* is pre-emptively eradicated by an algorithmic logic tuned to prevent insecurity[324] through dynamic data processing and real-time adjustment of the environment. It is possible, even likely, that an individual will never feel directly constrained, but rather will be guided into contexts where conflict is least probable.[325] Similar to the characteristics Deleuze identified in control societies, algorithmic governmentality should be seen less as a mode of *prevention*, where some threat of disciplinary force produces a conscious adjustment of individuals' behaviors, and more as a form of *pre-emption* that enables and guides behaviors along patterns already established. For Rouvroy, this process short-circuits individual reflexivity, their interpretive or deliberative capabilities, and ultimately any process of subjectivation (or that process by which individuals becomes subjects).[326] Instead, individuals are sent "signals that provoke stimuli and therefore reflexes,"[327] which means that the automatic algorithmic systems extend themselves into the profiles and the bodies of individual and relations between bodies. The media aren't an extension of man, but man becomes an extension of media.

Adapting the concept of "machinic enslavement" from Felix Guattari, it is the *signal* that allows organs of the body to interact directly with machinic systems at a subconscious level, as opposed to the *sign*, which would necessarily activate consciousness and concomitant interpretive processes.[328] In an extended quote in a footnote, Guattari gives the example of driving a car "in a dreamlike state… outside of consciousness… almost even asleep," showing how — along the lines

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[321] Rouvroy and Berns, "Gouvernementalité algorithmique et perspectives d'émancipation," VII.

[322] Rouvroy and Berns, "Gouvernementalité algorithmique et perspectives d'émancipation," VIII.

[323] Rouvroy and Stiegler, "The Digital Regime of Truth," 10.

[324] Rouvroy, "Governmentality in an Age of Autonomic Computing," 14.

[325] Rouvroy and Berns, "Gouvernementalité algorithmique et perspectives d'émancipation," IX.

[326] Rouvroy, "Governmentality in an Age of Autonomic Computing," 26; Rouvroy, "The End(s) of Critique," 2; Rouvroy and Stiegler, "The Digital Regime of Truth," 12.

[327] Rouvroy and Stiegler, "The Digital Regime of Truth," 12.

[328] Rouvroy and Berns, "Gouvernementalité algorithmique et perspectives d'émancipation," XIV.

of Crary's *Sleep* — capital has been increasingly making inroads into our lives in ways we often don't recognize. When Rouvroy, not unlike Flusser and Tiqqun, proposes "interrupting digital and capitalist flows" her form of interjection is through the re-introduction social institutions such as "the judicial, theatrical, literary, laboratory scenes,"[329] converting signals to signs.

Where Rouvroy talks about signals and signs, Flusser uses symptoms and symbols. At first glance, they appear to be parallel terms: symptoms are an index, an "objective" trace, and are therefore like signals in that they are messages that function outside of any system of meaning;[330] symbols "have *meanings*,"[331] which makes them more like signs. For Flusser, the idea that technical images — the automatic product of apparatuses, which might correspond to both the devices that collect raw data *and* to the algorithms that process that data — produce symptoms is a pretension because "apparatus *transcode symptoms into symbols*."[332] This difference might be explained by the fact that Flusser was generally thinking about apparatuses that produced audio-visual material, so his critique of mistaking symbols for symptoms referred to the attitude of taking technical images as direct traces of the world. He wanted to emphasize that "their significance" is *not* "automatically reflected on their surface"[333] and that instead they are "not only symbolic but represent even more abstract complexes of symbols than traditional images."[334] The 'universe of technical images' — all those images that have been realized from the possibilities latent in the program of the apparatus — is essentially Rouvroy's world of digital raw data. Although Rouvroy characterizes this data as "unfiltered… traces left,"[335] she wouldn't disagree with Flusser because "they are not conventional symbols either."[336] If anything, algorithmic governmentality represents a development of Flusser's post-industrial society, with its programs programming programs, into the data center.

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[329] Rouvroy, "The End(s) of Critique," 14.

[330] Flusser, *Post-History*, 96.

[331] Flusser, *Post-History*, 30.

[332] Flusser, *Post-History*, 96.

[333] Flusser, *Towards a Philosophy of Photography*, 14.

[334] Flusser, *Towards a Philosophy of Photography*, 15.

[335] Rouvroy and Berns, "Gouvernementalité algorithmique et perspectives d'émancipation," VI.

[336] Rouvroy, "The End(s) of Critique," 4. "Raw data do not resemble, nor keep even indirect physical bound with any thing of the world, and they are not conventional symbols either."

Making Data

In 2008, writer-entrepreneur Chris Anderson announced ”the end of theory” in the pages of *WIRED* magazine. The scientific method has become obsolete in the age of “abundant data,” “massive data,” or “the data deluge,”[337] such that the important work being done in science has been through looking for correlations in the data rather than approaching the data with preconceived hypotheses. “We can throw the numbers into the biggest computing clusters the world has ever seen and let statistical algorithms find patterns where science cannot.” The unstated assumption is exactly that which is made explicit by Antoinette Rouvroy’s description of (digital) reality: ”the numbers speak for themselves” without any need for humans and their models or interpretations. The end of theory is not limited to science either. How could it be? The disciplines themselves are instances of those obsolete models: “Out with every theory of human behavior, from linguistics to sociology. Forget taxonomy, ontology, and psychology.”[338]

As a way of introducing the automatic society, Bernard Stiegler identifies two exemplary statements to illuminate the fragile state of rationality under computational capitalism: one is Anderson’s article and the other is Alan Greenspan’s infamous admission of error in his Congressional hearing four months later. Whereas Anderson seems quite convinced of data’s empirical truth-value, Greenspan acknowledged that relying on data led, in some degree, to the erroneous understanding of subprime mortgage risk and the ensuing Global Financial Crisis of 2007-2008. This acknowledgment, however, was reflexively — a reflex common to both economists and programmers! — followed by the counterfactual proposition, “had instead the models been fitted more appropriately to historic periods of stress, capital requirements would have been much higher and the financial world would be in far better shape today.”[339] The cybernetic fantasy of the end of theory is that with enough of the right data, truth will emerge untarnished by accidents or human prejudice.

Wendy Hui Kyong Chun discusses another example of using the digital as an alibi in her discussion of face-recognition technology in the aftermath of September 11,

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[337] I list them all because the one way he *doesn’t* describe it is in terms of “big data,” which dominates today.

[338] Chris Anderson, “The End of Theory: The Data Deluge Makes the Scientific Method Obsolete,” *WIRED*, June 2008, *https://www.wired.com/2008/06/pb-theory/*.

[339] Alan Greenspan, “Greenspan Testimony on Sources of Financial Crisis,” *Wall Street Journal*, October 2008, *https://blogs.wsj.com/economics/2008/10/23/greenspan-testimony-on-sources-of-financial-crisis/*.

2001. The technology “corrects for visual subjective bias by inhumanly bypassing rationalization and deduction,”[340] identifying terrorists by correlating patterns of camera data. Chun quotes promotional media on the subject, which I will reproduce here because it all too clearly shows the prevalence of Anderson’s belief years before his article: “There is no chance for human error or ’racial profiling’ because there is no need for a human operator to fixate on a particular person. The camera does it all automatically.”[341] In the ensuing seven years (and then the subsequent decade) the “Petabyte Age”[342] would connect those automated cameras to an ever more comprehensive collection of facial data associated with medical records, communication trails, credit histories, and social network activity, heightening the stakes of Chun’s work on control and freedom. A paranoid society that values freedom but demands security (such as the U.S. after 2001) establishes control through ”the duplication of the real world”[343] in data. One cannot both refuse this control and be free *and vice-versa*: “Freedom is something one cannot not want.”[344]

Although ‘the end of theory’ as an ideological statement can be dismissed for its failure to account for its own ideology, or for failing to recognize the hidden (and often racist) models that continue to operate through the algorithmic processing of data, it succeeds insofar as it articulates a tendency that has only grown. The practice of theory, on the other hand, has continued its retreat into the University and even there its days appear numbered. A market-oriented digital media landscape and a security-obsessed state surveillance apparatus each ensure that we consumer-citizens become as fully transparent, so that as much data as possible is collected.

The data that courses through networks and algorithms or sits stored on hard drives or magnetic tape didn’t just appear, spontaneously generating out of fiberoptic cables and silicon. From the 1890s until being phased out 1980s, punch cards and keypunch machines were used to translate something about the world - the 1890 United States census, for example - into a machine readable format. In the 1970s and 1980s, computer terminals became more widely available in offices, allowing data entry clerks to manually enter the information through use of a

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[340] Chun, *Control and Freedom*, 263.

[341] Chun, *Control and Freedom*, 262. While I couldn’t find the same *New York Times Magazine* source as Chun, I located the same quote in another news item, CBSNEWS.COM STAFF, “Facial Recognition Technology May Screen for Terrorists,” *CBS News*, January 2002, *https://www.cbsnews.com/news/facial-recognition-technology-may-screen-for-terrorists/*.

[342] Anderson, “The End of Theory.”

[343] Chun, *Control and Freedom*, 277.

[344] Chun, *Control and Freedom*, 274.

keyboard. This work was (and is) labour intensive, demanding speed, focus, and accuracy, but not much specialized training beyond the task at hand. I had this kind of job in the early 1990s, where I was given a stack of folded dot matrix printer paper to check against the contents of some database system, inventories of shoes, maybe. Related as this kind of data entry work was to clerical work, it has been historically women in these jobs.

Entering data into a computer system involved essentially the same process as "programming," meaning that women were more central to the history of programming than the largely white male composition of the field today would suggest. Over the past few years, however, some of those early stories have been told, including Margaret Hamilton, who wrote software for the Apollo space program;[345] Katherine Johnson, Mary Jackson, and Dorothy Vaughan, depicted in the film *Hidden Figures*, were black female mathematicians who worked *as* computers for NASA;[346] and even Ada Lovelace, who wrote the first program (on paper) for Charles Babbage's analytical engine. While it is possible to place women back into the history of computing in general and programming more specifically, it is also useful to understand acknowledge the specifically gendered division of computational labour.

Before offices were computerized from the late 1950s onward, information processing was split into keypunch operators, primarily women, and punchcard machine operators, which were almost exclusively men. Keypunching created the cards that would be fed into punchcard machines in order to add, sort, or tabulate figures. "Systems men" organized and designed the processes to be implemented by the machine operators and when computers arrived, programming emerged as a new role in the workplace, a hybridized analyst-operator. Not only did the gender division persist in programming, but Thomas Misa also describes that this division was actively maintained due to status anxiety and a defense of the emerging middle-class masculinity, oriented around organization rather than machine (or intellectual labour rather than manual labour).[347] The continued presence of women as keypunch operators, whose numbers were steadily increasing in order to satiate the hungry computerized data systems, only reinforced the masculinist defense of programming and analysis as "men's work."

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[345] Robert McMillan, "Her Code Got Humans on the MoonAnd Invented Software Itself," *Wired*, October 2015, *https://www.wired.com/2015/10/margaret-hamilton-nasa-apollo/*.

[346] Edward Helmore, "How Three Black Women Helped Send John Glenn into Orbit," *The Observer*, December 2016, *https://www.theguardian.com/film/2016/dec/11/black-women-mathematicians-nasa-john-glenn-space-race*.

[347] Thomas J. Misa, "Masculinity and the Machine Man: Gender in the History of Data Processing," in *Gender Codes: Why Women Are Leaving Computing* (Hoboken, N.J. : [Piscataway, NJ]: Wiley ; IEEE Computer Society, 2010), 55–58.

Until 1992, women consistently outnumbered men in computer-related jobs, but were relegated to the low-paying manual work of punching cards or word processing. After 1992, something peculiar happened: men came to outnumber women by two to one, largely because of a drastic reduction in data entry clerks.[348] Even in the past year, data entry job advertisements have fallen by 56 percent.[349] One reason for this is that data entry has been distributed across many other occupations via online systems, such that information would skip paper and go 'straight to data,' reducing the need for a specialized role. The other reason, of course, is the growth of automated equipment and processes for the "entering" of data into digital systems.

Figure 4.1. Computer automation of data entry in the insurance industry. Computerization with Inforex data-entry system: "Data is displayed progressively as it is keyed to build full records for visual inspection." Screen reads "ERROR," but "operators easily make on-the-spot correction." (Courtesy of Charles Babbage Institute.)

Figure 18: What was called computer automation at one time still required human labour using the computer.[350]

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[348] Misa, "Masculinity and the Machine Man," 66.

[349] Anne Vandermey, "AI Hasn't Ushered in the Job-Pocalypse Yet," *Bloomberg News*, September 2018, *https://www.bloomberg.com/news/articles/2018-09-11/ai-hasn-t-ushered-in-the-job-pocalypse-yet*.

[350] Corinna Schlombs, "A Gendered Job Carousel: Employment Effects of Computer Automation," in *Gender Codes: Why Women Are Leaving Computing* (Hoboken, N.J. : [Piscataway, NJ]: Wiley ; IEEE Computer Society, 2010), 76.

”Automation” was the general term for the transformation of labour when computers entered the workplace: “Computer automation of data entry in the insurance industry”[351] captions a photograph (Figure 18) depicting a woman typing data at a terminal. What I am describing is an *automation of automation*, as typing gives way to image scanners, optical character recognition, barcode and RFID scanning, speech to text transcription, and various forms of image and video analysis. On the crest of this wave are “smart speakers,” which are voice-controlled, wireless speakers that integrate AI in order to more naturally recognize speech and respond accordingly. Like a Trojan Horse, the smart speaker is brought into the home where it is then *always on*, listening, recording, and profiling for the manufacturer of its AI, Apple, Google, or Amazon.

In 2017, members of the Sound and Video Understanding team[352] at Google announced *Audio Set*, a new, enormous dataset that aspired to “substantially stimulate the development of high-performance audio event recognizers.”[353] This announcement was accompanied by relatively little fanfare because, rather than news media, it was published on the Google research blog and in an academic paper. It was — and still is, at the time of this writing — an esoteric development, primarily of interest to programmers and machine learning enthusiasts. And crucially, it is temporally *prior* to any particular artificial intelligence, or machine learning application, that will be developed from the dataset.

Safiya Noble argues that “artificial intelligence will become a major human rights issue in the twenty-first century,” particularly because of the way that automated decision making has served to deepen inequality by race, class, and gender, demonstrating that these algorithms are not ”neutral.”[354] The algorithms that Noble writes about, such as the Google Search, are experienced as proprietary Black Boxes and her questions, “To whom do we appeal? What bodies govern artificial intelligence, and where does the public raise issues or lodge complaints with national and international courts?,” remain largely unanswered.[355] Since *Audio Set* has not yet been ‘baked’ into machine listening algorithms that govern the lives of

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[351] Schlombs, “A Gendered Job Carousel,” 76.

[352] Part of the Google Machine Perception Team

[353] Jort F. Gemmeke et al., “Audio Set: An Ontology and Human-Labeled Dataset for Audio Events” (IEEE, 2017), 776, doi:*10.1109/ICASSP.2017.7952261*.

[354] Safiya Umoja Noble, *Algorithms of Oppression: How Search Engines Reinforce Racism*, e-book (New York: New York University Press, 2018), ”Introduction.”.

[355] Noble, *Algorithms of Oppression*, ”A Society, Searching.”.

real people, does that mean there is opportunity for a different kind of intervention than those algorithms that already exist?

Usually, “machine listening” brings to mind the use of computers to transcribe speech into text, but “audio event recognition” is a further step back from that. “Speech” is just one of 632 sound categories — in fact, it is one of 13 different kinds of *human voice* sounds, such as “sigh” or “wail, moan” — in the *Audio Set* ontology.[356] This hierarchical classification system defines the space of possibilities for all sounds and as such suggest a correspondingly vast number of applications. For example, an algorithm could listen for speech events before routing the signal to a speech to text translator; it could listen for the sound of crying and send a message to a parent’s mobile phone; it could count the number of times you clear your throat in a day, perhaps contributing data to an automated overview of your health. The ontology contains 25 musical genres,[357] which already suggests commercial applications in the area of automated classification and recommendation systems.

While all of these speculative applications of “audio event recognition” seem like raw material for science fiction, it probably comes as no surprise that machine listening is already being deployed in the field of audio surveillance. Louroe Electronics’s Intelligent Audio Analytics System, for example, detects gunshots, aggressive speech, glass breaking, and car alarms “through advanced algorithms.”[358] Audio Analytic (Figure 19), who maintain their own proprietary audio dataset called Alexandria, develops software that is implemented by smart home devices to listen for alarms or break-ins, with annoyances like dog barks and snoring around the corner. Shooter Detection Systems provides technology for early detection of active shooter situations, with marketing material claiming their Guardian System “removes the ’human factor’ so that nothing is left to interpretation and costly delays can be avoided.”[359]

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[356] “Ontology” is the name used by the engineers at Google, drawing from a longer history of use in information science, to establish a “fixed, controlled vocabular[y]” to model some aspect of the world. “Ontology (information science)”, *Wikipedia*, last modified 4 March 2018, https://en.wikipedia.org/wiki/Ontology_(information_science)

[357] While this number seems small and the list arbitrary to me, it greatly exceeds the 10 genres in the GTZAN dataset, which is widely used in music genre recognition research. Still, Spotify’s 1,628 genres, created by their genre taxonomist, Glenn McDonald, dwarfs them both.

[358] “Why Audio Analytics?”, *YouTube*, accessed 3 April 2018, https://www.youtube.com/watch?v=fxg6ZfkgpM8

[359] ”The Guardian Indoor Active Shooter Detection System”, *Shooter Detection Systems*, accessed 3 April 2018, http://shooterdetectionsystems.com/products/guardian/

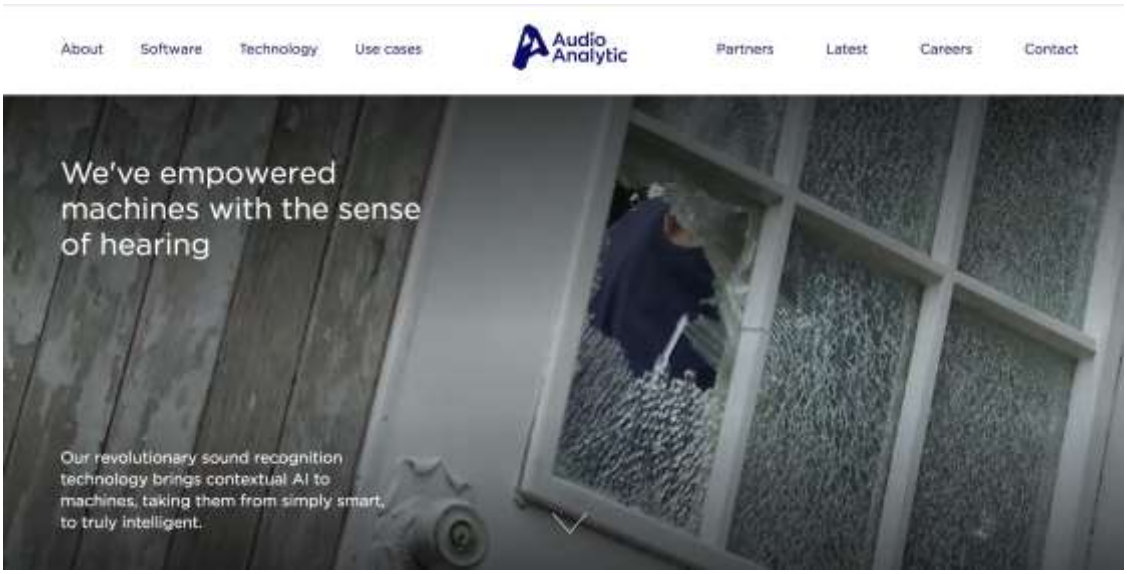

Figure 19: Audio Analytic homepage. (https://www.audioanalytic.com/, Accessed 24 June 2019)

If the *Audio Set* ontology says nothing (and everything) by virtue of its exhaustiveness, it's not hard to see how audio event recognition implementations could contribute to the automation of inequality. Louroe's detection of aggression and broken glass brings to mind the "broken windows" theory, which asks how to "identify neighborhoods at the tipping point… where a window is likely to be broken at any time, and must quickly be fixed if all are not to be shattered." At the time that the theory was introduced in 1982, the police did not have "ways of systematically identifying such areas,"[360] a limitation directly addressed by algorithmic surveillance. The preemptive logic of the theory — hypothesizing that urban disorder cultivates actual, serious crime — is reinforced by these algorithms, which aim to intervene "before an incident turns into a violent outbreak."[361] The fear and anxiety that is mobilized tends to be oriented towards specific groups of people, like "panhandlers, drunks, addicts, rowdy teenagers, prostitutes, loiterers, the mentally disturbed,"[362] ultimately subjecting these people to (sometimes lethal) police force in the name of "security."

The mass of YouTube videos in *Audio Set* are akin to the cropped centerfold image of *Playboy* model, Lena Söderberg, which was used as a test image for digital image compression research and has been an industry standard for testing

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[360] George L. Kelling and James Q. Wilson, "Broken Windows," *The Atlantic*, no. March (1982), https://www.theatlantic.com/magazine/archive/1982/03/broken-windows/304465/.

[361] "Why Audio Analytics?"

[362] Kelling and Wilson, "Broken Windows."

imaging algorithms ever since. In the age of machine learning, the test image becomes a massive dataset. Near the end of 2016, the Google Research Blog announced YouTube-8M, a dataset of 8 million categorized YouTube videos in order to accelerate breakthroughs in machine learning and machine perception.[363] Not long afterwards, Sundar Pichai, Google's CEO, shifted the corporation's strategy to be "AI first." Suddenly, Google's decision to acquire YouTube in 2006 seemed to be less about buying attention and a community, but also about purchasing massive amounts of data for training and testing AIs. Unbeknownst to every single person who uploaded these 8 million videos (2 million of which are a part of the *Audio Set*) their video would become a tiny granule that would shift the weights within an undetermined number of future neural networks. They had been retroactively automated, crowdsourced without realizing it, to be a memory for an algorithm with unknown politics. They *had* agreed to be used in this way somewhere along the line — or something like that — in some terms and conditions. And chances are, they will never know anyway.

The degree to which different kinds of automation abound in the acquisition of data and training of neural networks anticipates the way that artificial intelligence automates certain jobs, such as police surveillance. "Broken Windows" was written at a moment of cuts to police forces across the U.S. and should be read, in part, as a strategy for reorganizing policing when budgets no longer allow for foot patrols. Networked surveillance cameras allow few people to monitor many different locations from a distance. Each image is confined to the zoom, focus, and orientation of a particular camera, and each image depends on an operator to see what it displays. An omnidirectional microphone, on the other hand, covers a much larger area, including spaces outside the frame of the image. Moreover, it is unnecessary, even impossible, for the human operator to listen to the audio, which is instead monitored by algorithm. Not only does this further the conversion of the body of the policeman into electronics and code — much the same way that the 19th century officer (Figure 20) has been absorbed into the 21st century traffic control systems[364] — but it enables a kind of just-in-time policing that would short-circuit criminal investigations and legal deliberation, theoretically preempting criminal acts.

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[363] Sudheendra Vijayanarasimhan and Paul Natsev, "Announcing YouTube-8M: A Large and Diverse Labeled Video Dataset for Video Understanding Research," *Google Research Blog*, September 2016, *https://research.googleblog.com/2016/09/announcing-youtube-8m-large-and-diverse.html*.

[364] Sean Dockray, Steve Rowell, and Fiona Whitton, "Blocking All Lanes," *Cabinet*, no. 17: Laughter, accessed April 4, 2018, *http://cabinetmagazine.org/issues/17/blocking.php*.

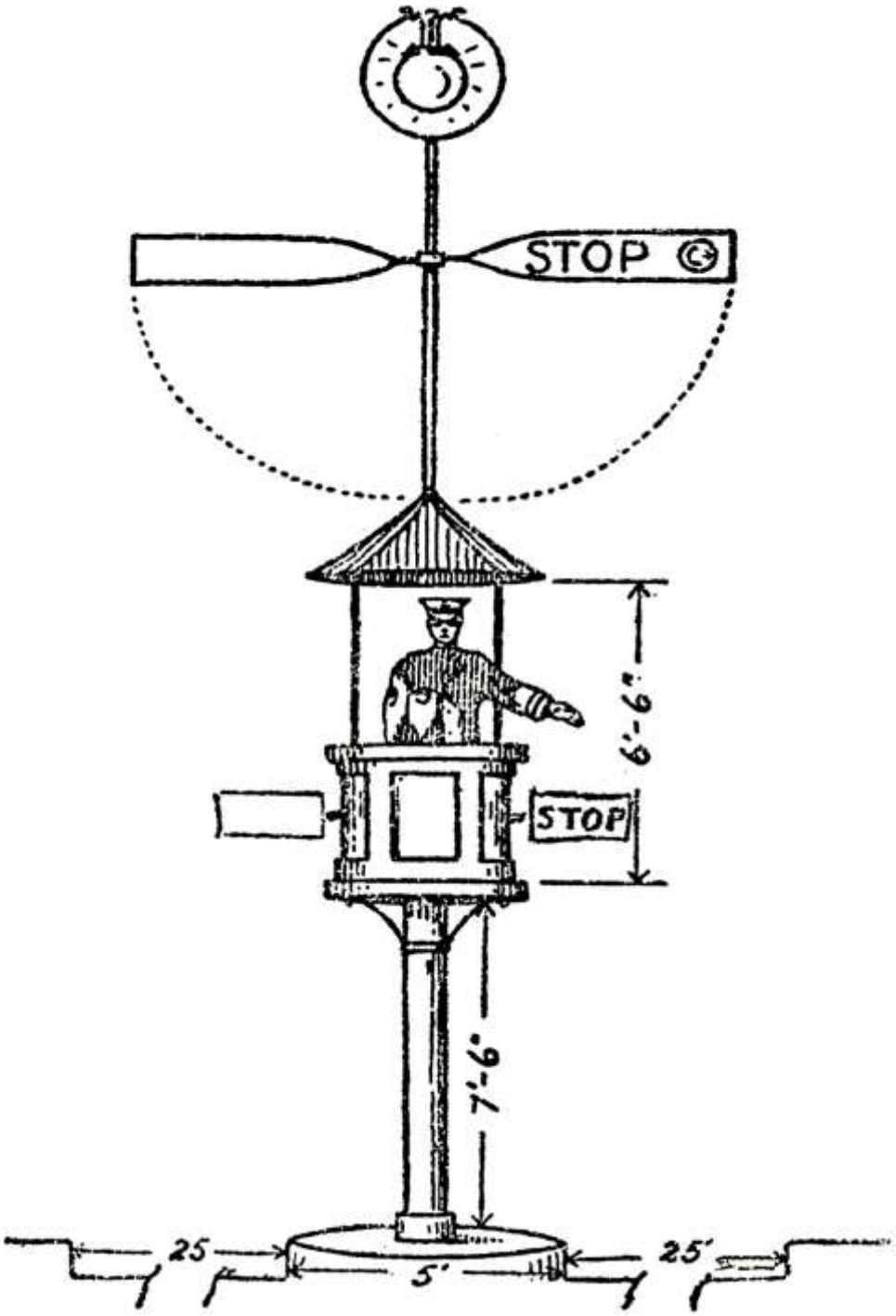

Figure 20: The hands and brains of police were transformed into the traffic control systems we know today.

Automation

The difference between a pin-maker and a pin factory, in Adam Smith's well-known example to open the *Wealth of Nations*, is measured as a ratio, the multiplication of productivity as the manufacturing process moves from the work of a single tradesman to the organized work of ten people. Smith calculates that an individual in the factory is about 240 times more productive because it can produce 48,000 pins in a day, whereas the individual struggles to make 20.[365]

Qualitatively, he argued, the advantages of the division of labour, and the explanation for the increases in productivity, were threefold:

> first, to the increase of dexterity in every particular workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labour, and enable one man to do the work of many.[366]

As Harry Braverman points out, the foundational act in the division of labour is the "*analysis of the labor process*," or the decomposition of the total process of making something into its constituent parts.[367] By breaking the pin-making process into 18 steps and dividing those steps among the ten workers, each becomes a "detail worker," thus losing any sense of the totality. Furthermore, one pin-maker can't compete with the volume of the factory and is compelled to join it. Marx wrote on how this reorganization, which split the intellectual and manual parts of this productive process, "implies the undisputed authority of the capitalist over men, that are but parts of a mechanism that belongs to him."[368]

There is a suggestion here that workers are reduced to parts in a machine, an automatic metaphor repeated throughout *Capital*. In a footnote, he quotes a

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[365] Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, ed. R. H. Campbell and Andrew S. Skinner, vol. 1, The Glasgow Ed. of the Works and Correspondence of Adam Smith 2 (Indianapolis: Liberty Classics, 1981), 13–15.

[366] Smith, *Wealth of Nations*, 1:17.

[367] Harry Braverman, *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century*, 25th anniversary ed (New York: Monthly Review Press, 1998), 52.

[368] Karl Marx and Friedrich Engels, *Karl Marx, Frederick Engels: Volume 35: Karl Marx - Capital Volume I*, Marx & Engels: Collected Works 35 (London: Lawrence & Wishart Electric Book, 2010), 361.

description of manufacturing workers as "living automatons;"[369] more evocative still is his description of the a factory's insides:

> An organised system of machines, to which motion is communicated by the transmitting mechanism from a central automaton, is the most developed form of production by machinery. Here we have, in the place of the isolated machine, a mechanical monster whose body fills whole factories, and whose demon power, at first veiled under the slow and measured motions of his giant limbs, at length breaks out into the fast and furious whirl of his countless working organs.[370]

Workers, are "merely conscious organs, co-ordinat[ed] with the unconscious organs of the automation, and together with them, subordinated to the central moving-power."[371] Interestingly, this "central moving-power" corresponds with the animating force of automata, the intricate mechanical proto-robots that were well-known in the time between Smith and Marx (between the mechanical ducks of Vaucanson and Reichsteiner, Figure 21). A clockwork mechanisms was tasked with not just *powering* an automaton, but also *sequencing* it via "whole sets of cams upon which would ride many interlinked mechanical arms," resulting in a complex choreography in which a duck eats, flap its wings, looks around, and digests its food to the smelly end.[372]

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[369] Marx and Engels, *MECW 35*, 366. Dugald Stewart, quoted in fn. 1.

[370] Marx and Engels, *MECW 35*, 384–85.

[371] Marx and Engels, *MECW 35*, 422.

[372] Langton, "Artificial Life," 42–43.

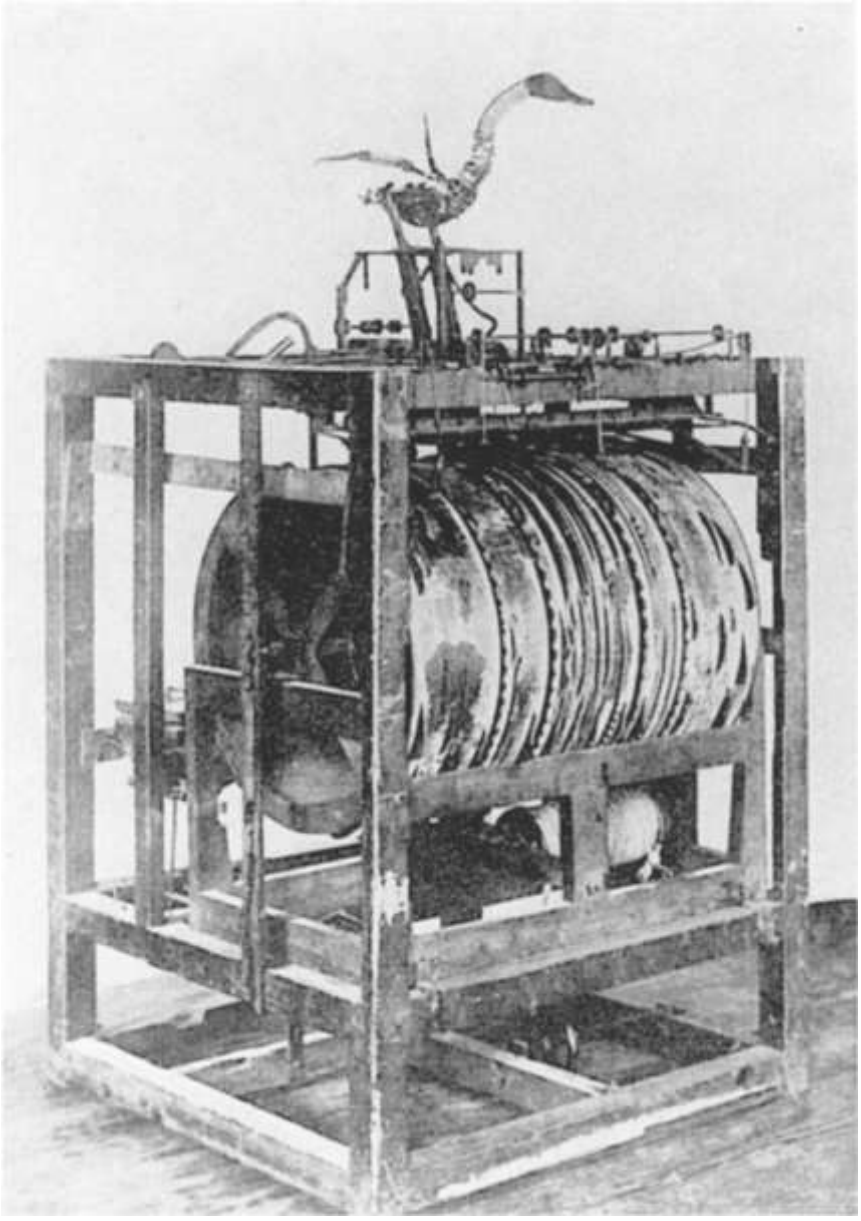

Figure 21: Mechanical duck attributed to Jacques de Vaucanson. From Edmond Droz and Alfred Chapuis, Automata : A Historical and Technological Study *(Neuchâtel : Éditions du Griffon, 1958).*

But Marx's use of the automaton went even further than worker or even a whole factory; he wrote of "an industrial *perpetuum mobile*" that would produce incessantly were it not for the limits of human bodies or their recalcitrance: "The automaton, as capital, and because it is capital, is endowed, in the person of the capitalist, with intelligence and will."[373] Here, capital itself is portrayed as an autonomous mechanical device capable of acting through the bodies of individual

[373] Marx and Engels, *MECW 35*, 406.

capitalists. From this fact that the “capitalist merely *executes the logic* of capital,” perpetually circulating money for the expansion of value, Marx describes capital as the “automatic subject.”[374]

Laying the groundwork for how ”life” might be synthesized in a computational rather than biological substrate, Langton explains that the logical form of a machine can be separated from the material out of which the machine is built. A “program” or “procedure,” different names for the logical series of steps that comprise the behavior of the machine, are the essence of the machine — an abstract control structure that is consistent regardless of the details of construction of the machine.[375] If the capitalist “executes the logic” of capital, then ”machine” becomes more than a simple metaphor. And if “[t]oday, the formal equivalent of a ‘machine’ is an *algorithm*,”[376] then we might also speak of capital as algorithm and as Artificial Life.

Algorithm

There is a longstanding affinity between computation and the division of labour. In a chapter called “On the Division of Mental Labour,” Charles Babbage recounts the story of the mathematician Gaspard de Prony, who faced the insurmountable task of calculating — by hand — the logarithms and trigonometric functions of the numbers from 1 to 200,000 for the French government in 1791. This laborious work could not be completed in several lifetimes, so it was a stroke of luck that he picked up the *Wealth of Nations* in a bookshop and browsed the opening chapter on the division of labour. Imagining that a pin might just as well be a logarithm, de Prony reorganized the work into three stages of increasing detail but demanding decreasing mathematical competence.[377] Babbage extrapolates from this anecdote ”the possibility of performing arithmetical calculations by machinery,”[378] which, of course, was explored through his own designs for the Difference Engine and then

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[374] Michael Heinrich, *An Introduction to the Three Volumes of Karl Marx’s Capital*, trans. Alexander Locascio (New York: Monthly Review Press, 2012), 89. Emphasis mine.

[375] Even the algorithm itself is subject to the same division: Boden and Edmonds refer to a “rules-based approach,” which approximates an artist’s natural language ideas and constraints for an artwork, versus a “step-by-step approach,” which is the implementation of these rules in a specific machine. Boden and Edmonds, “What Is Generative Art?”, p. 24

[376] Langton, “Artificial Life,” 44–45.

[377] Charles Babbage, *On the Economy of Machinery and Manufactures* (Cambridge: Cambridge University Press, 2010), 155.

[378] Babbage, *On the Economy of Machinery and Manufactures*, 158.

the Analytical Engine, important moments in the prehistory of the modern computer.

In the pin factory, the division of labour appears to not only divide the physical aspects of the work into parts, but to divide the intellectual from the manual dimension of the work, whether fixing this intelligence in the machine *or* displacing it into the overall organization of the factory. Babbage demonstrates, via de Prony, that intellectual labour is also subject to the same tendency, especially after the development of general purpose computers.

Logic Theorist is often credited as the first Artificial Intelligence program, created contemporaneously with the Dartmouth Summer Research Project on Artificial Intelligence in 1956. Herbert Simon and Allan Newell, attendees at the Dartmouth conference, "invented a thinking machine"[379] that could prove 38 theorems from Alfred North Whitehead and Bertrand Russell's *Principia Mathematica*, originally written in 1910. Their paper makes curious references to "hand simulation,"[380] which Simon discusses in his autobiography as the "literal imitation of a computer program."[381] More interesting than the programmer emulating the execution of an algorithm, however, is his own story of division of labour while waiting for the computer implementation of Logic Theorist to be finished:

> Al and I wrote out the rules for the components of the program (subroutines) in English on index cards, and also made up cards for the contents of the memories (the axioms of logic). At the GSIA building on a dark winter evening in January 1956, we assembled my wife and three children together with some graduate students. To each member of the group, we gave one of the cards, so that each person became, in effect, a component of the LT computer program — a subroutine that performed some special function, or a component of its memory. It was the task of each participant to execute his or her subroutine, or to provide the contents of his or her memory, whenever called by the routine at the next level above that was then in control.
> So we were able to simulate the behavior of LT with a computer constructed of human components. Here was nature imitating art imitating nature. The actors were no more responsible for what they were doing than the slave boy in Plato's *Meno,* but they were successful in proving the theorems given them. Our children were then nine, eleven, and thirteen.[382]

Like de Prony's logarithmic human-machine, Simon and Newell's program was executed by human "components." The division of labour in Logic Theorist, however, was less informed by the particular task to accomplish than the structure

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[379] Herbert A Simon, *Models of My Life* (Cambridge, Mass.: MIT Press, 1996), 206.

[380] Newell and Simon, "The Logic Theory Machine–A Complex Information Processing System," 61, p.79.

[381] Simon, *Models of My Life*, 205.

[382] Simon, *Models of My Life*, 206–7.

of computers more generally, like ”subroutines” and “memory.” The humans were so varied (men, women, children) that their particular capabilities mattered little, for they were performing simple operations almost automatically, like a “slave boy.” Out of these simple minds and simple operations emerged complex proofs of symbolic logic, with much the same alchemical magic as generative art.

This quaint choreography of enlisting employees and family to *play* a computer, as if it were a board game or a piece of theatre, has since given way to social media platforms, computational systems sprawling across data centres and mobile devices where “user generated content” gives form to the experience of others, placing people both within and outside. At times, users are even treated as computational components: when authenticating, for instance, one might have to prove that they are a human by recognizing a license plate, street sign, or building number, thus being transformed from ”just a user” to a producer of training data for a machine learning application.

The Black Box is the basic unit of the division of labour in a cybernetic society. Both presupposing and producing interoperability, Black Boxes can be *anything*, from systems to objects to people, potentially mobilizing all of it into a shifting field of value production. As long as some inputs can be coupled with some outputs, it doesn’t matter what the particular components are made from, what’s *inside*; what matters is their compatibility with other systems. Schematic diagrams, which visualize a machine’s logic rather than its material construction, are, in this sense, both plans and representations, virtually programs themselves, of this division of labour.

The End of Work

The first volume of Bernard Stiegler’s series, *Automatic Society*, is titled *The Future of Work*, pointing to its fundamental interest in “a new explosion of generalized insolvency” on the horizon because of the reduction in employment due to automation. If unemployment rises then there is simply less money put into circulation through wages that will be able to buy the products and services that are produced. And if this is indeed what the future holds, then there will need to be a deep transformation in both how goods are distributed, if not through the market, and how people spend their time, if not at a job. Governments, Stiegler believes, are committed to the platitude of ‘full employment’ (or, here in Australia, ‘jobs and growth’) and are failing to see the catastrophe unfolding in front of them.[383]

“Historically,” defenders of the status quo inevitably begin their response to these kinds of warnings, “automation has no net effect on employment because different

[383] Stiegler, “Automatic Society 1,” 125–27.

jobs are created."[384] But this position, which doesn't expect anything new to happen, sets itself to make the same error as Greenspan and perhaps the same shocked apology, "This crisis, however, has turned out to be much broader than anything I could have imagined."[385] Rather than get mired in questions of 'will it or won't it,' I am going to discuss the structural transformations that have *already* taken place (and continue to unfold precisely through the advance of automation) using the research of the Endnotes collective on surplus populations and surplus capital.

If automation refers to the introduction of machines to do the work that people had previously performed for a wage, then it is described in Marxist terms as the increasing organic composition of capital, or the shifting balance between variable capital (costs relating to the workers) and constant capital (capital invested in machines and other physical components of the production process). When a manual skill is mechanized, there are fewer labor costs, which boosts productivity and profitability. This boost in profit, however, only lasts until the new technology is generalized and used throughout the industry. The productivity gains lead through a whole series of rises and falls, such as lower prices, bigger markets, market saturation, falling profitability, and lay-offs. These cycles, moving workers into and out of their industries, ensures the "expanded reproduction" of capital but also reveals a limit in a "deterioration of its own conditions of accumulation."[386]

The rising organic composition of capital means that — as new technologies lead to new productivity gains which leads to new industries — new industries don't need to hire as many workers because they are able to take advantage of the machines and processes already invented. As time goes on, the newer industries absorb fewer and fewer of the workers who have been pushed out of the older industries. These workers without access to work are described by Marx in his chapter on the "general law of capitalist accumulation"[387] as *surplus population*, which is to say they "are surplus relative to the needs of capital — that is, relative to capital's demand for labor."[388] Over time, this "industrial reserve army" grows in relation to the army of workers, ultimately resulting in the pauperization of the

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[384] This is the basic expression of the "Luddite fallacy."

[385] Greenspan, "Greenspan Testimony on Sources of Financial Crisis."

[386] Endnotes, "Misery and Debt: On the Logic and History of Surplus Populations and Surplus Capital," in *Misery and the Value Form*, Endnotes 2 (London: Endnotes, 2010), *https://endnotes.org.uk/issues/2/en/endnotes-misery-and-debt*.

[387] Marx and Engels, *MECW 35*, 634–42.

[388] Endnotes, "An Identical Abject-Subject?" in *Unity in Separation*, Endnotes 4 (London: Endnotes, 2015), 280.

working class as they cannot be reabsorbed into industry. In short, “the accumulation of wealth occurs alongside the accumulation of poverty.”[389]

Endnotes acknowledges that this “immiseration thesis“ failed to account for the birth of new industries after the publication of *Das Kapital* — namely the automobile, telecommunications, and electronics industries — which lead to a growth in the working class and living conditions in the 20th century. Rather than discarding the thesis, however, they ask, “What if Marx had just been wrong on the timing?”[390] This question allows them to approach the growth of the service sector and the proliferation of insecure forms of work as the expansion of the surplus population. With “the unemployed” as an increasingly archaic category (given the shifts towards things like workfare and means-testing) people are necessarily thrown into “low-wage, super exploited” and “informal, self-exploiting” sections of the economy.[391] Here, wages are constantly under pressure and there is practically no workers’ bargaining power.

Contrary to the commonly-held belief that ’the jobs’ have simply moved to factories in Asia, Endnotes points out that in most newly industrialized countries industrial employment has generally declined since the mid-1980s[392] and has essentially remained flat in China.[393] For economies in which service dominates — such as Australia where 80% of jobs are in the service sector — employment expands slowly and growth tends to be low.[394] Finance becomes important in these contexts to fight stagnation by inflating bubbles (in real estate or other complex financial instruments) in order to provide an opportunity for capital to increase. Consumer debt allows spending to continue in the absence of wage-growth, allowing both the economy and individuals to survive.

Crucially, computers are a driving force behind the realization of the immiseration thesis, first by accelerating the degree of automation across manufacturing but also, increasingly, the service sector; and second, because the computer industry itself requires very few factories.[395] And the effects of computers have ripple-effects that spread insecurity far and wide, through the growing gig economy, for example. A 2017 McKinsey Global Institute report, *A future that works: automation,*

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[389] Endnotes, “An Identical Abject-Subject?” 281.

[390] Endnotes, “An Identical Abject-Subject?” 283.

[391] Endnotes, “An Identical Abject-Subject?” 286.

[392] As a share of overall employment.

[393] Endnotes, “An Identical Abject-Subject?” 283. And Endnotes, “Misery and Debt.”.

[394] Endnotes, “An Identical Abject-Subject?” 285–88.

[395] Endnotes, “Misery and Debt.”

employment, and productivity, forecasts that automation will completely replace only about 5% of occupations, but will replace significant *parts* of 60% of occupations. In order to maintain GDP growth targets, "everyone needs to keep working — with the robots working alongside them."[396] In this view, the easily automated aspects are robotized whereas the "logical thinking and problem solving, social and emotional capabilities, coaching and developing others, and creativity" are left as complementary work for people to do. In short, the report claims that "Automation could make us all more human."[397]

This is a flattering sentiment, but it is just as likely that the stubbornly human dimensions of various occupations will be reformatted to better comply with the demands of automation. In Figure 22, occupations are broken down into 'activities', then into 'capability requirements,' which are finally distilled into granular tasks, such as "coordination with multiple agents." Presumably this refers to how people (and now intelligent machines) work together, but the language certainly points towards total automation, where even the most 'human' of the tasks are conceptualized as if they were ready to be implemented in some configuration of silicon, software, and sensors.

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[396] James Manyika et al., *A Future That Works: Automation, Employment, and Productivity* ([San Francisco]: McKinsey Global Institute, 2017), 15, *http://www.mckinsey.com/global-themes/digital-disruption/harnessing-automation-for-a-future-that-works*. This tautological reasoning is hardly convincing because people continue to work because GDP targets require it, not because capital actually needs their labor.

[397] Manyika et al., *A Future That Works*, 19.

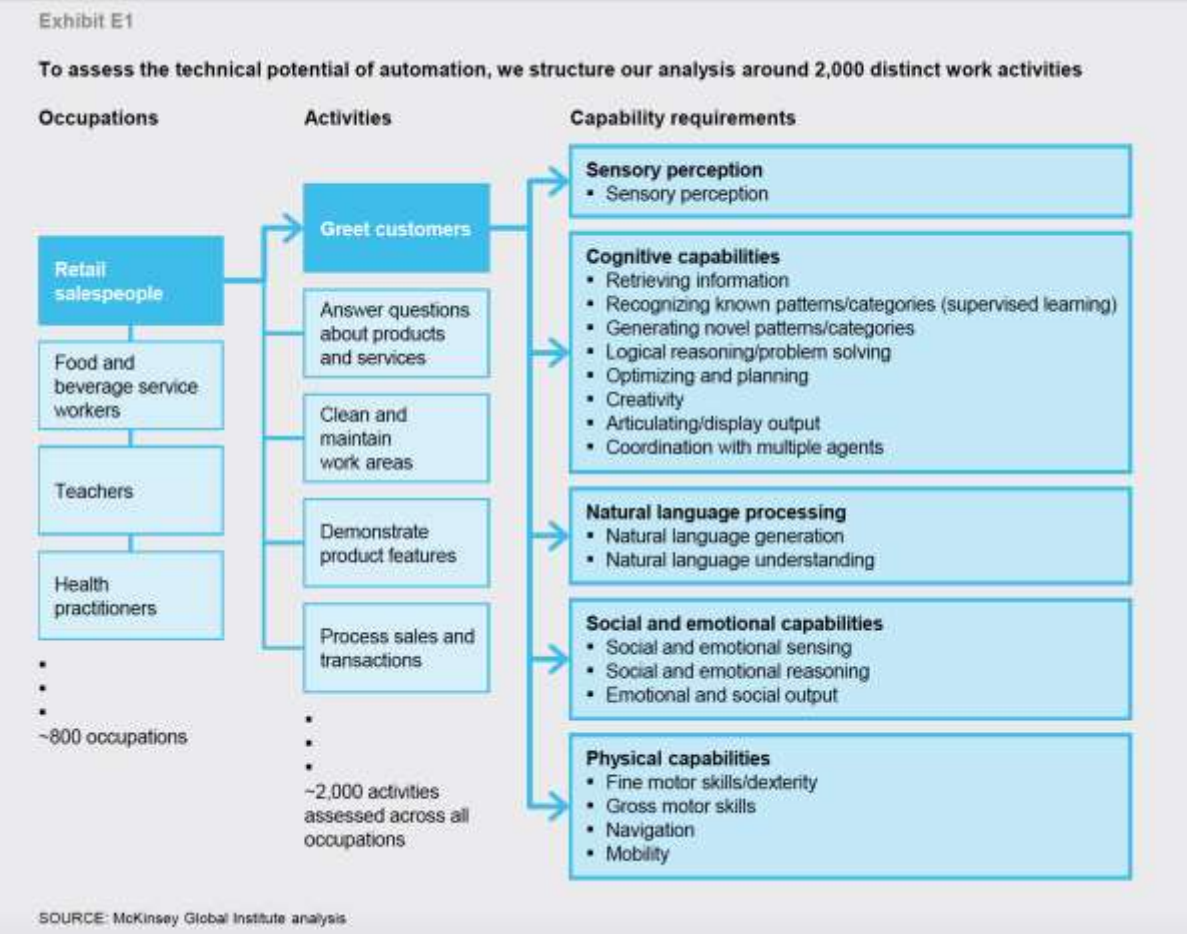

Figure 22: Explanatory diagram which assess the potential to automate occupations, but also already automates them 'on paper' by breaking them down into small units. From Manyika et al.

Partial automation produces hybrid workers during the decades long process of total automation. While the McKinsey report conjures up images of humans in robes or lab coats doing their human (creative, or at least, intellectual) work, the reality may very well look something like the worker depicted in Amazon's recent patent[398] for a haptic feedback system (Figure 23) worn on the wrist of workers to guide their hands to the correct bin – or rather, to guide their hands in a negative cybernetic loop *away* from the *incorrect* bin. The human body's amazing muscular-skeletal system, developed over millennia and reproduced without any assistance from Amazon, is rented for only 13 dollars an hour, and cut off from its own

[398] Jonathan Evan Cohn, Ultrasonic Bracelet and Receiver for Detecting Position in 2D Plane, US 2017/0278051 A1 (Seattle, issued September 2017), *http://pdfaiw.uspto.gov/.aiw?docid=20170278051*.

consciousness or creativity, the haptic feedback interfacing directly with that body's nervous system.

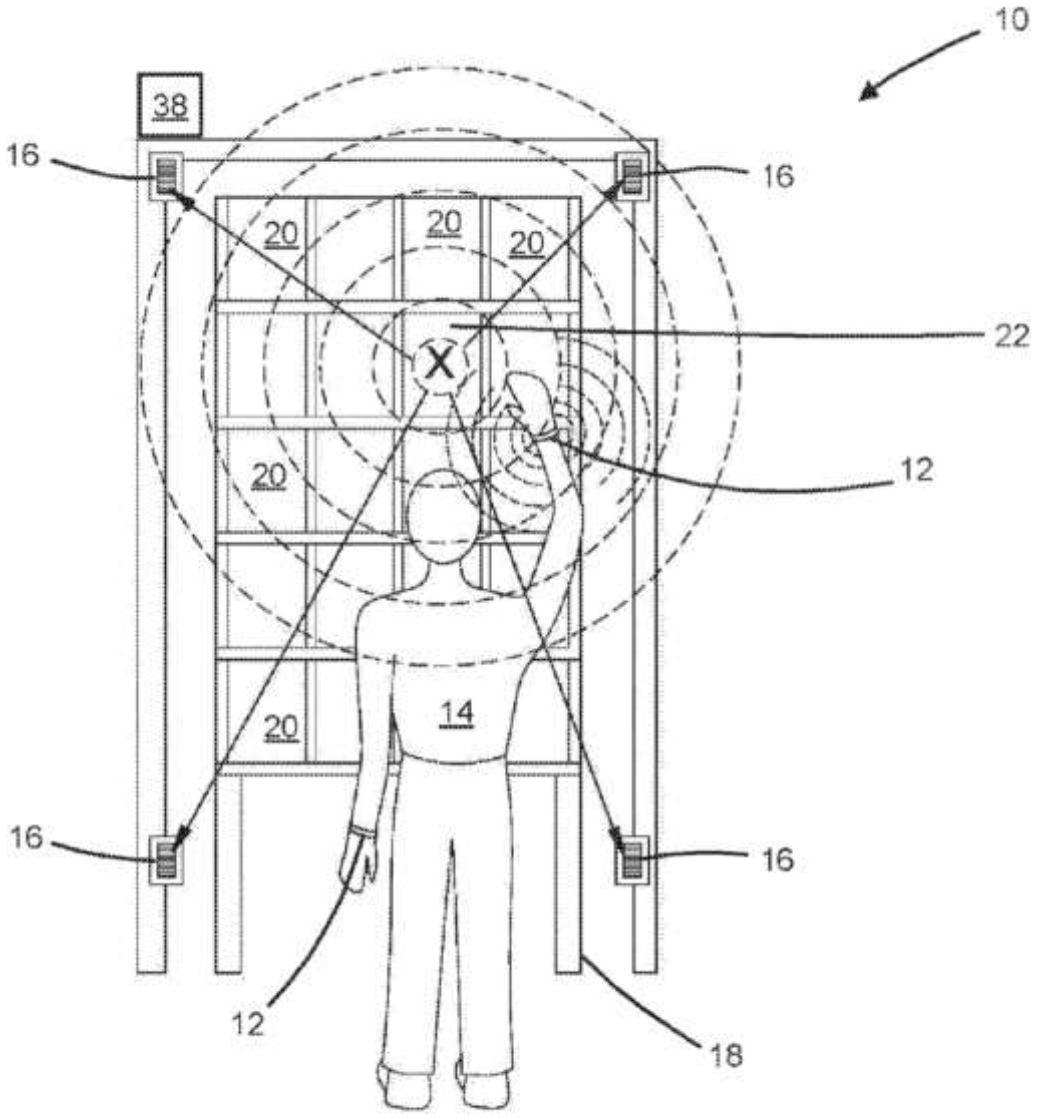

FIG. 1

Figure 23: Amazon, Inc. patent for Ultrasonic Bracelet and Receiver for Detecting Position in 2D Plane

Zombies

The Amazon employee represented in the Ultrasonic Bracelet patent is a condensation of the already-existing labour conditions under Jeff Bezos, the world's richest person.[399] Working long hours for minimal wages with little rest, the Amazon employee has nine seconds to process a package and some suffer panic attacks from the pressure of meeting steadily increasing 'targets'.[400] Although there is a hierarchy and there are bosses, it isn't the boss ordering the warehouse worker around, but the algorithm, which persuades the shopper via recommendations on one side of the purchase and pressures the warehouse worker on the other side. Searching for any way to squeeze more productivity out of the system, Amazon even patented a method for "anticipatory shipping," or shipping packages before they have even been ordered.[401] Interestingly, it's not that an individual shopper's future decision is predicted but, as Figure 24 shows, it is the probability that a product will be ordered from some geographic area and so it is sent en route, in anticipation of the order actually occurring. In short, there is no 'down time' for a worker, no slowdown, because in this "logistical capitalism, it is the continuous improvement of the production line that never finishes, that's never done, that's undone continuously."[402] The algorithm can even squeeze profit from the future itself.

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[399] As of January 2018.

[400] Charlie Parker and Brittany Vonow, "WAREHOUSE OF HORRORS: Amazon Warehouse Life 'Revealed with Timed Toilet Breaks and Workers Sleeping on Their Feet'," *The Sun*, November 2017, *https://www.thesun.co.uk/news/5004230/amazon-warehouse-working-conditions/*.

[401] Joel R. Spiegel et al., Method and System for Anticipatory Package Shipping, 8,615,473 B2 (Seattle, issued December 2013), *http://pdfpiw.uspto.gov/.piw?Docid=08615473*.

[402] Fred Moten and Stefano Harney, "Leave Our Mikes Alone," 2017, 2.

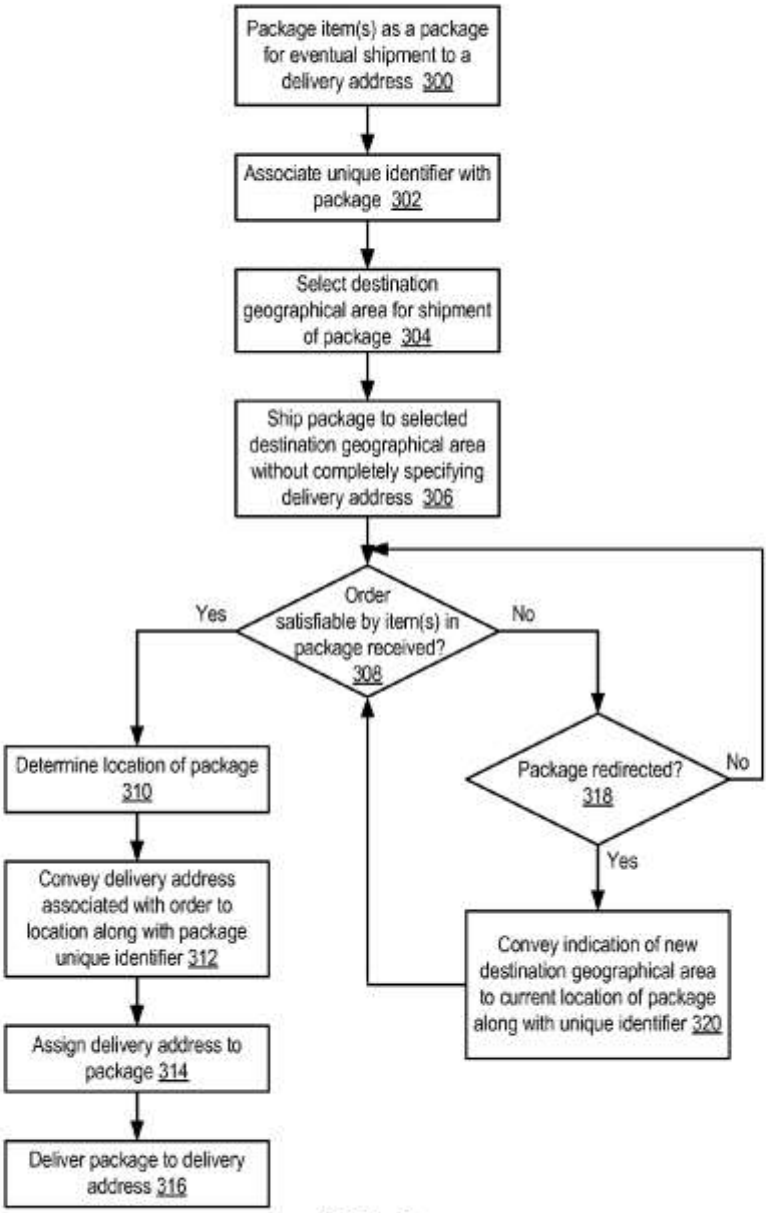

FIG. 3

Figure 24: Amazon, Inc. patent for anticipatory shipping.

Fred Moten and Stefano Harney trace lines between factory production and spoken language in “Leave Our Mikes Alone.” These lines reach across the globe and between our lips. Their ’logistical capitalism’ — another perspective on the same political economy of planetary computation I’ve discussed throughout — wants everything: total access, total transparency, total value. It breaks every part of the production process down, from the machines to the workers to the consumers, to put them back together again in its own image. Through constant, ongoing self-diagnosis, self-reflection, and self-improvement, we participate in this improvement (efficiency and profitability) of the system.[403] Amazon says that its targets “are based on previous performance achieved by our workers,”[404] which is a constantly moving goalpost, never-ending ‘improvement.’ The algorithm “is the only machine that makes new machines,”[405] it turns humans into machines, like the haptic feedback-driven worker, in the service of *the* machine.

Pulling apart and weaving together the production lines, lines of poetry, and lines of code of logistical capitalism, Moten and Harney ask, “What else is a colonial regime but the imposition of psychopathic protocols of total access to bodies and land in the service of what today is called supply-chain management?”[406] This question reminds us that algorithmic-logistical-computational-cybernetic capitalism is new, but it is also not new, because when it aspires to own and dominate a body, totally, it has been practicing for centuries. Achille Mbembe writes:

> Across early capitalism, the term ‘Black’ referred only to the conditions imposed on peoples of African origin (different forms of depredation, dispossession of all power of self-determination, and, most of all, dispossession of the future and of time, the two matrices of the possible). Now for the first time in human history, the term ‘Black’ has been generalized. This new fungibility, this solubility, institutionalized as a new norm of existence and expanded to the entire planet, is what I call the *Becoming Black of the world*.[407]

When Toni Morrison said that “modern life begins with slavery” it points to something fundamental in the source code of capitalism, not to a program run amok. She continued, “Slavery broke the world in half, it broke it in every way. It broke Europe. It made them into something else, it made them slave masters, it

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[403] Moten and Harney, “Leave Our Mikes Alone,” 1–13.

[404] Parker and Vonow, “WAREHOUSE OF HORRORS.”

[405] Moten and Harney, “Leave Our Mikes Alone,” 10.

[406] Moten and Harney, “Leave Our Mikes Alone,” 3.

[407] Achille Mbembe, *Critique of Black Reason*, trans. Laurent Dubois (Durham: Duke University Press, 2017), 6.

made them crazy."[408] *Move fast and break things* is what Mark Zuckerberg used to tell his Facebook employees, carrying on that crazy European spirit, not asking what Facebook is doing to its users, let alone into what kind of monsters Facebook is turning its own programmers, investors, and advertisers. If the out of control Artificial Intelligence provides the imagination of the present with popular techno-distopian nightmares, Kodwo Eshun reminded us in 2003 that "Afrodiasporic subjects live the estrangement that science-fiction writers envision."[409]

As living labour is converted into dead labour, bodies into machines, workers into surplus populations, "the dead weight of accumulated zombie labour acts as a sort of brake on the continued valorisation of capital."[410] The brake that Steve Shaviro refers to in "Capitalist Monsters" is the "law of the tendency of the rate of profit to fall,"[411] which says that over the long run, the increased productivity comes from an increased investment in constant capital and the rate of profit will tend to drop. Shaviro's essay argues that although much of the canonical literary tradition of horror imagines monsters as *invaders* or a technological innovation running *out of control*, we can also find monsters produced by the workings of everyday capitalism itself.[412] The *indeadted* of K.W. Jeter's novel *Noir* concatenates the figure of the zombie with the perpetually insolvent masses, a class created not by a mad inventor, but by the flow of capitalism, which keeps flowing until "nearly every last person in the world will have become a zombie."[413]

This 'twist' on the zombie myth[414] points back to its capitalist origins in Haiti, where African slaves were worked to death on sugar plantations hundreds of years ago. Death, the only escape, didn't come quickly enough, but suicide sentenced the person to an eternity of slavery. Without access to even this one means of possessing their own body, the person was kept in a suspended state of slavery, a zombie already.[415] Even in the 20th century, an American writer, William Seabrook,

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[408] Paul Gilroy, *Small Acts: Thoughts on the Politics of Black Cultures* (London ; New York: Serpent's Tail, 1993), p. 178

[409] Kodwo Eshun, "Further Considerations of Afrofuturism," *CR: The New Centennial Review*, no. 2 (2003): 298.

[410] Steve Shaviro, "Capitalist Monsters," *Historical Materialism* 10, no. 4 (December 2002): 283, doi:*10.1163/15692060260474486*.

[411] See Chapter 13 in *Capital, Vol. 3*.

[412] As I wrap up the editing of this text, the *Child's Play* reboot features a murderous "Buddi Doll" that is marketed for its a playful, wireless connection to other smart home devices.

[413] Shaviro, "Capitalist Monsters," 281–84.

[414] I'm referring to the *consumerist* zombies of American horror.

[415] Mike Mariani, "From Haitian Slavery to 'The Walking Dead': The Forgotten History of the Zombie," *The Atlantic*, October 2015,

wrote an account of “walking dead men” toiling for the Haitian-American Sugar Company, whom he described “like automatons… the whole face… not only expressionless, but incapable of expression.”[416] The suggestion here is that the zombie workers are like a lobotomized person, where there is no intervention of conscious thought, deliberation, or sociality, but only the bare minimum cerebral involvement to keep the body at work. The Louisiana Slave Code of 1852 likewise programmed slaves to “*instantly* obey all orders he receives from… his master and all his family.”[417] Obedience is one thing, but to obey instantly is to short-circuit the individual operating system, to override it with the total automation of the body.[418]

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https://www.theatlantic.com/entertainment/archive/2015/10/how-america-erased-the-tragic-history-of-the-zombie/412264/; Amy Wilentz, “A Zombie Is a Slave Forever,” *The New York Times*, October 2012, *https://www.nytimes.com/2012/10/31/opinion/a-zombie-is-a-slave-forever.html*

[416] W. B. Seabrook, *The Magic Island* (Literary Guild of America, 1929), 101.

[417] Quoted in S. Mintz and S. McNeil, “Chapter 5: Methods of Controlling Slaves,” *Digital History*, 2016, *http://www.digitalhistory.uh.edu/teachers/lesson_plans/pdfs/unit4_5.pdf*. Emphasis mine.

[418] In an expanded version of this chapter, I would like to return to Endnotes here to discuss their racialised abject subject. A large portion of the “surplus population,” they say, “exists now only to be managed: segregated into prisons, marginalised in ghettos and camps, disciplined by the police, and annihilated by war.”, Endnotes, “Misery and Debt.” This subject is the object of surveillance, algorithmic policing, Noble, *Algorithms of Oppression*; Jackie Wang, “‘This Is a Story About Nerds and Cops’: PredPol and Algorithmic Policing,” *E-Flux Journal*, December 2017, *http://www.e-flux.com/journal/87/169043/this-is-a-story-about-nerds-and-cops-predpol-and-algorithmic-policing/*. and automated austerity,, Virginia Eubanks and Sam Adler-Bell, “The High-Tech Poorhouse,” *Jacobin*, January 2018, *http://jacobinmag.com/2018/01/virginia-eubanks-interview-automating-inequality-poverty*; Gillian Terzis, “Austerity Is an Algorithm,” *Logic Magazine*, 2017, *https://logicmag.io/03-austerity-is-an-algorithm/*. the most direct expression of the more theoretical tendencies I have been discussing.

Accident

On August 3, 2011, I received an email (Figure 25) from YouTube:


From: YouTube <no_reply@youtube.com>
Subject: Information about your video "Logical Conclusion #2174"
Date: August 3, 2011 6:14:48 AM PDT
To: AlexanderRodchenko <sean.patrick.dockray@gmail.com>

YouTube

Dear AlexanderRodchenko,

Your video, Logical Conclusion #2174, may have content that is owned or licensed by finetunes.

No action is required on your part; however, if you are interested in learning how this affects your video, please visit the Content ID Matches section of your account for more information.

Sincerely,
- The YouTube Team

Figure 25: Email from YouTube to my account, AlexanderRodchenko, on August 3, 2011, regarding a video uploaded in the course of my project, Logical Conclusions (2007-)

Several things about it caught me off guard. First, it seemed to be suggesting that I had violated someone's intellectual property ("Your video, Logical Conclusion #2174, may have content that is owned or licensed by finetunes.") But that video — in fact all of the *Logical Conclusions* videos — were automatically generated by some software that I had written! Second, I had uploaded that video almost four years earlier and had discontinued the project, so it was a surprise to see it get a second life, but also that it was getting me into some (very minor) trouble. Third, when I investigated in order to find what the 'content' was that I had infringed upon a song, "Moon and Stars (Club Mix)" by Hakan Lidbo and Alvina Red, I discovered that it was a track that was released in 2009, *two years after my video*. What was happening?

Sometime between 2007 and 2009, YouTube launched its Content ID system to digitally scan every newly-uploaded video and try to determine if it was infringing copyright. In order to do this, the Content ID system maintains a database of digital fingerprints against which it can compare the videos. Sometime after it launched, Google (who bought YouTube in 2006) applied the system retroactively to all of the videos that had ever been uploaded, such as mine. "No action" was required in my part because the 'copyright owner' had configured their settings to *monetize* my video, or collect income from advertisements, rather than automatically take my video down.

I began *Logical Conclusions* with the quixotic idea of uploading every one of the 16,777,216 possible (within an RGB colourspace) monochrome videos to YouTube, overwhelming the servers or at least slipping them into all kinds of recommended video lists like a virus. After a while, it became plain to see that at the rate my software was generating and uploading the videos, it would take more than a century to reach the end. This was, of course, part of the absurdity of the work; worse was the fact that every so often Google would change some server configuration or form or API setting and I would need to update my code to keep running. Eventually, after making around 20,000 videos, I gave up.

When the email arrived more than three years later, in 2011, I realized that *Logical Conclusions* wasn't finished. Not because of the 16,750,000 or so videos left to make, but because the continuously evolving character of platform capitalism meant that even when nothing seemed to be happening, something was. Moreover, the platform itself — opaque, unreliable, and antagonistic — was asserting its role as a collaborator in the project. My data wasn't just being stored on servers and being shown on webpages, it was being interrogated by algorithms in the data centre. I would never had known — and I still don't know all of it — what they put my data through if I hadn't received that email.

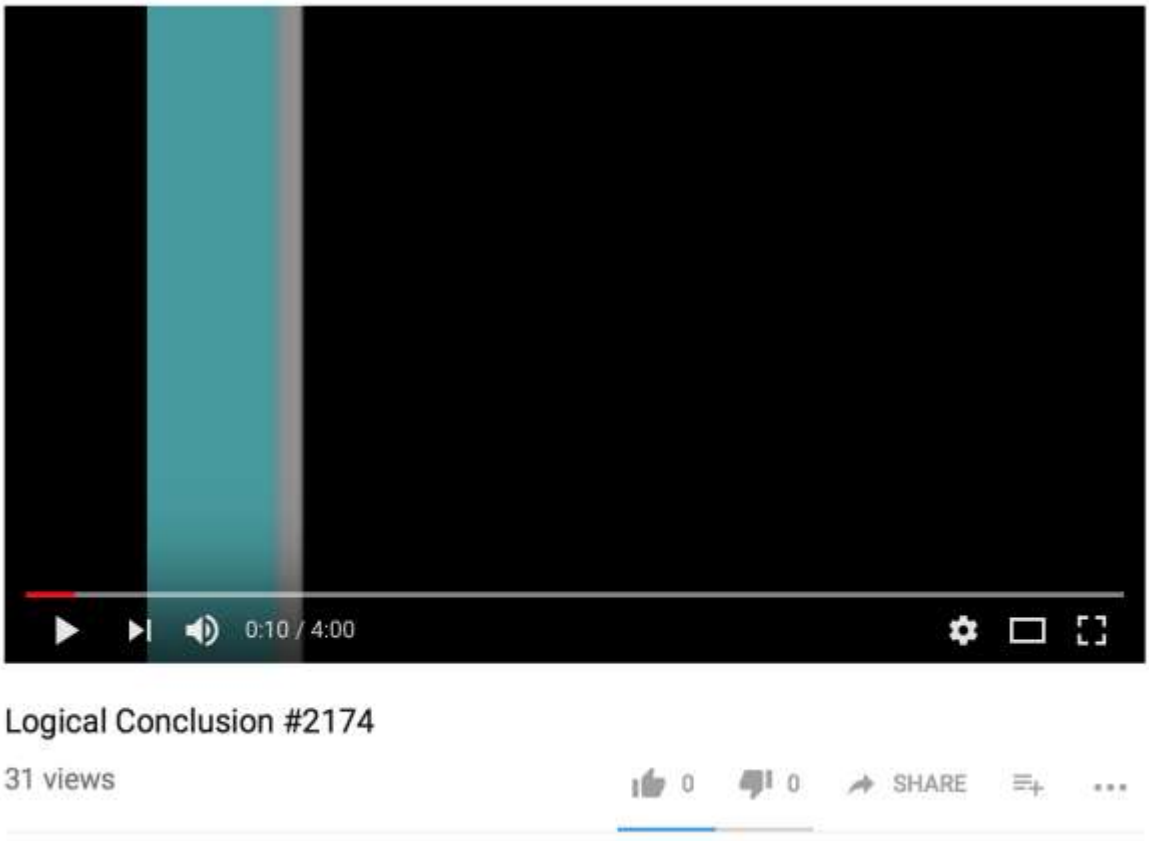

Figure 26: Logical Conclusion #2174 (2007-) is now a narrow two-colour strip rather than a single field of colour.

Dozens more emails followed. Some months later, I became aware that many of my older videos had changed from a full-screen single colour to a narrow strip of colour over black; then some years later, some of the strips had inexplicably become two-colours. (Figure 26) The once-blank artifacts, composed of just a single colour and a single frequency in the audio channel, have turned out to be probes for registering activity in the cloud, accreting significance over more than a decade. In fact, it is the videos' blankness that allows them to operate in this way. If they had any content to speak of, if they were singular and expressive, then they probably wouldn't have registered anything.

Sometimes, even without these probes, I can sense that something is different than usual. Companies like Google are too mature for big changes or drastically new looks, so any adjustments are usually quite subtle like someone slightly moving the furniture in your home, an eerie shift in ambience maybe, which quickly becomes the new normal. But how often does something change behind, for example, Google's perennial search box? (Figure 27) In 2012, the answer was 665. If two-per-day seems like a lot of incremental "improvements," then consider that Google evaluated 118,812 potential changes in that same period, and trialed 7,018 of those to a small group of unsuspecting users.[419]

Figure 27: Screenshot of the Google search page on February 7, 2018.

[419] Google, "Inside Search: Algorithms," *Google*, 2012, *https://www.google.com/intl/bn/insidesearch/howsearchworks/algorithms.html*.

As the emails from YouTube poured in, it occurred to me that as the totality of correspondences, photographs, friendships, finances, books, music, movies, institutions, and memories are inexorably pulled into 'the cloud' they are going to be further drawn into political, economic, legal, and technological currents that are transformative and may, at times, become destructive. A photograph of a child might disappear because of the movie poster in the background. A text document gathering research on the 1970s might get the NSA's attention because of a keyword. It will always be for a reason, a logic will have been followed, but the consequence is irrational.

s2t

I begin *s2t* with a gesture from the lecture podium to the A/V technician at the back of the auditorium to turn off the speakers. "Tonight I am using Google Docs as my microphone," I say leaning in towards my laptop just before the words "Tonight I'm using Google Docs is my microphone is my microphone" unfold across the projection screen behind me. Over the next 10 minutes, I will narrate the journey taken by my voice as it passes from the space of the auditorium into the Internet, to a Google data center, and then back again, re-entering the space of performance as text.

This lecture-performance, originally staged at the National Gallery of Victoria on September 24, 2015 as a part of Liquid Architecture's *Capitalist Surrealism* program, extended the research into synthetic language within an earlier project, *AI-Commune*. In the process of developing a recurrent neural network (RNN) that could be trained on the corpus of writing of certain influential peers of mine (under the conceit of textual "immortality" through the continuous generation of discourse and further text) I had been experimenting with creating autosuggestion systems. I built a rudimentary text editor, for example, that would suggest words and phrases in the style of one or more of my peers or influences, similar to the way a phone might make normative or personalized suggestions. The similarity was, of course, the form of the suggestion, whereas the suggested content was entirely different in terms of the production of subjectivity of the user. Until the final days before the performance, I was intending to perform a script that was written in real-time before me by one of these suggester systems, effectively putting my live body at the mercy of the algorithm and the discourse of others.

My reasoning is probably obvious: taking the curatorial concept of "capitalist surrealism," I made a connection between the algorithmic suggestions that are increasingly embedded in our communication technologies (and with which I was already materially engaged) and the Surrealist practices of "automatic writing." If automatic writing was an artistic strategy for allowing the subconscious to circumvent the conscious mind, then the use of suggestion would allow the algorithmic mind to "speak" through me. This was not particularly novel: generative

art has constantly substituted mechanized thought for human thought in reprising the Manifesto of Surrealism's "automatism," locating creativity "in the absence of any control exercised by reason."[420] Although I was interested in going through with the process of putting my body and voice into an uncomfortable relationship with computation, I was concerned that the nonsensical quality of the generative text would dominate the performance, making it more about this software that I had written than a shared experience under capitalism.

In the final days, I abandoned the suggestion system that I had programmed and wrote a text that ended up being the final script: a guided tour into the cloud in which the audience didn't need to leave their seats. Rather than the script emerging in front me, one step at a time, the script, as projected onto the screen, receded behind me. Moreover, I realized that I hadn't abandoned the suggestion system so much as inverted it, shifting from techniques of generation to techniques of recognition. In many of the machine learning examples that I was looking at, in fact, networks that were designed for image or speech recognition could also be turned inside out and used to produce new data. Google's speech recognition was only partly based on the way it analyzed the audio signal of a voice: it also evaluated the likelihood of one word following another, a probability it could calculate based on its reservoir of accumulated textual knowledge.

This was most apparent in the lag between my naked voice and the projected, retroactive script, a lag that wasn't so much a delay as a translation. Words would appear on the screen, individually or in small groups, but then often disappear, giving way to a different but similar set of words as Google revised itself. The effect was not simply a temporal gap, a duration between speech and text, but the unfolding of a functioning intelligence. If there was a predictable humor to Google's misrecognition of what I said, there was something more complex and subtle in Google's own constant self-correction. In turn, I would adjust my own speech, correcting myself to be better understood, sometimes successfully, while at other times setting off a further chain of confusion.

Afterwards, I found myself describing the experience of performing *s2t* as collaborating with Google (even if Google wasn't a consenting participant). It was more of a duet than it was like playing an instrument (or being played like an instrument, in the way my original concept). There was no mastery, but rather negotiation, awkwardness, and frustration - I was more emotionally involved than I had expected to be. If accident was a part of the work, then that included my own failures (as a writer, as a speaker, as a performer) as much as Google's (as a transcription service). In retrospect, my voice carried through the space of the auditorium more than I intended, inviting the audience to compare and contrast the

[420] Breton, *Manifestoes of Surrealism*, 26.

words that I spoke with those that appeared on the projection. I was concerned, prior to the performance, that if this happened it would set up a dynamic in which I was simply ridiculing Google's failure to keep up. And this dynamic *was* unintentionally present, but the audibility of my voice allowed my writing to be more present than it would have otherwise been, such that the errors that occurred on screen were also characters in the spoken narration.

Adorno wrote that the essay "is given contour by its substance."[421] On the other hand, Kittler wrote that "[t]here exists no word in any ordinary language which does what it says," which on the one hand points out the limitations of (ordinary) language, while opening up a potential avenue for the algorithmic essay. Such an essay would endeavor to "set[] the machine into motion,"[422] not so much in its substance, but through its material and performative contours. This is partly to activate the essay, to allow it to operate on the same plane as its subject rather than description at a remove; but it also instigates a diachronic relationship with the algorithmic subject, provoking reconfigurations that generate new perspectives and new knowledge.

Occupying the Accident

In a consideration of art that cultivates *error*, Tim Barker writes that "the artist sets up particular degrees of freedom as a set of internal limitations in which the system must function, directing, but not producing, the end product."[423] While inheriting the rational language of Bense's generative aesthetics, or even his attention to "producing the conditions" for aesthetic experience, Barker shifts away from a complex system's permutatorial logic. Rather than realizing an unlikely - surprising, even - latent possibility of some combination of operations, rules, and variables, he gives attention to actualizing a virtuality through the proactive discovery of errant behavior. In short, the shift he describes is from automation to accident.

Drawing on Manuel de Landa's *degrees of freedom* (the material limits in which a system unfolds) and Gilles Deleuze's *philosophy of the virtual* (conceptualizing the real field of potentiality out of which certain things or events come into existence) Barker is attracted to the errant as a source of novelty or creativity, a potential out of which the unforeseen emerges.[424] Glitches, here, are not things that can be

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[421] Adorno, "The Essay as Form," 17.

[422] Friedrich Kittler, "On the Implementation of Knowledge - Toward a Theory of Hardware," Mailing List, *Nettime*, (1999), *http://hydra.humanities.uci.edu/kittler/implement.html*.

[423] Tim Barker, "Aesthetics of the Error: Media Art, the Machine, the Unforeseen, and the Errant," in *Error: Glitch, Noise, and Jam in New Media Cultures* (New York: Continuum, 2011), 46.

[424] Barker, "Aesthetics of the Error," 51.

instrumentalized, at least not intentionally. As Rosa Menkman writes, “A glitch represents a loss of control.”[425] Rather than directly producing errors, the artist directs the system to actualize their potential by setting its initial conditions or nudging its processes. Like theorists of generative art, Barker and Menkman demarcate a space in which control is relinquished after setting some process in motion, but whereas generative art typically delegates formal decision-making to complexity or emergence, Barker and Menkman leave it to the glitch.

From a political perspective, this distinction might be reframed as whether or not a new, post-capitalist world could emerge from within the complexity of our existing system, or whether any such novelty would only be an innovation of capitalism and that what would actually be required to deliver this new world is some kind of rupture. At the level of art practice, it would seem that there is no ostensible political dimension to a generative art of emergence. What is at stake is usually whether a machine can be creative or not and what happens to our cultural understanding of an artist embedded in some technological context. A generative art of error,[426] on the other hand, attempts to destabilize total informatic control, proposing forms of “asystematic resistance.”[427] In searching for glitches, bugs, and crashes, artists researched the conventions, codecs, and constraints of of our increasingly digital media landscape, looking for cracks and openings.

In the late 1990s, I happened to browse my way to the website anti-theory.com, where I learned about the “circuit bending” of Qubais Reed Ghazala. By short-circuiting the electrical components of low voltage musical instruments, Ghazala was able to provoke dirty, choppy, and alien, sounds that weren’t available off-the-shelf to the consumer. Inspired, I unscrewed the back of my Casio SK-1 keyboard and laid the screwdriver across different parts of the circuit board, while continuing to press keys on the other side. It was strange to try and play both sides of the instrument at once - not so much the back and the front, but the inside and the outside. The outside was an abstraction, a domesticated representation of a musical instrument. Inside was a world of sound, the vast majority of which was repressed by familiar packaging. In order to play more rigorously, I soldered dozens of the most potent points on the circuit board to wires running up a vacuum

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[425] Rosa Menkman, *The Glitch Moment(Um)*, Network Notebook 4 (Amsterdam: Institute of Network Cultures, 2011), 31.

[426] I’ve softened the dichotomy that I have been setting up between the “generative” and the “glitch” because of the many overlaps between these two approaches to software art over the past 20 years. Menkman consistently refers to “generative glitch” in *The Glitch Moment(um)* and Barker writes that “the artist can no longer be thought of as the sole creative force. Rather it is now the artist’s role to provide the circumstances for an error to emerge.”, Barker, “Aesthetics of the Error,” 56. This language is right at home amidst the generative art theorists I discuss here.

[427] Mark Nunes, “Error, Noise, and Potential: The Outside of Purpose,” in *Error: Glitch, Noise, and Jam in New Media Cultures* (New York: Continuum, 2011), 8.

formed, Devo-eque keytar neck and renamed it the *SD-1*. If the keytar is already a parody of the guitar, the *SD-1* in particular undermined any pretense of mastery or virtuosity. Playing it was more like wrestling, or awkwardly dancing, or catching a cat, because it was unpredictable, fickle, and prone in equal measure to moments of breathtaking beauty and total power failure. What I was discovering for myself, under the tutelage of Ghazala's website, was what Kim Cascone was in the process of naming "the aesthetics of failure," which "remind[s] us that our control of technology is an illusion."[428]

When I recall this experience and when I read Rosa Menkman's writing on glitch, I imagine the artist as analyst, provoking an "*encounter with the real*"[429] within the technosphere. If the normative soundscape, functioning "properly" suggests a kind of Freudian conscious mind, then the unconscious might be all of the repressed sonic "thoughts" that are brought forth through various glitch practices. This project doesn't pursue the potential relationship between psychoanalysis and technological systems,[430] but I do want to note that the first part of *A General Introduction to Psychoanalysis* is called "The Psychology of Errors," and that Lacan devotes attention to "Tuché and Automoton," referencing Aristotle's reflection on accidents. The very first example of an "error" that Freud gives, which I will return to in relation to my own work, is when someone wants to say something and uses the wrong word - a slip of the tongue. For both psychoanalysis and glitch, the accident is a privileged mechanism. Explicitly drawing these together, Paul Virilio writes that "WHAT CROPS UP (*accidens*) is a sort of analysis, a techno-analysis of WHAT IS BENEATH (*substare*) any knowledge."[431] Or, more explicitly, "the accident is an unconscious oeuvre."[432]

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[428] Kim Cascone, "The Aesthetics of Failure: 'Post-Digital' Tendencies in Contemporary Computer Music," *Computer Music Journal* 24, no. 4 (December 2000): 13, doi:*10.1162/014892600559489*.

[429] Jacques Lacan, *Book XI: The Four Fundamental Concepts of Psychoanalysis*, ed. Jacques-Alain Miller, trans. Alan Sheridan, Reiss, The Seminar of Jaques Lacan, Jacques Lacan. Transl. with notes by Bruce Fink ; Book 11 (New York, NY: Norton, 1998), 53.

[430] It would, however, be interesting to do. Sherry Turkle wrote multiple essays on how psychoanalysis might draw from findings in artificial intelligence, such as Sherry Turkle, "Artificial Intelligence and Psychoanalysis: A New Alliance," *Daedalus* 117, no. 1 (1988): 241–68, *http://www.jstor.org/stable/20025146*. and Sherry Turkle, "Whither Psychoanalysis in Computer Culture?" *Psychoanalytic Psychology* 21, no. 1 (2004): 16–30, doi:*10.1037/0736-9735.21.1.16*; and recent corporate AI depends not only on "neural architectures" but also using the mind as a metaphor to conceptualize computational knowledge and the autonomy of technological systems, such that a project like "Deep Dream," producing hallucinogenic imagery might benefit from a psychoanalytic reading.

[431] Paul Virilio, *The Original Accident* (Cambridge ; Malden, Mass: Polity, 2007), 10.

[432] Virilio, *The Original Accident*, 9.

The accident was a methodological engine for Michel de Montaigne. “Chance has more power here than I,” he wrote. “The occasion, the company, the very sound of my voice, draw more from my mind than I find in it when I sound it and use it by myself.”[433] He anticipates psychoanalysis’s distrust of intention: “Things must not be taken at the level at which the subject puts them,”[434] Lacan would say 390 years later. The occasion - or for Lacan, the essential encounter - overcomes the inhibiting consciousness.

Most discussions of the accident refer back to Aristotle’s categories of *tuchê*[435] and *automaton*, in his discourse on the causes of things. Interestingly, Aristotle uses the causal relationship between a sculptor and a statue as an introductory framing of this argument on luck and chance. Here, *tuchê* is the kind of luck (good or bad) that results from action or deliberate choice. The more general category of *automaton* refers to chance events that occur, seemingly spontaneously, due to things incapable of deliberate choice.[436] What has proven more important than these specific categories in Western thought, however, has been the division between an object’s (or a person’s) immutable substance and its inessential, accidental qualities. It is this relationship that Virilio takes up and inverts when he writes that the “invention of the ‘substance’ is equally the invention of the ‘accident’,”[437] or more memorably “[t]o invent the sailing ship or steamer is *to invent the shipwreck*.”[438] Every technology has its own specific accident. In these terms, accident inheres in substance, which corresponds to a growing sense in modernity of the accident as not the extraneous or inessential, but that which gives specificity, identity, or definition to the subject.[439] Montaigne, foreshadowing how essential the accident would become, even wrote that “[i]f I erased every passage where [the chance encounter] happens to me, there would be nothing left of myself.”[440]

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[433] Montaigne, *The Complete Essays of Montaigne*, 26. “Of prompt or slow speech”.

[434] Lacan, *Book XI*, 54.

[435] While Lacan uses an acute accent, the word is commonly found unaccented, or in academic literature given a circumflex. I will follow the example set in C.D.C. Reeve’s translation of Aristotle’s *Physics*.

[436] Aristotle and C. D. C. Reeve, *Physics*, The New Hackett Aristotle (Indianapolis: Hackett Publishing Company, Inc, 2018), 27–31.

[437] Virilio, *The Original Accident*, 9.

[438] Virilio, *The Original Accident*, 10.

[439] Ross Hamilton, *Accident: A Philosophical and Literary History* (Chicago: University of Chicago Press, 2007).

[440] Montaigne, *The Complete Essays of Montaigne*, 27.

Because of the planetary scale of contemporary technology, Virilio gives the reader the feeling of being already immersed in accident. There is a sense of fatalism, amplified by frequent eschatological references, in which catastrophe is both immanent and imminent. Although many of the disasters he mentions concern energy or industry (shipwrecks, train derailments, or Chernobyl), he extends the same logic in considering computation and communication systems:

> After the accident in substances, meaning matter, the time of the accident in knowledge is upon us: this is what the so-called information revolution really is and what cybernetics really is: the arbitrariness of of anarchy in the power of nations, the different powers of a community not only thrown out of work by automation but further thrown out of whack by the sudden synchronization of human activities.[441]

The clarity of Virilio's schema breaks down here, if only because cybernetics and networks are not inventions in the same way an airplane is. Even to take one object, completing the phrase, "the invention of the personal computer is the invention of [what accident]," is difficult. Perhaps, this difficulty arises from the Aristotlean foundation for the substance-accident - the relationship between kinds (*genos*) of things and their essential qualities - and the 'general purpose' nature of the personal computer. It is an *object without qualities*.[442] Although it seems as if the accident in knowledge is an impending accident at an unfathomable scale, it seems just as likely that it is, or they are, unfolding constantly around us in a manner as distributed and abstract as networked computation.

The self-driving car, which straddles the accident in substances and the accident in knowledge, has opened up a cultural debate, particularly around the possibility - or perhaps probability, with its calculated, mathematical connotation, is the right word here - of the automated accident. In one prominent example, a self-driving Uber vehicle struck and killed a pedestrian, Elaine Herzberg, in Arizona during the night as she walked her bicycle across the street. This is recognized as the first instance of a pedestrian being killed by an autonomous automobile. Editorials in the weeks and months that followed repeatedly asked similar questions: "Who's to blame when driverless cars have an accident?,"[443] "Who's at fault when a self-driving car

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[441] Virilio, *The Original Accident*, 53.

[442] This reference to Robert Musil's *The Man Without Qualities* echoes my earlier comment about the importance of the accident to the modern subject (Ross Hamilton deals with Musil's novel in his study) as well as to specifically note that the computer develops its particular character in response to the world around it, to who uses it and how.

[443] Raja Jurdak and Salil S. Kanhere, "So Who's to Blame When a Driverless Car Has an Accident?" Text, *ABC News*, (March 2018), *https://www.abc.net.au/news/2018-03-20/uber-driverless-car-accident-who-is-to-blame/9567766*.

is involved in an accident?"[444], "Who's to blame when there's no driver?"[445] and "Can You Sue a Robocar?"[446] Across all of these, the questions focused on liability: if there is a bug in the code, faulty equipment, or improper system design, then responsibility might be held by different parties - the manufacturer, the software developer, or the service center. Ian Bogost's editorial does an exemplary job of demonstrating just how difficult it would be in Herzberg's case to not only locate responsibility, but litigate it under Arizona's existing legal framework. But lurking underneath these ultimately legal discussions is Aristotle's attempt to understand causes, as seen in the phrase "*when things go wrong*."[447]

Things going wrong sounds spontaneous, even automatic. Aristotle emphasizes the *pointlessness* of chance (*automaton*) in that what happens does not coincide with what the original action "was for the sake of,"[448] or it produces an effect outside of its aim. The action misses the point, it goes wrong. It is a sentiment found in the inevitability of Virilio's accident specific to a form of technology. At some point, it will go wrong and the ship will sink or the car will crash. Any humans on a collision course with the errant technology will have had bad luck (*tuchê*), which is not to say that luck caused their accident, nor that some deities fated the thing to happen, but simply that some deliberate action taken from among other possible actions was the retroactive precondition for the coincidence.[449] The importance of "deliberation" takes on a new significance in an automatic society for two different reasons: firstly, if our deliberative capacities are being algorithmically reconfigured within an automated society, as Rouvroy and Stiegler warn, then there will be a shift from *tuchê* to *automaton*; secondly, the development of 'ethical AI,' which finds its most caricatured expression in applications of the "trolley problem"[450] to the

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[444] Paul Attfield, "Who's at Fault When a Self-Driving Car Is Involved in an Accident?" November 2018, *https://www.theglobeandmail.com/drive/news/article-whos-at-fault-when-a-self-driving-car-is-involved-in-an-accident/*.

[445] This is the title given by ABC News to a republication of Raja Jurdak and Salil Kanhere's piece from *The Conversation*.

[446] Ian Bogost, "Can You Sue a Robocar?" *The Atlantic*, March 2018, *https://www.theatlantic.com/technology/archive/2018/03/can-you-sue-a-robocar/556007/*.

[447] Jurdak and Kanhere, "So Who's to Blame When a Driverless Car Has an Accident?"

[448] Aristotle and Reeve, *Physics*, 31.

[449] When he takes up *tuchê* in *Ethics*, however, Aristotle does leave open the possibility that divine aid might bestow good fortune upon someone.

[450] A thought-experiment in which a person is asked to choose, by hypothetically pulling a lever, who among two people or groups of people tied to trolley tracks should be spared by a runaway trolley.

self-driving car, suggests that deliberation is strained as a concept within evolving forms of computational intelligence.

Yuk Hui's essay, "Algorithmic Catastrophe - The Revenge of Contingency," takes up this transformation of *tuchê* and *automaton* within the context of "the automation of reason." Algorithmic contingency differs from the contingency of the laws of nature that animated Aristotle's inquiry because whereas "the contingency of the laws of nature always come from the outside," in the case of autonomous machines, "accidents are expected" and integrated into their evolution.[451] Although accidents might be anticipated, handled in software, and surveilled in automated testing, this process is never complete. As automatic processes accrue and aggregate with other automatic processes, a recursive complexity develops in which contingency is paradoxically necessary. In response to Uber's automated accident, for example, Jurdak and Kanhere accept the inevitability of the accident and propose an additional algorithmic system: a configuration of sensors and blockchain in order to provide automatic, trusted monitoring that will assist in properly directing blame. In much the same way that Flusser characterized the industrial society with causality, Hui notes that the causes of industrial accident could be identified and prevented, whereas "control of the algorithmic catastrophe is increasingly beyond the capacity of human beings."[452] The very thing that gives us the ability to comprehend and act (further technological development) is also that which pulls control even further out of reach.

Virilio warned that it would be unacceptable to "allow the *accident* … to become *automatic*"[453] because it would amount to a willful ignorance, turning a blind-eye to the consequences of our inventions. Would this also change the nature of the long-standing aesthetic investment in the accident as an artistic strategy? If contingency is no longer exceptional but unavoidable[454] then is glitch not nostalgic in much the same way as the transgressive avant-garde? Inasmuch as accidents are now anticipated, wouldn't the practices of "asystematic resistance" find that they are now performing an immunological function and strengthening systemic resistance? It's not that there is no value in methodically probing the contours of algorithmic systems, but that the recursive complexity of these systems suggests similarly recursive artistic strategies that learn to occupy rather than display the accident.

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[451] Yuk Hui, "Algorithmic Catastrophe - The Revenge of Contingency," *Parrhesia: A Journal of Critical Philosophy*, no. 23 (2015): 131, *http://www.parrhesiajournal.org/parrhesia23/parrhesia23_hui.pdf*.

[452] Hui, "Algorithmic Catastrophe," 139.

[453] Virilio, *The Original Accident*, 6.

[454] Hui, "Algorithmic Catastrophe," 136.

The popular imagination tends to see technology as either utopian or dystopian, or some combination of the two. On the one hand, the marketing behind the corporate tech monopolies sees new forms of democracy with global communities bypassing the inefficiencies of government and traditional institutions, while, on the other hand new totalitarianisms emerge from mass surveillance and informatic control. Usually, the utopians conceive of technology as a tool in the service of humanity, whereas the dystopians believe that technology has - or will soon - overcome humanity. Langdon Winner reminded us already in the late 1970s that there has been a long history to the theme of out-of-control technology in political thought.[455] Perhaps accidents and catastrophes belong to this dystopia because even if technology is not completely autonomous, free from human control, Hui reminds us that reflection "always arrives too late,"[456] such as in the case of "flash crashes" in financial markets. But the lived experience of technology is most often decidedly less perfect than the visions of either utopians or dystopians. And when "things go wrong" it often feels absolutely mundane, boring, like they just *aren't working*.

Investigators found that the Uber vehicle that killed Elaine Herzberg had identified her as "an unknown object, as a vehicle, and then as a bicycle with varying expectations of future travel path"[457] prior to the collision. Although the autonomous vehicle was capable of stopping itself in normal traffic conditions, Uber had disabled the emergency braking[458] system in order to "*to reduce the potential for erratic vehicle behavior*."[459] Therefore, although the system detected Herzberg 1.3 seconds before impact and determined that an emergency stop would be necessary, it was not equipped to actually do the maneuver nor would it give any indication to the operator. The Uber vehicle's operator, Rafaela Vasquez, would have to be the one in this situation to see Herzberg and apply the brakes, but she reacted too late because she was watching an episode of *The Voice*, "Blind Auditions" from the video streaming service Hulu on her mobile phone.

On that drive, nothing was working: the emergency braking system wasn't working for reasons that weren't purely technical but because Uber chose to disable the emergency braking system; and the operator (or "Mission Specialist" in Uber's

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[455] Langdon Winner, *Autonomous Technology: Technics-Out-of-Control as a Theme in Political Thought*, 9. printing (Cambridge, Mass.: MIT Pr, 2001).

[456] Hui, "Algorithmic Catastrophe," 140.

[457] NTSB, "Preliminary Report Highway," Accident Report (USA: National Transport Safety Board, May 2018), 2, *https://www.ntsb.gov/investigations/AccidentReports/Reports/HWY18MH010-prelim.pdf*.

[458] The definition of emergency braking, as opposed to normal stopping, is a required deceleration of more than 6.5m/s^2.

[459] NTSB, "Preliminary Report Highway," 2. My emphasis.

terminology) wasn't working inasmuch as she was seeking escape and entertainment from the course of an otherwise boring job. Is this not a common refrain in the actual performance of autonomous technology? While the utopian and dystopian imaginaries have largely substituted the human with technology, the complicated or expensive bits continue to depend on human labor, although that labor is often invisible or casual. Because automated moderation systems can't filter out videos and images featuring gore and violence effectively, social media companies outsource the work to contractors in Manila.[460] When a man broadcast video of himself murdering his 11-month-old daughter on Facebook in 2017, the company quickly pledged to add 3,000 moderators.[461] Amazon pays thousands of people in Costa Rica, India, Romania, and the United States to work 9-hour shifts listening to the recordings that its Echo smart speakers make in users' homes to further train Amazon's speech recognition and language understanding.[462] All of these examples occur within a context that is ostensibly temporary - Herzberg's death happened during a period in which Uber was testing its self-driving vehicles - with the humans merely filling the gaps until the machine can effectively take over.

While there is no doubt of the will of corporations to automate the work that is currently being done by a human labor force, such as Amazon's efforts at warehouse automation, the continued presence and anticipation of accident and contingency within algorithmic system suggests that this labor won't disappear, but will be constantly redistributed to different places within these systems, where the nature of the work, removed from the privileged and wealthy, moves between the mundane and the traumatic: when content moderators were presented with a beheading, when the car struck a body, when Amazon contractors heard a sexual assault and "were told that it wasn't Amazon's job to interfere."[463] Are not call center operators subject to extraordinary abuse because they are the living, breathing, feeling edge of some otherwise inaccessible corporation? The very presence of this type of work testifies to the existence of the accident even though that work exists to preempt, manage and contain the accident, helping maintain the system's smooth and functional image.

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[460] Adrian Chen, "The Laborers Who Keep Dick Pics and Beheadings Out of Your Facebook Feed," *Wired*, October 2014, *https://www.wired.com/2014/10/content-moderation/*.

[461] Samuel Gibbs, "Facebook Live: Zuckerberg Adds 3,000 Moderators in Wake of Murders," *The Guardian*, May 2017, *https://www.theguardian.com/technology/2017/may/03/facebook-live-zuckerberg-adds-3000-moderators-murders*.

[462] Matt Day, Giles Turner, and Natalia Drozdiak, "Amazon Workers Are Listening to What You Tell Alexa," *Bloomberg*, April 2019, *https://www.bloomberg.com/news/articles/2019-04-10/is-anyone-listening-to-you-on-alexa-a-global-team-reviews-audio*.

[463] Day, Turner, and Drozdiak, "Amazon Workers Are Listening to What You Tell Alexa."

Even without considering the factor of contingency, historians of Marx have noted that with an increase in productivity, such as through automation, "entirely new branches of unproductive work were called into being, of which the banking system, the credit system, insurance empires and advertising are the most obvious examples."[464] The particular reasons for this symmetry (which was theorized for an industrial economy) between overall capitalist productivity and unproductive work is not as important for me here as the unintended consequences - the pointlessness, or accidents - of capitalist development. I should point out that the more consistent analogy from the perspective of class might, today, be programmers. Most of the jobs that I referred to above are demanding, unsustainable, and unlikely to result in a long-term career, positions that are typically occupied by people in more marginal and precarious circumstances,[465] whereas the new branches of unproductive work in the 20th century were thought to have contributed to the middle-class. Nevertheless, any discussion of automation and work ought to also consider accident and work.

Franz Kafka worked for 14 years as an official at the Workers' Accident Insurance Institute and spent a significant amount of time writing accident reports. Howard Caygill's *Kafka: In Light of the Accident*[466] reads Kafka's professional writing in order to consider how his day job contributed to the character of his fiction writing, which narrated the forces of law and chance through scenarios that extracted strangeness from the surface of the familiar. The insurance industry, observed from the inside by Kafka, reflected the dynamic between *tuchê* and *automaton*, between the "singularity of the accident experienced by its victim" and "relatively stable number of accidents befalling a given population over a given time."[467] Accidents were inevitable, necessary even. If Virilio proposes that every technology has its own accident, then Kafka's articles on safety measures, such as "Measures for Preventing Accidents from Wood-Planing Machines" are catalogues of the bodily effects (Figure 28) of those potential accidents.

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[464] Martin Nicolaus, "Proletariat and Middle Class in Marx: Hegelian Choreography and the Capitalist Dialectic," in *Class: Critical Concepts*, ed. John Scott (London ; New York: Routledge, 1996), 204.

[465] Rafaela Vasquez, for example, is a trans woman who has spent time in prison for two felonies.

[466] I want to acknowledge and thank Jan Bryant for accidentally ordering two copies of this book and gifting one to me.

[467] Howard Caygill, *Kafka: In Light of the Accident* (London: Bloomsbury Academic, 2017), 5.

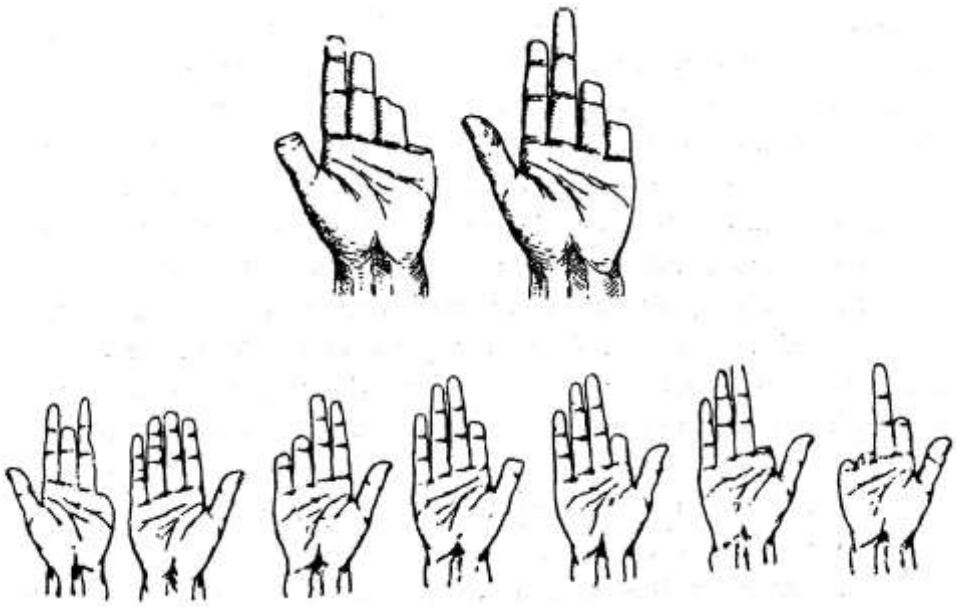

Figure 28: Permutations of finger trauma from wood-planing machines. Image originally from Kafka's 'Measures for Preventing Accidents from Wood-Planing Machines,' 1909, but found in Caygill, p. 61.

The death of Elaine Herzberg forced discussions about liability within complex human-machine-corporation systems. How responsibility and risk will be distributed across those systems has become an ongoing process, with potentially strange consequences, such as the operator of being liable for any traffic problems, even while the vehicle is in autonomous mode.[468] Efforts are naturally underway to develop a "taxonomy of autonomous vehicle handover situations"[469] in order to enumerate all the different environmental and contextual factors that would describe the split-second moment of transition from autonomous to human control. Like for Kafka, this technological development generates strange effects as the institutions attempt to accommodate it within their own language. In 1908, just 12 years after the first pedestrian was killed by an automobile, Kafka's Institute was required by the Austrian legislature to provide compulsory car insurance. In providing this directive, however, the legislature transformed the car-owner into a company by defining them as a 'firm,' launching a legal fiction with as bizarre a premise as corporate personhood.

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[468] Bogost, "Can You Sue a Robocar?"

[469] Rod McCall et al., "A Taxonomy of Autonomous Vehicle Handover Situations," *Transportation Research Part A: Policy and Practice*, June 2018, doi:10.1016/j.tra.2018.05.005.

Caygill argues that Kafka's fiction developed out of "fully immersing himself in [modernity] at one of its most sensitive points: the management of chance and the accident through the institutions of insurance."[470] His stories abound with characters who fall victim to some systemic inevitability that chances upon them, which they can neither understand nor defend themselves against. There is no pleasure in the accident, like for Montaigne, but rather a fascination. Montaigne went out for a leisurely ride during one of France's civil wars and was famously thrown from his horse after colliding with another horse. He recounted in his essay "Of practice" (1574) that, skinned, bruised, and vomiting blood, he approached death and was able to "try[] it out to some extent."[471] I make note throughout this research that Montaigne (and the essay form) methodologically appropriates the errant, but "Of practice" is the moment where the accident literally appears in the text. When he writes, "in order to get used to the idea of death, I find there is nothing like coming close to it,"[472] we must underscore that the accident physically and methodologically brings him into contact with his subject. For Montaigne, for Kafka, and for us today in a time of algorithmic contingency, the accident opens up an errant path, allowing a perspective that is otherwise unavailable. For Lacan, the *tuché* gives us an encounter with the real, a real that lurks behind the *automaton*, that insistent return of language and meaning.

But something is different. Whereas the insurance system in an industrial society considered the accident a statistical probability for some part of a population, the explanation of the individual accident was fate, God, or luck. It certainly wasn't predictable. In an algorithmic context, where unimaginable data is collected and collated and mobilized through computation operating on the scale of the planet, the assessment of risk becomes more granular. We understand ourselves as targets of drones or political campaigns, under the gaze of Cambridge Analytica.[473] We understand that we are being not simply polled, but tracked. Increasingly, when something goes wrong, it is hard to conceptualize it as merely bad luck. It feels more like a new, digital fate that is set into motion by a black box, somewhere. The Black Box, in this sense, could be the fear and awe that was once projected onto God and now displaced onto a tellurian Artificial Intelligence.

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[470] Caygill, *Kafka*, 4.

[471] Montaigne, *The Complete Essays of Montaigne*, 268.

[472] Montaigne, *The Complete Essays of Montaigne*, 272.

[473] Cambridge Analytica folded in the aftermath of a scandal involving Russian interference campaigns in Western democratic elections and Facebook and the ensuing scrutiny. The company applied data collection and analytics to political strategic communication. One key investor was Robert Mercer, the billionaire hedge-fund manager and conservative political donor, whose early career with IBM Research saw him working on a machine speech recognition and translation program before applying his statistical skills to financial investment and trading.

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